

VWorks Automation Control Software

User Guide

Original Instructions



Agilent Technologies

Notices

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Contents



VWorks Automation Control User Guide

Preface

This preface contains the following topics:

- "About this guide" on page x
- "Accessing Automation Solutions user guides" on page xi



About this guide

Who should read this guide

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

Job role	Responsibilities
Integrator	Someone who writes software and configures hardware controlled by VWorks software.
Lab manager,	Someone who is responsible for:
administrator, or technician	• Developing the applications that are run using VWorks software
	• Developing training materials and standard operating procedures for operators
Operator	Someone who performs the daily production work using VWorks software and solves routine problems.
	Your organization may choose to create its own procedures for operators including the procedures in this guide.

What this guide covers

This guide explains how to use the VWorks software. This guide does not provide procedures for setting up, operating, or troubleshooting devices using the device diagnostic software. For information on devices and how to use the diagnostic software, see the device user guide.

What is new in this revision

Feature and description	See
New method is added to the plateDB object.	"Creating a protocol: advanced topics" on page 73

Software version

This guide describes VWorks Automation Control 12.2 and later.

Related guides

This guide should be used in conjunction with the following user documents:

• *VWorks Automation Control Setup Guide*. Explains how to install the VWorks software, define labware, specify pipetting speed and accuracy, track and manage labware in storage, manage user accounts, and use VWorks ActiveX control.

- Automation Control Unit User Guide. Describes the functions of the Automation Control Unit and explains how to operate an automation system that uses the Automation Control Unit.
- Agilent lab automation system user documentation. Presents safety information, and explains how to set up, operate, maintain, and troubleshoot the lab automation system, such as the BioCel System, BenchBot Workstation, or the BenchCel Workstation.
- Agilent device user documentation. Explains how to set up and use Agilent devices.
- *Third-party device user documentation.* Explains how to set up and use third-party devices.

Related information

For information about	See
Accessing related user guides	"Accessing Automation Solutions user guides" on page xi
Reporting problems with the software	"Reporting problems" on page 661

Accessing Automation Solutions user guides

About this topic

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

Where to find user information

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

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

Accessing safety information

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

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

Using the knowledge base

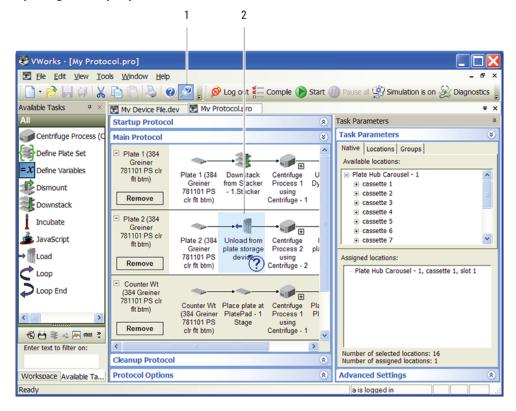
Knowledge base topics are displayed using web browser software such as Microsoft Internet Explorer and Mozilla Firefox.

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

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

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

Opening the help topic for an area in the VWorks window



To access the context-sensitive help feature:

In the main window of the VWorks software, click the help button
 The pointer changes to O. Notice that the different icons or areas are highlighted as you move the pointer over them.

2 Click an icon or area of interest. The relevant topic or document opens.

Features in the Knowledge Base window

1	2	3	4
🖁 Running a protocol - Mozilla Firefox			
File Edit View Histo y Bookmarks Tools	Help		
	ram Fills/Agient Technologies/	/Works/HelpSystem/VWorks	
			rogic 💽
应 Most Visited 🏟 Getti g Started 🔊 Latest Head			
Contents Index Search Favorites	¢ < >		<u> 8</u>
 VWorks Setup Guide VWorks User Guide Preface Works software overview 		* Ag	ilent Technologies
 Works software overvew Creating a protocol: basic procedure creating a protocol: advanced topics Running a protocol Setting parameters for I/O-handling tas 	Running a	protocol	
Setting parameters for microplate-hand	This section con	tains the following topics:	
Setting parameters for microplate stora	<u>"Workflow fo</u>	r running a protocol"	
Setting parameters for liquid-handling takes Setting parameters for scheduling tasks	<u>"Opening a p</u>	protocol"	
Specifying pipetting techniques	"Setting log	file directories"	
Maintenance and troubleshooting	"Setting gen	eral and view options"	a
BenchCel Workstation User Guide		pr-handling options"	
Bravo Platform User Guide			
Centrifuge and Loader User Guides		email notification"	
Microplate Labeler User Guide		<u>e protocol run"</u>	
PlateLoc User Guide	<u>"Managing ru</u>	<u>un sets"</u>	
Seal Piercer User Guide Vertical Pipetting Station User Guide	<u>"Monitoring</u>	the overall run progress"	
Third-party device guides	<u>"Tracking the</u>	e run progress of instances, prod	cesses,
Slossary	or devices"		
Contact Agilent Technologies	<u>"Pausing the</u>	run"	
	<u>"Stopping th</u>	e run"	
< >			*
Done			

Item Feature

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

For information about	See
Who should read this guide, what this guide covers, software version covered, and related guides	"About this guide" on page x
Reporting problems with the software	"Reporting problems" on page 661



VWorks Automation Control User Guide

1

VWorks software overview

This chapter contains the following topics:

- "VWorks software description" on page 2
- "Supported devices" on page 3
- "Relationship of VWorks components" on page 4
- "Overview of VWorks software user interface" on page 8



VWorks software description

Description

The VWorks Automation Control software (or VWorks software) manages and controls both standalone devices and integrated devices in a laboratory automation system. You use VWorks software to:

- *Set up and manage user accounts.* You can set up different user accounts to enforce access policies.
- *Define labware*. Labware definitions describe the labware you will use during protocol runs.
- *Manage inventory*. The Inventory Editor helps you track barcodes and labware as you move them into and out of storage or incubation.
- *Set up devices.* During setup, you need to add standalone or integrated devices in the software.
- *Create protocols.* Protocols determine the sequence of tasks you want to automate in a run. For example, you can use a protocol to apply barcode labels to 100 microplates.
- *Run, pause, monitor, and stop protocols.* You can start, pause, monitor, and stop a protocol run from the controlling computer.

For information about	See
VWorks software installation and setup	VWorks Automation Control Setup Guide
Defining labware and creating liquid classes	VWorks Automation Control Setup Guide
Managing and tracking labware in storage	VWorks Automation Control Setup Guide
Managing user accounts	VWorks Automation Control Setup Guide
Using VWorks ActiveX control	VWorks Automation Control Setup Guide
Device setup	Device user guide or third-party device driver user guide

Supported devices

The VWorks software manages and controls all Automation Solutions devices and a large number of third-party devices.

Automation Solutions devices

All of Automation Solutions devices can be used with the VWorks software, including:

- BenchBot Robot
- BenchCel Microplate Handling Workstation
- BioCel System
- Bravo Automated Liquid Handling Platform
- Direct Drive Robot
- Labware Stacker
- Microplate Barcode Labeler
- Microplate Centrifuge
- Microplate Seal Piercer
- PlateLoc Thermal Microplate Sealer
- Vertical Pipetting Station

Third-party devices

A large number of third-party devices can be used with the VWorks software. For a comprehensive list, go to www.agilent.com/lifesciences/automation.

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

For information about	See
Device setup	Device user guide or the third-party device driver user guide
Relationship of VWorks software components	"Relationship of VWorks components" on page 4
Introduction to the VWorks software user interface	"Overview of VWorks software user interface" on page 8
VWorks software installation and setup	VWorks Automation Control Setup Guide

Relationship of VWorks components

The VWorks software uses different components (files and databases) to run protocols. It is important to understand the way each of the components in the software relate. Changing settings or options in one component will affect one or more of the other components.

Component descriptions

The following table lists and describes the VWorks software components.

Note: The device, teachpoint, and protocol files are stored in locations you specify. Agilent Technologies recommends that you create folders within the c:\VWorks Workspace folder for storing these files.

Component	Description	Extension	Opening this component loads
Device file	 A file that contains: The list of devices the software will communicate with and control Configuration information of each device Communication settings (profile) 	.dev	 Device profile Teachpoint file (applicable to some devices such as the robot in the BioCel System and the BenchCel device)
Device profile	A collection of settings, stored in the Windows registry, that the VWorks software uses to control a specific device.	None	Teachpoint file (applicable to some devices such as the robot in the BioCel System and the BenchCel device)
Teachpoint file	A device-dependent file that contains your teachpoint settings.	.xml	Teachpoint definitions
Protocol file	A file that contains instructions for performing a run.	.pro	VWorks software (if it is not already open)Device file
Labware definition	Labware properties stored in the Windows registry.	None	Labware definitions
Liquid class	Pipetting settings, setup for different liquid types, stored in the Windows registry.	None	Liquid class information
Pipette technique	A file that specifies the x - and y - axis offset when pipetting.	.xml	Pipette x - and y -axis offset information
Hit-pick format	A file used by the Hit Pick Replication task and specifies the dispense pattern in destination microplates.	.xml	Dispense information in destination microplates

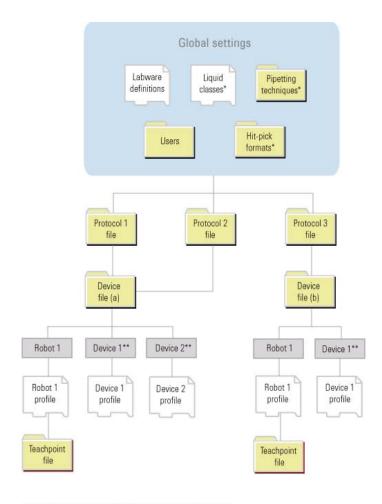
Component	Description	Extension	Opening this component loads
User information	A file that contains information about a user, including the user name, password, and account privileges.	.xml	Account information of a specific user

The following diagram summarizes the relationship of the components. Notice the following:

- Labware definitions and user information are used by all protocols. Liquid classes, pipetting techniques, and hit-pick formats are used by protocols containing liquid-handling tasks. In particular, hit-pick formats are used by the Hit Pick Replication task.
- Each protocol references a single device file that contains one or more devices.
- More than one protocol can reference the same device file.
- Each device (or robot) references a single profile.
- Some devices, such as the robot in the BioCel System and BenchCel device, reference a single teachpoint file.

1 VWorks software overview

Relationship of VWorks components



* Applicable to protocols containing liquid-handling tasks only

** Individual device, not a device type

Impact of changes to the components

The following table describes the consequences of making changes to one or more components.

If you	Then
Make a change to the teachpoint file	• All profiles that use that teachpoint file are affected
	• All device files that use those profiles are affected
	• All protocols that use those device files are affected
Create a new profile	You must specify the new profile in your device file

Relationship of VWorks components

lf you	Then
Want to use two different teachpoint files	 You must create two: Device files Profiles Teachpoint files Protocol files
Want to copy a protocol to another system or computer	 Use the File > Export command to export all components: Protocol file Device file Device profiles Labware definitions and classes Liquid classes Liquid classes Pipette techniques Hit-pick format or input files Plate map database The exported .vzp file can be imported in another computer.

For information about	See
Works software description	"VWorks software description" on page 2
VWorks software user interface	"Overview of VWorks software user interface" on page 8
Supported devices	"Supported devices" on page 3
Device setup, including creating profiles and setting teachpoints	Device user guide or the third-party device driver user guide
VWorks software installation and setup	VWorks Automation Control Setup Guide
Defining labware and creating liquid classes	VWorks Automation Control Setup Guide
Managing and tracking labware in storage	VWorks Automation Control Setup Guide
Managing user accounts	VWorks Automation Control Setup Guide
Using VWorks ActiveX control	VWorks Automation Control Setup Guide
Exporting protocols and associated components	"Exporting and importing protocols and associated components" on page 626

Overview of VWorks software user interface

The VWorks software user interface consists of menus and menu commands, toolbars, tabbed areas, and a status bar. The content of each of these items can change depending on whether you are viewing a device file or protocol file.

Basic terminology

The following diagram shows the basic VWorks software user interface elements.

1	·	😻 VWorks - [Serial Dil	ution.pro]	
2		🛃 Ele Edit View Too	ols <u>W</u> indow <u>H</u> elp	_ 8 ×
3		🗋 • 🖻 🗔 🛱 🐰	🗈 🖺 🍓 🕢 🍠 🚦 🔗 Log out 🚰 Compie 🌔 Sta	art 🕕 Pause al 🕵 Simulation is on 🔬 Diagnostics
		Available Tasks $\qquad ^{\oplus} \times$	😢 Device File - 1 * 😰 Serial Dilution.pro	₹ ×
		All	Startup Protocol (*)	Task Parameters P
		Define Plate Set	Main Protocol 🔹	Task Parameters 😵
		= X Define Variables	Source (384	21
			Greiner	Plate identity
		Deld	781101 PS clr Source (384 Downstack Liquid	Plate name: Source
		Dismount	Greiner from Handling 781101 PS BenchCel - using Bravo	Plate type: 384 Greiner 781101 PS
		Downstack	Remove cir fit btm) 1.Stacker 1 1	Plates have lids:
4		~		Plates enter the syste
а.		Incubate	□ Destination (384 Greiner →) →) →) →	Process control
		JavaScript	781101 PS clr Destination Downsteek	Simultaneous plates: 1
			(384 Greiner from Handling	Use single instance of
		· · · · · · · · · · · · · · · · · · ·	Remove 781101 PS BenchCel - using Bravo clr fit btm) 1.Stacker 2 1	Automatically update
		🕲 🛗 🕸 🛰 🚾 📾 🎽		Enable timed release:
		Enter text to filter on:	٢	Release time: 0:00:30
			Cleanup Protocol	
		Workspace Available Ta	Protocol Options (*)	Advanced Settings
		Main Log		₽ ×
		Timestamp	Class Description	^
		12/11/2008 10:54:29 AM	↓ Info File saved	
5		12/11/2008 11:05:20 AM	Unfo Opening diagnostics	
U		12/11/2008 11:05:48 AM	Unfo Closina diagnostics	>
		Main Log Pipette Log Tim	e Constraints Log Progress Runset Manager	
6		Ready		a is logged in

ltem	Terminology	Description
1	Title bar	Displays the name of the window.
2	Menus	Lists menu commands.
3	Toolbars	Displays button commands.
4	Work area	Displays either device files or protocols.
5	Log and progress area	Displays the Main Log, Pipette Log, Time Constraint Log, Progress, and Runset Manager. You use these tabs primarily to set up multiple protocol runs in a sequence and monitor various aspects of the run.
6	Status bar	Displays the state of the software.

Device file terminology

To display device file information, click the tab that displays the name of the device file. The following diagram shows the device file user-interface terminology. In the example, the device file name is Device File - 1.

1 Structure File - 1 Ele Edit Vew Tools Windo C + P I + Vew Tools Windo	2 W Help	Start 11 Pause al	3 - ♂ × ② Simulation is on ⅔ Diagnostics
Available Devices 4	× 🛃 Device File - 1 * 🛃 Serial Dilution.pro		₹ ×
3-Axis Robot	Devices	<u>:</u>	
APCUPS	BenchCel	🗉 Bravo Properti	ies
	E-S Bravo Pipettor	Name	Bravo - 1
	🕒 🔊 Bravo - 1	Profile	080828_96LT_series_II
Bio-Tek Washer Bravo Pipettor Cavro Pump Network Centrfuge	Initialize all devices		
Centrifuge Loader	Initialize selected devices	1	
	> Close selected devices		
Enter text to filter on:	Delete selected devices		
Workspace Available Devices	Device diagnostics		
Main Log			₽ ×
Timestamp Class Des	cription		^
12/11/2008 10:54:29 AM 🕠 Info File	saved		
12/11/2008 11:05:20 AM 🔅 Info Ope	ening diagnostics		
12/11/2008 11:05:48 AM 🛈 Info Clos	sina diaanostics		>
Main Log Pipette Log Time Constrain	ts Log Progress Runset Manager		
Ready		a is l	ogged in

ltem	Terminology	Description
1	Available Devices area	Displays the following tabs: • Available Devices. The list of devices
		you can add to the device file.
		• <i>Workspace</i> . The list of protocols and devices that are currently open.
2	Device file area	Displays the list of devices that are added to the device file.
		The area also allows you to:
		• Initialize all devices.
		• Initialize selected devices.
		Close selected devices.
		• Delete selected devices.
		• Open the diagnostics software of the selected device.
3	Device properties area	Displays the properties you can set for the selected device.

Protocol terminology

To display the protocol information, click the tab that displays the name of the protocol. The following diagram shows the protocol user-interface terminology. In the example, the protocol name is Serial Dilution.

1		2				3	
🐯 VWorks - [Serial Dil	lution.prol						
Ele Edit View To							
				Countr (R		1	
🔲 • 🖻 🖯 🖓 🗡		121		Compile 🕑) Sta	art 🕕 Pause al 🕵 Simulatio	In is on 22 Diagnostics
Available Tasks # ×	🗒 Device File - 1 *	🚼 Serial Diluti	on.pro				₹ ×
All	Startup Protocol				۲	Task Parameters	¢
Define Plate Set	Main Protocol				۲	Task Parameters	۲
= x Define Variables	Source (384		~	~	^	11 2 L	
	Greiner			→ <u>®</u> ⊞		Plate identity	
Delid Delid	781101 PS clr fit btm)	Source (384	Downstack	Liquid		Plate name: Sou	Jrce
Dismount	in burry	Greiner 781101 PS	from BenchCel -	Handling using Bravo -		Plate type: 384	4 Greiner 781101 PS
Downstack	Remove	clr fit btm)	1.Stacker 1	1	н	Plates have lids:	
Downstack						Plates enter the syste	
Incubate	 Destination (384 Greiner 			→ 1 =		Process control	
JavaScript	781101 PS clr	Destination	Downstack	Liquid	-	Simultaneous plates: 1	
	fit btm)	(384 Greiner	from	Handling		Use single instance of	
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Main Log Pipette Log Tim	e Constraints Log	Proaress Runs	et Manader				
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ltem	Terminology	Description
1	Available Tasks area	Displays the following tabs:
		• <i>Available Tasks.</i> The list of tasks you can add to a protocol. The list of tasks can vary, depending on the devices added in the device file and the process or subprocess selected.
		<i>Note:</i> You can use the filter buttons beneath the tasks to display only the tasks in a selected category.
		• <i>Workspace</i> . The list of protocols and devices that are currently open.

Overview of VWorks software user interface

ltem	Terminology	Description				
2	Protocol area	Displays the following:				
		• <i>Startup Protocol.</i> Contains tasks that must be run before the main protocol starts.				
		• <i>Main Protocol.</i> Contains tasks of the protocol.				
		• <i>Cleanup Protocol.</i> Contains tasks that must be run after the main protocol finishes.				
		• <i>Protocol Options.</i> References the device file and contains additional information associated with the protocol.				
3 Ta	Task Parameters area	Displays one or more of the following, depending on the task selected:				
		• <i>Task Parameters.</i> Contains parameters associated with the selected process plate or task.				
		• <i>Custom Parameters.</i> Allows you to create variables to be used by the selected task. Might also contain parameters or options associated with the task.				
		• <i>Device Selection.</i> Contains the list of devices that will perform the selected task. Also allows you to set up a pool of devices for the same task to increase throughput and backup devices in case the primary devices are in an error state.				
		• Advanced Settings. Allows you to add JavaScript to change the task parameters or pass information to and from an external database during a protocol run.				

For information about	See
Works software description	"VWorks software description" on page 2
Quick reference of menu and toolbar commands	"Quick reference" on page 663
Supported devices	"Supported devices" on page 3
Agilent Technologies devices	Agilent Technologies device user guide

1 VWorks software overview

Overview of VWorks software user interface

For information about	See
Third-party devices	Third-party device user guide and the corresponding device driver user guide
VWorks software installation and setup	VWorks Automation Control Setup Guide
Defining labware and creating liquid classes	VWorks Automation Control Setup Guide
Managing and tracking labware in storage	VWorks Automation Control Setup Guide
Managing user accounts	VWorks Automation Control Setup Guide
Using VWorks ActiveX control	VWorks Automation Control Setup Guide



VWorks Automation Control User Guide

2

Creating a protocol: basic procedure

Read this chapter if you are an administrator or technician who writes protocols.

This chapter contains the following topics:

- "About protocols, processes, and tasks" on page 14
- "Workflow for creating a basic protocol" on page 18
- "Preparing for protocol writing" on page 19
- "Logging in, logging out, and changing passwords" on page 22
- "Adding devices" on page 25
- "Creating a new protocol" on page 29
- "Setting protocol options" on page 30
- "Adding an alarm" on page 37
- "Configuring labware" on page 40
- "Adding processes" on page 44
- "Setting plate parameters" on page 46
- "Adding and deleting tasks" on page 53
- "Specifying time constraints between dependent tasks" on page 57
- "Setting up Startup and Cleanup Protocol processes" on page 60
- "Saving the protocol" on page 61
- "Opening a plugin" on page 62
- "Compiling the protocol" on page 63
- "Simulating the protocol run" on page 64
- "Printing protocols" on page 70

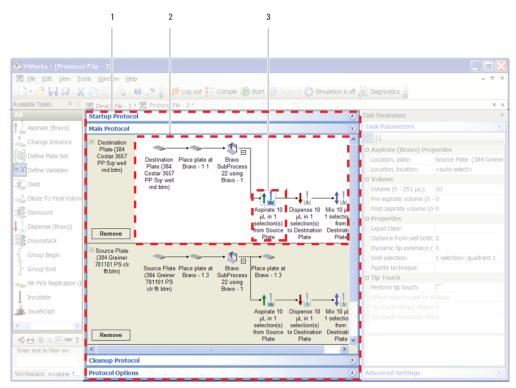
For details on using macros to help create your protocols, see "Using macros to create protocols" on page 133.



About protocols, processes, and tasks

Concept overview

The VWorks software enables you to create protocols to specify the laboratory tasks to automate. A protocol (1) consists of one or more processes (2). Each process consists of one or more tasks (3).



Protocols

A protocol is a schedule of tasks to be performed by a standalone device or devices integrated in the lab automation system. The purpose of a protocol is to process or perform tasks on labware.

Protocols appear in the Protocol area of the VWorks window. The following example shows a protocol called Serial Dilution3 displayed in the VWorks window.

2 Creating a protocol: basic procedure

About protocols, processes, and tasks

😻 VWorks - [Serial D	Dilution3.pro]							
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Define Plate Set	Main Protocol			۲	Task Parameters			۲
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7/10/2008 2:47:48 PM	↓ Info						Moved task	witi 🗸
<								>
Logs user out					administrator is log	aed in		

Processes

A process is a sequence of tasks that are performed on a particular labware or a group of labware. A process is represented by a lane with white background in the Protocol area.

Main Protocol						8
Source Plate	Source Plate Bravo (384 Costar Proce 3657 PP Sqr using E well rnd btm) 1	ess 2	t	t⊥		
Remove		Set head mode to All barrels	Tips On in 1 selection(s) from 5	Aspirate 10 µL in 1 selection(s) from 1	Dispense 10 µL in 1 selection(s) from 3	Tips Off in 1 selection(s) from 6

Each process lane starts with a microplate icon. The icon typically represents the labware or group of labware that you are processing. The labware is called the process plate.

In the previous example, the process plate is called Source Plate and is associated with a specific labware type (the type is defined in the Labware Editor). The process contains a sequence of tasks for processing the Source Plate: Set head mode, Tips On, Aspirate, Dispense, and Tips Off. (For a description of the tasks, see "Setting parameters for liquid-handling tasks" on page 387.)

A process lane can also be used as a control to initiate other processes in the protocol. In this case, the microplate icon at the beginning of the process lane is not associated with any labware.

In the following example, the process lane named Control is used to initiate other processes in the protocol. Notice that the protocol can contain more than one process.

The example also shows a lane with gray background. The gray lane displays activities of configured labware. For more information about configured labware, see "Configuring labware" on page 40.

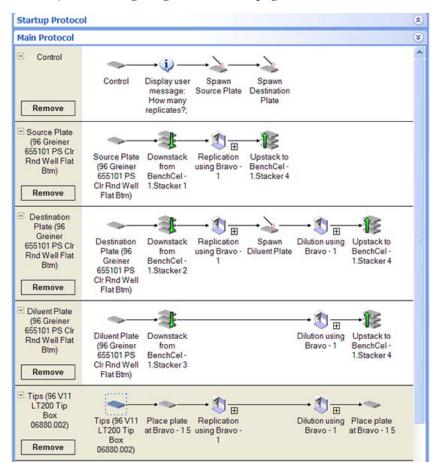


Plate instances

When a process plate icon represents a group of labware, each labware in the group is called a plate instance. Using the previous example, if you have 10 microplates that need to be processed as the Source Plate, then microplate 1 is Source Plate instance 1, microplate 2 is Source Plate instance 2, microplate 3 is Source Plate instance 3, and so on.

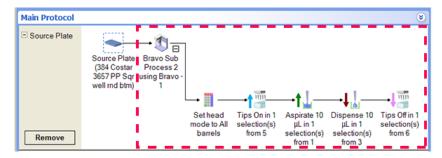
IMPORTANT All labware represented by a process plate must be the same labware type.

Subprocesses

A subprocess is a sequence of tasks performed as a subroutine within a protocol. A subprocess is performed by a single device type, such as the Bravo device.

IMPORTANT Within a given protocol, ensure that any main process and subprocess do not share the same name.

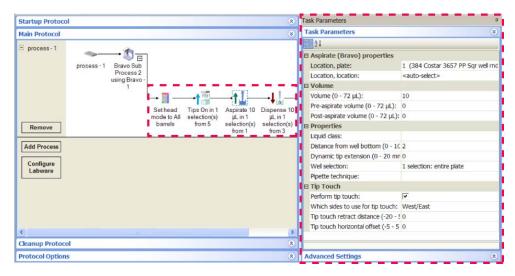
Subprocesses are represented by a subprocess icon in the protocol. You can expand or collapse the subprocess to show or hide the subprocess tasks. In the following example, the Bravo Subprocess is expanded to show the following tasks: Set Head Mode, Tips On, Aspirate, Dispense, and Tips Off. (For a description of the tasks, see "Setting parameters for liquid-handling tasks" on page 387.)



Tasks

A task is an operation performed on one or more labware, and is represented by an icon in the protocol. It has associated parameters that are set in the Task Parameters area.

In the following example, the tasks in the Bravo subprocess are highlighted. Notice that the Aspirate task is selected, and the parameters for the Aspirate task are displayed in the Task Parameters area on the right.



For information about	See
Defining labware	VWorks Automation Control Setup Guide

Workflow for creating a basic protocol

For information about	See
Preparing for protocol writing	"Preparing for protocol writing" on page 19
Workflow for creating basic protocol	"Workflow for creating a basic protocol" on page 18
Configuring labware	"Configuring labware" on page 40
Using advanced features	"Creating a protocol: advanced topics" on page 73

Workflow for creating a basic protocol

The following table presents the workflow for creating a protocol.

Step	For this task	See
1	Prepare for protocol writing.	"Preparing for protocol writing" on page 19
2	Log in to the VWorks software.	"Logging in, logging out, and changing passwords" on page 22
3	Add devices and create a profile for each device.	"Adding devices" on page 25
4	Create a protocol.	"Creating a new protocol" on page 29
5	Set protocol options.	"Setting protocol options" on page 30
6	Add an alarm.	"Adding an alarm" on page 37
7	Configure labware.	"Configuring labware" on page 40
8	Adding processes.	"Adding processes" on page 44
9	Set plate properties.	"Setting plate parameters" on page 46
10	Add tasks.	"Adding and deleting tasks" on page 53
		To use macros for commonly used task sequences, see "About protocol macros and the macro library" on page 134.
11	<i>Optional.</i> Set up startup and cleanup protocols.	"Setting up Startup and Cleanup Protocol processes" on page 60
12	Save the protocol.	"Saving the protocol" on page 61

Preparing for protocol writing

Step	For this task	See
13	Compile the protocol.	"Compiling the protocol" on page 63
14	Simulate the protocol run.	"Simulating the protocol run" on page 64
15	Optional. Print the protocol.	"Printing protocols" on page 70

Related information

For information about	See
Creating a simplified interface for operators to use	"Creating protocol forms for operators" on page 153
Protocols, processes, and tasks	"About protocols, processes, and tasks" on page 14
Using advanced features	"Creating a protocol: advanced topics" on page 73

Preparing for protocol writing

Before you create a protocol, determine the following:

• The devices and accessories you need for the protocol.

A device is a robot, instrument, or location in the lab automation system that can hold a piece of labware. For more information, see "Adding devices" on page 25.

An accessory is an option that can be added to a robot, instrument, or location to enhance existing functions and facilitate operation (for example, an Auto Filling Reservoir).

- The labware that will be used or processed during the protocol run and their starting and ending locations.
- Whether the macro library contains any task sequences that you can use. For details on using macros, see "Using macros to create protocols" on page 133.

This topic explains how you plan for and specify the different devices, accessories, and labware in a protocol and the terminology that is used.

Planning device and accessory use

When planning for devices and accessories:

• Determine the devices and accessories you will need in the protocol.

• Determine the locations of the accessories on devices such as the Bravo Platform or the Vertical Pipetting Station. You do this when you configure the accessory in the diagnostics software. For instructions, see the device user guide.

IMPORTANT Accessory locations are displayed in the diagnostics Configuration tab only. You need to remember their locations when configuring labware in the protocol.

Note: Devices and accessories stay at the same location throughout a protocol run.

For the list of available devices and accessories you can use in the lab automation system, see the device user guide or the Agilent Technologies website at www.agilent.com/lifesciences/automation.

Planning labware use

In a lab automation system, labware can either:

- Transfer into and out of the system for processing.
- Start and stay in the system during the entire protocol run.

When you plan a protocol, you should determine how the labware will be used or processed and how they will move in the system. For example, if you are writing a microplate replication protocol, you need to decide whether the source microplates or destination microplates will be moved into the system while the other will remain stationary in the system. The decision can depend on many factors, including your preferences.

In the VWorks software, labware can be categorized as follows:

- Process plates
- Configured labware
- Static labware

Process plates

A process plate is a labware that:

- Is transferred into the system automatically or manually during the protocol run.
- Is the object of one or more tasks in the protocol run.
- Might move to different locations during the run.
- Is transferred out of the system automatically or manually during the protocol run.

For more information about process plates, see "About protocols, processes, and tasks" on page 14. To create a protocol process, see "Workflow for creating a basic protocol" on page 18.

Configured labware

A configured labware is a labware that:

- Starts at a location on a device.
- Is used by one or more tasks in the protocol process.
- Might move to different locations during the run.
- Returns to the original location after the protocol run is finished.

For the Bravo Platform, configured labware represents the single physical labware on the deck, such as a tip box. For example, if you are using two different tip boxes in a protocol, you would configure two labware in the software, one for each tip box on the deck.

Like accessories, you must let the software know the labware's starting location. To do this, see "Configuring labware" on page 40.

Configured labware is displayed in a protocol with a gray background. If it is used by a task in a Bravo sub-process, a copy of the sub-process tasks are shown next to the configured labware. You cannot add or remove tasks in the duplicated process. However, whenever the sub-process is updated, the duplicate copy is also updated automatically.

You have the option of converting a configured labware into a process plate. For instructions, see "Configuring labware" on page 40.

Static labware

IMPORTANT The latest version of the VWorks software is backwardcompatible with Bravo Platform protocols created in VWorks4 version 6.2.3 or earlier and will continue to support static labware configuration procedures. However, Agilent Technologies recommends that you use the configured labware when writing new protocols.

A static labware is a labware that will start on the Bravo deck and will remain at the same location during the protocol run. For example, a tip box can be a static labware.

To specify its starting location, you must configure the static labware using one of the following methods:

- The Bravo Sub-Process task in a Main Protocol
- The Configure Static Labware task in the Startup Protocol
- In general, you configure static labware before the first task in a protocol. If you have multiple processes in the protocol, configure the labware once before the first task of the first process.

Configure static labware in a Startup Protocol if it will be used in all the Main Protocol subprocesses. Configure static labware in the Main Protocol subprocess if you want to override the labware configuration in the Startup Protocol.

For information about	See
Protocols, processes, and tasks	"About protocols, processes, and tasks" on page 14
Workflow for creating a basic protocol	"Workflow for creating a basic protocol" on page 18
Using advanced features	"Creating a protocol: advanced topics" on page 73
Using macros to expedite protocol writing	"Using macros to create protocols" on page 133
Creating a custom interface for the operator who runs the protocol	"Creating protocol forms for operators" on page 153

Logging in, logging out, and changing passwords

About this topic

To create, modify, or run a protocol, you must first log in. Contact your lab manager or administrator to set up a user account or to find out your access privileges. If you are an administrator, see the *VWorks Automation Control Setup Guide* for instructions on setting up user accounts.

This topic explains the following:

- "Logging in" on page 22
- "Logging out" on page 24
- "Changing passwords" on page 24

Logging in

To log in VWorks software:

1 Start VWorks software. To do this, double-click the VWorks icon on the Windows desktop.



2 In the VWorks window that opens, click **Log** in on the toolbar.

😻 VWorks						
<u>File View</u>	Tools	Help				
	1 61	XDBB	0,3	🔑 Log in 🎦 Comple	Start D Pause	al 🏠 Simulation is off 🔬 Diagnostic

The User Authentication dialog box opens.



3 Type your VWorks user name and password, and then click **OK**. (If no user account is set up, contact the administrator.)

In the VWorks window, the Log in button changes to Log out. In addition, the status bar indicates that the login is successful.

Logging in, logging out, and changing passwords

😻 VWorks	
Ele View Iools Help	Comple 🌔 Start 🕕 Pause al 🛞 Simulation is on 🎉 Diagnostics
Available Devices • ×	
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H BioCel I/O Interface	
Silo-Tek Washer Bravo Pipettor	
Cavro Pump Network	
Centrifuge	
Centrfuge Loader	
Enter text to filter on:	
Workspace Available Devices	
Ready	administrator is logged in

Logging in, logging out, and changing passwords

Logging out

To log out of VWorks software:

In the **VWorks** window, click **Log out** on the toolbar.



Changing passwords

You can change your password if you have administrator or technician privileges. If you have an operator or guest user account, you must contact the administrator to change your password.

To change your password:

1 In the **VWorks** window, select **Tools > User Management**. If you have administrator privileges, the User Editor dialog box opens.

User Editor			2		
Please select the users you wish to edit:	<u>:</u> 2↓				
eoit.	User information				
administrator Edna	First name:				
eliu	Last name:				
Guest	Email address:				
Operator Technician	User security				
	Security level:	Guest			
	Password can expire:	<u>v</u>			
	Password expiration date:	1/6/2009			
	Automatically logout after period of inactivity:	<u>v</u>			
	Period of inactivity before automatically logging c 30				
	🗉 Miscellaneous				
	Account disabled:				
	Number of failed login attempts:	0			
Create new user	1				
Create copy of user					
Update selected user					
		Set password	Reset failed login count		

If you have technician privileges, the User Management dialog box opens.

User Management	
21	
User information	
First name:	
Last name:	
Email address:	
User security	
Security level:	Technician
	Save changes
	Change password

2 Click **Set Password**. If you have technician privileges, click **Change Password**. The Set Password or Change Password dialog box opens.

Set Password	
New password:	
Confirm new password:	Cancel

3 Type the new password in the **New password** and **Confirm new password** boxes, and then click **OK**. A message appears and lets you know that the password was successfully changed.

Related information

For information about	See
Setting up and managing user accounts	VWorks Automation Control Setup Guide
Workflow for running a protocol	"Workflow for running a protocol" on page 210
Creating a new protocol	"Creating a protocol: basic procedure" on page 13

Adding devices

About devices

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

- The robot in the BioCel System
- PlateLoc Sealer
- Microplate Labeler
- Labware Stacker
- Platepad
- A third-party device integrated in the lab automation system

About device files

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

· List of devices the software will communicate with and control

- Device type of each device (for example, the robot in the lab automation system, PlateLoc Sealer, and any integrated device)
- Configuration information of each device (for example, approach height, allowed or prohibited labware, barcode reader access, and so on)
- The communication settings (profile) needed for communication between the devices and the VWorks software

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

Creating a device file

To create a device file:

- 1 In the VWorks window, select File > New > Device. A Device File tab appears.
- 2 Select File > Save to save the device file. The file name appears in the Device File tab.

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Centrifuge	Initialize all devices	•	
Centrifuge Loader	Initialize selected devices		
< >	Close selected devices		
Enter text to filter on:	Delete selected devices		
Workspace Available Dev	Device diagnostics		

Adding devices to the device file

To add a device to the device file:

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

If you do not see the device in the **Available Devices** list, check that the device plugin file is stored in the ...\Agilent Technologies\VWorks\Plugins folder.

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

In the following example, the Bravo Pipettor device type is added. Notice that the first Bravo device is labeled Bravo-1. If you add another Bravo device, it will appear as Bravo-2 under the Bravo Pipettor.

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	Device File - 1 *		₹ X
3-Axis Robot	Devices	¥1 21	
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W BenchCel	•	Profile	080828_96LT_series_II
BioCel I/O Interface	BioCel I/O Interface		
Bio-Tek Washer			
Bravo Pipettor	•		
Cavro Pump Network			
Centrifuge	Initialize all devices		
Centrifuge Loader	Initialize selected devices		
<	Close selected devices		
Enter text to filter on:	Delete selected devices		
Workspace Available Dev	Device diagnostics		

2 Type a name for the device and set the device properties. For detailed description of the properties, see the device user guide.

In the following example, Bravo-1 is the default name of the Bravo Pipettor device. The only property shown is the profile selection.

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Available Devices 4 ×	Device File - 1 *		¥)
3-Axis Robot	Devices	<u>:</u> ≣ 2↓	
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BioCel I/O Interface			
Bio-Tek Washer			
Bravo Pipettor			
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Enter text to filter on:	Delete selected devices		
Workspace Available Dev	Device diagnostics		

- **3** Create a profile for the device:
 - **a** Select the device in the **Devices** list.
 - **b** Click **Device diagnostics**.

Adding devices

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Centrifuge Loader	Initialize selected devices		
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Enter text to filter on:	Delete selected devices		
Workspace Available Dev	Device diagnostics		

- **c** In the device diagnostics dialog box, name the profile, select the connection type (Ethernet or serial), and locate and connect to the device in the Discovered Bionet Devices dialog box (Ethernet connections only).
- **d** For devices such as the Bravo Platform and the Vertical Pipetting Station, set the teachpoints.

For detailed instructions on creating device profiles and setting teachpoints, see the device user guide.

- **4** Select the profile in the device properties area.
- 5 Select File > Save to save the device file. The file name appears in the Device File tab.
- 6 Repeat steps 1 through 5 to add other devices.
- 7 In the **Device File** area, click **Initialize all devices** to establish communication with the devices.
- 8 If you are adding devices to the BenchCel Workstation or the BioCel System, enable the robot to move to the correct locations during a protocol run as follows:
 - **a** In the BenchCel or the BioCel robot diagnostics dialog box, set teachpoints at each device or location. Save and reference the teachpoint file in the diagnostics dialog box.

For detailed instructions, see the *BenchCel Microplate Handling Workstation User Guide* or the *BioCel System User Guide*.

b In the VWorks window, select each of the devices in the device file, and select the correct robot teachpoint in the device properties area.

The following example shows a device file for a BioCel System. To ensure that the BioCel robot will move correctly to and from Platepad - 1, **Platepad - 1 Stage** is selected in the **Device File** area, and the defined teachpoint called Plate Pad 1 is selected in the **PlatePad Stage** Location Properties area.

Creating a new protocol

😻 VWorks - [Device File	- 1]		
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Available Devices 4 ×	E Device File - 1 *		. >
3-Axis Robot	Devices	21	
UPS APCUPS	🖻 📲 3-Axis Robot	PlatePad Stage Location Proper	rties
	BioCel Robot	Approach height (mm)	9
J BenchCel	PlatePad - 1	Allowed/prohibited labware	
BioCel I/O Interface	> Stage	BCR on south side	<no bar="" code="" device=""></no>
-	PlatePad - 2 Stacker (3)	BCR on west side	<no bar="" code="" device=""></no>
Bio-Tek Washer	Stacker (3)	BCR on north side	<no bar="" code="" device=""></no>
Bravo Pipettor	Stacker - 2	SCR on east side	<no bar="" code="" device=""></no>
Cavro Pump Network	Stacker - 3 Plate Hub Carousel	Teachpoint for robot BioCel Robot	Plate Pad 1
	Plate Hub Carousel - 1		
Centrifuge	🖃 📓 PlateLoc		
Centrifuge Loader	🕖 🛃 PlateLoc - 1		
	 Centrifuge Centrifuge - 1 		
DPC MicroMix 5			
FlexDrop Dispenser	Initialize all devices		
S Flexispense	Initialize selected devices		
		Teachpoint for robot BioCel Robo	ot
Enter text to filter on:	Close selected devices		
enter text to inter on:	Delete selected devices		
Workspace Available Dev	Device diagnostics		

- 9 Select File > Save to save the changes.
- **10** In the Device File area, click Initialize all devices.

Disabling devices in a device file

You can temporarily disable a device in a device file to run protocols using only a subset of devices or during troubleshooting.

For more information see, "Disabling and enabling a device in the device file" on page 215.

Related information

For information about	See
Device-specific properties	Device user guide
Creating a new protocol	"Workflow for creating a basic protocol" on page 18

Creating a new protocol

Procedure

To create a new protocol: Select **File > New > Protocol**. A Protocol File tab appears.

Setting protocol options

😻 VWorks - [Protoco	l File - 1]				
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Available Tasks 🛛 🌣 🗵	MyDeviceFile.dev 🔀 Protocol File - 1 *				₹×
All	Startup Protocol (*)	Tas	k Parameters		¢
Define Plate Set	Main Protocol 😵	Ta	ask Parameters		*
= X Define Variables	process - 1		2↓		
	S process · 1		Plate identity		
Deld	Remove process - 1		Plate name:	process - 1	
Dismount		0	Plate type:		
Downstack	Add Process		Plates have lids:		
8	Configure		Plates enter the system	Г	_
Incubate	Labware		Process control		
JavaScript			Simultaneous plates:		
-		0	Use single instance of		
CLOOP			Automatically update I		
Loop End		1	Enable timed release:	Г	
			Release time:	0:00:30	
< < > >		∎	Barcode informatio	n	
\$ ₩ ₹ * ₩ **			Barcode filename:	No Selection	
Enter text to filter on:			Has header:		-
	Cleanup Protocol				
Workspace Available T	Protocol Options	A	dvanced Settings		۲

Related information

For information about	See
Setting protocol options	"Setting protocol options" on page 30
Adding tasks	"Adding and deleting tasks" on page 53
Setting up startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60
Using advanced protocol features	"Creating a protocol: advanced topics" on page 73

Setting protocol options

When you create a protocol, you need to specify which device file to use with the protocol. Optionally, you can specify additional information to associate with your protocol.

This topic explains the following:

- "Specifying the device file for a protocol" on page 30
- * "Adding information about the protocol" on page 31
- "Specifying protocol rules" on page 34

Specifying the device file for a protocol

To specify the device file:

1 In the Protocol area, click **Protocol Options** to view the properties.

Main Protocol	
Cleanup Protocol	
Protocol Options	
Protocol Options Measurement Manager	
Properties	
Device file path:	C:\VWorks Workspace\Device Files\M
Form to use:	
Automatically load form file:	v
Protocol alas:	
Description:	
Notes:	
Display user task descriptions:	v
Bar code file directory:	
Use global context for this protocol:	
Startup Script:	
Finish Script:	()
Delete hit pick output files:	
Auto-Export Gantt Chart:	
Clear inventory:	
Import inventory:	
Inventory file:	

- **2** Click the field adjacent to **Device file path**, and then click the **____** button that appears. The Open dialog box opens.
- **3** Locate and select the correct device (.dev) file, and then click **Open**. The path of the device file appears in the Device file path box.

Adding information about the protocol

You can add information about your protocol. For example, you can provide a description and some notes about the protocol.

To add information about the protocol:

In the Protocol Options area, type the following information:

Setting protocol options

Startup Protocol			
Main Protocol			
Cleanup Protocol	*		
Protocol Options	8		
Protocol Options Measurement Manager			
<u>21</u> 21			
Properties	-		
Device file path: Form to use:	C:\VWorks Workspace\Device Files\MySy		
Automatically load form file:	V		
Protocol alias:			
Description:	1		
Notes:			
Display user task descriptions:	V		
Bar code file directory:			
Use global context for this protocol:	D		
Startup Script:			
Finish Script:			
Delete hit pick output files:	N		
Auto-Export Gantt Chart:	D 1		
Clear inventory:	- N		
Import inventory:	N		
Inventory file:			

Optional protocol information	Description
Form to use	The option that specifies a VWorks form for operators to use as the graphical interface to run a protocol. For details on how to create forms and specify which form to use, see "Creating protocol forms for operators" on page 153.
Automatically load form file	The option that opens the form that is specified in the Form to use field anytime the corresponding protocol is opened.
Protocol alias	Another name for the protocol. The alias is displayed in the software, but the protocol file name is not changed.
Description	A brief description of the protocol.
Notes	Special notes about the protocol.
Display user task descriptions	The option to display the task description (or task label) that you provide instead of the default task label. The label is displayed under the task icon in the protocol.

Optional protocol information	Description
Bar code file directory	The location of the files that contain the barcodes you want to track in the software. The list of files in this folder will be available in the Plate Properties area. For details, see "Setting plate parameters" on page 46 and "Tracking barcodes" on page 74.
Use global context for this protocol	The option that permits variables to be available across all protocols that also use the global context for variables.
	CAUTION Variables with the same name in other protocols, which also use the global context, will interfere with each other. Always make sure the variable values you want to use globally are applicable to the other protocols that use the global context.
Startup script	The JavaScript code you want to run before the Startup or Main Protocol begins.
Finish script	The JavaScript code you want to run after the Main or Cleanup Protocol finishes.
Delete hit pick output files	The option to delete hit-pick output files after the protocol run finishes.
Auto-export Gantt Chart	The option to automatically export the Gantt Chart after the protocol run is finished. The exported file is stored in C:\VWorks Workspace\VWorks\Logs\.
Clear inventory	The option to automatically clear the labware information from the inventory database at the start of the protocol run. <i>Note:</i> Plate and location group information are retained.
Import inventory	The option to automatically import and use the specified inventory file when starting the protocol run. You specify the inventory file to import in the Inventory file box.

Setting protocol options

Optional protocol information	Description	
Inventory file	The inventory file you want to import an use when starting the protocol run.	
	1 Click the Inventory file box, and then click the browse button that appears.	
	2 Locate and select the desired inventory (SQL) file.	
	<i>Note:</i> This box is only active if you selected Import inventory .	
	IMPORTANT Make sure you import the most current inventory file. Importing an out-of-date inventory file can cause protocol runs to abort.	

Specifying protocol rules

You can specify certain actions to occur before or after the protocol run.

To specify the protocol rules:

In the **Protocol Options** area, specify the following rules:

- Allow this protocol to execute while other protocols are running
- Automatically load stacker racks
- Automatically release stacker racks
- Dynamically assign empty slot to load to storage device
- Handle plate in instance order
- Pipette plates in instance order

Startup Protocol		۲
Main Protocol		۲
Cleanup Protocol		۲
Protocol Options		۲
Protocol Options Measurement Manager		
Bar code file directory: Use global context for this protocol: Startup Script: Finish Script: Delete hit pick output files: Auto-Export Gantt Chart: Clear inventory: Import inventory: Import inventory: Inventory file: Protocol Rules Allow this protocol to execute while	♥ □ □ V When the main protocol starts	*
Dynamically assign empty slot to load Handle plates in instance order:	<u>()</u>	

Allow this protocol to execute while other protocols are running

This rule allows you to specify the following:

• Select the check box (default). Enables the Runset Manager to run the protocol simultaneously with another protocol.

IMPORTANT Simultaneously running protocols must specify the same static or configured labware.

• *Clear the check box.* Prevents the protocol from running simultaneously with another protocol.

Automatically load stacker racks

Select the **Automatically load stacker racks** rule to require that all racks on stacking devices (such as the BenchCel Microplate Handler and the Labware Stacker) be automatically loaded before either one of the following starts:

- Startup Protocol
- Main Protocol

Automatically release stacker racks

Select the **Automatically release stacker racks** rule to require that all racks on stacking devices (such as the BenchCel Microplate Handler and the Labware Stacker) be automatically released after the protocol finishes.

Dynamically assign empty slot to load to storage device

Select the rule to have the software assign slots in the storage device according to what is available at that moment. Under this rule, labware can be placed in different locations (not grouped together).

Clear the check box if you want to store labware consecutively in the same carousel or stacker.

Handle plate in instance order

Select the **Handle plate in instance order** rule to require that microplates be processed in the order as they enter the system.

For example:

Two PlateLoc Sealers are used in a BioCel System to seal microplates. One of the PlateLoc Sealers runs out of seal material and stops on a microplate.

If this rule is selected, the second sealer would also stop until you load a new roll of seal, start the first sealer, and the microplate at the first sealer is upstacked to its position in the expected order.

If this rule is not selected, the second sealer would continue sealing and upstacking microplates. The microplate at the stopped sealer would be omitted, thus the sequence of microplates will be out of order.

Pipette plates in instance order

Select the **Pipette plate in instance order** rule to require that microplates be processed at pipetting devices in the order as they enter the system.

Select the check box if time-sensitive assays require that each microplate be processed the same way within the same length of time. Doing so ensures the data are comparable across the microplates.

Clear the check box if:

- The protocol has more than one pipette process that uses the same liquid-handling device.
- The duration of one of the pipetting operations is much longer than another.

For example:

A protocol has two processes and both have a pipetting operation that uses the same Vertical Pipetting Station.

If the rule is selected, the pipetting operations for one process are completed before the pipetting operations begin for the other process. The first pipetting operation takes significantly longer to complete than the second operation, and the protocol is run several times in succession. The overall time taken for the protocol to complete is much greater than it needs to be because during each cycle the system had to wait for the slower pipetting operations to complete for all the microplates in the process before it could continue.

If the rule is not selected, a microplate from the fast pipetting process can be delivered to the Vertical Pipetting Station after a microplate from the slow pipetting process, followed by another microplate from the slow pipette process, and so on. This reduces the bottleneck at the Vertical Pipetting Station because it allows the faster process to continue, and its second cycle in the series to start before the first cycle is complete.

Related information

For information about	See
Specifying a device file for the protocol	"Specifying the device file for a protocol" on page 30
Adding other information about the protocol	"Adding information about the protocol" on page 31
Adding an alarm	"Adding an alarm" on page 37

Adding an alarm

You can set an alarm to create an error message when a measurement falls outside the range that you specify. For example, you can specify that the alarm creates an error message when:

- The bottle on the Weigh Pad becomes too heavy or too light.
- A particular temperature, humidity, or gas concentration level is reached.
- A system door is open.
- The battery power in the uninterruptible power supply (UPS) is low.

Note: The alarm can only be used if your lab automation system is equipped with doors, a Weigh Pad, a StoreX incubator with environmental control, an iSeries controller in a BioCel System, or a UPS.

IMPORTANT You can add User Message tasks in the protocol to remind the operator to empty or fill containers or reservoirs at the appropriate steps in the protocol. For instructions on adding User Message tasks, see "User Message" on page 599.

Procedure

IMPORTANT The alarm settings apply only to the current protocol and do not impact other protocols.

To set up alarms:

- **1** In the **Protocol** area, click **Protocol Options**.
- 2 Click the Measurement Manager tab and specify the alarm parameters.

The Measurement Manager tab displays all the measurements for the devices you want to monitor (for example, the Weigh Pad). If you do not see the information in the tab, check that you have added the devices you want to monitor in the device file. See "Adding devices" on page 25 for instructions.

ľ	Protocol Options									
	Protocol Options Measurement Manager									
	r-Measurement Manager-									
		noger								
	Device Name	Device Type	Measurement Name	Unit	Poll Frequ	Critical Time	Lower Limit	Upper L	Log Action	Pause Action
	APCUPS - 1	APCUPS	Battery level	percent	1s	5s	80	100	LOG_ACTION_ALWAYS	PAUSE_ACTION_HIGHLOW
	WeighPad - 1	WeighPad	Mass 1	g	1s	5s	0	1000	LOG_ACTION_ALWAYS	PAUSE_ACTION_HIGHLOW
	WeighPad - 2	WeighPad	Volume 1	mL	1s	5s	0	1000	LOG_ACTION_ALWAYS	PAUSE_ACTION_HIGHLOW

Adding an alarm

Parameter	Description
Device Name	The name of the device for which the alarm is set.
	If you have two devices of the same type, each device is distinguished by its device name. In the example shown, two Weigh Pads are listed: Weigh Pad - 1 and Weigh Pad - 2.
Device Type	The type of device. The device type can be the Weigh Pad, the UPS (ACPUPS), StoreX incubator, Cytomat incubator, or the iSeries controller.
Measurement Name	The measurement you want to monitor. For example, you monitor the battery level in the UPS.
	The measurement is device dependent. In the example shown, the two Weigh Pads have different measurement names.
Unit	The unit of measure. For example, if you are monitoring the battery, the unit of measure is percent (%). If you are monitoring the mass on the Weigh Pad, the unit of measure is grams (g).
Poll Frequency	The frequency at which the software takes the measurements. For example, 1 s means the software will check the device every second and display the measurement in the log.
Critical Time	The length of time the measurement is allowed to be above the upper limit or below the lower limit before it is considered to be out of range.
	For example, the upper limit of a measurement is 5 volts and you specify a 2 s critical time. When the software takes a measurement, the reading fluctuates and is at 6 volts for longer than 2 s overall. So it is considered to be out of range.
Lower Limit	The low value at which the alarm is turned on.
Upper Limit	The high value at which the alarm is turned on.

Parameter	Description				
Log Action	The action to record the error:				
	• LOG_ACTION_ALWAYS. Records the measurements in the log. For example, if the Poll Frequency is 1 s the measurement for every second is recorded in the log.				
	• LOG_ACTION_NONE. Does not record the measurement in the log.				
	• <i>LOG_ACTION_LOW</i> . Records the measurement when it exceeds the lower limit.				
	• <i>LOG_ACTION_HIGH</i> . Records the measurement when it exceeds the upper limit.				
	• LOG_ACTION_HIGHLOW. Records th measurement when it exceeds the upper or lower limit.				
Pause Action	The action to pause the run:				
	• <i>PAUSE_ACTION_NONE</i> . Does not pause the run when the measurement is out of range.				
	• <i>PAUSE_ACTION_LOW</i> . Pauses the run when the measurement exceeds the lower limit.				
	• <i>PAUSE_ACTION_HIGH.</i> Pauses the run when the measurement exceeds the upper limit.				
	• <i>PAUSE_ACTION_HIGHLOW</i> . Pauses the run when the measurement exceeds the upper or lower limit.				

3 When you are finished, click **Apply**.

Related information

For information about	See
BioCel I/O Interface	BioCel System User Guide
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Adding User Message tasks	"User Message" on page 599
Protocol options	"Setting protocol options" on page 30

Configuring labware

About this topic

After you create a new protocol, you can configure labware for devices that have locations for labware placement. When labware is configured at a device location, the labware might be moved from its location for deadlock avoidance or be used as a counterweight, but returned to the same location by the end of the run.

For example, you can configure labware that will be stored at Bravo deck location 2. During the protocol, the labware will be moved to deck location 5 temporarily for processing, and then returned to deck location 2.

This topic explains how to configure labware. For more information about configured labware and how it is used in a protocol, see "Planning labware use" on page 20.

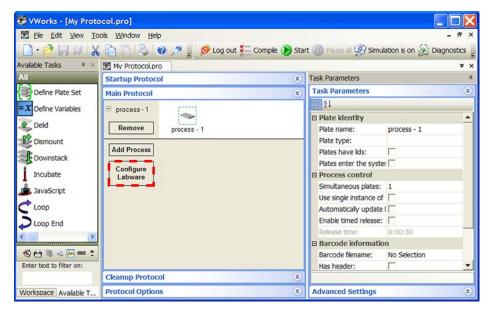
Configuring labware for Auto managed counterweight

If you are configuring labware for use as an Auto managed counterweight, see "Example: Auto managed counterweight mode" on page 290 for instructions on how to configure labware for this feature.

Procedure

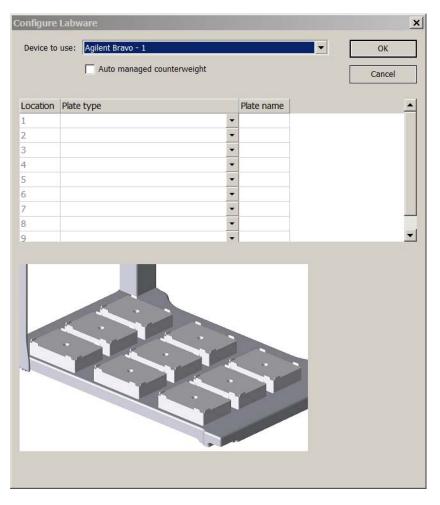
To configure labware:

1 In the **Main Protocol** of the VWorks window, in the area below the protocol process, click **Configure Labware**.



The Configure Labware dialog box opens.

Configuring labware



2 In the **Device to use** list, select the device on which you want to configure labware.

Note: Devices that are in the device file and have labware placement locations appear in the list. Exceptions include storage devices such as the Plate Hub Carousel or incubators, centrifuge devices, and stacking devices.

- **3** If you are configuring labware as an auto-managed counterweight for use with the Centrifuge or Centrifuge with Loader, select **Auto managed counterweight**. See "Example: Auto managed counterweight mode" on page 290 for further information and instructions on using this feature.
- **4** In the **Location** table:
 - **a** In the **Plate type** column, select the labware for the corresponding location.
 - **b** In the **Plate name** column, double-click the text box, and then type a name for the labware you selected.

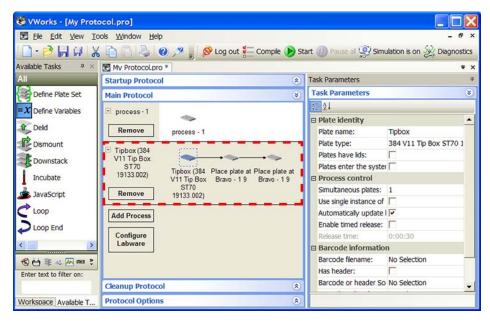
Note: For the Bravo Platform, configured static labware (from protocols created in VWorks4 version 6.2.3 or earlier) will appear in the table and graphic. However, configured accessories do not appear in the table and graphic.

Configuring labware

Configure	Labware				×
Device to	use: Agilent Bravo - 1			•	ОК
	Auto managed counterweight				Cancel
Location	Plate type		Plate name		_
1		-			
2		-			
3		*			
4		•			
5		-			
6		-			
7		-			
8	384 V11 ST10 Tip Box 10734.102	-	plate - 1		_
9		-			-

5 When you are finished, click **OK** to save the information and close the Configure Labware dialog box.

In the Main Protocol area, the labware appears. Click + to expand and view the labware icon. Notice that two Place Plate tasks are automatically added, one to indicate its starting location and the other to make sure it returns to its starting location at the end of the protocol.



- **6** Select the configured labware icon. In the **Task Parameters** area, set the plate properties. For a description of the plate properties, see "Setting plate parameters" on page 46.
- 7 If you want to remove the configured labware, click **Remove**.

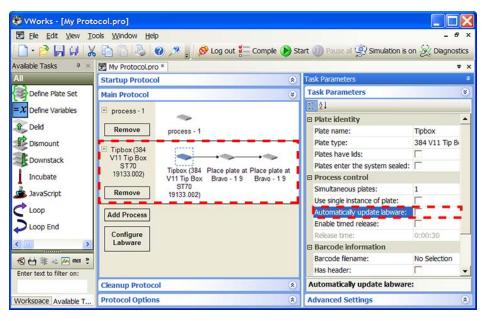
Configuring labware

VWorks - [My Protoc				_ *	×
		🥕 🚽 🚫 Log out 🏣 Comple 🌔 St	art ៣ Pause al 🧐 Sim	ulation is on 🔗 Diagnos	tics
	My Protocol.pro *		A. A		, ,
	Startup Protocol	۲	Task Parameters		ą
Define Plate Set	Main Protocol	*	Task Parameters		*
			÷≣ 2↓		
	process - 1	۰	Plate identity		
Deld	Remove	process - 1	Plate name:	Tipbox	
Dismount			Plate type:	384 V11 Tip Box ST70 1	
	 Tipbox (384 V11 Tip Box 		Plates have lids:		
Downstack	ST70	Tipbox (384 Place plate at Place plate at	Plates enter the syste		
Incubate	19133.002)	V11 Tip Box Bravo - 1 9 Bravo - 1 9	Process control		
JavaScript	Remove	ST70 19133.002)	Simultaneous plates:	1	
- JavaScript		19133.002)	Use single instance of		
Loop	Add Process		Automatically update		
Loop End			Enable timed release:	Г	
	Configure		Release time:	0:00:30	
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Enter text to filter on:			Has header:		
	Cleanup Protocol	۲	Barcode or header So	No Selection	+
Workspace Available T	Protocol Options	*			

8 To convert a configured labware to a process plate (labware that is transferred into the system and out of the system during the run), in the **Process Control** area, clear the **Automatically update labware** check box.

The background in the configured labware process area becomes white, indicating that it is converted to a protocol process.

Note: You can use the **Automatically update labware** option to update a labware location throughout the protocol. For example, clear the check box, and then update a configured labware location from Bravo deck location 3 to location 5. Then select **Automatically update labware**. The software automatically makes the changes throughout the protocol.



Using configured labware

When you add a task in the process, you can use available configured labware by selecting it from the **Location**, **plate** list. In addition, if more than one subprocess uses the same configured labware, and the subprocesses are in different protocol processes, you can specify the sequence in which the subprocesses will be performed. For instructions, see "SubProcess (Bravo, Vertical Pipetting Station)" on page 388.

Related information

Planning for devices and accessories in the protocol	"Planning device and accessory use" on page 19
	on page 14
Process plates	"About protocols, processes, and tasks"
Planning labware use	"Planning labware use" on page 20
For information about	See

Adding processes

About processes

You can add processes at any time when you are creating the protocol. In addition, you can add multiple processes in one protocol.

Procedure

To add a new process: In the Main Protocol, click Add Process.

Adding processes

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Available Tasks 🌼 🛛	My Protocol.pro *					₹ ×
All	Startup Protocol		٢	Task Parameters		¢
Define Plate Set	Main Protocol		۲	Task Parameters		۲
= X Define Variables	Source (384 ::::::::::::::::::::::::::::::::::::			<u>:</u> 2↓		
			ţ—	Plate identity		-
Deld Deld	Source (3			Plate name:	Source	
Dismount	Greiner 781101 P	of plates as a from Br S JavaScript 1.1		Plate type:	384 Greiner 781101	PS cli
Downstack	Remove cir fit btm			Plates have lids:		
			_	Plates enter the syste	em 🔽	
Incubate	Add Process			Process control		
JavaScript	Configure			Simultaneous plates:	1	
-	Labware			Use single instance of	pt	
CLOOP				Automatically update	lat	
Loop End				Enable timed release:		
				Release time:	0:00:30	
				Barcode informatio	on	
🕲 😁 🕸 🛰 🚾 💐				Barcode filename:	No Selection	
Enter text to filter on:	<		>	Has header	_	<u> </u>
	Cleanup Protocol		۲			
Workspace Available	Protocol Options		۲	Advanced Settings		۲

A new process lane appears.

😻 VWorks - [My Pro	tocol.pro]							
Ele Edit View	Tools Window Help							- 8 ×
🗋 • 🖻 🖬 🖗 🕻	X 🖻 🖻 🍣 🖉	ا ۽ ڪر (🔗 Log out	Comple (•	Start 🕕 Pause al 🥺 Sin	nulation is on 🎉 Dia	gnostics 💂
Available Tasks 🌼 🛛	My Protocol.pro *							₹×
All	Startup Protocol				*	Task Parameters		¢
Define Plate Set	Main Protocol				8	Task Parameters		۲
= X Define Variables	 Source (384 		1997		-	21		
	Source (304	>			_	Plate identity		
Deld	5	Source (384	Define a set	Downstack		Plate name:	process - 1	
Dismount	-	Greiner 781101 PS	of plates as a JavaScript	from Bravo - 1.1	S	Plate type:		
Downstack		clr fit btm)	array	1,1		Plates have lids:		
8					-	Plates enter the system	n [
Incubate	process - 1					Process control		
JavaScript	Remove	process - 1				Simultaneous plates:	1	
-			_		_	Use single instance of p		
CLOOP	Add Process					Automatically update k	at 🔽	
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€⊡≩ ↔ № *						Barcode filename:	No Selection	_
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Workspace Available	Protocol Options				*	Advanced Settings		۲

Related information

For information about	See
Processes	"About protocols, processes, and tasks" on page 14
Process plates	"About protocols, processes, and tasks" on page 14
Configured labware	"Configuring labware" on page 40

Setting plate parameters

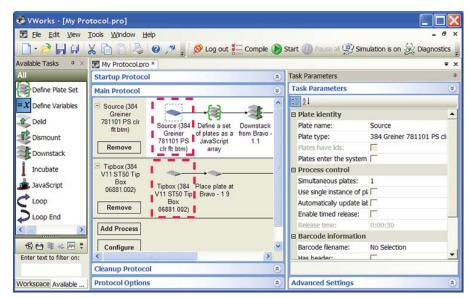
About this topic

You need to set parameters for process plates and configured labware. This topic explains how to set the parameters for both.

Procedure

To set plate parameters:

1 In the **Protocol** area, select the process plate icon or the configured labware icon.



2 In the **Plate identity** area, set the following parameters:

Task Parameters	(1
<u>::</u> 21	
Plate identity	
Plate name:	Source
Plate type:	384 Greiner 781101 PS cir fit btm
Plates have lids:	Γ
Plates enter the system sealed:	
Process control	
Simultaneous plates:	1
Use single instance of plate:	
Automatically update labware:	
Enable timed release:	
Release time:	0:00:30
Barcode information	
Barcode filename:	No Selection
Has header:	
Barcode or header South:	No Selection
Barcode or header West:	No Selection
Barcode or header North:	No Selection
Barcode or header East:	No Selection

Property	Description
Plate name	The name of the labware that will help you identify the labware. For example, you can use Source Plate or Destination Plate.
Plate type	The type of labware. The list of labware types is created in the Labware Editor.
Plates have lids	The indicator that the labware entering the system has a lid.
	Select the check box if the labware has a lid. Clear the check box if the labware does not have a lid.
	<i>Note:</i> The selection is only available if the Can have lid option is selected in the Labware Editor.
Plates enter the system sealed	The indicator that the labware entering the system is sealed.
	Select the check box if the labware is sealed. Clear the check box if the labware is not sealed.
	<i>Note:</i> The selection is only available if the Can be sealed option is selected in the Labware Editor.

 $\mathbf 3$ In the **Process control** area, set the following parameters:

Task Parameters	(3
21	
Plate identity	
Plate name:	Source
Plate type:	384 Greiner 781101 PS cir fit btm
Plates have lids:	F
Plates enter the system sealed:	
Simultaneous plates:	1
Use single instance of plate:	
Automatically update labware:	
Enable timed release:	E .
Release time:	0:00:30
Barcode information	
Barcode filename:	No Selection
Has header:	
Barcode or header South:	No Selection
Barcode or header West:	No Selection
Barcode or header North:	No Selection
Barcode or header East:	No Selection

Setting plate parameters

Property	Description
Simultaneous plates	The maximum number of labware instances that are processed in the system at one time.
	For details about how to determine the optimum number, see "Determining the number of simultaneous plates" on page 50.
Use single instance of plate	The indicator that the plate type has only one instance and will be used repeatedly during the run. For example, you might have a single source plate from which you will aspirate repeatedly during a protocol.
	Select the check box if the labware has only one instance. Clear the check box if the labware has more than one instance.
Automatically update labware	The indicator that the labware is configured labware.
	Select the check box if the labware is a configured labware and will be used by one or more tasks in the protocol process. When you revise the protocol, the changes are automatically reflected in the configured labware's process.
	Clear the check box if you want to convert the configured labware to a process plate.
Enable timed release	The indicator that the labware is delivered into the system in timed intervals. If you select this property, you also need to set the Release time.
	Select the check box if you want the system to deliver the labware in timed intervals. Clear the check box if the system can deliver the labware without waiting the specified time.
Release time (Sec)	The length of time to wait before delivering the next labware instance into the system.
	For details about how to determine the release time, see "Determining the correct microplate release rate" on page 51.

4 In the Barcode information area, set the following parameters:

Task Parameters	(1
<u>:</u> 21	
Plate identity	
Plate name:	Source
Plate type:	384 Greiner 781101 PS cir fit btm
Plates have lids:	F
Plates enter the system sealed:	
Process control	
Simultaneous plates:	1
Use single instance of plate:	
Automatically update labware:	
Enable timed release:	Г
Release time:	0:00:30
Barcode information	
Barcode filename:	No Selection
Has header:	
Barcode or header South:	No Selection
Barcode or header West:	No Selection
Barcode or header North:	No Selection
Barcode or header East:	No Selection

Property	Description
Bar code file name	The file you want to use to verify barcodes on incoming labware. For more information, see "Input files" on page 74.
	Select from the list of barcode files. If you do not see a list, make sure you specified the file location in the Protocol Options.
Has header	The indicator that the first line of the barcode file contains a header.
	Select if the code file name contains a header. Clear the check box if the file does not contain a header.
Barcode or header South/ West/North/East	The column ID in the barcode file. Select the column ID for the side of the labware. For example, if the barcode is on the east side of the labware, select the column ID in the Barcode or header East field.
	Select from the list of column IDs. If you do not see a list, make sure you specified the file location in the Protocol Options and selected the file from the Bar code file name property.

5 *Optional.* Reserve a device to store quarantined labware. Labware can be quarantined (moved aside and not processed) if a barcode label is misread, the labware orientation is incorrect, or the wrong labware type is detected. The quarantine option allows the system to continue running the protocol even though it is unable to resolve problems with the labware.

To reserve a device to store quarantined labware:

a Click Advanced Settings.

Setting plate parameters

- **b** In the **Available devices** list, double-click the device you want to use to store quarantined labware. The device appears in the **Quarantined devices** list.
- **c** Select **Quarantine plate after process completed** if you want to quarantine labware after the protocol is finished. Clear the check box if you want to quarantine the labware as soon as it is encountered in the run.

sk Parameters	۲
Ivanced Settings	۲
Quarantine devices:	
BenchCel - 1.Stacker 2	
Available devices:	
Bravo - 1.1	
Bravo - 1.1 Bravo - 1.2	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.3 Bravo - 1.4 Bravo - 1.6	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.6 Bravo - 1.7	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.5 Bravo - 1.6 Bravo - 1.7 Bravo - 1.8	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.6 Bravo - 1.7	

For more information about how to set up quarantine criteria, see "Setting up automated error responses" on page 654.

Determining the number of simultaneous plates

Factors to consider

The number of simultaneous plates you specify depends on the following:

- The number of positions available during a protocol process.
 - In general, you can specify one simultaneous plate for every task in the protocol, because each task typically uses one microplate position. For example, if your protocol downstacks a microplate, seals the microplate, labels the microplate, and then upstacks the microplate, you have three positions available: one in the robot grippers, one on the microplate sealer, and one on the microplate labeler.

Exceptions to this generalization include cases where the same microplate position is used for more than one task and when a Vertical Pipetting Station is used. Several microplates can be positioned on a Vertical Pipetting Station at the same time.

• The number of positions in the system that will incubate microplates.

A 10-position plate hotel contains 10 possible microplate positions. If your protocol downstacks a plate, dispenses liquid, incubates the microplate at a 10-position plate hotel, and then dispenses more of the same liquid, you have 12 positions available: one in the robot grippers, one on the dispenser, and 10 in the plate hotel.

• The number of microplates in a Reorder task.

If the protocol includes a Reorder task, the number of simultaneous plates must be equal to, or greater than, the number of microplates in the Reorder task.

• The slowest or rate-limiting task.

A task such as a long read step or wash task on a single device can impact the number of microplates that can enter the system.

How throughput is impacted

The number of simultaneous plates you specify can impact throughput as follows:

- *The value is too high.* The protocol run might slow down because the robot will move around to avoid a deadlock. (A deadlock occurs when the number of locations available in the system is less than the number of microplates in the system, and the protocol stops.)
- *The value is too low.* The time for the protocol run can be longer than desired.

Determining an optimum number of simultaneous plates

By default, the number of simultaneous plates is set to one for each protocol process. If your protocol process uses multiple devices, you can increase the throughput of the system by increasing the number of plate instances to be processed simultaneously. The optimum number should balance high throughput and deadlock avoidance.

To determine the optimum number of simultaneous plates:

- **1** Run the protocol in simulation, noting the protocol process time in the log.
- **2** Increase the number of simultaneous plates.
- **3** Repeat steps 1 and 2 until the simulated process time no longer decrease. The simultaneous plates value is optimum when the process time no longer decreases.

IMPORTANT If "Attempting to avoid deadlock by..." messages appear in the log, the protocol might have too many simultaneous plates. Decrease the number of simultaneous plates to decrease the likelihood of a deadlock during the protocol run.

Determining the correct microplate release rate

You can use the **Enable timed release** and **Release time** plate properties to control the microplate release rate and prevent bottlenecks and deadlocks. An optimum release rate should balance the number of microplates entering into the system with the number of microplates exiting the system.

Bottlenecks can occur when tasks or incubation times cause the number of incoming microplates to be greater than the number of outgoing microplates. To prevent the bottleneck, you can limit the rate of microplates entering into the system.

IMPORTANT Make sure you determine the optimum number of simultaneous plates before you change the microplate release rate.

To determine the optimum microplate release rate:

1 Run the protocol using empty labware.

Setting plate parameters

- **2** During or after the run, open the Gantt Chart dialog box to find the task that is causing the bottleneck and determine the length of time for the task to finish. (For information about the Gantt Chart dialog box, see "Tracking the run progress of instances or devices" on page 255.)
- **3** Select **Enable timed release.** Type the length of the bottlenecking task time in the **Release time** box.
- **4** Run the protocol again using empty labware.
- **5** Determine whether the bottleneck is still occurring.
 - If the bottleneck is resolved, determine if previous tasks can process microplates during the wait time so that you can improve throughput. If so, decrease the release time.
 - If the bottleneck still occurs, increase the release time.
- **6** Repeat steps 1 through 5 until the bottleneck is resolved and the throughput is optimized.

For example:

A protocol is running with three simultaneous plates. A pipetting task in the middle of the protocol takes 3 minutes. During this time, two other microplates have already entered the system and must wait for the pipetting task to finish. A deadlock error occurs, because the system is unable to find a storage location for the third microplate that entered the system.

By turning on the timed release property and setting the release time to 180 seconds (or 3 minutes), the system will wait 3 minutes after the first microplate is in the system before delivering the next microplate. However, a microplate-piercing task and a microplate-shaking task take a total of 1 minute before the pipetting task. So the release time can be decreased to 120 seconds (or 2 minutes) to improve throughput.

Note: Bottlenecks in a protocol might not always cause a deadlock error. Instead, microplates might wait in plate hotels or on platepads. Monitor the dry protocol run to check for non-error-causing bottlenecks.

Related information

For information about	See
Labware Editor	VWorks Automation Control Setup Guide
Barcode file folder location	"Setting protocol options" on page 30
Monitoring run progress of instances, processes, and devices	"Tracking the run progress of instances or devices" on page 255
Setting up quarantine criteria	"Setting up automated error responses" on page 654
Quarantining labware that are downstacked from a BenchCel stacker	"Downstack" on page 354

Adding and deleting tasks

Viewing the list of available tasks

The list of available tasks you can use in the protocol are in the Available Tasks area.

Avallable Tasks 🧧 🔻 🛛	T Protocol 001.pro *	
All	Startup Protocol	8
Aspirate (Bravo)	Main Protocol	۲
Assemble Vacuum (Bravo) Change Instance Define Plate Set Define Variables Define Variables Delid Dilute To Final Volume (Bravo) Disassemble Vacuum (Bravo) Disassemble Vacuum (Bravo) Dismount Dispense (Bravo) Dispense (Bravo) Dispense (Bravo) Dispense (Bravo)		→ Fips elec frc
Enter text to filter on:	 iii 	>
	Cleanup Protocol	\$
Workspace Available Tasks	Protocol Options	*

The tasks that are available depend on a number of factors:

- *Devices*. Tasks are associated with devices. Only the tasks associated with the devices in the current device file are displayed.
- *Startup or Cleanup protocol.* Some tasks appear only in the Startup or Cleanup protocols. For a description of Startup and Cleanup protocols, see "Setting up Startup and Cleanup Protocol processes" on page 60.
- *Subprocess*. Some tasks are grouped in a device subprocess, so you can view the tasks only when you select the subprocess.

Filtering the list of available tasks

You can filter and display a subset of the task icons using one of the following methods:

- Click a task filter button.
- Type filtering text.

Using the task filter buttons

To use the filter buttons:

Click one of the following filter buttons below the list of available tasks:



Adding and deleting tasks

ltem	Task display filter	Description
1	IO Device Handling	Displays tasks that perform signal input and output operations.
2	Plate Handling	Tasks that move labware or might change the labware characteristics without changing its contents. For example, Centrifuge, delid, and Seal are plate- handling tasks.
3	Plate Storage	Tasks that move labware into or out of storage devices such as the Plate Hotel. For example, Downstack and Reorder are plate storage tasks.
4	Liquid Handling	Tasks that perform liquid-handling operations. For example, Aspirate and Dispense are liquid handling tasks.
5	Reading	Tasks that perform microplate-scanning operations. For example, the Read task is a microplate-scanning task using the Perkin Elmer Fusion Reader.
6	Other	Displays scheduling tasks, such as Define Variable, Loop, and Spawn Process.
7	All	Displays all the available tasks.

Typing filtering text

To type filtering text:

1 Click one of the filter buttons. See "Using the task filter buttons" on page 53.

For example, if you want to search all the tasks, click All. However, if you only want to search the liquid-handling tasks, click the Liquid Handling filter button.

2 Type text you want to use to filter the task list in the **Enter text to filter on** box below the list of available tasks. As you type each character, the Available Tasks list changes to meet the filter requirement.

For example, if you type dil, only the dilution tasks remain in the Available Tasks list.



Adding tasks in a protocol

For details on how to use macros to insert a series of tasks, see "Using macros to create protocols" on page 133.

To add a task in a protocol:

1 In the **Available Tasks** area, double-click a task. Alternatively, drag a task from the **Available Tasks** area into the Protocol area. The task icon appears in the Protocol area.

In the following example, the Place Plate task is added to the protocol.

😻 VWorks - [Protoco	ol_001.pro]			
Ele Edit View T	ools <u>W</u> indow <u>H</u> elp			- 6' ×
🗋 • 🆻 🖬 🖗 🎖	🎖 🛅 🖺 🔌 🤣 🏸 🖕 🔗 Log out 🚝 Comple 🌘	🕨 Sta	art 🕕 Pause al 🥺 Sir	mulation is on 🞉 Diagnostics
Available Tasks 🏻 🏾 🛪	E Protocol 001.pro *			₹ ×
All	Startup Protocol	٤]	Task Parameters	Ф.
Define Plate Set	Main Protocol	۲	Task Parameters	۲
= x Define Variables	Source plate		21	
2 Deld	(384 Costar		Place Plate propert	ies
	3657 PP Sqr well rnd btm) Source plate Place plate		Device to use:	BenchCel - 1
Dismount	(384 Costar at BenchCel- 3657 PP Sqr 1		Location to use:	
Downstack	Remove well md btm)			
Incubate	Add Process			
		- 11		
JavaScript	Configure Labware	- 11		
CLOOP	Labware	- 11		
Loop End		- 11		
Mount		- 11		
Place Plate				
<				
€ H ≥ M mu *				
Enter text to filter on:	1			
	Cleanup Protocol	*		
Workspace Available T	Protocol Options		Advanced Settings	۲
Ready			administrator is	
ricoury		_		NOM SCRE

- **2** Set the task parameters. For a description of the task parameter, see one of the following:
 - "Setting parameters for I/O-handling tasks" on page 269
 - "Setting parameters for microplate-handling tasks" on page 277
 - "Setting parameters for microplate storage tasks" on page 349

Adding and deleting tasks

- "Setting parameters for liquid-handling tasks" on page 387
- "Setting parameters for scheduling tasks" on page 557

Deleting tasks from a protocol

To delete tasks from a protocol:

- 1 In the **Protocol** area, select a task.
- 2 Press **DELETE**. A confirmation message dialog box opens.
- **3** Click **Yes** to confirm the delete action. The task icon is removed from the protocol.

CAUTION Be aware of dependencies between tasks before you delete them. For example, the Tips On (Bravo) task relies on the pipette channel specifications in the Set Head Mode (Bravo) task to determine the number and position of pipette tips to install.

Related information

For information about	See
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
Using a macro to add a series of tasks	"Using macros to create protocols" on page 133

Specifying time constraints between dependent tasks

About dependent tasks and time constraints

After you add tasks to a protocol, you can specify a time interval between two dependent tasks. For example, you can specify that a microplate must be read within 30 minutes after a stop solution is added.

You can specify time constraints between any two non-scheduling tasks in the Startup, Main, or Cleanup Protocol. In addition:

- Both time-dependent tasks can be within a subprocess or a loop. If a Change Instance task is used in a loop, the time limit is used for every plate instance.
- One of the tasks can be within a subprocess and the other outside of the subprocess.
- One of the tasks can be within a loop and the other outside of the loop. If the constraining task is before a loop and the constrained task is within the loop, the constraint applies to the first loop only. If the constraining task is within the loop and the constrained task is after the loop, the constraint applies to the last loop only.
- Any number of tasks can be added between the two dependent tasks. However, if the time it takes to complete the enclosed tasks exceeds the time constraint of the dependent tasks, a compiler error results.

During a protocol run, if the time limit is exceeded, the run continues, but a message appears in the Time Constraint Log to alert you of this occurrence. If the task is finished before the time limit, the software waits until the minimum time limit is reached before proceeding to the next task.

Adding a time constraint

To set a time constraint between two dependent tasks:

- 1 In the protocol, CTRL+click the two dependent tasks to select both tasks.
- 2 Right-click one of the two tasks, and then select Add time constraint.

3359, PP rnd btm) selected> using Agient Bravo - 1 Set head mode to All barrels Tips On in 1 selection(s) Aspirate 10.00 select selection(s) Dispens pL in 1 selection(s)
Remove selection(s) select Enable all tasks
Source Plate (96 Greiner 650201, U-Bottom Standard, PolyPro)
Add time constraint

The Edit Time Constraint dialog box opens. Notice that the task that runs first is the constraining task, and the second task is the constrained task.

Specifying time constraints between dependent tasks

Edit Time Constraints				—
From Dispense (Bravo) (Bravo SubProcess 7 usi	To RunProtocol (Perkin Elmer Envision Reade	Time (m) 0.00		Minus(m) 0.00
			ок	Cancel .::

3 Specify the length of time between the two dependent tasks.

Parameter	Description
From	The first of the two dependent tasks you selected. You cannot edit this field.
То	The second of the two dependent tasks you selected. You cannot edit this field.
Time (m)	The length of time, in minutes, that is permitted for the first task. The minimum value is 1 minute.
Plus (m)	The time tolerance upper limit.
	For example, if you specified a total time of 25 minutes +5 minutes, the maximum time permitted for the first task is 30 minutes. The software will proceed to the next task after allowing 30 minutes for the first task to complete.
	The minimum tolerance is 0.5 minute.
Minus (m)	The time tolerance lower limit.
	For example, if you specified a total time of 25 minutes -5 minutes, the minimum time permitted for the first task is 20 minutes. The software will wait 20 minutes before proceeding to the next task even if the first task is completed in less time.
	The minimum tolerance is 0.5 minute.

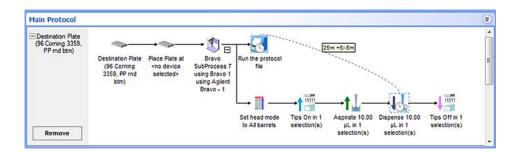
4 Click **OK** to save the changes and return to the protocol.

A clock appears on each of the two task icons to indicate that they are time-dependent. An arrow pointing away from the clock indicates that the task sets a constraint. (In the following example, the Dispense task is the constraining task.) An arrow pointing into the clock indicates that the task is constrained by an earlier task. (In the example, the Run the protocol file task is the constrained task.)

When you rest the cursor on either task icon, a dotted line and the specified time interval appear.

2 Creating a protocol: basic procedure

Specifying time constraints between dependent tasks



Note: A task can both constrain a later task and be constrained by an earlier task within a protocol. A clock icon with an arrow pointing into and away from it indicates that the task serves both time constraints.

Editing a time constraint

Note: The software allows you to edit time constraints during protocol runs. The time constrained tasks must be downstream from the task that is currently running. However, an edited time constraint that is too close to the running task will not likely be applied.

To edit a time constraint between two dependent tasks:

1 In the protocol, right-click one of the two dependent tasks, and then select **Edit time constraint**. The Edit Time Constraint dialog box opens. All constraints relevant to the selected task appear in the dialog box.

Edit Time Constraints						— ×
From		To	Change Countries Door do	Time (m)		Minus(m)
Dispense (Bravo) (Bravo	SubProcess 7 usi	KunProtocol (Perkin	Elmer Envision Reade	25.00	5.00	5.00
					ок	Cancel
					UK	Cancel

2 Change the Time, Plus and Minus values, and then click **OK** to save the changes and return to the protocol.

To display and edit all time constraints in a process or subprocess:

- 1 In the protocol, right-click the process plate or subprocess icon, and then select **Edit time constraint**. The Edit Time Constraint dialog box opens. All constraints relevant to the selected task appear in the dialog box.
- **2** Change the Time, Plus and Minus values, and then click **OK** to save the changes and return to the protocol.

Removing time constraints

To remove a time constraint between two dependent tasks:

In the protocol, right-click one of the two dependent tasks, and then select one of the following:

Command	Description
Edit time constraint	Allows you to remove a selected time constraint between two tasks.
	When you use this command, the Edit Time Constraints dialog box opens. Select the time constraint you want to remove, and then click Remove .
Remove all time constraints	Removes all time constraints relevant to the selected task.

Related information

For information about	See
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

Setting up Startup and Cleanup Protocol processes

About Startup and Cleanup Protocols

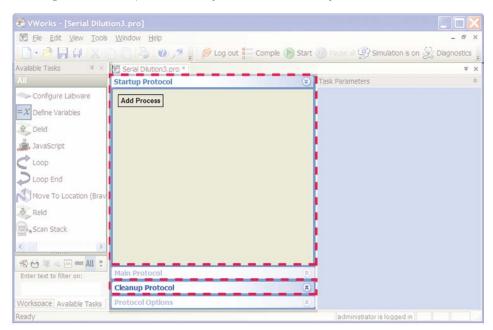
Startup Protocols are processes that are run before the Main Protocol starts. For example, you can use the Startup Protocol to prime pumps with fluid.

Cleanup Protocols are processes that are run after the main protocol finishes. For example, you can use the Cleanup Protocol to purge lines with a buffer or cleaning solution.

Procedure

To set up a startup protocol or cleanup protocol process:

1 In the protocol area, click Startup Protocol or Cleanup Protocol.



2 Add processes, set plate properties, and add tasks as you would in the Main Protocol.

Related information

For information about	See
Adding processes	"Adding processes" on page 44
Setting plate properties	"Setting plate parameters" on page 46
Adding tasks	"Adding and deleting tasks" on page 53

Saving the protocol

CAUTION When you edit a protocol, the changes take effect immediately. You must save the changes before you exit the VWorks software or the changes will be lost.

IMPORTANT You must have administrator or technician privileges to save a protocol.

To save a protocol: Select File > Save. If you just created a new protocol, the Save As dialog box opens to allow you to assign a name to the protocol before saving the file.

IMPORTANT You should regularly back up the protocol and associated components in case they become damaged or lost. For instructions, see "Exporting and importing protocols and associated components" on page 626.

Related information

For information about	See			
User accounts and privileges	VWorks Automation Control Setup Guide			
Adding notes about a protocol	"Setting protocol options" on page 30			
Compiling a protocol	"Compiling the protocol" on page 63			
Simulating a protocol run	"Simulating the protocol run" on page 64			
Backing up protocol and associated components	"Exporting and importing protocols and associated components" on page 626			

Opening a plugin

About this topic

The VWorks can interact with plugins that have been developed using the VWorks Hooks Interface. You might want to open a plugin to further configure a protocol or perform some additional tasks at run time.

If your team has developed plugins and the plugins are installed on the computer, you can use the following procedure to open the plugin.

Procedure

To display the graphical interface for your plugin:

- 1 In the VWorks main window, choose **Tools > Open Hooks Plugin**, and then click the file name (.dll) of the plugin that you want to open.
- **2** Perform the tasks required in the plugin.

Related information

For information about	See				
Using a plugin	User documentation for the plugin				
How to save a protocol	"Saving the protocol" on page 61				

For information about...

See...

VWorks Hooks Interface

User guide for the VWorks Hooks Interface

Compiling the protocol

You can compile a protocol before you run it. During the compiling process, the software reports errors found in the protocol. You can use the error information to troubleshoot the protocol.

Note: The software automatically compiles the protocol whenever you start a run.

To compile a protocol:

- 1 On the toolbar, click **Compile**. The Main Log area displays any errors found. For troubleshooting information, see "Maintenance and troubleshooting" on page 623.
- **2** Review the error and warning messages in the Main Log. You should fix all the errors. Depending on the protocol-writing stage, you can choose to ignore some of the warnings.

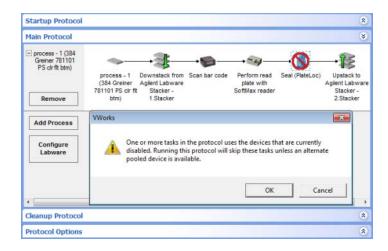
VWorks - [Aspirat				_				
Ele Edit View I				-				
	6 🗐 🗎 🛛	a 🙂 🎢 🔋 🛛	S Log out	Comple	D S	Start 🕕 Pause al Ç	Simulation is on §	
Available Tasks 🏻 🌣 🗡	😨 Aspirate and	Dispense Mix.pro *			_			
All	Startup Prot	ocol			۲	Task Parameters		
Define Plate Set	Main Protoco	4			۲	Task Parameters	ş	
= X Define Variables	 Destination 		-	~	^	20 24		
	(384 Greine		→ 3[→ <u>®</u> _		Plate identity		
Deld	781101 PS c fit btm)	Destination	Downstack	Bravo		Plate name:	Destination	
Dismount	in conty	(384 Greiner 781101 PS	from Bravo - 1.1	SubProcess 11 using	5 🗐	Plate type:	384 Greiner 7	81101 P
Downstack	Remove	cir fit btm)		Bravo - 1		Plates have lids:		
~	A	84 Greiner 781101 P	O als (the laters)		-	Plates enter the		
Incubate	 Source I (3 	54 Greiner 781101 P	S cir fit btm)		- 1	Process control		
< 💷 🗲 🕹	 Source 2 (3) 	84 Greiner 781101 P	S clr fit btm)			Simultaneous pla		
€8883≈∞783	• Tips (384 V	Tips (384 V11 Tip Box ST70 19133.002) Use single inst						
Enter text to filter on:	<			>		Automatically up Enable timed rel		
	Cleanup Pro	ocol			۲	Enable unied rea	ease: 1	
Workspace Available	Protocol Opt	ons			۲	Advanced Settin	gs	
Main Log								
Timestamp	Class	Description						
11/24/2008 6:10:28 AM	🕸 Info	I/Info Comple protocol						
11/24/2008 6:10:28 AM	🙁 Error	Parameter "Locatio	on, plate" spec	ifies a Plate S	Set na	med "x", which doe	sn't exist.	
11/24/2008 6:10:28 AM	Å Warning						too tall. Assuming tip	
11/24/2008 6:10:28 AM	A Warning	Stack height specif	ed in device f	le (100 mm)	for lo	cation 7 is probably	too tall. Assuming tip	enath of

- **3** Repeat steps 1 and 2 until the protocol compiles error-free.
- **4** Save the changes you made to the protocol.

2

Compiling a protocol with disabled devices

When you compile a protocol that contains tasks pointing to a disabled device, and no equivalent devices are available in the pool, the software displays a warning message and a \bigotimes is displayed on the affected task.



Click **OK** to compile the protocol.

For more information about temporarily disabling devices in a device file, see "Disabling and enabling a device in the device file" on page 215.

Related information

For information about	See
Troubleshooting compile errors	"Maintenance and troubleshooting" on page 623
Disabling a device in a device file	"Disabling and enabling a device in the device file" on page 215
Saving the protocol	"Saving the protocol" on page 61
Simulating the protocol run	"Simulating the protocol run" on page 64
Printing the protocol	"Printing protocols" on page 70

Simulating the protocol run

About run simulations

A protocol simulation is a virtual run where the software performs the tasks without moving robots or labware. Simulation runs are useful for troubleshooting scheduling and placement errors and optimizing throughput. After checking for compiler errors, you can start a simulation to verify that tasks are completed and sequenced correctly. In addition, the simulation can help you find:

- Deadlocks
- · Periods of inefficiency, such as when the robot is not being used
- Microplates spending different times at critical steps when they should be run under identical conditions
- A number of simultaneous plates that is too high or too low

Note: You can simulate the scheduling of multiple protocol runs, including those that run simultaneously.

Simulation time

The software uses the following lengths of time to simulate robot motions:

Robot movement	Time (sec)	
Direct Drive Robot and 3-Axis Robot	Slow	8
	Medium	6
	Fast	4
Peak KiNEDx Robot	Slow	16
	Medium	10
	Fast	4
Phantom Robot	Slow	16
	Medium	10
	Fast	4
Task	-	in the task Settings area. The lue is 5.0.

Note:

- The robot movement times are averages and might be conservative. The robots might take more or less time during a real protocol run.
- When using the Phantom Robot in a simulation, the software does not prompt the operator to move labware. Instead, the software uses the simulation time shown in the table.

You can override the default task simulation time in two ways:

- Perform a number of dry runs and allow the software to determine the average task time as it reaches a steady-state. The software then uses the average of the times during the subsequent simulation. See "Optimizing simulation time" on page 65.
- Manually set the desired task time in the Advanced Settings area of a task. See "Setting desired task times" on page 66.

Optimizing simulation time

To increase the accuracy of the run time, you can determine the optimum simulation time.

To determine the optimum task simulation time:

- **1** Start the simulation with the default task run times and the number of microplates expected for a run.
- 2 Resolve deadlocks and major errors in the protocol. Use the Gantt Chart to identify rate-limiting tasks and make adjustments to improve throughput. For instructions, see "Tracking the run progress of instances or devices" on page 255.
- **3** Turn off the simulation mode and perform a dry run with empty labware. Make sure the number of plate instances processed equals the number of simultaneous plates allowed. Doing so allows the run to reach a steady state and enables the software to update the task simulation times with actual times.

IMPORTANT If the number of plate instances does not reach the number of simultaneous plates allowed, the software will not be able to update the task simulation times.

4 Save the protocol to save the updated task simulation times.

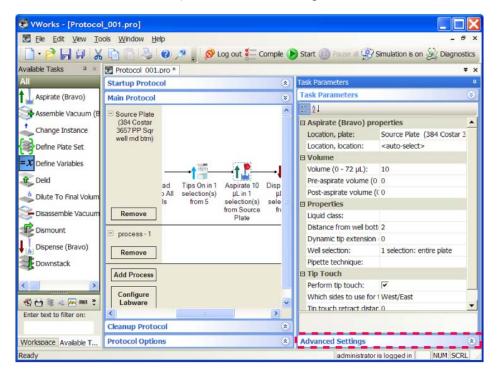
Setting desired task times

You can manually set task times to override the default task time or the optimized task time.

IMPORTANT The manually specified time is only retained and used for simulations. The optimized time will override the manually specified time if you turn off the simulation mode and run the protocol.

To set a desired task simulation time:

- **1** Select a task in the protocol.
- 2 In the Task Parameters area, click Advanced Settings.



3 At the bottom of the **Advanced Settings** area, view the existing value or type a new value for **Estimated time** for the selected task. To provide optimal simulation times, see "Optimizing simulation time" on page 65.

😻 VWorks - [Protoco	[_001.pro]					
🔄 Ele Edit View To	ools <u>W</u> indow <u>H</u> elt	0				- @ ×
🗋 • 🖻 🖬 🖗 🐰	BBB	0 🥕 🚽 🚫 I	.og out 📒 Co	ompile 🚺	Start 🕕 Pause al 🥵 Simulation is on 🏾	Diagnostics
Available Tasks 🌐 🛛	Protocol 001.p	ro *				₹ ×
All	Startup Protoco	d		۲	Task Parameters	4
Aspirate (Bravo)	Main Protocol			۲	Task Parameters	۲
Assemble Vacuum (B	E Source Plate			^	Advanced Settings	۲
Change Instance	(384 Costar 3657 PP Sqr well rnd btm)				Script to be executed before task	
Define Plate Set	weir nic buny					
= x Define Variables		•	+ P	-1		
û Delid		ad Tips On in 1	Aspirate 10	Disp		
📣 Dilute To Final Volum		All selection(s)	µL in 1 selection(s)	µl sele		
Se Disassemble Vacuum	Remove		from Source Plate	fn		
Dismount	🗉 process - 1			_		>
Dispense (Bravo)	Remove				21 "Aspirate (Bravo)" properties	
Downstack				_	Estimated time (seconds): 5.0	
	Add Process					
	Configure					
🕄 🗃 📚 🛶 🏧 akti 🤻	Labware			~		
Enter text to filter on:	Cleanup Protoco			*		
Workspace Available T	Protocol Option		_	*	Estimated time (seconds):	
Ready	Protocor Option	3		0	administrator is logged in	NUM SCRL
reduy					auminadator is logged in	HOM SCRL

Note: Only some tasks have adjustable run times.

Procedure

To run the simulator:

1 Select **Tools > Options**. In the **Options** dialog box, select the simulation quality you want to use:

2 Creating a protocol: basic procedure

Simulating the protocol run

Directories and Paths	
Main log path:	C:\VWorks Workspace\logs\vworks_log.
Pipette log path:	C:\VWorks Workspace\logs\vworks_pip
Time constraints log path:	C:\VWorks Workspace\logs\vworks_tim
Pipette technique editor root:	C:\VWorks Workspace\pipette technique
Automatic tip selection root:	C:\VWorks Workspace\tip box states\
Hit pick format file root:	C:\VWorks Workspace\hit picking\forma
Hit pick output file root:	C:\VWorks Workspace\hit picking\outpu
Options	
Debug log level:	0
Robot speed:	Fast
Use robot to check for plates:	Г
Halt on bar code misreads:	
Enable error library:	<u>v</u>
Delete orphaned plates:	ম
Enable migration notification:	<u> </u>
Simulation quality:	Improved graphical protocol tracking 👻
🗆 Email Setup	Standard
Enable email notification:	Improved graphical protocol tracking
Simulation quality: Choose simulation quality	Improved graphical protocol tracking wit

Simulation quality	Description		
Standard	Protocol tracking (green dots) is close to accurate, but not exact. This option results in faster simulation, because certain physical constraints are not simulated. In addition, less time is devoted to refreshing the graphical user interface.		
Improved graphical protocol tracking	Protocol tracking is more accurate but results in longer simulation time than the Standard quality option.		
	Similar to the Standard quality option, the software does not query the device plugins for physical constraints. However, the software ensures the green dots in the Protocol area are positioned accurately during the simulation.		
Improved graphical protocol tracking with device communication	Protocol tracking is the most accurate. The software queries the device plugins to ensure every move is physically permissible, resulting in a slower but more accurate simulation.		

2 Turn on the simulation mode: Click **Simulation is off** on the toolbar. The button changes to **Simulation is on**.

Simulating the protocol run

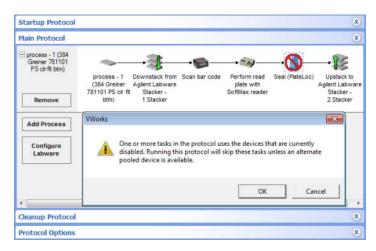


3 Start the protocol run. See "Starting the protocol run" on page 237 for the different ways you can start a run.

The simulation starts. The Run Configuration Wizard and other dialog boxes open as they would in a real protocol run. Follow the instructions in the dialog boxes to proceed with the simulation. For detailed information about Run Configuration Wizard, see "Starting the protocol run" on page 237.

Simulating a run with a disabled device

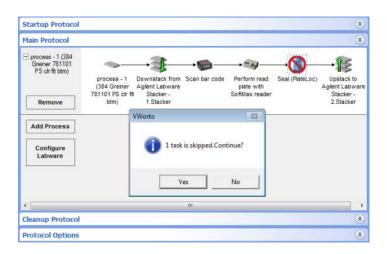
When you run a protocol in simulation that contains tasks pointing to a disabled device, and no equivalent devices are available in the pool, the software displays a warning message and a \bigotimes is displayed on the affected task.



Click **OK** to run the protocol. The following dialog box appears indicating how many tasks will be skipped:

2 Creating a protocol: basic procedure

Printing protocols



Click **Yes.** The Run Configuration Wizard opens. Follow the instructions in the wizard. For details on the wizard, see "Starting the protocol run" on page 237. During the run, the tasks associated with the disabled device are skipped.

For more information about temporarily disabling devices in a device file, see "Disabling and enabling a device in the device file" on page 215.

Related information

For information about	See
Compiling the protocol	"Compiling the protocol" on page 63
Selecting simulation qualities	"Setting general and view options" on page 224
Changing the robot speed	"Setting general and view options" on page 224
Disabling a device in a device file	"Disabling and enabling a device in the device file" on page 215
Scheduling multiple runs	"Starting the protocol run" on page 237
Managing runsets	"Managing runsets" on page 243
Monitoring runs	"Monitoring the overall run progress" on page 254
Pausing runs	"Pausing the run" on page 261
Deadlock recovery	"Recovering from deadlocks" on page 648

Printing protocols

You can use a printout of your protocol to:

- Troubleshoot the protocol
- Present in a report

Before you start

Make sure:

- The computer is connected to the printer you want to use.
- The printer driver is installed on the computer that has VWorks software installed.

Procedure

To print a protocol:

- **1** Open the protocol you want to print.
- 2 In the VWorks window, select File > Print.
- The protocol printout shows the following:

Ser	rial Dilution3.pro
	te Process: (96 Greiner 655101 PS Clr Rnd Well Flat Btm) called process - 1: ce Plate:Place plate at Bravo - 1 7
nfig Pla	te Process: (96 Velocity11 06880.002 Tip Box ST200) called Tip Box - Full (co jured): ce Plate: Place plate at Bravo - 1 9 ce Plate: Place plate at Bravo - 1 9
	te Process: (96 Velocity11 06880.002 Tip Box LT200) called Tip Box - Empty (cess):
****	*******
Set Tip: Ser	bProcess:'Bravo Sub Process 2': head mode to 4 rows: A-D, 3 columns: 1-3 s On in 1 selection(s) from Tip Box - Full (configured) ial dilute process - 1, putting tips-on in 6, putting tips-off in 3 s Off in 1 selection(s) from 3
	bProcess:'Bravo Sub Process 3': s On in 1 selection(s) from Tip Box - Empty (process)
****	***************************************
	vo Pipettor ravo - 1

Section	Description
Protocol name	The name of the protocol.
Process name	The name of the process and the associated labware type.
Tasks	The tasks in the process, the devices used in the task, and location information.

2 Creating a protocol: basic procedure

Printing protocols

Section	Description
Subprocesses	The subprocess and all tasks in the subprocess.

Related information

For information about	See
Compiling protocols	"Compiling the protocol" on page 63
Simulating protocol runs	"Simulating the protocol run" on page 64
Troubleshooting problems	"Maintenance and troubleshooting" on page 623



VWorks Automation Control User Guide

3 **Creating a protocol: advanced topics**

Read this chapter if you are an administrator or technician who writes protocols.

This chapter contains the following topics:

- "Tracking barcodes" on page 74 •
- "Using simple variables" on page 77
- "Using JavaScript" on page 84 •
- "Works-defined functions" on page 87
- InventoryLabware object
- "plate object" on page 91 ٠
- "plates[] object" on page 95
- ٠ "task object" on page 98
- "Using JavaScript with the CentrifugeAuto task" on page 108
- "About scripting the Print and Apply task" on page 109 .
- "plateDB object" on page 112
- ٠ "runset object" on page 123
- "forms object" on page 126 ٠
- "Using start and finish protocol scripts" on page 127 •
- "Using JavaScript utilities" on page 128
- "Creating new protocol tasks using the JavaScript Wrapper" on . page 132



Tracking barcodes

About this topic

The VWorks software allows you to track barcodes that are read or applied at a device. This topic explains how to set up barcode tracking in the software.

Barcode readers

Barcode readers can be installed on a number of devices in the lab automation system. For example, a barcode reader can be installed on a platepad so that every time a labware is placed there, the barcode is automatically read.

If your lab automation system contains a Microplate Labeler, you have the ability to print and apply barcode labels on microplates. If the Microplate Labeler includes an optional reader, barcode labels can be read.

To track barcodes in the system, you need the following:

- "Input files" on page 74
- "Data files" on page 75

Input files

Description

Created by upstream applications such as LIMS or created manually, barcode input files can be used to verify barcodes on incoming labware. As barcoded labware enter the system through tasks such as Downstack, the barcodes are scanned and compared against the barcodes in the barcode input file. You specify the input file to use when you set the process plate parameters. You can also specify a device to use to quarantine plates for which the barcode label is misread or incorrect. For details see "Setting plate parameters" on page 46.

Note: The software remembers where you are in the input file. For example, if you have 10 entries in the file, and the first protocol run processes the first six microplates, the next run will start at entry seven. To reset the file to the first row, reload the file. Barcode files are reloaded when you open a protocol file, when you update the Barcode file directory in Protocol Options, or when you update the Barcode filename or Has header option when setting up the plate parameters.

Requirements

Input files must meet the following requirements:

- The file must be a comma-separated value format with the .bar, .csv, or .txt file name extension.
- *Optional.* The file can contain a header that describes the columns in the file (for example, Plate Barcode).
- The file must contain at least one column.
- One of the columns must list the barcodes.

The following example shows an input file that is displayed in Excel. The file contains a header that labels two columns: Plate ID and Barcode.

	А	В
1	Plate ID	Barcode
2	Plate001	100001
3	Plate002	100002
4	Plate003	100003
5	Plate004	100004
6	Plate005	100005
7	Plate006	100006
8	Plate007	100007
9	Plate008	100008
10	Plate009	100009
11	Plate010	100010
12	Plate011	100011

The input file can be stored anywhere on the computer that runs the VWorks software. However, you must specify its location in the Protocol Options area.

Protocol Options	
Protocol Options Measuremen	t Manager
21	
Properties	
Device file path:	C:\VWorks Workspace\Protoco
Protocol alias:	
Description:	
Notes:	
Bar code file directory:	C:\VWorks Workspace\Baro
Use global context for this p	irc 🔽
Startup Script:	_
Finish Script:	
Delete hit pick output files:	v
Protocol Rules	

Data files

Description

Created by upstream applications such as LIMS or created manually, barcode data files are used by the Print task or the Print and Apply task to:

- Print barcodes on labels. For example, the software reads a row in the file and prints the barcode presented in that row.
- Look up barcodes to print on labels. For example, the software reads the east-side barcode on a labware, looks up the barcode in the file, and prints the north-side barcode that is in the corresponding column (same row).

You specify the data file to use when you specify the task parameters for the Print or Print and Apply task. See "Print" on page 578 and "Print and Apply" on page 318.

Requirements

Barcode data files must meet the following requirements:

- Be a comma-delimited text file with the .csv file name extension
- Optional. Contain a header, which can be in any format.
- Contain at least one column. For example, the file can contain four columns, each representing a side of the microplate.

The following example shows a data file displayed in Excel. The file contains four columns, each representing a side of the microplate. In addition, the file contains a header in row 1.

3 Creating a protocol: advanced topics

Tracking barcodes

	А	В	С	D
1	North	South	East	West
2	A00001	B00001	C00001	D00001
3	A00002	B00002	C00002	D00002
4	A00003	B00003	C00003	D00003
5				

The data file can be stored anywhere on the computer that runs the VWorks software.

Related information

For information about	See
Microplate Labeler	Microplate Barcode Labeler User Guide
Print task	"Print" on page 578
Print and Apply task	"Print and Apply" on page 318

Using simple variables

About this topic

This topic presents the following:

- "About variables" on page 77
- "Variable and snippet syntax" on page 78
- "Defining variables and adding code snippets" on page 78
- "Adding user message prompts" on page 82

About variables

You can use variables to assign operator-supplied values to task parameters, provide an initial value for looping, or reference an array in another task. An example of variable usage is as follows: During a protocol run, the software will prompt the operator for aspirate and dispense volumes. The software will use the operator-supplied values during the run.

Instead of writing detailed JavaScript code in the JavaScript task Advanced Settings area, you can type a simple variable assignment and a code snippet directly in a field in the Task Parameters area. The following example shows how to assign a variable called x to the Dispense Volume parameter in the Task Parameters area.

Task Parameters	ф.
Task Parameters	*
Dispense (Bravo) properties	
Location, plate:	3 (384 Costar 3657 PP Sqr well rn
Location, location:	<auto-select></auto-select>
□ Volume	
Empty tips:	
Volume (0 - 72 μL):	=x
Blowout volume (0 - 72 µL):	0

Assigning the variable in the Task Parameters area is equivalent to providing the following line of code in the Advanced Settings area:

task.Volume = x;

You can also add a snippet of code after the variable assignment. For example, you can assign the Dispense Volume to x, and then increment it by the same amount in each loop during the protocol run.

Task Parameters	Ψ
Task Parameters	8
2 ↓	
Dispense (Bravo) properties	
Location, plate:	3 (384 Costar 3657 PP Sqr well rn
Location, location:	<auto-select></auto-select>
🗆 Volume	
Empty tips:	
Volume (0 - 72 µL):	=x; ++x
Blowout volume (0 - 72 µL):	0

To prompt the operator for the values to use during the protocol run, you can select the option in the Define Variables task or add User Message tasks at the desired points in the protocol. See "Adding user message prompts" on page 82.

Variable and snippet syntax

When adding a variable and code snippet in the Task Parameters area, use the following syntax:

=x; <code snippet>

where x is the variable name and <code snippet> is additional code you want to run during the task. Use standard JavaScript rules for the variable name and for the code snippet.

Note: Variables defined here must be predefined in the protocol in the Define Variables task, User Message task, a previous JavaScript code snippet, or in the Advanced Settings area.

Defining variables and adding code snippets

You can define variables using the following:

- *Define Variables task.* In the Define Variables task, you can define multiple variables and set initial values. For more information, see "Define Variables" on page 564.
- *Define Plate Set task.* In the Define Plate Set task, you can define a variable that identifies a group of process plates to be processed identically. For more information, see "Define Plate Set" on page 560.
- *Task parameter variables.* You can define a variable for almost any parameter. For example, in the Aspirate task, you can define a variable for the Volume parameter. For more information, see "Task parameter variables" on page 78.
- Startup Protocol JavaScript task. Using the JavaScript task in the Startup Protocol, you can define multiple variables and assign initial values to them. For more information, see "Startup Protocol JavaScript task" on page 80.

Task parameter variables

The way you define a variable for other tasks depends on the field input style:

- Text box format
- List format
- Time format

Note: Parameters that require fixed values do not accept variables. For example, passwords, deck locations, and IP addresses cannot be assigned the value of a variable.

To assign a variable to a parameter whose value is displayed in a text box:

In the parameter value text box, type the variable assignment and optional code snippet. For syntax requirements, see "Variable and snippet syntax" on page 78.

Task Parameters	4
Task Parameters	۲
2↓	
Dispense (Bravo) properties	
Location, plate:	3 (384 Costar 3657 PP Sqr well rn
Location, location:	<auto-select></auto-select>
🗆 Volume	
Empty tips:	
Volume (0 - 72 µL):	=x; ++x
Blowout volume (0 - 72 µL):	0

To assign a variable to a parameter whose value can only be selected from a list:

1 In the list, select **Variable**.

Ξ	Properties		
	Liquid class:		•
	Distance from well bottom (0 - 1	Variable	^
	Dynamic tip extension (0 - 20 m	Edit liquids	
	Well selection:	384 disposable tip 0.5 - 10ul	
	Pipette technique:	384 disposable tip 10 - 50ul	
Ξ	Tip Touch	96 disposable tip 1 - 2ul	
	Perform tip touch:	96 disposable tip 1.0ul - 10ul 96 disposable tip 2 - 50ul	_
	Which sides to use for tip touch:	96 disposable tip 2 - 50ul	
	Tip touch retract distance (-20 -	96 disposable tip 51 - 200ul	
	Tip touch horizontal offset (-5 - !	fixed tip 0.05 - 1ul	~

The Script variable dialog box opens.

Script Variable	X
Please enter the variable or script:	
=	
OK Cancel	

2 Type the variable assignment and optional code snippet. For syntax requirements, see "Variable and snippet syntax" on page 78.

Note: The = symbol in front of the text box indicates that the software will automatically add the = symbol in front of the variable.

3 Click **OK**. The new variable and optional code snippet appear in the parameter value list.

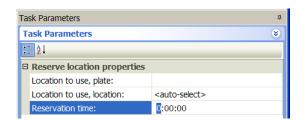
Ξ	Properties				
	Liquid class:	=у	•		
	Distance from well bottom (0 - 1		^		
	Dynamic tip retraction (0 - 20 m	96 disposable tip 51 - 200ul			
	Well selection:	fixed tip 0.05 - 1ul fixed tip 1 - 3ul fixed tip 1-3ul fixed tip 11 - 50ul			
	Pipette technique:				
	Tip Touch				
	Perform tip touch:	fixed tip 3 - 10ul			
	Which sides to use for tip touch:	fixed tip 51 - 200ul			
	Tip touch retract distance (-20 -	fixed tip wash fast fixed tip wash slow			
	Tip touch horizontal offset (-5 - !		~		

To add a variable to a parameter whose value is in the time format (h:mm:ss):

1 In the parameter value box, type = in the h, mm, or ss field. The Script variable dialog box opens.

3 Creating a protocol: advanced topics

Using simple variables

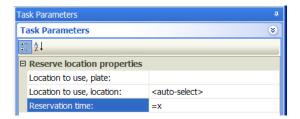


2 Type the variable assignment and optional code snippet. For syntax requirements, see "Variable and snippet syntax" on page 78.

Script Variable		
Please enter the variable or script:		
= X		
OK Cancel		

Note: The = symbol in front of the text box indicates that the software will automatically add the = symbol in front of the variable.

3 Click **OK**. The new variable and optional code snippet appear in the parameter field.



Startup Protocol JavaScript task

To create multiple variables and assign initial values to them:

1 In the protocol, click **Startup Protocol**.

Using simple variables

😻 VWorks - [MyProtocol ()1.pro]	
Ele Edit View Tools	<u>W</u> indow <u>H</u> elp	- @ ×
i 🗋 • 🖻 🖌 🕼 🗶 🐚	📋 🍓 🥑 🏸 🖕 🔗 Log out 🏭 Com	pile 🜔 Start 🕕 Pause al 🧟 Simulation is on
Available Tasks 🌼 ×	MyProtocol 01.pro *	₹ ×
All	Startup Protocol 🔹	Task Parameters 4
Configure Labware	Add Process	
Define Plate Set		
= X Define Variables		
Deld		
🍰 JavaScript		
C Loop		
Loop End		
Move To Location (Bravo)		
Print		
🗊 Pump Reagent (Bravo)		
Reld		
<>		
· · · · · · · · · · · · · · · · · · ·		
Enter text to filter on:	Main Protocol (8)	
	Cleanup Protocol (8)	
Workspace Available Tasks	Protocol Options (*)	
Ready		administrator is logged in NUM

2 Click Add Process. A Startup process appears.

Ele Edit View Tools	Window Help	- 8
🗋 • 🖻 🖬 🗑 🐰 🗋) 📋 🍓 🥝 🍠 🚽 🔗 Log out 🚝 Comj	ple 🌔 Start 🕕 Pause al 🧟 Simulation is c
Available Tasks 🌼 ×	MyProtocol 01.pro *	
All	Startup Protocol 🔹	Task Parameters
Configure Labware	E startup (*****)	Task Parameters
Define Plate Set	process - 1	20 24
	Remove process - 1	Plate properties
= X Define Variables		Plate name: startup process - 1
Deld	Add Process	
JavaScript		
Loop		
1		
Loop End		
Move To Location (Bravo)		
Print		
Pump Reagent (Bravo)		
Relid		
<		
🐔 🚔 😤 💉 🜆 🚌 All 😕		
Enter text to filter on:	Main Protocol 🛞	
	Main Protocol (*) Cleanup Protocol (*)	
		Advanced Settings

3 Add the **JavaScript** task.

3 Creating a protocol: advanced topics

Using simple variables

😻 VWorks - [MyProtocol 0	01.pro]			
Ele Edit View Tools Window Help - & ×				
🗋 • 🖻 🖬 🖗 🐰 🖻	🖺 🎍 🕢 🥕 🖕 🚫 Log out 🏣 Comp	ole 🌔 Start 🕕 Pause al 👰 Simulation is on		
Available Tasks 🛛 🕈 🗙	MyProtocol 01.pro *	₹ ×		
All	Startup Protocol 🛞	Task Parameters a		
Configure Labware	E startup	Advanced Settings (8)		
Define Plate Set	process - 1	Script to be executed before task		
= X Define Variables	Remove startup JavaScript process - 1			
2 Deld	Add Process			
JavaScript				
CLOOP				
Loop End				
Move To Location (Bravo)				
Print		< · · · · · · · · · · · · · · · · · · ·		
Pump Reagent (Bravo)		"JavaScript" properties		
42		Estimated time (sect 5.0		
Relid				
< - >				
🚭 台 📚 📣 🏧 🚥 📶 🤌	< >			
Enter text to filter on:	Main Protocol (*)			
	Cleanup Protocol (*)			
Workspace Available Tasks	Protocol Options (*)			
Ready		administrator is logged in NUM		

4 In the Advanced Settings area, type the variable assignments.

😻 VWorks - [MyProtocol ()1.pro]	
Ele Edit View Tools	Window Help	- 0
🗋 • 🖻 🖬 🖗 🐰 🖻	📋 🍓 🥝 🏸 🖕 🔗 Log out 🏣 Comj	ole 🌔 Start 🕕 Pause al 🥺 Simulation is o
Available Tasks 🌼 🔍	MyProtocol 01.pro *	-
All	Startup Protocol 😵	Task Parameters
Configure Labware Define Plate Set Define Variables Deld JavaScript Loop End Move To Location (Bravo) Print Pump Reagent (Bravo) Reld	startup process - 1 Remove Add Process	Advanced Settings
() (··· 응 ··· · ··· · ··· · ··· ··· ··· ··	< >	
Enter text to filter on:	Main Protocol (*)	
	Cleanup Protocol 🛞	
Workspace Available Tasks	Protocol Options (*)	
Ready		administrator is logged in NUM

Adding user message prompts

After adding variables to the desired task parameters, you can add User Message tasks to prompt operators for values at the beginning of the protocol run or at the desired points during the protocol run. *Note:* You do not need to add the User Message task when using the Define Variables task. The Define Variables task contains an option to add a user message prompt.

To add User Message tasks:

- **1** In the Startup Protocol:
 - Add a (i) User Message task for each variable assigned in a task parameter input field.
 - Add a (i) User Message task for any variable that you assigned in the Advanced Settings area of a given task. If you added variables in the Advanced Settings area, add the (i) User Message task after the

JavaScript task in the startup protocol.

Alternatively, at the desired points in the Main Protocol, add a User Message task for each variable assigned in a task parameter input field.

2 In the **Task Parameters** area, type values and select the desired options in the **User Message Properties** table. For a description of the properties, see "User Message" on page 599.

Task Parameters		*
8∎ 2 ↓		
🛛 User Message Propertie	25	
Title:		
Body:		
Notify First Time Only:		
Display Dialog Box:	-	
Pause Process:	~	
	_	

3 Select **User data entry into variable** and type the name of the variable in the **Variable name** box. During the protocol run, the software will prompt the operator for a value and assign it to this variable.

Fask Parameters	
Task Parameters	۲
: ∎ 2↓	
User Message Properties	
Title:	
Body:	
Only show the first time:	Г
Scripting variable data en	itry
User data entry into variable:	2
Variable name:	

IMPORTANT If you added multiple variables in the startup protocol, do not use the Variable name property. Instead, use the Body property to instruct the operator to set the variable values in the Advanced Settings area. For details on the Body property, see "User Message" on page 599.

Related information

For information about	See
User Message task	"User Message" on page 599
JavaScript task	"JavaScript" on page 573
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
Using JavaScript utilities	"Using JavaScript utilities" on page 128
Startup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60

Using JavaScript

About this topic

This topic explains how to use JavaScript in the VWorks software. For a full description of the JavaScript language, see the Mozilla Developer Center at http://www.mozilla.org/js/.

Read this topic if you have administrator or technician privileges. This topic assumes that you know how to write programs in JavaScript or have basic programming knowledge.

How JavaScript is used in the software

A comprehensive JavaScript engine is implemented in the VWorks software so that you can customize the software as follows:

- Change the existing task parameters.
- Skip a task if certain conditions are met.
- Repeat a task if certain conditions are met.

The task parameters can change dynamically during a run based on conditions such as:

- Information passed from an external source, such as a database
- The number of times the protocol has cycled
- · Feedback on changing conditions or data values during the run

Examples of use

You can use JavaScript in the VWorks software to:

- Print the parameters of a task to the main log.
- Run a command that launches an external application, such as a batch file or database-updating program.
- Reduce the length of the protocol.

Where to write JavaScript

You can write JavaScript in the Advanced Settings area of any task or in the JavaScript task in the Startup, Main, and Cleanup Protocols. JavaScript written in any task is run differently than code written in the JavaScript task:

• *Any task.* During a protocol run, the software will run the JavaScript first before evaluating whether the task is possible.

Note: In the previous version of the VWorks software, the software ran the script after evaluating whether the task was possible.

• *JavaScript task*. You can add the JavaScript task to run a program that is independent of any task. During a protocol run, the software will run the JavaScript as it reaches the JavaScript task.

The following example shows JavaScript written in the Advanced Settings area of the Aspirate task. Notice that the script is written directly in the text box.

😻 VWorks - [Quadrant	t Looping.pro]				
🗄 Ele Edit View Too	Ele Edit View Iools Window Help - 6 ×				
🗋 • 🆻 🖬 🖗 🐰	📄 🖺 🍓 🕜 🏸 🖕 🔗 Log out 🏣 Compile	D S	tart 🕕 Pause al 🧟 Simulation is on 🎉 Diagnostics 🍃		
Available Tasks 🌼 🌣	E Quadrant Looping.pro *		₹ ×		
All	Startup Protocol	*	Task Parameters 4		
Aspirate (Bravo)	Main Protocol	*	Task Parameters		
Assemble Vacuum (B	Destination	^	Advanced Settings 🛞		
Change Instance Define Plate Set Define Variables Define Variables Define Variables	(384 Costa deepwell PP Cir Sqr Well V Btm) → 1 times Aspirate 10 Dispense 10 µL in 1 selection(s) selection(s) from Source to Destination Source (96 Greiner 655101 PS Clr Rnd Well Flat Btm)		Script to be executed before task open("c:\\scripts\\script1.txt") 2 2 2 2 3 2 1 3 2 1 3 3 2 1 5 5 5 5 5 5 5 5 5 5 5 5 5		
Enter text to filter on:	Cleanup Protocol	*			
Workspace Ausiable T	provident in the second s	-			
Workspace Available T	Protocol Options	*			

You can add JavaScript in the following ways:

- Directly in the text box in the Advanced Settings area (see the previous example)
- As an external file that is called by the open() function in the text box

Task Parameters	Д
Task Parameters	۲
Advanced Settings	۲
Script to be executed before task	
open("c:\\scripts\\script1.txt")	
<	>
2	

About JavaScript variables

By default, the values of all variables are cleared (set to undefined) before the next protocol is run. To retain the value of all variables from protocol to protocol, select the **Use global context for this protocol** option in the Protocol Options tab. When the option is turned on, a variable and its value assigned in one protocol can be used by other protocols that have the same variable until you exit the software. If using the global context option, the values of variables are not reset until the software is restarted.

CAUTION If you select the Use global context for this protocol option, variables with the same name in different protocols will overwrite each other.

Cautions

Before running a protocol containing JavaScript, compile the protocol and run it in simulation mode.

During the compiling process, the software uses values displayed in the Task Parameters area and not the values set by JavaScript. Therefore, some errors might not be detected during compilation. The values that appear in the Task Parameters area do not reflect the effects of the JavaScript.

Be aware that JavaScript does not check pipetting volumes before the run begins. Therefore, you must make sure that the pipetting steps make logical sense. For example, the software does not alert you if a JavaScript attempts to aspirate 1 μ L from a microplate well that can only hold 0.5 μ L.

Related information

For information about	See
JavaScript language	Mozilla Developer Center
Using script variables directly in task parameters	"Using simple variables" on page 77
JavaScript task	"JavaScript" on page 573
Using JavaScript utilities	"Using JavaScript utilities" on page 128
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60

VWorks-defined functions

Function descriptions

The VWorks JavaScript interpreter supports the JavaScript 1.5 or later core functions and objects. VWorks also has its own functions and objects that can be used.

The following VWorks-defined functions are available globally, so they are not restricted to a particular object or programming context.

Function	Description		
GetGlobalObject()	Provides the ability to get the global context from a JavaScript that is executed in a context other than the global context. Returns an object that has all the variables of the global context. For example, in a protocol that uses the local context for variables, you can have a JavaScript task that includes a variable in the global context.		
	Example:		
	<pre>//(0) Create a reference to global object from this context.</pre>		
	<pre>var g_ref = GetGlobalObject();</pre>		
	//(1) Declare a var xx in GlobalObject.		
	g_ref.xx = 4		
	//(2) Increment the variable.		
	g_ref.xx++		
	//(3) Print the variable.		
	<pre>print(g_ref.xx)</pre>		
	<i>Note:</i> In this example, lines (2) and (3) could be executing from different protocols, each in their own private context, with shared data results.		
	<i>Note:</i> You can set a breakpoint on the task that uses this function to open the Debugger dialog box and view the variable (g_ref). For details on setting breakpoints, see "Using breakpoints to monitor and troubleshoot tasks" on page 643.		
open()	Opens a text file and immediately executes the file contents as script.		
	Parameter: Text string		
	Examples: open("c:\\VWorks workspace\\script.js")		
	open("c:\\VWorks workspace\\script.txt")		
	Make sure the file is in ANSI text format. The file extension is not important.		
	<i>Note:</i> Microsoft Notepad saves in ANSI text format by default.		

3 Creating a protocol: advanced topics

VWorks-defined functions

Function	Description		
print()	Prints time-stamped messages to the VWorks log. Parameter: Text string		
	<pre>Example: print(plate.name)</pre>		
run()	Runs a Microsoft Windows script as though it is being called from a command line.		
	Parameters:		
	• <i>Text string.</i> Required. Allows you to initiate a command that you could otherwise enter into the Windows Run dialog box, such as notepad text.txt (opens a file named text.txt in Windows Notepad).		
	• <i>Boolean True/False</i> . Optional. Default is False. If True, the software waits for the function to complete before continuing (blocking).		
	Examples:		
	 run("notepad") 		
	 run("notepad",true) 		
	The first example starts Notepad. The second example starts Notepad and pauses the VWorks software until you exit Notepad.		

Related information

For information about	See
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
VWorks-defined plate objects, properties, and methods	"plate object" on page 91
VWorks-defined task objects, properties, and methods	"task object" on page 98
Using JavaScript utilities	"Using JavaScript utilities" on page 128
JavaScript task	"JavaScript" on page 573
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60
Using script variables directly in task parameters	"Using simple variables" on page 77
How to specify the JavaScript context for a protocol	"Setting protocol options" on page 30
JavaScript context and form design	"Understanding JavaScript context in form design" on page 204

InventoryLabware object

About the InventoryLabware object

The VWorks JavaScript interpreter provides the following objects that can be accessed by a script.

- InventoryLabware object
- plate object
- plates[] object
- task object
- plateDB object
- runset object
- forms object

This topic describes the InventoryLabware object properties.

InventoryLabware represents an individual labware in the inventory database. By passing InventoryLabware objects to plateDB methods in a JavaScript, you can manage specific labware in the inventory. To see an example of this implementation, see the importLabwareToInventory method example in "plateDB object" on page 112.

Properties

InventoryLabware.property			
Property	Data type	Description	
name	String	Name of the labware.	
device	String	Name of the device.	
		IMPORTANT The device name must match the name in the device file. Be sure to include any spaces, underscores, dashes, and capitalization in the name.	
cassette	Integer	Cassette number.	
slot	Integer	Slot number.	
type	String	Labware type.	
westbc	String	Barcode on the west side of the labware.	
eastbc	String	Barcode on the east side of the labware.	
southbc	String	Barcode on the south side of the labware.	
northbc	String	Barcode on the north side of the labware.	

Syntax: InventoryLabware.property

3 Creating a protocol: advanced topics

InventoryLabware object

Property	Data type	Description
status	String	Status of the labware:
		0–0K
		1–Error
		2–Invalid
		3–Barcode misread
		You can set or get the status of the labware. When you add the labware information to the database using the importLabwareToInventory plateDB method, you can set the labware status. When you retrieve labware information using the getLocationByBarcode plateDB method, you can get the labware status.
plategroup	String	Plate group to which the labware belongs.
locationgroup	String	Location group to which the labware belongs.

Methods

Methods are JavaScript functions invoked through an object. The InventoryLabware object has the following methods, available on systems that have the inventory database option. Use these methods to track labwarespecific data.

Syntax:

InventoryLabware.method()

Method	Description
nextPlateGroupName()	Returns the name of the next plate group.
	A labware can belong to multiple plate groups. Use this method to determine all the plate groups to which a labware belongs.
nextLocationGroupName()	Returns the name of the next location group.
	A labware can belong to multiple location groups. Use this method to determine all the locations groups to which a labware belongs.

Related information

For information about	See	
Using JavaScript in the VWorks software	"Using JavaScript" on page 84	
VWorks-defined functions	"VWorks-defined functions" on page 87	
Other VWorks-defined objects	 "plate object" on page 91 "runset object" on page 123 "plateDB object" on page 112 "task object" on page 98 "forms object" on page 126 	
Using JavaScript utilities	"Using JavaScript utilities" on page 128	
JavaScript task	"JavaScript" on page 573	
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60	

plate object

About the plate object

The VWorks JavaScript interpreter provides the following objects that can be accessed by a script.

- plate object
- "plates[] object" on page 95
- "task object" on page 98
- "InventoryLabware object" on page 89
- "plateDB object" on page 112
- "runset object" on page 123
- "forms object" on page 126

This topic describes the plate object properties and methods.

plate provides access to properties of the labware that the current task is operating on. You use the plate object in non-subprocess tasks such as the Place Plate task.

IMPORTANT To access labware properties in a subprocess task, use the plates[] object.

Properties

To see the properties of a plate object:

- **1** Open a protocol and select a task in the protocol area.
- 2 In the Advanced Settings area, type plate. The software automatically displays the list of available properties for the plate object.

Task Para	meters	9
Task Parameters		۲
Advance	ed Settings	۲
Script to I plat	be executed before task te.	
	instance labware barcode volume plateMultiplier hasLid startedWithLid device location	
<		>
1 21		

Instead of displaying the list of plate properties in the Advanced Settings area, you can also list them in the Main Log. Doing so allows you to print the log file and retain a copy of the properties for reference.

To list the plate properties in the Main Log:

- **1** Open a protocol.
- 2 Select a task in the **Protocol** area.
- **3** In the Task Parameters area, click Advanced Settings.
- **4** Type the following in the **Script to be executed before task** area:

```
for (x in plate) {
    print ("plate." + x + " = " + plate[x]);
}
```

5 Run the protocol. The plate properties appear in the Main Log. The following table lists the plate properties.

Property	Data type	Description
plate.name	String	Name of the plate. The property is read- only.
plate.instance	Integer	Plate instance number. The property is read-only.
plate.labware	String	Name of the labware type. The property is read-only.
plate.barcode	Array	Array of four strings where, SOUTH=0, WEST=1, NORTH=2, EAST=3. The property is read-only, and can be changed by the plate.setBarcode() method. Example: plate.barcode[SOUTH]

Property	Data type	Description
plate.volume	Array of array of floats	An array consisting of one or more arrays of floating point numbers. The array size depends on the number of wells in the labware (96, 384, or 1536), arranged in row, column format.
		This property is available only in VWorks software that has the volume-tracking database option. The property is read- only.
		Example:
		plate.volume[row][column]
		For 96-well microplates, the maximum row value is 8, and the maximum column value is 12.
		For 384-well microplates, the maximum row value is 16, the maximum column value is 24.
		For 1536-well microplates, the maximum row value is 32, the maximum column value is 48.
plate.plateMultiplier	Integer	The number of microplates needed for the run. This number is based on the number of times the protocol is run and the specifications in the Loop and Change Instance tasks. The property is read-only.
		Examples:
		• A simple protocol processing Plate_A is run twice. The plateMultiplier is 2
		• A protocol loops four times to move contents from the Source Plate to the Destination Plate, and changes instance on the Source Plate only. The protocol is run once. The plateMultiplier is 4 for the Source Plate and 1 for the Destination Plate
plate.hasLid	Boolean	The indicator that the microplate currently has a lid. The property is read- only.
plate.startedWithLid	Boolean	The indicator that the microplate entered the system with a lid. The property is read-only.
plate.device	String	The device that is processing the plate. The property is read-only.
plate.location	String	The location on the device. The property is read-only.

Methods

Methods are JavaScript functions invoked through an object. The plate object has the following methods, available on systems that have the volume-tracking database option. Use these methods to track microplate-specific data.

Note: You can use the plate.getUserData() method to retrieve information stored by the plates[n].setUserData() method.

Method	Description
plate.setUserData(string <i>key</i> , string <i>value</i>)	Stores value under the key in a database record associated with this microplate. The data is retained across runs.
	The method is only available if the database is installed.
plate.getUserData(string <i>key</i>)	Returns the 'value' stored earlier using plate.setUserData or plates[n].setUserData. (See "plates[] object" on page 95.)
	The method is only available if the database is installed.
plate.reportErrorToPlugin(string error)	Calls the VWorks Hooks ScriptPlateError method to pass error to the Hooks plugin.
plate.setBarcode(SIDE, string <i>barcode</i>)	Manually stores the barcode data in plate.barcode[SIDE].
	For example:
	plate.setBarcode(WEST, "A1234")

Related information

For information about	See
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
VWorks-defined functions	"VWorks-defined functions" on page 87
Other VWorks-defined objects	 "InventoryLabware object" on page 89 "runset object" on page 123 "plates[] object" on page 95 "plateDB object" on page 112 "task object" on page 98 "forms object" on page 126
Using JavaScript utilities	"Using JavaScript utilities" on page 128
JavaScript task	"JavaScript" on page 573

Protocol processes" on page 60

For information about	See
Startup and cleanup protocols	"Setting up Startup and Cleanup

plates[] object

About the plates[] object

The VWorks JavaScript interpreter provides the following objects that can be accessed by a script.

- plates[] object
- "plate object" on page 91
- "task object" on page 98
- "InventoryLabware object" on page 89
- "plateDB object" on page 112
- "runset object" on page 123
- "forms object" on page 126

This topic describes the plates[] object properties and methods.

plates[] is a VWorks-defined array of plate objects that provides access to properties of one or more microplates upon which the current task is operating. You use the plates[] object only for subprocess tasks that reference at least one microplate. For subprocess tasks that do not employ microplates, such as the curly-brace task, the plates[] object is not relevant.

IMPORTANT To access microplate properties in a non-subprocess task, use the plate object.

In a subprocess, the plates[] object is defined only for those tasks that employ a microplate, such as Aspirate or Dispense. Each element in the plates[] object references a single microplate that is referenced by the current instance of the task. The array elements refer to actual process plates, not just instances of a plate. The first element of the plates[] object is the first plate associated with that subprocess task. Therefore, plates[0] in the Aspirate task refers to the Source plate, while in the Dispense task, plates[0] is the Destination plate.

The array elements are in the order that they appear in the task. For example, the Dilute to Final Volume task uses two microplates: Source (plate[0]) and Destination (plate[1]). Suppose the task is in a loop and a Change Instance task changes the Destination microplate each time through the loop. The Source microplate remains plates[0] and the Destination microplate remains plates[1] each time the Dilute to Final Volume task is performed.

Properties

IMPORTANT You can list plates[] properties only for a subprocess task that has at least one microplate associated with it.

You can list the plate properties of each plate[n]. For example, you can list the properties for plate[0] and plate[1] to identify and determine the differences between them.

To list the plates[] properties in the Main Log:

- **1** Open a protocol.
- 2 In the **Protocol** area, select a subprocess task that references at least one microplate.
- 3 In the Task Parameters area, click Advanced Settings.
- 4 Type the following in the Script to be executed before task area:

```
for (x in plates[n])
{
    print ("plates[n]." + x + " =" + plates[n][x]);
}
Where n is the array index.
```

5 Run the protocol. The plate properties appear in the Main Log.

The plates[] properties are the same as the plate properties. For the list and description of the plate properties, see "plate object" on page 91.

Methods

Methods are JavaScript functions invoked through an object. The plates[] object has the following methods, available on those systems with the volume-tracking database option. Use these methods to track microplate-specific data.

Note: You can use the plates[n].getUserData() method to retrieve information stored by the plate.setUserData() method.

Method	Description
plates[n].setUserData(string <i>key</i> , string <i>value</i>)	Stores the <i>value</i> under the <i>key</i> in a database record associated with this microplate. The data is retained across runs.
	The method is only available if the database is installed.
plates[n].getUserData(string <i>key</i>)	Returns the <i>value</i> stored earlier using plates[n].setUserData or plate.setUserData. (See "plate object" on page 91.)
	The method is only available if the database is installed.
plates[n].reportErrorToPlugin(string error)	Calls the VWorks Hooks ScriptPlateError method to pass <i>error</i> to the Hooks plugin.
plates[n].setBarcode(SIDE, string barcode)	Manually stores the barcode data in plates[n].barcode[SIDE].
	For example:
	plates[0].setBarcode(WEST, "A1234")

Related information

For information about	See
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
VWorks-defined functions	"Works-defined functions" on page 87
Other VWorks-defined objects	• "InventoryLabware object" on page 89
	• "plate object" on page 91
	• "runset object" on page 123
	• "plateDB object" on page 112
	• "task object" on page 98
	• "forms object" on page 126
Using JavaScript utilities	"Using JavaScript utilities" on page 128
JavaScript task	"JavaScript" on page 573
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60

task object

About the task object

The VWorks JavaScript interpreter provides the following objects that can be accessed by a script.

- task object
- "plate object" on page 91
- "plates[] object" on page 95
- "InventoryLabware object" on page 89
- "plateDB object" on page 112
- "runset object" on page 123
- "forms object" on page 126

This topic describes the task object properties and methods.

task refers to the currently running task. It allows the properties of the task to be accessed using a standard syntax. Depending on which task is running, a different set of properties might be available.

Properties

The properties available for a task correspond to its task parameters in the Task Parameters area.

To see the properties of a task:

- **1** Open a protocol that contains the task.
- 2 Select the task in the **Protocol** area.
- **3** In the Advanced Settings area, type task. in the Script to be executed before task box. The software automatically displays the list of available properties for the task object.

In the following example, the properties for the Aspirate (Bravo) task is shown in the Advanced Settings area. Notice that they correspond to the parameters in the Task Parameters area.

Task Parameters Task Parameters \$ Advanced Settings 8 21 Script to be executed before task Aspirate (Bravo) Properties Plate (384 Costar 3657 Pl task Location, plate: name Location, location: <auto-select> description **Volume** numberOfRuns Location_plate Volume (0 - 251 µL): 10 Location_location Pre-aspirate volume (0 - 25 0 Volume Preaspiratevolume Post-aspirate volume (0 - 2 0 Postaspiratevolume Liquidclass < > Properties Distancefromwellbottom Dynamictipextension B "Aspira Performtiptouch Estimate Whichsidestousefortiptouch Liquid class: Distance from well bottom (2 Dynamic tip extension (0 - 0 Estimate Whichsidestouse of Tiptouchretractdistance Tiptouchhorizontaloffset Well selection: 1 selection: quadrant 1 Wellselection Pipette technique: Pipettetechnique **Tip Touch** ~ Perform tip touch: Which sides to use for tip to None Tip touch retract distance (0 Tip touch horizontal offset (0 Aspirate (Bravo) Properties Set the "Aspirate (Bravo)" properties here Advanced Settings

Instead of displaying the list of task properties in the Advanced Settings area, you can also list them in the Main Log. Doing so allows you to print the log file and retain a hardcopy of the properties for reference.

To list the task properties in the Main Log:

- **1** Open a protocol that contains the task.
- 2 Select the task in the **Protocol** area.
- 3 In the Task Parameters area, click Advanced Settings.
- **4** Type the following in the **Script to be executed before task** area:

```
for (x in task) {
    print("task.[" + x + "] =" + task[x]);
}
```

5 Run the protocol. The task properties appear in the Main Log.The following example shows the properties for the Aspirate (Bravo) task.

task object

Main Log			Д	×
Timestamp	Class	Description		^
9/22/2008 5:52:34 PM	🗸 Event	Process starting		
9/22/2008 5:52:34 PM	💰 Script	task [name] =Bravo::secondary::Aspirate		
9/22/2008 5:52:34 PM	💰 Script	task [description] =Aspirate 10 µL in 1 selection(s)		
9/22/2008 5:52:34 PM	💰 Script	task [numberOfRuns] =1		
9/22/2008 5:52:34 PM	💰 Script	task [Location_plate] =		
9/22/2008 5:52:34 PM	💰 Script	task [Location_location] = <auto-select></auto-select>		
9/22/2008 5:52:34 PM	💰 Script	task [Volume] =10		
9/22/2008 5:52:34 PM	💰 Script	task [Preaspiratevolume] =0		
9/22/2008 5:52:34 PM	💰 Script	task [Postaspiratevolume] =0		
9/22/2008 5:52:34 PM	💰 Script	task [Liquidclass] =		
9/22/2008 5:52:34 PM	💰 Script	task [Distancefromwellbottom] =2		
9/22/2008 5:52:34 PM	💰 Script	task [Dynamictipextension] =0		
9/22/2008 5:52:34 PM	💰 Script	task [Performtiptouch] =false		
9/22/2008 5:52:34 PM	💰 Script	task [Whichsidestousefortiptouch] =None		
9/22/2008 5:52:34 PM	📥 Script	task [Tiptouchretractdistance] =0		
9/22/2008 5:52:34 PM	💰 Script	task [Tiptouchhorizontaloffset] =0		
9/22/2008 5:52:34 PM	💰 Script	task [Wellselection] =1,1		L
9/22/2008 5:52:35 PM	💰 Script	task [Pipettetechnique] =		1
<			>	
Main Log Pipette Log	Time Cons	traints Log Progress Runset Manager		
Ready		a is logged in		1

Task property data types

A task property can be one of the following data types. You can use the default task parameter value to determine the data type.

Data type	Example task parameter		
Array	Aspirate task, well selection		
	Well selection: 1 selection: quadrant 1		
	For more information about the array data type, see "Array data types" on page 101.		
Boolean	Aspirate task, Perform tip touch option		
	🗉 Tip Touch		
	Perform tip touch:		
Float	Aspirate task, Volume parameter		
	Volume		
	Volume (0 - 251 µL): 10.0		
Integer	Loop task, Number of times to loop parameter		
	Loop properties		
	Number of times to loop: 5		
String	Name of a process plate		
	Plate identity		
	Plate name: process - 1		

Array data types

In JavaScript, an array is a built-in object that stores a collection of like values called elements. Each element is accessed by an index value that is enclosed in square brackets. Index values must be non-negative integers.

The following example script declares an array with three elements:

```
var vehicle_type = new Array(3);
vehicle_type[0] = "car";
vehicle_type[1] = "truck";
vehicle_type[2] = "van";
```

In the VWorks software, the array data type applies to properties that specify:

- The sides of a microplate for barcode reading or labeling
- The well selection in liquid-handling tasks, such as the Aspirate task

Sides of a microplate

In properties that specify the sides of a microplate, the array contains four elements, each representing a side of the microplate, for example:

- task.side[SOUTH]
- task.side[EAST]
- task.side[NORTH]
- task.side[WEST]

Well selection

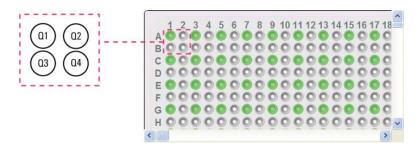
In properties that specify well selection, the array identifies the location of wells and quadrants in a microplate. Well locations are represented by a pair of integers that describe its row and column coordinates: [row, column].

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head. The following table lists the types of pipette heads and the number of accessible quadrants in various microplates.

Pipette head channels/ pin tool pins	Microplate	Number of quadrants
96	96- well	1
	384- well	4
	1536- well	16
384	384- well	1
	1536- well	4
1536 (pin tool only)	1536- well	1

The following diagram demonstrates the concept of quadrants. The diagram shows a portion of a 384-well microplate and highlights the four quadrants (Q1, Q2, Q3, and Q4) that are accessible by the A1 tip of a 96-channel pipette head. Notice that the green color highlights all of the quadrant 1 (Q1) wells across the microplate.

task object



When specifying well selection, you provide both the well location and quadrant location. For example, the designation for the four quadrants highlighted in the previous diagram is:

[[1,1],[1,2],[2,1],[2,2]]

where the Q1 coordinates are [1,1], Q2 coordinates are [1,2], Q3 coordinates are [2,1], and Q4 coordinates are [2,2].

You can also use variables to represent the row and column coordinates, as the following example shows:

task.Wellselection = [[disp row,disp col]]

IMPORTANT Quadrant specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To cycle through the quadrants in a liquid-handling task, you can use a series of if statements as the following example shows.

```
var Dispense Loop;
if (Dispense Loop == undefined) {
      Dispense Loop = 1;
}
if (isNaN(Dispense Loop)) {
   Dispense Loop = 1;
}
if ((Dispense Loop < 1) || (Dispense Loop > 4)) {
   Dispense Loop = 1;
}
if (Dispense Loop == 1) {
   task.Wellselection = [[1,1]];
}
if (Dispense Loop == 2) {
   task.Wellselection = [[1,2]];
}
if (Dispense Loop == 3) {
   task.Wellselection = [[2,1]];
}
if (Dispense Loop == 4) {
   task.Wellselection = [[2,2]];
}
```

```
Dispense_Loop++;
print("Dispensing to quadrant "+task.Wellselection+" of
Destination plate.");
}
```

Methods

The task object methods, and the properties of the methods, are specific to the selected task. The following table lists some of the shared methods:

Method	Description
task.skip()	Skips the current task. Use this function to conditionally run a task, such as in this example which skips the task if the simulator is not running:
	if (!task.isSimulatorRunning()) {
	<pre>task.skip();</pre>
	}
task.pause()	Pauses the protocol and opens a dialog box that asks you whether you want to continue or abort the run.
	Use this function if you need to pause the protocol to, for example, replenish the fluid in a static reservoir. You could use the print() function to add a note to the log toolbar describing the action to take when the VWorks software has paused.
task.isSimulatorRunning()	Returns true if this is a simulated run Has no arguments.
task.repeat()	Schedules the task to be repeated.
task.repeatDelay(int <i>timeseconds</i>)	Requests the task to wait the specified time (in seconds), and then repeats. For example, you can use this method to wait for a value to change.
task.setGlobalData(string <i>name</i> , string <i>value</i>)	Stores <i>value</i> in <i>name</i> in the Global database.
task.getGlobalData(string <i>name</i>)	Returns the value stored earlier using task.setGlobalData.
task.getProtocolName()	Retrieves the full protocol path (string).

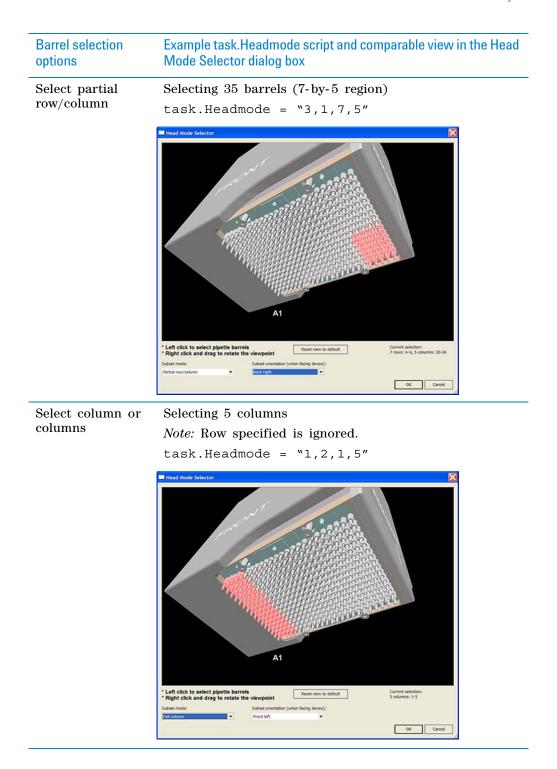
task.Headmode method

Available only for SubProcess (Bravo). The following method enables selection of a subset of the barrels in the pipette head:

task.Headmode(string hst,hso,row,col)

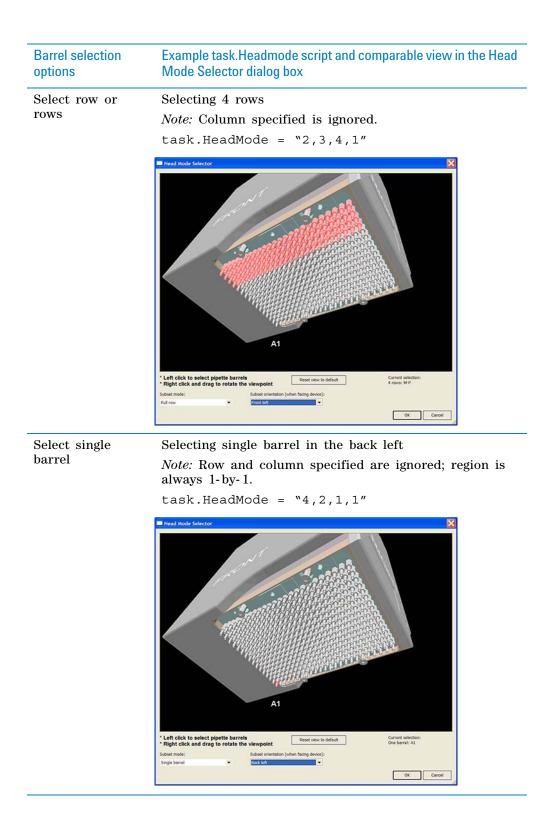
Parameter	Values
hst	Specifies the barrel selection as follows:
	$0 = all_barrels$
	1 = column
	2 = row
	3 = partial_column_row
	4 = single_barrel
hso	Specifies the region of the barrel selection, where,
	0 = front_right
	1 = back_right
	$2 = back_left$
	3 = front_left
row	Specifies the row dimensions of the barrel selection, for example,
	• 96-barrel head, the maximum row value is 8, and the maximum column value is 12.
	• 384-barrel head, the maximum row value is 16, the maximum column value is 24.
col	Specifies the column dimensions of the barrel selection, for example,
	• 96-barrel head, the maximum row value is 8, and the maximum column value is 12.
	• 384-barrel head, the maximum row value is 16, the maximum column value is 24.

The following examples show how to use task.Headmode.



3 Creating a protocol: advanced topics

task object



Related information

For information about	See
Writing JavaScript for the Print and Apply task	"Using JavaScript with the CentrifugeAuto task" on page 108
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
VWorks-defined functions	"VWorks-defined functions" on page 87
Other VWorks-defined objects	 "InventoryLabware object" on page 89 "plate object" on page 91 "plates[] object" on page 95
	 "plateDB object" on page 112 "runset object" on page 123 "forms object" on page 126
Using JavaScript utilities	"Using JavaScript utilities" on page 128
JavaScript task	"JavaScript" on page 573
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60
Specifying a quadrant pattern in the Well Selection dialog box	 "Aspirate (Bravo, Vertical Pipetting Station)" on page 392 "Dispense (Bravo, Vertical Pipetting Station)" on page 451 "Mix (Bravo, Vertical Pipetting Station)" on page 497

Using JavaScript with the CentrifugeAuto task

About this topic

This topic provides two examples of using JavaScript to modify the implementation of the CentrifugeAuto task. For more information about using the CentrifugeAuto task, see "CentrifugeAuto" on page 286.

Counterweight selection

When using the Auto managed counterweight mode, you can use JavaScript to select the counterweight, for example:

```
if(place.instance%2 == 1)
{
task.Counterweight = "CW1";
}
else
{
task.Counterweight = "CW2";
}
```

Reduce number of spins for one plate

When running an odd number of microplates with the CentrifugeAuto task in Use 2 protocol plates mode, the second to last plate is spun twice so that the last microplate is paired. Using JavaScript, you can direct the protocol to switch to Auto managed counterweight mode for the last spin, for example:

```
if((plate.instance == task.numberOfRuns) &&
(plate.instance%2 == 1))
{
 task.skip();
}
if((plate.instance == task.numberOfRuns) &&
(plate.instance%2 ==1))
{
 task.Counterweight = "CW1"
}
else
{
 task.skip();
}
```

Related information

For information about	See	
CentrfiugeAuto task	"CentrifugeAuto" on page 286	
Using JavaScript in the VWorks software	"Using JavaScript" on page 84	
VWorks-defined functions	"VWorks-defined functions" on page 87	
Using JavaScript utilities	"Using JavaScript utilities" on page 128	

About scripting the Print and Apply task

Print and Apply task parameter exceptions

Unlike other tasks, the Print and Apply task parameters have the following exceptions:

- The number of parameters can vary, because each labeling device has a different number of formats, and each format has a different number of fields. (In the software, the contents of each field are specified in the Field Composer dialog box.)
- The software uses the destination side of the microplate (south, west, north, or east) as a prefix for the parameter names:

In the following example, MyFormat is specified for the south and west sides of a microplate for fields 1 and 2. The software will append a prefix to each field name to indicate the side. The new field names will be South_1, South_2, West_1, and West_2.

Task Parameters		*
21		
South		
Format:	MyFormat	
1:		
2:		
🗆 West		
Format:	MyFormat	
1:		
2:		
North		
Format:	None	
🗆 East		
Format:	None	
Device Selection		۲
Advanced Settings		(*)

Scripting what to print (label content)

When scripting the task parameters for the Print and Apply task, the field parameter must be assigned to a string that encodes what is to be printed. The following table lists the task parameters and the corresponding string options.

Note: When in doubt about available task parameters, add the following script into the task and run: for $(x \text{ in } task) \{ print (x + "::" + task [x]) \}$ This script prints all the current task parameters.

Parameter	JavaScript string
Date	"[DATE:enum1]"
	Where enum1:
	0 – Use System Format
	1 – YYYY/MM/DD
	2 - DD/MM/YYYY
	3 – MM/DD/YYYY
	4 - YY/MM/DD
	5 - DD/MM/YY
	6 – MM/DD/YY
	Example:
	<pre>task.East_1 = "[DATE:0]"</pre>
Time	"[TIME:enum1]"
	Where enum1:
	0–12 (12-hour time AM/PM)
	1–24 (24-hour time)
	Example:
	<pre>task.East_1 = "[TIME:0]"</pre>
Counter	"[COUNTER:StartAt:IncBy:TotalNumberOfDigits:Inc EveryNPlates:enum1]"
	Where enum1:
	0 – Numeric (0–9)
	1 – Alphanumeric (0–Z)
	Example:
	<pre>task.East_1 = "[COUNTER:0:1:3:2:1]"</pre>
File With	"[FILEWLOOKUP:filename:keyCol:ValueCol]"
Lookup	Example:
	<pre>task.East_1 = "[FILEWLOOKUP:c:/ temp.csv:1:1]"</pre>
File Start at	"[FILE:filename:startRow:startCol]"
row/col and increment row	Example:
	<pre>task.East_1 = "[FILE:c:/temp.csv:1:1]"</pre>

About scripting the Print and Apply task

Parameter	JavaScript string	
Static Text	"[STATIC:staticText]"	
	Example:	
	<pre>var my_string = "hello world";</pre>	
	<pre>task.East_1 = "[STATIC:"+ my_string +"]";</pre>	
CopyBarcode	<pre>task.East_1 = "[BARCODE:copyFromSideEnum1]"</pre>	
from a different	Where copyFromSideEnum1:	
side	0 – south	
	1 – west	
	2 – north	
	3 – east	
	Example:	
	<pre>task.East_1 = "[BARCODE:2]"</pre>	

Guidelines for scripting where to print the barcode label

About scripting which field to print to

To print on a single side or more than one side, use the following syntax:

task.East_1
where, East is the side of the labware and 1 is field 1.

About scripting the format

Although it is possible to script the format, you must ensure that the scripted format has the same number of fields as the format specified in the protocol.

```
task.West_Format=3
//script the format
task.West_3 = "[FILEWLOOKUP:C:\\bcf.csv:1:3]"
//script field 3 of format 3
```

Note: To read and write the field task parameters, the values used are preevaluation. For example, to print the current time, you would set the task parameter for field 1 to [TIME:0]. If you print this from JavaScript using print(task.East_1), the result will be [TIME:0], not as the actual time.

Related information

For information about	See
Print and Apply task	"Print and Apply" on page 318
Label formats	Microplate Barcode Labeler User Guide
Field contents	"Print and Apply" on page 318
Using JavaScript in the VWorks software	"Using JavaScript" on page 84

plateDB object

About the plateDB object

The VWorks JavaScript interpreter provides the following objects that can be accessed by a script.

- plateDB object
- "InventoryLabware object" on page 89
- "plate object" on page 91
- "plates[] object" on page 95
- "task object" on page 98
- "runset object" on page 123
- "forms object" on page 126

This topic describes the plateDB object properties and methods.

plateDB enables control of the database through JavaScript. You can use the plateDB object to create plate groups, add plates to existing plate groups (if they exist in a location group), remove plates from plate groups, and delete plate groups.

Properties

The plateDB object has no properties.

Methods

Methods are JavaScript functions invoked through an object. The plateDB object has the following methods, which are available on systems with the inventory database option.

Syntax:

plateDB.method()

Note: A common set of return codes are used in the applicable methods. However, based on relevance, an applicable method might use only a subset of the return codes.

Method	Description
createPlateGroup(string plateGroup)	Creates a new plate group.
	Returns true on success, or returns false on failure. The method also prints to the log the reason for failure.
	<pre>Example: plateDB.createPlateGroup("myplate group")</pre>

Method	Description
deletePlateGroup(string plateGroup)	Deletes a plate group.
	Returns true on success, or returns false on failure. The method also prints to the log the reason for failure.
	Example: plateDB.deletePlateGroup("myplate group")
addPlateToGroup(int <i>side</i> , string <i>barcode</i> , string	Adds a labware that exists in a location group to a plate group.
<i>locationGroup</i> , string <i>plateGroup</i>)	Returns true if successful, or returns false upon failure. The method also prints the reason for failure to the log.
	<i>Note:</i> The plate must exist in a locationGroup, and the given barcode must be on the specified side of the plate.
	Example:
	plateDB.addPlateToGroup(WEST, "BC01", "locationGroup", "plateGroup")
deleteAllPlatesFromGroup(stri ng <i>plateGroup</i>)	Deletes all labware from a specified plate group.
	Returns false upon failure, and prints the reason for failure to the log.
	Note: The plate group must exist.
	Example:
	<pre>plateDB.deleteAllPlatesFromGroup ("plateGroupName")</pre>

Method	Description
importCsvToInventory(string CSVFilepath, bool OverwriteInventory)	Imports the contents of the specified CSV file into the inventory database.
	You have the option of overwriting the existing data in the database during the import process:
	true–Overwrite the existing data.
	false–Skip the current labware.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4-Cassette does not exist.
	5–Slot does not exist.
	6–CSV file does not exist in the specified directory.
	Example:
	plateDB.importCsvToInventory ("C:\VWorks Workspace\labware.csv ", true)

Method	Description
importLabwareToInventory(arr ay Labware, bool OverwriteInventory)	Imports the array of labware data into the inventory database. The InventoryLabware object is passed to this method and is an element in the array.
	Each array element (labware) must have the following information:
	• Device
	• Cassette number
	• Slot number
	• Labware type
	You have the option of overwriting the existing data in the database during the import process:
	true–Overwrite the existing data.
	false–Skip the current labware.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1-Location is occupied by another labware.
	2–Location is empty.
	3–Device does not exist.
	4-Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	<pre>var LabwareArray = new Array();</pre>
	var Labwareone = new InventoryLabware();
	Labwareone.device = "Agilent Plate Hub Carousel";
	Labwareone.cassette = "1";
	Labwareone.slot = "1";
	Labwareone.type = "384 Greiner ";
	Labwareone.westbc = "west";
	LabwareArray[0] = Labwareone;
	<pre>plateDB.importLabwareToInventory(LabwareArray,true);</pre>

3 Creating a protocol: advanced topics

Method	Description
clearInventory()	Deletes all labware data in the inventory database.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4–Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	<pre>plateDB.clearInventory();</pre>
clearStorageLocation(string GroupName)	Deletes labware in the specified location group or plate group.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4-Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	<pre>plateDB.clearStorageLocation("MyB lateGroup");</pre>
	<pre>plateDB.clearStorageLocation("MyL ocationGroup");</pre>

Method	Description
clearAbandonedLabware()	Deletes labware that has become abandoned. Labware becomes abandoned when it moves out of storage and is somewhere in the system when a deadlock occurs or when a run is aborted.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4–Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	<pre>plateDB.clearAbandonedLabware();</pre>
clearAllLabwareBarcodes()	Deletes all labware barcodes in the inventory database. Other labware information is retained.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4–Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	<pre>plateDB.clearAllLabwareBarcodes() ;</pre>

3 Creating a protocol: advanced topics

Method	Description
addLabwareToLocation(string DeviceName, string	Adds labware to the specified storage location in the inventory database.
CassetteNumber, string	The method returns the following:
<i>SlotNumber</i> , string <i>Type</i> , bool <i>Overwrite</i>)	–1–Unknown error.
	0–Method is successful.
	1-Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4–Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	<pre>plateDB.addLabwareToLocation("Agi lent Plate Hub Carousel","1","1","384 Greiner",true);</pre>
	<pre>plateDB.addLabwareToLocation("Agi lent Plate Hub Carousel","all","1","384 Greiner",true);</pre>
	<pre>plateDB.addLabwareToLocation("Agi lent Plate Hub Carousel","1","all","384 Greiner",true);</pre>
	plateDB.addLabwareToLocation("Agi lent Plate Hub Carousel","all","all","384 Greiner",true);

Method	Description
deleteLabwareAtLocation(strin g <i>DeviceName</i> , string	Deletes the labware information at the specified storage location.
CassetteNumber, string	The method returns the following:
SlotNumber)	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4–Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	<pre>plateDB.deleteLabwareAtLocation(" Agilent Plate Hub Carousel","1","1");</pre>
	<pre>plateDB.deleteLabwareAtLocation(" Agilent Plate Hub Carousel","all","1");</pre>
	<pre>plateDB.deleteLabwareAtLocation(" Agilent Plate Hub Carousel","1","all");</pre>
	<pre>plateDB.deleteLabwareAtLocation(" Agilent Plate Hub Carousel","all","all");</pre>
getLocationByBarcode(string Barcode)	Obtains the location of a labware using the supplied barcode.
	Returns an array of labware (InventoryLabware objects) if the method is successful. Otherwise, the method returns a null array.
	Example:
	<pre>var LabwareArray = new Array();</pre>
	<pre>LabwareArray = plateDB.getLocationByBarcode("bar code");</pre>

Method	Description
exportDatabase(string FileName)	Exports the data in the inventory database to a SQL file.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4–Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	plateDB.exportDatabase("C:/VWorks Workspace\exportedfile.sql")
importDatabase(string <i>FileName</i>)	Imports the data in the specified SQL file into the inventory database.
	The method returns the following:
	–1–Unknown error.
	0–Method is successful.
	1–Location is occupied by another labware
	2–Location is empty.
	3–Device does not exist.
	4–Cassette does not exist.
	5–Slot does not exist.
	6–File does not exist.
	Example:
	plateDB.importDatabase("C:/VWorks Workspace\importedfile.sql")
enumeratePlateGroup(string plateGroup)	Returns the plate IDs from the plate database for this plate group.
	Returns an array of database plate IDs.
	If the method fails, the reason for failure prints to the log.
	Note: The plate group must exist.
	Example:
	plateDB.enumeratePlateGroup("plat eGroupName")
	See additional example in getPlateBarcode method, below.

Method	Description
getPlateBarcode(int <i>side</i> , array <i>plateID</i>)	Returns the plate barcode (string) for the specified plate ID and the side of the plate
	If the method fails, the reason for failure prints to the log.
	Example:
	<pre>var plateIDs = plateDB.enumeratePlateGroup("plat eGroupName")</pre>
	for(var plateID in plateIDs){
	<pre>print(plateDB.getPlateBarcode (WEST, plateIDs[plateID])) }</pre>
enumerateListOfGroups(int groupType)	Returns the list of plate group names for the list type <i>groupType</i> , where
	0 = both types (plate and location groups)
	1 = plate groups
	2 = location groups
	The method returns an array of strings corresponding to the group names.
	If the method fails, the reason for failure prints to the log.
	Example:
	var group_array = plateDB.enumerateListOfGroups(0)
getLabwareInfo(string labwareName)	Returns information about the specified labware, such as the number of wells (NumberOfWells=N). If the labware specified does not exist in the labware definition, the method returns an empty string.
	Example:
	plateDB.getLabwareInfo("96 Greiner Polystyrene Clear Round Well, Flat Bottom")

Related information

For information about	See
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
VWorks-defined functions	"VWorks-defined functions" on page 87

For information about... See... Other VWorks-defined objects • "InventoryLabware object" on page 89 ٠ "plate object" on page 91 "plates[] object" on page 95 • "runset object" on page 123 • • "task object" on page 98 • "forms object" on page 126 Using JavaScript utilities "Using JavaScript utilities" on page 128 "JavaScript" on page 573 JavaScript task Startup and cleanup protocols "Setting up Startup and Cleanup Protocol processes" on page 60

runset object

About the runset object

The VWorks JavaScript interpreter provides the following objects that can be accessed by a script.

- runset object
- "plate object" on page 91
- "plates[] object" on page 95
- "task object" on page 98
- "InventoryLabware object" on page 89
- "plateDB object" on page 112
- "forms object" on page 126

This topic describes the runset object properties and methods.

runset enables control of the Runset Manager through JavaScript. You can use the runset object to clear the runs from a runset or append protocols to a runset. You can also query the Runset Manager and retrieve various fields of interest, such as barcodes. For more information on runsets, see "Managing runsets" on page 243.

Note: If you are using the VWorks Watcher, the runset object can be used in a script that is called by Watcher to create runsets automatically. For details, see "Setting up and using the Watcher tool" on page 685.

Properties

The runset object has no properties.

Methods

Methods are JavaScript functions invoked through an object. The runset object has the following methods.

Method	Description
clear()	Clears all of the entries in the runset manager, except for currently executing protocols, which are not affected. Example: runset.clear()

runset object

Method	Description
appendProtocolFileToRunset (string ProtocolPath, int RunTimes, string ProtocolNotes, string formToUse)	Appends the contents of the protocol file at <i>ProtocolPath</i> to the Runset Manager. Specifies the number of <i>RunTimes</i> , and provides any <i>ProtocolNotes</i> .
	Optionally, specifies the form to be associated with the protocol once the protocol starts running. The <i>formToUse</i> argument is for use with a scripted pushbutton in a form, where the script contains a call to appendProtocolFileToRunset(). <i>formToUse</i> must specify the file name (not the path) of the form that contains the pushbutton. The third argument, <i>ProtocolNotes</i> , must be an empty string in this case.
	Returns true if successful or false upon failure. If a failure occurs, for example, the .pro file is missing, errors are written to the log.
Example:	
runset.appendProtoc someprotocol.pro",	olFileToRunset("c:/some dir/ 10, "", "FormName1.VWForm");
appendRunsetFileToRunset (string <i>runsetPath</i> , string <i>formToUse</i>)	Appends the contents of a runset file, located at <i>runsetPath</i> , to the Runset Manager.
	Optionally, specifies the form to be associated with the runset. <i>formToUse</i> is for a scripted pushbutton in a form, and the argument must specify the file name (not the path) of the form that contains the pushbutton.
	Returns true if successful or false upon failure. If a failure occurs, for example, the .rst file is missing, errors are written to the log.
Examples:	
runset.appendRunset	<pre>FileToRunset("c:/runset.rst");</pre>
runset.appendRunset "FormName1.VWForm")	<pre>FileToRunset("c:/runset.rst", ;</pre>
openRunsetFile(string	Opens the runset located at <i>runsetPath</i> .
runsetPath, string formToUse)	Optionally, opens the form to use to run the runset. <i>formToUse</i> is for a scripted pushbutton in a form, and the argument must specify the file name (not the path) of the form that contains the pushbutton.
	Returns true if successful or false upon failure. If a failure occurs, for example, the .rst file is missing, errors are written to the log.
Examples:	
runset.openRunsetFi	le("c:/temp/my_runset.rst");
runset.openRunsetFi "FormName1.VWForm")	<pre>le("c:/temp/my_runset.rst", ;</pre>

Method	Description
getRunsetXML()	Returns the XML contents of a runset file (.rst).
Example for getRunsetXML()	
<pre>// Note: In this examp JavaScript function.</pre>	le, runsetParser is a hypothetical
var runsetXML = runset	getRunsetXML()
var runsetParser = new	<pre>runsetParser(runsetXML)</pre>
var numRunningProtocol runsetParser.GetNumber	
for(var running_prot	<pre>cocol_idx = 0;</pre>
running_protocol	_idx < numRunningProtocols;
running_protocol	_idx++) {
<pre>print(runsetParser.GetRunningProtocol(running_protocol_i dx).GetFilename())</pre>	
<pre>print(runsetParser.GetRunningProtocol(running_protocol_i dx).GetRunsetNotes())</pre>	
//The runset notes	might include items such as barcodes.
}	

Related information

For information about	See
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
VWorks-defined functions	"VWorks-defined functions" on page 87
Other VWorks-defined objects	• "InventoryLabware object" on page 89
	• "plate object" on page 91
	• "plates[] object" on page 95
	• "plateDB object" on page 112
	• "task object" on page 98
	• "forms object" on page 126
Using JavaScript utilities	"Using JavaScript utilities" on page 128
JavaScript task	"JavaScript" on page 573
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60
VWorks Watcher tool	"Setting up and using the Watcher tool" on page 685

For information about...

See...

How to create a runset

"Managing runsets" on page 243

forms object

About the forms object

The VWorks JavaScript interpreter provides the following objects that can be accessed by a script.

- forms object
- "plate object" on page 91
- "plates[] object" on page 95
- "task object" on page 98
- "InventoryLabware object" on page 89
- "plateDB object" on page 112
- "runset object" on page 123

This topic describes the forms object usage.

forms provides the same function as the Toggle Full Screen button, which is one of the specialized buttons that you can include on a form that runs a protocol. For more information on forms, see "Creating protocol forms for operators" on page 153.

Properties

The forms object has no properties.

Methods

Methods are JavaScript functions invoked through an object. The forms object has the following method.

Method	Description
setFullScreen(Boolean <i>True/</i> <i>False</i>)	Changes the display of the VWorks window between a full-screen view of a protocol form and a normal tabbed view.
	Example:
	forms.setFullScreen(true)
	forms.setFullScreen(false)

Related information

For information about	See
Designing forms to run protocols	"Creating protocol forms for operators" on page 153
Works-defined functions	"VWorks-defined functions" on page 87

Using start and finish protocol scripts

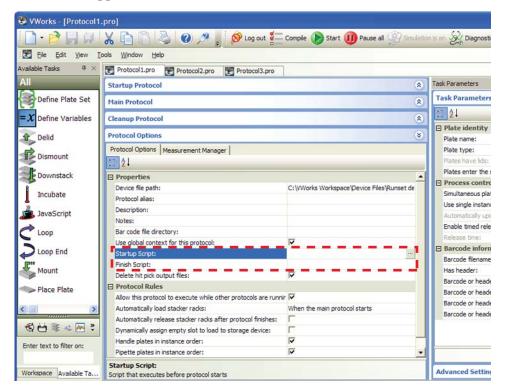
About start and finish scripts

A startup protocol script is a JavaScript that runs before the Startup Protocol begins. A finish protocol script is a JavaScript that runs after the Cleanup Protocol finishes. For example, you can use an open () statement to open and load a file.

Procedure

To add start or finish scripts:

- **1** Open the protocol file, and then click **Protocol Options**.
- **2** Click the **Startup Script** or the **Finish Script** field, and then click the **...** button that appears.



The Input Text dialog box appears.

🗆 Inj	put Text
Pleas	e enter text below:
	open("C:\\VWorks Workspace\\Scripts\\myscript.txt")
<	
	Browse OK Cancel

- **3** Do one of the following:
 - Type the JavaScript code in the box.
 - Click **Browse**. In the **Open** dialog box, select a file that contains the JavaScript code, and click **Open**.
- 4 Click **OK** to save the changes and return to the VWorks window.

Related information

For information about	See
Opening protocols	"Opening a protocol" on page 213
Setting protocol options	"Setting protocol options" on page 30
Using script variables directly in task parameters	"Using simple variables" on page 77
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60

Using JavaScript utilities

Utilities description

Two JavaScript utilities are available:

• *ActiveX Wrapper*. Allows you to create an ActiveX object and use the associated ActiveX methods.

• *File Object.* Allows you to create a file object to read from and write to a file.

You can write JavaScript using these utilities in the VWorks Advanced Settings area. For instructions on how to add the JavaScript task and display the Advanced Settings area, see "Where to write JavaScript" on page 85.

ActiveX Wrapper

ActiveX controls are software components that allow different software products to interact. For example, if you want to use the VWorks software to control a third-party device, you can use the device's ActiveX control to invoke the device's operations.

The ActiveX Wrapper utility in the VWorks software allows you to use another product's ActiveX control to invoke the product's operations. Make sure you install the product's ActiveX control software before you run the JavaScript.

To use the ActiveX utility, you need to:

- **1** Create an ActiveX object to reference the ActiveX control.
- 2 Call the associated ActiveX methods to invoke the ActiveX operations.
- **3** Use the Set and Get methods to access the ActiveX properties.

Create an ActiveX object

To create an ActiveX object:

In the Advanced Settings area, type the JavaScript code to create an ActiveX object.

For example, if the ActiveX control PROG_ID is PlateLocCtrl.2, you can create the object as follows:

```
var ocx
if( ocx == undefined) {
  ocx = new ActiveX( "PLATELOC.PlateLocCtrl.2");
}
```

The var statement declares a JavaScript variable. In this example, the variable is ocx.

The if statement prevents the software from creating the ActiveX multiple times if the script is run repeatedly.

The ocx = new ActiveX statement passes the PlateLoc PROG_ID to the ActiveX object generator. Using the ID, the generator calls the CreateInstance API. The resulting ActiveX object is then wrapped in the scripting layer that translates arguments and returns values that are understood by both the PlateLoc Sealer and the VWorks software.

Calling the ActiveX methods

To call the ActiveX methods:

Call the methods using the following syntax:

objectname.method

For example, if you want to call the AboutBox() method, you can type the following:

ocx.AboutBox()

To list the available ActiveX methods, use the following JavaScript statements: for(x in ocx.members)

print(x)

Accessing the ActiveX properties

To access the ActiveX properties:

Use the Set or Get method and the following syntax:

- comm.set("property_name", value)
- comm.get("property_name")

For example, if you want to access the ActiveConnection property of an ADO command object, you can type the following:

var db = new ActiveX("ADODB.Connection")

var comm = new ActiveX("ADODB.Command")

comm.set("ActiveConnection", db)

The first var statement creates an ADO object and assigns it to a variable named db.

The second var statement creates an ADO command object and assigns it to a variable named comm.

The comm.set statement sets the ActiveConnection property to the connection object in the db variable.

File Object

The File Object utility allows you to create a file object so that you can read from and write to a file.

To use the File Object utility:

- **1** Create the file object.
- **2** Call the desired file object methods:
 - Open()
 - Close()
 - Read()
 - Write()
 - IsOpen()
 - Exists()
 - Delete()

IMPORTANT The JavaScript language is case-sensitive. Make sure you use the correct upper- and lower-case letters when calling the methods.

Creating a file object

To create a file object:

In the Advanced Settings area, type the following JavaScript code:

```
var fileobjectname
if( fileobjectname == undefined) {
fileobjectname = new File()
}
```

Note: fileobjectname is the name of the file object you want to create.

Calling the Open() method

To call the Open() method:

Type the following JavaScript code:

fileobjectname.Open("filepath", 0, 0)

fileobjectname is the name of the file object you created.

filepath (the first argument) is the location of the file you are creating. For example, you can type $c: \fileobjectname.txt$.

0 (the second argument) specifies how new information will be added to the file. 0 adds new information after the existing information. A non-zero value erases the existing file contents before adding the new information. If you do not specify this argument, the system will use the default value of 0.

0 (the third argument) specifies how the line endings in binary files will be translated. 0 translates line endings to a carriage return followed by a line feed. 1 does not translate the existing line ending. If you do not specify this argument, the system will use the default value of 0.

Calling the Close() method

To call the Close() method:

Type the following JavaScript code:

fileobjectname.Close()

fileobjectname is the name of the file object you created.

The Close method closes the file and releases any locks on the file so that other software can access it.

Calling the Read() method

To call the Read() method:

Type the following JavaScript code:

var result = fileobjectname.Read()

The Read() method returns the entire file contents as a string into the variable called result. Although line-by-line reading is not available, you can use built-in JavaScript string methods to parse the file.

If another process is concurrently adding information to the file, later calls to the Read method will read the newly added information.

Calling the Write() method

To call the Write() method:

Type the following JavaScript code:

fileobjectname.Write("writeoutput" + "\n")

fileobjectname is the name of the file object you created.

writeoutput is the string you want to add to the file.

n adds a new line at the end of the string.

Calling the IsOpen() method

To call the IsOpen() method:

Type the following JavaScript code:

var open = fileobjectname.IsOpen()

The var statement checks to see if the file opening call was successful.

Creating new protocol tasks using the JavaScript Wrapper

Calling the Exists() method

To call the Exists() method:

Type the following JavaScript code:

var exists = fileobjectname.Exists("filepath")

filepath is the location of the file you are checking.

The var statement checks to see if the file exists in the specified folder and returns true if the file is present.

Calling the Delete() method

To call the Delete() method:

Type the following JavaScript code:

fileobjectname.Delete("filepath")

filepath is the location of the file you are deleting. For example, you can type c:\\fileobjectname.txt.

Related information

For information about	See
JavaScript language	Mozilla Developer Center
Using JavaScript in the VWorks software	"Using JavaScript" on page 84
Using script variables directly in task parameters	"Using simple variables" on page 77
JavaScript task description	"JavaScript" on page 573
Startup and cleanup protocols	"Setting up Startup and Cleanup Protocol processes" on page 60
Setting protocol options	"Setting protocol options" on page 30

Creating new protocol tasks using the JavaScript Wrapper

See the JavaScript Wrapper Application Note.

Note: If you have trouble opening the link, go to http://www.chem.agilent.com/Library/usermanuals/Public/G5415-90059_R_00_JSWrapper_S_EN.pdf



VWorks Automation Control User Guide

4

Using macros to create protocols

This chapter describes the VWorks macros that you can use to help simplify and expedite the protocol writing process. You must have VWorks Administrator or Technician access to create macros, and you should have an understanding of how to create VWorks protocols.

This chapter contains the following topics:

- "About protocol macros and the macro library" on page 134
- "Adding macros to the macro library" on page 137
- "Inserting macros in protocols" on page 140
- "Editing a macro" on page 142
- "Adding parameter variables and scripting to a macro" on page 148
- "Copying macros to a different computer" on page 151



About protocol macros and the macro library

About this topic

This topic describes the VWorks macros and the macro library that you can create to help simplify and expedite the protocol writing process. To create macros and protocols, you must have VWorks Technician- or Administrator-level access.

Macros defined

A VWorks macro is a collection of protocol tasks and associated task parameters grouped together in an abbreviated form. You can insert the macro easily at other places within the same protocol or throughout other protocols where the same task sequence is required.

A macro eliminates the need to recreate a repeated task sequence within the same protocols or subsequent protocols that you write. Therefore, protocol writing can be easier, faster, and less error-prone.

Suppose you want to create a protocol that has multiple wash routines, where each wash routine consists of a sequence of Tips On, Aspirate, Dispense, and Tips Off tasks. You could do the following using a macro:

- **1** Create the wash routine task sequence.
- **2** Highlight the task sequence and add it as a macro to the macro library.
- **3** Set custom variables at the macro level, such as the volume or number of times to wash, so that the parameters could be scripted before running the protocol.

For instance, the variables could be exposed on a protocol form that the operator is permitted to change at run time.

4 Insert the macro at the other points in the protocol where the wash routine is required.

For the subsequent protocols that you create, which require the wash routine, you can insert the macro from the macro library. For each instance of the macro, you should verify that the parameter values are set correctly, such as Location, plate and Location, location.

Later, if you want to modify the macro, the change can be replicated to all the other instances of the macro in an open protocol.

Types of macros

You can create the following types of macros in the VWorks software:

Macro	Description
Startup or cleanup macro	Available for use in the Startup Protocol area and the Cleanup Protocol area.
Clean cleanup(ver. 1)	

4 Using macros to create protocols

About protocol macros and the macro library

Macro	Description
Main process macro	Available for use in the Main Protocol area only within the main process.
Subprocess macro	Available for use in the Main Protocol area only within a subprocess.

Macros have the following requirements:

- All tasks in the macro must be contiguous in the protocol.
- A macro can contain subprocess or process tasks, but not both.
- A macro cannot contain another macro.

Macro library

The macro definitions are stored in a macro library. Although different versions of a given macro may be in use in the protocols, the software maintains only one official version in the macro library. The VWorks software uses an .mlb file to store the macro library. By default, the file path is as follows:

...\VWorks Workspace\VWorks\MacroLibrary.mlb

The Available Macros area in the VWorks window displays the contents of the macro library.

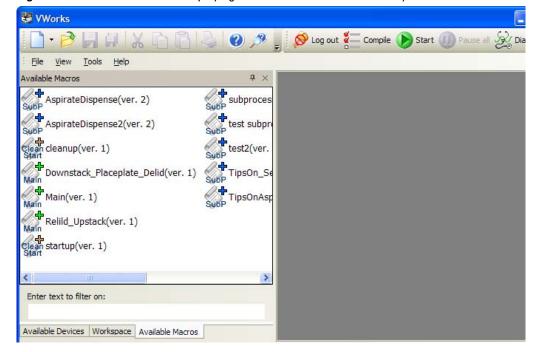


Figure Available Macros area displaying the contents of the macro library

About protocol macros and the macro library

The Available Macros area lists the macros alphabetically. If no protocol is open, the macro list includes all types of macros. If a protocol is open, a subset of the macro library appears in the list depending on which area of the protocol tab is active and which devices are used in the protocol. For example, in the following figure only the subprocess macros for the Bravo Platform appear.



VWorks - [Reorder_Delid_SerialDilute	_Bravo_BC.pro]	
🗋 • 🤌 🗒 🖗 🖌 🛅 🙆 i 🖇	🎍 🕐 🍠 🖉 🐼 Log out 辥 Compile 🜔 Start 🕕 Pause all 🧟 Simulation is on 🖗 Diagnosti	cs ,
Eile Edit View Tools Window Help		
Available Macros 🛛 🕈 🗙	Reorder_Delid_SerialDilute_Bravo_BC.pro	
AspirateDispense(ver. 2)	Startup Protocol	۲
AspirateDispense2(ver. 2)	Main Protocol	۲
subprocess(ver. 1)	$\begin{array}{c} \hline \\ \hline \\ Greiner 655101 \\ \hline \\ $	^
test subprocess macro(ver. 1)	PS Cir Rnd Well Flat Btm) Transfer using Relid plate Upstack to Bravo - 1 BenchCel -	=
test2(ver. 1)	1.Stacker 6	
TipsOn_SerDil_TipsOff(ver. 1)	└╍↑┉┈──┼╷┈	-
TipsOnAspDispOff(ver. 1)	Tips On in 1 Aspirate 10 µL Dispense 10 µL Tips Off in 1 selection(s) in 1 selection(s) in 1 selection(s) selection(s)	
	Remove from 3 from 5 to Replicate from 3	~
Enter text to filter on:		
	Cleanup Protocol	۲
Available Tasks Workspace Available Macros	Protocol Options	۲

Related information

For information about	See
Creating macros	"Adding macros to the macro library" on page 137
Editing macros and macro version control	"Editing a macro" on page 142
Using a macro in a protocol	"Inserting macros in protocols" on page 140
Exporting and importing the macro library	"Copying macros to a different computer" on page 151
Exporting and importing protocols	"Exporting and importing protocols and associated components" on page 626
Creating a basic protocol	"Creating a protocol: basic procedure" on page 13
Working with JavaScript	"Creating a protocol: advanced topics" on page 73

Adding macros to the macro library

About this topic

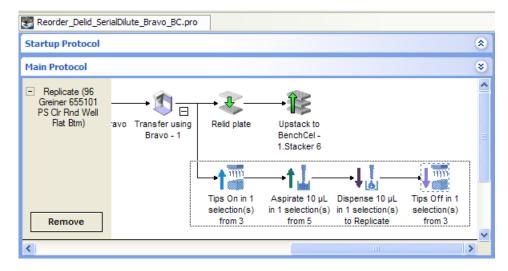
This topic describes how to create macros and add them to the macro library and how to delete macros.

The procedures in this topic assume that a protocol task sequence that you want to replicate as a macro is already created. For details on how to set up tasks and create a protocol, see "Workflow for creating a basic protocol" on page 18.

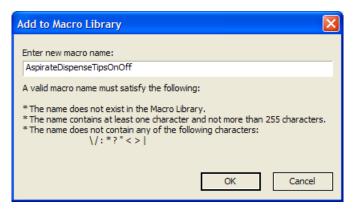
Creating a macro and adding it to the macro library

To create a macro and add it to the macro library:

1 In the protocol area, drag the pointer around the task or series of tasks that you want to include in the macro. Make sure that only the desired tasks are highlighted.



2 Right-click the selection, and then choose **Add to macro library** from the shortcut menu. The Add to Macro Library dialog box opens.

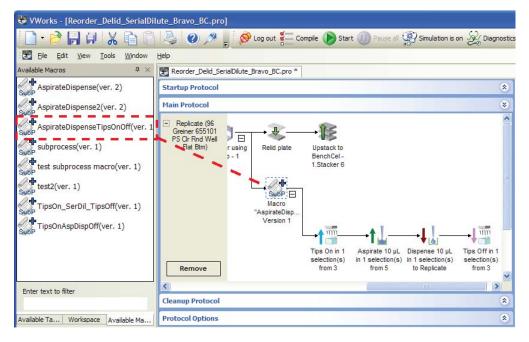


3 Type a name for the macro, and click **OK**. A descriptive name can be more helpful for other macro users than a generic name. A version number is appended to the macro name, starting with version 1.

The corresponding macro icon appears in the Available Macros area and in the protocol. Any future edits of the macro will increment the version number by 1.

IMPORTANT To ensure version control, you should not change the macro name after the macro has been used in a protocol. Although you can rename a macro in the macro library, doing so removes any association to instances of the macro with the former name that are already in use in a protocol.

In the protocol area, expand the macro icon to view and to verify the macro contents.



Note: To associate a custom icon or custom parameters with the macro, see "Editing a macro" on page 142.

Adding a copy of a macro or saving the macro by a different name

You can create a copy of a macro to add to the macro library. For example, you might want to copy a macro and use the copy as the starting point for creating a similar but slightly different macro.

To create a copy of a macro from the Available Macros tab:

- 1 In the Available Macros tab, right-click the macro icon, and then choose Make a copy from the shortcut menu.
- 2 In the **Create Macro Copy** dialog box, type a new name for the copy, and click **OK**. The new macro icon appears in the Available Macros area.

To save a copy of a macro from a protocol:

1 In the protocol, right-click the macro icon, and then choose **Save macro as** from the shortcut menu.

2 In the Add to Macro Library dialog box, type a new name for the copy, and click OK. The new macro icon appears in the Available Macros area.

Deleting a macro from the macro library or a protocol

You can delete a macro from the macro library or a macro instance from a protocol:

- *Deleting a macro from the macro library.* In this case, instances of the deleted macro can still remain in your protocols. However, the instances of the deleted macro no longer have version control or any association with other instances.
- *Deleting an instance of a macro from a protocol.* In this case, only the selected instance is deleted from the protocol. The macro remains in the macro library and in other protocols where it is used.

Note: In a protocol where you no longer want a macro, yet you still want to retain a macro's contents (task sequence), you can revert the macro. See "Reverting an instance of a macro to an ungrouped task sequence" on page 142.

To delete a macro from the macro library:

In the **Available Macros** area, right-click the macro icon, and then choose **Delete** from the shortcut menu. The macro icon disappears from the Available Macros list.

To delete an instance of a macro from a protocol:

In the protocol, right-click the macro icon, and then choose **Delete** from the shortcut menu. The macro icon and macro task contents disappear from the protocol.

Related information

For information about	See
Editing macros and understanding macro version control	"Editing a macro" on page 142
Adding a custom icon to the macro	"Associating a custom icon with the macro" on page 145
How to expose task parameter variables at the macro level	"Adding parameter variables and scripting to a macro" on page 148
Using a macro in a protocol	"Inserting macros in protocols" on page 140
Creating a basic protocol	"Creating a protocol: basic procedure" on page 13

Inserting macros in protocols

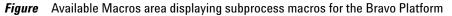
About this topic

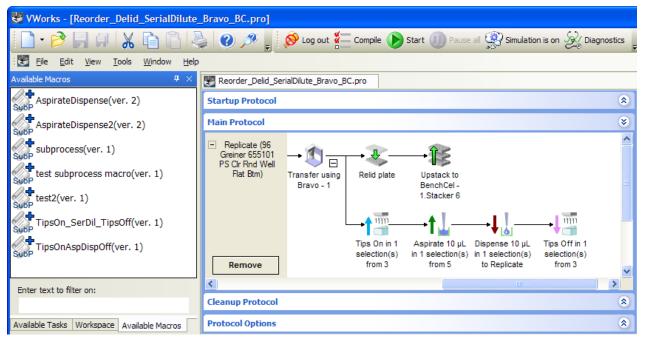
This topic describes how to insert macros into the protocols that you are creating. You must have VWorks Technician- or Administrator-level access to create protocols and work with macros.

Viewing and filtering the list of macros

In the VWorks window, the Available Macros area lists only the macros from the macro library that are relevant for the protocol type (startup, cleanup, main process, or subprocess) and associated devices selected in the protocol tab.

In the following figure, a Bravo subprocess appears in the Main Protocol area and the Available Macros area lists only subprocess macros for the Bravo Platform.





You can filter the Available Macros list even further.

To view and filter the list of macros in the macro library:

- 1 In the VWorks window, choose View > Available Macros to display the Available Macros area if not already displayed.
- **2** In the **Available Macros** area, type the text in the **Enter text to filter on** box that you want to use to filter the list of macro names. As you type each character, the Available Macros list changes to meet the filter requirement.

For example, if you type *wash*, only the macros that include the name *wash* remain in the Available Macros list.

Note: To preview a macro's contents, right-click the macro icon in the **Available Macros** tab, and then choose **Edit** from the shortcut menu. A macro editor tab appears in protocol area, as the following figure shows. To close the macro editor tab, click the corresponding \mathbf{x} button.

		بې 🌮 چ	by our game co	start	U raise a Q	
🛃 Ele Edit View Tools V Available Macros 9 ×	<u>Window</u> <u>H</u> elp Reorder_Delid_Seria	alDilute_Bravo_BC.pr	o = 🕎 Aspira	teDispense		- 6
AspirateDispense(ver. 1) subp subprocess(ver. 1) test subprocess macro(ve	4	AspirateDispe	Tips On in 1 selection(s) from 3	Aspirate 10 µL in 1 selection(s) from S	Dispense 10 µL in 1 selection(s) to Replicate	Tips Off in 1 selection(s) from 3
Enter text Available Workspace Available						

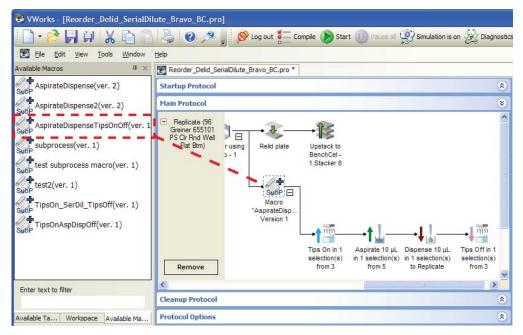
Inserting a macro in a protocol

To insert a macro in a protocol:

- 1 Click the position in the protocol where you want to insert the macro.
- **2** In the **Available Macros** area, double-click the macro icon. The selected icon appears in the protocol at the location you selected.

Alternatively, you can drag the macro from the **Available Macros** area into position in the protocol.

3 To view the contents of the macro within the protocol, expand the macro icon.



4 Verify that the task parameter settings are correct for the new instance of the macro, including Location, plate and Location, location.

Reverting an instance of a macro to an ungrouped task sequence

If you have an instance in a protocol where you no longer want a macro, yet you still want to retain a macro's contents (task sequence), you can revert the macro.

To revert an instance of a macro:

In the protocol area, right-click the macro icon, and then choose Ungroup macro.

The macro icon disappears from the protocol, and the tasks from the macro remain inserted in the protocol position where the macro formerly resided.

Related information

For information about	See
Adding macros and removing macros from the macro library	"Adding macros to the macro library" on page 137
How to edit macros and macro version control	"Editing a macro" on page 142
Exporting the macro library	"Copying macros to a different computer" on page 151
Creating a basic protocol	"Creating a protocol: basic procedure" on page 13
Using JavaScript	"Creating a protocol: advanced topics" on page 73

Editing a macro

About this topic

To edit a macro, you must have VWorks Technician- or Administrator-level access.

Editing options and macro version control

The macro library stores the latest version of a macro that has been edited in the macro editor tab. You can use different versions of a given macro in your protocols, but the different versions reside only in the protocols.

You can edit the VWorks macros in the following ways:

• *Editing a macro from the macro library in the macro editor tab.* Replaces the version of the same name in the macro library, incrementing the version number by 1. Later, if you open a protocol that has an earlier macro version than the macro in the macro library, the following Macro Change History dialog box opens. You can choose whether to update the macros in the protocol to match the definition in the macro library.

Macro Change H	listory
	teDispenseTipsOnOff" in the protocol is out of date. acro change comparing with that in Macro Library:
Version History	Notes
v1->v2	2010/03/20 Changed volume from 10 t0 20 in Aspirate and Dispens
Do you want to up	edate the macro in the just opened protocol?

- *Editing a macro directly in the protocol tab.* Updates the macro in the protocol only. Macros in the macro library remain unchanged. Instead, you have the following options:
 - Keep a derivative of the definition from the macro library in the selected protocol.
 - Replace the modified instances in the protocol with the definition from the macro library.
 - Add the modified definition under a new name in the macro library.

The software does not maintain a change history of the macros that are edited in the protocol tab. However, you can easily update all instances of a macro in a protocol to match the version of the same name in the macro library. See "Updating instances of a macro to match the version in the macro library" on page 147.

Editing a macro from the library in the macro editor tab

To edit a macro from the library in the macro editor tab:

1 In the Available Macros tab, right-click the macro icon, and then choose Edit from the shortcut menu.

A macro editor tab opens in protocol area and displays the contents of the macro as the following figure shows.

Editing a macro

Figure Macro editor tab

😻 VWorks - [AspirateDispense]		
🗋 • 🖻 🖬 🖬 🗶 🖻 🖪 🛛	🍃 🔞 🥕 🚦 🔗 Log out 🚛 Comple 🕦 Start 🕕 Pause al 🌜	
🔀 Ele Edit View Iools Window Help		- 6 ×
Available Macros 🔍 🗶 😢 Reorder	Delid_SerialDilute_Bravo_BC.pro = 🕎 AspirateDispense	.
AspirateDispense(ver. 1) subprocess(ver. 1) test subprocess macro(ve	AspirateDispe Tips On in 1 selection(s) from 3 Aspirate 10 µL Dispense 10 µL in 1 selection(s) in 1 selection(s) to Replicate	Tips Off in 1 selection(s) from 3
Enter text		
Available Workspace Available		

- **2** To add or delete a task:
 - Add a task. Either drag the task icon from the Available Tasks area to the macro editor tab, or double-click the task icon in the Available Tasks area to add the task to the macro editor tab.
 - *Delete a task.* In the macro editor tab, right-click the task icon, and then choose **Delete** from the shortcut menu.
 - *Change a task's parameter values.* Click the task icon in the macro editor tab. In the **Task Parameters** area, edit the task parameters as you typically would when creating a protocol.
 - Associate a custom icon with the macro. See "Associating a custom icon with the macro" on page 145.
 - Associate custom parameters with the macro. See "Adding parameter variables and scripting to a macro" on page 148.
- **3** Choose File > Save. The Macro Change Notes dialog box opens:

Macro Change Notes	
Please enter notes for the modifications to the macro:	
2010/03/20 Changed volume from 10 t0 20 in Aspirate and Dispense tasks.	~
	~
The following properties will not be saved into the macro which could be reconfigured when the macro is in a protocol context:	
Location, location Location, plate	~
OK Cancel	

4 Type a description of your edits, and then click **OK**.

Later, if you open a protocol containing a different version of this macro, the software displays this change history for reference.

5 When the message appears, asking if you want to update the macro in the protocol:

- Click **Yes** to update all instances of the macro with the same name in the specified protocol, regardless of version number. The software increments the macro version number by 1 in the macro library.
- Click **No** to increment the macro version number by 1 in the macro library only. Any previous versions of the macro in the protocol with the same macro name remain in the protocol intact.

If any unopened protocols also contain the previous version of the macro, you have the option to update the macros when you open each protocol.

Associating a custom icon with the macro

To associate a custom icon with the macro:

- 1 In the macro editor tab, right-click the macro icon, and then choose Add Custom lcon from the shortcut menu. The Edit Macro Icon dialog box opens.
- 2 Click the with button, select the image file (.jpg, .bmp, or .gif), and then click **Open**.

Edit Macro Icon		×
Choose an image as the macro icon : C:\VWorks Workspace\Images\Cup Wash.bmp		
A valid macro icon must satisfy the following:		
* It should be in .jpg, gif, or bmp format		
	OK Cancel	

3 Click **OK**. The selected image replaces the macro icon in the macro editor tab.

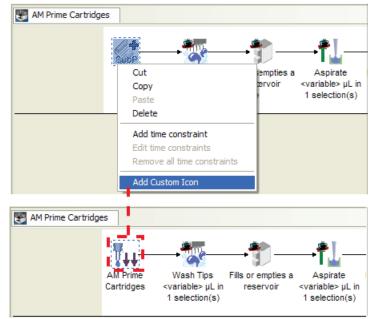


Figure Macro before (top) and after (bottom) adding custom icon in macro editor tab

Editing a macro directly in the protocol tab

Macros in the macro library remain unchanged when you edit an instance of a macro in the protocol.

To edit a macro in the protocol tab:

- **1** In the protocol, expand the macro icon so that you can view the macro task contents.
- **2** Edit the tasks as desired:
 - Add a task. Drag the task icon from the Available Tasks area to the macro in the protocol, or double-click the task icon in the Available Tasks area.

Alternatively, you can copy a task icon from elsewhere in the protocol. To do this, right-click the task icon, and then choose **Copy**. Click the target location in the macro, right-click, and then choose **Paste**.

- *Change task parameter values.* Click the task icon. Edit the values in the **Task Parameters** area as you typically would when creating a protocol.
- *Delete a task.* Right-click the task icon, and then choose **Delete** from the shortcut menu.
- Associate a custom icon with the macro. See "Associating a custom icon with the macro" on page 145.
- Add custom parameters and scripting to the macro. See "Adding parameter variables and scripting to a macro" on page 148.
- **3** Do one of the following:
 - To rename the edited macro and add it to the macro library. In the protocol, right-click the icon of the edited macro, and then choose Save macro as. The Add to Macro Library dialog box opens.

To keep the edited macro definition in the protocol only. Choose File > Save. The changes are applied to all instances in the protocol that have the same name and version number. The name of the edited instance changes to "macro_name Derived from Version n".

Note: If you subsequently add an additional macro of the same name from the macro library to this protocol, the Add macro to protocol dialog box opens. You can choose which definition to use for all the macros in the protocol that have the same name.

Add macro to protocol				
The macro in the protocol has been modified, please choose one definition to use:				
• Use the macro definition from the macro library				
$\ensuremath{\mathbb{C}}$ Use the macro definition from the protocol				
(OK) Cancel				

Updating instances of a macro to match the version in the macro library

If a protocol contains a derivative version of a macro or a different version than one of the same name in the macro library, you can choose to update all instances in the open protocol to the definition in the macro library or to keep the definition from the protocol.

To update a macro in the protocol tab to the current version in the macro library:

In the protocol tab, right-click the macro icon, and then choose one of the following:

- **Update this macro.** Replaces the selected macro instance in the open protocol with the definition from the macro library.
- **Update all revisions of this macro**. Replaces all macro instances of the same name with the definition from the macro library, regardless of the version number of the other macro instances in the protocol.

Renaming a macro in the macro library

CAUTION Renaming a macro in the macro library removes any association to the macro instances of the former name that are in the protocols.

To rename a macro in the macro library:

- 1 In the Available Macros tab, right-click the macro icon, and then choose Rename from the shortcut menu.
- 2 In the Rename Macro dialog box, type the new name and click OK.

Related information

For information about	See
Adding macros and removing macros from the macro library	"Adding macros to the macro library" on page 137

Adding parameter variables and scripting to a macro

For information about	See
Using macros in protocols	"Inserting macros in protocols" on page 140
Exporting the macro library	"Copying macros to a different computer" on page 151
Creating a basic protocol	"Creating a protocol: basic procedure" on page 13
Using JavaScript	"Creating a protocol: advanced topics" on page 73

Adding parameter variables and scripting to a macro

About this topic

This topic describes the following:

- "Adding macro parameter variables" on page 148
- "Filtering the macro parameters" on page 149
- "Adding JavaScript to a macro" on page 150

This topic assumes that you have an understanding of how to create VWorks protocols, including how to do the following:

JavaScript tasks	For details, see
Define JavaScript variables in the VWorks software	"Using simple variables" on page 77
Write programs in JavaScript in the VWorks software	"Using JavaScript" on page 84

Adding macro parameter variables

You can expose parameters for individual tasks at the task macro level. For example, you might want to edit the parameter values of tasks contained in the macro without having to open the macro and then open each task to access the task parameters.

To add task parameter variables to the macro:

1 In the **Available Macros** tab, right-click the macro icon, and then choose **Edit** from the shortcut menu.

A macro editor tab opens in protocol area and displays the contents of the macro.

- **2** In the macro editor tab, click the macro icon. The Custom Parameters area replaces the Task Parameters area next to the protocol area.
- **3** Click Add Variable. A row appears in the Variable Name table.

4 In the new row, click the **Variable Name** field, and then type the exact same JavaScript variable that appears in the Task Parameters area for the given task parameter.

For example, a macro contains multiple Wash Tips tasks for which you are using the same volume. In the corresponding Task Parameters for each task, you define the Volume parameter as a variable, such as =WashVol_. You use the same variable, WashVol_ as the variable name in the macro's custom parameters. You can change the volume specified for both tasks by editing the variable value in the macro's Custom Parameters area.

Task Parameters	۲
:: 2↓	
Wash Tips (Bravo) Properties	s 🔺
Location, plate:	
Location, locatio <auto-select></auto-select>	
Volume	
Empty tips:	
Volume (0 - 251 =WashVol_	
Pre-aspirate voli 0	
Blowout volume 0	
Properties	
Liquid class:	
Mix cycles (0 - 1 3	
Distance from w 2	-

5 In the **Initial Value** field of the **Custom Parameters** area, type the value for variable.

For more details on using JavaScript variables for task parameters, see "Using simple variables" on page 77.

Filtering the macro parameters

To show all macro parameters:

In the Custom Parameters area, right-click the variables table, and select Show all.

To filter the macro parameter list:

- 1 In the Custom Parameters area, right-click the variables table, and select Show all.
- **2** Right-click a cell in the table, and select from the available filtering options:

View	Description
Last filter	Returns the display to when the last filter was applied.
Filter by row	Displays the parameters that have the same value as the parameter in the selected row.
	For example, if you choose to filter the list based on the initial value of a given parameter. Only the parameters that have the same value as the parameter in the selected row are displayed.

4 Using macros to create protocols

Adding parameter variables and scripting to a macro

View	Description
Filter by column	Displays the parameter names that are an exact match of the selected column.

Adding JavaScript to a macro

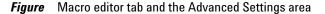
You can write JavaScript for a macro in a similar way that you can for a task. For example, you could enable a macro for one set of conditions and disable the macro for all other conditions using the task.skip() method.

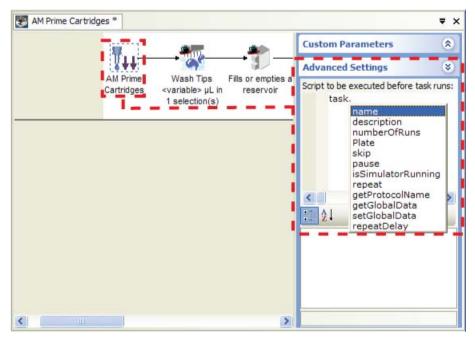
At the macro level, you can use only the shared methods of the task object. For a description of the task object's shared methods, see "task object" on page 98.

To add JavaScript to a macro:

1 In the **Available Macros** tab, right-click the macro icon, and then choose **Edit** from the shortcut menu.

A macro editor tab opens in protocol area and displays the contents of the macro.





- **2** In the macro editor tab, click the macro icon. The Custom Parameters area replaces the Task Parameters area next to the protocol area.
- **3** Click Advanced Settings.
- **4** In the Script to be executed before task runs box, type your script.

Note: To view the list of available properties for the task object, type task. You can select a property from the list that appears.

Related information

For information about	See
Adding macros to the macro library	"Adding macros to the macro library" on page 137
Macro version control	"Editing a macro" on page 142
VWorks JavaScript variables	"Using simple variables" on page 77
Advanced Parameters area	"task object" on page 98

Copying macros to a different computer

About this topic

To work with macros, you must have VWorks Technician- or Administratorlevel access. You can copy macros to a different computer in the following ways:

- *Copy the entire macro library*. This topic describes how to copy the entire macro library.
- *Export and import the macros that are part of a protocol.* If you export a protocol (.vzp file), the macros in the protocol are included in the exported .vzp file. You also have the option of exporting the protocol macros of the same name from the macro library as well as the protocol. In this case, the macros appear in the Available Macros tab as well as in the protocol after you import the protocol. For details, see "Exporting and importing protocols and associated components" on page 626.

Copying the macro library and verifying the file path

To copy the macro library to a different computer:

1 Copy and paste the library file (.mlb) from one computer to another.

By default, the file path is as follows:

...\VWorks Workspace\VWorks\MacroLibrary.mlb

2 On each computer, verify that the file path for the macro library is set in the VWorks software.

To verify or change the file path for the macro library:

- 1 In the **VWorks** window, choose **Tools > Options**. The Options dialog box opens.
- 2 Under Directories and Paths, verify that the file path in the Macro Library file path field is correct.

4 Using macros to create protocols

Copying macros to a different computer

ł	😻 Options 📀 🤶			X
	•	2↓		
	Ξ	Directories and Paths		
		Main log path:	C:\VWorks Workspace\logs\vworks_log.log	
		Pipette log path:	C:\VWorks Workspace\ogs\vworks_pipette_log.log	
		Time constraints log path:	C:\VWorks Workspace\ogs\vworks_time_constraints_log.	
		Pipette technique editor roc	C:\VWorks Workspace\pipette techniques\	
		Automatic tip selection root	C:\VWorks Workspace\tip box states\	
		Hit pick format file root:	C:\VWorks Workspace\hit picking\format files\	
		Hit pick output file root:	C:\VWorks Workspace\hit picking\output files\	
		Macro Library file path:	C:\VWorks Workspace\VWorks\MacroLibrary.mlb	

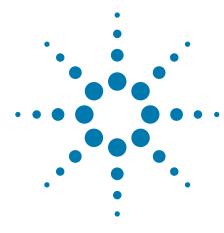
- **3** If the file path is not displayed or is not correct:
 - **a** Click the Macro Library file path field, and then click the with button that appears.
 - **b** In the **Open** dialog box, locate and select the .mlb file (for example, MacroLibrary.mlb), and then click **Open**. The new file path appears in the **Macro Library file path** field.

Related information

For information about	See
Exporting and importing macros	"Exporting and importing protocols and associated components" on page 626
Macros and the macro library	"About protocol macros and the macro library" on page 134
Creating macros	"Adding macros to the macro library" on page 137
Using macros to help create protocols	"Inserting macros in protocols" on page 140
Creating a basic protocol	"Creating a protocol: basic procedure" on page 13
Working with JavaScript	"Creating a protocol: advanced topics" on page 73

VWorks Automation Control User Guide

5



Creating protocol forms for operators

You can create forms with custom user interfaces for the operators who run your protocols. A form provides a simplified interface, which can be helpful for users who have limited or infrequent experience with the VWorks software.

You must have VWorks Administrator or Technician access to create protocol forms, and you should also have an understanding of how to create VWorks protocols.

This chapter contains the following topics:

- "About forms for running protocols" on page 154
- "Workflow for creating or editing a form" on page 160
- "Opening the Form Designer" on page 162
- "Configuring a run button and other specialized buttons in a form" on page 164
- "Adding indicators for elapsed time and progress to a form" on page 173
- "Adding form controls that allow editing or runtime data display" on page 176
- "Example: Creating a scripted Pushbutton control in a form" on page 197
- "Setting the form properties" on page 201
- "Understanding JavaScript context in form design" on page 204



About forms for running protocols

About this topic

To create or edit forms, you must have VWorks Technician- or Administratorlevel access. You should also have an understanding of how to create protocols in the VWorks software.

This topic describes the VWorks forms and the Form Designer window.

Forms defined

A form is a customized user interface that enables operators to run an associated VWorks protocol. A VWorks user who creates protocols (Technician or Administrator access) can design forms to simplify the operator duties when it comes time to run the associated protocols.

The form can be simple or relatively complex, depending on the requirements of a target group of operators. At a minimum, the form should have buttons for starting and pausing the associated protocol. You may also want to include the Full Screen On/Off button (default) to enable the form users to toggle the VWorks window between a full screen form view and the normal tabbed view. The form design can allow the operator to enter task parameter values for the associated protocol or limit the operator to a read-only display of task parameter values, progress, and other protocol data that the form's author wants to display.

Figure Example of VWorks window displaying a form in full screen view without the logs

	Run Protocol Deuse	Full Screen On/Off	
	Enter Parameter Values for the Run Volume (µL): 2 Select the number of columns to run: Type or select the incubation time (minutes): Select or type the number of mix cycles:	3 • 10 • - - 3 3	
rogress:	E	lapsed Time: 00:00:00	

Form Designer overview

The following figure shows four primary areas in the Form Designer window, and the table describes these four areas.

About forms for running protocols

- 3		
1	2	3
Editing Bravo_Protocol.VWFor	m	?
Available Controls General Controls A Static abl Edit control b Droplist C Droplist C Dropdown C Slider C Hockbox C Checkbox C Checkbox C Checkbox C Date and Time C Date and Time C Date Borwsing R Radio Button C Group Box Line T Tab Control Panel Specialized Buttons Specialized Buttons	Form Canvas Full Screen on/off	
Use global context for variables	Bring selected control to front	
Show log in Full Screen mode	Set background color Preview	OK Save As Cancel
4		

ltem	Area	Description
1	Available Controls	The control palette, which includes three categories from which to select controls and indicators.
2	Form Canvas	The work area where the form's author arranges the form controls while viewing a representation of the form. Three buttons are included in this area by default: Run Protocol, Pause, and Full Screen on/off.
		As you drag controls into position in the Form Canvas, invisible grid lines assist with the alignment based on the controls that are already in the form.
		<i>Note:</i> To disable the autogrid, press ALT while dragging the controls into place.
3	Control Properties	The properties associated with a control that is currently selected in the Form Canvas. The figure shows the Run Protocol Properties because the Run Protocol button is selected.
4	Form properties	The properties that apply to the entire form, such as the background color and the context for JavaScript variables that are used in the form.

Figure Form Designer window

Available controls overview

The Available Controls area of the Form Designer window contains the following areas, each of which provides different types of controls that you can use in your form design:

- "General Controls area" on page 156
- "Specialized Buttons area" on page 157
- "Specialized Display Controls area" on page 158

General Controls area

Most of the controls in the General Controls area can be assigned a JavaScript variable. By assigning a JavaScript variable, you can allow form users to edit task parameter values or enable the display of runtime data. The JavaScript variable must be assigned in both the control properties and in the corresponding task parameter in the protocol.

The following table provides an overview of the general controls. For more details about the general controls and how to configure them, see "Adding form controls that allow editing or runtime data display" on page 176.

Control	Description
Static (text)	Displays read-only text in the form. The Static control can be used to:
	• Provide a caption for another control.
	• Display runtime data if a JavaScript variable is assigned in the control properties and in the corresponding task parameter in the protocol.
Edit control	Allows the form users to enter or edit data for a task parameter.
Droplist	Presents a drop-down list of choices for a task parameter.
Dropdown	Allows the form users to type arbitrary text into the edit field or choose from a drop-down list of choices for a task parameter.
Slider	Lets users set a value on a continuous range of possible values for a task parameter.
Progress bar	Provides a visual indication of progress for a task.
Pushbutton	Allows you to write your own script for the action the button will perform for the form users.
Checkbox	Allows users to enable or disable the corresponding actions for a task parameter.
Date and Time	Displays the preset date and time or a date that the user can set for a task.
Image	Displays a static image.
File Browsing	Enables form users to select a file.

About forms for running protocols

Control	Description
Radio Button	Allows you to present options for a task parameter.
Group Box	Displays a rectangle that can be resized and labeled to visually group other controls together.
Line	Provides a vertical or horizontal line that you can use to visually separate items on the form.

Specialized Buttons area

The Specialized Buttons area contains button controls that are already programmed to perform specific commands, which are currently available elsewhere in the VWorks window.

The following table provides an overview of the specialized buttons. For more details about the buttons and how to configure them, see "Configuring a run button and other specialized buttons in a form" on page 164.

Button	Description
Toggle Full Screen	Changes the display of the VWorks window from a normal view to a full-screen view and back again. In the normal view, the form is a tab within the protocol area of the VWorks window. In the full-screen view, the VWorks window displays only the form, and optionally the logs.
Save Data Entry values	Saves all data entry values associated with the form's controls in the form file (.VWForm).
Reset Data Entry values	Resets all data entry values, which are associated with the controls in the form, to the default values.
Print Data Entry values	Prints all data entry values associated with the controls in the form.
Initialize All Devices	Opens the device file (.dev) specified by the button, and establishes communication with the corresponding devices.
	The following run buttons also initialize the devices for the corresponding protocol if simulation mode is off.
Run Protocol	Provide a choice of preprogrammed buttons for
Run Specified Protocol	starting the protocol or runset.
Run Runset	
Pause Run	Pauses the run and opens the Scheduler Paused dialog box, which is the same function as the Pause all button on the toolbar in the VWorks window.

5 Creating protocol forms for operators

About forms for running protocols

Button	Description
Menu Action	Performs a command that the form designer selects from a list of commands, which are also available in the Tools menu of the VWorks window.
	This button control can enable a user with VWorks Operator-level access the ability to perform a command that normally requires VWorks Technician-level access.

Specialized Display Controls area

The controls in the Specialized Display Controls area display data that is not drawn from a JavaScript variable.

The following table provides an overview of the specialized display controls. For more details about the specialized display controls and how to configure them, see "Adding indicators for elapsed time and progress to a form" on page 173.

Control	Description
Elapsed Time	Displays the duration (hours:minutes:seconds) of the corresponding protocol or runset that the form is running.
Overall Progress	Displays a visual progress indicator for the corresponding protocol or runset that the form is running.

Related information

For information about	See
Creating or editing a form	"Workflow for creating or editing a form" on page 160
Controls under General Controls in the Form Designer window	"Adding form controls that allow editing or runtime data display" on page 176
Controls under Specialized Buttons in the Form Designer window	"Configuring a run button and other specialized buttons in a form" on page 164
Controls under Specialized Display Controls in the Form Designer window	"Adding indicators for elapsed time and progress to a form" on page 173
Form properties in the Form Designer window	"Setting the form properties" on page 201
Creating a basic protocol	"Workflow for creating or editing a form" on page 160

5 Creating protocol forms for operators

About forms for running protocols

For information about	See
Working with JavaScript	"Creating a protocol: advanced topics" on page 73

Workflow for creating or editing a form

About this topic

To create a form, you must have VWorks Technician- or Administrator-level access and an understanding of how to create protocols in the VWorks software.

Before you start

- Create the protocol (.pro) or runset (.rst) that you want the form to run.
- Determine how you want the form to function. For example, will users simply press a run button to start the associated protocol, or will they be required to enter task parameter values before the run?
- If the form will include controls that display runtime data for a given task or require a user to enter values, you must have a JavaScript variable associated with the control and the corresponding task parameter. For details on JavaScript variables, see "Using simple variables" on page 77.
- Determine whether the form users will require documentation specific to your form.

E al	Run Proto	col	(I) Pause	Full Screen	On/Off	
	Enter Paramet Volume (µL): Select the num Type or select	er Values for th	e Run s to run: time (minutes):	3 × 10 ×	3	
Progress:				Elapsed Time: 00:00	:00	
				Elapsed Time: 00:00	:00	a
Progress:	Class	Device		Elapsed Time: 00:00	:00 Process	0. Tas
lain Log		Device				
lain Log mestamp	:10 PM 🕠 Info	Device				
ain Log mestamp 0/7/2013 5:32:	10 PM 🗘 Info 35 PM 🎝 Info	Device				

Figure Example VWorks form in full screen view with logs

Workflow

Step	For this task	See
1	Open the Form Designer.	"Opening the Form Designer" on page 162
2	Select an appropriate button to run the protocol or runset.	"Configuring a run button and other specialized buttons in a form" on page 164
3	Determine whether to include the Pause and Full Screen on/ off buttons (default), and add any other specialized buttons that you want to use.	"Configuring a run button and other specialized buttons in a form" on page 164
4	Add indicators for the elapsed time and progress of the protocol or runset that the form is running.	"Adding indicators for elapsed time and progress to a form" on page 173
5	Add controls that display or allow editing of the run data.	"Adding form controls that allow editing or runtime data display" or page 176
6	Set the form's parameters and save the form.	"Setting the form properties" on page 201

Related information

For information about	See
Creating or editing a form	"Workflow for creating or editing a form" on page 160
Creating a basic protocol	"Creating a protocol: basic procedure" on page 13
Working with JavaScript	"Creating a protocol: advanced topics" on page 73
JavaScript context and form design	"Understanding JavaScript context in form design" on page 204

Opening the Form Designer

About this topic

To open the Form Designer, you must have VWorks Technician- or Administrator-level access.

This topic describes how to open the Form Designer and how to move and resize the window.

Procedures

To open the Form Designer and create a new form:

- 1 In the **VWorks** window, choose **File > New > Form**. The Form Designer window opens, and three buttons appear by default in the Form Canvas area.
- **2** In the **Form Designer** window, click **Save As**. In the **Save As** dialog box, specify the file name and storage location. The file is saved with the .VWForm file extension.

Figure Form Designer window with the three default buttons

Available Controls	Form Canvas	811 24
General Controls Specialized Buttons ab Toggle Full Screen ab Save Data Entry values ab Reset Data Entry values ab Print Data Entry values ab Initialize All Devices ab Run Protocol ab Run Specified Protocol ab Run Specified Protocol ab Run Runset ab Pause Run ab Menu Action ab Form	Run Protocol D Pause Full Screen on/off	
Specialized Display Controls 🛛 🗸		*
Specialized Display Controls Use global context for variables Restore default values when load	Bring selected control to front	P

To open the Form Designer and edit a form:

1 In the VWorks window, choose File > Open. In the Open dialog box, select the .VWForm file that you want to edit, and then click Open.

The form tab appears in the protocol area of the VWorks window.

2 Choose Tools > Edit Form. The selected form appears in the Editing .VWForm window.

Opening the Form Designer

Available Controls	Form Canvas		21 2 I
General Controls A Static C Control C Control C Droplist Droplist Progress bar Progress bar Pushbutton C Checkbox Date and Time Image File Browsing Radio Button Group Box Line Tab Control Panel	Run Selected Protocol Select the protocol file: Run progress Elapsed Time: 00:00:00	Pause	File Browsing Properties JavaScript vark Always use glo Read only: Data entry: Mandatory: Default value: Font size (1 - 7 10 Font color: WebBlack
Specialized Buttons			
Specialized Display Controls			• L
Use global context for variabl Restore default values when	Bring selected control to front		

Figure Editing .VWForm window with a form to be edited

Moving and resizing the window

You can move the Form Designer window to the side of the screen so that you can continue to access the protocol task parameters while designing your form.

To move the Form Designer window:

Drag the Form Designer window to the new location.

To resize the Form Designer window:

Move the pointer to an edge of the window. When the pointer turns into a double-sided arrow, drag the edge of the window to the new size.

To resize the areas inside Form Designer window:

Move the pointer over the vertical splitter bar that separates each area. When the pointer turns into a double-sided arrow, drag the splitter to the new position.

Related information

For information about	See
Workflow for creating or editing a form	"Workflow for creating or editing a form" on page 160
Forms and Form Designer overview	"About forms for running protocols" on page 154
Creating a basic protocol	"Workflow for creating or editing a form" on page 160

5 Creating protocol forms for operators

Configuring a run button and other specialized buttons in a form

For information about...

See...

Using JavaScript

"Creating a protocol: advanced topics" on page 73

Configuring a run button and other specialized buttons in a form

About this topic

To create or edit forms, you must have VWorks Technician- or Administratorlevel access. You should also have an understanding of how to create protocols in the VWorks software.

This topic describes the following:

- "Determining which run button to include" on page 165
- "About including the Pause and Full Screen on/off buttons" on page 165
- "About including other specialized buttons" on page 167
- "Configuring the specialized buttons" on page 169

The Form Designer window contains buttons that perform specific commands, which are available elsewhere in the VWorks window. You can find these buttons under Specialized Buttons in the Form Designer window.

1.1.0.4		Form Canvas			21
General Controls Specialized Buttons b) Toggle Full Screen a) Save Data Entry values b) Reset Data Entry values a) Print Data Entry values b) Print Data Entry values c) Initialize All Devices b) Run Protocol c) Run Specified Protocol b) Run Sunset c) Rauset c) Runset c) Ru	Run Protocol	Pause	Full Screen on/off	i î	Caption: C:\Program Files Icon: C:\Program Files Caption: Run Protocol Font size (1 - 7 10 Font color: WebBlack Background col 240, 240, 24
Specialized Display Controls Vuse global context for variables	Bring selected cont				

Figure Form Designer window Specialized Buttons area and the default buttons

For more details on creating forms, see "Workflow for creating or editing a form" on page 160.

Determining which run button to include

The following table describes four different options that you can use as the run button on your form. To configure these run buttons, except the Pushbutton control, see "Configuring the specialized buttons" on page 169 in this section.

Run buttons	Description
Pushbutton control	Provides the most flexible way to run a protocol using a form, because you can allow the form users to choose which protocol to run and the number of run times. The Pushbutton control is under the General Controls area. For details on how to configure the Pushbutton control, see "Adding form controls that allow editing or runtime data display" on page 176 and "Example: Creating a scripted Pushbutton control in a form" on page 197.
Run Protocol (default)	Opens the Run Configuration Wizard for the protocol, so that the user can enter the number of times to run, when to start the run, and the starting barcode. When the user clicks Finish in the wizard, the protocol starts, or is scheduled to start in the future.
	The Run Protocol button is available to the form user only if the protocol is open and no run is currently in progress.
	The form can be used to start different protocols, but only one instance of the form can be open and running a given protocol at a time.
	Setup requirements. In the Protocol Options area of the VWorks window, you must specify the form to use (.VWForm). You can also choose to automatically load the form file, so that the form opens automatically when the protocol is opened.
	If you export a protocol that has a specified form to use, the form file can be included in the exported files.
Run Specified Protocol	Starts the run for the specified protocol immediately. The Run Configuration Wizard does not appear in this case.
• Run	Setup requirements. The properties for the button must specify the protocol file (.pro) and the number of times to run it.
Run Runset	Starts the specified runset. The Run Configuration Wizard does not appear in this case.
Run Runset	If any runs are scheduled to start as soon as possible, a warning message asks the operator to make sure that the system is ready for the runs to start.
	Setup requirements. The properties for button must specify the runset file (.rst), and you must select the Use global context for variables check box for the form.

About including the Pause and Full Screen on/off buttons

IMPORTANT Be sure to include the Toggle Full Screen button in your form if you want the user to view the form in the full screen view.

5 Creating protocol forms for operators

Configuring a run button and other specialized buttons in a form

When you open the Form Designer to create a form, the Pause and Full Screen on/off buttons are included in the form by default. If you accidentally remove these buttons, you can reselect the Pause Run and Toggle Full Screen controls from the Specialized Buttons area of the Form Designer window.

Buttons	Description		
Pause Run (default)	Provides the same function as the Pause all button on the toolbar: pauses the run and opens the Scheduler Paused dialog box. For details, see "Pausing the run" on page 261.		
	Include the Pause button in your form to give the form users a way to pause, continue, or abort the run when the form is in full-screen view and the toolbar is hidden.		
Toggle Full Screen (default)	Changes the VWorks window between the normal view and full-screen view of the form:		
Full Screen On/Off	• <i>Full screen on</i> . Displays only the form in the VWorks window. Optionally, the view can include the Main Log, Pipette Log, Time Constraints Log, and Progress tabs. All other controls and areas, such as menus, toolbars, and the work area are hidden.		
	• <i>Full screen off.</i> Displays the form as a tab in the protocol area of the VWorks window.		
	IMPORTANT The full-screen view is an option only if the form includes the Toggle Full Screen button.		
	IMPORTANT If you click the <i>in button in either view, you will exit the VWorks software.</i>		

The following figures show examples of the full screen on and off.

Configuring a run button and other specialized buttons in a form

F		
Figuro	VWorks window with example form in full screen vi	011/
114416		CVV

Works - (Brave	e_Protocol.VWForm]	Full Screen On/Off	
	Enter Parameter Values for the Run Volume (µL): 2 Select the number of columns to run: Type or select the incubation time (minutes): Select or type the number of mix cycles:	3 10 	
Progress:	E	lapsed Time: 00:00:00	

Figure VWorks window with example form in tab view (full screen off)

Works - [Bravo_Protocol.VWForm]				
Ele Edit View Tools Window Help				- 8 ×
i 🗋 • 🆻 🔛 🖉 🗶 🖓 🖉	🥕 🔋 😥 kog out 🖉	compile 🜔 :	Start 🕕 Pause al 👰 Simulation is on 🎉 I	Diagnostics
Available Devices 🔍 🗶 MyForm1.VWF	orm E Bravo_Protocol.VWI	Form		₹×
ABgene Automated Seal Pierce ABgene SEAL-IT 100 Agilent ACU Agilent BenchBot Robot Agilent BenchCel Agilent BioCel I/O Interface Agilent Bravo Agilent Centrifuge Agilent Centrifuge Loader	Enter Parameter Values Volume (µL): 2 Select the number of co Type or select the incub Select or type the numb	for the Rur lumns to ru	un: <u>3 ·</u> (minutes): 10 ·	
Agilent ChemStation Autosam Agilent Direct Drive Robot Agilent Generic I/O Module			Elapsed Time: 00:00:00	
Main Log				@ ×
Timestamp Class Device	Location	Process T	Task Description	•
10/9/2013 10:25:49 AM	Scanner		Plugin loaded from cache: ViafloStatPrep Plugin loaded from cache: ZlathDataPag2	
Ready			a is logged in	

About including other specialized buttons

In addition to the run buttons and the Pause and Full Screen on/off buttons, the Form Designer provides the following specialized buttons that you can include in your form:

• Initialize All Devices button

Configuring a run button and other specialized buttons in a form

- Buttons for data entry values (print, reset, and save)
- Menu Action button

Initialize All Devices button

If the simulation mode is turned off when you open a protocol, the software automatically loads the device file associated with the protocol and asks you whether you want to initialize the devices. If you want the form user to be able to initialize the devices manually while the form is displayed in fullscreen view, you can include the Initialize All Devices button. This button is available under Specialized Buttons in the Form Designer window, and the button performs the same function as the Initialize all devices button in the Devices tab of the VWorks window.

Buttons for data entry values

The Data entry property, which enables form users to enter or edit values, is available for many of the Form Designer controls found under General Controls. The following buttons manage the data entry values that are entered by a form's user.

Button	Description
Print Data Entry values	Prints all data entry values associated with the controls in the form, including values entered by the form user and default values that were not modified.
Reset Data Entry values	Resets all data entry values associated with the controls in the form to the default values.
	Alternatively, values can be reset automatically when the form is reopened if the Restore default values when loading check box is selected in the Form Designer window when creating the form.
Save Data Entry values	Saves the data entry values associated with the controls in the form so that the values persist until they are explicitly reset.

Menu Action button

IMPORTANT The Menu Action button gives a user who has VWorks Operatorlevel access the ability to perform actions that normally require Technicianlevel access.

You can use the Menu Action button to perform the following commands.

Menu Action button options	For details, see
 Display Gantt Charts Labware Editor Liquid Library Editor Pipette Technique Editor System State Editor Tip State Editor Configure Labware Backup, Restore (Backup Manager) Log Management Migrate All Files in a Folder Error Library Inventory Editor Global Options (Options command in the Tools menu) 	These commands are also available in the Tools menu of the VWorks window. For a description of the Tools menu commands, see "Tools menu" on page 666. IMPORTANT These commands normally require VWorks Technician-level access.
• Export (exports the form and all associated files)	The Export command is also available in the File menu. For details on the Export command, see "Exporting and importing protocols and associated components" on page 626.
 Hit Picking Format wizard– Bravo Hit Picking Format wizard– Labcyte Echo 	These commands are also available in the Tools menu of the VWorks window. For a description of the Tools menu commands, see "Tools menu" on page 666.
• Toggle Watcher	IMPORTANT These commands normally require VWorks Technician-level access.

Configuring the specialized buttons

To configure the specialized buttons:

1 If the button you are configuring is already in the Form Canvas area of the Form Designer window, go to step 4.

If the desired button is not yet in the form, click **Specialized buttons**, and drag the button to the **Form Canvas** area.

An invisible autogrid assists you in aligning the control in the form. To turn off the autogrid, press ALT while dragging the control into position.

2 In the **Form Canvas** area, click the button that you are configuring. A resizing box appears around the button's border. To resize the button, drag one of the sizing handles.

Note that the corresponding properties appear for the selected button as the following figure shows.

Configuring a run button and other specialized buttons in a form

_		
Editing MyForm1.VWFor	m	? <mark>- × -</mark>
Available Controls	Form Canvas	
General Controls	O O O Full Screen o	
Specialized Buttons Specialized Display Con	Run Protocol Pause Full Screen o	Icon: C:\Program Files (x86)\Agile
abl Elapsed Time	•	Caption: Run Protocol
Overall Progress		Font size (1 - 72): 10
Overall Progress		Font color: WebBlack
		Background color: 240, 240, 240
		-
	< >	
Use global context for va	riables	,
Restore default values w	Bring selected control to front	
Show log in Full Screen m		OK Save As Cancel

Figure Form Designer window displaying properties for the selected button

Note: Click Preview to display the image that the form's user will see.

3 Edit the **Properties** of the button as required. The following table describes all the properties, but a given button may use only a subset of these properties.

Properties	Description
Icon	<i>Optional.</i> To select an image to use as an icon in addition to the button caption, click the field, and
	then click the 🔛 button that appears.
	In the Open dialog box, locate and select the image file (.jpg, .png, .bmp, or .ico), and then click Open.
	<i>Note:</i> Icons for the run and pause buttons are installed in the following folder:\Program Files\Agilent Technologies\VWorks\clipart
Caption	To change the label that appears on the button, type the new text in the field.
Font size	<i>Optional.</i> To change the font size for the selected control and subsequently created controls, type a new number in the field.
	Default: 10

Configuring a run button and other specialized buttons in a form

Properties	Description
Font color, Background color	<i>Optional.</i> To change the font color for the selected control and subsequently created controls, click th
(button)	field, and then click the \checkmark that appears.
	In the palette list, select the color, or click Custor Color to open the Select Color dialog box and crea a custom color.
	Default font color: Web Black
	Default background color: 240, 240, 240
Run Specified Prot	ocol button only
Protocol file	To select the protocol that this form will run, clic
	the field, and then click the with button that appea
	In the Open dialog box, locate and select the .pro file, and then click Open.
Number of times to run	Type the number of times the protocol will run aft the form user clicks the run button.
Run Runset button	only
Runset file	To select the runset that this form will run, click the
	field, and then click the $\overline{\hdotsingle}$ button that appears.
	In the Open dialog box, locate and select the .rst fi and then click Open.
Menu Action butto	n only
Action	Click the field, and then click the \checkmark that appear Click the command that you want the button to perform.
	IMPORTANT The menu action button gives a use who has Operator-level access the ability to perfor the specified action, which may normally require
	Technician-level access.
Initialize All Devic	Technician-level access.
Initialize All Devic Device file	Technician-level access.
	Technician-level access. es button only To select the device file that contains the devices f
	Technician-level access. es button only To select the device file that contains the devices the corresponding protocol, click the field, and the click the button that appears.
Device file f you are configuri	Technician-level access. es button only To select the device file that contains the devices for the corresponding protocol, click the field, and the click the button that appears. In the Open dialog box, locate and select the .dev file, and then click Open. ng the Run Protocol button
Device file If you are configuri In the VWorks w	Technician-level access. es button only To select the device file that contains the devices f the corresponding protocol, click the field, and the click the i button that appears. In the Open dialog box, locate and select the .dev file, and then click Open. In the Run Protocol button I Run Protocol :: rindow protocol tab, under Protocol Options > Properties
Device file If you are configuri In the VWorks w click the Form to	Technician-level access. es button only To select the device file that contains the devices f the corresponding protocol, click the field, and the click the initial button that appears. In the Open dialog box, locate and select the .dev file, and then click Open. In the Run Protocol button in the Run Protocol button is a select the .dev rindow protocol tab, under Protocol Options > Properties use field, and then click the initial button that appear
Device file If you are configuri In the VWorks w click the Form to D In the Open dial	Technician-level access. es button only To select the device file that contains the devices is the corresponding protocol, click the field, and the click the button that appears. In the Open dialog box, locate and select the .dev file, and then click Open. In the Run Protocol button rindow protocol tab, under Protocol Options > Propertie

- **c** In the **Automatically load form file** field:
 - Ensure the check box is selected (default) if the form should open automatically anytime the protocol is opened.

Configuring a run button and other specialized buttons in a form

.

Clear the check box if the form should not open automatically when the protocol is opened.

🐯 Bravo_protocol_ReDeSeBraBen.VWF	Form 🛃 Reorder_Delid_SerialDilute_Bravo_BC.pro
Startup Protocol	۲
Main Protocol	۲
Cleanup Protocol	۲
Protocol Options	*
Protocol Options Measurement Mana	ger
2 ↓	
Properties	▲
Device file path:	C: \VWorks Workspace \Device Files \Bravo_BC6R.d
Form to use:	C: \VWorks Workspace \Protocol Files \Usability \'
Automatically load form file:	
Protocol alias:	
Description:	
Notes:	
Bar code file directory:	
Use global context for this protocol: $\overline{\checkmark}$	
Startup Script:	
Finish Script:	
Delete hit pick output files:	

5 If you are configuring the **Run Runset** button **Run Runset** , make sure

you select the $\ensuremath{\text{Use global context}}$ for variables check box in the Form Designer window.

If you want the JavaScript variables used by the form's controls to interact with variables in the protocols, ensure that the **Use global context for this protocol** check box is selected in the **Protocol Options** for each protocol.

If one of the protocols uses its own private context (the **Use global context for this protocol** check box is not selected), you can include a getGlobalObject() JavaScript call in each case where a variable in the protocol must read from, or write to, one of the variables used by the form. For details, see "VWorks-defined functions" on page 87.

Note: If you want one control to overlap another control on the form, select the control that you want on top, and then click **Bring selected control to front**.

Related information

For information about	See
Workflow for creating or editing a form	"Workflow for creating or editing a form" on page 160
Forms and Form Designer overview	"About forms for running protocols" on page 154
Controls under General Controls in the Form Designer window	"Adding form controls that allow editing or runtime data display" on page 176

For information about	See
Controls under Specialized Display Controls in the Form Designer window	"Adding indicators for elapsed time and progress to a form" on page 173
Form properties in the Form Designer window	"Setting the form properties" on page 201
Creating a basic protocol	"Workflow for creating or editing a form" on page 160

Adding indicators for elapsed time and progress to a form

About this topic

To create or edit forms, you must have VWorks Technician- or Administratorlevel access. You should also have an understanding of how to create protocols in the VWorks software.

This topic describes the controls in the Specialized Display Controls area of the Form Designer window and how to configure them.

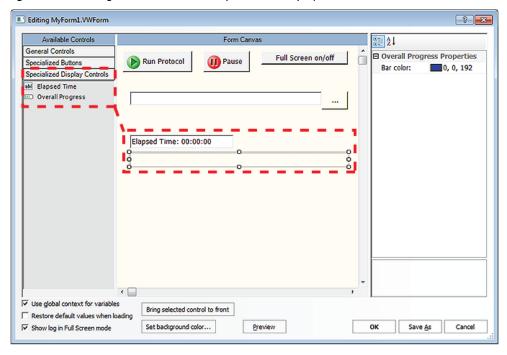


Figure Form Designer window and the Specialized Display Controls

For more details on creating forms, see "Workflow for creating or editing a form" on page 160.

Adding indicators for elapsed time and progress to a form

About the specialized display controls

The Form Designer has two controls that display standard data for the protocol or runset. The data for these controls are not drawn from JavaScript variables.

Specialized display controls	Description
Elapsed Time Displays the hours:minutes:seconds of dura corresponding protocol or runset that the running.	
	Elapsed Time: 00:00:00
Overall Progress	Provides a visual indication of the percent complete for the corresponding protocol or runset that the form is running.
	The following figure shows a Progress bar with a Static text control for the <i>Progress</i> caption. In this example, a gray bar shows the real-time progress.
	Progress:

Procedure

To add indicators for elapsed time and progress:

1 In the Form Designer window under Available Controls, click Specialized display controls, and then drag the desired control to the Form Canvas area.

An invisible autogrid assists you in aligning the control in the form. To turn off the autogrid, press ALT while dragging the control into position.

2 In the Form Canvas area, click the control so that a resizing box appears around the border.

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ٺ	

To resize the control, drag one of the sizing handles.

3 Edit the control **Properties** as required. The following table describes the properties.

Properties	Description
Font size	Elapsed time only. To change the font size, type a new number in the field. Any controls that you create subsequently will use the new font size.
	Default: 10

Adding indicators for elapsed time and progress to a form

Custom Color ...

Properties	Description			
Font color or Bar color	<i>Optional.</i> To change the color for the selected control and subsequently created controls, click the field, and then click the v that appears.			
	Click the color in the palette list, or click Custom Color to open the Select Color dialog box and create a custom color.			
	O O O			

Note: To create a caption for the Overall Progress control, you can combine the Overall Progress control with the Static text control. See "About the General Controls" on page 176.

Note: To have one control overlap another control on the form, select the control that you want on top, and then click **Bring selected control to front**.

Related information

For information about	See
Workflow for creating or editing a form	"Workflow for creating or editing a form" on page 160
Controls under General Controls in the Form Designer window	"Adding form controls that allow editing or runtime data display" on page 176
Controls under Specialized Buttons in the Form Designer window	"Configuring a run button and other specialized buttons in a form" on page 164
Form properties in the Form Designer window	"Setting the form properties" on page 201
Creating a basic protocol	"Workflow for creating or editing a form" on page 160

Adding form controls that allow editing or runtime data display

About this topic

To create or edit forms, you must have VWorks Technician- or Administratorlevel access. You should also have an understanding of how to create protocols and define JavaScript variables in the VWorks software.

This topic describes the General Controls in the Form Designer window and how to configure them:

- "About the General Controls" on page 176
- "Configuring the General Controls" on page 181

Figure Form Designer window General Controls and example form

Available Controls General Controls	Form Canvas						
	Form Canvas						
A Static B Edit control Droplist Dropdown Slider Progress bar Pushbutton Checkbox Date and Time Image File Browsing Radio Button Group Box Line Tab Control Tab Control	Image: Run Protocol Full Screen Or Enter Parameter Values for the Run Volume (µL): Select the number of columns to run: Type or select the incubation time (minutes): 10 Select or type the number of mix cycles: 10 3	<u>₹</u>					
Panel Specialized Buttons Specialized Display Control (III) (Use global context for variables	Progress: Elapsed Time: 00:0						
Restore default values when loading Show log in Full Screen mode		Cancel					

For more details on creating forms, see "Workflow for creating or editing a form" on page 160.

About the General Controls

The controls available under General Controls can be assigned JavaScript variables to allow users to edit data or to display runtime data on the form. For example, you might want the form to display the volume dispensed or to allow the form's user to enter the number of mix cycles. The JavaScript variable assigned to the control must also be assigned to the given task parameter value.

The general controls	include	the	following:
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Control	Description					
Static text	Displays read-only text. Use this control to create:					
	• Captions for other controls on the form, such as drop-down lists, progress bars, sliders, and edit controls.					
	• Read-only displays for runtime data. The JavaScript variable must be assigned in the Static control properties and in the corresponding task parameter in the protocol.					
	The following figure shows an example that consists of two Static text controls in combination with a Slider control. A Static text control (left) provides the caption <i>Mix cycles</i> , and a Static text control (right) displays the value of the current slider setting.					
	Mix cycles: 3					
Edit control	Allows form users to enter or edit data. The JavaScript variable must be assigned in the Edit control properties and in the corresponding task parameter in the protocol					
	The following figure shows an Edit control (right) that allows the form users to edit the volume. This control has an assigned JavaScript variable (vol), which is also assigned in the corresponding task parameter in the protocol.					
	Volume (µL): 2					
	Note: A Static text control (left) provides the caption, Volume (uL).					
Droplist	Provides a drop-down list of choices.					
	In the following figure the Droplist control has an assigned JavaScript variable (BCside) that is also specified in the protocol task parameter for defining the barcode side of the labware.					
	Select sides for barcode label:					
	North					
	North					
	South East					
	West					

Note: A Static text control provides the caption for the Droplist control.

Control	Description					
Dropdown controls	Provides a drop-down list of choices and allows users to type arbitrary text into the edit field.					
	The Dropdown control in the figure has an assigned JavaScript variable (time) that is also specified in the protocol task parameter for defining the incubation time					
	Type or select the incubation time (minutes):					
	<i>Note:</i> A Static text control provides the caption for the Dropdown control.					
Slider	Enables users to set a value on a continuous range of possible values.					
	The following figure shows a horizontal and vertical slider, where the position of the slider is coordinated with a Static text control (left) or Edit control (right).					
	Mix cycles: 3					
	In the horizontal example (left), the user moves the slider to set the Mix task parameter value, while the value updates in the display. In the vertical example (right), the user can type a number in the box or move the slider to set the Mix task parameter value.					

Adding form controls that allow editing or runtime data display

Control	Description					
Progress bar	Provides a visual indication of task progress. The JavaScript variable must be assigned in the control properties and in the corresponding task parameter in the protocol.					
	In the following figure, the gray bar shows how much of the task has been completed.					
	Progress:					
	<i>Note:</i> A Static text control provides the caption, <i>Progress</i> .					
	<i>Note:</i> To display the progress for the entire protocol or runset that the form is running, use the Overall Progress bar under Specialized Display Controls.					
Pushbutton	Allows you to write your own script for the action that the button will perform.					
	The following figure shows a form with a custom pushbutton for running a protocol that the form's user selects in a File Browsing control. The script specified in the Pushbutton Properties calls the file path defined as the JavaScript variable for the File Browsing control.					
	Works - [MyForm1.VWForm]					
	Run Selected Protocol Select the protocol file:					
	<u></u>					
	<i>Note:</i> For more details on how to set up this example, see "Example: Creating a scripted Pushbutton control ir a form" on page 197.					
File Browsing	Allows users to locate and select the specified file type					
	In the following figure, the File Browsing control has an assigned JavaScript variable for the file path (full file name and type), which is called by the script associated with the custom pushbutton that runs the selected protocol.					
	Works - [MyForm1.VWForm]					
	Run Selected Protocol Pause					

Note: A Static text control provides the caption, Select the protocol file.

Control	Description					
Checkbox	Allows users to enable or disable the corresponding actions. The JavaScript variable must be assigned in the Checkbox control properties and in the corresponding task parameter in the protocol.					
	The following figure shows two examples.					
	 □ Seal plates before upstack □ Select sides for barcode □ North □ South □ East □ West 					
	If the user selects the check box, the assigned JavaScript variable is set to 1. If the user clears the check box, the assigned JavaScript variable is set to 0.					
Radio button	Presents choices from among several items. Each Radio button control has a JavaScript variable that is also assigned in the corresponding protocol task parameter.					
	Options C Option example 1 C Option example 2 C Option example 3					
	If a user selects an option, the assigned JavaScript variable is set to 1. If the user clears the option, the assigned JavaScript variable is set to 0.					
Date and Time	Displays a preset date and time or a date that the user can set. To correspond with a given task, the JavaScript variable must be assigned in the control properties and in the corresponding task parameter in the protocol.					
	21:18:49 03-02-2010 💌					
	<i>Note:</i> You can use the Elapsed Time indicator for the entire run. See "Adding indicators for elapsed time and progress to a form" on page 173.					
Group box	Displays a rectangle that can be resized and labeled to visually group other controls together. To correspond with a given task, the JavaScript variable must be assigned in the control properties and in the corresponding task parameter in the protocol.					
Image	Allows you to place a static image on the form. To correspond with a given task, the JavaScript variable must be assigned in the control properties and in the corresponding task parameter in the protocol.					
Line	Provides a vertical or horizontal line that you can use to visually separate items on the form.					

Adding form controls that allow editing or runtime data display

Control	Description								
Tab Control	Displays tabbed pages in the form. You can add different controls and information in each tabbed page.								
	Figure Tabbed pages								
	Run Tools Select protocol: My Protocol Run Protocol								
	By default, when you drag a Tab Control onto the Form Canvas, the software displays two tabbed pages. To add another tabbed page, right-click the tab area, and select Add tab . To remove a tabbed page, right-click the tab, and then select Remove tab . To change the tab names, see "Setting Tab Control properties" on page 195.								
	<i>Figure</i> Adding or removing tabbed pages								
	Add tab Remove tab								
Panel	Displays a container in which you can add controls and information. You can add one or more panels in a form to group or categorize different controls.								
	Figure Panel containing different controls								
	Select protocol								

Configuring the General Controls

To add a control to the form:

1 Under Available Controls, click General Controls, and then drag the desired control to the Form Canvas area.

An invisible autogrid assists you in aligning the control in the form. To turn off the autogrid, press ALT while dragging the control into position.

2 In the **Form Canvas** area, click the control that you want to set up, so that a resizing box appears around the border. To resize the control, drag one of the sizing handles.

Adding form controls that allow editing or runtime data display

Note that the corresponding properties appear for the selected control as the following figure shows.

F -	- -			1° 1			r		
Figure	Form De	signer v	window	disnla	vina	properties	tor the 9	selected	control
riguio	101111 00	orginor v	viii aovv	aiopia	'y mg	proportioo			001101

💷 Editing I	MyForm1.VWForm						? 🔀
Avail	able Controls		Form Canvas				
b Drop b Drop C Slide: Prog: b Pushi ✓ Checi Date A Imag b File B ◆ Radio Group Line	iontrol list down r ress bar button ktbox and Time e trowsing 0 Button p Box control	Run Protocol	O Pause	Full Screen on/off		File Browsing Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory: Default value: Font size (1 - 72): Font color:	
Specializ Use glob Restore	ed Buttons ed Display Contr < bal context for variables e default values when load og in Full Screen mode	Bring selected co		▶ Preview	•	OK Save As	Cancel

Note: Click Preview to display the image that the form's user will see.

- **3** Edit the **Properties** for the control. The properties can include a combination of the following depending on the control:
 - "Setting properties common to the general controls" on page 183
 - "Setting Static text control properties" on page 187
 - "Setting Droplist and Dropdown properties" on page 188
 - "Setting Slider properties" on page 188
 - "Setting Progress bar properties" on page 190
 - "Setting Pushbutton control properties" on page 191
 - "Setting File Browsing properties" on page 192
 - "Setting Checkbox properties" on page 193
 - "Setting Radio Button properties" on page 193
 - "Setting Image (static) control properties" on page 194
 - "Setting Date and Time properties" on page 194
 - "Setting Group Box properties" on page 195
 - "Setting Tab Control properties" on page 195
 - "Setting Panel properties" on page 196

The Line control does have any properties that you can set.

Note: If you want one control to overlap another control on the form, select the control that you want on top, and then click **Bring selected control to front**.

Setting properties common to the general controls

The following table lists the properties for all controls. A given control might use only a subset of the properties listed.

Properties	Description	
JavaScript variable	The JavaScript va focused control.	ariable that will be associated with the
	Type any string JavaScript variab	that qualifies as valid syntax for a ole name.
		type the variable name for the ask Parameters property.
	control that has protocol, you wo	for a given task, you could use an Edit a JavaScript variable of vol. In the uld specify the Aspirate Properties for
	Volume as = vol	
	Edit control Properties JavaScript variable:	Vol
	Edit control Properties JavaScript variable: Always use global context:	vol
	 Edit control Properties JavaScript variable: Always use global context: Read only: 	vol Task Parameters
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry:	vol Task Parameters
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory:	vol ✓ Task Parameters ✓ ↓ ↓
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory: Default value (2 - 6):	Vol ✓ Task Parameters ✓ 2 ✓ Aspirate (Bravo) Properties ✓
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory: Default value (2 - 6): Min. value:	Vol ✓ ✓ ✓ 2 ✓ ✓ 2 ✓
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory: Default value (2 - 6): Min. value: Max. value:	Vol Image: Task Parameters Image:
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory: Default value (2 - 6): Min. value: Max. value: Font size (1 - 72):	vol Image: Task Parameters Image:
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory: Default value (2 - 6): Min. value: Max. value:	Vol Task Parameters ✓ Ž 2 Aspirate (Bravo) Phoperties 2 Location, plate: 5 (96 Greiner 655101 PS Clr Location, location: <auto-select> 11 Volume Volume (0 - 251 µL):</auto-select>
	Edit control Properties JavaScript variable: Always use global context: Read only: Data entry: Mandatory: Default value (2 - 6): Min. value: Max. value: Font size (1 - 72):	Vol ✓ ✓ ✓ 2 Cation, plate: 5 2 Location, plate: 5 4uto-select> 11

For more details on using JavaScript variables in the Task Parameters area, see "Using simple variables" on page 77.

Properties	Description
Always use global context	If the form's Use global context for variables check box is selected, you can ignore this setting. If the form's Use global context for variables check box is not selected, specify which context to use for the control's JavaScript variable:
	• <i>Global context</i> . Select this check box.
	For example, if the variable in question will be acted on before the protocol is running or is scheduled to run, use the global context.
	IMPORTANT Any protocol that uses the global context and has JavaScript variables of the same name will be affected by changes you make to this variable, even if this form's Use global context for variables check box is not selected.
	• Context of the running protocol. Clear this check box.
	For example, if the variable in question will communicate with the protocol once the protocol is running or is scheduled to run, you may not need to use the global context.
	For more details on JavaScript context, see "Understanding JavaScript context in form design" on page 204.
Read only	The state that determines whether the form's user can edit the contents of the control.
	• Select the check box to prevent users from editing the control contents.
	• Clear the check box to allow users to edit the control contents.
BorderStyle	The border surrounding the control.
	You can specify one of the following border styles:
	• FixedSingle. Adds a single line that encloses the control
	• <i>Fixed3D</i> . Adds a 3-dimensional effect to the border's appearance.
BackgroundIm age	The image displayed as the background for the control. The selected image is displayed on top of the selected background color.
	Click the browse button to locate and select the desired image.

Properties	Description
BackgroundIm	How the selected image is displayed.
ageLayout	Select one of the following display methods:
	• Center. Center-aligns the image on the control.
	• <i>Stretch.</i> Stretches the image to fit the size of the control. The dimensional ratio of the image is not maintained.
	• <i>Tile.</i> Uses multiple copies of the image to cover the entire control area. The images are in their original sizes and are placed adjacent to one another.
	• <i>Zoom.</i> Magnifies the image such that the width or length covers the width or length of the control. The dimensional ratio of the image is maintained.
Background_C	The color of the control.
olor	Click the field, and then select the desired color.
Data entry	The option to allow the user to edit the value in the control when the protocol is paused.
	• Select the check box to allow form users to edit the value when a protocol is not running and when a running protocol is paused.
	• Clear the check box to allow users to edit the value only when a protocol is not running.
	For the data entry controls, you can also provide the Print, Reset, and Save data entry buttons from the Specialized Buttons area. For details, see "Configuring a run button and other specialized buttons in a form" on page 164.
	<i>Note:</i> The Data entry property is not available if the Read only check box is selected.
Mandatory	The option to require the form's user to enter a value for this field before starting the associated protocol or runset.
	Select the check box to require the user to enter a value for the field. Clear the check box if the user can start the protocol or runset without entering a value for the field.
	Available if the Data entry check box is selected.
Default value	The value the form should display when the user resets the field.
	Type the default value in the box.
	Special conditions apply for some controls, such as check boxes and radio buttons. For details, see the property description for the specific control.

Properties	Description
Min value, Max value	A range of permitted values. The value saved to the associated JavaScript variable will be a number.
	Type the minimum and maximum value to define the range of values. If the form's user types a value outside this range, an error message appears.
	To allow the user to type any value in an Edit control, leave the Min and Max value properties blank. The value saved to the associated JavaScript variable will be a number, unless the value appears to be something other than a number. In which case, the value will be saved as a string.
	Special conditions apply for some controls, such as sliders. For details, see the property description for the specific control.
Dock	The option to anchor the control to a position on the Form Canvas.
	Select one of the following positions:
	• <i>None</i> . You can move the control freely on the canvas. Select None if you want to manually position the control, and you prefer to set the size of the control using the Width and Height properties.
	• <i>Top.</i> The top side of the control is adjacent to the top o the Form Canvas. The control's width is increased to match the width of the canvas. Although the width is fixed, you can change the Height value.
	• <i>Left.</i> The left side of the control is adjacent to the left side of the Form Canvas. The control's height is increased to match the height of the canvas. Although the height is fixed, you can change the Width value.
	• <i>Bottom.</i> The bottom side of the control is adjacent to the bottom of the Form Canvas. The control's width is increased to match the width of the canvas. Although the width is fixed, you can change the Height value.
	• <i>Right.</i> The right side of the control is adjacent to the right side of the Form Canvas. The control's height is increased to match the height of the canvas. Although the height is fixed, you can change the Width value.
	• <i>Fill</i> . The control's size is increased so that it completely covers the Form Canvas area. The width and height of the control are fixed.
Font size	The font size of the text that appears in the control.
	To change the font size, type a new number in the field. Any controls that you create subsequently will use the new font size.
	Default: 10

Adding form controls that allow editing or runtime data display

Properties	Description
Font color	The color of the text that appears in the control.
	To change the color for the selected control and subsequently created controls, click the field, and then click the \checkmark that appears.
	Click the color in the palette list, or click Custom Color to open the Select Color dialog box and create a custom color
	Default font color: Web Black
	Default background color: 240, 240, 240

Setting Static text control properties

The Static text control has the following properties in addition to the properties common to the other general controls.

Properties	Description
Display string	Type the text that you want to appear on the form, for example, a caption for another control on your form.
	The following figure shows an example of a Static text control with a display string that provides the label, <i>Volume (uL)</i> for an Edit control.
	Volume (µL): 2
	<i>Note:</i> Display string is enabled only if the JavaScript variable property is blank.
	Note: To use the symbol μ , copy the characters to the Microsoft Clipboard from other software. Right-click the field and choose Paste to insert the character into the field.
Border	To add a border around the control, ensure the check box is selected (default). For example, a border is useful if you want to provide a display of runtime data.
	To remove the border, clear the check box. For example, if you are creating a caption for one of the other controls, a border is unnecessary.
	The following figure shows an example of two Static text controls combined with a Slider control. The caption on the left is a Static control with no border. The display on the right is a Static control with a border.
	Mix cycles: 3

To coordinate the Static text control with a protocol task parameter, both the control and the task parameter must use the same JavaScript variable.

To coordinate the Static text control with another control, for example, the slider, both controls must have the same assigned JavaScript variable and both controls must specify the global JavaScript context so that they can communicate with each other.

Setting Droplist and Dropdown properties

The Droplist and Dropdown controls have the following properties in addition to the properties common to the other general controls.

Note: You might want to use these controls in combination with a Static text control to display a caption for your drop-down list or drop-down combo box.

Properties	Description
Items	Type the list of items that will appear in the list of the Droplist or Dropdown control, where each item is separated by a semicolon with no spaces.
	For example, type 3;6;9;12 to provide the form's user with the choices 3, 6, 9, 12.
Default value	Type the item from Items list that will display in the form by default.
	IMPORTANT Make sure that the default value is also in the Items list. Otherwise, the Droplist control will display the first list item by default. The Dropdown control will display the default value even if the value is not included in the Items list.

Setting Slider properties

The Slider control has the following properties in addition to the properties common to the other general controls.

Properties	Description	
Orientation	Click the field to display the , and then click one following: • <i>Horizontal</i> . The scale reads from left to right, Mir	
	to Max value.	
	• <i>Vertical.</i> The scale reads from bottom to top, Min to Max value.	value
	The figure shows an example of a horizontal and vert slider. The horizontal slider is combined with an Edit that displays the changing numeric value as the slider moved.	control
	Mix cycles: 3 Mix cycles	
Min value, Max value	To specify the range of values that the slider represent a minimum and maximum numeric value. The slider tick mark for each numeric value in the range. For ex a slider with a range of 1–10 has 10 tick marks, and a with a range of 1–20 has 20 tick marks.	has a ample,
	□ Slider Properties	
	JavaScript variable: mix	
	Always use global context: 🔽	
	Read only:	
	Data entry:	
	Min. value: 1 Mix cycles: —	3
	Max. value: 10	
	Default value (1 - 10): 3	
	Increment size: 1 1 5	10

When the form's user moves the slider, the resulting value is written to the control's JavaScript variable as soon as the slider is released.

Horizontal

WebBlack

10

Orientation:

Font color:

Font size (1 - 72):

_

_

Adding form controls that allow editing or runtime data display

Properties	Description
Increment size	Type a positive number to use as the increment that the numeric value changes as the slider is moved. For example, if the slider's range is 1–10 and the increment size is 1, the value will change by 1 each time you move the slider. If the increment is 2, the value will change by 2 each time you move the slider.
	The increment size should be in relation to the slider's range of values. For example, a slider that has a narrow range of values typically would not have a large increment size. Likewise, a small increment size may be insufficient for a slider that has a very wide range of values.

You can use the Slider control in combination with the:

- Static text control to display a caption for the slider or display the current value of the slider's setting.
- Edit control to display the current value of the slider's setting or allow users to enter a value instead of using the slider.

To coordinate the slider setting with a Static text control or Edit control and the protocol task parameter setting:

- Both the Slider and Static or Edit controls must have the same JavaScript variable assigned (for example, mix).
- The variable assigned in the Slider and Static or Edit controls must be in the global context so that the two controls can communicate.
- The corresponding Mix task parameter in the protocol must also have the same JavaScript variable assigned (for example, mix).

If the slider's Data Entry property is not selected, the slider will move according to the current value of the underlying JavaScript variable. The behavior of the slider is undefined if the JavaScript variable does not have a numeric value, or if the variable's value is outside the slider's range.

Setting Progress bar properties

The Progress bar control has the following properties in addition to the properties common to the other general controls.

Note: You might want to use this control in combination with a Static text control to create the progress bar caption.

Properties	Description
JavaScript variable	Must have a numeric value that is a positive number and the value must not be greater than the Max value setting.
Max value	Type a numeric value larger than 0. The value represented by the left end of the progress bar is always 0. The Max value determines the value represented by the right end of the progress bar.

Adding form controls that allow editing or runtime data display

Properties	Description
Bar color	 Optional. To change the color, click the field, and then click the that appears. Click the color in the palette list, or click Custom Color to open the Select Color dialog box and create a custom color.
	Overall Progress Properties Overall Progress Properties Bar color: WebBlue Overall Progress Properties Overall Progres Overall Progres

The progress bar moves according to the current value of the underlying JavaScript variable. All progress bars are horizontal.

Setting Pushbutton control properties

The Pushbutton control can execute any JavaScript code that you specify. You provide the script in the Pushbutton Properties, as the following figure shows.

Figure Workflow to create a pushbutton

Available Controls		Form Canvas		<u>811</u> 2↓	
Seneral Controls A Static B Edit control 3 Droplist 3 Dropdown − Slider □ Progress bar	Run Selected	Pause Fi		 Pushbutton Pro Script: Always use global of Icon: Disable when runn Caption: 	c: I♥ C:\Program Files (x86)\ ir I♥ Run Selected Protocol
	Elapsed Time: 00:00			Font size (1 - 72): Font color: Background colors	240, 240, 240
Tab Control Panel Specialized Buttons Specialized Display Contr Use global context for variable Restore default values when li Show log in Full Screen mode	Bring selected o		w: undProtocolFileToRunset	(fie01, 1, **, *myform)	UVWForm");
		<			,

Adding form controls that allow editing or runtime data display

In addition to the properties common to the general controls, the Pushbutton control has the following properties. For an example of how to set up a pushbutton using a script, see "Example: Creating a scripted Pushbutton control in a form" on page 197.

Properties	Description	
Script	Click the field, and then click the $\boxed{\cdots}$ button that appears. In the Input Text dialog box, type the JavaScript code to be executed when the pushbutton is pressed, or click Browse to select the file (.txt) that contains the script.	
	<i>Note:</i> If the script specifies a file on your computer, and you later export the form with this pushbutton, you must specify the file in the Additional Files page of the Export Wizard.	
Always use	Specify the context in which to execute the script:	
global context	• <i>Global context</i> . Select the check box to use the global context. For example, if the button is to be pressed while no protocol is running, you must use the global context.	
	IMPORTANT Any protocol that uses the global context and contains JavaScript variables of the same name will be affected by changes you make to this variable, even if this form's Use global context for variables check box is not selected.	
	• <i>Context of the running protocol.</i> Clear the check box to use the protocol's private context.	
Disable when running	To make the button unavailable (grayed) whenever the form is running a protocol or runset, select this check box (default).	
	To make the button enabled at all times, clear this check box.	
Icon	Optional. To select an image to use as an icon in addition	
	to the button caption, click the field, and then click the button that appears.	
	In the Open dialog box, locate and select the image file (.jpg, .png, .bmp, or .ico), and then click Open.	
	<i>Note:</i> Icons for the run and pause buttons are installed in the following folder:\Program Files\Agilent Technologies\VWorks\clipart	
Caption	To change the label that appears on the button, type the new text in the field.	

Setting File Browsing properties

The File Browsing control has the properties that are common to the other general controls. No additional properties are provided.

For an example of how to set up a File Browsing control, see "Example: Creating a scripted Pushbutton control in a form" on page 197.

Setting Checkbox properties

The Checkbox control has the following properties in addition to the properties common to the general controls.

Properties	Description
Caption	Type the string to be displayed to the right of the check box.
Default value	 Type one of the following: 0 - indicates the check box is cleared by default 1 - indicates the check box is selected by default <i>Note:</i> Any value other than zero indicates that the check box is selected.

The Checkbox control is binary. When the check box on the form is selected, a 1 is written to the associated JavaScript variable. When the check box is cleared (unchecked), a 0 is written to the associated JavaScript variable.

Note: If the JavaScript variable's numeric value is anything other than 0, the check box will display as checked.

Setting Radio Button properties

The Radio Button control has the following properties in addition to the properties common to the other general controls.

Properties	Description	
Default value	 Type one of the following: 0 - indicates the option is cleared by default 1 - indicates the option is selected by default <i>Note:</i> Any value other than zero indicates that the check box is selected. 	
Caption	Type the string to be displayed to the right of the radio button.	

Adding form controls that allow editing or runtime data display

Properties	Description
Group ID	Type a string to use as the ID of the radio button group. Only one button in the group can be selected at a time. When the form's user selects a button in the group, all other radio buttons with the same Group ID are cleared (not selected) automatically.
	For example, if you had a grouping of options for size, you could use the string, size, as the Group ID.
	Size
	C Small
	C Medium
	C Large

The Radio Button control is binary. When the button on the form is selected, a 1 is written to the associated JavaScript variable. When the button is cleared, a 0 is written to the associated JavaScript variable.

Note: If the JavaScript variable's numeric value is anything other than 0, the option will display as selected.

Setting Image (static) control properties

The Image control has the following properties in addition to the properties common to the other general controls.

Properties	Description
Image file	To select an image to display on the form, click the field, and then click the $\boxed{\cdots}$ button that appears. In the Open dialog box, locate and select the image file (.jpg, .png, or .bmp), and then click Open.

Setting Date and Time properties

The Date and Time control has the properties common to the other general controls. However, if you provide a default value, it must be in the following format. If you do not provide a default value, the software uses the current date and time from the computer.

Properties	Description
Default value	nn:nn:nn nn-nn-nnnn where, nn:nn:nn is the hour:minutes:seconds in a 24-hour clock and nn-nn-nnnn is the month:day:year

If you select the Data entry property for this control, the user can enter:

- *Time*. The user can edit the default values.
- *Date*. The user can click the drop-down list to select the date from a calendar.

Setting Group Box properties

The Group Box control has the following properties in addition to the properties common to the other general controls.

Properties	Description
Group name	Type the string to display as the caption for the group box.

Controls that you drag inside the group box become part of the group box. The group box may need to be resized to ensure that all the controls within the group box borders are clearly visible.

Setting Tab Control properties

The Tab Control has the following properties in addition to the properties common to the other general controls.

Tab Control properties	Description	
Alignment	Specifies the position of the tabs: Top, Left, Right, or Bottom.	
SizeMode	 Specifies the tab size: Normal. Each tab is sized to fit its name. Fixed. The longest tab name determines the size of all the tabs. FillToRight. The longest tab name determines the size of all the tabs, and the tabs are flush with the right and left margins of the control. 	
Width	Specifies the width of the tab control.	
Height	Specifies the height of the tab control.	

IMPORTANT The Dock selection overrides the values you specify for the Width and Height properties. For example, if you dock the control at the top of the canvas, the software increases the width of the control and updates the Width value. To return to the previously set Width and Height values, set the Dock property to None. For more information about docking tabbed pages, see "Setting properties common to the general controls" on page 183.

Each tabbed page contains the following properties in addition to the properties common to the other general controls.

Adding form controls that allow editing or runtime data display

Tabbed page properties	Description
Name	The text that is displayed on the tab. Provide a name that describes the function of the tab contents.

Setting Panel properties

The Panel control has properties that are common to the other general controls. See "Setting properties common to the general controls" on page 183.

Related information

For information about	See
Workflow for creating or editing a form	"Workflow for creating or editing a form" on page 160
Pushbutton and File Browsing controls	"Example: Creating a scripted Pushbutton control in a form" on page 197
Controls under Specialized Buttons in the Form Designer window	"Configuring a run button and other specialized buttons in a form" on page 164
Controls under Specialized Display Controls in the Form Designer window	"Adding indicators for elapsed time and progress to a form" on page 173
Form properties in the Form Designer window	"Setting the form properties" on page 201
JavaScript context and form design	"Understanding JavaScript context in form design" on page 204
Creating a basic protocol	"Workflow for creating or editing a form" on page 160
Using JavaScript	"Creating a protocol: advanced topics" on page 73

Example: Creating a scripted Pushbutton control in a form

About this topic

To create or edit forms, you must have VWorks Technician- or Administratorlevel access. You should also have an understanding of how to create protocols in the VWorks software.

This topic provides an example of the Pushbutton and File Browsing controls in the Form Designer. For more details, see "Adding form controls that allow editing or runtime data display" on page 176.

About the script for the example

The example presented in this topic uses the following script:

runset.appendProtocolFileToRunset (file01, numRunTimes, "", "myform1.VWForm");

This script appends the contents of a protocol file to the Runset Manager, specifies the number of times the protocol should run, and passes the file name of the form (.VWForm) to be associated with the protocol.

The following table describes the arguments for the appendProtocolFileToRunset method used in the example script.

Argument	Example	Descriptions
string ProtocolPath	file01	The protocol file path. In this example, the variable file01 is used for the file path.
int RunTimes	numRunTimes	The number of times (integer) to run the protocol. In this example, we use the variable numRunTimes so that the form users can edit this value.
string ProtocolNotes	""	An empty string. Although the third argument is not used in this case, the empty string is required as a placeholder.
string formToUse	"myform1.VWForm"	The file name of the form to be associated with the protocol once the protocol starts running. The argument must specify the file name (not the path) of the form that contains the pushbutton.

For details on other runset object methods that can be used with forms, see "runset object" on page 123.

Example: Creating a scripted Pushbutton control in a form

Creating the example pushbutton

The following example describes how to create a pushbutton that enables the form users to select which protocol to run.

To create the example pushbutton:

1 In the VWorks window, choose File > New > Form.

In the **Form Designer** window, click **Save As** and save the form with the name myform1.VWForm.

2 To configure the File Browsing control, drag File Browsing from General Controls to the Form Canvas. Enter the following settings under File Browsing Properties:

File Browsing Properties	;
JavaScript variable:	file01
Always use global context:	
Read only:	
Data entry:	
Mandatory:	
Default value:	
Font size (1 - 72):	11
Font color:	WebBlack

- a In the JavaScript variable field, type file01.
- **b** Select Always use global context and Data entry.
- **3** *Optional.* To provide a caption for the File Browsing control, drag **Static** from **General Controls** to the **Form Canvas**.

Under **Static Properties**, in the **Display string** field, type the following caption: Select the protocol file:

⊡	Static Properties	
	JavaScript variable:	
	Always use global context:	
	Display string:	Select the protocol file:
	Border:	
	Font size (1 - 72):	11
	Font color:	WebBlack

4 To configure an Edit control that allows users to enter the number of runs, drag **Edit control** from **General Controls** to the **Form Canvas**. Enter the following settings under **Edit control Properties**:

Ξ	Edit control Properties	
	JavaScript variable:	numRunTimes
	Always use global context:	
	Read only:	
	Data entry:	
	Mandatory:	
	Min. value:	
	Max. value:	
	Default value:	1
	Font size (1 - 72):	11
	Font color:	WebBlack

a In the **JavaScript variable** field type numRunTimes.

- **b** Select Always use global context and Data entry.
- **c** Select **Mandatory**. If the users forget to enter the number of runs, the software will display an error message after the user selects the protocol and clicks the pushbutton.

You can also enter a **Default value** that the software will use unless the form user changes the value.

- **5** Optional. Repeat step 3 to create the following caption for the number-ofruns control: Number of times to run:
- 6 To configure the pushbutton, drag **Pushbutton** from **General Controls** to the **Form Canvas**. Enter the following settings under **Pushbutton Properties**:

Pushbutton Properties						
	Script:	runset.appendProtocolFileToRu …				
	Always use global context:					
	Icon:	C:\Program Files\Agilent Technolog				
	Disable when running:					
	Caption:	Run Selected Protocol				
	Font size (1 - 72):	11				
	Font color:	WebBlack				
	Background color:	240, 240, 240				

a Click the Script field, and then click the with button that appears. In the Input Text dialog box, type the following script:

runset.appendProtocolFileToRunset (file01, numRunTimes, "", "myform1.VWForm");

Note: If you copy this example, make sure to use straight quotation marks instead of curly quotation marks or smart quotes.

Input Text	- ×-
Please enter text below:	
runset.appendProtocolFileToRunset (file01, 1, ", "myform1.VWForm");	
< III	•
Browse OK	Cancel

b Select Always use global context and Disable when running.

Example: Creating a scripted Pushbutton control in a form

IMPORTANT The global context is required for the variables in the Pushbutton script, the File Browsing control, and the Edit control because at the time the button is pressed the form is not yet associated with a protocol. Without a protocol association, there is no protocol from which to get an associated protocol's context.

- **c** Type the **Caption** that will appear on the pushbutton, for example, Run Selected Protocol.
- d Click the **Image** field, and then click the ... button that appears. In the **Open** dialog box, select the following:

...\Program Files\Agilent

Technologies\VWorks\clipart\24b_start_icon_up.ico

7 Click **OK** to close the Form Designer and save the changes.

Figure Example form in full screen view with the logs included

Works - [Bravo_Prot	ocol.VWFo	rm]			
	Run Proto	col Deuse	Full Screen	n On/Off	
Vol Sel Tyj	lume (µL): ect the nun pe or select	er Values for the Run 2 nber of columns to run: : the incubation time (minutes): the number of mix cycles:	3 • 10 • 	3	
Progress:			Elapsed Time: 00:00	:00	
Main Log					a ×
Timestamp	Class	Device	Location	Process	Tas 🔺
10/7/2013 5:32:10 PM	i) Info				
10/7/2013 5:33:35 PM	Info				
10/7/2013 5:46:42 PM	J Info				
Main Log Pipette Log	1114141	straints Log Progress			

Testing the example pushbutton

To test the example pushbutton:

- 1 Ensure *myform1.VWForm* is open in the **VWorks** window.
- **2** In the form, click ... and then select the protocol file (.pro).
- **3** In the Number of times to run box, type a value.
- 4 Click the custom pushbutton that you created, for example, Run Selected Protocol.

Related information

For information about	See
Workflow for creating or editing a form	"Workflow for creating or editing a form" on page 160
Controls under General Controls in the Form Designer window	"Adding form controls that allow editing or runtime data display" on page 176
Controls under Specialized Buttons in the Form Designer window	"Configuring a run button and other specialized buttons in a form" on page 164
Controls under Specialized Display Controls in the Form Designer window	"Adding indicators for elapsed time and progress to a form" on page 173
Form properties in the Form Designer window	"Setting the form properties" on page 201
Creating a basic protocol	"Workflow for creating or editing a form" on page 160
Using JavaScript	"Creating a protocol: advanced topics" on page 73

Setting the form properties

About this topic

This topic describes the properties that appear in the bottom corner of the Form Designer window and the Editing .VWForm windows.

To create or edit forms, you must have VWorks Technician- or Administratorlevel access. You should also have an understanding of how to create protocols in the VWorks software.

This topic describes the form properties that appear at the bottom of the Form Designer windows.

Available Controls	Form Canvas		
General Controls		•	
A Static Edit control Dropolist Slider Progress bar Pushbutton Checkbox Date and Time Image File Browsing Radio Button	Protocol Pause Enter Parameter Values for the Run Volume (μL): 2 Select the number of columns to run: Type or select the incubation time (minutes): Select or type the number of mix cycles:	Full Screen Or	1
Group Box Line Tab Control Panel Specialized Buttons Specialized Display Control (Elapsed Time: 00:0	1
Use global context for variables			-
Restore default values when loading	Bring selected control to front		
Show log in Full Screen mode	Set background color Preview O	K Save As	Cano

Figure Form properties in the Form Designer and Editing .VWForm windows

For more details on creating forms, see "Workflow for creating or editing a form" on page 160.

Procedure

To set the form's properties:

- **1** In the **Form Designer** window or **Editing**.**VWForm** window, specify the context for the JavaScript variables associated with all the controls in the form:
 - *Context of the running protocol.* Clear the **Use global context for variables** check box. JavaScript variables with the same name in different protocols will not be affected by the properties you set for the controls in this form.

Individual controls in the form can still specify the global context.

• *Global context for all variables in the form.* Select the **Use global context for variables** check box. For example, if the form is for a runset, you must use the global context.

All controls in the form will use the global context for their JavaScript variables and scripts, regardless of the settings for the individual control properties.

Any protocol that uses the global context and contains JavaScript variables of the same name will be affected by the changes you make to the properties for the controls in this form.

CAUTION Ensure that the variable values you want to use globally are applicable to all other protocols, which also specify the global context. Otherwise, variables with the same name in different protocols will interfere with each other.

For more details on JavaScript context, see "Understanding JavaScript context in form design" on page 204.

- 2 To ensure that the default values associated with the controls in the form appear each time a user opens the form, select **Restore default values when loading**.
- **3** If the form includes the Toggle Full Screen button, specify whether to show or hide the Main Log, Pipette Log, Time Constraints Log, and Progress tabs in the full screen view:
 - Select the Show log in Full Screen mode check box to include the logs.
 - Clear the Show log in Full Screen mode check box to hide the logs.
- **4** To change the background color of the form, click **Set background color**, and then select the color from the **Color** dialog box.
- **5** Click **OK**. If this is the first time to save the form, the Save As dialog box opens. Select a storage location, type a name for the form, and click **Save**. The software saves the form as file type .VWForm.

If you are editing a previously saved form, click File > Save after the Form Designer closes.

For information about	See
Workflow for creating or editing a form	"Workflow for creating or editing a form" on page 160
Controls under General Controls in the Form Designer window	"Adding form controls that allow editing or runtime data display" on page 176
Controls under Specialized Buttons in the Form Designer window	"Configuring a run button and other specialized buttons in a form" on page 164
Controls under Specialized Display Controls in the Form Designer window	"Adding indicators for elapsed time and progress to a form" on page 173
JavaScript context and form design	"Understanding JavaScript context in form design" on page 204
Creating a basic protocol	"Workflow for creating or editing a form" on page 160
Using JavaScript	"Creating a protocol: advanced topics" on page 73

Understanding JavaScript context in form design

About this topic

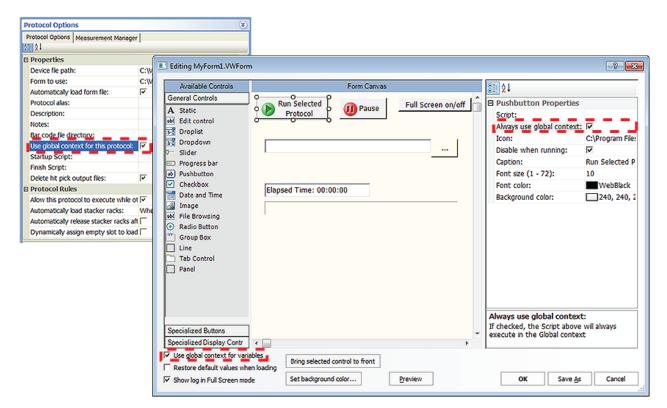
This topic assumes a basic understanding of how to use JavaScript variables and create protocols in the VWorks software.

About JavaScript context and form design

The JavaScript variables used in protocols and in the forms that run the protocols can be in either the global context or the context of the running protocol.

When designing a form, you specify the JavaScript context in three locations:

- 1 *Protocol.* In the **Protocol Options** area, you select or clear the **Use global context for this protocol** check box to specify the context for the variables in the protocol.
- **2** *Form.* In the Form Designer window, you select or clear the **Use global context for variables** check box to specify the context for the variables in the form.
- **3** Individual controls in the form. If the form's **Use global context for variables** check box is selected, the context setting for all the controls that use JavaScript is already set. If the form's **Use global context for variables** check box is not selected, you can select the **Always use global context** check box in the control properties for individual controls that use JavaScript.



Protocol's JavaScript context

For each protocol, you specify the context in the Protocol Options area:

- *Global context*. Variables of the same name in the given protocol will be available across all protocols that also specify the global context.
- *Context of the running protocol.* Prevents the variables in a given protocol from being impacted by changes to variables of the same name in other protocols.

Form's JavaScript context

In the Form Designer window, you select or clear the **Use global context for variables** check box to specify the context for the form.

- *Global context*. All variables throughout the entire form will be in the global context.
- *Context of the running protocol.* The variables in each individual control in the form will be in the context of the associated (running) protocol, unless the control specifies the global context. When no protocol association exists (the protocol is not running or scheduled to run), the individual controls that do not specify global context will retain their most recent previous value.

The global context may not be necessary if the variable in question will communicate with the protocol after the protocol is running or is scheduled to run.

No JavaScript objects that exist in a context other than the global context and the protocol's context will be accessible from either kind of form. For example, plate objects, plates[] array objects, and task objects will not be accessible. If you want the data from any of these objects to be shown on the form, the protocol must contain JavaScript statements at appropriate points to copy the relevant data into JavaScript variables that you devise.

Individual control's JavaScript context

In the Form Designer window, when you set the properties for a control that has an assigned JavaScript variable, you select or clear the **Always use global context** check box to specify the context.

• *Global context.* The variable in question will be available to the protocol and to other controls that also use the global context before the protocol is running or is scheduled to run.

If two controls on the form must communicate with each other, the global context is required for each control. For example, the following figure shows a Slider control and a display (Static text control). As the slider moves, the value in the display updates to match the slider's position.

Mix cycles:	-J	3

• *Context of the running protocol.* The variable in question will be available to the protocol only after the protocol is running or is scheduled to run.

Runsets and the global context

If you have a set of protocols designed to be a runset that will be launched by a form, you use the global context for both the protocols and the form.

Note: Alternatively, you can use the JavaScript function, GetGlobalObject, to access the global context for any variable within the protocol that should interact with the form. See "VWorks-defined functions" on page 87.

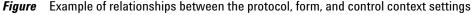
Understanding JavaScript context in form design

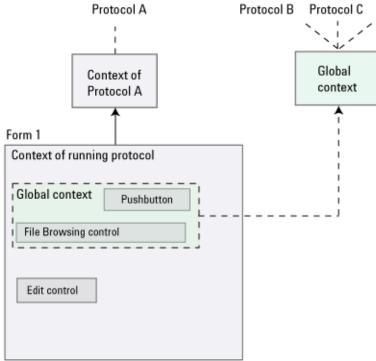
IMPORTANT Multiple protocols designed to run together in the same runset should not reuse the same JavaScript variable names unless the variables are intended to share data.

Context scenarios

The following figure shows four protocols (A, B, C, and D). Form 1 runs protocol A, and protocols B, C, and D run without using a form.

- Protocol A uses its own context for variables.
- Protocols B, C, and D use the global context for variables.
- Form 1 uses the context of the running protocol, except for two of its controls, a pushbutton and a file browsing control, which use the global context.





Suppose that protocol A does not use the global context because it uses a variable x to count the number of times a loop has executed. But, protocol D also uses a variable called x for something completely different. Even though both protocols may run at the same time, their JavaScript variables will not interfere with each other because protocol A uses its own private context.

Suppose that protocols B, C, and D must use the global context because each of these protocols keeps track of the total volume dispensed by all protocols in a variable called totVol. Whenever any of these protocols executes a Dispense task, it also executes the JavaScript: "totVol += task.volume;". When all three protocols are done, the total volume dispensed in all three protocols can be accessed in a single variable.

In Form 1, the File Browsing control and Pushbutton control are in the global context so that so that the two controls can communicate with each other. The Pushbutton control executes a script that uses a JavaScript variable of fileName, which must also be specified by the File Browsing control. Now

Protocol D

imagine that the user has typed, C:\myfile.txt in this control. When the user presses the Pushbutton control, whatever string happens to be showing in its File Browsing control at that time is assigned to the variable fileName in the global context. Now, not only does the script in the Form 1 Pushbutton control recognize the variable fileName as having a value of C:\myfile.txt, so would all the scripts throughout protocols B, C, and D.

For information about	See
Creating or editing a form	"Workflow for creating or editing a form" on page 160
Controls under General Controls in the Form Designer window	"Adding form controls that allow editing or runtime data display" on page 176
Form properties in the Form Designer window	"Setting the form properties" on page 201
Creating a basic protocol	"Workflow for creating or editing a form" on page 160
Working with JavaScript	"Creating a protocol: advanced topics" on page 73

5 Creating protocol forms for operators

Understanding JavaScript context in form design



VWorks Automation Control User Guide

6

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Running a protocol

This chapter contains the following topics:

- "Workflow for running a protocol" on page 210
- "Opening a form" on page 211
- "Opening a protocol" on page 213
- "Disabling and enabling a device in the device file" on page 215
- "Setting log file directories" on page 222
- "Setting general and view options" on page 224
- "Setting error-handling options" on page 229
- "Setting up email notification" on page 232
- "Setting up automatic online notification" on page 235
- "Starting the protocol run" on page 237
- "Managing runsets" on page 243
- "Monitoring the overall run progress" on page 254
- "Tracking the run progress of instances or devices" on page 255
- "Pausing the run" on page 261
- "Stopping the run" on page 268





Workflow for running a protocol

Cton	For this task	See
Step		See
1	Turn on the devices that will be used in the protocol and prepare them for operation.	Device user guide
2	Log in to the VWorks software.	"Logging in, logging out, and changing passwords" on page 22
3	Open a form or a protocol.	One of the following:
		• "Opening a form" on page 211
		• "Opening a protocol" on page 213
4	Optional. Temporarily disable a device.	"Disabling and enabling a device in the device file" on page 215
5	Optional. Set log file directories.	"Setting log file directories" on page 222
6	Optional. Set general and view options.	"Setting general and view options" on page 224
7	Optional. Set error-handling options.	"Setting error-handling options" on page 229
8	Optional. Set up email notification.	"Setting up email notification" on page 232
9	Start the protocol run.	"Starting the protocol run" on page 237
10	Optional. Create and manage runsets.	"Managing runsets" on page 243
11	Monitoring the run.	"Monitoring the overall run progress" on page 254
12	Optional. Pause the run.	"Pausing the run" on page 261
13	Optional. Stop the run.	"Stopping the run" on page 268

For information about	See
Preparing devices for a run	Device user guide
Creating protocols	 "Creating a protocol: basic procedure" on page 13 "Creating a protocol: advanced topics" on page 73

Opening a form

About this topic

The instructions in this topic assume that you have designed the form and you want to open it and verify that it works before distributing it for use in your lab.

Procedure

To open a form:

- **1** Log in to the VWorks software. For instructions, see "Logging in, logging out, and changing passwords" on page 22.
- 2 Select File > Open. The Open dialog box opens.
- 3 Locate and select the form (.VWForm) file, and then click Open.

The form opens in the VWorks window.

Note: A form file is not associated with a protocol or device file until you start a run. If you need to view or update the inventory database before starting the run, you must first open the related protocol or device file. If you want to display the device file, click the **Workspace** tab in the **Available tasks** area, and then click the device file name.

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	Plate Hub Carousel ● Plate Hub Carousel - 1 ● Plate Hub Carousel - 1 ● Plate Pad, Standard ● Plate Pad, -1 ● Istacker (3) ● Istacker - 1 ● Istacker - 2			
	Initialize all devices			
	Initialize selected devices	Plate Hub Carousel Properties		
	Close selected devices	Plate Hub Carousel Properties		
Workspace Available Devices Device diagnostics				

For information about	See
Creating forms	"Creating protocol forms for operators" on page 153

For information about...

See...

Opening a protocol

"Opening a protocol" on page 213

Opening a protocol

About this topic

The instructions in this topic assume that the protocol is associated with the correct device file, profiles, teachpoint files, labware definitions, liquid classes, and other relevant files and databases. For details about how these components relate and impact each other, see "Relationship of VWorks components" on page 4. For instructions on creating or selecting different device files, profiles, and other relevant files, see "Workflow for creating a basic protocol" on page 18.

Procedure

To open a protocol:

- 1 Log in to the VWorks software. For instructions, see "Logging in, logging out, and changing passwords" on page 22.
- 2 Select File > Open. The Open dialog box opens.
- 3 Locate and select the protocol (.pro) file, and then click Open.

The protocol information is displayed in the VWorks window. Notice that the name of the protocol appears in the title bar and on the tab in the protocol area.

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	Greiner	-	<u>→3</u> [-	Plate identity
= X Define Variables	781101 PS clr fit btm)	Plate 1 (384	Downstack	Centrifuge	U	Plate name: Plate 1
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Downstack	Remove	clr fit btm)	- Lotacker	Centrifuge - 1		Plates have lids:
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Incubate	Plate 2 (384 Greiner	-			1	Process control
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Enter text to filter on:	<	min			>	Barcode or header V No Selection
	Cleanup Protoco	i			*	
Workspace Available Ta	Protocol Options				۲	Advanced Settings

You can open and display multiple protocols. Repeat the steps in this section to open other protocols. To view a particular protocol, in the Protocol area, click the tab that displays the protocol name. *Note:* Every protocol requires a device file to run. When you open a protocol file, the device file associated with it is automatically loaded. However, the device file is not displayed. If you want to display the device file, click the **Workspace** tab in the **Available tasks** area, and then click the device file name.

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Protocol files	Devices	21		
My Protocol.pro My Device File.dev	🖻 🃲 3-Axis Robot	Plate Hub Carousel	Properties	
Device files	Arxis Robot - 1	Name	Plate Hub Carousel - 1	
My Device File.dev	Gentrifuge - 1	Profile	Plate Hub	
	Plate Hub Carousel - 1 Plate Pad, Standard P > Plate Pad, Standard P > PlatePad - 1 PlateCader (3) J Stacker - 1 J Stacker - 2 J Stacker - 3			
	Initialize all devices			
	Initialize selected devices			
	Close selected devices	Plate Hub Carousel Properties Plate Hub Carousel Properties		
	Delete selected devices			
Workspace Available Devices	Device diagnostics			
Ready		а	is logged in	

For information about	See
VWorks software components	"Relationship of VWorks components" on page 4
Preparing devices for a run	Device user guide
Creating protocols	 "Creating a protocol: basic procedure" on page 13 "Creating a protocol: advanced topics" on page 73
Setting the log file directories	"Setting log file directories" on page 222
Setting error-handling options	"Setting error-handling options" on page 229
Setting up email notification	"Setting up email notification" on page 232
Adding an alarm	"Adding an alarm" on page 37
Running a protocol	"Workflow for running a protocol" on page 210

Disabling and enabling a device in the device file

When to temporarily disable a device

You might want to temporarily disable a device when:

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

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

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

To disable a task without disabling the device, see "Disabling and enabling tasks" on page 641 for more information.

Devices that cannot be disabled

The following devices cannot be disabled:

- All robots, for example the BenchBot Robot and Direct Drive Robot
- Automation Control Unit
- BioCel I/O Interface

When to enable a device

You might want to enable a device when:

- You are running a protocol that uses a device that was disabled for another protocol
- You have finished performing maintenance on a device

Before you start

Before you enable a device, make sure that you have set the teachpoints for the device. For more information see "Adding devices" on page 25 and the user guide for the specific device.

Procedure

To disable a device in a device file:

- 1 In the VWorks window, choose **File > Open** and select the device file (.dev) that you want to edit. The device pane appears in the VWorks window and displays the list of devices.
- 2 Select the device in the Devices area and then select the Disable check box under the device properties area, or right-click the device and select Disable device. In the Device area, S appears on the device icon, and (Disabled) is appended to the device name.

6 Running a protocol

Disabling and enabling a device in the device file

Works - [Device File - 1]				
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Agilent Centrifuge				
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	Initialize selected devices	Disable		
Enter text to filter on:	Close selected devices			
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Availabl Worksp Availabl	Device diagnostics			
Ready		administrator is logged in		

To enable a device in a device file:

- 1 In the VWorks window, choose File > Open and select the device file (.dev) that you want to edit. The device pane appears in the VWorks window and displays the list of devices.
- 2 Clear the **Disable** check box under the device properties area. Alternatively, right-click the device name and select **Enable device**.

In the Devices area, the \bigotimes icon disappears from the device and the name is no longer appended with the (Disabled) status.

If you receive a VWorks Error message when enabling a device, stating the number of added devices has exceeded the number of devices allowed by your license, you will need to disable a device to continue. Alternatively, you can contact Automation Solutions Technical Support to inquire about increasing the number of devices for your license.

Example situations for disabling a device

Running a protocol using a subset of devices

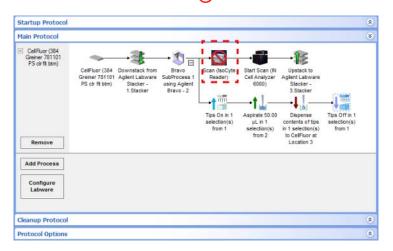
For example, your endpoint measurement for two assays use different readers that are not simultaneously accessible but the microplates are prepared using a similar procedure. In this case, you can disable the reader that you are not using and modify the task parameters for the common tasks, keeping the existing profiles and teachpoints.

- 1 In the VWorks window, choose File > Open and select the device file (.dev) that is associated with the protocol.
- **2** Ensure both readers are added and configured in the device file. See "Adding devices" on page 25 for instructions.
- **3** Open the protocol you want to run and ensure the Scan tasks for both readers are added to the protocol.

Startup Protocol								\$
Main Protocol								¥
CellPuor (384 Greiner 781101 PS cirfit btm)	CelFluor (384 Greiner 751101 PS cir fit btm)	Downstack from Agient Labware Stacker - 1.Stacker	Bravo SubProcess 1 using Aglent Bravo - 1	Crisocyte/met Tips On in 1 selection(s) from 1	Start Scan (IN Cell Analyzer 6000) Aspirate 50.00 yL in 1 selection(s) from 2	Upstack to Aglent Labware Stacker- 3.Stacker Dispense contents of tips in 1 selection(s) to CeliFuor	Tips Of selectio from	f in t
Add Process								
Configure Labware								
• [.111				_	,
Cleanup Protocol								٢
Protocol Options								(

4 In the device file, disable the reader that is not used in the protocol, in this example the IsoCyte Reader. See "To disable a device in a device file:" on page 215 for instructions.

In the protocol, the Scan (IsoCyte Reader) task associated with the disabled device, displays the \bigwedge icon.



- **5** Set the task parameters for the Scan (Cell Analyzer) and ensure the task parameters for the other tasks are correct.
- **6** When you are ready to run the protocol, click **Start**. A disabled device message appears and asks you to confirm that you want to skip the disabled tasks.



7 Click **OK** to confirm that the tasks should be skipped. A second message appears and asks you to confirm the number of tasks to be skipped. In the following example, one task is skipped.



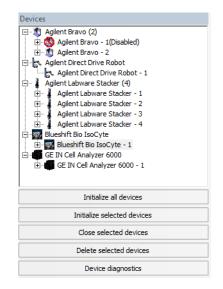
8 Click **Yes** to confirm the number. The Run Configuration Wizard opens. Follow the instructions in the wizard. For details on the wizard, see "Starting the protocol run" on page 237. During the run, the tasks associated with the disabled device are skipped. In the preceding example, the Scan (IsoCyte Reader) task is skipped because the IsoCyte Reader device is disabled.

Running protocols that use different pipette heads or deck setup

For example, you might want to run two protocols that use a Bravo Platform but each one requires a different pipette head. One protocol uses 96-well microplates and the other 384-well microplates. Instead of having two device files, each with a unique Bravo Platform profile for a specific head, you can create one device file in which you add two Bravo Platform devices, each with a unique profile and setup. When running one of the protocols, the Bravo Platform device with the configuration that is not in use is disabled.

- 1 In the VWorks window, choose File > Open and select the device file (.dev) that is associated with one of the protocols that use the Bravo Platform.
- **2** Add a second Bravo Platform and configure it to use the second profile and setup. See "Adding devices" on page 25 for instructions.
- **3** Open the protocol you want to run. In this example, it is the one that uses 384-well microplates (Bravo -2 profile).
- **4** Disable the Bravo Platform device with the profile (Bravo-1) that is not used in the protocol. See "To disable a device in a device file:" on page 215 for instructions.

Note: The disabled Bravo device will be removed from the available device list.



5 In the protocol, ensure the Bravo subprocess is associated with the correct Bravo device. See "SubProcess (Bravo, Vertical Pipetting Station)" on page 388 for instructions.

			Task Parameters		
Startup Protocol			* Task Paramete	rs	8
Iain Protocol CellFuor (384 General 73101 PS of R btm) Remove Add Process	CelFluor (384 Greiner 76110) Agliert Labwar PS of rit bitm) Stocker - 1.Stacker	SubProcess 1 Aglen using Agilent c:/isocyte/met St	Device Selection	io tadi: Devices in backup pool:	ie er

6 When you are ready to run the protocol, click **Start**. A disabled device message appears and asks you to confirm that you want to skip the disabled tasks.

VWorks	
1	One or more tasks in the protocol uses the devices that are currently disabled. Running this protocol will skip these tasks unless an alternate pooled device is available.
	OK Cancel

7 Click **0K** to run the protocol. The Run Configuration Wizard opens. Follow the instructions in the wizard. For details on the wizard, see "Starting the protocol run" on page 237.

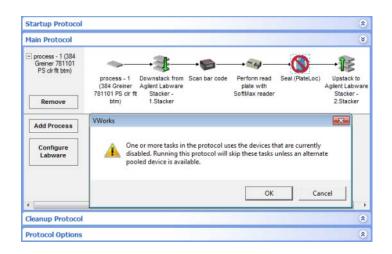
Performing maintenance on a non-pooled device

While replacing a roll of seal on a PlateLoc Sealer, you want to continue to perform tasks on the other devices.

- **1** Open the protocol you want to run.
- **2** Open the device file associated with the protocol.
- **3** Disable the PlateLoc Sealer associated with the protocol. See "To disable a device in a device file:" on page 215 for instructions.
- **4** When you are ready to run the protocol, click **Start**. A disabled device message appears and asks you to confirm that you want to skip the disabled tasks.

6 Running a protocol

Disabling and enabling a device in the device file



5 Click **0K** to confirm that the tasks should be skipped. A second message appears and asks you to confirm the number of tasks to be skipped. In the following example, one task is skipped.

Main Protocol						*
process - 1 (384 Greiner 781101 PS clrfit btm)	process - 1 (384 Greiner 781101 PS cir fit	Downstack from Agilent Labware Stacker -	Scan bar code	Perform read plate with SoftMax reader	Seal (PlateLoc)	Upstack to Aglient Labward Stacker -
Remove	btm)	1.Stacker				2.Stacker
Add Process		VWorks		-23		
Configure		1 task	is skipped.Con	tinue?		
		Y	es	No		
•	L		111			
Cleanup Protocol						*

6 Click **Yes** to confirm the number. The Run Configuration Wizard opens. Follow the instructions in the wizard. For details on the wizard, see "Starting the protocol run" on page 237. During the run, the tasks associated with the disabled device are skipped. In the preceding example, the Seal task is skipped because the PlateLoc Sealer device is disabled.

Performing maintenance on a pooled device

While performing maintenance on a PlateLoc Sealer that is a member of a pool of PlateLoc Sealers, you want to continue to run a protocol using the other devices.

- **1** Open the protocol you want to run.
- **2** Open the device file associated with the protocol.
- **3** Disable the PlateLoc Sealer you want to service. See "To disable a device in a device file:" on page 215 for instructions.

Note: If the disabled PlateLoc Sealer device was associated with a Seal task, the log contains a warning indicating that because no device is assigned to the Seal task, the task will be skipped during the protocol run.

4 Reassign another PlateLoc Sealer from the device pool to the Seal task and verify that the task parameters are correct.

Note: If another PlateLoc Sealer was placed in the backup pool, the software automatically moves the backup device to the Devices involved in this task area and you will not have to reassign another device.

5 Run the protocol. The software uses the alternate available device.

Note: If you do not reassign another device to the affected task, a message appears when you compile or run the protocol and allows you to skip the task.

For information about	See
Works software components	"Relationship of VWorks components" on page 4
Adding a device	"Adding devices" on page 25
Preparing devices for a run	Device user guide
Creating protocols	 "Creating a protocol: basic procedure" on page 13 "Creating a protocol: advanced topics" on page 73
Starting a protocol	"Starting the protocol run" on page 237
Add a SubProcess	"SubProcess (Bravo, Vertical Pipetting Station)" on page 388
Adding a task	"Adding and deleting tasks" on page 53
Simulating a run	"Simulating the protocol run" on page 64
Running a protocol	"Workflow for running a protocol" on page 210

Setting log file directories

About the log files

The VWorks software records events that occur and stores the information in the following logs:

- Main Log. Contains all of the actions that occur in the software.
- *Pipette Log.* Contains all pipetting transfer tasks.
- Time Constraints Log. Contains all information about time- limited tasks.

You cannot edit or delete log entries within the VWorks software, but you can specify where they are stored on the computer. This topic describes how to change the log file location.

Procedure

You can set the log file directory during setup or the first time a protocol is run in the software. You do not need to set the log file directory every time you run a protocol.

CAUTION The settings in the Options dialog box apply to all protocol runs. Always check the settings before you start a run.

To change the location of the log files:

1 Select **Tools > Options**. The Options dialog box opens. The Directory and Paths area lists the different log files and their directories.

÷	Doptions			
	2. 2↓			
E	Directories and Paths	<u> </u>		
	Main log path:	C:\VWorks Workspace\Jogs\vworks_log.log		
	Pipette log path:	C:\VWorks Workspace\ogs\vworks_pipette_h		
	Time constraints log path:	C:\VWorks Workspace\ogs\vworks_time_con		
	Pipette technique editor root:	C:\VWorks Workspace\pipette techniques\		
	Automatic tip selection root:	C:\VWorks Workspace\tip box states\		
	Hit pick format file root:	C:\VWorks Workspace\hit picking\format files		
	Hit pick output file root:	C:\VWorks Workspace\hit picking\output files		
	Macro Library file path:	C:\VWorks Workspace\VWorks\MacroLibrary.		
E	Options			
	Debug log level:	0		
	Robot speed:	Fast		
	Always run at "robot speed" when gripper			
	Use robot to check for plates:			
	Height to check above teachpoints (-100 -	2		
	Halt on bar code misreads:			
	Enable error library:			
	Delete orphaned plates:			
	Enable migration notification:			
	Simulation quality:	Standard 🗸		
	Error Handling			
		OK Cancel		

- **2** To change the log file location, click the log path, and then click the <u>...</u> button that appears. The Open dialog box opens.
- **3** Locate and select the desired location and click **Open**. The new path displays in the Options dialog box.
- $\label{eq:click} 4 \quad {\rm Click} \ {\rm OK} \ {\rm to} \ {\rm save} \ {\rm the} \ {\rm changes} \ {\rm and} \ {\rm close} \ {\rm the} \ {\rm Options} \ {\rm dialog} \ {\rm box}.$

For information about	See
Viewing the log files	"Viewing logs" on page 631
Setting error-handling options	"Setting error-handling options" on page 229
Setting up email notification	"Setting up email notification" on page 232
Adding an alarm	"Adding an alarm" on page 37
Running a protocol	"Workflow for running a protocol" on page 210

Setting general and view options

Setting the general options

General options allow you to specify the amount of debug information to display in the Main Log, set the robot speed, enable the error library, and other preferences.

You can set the general options during setup or the first time a protocol is run in the software. You do not need to set the general options every time you run a protocol.

CAUTION The settings in the Options dialog box apply to all protocol runs. Always check the settings before you start a run.

To set the general options:

1 Select **Tools > Options**. The Options dialog box opens.

Ξ	Directories and Paths	<u>•</u>
	Main log path:	C:\VWorks Workspace\ogs\vworks_log.log
	Pipette log path:	C:\VWorks Workspace\ogs\vworks_pipette_l
	Time constraints log path:	C:\VWorks Workspace\ogs\vworks_time_con
	Pipette technique editor root:	C:\VWorks Workspace\pipette techniques\
	Automatic tip selection root:	C:\VWorks Workspace\tip box states\
	Hit pick format file root:	C:\VWorks Workspace\hit picking\format files
	Hit pick output file root:	C:\VWorks Workspace\hit picking\output files
	Macro Library file path:	C:\VWorks Workspace\VWorks\MacroLibrary.
Ξ	Options	
	Debug log level:	0
	Robot speed:	Fast
	Always run at "robot speed" when gripper	
	Use robot to check for plates:	
	Height to check above teachpoints (-100 -	2
	Halt on bar code misreads:	
	Enable error library:	
	Delete orphaned plates:	
	Enable migration notification:	
	Simulation quality:	Standard
Er	rror Handling	

2 In the **Options** area, set or select the following options:

Option	Description
Debug log level	The amount of debug information presented in the Main Log. This field should be used by Automation Solutions Technical Support or advanced users for troubleshooting purposes.
	Valid values are:
	• 0. No debug information. This default value is for typical use.
	• 1-5. Various levels of plugin information.
	• 6-100. Additional debug information. The larger the value, the more information is presented.
Robot speed	The maximum general speed at which the robot will move during the run. If you are testing a new protocol or learning to use the system, run the robot at a slow or medium speed to reduce the risk of crashes.
	In addition to this general robot speed, you can set:
	• <i>Robot-handling speed for labware</i> . Specifies the maximum speed at which the robot can move when handling a specific type of microplate. This parameter is set in the Labware Editor on the Plate Properties tab.
	If this speed differs from the general robot speed, the robot uses the slower of the two speeds.
	For more details on the Labware Editor, see the <i>VWorks Automation Control Setup Guide</i> .
	• Always run at robot speed when gripper is empty This option allows the robot to move at a faster speed when no labware is in the gripper and yet retain the ability to move more slowly when carrying labware.
Always run at "robot speed" when gripper is empty	The option to move at the Robot speed setting, above when no labware is in the robot gripper. For example if the Robot speed is fast, but the speed for the labware is slow:
	• Select the check box (default). Allows the robot to move fast when moving to the labware pickup location, while the gripper is still empty.
	• <i>Clear the check box.</i> Results in the robot moving a slow speed both while moving to the pickup location and while picking up and placing the labware.
	For the maximum throughput, ensure this option is selected.
Use robot to check for plates	The option that requires the robot to move to all positions defined in the device file to check that the positions are empty. In devices that have more than one location such as the Microplate Rotator, Linear Translator, and the Microplate Centrifuge, the robot will check to make sure all locations are empty.
	<i>Note:</i> This option applies only to the BioCel System robots.

Setting general and view options

Option	Description
Height to check above teachpoints	This parameter is available if you select Use robot to check for plates. The height you specify is the offset added to the <i>z</i> -axis coordinate of the teachpoint being checked.
	Default: 2.0 mm
Halt on barcode misreads	The option that requires the software to pause the protocol when a barcode scanned does not match the barcode in the input file. Causes of the misread include missing barcode labels, damaged labels, or wrong labels.
Enable Error Library	The option to turn on access to the Error Library.
Delete Orphaned Plates	The option to clear from memory any labware that were left in storage devices temporarily before the run was aborted. Doing so allows the use of the storage location in the next protocol run.
	For example, during a run, a labware is placed in a Plate Hotel slot while it waits for a device. You abort the run. Before you can restart the run, you must physically remove orphaned labware left in the system from the previous run, such as the labware placed temporarily in the Plate Hotel. However, the software still remembers that the labware is in the Plate Hotel slot. Selecting this option clears the software memory and permits that location to be used in the new run.
Enable migration notification	The option that requires the software to display a message whenever you try to open a protocol written in the previous versions of the VWorks software.
Simulation	The accuracy of the simulation.
quality	Select one of the accuracy levels:
	• <i>Standard</i> . The lowest level of accuracy, because the software does not query the device plugins. Certain physical constraints are not simulated, so this option results in the fastest simulation.
	 More accurate green dots. The next level of accuracy where the simulation might take longer than Standard quality. Similar to the Standard quality option, the software does not query the device plugins for physical constraints. However, the software ensures the green dots in the Protocol area are positioned accurately during the simulation. Dota + communicate with when ine The highest
	• <i>Dots</i> + <i>communicate with plug-ins</i> . The highest level of accuracy. The software queries the device plugins to ensure every move is physically permissible, resulting in a slower but more accurate simulation.

Setting the view options

View options allow you to hide parameters that are not in use and remember the simulation mode when you restart the software.

You set the view options when you first set up the software. You do not need to set the view options every time you run a protocol.

To set the view options:

1 In the **View Options** area, set the following options:

	Send email from:	
	Send email when an error occurs:	
	Addresses to send to when an error occurs:	
⊡	View Options	
	Hide disabled parameters:	
	Remember simulator state between sessions:	v
Ξ	DB Setup	
	Enable database connection:	
	Connection string:	
Ξ	Error Handling	
	Halt on low disk space:	
	Disk space threshold (0 - 100 %):	
	Scheduler error behavior:	Processes as many plates as possible
	Deadlock behavior:	Abort
	Launch program if error occurs:	
	Program to launch if error occurs:	C:\WINDOWS\notepad.exe
	Add error text to command line argument:	
Ξ	Watcher Options	
	Path to Watcher configuration file:	C:\VWorks Workspace\Watcher\Watche
	Start watching when user logs in:	

Option	Description
Hide disabled parameters	The option to hide parameters that are not in use:
	• To hide the unavailable parameters, select the check box.
	• To show the unavailable parameters as grayed out items, clear the check box.
	For example, in the Aspirate task, if you select Perform tip touch, additional parameters appear, and you can specify the sides of wells to use for tip touch. If you do not select Perform tip touch, the additional parameters can be hidden or grayed out, depending on whether you selected Hide disabled parameters.
Remember simulator state between sessions	The option to remember the simulation mode (Simulation is on, or Simulation is off) when you restart the software.

2 Click **OK** to save the changes and close the Options dialog box.

For information about	See
Setting the log file directories	"Setting log file directories" on page 222
Resolving barcode reader error messages	"Resolving barcode reader error messages" on page 647
Setting error-handling options	"Setting error-handling options" on page 229
Setting up email notification	"Setting up email notification" on page 232
Adding an alarm	"Adding an alarm" on page 37
Running a protocol	"Workflow for running a protocol" on page 210
Setting up the error library	"Setting up automated error responses" on page 654

Setting error-handling options

Procedure

You can set the error-handling options during setup or the first time a protocol is run in the software. You do not need to set the error-handling options every time you run a protocol.

CAUTION The settings in the Options dialog box apply to all protocol runs. Always check the settings before you start a run.

To set the error-handling options:

1 Select **Tools > Options**. The Options dialog box opens.

Options	?	2
🗆 Email Setup		*
Enable email notification:		
SMTP server name:		
Authentication type:	LOGIN	
Authorized user:		
Password:		
Send email from:		
Send email when an error occurs:		
Addresses to send to when an error occurs:		
View Options		
Hide disabled parameters:		
Remember simulator state between sessions:		
🗆 DB Setup		
Enable database connection:		
Connection string:		
🖃 Error Handling		
Halt on low disk space:		
Disk space threshold (0 - 100 %):		
Scheduler error behavior:	Processes as many plates as possible	
Deadlock behavior:	Abort	
Launch program if error occurs:	<u>.</u>	
Program to launch if error occurs:	C:\WINDOWS\notepad.exe	
Add error text to command line argument:		Ŧ
Error Handling		
	OK Cancel	

2 In the **Error Handling** area, set or select the options:

Option	Description
Halt on low disk space	The option that requires the software to stop scheduling tasks when the computer disk space is low. If you select this option, you must specify the Disk space threshold .

Setting error-handling options

Option	Description				
Disk space threshold	The percentage of disk space at which the software will halt scheduling tasks.				
Scheduler error behavior	The action the software should take if an error occurs during the run. Select one of the following actions:				
	• Process as many plates as possible				
	• Continue processing without starting any new plates				
	• Stop scheduler				
Deadlock behavior	The action the software should take if a deadlock occurs during the run.				
	Select one of the following actions:				
	• Abort				
	• Show the System State Editor (pauses the run and displays the System State Editor)				
Launch program if error occurs	Starts a specified software application anytime a VWorks error occurs.				
Program to launch if error occurs	The file path to the executable file of the application that you want to start when an error occurs.				
	To set the file path, click the field, and then				
	click the $\overline{\hdown}$ button that appears. In the Open dialog box, select the file path for the executable file (.exe) or batch file (.bat).				
Add error text to command line	Passes the text of the error message to the specified application.				
argument	For example, if this check box is selected and an error occurs containing the text, "Your PlateLoc is out of seal," a command will be generated that says:				
	<filepath>\ABC.exe Your PlateLoc is out of seal</filepath>				
	If this check box is cleared, the following command would be generated for the same error:				
	<filepath>\ABC.exe</filepath>				

3 When you are finished, click **OK** to save the changes and close the Options dialog box.

For information about	See
Setting the log file directories	"Setting log file directories" on page 222
System State Editor	"Recovering from deadlocks" on page 648

For information about	See
Automated error responses	"Setting up automated error responses" on page 654
Posting messages about VWorks events, such as errors and deadlocks	"Setting up automatic online notification" on page 235

Setting up email notification

About email notification

You can specify that the VWorks software send you an email or text message when a run error occurs. Setting up email notification also enables bug reporting.

Alternatively, you can configure VWorks to post online messages on Twitter. For details, see "Setting up automatic online notification" on page 235.

Requirements

The following are required for the email notification to work:

- The VWorks computer must be connected to a network with internet access.
- The outgoing email server must be set up on the system's computer.

Work with your IT organization to meet these requirements.

Procedure

You can set up email notification during setup or the first time a protocol is run in the software. You do not need to set up email notification every time you run a protocol.

CAUTION The settings in the Options dialog box apply to all protocol runs. Always check the settings before you start a run.

To set up email notification:

1 In the VWorks window, select Tools > Options. The Options dialog box opens.

Email Setup		-
Enable email notification:	2	
SMTP server name:	smtp.gmail.com	
Authentication type:	LOGIN	
Authorized user:	administrator	
Password:	*****	
Send email from:	mary.smith@agilent.com	
Addresses to send to when User Message task executes:	john.doe@agilent.com	
Send email when an error occurs:		
Do not send email for those errors handled by Error Librar	ry 🔲	
Addresses to send to when an error occurs:		
View Options		
Hide disabled parameters:		
Email Setup		

2 Scroll down to the **Email Setup** area, and then specify the following:

Option or parameter	Description
Enable Email notification	The option that enables email communication from within the VWorks software. For example, you can report a bug from within the software by selecting Help > Report a Bug. The completed report is emailed to Agilent Technologies.
	Select the option to enable email communication. Clear the check box to disable email communication.
SMTP server name	The name of your outgoing email server. Contact your IT organization for details.
Authentication type	The information that might be required by the server. Contact your IT organization to obtain the information.
Authorized user	The user name used to access the email server. Contact your IT organization to obtain the information.
Password	The password that permits access to the email server. Contact your IT organization to obtain the information.
Send email from	The email address used in bug report emails to indicate the sender of the report. Agilent Technologies will reply to this email address when responding to the bug report.
Addresses to send to when User Message	The addresses to which the outgoing message is sent when the User Message task runs.
task executes	Click the browse button and type the email addresses in the Input Text dialog box that appears. Be sure to use semicolons between email addresses.
	To be notified on your mobile phone with a text message, type the email address for your mobile phone number. The typical format is: number@mobile_carrier_domain.com.
	Check with your mobile phone service provider. Any charges you might incur and the way messages are delivered and displayed depends on your wireless device and service plan.
Send email when an error occurs	The option to send an email or text message when an error occurs during the run.
Do not send email for those errors handled by Error Library	The option to not send emails if the errors are being handled by the Error Library.

Option or parameter	Description
Addresses to send to when an error occurs	The addresses to which the outgoing message is sent when an error occurs.
	Click the browse button and type the email addresses in the Input Text dialog box that appears. Be sure to use semicolons between email addresses.
	To be notified on your mobile phone with a text message, type the email address for your mobile phone number. The typical format is: number@mobile_carrier_domain.com.
	Check with your mobile phone service provider. Any charges you might incur and the way messages are delivered and displayed depends on your wireless device and service plan.

3 Click **OK** to return to the VWorks window.

For information about	See
Setting up online notification using Twitter	"Setting up automatic online notification" on page 235
Reporting problems	"Reporting problems" on page 661
Log file directory settings	"Setting log file directories" on page 222
General and view options	"Setting general and view options" on page 224
Error-handling options	"Setting error-handling options" on page 229
Starting a protocol run	"Starting the protocol run" on page 237

Setting up automatic online notification

About this topic

The VWorks software can automatically notify you about system status via email and online message postings. This topic describes how to configure online notification using Twitter. To configure VWorks email notification, see "Setting up email notification" on page 232.

About posting messages using an online service

The online posting feature can notify you about various system events, such as errors, deadlocks, and protocol and process starts and finishes. You can receive the online notification on any device where you can access a Twitter account. For example, suppose your lab has several workstations running protocols overnight. You could use a cell phone that has internet access to check on the run progress during a long commute home on the train.

The Twitter postings provide the flexibility to opt in or out at anytime. Whereas the email notification can be turned on or off only from within the VWorks software.

Before you start

The following are required for the online message posting to work:

- The VWorks computer must be connected to a network with internet access.
- The Twitter account must be set up ahead of time, and you must have the login information (user name and password) for the Twitter account.

Procedure

You can configure the online notification during setup or the first time a protocol is run in the software. You do not need to configure online notification every time you run a protocol.

CAUTION The settings for online posting apply to all protocol runs. Always check the settings before you start a run.

To configure automatic message posting:

 In the VWorks window, choose Tools > Open Hooks Plugin for > Twitter.dll. The Twitter Setup dialog box opens. Setting up automatic online notification

Twitter Setup
Login Info Enable Twitter communications Name:
Password:
Options Show postings in VWorks log Prepend identifier to all Twitter posts:
Messages To Post
OK Cancel

- 2 Under Login Info, select Enable Twitter communications, and type the Name and Password for the Twitter account that you want to use.
- **3** Under **Options**, select either of the following options, or clear the check boxes if you choose not to use these options:
 - Show postings in VWorks log. If you want the postings to appear in the VWorks log, select this check box.
 - **Prepend identifier to all Twitter posts**. To add a prefix to the start of each posting, select this check box, and then type the prefix that you want to include.

For example, if you have multiple systems posting messages to the same Twitter account, you can use the system name as a prefix.

- **4** Under **Messages To Post**, select the types of messages that the VWorks software should post to the Twitter account, for example, errors and deadlocks (defaults).
- **5** Click **OK** to return to the VWorks window.

You may want to perform a dry run of a short protocol to test the posting. For example, you can select Protocol starts as a message to post, run a protocol, and then go to the Twitter account to view the message.

IMPORTANT If the number of online postings exceeds the Twitter account's maximum for a given time period, no further VWorks messages can be posted until the limit is reset. In this case, the VWorks software adds an info message to the main log for each attempted posting.

Related information

For information about	See				
Adding alarms for error messages	"Adding an alarm" on page 37				
Setting up email notification	"Setting up email notification" on page 232				
Setting up automated error responses	"Setting up automated error responses" on page 654				
Viewing logs	"Viewing logs" on page 631				
Tracking the run progress of instances, processes, or devices	"Tracking the run progress of instances or devices" on page 255				
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661				

Starting the protocol run

Before you start

CAUTION The instructions in this topic assume that the protocol is free of errors.

Before you start a run, make sure you review the protocol. To prepare for the run, you should:

- Find out what devices are used in the protocol and prepare them for operation. For example, you might need to load a roll of seal on the PlateLoc Sealer or install a pipette head on a Vertical Pipetting Station. See the device user guides for prerun-check and homing instructions.
- Find out what labware are used in the protocol and where they should be positioned before the run starts. For example, you might have to load labware into a stacking device.
- Make sure waste bins are empty and reservoirs are filled.
- Check the protocol for User Message tasks.
- If you are starting a runset, verify whether simultaneous runs should be allowed. You can view the setting for this rule in the Runset Manager tab. To change this protocol rule, see "Specifying protocol rules" on page 34.

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Workspace P ×	🕎 Runset devices.dev	🕎 Protocol 1. pro	otocol2.pro 🐺 Protocol3.p	oro			₹ ×
Protocol files Protocol 1.pro	Startup Protocol			Task Parameters		ņ	
-Runset device	Main Protocol			*	Task Parameters		۲
 Protocol2.pro Runset device 	- Source (384			A 11 21			
Protocol3.pro	Greiner 781101	Source (384 Downstack from Bravo Upstac		Plate identity			
Device files Runset devices.de	PS clr fit btm)			Plate name: Source			
Runset devices.de		Greiner 781101 Stacker		acke	Plate type: 384 Grei		781101 P:
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Runset Manager							• ×
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C:\WWorks Workspace\Pr		3 minutes after C:\VWor	Yes	5 20	Scheduled at 2009-Ma Scheduled at 2009-Ma	2	
C:\VWorks Workspace\Pr	otocol Piles Protocol 2. pro	10 minutes after C:\VW	tes	20	Scheduled at 2009-Ma	3	
•							
•							

About scheduling runs

When you start a run, you have the option of scheduling the protocol to run immediately or at a future date and time. In addition, you can specify that the protocol start while another is still running. Running multiple protocols simultaneously can maximize device use and throughput.

IMPORTANT You can schedule multiple protocols to run simultaneously if they all reference the same device file.

When you schedule multiple runs:

- You can start a run while existing protocols are already running or are scheduled to run.
- Protocols that are running simultaneously can share devices. The priority of device use is specified in the device selection area when you set the task parameters.
- You can manage a set of runs using the Runset Manager. For details, see "Managing runsets" on page 243.

Procedure

You can start a run if you have administrator, technician, or operator privileges.

To start a run:

1 In the VWorks window, turn off the simulation mode: On the toolbar, click Simulation is on. The button changes to Simulation is off.

Starting the protocol run



- **2** Do one of the following:
 - Click Start on the toolbar.



• If you have a runset open, view the scheduled start times in the **Runset Manager** tab. To change a protocol start time, double-click the protocol name. For details about runsets, see "Managing runsets" on page 243.

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Workspace	Protocol 1.pro	Protocol2.pro Protocol3.pro				₹×
- Protocol files - Protocol 1.pro	Startup Protocol		۲	Task Paramet	ers	ņ
Runset devices.dev	Main Protocol		*	Task Para	meters	۲
Protocol2.pro Protocol2.pro Protocol3.pro Runset devices.dev Runset devices.dev Device files	Source (384 Greiner 781101 PS of fit btm) Remove Add Process Configure Labware	Greiner 781101 Stacker - SubProcess 17 Sta PS cir fit btm) 1.Stacker using Bravo - 1 3.St	tack to cker - tacker	Al Plate identity Plate identity Plate type: 394 Greiner Plates have b Plates there t Plates enter t Process control Simultaneous 1 Use single ins □ Automatically		▲ r 781
	Cleanup Protoco		*	Advanced	California	۲
Workspace Available Tasks	Protocol Options		×	Advanced	settings	
Runset Manager						¢ ×
Protocol		Start	Simultaneous		Status	Priority
C:\WWorks Workspace\Protocol Files\Protocol1.pro C:\WWorks Workspace\Protocol Files\Protocol3.pro C:\WWorks Workspace\Protocol Files\Protocol2.pro		6/15/2009 3:28:45 PM Ye		20	Scheduled	
		When C:\WWorks Workspace\Protocol Files\Protocol 1.pro ends When C:\WWorks Workspace\Protocol Files\Protocol 1.pro ends	Yes Yes	10 15	Scheduled Scheduled	
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The Run Configuration Wizard dialog box opens.



The Run Configuration Wizard allows you to:

- Specify the number of times to run the protocol.
- Schedule the run to start. You can start the run:
 - As soon as possible
 - On a specific date and at a specific time
 - At a fixed time after a selected protocol starts so that the two protocols are running simultaneously
 - At a fixed time after a selected protocol run ends
- Set the priority of runs (if multiple protocols are scheduled).
- Specify the starting barcode (if any).
- Type notes about the protocol.

CAUTION If you select the **As soon as possible** option, the protocol can start to run immediately after you complete the configuration wizard. Before you click **Finish**, verify that the system is set up and the protocol is ready to run.

IMPORTANT You must have technician or administrator privileges to set priorities. If you have operator privileges, the runs you start will always have the lowest priorities and the Higher priority and Lower priority buttons will be disabled.

3 Follow the instructions in the wizard and click **Next** or **Finish**.

When you click **Finish**, the run starts if it is scheduled to run as soon as possible.

If this is the first run with the device file, and it is the only protocol running, the software confirms communication with all devices, and then the devices home. (If other protocols are already in progress, the software does not need to establish communication with the devices.)

When the run starts

After you start the run, the following occur:

• The **Pause all** button becomes available.

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Ele Edit View Tools Window Help	-	0	3	×
🗋 • 🔌 📊 🕌 🐰 😭 🖺 😓 🕢 🥕 🚦 🤣 Log out 🏣 Comple 🔘 Start 🕕 Pause al 🛞 Simulation is on				

- If the protocol contains tasks pointing to a disabled device, the software displays a warning message and a 🚫 is displayed on the affected tasks. If you click OK, you will get a second message asking you to confirm the number of tasks to be skipped.
- If you selected the **Use robot to check for plates** option (Tools > Options dialog box), the robot moves to all teachpoints defined in the device file (except those associated with storage devices such as the Plate Hub Carousel, StoreX incubator, and Cytomat incubator) to make sure they are unoccupied. If the device contains more than one location, such as a Shuttle or a Microplate Centrifuge, the robot will check all possible locations in these devices. An error message displays if a position is occupied. Remove any labware from the positions. After you fix the error, click **Retry**.
- The software checks that the protocol you are starting is using the same device file as the other protocols that are already running. If it uses a different device file, an error message appears.
- The protocol instructions are performed.
- If User Message tasks are included in the protocol, the software prompts you to respond to them as they appear.

If there are no User Message tasks to remind you to empty liquid waste containers and refill liquid source containers, set your own reminders using lab timers.

- If it is not already listed, the protocol appears in the Runset Manager tab.
- Log messages appear in the Main Log, Pipette Log, and Time Constraints Log tabs. The log messages are recorded in the log file that is stored in the location you specified in the Tools > Options dialog box.

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🗋 • 🖻 🗟 🖗 🕻	x 🖻 🖹	💫 🔞 🥕 🔋 🧑 Log out 🏣 Comple 🌔 Start 🕕 Pa	use al 🧟 Simulation is on 🖉	Diagnostics
Available Tasks 🏻 🏾 🛛 🖉	E Reserve	Location.pro		¥ X
All	Startup P	rotocol	Task Parameters	
Centrifuge Process	Main Prot	ocol ×	Task Parameters	۲
Define Plate Set	🗉 Destina	ton	21	
	(384 Co	star 🔊 🛶 🌒 👝 📢 —	Plate identity	
= X Define Variables	3657 PP well rnd	Destination Downstack Bravo Run the	Plate name:	Destination
Deld		(384 Costar from SubProcess protocol file 3657 PP Sqr BenchCel - 19 using	Plate type:	384 Costar 3657 PP Sqr
Dismount	Remov	well md btm) 1.Stacker 1 Bravo - 1	Plates have lids:	П
	TT O		Plates enter the system	
Downstack	t Source	1 (384 Costa deepwell PP Cir Sqr Well V Btm)	Process control	
< >	Source	2 (384 Costa deepwell PP CIr Sqr Well V Btm)		12
dillo Da	• Tips (38	4 V11 ST50 Tip Box 06881.002)	Use single instance of p	
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Enter text to filter on:	and a		Enable timed release:	<u> </u>
	Cleanup P			
Workspace Available	Protocol (Options 🔹	Advanced Settings	۲
Main Log				å ×
Timestamp	Class	Description		^
11/24/2008 6:33:24 AM	🗸 Event	After 16 seconds		
11/24/2008 6:33:24 AM	🖉 Event	Place plate at Bravo - 1 2		
11/24/2008 6:33:24 AM	🖉 Event	After 16 seconds		
11/24/2008 6:33:24 AM	🖉 Event	Completed: Place plate at Bravo - 1 2		~
<				>
Main Log Pipette Log T	ime Constra	nts Loa Progress Runset Manager		
Ready			a is logged in	

Related information

For information about	See
Setting global options	• "Setting log file directories" on page 222
	• "Setting general and view options" on page 224
	• "Setting error-handling options" on page 229
	• "Setting up email notification" on page 232
Disabling a device in a device file	"Disabling and enabling a device in the device file" on page 215
Allowing or disallowing simultaneous runs	"Specifying protocol rules" on page 34
Managing runsets	"Managing runsets" on page 243
Use robot to check for plates option	"Setting general and view options" on page 224
Setting teachpoints on a device	Device user guide
User Message tasks	 "User Message" on page 599 "Using simple variables" on page 77
Monitoring the protocol run	"Monitoring the overall run progress" on page 254
Pausing a protocol run	"Pausing the run" on page 261

Managing runsets

About runsets and the Runset Manager

A runset is a collection of protocol runs that can be scheduled in advance to be performed without operator intervention. The following table provides an overview of how the Runset Manager works.

0.	_	
Ste	n l	ask
SLE	U I	IdSK

- **1** You add the protocols to a runset and specify the schedule for each protocol, or you can open an existing runset.
- **2** The Runset Manager determines the most efficient way to run the protocols based on the following:
 - The specified run start times.
 - Any specified run priorities.
 - Whether the protocols share the same device file.
 - Whether the protocol rules permit simultaneous runs.
- **3** The Runset Manager opens and compiles each protocol before running it the specified number of times.
- 4 The Runset Manager repeats step 3 for each protocol in the runset.

The following figure shows the Runset Manager tab, which lists each protocol in the runset on a separate row.

Note: To show or hide the Runset Manager tab, choose View > Runset Manager.

Figure A runset displayed in the Runset Manager tab

😻 VWorks - [Protocol2.pr	0]					
🗋 • 🤌 🗔 🖗 🐰	664	🕜 🥕 💡 🚫 Log out 🚰 Compile 🌔 Start 💷	Pause al	Simulation is	s on 🔬 Diagr	nostics
Ele Edit View Tools	Window Help				,	- 8 ×
Vorkspace $P \times$	Protocol 1.pro	Protocol2.pro Protocol3.pro				v)
Protocol files Protocol 1.pro	Startup Protocol		*	Task Paramet	ers	I
Runset devices.dev	Main Protocol		*	Task Para	meters	*
 Protocol2.pro Runset devices.dev 	 Source (384 			1 21		
Protocol3.pro Runset devices.dev Device files	Greiner 781101 PS olr fit btm) Remove Add Process Configure Labware	Greiner 781101 Stacker - SubProcess 17 Str PS cir fit btm) 1.Stacker using Bravo - 1 3.S	stack to tocker - tracker	Plate idi Plate nam Plate typ Plates ha Plates en Processs Simultane Use single Automati	e: Source e: 384 Greine ve la T ter t T control cous 1 e ins T	r 781
Norkspace Available Tasks	Protocol Options		۲	Advanced	Settings	*
unset Manager						ţ,
Protocol		Start	Simultaneou	s Runs	Status	Priorit
C:\WWorks Workspace\Protocol C:\WWorks Workspace\Protocol C:\WWorks Workspace\Protocol	Files\Protocol3.pro	6/15/2009 3:28-45 PM When C: \Works Workspace\Protocol Files\Protocol 1.pro ends When C: \Works Workspace\Protocol Files\Protocol 1.pro ends	Yes Yes Yes	20 10 15	Scheduled Scheduled Scheduled	2
Add run Delete run	Current runset file pa		0622.rst			_

The Runset Manager tab contains the following columns, which list the runset parameters for each protocol.

Calumnana	Description
Column name	Description
Protocol	The location and name of the protocol file.
Start	The scheduled start time of the protocol.
Simultaneous Runs Allowed	The protocol rule, set in the Protocol Options area, that specifies either:
	• <i>Yes (default).</i> The Runset Manager can run the protocol while another protocol is running.
	• <i>No.</i> The protocol cannot run simultaneously with another running protocol.
Runs	The number of times the protocol is scheduled to run.
Status	The status of the protocol:
	• Scheduled. The protocol has a scheduled start time.
	• <i>Pending</i> . The protocol is being prepared to run.
	• <i>Running</i> . The protocol is currently running.
	• Completed. The protocol run has finished.
	• <i>Expired</i> . The protocol was scheduled to start at a time that has already past.
	• Paused. The protocol run is paused.
	• <i>Aborting</i> . The protocol is in the process of being aborted.
	• Aborted. The protocol was aborted.
	• <i>No new plates.</i> The protocol run is not delivering new microplates in the system.
Priority	The schedule priority of the protocol relative to the others in the list, where 1 is the first priority.
Protocol Notes	Any notes about the protocol that were entered in the Run Configuration Wizard.

Understanding how the run sequence is determined

The Runset Manager determines the run sequence of the protocols based on:

- Scheduled start times
 - As soon as possible (default)
 - On a specific date and at a specific time
 - Dependencies on other protocols:
 - At a fixed time after a selected protocol starts
 - At a fixed time after a selected protocol run ends

The Runset Manager handles any protocols with such dependencies as a unit.

- Whether the protocols have run priorities. If the protocols in a runset have conflicting run times, the Runset Manager uses the priority settings to resolve which protocol to schedule before the others.
- Whether simultaneous runs are allowed. The Runset Manager may reschedule protocol start times if the protocol rules allow simultaneous runs. By default, protocols allow simultaneous runs. You can change this rule for each protocol in the Protocol Options area. See "Specifying protocol rules" on page 34.

The following scenarios provide a few examples.

Runset scenario 1. Start times with dependencies on other protocols

The Runset Manager processes the protocols in the set that have start time dependencies on one another as a unit. For example, assume that a runset includes the following four protocols, each of which can be completed in 10 minutes. The Runset Manager would change the run sequence as follows:

Run sequence: A, C, D, B

Device file	Start time
1	1:00 pm
2	1:15 pm
1	30 minutes after protocol A ends
1	60 min. after protocol A ends
	1

Even though no other protocols are running at 1:15 pm, the Runset Manager will reschedule the protocol B start time because of the start time dependencies of protocols C and D on protocol A.

Runset scenario 2. Start times with specific dates and times

If you change the start time of the protocols from scenario 1 to the specific start times in the following table, the run sequence would be as follows:

Run sequence: A, B, C, D

Protocol	Device file	Start time
А	1	1:00 pm
В	2	1:15 pm
С	1	1:30 pm
D	1	1:45 pm

Each protocol's start time is independent of the others in the set, so the Runset Manager processes each protocol individually. Although protocol B uses a different device file than the others, no other protocol is running at 1:15 pm, so the sequence is unchanged.

Scenario 3. As-soon-as-possible start times

If you change the start times of the protocols from scenario 1 to the as-soonas-possible (ASAP) option, the run sequence would be as follows:

Run sequence: A, C, D, B

Protocol	Device file	Start time
Α	1	As soon as possible
В	2	As soon as possible
С	1	As soon as possible
D	1	As soon as possible

Because protocol B does not use the same device file, the Runset Manager postpones the start until after completing the runs that share a common device file.

Additionally, if a protocol cannot be started for some reason, the Runset Manager can dynamically adjust the timing of the protocols that have as-soonas-possible start times. For example, if protocol A cannot be started, the Runset Manager could change the protocol A start to depend on the protocol B end. If protocol A still fails to start after protocol B ends, the Runset Manager could change the protocol A start to depend on the protocol C end. If additional protocols were in the set, the start time could continue to be adjusted in this way until protocol A could be started successfully.

Simultaneous runs

If simultaneous runs were allowed in the previous runset scenarios:

- *Scenarios 1 and 2.* The run sequences would not change because of the specified start times and dependencies.
- *Scenario 3.* The run sequence could change to ACD,B. The protocols that share device file 1 would run simultaneously. After the ACD runs ended, the Runset Manager would initialize the device file 2 devices and start protocol B.

Creating a runset

To create a runset, you must have administrator or technician privileges.

To create a runset:

1 Choose File > New > Runset.

Note: If the Runset Manager tab is not visible, choose View > Runset Manager.

2 Add protocols to the runset using one of the methods in "Adding protocols to a runset" on page 248.

IMPORTANT Simultaneously running protocols must specify the same static or configured labware.

- **3** Select File > Save Runset.
- 4 In the **Save As** dialog box, specify the file location and file name for the .rst file, and then click **Save**.

If any of the protocols in the runset have the **As soon as possible** designation, proceed to step 5. Otherwise, the software saves the runset.

5 In the **Save "As soon as possible" Runs** dialog box, verify that all the protocols with the **As soon as possible** setting can be run as soon as possible upon reopening the runset.

hoose one of the following options for each protocol i he next time the runset is opened: As soon as possible - This protocol will start to run as Fixed date and time - This protocol will start at the tin flick OK to apply these changes and save the runset fi	soon as possible. ne shown in the Next Start column.			
Protocol	Last Start	Next Start		
C:\VWorks Workspace\Protocol Files\Protocol1.pro	6/25/2009 9:42:50 AM (As s	<pre> <bred.date.and.time> •</bred.date.and.time></pre>		
C: \VWorks Workspace \Protocol Files \Protocol2.pro	6/25/2009 9:42:50 AM (As s	As soon as possible <foxed and="" date="" time=""></foxed>		

To change the **Next Start** setting, click the field in the column, and select **Fixed date and time**. Upon reopening the runset, the operator will be prompted to provide a new start time.

Click **OK** to save the runset.

Alternatively, you can simply add protocols to the runset using one of the methods in "Adding protocols to a runset" on page 248, and then choose **File > Save Runset As**.

If you want to export a runset for use on another computer, see "Exporting and importing protocols and associated components" on page 626.

Adding protocols to a runset

CAUTION To avoid potential hardware crashes, verify whether each protocol that you add can run simultaneously with the other protocols in the runset. To change the protocol rules, see "Specifying protocol rules" on page 34.

IMPORTANT Simultaneously running protocols must specify the same static or configured labware.

CAUTION If you select the **As soon as possible** option, the protocol can start to run immediately after you complete the configuration wizard. Before you click **Finish**, verify that the system is set up and the protocol is ready to run.

You can add a protocol to a runset in the following ways.

- Use the Add run button in the Runset Manager tab.
- Drag the protocol file name from the Workspace tab to the Runset Manager tab.
- Start a protocol run. See "Starting the protocol run" on page 237.

To add protocols using the Add run button:

1 In the Runset Manager tab, click Add run.

Runset Manage	a :					-	- 14	t ×
Protocol			Start	Simultaneous Runs Allowed	Runs	Status	Priority	Protocol Notes
•								
Add run Main Log Rur	Delete run	Current runset file path:	<empty></empty>			_		
Ready	lact Hanager			a is logged	lin			

2 When the **Open a protocol file** dialog box appears, select the protocol (.pro), and then click **Open**. The Run Configuration Wizard appears.

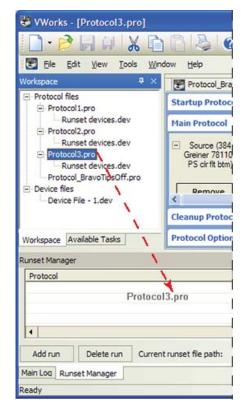
Protocol3.pro - Run Configurat	ion Wizard 🛛 🔀
• Run protocol this many times:	1
O Run protocol until manually aborted	i
Cancel << Back	Next >> Einish

- **3** In the Run Configuration Wizard:
 - Specify the number of times to run the protocol.
 - Schedule the run start times.
 - Set the priority of runs (if multiple protocols are scheduled).

- Specify the starting barcode (if any).
- Optional. Type notes about the protocol.
- **4** Repeat steps 1 to 3 for each protocol you want to add.

To add protocols using the drag-and-drop feature:

1 Drag the file name of the protocol from the **Workspace** tab to the **Runset** Manager tab.



Note: To add more protocols to the Workspace tab, see "Opening a protocol" on page 213.

- **2** In the Run Configuration Wizard:
 - Specify the number of times to run the protocol.
 - Schedule the run start time.
 - Set the priority of runs (if multiple protocols are scheduled).
 - Specify the starting barcode (if any).
 - Optional. Type notes about the protocol.
- **3** Repeat steps 1 and 2 for each protocol you want to add.

Opening runsets

IMPORTANT Verify whether the protocols in the runset can run simultaneously with other protocols (default). To change the protocol rules, "Allow this protocol to execute while other protocols are running" on page 35.

If you want to import a runset, see "Exporting and importing protocols and associated components" on page 626.

To open a runset:

1 *Optional.* To simulate the protocols in the runset before starting the actual runs, turn on the simulation mode. To turn on simulation, click **Simulation is off** on the toolbar. The button changes to **Simulation is on**.



- 2 Select File > Open. The Open dialog box appears.
- **3** Select the .rst file, and then click **Open**.

IMPORTANT If a protocol in the runset is scheduled to run as soon as possible, a message warns you that the run will start immediately when you open the runset. Make sure that the system is ready for the run to start before you continue.

Filtering the list of protocols displayed

You can apply a filter to display a subset of the protocols in the runset.

To filter the list of runs displayed in the Runset Manager tab:

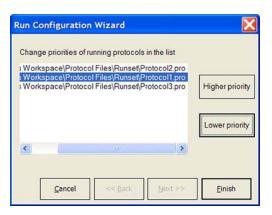
- 1 Right-click anywhere in the **Runset Manager** tab.
- 2 In the shortcut menu that appears, select the desired filter:

Filter command	Description
Show all	Displays all protocols in the runset.
Filter by row	Displays the protocols that meet the criteria you select. For example, you can display all protocols that are run 10 times.
Filter by column	Displays the protocols that meet the criteria you select.
Use last filter	Displays the protocols that meet the last filter criteria you selected.

Changing run priorities

To change the priority of the protocol runs:

- 1 In the **Runset Manager** tab, right-click anywhere in the protocol table.
- **2** In the shortcut menu that appears, select **Adjust run priority**. The Run Configuration Wizard dialog box appears.



- **3** Select the protocol whose priority you want to change, and then click **Higher Priority** to move it up the list, or click **Lower Priority** to move it down the list.
- 4 Click **Finish**. The Priority column shows the change in priority.

Aborting a protocol in a runset

If you abort a protocol in a runset, the software also aborts any other protocols that have time dependencies associated with the aborted protocol.

To abort a protocol in a runset:

- 1 In the **Runset Manager** tab, right-click the protocol name, and then choose **Abort this run** from the shortcut menu.
 - *If the protocol is scheduled but has not yet started.* The software aborts the protocol and any other protocols that have dependencies on the aborted protocol. The Status column in the Runset Manager tab shows the time at which the protocols were aborted.
 - *If the protocol has already started.* The software aborts the protocol. The Status column in the Runset Manager tab shows the time at which the protocol was aborted.
 - If you abort a running protocol and subsequent runs are scheduled. The Affected Plates dialog box appears and displays the status of all the labware in the selected protocol.

CAUTION Before you click OK, proceed to step 2. Manually remove all the labware associated with the aborted protocol to ensure that you avoid a potential hardware crash.

Affected Plates

The following plates are from protocol "C: \WWorks Workspace\Protocol Files\ProtocolMonet.pro".Please manually remove them from the system before you continue running the other protocols to avoid possible hardware crashes.

CAUTION!	Before you click OK, ensure all affected labware is removed. When the Scheduler Paused dialog box appears, make sure you click Abort process. Unexpected behavior may result if you click
	Continue instead of Abort process in the Scheduler Paused dialog box.

Plate	Location	Plate State		
Source 6	Bravo - 12	In progress		
Source 1	Stacker - 3	Completed		
Source 2	Stacker - 3	Completed		
Source 3	Stacker - 3	Completed		
Source 4	Stacker - 3	Completed		
Source 5	Stacker - 3	Completed		
			OK	
			LOK	

- **2** Manually remove the physical labware, which is associated with the aborted protocol, from the system.
- **3** In the Affected Plates dialog box, click **OK**. The Scheduler Paused dialog box appears, and the Status column in the Runset Manager tab indicates that the protocol is aborting.

Scheduler Paused
Continue
<u>D</u> iagnostics
Abort process
Finish, no new plates
Einish, no new plates

4 In the **Scheduler Paused** dialog box, click **Abort process**. The Abort Process dialog box appears.

Abort process
• Abort the remaining protocols in the runset
Only abort the runset protocols that are dependent on the selected protocol
${\sf O}$ Keep the subsequent protocols as scheduled
OK Cancel

- **5** In the **Abort process** dialog box, choose one of the following options, and then click **OK**:
 - Abort the remaining protocols in the runset

- Only abort the runset protocols that are dependent on the selected protocol
- Keep the subsequent protocols as scheduled

The Runset Manager updates the Status column.

Note: For details on the other options in the Scheduler Paused dialog box, see "Pausing the run" on page 261.

6 Verify that the remaining protocols in the runset have appropriate start times.

Rescheduling a protocol in a runset

To reschedule a protocol in a runset:

- 1 In the Runset Manager tab, right-click the protocol name, and choose Adjust run start time and dependencies from the shortcut menu.
- **2** In the **Run Configuration Wizard**, reset the protocol start time. The software automatically resets any other protocols that have time dependencies associated with the rescheduled protocol.

Deleting protocols in a runset

You can use the following procedure to delete a protocol that is not currently running. To abort a protocol that is in progress, see "Aborting a protocol in a runset" on page 251.

To delete a protocol from a runset:

- 1 In the **Runset Manager** tab, select the protocol.
- 2 Click **Delete run**. If no other protocols have dependencies on the selected protocol, the software removes the protocol from the list.

If other protocols in the runset have start time dependencies on the selected protocol, a message appears and warns you that continuing will abort the dependent protocols. After the protocol is deleted, adjust the start times of the remaining protocols.

Related information

For information about	See
Allowing or disallowing simultaneous runs	"Specifying protocol rules" on page 34
Starting a protocol	"Starting the protocol run" on page 237
Monitoring runs	"Monitoring the overall run progress" on page 254
Pausing runs	"Pausing the run" on page 261

Monitoring the overall run progress

Procedure

To check the overall run progress:

In the VWorks window, select View > Progress. The Progress tab appears at the bottom of the window and displays the following:

Works - [4S to 2D (TipFle	ex, Signals).pro]							
Ele Edit View Tools Wir	ndow <u>H</u> elp						-	θ×
🗋 • 🆻 🖬 🖗 🗶 🛅 🕯	👌 🍣 🥥 🏓 🖕 🔗 Log	out 🚰 Com	ole 🜔 Star	U Pause	al	🖗 Simulation is on 🎉 Dia	gnostics	
Available Tasks 🌼 🗴	🛃 4S to 2D (TipFlex, Signals).pro	x						₹ ×
All	Startup Protocol				۲	Task Parameters		â
Centrifuge Process	Main Protocol				۲	Task Parameters		۲
Define Plate Set	Source (384)				^	21		_
	Costa T					Plate identity		•
$= \chi$ Define Variables	deepwell PP Cir Sgr Well V Upstack to					Plate name:	Source	
1 Delid	Btm) Dynamicall					Plate type:	384 Costa deepwell PP	Cir
Dismount						Plates have lids:	Π	
Dismount			100			Plates enter the system		
Downstack	└→ (—					Process control		
Incubate	Hit Pick	Set head	Tips On in 1	Hit pick		Simultaneous plates:	1	
4	Routine (Begin)	mode to One barrel: A1	selection(s) from TB at	replicate from Source to		Use single instance of p		
🔊 JavaScript	Remove	Darret, AT	Location 2	Dest		Automatically update la	4 💷	
C Loop	 Dest (384 Greiner 781280 PP 0 					Enable timed release:		
	Dest (304 Greiner 761200 PP C	Jir Sqr well v b	um)		. 1	Release time:	0:00:30	
<>	TB (384 V11 ST30 Tip Box 114	484.102)				Barcode information		
🛞 📇 📚 🔩 🏧 🚥 All 😤	Add Process				v	Barcode filename:	4S to 2 D BC.txt	
Enter text to filter on:	And Process (>		Has header:		
	Cleanup Protocol					Daranda ar handar Cau	Ala Calastian	
Madaman A. Alla M. L.	Protocol Options			-		Advanced Settings		۲
Workspace Available Tasks	Protocol Options				~	Advanced Settings		-
Progress								
Overal progress:	Process Name	Not Started	In Progress	Completed	Pro	cess Progress		
	startup process - 2	0	0	1				
 Running protocols 4S to 2D (TipFlex, Signals).pr 	startup process - 1	0	0	1				
- startup process - 2	TB	3	1	0				
- startup process - 1	Source	3	1	0	1			
- ТВ	Dest	1	1	0				
- Source								
Dest								
	<							5
Main Lon Progress Runset Manan	er							

Area or table	Description
Overall progress	Displays a progress bar to indicate how far along the system is in all running protocols.
Running protocols	Contains the list of protocols that are currently running.
	You can select a protocol name to display the progress of all processes in the protocol, or you can select a specific process and display its progress.
Display	Based on your selection in the Overall progress area, shows an aspect of the overall run progress.

Related information

For information about	See
Tracking run progress of instances, processes, or devices	"Tracking the run progress of instances or devices" on page 255
Pausing the run	"Pausing the run" on page 261
Stopping the run	"Stopping the run" on page 268

Tracking the run progress of instances or devices

About this topic

This topic explains the following:

- "Displaying the run progress in the Gantt Chart format" on page 255
- "Displaying the progress by plate instance" on page 256
- "Displaying the progress by device" on page 258
- "Zooming the display" on page 258
- "Filtering the displayed information" on page 259
- "Opening the System State Editor" on page 260

Displaying the run progress in the Gantt Chart format

While the protocol is running, you can visually monitor the progress in realtime in the Gantt Chart dialog box. In addition, you have the option of displaying the progress by instance or device.

Run information displayed in the Gantt Chart format enables you to monitor resource usage during the run. Too much spacing (time) between tasks might indicate poor device usage or potential bottlenecks. After you examine the run information, you can:

- Determine the causes of bottlenecks and remove them.
- Add devices or try to run multiple protocols simultaneously to improve performance and throughput.

To visually track the progress of labware instances or devices:

In the VWorks window, select **Tools > Gantt Charts** while a run is in progress, after a run is finished, or when a run has a deadlock error. The Gantt Chart dialog box opens.

						~
control swim lan						
384 Destination		Dis	6s pense			
Blue Source - 1	19s Centrifuge at Centrifug	45				
TIPS - 1	9s Tips On at Bra					
Primary Ab - 1						
Tip box 2 - 1						
Wash TIPS - 1			10s Mix at Bravo	1.3		
384 Destination						
Blue Source - 2	19s Centrifuge at Centrifug	e - 1.Buck		4s Aspir		
384 Destination						
Blue Source - 3						
384 Destination						×
<	2 E 22	1 1 1		1 1 1		×
ō	00:00:08	00:00:16 00:00:2	00:00:32	00:00:40 00:00:48	00:00:56 00:01:0 Protocol runnin	4 00:01:12 g time: 23m49s

Displaying the progress by plate instance

To display the progress by individual plate instances:

In the Gantt Chart dialog box, click Instance view.

6 Running a protocol

Tracking the run progress of instances or devices

control swim lan	A
384 Destination	6s Dispense
Blue Source - 1	19s 4s Centrifuge at Centrifuge - 1 BuckAspir
TIPS - 1	9s Tips On at Bre
Primary Ab - 1	
Tip box 2 - 1	
Wash TIPS - 1	10s Mix at Bravo - 1.3
384 Destination	
Blue Source - 2	19s 4s Centrifuge - 1.Buck Aspir
384 Destination	
Blue Source - 3	
384 Destination	×

The Instance View presents a graph of the process plate instances (vertical axis) as a function of time (horizontal axis). Each row represents the timeline of a process plate instance. During a run, a row displays the tasks that are performed on a plate instance. The length of the task block represents the duration of the task. The actual duration of each task is displayed on the task block.

Note: A task that does not involve a process plate is not displayed.

If an error occurred during the run, you can use the Instance view to determine the plate instance at which the error occurred. If a deadlock occurred or if the run was aborted, a red X symbol appears on the task at which it occurred.

From within the Instance view, you can double-click a task to edit its parameters.

To edit a selected task parameter within the Instance view:

Right-click a task in the graph, and then select **Edit Parameter**. The software minimizes the Gantt Chart dialog box and displays the task within the protocol so that you can edit the parameters.

Displaying the progress by device

To display the progress by device:

In the Gantt Chart dialog box, click Device view.

Instance view	Export to file	Import from file	Zoom in	Zoom out	System state editor
BioTek Washer					^
Run Program					
Bravo - 1					
Tips On 9s TIPS - 1					
Aspirate	4s Blue		4s Blue		
Dispense	384	6s I Desti			
Mix		10s Wash TIPS - 1			
Tips Off					
Aspirate					
Tips On					
Dispense					
Centrifuge - 1					×
C 0 000	00:08 00:00:16 00:00:2	4 00:00:32 00:	00:40 00:00:48	00:00:56 00:01:04 Protocol running	00:01:12 time: 23m49s

The Device View presents a graph of devices (vertical axis) as a function of time (horizontal axis). A row represents the timeline of a device. During a run, each row expands and lists the tasks that the device is performing. The process plate on which the task is performed is shown on the task timeline. The length of the process-plate block represents the duration of the task on the plate.

To optimize the run, look for wide spacing between tasks and determine whether adding devices to the run can improve the throughput. Ideally, the spacing between the tasks should be kept to a minimum.

Zooming the display

You can zoom in or zoom out to change the horizontal (time) scale of the graphs. Each time you zoom in, you are reducing the time increments displayed. Each time you zoom out, you are increasing the time increments displayed.

For example, if the current scale is in increments of 4 seconds, zooming in reduces the increments to 2 seconds. Zooming out increases the increments to 8 seconds.

Note: Zooming has no affect on the scale of the vertical-axis.

To zoom in or zoom out of the current view:

Click Zoom in or Zoom out.

Filtering the displayed information

While in the instance or device view, you can filter the information displayed to focus on areas of interest. For example, you can choose to display the information from a single device instead of all devices in the run.

The filter selections are at the bottom of the Gantt Chart dialog box.

	😻 Device view - Gantt Chart of Protocol1.pro
	Instance view Device view Export to file Import from file Zoom in Zoom out System state editor
	BioTek Washer
	Run Program
	Bravo - 1
	Tips On 95 -1
	Aspirate 4s 4s Blue
	Dispense 6s 384 Desti
	Mix 10s Wash TPS - 1
	Tips Off
	Aspirate
	Tips On
	Dispense
	Centrifine - 1
<u> </u>	0 00.00.08 00.00.16 00.00.24 00.00.32 00.00.40 00.00.46 00.00.56 00.01.12 Protocol running time: 23m49s
	Show: All Devices

To filter the information displayed in the Gantt Chart dialog box:

1 Select one of the following from the Device list:

Selection	Description
All devices	Displays all devices used in the protocol.
Selected devices	Allows you to specify which devices to display in the dialog box.

2 Select one of the following from the Plate Instances list:

Selection	Description
All plate instances	Displays all plate instances.
Completed plate instances	Displays only plate instances that have finished processing.
Plate instances in progress	Displays only plate instances that are currently in progress.

3 Select one of the following from the Process Plate list:

Selection	Description
All processes	Displays all plate processes.
Completed processes	Displays only plate processes that are finished.

Tracking the run progress of instances or devices

Selection	Description
Processes in progress	Displays only plate processes that are currently in progress.
Selected processes	Displays only the plate processes that you have selected.

Opening the System State Editor

You can open the System State Editor to recover from a deadlock error.

To open the System State Editor:

In the **Gantt Chart** dialog box, click **System State Editor**. The System State Editor dialog box opens.

For information about deadlock recovery and the System State Editor, see "Recovering from deadlocks" on page 648.

Note: If you want the System State Editor dialog box to open automatically whenever a deadlock occurs, choose **Tools > Options**. Under **Error Handling** in the Options dialog box, choose **Deadlock behavior > Show the System State Editor**. For more information, see "Recovering from deadlocks" on page 648.

Exporting and importing Gantt charts

To export the run information in the Gantt format:

- 1 In the **Gantt Chart** dialog box, click **Export to file**. The Save As dialog box opens.
- 2 Select the folder in which you want to save the file, and type a name for the file, and then click **Save.** A .gnt file is created in the folder you specified.

To import the run information in the Gantt format:

- **1** In the **Gantt Chart** dialog box, click **Import from file**. The Open dialog box opens.
- 2 Select the .gnt file, and then click **Open**. The run information appears in the Gantt Chart dialog box.

Related information

For information about	See
The System State Editor	"About the System State Editor" on page 648
Monitoring the overall run progress	"Monitoring the overall run progress" on page 254
Viewing logs	"Viewing logs" on page 631

Pausing the run

Ways to pause runs

You can pause runs using one of the following methods:

- "Pausing all runs" on page 261
- "Pausing selected runs in a runset" on page 262

In addition, a protocol run will automatically pause when it reaches a User Message or Wait for User (Bravo) task. For details, see "Pausing at a User Message or Wait for User task" on page 263.

Pausing all runs

You can pause all runs that are in progress, and then continue the runs when you are ready. Pause all runs when you want to:

- Add or remove labware
- Add buffer to a reservoir
- Diagnose a problem
- Perform an operation that is not part of the protocol

If you need to stop a run in an emergency, press the emergency-stop button on the pendant. See the device user guide for the procedure.

To pause all runs currently in progress:

1 In the VWorks window, click Pause all on the toolbar.

😻 VWorks - [Protocol_001.pro]	
🔀 Eile Edit View Tools Window Help	_ 6 ×
🗋 • 🤌 🔛 🐳 🐰 🛅 🖺 🔌 🕘 🥕 🛔 🔗 Log ou	t 🔚 Comple 🌔 Start 🕕 Pause al 🛞 Simulation is on 😥 Diagnostics

The Scheduler Paused dialog box opens.

Scheduler Paused
Bypass interlock
Continue
Diagnostics
<u>A</u> bort process
Einish, no new plates

Note: The Bypass interlock button is only available if your system is equipped with an Automation Control Unit and the protocol is not running in simulation mode.

- 2 Systems that do not have an Automation Control Unit. If you moved or removed labware from the system, or if you fixed a device problem so that locations on the device are now available, select Tools > System State Editor. Change the process plate status and the device location status. For instructions, see "About the System State Editor" on page 648.
- 3 In the Scheduler Paused dialog box, click one of the following:

Pausing the run

Command	Description
Bypass interlock	Bypasses the interlock so that you can enter the system. For detailed instructions, see "Bypassing the interlock" on page 264.
	Bypass interlock is only available if:
	• Your system is equipped with an Automation Control Unit.
	• The protocol is not running in simulation mode.
	<i>Note:</i> If you click Bypass interlock, you will not be able to open any diagnostics dialog boxes.
Continue	Resumes the protocol run.
	IMPORTANT When you pause one or more runs, the Orbital Shaking Station stops. Before you continue the run, open Teleshake Diagnostics to restart the shaking.
Diagnostics	Allows you to select the device diagnostic software to open and troubleshoot a problem or perform a manual operation.
	<i>Note:</i> If you click Diagnostics and open a device diagnostics dialog box, you will not be able to open the Bypass Interlock dialog box.
Abort process	Aborts the current command or task in the run. Select Abort if you have determined that the protocol run is not recoverable.
Finish, no new plates	Resumes the protocol run. Processes that are currently in progress will finish. However, no new labware will be delivered into the system.

Pausing selected runs in a runset

If you want to bypass the interlock and enter the system, use the Pause All command. See "Pausing all runs" on page 261. To stop a run in an emergency, use the emergency-stop button on the pendant. See the safety instructions for the system, workstation, or device for details.

To pause one protocol run in the Runset Manager:

- 1 In the **Runset Manager** tab, right-click the protocol you want to pause.
- 2 In the shortcut menu that appears, select **Pause this run**. The selected protocol is paused, and its status is shown in the Runset Manager.

C:\Wworks Workspace\Protocol Files\Protocol2.pro 4/13/2009 11:50:21 AM (When C:\WWorks Yes 15 Paused at 4/13/2009 11:50:29 AM	Protocol	Start	Simultaneous	Runs	Status
C: Works Workspace Protocol Files Protocol 3.pro When C: Works Workspace Protocol Files Yes 20 Scheduled at 4/13/2009 11:49:10 AM	C:\WWorks Workspace\Protocol Files\Protocol 1.pro	4/13/2009 11:50:09 AM (As soon as possible)	Yes	12	Completed at 4/13/2009 11:50:21 AM
	C:\WWorks Workspace\Protocol Files\Protocol2.pro	4/13/2009 11:50:21 AM (When C:\VWorks	Yes	15	Paused at 4/13/2009 11:50:29 AM
•	C: \VWorks Workspace \Protocol Files \Protocol3.pro	When C:\VWorks Workspace\Protocol Files\	Yes	20	Scheduled at 4/13/2009 11:49:10 AM
	•				

Alternatively, you can select **Temporarily prevent new plates from entering system** in the shortcut menu to allow other runs to resume. Processes that are currently in progress will finish. No new labware will be delivered into the system.

Pausing at a User Message or Wait for User task

A run will automatically pause when it encounters a User Message or Wait for User task. These tasks pause the run to remind the operator to perform a task manually, such as refill a reservoir or replace labware.

When the system pauses, the message or Waiting for User dialog box appears.

Please press the Go but	tton to continue	*
		Ŧ
Pause and diagnose	Go	

To confirm that you want to pause or to diagnose a problem:

1 Click Pause and Diagnose. The Scheduler Paused dialog appears.

Schee	luler Paused
	Bypass interlock
	<u>C</u> ontinue
	Diagnostics
	<u>A</u> bort process
	Einish, no new plates

Note: Bypass interlock is only available if your system is installed with an Automation Control Unit and the protocol is not running in simulation mode.

- 2 Systems that do not have an Automation Control Unit. If you moved or removed labware from the system, or if you fixed a device problem so that locations on the device are now available, select Tools > System State Editor. Change the process plate status and the device location status. For instructions, see "About the System State Editor" on page 648.
- **3** In the **Scheduler Paused** dialog box, click one of the following:

Pausing the run

Description
Bypasses the interlock so that you can enter the system and refill a reservoir or replace labware. For detailed instructions see "Bypassing the interlock" on page 264.
Bypass interlock is only available if:
• Your system is installed with an Automation Control Unit.
• The protocol is not running in simulation mode.
<i>Note:</i> If you click Bypass interlock, you will not be able to open any diagnostics dialog box.
Resumes the protocol run.
IMPORTANT When you pause one or more runs, the Orbital Shaking Station stops. Before you continue the run, open Teleshake Diagnostics to restart the shaking.
Allows you to select the device diagnostic software to open and troubleshoot a problem or perform a manual operation.
<i>Note:</i> If you click Diagnostics and open a device diagnostics dialog box, you will not be able to open the Bypass Interlock dialog box.
Aborts the current command or task in the run. Select Abort if you have determined that the protocol run is not recoverable.
Resumes the protocol run. Processes that are currently in progress will finish. However, no new labware will be delivered into the system.

Bypassing the interlock

Note: This section is only applicable to systems that have an Automation Control Unit installed.

When the protocols are paused, you can bypass the interlock and enter the system to manually perform an operation, such as replacing labware or refilling a reservoir.

IMPORTANT For safety reasons, when the protocols are paused and the interlock is bypassed, the system will not be able to start or perform any operation until you resume the run.

To bypass the interlock:

1 In the Scheduler Paused dialog box, click **Bypass interlock**.

Scheduler Paused
Bypass interlock
Continue
Diagnostics
<u>A</u> bort process
Einish, no new plates

The Bypass Interlock dialog box appears.

Bypass Interlock		×
	until all devices are paused and the interlock is bypassed. To operation without entering the system, dick Resume Run.	
- System Status	The following devices are active:	
All devices paused	BenchBot Bravo Incubator	
Interlock bypassed		
Door open		
System State Editor		
	Resume Run	

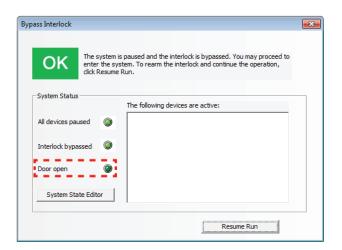
- **2** Check the message at the top of the Bypass Interlock dialog box:
 - *Wait*. The interlock will remain armed while devices are finishing their current tasks. You must wait until all of the devices have paused before entering the system.

CAUTION Entering the system while devices are performing tasks will trip the interlock, potentially causing the run to be unrecoverable.

- OK. When all of the devices have paused, the interlock will be bypassed, and you can enter the system.
 Note: The yellow INTERLOCK BYPASS light on the Automation Control Unit turns on.
- **3** When you are finished with your task inside the system, close the system doors or move away from the Light Curtain. In the Bypass Interlock dialog box, check that the **Door open** indicator light is off.

If the Door open indicator light is on, make sure the doors are closed fully or remove any object that is interrupting the Light Curtain.

CAUTION Make sure the **Door open** light is off before you resume the run. Resuming the run arms the interlock. An open door or interrupted Light Curtain will trip the interlock, potentially causing the run to be unrecoverable.



4 If you replaced or removed labware from the system, or if you fixed a device problem so that locations on the device are now available, click **System State Editor** in the **Bypass Interlock** dialog box.

Bypass Interlock	×
OK The system is paused and the interlock is bypassed. You may proceed to enter the system. To rearm the interlock and continue the operation, click Resume Run.	
System Status The following devices are active:	
All devices paused	
Interlock bypassed	
Door open 🔘	
System State Editor	
Resume Run	

- **5** In the **System State Editor** dialog box, update the labware, device, or location information. For instructions, see "About the System State Editor" on page 648. When you are finished, click **Accept All Changes** in the System State Editor.
- **6** In the **Bypass Interlock** dialog box, click **Resume Run** to rearm the interlock and return to the Scheduler Paused dialog box.

CAUTION Make sure the **Door open** light is off before you resume the run. Resuming the run arms the interlock. An open door or interrupted Light Curtain will trip the interlock, potentially causing the run to be unrecoverable.

Sypass Interlock		-
ОК	The system is paused and the interlock is bypassed. You may proceed to enter the system. To rearm the interlock and continue the operation, dick Resume Run.	
System Status	:	
All devices par	used 🕥	
Interlock bypa	assed 🔘	
Door open	۲	
System Sta	ate Editor	
	Resume Run	

Note: The green INTERLOCK NORMAL light on the Automation Control Unit turns on.

Related information

For information about	See
The System State Editor	"About the System State Editor" on page 648
Viewing logs	"Viewing logs" on page 631
Monitoring the protocol run	"Monitoring the overall run progress" on page 254
User Message task	"User Message" on page 599
Wait for User (Bravo) task	"Wait for User (Bravo)" on page 605

Stopping the run

If you want to stop a run and later continue the run, use one of the pause methods described in "Pausing the run" on page 261.

If you need to stop a run in an emergency, use the hardware Emergency Stop button. See the device user guide for the procedure.

CAUTION You cannot resume a protocol run after you press the hardware Emergency Stop button. To recover the system after an emergency stop, see the device user guide.

Related information

For information about	See
Pausing runs	"Pausing the run" on page 261
Starting runs	"Starting the protocol run" on page 237
Managing runsets	"Managing runsets" on page 243
Monitoring runs	"Monitoring the overall run progress" on page 254



VWorks Automation Control User Guide

7 Setting parameters for I/O-handling tasks

This chapter contains the following topics:

- "Digital Output" on page 270
- "Wait for Input" on page 274



Digital Output

Description

The Digital Output task (Digital Output) changes the state of a digital signal. For example, you can use the task to turn on, turn off, open, or close the following:

- Alarm
- UV lamp
- Vacuum pump
- Ventilation fan
- Waste bin door

You can also specify the length of time to leave the digital signal in the new state.

The digital signals you can turn on or off are configured in the IO Manager and the I/O device diagnostics (such as ACU Diagnostics). For details, see "Managing digital signals" on page 671 and the I/O device user documentation, such as the *Automation Control Unit User Guide*.

Task is available for	Task is available in
Automation Control Unit, BioCel I/O	Startup Protocol
Interface, or equivalent device	Main Protocol
(C Digital Output)	Cleanup Protocol

Task parameters

After adding the Digital Output task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters		
Task Parameters		*
21		
Digital Output properties		1
Digital output name:	Ventilation fan	-
On / Off:	On	_
Walt for time:	Γ	
Duration of On / Off (0 - 9999 s):	15	j.
Digital output name: Digital output name		

Parameter	Description
Digital output name	The name of the item whose state you want to change.
	Select from the list of names. The names are set up in the I/O device diagnostics.
On/Off	The new state of the item.
	Select On or Off. When you select On, the task icon changes to Set Digital Output. When you select Off, the task icon changes to Clear Digital Output.
Wait for time	The option to turn on or turn off the selected item and wait the specified duration before advancing to the next task. If you select the option, make sure you add another Digital Output task to reverse the state of the item at the desired point in the protocol. You must also select this option in the second task.
	If you do not select the option, the task will turn on or off the selected item, and then advance to the next task while the item is in the new state. If you specified duration, the item will reverse to its previous state after the duration ends.
Duration of On/Off (s)	The length of time, in seconds, the item should remain in the new state. For example, if you want to leave the UV lamp on for 15 seconds, type 15. At the end of the specified duration, the item reverses to its previous state. If you specify a duration, you do not need to add a second Digital Output task to reverse the state.
	If Wait for time is selected, this is the length of time, in seconds, the task waits before advancing to the next task.

Example 1: Turn on a ventilation fan while reagent is dispensed

Goal

The ventilation fan must be on while a particular reagent is being dispensed on the Bravo Platform.

Implementation

Add a Digital Output task before and after the Bravo Subprocess task that contains the dispensing subroutine. The first Digital Output task (Set digital output) turns on the fan. The second Digital Output task (Clear digital output) turns off the fan.

Digital Output



The task parameters for the digital output tasks are:

٢a	isk Parameters		4
Т	ask Parameters		۲
•	1 2↓		
8	Digital Output properties		
	Digital output name:	Ventilation fan	
	On / Off:	On	
	Wait for time:		
	Duration of On / Off (0 - 9999 s):	0	

		0
Task Parameters		۲
±∎ 2↓		
Digital Output properties		
Digital output name:	Ventilation fan	
On / Off:	Off	
Wait for time:		
Duration of On / Off (0 - 9999 s):	0	

Clear digital output

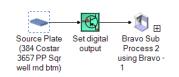
Example 2: Turn on a ventilation fan for 15 seconds

Goal

The ventilation fan must be on for 15 seconds while a particular reagent is being dispensed on the Bravo Platform.

Implementation

Add a Digital Output task before the Bravo Subprocess task that contains the dispensing subroutine. The Digital Output task (Set digital output) turns on the fan for 15 seconds. A second Digital Output task (Clear digital output) is not necessary.



The task parameters for the Digital Output task are:

Fask Parameters		4
Task Parameters		۲
<u>:</u> ∎ 2↓		
Digital Output properties		
Digital output name:	Ventilation fan	
On / Off:	Off	
Wait for time:		
Duration of On / Off (0 - 9999 s):	15	

Related information

For information about	See		
Adding devices	"Adding devices" on page 25		
Adding tasks in a protocol	"Adding and deleting tasks" on page 53		
Wait for Input task	"Wait for Input" on page 274		
Assigning signals to lights, alarms, pass-through gates, and sensors	"Managing digital signals" on page 671		

For information about	See
, 0	I/O device user documentation, such as the Automation Control Unit User Guide

Wait for Input

Description

The Wait for Input task (Wait For Input) requires that one or more conditions are met before starting the next task in the protocol. For example, you can require that the system environment reach a certain temperature and humidity before the Main Protocol starts.

The digital signals you can turn on or off are configured in the IO Manager and the I/O device diagnostics (such as ACU Diagnostics). For details, see "Managing digital signals" on page 671 and the I/O device user documentation, such as the *Automation Control Unit User Guide*.

Task is available for	Task is available in
Automation Control Unit, BioCel I/O	Startup Protocol
Interface, or equivalent	Main Protocol
(Wait For Input)	Cleanup Protocol

Task Parameters

After adding the Wait for Input task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Digital			Analog		
Task Parameters		φ.	Task Parameters		ç
Task Parameters		۲	Task Parameters		۲
21 21		_	2↓		
Wait For Input prope	rties		Wait For Input properties		
Input name:	Input 1 for Temperature	-	Input name:	Fluid level 1	
On / Off:	On		Wait for:	A Range	*
Timeout (s):	0		Min or exact value (0 - 9999):	0	
			Max value (0 - 9999):	0	
			Timeout (s):	0	
Input name: Input name			Wait for: Wait for		
Advanced Settings		۲	Advanced Settings		۲

Parameter	Description		
Input name	The name of the condition you want to check.		
	Select from the list of condition names. You can select either a digital input or an analog input condition. The names are set up in the I/O device diagnostics.		
On/Off	The new state of the item.		
	This parameter appears only if you select a digital input condition.		
Wait for	The condition to be met:		
	• Exactly		
	• A range		
	• At least		
	• At most		
	This parameter appears only if you select an analog input condition.		
Min or exact value	The minimum value or the exact value of the condition.		
	Examples:		
	• If you want to specify an exact value of 50, you can type 50 in this field.		
	• If you want to specify a minimum (at least) value of 100, type 100 in this field.		
	• If you want to specify a range such as 90 to 100, type 90 in this field, and then type 100 in the Max value field.		
	This parameter appears only if you select an analog input condition.		
Max value	The maximum value of the condition.		
	Examples:		
	• If you want to specify a maximum (at most) value of 110, type 110 in this field.		
	 If you want to specify a range such as 90 to 100, type 90 in the Min or exact value field, and then type 100 in this field. 		
	This parameter appears only if you select an analog input condition.		
Timeout (s)	The length of time, in seconds, the software should wait for the condition to be met before taking the action you specify in the On timeout field.		
	<i>Note:</i> 0 means wait indefinitely.		

Example

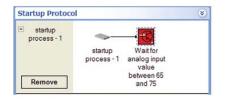
Goal

The humidity within the system chamber must be at least 65% RH before the protocol run can start. The humidity should not exceed 75% RH. The software will wait indefinitely for the condition to be satisfied.

Implementation

Configure the I/O device to include a humidity signal channel (in this example, an analog input channel). Add a Wait for Input task in the Startup Protocol or at the beginning of the Main Protocol.

or



Startup Protoco	bl		(
Main Protocol			(
process - 1	-		
	process - 1	Wait for analog input value	Unload from plate storage device
Remove		between 65 and 75	

The task parameters for the Wait for Input task are:

Task Parameters		9
Task Parameters		۲
<u>:</u>] 21		
Wait For Input properties		
Input name:	Humidity	+
Wait for:	A Range	
Min or exact value (0 - 9999):	65	
Max value (0 - 9999):	75	
Timeout (s):	0	

Related information

For information about	See
Adding devices	"Adding devices" on page 25
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Digital Output task	"Digital Output" on page 270
Assigning signals to lights, alarms, pass-through gates, and sensors	"Managing digital signals" on page 671
I/O device diagnostics	I/O device user documentation, such as the Automation Control Unit User Guide



VWorks Automation Control User Guide

8 Setting parameters for microplatehandling tasks

This chapter contains the following topics:

- "Centrifuge Process" on page 278
- "CentrifugeAuto" on page 286
- "Configure Static Labware" on page 294
- "Delid" on page 296
- "Dismount" on page 301
- "Incubate" on page 303
- "Mount" on page 307
- "Move to Location (Bravo)" on page 309
- "Place Plate" on page 311
- "Pierce Plate (Seal Piercer)" on page 314
- "Print and Apply" on page 318
- "Relid" on page 333
- "Reserve Location" on page 337
- "Rotate Stage (Rotator)" on page 339
- "Rotate Stage (Microplate Labeler)" on page 341
- "Seal (PlateLoc)" on page 343
- "Waste" on page 346

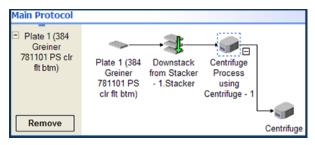


Centrifuge Process

Description

IMPORTANT The Centrifuge Process task is primarily used in protocols created in VWorks software, installer 11.1 or earlier. If you are running VWorks software, installer 11.2 or later, be sure to use the CentrifugeAuto task instead of the Centrifuge Process task. For instructions, see "CentrifugeAuto" on page 286.

The Centrifuge Process task for the Centrifuge (Centrifuge Process (Centrifuge)) and the Centrifuge with Loader (Centrifuge Process (Centrifuge Loader)) indicates the start of a protocol subroutine that employs the Microplate Centrifuge (or Centrifuge). Within the subprocess, the software automatically adds the (Centrifuge) task to spin microplates according to the task parameter settings.



One microplate with a counterweight or two microplates can be spun at one time. Counterweights can be placed manually or robotically.

Task is available for	Task is available in
Centrifuge, or Centrifuge with Loader	Main Protocol

Task parameters

You set parameters for:

- *Centrifuge Process.* Contains the counterweight position information. For more information, see "Centrifuge Process" on page 278.
- *Centrifuge task.* Contains the spin parameters and counterweight selections. For more information, see "Centrifuge" on page 279.

Centrifuge Process

IMPORTANT For BioCel System protocols, you can optimize the placement of microplates in the Microplate Centrifuge by adding a Place Plate (to platepad) task between two consecutive Centrifuge Process tasks or between an Unload and Centrifuge Process task.

After you add the Centrifuge Process task (subprocess) at the desired point in the protocol, select the subprocess icon and set the following parameters in the **Task Parameters** area:

Fask Parameters		ņ
Task Parameters		*
±∎ 2↓		
SubProcess (Centrifuge	Loader) Properties	
Sub-process name:	Centrifuge Loader Process	
Static labware configuration	ition	
Display confirmation:	Don't display	
Bucket 1:	<use default=""></use>	
Bucket 2:	<use default=""></use>	
Stage:	<use default=""></use>	

Parameter	Description		
Sub-process name	The name of the subprocess.		
	Select from the list of available subprocesses currently in the protocol.		
Display confirmation	The option to display a message at the beginning of the protocol run to remind you to verify the physical locations of the labware match what you specified in the software.		
Bucket 1/Bucket 2	The counterweight you want to use in the bucket location. You can select from the list of labware for either Bucket 1 or Bucket 2.		
	The counterweight selection depends on the counterweight mode you select in the Centrifuge task:		
	• If you are using the Interchangeable counterweight or Use 2 protocol plates counterweight mode, select <use default="">.</use>		
	• If you are using the Fixed Counterweight mode, select a labware for either Bucket 1 or Bucket 2.		
	For a description of the counterweight modes, see "Centrifuge" on page 279.		
Stage (Centrifuge with Loader only)	The stage at the Centrifuge Loader.		

Centrifuge

When you add the Centrifuge Process task (subprocess) at the desired point in the protocol, the Centrifuge task is automatically added. Select the Centrifuge task and set the following parameters in the **Task Parameters** area:

Centrifuge Process

Task Parameters	*
Centrifuge (Centrifuge) Proper	ties
Plate to spin, plate:	Plate 1 (384 Greiner 781101 PS clr fit
Plate to spin, location:	<auto-select></auto-select>
Relative centrifugal force (0.1 - 100	251.5
Acceleration (1 - 100 %):	80
Braking (1 - 100 %):	80
Timer mode:	Total time
Time to spin:	0:00:05
Counterweight mode:	Interchangeable counterweight
Counterweight, plate:	Counterweight (384 Greiner 781101
Counterweight, location:	<auto-select></auto-select>

Parameter	Description		
Plate to spin, plate	The microplate that will be spun.		
	<i>Note:</i> Select the counterweight microplate only if you plan to use the Fixed counterweight mode.		
Plate to spin, location	The device location to use. For example, you can select a centrifuge bucket.		
	<auto-select> automatically places the labware at the first-available or appropriate location for the task.</auto-select>		
	Make sure the Plate to spin, location selection does not conflict with the Counterweight, location selection.		
Relative centrifugal force (0.1– 1006.2 × g)	The rotor velocity, as a multiple of gravity.		
Acceleration (1–100%)	The rate of centrifugation, as a percent of maximum acceleration.		
Braking (1–100%)	The deceleration of the centrifuge, as a percent of maximum deceleration.		
Timer mode	How the specified spin time is implemented:		
	• Total time. The specified spin time includes acceleration and braking.		
	• Time at speed. The specified spin time does not include acceleration and braking.		
Time to spin	The length of time to spin the microplates in the desired mode.		

Parameter	Description
Counterweight mode	The counterweight method used. Select one of the following:
	• Fixed counterweight. The counterweight is manually placed in the centrifuge before starting the run. The counterweight remains in the centrifuge during the entire run. You must remember to place the counterweight in the device before the run and remove it after the run is finished.
	IMPORTANT Be sure to select the counterweight in the Centrifuge Process Task Parameters area. See "Task parameters" on page 278.
	• Interchangeable counterweight. The counterweight is on a platepad or Plate Hub Carousel. The robot will move it into the centrifuge during the run and return it to the platepad when the run is finished. If you select this mode, use the Counterweight , plate parameter to select the counterweight you want to use.
	• Use 2 protocol plates. Instead of a counterweight, a second process plate i used during the run.
	You must process two or more microplates in this mode. During the run, the robot places the first two microplates into the centrifuge. After spinning, the robot replaces the two microplates with the next pair, and so on. If you are processing an odd number of microplates, and three microplates are remaining, the robot will not remove the second from the last microplate so that the last microplate is paired.
	If you are processing an odd number o microplates, and:
	 A process contains only one Centrifuge Process task and it uses this counterweight mode, set the Simultaneous plate parameter to 2.
	 A process contains two or more Centrifuge Process tasks, and they all use this counterweight mode, se the Simultaneous plates parameter to 3 or greater.

Centrifuge Process

Parameter	Description
Counterweight, plate	The microplate or labware you want to use as the counterweight. This parameter is only available if you selected the Interchangeable counterweight method.
	If the list of counterweights do not appear, make sure:
	• You have added a device such as the Platepad for the counterweight. See "Adding devices" on page 25 for instructions.
	• You have configured the labware correctly. See "Configuring labware" on page 40 for instructions.
Counterweight, location	The device location to use. For example, you can select a centrifuge bucket.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task.</auto-select>
	Make sure the Counterweight , location selection does not conflict with the Plate to spin, location selection.

Device selection

You must select a device for Centrifuge Process tasks. If you have multiple devices of the same type, you can:

- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the list. However, if all of the devices in the list are in an error state, the software will automatically use the device in the backup pool.

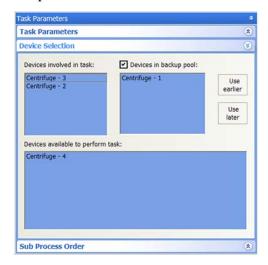
IMPORTANT The multiple devices must have the same setup and configuration.

After adding the Centrifuge Process task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- 1 Double-click the desired device in the **Devices available to perform task** area to move it to the **Devices involved in task** area. If you have multiple devices of the same type, you can move them to the **Devices involved in task** area.
- 2 If you have multiple devices in the **Devices involved in task** area, select a device, and then click **Use earlier** or **Use later** to prioritize it.
- **3** *Optional.* Select backup devices to use in case the primary device in the **Devices involved in task** area encounters an error.
 - **a** Select **Devices in backup pool**.

- **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.
- **c** If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.



Subprocess order

If more than one subprocess uses the same configured labware, and the subprocesses are in different protocol processes, you can specify the sequence in which the subprocesses will be performed.

To specify the sequence in which the subprocesses will be performed on the same configured labware:

1 In the protocol process, select the sub-process that contains the task that uses the configured labware.

In the following example, the Spin Plate 1 process is selected.

Startup Protoco	bl	۲	Task Parameters	4
Main Protocol		۲	Task Parameters	۲
Plate 1 (384		^	Device Selection	۲
Greiner 781101 PS clr			Sub Process Order	۲
fit btm)	Plate 1 (384 Downstack Spin Plate 1 Greiner from Stacker using 781101 PS -1.Stacker Centrifuge - clr fit btm) 2, Centrifuge - -3		This subprocess must follow:	
Remove	Centrifuge			
 Plate 2 (384 Greiner 781101 PS clr fit btm) 	Plate 2 (384 Downstack Spin Plate 2 Greiner from Stacker using 781101 PS - 2. Stacker Centrifuge - 1 cir fit btm)			
Remove	Centrifuge		This subprocess does not need to follow:	
Counterweight (384 Greiner 781101 PS clr fit btm)	Counterwei Place plate at (384 Greiner PlatePad for using 781101 PS Counterwt Centrifuge clr fit btm) Stage 2, Centrifuge 3		Spin Plate 2	
Remove	Centrifuge	*		
Cleanup Protoco	ol	۲		
Protocol Option	IS	۲		

- 2 In the Task Parameters area, click Sub Process Order.
- **3** In the **Sub Process Order** area, double-click the subprocess names to rearrange the order.

In the example shown in step 1, the order is Spin Plate 1 and Spin Plate 2.

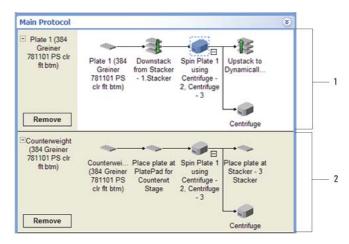
Example: Interchangeable counterweight mode

Goal

Downstack microplates from a Labware Stacker, spin the microplates in the Microplate Centrifuge, and then upstack the microplates to an available Labware Stacker. Use the counterweight that is stored on a designated platepad.

Implementation

(1) Add a process for microplates that will be downstacked, spun, and upstacked. Add a Downstack, Centrifuge Process, and Upstack task in the order shown. (2) Configure the counterweight on a platepad and call it Counterweight.



The task parameters for the Centrifuge Process and the Centrifuge task are shown. Notice that the Bucket n parameters are set to <use default>, because the Interchangeable counterweight mode is selected.

Centrifuge Process

Plate 1 (384 Greiner 781101 PS cir fit

Interchangeable counterweight Counterweight (384 Greiner 781101

<auto-select>

<auto-select>

80 80 Total time 0:00:05

*

*

Task Parameters		Task Parameters	
Task Parameters		Task Parameters	
<u>₹</u> 2↓		21	
SubProcess (Centrifug)	e) Properties	🗉 Centrifuge (Centrifuge) Pro	perties
Sub-process name:	Spin Plate 1	Plate to spin, plate:	Plate 1
🗉 Static labware configu	ration	Plate to spin, location:	<auto-s< td=""></auto-s<>
Display confirmation:	Don't display	Relative centrifugal force (0.1 -	100 251.5
Bucket 1:	<use default=""></use>	Acceleration (1 - 100 %):	80
Bucket 2:	<use default=""></use>	Braking (1 - 100 %):	80
		Timer mode:	Total tin
		Time to spin:	0:00:05
		Counterweight mode:	Intercha
		Counterweight, plate:	Counter
		Counterweight, location:	<auto-s< td=""></auto-s<>
Davies Coloritor		Advanced Settings	
Device Selection		Advanced Seconds	
Sub Process Order		8	

Because the robot will move the counterweight from the designated platepad to the centrifuge during the run, select the Interchangeable counterweight mode. For the Counterweight, plate parameter, select Counterweight.

Note: The robot will move the counterweight back to the platepad when the run is finished.

Related information

For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Configuring labware	"Configuring labware" on page 40	
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349	
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387	
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557	

CentrifugeAuto

Description

Note: If you want to manage counterweights and counterweight modes using JavaScript, see the examples in "Using JavaScript with the CentrifugeAuto task" on page 108.

If you have VWorks software installer 11.2, make sure that you use the CentrifugeAuto task. The CentrifugeAuto task (CentrifugeAuto) performs all the functions of the Centrifuge Process task but does not require a subprocess.

The CentrifugeAuto task (CentrifugeAuto) can be used with the Microplate

Centrifuge (Aglient Centrifuge) and Centrifuge with Loader (Aglient Centrifuge Loader) devices to spin microplates according to the task parameter settings. The CentrifugeAuto task enables you to spin one microplate with a counterweight or spin two microplates from a protocol process, at the same time. Counterweights can be placed manually or robotically. When using counterweights, you can use multiple counterweights for protocols with multiple processes. This is accomplished by using the Configure Labware feature to manage the centrifuge tasks.

Task is available for	Task is available in
Centrifuge	Main Protocol
Centrifuge with Loader	Main Protocol

The CentrifugeAuto task cannot be used in the following cases:

- Within a Loop task
- Within a Spawn process as a subroutine, as this will result in a deadlock
- Within a Macro
- As the first task in a process

You cannot assign multiple devices to a single CentrifugeAuto task.

Task parameters

After adding the CentrifugeAuto task in the main protocol, set the **CentrifugeAuto Properties** in the **Task Parameters** area:

Task Parameters	*
1. 2↓	
□ CentrifugeAuto Properties	
Max spin force (0.1 - 1006.2 g)	: 251.5
Acceleration (1 - 100 %):	80
Braking (1 - 100 %):	80
Timer mode:	Total time
Time to spin:	0:00:05
Counterweight mode:	Auto managed counterweight
Counterweight:	CW1

Parameter	Description
Max spin force (0.1 - 1006.2 × g)	The rotor velocity, as a multiple of gravity.
Acceleration (1–100%)	The rate of centrifugation, as a percent of maximum acceleration.
Braking (1–100%)	The deceleration of the centrifuge, as a percent of maximum deceleration.
Timer mode	The way the spin time is implemented:
	• Total time. The specified spin time includes acceleration and braking.
	• Time at speed . The specified spin time does not include acceleration and braking.
Time to spin	The length of time to spin the microplates in the desired mode.
Counterweight mode	The method used to keep the Centrifuge balanced during a spin.
Fixed counterweight	The manual mode for placing the counterweight.
	Place the counterweight in the device before the run (in bucket 2) and remove it after the run is finished.
	CAUTION Do not use the Fixed counterweight mode with other counterweight modes on the same device. Running a protocol with mixed counterweight modes will result in a compiling error. Ignoring the error and continuing to run the protocol could result in a collision.

CentrifugeAuto

Parameter	Description			
Auto managed counterweight	A counterweight managed as a Configure Labware process.			
	The robot will move the counterweight from a platepad or Plate Hub Carousel (specified by the plate process) into the Centrifuge during the run and return it to the platepad when the run is finished. If you select this mode, use the Counterweight parameter to select the Configure Labware process that corresponds to the counterweight you want to use.			
	Guidelines for use			
	To avoid deadlocks when there are two or more CentrifugeAut tasks in a protocol:			
	If the tasks are placed before pipetting tasks for both source and destination processes, and if the destination plate is spun first, set up an additional temporary-storage location for the destination plate.			
	This mode can be used in combination with the Use 2 protocol plates mode in the same protocol. See "Guidelines for use with two modes (Auto managed and Use 2 protocol plates)" on page 289 for additional guidelines.			
Use 2 protocol plates	A second process plate used as the counterweight.			
	During the run, the robot places the first two microplates into the centrifuge. After spinning, the robot replaces the two microplates with the next pair, and so on. If you are processing an odd number of microplates, and three microplates are remaining, the robot will not remove the second from the last microplate so that the last microplate is paired.			
	Guidelines for use			
	To avoid deadlocks, whenever using this task, set Simultaneous plates to 2 or greater and run the protocol at least twice.			
	To avoid deadlocks when there are two or more CentrifugeAut tasks in a protocol:			
	• If the tasks are within the same process and are using different devices and if Simultaneous plates is set to 2, rul an even number of microplates.			
	• If the tasks are within the same process and are using the same device and if you are running an odd number of plates, set up an additional temporary storage location to accommodate the odd plate.			
	• If the tasks are placed before pipetting tasks for both source and destination processes, and if the destination plate is spun first, set up an additional temporary-storage location for the destination plate.			
	• If using the same Centrifuge with Loader, ensure the task are not adjacent to each other.			
	<i>Note:</i> This is true only for the Centrifuge with Loader and not for the Centrifuge.			
	This mode can be used in combination with the Auto managed mode in the same protocol. See "Guidelines for use with two modes (Auto managed and Use 2 protocol plates)" on page 289 for additional guidelines.			

Parameter	Description
Counterweight	A configured labware used as the counterweight.
	This parameter is available only if you selected the Auto managed counterweight mode.
	Tip boxes and reservoirs, or any other labware not compatible with the Microplate Centrifuge or Centrifuge with Loader, cannot be used as counterweights.
	If the list of counterweights do not appear, make sure you have configured the labware correctly. See "Example: Auto managed counterweight mode" on page 290 for instructions.

Guidelines for use with two modes (Auto managed and Use 2 protocol plates)

Use the following guidelines to avoid deadlocks when the protocol has two or more CentrifugeAuto tasks, and one task uses the Auto managed mode and another uses the Use 2 protocol plates mode.

Multiple CentrifugeAuto tasks using the same device

If the tasks are using the same device, run an even number of plates.

A Reorder task is between two CentrifugeAuto tasks

- If using the Reorder task between two CentrifugeAuto tasks with the same device, and if placing the auto-managed CentrifugeAuto task before the Reorder task, set the **Number of plates** to store in the Reorder task to an even number.
- If using the Reorder task between two CentrifugeAuto tasks and if placing the Use 2 protocol plates mode CentrifugeAuto task before the Reorder task, set the **Number of plates** to store in the Reorder task to an even number.

A long Incubation task is between two CentrifugeAuto tasks

If placing a long Incubation task between two CentrifugeAuto tasks that use the same device, and if the Auto managed CentrifugeAuto task is before the Incubation task, set the number of incubation locations to an even number.

Device selection

You must select a device for each CentrifugeAuto task. After adding the CentrifugeAuto task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

Double-click the desired device in the **Devices available to perform task** area to move it to the **Devices involved in task** area. Only one device can be assigned to a given task.

CentrifugeAuto

Task Parameters	
Task Parameters	۲
Device Selection	۲
Devices involved in	
Agilent Centrifuge - 1	Use earlier
	Use later
Devices available to perform task:	
Agilent Centrifuge - 2 Agilent Centrifuge - 3	
Advanced Settings	۲

Example: Auto managed counterweight mode

Goal

Perform two spins on one microplate with a different task between spins, in this case, an incubate task. Both spins are performed with the same device and each spin uses a different counterweight.

Implementation

- 1 Create a protocol process that includes a Downstack, Spin, Incubate, a second Spin, and an Upstack task.
- 2 Select the parameters in the Task Parameters area for the Downstack, Incubate, and Upstack tasks.

Main Protocol							۲
 process - 1 (384 Greiner 781101 PS clr flt btm) Remove 	process - 1 (384 Greiner 781101 PS clr flt btm)	Downstack from Agilent Phantom Stacker - 1.Location	CentrifugeA (Agilent Centrifuge - 1)	Incubate for 10 seconds	CentrifugeA (Agilent Centrifuge - 1)	Upstack to Agilent Phantom Stacker - 2.Location	

- **3** Create a Configure Labware process for each counterweight as follows:
 - a Click Configure Labware.

Startup Protocol					
Main Protocol					
process - 1 (384 Greiner 781101 PS clr flt btm)	process - 1 (384 Greiner 781101 PS clr flt btm)	Downstack from Agilent Phantom Stacker - 1.Location	CentrifugeA (Agilent Centrifuge 1)		
Add Process Configure Labware					

- **b** In the **Configure Labware** dialog box, do the following:
 - Select the location of a counterweight from the Device to use list.
 - Select Auto managed counterweight.
 - Select the microplate from the Plate type list.
 - Click **OK**.

Device to	use:	Plate Pad, Standard - 1		•	ОК
		✓ Auto managed counterweight			Cancel
Location	Plate	type	Plate na… ∧		
Stage			-		
	1520	Croiper 792076 blk car well fit bt			
		5 Greiner 782076 blk sqr well fit btr	1		
	·····	Greiner 781101 PS clr flt btm V11 08104.001 Manual Fill Reserve			
		V11 11962.001 Autofilling MicroW V11 Nestable Tip Box d30			
		V11 ST10 Tip Box 10734.102			
		V11 ST30 Tip Box 10734.102			
		V11 ST50 Tip Box 06881.002			
		V11 Tip Box ST70 19133.002			
		ostar 3961 PP 2ml assay block			
		reiner 655101 PS Clr Rnd Well Flat	Btm		
	1000	11 11961.001 Autofilling MicroWa			
		11 LT200 Tip Box 06880.002			
		11 LT250 Tip Box 19477.002			

The configure labware process appears.

⊡ plate - 1 (384 Greiner 781101 PS clr flt btm)	plate - 1 (384 Place plate at Place	
Remove	781101 PS Standard - 1 Sta	ate Pad, indard - 1 Stage

c In the **Task Parameters** area, type a name for the Configure Labware process in the **Plate name** field (in this case, **CW1**).

Note: When the **Auto managed counterweight** option is selected, the **Simultaneous plates** and **Automatically update labware** options are not available.

<u>Plate identity</u>	
Plate name:	CW1
Plate type:	384 Greiner CVVI JI PS cir fit btm
Plates have lids:	
Plates enter the system sealed:	
Process control	
Automatically update labware:	\checkmark
Enable timed release:	
Release time:	0:00:30
Auto managed counterweight:	
Barcode information	
Barcode filename:	No Selection
Has header:	
Barcode or header South:	No Selection
Barcode or header West:	No Selection
Barcode or header North:	No Selection
Barcode or header East:	No Selection

- d Repeat steps 3a through 3c for the second counterweight.
- 4 Select the device for the **CentrifugeAuto** tasks:
 - a Select the first CentrifugeAuto task in the process.

Main Protocol						۲
process - 1 (384 Greiner 781101 PS clr flt btm) Remove	process - 1 (384 Greiner 781101 PS clr flt btm)	Downstack from Agilent Phantom Stacker - 1.Location	Incubate for 10 seconds	CentrifugeA (Agilent Centrifuge - 1)	Upstack to Agilent Phantom Stacker - 2.Location	

b In the Device Selection area, drag Agilent Centrifuge-1 to the Devices involved in task area.

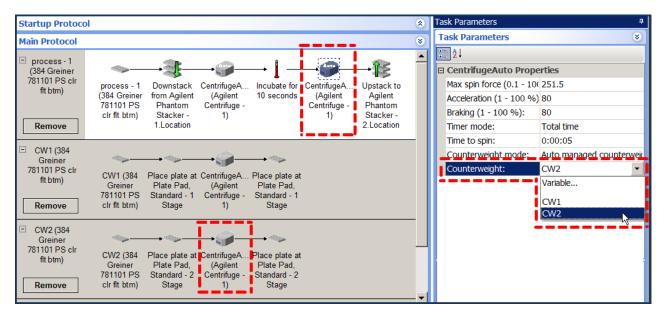
Task Parameters	д
Task Parameters	۲
Device Selection	۲
Devices involved in	
Agilent Centrifuge - 1	Use earlier Use later
Devices available to perform task:	
Agilent Centrifuge - 2 Agilent Centrifuge - 3	
Advanced Settings	۲

- c Repeat steps 4a and 4b for the second CentrifugeAuto task.
- 5 When setting the parameters of the first CentrifugeAuto task, select the Auto managed counterweight mode, and then select CW1 from the Counterweight list.

Note: A CentrifugeAuto task is automatically added to the Configure Labware process chosen for the counterweight.

Startup Protoco	ol						۲	Tas	sk Parameters		ф
Main Protocol				_			۲	T	ask Parameters		۲
process - 1		-	10000	θ					2↓		
(384 Greiner		<u>→₹</u> [-		i →] —	→)	→₩≶			CentrifugeAuto Prop	erties	
781101 PS clr flt btm)	process - 1	Downstack	CentrifugeA		CentrifugeA	Upstack to			Max spin force (0.1 - 10	251.5	
in burry	(384 Greiner 781101 PS	from Agilent		10 seconds	(Agilent	Agilent			Acceleration (1 - 100 %) 80	
	clr flt btm)	Phantom Stacker -	Centrifuge - 1)		Centrifuge - 1)	Phantom Stacker -			Braking (1 - 100 %):	80	
Remove	,	1.Location	<u> </u>		,	2.Location			Timer mode:	Total time	
				-			- 1		Time to spin:	0:00:05	
CW1 (384 Greiner	-								Counterweight mode:	Auto managed cou	nterweic
781101 PS clr	0144 /004							1	Counterweight:	CW1	-
flt btm)	CW1 (384 Greiner	Place plate a Plate Pad,	CentrifugeA (Agilent	Place plate at Plate Pad.				F	!	Variable	
	781101 PS	Standard - 1	Centrifuge -	Standard - 1						CW1	_
Remove	clr flt btm)	Stage	1)	Stage						CW1 CW2	
							-			CHZ	
CW2 (384 Greiner			→ @—	→ @⊳							
781101 PS clr	CW2 (384	Place plate at	CentrifugeA	Place plate at							
flt btm)	Greiner	Plate Pad,	(Agilent	Plate Pad,				C	counterweight:		
Demos	781101 PS clr flt btm)	Standard - 2	Centrifuge -	Standard - 2					etermines the counterwe	eight for the spin ses	sion.
Remove	cir ilt btm)	Stage	1)	Stage				T	his is applicable only for «	<auto managed<="" td=""><td></td></auto>	
								0	ounterweights ontion in	Countenweight mor	<u>م</u> ا

6 When setting the parameters of the second **CentrifugeAuto** task, select the **Auto managed counterweight** mode, and then select **CW2** from the Counterweight list.



7 Before you start the run, make sure the counterweights are at their starting locations.

Plate movement

When the protocol runs, the robot will place the downstacked microplate in bucket 1 of the centrifuge and the counterweight, CW1, into bucket 2. Counterweight CW1 will be swapped out for counterweight CW2 after the microplate is incubated and after it is placed back into bucket 1 of the Centrifuge. Both counterweight plates will automatically be placed back on their starting locations at the end of the process.

Related information

For information about	See		
Adding devices	 "Adding devices" on page 25 Device user guide		
Adding tasks in a protocol	"Adding and deleting tasks" on page 53		
Configuring labware	"Configuring labware" on page 40		
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349		
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557		

Configure Static Labware

Description

IMPORTANT The VWorks Automation Control software is backwardcompatible with protocols created in VWorks4 version 6.2.3 or earlier and will continue to support static labware configuration procedures. However, Agilent Technologies recommends that you use the concept and procedure in "Configuring labware" on page 40 when writing new protocols.

Available only in the Startup protocol, the Configure Labware task (Configure Labware) allows you to assign static labware to locations on a device. The labware will remain at these locations during the protocol.

Note: You can also configure static labware in the device subprocess task in the main protocol. Configure labware in the device subprocess if you want to override the labware configuration in the startup protocol. Configure labware in a Startup Protocol if the labware configuration will be used in all the Main Protocol subprocesses.

In general, you configure static labware before the first task in a protocol. If you have multiple processes in the protocol, configure the labware once before the first task of the first process.

Configure Static Labware

Task is available for	Task is available in
Any device	Startup Protocol

Task parameters

After adding the Configure Labware task in the startup protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	4
Task Parameters	۲
Ž↓	
Configure Labware properties	erties 🔺
Device to use:	Bravo - 1 🔹
Display confirmation:	—
1:	
2:	
3:	
Device to use: Select device to configure stat	ic labware for
Advanced Settings	۲

Parameter	Description
Device to use	The device on which the labware is placed. Select from the list of available devices.
Display confirmation	The option to display a message to check the physical placement of the labware against the assignment in the software.
Device location	The list of locations on the device. For example, if you select Bravo Pipettor as the device to use, deck locations 1 through 9 appear in the list. Click the device location, and then select the labware type.

Related information

For information about	See		
Adding devices	• "Adding devices" on page 25		
	• Device user guide		

For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Subprocess task	"SubProcess (Bravo, Vertical Pipetting Station)" on page 388
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
BioCel I/O Interface Diagnostics	BioCel System User Guide

Delid

Description

The Delid task (Teld) removes lids from microplates using a device such as a Bravo Pipettor, Lid Hotel Station, or Vacuum Delid Station (a vacuum-based delidding device). You can use the Delid task to remove and discard a lid, or you can pair it with the Relid task to retain the removed lid and later place the lid back on the microplate.

 $\it Note:$ You can only delid process plates and configured labware. You cannot delid static labware.

Task is available for	Task is available in
BenchCel Workstation	Startup Protocol
	Main Protocol
	Cleanup Protocol
Bravo Platform	Startup Protocol
	Main Protocol, Bravo Subprocess
	Cleanup Protocol
Lid Hotel Station	Startup Protocol
	Main Protocol
	Cleanup Protocol
Vacuum Delid Station	Startup Protocol
	Main Protocol
	Cleanup Protocol

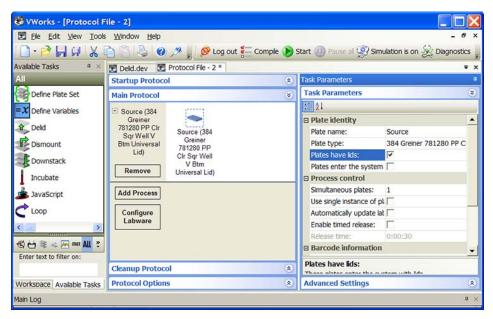
Requirements

Labware entry

In the Labware Editor, make sure the labware you want to delid has lid specifications in the **Plate Properties** tab. For detailed instructions, see the *VWorks Automation Control Setup Guide*.

Plate parameters

When you set parameters for the process plate, make sure you select the **Plates** have lids option. For detailed instructions, see "Setting plate parameters" on page 46.



Bravo Platform

To use the Delid task, you must first configure the Lid Hotel in Bravo Diagnostics. For detailed instructions, see the *Bravo Automated Liquid Handling Platform User Guide*.

Task Parameters

Bravo Platform

To delid microplates on the Bravo Platform, you add the Delid task within the Bravo Subprocess. After adding the Delid task at the desired point in the subprocess, select the microplate you want to delid in the **Task Parameters** area, as the following example shows.

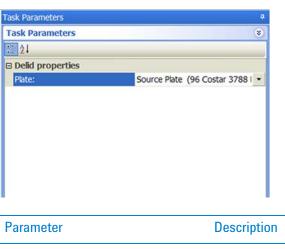


Plate The microplate that will be delidded.

Lid Hotel Station or Vacuum Delid Station

The Delid task does not have task parameters when using the Lid Hotel Station or the Vacuum Delid Station device. However, you must select the device you want to use.

Device selection

You must select a device for Delid tasks that use the Lid Hotel Station or the Vacuum Delid Station Station. You do not need to select a device when the Delid task is within a Bravo Subprocess, because the software assumes you want to use the Bravo Platform.

If you have multiple devices of the same type, you can prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.

IMPORTANT The multiple devices must have identical setup and configuration.

After adding the Delid task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- 1 Double-click the desired device in the **Devices available to perform task** area to move it to the **Devices involved in task** area. If you have multiple devices of the same type, you can move them to the **Devices involved in task** area.
- 2 If you have multiple devices in the **Devices involved in task** area, select a device, and then click **Use earlier** or **Use later** to prioritize it.

ask Parameters	
Fask Parameters	(*
Device Selection	*
Devices involved in task:	
Vacuum Delid Station - 1	Use earlier
	Use later
Devices available to perform task: BenchCel - 1 Lid Hotel Station - 1	
Advanced Settings	*

Example: Delid microplates

Goal

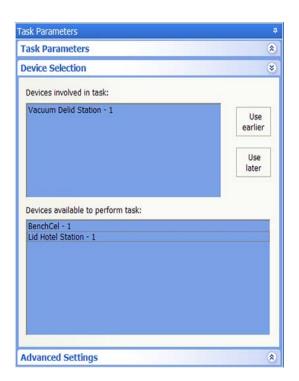
After a microplate is downstacked from the Labware Stacker device, remove the lid for liquid-handling tasks on the Vertical Pipetting Station. A Vacuum Delid Station is available to remove the lid and drop it into the waste bin.

Implementation

Add a Delid task after the Downstack task. The Delid task removes the lid from the microplate and drops it into the waste bin.

Main Protocol				(
Source (384 Costar 3657 PP Sqr well md btm) Source (3 Costar 365 PP Sqr well PP Sqr w md btm	57 from Stacker ell - 1.Stacker	Liquid handling using Vertical Pipetting	Seal a plate	Upstack to Dynamicall

The device selection for the Delid task is:



Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Relid task	"Relid" on page 333
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Dismount

IMPORTANT The Dismount task is always paired with the Mount task. Before adding the Dismount task, review the description for the Mount task. See "Mount" on page 307.

The Dismount task (Dismount) removes labware, such as a filter microplate, from the top of an elution microplate or reservoir that is resting on a platepad. Always paired with a Mount task, the Dismount task uses information that is specified in the Mount task.

For example, you can use the Mount task to place a filter microplate on a reservoir that catches the elution. After the centrifuge process, you can use the Dismount task to remove the filter microplate from the reservoir and discard it.

Task is available for	Task is available in
Platepad	Main Protocol

Task parameters

The Dismount task does not have task parameters.

Example: Dismount a filter microplate from a collection microplate

Goal

Downstack a collection microplate from a Labware Stacker device and place it on a platepad. Downstack a filter microplate from another Labware Stacker device and place it on top of the collection microplate. Centrifuge the assembly (filter microplate with collection microplate). Remove the filter microplate from the collection microplate and discard it. Upstack the collection microplate containing the elution for future processing.

Implementation

Add one process for the collection microplate and another process for the filter microplate. See "Example: Mount a filter microplate on a reservoir that collects elution" on page 308 for details about the Mount and Wait For tasks.

In the filter microplate process, add a Waste task after the Wait For task. The Waste task discards the filter microplate after the centrifuge is finished.

In the collection microplate process, add the following tasks after the Mount task: Centrifuge, Dismount (to remove the filter microplate from the collection microplate), and Upstack (to store the collection microplate containing the elution).

Dismount

Main Protocol						(
 Filter Plate (Wonder Filter) Remove 	Filter Plate (Wonder Filter)	Downstack from Stacker - 1.Stacker	Wait for Filter Plate	Discard plate at WasteBin - 1 Hole		
 Collection Plate (Acme) 	-	→ ③-	→ <i> <i> </i></i>			→ ĵ≩
Remove	Collection Plate (Acme)	Downstack from Stacker - 2.Stacker	Mount Wait for Filter Plate	Spin using Centrifuge - 1	Dismount	Upstack to Dynamicall

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Mount task	"Mount" on page 307
Downstack task	"Downstack" on page 354
Upstack task	"Upstack" on page 382
Waste task	"Waste" on page 346
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Incubate

Description

The Incubate task (Incubate) moves labware to a location, leaves it there for a specified time period, and then moves it from the location. The number of labware that can be incubated simultaneously is limited by the number of locations that are available for holding labware. Typically, you incubate labware on platepads or in Plate Hotels.

Note:

- To incubate a labware in a storage device such as a Plate Hub Carousel or the LiConic StoreX incubator, use the Storage Incubate task.
- To incubate labware on the Bravo Platform, use the Reserve Location task.

Task is available for	Task is available in	
Platepad	Main Protocol	
Plate Hotel	Main Protocol	
Vertical Pipetting Station	Main Protocol	

Task parameters

After adding the Incubate task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	۲
: ∎ 2↓	
Incubate properties	
Incubation time: 0 Days 0	0:00:10
Use relative timing:	
Allow plates to incubate at locatic	

Parameter	Description
Incubation time	The length of time to incubate the labware. <i>Note:</i> The actual incubation period might be longer than the incubation time you specify. The actual incubation period is affected by the scheduling and operating speed of the robot.

Incubate

Parameter	Description
Use relative timing	The option to start timing the incubation after the previous labware has finished incubating.
	<i>Note</i> : The option can result in a longer incubation period than specified.
	Select this option to prevent bottlenecking at a downstream device. Alternatively, use the Release time parameter when setting process plate properties.
Allow plates to incubate at locations with BCRs\	The option to permit a labware to be placed at a location with a barcode reader. The barcode reader is not used during the Incubate task.

Device selection

You must select a device for Incubate tasks. If you have multiple devices of the same type, you can:

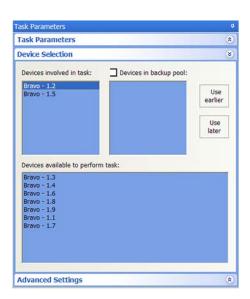
- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the list. However, if all of the devices in the list are in an error state, the software will automatically use the device in the backup pool.

IMPORTANT The multiple devices must have the same setup and configuration.

After adding the Incubate task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- 1 Double-click the desired device in the **Devices available to perform task** area to move it to the **Devices involved in task** area. If you have multiple devices of the same type, you can move them to the **Devices involved in task** area.
- 2 If you have multiple devices in the **Devices involved in task** area, select a device, and then click **Use earlier** or **Use later** to prioritize it.
- **3** *Optional.* Select backup devices to use in case all of the devices in the **Devices involved in task** area encounter an error.
 - a Select Devices in backup pool.
 - **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.
 - **c** If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.



Example: Incubate a microplate after mixing two reagents

Goal

Aspirate contents from two source microplates, dispense into a destination microplate. Incubate the mixture for at least 6 minutes, and then read the microplate.

Implementation

In the protocol, add an Incubate task after the liquid-handling tasks as shown in the following example.

Main Ductorel							6
Main Protocol							۷
Destination (384 Costar 3657 PP Sqr well rnd btm) Remove	Destination (384 Costar 3657 PP Sqr well md btm)	Downstack from BenchCel - 1.Stacker 1	Bravo SubProcess 19 using Bravo - 1	Incubate for 6 minutes	Run the protocol file	Upstack to BenchCel - 1.Stacker 2	*
E Source 1 (384 0	Costa deepwell P	P Clr Sqr Well	I V Btm)				-
E Source 2 (384 0	Costa deepwell P	P Clr Sqr Wel	IV Btm)				
Tips (384 V11 S	ST50 Tip Box 068	81.002)					~
<		TO .				>	
Cleanup Protoco	ol						\$
	5						\$

For the Incubate task, select platepad-1 for the incubation location. Set Incubation time to 6 minutes in the Task Parameters area as shown. Incubate

ask Parameters	*
evice Selection	۲
Devices involved in	
PlatePad - 1.Stage	Use earlier
	Use later
10527 TZ 15	
Bravo - 1.1	^
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.6	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.4 Bravo - 1.5 Bravo - 1.6 Bravo - 1.8	
Devices available to perform task: Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.3 Bravo - 1.4 Bravo - 1.6 Bravo - 1.6 Bravo - 1.9 Lid Hotel - 1.0pper plate pad	

Task Parameters		*
<u>:</u> 2↓		
Incubate Properties		
Incubation time:	0 Days 00:06:00	
Use relative timing:		
Allow plates to incubate	at loc 🔽	
Device Selection		*

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Process plate properties	"Setting plate parameters" on page 46
Storage Incubate task	"Storage Incubate" on page 373
Reserve Location task	"Reserve Location" on page 337
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate- handling tasks" on page 277
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Mount

Description

The Mount task (Mount) places a labware, such as a filter microplate, on top of a collection microplate or reservoir that is resting on a platepad. The Mount task works with the Wait For task and is paired with the Dismount task.

For example, you can use the Mount task to place a filter microplate on a reservoir that catches the elution. After the centrifuge process, you can use the Dismount task to remove the filter microplate from the reservoir and discard it.

The Mount task becomes available when you add a Platepad device in the device file. The task can be used only in the Main Protocol.

Task is available for	Task is available in
Platepad	Main Protocol

Requirements

Labware definition

The labware involved in the Mount task must have the following Plate Handling properties in the Labware Editor:

- *Can be mounted.* Select the **Can be mounted** property to define microplates or reservoirs that will be mounted (will be on the bottom).
- *Can mount*. Select the **Can mount** property to define microplates that will mount on top of the elution microplate or reservoir.

Plate Handling	
Lower plate at VCode	
Can mount	
Can be mounted	

Process setup

Each labware involved in the Mount task should be set up as independent processes in the protocol. For example, if you want to place a filter microplate on top of a reservoir or collection microplate that catches the elution, you should create two processes as shown in the following example:

Filter Plate (Wonder	-		Stop			
Filter)	Filter Plate	Downstack from Stacker		Discard plate at WasteBin -		
Remove	(Wonder Filter)	- 1.Stacker	Plate	1 Hole		
Collection			(- F	22
Plate (Acme)		→ _ y				
	Collection	Downstack	Mount Wait	Spin using	Dismount	Upstack to
Remove	Plate (Acme)	from Stacker - 2.Stacker	for Filter Plate	Centrifuge - 1		Dynamicall

Notice that a Wait For task is added to the Filter Plate process at the point where the mount task would occur. A Mount task is added to the Collection Plate process at the desired point. See "Example: Mount a filter microplate on a reservoir that collects elution" on page 308 for a detailed description.

Task parameters

After adding the Mount task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

	*
Wait for Filter Plate	
D	escription
T	escription he name of the Wait For task that you ant to pair with this Mount task.
	Wait for Filter Plate

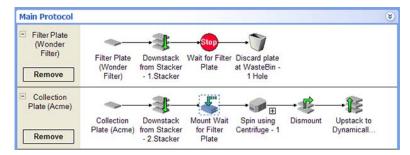
Example: Mount a filter microplate on a reservoir that collects elution

Goal

Downstack a reservoir (Collection Plate) from a Labware Stacker device and place it on a platepad. Downstack a filter microplate (Filter Plate) from another Labware Stacker device and place it on top of Collection Plate.

Implementation

Create one process for the Collection Plate and another process for Filter Plate. In the Filter Plate process, add a Wait For task after the Downstack task. In the Collection Plate process, add a Mount task after the Downstack task.



The task parameters for the Wait For task and the Mount task are:

Parameters				
SK Parameters		a.	Task Parameters	
ask Parameters		8	Task Parameters	
1 2↓			20 24	
Wait For properties			Mount properties	
Name:	Wait for Filter Plate-1		Wait For:	Wait for Filter Plate-

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Dismount task	"Dismount" on page 301
Wait For task	"Wait For" on page 603
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Move to Location (Bravo)

Description

The Move to Location task (Move To Location (Bravo)) moves the pipette head to a safe distance above a specified deck location. The safe distance is set in the Bravo Pipettor profile.

Typically, this task is used in Startup and Cleanup Protocols to move the pipette head out of the way. For example, you can move the pipette head to location 5 before placing a microplate at location 1.

_

Move to Location (Bravo)

Task is available for	Task is available in
Bravo Platform	Startup Protocol Main Protocol, Bravo Subprocess Cleanup Protocol

Task parameters

After adding the Move To Location task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters		
Task Parameters		*
21		
Move To Location (Bra	avo) properties	
Location:	5	-
Parameter		Descriptio
i ulumotoi		Description
Location		The decl

	Beeenpaten
eation	The deck location the pipette head will move to. The height above the deck location is determined by the <i>z</i> -axis safe position setting in the profile.

Example: Move a Bravo pipette head before the main protocol starts

Goal

Before the main protocol starts, move the Bravo pipette head to location 5.

Implementation

In the startup protocol, add a Move to Location task. Specify that the pipette head should move to location 5.

Startup Protoco	I	
 startup process - 1 	-	-
Remove	startup process - 1	Move above Location 5

The task parameter for the Move to Location task is:

۲
properties
5 -

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Place Plate

Description

The Place Plate task (\P Place Plate) moves labware to a specified location. If the location has a barcode reader installed, the Place Plate task moves the labware to the location and reads the barcode.

Task is available for...Task is available in...Any deviceMain Protocol

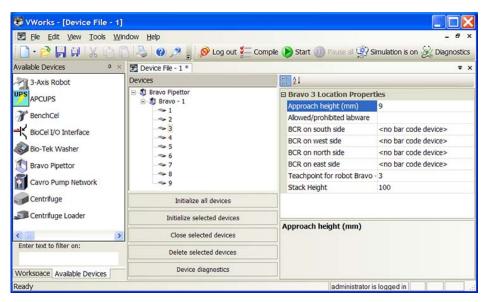
Requirements

To read barcodes at the specified location such as a platepad, you must:

- Set up the barcode reader in the device file.
- Add the device that has the barcode reader, and then specify the location of the barcode reader. For example, if the barcode reader is installed on a platepad, specify the side on which the barcode reader is installed.

If you are placing a labware on a device or accessory, make sure:

- The device or accessory is configured.
- The Device Properties approach height clears the top of tall accessories.



Task parameters

After adding the Place Plate task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters		
Task Parameters		۲
21		
Place Plate properties		
Device to use:	PlatePad - 1	Ψ.
Location to use:	Stage	
Parameter		D
Device to use		T
		la
Location to u	se	Т
		la
		10

Example: Place a microplate at a platepad and read its barcode label

Goal

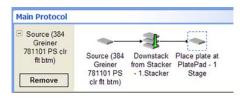
Place the Source Plate at the specified platepad and read the barcode label. The barcode reader is installed on the east side of the platepad.

Implementation

When adding the platepad in the device file, specify the barcode reader on the east side of the platepad.

🕎 PP Device.dev			₹ ×
Devices	: : 2↓		
🖻 📲 3-Axis Robot	PlatePad Stage Location P	roperties	
- Axis Robot - 1 - Plate Pad, Standard	Approach height (mm)	9	
PlatePad - 1	Allowed/prohibited labware		
> Stage	BCR on south side	<no bar="" code="" device=""></no>	
Generation Barcode Reader BCR on PP1	BCR on west side	<no bar="" code="" device=""></no>	
BCK ON PPI	BCR on north side	<no bar="" code="" device=""></no>	
	BCR on east side	BCR on PP1	-
	Teachpoint for robot 3-Axis R	obot Plate Pad 1	
Initialize all devices			
Initialize selected devices			
Close selected devices	BCR on east side		
Delete selected devices			
Device diagnostics			

Add a Place Plate task at the desired point in the protocol.



The task parameters for the Place Plate task are:

Task Parameters		
Task Parameters		۲
11 2l		
Place Plate properties		
Device to use:	PlatePad - 1	
Location to use:	Stage	
Location to use:	Stage	

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Pierce Plate (Seal Piercer)

Description

The Pierce Plate (Seal Piercer) task (Pierce Plate (Seal Piercer)) pierces a microplate seal using a Seal Piercer.

Task is available for	Task is available in
Seal Piercer	Main Protocol

Task parameters

After adding the Pierce Plate (Seal Piercer) task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

	۲
roperties	
75	

Parameter	Description
Piercing pressure	The air pressure, in psi, used during the piercing process.

Device selection

You must select a device for Pierce Plate (Seal Piercer) tasks. If you have multiple devices of the same type, you can:

- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the list. However, if of all the devices in the list are in an error state, the software will automatically use the device in the backup pool.

IMPORTANT The multiple devices must have the same setup and configuration.

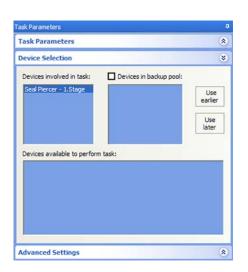
After adding the Pierce Plate (Seal Piercer) task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- **1** Double-click a device in the **Devices available to perform task** area to add it to the **Devices involved in task** area.
- **2** To prioritize its use, select the device in the **Devices involved in task** area, and then click **User earlier** or **Use later**. The devices that are higher in the list are favored by the software scheduler during the protocol run.
- **3** *Optional.* Select backup devices to use in case all of the devices in the **Devices involved in task** area encounter an error.
 - **a** Select **Devices in backup pool.**
 - **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.
 - **c** If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.

8 Setting parameters for microplate-handling tasks

Pierce Plate (Seal Piercer)



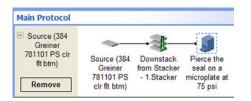
Example: Pierce a microplate seal

Goal

Pierce the Source Plate after it is downstacked from the Labware Stacker.

Implementation

Add a Pierce Plate (Seal Piercer) task after the Downstack task. Set the piercing pressure at 75 psi.



The task parameter and device selection for the Pierce Plate (Seal Piercer) task are:

8 Setting parameters for microplate-handling tasks

Pierce Plate (Seal Piercer)

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\$

ask Parameters	ņ	Task Parameters	
Task Parameters	۲	Task Parameters	(
: 21		Device Selection	(
Pierce Plate (Seal Piercer) Properties Piercing pressure (20 - 120 psi): 75		Devices involved in task: Devices in backup pool: Seal Piercer - 1.Stage Devices available to perform task:	Use earlier Use later
Device Selection	۲		
Advanced Settings	۲	Advanced Settings	14

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Print and Apply

Description

The Print and Apply task (Print and Apply) allows you to:

- Specify the contents to be printed on a microplate label.
- Print the specified contents on a label.
- Apply the label to a labware.

Task is available for	Task is available in
Microplate Labeler	Main Protocol

Requirements

Before adding the Print and Apply task, make sure you complete the following:

Step	For this task	See
1	Set up the Microplate Labeler.	"Setting up the Microplate Labeler" on page 318
2	Specify the label format.	"Specifying the label format" on page 319
3	<i>Optional</i> . Create barcode data files.	"Creating barcode data files" on page 319
4	Select the option to lower the plate stage when labeling.	"Lowering the plate stage" on page 320
5	<i>Optional.</i> Specify the label location on labware for barcode reading.	"Specifying label location for barcode reading" on page 321

Setting up the Microplate Labeler

For instructions on how to set up the Microplate Labeler (installing the device, adding the device in the VWorks software, creating a profile for the device in diagnostics, and so on), see the *Microplate Labeler User Guide*.

Specifying the label format

In Microplate Labeler Diagnostics, you specify the label format (label design). The format you specify includes the following:

- Number of fields to be printed (up to six are permitted)
- Type of content to be populated in a field (human-readable text or barcode)
- Font type of the human-readable text, or symbology of the barcode
- Position (coordinates) of the information on the label
- Field attributes, such as field size
- Position (coordinates) of the information on the label

For instructions, see the Microplate Labeler User Guide.

After you specify the label format, you can use the Print and Apply task to specify the content that will populate each field. When you run the protocol that contains the Print and Apply task, the software substitutes the data (label content) for the text and barcode fields in the label format, and then prints the label.

Creating barcode data files

The Print and Apply task provides many methods to create barcode label contents. Two of the methods require the use of barcode data files:

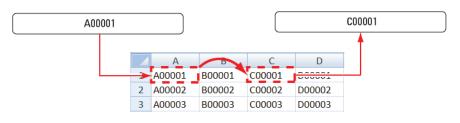
• The software reads data from the data file and prints that data on the label.

Note: You specify the row and column number of the starting value when you set the Print and Apply task parameter. For instructions, see "Setting the task parameters" on page 323.



• The software reads the barcode on one side of a labware, looks up the barcode (key) in the data file, locates the data found in another column (value), and prints and applies the new label to the same side. The primary use of this function is for label replacement.

Note: You specify the key and value columns when you set the Print and Apply task parameter. For instructions, see "Setting the task parameters" on page 323.



Barcode data files must meet the following requirements:

- Be a comma-delimited text file with the .csv file name extension
- Optional. Contain a header, which can be in any format.
- Contain at least one column. For example, the file can contain four columns, each representing a side of the microplate.

The following example shows a data file displayed in Excel. The file contains four columns, each representing a side of the microplate. In addition, the file contains a header in row 1.

	А	В	С	D
1	North	South	East	West
2	A00001	B00001	C00001	D00001
3	A00002	B00002	C00002	D00002
4	A00003	B00003	C00003	D00003
5				

The data file can be stored anywhere on the computer that runs the VWorks software.

If you plan to use data files, make sure the files meet the requirements described in this section. In addition, make sure you select the correct data file when setting the Print and Apply task parameters. See "Setting the task parameters" on page 323.

Lowering the plate stage

The Microplate Labeler plate stage has two vertical positions, top and bottom, which are used to accommodate two different sized microplates. By default, the system uses the top position during a protocol run. If the labware has a tall skirt (1) or has a raised surface on the sides (2), you can specify that the Microplate Labeler use the bottom position (or lower the stage) during the run so that the label can be applied above the skirt or raised surface.



IMPORTANT Always perform a dry run to verify that the positions are correct for the labware you are processing.

Note: The two vertical plate stage positions are set mechanically. To adjust the positions, see the *Microplate Labeler User Guide* for instructions.

To lower the Microplate Labeler plate stage during a run:

- 1 Open the Labware Editor, and then click the Plate Properties tab.
- 2 Select the labware from the list on the left of the dialog box.
- **3** In the Plate Handling area, select Lower plate at Microplate Labeler.

Robot gripper offset (mm)	6.50000	Lower plate at Microplate Labeler
Thickness (mm)	14.20000	Can mount
Stacking thickness (mm)	13.00000	Can be mounted
Shim/nesting thickness	0.00000	- Maximum Robot Handling Speed
Can be sealed?		O Slow
Sealed thickness (mm)	14.20000	O Medium
Sealed stacking thickness (mm)	13.00000	Fast
Can have lid?		Miscellaneous
Lidded thickness (mm)	16.20000	Length of filter 0.00000 tip/pin tool
Lidded stacking thickness (mm)	16.10000	Requires insert
Lid resting height (mm)	11.60000	None
Lid departure height (mm)	9.10000	

Specifying label location for barcode reading

If you plan to use a barcode reader at the Microplate Labeler, you must specify the location of the barcode label on the labware so that the system will know which side to scan during the run.

You specify the barcode label location when you set the plate parameters. For more information, see "Setting plate parameters" on page 46.

Task Parameters	4
Task Parameters	(*)
21	
Plate identity	
Plate name:	Source
Plate type:	384 Greiner 781101 PS cir fit btm
Plates have lids:	F
Plates enter the system sealed:	
Process control	
Simultaneous plates:	1
Use single instance of plate:	
Automatically update labware:	
Enable timed release:	
Release time:	0:00:30
Barcode information	
Barcode filename:	No Selection
Has header:	
Barcode or header South:	No Selection
Barcode or header West:	No Selection
Barcode or header North:	No Selection
Barcode or header East:	No Selection
A discount of the state of the	
Advanced Settings	۲

If you plan to scan a new label after it is applied, you must also select the Verify barcodes after Print and Apply option in the Microplate Labeler Diagnostics Profiles tab. For more information, see the *Microplate Labeler User Guide*.

Selecting devices for the task

After adding the Print and Apply task, you must select a device for the task before you can set the task parameters. If you have multiple devices of the same type, you can:

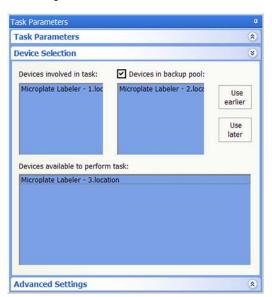
- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the primary list. However, if all of the devices in the primary list are in an error state, the software will automatically use the device in the backup pool.

IMPORTANT The multiple devices must be configured and set up identically. All formats must be identical across the multiple devices. This includes the format names, field names, and definitions.

After adding the Print and Apply task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- 1 Double-click the desired device in the **Devices available to perform task** area to move it to the **Devices involved in task** area. If you have multiple devices of the same type, you can move them to the **Devices involved in task** area.
- 2 If you have multiple devices in the **Devices involved in task** area, select a device, and then click **Use earlier** or **Use later** to prioritize it.
- **3** *Optional.* Select backup devices to use in case all of the devices in the **Devices involved in task** area encounter an error.
 - a Select Devices in backup pool.
 - **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.
 - **c** If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.



Setting the task parameters

IMPORTANT Make sure the label formats are uploaded to the printer. Be sure to initialize the Microplate Labeler device before you set the task parameters.

After selecting the device to use for the Print and Apply task, you can set the parameters in the **Task Parameters** area. The area lists the four sides of a microplate (south, west, north, and east). For each side, you can select a label format and specify the data that will substitute for the text and barcode fields in the label format.

CAUTION Format selection and field information are saved with the protocol. If the formats on the printer are changed, initializing the device will overwrite the information in the protocol. For example, suppose you created a protocol and selected a format called MyFormat. Later, MyFormat was deleted from the printer. The next time you initialize the device and open the protocol, MyFormat will not appear in the protocol.

To set the task parameters:

1 For the side on which the barcode label will be applied, select the barcode format in the **Format** list:

Task Parameters		*
21		
South		
Format:	None	-
🗆 West	Variable	-
Format:	None	1
🗉 North	Use from South	
Format:	Use from West	
🛛 East	Use from North	
Format:	Use from East	
	2	
	3	
	5	
Format:	6	
Earmat	7	
Device Selection	8	
Advanced Settings	9 10	

Format selection	Description
None	Indicates no label will be applied.

Format selection	Description			
Use from <i><side></side></i>	Uses the format from another side of the microplate to print a new label and apply it to the selected side.			
	For example, suppose you have already selected a format and specified the label contents for the South side. You want to use the same format and contents on the West side without having to reselect and respecify the same information. Then in the West Format list, select Use from South.			
	Task Parameters			
	Task Parameters 😵			
	21			
	South			
	Format: 3			
	1: [DATE:0][TIME:0][COUNTER:0:1:2:1:0]			
	2: [FILE:C:\VWorks Workspace\Barcode data files\			
	□ West			
	Format: Use from South			
	North			
	Format: None			
	🗉 East			
	Format: None			
Format name or number	Uses a format that was set up in Microplate Labeler Diagnostics.			
	<i>Note:</i> If you do not see a list of formats, make sure the label formats are not empty (formats must contain at least one field), the formats are uploaded to the printer, and the Microplate Labeler device is initialized.			

As soon as you select a format, fields appear in the Task Parameters area. You can specify the information you want to print in these fields.

Note: The number of fields that appear depends on the format you select.

Task Parameters		
Task Parameters		۲
11 21		
🗉 South		
Format:	MyFormat1	
1:		
2:		
3:		
4:		
5:		
6:		
🛛 West		
Format:	None	
🗆 North		
1.		
Device Selection		۲
Advanced Settings		۲

2 Click a field, and then click the <u>button</u> button that appears. The Field Composer dialog box opens.

The Field Composer allows you to specify the information to print on the barcode label. For example, you can print the current date and time.

Field Composer	factor and the second se	X
Tools	Field Value	
	- Properties-	
第 百 日		
8		
Τ		
080422		
	ОК	Cancel

3 In the **Tools** area, double-click one or more of the following icons to specify the information to be printed on the barcode label. The selected icon appears in the **Field Value** area.

IMPORTANT For field limitations, such as the maximum number of characters permitted or symbology-dependent limitations, check the format you set up in Microplate Labeler Diagnostics. See also the *Microplate Labeler User Guide*.

8 Setting parameters for microplate-handling tasks

Print and Apply

lcon	Description
	Prints the current date. Click the icon in the Field Value area. In the Properties area, select the desired date format. YYYY is the year, MM is the month, and DD is the day. <i>Note:</i> The Use System Format option uses the local computer's date format.
	Use System Format YYYY/MM/DD DD/MM/YYY MM/DD/YYY YY/MM/DD DD/MM/YY MM/DD/YY
Ø	Prints the current time. Click the icon in the Field Value area. In the Properties area, select the desired data format: 12 hours (AM/PM) or 24 hours.
티려꽃	Prints a numeric or alphanumeric value that can be
	 incremented. Click the icon in the Field Value area. Set the following in the Properties area: Character Set. The option to use either numeric or alphanumeric characters. Start at. The starting value. Increment by. The amount by which the value increments. Total number of digits. The total number of digits or characters, including leading 0s. Increment every N plates. The increment value. For example, 1 increments the value every microplate.
	Counter Start at: 0 Character Set Increment by: 1 Increment (0-9) Alphanumeric (0-Z) Total number of digits: 2 Increment every N plates: 1

lcon	Description
<u>0</u> _	Looks up a value (key) in the specified barcode data

Looks up a value (key) in the specified barcode data file and prints the corresponding value found in the file.

Click the icon in the Field Value area. In the Properties

area, click the button to select the barcode data file. Specify the column number that contains the lookup value (key) and the column number that contains the values you want to print.

For example, Key col is set at 1, and Value col is set at 3. During the run, an A00001 barcode is scanned. The software looks up A00001 in the specified file, and prints the barcode, C00001, found in the third column.

E E	rom File —						
N	latch existi	ng barco	de at key	y and use ne	w value fro	om the sa	ame row.
(C:\VWorks	Workspa	ace\Barco	ode data file	s\BarcodeD	ataFile.c	
	Key col:	1		Value	col: 3		
			_		-		
	A			с	_ [)	
1	A0000	1 80	B 00001	C C00001	D000		

3 A00003 B00003 C00003 D00003



Prints the values in the specified barcode input file.

Click the icon in the **Field Value** area. In the **Properties** area, click the <u>inc</u> button to select the input file. Specify the row and column number of the starting value. During the run, the software automatically increments to the next row to print the next value.

For example, Start at row is set at 2, Start at col is set at 3. During the run, the software starts with the value in row 2 column 3 (C00002). Then, the software moves to row 3 column 3 (C00003), row 4 column 3 (C00004), row 5 column 3 (C00005), and so on.

	om File - Start	at K/C and Ir	hcrement row-			
			code data files	\BarcodeDataF	ile.csv	
3	Start at row:	2	Start a	t 3		
	Α	В	С	D		
1	A A00001	B B00001	C C00001	D D00001		
12			C00001			
-	A00001	B00001	C00001	D00001		
2	A00001 A00002	B00001 B00002	C00001 C00002	D00001 D00002		

8 Setting parameters for microplate-handling tasks

Print and Apply

lcon	Description
т	Prints the text you specify.
l	Click the icon in the Field Value area. In the Prop area, type the text you want to print on every microplate.
	Static Text
080422	Copies the barcode data from an existing label the selected side to print a new label.
	<i>Note:</i> You can only copy barcode data from an label. You cannot copy human-readable text.
	Click the icon in the Field Value area. In the Prop area, select the side (barcode) to be copied.
	label on the west side. You want to copy the ba data from the west-side label to print a new la and apply the new label to the south side. In Task Parameters area, you specify that the sou side of the labware will be labeled. In the Field
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
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	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.
	Composer dialog box, you specify Use barcode processing plate, and select West.

- **4** When you are finished, click **OK**. The information you specified appears in the Task Parameters area.
- **5** Repeat the procedure if you want to print labels on other sides of the microplate.

Example 1: Copy label contents from one side of the microplate and print and apply to a new side

Goal

For each incoming microplate, scan the label on the east side of the microplate, print the same contents on a new label, and apply the new label to the north side of the microplate.

Implementation

Note: This example assumes that the Microplate Labeler is set up correctly and the format, MyFormat, is already defined and loaded to the printer. MyFormat contains two fields. Field 1 is a human-readable text field. Field 2 is a barcode field. The device file and protocol are correctly created.

When setting the plate parameters, select **Barcode or header East** in the **Barcode information** area so the system knows to scan the east side of the incoming microplates. No barcode verification file will be used, so select **Barcode not in file**.

🕙 Example1DeviceFile.dev 🛛 👻 Example1Protocol.pro *		• :
Startup Protocol	۲	Task Parameters
Main Protocol	۲	Task Parameters *
Plate_1 (384		21
Costar 3657	5	Plate identity
PP Sqr well rnd btm) Plate_1 (384 Downstack Place plate at Print and Upsta		Plate name: Plate_1
Costar 3657 from Stacker Microplate Apply to Stacker - PP Sgr well - 1.Stacker Labeler - 1 Microplate 2.Stacker		Plate type: 384 Costar 3657 PP Sqr well rnd
rnd btm) location Labeler -		Plates have lids:
Remove 1.location		Plates enter the system sealed:
Add Process		Process control
Add Flocess		Simultaneous plates: 1
Configure		Use single instance of plate:
Labware		Automatically update labware:
I		Enable timed release:
1		Release time: 0:00:30
1		Barcode information
1		Barcode filename: No Selection
		Has header:
		Barcode or header South: No Selection
		Barcode or header West: No Selection
		Barcode or header North: No Selection
		Barcode or header East: Barcode not in file
Cleanup Protocol	۲	Barcode or header East: Which column to use for this plate.
Protocol Options	۲	Advanced Settings

When setting the Print and Apply task parameter, select MyFormat for the side you want to label: North.

🕙 Example1DeviceFile.dev 🛛 🐮 Example1Protocol.pro *	₹ ×
Startup Protocol 🔹	Task Parameters a
Main Protocol 🔹	Task Parameters 😵
 Plate_1(384 Costar 3657 PP Sqr well md btm) Plate_1(384 Downstack Place plate at Costar 3657 PD Sqr well PP Sqr well md btm) Plate_1(384 Downstack Place plate at Costar 3657 PP Sqr well -1.Stacker Plate_1(384 Downstack Place plate at Labeler - 1 Add Process Configure Labware 	South Format: None West Format: None North Format: MyFormat 1: [BARCODE:3] 2: [BARCODE:3] East Format: None
Cleanup Protocol 🎗	Device Selection (*)
Protocol Options 🛞	Advanced Settings

For each of the two format fields (1 and 2), open the Field Composer dialog box and double-click the barcode icon in the **Tools** area to add it to the Field Value area. Because you want to copy the barcode information from the east side of the microplate, select **East** from the **Side** list.

eld Compose		
Tools	Field Value	
	080422	
\bigotimes	Properties-	
-	Use barcode from processing plate:	
불리역	Side. Edst.	
C		
-		
Τ		
080422		
060422		
000422		
000422		

Example 2: Use a barcode data file to print and apply labels

Goal

For each incoming microplate, scan the label on the east side of the microplate, locate the information (key) in the first column in the data file, print the corresponding information (value) from the third column in the file on a new label, and apply the new label to the same (east) side of the microplate.

Implementation

Note: This example assumes that the Microplate Labeler is set up correctly and the format, MyFormat, is already defined and loaded to the printer. MyFormat contains two fields. Field 1 is a human-readable text field. Field 2 is a barcode field. The barcode data file is stored in C:\VWorks Workspace\Barcode data files. The device file and protocol are correctly created.

When setting the plate parameters, select **Barcode or header East** in the **Barcode information** area so the system knows to scan the east side of the incoming microplates. No barcode verification file will be used, so select **Barcode not in file**.

Startup Protocol	۲	Task Parameters	
Main Protocol	۲	Task Parameters	*
Plate_1 (384		21	
Costar 3657		Plate identity	
PP Sqr well rnd btm) Plate_1 (384 Downstack Place plate at Print and Upstac		Plate name:	Plate_1
Costar 3657 from Stacker Microplate Apply to Stack PP Sgr well - 1.Stacker Labeler - 1 Microplate 2.Stack		Plate type:	384 Costar 3657 PP Sqr well m
rnd btm) location Labeler -		Plates have lids:	
Remove 1.location		Plates enter the system sealed:	
Add Process		Process control	
Add Process		Simultaneous plates:	1
Configure		Use single instance of plate:	
Labware		Automatically update labware:	Γ
I		Enable timed release:	Г
		Release time:	0:00:30
		Barcode information	
		Barcode filename:	No Selection
		Has header:	Г
		Barcode or header South:	No Selection
		Barcode or header West:	No Selection
		Barcode or header North:	No Selection
		Barcode or header East:	Barcode not in file
		Barcode or header East:	
Cleanup Protocol	۲	Which column to use for this plat	te.
Protocol Options	*	Advanced Settings	6

When setting the Print and Apply task parameter, select MyFormat for the same side: **East**.

Example1DeviceFile.dev 🗷 Example1Protocol.pro *			₹ X
Startup Protocol	۲	Task Parameters	
Main Protocol	(*)	Task Parameters	۲
PP Sqr well rnd btm) Plate_1 (384 Downstack Place plate at Print and Upst Costar 3657 from Stacker Microplate Apply to Stac	ack to cker - acker	South Format: None Vest Format: None Format: None East Format: I:	-
Cleanup Protocol	۲	Device Selection	۲
Protocol Options	۲	Advanced Settings	*

For each of the two format fields, open the Field Composer dialog box and double-click the key-file icon in the **Tools** area to add it to the Field Value area. In the **From File** area, locate and select the data file to use. In the **Key col** box, type 1. In the **Value col** box, type 3.

Field Composer		
Field Composer Tools	Field Value Properties From File Match existing barcode at key and use new value from the same row. [C:\VWorks Workspace\Barcode data files\BarcodeDataFile.c Key col: 1 Value col: 3	
080422	OK Cancel	

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Microplate Labeler User Guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Barcode data file and barcode input file	"Tracking barcodes" on page 74
Rotate Stage (Microplate Labeler) task	"Rotate Stage (Microplate Labeler)" on page 341
Writing JavaScript for the Print and Apply task	"Using JavaScript with the CentrifugeAuto task" on page 108
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Relid

Description

The Relid task (Relid) places lids on the microplates using a device such as the Bravo Pipettor or a Lid Hotel Station.

Task is available for	Task is available in
BenchCel Workstation	Startup Protocol
	Main Protocol
	Cleanup Protocol
Bravo Platform	Startup Protocol
	Main Protocol
	Cleanup Protocol

Task is available for	Task is available in
Lid Hotel Station	Startup Protocol
	Main Protocol
	Cleanup Protocol

Task Parameters

Bravo Platform

When relidding microplates on the Bravo Platform, you add the Relid task within the Bravo Subprocess. After adding the Relid task at the desired point in the Bravo Subprocess, select the microplate you want to relid in the Task Parameters area, as the following example shows.

ask Parameters		9
Task Parameters		۲
21		
Delid properties		
Plate:	Source Plate (96 Costar 378	881 -
Plate:		
Plate to use		
Advanced Settings		(*

Parameter	Description
Plate	The microplate that will be relidded.

Lid Hotel Station

The Relid task does not have task parameters when using the Lid Hotel Station.

Device selection

You do not need to select a device for the Relid task. The system automatically uses the correct device to relid the microplates.

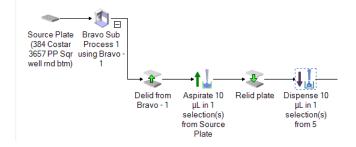
Example: Delid and relid microplates

Goal

On the Bravo Platform, remove a lid from the Source Plate for an Aspirate task. After the task is finished, relid the microplate.

Implementation

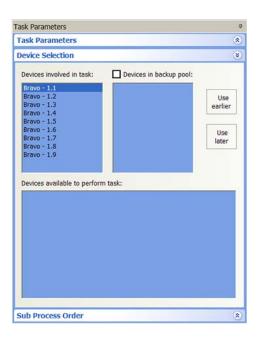
Within the Bravo Subprocess, add a Delid task before the Aspirate task to remove the lid. Add a Relid task after the Aspirate task to place the lid back on the microplate.



The task parameters for the Delid and Relid tasks are:

Task Parameters	¢.	Fask Parameters	9
Task Parameters	*	Task Parameters	*
1 21		21	
Delid properties		Relid properties	
Plate:	Source Plate (96 Costar 3788 -	Plate:	Source Plate (96 Costar 3788 🝷

The device selection for the Delid task is as follows. Note that you do not need to select a device for the Relid task.



Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Delid task	"Delid" on page 296
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Reserve Location

Description

The Reserve Location task (\blacksquare Reserve Location) reserves a location on the Bravo Platform for a specified length of time. The task is typically used to incubate a microplate at that location.

Note:

- To incubate labware on a platepad or in a Plate Hotel in a system, use the Incubate task.
- To incubate a labware in a storage device such as a Plate Hub Carousel or the LiConic StoreX incubator, use the Storage Incubate task.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

Task parameters

After adding the Reserve Location task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Fask Parameters	8
21	
Reserve Location properties	
Location to use, plate:	Source Plate (384 Costa 🕶
Location to use, location:	5
Reservation time:	0:03:00

Parameter	Description
Location to use, plate	The labware that will be placed at the specified location during the reservation period.
Location to use, location	The location that you want to reserve.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task.</auto-select>
Reservation time	The length of time that the location is reserved. The time starts when the desired labware arrives at the location.

Example: Reserving a deck location for incubation

Goal

Aspirate contents from two source microplates and dispense into a destination microplate. Incubate the destination microplate at Bravo deck location 5 for 2 minutes before reading the microplate.

Implementation

In the protocol, add a Reserve Location task after the liquid-handling tasks.

Startup Protoco	bl										(*
Main Protocol											*
Destination (384 Costar 3657 PP Sqr well rnd btm)	Destination (384 Costar 3657 PP Sqr well rnd btm)	Downstack from BenchCel - 1.Stacker 1	Bravo SubProcess 19 using Bravo - 1	Run the protocol file	Upstack to BenchCel - 1.Stacker 2 Aspirate 10 µL in 1 selection(s) from Source 1	Dispense 10 µL in 1 selection(s) to Destination	Aspirate 10 µL in 1 selection(s) from Source 2	Dispense 10 µL in 1 selection(s) to Destination	Tips Off in 1 selection(s) from Tips	Reserve a location on a device	
+ Source 1 (384 0											_
* Source 2 (384 C			V Btm)								-
Tips (384 V11 S	ST50 Tip Box 068	81.002)									
<										>	

The task parameters for the Reserve Location task are shown in the following example.

Task Parameters	4
Task Parameters	(*)
21	
Reserve Location Prope	rties
Location to use, plate:	Destination (384 Costar 3657 PP Sqr v
Location to use, location:	5
Reservation time:	0:02:00
Advanced Settings	

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53

For information about	See
Incubate task	"Incubate" on page 303
Storage Incubate task	"Storage Incubate" on page 373
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Rotate Stage (Rotator)

Description

The Rotate Stage task (Rotate Stage (Rotator)) rotates the stage on the Rotator device by 180°. You can use the task to change the orientation of microplates before they are placed in devices that require the rotated orientation.

Task is available for	Task is available in
Rotator	Main Protocol

Task parameters

The Rotate Stage (Rotator) task does not have task parameters.

Device selection

You must select a device for Rotate Stage (Rotator) tasks. If you have multiple devices of the same type, you can:

- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the list. However, if all of the devices in the list are in an error state, the software will automatically use the device in the backup pool.

IMPORTANT The multiple devices must have the same setup and configuration.

After adding the Rotate Stage (Rotator) task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- **1** Double-click a device in the **Devices available to perform task** area to add it to the **Devices involved in task** area.
- 2 To prioritize its use, select the device in the **Devices involved in task** area, and then click **User earlier** or **Use later**. The devices (deck locations) that are higher in the list are favored by the software scheduler during the protocol run.
- **3** *Optional.* Select backup devices to use in case all of the devices in the **Devices involved in task** area encounter an error.
 - **a** Select **Devices in backup pool**.
 - **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.
 - **c** If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.

evice Selection		*
Devices involved in task:	Devices in backup pool:	
Rotator - 1.Stage		Use earlier
		Use later

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53

For information about	See
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Rotate Stage (Microplate Labeler)

Description

The Rotate Stage (Microplate Labeler) task (**P**Rotate Stage (Microplate Labeler)) rotates the Microplate Labeler stage 180°. You use this task to change the orientation of microplates in preparation for label applications.

Task is available for	Task is available in
Microplate Labeler	Main Protocol

Task parameters

The Rotate Stage (Microplate Labeler) task does not have task parameters.

Device selection

You must select a device for Rotate Stage (Microplate Labeler) tasks. If you have multiple devices of the same type, you can:

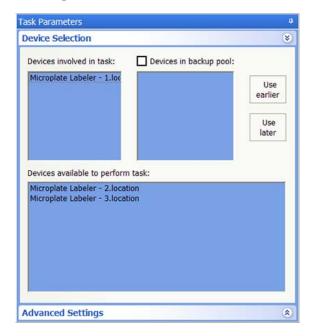
- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the list. However, if all of the devices in the list are in an error state, the software will automatically use the device in the backup pool.

IMPORTANT The multiple devices must have the same setup and configuration.

After adding the Rotate Stage (Microplate Labeler) task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- **1** Double-click a device in the **Devices available to perform task** area to add it to the **Devices involved in task** area.
- 2 To prioritize its use, select the device in the **Devices involved in task** area, and then click **User earlier** or **Use later**. The devices (deck locations) that are higher in the list are favored by the software scheduler during the protocol run.
- **3** *Optional.* Select backup devices to use in case all of the devices in the **Devices involved in task** area encounter an error.
 - **a** Select **Devices in backup pool.**
 - **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.
 - **c** If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.



Related information

For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Print and Apply task	"Print and Apply" on page 318	

For information about	See
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Seal (PlateLoc)

Description

The Seal (PlateLoc) task ($\int Seal (PlateLoc)$) seals microplates using the PlateLoc Sealer.

Note:

- If you require different sealing temperatures to accommodate different microplate types, Agilent Technologies recommends that you use a different PlateLoc Sealer for each sealing temperature. Using different PlateLoc Sealers that have dedicated temperature settings prevents time lost as the device heats or cools between microplate types.
- The PlateLoc Sealer immediately starts adjusting to the **Startup seal temp** defined in its profile when the profile is initialized. Initialization occurs when the protocol is first run or when you click **Initialize this profile** in the diagnostics dialog box.

Task is available for	Task is available in
PlateLoc Sealer	Main Protocol

Task parameters

After adding the Seal (PlateLoc) task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Seal (PlateLoc)

Seal time		The length of time the hot plate is in contact with the seal material and the microplate.
Parameter		Description
Seal temperature (20 - 235 °C):	170	
Seal time (0.5 - 12 s):	1.2	
Seal (PlateLoc) properties		
21		
		*
Task Parameters		

Device selection

You must select a device for Seal (PlateLoc) tasks. If you have multiple devices of the same type, you can:

seal cycle starts.

- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the list. However, if all of the devices in the list are in an error state, the software will automatically use the device in the backup pool.

IMPORTANT The multiple devices must have the same setup and configuration.

After adding the Seal (PlateLoc) task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- **1** Double-click a device in the **Devices available to perform task** area to add it to the **Devices involved in task** area.
- **2** To prioritize its use, select the device in the **Devices involved in task** area, and then click **User earlier** or **Use later**. The devices that are higher in the list are favored by the software scheduler during the protocol run.
- **3** *Optional.* Select backup devices to use in case all of the devices in the **Devices involved in task** area encounter an error.
 - a Select Devices in backup pool.
 - **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.

c If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.

	(
Devices in backup pool:	
	Use earlier
	Use later
II 1034.	
	Devices in backup pool:

Example

Goal

Downstack microplates from a stacking device for liquid-handling tasks on the Vertical Pipetting Station, seal them, and then upstack them to any available stacker.

Implementation

Add a Seal (PlateLoc) task after the Vertical Pipetting Station Subprocess.

Main Protocol					۲
 Destination (384 Costar 3657 PP Sqr well md btm) Remove 	Downstack from Stacker - 1.Stacker	Liquid handling subprocess using Vertical Pipetting Station - 1	Seal a plate	Upstack to Dynamicall	

Related information

For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Downstack task	"Mount" on page 307	
Upstack task	"Upstack" on page 382	

For information about	See
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

Waste

Description

The Waste task (\bigcirc Waste) moves a lid or labware into the waste bin. For example, you can use the Waste task to discard a filter microplate after the Centrifuge task is finished.

Task is available for	Task is available in
Waste Bin	Main Protocol

Task parameters

Task Parameters

After adding the Waste task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

₩ 21 ■ Waste properties		
Device to use: Location to use:	WasteBin - 1 Hole	
Parameter	Description	
Parameter Device to use		bin device you want to use for

4

Example: Discard filter microplates after filtering process

Goal

Downstack a reservoir (collection microplate) from a Labware Stacker device and place it on a platepad. Downstack a filter microplate from another Labware Stacker device and place it on top of the collection microplate. The assembly (filter microplate with collection microplate) is centrifuged. Remove the filter microplate from the collection microplate and discard it in the waste bin. Upstack the collection microplate containing the elution for future processing.

Implementation

Create one process for the collection microplate (Collection Plate) and another process for the filter microplate (Filter Plate). See "Example: Dismount a filter microplate from a collection microplate" on page 301 for details about the Mount, Dismount, and Wait For tasks.

In the Filter Plate process, add a Waste task after the Wait For task. The Waste task discards the filter microplate after the Centrifuge task is finished.

Main Protocol						(
Filter Plate (Wonder Filter)	Filter Plate (Wonder Filter)	Downstack from Stacker - 1.Stacker	Wait for Filter Plate	Discard plate at WasteBin - 1 Hole		
 Collection Plate (Acme) 	Collection	→	Mount Wait	• ⊕ Spin using	Dismount	Upstack to
Remove	Plate (Acme)	from Stacker - 2.Stacker	for Filter Plate	Centrifuge - 1	Distributit	Dynamicall

For information about	See	
Adding devices	• "Adding devices" on page 25	
	• Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Downstack task	"Mount" on page 307	
Upstack task	"Upstack" on page 382	
Mount task	"Mount" on page 307	
Dismount task	"Dismount" on page 301	
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277	
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349	
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387	

For information about	See
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269



VWorks Automation Control User Guide

9 Setting parameters for microplate storage tasks

This chapter contains the following topics:

- "Check First Plate Orientation (Stacker)" on page 350
- "clearInventory" on page 352
- "Downstack" on page 354
- "exportDatabase" on page 358
- "importCsvToInventory" on page 360
- "Load" on page 362
- "Reorder" on page 367
- "Scan Stack" on page 371
- "Storage Incubate" on page 373
- "Unload" on page 376
- "Upstack" on page 382





Check First Plate Orientation (Stacker)

Description

The Check First Plate Orientation (Stacker) task (Check First Plate Orientation (Stacker)) performs an orientation check on the first microplate in the specified stack. The task is primarily used in the Startup Protocol to ensure the correct loading of labware before a run starts. The task is especially useful if the labware is in a controlled-environment system and should not be taken out of the environment without operator assistance.

Note: If you want to check orientation of every microplate in the stack during the run, use the Check orientation option in the Labware Editor.

Task is available for	Task is available in
Labware Stacker (Stacker)	Startup Protocol Cleanup Protocol

Task parameters

The Check First Plate Orientation task does not have any task parameters.

Device selection

You must select the device for the Check First Plate Orientation task. After adding the Check First Plate Orientation task at the desired point in the Startup Protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

Double-click the desired device in the **Devices available to perform task** area to move it to the **Devices involved in task** area.

ask Parameters	4
Device Selection	۲
Devices involved in task:	
Stacker - 1.Stacker	
Devices available to perform task: Stacker - 2.Stacker Stacker - 3.Stacker	

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Process plate properties	"Setting plate parameters" on page 46
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

clearInventory

Description

The clearInventory task (is clearinventory) deletes all labware data from the inventory database. Use this task to clear the inventory at the desired point in the protocol.

If you want to automatically clear the inventory every time the run starts, select **Clear inventory** in Protocol Options. See "Setting protocol options" on page 30.

Task is available in	
Startup Protocol	
Main Protocol	
Cleanup Protocol	
	Startup Protocol Main Protocol

Task parameters

After adding the clearInventory task at the desired point in the protocol, set the following **Task Parameters**:

ask Parameters		
Task Parameters		۲
21		
Task Description	_	
Task number:	1	
Task description:	JS clearInventory	
Use default task description	1	

Parameter	Description
Task number	The number that indicates the position of the task in the protocol.
Task description	The description of the task.

Parameter	Description
Use default task description	The option to use the default task description or provide your own description for the task.
	Select the check box to use the default description. Clear the check box to provide your own description.

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Process plate properties	"Setting plate parameters" on page 46
exportDatabase task	"exportDatabase" on page 358
importCsvToInventory task	"importCsvToInventory" on page 360
Load task	"Load" on page 362
Unload task	"Unload" on page 376
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

9 Setting parameters for microplate storage tasks Downstack

Downstack

Description

The Downstack task (Downstack) moves labware as follows:

- Out of the bottom of stacking devices such as the Labware Stacker or BenchCel Workstation
- Out of the top of a stack of labware at a Bravo deck location or the Perkin Elmer PlateStaks

Labware Stacker or BenchCel Workstation Bravo Platform or PlateStaks



For example, you can use the Downstack task to move microplates out of the Stacker and onto a platepad.

You can use a single Downstack task to move labware out of multiple stacking devices. For example, after all the microplates are moved out of one stacker, the Downstack task can continue at a second stacking device.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
BenchCel Workstation	Main Protocol
Stacker	Main Protocol
Perkin Elmer PlateStaks	Main Protocol

Requirements

Bravo Platform

To use the Downstack task in a Bravo Subprocess, you must:

- Specify the maximum stack height in the Bravo deck location properties area.
- Add a Scan Stack task for each Downstack task.

BenchCel Workstation

The software always determines a location for a labware before it is downstacked from the BenchCel stacker. If you add a subprocess immediately after a Downstack task, the system will downstack the labware and place it at the location where the first subprocess task will be performed. If you want to quarantine microplates with the wrong orientation immediately after they are downstacked from a BenchCel stacker, add a Place Plate task immediately after the Downstack task. Doing so ensures that the labware will be quarantined before proceeding to downstream tasks.

For information on how to set up quarantine criteria, see "Setting up automated error responses" on page 654.

Task parameters

After adding the Downstack task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	4
Task Parameters	۲
<u>:</u> 2↓	
Downstack properties	
Free empty stackers:	
Parameter	Descripti

Free empty stackers	The option to allow this stacker, when emptied, to become available for Upstack or Reorder tasks.

Device selection

You must select a device for Downstack tasks. If you have multiple devices of the same type, you can prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.

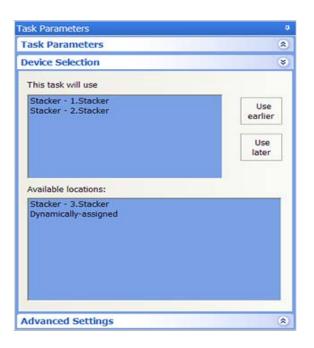
IMPORTANT The multiple devices must have the same setup and configuration.

After adding the Downstack task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- 1 Double-click a device or deck location in the **Devices available to perform task** area to add it to the **Devices involved in task** area.
- **2** To prioritize its use, select the device in the **Devices involved in task** area, and then click **User earlier** or **Use later**. The devices that are higher in the list are favored by the software scheduler during the protocol run.

Downstack



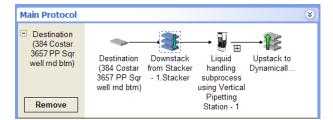
Example: Downstack microplates from Labware Stacker

Goal

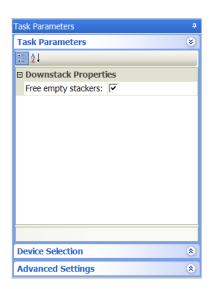
Downstack the Destination Plate from Stacker 1 for liquid-handling tasks at the Vertical Pipetting Station. After the stack is emptied, the stack can be used for Upstack and Reorder tasks.

Implementation

Add a Downstack task before the Vertical Pipetting Station Subprocess task that contains the liquid-handling subroutine.



The task parameters and device selections are:



Task Parameters	
Task Parameters	۲
Device Selection	۲
Devices	
Stacker - 1.Stacker	Use earlier
	Use later
Devices available to perform task:	
Stacker - 2.Stacker Stacker - 3.Stacker	
Advanced Settings	۲

For information about	See
Adding devices	• "Adding devices" on page 25
	• Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Scan Stack task	"Scan Stack" on page 371
Upstack task	"Upstack" on page 382
Reorder task	"Reorder" on page 367
Quarantining labware	• "Setting plate parameters" on page 46
	• "Setting up automated error responses" on page 654
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

exportDatabase

Description

The exportDatabase task (SeportDatabase) exports all data in the inventory database to the specified location. You can use this task to create a backup copy of the inventory database at the desired point in the protocol.

Task is available for	Task is available in
Any device	Startup Protocol
	Main Protocol
	Cleanup Protocol

Task parameters

After adding the exportDatabase task at the desired point in the protocol, set the following **Task Parameters**:

Task Parameters Image: C:\VWorks Workspace\Storage E exportDatabase C:\VWorks Workspace\Storage E Task Description C:\VWorks Workspace\Storage	*
exportDatabase File name: C:\VWorks Workspace\Storage	
File name: C:\VWorks Workspace\Storag	
Task Description	torage
Task number: 4	
Task description: JS exportDatabase	
Use default task description: 🔽	

Parameter	Description
File name	The path and name of the exported inventory file.
	Click the browse button to select the location and provide a name for the exported file.
Task number	The number that indicates the position of the task in the protocol.
Task description	The description of the task.

Parameter	Description
Use default task description	The option to use the default task description or provide your own description for the task.
	Select the check box to use the default description. Clear the check box to provide your own description.

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
clearInventory task	"clearInventory" on page 352
importCsvToInventory task	"importCsvToInventory" on page 360
Scan Stack task	"Scan Stack" on page 371
Upstack task	"Upstack" on page 382
Reorder task	"Reorder" on page 367
Quarantining labware	 "Setting plate parameters" on page 46 "Setting up automated error responses" on page 654
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

importCsvToInventory

Description

The importCsvToInventory task (SimportCsvToInventory) imports labware data in the specified CSV file into the inventory database.

Task is available for	Task is available in
Any device	Startup Protocol
	Main Protocol
	Cleanup Protocol

For the list of CSV requirements, see the *VWorks Automation Control Setup* Guide

You can use this task to add a large amount of labware data in the inventory database. For example, in the protocol, you can add a Load task to fill a storage device with labware. If the labware do not have barcodes, or if your system does not have a barcode reader, you can add the importCsvToInventory task to enter the corresponding labware data in the inventory database.

Task parameters

After adding the importCsvToInventory task at the desired point in the protocol, set the following **Task Parameters**:

rage

Parameter	Description
File name	The path and name of the CSV file.
	Click the browse button to locate and select the CSV file.
Overwrite inventory	The option to replace the existing entry in the database with the data in the CSV file.
Task number	The number that indicates the position of the task in the protocol.
Task description	The description of the task.
Use default task description	The option to use the default task description or provide your own description for the task.
	Select the check box to use the default description. Clear the check box to provide your own description.

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
clearInventory task	"clearInventory" on page 352
exportDatabase task	"exportDatabase" on page 358
Scan Stack task	"Scan Stack" on page 371
Upstack task	"Upstack" on page 382
Reorder task	"Reorder" on page 367
Quarantining labware	 "Setting plate parameters" on page 46 "Setting up automated error responses" on page 654
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Load

Description

The Load task (I load) instructs a robot to move a defined set of labware into a storage device.

Note: If you want to move a defined set of labware from one storage device to another, use the Unload task and Load task in sequence. For information about the Unload task, see "Unload" on page 376.

Task is available for	Task is available in
Plate Hub Carousel	Main Protocol
Heraeus Cytomat incubator	Main Protocol
LiConic StoreX incubator	Main Protocol

Storage location selections

When you add the Load task, you can select the storage locations in one of the following ways:

- *Native locations.* Native locations are known locations in a device file. For example, if the Plate Hub Carousel is in the device file, you can select a cassette in that carousel for the Load task. When you select a cassette, all 16 slots in the cassette are available for the task. If you have only 10 microplates to load into that cassette, six of the slots will remain empty.
- Location groups. Location groups are device locations that are grouped together. For example, a location group can consist of 21 Plate Hub Carousel slots as follows: cassette 3 (all 16 slots) and cassette 7 slots 1 through 5 only. If you want to load exactly 21 microplates, you can select that particular location group.

Labware loading order

Under some circumstances, the original order of the labware in plate groups might not be maintained during the Load tasks:

- If the **Dynamically assign empty slot to load to storage device** option is selected in the Protocol Options, the software will find an empty slot to load labware if the original slot is occupied.
- The software always unloads the first labware in the plate group. For example, if a plate group contains microplates 1 through 5, microplate 1 is unloaded, then microplate 2, and so on. If microplate 1 is loaded back into the plate group before microplate 2 is unloaded, the software will attempt to unload the first in the sequence, microplate 1.

If keeping the original order of labware is important, do one of the following:

• Select the **Use original locations** option in the Load task parameters. The original storage locations will be reserved and the same labware order is preserved.

• When adding the Unload task preceding a Load task, select the **Remove plates from group when processed** option so that each labware is removed from the plate group (no longer a member of the plate group) as it is unloaded. This ensures that the labware is unloaded in the expected order. For example, a plate group consists of microplates 1 through 5. When microplate 1 is unloaded, it is removed from the plate group, so that microplate 2 becomes the first microplate in the group. If microplate 1 is loaded back into the plate group location before microplate 2 is unloaded, the software will attempt to unload microplate 2 instead of looking for microplate 1.

When adding the Load task, add the labware to the original plate group. If you select the same plate group for the Load task, the labware will be loaded back into the plate group in the correct sequence.

Task parameters

After adding the Load task at the desired point in the protocol, set the following **Task Parameters**:

Task Parameters	9
Task Parameters	8
<u>21</u> 2↓	
Task Description	
Task number:	1
Task description:	Load
Use default task description:	v
Storage Load	۲
Advanced Settings	8

Parameter	Description
Task number	The number that indicates the position of the task in the protocol.
Task description	The description of the task.
Use default task description	The option to use the default task description or provide your own description for the task.
	Select the check box to use the default description. Clear the check box to provide your own description.

Storage Load parameters

After setting the Task Parameters, click $\ensuremath{\textbf{Storage Load}}\xspace$, and set the following parameters:

Fask Parameters	
Task Parameters	۲
Storage Load	۲
Use original locations Native Locations Groups	
Available locations:	
Aglent Plate Hub Carousel - 1 Thermo Cytomat 44 - 1 Ocassette 1 Cassette 2	
- cassette 3 - slot 1 - slot 2 - <u>slot 3</u> - slot 4	
Assigned locations or groups:	
Thermo Cytomat 44 - 1, cassette 3, slot 1 Thermo Cytomat 44 - 1, cassette 3, slot 2 Thermo Cytomat 44 - 1, cassette 3, slot 3	
Number of selected locations: 1 Number of assigned locations: 3	
Advanced Settings	۲

Parameter	Description
Use original locations	The option to move a set of labware back to its original storage location and maintain the original order in storage.
	For example, if a set of microplates were unloaded from Plate Hub A cassette 3, selecting this option in the Load task would move the microplates back to Plate Hub A cassette 3.
Native tab	The tab that allows you to select the storage locations from a list of known locations in the device file.
	Double-click a location in the Available locations area. The selected location appears in the Assigned locations area.

Parameter	Description
Locations tab	The tab that allows you to select locations from a list of location groups. The location groups are created in the Inventory Editor.
	Double-click a location group in the Available locations area. The selected location group appears in the Assigned locations area
	To view or revise existing location groups, click Edit location groups .
Groups tab	The tab that allows you to select a plate group into which you want to add the labware.
	In addition to specifying the storage location during a Load task, you can add the labware to an existing plate group. Plate groups are created in the Inventory Editor.
	Double-click a plate group in the Available groups area. The selected plate group appears in the Assigned locations area.
	To view or revise existing plate groups, click Edit plate groups .

Example: Load microplates into the Plate Hub Carousel after processing

Goal

Load the destination microplates into Plate Hub Carousel cassette 1 after the specified liquid-handling tasks.

Implementation

Add the Load task after the liquid-handling tasks as shown.

 Destination (384 Greiner 781101 PS clr flt btm) 	Destination (384 Greiner	Downstack	→ J – Liquid Handling	Load into
Remove	781101 PS clr fit btm)	- 1.Stacker	using VPrep - 1	device

In the ${\it Storage \, Load}$ area, click the ${\it Native}$ tab. Select cassette 1 in the Plate Hub Carousel to use the cassette.

to de Deve es a trans	
Task Parameters	۲
Storage Load	8
Use original locations	
Native Locations Groups	
Available locations:	
E Aglent Plate Hub Carousel - 1	
Cassette 1	
E- cassette 2	
cassette 3	E
cassette 4	
€ cassette 5	
⊕ cassette 6	
Cassette 8	٠
Assigned locations or groups:	
④ Agilent Plate Hub Carousel - 1, cassette	21
Number of selected locations: 16	
Number of assigned locations: 16	
Advanced Settings	

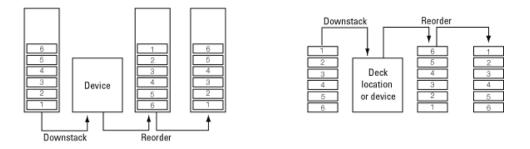
For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Setting up plate locations and plate groups in inventory manager	VWorks Automation Control Setup Guide	
Unload task	"Unload" on page 376	
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349	
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387	
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557	
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269	

Reorder

Description

The Reorder task (**Reorder**) collects and incubates labware in a stack and then reverses the order of the labware in a second stack as shown in the following diagram.

Labware Stacker or BenchCel Workstation Bravo Platform or PlateStaks



You use the Reorder task to:

- Ensure liquid transfers from different source microplates occur in the same order.
- Ensure equal incubation time across all the labware in a stack.
- Minimize evaporation in the labware.

In the example shown, labware is downstacked to a device or deck location where reagents are added. The labware is then upstacked to and incubated in the first of the two reorder stacks. The labware is then moved to a second stack so that the original stack order is maintained. If the labware moves on to a downstream task, the incubation time of the first labware is the same as the last labware to leave the stack. Without the Reorder task, the first labware to move to the next task has the shortest incubation time and the last labware has the longest incubation time.

Task is available for	Task is available in
BenchCel Workstation	Main Protocol
Bravo Platform	Main Protocol, Bravo Subprocess
Stacker	Main Protocol
Perkin Elmer PlateStaks	Main Protocol

Requirements

General

At least two stacking locations are required for the Reorder task. For example, you need at least two Labware Stackers, two BenchCel stacker heads, or two Bravo deck locations.

Bravo Platform

To use the Reorder task in a Bravo Subprocess, you must:

- Select the desired stacking options in the Bravo profile.
- Specify the maximum stack height in the Bravo deck location properties area.
- Add two Scan Stack tasks for each pair of stacking locations used in the task.

PlateStaks

Be sure to add two Scan Stack tasks for each pair of PlateStaks locations.

Task parameters

After adding the Reorder task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters		*
: 1 21		
Reorder Properties		
Plate storage time:	0 Days 00:05:00	
Number of plates to store:	2	

Parameter	Description
Plate storage time	The length of time to incubate the labware in the collection stack.
Number of plates to store	The maximum number of labware allowed in the collection stack for incubation.
	<i>Note:</i> This value can affect the timing of the incubation. For example, if the time taken to move all labware to the first reorder stack is greater than the time specified for the incubation, the first labware cannot be moved to the next task in time. To resolve this problem, reduce the number of labware to store and add more stackers.

Device selection

You must select a device for Reorder tasks. If you have multiple devices of the same type, you can prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.

IMPORTANT The multiple devices must have the same setup and configuration.

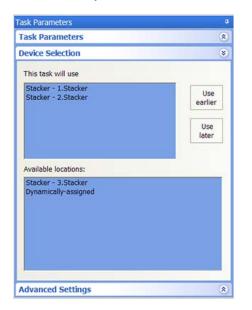
After adding the Reorder task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

1 Double-click a device or deck location in the **Devices available to perform task** area to add it to the **Devices involved in task** area.

Note: If you want the software to dynamically move labware to available stackers, double-click **Dynamically assigned** in the **Devices available to perform task** area. You can check the run log to determine the location of the labware in the various stackers.

2 To prioritize its use, select the device in the **Devices involved in task** area, and then click **User earlier** or **Use later**. The devices that are higher in the list are favored by the software scheduler during the protocol run.



Example: Reorder microplates before reading them

Goal

Aspirate contents from two source microplates, dispense into a destination microplate. Incubate the destination microplate for at least 20 minutes. Rearrange the microplate order to the original sequence, and then read the microplates.

Implementation

In the protocol, add a liquid-handling subprocess to specify the tasks for adding the contents from the two source microplates into the destination microplate. Add a Reorder task after the liquid-handling tasks and before the microplate-reading task as shown in the following example.

Main Protocol						۲
Destination (384 Costar 3657 PP Sqr well rnd btm) Remove	Destination (384 Costar 3657 PP Sqr well rnd btm)	Downstack from BenchCel - 1.Stacker 1	→ ① Bravo SubProcess 19 using Bravo - 1	Reorder at BenchCel - 1.Stacker 2, BenchCel - 1.Stacker 3	Run the protocol file	Upstack to BenchCel - 1.Stacker 4
* Source 1 (384)	Costa deepwell P	P Clr Sqr Well	V Btm)			
Image: Source 2 (384 Costa deepwell PP CIr Sqr Well V Btm)						
• Tips (384 V11 \$	ST50 Tip Box 068	81.002)				

For the Reorder task, select two stacking devices to use, and then set the Plate storage time to 20 minutes in the Task Parameters area as shown in the following examples.

ask Parameters	4	Task Parameters	
Task Parameters	۲	Task Parameters	
Device Selection	*	21	
This task will use these		Reorder Properties	
		Plate storage time:	0 Days 00:20:00
BenchCel - 1.Stacker 2 BenchCel - 1.Stacker 3	Use earlier	Number of plates to store:	10
	Use later		
Available locations:			
BenchCel - 1.Stacker 1 BenchCel - 1.Stacker 4 Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4			
Available locations: BenchCel - 1.Stacker 1 BenchCel - 1.Stacker 4 Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.6 Bravo - 1.8 Bravo - 1.8 Bravo - 1.9		Device Selection	

For information about	See
Adding devices	 "Adding devices" on page 25 Stacking device guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Scan Stack task	"Scan Stack" on page 371
Downstack task	"Downstack" on page 354
Upstack task	"Upstack" on page 382

For information about	See
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Scan Stack

Description

The Scan Stack task (Scanstack) scans a specified Bravo deck location to confirm the presence or absence of labware and determine the height of the stack. You must add one Scan Stack task for each Downstack or Upstack task, and at least two Scan Stack tasks for each Reorder task in the Bravo Subprocess.

Task is available for	Task is available in
Bravo Platform	Startup Protocol Cleanup Protocol
Perkin Elmer PlateStaks	Main Protocol

Task parameters

After adding the Scan Stack task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Fask Parameters		*
21		
Scan Stack properties		
Device to use:	Bravo - 1	-
Location to use:	1	

Parameter	Description
Device to use	The Bravo Platform on which the stacking will occur.

Scan Stack

Parameter	Description
Location to use	The the deck location to be scanned.
	If the deck location will be used for a Downstack task, the robot will scan the stack to confirm the presence of the stack and determine its height.
	If the deck location will be used for an Upstack task, the robot will scan the location to confirm that it is empty and ready to receive labware.

Example

Goal

Add the correct number of Scan Stack tasks to permit downstacking of microplates from deck location 4 for liquid-handling tasks. Add the correct number of Scan Stack tasks to permit uploading of those microplates to deck location 7 after processing.

Implementation

In the Startup Protocol, add two Scan Stack tasks: one to scan deck location 4 (where the microplates will be downstacked), and one to scan deck location 9 where the microplates will be upstacked.

Startup Protoco	I			۲
 startup process - 1 Remove 	startup process - 1	ScanStack on device Bravo - 14	ScanStack on device Bravo - 17	

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Downstack task	"Downstack" on page 354
Upstack task	"Upstack" on page 382
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

9 Setting parameters for microplate storage tasks Storage Incubate

For information about	See
,	"Setting parameters for I/O-handling tasks" on page 269

Storage Incubate

Description

The Storage Incubate task (Storage Incubate) moves a defined set of labware into a storage device, leaves it there for a specified time period, and then moves it out of the storage device.

Note:

- To incubate labware on a platepad, in a Plate Hotel, or in a Vertical Pipetting Station, use the Incubate task.
- To incubate labware on the Bravo Platform, use the Reserve Location task.

Task is available for	Task is available in
Plate Hub Carousel	Main Protocol
Heraeus Cytomat incubator	Main Protocol
LiConic StoreX incubator	Main Protocol

Task parameters

After adding the Storage Incubate task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

9 Setting parameters for microplate storage tasks

Storage Incubate

Fask Parameters	\$
Task Parameters	۲
Length of incubation (sec): 0 Days 00:00: Start timer when previous plate finishes inc Native Locations Available locations:	and the second se
 PlateHub Carousel - 1 cassette 1 slot 1 slot 2 slot 3 slot 4 slot 5 slot 6 	
Assigned locations: PlateHub Carousel - 1, cassette 1, slot 2	
Number of selected locations: 1 Number of assigned locations: 1	
Advanced Settings	۲

Parameter	Description
Length of incubation	The length of time to incubate the labware.
Start timer when previous plate finishes incubation	The option to start timing the incubation after the previous labware has finished incubating.
Native tab	The tab that allows you to select the storage locations from a list of all the known locations in the device file.
	Double-click a location in the Available locations area. The selected location appears in the Assigned locations area.
Locations tab	The tab that allows you to select locations from a list of location groups. The location groups are created in the Inventory Editor.
	Double-click a location group in the Available locations area. The selected location group appears in the Assigned locations area.
	To view or revise existing location groups, click Edit location groups .

Example: Incubate destination microplates in the Plate Hub Carousel

Goal

Aspirate contents from two source microplates and dispense into a destination microplate. Incubate the destination microplate in the Plate Hub Carousel for 5 minutes before reading the microplates.

Implementation

In the protocol, add a liquid-handling subprocess to specify the tasks for moving contents from the two microplates into the destination microplates. Add a Storage Incubate task after the liquid-handling subprocess and before the microplate-reading task as shown in the following example.

 Destination (384 Costar 3657 PP Sqr well rnd btm) 	Destination (384 Costar 3657 PP Sqr	Downstack from Stacker - 1.Stacker	Liquid Handling using Vertical	Incubate at plate storage device	Run the protocol file	Upstack to Stacker - 2.Stacker
Remove Source 1 (384 0	well rnd btm) Costar 3657 PP S	qr well rnd btm	Pipetting Station - 1	 popolations 		
• Source 2 (384 (

In the Storage Incubate Task Parameters area, set the Length of incubation at 5 minutes as shown in the following example. The example assumes that cassettes 1 and 2 are available for use.

sk Parameters	4
ask Parameters	*
ength of incubation (sec): 0 Days 00:05:00	
Start timer when previous plate finishes incubatin	
Vative Locations	
Available locations:	
PlateHub Carousel - 1	^
I cassette 1	
cassette 2	
+ cassette 3	
cassette 4	
😧 cassette 5	~
in assasta é	
Assigned locations:	
PlateHub Carousel - 1, cassette 1	
PlateHub Carousel - 1, cassette 2	
, Number of selected locations: 0	
Number of assigned locations: 32	
	(*

For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Incubate task	"Incubate" on page 303	
Reserve Location task	"Reserve Location" on page 337	

For information about	See
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Unload

Description

The Unload task (Unload) instructs a robot to move a defined set of labware out of a storage device.

Note: If you want to move a defined set of labware from one storage device to another, use the Unload task and Load task in sequence. For information about the Load task, see "Load" on page 362.

Task is available for	Task is available in
Plate Hub Carousel	Main Protocol
Heraeus Cytomat incubator	Main Protocol
LiConic StoreX incubator	Main Protocol

Storage location selections

When you add the Unload task, you can select the storage locations in one of the following ways:

- *Native locations.* Native locations are known locations in a device file. For example, if the Plate Hub Carousel is in the device file, you can select a cassette in that carousel for the Load task. When you select a cassette, all 16 slots in the cassette are available for the task. If you only have 10 microplates to load into that cassette, six of the slots will remain empty.
- Location groups. Location groups are device locations that are grouped together. For example, a location group can consist of 21 Plate Hub Carousel slots as follows: cassette 3 (all 16 slots) and cassette 7 slots 1 through 5 only. If you want to load exactly 21 microplates, you can select that particular location group.

• *Plate groups*. Plate groups are labware that are grouped together. Each group member has location information. So when you add the Unload task and select a plate group, the software knows where to go to unload the labware.

Unload parameters that affect labware order

The software always unloads the first labware in the plate group. For example, if a plate group contains microplates 1 through 5, microplate 1 is unloaded, then microplate 2, and so on. If microplate 1 is loaded back into the plate group location before the labware 2 is unloaded, the software will attempt to unload the first in the sequence, labware 1.

If you plan to load any unloaded plate groups back in storage devices in the same order, do one of the following:

- Select the **Use original locations** option in the Load task parameters. The original storage locations will be reserved and the same labware order is preserved.
- When adding the Unload task, select the **Remove plates from group when processed** option. When adding the Load task, either add the labware to the original plate group, or create a new plate group and add the labware to the new group. During the unload, the labware is removed from the plate group so that the software will seek the next labware in the group. If you select the same plate group for the Load task, the labware will be loaded back into the plate group at the bottom of the sequence.

Task parameters

After adding the Unload task at the desired point in the protocol, set the following **Task Parameters**:

Task Parameters	
Turre turbing curb	8
1 11 2↓	
Unload Properties	
Unload base on barcode:	
Barcode:	
Task Description	
Task number:	2
Task description:	Unload
Use default task description	· •

Parameter	Description	
Unload based on barcode	The option to use the specified barcodes to search for and unload specific labware from storage.	
	If you select this option, you must supply the barcodes in the Barcode box.	
Barcode	The barcode of the labware you want to unload. You can supply one or more barcodes as follows:	
	• Type the single barcode in the box.	
	• Manually scan the single barcode label.	
	• Type a JavaScript variable to supply a different barcode per labware instance.	
	This box is only active if you selected Unload base on barcode.	
Task number	The number that indicates the position of the task in the protocol.	
Task description	The description of the task.	
Use default task description	The option to use the default task description or provide your own description for the task.	
	Select the check box to use the default description. Clear the check box to provide your own description.	

Storage Load parameters

After setting the Task Parameters, click **Storage Load**, and set the following parameters:

Task Parameters	
Task Parameters	۲
Storage Load	۲
Use original locations	
Native Locations Groups	
Available locations:	
Aglent Plate Hub Carousel - 1 Thermo Cytomat 44 - 1 Cassette 1 Cassette 2 Cassette 3 Slot 1 Slot 1 Slot 2 Slot 4	
Assigned locations or groups:	
Thermo Cytomat 44 - 1, cassette 3, slot 1	
Thermo Cytomat 44 - 1, cassette 3, slot 2 Thermo Cytomat 44 - 1, cassette 3, slot 3	
Number of selected locations: 1 Number of assigned locations: 3	
Advanced Settings	۲

Parameter	Description
Native tab	The tab that allows you to select the storage locations from a list of known locations in the device file.
	Double-click a location in the Available locations area. The selected location appears in the Assigned locations area.
Locations tab	The tab that allows you to select locations from a list of location groups. The location groups are created in the Inventory Editor.
	Double-click a location group in the Available locations area. The selected location group appears in the Assigned locations area.
	To view or revise existing location groups, click Edit location groups .
Groups tab	The tab that allows you to select a plate group that you want to move out of storage.
	Double-click a plate group in the Available groups area. The selected plate group appears in the Assigned locations area.
	To view or revise existing plate groups, click Edit plate groups .
Remove plates from group when processed	The option to remove the specified labware from a plate group after the labware is moved out of storage.

Note: A compiler error will appear if you try to unload from a plate group (Groups tab) and another storage location type (Native tab or Locations tab).

Example: Unload microplates from the Plate Hub Carousel for processing

Goal

Unload the specified microplates from Plate Hub Carousel cassette 1 in preparation for liquid-handling tasks. In this example, barcodes will not be used to unload the microplate.

Implementation

In the protocol, add the Unload task before the liquid-handling tasks as shown.

Main Protocol	۲			
Destination (384 Greiner 781101 PS clr flt btm) Remove	Destination Unload from Liquid Load into (384 Greiner plate storage 781101 PS device using VPrep - device clr fit btm) 1			
Source - 1 (384 Greiner 781280 PP CIr Sqr Well V Btm)				
Tips (384 V11 Tip Box ST70 19133.002)				

In the Task Parameters area, clear the Unload based on barcode check box.

Task Parameters	9
Task Parameters	8
21 2↓	
Unload Properties	
Unload base on barcode:	
Barcode:	
Task Description	
Task number:	2
Task description:	Unload
Use default task description	. V
Storage Unload	
Storage onioau	8

In the Storage Load area, click the Native tab. Select cassette 1 in the Plate Hub Carousel to use the cassette.

Task Parameters	4
Task Parameters	۲
Storage Load	۲
Use original locations	
Native Locations Groups	
Available locations:	
Aglent Plate Hub Carousel - 1	
€ cassette 1	1
cassette 2	
cassette 3	1
cassette 4	
cassette 5	
⊕ cassette 6	
⊕ cassette 7	
cassette 8	
Assigned locations or groups:	
① Agilent Plate Hub Carousel - 1, cassette 1	
Number of selected locations: 16 Number of assigned locations: 16	
Advanced Settings	

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Setting up plate locations and plate groups in inventory manager	VWorks Automation Control Setup Guide
Load task	"Load" on page 362
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

9 Setting parameters for microplate storage tasks Upstack

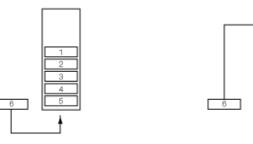
Upstack

Description

The Upstack task (Upstack) moves labware as follows:

- Into the bottom of stacking devices such as the Labware Stacker or the BenchCel Workstation
- Onto the top of a stack of labware at a Bravo deck location or the Perkin Elmer PlateStaks

Labware Stacker or BenchCel Workstation Bravo Platform or PlateStaks



For example, you can use the Upstack task to move a microplate from a platepad into the Labware Stacker.

You can use a single Upstack task to move labware into multiple stacking devices. For example, if three stackers are available, the upstack task can dynamically move microplates into any of the three stacking devices.

Task is available for	Task is available in
BenchCel Workstation	Main Protocol
Bravo Platform	Main Protocol, Bravo Subprocess
Stacker	Main Protocol
Perkin Elmer PlateStaks	Main Protocol

Requirements

Bravo Pipettor

To use the Upstack task in a Bravo Subprocess, you must:

- Select the desired stacking options in the Bravo profile.
- Specify the maximum stack height in the Bravo deck location properties area.
- Add a Scan Stack task for each Upstack task.

Task parameters

The Upstack task does not have any task parameters.

Device selection

You must select a device for Upstack tasks. If you have multiple devices of the same type, you can prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.

IMPORTANT The multiple devices must have the same setup and configuration.

After adding the Upstack task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

1 Double-click a device or deck location in the **Devices available to perform task** area to add it to the **Devices involved in task** area.

Note: If you want the software to dynamically move labware to available stackers, double-click **Dynamically assigned** in the **Devices available to perform task** area. You can check the run log to determine the location of the labware in the various stackers.

2 To prioritize its use, select the device in the **Devices involved in task** area, and then click **User earlier** or **Use later**. The devices that are higher in the list are favored by the software scheduler during the protocol run.

ask Parameters	ą
ask Parameters	*
Device Selection	*
This task will use	
Stacker - 1.Stacker Stacker - 2.Stacker	Use earlier
	Use later
Available locations: Stacker - 3.Stacker	
Dynamically-assigned	

Example 1: Dynamically upstack microplates into a stacking device

Goal

After the Destination Plate is finished with the Bravo liquid-handling process, upstack it to any available stacker.

Implementation

Add a Upstack task after the Bravo Subprocess task that contains the liquid-handling sub-routine.

Main Protocol					(
 Destination (384 Costar 3657 PP Sqr well rnd btm) 	Destination (384 Costar 3657 PP Sqr well rnd btm)	Downstack from Stacker - 1.Stacker	Liquid handling subprocess using Vertical Pipetting	Upstack to Dynamicall	
Remove			Pipetting Station - 1		

The device selection is:

sk Parameters	4
evice Selection	۲
Devices involved in	
Dynamically-assigned	Use earlier
	Use later
Devices available to perform task: Bravo - 1.1	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.6 Bravo - 1.7	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.6	
Bravo - 1.1 Bravo - 1.2 Bravo - 1.3 Bravo - 1.4 Bravo - 1.5 Bravo - 1.5 Bravo - 1.6 Bravo - 1.7 Bravo - 1.8 Bravo - 1.9	

Example 2: Stacking on the Bravo Platform

Goal

Downstack microplates for liquid-handling process, then upstack them.

Implementation

The protocol is set up as follows:

- A stack of microplates (Process Plates) is at deck location 4.
- A tip box (Tip Box) is configured at deck location 6.
- A Manual Fill Reservoir (Reservoir) is configured at deck location 9.
- The Startup Protocol (not shown) contains Scan Stack tasks for deck locations 4 (where the stack starts) and 7 (where the stack will end up after upstacking).

Main Protocol		۲
Process Plate (96 Greiner 655101 PS Clr Rnd Well Flat Btm)	Process Lownstack Bravo Sub Plate (86 from Bravo - Process) Greiner 1.4 using Bravo - 655101 PS 1 Cir Rnd Well FlatBim)	
Remove	Tips On in 1 Aspirate 10 Dispense 10 Mix 10 µL in 1 Tips Off in 1 selection(s) µL in 1 µL in 1 selection(s) selection(s) from Trocess from Tip Box from Tip Box selection(s) selection(s) rom Process from Tip Box from Process from Tip Box from Plate at Reservoir Plate at	
Tip Box (96 V11 LT200 Tip Box 06880.002) Remove	Tip Box (96 Place plate Bravo Sub Place plate V11 L1200 at Bravo - 16 Process 3 at Bravo - 16 Tip Box using Bravo - 06880.002) 1	
Remove	Reservoir (96 Place plate Bravo Sub Place plate V11 at Bravo - 19 Process 3 at Bravo - 19 (Manual Fill)) 1	

The protocol performs the following:

- **1** The robot scans deck location 4 to confirm the presence of the stack and determines the number of microplates. (The Scan Stack task in the Startup Protocol, not shown, performs this task.)
- **2** The robot scans deck location 7 to confirm the absence of labware. (The Scan Stack task in the Startup Protocol, not shown, performs this task.)
- **3** The top-most Process Plate is downstacked from deck location 4 to deck location 1.

By default, when the <auto-select> location is selected for a process plate task, the process plates are always placed or downstacked at deck location 1. If deck location 1 is occupied, the process plate will be placed or downstacked at the next-available location.

- **4** Tips are installed on the pipette head at deck location 6.
- **5** The robot aspirates solution from the Reservoir at deck location 9.
- **6** The robot dispenses the solution into the Process Plate at deck location 1.
- 7 The robot mixes the solution in the Process Plate at deck location 1.
- 8 The pipette tips are removed at the Tip Box at deck location 6.
- **9** The Process Plate at deck location 1 is upstacked to deck location 7.
- **10** Steps 1 through 8 is repeated for each Process Plate stacked at deck location 4.

Related information

For information about	See
Adding devices	"Adding devices" on page 25
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Scan Stack task	"Scan Stack" on page 371
Downstack task	"Downstack" on page 354

For information about	See
Microplate-handling tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269



VWorks Automation Control User Guide

10 Setting parameters for liquid-handling tasks

This chapter describes the Bravo and Vertical Pipetting Station liquid-handling tasks you can add in a protocol:

- "SubProcess (Bravo, Vertical Pipetting Station)" on page 388
- "Aspirate (Bravo, Vertical Pipetting Station)" on page 392
- "AM Aspirate (Bravo)" on page 400
- "AM Dispense (Bravo)" on page 410
- "AM Mix (Bravo)" on page 420
- "AM Cartridges Off (Bravo)" on page 429
- "AM Cartridges On (Bravo)" on page 431
- "AM Wash Syringes (Bravo)" on page 433
- "Assemble Vacuum (Bravo)" on page 439
- "Dilute to Final Volume (Bravo)" on page 442
- "Disassemble Vacuum (Bravo)" on page 449
- "Dispense (Bravo, Vertical Pipetting Station)" on page 451
- "Dispense to Waste (Bravo)" on page 459
- "Evaporate (Bravo)" on page 464
- "Hit Pick Replication (Bravo)" on page 466
- "Mix (Bravo, Vertical Pipetting Station)" on page 497
- "Move and Filter Plate (Bravo)" on page 505
- "Pin Tool (Bravo, Vertical Pipetting Station)" on page 511
- "Pump Reagent (Bravo, Vertical Pipetting Station)" on page 521
- "Serial Dilution (Bravo, Vertical Pipetting Station)" on page 524
- "Set Head Mode (Bravo)" on page 529
- "Shake (Bravo, Vertical Pipetting Station)" on page 536
- "Tips Off (Bravo, Vertical Pipetting Station)" on page 539
- "Tips On (Bravo, Vertical Pipetting Station)" on page 542
- "Toggle Vacuum (Bravo, Vertical Pipetting Station)" on page 545
- "Wash Tips (Bravo, Vertical Pipetting Station)" on page 550



SubProcess (Bravo, Vertical Pipetting Station)

Description

The Subprocess (Bravo) (1 SubProcess (Bravo)) and Subprocess (Vertical Pipetting

Station) (SubProcess (Vertical Pipetting Station)) tasks indicate the start of a protocol subroutine that employs either the Bravo Platform or the Vertical Pipetting Station. Within the subprocess, you can add tasks that are unique to the device. You can expand or collapse the subprocess to show or hide the subprocess tasks.

IMPORTANT All Bravo or Vertical Pipetting Station liquid-handling tasks must be added within a Bravo or Vertical Pipetting Station Subprocess respectively.

Task is available for	Task is available in
Bravo Platform	Main Protocol
Vertical Pipetting Station	Main Protocol

Task parameters

IMPORTANT The latest version of the VWorks software is backwardcompatible with protocols created in VWorks4 version 6.2.3 or earlier and will continue to support static labware configuration procedures. However, Agilent Technologies recommends that you use the concepts and procedure in "Configuring labware" on page 40 when writing new protocols.

After adding the Subprocess task at the desired point in the protocol, you have the option of assigning static labware to locations on a device. You assign static labware in the subprocess to override the static labware configuration in the Startup Protocol. For more information about static labware, see "Planning labware use" on page 20.

To assign static labware to locations on the device, set the following parameters in the **Task Parameters** area:

Task Parameters	*
<u>:</u> ⊉↓	
SubProcess (Vertical Pip	etting Station) Properties
Sub-process name:	Vertical Pipetting Station SubProce
Static labware configura	tion
Display confirmation:	Don't display
Shelf 1:	<use default=""></use>
Shelf 2:	<use default=""></use>
Shelf 3:	<use default=""></use>
Shelf 4:	<use default=""></use>
Shelf 5:	<use default=""></use>
Shelf 6:	<use default=""></use>
Shelf 7:	<use default=""></use>
Shelf 8:	<use default=""></use>

SubProcess (Bravo, Vertical Pipetting Station)

Parameter	Description
Subprocess name	The name of the subprocess.
	Select from the list of available subprocesses currently in the protocol.
Display confirmation	The option to display a message at the beginning of the protocol run and the subprocess to remind you to verify the physical locations of the labware match what you specified in the software.
Location/Shelf n	The Bravo deck locations or Vertical Pipetting Station shelves.
	Select the labware for the specific locations or shelves.

Device selection

You must select a device for Subprocess tasks. If you have multiple devices of the same type, you can:

- Prioritize the list of devices for the task. If the first device in the list is busy, the software will automatically use the next device in the list. If all of the devices in the list are busy, the task that needs the device will wait until one becomes available.
- Set up a backup pool. If the primary device encounters an error, the software will automatically use the next device in the list. However, if all of the devices in the list are in an error state, the software will automatically use the device in the backup pool.

IMPORTANT The multiple devices must be configured with the same static labware and accessories, and all the accessories must have identical setups.

After adding the Subprocess task at the desired point in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

- 1 Double-click the desired device (deck location or shelf) in the **Devices** available to perform task area to move it to the **Devices involved in task** area. If you have multiple devices of the same type, you can move them to the **Devices involved in task** area.
- 2 If you have multiple devices in the **Devices involved in task** area, select a device, and then click **Use earlier** or **Use later** to prioritize it.
- **3** *Optional.* Select backup devices to use in case all of the devices in the **Devices involved in task** area encounter an error.
 - **a** Select **Devices in backup pool**.
 - **b** Drag one or more devices from the **Devices available to perform task** area to the **Devices in backup pool** area.
 - **c** If you have multiple devices in the backup pool, select a device in the **Devices in backup pool** area, and then click **Use earlier** or **Use later** to prioritize it.

SubProcess (Bravo, Vertical Pipetting Station)



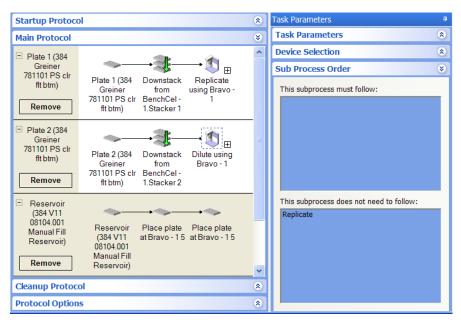
Subprocess Order

If more than one sub-process uses the same configured labware, and the subprocesses are in different protocol processes, you can specify the sequence in which the sub-processes will be performed.

To specify the sequence in which the sub-processes will be performed on the same configured labware:

1 In the protocol process, select the sub-process that contains the task that uses the configured labware.

In the following example, the Bravo Subprocess named Dilute is selected.



- 2 In the Task Parameters area, click Sub Process Order.
- **3** In the **Sub Process Order** area, double-click the subprocess names to rearrange the order.

In the following example, the Dilute subprocess is selected. So the task sequence will be Replicate subprocess, followed by the Dilute subprocess.

Startup Protoco	bl	۲	Task Parameters 4
Main Protocol		۲	Task Parameters
 Plate 1 (384 Greiner 781101 PS clr flt btm) 	Plate 1 (384 Downstack Replicate	^	Device Selection Sub Process Order
Remove	Greiner from using Bravo - 781101 PS clr BenchCel - 1 flt btm) 1.Stacker 1		This subprocess must follow: Replicate
Plate 2 (384 Greiner 781101 PS clr flt btm) Remove	Plate 2 (384 Downstack Dilute using Greiner from Bravo - 1 781101 PS clr BenchCel - flt btm) 1.Stacker 2		
 Reservoir (384 V11 08104.001 Manual Fill Reservoir) Remove 	Reservoir Place plate Place plate (384 V11 at Bravo - 15 at Bravo - 15 08104.001 Manual Fill Reservoir)	~	This subprocess does not need to follow:
Cleanup Protoc	l	۲	
Protocol Option	5	۲	

Related information

For information about	See
Configured labware	"Planning labware use" on page 20
Static labware	"Planning labware use" on page 20
Startup Protocol	"Setting up Startup and Cleanup Protocol processes" on page 60
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Aspirate (Bravo, Vertical Pipetting Station)

Description

The Aspirate (Bravo) (Aspirate (Bravo)) and Aspirate (Vertical Pipetting Station)

(Aspirate (Vertical Pipetting Station)) tasks draw liquid from a microplate or reservoir.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Task parameters

Note: The task parameters for Aspirate (Bravo) and Aspirate (Vertical Pipetting Station) are identical.

After adding the Aspirate task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	۲
21 2↓	
🗆 Aspirate (Bravo) properties	
Location, plate:	Source Plate (384 Co 🔻
Location, location:	<auto-select></auto-select>
Volume	
Volume (0 - 72 µL):	10
Pre-aspirate volume (0 - 72 µL):	0
Post-aspirate volume (0 - 72 µL):	0
Properties	
Liquid class:	384 disposable tip 10 - 50
Distance from well bottom (0 - 100 mm):	2
Dynamic tip extension (0 - 20 mm/µL):	0
Well selection:	1 selection: entire plate
Pipette technique:	
🗆 Tip Touch	
Perform tip touch:	✓
Which sides to use for tip touch:	South/North
Tip touch retract distance (-20 - 50 mm):	0
Tip touch horizontal offset (-5 - 5 mm):	0
Location, plate:	
Plate to use in the pipette task.	
Advanced Settings	۲

Parameter	Description
Location, plate	The labware involved in the Aspirate task.

Parameter	Description		
Location, location	The location at which the Aspirate task occurs.		
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>		
Volume (µL)	The volume of liquid to be drawn into each pipette tip.		
Pre-aspirate volume (µL)	The volume of air to be drawn before the pipette tips enter the liquid.		
Post-aspirate volume (μ L)	The volume of air to be drawn after the liquid is drawn.		
Liquid class	The pipetting speed and accuracy.		
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.		
Distance from well bottom (0–100 mm)	The distance between the end of the pipette tips and the well bottoms during the Aspirate task.		
	If you specify dynamic tip extension, this is the distance at the end of the Aspirate task.		
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.)		

Aspirate (Bravo, Vertical Pipetting Station)

Parameter	Description		
Dynamic tip extension (0–20 mm/µL)	The rate at which the pipette head moves during the Aspirate task. The software calculates the distance over which the tips will move without crashing.		
	Use dynamic tip extension to prevent spills as the pipette tips displace the liquid.		
	To move the tips:		
	• At the same rate as the volume change. Calculate dynamic tip extension (DTE) as follows:		
	DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls		
	• Faster than the volume change. DTE > 1/A		
	• Slower than the volume change. DTE < 1/A		
	The starting and ending positions can be calculated as follows:		
	(V _{aspirated} * DTE) + Distance _{well bottom}		
	<i>Note:</i> Instead of a negative aspirated volume the software automatically moves downward toward the well bottom with each aspirate action.		
Well selection	The wells at which the Aspirate task occurs		
	Click in the parameter box, and then click the Browse button to select the wells in the Well Selection dialog box.		
	Use this parameter only if the pipette head has fewer tips than the number of wells in the microplate, or if you are in single-row of single-column mode.		
Pipette technique	The pipette location offset you want to use for the Aspirate task.		
	The list of pipette techniques are defined in the Pipette Technique Editor.		
Perform tip touch	The option to touch the pipette tip on one of more sides of the well.		
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/ South, West/East, West/East/South/North.		
Tip touch retract distance (–20 to 50 mm)	The vertical distance for the pipette tips to rise before touching the sides of the wells.		

Parameter	Description		
Tip touch horizontal offset (-5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.		
	For example, if you set a value of:		
	• 0, the tips move a horizontal distance equal to the well radius		
	 > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch 		
	 < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch 		

Quadrant pattern well selection

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head. The following table lists the types of pipette heads and the number of accessible quadrants in various microplates.

Pipette head channels/ pin tool pins	Microplate	Number of quadrants
96	96- well	1
	384- well	4
	1536- well	16
384	384- well	1
	1536- well	4
1536 (pin tool only)	1536- well	1

The following diagram demonstrates the concept of quadrants. The diagram shows a portion of a 384-well microplate and highlights the four quadrants (Q1, Q2, Q3, and Q4) that are accessible by the A1 tip of a 96-channel pipette head. Notice that the green color highlights all of the quadrant 1 (Q1) wells across the microplate.



Aspirate (Bravo, Vertical Pipetting Station)

Instead of a column- or row-wise pattern, you can select a quadrant pattern during well selection.

The quadrant pattern option is available only if:

- The number of channels in the pipette head (or pins in a pin tool) is fewer than the number of wells in the microplate. For example, you can use a 96-channel pipette head to dispense liquid into a 384-well microplate or 1536-well microplate.
- All the channels are selected in the Set Head Mode task when using a pipette head. (The Set Head Mode task is not an option when using a pin tool).
- The liquid-handling task is inside a loop.

IMPORTANT If you select a quadrant pattern, specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To select a quadrant pattern:

1 In the **Task Parameters** area, click the **Well selection** parameter box, and then click the Browse button. The Well Selection dialog box opens. By default, the **Normal well selection** option is selected. This option is used for columnand row-wise liquid-handling patterns.

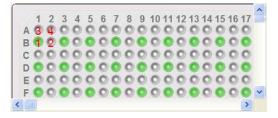
Well Selection	
Normal well selection	
O Quadrant pattern in a loop	
1 2 3 4 5 6 7 8 9 B •	
384 wells in plate	* Right-click for more options
1 selection: quadrant 1	
	OK Cancel

- **2** Select **Quadrant pattern in a loop**. The contents of the dialog box change. Notice the following:
 - Red numbers (1 through 4) appear on wells A1, A2, B1, and B2. The numbers indicate the pipetting sequence: 1 is the starting well, and 4 is the last well. In the following example, the sequence is A1, A2, B1, B2.
 - Green wells indicate the starting well in the pipetting sequence.
 - Pattern buttons at the bottom of the dialog box indicate the movement of the pipette channels. The movement description is provided in the text box above the buttons.

Note: The last two patterns are unavailable if a group contains 16 wells. For example, the last two patterns are not available if you have a 96-well pipette head and a 1536-well microplate.

- We	ell Se	lect	ion													X
O No	irmal	well s	elect	ion												
🖲 Qu	Jadra	nt pat	tern i	n a lo	op											
	Clic	k a we	ll to	select	the	star	ting	qua	dra	nt						
	1 :	23	4	56	7	8	9	10	11	12	13	14	15	16	17	^
A	1	20	0	00	0	0	0	0	0	0	0	0	0	0	0	
В	3 9	0	0	00	0	0	0	0	0	0	0	0	0	0	0	
C	09	0	0	00	0	0	0	0	0	0	0	0	0	0	0	
D	09	20	0	00	0	0	0	0	0	0	0	0	0	0	0	
E	09	20	0	00	0	0	0	õ	o	õ	0	0	Q	0	0	_
I F	00	00	0	00	0	0	0	0	0	0	0	0	0	0	0	~
< 384 w	olle i	n ninte	06	harrol		has									>	
Left-t									t au	ade		1				_
Leit-t	o-rigi	it, the	n top	-10-00	uton	1, SL	aru	iy a	t qu	aur	anı	1				
Apply	patte	rn:	7] <	2	V	/	1]	Ļ	Ĵ		
								[0	(Ca	ncel	

3 Select the starting well. The well becomes green and is labeled 1. In the following example, the third quadrant (B1 well) is selected.



4 Click a pattern button to specify the pipette channel movement. After you click a pattern, the red numbers in the graphic are updated to show the sequence.

In the following example, the second pattern is selected (right-to-left, then top-to-bottom). The third quadrant (B1) is the starting well. The resulting movement is:

Quadrant 3 (B1)

Quadrant 2 (A2)

Quadrant 1 (A1)

Quadrant 4 (B2)

Well Selection					
O Normal well selection					
 Quadrant pattern in a loop 					
Click a well to select the starting quadrant					
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17					
A 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
000000000000000000000000000000000000000					
384 wells in plate, 96 barrels on head Right-to-left, then top-to-bottom, starting at quadrant 3					
Apply pattern:					
OK Cancel					

Aspirate (Bravo, Vertical Pipetting Station)

5 When you are finished, click **OK** to save the changes and return to the VWorks window.

Example: Aspirate from a source microplate on the Bravo Platform

Goal

Aspirate contents from a source microplate (Source 1) and dispense into a destination microplate.

Implementation

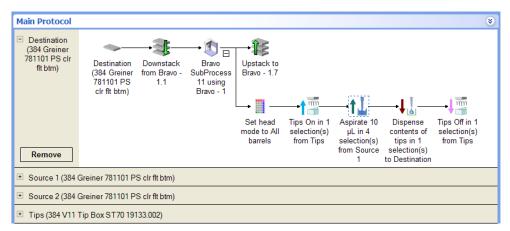
The Bravo deck is physically set up as follows:

- The destination microplates are at Bravo deck location 1.
- The source microplate is at deck location 2.
- The tipbox is at deck location 9.

In the protocol, the following are added:

- Process for the destination microplate
- Configured labware for the source microplate
- Configured labware for the tipbox

In the Destination plate process, a Bravo subprocess is added. Within the subprocess, an Aspirate task and a Dispense task are added as shown in the following example.



In the Aspirate Task Parameters area, Source 1 is selected, because the goal is to aspirate from that microplate.

Aspirate (Bravo, Vertical Pipetting Station)

Task Parameters	4
Task Parameters	*
2∎ <u>A</u> ↓	
Aspirate (Bravo) Properties	
Location, plate:	Source 1 (384 Greiner 7811
Location, location:	<auto-select></auto-select>
🗆 Volume	
Volume (0 - 251 µL):	10
Pre-aspirate volume (0 - 251 µL):	0
Post-aspirate volume (0 - 251 µL	0
Properties	
Liquid class:	
Distance from well bottom (0 - 10	2
Dynamic tip extension (0 - 20 mr	0
Well selection:	4 selections: quadrants 1-4
Pipette technique:	
🗆 Tip Touch	
Perform tip touch:	
Which sides to use for tip touch:	None
Tip touch retract distance (-20 -	0
Tip touch horizontal offset (-5 - 5	0
Advanced Cettings	
Advanced Settings	۲

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Liquid classes	VWorks Automation Control Setup Guide
Pipette techniques	"Specifying pipetting techniques" on page 613
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
Set Head Mode task	"Set Head Mode (Bravo)" on page 529
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Tips Off task	"Tips Off (Bravo, Vertical Pipetting Station)" on page 539
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349

For information about	See
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

AM Aspirate (Bravo)

Description

The AM Aspirate (Bravo)) ((AM Aspirate (Bravo)) task is designed for aspirating
fluids through AssayMAI 96AM Head.	P Bravo cartridges that are mounted on the Bravo
Teels is evailable for	Teal, is swellahle in

lask is available for	lask is available in
Bravo Platform with Bravo 96AM Head	Main Protocol, Bravo Subprocess

The AM Aspirate (Bravo) task has the same task parameters as the Aspirate (Bravo) task, except for the following parameters:

• Override aspirate flow rate from liquid class

Precise flow-rate control is critical for the performance of the AssayMAP Bravo cartridges. The option to override the aspirate flow rate (velocity) in the liquid class enables an operator to change the flow rate from experiment to experiment for rapid method development without modifying the liquid class. Likewise, the flow rate can vary for different AM Aspirate tasks that use the same liquid class in a given protocol.

• Distance from well bottom (-20-100 mm)

The range includes negative values, which is critical for steps that require using the bare probes to aspirate from the top portion of unmounted cartridges.

Please select a liquid entry from the list below in order to view and edit its properties.	Use this l	box to enter a description of t	the liquid entry	and any notes pertaining to it	s use.
384 disposable tip 0.5 - 10ul 384 disposable tip 10 - 50ul 96 disposable tip 11-50µl 96 disposable tip 1 - 2ul 96 disposable tip 1 - 2ul 96 disposable tip 10 - 50ul 96 disposable tip 2 - 50ul 96 disposable tip 2 - 50ul 96 disposable tip 2 - 20ul 96 disposable tip 1 - 20ul 96 disposable tip 2 - 00ul 96 disposable tip 2 - 00ul		irate Parameters Velocity (0.1 - 500 ul/s) 10 Acceleration (1 - 1000ul/s^2) 500 Post-aspirate delay (0 - 200000 ma)	Z-axis Aspi	velocity into wells (1 - 250 mm/s) Acceleration into wells (1 - 2000 mm/s ⁻² 2) Velocity out of wells (1 - 250 mm/s)	
Task Parameters		*			
New liquid			30	Acceleration out of wells(1 · 2000 mm/s ²)	
Rename liqui	es				
Location, plate:	L	Buffer (no labware)	1		
L Location, location:		<auto-select></auto-select>			
E Volume					
Volume (0 - 250 µL):		=aspEguilVol			
Pre-aspirate volume (0 - 250 µL):	1	0			
Post-aspirate volume (0 - 250 µL):		0			
Properties		15			
Liquid class: Override aspirate flow rate from lie	uid class	96_AM_equilibrate			
Aspirate flow rate (0 - 500 µL/s): Distance from well bottom (-20 - 1)		=(aspEquiRate/60).toFixe			
Dynamic tip extension (0 - 20 mm/	-	0			
Well selection:		1 selection: column 1			
Pipette technique:					
Tip Touch		1			
Perform tip touch:		v			
Which sides to use for tip touch:		South			
Tip touch retract distance (-20 - 50) mm):	6			
Tip touch horizontal offset (-5 - 5 r		-5			

Figure Liquid class velocity setting in the Liquid Library Editor and flow rate override option

Task parameters

After adding the AM Aspirate task at the desired point in the protocol, set the following parameters in the **Task Parameters** area.

	21	
Ξ	AM Aspirate (Bravo) Properties	
	Location, plate:	Buffer (no labware)
	Location, location:	<auto-select></auto-select>
8	Volume	
	Volume (0 - 250 µL):	=aspEquilVol
	Pre-aspirate volume (0 - 250 µL):	0
	Post-aspirate volume (0 - 250 µL):	0
8	Properties	
	Liquid class:	96_AM_equilbrate
	Override aspirate flow rate from liquid class:	v
	Aspirate flow rate (0 - 500 µL/s):	=(aspEquiRate/60).toFixe
	Distance from well bottom (-20 - 100 mm):	4
	Dynamic tip extension (0 - 20 mm/µL):	0
	Well selection:	1 selection: column 1
	Pipette technique:	
Ξ	Tip Touch	
	Perform tip touch:	~
	Which sides to use for tip touch:	South
	Tip touch retract distance (-20 - 50 mm):	6
	Tip touch horizontal offset (-5 - 5 mm):	-5

Parameter	Description
Location, plate	The labware involved in the AM Aspirate task.
Location, location	The location at which the AM Aspirate task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck, the software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task.</auto-select>
Volume (µL)	The volume of liquid to be drawn into each probe, cartridge, or tip.
Pre-aspirate volume (µL)	The volume of air to be drawn before the probes, cartridges, or tips enter the liquid.
Post-aspirate volume (µL)	The volume of air to be drawn after the liquid is drawn.

Parameter	Description
Liquid class	The pipetting speed and accuracy.
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
Override aspirate flow rate from liquid class	The option to override the aspirate velocity in the specified liquid class. Selecting this option enables you to specify a value for the aspirate flow rate without changing the liquid class.
Aspirate flow rate (0–500 μ L/s)	The numerical value or the JavaScript variable that will override the aspirate velocity setting in the liquid class.
	A JavaScript variable enables the value to be assigned later. For example, using a VWorks form, an operator could easily change the flow rate for an aspirate step in increments from as low as 1 μ L/min up to 2000 μ L/min or more using the same liquid class.
	If the task is included in a VWorks macro, a JavaScript variable enables you to change the value for the task at the macro level.
	IMPORTANT The software requires that the flow rate value be in microliters per second $(\mu L/s)$ at run time. If you want an operator to enter the value in microliters per minute $(\mu L/min)$, you can use scripting to convert the values for the software to use.

AM Aspirate (Bravo)

Parameter	Description
Distance from well bottom (-20–100 mm)	The distance between the tips of the probes, cartridges, or disposable tips and the <i>well</i> bottoms during the AM Aspirate task.
	If you specify dynamic tip extension, this is the distance at the end of the AM Aspirate task.
	Use a positive number for tasks that are performed with mounted cartridges, mounted tips, or bare probes at labware other than a cartridge rack.
	If the task is performed in the upper cup of unmounted cartridges, you can use a negative number for the parameter value. In this case, the <i>well bottom</i> is the top of the cartridge cup, as shown in the following figure.
	For example, a negative number enables a cup wash step while the cartridges are in the cartridge rack before they are mounted on the Bravo 96AM Head.
	IMPORTANT You can use a negative number for this parameter only if the AM Aspirate task is performed in cartridges that are located in a cartridge rack.

IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.

Parameter	Description
Dynamic tip extension (0–20 mm/µL)	The rate at which the Bravo 96AM Head moves during the AM Aspirate task. The software calculates the distance over which the tips will move without crashing.
	Use dynamic tip extension to prevent spills as the pipette tips displace the liquid.
	To move the tips:
	• At the same rate as the volume change. Calculate dynamic tip extension (DTE) as follows:
	DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls
	• Faster than the volume change. DTE > $1/A$
	• Slower than the volume change. DTE < 1/A
	The starting and ending positions can be calculated as follows:
	($V_{aspirated} * DTE$) + Distance _{well bottom}
	<i>Note:</i> Instead of a negative aspirated volume, the software automatically moves downward toward the well bottom with each aspirate action.
Well selection	The wells at which the AM Aspirate task occurs.
	Click in the parameter box, and then click the Browse button to select the wells in the Well Selection dialog box.
	Use this parameter only if the Bravo 96AM Head has fewer tips than the number of wells in the microplate, or if you are in single-row or single-column mode.
Pipette technique	The pipette location offset you want to use for the AM Aspirate task.
	The list of pipette techniques are defined in the Pipette Technique Editor.
Perform tip touch	The option to touch the pipette tip on one or more sides of the well.
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/ South, West/East, West/East/South/North.
Tip touch retract distance (-20 to 50 mm)	The vertical distance for the pipette tips to rise before touching the sides of the wells.

AM Aspirate (Bravo)

Parameter	Description
Tip touch horizontal offset (-5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.
	For example, if you set a value of:
	• 0, the tips move a horizontal distance equal to the well radius
	 > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch
	 < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch

Quadrant pattern well selection

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head.

IMPORTANT For the Bravo 96AM Head, the quadrant pattern option is available only if you are using 384-well microplates.

Instead of a column- or row-wise pattern, you can select a quadrant pattern during well selection.

The quadrant pattern option is available only if:

- The number of channels in the pipette head (or pins in a pin tool) is fewer than the number of wells in the microplate. For example, you can use a 96-channel pipette head to dispense liquid into a 384-well microplate or 1536-well microplate.
- All the channels are selected in the Set Head Mode task when using a pipette head. (The Set Head Mode task is not an option when using a pin tool).
- The liquid-handling task is inside a loop.

IMPORTANT If you select a quadrant pattern, specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To select a quadrant pattern:

1 In the **Task Parameters** area, click the **Well selection** parameter box, and then click the Browse button. The Well Selection dialog box opens. By default, the **Normal well selection** option is selected. This option is used for columnand row-wise liquid-handling patterns.

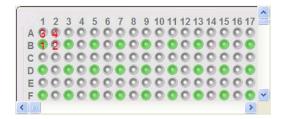
13 14 15 16 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1 2 3 4 5 A O O O O O
	0000	AUUUUU
00000	0000	R (C) (C) (C) (C)
00000		c 0 0 0 0 0
	0000	000000
00000	0000	E O O O O O
00000	0000	F00000
00000	0000	GOOOOO
00000	0000	H00000
>		
0000	0000	H00000

- **2** Select **Quadrant pattern in a loop**. The contents of the dialog box change. Notice the following:
 - Red numbers (1 through 4) appear on wells A1, A2, B1, and B2. The numbers indicate the pipetting sequence: 1 is the starting well, and 4 is the last well. In the following example, the sequence is A1, A2, B1, B2.
 - Green wells indicate the starting well in the pipetting sequence.
 - Pattern buttons at the bottom of the dialog box indicate the movement of the pipette channels. The movement description is provided in the text box above the buttons.

Note: The last two patterns are unavailable if a group contains 16 wells. For example, the last two patterns are not available if you have a 96-well pipette head and a 1536-well microplate.

Well Selection	×
Normal well selection Quadrant pattern in a loop	
Click a well to select the starting quadrant	
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 A 2 0 <td< td=""><td></td></td<>	
384 wells in plate, 96 barrels on head	
Left-to-right, then top-to-bottom, starting at quadrant 1	
Apply pattern: 🗾 💟 🔽 🏷 🛄 🛄	
OK Cancel	

3 Select the starting well. The well becomes green and is labeled 1. In the following example, the third quadrant (B1 well) is selected.



4 Click a pattern button to specify the pipette channel movement. After you click a pattern, the red numbers in the graphic are updated to show the sequence.

In the following example, the second pattern is selected (right-to-left, then top-to-bottom). The third quadrant (B1) is the starting well. The resulting movement is:

Quadrant 3 (B1)

Quadrant 2 (A2)

Quadrant 1 (A1)

Quadrant 4 (B2)

Well Selection
O Normal well selection
 Quadrant pattern in a loop
Click a well to select the starting quadrant
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 A 6 0 <td< td=""></td<>
384 wells in plate, 96 barrels on head
Right-to-left, then top-to-bottom, starting at quadrant 3
Apply pattern:
OK Cancel

5 When you are finished, click **OK** to save the changes and return to the VWorks window.

Example: Allowing an operator to change the aspirate flow rate using an edit control on a VWorks form

Goal

Allow an operator to change the aspirate flow rate easily from run to run without modifying the liquid class.

Implementation

In the protocol, the AM Aspirate task is added. In the task parameters, the **Override aspirate flow rate from liquid class** check box is selected, and the **Aspirate flow rate** is specified as a variable, for example =AspFlowRate.

In the VWorks form, an edit control is added for the aspirate flow rate using the =AspFlowRate variable. The operator can enter values within a specified range in the form and run the protocol using the form. For details on how to design VWorks forms to run protocols, see "Creating protocol forms for operators" on page 153.

Figure Flow rate parameter as JavaScript variable that appears as edit control in a VWorks form

THE A L			۲			
:≣ <u>2</u> ↓						
AM Aspirate (Bra	vo) Properties					
Location, plate:		Buffer (no lab	ware)			
Location, location:		<auto-select></auto-select>				
3 Volume						
Volume (0 - 250 µL):		=aspEquilVol				
Pre-aspirate volume	(0 - 250 µL):	0				
Post-aspirate volume	(0 - 250 µL):	0				
Properties						
Liquid class:		96_AM_equilibr	rate			
Override aspirate flo	w rate from liquid cla	iss: 🔽	-			
Aspirate flow rate (0	- 500 µL/s):	=(aspEquiRate	e/60).toFixe			
Distance from well be	ottom (-20 - 100 mm)	: 4	1			
Dynamic tip	rks - [AM_ProteinA_	rows W/Form1				
Well selection						
Pipette tech Pro	tein A Pu	rification	Rows			
Tip Touch						
Perform tip t Nur	nber of Rows	8				
Which sides		Sec. 1	1			
Tip touch ret						
np touch rea		-Assay Para	aneters -			
Tip touch ho		Assay Par			Volu	me
and the second sec		—— Assay Par	ameters – Flow Ra	ite	Volu	me
and a state of the	Prime Ca	artridges	Flow Ra			me
and a state of the				ite µl∕min	Volu 125	me µl
and the second se		artridges	Flow Ra			
and the second se	🚽 🔽 pre-	artridges -wet cartridges	Flow Ra	µl/min	125	μ
and the second se		artridges -wet cartridges	Flow Ra			
and the second sec	🚽 🔽 pre-	artridges -wet cartridges	Flow Ra	µl/min	125	μ
and the second se	🚽 🔽 pre-	ortridges -wet cartridges uilibrate	Flow Ra	µl/min	125	μ
and the second sec	Aspirate Equ	ortridges -wet cartridges uilibrate	Flow Ra 50 25	µl∕min µl∕min	50	μl μl
and the second se	Aspirate Equ Aspirate Loc	artridges -wet cartridges uilibrate ad	Flow Ra 50 25 10	µl/min µl/min µl/min	[125 [50 [25	וע עו
and the second se	Aspirate Equ	artridges -wet cartridges uilibrate ad	Flow Ra 50 25	µl∕min µl∕min	50	μl μl
and the second sec	Aspirate Equilation	artridges -wet cartridges uilibrate ad ash	Flow Ra 50 25 10 25	µl/min µl/min µl/min	125 50 25 100	ן א א א א
and the second sec	Aspirate Equ Aspirate Loc	artridges -wet cartridges uilibrate ad ash	Flow Ra 50 25 10	µl/min µl/min µl/min	[125 [50 [25	וע עו
and the second se	Aspirate Equilation	artridges -wet cartridges uilibrate ad ash	Flow Ra 50 25 10 25	µl/min µl/min µl/min	125 50 25 100	ן א א א א

Related information



AM Dispense (Bravo)

For information about	See
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
AM Cartridges On	"AM Cartridges On (Bravo)" on page 431
AM Cartridges Off	"AM Cartridges Off (Bravo)" on page 429
Task macros	"Using macros to create protocols" on page 133
Protocol forms	"Creating protocol forms for operators" on page 153
Using JavaScript variables	"Using simple variables" on page 77

AM Dispense (Bravo)

Description

The AM Dispense (Bravo) (The AM Dispense (Bravo)) task is designed for dispensing fluids through AssayMAP Bravo cartridges that are mounted on the Bravo 96AM Head.

Task is available for	Task is available in
Bravo Platform with Bravo 96AM Head	Main Protocol, Bravo Subprocess

The AM Dispense (Bravo) task has the same task parameters as the Dispense (Bravo) task, except for the following parameters:

Override dispense flow rate from liquid class

Precise flow-rate control is critical for the performance of the AssayMAP Bravo cartridges. The option to override the dispense flow rate (velocity) in the liquid class enables an operator to change the flow rate from experiment to experiment for rapid method development without modifying the liquid class. Likewise, the flow rate can vary for different AM Dispense tasks that use the same liquid class in a given protocol.

• Distance from well bottom (-20-100 mm)

The range includes negative values, which is critical for steps that require using the bare probes to dispense into the top portion of unmounted cartridges.

ease select a liquid entry from der to view and edit its proper		a description of the liquid entry and ar	ny notes pertaining to its us
84 disposable tip 0.5 - 10ul 84 disposable tip 10 - 50ul 6 disposable tip 10 - 50ul 6 disposable tip 1 - 2ul 6 disposable tip 1 - 2ul 6 disposable tip 1 - 2ul 6 disposable tip 2 - 50ul 6 disposable tip 2 - 50ul 6 disposable tip 51 - 200ul 6 _AM_Dip 6_AM_Equilibrate 6_AM_equilibrate 6_AM_probeWash	Dispense Param BE Velc (0.1 50 Acc	eters Z-axis Dispense A city 10 Vek 500 ul/s [1 - eleration 500 Acc	ocity into wells 250 mm/s) eleration into wells
6_AM_wash 6_AM_ZWash	Task Parameters		2000 mm/s^2)
xed tip 0.05 - 1ul xed tip 1 - 3ul			vout of wells
xed up 1 - Sul	21		1 mm/s)
New liquid entry 5/	AM Dispense (Bravo) Properties		 ration out of
	Location, plate:	(96 V11 AM MicroWash)	 2000 mm/s²)
ename liquid entry Save	Location, location:	<auto-select></auto-select>	
Delete liquid entr	Volume		
Delete liquid entr	Empty tips:	E.	
	Volume (0 - 250 µL):	125	
	Blowout volume (0 - 250 µL):		
	Properties		
	Liquid class: Override dispense flow rate from liquid cla	96_AM_prime ss: I✔	
	Dispense flow rate (0 - 500 µL/s): Distance from well bottom (-20 - 100 mm):	=(primeDispenseRate/60).toFixed(4) =washDispenseHeight	
	Dynamic tip retraction (0 - 20 mm/µL):	0	
	Well selection:	1 selection: column 1	
	Pipette technique:	offset dispense	
	Tip Touch		
	Perform tip touch:	2	
	Which sides to use for tip touch:	West	
	Tip touch retract distance (-20 - 50 mm):	=(washRetract-2)	
	Tip touch horizontal offset (-5 - 5 mm):	=washOffset	

Figure Liquid class velocity setting in the Liquid Library Editor and flow rate override option

Task parameters

After adding the AM Dispense task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

AM Dispense (Bravo)

Task Parameters	(3
<u>₹</u> 2↓	
AM Dispense (Bravo) Properties	
Location, plate:	1 (96 V11 AM MicroWash)
Location, location:	<auto-select></auto-select>
Volume	
Empty tips:	Г
Volume (0 - 250 µL):	125
Blowout volume (0 - 250 µL):	0
Properties	
Liquid class:	96_AM_prime
Override dispense flow rate from liquid class:	v
Dispense flow rate (0 - 500 µL/s):	=(primeDispenseRate/60).toFixed(4)
Distance from well bottom (-20 - 100 mm):	=washDispenseHeight
Dynamic tip retraction (0 - 20 mm/µL):	0
Well selection:	1 selection: column 1
Pipette technique:	offset dispense
🗄 Tip Touch	
Perform tip touch:	v
Which sides to use for tip touch:	West
Tip touch retract distance (-20 - 50 mm):	=(washRetract-2)
Tip touch horizontal offset (-5 - 5 mm):	=washOffset

Parameter	Description
Location, plate	The labware involved in the AM Dispense task.
Location, location	The location at which the AM Dispense task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck, the software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task.</auto-select>
Empty tips	The option to empty all liquid from the probes, cartridges, or tips instead of using the dispense volume specification.
Volume (µL)	The volume of liquid to be dispensed from each probe, cartridge, or tip.
Blowout volume (µL)	Specifies the volume of air to dispense after the main volume has been dispensed while the probes, cartridges, or tips are still in the wells.
	Typically, the blowout volume is the same as the pre-aspirate volume.
	Note: Blowout occurs only in the last quadrant dispensed for a given AM Dispense task.

Parameter	Description
Liquid class	The pipetting speed and accuracy.
	IMPORTANT To ensure consistent pipetting always select a liquid class for liquid-handling tasks.
Override dispense flow rate from liquid class	The option to override the dispense velocity in the selected liquid class. Selecting this option enables you to specify a value for the dispense flow rate without changing the liquid class.
Dispense flow rate (0– 500 µL/s)	The numerical value or the JavaScript variable that will override the dispense velocity setting in the liquid class.
	A JavaScript variable enables the value to be assigned later. For example, using a VWorks form, an operator could easily change the flow rate for an aspirate step in increments from as low as 1 μ L/min up to 2000 μ L/mir or more using the same liquid class.
	If the task is included in a VWorks macro, a JavaScript variable enables you to change the value for the task at the macro level.
	IMPORTANT The software requires that the flow rate value be in microliters per second $(\mu L/s)$ at run time. If you want an operator to enter the value in microliters per minute $(\mu L/min)$, you can use scripting to convert the values for the software to use.

AM Dispense (Bravo)

Parameter	Description
Distance from well bottom (-20–100 mm)	The distance between the tips of the probes, cartridges, or disposable tips and the <i>well</i> bottoms during the AM Dispense task.
	If you specify dynamic tip extension, this is the distance at the end of the AM Dispense task.
	Use a positive number for tasks that are performed with mounted cartridges, mounted tips, or bare probes at labware other than a cartridge rack.
	If the task is performed in the upper cup of unmounted cartridges, you can use a negative number for the parameter value. In this case the <i>well bottom</i> is the top of the cartridge cup, as shown in the following figure.
	For example, a negative number enables a prewetting step before mounting and priming the cartridges.
	IMPORTANT You can use a negative number for this parameter only if the AM Dispense task is performed in cartridges that are

IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.

located in a cartridge rack.

Parameter	Description
Dynamic tip retraction (0–20 mm/µL)	The rate at which to raise the pipette head during the Dispense task.
	Use dynamic tip retraction to prevent spills as the pipette tips displace the liquid.
	To move the tips:
	• At the same rate as the volume change. Calculate dynamic tip retraction (DTR) as follows:
	DTR = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls
	• Faster than the volume change. DTR > 1/A
	• Slower than the volume change. DTR < 1/A
	The starting and ending positions can be calculated as follows:
	$(V_{dispensed} * DTR)$ + Distance _{well bottom}
Well selection	The wells at which the AM Dispense task occurs.
	Click in the parameter box, and then click the Browse button to select the wells in the Well Selection dialog box.
	Use this parameter only if the pipette head has fewer tips than the number of wells in the microplate, or if you are in single-row or single-column mode.
Pipette technique	The pipette location offset you want to use for the AM Dispense task.
	The list of pipette techniques are defined in the Pipette Technique Editor.
Perform tip touch	The option to touch the probes, cartridges, or tips on one or more sides of the well.
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/ South, West/East, West/East/South/North.
Tip touch retract distance (–20 to 50 mm)	The vertical distance for the probes, cartridges, or tips to rise before touching the sides of the wells.

AM Dispense (Bravo)

Parameter	Description	
Tip touch horizontal offset (-5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.	
	For example, if you set a value of:	
	• 0, the tips move a horizontal distance equal to the well radius	
	 > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch 	
	 < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch 	

Quadrant pattern well selection

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head.

IMPORTANT For the Bravo 96AM Head, the quadrant pattern option is available only if you are using 384-well microplates.

Instead of a column- or row-wise pattern, you can select a quadrant pattern during well selection.

The quadrant pattern option is available only if:

- The number of channels in the pipette head (or pins in a pin tool) is fewer than the number of wells in the microplate. For example, you can use a 96-channel pipette head to dispense liquid into a 384-well microplate or 1536-well microplate.
- All the channels are selected in the Set Head Mode task when using a pipette head. (The Set Head Mode task is not an option when using a pin tool).
- The liquid-handling task is inside a loop.

IMPORTANT If you select a quadrant pattern, specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To select a quadrant pattern:

1 In the **Task Parameters** area, click the **Well selection** parameter box, and then click the Browse button. The Well Selection dialog box opens. By default, the **Normal well selection** option is selected. This option is used for columnand row-wise liquid-handling patterns.

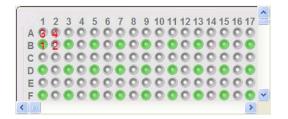
Quadrant pattern in	
1234	5 6 7 8 9 10 11 12 13 14 15 16 17
B00000	0000000000000000
c 0 0 0 0 0	00000000000000
D00000	00000000000000
E O O O O O	000000000000000000000000000000000000000
F00000	00000000000000
GOOOO	
H00000	000000000000000000000000000000000000000
100000	
<	>
84 wells in plate	Right-click for more options

- **2** Select **Quadrant pattern in a loop**. The contents of the dialog box change. Notice the following:
 - Red numbers (1 through 4) appear on wells A1, A2, B1, and B2. The numbers indicate the pipetting sequence: 1 is the starting well, and 4 is the last well. In the following example, the sequence is A1, A2, B1, B2.
 - Green wells indicate the starting well in the pipetting sequence.
 - Pattern buttons at the bottom of the dialog box indicate the movement of the pipette channels. The movement description is provided in the text box above the buttons.

Note: The last two patterns are unavailable if a group contains 16 wells. For example, the last two patterns are not available if you have a 96-well pipette head and a 1536-well microplate.

Well Selection		
Normal well selection Quadrant pattern in a loop		
Click a well to select the starting quadrant		
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 A 2 0		
384 wells in plate, 96 barrels on head		
Left-to-right, then top-to-bottom, starting at quadrant 1		
Apply pattern: Z		
OK Cancel		

3 Select the starting well. The well becomes green and is labeled 1. In the following example, the third quadrant (B1 well) is selected.



4 Click a pattern button to specify the pipette channel movement. After you click a pattern, the red numbers in the graphic are updated to show the sequence.

In the following example, the second pattern is selected (right-to-left, then top-to-bottom). The third quadrant (B1) is the starting well. The resulting movement is:

Quadrant 3 (B1)

Quadrant 2 (A2)

Quadrant 1 (A1)

Quadrant 4 (B2)

Well Selection
O Normal well selection
Quadrant pattern in a loop
Click a well to select the starting quadrant
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 A 3 2 0 <td< td=""></td<>
384 wells in plate, 96 barrels on head Right-to-left, then top-to-bottom, starting at quadrant 3
Apply pattern: D D D D D D D D D D D D D D D D D D D
OK Cancel

5 When you are finished, click **OK** to save the changes and return to the VWorks window.

Example: Allowing an operator to change the dispense flow rate using an edit control on a VWorks form

Goal

Allow an operator to change the dispense flow rate from run to run without modifying the liquid class.

Implementation

In the protocol, the AM Dispense task is added. In the task parameters, the **Override dispense flow rate from liquid class** check box is selected, and the **Dispense flow rate** is specified as a variable, for example =dspFlowRate.

In the VWorks form, an edit control is added for the dispense flow rate using the =dspFlowRate variable. The operator can enter values within a specified range in the form and run the protocol using the form. For details on how to design VWorks forms to run protocols, see "Creating protocol forms for operators" on page 153.

Task Parameters	(3	8
±1 2↓		
AM Dispense (Bravo) Properties		
Location, plate:	Results Plate (96)	on: Rows
Location, location:	<auto-select></auto-select>	
🖃 Volume		
Empty tips:	Г	
Volume (0 - 251 µL):	=aspLoadVol	Parameters
Blowout volume (0 - 251 µL):	0	rarameters
Properties		Flow Rate Volume
Liquid class:	96_AM_load	
Override dispense flow rate from liquid class:		
Dispense flow rate (0 - 500 µL/s):	=dspFlowRate	es 50 µl/min 125 µl
Distance from well bottom (-20 - 100 mm):	-1.5	
Dynamic tip retraction (0 - 20 mm/µL):	0	
Well selection:	1 selection: entire	25 µl/min 50 µl
Pipette technique:		
Tip Touch		
	spirate Load	5 μl/min 25 μl
	ispense Elute	5 µl/min 25 µl
<		<u>></u>
Main Log		D

Figure Flow rate parameter as a variable that appears as an edit control in a VWorks form

Related information

For information about	See
Using the Bravo 96AM Head	Bravo Automated Liquid Handling Platform User Guide
AM Aspirate task	"AM Aspirate (Bravo)" on page 400
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
AM Cartridges On	"AM Cartridges On (Bravo)" on page 431
AM Cartridges Off	"AM Cartridges Off (Bravo)" on page 429

For information about	See
Task macros	"Using macros to create protocols" on page 133
Protocol forms	"Creating protocol forms for operators" on page 153
Using JavaScript variables	"Using simple variables" on page 77

AM Mix (Bravo)

Description

The AM Mix (Bravo) (AM Mix (Bravo)) task is designed for aspirating and dispensing fluids through AssayMAP Bravo cartridges that are mounted on the Bravo 96AM Head.

Task is available for	Task is available in
Bravo Platform with Bravo 96AM Head	Main Protocol, Bravo Subprocess

The AM Mix (Bravo) task has the same task parameters as the Mix (Bravo) task, plus an additional parameter that enables you to override the flow rate in the liquid class, if specified. Precise flow-rate control is critical for the performance of the AssayMAP Bravo cartridges. The option to override the aspirate and dispense flow rate (velocity) in the liquid class enables an operator to change the flow rate from experiment to experiment for rapid method development without modifying the liquid class. Likewise, the flow rate can vary for different AM Mix tasks that use the same liquid class in a given protocol.

Please select a liquid entry from the list below in order to view and edit is properties. Se deposable to 1 - 24 Se deposable to 2 - 50 ul Se AM_poine Se AM_poine Se AM_poteVisahFast Se AM_po	Liquid Library Editor v9.0.0	8
96 disposable tip 2 - SOU 96 disposable tip 5 1 - 200u 95 AM Dio 95 AM points 95 AM points 95 AM prote 95 AM prote		Use this box to enter a description of the liquid entry and any notes pertaining to its use
Aspirate Dispense Equation Task Parameters 	96 disposable tip 2 - S0ul 96 disposable tip 51 - 200ul 96 JAM Club 96 JAM club 96 JAM clubrate 96 JAM coulibrate 96 JAM probelWash 96 JAM	50 Velocity (0.1 - 500 ul/s) 100 Velocity into wells (1 - 250 mm/s) 500 Acceleration (1 - 1000ul/s^22) 500 Acceleration into wells (1 - 2000 mm/s^22) 0 Post-aspirate delay (0 - 300000 ms) 100 Velocity out of wells (1 - 250 mm/s) 500 Acceleration into wells (1 - 2000 mm/s^22) 500 0 Post-aspirate delay (0 - 300000 ms) 100 500 Acceleration out of wells(1 - 250 mm/s)
Image: Second Secon	Delete liquid entry	Aspirate Dispense Equation
 AM Mix (Bravo) Properties Location, plate: Location, location: volume Volume Volume (0 - 250 µL): Pre-aspirate volume (0 - 250 µL): Blowout volume (0 - 250 µL): Properties Liquid class: AM_50uLperSec Override flow rates from liquid class: Aspirate/dispense flow rate (0 - 500 µL/s): I0 Mix cycles (0 - 100): Liquid class: 	Task Parameters	*
Location, plate: Location, location: <auto-select> Volume Volume (0 - 250 µL): 10 Pre-aspirate volume (0 - 250 µL): 0 Blowout volume (0 - 250 µL): 0 Properties Liquid class: AM_SOuLperSec Override flow rates from lquid class: Aspirate/dispense flow rate (0 - 500 µL/s): 10 Mix cycles (0 - 100): 3 Liquid class:</auto-select>	<u>21</u> 2↓	
Location, location: <auto-select> Volume Volume (0 - 250 µL): 10 Pre-aspirate volume (0 - 250 µL): 0 Blowout volume (0 - 250 µL): 0 Properties Liquid class: AM_50uLperSec ▼ Override flow rates from liquid class: ▼ Aspirate/dispense flow rate (0 - 500 µL/s): 10 Mix cycles (0 - 100): 3 Liquid class: ▼</auto-select>	AM Mix (Bravo) Propertie	es 🔺
□ Volume 10 Volume (0 - 250 µL): 10 Pre-aspirate volume (0 - 250 µL): 0 Blowout volume (0 - 250 µL): 0 □ Properties Iliquid class: Volume flow rates from liquid class: ✓ Aspirate/dispense flow rate (0 - 500 µL/s): 10 Mix cycles (0 - 100): 3	Location, plate:	
Volume (0 - 250 µL): 10 Pre-aspirate volume (0 - 250 µL): 0 Blowout volume (0 - 250 µL): 0 Properties Image: Comparison of the system of the sys		<auto-select></auto-select>
Pre-aspirate volume (0 - 250 µL): 0 Blowout volume (0 - 250 µL): 0 E Properties Iduid class: Liquid class: AM_50uLperSec ▼ Override flow rates from liquid class: Image: Comparison of the class of the clas of the clas of the class of the class of the class	-	
Blowout volume (0 - 250 µL): 0 Properties Liquid class: AM_50uLperSec ▼ Override flow rates from liquid class: ▼ Aspirate/dispense flow rate (0 - 500 µL/s): 10 Mix cycles (0 - 100): 3 Liquid class:		
Properties AM_50uLperSec Verride flow rates from liquid class: Aspirate/dispense flow rate (0 - 500 µL/s): 10 Mix cycles (0 - 100): 3 V Liquid class:		
Liquid class: AM_50uLperSec Override flow rates from liquid class: ✓ Aspirate/dispense flow rate (0 - 500 µL/s): 10 Mix cycles (0 - 100): 3 Liquid class: ✓		L): 0
Override flow rates from liquid class: Image: Comparison of the comparison		AM SoulperSec.
Aspirate/dispense flow rate (0 - 500 µL/s): 10 Mix cycles (0 - 100): 3		
Mix cycles (0 - 100): 3		
Liquid class to use in determining pipette velocity and accelerations.	Liquid class:	
	Liquid class to use in determin	ing pipette velocity and accelerations.

Figure Liquid class velocity setting in the Liquid Library Editor and flow rate override option

Task parameters

After adding the AM Mix task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

AM Mix (Bravo)

Task Parameters	*
au 2↓	
AM Mix (Bravo) Properties	
Location, plate:	
Location, location:	<auto-select></auto-select>
Volume	
Volume (0 - 250 µL):	10
Pre-aspirate volume (0 - 250 µL):	0
Blowout volume (0 - 250 µL):	0
Properties	
Liquid class:	AM_50uLperSec
Override flow rates from liquid class:	V
Aspirate/dispense flow rate (0 - 500 µL/s):	10
Mix cycles (0 - 100):	3
Dynamic tip extension (0 - 20 mm/µL):	0
Well selection:	1 selection: entire plate
Pipette technique:	
Distance From Well Bottom	
Aspirate distance (0 - 100 mm):	2
Dispense at different distance:	
Dispense distance (0 - 100 mm):	2
🛛 Tip Touch	
Perform tip touch:	
Which sides to use for tip touch:	None
Tip touch retract distance (-20 - 50 mm):	0
Tip touch horizontal offset (-5 - 5 mm):	0

Parameter	Description
Location, plate	The labware involved in the Mix task.
Location, location	The location at which the Mix task occurs
	<auto-select> automatically places the labware at the first-available or appropria location for the task. If accessories are installed on the deck or shelf, the softwar uses the accessory configuration informati in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the corre- location for the task.</auto-select>
Volume (µL)	The volume of liquid to be mixed in each well.
Pre-aspirate volume (µL)	The volume of air to be drawn before the pipette tips enter the liquid.
Blowout volume (µL)	The volume of air to dispense after the may volume has been dispensed while the tips still in the wells.
	Typically, the blowout volume is the same the pre-aspirate volume.
Liquid class	The pipetting velocity and accuracy.
	IMPORTANT To ensure consistent pipetti always select a liquid class for liquid-handling tasks.

Parameter	Description
Override flow rates from liquid class	The option to override the aspirate and dispense velocity in the selected liquid class. Selecting this option enables you to specify a value for the flow rate without changing the liquid class.
Aspirate/dispense flow rate (0–500 µL/s)	The numerical value or the JavaScript variable that will override both the aspirate and dispense velocity in the selected liquid class.
	A JavaScript variable enables the value to be assigned later. For example, using a VWorks form, an operator could easily change the flow rate for a mix step in increments from as low as 1 μ L/min up to 2000 μ L/min or more using the same liquid class.
	If the task is included in a VWorks macro, a JavaScript variable enables you to change the value for the task at the macro level.
	IMPORTANT The software requires that the flow rate value be in microliters per second $(\mu L/s)$ at run time. If you want an operator to enter the value in microliters per minute $(\mu L/min)$, you can use scripting to convert the values for the software to use.
Mix cycles (0–100)	The number of times to repeat the aspirate- and-dispense cycle.

AM Mix (Bravo)

Parameter	Description
Dynamic tip extension (0–20 mm/µL)	The rate at which the Bravo 96AM Head moves during the aspirate action. The software calculates the distance over which the tips will move without crashing.
	Use dynamic tip extension to prevent spills as the pipette tips displace the liquid.
	To move the tips:
	• At the same rate as the volume change. Calculate dynamic tip extension (DTE) as follows:
	DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls
	• Faster than the volume change. DTE > 1/A
	• Slower than the volume change. DTE < 1/A
	The starting and ending positions can be calculated as follows:
	$(V_{aspirated} * DTE)$ + Distance _{well bottom}
	<i>Note:</i> Instead of a negative aspirated volume, the software automatically moves downward toward the well bottom with each aspirate action.
Well selection	The wells at which the Mix task occurs.
	Click in the parameter box, and then click the Browse button to select the wells in the Well Selection dialog box.
	Use this parameter only if the Bravo 96AM Head has fewer tips than the number of wells in the microplate, or if you are in single-row or single-column mode.
Pipette technique	The pipette location offset you want to use for the Mix task.
	The list of pipette techniques are defined in the Pipette Technique Editor.
Aspirate distance (0–100 mm)	The distance between the end of the pipette tips and the well botttoms during the aspirate action.
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.

Parameter	Description					
Dispense at different distance	The option to dispense at a pipette tip heigh that is different than the aspirate distance.					
	Select the check box to enter a value for the dispense distance.					
Dispense distance (0–100 mm)	The distance between the tips of the probes, cartridges, or disposable tips and the well bottoms during the dispense action.					
Perform tip touch	The option to touch the tips on one or more sides of the well.					
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/ South, West/East, West/East/South/North.					
Tip touch retract distance (–20 to 50 mm)	The vertical distance for the tips to rise before touching the sides of the wells.					
Tip touch horizontal offset (-5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.					
	For example, if you set a value of:					
	• 0, the tips move a horizontal distance equal to the well radius					
	 > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch 					
	 < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch 					

Quadrant pattern well selection

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head.

IMPORTANT For the Bravo 96AM Head, the quadrant pattern option is available only if you are using 384-well microplates.

Instead of a column- or row-wise pattern, you can select a quadrant pattern during well selection.

The quadrant pattern option is available only if:

- The number of channels in the pipette head (or pins in a pin tool) is fewer than the number of wells in the microplate. For example, you can use a 96-channel pipette head to dispense liquid into a 384-well microplate or 1536-well microplate.
- All the channels are selected in the Set Head Mode task when using a pipette head. (The Set Head Mode task is not an option when using a pin tool).

• The liquid-handling task is inside a loop.

IMPORTANT If you select a quadrant pattern, specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To select a quadrant pattern:

1 In the **Task Parameters** area, click the **Well selection** parameter box, and then click the Browse button. The Well Selection dialog box opens. By default, the **Normal well selection** option is selected. This option is used for columnand row-wise liquid-handling patterns.

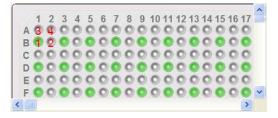
	ladr	ant	pat	tern	ina	3 100	pp											•
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
B	ŏ	õ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
c	ŏ	õ	ŏ	õ	ŏ	õ	ŏ	õ	ŏ	õ	ŏ	õ	ŏ	õ	ŏ	0	ŏ	
D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Е	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
F	0	õ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
н	2	0	2	20	2	00	2	00	2	20	2	00	2	00	2	0	2	
1	×	×	×	×	×	×	×	×	×	×	~	×	×	×	×	ž	×	~
<																	>	
84 w	ells	in p	plate	8							Righ	nt-cl	ick f	ior r	nore	e op	tion	s

- **2** Select **Quadrant pattern in a loop**. The contents of the dialog box change. Notice the following:
 - Red numbers (1 through 4) appear on wells A1, A2, B1, and B2. The numbers indicate the pipetting sequence: 1 is the starting well, and 4 is the last well. In the following example, the sequence is A1, A2, B1, B2.
 - Green wells indicate the starting well in the pipetting sequence.
 - Pattern buttons at the bottom of the dialog box indicate the movement of the pipette channels. The movement description is provided in the text box above the buttons.

Note: The last two patterns are unavailable if a group contains 16 wells. For example, the last two patterns are not available if you have a 96-well pipette head and a 1536-well microplate.

c	lick a we	ell to selec	t the sta	rting qua	adrant			_
1	2 3	4 5 6	578	9 10	11 12	13 14	15 16 1	7
A 1	80			00	00	00		5
c	00	000	000	00	00	00	000	5
DO	00	000	000	00	00	00	000	0
EO	00	000	000	00	00	00	000	0
FO	00	000	000	00	00	00	000) -
< 🗆								>
		e, 96 barro						
Left-to-r	ight, the	n top-to-b	ottom, s	tarting a	t quadra	ant 1		

3 Select the starting well. The well becomes green and is labeled 1. In the following example, the third quadrant (B1 well) is selected.



4 Click a pattern button to specify the pipette channel movement. After you click a pattern, the red numbers in the graphic are updated to show the sequence.

In the following example, the second pattern is selected (right-to-left, then top-to-bottom). The third quadrant (B1) is the starting well. The resulting movement is:

Quadrant 3 (B1)

Quadrant 2 (A2)

Quadrant 1 (A1)

Quadrant 4 (B2)

Well Selection			
O Normal well selection			
Quadrant pattern in a loop			
Click a well to select the starting quadrant			
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17			
A 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
c000000000000000000			
384 wells in plate, 96 barrels on head Right-to-left, then top-to-bottom, starting at quadrant 3			
Apply pattern: 🗾 🚺 🚺 🏠 🛄			
OK Cancel			

5 When you are finished, click **OK** to save the changes and return to the VWorks window.

Example: Allowing an operator to change the mix flow rate using an edit control on a VWorks form

Goal

Allow an operator to change the mix flow rate from run to run without modifying the liquid class.

Implementation

In the protocol, the AM Mix task is added. In the task parameters, the **Override** dispense flow rates from liquid class check box is selected, and the Aspirate/dispense flow rate is specified as a variable, for example =mixFlowRate.

In the VWorks form, an edit control is added for the mix flow rate using the =mixFlowRate variable. The operator can enter values within a specified range in the form and run the protocol using the form. For details on how to design VWorks forms to run protocols, see "Creating protocol forms for operators" on page 153.

Related information

For information about	See
Using the Bravo 96AM Head	Bravo Automated Liquid Handling Platform User Guide
AM Aspirate task	"AM Aspirate (Bravo)" on page 400
AM Dispense task	"AM Dispense (Bravo)" on page 410
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
AM Cartridges On	"AM Cartridges On (Bravo)" on page 431
AM Cartridges Off	"AM Cartridges Off (Bravo)" on page 429
Task macros	"Using macros to create protocols" on page 133
Protocol forms	"Creating protocol forms for operators" on page 153
Using JavaScript variables	"Using simple variables" on page 77

AM Cartridges Off (Bravo)

Description

The AM Cartridges Off (Bravo) (AM Cartridges Off (Bravo)) task removes the AssayMAP Bravo cartridges from the Bravo 96AM Head. The task is available only if the device profile specifies the Bravo 96AM Head. You can use the AM Cartridges Off task while the head's syringes contain liquid, and then subsequently dispense the liquid using the syringe probes.

Task is available for...Task is available in...Bravo Platform with a gripper and a
Bravo 96AM Head installedMain Protocol, Bravo Subprocess

Task parameters

After adding the AM Cartridges Off task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

21	
AM Cartridges Off	(Bravo) Properties
Location, plate:	2 (96AM Cartridge Rack with Receiver Plate)
Location, location:	<auto-select></auto-select>
Properties	
Well selection:	1 selection: column 1

Parameter	Description
Location, plate	The labware involved in the AM Cartridges Off task.
	Ensure a cartridge rack is selected.
Location, location	The location at which the AM Cartridges Off task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck, the software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task.</auto-select>

AM Cartridges Off (Bravo)

Parameter	Description
Well selection	The well positions to use for the AM Cartridges Off task.
	To select fewer positions than a full head, a Set Head Mode task must precede the AM Cartridges Off task in the protocol.
	IMPORTANT See the <i>Bravo 96AM Head and</i> <i>AssayMAP Bravo Cartridges User Guide</i> for restrictions related to using a subset of channels in the Bravo 96AM Head.

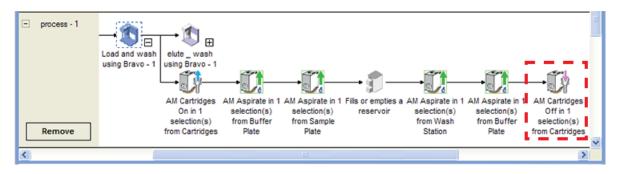
Example: Remove cartridges while the syringes contain liquid after a series of AM Aspirate tasks

Goal

After aspirating a series of reagents through the AssayMAP Bravo cartridges to bind a target to the cartridge resin bed, remove the cartridges to wash the head's syringes before mounting the cartridges again for elution.

Implementation

In a liquid-handling subprocess, the AM Cartridges Off task is added after a series of AM Aspirate tasks and before a subsequent elute-wash subprocess.



Because the cartridges are removed at a cartridge rack, the Cartridge Rack is selected as the Location, plate in the Task Parameters area.

<u>31</u> 21	
AM Cartridges Off	(Bravo) Properties
Location, plate:	2 (96AM Cartridge Rack with Receiver Plate)
Location, location:	<auto-select></auto-select>
Properties	
Well selection:	1 selection: column 1

Related information

For information about	See
Using the Bravo 96AM Head	Bravo Automated Liquid Handling Platform User Guide
AM Cartridges On task	"AM Cartridges On (Bravo)" on page 431
AM Aspirate task	"AM Aspirate (Bravo)" on page 400
AM Dispense task	"AM Dispense (Bravo)" on page 410
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Set Head Mode task	"Set Head Mode (Bravo)" on page 529

AM Cartridges On (Bravo)

Description

The AM Cartridges On (Bravo) (AM Cartridges On (Bravo)) task presses cartridges on a Bravo 96AM Head. The task is available only if the profile specifies the Bravo 96AM Head. You can use the AM Cartridges On (Bravo) task while the head's syringes are empty or contain liquid.

 Task is available for...
 Task is available in...

Bravo Platform with a gripper and a Main Protocol, Bravo Subprocess Bravo 96AM Head installed

Task parameters

After adding the AM Cartridges On task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

10 <u>2</u> 1	
E AM Cartridges On (Bravo) Properties
Location, plate:	2 (96AM Cartridge Rack with Receiver Plate)
Location, location:	<auto-select></auto-select>
Properties	
Well selection:	1 selection: column 1

AM Cartridges On (Bravo)

Parameter	Description
Location, plate	The labware involved in the AM Cartridges On task.
	Ensure a cartridge rack is selected.
Location, location	The location at which the AM Cartridges On task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck, the software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task.</auto-select>
Well selection	The well positions to use for the AM Cartridges On task.
	To select fewer positions than a full head, a Set Head Mode task must precede the AM Cartridges On task.
	IMPORTANT See the <i>Bravo 96AM Head and</i> <i>AssayMAP Bravo Cartridges User Guide</i> for restrictions related to using a subset of channels in the Bravo 96AM Head.

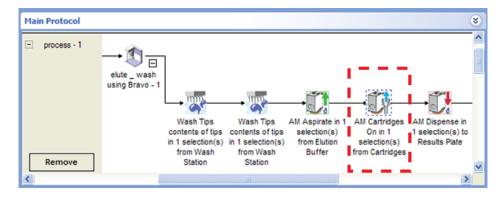
Example: Press on cartridges in order to perform a dispense through the cartridges

Goal

Press on the cartridges while fluid is held in the Bravo 96AM Head syringes so that the fluid can be dispensed through the cartridge resin bed for collection in a sample plate.

Implementation

In a liquid-handling subprocess, an AM Aspirate task is used to aspirate elution buffer using the bare probes into the Bravo 96AM Head syringes. The AssayMAP Bravo cartridges are pressed on using the AM Cartridges On task. An AM Dispense task is used to dispense the elution buffer through the cartridges into a results plate.



Because the cartridges are pressed on at a cartridge rack, the Cartridge Rack is selected for the Location, plate in the Task Parameters area.

10 <u>2</u> 1	
AM Cartridges On (Bravo) Properties
Location, plate:	2 (96AM Cartridge Rack with Receiver Plate)
Location, location:	<auto-select></auto-select>
Properties	
Well selection:	1 selection: column 1

Related information

For information about	See
Using the Bravo 96AM Head	Bravo Automated Liquid Handling Platform User Guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
AM Cartridges Off task	"AM Cartridges Off (Bravo)" on page 429
AM Aspirate task	"AM Aspirate (Bravo)" on page 400
AM Dispense task	"AM Dispense (Bravo)" on page 410
Set Head Mode task	"Set Head Mode (Bravo)" on page 529

AM Wash Syringes (Bravo)

Description

The AM Wash Syringes (Bravo) (AM Wash Syringes (Bravo)) task enables the following types of washes using the Bravo 96AM Head:

- Internal washing of the Bravo 96AM Head syringes
- External washing of the syringe probes
- External washing of the AssayMAP Bravo cartridges while mounted on the probes

Task is available for	Task is available in
Bravo Platform with a Bravo 96AM Head and an autofilling station	Main Protocol, Bravo Subprocess

AM Wash Syringes (Bravo)

Requirements

In Bravo Diagnostics, ensure that the 96AM Wash Station is set up at the correct deck location and associated with a Pump Module.

Ensure that the protocol has a configured labware for the 96AM Wash Station in addition to the other processes and configured labware required by the protocol.

Task parameters

After adding the AM Wash Syringes task at the desired point in the protocol, you set the parameters in the **Task Parameters** area.

CAUTION Ensure that all the syringes have bare probes or that all syringes have mounted cartridges for this task. Otherwise, a potential collision can occur, which can damage the syringes and the 96AM Wash Station.

CAUTION Ensure that the labware definition for the 96AM Wash Station is accurate and the teachpoint for the location is precise so that the system can position the syringe probes or cartridge tips at the correct location. Otherwise, a potential collision can occur, which can damage the syringes and the 96AM Wash Station.

The software automatically selects all the chimneys in the wash station (entire plate) for the well selection and sets the volume and other properties. The following figure shows the AM wash type parameter: (A) External Wash or (B) Internal Syringe Wash.

Task Parameters	*	Task Parameters	
201 21		21	
AM Wash Syringes (Bravo) Pro	operties	AM Wash Syringes (Bravo) Pr	operties
Location, plate:	1 (96AM Tip Wash Station)	Location, plate:	1 (96AM Tip Wash Station)
Location, location:	<auto-select></auto-select>	Location, location:	<auto-select></auto-select>
Properties	and the second second	Properties	
AM wash type: Liquid class:	External Wash	AM wash type: Liquid class:	Internal Syringe Wash
Mix cycles (0 - 100):	0	Mix cycles (0 - 100):	0
3 Pump		🛛 Pump	
Pump fill speed (1 - 100 %):	25	Pump fil speed (1 - 100 %):	50
Pump empty speed (1 - 100 %):	35	Pump empty speed (1 - 100 %):	60
E Task Description		Task Description	
Task number:	2	Task number:	2
Task description:	AM Wash Syringes (Bravo)	Task description:	AM Wash Syringes (Bravo)
Use default task description:	5	Use default task description:	N

The task actions vary depending on what you select for the **AM wash type** parameter:

• **External Wash**. Moves the tips of the probes or cartridges into the 96AM Wash Station chimneys. This wash type does not aspirate or dispense any volume. The liquid class can be used to control the duration of the wash.

Select the **External Wash** to wash the tips of the syringe probes or the cartridges mounted on the probes. See "Example External Wash" on page 436.

• Internal Syringe Wash. Dispenses to waste any contents remaining in the syringes, and then aspirates $250 \cdot \mu L$ wash liquid from the 96AM Wash Station chimneys into the syringes. The task dispenses the $250 \cdot \mu L$ volume to waste outside the chimneys, and then performs a tip touch on the chimneys' exterior.

Select the **Internal Syringe Wash** to flush the syringe barrels with wash liquid. See "Example Internal Syringe Wash" on page 437.

CAUTION Ensure that all syringe probes are bare (cartridges are off) for the Internal Syringe Wash. Otherwise, a potential collision can occur, resulting in equipment damage.

Parameter	Description
Location, plate	The labware involved in the AM Wash Syringes task.
	Ensure that you use a 96AM Wash Station.
Location, location	The location at which the AM Wash Syringes task occurs.
	<auto-select> The software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task. This should be the deck location where the 96AM Wash Station is installed.</auto-select>
AM wash type	The type of wash: External Wash (default) or Internal Syringe Wash.
Liquid class	The liquid class for this wash liquid.
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
	<i>Note:</i> Although the External Wash does not include aspirate and dispense actions, you can use a liquid class with a delay to control the duration of the wash.
Mix cycles (0–100)	Internal Syringe Wash only. The number of times to repeat the aspirate-and-dispense cycle for the wash task. Each mix cycle consists of one aspirate action and one dispense action.

For each wash you select the following parameters.

AM Wash Syringes (Bravo)

Parameter	Description
Pump fill speed (%)	The speed, in percent of maximum, at which liquid flows into the 96AM Wash Station inlet ports and up into the chimneys.
	The Pump fill speed should be fast enough for the wash liquid to just bubble over the tops of the chimneys.
	Initially, you should use the following values, and then determine if you need to make adjustments:
	External Wash
	- Pump fill speed 25%
	- Pump empty speed 35%
	Internal Syringe Wash
	– Pump fill speed 50%
	- Pump empty speed 60%
Pump empty speed (%)	The speed, in percent of maximum, at which the waste liquid is pumped out of the 96AM Wash Station outlet ports.
	You should use the default values initially, and then determine if you need to adjust the value.
	CAUTION The Pump empty speed should be slightly faster than the Pump fill speed to prevent an overflow.
Use default task description	The option to change the label that appears with the task icon in the Main Protocol area
	• To use the default text, ensure that the check box is selected.
	• To create your own label, clear the check box, and then type the desired text in the field next to Task description .

Example External Wash

Goal

After aspirating samples or other reagents through the AssayMAP cartridges, perform an External Wash to remove the residual liquid that can cling to the external surfaces of the cartridges and prevent carryover to future steps.

Implementation

In the following example, the configured wash station at deck location 1 is called 96AM Tip Wash Station. In the Load Samples subprocess, an External Wash (AM Wash Cartridge Tips) task is added between an AM Aspirate task to load the sample on the mounted cartridges and an AM Aspirate task that aspirates 5 μ L buffer as a sample chase. In the External Wash parameter settings, the liquid class specifies a delay that defines the time duration that the tips remain in the chimneys.

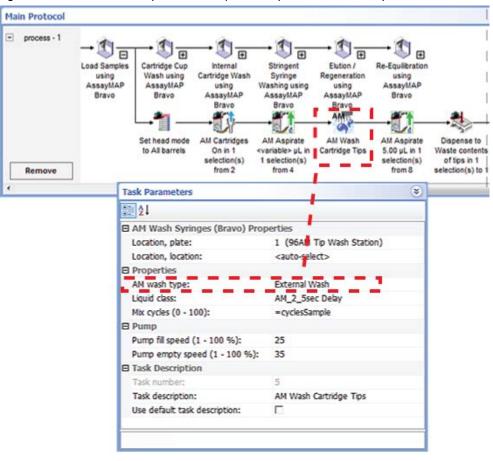


Figure External Wash example in an AssayMAP subprocess to load samples

Example Internal Syringe Wash

Goal

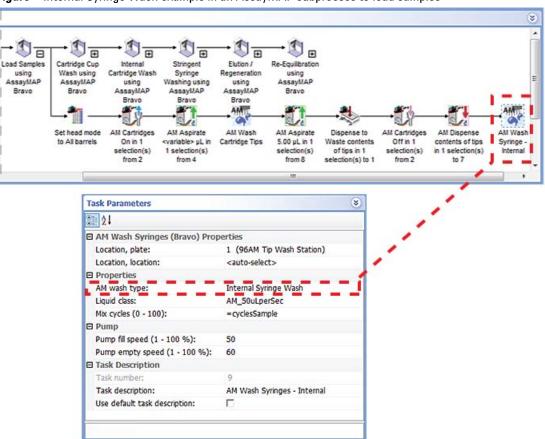
After aspirating samples or other reagents through the AssayMAP cartridges and into the syringes, eject the cartridges, and perform an Internal Syringe Wash to remove unwanted residual reagents from the syringes.

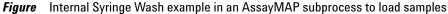
Implementation

In the following example, the configured wash station at deck location 1 is called 96AM Tip Wash Station. In the Load Samples subprocess, an Internal Syringe Wash task is added at the end of the subprocess after the cartridges are removed at deck location 2 and the syringe contents have been dispensed for collection at deck location 7.

Note: The Internal Syringe Wash dispenses to waste any contents remaining in the syringes when the task begins.

AM Wash Syringes (Bravo)





Related information

For information about	See
Using the Bravo 96AM Head	Bravo Automated Liquid Handling Platform User Guide
AM Aspirate task	"AM Aspirate (Bravo)" on page 400
AM Dispense task	"AM Dispense (Bravo)" on page 410
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
AM Cartridges On	"AM Cartridges On (Bravo)" on page 431
AM Cartridges Off	"AM Cartridges Off (Bravo)" on page 429
Task macros	"Using macros to create protocols" on page 133

10 Setting parameters for liquid-handling tasks Assemble Vacuum (Bravo)

For information about	See
Protocol forms	"Creating protocol forms for operators" on page 153
Using JavaScript variables	"Using simple variables" on page 77

Assemble Vacuum (Bravo)

Description

The Assemble Vacuum task (Assemble Vacuum (Bravo)) directs the robot to pick up the Vacuum Filtration Station components from designated deck locations and stack them in the order you specify.

The task is used in conjunction with the following tasks:

- Disassemble Vacuum
- Move and Filter Plate, or Toggle Vacuum

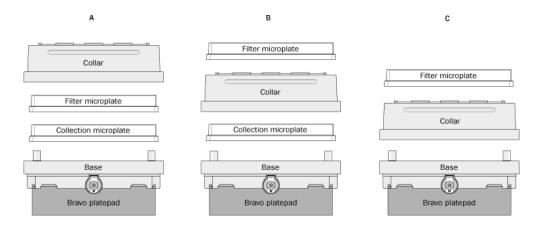
Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

Supported configurations

To accommodate different assay types, the Bravo Platform supports the Vacuum Filtration Station configurations shown in the diagram. Note the following:

- *Configuration A.* The filter microplate is part of the station assembly. The assembly process can be automated during the protocol run. The filtrate in the collection microplate is retained.
- *Configuration B.* The filter microplate is not part of the station assembly. The assembly process can be automated during the protocol run. The robot will move the filter microplate to the station after the assembly process is finished. The filtrate in the collection microplate is retained.
- *Configuration C.* The basic configuration that must be assembled before a protocol run (assembly is not automated, so the Assembly and Disassembly tasks are not used). The filter microplate is not part of the station assembly. The robot will move the filter microplate to the station during the protocol run. The filtrate is discarded.

Assemble Vacuum (Bravo)



Requirements

To use the Assemble Vacuum (Bravo) task, you must first:

- Configure the Vacuum Filtration Station in Bravo Diagnostics.
- Set the robot gripper offset for labware that will be placed on the Vacuum Filtration Station during a protocol run. You set the offset in the Labware Editor.

Task parameters

After adding the Assemble Vacuum (Bravo) task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	д
Task Parameters	۲
2∎ 2↓	
Assemble Vacuum (Bravo) properties	5
Assembly Order:	Base-Collection plate-F 🔻
Collection Plate, plate:	
Collection Plate, location:	<auto-select></auto-select>
Filter Plate, plate:	
Filter Plate, location:	<auto-select></auto-select>
Vacuum Filtration base:	

Parameter	Description	
Assembly order	The order, from bottom to top, in which you want to stack the station components. The selections are:	
	• Base-Collection plate-Filter plate-Collar (configuration A)	
	• Base-Collection plate-Collar (configuration B)	
	• Base-Collar (configuration C)	
Collection Plate, plate	The type of microplate for collecting the filtrate.	

Parameter	Description
Collection Plate, location	The location of the collection microplate.
	Select the deck location of the collection microplate.
	Select <auto-select> only if the software knows of the collection microplate location (for example, if you used a Place Plate task earlier in the protocol to specify its location).</auto-select>
Filter Plate, plate	The type of microplate used for the filtering process.
Filter Plate, location	The location of the filtering microplate.
	Select the deck location of the filter microplate.
	Select <auto-select> only if the software knows of the filter microplate location (for example, if you used a Place Plate task earlier in the protocol to specify its location).</auto-select>
Vacuum Filtration base	The location of the Vacuum Filtration Station base.

Examples:

See the example in:

- "Move and Filter Plate (Bravo)" on page 505
- "Toggle Vacuum (Bravo, Vertical Pipetting Station)" on page 545

Related information

For information about	See
Adding devices	• "Adding devices" on page 25
	• Bravo Automated Liquid Handling Platform User Guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Configuring the Vacuum Filtration Station	Bravo Automated Liquid Handling Platform User Guide
Setting the robot gripper offset in the Labware Editor	VWorks Automation Control Setup Guide
Move and Filter Plate task	"Move and Filter Plate (Bravo)" on page 505
Toggle task	"Toggle Vacuum (Bravo, Vertical Pipetting Station)" on page 545
Disassemble Vacuum (Bravo) task	"Disassemble Vacuum (Bravo)" on page 449

For information about...See...Microplate-handling tasks"Setting parameters for microplate-
handling tasks" on page 277Microplate-storage tasks"Setting parameters for microplate
storage tasks" on page 349Scheduling tasks"Setting parameters for scheduling
tasks" on page 557I/O-handling tasks"Setting parameters for I/O-handling
tasks" on page 269

Dilute to Final Volume (Bravo)

Description

The Dilute to Final Volume task (Dilute To Final Volume (Bravo)) allows you to transfer liquid from a reagent labware to a destination microplate. The task is available only if you specified dilution series parameters within the Format Wizard in the Hit Pick Replication task.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

You can add the Dilute to Final Volume task before or after the Hit Pick Replication task.

- *Before hit-picking.* Prefills the destination microplate with reagent. If the destination microplates are empty when the task starts, you only need to change the pipette tip with every destination microplate. You do not have to change the pipette tip between each reagent well, thus reducing the number of tips used.
- *After hit-picking*. Backfills the destination microplate with reagent. In this case, you must change the pipette tip between each reagent well to prevent contamination, thus using more tips.

Adding the Dilute to Final Volume task

To add the Dilute to Final Volume task:

1 Add another Bravo Subprocess in the destination microplate process. (You cannot add the Dilute to Final Volume task in the subprocess that contains the Hit Pick Replication task.)

In the following example, the first Bravo subprocess (called Hit Picking) contains the Hit Pick Replication task. The second Bravo subprocess, Back Fill, contains the Dilute to Final Volume task. Notice that both subprocesses are in the Destination Plate process.



When you add the Dilute to Final Volume (Bravo) task, the software automatically starts the Dilute to Final Volume Wizard.

- **2** On the first page of the wizard:
 - **a** Select the source and destination labware to use.

Note: The source labware is the labware that contains the reagent for back filling. It is not the source microplate used for the Hit Pick Replication task.

b Specify the locations of the reagent and destination labware.

ute to Final Volume Wizard			
Primary Parameters For Dilute To Final Volume Task			
Hit pick task to link to:			
Task 4; Subprocess "Hit Picking"	•		
Reagent plate:		Destination plate:	
Reagent for Backfill (96 Greiner 655101 PS Clr Rnd Well Flat Btr	•	Destination (384 Greiner 781280 PP Clr Sqr Well V btm_)	•
Reagent plate		Destination plate location:	
<auto-select></auto-select>	-	<auto-select></auto-select>	-

When you are finished, click Next.

3 Specify the Aspirate and Dispense task parameters. For detailed parameter descriptions, see "Aspirate (Bravo, Vertical Pipetting Station)" on page 392 and "Dispense (Bravo, Vertical Pipetting Station)" on page 451.

21	
Aspirate	
Pre-aspirate volume (0 - 251 µL):	0
Post-aspirate volume (0 - 251 µL):	0
Liquid class:	
Distance from well bottom (0 - 100 mm):	2
Dynamic tip extension (0 - 20 mm/µL):	0
Pipette technique:	
Perform tip touch:	
Which sides to use for tip touch:	None
Tip touch retract distance (-20 - 50 mm):	0
Tip touch horizontal offset (-5 - 5 mm):	0
Dispense	
Blowout volume (0 - 251 µL):	0
Liquid class:	
Distance from well bottom (0 - 100 mm):	2
Dynamic tip retraction (0 - 20 mm/µL):	0
Pipette technique:	
Perform tip touch:	
Which sides to use for tip touch:	None
Tip touch retract distance (-20 - 50 mm):	0
Tip touch horizontal offset (-5 - 5 mm):	0

When you are finished, click Next.

Dilute to Final Volume (Bravo)

4 Select additional operations, if applicable.

itional Operations	
Mixing Options	
Mixing before each aspirate	
Mixing after each dispense	
Enable Washing	
Wash 1 time(s) using reservoir and/or wash	
O Wash after every transfer.	
O Wash with every source plate change	
Tip Options	
O Never change	
O Change after every dispense	
O Change with every reagent well change	
Tip box Options	
Change tip boxes involved in this routine? (Configured labware should always choose "Change tip box based on Automatic Tip Selection")	
O Never. Use single instance of tip boxes (example: Static labware)	
 Change tip box based on Automatic Tip Selection (recommended for hit picking) 	(pr
O Change tip box with every source plate change (replication only)	

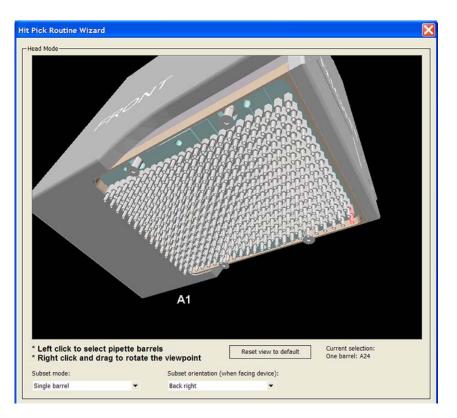
Additional operation	Description
Mixing Options	Select where you want to add a Mix task:
	• Before each aspirate task
	• After each dispense task
	You will need to set the Mix parameters later in the wizard.
	If you do not want to mix, clear both check boxes.
Enable Washing	Select the check box if you want to add one or more Wash Tips tasks. You can specify the number of tip washes and whether you want to:
	• Wash after every transfer
	• Wash with every source microplate change
	You will need to set the Wash Tips parameters later in the wizard.
	Clear the check box if you do not want to add any Wash Tips tasks.

Additional operation	Description
Tip Options	Select the tip-change option:
	• <i>Never change</i> . If you select option, you must add the Set Head Mode, Tips On, and Tips Off tasks in the subprocess, outside of the Dilute to Final Volume routine, after you are finished with the wizard.
	Set head mode to Al Barrels Set bead mode (Bogn) Set head mode (B
	• <i>Change after every dispense.</i> Changes the tips after every dispense within the routine.
	• Change with every reagent well change. Changes the tips after every reagent well change during the routine.
Tip Box Options	Select when to change the tipbox:
	• Never. Use single instance of tip boxes (example: Static labware). Does not change the tipbox within the routine.
	• Change tip box based on Automatic Tip Selection. Uses tip-tracking within the routine, and changes the tipbox when the box if fully used. Select this option if the tipboxes you are using are configured labware.
	<i>Note:</i> Tip-tracking continues in subsequent tasks in the process.
	• Change tipbox with every source plate change (replication only). Changes the tipbox every time the source microplate changes. This option is available only when a replication format file is selected.
	• Change tipbox with every destination plate change (replication only). Changes the tipbox every time the destination microplate changes. This option is available only when a replication format file is selected.

When you are finished, click Next.

5 Select the pipette channels to use. For a description of the selections, see "Set Head Mode (Bravo)" on page 529.

Dilute to Final Volume (Bravo)



When you are finished, click Next.

6 If you selected mixing options in step 4. Set the mixing parameters. For a description of the parameters, see "Mix (Bravo, Vertical Pipetting Station)" on page 497.

Pick Routine Wizard		
fix Parameters		
: 21		
Volume		
Volume (0 - 251 µL):	10	
Pre-aspirate volume (0 - 251 µL):	0	
Blowout volume (0 - 251 µL):	0	
Properties		
Liquid class:		
Mix cycles (0 - 100):	3	
Dynamic tip extension (0 - 20 mm/µL):	0	
Pipette technique:		
Distance From Well Bottom		
Aspirate distance (0 - 100 mm):	2	
Dispense at different distance:		
Dispense distance (0 - 100 mm):	2	
Tip Touch		
Perform tip touch:		
Which sides to use for tip touch:	None	
Tip touch retract distance (-20 - 50 mm):	0	
Tip touch horizontal offset (-5 - 5 mm):	0	

When you are finished, click Next.

- 7 If you selected wash options in step 4. Set the wash parameters.
 - **a** In the **Wash In** area, select the type of labware to be used for the wash task:
 - *Tip Wash Station (MicroWash Reservoir)*. Adds Wash Tips tasks and will use either configured or static labware.
 - A microplate or standard reservoir. Adds Mix tasks.
 - **b** In the **Wash plate** list, select the desired labware and location.

c Set wash-tip parameters. For a description of the parameters, see "Wash Tips (Bravo, Vertical Pipetting Station)" on page 550.

	Wa	ash 1 d	of 1	Γ	Wash		wash	reser	voir	0	A micr	oplate	e or st	andar	d res	ervoir									
Nash pla	ate:												W	ash p	late lo	cation	n:								
Wash re	eservo	oir (38	4 V 1 1	0810	4.001	Manu	ial Fil	Rese	rvoir)		•			auto	selec	t>									-
Nell sele	ction:																								
12																									^
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
в	õ	õ	õ	õ	0	õ	õ	õ	õ	õ	õ	0	õ	õ	0	õ	õ	0	0	õ	0	0	0	õ	
D	2	2	2	0	2	~	2	2	2	-	2	-	-	0	-	2	2	-	-	-	0	2	-	2	
C	0	0	Q	0	0	Q	Q	0	0	0	Q	0	0	0	0	0	0	Q	0	0	0	0	0	0	
D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
E	-	-	~	-	-	-	-	~	-	-	-	-	-	-	-	-	-	-	~	-	~	-	-	-	~
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Specify t		ashing	para	meter	s:																				
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E Tip 1	Touch	1																							
Perfo	orm tip	toud	n:									Г													
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		etract										0													
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		beed (ty spe										50													
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When you are finished, click Next.

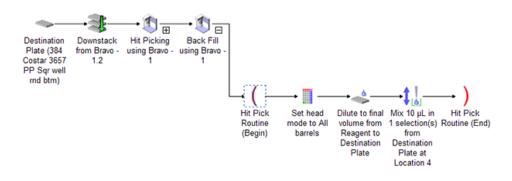
- 8 If you selected a tip-change option in step 4. Select the tipbox options.
 - **a** Select the tipboxes you want to use.
 - **b** Select the tip-tracking options you want to use:
 - Allow automatic tracking of tip usage. Allows the software to track pipette tip usage during the protocol run or across different protocol runs. If you select the option in this task, you must also select the option in the Tips Off task. In general, use the default selections displayed.
 - *Mark tips as used.* The option to use only new pipette tips during the protocol run. Select the option so that the software counts the number of tips used during the protocol run. The tips that have been used once are marked as used so that they cannot be reused. Clear the check box so that during the next Tips On task, the same tips can be reused. In general, use the default selections displayed.

Dilute to Final Volume (Bravo)

Tips-on		2010 A.	
		Tips-on plate	
Tips On for HP (384 V11 ST30 Tip Box 11484.102)	-	2	-
Tips-on			
21			
Properties			
Allow automatic tracking of tip usage:		 Image: A start of the start of	
Tips-off plate:		Tips-off plate	
	•	Tips-off plate	
Tips Off for HP (384 V11 ST30 Tip Box 11484.102)	•		
Tips Off for HP (384 V11 ST30 Tip Box 11484.102) Tips-off parameters:	×		Ţ
Tips-off plate: Tips Off for HP (384 V11 ST30 Tip Box 11484.102) Tips-off parameters: 같 21 은 Properties	•	3	
Tips Off for HP (384 V11 ST30 Tip Box 11484.102) Tips-off parameters:	•		

9 Click Finish.

Based on the information you provide in the wizard, the software adds the Aspirate, Dispense, Mix, tip-washing, and other tasks that are necessary to produce the desired results.



Notice the following:

- The Hit Pick Routine (Begin) and Hit Pick Routine (End) tasks mark the beginning and end of the dilute-to-final-volume tasks.
- You can modify any of the task parameters directly in the Task Parameters area.
- You can return to the Dilute to Final Volume Wizard. To do this, select either the Hit Pick Routine (Begin) or Hit Pick Routine (End) task. In the Task Parameters area, click Launch hit pick routine wizard.

Related information



For information about	See
Hit Pick Replication task	"Hit Pick Replication (Bravo)" on page 466
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Disassemble Vacuum (Bravo)

Description

The Disassemble Vacuum task (Disassemble Vacuum (Bravo)) directs the robot to remove components from the Vacuum Filtration Station and place them back at the locations specified in the Assemble Vacuum task. If a filter microplate was placed on top of the station, the Disassemble Vacuum task directs the robot to move the microplate to a specified location before disassembly.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

The task is used in conjunction with the following tasks:

- Assemble Vacuum
- Move and Filter Plate, or Toggle Vacuum

Requirements

To use the Disassemble Vacuum (Bravo) task, you must first:

- Configure the Vacuum Filtration Station in Bravo Diagnostics.
- Set the robot gripper offset for labware that will be placed on the Vacuum Filtration Station during a protocol run. You set the offset in the Labware Editor.
- Add an Assemble Vacuum (Bravo) task.

Disassemble Vacuum (Bravo)

Task parameters

After adding the Disassemble Vacuum (Bravo) task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Ta	sk Parameters	4
Т	ask Parameters	۲
	Ż↓	
Ξ	Disassemble Vacuum (Bravo)	properties
	Filter Plate, plate:	
	Filter Plate, location:	<auto-select></auto-select>
	Vacuum Filtration Assembly:	

Parameter	Description
Filter Plate, plate	The type of microplate for collecting the filtrate.
Filter Plate, location	The location at which you want to place the filter microplate during the disassembly process.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>
Vacuum Filtration Assembly	The location of the Vacuum Filtration Station.

Examples:

See the example in:

- "Move and Filter Plate (Bravo)" on page 505
- "Toggle Vacuum (Bravo, Vertical Pipetting Station)" on page 545

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Configuring the Vacuum Filtration Station	Bravo Automated Liquid Handling Platform User Guide

For information about	See
Setting the robot gripper offset in the Labware Editor	VWorks Automation Control Setup Guide
Move and Filter Plate	"Move and Filter Plate (Bravo)" on page 505
Toggle	"Toggle Vacuum (Bravo, Vertical Pipetting Station)" on page 545
Assemble Vacuum (Bravo) task	"Assemble Vacuum (Bravo)" on page 439
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

Dispense (Bravo, Vertical Pipetting Station)

Description

The Dispense (Bravo) (\mathbf{U} Dispense (Bravo)) and Dispense (Vertical Pipetting Station) (\mathbf{U} Dispense (Vertical Pipetting Station)) tasks dispense liquid into a microplate, reservoir, or tubes in a tube rack.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Task parameters

Note: The task parameters for Dispense (Bravo) and Dispense (Vertical Pipetting Station) are identical.

After adding the Dispense task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Dispense (Bravo, Vertical Pipetting Station)

Task Parameters	
2↓	
Dispense (Bravo) properties	
Location, plate:	
Location, location:	<auto-select></auto-select>
∃ Volume	
Empty tips:	
Volume (0 - 72 µL):	10
Blowout volume (0 - 72 µL):	0
Properties	
Liquid class:	
Distance from well bottom (0 - 100 mm):	2
Dynamic tip retraction (0 - 20 mm/µL):	0
Well selection:	1 selection: A1
Pipette technique:	
∃ Tip Touch	
Perform tip touch:	V
Which sides to use for tip touch:	None
Tip touch retract distance (-20 - 50 mm):	0
Tip touch horizontal offset (-5 - 5 mm):	0

Parameter	Description	
Location, plate	The labware involved in the Dispense task.	
Location, location	The location at which the Dispense task occurs.	
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>	
Empty tips	The option to empty all liquid from the tips instead of using the dispense volume specification.	
Volume (µL)	The volume of liquid to be dispensed from each pipette tip.	
Blowout volume (µL)	Specifies the volume of air to dispense after the main volume has been dispensed while the tips are still in the wells.	
	Typically, the blowout volume is the same as the pre-aspirate volume.	
	Note: Blowout only occurs in the last quadrant dispensed for a given Dispense task.	

Parameter	Description	
Liquid class	The pipetting speed and accuracy.	
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.	
Distance from well bottom (0–100 mm)	The distance between the end of the pipette tips and the well bottoms during the Dispense task.	
	If you specify dynamic tip retraction, this is the starting distance.	
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.	
Dynamic tip retraction (0–20 mm/µL)	The rate at which to raise the pipette head during the Dispense task.	
	Use dynamic tip retraction to prevent spills as the pipette tips displace the liquid.	
	To move the tips:	
	• At the same rate as the volume change. Calculate dynamic tip retraction (DTR) as follows:	
	DTR = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls	
	• Faster than the volume change. DTR > 1/A	
	• Slower than the volume change. DTR < 1/A	
	The starting and ending positions can be calculated as follows:	
	$(V_{dispensed} * DTR)$ + Distance _{well bottom}	
Well selection	The wells at which the Dispense task occurs	
	Click in the parameter box, and then click the Browse button to select the wells in the Well Selection dialog box.	
	Use this parameter only if the pipette head has fewer tips than the number of wells in the microplate, or if you are in single-row or single-column mode.	
Pipette technique	The pipette location offset you want to use for the Dispense task.	
	The list of pipette techniques are defined in the Pipette Technique Editor.	
Perform tip touch	The option to touch the pipette tip on one or more sides of the well.	

Dispense (Bravo, Vertical Pipetting Station)

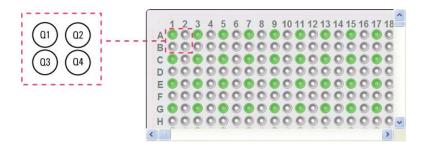
Parameter	Description	
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/ South, West/East, West/East/South/North.	
Tip touch retract distance (-20 to 50 mm)	The vertical distance for the pipette tips to rise before touching the sides of the wells.	
Tip touch horizontal offset (-5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.	
	For example, if you set a value of:	
	• 0, the tips move a horizontal distance equal to the well radius	
	 > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch 	
	 < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch 	

Quadrant pattern well selection

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head. The following table lists the types of pipette heads and the number of accessible quadrants in various microplates.

Pipette head channels/ pin tool pins	Microplate	Number of quadrants
96	96- well	1
	384- well	4
	1536- well	16
384	384- well	1
	1536- well	4
1536 (pin tool only)	1536- well	1

The following diagram demonstrates the concept of quadrants. The diagram shows a portion of a 384-well microplate and highlights the four quadrants (Q1, Q2, Q3, and Q4) that are accessible by the A1 tip of a 96-channel pipette head. Notice that the green color highlights all of the quadrant 1 (Q1) wells across the microplate.



Instead of a column- or row-wise pattern, you can select a quadrant pattern during well selection.

The quadrant pattern option is available only if:

- The number of channels in the pipette head (or pins in a pin tool) is fewer than the number of wells in the microplate. For example, you can use a 96-channel pipette head to dispense liquid into a 384-well microplate or 1536-well microplate.
- All the channels are selected in the Set Head Mode task when using a pipette head. (The Set Head Mode task is not an option when using a pin tool).
- The liquid-handling task is inside a loop.

IMPORTANT If you select a quadrant pattern, specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To select a quadrant pattern:

1 In the **Task Parameters** area, click the **Well selection** parameter box, and then click the Browse button. The Well Selection dialog box opens. By default, the **Normal well selection** option is selected. This option is used for columnand row-wise liquid-handling patterns.

Well Selection	E E E E E E E E E E E E E E E E E E E
Normal well selection	
O Quadrant pattern in a loop	
	^
1 2 3 4 5 6 7 8	9 10 11 12 13 14 15 16 17 🚞
B00000000	0000000000
c000000000	000000000
D00000000	000000000
E O O O O O O O O O	0000000000
F00000000	000000000
100000000	0000000000
384 wells in plate	* Right-click for more options
1 selection: quadrant 1	
	OK Cancel

- **2** Select **Quadrant pattern in a loop**. The contents of the dialog box change. Notice the following:
 - Red numbers (1 through 4) appear on wells A1, A2, B1, and B2. The numbers indicate the pipetting sequence: 1 is the starting well, and 4 is the last well. In the following example, the sequence is A1, A2, B1, B2.
 - Green wells indicate the starting well in the pipetting sequence.

•

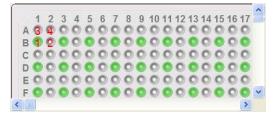
Dispense (Bravo, Vertical Pipetting Station)

Pattern buttons at the bottom of the dialog box indicate the movement of the pipette channels. The movement description is provided in the text box above the buttons.

Note: The last two patterns are unavailable if a group contains 16 wells. For example, the last two patterns are not available if you have a 96-well pipette head and a 1536-well microplate.

Well Selection	×				
Normal well selection Quadrant pattern in a loop Click a well to select the starting quadrant					
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 A 1 2 4 6 <td< td=""><td></td></td<>					
Apply pattern:					

3 Select the starting well. The well becomes green and is labeled 1. In the following example, the third quadrant (B1 well) is selected.



4 Click a pattern button to specify the pipette channel movement. After you click a pattern, the red numbers in the graphic are updated to show the sequence.

In the following example, the second pattern is selected (right-to-left, then top-to-bottom). The third quadrant (B1) is the starting well. The resulting movement is:

Quadrant 3 (B1)

Quadrant 2 (A2)

Quadrant 1 (A1)

Quadrant 4 (B2)

01	/ell Selection	Ľ				
•	Quadrant pattern in a loop Click a well to select the starting quadrant					
4 E C E F 384	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 3 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
Righ	ht-to-left, then top-to-bottom, starting at quadrant 3					
Appl	Apply pattern: 🗾 🚺 💭 💭 🛄 🛄					
	ОК	Cancel				

5 When you are finished, click **OK** to save the changes and return to the VWorks window.

Example: Dispense into a microplate on the Bravo Platform

Goal

Aspirate contents from a source microplate (Source 1) and dispense into a destination microplate.

Implementation

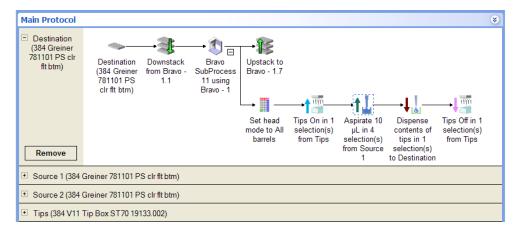
The Bravo deck is physically set up as follows:

- The destination microplates are at Bravo deck location 1.
- The source microplate is at deck location 2.
- The tipbox is at deck location 9.

In the protocol, the following are added:

- Process for the destination microplate
- Configured labware for the source microplate
- Configured labware for the tipbox

In the Destination plate process, a Bravo subprocess is added. Within the subprocess, an Aspirate task and a Dispense task are added as shown in the following example.



In the Dispense Task Parameters area, Destination is selected, because the goal is to dispense into that microplate.

Tas	k Parameters	*
31 2	ž↓	
🗆 Di	spense (Bravo) Properties	
Lo	cation, plate:	Destination (384 Greiner 78
Lo	cation, location:	<auto-select></auto-select>
🗆 Ve	olume	
En	npty tips:	✓
Vo	olume (0 - 251 μL):	10
Bk	owout volume (0 - 251 µL):	0
🗆 Pr	roperties	
Lic	quid class:	
Di	stance from well bottom (0 - 10	2
Dy	ynamic tip retraction (0 - 20 mr	0
W	'ell selection:	4 selections: quadrants 1-4
Pi	pette technique:	
🗆 Ti	p Touch	
Pe	erform tip touch:	
W	'hich sides to use for tip touch:	None
Tip	p touch retract distance (-20 - !	0
Tir	p touch horizontal offset (-5 - 5	0

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Liquid classes	VWorks Automation Control Setup Guide
Pipette techniques	"Specifying pipetting techniques" on page 613
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Set Head mode task	"Set Head Mode (Bravo)" on page 529
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Tips Off task	"Tips Off (Bravo, Vertical Pipetting Station)" on page 539
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349

10 Setting parameters for liquid-handling tasks Dispense to Waste (Bravo)

For information about	See
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

Dispense to Waste (Bravo)

Description

The Dispense to Waste (Bravo) (Dispense to Waste (Bravo)) task moves the pipettes by a horizontal offset and then dispenses used fluid in between the chimneys in the Tip Wash Station. The software calculates the horizontal offset automatically based on the labware definition for the Tip Wash Station.

Task is available for	Task is available in			
Tip Wash Station (MicroWash Reservoir) on Bravo Platform	Main Protocol, Bravo Subprocess			

Task parameters

After adding the Dispense to Waste task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

<u>:</u> 2↓	
Dispense to Waste (Bravo) Properties	
Location, plate:	
Location, location:	1
🗆 Volume	
Empty tips:	2
Volume (0 - 250 µL):	10
Blowout volume (0 - 250 µL):	0
Properties	
Liquid class:	96_AM_wash
Override dispense flow rate from liquid class:	
Dispense flow rate (0 - 500 µL/s):	
Distance from well bottom (0 - 100 mm):	=washWasteHeight
Dynamic tip retraction (0 - 20 mm/µL):	0
Well selection:	1 selection: entire plate
Tip Touch	
Perform tip touch on North/East side:	V
Tip touch retract distance (-20 - 50 mm):	=washRetract
Tip touch horizontal offset (-5 - 5 mm):	=washOffset

Dispense to Waste (Bravo)

Parameter	Description
Location, plate	The Tip Wash Station involved in the Dispense to Waste task.
	<i>Note:</i> The Tip Wash Station is also known as the Microwash Reservoir.
Location, location	The location of the Tip Wash Station at which the Dispense to Waste task occurs. <auto-select> If accessories are installed on the deck, the software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task.</auto-select>
Empty tips	The option to empty all the liquid from the head into the Tip Wash Station outside the chimneys.
Volume (µL)	The volume of liquid to be dispensed from each pipette.
Blowout volume (µL)	Specifies the volume of air to dispense after the main volume has been dispensed while the tips are still in the Tip Wash Station.
Liquid class	The pipetting speed and accuracy.
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
Override dispense flow rate from liquid class	The option to override the dispense velocity specified in the liquid class. Selecting this option enables you to specify a value for the dispense flow rate without changing the liquid class.

Parameter	Description				
Dispense flow rate (0–500 μ L/s)	The numerical value or the JavaScript variable that will override the dispense velocity setting in the liquid class.				
	A JavaScript variable enables the value to be assigned later, for example through a VWork form. Using a VWorks form, an operator could easily change the flow rate for a dispense step in increments from as low as 1 μ L/min up to 1001 μ L/min using the same liquid class.				
	If the task is included in a VWorks macro, a JavaScript variable enables you to change the value for the task at the macro level.				
	IMPORTANT The software requires that the flow rate value be in microliters per second $(\mu L/s)$ at run time. If you want an operator to enter the value in microliters per minute $(\mu L/min)$, you can use scripting to convert the values for the software to use.				
Distance from well bottom (mm)	The absolute distance between the end of the pipette tips and the bottom of the Tip Wash Station during the Dispense to Waste task.				
	If you specify dynamic tip retraction, this is the starting distance.				
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.				
Dynamic tip retraction (mm/µL)	The rate at which to raise the pipette head during the Dispense to Waste task.				
	Use dynamic tip retraction to prevent spills as the pipette tips displace the liquid.				
	To move the pipettes:				
	• At the same rate as the volume change. Calculate dynamic tip retraction (DTR) as follows:				
	DTR = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls				
	• Faster than the volume change. DTR > 1/A				
	• Slower than the volume change. DTR < 1/A				
	The starting and ending positions can be calculated as follows:				
	(V _{dispensed} * DTR) + Distance _{well bottom}				

Dispense to Waste (Bravo)

Parameter	Description				
Well selection	The chimney locations at which the Dispense to Waste task occurs.				
	Click in the parameter box, and then click the Browse button to select the locations in the Well Selection dialog box.				
	Use this parameter only if the pipette head has fewer tips or cartridges than the number of locations in the wash station, or if you are in single-row or single-column mode.				
Perform tip touch on North/ East side	The option to touch the tip on an outer side of the adjacent northeast chimney or wall in the Tip Wash Station after performing the dispense.				
Tip touch retract distance (-20 to 50 mm)	The vertical distance for the pipette tips to rise before performing the tip touch.				
Tip touch horizontal offset (-5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.				
	For example, if you set a value of:				
	• 0, the tips move a horizontal distance equal to the well radius				
	 > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch 				
	• < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch				

Example: Dispense into a Tip Wash Station on the Bravo Platform using a Bravo 96AM Head

Goal

After aspirating fluids up through mounted AssayMAP Bravo cartridges, remove the cartridges, dispense the contents of the Bravo 96AM Head syringes at a Tip Wash Station, remount the cartridges for additional aspiration steps.

Implementation

In Bravo Diagnostics, set up the Tip Wash Station on a deck location. Associate the station with one or more pump modules.

In the protocol, add a configured labware for the Tip Wash Station in addition to the other processes and configured labware required by the protocol. In the example shown, the configured reservoir is called Wash.

In the Bravo subprocess where the liquid-handling tasks are specified, a Dispense to Waste task is added after a series of aspiration tasks.

Dispense to Waste (Bravo)

Main Protocol	Load and wash using AssayMAP Bravo								
Remove		AM Cartridges On in 1 selection(s) from 2	AM Aspirate <variable> µL in 1 selection(s) from Buffer</variable>	AM Aspirate <variable> µL in 1 selection(s) from Sample</variable>	AM Cartridges Off in 1 selection(s)	Dispense to Waste 10 µL in 1 selection(s)	AM Cartridges On in 1 selection(s)	AM Aspirate 5 µL in 1 selection(s)	AM Aspirat <variable> µL 1 selection(i from Buffe</variable>
Buffer (no labware Sample (no labware)									

In the Dispense to Waste Task Parameters area, the Tip Wash Station is selected so that the task is performed in this labware.

Task Parameters	(
21		
Dispense to Waste (Bravo) Properties		
Location, plate:		
Location, location:	1	
🗆 Volume		
Empty tips:	2	
Volume (0 - 250 µL):	10	
Blowout volume (0 - 250 µL);	0	
Properties		
Liquid class:	96_AM_wash	
Override dispense flow rate from liquid class:		
Dispense flow rate (0 - 500 µL/s):		
Distance from well bottom (0 - 100 mm):	=washWasteHeight	
Dynamic tip retraction (0 - 20 mm/µL):	0	
Well selection:	1 selection: entire plate	
Tip Touch		
Perform tip touch on North/East side:	V	
Tip touch retract distance (-20 - 50 mm):	=washRetract	
Tip touch horizontal offset (-5 - 5 mm):	=washOffset	

Related information

For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Liquid classes	VWorks Automation Control Setup Guide	
Pipette techniques	"Specifying pipetting techniques" on page 613	
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392	

For information about	See
Set Head mode task	"Set Head Mode (Bravo)" on page 529
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Tips Off task	"Tips Off (Bravo, Vertical Pipetting Station)" on page 539
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

Evaporate (Bravo)

Description

The Evaporate (Bravo) task (Evaporate (Bravo)) places labware on the Evaporator accessory and blows air over the labware to remove solvent or dry the sample.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

Requirements

To use the Evaporate (Bravo) task, you must first configure the Evaporator in Bravo Diagnostics.

Task parameters

After adding the Evaporate (Bravo) task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters		ņ
Task Parameters		۲
::: 2↓		_
🗆 Evaporate (Bravo) Properties		
Location, plate:		
Location, location:	<auto-select></auto-select>	
Mode:	Timed	
Time for operation in Timed mode (s):	30	
Allow concurrent operation:		

Parameter	Description	
Location, plate	The labware involved in the Evaporate task.	
Location, location	The location at which the Evaporate task occurs.	
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics to determine the correct location for the task.</auto-select>	
Mode	The action of the task:	
	• On. Turns on the Evaporator.	
	• Off. Turns off the Evaporator.	
	• <i>Timed.</i> Turns on the Evaporator timer. You must specify the length of time the Evaporator must remain on.	
	If you did not select Timed, add a second Evaporate task to turn off the Evaporator.	
Time for operation in Timed mode	The length of time, in seconds, you want to leave the Evaporator on. At the end of the period, the Evaporator will turn off.	
Concurrent operation	The option to permit the accessory to operate simultaneously with other tasks.	

Related information

For information about	See	
Adding devices	• "Adding devices" on page 25	
	Bravo Automated Liquid Handling Platform User Guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	

Hit Pick Replication (Bravo)

For information about	See
Configuring the Evaporator	Bravo Automated Liquid Handling Platform User Guide
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Hit Pick Replication (Bravo)

Description

The Hit Pick Replication (Bravo) (_ Hit Pick Replication (Bravo)) task allows you to:

- Hit pick, or transfer contents, from selected wells in a source microplate to a destination microplate.
- Replicate a microplate by transferring contents from a source microplate into multiple destination microplates.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

Workflow

The following table presents the steps for using the Hit Pick Replication task.

Step	For this task	See
1	Set up labware on the Bravo deck.	"Setting up labware on the Bravo deck" on page 467
2	Create an input file.	"Creating input files" on page 468
3	Create the protocol.	"Creating a protocol: basic procedure" on page 13
4	Add the Hit Pick Replication task, and select or create a format file.	"Adding the Hit Pick Replication task" on page 470 "Creating format files" on page 480

Hit Pick Replication (Bravo)

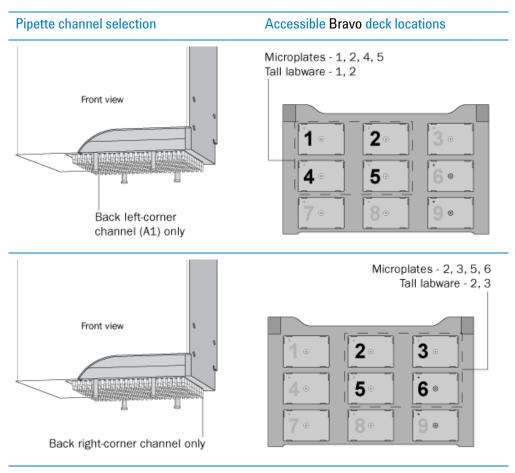
Step	For this task	See
5	Verify source-destination transfers.	"Verifying source-destination transfers" on page 496

Setting up labware on the Bravo deck

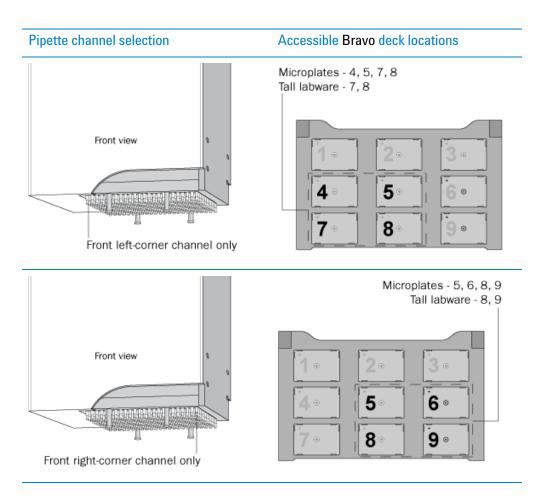
For hit-picking transfers, the deck locations you can access depends on the pipette head channel you select. In addition, because tipboxes and reservoirs are tall, you must consider the locations of the these labware relative to the source and destination microplates.

The following table shows the channel selection and corresponding deck location limits for both microplates and tall labware. Use this information when setting up labware for the hit-picking task.

For example, if you select the A1 channel, you can place microplates at locations 1, 2, 4, and 5. If you have tall labware, such as a tipbox and a reservoir, place them at locations 1 and 2. Doing so permits the pipette head to access the microplates at locations 4 and 5 without colliding with the tall labware.

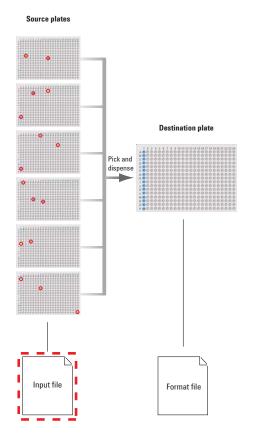


Hit Pick Replication (Bravo)



Creating input files

Both the hit-picking and microplate replication tasks require an input file. An input file contains information about the source microplates.



You must have the required input file before adding the Hit Pick Replication task or before you start the protocol run. The input file can be from a LIMS or created manually. The file must meet the following requirements:

- The file must be in the comma-separated value (CSV) format.
- The file can contain a heading in the first row, or the first few consecutive rows.
- *Microplate replication*. The input file must contain a column that lists source microplate barcodes or IDs.
- *Hit picking*. The input file must contain the following columns, in any order:
 - Source microplate barcode or ID
 - Well locations (in a single column or across two columns)
 - Variable dilution factors (if dilution series will be created)
 - Transfer-volume information (if variable-volume transfer is desired)

IMPORTANT Hits from each source microplate must be in consecutive rows in the input file. In addition, the order in which the microplates are processed in protocol runs must match the order of the microplates in the input files.

The following examples show two input files (1 and 2) displayed in Microsoft Excel. The heading is in the first row in both files. Microplate IDs are used instead of barcodes. Notice that the well locations are displayed differently in the two files. The file on the right (2) also contains dilution factor information.

Hit Pick Replication (Bravo)

1			
	Α	В	С
1	PlateID	Well	Volume
2	Plate 1	H12	20
3	Plate 1	G3	30
4	Plate 2	C6	20
5	Plate 2	B12	15
6	Plate 2	M1	20
7	Plate 3	A9	20
8	Plate 3	E16	30
9	Plate 3	01	15
10	Plate 4	H6	20
11	Plate 4	110	30
12	Plate 5	A2	20
13	Plate 5	F5	20
14	Plate 5	G1	20
15	Plate 6	F9	15
16	Plate 6	B1	30
17	Plate 6	P24	20

	Α	В	С	D
1	PlateID	Well row	Well col	Dil factor
2	Plate 1	н	12	2
3	Plate 1	G	3	2
4	Plate 2	С	6	3
5	Plate 2	В	12	4
6	Plate 2	M	1	3
7	Plate 3	A	9	1
8	Plate 3	E	16	2
9	Plate 3	0	1	3
10	Plate 4	н	6	4
11	Plate 4	1	10	2
12	Plate 5	A	2	4
13	Plate 5	F	5	3
14	Plate 5	G	1	2
15	Plate 6	F	9	3
16	Plate 6	В	1	1
17	Plate 6	Ρ	24	4

2

Adding the Hit Pick Replication task

When you add the Hit Pick Replication (Bravo) task, the software automatically starts the Hit Pick Routine Wizard.

In the Hit Pick Routine Wizard:

1 Select the source and destination microplates. You must also select their locations.

When setting up hit-picking transfers, make sure the source microplate and destination microplate are at one of the accessible deck locations. See "Setting up labware on the Bravo deck" on page 467.

For example, if you are using the A24 (back right-corner channel) pipettetip channel for hit picking, the accessible deck locations are 2, 3, 5, and 6. If the source microplate will be at deck location 5 and the destination microplate will be at deck location 6, you must provide this information on the first page of the Hit Pick Routine Wizard as shown.

Source plate:		Destination plate:	
Source (384 Greiner 781280 PP Clr Sqr Well V btm_)	•	Destination (384 Greiner 781280 PP Clr Sqr Well V btm_)	
Source plate location:		Destination plate location:	
<auto-select></auto-select>	-	<auto-select></auto-select>	
Hit pick replication format file:			

- **2** Do one of the following:
 - Select an existing format file from the Hit pick replication format list.

• Click Launch format wizard to create a new format file. See "Creating format files" on page 480 for detailed instructions.

Source plate:		Destination plate:	
Source (384 Greiner 781280 PP Clr Sqr Well V btm_)	•	Destination (384 Greiner 78 1280 PP Clr Sqr Well V btm_)	20
Source plate location:		Destination plate location:	
<auto-select></auto-select>	-	<auto-select></auto-select>	1
Hit pick replication format file:		-	

When you are finished, click Next.

Hit Pick Replication (Bravo)

3 Supply the input file information. If you do not have an input file, see "Creating input files" on page 468.

	O Specify an i O Specify an i	input file when the input file now	protocol runs		100000000000000000000000000000000000000	skip headings heading lines:	0	-
2	C:\VWorks Wo	orkspace (Usability)	16 SAMPLE PICK_	Usability_varDil.csv	 Start fro	om transfer number:	1	Ī
3	Column 1	Column 2	Column 3	Column 4				-
	PlateID	Well	Volume	Dilutionfactor				
	Plate1	H12	20	2				
	Plate1	G3	30	2				
	Plate2	C6	20	3				
	Plate2	B12	15	4				
	Plate2	M1	20	3				
	Plate3	A9	20	1				
	Source plate ban Source plate (c	code/ID olumn in csv): 1	• • Well II	ell Format and Corresponding) (column in csv): 2 👻 w and column Row (colum		Column (column in	csv); 💌	

1 Operation type Displays the type of operation: Hi picking, or replication. The selection made in the format file and cannot changed on this page. For information
about the format file, see "Creatin format files" on page 480.

Description Allows you to select one of the following: • Specify an input file when the protocol runs Specify an input file now If you select Specify an input file now, use the browse button to locate and select the desired input file.

In either case, you can select one of the following:

- Auto skip heading. Enables the software to automatically find and skip rows that contain heading information.
- Skip heading lines. Skips the specified number of rows at the top of the input file. Select this option if you want to manually specify the number of heading rows.

In addition, you can specify the row to start the transfer from in the Start from transfer number box. 1 indicates starting the first transfer from the first row after the heading rows. Input file contents Displays the contents of the input file. Source plate barcode/ID Allows you to select the column that contains the source plate barcode or ID. Source well format and Hit-picking only. Allows you to corresponding input file indicate whether the well location is specified as:

- Well ID. The well location is in a single column (for example, A24). Select the column that contains the well ID.
- Well row and column. The well . location is in two columns. Select the columns that contain the well row and well column information. The row information can be a letter or a number.

6 Variable dilution factor and Variable transfer volume <i>Hit-picking only.</i> Allows you to se the column that contains the diluti factors and transfer volume.	
--	--

When you are finished, click Next.

ltem

2

3

4

5

column

Input file specification

Select input file

7 Specify the Aspirate and Dispense task parameters. For detailed parameter descriptions, see "Aspirate (Bravo, Vertical Pipetting Station)" on page 392 and "Dispense (Bravo, Vertical Pipetting Station)" on page 451.

Hit Pick Replication (Bravo)

21		
3 Aspirate		
Pre-aspirate volume (0 - 251 µL):	0	
Post-aspirate volume (0 - 251 µL):	0	
Liquid class:		
Distance from well bottom (0 - 100 mm):	2	
Dynamic tip extension (0 - 20 mm/µL):	0	
Pipette technique:		
Perform tip touch:		
Which sides to use for tip touch:	None	
Tip touch retract distance (-20 - 50 mm):	0	
Tip touch horizontal offset (-5 - 5 mm):	0	
3 Dispense		
Blowout volume (0 - 251 µL):	0	
Liquid class:		
Distance from well bottom (0 - 100 mm):	2	
Dynamic tip retraction (0 - 20 mm/µL):	0	
Pipette technique:		
Perform tip touch:		
Which sides to use for tip touch:	None	
Tip touch retract distance (-20 - 50 mm):	0	
Tip touch horizontal offset (-5 - 5 mm):	0	

When you are finished, click Next.

8 Select additional operations, if applicable.

itional Operations	
Mixing Options	
Mixing before each aspirate	
Mixing after each dispense	
Enable Washing	
Wash 1 time(s) using reservoir and/or wash	
O Wash after every transfer	
O Wash with every source plate change	
Tip Options	
O Never change	
⊙ Change after every dispense	
O Change with every reagent well change	
Tip box Options	
Change tip boxes involved in this routine? (Configured labware should always choose "Change tip box based on Automatic Tip Selection")	
O Never. Use single instance of tip boxes (example: Static labware)	
O Change tip box based on Automatic Tip Selection (recommended for hit picking)	
O Change tip box with every source plate change (replication only)	
O Change tip box with every destination plate change (replication only)	

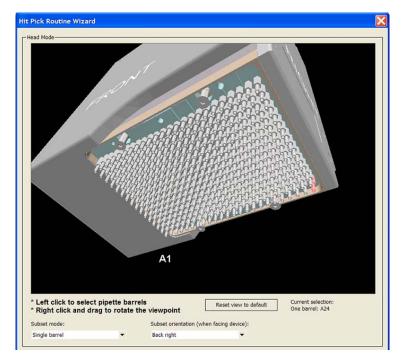
Additional operation	Description					
Mixing Options	Select where you want to add a Mix task:					
	• Before each aspirate task					
	• After each dispense task					
	You will need to set the Mix parameters later in the wizard.					
	If you do not want to mix, clear both check boxes.					
Enable Washing	Select the check box if you want to add one or more Wash Tips tasks. You can specify the number of tip washes and whether you want to:					
	• Wash after every transfer					
	• Wash with every source microplate change					
	You will need to set the Wash Tips parameters later in the wizard.					
	Clear the check box if you do not want to add any Wash Tips tasks.					
Tip Options	Select the tip-change option:					
	• <i>Never change</i> . Does not change the tips within the hit-picking routine.					
	<i>Note:</i> If you select Never change, you must add the Set Head Mode, Tips On, and Tips Off tasks in the subprocess, outside of the hit-picking routine, after you are finished with the wizard.					
	He Ricking using Brave - 1 Set head mode to One barret: P24 transform Soft HP HP HP HP HP HP HP HP HP HP HP HP HP					
	• <i>Change after every dispense.</i> Changes the tips after every dispense within the hitpicking routine.					
	• Change with every source well change. Changes the tips after every source well change during the hit-picking routine.					

Hit Pick Replication (Bravo)

Additional operation	Description
Tip Box Options	Select when to change the tipbox:
	• Never. Use single instance of tip boxes (example: Static labware). Does not change the tipbox within the hit-picking routine.
	• Change tip box based on Automatic Tip Selection (recommended for hit picking). Uses tip-tracking within the hit-picking routine, and changes the tipbox when the box is fully used. Select this option if the tipboxes you are using for hit-picking are configured labware.
	<i>Note:</i> Tip-tracking continues in the Dilute to Final Volume routine.
	• Change tip box with every source plate change (replication only). Changes the tipbox every time the source microplate changes. This option is available only when a replication format file is selected.
	• Change tipbox with every destination plate change (replication only). Changes the tipbox every time the destination microplate changes. This option is available only when a replication format file is selected.

When you are finished, click Next.

9 Select the pipette channels to use. For a description of the selections, see "Set Head Mode (Bravo)" on page 529.



When you are finished, click Next.

10 If you selected mixing options in step 8. Set the mixing parameters. For a description of the parameters, see "Mix (Bravo, Vertical Pipetting Station)" on page 497.

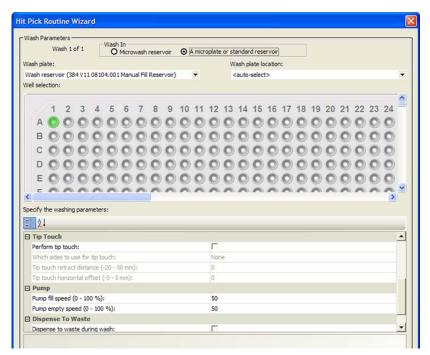
Pick Routine Wizard		
fix Parameters		
21		
Volume		
Volume (0 - 251 µL):	10	
Pre-aspirate volume (0 - 251 µL):	0	
Blowout volume (0 - 251 µL):	0	
Properties		
Liquid class:		
Mix cycles (0 - 100):	3	
Dynamic tip extension (0 - 20 mm/µL):	0	
Pipette technique:		
Distance From Well Bottom		
Aspirate distance (0 - 100 mm):	2	
Dispense at different distance:		
Dispense distance (0 - 100 mm):	2	
Tip Touch		
Perform tip touch:		
Which sides to use for tip touch:	None	
Tip touch retract distance (-20 - 50 mm):	0	
Tip touch horizontal offset (-5 - 5 mm):	0	

When you are finished, click Next.

- 11 If you selected wash options in step 8. Set the wash parameters.
 - **a** In the **Wash in** area, select the type of labware to be used for the wash task:
 - *Tip Wash Station (also known as MicroWash Reservoir).* Adds Wash Tips tasks and will use either configured or static labware.
 - A microplate or standard reservoir. Adds Mix tasks.
 - **b** In the **Wash plate** list, select the desired labware and location.

Hit Pick Replication (Bravo)

c Set wash-tip parameters. For a description of the parameters, see "Wash Tips (Bravo, Vertical Pipetting Station)" on page 550.



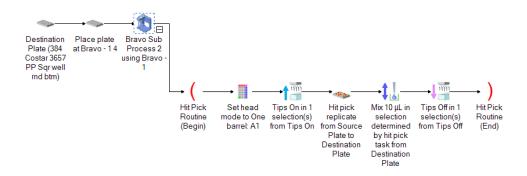
When you are finished, click Next.

- 12 If you selected a tip-change option in step 8. Select the tipbox options.
 - **a** Select the tipboxes you want to use.
 - **b** Select the tip-tracking options you want to use:
 - Allow automatic tracking of tip usage. Allows the software to track pipette tip usage during the protocol run or across different protocol runs. If you select the option in this task, you must also select the option in the Tips Off task. In general, use the default selections displayed.
 - *Mark tips as used.* The option to use only new pipette tips during the protocol run. Select the option so that the software counts the number of tips used during the protocol run. The tips that have been used once are marked as used so that they cannot be reused. Clear the check box so that during the next Tips On task, the same tips can be reused. In general, use the default selections displayed.

ips-on			Tips-on plate	
Tips On for HP (384 V11 ST30 Tip Box 11484.102)	-		2	
ips-on				
21				
Properties Allow automatic tracking of tip usage:		~		
Allow automatic tracking of tip usage:		1.		
ips-off plate:			Tips-off plate	
Tips Off for HP (384 V11 ST30 Tip Box 11484.102)	-		3	
ips-off parameters:				
1 2↓				
Properties		~		
Properties Allow automatic tracking of tip usage: Mark tips as used:		~		

13 Click Finish.

Based on the information you provide in the wizard, the software adds the Aspirate, Dispense, Mix, Wash Tips, and other tasks that are necessary to produce the desired hit-picking or replication results.



Hit Pick Replication (Bravo)

Notice the following:

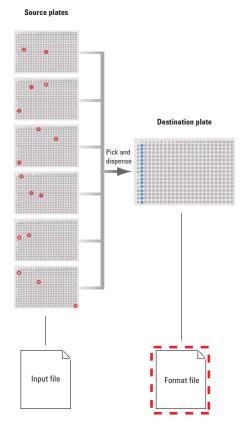
- The Hit Pick Routine (Begin) and Hit Pick Routine (End) tasks mark the beginning and end of the microplate-replication or hit-picking tasks.
- You can modify any of the task parameters directly in the Task Parameters area.
- You can add more tasks to or delete tasks from the routine.
- You can return to the Hit Pick Routine Wizard. To do this, select either the Hit Pick Routine (Begin) or Hit Pick Routine (End) task. In the Task Parameters area, click Launch hit pick routine wizard.

CAUTION Whenever you return to the Hit Pick Routine Wizard, make modifications, and finish the wizard, a new set of tasks will replace the existing tasks in the routine.

Creating format files

About format files

For both microplate replication and hit picking, you are required to use a format file. The format file shows the dispense pattern in destination microplates.



Workflow

You use the Hit Pick Replication Format Wizard to create the format file. You can access the wizard when you add the Hit Pick Replication task. The overall workflow for creating the format file is:

Hit Pick Replication (Bravo)

Step	For this task	See
1	Create the format file.	"Creating format files" on page 480
2	Add contents to the format file for one of the following:	One of the following:
	• Hit picking, and dilution series (if desired)	• "Adding hit-picking information in the format file" on page 482
	Replication	• "Adding replication information in the format file" on page 488

Creating new format files

To create a new format file:

1 On the first page of the Hit Pick Routine Wizard, click Launch format wizard.

Source plate:		Destination plate:	
Source (384 Greiner 781280 PP Clr Sqr Well V btm_)	•	Destination (384 Greiner 781280 PP Clr Sqr Well V btm_)	
Source plate location:		Destination plate	
5	•	6	
	·	•	
5 Hit pick replication format 16SampleColumnLayout.xml			

The Hit Pick Replication Format Editor opens.

2 Click **Create new format file**, type a name for the file in the prompt dialog box, and then click **OK**. The new format file name appears in the list.

Hit Pick Replication Format Editor		X
Create a new format file, or select an existing format file, and then click Launch format wizard to view and edit		
MyFormatFile16_a.xml	Format Description	
new.xml	<please description="" file="" format="" here.="" input="" of=""></please>	
		*
Create new format file	Launch format wizard	
Save changes		
Bave changes as]	
Rename format file]	
Delete format file]	

The software saves the format file in the XML format in the following folder: C:\VWorks Workspace\VWorks\Hit Picking\Format Files\

You can change the default storage location. To do this, in the VWorks window, select Tools > Options. Change the file path in the Directories and Paths area of the **Options** dialog box.

Directories and Paths	
Main log path:	C:\VWorks Workspace\VWorks\Logs\vworks_log.log
Pipette log path:	C:\VWorks Workspace\VWorks\Logs\vworks_pipette_log.log
Time constraints log path:	C:\VWorks Workspace\VWorks\Logs\vworks_time_constraints_log
Pipette technique editor root:	C:\VWorks Workspace\VWorks\Pipette Techniques\
Automatic tip selection root:	C:\WWorks Workspace\WWorks\Tip Box States\
Hit pick format file root:	C: \VWorks Workspace \VWorks \Hit Picking \Format Files \
Hit pick output file root:	C: \VWorks Workspace \VWorks \Hit Picking \Output Files \
Macro Library file path:	C:\/Works Workspace\/Works\MacroLibrary.mlb
Options	
Debug log level:	0
Robot speed:	Fast
Always run at "robot speed" when grippe	er is empty: 🔽
Hit pick format file root: Folder location of hit pick format files	
	OK Cancel

Adding hit-picking information in the format file

To add hit picking information in the format file:

1 In the **Hit Pick Replication Format Editor**, make sure the format file name is selected, and then click **Launch format wizard**.

-Format Description	*
Launch format wizard	

The Hit Pick Replication Format Wizard opens.

2 On the first page of the wizard:

Opera	tion Type	
	O Plate replication	
	Hit picking	
.abwa	re	
	Source plate labware:	
	384 Greiner 781280 PP Clr Sqr Well V btm_	•
	Source plate number of wells:	
	384	*
	Destination plate labware:	
	384 Greiner 781280 PP Clr Sqr Well V btm_	•
	Destination plate number of	
	384	-

- **a** In the **Operation Type** area, select **Hit picking**.
- **b** In the Labware area, select the Source plate labware and the Destination plate labware.
- c Click Next.
- **3** On the dispense information page:

pense Pattern	Dispense Properties
O Row-wise	Replicates per source well: 2 (1-1536)
ect Available Wells I	n Destination Plate
1 2 3 4 5	6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 :
A Selec	t all wells
cooc Clear	all selected wells
DOOC Selec	t all wells in highlighted row
E C C C	all selected wells in highlighted row
	t all wells in highlighted column
	all selected wells in highlighted column
	t all wells in a 96 head guadrant containing highlighted well
	all wells in a 96 head guadrant containing highlighted well
	t all wells in a 384 head quadrant containing highlighted well
MOOC Clear	all wells in a 384 head quadrant containing highlighted well
000000	000000000000000000000000000000000000000
	>
	Right-click for multi-select optio

- **a** In the **Dispense Pattern** area, select one of the following dispense methods:
 - Row-wise
 - Column-wise
- **b** In the **Dispense Properties** area, type the number of **Replicates per source** well, if applicable.

Hit Pick Replication (Bravo)

- **c** In the destination plate graphic, select the wells into which the source contents will be dispensed. Click a well to individually select or clear the well. Alternatively, right-click a desired well and select a command from the menu that appears.
- d Click Next.
- **4** On the dilution series page:
 - a In the Dilution Series area, select one of the following:
 - Yes. If you select **Yes**, you must supply additional information about the dilution series.

Hit Pick Replication F	ormat Wiza	rd					
Dilution Series	Dilution						
	Number of d	3		(>=)	1)		
	Dilution fac O Consta O Variable		: 2 (>= 1 t file)			1.0)	
	Stock concer	0.0	001	(> 0.			
	Starting con	0.001 (>0.00			.00 1mM)		
	Final volume	:	2.5 (0.1-120 μL)			120 µL)	
Coutput-			_				
	Dilution1	Dilution2	_	Dilutio	n3		
Transfer Volume(µL) Concentration(mM)	2.5 0.001	1.25 0.0005		0.625	25		

Dilution selection or parameter

Dilution in adjacent wells

Dispenses the dilution in adjacent wells before replicating the same series, as the following example shows. Notice that the dispense pattern is row-wise.

Description

				Pre	nen		_	_		_	_	_	_	_	_		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A (0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
в 🤇	Ó	Ó	Õ	Õ	Ó	õ	Õ	Ō	õ	Õ	O	Ö	ō	Ō	Ö	Ó	0
C 🤇	Ó	0	Ó	Ó	0	Ó	0	0	Ó	0	0	Ó	Ó	0	Ó	0	0
D	0	0	0	0	0	Ó	Ó	Ó	Ó	Ó	0	Ó	Ó	Ó	Ó	Ó	0
E	0	0	0	0	0	Ó	Ó	0	Ó	Ó	0	Ó	0	0	0	0	0
FC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G 🄇	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
н 🄇	Ó	0	0	0	0	Ó	Ó	0	Ó	Ó	0	0	Ó	0	0	0	0
1.0	Ó	0	0	0	0	Ó	0	0	0	Ó	0	Ó	Ó	0	Ó	Ó	0
J	Ó	0	Ó	Ó	0	Ó	Ó	Ó	Ó	Ó	Ó	Ó	Ó	Ó	Ó	Ó	0
K 🌔	Ó	0	0	Ó	0	Ó	Ó	0	Ó	Ó	0	Ó	Ó	0	Ó	Ó	0
		-	-	-	~			0		0	0		0	0	0	0	0

Dilution selection or parameter	Description
Replications in adjacent wells	Dispenses the replicates in adjacent wells before continuing the dilution series, as the following example shows. Notice that the dispense pattern is row-wise.
Number of dilutions	Specifies the number of dilutions to perform. A value of 1 means no dilution is performed.
Dilution factor	 Uses the specified dilution factor: <i>Constant.</i> The same dilution factor is used throughout the process. Type the factor to use in the box. For example, a factor of 1:2 dilutes the starting concentration by one-half. If the number of dilutions is 3, then the concentrations in the series are 1, 1:2, and 1:4.
	• Variable (from input file). Different factors are used during the process. The factors are specified in the input file.
Stock concentration	Specifies the concentration of the stock solution.
Starting concentration	Specifies the concentration of the starting concentration.
Final volume	Specifies the concentration of the final volume in each well. The software will use this value to calculate the volume for prefilling or backfilling. See "Dilute to Final Volume (Bravo)" on page 442.

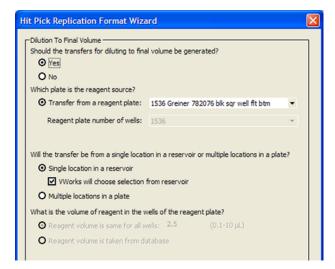
Hit Pick Replication (Bravo)

Hit Pick Replication Form	at Wizard			
Hit Pick Replication Form		2.5	(0.1-120 µL) rom input file;	

Dilution selection or parameter	Description
Constant transfer volume	Uses the same transfer volume throughout the process.
Variable transfer volume	Uses different transfer volumes during the process. The volumes are specified in the input file.

b Click Next.

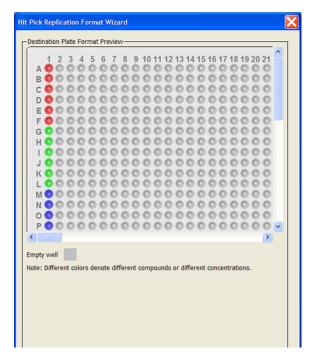
5 If you selected dilution series in step 4. Select the desired options for dilute to final volume.



- a Select whether you want to backfill or prefill the destination microplate. If you select Yes, you must supply additional information. If you select No, you can proceed to step d.
- **b** Select the reagent microplate to use for the backfilling or prefilling process.

- c Select whether the transfer will be from one of the following:
 - **Single location in a reservoir.** Some reservoir designs might limit the pipette's access. You can allow the software to determine how to access the reservoir, based on the labware definition. To do this, select **VWorks will choose selection from reservoir.** Alternatively, you can clear the check box and manually select the access point in the reservoir, using the microplate graphic displayed. The wells in the microplate represent different access points in the reservoir.
 - **Multiple locations in a plate.** If the transfer will be from a microplate, you can select the wells from which to aspirate. In addition, you can specify a constant reagent volume, or indicate that the reagent volume information will be obtained from a database.
- d Click Next.
- **6** On the destination plate preview page, confirm that the dispense pattern is correct.

Note: The dispense pattern shown on the screen is a preview of the *first* destination microplate only. To check the mapping in all of the destination microplates, compile the protocol, and then view the output files. Alternatively, you can check the Pipette Log after running the protocol in simulation mode. For more information about output files and the Pipette Log, see "Verifying source-destination transfers" on page 496.



When you are done, click Finish.

7 Back in the **Hit Pick Replication Format Editor**, make sure the correct format file name is selected, and then click **Save changes**. If you altered an existing format file, you can click **Save changes as** to save it as a different file.

Hit Pick Replication (Bravo)

format file, and then click Launch format wize to view and edit MyFormatFile16a.xml New.xml	Format Description <pre></pre>	~
		3
Create new format file Save changes	Launch format wizard	
Save changes as		
Rename format file		

8 Click the close button (X) at the top right corner of the dialog box to return to the Hit Pick Routine Wizard. To continue in the Hit Pick Routine Wizard, return to step 3 in "Adding the Hit Pick Replication task" on page 470.

Adding replication information in the format file

To add replication information in the format file:

1 In the **Hit Pick Replication Format Editor**, make sure the format file name is selected, and then click **Launch format wizard**.

wizard to view and edit MyFormatFile16_a.xml	Format Description	
new.xml	<please description="" file="" format="" here.="" input="" of=""></please>	~
Create new format file		2
Create new format file Save changes	Launch format wizard	~
	Launch format wizard	3
Save changes	Launch format wizard	

The Hit Pick Replication Format Wizard opens.

2 On the first page of the wizard:

Opera	tion Type	
	Plate replication	
	O Hit picking	
abwa	are	
	Source plate labware:	
	384 Costar 3657 PP Sqr well rnd btm	•
	Source plate number of wells:	
	384	Ψ.
	Destination plate labware:	
	384 Costar 3657 PP Sqr well rnd btm	•
	Destination plate number of	
	384	*

- **a** In the **Operation Type** area, select **Plate replication**.
- **b** In the Labware area, select the Source plate labware and the Destination plate labware.
- c Click Next.
- **3** On the transfer page, select the **Transfer mode**.

Hit Pick Replication Forma	at Wizard			X
Transfer Properties				_
Transfer mode: Tra	ansfer volume:	2.5	(2.5-well volume nL)	
Interleaved Nur Quadrants ead	mber of copies of th source plate:	1	(1 - 1000)	
Destination plate formatting All destination plates v Minimize the number of Don't place replicates 	will have identical of destination plat	es usec		
Select Source Wells to Transfer		12 13 14 15 0 0 0 0	5 16 17 18 19 20 21	
F 0000000 G 0000000 H 0000000	0000		0000000	
	00000		000000	
N 0000000	0000		000000	
		Right-clic	k for multi-select options	
	<u>C</u> ancel <	< <u>B</u> ack	Next >> Einish	

Hit Pick Replication (Bravo)

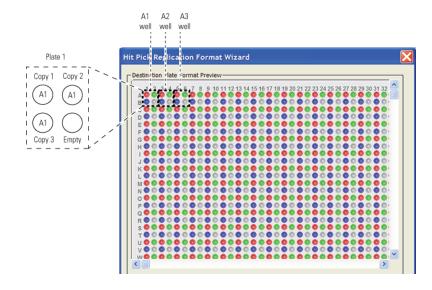
Contents of corresponding wells from different		
Contents of corresponding wells from different source microplates are placed consecutively in the destination microplate. For example, if you are transferring contents from four 384-well source microplates into a 1536-well destination microplate, the Interleaved transfer would result in the following destination microplate layout:		
Contents from different source microplates are placed in quadrants of the destination microplate.		
For example, if you are transferring contents from four 384-well source microplates into a 1536-well microplate, the Quadrant transfer wil result in the following destination microplate layout:		
Hit Pick Replication Format Wizard		

4 Type the volume to transfer from each source microplate well.

5 Type the number of copies you want to transfer from the source microplate.

IMPORTANT This value will affect the layout of the contents in the destination microplate.

For example, if you are transferring three copies of the contents from a 384-well source microplate into a 1536-well destination microplate, the Interleaved transfer will result in the following destination microplate layout. Notice that the wells in the fourth quadrant remain empty.



Hit Pick Replication (Bravo)

6 Select the destination microplate format:

Transfer mode	Description		
All destination plates will have identical format/patterning	All destination microplates will look identical. The layout of the destination microplate depends on the format of the source microplate, the number of copies you want to transfer, the total number of source microplates, and other selections in the wizard.		
	accommodate co microplates. To all of the destin destination micr contents from e transferred to o microplate. <i>Note:</i> In the exa	ive 384-well sou re 1536-well des e 1536-well micro ontents from fou maintain the san lation microplate coplates will be ach source micro ne 1536-well de umple, five desti	rce microplates tination roplate can only ir 384-well me layout across es, five used. The oplate are sstination
	microplates are Source 1 - 5	used.	Destination 1 - 5

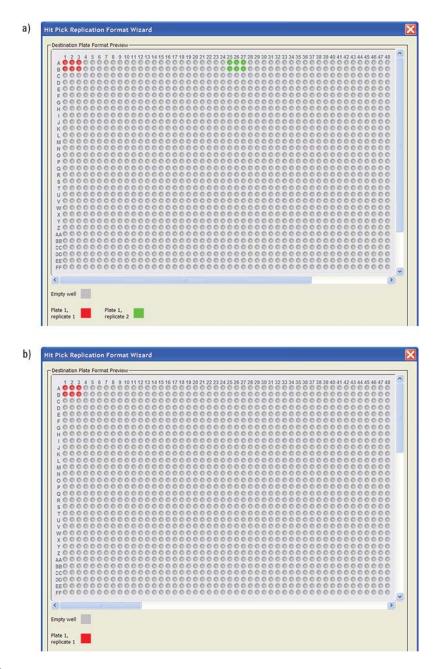
Trenefanneada	Description	
Transfer mode	Description	
Minimize the number of destination plates used	The destination microplate will contain as many source contents as allowable to minimize the number of destination microplates used.	
	contents from five 38 into one or more 153 microplates. One 153 accommodate content microplates. The content	6-well microplate can ts from four 384-well tents from the fifth source ansferred into a second
	<i>Note:</i> In this example microplates are used	e, only two destination
	Source 1 - 4	
		Destination 1
		
	110000000000000000000000000000000000000	Destination 2
	Source 5	

7 Select **Don't place replicates of the source plates on the same destination** if you want to place replicates in different destination microplates. Do not select the option if you want to place replicates in the same destination microplate.

In the following example, the Quadrant transfer mode is used and the **All destination plates will have identical format/patterning option** is selected. Two replicates are requested from each source microplate.

In example a, the two replicates are placed in the same destination microplate. In example b, only one copy is placed in each destination microplate.

Hit Pick Replication (Bravo)



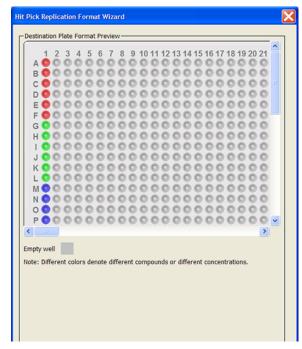
- 8 In the Select Source Wells to Transfer area, select the source wells from which to transfer the contents.
- **9** Click **Next** to preview the layout of the first destination microplate. The wells are color coded so you can see the replication pattern in the microplate.

To see the layout of all of the destination microplates, compile the protocol and check the output file. Alternatively, you can run the protocol in simulation mode and check the Pipette Log. For more information, see "Verifying source-destination transfers" on page 496.

Note that the layout shown in the preview might differ from the actual layout at run time if:

• The destination microplate has more wells than the source microplate.

- More than four source microplates will be processed during the run.
- You have selected All destination plates will have identical format/patterning in step 6.
- You have cleared the **Don't place replicates of source plates on the same destination** check box in step step 7.



When you are done, click Finish.

10 Back in the **Hit Pick Replication Format Editor**, make sure the correct format file name is selected, and then click **Save changes**. If you altered an existing format file, you can click **Save changes as** to save it as a different file.

Hit Pick Replication Format Editor		
Create a new format file, or select an existing format file, and then click Launch format wizard to view and edit <u>MyFormatFile 16, a.xml</u> New.xml	Format Description Please input description of format file here.>	8
Create new format file Save changes	Launch format wizard	
Save changes as		
Rename format file		
Delete format file		

11 Click the close button (X) at the top right corner of the dialog box to return to the Hit Pick Routine Wizard. To continue in the Hit Pick Routine Wizard, return to step 3 in "Adding the Hit Pick Replication task" on page 470.

Verifying source-destination transfers

Before you start an actual run, you can verify that the source-destination transfers are correct using either output files or the Pipette Log.

Using output files

Compile your protocol to generate output files. The files list sourcedestination transfers by well and show the volume transferred. One output file is generated per source-destination microplate combination. For example, if contents from Source 1 are transferred to Destinations 1 and 2, then two output files are created, one for Source 1/Destination 1, and another for Source 1/Destination 2.

Output files are in the CSV format and are stored in the following folder:

...\VWorks Workspace\hit picking\output files

The following example shows an output file displayed in Excel. The first row shows the source and microplate IDs. Subsequent rows show the source wells, the corresponding destination wells, and the volume transferred.

	A	В	С
1	Plate2	1	Volume
2	Source Well	Destination Well	Volume in µL
3	C6	E1	2.5
4	C6	F1	2.5
5	B12	G1	2.5
6	B12	H1	2.5
7	M1	11	2.5
8	M1	J1	2.5

Using the Pipette Log

Run your protocol in simulation mode and check the Pipette Log in the log area. The Pipette Log records every pipetting event that occurs, including aspirate location, dispense location, and volume information. For details, see "Pipette Log" on page 633.

Related information

For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Creating a protocol	• "Creating a protocol: basic procedure" on page 13	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	
Dilute to Final Volume task	"Dilute to Final Volume (Bravo)" on page 442	

For information about	See
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
Mix task	"Mix (Bravo, Vertical Pipetting Station)" on page 497
Pipette Log	"Pipette Log" on page 633
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Mix (Bravo, Vertical Pipetting Station)

Description

The Mix (Bravo) (

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Task parameters

Note: The task parameters for Mix (Bravo) and Mix (Vertical Pipetting Station) are identical.

After adding the Mix task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Mix (Bravo, Vertical Pipetting Station)

ask Parameters Task Parameters	(*)
21	
Mix (Vertical Pipetting State)	tion) Properties
Location, plate:	uon roperues
Location, location:	<auto-select></auto-select>
E Volume	
Volume (0 - 200 µL):	10
Pre-aspirate volume (0 - 200	0
Blowout volume (0 - 200 µL)	0
E Properties	
Liquid class:	
Mix cycles (0 - 100):	3
Dynamic tip extension (0 - 2	0
Well selection:	1 selection: A1
Pipette technique:	
Distance From Well Botto	m
Aspirate distance (0 - 100 mr	2
Dispense at different distance	
Dispense distance (0 - 100 m	2
E Tip Touch	
Perform tip touch:	<u>.</u>
Which sides to use for tip tou	None
Tip touch retract distance (-2	0
Tip touch horizontal offset (-:	0

Parameter	Description	
Location, plate	The labware involved in the Mix task.	
Location, location	The location at which the Mix task occurs.	
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>	
Volume (0–200 μL)	The volume of liquid to be mixed in each well.	
Pre-aspirate volume (0–200 µL)	The volume of air to be drawn before the pipette tips enter the liquid.	
Blowout volume (0–200 μL)	Specifies the volume of air to dispense after the main volume has been dispensed while the tips are still in the wells.	
	Typically, the blowout volume is the same as the pre-aspirate volume.	
Liquid class	The pipetting speed and accuracy.	
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.	

Mix (Bravo, Vertical Pipetting Station)

Parameter	Description
Mix cycles ((0–100)	Specifies how many times to repeat the aspirate-and-dispense cycle.
Dynamic tip extension (0–20 mm/µL)	The rate at which the pipette head moves during the Aspirate task. The software calculates the distance over which the tips will move without crashing.
	Use dynamic tip extension to prevent spills as the pipette tips displace the liquid.
	To move the tips:
	• At the same rate as the volume change. Calculate dynamic tip extension (DTE) as follows:
	DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls
	• Faster than the volume change. DTE > 1/A
	• Slower than the volume change. DTE < 1/A
	The starting and ending positions can be calculated as follows:
	$(V_{aspirated} * DTE)$ + Distance _{well bottom}
	<i>Note:</i> Instead of a negative aspirated volume the software automatically moves downward toward the well bottom with each aspirate action.
Well selection	The wells at which the Dispense task occurs
	Click the field, and then click the <u>buttor</u> to select the wells in the Well Selection dialog box.
	Use this parameter only if the pipette head has fewer tips than the number of wells in the microplate, or if you are in single-row or single-column mode.
Pipette technique	The pipette location offset you want to use for the Dispense task.
	The list of pipette techniques are defined in the Pipette Technique Editor.
Aspirate distance (0–100 mm)	The distance between the end of the pipette tips and the well botttoms during the aspirate action.
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.

Mix (Bravo, Vertical Pipetting Station)

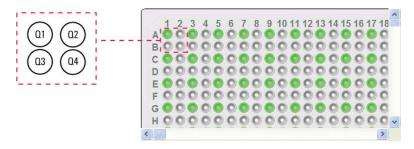
Parameter	Description	
Dispense at different distance	The option to dispense at a pipette tip height that is different than the aspirate distance.	
	Select the check box to enter a value for the dispense distance.	
Dispense distance (0–100 mm)	The distance between the end of the pipette tips and the well bottoms during the dispense action.	
Perform tip touch	The option to touch the pipette tip on one of more sides of the well.	
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/ South, West/East, West/East/South/North.	
Tip touch retract distance (–20 to 50 mm)	The vertical distance for the pipette tips to rise before touching the sides of the wells.	
Tip touch horizontal offset (-5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.	
	For example, if you set a value of:	
	• 0, the tips move a horizontal distance equal to the well radius	
	 > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch 	
	 < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch 	

Quadrant pattern well selection

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head. The following table lists the types of pipette heads and the number of accessible quadrants in various microplates.

Microplate	Number of quadrants
96-well	1
384- well	4
1536- well	16
384- well	1
1536- well	4
1536- well	1
	96- well 384- well 1536- well 384- well 1536- well

The following diagram demonstrates the concept of quadrants. The diagram shows a portion of a 384-well microplate and highlights the four quadrants (Q1, Q2, Q3, and Q4) that are accessible by the A1 tip of a 96-channel pipette head. Notice that the green color highlights all of the quadrant 1 (Q1) wells across the microplate.



Instead of a column- or row-wise pattern, you can select a quadrant pattern during well selection.

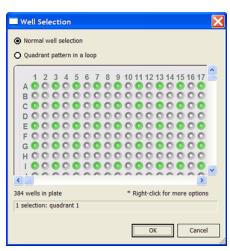
The quadrant pattern option is available only if:

- The number of channels in the pipette head (or pins in a pin tool) is fewer than the number of wells in the microplate. For example, you can use a 96-channel pipette head to dispense liquid into a 384-well microplate or 1536-well microplate.
- All the channels are selected in the Set Head Mode task when using a pipette head. (The Set Head Mode task is not an option when using a pin tool).
- The liquid-handling task is inside a loop.

IMPORTANT If you select a quadrant pattern, specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To select a quadrant pattern:

1 In the Task Parameters area, click the Well selection parameter box, and then click the Browse button. The Well Selection dialog box opens. By default, the Normal well selection option is selected. This option is used for column-and row-wise liquid-handling patterns.



2 Select **Quadrant pattern in a loop.** The contents of the dialog box change. Notice the following:

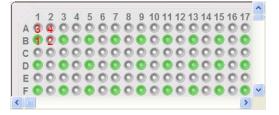
Mix (Bravo, Vertical Pipetting Station)

- Red numbers (1 through 4) appear on wells A1, A2, B1, and B2. The numbers indicate the pipetting sequence: 1 is the starting well, and 4 is the last well. In the following example, the sequence is A1, A2, B1, B2.
- Green wells indicate the starting well in the pipetting sequence.
- Pattern buttons at the bottom of the dialog box indicate the movement of the pipette channels. The movement description is provided in the text box above the buttons.

Note: The last two patterns are unavailable if a group contains 16 wells. For example, the last two patterns are not available if you have a 96-well pipette head and a 1536-well microplate.

Well Selection
O Normal well selection
Quadrant pattern in a loop
Click a well to select the starting quadrant
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
c 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
F00000000000000000
384 wells in plate, 96 barrels on head
Left-to-right, then top-to-bottom, starting at quadrant 1
Apply pattern:
OK Cancel

3 Select the starting well. The well becomes green and is labeled 1. In the following example, the third quadrant (B1 well) is selected.



4 Click a pattern button to specify the pipette channel movement. After you click a pattern, the red numbers in the graphic are updated to show the sequence.

In the following example, the second pattern is selected (right-to-left, then top-to-bottom). The third quadrant (B1) is the starting well. The resulting movement is:

Quadrant 3 (B1)

Quadrant 2 (A2)

Quadrant 1 (A1)

Quadrant 4 (B2)

We	ell Selection	E
O No	ormal well selection	
Q	uadrant pattern in a loop	
	Click a well to select the starting quadrant	
A B C D E F	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 7 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<
	vells in plate, 96 barrels on head	
Right	t-to-left, then top-to-bottom, starting at quadrant 3	
Apply	pattern: Z S L	
	OK Cance	el l

5 When you are finished, click **OK** to save the changes and return to the VWorks window.

Example: Mix the contents in the destination microplate on the Bravo Platform

Goal

Aspirate contents from a source microplate (Source 1), dispense into a destination microplate, and then mix the contents in the destination microplate. Use the default Mix parameters.

Implementation

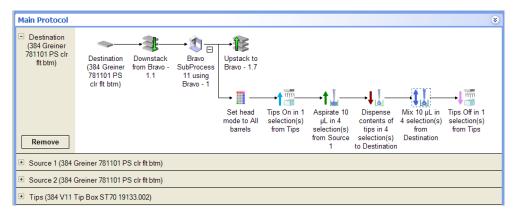
The Bravo deck is physically set up as follows:

- The destination microplates are at Bravo deck location 1.
- The source microplate is at deck location 2.
- The tipbox is at deck location 9.

In the protocol, the following are added:

- Process for the destination microplate
- Configured labware for the source microplate
- Configured labware for the tipbox

In the Destination plate process, a Bravo subprocess is added. Within the subprocess, a Mix task is added after the Aspirate and Dispense tasks as shown in the following example.



Mix (Bravo, Vertical Pipetting Station)

In the Mix Task Parameters area, Destination is selected, because the goal is to mix the contents in the destination microplate.

Ta	sk Parameters	Ф.	
Т	Task Parameters 😵		
•	Ż↓		
	Mix (Bravo) Properties		
	Location, plate:	Destination (384 Greiner 78	
	Location, location:	<auto-select></auto-select>	
Ξ	Volume		
	Volume (0 - 251 µL):	10	
	Pre-aspirate volume (0 - 251 µL):	0	
	Blowout volume (0 - 251 µL):	0	
Ξ	Properties		
	Liquid class:		
	Mix cycles (0 - 100):	3	
	Dynamic tip extension (0 - 20 mr	0	
	Well selection:	4 selections: quadrants 1-4	
	Pipette technique:		
Ξ	Distance From Well Bottom		
	Aspirate distance (0 - 100 mm):	2	
	Dispense at different distance:		
	Dispense distance (0 - 100 mm):	2	
Ξ	Tip Touch		
	Perform tip touch:		
	Which sides to use for tip touch:		
	Tip touch retract distance (-20 - !		
	Tip touch horizontal offset (-5 - 5	0	
H	L Louit		
LA	dvanced Settings	۲	

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
Set Head mode task	"Set Head Mode (Bravo)" on page 529
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Tips Off task	"Tips Off (Bravo, Vertical Pipetting Station)" on page 539
Pipette technique	"Specifying pipetting techniques" on page 613

For information about	See
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Move and Filter Plate (Bravo)

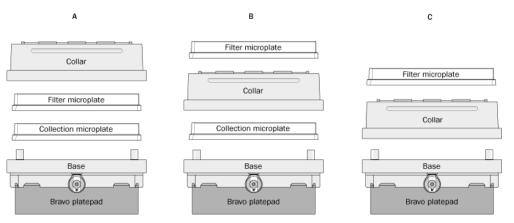
٠

Description

The Move and Filter Plate (Bravo) task (SMove and filter plate (Bravo)):

- Moves a specified filter microplate from its current location to the Vacuum Filtration Station.
- Turns on and turns off the vacuum.

Use the Move and Filter Plate task if the Vacuum Filtration Station has configuration B or C shown in the following diagram. In this configuration, the filter microplate is not part of the station assembly.



If the Vacuum Filtration Station has configuration A, where the filter microplate is part of the assembly (it sits under the collar), use the Toggle Vacuum task to turn on and turn off the vacuum. See "Toggle Vacuum (Bravo, Vertical Pipetting Station)" on page 545.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

Task parameters

Note: The Move and Filter task parameters displayed can vary, depending on the type of vacuum pump used with the Vacuum Filtration Station.

After adding the Move and Filter task at the desired point in the Bravo Subprocess, set the following parameters in the **Task Parameters** area:

ask Parameters		- 3
21		
Move and filter plate (Bravo) Prope	erties	
Location, plate:		
Location, location:	<auto-select></auto-select>	
Mode:	Timed	
Time for operation in Timed mode (s):	30	
Hold down filter plate:		
Allow concurrent operation:		

Parameter	Description
Location, plate	The name of the filter microplate. The robot will move this filter microplate to the Vacuum Filtration Station (specified by the Location, location parameter).
Location, location	The deck location of the Vacuum Filtration Station.
	Select <auto-select> if you want the robot to place the filter microplate at the first- available Vacuum Filtration Station. If more than one Vacuum Filtration Station is on the deck, select the specific deck location.</auto-select>
Mode	The action of the task:
	• On. Turns on the vacuum.
	• Off. Turns off the vacuum.
	• <i>Timed.</i> Turns on the vacuum timer. You must specify the vacuum length of time.
	If you plan to time the filtering process, add only one Move and Filter Plate task (the task turns on the vacuum, and at the end of the time period, the vacuum turns off automatically). If you are not timing the filtering process, add two Move and Filter Plate tasks in the protocol (one to turn on the vacuum and the other to turn off the vacuum).
	<i>Note:</i> If the filtering process is not timed, the protocol can perform other tasks in parallel.

Parameter	Description	
When filtration timing begins (ME4C Vario Vacuum Pump	The different options for when to start timing the filtration process:	
Unit only)	• When pressure is achieved	
	• When the pump starts	
	This parameter is only used if the ME4C Vario Vacuum Pump Unit is configured as part of the Vacuum Filtration Station.	
Time for operation in Timed mode	The length of time, in seconds, you want to leave the vacuum on. At the end of the period, the vacuum will turn off.	
Hold down filter plate	The option to have the robot hold down the filter microplate when the vacuum is turned on to ensure a secure vacuum seal.	
Allow concurrent operation	The option to permit the accessory to operate simultaneously with other tasks.	
Time allowed to reach pressure(s) (ME4C Vario Vacuum Pump Unit only)	The length of time, in seconds, to allow the vacuum to reach the specified target pressure. An error message displays if the target pressure is not reached within the time specified.	
	This parameter is only used if the ME4C Vario Vacuum Pump Unit is configured as part of the Vacuum Filtration Station.	
Target pressure (ME4C Vario Vacuum Pump Unit only)	The desired vacuum pressure, in mbar, Torr, or hPa. The pressure unit is set on the Vario vacuum pump.	
	This parameter is only used if the ME4C Vario Vacuum Pump Unit is configured as part of the Vacuum Filtration Station.	
Vent delay (ME4C Vario Vacuum Pump Unit only)	The length of time, in seconds, to wait for the air pressure under the filter to equalize with the ambient air pressure.	
	This parameter is only used if the ME4C Vario Vacuum Pump Unit is configured as part of the Vacuum Filtration Station.	

Example

Goal

Assemble a Vacuum Filtration Station whose configuration is base-collection plate-collar. Move a filter microplate to the station. Filter for 30 seconds. Disassemble the station.

Implementation

In Bravo Diagnostics, the Bravo deck is configured such that:

• The Vacuum Filtration Station will be assembled at deck location 3.

Move and Filter Plate (Bravo)

- The Vacuum Filtration Station base is at deck location 3.
- The collar is at deck location 9.
- During the disassembly process, the filter microplate will be placed at the first-available deck location.

In the protocol, the following are added as shown:

- Filter Plate process
- Collection Plate configured labware (at deck location 8)
- Place Plate (to place the Filter Plate at location 5), Assemble Vacuum, Move and Filter Plate, and Disassemble Vacuum tasks

Startup Protoco							\$
Main Protocol							*
 Filter Plate (384 Greiner 781101 PS clr fit btm) 	Filter Plate (384 Greiner 781101 PS clr flt btm)	Place plate at Bravo - 1 5	Bravo SubProcess 4 using Bravo -1			0	^
Remove				Assemble Vacuum	Move and filter plate	Disassemble Vacuum	
Collection Plate (384 Greiner 781101 PS clr fit btm)	Collection Plate (384 Greiner 781101 PS clr flt btm)	Place plate at Bravo - 1 8	Bravo SubProcess 4 using Bravo - 1	Place plate at Bravo - 1 8			
Remove				Assemble Vacuum	Move and filter plate	Disassemble Vacuum	~
Cleanup Protoco	1						8
Protocol Options							\$

The Assemble Vacuum task parameters are set as follows:

ask Parameters	ņ
Task Parameters	۲
: 2↓	
Assemble Vacuum (Bravo) P	roperties
Assembly Order:	Base-Collection plate-Collar
Collection Plate, plate:	Collection Plate (384 Greiner 781101 PS
Collection Plate, location:	<auto-select></auto-select>
Filter Plate, plate:	Filter Plate (384 Greiner 781101 PS clr f
Filter Plate, location:	<auto-select></auto-select>
Vacuum Filtration base:	3

The Move and Filter Plate task parameters are set as follows:

Task Parameters	*
	*
21	
Move and filter plate (Bravo) Prop	erties
Location, plate:	Filter Plate (384 Greiner 781101 PS clr 1
Location, location:	5
Mode:	Timed
Time for operation in Timed mode (s):	30
Hold down filter plate:	
Allow concurrent operation:	

Set the Disassemble Vacuum task parameters as follows:

Move and Filter Plate (Bravo)

Task Parameters	*
<u>≩</u> ↓	
Disassemble Vacuum (Bravo)	Prope
Filter Plate, plate:	Filter Plate (384 Greiner 781101 PS cir f
Filter Plate, location:	<auto-select></auto-select>
Vacuum Filtration Assembly:	3

The resulting protocol will run as follows:

- 1 Acknowledge that the filter microplate (Filter Plate) is starting at deck location 5.
- **2** Acknowledge that the collection microplate (Collection Plate) is starting at deck location 8.
- **3** Assemble the Vacuum Filtration Station (base-collection plate-collar):
 - **a** Move the Collection Plate from deck location 8 and place it on top of the base at deck location 3.
 - **b** Move the collar from deck location 9 and place it on top of the Collection Plate at deck location 3.
- **4** Move the Filter Plate from deck location 5 and place it on top of the assembled Vacuum Filtration Station at deck location 3.
- 5 Turn on the vacuum for 30 seconds, and then turned off the vacuum.
- **6** Disassemble the Vacuum Filtration Station:
 - **a** Move the Filter Plate to an available deck location.
 - **b** Move the collar back to deck location 9.
 - **c** Move the Collection Plate back to deck location 8.

Related information

For information about	See	
Adding devices	 "Adding devices" on page 25 Device user guide	
Adding tasks in a protocol	"Adding and deleting tasks" on page 53	

For information about	See
Assemble Vacuum task	"Assemble Vacuum (Bravo)" on page 439
Disassemble Vacuum task	"Disassemble Vacuum (Bravo)" on page 449
Toggle Vacuum task	"Toggle Vacuum (Bravo, Vertical Pipetting Station)" on page 545
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Pin Tool (Bravo, Vertical Pipetting Station)

Description

The Pin Tool (Bravo) (

(1) Pin Tool (Vertical Pipetting Station)) tasks can be used to perform low-volume transfers of a fixed volume using a pin tool. You can use the Pin Tool task repeatedly in a protocol subprocess to perform all the pin-tool-related steps, such as:

- Pin Tool-Adsorb
- Pin Tool–Dispense
- Pin Tool–Wash
- Pin Tool–Blot
- Pin Tool-Mix

Task is available for	Task is available in	
Bravo Platform	Main Protocol, Bravo Subprocess	
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess	

Before you begin

Ensure the following:

Pin Tool (Bravo, Vertical Pipetting Station)

• The Bravo or Vertical Pipetting Station device profile specifies an appropriate pin tool. To create or edit a profile, see the user guide for the applicable device.

IMPORTANT Ensure the pin tool teachpoints are set up in the same manner as a fixed-tip pipette head.

• The protocol includes the SubProcess (Bravo) or SubProcess (Vertical Pipetting Station).

Task parameters

Note: The Pin Tool task parameters for the Bravo Platform and Vertical Pipetting Station are identical.

After adding the Pin Tool task at the desired point in the subprocess, set the following parameters in the **Task Parameters** area:

Task Parameters		*
: ∎ ≩↓		
Pin Tool (Vertical Pipetting St	tation) Properties	
Location, plate:	source (96 Greiner 6551	
Location, location:	<auto-select></auto-select>	
Properties		
Dwell time (0 - 100 s):	0.5	
Descriptive label:	Adsorb	
Liquid class:		
Well selection:	1 selection: entire plate	
Pipette technique:	Pin Tool	
Distance From Well Bottom		
First distance (-5 - 100 mm):	0	
Use two distances:	V	
Second distance (-5 - 100 mm):	10	
Cycles (0 - 100):	3	
Tip Touch		
Perform tip touch:	Г	
Which sides to use for tip touch:	None	
Tip touch retract distance (-20 - 5	0	
Tip touch horizontal offset (-5 - 5	0	-

Parameter	Description The labware involved in the Pin Tool task.	
Location, plate		
Location, location	The location at which the Pin Tool task occurs.	
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>	

PIN	1001	(Bravo,	vertical	Pipetting	Station)

Parameter	Description
Dwell time (s)	The time duration that the pins remain at the specified height (First distance or Second distance) within the well.
	For example, you might start with the following values:
	• Adsorb, Dispense into fluid, or Mix–0.5 s or longer for more viscous fluids
	• Blot-2 s, or longer for more viscous fluids
Descriptive label	A text label that you can add to the task icon in the protocol. Click the arrow in the Descriptive label box to choose an option.
	The options include:
	• Enter a JavaScript variable or script.
	• Use a predefined label: Adsorb, Dispense, Wash, Blot, or Mix
	• Type your own label in the box.
Liquid class	A parameter that you can use to control the accuracy and the speed of the pin tool as it moves into and out of the wells.
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
Well selection	The wells at which the Pin Tool task occurs.
	Use this parameter only if the pin tool has fewer pins than the number of wells in the microplate, for example, a 96-pin pin tool and a 384-well microplate.
	Click in the parameter box, and then click the Browse button to select the wells in the Well Selection dialog box.
Pipette technique	The pipette location offset you want to use for the Pin Tool task.
	The list of pipette techniques are defined in the Pipette Technique Editor.

Pin Tool (Bravo, Vertical Pipetting Station)

Parameter	Description		
First distance (mm)	The first height for the pin tool during the Pin Tool task. The value is the distance between the pin tips and the well bottoms.		
	For example, during an adsorb step, you might set this value to 0 mm so that the pin tips touch the bottom of the wells. This parameter can affect the quantity adsorbed.		
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the pins at the correct distance from the well bottom		
Use two distances	The option to specify a second height for the pins during the Pin Tool task.		
	For example, you could cycle the pin positions between two heights within the wells repeatedly to perform mixing or to wash the pins.		
	Default: Not selected		
Second distance (mm)	The distance between the pin tips and the well bottoms at the second height for the pins.		
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the pins at the correct distance from the well bottom		
Cycles	Available if you select the Use two distances option. The Cycles parameter sets the number of times to move the pins repeatedly to the two heights, for example to perform mixing or to wash the pins.		
Perform tip touch	The option to touch the pins on one or more sides of the well, or to enable the pins to make lateral stirring moves inside the fluid, for example during a wash task.		
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/ South, West/East, West/East/South/North.		
Tip touch retract distance (mm)	The vertical distance for the pins to move before moving laterally within the well,		
	where		
	• 0 is the vertical distance equal to the well bottom		
	• > 0 is the vertical distance the pins rise above the bottom		
	• < 0 is the vertical distance the pins attempt to move past the well bottom		

Parameter	Description	
Tip touch horizontal offset (mm)	The horizontal distance that the pins move. The value is based on the well diameter specified by the labware definition,	
	where	
	• 0 is a distance equal to the well radius	
	• > 0 is the distance the pins attempt to move past the well radius, which results in a more forceful tip touch	
	• < 0 is a distance less than the radius of the well, resulting in a lighter tip touch or no tip touch	

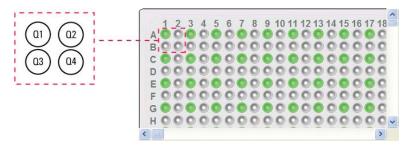
Pin Tool (Bravo, Vertical Pipetting Station)

Quadrant pattern well selection

A quadrant is an evenly spaced array of locations that are accessible by the tips on a pipette head. The following table lists the types of pipette heads and the number of accessible quadrants in various microplates.

Pipette head channels/ pin tool pins	Microplate	Number of quadrants
96	96- well	1
	384- well	4
	1536- well	16
384	384- well	1
	1536- well	4
1536 (pin tool only)	1536- well	1

The following diagram demonstrates the concept of quadrants. The diagram shows a portion of a 384-well microplate and highlights the four quadrants (Q1, Q2, Q3, and Q4) that are accessible by the A1 tip of a 96-channel pipette head. Notice that the green color highlights all of the quadrant 1 (Q1) wells across the microplate.



Instead of a column- or row-wise pattern, you can select a quadrant pattern during well selection.

The quadrant pattern option is available only if:

- The number of channels in the pipette head (or pins in a pin tool) is fewer than the number of wells in the microplate. For example, you can use a 96-channel pipette head to dispense liquid into a 384-well microplate or 1536-well microplate.
- All the channels are selected in the Set Head Mode task when using a pipette head. (The Set Head Mode task is not an option when using a pin tool).
- The liquid-handling task is inside a loop.

IMPORTANT If you select a quadrant pattern, specifications in the Well Selection dialog box will override task.Wellselection values assigned in the Advanced Settings area.

To select a quadrant pattern:

1 In the **Task Parameters** area, click the **Well selection** parameter box, and then click the Browse button. The Well Selection dialog box opens. By default, the **Normal well selection** option is selected. This option is used for column-and row-wise liquid-handling patterns.

Well Selection					
Normal well selection					
O Quadrant pattern in a loop					
	10 11 12 13 14 15 16 17				
	000000000				
G O O O O O O O O O O O O O O O O O O O	000000000000000000000000000000000000000				
384 wells in plate 1 selection: quadrant 1	* Right-click for more options				
	OK Cancel				

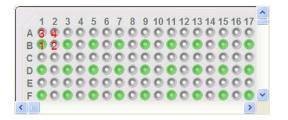
- **2** Select **Quadrant pattern in a loop**. The contents of the dialog box change. Notice the following:
 - Red numbers (1 through 4) appear on wells A1, A2, B1, and B2. The numbers indicate the pipetting sequence: 1 is the starting well, and 4 is the last well. In the following example, the sequence is A1, A2, B1, B2.
 - Green wells indicate the starting well in the pipetting sequence.
 - Pattern buttons at the bottom of the dialog box indicate the movement of the pipette channels. The movement description is provided in the text box above the buttons.

Note: The last two patterns are unavailable if a group contains 16 wells. For example, the last two patterns are not available if you have a 96-well pipette head and a 1536-well microplate.

We	ll Sele	ction												D
0 N	rmal we	ell select	tion											
0	adrant	pattern	in a loop											
	Click a	well to	select th	ne sta	ting	gua	dran	nt						
	12	3 4	56	78	9	10	11 1	12	13	14	15	16	17	^
B	34	00	00	00	0	õ	0	õ	õ	õ	õ	õ	õ	
CD	00	00			0	0	0	0	0	00	00	00	0	
E	00	00		00	0	0	0	0	0	õ	0	0	0	v
<		00			0	0	0	0	9	9	9	-	>	-
384 wells in plate, 96 barrels on head														
Left-to-right, then top-to-bottom, starting at quadrant 1														
Apply pattern: Z														
						Ľ		OK				Са	ncel	

3 Select the starting well. The well becomes green and is labeled 1. In the following example, the third quadrant (B1 well) is selected.

Pin Tool (Bravo, Vertical Pipetting Station)



4 Click a pattern button to specify the pipette channel movement. After you click a pattern, the red numbers in the graphic are updated to show the sequence.

In the following example, the second pattern is selected (right-to-left, then top-to-bottom). The third quadrant (B1) is the starting well. The resulting movement is:

Quadrant 3 (B1)

Quadrant 2 (A2)

Quadrant 1 (A1)

Quadrant 4 (B2)

Well Selection						
O Normal well selection						
 Quadrant pattern in a loop 						
Click a well to select the starting quadrant						
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 A S O <td< td=""></td<>						
384 wells in plate, 96 barrels on head Right-to-left, then top-to-bottom, starting at quadrant 3						
Apply pattern:						
OK Cancel						

5 When you are finished, click **OK** to save the changes and return to the VWorks window.

Example: Pin Tool tasks on a Vertical Pipetting Station

Goal

Using a pin tool, transfer a small volume from a source microplate (Source 1) into a destination microplate, and wash and blot the pins.

Implementation

The Vertical Pipetting Station is physically set up as follows:

- The source microplate is on shelf 3.
- The destination microplate is on shelf 4.
- The wash station is on shelf 5.
- The blotting material is on shelf 6.

In the protocol, the following are added:

- Process for the destination microplate
- Configured labware for the source microplate
- Configured labware for the wash station
- Configured labware for the blotting station

In the process, a Vertical Pipetting Station subprocess is added. Within the subprocess, four Pin Tool tasks are added for Adsorb, Dispense, Wash, and Blot.

Main Protocol						(
destination (96 Greiner 655101 PS Cir Rnd Well Flat	destination (96 Greiner 655101 PS CF rad Well Flat Btm_042709	Vertical Pipetting Station SubProcess 1 using Vertical Pipetting Station -1	Pin Tool Adsorb in 1 selection(s) from source	Pin Tool Dispense in 1 selection(s) from destination-1	Pin Tool Wash in 1 selection(s) from wash station	Pin Tool Blot in 1 selection(s) from blotting station
• source (96 Greiner	655101 PS Cir Rnd Well Rat	Btm)				
+ destination-1 (96 G	reiner 655101 PS Clr Rnd We	ll Flat Btm)				
+ wash station (96 V	11 11961.001 Autofilling Micro	Wash)				
• blotting station (Blo	tting Tray)					

Parameter settings for each Pin Tool task in the example

- Adsorb
 - Dwell time 0.5 s
 - First distance 0 mm
 - Second distance 10 mm
 - Cycles 3
 - No tip touch
 - Dispense (into dry microplate)
 - Dwell time 0.5 s
 - First distance –2 mm
 - No second distance
 - No tip touch
- Wash
 - Dwell time 0.5 s
 - First distance 0 mm
 - Second distance 10 mm
 - Cycles 3
 - Perform tip-touch on all sides with horizontal offset of 0 mm and at a retract distance of 2 mm
- Blot
 - Dwell time 2 s
 - First distance -2 mm
 - No second distance
 - No tip touch

Pin Tool (Bravo, Vertical Pipetting Station)

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tools in a matrical	U U
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Liquid classes	VWorks Automation Control Setup Guide
Set Head Mode task	"Set Head Mode (Bravo)" on page 529
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Pump Reagent (Bravo, Vertical Pipetting Station)

Description

The Pump Reagent (Bravo) (TPump Reagent (Bravo)) and Pump Reagent (Vertical

Pipetting Station) (Pump Reagent (Vertical Pipetting Station)) tasks fill or empty the Auto Filling Reservoir and Tip Wash Station (also known as MicroWash Reservoir) by pumping for a specified number of seconds or until the percent of maximum tared weight is reached. If the reservoir is on a Weigh Station or Weigh Shelf, the pump stops fluid flow when the target weight is reached. Otherwise, gravity drain is used to empty the reservoir.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Requirements

The following must be configured on the Bravo Platform or the Vertical Pipetting Station:

- Autofilling Reservoir or Tip Wash Station
- Pump Module
- Weigh Station or Weigh Shelf (optional)

Task parameters

Note: The task parameters for Pump Reagent (Bravo) and Pump Reagent (Vertical Pipetting Station) are identical.

After adding the Pump Reagent task at the desired point in the subprocess, set the following parameters in the **Task Parameters** area:

ask Parameters	
Task Parameters	(
11 Q1	
Pump Reagent (Bravo) Properties	
Location, plate:	
Location, location:	<auto-select></auto-select>
Allow concurrent operation:	
Autofill settings	
Reservoir mode:	Fil
Pump speed (0 - 100 %):	50
Pump on time (1 - 600 s):	5
Weigh station	
Use weigh station:	
Weigh station action threshold (0 - 100	50
Weigh station stop action threshold (0	50

Pump Reagent (Bravo, Vertical Pipetting Station)

Parameter	Description
Location, plate	The labware involved in the Pump Reagent task.
Location, location	The location at which the Pump Reagent task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>
Reservoir mode	The action of the task:
	• Fill
	• Empty
Pump speed	The speed, in percent of maximum, at which to pump the reagent.
Pump on time	The duration of the pumping time, in seconds.
Use weigh station/shelf	The option to use the Weigh Station or Weigh Shelf.
Weigh station/shelf action threshold	The minimum fluid weight, in percent of the full weight that was calibrated on the Weigh Station or Weigh Shelf.
	For example, you can set the minimum threshold at 45% so that when the fluid reaches 45% of the full weight, fluid starts to pump into the reservoir.
Weigh station stop action threshold	The maximum fluid weight, in percent of the full weight that was calibrated on the Weigh Station or Weigh Shelf.
	For example, you can set the stop threshold at 60% so that when the fluid reaches 60% of the full weight, fluid starts to drain or pump out of the reservoir.
Allow concurrent operation	The option to permit the accessory to operate simultaneously with other tasks.

Example: Fill the Tip Wash Station after the Tip Wash task

Goal

After some liquid-handling tasks, wash the tips, and then fill the Tip Wash Station.

Implementation

In Bravo Diagnostics, set up the Auto Filling Reservoir on a deck location. Associate the reservoir with one or more pump modules.

In the protocol, add a configured labware for the Auto Filling Reservoir in addition to the other processes and configured labware required by the protocol. In the example shown, the configured reservoir is called Wash.

In the Bravo subprocess where the liquid-handling tasks are specified, a Pump Reagent task is added after the Wash Tips task. After adding the Pump Reagent task, the task name changes to Fill or empty a reservoir in the protocol, as shown in the following example.

 Destination (384 Greiner 781101 PS clr fit btm) Remove Concentration Destination Downstack from Bravo - SubProcess 11 using Bravo - 1 Set head mode to 1 column: 1 Set head mode to 1 to Destination Set head mode to 1 to Destination 	Main Protocol								۲
Source 1 (384 Greiner 781101 PS clr fit btm)	(384 Greiner 781101 PS clr fit btm)	(384 Greiner 781101 PS	from Bravo -	Bravo SubProcess 11 using	Bravo - 1.7 Set head mode to 1	Tips On in 1 selection(s)	µL in 4 selection(s)	Dispense contents of tips in 4 selection(s)	Tips Off in 1 selection(s)
Source 2 (384 Greiner 781101 PS clr fit btm)									

In the Pump Reagents Task Parameters area, Wash (the name for the Auto Filling Reservoir) is selected, because the goal is to pump fluid into the Auto Filling Reservoir.

Task Parameters #						
Task Parameters 📀						
2↓						
Pump Reagent (Bravo) Properties						
Location, plate:	Wash (384 V11 11962.001 Autofi					
Location, location:	<auto-select></auto-select>					
Allow concurrent operation:						
Autofill settings						
Reservoir mode:	Fill					
Pump speed (0 - 100 %):	50					
Pump on time (1 - 600 s):	5					
Weigh station						
Use weigh station:						
Weigh station action threshold ((50					
Weigh station stop action thresh	50					
Advanced Settings	۲					

Serial Dilution (Bravo, Vertical Pipetting Station)

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
Set Head Mode task	"Set Head Mode (Bravo)" on page 529
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Tips Off task	"Tips Off (Bravo, Vertical Pipetting Station)" on page 539
Wash Tips task	"Wash Tips (Bravo, Vertical Pipetting Station)" on page 550
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Serial Dilution (Bravo, Vertical Pipetting Station)

Description

The Serial Dilution (Bravo) (Serial Dilution (Bravo)) and Serial Dilution (Vertical Pipetting Station) (Serial Dilution (Vertical Pipetting Station)) tasks allows you to set up serial dilution in a microplate using a single task. You use the Serial Dilution wizard to set up the task parameters. The end result is a sequence of Aspirate, Dispense, and optional Mix tasks that produce a linear or non-linear concentration gradient in selected wells.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess

Serial Dilution (Bravo, Vertical Pipetting Station)

Task is available for	Task is available in

Vertical Pipetting Station

Main Protocol, Vertical Pipetting Station Subprocess

Requirements

Setup

Make sure you:

- Check that the Vertical Pipetting Station device has the 8- or 16-channel serial dilution head installed. In general, the Vertical Pipetting Station device can perform single-column or single-row serial dilution only.
- Configure the labware on the Bravo deck or the Vertical Pipetting Station shelves in the software. For instructions, see "Configuring labware" on page 40.
- If you are using a Series III pipette head on the Bravo Platform, add a Set Head mode task before the Serial Dilution task to select the pipette channels. See "Set Head Mode (Bravo)" on page 529 for details.
- If you are using a Series II pipette head and you want to dilute by quadrant, check that the number of channels is fewer than the number of wells in the microplate.



Series III pipette head



Series II pipette head

The Serial Dilution task can be used with the following pipette head and microplate formats:

Series II pipette head	Microplate format
8-channel head	96, 384, 1536
16-channel head	384, 1536
96-channel head	384, 1536
384-channel head	1536
Series III pipette head	Microplate format
96-channel head with disposable tips	96, 384, 1536

Serial Dilution (Bravo, Vertical Pipetting Station)

Series II pipette head	Microplate format
384-channel head with disposable tips	384, 1536

Labware

IMPORTANT The Serial Dilution task can only be used with a microplate. The task cannot be used with a reservoir.

Make sure the serial dilution microplate meets the following requirements:

- A column, row, or quadrant contains the starting concentration of a compound to be diluted.
- One or more columns, rows, or quadrants contain the same amount of diluent.

Pipette-tip tracking

You can track pipette tip usage on the Bravo Platform and the Vertical Pipetting Station. To track pipette tip usage, turn on the tracking options in the following:

- Tips On task
- Tips Off tasks.
- Serial Dilution wizard, step 2

Custom parameters

Note: The custom parameters for Serial Dilution (Bravo) and Serial Dilution (Vertical Pipetting Station) are identical.

After adding the Serial Dilution task at the desired point in the protocol, set the following parameters in the **Custom Parameters** area:

Serial Dilution (Bravo, Vertical Pipetting Station)

Task Parameters		ņ
Custom Parameters	3	
		٦
Select a serial dilution plate:		
Serial Dilution Plate (process) (384	Costar 3657 PP Sqr well rnd btr 🔻	
Select a wash plate:		
	v	
Select a tip box for tips-on operatio	ne	
Select a up box for ups on operatio		
Select a tip box for tips-off operatio	ns:	
	~	
Launch serial	dilution wizard	
□ Aspirate (step 1 of 3)		
Plate name	Serial Dilution Plate (process)	
Volume (0-251 µL)	72	
Pre-aspirate volume (0-251 µL)	0	
Post-aspirate volume (0-251	0	
Liquid class Distance from well bottom (0	2	
Distance from well bottom (0 Dynamic tip extension (0-20	0	
Perform tip touch	No	
Advanced Settings		ຄ
Auvanceu secultys		2

Parameter	Description
Select a serial dilution plate	The labware involved in the Serial Dilution task.
Launch serial dilution wizard	The command that opens the Serial Dilution Wizard dialog box. See "Serial dilution wizard" on page 527 for instructions.

Note: The remaining task parameters will be filled in after you go through the Serial Dilution wizard.

Serial dilution wizard

The serial dilution wizard guides you through the serial dilution setup.

To use the wizard:

- 1 In the Task Parameters area, click Launch serial dilution wizard. The Serial Dilution Wizard dialog box opens.
- **2** Follow the instructions to set up the serial dilution.

IMPORTANT In step 1 of the wizard, if you want the transfer volume to be determined by a concentration gradient, be sure to type a gradient factor.

For example, if the concentration gradient is 2, then the concentration of the first dilution will be the concentration in the starting column C_1 divided by 2, or $C_1/2$. The concentration of the second dilution will be the concentration of the second column C_2 divided by 2, or $C_2/2$, and so on.

Serial Dilution (Bravo, Vertical Pipetting Station)

The upper range of the transfer volume is determined by the capacity of the pipette head and the well volume of the microplate.

IMPORTANT Select whether you want the software to track tip usage in Step 2 of the wizard.

IMPORTANT If you want to track tips, make sure you also select the tracking options in the Tips On and Tips Off tasks.

For the description of the Aspirate parameters, see "Aspirate (Bravo, Vertical Pipetting Station)" on page 392. For the description of the Dispense parameters, see "Dispense (Bravo, Vertical Pipetting Station)" on page 451. For the description of the Mix parameters, see "Mix (Bravo, Vertical Pipetting Station)" on page 497.

When you are finished setting up the serial dilution task, the parameters you specified in the wizard appear in the **Task Parameters** area. Review the parameters. To see additional parameters, click the arrow buttons under the parameter table. If you need to edit a parameter value, double-click in the box and type the new value.

Task Parameters	д		
Custom Parameters	۲		
Select a serial dilution plate:			
Serial Dilution Plate (process) (1536	Greiner 782076 blk sqr well fit 💌		
Select a wash plate:			
	~		
Select a tip box for tips-on operation	5:		
	•		
Colorto Valhas fan Kanadifan arriva			
Select a tip box for tips-off operation	s:		
	Ψ.		
Launch serial of	dilution wizard		
□ Aspirate (step 1 of 3)			
Plate name	Serial Dilution Plate (process)		
Volume (0-251 µL)	10		
Pre-aspirate volume (0-251 µL)	0		
Post-aspirate volume (0-251 µL)	0		
Liquid class			
Distance from well bottom (0-1			
Dynamic tip extension (0-20 m	0		
Perform tip touch	No		
Which sides to use for tip touch None			
Tip touch retract distance (-20 0			
Tip touch horizontal offset (-5 0			
Well selection 1 selection: A3			
Pipette technique			
Advanced Settings	٢		

Related information

For information about	See
Configured labware	"Planning labware use" on page 20
Static labware	"Planning labware use" on page 20

For information about	See
Startup Protocol	"Setting up Startup and Cleanup Protocol processes" on page 60
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Set Head Mode (Bravo)

Description

The Set Head Mode (Bravo) ($\prod_{K \in \mathcal{B} \ Set \ Head \ Mode \ (Bravo)}$) task specifies the channels (or barrels) in the pipette head to be used for pipetting. You can select an m × n array of channels (barrels) for one of the following configurations:

- All of the pipette channels
- The first or last full column or row of pipette channels
- Multiple full columns or rows of pipette channels
- The first or last partial column or row of pipette channels
- Multiple partial columns or rows of pipette channels
- A single pipette barrel at the corner of the pipette head

This task should only be used if the Series III pipette head is installed.

Task is available for	Task is available in		
Bravo Platform	Main Protocol, Bravo Subprocess		

Pipette head requirements

You can use the following pipette heads with a flexible array of pipette tips:

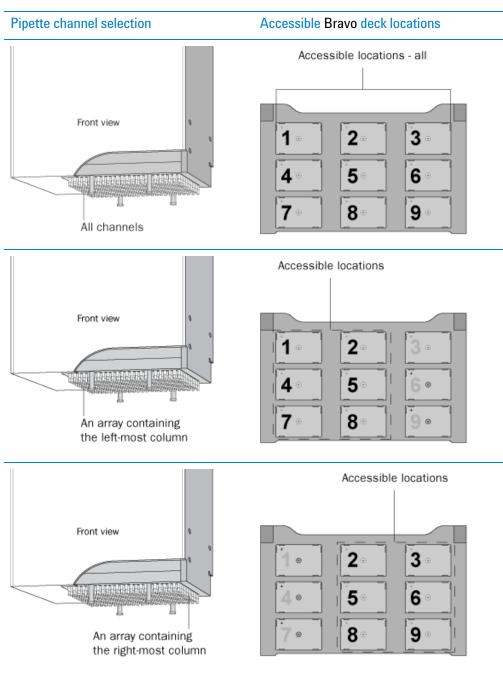
Pipette head	Microplate format
Series III 96-channel head with disposable tips	96, 384, or 1536

Set Head Mode (Bravo)

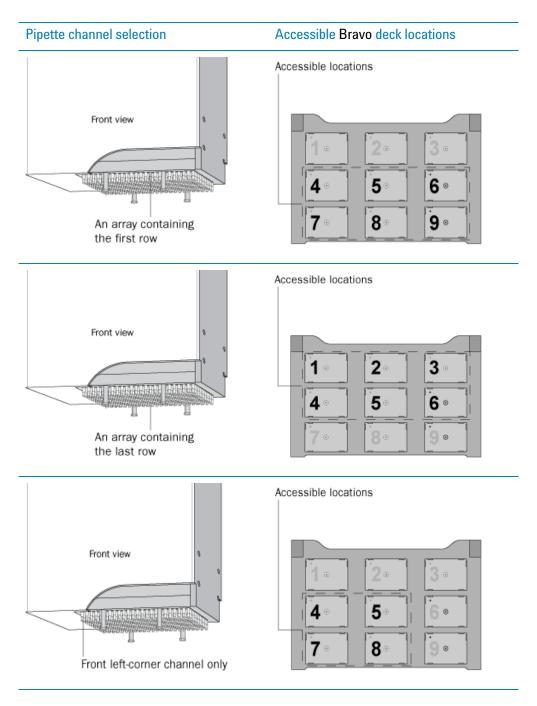
Pipette head	Microplate format
Series III 384-channel head with disposable tips	96, 384 or 1536

Accessible deck locations

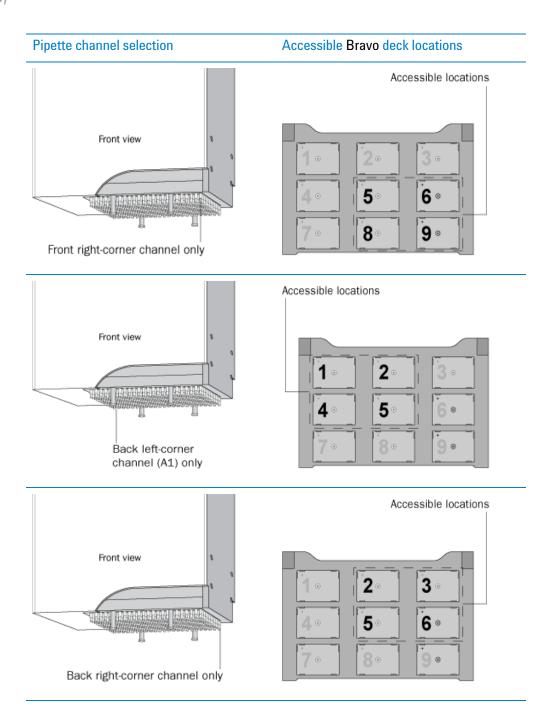
The deck locations you can access depends on the pipette head channels you select. The following table shows the channel selections and corresponding deck location limits. Use this information when you set up labware on the Bravo deck.



Set Head Mode (Bravo)



Set Head Mode (Bravo)



Before you add the task

Make sure:

- You have installed the correct pipette head. See "Pipette head requirements" on page 529 and the *Bravo Automated Liquid Handling Platform User Guide*.
- If you are going to use partial rows or columns of channels (barrels) on the pipette head, retract the tip box stripper pins on the pipette head. See the *Bravo Automated Liquid Handling Platform User Guide* for this procedure.

- The correct Bravo device file is open in the VWorks window.
- The profile you selected shows the correct head type, tip type, and miscellaneous settings.
- All the teachpoints have been added and verified.

Task parameters

IMPORTANT The Set Head Mode task should always precede the pipetting tasks that require the specified subset of pipettes.

IMPORTANT The Set Head Mode task should precede the Serial Dilution task. If you plan to change tips during the serial dilution process, add the Set Head Mode task before the Tips On task.

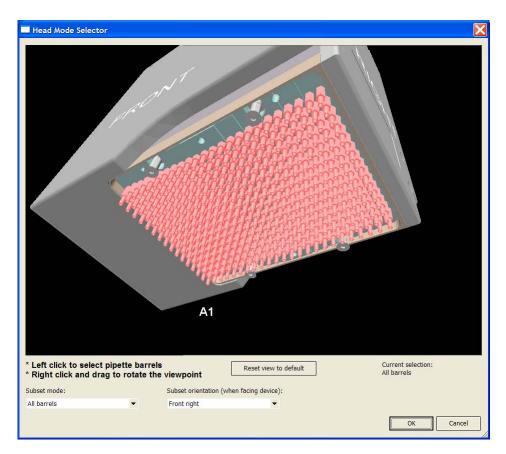
After adding the Set Head Mode task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	Д
Task Parameters	*
2↓	
□ Set Head Mode (Bravo) properties	
Head mode: All bar	els
	I I I I I I I I I I I I I I I I I I I
Parameter	Description
Head mode	The channel selection.
	Click the Head mode field, and then click th
	w button that appears. In the Head Mode
	Selector dialog box that opens, select the pipette channels.
	pipette channels.

Head Mode Selector dialog box

The Head Mode Selector dialog box allows you to select the pipette channels. Except for the **Subset: All barrels** mode, you select the desired channels using a combination of the **Subset mode** selection with the **Subset orientation** selection.

Set Head Mode (Bravo)



To select the pipette channels:

1 In the **Subset** list, select one of the following:

Subset mode	Description
All barrels	Uses all of the pipette channels.
Full column	Uses one or more full columns of pipette channels, starting from the right-most or left-most column.
Full row	Uses one or more full rows of pipette channels, starting from the first row or the last row.
Partial row/column	Uses part of the selected columns or rows.

2 In the **Subset orientation** list, select one of the following:

Subset orientation	Description
Front right	Uses pipette channels that contain the single channel in the front right corner.
Back right	Uses pipette channels that contain the single channel in the back right corner.
Front left	Uses one or more full rows of pipette channels, starting from the first row or the last row.
Back right	Uses part of the selected columns or rows.

3 When you are finished, click **OK** to save the selection.

Example: Specify the pipette channels to use on the Bravo Platform

Goal

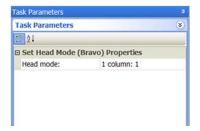
Use all of the channels of a Series III 96-channel pipette head for the liquid-handling tasks.

Implementation

At the beginning of the Bravo subprocess, add a Set Head Mode task as shown.

Main Protocol								۲
Destination (384 Greiner 781101 PS clr filt btm) Remove	Destination (384 Greiner 781105 clr flt btm)	Downstack from Bravo - 1.1	Bravo Bravo SubProcess 11 using Bravo - 1	Upstack to Bravo - 1.7 Set head mode to 1 column: 1	Tips On in 1 selection(s) from Tips	Aspirate 10 µL in 4 selection(s) from Source 1	Dispense contents of tips in 4 selection(s) to Destination	Tips Off in 1 selection(s) from Tips
• Source 1 (384 (Greiner 781101 P	S clr fit btm)						
• Source 2 (384 0	Greiner 781101 P	S clr fit btm)						
1 Tips (384 V11	Tip Box ST70 191	33.002)						

In the Set Head Mode Task Parameters area, All barrels is selected.



Related information

For information about	See
Configured labware	"Planning labware use" on page 20
Static labware	"Planning labware use" on page 20
Startup Protocol	"Setting up Startup and Cleanup Protocol processes" on page 60
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542

Shake (Bravo, Vertical Pipetting Station)

For information about	See
Tips Off task	"Tips Off (Bravo, Vertical Pipetting Station)" on page 539
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Shake (Bravo, Vertical Pipetting Station)

Description

The Shake (Bravo) (shake (Bravo)) and Shake (Vertical Pipetting Station) (Shake (Vertical Pipetting Station)) tasks instructs the Orbital Shaking Station to shake.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Requirements

To use the Shake task, you must first configure the Orbital Shaking Station in Bravo Diagnostics or Vertical Pipetting Station Diagnostics.

Task parameters

Note: The task parameters for Shake (Bravo) and Shake (Vertical Pipetting Station) are identical.

After adding the Shake task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Shake (Bravo, Vertical Pipetting Station)

Task Parameters	(*)
:: 21	
Shake (Bravo) Properties	
Location, plate:	
Location, location:	<auto-select></auto-select>
Mode:	Timed
RPM (100 - 2000):	500
Direction:	NWSE
Time for operation in Timed mod	10
Allow concurrent operation:	

Parameter	Description
Location, plate	The labware involved in the Shake task.
Location, location	The location at which the Shake task occurs. <auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>
Mode	 The action of the task: On. Turns on the Orbital Shaking Station. Off. Turns off the Orbital Shaking Station. Timed. Turns on the shaking timer. You must specify the length of time to shake. If you plan to time the shaking, add only one Shake task (the task turns on the shaking, and at the end of the time period, the shaking turns off automatically). If you are not timing the shaking, add two Shake tasks in the protocol (one to turn on the shaking and the other to turn off the shaking).
RPM	The shake speed, in revolutions per minute.
Direction	The direction to shake. Select one of the direction combinations: NWSE, NESW, NS, EW, NW/SE, NE/SW.
Time for operation in Timed mode	The length of time, in seconds, you want to leave the shaking on. At the end of the period, the shaking will turn off.

Shake (Bravo, Vertical Pipetting Station)

Parameter	Description	
Allow concurrent operation	The option to permit the accessory to ope simultaneously with other tasks. For exam the Shake and Mix tasks can operate simultaneously.	
	CAUTION To shake and mix concurrently, use only 96-well disposable-tip pipette heads in 96-well microplates.	

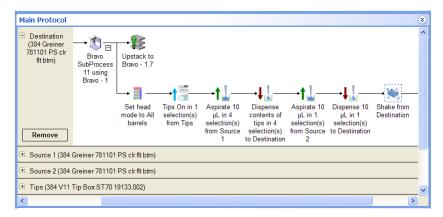
Example: Shake the destination microplate after adding reagents

Goal

Shake the destination microplate after adding reagents from two source microplates.

Implementation

In the liquid-handling subprocess, a Shake task is added after the second reagent is added. In the following example, a Shake task is added in a Bravo subprocess.



In the Shake Task Parameters area, Destination is selected, because the goal is to shake the destination microplate.

Task Parameters	
Task Parameters	۲
Ż↓	
Shake (Bravo) Properties	
Location, plate:	Destination (384 Greiner 781101 F
Location, location:	<auto-select></auto-select>
Mode:	Timed
RPM (100 - 2000):	500
Direction:	NWSE
Time for operation in Timed mo	1 10
Allow concurrent operation:	

Related information

For information about	See
Configured labware	"Planning labware use" on page 20
Static labware	"Planning labware use" on page 20
Startup Protocol	"Setting up Startup and Cleanup Protocol processes" on page 60
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Tips Off (Bravo, Vertical Pipetting Station)

Description

The Tips Off (Bravo) (Image Tips off (Bravo)) and Tips Off (Vertical Pipetting Station) tasks (Image Tips Off (Vertical Pipetting Station)) remove disposable pipette tips from the pipette heads that are compatible with disposable tips.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Note: Options in the Tips On and Tips Off tasks permit tracking of pipette tip usage during and across protocol runs. In addition, an option in the Tips Off task allows you to reuse pipette tips for a portion of the protocol run.

Tips Off (Bravo, Vertical Pipetting Station)

Requirements

Tracking tips in serial dilution tasks

In addition to selecting the tracking option in the Tips On and Tips Off tasks, you must also turn on the tracking in the Serial Dilution Wizard. For more detailed information, see "Serial Dilution (Bravo, Vertical Pipetting Station)" on page 524.

Tracking tips across different protocols

If you want to track pipette tip usage across different protocols that contain Bravo and Vertical Pipetting Station Subprocesses, make sure:

- The protocols reference the same device file.
- The tip boxes are at the same physical locations.
- In the software, the tip boxes are configured at the same locations across the protocols.

Note: When a set of tipboxes are designated as a process plate, tip usage is tracked during the protocol run. At the end of a run, the software resets the tipbox to the original state. The software assumes that in each subsequent run, you will load tipboxes in the original state before the run.

Task parameters

Note: The task parameters for Tips Off (Bravo) and Tips Off (Vertical Pipetting Station) are similar.

After adding the Tips Off task at the desired point in the protocol, set the following parameters in the Task Parameters area:

Task Parameters		ţ.
Task Parameters		۲
Tips Off (Bravo) properties	5	
Location, plate:		
Location, location:	<auto-select></auto-select>	
Properties		
Allow automatic tracking of tip) US 🗌	
Mark tips as used:	✓	
Well selection:	1 selection: A1	

Parameter	Description
Location, plate	The labware involved in the Tips Off task.
Location, location	The location at which the Tips Off task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>

Tips Off (Bravo, Vertical Pipetting Station)

Parameter	Description
Allow automatic tracking of tip usage	The option to allow the software to track pipette tip usage during the protocol run or across different protocol runs. When you start the run, the software will determine the positions to use in the tipbox.
	If you select the option in this task, you must also select the option in the Tips On task.
	If you do not select this option, you must specify the positions to use in the tip box using the Well selection parameter.
Mark tips as used	The option to use only new pipette tips during the protocol run.
	Select the option so that the software counts the number of tips used during the protocol run. The tips that have been used once are marked as used so that they cannot be picked up and reused.
	Clear the check box so that during the next Tips On task, the same tips can be reused.
Well selection	The well positions to use for the Tips Off task.
	This parameter is available only for manual tracking of pipette tips.

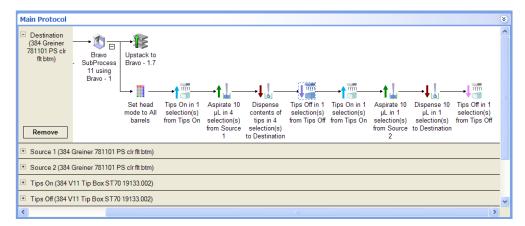
Example: Change tips during liquid-handling tasks on the Bravo Platform

Goal

Add reagents from two source microplates into a destination microplate. Change tips between source microplate 1 and source microplate 2 to prevent contaminating the source microplates.

Implementation

In the liquid-handling subprocess, add a Tips Off task after each Dispense task as shown.



Tips On (Bravo, Vertical Pipetting Station)

Because the tips are removed at a Tips Off tipbox, the Tips Off tipbox is selected in the Tips Off Task Parameters area.

Task Parameters	д
Task Parameters	۲
2↓	
Tips Off (Bravo) Properties	
Location, plate:	Tips Off (384 V11 Tip Box ST70 1
Location, location:	<auto-select></auto-select>
Properties	
Allow automatic tracking of tip us	
Mark tips as used:	v
Well selection:	1 selection: quadrant 1

Related information

For information about	See
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Serial Dilution task	"Serial Dilution (Bravo, Vertical Pipetting Station)" on page 524
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Tips On (Bravo, Vertical Pipetting Station)

Description

The Tips On (Bravo) (Tips On (Bravo)) and Tips On (Vertical Pipetting Station) tasks (Tips On (Vertical Pipetting Station)) presses disposable pipette tips on the pipette head. The task is not for use with fixed-tip pipette heads.

Tips On (Bravo, Vertical Pipetting Station)

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Note: Options in Tips On and Tips Off tasks permit the tracking of pipette tip usage during and across protocol runs. In addition, an option in the Tips Off task allows you to reuse pipette tips for a portion of the protocol run.

Requirements

Tracking tips in serial dilution tasks

In addition to selecting the tracking option in the Tips On and Tips Off tasks, you must also turn on the tracking in the Serial Dilution Wizard. For more detailed information, see "Serial Dilution (Bravo, Vertical Pipetting Station)" on page 524.

Tracking tips across different protocols

If you want to track pipette tip usage across different protocols that contain Bravo and Vertical Pipetting Station Subprocesses, make sure:

- The protocols reference the same device file.
- The tip boxes are at the same physical deck locations.
- In the software, the tip boxes are configured at the same locations across the protocols.

Note: When a set of tip boxes are designated as a process plate, tip usage is tracked during the protocol run. At the end of a run, the software resets the tip box to the original state. The software assumes that in each subsequent run, you will load tip boxes in the original state before the run.

Task parameters

Note: The task parameters for Tips On (Bravo) and Tips On (Vertical Pipetting Station) are similar.

After adding the Tips On task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	Ф.
Task Parameters	۲
Ż↓	
Tips On (Bravo) properties	
Location, plate:	
Location, location:	<auto-select></auto-select>
Properties	
Allow automatic tracking of tip us	
Well selection:	1 selection: A1

Tips On (Bravo, Vertical Pipetting Station)

Parameter	Description
Location, plate	The labware involved in the Tips On task.
Location, location	The location at which the Tips On task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>
Allow automatic tracking of tip usage	The option to allow the software to track pipette tip usage during the protocol run or across different protocol runs. When you start the run, the software will determine the positions to use in the tipbox.
	If you select the option in this task, you must also select the option in the Tips Off task.
	If you do not select this option, you must specify the positions to use in the tip box using the Well selection parameter.
Well selection	The well positions to use for the Tips On task.
	This parameter is available only for manual tracking of pipette tips.

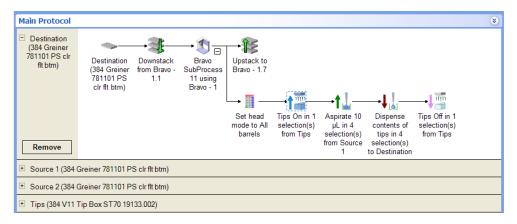
Example: Press tips on before liquid-handling tasks on the Bravo Platform

Goal

Make sure tips are pressed on before liquid-handling tasks start.

Implementation

In the liquid-handling subprocess, a Tips On task is added at the beginning. In the following example, because the protocol is run on a Bravo Platform, a Set Head Mode task must be added before the Tips On task.



Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Serial Dilution task	"Serial Dilution (Bravo, Vertical Pipetting Station)" on page 524
Set Head Mode task	"Set Head Mode (Bravo)" on page 529
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

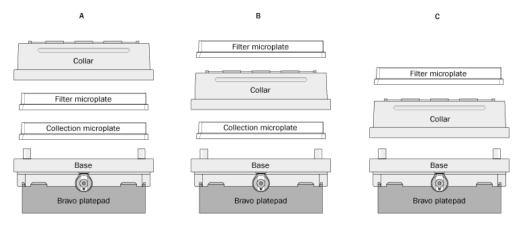
Toggle Vacuum (Bravo, Vertical Pipetting Station)

Description

The Toggle Vacuum (Bravo) (Toggle Vacuum (Bravo)) and Toggle Vacuum (Vertical Pipetting Station) (Toggle Vacuum (Vertical Pipetting Station)) tasks turn on and turn off the vacuum.

In a Bravo Subprocess, use the Toggle Vacuum (Bravo) task if the Vacuum Filtration Station has configuration A as shown in the following diagram. In configuration A, the filter microplate is part of the station assembly.

Toggle Vacuum (Bravo, Vertical Pipetting Station)



If the Vacuum Filtration Station has configuration B and you want the robot to move the filter microplate from another location to the station, use the Move and Filter Plate task to turn on and turn off the vacuum. See "Move and Filter Plate (Bravo)" on page 505.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Task parameters

Note: The task parameters for Toggle Vacuum (Bravo) and Toggle Vacuum (Vertical Pipetting Station) are identical.

After adding the Toggle Vacuum task at the desired point in the subprocess, set the following parameters in the **Task Parameters** area:

Task Parameters		۲
1		
Toggle Vacuum (Bravo) Properties	1	
Location:		
Mode:	Timed	
Time for operation in Timed mode (s):	30	
Hold down filter plate:		
Allow concurrent operation:		

ParameterDescriptionLocationThe location of the Vacuum Filtration Station.

Toggle Vacuum (Bravo, Vertical Pipetting Station)

Parameter	Description
Mode	The action of the task:
	• On. Turns on the vacuum.
	• <i>Off.</i> Turns off the vacuum.
	• <i>Timed.</i> Turns on the vacuum timer. You must specify the vacuum length of time.
	If you plan to time the filtering process, add only one Toggle Vacuum task (the task turns on the vacuum, and at the end of the time period, the vacuum turns off automatically). If you are not timing the filtering process, add two Toggle Vacuum tasks in the protoco (one to turn on the vacuum and the other to turn off the vacuum).
	<i>Note:</i> If the filtering process is not timed, the protocol can perform other tasks in parallel.
When filtration timing begins	The different options for when to start timing the filtration process:
	• When pressure is achieved
	• When pump starts
	This parameter is for the Vario vacuum pump only.
Time for operation in Timed mode	The length of time, in seconds, you want to leave the vacuum on. At the end of the period, the vacuum will turn off.
Hold down filter plate	The option to have the robot hold down the filter microplate when the vacuum is turned on to ensure a secure vacuum seal.
Time allowed to reach pressure	The length of time, in seconds, during which the pump is allowed to reach the target pressure. The software will display an error message if the target pressure is not reached at the end of the specified time.
	This parameter is for the Vario vacuum pump only.
Target pressure	The desired vacuum pressure, in mbar, Torr or hPa. The pressure unit is set on the Vario vacuum pump.
	This parameter is for the Vario vacuum pump only.
Allow concurrent operation	The option to permit the accessory to operate simultaneously with other tasks.

Example

Goal

Assemble a Vacuum Filtration Station whose configuration is base-collection plate-filter plate-collar. Filter for 30 seconds. Disassemble the station.

Implementation

In Bravo Diagnostics, configure the Bravo deck such that:

- The Vacuum Filtration Station will be assembled at deck location 3.
- The Vacuum Filtration Station base is at deck location 3.
- The collar is at deck location 9.

In the protocol, add the following as shown:

- Filter Plate process
- Collection Plate configured labware (at deck location 8)
- Place Plate (to place the Filter Plate at location 5), Assemble Vacuum, Toggle Vacuum, and Disassemble Vacuum tasks

Startup Protocol						(\$
Main Protocol						(¥
 Filter Plate (384 Greiner 781101 PS clr fit btm) 	Filter Plate (384 Greiner 781101 PS clr fit btm)	Place plate at Bravo - 1 5	Bravo Bravo SubProcess 4 using Bravo -1		→ [©]		~
Remove				Assemble Vacuum	Toggle Vacuum	Disassen Vacuur	
 Collection Plate (384 Greiner 781101 PS clr fit btm) 	Collection Plate (384 Greiner 781101 PS clr fit btm)	Place plate at Bravo - 1 8	Bravo SubProcess 4 using Bravo - 1	Place plate at Bravo - 1 8	0	0	
Remove				Assemble Vacuum	Toggle Vacuum	Disassen Vacuur	~
<		. Ul				>	
Cleanup Protoco	I					(^
Protocol Options						6	^

Set the Assemble Vacuum task parameters as shown:

	*
21	
Assemble Vacuum (Bravo) Pr	roperties
Assembly Order:	Base-Collection plate-Filter plate-Collar
Collection Plate, plate:	Collection Plate (384 Greiner 781101
Collection Plate, location:	<auto-select></auto-select>
Filter Plate, plate:	Filter Plate (384 Greiner 781101 PS cl
Filter Plate, location:	<auto-select></auto-select>
Vacuum Filtration base:	3

Set the Toggle Vacuum task parameters as shown:

	64
Task Parameters	\$
2 2 J	
Toggle Vacuum (Bravo) Properties	
Location:	3
Mode:	Timed
Time for operation in Timed mode (s):	30
Hold down filter plate:	
Allow concurrent operation:	

Set the Disassemble Vacuum task parameters as shown:

Task Parameters	8
<u>₹</u> 21	
🗆 Disassemble Vacuum (Bravo) Pr	roperties
Filter Plate, plate:	Filter Plate (384 Greiner 781101 PS clr
Filter Plate, location:	5
Vacuum Filtration Assembly:	3

The resulting protocol will run as follows:

- **1** Acknowledge that the filter microplate (Filter Plate) is starting at deck location 5.
- **2** Acknowledge that the collection microplate (Collection Plate) is starting at deck location 8.
- **3** Assemble the Vacuum Filtration Station (base-collection plate-filter plate-collar):
 - **a** Move the Collection Plate from deck location 8 and place it on top of the base at deck location 3.
 - **b** Move the Filter Plate from deck location 5 and place it on top of the Collection Plate at deck location 3.
 - **c** Move the collar from deck location 9 and place it on top of the Filter Plate at deck location 3.
- **4** Turn on the vacuum for 30 seconds, and then turn off the vacuum.

Wash Tips (Bravo, Vertical Pipetting Station)

- **5** Disassemble the Vacuum Filtration Station:
 - **a** Move the collar back to deck location 9.
 - **b** Move the Filter Plate back to deck location 5.
 - **c** Move the Collection Plate back to deck location 8.

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Assemble Vacuum task	"Assemble Vacuum (Bravo)" on page 439
Disassemble Vacuum task	"Disassemble Vacuum (Bravo)" on page 449
Move and Filter Plate task	"Move and Filter Plate (Bravo)" on page 505
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Wash Tips (Bravo, Vertical Pipetting Station)

Description

The Wash Tips (Bravo) (Wash Tips (Bravo)) and Wash Tips (Vertical Pipetting Station) (Wash Tips (Vertical Pipetting Station)) tasks wash pipette tips using a number of aspirate and dispense actions.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Requirements

In Bravo Diagnostics or Vertical Pipetting Station Diagnostics, as applicable, ensure that at least one of the following is set up at the correct deck location or shelf and associated with a Pump Module.

- Autofilling Reservoir
- Tip Wash Station (also known as MicroWash Reservoir)
- Open Wash Tray

Ensure that the protocol has a configured labware for the selected autofilling reservoir in addition to the other processes and configured labware required by the protocol.

Task parameters

Note: The task parameters for Wash Tips (Bravo) and Wash Tips (Vertical Pipetting Station) are identical.

After adding the Wash Tips task at the desired point in the subprocess, set the following parameters in the **Task Parameters** area:

_	sk Parameters ask Parameters	(
:		
	Wash Tips (Bravo) properties	
	Location, plate:	
	Location, location:	<auto-select></auto-select>
⊟	Volume	
	Empty tips:	
	Volume (0 - 72 μL):	10
	Pre-aspirate volume (0 - 72 µL):	0
	Blowout volume (0 - 72 µL):	0
Ξ	Properties	
	Liquid class:	
	Mix cycles (0 - 100):	3
	Distance from well bottom (0 - 100 mm):	2
	Dynamic tip extension (0 - 20 mm/µL):	0
	Well selection:	1 selection: A1
⊟	Tip Touch	
	Perform tip touch:	v
	Which sides to use for tip touch:	None
	Tip touch retract distance (-20 - 50 mm):	0
	Tip touch horizontal offset (-5 - 5 mm):	0
Ξ	Pump	
	Pump fill speed (0 - 100 %):	50
	Pump empty speed (0 - 100 %):	50
Ξ	Dispense To Waste	
	Dispense to waste during wash:	v
	Dispense to waste at height (-10 - 5 mm):	0
A	1 5	

Parameter

Description

Location, plate

The labware involved in the Wash Tips task.

Wash Tips (Bravo, Vertical Pipetting Station)

Parameter	Description
Location, location	The location at which the Wash Tips task occurs.
	<auto-select> automatically places the labware at the first-available or appropriate location for the task. If accessories are installed on the deck or shelf, the software uses the accessory configuration information in Bravo Diagnostics or Vertical Pipetting Station Diagnostics to determine the correct location for the task.</auto-select>
Empty tips	The option to empty the entire contents of the pipette tips, including fluid and air. The Volume parameter is ignored if this option is selected.
	Bravo 96AM Head only. Empty tips causes any liquid in the syringes and cartridges or pipette tips to be automatically dispensed to waste at the beginning of the Wash Tips task. In addition, if the Perform tip touch check box is selected, the syringe probes, cartridge tips, or pipette tips will perform a tip touch on the sides of the wash station chimneys after dispensing to waste.
Volume (µL)	The volume of liquid to be dispensed from each pipette tip.
Pre-aspirate volume (µL)	The volume of air to be drawn before the pipette tips enter the liquid.
Blowout volume (µL)	Specifies the volume of air to dispense after the main volume has been dispensed.
	Typically, the blowout volume is the same as the pre-aspirate volume.
	<i>Note:</i> Blowout only occurs in the last quadrant dispensed for a given dispense action.
Liquid class	The liquid class associated with this liquid.
	IMPORTANT To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
Mix cycles	The number of times you want to aspirate and dispense. Each cycle consists of one aspirate action and one dispense action.

Parameter	Description
Distance from well bottom (mm)	The distance between the end of the pipette tips and the well bottoms during the Wash Tips task.
	IMPORTANT The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.
Dynamic tip extension (mm/(µL)	The rate at which the pipette head moves during the Wash Tips task. The software calculates the distance over which the tips will move without crashing.
	Use dynamic tip extension to prevent spills as the pipette tips displace the liquid.
	To move the tips:
	• At the same rate as the volume change. Calculate dynamic tip extension (DTE) as follows:
	DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls
	• Faster than the volume change. DTE > 1/A
	• Slower than the volume change. DTE < 1/A
	The starting and ending positions can be calculated as follows:
	$(V_{dispensed} * DTE) + D_{well bottom}$
	($V_{aspirated} * DTE$) + $D_{well bottom}$
Well selection	The wells at which the Wash Tips task occurs.
	Click in the parameter box, and then click the Browse button to select the wells in the Well Selection dialog box.
	Use this parameter only if the pipette head has fewer tips than the number of wells in the microplate, or if you are in single-row or single-column mode.
Perform tip touch	The option to touch the pipette tip on one or more sides of the well.
Which side to perform tip touch	The wall or walls for tip touch: North, South, East, West, North/South, West/East, West/ East/South/North.
	If you also select the Dispense to waste during wash option, the tip touch is performed on the northeast side only.

Wash Tips (Bravo, Vertical Pipetting Station)

Parameter	Description
Tip touch retract distance	The vertical distance the pipette tips rise before touching the sides of the wells.
Tip touch horizontal offset	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition.
	The value of the parameter determines the direction of movement:
	• <i>0</i> . Tips move a horizontal distance equal to the well radius.
	• <i>Great than 0.</i> Tips attempt to move past the well radius, which results in a more forceful tip touch.
	• <i>Less than 0.</i> Tips move a distance less than the radius of the well, resulting in a lighter tip touch.
Pump fill speed (%)	The speed, in percent of maximum speed, of liquid flow into the reservoir.
	For the MicroWash Reservoir, this value should be high enough for the washing liquid to just bubble over the tops of the chimneys
Pump empty speed (%)	The speed, in percent of maximum speed, of liquid flow out of the the reservoir.
	For the MicroWash Reservoir, this value should be slightly higher than that of the inflow pump to prevent an overflow.
Dispense to waste during wash	The option to move the tips by a specified offset (defined in the Labware Editor) and dispense used fluid outside of the reservoir chimney.
	This option applies only to reservoirs that have chimneys.
Dispense to waste at height (mm)	The height at which the dispense action occurs.
	For example, during the dispense action, the tips move up to clear the chimneys, move the offset distance, and then lower to the distance you specified. If you want the lower the tips by 10 mm, specify -10 mm.

Example: Wash the pipette tips after the liquid-handling tasks on the Bravo Platform

Goal

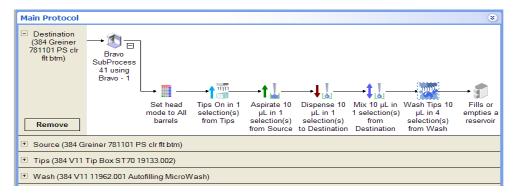
After some liquid-handling tasks, wash the pipette tips in preparation for reuse.

Implementation

In Bravo Diagnostics, set up the Tip Wash Station on a deck location. Associate the reservoir with one or more pump modules.

In the protocol, add a configured labware for the Tip Wash Station in addition to the other processes and configured labware required by the protocol. In the example shown, the configured reservoir is called Wash.

In the Bravo subprocess where the liquid-handling tasks are specified, a Wash Tips task is added at the end of a cycle of liquid-handling tasks.



In the Wash Tips Task Parameters area, Wash (the name for the Tip Wash Station) is selected so that the task is performed in this labware.

Task Parameters +		
Task Parameters 🔹		
Wash Tips (Bravo) Properties	;	
Location, plate:	Wash (384 V11 11962.001 Autofi	
Location, location:	<auto-select></auto-select>	
□ Volume		
Empty tips:		
Volume (0 - 251 µL):	10	
Pre-aspirate volume (0 - 251 µL)	0	
Blowout volume (0 - 251 µL):	0	
Properties		
Liquid class:		
Mix cycles (0 - 100):	3	
Distance from well bottom (0 - 1	2	
Dynamic tip extension (0 - 20 m	0	
Well selection:	4 selections: quadrants 1-4	
🗉 Tip Touch		
Perform tip touch:		
Which sides to use for tip touch:	None	
Tip touch retract distance (-20 -	0	
Tip touch horizontal offset (-5 - 5	0	
🗆 Pump		
Pump fill speed (0 - 100 %):	50	
Pump empty speed (0 - 100 %):	50	
Dispense To Waste		
Dispense to waste during wash:		
Dispense to waste at height (-10	0	
Advanced Cettings	٢	
Advanced Settings	*	

Wash Tips (Bravo, Vertical Pipetting Station)

Related information

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
Set Head Mode task	"Set Head Mode (Bravo)" on page 529
Tips On task	"Tips On (Bravo, Vertical Pipetting Station)" on page 542
Tips Off task	"Tips Off (Bravo, Vertical Pipetting Station)" on page 539
Pump Reagent task	"Pump Reagent (Bravo, Vertical Pipetting Station)" on page 521
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269



VWorks Automation Control User Guide

11 Setting parameters for scheduling tasks

This chapter contains the following topics:

- "Connect to Encore" on page 558
- "Define Plate Set" on page 560
- "Define Variables" on page 564
- "Change Instance" on page 568
- "Group Begin and Group End" on page 570
- "JavaScript" on page 573
- "Loop and Loop End" on page 574
- "Print" on page 578
- "Process Control" on page 586
- "Signal" on page 593
- "Spawn Process" on page 595
- "User Message" on page 599
- "Wait For" on page 603
- "Wait for User (Bravo)" on page 605
- "Watch (Process Watcher)" on page 607





Connect to Encore

Description

The Connect to Encore task (Free Connect to Encore) establishes communication with the Encore Multispan software.

You use the Connect to Encore task if you are running an Encore Multispan software and you want to process labware at VWorks-controlled devices. For information about integrating VWorks-controlled devices with an Encore Multispan System, see the *Encore Multispan System knowledge base*.

Task is available for	Task is available in	
Any device	Startup Protocol	
	Main Protocol	
	Cleanup Protocol	

Note: Although you can add the Connect to Encore task at any point in a protocol, it is typically added in the Startup Protocol.

Task parameters

After adding the Connect to Encore task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters	0.
Task Parameters	۲
<u>2</u> ∎ 2↓	
Connect to Encore (Agilent I	Encore Multispan) Properties
Namespace:	
Task Description	
Task number:	1
Task description:	Connect to Encore (Agilent Encore
Use default task description:	V
Device Selection	۲
Advanced Settings	۲

Parameter	Description
Namespace	The unique name that identifies the VWorks protocol.
	The Namespace parameter allows the Encore Multispan software to start the correct VWorks process if you are running more than one VWorks protocol, and processes in different protocols have the same name. If you are running only one VWorks protocol, the Namespace parameter is not used.
	The Namespace value is referenced by the VWorks task in the Encore Multispan protocol. For more information, see the <i>Encore Multispan System knowledge base</i> .
Task number	The number that indicates the position of the task in the protocol.
Task description	The description of the task.
Use default task description	The option to use the default task description or provide your own description for the task.
	Select the check box to use the default description. Clear the check box to provide your own description.

Related information

For information about	See
Running VWorks-controlled devices with the Encore Multispan System	Encore Multispan System knowledge base
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
User Message task	"User Message" on page 599
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387

Define Plate Set

Description

The Define Plate Set task (Define Plate Set) allows you to create an array variable to represent a group of process plates that will be processed using the same tasks in a looping routine. You can reference the plate set using the Location, plate parameter in a task.

Task is available for	Task is available in
Any device	Main Protocol, not in a subprocess

Requirements

You must use the Define Plate Set task with the Loop and Loop End tasks, and it must be added in the protocol as follows:

- Before the Loop and Loop End tasks that uses it.
- In the top-level process, not in the subprocess that contains the Loop and Loop End tasks.
- At the beginning of the process, and the process is not spawned.

The Loop tasks allow you to specify the starting array index value, how frequently the variable will increment or decrement, and the amount by which the index will increment or decrement.

Custom parameters

After adding the Define Plate Set task at the desired point in the protocol, define the plate set in the **Custom Parameters** area:

Task Parameter	s	ņ
Custom Para	meters	8
Change	Plate set variable MyPlateSet	
Assign plates	to plate	
Add plate	Delete plate	
Array index	Plate	
0	Source Plate 🔽	
1	Source Plate	
2	Destination Plate Plate 3	

Parameter	Description
Plate set variable	The name of the variable assigned to the plate set. The name must conform to JavaScript rules for variable names: start with an alphabetical character or the underscore symbol, followed by combinations of alphabetical characters, numbers, and underscore symbols.
	To define a new name, click Change , type the new name, and then click OK .
Add plate	The command that allows you to add a process plate to the plate set.
	To add a process plate, click Add plate . A new row appears in the Array table and an index value is automatically assigned. In the Plate field, select a process plate from the list.
Delete plate	The command that deletes the selected process plate.
Array table	The list of process plates in the plate set. The table consist of:
	• <i>Array index</i> . The value that identifies the process plate in the array.
	• <i>Plate.</i> The process plate name.

Referencing a plate set in a task

To reference a plate set in a task:

- **1** Select the task in the protocol.
- 2 In the Task Parameters area, select the plate-set variable from the Location, plate list.
 - If the variable does not appear in the list, make sure:
 - The task is inside of a loop.
 - The Loop task specifies the plate set name in its Custom Parameters area.

The following example shows the Aspirate task parameters. Three plate-set variables were defined earlier in the protocol and are available for selection: Tips, Source, and Destination. The example shows the Source variable selected.

11 Setting parameters for scheduling tasks

Define Plate Set

Task Parameters	Ф.		
Task Parameters	۲		
Ż↑			
🗆 Aspirate (Bravo) properties			
Location, plate:	Source1 (96 Costar 3961 PP		
Location, k = Tips			
Volume =Source			
Volume (0 =Destination			
Dro popirat	DIOCESS - 1 ()		
Post-aspira Source2 (96 Costar 3961 PP 2ml assay block)			
Propertie Source3 (96 Costar 3961 PP 2ml assay block)			
Liquid class Dest3 (96 Greiner 655101 PS Clr Rnd Well Flat Btm)			
Distance fr Dest1 (96 Greiner 655101 PS Clr Rnd Well Flat Btm) Dest2 (96 Greiner 655101 PS Clr Rnd Well Flat Btm)			
Dynamic tip extension (0 - 20 mi			
Well selection:	1 selection: entire plate		
Pipette technique:			
🗉 Tip Touch			
Perform tip touch:			
	· · · · · · · · · · · · · · · · · · ·		

Example: Define a plate set for processing on the Bravo Platform

Goal

Define a plate set of source microplates (Source A, B, C, and D). Aspirate from each source microplate into a destination microplate.

Implementation

Add a Define Plate Set task at the beginning of the protocol.

Startup Protoco	ol	*		
Main Protocol		*		
Cource A (96 Greiner 655101 PS Clr Rnd Well Flat Btm)	Source A (96 Unload from Define a set Bravo Greiner plate storage of plate s as a SubProces 655101 PS device JavaScript 3 using Bravo Clr Rnd Well array named -1 Flat Btm) "PlateSet" -1 Loop 4 times Tips On in 1 selection(s) from Tips Datem 1 to pattern from Tips Starting at "PlateSet" using at "PlateSet"			
• Source B (96 G	Greiner 655101 PS Clr Rnd Well Flat Btm)			
Source C (96 Greiner 655101 PS Clr Rnd Well Flat Btm)				
Source D (96 Greiner 655101 PS CIr Rnd Well Flat Btm)				
 Destination (38) 	E Destination (384 Greiner 781101 PS clr flt btm)			
🗉 Tips (96 V11 L	E Tips (96 V11 LT200 Tip Box 06880.002)			

The plate set is called PlateSet.

Task Parameter	s		4
Custom Para	meters		۲
Change	Plate set va PlateSet	iriab	le
Assign plates	to plate		
Add plate	De	lete	plate
Array index	Plate		
0	Source A	•	
1	Source B	•	
2	Source C	•	
3	Source D	•	

Instead of adding four separate Aspirate tasks for each source microplate, add only one Aspirate task in the liquid-handling subprocess. In the Aspirate Task Parameters area, PlateSet is selected.

Task Parameters	џ		
Task Parameters 🛛 😵			
2∎ 2↓			
Aspirate (Bravo) Properties			
Location, plate:	=PlateSet		
Location, location:	<auto-select></auto-select>		
🗆 Volume			
Volume (0 - 72 µL):	10		
Pre-aspirate volume (0 - 72 µL):	0		
Post-aspirate volume (0 - 72 µL)	0		
Properties			
Liquid class:			
Distance from well bottom (0 - 1	2		
Dynamic tip extension (0 - 20 m	0		
Well selection:	1 selection: entire plate		
Pipette technique:			
🗆 Tip Touch			
Perform tip touch:			
Which sides to use for tip touch:	None		
Tip touch retract distance (-20 -	0		
Tip touch horizontal offset (-5 - 5	0		
Advanced Settings	۲		

For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Loop and Loop End tasks	"Loop and Loop End" on page 574
Spawn Process task	"Spawn Process" on page 595
Process Control task	"Process Control" on page 586
Task parameter variables	"Using simple variables" on page 77

For information about	See
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Define Variables

Description

The Define Variables task (=x Define Variables) allows you to create variables and assign initial values. You can reference the variables in a task.

You can use the Define Variables task with the Loop and Loop End tasks. The Loop tasks allow you to specify the starting variable value, how frequently the value will increment or decrement, and the amount by which the value will increment or decrement.

Task is available in
Startup Protocol
Main Protocol
Cleanup Protocol

Custom parameters

After adding the Define Variables task at the desired point in the protocol, define the variables in the **Custom Parameters** area:

isk Parameters		4
Custom Param	eters	۲
Prompt user	for initial values when task is ex o user when	xecuted
Enter initial value	100	
Enter initial valu	les	
	task the first time it is encounte	ered
		ered
 Only run this 	task the first time it is encounte	ered
 Only run this Add variable 	task the first time it is encounte	ered

Parameter	Description		
Prompt operator for initial values when task is run	The option to display all the variables in the Define Variables task and ask the operator to specify initial values for the variables.		
	<i>Note:</i> This option is equivalent to the User data entry into variable option in the User Message task.		
Text to display to operator when prompted	The instructions or description that displays in the prompt dialog box.		
Only run this task the first time it is encountered	The option to run this task the first time it appears in the protocol run.		
	Select this option if the protocol is run multiple times or the task is in a loop, and you only want to run it the first time.		
Add variable	The command that adds a new variable in the Variable table.		
	To add a new variable, click Add variable . Double-click the Variable Name field and type the variable name. Double-click the Initial Value field and type the starting value		
	<i>Note:</i> The starting value specified in this task overrides the starting value the operator provides during run time.		
Delete variable	The command that deletes the selected variable.		
Variable table	The list of variables. The table consists of:		
	• <i>Variable Name</i> . The name of the variable.		
	• <i>Initial Value</i> . The starting value of the variable.		

Referencing variables in a task

To reference variables in a task:

- **1** Select the task.
- 2 In the Task Parameters area, type the =x in the parameter field, where x is the variable name. For more information about using variables, see "Using simple variables" on page 77.

Example: Define a plate set for processing on the Bravo Platform

Goal

Define a variable to represent the aspirate volume. Request the operator to provide the initial value of the aspirate volume.

Implementation

Add a Define Plate Set task at the beginning of the protocol.

Main Protocol											
Source Plate (96 Greiner 655101 PS Ctr Rnd Weil Flat Btm)	Source Plate (96 Greiner 655101 PS Cir Rnd Well Flat Btm)	Define variables	Downstack from BenchCel - 1.Stacker 1	Replication using Bravo - 1	Upstack to BenchCel - 1.Stacker 4	Tips On in 1 selection(s) from Tips	Aspirate <variable> µL in 1 selection(s) from Source Plate</variable>	Dispense 10 µL in 1 selection(s) to Destination Plate	Change instance on Destination Plate	Tips Off in 1 selection(s) from Tips	→⊋ Loop End
Destination Pla	ate (96 Greiner 655	101 PS Clr R	nd Well Flat Btr	n)							
 Diluent Plate (9 	Diluent Plate (96 Greiner 655101 PS Clr Rnd Well Flat Btm)										
🗉 Tips (96 V11 L	T200 Tip Box 0688	0.002)									

The AspVol variable is defined and it represents the aspirate volume. Notice the options are selected to request input from the operator at the start of the protocol run. The operator's input will override the initial value specified in the Custom Parameters area.

isk Parameters Justom Param	otorc		, (\$
	for initial values v	hen task is exe	
What volume to	aspirate from the	Source Plate?	
Only run this	task the first time	it is encounter	ed
Add variable	Delete varia	ple	
rigg variable			
Variable Name	Initial Value		

In the Aspirate Task Parameters area, the AspVol variable is selected for the aspirate volume.

Fask Parameters		1
Task Parameters		*
21		
Aspirate (Bravo) Properties		-
Location, plate:	Source Plate (96 Greiner 655101	
Location, location:	<auto-select></auto-select>	
🗆 Volume		
Volume (0 - 72 µL):	=AspVol	
Pre-aspirate volume (0 - 72 µL)	0	
Post-aspirate volume (0 - 72 µl	0	
Properties		
Liquid class:		
Distance from well bottom (0 -	2	
Dynamic tip extension (0 - 20	0	
Well selection:	1 selection: entire plate	
Pipette technique:		
🗆 Tip Touch		
Perform tip touch:		
Which sides to use for tip touc	None	-
Tip touch retract distance (-20	0	-

For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Loop and Loop End tasks	"Loop and Loop End" on page 574
Spawn Process task	"Spawn Process" on page 595
Process Control task	"Process Control" on page 586
Task parameter variables	"Using simple variables" on page 77
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Change Instance

Description

The Change Instance task (change Instance) allows you to change a plate instance within a loop. For example, you can use the Change Instance task within the Loop and Loop End tasks to aspirate from one source microplate and dispense into different instances of a destination microplate.

Task is available for	Task is available in
Any device	Main Protocol

Do not include the Change Instance task in a subprocess of a spawned process that is running as a subroutine. For example, if process 1 spawns process 2 as a subroutine (Spawn as subroutine option) and process 2 contains a subprocess, the Change Instance task will not work in the subprocess.

Task parameters

After adding the Change Instance task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Parameter	Descript	ion
Spawn control:	Precalculate # of plates (normal o	2
Plate to change:	Destination	
Change Instance propertie	s	
2↓		
		*
Fask Parameters	8	

Parameter	Description
Spawn control	The spawn options:
	• Precalculate # of plates (normal operation). Select this option if the number of microplates can be calculated before the run starts. For example, the calculation can be based on the Number of times to loop value in the Loop task. Do not select this option if the Number of times to loop i a variable, or the looping and the Change Instance task is scripted.
	• Spawn new plate when task runs. Select this option if the Number of times to loop is a variable, or you are scripting the looping and the Change Instance task. The software will not precalculate the number of microplates to use in the Change Instance task. Instead, every time this task runs, a new microplate is brought into the system.
	• Do not spawn new plates. Select this option to script the number of microplates in the run without having to wait for the Change Instance task to execute to bring in new microplates.

Example: Dispense into multiple destination microplates

Goal

Aspirate from one source microplate and dispense into multiple destination microplates.

Implementation

Within the liquid-handling subprocess loop, add a Change Instance task after the Dispense task.

Main Protocol										۲
Source Plate (96 Greiner 655101 PS Clr Rnd Well Flat Btm)	Source Plate (96 Greiner 655101 PS Cir Rnd Well Flat Btm)	Downstack from BenchCel - 1.Stacker 1	Replication using Bravo - 1	Upstack to BenchCel - 1.Stacker 4	Tips On in 1 selection(s) from Tips	Aspirate 10 µL in 1 selection(s) from Source	Dispense 10 µL in 1 selection(s) to Destination	Change instance on Destination Plate	Tips Off in 1 selection(s) from Tips	→⊋ Loop End
						Plate	Plate			
Destination Pla	Destination Plate (96 Greiner 655101 PS Clr Rnd Well Flat Btm)									
Diluent Plate (S	96 Greiner 655101	PS Clr Rnd W	ell Flat Btm)							
• Tips (96 V11 L	T200 Tip Box 068	80.002)								

In the Change Instance Task Parameters area, the Destination Plate is selected.

11 Setting parameters for scheduling tasks

Group Begin and Group End

	sk Parameters	4
T	ask Parameters	۲
•	Ź↓	
⊡	Change Instance Properties	
	Plate to change:	Destination Plate
	Spawn control:	Precalculate # of plates (normal op

Related information

For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Loop and Loop End tasks	"Loop and Loop End" on page 574
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Group Begin and Group End

Description

The Group Begin ($\{$ Group Begin) and Group End ($\}$ Group End) tasks are used together to:

- Group a number of tasks within a subprocess.
- Constrain the grouped tasks to run in the specified sequence.
- Prevent downstream tasks from starting until the grouped tasks are finished.

Note: If the tasks are not grouped, the software will determine the fastest task sequence based on available resources.

During the protocol run, the software will make sure the labware needed by the grouped tasks are on the device locations before running the first task in the group. In addition, while the grouped tasks are running, only the microplates required by the grouped tasks will be allowed to be moved onto, off of, or within the device. Use the Group Begin and Group End tasks if you want to control the sequence of liquid-handling tasks to make sure each microplate is handled the same way in the same sequence.

Note: To further control the tasks, especially those with time limits, you can specify time constraints between dependent tasks. See "Specifying time constraints between dependent tasks" on page 57.

Task is available for	Task is available in
Bravo Platform	Main Protocol, Bravo Subprocess
Vertical Pipetting Station	Main Protocol, Vertical Pipetting Station Subprocess

Requirements

You cannot add a Change Instance task within the grouped tasks.

Task parameters

The Group Begin and Group End tasks do not have task parameters.

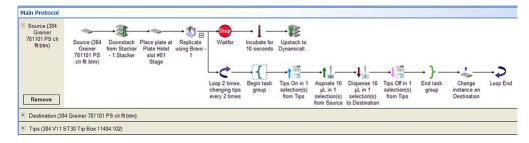
Example: Group liquid-handling tasks

Goal

Make sure all liquid-handling tasks are finished before incubation begins.

Implementation

Add the Group Begin and Group End tasks around the liquid-handling tasks. Notice that the Change Instance task is not within the group.



For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557

11 Setting parameters for scheduling tasks

Group Begin and Group End

For information about	See
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

JavaScript

Description

The JavaScript task (JavaScript) runs the specified JavaScript at the desired point in the protocol. Typically, you use the JavaScript task to run a program that is independent of any task.

Note: If you want to run a JavaScript that skips a task or changes the parameters of the task, write the JavaScript code in the Advanced Settings area of that task. See "Using JavaScript" on page 84 for more information.

Task is available in	
Startup Protocol	
Main Protocol	
Cleanup Protocol	
	Startup Protocol Main Protocol

Advanced Settings

After adding the JavaScript task at the desired point in the protocol, write the code in the **Advanced Settings** area:

Task Parameters	ą.
Advanced Settings	۲
Script to be executed before task	
	>
21 2↓	

For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Writing JavaScript in a protocol	"Using JavaScript" on page 84
Define Variables task	"Define Variables" on page 564
Task parameter variables	"Using simple variables" on page 77
Adding start and finish protocol scripts	"Using start and finish protocol scripts" on page 127

For information about	See
JavaScript utilities	"Using JavaScript utilities" on page 128
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Loop and Loop End

Description

The Loop (\bigcirc Loop) and Loop End (\bigcirc Loop End) tasks are used together to repeat a set of tasks that are within the two tasks.

Task is available for	Task is available in
Any device	Startup Protocol
	Main Protocol
	Cleanup Protocol

Task parameters

Note: Loop End does not have any task parameters.

After adding the Loop task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Ta	sk Parameters	Ф
т	ask Parameters	۲
	2↓	
Ξ	Loop properties	
	Number of times to loop:	5
	Change tips every N times, N = :	2

 0	n	n	2	n	d.	Lo	۱n	m	E	n	d.
 .υ	υ	μ.	α		u	ш,	νu	ιP.	-		u

Parameter	Description
Number of times to loop	The number of times you want to run the tasks within the loop.
Change tips every N times, N=	The number of times to run the tasks in the loop before changing the tips.
	For example, if N is set to 2, the Tips On task will be run every odd number of the loop: first, third, fifth, and so on. The Tips Off and Change Instance tasks that operate on the tip box used by the Tips On task will run every even number of the loop: second, fourth, sixth, and so on.
	<i>Note:</i> If the loop does not contain any tasks that require pipette tips, the software ignores this parameter.

If you want to change the value of variables during the looping process, click **Custom Parameters** and set the following:

ask Paramete	ers						1
Fask Param	ete	rs					*
Custom Par	am	eters					*
Add Variab		Delete V		Frequency		n	
x	-	0	1	Every time	•		
у	-	10	2	Every n times	•	3	
	_				_		

Parameter	Description
Add Variable	The command that adds a variable in the Variable table.
	To add a variable, click Add Variable . A blank row appears in the table. Select the desired value for each column.
Delete Variable	The command that deletes the selected variable from the table.
Variable table	The table that lists the variables to be incremented or decremented in the loop.

11 Setting parameters for scheduling tasks

Loop and Loop End

Parameter	Description			
Variable name	The variable you want to increment or decrement.			
	Select the variable from the list. The variables are defined in the Define Variables task, the Define Plate Set task, or the JavaScript code in the Advanced Settings area.			
	If the variable is new and was not previously defined elsewhere, and an initial value is given, the variable will be defined the moment the Loop task runs.			
Initial value	The starting value to be used the first time through the loop.			
	For variables, the Initial value is the starting value of the variable. For plate sets, the Initial value is the starting array index value.			
	<i>Note:</i> The starting variable value specified in this task overrides the starting variable value the operator provides during run time.			
Increment	The amount you want the variable to increment or decrement.			
Frequency	The frequency of the increment or decrement:			
	• <i>Every time</i> . The variable should increment or decrement every loop.			
	• <i>Every n times.</i> The variable should increment or decrement every specified number of times.			
	• <i>After first time.</i> The variable should increment or decrement starting from the second loop.			
	• <i>After last time</i> . The variable should increment or decrement after the last loop.			
n	The number of times to loop before a variable increments or decrements.			
	This field is available only if you selected Every n times.			

Example: Use the Loop task for plate set indexing

Goal

In a protocol where a plate set variable is defined, use the Loop task to specify the starting plate set (or array) index, how frequently the variable will increment or decrement, and the amount by which the index will increment or decrement.

Implementation

In the following protocol example, a plate set is defined and used in the liquid-handling tasks.

Main Protocol										
Source A (96 Greiner 655101 PS Clr Rnd Well Flat Btm)	Source A (96 Greiner 655101 PS Clr Rnd Well Flat Btm)	Unload from plate storage device	Define a set of plates as a JavaScript array named "PlateSet"	Bravo Bravo SubProcess 3 using Bravo - 1	Load into plate storage device	Tips On in 1 selection(s) from Tips	Aspirate 10 µL in 1 selection(s) from plate set "PlateSet"	Dispense 10 µL in a patterm starting at quadrant 1 to	Tips Off in 1 selection(s) from Tips	→⊋ Loop End
Remove							i lateGet	Destination		
🙂 Source B (96 G	reiner 655101 PS	Clr Rnd Well	Flat Btm)							
🗉 Source C (96 G	reiner 655101 PS	Clr Rnd Well	Flat Btm)							

In the Define Plate Set Task Parameters area, an array of source microplates is defined and indexed (0, 1, 2, and 3). In the Loop Custom Parameters area, the PlateSet variable is selected. The Initial Value is set to 0 to match the first PlateSet index (0). The PlateSet variable will increment by 1 every time through the loop. So the first time through the loop, PlateSet index 0, or SourceA is processed. The second time through the loop, PlateSet index 1, or Source B is processed, and so on.

Custom Parameters Plate set variable Change PlateSet Assign plates to plate Add plate Delete plate	8
Change PlateSet	
Array index Plate	el.
0 Source A 👻	1
Source B 🝷	
Source C 🔹	
Source D 👻	

					â
ers					۲
eters					۲
Delete \	/ariable				
Initial Value	Increment	Frequency		n	
0	1	Every time	-	1	
ings					
	J	eters Delete Variable Initial Value Increment	Delete Variable	Initial Value Increment Frequency	Initial Value Increment Frequency n

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Define Plate Set task	"Define Plate Set" on page 560

For information about	See
Task parameter variables	"Using simple variables" on page 77
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

Print

Description

The Print task (Print) prints barcode labels using the Microplate Labeler. The task does not apply labels to labware.

Use this task if you want to print labels and manually apply the labels to labware such as tubes or other containers. You can also apply the labels to pages in your lab notebook for record keeping purposes.

Task is available for	Task is available in
Microplate Labeler (standalone only)	Startup Protocol Cleanup Protocol

Requirements

The requirements for the Print task is identical to the requirements for the Print and Apply task. See "Print and Apply" on page 318.

Selecting devices for the task

You must select a device for the Print task before you can set the task parameters. After adding the Print task in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

Double-click the desired device in the **Devices available to perform task** area to move it to the **Devices involved in task** area.

Task Parameters	
Task Parameters	۲
Device Selection	۲
Devices involved in task: Devices in backup pool: Microplate Labeler - 1.loc Devices available to perform task:	

Setting the task parameters

IMPORTANT Make sure the label formats are uploaded to the printer. Be sure to initialize the Microplate Labeler device before you set the task parameters.

After selecting the device to use for the Print and Apply task, you can set the parameters in the **Task Parameters** area. The area lists the four sides of a microplate (south, west, north, and east). For each side, you can select a label format and specify the data that will substitute for the text and barcode fields in the label format.

CAUTION Format selection and field information are saved with the protocol. If the formats on the printer are changed, initializing the device will overwrite the information in the protocol. For example, suppose you created a protocol and selected a format called MyFormat. Later, MyFormat was deleted from the printer. The next time you initialize the device and open the protocol, MyFormat will not appear in the protocol.

To set the task parameters:

1 Select the barcode format in the **Format** list:

ask Parameters	
Task Parameters	8
11 24	
No Apply	
Format:	MyFormat 🔹
1:	Variable
2:	None
3:	MyFormat
4:	MyNextFormat
5:	3
6:	4
Format:	6
Device Selection	8
Advanced Settings	9

Format selection	Description
None	Indicates no label will be printed.
Format name or number	Uses a format that was set up in Microplate Labeler Diagnostics.
	<i>Note:</i> If you do not see a list of formats, make sure the label formats are not empty (formats must contain at least one field), the formats are uploaded to the printer, and the Microplate Labeler device is initialized.

As soon as you select a format, fields appear in the Task Parameters area. You can specify the information you want to print in these fields. *Note:* The number of fields that appear depends on the format you select.

Task Parameters		8
21		
No Apply		
Format:	MyFormat	
1:		
2:		
3:		
4:		
5:		
6:		
Device Selection		*

2 Click a field, and then click the with button that appears. The Field Composer dialog box opens.

The Field Composer allows you to specify the information to print on the barcode label. For example, you can print the current date and time.

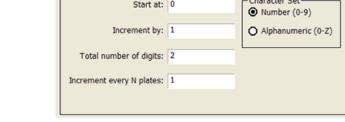
Field Composer		X
Tools	Field Value	
	Properties-	
철리역		
8		
Τ		
080422		
	ОК Саг	ncel

3 In the Tools area, double-click one or more of the following icons to specify the information to be printed on the barcode label. The selected icon appears in the Field Value area.

IMPORTANT For field limitations, such as the maximum number of characters permitted or symbology-dependent limitations, check the format you set up in Microplate Labeler Diagnostics. See also the G5404B Microplate Labeler User Guide.

lcon	Description		
	Prints the current date.		
	Click the icon in the Field Value area. In the Properties area, select the desired date format. YYYY is the year, MM is the month, and DD is the day.		
	<i>Note:</i> The Use System Format option uses the local computer's date format.		
	Date Stamp		
	Use System Format		
	O YYYY/MM/DD O DD/MM/YYYY O MM/DD/YYYY		
	O YY/MM/DD O DD/MM/YY O MM/DD/YY		

Icon Description Prints the current time. Œ Click the icon in the Field Value area. In the Properties area, select the desired data format: 12 hours (AM/PM) or 24 hours. -Time Format 12 hours (AM/PM) O 24 hours Prints a numeric or alphanumeric value that can be 취리년 incremented. Click the icon in the Field Value area. Set the following in the **Properties** area: . Character Set. The option to use either numeric or alphanumeric characters. Start at. The starting value. *Increment by.* The amount by which the value • increments. Total number of digits. The total number of . digits or characters, including leading 0s. Increment every N plates. The increment value. ٠ For example, 1 increments the value every microplate. Counter-Character Set-Start at: 0 Number (0-9) Increment by: 1 Alphanumeric (0-Z)





Not used. If you add this icon, the software will ignore it.

lcon	Description			
	Prints the values in the specified barcode input file.			
	Click the icon in the Field Value area. In the Properties			
	area, click the <u>button</u> button to select the input file. Specify the row and column number of the starting value. During the run, the software automatically increments to the next row to print the next value.			
	For example, Start at row is set at 2, Start at col is set at 3. During the run, the software starts with the value in row 2 column 3 (C00002). Then, the software moves to row 3 column 3 (C00003), row 4 column 3 (C00004), row 5 column 3 (C00005), and so on.			
	From File - Start at R/C and increment row			
	C:\VWorks Workspace\Barcode data files\BarcodeDataFile.csv			
	Start at row: 2 Start at 3			
	A B C D			
	1 A00001 B00001 C00001 D00001			
	2 A00002 B00002 C00002 D00002			
	3 A00003 B00003 C00003 D00003			
	4 A00004 B00004 C00004 D00004			
	5 A00005 B00005 C0005 D00005			
Τ	Prints the text you specify. Click the icon in the Field Value area. In the Properties area, type the text you want to print on every			
	microplate.			
	Static Text			
080422	Not used. If you add this icon, the software will ignore it.			

4 When you are finished, click **OK**. The information you specified appears in the Task Parameters area.

Example

Goal

Using the Microplate Labeler, print values read from a barcode data file. The software should start reading the file from row 1 column 1.

The software should pause after it prints a label to permit you to remove the label from the device and manually apply it to a page in your lab notebook.

Implementation

Note: This example assumes that the Microplate Labeler is set up correctly and the format, MyFormat, is already defined and loaded to the printer. MyFormat contains two fields. Field 1 is a human-readable text field. Field 2 is a barcode field.

Create a device file that contains both the Microplate Labeler and a Phantom Robot, as shown. In the Microplate Labeler Location Properties area, make sure the Teachpoint for Phantom Robot is <a column shows a straight straights

Devices	21		
Microplate Labeler Microplate Labeler 1 Contion Phantom Robot	Microplate Labeler Location Propertie Alowed/prohibited labware BCR on south side BCR on west side BCR on north side BCR on east side Teachpoint for robot Phantom Robot - 1 Use for deadlock avoidance Door	<no bar="" code="" device=""> <no bar="" code="" device=""> <no bar="" code="" device=""> <no bar="" code="" device=""> <accessible> Yes</accessible></no></no></no></no>	
Initialize all devices			
Initialize selected devices Close selected devices	Teachpoint for robot Phantom Robot - 1		
Delete selected devices Device diagnostics			

Create a Startup Protocol as shown and add a Print task and a User Message task. The User Message task creates the pause to permit you to remove the label from the device. When setting the Print and Apply task parameter, select MyFormat.

PrintLabelOnly.	dev 🔄 PrintLa	belOnly.pro	14 I			×	
Startup Protoco	bl		۲	Task Parameters		4	
Process plate		()	200	Task Parameters		*	
	—		→ŵ	11 21			
	Process plate	Print to Microplate	Display user message:	E No Apply			
		Labeler -	Remove	Format:	MyFormat		
Remove 1.location label;	label;	1:	[FILE:C:\VWorks Workspace]	\B			
Add Desease		2:	[FILE:C:\VWorks Workspace]	B			
Add Process	3:						
				4:			
				5:			
				6:			
Main Protocol			۲				
Cleanup Protoc	ol		۲	Device Selection		\$	
Protocol Option	s		۲	Advanced Settings		â	

For each of the two format fields (1 and 2), open the Field Composer dialog box and double-click the data file icon in the **Tools** area to add it to the Field Value area. In the **Properties** area, locate and select the data file. In the **Start at row** box, type 1. In the **Start at col** box, type 1.

Compose		
Fools	Field Value	
0		
(\mathcal{E})	[Properties-	
	From File - Start at R/C and increment row	
2002	C:\VWorks Workspace\Barcode data files\BarcodeData.csv	
-	Start at row: 1 Start at col: 1	
C		
-		
Т		
080422		

For information about	See
Adding devices	• "Adding devices" on page 25
	• Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Print and Apply task	"Print and Apply" on page 318
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Process Control

Description

The Process Control task (Process Control) is used to initiate a specific process within the same protocol based on an upstream condition or the type of labware entering the process.

Task is available for	Task is available in
Any device	Main Protocol

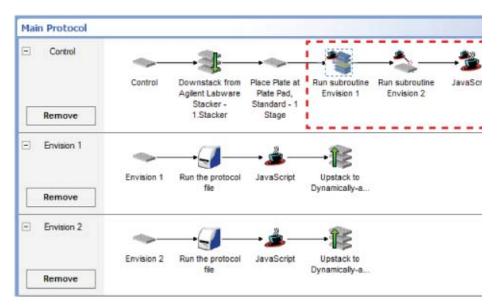
When to use Process Control instead of Spawn Process

The Process Control task extends the functions of a Spawn Process task with simplified implementation in a protocol. Instead of adding multiple Spawn Process tasks in one process, you can simplify the protocol by adding a single Process Control task.

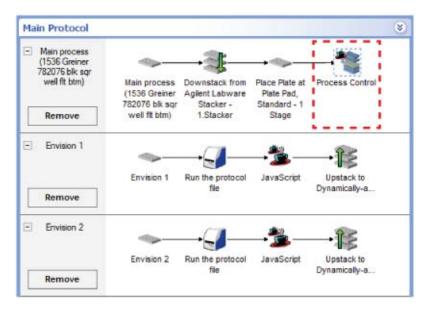
For example, suppose you have two devices in a device pool. You want to design the protocol such that if the first device is busy, the system will use the second device.

You can write the protocol in one of two ways:

• Add two Spawn Process tasks, one for using each device. The required JavaScript will be distributed across the two Spawn Process tasks and a separate JavaScript task, thus making debugging and future updates difficult.



• Add a single Process Control task that controls the use of both devices. The required JavaScript is consolidated in the Process Control task, thus facilitating debugging and future updates.



Task parameters

After adding the Process Control task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

Task Parameters		*
81 2↓		
Process Control Properties		
Process to trigger option 1:	Destination Plate 1	
Process to trigger option 2:	Destination Plate 2	
Process to trigger option 3:	N/A	
Process to trigger option 4:	N/A	
Process to trigger option 5:	N/A	
Process to trigger option 6:	N/A	
Process to trigger option 7:	N/A	
Process to trigger option 8:	N/A	
Process to trigger option 9:	N/A	
Process as subroutine:	2	
Process selection value:	=processoption	
Advanced Settings		

11 Setting parameters for scheduling tasks

Process Control

Parameter	Description
Process to trigger option 1–9	One of the processes that will be initiated when the run reaches the Process Control task.
	Select the process that you want to initiate. For example, if you have two potential processes to initiate, Destination1 and Destination2, select Destination1 for Process to trigger option 1 and Destination2 for Process to trigger option 2.
	<i>Note:</i> The Process selection value determines which process will be initiated.
Process as subroutine	The option to run the initiated process as a subroutine (or subprocess) of the current process.
	Select the check box if you have data, such as barcode information, from the current process that you want to pass to the initiated process.
	Clear the check box if the two processes can run in parallel when the current process reaches the Process Control task.
Process selection value	The value that determines which process to initiate. For example, if you specify 5, then the process you selected for Process to trigger option 5 will initiate.
	You can also specify a variable. During the protocol, the value of the variable (1, 2, 3,, or 9) is passed to the Process Controls task from an upstream task or from the Process Control task JavaScript. The value determines which process to run. If the value is 1, the specified process for Process to trigger option 1 will initiate; if the value is 2, the specified process for Process to trigger option 2 will initiate; and so on.

Example

Goal

٠

Downstack microplates from the Labware Stacker, scan the microplate barcode, read the microplate using an available Envision Reader, and then upstack the microplate to an available Labware Stacker.

Use the pool of two Envision Readers during the protocol run:

- If the first reader is busy, use the second reader.
- If the second reader is busy, use the first reader.
 - If both readers are busy, wait 2 seconds and check each reader again.

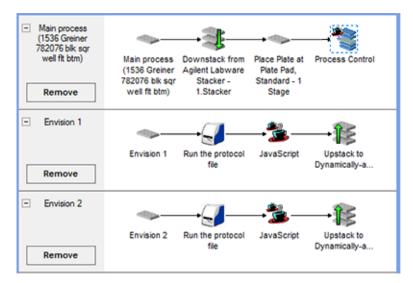
Set variables for the following purposes:

- Determine which Envision Reader to use. In the example, the variable used for this purpose is procoption.
- Determine the state of the first Envision Reader. Valid values are true (busy) and false (available for use). In the example, the variable used for this purpose is bEnvision1Busy.
- Determine the state of the second Envision Reader. Valid values are true (busy) and false (available for use). In the example, the variable used for this purpose is bEnvision2Busy.

Implementation

Create a protocol as shown.

Note: The barcode reader is attached to the platepad, so a Place Plate task is added to scan the microplate barcode at the platepad.



In the **Protocol Options Startup Script**, add JavaScript to reset all relevant variables at the start of the run. Set the Envision Reader busy state (bEnvision1Busy and bEnvision2Busy) to false, and set the procoption to 0.

11 Setting parameters for scheduling tasks

Process Control

Protocol Options		*
Protocol Options Measurement Manager		
in 2↓		
Form to use:		•
Automatically load form file:	-	
Protocol alias:		
Description:		
Notes:		
Display user task descriptions:	-	
Bar code file directory:		
Use global context for this protocol:		
Startup Script:	var b	Envision1Busy = false, bEnvision2Bu \cdots 🐂 🖛 🖛 🐂
Finish Script:		
Delete hit pick output files:		Input Text
Auto-Export Gantt Chart:		
Clear inventory:		Please enter text below:
Import inventory:		var bEnvision1Busy - false, bEnvision2Busy - false;
Inventory file:		var procoption = 0;
Protocol Rules		
Allow this protocol to execute while o	othe 💌	
		< <u> </u>
		Transfer
		Browse

Before setting the task parameters, add JavaScript to the **Process Control** task to determine which Envision Reader to use. (The script is run before the Process Control task is performed.) The script logic is as follows:

- The system checks to see if the first Envision Reader is available. If it is, procoption is set to 1.
- If the first Envision Reader is busy, the system checks the second Envision Reader. If it is available, procoption is set to 2.
- If both devices are busy, the system will wait 2 seconds before checking the devices again.

	Task Parameters	Task Parameters		
	Task Parameters	3		
Process Control	Advanced Settings	(
	<pre>Script to be executed before task runs: If (bEnvision1Busy == false) { // if envision1 is free, use it and mark it as busy procoption = 1; bEnvision1Busy = true; } else if (bEnvision2Busy == false) { // if envision 2 is free, use it and mark it as busy procoption = 2; bEnvision2Busy = true; } else { // if oth devices are busy, wait 2 seconds. procoption = 0; task.repeatDelay = 2; } </pre>			

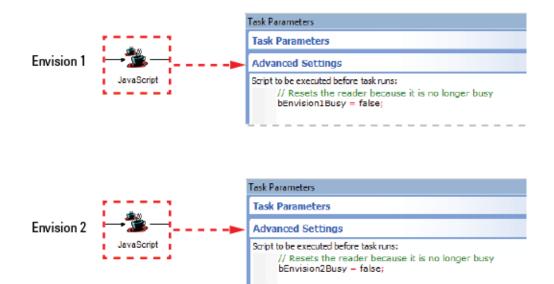
Set the Process Control Task Parameters as shown.

- Notice that the process selection variable is procoption. This variable determines which process to initiate. The value of this variable is passed from the Process Control JavaScript. If procoption = 1, the task will initiate option 1: Envision 1. If procoption = 2, the task will initiate option 2: Envision 2.
- Select **Process as subroutine**. The microplate barcode information is retained during the Envision processes.

Process Control Properties Process to trigger option 1: Envision 1	۲
Image: Second state Image: Second state Image: Second state Image: Second state </th <th></th>	
Process to trigger option 1: Envision 1	
Process to trigger option 2: Envision 2	
Process to trigger option 3: N/A	
Process to trigger option 4: N/A	
Process to trigger option 5: N/A	
Process to trigger option 6: N/A	
Process to trigger option 7: N/A	
Process to trigger option 8: N/A	
Process to trigger option 9: N/A	
Process as subroutine:	
Process selection variable name: =procoption	

Add the JavaScript as shown in each Envision Reader process to set the Envision Reader busy state to false. After the microplate-reading is finished, the devices are available for other labware.

Process Control



For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Wait For task	"Wait For" on page 603
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Signal

Description

The Signal task (Go Signal) permits another process that is currently in the wait state to continue to the next task. The wait state is from the Wait For task in the other process.

Note: Each Signal task can be used with multiple Wait For tasks.

Task is available for	Task is available in
Any device	Startup Protocol
	Main Protocol
	Cleanup Protocol
	Cleanup Protocol

Requirements

You must first add the Wait For task at the desired point in the protocol before adding the Signal task.

Waitfor Selection

After adding the Signal task at the desired point in the protocol, select the corresponding Waitfor task in the **Waitfor Selection** area. Double-click the Waitfor task name in the **Available waitfors** area. The selected Waitfor task name appears in the **Waitfors this task will signal** area.



Example

See the example in "Wait For" on page 603.

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Wait For task	"Wait For" on page 603
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Spawn Process

Description

The Spawn Process task (Spawn Process) is used to initiate another process within the same protocol. For example, to reduce evaporation, you can use Process Control task to deliver a certain labware into the system only when they are ready to be processed. You can also use the Process Control task with JavaScript code to use operator-supplied information to initiate a new process or funnel incoming labware into a different process depending on the barcode.

Task is available for	Task is available in
Any device	Main Protocol

When to use Spawn Process instead of Process Control

The Spawn Process task provides a simple way to initiate another process in the same protocol. Use the task if you want to initiate only one or two processes in the protocol, and the spawning of the processes do not depend on varying run-time conditions.

If you want to initiate multiple processes depending on changing run-time conditions, use the Process Control task instead. See "Process Control" on page 586.

Task parameters

After adding the Spawn Process task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

task.

Select from the list of processes.

Fask Parameters		#
Task Parameters		*
:∎ ≵↓		
🗆 Spawn Process properti	es	
Process to spawn:		•
Spawn as subroutine:	Variable	
	Plate B	
	Plate C	
Parameter		Description
Process to spawn		The process that starts to run whe current process reaches the Spawn

11 Setting parameters for scheduling tasks

Spawn Process

Parameter	Description
Spawn as subroutine	The option to run the spawned process as a subroutine (or subprocess) of the current process.
	IMPORTANT If the spawned subprocess specifies a different labware type, the software ignores the labware specification.
	Select the option if you want the software to start the spawned process when the Spawn Process task is reached, and continue the current process after the spawned process is finished.
	Clear the check box if the two processes can run in parallel when the current process reaches the Spawn Process task.

Example 1

Goal

Replicate Source Plate on the Bravo Platform. Deliver the Diluent Plate from the BenchCel Microplate Handler into the system only when the Destination Plate is ready for dilution.

Implementation

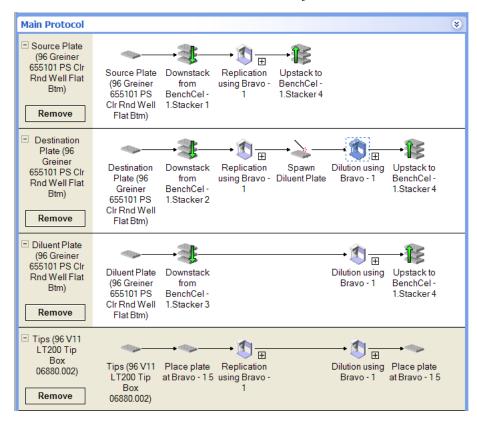
The Bravo Platform and BenchCel Microplate Handler in the example are configured as follows:

- The replication process will occur on the Bravo Platform.
- The Source Plate, Destination Plate, and Diluent Plate will be stored in different stacks in the BenchCel Workstation. At the end of the process, the microplates are stored in an empty stack in the BenchCel Microplate Handler.

When writing the protocol:

- Add a process for the Source Plate as shown. In the Source Plate process, add a Bravo Subprocess (renamed Replication in the example) that aspirates contents from the Source Plate and dispenses into the Destination Plate.
- Add a process for the Destination Plate as shown. In the Destination Plate process, add two Bravo Subprocesses:
 - The first subprocess (renamed Replication in the example) reflects the movement of contents from the Source Plate and into the Destination Plate. This is a copy of the tasks in the Source Plate process.
 - The second subprocess (renamed Dilution in the example) aspirates contents from the Diluent Plate and dispenses into the Destination Plate.
- Add a process for the Diluent Plate as shown. In the Diluent Plate process, add a subprocess (renamed Diluent in the example) that reflects the movement of contents from the Diluent Plate into the Destination Plate. This is a copy of the tasks in the Diluent subprocess in the Destination Plate process.
- Add a configured labware for the Tip Box as shown.

• In the Destination Plate process, add a Spawn Process task between the Replication subprocess and the Dilution subprocess. Doing so holds the Diluent Plate in the BenchCel stack until the Replication subprocess is finished and the Destination Plate is ready to receive the diluent.



Example 2

Goal

The same goal as Example 1, except:

- Ask the operator to specify the number of replications.
- Control the spawning of the Source Plate and Destination Plate processes based on the operator input.

Implementation

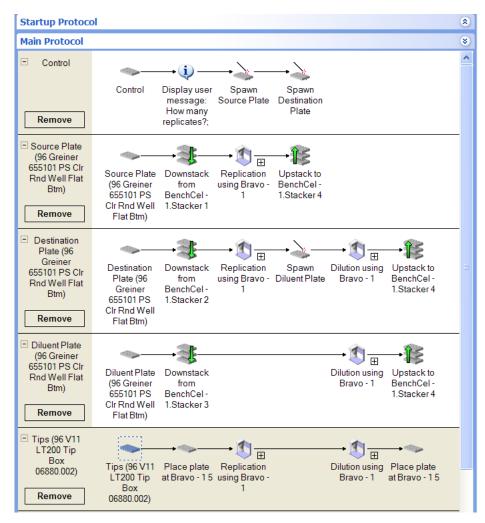
The Bravo Platform and the BenchCel Microplate Handler are configured as described in Example 1. Set up the Source Plate, Destination Plate, and Diluent Plate processes as described in Example 1.

Add a new process called Control at the top of the Main Protocol as shown. Add the following tasks in the Control process:

- User Message. Asks the operator to specify the number of replications.
- *Spawn Process.* Starts the Source Plate process. In addition, provide JavaScript code in the Advanced Settings area to incorporate the input from the operator during the run. For example, if the operator specified two replications, the JavaScript code should use that value to produce two replications during the run.

Spawn Process

• *Spawn Process*. Starts the Destination Plate process. Provide JavaScript code in the Advanced Settings area to incorporate the input from the operator during the run.



For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Task parameter variables	"Using simple variables" on page 77
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557

For information about	See
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

User Message

Description

The User Message task ((i) User Message):

- Displays reminder messages. For example, the message can remind the operator to change pipette heads, empty the waste container, empty a reservoir, or replace labware.
- Prompts operators for variable values.

The protocol run is paused until the operator clicks Continue, or supplies the requested variable value and clicks Continue.

Note: Except for those that request variable input, user messages do not appear when running a protocol in simulation mode.

IMPORTANT Remove all user messages from protocols that will run unattended.

Task is available for	Task is available in
Any device	Startup Protocol Main Protocol Cleanup Protocol

Requirements

If you want the User Message task to request variable input, add the variable in the desired tasks. For information, see "Using simple variables" on page 77.

Task parameters

After adding the User Message task at the desired point in the protocol, set the following parameters in the **Task Parameters** area:

User Message

Task Parameters	(3
BB 2↓	
User Message Properties	
Title:	
Body:	
Notify First Time Only:	
Display Dialog Box:	▼
Pause Process:	▼
Email:	
Twitter Message:	
Scripting variable data ent	try
User Data Entry into Variable:	
Variable Name:	
Task Description	
Task number:	3
Task description:	User Message
Use default task description:	✓

Parameter Description

User Message Properties

Title	The text that appears in the titlebar of the message dialog box.
Body	The text that displays in the message dialog box.
	To enter the message using the Input Text dialog box:
	 Click the Body field in the Task Parameters area, and then click the is button that appears. The Input Text dialog box opens.
	2 Type the message that you want to display, and then click OK.
	Input Text
	Please enter text below:
	OK Cancel

Parameter	Description
Notify First Time Only	The option to display the message the first time it appears in the protocol if you are running the protocol multiple times, or if the User Message task is in the loop
Display Dialog Box	The option to display the message dialog box when the User Message task runs.
Pause Process	The option to pause the run when the User Message task runs. This option is only available when the Display Dialog Box option is selected.
Email	The option to send an email when the User Message task runs. The email subject is the message title and the email body is the text displayed in the message dialog box.
	To receive email, you must set up email notification. See "Setting up email notification" on page 232 for instructions on how to set up email notification.
	<i>Note:</i> If the email setup is incorrect, an error will be recorded in the main log but will not cause the run to pause.
Twitter Message	The option to send a message to a Twitter account when the User Message task run. The message contains the text displayed in the message dialog box.
	To receive a Twitter message, you must set up a Twitter account. See "Setting up automatic online notification" on page 235 for instructions on setting up online notification.
Scripting Variable	Data Entry
User Data Entry into Variable	The option to prompt the operator for a variable value.
Variable name	The name of the variable.
Task Description	
Task Number	The number that indicates the position of the task in the protocol.
Task Description	The description of the task.
Use Default Task Description	The option to use the default task description or provide your own description for the task.
	Select the check box to use the default description. Clear the check box to provide your own description.

Example

Goal

Display messages at the beginning of the protocol run to remind the operator to check fluid levels and to set the aspirate volume.

Implementation

In the Startup Protocol, add two User Message tasks. The first task asks the operator to check fluid levels. The second message asks the operator for the aspirate volume. AspVol is the variable defined for the aspirate volume.

Startup Protoco	bl			۲
Startup	—	→ į)—	-	
Remove	Startup	Display user message: Startup reminders; Check all fluid levels and refill if necessary.	Display user message: Set variable;	

The task parameters for both User Message tasks are as follows:

Start up reminder Check all fluid levels and refil if n	D User Message Properties	
	Title:	
Charle all fluid laugh and soft if a		Set varable
check all huid levels and refill if h	Body:	
	Notify First Time Only:	
v	Display Dialog Box:	
v	Pause Process:	
	Emai:	
	Twitter Message:	
ry	Scripting variable data en	try
É.	User Data Entry into Variable:	v
	Variable Name:	AspVol
	Task Description	
1	Task number:	2
User Message	Task description:	User Message
v	Use default task description:	v
	V V V V V V V V V V V V V V V V V V V	Image: Second

For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Using simple variables	"Using simple variables" on page 77
Adding user message prompts	"Adding user message prompts" on page 82
Defining variables	"Define Variables" on page 564
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Wait For

Description

In a multi-process protocol, the Wait For task (Stop Walt For) pauses the process that contains the task and waits for the go-ahead signal from another process before continuing to the next task. The go-ahead signal comes from the Signal task in the other process.

Note: Multiple Wait For tasks can be used with a single Signal task.

Task is available for	Task is available in
Any device	Startup Protocol
	Main Protocol
	Cleanup Protocol

Requirements

The Wait For task is always used with the Signal task. You must first add the Wait For task at the desired point in the protocol before adding the Signal task.

Task parameters

After adding the Wait For task at the desired point in the protocol, doubleclick the corresponding Wait For task in the **Task Parameters** area:

Task Parameters		ф.
Task Parameters		۲
Ž↓		
Wait For properties		
Name:	Waitfor DestPlateAspirate	

Parameter	Description
Name	The name you want to assign the Wait For task.
	Type a name that describes the waitfor condition.

Example: Finish all liquid-handling tasks before incubation

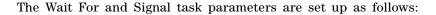
Goal

Make sure all liquid-handling tasks are finished before storing the source microplates.

Implementation

In the protocol where the source microplate and destination microplates are separate processes, add a Wait For task in the source microplate process, after the liquid-handling tasks. Add a Signal task in the destination microplate process after the liquid-handling tasks.

Source (384 Greiner	-			→ <u>()</u>	Stop	→ I —	ĵ 🗧
781101 PS clr fit btm)	Source (384 Greiner	Downstack from Stacker	Place plate at Plate Hotel	Replicate using Bravo -	Waitfor	Incubate for 10 seconds	Upstack to Dynamicall
Remove	781101 PS clr fit btm)	- 1.Stacker	slot #01 Stage	1			
Destination (384 Greiner			→ ≪>	→ <u>(</u>]	→ ĵ≧	Go	
781101 PS clr flt btm)	Destination	Downstack	Place plate at	Replicate	Upstack to	Signal	
Remove	(384 Greiner 781101 PS clr fit btm)	from Stacker - 2.Stacker	VCode - 1 location	using Bravo - 1	Stacker - 3.Stacker	Waitfor	



Task Parameters 🛛	Task Parameters	8
Waitfor Selection	Task Parameters	*
Waitfors this task will signal:	21	
Waitfor	Wait For Properties	
	Name: Waitfor	
Available waitfors:		
Advanced Settings	Advanced Settings	۲

For other examples, see "Dismount" on page 301 and "Mount" on page 307.

For information about	See
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
Signal for task	"Signal" on page 593

For information about	See
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269

Wait for User (Bravo)

Description

The Wait For User task (Wait For User (Bravo)) pauses the protocol and waits until the operator presses the go button on the pendant. When the operator presses the go button, the protocol resumes.

You use the Wait For User task if you want to perform a task manually at the desired point in the protocol. For example, you can use the Wait For User task to pause the run so that you can manually replace a microplate on the deck. When you are finished, you press the go button on the pendant.

Note: Alternatively, you can use the User Message task to insert a pause in a protocol. Use the User Message task instead of the Wait For User task if you have easier access to the computer than the pendant during a run.

Task is available for	Task is available in
Any device	Startup Protocol
	Main Protocol
	Cleanup Protocol

Task parameters

The Wait For User task does not have task parameters.

Example

Goal

After the first dispense task, move the pipette head out of the way. Pause the run so that you can replace the destination microplate on the Bravo deck. Press the Go button on the pendant after the new destination microplate is placed.

Implementation

A Move to Location task is added after the first Dispense task to move the pipette head away from the current destination microplate. In the following example, because the destination microplate is at location 1, the pipette head is moved to location 5.

A Wait for User task is added after the Move to Location task to pause the run.

Main Protocol								۲
 Destination (384 Greiner 781101 PS clr fit btm) 	Destination (384 Greiner 781101 PS clr fit btm)	Bravo BubProcess 5 using Bravo -1	• 1 m	t <u>⊥</u>	↓ []			•\$3
Remove			Tips On in 1 selection(s) from Tips	Aspirate 10 µL in 1 selection(s) from Source	Dispense 10 µL in 1 selection(s) to Destination	Tips Off in 1 selection(s) from Tips	Move above Location 5	Wait for the user to press the "Go" button
• Source (384 Gr	einer 781101 PS clr fit btm	1)						Ĵ
🖭 Tips (384 V11 T	ip Box ST70 19133.002)							

For information about	See
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
User Message task	"User Message" on page 599
Microplate-handling tasks	"Setting parameters for scheduling tasks" on page 557
Microplate-storage tasks	"Setting parameters for scheduling tasks" on page 557
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387
Scheduling tasks	"Setting parameters for scheduling tasks" on page 557

Watch (Process Watcher)

Description

The Watch task (Watch (Agilent Process Watcher)) monitors the\VWorks Workspace\Inputs\Encore folder for new file activity. When the Watch task detects a new file in the folder, it runs the specified JavaScript file.

You use the Watch task if you are running an Encore Multispan System and you want to process labware at VWorks-controlled devices. For information about integrating VWorks-controlled devices with an Encore Multispan System, see the *Encore Multispan System knowledge base*.

Task is available for	Task is available in
Process Watcher device	Startup Protocol Main Protocol Cleanup Protocol

The Process Watcher device is a virtual device that monitors communication from the Encore Multispan System. For more information, see the *Encore Multispan System knowledge base*.

Note: Although you can add the Watch task at any point in a protocol, it is typically added in the Main Protocol.

Requirements

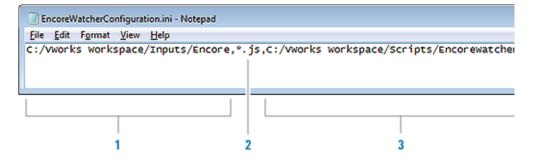
The Watch task requires the following:

- "EncoreWatcherConfiguration.ini file" on page 607
- "EncoreWatcher.js file" on page 608

EncoreWatcherConfiguration.ini file

The Watch task uses the information in the EncoreWatcherConfiguration.ini file to determine which folder to monitor and what JavaScript file to run.

The EncoreWatcherConfiguration.ini file is supplied with the VWorks software and resides in the C:\VWorks Workspace\INIs folder. The file specifies the following:



11 Setting parameters for scheduling tasks

Watch (Process Watcher)

ltem	Value	Description
Item	Value	Description
1	Folder to monitor	The name and full path of the folder that the Watch task will monitor during the protocol run. The default folder specification is:
		C:/VWorks Workspace/Inputs/Encore
		<i>Note:</i> The path separators are forward slashes (/).
2	Input file to detect	The file that the Watch task will look for in the C:\VWorks Workspace\Inputs\Encore folder. The input file is any file that has the js file name extension and contains the following information:
		• The VWorks protocol process to run
		• Optional data from the Encore Multispan protocol, such as task parameters for use by VWorks tasks
		The Encore Multispan software adds the .js file in the Encore folder just before the robot moves labware to the VWorks-controlled device.
3	JavaScript file to run	The name and full path of the JavaScript file that will run after the input file is detected.
		A default JavaScript file, EncoreWatcher.js, is supplied with the VWorks software and resides in the C:\VWorks Workspace\Scripts folder. For more information, see "EncoreWatcher.js file" on page 608.
4	JavaScript function to run	The JavaScript function that the EncoreWatcher.js file will run. By default, the function is WatcherMain.

You can use the default configuration file and modify items 1, 3, and 4. You can also store the configuration file in a different folder. If you decide to store the configuration file in another folder, be sure to specify the location when you set the Watch task parameters.

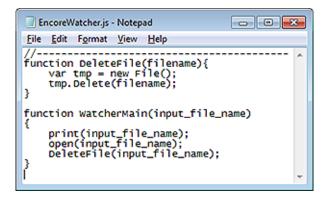
EncoreWatcher.js file

After the Watch task detects an input file in theVWorks Workspace\Inputs\Encore folder, it will run EncoreWatcher.js (item **3** in the configuration file) to do the following:

• Read the input (.js) file to get the VWorks protocol process information and any optional data (such as task parameter values).

Note: To parse the optional data, you need to add the Parse Encore Spawn Parameter task in the VWorks protocol. For information about where to add the task in the protocol, see the *Encore Multispan System knowledge base*. • Delete the input (.js) file in the ...VWorks Workspace\Inputs\Encore folder.

The following figure shows the contents of the default EncoreWatcher.js file. The code deletes the detected input file and runs the WatcherMain JavaScript function.



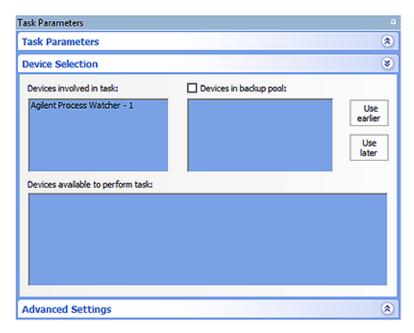
If you want to modify the EncoreWatcher.js file or create your own JavaScript file, see "Guidelines for creating your script" on page 687. (The guidelines are written for the Watcher tool. However, the principles of the guidelines are the same for the Watch task JavaScript file.)

Selecting devices for the task

Before setting the Watch task parameters, you must select a device for the task. After adding the Watch task in the protocol, select the task, and then click **Device Selection** in the **Task Parameters** area.

To select a device for the task:

Double-click the Process Watcher device in the **Devices available to perform task** area to move it to the **Devices involved in task** area.



Watch (Process Watcher)

Task parameters

After selecting the device for the Watch task, set the following parameters in the Task Parameters area:

		0
Task Parameters		۲
8 0 2↓		
Watch (Agilent Pr	ocess Watcher) Properties	
Configuration File:	C:\VWorks Workspace\EncoreWatcherConfiguration.ini	
Task Description		
Task number:	2	
Task description: Watch (Aglent Process Watcher)		
Use default task des	or 🔽	
Device Selection		(2
Advanced Settings		6

Parameter	Description
Configuration File	The full path to the EncoreWatcherConfiguration.ini file. By default, it is stored in C:\VWorks Workspace.
	For more information, see "EncoreWatcherConfiguration.ini file" on page 607.
Task number	The number that indicates the position of the task in the protocol.
Task description	The description of the task.
Use default task description	The option to use the default task description or provide your own description for the task.
	Select the check box to use the default description. Clear the check box to provide your own description.

For information about	See
Running VWorks- controlled devices with the Encore Multispan System	Encore Multispan System knowledge base
Adding devices	 "Adding devices" on page 25 Device user guide
Adding tasks in a protocol	"Adding and deleting tasks" on page 53
User Message task	"User Message" on page 599

For information about	See
Microplate-handling tasks	"Setting parameters for microplate- handling tasks" on page 277
Microplate-storage tasks	"Setting parameters for microplate storage tasks" on page 349
Liquid-handling tasks	"Setting parameters for liquid-handling tasks" on page 387

11 Setting parameters for scheduling tasks

Watch (Process Watcher)



VWorks Automation Control User Guide

12 Specifying pipetting techniques

This chapter contains the following topics:

- "About the Pipette Technique Editor" on page 614
- "Creating and editing pipetting techniques" on page 615
- "Managing pipetting techniques" on page 619
- "Storing Pipette Technique files" on page 620



About the Pipette Technique Editor

Pipette techniques

You can define a Pipette Technique to use different pipetting methods. Different applications can benefit from different pipetting methods. For example, in multiplexed microplates, dispensing at an offset from the well center can improve distribution of the fluid. In cell-based assays, moving the pipette to the side of the wells minimizes the removal of the cells from the center or reading area of the well.

Pipette Technique Editor

You use the Pipette Technique Editor to define any number of Pipette Techniques. After you create a technique, it becomes available for the following tasks in any Bravo or Vertical Pipetting Station Subprocess:

- Aspirate
- Dispense
- Mix
- Pin Tool

For information about	See
Creating and editing Pipette Techniques	"Creating and editing pipetting techniques" on page 615
Managing Pipette Techniques	"Managing pipetting techniques" on page 619
Pipette Technique files	"Storing Pipette Technique files" on page 620
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
Mix task	"Mix (Bravo, Vertical Pipetting Station)" on page 497
Pin Tool task	"Pin Tool (Bravo, Vertical Pipetting Station)" on page 511

Creating and editing pipetting techniques

Creating a pipette technique

You can create a Pipette Technique in two ways:

- When setting task parameters in a protocol
- Using the Tools menu

To create a Pipette Technique when setting task parameters:

- 1 In the VWorks window, create a new protocol.
- 2 Add the Subprocess (Bravo) or Subprocess (Vertical Pipetting Station) task.
- **3** Add one of the following tasks:
 - Aspirate
 - Dispense
 - Mix
 - Pin Tool
- **4** In the Task Parameters area, select Edit technique in the Pipette Technique property list.

Task Parameters	¢
Task Parameters	۲
21 2↓	
Aspirate (Bravo) properties	
Location, plate:	
Location, location:	<auto-select></auto-select>
Volume	
Volume (0 - 72 µL):	10
Pre-aspirate volume (0 - 72 µL):	0
Post-aspirate volume (0 - 72 µL):	0
Properties	
Liquid class:	
Distance from well bottom (0 - 100 mm):	2
Dynamic tip extension (0 - 20 mm/µL):	0
Well selection:	1 selection: A1
Pipette technique:	-
🗆 Tip Touch	Variable
Perform tip touch:	Edit technique
Pipette technique: Specifies an additional pipette technique.	
Advanced Settings	۲

The Pipette Technique Editor dialog box opens.

12 Specifying pipetting techniques

Creating and editing pipetting techniques

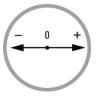
ipette Technique Editor		
ase select the techniques you h to edit:	21	
Create new technique		
Create new technique Create copy of technique	3	
]	
Create copy of technique		

5 Click **Create new technique**, type a technique name, and then click **OK**. The new technique name appears in the Pipette Technique Editor dialog box. In addition, the **X/Y Offset** parameters appear to the right of the technique name.

Pipette Technique Editor	2		
Please select the techniques you wish to edit:	:: 2↓		
wish to edit:	Available Pipettors		
Bravo Pipette Technique	Bravo:	—	
	VPrep:	—	
	X/Y Offset Pipetting		
	East/west offset (-100 - 100 %):	0	
	North/south offset (-100 - 100 %):	0	
Create new technique			
Create copy of technique			
Rename technique			
Delete selected technique			

- 6 In the **East/west offset (-100 100%)** box, type the distance (in percent of well radius) you want the pipette to move in the X direction:
 - 0 does not move the pipette horizontally.
 - Positive value moves the pipette to the right.
 - Negative value moves the pipette to the left.

Note: The pipette offset directions do not correspond to the robot jog directions in Bravo and Vertical Pipetting Station Diagnostics.



- 7 In the North/south offset (-100 100%) box, type the distance (in percent of well radius) you want the pipette to move in the Y direction.
 - 0 does not move the pipette forward or backward.

- Positive value moves the pipette backward.
- Negative value moves the pipette forward.

Note: The pipette offset directions do not correspond to the robot jog directions in Bravo and Vertical Pipetting Station Diagnostics.



8 When you are finished, click Update the selected technique.

To create a Pipette Technique using the Tools menu:

- 1 In the **VWorks** window, on the **Tools** menu, click **Pipette Technique Editor**. The Pipette Technique Editor dialog box opens.
- 2 Click **Create new technique**, type a technique name, and then click **OK**. The new technique name appears in the Pipette Technique Editor dialog box. In addition, the X/Y Offset parameters appear to the right of the technique name.
- **3** Set the parameters in the **X/Y Offset Pipetting** table.
- 4 When you are finished, click **Update** the selected technique.

Editing a pipette technique

You can edit a Pipette Technique in two ways:

- When setting task parameters in a protocol
- Using the Tools menu

To edit a Pipette Technique when setting task parameters:

- 1 In the **VWorks** window, open the protocol.
- 2 In the **Main Protocol** area, select the task for which the Pipette Technique will change.
- **3** In the Task Parameters area, select Edit technique in the Pipette Technique property list.

12 Specifying pipetting techniques

Creating and editing pipetting techniques

Task Parameters	9
Task Parameters	۲
21	
🗉 Aspirate (Bravo) Propert	ies
Location, plate:	Destination (384 Greiner 7811
Location, location:	<auto-select></auto-select>
🗉 Volume	
Volume (0 - 72 µL):	10
Pre-aspirate volume (0 - 72	0
Post-aspirate volume (0 - 72	0
Properties	
Liquid class:	
Distance from well bottom (2
Dynamic tip extension (0 - 2	0
Well selection:	1 selection: quadrant 1
Pipette technique:	•
Tip Touch	Variable
Perform tip touch:	Edit technique
Which sides to use for tip to	Bravo Pipette Technique
	Vertical Pipettor Pipette Techni
Tip touch horizontal offset (-	0
Pipette technique:	
Advanced Settings	*

The Pipette Technique Editor dialog box opens.

Pipette Technique Editor			2
Please select the techniques you vish to edit:	21		
ish to edit.	Available Pipettors		
Bravo Pipette Technique	Bravo:	F	
ertical Pipettor Pipette Technique	Vertical Pipetting Station:	E	
	X/Y Offset Pipetting		
	East/west offset (-100 - 100 %):	0	
	North/south offset (-100 - 100 %):	0	
Contra constante la constante de la constante d	1		
Create new technique			
Create copy of technique			
Rename technique			
Delete selected technique			
Update selected technique			

- 4 Select the **Pipette Technique** on the left side of the dialog box.
- 5 Make the desired changes in the X/Y Offset Pipetting table.
- **6** When you are finished, click **Update selected technique**.

To edit a Pipette Technique using the Tools menu:

- 1 In the VWorks window, on the Tools menu, click Pipette Technique Editor. The Pipette Technique Editor dialog box opens.
- 2 Select the **Pipette Technique** on the left side of the dialog box.
- **3** Make the desired changes in the **X/Y Offset Pipetting** table.
- 4 When you are finished, click Update selected technique.

Related information

For information about	See
Pipette Techniques	"About the Pipette Technique Editor" on page 614
Managing Pipette Techniques	"Managing pipetting techniques" on page 619
Pipette Technique files	"Storing Pipette Technique files" on page 620
Aspirate task	"Aspirate (Bravo, Vertical Pipetting Station)" on page 392
Dispense task	"Dispense (Bravo, Vertical Pipetting Station)" on page 451
Mix task	"Mix (Bravo, Vertical Pipetting Station)" on page 497
Pin Tool task	"Pin Tool (Bravo, Vertical Pipetting Station)" on page 511

Managing pipetting techniques

To copy, rename, and delete an existing Pipette Technique:

1 In the **VWorks** window, on the **Tools** menu, click **Pipette Technique Editor**. The Pipette Technique Editor dialog box opens.

Please select the techniques you wish to edit:	21		
	Available Pipettors		
Bravo Pipette Technique Vertical Pipettor Pipette Technique	Bravo:		
	Vertical Pipetting Station:	1	
	X/Y Offset Pipetting		
	East/west offset (-100 - 100 %):	0	
	North/south offset (-100 - 100 %):	0	
Create new technique			
Create new technique Create copy of technique			
Create copy of technique			

- 2 Select the Pipette Technique on the left side of the dialog box.
- **3** Click one of the following:
 - *Create copy of technique*. The software prompts you to type a new name for the duplicated technique, and then creates a copy of the selected technique and saves it using the new name.

Storing Pipette Technique files

- *Rename technique.* The software prompts you to type a new name for the selected technique, and then saves the technique using the new name.
- Delete selected technique. The software deletes the selected technique.

Related information

For information about	See
Pipette Techniques	"About the Pipette Technique Editor" on page 614
Creating and editing Pipette Techniques	"Creating and editing pipetting techniques" on page 615
Pipette Technique files	"Storing Pipette Technique files" on page 620

Storing Pipette Technique files

Default storage location

By default, the VWorks software stores Pipette Technique files in the following folder:

...\VWorks Workspace\pipette techniques

Changing the storage location

To change the location of the Pipette Technique files:

- 1 In the **VWorks** window, choose **Tools** > **Options**. The Options dialog box opens.
- **2** In the **Options** area, click the **Pipette technique editor root** field, and then click the $\boxed{\cdots}$ button that appears. The Browse for Folder dialog box opens.
- **3** Locate and select a folder for the Pipette Technique files.
- 4 Click **OK** to save the new location.

For information about	See
Pipette Techniques	"About the Pipette Technique Editor" on page 614

For information about	See
Creating and editing Pipette Techniques	"Creating and editing pipetting techniques" on page 615
Managing Pipette Techniques	"Managing pipetting techniques" on page 619

12 Specifying pipetting techniques

Storing Pipette Technique files



VWorks Automation Control User Guide

13 Maintenance and troubleshooting

This chapter contains the following topics:

- "Backing up and restoring files" on page 624
- "Exporting and importing protocols and associated components" on page 626
- "Viewing logs" on page 631
- "Resolving device initialization errors" on page 639
- "Resolving compilation error messages" on page 640
- "Disabling and enabling tasks" on page 641
- "Using breakpoints to monitor and troubleshoot tasks" on page 643
- "Resolving barcode reader error messages" on page 647
- "Recovering from deadlocks" on page 648
- "Setting up automated error responses" on page 654
- "Viewing the status of the UPS" on page 659
- "Reporting problems" on page 661



Backing up and restoring files

Backing up files

You should regularly back up the following files in case they become damaged or lost:

- Protocols and associated files
- System files

You should store the backup files on a different computer or storage device.

Backing up protocols and associated files

You can back up files if you have administrator or technician privileges.

You can use the **Files > Export** command to back up protocols and associated files. For instructions, see "Exporting and importing protocols and associated components" on page 626.

Backing up system files

You use the Backup Manager to back up system files. The Backup Manager creates a copy of the following information and stores them in the .vbk file:

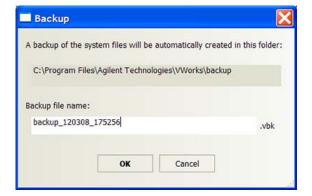
- Existing state of the inventory databases
- Labware definitions and liquid classes
- Pipette techniques

Make sure the inventory database is up-to-date before you back up the system files.

If you want to back up the inventory database without backup the entire set of system files, see *VWorks Automation Control Setup Guide*.

To back up system files:

1 In the VWorks window, select Tools > Backup Manager > Backup. The Backup dialog box opens.



2 Type a name for the backup file.

Note: The backup file location is the ...\VWorks\backup folder. You cannot change this location.

3 Click **OK**. The .vbk file is created and stored in the ...\VWorks\backup folder.

Restoring system files

Restoring protocols and associated files

You can restore files if you have administrator or technician privileges.

You can use the **Files > Import** command to restore protocols and associated files. For instructions, see "Exporting and importing protocols and associated components" on page 626.

Restoring system files

You use the Backup Manager to restore system files. The Backup Manager restores the following information in the databases and Windows registry:

- Existing state of the databases
- Labware definitions and liquid classes
- Pipette techniques

To restore system files:

- 1 In the VWorks window, select Tools > Backup Manager > Restore. The Open dialog box appears.
- **2** Locate and select the .vbk file, and then click **Open**. A message dialog box opens and asks you if you want to replace the existing labware definition, liquid classes, and pipette techniques.
- **3** Do one of the following:
 - Click **Yes** to overwrite existing labware definition, liquid classes, and pipette techniques.
 - Click No to cancel the restore process.

For information about	See
Exporting and importing protocols and associated files	"Exporting and importing protocols and associated components" on page 626
VWorks software components: protocol, device file, and so on	"Relationship of VWorks components" on page 4
Viewing logs	"Viewing logs" on page 631
Contacting Agilent Technologies and Reporting problems	"Reporting problems" on page 661

Exporting and importing protocols and associated components

Reasons for exporting and importing files

You can export and import protocols and associated components to transport protocols between computers, back up and recover protocols and associated files, and to facilitate troubleshooting problems with protocols and other files when seeking assistance from Automation Solutions Technical Support.

You can export or import the following:

- Protocol file
- Form file
- Runset file
- Device file, including the device profile and teachpoint file
- Macros used in the exported protocol or the entire macro library (.mlb file)
- Labware definitions
- Liquid classes
- Pipette techniques
- Hit-picking files
- Plate map files
- Barcode files
- Error library
- Log files

Exporting files

You can export files if you have administrator, technician, or operator privileges.

To export the system files:

1 In the **VWorks** window, select **File > Export**. The Export Wizard dialog box opens.

Exporting and importing protocols and associated components

Export Wizard	? 🔀
Export to:	
C:\VWorks Workspace\Exported files\ExportedFile.vzp]
	,
Cancel < <back next="">></back>	Einish

- **2** Follow the instructions in the wizard to do the following:
 - **a** Specify the location and name of the .vzp file, which contains the exported and compressed files.
 - **b** Select the protocol, runset, or form you want to export. You do not need to select the associated device file and other files. The software automatically exports all the associated files with the protocol.
 - **c** *Optional.* If a form (.VWForm file) is specified in the protocol's options, verify the **Include all Form files specified in Protocol options** is selected (default) to include the form in the export. If you do not want to include the form, clear the **Include all Form files specified in Protocol options** check box.

IMPORTANT Any custom image files that you provide for the form, must be in the same folder as the .VWForm file that you are exporting.

- **d** *Optional.* If the protocol is associated with barcode files, select **Export** barcode files.
- e *Optional.* If the protocol is associated with an error library file, select **Export error library file**.
- **f** *Optional.* If the protocol is associated with a plate map database, select **Export plate map database**.
- **g** *Optional.* If the protocol contains task macros that have the same names as macros in the Available Macros area in the VWorks window (macro library), do one of the following:
 - Select the **Export macro library file** check box to export the macro library information for those macros from the protocol that are also in the macro library. After the .vzp file is imported, this set of macros can be added to the macro library on the destination computer.
 - Clear the **Export macro library file** check box to export the protocol version of the macros only. After the .vzp file is imported, the macros will appear in the protocol only.

Exporting and importing protocols and associated components

Note: The Export macro library file check box is available only for the macros in the protocol that are also in the macro library. If you want to export the entire macro library, you can attach the .mlb file on the Additional files list page of the Export Wizard.

h Select the log files you want to include.

Export Wizard	
Protocol/Runset/Form File Select a recently opened file (protocol, runset or form)	
C:\/Works Workspace\Protocol Files\AssayMap\Purification 1.pro	
O Browse to a file (protocol, runset or form)	
Include all Form files specified in Protocol options	
	_
C:\VWorks Workspace\Device Files\Bravo AssayMAP.dev	
Export barcode files	
Export error library file	
Export plate map database	
Export macro library file	
Cancel << Back Next >>	

3 When you are finished, click **Finish**. The .vzp file appears in the specified location.

You can move the .vzp file to another computer and import it into the VWorks software, or send the .vzp file to Automation Solutions Technical Support to report a problem.

Importing files

You can import files if you have administrator or technician privileges.

To import the system files:

- 1 In the **VWorks** window, select **File > Import**. A message dialog box opens and asks if you want to back up the existing labware definitions, liquid classes, pipette techniques, and plate-map databases.
- **2** Do one of the following:
 - Click **Yes** to back up the information. In the **Backup** dialog box, type a name for the backup file (.vbk), and then click **OK**. The .vbk file is created and stored in the ...\VWorks\backup folder.
 - Click **No** to start the import process.

The Import Wizard dialog box opens.

Exporting and importing protocols and associated components

Import Wizard		? 🗙				
File to import:	C:\WWorks Workspace\RunSet Files\Runsets\Runset_20090622_form.rst.vzp					
☑ Import protocol file(s) to						
C:\VWorks W	/orkspace\Protocol Files\Usability					
Import device f	ile(s) to /orkspace\Device Files					
Import form file						
	(s) to: /orkspace\Protocol Files\Usability					
Import barcode	file(s) to:					
Import runset f						
C:\VWorks W	/orkspace\RunSet Files\Runsets					
Import plate map database (This could take a long time)						
Importing file se	t was generated from VWorks: 11.0.0.4.5.2010					
	Cancel << Back	nish				

- **3** Follow the instructions in the wizard to:
 - **a** Select the .vzp file you want to import. The .vzp file contains the protocol and associated files.
 - **b** Select the location to store the imported protocol file, device file, barcode files, and runset file, if applicable.
 - **c** *Optional.* Select the option to import the associated plate-map database.
 - **d** Select the labware entries and classes you want to import. If a labware entry or class has the same name as an existing entry or class in the database, you have the following options:
 - Labware classes only. Append new labware entries to the existing labware class.
 - Replace existing labware entries or classes with newly imported entries and classes.

CAUTION Protocols that rely on existing labware entries or classes might be affected.

- Create a new file for the newly imported labware entries and classes. You can choose to append the import date on the name of either the new labware file or the existing labware file. The imported protocol will use the imported labware definitions. When running existing protocols, you have to use the old labware file.
- **e** Select the pipette technique files.
- **f** Select the hit-picking input and format files.
- **g** Select the device profiles.
- **h** Select the error handlers and log files.
- **i** If macros were associated with the exported protocol, review the list of exported macros. An asterisk highlights any macros that are already in the VWorks macro library on the destination computer.

Exporting and importing protocols and associated components

You can choose to overwrite the macros of the same name or append the import date on the name of the imported macros.

4 When you are finished, click **Finish**. The files are imported in the specified locations. If you selected the option, the imported protocol opens in the VWorks window.

For information about	See
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661
Works software components: protocol, device file, and so on	"Relationship of VWorks components" on page 4
Viewing logs	"Viewing logs" on page 631
Backing up system files	"Backing up and restoring files" on page 624
Macros in protocols	"Using macros to create protocols" on page 133
Protocol forms	"Creating protocol forms for operators" on page 153

Viewing logs

About the logs

The VWorks software records events that occur and stores the information in the following logs:

- *Main Log.* Contains all of the actions that occur in the software. For more information, see "Main Log" on page 631.
- *Pipette Log.* Contains all pipetting events and error information. For more information, see "Pipette Log" on page 633.
- *Time Constraints Log.* Contains all information about time-limited tasks. For more information, see "Time Constraints Log" on page 634.

The log text colors can help you distinguish between different types of messages and events. For more information, see "Log text colors" on page 637.

In addition, you have the option of backing up and validating the log files for regulatory compliance. For more information, see "Backing up and validating the log files" on page 637.

Main Log

The Main Log records all available event and error information. You can view the Main Log in the following:

- VWorks window
- VWorks log file

Viewing the Main Log in the VWorks window

To view the Main Log in the VWorks window:

- 1 In the VWorks window, select View > Main Log.
- **2** Review the information in the Main Log tab.

Viewing logs

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7/1/2008 2:19:14 PM	🤃 Info	E .	File unloaded			-					
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Checks the current prot	tocol for	errors						administrator is logge	d in		

Viewing the Main Log in a text editor

The VWorks log file is a text file with the following file name:

VWorks_log(date_time).log

To view the Main Log in a text editor:

- 1 In the Windows Explorer window, locate and select the VWorks_log(date_time).log file. The location is specified in the Options (Tools > Options) dialog box.
- **2** Open the file using a text editor such as Notepad.

Main Log contents

The Main Log contains the following information:

Column name	Description
Timestamp	Time and date of the event or error.
Class	 The type of event or error message: Info. General information. For example, System start up, or Simulation mode toggled on. Event. A software action. For example, Scheduler started, or Move plate. Error. An error that can stop the software and must be resolved. For example, Location incompatible with labware. Warning. An error that might permit the software to continue. For example, Task requires that tips be on the pipette head.

Description
Device at which the event or error occurred.
Location where the event or error occurred. For example, Bravo location 9.
Name of the protocol process and subprocess that is running.
Task at which the event or error occurred.
Description of the action that is being recorded.
Name and location of the protocol file.
Login session number.

Pipette Log

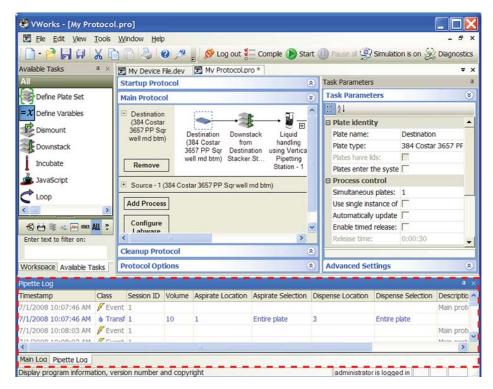
The Pipette Log records all pipetting events and error information. You can view the Pipette Log in the following:

- VWorks window
- VWorks pipette log file

Viewing the Pipette Log in the VWorks window

To view the Pipette Log in the VWorks window:

- 1 In the VWorks window, select View > Pipette Log.
- 2 Review the information in the Pipette Log tab.



Viewing the Pipette Log in a text editor

The VWorks log file is a text file with the following file name:

 $VWorks_pipette_log(date_time).log$

To view the Pipette Log in a text editor:

- 1 In the Windows Explorer window, locate and select the VWorks_pipette_log(date_time).log file. The location is specified in the Options (Tools > Options) dialog box.
- **2** Open the file using a text editor such as Notepad.

Pipette Log contents

The Pipette Log contains the following information:

Column name	Description
Timestamp	Time and date of the pipetting event or error.
Class	 The type of event or error message: <i>Event</i>. A software action. For example, when a protocol is started, the event is logged. <i>Transfer</i>. A pipetting event.
Session ID	Login session number.
Volume	The volume of liquid transferred.
Aspirate Location	The location at which the Aspirate task occurred.
Aspirate Selection	The wells from which fluid was drawn for the Aspirate task.
Dispense Location	The location at which the Dispense task occurred.
Dispense Selection	The wells into which fluid was dispensed.
Description	The description of the action that is being recorded.
File name	The name and location of the protocol file.

Time Constraints Log

The Time Constraints Log records any time-limited task events and errors. If you did not specify time constraints, no information appears in the log.

You can view the Time Constraints Log in the following:

- VWorks window
- VWorks time constraint log file

Viewing the Time Constraints Log in the VWorks window

To view the Time Constraints Log in the VWorks window:

- 1 In the VWorks window, select View > Time Constraints Log.
- 2 Review the information in the Time Constraints Log tab.

Viewing logs

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Timestamp	Class	Session ID	Start process	Start task	End process	End task	Tar	rget interval	Allowed deviatio	n Actual interval	Actual devia
11/21/2008 2:58:16 PM	🗸 Event	1									
11/21/2008 2:58:19 PM	/ Event	1									
11/21/2008 2:58:19 PM	/ Event	1									
11/21/2008 3:07:46 PM											
11/21/2008 3:07:47 PM	1.00		Bravo Sub Proc	3	Bravo Sub Pro	4	+0	0:02:00	±00:00:30	+00:02:30	+00:00:30
11/21/2008 3:07:48 PM	6 Event	1									

Viewing the Time Constraints Log in a text editor

The VWorks log file is a text file with the following file name: VWorks_time_constraints_log(date_time).log

To view the Time Constraints Log in a text editor:

- 1 In the **Windows Explorer** window, locate and select the VWorks_time_constraints_log(*date_time*).log file. The location is specified in the Options (Tools > Options) dialog box.
- **2** Open the file using a text editor such as Notepad.

Time Constraints Log contents

The Time Constraints Log contains the following information:

Column name	Description
Timestamp	Time and date of the event or error.
Class	The type of event or error message:
	• Info. General information. For example, System start up, or Simulation mode toggled on.
	• <i>Event</i> . A software action. For example, Scheduler started, or Move plate.
	• <i>Error</i> . An error that can stop the software and must be resolved. For example, Location incompatible with labware.
	• <i>Warning</i> . An error that might permit the software to continue. For example, Task requires that tips be on the pipette head.

13 Maintenance and troubleshooting

Viewing logs

Column name	Description
Session ID	The login session number.
Start Process	The name of the protocol process or subprocess that contains the first of the two dependent tasks. This field also includes the instance number to help you identify the plate instance. For example, Process - 1 1 means Process - 1, instance 1.
	Start Process is paired with Start Task to identify the first of the two dependent tasks.
Start Task	The task number that identifies the first of the two dependent tasks. For example, 1 is the first task in the process, and 5 is the fifth task in the process.
	Start Task is paired with Start Process to identify the first of the two dependent tasks in the protocol.
End Process	The name of the protocol process or subprocess that contains the second of the two dependent tasks. This field also includes the instance number to help you identify the plate instance. For example, Process - 3 1 means Process - 3, instance 1.
	End Process is paired with End Task to identify the second of the two dependent tasks.
End Task	The task number that identifies the second of the two dependent tasks. For example, 3 is the third task in the process, and 10 is the tenth task in the process.
	End Task is paired with End Process to identify the second of the two dependent tasks in the protocol.
Target interval	The time specified in the Edit Time Constraints dialog box.
Allowed deviation	The time tolerance specified in the Edit Time Constraints dialog box.
Actual interval	The length of time of the first task during the run.
Actual deviation	The difference between the Target interval and the Actual interval.

Column name	Description
Error	The result of the following:
	Actual deviation – Allowed deviation
	If the result is less than 0, Error is set to 0.
	For example:
	 Actual deviation is 66. Allowed deviation is 60. So Error is 66 - 60, or 6.
	• Actual deviation is 30. Allowed deviation is 60. So Error is 30 – 60, or –30. Because the result is less than 0, Error is set to 0.
Description	The description of the action that is being recorded.
File name	The name and location of the protocol file.

Log text colors

Text in the logs appear in the following colors:

Color	Description	
Grey	Standard events with a date stamp or operator- added notes	
Blue	Liquid transfer events	
Orange	Warnings	
Red	Error	
Green	General information	
Purple	Debug information (shown only if the Debug log level is greater than 0 in Tools > Options)	

Backing up and validating the log files

You can back up and validate the log files to comply with regulatory requirements. The validation process checks the log file to see if it has been altered.

Backing up log files

To back up the log files:

- 1 With the protocol file open in the **VWorks** window, select **Tools > Log Management.** The Log Management dialog box opens.
- 2 Click the $\boxed{\cdots}$ button, and then locate and select the log file you want to back up. The log file location is specified in Tools > Options. The file path and name appear in the **Target** box.

Viewing logs

g Manage	menc	
Target		Validate
	C:\VWorks Workspace\logs\vworks_log(12_2_20(Backup

- 3 Click Backup. The Please name backup log file dialog box opens.
- **4** Select the folder in which you want to store the backup copy. In addition, type a name for the backup file.
- **5** Click **Save**. A backup copy of the log file is created.

Validating log files

To validate a log file:

- 1 With the protocol file open in the VWorks window, select Tools > Log Management. The Log Management dialog box opens.
- 2 Click the $\boxed{\cdots}$ button, and then locate and select the log file you want to validate. The log file location is specified in Tools > Options. The file path and name appear in the **Target** box.

g Manag	ement	
		Validate
arget	C:\VWorks Workspace\logs\vworks_log(12_2_20(Backup

3 Click **Validate**. The software checks the log file and displays a message that explains whether the validation is successful. Validation is successful only if the file has not been altered.

For information about	See
Setting system-wide options	"Setting general and view options" on page 224
Specifying log file storage locations	"Setting log file directories" on page 222
Exporting and importing protocol and associated files	"Exporting and importing protocols and associated components" on page 626
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Resolving device initialization errors

Device initialization process

When you start the VWorks software, the software loads the driver files for all the devices in the automation system. A record of this process is displayed in the Main Log.

When you open a protocol, the device file associated with that protocol opens. The device file tells the software which devices are connected to the system. For some devices, an initialization step tests the communication between the VWorks software and the device.

Resolving initialization errors

During the device initialization process, the software displays the list of devices it is expecting to find. Devices are removed from the list as the software determines that the devices are ready.

If a problem occurs during initialization, an error message appears and explains the problem.

To resolve the problem:

- **1** Make sure the device is turned on.
- 2 Make sure the communication cable is connected properly.
- **3** Make sure the communication cable is connected to the correct COM port.
- **4** Check the device profile to make sure it is set up correctly for communication.
- **5** If applicable, follow the instructions in the error message to fix the communication problem.
- **6** Click **Retry** to re-initialize the device.
- 7 If the problem persists, contact Automation Solutions Technical Support.

For information about	See
Turning on the device	Device user guide
Editing the device profile	Device user guide
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Resolving compilation error messages

Compilation warnings and error messages

During the protocol-compiling process, the software reports errors in the Main Log. You can use the information to troubleshoot the protocol.

The software displays two types of messages during the compiling process:

- Warning messages
- Error messages

Note: If you are logged in with technician, operator, or guest privileges, you are unable to continue with the protocol. If you are logged in with administrator privileges, the dialog box allows you to run the protocol despite the errors.

Warning messages

A warning message alerts you to an error that should be fixed. If the error is left unresolved, the software can still continue. For example, a pipetting task requires that tips be on the pipette head, but there was no Tips On task preceding the pipetting task.

Error messages

Error messages alert you to situations where a protocol or device will fail. You must resolve the problem to continue the run.

Errors are generated when:

- Operating parameters are out of range, denoted by red text in the Task Parameters area.
- A task wants to use a labware that does not exist in the system.
- Volumes in pipette steps do not match, such as when a dispense volume is greater than a previous aspirate volume
- A Signal task has no associated Wait For task

For information about	See
Compiling protocols	"Compiling the protocol" on page 63
Viewing logs	"Viewing logs" on page 631
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Disabling and enabling tasks

When to disable tasks

You can disable tasks when you test run a protocol. Disabling one or more tasks allows you to:

- Run a protocol but skip tasks that use problem devices or locations. Doing so allows you to verify that the rest of the protocol is working properly while you troubleshoot the problem devices and locations.
- Skip tasks that are not needed for certain runs. You can reuse the same protocol for a number of situations without creating a number of different protocols.

Note: You can also skip tasks by disabling the device assigned to the task in the device file. This allows you to run alternative protocol configurations using a single device file. See "Disabling and enabling a device in the device file" on page 215 for more information.

Disabling tasks

To disable a task:

- **1** Right-click the task that you want to disable.
- 2 In the shortcut menu that appears, select **Disable task**.

A red circle and strike line appears on the icon to indicate that it is a disabled task. The software will bypass the task when the protocol is running.

In the following example, the Seal a Plate task is disabled in the protocol.



Enabling tasks

You can enable tasks individually or you can enable all tasks using one command.

To enable a task:

- **1** Right-click the disabled task.
- 2 In the shortcut menu that appears, select **Enable task**.

To enable all tasks in a protocol:

- **1** Right-click any task in the protocol.
- 2 In the shortcut menu that appears, select **Enable all tasks**.

Disabling and enabling tasks

Related informatio	n	
	For information about	See
	The Halt on barcode misreads option in the Options dialog box	"Setting general and view options" on page 224
	Viewing logs	"Viewing logs" on page 631
	Running protocols in simulation mode	"Simulating the protocol run" on page 64

Using breakpoints to monitor and troubleshoot tasks

About breakpoints

A breakpoint is a point in the protocol where you want the system to pause operation. Adding a breakpoint at a task pauses the run or simulation and opens the Debugger dialog box before the system performs the actual task. The Debugger dialog box provides JavaScript information for the corresponding task.

Breakpoints enable you to do the following:

• You can monitor parameter values and verify the actions of certain tasks during simulation or a dry run, and change the values if necessary.

For example, you can add a breakpoint at an aspirate task to pause the system just before the aspirate task starts. During the pause, you can verify the task parameter values in the JavaScript engine, after the task's script executes, and before the parameters are applied to the task.

- If you declare your own JavaScript variables for certain tasks, you can monitor the values by placing breakpoints at those tasks.
- You can troubleshoot tasks and fine-tune task parameter values.
- The Debugger dialog box also enables you to write and execute scripts in real time that are not necessarily associated with the selected task.

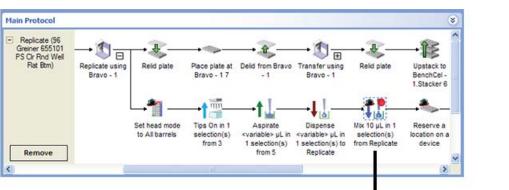
During the protocol run, the following sequence occurs when the software reaches a breakpoint:

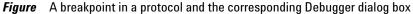
Description
The protocol pauses at the task with the breakpoint.
The JavaScript associated with the selected task executes.
The Debugger dialog box opens and displays the JavaScript for that task.
In the Debugger dialog box, you can modify values in the JavaScript engine.
The software applies the relevant task parameters from the JavaScript engine to the scheduler. If you changed task parameter values in the Debugger dialog box, the task will use the updated values when you continue the run.
You can continue running the selected task and the rest of the protocol or abort the run.

Note: If the breakpoint is on a task within a loop or if the protocol is run multiple times in one session, the protocol will pause each time it reaches that task.

13 Maintenance and troubleshooting

Using breakpoints to monitor and troubleshoot tasks





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urrent JS Object	s		- Run Script Now
lame	Value	Туре	
SOUTH	0	number (builtin)	
WEST	1	number (builtin)	
NORTH	2	number (builtin)	
EAST	3	number (builtin)	
+task	N/A	object (builtin)	
+plateDB	N/A	object (builtin)	
+plate	N/A	object (builtin)	
+plates	N/A	array (builtin)	
+forms	N/A	object (builtin)	
+runset	N/A	object (builtin)	
mix	1	number	
time	1	number	
columns	1	number	
vol	2	number	
Show Function			Apply changed values

Adding breakpoints

You can add as many breakpoints as you want in a protocol. In addition, you can add breakpoints while a protocol or simulation is running.

To add a breakpoint:

- 1 In the **Protocol** area, right-click the task at which you want the breakpoint.
- 2 In the shortcut menu that appears, click **Set breakpoint**. A red dot appears on the task icon.



Using a breakpoint during a simulation or a dry run

To use a breakpoint in a protocol:

- 1 Start a simulation or dry run of the protocol that contains the breakpoint. When the software reaches the task that has the breakpoint, the Debugger dialog box opens.
- **2** Under **Current JS Objects** in the Debugger dialog box, look in the **Name** column for the object that you want to view. Click the **+** symbol next to the object name to view the corresponding properties.

For example, the following figure shows the task object properties for an aspirate task at which a breakpoint was set.

lame	Value
-task	N/A
task.name	Bravo::secondary::Aspirate
task.description	Aspirate <variable> µL in 1 selection</variable>
task.numberOfRuns	1
task.Location_plate	5
task.Location_location	<auto-select></auto-select>
task.Volume	2
task.Preaspiratevolume	0
task.Postaspiratevolume	0
task.Liquidclass	
task.Distancefromwellbottom	2
task.Dynamictipextension	0
task.Performtiptouch	false
task.Whichsidestousefortiptouch	None
task.Tiptouchretractdistance	0
task.Tiptouchhorizontaloffset	0
+task.Wellselection	N/A
task.Pipettetechnique +plateDB	N/A
-	N/A N/A
+plate +plates	N/A N/A
+plates +forms	N/A N/A
	>

Note: To show the functions (methods) as well as the properties associated with the JavaScript object, select **Show Functions**, and then expand the object in the **Name** column.

- **3** In the Value column, change a property value, if required. For example, you might change the task.Volume value from 2 to 3.
- **4** To apply any changed values without closing the Debugger dialog box, click **Apply changed values**.
- **5** If you want to run a script from the Debugger dialog box:
 - **a** Type the script in the **Run Script Now** area.
 - **b** Click **Execute JavaScript**.

The status of the script appears in the bottom left of the Debugger dialog box.

For example, you could type the script runset.clear()to clear all the entries in the runset manager, except for currently running protocol.

13 Maintenance and troubleshooting

Using breakpoints to monitor and troubleshoot tasks

rent JS Objects		Run Script Now
ime	Value	runset.clear()
SOUTH	0	
WEST	1	
NORTH	2	
EAST	3	
task	N/A	
plateDB	N/A	
plate	N/A	
plates	N/A	
forms	N/A	
runset	N/A	
mix	1	
time	1	
columns	1	
vol	2	
		> < ==

6 Click the button in the Debugger dialog box that corresponds to the command you want to use next:

Button	Description
Clear all breakpoints	Removes all breakpoints in the protocol and continues the run.
Single step	Permits the protocol to perform one task at a time, pausing before each task.
Continue	Resumes the protocol run until the next breakpoint is reached.
Abort	Aborts the protocol run.

Removing breakpoints from an open protocol

You can remove breakpoints individually or you can remove all breakpoints with one command.

To remove a specific breakpoint:

- **1** Right-click the task that has a breakpoint.
- 2 In the menu that appears, click **Remove breakpoint**.

To remove all breakpoints in a protocol:

- **1** Right-click any task in the protocol.
- 2 In the menu that appears, click **Clear all breakpoints**.

Related information

For information about	See
Compiling protocols	"Compiling the protocol" on page 63
Simulating a protocol run	"Simulating the protocol run" on page 64
JavaScript objects in the VWorks software	"Creating a protocol: advanced topics" on page 73
Tracking the run progress of instances, processes, or devices	"Tracking the run progress of instances or devices" on page 255
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Resolving barcode reader error messages

About this topic

The information in this topic applies only to the following barcode readers:

- Robot barcode readers
- Barcode readers that are installed on a device such as a platepad

The information in this topic does not apply to the Microplate Labeler.

Causes of barcode reader errors

Errors generated by robot barcode readers and barcode readers that are installed on devices are generally caused by:

- Poor printing or label placement such that the barcodes are not perpendicular to the barcode laser read line
- Poor label placement such that the barcode cannot be fully read
- Missing or damaged barcode labels
- Wrong barcode labels

Note: The system does not attempt to read a barcode unless you specified that the labware has a barcode label. See "Setting plate parameters" on page 46 for instructions.

Recovering from barcode reader errors

Your ability to resolve the barcode reader errors depends on whether the **Halt on bar code misreads** option is selected in the Options (Tools > Options) dialog box.

- If the Halt on bar code misreads option is selected:
- The protocol pauses.

• The error message is recorded in the Main Log.

• The error message dialog box opens and allows you to type the correct barcode. With the correct barcode, the software continues the run.

If the Halt on bar code misreads option is not selected:

- The error message is recorded in the Main Log.
- The protocol continues without pausing, so you cannot correct from the error.

A quarantine response is set up in the Error Library for a default set of barcode reader error messages. The quarantine response allows the system to continue running the protocol even though it is unable to resolve problems with the labware. For a description of the quarantine response, see "Setting up automated responses" on page 655.

Related information

For information about	See
The Halt on bar code misreads option in the Options dialog box	"Setting general and view options" on page 224
Viewing logs	"Viewing logs" on page 631
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Recovering from deadlocks

About deadlocks

A deadlock is an error that occurs when the number of locations available in the system is less than the number of microplates in the system. Because the microplates cannot move to the expected locations, the protocol either aborts or pauses, depending on the **Deadlock behavior** selection in the Tools > Options dialog box.

About the System State Editor

In the Tools > Options dialog box, if the **Deadlock behavior** is **Show the System State Editor**, the run will pause when a deadlock error occurs.

Enable email notification:	F 2
SMTP server name:	
Authentication type:	None
Authorized user:	
Password:	
Send email from:	
Send email when an error occurs:	F
Addresses to send to when an erro	01 OF
View Options	
Hide disabled parameters:	E.
Remember simulator state between	n se 🔽
DB Setup	
Enable database connection:	E
Connection string:	
Error Handling	
Halt on low disk space:	E
Disk space threshold (0 - 100 %):	
Scheduler error behavior:	Processes as many plates as possible
Deadlock behavior:	Show the System State Editor
Deadlock behavior:	Abort
What should the scheduler's behavio	or be Show the System State Editor

During the pause:

- Systems with an Automation Control Unit. The Scheduler Paused dialog box appears. To access the System State Editor, click **Bypass interlock**, and then click **System State Editor** in the Bypass Interlock dialog box.
- Systems that do not have an Automation Control Unit. The System State Editor dialog box appears.

In the System State Editor dialog box, you can:

- 1 View the status of the devices and locations to assess and correct the causes of the errors. For example, if the device status indicates that a labware at a particular location is causing device problems, you can physically remove that labware from the system and restore the device to its operational state.
- **2** Specify in the software that a labware has been removed from certain locations or from the system. For example, after you physically remove the labware that is causing problems, you need to indicate in the software that the labware is removed and its location is now ready to accept new labware.
- **3** Edit or reset the status of devices and locations. If you fixed a device problem, you can indicate that the device is now operational and ready to accept labware.
- **4** Continue the protocol run.

If you determine that the causes of the deadlock error cannot be fixed, you can choose to abort the run or allow the existing labware to finish processing but not introduce new labware. For more information about these options, see "Pausing the run" on page 261.

You can also open the System State Editor when you pause all runs. For instructions, see "Pausing the run" on page 261.

Recovering from deadlocks

Viewing the device and location status

To view the device and location status:

- 1 In the System State Editor dialog box, click the Paused Status tab.
- 2 Review the information in the Paused Status tab.
 - The Paused Status tab contains the following information:
 - Causes of the deadlock error
 - Current locations of the labware in the system and the expected locations when the deadlock error occurred
 - The current status of all the devices and locations in the system

Note: The information in the Paused Status tab can be appended to the Main Log file. To do this, select **Tools > Get Status**.

		_
Deadlock detected: Spin Plate 1 1, task 1: No location	available	2
Finding plates:		
	. Waiting for Spin Plate 1 using Centrifuge - 2, Centrifuge - 3. in protocol C:\\Works W Countervt Stage. Waiting for Spin Plate 1 using Centrifuge - 2, Centrifuge - 3. in prot	
Querying devices		
Centrifuge - 1 Bucket 1 is available		
Centrifuge - 1 Bucket 2 is available		
Centrifuge - 2 Bucket 1 is available Centrifuge - 2 Bucket 2 is available		
Centrifuge - 2 Bucket 2 is available Centrifuge - 3 Bucket 1 is available		
Centrifuge - 3 Bucket 2 is available		
Centrifuge - 4 Bucket 1 is available		
Centrifuge - 4 Bucket 2 is available		
	a plate available for pickup called Counterweight 1 in C:\VWorks Workspace\Protocol	
	ailable for pickup called Plate 1 1 in C:\/Works Workspace\Protocol Files\Counterweig	
Stacker - 2 Stacker is available		
Stacker - 3 Stacker is available		
Stacker - 4 Stacker is available		
Stacker - 4 Stacker is available "Query Devices" completed		
"Query Devices" completed		10
	×	1

Moving or removing labware from locations

The Plate Location Editor tab lists:

- All active process plates in all running protocols
- The current locations of the process plates

IMPORTANT The list does not include finished process plates. To see the finished process plates, click the Location Status Editor tab.

IMPORTANT You can move labware to any location except into a Labware Stacker.

To indicate that labware is moved or removed from locations:

1 In the System State Editor dialog box, click the Plate Location Editor tab.

2 To change the location of a process plate, select the new location from the list. If you want to indicate that a process plate was removed from the system, select **REMOVE FROM SYSTEM**.

Note: The software prevents you from selecting one location for two different process plates. If you select a location that is already occupied by another process plate, the software will exchange the two locations.

2↓ □ plates		
Destination Plate 1:	BenchCel - 1 Stacker 1	
Source Plate 2:	Bravo - 1 2	•
	REMOVE FROM SYSTEM BenchCel - 1 Stacker 1 BenchCel - 1 Stacker 2 Bravo - 1 1 Bravo - 1 2 Bravo - 1 3 Bravo - 1 4 Bravo - 1 5 Bravo - 1 6 Bravo - 1 7 Bravo - 1 8	×
Source Plate 2: Source Plate 2. Waiting for Bravo Sub Pro	ocess 31 using Bravo - 1	

Editing the status of the devices and locations

CAUTION Do not change the status of device locations without fully knowing the state of all process plates and device locations. An arbitrary change can cause crashes when you resume the run. If you are uncertain of the state of the process plates and device locations, contact Automation Solutions Technical Support.

The Location Status Editor tab displays all labware in running protocols in:

- The list of every device and associated locations
- The status of the locations

Finished process plates appear in this tab. You can use the selections in this tab to remove finished process plates.

CAUTION Make sure finished process plates will not be used by downstream processes before removing them.

Except to remove finished process plates, you do not need to change the status of device locations. The changes you made in the Plate Location Editor tab are automatically reflected in the Location Status Editor tab. For example, if you removed a process plate from a location in the Plate Location Editor tab, the status of that location will change from Plate available for pickup (location is occupied) to Ready for use (location is available for use).

To remove a finished process plate:

- 1 In the System State Editor dialog box, click the Location Status Editor tab.
- **2** Find the finished process plate location, and then select the new status from the list.

aused Status Plate Location Editor		
Location		Status
2↓		
BenchCel - 1		
Default Location:	ready for use	
Stacker 1:		
Stacker 2:	ready for use	
🗆 Bravo - 1		
1 *:	ready for use	
2:	plate available for pickup	-
3:	plate available for pickup	
4:	ready for use	
5:	ready for use	
6:	ready for use	
7:	ready for use	
8:	ready for use	
9:	ready for use	
Default Location:	ready for use	-

Status	Description
Plate available for pickup	Retains the finished process plate in the system.
Ready for use	Removes the finished process plate from the system.

Continuing the protocol run

After you specify the labware movement or removal and the new device and location status:

- 1 In the System State Editor dialog box, click Accept all changes.
- 2 Systems with an Automation Control Unit. In the Bypass Interlock dialog box, click Resume Run.
- **3** In the Scheduler Paused dialog box, click Continue to resume the run.

The Scheduler Paused dialog box also provides other options. For details, see "Pausing the run" on page 261.

For information about	See
Pausing a run	"Pausing the run" on page 261
Monitoring a run	"Tracking the run progress of instances or devices" on page 255
Viewing logs	"Viewing logs" on page 631
Tracking the run progress of instances, processes, or devices	"Tracking the run progress of instances or devices" on page 255
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Setting up automated error responses

About the Error Library

You can use the Error Library to:

- Display or hide certain error messages during a protocol run. Hiding minor errors reduces the number of interruptions in the protocol run.
- Automate error recovery responses for selected errors to reduce the number of manual interventions in a protocol run.
- Track the frequency of certain errors for troubleshooting, establishing standard automated recovery responses, or quality-control reporting.

For example, you can set up a quarantine response for barcode reading, incorrect labware orientation, and wrong labware type errors. The quarantine response allows the system to continue running the protocol even though it is unable to resolve problems with the labware.

Adding errors to the library

You can add error messages to the Error Library to set up display options and automated responses. When you run a protocol and an error dialog box opens, click **Add to Error Library** to add the displayed error message to the Error Library.

To set up quarantine responses, you can perform dry runs to generate the desired error messages for the Error Library. For example, you can use labware that have poorly printed or missing barcode labels, load labware backwards in stackers, or load the wrong labware type in stackers.

Note: The software automatically records the frequency of the error in the Error Library.



Setting up automated responses

To set up error responses:

1 In the VWorks window, select Tools > Error Library. The Error Library dialog box opens.

Note: The software opens the last saved error library file shown in the Error Library File area. To open a different file, click the with button.

Name	Match Text	Match Type		
Default		Match any error		
Error - 1	Unable to retrieve firmware version from Bench	Error text exactly matches match text		
Error - 3	Cannot connect to the device using Ethernet, sin	Error text exactly matches match text		
Error - 4	Unable to retrieve sensor thresholds.	Error text exactly matches match text		
Error - 5	No stacks found	Error text exactly matches match text		
Error - 6	Status check: failed to communicate with the Be	Error text exactly matches match text		
Error - 7	Could not retrieve the firmware version.	Error text exactly matches match text		
New	Delete			
Error Library	/ File			
Filename	C:\VWorks Workspace\Error Library\My error library.e	Save As		

2 In the **Error Handlers** tab, set the following parameters to identify the error handlers. An error handler is a set of conditions that define a specific recovery response to an error.

Parameter	Description
Name	The name of the error handler. Type a name that can help you to identify it quickly in the log.
	<i>Note:</i> The Default error handler is used to define the default error response. It can be edited, but it cannot be deleted from the Error Library.
Match Text	The text of the error message that must be matched to activate the error handler.
	You can modify the text to set it up for match-text filtering.
Match Type	The match-text filtering to use:
	• Error text exactly matches Match Text
	• Error text contains Match Text

3 Set the following to determine the error response:

13 Maintenance and troubleshooting

Setting up automated error responses

	Action Type	Action Value	Priority Value	Error Annotation	Script to Execute	Devi
14	show error dialog	0	1			
1.0	show error dialog	0	1			
	show error dialog	0	1			BioTe
	always ignore error		1			
ŧ.	always ignore error	0	1			VPrej
1	always ignore error 💌	0	1			VPrep
1	pause protocol	1				
	always ignore error	1				
	retry n times					
	rotate plate					
	show error dialog					
	quarantine plate					
13	script	1				
*						,
_	New Delet	e				
Er	ror Library File —					
F	ilename C:\Program F	iles \Arilant T	achnologiar\War	kr\Freerich alb	Save As	
0.5	o. ar off an 1	and infrastric 1		and the s value of the o	TTT Dave M	

Parameter	Description
Action Type	The automated error response to use whenever the text-matching conditions are met:
	• <i>Pause protocol.</i> Pauses the protocol.
	• <i>Always ignore error.</i> Ignores the current command or task and continues to the next command or task in the protocol sequence.
	• <i>Retry n times.</i> Attempts to restart the current command or task in the run. The number of attempts is specified by the Action Value.
	• <i>Rotate plate</i> . Places the labware at a device that can rotate it to correct its orientation.
	• Show error dialog. Displays the error dialog box to allow the operator to determine the error response.
	• <i>Quarantine plate</i> . Moves the labware that caused the error to a quarantine location and continues the run.
	• <i>Script</i> . Runs the script specified in the Script to Execute box. See step 6.
Action Value	The number of times to restart the current command or task.

4 Type the **Priority** value in case the text from two errors matches the conditions in two handlers. The larger the value, the lower the priority.

The software sets the overall priority as follows:

- a Exact error text match
- **b** Partial error text match (longer text matches are preferred over shorter text matches)
- **c** Larger Priority value (for example, 1 has higher priority than 2)
- **5** Type additional notes about the error in the **Error Annotation** box. The text in this box is displayed with the original error text. You can use this field to explain how to fix the error.
- **6** Type the script you want to run in the **Script to Execute** box. This box is only active if you have selected **Script** for the **Action Type** in step 3.
- 7 Set up additional filters for the error message. You can select the desired value for each of the parameters in the following table. If you do not want to set up a filter for one or more of the parameters, select the empty value from the parameter list.

Annotation	Device Type Filter	Device Name Filter	Task Type Filter	Task Name Filter
	BenchCel	BenchCel - 1	-	
	Bravo Pipettor	Bravo - 1	-	
	BenchCel	BenchCel - 1	IO Davias Handlin	A
	BenchCel	BenchCel - 1	IO Device Handlin Plate Storage	ig
	BenchCel	BenchCel - 1	Plate Handling	
	Bravo Pipettor	Bravo - 1	Other	
			Reading	
			Liquid Handling	-
			All	~
•				•
New	Delete			
Error Library	/ File			
Filename	C:\VWorks Workspace\Erro	r Library\My error library.elb		Save As

Parameter	Description
Device Type Filter	The device type, such as Bravo Pipettor.
Device Name Filter	The device name that distinguishes two devices of the same type. For example, Bravo- 1 and Bravo-2.
Task Type Filter	The task category. For example, Plate Handling tasks.
Task Name Filter	The name of the task. For example, Aspirate.

Creating a new error handler

To create a new error handler:

1 In the **Error Library** dialog box, click **New**. A new row appears in the error handler table with a default name, Error - n.

13 Maintenance and troubleshooting

Setting up automated error responses

	Match Text	Match Type	
Default		Match any error	
Error - 1	Unable to retrieve firmware version from Bench	Error text exactly matches match text	
Error - 3	Cannot connect to the device using Ethernet, sin	Error text exactly matches match text	
Error - 4	Unable to retrieve sensor thresholds.	Error text exactly matches match text	
Error - 5	No stacks found	Error text exactly matches match text	
Error - 6	Status check: failed to communicate with the Be	Error text exactly matches match text Error text exactly matches match text Error text exactly matches match text	
Error - 7	Could not retrieve the firmware version.		
•			
New Error Library	Delete		
Error Library	File		
Filename	C:\VWorks Workspace\Error Library\My error library.e	elb Save As	

2 Follow the instructions in "Setting up automated responses" on page 655 to set up the new error handler.

Note: In a newly created handler, the Match Text field is empty. Type the error text that you want to use to set up the handler.

Deleting an error handler

To delete an error handler:

- 1 In the Error Library dialog box, select the error handler you want to delete.
- 2 Click **Delete**. The error handler is removed from the table.

Saving the error library file

To save the error library file:

- 1 In the Error Library File area, click Save As. The Save As dialog box opens.
- 2 Locate the folder in which you want to save the file, type a name for the error library file, and then click **Save**.

Viewing and tracking error occurrences

You can view all the errors that have occurred during the protocol run that have not yet been assigned an error handler. The Error Library records the frequency of their occurrences and other information to help you determine whether you want to add them to the library and what automated response to specify.

To view errors that are not yet set up with error handlers:

- 1 In the Error Library dialog box, click the Error History tab.
- **2** Review the list of errors in the table:

Viewing the status of the UPS

Parameter	Description
Error Message	The text of the error message.
Device Type	The type of device on which the error occurred. For example, Bravo Pipettor.
Device Name	The name of the device on which the error occurred. The name distinguishes two devices of the same type. For example, Bravo-1 and Bravo-2.
Task Type	The category of the task in which the error occurred. For example, Plate Handling tasks.
Task Name	The task in which the error occurred. For example, Aspirate.
Error Times	The number of times the error occurred within the protocol.
File Name	The name of the device file containing the device.

To add an error message to the error library file:

- **1** Select the error message in the table.
- **2** Click Add to Error Library.
- **3** Follow the instructions in "Setting up automated responses" on page 655.

To clear the history table:

Click Clear All.

Related information

For information about	See
Viewing logs	"Viewing logs" on page 631
Tracking the run progress of instances, processes, or devices	"Tracking the run progress of instances or devices" on page 255
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Viewing the status of the UPS

About the UPS and the APCUPS device

An uninterrupted power supply (UPS) is provided with the BioCel 1800 System and the BioCel 1200 System, and is optional in the BioCel 900 System. The UPS is powered by a battery and supplies backup power to the system in case of a power outage. Viewing the status of the UPS

You can check the battery level and power load of the UPS using the APCUPS Diagnostics. If you set up an alarm for the UPS, an error message would display when the battery level drops below the specified level.

Before you start

To check the status of the UPS, you must add the APCUPS device in the device file.

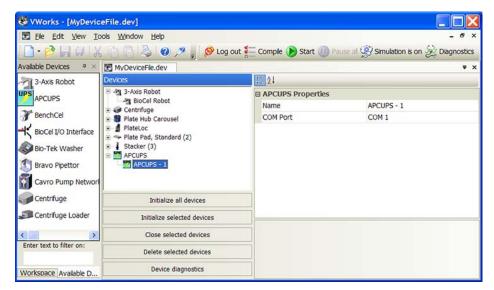
Note: The APCUPS device does not have associated tasks that you can add in a protocol.

Procedure

If you have a UPS in the system, you can check the battery level and power load of the UPS at any time.

To check the status of the UPS:

- 1 In the **VWorks** window, open the device file that contains the UPS device.
- 2 In the Device File area, select APCUPS, and then click Device diagnostics.



The APCUPS dialog box opens.

APCUPS Diagnostics v9.0.2	? 🛚
Battery level (%):	
Power load (%):	
Internal temperature (°C):	
Power source: AC	
Agilent Technologies About	OK Cancel

3 Check the following:

Indicator	Value
Batter level	The amount of battery power remaining, in percent of the full level.
Power load	The amount of power drawn by the devices, in percent of the maximum load.
Internal temperature	The temperature, in degrees Celsius, of the internal battery.

Related information

For information about	See
Adding an alarm for the UPS	"Adding an alarm" on page 37
Contacting Agilent Technologies and reporting problems	"Reporting problems" on page 661

Reporting problems

Contacting Automation Solutions Technical Support

If you find a problem with the VWorks software, contact Automation Solutions Technical Support at one of the following:

Europe

Phone: +44 (0)1763850230

email: euroservice.automation@agilent.com

US and rest of world

Phone: 1.800.979.4811 (US only) or +1.408.345.8011

email: service.automation@agilent.com

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

Reporting hardware problems

When contacting Agilent Technologies, make sure you have the serial number of the device ready. See the device user guide for the location of the label.

Reporting software problems

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

• Short description of the problem

Reporting problems

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

To find the VWorks software version number:

In the VWorks software, select Help > About VWorks.

To find the Diagnostics software version number:

- **1** Open **Diagnostics**.
- 2 Read the version number on the title bar of the diagnostics window.

To send compressed protocol and associated files in VZP format:

In the VWorks software, select $\mathsf{File} > \mathsf{Export}$ to export and compress the following files:

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

Reporting user guide problems

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

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

For information about	See
Exporting a protocol and associated files	"Exporting and importing protocols and associated components" on page 626
VWorks software components: protocol, device file, and so on	"Relationship of VWorks components" on page 4
Viewing logs	"Viewing logs" on page 631



VWorks Automation Control User Guide

Quick reference

This appendix contains the following topics:

- "Menu commands" on page 664
- "Toolbar buttons" on page 668



Menu commands

File menu

Command	Description
New > Protocol	Creates a new protocol. See "Creating a protocol: basic procedure" on page 13.
New > Device	Creates a new device file. See "Creating a device file" on page 26.
New > Runset	Clears the Runset Manager tab so that you can create a new runset. See "Managing runsets" on page 243.
New > Form	Opens the Form Designer so that you can create a new form to run a protocol or runset. See "Workflow for creating or editing a form" on page 160.
Open	Allows you to locate and open files, such as protocol, device, runset, and form files.
Close	Closes the displayed protocol, device, runset, or form file.
Save	Saves the changes in the protocol, device, or form file.
Save As	Opens the Save As dialog box and allows you to create a copy of the existing protocol or device file and specify a new name.
Save All	Saves all protocol, device, and form files currently open in the software.
Save Runset	Saves a runset in a folder that you specify.
Save Runset As	Opens the SaveAs dialog box, which enables you to save the runset file using a different file name and storage location.
Recent .pro files	Opens a recently opened protocol file.
Recent .dev files	Opens a recently opened device file.
Recent .rst files	Opens a recently opened runset.
Recent .VWForm files	Opens a recently opened protocol form.
Print	Prints the selected protocol, device, or form file
Print Setup	Opens the Print Setup dialog box and allows you specify printing options.
Print Preview	Allows you to preview the printout.

Command	Description
Import	Imports a .vzp file that contains a protocol, runset, or form file and associated components. See "Exporting and importing protocols and associated components" on page 626.
Export	Exports a protocol, runset, or form file and associated components and stores them in a .vzp file. See "Exporting and importing protocols and associated components" on page 626.
Exit	Quits the VWorks software.

Edit menu

Command	Description
Cut	Removes selected text and stores it in memory.
Сору	Copies selected text and stores it in memory.
Paste	Pastes the text that is currently stored in memory.

View menu

Command	Description
Menubar	Displays or hides the menubar. When it is hidden, press ALT+V, or right-click in the protocol or device file area and select Menubar to display it.
Standard Toolbar	Displays or hides the standard toolbar.
Control Toolbar	Displays or hides the control toolbar.
Workspace	Displays or hides the Workspace area.
Available Tasks	Displays or hides the Available Tasks area.
Available Macros	Displays or hides the Available Macros area. For details on macros, see "Using macros to create protocols" on page 133.
Main Log	Displays or hides the Main Log in the log and progress area.
Pipette Log	Displays or hides the Pipette Log in the log and progress area.
Time Constraints Log	Displays or hides the Time Constraint Log in the log and progress area.

Command	Description
Status Bar	Displays or hides the status bar below the log and progress area.
Progress	Displays or hides the Progress table in the log and progress area.
Runset Manager	Displays or hides the Runset Manager in the log and progress area. For details on managing runsets, see "Managing runsets" on page 243.
Full Screen Mode	Available only if a form is open in the VWorks window and the form contains a Toggle Full Screen control. The Full Screen Mode command changes the VWorks window to a full screen display of only the form.

Tools menu

Command	Description
Labware Editor	Opens the Labware Editor. For details, see the VWorks Automation Control Setup Guide.
Liquid Library Editor	Opens the Liquid Library Editor. For details, see the VWorks Automation Control Setup Guide.
Pipette Technique Editor	Opens the Pipette Technique Editor. For details, see the VWorks Automation Control Setup Guide.
System State Editor	Opens the System State Editor.
Automatic Tip State Editor	Opens the Tip State Editor.
Configure Labware	Allows you to assign labware to device locations.
Backup Manager > Back up	Allows you back up system files.
Backup Manager > Restore	Allows you to restore system files.
Log Management	Allows you to back up or validate a selected log file.
Hit Pick Format Wizard	Allows you to set up the fluid transfer from a source microplate to a destination microplate.
Migrate All Files in a Folder	Allows you to migrate all files that are stored in a folder. For details, see the <i>VWorks Automation</i> <i>Control Setup Guide</i> .

Command	Description
Reload Plugins	Scans the Plugins folder and reloads the device plugins. The command is only available if all device files and protocol files are closed.
	Use the command if you have added a new device plugin in the Plugins folder and you want to reload all the plugins without restarting the software.
Open Hooks Plugin for	Allows you to open any VWorks plugins that are installed on the computer.
	For details on the Twitter plugin, see "Setting up automatic online notification" on page 235.
User Management	Allows you to manage users and privileges. For details, see the <i>VWorks Automation Control Setup Guide</i> .
Error Library	Opens the Error Library. For details, see "Setting up automated error responses" on page 654
Gantt Charts	Allows you to visually monitor the real-time status of processes, plate instances, and devices. For details, see "Tracking the run progress of instances or devices" on page 255
Get Status	Appends the current status to the Main Log. You can use this command at any time, including during a run.
Inventory Editor	Opens the Inventory Editor. For details, see the VWorks Automation Control Setup Guide.
Manage IO	Allows you to manage and set options for input and output signals.
Watcher is ON/OFF	Available only if you have a current license for the Watcher feature and the Watcher feature is configured. For details, see "Setting up and using the Watcher tool" on page 685.
Edit Form	Available only if a form is open in the VWorks window. Displays the Form Editor window that enables you to edit the form. For details, see "Workflow for creating or editing a form" on page 160.
Options	Allows you to specify global options in the software, including paths to various logs, e-mail setup, robot speed, database setup, and error handling. For details, see "Running a protocol" on page 209.

Window menu

Command	Description
Cascade	Arranges the protocols and device files in the cascade style.
Tile	Arranges the protocols and device files in the tile style.
Arrange Icons	Aligns the icons in a sequential order.
Close All	Closes all open protocols and device files. If changes were made to the protocols and device files, a message will prompt you to save the changes.
Manage Windows	Opens the Window dialog box and allows you to arrange, minimize, or close the selected protocol and device files.

Help menu

Command	Description
VWorks Help	Opens the default browser window and displays the Knowledge Base.
Report a Bug	Allows you to send a software bug report to Agilent Technologies.
About VWorks	 Displays the following: VWorks software installer number Copyright dates License information Product key List of plugins installed

Toolbar buttons

Standard toolbar

Button	Description
•	Creates a new device file or protocol.
B	Opens the file you select.

Button	Description
	Saves the changes in the protocol or device file
創	Saves all protocol and device files currently ope in the software.
Ж	Removes selected text and stores it in memory
È	Copies selected text and stores it in memory.
1	Pastes the text that is currently stored in memory.
4	Prints the selected protocol, device, or form fil
0	 Displays the following: VWorks software installer number Copyright dates License information Product key List of plugins installed
2	Allows to you to display a help topic in contex of where you are in the software. Click the Context Help button, and then click user-interface item, such as a task icon, to display information about that item.

Control toolbar

Button	Description
Log in Or SLog out	Allows you to log in or log out of the software.
Compile	Compiles the selected protocol.
Start	Starts the protocol run.
Dause all	Pauses the protocol run.
Simulation is on Or	Turns on or turns off the simulation mode.
Off Simulation is off	
Diagnostics	Opens the selected device diagnostics.



VWorks Automation Control User Guide

Managing digital signals

This appendix contains the following topics:

- "About the IO Manager" on page 672
- "Assigning channels to lights and audible alarms" on page 674
- "Setting up channels for pass-through gates" on page 677
- "Setting up channels for spill detection and other sensors" on page 681



About the IO Manager

Description

The IO Manager allows you to assign signals from the Automation Control Unit, or equivalent I/O device, to:

- Status lights and audible alarms
- Pass-through gates
- Spill detection or other sensors

Opening the IO Manager

IMPORTANT Digital signal channels that have been assigned a name will appear in the IO Manager dialog box. Channels that have the default port names will not appear in the IO Manager dialog box. For instructions on naming the digital signal channels, see the *Automation Control Unit User Guide* or the user documentation for the I/O device.

To open the IO Manager:

1 In the VWorks window, select the ACU or equivalent I/O device, and then click Initialize selected devices.

Works - [Device File - 1]			
Ele Edit View Tools W	(indow <u>H</u> elp		_ # X
🗋 • 🖻 🖬 🖗 🐰 🖻	🖺 🔌 🕖 🥕 📕 🔗 Log ol	ut 🏪 Compile 🕟 St	rart 🕕 Pause all 🧟 Simulation is on 💂
Available Devices # ×	🛃 Device File - 1 *		₹ ×
ABgene Automated Seal Pierce		21	
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Agilent BenchBot Robot	Thermo Cytomat 44 Thermo Cytomat 44 - 1 External Transfer Station		
J Agilent BenchCel			
Agilent BioCel I/O Interface			
Agilent Bravo			
Agilent Centrifuge			
Agilent Centrifuge Loader	Initialize all devices		
· 🗆 🔹 🖡	Initialize selected devices	Door	
Enter text to filter on:	Close selected devices		
Enter text to finder on.	Delete selected devices		
Available Workspace Available	Device diagnostics		
Ready		a is logge	id in 🛛 👘 🚛

2 Select Tools > Manage IO. The Manage IO dialog box opens and displays the Lights and Alarms tab.

Notice the following:

- The **Outputs** list contains the renamed digital output channels.
- The **lnputs** list contains the renamed digital input channels. The fields in the Inputs area are automatically filled in and cannot be changed.

Dutputs Air Audible Alarm	Stat	us Lights	Status Light Ty	De
Red Green Yellow			Multicolor	•
	≡ Audil	ble Alarm	Sound Alarm W	hen
	- -		VWorks Error	-
EStop Pendant 1 Zone A EStop Pendant 2 Zone A EStop Pendant 3 Zone B EStop Pendant 4 Zone B	Вура	ass Key	Interlock Bypas ANY input is ⓒ High	v v v v v v v v v v v v v v
		lock Sensors	Interlock Trippe	d When
	Door Door Door	Input 2 Input 3 Input 4 : Curtain Input	ANY input is	▼ O Low
ghts and Alarms / Pa	ss through Ga	ates \Sensors /		

Related information

For information about	See
Location and instructions of the Automation Control Unit or I/O console	 BioCel System User Guide Workstation user guide I/O device user documentation
Setting up the Automation Control Unit	Automation Control Unit User Guide
Status light description	BioCel System User Guide
Writing protocols	"Creating a protocol: basic procedure" on page 13
Adding I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Setting up the BioCel I/O Interface	<i>BioCel System User Guide</i> , Revision 01, August 2010.

Assigning channels to lights and audible alarms

About this topic

In the Manage IO dialog box, you can assign digital output signals from the Automation Control Unit, or equivalent I/O device, to lights and audible alarms.

This topic explains how to do the following:

- "Assigning channels to lights" on page 674
- "Assigning channels to sounds" on page 675

Assigning channels to lights

To assign digital output signals to lights:

1 In the **Lights and Alarms** tab, drag the names of light channels from the **Outputs** list into the **Status Lights** box. To use the multicolor lights, you need three channels, one for each of the colored lights, in the following sequence: red, green, and yellow.

Audible Alarm	Status Light Type
Green L	Multicolor
/ellow	
E Audible Alarm	Sound Alarm When

2 In the Status Light Type list, select Multicolor (red, green, and yellow). If your system does not use lights to indicate output signals, select None.

Air		Status Lights		
Audible Alarm		Red	Status Light Type	
		Green Yellow	Multicolor	
	_		Blue	
			Multicolor	
	-	- Audible Alarm	None	
	E Audible Alarm	Sound Alarm When		
			VWorks Error 👻	

Note: The Blue status light type selection is provided to ensure backward compatibility with older systems only. To use the Blue light, you must have eight channels, one for each of the eight blue status lights at the top corners of the system.

Assigning channels to sounds

To assign digital output signals to audible alarms:

1 In the Lights and Alarms tab, drag the names of the sound channels from the **Outputs** area to the **Audible Alarm** box.

Air Audible Alarm	Status Lights	Status Light Type
	Yellow	Multicolor
	E Audible Alarm -	Sound Alarm When

 $\label{eq:linear} 2 \quad \mbox{In the Sound Alarm When area, select one of the following:}$

Air	Rec	Status Lights Red Green Yellow	Status Light Type	
			Multicolor 👻	
		lible Alarm	Sound Alarm When	
		lible Alarm dible Alarm	Sound Alarm When VWorks Error	

Selection	Description
VWorks error	Sound the alarm only when a run error occurs.
Tripped Interlock	Sound the alarm only when the interlock is tripped.
Both	Sound the alarm whenever a run error occurs or when the interlock is tripped.

Related information

For information about	See
Location and instructions of the Automation Control Unit or I/O console	 BioCel System User Guide Workstation user guide I/O device user documentation
Setting up the Automation Control Unit	Automation Control Unit User Guide
Status light description	BioCel System User Guide

Assigning channels to lights and audible alarms

For information about	See
Writing protocols	"Creating a protocol: basic procedure" on page 13
Adding I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Setting up the BioCel I/O Interface	<i>BioCel System User Guide</i> , Revision 01, August 2010.

Setting up channels for pass-through gates

About this topic

Some systems have an environmental-control option that creates fully contained environments within the system chamber. Automated pass-through gates can be used to permit labware to move between the system and external devices while maintaining the enclosed environment. External devices include an incubator below the system table or next to the system, the waste bin below the system table, and so on.

For each separated device that sits just beyond a pass-through gate, make sure you:

- Set up the signals for the gate in the I/O device. For each gate, two input signals and one output signal are required. One input signal is used to detect whether the gate is open. Another input signal is used to detect whether the gate is closed. The output signal is used to open or close the gate, depending on the control signal received.
- Select the signals that will be used to automate the gate actions.
- Associate the gate to a device.
- Specify the signals to use to automatically open or close gates during a run.

This topic explains how to set up I/O signals for pass-through gates.

Before you begin

Pass-through gates require two 5 VDC digital input channels and one 24 VDC digital output channel. Make sure these channels are configured in the ACU Diagnostics I/O Setup tab before setting them up in the Manage IO dialog box. For instructions on configuring channels in the ACU Diagnostics I/O Setup tab, see the *Automation Control Unit User Guide*.

Procedure

To select signals to automate pass-through gate actions:

- 1 In the Manage IO dialog box, click the Pass-Through Gates tab.
- 2 Click **New** to add a gate.
- **3** Specify the following:

B Managing digital signals

Setting up channels for pass-through gates

Manage IO				? 🔀
Gate Name	Input (open)	Input (close)	Output	Gate Close Delay (s)
Trash Door	Trash Door - Open	Trash Door - Close	Opens or closes trash de 💌	3.00
New	Delete			
ights and A	larms A Pass-Thro	ugh Gates / Sen	sors /	
			Apply OK	Cancel

Parameter	Description
Gate Name	The name of the pass-through gate.
	Double-click in the field to type the name.
Input(open)	The I/O signal that detects whether the gate is open.
	Click the field to display the list of named signals, and then select one. If you do not see the signals in the list, initialize the Automation Control Unit.
Input(close)	The I/O signal that detects whether the gate is closed.
	Click the field to display the list of named signals, and then select one. If you do not see the signals in the list, initialize the Automation Control Unit.
Output	The I/O signal that changes to open or close the gate.
	Click the field to display the list of named signals, and then select one. If you do not see the signals in the list, initialize the Automation Control Unit.

Parameter	Description
Gate Close Delay (sec)	The length of time, in seconds, between when the robot moves labware through the gate and when the gate closes.
	Double-click in the field, and then type an integer.

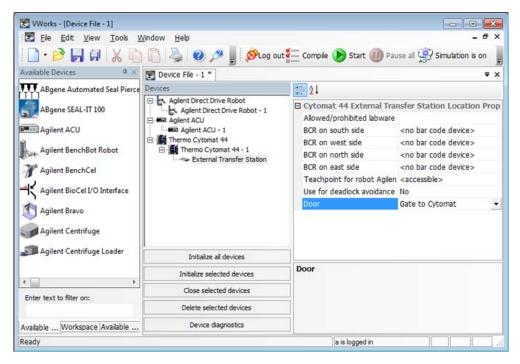
4 When you are finished, click **OK** to save the changes and return to the VWorks window.

To associate the gate to a device:

- **1** In the device file, select the device.
- 2 In the device properties area, select the gate associated with the device from the **Door** list.

Note: You can open the IO Manager from the device properties area to edit or add gates. From the **Door** list, click **<Edit...>**.

In the following example, an automated gate was set up in ACU Diagnostics and the IO Manager for the Cytomat incubator device. The gate that was defined for the incubator in the IO Manager must be selected in the Cytomat device properties area.



Related information

For information about	See
Location and instructions of the Automation Control Unit or I/O console	 BioCel System User Guide Workstation user guide I/O device user documentation

Setting up channels for pass-through gates

For information about	See
Setting up the Automation Control Unit	Automation Control Unit User Guide
Status light description	BioCel System User Guide
Interlock bypass mode description	Automation Control Unit User Guide
Writing protocols	"Creating a protocol: basic procedure" on page 13
Adding I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Setting up the Automation Control Unit	Automation Control Unit User Guide

Setting up channels for spill detection and other sensors

About this topic

Some systems with liquid management components use sensors to detect spills or other events. In the Manage IO dialog box, you can:

- Add new sensors.
- Specify when the sensor is tripped.
- Specify whether a detection event should be recorded in the log file, display an error message, or both.

This topic explains how to assign I/O channels to sensors.

Managing sensor signals

To set up channels for sensor signals:

- 1 In the Manage IO dialog box, click the Sensors tab.
- 2 Click New to add a sensor.
- **3** Specify the following:

Digital Input Name	Sensor Tripped When	Results in	User Specified String	Execute Script
Spill sensor	High	Script	Sensor Tripped	1
Add	Delete			
ights and Alarms	Pass-Through Gates	s > Sensors /		

B Managing digital signals

Setting up channels for spill detection and other sensors

Parameter	Description
Digital Input Name	The digital input signal used by the sensor. Click the field to display the list of channels, and then select the desired channel.
	If the sensor name does not appear in the list, make sure you have configured it in the I/O device diagnostics, such as ACU Diagnostics.
Sensor Tripped When	The state that indicates the sensor is tripped. Select one of the following: high- voltage signal (High) or low-voltage signal (Low).
	The system checks the sensor only during protocol runs. The sensor trips at the specified voltage signal, not the change in the voltage signal. For example, if the sensor should trip when the voltage signal is high, and signal is already high when you start the protocol, the sensor will automatically be tripped.
Results in	The software action when the sensor is tripped. Select one of the following:
	• Log entry . Records detection events in the log file.
	• Message box . Pauses the run and displays an error message when a detection event occurs. The error message explains which sensor is tripped. You can add a custom message by typing the desired text in the Custom Error String field.
	In the error message dialog box, you have the following options:
	 Fix the problem and resume the run.
	 Ignore the sensor (turn it off) and resume the run. The sensor will be turned on again after the protocol run is finished.
	• Script . Runs the specified JavaScript when the sensor is tripped. You can specify the script in the Execute Script box.
User-Specified String	The custom text to be displayed in the error message dialog box. Type the desired text in this field.
	This field is available only if you have selected VWorks error message from the Results in list.

Parameter	Description
Execute Script	The standard JavaScript or predefined JavaScript functions to run when the sensor is tripped. Type the script in the box.
	This box is only active if you selected Script in the Results in list.

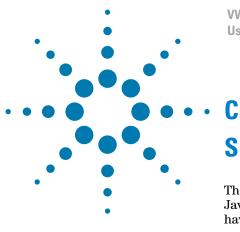
4 When you are finished, click **OK** to save the changes and return to the VWorks window.

Related information

For information about	See
Location and instructions of the Automation Control Unit or I/O console	 BioCel System User Guide Workstation user guide I/O device user documentation
Setting up the Automation Control Unit	Automation Control Unit User Guide
Status light description	BioCel System User Guide
Interlock bypass mode description	Automation Control Unit User Guide
Writing protocols	"Creating a protocol: basic procedure" on page 13
Adding I/O-handling tasks	"Setting parameters for I/O-handling tasks" on page 269
Setting up the Automation Control Unit	Automation Control Unit User Guide

B Managing digital signals

Setting up channels for spill detection and other sensors



VWorks Automation Control User Guide

Setting up and using the Watcher tool

This appendix assumes that you know how to write programs in JavaScript or have basic programming knowledge. You also must have VWorks administrator or technician privileges.

The topics in this appendixsection are:

- "Watcher overview" on page 686
- "Creating the script that Watcher will run" on page 687
- "Setting up the Watcher configuration file" on page 691
- "Turning on Watcher" on page 695



Watcher overview

Description

Watcher is a tool that automates the processing of designated files using JavaScript. Watcher monitors a designated folder for new file activity, and when a new file appears, Watcher runs a specified JavaScript to process the file. A couple of scenarios are described below, but your script might process files in a variety of other ways.

Scenario 1—Asynchronous post-processing of instrument-generated files

In this scenario, Watcher automates the post-processing of instrumentgenerated files as follows:

- A protocol includes a reader task that generates an output file and stores the file in a folder that is designated for monitoring by Watcher.
- When the new file appears in the folder, Watcher validates the file and then runs a script.
- The script parses out the relevant information from the instrumentgenerated file and performs additional tasks, such as aggregating the information across multiple files or saving the information in a database.

Scenario 2—Creating data-driven working protocols from a template protocol

In this scenario, the VWorks software is integrated with a LIMS. Watcher runs a script that automates the creation of a working protocol based on a template protocol and a LIMS-generated input file, where:

- *Input file*. A file that appears in the watched folder. In this scenario, the file specifies attributes of a single protocol run.
- *Template protocol.* A protocol that is used as the basis for creating a working protocol.
- *Working protocol.* The protocol that is created by JavaScript based on the template protocol and the input file.

When an input file appears in the Watcher monitored folder, Watcher runs a script. The script that has to parse the input file must be developed to recognize the file format. The script uses the information from the input file to modify the template protocol into a working protocol, and then schedules the newly created working protocol as part of a runset.

For an example script of this scenario, see "Creating the script that Watcher will run" on page 687.

Workflow for setting up and using Watcher

Step	For this task	See
1	Create the JavaScript that Watcher will run.	"Creating the script that Watcher will run" on page 687
2	Set up the Watcher configuration file.	• "Creating the configuration file" on page 691
		• "Specifying the configuration file location" on page 693

C Setting up and using the Watcher tool

Creating the script that Watcher will run

Step	For this task	See
3	Turn on the Watcher.	"Turning on Watcher" on page 695

Creating the script that Watcher will run

About this topic

This topic assumes that you know how to write programs in JavaScript or have basic programming knowledge.

For a full description of the JavaScript language, see the Mozilla Developer Center at http://www.mozilla.org/js/.

Guidelines for creating your script

In addition to using good script-writing practices, follow these guidelines when creating a script for Watcher to run:

• *Define the JavaScript function correctly.* The function that Watcher will run, for example WatcherMain, must take one parameter:

Parameter	Туре	Description
input_file	string	The file path to the input file.

The name of the function in the script must match the function name in the Watcher configuration file (.ini).

Creating the script that Watcher will run

• *Identify or create any other scripts that your script will call.* Automation Solutions has JavaScript files with predefined objects and functions that you may use, including:

Script file name	Description
DeviceArbitration.js	Enables device pooling in JavaScript.
FileUtilities.js	Provides the following functions:
	isFileExist(filename)
	DeleteFile(filename)
	<pre>StripPath(full_path) //for example, changes "c:/mydir/mysubdir/ myfile.ext" to "myfile.ext"</pre>
	<pre>ForwardToBackSlashes(full_path) //for example, changes "c:/mydir/ mysubdir/myfile.ext" to "c:\mydir\mysubdir\myfile.ext"</pre>
ProtocolEditor.js	Provides various functions for editing a protocol.
StopGo.js	Provides a way to create stop and go tasks using JavaScript, which is useful when stop and go should be scripted based on instance number.
VIN_handling.js	Provides a way to assign virtual instance numbers (VIN) to plates. This is useful if instance numbers:
	• Must be passed from process to spawned process.
	• Require an out-of-order assignment, for example, if rejecting some plates, sequential [virtual] instance numbers can be assigned to the plates that remain.
XMLKeyValueLookup.js	Script and sample data for mapping one string
XMLKeyValueLookup SampleData.xml	to another string, where the definition is in XML format. For example, you might use this script to translate an alias into a final file name.
XML_files.js and Formatter.xml	Provides script for opening XML files, validation against schemas, and saving. Uses MSXMLDOM ActiveX, which requires Msxml2.DOMDocument.6.0 and Msxml2.XMLSchemaCache.6.0.
File_operations.js	Provides functions for various file operations, such as creating, reading, writing to, and debugging files.
plateDB_HowTOUse.js	Provides examples on how to use the VWorks plateDB object, which can be accessed by a script. For a description of the plateDB object, see "plateDB object" on page 112.

• *Define any required global variables, such as folder paths.* You should define the folder paths where processed files will be stored, such as the VWorks folder, the working folder, and an output folder, if applicable. For example, you might define the following:

var VWorksFolder	= "C:/VWorks Workspace/"
var WorkingFolder	= VWorksFolder + "WorkingFolder/"

var	OutputFolder	=	VWorksFolder	+	"Output/"	,
-----	--------------	---	--------------	---	-----------	---

• Include code at the end of the script to delete the input file from the monitored folder, if applicable. To prevent repeated processing of files upon restarting Watcher, the script should delete the input file or move it into a processed folder or output folder after processing the file.

Example script:

print("deleting input file: [" + input_file_name + "]")
DeleteFile(input file name);

Script example—Creating data-driven working protocols from a template protocol

This section provides example script for scenario 2 in "Description" on page 686. In this scenario, Watcher monitors a folder for new input files, each of which specifies the attributes of a single protocol run. When a new input file appears in the folder, Watcher runs a script to create a working protocol based on a template protocol and an input file, and then schedules the protocol.

The following script example shows a hypothetical WatcherMain function, which does following:

- **1** Verifies that the input file exists.
- **2** Reads the input file.
- **3** Opens the template protocol.
- 4 Modifies the template protocol to create a working protocol.
- **5** Saves the input file and the modified protocol (working protocol) to the working folder.
- 6 Schedules the working protocol as part of a runset.
- 7 Deletes the input file from the monitored folder.

To accomplish some of these tasks, the WatcherMain function includes calls to other predefined JavaScript functions, such as inputParser and protocolEditor.

C Setting up and using the Watcher tool

Creating the script that Watcher will run

WatcherMain function example

```
function WatcherMain(input file name) {
  print("Starting WatcherMain...with input file: [" + input file name + "]")
  print("OutputFolder : [" +OutputFolder+"]")
  if(!isFileExist(input file name))
      Print("input file does not exist");
  var inputParser = new InputParser();
  inputParser.Open(input file name);
  var protocol file name = inputParser.getOrderAttribute("protocol")
  print("\n protocol file: " + protocolKey);
  print("\n protocol file name: " + protocol file name);
  var time string = getTimeString()
  var protocolEditor = new ProtocolEditor();
  protocolEditor.Open(protocol file name);
  var working input filename = WorkingFolder + time string + " " +
   StripPath(input_file name)
  print("saving working input file to: ["+working input filename+"]")
  inputParser.Save(working input filename)
  print("success")
  print("modifying protocol")
  ModifyProtocol(inputParser, protocolEditor, working input filename);
  print("success")
  var working protocol filename= WorkingFolder + time string + " " +
   StripPath(protocol file name)
  print("saving working protocol to: ["+working protocol filename+"]")
  protocolEditor.Save(working protocol filename);
  print("success")
  runset.appendProtocolFileToRunset(working protocol filename, 1, "this is
   a note: blah", false)
  print("deleting input file: [" + input file name + "]")
  DeleteFile(input file name);
```

}

Related information

For information about	See
Getting a license for Watcher	Automation Solutions Customer Service
Configuring the Watcher feature	"Setting up the Watcher configuration file" on page 691
Creating the JavaScript	"Creating the script that Watcher will run" on page 687
Turning on or off the Watcher feature	"Turning on Watcher" on page 695

Setting up the Watcher configuration file

About this topic

This topic assumes that you know how to write programs in JavaScript or have basic programming knowledge. You must also have VWorks administrator or technician privileges.

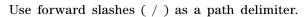
Creating the configuration file

Watcher requires a single configuration file (.ini) that contains one entry (monitoring condition) per line. Each monitoring condition entry must consist of the following four values separated by commas:

<folder to monitor>,<file filter>,<JavaScript file location>, <JavaScript function>

🖡 WatcherConfiguration.ini - Notepad				
File Edt Format View Help				
c:/vwork	<pre>workspace/In</pre>	puts,*.xml,C:/Vwor	ks workspace/Scripts/mys	script.js, main 📩
		-		
L				
	1	2	3	4
ltem	Value	Descrip	tion	
1	Folder to n		ll path to the file fold or for new files.	ler that Watcher wil

Figure Watcher configuration file showing an example of the four comma-separated values



C Setting up and using the Watcher tool

Setting up the Watcher configuration file

ltem	Value	Description
2	File filter	The file name extension of the file type to be monitored. The filter applies to file name extensions only. You cannot filter by partial file names.
3	JavaScript file location	The full path to the JavaScript file. Use forward slashes (/) as a path delimiter.
4	JavaScript function	The function in the JavaScript file that you want to run when the desired files appear in the monitored folder.

Configuration example—Monitoring one folder for one file type

In the following example, Watcher will monitor the Inputs folder for the file type .xml. When an .xml file is added to the folder, Watcher will run myscript.js and call the main function. The function main must be defined to take in one parameter, the full path of the file that has appeared in the folder to be watched.

• Contents of .ini file:

```
C:/VWorks Workspace/Inputs,.xml,C:/VWorks Workspace/
Scripts/myscript.js, main
```

• Contents of myscript.js file:

```
function main(input_file) {
    print("in main: " + input_file)
}
```

Configuration example—Monitoring one folder for more than one file type

The Watcher configuration file (.ini) can specify multiple monitoring conditions, but each condition must be stated on a single line and consist of the four comma-separated values.

In the following example, Watcher will monitor the Inputs folder for the file types .xml and .rst (runset). When either file is added to the folder, Watcher runs myscript.js and calls the corresponding JavaScript function for the file type. The functions mainXML and mainRST must be defined to take in one parameter, the full path of the file that has appeared in the folder to be watched.

Figure Watcher configuration file example specifying one folder and two file types for monitoring



For this example, the myscript.js file would contain the following code: function mainXML(input file) {

```
print("in mainXML: " + input_file)
}
function mainRST(input_file){
```

```
print("in mainRST: " + input_file)
```

Configuration example—Monitoring more than one folder

You can specify that more than one folder be monitored and run different scripts for different file types that appear in each folder.

Figure Watcher configuration file example specifying two folders and two file types for monitoring

Ele Edit Format View Help	
C://Works Workspace/InputsXML,*.xml,C://Works Workspace/Scripts/myscript.js, C://Works Workspace/InputsRST,*.rst,C://Works Workspace/Scripts/myscript.js,	-

Using the same script from the previous example, this configuration file would do the following:

- Monitor the InputsXML folder for new .xml files, and then call the mainXML function. The mainXML function must be defined to take in one parameter, the full path of the file that has appeared in the folder to be watched.
- Monitor the InputsRST folder for new .rst files, and then call the mainRST function. The mainRST function must be defined to take in one parameter, the full path of the file that has appeared in the folder to be watched.

Specifying the configuration file location

}

To set the configuration file location:

1 Select **Tools > Options**. The Options dialog box opens.

C Setting up and using the Watcher tool

Setting up the Watcher configuration file

Password:	
Send email from:	
Send email when an error occurs:	Г
Addresses to send to when an error occurs:	
View Options	
Hide disabled parameters:	
Remember simulator state between sessions:	
DB Setup	
Enable database connection:	
Connection string:	
Error Handling	
Halt on low disk space:	
Disk space threshold (0 - 100 %):	
Scheduler error behavior:	Processes as many plates as possible
Deadlock behavior:	Abort
Watcher Options	
Path to Watcher configuration file:	
Start watching when user logs in:	

- 2 In the Watcher Options area, click the field next to Path to Watcher configuration file, and then click the button that appears.
- 3 In the Open dialog box, select the desired location and click Open.
- 4 In the **Options** dialog box, verify the new path, and then click **OK**.

Related information

For information about	See
Getting a license for Watcher	Automation Solutions Customer Service
Creating the JavaScript	"Creating the script that Watcher will run" on page 687
Turning on or off the Watcher feature	"Turning on Watcher" on page 695
Reporting problems with the software	"Reporting problems" on page 661

Turning on Watcher

About this topic

This topic assumes that you have VWorks administrator or technician privileges.

About monitoring new files

The first time you turn on Watcher, the program runs the specified JavaScript for the existing files in the folder that is configured for monitoring. Subsequently, Watcher processes only the new files that appear in the folder.

Watcher will not process existing files whose contents were modified. For example, if a new file replaces an existing file with the same file name, Watcher does not reprocess the file. If you rename an existing file, Watcher processes the renamed file as a new file.

Turning on and turning off Watcher

You can turn on Watcher manually or automatically every time you log in to the VWorks software. You can turn off Watcher manually.

To turn on Watcher manually:

1 Select Tools > Watcher is OFF. The menu command changes to Watcher is On.

To turn on Watcher automatically every time you log in:

- **1** Select **Tools > Options**. The Options dialog box opens.
- 2 In the Watcher Options area, select Start watching when user logs in.

The next time a user logs into the VWorks software, Watcher will turn on automatically and remain on after the user logs out.

To turn off Watcher:

1 Select **Tools > Watcher is On**. The menu command changes to Watcher is Off.

To prevent Watcher from turning on automatically when a user logs in:

- **1** Select **Tools > Options**. The Options dialog box opens.
- 2 In the Watcher Options area, clear the Start watching when user logs in check box.

Options	?
: ∎ 2↓	
Authorized user:	
Password:	
Send email from:	
Send email when an error occurs:	П
Addresses to send to when an error occurs:	
View Options	
Hide disabled parameters:	
Remember simulator state between sessions:	
🗆 DB Setup	
Enable database connection:	Г
Connection string:	
🗆 Error Handling	
Halt on low disk space:	Г
Disk space threshold (0 - 100 %):	
Scheduler error behavior:	Processes as many plates as possible
Deadlock behavior:	Abort
Watcher Options	
Path to Watcher configuration file:	
Start watching when user logs in:	

Figure Options dialog box showing the Watcher Options area

Related information

For information about	See
Reporting problems	"Reporting problems" on page 661
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