Vertical Pipetting Station

User Guide

Original Instructions

Agilent Technologies

Notices

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A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

Contents

Preface

This guide describes how to use the Vertical Pipetting Station. This preface contains the following topics:

About this guide

Who should read this guide

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

Job role	Responsibilities
Installer	Unpacks, installs, and tests the Vertical Pipetting Station before it is used.
Integrator	Configures hardware and writes software.
Lab manager, administrator, or technician	• Manages the automation system that contains the Vertical Pipetting Station • Develops the applications that are run on the system • Develops training materials and standard operating procedures for operators
Operator	Performs the daily production work on the Vertical Pipetting Station and solves routine problems.

What this guide covers

This guide covers the description, installation, setup, and operation of the Vertical Pipetting Station.

This guide does not provide instructions for the VWorks automation control software or third-party software. For more information about these topics, see the relevant user guides for these products.

Software version

This guide documents Vertical Pipetting Station Diagnostics version 2.0.135 or later.

What is new in this revision

Feature and description	See
Tip box stripper pin procedure. Updated the procedure for retracting the tip box stripper pins.	"Retracting and releasing stripper pins" on page 80

Related guides

Use this guide in conjunction with the following:

- *VWorks Automation Control Setup Guide*. In addition to installation instructions, this guide explains how to define labware and labware classes, liquid classes, and pipetting techniques.
- *VWorks Automation Control User Guide*. Explains how to create protocols, and set task parameters for each device in the system

If the Vertical Pipetting Station is a device in a third-party system, see the relevant third-party system guides.

Related information

For more information about...	See...
Reporting problems	"Reporting problems" on page 93
Other Automation Solutions user guides	"Accessing Automation Solutions user guides" on page ix
Vertical Pipetting Station safety	"Safety guidelines" on page 1

Accessing Automation Solutions user guides

About this topic

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

Where to find user information

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

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

Accessing safety information

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

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

Using the knowledge base

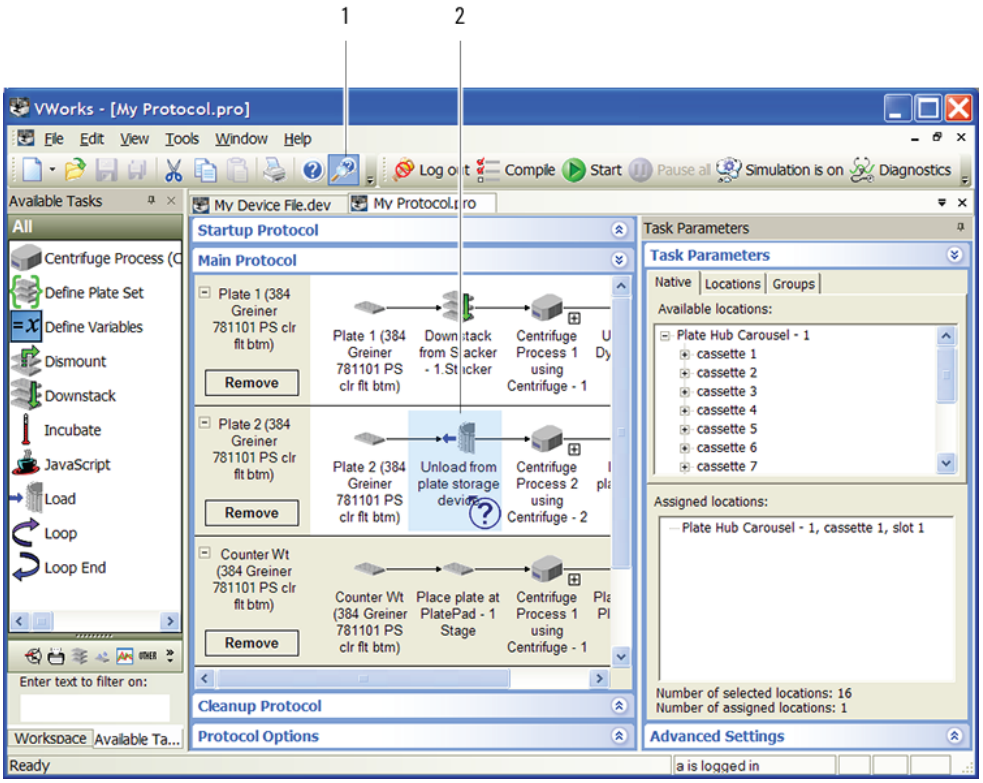
Knowledge base topics are displayed using web browser software such as Microsoft Internet Explorer and Mozilla Firefox.

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

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

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

Opening the help topic for an area in the VWorks window



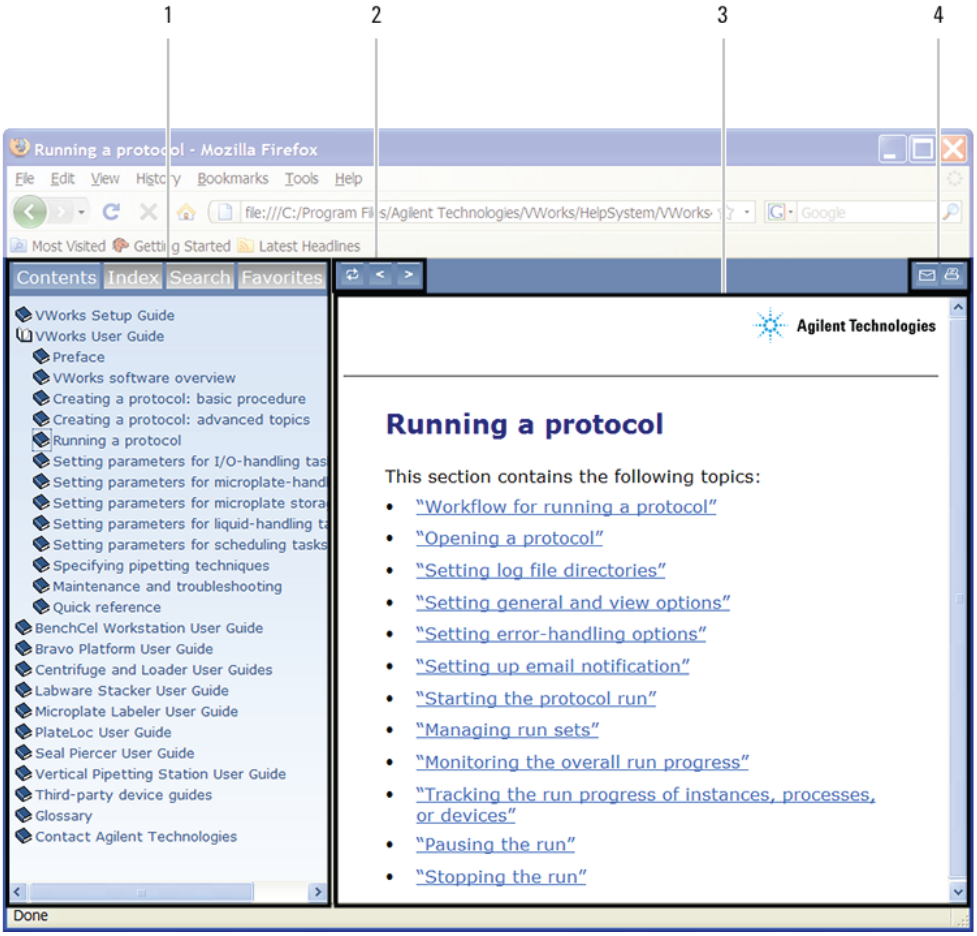
To access the context-sensitive help feature:

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.

Related information

For more information about...	See...
Who should read this guide and what this guide covers	“About this guide” on page viii
Reporting problems	“Reporting problems” on page 93
Vertical Pipetting Station safety	“Safety guidelines” on page 1

1 Safety guidelines

Before installing and using the Vertical Pipetting Station, you must be familiar with the potential safety hazards and how to avoid them.

This chapter contains the following topics:

General safety information

Before installing and using the Vertical Pipetting Station

Before installing and using the Vertical Pipetting Station, make sure you are aware of the potential hazards and understand how to avoid being exposed to them. You must be properly trained in the correct and safe installation and operation of the device.

Intended product use

WARNING **Do not remove the Vertical Pipetting Station exterior covers or otherwise disassemble the system or device. Doing so can expose you to hazards that could cause serious injury and damage the Vertical Pipetting Station.**

WARNING **Using controls, making adjustments, or performing procedures other than those specified in the user guide can expose you to moving parts, hazardous voltage, high-pressure gases, and laser radiation. Exposure to these hazards can cause severe injury.**

Agilent Technologies products must only be used in the manner described in the Agilent Technologies product user guides. Any other use may result in damage to the product or personal injury. Agilent Technologies is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent Technologies product user guides, or use of the products in violation of applicable laws, rules or regulations. Except as otherwise expressly provided in Agilent Technologies product user guides, any alteration, adjustment or modification to the products will void the product warranty and may invalidate the safety compliance certification.

The Vertical Pipetting Station is not intended or approved for diagnosis of disease in humans or animals. You assume full responsibility for obtaining any regulatory approvals required for such use and assume all liability in connection therewith.

CAUTION Improper use of the Vertical Pipetting Station Diagnostics by an untrained user could damage the Vertical Pipetting Station. For example, the pipette head could collide with a shelf if a teachpoint is not defined properly.

Ensure that only fully trained Vertical Pipetting Station administrators have access to the user account passwords.

Safety labels

Warnings in the user documentation or on the device must be observed during all phases of operation, service, and repair of this device. Failure to comply with these precautions violates safety standards of design and the intended use of the product. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

The following table lists the common symbols you might find on the system or device. The symbol on the label indicates the risk of danger. A description of the warning and information that will help you avoid the safety hazard are provided in this guide.

Symbol	Description
	Indicates that you must read the accompanying instructions (for example, the safety guide) for more information before proceeding.
	Indicates hazardous voltages.
  	Indicates pinch, crush, or cut hazard.
	Indicates laser hazard.
	Indicates hot surface hazard.
	Indicates protective conductor terminal, which is bonded to conductive parts of an equipment for protection against electric shock in case of a fault and is intended to be connected to an external protective earthing system.
	Indicates frame or chassis terminal, which is bonded to conductive parts of an equipment for safety purposes.
	Indicates that you must not discard this electrical/ electronic product in domestic household waste.

Related topics

For more information about...	See...
Safety hazards	“Potential safety hazards” on page 6

For more information about...	See...
Stopping the Vertical Pipetting Station in an emergency	"Stopping in an emergency" on page 4
Reporting problems with the Vertical Pipetting Station	"Reporting problems" on page 93

Stopping in an emergency

About this topic

This topic describes how to stop the pipette head in an emergency. The procedure can vary for an integrated device in a lab automation system. For details, see the user guide for your lab automation system, such as the *BioCel System User Guide*.

WARNING **The Vertical Pipetting Station should be fitted with a robot-disable pendant positioned at the front of the device for easy access. You can acquire a robot-disable pendant from Agilent Technologies. The pendant connects to the robot-disable circuit loop on the rear panel of the Vertical Pipetting Station.**

When to use the emergency stop feature

When you perform an emergency stop, the internal logic of the Vertical Pipetting Station is preserved, which makes it possible to resume a protocol. However, if you turn off the power switch, the internal logic is lost until you reinitialize the Vertical Pipetting Station.

CAUTION Do not turn off the power switch on the rear panel of the Vertical Pipetting Station to stop a run. When you turn on the power again, the protocol cannot resume, and the shelf movement could result in a pipette head crash.

IMPORTANT Do not use the emergency stop procedure for a normal stop or to pause and continue a run. The pipetting accuracy of the running protocol might be impaired. For a normal stop or to pause a run, use the Stop button or Pause button in the VWorks software.

Performing an emergency stop

CAUTION The robot-disable circuit does not turn off the air pressure. Therefore, the shelves can continue to move.

The robot-disable pendant stops the pipette head motion as follows:

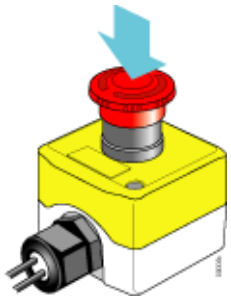
- Turns off power to all the motors
- Activates the *z*-axis brake to prevent the pipette head from falling

The air pressure remains on. Therefore, the shelves can continue to move.

To stop the pipette head motion:

1 Press the red button on the robot-disable pendant.

2 To release the button, turn it clockwise.



Recovering from an emergency stop

To re-enable the motors in the pipette head:

1 Ensure the robot-disable button is released. If necessary, turn the button clockwise to release it.

2 In the message dialog that appears on screen, click one of the following buttons:

- **Abort**—Cancels the protocol.
- **Retry**—Attempts to resume the protocol.
- **Ignore and Continue**—Ignores the error condition and attempts to perform the next command.

Related topics

For more information about...	See...
Stopping or pausing a run	• "Using diagnostics software to stop the device" on page 97 • *VWorks Automation Control User Guide*
Recovering from a crash	"Recovering from a head collision" on page 87
Recovering from a power outage	"Recovering from a power outage" on page 85
Connector locations	"Hardware overview" on page 12

Potential safety hazards

About this topic

This topic describes potential hazards that you can encounter when using the Vertical Pipetting Station.

Mechanical hazards

Safety shield

WARNING **Operating the Vertical Pipetting Station without a safety shield or enclosure cover increases the risk of injury.**

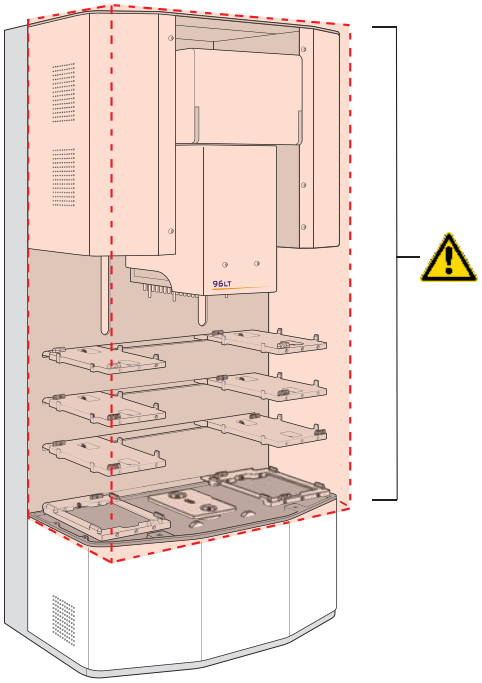
You should enclose the Vertical Pipetting Station in a safety shield or enclosure to restrict access to the Vertical Pipetting Station while it is operating. For example, you can connect a light curtain to the Vertical Pipetting Station robot-disable circuit.

Moving parts

WARNING **When you initialize the Vertical Pipetting Station, the pipette head and shelves can move.**

WARNING **Keep clear of the pipette head while it is in motion. Do not touch any of the moving parts or attempt to move labware while the Vertical Pipetting Station is in operation. The device could pinch, pierce, or bruise you. For example, a pipette tip could pierce your hand.**

Figure Vertical Pipetting Station with shaded areas showing pinch point hazards



The Vertical Pipetting Station has moving parts that can injure you if you deviate from the procedures given in this guide. It is the responsibility of every operator to follow safety precautions and keep away from the Vertical Pipetting Station whenever it is likely to move.

Hazardous-voltage electronics

Hazardous-voltage electronics can be found within the Vertical Pipetting Station. Under normal operating conditions, you are protected from exposure to the hazardous voltage.

WARNING **Do not try to gain access to the interior of the Vertical Pipetting Station. Do not remove panels for any reason. Exposure to the interior electronics of a device can cause severe injury.**

Hazardous-voltage electronics can also be found in the computer. See the computer manufacturer documentation for the hazard warnings. Make sure you follow the instructions on the safe operation of the computer.

WARNING **Ensure that the power cords are in good condition and are not frayed. Use of frayed or damaged power cords can cause injury. Use of incorrect power cords can cause damage to the device.**

High-pressure gas

Compressed air is used to move components inside the Vertical Pipetting Station.

WARNING **Working with open, charged air lines can result in injury. Turn off the compressed air line when disconnecting or reconnecting devices that use compressed air. Contact your facilities department or Automation Solutions Technical Support with questions about setting up the air line.**

Follow the local, state, and federal safety codes for the placement and mounting of gas cylinders. For example, you might have to attach a standard cylinder bracket to a solid permanent structure to meet or exceed all local seismic and safety requirements.

Always use good laboratory practices when handling high-pressure cylinders. Make sure you follow any instructions provided with the cylinders.

Chemical hazards

General guidelines

Some chemicals used when working with the Vertical Pipetting Station can be hazardous. Make sure you:

- Follow standard laboratory procedures and cautions when working with chemicals.
- Follow your local, state, and federal safety regulations when using and disposing of the chemicals.

Compatible chemicals

The Vertical Pipetting Station surfaces are designed to be compatible with small volumes of aqueous solutions, common biological buffers, solvents, and common reducing agents.

The following chemicals were tested for brief exposures outside the liquid-handling channels:

- Water (deionized, ultrapure type 1)
- Dimethyl sulfoxide (100%)
- Strong acid, such as hydrochloric acid (100 mM HCl) pH 2-3
- Strong base (HPO_4 or sodium hydroxide, 100 mM) pH 12-13
- Ethanol (95% alcohol)
- Methanol (95% alcohol)
- Acetonitrile (100%)
- Chloroform (100%)
- Hydrogen peroxide (35%)
- Tetrahydrofuran
- Dichlormethan
- Toluene
- Acetone

Agilent Technologies recommends that you employ an Environmental Health and Safety professional on site to confirm the compatibility of other chemicals.

Moving the Vertical Pipetting Station

Before moving a Vertical Pipetting Station, see “Laboratory requirements” on page 25 for information on selecting the new location.

WARNING **The Vertical Pipetting Station weighs 37.195 kg (82 lb). Do not attempt to move the Vertical Pipetting Station without assistance. Use proper lifting techniques when lifting the Vertical Pipetting Station.**

CAUTION Agilent Technologies is not responsible for damage if the Vertical Pipetting Station is incorrectly packaged and moved by someone other than an Agilent Technologies employee.

Related topics

For more information about...	See...
General safety	“General safety information” on page 2
Stopping the Vertical Pipetting Station in an emergency	“Stopping in an emergency” on page 4
Reporting problems with the Vertical Pipetting Station	“Reporting problems” on page 93

2 Introduction

This chapter contains the following topics:

Vertical Pipetting Station description

About this topic

This topic describes the Vertical Pipetting Station and explains its uses.

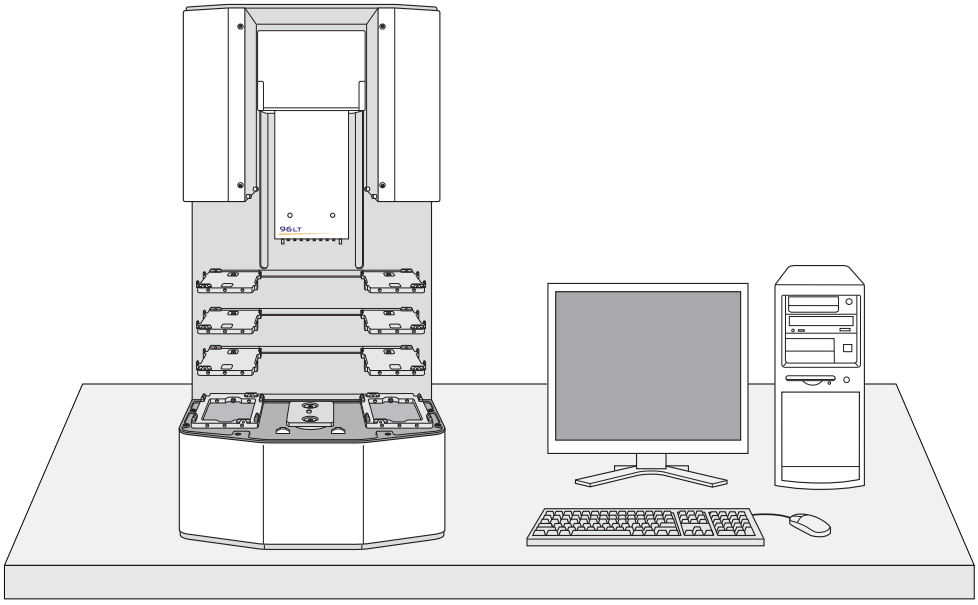
Description

The Vertical Pipetting Station is an automated liquid-handling platform that dispenses liquid accurately and precisely into microplates.

The system consists of the following components:

- Pipetting platform with eight sliding shelves
- Pipette head
- VWorks software
- Computer

A variety of interchangeable fixed-tip and disposable-tip pipette heads are available, including 8-, 16-, 96- and, 384-channel pipette heads. Vertical Pipetting Station accessories are also available, such as plate sensing and alignment shelves and autofilling reservoirs.



System configuration variations

The Vertical Pipetting Station can be used in the following ways:

- As a standalone device controlled by a computer
- Integrated with other devices in a lab automation system

As an integrated device in a lab automation system, the Vertical Pipetting Station can be used to prepare plates for high-throughput screening or other automated processes.

Related topics

For more information about...	See...
Hardware overview	“Hardware overview” on page 12
Accessories	“Vertical Pipetting Station accessories” on page 109
Automation-ready labware	“Labware considerations” on page 18
Software that controls the Vertical Pipetting Station	“Software description” on page 19
Safety information	“Safety guidelines” on page 1
Installation requirements	“Installing Vertical Pipetting Station” on page 23

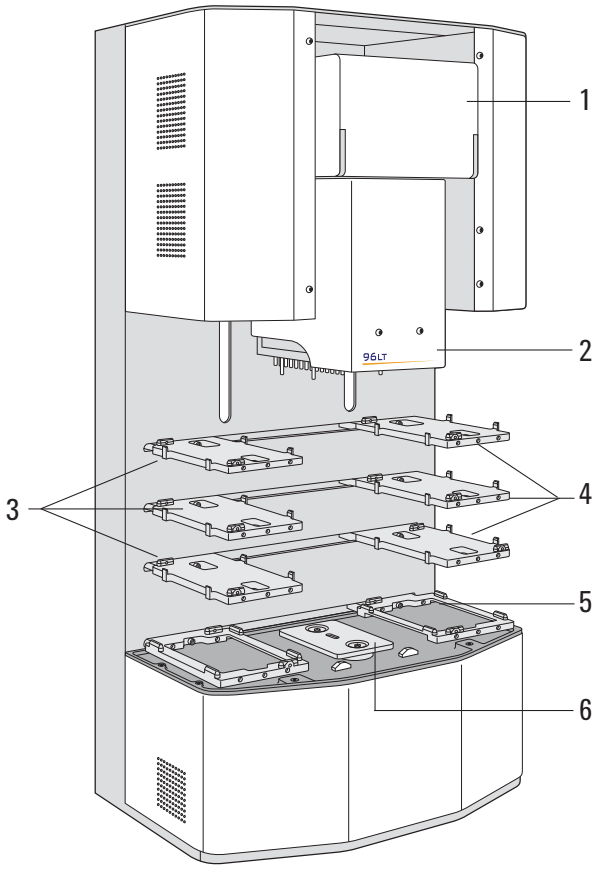
Hardware overview

About this topic

This topic describes the hardware features and axes of motion.

Front view

The Vertical Pipetting Station front view contains the following features.



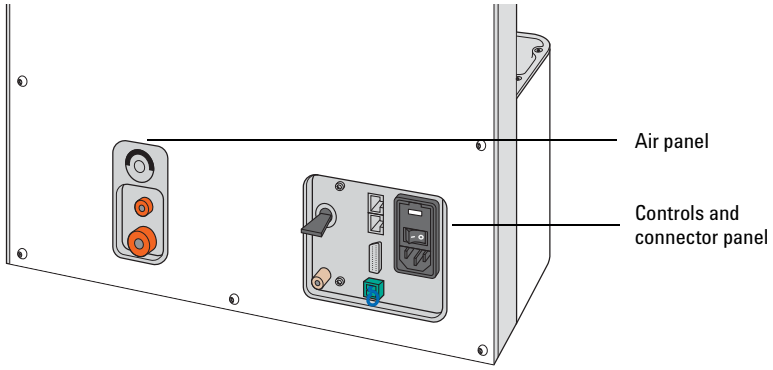
Item	Feature	Description
1	Head mount	Fixture to which the pipette head mounts.
2	Pipette head	Interchangeable fixed-tip or disposable-tip head that aspirates and dispenses fluid.
3	Shelves 1, 3, 5 (left)	Actuated shelves used to hold microplates, reservoirs, wash stations, and other liquid containers.
4	Shelves 2, 4, 6 (right)	Actuated shelves used to hold microplates, reservoirs, wash stations, and other liquid containers.

Item	Feature	Description
5	Shelves 7 (left) and 8 (right)	Actuated shelves that have access to the tipbox press. These shelves have a higher vertical clearance for tall labware or accessories.
6	Tipbox press	Actuated press for mounting tips onto the barrels of a disposable-tip pipette head during tips-on operations.

In a lab automation system, the shelves on one side of the Vertical Pipetting Station are accessible by a robot.

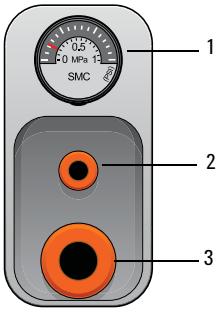
Back view

The back panel of the Vertical Pipetting Station contains an air panel and a controls and connector panel.



Air panel

The Vertical Pipetting Station air panel has the following features.

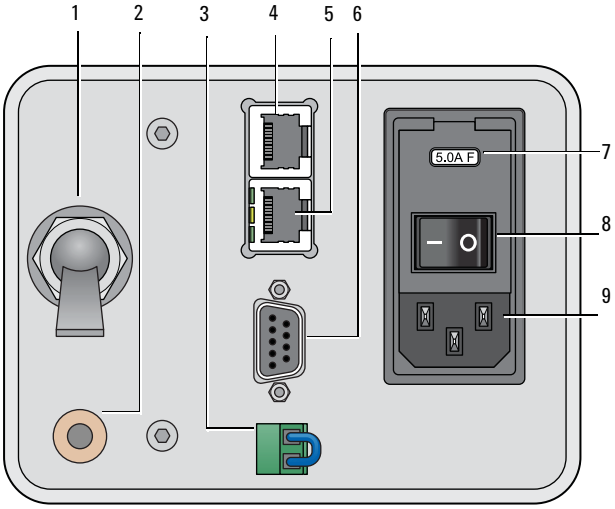


Item	Feature	Description
1	Pressure gauge	Indicates the air pressure.
2	Air input port	Connects to a compressed air source, which is used to actuate the shelves and the tipbox press.
3	Vacuum port	Connects to a vacuum source for use with vacuum shelves.

Controls and connector panel

The Vertical Pipetting Station controls and connector panel contains the following features.

WARNING **The Vertical Pipetting Station should be fitted with a robot-disable pendant positioned at the front of the device for easy access. You can acquire a robot-disable pendant from Agilent Technologies. The pendant connects to the robot-disable circuit loop on the rear panel of the Vertical Pipetting Station.**



Item	Feature	Description
1	Air switch	Turns on (up) or off (down) the air supply.
2	Drainage port	Provides an exit path for waste or overflow liquids.
3	Robot-disable circuit loop	Enables connection of a pendant to the Vertical Pipetting Station robot-disable circuit.
4	Pump I/O port	Connects the serial cable from a Pump Module to the Vertical Pipetting Station to enable communication. This is not an Ethernet port and should only be used to connect Automation Solutions accessories to the Vertical Pipetting Station.
5	Ethernet port	Unsupported.
6	Serial port	Connects the serial cable from the controlling computer to the Vertical Pipetting Station to enable communication.
7	Fuse enclosure	Houses the main fuse. See “Compressed air requirements” on page 26.
8	Power switch	Turns on (–) or off (o) the power.
9	AC power connector	Connects the power cable.

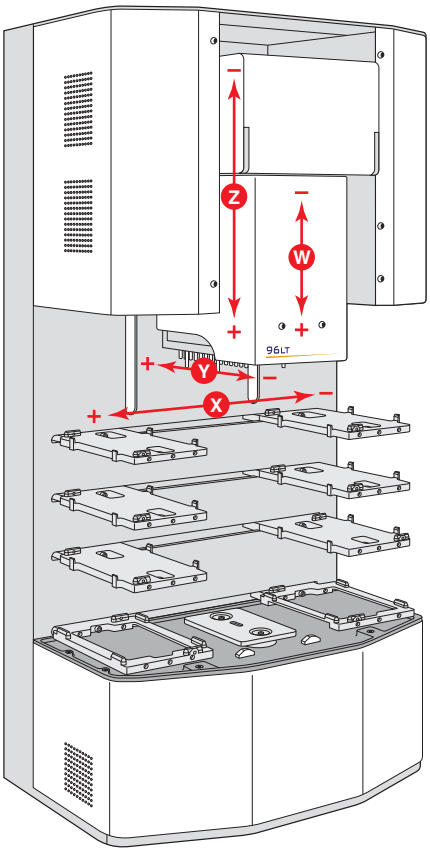
Accessories

Vertical Pipetting Station accessories are optional components that can be added to enhance existing functions and facilitate operation. For details, see "Vertical Pipetting Station accessories" on page 109.

Pipette head axes of motion

The pipette head has the following axes of motion:

- *x-axis*. Horizontal, left and right
- *y-axis*. Horizontal, forward and backward
- *z-axis*. Vertical up and down
- *w-axis*. Vertical displacement of the pipettor inside the pipette head during aspirate and dispense tasks



Each shelf moves horizontally to the center position under the pipette head during pipetting tasks, and then moves back to the outer position.

Related topics

For more information about...	See...
Pipette heads	"Pipette heads" on page 16

For more information about...	See...
Connecting the Vertical Pipetting Station	"Installing Vertical Pipetting Station" on page 23
Accessories	"Vertical Pipetting Station accessories" on page 109
Laboratory requirements	"Laboratory requirements" on page 25

Pipette heads

About this topic

The Vertical Pipetting Station head mount is fitted with a 3-axis positioning stage (*x*-, *y*-, and *z*-axes) that provides access to all quadrants of 96-well, 384-well, and 1536-well microplates. The head mount accepts interchangeable pipette heads with either disposable tips or fixed tips. This topic describes the types of pipette heads.

Disposable-tip pipette heads

Disposable-tip pipette heads enable you to change pipette tips during a run to prevent cross-contamination. The following types of disposable-tip pipette heads are available for use on the Vertical Pipetting Station:

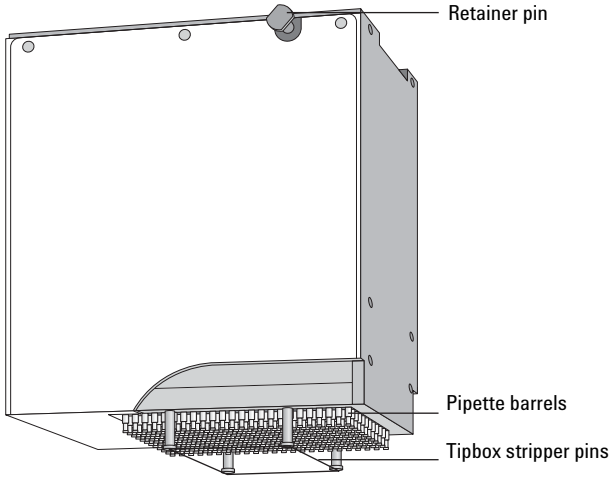
- Series II and Series III 96- and 384-channel pipette heads can dispense fluid into all the wells in a plate simultaneously.

  Note: The Series II and Series III pipette heads are functionally equivalent on the Vertical Pipetting Station.

- 8- and 16-channel serial-dilution pipette heads can dispense fluid into a single column or row in a plate.

  Note: If you have an older model Vertical Pipetting Station, verify that the device can accept a serial-dilution pipette head before attempting to install one.

Figure Series III 384-channel disposable-tip pipette head



The following table lists the available disposable-tip pipette heads.

Head type	Max volume	Dispense into...
8LT	200 µL	96-well, 384-well
16ST	70 µL	96-well, 384-well, 1536-well plates
96LT	200 µL	96-well, 384-well plates
96ST	70 µL	96-well, 384-well, 1536-well plates
384ST	70 µL	384-well, 1536-well plates

The large transfer (LT) pipette heads can dispense up to 200 µL per well and the small transfer (ST) pipette heads can dispense up to 70 µL per well. You can use the 96ST and 384ST pipette heads to dispense fluid into each quadrant of a plate and replace the tips after completing each quadrant.

Fixed-tip pipette heads

The fixed-tip pipette heads have non-disposable dispensing needles and include the following types:

- *96- and 384-channel.* Able to dispense fluid into an entire plate simultaneously.
- *8-channel.* Able to dispense fluid into a single column in a plate.

The following table lists the available fixed-tip pipette heads.

Head type	Max volume	Dispense into...
8F200	200 µL	96-well, 384-well, and 1536-well plates
96F	50 µL	96-well, 384-well, and 1536-well plates
96F	200 µL	96-well, 384-well, and 1536-well plates
384F	50 µL	384-well, 1536-well plates

Controlling the pipette heads

You use the VWorks software to control the pipette head. For example, the software allows you to do the following:

- Move the pipette heads into position
- Calibrate volumes
- Enable tip touching
- Enable dynamic tip extension and retraction

Related topics

For more information about...	See...
Setting up the Vertical Pipetting Station and installing a pipette head	"Setting up Vertical Pipetting Station" on page 41
Exchanging a pipette head	"Changing the pipette head" on page 74
Creating a profile	"Creating Vertical Pipetting Station profiles" on page 52

Labware considerations

About this topic

This topic provides guidelines for selecting automation-ready labware for use with the Vertical Pipetting Station.

Acceptable microplates

Use only labware that meet the American National Standards Institute (ANSI) standards. For the latest labware standards, go to www.sbsonline.org. You can also contact the labware manufacturer to inquire about ANSI-compliant labware.

Height limitations on shelves 1 and 2

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

CAUTION If you are using long tips, the labware height on shelves 1 and 2 must be no taller than 24 mm.

Related topics

For more information about...	See...
Defining labware in the software	*VWorks Automation Control Setup Guide*
Accessories	"Vertical Pipetting Station accessories" on page 109

Software description

About this topic

This topic provides an overview of the software that you use to set up, control, and troubleshoot the Vertical Pipetting Station.

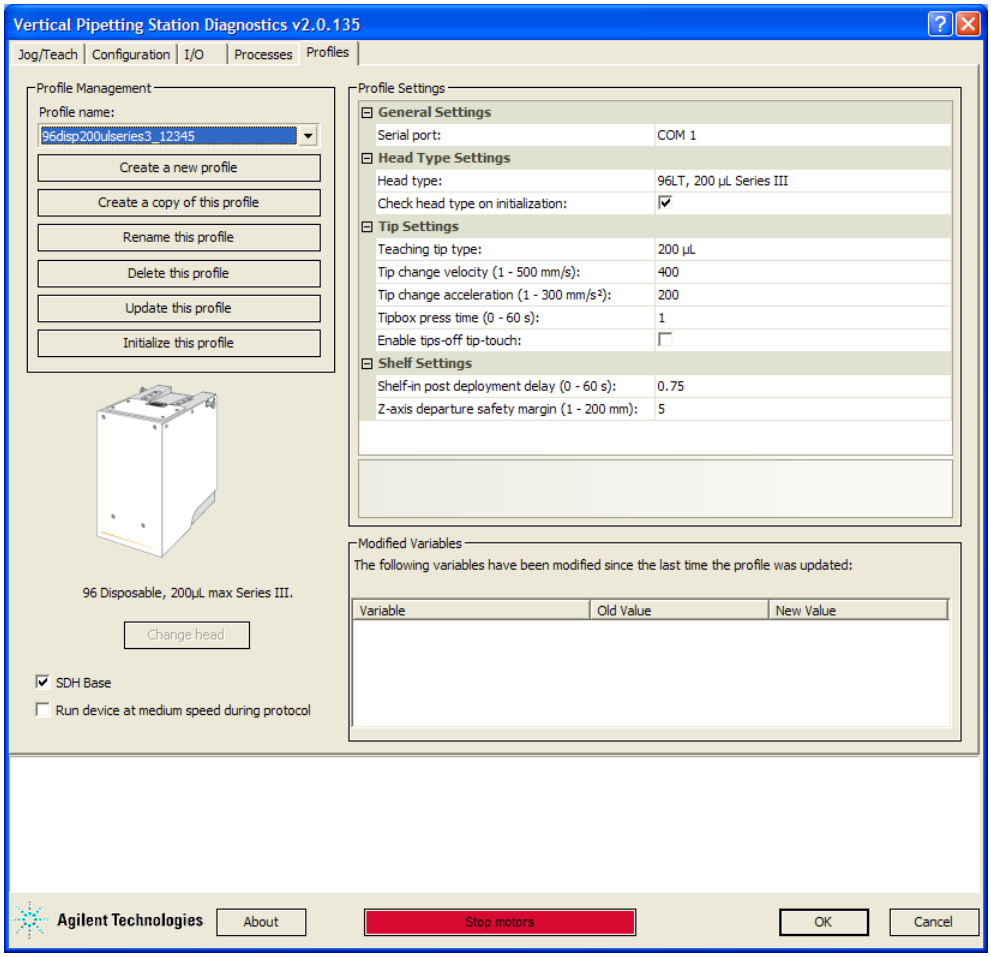
VWorks software

The VWorks software enables you to:

- *Set up the Vertical Pipetting Station*. During setup, you create a device file for the Vertical Pipetting Station. For setup information, see "Setting up Vertical Pipetting Station" on page 41.
- *Set up user accounts and privileges*. You can set up different user accounts to enforce access policies. For instructions, see the *VWorks Automation Control Setup Guide*.
- *Define labware*. Labware definitions describe the labware you will use during protocol runs. For instructions, see the *VWorks Automation Control Setup Guide*.
- *Create protocols*. Protocols determine the sequence of tasks you want to automate in a run. For protocol-writing instructions, see the *VWorks Automation Control User Guide*.
- *Run, pause, monitor, and stop protocols*. You can start, pause, monitor, and stop a protocol run from the controlling computer. For details, see the *VWorks Automation Control User Guide*.

Vertical Pipetting Station Diagnostics software

You use the Vertical Pipetting Station Diagnostics software to set up the Vertical Pipetting Station.



CAUTION Ensure that only fully trained Vertical Pipetting Station administrators have access to the user account passwords. Improper use of Vertical Pipetting Station Diagnostics by an untrained operator could damage the Vertical Pipetting Station. For example, the pipette head could collide with a shelf if a teachpoint is not defined properly.

In Vertical Pipetting Station Diagnostics, you do the following:

- *Create profiles.* A profile contains the communication and configuration settings (Vertical Pipetting Station base, head type, accessories, and teachpoint settings) required to run protocols for a given hardware configuration. The profiles also store teachpoints and configured shelf location information.
- *Set teachpoints.* A teachpoint is a set of coordinates that tells the pipette head exactly where to move to perform a task for a particular type of labware.
- *Configure the accessory shelves.* If you have shelf accessories, such as a Weigh Shelf, you must specify the location. This location information is stored in the profile.
- *Run individual tasks in real time.* Performing individual tasks, such as aspirate and dispense, is useful when calculating the correct parameters for a protocol or for troubleshooting a problem.

- *Diagnosing problems*. Moving and adjusting individual hardware components can help to diagnose and troubleshoot problems.

You access Vertical Pipetting Station Diagnostics through the VWorks software.

Related topics

For more information about...	See...
Setting up the Vertical Pipetting Station	"Setting up Vertical Pipetting Station" on page 41
Using Vertical Pipetting Station Diagnostics	• "Creating Vertical Pipetting Station profiles" on page 52 • "Setting shelf teachpoints" on page 59 • "Running a process using Diagnostics software" on page 106 • "Vertical Pipetting Station accessories" on page 109
Defining labware and liquids	*VWorks Automation Control Setup Guide*
Using the VWorks software	*VWorks Automation Control User Guide*

Workflow for operating the Vertical Pipetting Station

Use the following basic workflow for operating the Vertical Pipetting Station as a standalone device or in an Agilent Technologies lab automation system.

Note: The steps for installing and operating the Vertical Pipetting Station in a third-party lab automation system might differ. For details, see the third-party user documentation.

Step	Procedure	See...
1	Install the Vertical Pipetting Station.	"Installing Vertical Pipetting Station" on page 23
2	Set up the Vertical Pipetting Station, including mounting the pipette head, creating profiles, and setting teachpoints.	"Setting up Vertical Pipetting Station" on page 41
3	Create protocols and set task parameters.	*VWorks Automation Control User Guide*
4	Prepare the Vertical Pipetting Station for a run.	"Preparing to run a protocol" on page 68
5	Start the protocol run.	*VWorks Automation Control User Guide*

3 Installing Vertical Pipetting Station

This chapter describes how to unpack and install the Vertical Pipetting Station.

This chapter contains the following topics:

Installation workflow

Workflow

The following table presents the procedures for installing the Vertical Pipetting Station.

Step	Procedure	See...
1	Verify laboratory requirements.	"Laboratory requirements" on page 25
2	Unpack and inspect the Vertical Pipetting Station.	"Unpacking Vertical Pipetting Station" on page 28
3	Mount the Vertical Pipetting Station on the lab bench.	"About mounting the Vertical Pipetting Station" on page 31
4	Connect the power and computer.	"Connecting the power and the computer" on page 32
5	Connect the air supply and the vacuum source, if applicable.	"Connecting the air and vacuum sources" on page 33
6	Install the pipette head	"Installing a pipette head" on page 36
7	Install the VWorks software, if not already installed.	*VWorks Automation Control Setup Guide*

Related topics

For more information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Setting up the Vertical Pipetting Station	"Setting up Vertical Pipetting Station" on page 41
Setting up device files and writing protocols	*VWorks Automation Control User Guide*
Maintenance guidelines	"Maintaining Vertical Pipetting Station" on page 69

Laboratory requirements

Laboratory space requirements

General bench requirements

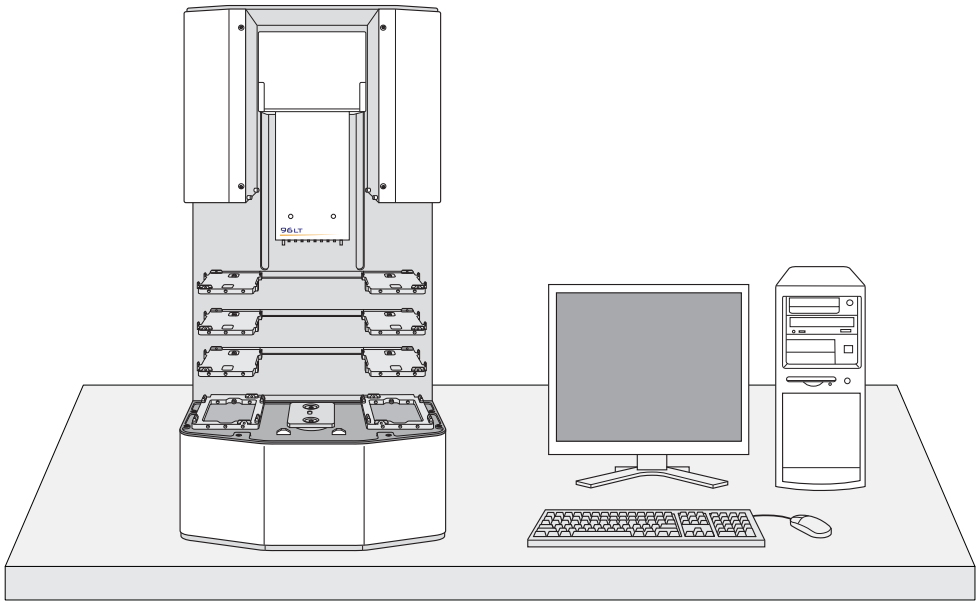
Make sure the bench for the Vertical Pipetting Station has the following:

- Sufficient space to accommodate the Vertical Pipetting Station, computer, monitor, and accessories
- Sufficient clearance on the back side of the Vertical Pipetting Station to access power, communication, and air tubing connections
- Easy access to disconnect the power to the Vertical Pipetting Station quickly if necessary
- A fixed bench (without wheels) that can support the weight of the Vertical Pipetting Station without excessive shaking or movement
- Proper height for any operator to comfortably operate the Vertical Pipetting Station

Vertical Pipetting Station physical specifications

Dimension	Value
Width	38.1 cm (15.0 in)
Height	78.7 cm (31.0 in)
Depth	25.9 cm (10.2 in)
Weight	37.2 kg (82 lb)

Note: Measurements do not include the cables or the computer.



Electrical requirements

The Vertical Pipetting Station device has the following power requirements. For power requirements of other devices in the workstation, see the device user documentation.

Utility	Requirement
Electrical	100–240~, 50/60 Hz, 5.5 A
Fuse	5 A, 250 V, 0.25 × 1.25 in (6.35 x 31.75 mm), fast acting

Compressed air requirements

The Vertical Pipetting Station requires the use of clean, dry, compressed air to move the pneumatic components, such as the shelves. The compressed air can be from the following sources:

- Centralized source (house)
- Compressed-air cylinders
- Portable pumps

CAUTION Ensure that the air coming into the Vertical Pipetting Station is properly filtered from moisture or aerosolized impurities. Significant moisture or impurities in the air line can adversely affect the performance and life of the Vertical Pipetting Station. Using oil compressors can cause oil to leak into the Vertical Pipetting Station and void your warranty.

The Vertical Pipetting Station has the following compressed air requirements:

Requirement	Value
Quality	Clean, dry, compressed
Flow rate	34.0 Lpm (1.2 cfm)
Pressure	0.59–0.69 MPa (85–100 psi)

Environmental requirements

The lab must meet the following environmental requirements.

Requirement	Value
Ambient temperature	5–40 °C
Humidity condition	10–90% RH, non-condensing
Elevation	1–2000 m

Locate the Vertical Pipetting Station away from heat and air conditioning ducts and away from direct sunlight, as these conditions could damage or cause interference with the Vertical Pipetting Station.

Computer requirements

The Vertical Pipetting Station device is shipped with a computer that controls the Vertical Pipetting Station operations. The computer has all the necessary software and is configured to operate the Vertical Pipetting Station.

IMPORTANT Agilent Technologies recommends that you use the supplied computer, because it is set up and tested for Vertical Pipetting Station operations.

If your organization uses a computer other than one configured by Agilent Technologies, make sure the computer meets the following minimum requirements:

- Computer system
  - Microsoft Windows XP with Service Pack 3,
    Microsoft Windows Vista with Service Pack 2, or
    Microsoft Windows 7
  - 2 GHz or faster 32-bit (x86) processor, multicore preferred
  - 2 GB system memory
  - 40 GB hard drive capacity with 10 GB free space
  - 1280 x 1024 pixel screen resolution
  - Microsoft Internet Explorer 6.0 or Mozilla Firefox 1.0 with JavaScript enabled (required for using the context-sensitive help and knowledge base)
  - A PDF viewer, such as Adobe Reader (required for opening the user guide PDF files)
- Communications interface: RS-232 DB9 serial port

To facilitate the setup process, a software installation CD is supplied. You can use the CD to install the necessary software and setup configurations.

Related topics

For more information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Mounting the Vertical Pipetting Station	"About mounting the Vertical Pipetting Station" on page 31
Connecting the Vertical Pipetting Station	• "Connecting the power and the computer" on page 32 • "Connecting the air and vacuum sources" on page 33

Unpacking Vertical Pipetting Station

About this topic

This topic describes the shipping containers and how to unpack the Vertical Pipetting Station device.

Shipping containers

The Vertical Pipetting Station ships in the following containers:

- *Vertical Pipetting Station crate*. Contains the Vertical Pipetting Station device.
- *Peripherals box*. Contains the following packages:
  - Vertical Pipetting Station utility kit
  - Pipette head box
  - Computer box

Depending on the configuration ordered, additional packages or items can be included, such as accessories.

Before you start

Verify the following:

1. *Vertical Pipetting Station utility kit contents*. Verify the kit includes:
   - Power cable and serial communications cable
   - Tubing and quick-disconnect fittings for the air connection (1/4-in) and vacuum (3/8-in), if applicable
   - Software CD-ROM
   - *Vertical Pipetting Station User Guide*
2. *Site specifications*. Ensure the installation site meets the requirements specified in the "Laboratory requirements" on page 25.
3. *Required tools and equipment*. Obtain the following:
   - Large flat-head screwdriver
   - Cart for moving the Vertical Pipetting Station
4. *Personnel*. Make sure two people are available for lifting the Vertical Pipetting Station from the crate.

WARNING **The Vertical Pipetting Station weighs 37.195 kg (82 lb). Do not attempt to move the Vertical Pipetting Station without assistance. Use proper lifting techniques when lifting the Vertical Pipetting Station.**

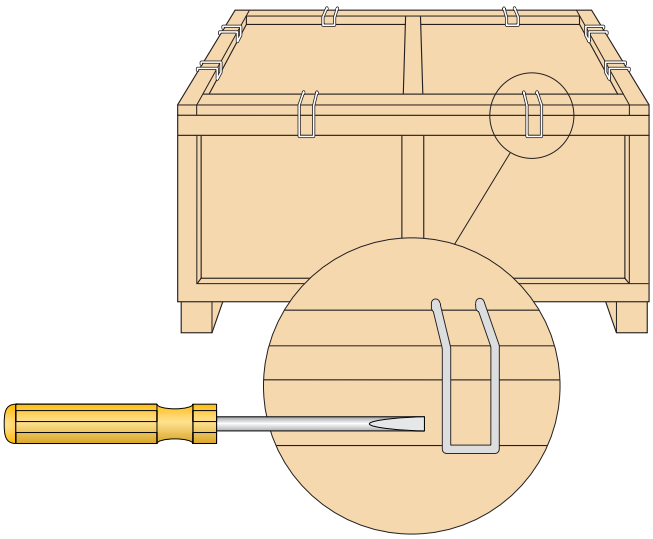
Unpacking the Vertical Pipetting Station crate

IMPORTANT Save the packaging materials in case you are required to move or ship the Vertical Pipetting Station.

To unpack the Vertical Pipetting Station crate:

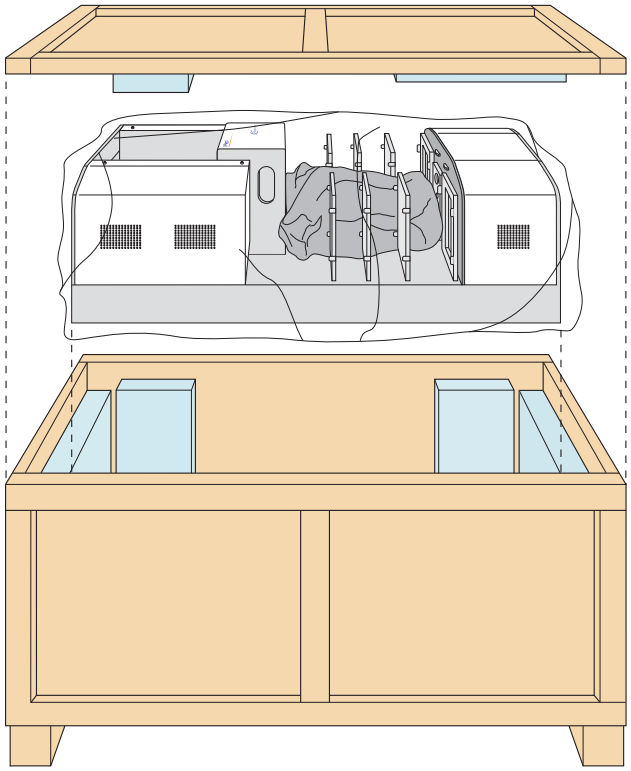
1 Use a large flat-head screwdriver to pry off the crate-locking clips, and remove the top of the crate.

WARNING **Use care when removing the crate clips. The clips are spring loaded and can pop off when loosened.**



CAUTION Do not lift use the shelves, head mount, or any other moving parts to lift the Vertical Pipetting Station. Doing so can damage the device.

2 With a person on either side of the crate, reach between the foam blocks until you can grasp underneath the Vertical Pipetting Station.



3 While firmly supporting underneath the Vertical Pipetting Station, lift it up and out of the crate.

4 Place the Vertical Pipetting Station in the upright position on the lab bench or table.

5 Remove the protective plastic bag covering the Vertical Pipetting Station, and remove the protective cushioning from between the shelves.

6 Verify that all Vertical Pipetting Station parts are free of possible shipping damage. If anything appears to be missing or damaged, contact Automation Solutions Technical Support.

Related topics

For more information about...	See...
Site installation requirements	"Laboratory requirements" on page 25
Mounting the Vertical Pipetting Station	"About mounting the Vertical Pipetting Station" on page 31
Connecting the Vertical Pipetting Station	• "Connecting the power and the computer" on page 32 • "Connecting the air and vacuum sources" on page 33

About mounting the Vertical Pipetting Station

About this topic

If the Vertical Pipetting Station is part of an Agilent Technologies lab automation system, such as the BioCel System, the unit is already mounted.

This topics describes the requirements for mounting the Vertical Pipetting Station on a lab bench or table or as part of a third-party lab automation system.

Mounting requirements

WARNING **The Vertical Pipetting Station weighs 37.195 kg (82 lb). Do not attempt to move the Vertical Pipetting Station without assistance. Use proper lifting techniques when lifting the Vertical Pipetting Station.**

Ensure the destination lab bench meets the requirements listed in "General bench requirements" on page 25.

If the Vertical Pipetting Station is operated as a standalone device, you are not required to fasten the Vertical Pipetting Station to the lab bench or table. Place the Vertical Pipetting Station next to the computer on the lab bench or table.

If the Vertical Pipetting Station is integrated as part of a third-party lab automation system, the Vertical Pipetting Station must be in a fixed position so that the other devices in the system can train teachpoints specific to the location of the Vertical Pipetting Station shelves. For mounting instructions, contact Automation Solutions Technical Support.

Related topics

For more information about...	See...
Connecting the Vertical Pipetting Station	• "Connecting the power and the computer" on page 32 • "Connecting the air and vacuum sources" on page 33
Set up requirements	"Laboratory requirements" on page 25
Hardware components	"Hardware overview" on page 12
Contacting Automation Solutions	"Reporting problems" on page 93

Connecting the power and the computer

About this topic

This topic provides instructions on how to connect the Vertical Pipetting Station to a grounded power source and to its controlling computer.

Before you begin

Before you plug in the Vertical Pipetting Station, make sure the laboratory set up requirements have been met. See “Laboratory requirements” on page 25.

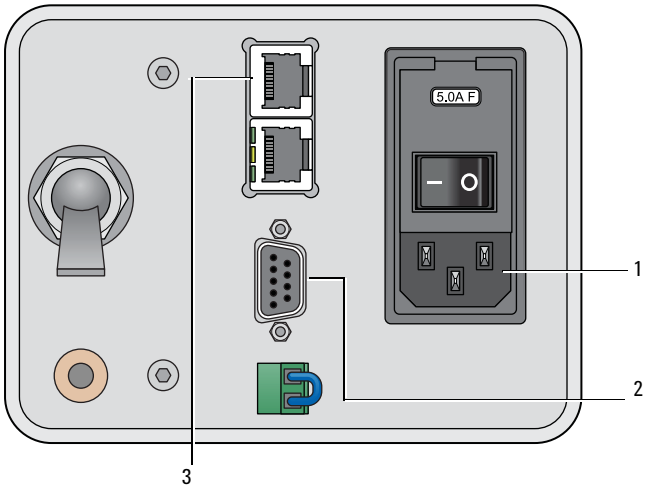
WARNING **Interconnect cables should be routed carefully to prevent trip hazards.**

CAUTION Operating the Vertical Pipetting Station at the wrong voltage might seriously damage the device.

Connecting the power and computer

The following figure shows the connections on the rear panel.

Figure Vertical Pipetting Station rear panel



Item	Connector
1	AC power connector
2	Serial communications port (DB-9) for the controlling computer
3	PUMP I/O port

To connect the Vertical Pipetting Station:

1. Connect the Vertical Pipetting Station power cable by plugging in one end of the cable at the AC power connector on the rear panel as the figure shows. Plug in the other end of the cable at an appropriately grounded electrical socket.
2. Connect the Vertical Pipetting Station serial communications cable by plugging in one end of the cable at the serial communications port on the Vertical Pipetting Station rear panel as the figure shows. Plug in the other end of the cable to the computer that controls the Vertical Pipetting Station.

   Be sure to tighten the thumbscrews on the connector.
3. If you are using the Automation Solutions Pump Module, see "Setting up a Pump Module" on page 133 for connection details.

Related topics

For more information about...	See...
Set up requirements	"Laboratory requirements" on page 25
How to set up the Vertical Pipetting Station	"Workflow for setting up the Vertical Pipetting Station" on page 42
Component locations	"Hardware overview" on page 12

Connecting the air and vacuum sources

About this topic

Compressed air is used to move the Vertical Pipetting Station shelves, tipbox press, and other components. If the Vertical Pipetting Station is fitted with vacuum shelves, a vacuum source is required. This topic explains how to connect the Vertical Pipetting Station to an air source and vacuum source and how to check the connections for leaks before use.

Before you begin

Make sure the laboratory set up requirements for compressed air have been met. See "Laboratory requirements" on page 25.

Make sure you have the supplied ¼-in tubing for the compressed air.

If the Vertical Pipetting Station is fitted with vacuum shelves, make sure you have the supplied 3/8-in tubing for the vacuum.

Ensure you follow all safety precautions.

WARNING Working with open, charged air lines can result in injury. Switch the compressed air line off before installing the Vertical Pipetting Station. Contact your facilities department or Automation Solutions Technical Support with questions about setting up the air line.

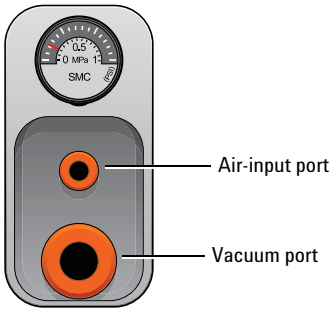
CAUTION Ensure that the air coming into the Vertical Pipetting Station is properly filtered from moisture or aerosolized impurities. Significant moisture or impurities in the air line can adversely affect the performance and life of the Vertical Pipetting Station. Using oil compressors can cause oil to leak into the Vertical Pipetting Station and void your warranty.

Connecting the air source

To connect the Vertical Pipetting Station to the air source:

1. Turn off the air at the source (house, cylinder, or pump).
2. Use tubing cutters to cut the supplied tubing to the length required for the air line.
3. Connect one end of the air tubing to the air source (house, cylinder, or pump).
4. Connect the free end of the air tubing to the quick-disconnect fitting at the air-input port on the Vertical Pipetting Station, as the figure shows.

Figure Vertical Pipetting Station rear air panel



To connect the tubing, push the end of the tubing into the quick-disconnect fitting. Make sure the tubing is free of any kinks.

Note: If your house air uses a threaded nozzle, attach the ¼-in NPT fitting to your house air.

Connecting the vacuum source

If your Vertical Pipetting Station is fitted with a vacuum shelf, use the following procedure to connect the device to the vacuum source.

To connect the Vertical Pipetting Station to the vacuum source:

1. Turn off the vacuum supply at the source.
2. Use tubing cutters to cut the supplied 3/8-in tubing to the length required for the vacuum line. Ensure the cut edge of the tubing is square and clean.
3. Connect one end of the vacuum tubing to your house vacuum supply, and then connect the free end of the tubing to the quick-disconnect fitting at the vacuum-input port on the back of the Vertical Pipetting Station.

Checking air and vacuum connections

To check the air and vacuum connections:

1. With the air source turned off, gently tug the air tubing at each connection.

   If you feel resistance at the connection, the tubing has been properly installed.

2. Turn on the air at the source (house, cylinder, or pump).

3. Listen near each connection for hissing sounds that might indicate a leak.

   If you hear hissing sounds, turn off the air at the source, check and tighten the connections, and then turn on the air again. If the problem persists, contact your facilities department or Automation Solutions Technical Support.

4. If you connected a vacuum source, repeat step 1 to step 3 for the vacuum connections.

Disconnecting air and vacuum sources

You must disconnect the air and vacuum tubing before moving or shipping the Vertical Pipetting Station and before performing maintenance or cleaning.

CAUTION Do not pull the tubing out of the orange quick-disconnect fitting. Doing so can damage the fitting.

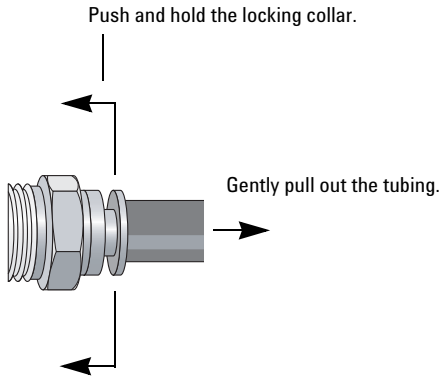
To disconnect the air and vacuum tubing from the Vertical Pipetting Station:

1. Turn off the air at the source (house, cylinder, or pump).

2. If a vacuum source is connected, turn off the vacuum at the source.

3. At the back of the Vertical Pipetting Station, push and hold the locking collar against the quick-disconnect fitting, and then gently pull the tubing out of the fitting.

Figure Closeup view of quick-disconnect fitting



Note: Alternatively, you can use the SMC Pneumatics tool (TG-2) to aid in this task. See the manufacturer's documentation for use instructions. Contact your local SMC parts supplier for ordering details.

4. Repeat step 3 for the vacuum line, if applicable.

Related topics

For more information about...	See...
Air source requirements	"Laboratory requirements" on page 25
How to set up the Vertical Pipetting Station	"Workflow for setting up the Vertical Pipetting Station" on page 42
Component locations	"Hardware overview" on page 12

Installing a pipette head

About this topic

This topic describes how to install the pipette head when you set up the Vertical Pipetting Station. For details on how to replace a pipette head that is already mounted on the device, see "Changing the pipette head" on page 74.

About the pipette head mount

The pipette head fits onto the head mount using a dovetail interface, shown in the following figures. The 96- and 384-channel pipette heads have two head-retainer pins that secure the head in the head mount. The 8- and 16-channel pipette heads have a lock on the front of the head.

Figure Pipette head

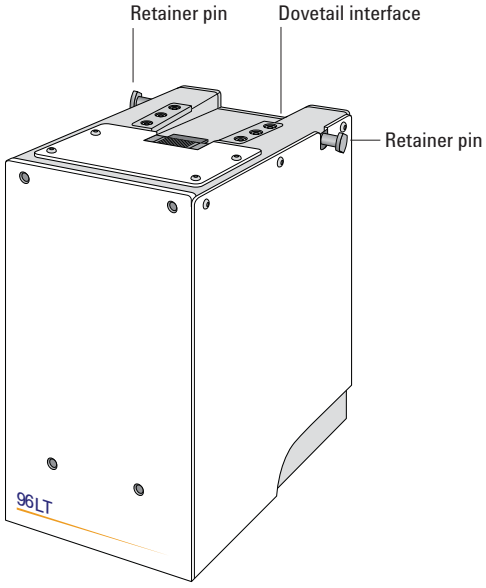
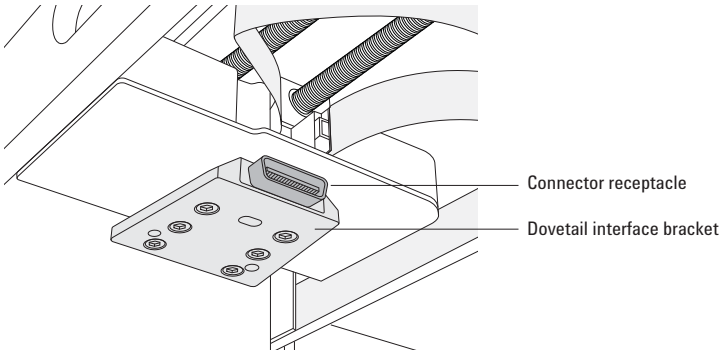


Figure Vertical Pipetting Station head mount (bottom view)



Installing the pipette head

CAUTION Always turn off the Vertical Pipetting Station before installing or removing a pipette head. Failure to turn off the Vertical Pipetting Station before installing or removing a pipette head can damage the pipette head electronics.

To install the pipette head on the head mount:

1. Verify that the head mount of the Vertical Pipetting Station is in an easily accessible position.

   The Vertical Pipetting Station ships with the head mount already in position for easy access.

2. On the Vertical Pipetting Station rear panel, ensure the power switch is set to **off (o)**.

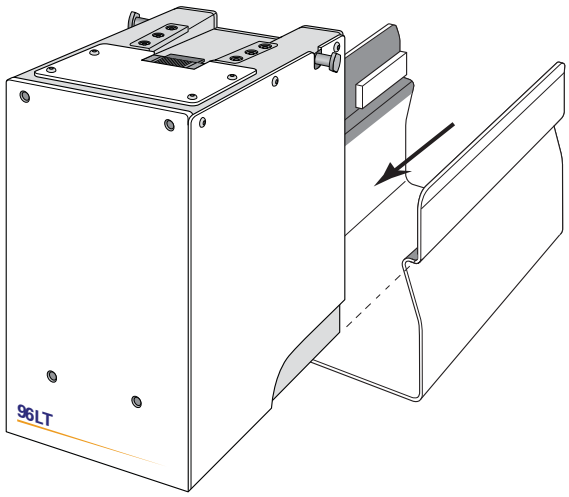
3. Remove the pipette head from the packaging, using care to avoid touching the tips or barrels.

   CAUTION Keep the pipette head in the supplied stand until mounting. Do not place the bottom of the pipette head on a surface. Doing so can damage the pipette barrels.

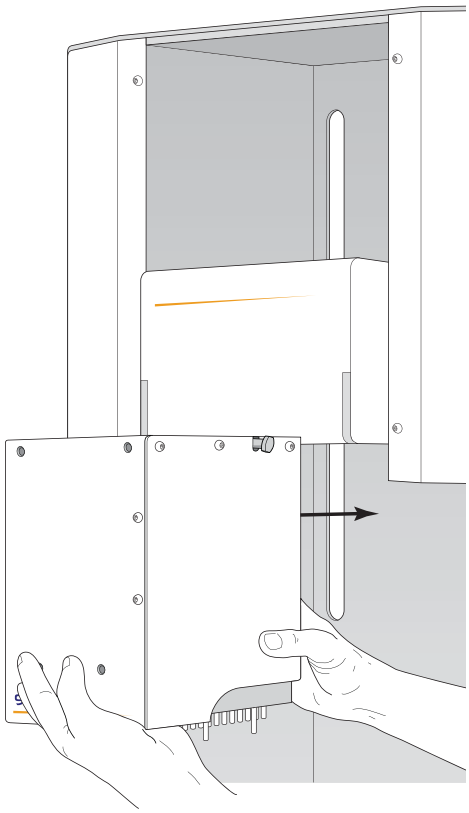
4. (96- and 384-channel heads only)

   a On each side of the head, pull out and twist the head-retainer pins 90 degrees so that they remain retracted.

   b Slide the head out of the stand.



5 Slide the pipette head onto the head mount as the figure shows.



6 Do one of the following to lock the pipette head in place:

- (96- and 384-channel heads) Twist the two head-retainer pins so that they snap into place.
- (8- and 16-channel heads) On the front of the pipette head, rotate the head lock (not shown) counterclockwise to the **Lock** position.

7 To verify that the pipette head is secure, firmly support the head with your hands while you attempt to move the head from side to side as if to remove it. If the head is locked, it will not disengage from the dovetail interface.

CAUTION Do no touch the pipette head barrels or tips with your hands.

CAUTION If the pipette head is not properly secured in place, it could drop unexpectedly. Dropping the pipette head or bumping the tips or barrels will damage the head. Contact Automation Solutions Technical Support if you suspect that the pipette head is damaged.

Related topics

For more information about...	See...
Safety guidelines	“Safety guidelines” on page 1
Starting up the Vertical Pipetting Station	“Starting up and shutting down” on page 43
Replacing a pipette head	“Changing the pipette head” on page 74
Connector and switch locations	“Hardware overview” on page 12

4 Setting up Vertical Pipetting Station

This chapter explains how to set up the Vertical Pipetting Station. Read this chapter after unpacking and installing your Vertical Pipetting Station.

This chapter contains the following topics:

Workflow for setting up the Vertical Pipetting Station

Step	Procedure	Role	See...
1	Start up the Vertical Pipetting Station.	Operator	"Starting up and shutting down" on page 43
2	Select or create a Vertical Pipetting Station device.	Administrator or Technician	"Creating or adding a Vertical Pipetting Station device" on page 45
3	Create and initialize a Vertical Pipetting Station profile.	Administrator or Technician	"Creating Vertical Pipetting Station profiles" on page 52
4	Edit or set teachpoints.	Administrator or Technician	• "Setting shelf teachpoints" on page 59 • "Teaching shelves 7 and 8 for tipboxes" on page 64 (disposable-tip pipette heads only)
5	(Special accessory shelves) Reconfigure the shelves for accessories, such as the Weigh Shelf, reinitialize the profile, and reteach the shelf, if necessary.	Administrator or Technician	"Vertical Pipetting Station accessories" on page 109
6	Create protocols and set task parameters.	Administrator or Technician	*VWorks Automation Control User Guide*
7	Prepare to run a protocol.	Operator	"Preparing to run a protocol" on page 68

Starting up and shutting down

About this topic

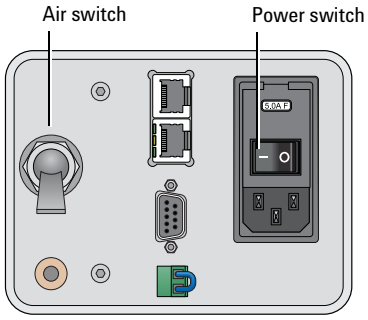
This topic describes how to start up and shut down the Vertical Pipetting Station.

Starting up the Vertical Pipetting Station

To start up the Vertical Pipetting Station:

1. On the Vertical Pipetting Station rear panel, check the air pressure gauge and verify the incoming air pressure is between 0.59–0.69 MPa (85–100 psi).

2. Verify that the power and serial communication cables are plugged into the Vertical Pipetting Station.
3. Turn on any accessories, for example, Pump Modules.
4. On the Vertical Pipetting Station rear panel, set the air switch to **on (up)**, and press the power switch to the **on (-)** position.



WARNING **The shelves might move when you turn on the power and the air. Keep fingers, hair, clothing, and jewelry away from the Vertical Pipetting Station while it is in motion. Never touch any of the moving parts or attempt to move labware while the Vertical Pipetting Station is in operation. The device could pinch, pierce, or bruise you.**

5. Turn on the computer and the monitor, and start the Microsoft Windows operating system.
6. Start the VWorks software.

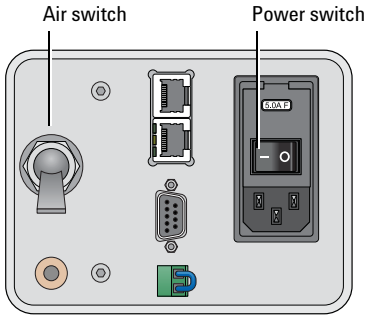
Shutting down the Vertical Pipetting Station

Shut down the Vertical Pipetting Station before you:

- Install accessories or change the pipette head
- Clean the Vertical Pipetting Station
- Move the Vertical Pipetting Station

To shut down the Vertical Pipetting Station:

1. Verify that the post-run clean-up procedure was completed after the last run.
2. If using an Auto Filling Reservoir, drain the reservoir to prevent siphoning.
3. (Optional) Home the pipette head.
4. Shut down the computer and turn off the monitor.
5. Turn off any accessories, for example, Pump Modules.
6. On the Vertical Pipetting Station rear panel, set the air switch to **off (down)**, and press the power switch to the **off (o)** position.



Related topics

For more information about...	See...
Air-pressure, power, and other requirements	"Laboratory requirements" on page 25
Post-run cleanup	"Routine maintenance" on page 70
Stopping a run under normal conditions	*VWorks Automation Control User Guide*
Stopping in an emergency	"Stopping in an emergency" on page 4
Homing the pipette head	"Homing the pipette head" on page 98

Creating or adding a Vertical Pipetting Station device

About this topic

Read this topic if you are an administrator responsible for managing Agilent Technologies devices that are running the VWorks software. This topic describes how to add and delete new Vertical Pipetting Station devices in the VWorks software.

The VWorks software uses the information in a device file to communicate with and operate devices within the lab automation system.

- *If your computer was configured by Automation Solutions*. The correct device configuration is already set up for communication with the Vertical Pipetting Station. You are not required to create a new Vertical Pipetting Station device in the software unless you want to reference different profiles. To establish communication, you must initialize the device.
- *If you configured your own computer*. You must add a device in the VWorks software for each Vertical Pipetting Station in the system.

For detailed information about device files and associations with profiles, teachpoints, and labware definitions, see the *VWorks Automation Control User Guide*.

Devices and device files defined

A device is an item in your lab automation system that has an entry in a VWorks software device file. A device can be a robot, an instrument, or a location in a lab automation system that can hold a piece of labware.

The device file (*.dev) stores information for all the devices in an integrated system, including:

- Type of device (for example, Vertical Pipetting Station device)
- Device configuration information (for example, approach height, allowed or prohibited labware, and so on)
- Profile to use

Creating a device file

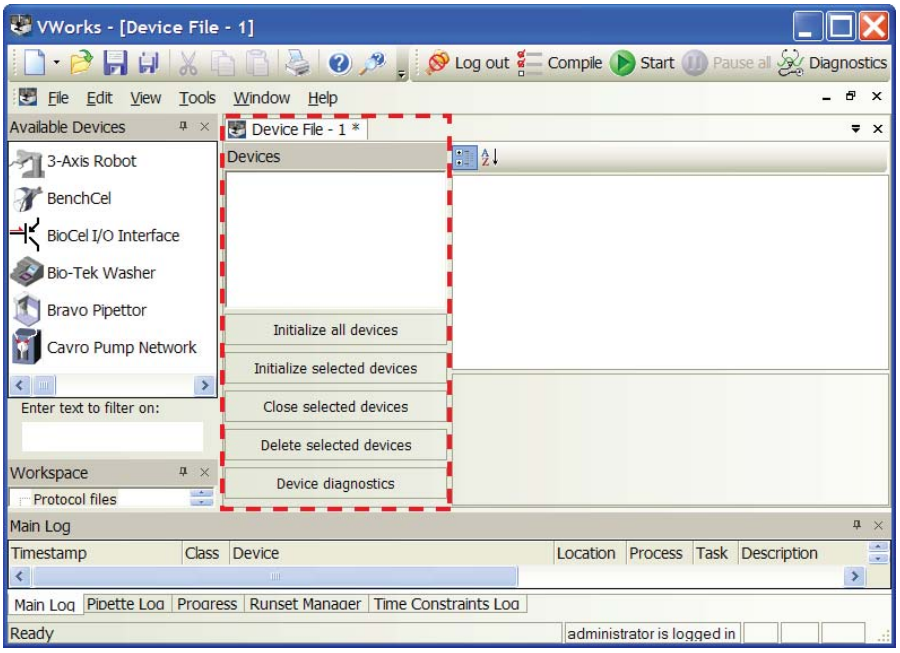
If you are setting up the Vertical Pipetting Station for the first time, you will create a device file. You add the Vertical Pipetting Station device and the external devices to the device file.

To create a device file:

1. Log in to the VWorks software as an Administrator.
2. In the **VWorks** window, choose **File** > **New** > **Device.**

   A Device File tab appears in the **VWorks** window.
3. Choose **File** > **Save**. In the **Save As** dialog box, type a file name (*.dev), select the following storage location, and click **Save**:

   ...\VWorks Workspace\Device Files



Adding the Vertical Pipetting Station to a device file

Before you begin:

- Ensure that any devices are physically networked to the computer.
- Turn on the devices.

To add devices to a device file:

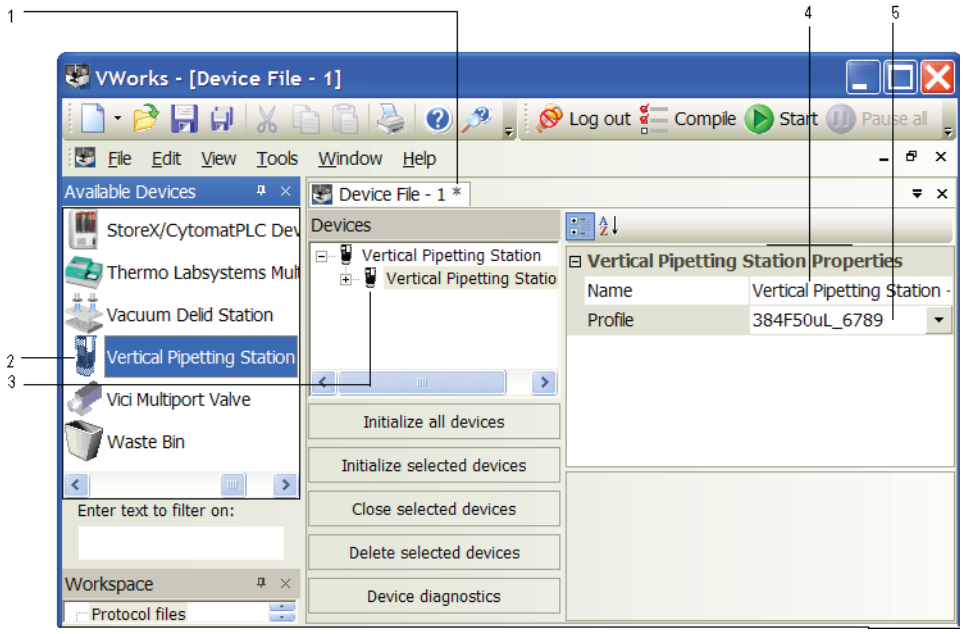
1 In the **VWorks** window, verify that the correct device file is open.

To open a device file, choose **File** > **Open**. In the **Open** dialog box, select your device file (*.dev), and then click **Open**. The device files should be stored in the following location:

...\VWorks Workspace\Device Files

2 In the **Available Devices** area, double-click the **Vertical Pipetting Station** icon. Or, drag the **Vertical Pipetting Station** icon to the **Device File** tab.

Note: To show or hide the list of available devices, choose **View > Available Devices**.



3 In the **Device File** tab, select the **Vertical Pipetting Station-*n*** icon.

4 Under **Vertical Pipetting Station Properties**, type a **Name** for the device. By default, the software assigns Vertical Pipetting Station-*n*, and increments the number for each Vertical Pipetting Station device that you add.

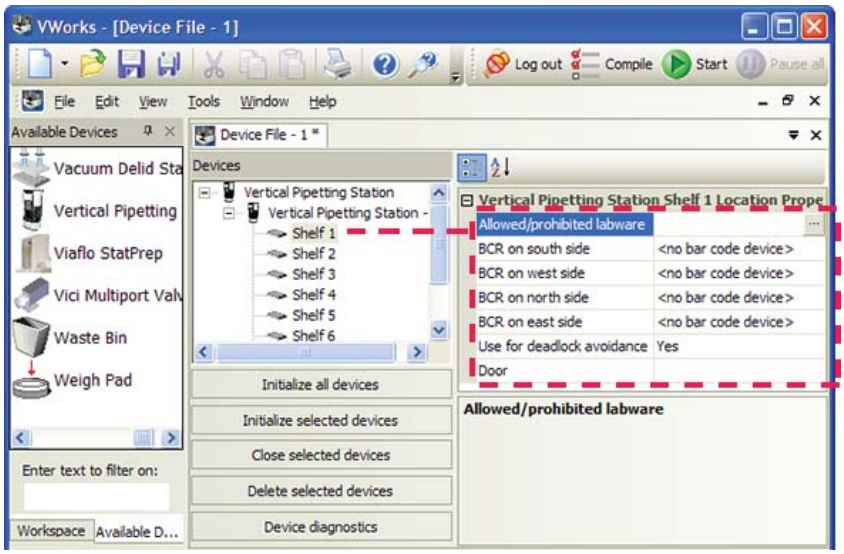
To identify the specific Vertical Pipetting Station, the device name should include the device serial number.

5 In the **Profile** list, select a profile for the device.

If the **Profile** list is empty, open Vertical Pipetting Station Diagnostics and create a profile. Then return to the **Profile** list under **Vertical Pipetting Station Properties** and select the new profile.

IMPORTANT To use different configurations of the same device in different protocols, you can save time by creating a different device file for each configuration. For example, if you change a pipette head on a pipettor, you can simply open the device file that contains the device with the appropriate profile instead of editing the profile selection in the device file.

6 On the **Device File** tab, expand the **Vertical Pipetting Station** device icon to show the list of shelves, and then click the **Shelf 1** icon. The corresponding properties appear.



Set the desired values for the following properties. Use the default values for the remaining properties.

Property	Description
Allowed/prohibited labware	*Optional.* Click … if you want to specify labware restrictions for this location. The Allowed/prohibited labware dialog box appears. For details on the labware classes, see the *VWorks Automation Control Setup Guide*. *Note:* If the … button is not visible, click the empty field.

Repeat this step for each shelf.

7 Select **File** > **Save**.

If you are creating a new device file, the Save As dialog box appears so that you can specify a name and location for your device file. Ensure the file type is ***.dev**.

Alternatively, you can select **File** > **Save All** to save the device file and the current protocol file at the same time.

Related topics

For more information about...	See...
Initializing the device	"Initializing the Vertical Pipetting Station" on page 55
Device files and associations with profiles, teachpoints, and labware	*VWorks Automation Control User Guide*
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Creating a profile	"Creating Vertical Pipetting Station profiles" on page 52

Opening Vertical Pipetting Station Diagnostics

About this topic

This topic describes how to open Vertical Pipetting Station Diagnostics from a device tab displayed in the VWorks software window. Alternatively, you can use the Diagnostics button on the toolbar to open Vertical Pipetting Station Diagnostics. In either case, you must have an open device file.

Procedure

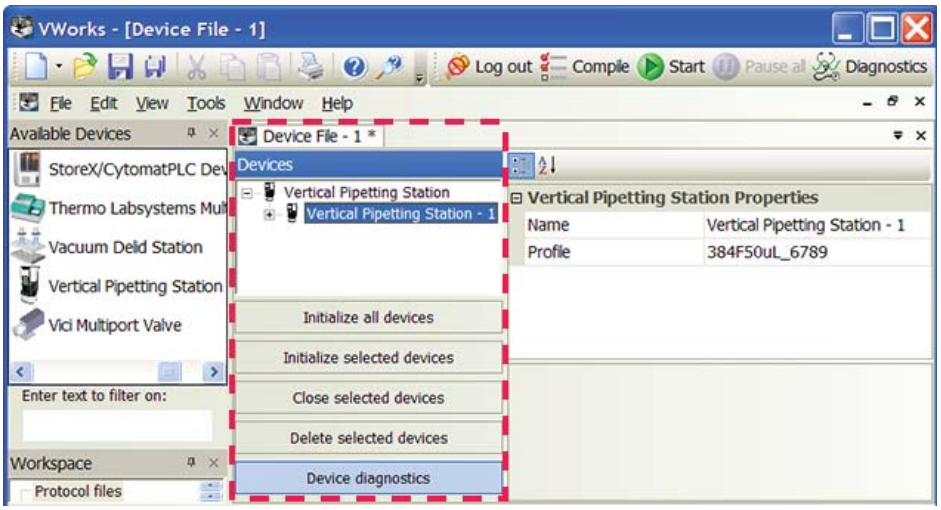
To open Vertical Pipetting Station Diagnostics:

1 In the **VWorks software** window, ensure the correct device file is open.

To open a device file, choose **File > Open**, and then select the appropriate device file (*.dev) in the **Open** dialog box.

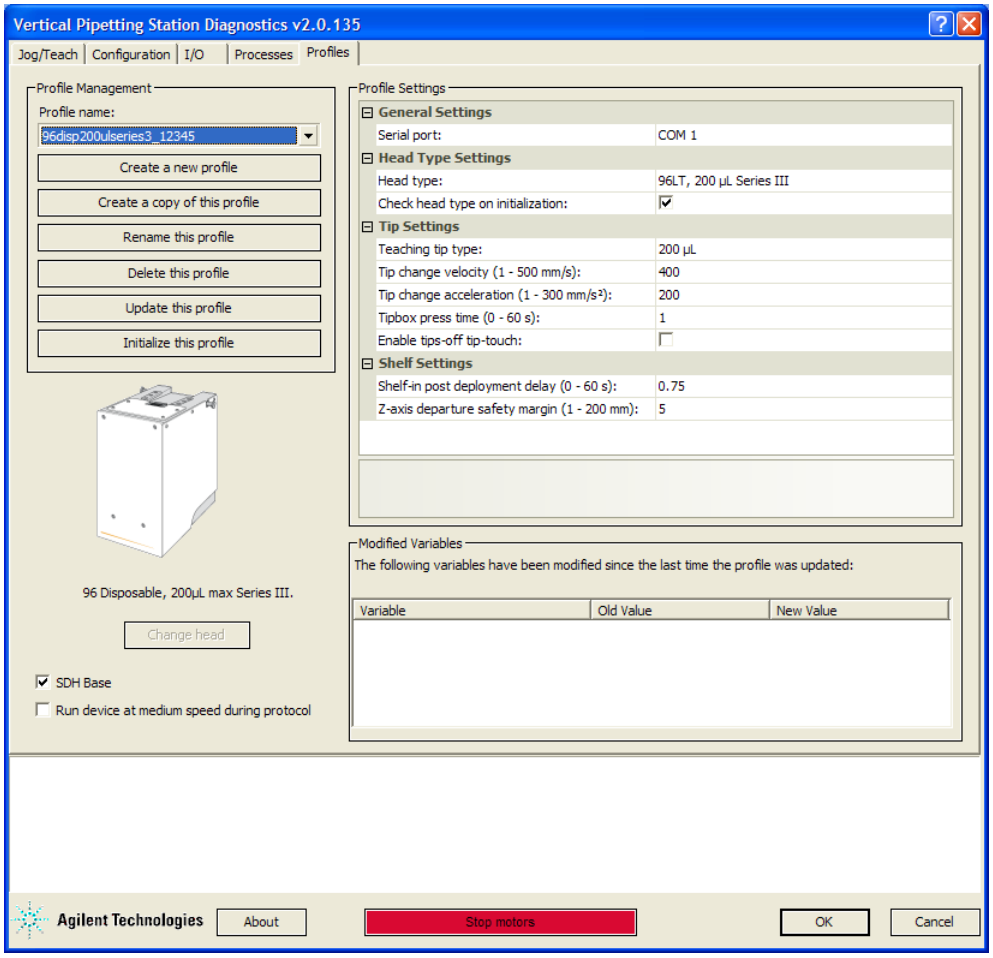
2 In the **Devices** area of the opened device file tab, highlight the device icon, and then click **Device diagnostics**.

Alternatively, you can double-click the device icon.



The device's diagnostics dialog box opens.

Figure Vertical Pipetting Station Diagnostics dialog box



For more information about...	See...
The VWorks software	• *VWorks Automation Control Setup Guide* • *VWorks Automation Control User Guide*
Creating a profile	"Creating Vertical Pipetting Station profiles" on page 52
Editing shelf teachpoints	"Setting shelf teachpoints" on page 59

Creating Vertical Pipetting Station profiles

About this topic

VWorks software users with Administrator or Technician privileges (advanced users) can create and manage profiles for the Vertical Pipetting Station.

CAUTION Using the wrong profile for the configuration or using an improperly created profile can damage the Vertical Pipetting Station.

Profiles defined

Profiles enable the VWorks software to:

- Identify and communicate with the Vertical Pipetting Station
- Determine which pipette head is being used
- Store teachpoints and other Microsoft Windows registry file values

The Vertical Pipetting Station requires a profile for each combination of Vertical Pipetting Station base, pipette head, and configured accessories.

If you move a pipette head from one Vertical Pipetting Station to another, you must create two profiles, one for each Vertical Pipetting Station base. The Vertical Pipetting Station has no firmware, so all configuration settings are stored in the profile, which is part of the Microsoft Windows registry.

Example of four configurations that require four profiles

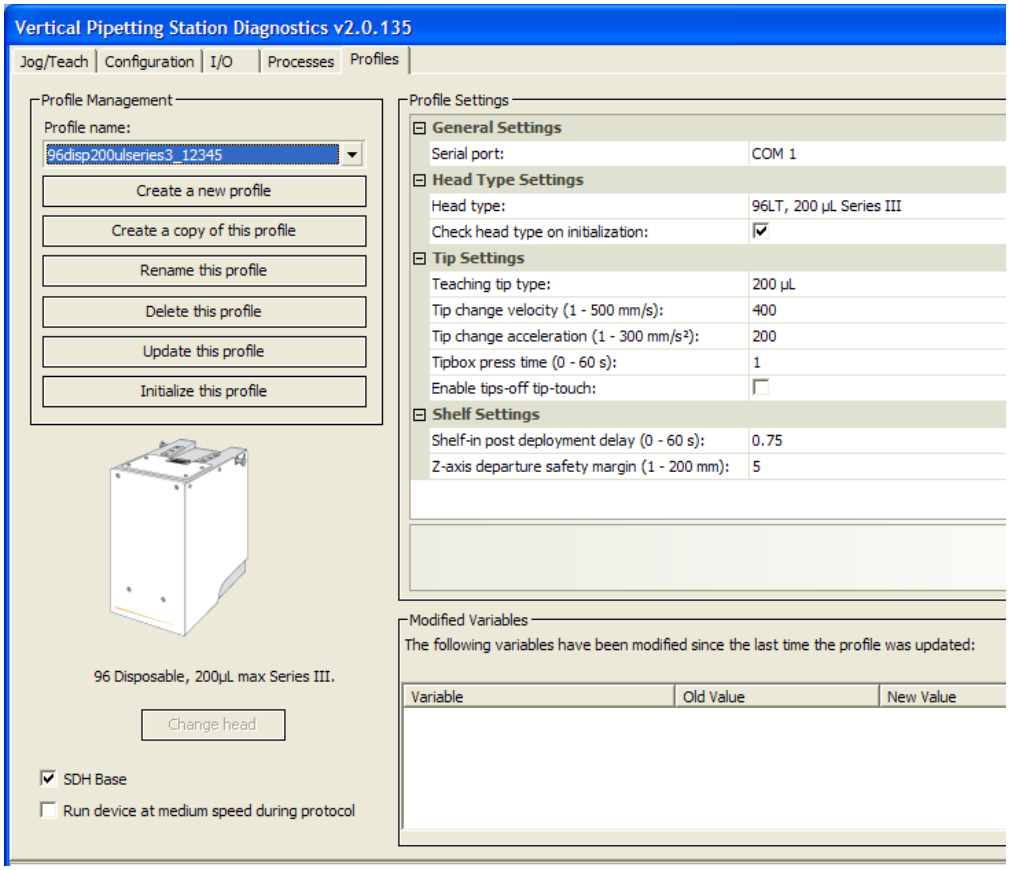
Base A		Base B	
Head 1	Head 2	Head 1	Head 2
Profile 1:	*Profile 2:*	*Profile 3:*	*Profile 4:*
base A head 1	base A head 2	base B head 1	base B head 2

Every Vertical Pipetting Station setup that requires different teachpoints requires a profile for that set of teachpoints. For example, if you add an accessory such as a Weigh Shelf to the Vertical Pipetting Station, you must modify the profile to include the new teachpoint for the Weigh Shelf.

Creating a profile

You use the Profiles page in Vertical Pipetting Station Diagnostics to create profiles.

Figure Profiles page in Vertical Pipetting Station Diagnostics



CAUTION Each profile can be used by multiple protocols. Deleting, renaming, or changing the parameters for a profile based on one protocol can invalidate other protocols that use the profile.

To create a new profile:

1. In **Vertical Pipetting Station Diagnostics**, click the **Profiles** tab.
2. Click **Create a new profile**.
3. In the **Create Profile** dialog box, type a name for the new profile, and click **OK**. Use a profile name that identifies the specific configuration, for example:

   head type_head serial number_base serial number
4. Under **General Settings**, select the **Serial port** on the controlling computer to which the Vertical Pipetting Station serial communications cable is connected.
5. Under **Head Type Settings**, verify the following parameters:
   - **a** In the **Head type** box, make sure the selected pipette head is correct.

     If you select a different pipette head from the list, a message appears and asks if you want to use the default parameter values for the selected head. Click **Yes** to use the default values.
   - **b** Ensure the **Check head type on initialization** check box is selected (default). This enables a notification if the mounted head does not match the profile head type when the operator initializes a profile.

6 (Disposable-tip pipette heads only) Under **Tip Settings**, select the **Teaching tip type (µL)** from the list, and then verify the remaining parameter values.

CAUTION If you change the teaching tip type in a profile, you must reteach the shelves using the new tip type.

Note: The 200 µL and 250 µL filtered tips have a 180 µL maximum volume.

Note: For details on the parameters under Tip Settings, see "Profile Settings area" on page 158.

7 Configure any special shelf settings as follows:

a In the **Shelf Settings** area, try using the default settings at first, and make adjustments later, if necessary.

b On the **Configuration** page, configure any accessories. The accessory settings must be saved with the profile.

c On the **Configuration** page under **Toggle Shelf on Initialization**, select the check box of a shelf that you want to toggle when the device initializes. For example, you might toggle a shelf that is configured for autofilling to ensure that the tubing does not interfere with the shelf movement.

8 If you want to slow down the pipette head during protocols, select the **Run device at medium speed during protocol** check box.

9 Verify that the **SDH Base** check box setting is correct for your Vertical Pipetting Station base.

WARNING **If the SDH Base check box setting is incorrect, potential damage to the device can result. If you are unsure about the selection, contact Automation Solutions Technical Support.**

- If the base is compatible with serial dilution heads, select the check box (default).
- If the base has part number 02318.001 or 02318.002, clear the check box. These models are not compatible with serial dilution heads.

10 Click **Update this profile** to save the new profile.

11 To establish communication with the device using this profile, click **Initialize this profile**.

If you are setting up the Vertical Pipetting Station for the first time, return to "Creating or adding a Vertical Pipetting Station device" on page 45 and select the profile name (step 5).

Related topics

For more information about...	See...
Profiles tab settings	"Profiles tab quick reference" on page 157
Replacing the pipette head	"Changing the pipette head" on page 74
Changing shelf settings on the Configuration page	"About configuring the shelves" on page 57
Configuring accessories	"Accessories overview" on page 110

For more information about...	See...
Setting teachpoints	"Setting shelf teachpoints" on page 59
Creating and running protocols	*VWorks Automation Control User Guide*

Initializing the Vertical Pipetting Station

About this topic

You initialize the Vertical Pipetting Station to establish communication between the computer and the device. To initialize the Vertical Pipetting Station, you can do either of the following:

- In the VWorks window, initialize the selected device
- In the Vertical Pipetting Station Diagnostics Profiles tab, initialize the profile

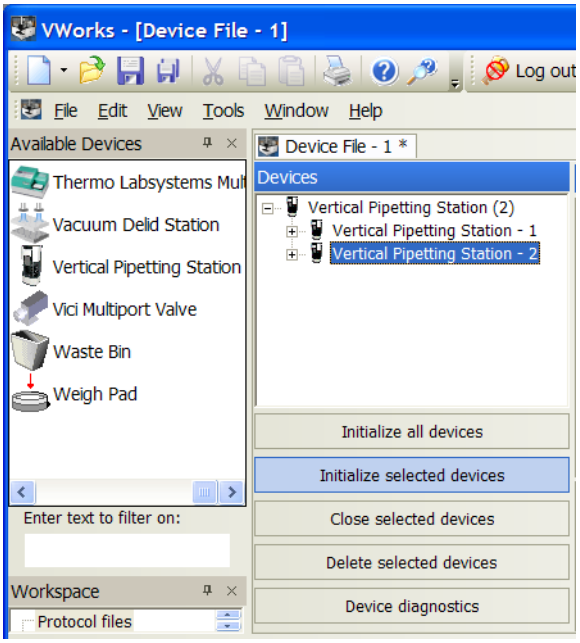
Procedures

To initialize a device in the VWorks window:

1. In the **VWorks** window, choose **File > Open**. In the **Open** dialog box, select the ***.dev** file type, navigate to the device file, and then click **Open**.

   A list of the devices appears in the Device File tab.

2. In the **Devices** area, highlight the device or devices that you want to establish communication with, and then click **Initialize selected devices**.



To initialize a profile in Vertical Pipetting Station Diagnostics:

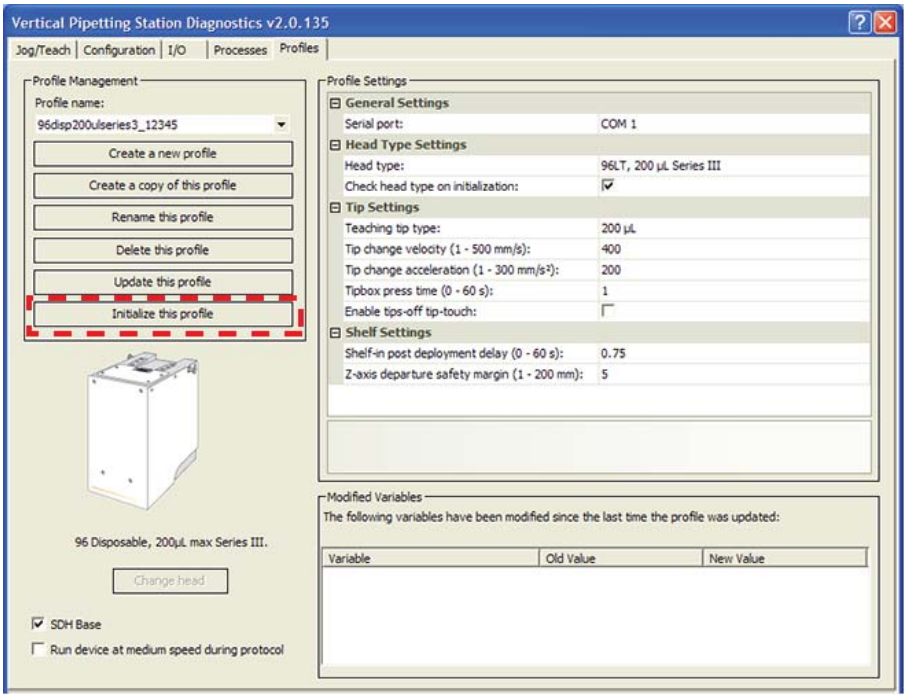
1. On the **Profiles** tab under **Profile Management**, select the **Profile** from the list.

   Note: If necessary, click **Close this profile** to close the currently initialized profile.

2. Verify that the selected **Head type** matches the pipette head mounted on the Vertical Pipetting Station.

   For example, if you installed a Series III pipette head, you must select a Series III head type.

3. Click **Initialize this profile** to establish communication with the Vertical Pipetting Station. An audible click indicates that the initialization is complete.



Related topics

For more information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Creating a profile	"Creating Vertical Pipetting Station profiles" on page 52
Replacing the pipette head	"Changing the pipette head" on page 74
Setting teachpoints	"Setting shelf teachpoints" on page 59
Creating and running protocols	*VWorks Automation Control User Guide*

About configuring the shelves

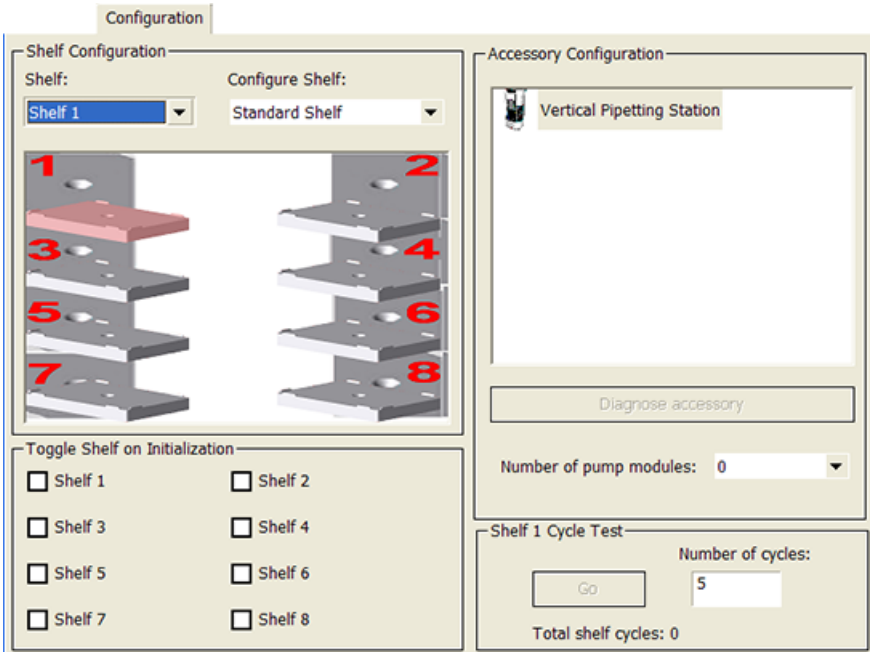
About this topic

This topic describes the configuration settings and options for the Vertical Pipetting Station shelves.

IMPORTANT The shelf configuration settings are saved with the profile.

Shelf configuration settings

In Vertical Pipetting Station Diagnostics, the Configuration page contains settings that specify the shelf type and function. Do not change the shelf configuration from a standard shelf unless you add an accessory that requires configuration or if you remove a shelf.



Toggling the shelves during initialization

Moving a shelf in and out (toggling the shelf) can reduce friction if the shelf has not been used recently. Toggling a shelf is also useful to ensure any Pump Module tubing is attached properly. You can configure a shelf to toggle automatically after homing during initialization.

To automatically toggle shelves during initialization:

1. On the **Vertical Pipetting Station Diagnostics Profiles** page, select the profile that you want to change.
2. On the **Configuration** page, select the check boxes of the shelves under **Toggle Shelf on Initialization**.
3. On the **Profiles** page, click **Update this profile**.

Related topics

For more information about...	See...
Creating a profile	"Creating Vertical Pipetting Station profiles" on page 52
Configuring an accessory shelf	"Accessories overview" on page 110
Configuring a standard shelf or an empty shelf location	"Configuring standard or empty shelves" on page 115
Setting teachpoints	"Setting shelf teachpoints" on page 59
Creating and running protocols	*VWorks Automation Control User Guide*

Setting shelf teachpoints

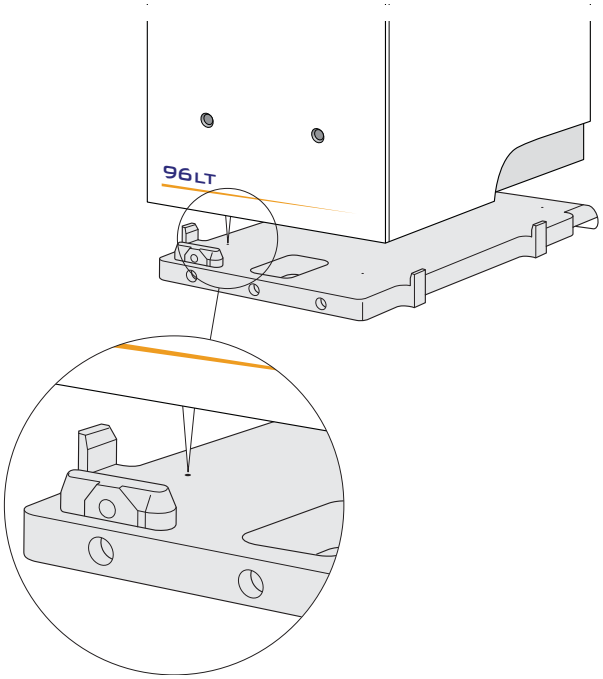
About this topic

This topic describes how to set the shelf teachpoints for the Vertical Pipetting Station.

CAUTION This topic is appropriate for lab managers, administrators, or technicians (advanced users). Setting a teachpoint incorrectly can damage the Vertical Pipetting Station.

Teachpoint defined

A teachpoint is the *x*-, *y*-, and *z*-axes coordinates that the pipette head moves to when the left-front tip (A1 position for a 96-well plate) is over the shelf index point and almost touching the surface of the shelf.



When aspirating or dispensing, the software uses the shelf teachpoint and information about the labware geometry to determine where to position the pipette head to access the wells specified in the protocol.

When to do this

You must set the teachpoints when you:

- Set up the Vertical Pipetting Station
- Add an additional accessory or pipette head to the Vertical Pipetting Station
- Change the teaching tip type in the profile for a disposable-tip pipette head

Before you begin

Verify that the following conditions are met:

- You have administrative privileges for the Microsoft Windows registry.

  Vertical Pipetting Station teachpoints are stored in the Microsoft Windows registry, which requires administrative privileges for making changes. See the system administrator for details.
- A device file exists for the Vertical Pipetting Station.
- The shelves are free of any labware and are in the out position.
- The correct pipette head is installed, and the corresponding profile is initialized.
- You are familiar with the pipette head axes of motion. See "Pipette head axes of motion" on page 15.

CAUTION Modifying the registry values incorrectly can cause the computer crash or result in a head collision on the Vertical Pipetting Station.

CAUTION Use the Toggle Shelf button on the Jog/Teach page to move a previously used shelf to the out position before selecting a new shelf.

IMPORTANT To perform an immediate stop, press the SPACEBAR on your keyboard, or click **Stop motors** in the Vertical Pipetting Station Diagnostics window.

Note: Each shelf teachpoint is set individually. Adjusting one shelf's teachpoint has no effect on the another shelf's teachpoint.

Setting the shelf teachpoints

Use the following procedure to set teachpoints for:

- Shelves 1 to 6
- Shelves 7 and 8 if using a fixed-tip pipette head

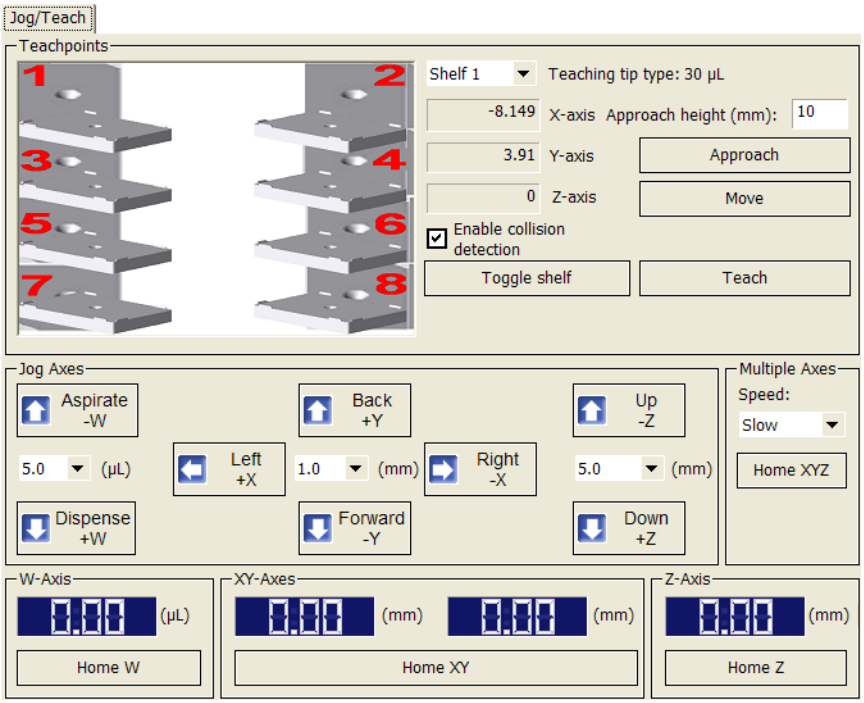
  For disposable-tip pipette heads, see "Teaching shelves 7 and 8 for tipboxes" on page 64.

If you are using a fixed-tip pipette head, you set the teachpoint according to the A1 needle of the pipette head. If you are using a pipette head with disposable tips, you place a tip on the A1 barrel to set the teachpoint.

To set a shelf teachpoint:

1 In **Vertical Pipetting Station Diagnostics**, click the **Jog/Teach** tab.

2 To ensure that the pipette head is out of the path of the shelves, click the **Home Z** button.



3 Under **Multiple Axes**, set the **Speed** to **Slow**. This slows down the pipette head movement.

4 Select a shelf from the list. The currently stored coordinates for that teachpoint appear below the list. Make a note of the stored coordinates as a back-up.

5 (Disposable-tip head only) Manually attach a single tip firmly on the A1 barrel (left front) of the pipette head.

Make sure to use an Automation Solutions tip that is the same type specified in the profile as the teaching tip type.

6 In the **Teachpoints** area, set the **Approach height** to a safe stopping distance above the shelf (typically, 20 mm).

IMPORTANT The approach height value is dependent on the type of pipette head, the tip size, and shelf height. For example, the Approach height for shelves 1 and 2 might be smaller than the approach height for other shelves. If you are uncertain about how to set this value, start with a large value, such as 50 mm.

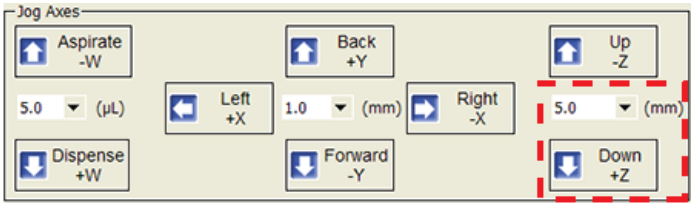
7 Click **Approach**. The head moves along the x-, y-, and z-axes to the specified coordinates above the saved teachpoint.

8 Verify that the shelf has enough clearance to move into position under the pipette head. If necessary, adjust the approach height (z-axis) to ensure sufficient clearance.

9 Click **Toggle shelf**. The shelf slides into position under the pipette head.

10 Under **Jog Axes**, use the controls to jog the pipette head down to the teachpoint position as follows:

IMPORTANT Set the increment of travel based on how far above the shelf the pipette head is located. If you are uncertain about how to set this value, start with a small value, such as 1 mm or less.



a Set the z-axis increment to 2–5 mm, and click **Down +Z** to jog the head down until the tip is just above the shelf index point.

b Set the z-axis increment to 0.1 mm.

c While sliding a thin sheet of paper between the shelf and the tip, jog the head down until the tip barely pinches the paper.

d Click **Up –Z** to back off the teachpoint by 0.1 mm.

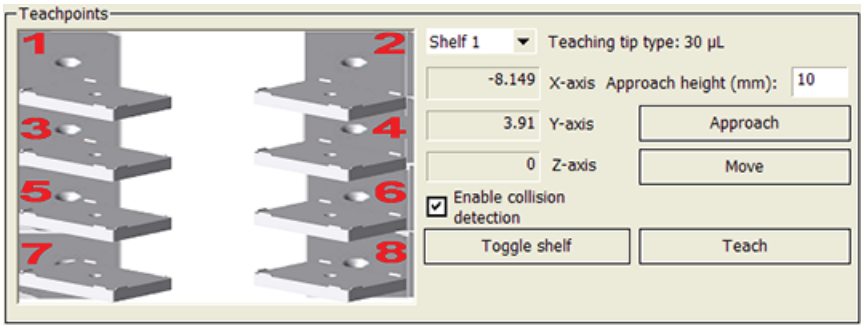
e Set the x- and y-axes increment to 0.1–0.2 mm.

f Use the **X** and **Y** buttons to position the tip exactly above the shelf index point.

11 When the tip is in the correct position (directly over the index point with paper-thin clearance), click **Teach**.

Verify the information in the message box before you click **Yes**.

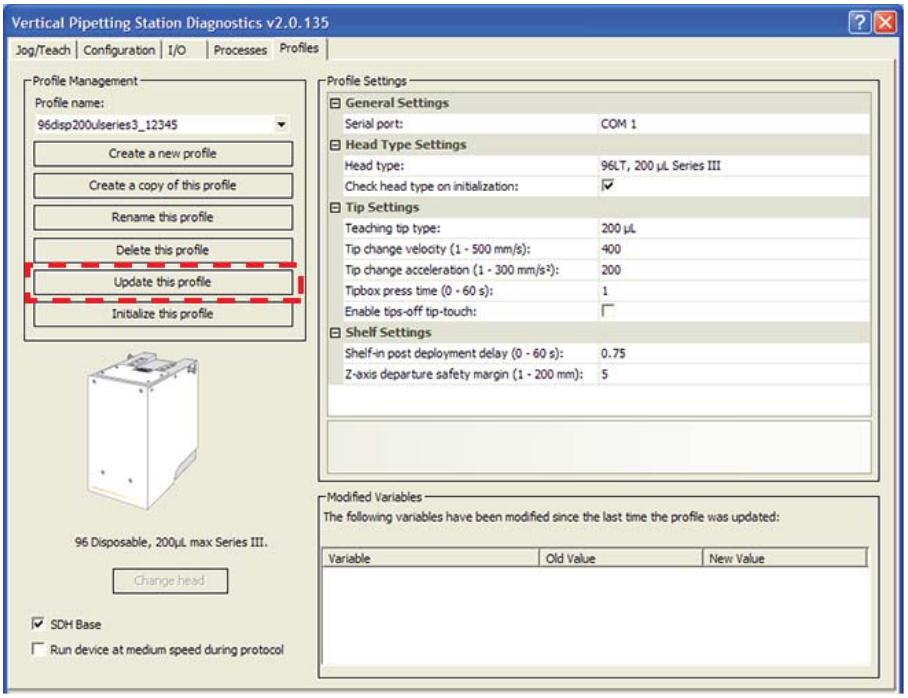
12 Click **Approach** to move the pipette head up, and then click **Toggle shelf** to move the shelf out.



13 Repeat step 4 to step 12 to teach the next shelf.

(Disposable-tip pipette heads only) To set the teachpoints for shelves 7 and 8, see "Teaching shelves 7 and 8 for tipboxes" on page 64.

14 On the **Profiles** tab, click **Update this profile** to save the teachpoints.



Related topics

For more information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Creating profiles	"Creating Vertical Pipetting Station profiles" on page 52
Setting teachpoints for tipboxes	"Teaching shelves 7 and 8 for tipboxes" on page 64
Initializing a profile	"Initializing the Vertical Pipetting Station" on page 55
Configuring a shelf for an accessory, such as the Weigh Shelf	"Vertical Pipetting Station accessories" on page 109
Creating protocols	*VWorks Automation Control User Guide*
Preparing to run a protocol	"Preparing to run a protocol" on page 68

Teaching shelves 7 and 8 for tipboxes

About this topic

The tips-on and tips-off operations for disposable-tip pipette heads require a tipbox on shelf 7 or 8 to attach the fresh tips and receive the used tips. This topic describes how to set the teachpoint for a tipbox shelf.

CAUTION This topic is appropriate for lab managers, administrators, or technicians (advanced users). Setting a teachpoint incorrectly can damage the Vertical Pipetting Station.

Before you begin

CAUTION The Vertical Pipetting Station requires a pipette profile for each combination of base, pipette head, and accessories. Teachpoint values created for one combination can be inaccurate for another.

Before you perform the following procedure:

- Ensure the correct pipette head is installed, no tips are installed on the pipette head, and the corresponding profile is initialized.
- Retract the pipette head stripper pins to help ensure that the tipbox will not move. See “Retracting and releasing stripper pins” on page 80.
- Remove all labware removed from the shelves.
- Make sure you have the correct tipbox for the teaching tip, and verify that a labware definition exists for the tipbox.

To set the teachpoints for a tipbox shelf, you must use a tipbox.

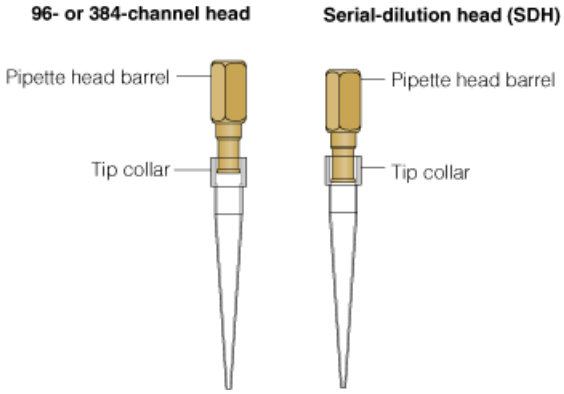
If you are using small transfer (ST) tips that are 30 µL or less, you must use a tipbox to set the teachpoints on shelves 7 and 8 even if one of the shelves is used for other labware. In this case, the ST tips cannot reach the index point on shelves 7 and 8. Therefore, the software uses a combination of the shelf teachpoint and the tipbox labware definition to position the pipette head correctly.

Tip position in the pipette head barrels

Tipbox operations can be performed from Vertical Pipetting Station shelves 7 and 8. To ensure proper tipbox operations, the pipette head barrels must be in a specific position relative to the tipbox during a tips-on or tips-off process. The correct position for the head barrels varies depending on the type of pipette head:

- *96- or 384-channel pipette heads*. The pipette head barrels should be halfway into the tip collars.
- *Serial-dilution pipette heads (SDH)*. The pipette head barrels should be all the way down into the tip collars.

Figure Tip position in the pipette head barrels

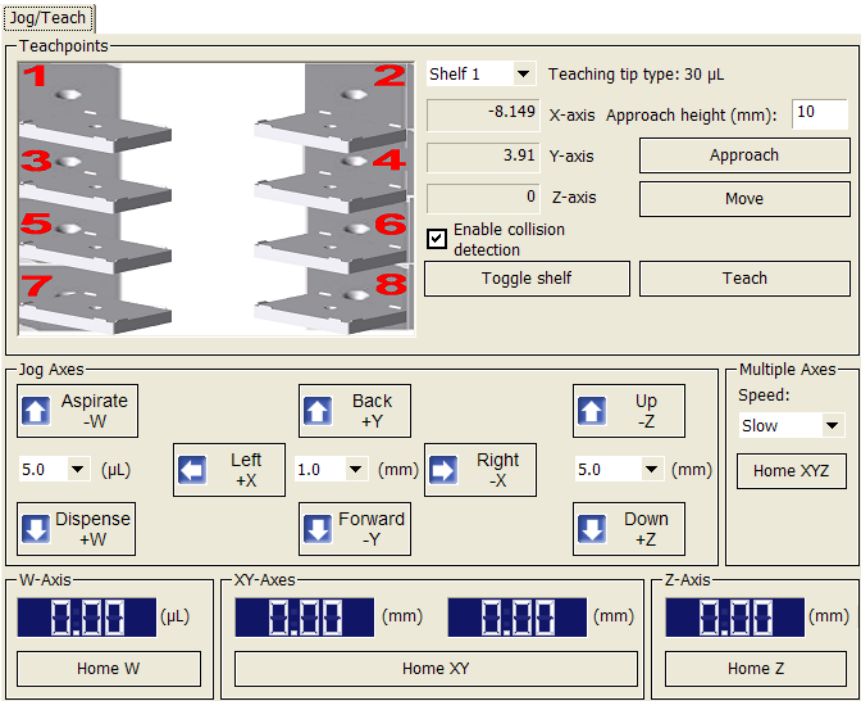


Procedure

To teach shelves 7 and 8 for tipboxes:

1 Verify that no tips are on the pipette head.

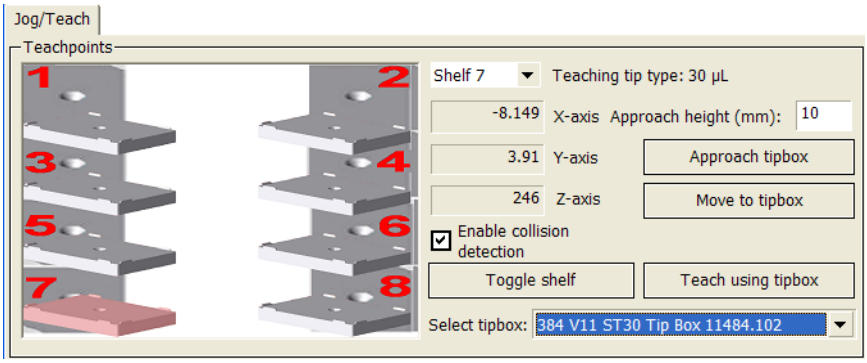
2 In **Vertical Pipetting Station Diagnostics**, click the **Jog/Teach** tab.



3 To ensure that the pipette head is out of the path of the shelves, click the **Home Z** button. Make sure the shelves are in the out position.

4 In the **Teachpoints** area, select **Shelf 7**. The **Teachpoints** area changes to include tipbox controls.

5 In the **Select tipbox** list, select the tipbox for the specified Teaching tip type.



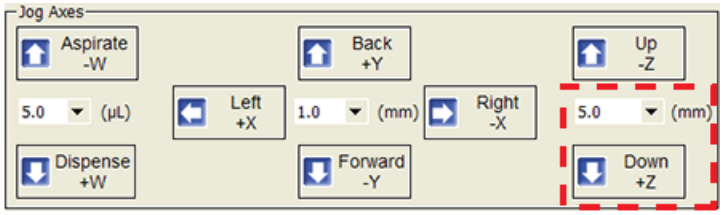
6 In the **Approach height** box, type a safe stopping distance (mm) above the saved teachpoint, for example, 20 mm. Click **Approach tipbox**.

The pipette head moves to the approach height above the existing tipbox teachpoint.

7 Verify that shelf 7 has clearance to move into position under the pipette head, and then click **Toggle shelf**.

8 At the Vertical Pipetting Station, place the tipbox containing a full set of tips on shelf 7.

9 In the **Jog Axes** area, set the z-axis increment to 1.0 mm.

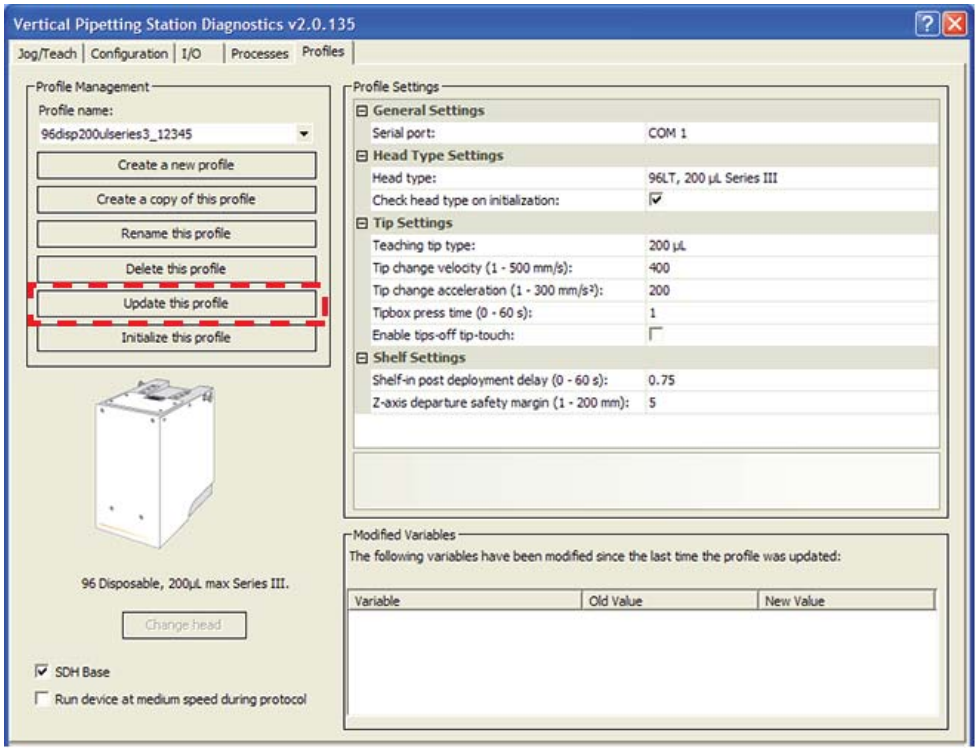


10 Click the **Down +Z** button repeatedly to jog the head down until the pipette barrels are in position within the tip collars. If necessary, jog in the x-axis and y-axis to center the barrels within the tip collars.

11 Click **Teach using tipbox**, and then click **Yes** when the confirmation dialog box appears.

12 Repeat step 1 to step 11 to teach shelf 8.

13 On the **Profiles** tab, click **Update this profile** to save the teachpoints.



Related topics

For more information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Setting the shelf teachpoints	"Setting shelf teachpoints" on page 59
Initializing a profile	"Initializing the Vertical Pipetting Station" on page 55
Defining labware and liquid classes	*VWorks Automation Control Setup Guide*
Creating protocols	*VWorks Automation Control User Guide*
Performing tips-on and tips-off tasks	"Running a process using Diagnostics software" on page 106
Preparing to run a protocol	"Preparing to run a protocol" on page 68

Preparing to run a protocol

About this topic

This topic describes how to prepare the Vertical Pipetting Station for a run.

Procedure

To prepare the Vertical Pipetting Station for a a run:

1. Ensure the correct pipette head is installed and the Vertical Pipetting Station is turned on.
2. Initialize the profile for the hardware configuration. See "Initializing the Vertical Pipetting Station" on page 55.
3. If required, place microplates, tipboxes, and other labware in their correct locations on the Vertical Pipetting Station shelves.
4. If applicable, ensure the reservoirs are filled, the waste bottles are empty, and all tubing is correctly connected.
5. Ensure that the protocol has been checked for errors using the compile feature. If possible, run the protocol in simulation mode to identify possible conflicts or errors.

Related topics

For more information about...	See...
Installing and setting up Vertical Pipetting Station	• "Installing Vertical Pipetting Station" on page 23 • "Workflow for setting up the Vertical Pipetting Station" on page 42
Installing, setting up, and running the automation control software	*VWorks Automation Control User Guide*
Initializing the Vertical Pipetting Station	"Initializing the Vertical Pipetting Station" on page 55
Changing the pipette head	"Changing the pipette head" on page 74

5 Maintaining Vertical Pipetting Station

This chapter describes how to maintain the Vertical Pipetting Station in good working order and what to do when you encounter a problem.

This chapter contains the following topics:

Routine maintenance

About this topic

Preventive maintenance is an important part of keeping the Vertical Pipetting Station running smoothly and error free. This topic describes the periodic routine maintenance you should perform.

Practice good housekeeping by cleaning up spills immediately and routinely cleaning the Vertical Pipetting Station and pipette head after use. Contact Automation Solutions Technical Support if you are unable to resolve problems.

Routine inspection and maintenance

Periodically, perform the routine maintenance listed below. Your schedule might vary depending on the frequency of Vertical Pipetting Station use.

Maintenance task	Schedule	Symptoms
Clean the Vertical Pipetting Station.	Weekly or as needed	Dust, grime, or chemical deposits on exterior
Verify shelf teachpoint accuracy	Bimonthly	Inaccurate dispensing on a particular shelf
Calibrate the Weigh Shelf, if applicable.	Bimonthly	Deterioration of liquid-level accuracy in reservoir
Inspect the Pump Module tubing. Change out the tubing as necessary.	Monthly	Tube deterioration, or liquid fails to pump or fails to drain properly
Check the air-pressure level at the Vertical Pipetting Station. You can find the air-pressure level on the IO page in Vertical Pipetting Station Diagnostics.	Monthly	Insufficient air pressure errors and unresponsive shelves
Inspect shelf movement for smoothness.	Monthly	Jerky shelf movement, or shelf moves too fast or too slow
Inspect moving parts to ensure they are not rubbing against each other.	Monthly	Rub marks or noises that might indicate rubbing

Related topics

For information about...	See...
Safety guidelines	“Safety guidelines” on page 1
Cleaning between protocol runs	“Cleaning up after a run” on page 71

For information about...	See...
Cleaning the Vertical Pipetting Station	"Cleaning the Vertical Pipetting Station" on page 72
Air source requirements	"Laboratory requirements" on page 25
Reporting a problem	"Reporting problems" on page 93

Cleaning up after a run

About this topic

This topic describes the post-run tasks you perform after a protocol run before running the next protocol.

Cleaning up after a run

To clean up the Vertical Pipetting Station after a run:

1. Ensure the tips are clean or fresh:
   - *Fixed-tip pipette head*. Use the wash-tips task in Vertical Pipetting Station Diagnostics to wash the pipette tips.
   - *Disposable-tip pipette head*. Use the tips-off task in Vertical Pipetting Station Diagnostics to remove the pipette tips.
2. Ensure all shelf and head movement has stopped, and then remove any manually placed labware from the shelves, and clean the shelves and base of any spills or debris.
3. Wash the liquid reservoirs and wash trays.
4. If the system has a Pump Module:
   a. (Optional) Wash the tubing and reinstall the reservoirs or wash trays. Ensure that the tubing is connected to the correct pumps and allows the shelves to move freely.
   b. Fill the fluid reservoir bottle, replace the cap, and attach the fluid line that pumps towards the Vertical Pipetting Station to the cap connector.
   c. Empty the waste container, replace the cap, and attach the fluid line that pumps away from the Vertical Pipetting Station to the cap connector.
   d. To prime the fluid lines between the pump and reservoirs, use Vertical Pipetting Station Diagnostics to fill the lines with the appropriate fluid.
5. Check the run log file for errors. For details on the run log, see the appropriate software user guide, such as *VWorks Automation Control User Guide*.
6. (Weigh Shelf only) Recalibrate the Weigh Shelf if:
   - Moving the reservoir, wash station, and Weigh Shelf

- Changing the tubing connected to the reservoir or wash station
- Changing the liquid type used in the reservoir or wash station
- More than two weeks have elapsed since the last Weigh Shelf calibration

Related topics

For information about...	See...
Log and data files	*VWorks Automation Control User Guide*
Safety guidelines	"Safety guidelines" on page 1
Shutting down	"Shutting down the Vertical Pipetting Station" on page 44
Maintaining the Vertical Pipetting Station	"Routine maintenance" on page 70
Wash tips and tips-on and off tasks	"Running a process using Diagnostics software" on page 106
Calibrating a Weigh Shelf	"Installing and calibrating a Weigh Shelf" on page 149
Reporting a problem	"Reporting problems" on page 93

Cleaning the Vertical Pipetting Station

About this topic

This topic provides guidelines for periodic routine cleaning of the Vertical Pipetting Station to remove dust, grime, or chemical deposits on the exterior.

For details on cleaning up between protocols, see "Cleaning up after a run" on page 71.

Procedure

About this topic

This topic provides guidelines for periodic routine cleaning of the Vertical Pipetting Station to remove dust, grime, or chemical deposits on the exterior.

Procedure

WARNING **Disconnect the power and communication cables before cleaning.**

CAUTION Do not use harsh abrasives, corrosive cleaning agents, or metal brushes to clean any Vertical Pipetting Station component or accessory.

To clean the Vertical Pipetting Station:

1. Shut down the Vertical Pipetting Station.
2. Disconnect the power cable and communication cable.
3. Use standard laboratory wipes and a mild detergent or ethanol to clean the painted white surfaces and the aluminum surfaces.

WARNING **Disconnect the power and communication cables before cleaning.**

CAUTION Do not use harsh abrasives, corrosive cleaning agents, or metal brushes to clean any Vertical Pipetting Station component or accessory.

To clean the Vertical Pipetting Station:

1. Shut down the Vertical Pipetting Station.
2. Disconnect the power cord and communication cord.
3. Use standard laboratory wipes and a mild detergent or ethanol to clean the painted white surfaces and the aluminum surfaces.

Related topics

For information about...	See...
Safety guidelines	“Safety guidelines” on page 1
Shutting down the Vertical Pipetting Station	“Shutting down the Vertical Pipetting Station” on page 44
Cleaning between protocol runs	“Cleaning up after a run” on page 71
Moving the pipette head	“Moving the pipette head manually” on page 82
Removing the pipette head	“Changing the pipette head” on page 74
Maintaining the Vertical Pipetting Station	“Routine maintenance” on page 70
Reporting a problem	“Reporting problems” on page 93

Changing the pipette head

About this topic

This topic describes how to change the pipette head using the Change Head wizard in Vertical Pipetting Station Diagnostics. The wizard positions the pipette head for easy access and provides prompts that step you through the procedure.

Before you begin

IMPORTANT If a pipette head is being used for the first time, make sure you have a profile specifically for the pipette head.

IMPORTANT If you have an older model Vertical Pipetting Station, verify that the device can accept a serial-dilution pipette head before attempting to install this type of pipette head.

Verify the following:

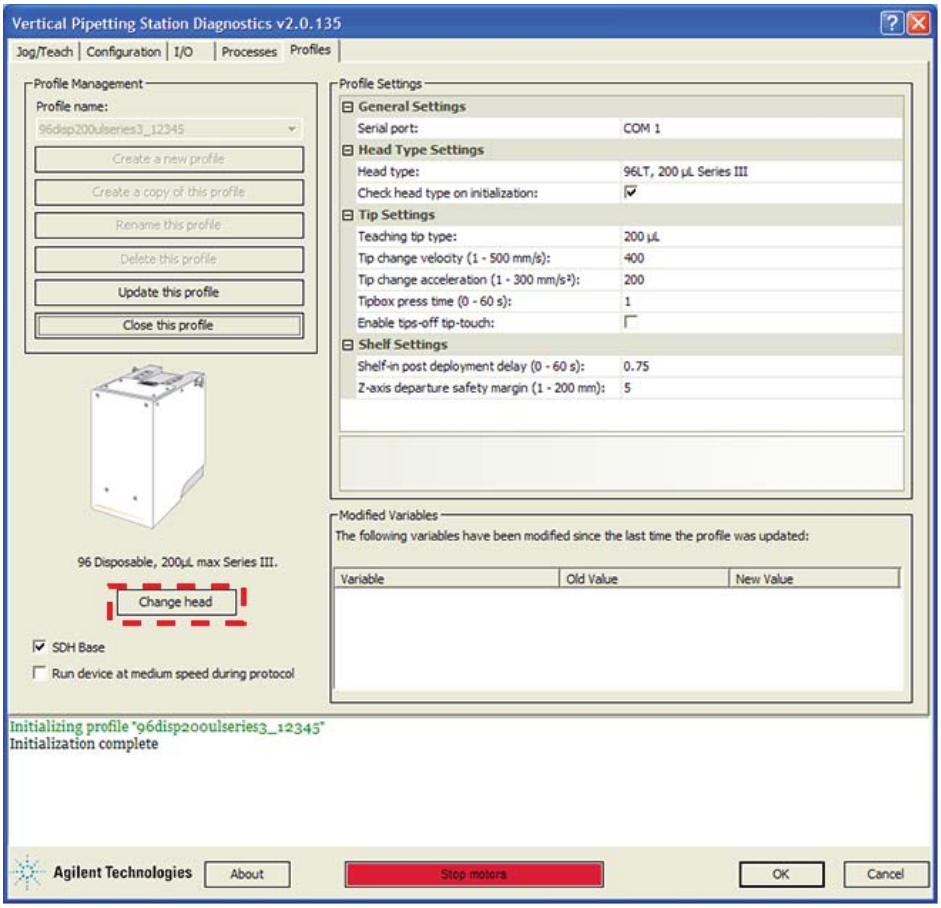
- (Disposable-tip pipette heads only) The currently mounted head contains no tips. To remove any tips, see "Running a process using Diagnostics software" on page 106.
- All shelves are moved to the out position and clear of the pipette head. You can use the Shelf buttons on the IO tab to move a shelf. See "Using actuator controls and indicators" on page 105.

Changing a pipette head

To change the pipette head using the Change Head wizard:

1. In Vertical Pipetting Station Diagnostics, click the **Profiles** tab.
2. On the **Profiles** page, click **Change head**.

   Note: The Change head button is available only after initializing the current profile.

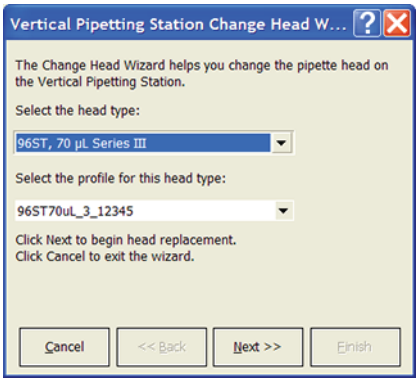


3 In the **Change Head Wizard**:

a Select the pipette head from the **Select the head type** list.

b In the **Select the profile for this head type** list, select the profile name.

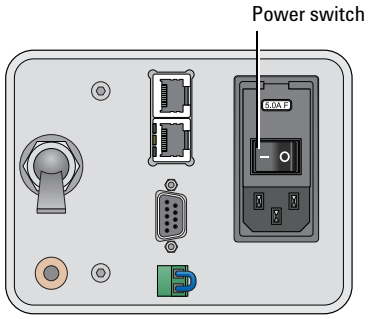
c Click **Next**.



WARNING **Keep clear of the Vertical Pipetting Station while it is in motion. Never touch any of the moving parts or attempt to move labware while the Vertical Pipetting Station is in operation. The device could pinch, pierce, or bruise you.**

The pipette head moves down into position. The Change Head Wizard displays an overview of the procedure for changing the pipette head. For the detailed procedure, proceed to step 4 through step 11.

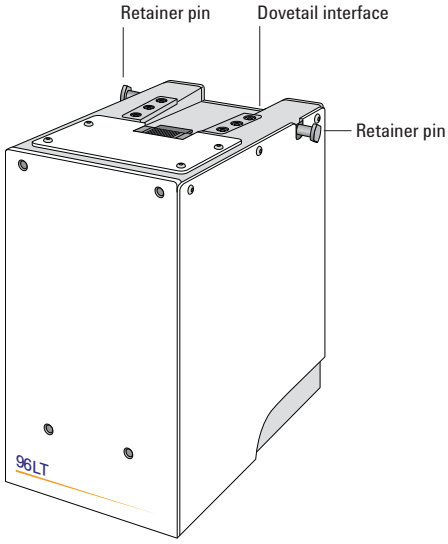
4 To turn off the Vertical Pipetting Station, press the power switch on the rear panel to the **off (o)** position.



CAUTION Always turn off the Vertical Pipetting Station before removing a pipette head. Failure to turn off the Vertical Pipetting Station before changing the pipette head can damage the pipette head electronics.

5 To unlock the mounted pipette head, do one of the following:

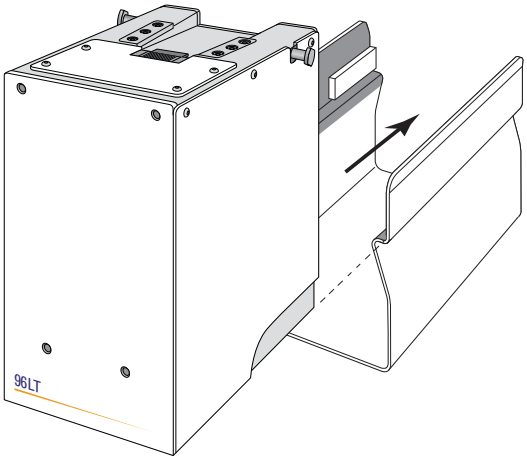
- *8- and 16-channel heads.* On the front of the pipette head, rotate the head lock (not shown) counterclockwise to the **Unlock** position.
- *96- and 384-channel heads.* Pull out and twist the two head-retainer pins one-quarter turn so that they remain retracted.



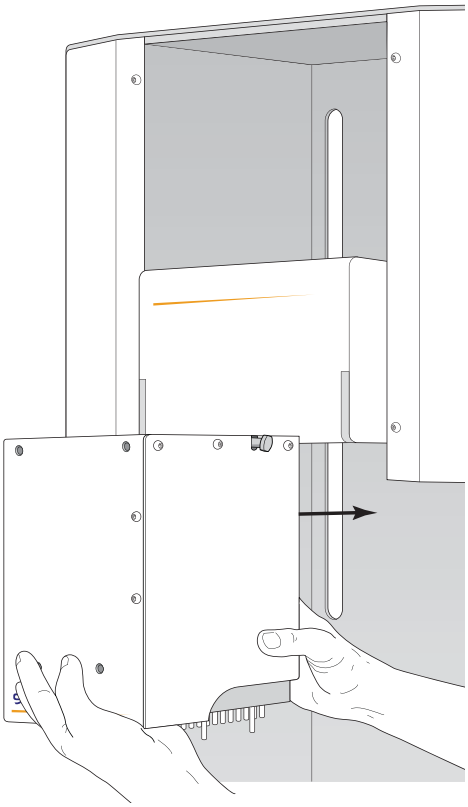
6 Grasp the pipette head firmly using care not to touch the tips or barrels. While supporting the head with your hands, use your thumbs to push the head from side to side and slide it out of the Vertical Pipetting Station head mount.

CAUTION Support the pipette head carefully without touching the barrels or tips. Dropping the head or bumping the tips or barrels will damage the head.

7 Carefully slide the pipette head into the head stand to protect the barrels and tips for storage.



8 Slide the pipette head onto the Vertical Pipetting Station head mount. Press the pipette head firmly into place to ensure the head is plugged into the connector receptacle on the head mount.



9 To lock the pipette head in place, do one of the following:

- *98- and 384-channel heads.* Twist the two head-retainer pins so that they snap into place.
- *8- and 16-channel heads.* On the front of the pipette head, rotate the head lock (not shown) counterclockwise to the **Lock** position.

10 To verify that the pipette head is secure, firmly support the head with your hands while you attempt to move the head from side to side as if to remove it. If the head is locked, it will not disengage from the dovetail interface.

CAUTION Do no touch the pipette head barrels or tips with your hands.

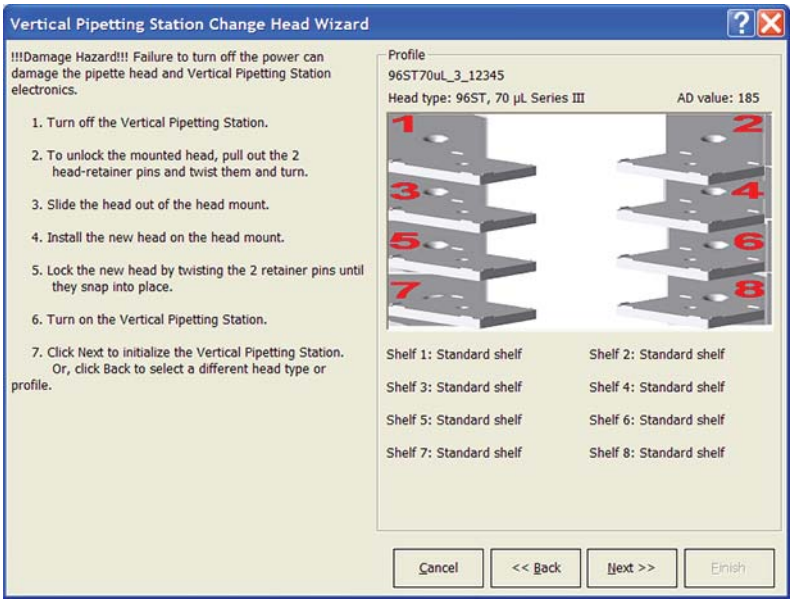
CAUTION If the pipette head is not properly secured in place, it could drop unexpectedly. Dropping the pipette head or bumping the tips or barrels will damage the head. Contact Automation Solutions Technical Support if you suspect that the pipette head has been damaged.

11 To turn on the power, press the power switch on the rear panel to the **on (–)** position.

WARNING **During initialization the pipette head can move. Keep fingers, hair, clothing, and jewelry away from the Vertical Pipetting Station while it is in motion. Never touch any of the moving parts or attempt to move labware while the Vertical Pipetting Station is in operation. The device could pinch, pierce, or bruise you.**

12 In the **Change Head Wizard**, click **Next** to initialize the installed pipette head.

When the **Vertical Pipetting Station initialization was successful** page appears, click **Finish** to complete the process.



Related topics

For information about...	See...
Safety guidelines	“Safety guidelines” on page 1
Opening Vertical Pipetting Station Diagnostics	“Opening Vertical Pipetting Station Diagnostics” on page 50
Creating a profile	“Creating Vertical Pipetting Station profiles” on page 52
Pipette heads	“Pipette heads” on page 16
Moving the pipette head	• “Moving the pipette head manually” on page 82 • “Jogging the pipette head” on page 101 • “Using the Approach and Move commands” on page 104

Retracting and releasing stripper pins

About this topic

This topic describes how to retract and release the tip box stripper pins on a disposable-tip pipette head.

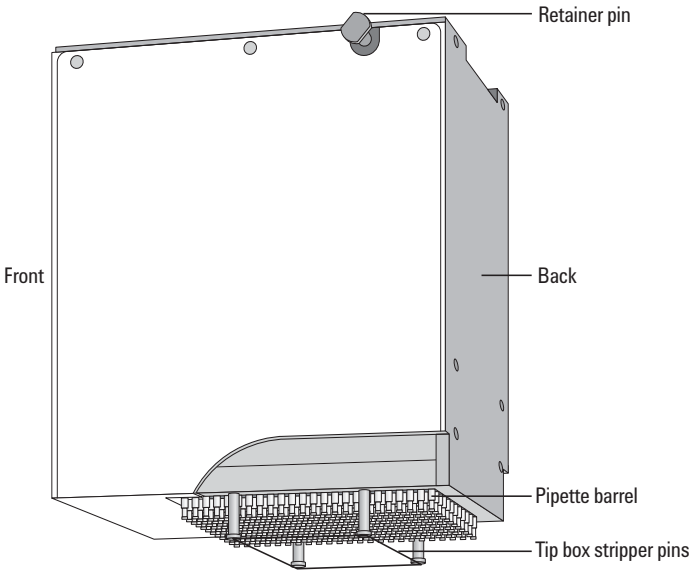
CAUTION Do not use the Tips On command while the stripper pins are retracted. The tip box could be picked up by the pipette head, which could result in a crash if the head is accessing a shelf.

Tip box stripper pins described

The disposable-tip pipette heads have four stripper pins that prevent the tip box from raising off the shelf when tips are being applied.

However, you can retract the stripper pins to perform a task where the pins will interfere. For example, you should retract the stripper pins when you teach a tip box shelf.

Figure Pipette head components



The pins are spring-loaded and should retract until the pin head is nearly flush with the surface of the pipette head. The tip of each pin, which is hidden within the pipette head housing, has a semi-circle-shaped locking mechanism that aligns with a dowel inside the pipette head to lock the pin in the retracted position.

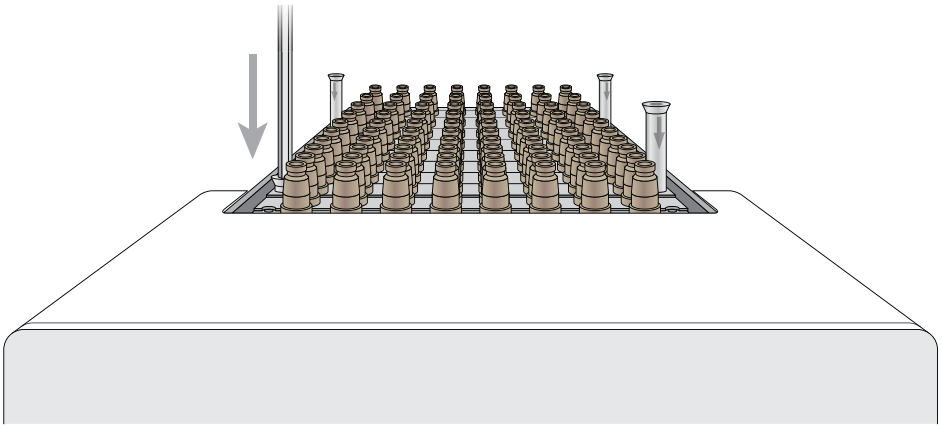
Retracting tip box stripper pins

CAUTION If you apply too much force when pressing down or rotating the pin to retract it, the locking mechanism at the tip of the pin can bend or break. A damaged pin cannot lock in the retracted position. Use only gentle pressure to push down and rotate the pin to lock it into place.

To retract the tip box stripper pins:

1. Place the pipette head upside down on a stable surface, so that the barrels are facing up and the front of the pipette head is facing you as the following figure shows.

   If directional arrows appear on the pins, gently rotate the pins so that the arrows are facing you.



2. Insert the end of a 2-mm hex wrench into the head of one of the pins, and very gently push the pin down into the pipette head until you feel the pin stop.

   Verify that the pin is properly seated, as the preceding figure shows. If the pin has an arrow, the square end of the arrow should disappear or be barely visible.

   IMPORTANT If the pin hits a stop before it retracts completely, the pin locking mechanism is above instead of below the locking dowel. While removing any downward pressure on the pin head, gently rotate the pin in quarter-turn increments until you feel the pin drop into the seated position.

3. When the pin is properly seated, rotate it counterclockwise no more than 180° until it locks.
4. Repeat this procedure for the other pins.

Releasing tip box stripper pins

To release the retracted tip box stripper pins:

1. Insert a 2-mm hex wrench into the pin head.
2. Turn the wrench clockwise to release the pin.
3. Repeat this procedure for the other pins.

Related topics

For information about...	See...
Teaching a tipbox shelf	"Teaching shelves 7 and 8 for tipboxes" on page 64
Removing a pipette head	"Changing the pipette head" on page 74
Maintaining the Vertical Pipetting Station	See "Routine maintenance" on page 70.
Reporting a problem	"Reporting problems" on page 93

Moving the pipette head manually

About this topic

This topic describes how to move the pipette head manually in the x- and y-axis. For example, you might want to move the head position when changing pipette heads or cleaning the Vertical Pipetting Station.

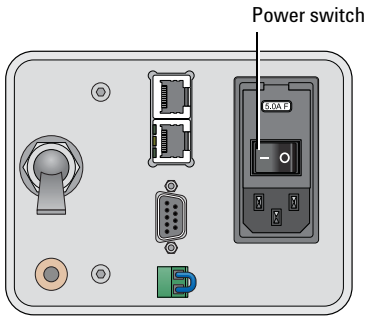
To use Vertical Pipetting Station Diagnostics to move the pipette head to a specific location, see "Using Diagnostics software" on page 95.

Procedures

CAUTION Turn off the Vertical Pipetting Station before attempting to move the pipette head manually. Manually moving the pipette head in any of its axes without first disabling the servos could damage the pipette head motors.

To move the pipette head manually:

1 On the back of the Vertical Pipetting Station, press the power switch to the **off (o)** position.



2 Use your hands to gently move the pipette head along the x-axis and y-axis.

3 When you are finished moving the pipette head, press the power switch to the **on (-)** position.

Related topics

For information about...	See...
Using Vertical Pipetting Station Diagnostics to move the pipette head	• "Homing the pipette head" on page 98 • "Jogging the pipette head" on page 101 • "Using the Approach and Move commands" on page 104

Replacing the fuse

About this topic

This topic describes how to replace the main fuse in the Vertical Pipetting Station.

Before you begin

CAUTION A blown fuse can indicate more serious problems. If the new fuse blows after replacement, contact Automation Solutions Technical Support.

CAUTION Using an incorrect fuse can damage the Vertical Pipetting Station.

Use only the specified fuse type: 5 A, 250 V, 0.25 × 1.25 in (6.35 x 31.75 mm), fast acting.

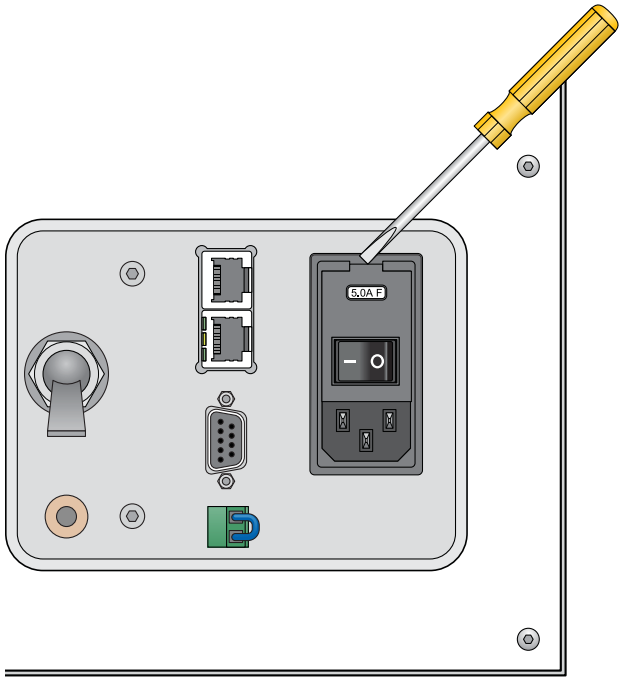
You can order fuses from Agilent Technologies.

Procedure

To replace the fuse in the power switch:

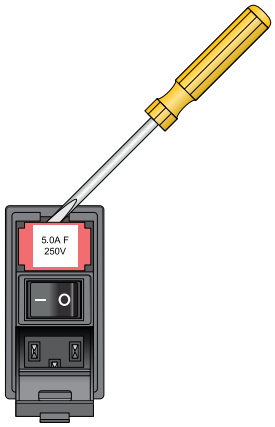
1. Shut down the Vertical Pipetting Station, and unplug the power cable from the rear panel connector.
2. At the rear panel power switch enclosure, use a small flat-head screwdriver (2.5 mm) to pry open the tab at the top of the enclosure and open the enclosure cover.

Figure Fuse enclosure location



3 At the top of the enclosure, insert the screwdriver head in the notch to dislodge the red fuse cartridge. Slide the fuse cartridge all the way out of the enclosure.

Figure Opened fuse enclosure



4 Replace the fuse or fuses for the type of system you are using:

- *115 V power*. While maintaining the fuse cartridge orientation relative to the enclosure, replace the fuse on the right side of the cartridge. The cartridge might also contain a second fuse as a spare.
- *230 V power*. Inspect the fuses on each side of the cartridge, and then replace the suspect fuse.

5 Slide the fuse cartridge back into the power switch enclosure.

6 Press the enclosure cover securely into the closed position.

7 Plug in the power cable at the rear panel connector, and then start up the Vertical Pipetting Station.

Related topics

For information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Shutting down the Vertical Pipetting Station	"Shutting down the Vertical Pipetting Station" on page 44
Starting the Vertical Pipetting Station	"Starting up and shutting down" on page 43
Maintaining the Vertical Pipetting Station	"Routine maintenance" on page 70
Reporting a problem	"Reporting problems" on page 93

Recovering from a power outage

About this topic

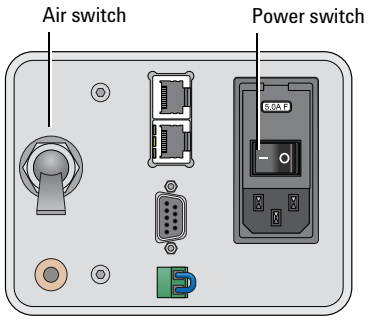
A loss of power can be the result of either inadvertently turning off the power switch or a power failure. Regardless of the cause, a loss of power disrupts the communication between the Vertical Pipetting Station and the automation control software. You cannot resume a protocol that was running at the time of the power outage. To recover from the power outage safely, perform the following procedure.

CAUTION If a power outage occurs when the pipette tips are inside of a plate, the shelves will move to the outer position. The shelf movement can cause damage to a fixed-tip head.

Recovering from a power outage

To recover from a power outage:

1 On the Vertical Pipetting Station rear panel, ensure the power switch is set to the **off (o)** position and the air switch is set to the **off (down)** position.



2 Ensure that the shelves are moved out and clear of the pipette head, and remove any labware from the shelves.

   If necessary, you can manually move a shelf to the out position.

3 If possible, cancel the run in the VWorks software.

   CAUTION Before you click Abort, make sure the shelves are in the out position. Aborting a run causes the shelves to retract, which could cause a head collision.

   For example, click **Abort** if an error message appears with options to Retry, Ignore, or Abort.

   Alternatively, click **Pause** on the toolbar, and then click **Abort process**.

4 On the rear panel, press the power switch to the **on (–)** position.

5 Open Vertical Pipetting Station Diagnostics and initialize the correct profile. Ignore the low air-pressure warning. Wait until the pipette head moves upwards in the *z*-axis to the top of its travel.

6 On the rear panel, set the air switch to the **on (up)** position.

   The shelves should move to the outer positions.

7 Re-initialize the profile so that the system also monitors the air pressure.

8 To continue an interrupted protocol task manually, use the **Processes** tab in Vertical Pipetting Station Diagnostics. See "Running a process using Diagnostics software" on page 106.

Related topics

For information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Stopping or pausing a run	*VWorks Automation Control User Guide*
Stopping in an emergency	"Stopping in an emergency" on page 4
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Initializing a profile	"Initializing the Vertical Pipetting Station" on page 55
Reporting a problem	"Reporting problems" on page 93

Recovering from a head collision

About this topic

This topic describes what to do in the event that a pipette head collides with an object, such as an accessory, labware, or shelf. A head collision can occur for various reasons, for example, if the wrong profile is initialized, the teachpoints are not correct, or the wrong labware is placed on the shelves. A head collision can result in a bent shelf, bent pipette tips, and other problems.

Procedure

To recover from a head collision:

1. Follow the procedure "Recovering from a power outage" on page 85.
2. Clean up any spills that might have occurred as a result of the collision.
3. Carefully inspect the impacted parts for signs of damage:
   - *Pipette barrel or tip*. Compare the affected area to the surrounding barrels or tips. Look for bent barrels and damaged seals.
   - *Shelves*. Inspect the shelves for flatness. Verify the teachpoints.
   - *Alignment Shelf*. Verify the rollers and springs are not damaged and still allow plates to be easily picked and placed.

   Make sure the specific functionality of shelves has not been compromised.
4. For each axis, jog the pipette head in both directions while listening for any new noise. If new noises are present or if any axis movement is impaired, contact Automation Solutions Technical Support.
5. Move to the teachpoints and verify the alignment in the x-, y-, and z-axes.

   If the x- or y-axis are misaligned, contact Automation Solutions Technical Support.

Related topics

For information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Stopping in an emergency	"Stopping in an emergency" on page 4
Removing and installing a pipette head	"Changing the pipette head" on page 74
Jogging the pipette head	"Jogging the pipette head" on page 101
Reporting a problem	"Reporting problems" on page 93

Troubleshooting hardware problems

About this topic

This topic lists some potential hardware problems, the possible causes, and ways to resolve the problems.

Hardware problems

Locate your problem in the table and try the solution. If the problem persists after you try the solutions, contact Automation Solutions Technical Support.

Problem	Possible cause	Solution
The Vertical Pipetting Station does not turn on.	Your lab does not meet the electrical requirements.	Make sure your lab meets the electrical requirements.
	The power cord is damaged or is not connected to the power source.	Ensure the power cord is in good condition and is connected to the Vertical Pipetting Station and the power source.
	The Vertical Pipetting Station fuse is bad.	Replace the fuse. A bad fuse could be indicative of other problems. If the fuse blows again, contact Automation Solutions Technical Support.
A hissing sound is present when the air is turned on and nothing is moving.	A leak is present in the air connections or inside the device.	Check the air tubing and the connections on the Vertical Pipetting Station rear panel and at the source for leaks.
The Vertical Pipetting Station does not dispense accurately on a particular shelf.	The shelf is loose, or the teachpoint is incorrect.	Gently wiggle the shelf to check the tightness. Verify the teachpoint.
	The pipette head barrels or o-rings are bad.	Contact Automation Solutions Technical Support.
The pipette head will not disengage from the head mount.	The pipette head is locked.	Verify that the head retainer pins are retracted (96- or 384-channel head), or the head lock is in the unlocked position (8- or 16-channel head).
Liquid fails to pump into or drain from an autofilling reservoir.	The Pump Module tubing has deteriorated or is not connected properly.	Inspect the tubing and the connections, and replace, if necessary.
The liquid in the wash trays or reservoirs is overflowing causing flooding.	The tubing is kinked or the Weigh Shelf might require recalibration.	Inspect the tubing. If necessary, recalibrate the Weigh Shelf.

Problem	Possible cause	Solution
During a tips-off operation, the tips remain on the pipette barrels.	Static electricity buildup is causing the tips to stick on the barrels.	Edit the profile to include a tip-touch during the tips-off task.
During initialization, a *z*-position timeout occurs.	The *z*-motor brake is sticking.	Contact Automation Solutions Technical Support.

Related topics

For information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Stopping in an emergency	"Stopping in an emergency" on page 4
Site requirements	"Laboratory requirements" on page 25
Replacing the fuse	"Replacing the fuse" on page 83
Creating or editing profiles	"Creating Vertical Pipetting Station profiles" on page 52
Adjusting a teachpoint	"Setting shelf teachpoints" on page 59
Setting up a Weigh Shelf and Pump Module	"Setup workflow for autofilling shelf" on page 128
Reporting a problem	"Reporting problems" on page 93

Resolving hardware-related error messages

About this topic

This topic describes some hardware-related error messages and their possible causes and solutions. For software error messages, see the *VWorks Automation Control User Guide*.

Communication- or power-related messages

If the communication or power problem persists after you try the solutions or you cannot locate the error message in the table, contact Automation Solutions Technical Support.

Error	Possible cause	Solution
Pipettor not initialized.	A command was issued before the Vertical Pipetting Station was fully initialized.	Initialize or re-initialize the Vertical Pipetting Station.
E-Stop detected.	The robot-disable circuit was activated.	See "Recovering from an emergency stop" on page 5.
Incorrect number of modules found.	The Vertical Pipetting Station is turned off or the power or serial communication cable is not connected properly.	***Perform the following steps:*** **1** Ensure the power switch is set to **on (–)**. **2** Ensure the power cable and serial cables are connected and in good condition. • If the cables are in good condition, click **Retry**. • If either cable is damaged, go to step 3. **3** Click **Abort**, and shut down the Vertical Pipetting Station. **4** Replace the damaged cables.
	The computer COM port is not set correctly.	***Perform the following steps:*** **1** Click **Abort**. **2** In **Vertical Pipetting Station Diagnostics**, click the **Profiles** tab, and verify the **COM port** setting **3** Close the VWorks software. **4** Power cycle the Vertical Pipetting Station by turning off and then turning on the device. **5** Restart the VWorks software.

Error	Possible cause	Solution
Could not issue NmcNoOp() to Servo 1 while waiting for E-Stop clear.	The Vertical Pipetting Station lost power or communications during a process, or the system encountered an error.	***Perform the following steps:*** **1** Click **Abort**, and close the VWorks software. **2** Turn off the Vertical Pipetting Station. **3** Verify the power and serial cables are in good condition and connected properly. **4** Turn on the Vertical Pipetting Station. **5** Restart the VWorks software. *Note:* The tips might have liquid that will be expelled when the pipette head moves home.
Motor power fault error.	The servo motors are not working properly.	***Try to clear the error as follows:*** **1** Power cycle the Vertical Pipetting Station by turning off and then turning on the device. **2** Initialize the Vertical Pipetting Station.
Could not establish communication with Vertical Pipetting Station on COM *n*. CHome: Check Head Type: Could not configure IO 1. EStop Pushed: Unidentified board rev. Could not issue NmcNoOp to x. Could not issue ServoSetIoCtrl. Can't get board revision number. Error initializing IO subsystem x.	The Vertical Pipetting Station is not connected properly to the computer, or the serial communication is faulty.	***Perform the following steps:*** **1** Ensure the serial cable is in good condition and connected properly to the computer and the Vertical Pipetting Station. See "Connecting the power and the computer" on page 32. • If the cable is in good condition and connected correctly, click **Retry**. • If the cable is damaged, go to step 2. **2** Click **Abort**, and shut down the Vertical Pipetting Station. **3** Replace the damaged cable.
Error initializing reagent module. Illegal pump number.	The Vertical Pipetting Station was turned on before turning on the Pump Module.	***Perform the following steps:*** **1** Turn off the Pump Module and the Vertical Pipetting Station. **2** Turn on the Pump Module, wait a minute, and then turn on the Vertical Pipetting Station.

Other hardware-related error messages

Locate the error message in the table and try the solution. If the problem persists after you try the solutions or you cannot locate the error message in the table, contact Automation Solutions Technical Support.

Error	Possible cause	Solution
Incorrect head type installed.	The mounted pipette head does not match the head type specified in the selected profile.	***If the correct pipette head is already installed:*** **1** In **Vertical Pipetting Station Diagnostics**, click the **Profiles** tab. **2** Verify the selected **Head Type** matches the installed pipette head, and then click **OK**. **3** Click **Retry**. If the installed pipette head is not correct: **4** Click **Abort**. **5** See "Changing the pipette head" on page 74.
Insufficient air pressure. Excessive air pressure.	The air pressure is not within the required range, or the air-pressure sensor or gauge is not working properly.	Verify that the air pressure is within acceptable range. See "Laboratory requirements" on page 25. Adjust the pressure if necessary, and then click **Retry**. You can use an independent pressure gauge to verify that the air-pressure gauge on the rear panel is working correctly.
Shelf *n* timed out moving in.	A blockage prevented the shelf from moving.	Check for a head crash or other shelf blockage. If there is no evidence of blockage, the shelf sensor may have malfunctioned.
Weigh Shelf found without valid reagent module	The system detected a Weigh Shelf but did not detect a corresponding Pump Module.	Verify that the Weigh Shelf and Pump Modules are connected properly. See "Setting up a Pump Module" on page 133.
No tipbox is present.	Tipbox sensor did not detect a tipbox.	***Perform the following steps:*** **1** Ensure a tipbox is on the tipbox shelf or that a tip chute is installed. **2** On the tipbox press, ensure that the sensor LEDs change color when the sensor should be triggered. **3** In **Vertical Pipetting Station Diagnostics**, click the **IO** tab, and verify that the tipbox sensor state changes. **4** Click **Retry**.

Related topics

For information about...	See...
Safety guidelines	"Safety guidelines" on page 1
Software error messages	*VWorks Automation Control User Guide*
Shutting down	"Shutting down the Vertical Pipetting Station" on page 44
Using Vertical Pipetting Station Diagnostics	"Using Diagnostics software" on page 95
Reporting a problem	"Reporting problems" on page 93

Reporting problems

Contacting Automation Solutions Technical Support

Note: If you find a problem with the Vertical Pipetting Station, 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. You can find the serial number on the Vertical Pipetting Station serial number 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 Vertical Pipetting Station Diagnostics software version number:

1 Open **Vertical Pipetting Station 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 topics

For information about...	See...
Troubleshooting problems	• "Troubleshooting hardware problems" on page 88 • "Resolving hardware-related error messages" on page 90
Software error messages	*VWorks Automation Control User Guide*
Stopping in an emergency	"Stopping in an emergency" on page 4
Shutting down	"Shutting down the Vertical Pipetting Station" on page 44

6 Using Diagnostics software

This chapter explains how to use the Diagnostics software to control the Vertical Pipetting Station.

This chapter contains the following topics:

About Vertical Pipetting Station Diagnostics

Use Vertical Pipetting Station Diagnostics to do the following:

- *Create profiles.* A profile contains the communication and configuration settings (base, head type and teachpoint settings) required to run protocols for a given hardware configuration. The profiles also store teachpoints and configured shelf location information.
- *Set teachpoints.* A teachpoint is a set of coordinates that tells the pipette head exactly where to move to perform a task for a particular type of labware.
- *Move the pipette head.* You can home the head, jog the head incrementally, and approach or move to a teachpoint.
- *Configure accessories.* If you have shelf accessories, such as a Pump Module and Weigh Shelf, you must specify the configuration. The location information is stored in the profile.
- *Run individual processes.* Running processes, such as aspirate and dispense, is useful when calculating the correct parameters for a protocol, performing one-time operations, and troubleshooting.
- *Diagnose problems.* Moving and adjusting individual hardware components can help to diagnose and troubleshoot problems.

Related topics

For information about...	See...
Opening diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Creating and initializing profiles	• "Creating Vertical Pipetting Station profiles" on page 52 • "Initializing the Vertical Pipetting Station" on page 55
Setting teachpoints	• "Setting shelf teachpoints" on page 59 • "Teaching shelves 7 and 8 for tipboxes" on page 64
Configuring the accessories	• "Configuring the autofilling function" on page 143 • "Installing and calibrating a Weigh Shelf" on page 149
Running a process	"Running a process using Diagnostics software" on page 106

Using diagnostics software to stop the device

About this topic

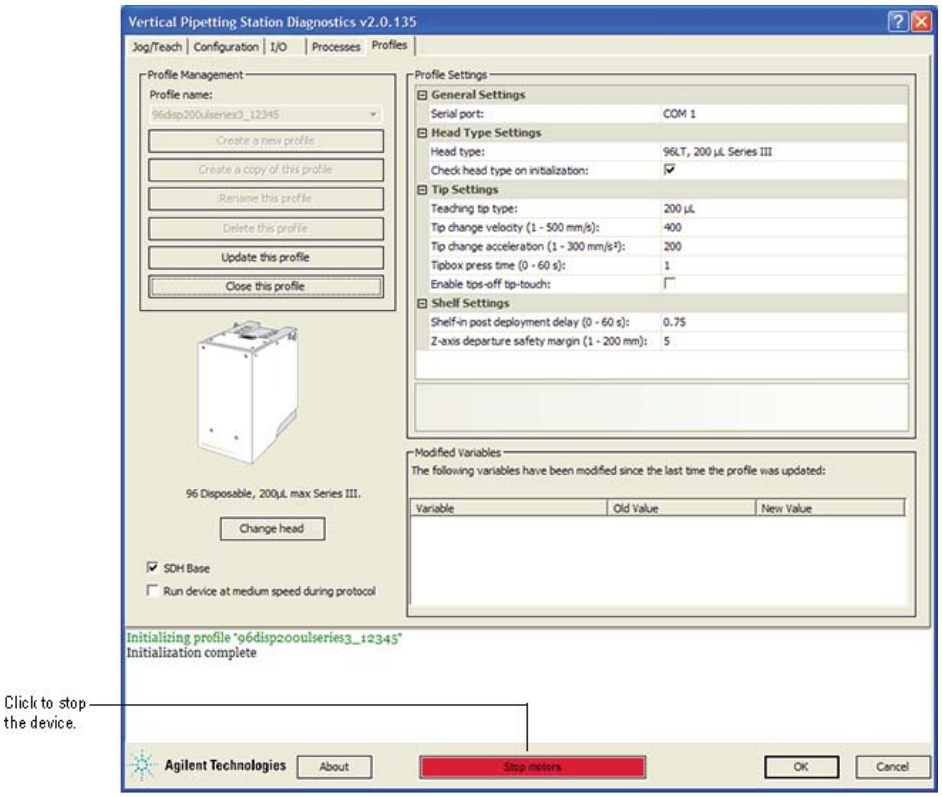
This topic describes how to stop the motors while using Vertical Pipetting Station Diagnostics.

For details on performing an emergency stop, see "Stopping in an emergency" on page 4.

Stopping the motors

To perform a stop from Vertical Pipetting Station Diagnostics:

1 In the **Vertical Pipetting Station Diagnostics** window, click the red **Stop motors** button.



To resume pipette head movement, you can use the tools on the Jog/Teach tab.

Related topics

For information about...	See...
Opening diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50

For information about...	See...
Homing the pipette head	“Jogging the pipette head” on page 101
Performing an emergency stop	“Stopping in an emergency” on page 4
Reporting a problem	“Reporting problems” on page 93

Homing the pipette head

About this topic

This topic describes when and how to home the pipette head. The procedure is the same whether or not a pipette head is mounted on the Vertical Pipetting Station.

The Vertical Pipetting Station has a defined home position for each of the four axes of motion. Homing sends the pipette head to the home position for the specified axes.

When to do this

When you first initialize the Vertical Pipetting Station after startup, the pipette head automatically homes. You may also want to home the pipette head to:

- Move the head to a safe position or out of the way of the shelves.
- Reset the axes. For example, if you notice the Vertical Pipetting Station is not moving to locations or teachpoints accurately, home the pipette head.

Homing the pipette head

Anytime that you initialize a profile, the pipette head homes the *z*-axis first and then homes the other axes. You can also home the pipette head using the following procedures.

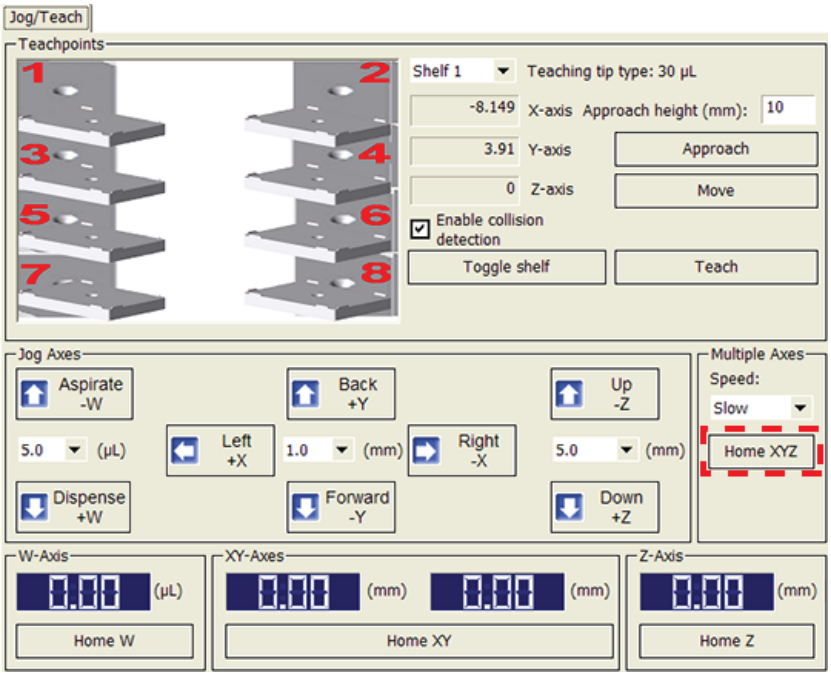
WARNING Stay clear of the Vertical Pipetting Station while it is in motion. Never touch any of the moving parts or attempt to move labware while the Vertical Pipetting Station is in operation. The device could pinch, pierce, or bruise you. For example, a pipette tip could pierce your hand.

WARNING When the internal pipette head mechanism is homed along the w-axis, for example during initialization, any liquids present in the syringes or tips are ejected.

To home the head in all axes:

1 In **Vertical Pipetting Station Diagnostics**, click the **Jog/Teach** tab.

2 Under **Multiple Axes**, click **Home XYZ**.



To home the head in each axis individually:

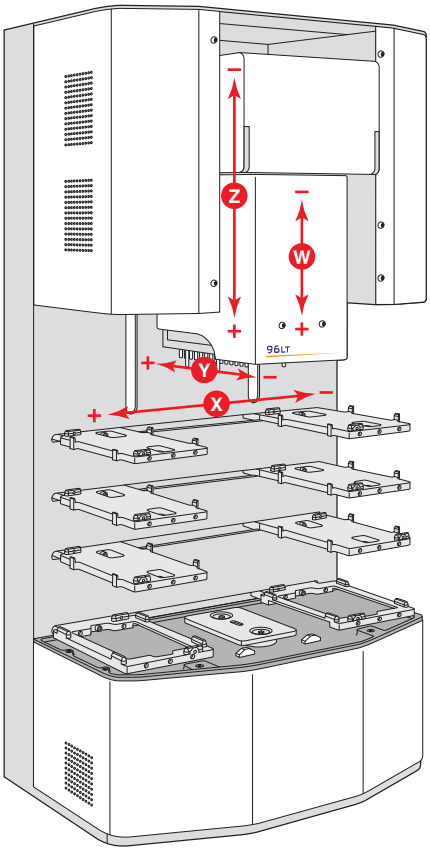
1 In **Vertical Pipetting Station Diagnostics**, click the **Jog/Teach** tab.

2 Click a **Home** button to move the pipette head in the corresponding direction.

- **Home W** moves the internal head syringe mechanism to its home position.
- **Home XY** moves the pipette head to its *xy*-axes (horizontal) home positions.
- **Home Z** moves the head to its *z*-axis (vertical) home position.

A value of 0.00 appears in the digital display when the head mount is in the home position for the given axis.

Figure Pipette head axes of motion



Related topics

For information about...	See...
Opening diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Moving the pipette head	• "Jogging the pipette head" on page 101 • "Using the Approach and Move commands" on page 104 • "Moving the pipette head manually" on page 82
Changing the pipette head	"Changing the pipette head" on page 74
Reporting a problem	"Reporting problems" on page 93

Jogging the pipette head

About this topic

IMPORTANT Only administrators and experienced personnel should use this procedure.

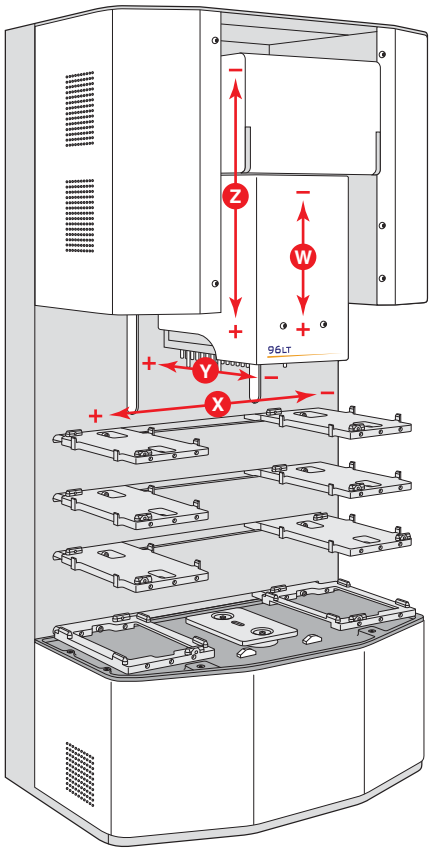
Jogging moves the pipette head incrementally along the *xy*-axes, *z*-axis, or *w*-axis. Jogging the head is useful for setting teachpoints and performing maintenance activities.

Before you begin

WARNING **Stay clear or the Vertical Pipetting Station when the pipette head is moving or about to move. In particular, the *z*-axis motor is powerful and a pipette tip could pierce your hand.**

CAUTION Before jogging the pipette head, ensure no obstructions are in the path of the pipette head.

The Jog/Teach tab provides the controls for jogging the pipette head. The labeling conventions for the axes of motion are as follows.



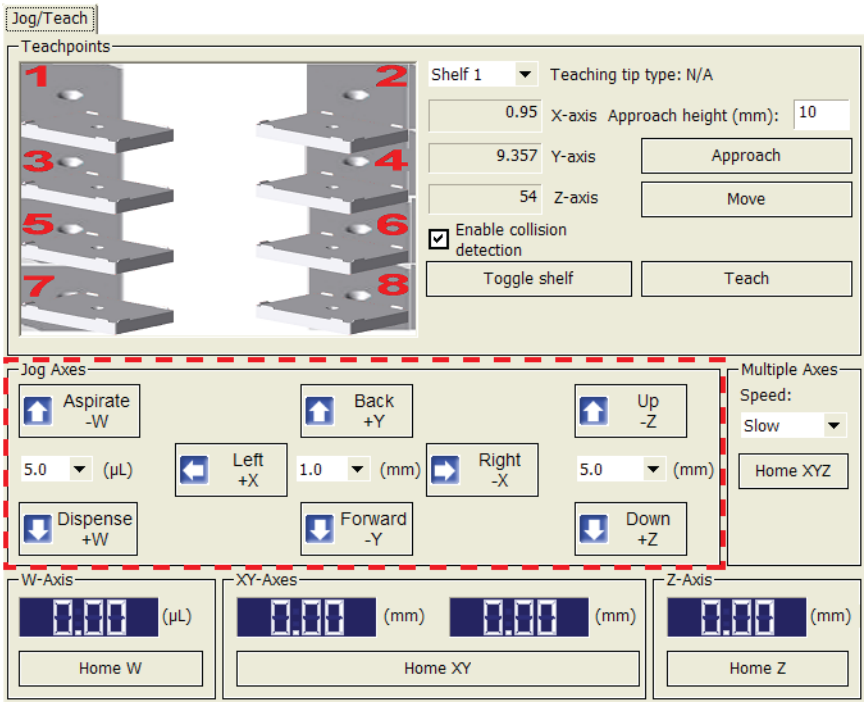
Jogging the pipette head

CAUTION Verify that the pipette head has clearance for each increment of travel that you select.

To jog the pipette head:

1. In **Vertical Pipetting Station Diagnostics**, click the **Jog/Teach** tab.
2. Under **Multiple Axes**, select the **Speed**.
3. Under **Jog Axes**, select an increment in distance (mm) or (µL) list for the corresponding axis of movement.

   For example, to jog the pipette head vertically, select an increment from the list (mm) located between the **Up –Z** and **Down +Z** buttons.



4. Click the corresponding axis button to move the pipette head the specified distance.

   For example, click **Up –Z** or **Down +Z** to move the pipette vertically.

   The digital display shows the distance that the pipette head traveled from the home position.

Related topics

For information about...	See...
Opening diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Pipette head axes of motion	"Hardware overview" on page 12
Setting or editing teachpoints	"Setting shelf teachpoints" on page 59

For information about...	See...
Moving the pipette head	• "Homing the pipette head" on page 98 • "Using the Approach and Move commands" on page 104 • "Moving the pipette head manually" on page 82
Reporting a problem	"Reporting problems" on page 93

Changing the pipette head speed

About this topic

You might want to slow down the pipette head when creating teachpoints or troubleshooting a problem.

This topic is appropriate for users who have Administrator or Technician privileges in the VWorks software.

Procedure

This procedure describes how to change the speed that the pipette head moves in the *x*-axis, *y*-axis, and *z*-axis while using the controls on the **Jog/Teach** page.

WARNING **If you logged in as an Administrator, a message warns you the Vertical Pipetting Station will run regardless of out-of-range conditions. Click OK if you want to continue.**

To change the pipette head speed:

1. In **Vertical Pipetting Station Diagnostics,** click the **Jog/Teach** tab.
2. In the **Multiple Axes** area, select the **Speed** from the list:
   - Slow
   - Medium
   - Fast

Related topics

For information about...	See...
Opening diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Safety issues	"Safety guidelines" on page 1

Using the Approach and Move commands

About this topic

This topic describes the Approach and Move commands. Typically, you use these commands when editing teachpoints to move the head quickly to specific locations on the Vertical Pipetting Station shelves.

CAUTION Before you click Approach or Move, verify that the pipette head is clear of any obstacles.

IMPORTANT Only administrators and experienced personnel should use these procedures.

IMPORTANT To perform an immediate stop of the pipette head, click **Stop motors**.

Approaching a shelf

The **Approach** command moves the pipette head to a specified stopping distance above the teachpoint for the selected shelf.

To approach a shelf:

1. Initialize the profile for the given configuration.
2. On the **Jog/Teach** tab, select the shelf that you want to approach.
3. In the **Approach height** box, type a safe stopping distance (mm) above the teachpoint.
4. Click **Approach**. The pipette head moves to the specified location above the saved teachpoint.

Moving to a teachpoint

The **Move** command moves the pipette head to the teachpoint for the selected shelf.

To move to a shelf teachpoint:

1. Initialize the profile for the given configuration.
2. On the **Jog/Teach** tab, select the shelf.
3. Click **Move**. The pipette head moves to the saved teachpoint for the shelf.

Related topics

For information about...	See...
Opening diagnostics	“Opening Vertical Pipetting Station Diagnostics” on page 50
Setting or editing teachpoints	“Setting shelf teachpoints” on page 59

For information about...	See...
Moving the pipette head	• "Homing the pipette head" on page 98 • "Jogging the pipette head" on page 101 • "Moving the pipette head manually" on page 82
Reporting a problem	"Reporting problems" on page 93

Using actuator controls and indicators

About this topic

IMPORTANT Only administrators and experienced personnel should use this procedure.

The IO tab in Vertical Pipetting Station Diagnostics provides controls and indicators for actuating the shelves, the tipbox press, and the *z*-motor brake.

Using the actuator controls

To use the actuator controls:

1. In **Vertical Pipetting Station Diagnostics**, click the **IO** tab.
2. To move a shelf out or in, click the **Out/In** button for the shelf. The text on the button changes to match the current state.
3. To move the tipbox press, click the **Tipbox press Down/Up** button. The text on the button changes to match the current state.

WARNING Activating the Tipbox Press generates hundreds of pounds of force. Stay clear of the device when activating the Tipbox Press.

4. Return the Vertical Pipetting Station to its normal state after using the actuator controls. The normal state has the following conditions:
   - Z-motor brake: **Locked**
   - All shelves: **Out**
   - Tipbox press: **Down**

Related topics

For information about...	See...
Opening diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50

For information about...	See...
IO tab controls and indicators	"IO tab quick reference" on page 162
Troubleshooting problems	"Troubleshooting hardware problems" on page 88
Reporting a problem	"Reporting problems" on page 93

Running a process using Diagnostics software

About this topic

For protocol development and troubleshooting purposes, you can use Vertical Pipetting Station Diagnostics to run a process in real time. This topic describes the procedure for running a process in Vertical Pipetting Station Diagnostics. For a description of the process parameters, see the following:

Process	For parameter descriptions see...
Aspirate	"Aspirate process parameters" on page 176
Dispense	"Dispense process parameters" on page 178
Mix	"Mix process parameters" on page 180
Wash Tips	"Wash Tips process" on page 182
Tips On, Tips Off	These commands have no parameter settings
Pump Reagent	"Pump Reagent process parameters" on page 184

Before you begin

Do the following:

- Initialize the profile.
- Verify that the correct labware is positioned on the selected shelf.

Running a process

Running a process requires that you:

- Choose a shelf location
- Select the labware and target wells
- Select the process command and parameters

To run a process:

1 In **Vertical Pipetting Station Diagnostics**, click the **Processes** tab.

2 In the **Shelves** area, select the target **Shelf**.

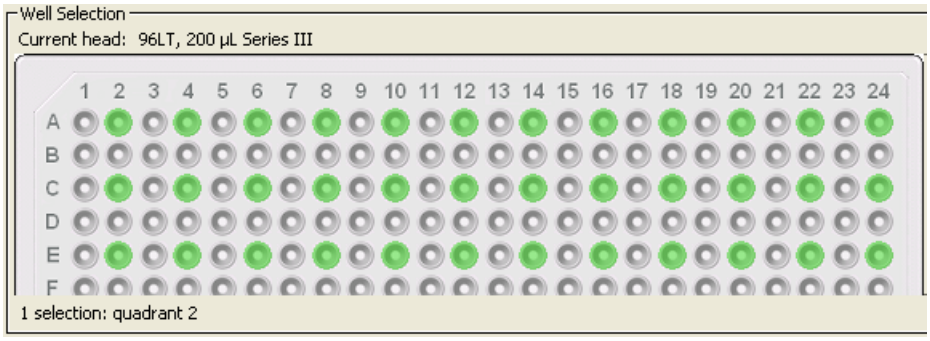
3 Select the labware from the **Labware** list.

Note: To add labware to the list, click **Open labware editor**, and use the Labware Editor.

4 In the **Well Selection** area, verify that the target wells are selected. You can select from 1 to 4 quadrants of the plate.

Click a well to select the corresponding quadrant. Green highlights the selected wells.

Alternatively, right-click the graphic to display a shortcut menu, and select the desired **Select wells** or **Clear wells** command.

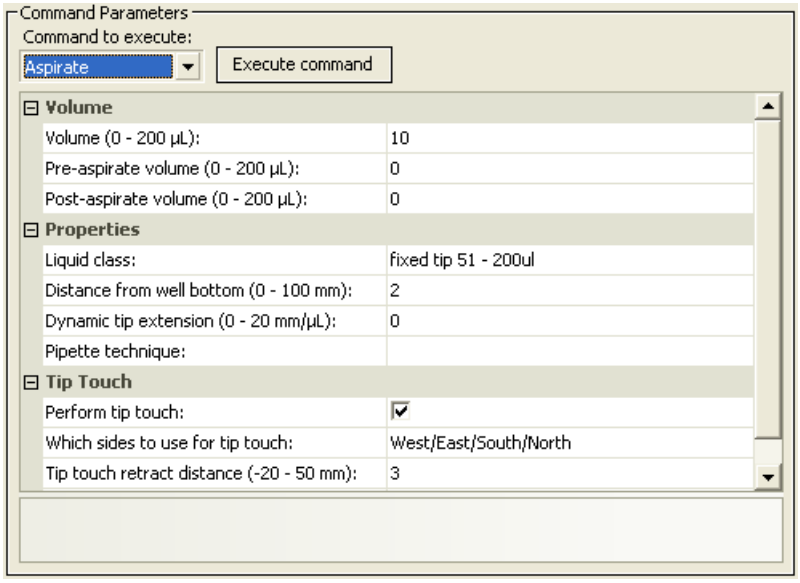


5 In the **Command Parameters** area:

a Select the process from the **Command to execute** list.

b Set the parameter values for the command.

c To start the process, click **Execute command**.



IMPORTANT If you must stop a process before completion, click **Stop motors** to stop the pipette head movement.

Related topics

For information about...	See...
Opening diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Processes tab reference	"Processes tab quick reference" on page 173
Creating protocols	*VWorks Automation Control User Guide*
Editing labware and liquid definitions	*VWorks Automation Control Setup Guide*
Troubleshooting problems	"Troubleshooting hardware problems" on page 88
Reporting a problem	"Reporting problems" on page 93

A
Vertical Pipetting Station accessories

This appendix describes the accessories that can be used with the Vertical Pipetting Station and provides the setup procedures.

This appendix contains the following topics:

Accessories overview

About this topic

This topic describes the accessories that are available for the Vertical Pipetting Station and provides guidelines on determining the shelf locations.

Accessories overview

You can add the following accessories to the Vertical Pipetting Station to enhance functions. In addition to setting up the hardware, accessories that are controlled by the device must be configured in Vertical Pipetting Station Diagnostics.

Accessory	Description	See...
Autofilling shelf	Consists of the following components:	"Autofilling shelf accessories" on page 127
	Pump Module. Pumps fluids to and from an autofilling reservoir.	"Setting up a Pump Module" on page 133
	Tubing Rack. Provides mounting on the Vertical Pipetting Station for the tubing quick-disconnect fittings, which enable easy reservoir removal or tubing replacement.	"Setting up a Pump Module" on page 133
	Auto Filling Reservoir. Supplies reagents to the pipette head for 96- and 384-well plates. Use this reservoir with a Pump Module to refill and empty the reservoir automatically. You can also use this reservoir with a Weigh Shelf.	"Reservoirs and wash trays for autofilling" on page 130
	Tip Wash Station. Washes the pipette tips during a run to prevent carryover and reduce cross-contamination. Use this reservoir with a Pump Module. You can also use this reservoir with a Weigh Shelf.	"Reservoirs and wash trays for autofilling" on page 130
	Weigh Shelf. Works with a Pump Module to provide precise liquid-level control for the Auto Filling Reservoir or Tip Wash Station.	"Installing and calibrating a Weigh Shelf" on page 149

Accessory	Description	See...
Argon Shelf	*Available only as part of a BioCel System*. Applies argon to a microplate to protect the samples from humidity and air.	Automation Solutions Technical Support
Manual Fill Reservoir	Supplies reagents to the pipette head for 96- and 384-well plates. This reservoir requires manual refilling and emptying.	"Using the Manual Fill Reservoir" on page 112
Microplate Alignment Shelf	Uses spring-loaded clamps to align the plate with the shelf A1 position.	"Installing a Microplate Alignment Shelf" on page 116
Sensor Alignment Shelf	Senses the presence of a microplate and aligns and holds the plate during pipetting tasks.	"About the Sensor Alignment Shelf" on page 118
Tip Chute	Directs disposable tips to the tip trash.	"About the Tip Chute" on page 123
Tube-Stripper Plate	Prevents septum tubes from adhering to the tips of a fixed-tip pipette head during pipetting tasks.	"Setting up a Tube-Stripper Plate" on page 124
Vacuum Alignment Shelf	Uses vacuum to hold PCR plates flat on the shelf to ensure reliable pipetting in every well.	"About the Vacuum Alignment Shelf" on page 120

Note: For information on using a Vacuum Filtration Station or an Orbital Shaking Station with a Vertical Pipetting Station, see Automation Solutions Technical Support.

Determining the shelf location for an accessory

To determine where to locate an accessory on the Vertical Pipetting Station, consider the following factors:

- *Shelves 1 and 2*. The top shelves have a height limitation for labware when using a pipette head with long tips. For example, the 96LT head with 200 µL tips and the 96ST head with 70 µL tips prevent the use of tall labware on shelves 1 and 2.
- *Shelves 7 and 8*. The bottom shelves may be unavailable for certain types of labware when using a pipette head with short tips. For example, 10 µL or 30 µL tips may not reach a low-volume plate on these shelves. In this case, you could use a Tip Wash Station on shelves 7 and 8, but the short tips can reach only partially into the chimneys.
- *Robot-accessibility*. If part of a lab automation system, either the left or right side of the Vertical Pipetting Station is accessible by a robot. Locate accessories that are not accessed by the robot on the opposite side. For example, if the right side of the Vertical Pipetting Station is robot-accessible (shelves 2, 4, 6, and 8), locate any reservoirs or wash stations on shelves 1, 3, 5, or 7.

Related topics

For information about...	See...
Pipette heads	"Pipette heads" on page 16
Setting up liquid and labware definitions	*VWorks Automation Control Setup Guide*
Using an accessory in a protocol	*VWorks Automation Control User Guide*

Using the Manual Fill Reservoir

About this topic

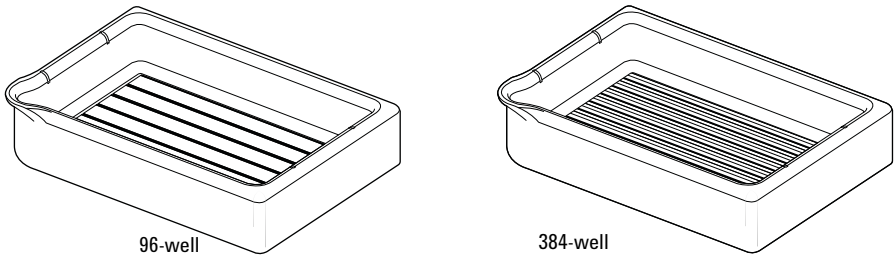
This topic describes the Manual Fill Reservoir.

Description

The Manual Fill Reservoir is an open tray that you can install on a shelf to supply reagents to 96- and 384-channel pipette heads. You must manually refill and empty the reservoir.

Automation Solutions reservoirs are approved for use with most reagents and solvents. If you have questions on the use of a particular chemical or solvent in a Automation Solutions reservoir, contact Automation Solutions Technical Support prior to use.

Figure Two types of Manual Fill Reservoirs: 96-well and 384-well options



Using the reservoir

Before using the reservoir:

1 In the **Labware Editor**, ensure a labware definition is set up with the Reservoir base class. See *VWorks Automation Control Setup Guide*.

WARNING **Before you place labware on the shelves, ensure that the shelves are in the out position and the pipette head is not moving.**

To use a Manual Fill Reservoir:

1. Fill the reservoir and place it on a shelf. The reservoir can be in any orientation.
2. To empty the reservoir, lift it from the shelf and discard the fluid according to applicable regulations.

Related topics

For information about...	See...
Starting up and shutting down the Vertical Pipetting Station	"Starting up and shutting down" on page 43
Safety guidelines	"Safety guidelines" on page 1
Accessory location guidelines	"Determining the shelf location for an accessory" on page 111
Setting up liquid and labware definitions	*VWorks Automation Control Setup Guide*
Using the accessory in a protocol	*VWorks Automation Control User Guide*

Removing or installing a standard shelf

About this topic

You might want to remove a standard shelf in some situations, for example:

- To install an accessory shelf, such as a Weigh Shelf
- To make room for tall labware on the shelf below

This topic describes how to remove and install a standard shelf.

Before you begin

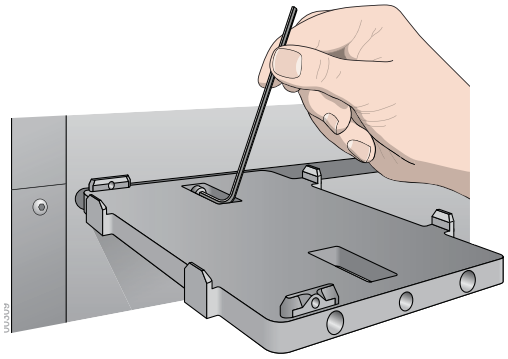
WARNING **Before connecting an accessory, shut down the Vertical Pipetting Station to ensure that the power and air are turned off.**

Make sure you have an 3-mm hex wrench.

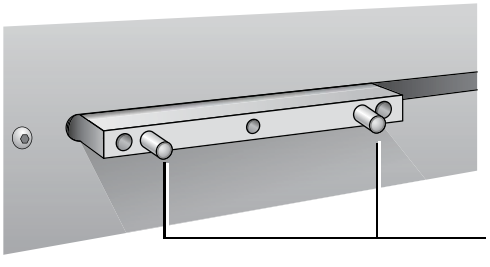
Removing a standard shelf

To remove a standard shelf:

1 At the top center of the standard shelf, remove the screw that secures the shelf to the shelf connector on the device.



2 Slide the shelf off of the dowel pins of the shelf connector.



3 Do one of the following:

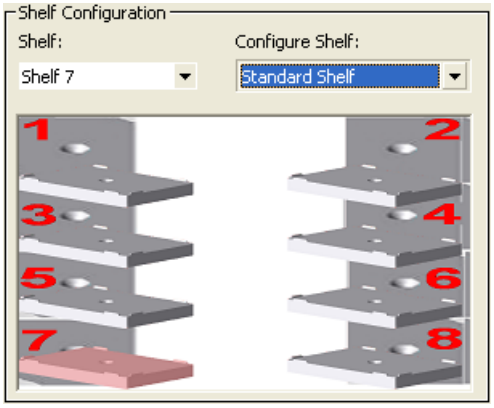
- Install the accessory for this location.
- Configure an empty shelf location in Vertical Pipetting Station Diagnostics.

Note: The shelf connector remains in the empty shelf slot after you remove the standard shelf.

Configuring standard or empty shelves

To configure the shelf type:

1. In **Vertical Pipetting Station Diagnostics**, click the **Profiles** tab, and select the profile that you want to change.
2. On the **Configuration** page, select the shelf number in the **Shelf** list, or click the location in the graphic display.

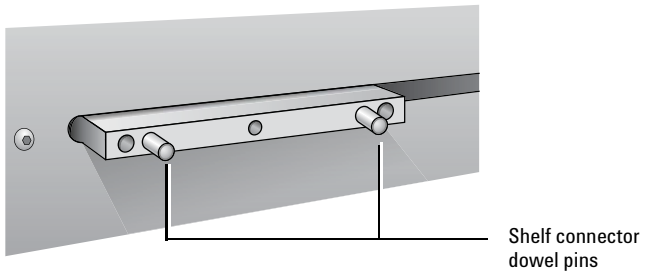


3. In the **Configure Shelf** list, select one of the following:
   - **Standard Shelf**
   - **Shelf removed**
4. On the **Profiles** tab, click **Update this profile** to save the settings for the selected profile.

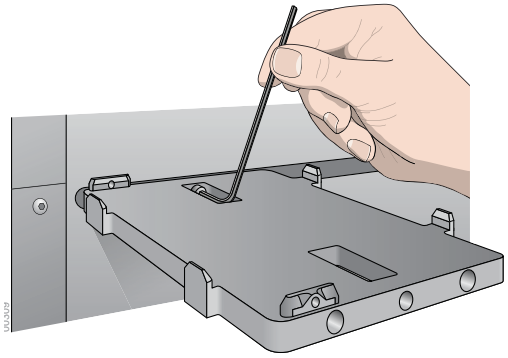
Installing a standard shelf

To install a standard shelf:

1. Slide the shelf onto the dowel pins of the Vertical Pipetting Station shelf connector.



2. Use a 3-mm hex wrench to install the screw and secure the shelf to the shelf connector.



3 Configure a standard shelf in Vertical Pipetting Station Diagnostics.

CAUTION Before using a newly installed shelf, verify that the teachpoint is accurate.

Related topics

For information about...	See...
Accessories and accessory location guidelines	"Accessories overview" on page 110
Configuring a standard shelf or an empty shelf in Vertical Pipetting Station Diagnostics	"About configuring the shelves" on page 57
Editing teachpoints	"Setting shelf teachpoints" on page 59

Installing a Microplate Alignment Shelf

About this topic

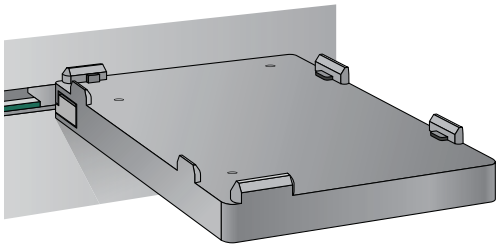
The Microplate Alignment Shelf ensures precise positioning of microplates. This topic describes how to install the shelf.

Description

The Microplate Alignment Shelf is particularly useful for 1536-well and 384-well microplates where high-precision positioning of the tips is essential.

The shelf uses three spring-loaded arms to move the plate into position and hold it in place during pipetting tasks.

Microplates are the only labware appropriate for use on the Microplate Alignment Shelf.



Before you begin

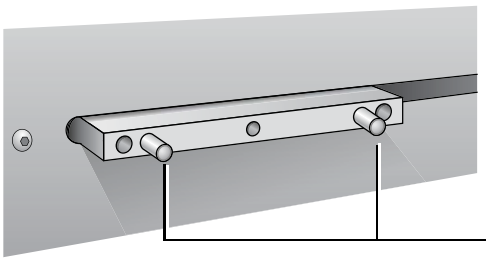
WARNING **Before connecting an accessory, shut down the Vertical Pipetting Station to ensure that the power and air are turned off.**

Make sure you have an 3-mm hex wrench.

Installing the shelf

To install a Microplate Alignment Shelf:

1. If applicable, remove the standard shelf from the target location. See "Removing or installing a standard shelf" on page 114.
2. Slide the Microplate Alignment Shelf onto the two dowel pins of the Vertical Pipetting Station shelf connector.



3. Secure the shelf to the connector using the hex screw at the bottom center of the shelf.
4. In Vertical Pipetting Station Diagnostics, verify that the location is configured for a standard shelf.

CAUTION Before using the Microplate Alignment Shelf, verify that the teachpoint is accurate.

Related topics

For information about...	See...
Accessory location guidelines	"Determining the shelf location for an accessory" on page 111
Configuring a standard shelf	"Configuring standard or empty shelves" on page 115

For information about...	See...
Editing teachpoints	"Setting shelf teachpoints" on page 59
Using the accessory in a protocol	*VWorks Automation Control User Guide*

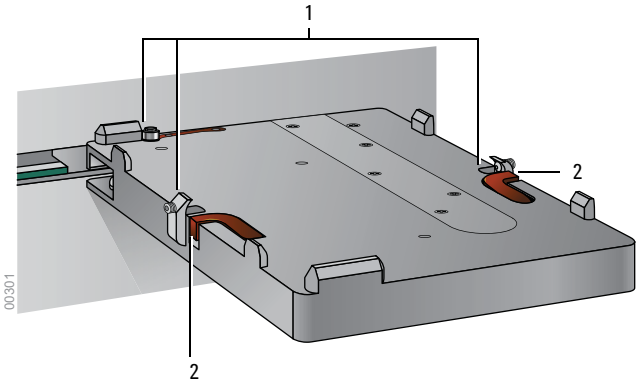
About the Sensor Alignment Shelf

About this topic

The Sensor Alignment Shelf ensures precise positioning of microplates. This topic describes the shelf, which is an Automation Solutions-installed accessory.

Description

The Sensor Alignment Shelf is particularly useful for 1536- and 384-well microplates where high-precision positioning is essential. The shelf has two built-in sensors that detect the presence of a microplate. During pipetting tasks, the shelf movement actuates three alignment clamps. The clamps position and actively hold the plate during pipetting operations, and then release the plate after the pipetting task is completed.



Item	Feature	Description
1	Actuated clamps	Three clamps are actuated by the shelf movement.
2	Sensors	Two sensors detect the presence of a plate.

About using the shelf

Microplates are the only labware appropriate for use on the Sensor Alignment Shelf.

CAUTION Before using the Sensor Alignment Shelf, verify that the teachpoint is accurate.

CAUTION Clean up any spills immediately. Excess fluid can damage the sensing mechanism in the Sensor Alignment Shelf.

Related topics

For information about...	See...
Accessory location guidelines	"Determining the shelf location for an accessory" on page 111
Editing teachpoints	"Setting shelf teachpoints" on page 59
Editing labware definitions	*VWorks Automation Control Setup Guide*
Using the accessory in a protocol	*VWorks Automation Control User Guide*

About the Vacuum Alignment Shelf

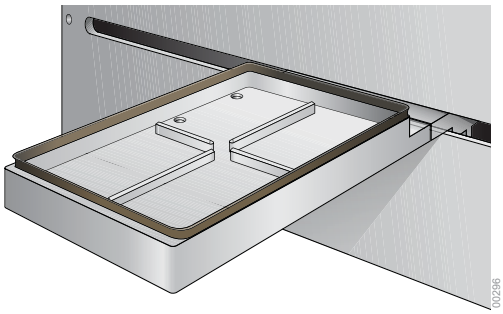
About this topic

The Vacuum Alignment Shelf is designed to prevent problems caused by warped PCR microplates. The Vacuum Alignment Shelf is an Automation Solutions-installed and configured accessory. This topic describes the shelf and how to test the shelf function.

Description

The Vacuum Alignment Shelf uses a vacuum system to hold the PCR plate flat and ensure reliable pipetting in every well. A vacuum sensor ensures proper plate engagement before any liquid handling steps.

The following figure shows the Vacuum Alignment Shelf.



Before using the shelf

Verify the setup:

- Ensure the vacuum tubing is in good condition and is connected from the vacuum source to the vacuum port on the back of the Vertical Pipetting Station.
- Make sure the vacuum is turned on at the source.
- Verify that the teachpoint for the Vacuum Alignment Shelf is accurate.
- *Optional*. Create a special labware class for the plates that require the Vacuum Alignment Shelf.

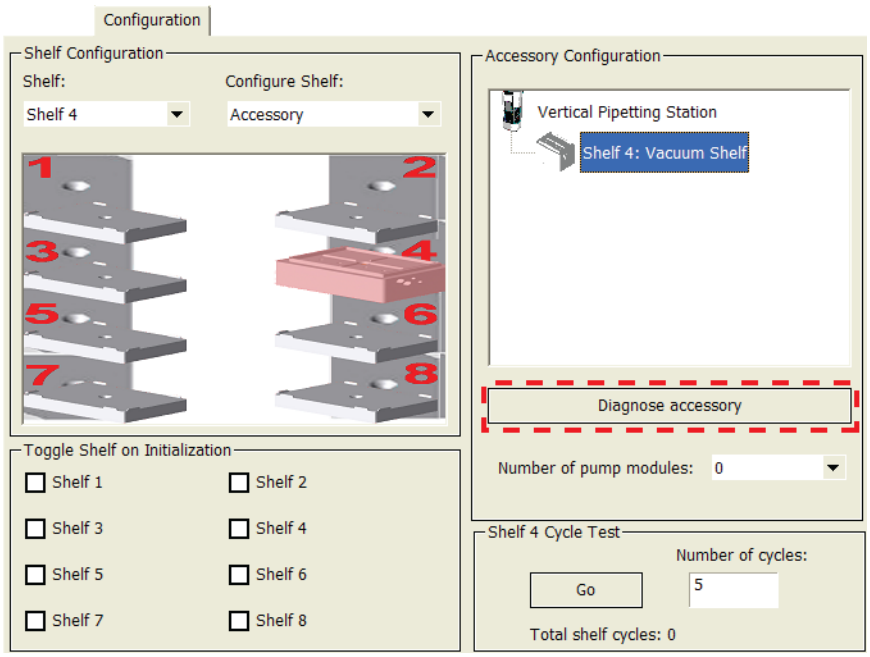
  Microplates are the only labware appropriate for use on the Vacuum Alignment Shelf. In the Labware Editor, you can define a labware class for the plates that require the vacuum alignment to automate which plates are placed on the Vacuum Alignment Shelf.

CAUTION Clean up any spills immediately. Excess fluid can damage the Vacuum Alignment Shelf.

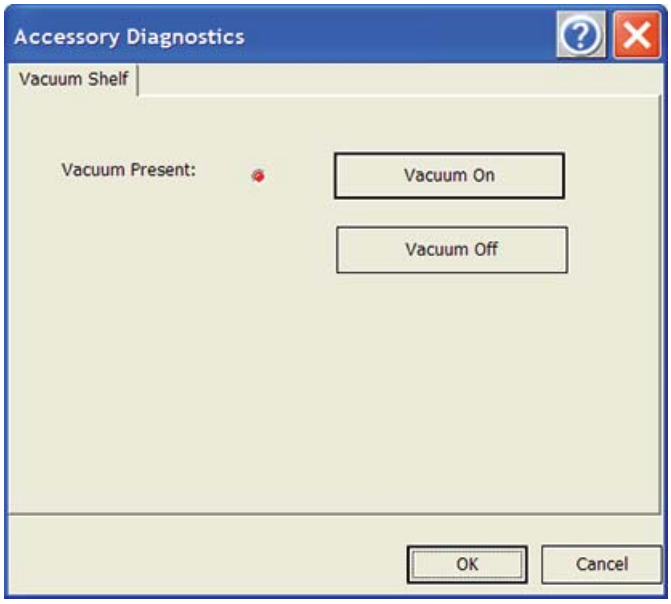
Testing the Vacuum Alignment Shelf

To test the Vacuum Alignment Shelf:

1. At the Vertical Pipetting Station, verify the following:
   - **a** The tubing is securely connected to the vacuum port on the rear panel and the vacuum source is turned on.
   - **b** A microplate is in position on the Vacuum Alignment Shelf.
2. In **Vertical Pipetting Station Diagnostics**, click the **Configuration** tab.
3. In the **Accessory Configuration** area, highlight **Vacuum shelf**, and then click **Diagnose accessory**.



4. In the **Accessory Diagnostics** dialog box, click **Vacuum On** to open up the vacuum supply to the Vacuum Alignment Shelf.



5 Verify that the **Vacuum Present** indicator is green.

If the indicator is red, the Vacuum Alignment Shelf cannot establish a vacuum with the microplate. Verify that the vacuum is turned on at the source and that the vacuum tubing and connections are in good condition.

6 To interrupt the vacuum supply to the Vacuum Alignment Shelf, click **Vacuum Off**.

Related topics

For information about...	See...
Vacuum connections	"Connecting the air and vacuum sources" on page 33
Editing teachpoints	"Setting shelf teachpoints" on page 59
Editing labware definitions	*VWorks Automation Control Setup Guide*
Using the accessory in a protocol	*VWorks Automation Control User Guide*

About the Tip Chute

About this topic

The Tip Chute is an Automation Solutions-installed accessory that routes used tips to a trash receptacle.

Description

When the Vertical Pipetting Station is part of the lab automation system, such as the BioCel system, the Tip Chute can be mounted on shelf 7 to direct used disposable tips to a trash receptacle. When shelf 7 moves into position under the pipette head during a tips-off process, the Tip Chute is in position to direct the discarded tips to the trash receptacle.

Related topics

For information about...	See...
Other accessories	"Accessories overview" on page 110
Using an accessory in a protocol	*VWorks Automation Control User Guide*

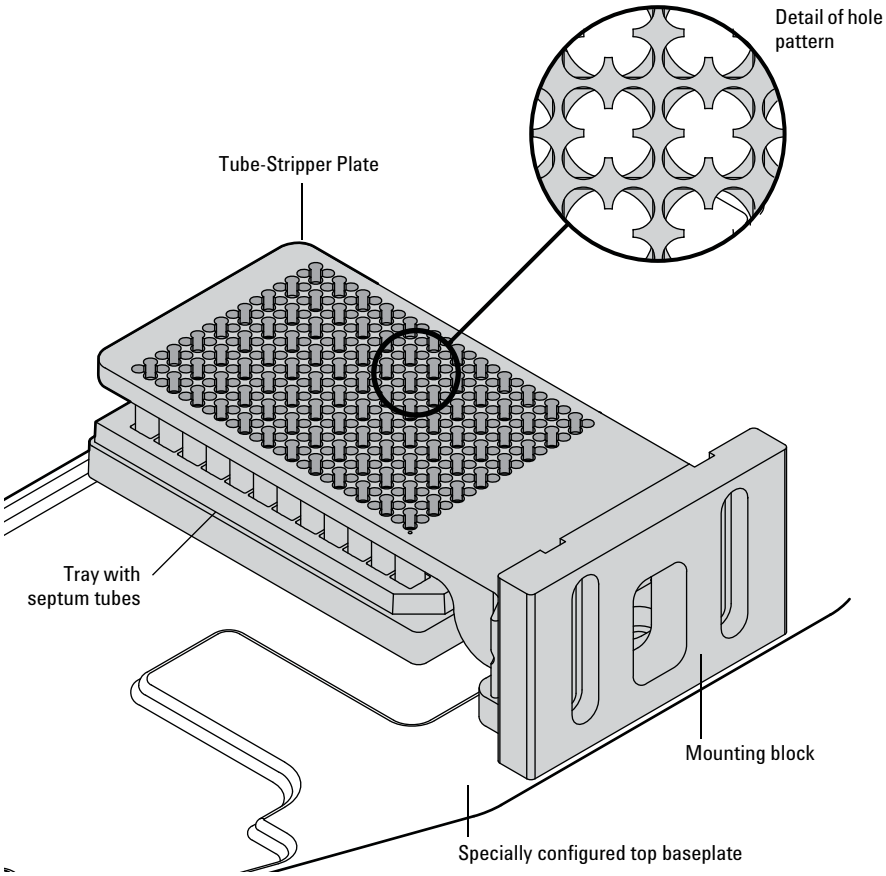
Setting up a Tube-Stripper Plate

About this topic

The Tube-Stripper Plate prevents septum tubes from adhering to the tips of a fixed-tip pipette head during pipetting tasks. This topic describes how to set up the Tube-Stripper Plate.

Description

The Tube-Stripper Plate is compatible with fixed-tip pipette heads. During a pipetting process, the shelf that contains a tray of septum tubes (shelf 7 or 8) moves into position under the Tube Stripper Plate. The pipette tips enter the tubes through the holes in the Tube-Stripper Plate. When the pipette head lifts up, the Tube-Stripper Plate holds the tubes in place in the tray.



The tip holes in the Tube-Stripper Plate are arranged in a pattern that enables compatibility with both 96- and 384-tip pipette heads. See the figure detail. For a 96-tip pipette head, the tip goes through the center of the hole. For a 384-tip pipette head, each tip in a set of four goes through each of the four semicircles in the pattern.

Before you begin

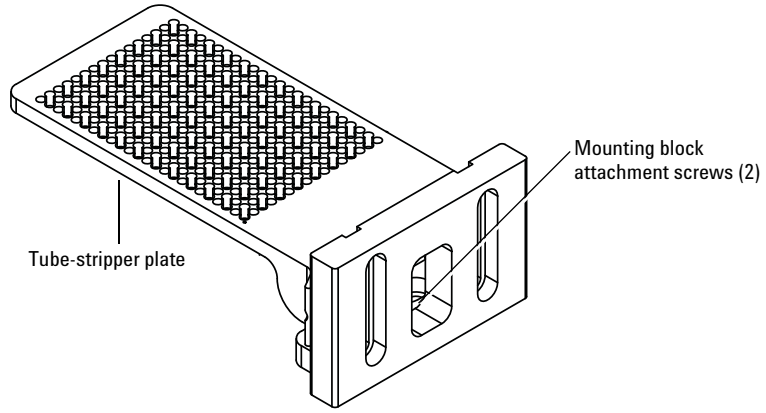
The Tube-Stripper Plate requires a specially configured Vertical Pipetting Station top baseplate.

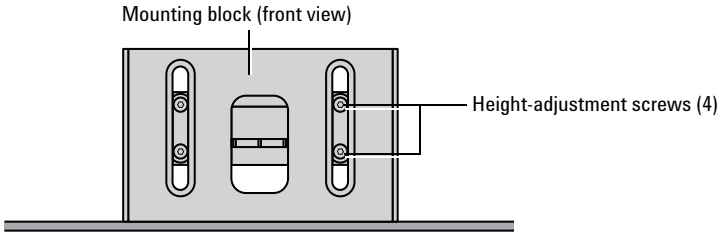
CAUTION Before you install the Tube-Stripper Plate, verify that the teachpoints for shelves 7 and 8 are accurate.

Setting up the Tube-Stripper Plate

To set up a Tube-Stripper Plate:

1. Position the mounting block above the two screw holes on the front center of the Vertical Pipetting Station top baseplate between shelves 7 and 8.
2. Secure the mounting block to the top baseplate using the two hex-head screws provided.
3. While holding the Tube-Stripper Plate in position against the back of the mounting block, insert the four height-adjustment screws through the vertical slots in the front of the mounting block. Use two screws in each vertical slot.





4. Check the clearance above and below the Tube-Stripper Plate to determine whether a height adjustment is required. Verify the following:
   - Shelves 5 and 6 can move in and out above the Tube-Stripper Plate.
   - A plate loaded with septum tubes on shelf 7 or 8 can move into position under the Tube-Stripper Plate.
5. To adjust the height of the Tube-Stripper Plate:
   a. Use a hex wrench to loosen the four adjustment screws on the front of the mount, and slide the Tube-Stripper Plate up or down as required.
   b. At the desired height, tighten the four adjustment screws.

Related topics

For information about...	See...
Editing teachpoints	"Setting shelf teachpoints" on page 59
Using the accessory in a protocol	*VWorks Automation Control User Guide*
Other accessories	"Accessories overview" on page 110

B
Autofilling shelf accessories

This appendix describes the autofilling accessories that can be used with the Vertical Pipetting Station and provides the installation and removal procedures.

This appendix contains the following topics:

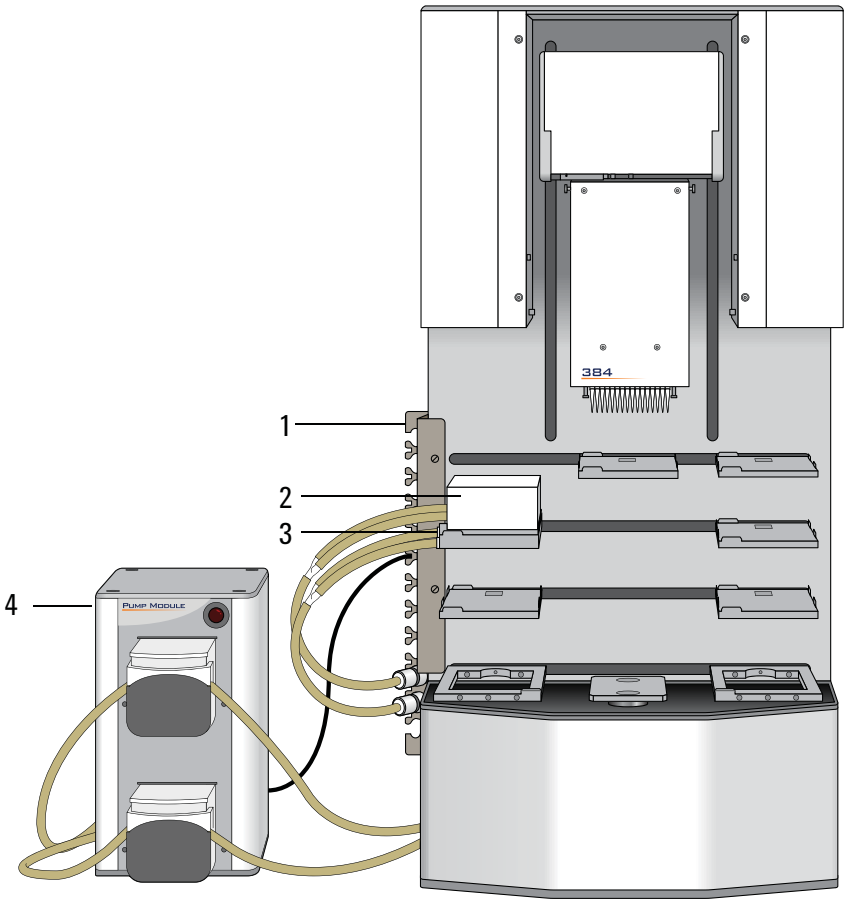
Setup workflow for autofilling shelf

About this topic

The topic describes the components of an autofilling shelf and provides the workflow for setting up an autofilling shelf on the Vertical Pipetting Station.

Autofilling shelf components

An autofilling shelf is a location on the Vertical Pipetting Station where a reservoir or wash tray can be automatically filled with liquid and emptied. The components include the following.



Item	Accessory	Description
1	Tubing Rack	Mounts the quick-disconnect fittings, which enable easy reservoir removal for washing and repair, as well as tubing replacement.
2	Reservoir	Autofilling tray, such as the Auto Filling Reservoir or Tip Wash Station.

Item	Accessory	Description
3	Weigh Shelf	*Optional.* Works with a Pump Module to provide precise liquid-level control for the Auto Filling Reservoir or Tip Wash Station.
4	Pump Module	Contains two peristaltic pumps, one that pumps the fluid into the reservoir, and a second that pumps the waste fluid from the reservoir.

IMPORTANT The Pump Module must be internally configured to specify use with or without a Weigh Shelf. If a configuration change is required, contact Automation Solutions Technical Support.

Workflow to set up an autofilling shelf

WARNING Before connecting an accessory, shut down the Vertical Pipetting Station to ensure that the power and air are turned off.

For accessory location guidelines, see "Determining the shelf location for an accessory" on page 111.

Step	Procedure	See...
1	If applicable, install the Weigh Shelf.	"Installing and calibrating a Weigh Shelf" on page 149
2	Install the Tubing Rack, the Pump Module, and a reservoir.	"Setting up a Pump Module" on page 133
3	In Vertical Pipetting Station Diagnostics, configure the autofilling function.	"Configuring the autofilling function" on page 143
4	If applicable, calibrate the Weigh Shelf.	"Calibrating a Weigh Shelf" on page 151
5	If applicable, verify the teachpoint accuracy for the Weigh Shelf.	"Setting shelf teachpoints" on page 59

Related information

For information about...	See...
Reservoirs and wash trays	"Reservoirs and wash trays for autofilling" on page 130
Other accessories	"Vertical Pipetting Station accessories" on page 109
Using an accessory in a protocol	*VWorks Automation Control User Guide*

Reservoirs and wash trays for autofilling

About this topic

This topic describes the following containers that can be automatically filled and emptied using the Pump Module:

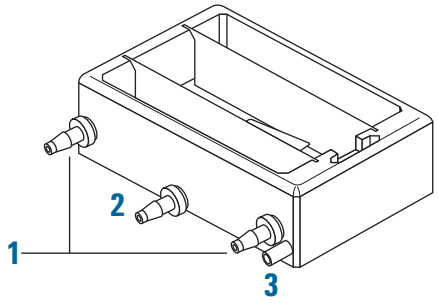
- Agilent Auto Filling Reservoir
- Agilent Tip Wash Station (also known as the MicroWash Reservoir)
- Agilent Open Wash Reservoir

Agilent reservoirs are approved for use with most reagents and solvents. If you have questions on the use of a particular chemical or solvent, contact Automation Solutions Technical Support before use.

Auto Filling Reservoir

The Auto Filling Reservoir is an open tray that can be installed on a Weigh Station for precision liquid-level control. The reservoir can supply reagents to single-channel pipettors and multichannel pipette heads.

Figure Auto Filling Reservoir



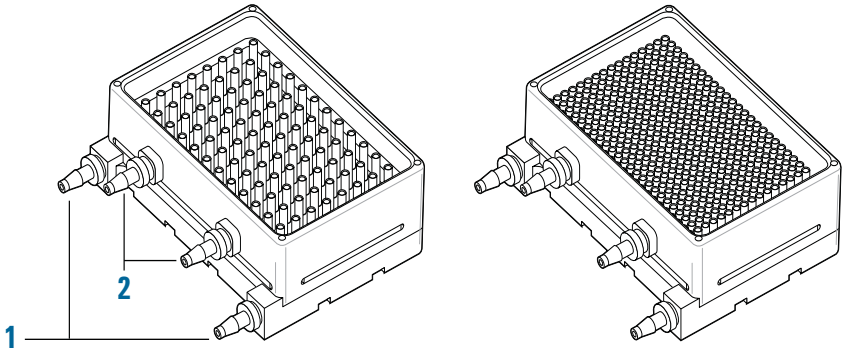
Item	Description
1	*Inlet ports*. Connect to the input tubing from the Pump Module that fills the reservoir.
2	*Outlet port*. Connects to the output tubing from the Pump Module that empties the reservoir.
3	*Overflow drain*. Uses gravity to drain excess fluid.

When properly configured in the automation software, the Pump Module automatically fills and drains the Auto Filling Reservoir. As the figure shows, two inlet ports are available to supply reagents to the reservoir. An outlet port is used to pump the waste and excess fluid from the reservoir. An overflow drain port can also be connected to drain the excess fluid.

Tip Wash Station

The Tip Wash Station is available in 96-chimney or 384-chimney formats.

Figure Tip Wash Station: 96-chimney (left) and 384-chimney (right)



Item	Description
1	*Inlet ports*. Fill the wash station. Liquid flows up through the chimneys.
2	*Outlet ports*. Empties the wash station. The overflow of the chimneys flows out through the two upper output ports.

You can use the 96- and 384-chimney Tip Wash Station with any of the Agilent 96-channel pipette heads. However, the 384-channel pipette head is limited to the 384-chimney Tip Wash Station.

CAUTION Attempting to use the 384-channel pipette head with a Tip Wash Station other than the 384-chimney format can damage the pipette head.

Make sure the pipette tips do not touch the bottom of the Tip Wash Station. To adjust the distance from the bottom, you can set parameters in the automation software. For instructions, see the user documentation for the device automation software.

CAUTION To prevent potential damage to the tips, ensure that the pipette tips do not touch the bottom of a reservoir.

The chimneys in the wash station prevent carryover and reduce contamination. The Pump Module pumps wash liquid into the Tip Wash Station through two inlet ports. The wash liquid flows up through the chimneys in the Tip Wash Station to wash the tips. The waste overflows from the chimneys and is removed through two outlet ports.

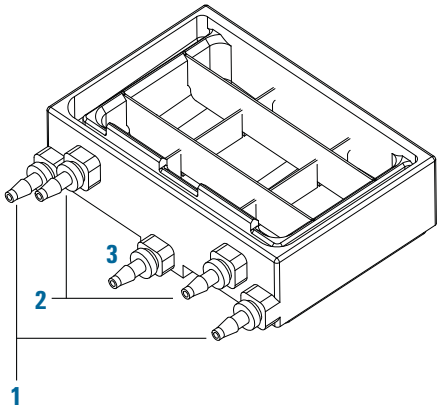
Optionally, the Tip Wash Station can be used on a Weigh Shelf for precision liquid-level control.

Open Wash Reservoir

The Open Wash Reservoir is an open tray that can be installed on a Weigh Shelf for precision liquid-level control.

CAUTION *Vertical Pipetting Station only*. Ensure that the baffles are installed in the reservoir to prevent potential splashing when the shelf moves.

Figure Open Wash Reservoir



To set up the tubing for each mode:

Item	Description	Overflow mode	Fill and empty mode
1	Inlet ports	Connected to input (fill) tubing	Connected to input (fill) tubing
2	Outlet ports	Connected to output (empty) tubing	Plugged
3	Bottom center port	Plugged	Connected to output (empty) tubing

When properly configured in the automation software, the Pump Module automatically fills and drains the reservoir. The Open Wash Reservoir can be set up to run in either of two modes:

- *Overflow mode*. Fresh wash solution enters the reservoir from the two inlet ports (**1**), overflows into the overflow trough, and is pumped through the two outlet ports (**2**) to waste.
- *Fill and empty mode*. Fresh wash solution enters the reservoir from the two inlet ports (**1**), but is drained via the bottom center port (**3**). In this mode the reservoir is filled and emptied one or more times between each wash cycle. The reservoir design ensures maximal emptying to reduce the contamination load in the wash fluid between each cycle.

Related information

For information about...	See...
Weigh Shelf	"Installing and calibrating a Weigh Shelf" on page 149
Connecting the Pump Module	"Setting up a Pump Module" on page 133
Configuring the autofilling functions	"Configuring the autofilling function" on page 143

Setting up a Pump Module

About this topic

This topic provides installation instructions for the Pump Module, Tubing Rack, and a reservoir.

The Pump Module transfers fluids into and transfers waste away from a reservoir. You can use the Pump Module with an Auto Filling Reservoir and a Weigh Shelf or with a Tip Wash Station.

Before you start

WARNING **Before connecting an accessory, shut down the Vertical Pipetting Station to ensure that the power and air are turned off.**

CAUTION Do not lift the Pump Module by the peristaltic pumps that are mounted on the front of the device. Doing so could damage the Pump Module.

IMPORTANT The Pump Module must be internally configured to specify use with or without a Weigh Shelf. If a configuration change is required, contact Automation Solutions Technical Support.

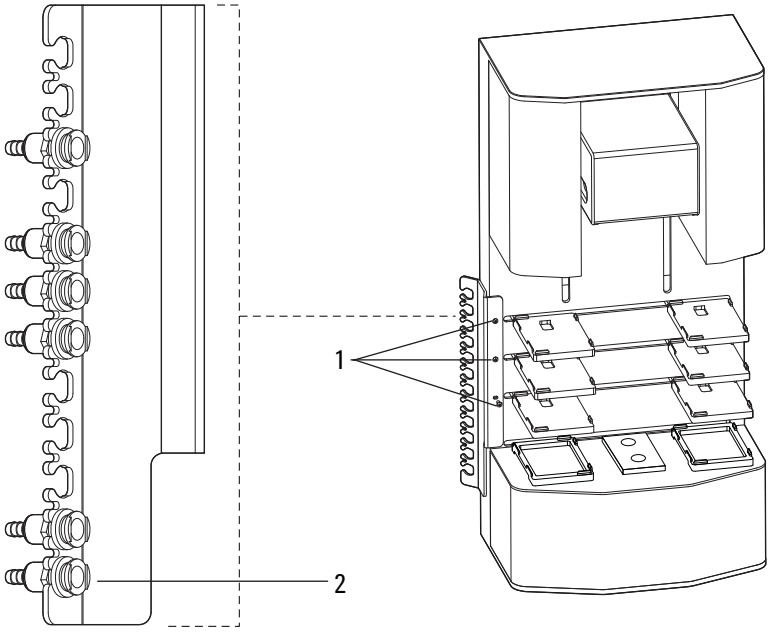
Make sure you are familiar with the setup workflow. See "Setup workflow for autofilling shelf" on page 128.

Installing the Tubing Rack

To install the Tubing Rack on the Vertical Pipetting Station:

1. Secure the Tubing Rack to the Vertical Pipetting Station left side using the three hex-head screws as the figure shows.
2. Attach the quick-disconnect fittings to the Tubing Rack. To do this, slide the threaded portion of the fitting through a Tubing Rack notch, and screw the nut onto the opposite side of the fitting.

Figure Tubing Rack installation



Connecting power and communication

Before you begin

- Ensure that the Pump Module location meets the site requirements.
- Make sure you have the Pump Module power cord and communications cable.

WARNING **Ensure that the power cords are in good condition and are not frayed. Use of frayed or damaged power cords can cause injury.**

WARNING **Ensure that the Pump Module and the associated liquid-handling device, such as the Bravo Platform, are turned off before connecting the cables and routing the tubing.**

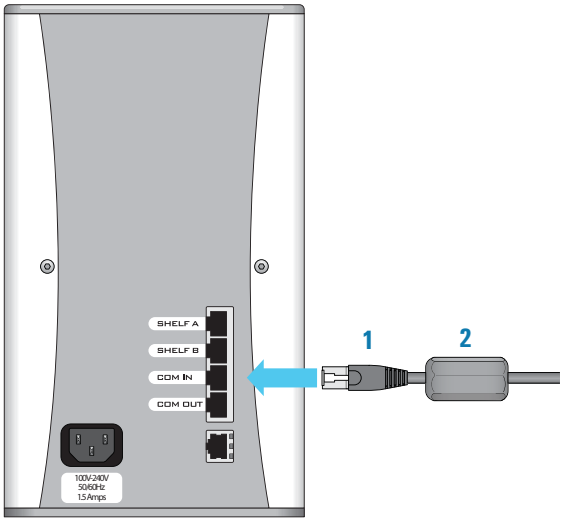
CAUTION Before operating the Pump Module, ensure that the communications cable plug with the EMI filter is connected to the COM IN port. Failure to do so will cause the Pump Module to be non-compliant with the EU Directives for electromagnetic emissions and may cause interference with nearby instruments.

Connecting the cables

To connect the power and communication cables:

1. Ensure that the liquid-handling device and the Pump Module are turned off.
2. Connect the end of the communications cable with the EMI filter to the Pump Module COM IN port, and connect the other end of the cable to the pump I/O port on the liquid-handling device.

Figure Pump Module communications cable (1) with EMI filter (2)



3 To connect multiple Pump Modules, use a second serial cable to connect the COM OUT port on the first Pump Module to the COM IN port on the second Pump Module.

CAUTION Ensure that the communications cable plug with the EMI filter is connected to the Pump Module COM IN port.

Repeat this step for each Pump Module that is to be controlled by the same device. Up to eight Pump Modules can be controlled in this manner.

4 Connect the provided power cable to the AC power connector on the back of the Pump Module and into an appropriately grounded electrical receptacle.

5 If you are using a Weigh Shelf, Weigh Station, or Weigh Pad, connect its cable to the SHELF A port on the back of the Pump Module.

Routing the tubing

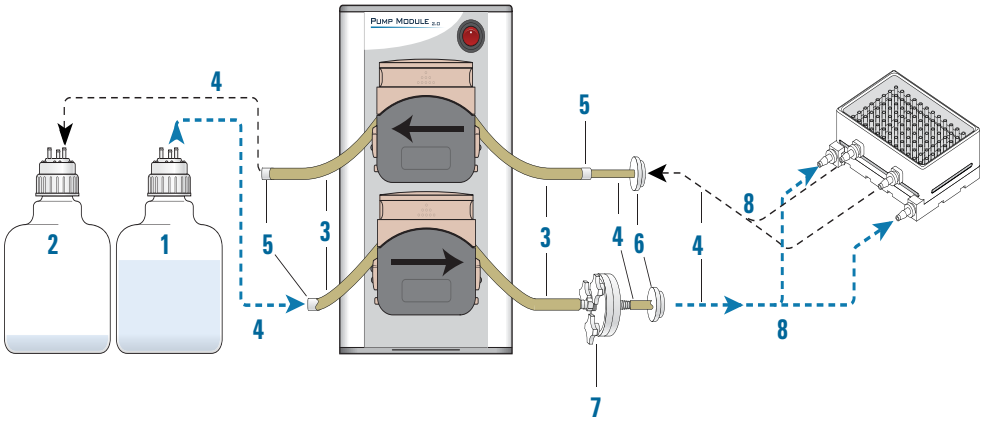
Before you begin

- Make sure you are familiar with the input and output ports for the type of reservoir or wash station.
- Ensure that you have the tubing kit (tubing, connectors, and quick-disconnect fittings) and source and waste bottles.

  If you are using a Tip Wash Station (also known as a MicroWash Reservoir), make sure you have the inline pump filter.

  The following figure shows a tubing configuration example for a single Pump Module and a Tip Wash Station. The table lists the components shown in the figure.

Figure Example tubing configuration showing components



Item	Component	Description
1	Source bottle	Supplies the fill liquid for an autofilling reservoir, such as the Tip Wash Station
2	Waste bottle	Collects the waste liquid that is pumped from the reservoir
3	Tube B	The 8 mm (5/16 in) Marprene tubing Use tube B (larger diameter tubing) for the lengths of tubing in the pump heads and for the gravity drain on an Auto Filling Reservoir.
4	Tube A	The 6.4 mm (4/16 in) Marprene tubing Use tube A (smaller diameter tubing) for the input and output tubing connections to the reservoir and the source and waste bottles.
5	Connector, union	Joins tube A to tube B Over time, the tubing in the pump heads deteriorates and requires replacement. By placing a union connector on either side of the pump head, you can minimize the length of tubing that needs to be replaced.
6	Quick-disconnect fitting	Enables easy removal of an autofilling reservoir, such as the Tip Wash Station The quick-disconnect fittings include an automatic-close valve. Fluid can flow only if a positive connection is made.
7	Inline pump filter	Removes the particulates that can clog the chimneys in the Tip Wash Station As the pump operates, the inside of the tubing sheds particulates that must be filtered downstream to prevent the chimneys from clogging.
8	3-way connector	Enables one tube to branch into two tubes at the input and output ports on an autofilling reservoir, such as the Tip Wash Station

WARNING **Ensure that the Pump Module and the liquid-handling device are turned off before routing the tubing.**

Workflow for routing the tubing

Perform the following procedures in the order given:

Step	For this task...	See...
1	Connect tube A (smaller diameter tubing) to the reservoir ports.	"To connect tube A to a reservoir:" on page 137
2	Position tube B (larger diameter tubing) in the pump heads.	"To position tube B in the pump heads:" on page 138
3	Connect tube B from the pump heads to tube A from the reservoir.	"To connect Pump Module tube B to the tubing from the reservoir:" on page 140
4	Connect tube B from the pump heads to tube A from source and waste bottles.	"To connect the source and waste bottles to tube B:" on page 141
5	*Auto Filling Reservoir only.* Connect a length of tube B from the overflow gravity-drain to a waste bottle.	"(Auto Filling Reservoir only) To route the overflow gravity-drain tubing:" on page 141
6	Complete the Pump Module setup.	"To complete the Pump Module setup:" on page 141

To connect tube A to a reservoir:

1 Place the reservoir on the platepad for the liquid-handling device.

Vertical Pipetting Station only. Place the reservoir on the shelf, and then skip to step 3.

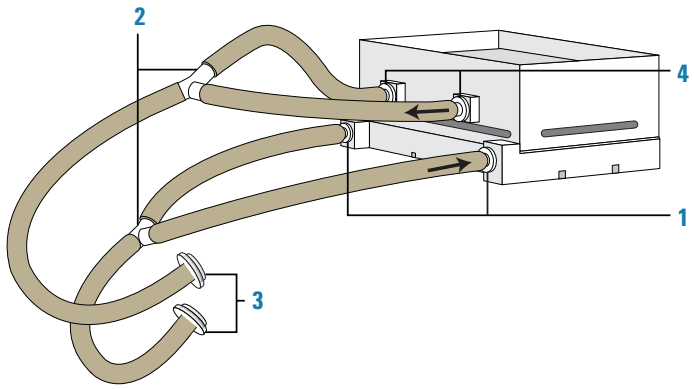
2 Using the following figure as a guide, route the tubing as follows for a reservoir with two input ports and two output ports:

a *Fill (input).* Cut three lengths of tube A. Two lengths of tubing are for the measured distance from the reservoir ports (1) to a 3-way connector (2). The third length of tubing is for the distance between the 3-way connector and either a quick-disconnect fitting (3) or tubing connector (not shown). Connect the tubing.

b *Empty (output).* Cut three lengths of tube A. Two lengths of tubing are for the measured distance from the reservoir output ports (4) to a 3-way connector (2). The third length of tubing is for the distance between the 3-way connector and either a quick disconnect fitting or tubing connector. Connect the tubing.

Note: If the reservoir has one output port, cut one length of tube A for the output tubing.

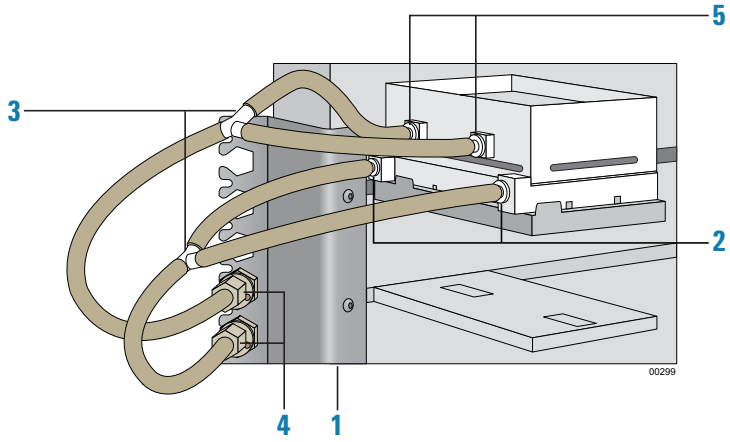
Figure Example tubing configuration for a Tip Wash Station: (1) input ports, (2) 3-way connectors, (3) quick-disconnect fittings, and (4) output ports



Note: The liquid enters the Tip Wash Station through the two lower input ports and flows up through the chimneys. The overflow of the chimneys flows out through the two upper output ports.

3 *Vertical Pipetting Station only.* Using the following figure as a guide, route the tubing from the reservoir to the Tubing Rack (1) as follows:

Figure Example tubing configuration for Vertical Pipetting Station with Tip Wash Station



a *Fill (input).* Cut three lengths of tube A: two for the measured distance from the reservoir input ports (2) to the 3-way connector (3), and a third for the distance between the 3-way connector and a quick-disconnect fitting (4) on the Tubing Rack. Connect the tubing as the figure shows.

b *Empty (output).* If the reservoir has two output ports (5), cut three lengths of tube A following the procedure in step a, and connect the tubing using a 3-way connector (3) as the figure shows. If the reservoir has one output port, cut one length of tube A.

To position tube B in the pump heads:

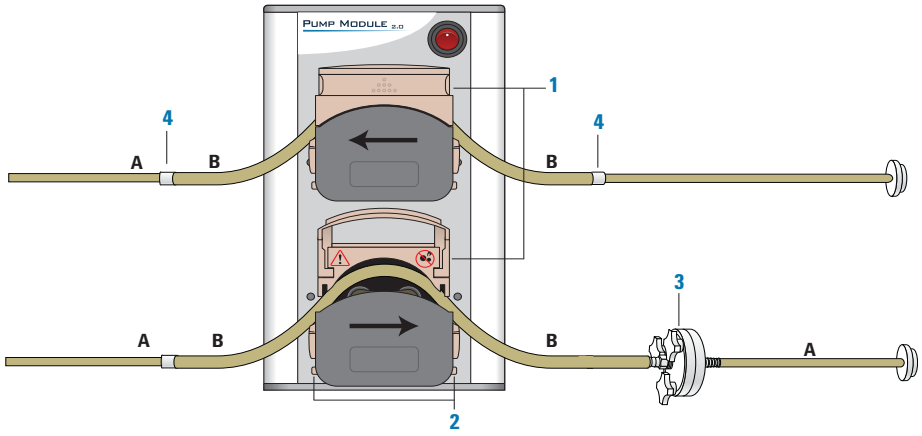
WARNING **Pinch hazard! Keep your fingers clear of the pump head interior when you close the pump head cover. Keep the pump head cover closed while the pump is running.**

CAUTION Ensure that the tubing is not kinked, twisted, or stretched against the rollers. Make sure that the tube is not crushed in the clamps.

1 Determine which of the two pump heads (1) will control the input flow (fill direction) to the reservoir and which will control the output flow (empty direction) to the waste bottle.

Each pump head can be configured in the software to flow in either direction. In the following figure, the lower pump head controls the input flow to the reservoir, and the upper pump head controls the output flow.

Figure Inserting tubing into the pump heads



2 For each pump head, cut a length of tube B that is long enough so that the tubing can gently arch over the rollers in the pump head and still have plenty of slack on either side of the pump head for a connection to tube A.

3 To insert tube B into a pump head:

a Lift up the flip-top cover on the pump head so that it is fully open.

b On each side of the pump head, turn the dial (2) to open the clamps (V-grooves) fully to accommodate the diameter of tube B.

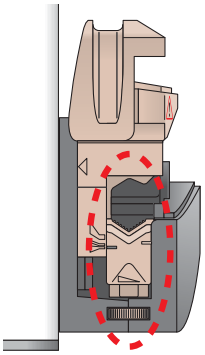
c Insert a portion of tube B so that the tubing gently arches over the rollers. Ensure the tubing is located in the center of the tube clamps (V-grooves) on either side of the pump head, and then carefully lower the cover.

Repeat this step for the other pump head.

CAUTION Ensure that the pump head clamps are set properly for the diameter of the tubing. Incorrectly adjusted clamps can constrict the flow or damage the tubing when the pump head is closed.

Note: If any creeping of the tubing occurs during operation, tighten the clamps slightly using the clamp dials (2).

Figure Open pump head (side view) showing fully open clamp and clamp dial



4 *Tip Wash Station only*. For the input flow (fill direction) into the Tip Wash Station, connect the pump filter (3) to tube B between the Pump Module and the Tip Wash Station as the figure shows.

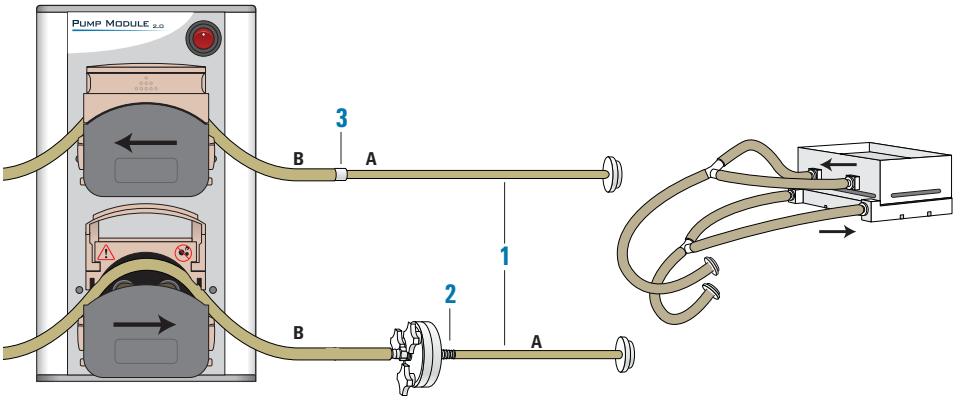
Ensure that the filter is oriented so that the three thumbscrews face toward the Pump Module and the other side of the filter faces toward the Tip Wash Station.

5 Insert a tubing connector (4) on each open end of tube B, as the figure shows.

To connect Pump Module tube B to the tubing from the reservoir:

1 Cut two lengths of tube A measured for the distance between the end of tube B and the connector on the end of tube A from the reservoir. See the following figure, item 1.

Figure Tubing from Pump Module to reservoir



2 For the fill direction:

a Connect one length of tube A to the tube B connector or to the inline filter (2), if applicable, on the input tubing (fill direction) from the Pump Module.

b Connect the other end of tube A to the quick-disconnect fitting on the end of tube A that is connected to the reservoir input ports.

3 For the empty direction:

a Connect the other length of tube A to the tube B connector (3) on the empty-direction tubing going into the Pump Module.

b Connect the other end of tube A to the quick-disconnect fitting on the end of tube A that is connected to the reservoir output ports.

To connect the source and waste bottles to tube B:

1 Cut a length of tube A measured for the distance from the source bottle to the Pump Module. Allow plenty of slack in the tubing.

2 Attach a quick-disconnect fitting to one end of tube A, and insert the quick-disconnect fitting into the output port of the source bottle.

3 Connect the other end of tube A to the tube B connector on the input line.

4 Repeat steps 1 to 3 for the waste bottle, ensuring that you connect tube A from the waste bottle to the tube B connector on the output line at the Pump Module.

(Auto Filling Reservoir only) To route the overflow gravity-drain tubing:

1 Cut tube B to the measured length from the reservoir drain port to a waste bottle.

Vertical Pipetting Station only. Cut a length of tube B for the distance from the reservoir drain port to the Tubing Rack, and from the Tubing Rack to the waste bottle. Attach the tubing using the quick-disconnect fittings.

2 Attach a quick-disconnect fitting to one end of the tubing, and insert the fitting into one of the ports on the waste bottle. Make sure the waste bottle is vented.

3 Attach the other end of the tubing to the reservoir drain port connection.

CAUTION Do not connect the overflow line to the empty line, or else the overflow will not drain properly. To enable the gravity drain system to work effectively, the drain tubing must always travel downward.

To complete the Pump Module setup:

1 *Vertical Pipetting Station only*. Slide the reservoir shelf back and forth to ensure the shelf has enough tubing for unrestricted travel.

2 Turn on the Pump Module, and then turn on the liquid-handling device.

3 Start the automation software, and then configure the autofilling accessory parameters.

IMPORTANT When using Marprene tubing, reset the tension after you run the Pump Module for the first 30 minutes. To reset the tension on the tubing, open the flip-top cover of the pump head, allow the tube to settle naturally across the rollers, and then reclamp the tube.

IMPORTANT When the Pump Module is not in use, lift the flip-top cover on each pump head to prevent flattening the tubing and to help maximize the tubing life.

Removing a Pump Module

To remove the Pump Module:

1 Using the automation control software, run the Pump Module and drain the reservoir until empty.

2 Turn off the Pump Module, and then turn off the liquid-handling device.

3 Disconnect the Pump Module power and communication cables. Unplug the Weigh Station cable from the Pump Module.

4 Disconnect the tubing from the reservoir.

5 Remove the reservoir.

6 Remove the tubing from the Pump Module and from the source and waste bottles.

Related information

For information about...	See...
Starting up and shutting down the Vertical Pipetting Station	"Starting up and shutting down" on page 43
Installing a Weigh Shelf	"Installing and calibrating a Weigh Shelf" on page 149
Reservoirs and wash trays	"Reservoirs and wash trays for autofilling" on page 130
Configuring autofilling parameters	"Configuring the autofilling function" on page 143
Setting up liquid and labware definitions	*VWorks Automation Control Setup Guide*
Using an accessory in a protocol	*VWorks Automation Control User Guide*

Configuring the autofilling function

About this topic

This topic describes how to configure the autofilling functions for the Pump Module.

Before you begin

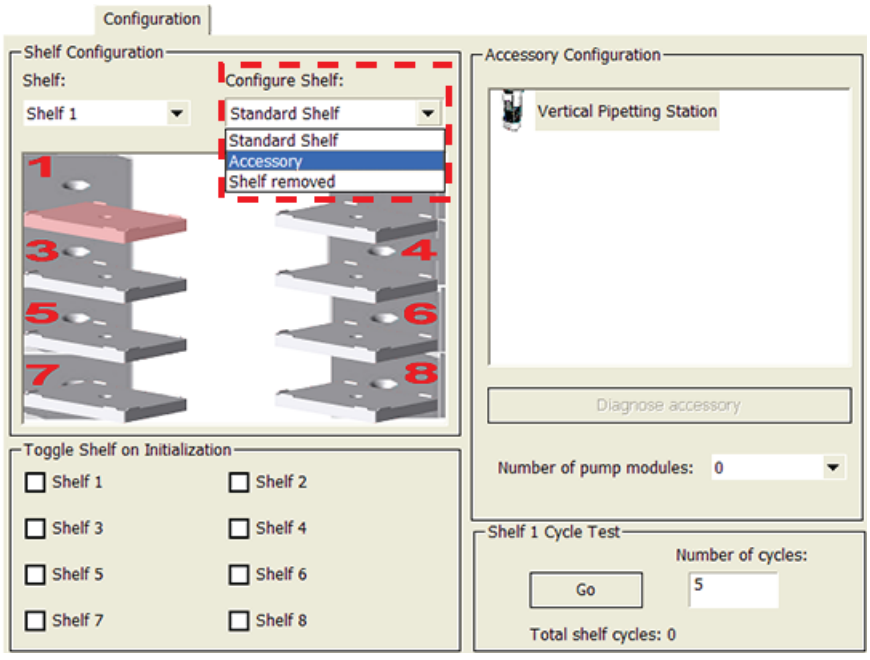
Connect the Pump Module, Weigh Shelf, and an Agilent autofilling type reservoir.

For details, see the *Pump Module User Guide*.

Configuring the autofilling function

To configure an autofilling shelf:

1. In **Vertical Pipetting Station Diagnostics**, click the **Profiles** tab, and select the profile that you want to change.
2. On the **Configuration** page, select the location in the **Shelf** list, or click the location in the graphic display.
3. In the **Configure Shelf** list, select **Accessory**.



4. In the **Accessories Wizard**, do the following:
   a. In the **Location for accessory** list, verify the location and then click **Next**.
   b. In the **Accessory** list, select **Autofill Shelf**, and then click **Next**.
   c. In the **Number of pump modules** box, select the total number of Pump Modules connected to this device, and then click **Next**.

For example, if only one Pump Module is connected to this Vertical Pipetting Station, select **1**. If two Pump Modules are connected to this Vertical Pipetting Station, select **2**, and so forth.

Note: To make a change, click the number to display a list of options.

d In the **Autofill Shelf properties** table, set the following parameters.

Parameter	Settings
Fill module	Specify the Pump Module that this shelf uses. For example, select 1 if only one Pump Module is connected to the device. One Pump Module can function as both the Fill module and Empty module.
Pump for filling	Select which of the two pumps on the Pump Module will fill the container on the shelf, where, • Pump 1 controls the upper pump. • Pump 2 controls the lower pump.
Direction for filling	Select the pumping direction, where, • Forward moves the pumped fluid in the forward direction of the pump. • Reverse moves the fluid in the opposite direction. For example, if a single Pump Module connects to a left side shelf on the Vertical Pipetting Station, select Pump 1 Forward for autofilling and Pump 2 Reverse for autoemptying. However, if the Pump Module connects to a right side shelf, select Pump 1 Reverse for autofilling and Pump 2 Forward for autoemptying.
Empty module	Specify the Pump Module that this shelf uses. For example, select 1 if only one Pump Module is connected to this device. One Pump Module can function as both the Fill module and Empty module.
Pump for emptying	Select which of the two pumps on the given Pump Module will empty the container on the shelf, where, • Pump 1 controls the upper pump. • Pump 2 controls the lower pump.
Direction for emptying	Select the pumping direction: Forward or Reverse.
Use Weigh Shelf?	If you are using a Weigh Shelf at this location, select Yes.

Parameter	Settings
Weigh Shelf module number	If connecting the Weigh Shelf serial cable to the Pump Module SHELF A input port, select 1. If more than one Weigh Shelf is connected, the module number corresponds to the order in which they are connected to the controlling computer. *Note:* Agilent Technologies recommends using one Pump Module for each pairing of reservoir and Weigh Shelf.

e Click **Next**, and then click **Finish** on the **Summary** page.

5 When the accessory configuration message appears and advises you to set the teachpoint to a safe value, do one of the following:

- If you are using a Weigh Shelf at this location, click **Yes** to move the teachpoint to a safe value.

  On the **Profiles** tab, click **Initialize this profile** , and then reset the teachpoint for the installed Weigh Shelf.
- If you are placing the reservoir on a standard shelf, click **No** to preserve the existing teachpoint. On the **Profiles** tab, click **Update this profile** to save the settings.

Testing the autofilling function

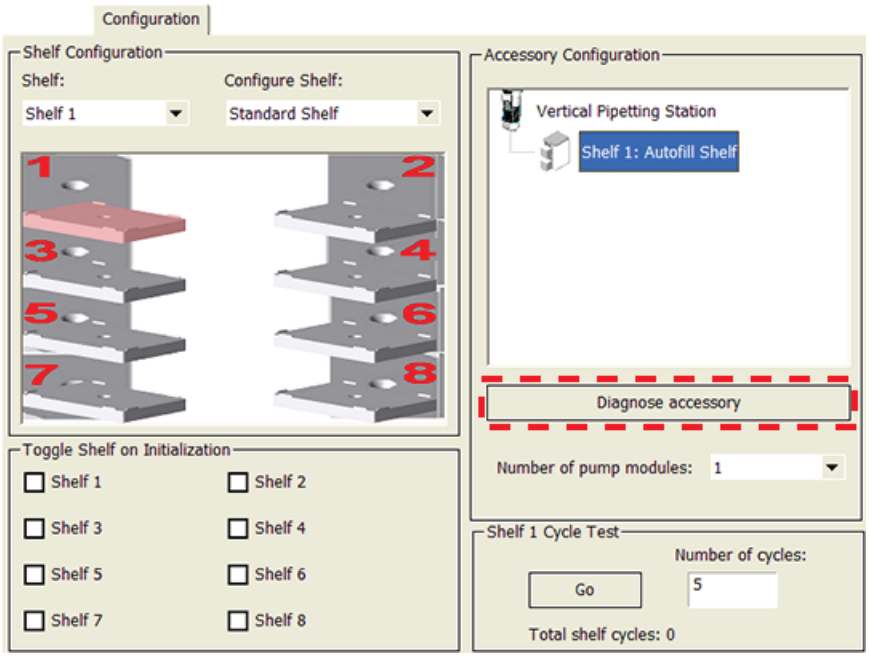
To test the autofilling and autoemptying functions, you can use Vertical Pipetting Station Diagnostics to run the pumps in real time.

To test autofilling:

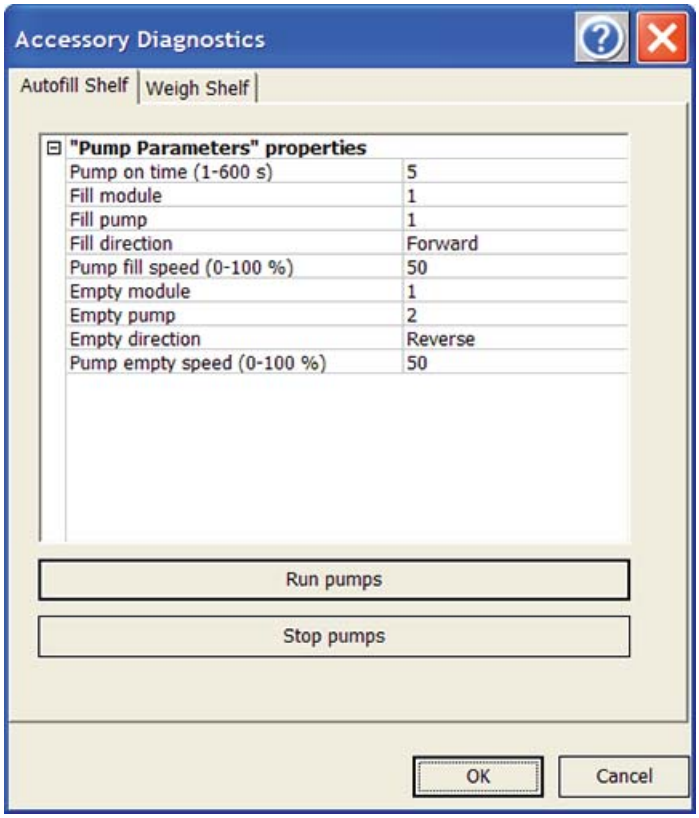
1 In **Vertical Pipetting Station Diagnostics**, click the **Configuration** tab.

2 In the **Accessory Configuration** area, highlight the **Autofill Shelf** icon, and then click **Diagnose accessory**.

Note: The Autofill Shelf is represented by a Pump Module graphic in the software.



3 In the **Accessory Diagnostics** dialog box, verify the following settings.



Control	Description
Pump on time (s)	Specifies the duration that the selected pump on the Pump Module runs when you click Run pumps.
Fill module	Specifies the Pump Module that this shelf uses. One Pump Module can function as both the Fill module and Empty module. For example, select 1 if only one Pump Module is connected.
Fill pump	Specifies which of the two pumps on the Pump Module to use for filling the container on the shelf, where 1 controls the upper pump. 2 controls the lower pump.
Fill direction	*Forward*. Moves the pumped fluid in the forward direction of the pump. *Reverse*. Moves the fluid in the opposite direction.
Pump fill speed (0–100%)	Specifies how quickly the pump moves the fluid, where 100% is the fastest setting.
Empty module	Specifies the Pump Module that this shelf uses. One Pump Module can function as both the Fill module and Empty module. For example, select 1 if only one Pump Module is connected.
Empty pump	Specifies which of the two pumps on the Pump Module to use for emptying the container on the shelf, where 1 controls the upper pump. 2 controls the lower pump.
Empty direction	*Forward*. Moves the pumped fluid in the forward direction of the pump. *Reverse*. Moves the fluid in the opposite direction.
Pump empty speed (0–100%)	Specifies how quickly the pump moves the fluid, where 100% is the fastest setting.
Run pumps	Starts the pumps on the selected Pump Module in real time.
Stop pumps	Stops the pumps in real time.

4 Click **Run pumps** and verify that the pump is functioning properly.

5 Click **Stop pumps**, and then click **OK**.

Related information

For information about...	See...
Starting up and shutting down the Vertical Pipetting Station	"Starting up and shutting down" on page 43
Setting up a Pump Module	"Setting up a Pump Module" on page 133

For information about...	See...
Calibrating a Weigh Shelf	"Installing and calibrating a Weigh Shelf" on page 149
Reservoirs and wash trays	"Reservoirs and wash trays for autofilling" on page 130
Draining or filling a reservoir using the Pump Reagent process	"Running a process using Diagnostics software" on page 106
Setting up liquid and labware definitions	*VWorks Automation Control Setup Guide*
Using an accessory in a protocol	*VWorks Automation Control User Guide*

Installing and calibrating a Weigh Shelf

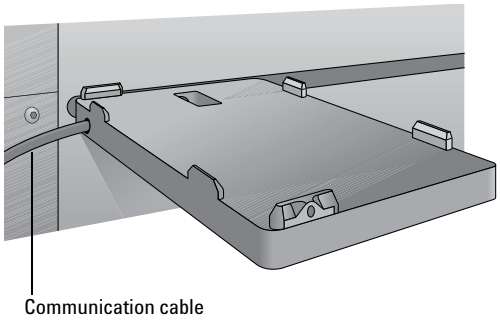
About this topic

The Weigh Shelf works with a Pump Module to control the liquid level in the Auto Filling Reservoir or in a Tip Wash Station. This topic describes how to install and calibrate a Weigh Shelf.

Description

The Weigh Shelf contains an electronic monitor that checks the percentage of liquid in a reservoir. By monitoring the weight of the reservoir, the Weigh Shelf controls when the Pump Module is activated. The Weigh Shelf works with the Pump Module to maintain an optimal level of liquid and ensures the reservoir is not overfilled.

IMPORTANT The Pump Module must be internally configured to specify use with or without a Weigh Shelf. If a configuration change is required, contact Automation Solutions Technical Support.



Installation and setup workflow

Step	Procedure	See...
1	Install the Weigh Shelf on the Vertical Pipetting Station.	“Installing a Weigh Shelf” on page 150
2	Connect the Weigh Shelf communication cable to the Pump Module.	“Setting up a Pump Module” on page 133
3	Configure the Weigh Shelf reservoir operations.	“Configuring the autofilling function” on page 143
4	Calibrate the Weigh Shelf.	“Calibrating a Weigh Shelf” on page 151
5	Verify the teachpoint accuracy for the Weigh Shelf.	“Setting shelf teachpoints” on page 59

Installing a Weigh Shelf

Before you begin

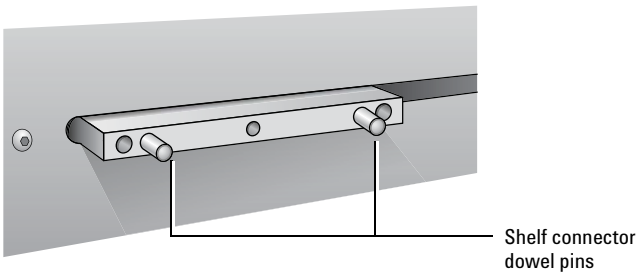
WARNING **Before connecting an accessory, shut down the Vertical Pipetting Station to ensure that the power and air are turned off.**

Make sure you have an 3-mm hex wrench.

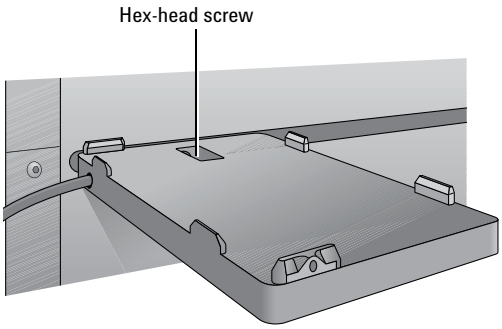
For accessory location guidelines, see "Determining the shelf location for an accessory" on page 111.

To install a Weigh Shelf:

1. If applicable, remove the standard shelf from the target location. See "Removing or installing a standard shelf" on page 114.
2. Slide the Weigh Shelf onto the two dowel pins of the Vertical Pipetting Station shelf connector.



3. At the top center of the shelf, insert the hex-head screw to secure the shelf in position.



About connecting a Weigh Shelf

Use one Pump Module for each pairing of reservoir and Weigh Shelf. For the connection procedure, see "Setting up a Pump Module" on page 133.

Before the Weigh Shelf is ready for use in a protocol, you must:

- Configure the autofilling shelf parameters in Vertical Pipetting Station Diagnostics. See "Configuring the autofilling function" on page 143.
- Calibrate the Weigh Shelf empty and full settings.

Calibrating a Weigh Shelf

Before you begin

- Make sure the Pump Module is set up and connected to the Weigh Shelf.
- Verify that the Autofilling shelf is configured in Vertical Pipetting Station Diagnostics.

Procedure

Before the Weigh Shelf is ready for use in a protocol, you must calibrate the empty and full settings. When you calibrate the Weigh Shelf, you must use the reservoir type that will be weighed.

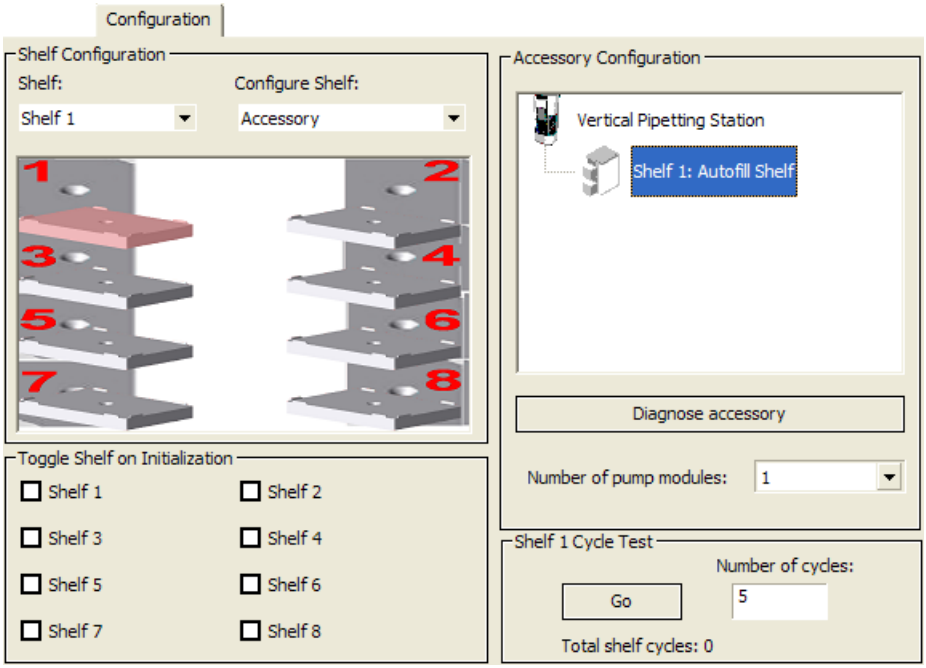
To calibrate a Weigh Shelf:

1 In **Vertical Pipetting Station Diagnostics**, click the **Profiles** tab and make sure the correct profile is initialized.

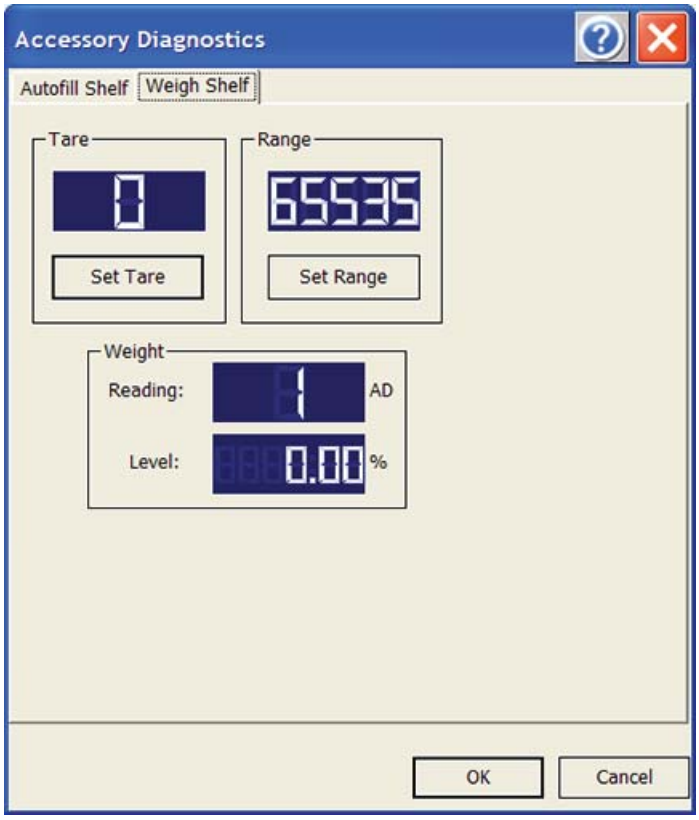
2 Click the **Configuration** tab.

3 In the **Accessory Configuration** area, highlight **Autofill Shelf**, and then click **Diagnose accessory**.

Note: The Autofill Shelf is represented by a Pump Module graphic in the software.



4 In the **Accessory Diagnostics** dialog box, click the second tab.



5 At the Vertical Pipetting Station, place the reservoir on the Weigh Shelf. Make sure the reservoir is empty.

6 In the **Accessory Diagnostics** dialog box, click **Set Tare** to configure the empty setting.

7 To configure the full setting for the reservoir:

   a Fill the reservoir to the desired full level.

   You can use the Pump Reagent command on the Processes tab to fill or drain the reservoir.

   b In the **Accessory Diagnostics** dialog box, click **Set Range**.

   The digital display shows a sensor reading that corresponds to the current weight of the reservoir that is on the Weigh Shelf.

IMPORTANT To avoid overfilling the reservoir, ensure that the full range is set while the fluid level is below the top of the reservoir.

8 Verify that the **Level** reading decreases as the liquid level decreases while you run the designated empty pump to remove any liquid from the reservoir.

9 Click **OK**.

10 On the **Profiles** tab, click **Update this profile**.

Related information

For information about...	See...
Starting up and shutting down the Vertical Pipetting Station	"Starting up and shutting down" on page 43
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Connecting the Pump Module	"Setting up a Pump Module" on page 133
Configuring the reservoirs	"Configuring the autofilling function" on page 143
Editing teachpoints	"Setting shelf teachpoints" on page 59
Using an accessory in a protocol	*VWorks Automation Control User Guide*

C
Diagnostics software quick reference

This appendix provides a quick reference to the Vertical Pipetting Station Diagnostics software. The topics are:

Vertical Pipetting Station Diagnostics dialog box

About this topic

This topic provides a quick reference for the Vertical Pipetting Station Diagnostics dialog box.

Buttons

Button	Description
About	Displays Vertical Pipetting Station Diagnostics version and copyright information.
Stop motors (keyboard SPACEBAR)	Immediately stops the pipette head movement by doing the following: • Turns off power to all the motors • Activates the *z*-axis brake to prevent the pipette head from falling The air pressure remains on. Therefore, the shelves can continue to move.

Tabbed pages

Tabbed page	Description
"Jog/Teach tab quick reference" on page 164	Provides controls for jogging the pipette head and setting shelf teachpoints.
"Configuration tab quick reference" on page 168	Provides controls for configuring the shelves and accessories, and for performing shelf cycle tests.
"IO tab quick reference" on page 162	Provides actuator controls and sensors for the shelves, tipbox press, and *z*-motor brake.
"Processes tab quick reference" on page 173	Provides controls for running diagnostic processes in real time.
"Profiles tab quick reference" on page 157	Provides controls for managing and creating profiles and replacing the pipette head.

Profiles tab quick reference

About this topic

This topic provides a reference for the Profiles tab in Vertical Pipetting Station Diagnostics.

Profiles tab procedures

The Profiles tab enables you to:

Procedure	See...
Create a profile, or manage the available profiles	"Creating Vertical Pipetting Station profiles" on page 52
Initialize a profile	"Initializing the Vertical Pipetting Station" on page 55
Change the pipette head	"Changing the pipette head" on page 74

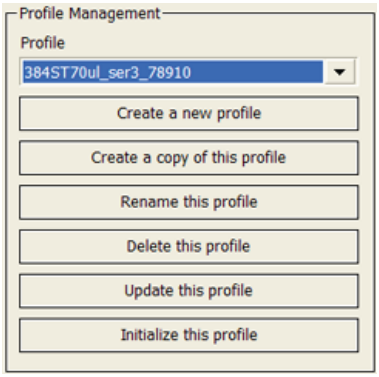
Profiles tab contents

The Profiles tab contains the following:

- "Profile Management area" on page 157
- "Profile Settings area" on page 158
- "Modified Variables area" on page 160
- "Additional controls" on page 160

Profile Management area

The Profile Management area contains the following controls.

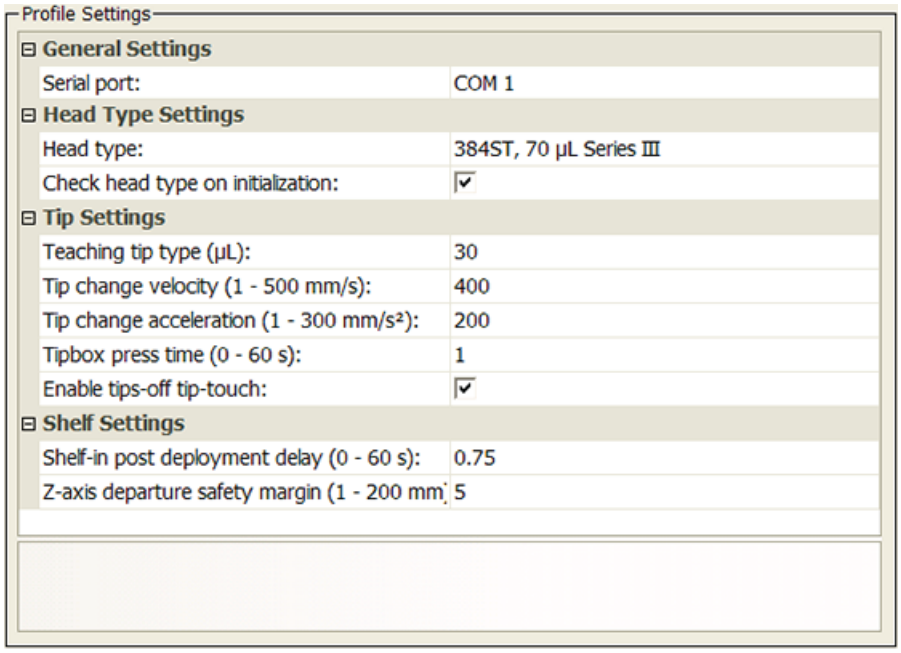


CAUTION Each profile can be used by multiple protocols. Deleting, renaming, or changing the parameters for a profile based on one protocol can invalidate other protocols that use the profile.

Control	Description
Profile name list	Specifies the active profile. Select the profile that you want to use from the list.
Create a new profile	Displays the Create Profile dialog box so that you can name the new profile. To add a profile, see "Creating Vertical Pipetting Station profiles" on page 52.
Create a copy of this profile	Creates a copy of the profile selected in the Profile list. The new profile name has the prefix, *Copy of*.
Rename this profile	Displays the Rename Profile dialog box so that you can rename the profile selected in the Profile name list.
Delete this profile	Confirms the profile to be deleted, and then deletes the selected from the Profile name list.
Update this profile	Saves changes to the selected profile and displays a summary of the changes in the Modified Variables area.
Initialize this profile/ Reinitialize this profile Close this profile	Initiates communication with the Vertical Pipetting Station using the selected profile, reinitializes communication, or closes the currently initialized profile, respectively.

Profile Settings area

The Profile Settings area can contain the following controls. The Tip Settings parameters are available only if the profile uses a disposable-tip head.

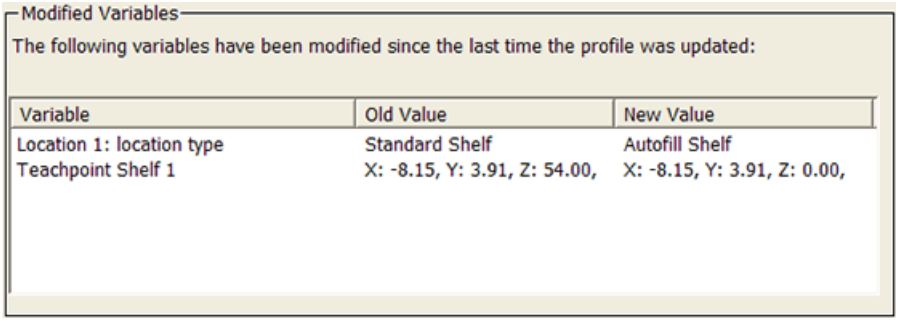


Control	Description
General Settings: Serial port	Specifies the serial communication port on the controlling computer.
Head Type Settings	
Head type	Specifies the pipette head for the active profile. The type should match the head mounted on the Vertical Pipetting Station when the profile is in use. To change the pipette head that is mounted on the Vertical Pipetting Station, see "Changing the pipette head" on page 74.
Check head type on initialization	Verifies that the pipette head specified in the profile matches the head mounted on the Vertical Pipetting Station when the profile is used by a protocol. If this check box is cleared, the Vertical Pipetting Station will run with any pipette head installed. Therefore, if you select a 96-channel head type while a 384-channel head is installed, the head will crash.
Tip Settings	Available only if a disposable-tip pipette head is selected.
Teaching tip type (µL)	Specifies the tip size to use when setting the shelf teachpoints. **IMPORTANT** If you change this value, you must reset the shelf teachpoints.

Control	Description
Tip change velocity (mm/s)	Sets the speed at which the tip change occurs (w-axis).
Tip change acceleration (mm/s^2)	Specifies the rate of increase in velocity at which the tip change occurs (w-axis).
Tipbox press time	Specifies the duration that the tipbox press is active.
Enable tips-off tip-touch	Enables the pipette tips to touch one or more sides of the wells, during tips-off operations.
Shelf Settings	
Shelf-in post deployment delay (s)	Sets the duration for liquid to settle after a shelf stops moving.
Z-axis departure safety margin (mm)	Specifies the vertical distance to move the tips after pipetting tasks, such as aspirating, dispensing, and mixing.
Tooltips area	Displays a description of the selected variable in the Profile Settings area.

Modified Variables area

The Modified Variables area displays any changes to the profile settings.



Additional controls

WARNING **If the SDH Base check box setting is incorrect, potential damage to the device can result. If you are unsure about the selection, contact Automation Solutions Technical Support.**

Control	Description
Change head button	Available only after you initialize a Vertical Pipetting Station profile. Displays the Change Head Wizard, which steps you through the process of changing the pipette head that is mounted on the Vertical Pipetting Station. See "Changing the pipette head" on page 74.
SDH Base	Resets the x- and y-axes coordinates depending on the type of Vertical Pipetting Station device. • If the base is compatible with serial dilution heads (SDH), select the check box (default). • If the base has part number 02318.001 or 02318.002, clear the check box. These models are not compatible with serial dilution heads.
Run device at medium speed during protocol	Sets the device speed to medium during a protocol run.

Related topics

For information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Editing teachpoints	"Setting shelf teachpoints" on page 59
Troubleshooting problems	"Troubleshooting hardware problems" on page 88
Reporting a problem	"Reporting problems" on page 93

IO tab quick reference

About this topic

This topic provides a reference for the IO tab in Vertical Pipetting Station Diagnostics.

To use the IO tab, see "Using actuator controls and indicators" on page 105.

IO tab contents

The IO tab in Vertical Pipetting Station Diagnostics contains the following areas:

- Actuator Control
- Sensors

Actuator Control area

The Actuator Control area contains the following controls that you can use to and test the sensors.

Control	Description	Default state
Z-motor brake	Locks and frees the brake on the *z*-motor. All processes automatically lock the *z*-motor brake when pressing tips on.	Locked
Shelf In/Out	Moves the selected shelf in or out and lights the corresponding shelf sensor.	Out
Tipbox press	Moves the tipbox press up or down.	Down

WARNING **Activating the tipbox press generates hundreds of pounds of force. Keep all body parts clear of the machine when activating the Tipbox Press.**

CAUTION Do not activate the tipbox press above tips unless the *z*-motor brake is locked.

IMPORTANT After actuating the shelves, return the Vertical Pipetting Station to the *normal* state (all shelves out, tipbox press down, and *z*-axis brake locked).

Sensors area

The Sensors area contains the following indicators.

Note: If a sensor indicator fails to light, the sensor might be faulty. Contact Automation Solutions Technical Support for sensor replacement.

Control or indicator	Description
W axis home Z axis home	Lights (green) to indicate that the w- and z-axes are in the home position.
Motor 1 home Motor 2 home	Lights (green) to indicate the x- and y-motors are in the home position.
Tipbox present	Lights (green) to indicate that the tipbox sensor has been tripped.
Air pressure	Displays the pressure of the compressed air coming into the Vertical Pipetting Station.
Shelf n in	Lights (yellow) to indicate that the shelf is in position under the pipette head.
Shelf n out	Lights (yellow) to indicate that the shelf is in the out position away from the pipette head.

Related topics

For information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Troubleshooting problems	"Troubleshooting hardware problems" on page 88
Reporting a problem	"Reporting problems" on page 93

Jog/Teach tab quick reference

About this topic

This topic provides a quick reference for the Jog/Teach tab in Vertical Pipetting Station Diagnostics.

Jog/Teach tab procedures

The Jog/Teach tab enables you to:

Procedure	See...
Home the pipette head	"Homing the pipette head" on page 98
Set teachpoints	"Setting shelf teachpoints" on page 59
Move the pipette head to a safe distance above a teachpoint, or move to a teachpoint	"Using the Approach and Move commands" on page 104
Move the pipette head incrementally in each of its axes	"Jogging the pipette head" on page 101
Change the speed of the pipette head	"Homing the pipette head" on page 98

Jog/Teach tab contents

The Jog/Teach tab contains the following:

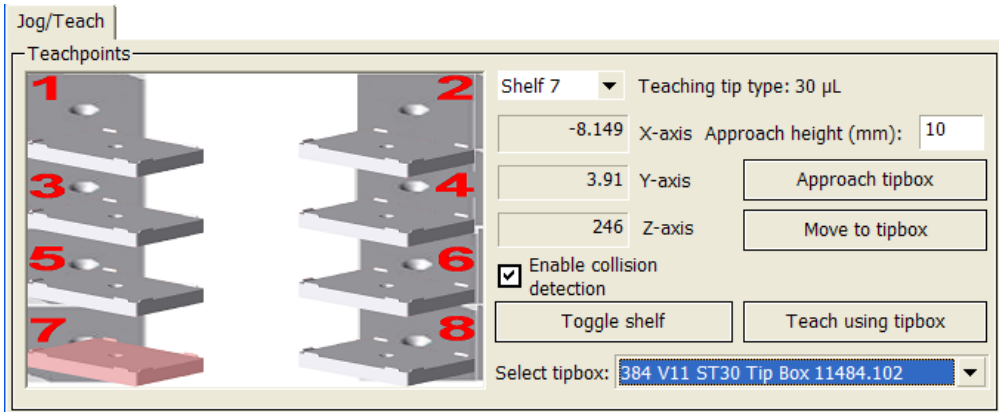
- "Teachpoints area" on page 165
- "Jog and Home Axes areas" on page 166

WARNING **If your user level is Administrator, you are able to run the Vertical Pipetting Station in out-of-range conditions. As an Administrator, you must accept all liability and risk of operating the Vertical Pipetting Station at high speeds.**

CAUTION For details on editing teachpoints, see ""Setting shelf teachpoints" on page 59 and "Teaching shelves 7 and 8 for tipboxes" on page 64.

Teachpoints area

The Teachpoints area contains the following controls and indicators.



Vertical Pipetting Station shelves graphic display

The Vertical Pipetting Station shelves graphic display provides a visual way to control the Vertical Pipetting Station and monitor the pipette head movement. The highlighted shelf indicates the location of the pipette head. You can move the head in real time by right-clicking a location and selecting a command.

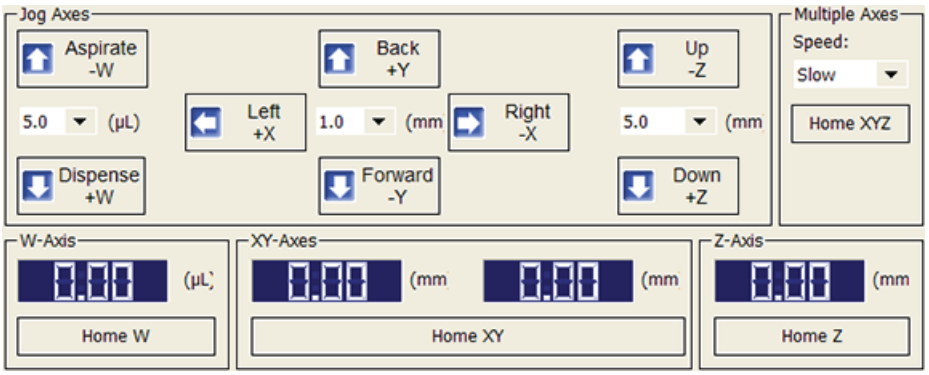
Controls and indicators

Control or indicator	Description
Shelf list	Specifies the shelf that you are moving or teaching.
X-axis, Y-axis, and Z-axis displays	Shows the current teachpoint coordinates for the selected shelf. *Note:* For 30 µL or smaller volume ST tips, the *z*-axis value is a theoretical value for the shelf 7 and 8 teachpoints. The software calculates the theoretical *z*-axis value from the location of the pipette head when the teach tipbox button is activated and the tipbox labware definition.
Enable collision detection	Enables a warning message to appear if the software detects a possible collision.
Toggle shelf	Moves the selected shelf into position under the pipette head or to the out position. *Note:* Toggling a shelf can release a stuck shelf. The pneumatic cylinder for a shelf can get stuck if a shelf is inactive for awhile.
Teaching tip type (µL)	*Disposable-tip heads only.* Specifies the tip size to use when setting the shelf teachpoints.
Approach height (mm)	Specifies a vertical offset that is used when you click Approach to move the pipette head above a teachpoint.

Control or indicator	Description
Approach	Moves to the specified approach height above the teachpoint for the selected shelf.
Move	Moves the pipette head to the teachpoint for the selected shelf.
Teach	Saves the teachpoint coordinates for the shelf. The Vertical Pipetting Station teachpoints are stored in the Microsoft Windows registry.
Disposable-tip heads only. When you select shelf 7 or 8, the Approach, Move, and Teach buttons change to reflect teaching with a tipbox.	
Approach tipbox	Moves to the specified approach height above the tipbox teachpoint for shelf 7 or 8.
Move to tipbox	Moves the pipette head to the tipbox teachpoint for shelf 7 or 8.
Teach using tipbox	Saves the tipbox teachpoint coordinates for shelf 7 or 8. The Vertical Pipetting Station teachpoints are stored in the Microsoft Windows registry.

Jog and Home Axes areas

The Jog Axes, Multiple Axes, and Home Axes areas contain the following controls and indicators.



Control or indicator	Description
Jog Axes area	
Aspirate –W, Dispense +W buttons and increment (µL) list	Enables you to select the incremental distance (µL) to move the pipette head, and then click the Aspirate or Dispense button to move the pipette head in the *w*-axis.
Left +X, Right –X. Back +Y, Forward –Y buttons and increment (mm) list	Enables you to select the incremental distance (mm) to move the pipette head, and then click the corresponding button to move the pipette head along the *x*- or *y*-axis.

Control or indicator	Description
Up –Z, Down +Z buttons and increment (mm) list	Enables you to select the incremental distance (mm) to move the pipette head, and then click the Up –Z or Down +Z button to move the pipette head in the corresponding direction.
Multiple Axes: Speed	Sets the velocity of each pipette head movement. For example, you might want to specify a slower speed when setting teachpoints.
Multiple Axes: Home XYZ	Homes the pipette head in the horizontal (*xy*) and vertical (*z*) axes.
W Axis	
Digital display	Displays 0.00 when the pipette head is in the *w*-axis home position. Displays the distance (µL) from the *w*-axis home position when the pipette head is not in the home position.
Home W position	Homes the pipette head in the vertical aspirate-dispense axis. The home position is near the low-to-mid *w*-axis range.
XY Axes	
Digital display	Displays 0.00 when the pipette head is in the *xy*-axis home position. Displays the distance (mm) from the *x*-axis (left) and *y*-axis (right) home position when the pipette head is not in the home position.
Home XY position	Homes the pipette head in the horizontal (forward-backward and side-to-side) axes. The home position is near the middle of the *x*- and *y*-axes range.
Z Axis	
Digital display	Displays 0.00 when the pipette head is in the *z*-axis home position. Displays the distance (mm) from the *z*-axis home position when the pipette head is not in the home position.
Home Z position	Homes the pipette head in the vertical (up-down) axis. The home position is near the top of the *z*-axis range.

Related topics

For information about...	See...
Opening Vertical Pipetting Station Diagnostics	“Opening Vertical Pipetting Station Diagnostics” on page 50
Stopping in an emergency	“Stopping in an emergency” on page 4
Editing teachpoints	“Setting shelf teachpoints” on page 59
Troubleshooting problems	“Troubleshooting hardware problems” on page 88
Reporting a problem	“Reporting problems” on page 93

Configuration tab quick reference

About this topic

This topic provides a reference for the Configuration tab in Vertical Pipetting Station Diagnostics.

Configuration tab procedures

The Configuration tab enables you to:

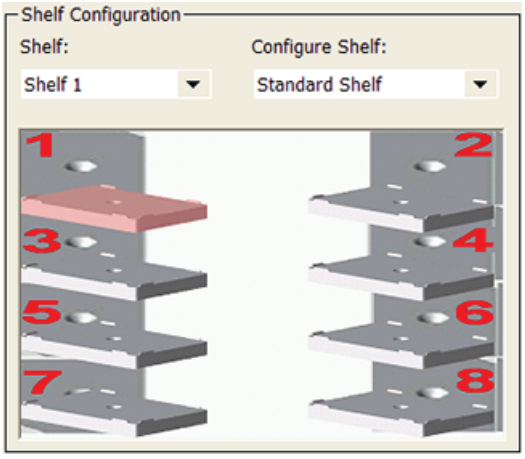
Procedure	See...
Configure accessories	• “Vertical Pipetting Station accessories” on page 109 • “Autofilling shelf accessories” on page 127
Test a configured accessory	• “Testing the autofilling function” on page 145 • “Testing the Vacuum Alignment Shelf” on page 121
Configure a standard shelf	“Installing a standard shelf” on page 115
Configure an empty shelf location	“Removing a standard shelf” on page 114

Configuration tab contents

The Configuration tab in Vertical Pipetting Station Diagnostics contains the following areas:

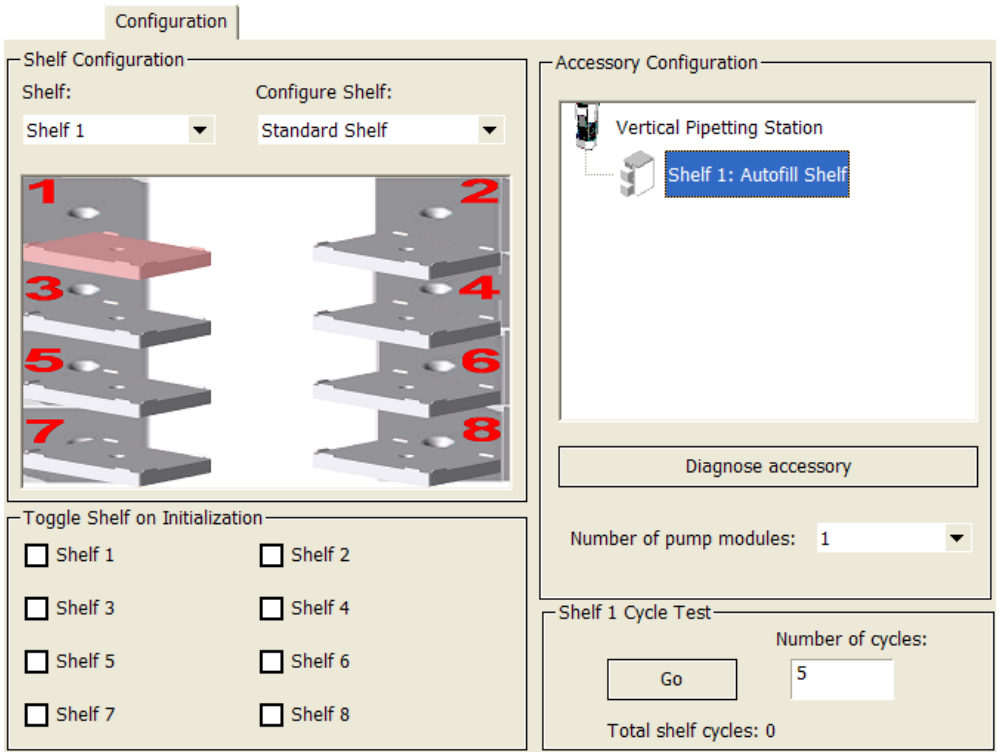
- “Shelf Configuration area” on page 169

Shelf Configuration area



Control or indicator	Description
Shelf list	Selects the shelf location. The shelves graphic highlights the selected location.
Graphical display of shelves	An interactive display that provides the following: • Alternative way to specify the location that you want to configure. • Visual display of the type of shelf configured for each location.
Configure Shelf list	Specifies the function of the selected shelf: • *Standard Shelf*. Designates a generic shelf. • *Accessory*. Displays the Accessory Wizard, which steps you through specifying an accessory at the specified position. • *Shelf removed*. Designates no shelf in the specified position. *Note:* A shelf connector remains in the empty shelf slot even if you physically remove the shelf.

Accessory Configuration area



Control or indicator	Description
Graphical display of configured accessories	Shows icons for the Vertical Pipetting Station and the accessories associated with specific shelves.
Diagnose accessory	*Available only if the selected profile is initialized.* Displays the Accessory Diagnostics dialog box for the selected accessory. Click the accessory icon in the graphic to display the corresponding dialog box.
Number of pump modules	Specifies the total number of Pump Modules for the given Vertical Pipetting Station.

Shelf Cycle Test area

The Shelf Cycle Test area contains the following controls and indicators.

Control or indicator	Description
Number of cycles	Specifies the number of times to move the specified shelf in and out.
Go	Starts the shelf cycle test.
Total shelf cycles	Displays the total number of cycles from all cycle tests.

Toggle Shelf on Initialization area

This area contains a check box for each shelf. Selecting a Shelf check box activates the shelf to move in and out during initialization after homing.

Toggling a shelf during initialization can reduce friction if the shelf has not been used recently. It can also be useful to check that the tubing for an autofilling shelf does not inhibit the shelf movement.

Related topics

For information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Setting up accessories	"Vertical Pipetting Station accessories" on page 109
Troubleshooting problems	"Troubleshooting hardware problems" on page 88
Reporting a problem	"Reporting problems" on page 93

About the Accessory Diagnostics dialog box

About this topic

This topic provides a quick reference for the Accessory Diagnostics dialog box.

Accessory Diagnostics dialog box procedures

The Accessory Diagnostics dialog box provides controls for testing the functioning of an accessory that is configured in Vertical Pipetting Station Diagnostics. The tabbed pages in the dialog box change depending on which accessory you select.

The tabbed pages in the dialog box contain controls for:

- "Testing the autofilling function" on page 145
- "Calibrating a Weigh Shelf" on page 151
- "Testing the Vacuum Alignment Shelf" on page 121

Related topics

For information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Setting up accessories	"Vertical Pipetting Station accessories" on page 109
Troubleshooting problems	"Troubleshooting hardware problems" on page 88
Reporting a problem	"Reporting problems" on page 93

Processes tab quick reference

About this topic

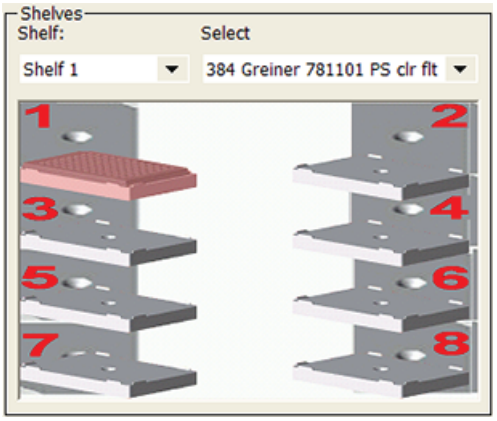
This topic provides a reference for the Processes tab in Vertical Pipetting Station Diagnostics.

To run a process in real time, see "Running a process using Diagnostics software" on page 106.

Process tab contents

The Processes tab contains the following:

Shelves area



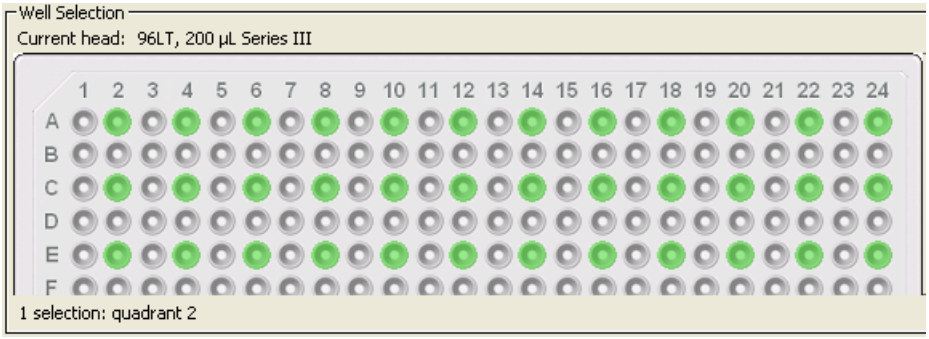
Control or indicator	Description
Shelf list	Specifies the Vertical Pipetting Station shelf to be used for the selected process command.

Control or indicator	Description
Graphical display of the shelves	An interactive display that provides the following: • Alternative way to specify the target shelf. • Visual display of the type of shelf and labware configured for each location.
Select labware list	Specifies the labware to be used for the selected process command. To add a labware selection to the list, click **Open labware editor**, and use the Labware Editor.

Miscellaneous area

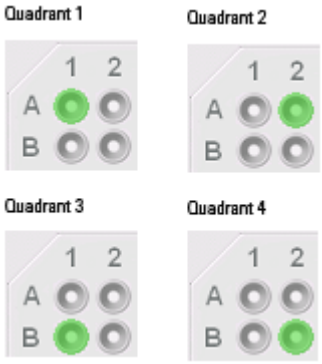
Control or indicator	Description
Open labware editor	Starts the Labware Editor software.
Open pipette technique editor	Starts the Pipette Technique Editor software.
Open liquid library	Starts the Liquid Library Editor software.

Well Selection area



The Well Selection area changes based on the labware selection. For example, if you use a 96-tip head and a 96-well microplate, all the wells are selected (green) by default. If you use a 96-tip head and a 384-well plate, only 1 quadrant of the wells are selected by default.

A quadrant is one-quarter of the wells on a plate. The wells that comprise a quadrant are not contiguous. You can specify one or more of the following quadrants:



- *Quadrant 1 (A1).* All the upper left wells from each group of four wells on the plate.
- *Quadrant 2 (A2).* All the upper right wells from each group of four wells on the plate.
- *Quadrant 3 (B1).* All the lower left wells from each group of four wells on the plate.
- *Quadrant 4 (B2).* All the lower right wells from each group of four wells on the plate.

To select a quadrant:

Click a well in that quadrant. All the wells in that quadrant turn green, indicating the selected wells.

Alternatively, right-click the graphic to display the following shortcut menu commands:

- Select all wells
- Clear all wells
- Select all wells in highlighted row
- Clear all wells in highlighted row
- Select all wells in highlighted column
- Clear all wells in highlighted column

Command Parameters area

The Command Parameters area contains the following controls.

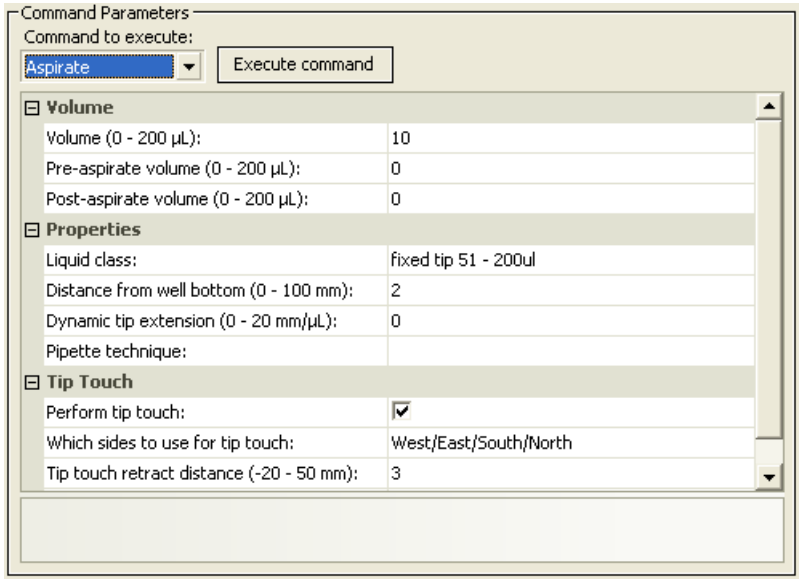
Parameter	Description
Command to execute	Provides the following list of processes that you can run in real time: • "Aspirate process parameters" on page 176 • "Dispense process parameters" on page 178 • "Mix process parameters" on page 180 • "Wash Tips process" on page 182 • "Pump Reagent process parameters" on page 184

Parameter	Description
Execute command	Runs the selected process. *Note:* To stop a process immediately before it finishes running, click **Stop motors** or press the SPACEBAR on your computer. To resume movement of the pipette head, see "Jogging the pipette head" on page 101.
Parameter settings	Allows you to set the values for the parameters associated with the selected command.
Description	Displays a brief description of the currently highlighted parameter.

Aspirate process parameters

To run the Aspirate process, see "Running a process using Diagnostics software" on page 106.

The Aspirate command has the following parameters.



Parameter	Description
Volume (µL)	The volume of liquid to be drawn into each pipette tip.
Pre-aspirate volume (µL)	The volume of air to be drawn before the pipette tips enter the liquid.
Post-aspirate volume (µL)	The volume of air to be drawn after the liquid is drawn.

Parameter	Description
Liquid class	The pipetting speed and accuracy. **IMPORTANT** To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
Distance from well bottom (0–100 mm)	The distance between the end of the pipette tips and the well bottoms during the Aspirate task. If you specify dynamic tip extension, this is the distance at the end of the Aspirate task. **IMPORTANT** The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.)
Dynamic tip extension (0–20 mm/µL)	The rate at which the pipette head moves during the Aspirate task. The software calculates the distance over which the tips will move without crashing. Use dynamic tip extension to prevent spills as the pipette tips displace the liquid. To move the tips: • *At the same rate as the volume change.* Calculate dynamic tip extension (DTE) as follows: DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls • *Faster than the volume change.* DTE > 1/A • *Slower than the volume change.* DTE < 1/A The starting and ending positions can be calculated as follows: $(V_{aspirated} * DTE) + Distance_{well\ bottom}$ *Note:* Instead of a negative aspirated volume, the software automatically moves downward toward the well bottom with each aspirate action.
Pipette technique	The pipette location offset you want to use for the Aspirate task. The list of pipette techniques are defined in the Pipette Technique Editor.
Perform tip touch	The option to touch the pipette tip on one or more sides of the well.

Parameter	Description
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/South, West/East, West/East/South/North.
Tip touch retract distance (–20 to 50 mm)	The vertical distance for the pipette tips to rise before touching the sides of the wells.
Tip touch horizontal offset (–5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition. For example, if you set a value of: • 0, the tips move a horizontal distance equal to the well radius • > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch • < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch

Dispense process parameters

To run the Dispense task, see "Running a process using Diagnostics software" on page 106.

The Dispense command has the following parameters.

Parameter	Description
Empty tips	The option to empty all liquid from the tips instead of using the dispense volume specification.
Volume (µL)	The volume of liquid to be dispensed from each pipette tip.
Blowout volume (µL)	Specifies the volume of air to dispense after the main volume has been dispensed while the tips are still in the wells. Typically, the blowout volume is the same as the pre-aspirate volume. Note: Blowout only occurs in the last quadrant dispensed for a given Dispense task.
Liquid class	The pipetting speed and accuracy. **IMPORTANT** To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.

Parameter	Description
Distance from well bottom (0–100 mm)	The distance between the end of the pipette tips and the well bottoms during the Dispense task. If you specify dynamic tip retraction, this is the starting distance. **IMPORTANT** The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.
Dynamic tip retraction (0–20 mm/µL)	The rate at which to raise the pipette head during the Dispense task. Use dynamic tip retraction to prevent spills as the pipette tips displace the liquid. To move the tips: • *At the same rate as the volume change.* Calculate dynamic tip retraction (DTR) as follows: DTR = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls • *Faster than the volume change.* DTR > 1/A • *Slower than the volume change.* DTR < 1/A The starting and ending positions can be calculated as follows: $(V_{dispensed} * DTR) + Distance_{well\ bottom}$
Pipette technique	The pipette location offset you want to use for the Dispense task. The list of pipette techniques are defined in the Pipette Technique Editor.
Perform tip touch	The option to touch the pipette tip on one or more sides of the well.
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/South, West/East, West/East/South/North.
Tip touch retract distance (–20 to 50 mm)	The vertical distance for the pipette tips to rise before touching the sides of the wells.

Parameter	Description
Tip touch horizontal offset (–5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition. For example, if you set a value of: • 0, the tips move a horizontal distance equal to the well radius • > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch • < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch

Mix process parameters

To run the Mix process, see "Running a process using Diagnostics software" on page 106.

The Mix command contains the following controls.

Parameter	Description
Volume (0–200 µL)	The volume of liquid to be mixed in each well.
Pre-aspirate volume (0–200 µL)	The volume of air to be drawn before the pipette tips enter the liquid.
Blowout volume (0–200 µL)	Specifies the volume of air to dispense after the main volume has been dispensed while the tips are still in the wells. Typically, the blowout volume is the same as the pre-aspirate volume.
Liquid class	The pipetting speed and accuracy. **IMPORTANT** To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
Mix cycles ((0–100)	The number of times to repeat the aspirate-and-dispense cycle.
Aspirate distance (0–100 mm)	The distance between the end of the pipette tips and the well botttoms during the aspirate action. **IMPORTANT** The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.

Parameter	Description
Dispense at different distance	The option to dispense at a pipette tip height that is different than the aspirate distance. Select the check box to enter a value for the dispense distance.
Dispense distance (0–100 mm)	The distance between the end of the pipette tips and the well bottoms during the dispense action.
Dynamic tip extension (0–20 mm/µL)	The rate at which the pipette head moves during the Aspirate task. The software calculates the distance over which the tips will move without crashing. Use dynamic tip extension to prevent spills as the pipette tips displace the liquid. To move the tips: • *At the same rate as the volume change.* Calculate dynamic tip extension (DTE) as follows: DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls • *Faster than the volume change.* DTE > 1/A • *Slower than the volume change.* DTE < 1/A The starting and ending positions can be calculated as follows: $(V_{aspirated} * DTE) + Distance_{well\ bottom}$ *Note:* Instead of a negative aspirated volume, the software automatically moves downward toward the well bottom with each aspirate action.
Pipette technique	The pipette location offset you want to use for the Dispense task. The list of pipette techniques are defined in the Pipette Technique Editor.
Perform tip touch	The option to touch the pipette tip on one or more sides of the well.
Which sides to use for tip touch	The side or sides of the well to use during tip touch: North, South, East, West, North/South, West/East, West/East/South/North.
Tip touch retract distance (–20 to 50 mm)	The vertical distance for the pipette tips to rise before touching the sides of the wells.

Parameter	Description
Tip touch horizontal offset (–5 to 5 mm)	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition. For example, if you set a value of: • 0, the tips move a horizontal distance equal to the well radius • > 0, the tips attempt to move past the well radius, which results in a more forceful tip touch • < 0, the tips move a distance less than the radius of the well, resulting in a lighter tip touch

Wash Tips process

To run the Wash Tips process, see "Running a process using Diagnostics software" on page 106.

The Wash Tips command has the following parameters.

Parameter	Description
Empty tips	The option to empty the entire contents of the pipette tips, including fluid and air. The Volume parameter is ignored if this option is selected.
Volume (µL)	The volume of liquid to be dispensed from each pipette tip.
Pre-aspirate volume (µL)	The volume of air to be drawn before the pipette tips enter the liquid.
Blowout volume (µL)	Specifies the volume of air to dispense after the main volume has been dispensed. Typically, the blowout volume is the same as the pre-aspirate volume. *Note:* Blowout only occurs in the last quadrant dispensed for a given dispense action.
Liquid class	The liquid class associated with this liquid. **IMPORTANT** To ensure consistent pipetting, always select a liquid class for liquid-handling tasks.
Mix cycles	The number of times you want to aspirate and dispense. Each cycle consists of one aspirate action and one dispense action.

Parameter	Description
Distance from well bottom (mm)	The distance between the end of the pipette tips and the well bottoms during the Wash Tips task. **IMPORTANT** The labware definition must be accurate and the teachpoint must be precise in order for the system to position the tips at the correct distance from the well bottom.
Dynamic tip extension (mm/(µL)	The rate at which the pipette head moves during the Wash Tips task. The software calculates the distance over which the tips will move without crashing. Use dynamic tip extension to prevent spills as the pipette tips displace the liquid. To move the tips: • *At the same rate as the volume change.* Calculate dynamic tip extension (DTE) as follows: DTE = (well depth)/(well vol) = 1/A, where A is the cross-sectional area of a well with straight walls • *Faster than the volume change.* DTE > 1/A • *Slower than the volume change.* DTE < 1/A The starting and ending positions can be calculated as follows: $(V_{dispensed} * DTE) + D_{well\ bottom}$ $(V_{aspirated} * DTE) + D_{well\ bottom}$
Perform tip touch	The option to touch the pipette tip on one or more sides of the well.
Which side to perform tip touch	The wall or walls for tip touch: North, South, East, West, North/South, West/East, West/East/South/North. If you also select the Dispense to waste during wash option, the tip touch is performed on the northeast side only.
Tip touch retract distance	The vertical distance the pipette tips rise before touching the sides of the wells.

Parameter	Description
Tip touch horizontal offset	The horizontal distance the tips move. The value is based on the well diameter specified by the labware definition. The value of the parameter determines the direction of movement: • *0*. Tips move a horizontal distance equal to the well radius. • *Great than 0*. Tips attempt to move past the well radius, which results in a more forceful tip touch. • *Less than 0*. Tips move a distance less than the radius of the well, resulting in a lighter tip touch.
Pump fill speed (%)	The speed, in percent of maximum speed, of liquid flow into the reservoir. For the MicroWash Reservoir, this value should be high enough for the washing liquid to just bubble over the tops of the chimneys.
Pump empty speed (%)	The speed, in percent of maximum speed, of liquid flow out of the the reservoir. For the MicroWash Reservoir, this value should be slightly higher than that of the inflow pump to prevent an overflow.
Dispense to waste during wash	The option to move the tips by a specified offset (defined in the Labware Editor) and dispense used fluid outside of the reservoir chimney. This option applies only to reservoirs that have chimneys.
Dispense to waste at height (mm)	The height at which the dispense action occurs. For example, during the dispense action, the tips move up to clear the chimneys, move the offset distance, and then lower to the distance you specified. If you want the lower the tips by 10 mm, specify –10 mm.

Pump Reagent process parameters

To run the Pump Reagent process, see "Running a process using Diagnostics software" on page 106.

The Pump Reagent command has the following parameters.

Parameter	Description
Reservoir mode	The action of the task: • Fill • Empty
Pump speed	The speed, in percent of maximum, at which to pump the reagent.
Pump on time	The duration of the pumping time, in seconds.
Use weigh station/shelf	The option to use the Weigh Station or Weigh Shelf.
Weigh station/shelf action threshold	The minimum fluid weight, in percent of the full weight that was calibrated on the Weigh Station or Weigh Shelf. For example, you can set the minimum threshold at 45% so that when the fluid reaches 45% of the full weight, fluid starts to pump into the reservoir.
Weigh station stop action threshold	The maximum fluid weight, in percent of the full weight that was calibrated on the Weigh Station or Weigh Shelf. For example, you can set the stop threshold at 60% so that when the fluid reaches 60% of the full weight, fluid starts to drain or pump out of the reservoir.

Related topics

For information about...	See...
Opening Vertical Pipetting Station Diagnostics	"Opening Vertical Pipetting Station Diagnostics" on page 50
Editing the labware classes, liquid library, or pipetting techniques	*VWorks Automation Control Setup Guide*
Troubleshooting problems	"Troubleshooting hardware problems" on page 88
Reporting a problem	"Reporting problems" on page 93

Glossary

cassette The column of shelves or slots in a Labware MiniHub or the Plate Hub Carousel.

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

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

cycle See seal cycle.

deadlock An error that occurs when the number of locations available in the system is less than the number of microplates in the system. Because the microplates cannot move to the expected locations, the protocol pauses.

device An item on your lab automation system that can have an entry in the device file. A device can be a robot, an instrument, or a location on the lab automation system that can hold a piece of labware.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

regrip station A location that enables the robot to change its grip orientation (landscape or portrait), or adjust its grip at the specified gripping height. Grip height adjustment might be necessary after a robot picks up a labware higher than the specified gripping height because of physical restrictions at a teachpoint.

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

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

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

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

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

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

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

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

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

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

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

task An operation performed on one or more labware.

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

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

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

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

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

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

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

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Agilent Technologies

User Guide

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