

# AssayMAP Bravo Platform

## Getting Started Guide



This guide contains the following topics:

- [“About this guide” on page 2](#)
- [“AssayMAP Bravo Platform components” on page 3](#)
- [“Bravo 96AM Head overview” on page 8](#)
- [“AssayMAP cartridge overview” on page 12](#)
- [“Starting up and shutting down the platform” on page 14](#)
- [“Uninstalling and installing the Bravo 96AM Head” on page 17](#)
- [“Reference for protocol authors” on page 27](#)
- [“Reporting problems” on page 31](#)

## About this guide

The instructions in this guide assume that the AssayMAP Bravo Platform has been installed properly and that you are trained in the safe operation of the platform.

### **WARNING**

**Using controls, making adjustments, or performing procedures other than those specified in the user documentation can expose you to moving-parts hazards and hazardous voltage. Before using the AssayMAP Bravo Platform, make sure you are aware of the potential hazards and understand how to avoid being exposed to them.**

### Software version

This guide is applicable for the following versions:

- AssayMAP Protein Sample Prep Workbench v4.0
- AssayMAP Protein Sample Prep Workbench v3.2

### Related guides

- [AssayMAP Protein Sample Prep Workbench application and utility guides](#). Describe how to set up and run the AssayMAP applications and utilities.
- [AssayMAP Bravo Platform Installation Guide](#). Describes how to install and set up the AssayMAP Bravo Platform, including how to set the teachpoints.
- [Automation Solutions Products General Safety Guide](#). Provides general safety information and describes potential safety hazards that you might encounter when using Automation Solutions products.
- [G5562A, G5563A Bravo Platform Safety and Installation Guide](#). Describes how to avoid potential safety hazards on the Bravo Platform.
- [Bravo Platform User Guide](#). Explains how to set up, operate, and maintain the Bravo Platform and how to install accessories.
- [VWorks Automation Control Setup Guide](#). Explains how to define labware and labware classes, liquid classes, and pipetting techniques.
- [96 Channel Wash Station Maintenance Guide](#). Describes how to replace chimneys in a 96 channel wash station and how to troubleshoot wash station problems.

### Accessing the user guides

**To access the user guides:**

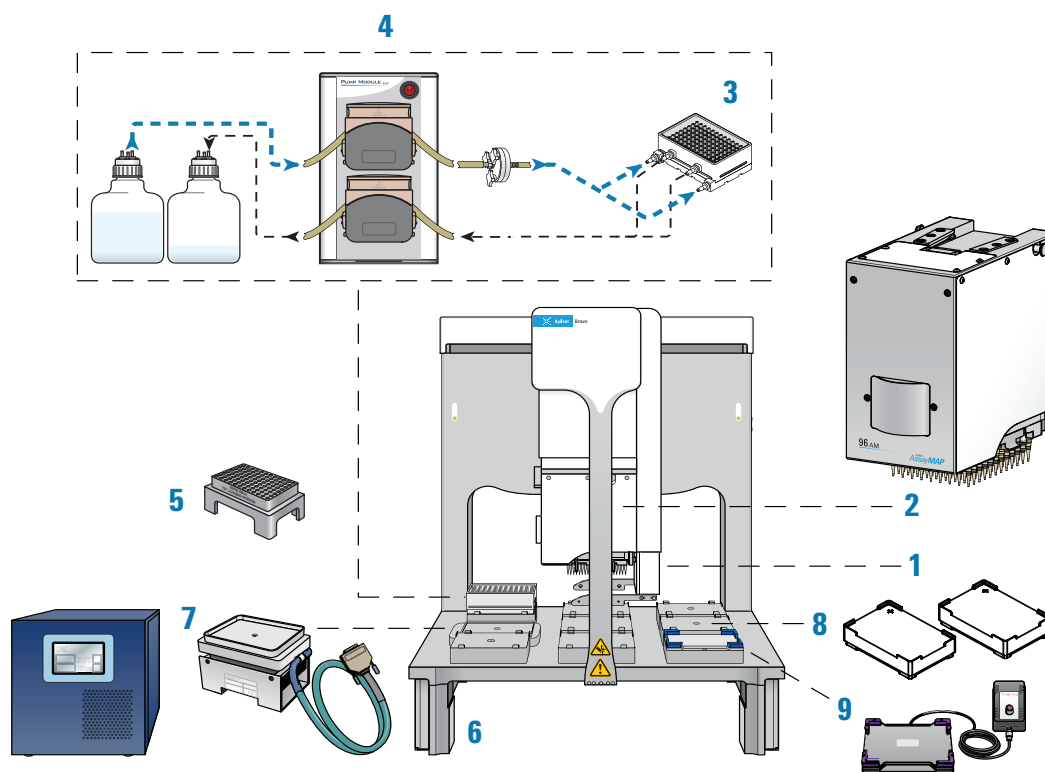
- 1 Log in to the AssayMAP Protein Sample Prep Workbench.
- 2 Open one of the following to access the guides:
  - **App Library** provides links to all the app quick start guides.
  - **Utility Library** provides links to all the utility user guides.
  - **Literature Library** provides links to all the app user guides and other guides, such as installation, maintenance, and VWorks guides.

# AssayMAP Bravo Platform components

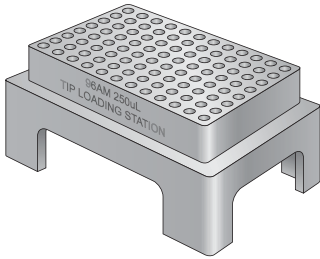
The AssayMAP Bravo Platform can enable high-throughput microchromatography for small-scale sample preparation.

## Hardware overview

The following figure and table provide an overview of the hardware components.



Item	Name	Description
1	Gripper upgrade	The mechanical gripper assembly that extends from the head mount to below the probes of the Bravo 96AM Head. The gripper picks up and places labware on the Bravo deck. In addition, the mechanism for removing mounted cartridges and pipette tips is actuated by the gripper.
2	Bravo 96AM Head	The 96-channel AssayMAP liquid-handling head. Each channel consists of a syringe with a probe on the end. The syringes can employ a combination of direct-liquid-flow and air-displacement techniques for liquid-handling tasks. For a detailed description of the head, see <a href="#">"Bravo 96AM Head overview" on page 8</a> .

Item	Name	Description
3	Wash station	<p>The 96-chimney reservoir that is used for washing operations. The platform requires one of the following models:</p> <ul style="list-style-type: none"> <li>96 Channel Wash Station (part number G5498B#90)</li> <li>96AM Wash Station (part number G5498B#57)</li> </ul> <p>The liquid enters the wash station through two input ports and then flows up through the chimneys to wash the cartridges, pipette tips, probes or syringes. The waste overflows from the chimneys and is removed through two outlet ports.</p>
4	Pump Module 2.0 and two carboys	The accessory that supplies fresh liquid to the wash station and removes the waste liquid during washing operations. An inline filter is required to help prevent any tubing particulates from potentially clogging the chimneys of the wash station.
5	96AM Cartridge & Tip Seating Station	<p>The accessory that ensures proper seating of the cartridges or pipette tips on the syringe probes.</p>  <p>The Protein Sample Prep Workbench includes utilities that automatically transfer cartridges and pipette tips to and from their respective racks to the seating station.</p> <p><i>Note:</i> In the software, the seating station is defined as labware. This labware definition is installed when you install the Protein Sample Prep Workbench.</p>
6	Risers, 146 mm	The structures that raise the Bravo deck surface to accommodate the below-deck height of accessories, such as the Peltier Thermal Station.
7	STC controller	The module that controls the Peltier Thermal Station.
8	Peltier Thermal Station	The accessory that provides temperature control uniformly across a microplate.
9	Thermal plate inserts	<p>The inserts that are available to provide efficient heat transfer for different types of microplates at the Peltier Thermal Station including, the Red PCR Plate Insert (supplied), the 96 Greiner U- or V-Bottom Insert, and the 96 Abgene Deep Well Insert.</p> <p><i>Note:</i> In the software, these inserts are defined as labware. These labware definitions are installed when you install the Protein Sample Prep Workbench.</p>
10	Orbital Shaking Station with Control Unit	The orbital shaker with its own control module.
11	Plate Riser	The 2.84 cm tall accessory used to raise the labware at a deck location when performing a run of the Normalization, Serial Dilution, or Reformatting utility.

**CAUTION**

Ensure that you use only the specified wash station for the AssayMAP Bravo Platform. Using a different wash station model can result in a potential collision with the Bravo 96AM Head.

**CAUTION**

To avoid a hardware crash and equipment damage, ensure that the wash station contains the white wide-bore chimneys when using the 25 µL cartridges.

## Software overview

The software runs on a single computer workstation to control the AssayMAP Bravo Platform. The platform requires the following software.

Software	Description
Agilent AssayMAP Protein Sample Prep Workbench	<p>A collection of simple form-based user interfaces for running the application and utility protocols on the AssayMAP Bravo Platform.</p> <p>Protein Sample Prep Workbench 4.0 includes default methods, which can be altered and saved, for each application and utility.</p>
Microsoft Excel	Required for the method setup tools and reagent volume calculators.
Agilent VWorks software	<p>Provides the user management and instrument control for the AssayMAP Bravo Platform. VWorks includes the tools to create labware definitions and liquid classes, set up devices, create device profiles, and create and run protocols.</p> <p>The VWorks software must be configured before using the Protein Sample Prep Workbench.</p> <ul style="list-style-type: none"> <li>Protein Sample Prep Workbench 3.2 runs on VWorks 13.1.5 to 13.1.x. Refer to the software release notes for a compatibility matrix.</li> <li>Protein Sample Prep Workbench 4.0 runs on VWorks 14.1.1 and includes additional software components, as the following section describes.</li> </ul>

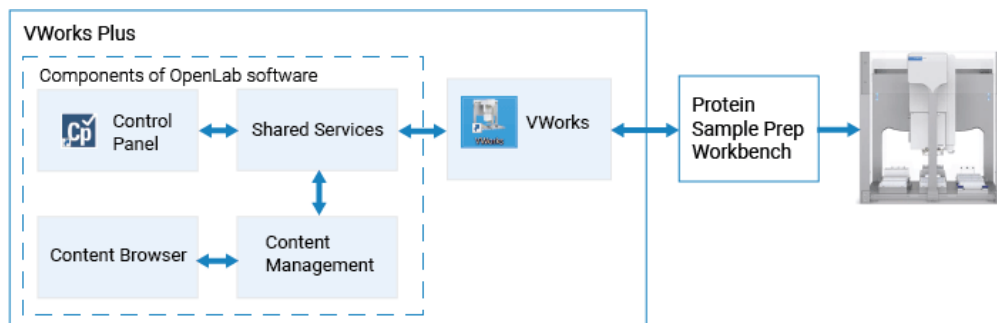
## VWorks 14.1.1 component overview

VWorks 14.1.1 is combination of Agilent OpenLab components and Agilent VWorks software. The software is available in the following editions.

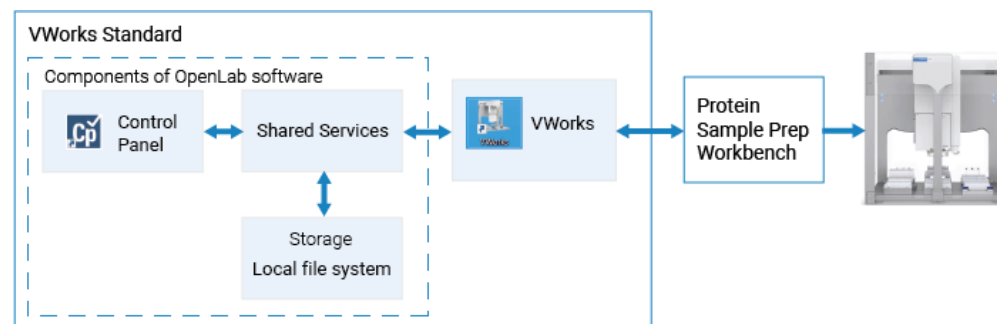
VWorks edition	File storage type	Compliance enabled?
VWorks Plus	<p>Content Management</p> <p><i>Note:</i> A system or VWorks administrator can use the Content Browser to view and edit the project structure and contents at /VWorks Projects/VWorks/</p>	Yes
VWorks Standard	<p>Local file system</p> <p><i>Note:</i> Any user can access the project files directly using the Windows File Explorer at C:\OLSS Projects\VWorks Projects\VWorks\</p>	No

The following figures show the software architecture for each VWorks edition. As the figures show, the OpenLab components include a Control Panel, which is the user interface for the Shared Services. The Shared Services, such as user access, software licenses, and storage are configured initially when the software is installed.

**Figure** Architecture of VWorks Plus and Protein Sample Prep Workbench



**Figure** Architecture of VWorks Standard and Protein Sample Prep Workbench



The VWorks 14.1.1 files, such as device files, profiles, labware, protocols, and the like, are stored as .roiZip archives. All file modifications must be handled within the VWorks software.

## IMPORTANT

The VWorks software cannot reload files (.roiZip extension) that have been modified or renamed outside of the VWorks software.

For more details on the OpenLab for VWorks components, see the [Configuration and Administration Guide](#) for your VWorks edition.

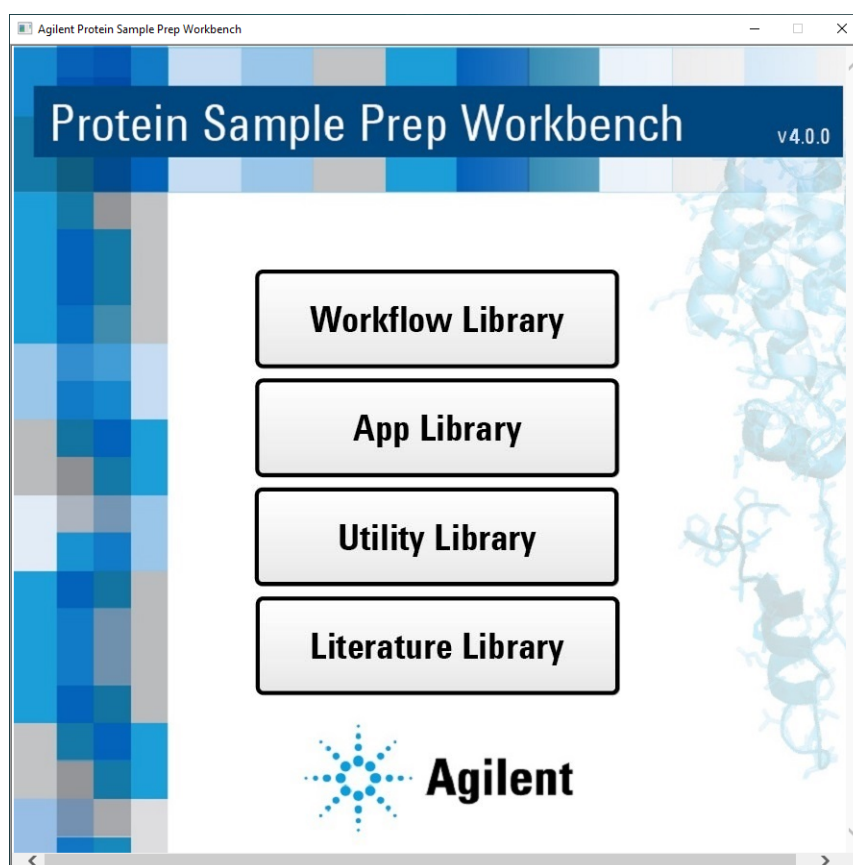
## Protein Sample Prep Workbench

The Protein Sample Prep Workbench includes the following:

- **Workflow Library.** A collection of protein sample preparation workflows. Each workflow consists of a set of applications that are performed in sequence to complete an experiment.
- **Application Library.** A collection of applications that make up the sequence of steps in various workflows. The applications may be combined in any sequence that suites your experimental needs.

- **Utility Library.** A collection of utilities that automate specific tasks (for example, liquid handling) to prepare the system for an application protocol, transition between applications in a workflow, or transition between an application and loading onto an analytical device.
- **Literature Library.** A collection of AssayMAP reference guides and the user guides for applications and utilities available in the workbench.

For a detailed description of the workflows, applications, and utilities see the guides available in the Literature Library page.



## Labware and cartridges

Labware requirements vary depending on experimental design. The complete list of labware options for each application and utility is listed in the [AssayMAP Bravo Labware Reference Guide](#). You can find a link to the guide in the Literature Library page of the Protein Sample Prep Workbench.

For an overview of the AssayMAP cartridge, see “[AssayMAP cartridge overview](#)” on [page 12](#). For more details about the available cartridges, see the [Agilent AssayMAP Bravo Cartridges Selection Guide](#) or the [AssayMAP Cartridges](#) page on [Agilent.com](#).

## Bravo 96AM Head overview

This topic describes:

- [“Bravo 96AM Head components” on page 8](#)
- [“Liquid-handling modes” on page 9](#)

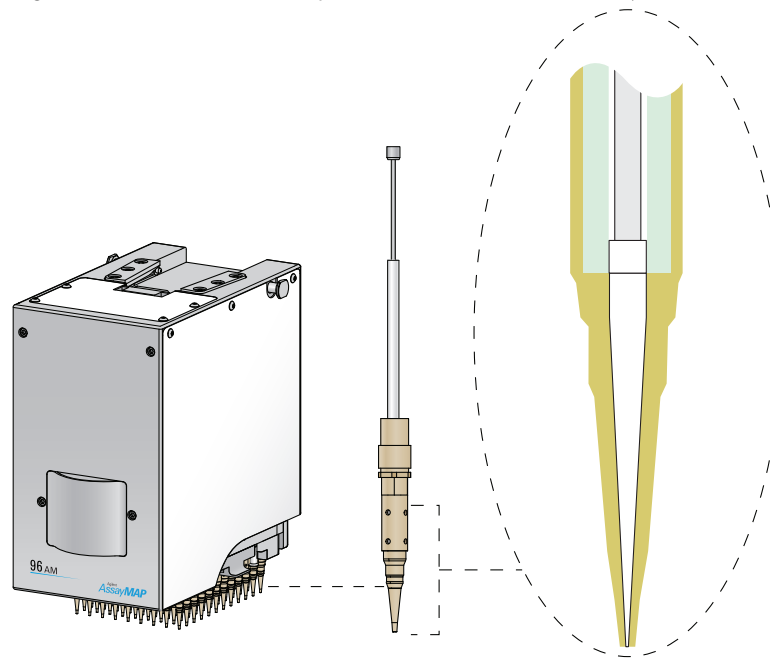
### Bravo 96AM Head components

The Bravo 96AM Head components include:

- *96 channels for liquid handling.* Each channel consists of a syringe with a probe on the end. A syringe consists of a glass barrel with a plunger and a seal. The syringes can employ a combination of direct-liquid-flow and air-displacement techniques for liquid-handling tasks.

The following figure shows a syringe and a cross-sectional close-up view of the plunger in the probe.

**Figure** Bravo 96AM Head, syringe, and detail of probe tip (cross-section)

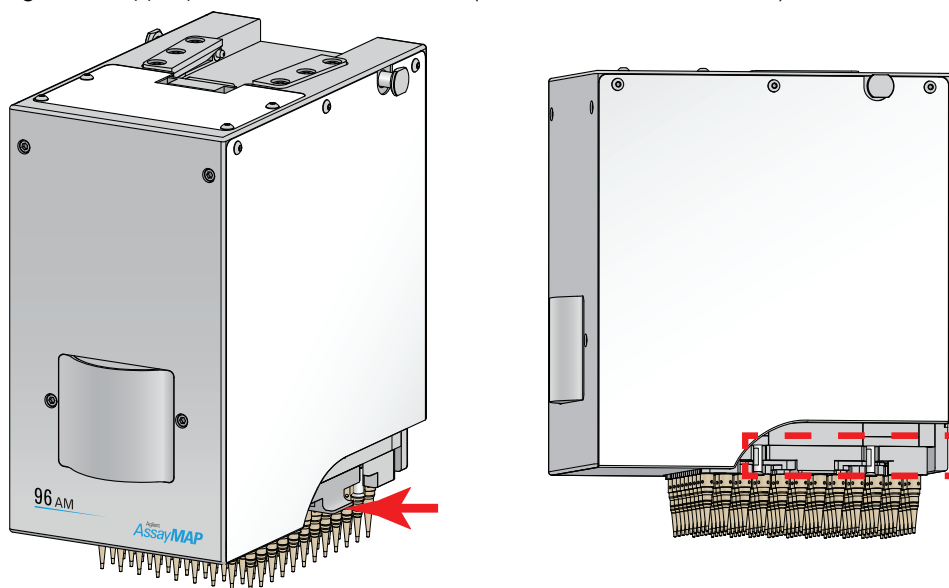


- *Mechanism for removing mounted cartridges and pipette tips.* The head has a stripper plate, which is a spring-loaded mechanism that is actuated by the Bravo gripper assembly. The stripper plate enables the Bravo 96AM Head to remove the cartridges while still holding liquid in the syringes.

*Note:* The *w*-axis is the motion of the displacement of the pipettor inside the head. The *w*-axis is not engaged during cartridge mounting or removal from the head so that fluid can be held in the syringes and probes. For the Tips On and Tips Off tasks, the Bravo *w*-axis goes to the zero position to empty any fluid contained in the syringes.



**Figure** Stripper plate on Bravo 96AM Head (front-side view and side view)



## Liquid-handling modes

The Bravo 96AM Head features include the ability to:

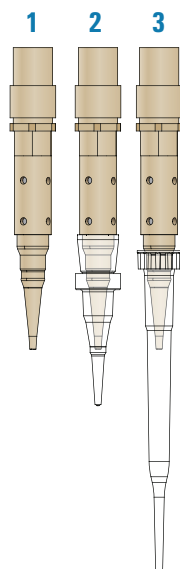
- Transfer liquids directly with the bare probes, through AssayMAP Bravo cartridges mounted on the probes, and using mounted 250- $\mu$ L large-transfer (LT) pipette tips
- Mount or remove the cartridges while holding liquid in the syringes
- Provide precise control of flow rates and volume required for moving fluid through the packed resin in the cartridges
- Access 96-well and 384-well microplates
- Perform 96-channel liquid handling or partial-head liquid handling using a subset of the 96 channels

Protocols for the Bravo 96AM Head can employ a combination of the following liquid-handling modes:

- Bare probes
- AssayMAP Bravo cartridges mounted on the probes
- 250- $\mu$ L LT pipette tips mounted on the probes

### Capabilities of each liquid-handling mode

The following figure shows a side-by-side comparison of a bare probe, a probe with a mounted cartridge, and a probe with a mounted 250- $\mu$ L LT pipette tip. The following table provides the details for each.

**Figure** Comparison of probe, probe with cartridge, and probe with 250- $\mu$ L LT pipette tip

Item	Mode	Description
1	Bare probe	<ul style="list-style-type: none"> <li>Maximum volume: 250 <math>\mu</math>L can be aspirated into the syringe before the syringe is full.</li> <li>Only 96-channel (full head) liquid handling is supported.</li> <li>As the tips of the syringes, the probes can be in direct contact with the samples for liquid-handling tasks.</li> </ul>
2	AssayMAP cartridge	<ul style="list-style-type: none"> <li>Maximum volume: 250 <math>\mu</math>L can be pulled through the cartridge into the syringe before the syringe is full.</li> <li>Either all 96 or a subset of the liquid-handling channels are supported.</li> <li>When cartridges are mounted on the probes, the syringes can push or pull liquids through the resin bed of the cartridges.</li> </ul>
3	Disposable 250 $\mu$ L LT pipette tip	<ul style="list-style-type: none"> <li>Maximum volume: 140 <math>\mu</math>L can be pulled into a mounted tip before the excess fluid overflows into the syringe. The probe protrudes into the tip volume capacity.</li> <li>Either all 96 or a subset of the liquid-handling channels are supported.</li> <li>With pipette tips seated on the probes, the syringes can transfer samples without coming into direct contact with them.</li> </ul> <p><i>Note:</i> Disposable pipette tips mount approximately 9.68 mm (0.15-inch) lower relative to the housing of a Bravo 96AM Head than they would relative to the housing of a standard 96LT Head.</p>

**CAUTION**

Extended use of the Bravo 96AM Head with dry syringes for disposable-tip liquid handling can shorten the life of the syringe seals.

**IMPORTANT**

To aspirate more than 140  $\mu\text{L}$  of liquid, use the bare probes instead of disposable pipette tips. The syringes can hold up to 250  $\mu\text{L}$ . If you aspirate more than 140  $\mu\text{L}$  using 250- $\mu\text{L}$  pipette tips, the excess aspirated liquid will enter the syringes. Ensure that you wash the syringes as appropriate for your protocol to prevent contamination.

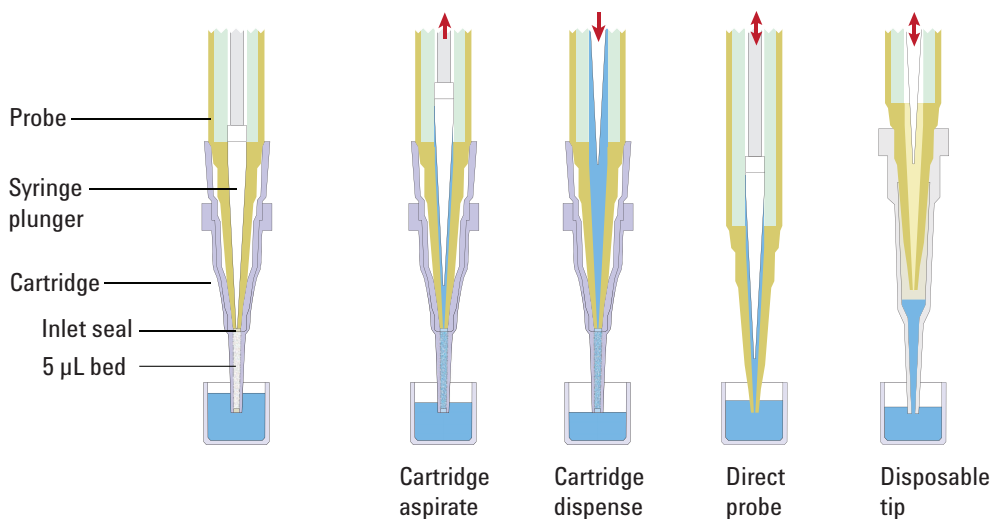
**IMPORTANT**

The 96AM Cartridge & Tip Seating Station is required to mount pipette tips on the Bravo 96AM Head.

### Examples of each liquid-handling mode

The following figure shows how liquid moves through a mounted cartridge, through a bare probe, and into a mounted disposable pipette tip.

**Figure** Syringe-and-probe liquid-handling modes (cutaway views)



- *Cartridge aspirate.* A series of different liquids can be pulled up through the cartridge bed in sequence without removing the mounted cartridges and washing out the syringes in between the different aspirate steps.
- *Cartridge dispense.* Cartridges can be mounted while the syringes contain liquids. The liquid in the syringes can be dispensed down through the mounted cartridges at precisely controlled flow rates for different types of tasks.

For example, you can dispense equilibration buffer down through the mounted cartridges for priming and equilibration tasks, and you can dispense elution buffer through the mounted cartridges to recover eluate in a microplate.

- *Direct probe.* Liquid can be aspirated directly into the syringes and transferred using the bare probes.

The cartridges can be removed to dispense the liquid collected in the syringes, wash the syringes, and then aspirate other fluids into the syringes before mounting the cartridges again for additional dispensing steps.

- *Disposable pipette tip.* As the preceding figure shows, the probe protrudes into the tip volume that is normally used to hold liquid. Therefore, the tip volume capacity is reduced when mounted on a probe.

# AssayMAP cartridge overview

This topic describes the AssayMAP cartridge, cartridge rack, and receiver plate.

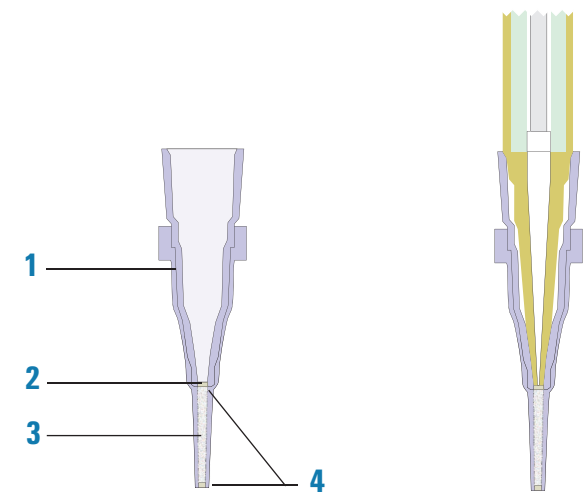
## Description

The AssayMAP cartridges are microchromatography cartridges for small-scale sample preparation. Each cartridge features a bed that is packed with chromatographic resin to support a variety of applications. Liquid can be aspirated or dispensed through the packed resin in the cartridges. The AssayMAP Bravo Platform provides the precision flow-rate control required for aspirating or dispensing the fluid through the cartridges.

## Cartridge anatomy

The following figure shows the parts of the cartridge.

**Figure** Cross-sectional side view of cartridge (left) and cartridge mounted on probe (right)

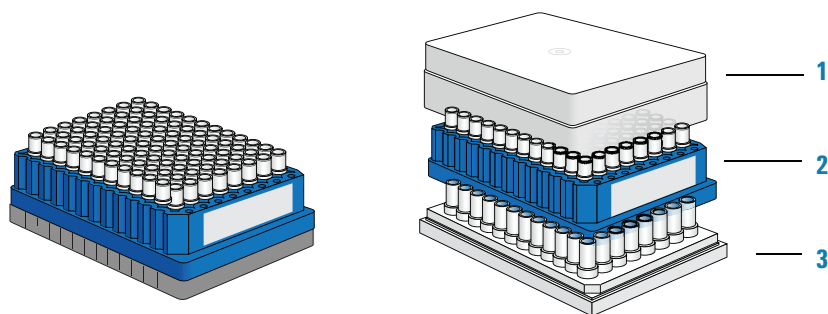


Item	Part	Description
1	Sample cup	The top part of the cartridge that mounts on the probe.
2	Inlet seal	The tapered seal at the top of the packed resin bed. When the probe is inserted into the cartridge, the tip of the probe engages the inlet seal. This configuration enables the Bravo 96AM Head probe to make or break a fluid-tight connection between the packed-resin bed and the liquid inside the syringe.
3	Resin bed	The part of the cartridge that is packed with beaded resin. The bead size can vary depending on the assay.

Item	Part	Description
4	Bed supports, upper and lower	Frits at the top and bottom of the resin bed provide a membrane that retains the resin beads within the bed while allowing a bidirectional flow of fluid to pass through the cartridge.

## Cartridge rack, lid, and receiver plate

The cartridges are shipped in a stack that consists of a lid, cartridge rack, and receiver plate. The following figure shows the cartridge rack seated in the receiver plate (left) and a view of the lid (1), cartridge rack (2), and receiver plate (3).



The lid provides protection during shipping and storage. The lid can also prevent cartridges from being pushed out when the cartridge rack is inserted into a receiver plate.

*Note:* In the VWorks software, the 96AM Cartridge Rack and Receiver Plate is defined as labware. This labware definition is installed when you install the Protein Sample Prep Workbench.

## Starting up and shutting down the platform

### Starting up the platform

You use the System Startup utility to prepare the AssayMAP Bravo Platform for use by initializing the device if this is the first time the Startup utility is run after powering up the AssayMAP Bravo Platform. The utility also does the following:

- Dispenses any remaining liquid in the syringes into the wash station.
- Primes the wash station lines.
- Washes the syringes.

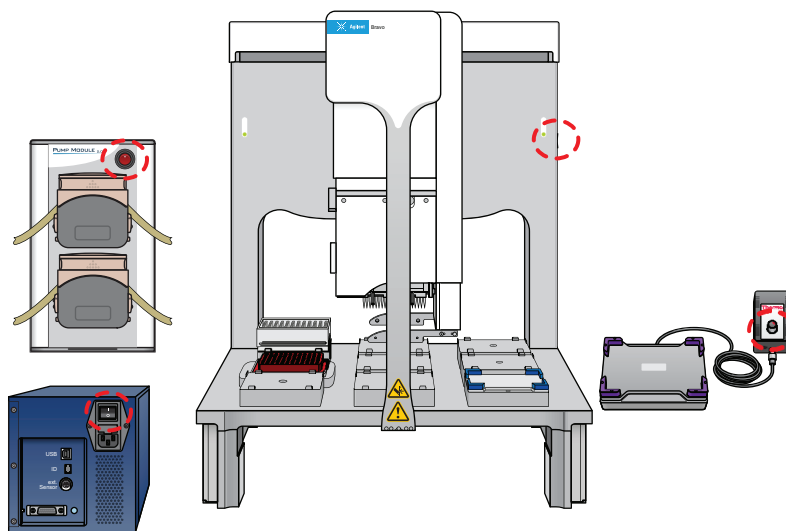
*Note:* You also use the Startup utility to empty fluid from the syringes before uninstalling the liquid-handling head. For details, see ["Uninstalling the Bravo 96AM Head" on page 18](#).

#### ***Before you start:***

Ensure that the Bravo 96AM Head is installed. For installation instructions, see ["Uninstalling and installing the Bravo 96AM Head" on page 17](#).

#### ***To start up the platform:***

- 1 If you have not already done so, turn on the accessories: Pump Module, STC Controller, and Orbital Shaking Station control module.
- 2 Turn on the computer, and start the Microsoft Windows operating system.
- 3 On the side of the AssayMAP Bravo Platform, press the power switch to the **on (I)** position.



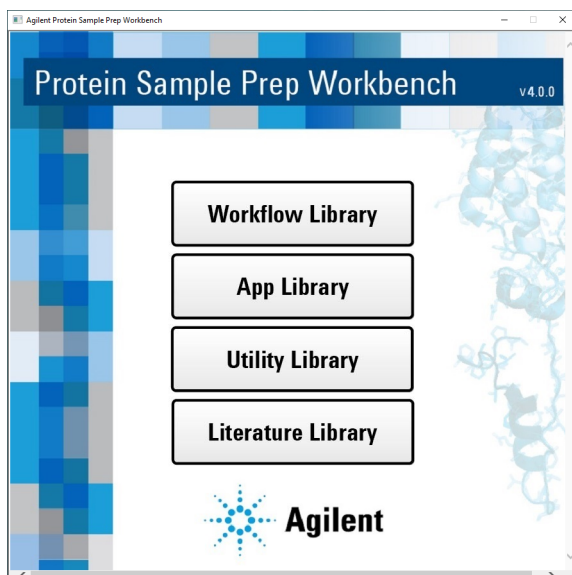
The front panel status lights turn blue.

*Note:* If the emergency-stop pendant is engaged or absent, the status lights will turn red.

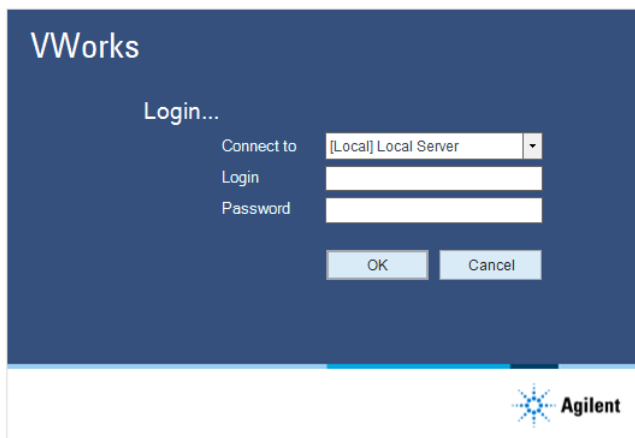
- 4 To start the Protein Sample Prep Workbench, double-click the **Protein Sample Prep Workbench** icon.



Alternatively, click **Start > All Programs > Agilent Technologies > Protein Sample Prep Workbench**.

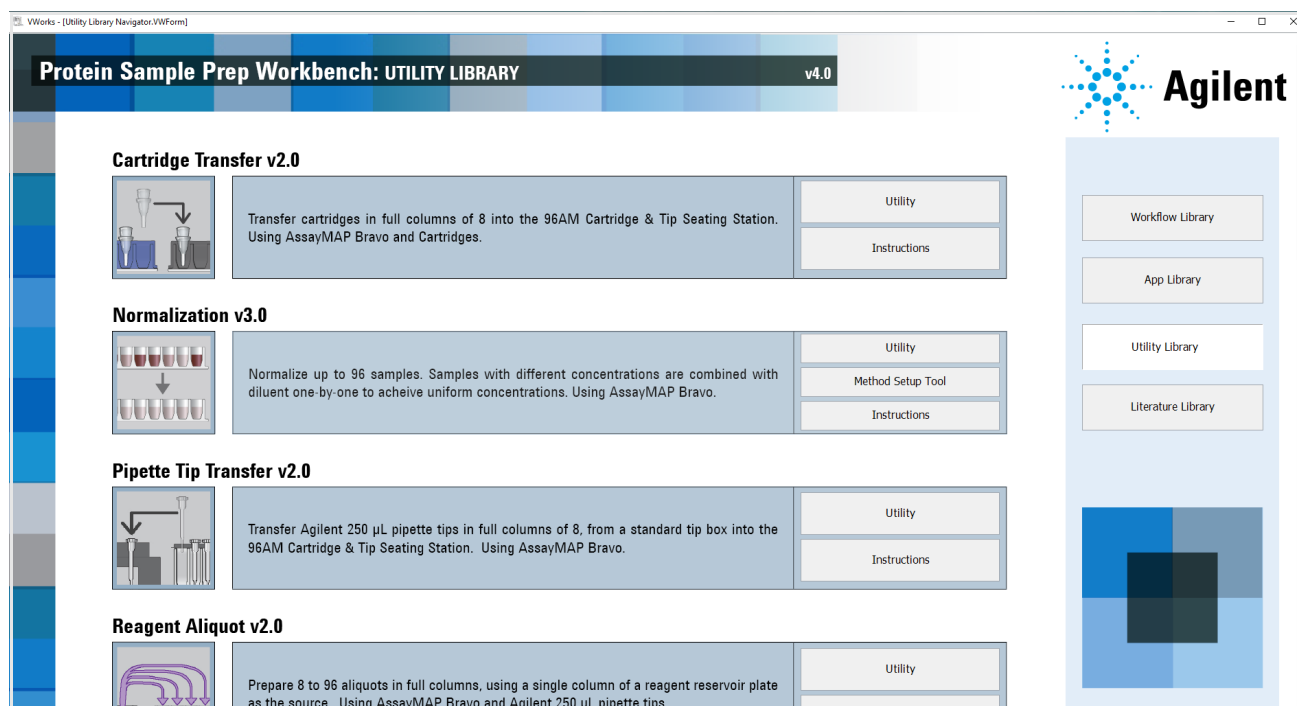


- 5 In the Protein Sample Prep Workbench, click **Utility Library**.  
The VWorks software starts and the VWorks Login window opens.



- 6 In the **VWorks Login** window, type your **Login** and **Password**, and then click **OK**.  
7 In the **Utility Library**, locate the **System Startup/Shutdown** utility, and click **Instructions** for a detailed procedure on how to set up and run the System Startup utility.

**Figure** Utility Library



## Shutting down the platform

Use the Shutdown utility to aspirate liquid into the syringes and protect the plunger seals from drying during extended periods of inactivity.

### **To shut down the platform:**

- 1 In the Protein Sample Prep Workbench, go to the **Utility Library** page.
- 2 Locate the **System Startup/Shutdown** utility, and then click **Instructions** for a detailed procedure on how to run the System Shutdown utility and how to shut down the platform.



# Uninstalling and installing the Bravo 96AM Head

This topic addresses the following:

- [Guidelines for using and storing the Bravo 96AM Head](#)
- [Uninstalling the Bravo 96AM Head](#)
- [Before installing the Bravo 96AM Head](#)
- [Retracting the tip box stripper pins on the head](#)
- [Before installing the Bravo 96AM Head](#)

## Guidelines for using and storing the Bravo 96AM Head

Ensure that you understand the following warnings and cautions about the proper way to handle and use the Bravo 96AM Head.

### WARNING

The probes of the Bravo 96AM Head are sharp and can scratch you if they brush across your hand. A probe scratch can expose you to any contaminants remaining on the probes. Be careful to avoid touching the probes.

### CAUTION

Extended use of the Bravo 96AM Head with dry syringes for disposable-tip liquid handling can shorten the life of the syringe seals.

### CAUTION

Before leaving the Bravo 96AM Head idle overnight, wash the syringes thoroughly with deionized water to prevent salt buildup that could damage the syringe seals.

### CAUTION

If the tip-box stripper pins are extended, the pins will crash into the wash station during syringe washing. To prevent potential equipment damage, ensure that the pins are always retracted during use.

### IMPORTANT

To aspirate more than 140  $\mu\text{L}$  of liquid, use the bare probes instead of disposable pipette tips. The syringes can hold up to 250  $\mu\text{L}$ . If you aspirate more than 140  $\mu\text{L}$  using 250- $\mu\text{L}$  pipette tips, the excess aspirated liquid will enter the syringes. Ensure that you wash the syringes as appropriate for your protocol to prevent contamination.

For information about using a subset of the 96 channels, see [“Reference for protocol authors” on page 27](#).

## Uninstalling the Bravo 96AM Head

### CAUTION

Placing the probes of the 96AM Head (bottom of head) on any surface can damage the probes. To protect the probes when the head is not mounted on the Bravo Platform, place the top of the head on a clean, stable surface so that the probes are facing upward. For storage, use the storage stand.

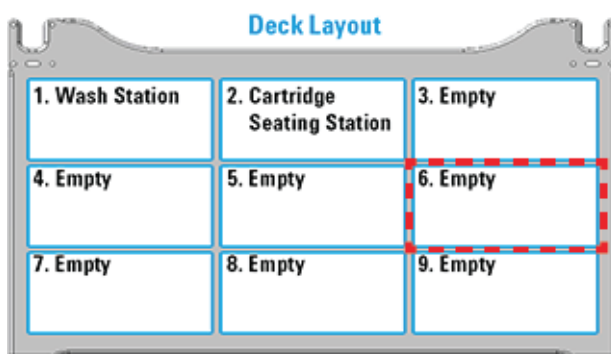
### To uninstall the Bravo 96AM Head:

- 1 Put on gloves to protect your hands from potential exposure to sharp edges and any residual contaminants.
- 2 Ensure that the syringes are empty as follows:
  - a In the Protein Sample Prep Workbench, open the **Utility Library**.
  - b In the **System Startup/Shutdown** utility, run the **Startup** protocol. The Startup protocol purges any liquid left in the head, which is required for long-term storage or conducting syringe repairs.
- 3 On the side of the Bravo Platform, press the power switch to the **off (o)** position.

### CAUTION

**Always turn off the AssayMAP Bravo Platform before uninstalling a liquid-handling head. Failure to do so can damage the head electronics.**

- 4 Gently, move the Bravo head manually to position it over deck location 6, which will provide easier access for removing the head.

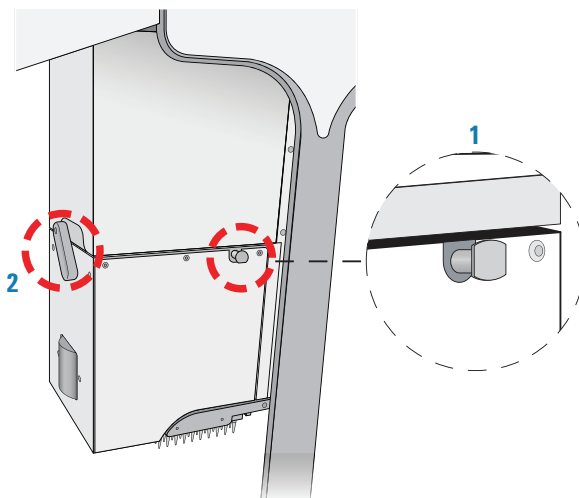


- 5 To unlock the mounted head, refer to the following figure:
  - a Pull out and twist the (1) two head-retainer pins one-quarter turn (90°) so that they remain retracted.

*Note:* The straight edge of the retainer pins should be horizontal.

  - b Turn the (2) head lock counterclockwise until it clicks into position.

**Figure** Installed head: (1) retainer pin and (2) head lock

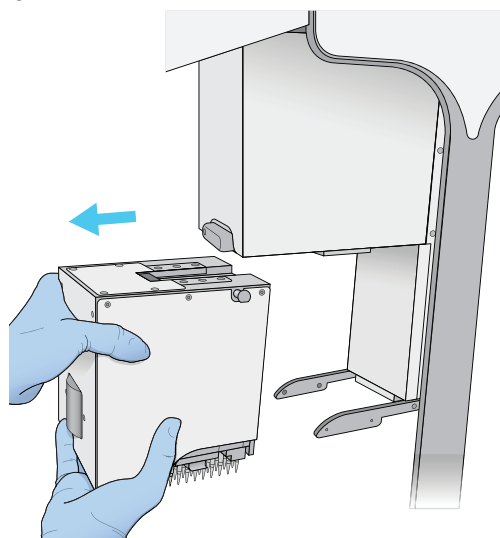


- 6 Reaching from the left side of the Bravo tie bar, grasp the head firmly as follows:
  - a With your left hand firmly grip the left side of the head.
  - b Place your right hand under the flat area just to the left of the syringe array to support the weight of the head.
- 7 While supporting the head with your hands, slide the head to the left and out of the Bravo head mount.

## CAUTION

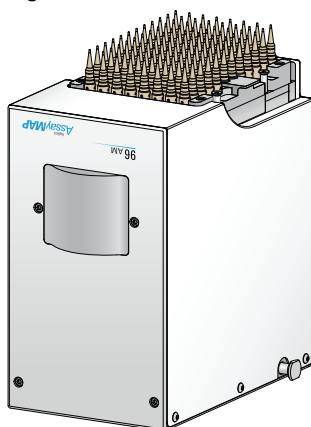
**Support the head securely without touching the probes. Dropping the head or bumping the probes will damage the syringes.**

**Figure** Uninstalling the head



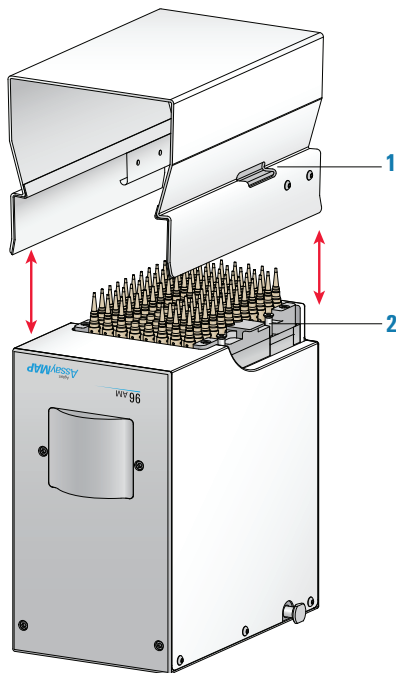
- 8 Carefully place the head upside down on a clean, stable surface so that the probes are facing up.

**Figure** Bravo 96AM Head upside down

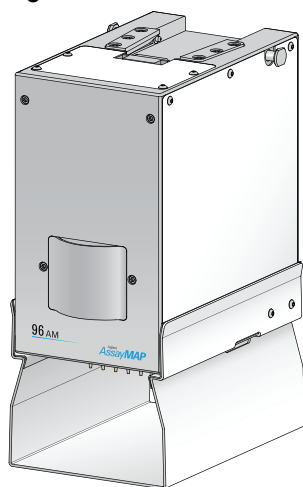


- 9 Carefully lift the stand onto the head, guiding the stand side cutouts (1) onto the head side tabs (2). Use care to avoid touching the probes.

**Figure** Removing or inserting the stand on the head



**Figure** Bravo 96AM Head in storage stand



### Before installing the Bravo 96AM Head

#### CAUTION

Always turn off the AssayMAP Bravo Platform before installing a liquid-handling head. Failure to do so can damage the head electronics.

#### CAUTION

If the Bravo 96AM Head tip box stripper pins are extended, the pins will crash into the wash station during syringe washing. To prevent potential equipment damage, ensure that the pins are always retracted during use.

- Turn off the AssayMAP Bravo Platform.

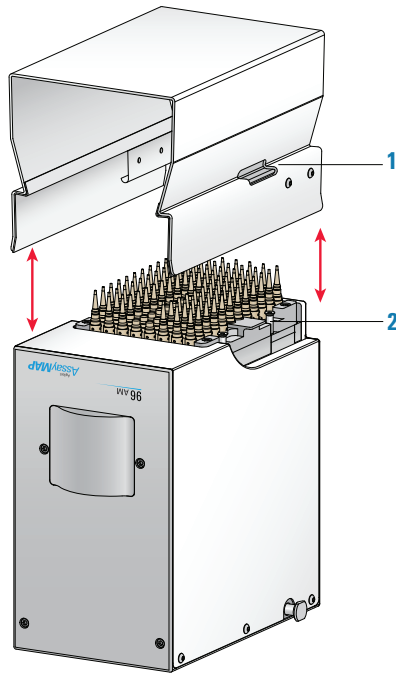
- If necessary, remove the head from the storage stand.
- Ensure that the head's tip box stripper pins are retracted.

### Removing the head from the storage stand

#### *To remove the head from the storage stand:*

- 1 Ensure that the top of the head is resting on a clean, stable surface. The probes should be facing upward, as the following figure shows.
- 2 Using both hands, carefully lift the stand off of the head while guiding the stand side cutouts (1) off the head side tabs (2). Use care to avoid touching the probes.

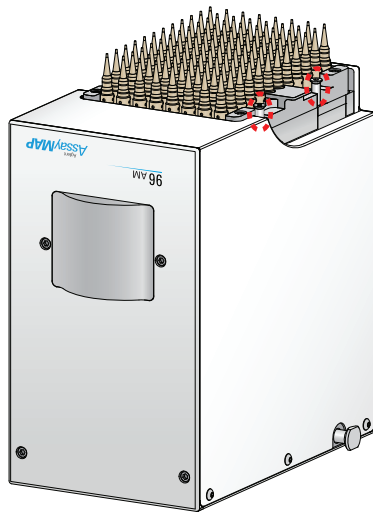
**Figure** Removing or inserting the stand on the Bravo 96AM head



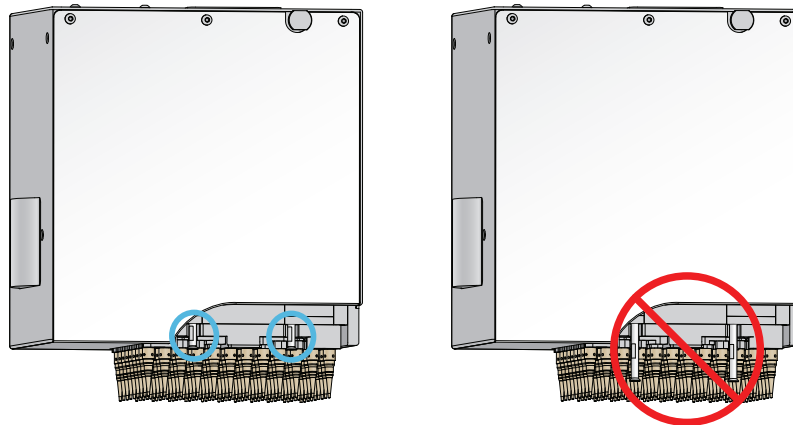
### Retracting the tip box stripper pins on the head

The Bravo 96AM Head has four retractable tip-box stripper pins, two on each side of the probes, as the following figure shows. Before you install the Bravo 96AM Head, ensure that the tip-box stripper pins are retracted, as the following figures show.

**Figure** Bravo 96AM Head (upside down) with stripper pins retracted



**Figure** Bravo 96AM Head with tip-box stripper pins retracted (left) and extended (right)



If necessary, perform the following procedure to retract the stripper pins.

**To retract the 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.

- 1 Ensure that the top of the head is resting on a clean, stable surface. The probes should be facing upward, as the preceding 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. If the pin has an arrow, the square end of the arrow should disappear or be barely visible.

### IMPORTANT

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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.

## Installing the Bravo 96AM Head

### CAUTION

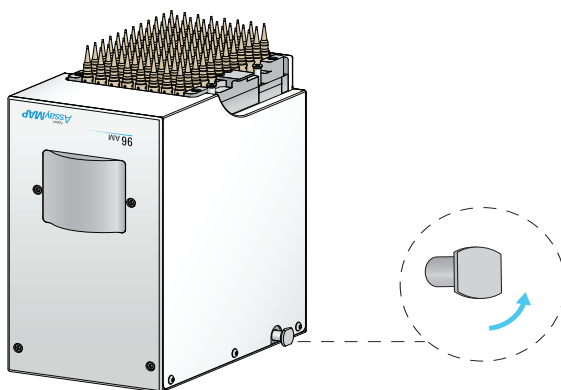
Always turn off the AssayMAP Bravo Platform before installing a liquid-handling head. Failure to do so can damage the head electronics.

### CAUTION

Placing the probes of the 96AM Head (bottom of head) on any surface can damage the probes. To protect the probes when the head is not mounted on the Bravo Platform, place the top of the head on a clean, stable surface so that the probes are facing upward. For storage, use the storage stand.

#### *To install the Bravo 96AM Head:*

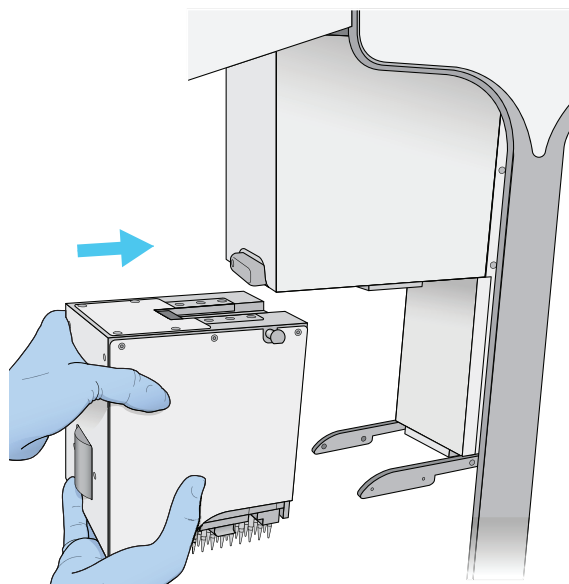
- 1 On the head, twist the two head-retainer pins one-quarter turn so that they are in a vertical orientation. (The pins will snap back into place when you install the head.)



- 2 With your left hand, firmly grip the left side of the head. Place your right hand under the flat area just to the left of the syringe array to support the weight of the head.
- 3 While supporting the head with your hands, slide the head onto the Bravo head mount. Press the head firmly into place to ensure the head is plugged into the connector receptacle on the head mount. You should hear the click when the retaining pins snap into place.

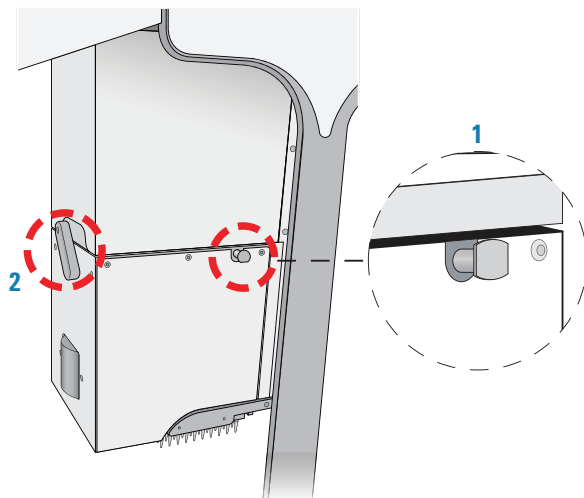


**Figure** Installing the Bravo 96AM Head in the Bravo head mount

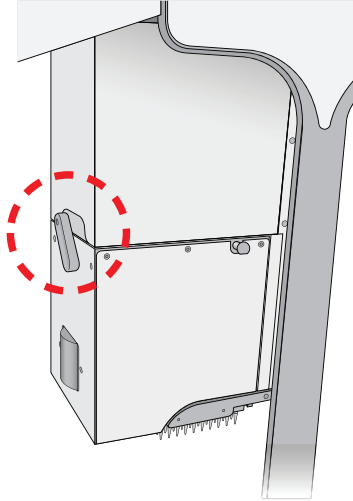


**Note:** If you do not hear the pins snap into place, check that the straight edges of the retainer pins are in the vertical position, as the following figure shows. Attempt to rotate the pins to ensure that they are in the locked position. The pins should not rotate freely.

**Figure** Installed Bravo 96AM Head: (1) retainer pin and (2) head lock



- 4 To lock the head, rotate the head lock clockwise until it reaches its hard stop. This ensures that the head is fully seated and does not shift position during operation.



### CAUTION

Dropping the head or bumping the probes will damage the syringes. If the Bravo head is not properly secured in place, it could drop unexpectedly. Ensure that the head is securely locked into the head mount.

## Reference for protocol authors

### CAUTION

To prevent potential damage, ensure the Bravo 96AM Head probes, pipette tips, or cartridges do not touch the bottom of the wash station. To adjust the distance from the bottom, you can use the Bravo liquid-handling task parameters in the VWorks software.

The Bravo 96AM Head can perform liquid-handling tasks with a subset of the 96 channels (partial head) only if you are using AssayMAP cartridges or 250- $\mu$ L pipette tips. This topic provides guidelines to help ensure that any partial-head liquid handling is done correctly.

### CAUTION

Attempting to use the bare probes for liquid-handling tasks that employ fewer than 96 channels can cause a crash, resulting in damage to the Bravo 96AM Head.

## Tasks performed at the wash station

To prevent potential crashes with the tall chimneys and walls of the wash station, ensure that the well selection parameter is set to the entire plate for any task at the wash station.

### CAUTION

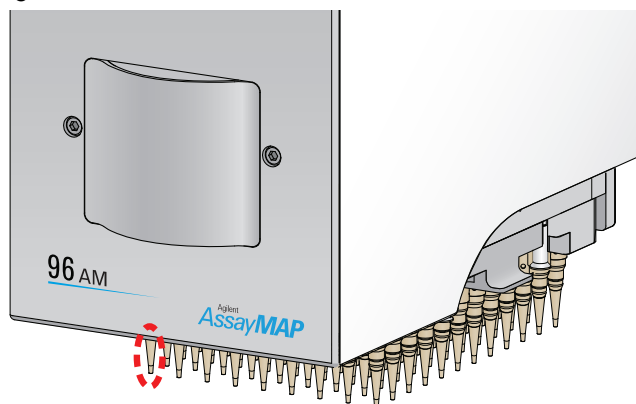
Attempting to perform a task at the wash station while a portion of the Bravo 96AM Head is offset above an adjacent location may result in a crash, causing potential damage to the head. Ensure that you use the entire plate well selection for any task at the wash station.

## Clearance issues when using a partial head of cartridges

### CAUTION

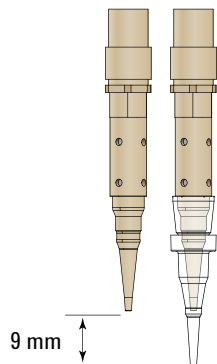
Using a single cartridge or an irregular array of cartridges can cause a potential head crash. Ensure that the selection of cartridges originates at probe A1 and that the selection of probes is contiguous. Carefully plan the deck layout and robot moves to prevent potential collisions between the remaining bare probes and the items on the Bravo deck.

**Figure** Probe for channel A1 in the Bravo 96AM Head



When fewer than 96 cartridges are mounted on the head, careful planning of the deck layout and the robot moves is required to prevent potential collisions between the remaining bare probes and the items on the Bravo deck. A mounted cartridge extends only 9 mm beyond the tip of a bare probe, as the following figure shows.

**Figure** Vertical distance between the tips of a bare probe and a mounted cartridge



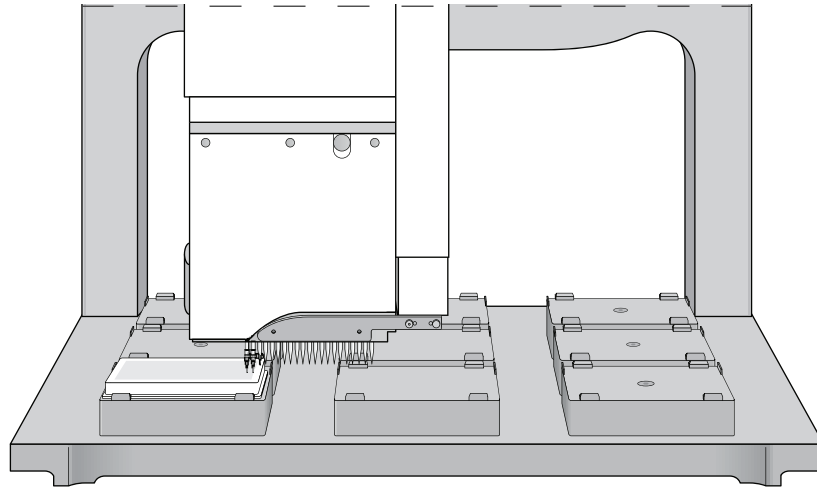
Because the distance between the tip of the bare probe and a mounted cartridge is relatively small, you must ensure the following:

- The depth at which the cartridges enter the wells is no more than 9 mm.
- When doing partial-plate operations where the head is offset horizontally from the target deck location (not centered over the platepad), ensure sufficient vertical clearance for the unused probes:
  - *Target deck location.* If the labware has deep wells and the head goes down too far, a collision between the unused probes and the perimeter of the labware can occur.
  - *Adjacent deck location.* If a labware or other object at the adjacent location is taller than the labware at the target location, a collision between the unused probes and the tall object or labware can occur.

**Note:** No horizontal offset of the head is required for partial-plate operations where the selection of channels in the head aligns with the labware well selection. For example, probe A1 enters well A1.

The following figures show examples of partial-plate operations where the head is offset horizontally from the target deck location. In this example, cartridges are mounted on the probes in columns 1 and 2. To access the wells in columns 11 and 12 of the labware at deck location 7, the head is offset over deck location 8.

**Figure** Example of a partial-head horizontal offset from deck location 7



### CAUTION

**If the head is offset from deep-well labware at the target deck location, the unused probes can collide with the labware perimeter if the head goes down too far.**

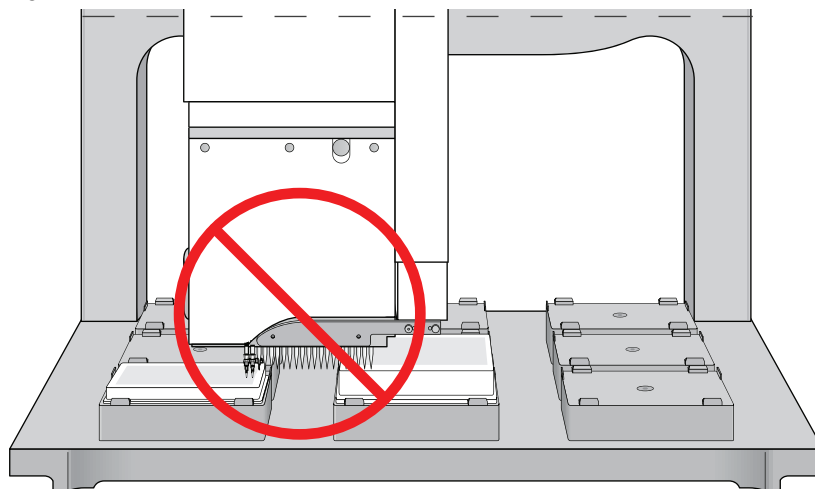
If the labware at location 7 was a deep-well microplate and you tried to aspirate from the bottom of the wells in columns 11 and 12, the bare probes in column 3 of the head would crash into the right side wall of the deep-well microplate.

### CAUTION

**If the head has fewer than 96 cartridges and is offset from the target deck location, the unused probes can have undesired contact with surrounding objects or samples. To prevent equipment damage and contamination, verify that sufficient clearance exists at the adjacent deck location.**

If deck location 8 contained labware taller than the microplate at deck location 7, the head's bare probes would crash into the labware at location 8, as the following figure shows.

**Figure** Example of partial-head horizontal offset with taller labware at the adjacent location



Although the VWorks software considers the geometry of the labware at the target deck location during the task, the software is unaware of the labware height on the adjacent deck location where the head will be offset.

### Requirements for mounting a partial head of 250- $\mu$ L pipette tips

#### CAUTION

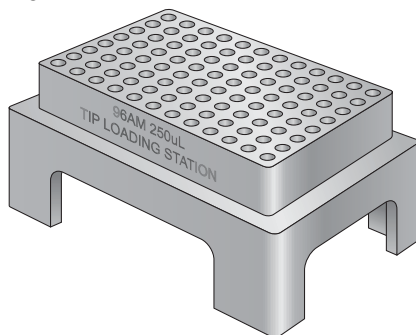
A collision will result if the Bravo 96AM Head is offset from the tip box location when pressing on pipette tips. When picking up pipette tips from a tip box, ensure that the Bravo 96AM Head is centered over the tip box.

#### CAUTION

To ensure consistent seating of pipette tips on the probes, use the 96AM Cartridge & Tip Seating Station to seat the pipette tips on the probes.

The Bravo 96AM Head must be centered over the tip box when picking up pipette tips to be transferred to the 96AM Cartridge & Tip Seating Station.

**Figure** 96AM Cartridge & Tip Seating Station



## Reporting problems

If you find a problem with the AssayMAP Bravo Platform, contact Agilent Technical Support.

To report problems with...	Have the following information ready
Hardware	<ul style="list-style-type: none"><li>• Instrument serial number from the Bravo serial number label</li><li>• Short description of the problem</li></ul>
Software	<ul style="list-style-type: none"><li>• Instrument serial number from the Bravo serial number label</li><li>• Short description of the problem</li><li>• Relevant software version number (for example, automation control software, diagnostics software, and firmware)</li><li>• Error message text (or screen capture of the error message dialog box)</li><li>• Relevant files, such as log files</li></ul>

## In This Book

This guide provides an overview of the AssayMAP Bravo Platform.

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