VWorks Automation Control

Version 13

Setup Guide

Original Instructions

Agilent Technologies

Notices

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Contents

Preface

This preface contains the following topics:

About this guide

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.

What this guide covers

This guide describes how to:

- Install the VWorks software
- Define labware
- Specify pipette speed and accuracy
- Track and manage labware using a database inventory system
- Manage user accounts

This guide does not provide instructions for writing protocols, running protocols, troubleshooting protocols, or operating devices using the 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 version

This guide describes VWorks Automation Control 13.0 and later versions.

The software runs on the Microsoft Windows 7 64-bit or Windows 10 operating system.

IMPORTANT If using Windows 10, the computer display must be set to a scale of 100% to ensure the VWorks software displays properly.

Related guides

The *VWorks Automation Control Setup Guide* should be used in conjunction with the following guides, which are available in the VWorks Knowledge Base:

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

The *VWorks Bravo Platform for Windows Non-Administrators Setup Guide* describes how to set up user accounts that can be shared across multiple computers and configure the VWorks Automation Control software so that Windows users with non-Administrator privileges can use the VWorks software to operate the Bravo Automated Liquid Handling Platform.

Related information

For information about...	See...
Accessing user documentation in the VWorks Knowledge Base	"Accessing Automation Solutions user guides" on page viii

Accessing Automation Solutions user guides

About this topic

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

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 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 website*. You can search the online knowledge base or download the latest version of any PDF file from the Agilent website at www.agilent.com/chem/askb.

Accessing safety information

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

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

Using the knowledge base

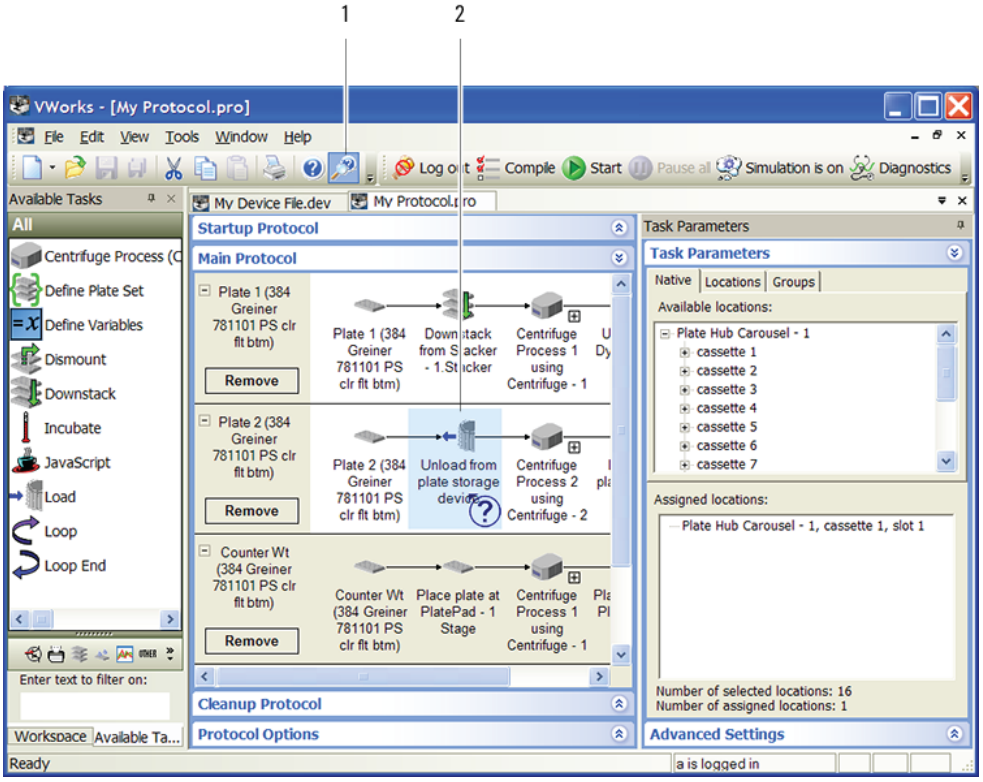
Knowledge base topics are displayed using web browser software such as Microsoft Internet Explorer and Mozilla Firefox.

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

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

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

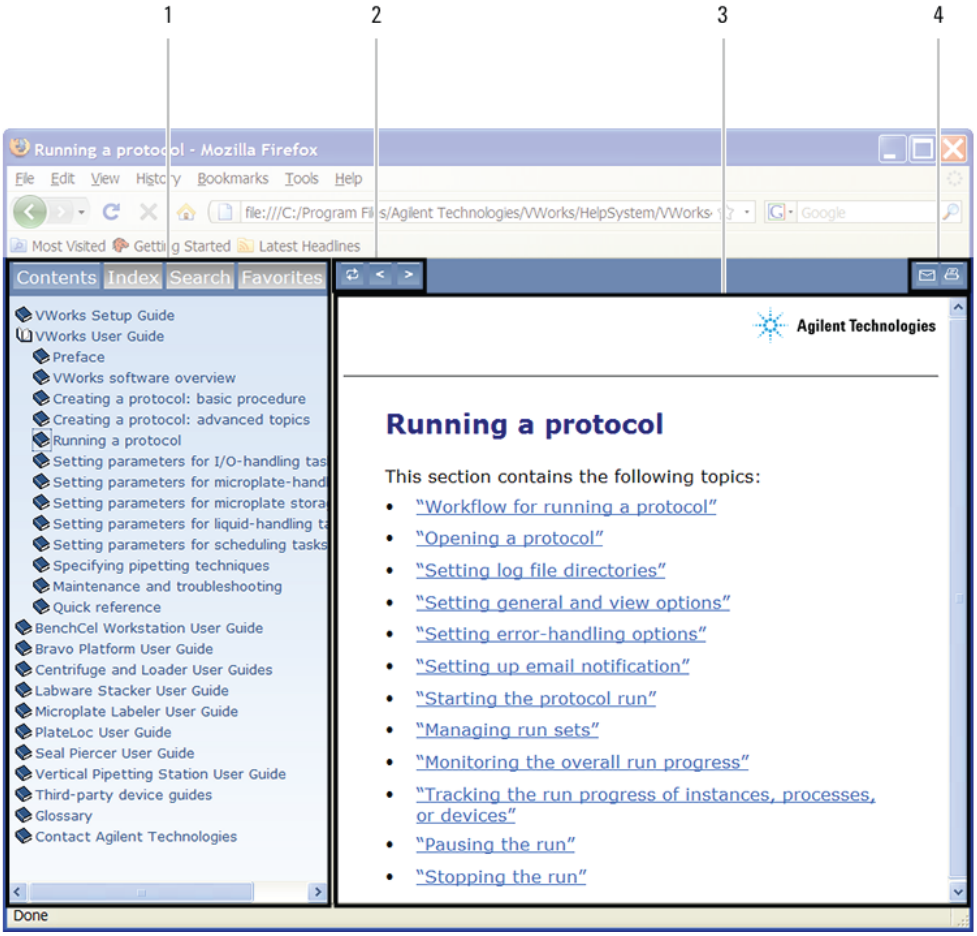
Opening the help topic for an area in the VWorks window



To access the context-sensitive help feature:

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

Features in the Knowledge Base window



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

1 Installing and setting up the VWorks software

This chapter contains the following topics:

Installing and uninstalling the software

About this topic

This topic describes how to install the VWorks Automation Control software (VWorks software). The VWorks software manages and controls standalone devices and integrated devices in a laboratory automation system.

For the computer requirements, see the VWorks software release notes.

If you encounter problems after installing the software, try to locate a solution using the guidelines in one of the following documents:

- *VWorks Automation Control User Guide*
- Applicable user guide for your device

If you are unable to resolve the problem, see "Reporting problems" on page 5.

Installing the software

If you have a previous version of the VWorks software, you must first uninstall it before installing the new software.

To install the software:

1. Insert the VWorks software CD into the computer CD-ROM drive. The software installer should start automatically.

   If installer does not start, navigate to the CD-ROM drive, and then double-click **VWorks_x.x.x.exe**.

2. Follow the instructions that appear on the screen.

Uninstalling the software

To uninstall the VWorks software:

Uninstall the VWorks software using the applicable uninstall apps or programs feature in Microsoft Windows 7 or 10. The removal process might take a few minutes.

When the removal process is finished, the following folders and files may remain depending on the version of the VWorks software:

...\VWorks folder:

- Users folder
- VWorks.vln file (This file is installed by earlier versions than VWorks software 13.0.)

...\VWorks Workspace folder:

- Barcode Input Files folder
- Protocol Files folder
- Device Files folder
- RunSet Files folder
- Scripts folder
- VWorks folder

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 do not intend to run the VWorks software on the computer again, or if you want a completely fresh start with VWorks software. For assistance, contact Agilent Automation Solutions Technical Support.

Related information

For information about...	See...
Setting up the software	"Logging in and setting up the software" on page 3
Reporting a problem	"Reporting problems" on page 5

Logging in and setting up the software

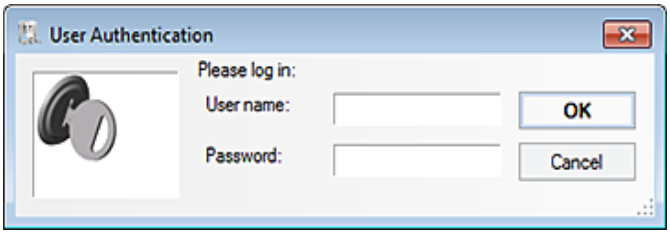
Logging in the first time

To log in the VWorks software:

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

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

The User Authentication dialog box opens.



3 Log in as `administrator`.

VWorks setup workflow

If you are setting up the software for the first time, use the following workflow:

Step	For this task...	See...
1	Set up user accounts. You can set up different user accounts to enforce access policies.	"Planning and managing user accounts" on page 119
2	Create labware definitions for the labware you will use during protocol runs.	"Defining labware" on page 7
3	If you have a Bravo Platform or Vertical Pipetting Station, specify the pipetting speed and accuracy. The Liquid Library Editor provides tools for specifying properties that affect pipetting speed, accuracy, and precision.	"Specifying pipette speed and accuracy" on page 55
4	Set up the devices. During setup, you add the standalone or integrated devices in the software and establish communication with the device.	Device user guide
5	If you have a labware storage device, such as the Labware MiniHub, manage the labware inventory. The Inventory Editor helps you track barcodes and labware as you move them into and out of storage or incubation.	"Tracking and managing labware in storage" on page 65
6	Create protocols. Protocols determine the sequence of tasks you want to automate in a run. For example, you can use a protocol to apply barcode labels to 100 microplates.	*VWorks Automation Control User Guide*

Reporting problems

Contacting Automation Solutions Technical Support

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

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

Reporting hardware problems

When contacting Agilent Technologies, make sure you have the serial number of the device ready. See the device user guide for the location of the label.

Reporting software problems

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

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

To find the VWorks software version number:

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

To find the Diagnostics software version number:

1 Open **Diagnostics.**

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

To send compressed protocol and associated files in VZP format:

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

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

Reporting user guide problems

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

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

Related information

For information about...	See...
Troubleshooting problems with the VWorks software	*VWorks Automation Control User Guide*
Troubleshooting problems with a device controlled by the VWorks software	Applicable user guide for the device

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 microplate, lid, or tip box that will be acted upon by the tasks stored in your protocol.

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

Labware entry defined

A labware entry is the collection of properties or parameter values that describe a specific type of labware. This information is used by the 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 or parameters

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

After labware is defined in 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 tip box 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 13
Overview of the Labware Editor	"Labware Editor overview" on page 9
Opening the Labware Editor	"Opening the Labware Editor" on page 15

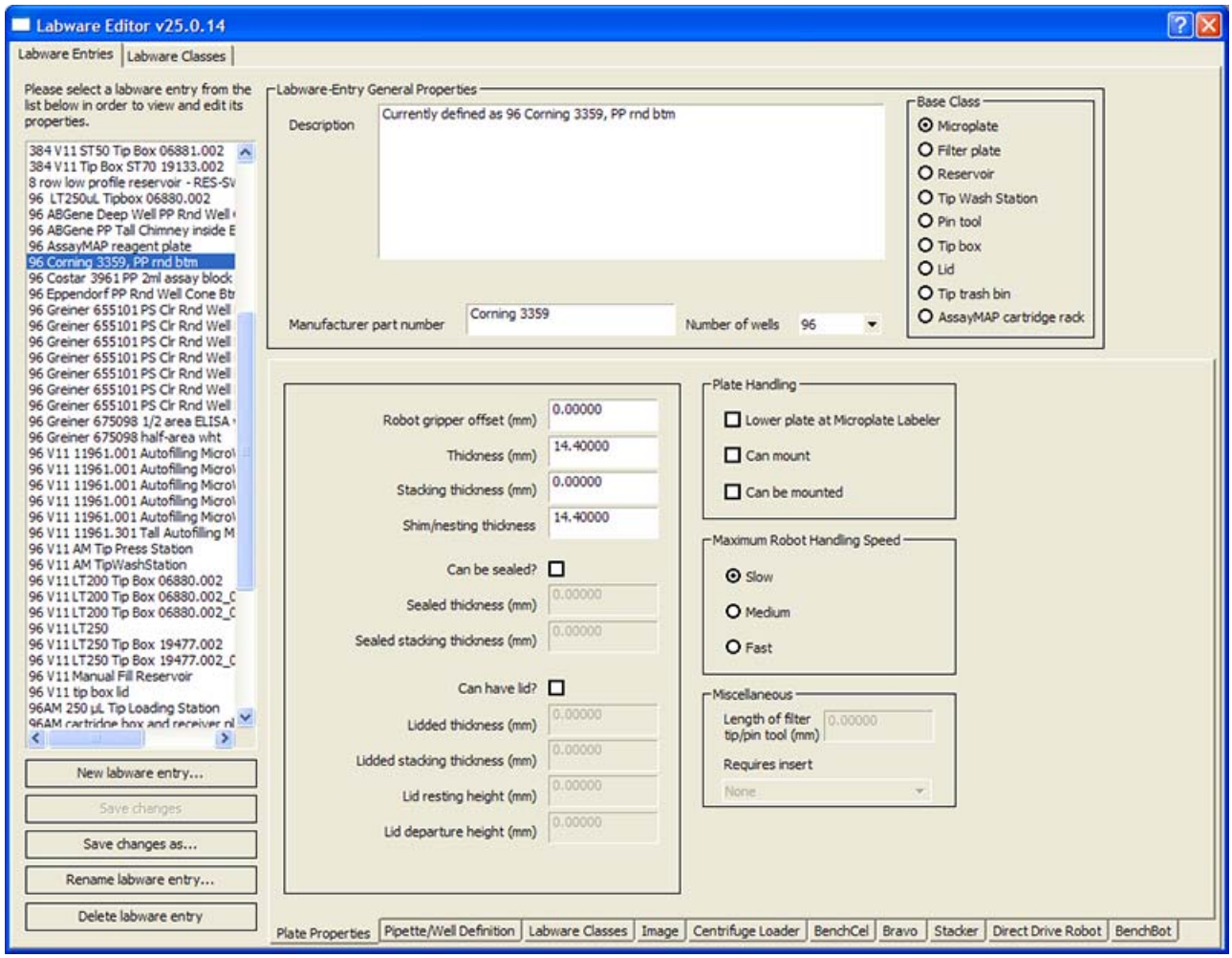
Labware Editor overview

Labware Editor tabs

The Labware Editor has two tabbed pages:

- *Labware Entries*. Provides tools for creating and editing labware definitions
- *Labware Classes*. Provides tools for creating and editing labware classes and the labware entries for each class.

Labware Entries tab



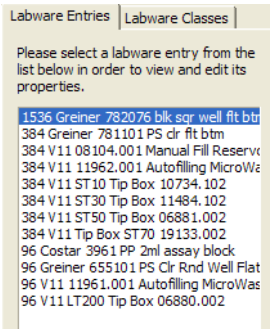
Sub-tabs

The Labware Entries tab contains the following sub-tabs that contain the properties associated with a labware entry.

To find out more about...	See...
Plate Properties tab	"Setting microplate properties" on page 22
Pipette/Well Definition tab	"Setting tip and well properties for pipetting" on page 28
Labware Classes tab	"Using labware classes example" on page 33
Image tab	"Adding a labware image" on page 36
Centrifuge Loader tab	"Setting Centrifuge Loader properties" on page 37
BenchCel tab	"Setting BenchCel Microplate Handler properties" on page 38
Bravo tab	"Setting Bravo Platform properties" on page 42
Stacker tab	"Setting Stacker properties" on page 44
Direct Drive Robot tab	"Setting Direct Drive Robot properties" on page 47
BenchBot tab	"Setting BenchBot properties" on page 50

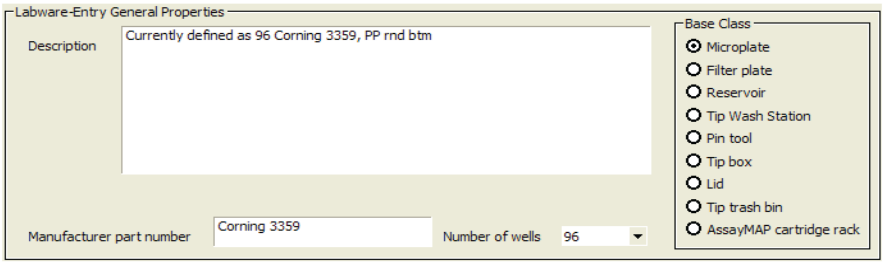
Labware selection list

The labware selection list, which is the left-hand column, displays the list of labware definitions and allows you to select the labware entry that you want to edit.



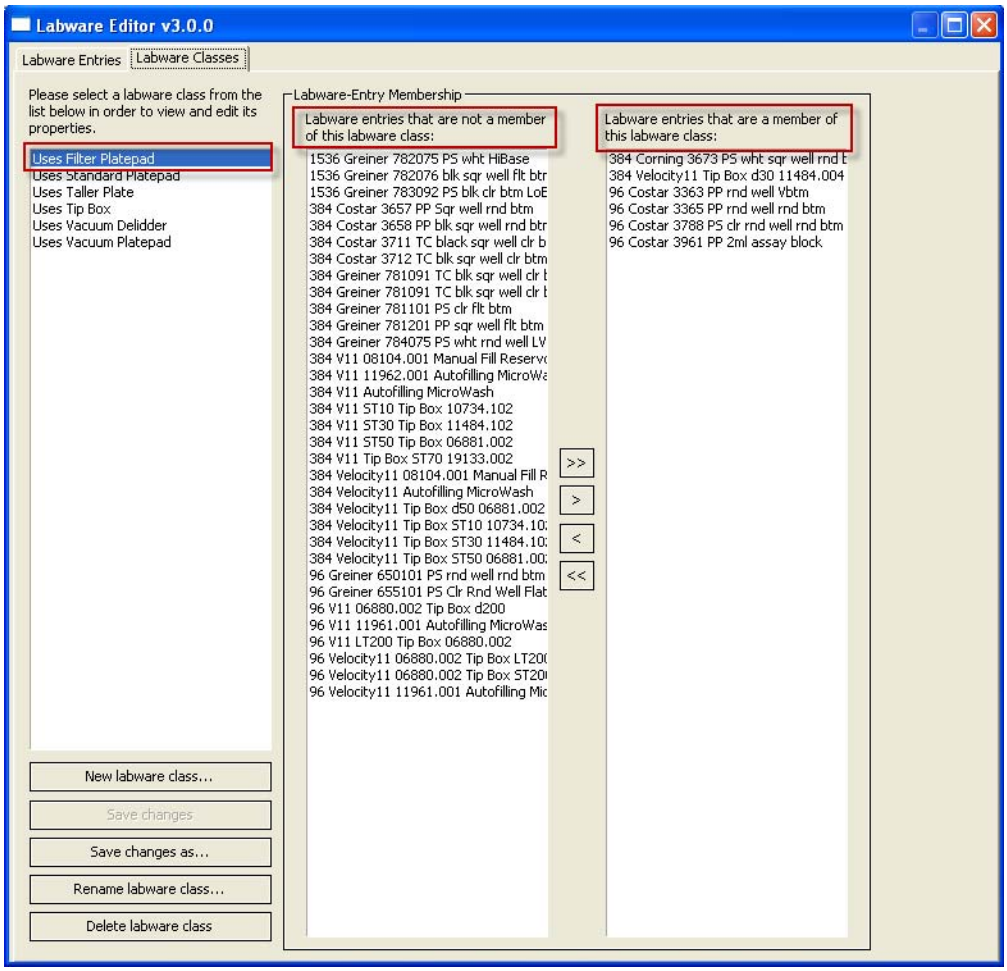
Labware-Entry General Properties area

The Labware-Entry General Properties area displays the labware properties that apply across all sub-tabs.



Labware Classes tab

You use the Labware Classes tab to create labware classes and assign defined labware to a labware class.



Related information

For information about...	See...
The Labware Editor	"About defining labware with the Labware Editor" on page 8

For information about...	See...
Workflow for defining labware in the Labware Editor	"Workflow for defining labware" on page 13

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 depends 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

The following table presents the sequence of steps to define labware for devices that use the 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 15 • "Adding a labware entry" on page 17
2	Set the general properties of the labware.	"Setting general properties" on page 20
3	Set the microplate properties.	"Setting microplate properties" on page 22
4	*Bravo Platform or Vertical Pipettor only*. Set the pipetting properties.	"Setting tip and well properties for pipetting" on page 28
5	Assign the labware to a class.	"Creating and assigning labware classes" on page 30

Step	For this task...	See...
6	*Optional*. Add a labware image.	"Adding a labware image" on page 36
7	*Centrifuge Loader only*. Set the robot gripper offset if using a Centrifuge Loader.	"Setting Centrifuge Loader properties" on page 37
8	*BenchCel Microplate Handler only*. Set the robot and stacker gripping positions.	"Setting BenchCel Microplate Handler properties" on page 38
9	*Bravo Platform only*. Set properties for the Bravo gripper, if applicable.	"Setting Bravo Platform properties" on page 42
10	*BenchCel Microplate Handler and Labware Stacker only*. Set the gripper and sensor settings and any microplate notch positions.	"Setting Stacker properties" on page 44
11	*Direct Drive Robot only*. Set the robot gripper offsets and the grip force.	"Setting Direct Drive Robot properties" on page 47
12	*BenchBot only*. Set the robot gripper offsets and the grip force.	"Setting BenchBot properties" on page 50
13	Save a new or edited labware entry.	"Adding a labware entry" on page 17

Related information

For information about...	See...
The Labware Editor	• "About defining labware with the Labware Editor" on page 8 • "Labware Editor overview" on page 9
Opening the Labware Editor	"Opening the Labware Editor" on page 15

Opening the Labware Editor

About this topic

You use the Labware Editor when you want to view, add, delete, edit, or rename labware entries or labware classes. This topic explains how to open the Labware Editor from the Tools menu and protocol editor in the VWorks software. See the device user guide for details on how to open the Labware Editor from the device diagnostics software.

Before you start

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

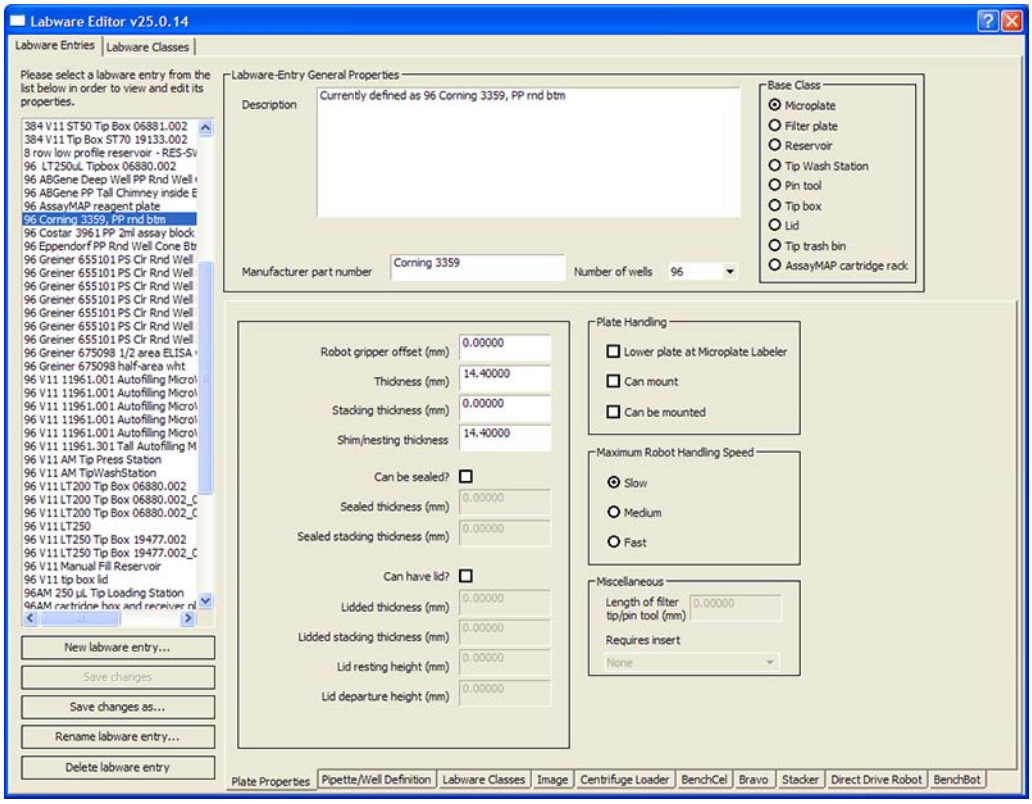
If you are adding labware, make sure you have the following:

- Calipers
- Two samples of the labware you are adding

Procedure

To open the Labware Editor from the Tools menu:

In the **VWorks** window, choose **Tools** > **Labware Editor**. The Labware Editor window opens.

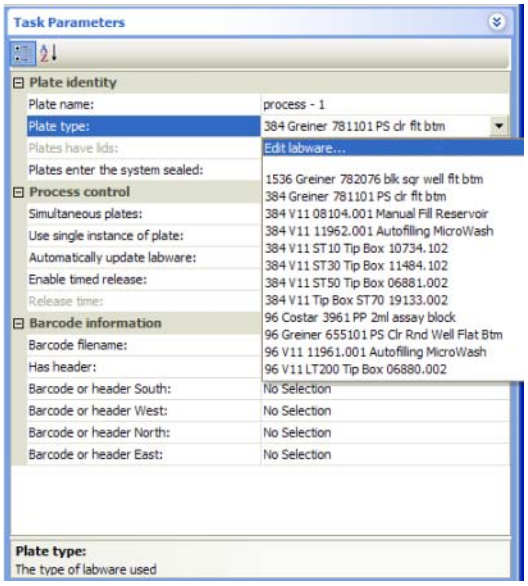


To open the Labware Editor from the protocol editor:

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.



Related information

For information about...	See...
The Labware Editor	• "About defining labware with the Labware Editor" on page 8 • "Labware Editor overview" on page 9
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Adding a labware entry	"Adding a labware entry" 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 the VWorks software.

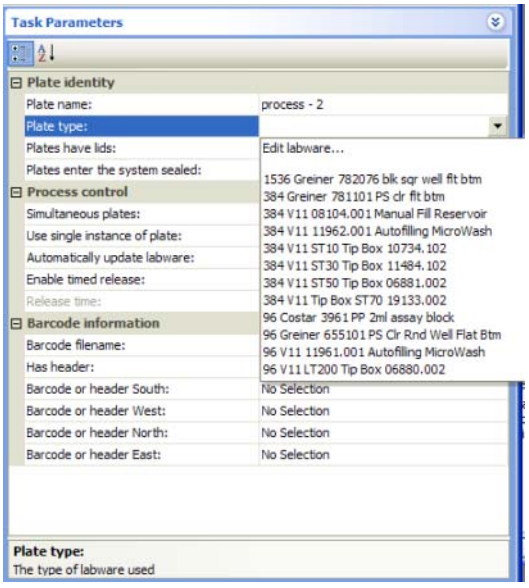
- Contact Automation Solutions Technical Support with the definition you need.

  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 microplate types are a good starting point.

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

1. In the **VWorks** window, click **Main Protocol**, and select the microplate icon in a process.
2. In the **Plate identity** area, click the **Plate type** list and look for the microplate name.

   If the list does not contain an entry for the microplate type, it is not yet defined.

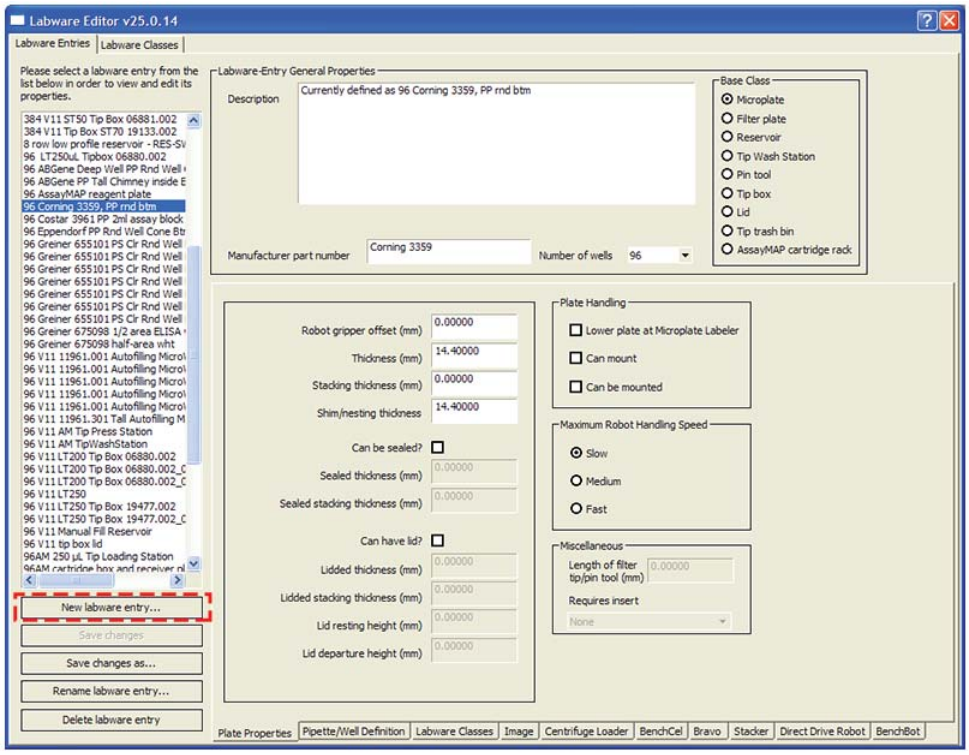


Procedure

To add a labware entry:

1 Open the **Labware Editor**.

2 In the **Labware Entries** tab, click **New labware entry** at the bottom left of the window.



Note: You can save time by using a definition for a similar labware type as a template. Select the pre-existing definition in the list, click **Save changes as**, and enter a name for the new labware definition.

3 In the **New Labware Entry** dialog box, type a name for the labware type, and click **OK**. The new entry appears in the labware list.

For clarity, enter a detailed name for the labware that includes labware-specific information. For example, the name should include the number of wells, the manufacturer's name and part number, and descriptive terms, such as *square-well*, *flat-bottom* or *tip box*.

IMPORTANT If you plan to use a .csv file to import labware into an inventory database, avoid using any commas in the name that you assign to the labware entry in the Labware Editor.

To save the labware entry:

1 Edit the properties as appropriate for the labware type. See "Workflow for defining labware" on page 13.

2 Click **Save changes** to save the newly defined labware entry.

Related information

For information about...	See...
The Labware Editor	• "About defining labware with the Labware Editor" on page 8 • "Labware Editor overview" on page 9
Plate Properties tab	"Setting microplate properties" on page 22
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Opening the Labware Editor	"Opening the Labware Editor" on page 15

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.

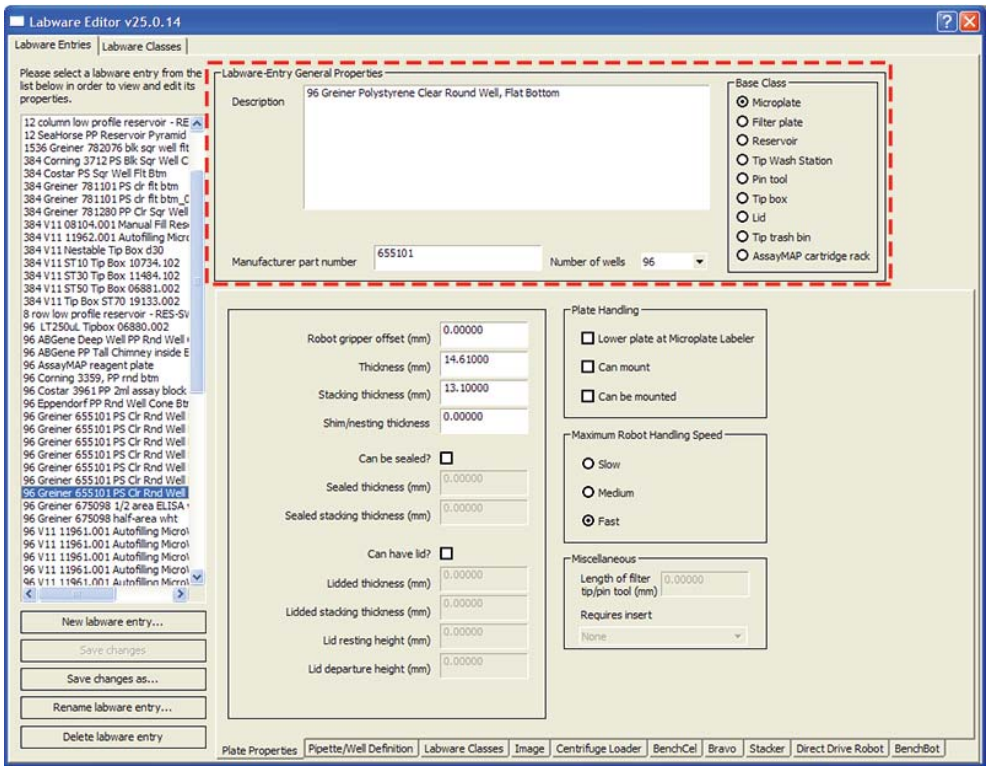
Procedure

To define the general properties of a piece of labware:

1 Open the **Labware Editor**.

2 In the **Labware Entries** tab, select the labware from the list.

3 Under **Labware-Entry General Properties**, type a detailed description of the labware in the **Description** box.



4 In the **Manufacturer part number** box, type the appropriate number for your reference.

5 In the **Number of wells** list, select the number of wells in the microplate.

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 base class is not used.

Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Setting microplate properties for labware	"Setting microplate properties" on page 22

Setting microplate properties

Before you start

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

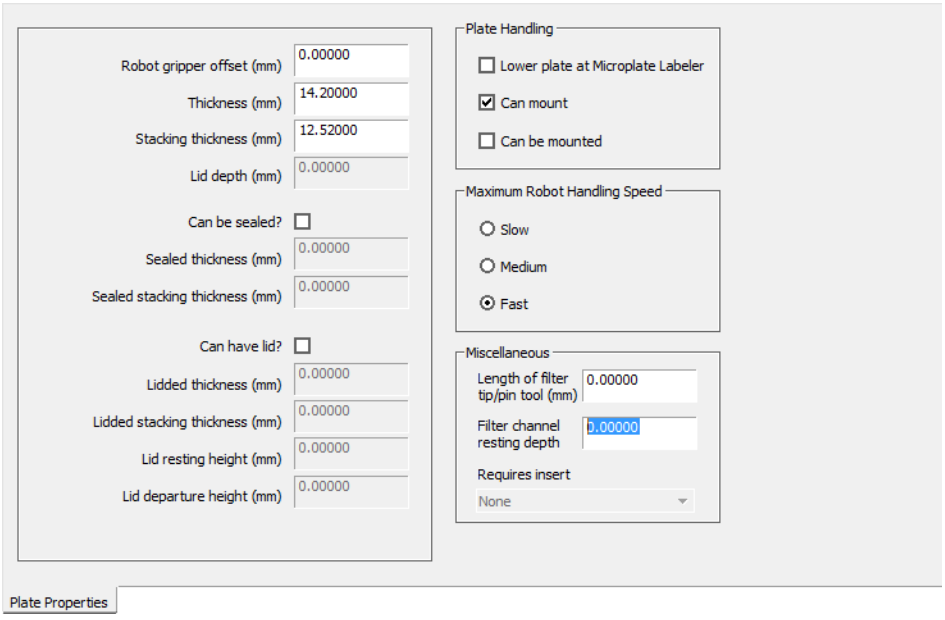
Setting microplate properties

To set microplate properties:

1 Open the **Labware Editor**.

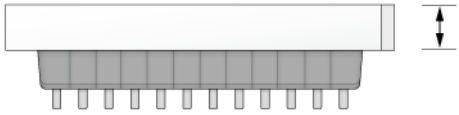
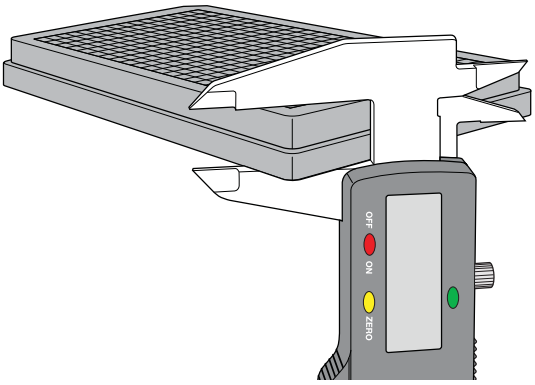
2 In the **Labware Entries** tab, click the **Plate Properties** sub-tab.

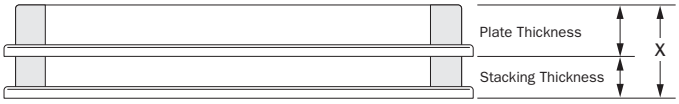
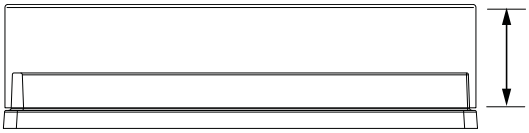
Figure Plate Properties sub-tab

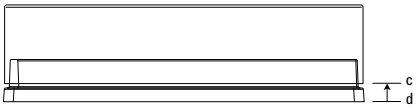
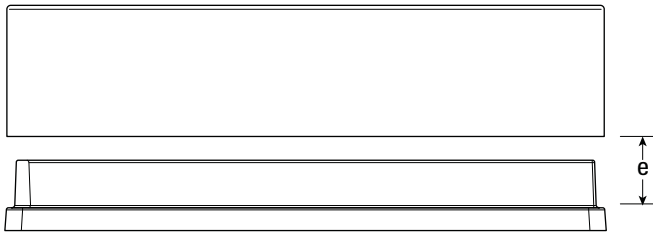


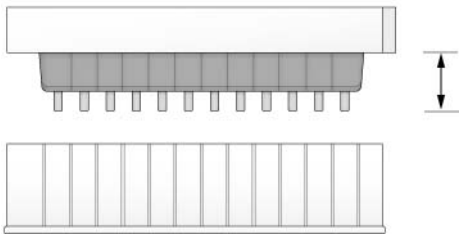
3 Enter the values for the available parameters according to the labware type you are defining. The following table describes each parameter.

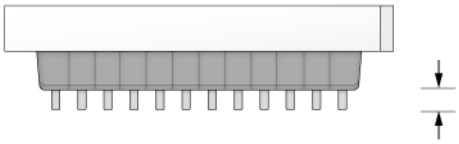
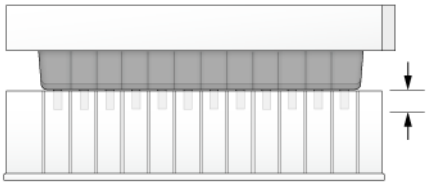
Note: The Base Class you select in the General Properties section determines which microplate properties are available.

Parameter	Description
Robot gripper offset (mm)	*Note:* Applies to the 3-Axis Robot in the BioCel Systems only. The Direct Drive Robot ignores this value, and uses the gripper offset values on the Direct Drive Robot tab. The height (mm) of the gripper above any teachpoint when the robot is picking up or placing a microplate 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 parameter is used by the VWorks software when running protocols. The gripper offset parameter in the device Diagnostics software performs the same function when picking and placing labware using commands in the Diagnostics software.
Thickness (mm)	The distance from the bottom of the microplate skirt to the top of the microplate. For a tip box, this is the distance from the bottom of the box to the top of the tips. For a filter plate that has filter nozzles that extend below the skirt, measure the distance from the bottom of the filter plate skirt to the top of the filter plate. You will use the parameters in the Miscellaneous section to account for the filter nozzles. ***Figure*** Example of the thickness measurement for a filter plate  To increase the number of contact points, measure the distance at the corner of the microplate or tip box (using calipers). This method prevents the calipers from angling inward, which can produce inaccurate measurements. 

Parameter	Description
Stacking thickness (mm)	The thickness of two stacked microplates of the same type minus the thickness of one microplate. Measure the distance using calipers. Example: Thickness of two stacked microplates (x) = 23.14 mm Thickness of one microplate = 14.14 mm Stacking thickness: 23.14 mm - 14.14 mm = 9.00 mm 
Lid depth (nm)	The height of the lid interior, which is measured from the bottom resting surface of the lid to the underside of the lid's top surface. 
Can be sealed?	The option to include the microplate seal.
Sealed thickness (mm)	The thickness of the microplate with a seal in place. Available only if **Can be sealed?** is selected.
Sealed stacking thickness (mm)	The stacking thickness of the microplate with a seal in place. Available only if **Can be sealed?** is selected.
Can have lid?	The option to include a microplate lid.
Lidded thickness (mm)	The thickness of the microplate with a lid in place. Available only if **Can have lid?** is selected.
Lidded stacking thickness (mm)	The stacking thickness of the microplate with the lid in place. Available only if **Can have lid?** is selected.

Parameter	Description
Lid resting height (mm)	The height (c) above the bottom of the microplate (d) at which the bottom of a microplate lid rests.  **IMPORTANT** If you are using the Direct Drive Robot in your automation system, be aware that the **Lid resting height** parameter works with the gripper offset range parameters. If you select the **Plates have lids** option in the **Plate identity** area in the protocol, the software automatically subtracts the thickness of the robot gripper fingers from the lid resting height to avoid gripping the lid. If the gripper offset range does not overlap with this value, an error will occur during the run. For example, suppose the **Lid resting height** is 9.8 mm, and the Direct Drive Robot gripper finger thickness is 4.5 mm. Because you selected the **Plates has lids** option, the software will calculate the difference, which is 5.3 mm. However, the specified gripper offset range is 6–10 mm. 5.3 mm is outside of the range, so an error will occur.
Lid departure height (mm)	The height (e) above the lid resting height to which the lid is lifted. In the BenchCel Microplate Handler, the lid is lifted to this height, and then the lid is removed. 
Plate Handling	
Lower plate at Microplate Labeler	The option to lower the Microplate Labeler stage if the microplate has a tall skirt or a raised surface in the middle of each side. Lowering the stage allows the Microplate Labeler to place the label above the tall skirt or raised surface. *Note:* The two vertical plate stage positions are set mechanically. To adjust the positions, see the *Microplate Barcode Labeler User Guide* for instructions.
Can mount	The option to place this microplate on top of another microplate. 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 microplates.

Parameter	Description
Can be mounted	The option to place another microplate on top of this microplate. This property is for collection microplates that collect filtrate from filter plates during the filtration steps of a protocol. Many different microplates 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 microplate.
Maximum Robot Handling Speed	
Maximum robot handling speed	The maximum speed at which the robot can move this type of microplate. In addition to this microplate-specific speed, you set the general robot speed via the Tools > Options menu in the VWorks software. If these speeds are different, the robot uses the slower of the two speeds. *Note:* To increase throughput, you can use a higher speed when the robot is not carrying labware. For details, see the *VWorks Automation Control User Guide*.
Miscellaneous	
Length of filter tip/pin tool (mm)	Available for labware of the Filter plate or Pin tool Base Class only. The length of the pins that protrude below the pin tool head, or the distance that the filter nozzle extends below the bottom edge of the filter plate skirt. Use a caliper to measure the length. ***Figure*** Length of filter tip 

Parameter	Description
Filter channel resting depth	Available for labware of the Filter plate Base Class only. The distance from the tip of the protruding filter nozzles to the point at which the filter plate rests on another plate. Use a caliper to measure the distance. ***Figure*** Filter plate channel resting depth  ***Figure*** Filter channel resting depth (filter plate on microplate  The software uses this parameter to calculate the effective height (Zg-axis) of the gripper and ensure sufficient clearance when gripping and moving the filter plates.
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 13
Opening the Labware Editor	“Opening the Labware Editor” on page 15
Setting general properties for labware	“Setting general properties” on page 20
Setting Direct Drive Robot properties for labware	“Setting Direct Drive Robot properties” on page 47

Setting tip and well properties for pipetting

When to set the pipetting properties

If the VWorks software is controlling a Vertical Pipetting Station or a Bravo Platform, you must set the properties for the labware type in the Pipette/Well Definition sub-tab.

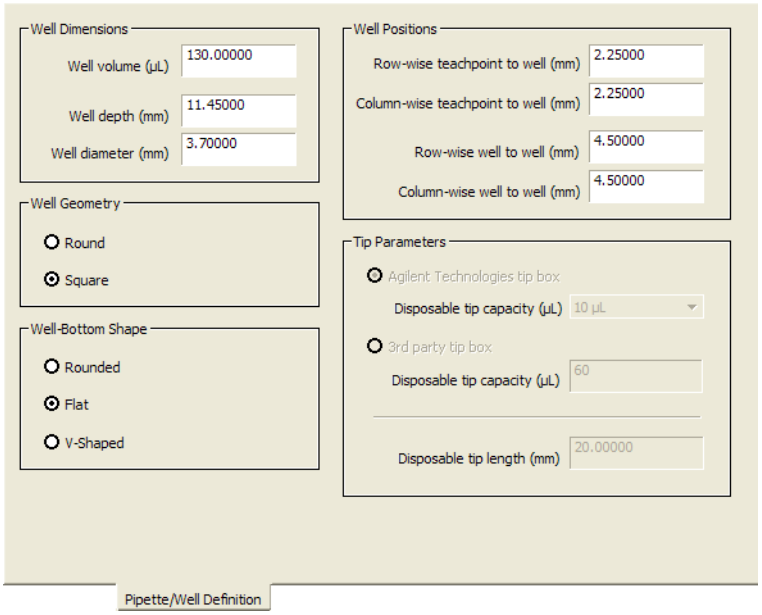
Setting properties

To set pipette/well properties:

1 Open the **Labware Editor**.

2 In the **Labware Entries** tab, click the **Pipette/Well Definition** sub-tab.

Figure Pipette/Well Definition sub-tab



3 Enter the values for the available parameters according to the labware type that you are defining. The following table provides a description of each parameter.

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

Parameter	Description
Well volume	Maximum volume (µL) of fluid for one well.
Well depth	Distance (mm) from the top of the microplate to the bottom of the well.
Well diameter	Diameter of the well (mm).
Well Geometry	Shape of the wells: round or square.

Parameter	Description
Well-Bottom Shape	Shape of the well bottoms: rounded, flat, or V-shaped.
Row-wise teachpoint to well	Distance (mm) from the teachpoint to the center of the A1 well along the row (letter axis). This setting should be 0 mm for standard 96-well microplates and 2.25 mm for standard 384-well microplates.
Column-wise teachpoint to well	Distance (mm) from the teachpoint to the center of the A1 well along the column (number axis). This setting should be 0 mm for standard 96-well microplates and 2.25 mm for standard 384-well microplates.
Row-wise well to well	Distance (mm) from well-center to well-center across the row. This setting should be 9 mm for standard 96-well microplates and 4.5 mm for standard 384-well microplates.
Column-wise well to well	Distance (mm) from well-center to well-center across the column. This setting should be 9 mm for standard 96-well microplates and 4.5 mm for standard 384-well microplates.
Disposable tip capacity	Volume capacity (µL) of the disposable tips when labware is a tip box.
Disposable tip length	Length (mm) of the disposable tips being used 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 13
Opening the Labware Editor	“Opening the Labware Editor” on page 15
Setting general properties for labware	“Setting general properties” on page 20
Setting microplate properties for labware	“Setting microplate properties” on page 22

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:

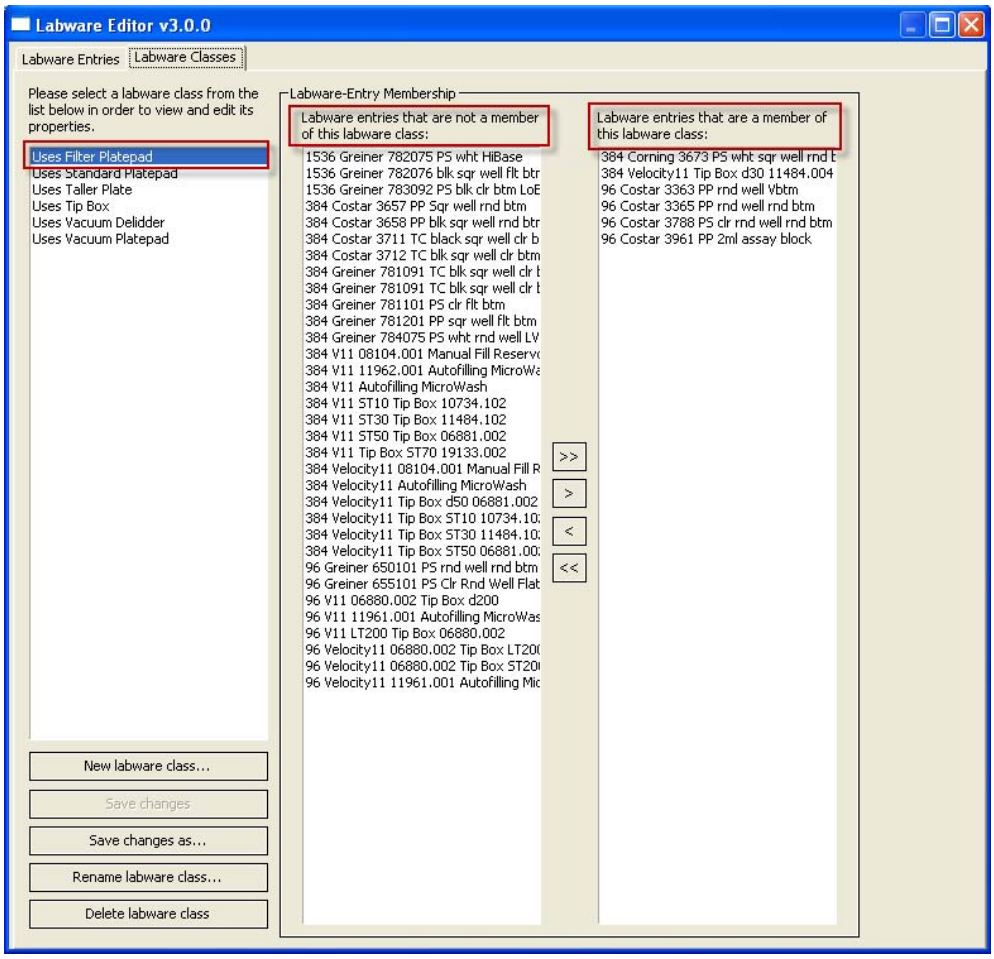
- Uses Filter Platepad
- Uses Standard Platepad
- Uses Taller Plate
- Uses Tip Box
- Uses Vacuum Delidder
- Uses Vacuum Platepad

These default classes should be enough for your microplate 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 in the Labware Editor provides the tools for creating and managing labware classes and labware entry membership.

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 on the Labware Entries tab. 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 15
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
An example demonstrating the use of labware class	"Using labware classes example" on page 33

Using labware classes example

Example

You have configured shelves 2, 4, and 6 of a Vertical Pipettor as devices that are accessible by the system's robot. You are using a mix of microplates, 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.

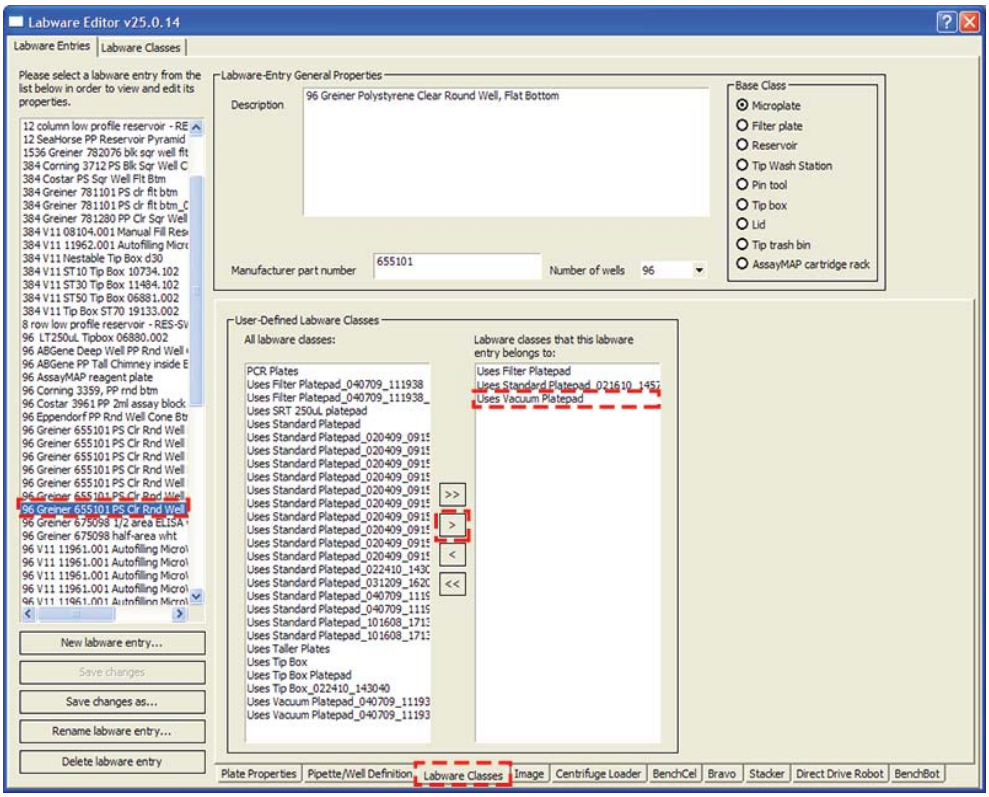
You need to:

1. Assign the tall labware to the appropriate labware class.
2. Restrict shelf 2 from using any labware that is a member of the Uses Taller Plates class.

Assigning the labware to a labware class

To assign the labware:

1. Open the **Labware Editor**.
2. In the **Labware Entries** tab, select the labware from the list, and then click the **Labware Classes** sub-tab. 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, and then click > to move the class to the **Labware classes that this labware entry belongs to** area.
4. Click **Save changes**.

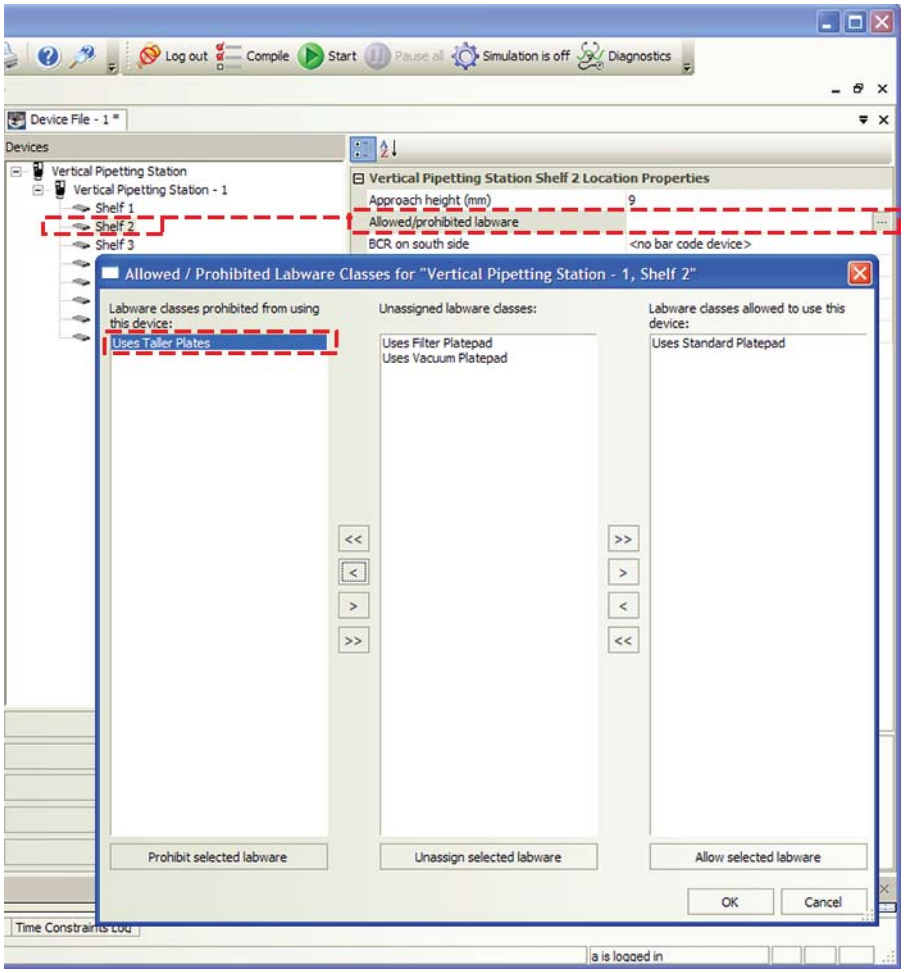


Setting restrictions for shelf 2

To restrict shelf 2:

1. In the **VWorks** window, open the device file, and ensure the correct Vertical Pipetting Station device is selected.
2. In the **Devices** list under **Vertical Pipetting Station**, select **Shelf 2**.
3. Under **Shelf 2 Location Properties**, click the **Allowed/prohibited labware** field, and then click the [...] button. The Allowed/Prohibited Labware Classes dialog box opens.
4. In the **Unassigned labware classes** area, select **Uses Taller Plates**, and then click **<** to move it to the **Labware classes prohibited from using this device** area.
5. Click **OK**.

Figure VWorks software main window (partial) and Allowed/Prohibited Labware Classes dialog box



Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Labware classes	"Creating and assigning labware classes" on page 30

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

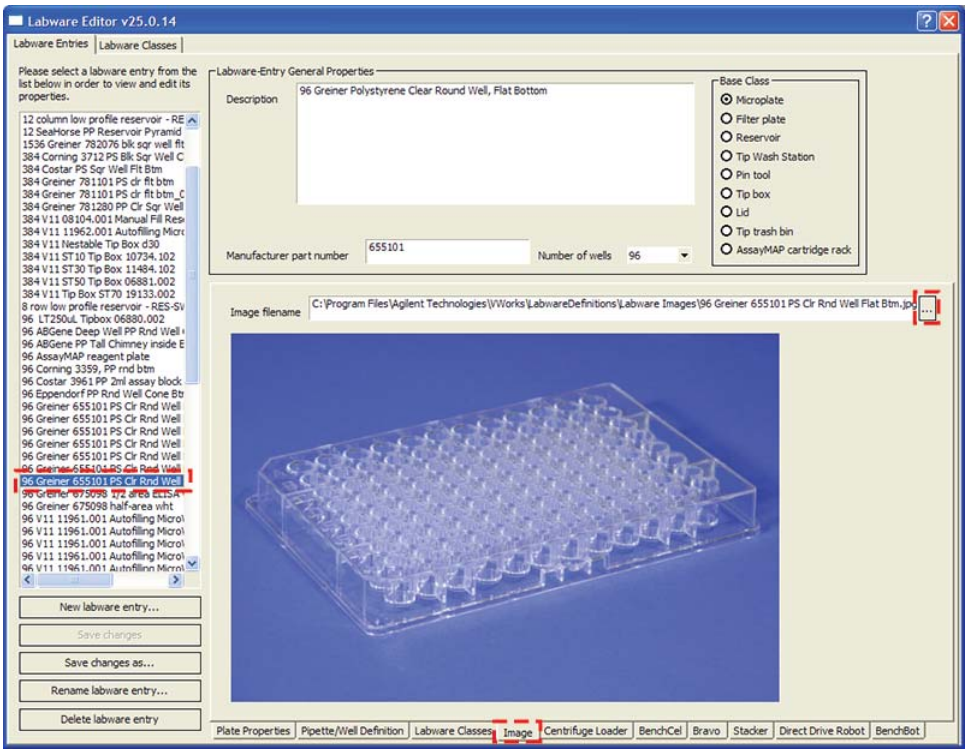
Make sure the image file you want to add is either the JPG, GIF, or BMP format.

Procedure

To insert an image:

1 Open the **Labware Editor**.

2 In the **Labware Entries** tab, select the labware in the left column, and then click the **Image** sub-tab.



3 At the **Image filename** box, click the [...] button to locate the file.

4 In the **Open** dialog box, select the image file and click **Open**.

The image appears below the file name.

5 Click **Save changes**.

Related information

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Using the Labware Editor	"Labware Editor overview" on page 9

Setting Centrifuge Loader properties

When to set Centrifuge Loader properties

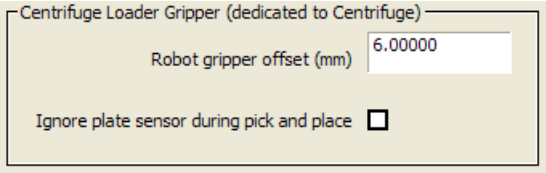
If you are operating a Centrifuge with a Centrifuge Loader, set the corresponding properties in the Centrifuge Loader sub-tab of the Labware Editor.

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

Procedure

To set Loader properties:

1. Open the **Labware Editor**.
2. In the **Labware Entries** tab, click the **Centrifuge Loader** sub-tab.
3. In the Robot gripper offset (mm) box, type the distance from the bottom of the microplate where the robot can grip the microplate.
4. *Optional.* Select the **Ignore plate sensor during pick and place** check box if you want to ignore the microplate sensor, for example if you are using a black microplate that has a finish and skirt that would otherwise avoid detection.



For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Using the Labware Editor	"Labware Editor overview" on page 9

Setting BenchCel Microplate Handler properties

About the BenchCel Microplate Handler properties

The BenchCel Microplate Handler X-Series and R-Series each have their own gripper offsets and positions. When you add a new labware entry, default parameter 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 must be redefined to work with the R-Series BenchCel Microplate Handler because the parameter 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 Microplate Handler.

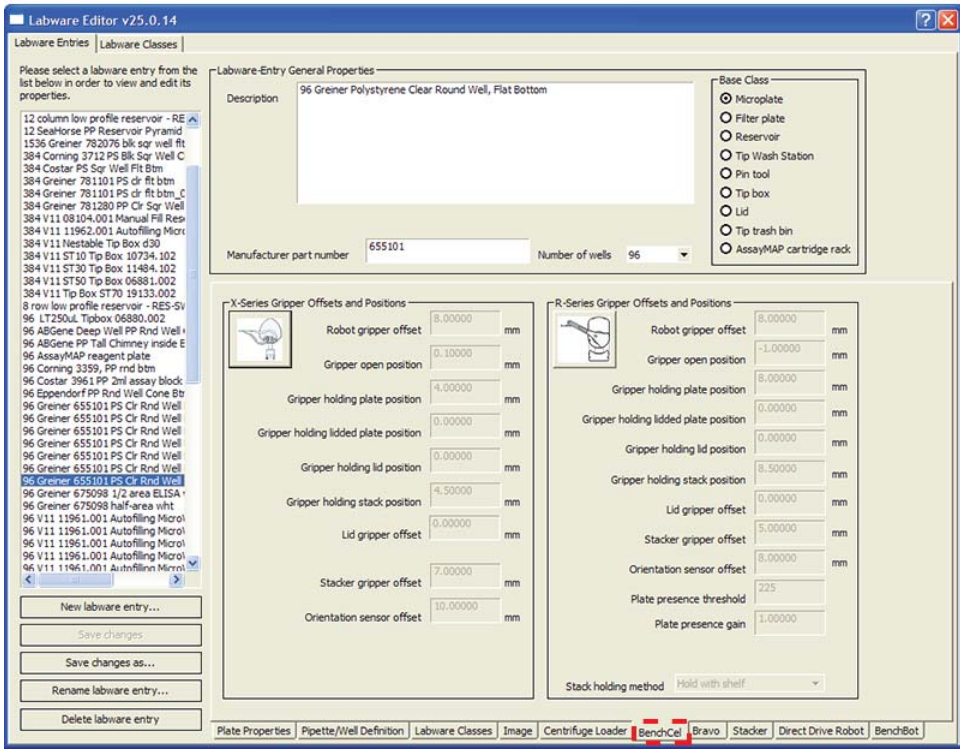
Procedure

To define the BenchCel Microplate Handler properties:

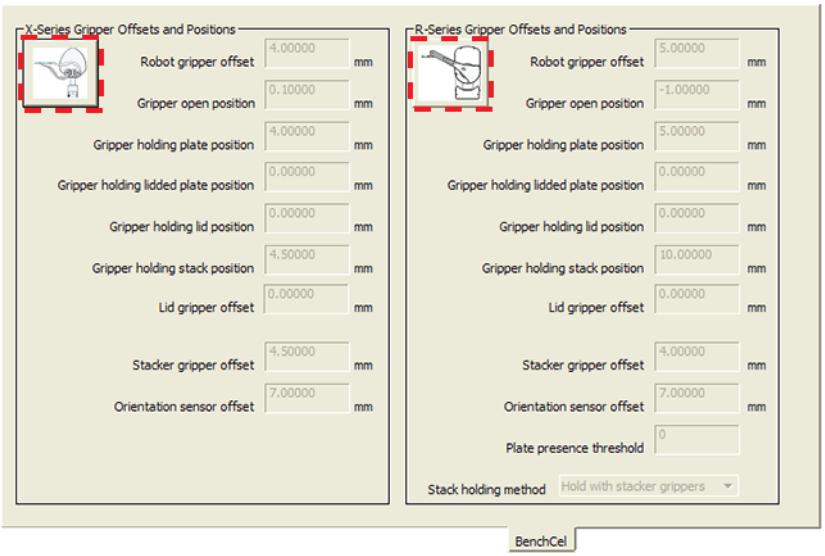
1 Open the **Labware Editor**.

2 In the **Labware Entries** tab, click the **BenchCel** sub-tab.

Figure BenchCel sub-tab



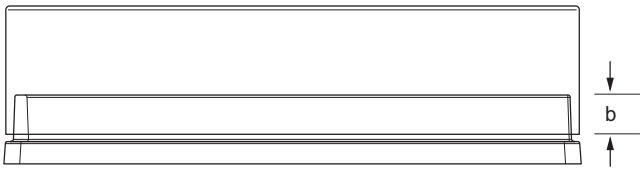
3 Click the button that corresponds to the BenchCel Microplate Handler type that is currently operating and for which you are defining the labware.

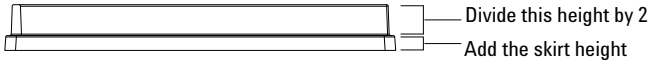


IMPORTANT Make sure you enter values for the correct model of the BenchCel Microplate Handler. Fields for X-Series and R-Series BenchCel Microplate Handlers can be enabled regardless of the type of BenchCel Microplate Handler that you are operating.

4 Measure the labware and enter the values for the following fields.

Parameter	Description
Robot gripper offset (mm)	The distance from the bottom of a microplate to where the robot grippers will hold the microplate. **IMPORTANT** Make sure that the gripper points do not close at the edge of the skirt. Otherwise, the gripper can slip onto the body of the microplate and drop the microplate.
Gripper open position (mm)	The distance the grippers move from the home position as the robot releases a microplate. A larger value moves the grippers closer together. A smaller value opens the grippers wider. Set this to –1 for R series and 0.1 for X Series BenchCel Microplate Handlers.
Gripper holding plate position (mm)	The distance 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. *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.

Parameter	Description
Gripper holding lidded plate position (mm)	The distance that the grippers move inward from 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 (mm)	The distance the grippers move inward from home position when holding a microplate lid. Increasing the value moves the grippers closer together and holds the lid tighter. Decreasing the value opens the grippers wider. 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.
Gripper holding stack position (mm)	The distance the grippers move inward from the home position when holding a microplate that is in a stack. A larger value moves the grippers closer together and holds the microplate tighter. A smaller value opens the grippers wider. 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.
Lid gripper offset (mm)	The height (a) above the lid resting height (b) at which the gripper can grip the lid. 
Stacker gripper offset (mm)	The distance from the bottom of a microplate to where the stacker grippers will hold the microplate. Be careful not to grab the microplate on the top edge of the skirt where the stacker grippers could slip onto the microplate body. Change this value only if the stacker is not gripping the microplates correctly.

Parameter	Description
Orientation sensor offset (mm)	The distance from the bottom of a microplate to where the orientation sensors will check for notches. You can calculate the initial 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.  See the *BenchCel Microplate Handler User Guide* for details on how to determine the optimum Orientation sensor offset.
Stack holding method	*R-Series only*. The option that specifies how the stacker holds the stack of microplates: • *Hold with stacker gripper*. For the greatest precision, select this method, for example, if your microplate has a narrow gripping tolerance requiring a specific stacker gripper offset. Holding the stack with grippers results in slower cycle time than the Hold with shelf method. • *Hold with shelf*. For faster cycle time, select this method if your microplate has a wider gripping tolerance and does not require a specific stacker gripper offset.

Related information

For information about...	See...
Using the Labware Editor	"Labware Editor overview" on page 9
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Setting general properties for labware	"Setting general properties" on page 20

Setting Bravo Platform properties

When to set Bravo properties

If you are operating a Bravo Platform that has a robot gripper, use this procedure to ensure that the parameter values are set correctly.

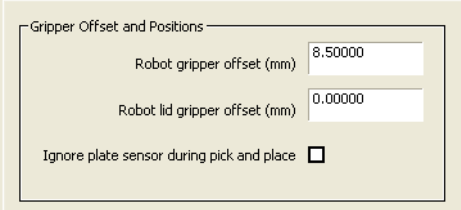
Note: The Bravo robot gripper is an optional feature.

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

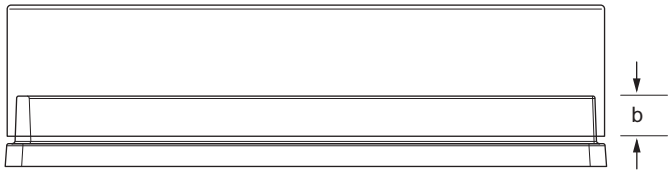
Procedure

To set Bravo Platform properties:

1. Open the **Labware Editor**.
2. In the **Labware Entries** tabs, click the **Bravo** sub-tab.
3. Under **Gripper Offset and Positions**, type the **Robot gripper offset**. This is the height (mm) of the gripper above any teachpoint when the Bravo gripper is picking up or placing a microplate of this type.



4. Enter the **Robot lid gripper offset**. This is the height (mm) above the lid resting height at which to grip the lid. (Shown as *b* below.)



5. Select **Ignore plate sensor during pick and place** to tell the robot gripper to ignore the feedback from the microplate 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 15
Workflow for adding labware to the Labware Editor	“Workflow for defining labware” on page 13
Using labware classes	“Creating and assigning labware classes” on page 30

Setting Stacker properties

When to set Stacker properties

If you are using a Stacker or a BenchCel Microplate Handler in your automation system, you must set the properties in the Stacker sub-tab of the Labware Editor.

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

Before you start

BenchCel Microplate Handler users. Make sure you have read the sections of the *BenchCel Microplate Handler User Guide* that describe the location and function of the stacker sensors.

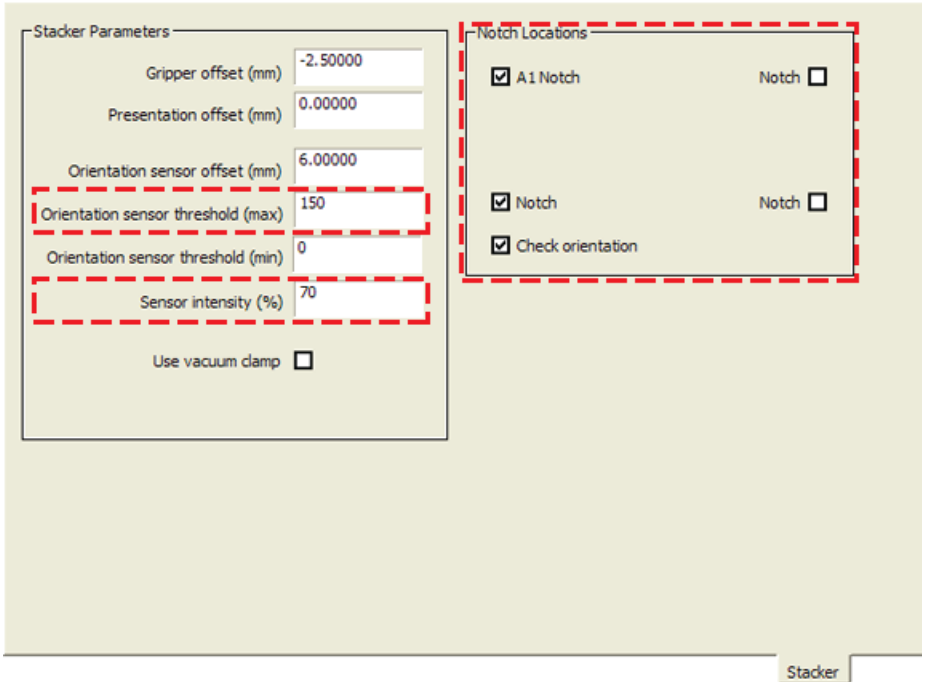
Setting properties

To set stacker properties:

1. Open the **Labware Editor**.
2. In the **Labware Entries** tab, click the **Stacker** sub-tab.
3. Enter the values for the available properties according to the labware you are defining.

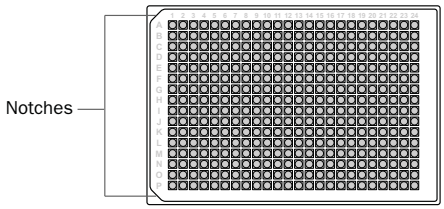
   BenchCel Microplate Handler only. Set only the maximum orientation sensor threshold, sensor intensity, and notch locations. The other settings are used by the Stacker.

Figure Properties required for the BenchCel Microplate Handler



The following table provides descriptions of each parameter.

Parameter	Description
Stacker only. Stacker gripper offset	Adjusts the height at which the microplate stage stops for the grippers to grip the microplate, with respect to the Stacker's grip teachpoint. Change this value only if the stacker is not gripping the microplates 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 microplate, 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 microplate wall is present. Any sensor value below this threshold indicates that either a notch, or no microplate 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.
Stacker only. Orientation sensor threshold (min)	Indicates whether a microplate was downstacked or is present on the stage. This threshold 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, an error message appears stating that no microplate is present on the stage. If the stacker does not sense a notch when it should, a "wrong plate type" or a "plate rotated 180 degrees" error message appears. In this case, 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 microplate 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 microplate. This parameter adjusts for the fact that clear, black, and white microplates reflect light differently. For example, white microplates generally reflect more light so the sensor intensity should be set lower.

Parameter	Description
Stacker only. Use vacuum clamp	Instructs theStacker you are using a vacuum clamp in the Stacker stage to grasp the microplate during delidding.
Notch Locations	• *Check orientation.* Turns on microplate-orientation checking based on the selected notch locations for your microplate. The notch locations are ignored when this check box is cleared. • *Notch location check boxes.* Select the corresponding notch or notches for your microplate. For BenchCel Microplate Handlers, the A1 well of the microplate is positioned in the far, left corner as you face the front of the BenchCel Microplate Handler. For BioCel Systems, the A1 well of the microplate is positioned in the far, left corner from the perspective of the robot.  **IMPORTANT** The Stacker has only two orientation sensors for detecting notches. If the wrong microplate is loaded and an orientation sensors detect notches, the sensors will not flag an incorrect orientation for the wrong microplate. **IMPORTANT** If the orientation sensors detect notches in the correct location, the sensors will not flag an incorrect orientation for the wrong microplate.

Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Using the Labware Editor	"Labware Editor overview" on page 9

Setting Direct Drive Robot properties

When to set Direct Drive Robot properties

If you are using the Direct Drive Robot in your automation system, you must specify the robot properties for the labware that the robot will handle. Because the weight, material, and design varies, you specify the properties for each labware type.

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

About the robot gripper ranges properties

The robot gripper offset range parameters tell the Direct Drive Robot where to grip a given labware type when transferring it from one device to another. Each device within a system can pose different accessibility challenges when transferring the labware. For example, some devices can have a deep, recessed area, whereas others are more flat. Some devices might have tall flanges that make it impossible for the robot to grip a microplate at a very low point.

The Direct Drive Robot uses three types of gripper offset ranges to determine the most compatible grip position for the labware type:

1. *Gripper offset range for the labware*. Specified on the Direct Drive Robot tab in the Labware Editor for each labware definition.
2. *Gripper offset range for pick-location device*. Specified in the DD Robot Diagnostics software for a given device (device A).
3. *Gripper offset range for place-location device*. Specified in the DD Robot Diagnostics software for a given device (device B).

If the three gripper offset ranges overlap, the robot will use the smallest common gripper offset to perform a direct labware transfer from device A to device B without regripping the labware. If the three ranges do not overlap, the software attempts to plan a path through one or more regrip stations. If the robot cannot perform the transfer, an error message appears at the time of the requested labware transfer.

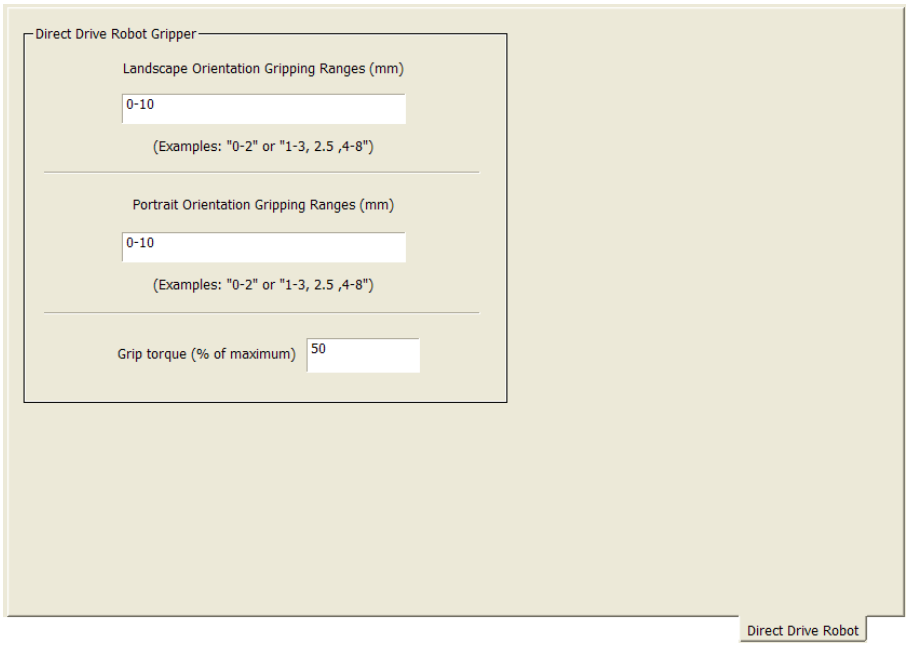
To provide the system with the greatest flexibility for identifying a grip position that works for all locations, you should set the widest possible range for each gripper offset parameter.

Procedure

To set Direct Drive Robot properties:

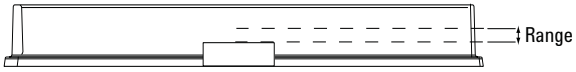
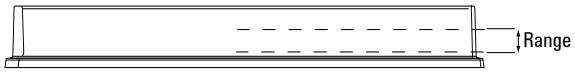
1. Open the **Labware Editor**.
2. In the **Labware Entries** tab, click the **Direct Drive Robot** sub-tab.

Figure Direct Drive Robot sub-tab



3 Enter the values for the following properties according to the labware type that you are defining.

Parameter	Description
Landscape Orientation Gripping Ranges (mm)	The distance from the bottom of the microplate to the lowest and highest points where the bottom of the robot grippers will be holding the microplate in landscape orientation. Default range: 0–10 mm  The minimum and maximum values in the ranges depend on the given microplate features and the robot gripper fingers you are using. For example, suppose you are using standard grippers, which are 4.5 mm tall. If the microplate has a 6-mm tall skirt, you could set the gripper offset range from 0 mm to 2.00 mm. At the minimum, the standard gripper will be flush with the bottom of the microplate. At the maximum, the bottom of the gripper will be at 2.00 mm, still permitting the robot to grip the microplate securely. Specifying multiple ranges provides the robot with additional grip options. In the following example, to avoid the ledge at the top of the skirt, you can specify two ranges: one above the skirt and another on the skirt.  Use a comma to separate ranges.

Parameter	Description
Portrait Orientation Gripping Ranges (mm)	The distance from the bottom of the microplate to the lowest and highest points where the robot grippers can hold the microplate in portrait orientation. Default range: 0–10 mm The minimum and maximum values in the ranges depend on the given microplate features and the robot gripper fingers you are using. The long sides of some microplates have a raised section in the middle of each side. In this case, set the minimum gripper offset higher than the uneven surface to ensure that the robot can grip the microplate evenly and securely. The following example shows how the range can vary depending on the microplate features.   Specifying multiple ranges provides the robot with additional grip options. In the following example, you can specify three ranges: one above the raised section, one at the raised section, and one on the skirt.   Use a comma to separate ranges.
Grip torque percentage	The grip force with which the robot grips the microplate, where 100% is the maximum gripping force. A smaller value grips the microplate with less force than a greater value. The force with which the robot can grip a microplate depends on the microplate weight, material, and design. You should run some tests to optimize the setting.

Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13

For information about...	See...
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Using the Labware Editor	"Labware Editor overview" on page 9
Direct Drive Robot	*Direct Drive Robot User Guide*

Setting BenchBot properties

When to set BenchBot properties

If you are using the BenchBot in your automation system, you must specify the robot properties for the labware that the robot will handle. Because the weight, material, and design varies, you specify the properties for each labware type.

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

About the labware gripping ranges properties

The labware gripping offset range (Min and Max) parameters tell the VWorks software where to grip a given labware type when transferring it from one device to another. Each device within a system can pose different accessibility challenges when transferring the labware. For example, some devices can have a deep, recessed area, whereas others are more flat. Some devices might have tall flanges that make it impossible for the robot to grip a microplate at a very low point.

You can set two types of gripper offset ranges:

- *Gripper offset range for the labware*. Specified on the VWorks software tab in the Labware Editor for each labware definition.
- *Gripper offset range for the device*. Specified in the VWorks software Diagnostics software for a given device.

During a protocol run, the VWorks software uses three gripper offset ranges to determine the most compatible grip position for the labware:

- Gripper offset range for the labware
- Gripper offset range for the device (A) where it will pick up the labware
- Gripper offset range for the device (B) where it will place the labware

You should set the widest possible range for each gripper offset parameter. If the three gripper offset ranges overlap, the robot will use the smallest common gripper offset to perform a direct labware transfer from device A to device B without regripping the labware. If the three ranges do not overlap, the software attempts to plan a path through one or more regrip stations. If the robot cannot perform the transfer, an error message appears at the time of the requested labware transfer.

To provide the system with the greatest flexibility for identifying a grip position that works for all locations, you should set the widest possible range for each gripper offset parameter.

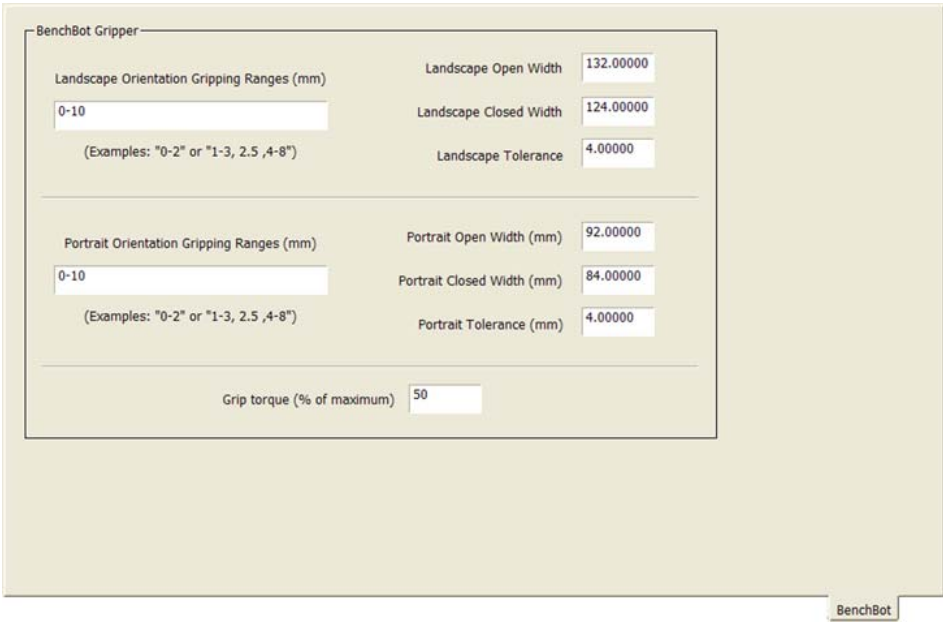
Procedure

To set BenchBot properties:

1 Open the **Labware Editor**.

2 In the **Labware Entries** tab, click the **BenchBot** sub-tab.

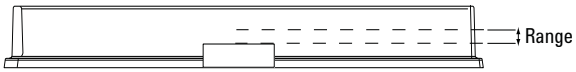
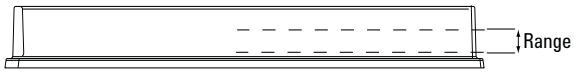
Figure BenchBot sub-tab



3 Enter the values for the following landscape-orientation properties. The values must be based on the labware type that you are defining.

Parameter	Description
Landscape Orientation Gripping Ranges (mm)	The distance from the bottom of the microplate to the lowest and highest points where the bottom of the robot grippers will be holding the microplate in landscape orientation. Default range: 0–10 mm  The minimum and maximum values in the ranges depend on the given microplate features and the robot gripper fingers you are using. For example, suppose you are using standard grippers, which are 4.5 mm tall. If the microplate has a 6-mm tall skirt, you could set the gripper offset range from 0 mm to 2.00 mm. At the minimum, the standard gripper will be flush with the bottom of the microplate. At the maximum, the bottom of the gripper will be at 2.00 mm, still permitting the robot to grip the microplate securely. Specifying multiple ranges provides the robot with additional grip options. In the following example, to avoid the ledge at the top of the skirt, you can specify two ranges: one above the skirt and another on the skirt.  Use a comma to separate ranges.
Landscape Open Width	The distance, in millimeters, between the grippers when they are open for labware in the landscape orientation. Enter a value between 76 and 134 mm.
Landscape Closed Width	The approximate distance, in millimeters, between the grippers when they are closed. Enter a value between 76 and 134 mm. The Landscape Closed Width value is always used with the Landscape Tolerance value. When picking up labware, the grippers close until the Grip torque is reached. Then, the robot checks to see if the distance between the grippers is within the Landscape Closed Width value +/- the Landscape Tolerance value. If it is outside the summed value, the software will display an error message.
Landscape Tolerance	The distance, in millimeters, the Landscape Closed Width is allowed to vary without causing an error. You can enter a value between 0 and 10 mm.

4 Enter the values for the following portrait-orientation properties. The values must be based on the labware type that you are defining.

Parameter	Description
Portrait Orientation Gripping Ranges (mm)	The distance from the bottom of the microplate to the lowest and highest points where the robot grippers can hold the microplate in portrait orientation. Default range: 0–10 mm The minimum and maximum values in the ranges depend on the given microplate features and the robot gripper you are using. The long sides of some microplates have a raised section in the middle of each side. In this case, set the minimum gripper offset higher than the uneven surface to ensure that the robot can grip the microplate evenly and securely. The following example shows how the range can vary depending on the microplate features.   Specifying multiple ranges provides the robot with additional grip options. In the following example, you can specify three ranges: one above the raised section, one at the raised section, and one on the skirt.   Use a comma to separate ranges.
Portrait Open Width	The distance, in millimeters, between the grippers when they are open for labware in the portrait orientation. Enter a value between 76 and 134 mm.
Portrait Closed Width	The approximate distance, in millimeters, between the grippers when they are closed. Enter a value between 76 and 134 mm. The Landscape Closed Width value is always used with the Landscape Tolerance value. When picking up labware, the grippers close until the Grip torque is reached. Then, the robot checks to see if the distance between the grippers is within the Landscape Closed Width value +/- the Landscape Tolerance value. If it is outside the summed value, the software will display an error message.
Portrait Tolerance	The distance, in millimeters, the Landscape Closed Width is allowed to vary without causing an error. Enter a value between 0 and 10 mm.

5 In the **Grip torque** box, type the percent of maximum grip force the robot must use when gripping labware. The range is 0 to 100.

The force with which the robot can grip a labware depends on the labware weight, material, and design. You should run some tests to optimize the setting.

Related information

For information about...	See...
Workflow for adding labware to the Labware Editor	"Workflow for defining labware" on page 13
Opening the Labware Editor	"Opening the Labware Editor" on page 15
Using the Labware Editor	"Labware Editor overview" on page 9
Direct Drive Robot	*Direct Drive Robot User Guide*
BenchBot	*BenchBot Robot User Guide*

3 Specifying pipette speed and accuracy

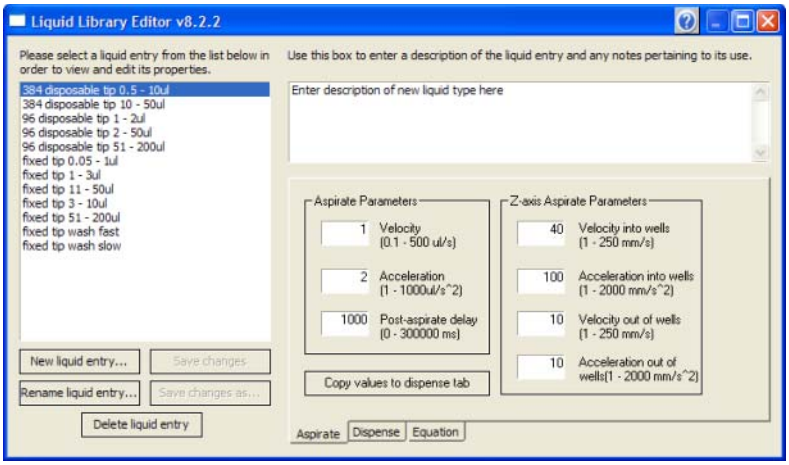
This chapter contains the following topics:

About liquid classes

Liquid Library Editor defined

The Liquid Library Editor provides tools for users with technician or administrator privileges to enter values for properties that affect pipetting speed, accuracy, and precision.

Figure Liquid Library Editor window



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 use the Liquid Library to fine-tune the volume aspirated or dispensed by your Bravo Platform or Vertical Pipetting Station.

IMPORTANT Verify the pipetting of your Bravo Platform or Vertical Pipetting Station. Accurate and precise pipetting depends on a variety of factors including the liquid properties.

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.

Related information

For information about...	See...
Opening the Liquid Library Editor	“Opening the Liquid Library Editor” on page 58
Creating a liquid class	“Creating a liquid class” on page 59
Calibrating your pipettor	“Calibrating the pipettor” on page 62

Opening the Liquid Library Editor

Before you start

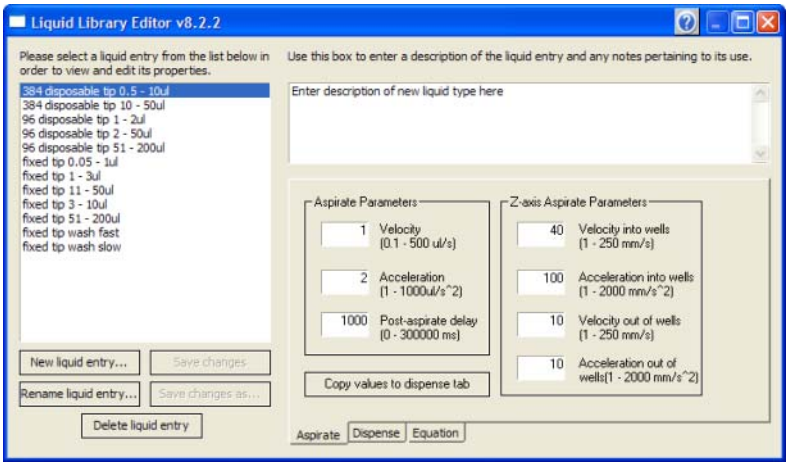
You must be logged in as an administrator or technician to open the Liquid Library Editor.

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 56
Creating a liquid class	“Creating a liquid class” on page 59
Calibrating your pipettor	“Calibrating the pipettor” on page 62

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

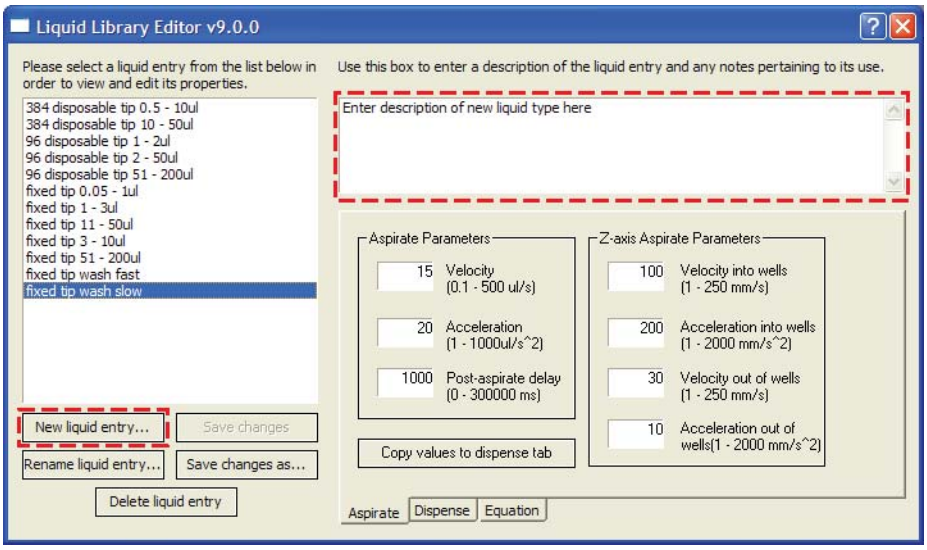
WARNING **Agilent Technologies products are intended to be used with non-hazardous liquids. Please contact Automation Solutions Technical Support before using any non-aqueous solvents or solvents generally considered to be hazardous.**

Procedure

To create a liquid class:

1 Open the **Liquid Library Editor**.

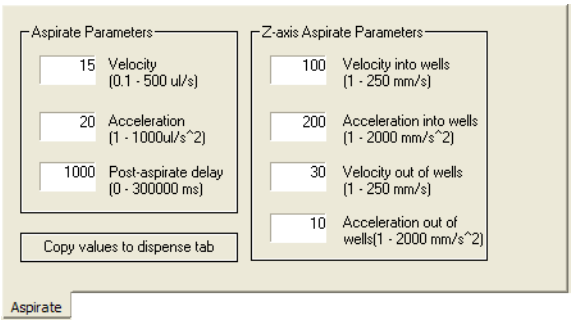
2 Click **New liquid entry**.



3 In the **New Liquid Entry** dialog box, type a name for the liquid class and click **OK**.

4 *Optional.* In the box at the top right of the **Liquid Library Editor** window, type a note describing the entry for your records.

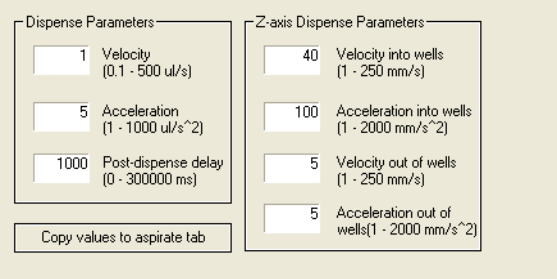
5 On the **Aspirate** tab, type the values for the following aspirate parameters.



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

Aspirate	Definition
Velocity (µL/s)	Specifies the speed of the aspiration stroke.
Acceleration (µL/s^2)	Specifies acceleration during the aspiration stroke.
Post-aspirate delay (ms)	Specifies the time the pipettor waits after aspiration is complete before moving the tips out of the wells.
Z-axis velocity into wells (mm/s)	Specifies how fast the pipettor moves as the tips enter the wells.
Z-axis acceleration into wells (mm/s^2)	Specifies the acceleration of the pipettor as the tips move into the wells.
Z-axis velocity out of wells (mm/s)	Specifies how fast the tips leave the wells.
Z-axis acceleration out of wells (mm/s^2)	Specifies the acceleration of the pipettor as the tips move out of the wells.

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



The following table describes the dispense parameters.

Dispense	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.

Dispense	Definition
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.
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 56
Opening the Liquid Library Editor	“Opening the Liquid Library Editor” on page 58
Calibrating your pipettor	“Calibrating the pipettor” on page 62

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 microplate 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.

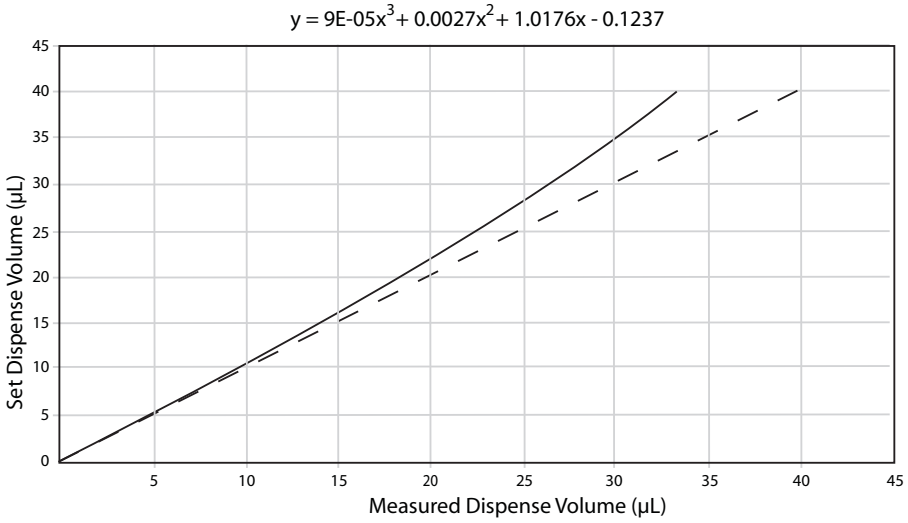
The overall method is:

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

You use the equation editor in the Liquid Library Editor to enter the calibration curve data and 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.

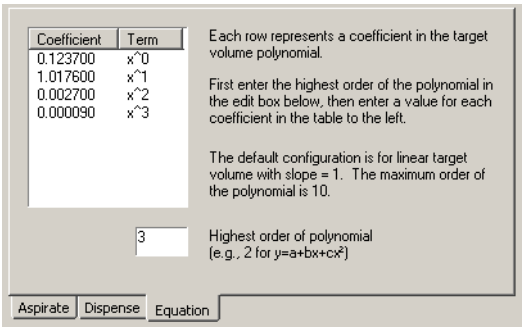
3 In the **Highest order of polynomial** text box, enter the value for the highest order of the polynomial.

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, 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 56
Opening the Liquid Library Editor	“Opening the Liquid Library Editor” on page 58
Creating a liquid class	“Creating a liquid class” on page 59

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 on how to use the VWorks Inventory Editor to track labware moving into and out of storage devices, such as the Labware MiniHub.

Barcode tracking versus inventory management

Barcode tracking

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

Inventory management

The inventory management system allows long-term tracking of microplates because barcode data is permanently stored in a database. This is useful for lab automation systems with devices that store microplates for a long time, such as the Agilent Labware MiniHub.

Required database

To use inventory management, you must have a MySQL database set up on the computer that runs the VWorks software.

How labware is stored

The long-term storage devices supported by the VWorks software store labware in cassettes and slots. A cassette is a vertical rack that has many slots, where each slot holds one labware.

Information that is stored

The inventory database maintains a list of labware located in long-term labware storage devices. Each labware entry in the database includes the following information:

- Device in which the labware is located
- Cassette and slot location of the labware
- Names of the location and plate groups to which it belongs
- Labware type
- Any north-side, south-side, east-side, and west-side barcodes
- Volume of the wells in the labware

How to access data in the inventory database

You use the VWorks Inventory Editor to access the data in the inventory database. In the Inventory Editor, you can:

- View the information in the inventory database.
- Add or import labware information in the database.
- Remove labware information from the database.
- Create or modify plate groups.
- Import plate groups from a barcode file.
- Create or modify location groups.
- Inventory the labware in a storage device.
- Export and import the entire inventory database.

The list of labware in the database is automatically updated every time the robot moves a labware into or out of a storage device. If you have a Liconic storage device, you can also re-inventory the device to keep the list up-to-date.

Figure Inventory Editor window

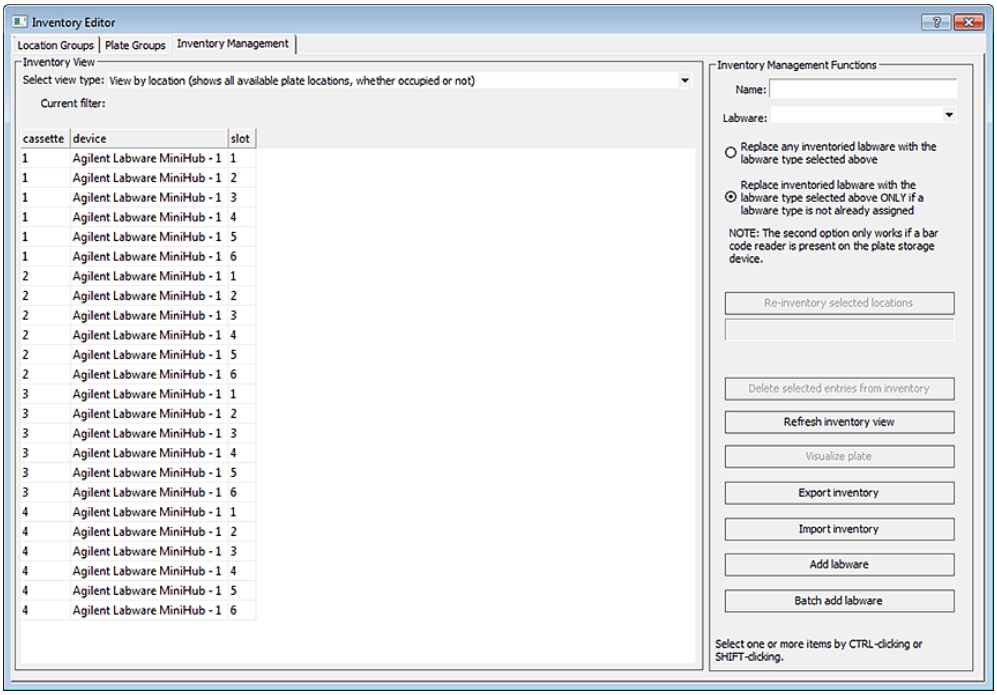


Plate groups and location groups

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

- A plate group consists of a group of labware where the group membership is often based on the labware's unique database identifier.
- A location group is a group of slots in a storage device.

For more information, see "About inventory groups" on page 73.

Inventory management tasks

The following protocol tasks interact with the inventory database:

- clearInventory
- exportDatabase
- ImportCsvToInventory
- Load
- Unload
- Incubate at microplate storage device

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

About adding labware into inventory

You can add labware information into the inventory database using one of the following methods:

- Run a protocol to physically move labware into the storage device. During the run, the system will update the inventory.
- Use the Inventory Editor to:
  - Add an individual labware into the inventory.
  - Add multiple labware by importing a CSV file.

For detailed instructions, see "Adding labware information in the inventory database" on page 81.

Terminology

The following terms are used to describe the movement of labware in the system.

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

Database backup

You can back up the inventory database by exporting it to a SQL file. For instructions, see "Exporting and importing the inventory data" on page 114.

To back up the inventory database along with the VWorks software system files, see *VWorks Automation Control User Guide*. For assistance, contact Automation Solutions Technical Support.

Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 73
Setting up the database	"Setting up a Windows 7 MySQL database" on page 123
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Incubating labware	"Using a plate group to process labware" on page 100
Using barcode input files	"Creating a plate group with a barcode input file" on page 105

Connecting to the inventory database

Who should read this

Read this topic if your lab automation system has an incubator or random-access storage device, such as the Labware MiniHub.

Before you start

Before you can connect to the database, you must install and configure the inventory database. To install and set up the inventory database, see the appropriate instructions for your Microsoft Windows operating system:

- "Setting up a Windows 7 MySQL database" on page 123
- "Setting up a Windows 10 MySQL database" on page 133

For assistance, contact Agilent Automation Solutions Technical Support.

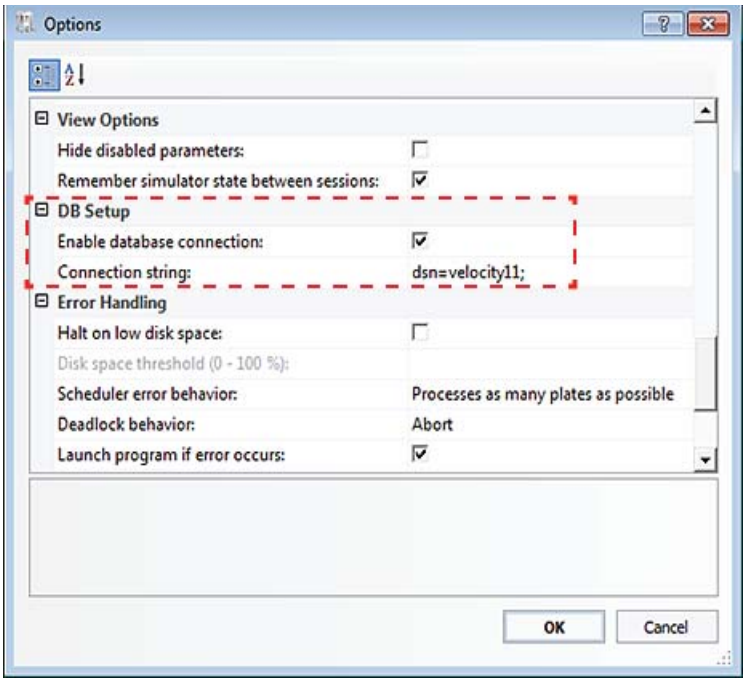
Connecting to the database

The database connection is specified in the VWorks software.

To connect to the database:

1. In the **VWorks** window, select **Tools** > **Options**. The Options dialog box appears.
2. Under **DB Setup**, verify the following, and then click **OK**.
   - **Enable database connection** is selected.
   - **Connection string** is `dsn=velocity11;`

     Note: velocity11 is the factory-default database name specified in the ODBC. If you changed the name in the ODBC, you must update the Connection string field in the Options dialog box.



Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 73
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Incubating labware	"Using a plate group to process labware" on page 100

For information about...	See...
Using barcode input files	"Creating a plate group with a barcode input file" on page 105
Specifying the database name in the ODBC	"Resolving labware inventory problems" on page 117

Opening the Inventory Editor

About this topic

This topic explains the two ways you can open the Inventory Editor:

- "Opening from the Tools menu" on page 71
- "Opening from within a protocol" on page 72

Read this topic if your lab automation system has an incubator or random-access storage device, such as the Labware MiniHub.

Before you start

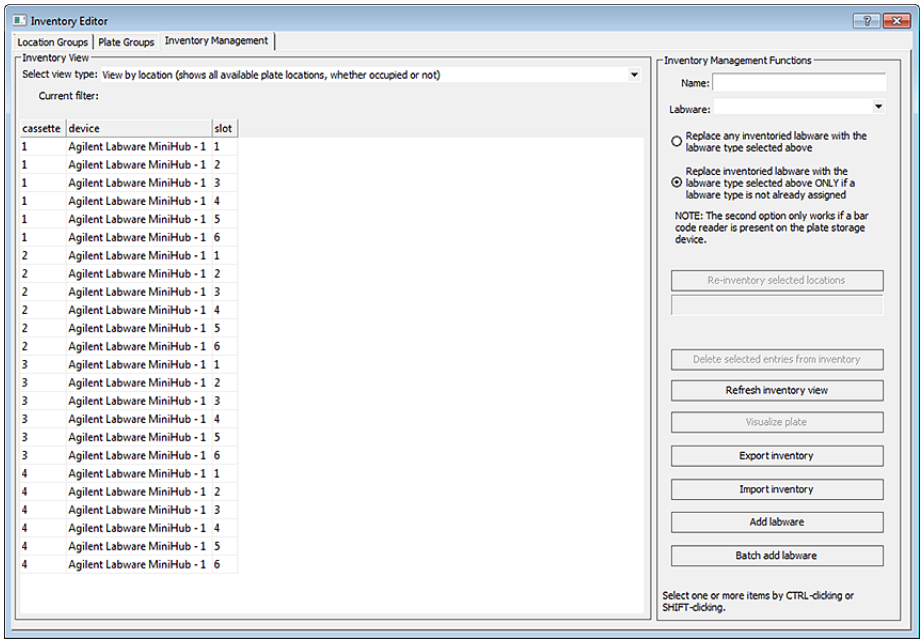
Before opening the Inventory Editor, make sure you have installed and configured a MySQL database, and connected to the database. For instructions, "Connecting to the inventory database" on page 69.

Each labware entry in the inventory database is associated with a storage location. To view the contents of the inventory database, you must first open the relevant device file and initialize the devices.

Opening from the Tools menu

To open the Inventory Editor from the Tools menu:

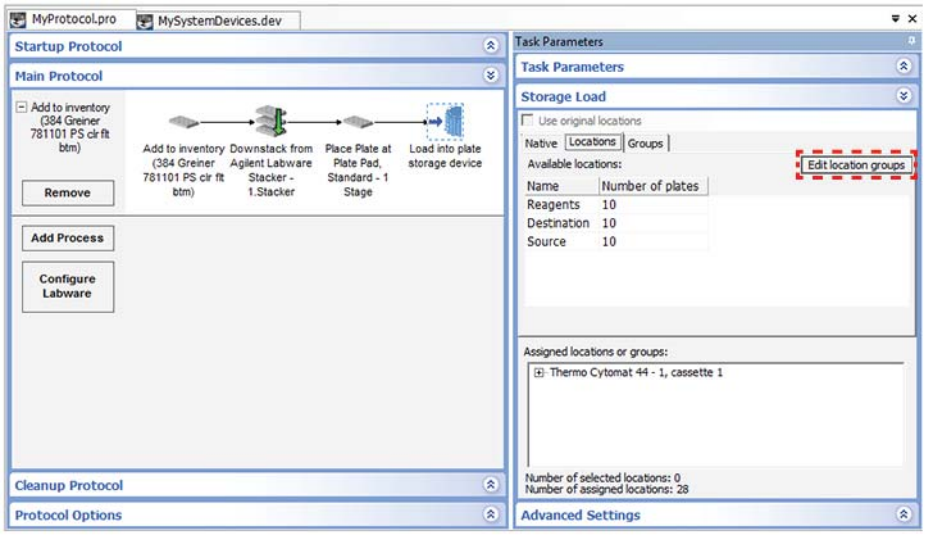
In the **VWorks** window, select **Tools** > **Inventory Editor.**



Opening from within a protocol

To open the Inventory Editor from within a protocol:

1. In the protocol, select a **Load** or **Unload** task.
2. Click **Storage Load** in the **Task Parameters** area.
3. Do one of the following:
   - In the **Locations** tab, click **Edit location groups**.
   - In the **Groups** tab, click **Edit plate groups**.



Related information

For information about...	See...
Connecting to the inventory database	"Connecting to the inventory database" on page 69
Inventory groups, plate groups and location groups	"About inventory groups" on page 73
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Incubating labware	"Using a plate group to process labware" on page 100
Using barcode input files	"Creating a plate group with a barcode input file" on page 105

About inventory groups

Who should read this

Read this topic if your lab automation system has an incubator or random-access storage device, such as the Labware MiniHub.

Inventory groups defined

An inventory group is a group of labware 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 cassette 1, slots 1–10 of the storage device, regardless of the identity of the labware.

When to use

Location groups are used when:

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

Plate groups

Plate groups are used to move specific labware 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 labware.

When a labware 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, the VWorks software tracks where that labware is at all times. This tracking does not require the labware to have barcode labels. The VWorks software tracks the movement of each labware through out a protocol.

Note: You cannot use a plate group with a Load task, unless a native location or location group is associated with it– you must specify a location. You can associate a plate group with the location group so that the labware that are loaded are simultaneously 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 labware.

Example:

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

- Plate 1
- Plate 26
- Plate 31
- Plate 41

These microplates 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 microplates out of the storage device and into the system.

When to use

Plate groups are typically used in compound management systems where labware 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 labware is tracked, the labware can be stored in any open location.

Group membership

A single labware 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 76
Creating a plate group	"Creating and managing plate groups" on page 78
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Incubating labware	"Using a plate group to process labware" on page 100
Using barcode input files	• "Creating a plate group with a barcode input file" on page 105 • *VWorks Automation Control User Guide*

Creating and managing location groups

About this topic

This topic describes how to create a labware location group in the Inventory Editor. Read this topic if your lab automation system has an incubator or random-access storage device, such as the Labware MiniHub.

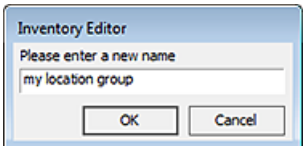
Procedure

To create a location group:

1 In the **VWorks** window, select **Tools** < **Inventory Editor**.

2 In the **Inventory Editor** window, click the **Location Groups** tab.

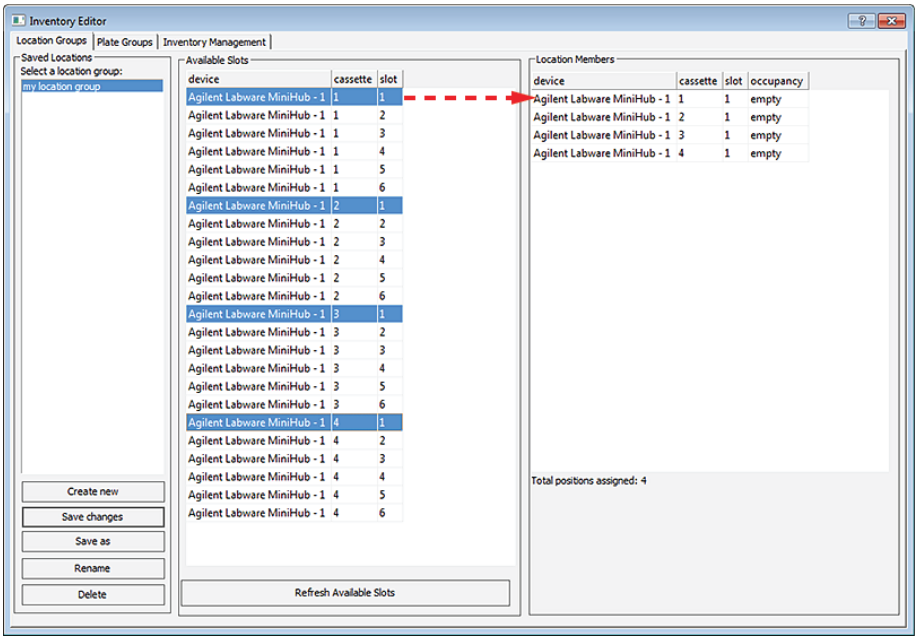
3 Click **Create new**, type a name for the group, and click **OK**.



4 In the **Available Slots** area, select a group of slots and drag the selection into the **Location Members** area.

You can use CTRL+click or SHIFT+click to select more than one slot. Alternatively, you can double-click a slot to add it to the location group.

Note: The slots do not have to be adjacent to each other. For example, is you have different height shelves in the Labware MiniHub, you might want the location group to define the same shelf (slots) in all four cassettes.

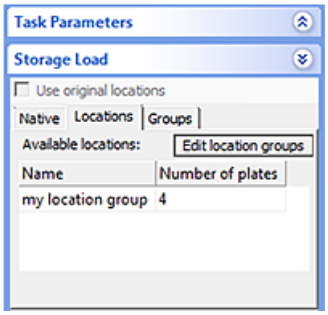


Note: To delete a member of the location group, select the item in the Location Members area, and then press DELETE.

5 Click **Save Changes**.

6 Close the Inventory Editor window.

The new location group is listed as an available location in Locations tab of the Load/Unload Task Parameters area.



Deleting a location group

To delete a location group from the inventory:

1 In the **Inventory Editor** window, click the **Location Groups** tab.

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

3 Click **Delete**.

Related information

For information about...	See...
Creating a plate group	"Creating and managing plate groups" on page 78
Opening the Inventory Editor	"Opening the Inventory Editor" on page 71
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Incubating labware	"Using a plate group to process labware" on page 100
Using barcode input files	• "Creating a plate group with a barcode input file" on page 105 • *VWorks Automation Control User Guide*

For information about...	See...
Using storage tasks in a protocol	*VWorks Automation Control User Guide*

Creating and managing plate groups

About this topic

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

Read this topic if your lab automation system has an incubator or random-access storage device, such as the Labware MiniHub.

For instructions on how to add labware into the database, see "Adding labware information in the inventory database" on page 81.

Procedure

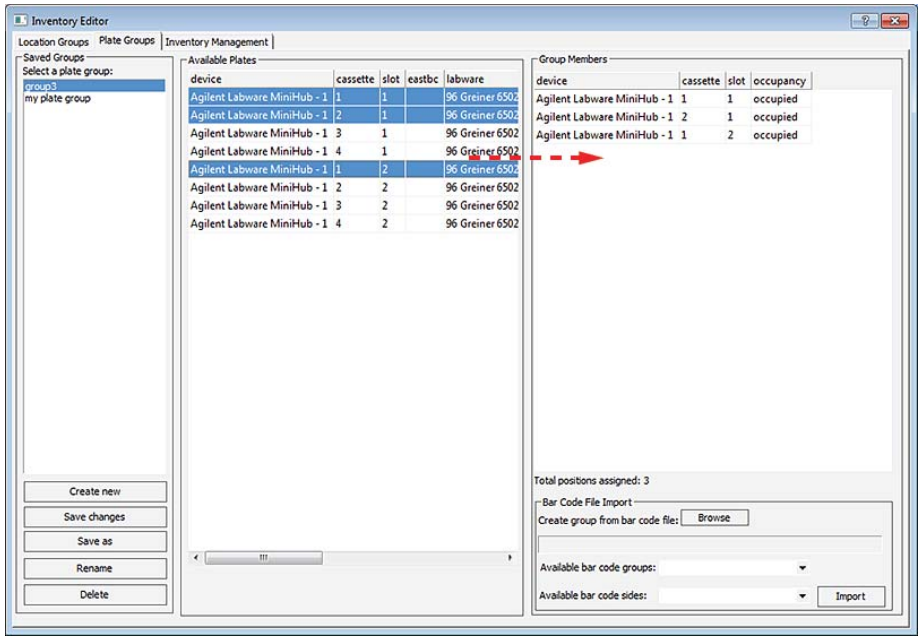
To create a plate group:

1. In the **VWorks** window, select **Tools** < **Inventory Editor**.
2. In the **Inventory Editor** window, click the **Plate Groups** tab.
3. Click **Create new**, type a name for the group, and click **OK**.

To add labware to the plate group:

1. In the **Available Plates** area, select a group of available labware, and drag the selection into the **Group Members** area.

   You can use CTRL+click or SHIFT+click to select more than one labware. Alternatively, you can double-click a plate to add it to the plate group.

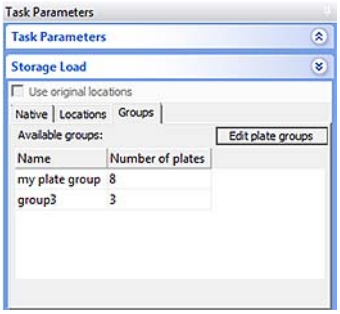


Note: To delete a plate from the plate group, select the plate in the Group Members area, and then press DELETE.

2 Click **Save Changes**.

3 Close the Inventory Editor window.

The plate group is listed as a available groups in the Groups tab in the Load/Unload Task Parameters area.

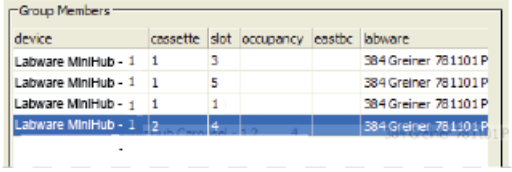


Changing the processing order

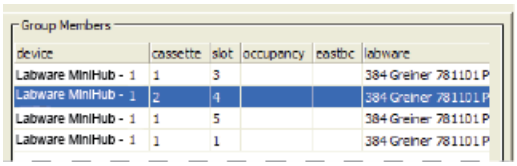
You can change the order in which the labware in a plate group will be processed.

To change the processing order:

1 In the plate group list, select a labware.



2 Drag it to another position in the list.



Deleting a plate group

To delete a plate group from the inventory:

1 In the **Inventory Editor** window, click the **Plate Groups** tab.

2 In the **Saved Groups** area, select the plate group.

3 Click **Delete**.

Related information

For information about...	See...
Creating a location group	"Creating and managing location groups" on page 76
Opening the Inventory Editor	"Opening the Inventory Editor" on page 71
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Incubating labware	"Using a plate group to process labware" on page 100
Using barcode input files	• "Creating a plate group with a barcode input file" on page 105 • *VWorks Automation Control User Guide*
Using storage tasks in a protocol	*VWorks Automation Control User Guide*

Adding labware information in the inventory database

About this topic

You can add labware information in the inventory database in one of many ways.

If you want to...	See...
• Load a batch of labware into storage devices. • Add the labware information in the database.	"Running a protocol to load labware into a storage device" on page 81
Add the information for a batch of labware in the database. *Note:* The labware are already in the storage devices.	"Adding multiple labware by importing a CSV file" on page 85
• Load a few labware into storage devices. • Add the labware information in the database.	"Adding individual labware in the inventory database" on page 88
Add the information for a few labware in the database. *Note:* The labware are already in the storage devices.	"Adding individual labware in the inventory database" on page 88

You can also use the plateDB and InventoryLabware JavaScript functions to add labware information. For more information, see *VWorks Automation Control User Guide*.

Running a protocol to load labware into a storage device

You can run a protocol to load a batch of labware into storage devices. During the run, the system will update the inventory database.

- If the labware has barcode labels and the system has a barcode reader, see "Loading labware into storage devices and updating the inventory database" on page 81.
- If the labware does not have barcode labels, or if the system does not have a barcode reader, see "Updating the inventory database without barcode readers" on page 84.

Loading labware into storage devices and updating the inventory database

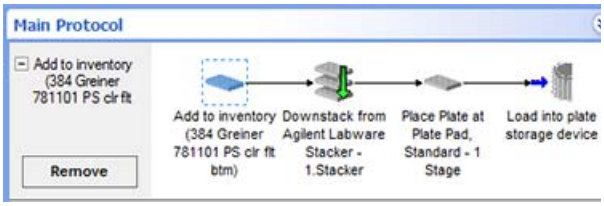
To run a protocol to load labware into a storage device:

1. Load the labware in a Labware Stacker by hand before running the protocol.
2. Write a protocol that contains the following:

- **Downstack** task to move the labware from the stacker.
- A task that reads the barcode on the labware.

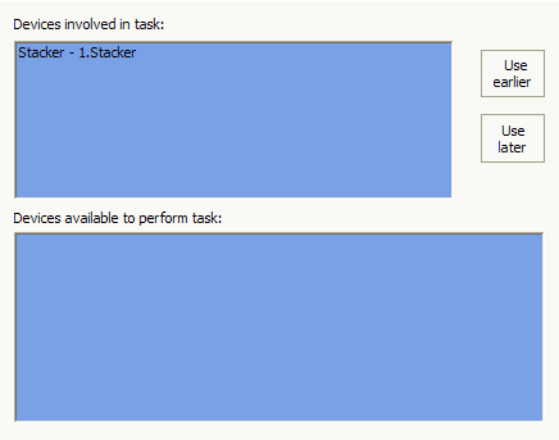
  For example, if the barcode reader is installed on a platepad, add the **Place Plate** task. Make sure the process labware parameter specifies the side on which the barcode label resides. The side that you select must match the side on which the barcode reader is installed. In addition, select **Barcode not in file** from the **Barcode or header** list.

  If the storage device has an integrated barcode reader, you might not need to add this task.
- **Load** task to move the labware into the storage device.



For instructions on how to write protocols, see "Creating a protocol: basic procedure" on page 15.

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



4 When adding the **Load** task, create a location group:

a Select the **Load** task.

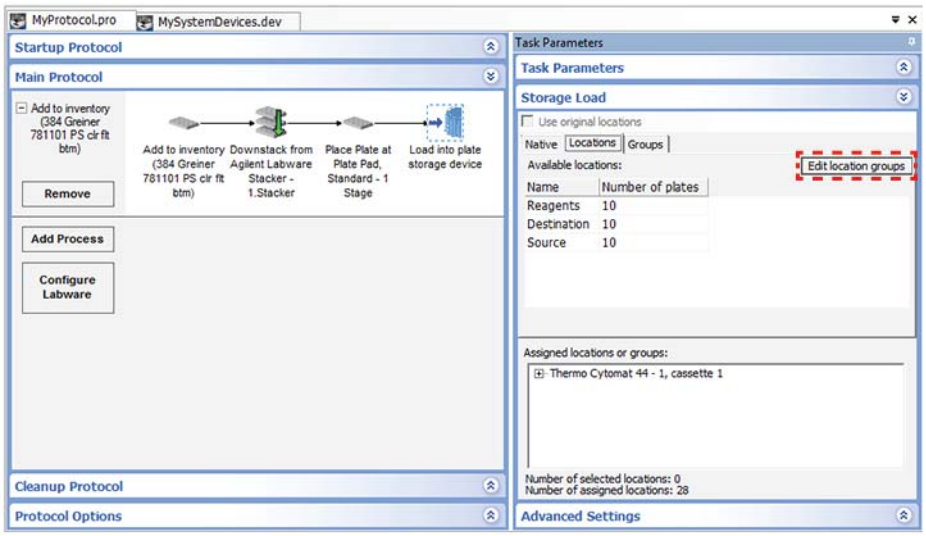
b Click **Storage Load**.

c Click the **Locations** tab.

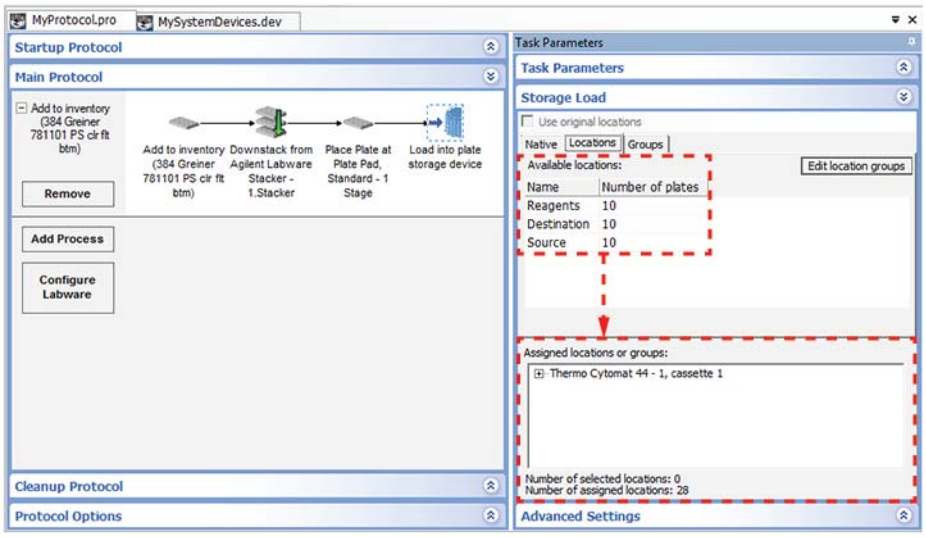
d Click **Edit location groups**.

e See "Creating and managing location groups" on page 76 for instructions.

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



5 Drag the group into the **Assigned locations or groups** area.



6 Compile the protocol and resolve any error messages.

7 Run the protocol (click **Start**).

8 In the **Run Configuration** dialog box that appears, specify the number of times to run the protocol. Type a number that is equal to or less than the number of labware you want to load into the storage device.

9 Click **Finish**. The protocol run starts.

10 To confirm that the labware are in the inventory database, open the Inventory Editor. See "Opening the Inventory Editor" on page 71.

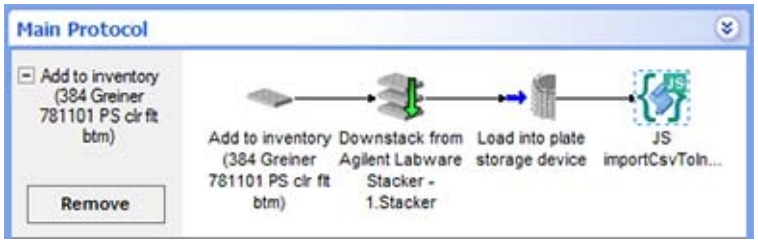
Updating the inventory database without barcode readers

If the labware do not have barcode labels, or if the system does not have a barcode reader:

1 Load the labware in a Labware Stacker by hand before running the protocol.

2 Write the protocol described in "Loading labware into storage devices and updating the inventory database" on page 81. You do not need to include the barcode-reading task.

3 Add the importCsvToInventory task at the end of the protocol. For more information, see *VWorks Automation Control User Guide*.



4 Compile the protocol and resolve any error messages.

5 Run the protocol (click **Start**).

6 In the **Run Configuration** dialog box that appears, specify the number of times to run the protocol. Type a number that is equal to or less than the number of labware you want to load into the storage device.

7 Click **Finish**. The protocol run starts.

8 To confirm that the labware are in the inventory database, open the Inventory Editor. See "Opening the Inventory Editor" on page 71.

Adding multiple labware by importing a CSV file

You can add the information for a batch of labware by importing a CSV file in the Inventory Editor. Use this method if a large number of labware physically exist in the storage device, and you want to enter the labware information in the inventory database.

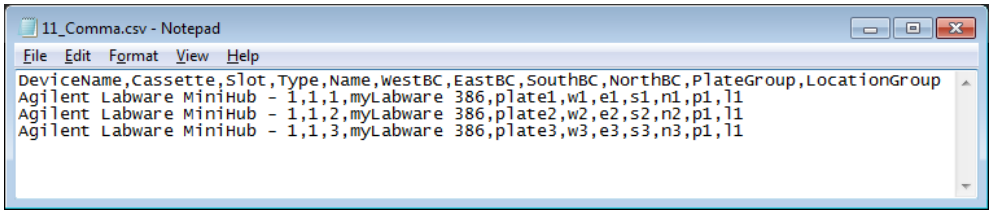
Make sure the CSV file meets the following requirements:

- The accepted delimiters are comma, tab, colon, and semicolon.
- The first row contains the header.
- The columns must consist of the following, in the order shown:

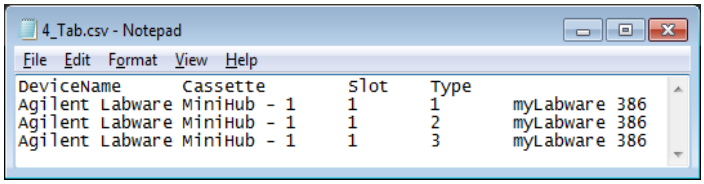
Property	Description
DeviceName	*Required column.* The name of the device in which the labware resides. Make sure the device name in this column matches the name in the device file. Be sure to include any spaces, underscores, dashes, and capitalization in the name.
Cassette	*Required column.* The cassette in which the labware resides. Make sure the cassette number in this column is valid. For example, if the device only has four cassettes, the valid values are 1, 2, 3, and 4.
Slot	*Required column.* The slot in which the labware resides. Make sure the slot number in this column is valid. For example, if the cassette only has 5 slots, the valid values are 1, 2, 3, 4, and 5.
Type	*Required column.* The type of labware. Make sure the labware type in this column matches the name in the Labware Editor. **IMPORTANT** The labware type may not contain any commas.
Name	The name of the labware.
WestBC	The barcode that is on the west side of the labware. **IMPORTANT** The west-side barcode must be unique, or the labware information will not be imported.
EastBC	The barcode that is on the east side of the labware.
SouthBC	The barcode that is on the south side of the labware.

Property	Description
NorthBC	The barcode that is on the north side of the labware.
PlateGroup	The plate group to which the labware belongs.
LocationGroup	The location group to which the labware belongs.

The following example shows that the columns in the file are separated by commas. In this example, all required and optional columns are specified in the file.

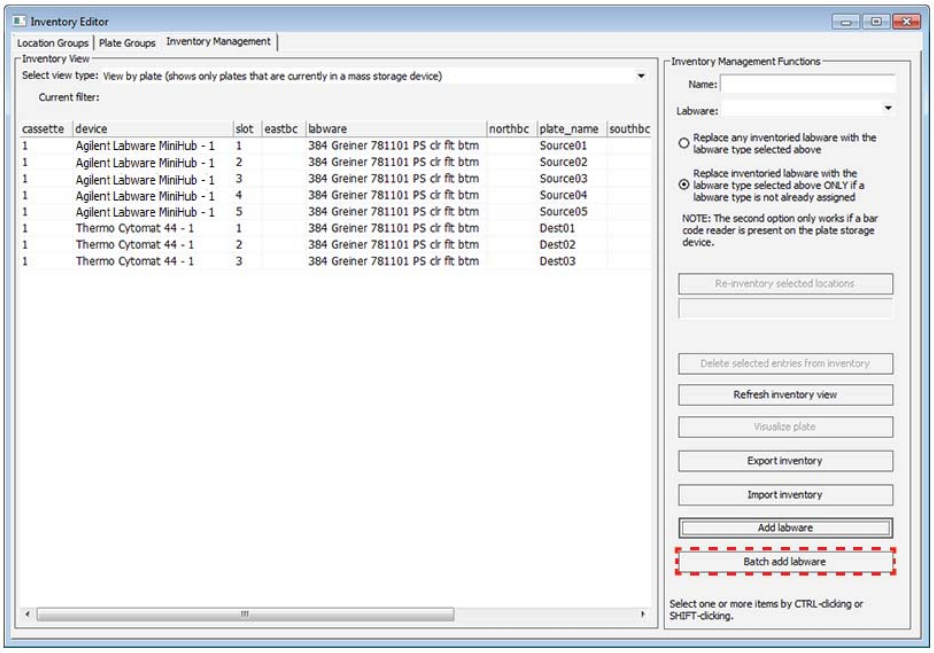


Instead of commas, you can use one of the other delimiters. The following example shows the use of tabs instead of commas to separate the columns. In this example, only the required columns are included.

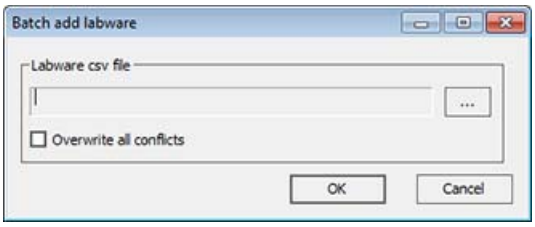


To add multiple labware by importing a CSV file:

1. Physically load the cassettes of labware into the storage device.
2. Open the **Inventory Editor**. See "Opening the Inventory Editor" on page 71.
3. Click the **Inventory Management** tab.
4. Click **Batch add labware**.



The Batch add labware dialog box opens.



5 Click the browse button to locate and select the CSV file.

6 Select **Overwrite all conflicts** if an entry already exists in the database and you want to replace it with the data in the CSV file. If you do not select this option, the software will skip the current labware in the CSV file.

7 Click **OK** to start importing the labware data.

During the import process:

- The software will import each row of data in the CSV file.
- If one of the required columns is missing, the software will halt the import process and display an error message.
- If the storage location is already occupied by a labware:
  - The software will overwrite the existing data if you selected Overwrite all conflicts, and record the incident in the Main log.
  - The software will skip the current row in the CSV file if you cleared the Overwrite all conflicts check box.
- If a specified device in the CSV file does not exist in the device file, the software will proceed to add the labware information and record the error in the log file.
- If the west-side barcode is not unique, the system will skip the current row in the CSV file and record the incident in the main log.

IMPORTANT Make sure you reconcile any conflict before running a protocol. Running a protocol with an out-of-date inventory database will cause the run to abort.

Adding individual labware in the inventory database

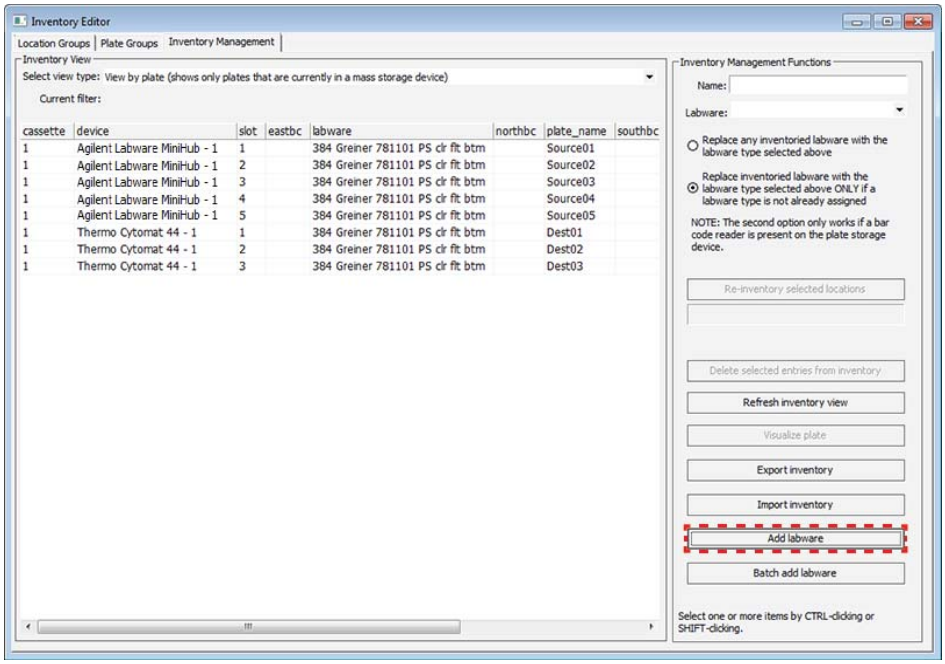
You can add an individual labware entry in the inventory database. Use this method if you want to add a nominal number of labware entries in the inventory database. For example, instead of running a protocol, you can load the labware in the storage device by hand, and then use the Inventory Editor to update the inventory database.

To add an individual labware in the inventory database:

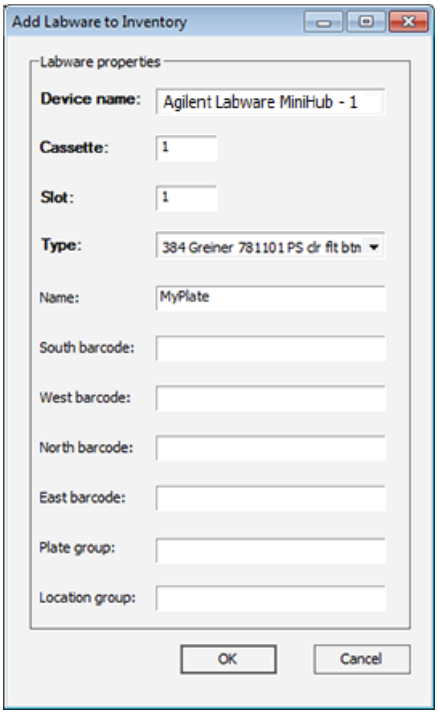
1 Open the **Inventory Editor**. See "Opening the Inventory Editor" on page 71.

2 Click the **Inventory Management** tab.

3 Click **Add labware**.



4 In the **Add Labware to Inventory** dialog box, set the labware properties:



Property	Description
Device name	*Required field*. The name of the device in which the labware resides. Select the device from the list.
Cassette	*Required field*. The cassette in which the labware resides. Type the cassette number.
Slot	*Required field*. The slot in which the labware resides. Type the slot number.
Type	*Required field*. The type of labware. Select the labware type from the list. *Note:* During a protocol run, the labware type specified in the process plate parameters area will override the specification in the inventory database.
Name	The name of the labware. Type a name that identifies the labware.
South/West/North/ East barcode	The barcode associated with the labware. Type or manually scan the barcode to enter it in the box. Be sure to enter the barcode in the appropriate box to indicate the location of the barcode label. For example, if the barcode label is on the south side of the labware, enter the barcode in the South barcode box.
Plate group	The plate group to which the labware belongs.

Property	Description
Location group	The location group to which the labware belongs.

5 When you are finished, click **OK** to save the changes in the database. The new labware entry appears in the Inventory View.

6 If you have not done so, make sure you physically load the labware in the storage device so that its location matches the information in the database.

Related information

For information about...	See...
Moving labware out of a storage device	"Removing labware information from the inventory database" on page 95
Moving labware between storage devices	"Moving labware between storage devices" on page 91
The Load and Unload tasks	*VWorks Automation Control User Guide*
Exporting the database data	"Exporting and importing the inventory data" on page 114

Moving labware between storage devices

About this topic

This topic provides an example to illustrate how you can move a group of labware from one storage device to another storage device. The general procedure could also be used to move a group of labware within a single storage device.

Who should read this

Read this topic if your lab automation system has incubators and random-access storage devices such as the Labware MiniHub.

Before you start

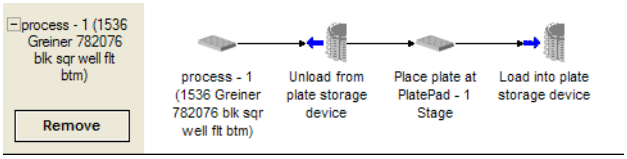
Make sure that both labware storage devices are properly configured in the device manager.

Moving a labware

In this example procedure, a group of four microplates is moved from one storage device (Labware MiniHub1) to another (Labware MiniHub2).

To move a labware:

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



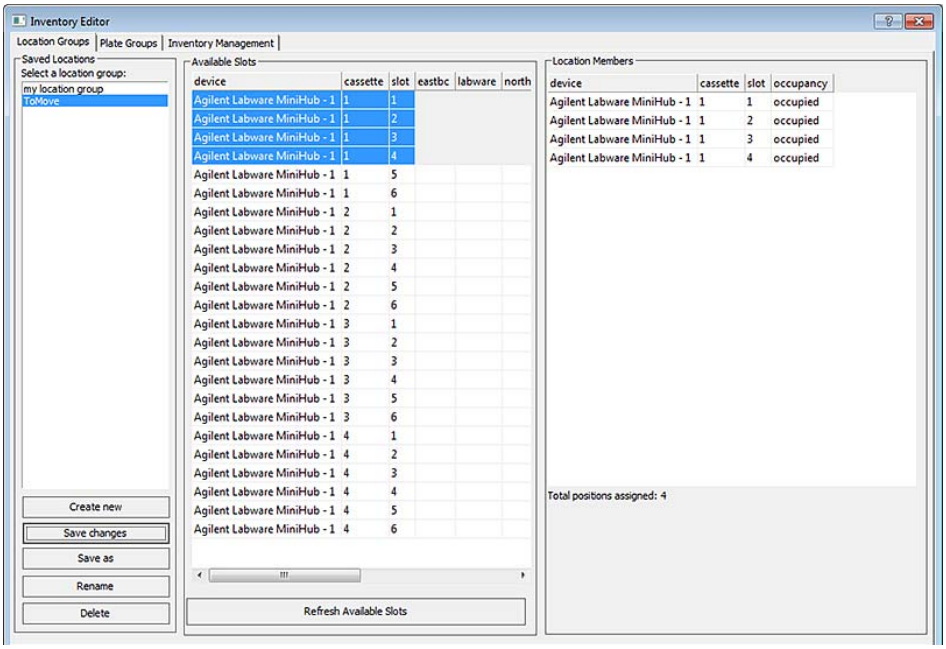
2. Select either the **Load** or **Unload** task, and in the **Task Parameters** area, click **Edit location groups**.

   The Inventory Editor opens.

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

   In this example, the microplates will be moved from MiniHub1, cassette 1, slots 1 to 4.

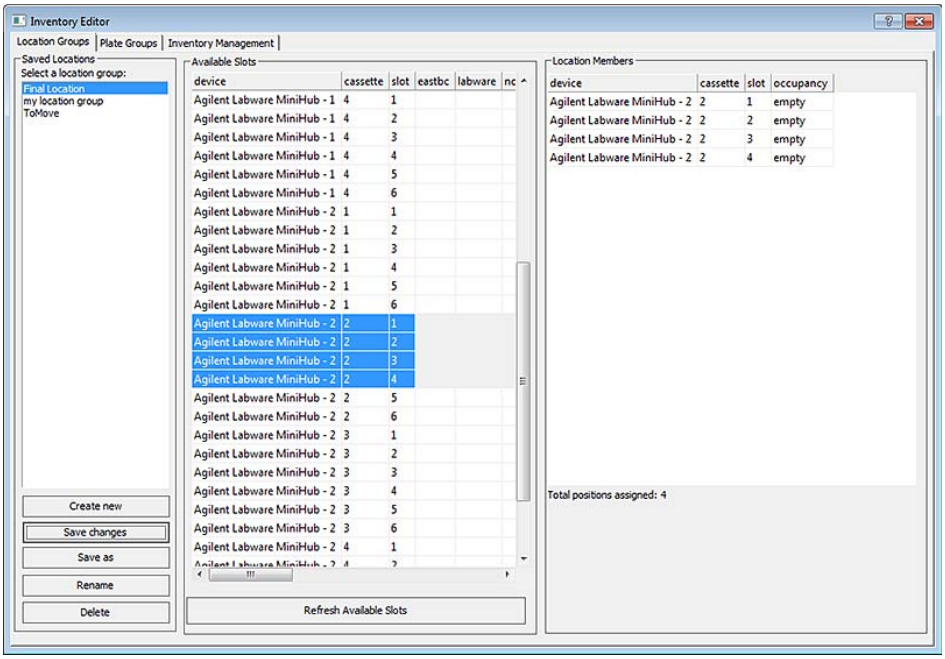
4. Click the **Location Groups** tab and create a location group for these microplates.



5 In the **Inventory Management** tab, note the device, cassette, and slot numbers for the destination slots.

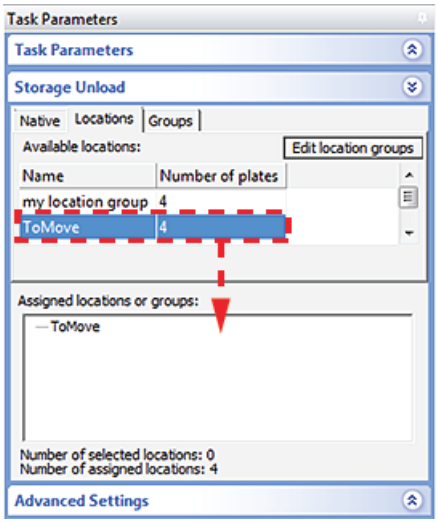
In this example, the microplates will be moved to MiniHub2, cassette 2, slots 1 to 4.

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

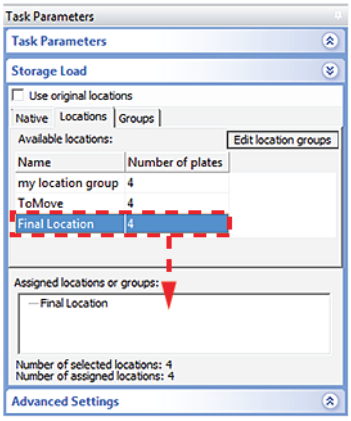


7 Click **Save changes** and close the Inventory Editor.

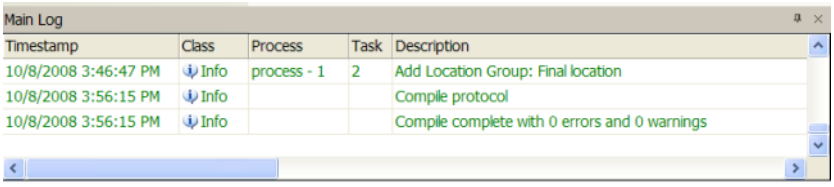
8 Select the **Unload** task, and in the **Task Parameters** area, drag the location group in the first device to the **Assigned locations** area.



9 Select the **Load** task, and in the **Protocol Task Parameters** area 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 the number of microplates that you are moving and click **OK**.

13 Open the Inventory Editor, and click the **Inventory Management** tab to make sure that the microplates moved as expected.

Related information

For information about...	See...
Creating a location group	"Creating and managing location groups" on page 76
Creating a plate group	"Creating and managing plate groups" on page 78
Opening the Inventory Editor	"Opening the Inventory Editor" on page 71
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95
Incubating labware	"Using a plate group to process labware" on page 100
Using barcode input files	• "Creating a plate group with a barcode input file" on page 105 • *VWorks Automation Control User Guide*
Load and Unload tasks	*VWorks Automation Control User Guide*

Removing labware information from the inventory database

About this topic

You can remove labware information from the inventory database in one of many ways.

If you want to...	See...
• Unload a batch of labware from storage devices. • Remove the labware information from the database.	"Running a protocol to unload labware from a storage device" on page 95
Remove the information for a batch of labware from the database. *Note:* The labware have been removed from the storage devices previously.	"Removing selected labware information from the database" on page 98
• Unload a few labware from storage devices. • Remove the labware information from the database.	"Removing selected labware information from the database" on page 98
Remove the information for a few labware from the database. *Note:* The labware have been unloaded from the storage devices previously.	"Removing selected labware information from the database" on page 98

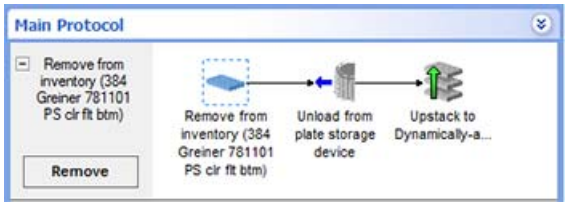
To replace the entire inventory database with known configuration and contents, use the inventory management export and import commands. For instructions, see "Exporting and importing the inventory data" on page 114.

Running a protocol to unload labware from a storage device

You can run a protocol to unload a batch of labware from storage devices. During the run, the system will automatically track the labware (with or without barcodes) and update the inventory database.

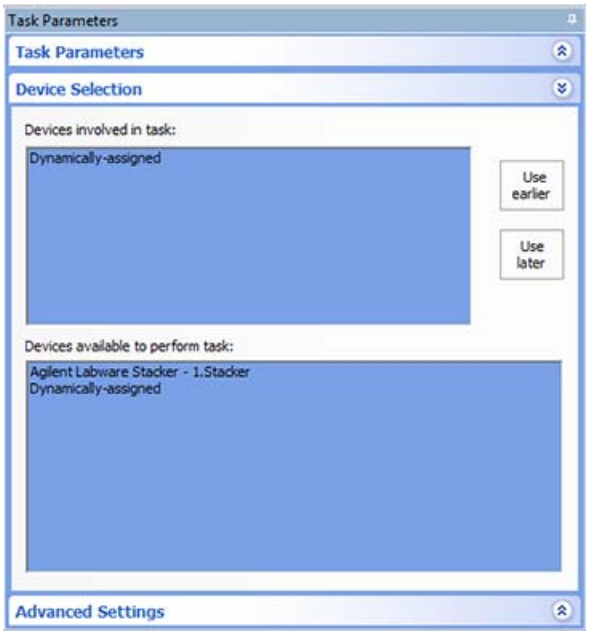
To run a protocol to remove labware from a storage device:

1. Prepare one or more empty Labware Stackers before running the protocol.
2. Write a protocol that contains the following:
   - **Unload** task to remove the labware from the storage device.
   - **Upstack** task to move the labware into an available stacker.



For instructions on how to write protocols, see "Creating a protocol: basic procedure" on page 15.

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



4 In the **Inventory Editor**, identify the labware that you want to move:

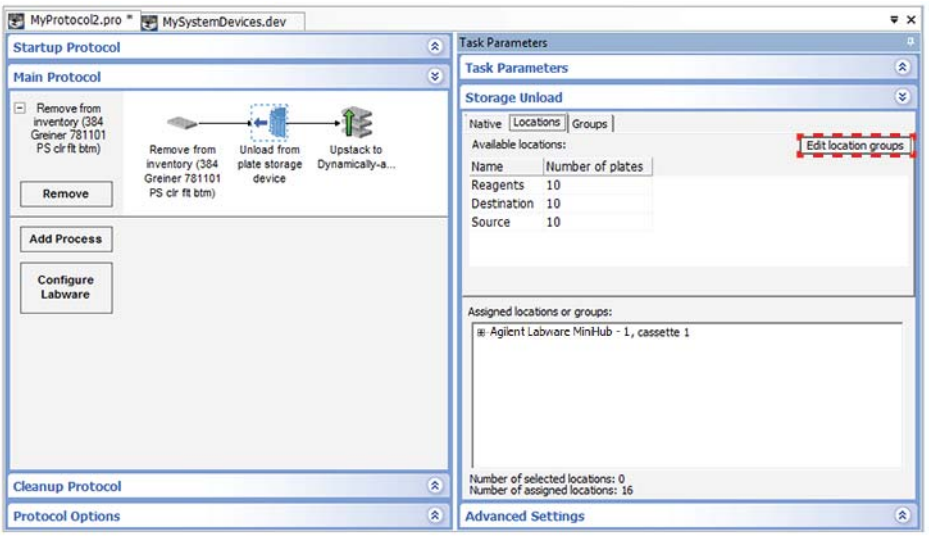
a Click the **Unload** task.

b Click **Storage Load**.

c Click the **Locations** tab.

d Click **Edit location groups** to open the Inventory Editor.

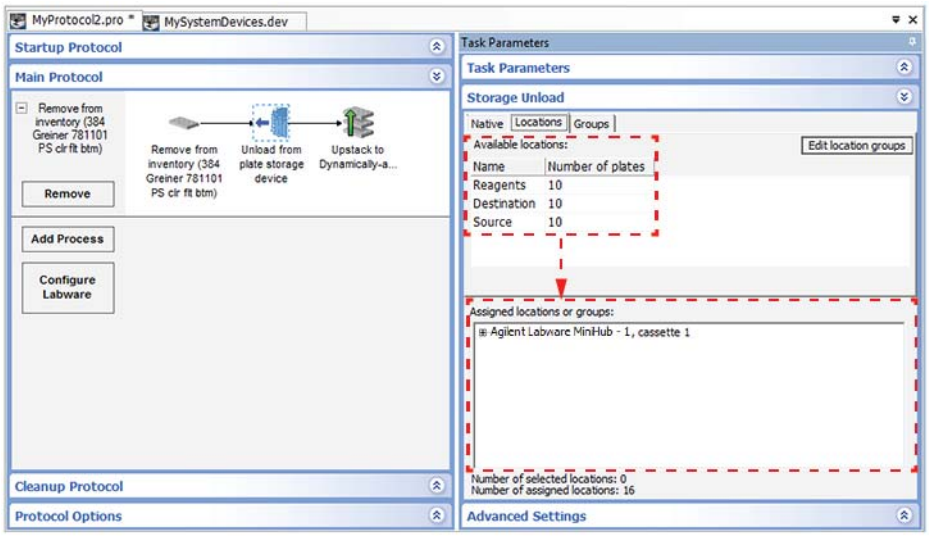
e Click the **Inventory Management** tab. Note the device, cassette and slot numbers for the labware that you want to remove.



5 If necessary, create a location group in the Inventory Editor that contains the labware you want to remove. See "Creating and managing location groups" on page 76 for instructions.

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.

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



7 Compile the protocol and resolve any error messages.

8 Run the protocol (click **Start**).

9 In the **Run Configuration** dialog box that appears, specify the number of times to run the protocol. Type a number that is equal to or less than the number of labware you want to unload from the storage device.

10 Click **Finish**. The protocol run starts.

11 To confirm that the labware are removed from the inventory database, open the Inventory Editor. See "Opening the Inventory Editor" on page 71.

Removing selected labware information from the database

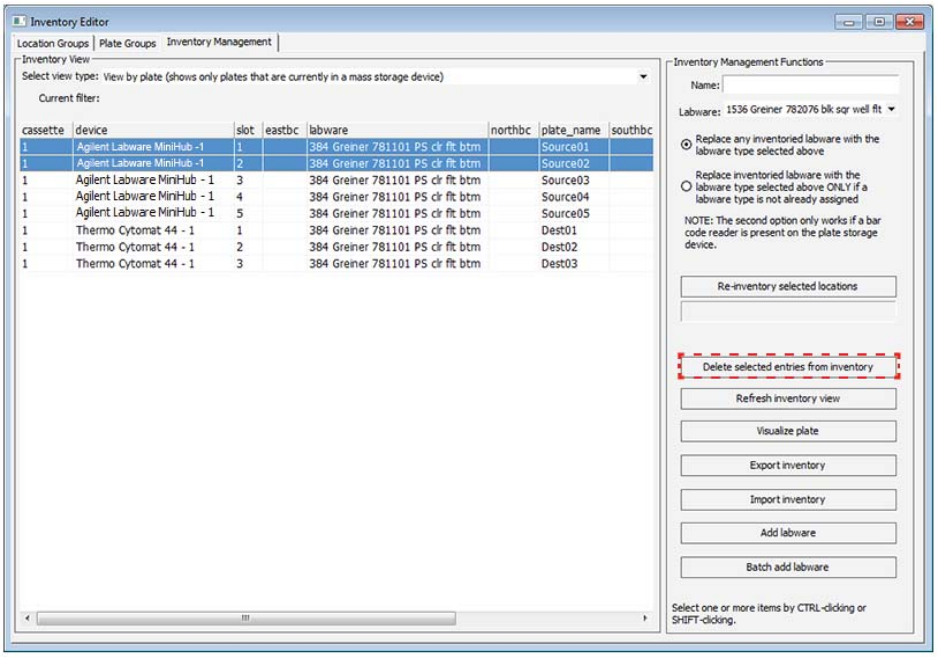
You can remove individual labware entries in the inventory database. Use this method if you want to remove labware entries under the following scenarios:

- Instead of running a protocol, you can unload individual labware in the storage device by hand, and then use the Inventory Editor to update the inventory database.
- A batch of labware was already removed from storage devices, but you need to remove the corresponding entries from the inventory database.

To remove labware entries from the database:

1. Open the **Inventory Editor**. See "Opening the Inventory Editor" on page 71.
2. Click the **Inventory Management** tab.
3. Select the labware entries you want to delete, and then click **Delete selected entries from inventory**.

   If you are deleting a batch of labware entries, you can CTRL+click to select non-contiguous entries, or SHIFT+click to select contiguous entries.



4. Make sure you physically unload the labware from the storage device so that the storage state of the device matches the information in the database.
5. *Storage devices that have their own barcode readers*. To validate the changes, in the **Inventory Editor Inventory Management** tab, click **Re-inventory selected locations**. For instructions, see "Reinventorying the labware inventory" on page 112.

Related information

For information about...	See...
Creating a location group	"Creating and managing location groups" on page 76
Creating a plate group	"Creating and managing plate groups" on page 78
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Moving labware between storage devices" on page 91
Incubating labware	"Using a plate group to process labware" on page 100
Exporting the database data	"Exporting and importing the inventory data" on page 114
Using barcode input files	• "Creating a plate group with a barcode input file" on page 105 • *VWorks Automation Control User Guide*

Using a plate group to process labware

About this topic

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

Who should read this

Read this topic if your lab automation system has incubators and random-access storage devices such as the Labware MiniHub.

Before you start

- Place the labware in Labware MiniHub and make sure the labware are added to the Inventory Editor.
- Create a plate group containing the labware that you want to process.

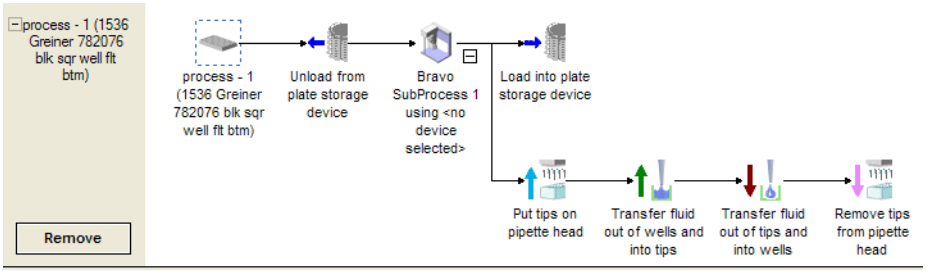
To enable the software to track individual plates:

- Under **Protocol Options**, select the **Dynamically assign empty slot to load to storage device** option.

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

To process a plate group:

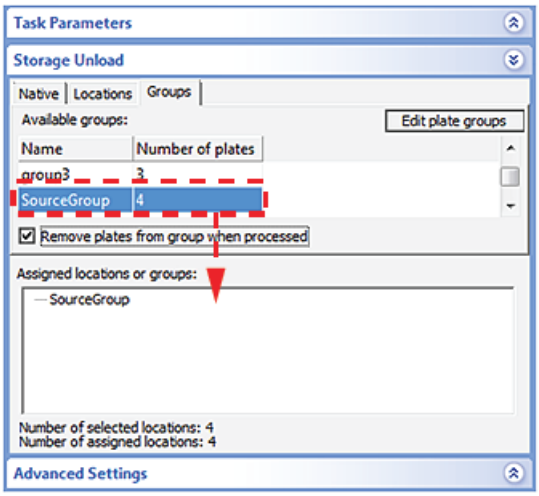
1 Create a process like the one shown below.



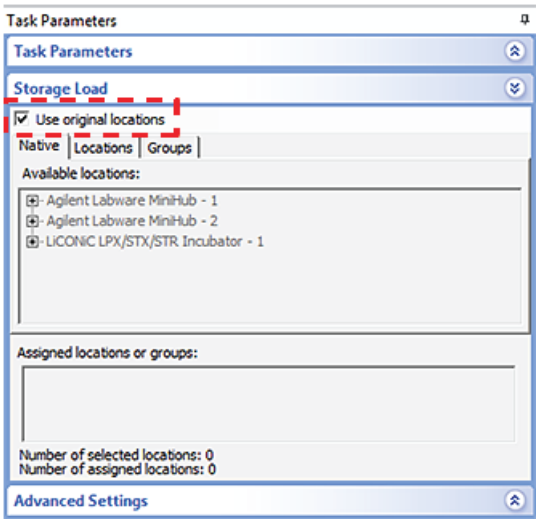
2 Select the **Unload** task, and in the **Task Parameters** area, click the **Groups** tab and drag the plate group to the **Assigned location** area.

3 If you want the labware to be handled in the same numerical order or will not be reusing the labware, select **Remove plates from group when processed**.

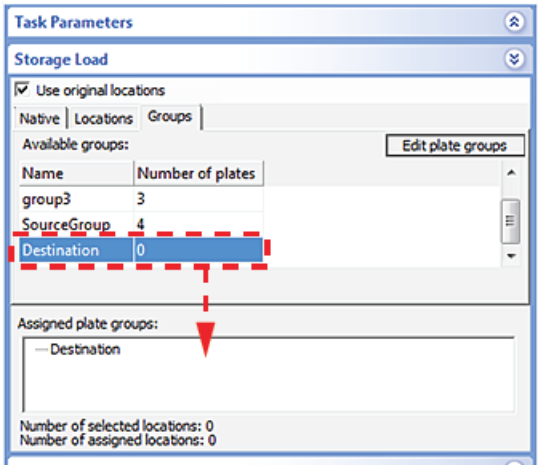
Note: The labware can be loaded back into the group during the Load task execution.



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



Optional. You can reassign the labware 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 labware that you want to process from the group.

7 Click **OK**.

8 To confirm that the labware have been returned to their original position in the inventory:

a Click the **Load** task.

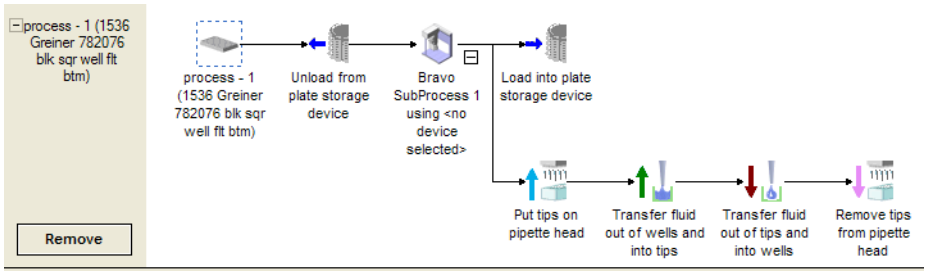
b Click **Edit location groups** or **Edit plate groups**.

c Click the **Inventory Management** tab.

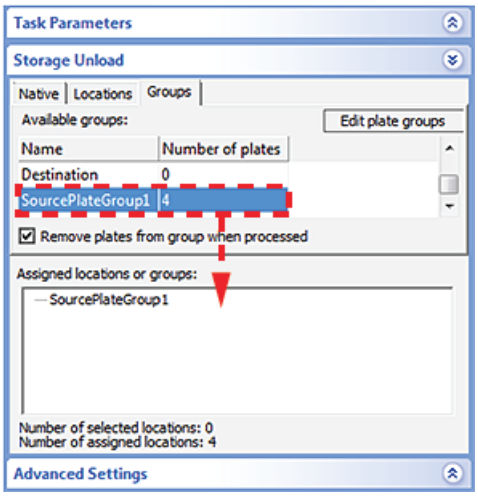
Processing a plate group and returning the labware to a different location

To process a plate group:

1 Create a protocol like the one shown below.

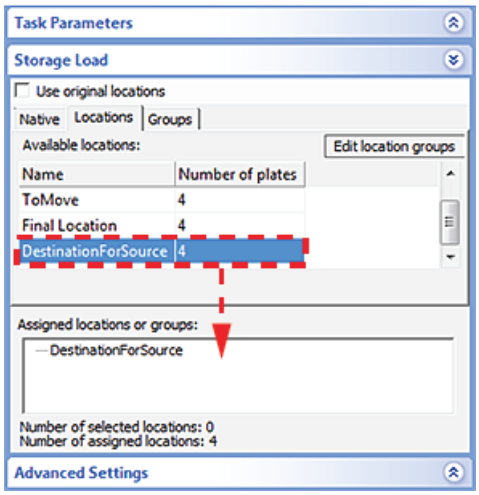


2 Select the **Unload** task. In the **Task Parameters** area, click the **Groups** tab and drag the plate group to the **Assigned locations or groups** area.



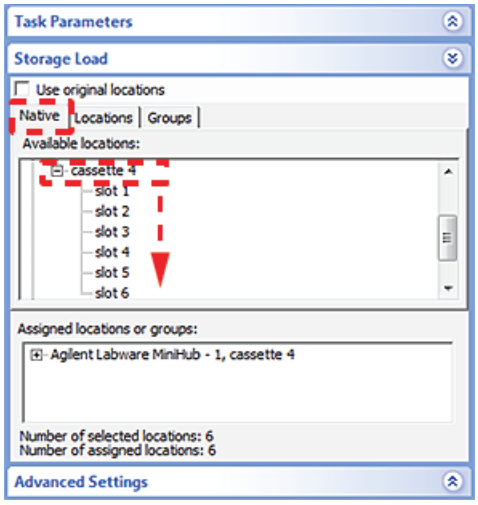
3 Select the **Load** task. In the **Task Parameters** area, choose one of the following ways to load the labware into a different location.

- Specify a predefined location group to load to. To specify a predefined location group, click the **Locations** tab and drag the location group to the **Assigned locations or groups** area.



- Assign specific locations to load to without using a location group, as follows:

  Click the **Native** tab, and drag the selected locations to the **Assigned locations or groups** 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 labware that you want to process from the group.

6 Click **OK**.

7 To confirm that the labware 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 66
Creating a plate group	"Creating and managing plate groups" on page 78
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Using barcode input files	• "Creating a plate group with a barcode input file" on page 105 • *VWorks Automation Control User Guide*

For information about...	See...
Starting a run	*VWorks Automation Control User Guide*
Load and Unload tasks	*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 a plate group if you previously used a barcode input file to label a collection of labware that are now stored in a storage device.

Who should read this

Read this topic if your lab automation system has incubators and random-access storage devices such as the Labware MiniHub.

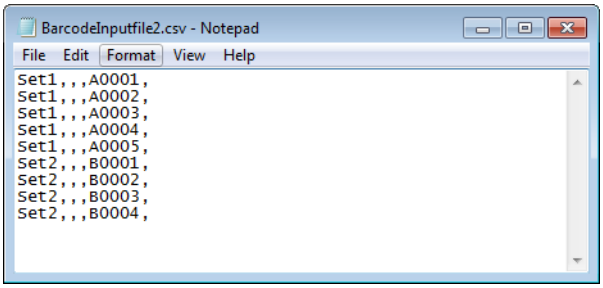
Barcode input files

The barcode input file must be a text file, created in Notepad or equivalent editor, and have the .csv or .bar file name extension. The input file can be stored anywhere on the computer that runs the VWorks software.

File requirements for .csv files

- The file may contain any number of columns, but only the first 5 columns are significant.
- The first column file indicates the barcode group name.
- The second, third, fourth, and fifth columns indicate the north, south, west, and east barcode, respectively.

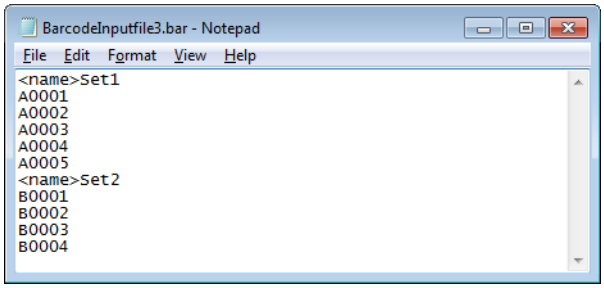
  In the following example, Set1 and Set2 are the group names. Plates A0001 through A0005 in the Set1 group, and plates B0001 to B0004 are in the Set2 group. All barcodes are on the west side in this example.



File requirements for .bar files

- The file must contain only one column. The column can contain as many groups of plates as desired.
- The first row in each plate group must contain the string, `<name>`, followed by the group name.

  In the following example, Set1 and Set2 are the group names. All barcodes are on the west side of the plate. Plates A0001 through A0005 are in the Set1 group.

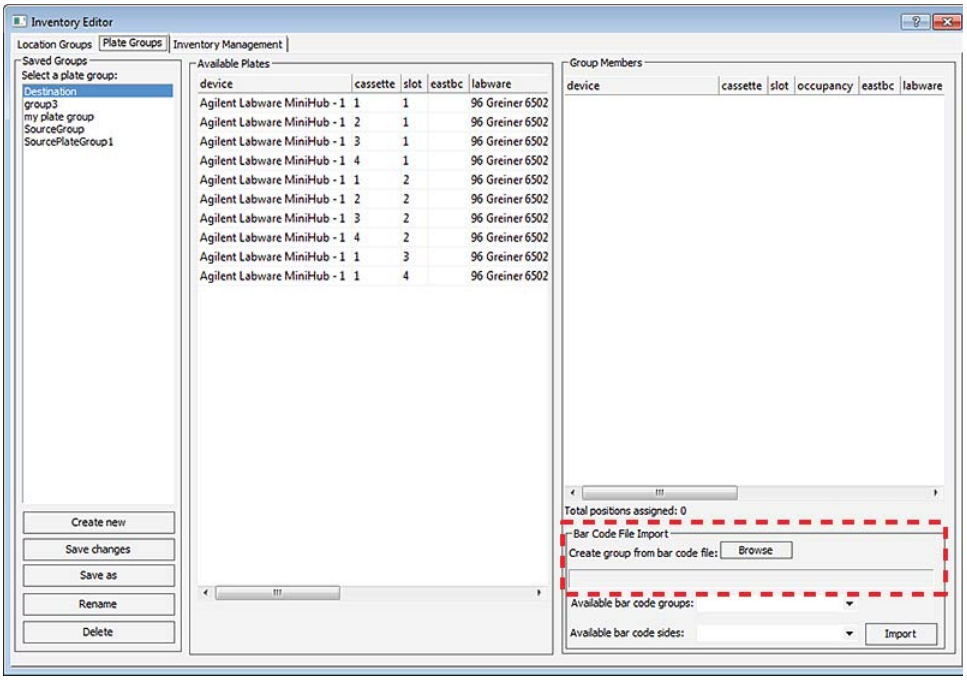


Procedure

IMPORTANT All labware with barcodes listed in the selected barcode input file series must already be in the storage device. To load labware into storage devices, see "Adding labware information in the inventory database" on page 81.

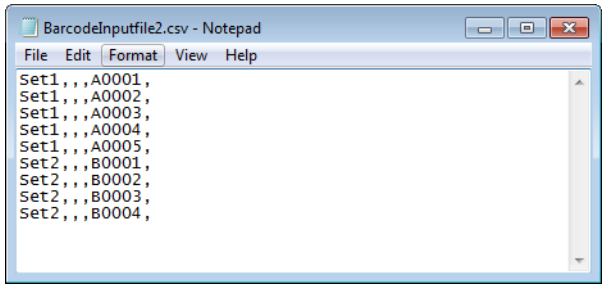
To create a plate group with a barcode input file:

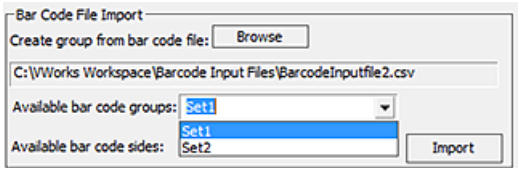
1. In the **Inventory Editor** window, click the **Groups** tab.
2. In the **Bar Code File Input** area, click the **Browse** button and locate the .bar or .csv file that you want to use.



3 From the **Available bar code groups** list, select the group that you want to use. If you do not see the desired group name, check the input file. See "Barcode input files" on page 105.

If you are using the input file in the following example, you should see Set1 and Set2 in the Available bar code groups list.





4 In the **Available bar code sides** list, select which of the plate's four barcodes is going to be matched with a barcode read from the imported file.

If the imported file is a .csv file, this list also specifies which column in the .csv file to use when matching the existing plate's barcode:

- **northbc** means match to column 2
- **southbc** means match to column 3
- **westbc** means match to column 4
- **eastbc** means match to column 5

The software ignores the other three barcode columns in the .csv file.

5 Click **Import**.

The labware labeled with the barcodes listed in the series will be used to create a plate group.

6 In the **Inventory Management** tab, specify a labware type for each labware.

Related information

For information about...	See...
Software inventory	"About labware inventory management" on page 66
Opening the Inventory Editor	"Opening the Inventory Editor" on page 71
Using the labware selection list	"Reinventorying the labware inventory" on page 112

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 incubators and random-access storage devices such as the Labware MiniHub.

Inventory Editor views

There are three ways to view the labware in the Inventory Editor.

To set the view:

1. In the **Inventory Editor** window, click the **Inventory Management** tab.
2. In the **Select view type** list, select one of the following options:

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

Filtering displayed labware

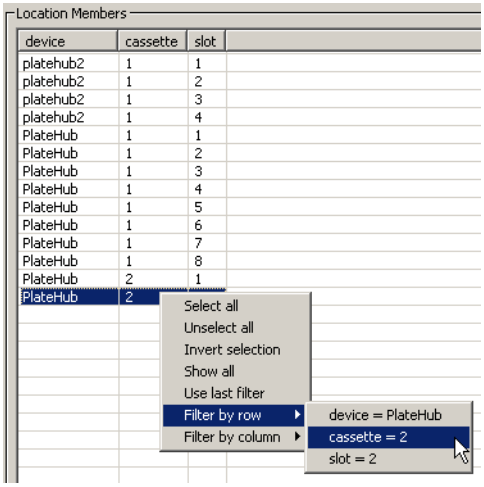
To simplify your view of the database, you can filter the records that are displayed.

To filter the labware records:

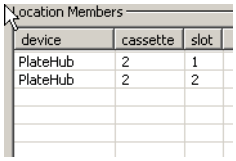
1. Right-click a list in any of the tabbed pages of the Inventory Editor and select **Show all**.
2. Right-click a particular cell and select from the available filtering options.

View	Description
Use last filter	Returns the display of items to that displayed when the last filter was applied
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 labware 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 66
Opening the Inventory Editor	"Opening the Inventory Editor" on page 71

Auditing plate volumes in the Inventory Editor

About this topic

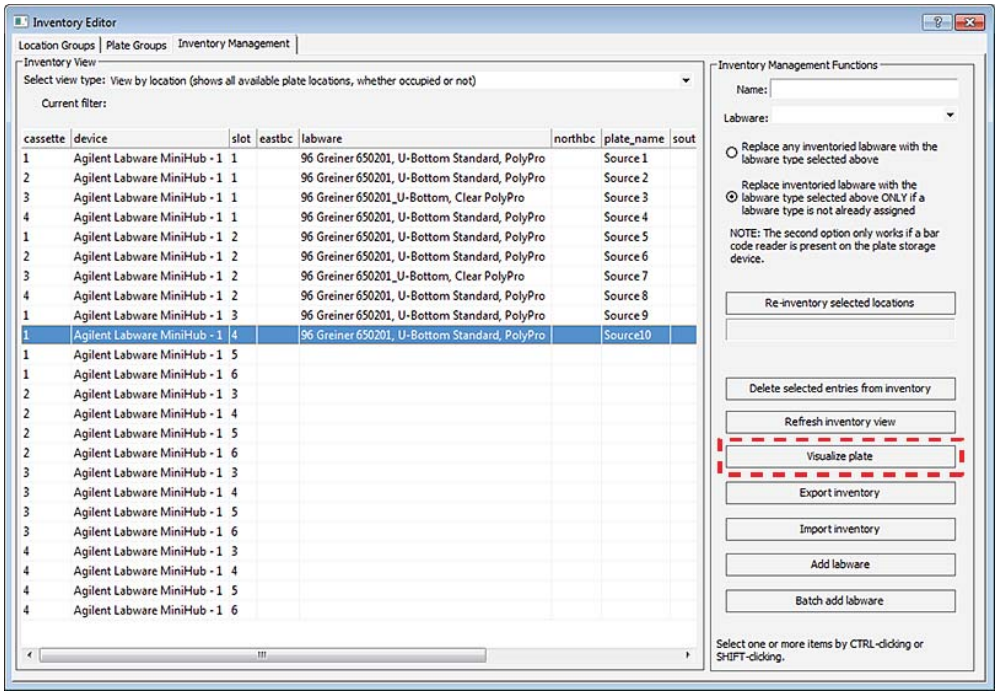
The VWorks software tracks the pipetting tasks performed on the labware during a protocol run, calculating the volume resulting from those tasks, and storing the information in the database. When the labware is displayed in the software, the volume is represented with color.

This topic describes how to use the Inventory Editor to audit the volume in a labware.

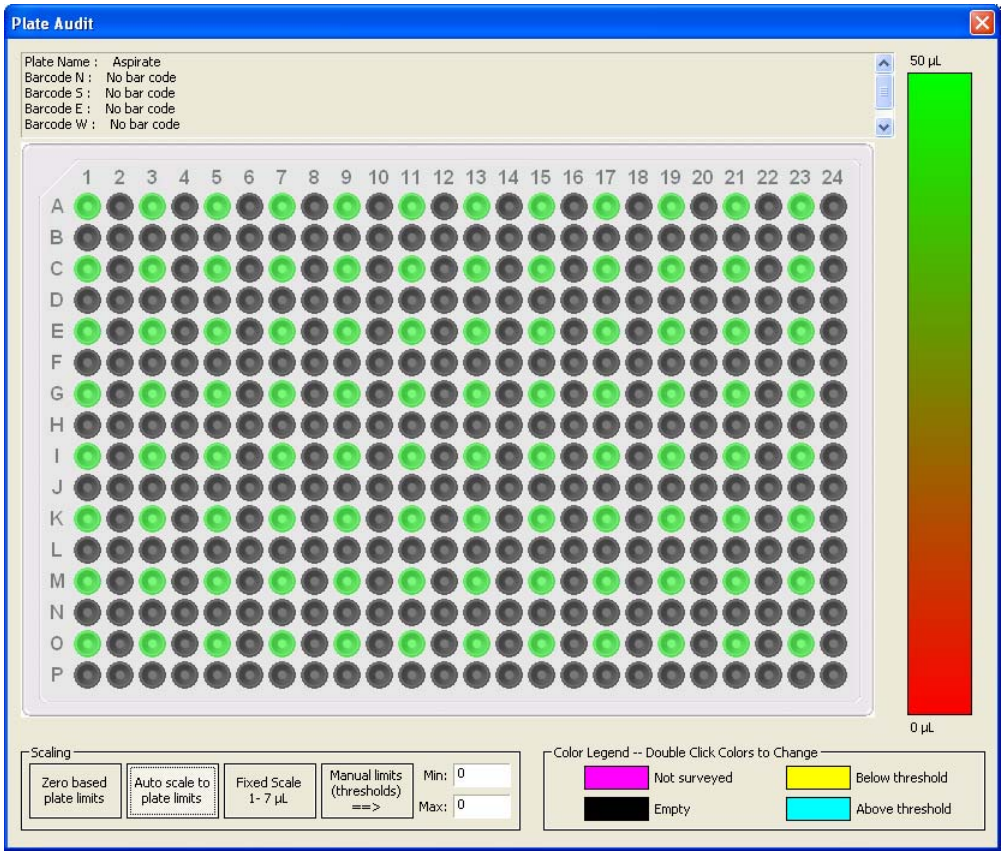
Procedure

To audit the volume of a labware:

1. In the **Inventory Editor** window, click the **Inventory Management** tab.
2. From the **Select view type** list, select the view.
3. Select the labware you want to audit.



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



The liquid volume is displayed on the right. You can change the limits of this scale in the Scaling area.

Click this button...	To...
Zero based plate limits	Set the gradient limits from 0 µL to the highest volume found in the labware.
Auto scale to plate limits	Set the scale limits to the lowest and highest volume found in the labware.
Fixed Scales 1-7 µL	Set the minimum and maximum limits to 1 µL and 7 µL, respectively.
Manual limits (thresholds)	Manually set the lower and upper limits. Enter the value (in µL) in the Min and Max boxes.

The color legend indicates the following conditions.

Condition	Description
Not surveyed	The well is not available for measurement.
Empty	The well is empty.

Condition	Description
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 information

For information about...	See...
Software inventory	"About labware inventory management" on page 66
Opening the Inventory Editor	"Opening the Inventory Editor" on page 71

Reinventorying the labware inventory

About this topic

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

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

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

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

Who should read this

Read this topic if your lab automation system has a 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 labware must have a unique barcode.

Reinventorying logic

If a labware is found in a slot that, according to the inventory database, should be empty, a line is added to the Inventory Editor for that slot and the labware 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 labware has been manually moved.

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

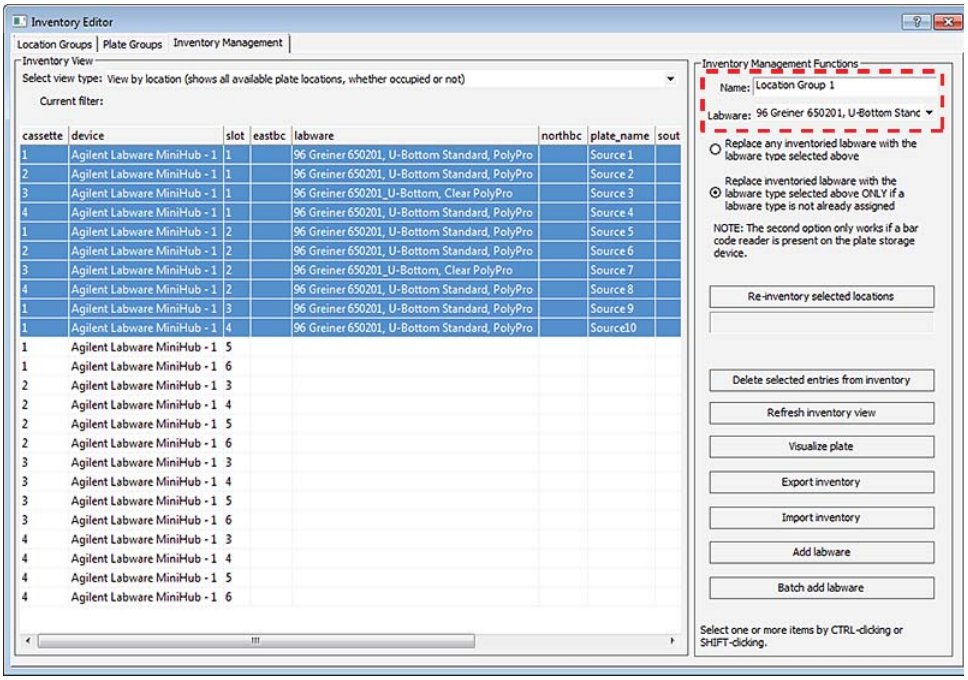
Procedure

To reinventory the storage device:

1. In the **Inventory Editor** window, click the **Inventory Management** tab.
2. From the **Select view type** list box, select **View by location**.

   This lists the labware in the inventory database by location.
3. Select the labware that you want to inventory.

   You can use SHIFT+click to select a range of listed labware.
4. Under Inventory Management Functions, type the **Name** of the location group.
5. In the **Labware** list, select the type of labware.



6. 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.
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.

7 Click **Reinventory selected locations**.

A barcode reader reads each labware 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 73
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Changing the labware associated with labware record in the inventory database	"Reinventorying the labware inventory" on page 112
Inventory Editor filters	"Inventory Editor views and filters" on page 108

Exporting and importing the inventory data

About this topic

You can export the inventory data to create a backup copy of the inventory database without performing a system-wide backup. You can also use the backup copy to restore the inventory data in case they become damaged or lost.

This topic describes how to use the following methods to back up and recover the inventory data:

- "Exporting the inventory data" on page 115
- "Importing the inventory data" on page 115

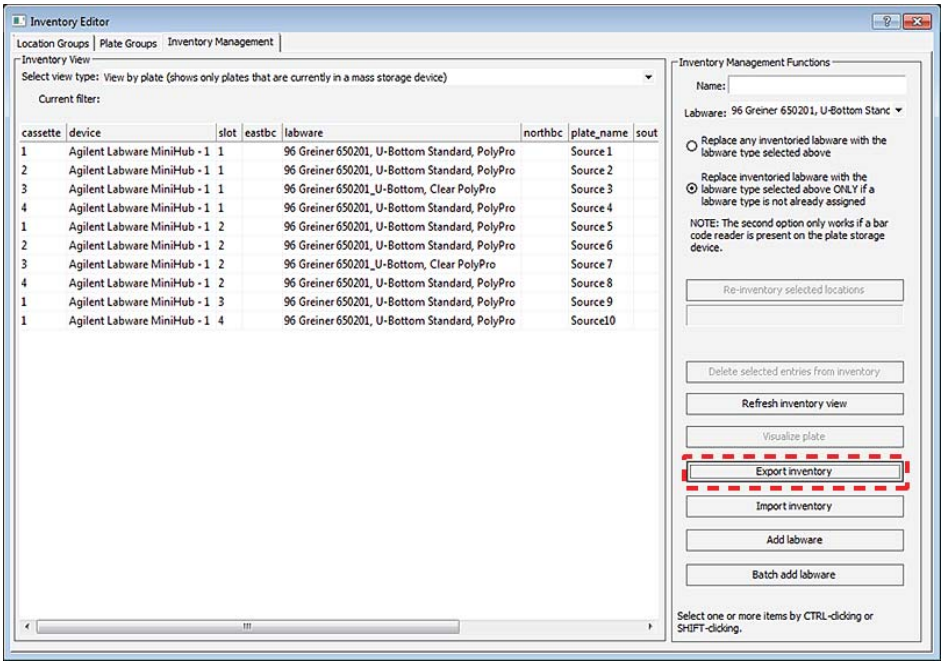
To back up all VWorks software system files, see *VWorks Automation Control User Guide*.

Exporting the inventory data

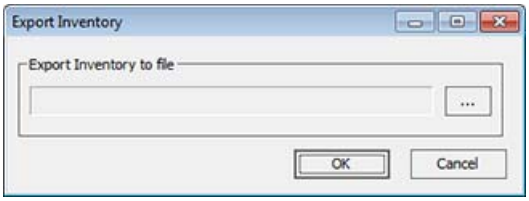
You can export the inventory data for backup and recovery.

To export the inventory data:

1. Open the **Inventory Editor**. See "Opening the Inventory Editor" on page 71.
2. Click the **Inventory Management** tab.
3. Make sure the inventory data is up-to-date. See "Reinventorying the labware inventory" on page 112.
4. Click **Export inventory**.



The Export Inventory dialog box opens.



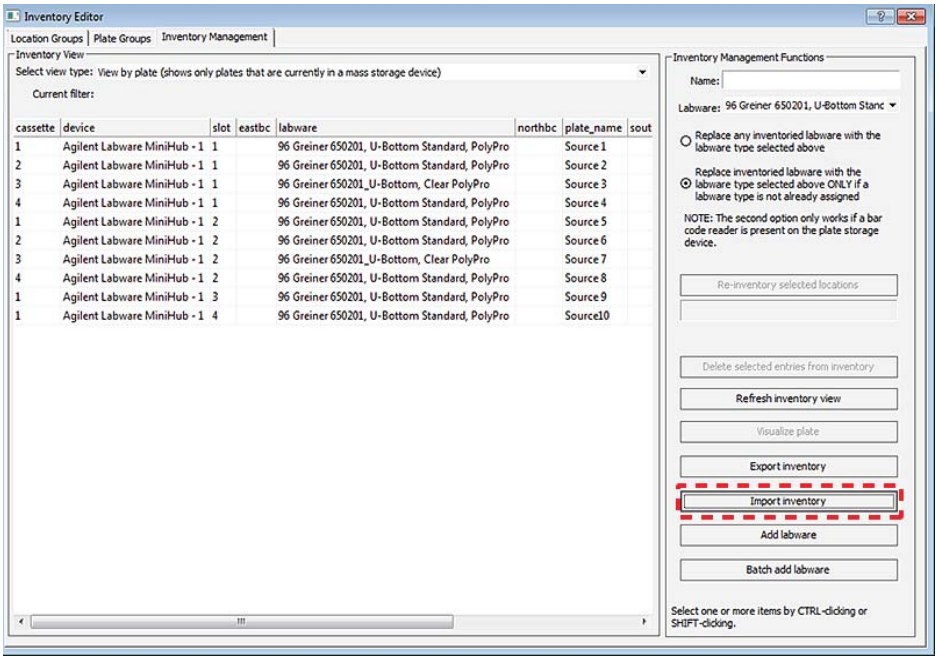
5. Click the browse button to select the folder in which you want to store the backup copy.
6. Click **OK**. The software exports the inventory data. The exported file has a .sql file name extension.

Importing the inventory data

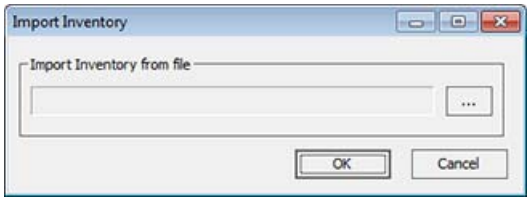
You can import the inventory data as part of the data recovery process.

To import the inventory data:

1. Open the **Inventory Editor**. See "Opening the Inventory Editor" on page 71.
2. In the **Inventory Management** tab, click **Import inventory**.



The Import Inventory dialog box opens.



3. Click the browse button to locate and select the backup file.
4. Click **OK**. The software imports the inventory data.

Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 73
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91

For information about...	See...
Changing the labware associated with labware record in the inventory database	"Reinventorying the labware inventory" on page 112
Inventory Editor filters	"Inventory Editor views and filters" on page 108

Resolving labware 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

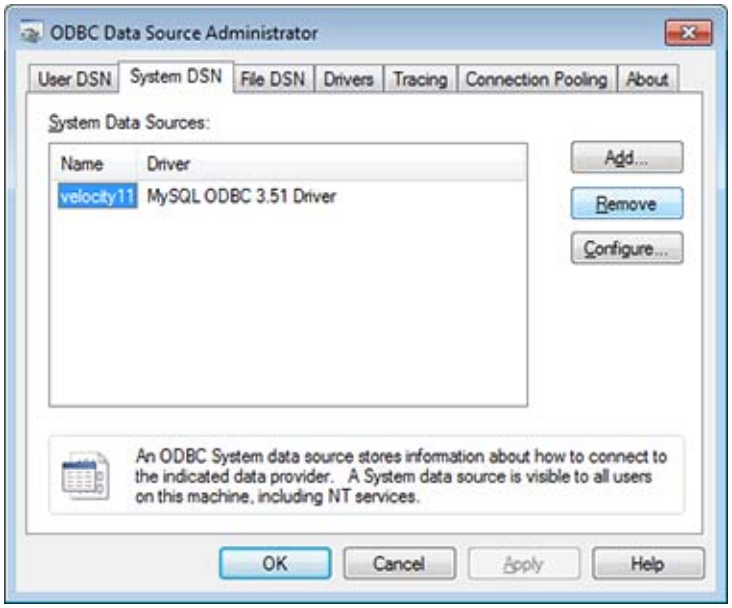
The inventory database uses a Windows Open Database Connectivity (ODBC) interface. If you encounter inventory management problems, you may need to check the database settings.

To check the database settings:

1 Open the ODBC Data Source Administrator as follows:

   a In the **Windows Explorer**, navigate to C:\Windows\SysWOW64.

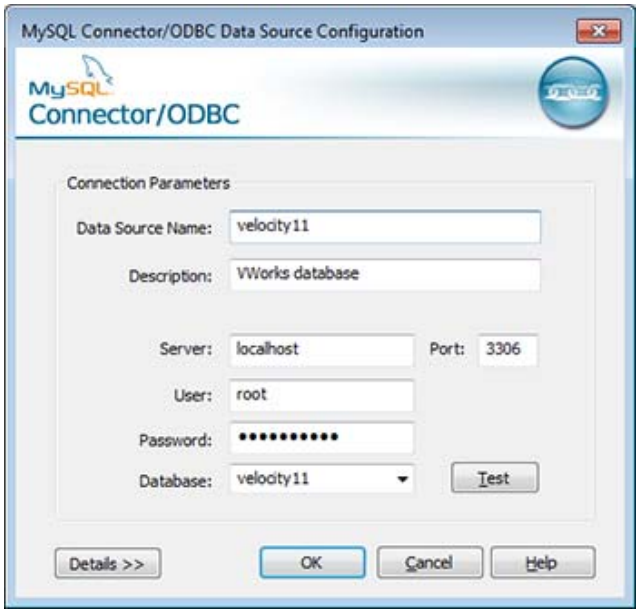
   b Right-click **odbcad32.exe** and select **Run as administrator**.



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** parameters must both specify `velocity11`.

Testing the connection

To test the database connection:

1 Follow the procedure in "Checking the database settings" on page 117 to open the **Connector/ODBC** dialog box.

2 Click **Test**.

A message appears and confirms a successful connection.

Related information

For information about...	See...
Inventory groups, plate groups and location groups	"About inventory groups" on page 73
Moving labware in and out of a storage device	• "Adding labware information in the inventory database" on page 81 • "Removing labware information from the inventory database" on page 95 • "Moving labware between storage devices" on page 91
Changing the labware associated with plates in the inventory database	"Reinventorying the labware inventory" on page 112

5 Planning and managing user accounts

This chapter contains the following topics:

For a description of how to set up user accounts that can be shared across multiple computers, see the *VWorks Bravo Platform for Windows Non-Administrators Setup Guide*. This guide describes how to configure the VWorks Automation Control software so that Windows users with non-Administrator privileges can use the VWorks software to operate the Bravo Automated Liquid Handling Platform.

For instructions on how to set up email for error notification, see the *VWorks Automation Control User Guide*.

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 the 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 121
Setting up email notification	*VWorks Automation Control User Guide*

Managing user accounts

About user accounts and passwords

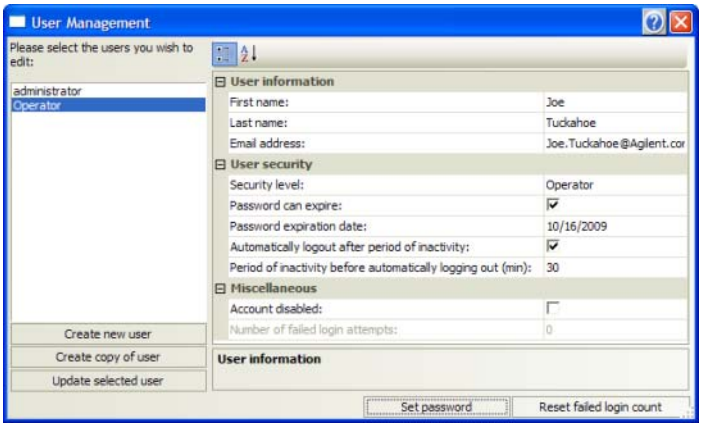
User accounts and passwords use the following conventions:

- 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:

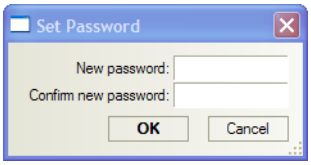
1. Select **Tools** > **User Management**.
2. Select the account.
3. Click **Reset failed login count**.
4. Click **Update selected user** to save changes, and then close the dialog box.

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:

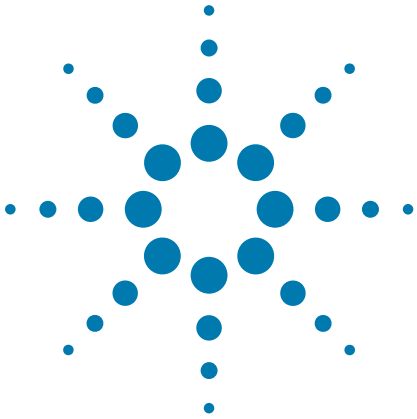
1. Select **Tools** > **User Management**.
2. Select the account.
3. Click **Set password**, enter the new password twice and click **OK**.



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

Related information

For information about...	See...
User accounts	"Planning user accounts and privileges" on page 120
Setting up email notification	*VWorks Automation Control User Guide*



A

Setting up a Windows 7 MySQL database

The VWorks labware inventory management feature requires a MySQL database. This section describes how to install and configure a MySQL 5.1 database for the Microsoft Windows 7 64-bit operating system.

Note: The database may be configured already if the computer was provided by Agilent Technologies and your system contains a device that requires a database, such as a Labware MiniHub.

The topics are:

If you are running the VWorks software on the Microsoft Windows 10 operating system, see "Setting up a Windows 10 MySQL database" on page 133.

Installing and setting up MySQL 5.1

Before you start

Required installation files

Ensure you have the following installation files:

- mysql-essential-5.1.44-winx64.msi
- mysql-connector-odbc-5.1.6-winx64.msi
- velocity11_mysql5.sql

  This file is installed with the VWorks software in C:\Program Files (x86)\Agilent Technologies\VWorks\Schema\velocity11_mysql5.sql

For assistance, contact Agilent Technologies Automation Solutions Technical Support.

Required computer settings

Before you install the MySQL software:

- Log on to the computer as an administrator with full rights.
- In Microsoft Windows Explorer, configure the following settings:

  Folder options > View settings:

  – Select **Show hidden files, folders, and drives**.

  – Clear the **Hide extensions for known file types** check box.

For detailed instructions, see the Microsoft Windows user documentation.

Installation and setup workflow

Step	For this task...	See...
1	Uninstall any existing MySQL versions and restart the computer.	"About uninstalling MySQL" on page 131
2	Install MySQL Server 5.1.	"Installing MySQL Server 5.1" on page 124
3	Install MySQL ODBC and import the database.	"Installing and setting up a MySQL ODBC" on page 127
4	Connect to the VWorks inventory management database.	"Connecting to the inventory database" on page 69

Installing MySQL Server 5.1

To install MySQL Server 5.1:

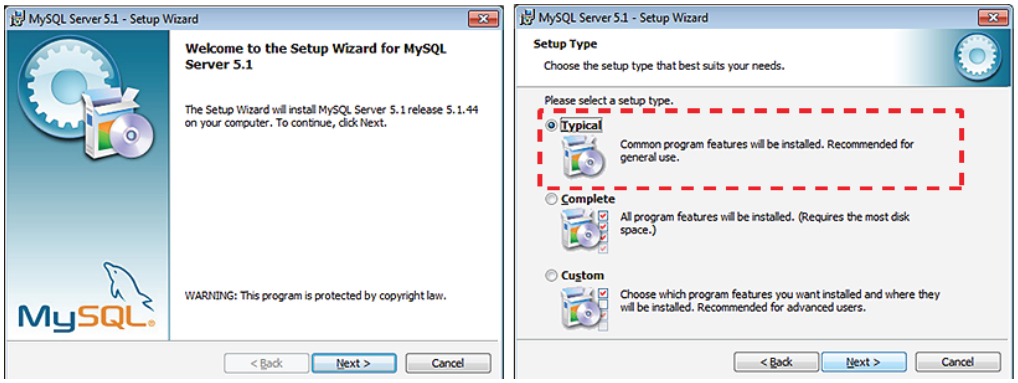
1 Double-click the installation file:

mysql-essential-5.1.44-winx64.msi

2 When the **MySQL Server 5.1 Setup Wizard** opens:

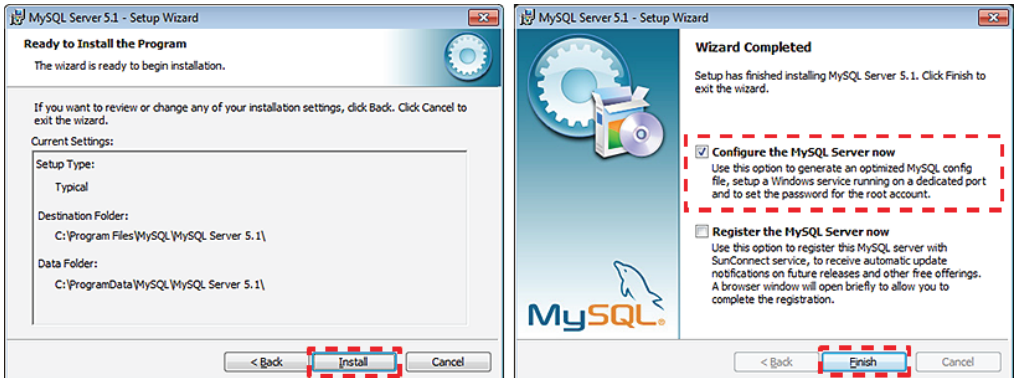
a Click **Next** to start the wizard.

b In the **Setup Type** page, select **Typical** > **Next**.



c Click **Install**.

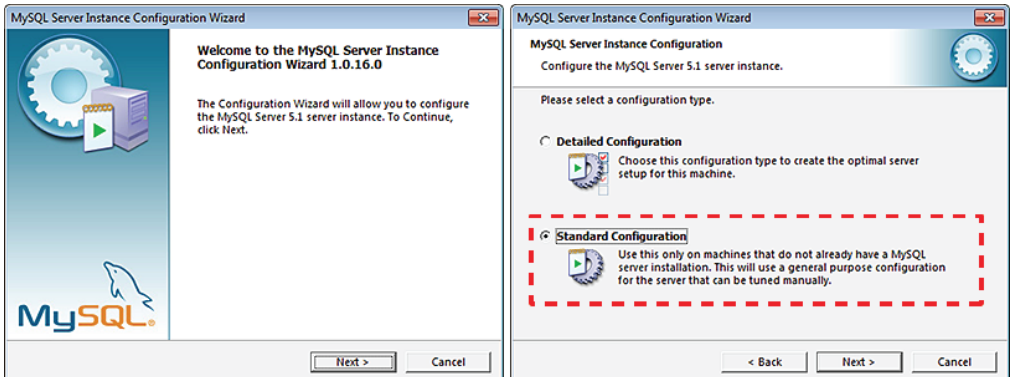
d In the **Wizard Completed** page, select **Configure the MySQL Server now** > **Finish**.



3 When the **MySQL Server Instance Configuration Wizard** opens:

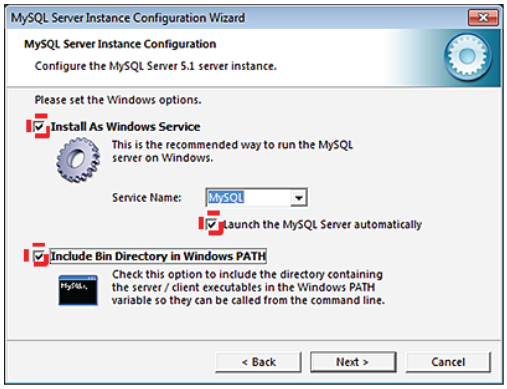
a Click **Next** to start the wizard.

b Select **Standard Configuration** > **Next**.



4 In the **select Windows options** page, select all 3 check boxes, and then click **Next**:

- **Install as Windows Service**
- **Launch MySQL Server automatically**
- **Include Bin Directory in Windows PATH**



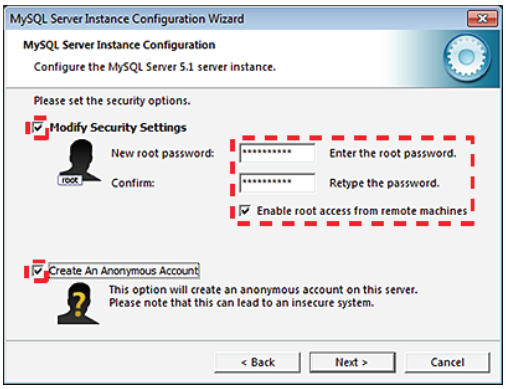
5 In the **security options** page, do the following:

a Select **Modify Security Settings**

b Enter the **New root password** as `velocity11`

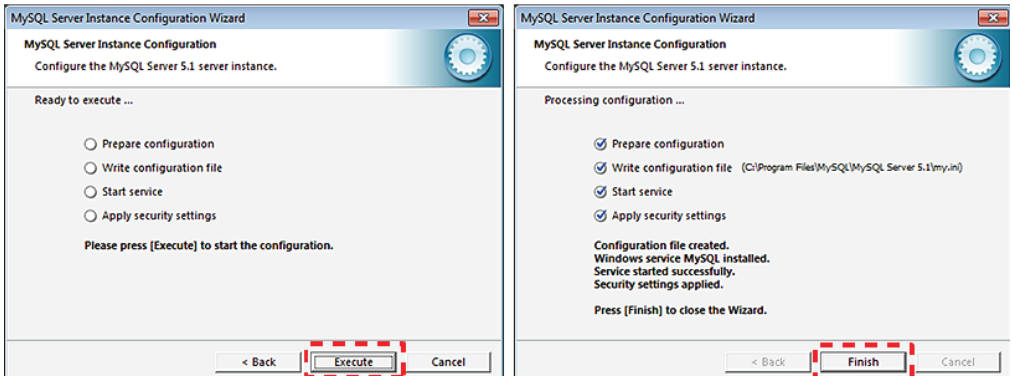
c Select **Enable root access from remote machines**

d Select **Create An Anonymous Account** > **Next**.



6 When the **Ready to execute** page appears, click **Execute**.

7 When the configuration file has been successfully created and the security settings have been applied, click **Finish**.



Installing and setting up a MySQL ODBC

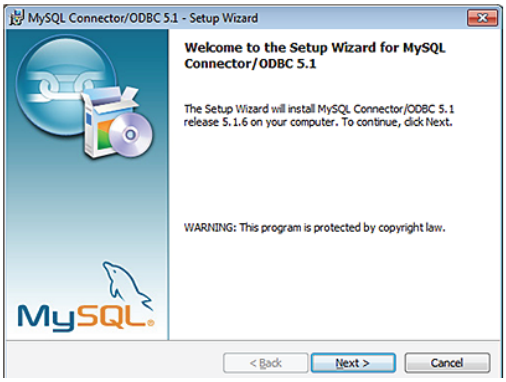
To install and set up a MySQL ODBC connection:

1 Double-click the installation file:
mysql-connector-odbc-5.1.6-winx64.msi

2 When the **MySQL Connector/ODBC 5.1 Setup Wizard** opens:

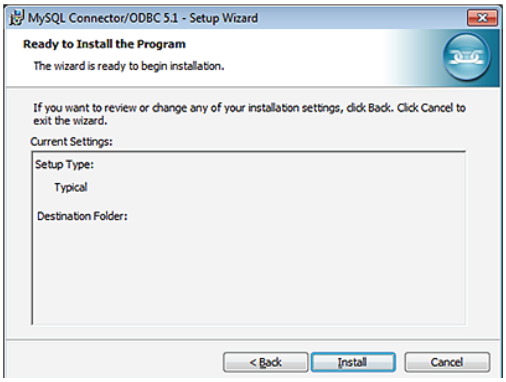
a Click **Next** to start the wizard.

b In the **Setup Type** page, select **Typical** > **Next**.

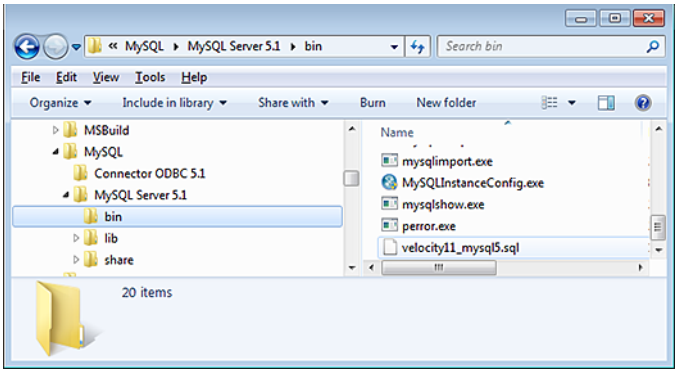


c Click **Install** to start the installation.

d In the **Wizard Completed** page, click **Finish**.



3 Copy the velocity11_mysql5.sql file into the following folder:
C:\Program Files\MySQL\MySQL Server 5.1\bin\

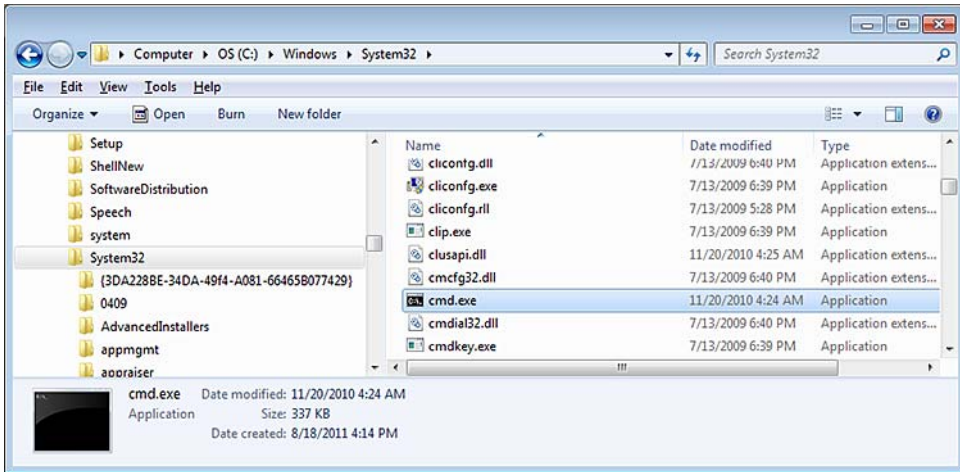


4 From the Windows desktop, open a command window as follows:

a In Windows Explorer, navigate to C:\Windows\System32.

b Right-click **cmd.exe** and select **Run as administrator**.

c In the **User Account Control** dialog box, click **Yes**.



5 Execute the following lines in the command window to copy the provided velocity11 database file into the MySQL Server program:

`cd c:\` <press ENTER>

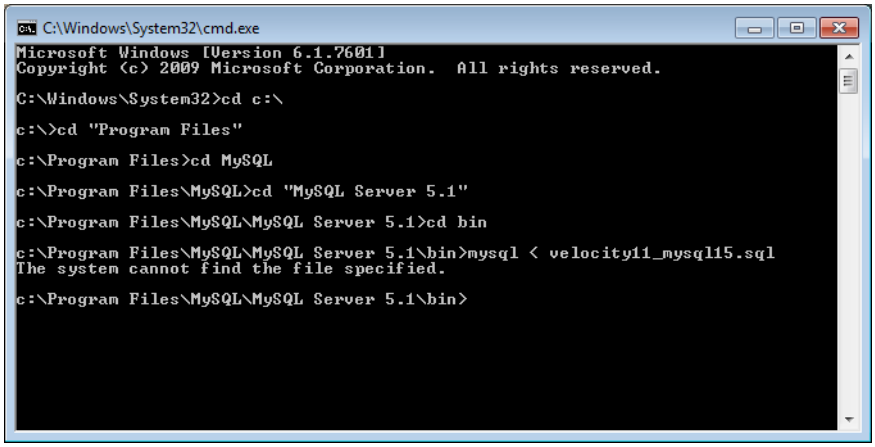
`cd Program` <press TAB>

`cd MySQL` <press ENTER>

`cd MySQL` <press TAB>

`cd bin` <press ENTER>

`mysql < velocity11_mysql5.sql` <press ENTER>



Close the command window.

6 Open the ODBC Data Source Administrator to create an ODBC connection, as follows:

a In Windows Explorer, navigate to `C:\Windows\SysWOW64`.

b Right-click **odbcad32.exe**, and select **Run as administrator**.

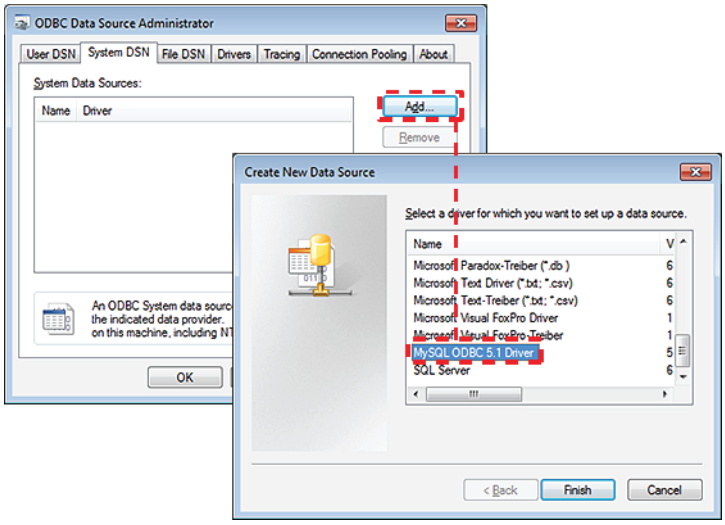
7 In the **ODBC Data Source Administrator** dialog box:

a Remove any previously defined MySQL ODBC Driver Sources as follows:

- Click the **User DSN** tab, select any predefined MySQL ODBC Driver Sources named velocity11, and click **Remove**.
- Click the **System DSN** tab, select any predefined MySQL ODBC Driver Sources named velocity11, and click **Remove**.

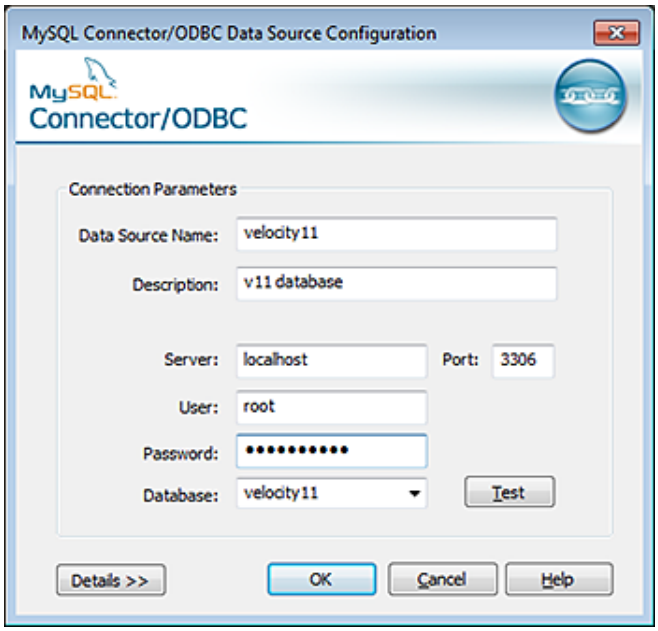
b In the **System DSN** tab, click **Add** to create a new data source.

c In the **Create New Data Source** dialog box, select **MySQL ODBC 5.1 Driver**, and then click **Finish**.



8 In the **MySQL Connector/ODBC Data Source Configuration** dialog box that opens, define your data source as follows:

Note: Use the default port number displayed in the Port box.

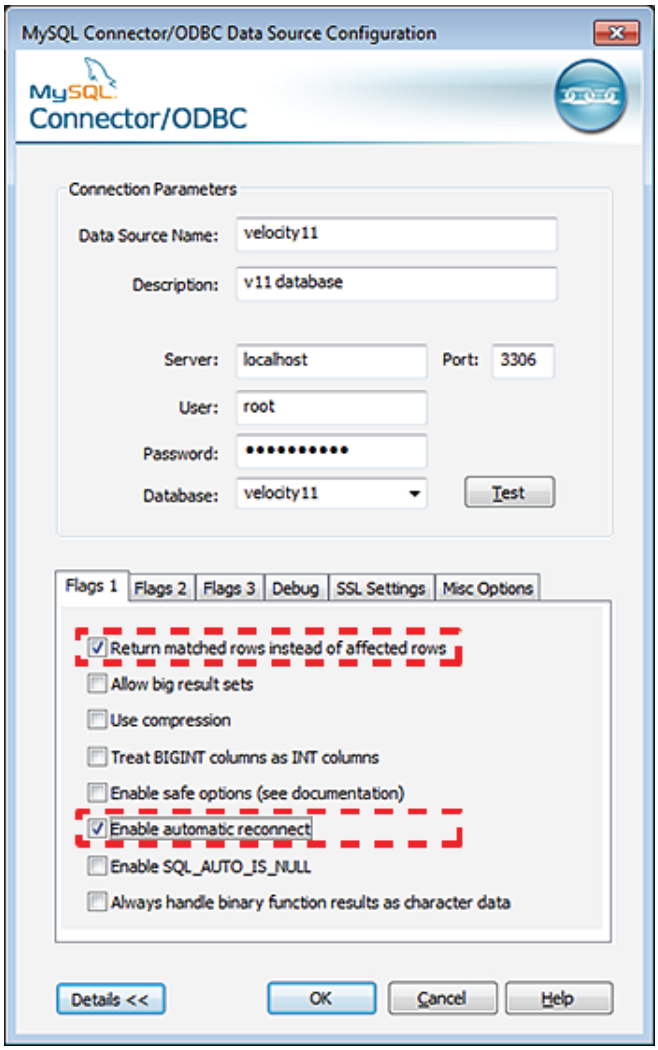


Connection Parameters	Settings
Data Source Name	`velocity11`

Connection Parameters	Settings
Description	`v11 database` (optional)
Server	`localhost`
User	`root`
Password	`velocity11`
Database	`velocity11`

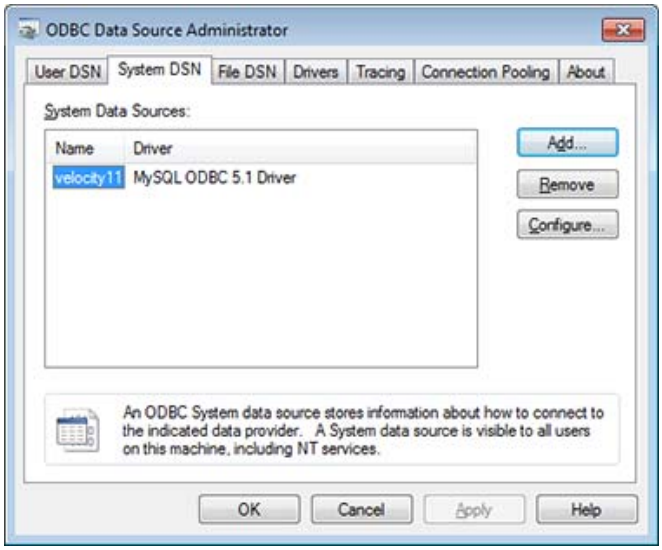
9 Click **Details** to expand the dialog box. In the **Flags 1** tab, select the following:

- **Return Matching Rows**
- **Enable Auto Reconnect**



10 To verify that the data source file is properly configured, click **Test**. A message appears telling you that the connection was successful. Click **OK** to return to the ODBC Data Source Administrator dialog box.

11 In the **System DSN** tab, verify that **velocity11** appears in the **System Data Source** box, and then click **OK**.



Related information

For information about...	See...
VWorks labware inventory management feature	"About labware inventory management" on page 66
How to connect to the VWorks inventory management database	"Connecting to the inventory database" on page 69

About uninstalling MySQL

About this topic

This topic provides the workflow for uninstalling MySQL.

CAUTION Incorrectly modifying the registry can result in serious software problems. Contact Agilent Automation Solutions Technical Support for assistance with the following workflow.

Workflow

The workflow to uninstall previous MySQL installations is as follows.

1 If applicable, export the existing MySQL velocity11 database to an SQL file and move the file to a backup storage location. For instructions, see "Exporting and importing the inventory data" on page 114.

2 Use the Windows Add/Remove programs feature to uninstall MySQL Server and MySQL Connector/ODBC.

3 Restart the computer.

4 Verify that MySQL service is completely removed from the computer's list of services. To display the services, go to MyComputer > Manage Computer > Services and Applications > Services

   If MySQL appears in the list, do the following:

   a Right-click **MySQL**, and select **Stop**. An unable-to-stop error message may appear.

   b Open a Command Prompt window:

   - In the **C:\Windows\System32**. folder, right-click **cmd.exe,** and then select **Run as administrator**.
   - In the **User Account Control** dialog box, click **Yes**.

   c Execute the following lines in the Command Prompt window:

   ```
   sc delete MySQL <ENTER>
   ```

5 Check the Microsoft Windows registry keys for any references to old versions of MySQL.

   In the Registry Editor, navigate to HKEY_LOCAL_MACHINE\SOFTWARE\WOW6432Node\MySQL AB\

   If present, delete MySQL Server 5.1 or MySQL Server 5.0.

6 Restart the computer.

Related information

For information about...	See...
Installing MySQL 5.7 for Microsoft Windows 10 operating system	"Setting up a Windows 10 MySQL database" on page 1
Installing MySQL 5.1 for Microsoft Windows 7 operating system	"Installing and setting up MySQL 5.1" on page 124

B

Setting up a Windows 10 MySQL database

The VWorks labware inventory management feature requires a MySQL database. This section describes how to install and configure a MySQL 5.7 database if you are running the VWorks software on the Microsoft Windows 10 64-bit operating system.

Note: The database may be configured already if the computer was provided by Agilent Technologies and your system contains a device that requires a database, such as a Labware MiniHub.

If you are running the VWorks software on the Microsoft Windows 7 operating system, see "Setting up a Windows 7 MySQL database" on page 123.

Before you start

Required installation files

To install MySQL 5.7, ensure you have the following installation files:

- vc2013redist_x86.exe
- mysql-installer-community-5.7.13.0.msi
- velocity11_mysql57.sql

  This file is installed with the VWorks software in C:\Program Files (x86)\Agilent Technologies\VWorks\Schema\velocity11_mysql57.sql.

For assistance, contact Agilent Technologies Automation Solutions Technical Support.

Required computer settings

Before you install the software:

- Log on to the computer as an administrator with full rights.
- In Microsoft Windows Explorer, configure the following settings:

  Folder options > View settings:

  – Select **Show hidden files, folders, and drives**.

  – Clear the **Hide extensions for known file types** check box.

For detailed instructions, see the Microsoft Windows user documentation.

Installation and setup workflow

Step	For this task...	See...
1	Uninstall any existing MySQL versions, and then restart the computer.	"About uninstalling MySQL" on page 131
2	Install MySQL Server 5.7.	"Installing MySQL 5.7" on page 134
3	Install MySQL ODBC and import the database.	"Installing and setting up a MySQL ODBC" on page 141
4	Connect to the VWorks inventory management database.	"Connecting to the inventory database" on page 69

Installing MySQL 5.7

To install Microsoft Visual C++ 2013 redistributable package:

1 Double-click the vc2013redist_x86.exe file.

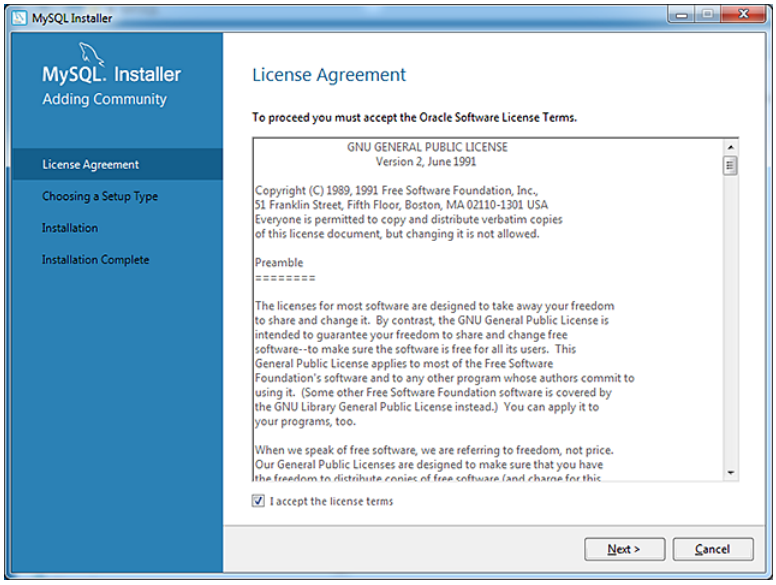
2 Follow the Setup Wizard instructions.

To install MySQL 5.7:

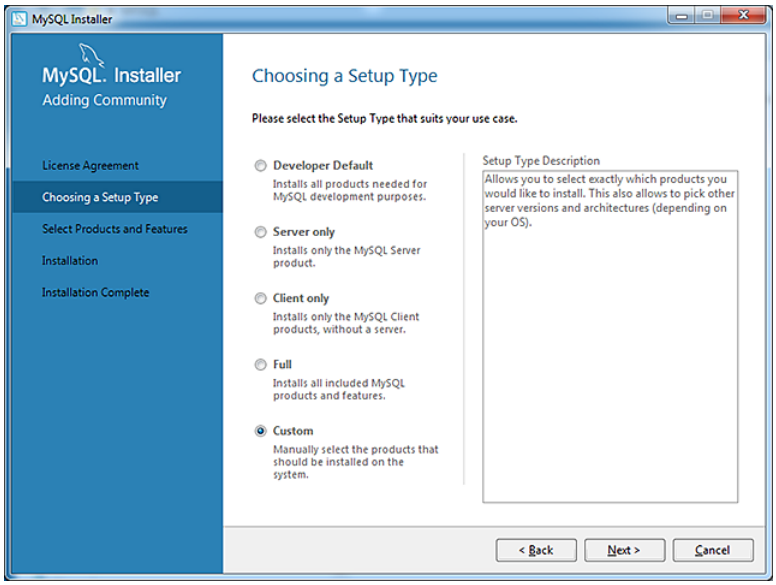
1 Double-click the installation file:

mysql-installer-community-5.7.13.0.msi

2 When the **MySQL Installer** setup wizard opens, accept the license terms and click **Next**.



3 In the **Choose a Setup Type** page, select **Custom**, and then click **Next**.

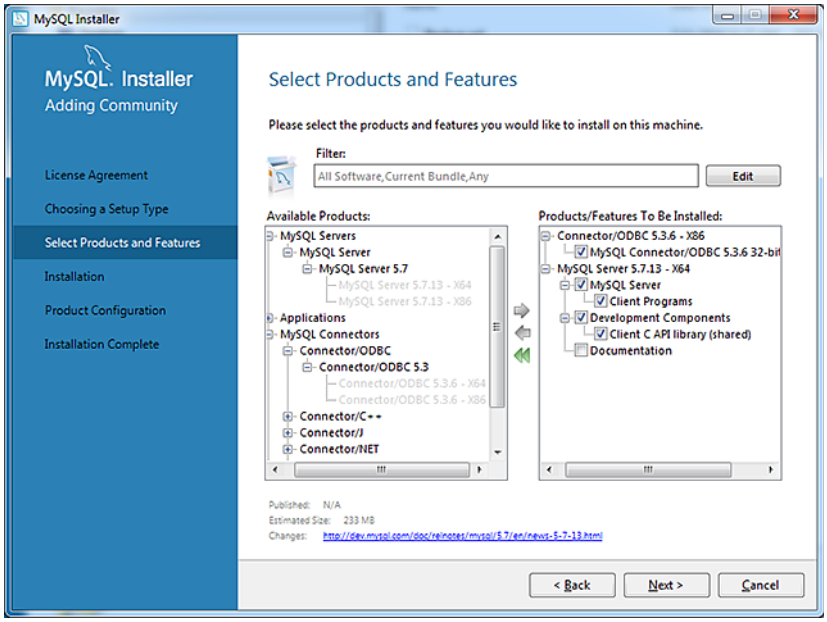


4 In the **Select Products and Features** page:

a Under **Available Products**, select the **MySQL Server 5.7.13 - X64** and **Connector/ODBC 5.3.6 - X86** products.

b Click the right arrow to move the selections to the Products/Features To Be Installed area, as the following figure shows.

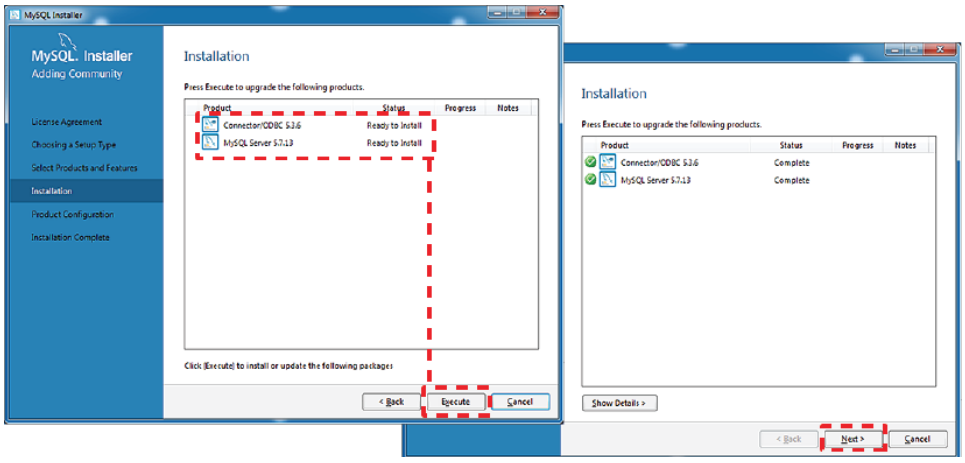
c Click **Next**.



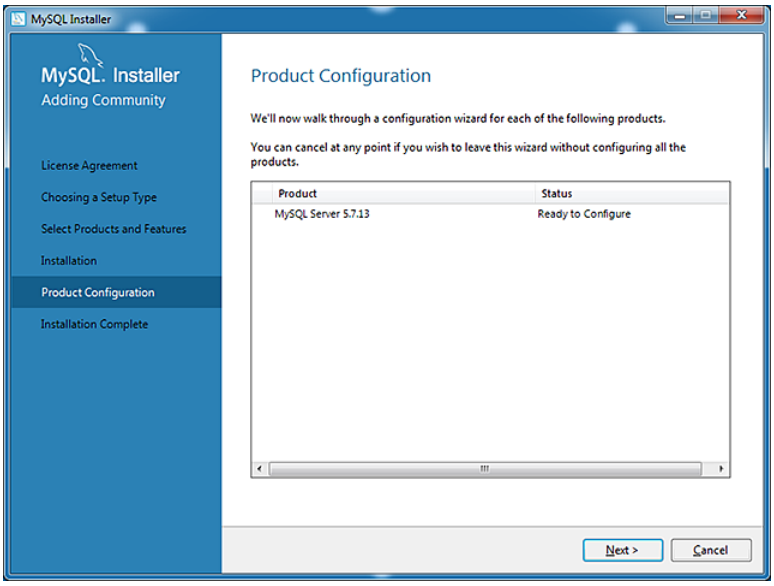
5 In the **Installation page:**

a Ensure that ODBC 5.3.6 and MySQL Server 5.7.13 are ready to install, and then click **Execute**.

b When the installation is finished, click **Next**.



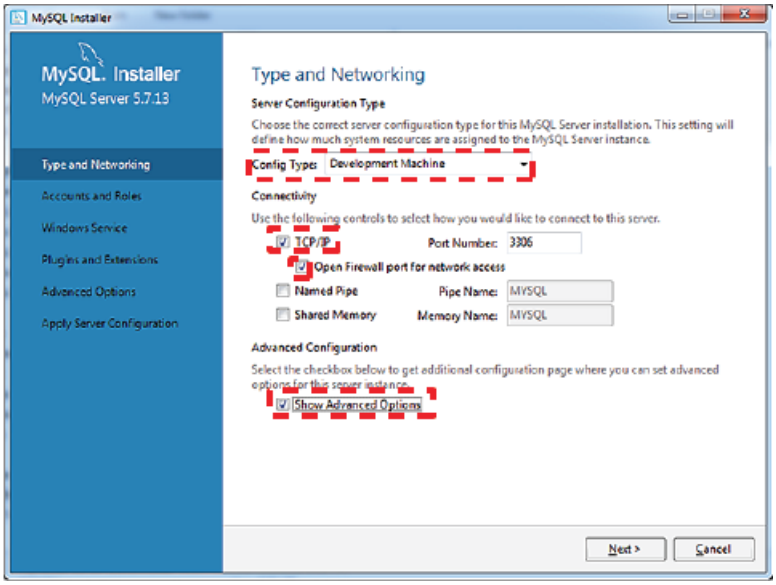
6 In the **Product Configuration** page, click **Next.**



7 In the **Type and Networking** page, specify the following:

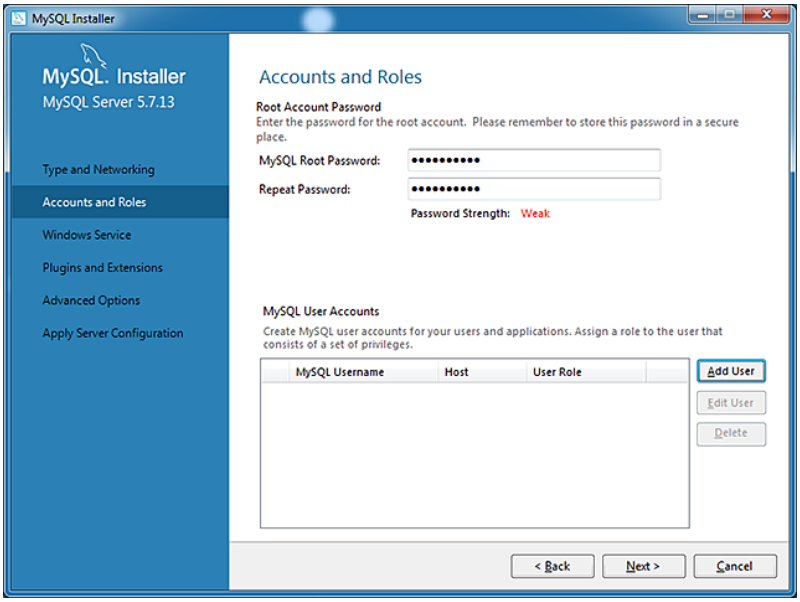
- In the **Config Type** list, select **Development Machine**.
- Select the **TCIP/IP** and **Open Firewall port for network access** check boxes.
- Select the **Show Advanced Options** check box.

Click **Next**.



8 In the **Accounts and Roles** page, type `velocity11` for **MySQL Root Password** and **Repeat Password** fields.

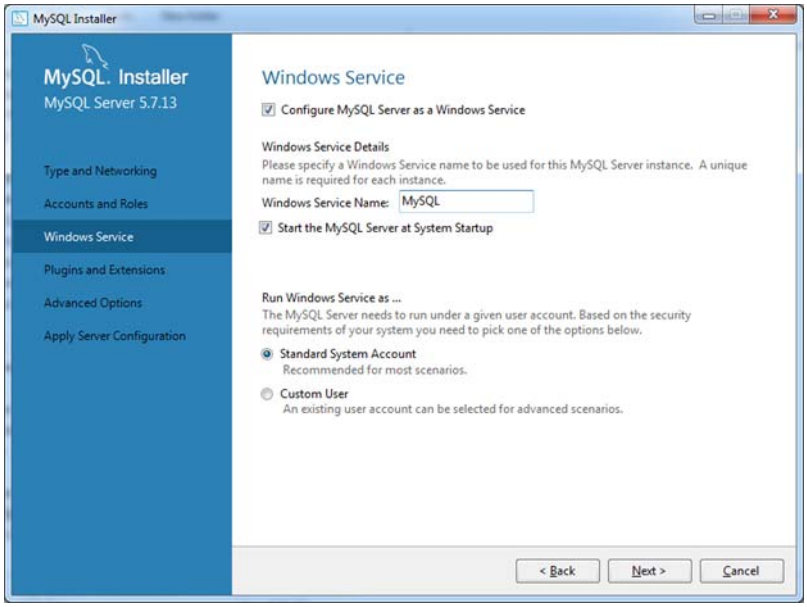
Click **Next**.



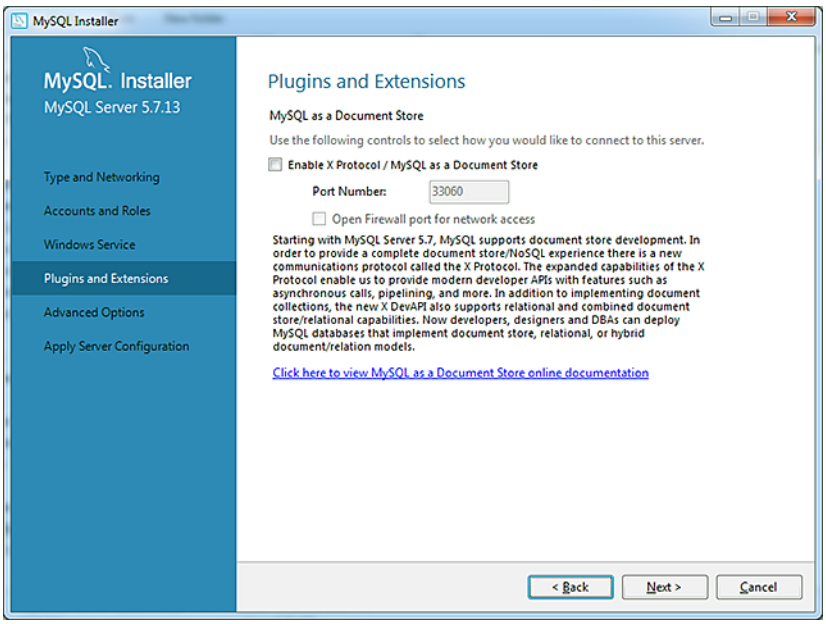
9 In the **Windows Service** page, do the following:

- Select the **Configure MySQL Service as a Windows Service** check box.
- In the **Windows Service Name** box, type `MySQL`.
- Select the **Start the MySQL Server at Startup** check box.
- Select the **Standard System Account** option.

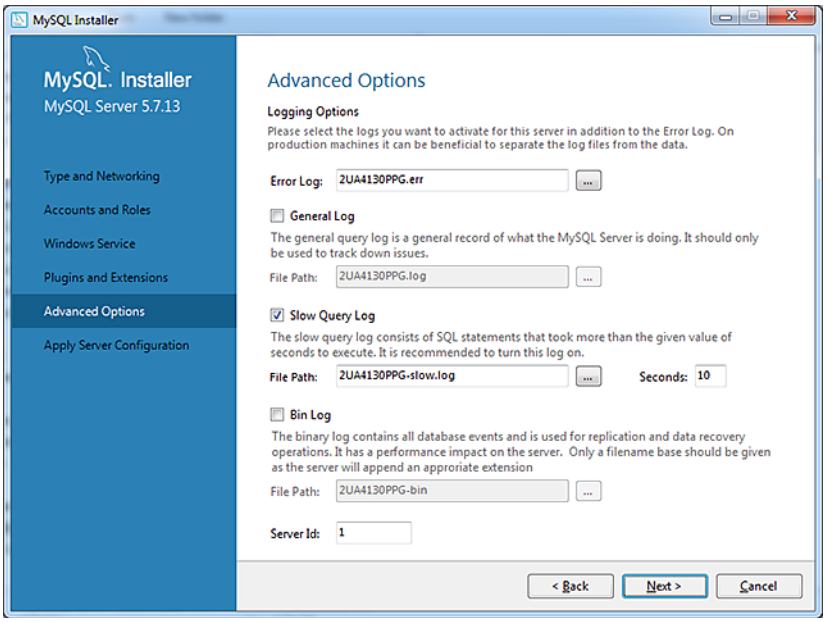
Click **Next**.



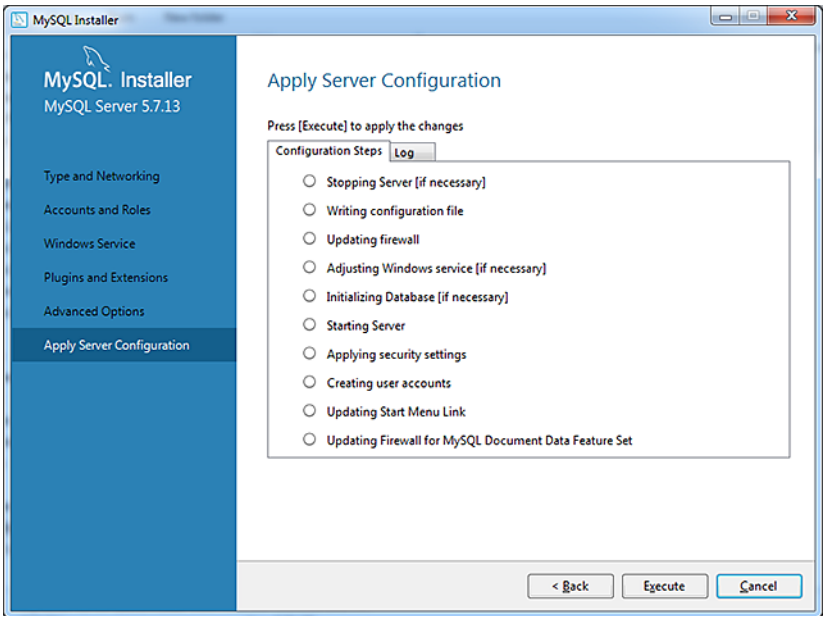
10 In the **Plugins and Extensions** page, keep the default settings. Click **Next**.



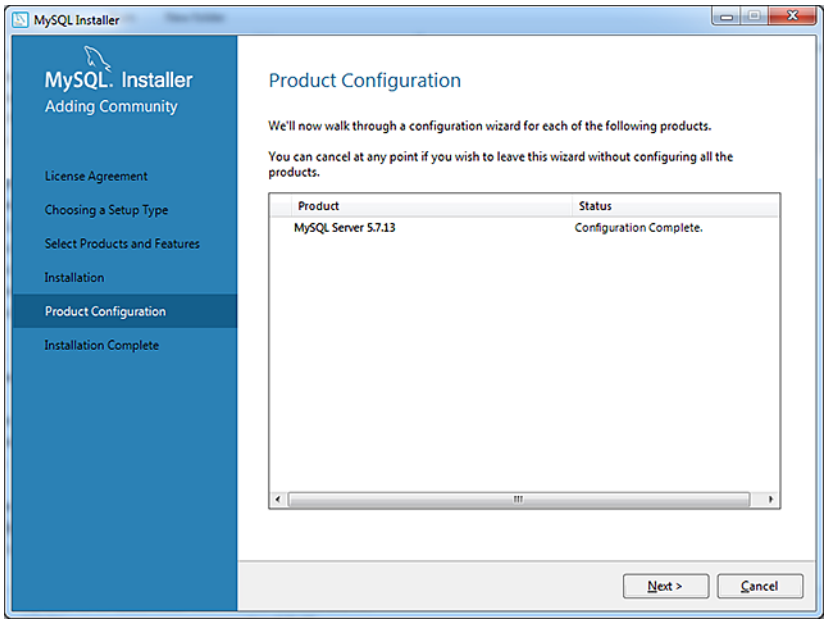
11 In the **Advanced Options** page, keep the default settings. Click **Next**.



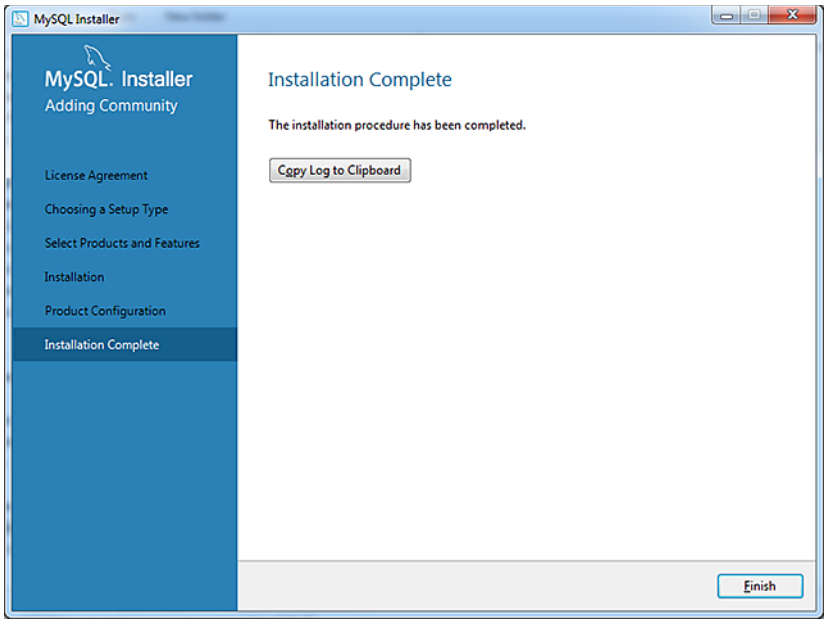
12 In the **Apply Server Configuration** page, click **Execute** to apply the configuration settings.



13 Click **Next** to finish the configuration.



14 Click **Finish** to close the installer.



Installing and setting up a MySQL ODBC

During the MySQL ODBC connection setup you will:

- Import the VWorks inventory (velocity11) database into MySQL. This sets up the database table structures for use by the VWorks Inventory Editor.
- Create, define, and configure a new ODBC data source so that MySQL can access data in the VWorks inventory (velocity11) database.

To import the database structure:

1 Copy the velocity11_mysql57.sql file into the following folder:

C:\Program Files\MySQL\MySQL Server 5.7\bin\

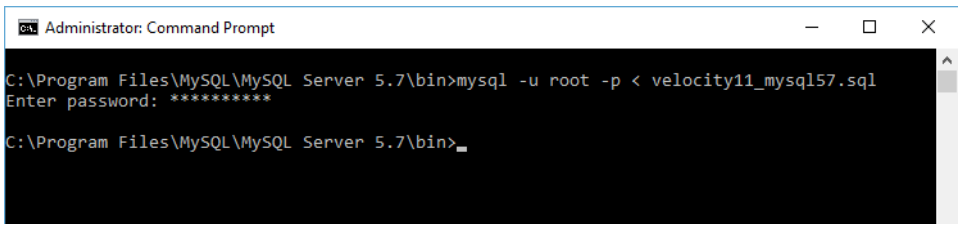
2 Open the Command Prompt window, as follows:

a In the **C:\Windows\System32** folder, right-click **cmd.exe,** and then select **Run as administrator**.

b In the **User Account Control** dialog box, click **Yes**.

3 Execute the following lines in the **Command Prompt** window:

```
cd c:\program files\mysql\mysql server 5.7\bin <ENTER>
mysql -u root -p < velocity11_mysql57.sql <ENTER>
```



When prompted for a password, enter `velocity11`.

To create an ODBC connection:

1 Open the ODBC Data Source Administrator to create an ODBC connection, as follows:

   a Navigate to `C:\Windows\SysWOW64`.

   b Right-click **odbcad32.exe**, and select **Run as administrator**.

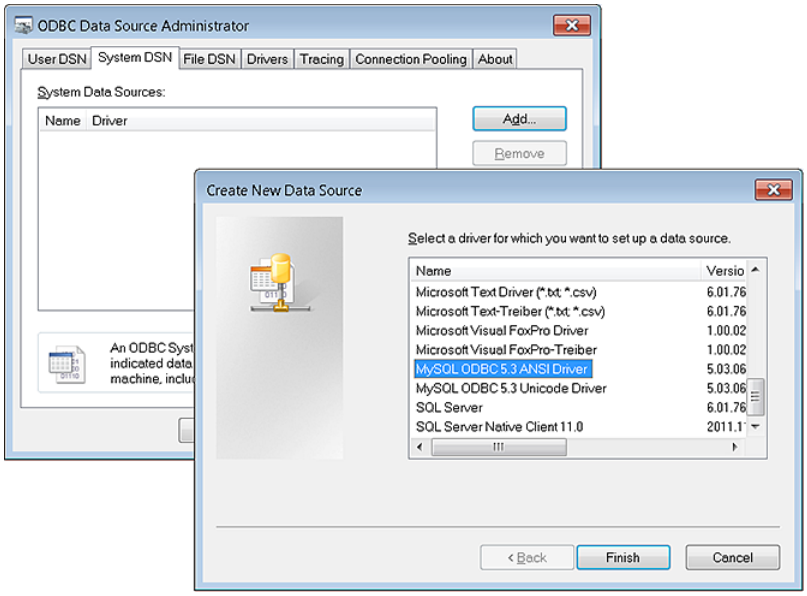
2 In the **ODBC Data Source Administrator** dialog box:

   a Remove any previously defined MySQL ODBC Driver Sources as follows:

   - Click the **User DSN** tab, select any predefined MySQL ODBC Driver Sources named velocity11, and click **Remove**.
   - Click the **System DSN** tab, select any predefined MySQL ODBC Driver Sources named velocity11, and click **Remove**.

   b In the **System DSN** tab, click **Add** to create a new data source.

   c In the **Create New Data Source** dialog box, select **MySQL ODBC 5.3 ANSI Driver**, and then click **Finish**.



3 In the **MySQL Connector/ODBC Data Source Configuration** dialog box that opens, define your data source as follows:

Note: You do not have to provide a port number. Use the default number displayed.

   a Specify the following parameter settings.

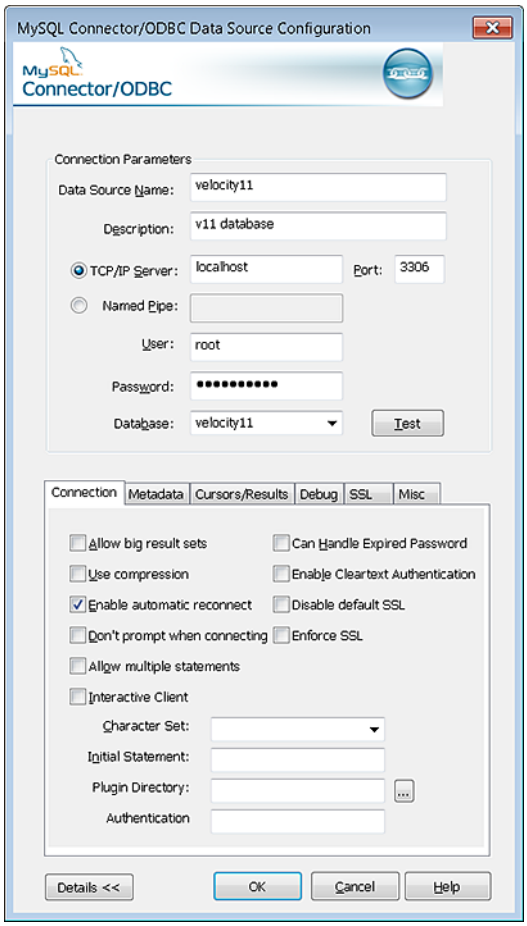
Connection Parameters	Settings
Data Source Name	`velocity11`
Description	`v11 database` (optional)
Server	`localhost`
User	`root`
Password	`velocity11`
Database	`velocity11`

b Click **Details** to expand the dialog box.

c In the **Connection** tab, select the **Enable automatic reconnect** check box.

d In the **Cursors/Results** tab, select the **Return matched rows instead of affected rows** check box.

4 Click **Test**. A **Success, Connection was made** message appears. Click **OK**.



Related information

For information about...	See...
VWorks labware inventory management feature	"About labware inventory management" on page 66
How to connect to the VWorks inventory management database	"Connecting to the inventory database" on page 69

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User Guide

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