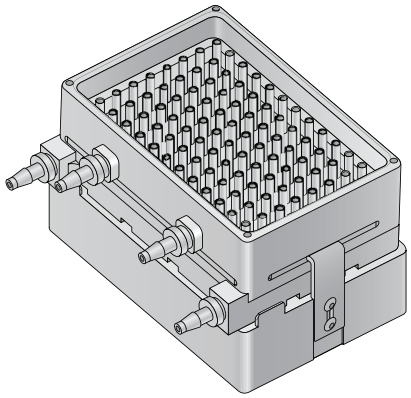
Agilent

Bravo Platform

96 Channel Wash Station

Maintenance Guide



This guide contains the following topics:

About this guide

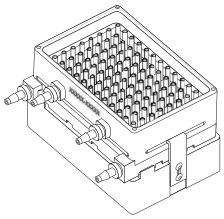
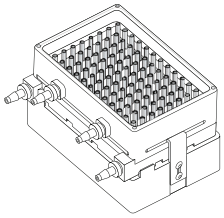
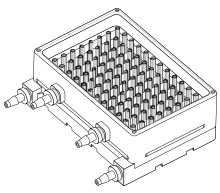
Assumptions

The instructions in this guide assume that you have the following:

- Experience working on mechanical equipment
- An understanding of the Bravo Platform
- Familiarity with the VWorks software

What this guide covers

This guide describes how to inspect and replace chimneys in the following Agilent wash station models.

Wash station name, Agilent part number (internal part number)	Description	Liquid-handling head compatibility	AssayMAP cartridge compatibility
96 Channel Wash Station, G5498B#90 (G5409-60125) 	Equipped with 96 wide-bore chimneys (part number G5409-68004) and a bracketed platepad to secure it. This model supersedes the following wash station models listed in this table. *Note:* Use only the wide-bore chimneys with this wash station model.	Bravo 96AM Head, and 96LT, 96ST, and 384ST heads	5 µL or 25 µL cartridges
96AM Wash Station, G5498B#57 (11961-311) 	Equipped with 96 standard-bore chimneys (part number 15586-002) before June 2020 or 96 wide-bore chimneys (part number G5409-68004) after June 2020. This model also has a bracketed platepad to secure it. This wash station may be retrofitted with the wide-bore chimneys (part number G5409-68004).	Bravo 96AM Head, and 96LT, 96ST, and 384ST heads	5 µL cartridges 25 µL cartridges only if upgraded with white, wide-bore chimneys
96 Well MicroWash Reservoir, G5498B#51 (11961-301) 	Equipped with 96 standard-bore chimneys (part number 15586-002). The setscrews in the deck platepads are used to secure this wash station in place.	96LT, 96ST, and 384ST heads	Incompatible Using this wash station on the AssayMAP Bravo Platform can cause a head crash.

Software versions

The procedures in this guide describe the following software versions:

- Protein Sample Prep Workbench 3.2 and VWorks 13.1.5 or later
- Protein Sample Prep Workbench 4.0 and VWorks 14.1 or later

Related user guides and where to find them

For information on…	See…
Potential safety hazards of the platform and how to avoid them Installing and setting up the Bravo Platform	*G5562A, G5563A Bravo Platform Safety and Installation Guide*
Installing and setting up the AssayMAP Bravo Platform	*AssayMAP Bravo Platform Installation Guide*
How to use Bravo Diagnostics	*Bravo Platform User Guide*

You can access the Bravo user documentation in the VWorks Knowledge Base using any of the following methods:

- From within VWorks software, select **Help** > **Knowledge Base** or press F1.
- From the Windows 10 desktop, select **Start** > **All Apps** > **Agilent Technologies** > **VWorks Knowledge Base.**
- Go to www.agilent.com/chem/askb.

For AssayMAP user documentation, see the Literature Library page in the Protein Sample Prep Workbench.

Contacting Agilent Technologies

Web: https://www.agilent.com

Contact page: https://www.agilent.com/en/contact-us/page

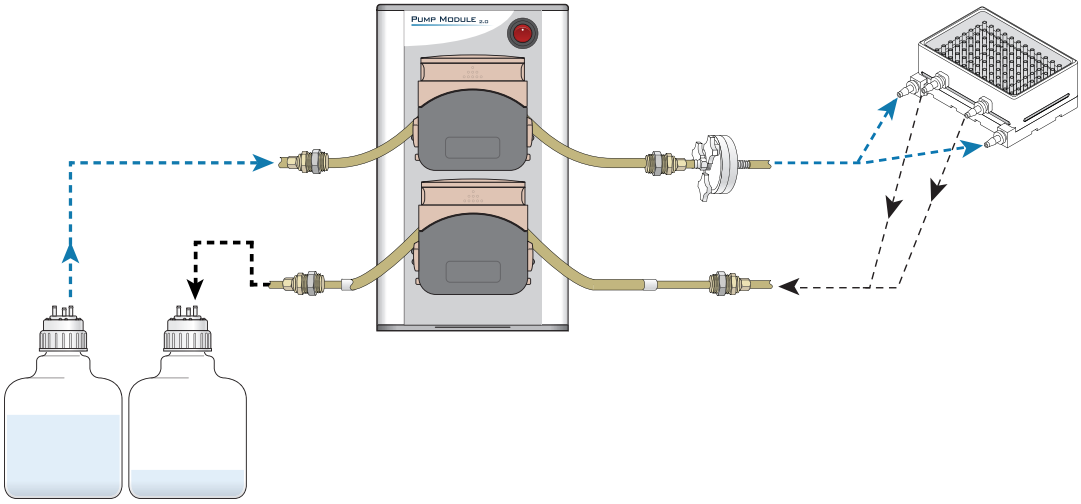
Documentation feedback: documentation.automation@agilent.com

About the wash station

Overview

The wash station is a component of the Bravo autofilling station, as the following figure shows.

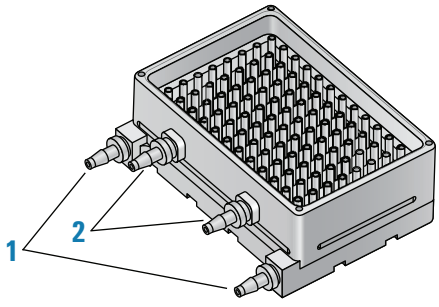
Figure Example of autofilling station: wash station, Pump Module, tubing, and carboys



How liquid flows through the wash station

Fresh wash liquid enters the wash station through two inlet ports (**1**), shown in the following figure. The wash liquid flows up through the chimneys, and the waste overflows from the chimneys and is removed through two outlet ports (**2**).

Figure Wash station (1) inlet ports and (2) outlet ports



Types of wash station chimneys for 96 channel wash stations

The following figure and table describe the two types of wash station chimneys:

- *Wide-bore chimneys*. The 96 Channel Wash Station (part number G5409-60125) comes equipped with the wide-bore chimneys.
- *Standard-bore chimneys (formerly, large-bore chimneys)*. The 96AM Wash Station (part number 11961-311) were previously equipped with the standard-bore chimneys, but as of June 2020 they ship with the wide-bore chimneys. The 96 Well MicroWash Reservoir/Tip Wash Station (part number 11961-301) ships with the standard-bore chimneys.

Feature	Wide-bore chimney	Standard-bore chimney
Part number	Agilent G5409-68004 (pack of 100)	Agilent 15586-002 (pack of 100)
Color	White, opaque	Neutral, semi-translucent
Geometry	Tapered diameter with wider top opening and narrower bottom opening.	Very slight taper from top to bottom opening.
Correct chimney orientation	Wider opening at top end; white bump for alignment closer to top end	White dot for alignment closer to top end
		
Liquid-handling head compatibility	All Agilent 96-channel heads and pipette tips	All Agilent 96-channel heads and pipette tips
AssayMAP cartridge compatibility	AssayMAP 25-µL and 5-µL cartridges	AssayMAP 5-µL cartridges only

Note: If you are unsure of the chimney type that you have in the wash station, see "Measuring your chimney to verify type" on page 40.

When to replace the chimneys

The wash station chimneys require replacement for the following reasons:

- Irregular or damaged chimneys. See the following figure for examples.
- Incompatibility with AssayMAP 25-µL cartridges. The standard-bore chimneys are not compatible with the AssayMAP 25-µL cartridges. Before using the 25-µL cartridges, replace the standard-bore chimneys with the white wide-bore chimneys. See "Types of wash station chimneys for 96 channel wash stations" on page 5.

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

Determining if the chimneys are in good condition

Carefully inspect the chimneys in the wash station to ensure that they are:

- In good condition and free of deformities and irregularities. See the following figure for examples.

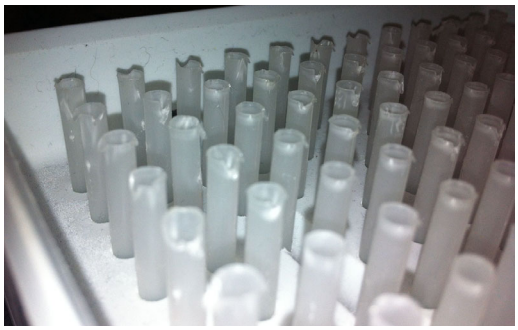
  Chimney irregularities or damaged chimneys can prevent wash solution from forming domes atop the chimneys, which will decrease the ability to wick off the droplets from the syringe probes of the Bravo 96AM Head and may introduce variability in the assay.
- Of equal height. When the chimneys are fully seated in the wash station their height should be consistent (less than 1 mm difference in height). If any chimneys seem higher than the others, push them down to the hard stop. See step 8 in the following replacement procedure.
- Installed in the correct orientation. See "Types of wash station chimneys for 96 channel wash stations" on page 5.

  Note: Incorrect orientation is only possible on the standard-bore chimneys.
- Clean and free of any debris.

Figure Close up views of wash station chimneys

Standard-bore chimneys: Good condition

Damaged standard-bore chimneys (possibly from a head collision)



Replacing the chimneys

WARNING **The probes of the AssayMAP 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. Wear gloves and use extreme caution to avoid brushing against the probes.**

Before you start

Required tools and materials

- Replacement chimneys and chimney insertion tool (included in the package)

  Ensure that you have the correct chimney type. See "Types of wash station chimneys for 96 channel wash stations" on page 5.

  To verify the chimney type installed in your wash station, see "Measuring your chimney to verify type" on page 40.

  Note: If you do not have an insertion tool, use a rubber pad between your thumb and the chimney to protect your thumb while pressing down on each chimney.
- Needle-nose pliers to remove the old model or defective chimneys from the wash station.

IMPORTANT Ensure that all chimneys are of the same type, wide-bore or standard-bore. Ensure you discard any chimneys that you remove. Using pliers on a chimney will permanently damage the chimney.

IMPORTANT Use only wide-bore chimneys with the 96 Channel Wash Station (part number (G5409-60125).

Workflow

Step	For this task...	See...
1	Inspect the chimneys for damage and irregularities.	"Determining if the chimneys are in good condition" on page 6
2	Replace the chimneys.	"Replacing the chimneys" on page 7
3	• *AssayMAP Bravo Platform*. Verify the teachhpoint at the wash station and adjust it as necessary.	"AssayMAP Bravo: Verifying the wash station teachpoint" on page 11
	• *Bravo Platform*. If you replace standard-bore chimneys with wide-bore chimneys, verify the *x*- and *y*-axes of the teachpoint at the wash station.	*Bravo Platform User Guide*

Step	For this task...	See...
4	Start up the platform and verify that all the chimneys work consistently using one of the following procedures:	
	• AssayMAP Bravo Platform	"AssayMAP Bravo: Testing the wash station" on page 22
	• Bravo Platform	"Testing the wash station in a Bravo Platform" on page 24

Chimney replacement procedure

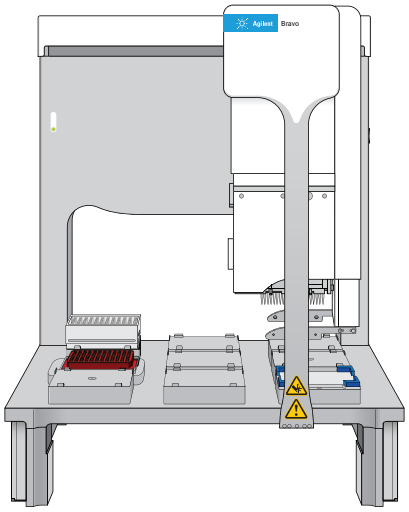
To replace the chimneys:

1 Exit the Protein Sample Prep Workbench and VWorks software.

2 On the side of the Bravo Platform, press the power switch to the **off** (**o**) position.

3 Gently, move the Bravo head manually to a deck location that allows you unobstructed access to the wash station installed on the deck. For example, if the wash station is installed at deck location 1, move the head to the far right side over deck location 3, as the following figure shows.

Figure Bravo head positioned at deck location 3



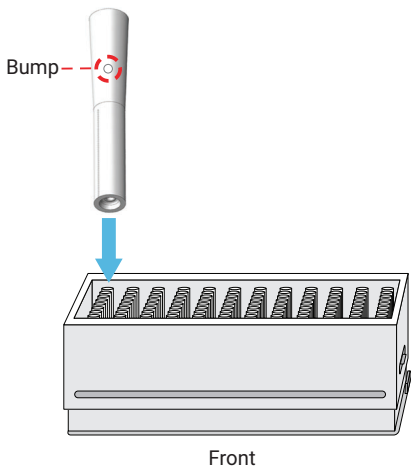
4 Using needle-nose pliers, pull out the defective (or older model) chimney from the wash station.

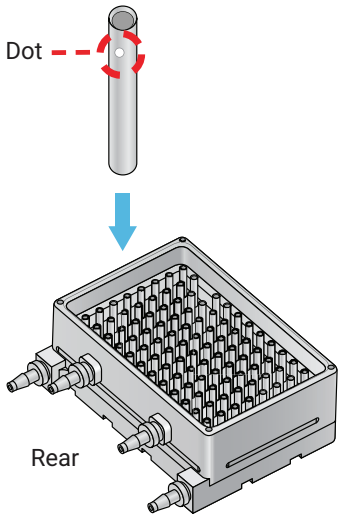
IMPORTANT Ensure that you discard any chimneys that you remove from the wash station. Using pliers to remove the chimneys will damage them.

5 Orient the new chimney with the little alignment bump (wide-bore chimney) or dot (standard-bore chimney) as the figure shows, and then insert the chimney bottom end into the hole in the wash station.

Note: All the chimney alignment bumps or dots should face the same direction.

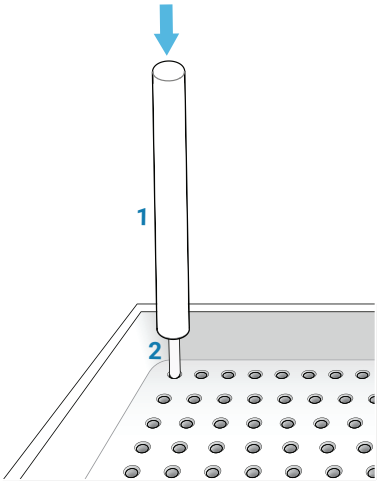
Wide-bore chimney orientation	Standard-bore chimney orientation
Alignment bump faces the front of the wash station. Larger opening is at the top. This is the only orientation that will fit.	Little dot on side of chimney is at the top and faces wash station rear (side with ports). Even though this chimney fits in either orientation, the size of the top and bottom ends are different.





CAUTION **To avoid a hardware crash and equipment damage, ensure that the chimneys are oriented correctly in the wash station.**

6 Position the (1) insertion tool atop the (2) chimney, and press straight down on the insertion tool to install the chimney until you feel a hard stop. The chimney touches the bottom surface of the wash station when fully seated.



CAUTION **Use care while pressing down in a vertical motion to avoid bending the chimneys during installation.**

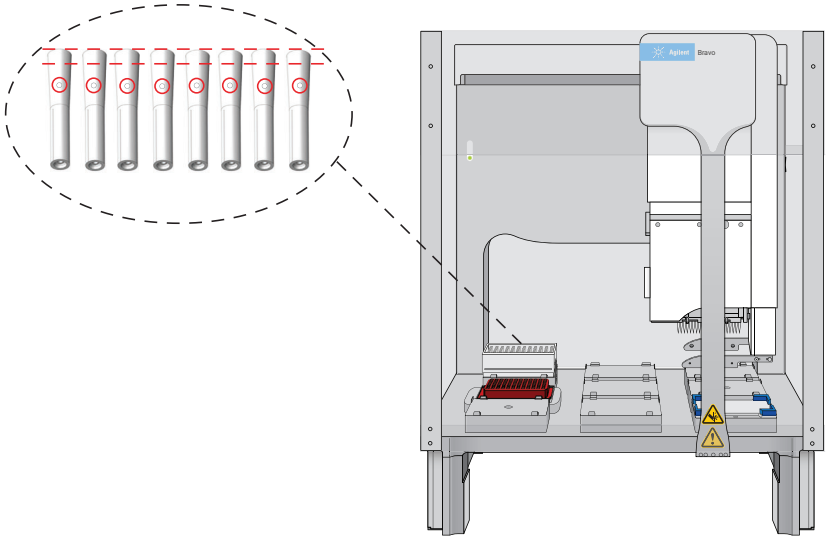
7 Repeat steps 1 to 5 to replace any other chimneys.

8 Carefully inspect the chimneys in the wash station to ensure proper alignment:

- All the chimney tops are level with each other (less than 1 mm difference in height).

  If any chimney is taller than the others, use the insertion tool or your thumb to press down on the chimney so that it touches the bottom surface (hard stop) of the wash station.
- All the alignment bumps or dots on the chimneys are facing the same direction.

Figure Example of wide-bore chimney alignment: tops level and alignment bumps aligned



IMPORTANT Good condition chimneys and consistent chimney height are critical for proper functioning of the wash station.

AssayMAP Bravo: Verifying the wash station teachpoint

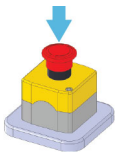
The syringes in the Bravo 96AM Head are fragile and can be damaged if the head collides with an object on the deck. To prevent the potential of collisions at the wash station, you must verify the teachpoint at the wash station after installing new chimneys.

For this procedure, you will determine if the alignment of the syringe probes in the Bravo 96AM Head are still centered in wash station chimneys. If an adjustment is necessary, only the *x*- and *y*-axes will be adjusted.

Before you start

Ensure the following:

- The emergency-stop pendant is within easy reach.



- No pipette tips or cartridges are on the syringes of the head.

WARNING **The Jog/Teach tab in Bravo Diagnostics poses an increased risk of collision because the jog controls enable you to move the head without regard to items on the Bravo deck. To prevent potential injury and damage to the device, use extreme caution when using the Jog/Teach tab controls.**

WARNING **The red Stop motors button in Bravo Diagnostics does not perform an immediate stop. To perform an emergency stop, press the red button on the emergency-stop pendant.**

Workflow

Workflow for verifying and adjusting the teachpoints

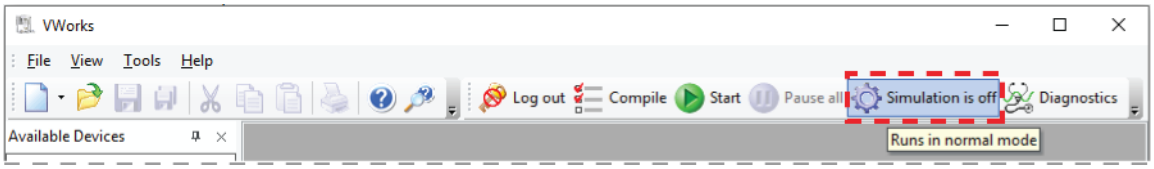
Step	For this task...	See...
1	In the Bravo Diagnostics dialog box, initialize the AssayMAP 1 profile.	"Initializing AssayMAP 1 profile" on page 12
2	Verify the wash station teachpoint for the AssayMAP 1 profile, and adjust it if necessary.	"Verifying and adjusting the teachpoint for AssayMAP 1 profile" on page 14

Step	For this task...	See...
3	If you updated the AssayMAP 1 profile, update the remaining profiles:	
	• Protein Sample Prep Workbench 3.2 and VWorks 13.1.5 – 13.1.x	"Updating the remaining profiles in VWorks 13.1.x" on page 17
	• Protein Sample Prep Workbench 4.0 and VWorks 14.1 or later	"Updating the remaining profiles in VWorks 14.1 or later" on page 20

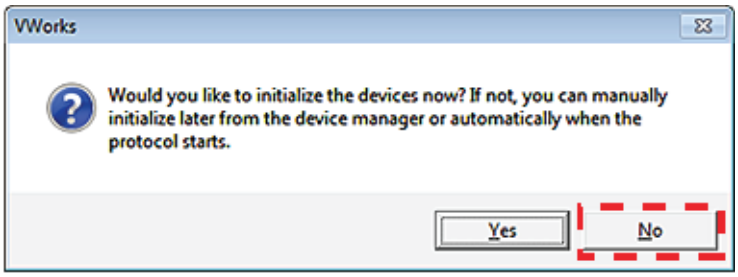
Initializing AssayMAP 1 profile

1. Ensure that the Protein Sample Prep Workbench and VWorks software is closed.
2. To start the VWorks software, click the VWorks icon 

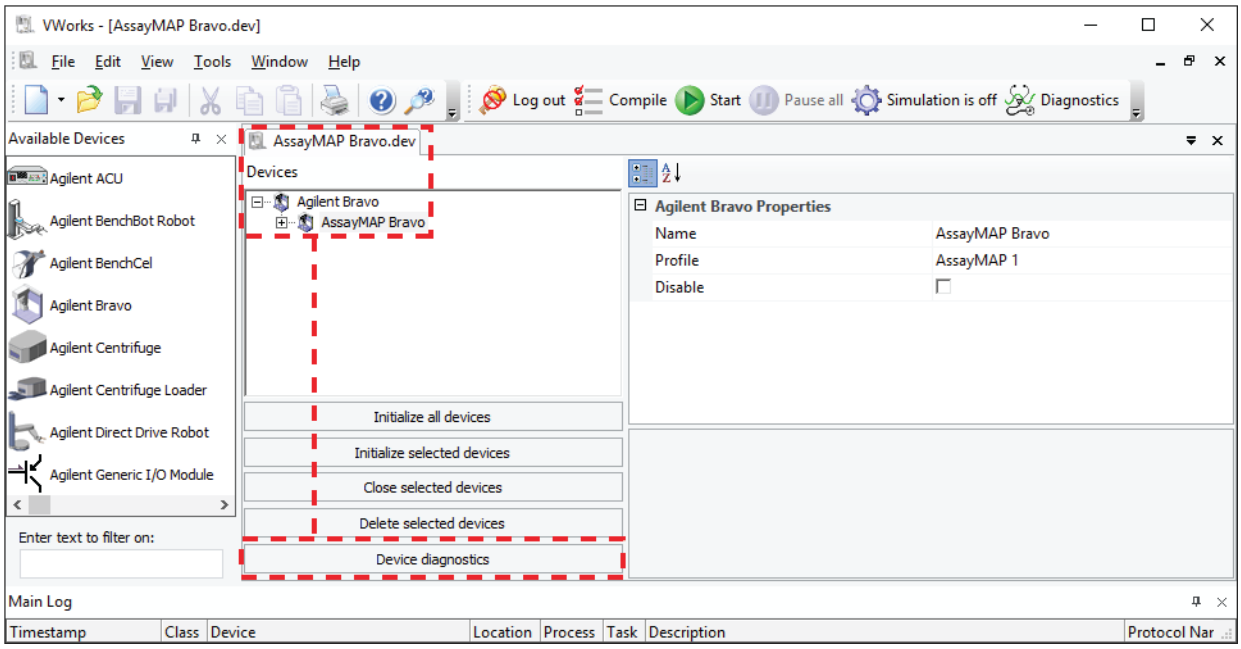
on the desktop and log in using your user name and password.
3. On the VWorks toolbar, ensure that **Simulation is off** is displayed.



4. In the VWorks window, click **File > Open**.
5. In the **Open File** dialog box, ensure the file type is **Device Files (*.dev)**, select **AssayMAP Bravo.dev**, and then click **Open**:
   - *Workbench 3.2*. The file is stored at C:\VWorks Workspace\Workbench\Device Files\
   - *Workbench 4.0*. The file is stored in Shared Services storage:
     - VWorks Plus stores the file at /VWorks Projects/VWorks/Protein Sample Prep Workbench/Device Files/
     - VWorks Standard stores the file at C:\OLSS Projects\VWorks Projects\VWorks\Protein Sample Prep Workbench\Device Files\
6. Click **No** when the **Would you like to initialize devices now?** message appears.



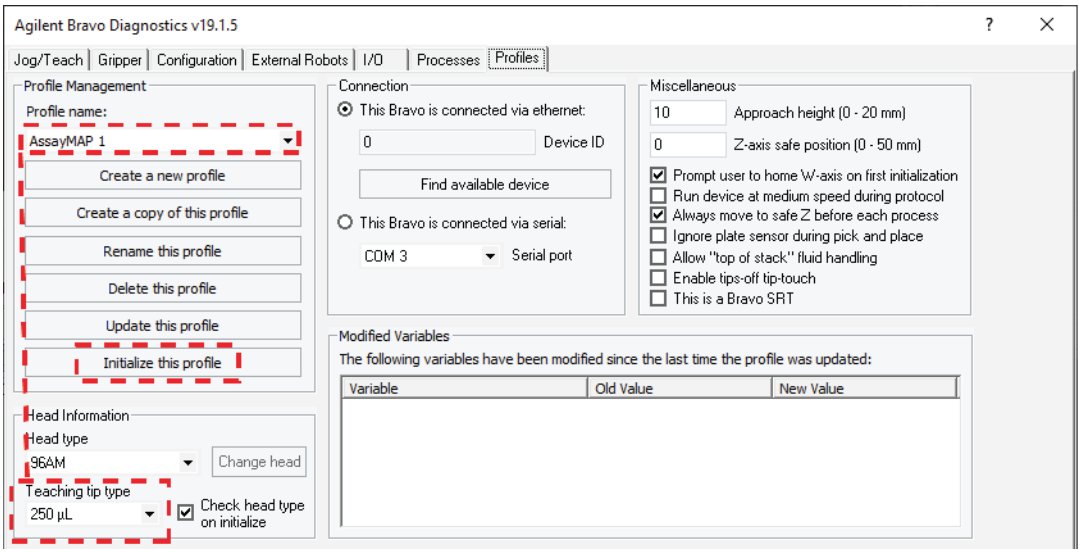
7. In the **Devices** tab (AssayMAP Bravo.dev), select the device and then click **Device diagnostics**.



8 In the **Agilent Bravo Diagnostics** dialog box, click the **Profiles** tab, and then do the following:

a Verify the **Profile name** is AssayMAP 1, and verify the **Teaching tip type** is 250 µL.

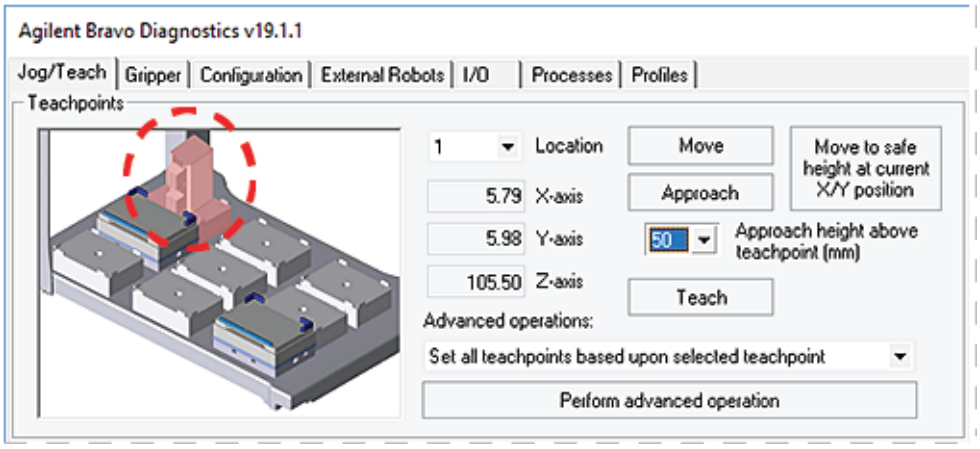
b Click **Initialize this profile**.



Verifying and adjusting the teachpoint for AssayMAP 1 profile

To verify and, if necessary, adjust the teachpoint:

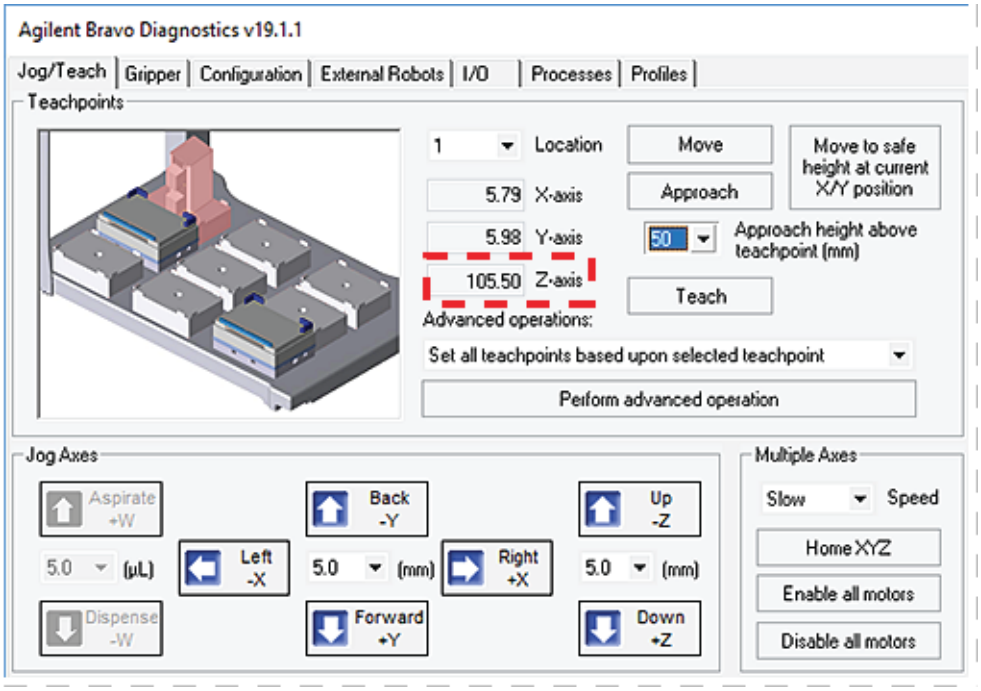
1 In **Agilent Bravo Diagnostics**, click the **Jog/Teach** tab, and then click **Location 1**.



Note: Additional accessories will appear in the image if you have configured them in this profile.

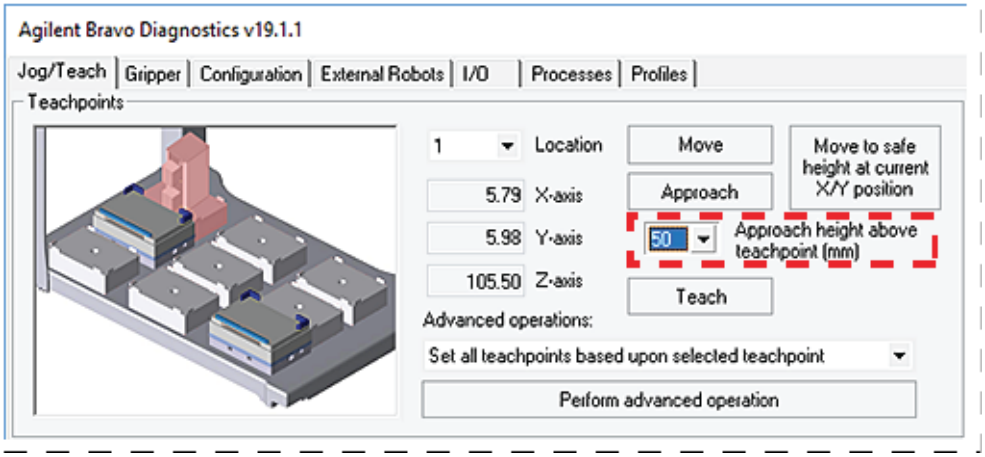
2 In the **Location** list, locate the **Z-axis** box. Write down the Z-axis value on a piece of paper. You will use this value in a subsequent step.

Note: The Z-axis teachpoint value for deck location 1 is typically between 105.2–105.8 mm for a standard height AssayMAP Bravo Platform and standard platepad.



3 Move the head down so that you can verify the teachpoint as follows:

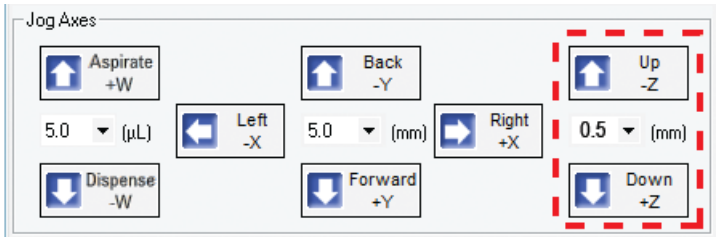
a In the **Approach height above teachpoint** box, type **50**, and then click **Approach**.



b Carefully, use the **Jog Axes** controls to move the head down (z-axis) using small incremental steps until the tips of the probes are approximately 1 mm above the tops of the chimneys. To do this:

Set the jog increment (mm), and then click the **Down +Z** button.

Reduce the increment value as the tips get closer to the wash station chimneys.

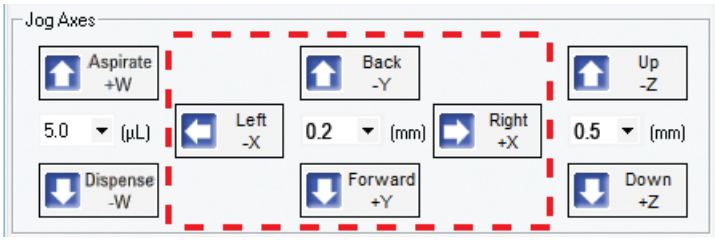


4 While syringe probe tips are in position just above the chimney tops, check the alignment to see if the probe tips are centered in the chimneys:

- If no adjustment is necessary to center the probe tips, click **Move to safe height at current X/Y position** and then click **Cancel** to close Bravo Diagnostics without saving any changes.

  Proceed to "AssayMAP Bravo: Testing the wash station" on page 22.
- If an adjustment is necessary to center the probe tips, continue to step 5.

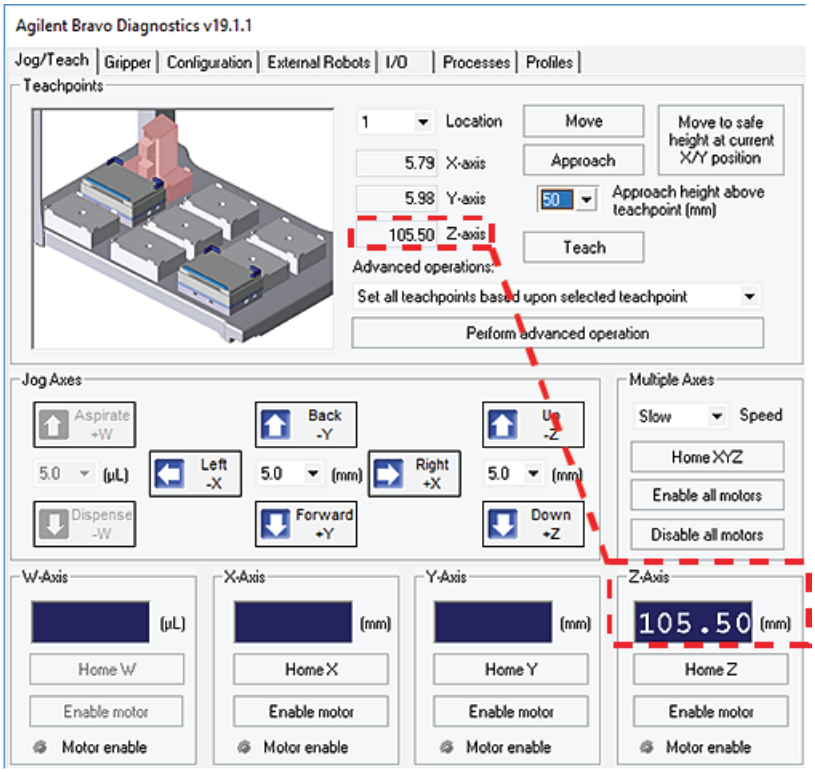
5 Carefully, use the **Jog Axes** controls to position the syringe probes so that they are centered over the corresponding chimneys in the *x*- and *y*-axes.



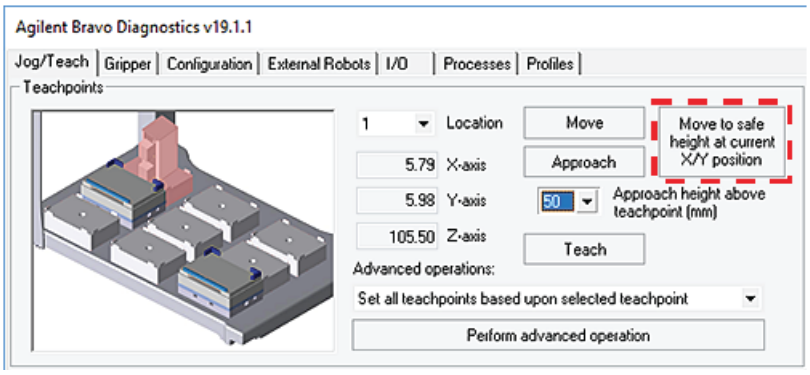
6 When the probes and chimneys are aligned, use the **Jog Axes** controls to move the head down incrementally along the *z*-axis, using smaller and smaller jog increments until you reach the original **Z-axis** teachpoint value that you recorded in step 2.

Note: This step will insert the probes into the wash station chimneys, which is a normal part of the teaching process.

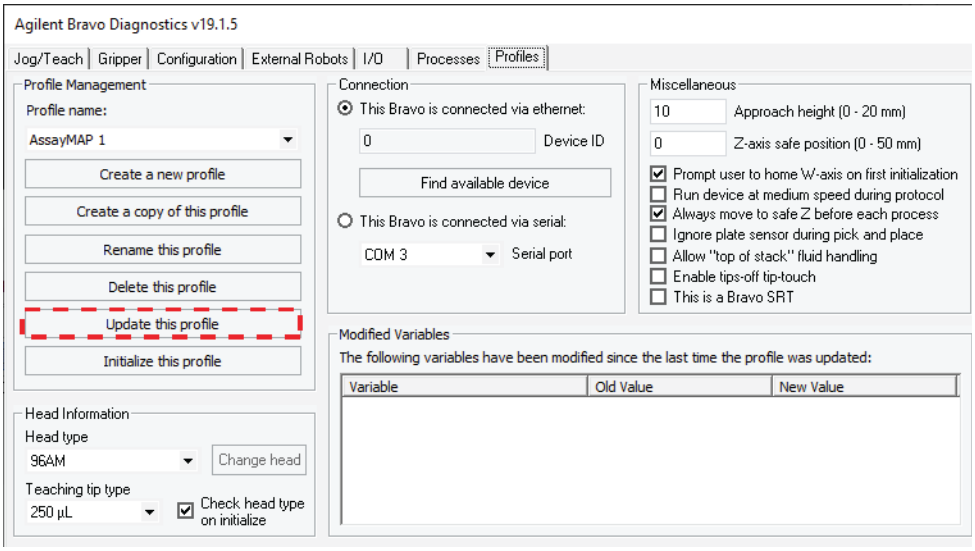
7 When the position of the *z*-axis (as indicated by the Z-axis readout in the bottom right of the screen) matches the Z-axis value that you recorded in step 2, click **Teach** to set the new teachpoint for deck location 1.



8 Click **Move to safe height at current X/Y position**. The head moves up and returns to a safe height above the wash station.



9 In the **Profiles** tab, click **Update this profile** to save the new teachpoint.



10 *VWorks Plus only*. If an audit trail is being logged, the Audit Comment dialog box opens. Select or type the audit comment, and then click **OK**.

Updating the remaining profiles in VWorks 13.1.x

The AssayMAP Teachpoint Update protocol will set the teachpoints for all other profiles in the Protein Sample Prep Workbench based on the AssayMAP 1 profile.

Note: The AssayMAP Teachpoint Update protocol also automatically makes z-axis teachpoint adjustments for the GlykoPrep-Plus profile to accommodate the height of the Red PCR Insert at deck location 4, and the AssayMAP Normalization profile to accommodate the height of the Bravo Plate Riser at deck locations 2 and 6.

Before you start

Ensure that you have the AssayMAP Teachpoint Update protocol (.pro), which is installed in the following location:

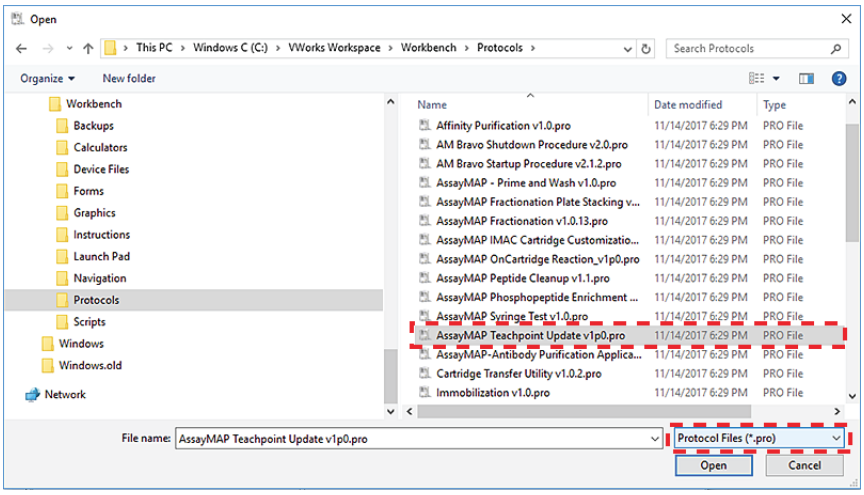
C:\VWorks Workspace\Workbench\Protocols\AssayMAP Teachpoint Update v1p0.pro

Note: The AssayMAP Teachpoint Update protocol is not designed to work in simulation mode.

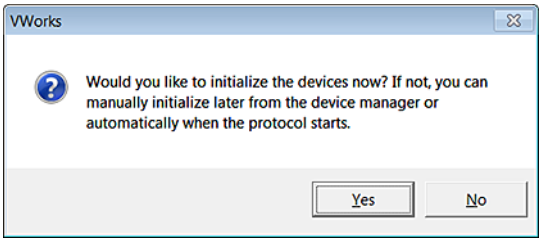
To start the AssayMAP Teachpoint Update protocol:

1 In the VWorks window, click **File > Open**. The Open dialog box appears.

2 In the **Open** dialog box, ensure the file type is **Protocol Files (*.pro)**. Locate the C:\VWorks Workspace\Workbench\Protocols folder, select the **AssayMAP Teachpoint Update v1p0.pro** file, and then click **Open**.

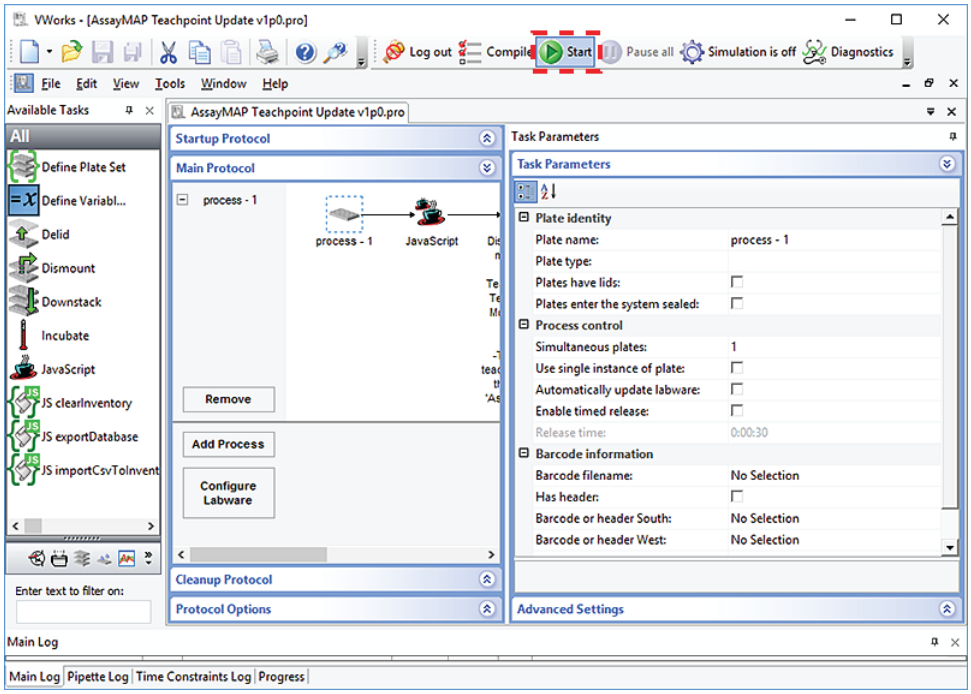


3 When the following VWorks initialization message appears, click **Yes**.

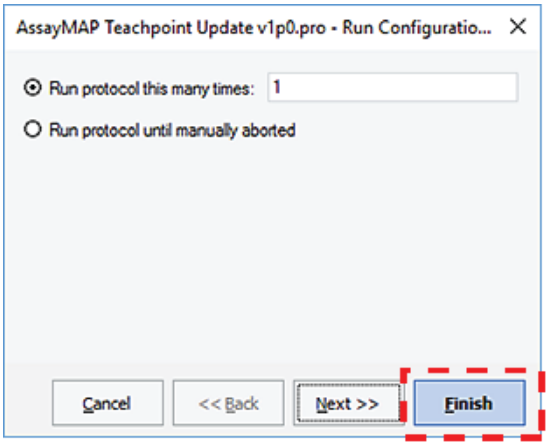


The AssayMAP Bravo.dev file opens, and the AssayMAP 1 profile initializes.

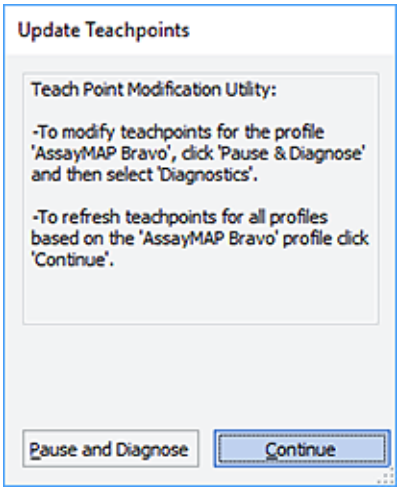
4 Ensure that the AssayMAP Teachpoint Update protocol is open in the VWorks window, and then click **Start**.



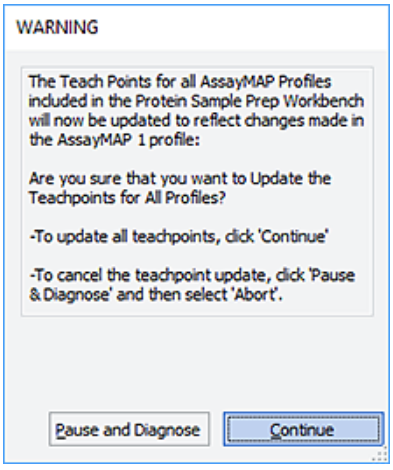
5 In the **Run Configuration** dialog box, click **Finish** to start the protocol.



6 When the **Update Teachpoints** dialog box appears, click **Continue** to update teachpoints in all the other Workbench profiles based on the AssayMAP 1 profile.



7 When the **WARNING** dialog box appears, click **Continue** to complete the update.



8 Close the VWorks software.

Updating the remaining profiles in VWorks 14.1 or later

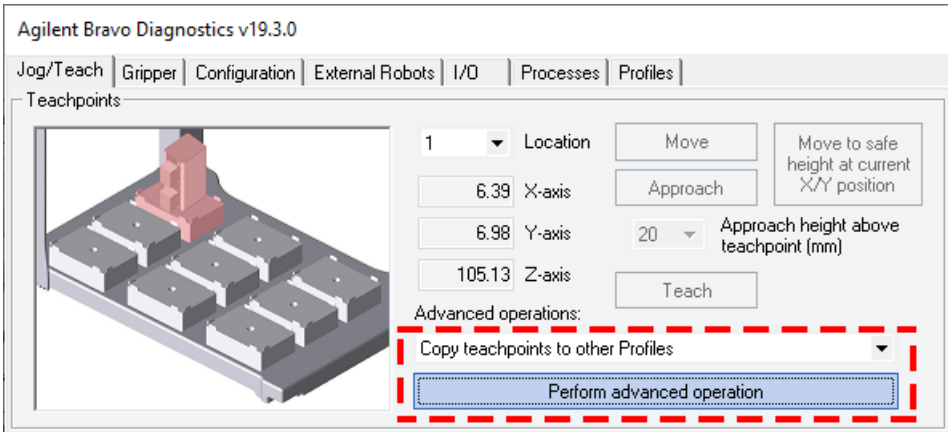
This procedure updates the following teachpoints:

- Pipette head teachpoints (*x*- , *y*-, and *z*-axes) for all nine deck locations
- Gripper *y*-axis offset

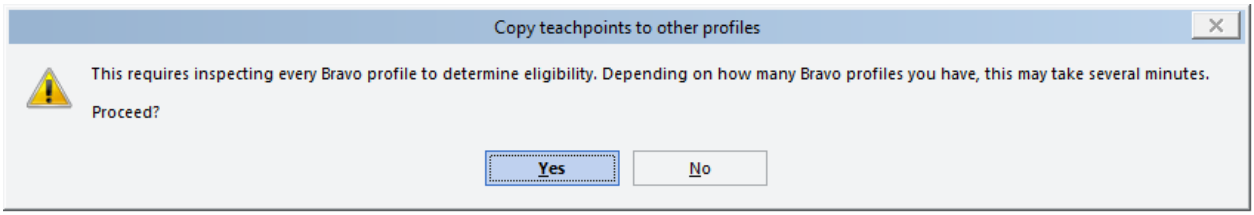
Note: The AssayMAP Normalization profile for Workbench 4.0 includes z-*axis* offsets configured at deck locations 2 and 6 to accommodate the height of the Bravo Plate Riser.

To copy the AssayMAP 1 teachpoints to the other profiles:

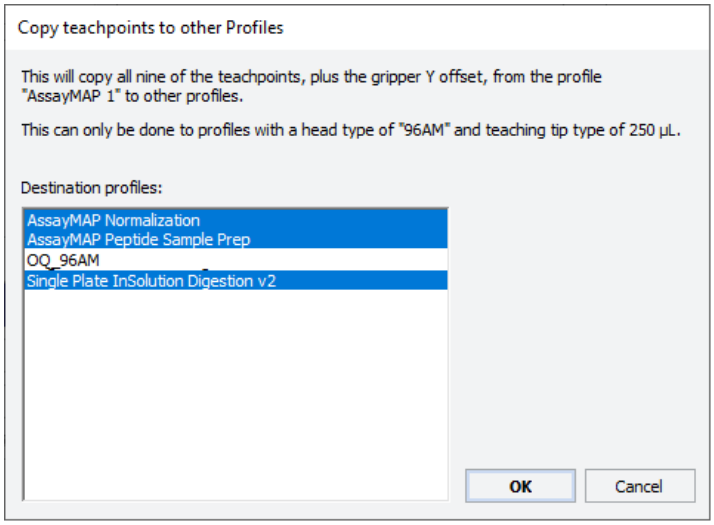
1. In the **Bravo Diagnostics** dialog box, ensure that the **AssayMAP 1** profile is initialized in the **Profiles** tab.
2. In the **Jog/Teach** tab, under **Advanced operations**, select **Copy teachpoints to other Profiles**, and then click **Perform advanced operation**.



A message appears and warns you that the software must inspect every Bravo profile before providing a list of eligible profiles. Click **Yes** to proceed.

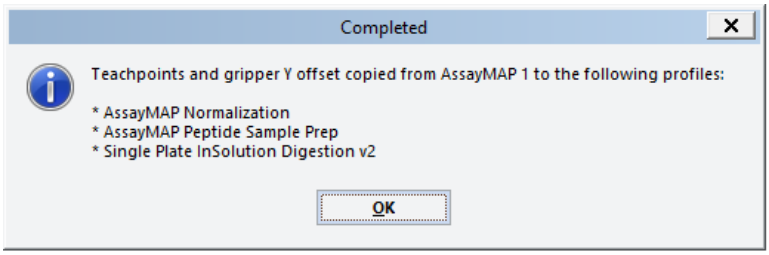


3. In the **Copy teachpoints to other Profiles** dialog box, select the following profiles, and then click **OK**:
   - AssayMAP Normalization
   - AssayMAP Peptide Sample Prep
   - Single Plate InSolution Digestion v2



4 *VWorks Plus only*. If an audit trail is being logged, the Audit Comment dialog box opens. Select or type the audit comment for all the profiles to be updated, and then click **OK**.

5 Click **OK** when the confirmation message appears.



AssayMAP Bravo: Testing the wash station

Before you start

Ensure that you verify the wash station teachpoint and adjust it as required. For details, see "AssayMAP Bravo: Verifying the wash station teachpoint" on page 11.

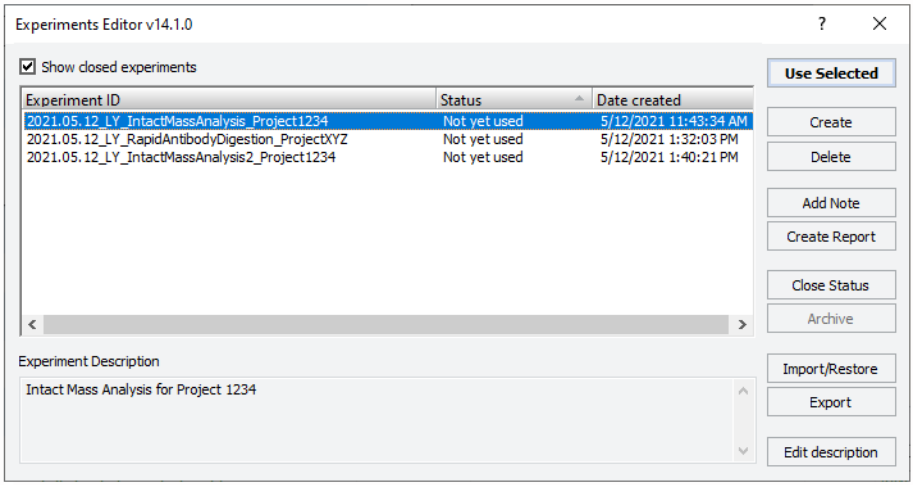
Starting up the AssayMAP Bravo Platform

To test the performance of the wash station, you run the Startup utility in the Protein Sample Prep Workbench. During the Startup protocol, carefully observe the fluid as it flows out of the top of the chimneys in the wash station.

To start up the system:

1. Check the levels of the wash station source and waste carboys, and fill or empty as required.
2. Turn on the AssayMAP Bravo Platform and accessories.
3. Start the Protein Sample Prep Workbench, and open the **Utility Library**.
4. Open the **System Startup/Shutdown** utility  .
5. *Workbench 4.0 only*. Under **Experiment Settings**, select the following:

   a. If applicable, click **Select Experiment**. The Experiments Editor opens.



   Select the **Experiment ID** that you want to use to capture the steps in this application or utility, and then click **Use Selected**. The Experiments Editor closes.

   b. In the form, click **Select Method** to locate and select a method.

   In the **Open File** dialog box, select the method, and click **Open**.

   To modify the selected method, proceed to step c. Otherwise, go to step 6.

c To create or modify a method:

VWorks Plus only. Administrator or technician privileges are required to create or modify methods.

In the **Startup Options** area of the AssayMAP Startup & Shutdown form, enter the values for the following properties:

Property	Description
Number of Syringe Wash Cycles	Specifies the number of syringe wash cycles that will be conducted at the wash station at deck location 1. Default: 3 Range: 0–10
Wash Station Prime Duration (sec)	Specifies how long (seconds) to run the wash station pumps in order to prime the tubing lines and wash station chimneys. If the tubing lines are dry, set this value to 60 seconds. Default: 10 Range: 0–300

To save the method, click **Save Method**. In the **Save File As** dialog box, type the file name and click **Save**.

VWorks Plus only. You must save the method before you can run it.

Note: If the wash station was allowed to dry, change the Wash Station Prime Duration setting from 10 to 60 seconds before clicking Run Startup.

6 Click **Run Startup** to initialize the AssayMAP Bravo Platform and accessories.

WARNING **When you initialize the Bravo Platform, the head and tie bar will move. To prevent injury, keep clear of the device while it is in motion.**

7 During the Startup protocol, verify that all the wash station chimneys have liquid flowing through them.

- If all the chimneys are flowing evenly, the device is ready for operation.
- If no liquid is flowing through **any** of the chimneys, check to see if:
  - Liquid is in the source carboy.
  - The tubing is clamped into the pump heads.
  - The tubing is routed correctly, and free of kinks or damage.

  Repeatedly run the Startup utility or increase the wash station prime duration in the Startup utility.

  For more guidelines, see "Troubleshooting problems with the wash station" on page 38.
- If no liquid is flowing through a subset of chimneys, suspect an airlock. Use a plastic transfer pipette or a 1 mL pipette to draw liquid through the problematic chimneys. Rerun the Startup utility, and repeat this step until all the chimneys are flowing freely.

Testing the wash station in a Bravo Platform

Before you start

If you did not uninstall the wash station, you do not need to verify the teachpoints for the wash station installed on a standard Bravo Platform. If you replaced the standard-bore chimneys in the wash station with wide-bore chimneys, you should verify the teachpoint at the wash station.

CAUTION **If you uninstall and reinstall the wash station, the wash station teachpoint can shift. To prevent a potential crash, verify the wash station teachpoint in your Bravo profiles any time you reinstall the wash station. In addition, you should verify the wash station teachpoint if you replace standard-bore chimneys with wide-bore chimneys.**

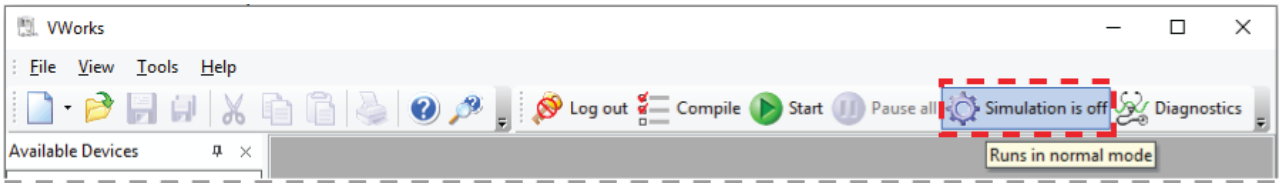
For instructions on how to set and verify the Bravo teachpoints, see *Bravo Platform User Guide*.

To test the performance of the wash station, use the following procedure to run the Pump Reagent task in Bravo Diagnostics to pump liquid into the wash station. While running the task, carefully observe the fluid as it flows out of the top of the chimneys in the wash station. Verify that all the wash station chimneys have liquid flowing through them.

Starting up the Bravo Platform

To start up the system:

1. Check the levels of the wash station source and waste carboys, and fill or empty as required.
2. Turn on the Bravo Platform and accessories.
3. Start the VWorks software.
4. In the VWorks window, ensure that **Simulation is off**.



5. In the VWorks window, open the Bravo device file.

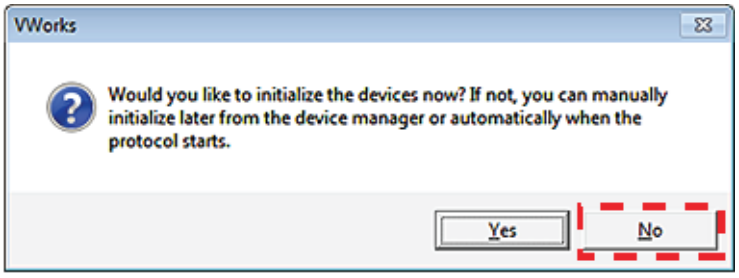
   To do this, click **File > Open**. In the **Open File** dialog box, ensure the file type is **Device Files (*.dev)**, select the file, and then click **Open**.

   - *VWorks 13.1.x*. Typically, the file is stored at C:\VWorks Workspace\Workbench\Device Files\
   - *VWorks 14.1*. The VWorks project folder path varies depending on the VWorks edition and how the folders are configured within the VWorks project, for example:

VWorks edition	Example Devices folder path
VWorks Plus	/VWorks Projects/VWorks/Devices

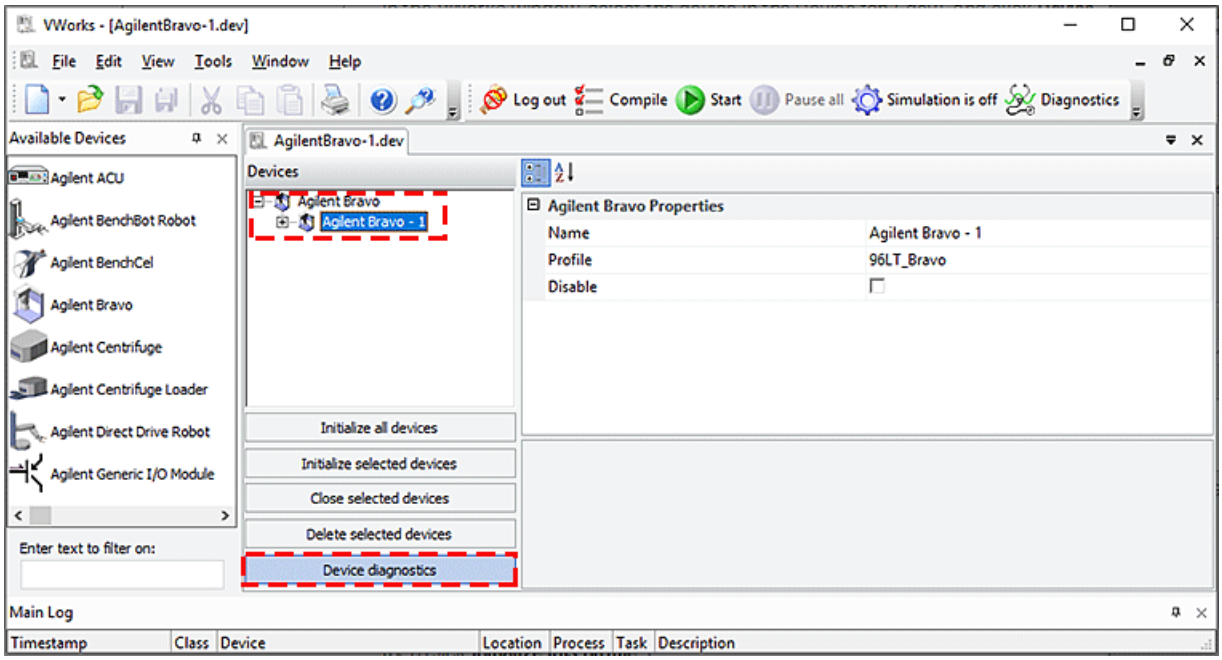
VWorks edition	Example Devices folder path
VWorks Standard	C:\OLSS Projects\VWorks Projects\VWorks\Devices

6 Click **No** when the **Would you like to initialize devices now?** message appears.



7 Open Bravo Diagnostics as follows:

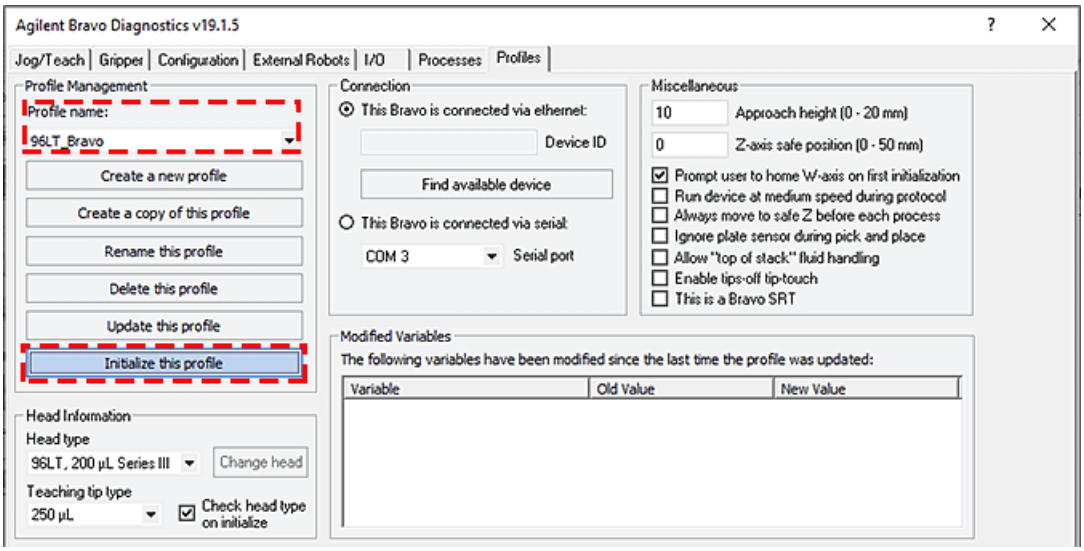
In the VWorks window, select the device in the Device tab (.dev), and click **Device diagnostics**.



The Agilent Bravo Diagnostics dialog opens.

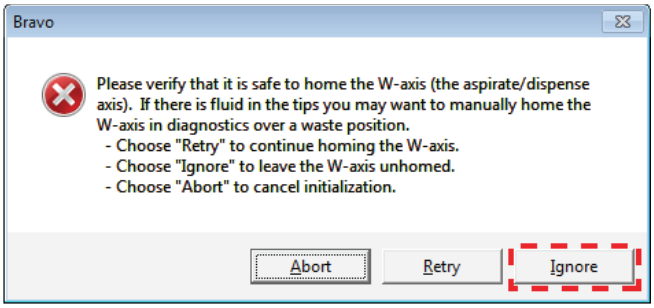
8 To initialize your Bravo profile, click the **Profiles** tab, select the **Profile name**, and then click **Initialize this profile**.

WARNING **When you initialize the Bravo Platform, the head and tie bar will move. To prevent injury, keep clear of the device while it is in motion.**



9 If the **There appears to be a plate present** error message appears, click **Ignore and Continue** to continue the homing process.

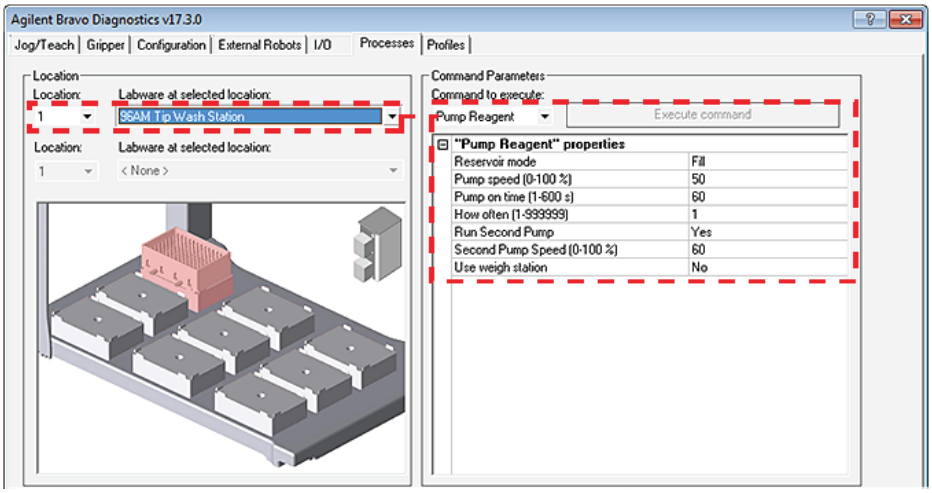
10 When the **Verify that it is safe to home the W-axis** message appears, click **Ignore** to skip the *w*-axis homing for now.



Running the Pump Reagent task to fill the wash station

To run the Pump Reagent task:

1 In **Bravo Diagnostics**, click the **Processes** tab.



2 Select the following:

Setting	Value
Location	Number of the deck location where the wash station is installed.
Labware at selected location	96AM Tip Wash Station
Command to execute	Pump Reagent
Pump Reagent properties	
Reservoir mode	Fill
Pump speed (0–100%)	50%
Pump on time (1–600 s)	60 seconds
How often	1
Run second pump	Yes
Second pump speed (0–100%)	60%
Use weigh station	No

3 Click **Execute command**.

4 Observe the fluid as it flows out of the top of the chimneys in the wash station. If all the chimneys are flowing evenly, the wash station is ready for operation.

To troubleshoot problems with the wash station, locate your problem in the troubleshooting table and try the solution. See "Troubleshooting problems with the wash station" on page 38. If the problem persists, contact Agilent Technical Support.

IMPORTANT To home the *w*-axis, make sure that you reinitialize the profile before running a protocol.

Replacing a wash station

If the wash station requires replacement, use the following workflow.

Workflow

Step	For this task...	See...
1	Empty the wash station.	"Emptying the wash station" on page 29
2	Uninstall the wash station.	"Uninstalling the wash station" on page 33
3	Install the wash station.	"Installing the wash station and connecting the tubing" on page 34
4	Verify the wash station teachpoint and adjust it, as necessary, for your configuration:	
	• *AssayMAP Bravo Platform*. Initialize the AssayMAP 1 profile and adjust the teachpoint for the wash station.	"AssayMAP Bravo: Verifying the wash station teachpoint" on page 11
	• *Bravo Platform*. Initialize your Bravo profile and verify the teachpoint for the wash station.	*Bravo Platform User Guide*
5	Start up the platform and verify that all the chimneys work consistently using one of the following procedures:	
	• AssayMAP Bravo Platform	"AssayMAP Bravo: Testing the wash station" on page 22
	• Bravo Platform	"Testing the wash station in a Bravo Platform" on page 24

Emptying the wash station

This topic describes how to use the Pump Reagent task in Bravo Diagnostics to empty any fluid from the wash station.

Before you start

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. Wear gloves and use extreme caution to avoid brushing against the probes.**

WARNING **When you initialize the Bravo Platform, the head and tie bar will move. To prevent potential injury, keep clear of the device while it is in motion.**

CAUTION **To prevent potential equipment damage, ensure that the deck is clear of any obstacles before initializing the Bravo Platform.**

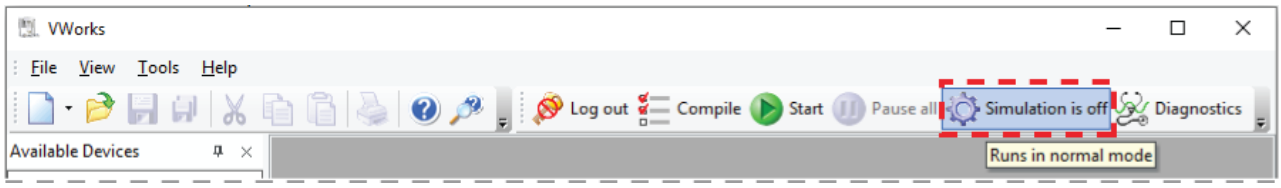
CAUTION **Using an incorrect profile can cause equipment damage. Ensure that the profile is correct for the head type and deck configuration.**

Running the Pump Reagent task to empty the wash station

To empty the wash station using the Pump Reagent task:

1. At the carboy that contains the wash solution, disconnect the lid and lift it so that the tubing is above the liquid level in the carboy.
2. *AssayMAP Bravo Platform only*. Ensure that the Protein Sample Prep Workbench is closed.
3. Start the VWorks software.

   You can use the VWorks desktop icon or the Start menu on the Windows desktop to start the VWorks software.
4. In the VWorks window, ensure that **Simulation is off**.



5. In the VWorks window, open the device profile:

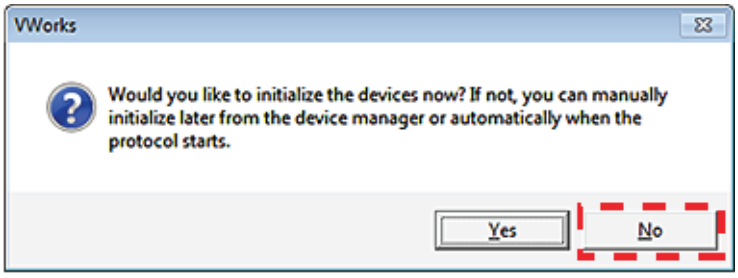
   To do this, click **File > Open**. In the **Open File** dialog box, ensure the file type is **Device Files (*.dev)**, select the file, and then click **Open**.

   AssayMAP Bravo Platform only. Open the **AssayMAP Bravo.dev** file.

   - *Workbench 3.2*. The file is stored at C:\VWorks Workspace\Workbench\Device Files\

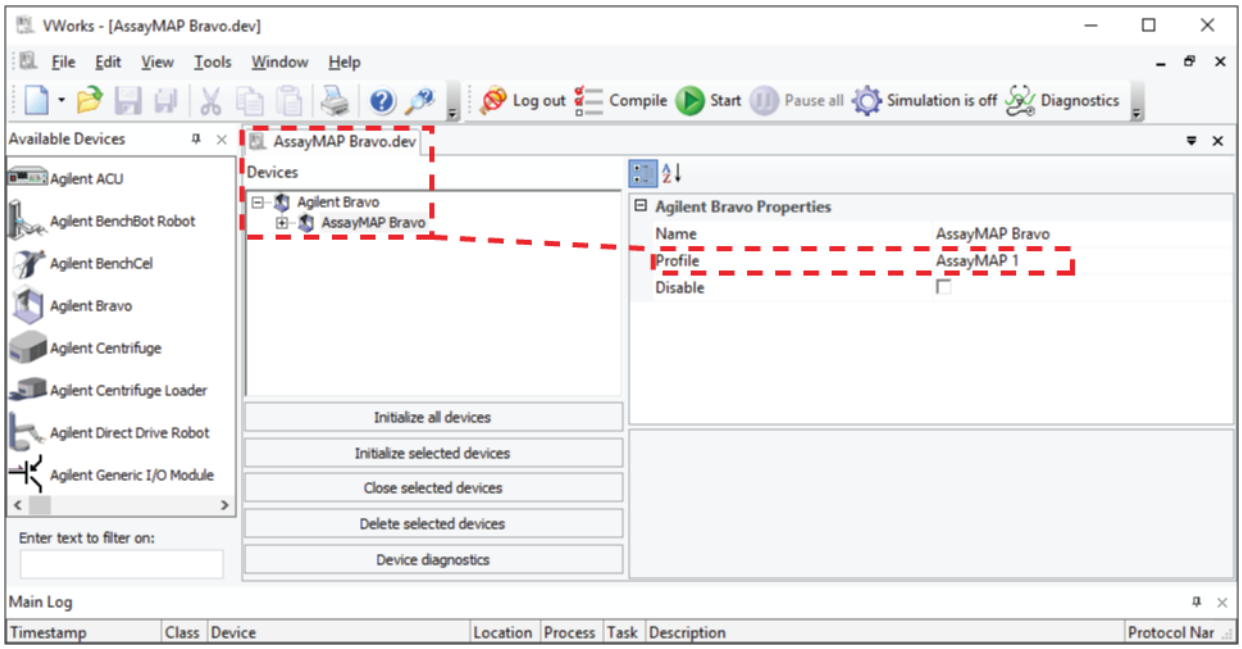
- *Workbench 4.0*. The file is stored in Shared Services storage:
  - VWorks Plus stores the file at /VWorks Projects/VWorks/Protein Sample Prep Workbench/Device Files/
  - VWorks Standard stores the file at C:\OLSS Projects\VWorks Projects\VWorks\Protein Sample Prep Workbench\Device Files\

6 Click **No** when the **Would you like to initialize devices now?** message appears.



7 In the **Devices** tab (for example, AssayMAP Bravo.dev), select the device and then click **Device diagnostics**.

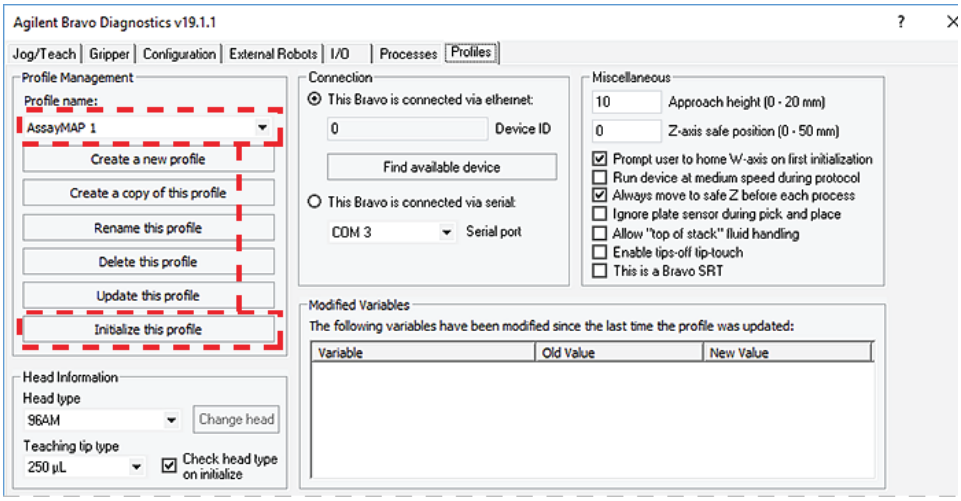
Figure AssayMAP Bravo.dev tab and Profile setting for AssayMAP 1



The Agilent Bravo Diagnostics dialog opens.

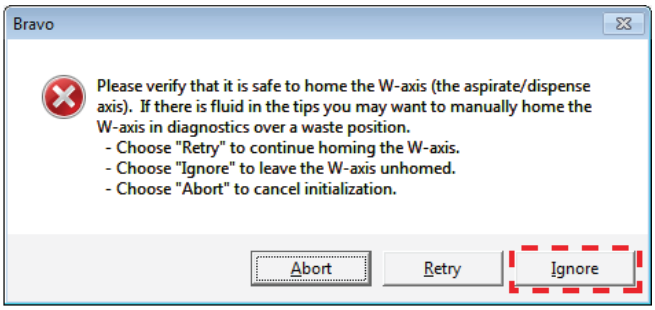
8 Click the **Profiles** tab, select the **Profile name**, and then click **Initialize this profile**.

For the AssayMAP Bravo Platform, make sure that you select the **AssayMAP 1** profile.

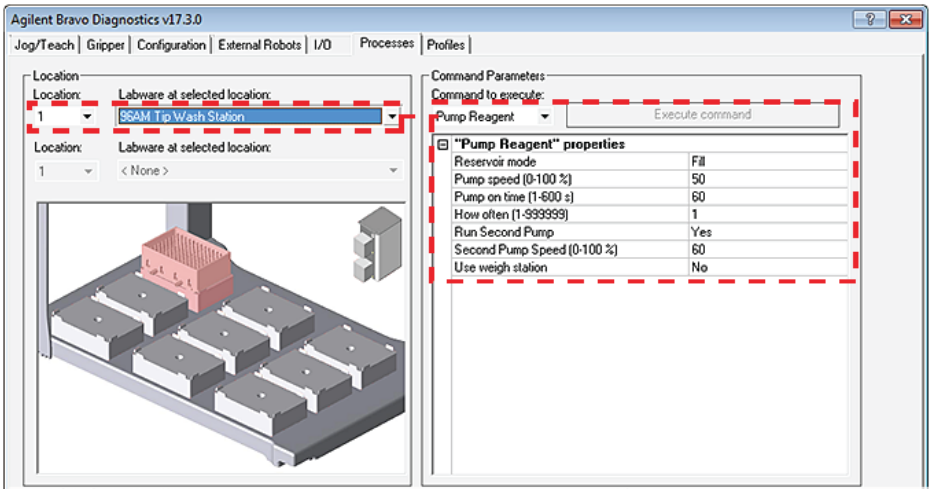


9 If the **There appears to be a plate present** error message appears, click **Ignore and Continue** to continue the homing process.

10 When the **Verify that it is safe to home the W-axis** message appears, click **Ignore** to skip the homing of the *w*-axis for now.



11 Click the **Processes** tab and run the **Pump Reagent** task as follows:



a Select the following:

Setting	Value
Location	Number of the deck location where the wash station is installed For the AssayMAP Bravo Platform, the location is 1.
Labware at selected location	96AM Tip Wash Station
Command to execute	Pump Reagent
Pump Reagent properties	
Reservoir mode	Fill
Pump speed (0–100%)	50%
Pump on time (1–600 s)	60 seconds
How often	1
Run second pump	Yes
Second pump speed (0–100%)	60%
Use weigh station	No

b Click **Execute command**. The wash station empties.

Uninstalling the wash station

IMPORTANT Exit the Protein Sample Prep Workbench and VWorks software before you turn off the Bravo Platform.

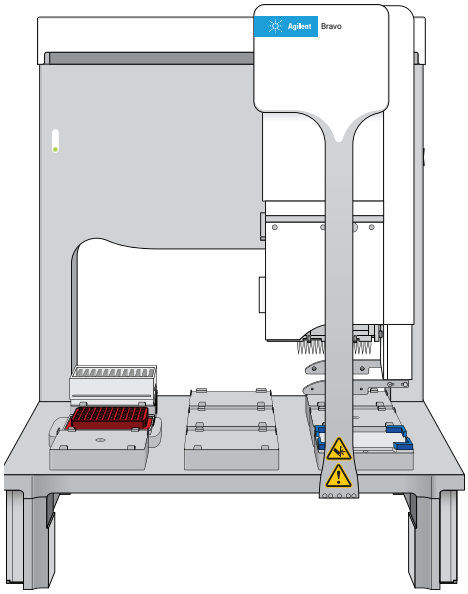
WARNING **To prevent potential injury, turn off the Bravo Platform before you install or remove the wash station.**

To uninstall the wash station:

1 On the side of the Bravo Platform, press the power switch to the **off** (**o**) position.

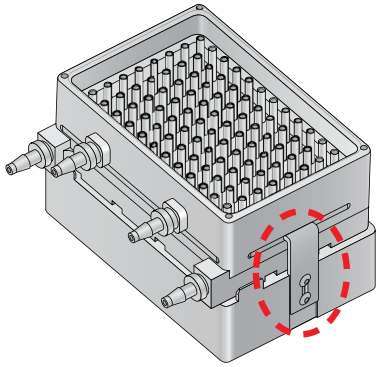
2 Gently, move the Bravo head manually to position it so that you have unobstructed access to the wash station installed on the deck.

For example, if the wash station is installed at deck location 1, move the head to the far right over deck location 3, as the following figure shows.



3 On the left side as you face the front of the Bravo Platform, loosen the two 2-mm screws using a hex driver. Uninstall the bracket that secures the wash station to the platepad.

Figure Wash station secured with platepad brackets



4 On the opposite side of the platepad, loosen but do not remove the screws that secure the remaining bracket. Guide the wash station horizontal slot off the platepad bracket.

5 Lift the wash station off of the platepad.

For ease of handling, you may disconnect the tubing from the wash station using the quick-disconnect fittings.

Installing the wash station and connecting the tubing

CAUTION **On the AssayMAP Bravo Platform, ensure that you use either the 96 Channel Wash Station (part number G5409-60125) or the 96AM Wash Station. Using a different wash station model can result in a potential collision with the Bravo 96AM Head.**

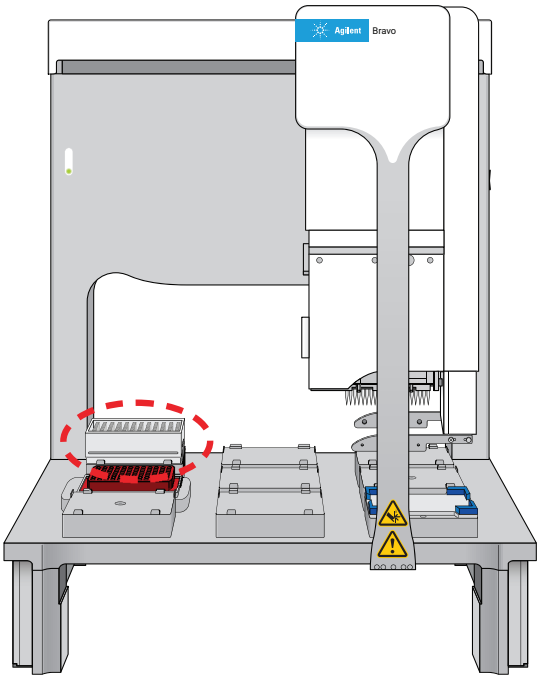
Installing the wash station

Before you start

WARNING **To prevent potential injury, turn off the Bravo Platform before you install or remove the wash station.**

The following procedure assumes that the platepad with brackets is already installed on the Bravo deck at deck location 1.

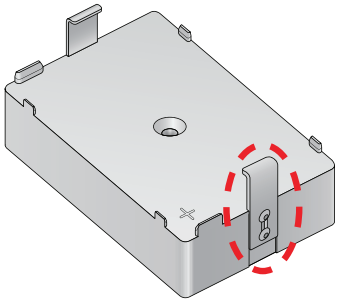
Figure Wash station installed at deck location 1



To install the wash station:

1 At the wash station deck location, ensure that the outer side bracket (next to the crosshairs) is removed from the platepad, or that the screws securing the bracket are loosened.

Figure Bracket next to platepad crosshairs



Note: The wash station may be easier to install if you install one of the platepad brackets after the wash station is in position.

2 Install the wash station on the platepad as follows:

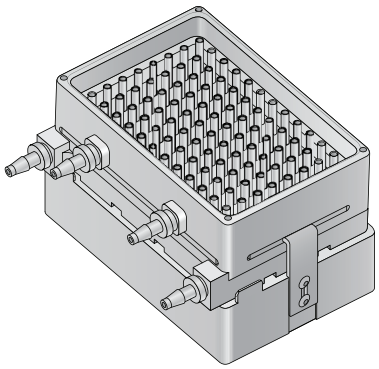
a Ensuring that the inlet and outlet ports are towards the rear of the deck, place the wash station on the platepad.

b Guide the platepad bracket into the wash station's horizontal side slot.

c Re-install the remaining platepad bracket. Ensure that you guide the bracket into the corresponding horizontal slot on the wash station. Ensure that both brackets remain engaged as you tighten the bracket screws.

d Ensure that the wash station sits level on the platepad and that both brackets are holding the wash station securely in place.

Figure Wash station secured with platepad brackets

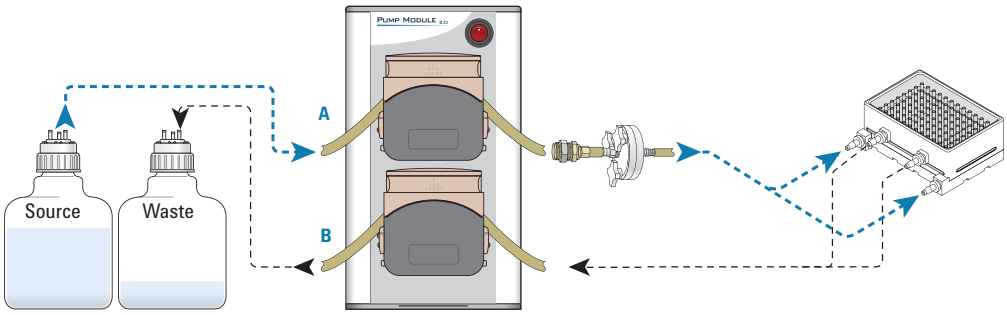


Tubing connections for the wash station

Reconnect any of the disconnected tubing. For reference, see the following figure. As the figure shows, the upper pump (**A**) is for the fill line and the lower pump (**B**) is for the empty line.

Note: You specify which pump is for filling and which pump is for emptying in Bravo Diagnostics.

Figure Wash station fill line (A) and empty line (B)



To ensure proper chimney filling and waste emptying characteristics for the wash station, ensure that you use the proper tubing combination for the Pump Module. See the following figure and table. For a detailed tubing installation procedure, see the *AssayMAP Bravo Platform Installation Guide* or the *Pump Module User Guide*.

CAUTION **To ensure that the tubing is not pinched by the pump head clamp, leave the clamps wide open and only tighten them if necessary. Make sure you push the tubing to the back of the pump head while closing the flip-top cover.**

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

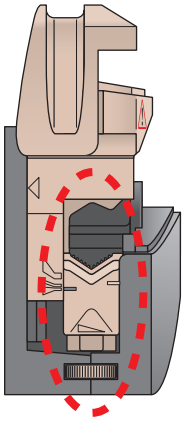
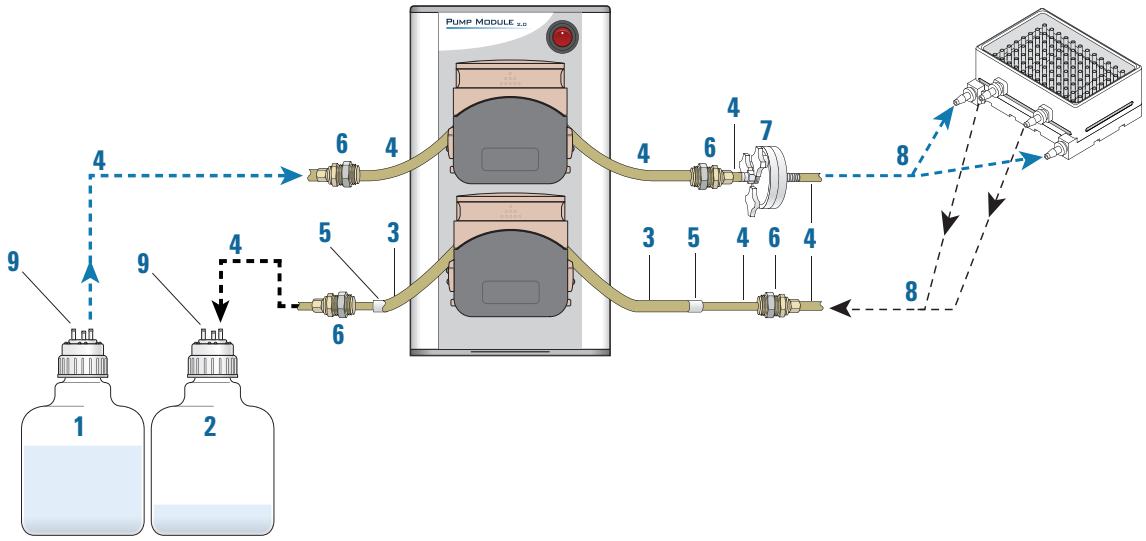


Figure Tubing configuration



Item	Component	Description
1	Source bottle	Supplies the fill liquid for the wash station.
2	Waste bottle	Collects the waste liquid that is pumped from the reservoir.
3	Tubing, 8-mm (5/16-in)	The empty-line tubing in the lower pump head, which is used for emptying the wash station. The larger diameter tubing ensures that the fluid is removed efficiently from the wash station
4	Tubing, 6.4-mm (1/4-in)	The fill-line tubing from the source bottle to the wash station, and empty-line tubing connections on either side of the 5/16-in diameter tubing. *Note:* The 5/16-in diameter tubing is too large for the quick-disconnect fittings and the wash station ports. So, you use a union connector (5) to splice the 5/16-in tubing to the 1/4-in tubing.
5	Connector, union	Joins the two sizes of tubing.
6	Quick-disconnect fitting	Enables easy removal of the wash station and quick replacement of the tubing in the pump heads. 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 wash station.
8	3-way connector	Enables one tube to branch into two tubes at the input and output ports on the wash station.
9	Quick-disconnect fitting	Acts as a vent to prevent pressure from building up inside the bottle. Plug a quick-disconnect fitting in the open hole in the carboy to act as a vent. If an extra quick-disconnect fitting is not available, loosen the lid to allow air to vent.

Troubleshooting problems with the wash station

Problem	Potential causes	Solution
Liquid flow is constricted or insufficient in all the chimneys of the wash station.	The source carboy does not have any liquid.	Ensure that the source carboy is filled.
	A pump head is not closed.	Ensure that the flip-top cover on each pump head is closed. To ensure that the tubing is not pinched by the pump head clamp, leave the clamps wide open and only tighten them if necessary. Make sure you push the tubing to the back of the pump head while closing the flip-top cover.
	No liquid is in the tubing.	Run the pumps for 30 to 60 seconds to drive liquid through the length of the tubing. For an AssayMAP Bravo Platform, run the Startup utility with a longer run time.
	The tubing is not routed properly, the tubing is kinked or blocked, or the tubing is worn where it is clamped onto the pump head.	Inspect the tubing to verify that it is routed properly and in good condition. Check for kinks and damage to the tubing. Reroute and replace the tubing if necessary. If the tubing is worn where it is clamped onto the pump head, replace the tubing going through the pump head. To ensure that the tubing is not pinched by the pump head clamp, leave the clamps wide open and only tighten them if necessary. Make sure you push the tubing to the back of the pump head while closing the flip-top cover.
	The tubing diameter of the fill line is the wrong size, or the pump head clamp is too tight for the tube size.	Replace the tubing on the fill line using the correct diameter tubing. See "Tubing connections for the wash station" on page 36. If necessary adjust the pump head clamp, see the *Pump Module User Guide*.
	The inline filter is clogged.	Replace the inline filter. See "Tubing connections for the wash station" on page 36.
Liquid is not flowing through a subset of the chimneys in the wash station.	The chimneys are blocked or damaged.	To resolve the problem chimneys: **1** Use a plastic Pasteur or 1 mL pipette to quickly aspirate liquid through the chimneys that are not flowing. Test the wash station again to verify that the chimneys are flowing. If the problem persists, repeat this step several times. **2** If the problem persists, replace the problematic chimneys. See "Replacing the chimneys" on page 7.

Problem	Potential causes	Solution
Waste is accumulating in the wash station.	The waste carboy is not properly vented and the carboy lid is too tight causing pressure to build within the carboy.	Plug a quick-disconnect fitting into the open hole in the carboy to act as a vent and prevent pressure from building up inside the bottle. If an extra quick-disconnect fitting is not available, loosen the lid to allow air to vent.
	A pump head is not closed.	Ensure that the flip-top cover on each pump head is closed.
	The tubing is not routed properly, the tubing is kinked or blocked, or the tubing is worn where it is clamped onto the pump head.	Inspect the tubing to verify that it is routed properly and in good condition. Check for kinks and damage to the tubing. Reroute and replace the tubing if necessary. If the tubing is worn where it is clamped onto the pump head, replace the tubing in the pump head with fresh tubing. To ensure that the tubing is not pinched by the pump head clamp, leave the clamps wide open and only tighten them if necessary. Make sure you push the tubing to the back of the pump head while closing the flip-top cover.
	The tubing diameter of the fill line is the wrong size, or the pump head clamp is too tight for the tube size.	Replace the tubing on the fill line using the correct diameter tubing. See "Tubing connections for the wash station" on page 36. If necessary adjust the pump head clamp, see the *Pump Module User Guide*.
Tubing creeps through the pump head instead of being secured in place.	The pump head clamp is too loose for the tube size.	Adjust the tubing clamp for the tube size. See the *Pump Module User Guide*.
The tubing is crushed or damaged in the pump head.	The pump head clamp is too tight for the tube size.	Adjust the tubing clamp for the tube size. See the *Pump Module User Guide*.
The fluid in the wash station chimneys is rapidly emptying when the pumps are not running.	The tubing is worn where it is clamped onto the pump head.	Replace the worn tubing in the pump head with fresh tubing.
Wash station chimneys are sticking to AssayMAP 25 µL cartridges, or 25 µL cartridges are sticking to the chimneys.	The wash station has the standard-bore chimneys and they are installed upside down.	To avoid a potential crash, ensure that the wash station contains white wide-bore chimneys if you are using the 25 µL cartridges. See "When to replace the chimneys" on page 6. To avoid a potential crash, ensure that the chimneys are properly oriented in the wash station. See "Replacing the chimneys" on page 7.

Measuring your chimney to verify type

If you are unsure of the chimney type that you have, you can use the following figure as a tool to measure a chimney. You can do this even while the chimney is installed in the wash station.

To check the chimney type:

1. Print out this page, and cut out the figure using the cut line as a guide.
2. Visually inspect the vertical surface of your chimney for the following:
   - *Wide-bore chimney*. Small white bump is located closer to the top end.
   - *Standard-bore chimney*. Small white dot is located closer to the top end.
3. Align the dimension marks at the top of this drawing above the top opening of the actual chimney to confirm the size.

   The radius of the wide-bore chimney is larger that the standard-bore chimney. See the following figures for examples.

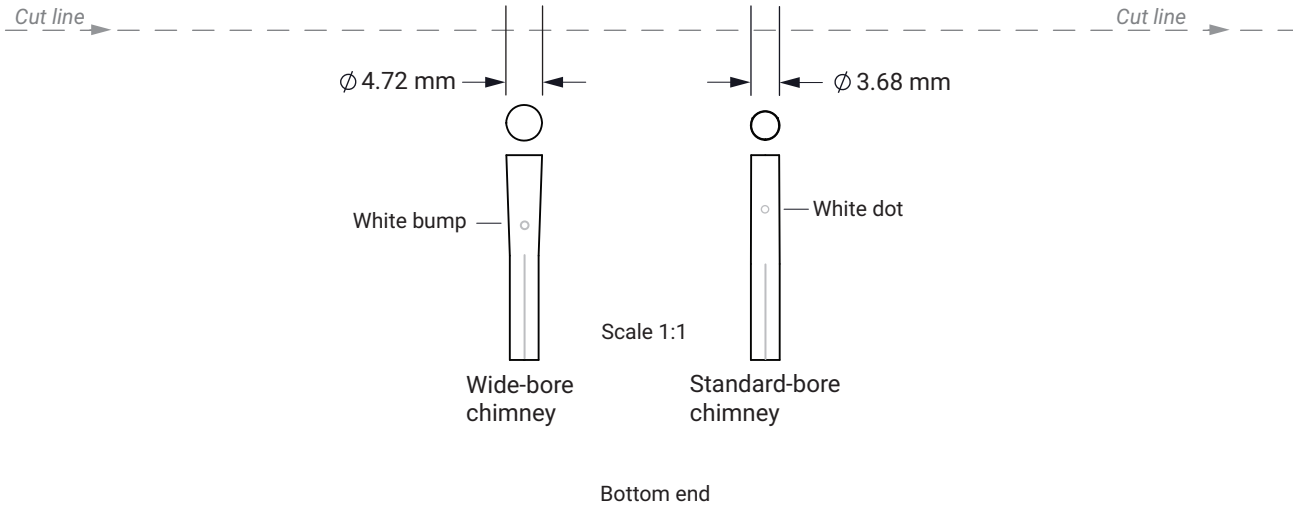


Figure Wide-bore chimney and drawing aligned atop chimney

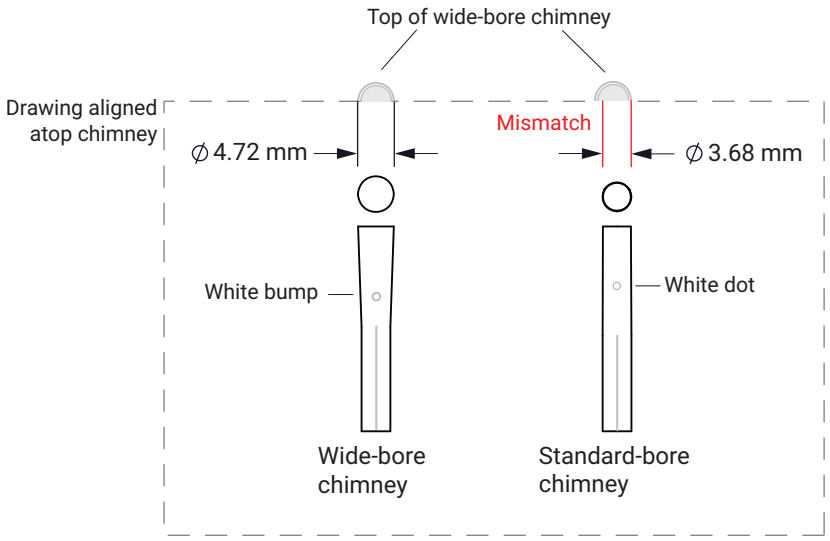
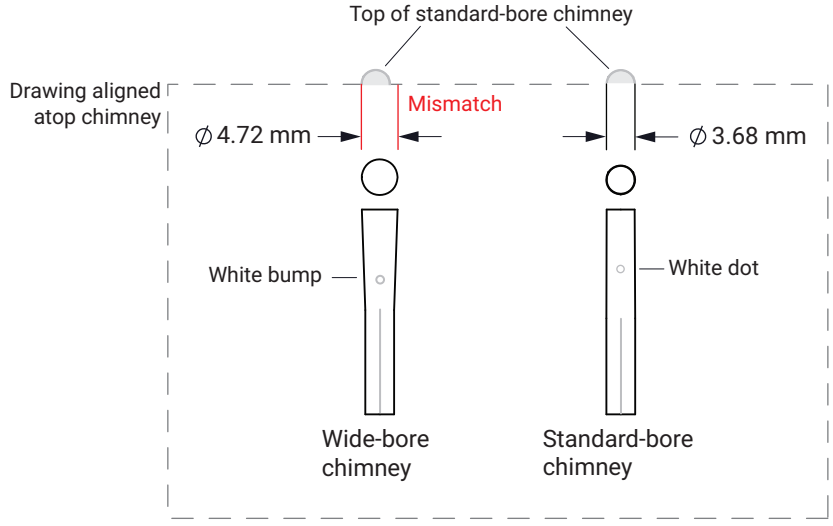


Figure Standard-bore chimney and drawing aligned atop chimney



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