VWorks Automation Control

Setup Guide

Agilent Technologies

Notices

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Contents

Preface

This preface contains the following topics:

Who should read this guide

Job roles

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, administrator, or technician	Someone who is responsible for: • 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.

Related topics

For information about...	See...
What is covered in this guide	"What this guide covers" on page vii
How to access user guides	"Accessing Automation Solutions user guides" on page viii
VWorks software available licenses	"Description of VWorks software license packages" on page 2

What this guide covers

What is covered

This guide describes how to:

- Install VWorks software
- Migrate protocols from previous versions of VWorks software.
- Define labware
- Specify pipette speed and accuracy
- Track and manage labware using a database inventory system,
- Manage user accounts
- Implement ActiveX

What is not covered

This guide does not provide instructions for the following:

- Writing protocols
- Running protocols
- Troubleshooting protocols
- Operate devices using VWorks software

For information about these topics, see the *VWorks Automation Control User Guide*, relevant Agilent Technologies device user guide or third-party user documentation.

Software installer

This guide documents VWorks software installer 9 and later.

Related guides

The *VWorks Automation Control Setup Guide* should be used in conjunction with:

- *VWorks Automation Control User Guide*
- Agilent Technologies device user guides
- Third-party device user documents

Related topics

For information about...	See...
Accessing user guides for Automation Solutions products	"Accessing Automation Solutions user guides" on page viii
VWorks software available licenses	"Description of VWorks software license packages" on page 2

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.

Accessing safety information

Safety information for the Automation Solutions devices appears in the corresponding device user guide.

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

Using the knowledge base

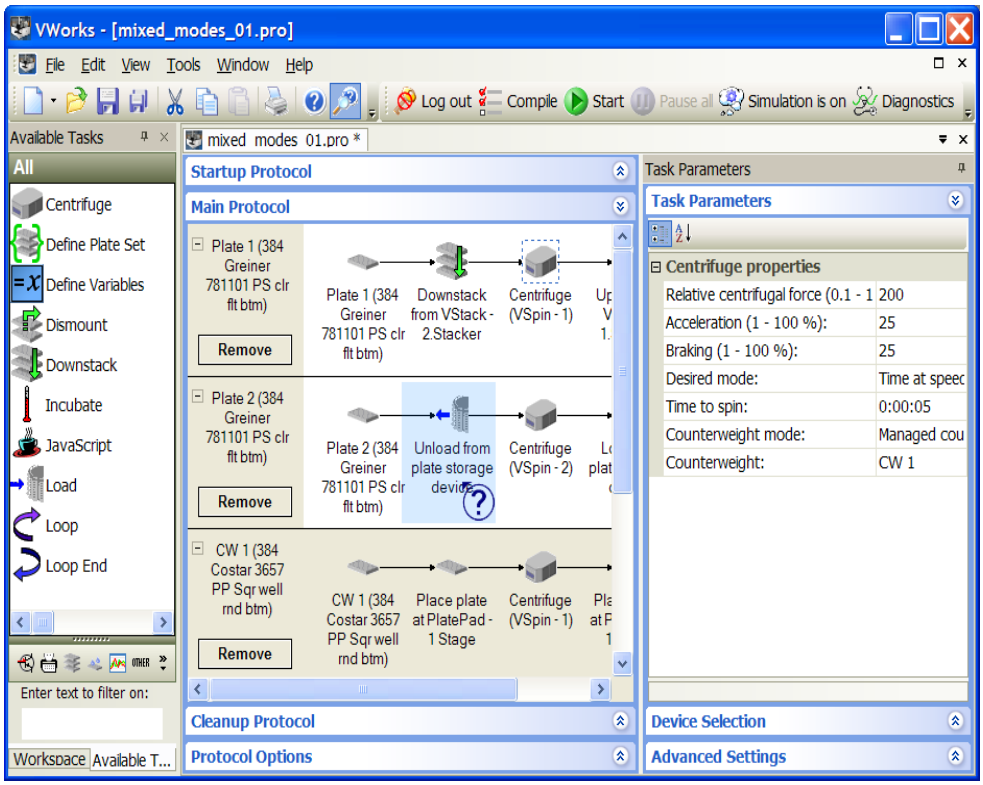
Knowledge base topics are displayed using web browser software such as Microsoft Internet Explorer and Mozilla Firefox.

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

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

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

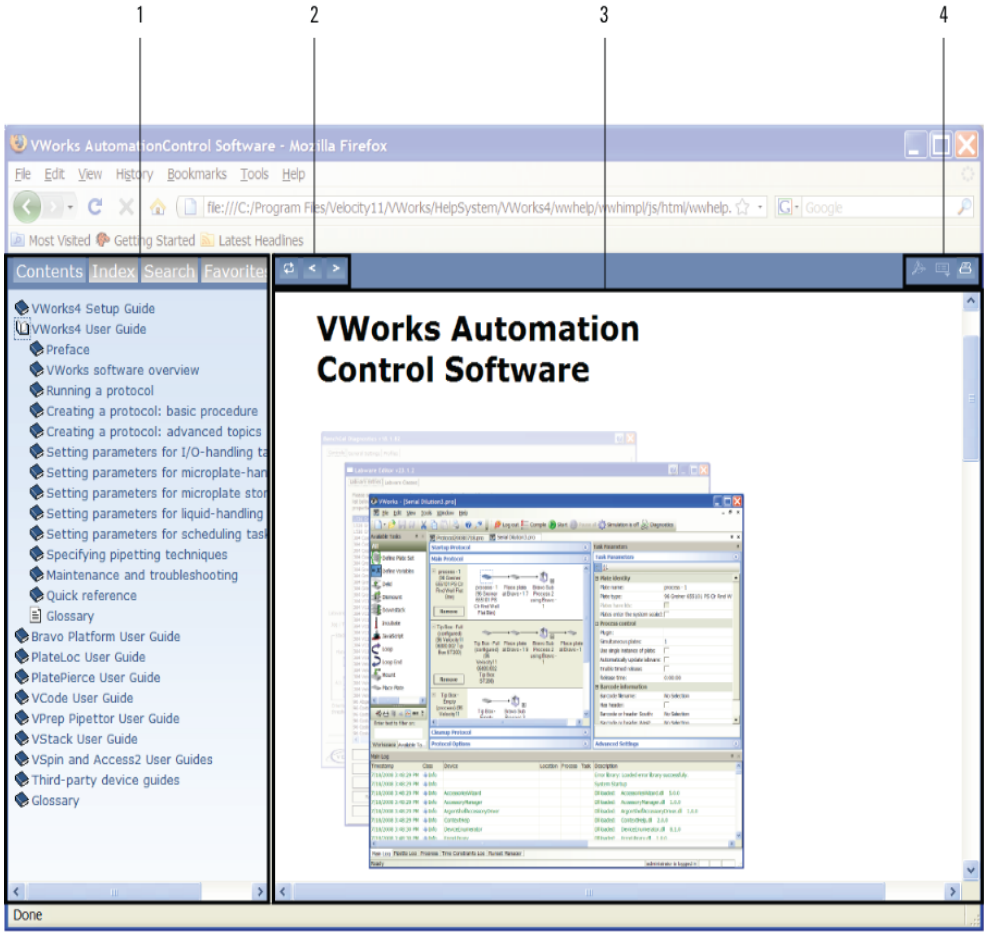
Opening the help topic for an area in the VWorks window



To access the context-sensitive help feature:

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

Features in the Knowledge Base window



Item	Feature
1	*Navigation area.* Consists of four tabs: • *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 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.

Related topics

For information about...	See...
What this guide covers	"What this guide covers" on page vii
Who this guide is for	"Who should read this guide" on page vi
VWorks software available licenses	"Description of VWorks software license packages" on page 2

1 Installing and setting up the VWorks software

This chapter contains the following topics:

Description of VWorks software license packages

License packages

There are eight license packages available for VWorks Automation Control software. They are described in the table below.

This package...	Is used for...
Simulation license	Running VWorks software in simulation mode. This license is useful for testing protocols on computers that are not controlling any devices.
Instrument license	Controlling a Bravo Platform, Vertical Pipetting Station, or Microplate Labeler in a standalone mode.
BenchTop license	Either • Controlling a BenchCel Workstation and up to 10 devices associated with it. • Controlling a BenchCel Workstation using 3rd-party software.
System license	Controlling an automation system that has an articulating robot arm such as a 3-Axis Robot.
VWorks Appication Programming Interface license	Controlling VWorks software by an external system.
VWorks Hooks Interface license	Integrating with LIMS, sample, and workflow management systems by providing a callback interface to hook into key VWorks software events.
VWorks DCL Interface license	Writing device drivers using a COM interface.
VWorks Software Developer Kit license	Interfacing with VWorks software using VWorks Appication Programming Interface license, VWorks Hooks Interface license, and VWorks DCL Interface license.

Related topics

For information about...	See...
Installing VWorks software	"Installing the VWorks software" on page 3

For information about...	See...
Uninstalling VWorks software	"Uninstalling the VWorks software" on page 4
Upgrading to a new licence	"Upgrading or replacing the VWorks software license" on page 6
Migrating a protocol created with a previous version of VWorks software	"Migrating files created in VWorks 3 and BenchWorks" on page 7

Installing the VWorks software

About this topic

This topic explains how to install the VWorks software. If you have an existing version of VWorks software on the computer, and you are upgrading, see "Upgrading or replacing the VWorks software license" on page 6. If you have a previous version of VWorks, you must uninstall it first. For instructions, see "Uninstalling the VWorks software" on page 4.

Procedure

To install the new VWorks software

1. Insert the VWorks software CD into the computer's CD-ROM drive. The software installer should start automatically. If it does not, navigate to the CD-ROM drive, and then double-click VWorks.exe.
2. Follow the instructions on the installation software screens.
3. In the last screen, select **Launch VWorks software Activation Program** if this is a new VWorks software installation (you did not have an existing version on the computer).
4. Click **Finish**. If you selected Launch VWorks software Activation Program, the VWorks software Activation dialog box opens. Follow the instructions in the dialog box to obtain a software license file.
5. Place the license file (VWorks.vln) in the folder that contains the VWorks software. For example, if you installed the software in the C:\Program Files\Agilent Technologies\VWorks folder, place the VWorks.vln file in that folder.

Related topics

For information about...	See...
Upgrading software license	"Upgrading or replacing the VWorks software license" on page 6

For information about...	See...
Uninstalling VWorks software	"Uninstalling the VWorks software" on page 4
Migrating protocols created with a previous version of VWorks software	"Migrating files created in VWorks 3 and BenchWorks" on page 7

Uninstalling the VWorks software

About this topic

If you have a previous version of the VWorks software, you must first uninstall it before installing the new software. This topic explains how to uninstall the existing software.

When to remove the Automation Solutions registry files

Typically, uninstalling the VWorks software without removing the registry files is sufficient. However, you can remove the Automation Solutions files from the registry if:

- You want to make a completely fresh start with VWorks software, removing all user accounts, teachpoints, device profiles, and liquid and labware definitions,

  or

- You do not intend to run VWorks software on that computer again

Procedures

To remove VWorks software:

1. On the **Start** menu, **Control Panel**. The Control Panel window appears.
2. Double-click **Add/Remove Programs**. The Add or Remove Programs dialog box opens.
3. Locate and select the VWorks software you want to uninstall, then click **Change/Remove**. The removal process might take a few minutes.

When the removal process is finished, the following folder and file remain in the ...\VWorks or ...\VWorks4 folder:

- Users folder
- VWorks.vln file

The following folders remain in ...\VWorks Workspace if they contain files:

- Barcode Input Files
- Protocol Files
- Device Files
- RunSet Files

- Scripts
- VWorks
  - Pipette Techniques
  - Hit Picking
  - Tip Box States
  - Logs

CAUTION The following procedure deletes the user accounts, labware definitions, liquid library data, device profiles, and teachpoints.

To remove the VWorks software files from the registry:

1. From the Windows **Start** menu, select **Run**.
2. In the **Open** text box, type **regedit**.
3. Click **OK**. The Windows registry editor opens.
4. Expand folders to select the following folder:
   HKEY_LOCAL_MACHINE\SOFTWARE\Velocity11
   Make sure you have selected the Velocity11 folder.
5. Select **Edit** > **Delete**.

   CAUTION Making a mistake and deleting the wrong registry folder can cause critical failures with your operating system.

Related topics

For information about...	See...
Converting protocols created with previous versions of VWorks software	"Migrating files created in VWorks 3 and BenchWorks" on page 7
Reporting a problem	*VWorks Automation Control User Guide*
Setting up email for error notification	"Setting up email for error notification" on page 105

Upgrading or replacing the VWorks software license

About upgrading

If you purchased an upgrade to VWorks software, or if you lost your current license, you do not have to re-install the software but you must activate the new license.

Procedure

To upgrade or replace your new license:

1. Open VWorks software.
2. Select **Options > Request license file**.
3. Follow the instructions in the dialog box to obtain a software license file.
4. For upgrading to a new license:
   - Place the license file (VWorks.vln) in the folder that contains the VWorks software and allow it to overwrite the old license file.

   For replacing a lost or deleted license:
   - Place the license file (VWorks.vln) in the folder that contains the VWorks software.

For information about...	See...
Uninstalling VWorks software	"Uninstalling the VWorks software" on page 4
Available VWorks software licenses	"Description of VWorks software license packages" on page 2
Migrating protocols created in a previous version of VWorks software	"Migrating files created in VWorks 3 and BenchWorks" on page 7

Migrating files created in VWorks 3 and BenchWorks

About this topic

When you start the VWorks software for the first time, you will be prompted to migrate existing BenchWorks or VWorks3 protocols and associated files so that they will be compatible in the new software. This topic explains how to migrate the protocols and associated files.

Files types that require migration

The following BenchWorks or VWorks3 files must be migrated to be compatible in the new software:

- Profiles
- Devices
- Protocols
- Runsets
- Labware
- Liquid classes
- JavaScript

Preparing for the migration

Careful planning and preparation can optimize the migration process. Before you start migrating your files, make sure you are aware of any limitations or post-migration adjustments you need to make. For example, some devices have been renamed. The software will change the device names during migration, but you should review the files to make sure they are correct before running protocols.

If you have questions or need assistance, contact Automation Solutions Technical Support.

User account passwords

During the migration, all user account passwords are reset to `password`. After migration, check the user accounts. As an Administrator, you can change `password` to a default password that complies with your organization's user account policies.

Liquid class specifications

If no liquid class was specified in the VWorks3 software, the following VWorks3 VPrep parameters are moved into the Liquid Library after migration:

- Aspirate velocity
- Aspirate acceleration
- Dispense velocity
- Dispense acceleration

BioIO specifications

The BioIO specifications in the VWorks3 software are not migrated. After the migration process, you must add the BioCel I/O Interface device, create a profile for it, and set up the signal channels.

Vertical Pipetting Station shelves

Standard, Reagent, and Shaking shelves can be migrated. The following shelves will be converted to Standard shelves and must be reconfigured after the migration:

- Filter
- Servo
- Tipbox
- Tip Chute

JavaScript parameters

All tasks and parameters referenced in JavaScript are migrated with the following exceptions. After migration, make sure you check the JavaScript and make the necessary modifications manually.

- Print and Apply
- Deerac Fluidics Equator device, Execute Method
- Labcyte Echo 550 device
  - Cherry Transfer
  - NBSurvey
  - Standard Transfer
- Tecan Freedom EVO device
  - Run Script(SubProcess)
  - Run Worklist(SubProcess)
- FLIPR Tetra device
  - Run Protocol
  - Load Tips
  - Unload Tips
- Hamilton Microlab STAR device, Execute Method

Device names

Some devices have been renamed. During migration, the software will change the names in the migrated files, and the new names will appear in the VWorks software. Make sure you check the protocols and device files before running protocols.

Old name	New name
Access2 Automated Microplate Loader	Automated Centrifuge Loader, or Centrifuge Loader
Bio IO	BioCel I/O Interface
Delid Station (Vacuum), Tip Box Delidder	Vacuum Delid Station
PlatePierce Seal Piercing Station	Microplate Seal Piercer
Shuttle Robot Microplate Rotator	Shuttle

Old name	New name
VCode Barcode Print and Apply Station	Microplate Barcode Labeler
Velocity11 Conveyor	Microplate Conveyor
Velocity11 Phantom Human Robot	Phantom Robot
Velocity11 Robot	3-Axis Robot
VMix Mixing Station	Mixing Station
VPrep Pipetting System	Vertical Pipetting Station
VShuttle Rotating Microplate Mover	Rotator
VSpin Microplate Centrifuge	Microplate Centrifuge
VStack Labware Stacker	Labware Stacker

Tasks not supported by the VWorks software

The following tasks are currently not supported in VWorks software:

- Fill Plate (VPrep)
- DryTips (VPrep)
- PrePostMix (VPrep)
- Dispense (Genetix QFill)
- Run Program (Nanodrop)
- Seal (Remp CSP)
- Read Plate (Ultramark)
- Toggle door (Door)
- PrePostWellmate (Wellmate)
- Read Plate (Zeiss)

Parameters not supported by the VWorks software

The VCode Print and Apply PLUGIN parameter is not supported in the VWorks software.

Treatment of excluded devices in the VWorks3 Incubate task

After migration, an Incubate task will list all devices referenced by the device file in the Available Devices list. The devices that were specifically excluded in the original VWorks3 task will not appear in the list.

Other migration notes

The software allows you to migrate a protocol file that is not associated with a device file. However, you must associate the migrated protocol with a device file before running it.

Migrating protocols

CAUTION Before you migrate to VWorks software, back up all of your profiles, device files, and protocols.

To migrate a single protocol file:

Note: Existing protocols are not affected by this procedure.

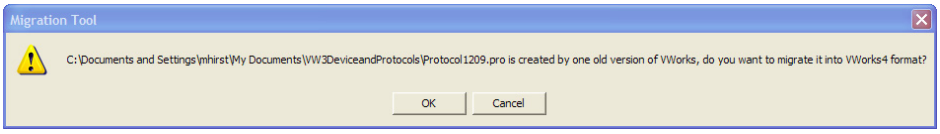
1 Start the VWorks software.

IMPORTANT If this is the first time you are starting the VWorks software on this computer, a dialog box displays informing you that some settings from the previous version of software was found and asks if you want to migrate these settings. This refers only to global settings, not protocols.

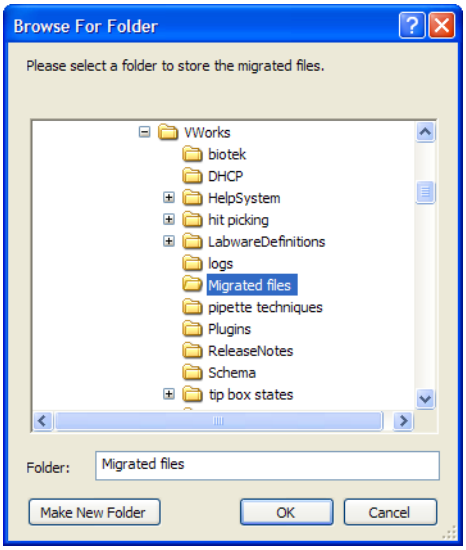
2 Select **File > Open**.

3 Locate and select the protocol, then click **Open**.

4 Click **OK** to the warning message explaining that you are opening a protocol created in an older version of VWorks.

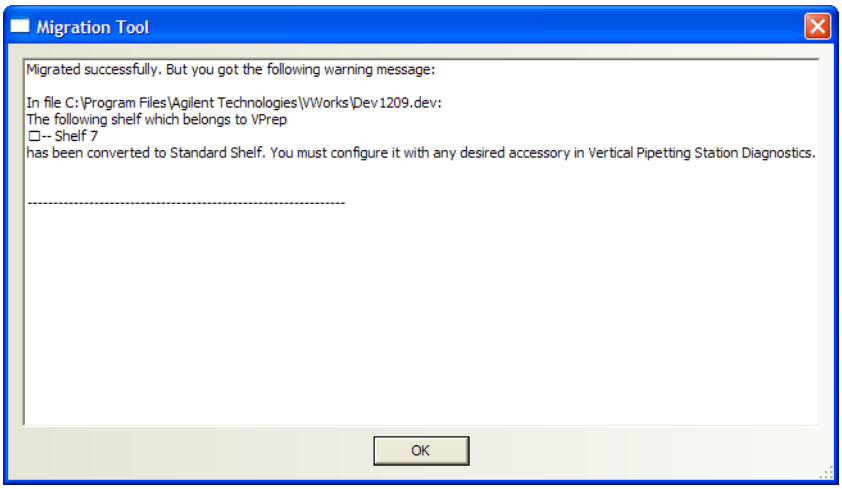


5 Navigate to a folder, or create a new one for the migrated protocols and click **OK**.



The migration starts. All associated files (device, profiles, teachpoints, labware definitions, liquid definitions) are migrated and the new files appear in the newly created destination folder.

When the migration is completed, a message is displayed informing you if the migration was successful and any warnings that were encountered during the migration. An example is shown below:



Click OK to close the message box.

6 In VWorks software, check the Log area for error messages.

VWorks software notifies you of any changes to task parameters that occurred during the development of VWorks software. For example, auto tip tracking is now available in VWorks software but was not in VWorks3 software.

7 Verify the protocol is intact and start using any of the new task parameters now available in VWorks software.

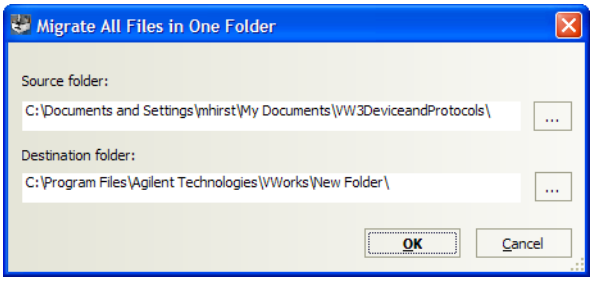
8 Save the new protocol file.

To migrate a number of protocols stored in one folder:

1 Start the VWorks software.

IMPORTANT If this is the first time you are starting VWorks software on this computer, a dialog box displays informing you that some settings from the previous version of software was found and asks if you want to migrate these settings. This refers only to global settings, not protocols.

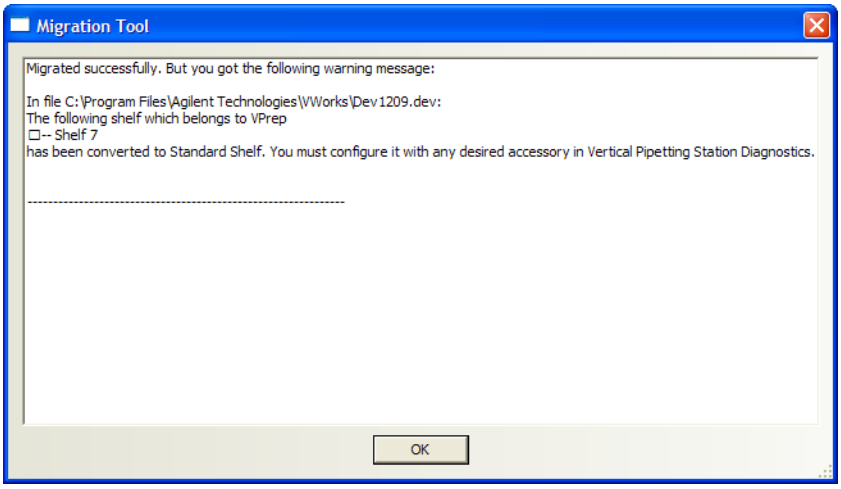
2 Select **Tools** > **Migrate all files in a folder**. The Migrate All Files in One folder dialog box opens.



3 Select the source and destination folders and click **OK**.

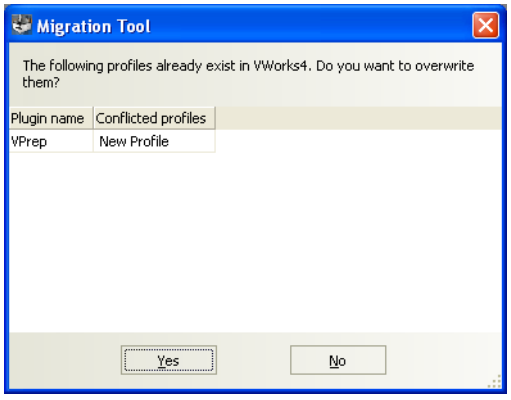
The migration starts. All associated files (device, profiles, teachpoints, labware definitions, liquid definitions) are migrated and the new files appear in the newly created destination folder.

4 When the migration is completed, a message is displayed informing you if the migration was successful and any warnings that were encountered during the migration. An example is shown below:



Migrating profiles

When protocols are migrated from an older version of the VWorks software, the profiles are automatically migrated unless there is a naming conflict. VWorks software installs some default profiles. These profiles may have the same name as ones you created in previous version of the VWorks software. If so, when starting the VWorks software the first time, you may see a dialog box such as the following:



Related information

For information about...	See...
Different file types and how they are related	*VWorks Automation Control User Guide*
Setting up user accounts	"Managing user accounts" on page 101
Devices supported by the VWorks software	*VWorks Automation Control User Guide*

For information about...	See...
Adding the BioCel I/O Interface and setting up digital signals	*BioCel System User Guide*

2 Defining labware

This chapter contains the following topics:

About defining labware with the Labware Editor

Labware defined

Labware is a physical object such as a plate, lid, or tip box that will be acted upon by the tasks stored in your protocol.

VWorks software requires all labware to be handled by the automation system defined in the labware database.

Labware entry defined

A labware entry is the collection of property values used to describe a piece of labware. This information is used by VWorks software to command the robot and other devices to do tasks based on the information in the definition.

All labware parameters are entered and accessible through the Labware Editor.

Labware Editor defined

The Labware Editor is the VWorks software interface through which you can enter information about labware.

You must be logged in as an administrator or technician to use the Labware Editor.

Types of information stored

Two main types of information are stored in the labware database:

- Information about the labware properties
- Information about labware classes

About labware properties

Labware has physical properties such as width, length, and number of wells. Labware can also have non-physical properties, such as robot-handling speed, offsets, and plate-handling options.

With the Labware Editor, all you have to do is select the type of labware to use each time you set up a protocol.

About labware classes

Labware classes are sets of labware entries, grouped so they are easier to manage than many individual labware entries.

Labware classes are used in combination with the device manager to restrict which types of labware can be used on which devices during a protocol run. This prevents wasted runs and damage to the devices on the platform.

An example of how damage can be prevented by labware restriction is where a tipbox that is too tall for a device crashes into the device as the robot delivers it.

Related information

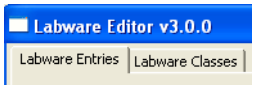
For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Overview of the Labware Editor	"Labware Editor overview" on page 17
Opening the Labware Editor	"Opening the Labware Editor" on page 21

Labware Editor overview

Labware Editor pages

The Labware Editor has two tabs at the top of the screen:

- *Labware Entries*. The tab contains labware definitions
- *Labware Classes*. The tab contains a list of labware classes and the labware entries for each class

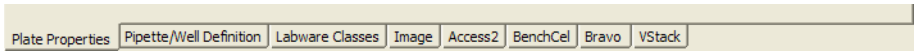


Labware Entries page

Sub-pages

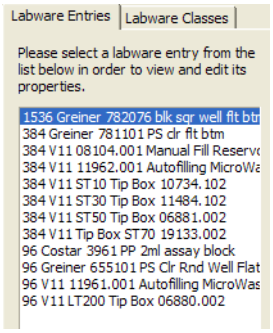
The Labware Entries tab contains the following tabs at the bottom of the screen:

- Plate Properties
- Pipette/Well Definition
- Labware Classes
- Image
- Loader
- BenchCel
- Bravo
- Stacker



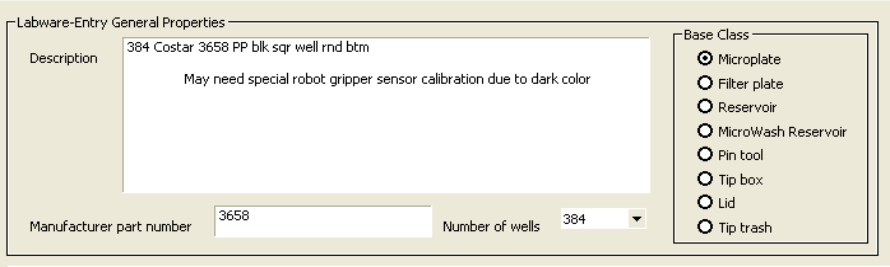
Labware selection box

The labware selection box, which is the left-hand column, is used to select a labware entry that you want to edit.



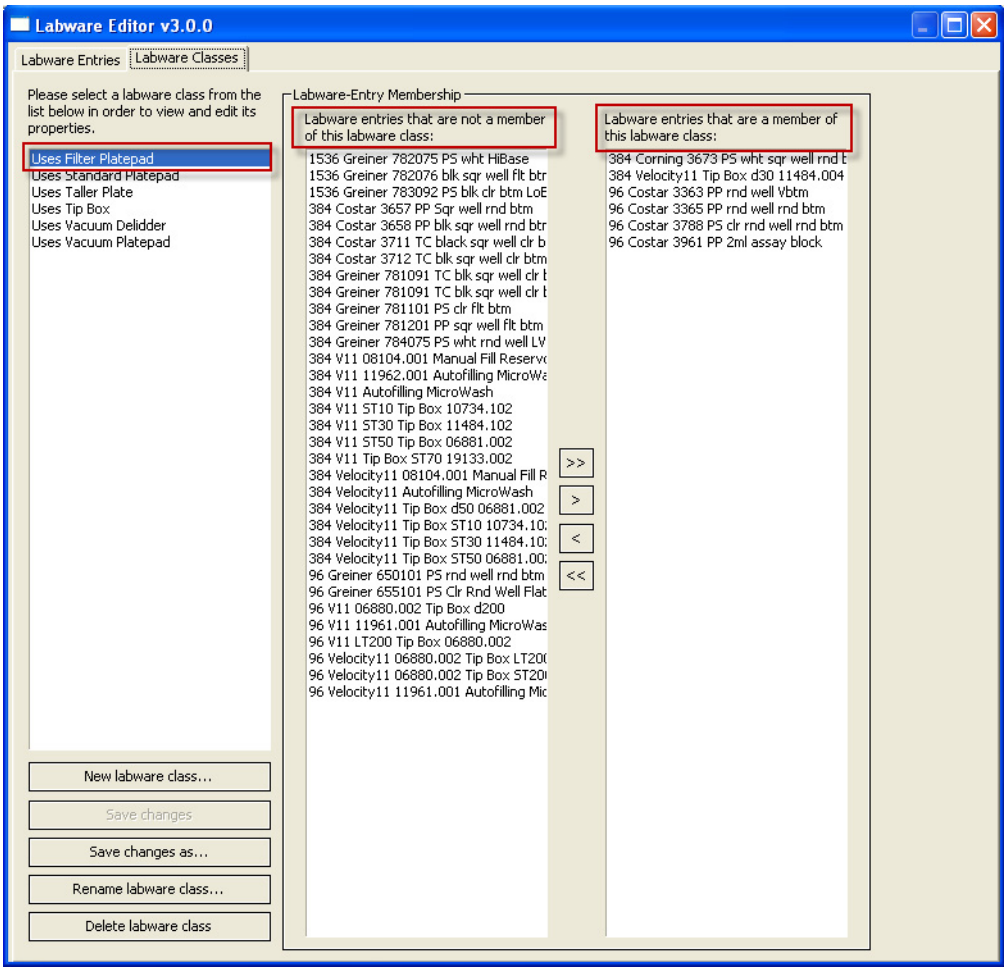
Labware-Entry General Properties area

The Labware-Entry General Properties area displays the labware-entry general properties whose selections apply across all sub-tabs.



Labware Classes page

In the Labware Classes page, you create labware classes and assign defined labware to a labware class.



Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Using the Labware Editor	"About defining labware with the Labware Editor" on page 16

Workflow for defining labware

Labware standards and considerations

IMPORTANT All labware used with Agilent Technologies products must conform to the American National Standards Institute (ANSI) microplate standards. This includes deepwell and PCR plates. A group within the Society for Biomolecular Sciences (SBS) recommends and maintains the standards. Visit www.sbsonline.org for more information, or contact your labware's manufacturer.

Vertical Pipetting Station users. In addition to the ANSI standards for labware, Vertical Pipetting Station shelves 1 and 2 have a height restriction to ensure clearance for the pipette head. The maximum height of the labware that you can use on shelves 1 and 2 is dependent on several factors, such as the type of pipette head, tip size, and type of shelf.

Note: The software displays an error message if you select a labware definition that exceeds the maximum allowable height for shelves 1 and 2.

Workflow

This topic provides the sequence of steps for defining labware for devices that use VWorks software.

Note: Some of these steps may be omitted, depending on your system configuration.

Step	For this task...	See...
1	Add the labware entry to the Labware Editor	• "Opening the Labware Editor" on page 21 • "Adding a labware entry" on page 24
2	Specify the general properties of the labware	"Setting general properties" on page 26
3	• Specify the plate properties • Specify robot gripper offset (for BioCel System robots)	"Setting plate properties" on page 27
4	Specify Vertical Pipetting Station properties	"Setting Vertical Pipetting Station properties" on page 31
5	Assign the labware to a class	"Creating and assigning labware classes" on page 33
6	Add a labware image	"Adding a labware image" on page 38
7	Specify robot gripper offset if using a Centrifuge Loader	"Setting Centrifuge Loader properties" on page 39

Step	For this task...	See...
8	Specify the robot and stacker gripping positions for BenchCel Workstations	"Setting BenchCel Workstation properties" on page 40
9	Specify Bravo Platform properties	"Setting Bravo Platform properties" on page 45
10	Specify Stacker gripper and sensor settings and any plate notch positions	"Setting Stacker properties" on page 46

Related information

For information about...	See...
Overview of the Labware Editor	"Labware Editor overview" on page 17
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Using the Labware Editor	"About defining labware with the Labware Editor" on page 16

Opening the Labware Editor

About this topic

This topic explains how to open the Labware Editor.

You open the Labware Editor when you want to:

- View existing labware entries or classes
- Edit labware entries or classes
- Add new labware entries or classes
- Delete labware entries or classes
- Rename labware entries or classes

Before you start

You must be logged in as an administrator or technician to open the Labware Editor.

If you are adding labware, make sure you have the following:

- Calipers
- Two samples of the labware you are adding

Procedure

You can open the Labware Editor from the Tools menu, protocol editor, or device diagnostics.

To open the Labware Editor from the Tools menu:

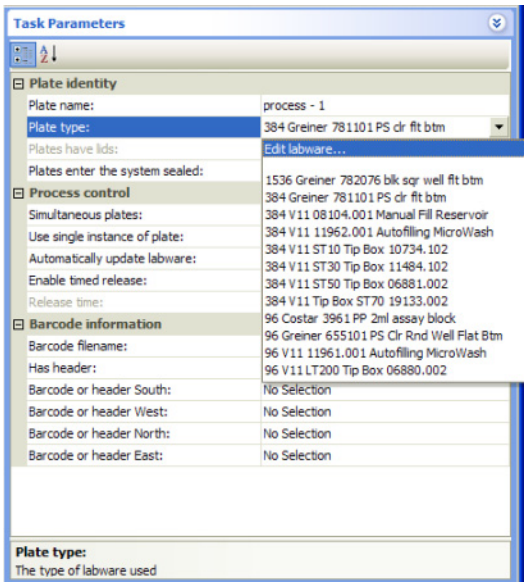
Click **Tools** > **Labware Editor**.

To open the Labware Editor from the protocol editor:

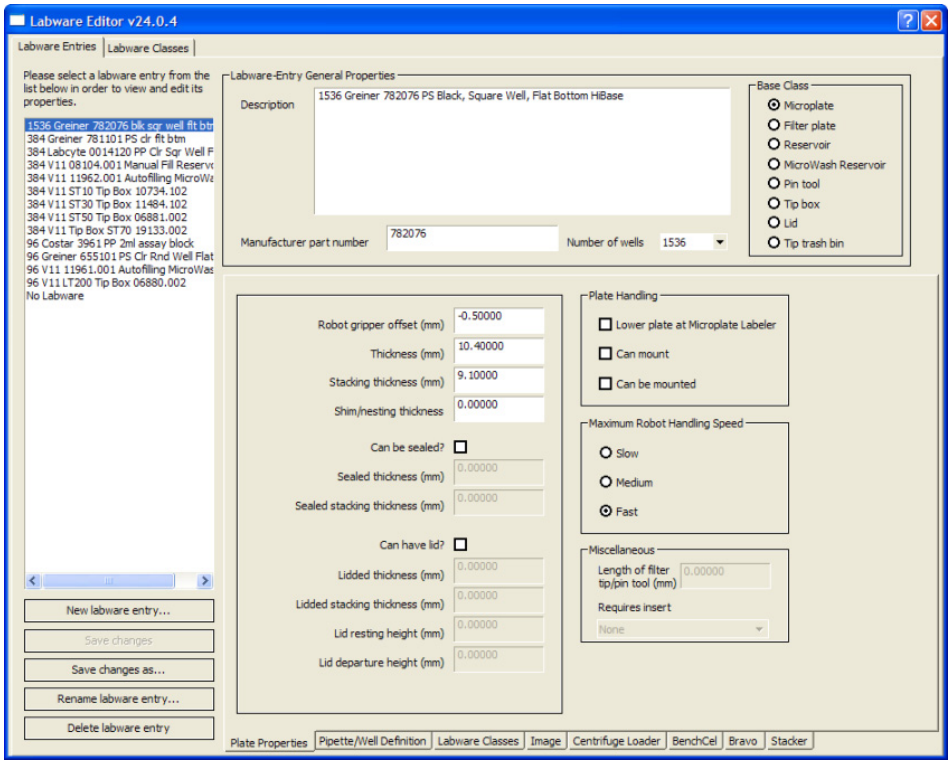
1 Open a protocol file (**File** > **New** > **Protocol** or **File** > **Open**). This opens the Main Protocol area with Process-1 and a list of Plate properties in the Task Parameters area.

Note: If the Task Parameters area is empty, click **Add Process** in the Main Protocol area.

2 Select **Edit labware** from the Plate type list under Plate identity.



The Labware Editor dialog box opens.



To open the Labware Editor in device diagnostics:

1. Open the device file that contains the device.
2. Select the device icon in the Devices area.
3. Click **Device diagnostics**.
4. Refer to the using diagnostics section of the device user guide for location of the Labware Editor access.

Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Adding a labware entry	"Adding a labware entry" on page 24
Using the Labware Editor	"Labware Editor overview" on page 17

Adding a labware entry

Before you start

You must be logged in as an administrator or technician to perform this procedure.

Before you add a new labware entry:

- Check to see if it is already defined in the Labware Editor.

  Some common labware and some Agilent Technologies labware comes already defined in VWorks software.

- Contact Automation Solutions Technical Support with the definition you need.

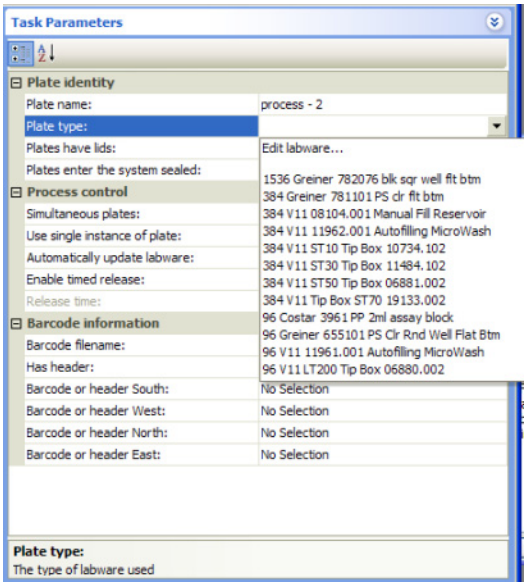
  Automation Solutions Technical Support maintains a large collection of labware definitions and might be able to supply you with what you need. However, these labware definitions will still require some fine-tuning for each particular system. The generic definitions available for some plate types are a good starting point.

To find out if a type of plate is already defined:

1 In VWorks software, click **Main Protocol**, and select the plate icon in a process.

2 In the **Plate identity** area, click the down arrow on the list box and look for the name of the plate.

If there is no entry for the plate, it is not defined.



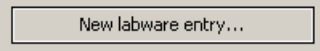
Procedure

To add a labware entry:

1 Open the **Labware Editor** dialog box.

2 Under the labware selection area on the left side of the window, click **New labware entry**.

Note: You can save a lot of time by first checking to see if there's a similar piece of labware already defined. Click **Save changes as** and enter a name for the new labware.



3 In the **New Labware Entry** dialog box, enter a name for the plate and click **OK**.

For clarity, enter a detailed name for the labware that includes the manufacturer's name and plate-specific information.

The entry appears in the labware selection area.

Related information

For information about...	See...
Using the Labware Editor	"About defining labware with the Labware Editor" on page 16
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Opening the Labware Editor	"Opening the Labware Editor" on page 21

Setting general properties

About general properties

The general properties describe the type of labware that is being entered into the database and are visible on all of the sub-tabs of the Labware Editor.

Before you start

- You must be logged in as an administrator or technician to perform this procedure.
- You must first create an entry for the labware.

Procedure

To define the general properties of a piece of labware:

1. Open the Labware Editor dialog box.
2. Select the labware in the left column.
3. In the **Description** text box, type in a detailed description of the labware.
4. For your reference, in the **Manufacturer part number** text box, enter the appropriate number.
5. In the **Number of wells** list, select the number of wells in the plate.

   If you are defining a tip box, this is the number of tips that the box can hold.
6. In the **Base Class** area, select one of the options.

   The option you select determines which Labware Editor properties are available. For example, when a base class of **Microplate** is selected, the **Length of filter tip/pin tool (mm)** property is unavailable.

   Note: The pin tool is not available for the Bravo Automated Liquid Handling Platform.

Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Setting plate properties for labware	"Setting plate properties" on page 27

Setting plate properties

Before you start

You must have a technician or administrator user account to perform this procedure.

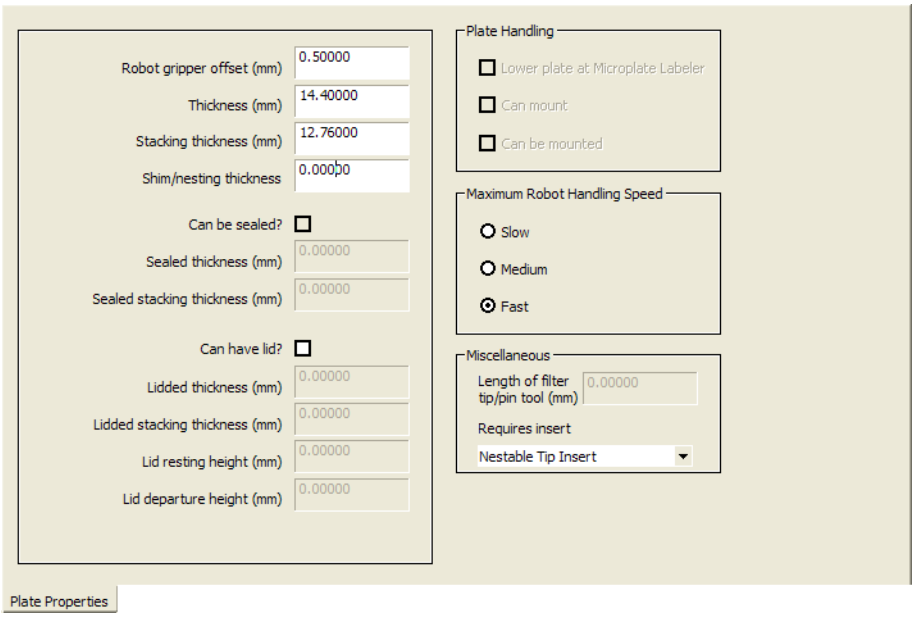
Setting plate properties

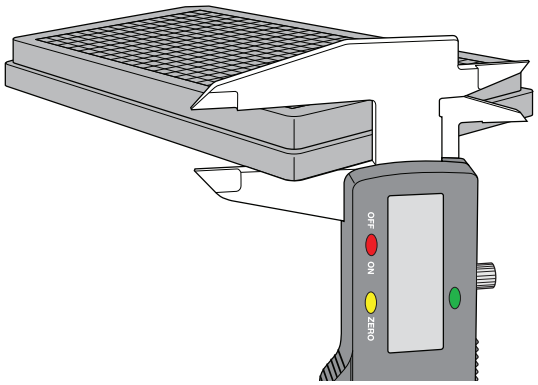
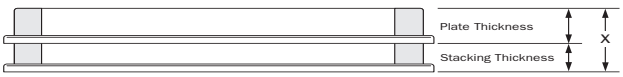
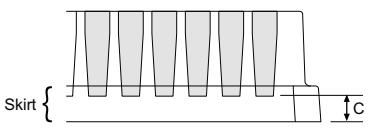
To set plate properties:

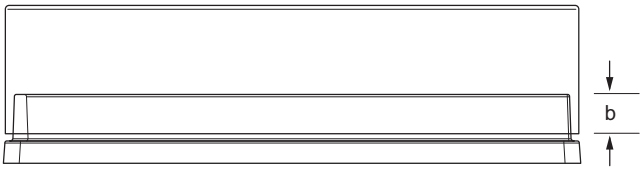
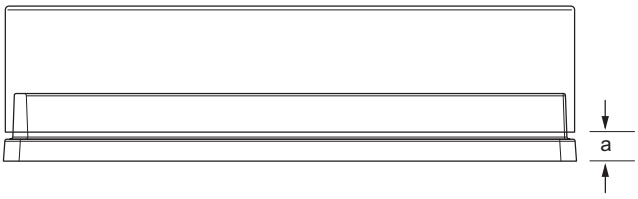
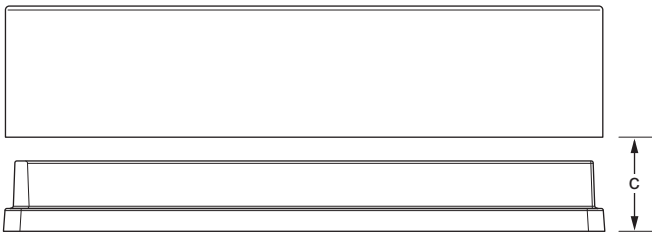
1. Open the **Labware Editor** dialog box.
2. Click the **Plate Properties** sub-tab.
3. Enter the values for the available parameters according to the type of plate or labware you are defining.

   The parameters on the Plate Properties tab are described in the following screenshot and table.

   Note: The Base Class you select in the General Properties section will determine which plate property parameters are available.



Property	Description
Robot gripper offset	Applies to BioCel Systems only. The height, in millimeters, of the gripper above any teachpoint when the VWorks software is picking up or placing a plate of this type. The value is typically 0–3 mm. *Note:* The offset could be a negative value, indicating it is below the teachpoint. This property is used by VWorks software when running protocols. The similar gripper offset property in the VWorks software Diagnostics performs the same function when picking and placing using Diagnostics software.
Thickness	The distance, in millimeters, from the bottom surface of the plate to the top surface of the plate. For a tip box, this is the distance from the bottom surface of the box to the top of the tips. To increase the number of contact points, measure the distance at the corner of the plate or tip box (using calipers). This method is especially useful if the plate has a lip at the top and the caliper can angle inward, producing inaccurate measurements. 
Stacking thickness	The thickness, in millimeters, of two stacked plates minus the thickness of one plate. Measure the distance using calipers. Example: Thickness of two stacked plates (x) = 23.14 mm Thickness of one plate = 14.14 mm Stacking thickness: 23.14 mm - 14.14 mm = 9.00 mm 
Shim/nesting thickness	The distance between the bottom of the microplate skirt and the exterior bottom of the wells. (Shown as c below.) 

Property	Description
Can be sealed?	The option to include the plate seal.
Sealed thickness	The thickness, in millimeters, of the plate with a seal in place. Available only if Can be sealed? is selected.
Sealed stacking thickness	The stacking thickness, in millimeters, of the plate with a seal in place. Available only if Can be sealed? is selected.
Can have lid?	The option to include a plate lid.
Lidded thickness	The thickness, in millimeters, of the plate with a lid in place. Available only if Can have lid? is selected.
Lidded stacking thickness	The stacking thickness, in millimeters, of the plate with the lid in place. Available only if Can have lid? is selected.
Lid gripper offset	The height, in millimeters, above the lid resting height at which to grip the lid. (Shown as *b* below.) 
Lid resting height	The height, in millimeters, above the bottom of the plate at which the bottom of a plate lid rests. (Shown as *a* below.) 
Lid departure height	The height, in millimeters, above the bottom of the plate to which the lid is lifted. 
Lower plate at Microplate Labeler	The option to lower the plate on the stage of the Microplate Labeler, if the plate has a thick skirt. This allows the Microplate Labeler to place the label above the thick skirt.

Property	Description
Can mount	The option to place this plate on top of another plate. This property is for filter plates that are placed on top of waste plates during filtration steps of a protocol. This option can also be used to mount lids onto plates.
Can be mounted	The option to place another plate on top of this plate. This property is for collection plates that collect filtrate from filter plates during the filtration steps of a protocol. Many different plates might be able to fit under any one type of filter plate. **IMPORTANT** The wells of the waste plate must have a large enough diameter that the filter plate does not stick on the waste plate. The robot must be able to pick up the filter plate without the waste plate lifting up with it. This option can also be used to mount lids onto plates.
Maximum robot handling speed	The maximum speed at which this type of plate should be moved. The general robot speed is set in VWorks software. If the plate-specific robot speed (set here) is different from the general robot speed, the slower of the two speeds is used.
Length of filter tip/pin tool	The length, in millimeters, the filter nozzle extends below the bottom edge of the skirt. Use a caliper to measure the length.
Requires insert	The option to require an insert for use with nestable tip boxes.

Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Setting general properties for labware	"Setting general properties" on page 26

Setting Vertical Pipetting Station properties

When to set the pipette/well properties

The values on the Pipette/Well Definition sub-tab must be set when VWorks software is controlling a Vertical Pipetting Station.

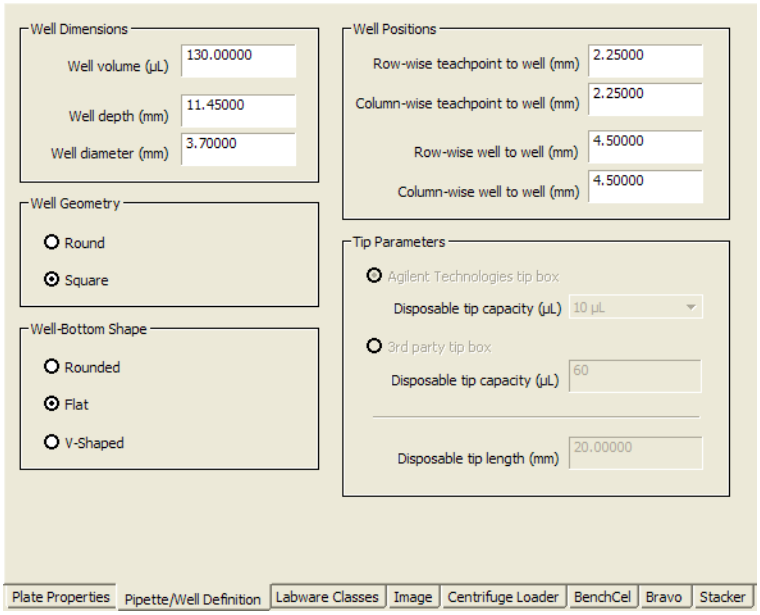
Setting properties

To set pipette/well properties:

1. Click the **Pipette/Well Definition** sub-tab of the Labware Editor.
2. Enter the values for the available parameters according to the type of plate or labware you are defining.

   The properties on the Pipette/Well Definition sub-tab are described in the following screenshot and table.

   Use calipers to carefully measure the labware you are defining in the Labware Editor.



Property	Description
Well volume	Maximum volume of fluid for one well, in microliters.
Well depth	Distance from the top of the plate to the bottom of the well, in millimeters.
Well diameter	Diameter of the well, in millimeters.
Well Geometry	Shape of the wells: round or square.
Well-Bottom Shape	Shape of the well bottoms: rounded, flat, or V-shaped.

Property	Description
Row-wise teachpoint to well	Distance from the teachpoint to the center of the A1 well along the row (letter axis), in millimeters. This setting should be 0 mm for standard 96-well plates and 2.25 mm for standard 384-well plates.
Column-wise teachpoint to well	Distance from the teachpoint to the center of the A1 well along the column (number axis), in millimeters. This setting should be 0 mm for standard 96-well plates and 2.25 mm for standard 384-well plates.
Row-wise well to well	Distance from well-center to well-center across the row, in millimeters. This setting should be 9 mm for standard 96-well plates and 4.5 mm for standard 384-well plates.
Column-wise well to well	Distance from well-center to well-center across the column, in millimeters. This setting should be 9 mm for standard 96-well plates and 4.5 mm for standard 384-well plates.
Disposable tip capacity	Volume capacity of the disposable tips, in microliters, when labware is a tip box.
Disposable tip length	Length of the disposable tips being used, in millimeters, when labware is a tip box.

Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Setting general properties for labware	"Setting general properties" on page 26
Setting plate properties for labware	"Setting plate properties" on page 27

Creating and assigning labware classes

About labware classes

When you configure a device for the VWorks software, you can associate the device with labware classes to indicate what labware can (and cannot) be used with the device. Associating a device with a labware class is performed in the device file under the Allowed/prohibited labware property.

For example, if you have a Microplate Vacuum Alignment Station on a Bravo platform, you might want to set up a labware class from which tube racks are excluded. (Most types of tube racks will cause an error on the Microplate Vacuum Alignment Station).

VWorks software is provided with six labware classes already defined:

- Uses Filter Platepad
- Uses Standard Platepad
- Uses Taller Plate
- Uses Tip Box
- Uses Vacuum Delidder
- Uses Vacuum Platepad

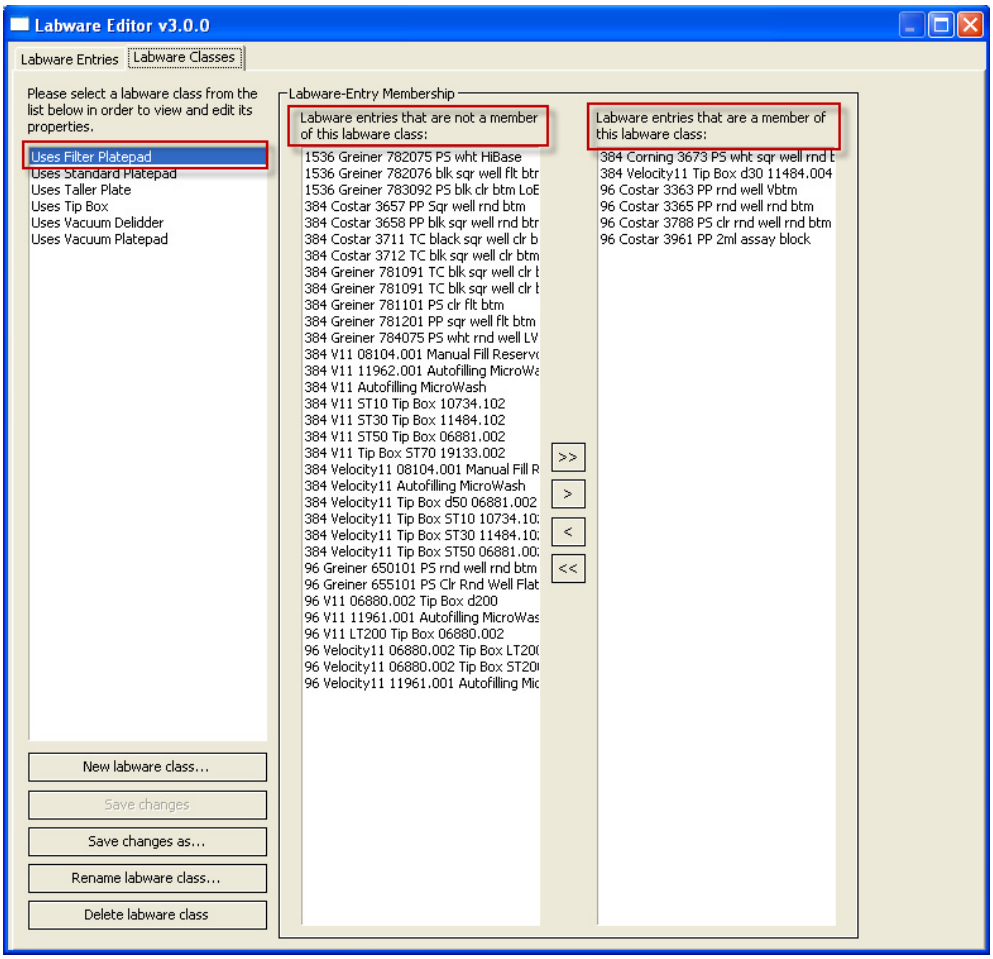
These default classes should be enough for your plate handling needs. However, if you want an additional special class that is excluded from a particular device or set of devices, you can create a new class.

About creating and assigning labware classes

The Labware Classes tab is used to create and manage labware classes and labware entry membership.

The Labware Classes tab is located in the Labware Editor dialog box. To open, click **Tools** and select **Labware Editor**.

Select a class (in the left-most column) to see the labware entries that are members and non-members for that class (right two columns). In the example below, the class Uses Filter Platepad is selected and the labware that are members and non-members of this class are displayed.



Creating labware classes

To create a new labware class:

1. Open the Labware Editor.
2. In the **Labware Classes** tab, click **New labware class**.
3. In the **New Labware Class** dialog box, enter a name for the labware class and click **OK**.

   The class appears in the list of labware classes.

Note: You can also create a new labware class by clicking **Save changes as** and entering a different name.

Assigning labware classes

To associate a specific piece of labware with a labware class:

1. Open the Labware Editor.
2. In the **Labware Classes** tab select an item from the middle column.
3. Click > to move the labware entries or labware classes to the right-hand column.

To select more than one item, use SHIFT-click or CTRL + click. If you want to move all entries, click > >.

4 Click **Save Changes** to save your changes.

Note: You can also assign labware to a class using the Labware Classes tab at the bottom of the Labware Editor. This may be more convenient when you are defining a new piece of labware and want to assign it to an existing labware class.

Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
An example demonstrating the use of labware class	"Using labware classes example" on page 35

Using labware classes example

About this topic

This topic provides an example of how to use labware classes in conjunction with a device.

The example

You have configured shelves 2, 4, and 6 of a Vertical Pipetting Station as devices that are accessible by the system's robot. You are using a mix of plates, some of which are too tall to fit on shelf 2. By using labware classes, you will ensure that the robot will never try to place the wrong type of labware on shelf 2.

The labware has been defined and added to the Labware Editor but it still has the default settings for class membership.

Assigning the labware

The first task is to assign the tall labware to the appropriate labware class.

To assign the labware:

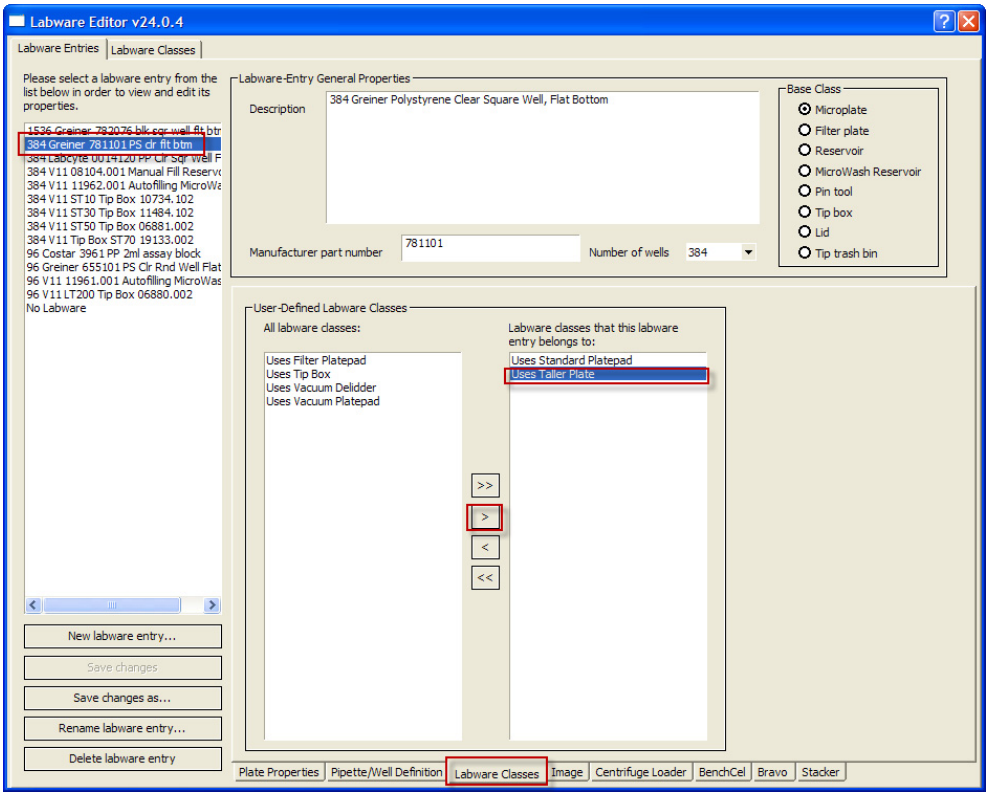
1 Open the **Labware Entries** tab of the **Labware Editor**.

2 Select the labware from the list. The classes that the labware are and are not a member of is displayed.

3 Select **Uses Taller Plates** from the **All labware classes** area.

4 Move it to the **Labware classes that this labware entry belongs to** area by clicking the > arrow.

5 Click **Save changes**.



Setting restrictions for shelf 2

The next task is to restrict shelf 2 from using any labware that is a member of the Uses Taller Plates class.

To restrict shelf 2:

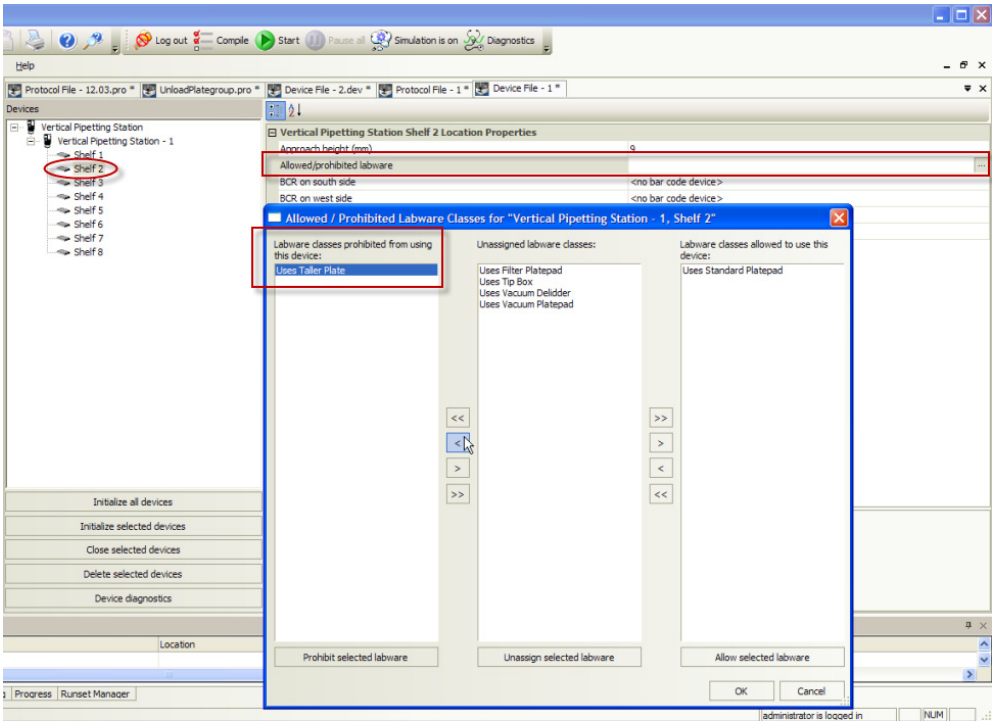
1 Open the **Device File**.

2 Select **Shelf 2** from the **Devices** list.

3 Click in the cell next to **Allowed/prohibited labware** in **Shelf 2 location Properties**. The Allowed/Prohibited Labware Classes for Shelf 2 dialog box opens.

4 Select **Uses Taller Plates** in the **Unassigned labware classes** area and move it to the **Labware classes prohibited...** area using the left arrow (<).

5 Click **OK**.



Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Labware classes	"Creating and assigning labware classes" on page 33

Adding a labware image

About labware images

To make it easier for operators to identify a labware type, you can insert an image of it in the Labware Editor.

Before you start

Make sure the image file you want to add is either the JPG, GIF, or BMP format.

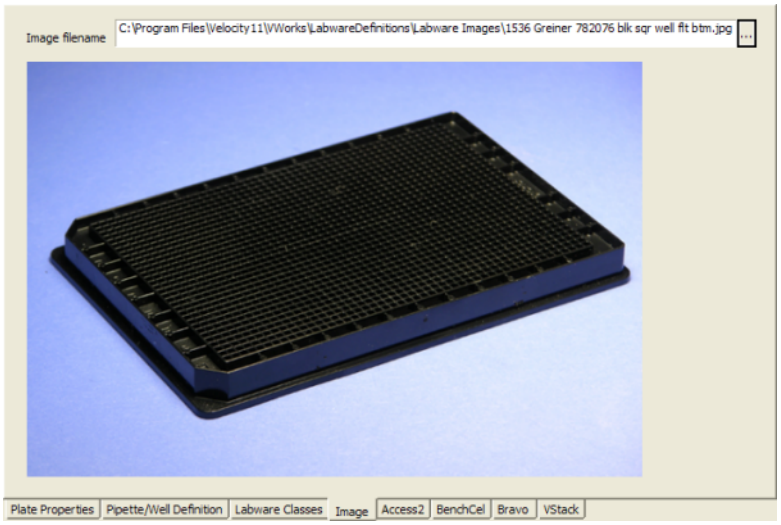
Procedure

To insert an image:

1. Open the Labware Editor.
2. Select the labware in the left column.
3. Click the **Image** sub-tab of the Labware Editor.
4. Click the ellipsis button (...), and navigate to the folder location of the image file.

5. Double-click the image file.

   The image appears below the file name.



6. Click **Save changes**.

Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Using the Labware Editor	"Labware Editor overview" on page 17

Setting Centrifuge Loader properties

When to set Loaderproperties

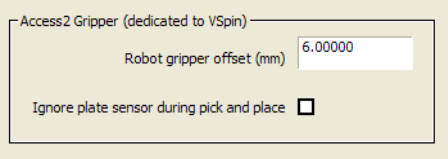
Enter values on this page of the Labware Editor if you are operating a Centrifuge with an Centrifuge Loader.

You must be logged in as an administrator or technician to perform this procedure.

Procedure

To set Loader properties:

1. Click the **Loader** tab of the Labware Editor.
2. Enter the Robot gripper offset (in millimeters). This specifies the distance from the bottom of the plate.
3. *Optional.* Select **Ignore plate sensor during pick and place**. You might want to ignore the plate sensor if you are using black plates whose finish and skirts sometimes causes them to avoid detection.



For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Using the Labware Editor	"Labware Editor overview" on page 17

Setting BenchCel Workstation properties

About the BenchCel Workstation properties

The BenchCel Workstation X-Series and R-Series each have their own gripper offsets and positions. When you add a new labware entry, default property values are automatically inserted for both series. These values are approximate and should be ignored because the labware you are defining may be different.

Any labware that you are using with the X-Series will need to be redefined to work with the R-Series BenchCel Workstation because the property values are different for the same piece of labware.

Note: You must also define a subset of the Stacker properties (under the Stacker sub-tab) because they apply to the built-in stackers of the BenchCel Workstation.

Procedure

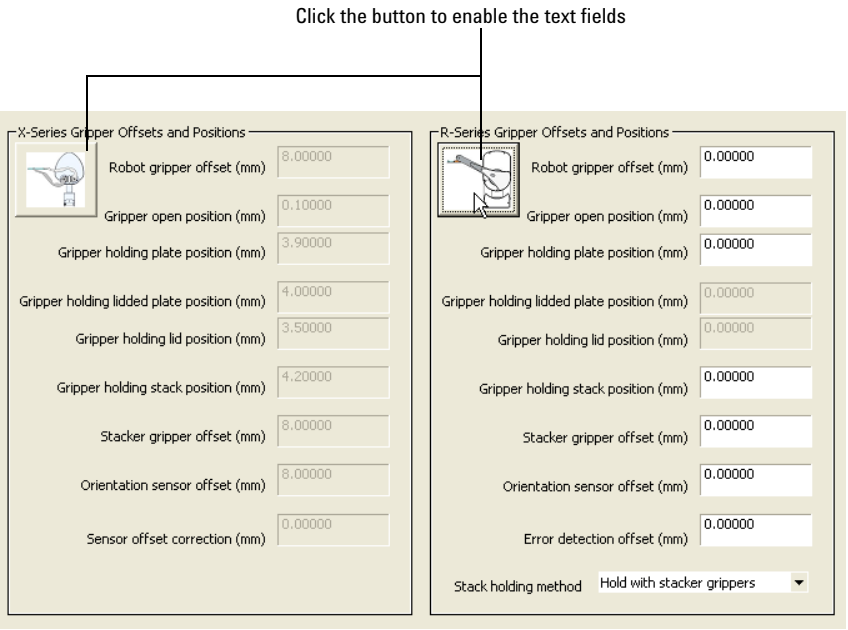
To define the BenchCel Workstation properties:

1. Open the Labware Editor dialog box.
2. Click the BenchCel tab.
3. Click the button that corresponds to the BenchCel Workstation type that is currently operating and for which you are defining the labware.

IMPORTANT Make sure you are entering data for the correct BenchCel Workstation type. Fields for X-Series and R-Series BenchCel Workstations can be enabled regardless of the type of BenchCel Workstation that you are operating.

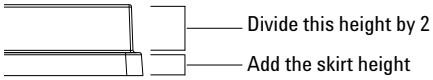
4. Measure the labware and enter the values into the appropriate fields.

   The properties on the BenchCel tab are described in the following screenshot and table. All of the properties on this tab apply to the BenchCel Workstation.



Property	Description
Robot gripper offset	The distance, in millimeters, from the bottom of the plate to the point where the grippers grip the plate. Typically this value is 6–10 mm. **IMPORTANT** Make sure that the gripper points are not closing near the very edge of the skirt causing some of the gripper points to slip onto the body of the plate and the plate to be dropped. *Note:* The robot gripper offset that appears on the Plate Properties page applies to Agilent Technologies robots used in BioCel Systems, not BenchCel Workstation robots.
Gripper open position	The distance, in millimeters, that each gripper moves from its home position as the robot releases a microplate. An larger value moves the grippers closer together. A smaller value opens the grippers wider. The parameter value is applied to both robot grippers. For example, a value of –1.00 mm opens each robot gripper –0.50 mm from its home position. Set this to –1 for R series and 0.1 for X Series BenchCel Workstations.

Property	Description
Gripper holding plate position	The distance, in millimeters, that the grippers move inward from their home position when holding a microplate that is not in a stack. A larger value moves the grippers closer together and holds the microplate tighter. A smaller value opens the grippers wider. The parameter value is applied to both robot grippers. For example, a value of 5.25 mm moves each robot gripper 2.625 mm toward each other from its home position. *Note:* How tightly the robot grippers should hold a microplate depends on the microplate material and design. You might want to run some tests to optimize the parameter.
Gripper holding lidded plate position	The distance, in millimeters, that each gripper moves inward from its home position when holding a lidded microplate. An increasing value moves the grippers closer together and holds the lidded microplate tighter. A decreasing value opens the grippers wider.
Gripper holding lid position	The distance, in millimeters, that each gripper moves inward from its home position when holding a microplate lid. An larger value moves the grippers closer together and holds the microplate tighter. A smaller value opens the grippers wider. The parameter value is applied to each robot gripper. For example, a value of 5.25 mm moves each robot gripper 2.625 mm toward each other from its home position. In general, type a value that is less than Gripper holding plate position to open the grippers slightly. Holding the lid too tightly might cause the microplate to be lifted with the lid.

Property	Description
Gripper holding stack position	The distance, in millimeters, that each gripper moves inward from its home position when holding a microplate that is in a stack. An increasing value moves the grippers closer together and holds the microplate tighter. A decreasing value opens the grippers wider. The parameter value is applied to both robot grippers. For example, a value of 5.25 mm moves each robot gripper 2.625 mm toward each other from its home position. Note: Because the weight of the entire stack will be on the robot grippers, you should use a value greater than the Gripper holding plate parameter.
Stacker gripper offset	Adjusts the height at which the stacker grippers will grab the plate. This distance is measured in millimeters from the bottom of the plate. Be careful not to grab the plate on the top edge of the skirt where the stacker grippers could slip onto the plate body. Change this value only if the stacker is not gripping the plates correctly.
Orientation sensor offset	The distance, in millimeters, from the bottom of a microplate to where the orientation sensors will check for notches. Agilent Technologies recommends that you calculate the offset as follows: Determine the halfway distance between the top of the microplate and the top of the microplate skirt, and then add the height of the skirt. 

Property	Description
Stack holding method (R-Series only)	Determines how the stacker holds the stack of plates. Holding the stack with grippers is more precise and slower than holding the stack with a shelf. Choose Hold with stacker gripper if your plate has a narrow gripping tolerance requiring a specific stacker gripper offset. Choose Hold with shelf if your plate has a wider gripping tolerance and does not require a specific stacker gripper offset. *Note:* Cycle time is faster with the shelf method.

Related information

For information about...	See...
Using the Labware Editor	"Labware Editor overview" on page 17
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Setting general properties for labware	"Setting general properties" on page 26

Setting Bravo Platform properties

When to set Bravo properties

Enter values on this page of the Labware Editor if you are operating a Bravo Platform that has a robot gripper.

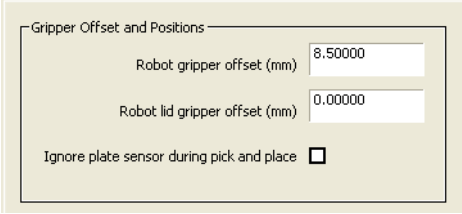
Note: The Bravo robot gripper is an optional feature.

You must be logged in as an administrator or technician to perform this procedure.

Procedure

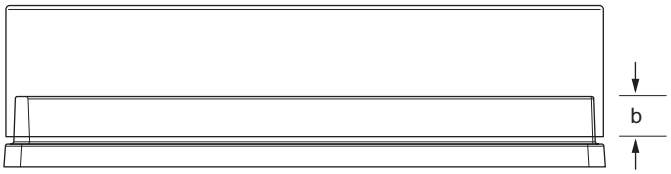
To set Bravo Platform properties:

1 Click the **Bravo** tab of the Labware Editor.



2 Enter the **Robot gripper offset** (in millimeters). This is the height of the gripper above any teachpoint when the Bravo gripper is picking up or placing a plate of this type.

3 Enter the **Robot lid gripper offset** (in millimeters). This is the height, in millimeters, above the lid resting height at which to grip the lid. (Shown as *b* below.)



4 Select **Ignore plate sensor during pick and place** to tell the robot gripper to ignore the feedback from the plate sensor during a pick and place for this labware. Typically, this is selected when troubleshooting.

Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20

For information about...	See...
Using labware classes	“Creating and assigning labware classes” on page 33

Setting Stacker properties

When to set Stacker properties

If you are using Stacker or a BenchCel Workstation in your automation system, you must specify the properties on this page of the Labware Editor. For BenchCel Workstation users, not all of the information is required (see below).

You must be logged in as an administrator or technician to perform this procedure.

Before you start

BenchCel Workstation users. Make sure you have read the portions of the *BenchCel Microplate Handling Workstation User Guide* that describes the location and function of the stacker sensors.

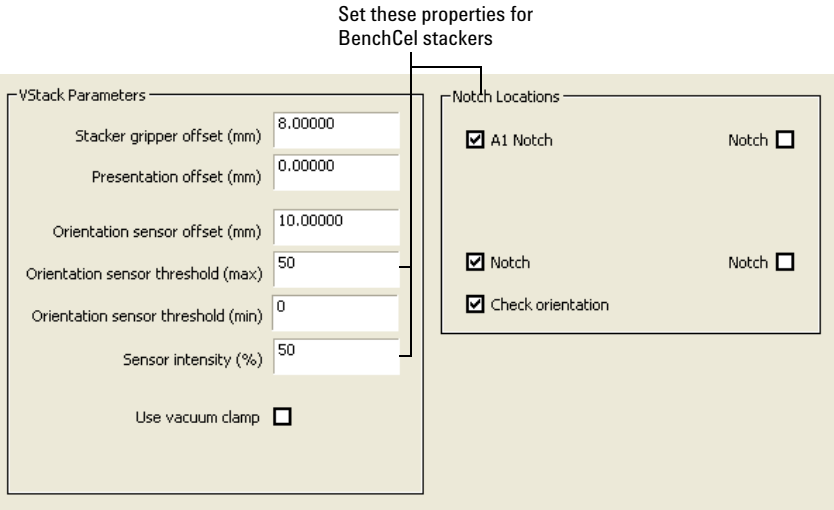
Setting properties

To set stacker properties:

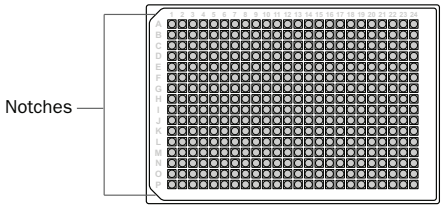
1. Click the **Stacker** tab of the Labware Editor.
2. Enter the values for the available parameters according to the type of plate or labware you are defining.

   The properties on the Stacker sub-tab are described in the following screenshot and table.

   For BenchCel Workstations, you only need to set the maximum orientation sensor threshold, sensor intensity and notch locations. The other settings are used by the Stacker.



Property	Description
Stacker only. Stacker gripper offset	Adjusts the height at which the plate stage stops for the grippers to grip the plate, with respect to the Stacker's grip teachpoint. Change this value only if the stacker is not gripping the plates correctly.
Stacker only. Presentation offset	You should never need to change this value. Adjusts the height of the Stacker plate stage with respect to the presentation teachpoint of a Stacker.
Stacker only. Orientation sensor offset	Adjusts the height at which the orientation checking sensors view the plate, with respect to the sensor.
Orientation sensor threshold (max)	Specifies the highest value that an orientation sensor can register when sensing a notch. Any sensor reading above this value indicates that a solid plate wall is present. Any sensor value below this threshold indicates that either a notch, or no plate is present. If the stacker does not sense a notch when it should, you will get a "wrong plate type" or a "plate rotated 180 degrees" error message. Adjust the sensor threshold value. The maximum value is 255.

Property	Description
Stacker only. Orientation sensor threshold (min)	Specifies the lowest value that an orientation sensor can register and still consider a notch to be present. If the orientation sensor returns a value below this threshold then no plate is present. If the stacker does not sense a notch when it should, you will get a “wrong plate type” or a “plate rotated 180 degrees” error message. Adjust the sensor threshold value.
Sensor intensity	Sets the percentage of maximum sensor intensity for all sensors. If the sensor intensity is set too low, a plate will not be detected even though one is present. If it is set too high, the sensors might become saturated, causing failure to detect the orientation of a plate. This property adjusts for the fact that clear, black, and white plates reflect light differently. For example, white plates generally reflect more light so the sensor intensity should be set lower.
Use vacuum clamp	Instructs theStacker you are using a vacuum clamp in the Stacker stage to grasp the plate during delidding.
Notch locations	Select the corresponding notch or notches for your plate in the Notch Locations area. For BenchCel Workstations, the A1 well of the plate is positioned in the far, left corner as you face the BenchCel Workstation. For BioCel Systems, the A1 well of the plate is positioned in the far, left corner from the perspective of the robot. 
Check orientation	Turns on plate-orientation checking. The notch locations are ignored when this option is cleared.

Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 20
Opening the Labware Editor	"Opening the Labware Editor" on page 21
Using the Labware Editor	"Labware Editor overview" on page 17

3 Specifying pipette speed and accuracy

This chapter contains the following topics:

About liquid classes

Liquid Library Editor defined

The Liquid Library Editor is a dialog box through which users with technician or administrator privileges can enter values for properties that affect pipetting speed, accuracy, and precision.

Default liquid library entries

When installing VWorks software, you might have elected to install the default liquid library entries. These entries are provided as examples and thus might only approximate your particular reagents. For the best performance, you should create your own liquid library definitions.

When to use the Liquid Library Editor

You open the Liquid Library Editor when you want to:

- View the properties that are defined for a liquid class
- Edit the properties that are defined for a liquid class
- Add new liquid classes

IMPORTANT You should verify the pipetting of your Vertical Pipetting Station or Bravo Platform. Accurate and precise pipetting depends on a variety of factors including the liquid properties. Use the Liquid Library to fine-tune the volume delivered.

Liquid classes defined

The values entered into the Liquid Library Editor can be saved as a collection, known as a liquid class. Using liquid classes saves time when writing protocols because you do not have to enter values for the liquid properties every time you create a protocol.

Types of liquid classes

You might want to create different classes for different:

- Types of liquids

  For example, water versus DMSO
- Volumes of liquids

  For example, 1 µL versus 200 µL
- Liquid operations

  For example, washing versus mixing

Liquid library database defined

The data that represents a liquid class is saved to the liquid library database, which is maintained in the Windows registry.

Using a liquid class

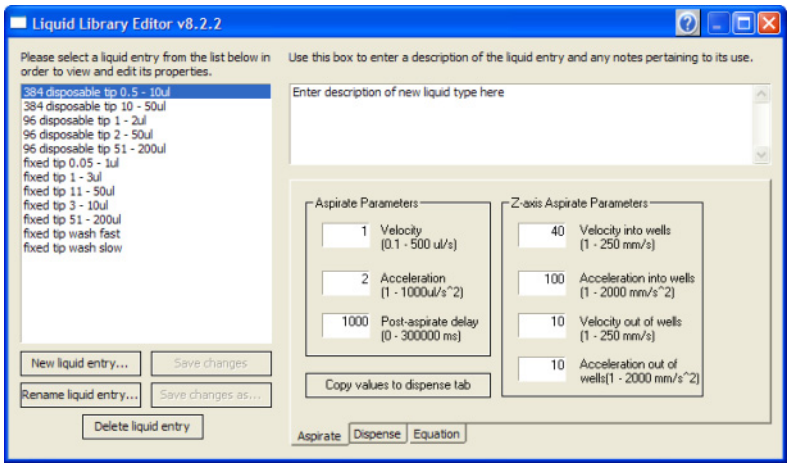
When preparing for a protocol run, you select the liquid class that you want to use. During the run, the liquid class values are referenced for pipetting operations.

Calibrating the Bravo Platform and Vertical Pipetting Station

The Liquid Library Editor also has an equation editor that can be used to calibrate the Bravo Platform and Vertical Pipetting Station.

Liquid Library Editor dialog box

A screenshot of the Liquid Library Editor follows.



Related information

For information about...	See...
Opening the Liquid Library Editor	“Opening the Liquid Library Editor” on page 54
Creating a liquid class	“Creating a liquid class” on page 55
Calibrating your pipettor	“Calibrating the pipettor” on page 58

Opening the Liquid Library Editor

Before you start

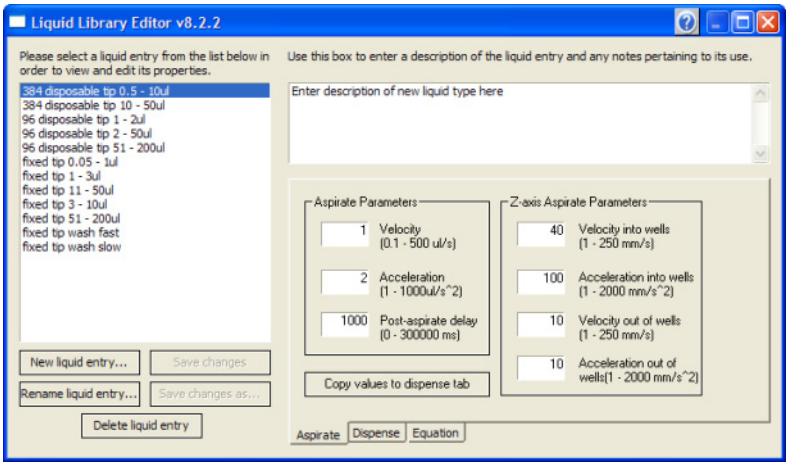
You must be logged in as an administrator or technician to open the Liquid Library Editor.

Procedure

To open the Liquid Library Editor from VWorks software:

1 Select **Tools > Liquid Library Editor**.

The **Liquid Library Editor** opens.



Related information

For information about...	See...
Liquid classes	“About liquid classes” on page 52
Creating a liquid class	“Creating a liquid class” on page 55
Calibrating your pipettor	“Calibrating the pipettor” on page 58

Creating a liquid class

About this topic

This topic describes how to create a liquid class using the Liquid Library Editor.

You must be logged in as an administrator or technician to perform this procedure.

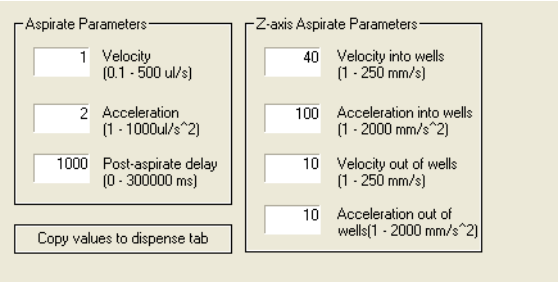
Liquid compatibility

WARNING **Agilent Technologies products are intended to be used with non-hazardous liquids. Please contact Automation Solutions Technical Support before using any non-aqueous solvents or solvents generally considered to be hazardous.**

Procedure

To create a liquid class:

1. Open the Liquid Library Editor.
2. Click **New liquid entry**.
3. In the **New Liquid Entry** dialog box, enter a name for the liquid class and click **OK**.
4. Optionally, in the text box at the top right, type a note describing the liquid library entry for your records.
5. Enter values for the aspirate properties.



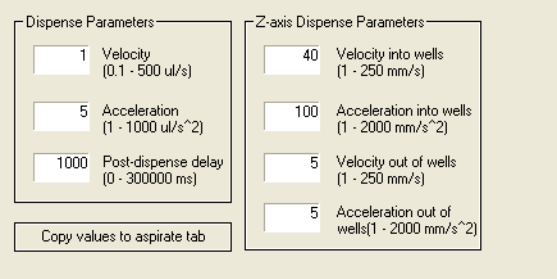
The following table describes these properties.

Note: The upper limits for some of the properties might not be achievable for the device you are using.

Aspirate property	Definition
Velocity	Specifies the speed of the aspiration stroke, in microliters per second.
Acceleration	Specifies acceleration during the aspiration stroke, in microliters per second squared.

Aspirate property	Definition
Post-aspirate delay	Specifies the time the pipettor waits after aspiration is complete before moving the tips out of the wells, in milliseconds.
Z-axis velocity into wells	Specifies how fast the pipettor moves as the tips enter the wells, in millimeters per second.
Z-axis acceleration into wells	Specifies the acceleration of the pipettor as the tips move into the wells, in millimeters per second squared.
Z-axis velocity out of wells	Specifies how fast the tips leave the wells, in millimeters per second.
Z-axis acceleration out of wells	Specifies the acceleration of the pipettor as the tips move out of the wells, in millimeters per second squared.

6 Click the **Dispense** tab and enter values for the dispense properties.



The following table describes these properties.

Dispense property	Definition
Velocity	Specifies the maximum speed of the dispensing stroke, in microliters per second.
Acceleration	Specifies acceleration during the dispensing stroke, in microliters per second squared.
Post-dispense delay	Specifies the time the pipettor waits after the dispense stroke before moving the tips out of the wells, in milliseconds.
Z-axis velocity into wells	Specifies how fast the pipettor moves as the tips enter the wells, in millimeters per second.
Z-axis acceleration into wells	Specifies the acceleration of the pipettor as the tips enter the wells, in milliliters per second squared.

Dispense property	Definition
Z-axis velocity out of wells	Specifies how fast the pipettor moves as the tips leave the wells, in millimeters per second.
Z-axis acceleration out of wells	Specifies the acceleration of the pipettor as the tips leave the wells, in millimeters per second squared.

7 Click **Save changes**.

The changes are now stored in the liquid library database.

Related information

For information about...	See...
Liquid classes	"About liquid classes" on page 52
Opening the Liquid Library Editor	"Opening the Liquid Library Editor" on page 54
Calibrating your pipettor	"Calibrating the pipettor" on page 58

Calibrating the pipettor

About calibrating the pipettor

You can improve the accuracy of pipetted volumes by:

- Calibrating the pipettor
- Plotting the actual volume dispensed as a function of the set dispense volume
- Calculating the polynomial coefficients of the plot
- Entering the coefficients into the liquid library equation editor

Do you need to calibrate your pipettor?

Pipetting accuracy is the ability to dispense an absolute volume of liquid. In practice, the volume that is actually dispensed by a pipettor may be different from the dispense volume that you select. This difference is the absolute error.

In some protocols, as long as you dispense an excess of liquid, the actual volume pipetted is not important. In other protocols, pipetting accuracy can be a critical factor. You must remember, though, that every step of an experiment has error and there is no point taking time to improve the accuracy of pipetting to four significant digits if another step in your protocol has error at the third significant digit.

If you are sure that the overall error of the experiment is limited by pipetting accuracy, and error at this number of significant figures makes a practical difference to you interpretation of the data, consider performing an accuracy calibration.

Method overview

This section gives an overview of the method you can use to measure pipetting accuracy. It does not give a detailed procedure because that depends on exactly how you choose to conduct the experiment.

To calibrate a pipettor, an independent method of measuring dispensed volume is required. One method is to dispense a solution of fluorescein dye and measure the fluorescence emitted from each plate well.

IMPORTANT Whichever method you use, verify that the error in the detection method is significantly smaller than the pipetting error. Otherwise, the error you detect might be from the detection method and not the pipetting error.

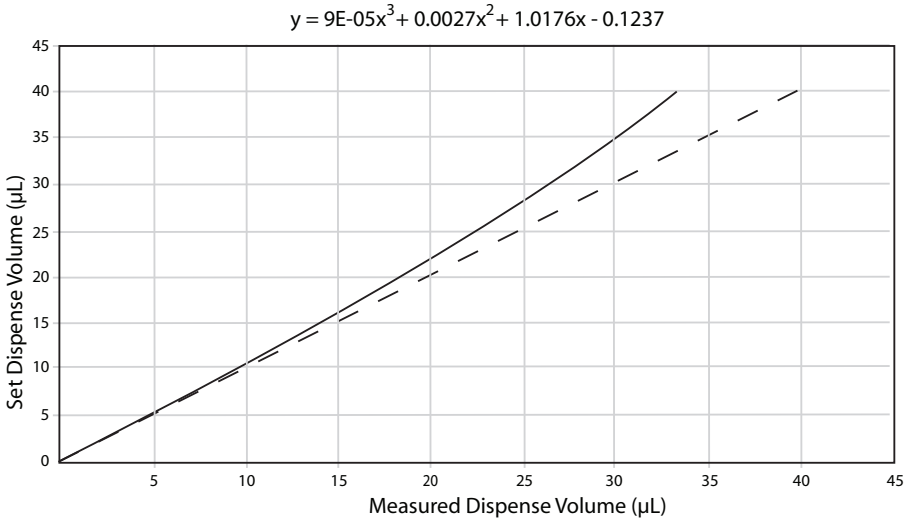
The overall method is:

1. Perform a series of pipetting operations in which different volumes are pipetted.
2. Measure the volumes of dispensed liquid using the independent measuring method.
3. In a spreadsheet program, tabulate the dispense volumes that you set in the software against the measured volumes.
4. Plot a graph, with the set dispense volume on the y-axis and measured dispense volume on the x-axis.

The plot will be a curve, reflecting the fact that absolute error is a function of the magnitude of the measurement.

5 Use the statistical functions of the spreadsheet program to fit a curve to the data.

Your result might look like this:



The dashed line is a reference line, where the set dispense volume equals the measured dispense volume. The equation is the polynomial for the line, calculated by the spreadsheet program.

6 Enter the curve information into the equation editor of the Liquid Library Editor.

If you repeat the experiment, you will find that the curve is much closer to a straight line. This is because the equation you entered adjusts the action of the servo motor that determines aspirate and dispense volumes, thereby calibrating the dispense.

Using the equation editor

The equation editor in the Liquid Library Editor is where you enter the calibration curve data to correct for pipetting inaccuracy.

To enter a polynomial into the equation editor:

1 Open the Liquid Library Editor.

2 Click the **Equation** tab to display the equation editor.

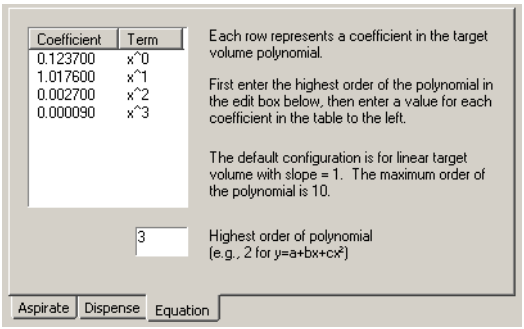
3 In the **Highest order of polynomial** text box, enter the value for the highest order of the polynomial.

This is the largest exponent in the equation and tells you how many terms are in the equation. For example, if the highest order of the polynomial is 3, the equation will have the general form: $y = a + bx + cx^2 + dx^3$, where 'x' is the volume specified by any pipettor task that uses this liquid class. With an exponent of three, four rows are added to the equation editor table.

4 In the Coefficient/Term table, in turn, enter the coefficient and exponent for each of the terms in the equation, starting with the zero order term.

To enter a value, single-click the **Coefficient** table row twice. Note that the exponents are already entered for you and cannot be edited.

The following example is for the curve displayed in the previous graph.



5 Click **Save changes**.

Related information

For information about...	See...
Liquid classes	“About liquid classes” on page 52
Opening the Liquid Library Editor	“Opening the Liquid Library Editor” on page 54
Creating a liquid class	“Creating a liquid class” on page 55

4 Tracking and managing labware in storage

This chapter contains the following topics:

About labware inventory management

About this topic

This topic provides the background information you need to understand how to use the plate inventory manager to track groups of plates moving into and out of a plate storage device.

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX, Heraeus Cytomat PLC, or a Agilent Technologies Plate Hub Carousel and you are using, or want to set up, inventory management with a database.

Before you start

Before starting to create protocols that use the storage device, make sure you have read the device driver user documentation for your particular storage device as well as “Resolving plate inventory problems” on page 97.

Barcode tracking versus inventory management

Barcode tracking

Barcode tracking without an inventory system is limited because the plate locations are stored in memory and are lost when you exit VWorks software.

Inventory management

The inventory management system allows long-term tracking of plates as barcode data is permanently stored in a database. This is useful for lab automation systems with devices that store plates for a long time, such as a Heraeus Cytomat PLC and Liconic StoreX.

Required database

To use inventory management you must have an SQL database set up, either on the computer that runs VWorks software or a computer that is on the same local area network.

How plates are stored

The long-term storage devices supported by VWorks software store plates in cassettes and slots. A cassette is a vertical rack that has many slots, with each holding one plate.

Information that is stored

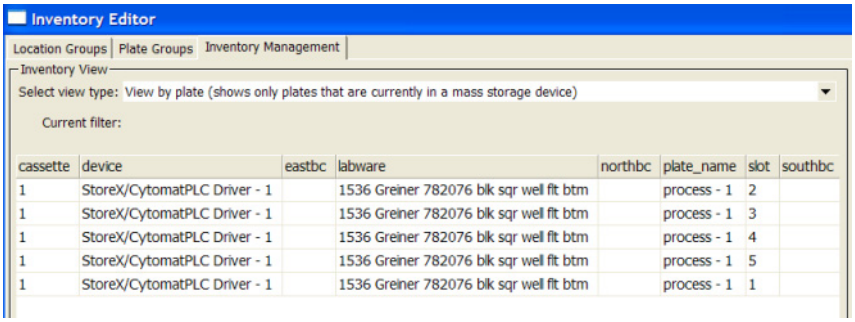
The inventory maintains a list of plates located in a long-term plate storage device.

The information contained about each plate in the inventory includes:

- Device in which the plate is located
- Cassette and slot location of the plate
- Name of the group or location to which it belongs
- Labware type
- Any north-side, south-side, east-side, and west-side barcodes.

  West side barcodes are tracked only if an optional barcode reader is used.
- Volume of the wells in the plate

The list of plates in the inventory is displayed in the Inventory Editor dialog box. An example view is shown below.



The list of plates in the inventory is updated every time a plate is moved with a robot in to or out of a storage device so that at all times, the list is current.

Inventory manager

The Inventory Editor dialog box is where you manage the inventory. From here you can:

- Create plate groups
- Create location groups
- Review information about plates in a group
- Import groups from a barcode file
- Change the labware type associated with plates in the database
- Delete plates from the database
- Inventory the labware in a storage device

Plate groups and Location groups

With long-term storage devices, typically only a sub-set of the plates stored in the device is used in one protocol. You can set up two different types of plate sub-sets, called plate groups and location groups. Which you choose for a particular protocol depends on what you are planning to do.

Plate groups are a group of plates based on the unique database identifier for that plate.

Location groups are a group of slots that are not based on information in the plate database.

Inventory management tasks

The following tasks are used with the inventory management system. These are the tasks that move labware in to and out of a storage device:

- Load
- Unload
- Incubate at plate storage device

About manually moving plates

Keeping the database synchronized

It is important to note that the database cannot track plates that you manually add, remove, or move. To keep the database synchronized with the storage device, load and unload the plate storage device robotically, or periodically reinventory the storage device.

Instead of manually adding plates to the storage device, write a protocol to downstack the plates and load them. Instead of manually removing plates from the storage device, write a protocol to unload the plates and upstack them.

If you must manually load and unload plates

If you must manually load and unload plates you will need to create a protocol to load or unload the exact plates that you are manually adding or removing and then run the simulator.

With an appropriate protocol, the simulated run accurately changes the plates listed in the database without actually moving any plates.

Terminology

When describing the movement of plates, it is important to use terms correctly. The terms *load* and *unload* are used from the storage device's perspective.

Term	Definition
Unload	The act of moving a plate from a storage device into the system.
Load	The act of moving a plate from the system into a storage device.
System	Plates that are being processed by the current protocol are considered to be in the system. For example: • A plate on a platepad is in the system. • A plate in a plate hotel is in the system. • A plate being incubated in an incubator is in the system. • A plate half-way up a Stacker rack is not in the system, unless it will be moved during the current protocol. • A plate being stored in a Plate Hub Carousel is not in the system unless it will be moved during the current protocol.

Database backup

The inventory management database can be backed up onto another computer using a software utility. If you want to do this, contact the Automation Solutions Technical Support for more information.

Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 68
Setting up the database	"Setting up the database" on page 66
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Incubating plates	"Using a plate group to process plates" on page 83
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

Connecting to the inventory management database

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel and you are using, or want to set up, inventory management with a database.

Setting up the database

Before you can connect to the database, you must install and configure the inventory management database. To set up the inventory management database, contact Automation Solutions Technical Support for assistance.

Connecting to the database

The database connection is specified in VWorks software.

To connect to the database:

1. Navigate to **Tools** > **Options**.
2. Under **DB Setup**, make sure:
   - **Enable database connection** is selected
   - **Connection string** is `dsn=velocity11;`

     Note: This is the standard name for the database but it can be any name you would like.

Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 68
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Incubating plates	"Using a plate group to process plates" on page 83
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

Opening the inventory editor

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX, Heraeus Cytomat PLC, or a Agilent Technologies Plate Hub Carousel and you are using inventory management with a database.

Before you start

Before you can open the inventory editor, the inventory database that the editor communicates with must be installed and configured.

Opening the inventory editor

To open the inventory editor:

Select **Tools** > **Inventory Editor**

You can also open it by selecting a **Load** or **Unload** task in a protocol and clicking **Edit location groups** or **Edit plate groups**.

Closing the inventory editor

To close the inventory editor:

Click the close box in the top right corner.

Related information

For information about...	See...
Setting up the inventory management database	"Setting up the database" on page 66
Inventory groups, plate groups and location groups	"About inventory groups" on page 68
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Incubating plates	"Using a plate group to process plates" on page 83
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

About inventory groups

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

Inventory groups defined

An inventory group is a group of plates or slots that is a subset of the labware listed in the inventory.

Types of inventory groups

There are two types of inventory groups:

- Location group
- Plate group

Location groups

Location groups are used to move labware to and or from a specific location in the storage device.

Example:

In this example, a location group that contains slots 1–10 in cassette 1 is created.

When an Unload task uses this location group, the robot moves whatever labware are in cassette 1, slots 1–10, regardless of the identity of the labware, out of the storage device and into the system.

When a Load task uses a location group, it moves the labware that are in the system into to cassette 1, slots 1–10 of the storage device, regardless of the identity of the labware.

When to use

Location plate groups are used:

- When the storage device is being filled or emptied.
- When groups of plates or labware are removed from the lab automation system and replaced with other groups of plates or labware on a regular basis. This would be done by replacing a cassette of plates with a new one.

Plate groups

Plate groups are used to move specific plates to or from the storage device, but without regard for the location. Plate groups can be used when operators do not routinely remove and replace whole cassettes of plates.

When a plate is first moved into the system by the system's robot, such as when it is downstacked, it is assigned an identifier in the database. After that, VWorks software tracks where that plate is at all times. This tracking does not

require the plates to have barcode labels, VWorks software knows what it does with every plate during a protocol and so is able to track where each plate goes. Plate groups make use of this tracking system.

Note: You cannot use a plate group with a Load task, unless a native location or location group is associated with it– you have to specify a location group. You can, though, associate a plate group with the location group so that the plates that are loaded are immediately loaded into a plate group as well.

Note: When you load into a plate group you must also load into a location group, native location, or choose return to original locations, otherwise the software will not know where to put the plates.

Example:

A plate group in a storage device contains the following plates:

- Plate 26
- Plate 31
- Plate 41
- Plate 107

These plates are scattered around the storage device, not necessarily in adjacent slots of the same cassette. When the Unload task uses this plate group, it moves these plates out of the storage device into the system.

When to use

Plate groups are typically used in compound management systems where plates are housed in the storage device almost permanently.

For each protocol, a different plate group is unloaded, run and then loaded back to a storage device. As long as the identification of the plates are tracked, the plates can be stored in any open location.

Group membership

A single plate can be a member of more than one plate group.

Related information

For information about...	See...
Creating a location group	"Creating and managing location groups" on page 70
Creating a plate group	"Creating and managing plate groups" on page 72
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Incubating plates	"Using a plate group to process plates" on page 83

For information about...	See...
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

Creating and managing location groups

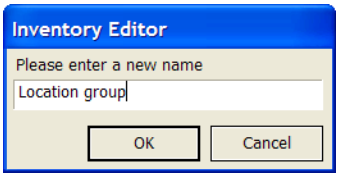
Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

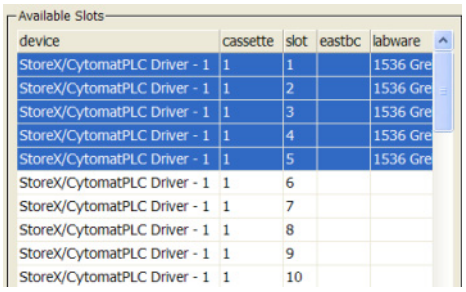
Procedure

To create a location group:

1. Select **Inventory Editor** from the **Tools** menu.
2. Click the **Location Groups** tab.
3. Click **Create new** and enter a name for the group.

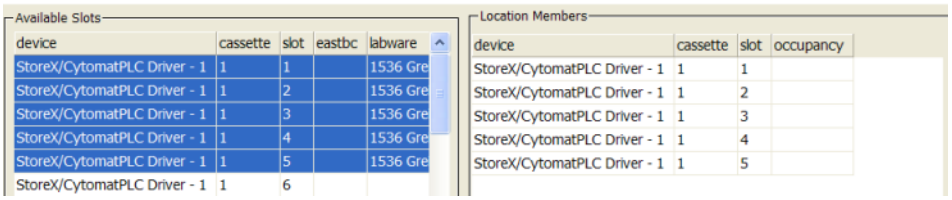


4. Click **OK**.
5. Select a group of slots in the **Available Slots** area.



   You can use CTRL + click or SHIFT + click to select more than one slot.
6. Drag the group into the **Location Members** area.

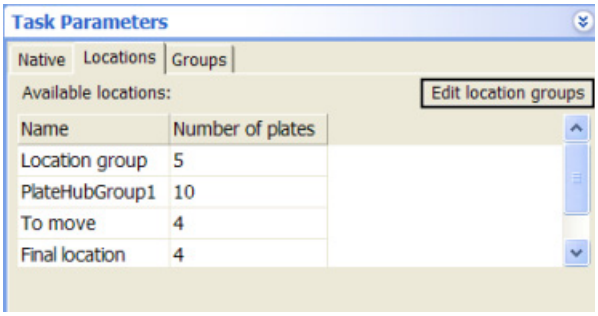
   Note: The slots do not have to be adjacent to each other.



7 Click **Save Changes**.

8 Close the inventory editor.

The location group is listed in the Available locations area of the Load/Unload Task Parameters toolbar.



Deleting a location group

To delete a location group from the inventory:

1 Open the inventory editor.

2 Select a location group in the **Saved Locations** group box.

3 Click **Delete**.

Related information

For information about...	See...
Creating a plate group	"Creating and managing plate groups" on page 72
Opening the inventory editor	"Opening the inventory editor" on page 67
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Incubating plates	"Using a plate group to process plates" on page 83

For information about...	See...
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

Creating and managing plate groups

About this topic

This topic describes how to create a plate group, which is a list of specific plates that can be moved to or out of a plate storage device without regard for which slots they are stored.

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

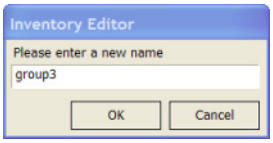
Procedure

To create a plate group:

1 Select **Inventory Editor** from the **Tools** menu.

2 Click the **Plate Groups** tab.

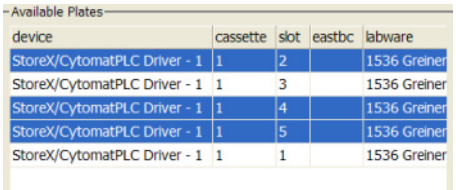
3 Click **Create new** and enter a name for the group.



4 Click **OK**.

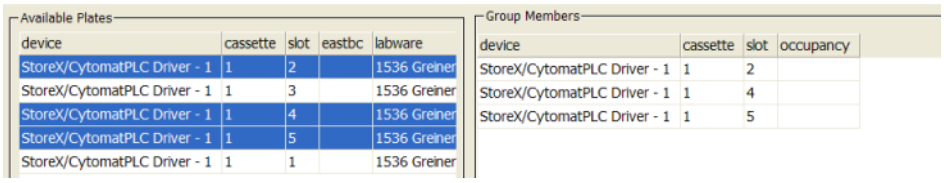
To add plates to the plate group:

1 Select a group of available plates.



You can use CTRL + click or SHIFT + click to select more than one plate.

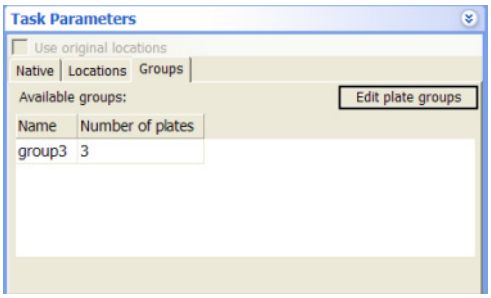
2 Drag the group into the **Group Members** area.



3 Click **Save Changes**.

4 Close the inventory editor.

The plate group is listed in the Available groups area of the Groups tab in the Load/Unload Task Parameters toolbar.

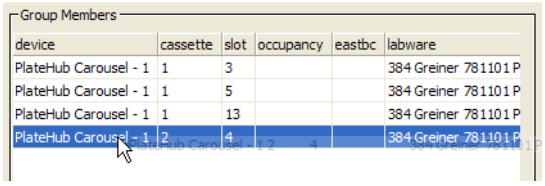


Changing the processing order

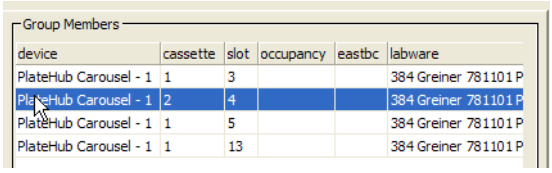
You can change the order in which the plates in a plate group will be processed.

To change the processing order:

1 In the plate group list, select a plate.



2 Drag it to another position in the list.



Deleting a plate group

To delete a plate group from the inventory:

1 Open the inventory editor.

2 Select the plate group in the **Saved Groups** group box.

3 Click **Delete**.

Related information

For information about...	See...
Creating a location group	"Creating and managing location groups" on page 70
Opening the inventory editor	"Opening the inventory editor" on page 67
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Incubating plates	"Using a plate group to process plates" on page 83
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

Loading labware into storage devices

About this topic

This topic describes how to add plates into the system for storage in a storage device. You would do this when first filling the device. Adding plates into the system means more than just loading them into a storage device. It means adding the plate identifications into the record that VWorks software keeps of plates in the system.

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

Ways to fill a storage device

There are two ways to fill an empty storage device with plates.

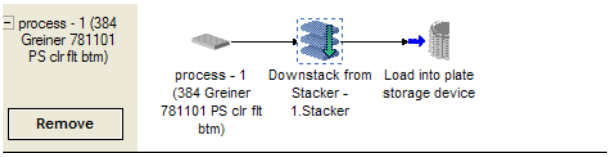
- Robotically
- Manually

Loading plates robotically

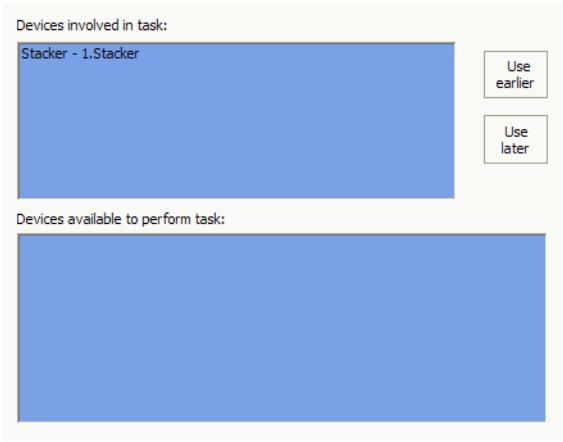
To load plates robotically, the plates are placed in a stacker, downstacked and moved to the storage device.

To load plates robotically:

1 Create a protocol like the one in the following screenshot:

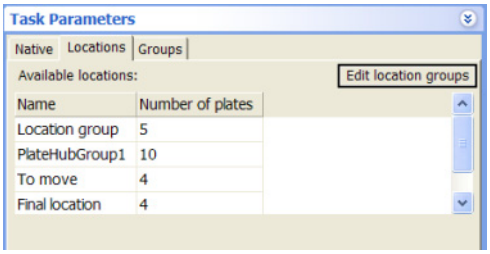


2 Make sure that the **Downstack** task is configured to use the stacker.

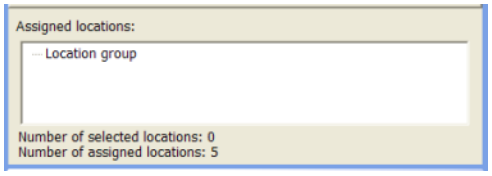


3 Create a location group.

Make sure that the location group is listed in the Available locations area of the Load Task Parameters toolbar.



4 Drag the group into the **Assigned locations** area.



5 Click **Start** and resolve any error messages.

Note: If you are using the simulator to "virtually" load plates, make sure that simulation mode is on before you click Start.

6 In the **Number of Cycles** dialog box, enter a number that is equal to or less than the number of plates you want to load into the storage device.

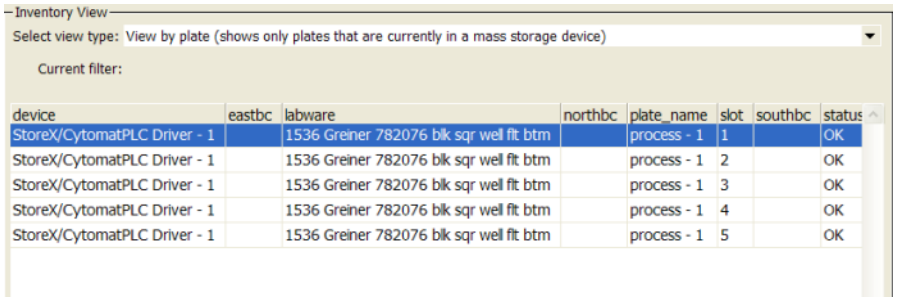
7 Click **OK**.

8 Confirm that the plates are in the inventory:

   a Click the **Load** task.

   b Click **Edit location groups** to open the inventory editor.

   c Click the **Inventory Management** tab.



Loading plates manually

Plates can be loaded manually two ways:

- Cassettes of plates are physically put in to the storage device and a run is simulated to create the matching list of plates in the inventory
- Cassettes of plates are physically put into the storage device, manually added to the inventory and then re-inventoried

  Note: To load by reinventory, the storage device must have a barcode reader.

To load plates manually using a simulated run:

1 Physically load the cassettes of plates in to the storage device.

2 Follow the procedure for loading plates robotically, but click **Simulation is off** to turn on the simulator.

  Make sure that the location group matches the cassettes that you loaded.

3 Click **Start** to run the simulator.

4 In the **Number of Cycles** dialog box, enter a number that is equal to or less than the number of plates you want to load into the storage device.

5 Review the inventory editor to make sure that the plates listed in the inventory match the plates actually in the device.

6 Click **Simulation is on** to turn off the simulator.

To load plates manually and then re-inventory:

1 Physically load the cassettes of plates in to the storage device.

2 Open the Inventory Editor and click the **Inventory Management** tab.

3 From the **Select view type** list, select **View by location (shows all available plate locations whether they are occupied or not**.

4 In the **Inventory Management Functions** area:

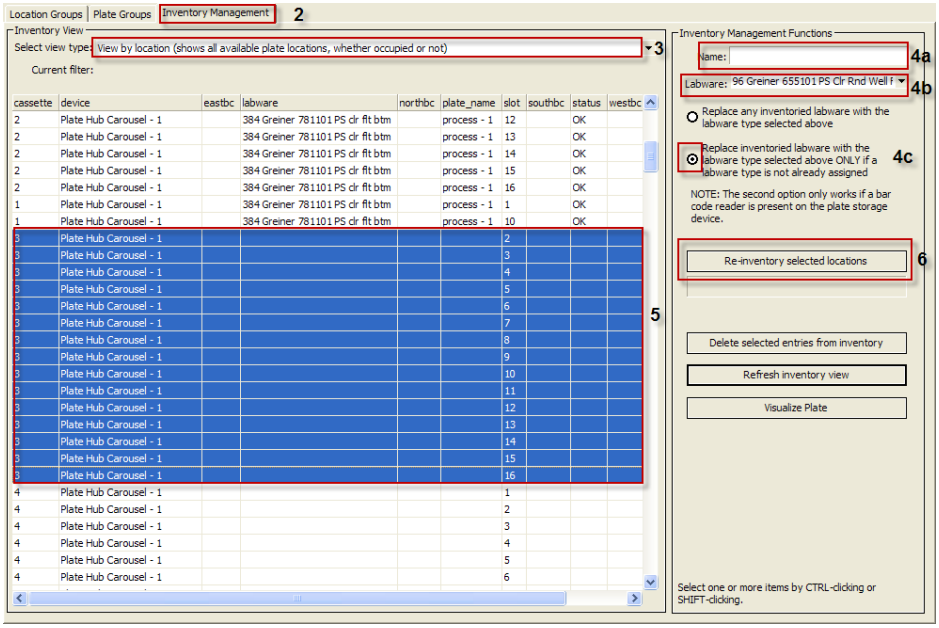
   a Enter the name of the plates in the **Name** field.

   b Select the labware type from the **Labware** list.

c Select **Replace inventoried labware with the labware type selected above ONLY if a labware type is not already assigned**. (This prevents you from accidently overwriting an occupied slot with the wrong labware type).

5 Select the slots you loaded the plates into. Use SHIFT- click or CTRL + click to select more than one item.

6 Click **Re-inventory selected locations**.



Related information

For information about...	See...
Moving plates out of a storage device	"Unloading labware out of inventory" on page 81
Moving plates between storage devices	"Moving labware between storage devices" on page 78

Moving labware between storage devices

About this topic

This topic provides an example to illustrate how you can move a group of plates out of one storage device and put them into another. The general procedure could also be used to move a group of plates within a single storage device.

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

Before you start

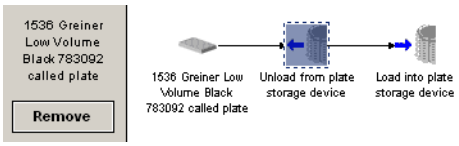
Make sure that both plate storage devices are properly configured in the device manager.

Moving a plate

In this example procedure, a group of four plates is moved from one plate storage device (PlateHub) to another (PlateHub2).

To move a plate:

1. Create a process that has a Load and an Unload task, as shown in the following example.



2. Select either the **Load** or **Unload** task and click **Edit location groups**.

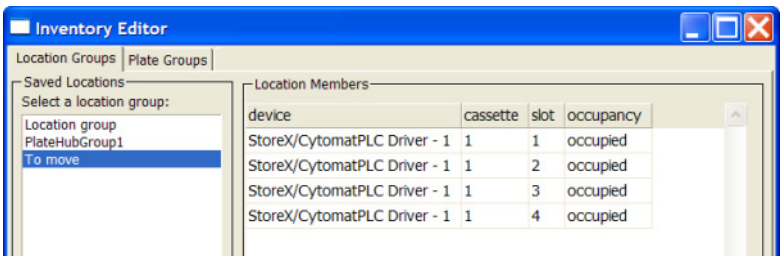
   The inventory editor opens.

3. Click the **Inventory Management** tab and note the device, cassette, and slot locations of the plates that you want to move.

   In this example, the plates will be moved from PlateHub, cassette 1, slots 1–4.

4. Click the **Location Groups** tab and create a location group for these plates.

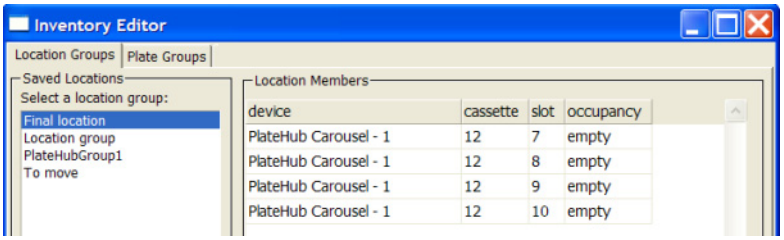
   Note: The plates do not need to be in adjacent slots for them to be in a location group.



5 Return to the **Inventory Management** tab and note the device, cassette and slot numbers for the slots that you want to move the plates to.

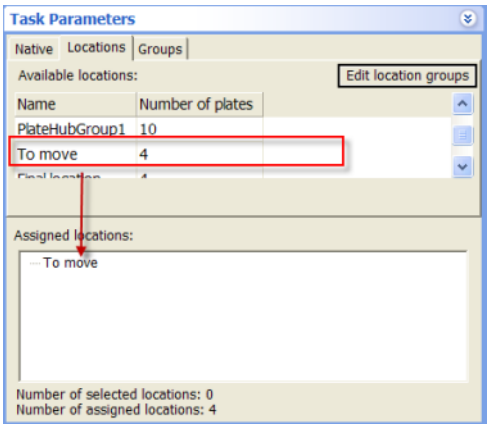
In this example, the plates will be moved to PlateHub2, cassette 12, slots 7-10.

6 Click the **Location Groups** tab and create a location group for these slots.

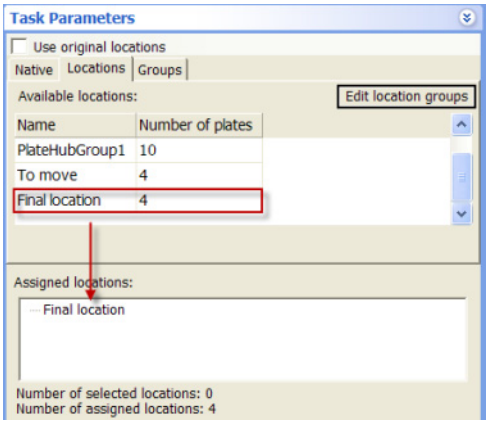


7 Click **Save changes** and close the inventory editor.

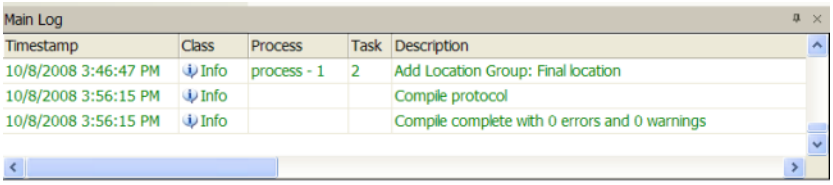
8 Select the **Unload** task and in the **Task Parameters** toolbar drag the location group in the first device to the **Assigned locations** area.



9 Select the **Load** task and in the **Protocol Task Parameters** toolbar drag the location group in the second device to the **Assigned locations** area.



10 Compile the protocol and check for errors.



11 Click **Start** to start the run.

12 In the **Number of Cycles** dialog box, type in the number of plates that you are moving and click **OK**.

13 Open the inventory editor and click the **Inventory Management** tab to make sure that the plates moved as expected.

Related information

For information about...	See...
Creating a location group	"Creating and managing location groups" on page 70
Creating a plate group	"Creating and managing plate groups" on page 72
Opening the inventory editor	"Opening the inventory editor" on page 67
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81
Incubating plates	"Using a plate group to process plates" on page 83
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

Unloading labware out of inventory

About this topic

This topic describes how to remove plates that are in a storage device from the system. Removing plates from the system is more than just unloading them from the storage device. It means removing the plates from the lab automation system as well as removing the plate identifications from the record of the plates in the system that VWorks software keeps.

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

Ways to unload plates

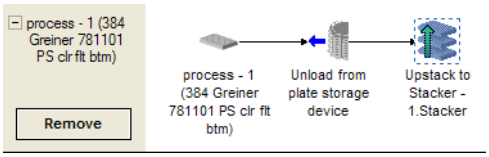
There are two ways to remove plates from a plate storage device.

- Robotically
- Manually

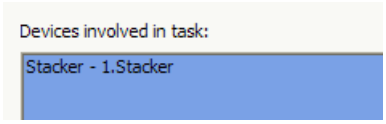
Unloading plates robotically

To unload plates from a storage device robotically:

1 Create a protocol like the one shown in the following screenshot:



2 Make sure that the **Upstack** task is configured to use the appropriate stacker.



3 In the inventory editor, identify the plates that you want to move:

a Click the **Unload** task.

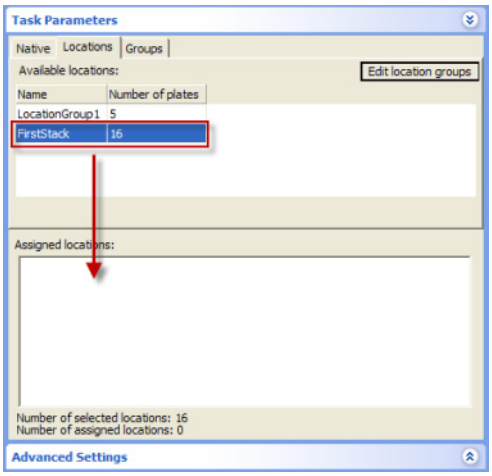
b Click **Edit location groups** to open the inventory editor.

c Click the **Inventory Management** tab. Note the device, cassette and slot numbers for the plates that you want to remove.

4 If necessary, create a location group in the inventory editor that contains the plates you want to remove.

Save the changes and confirm it by making sure it is listed in the Available locations area on the Locations tab of the Load Task Parameters toolbar.

5 Drag the location group into the **Assigned locations** area.



6 Click **Start**.

7 In the **Number of Cycles** dialog box, enter a number that equals the number of plates you want to remove from the storage device.

8 Click **OK**.

9 Confirm that the plates are no longer in the inventory:

- **a** Click the **Load** task.
- **b** Click **Edit location groups** to open the inventory editor.
- **c** Click the **Inventory Management** tab.

Unloading a storage device manually

To unload a storage device manually, cassettes of plates are physically removed from the storage device and a run is simulated to unload the matching list of plates from the inventory.

To unload plates manually using a simulated run:

1 Physically remove the cassettes of plates from the storage device.

2 Follow step 1 to step 5 in the procedure above for unloading a storage device robotically.

3 Click **Simulation is off** to turn on the simulator.

4 Click **Start**.

5 In the **Number of Cycles** dialog box, enter a number that equals the number of plates you want to remove from the storage device.

6 Click **OK**.

7 Confirm that the plates are no longer in the inventory:

- **a** Click the **Load** task.
- **b** Click **Edit location groups** to open the inventory editor.
- **c** Click the **Inventory Management** tab.

To unload plates manually and then reinventory the database:

1 Physically unload the cassettes of plates from the storage device.

2 Open the Inventory Editor and click the **Inventory Management** tab.

3 From the **Select view type** list, select **View by location (shows all available plate locations whether they are occupied or not**.

4 Select the slots you unloaded the plates from. Use SHIFT-click or CTRL + click to select more than one slot.

5 In the **Inventory Management Functions** area, click **Delete selected entries from inventory**. Click **Yes** to the message asking if you are sure you want to delete the selected plates (they will be permanently deleted from the database).

6 Click **Re-inventory selected locations**.

Related information

For information about...	See...
Creating a location group	"Creating and managing location groups" on page 70
Creating a plate group	"Creating and managing plate groups" on page 72
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Moving labware between storage devices" on page 78
Incubating plates	"Using a plate group to process plates" on page 83
Using barcode input files	"Creating a plate group with a barcode input file" on page 88

Using a plate group to process plates

About this topic

This topic shows an example protocol where a plate group is moved out of a Plate Hub Carousel, transferred to a liquid-handling device where liquid is aspirated, and then loaded back into the same or different locations of the Plate Hub Carousel.

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, Agilent Technologies Plate Hub Carousel.

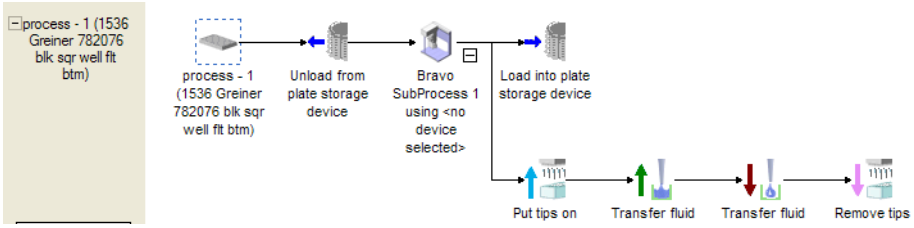
Before you start

- Place plates in a Plate Hub Carousel (or other) storage device and make sure they are stored in the inventory editor
- Create a plate group containing the plates you want processed
- Select the Dynamically assign empty slot to load to storage device option, located under Protocol Options, to enable the software to track individual plates

Processing a plate group and returning the plates to the original location

To process a plate group:

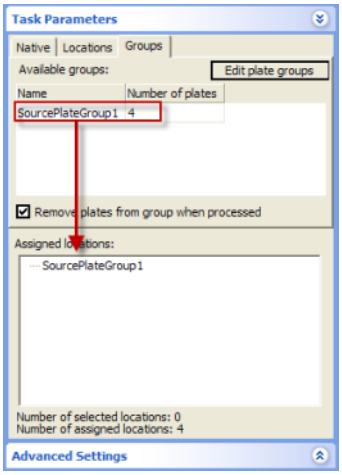
1 Create a process like the one shown below.



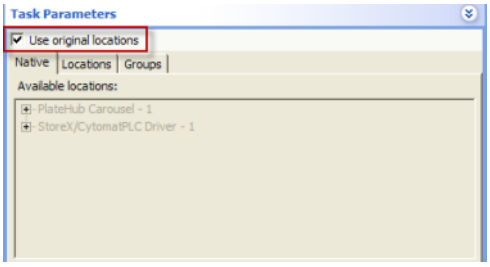
2 Select the **Unload** task and in the **Task Parameters** toolbar, click the **Groups** tab and drag the plate group to the **Assigned location** area.

3 Select **Remove plates from group when processed** if you want them to be handled in the same numerical order and/or will not be reusing the plates.

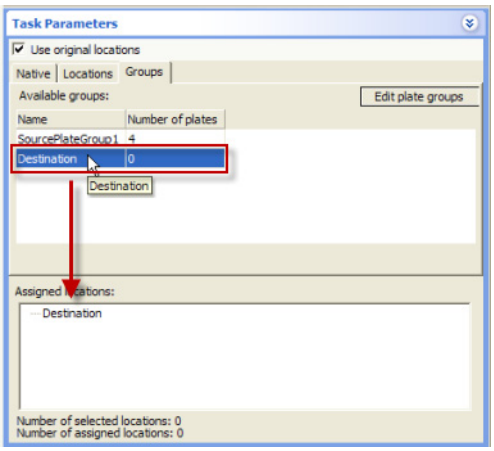
Note: The plates can be loaded back into the group during the load task execution.



4 Select the **Load** task and then select **Use original locations**. The Locations and Native tabs will become uneditable.



Optional. You can reassign the plates back to the original group or to a new plate group. Click the **Groups** tab and drag the plate group from the **Available groups** area to the **Assigned locations** area.



5 Click **Start**.

6 In the **Number of Cycles** dialog box, enter a number that is equal to or less than the number of plates you want to process from the group.

7 Click **OK**.

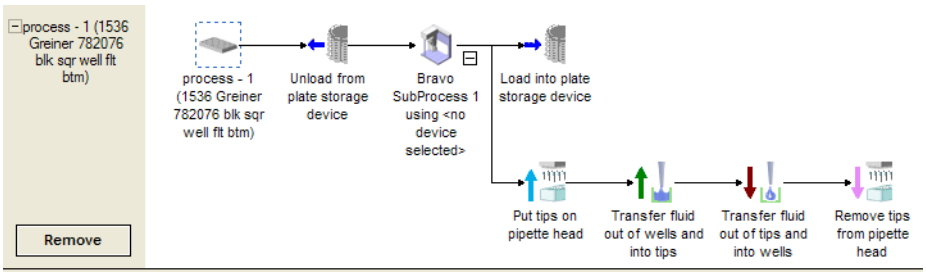
8 Confirm that the plates have been returned to their original position in the inventory:

- **a** Click the **Load** task.
- **b** Click **Edit location groups** or **Edit plate groups**.
- **c** Click the **Inventory Management** tab.

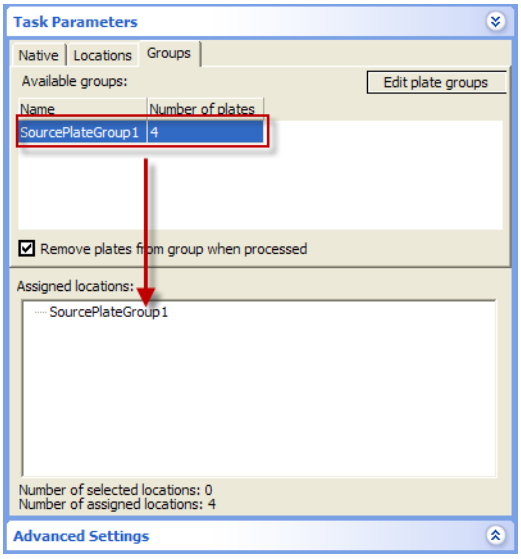
Processing a plate group and returning the plates to a different location

To process a plate group:

1 Create a protocol like the one shown below.

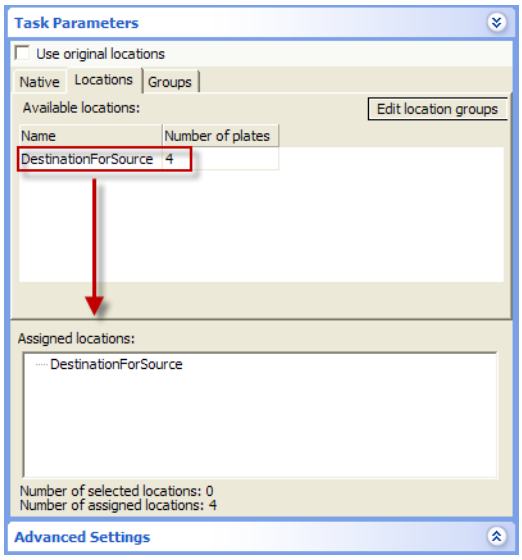


2 Select the **Unload** task and in the **Task Parameters** toolbar, click the **Groups** tab and drag the plate group you created at the beginning to the **Assigned locations** area.

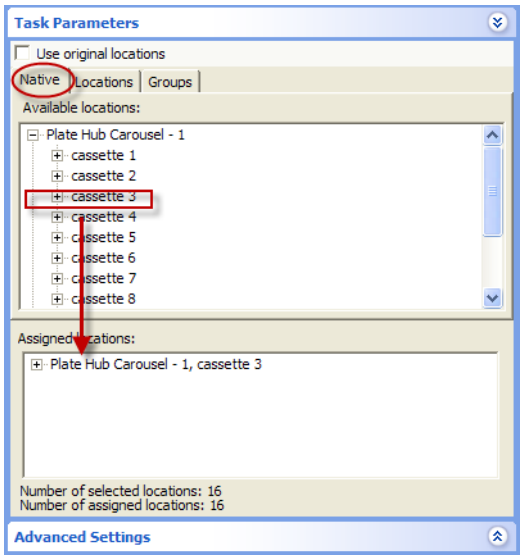


3 Select the **Load** task and in the **Task Parameters** toolbar choose one of the following ways to load the plates into a different location.

- Specify a pre-defined location group to load to. To specify a pre-defined location group, click the **Locations** tab and drag the location group in the **Available locations** to the **Assigned locations** area.



- Assign specific locations to load to without using a location group. To assign specific locations without defining a location group, click the **Native** tab and drag the locations from the **Available locations** area to the **Assigned locations** area.



4 Click **Start**.

5 In the **Number of Cycles** dialog box, enter a number that is equal to or less than the number of plates you want to process from the group.

6 Click **OK**.

7 Confirm that the plates have been returned to their assigned positions in the inventory:

   a Click the **Load** task.

   b Click **Edit location groups** or **Edit plate groups**.

   c Click the **Inventory Management** tab.

Related information

For information about...	See...
Software inventory	"About labware inventory management" on page 62
Creating a plate group	"Creating and managing plate groups" on page 72
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Using barcode input files	"Creating a plate group with a barcode input file" on page 88
Starting a run	*VWorks Automation Control User Guide*

Creating a plate group with a barcode input file

About this topic

This topic describes how to use a barcode input file to create a plate group. This is the most efficient way to create plate group if you previously used a barcode input file to label a collection of plates. which are now stored in a storage device.

Who should read this

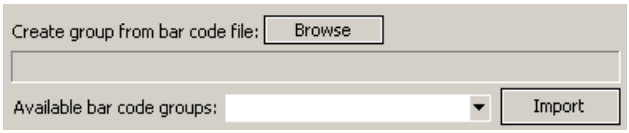
Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

Procedure

IMPORTANT All plates with barcodes listed in the selected barcode input file series must already be in the storage device.

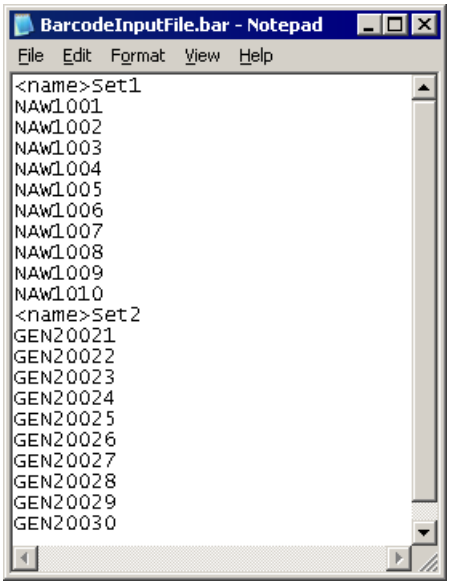
To create a plate group with a barcode input file:

1. Open the inventory editor.
2. Click the **Groups** tab.
3. Click the **Browse** button and navigate to the .bar file that you want to use.



4. From the **Available Barcode groups** list box, select the group that you want to use.

   In the following example of a barcode input file, the options would be Set1 and Set2.



5 Click **Import**.

The plates labelled with west-side barcodes listed in the series will be used to create a group and will appear in the **Plates currently in the selected group** list.

6 Specify a labware type for each plate using the labware selection function in the **Inventory Management** tab.

Related information

For information about...	See...
Software inventory	"About labware inventory management" on page 62
Opening the inventory editor	"Opening the inventory editor" on page 67
Using the labware selection list	"Reinventorying the plate inventory" on page 94

Inventory editor views and filters

About this topic

This topic describes how to make the inventory editor easier to work with by showing only the items in the inventory editor that are relevant at the particular time.

Who should read this

Read this topic if your lab automation system has a storage device such as a Liconic StoreX incubator, Heraeus Cytomat PLC, or Agilent Technologies Plate Hub Carousel.

Inventory editor views

There are three ways to view the plates in the inventory editor.

To set the view:

1. Open the inventory editor.
2. Click to select the **Inventory Management** tab.
3. From the **Select view type** list, select one of the following options:

View	Description
View by plate	Displays every plate in the inventory. This is the most frequently used view.
View by location	Displays both plates and slots.
View unassigned plates	Displays plates that were orphaned during previous runs. This means plates that are in the system but not in a storage device.

Filtering displayed plates

You may have many plates stored in the database. To simplify your view of the database, you can filter the records that are displayed.

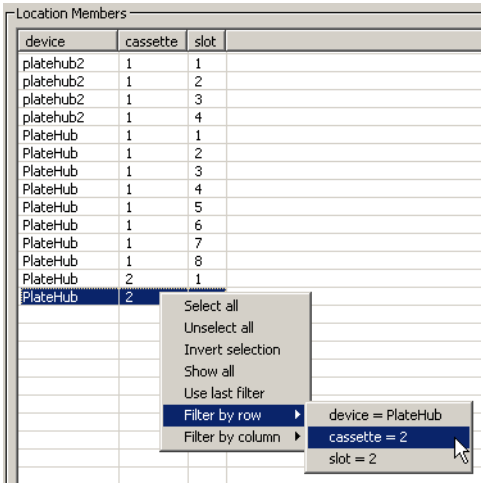
To filter the plate records:

1. Right-click on a list in any of the tabbed pages of the inventory editor and select **Show all**.
2. Right-click on a particular cell and select from the available filtering options.

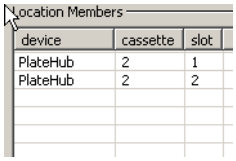
View	Description
Use last filter	Returns the display of items to that displayed when the last filter was applied

View	Description
Filter by row	The items that have the same value as the selected item in the row are displayed
Filter by column	The items that have the same value as the selected item in the column are displayed

The items that have the same value as the selected item in the row are displayed.



The result is that only those plates in cassette number 2 are listed.



To show all plate records:

Right-click on the database list and select **Show all**.

Related information

For information about...	See...
Software inventory	“About labware inventory management” on page 62
Opening the inventory editor	“Opening the inventory editor” on page 67

Auditing plate volumes in the inventory editor

About this topic

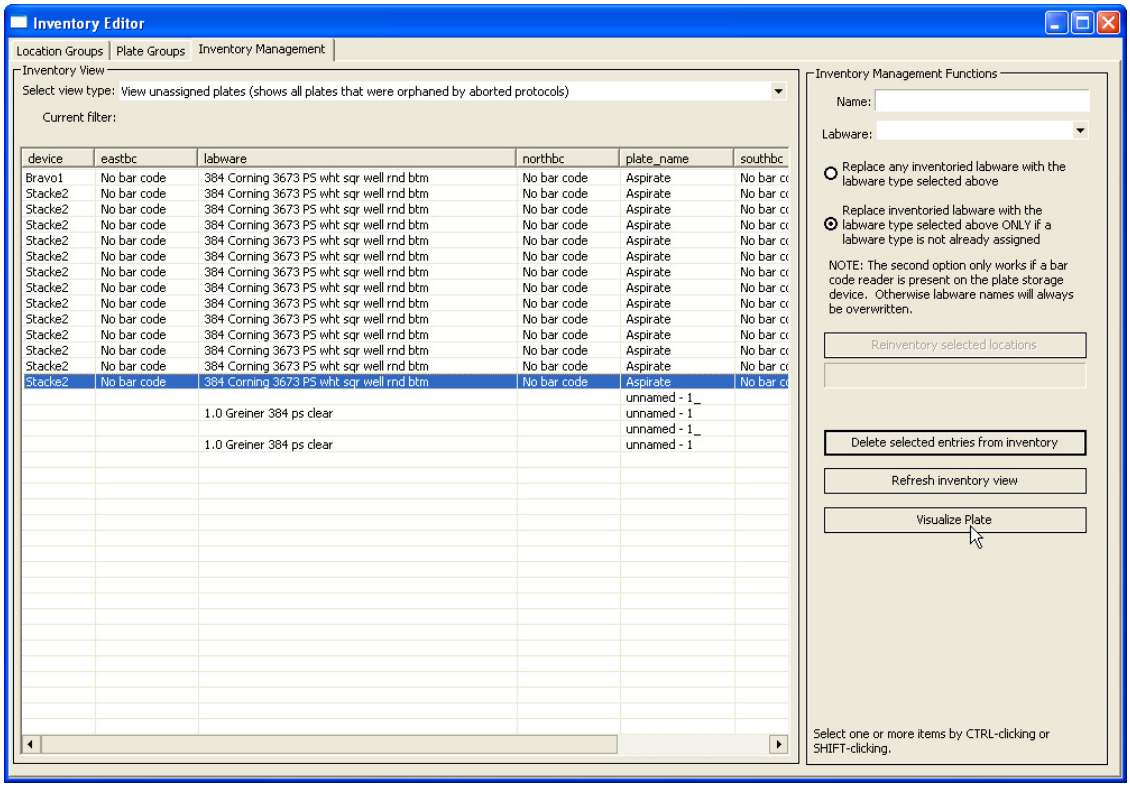
Sometimes it is useful to view the results of pipetting tasks visually. VWorks software does this by tracking the pipetting tasks performed on a plate during a protocol run, calculating the volume resulting from those tasks, and storing the information in the database. When the plate is viewed in the software, the volume is represented with color.

This topic describes how to audit a plate's volume using the inventory editor.

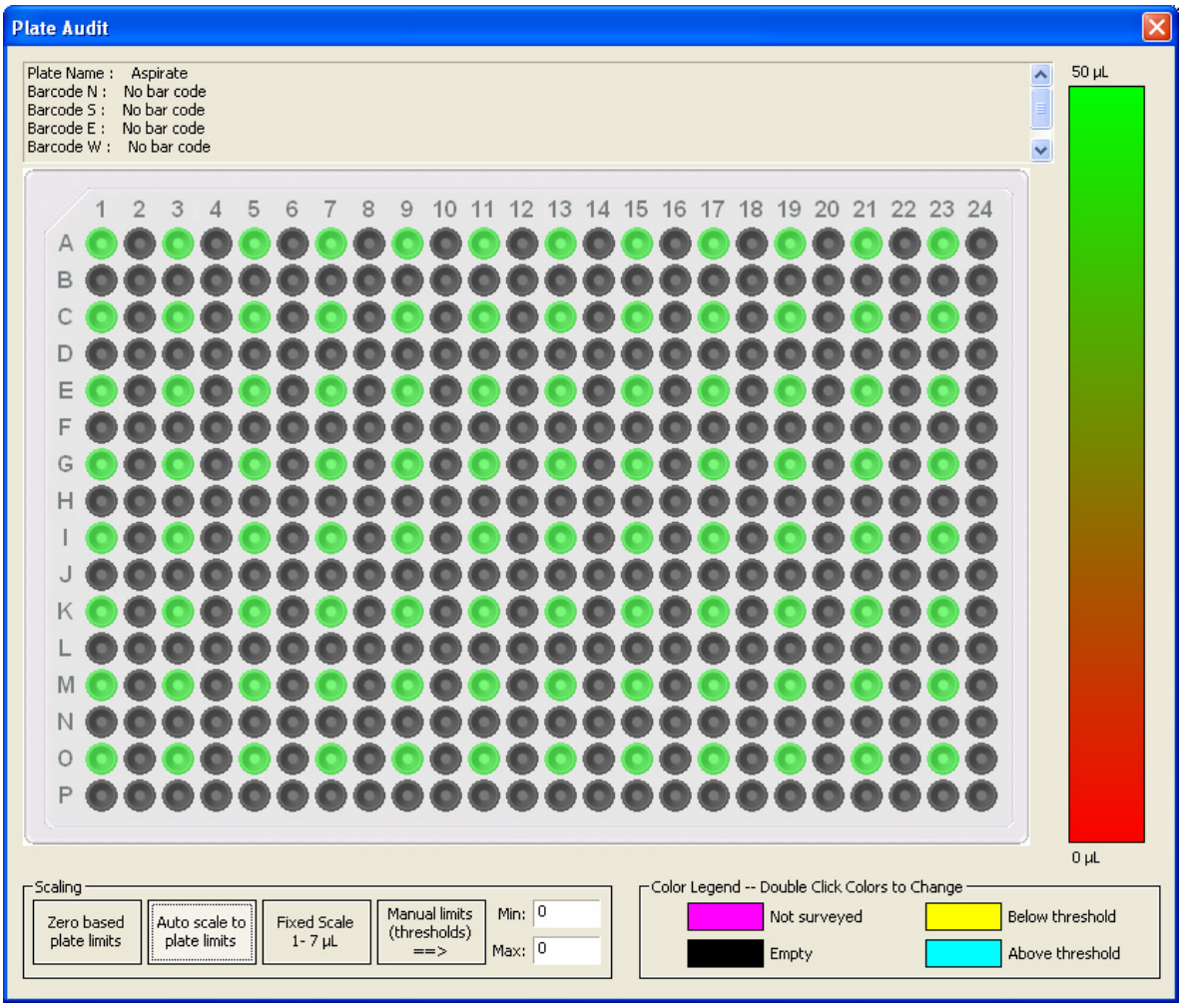
Procedure

To audit the volume of a plate:

1. Open the inventory editor.
2. Click the **Inventory Management** tab.
3. From the **Select view type** list, select the view.
4. Select the plate you want to audit.



5. Click **Visualize Plate**. The Audit Plate dialog box opens.



The volume of liquid is visualized by a color gradient, displayed on the right. The limits of this gradient is controlled by the buttons in the Scaling area.

Click this button...	To...
Zero based plate limits	Set the gradient limits from zero to the highest volume found on the plate
Auto scale to plate limits	Set the gradient limits to the lowest and highest volume found on the plate.
Fixed Scales 1-7 µL	Set the min and max limits to 1 and 7 µL respectively.
Manual limits (thresholds)	Manually set the lower and upper limits. Enter the value (in µL) in the Min and Max fields.

The color legend indicates what the well color will be for the following conditions.

Condition	Description
Not surveyed	The well is not available for measurement.
Empty	The well is empty.
Below threshold	The well is below the lower limit set by the user.
Above threshold	The well is above the upper limit set by the user.

Double-click on a color in the legend to change it.

Related topics

For information about...	See...
Software inventory	“About labware inventory management” on page 62
Opening the inventory editor	“Opening the inventory editor” on page 67

Reinventorying the plate inventory

About this topic

This topic describes how to use the reinventory feature of plate inventory.

This feature can be used to check for mismatches by comparing the identities of the plates actually in a plate storage device with the plates that the inventory database says should be in the plate storage device.

Mismatches can arise, for example, if you physically load plates into the storage device and then use the simulator to virtually “move the plates” into the database without specifying a plate type before running the simulated protocol. In this case there will be no labware associated with the plates.

The reinventory feature can also be used to enter barcode information for plates that have been manually placed into the storage device.

Note: Reinventorying requires that the storage device have a barcode reader.

Who should read this

Read this topic if your lab automation system has a plate storage device that includes an optional barcode reader.

About performing an inventory

The accuracy of the inventory database can be checked by performing a new inventory of the database. You can perform an inventory of the entire storage device or part of it.

The device's barcode reader checks all selected slots for the presence of a barcode and reads those that it finds. The results are checked against the inventory database.

IMPORTANT For reinventorying to be successful, each plate must have a unique barcode.

Reinventorying logic

If a plate is found in a slot that, according to the inventory database, should not have a plate, a line is added to the inventory editor for that slot and the plate's barcode is recorded. If that barcode is already associated with another slot in the database, the previous association is deleted. In doing this, the system assumes that the plate has been manually moved.

If the inventory has a line for a plate in a particular slot, but the inventory finds no plate in that slot, the line is removed from the inventory. However, the data in the system that is associated with the plate is not deleted. If in the future, a plate with an identical barcode is returned to the system, when the next inventory is performed the data can be reassociated with it.

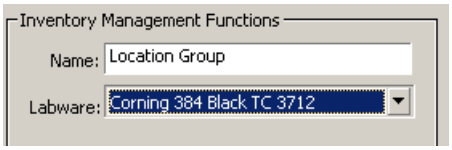
Procedure

To reinventory the plate storage device:

1. Open the inventory editor.
2. Click the **Inventory Management** tab.
3. From the **Select view type** list box, select **View by location**.

   This lists the plates in the inventory database by location.
4. Select the plates that you want to inventory.

   You can use SHIFT + click to select a range of listed plates.
5. In the **Name** text box, type the name of the location group.
6. From the **Labware** list box, select the type of labware to associate.



7. Select one of the following options:

Option	Comments
Replace any inventoried labware with the labware selected above	Labware for all selected items are replaced with the labware displayed in the list box. This overwrites labware already assigned.

Option	Comments
Replace inventoried labware with the labware selected above ONLY if a labware is not already assigned	Labware for all selected items that do not already have a labware entry are replaced with the indicated labware.

8 Click **Reinventory selected locations**.

A barcode reader reads each plate in the storage device and adds the barcode data to the inventory database.

Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 68
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Changing the labware associated with plates in the inventory database	"Reinventorying the plate inventory" on page 94
Inventory editor filters	"Inventory editor views and filters" on page 90

Resolving plate inventory problems

About this topic

This topic describes how to check and test the Windows Open Database connection that is used by the VWorks software inventory management system.

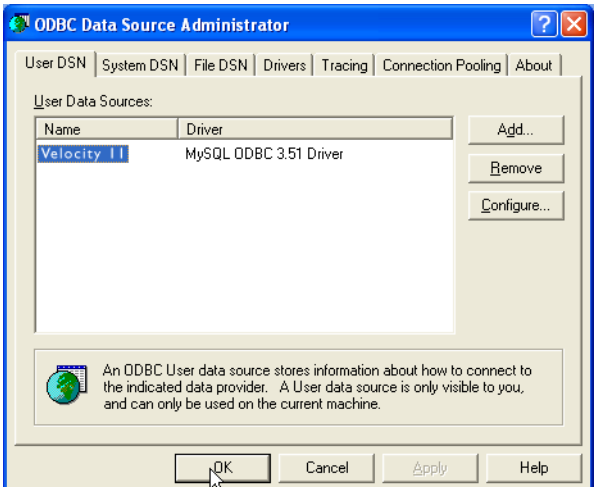
Checking the database settings

The inventory management database uses a Windows Open Database Connectivity (ODBC) interface. If you encounter inventory management problems, you may need to check the database settings.

To check the database settings:

1 In Windows, navigate to **Start > Settings** > **Control Panel** > **Administrative Tools** > **Data Sources (ODBC)**.

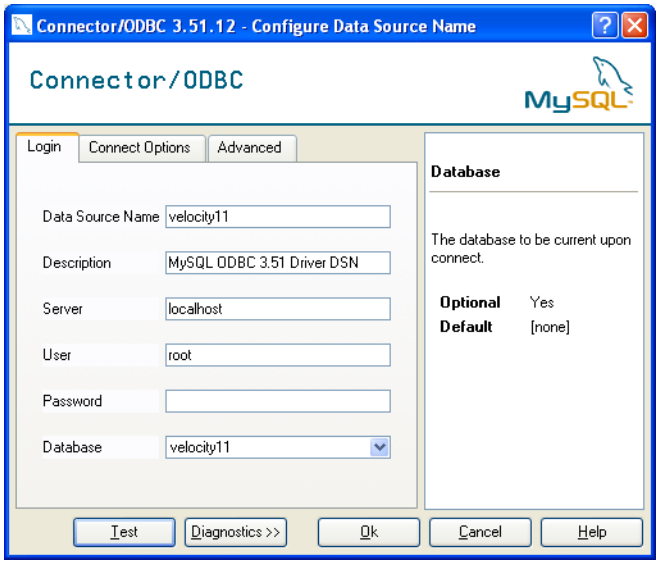
The **ODBC Data Sources Administrator** dialog box opens.



2 Click the **System DSN** tab.

3 Click **Configure**.

The **Connector/ODBC** dialog box opens showing the database settings.



The **Data Source Name** and **Database Name** fields must both contain "velocity11".

Testing the connection

To test the database connection:

1. Follow the procedure in "Checking the database settings" on page 97 to open the **Connector/ODBC** dialog box.
2. Click **Test**.

   A dialog box like the following example confirms a successful connection.

Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 68
Moving plates in and out of a storage device	• "Loading labware into storage devices" on page 74 • "Unloading labware out of inventory" on page 81 • "Moving labware between storage devices" on page 78
Changing the labware associated with plates in the inventory database	"Reinventorying the plate inventory" on page 94

For information about...	See...
Inventory editor filters	“Inventory editor views and filters” on page 90

5 Managing user accounts

This chapter contains the following topics:

Planning user accounts and privileges

The role of user accounts

You must have a user account to log in to VWorks software. Your user account is associated with a user role that determines the privileges you have to perform particular functions. Users are added and assigned privileges by an Administrator.

The effect of privileges

Privileges have the following effects:

- If you do not have the privilege to perform a function associated with a particular menu command, the text of the command is gray.
- If you do not have the privilege to perform the functions accessed from a particular tabbed page, the tab is not visible to you.
- In some cases, if you do not have the privilege to perform an operation, when you attempt the operation you get an error message telling you that your privileges are insufficient.

User roles and privileges

User roles enforce the following privileges:

User role	Has privileges to...
Guest	• Log in and log out. • Access Knowledge Base through the Help menu. • Use context-sensitive help.
Operator	• Perform guest functions (see above). • Operate devices in real-time using diagnostics software. • Run protocols.
Technician	• Perform operator functions (see above). • Create and save protocols. • Manage devices through the device manager. • Perform all of the functions listed in the Tools menu (except managing users).
Administrator	• Perform technician functions (see above). • Manage user accounts. • Run a protocol that contains compiler errors.

Related information

For information about...	See...
managing user accounts	“Managing user accounts” on page 103
Setting up email notification	“Setting up email for error notification” on page 105

Managing user accounts

About user accounts and passwords

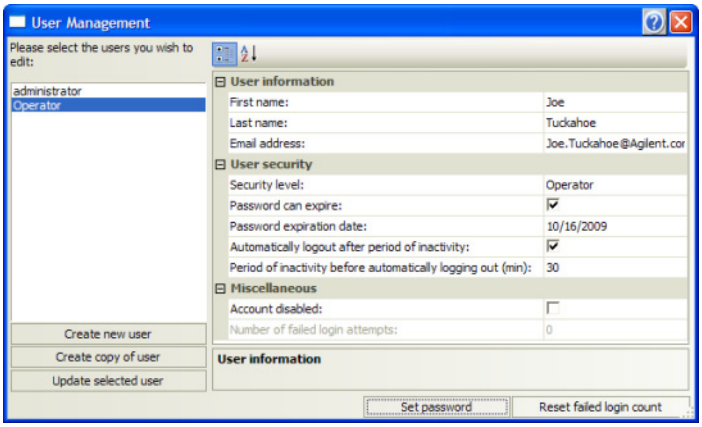
User accounts and passwords use the following conventions:

- User accounts can be disabled but not deleted.
- User names and passwords are case-sensitive.
- Passwords must contain six or more characters.
- If a user enters an incorrect password five times consecutively, the user is locked out until an administrator resets the account.

Adding a user account

To add a user account:

1. Select **Tools** > **User Management**.
2. In the **User Management** dialog box, click **Create new user** and enter a name for the user.
3. In the Set Password dialog box, enter the password twice for the new user.
4. Enter values in the **User information**, and **User security** areas.



5. Click **Update selected user** to save changes, and then close the dialog box.

Disabling a user account

You cannot delete a user account, but you can disable it.

To disable an account so that the user cannot log in:

1. Select **Tools** > **User Management**.
2. Select the account.
3. Select the **Account disabled** check box.
4. Click **Update selected user** to save changes, and then close the dialog box.

Resetting a user account

If a user mistypes the password five consecutive times, the user is locked out of the account until an administrator resets the account.

To reset an account:

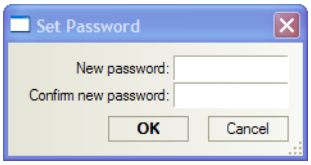
1. Select **Tools** > **User Management**.
2. Select the account.
3. Click **Reset failed login count**.
4. Click **Update selected user** to save changes, and then close the dialog box.

Changing a password

An administrator can reset the password of any account. Technicians can change their own passwords at Log in.

To reset a password:

1. Select **Tools** > **User Management**.
2. Select the account.
3. Click **Set password**, enter the new password twice and click **OK**.



4. Click **OK** to the Password Update message.

Related information

For information about...	See...
User accounts	"Planning user accounts and privileges" on page 102
Setting up email notification	"Setting up email for error notification" on page 105

Setting up email for error notification

About email error notification

Email setup in VWorks software enables you to do the following tasks:

- Automatically be notified by email or pager when errors occur during a protocol run
- Send a bug report to Agilent Technologies

Requirements for email notification

Before you can send an email from VWorks software, the controlling computer must:

- Be connected to a network with internet access
- Have network access to an outgoing mail server that supports one of the authentication methods available through VWorks software.

Procedure

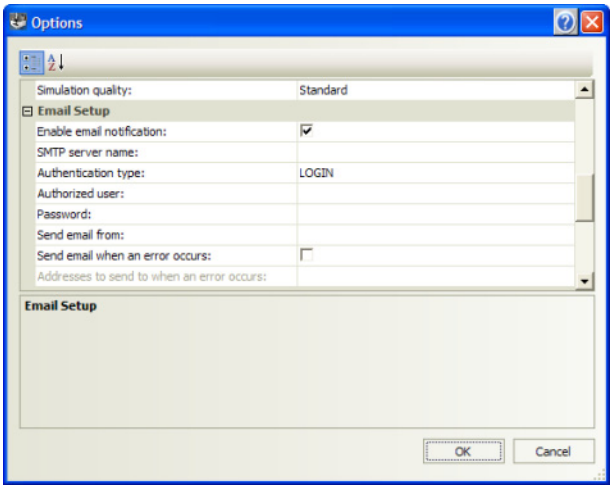
To set up the outgoing mail server:

1. Select **Tools > Options**.
2. In the **Email Setup** area make sure **Enable email notification** is selected.
3. Enter the name of your **SMTP server name** (outgoing email server).
4. If the server requires a user name and password:
   a. Select the **Authentication type** from the list.

      IMPORTANT The authentication type is critical. Check with your network administrator to determine the best authentication network for your email server. (NTLM is typically used when Microsoft Exchange is the email server.)

   b. Enter your **Authenticated user** name and **Password** for the selected authentication type.
5. Next to the **Send email from** field, enter the email address you want to use for auto-generated crash reports.
6. Select **Send email when an error occurs**, then next to **Addresses to send to when an error occurs**, enter the address to which you want the email delivered.

   Note: Multiple email addresses must be separated with a semicolon.
7. Click **OK** to save the email setup information and close the dialog box.



Related information

For information about...	See...
Using user accounts	"Planning user accounts and privileges" on page 102
Managing user accounts	"Managing user accounts" on page 103

6 VWorks ActiveX control

This chapter contains the following topics:

About the VWorks ActiveX control

What is the VWorks ActiveX control

The VWorks ActiveX control is the software component that allows the VWorks software to interact with a third-party lab automation system.

How the VWorks ActiveX control is used

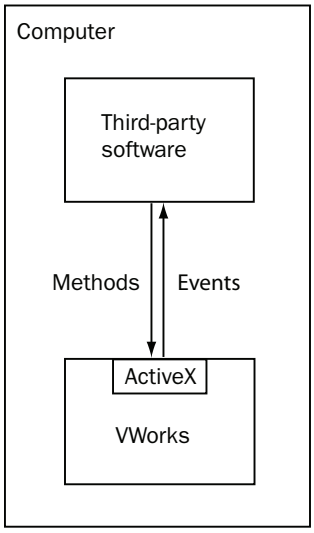
In an Agilent Technologies automation system, VWorks software is already configured to interface with the VWorks software. The operator can control the device using the software.

In a third-party lab automation system, you need to use ActiveX to enable the third-party software to interface with the VWorks software. Each ActiveX control consists of a collection of the following:

- *Methods*. Functions that can be called to invoke individual operations
- *Properties*. Variables that are used in methods (for example, speed = fast)
- *Events*. Notifications that methods have completed or resulted in errors

When integrating the VWorks software in a lab automation system, you need to know the available methods and properties for the ActiveX control.

The following diagram illustrates the use of the VWorks ActiveX control in a lab automation system environment. Actions you perform are conducted through ActiveX methods. System responses are relayed back through ActiveX events.



Integrating the VWorks ActiveX control

When integrating the VWorks ActiveX control in a third-party lab software:

1 Install the VWorks ActiveX control. To install the VWorks ActiveX control:

a Insert the VWorks software CD into the controlling computer CD-ROM drive.

b In the CD folder, double-click VWorks Installer.exe.

c Follow the directions in the installation wizard window.

2 Open the Command Prompt window and type VWorks/register to register the application program interface.

3 Refer to the description of the Methods and Properties in this section.

Related information

For information about...	See...
VWorks ActiveX methods	"Methods" on page 110
VWorks ActiveX events	"Events" on page 122
VWorks ActiveX enumerated types	"Enumerated types" on page 125

Methods

AbortProtocol

Description

Aborts the protocol run that is in progress.

Parameters

None

Returns

Name	Type	Description
returnCode	V11ReturnCode	See"Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode = oVWorks4COM.AbortProtocol();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode = oVWorks4COM.AbortProtocol()
```

CloseProtocol

Description

Closes the specified protocol file.

Parameters

Name	Type	Description
protocol	BSTR	The protocol file path.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125. *Note:* returnCode is RETURN_SUCCESS if the file closed successfully.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode = oVWorksCOM.CloseProtocol("myprotocol.pro");
```

Visual Basic .NET example

```
Dim vwRetCode As VWorks4Lib.V11ReturnCode
vwRetCode = oVWorksCOM.CloseProtocol("myprotocol.pro")
```

CompileProtocol

Description

Compiles the protocol and is used with the LogMessage event.

Parameters

Name	Type	Description
protocol	BSTR	The protocol file path.
errorCount	*LONG	The number of errors found.
warningCount	*LONG	The number of warnings found.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
LONG errCount, wrnCount;
retCode = oVWorks4COM.CompileProtocol ("c:\\myprotocol.pro",
&errCount, &wrnCount);
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
Dim errCount, wrnCount as Long
retCode = oVWorks4COM.CompileProtocol ("c:\myprotocol.pro",
errCount, wrnCount)
```

EnumerateUsers

Description

Returns the list of users with VWorks accounts.

Parameters

None.

Returns

Name	Type	Description
user	*VARIANT	The user name.
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual Basic .NET example

```
Dim oEnumerateUsers As Object = Nothing
Dim retCode As VWorks4Lib.V11ReturnCode
Dim sUsers As String = ""

retCode = oVWorksCOM.EnumerateUsers(oEnumerateUsers)

If Not (oEnumerateUsers Is Nothing) Then
Dim i As Integer
For i = 0 To oEnumerateUsers.GetLength(0) - 1
sUsers = sUsers & oEnumerateUsers(i) & " , "
Next
End If
```

GetSimulationMode

Description

Gets the simulation mode state.

Parameters

None.

Returns

Name	Type	Description
mode	VARIANT_BOOL	The value that indicates the simulation state: • True = The simulation mode is on. • False = The simulation mode is off.

Visual C++ example

```
VARIANT_BOOL bSimMode;
bSimMode= oVWorksCOM.GetSimulationMode();
```

Visual Basic .NET example

```
Dim bSimMode as Boolean
bSimMode= oVWorksCOM.GetSimulationMode()
```

GetTipStates

Description

Gets the state of the tipboxes in a protocol for automated tip tracking.

Parameters

Name	Type	Description
protocol	BSTR	The protocol file path.

Returns

Name	Type	Description
TipStateXML	BSTR	The current status of the tipboxes.
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual Basic .NET example

```
Dim TipStateXML As String = ""
Dim retCode As VWorks4Lib.V11ReturnCode
retCode = oVWorksCOM.GetTipStates("c:\myprotocol.pro",
TipStateXML)
```

LoadProtocol

Description

Loads the protocol for a run.

Parameters

Name	Type	Description
protocol	BSTR	The protocol file path.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.CompileProtocol("c:\\myprotocol.pro");
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM.CompileProtocol ("c:\myprotocol.pro")
```

LoadRunsetFile

Description

Loads the runset file.

Parameters

Name	Type	Description
runset	BSTR	The runset file path.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.LoadRunsetFile ("c:\\myrunset.rst");
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM.LoadRunsetFile ("c:\myrunset.rst")
```

Login

Description

Logs into VWorks software using the provided user name and password.

Parameters

Name	Type	Description
userName	BSTR	The user name.
password	BSTR	The password.

Returns

Name	Type	Description
loginResult	V11LoginResult	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11LoginResult retCode;
loginResult= oVWorksCOM.Login("user1","mypassword!");
```

Visual Basic .NET example

```
Dim loginResult as VWorks4Lib.V11LoginResult
loginResult= oVWorksCOM.Login("user1","mypassword!")
```

Logout

Description

Logs out the current user session.

Parameters

None.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode = oVWorksCOM.Logout();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode = oVWorksCOM.Logout()
```

PauseProtocol

Description

Pauses the protocol run that is in progress. The tasks that are in progress will be finished. No new tasks will be started.

Parameters

None.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode = oVWorksCOM.PauseProtocol();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode = oVWorksCOM.PauseProtocol()
```

ReinitializeDevices

Description

Reinitializes devices.

Parameters

None

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ReinitializeDevices ();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ReinitializeDevices ()
```

ResumeProtocol

Description

Resumes the protocol run.

Parameters

None.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode = oVWorksCOM.ResumeProtocol ();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode = oVWorksCOM.ResumeProtocol ()
```

RunProtocol

Description

Starts the protocol run.

Parameters

Name	Type	Description
protocol	BSTR	The protocol file path.
runCount	LONG	The number of times to run the protocol.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.RunProtocol ("c:\\myprotocol.pro",2);
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM.RunProtocol ("c:\myprotocol.pro",2)
```

SetSimulationMode

Description

Sets the simulation mode.

Parameters

Name	Type	Description
mode	VARIANT_BOOL	The value that sets the simulation state: • True = Turns on the simulation mode. • False = Turns off the simulation mode.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125. *Note:* returnCode is always RETURN_SUCCESS.

Visual C++ example

```
oVWorksCOM.SetSimulationMode(VARIANT_TRUE);
oVWorksCOM.SetSimulationMode(VARIANT_FALSE);
```

Visual Basic .NET example

```
oVWorksCOM.SetSimulationMode(True)
oVWorksCOM.SetSimulationMode(False)
```

ShowDiagsDialog

Description

Displays the device diagnostics dialog box.

Parameters

None

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ShowDiagsDialog ();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ShowDiagsDialog ()
```

ShowLoginDialog

Description

Displays the User Authentication (or login) dialog box.

Parameters

None

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ShowLoginDialog ();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ShowLoginDialog ()
```

ShowManageUserDialog

Description

Displays the User Management dialog box.

Parameters

None

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ShowManageUserDialog ();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ShowManageUserDialog ()
```

ShowOptionsDialog

Description

Displays the Options dialog box.

Parameters

None

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ShowOptionsDialog ();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ShowOptionsDialog ()
```

ShowPlateGroupEditorDialog

Description

Displays the Plate Group Editor dialog box.

Parameters

None

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ShowPlateGroupEditorDialog ();
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ShowPlateGroupEditorDialog ()
```

ShowTipStateEditor

Description

Displays the Tip State Editor dialog box.

Parameters

Name	Type	Description
Protocol	BSTR	The protocol file path.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ShowTipStateEditor
("c:\\myprotocol.pro");
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ShowTipStateEditor
("c:\myprotocol.pro")
```

ShowVWorks

Description

Displays or hides the VWorks software window.

Parameters

Name	Type	Description
showOrHide	VARIANT_BOOL	The value that displays or hides the window: • TRUE = Display the window. • FALSE = Hide the window.

Returns

Name	Type	Description
returnCode	V11ReturnCode	See "Enumerated types" on page 125.

Visual C++ example

```
VWorks4Lib.V11ReturnCode retCode;
retCode=oVWorks4COM.ShowVWorks (VARIANT_TRUE);
```

Visual Basic .NET example

```
Dim retCode as VWorks4Lib.V11ReturnCode
retCode=oVWorks4COM. ShowVWorks (True)
```

Related information

For information about...	See...
VWorks ActiveX control	"About the VWorks ActiveX control" on page 108
VWorks ActiveX events	"Events" on page 122
VWorks ActiveX enumerated types	"Enumerated types" on page 125

Events

LogMessage

Description

The LogMessage event occurs every time a message is posted to the log.

Parameters

Name	Type	Description
session	LONG	The session ID.
logClass	LONG	The type of log event: Error, Warning, or Event.
timeStamp	BSTR	The time at which the error occurred.
device	BSTR	The device name. An empty string is permitted.
location	BSTR	The location. An empty string is permitted.
process	BSTR	The process plate name. An empty string is permitted.
task	BSTR	The task name. An empty string is permitted.
fileName	BSTR	The protocol file or device file name. An empty string is permitted.
message	BSTR	The the error message text.

Returns

None.

PromptUser

Description

The PromptUser event occurs every time VWorks software displays a message that expects the operator to respond with a decision.

Parameters

Name	Type	Description
session	LONG	Session ID
prompt	BSTR	Message to prompt

Returns

Name	Type	Description
choice	*LONG	0 = OK, 1 = Cancel

ProtocolComplete

Description

The ProtocolComplete event occurs after startup, cleanup, and main protocols are finished.

Paramters

Name	Type	Description
session	LONG	The session ID.
protocol	BSTR	The protocol file path.
protocol_type	BSTR	The type of protocol: Startup, Main, or Cleanup.

Returns

None.

ProtocolAborted

Description

The ProtocolAborted event occurs when the operator or automation client aborts the protocol run.

Parameters

Name	Type	Description
session	LONG	The session ID.
protocol	BSTR	The protocol file path.
protocol_type	BSTR	The type of protocol: Startup, Main, or Cleanup.

Returns

None.

RecoverableError

Description

The RecoverableError event occurs whenever an error is displayed and expects the operator to abort, retry, or ignore the error.

Parameters

Name	Type	Description
session	LONG	The session ID.
device	BSTR	The device name. An empty string is permitted.
location	BSTR	The location. An empty string is permitted.
description	BSTR	The description of the error.

Returns

Name	Type	Description
actionToTake	*LONG	The value that indicates the action to take: • 0 = Abort • 1 = Retry • 2 = Ignore
vworksHandlesError	*VARIANT_BOOL	Value values are: • TRUE = Allows the VWorks4 software to handle the error. the VWorks4 software will not display the error message. • FALSE = Prevents the VWorks4 software from handling the error.

UnrecoverableError

Description

The UnrecoverableError event occurs when an error is displayed and does not expect the operator to respond with a decision.

Parameters

Name	Type	Description
session	LONG	The session ID.
description	BSTR	The description of the error.

Returns

None.

UserMessage

Description

The UserMessage event occurs when a User Message task occurs.

Parameters

Name	Type	Description
session	LONG	User message tasks can prompt user for data entry.
caption	BSTR	
message	BSTR	
wantsData	VARIANT_BOOL	

Returns

Name	Type	Description
userData	*BSTR	Allows user to enter data if wantsData = True.

Related information

For information about...	See...
VWorks ActiveX control	“About the VWorks ActiveX control” on page 108
VWorks ActiveX methods	“Methods” on page 110
VWorks ActiveX enumerated types	“Enumerated types” on page 125

Enumerated types

V11ReturnCode

Description

Indicates the method call status.

Constants

Name	Value	Description
RETURN_SUCCESS	0	The method was called successfully.
RETURN_BAD_ARGS	1	The method contains bad arguments.

Name	Value	Description
RETURN_FAIL	2	The method call failed.

V11LoginResult

Description

Indicates the login status.

Constants

Name	Value	Description
LOGIN_SUCCESS	0	The login was successful.
LOGIN_FAIL	1	The login failed.
LOGIN_DISABLED	2	The login was disabled.
LOGIN_EXPIRED	3	The login period passed.
LOGIN_TOO_MANY_FAILED_ATTEMPTS	4	Too many login attempts were made and failed.
LOGIN_NOT_ENOUGH_AUTHORIZATION	5	Higher access priveleges are required to perform the requested action.

Related information

For information about...	See...
VWorks ActiveX control	"About the VWorks ActiveX control" on page 108
VWorks ActiveX methods	"Methods" on page 110
VWorks ActiveX events	"Events" on page 122

Glossary

clamps (BenchCel) The components inside of the stacker head that close and open the stacker grippers during the loading, unloading, downstacking, and upstacking processes.

controlling computer The lab automation system computer that controls the devices in the system.

cycle See seal cycle.

deadlock 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 pauses.

device An item on your lab automation system that can have an entry in the 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.

device file A file that contains the configuration information for a device. The device file has the .dev file name extension and is stored in the folder that you specify when saving the file.

downstack The process in which a microplate is moved out of the stack.

error handler The set of conditions that define a specific recovery response to an error.

home position The position where all robot axes are at the 0 position (the robot head is approximately at the center of the x-axis and at 0 of the z-axis, and the robot arms are perpendicular to the x-axis).

homing The process in which the robot is sent to the factory-defined home position for each axis of motion.

hot plate (PlateLoc) A heated metal plate inside the sealing chamber that descends and presses the seal onto the plate.

insert A pad placed under the plate to support the bottom of the wells for uniform sealing.

location group A list of labware that can be moved into or out of particular slots in a storage device.

plate group A list of specific labware that can be moved into or out of a storage device without regard for the slot locations.

plate instance A single labware in a labware group that is represented by the process plate icon.

plate stage The removable metal platform on which you load a plate.

plate-stage support The structure on which you load a plate stage. The plate-stage support extends when the door opens.

profile The Microsoft Windows registry entry that contains the communication settings required for communication between a device and the VWorks software.

process A sequence of tasks that are performed on a particular labware or a group of labware.

protocol A schedule of tasks to be performed by a standalone device, or devices in the lab automation system.

regripping station A location that enables the robot to adjust its grip at the specified gripping height. The location is typically used after a robot picks up a labware higher than the specified gripping height because the labware was sitting in a box.

robot grippers The components that the robot uses to hold labware.

run A process in which one or more microplates are processed. In a standalone device, the run consists of one cycle. In a lab automation system, a run can consist of multiple cycles that are automated.

safe zone The boundary within which the robot is allowed to move without colliding with external devices.

seal cycle The process in which a single plate is sealed on the PlateLoc Sealer.

seal entry slot The narrow entry on the back of the PlateLoc Sealer where the seal is inserted into the device.

seal-loading card A rectangular card that is used to facilitate the seal loading process on the PlateLoc Sealer.

seal-roll support The triangular structures at the top of the PlateLoc Sealer where a roll of seal is mounted.

sealing chamber The area inside of the PlateLoc Sealer where the seal is applied to a plate.

shelves (BenchCel) The components inside of the stacker head that provide leveling surfaces for the microplates, thus ensuring accurate robot gripping, during the downstacking process.

stacker grippers The padding at the bottom of the stacker racks that hold microplates when a microplate is loaded, downstacked, or upstacked.

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

task An operation performed on one or more labware.

task parameters The parameters associated with each task in a protocol. For example, in a labeling task, the parameters include the label value.

teachpoint A set of coordinates that define where the robot can pick up or place labware and the location of a known object.

teachpoint file The XML file that contains the settings for one or more device teachpoints.

touch screen The interface on the front of the PlateLoc Sealer where sealing parameters are set, the seal cycle can be started or stopped, and the seal cycle can be monitored.

upstack The process in which a microplate is moved back into the stack.

waypoint A set of coordinates that define a location the robot passes through on its way to a teachpoint.

workspace The boundary within which the robot can move without limitations.

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User Guide

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