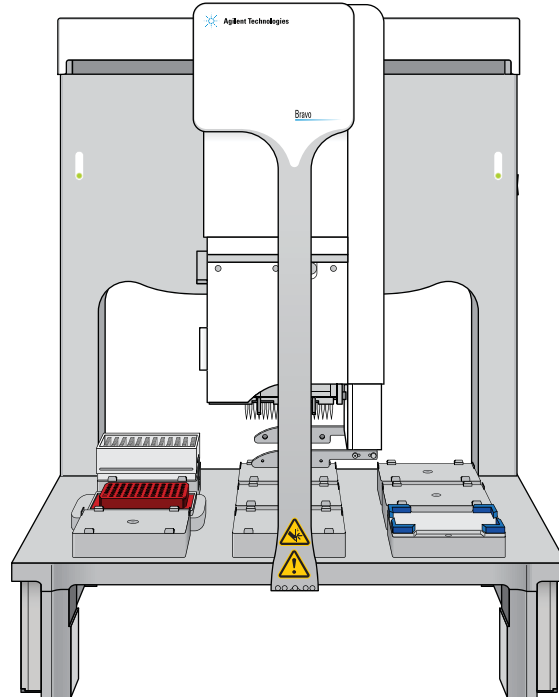# AssayMAP Bravo Platform

Installation Guide

Original Instructions

Notices

Manual Part Number

SD-V1000175 Revision D

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Safety Notices

WARNING

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

CAUTION

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

Contents

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1 Before you start

- "About this guide" on page 2
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- "Service documentation" on page 4
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About this guide

Intent

This installation guide is intended for use by qualified and authorized Agilent Technologies service personnel who possess an in-depth service background and have received training in the installation of the AssayMAP Bravo Platform.

What this guide covers

This guide describes the following software versions, which are required for the AssayMAP Bravo Platform:

- Protein Sample Prep Workbench 3.2
- VWorks Automation Control 13.1.5

Microsoft Excel 2016, which is not included, is required for the reagent volume calculators and method setup tools in the Protein Sample Prep Workbench.

What is new in this revision

Feature and description	See…
Added a caution that the 25 µL cartridges require a wash station with wide-bore chimneys.	"Overview of the hardware components" on page 6
Updated the software requirements.	"Installing the software" on page 40
Revised the verification procedures to reflect changes in Protein Sample Prep Workbench v3.2.	"Verifying the installation and setup" on page 83

Related guides and where to find them

Checklists

You can find the following checklists on the Agilent AssayMAP Bravo Platform product page at https://www.agilent.com/en/products/automation-solutions/protein-sample-preparation/assaymap-bravo-platform

- *Site Preparation Checklist*. Specifies the site requirements that must be met before installing the AssayMAP Bravo Platform.
- *Installation Checklist*. Lists the tasks to be performed to install the AssayMAP Bravo Platform.

User guides

Printed copies of the following guides are provided with the platform.

Guide	Description
Bravo Platform Unpacking Guide	Unpacking instructions for the Bravo Platform
Bravo Platform Safety and Installation Guide	Safety guidelines, site specifications, and installation procedures
General Safety Guide	Safety label descriptions and guidelines for Agilent Automation Solutions products.

The following guides are available as links in the Literature Library page of the Protein Sample Prep Workbench and available in the online VWorks Knowledge Base.

Guide	Description
Bravo Platform User Guide	Setting up, operating, maintaining, and troubleshooting the Bravo Platform
AssayMAP Bravo Platform Error Recovery Guide	Error messages, and how to handle them
AssayMAP Bravo Platform Labware Reference Guide	Labware photo reference and descriptions
AssayMAP Syringe Test Utility User Guide	Running a syringe test of the Bravo 96AM Head
AssayMAP Bravo Syringe Replacement User Guide	Replacing a defective syringe in the Bravo 96AM Head
96 Channel Wash Station Maintenance Guide	Replacing chimneys and troubleshooting problems in a 96 channel wash station.
VWorks Knowledge Base	Creating and editing VWorks protocols and application interfaces

To access the VWorks Knowledge Base, do one of the following:

• From within VWorks software, select **Help** > **Knowledge Base** or press F1.

• From the Windows desktop, select **Start** > **Agilent Technologies** > **VWorks Knowledge Base.**

• Go to the online VWorks Knowledge Base at www.agilent.com/chem/askb and click the link for PDF user guides.

To access the context-sensitive help feature in the VWorks software:

1   In the main window of the VWorks software, click the help button . The pointer changes to . Notice that the different icons or areas are highlighted as you move the pointer over them.

2   Click an icon or area of interest. The relevant topic or document opens.

Service documentation

Agilent field service engineers can find instructions on how to maintain and repair the Bravo Platform in the following guides:

- *Bravo Platform Service Guide*
- *Pipette Head Service Guide*

Changes to existing procedures and additional service procedures are published as service bulletins and posted in the Support Portal at

http://intranet.chem.agilent.com/sites/partners/support/default.aspx

Safety information

Before installing and using the Bravo Platform, make sure you are aware of the potential hazards and understand how to avoid being exposed to them. You must be properly trained in the correct and safe installation and operation of the device. For details, see the *Bravo Platform Safety and Installation Guide*.

Do not substitute parts or make any unauthorized modifications to the Bravo Platform or the supplied safety equipment.

WARNING **Changing or modifying the Bravo Platform safety equipment may prevent the safe operation of the device, invalidate its safety compliance, and lead to personal injury or property damage. Any customer who does not use the supplied safety equipment or who modifies the supplied safety equipment assumes full responsibility for providing an appropriate level of safety for its operators and for providing the applicable safety compliance marking and documentation.**

2 Installing the platform

Agilent

Overview of the hardware components

The following figure and table show the components of the AssayMAP Bravo Platform, which are required for running the AssayMAP protocols.

Figure   AssayMAP Bravo Platform components
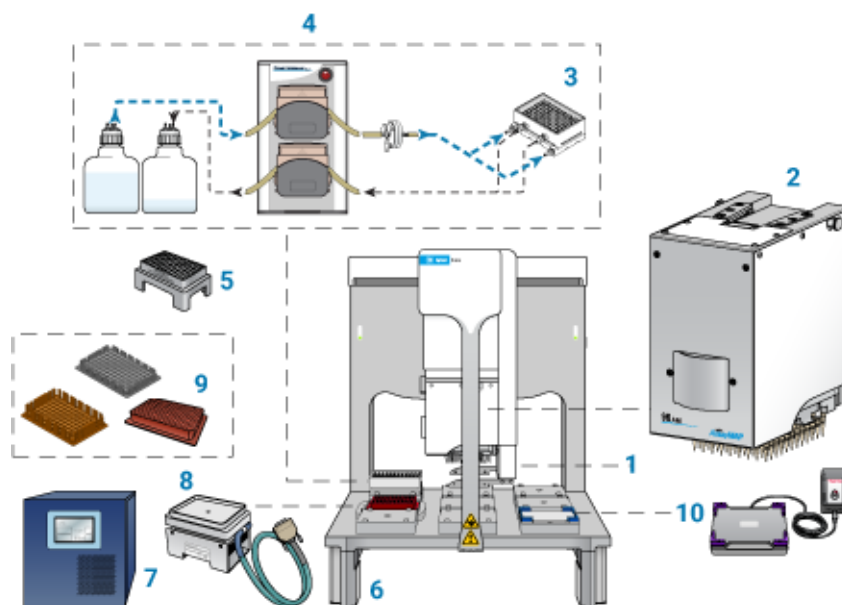
Item	Required hardware
1	Gripper upgrade
2	Bravo 96AM Head
3	96AM Wash Station or the later model 96 Channel Wash Station
4	Pump Module 2.0 and two carboys
5	96AM Cartridge & Tip Seating Station
6	Risers, 146 mm
7	STC controller
8	Peltier Thermal Station with custom plate nest
9	Thermal plate insert
10	Orbital Shaking Station with Control Unit

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.**

Note: The white wide-bore chimneys work for both 5-µL and 25-µL cartridges and are standard on wash stations purchased in 2020 onward. The wide-bore chimneys are white plastic, whereas the standard-bore chimneys are a semi-clear plastic. For details, see the *96 Channel Wash Station Maintenance Guide*.

In addition to the components listed in the preceding table, the AssayMAP Bravo Platform includes:

- Bravo Standard Light Curtain and the emergency-stop pendant shown in the following figures
- Computer workstation

Figure Standard configuration with Light Curtain
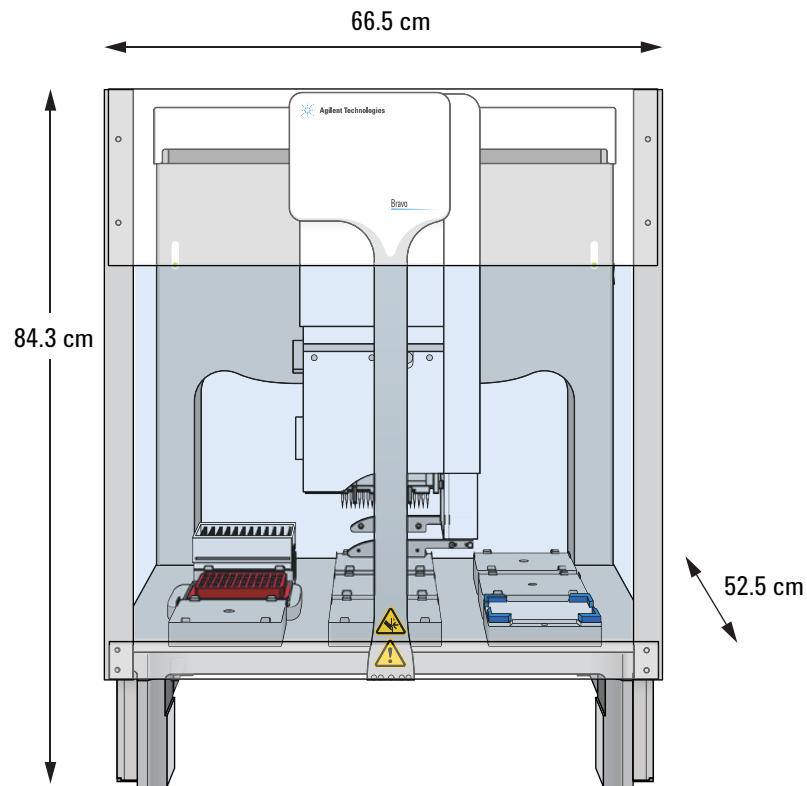
Figure Emergency-stop pendant
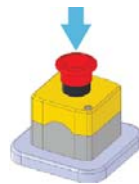
Computer requirements

The software user interface for the AssayMAP applications is optimized for a monitor with a resolution of 1920 x 1080 (full HD). For a full list of the computer requirements, see the software release notes.

Installation workflow for standard configuration

Step	For this task...	See...
1	Verify that the installation site meets the site requirements. **IMPORTANT** Ensure that the laboratory table is not bowed and is perfectly flat and rigid. A bowed or wobbly table will cause placement errors during protocol execution. Clear the table of all other material that may interfere with the installation.	*Bravo Platform Safety and Installation Guide*
2	Unpack and connect the computer.	Manufacturer's instructions
3	Unpack the Bravo Platform and accessories. **IMPORTANT** Do not remove the y-axis shipping stop from the head mount until after you have installed the risers ("Installing the Bravo risers" on page 9).	*Bravo Platform Unpacking Guide*
4	Install the Bravo deck risers.	"Installing the Bravo risers" on page 9
5	Connect the Bravo Platform power cord, communications cable, and pendant cable.	*Bravo Platform Safety and Installation Guide*
6	Install the Bravo 96AM Head.	"Before you install the AssayMAP head" on page 12
7	Install the 96AM Wash Station and Pump Module.	"Installing the Wash Station and Pump Module" on page 15
8	Install the standard platepads at the specified Bravo deck locations.	"Installing the standard platepads" on page 25
9	Install the Peltier Thermal Station and the Inheco STC Controller.	"Installing the Peltier Thermal Station" on page 26
10	Install the Orbital Shaking Station.	"Installing and connecting the Orbital Shaking Station" on page 31
11	Set up the software, and configure the device files.	"Setting up the computer and software" on page 35
12	Set the AssayMAP head teachpoints in every one of the AssayMAP profiles. Verify the gripper offset in every profile.	"Setting the teachpoints" on page 61
13	Install the Bravo shields and Light Curtain.	*Bravo Platform Safety and Installation Guide*
14	Verify the installation and setup.	"Verifying the installation and setup" on page 83

Installing the Bravo risers

Before you start

WARNING The Bravo device weighs approximately 52.1 kg (114.9 lb). Attempting to move the Bravo device without assistance could cause personal injury. Request assistance and use proper lifting techniques when moving the Bravo device.

CAUTION Tugging on the tie bar or using it to lift the Bravo Platform can damage the device. Do not grab the tie bar when lifting the Bravo Platform.
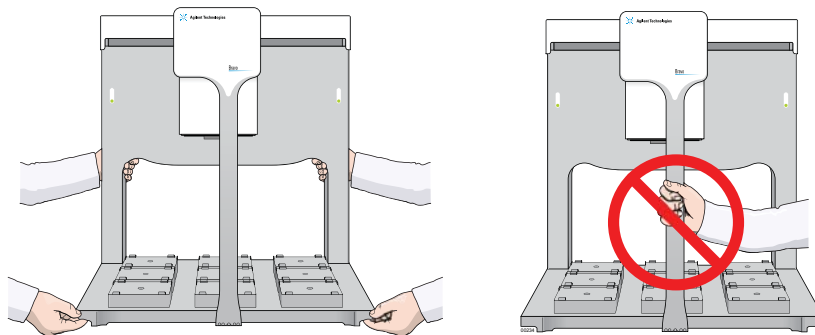
IMPORTANT The following procedure is intended only for fully qualified and trained Agilent service engineers.

Ensure that you have the following:

- Two people to lift the Bravo Platform
- Foam pad (3-inch thick) or similar cushioning material to use when you tilt the Bravo Platform onto its back plate

    Note: EPE foam is preferred due to its firmness.
- Risers
- Hex drivers

Procedure

CAUTION When tilting the Bravo Platform backwards to rest on its back plate, the head mount can slide back rapidly along the y-axis and collide with the back plate. To prevent potential equipment damage, ensure that the y-axis shipping stop remains installed on the head mount until after you install the risers. If the shipping stop has already been removed during unpacking, ensure that the head mount is resting against the Bravo back plate before tilting the Bravo Platform backwards.

To install the risers:

1 Place the foam pad on the work table behind the Bravo Platform.

2 Ensure that the head mount is resting against the Bravo back plate. With a person positioned on each side of the Bravo Platform, slowly tilt the device backwards until the back plate rests on the foam.

3 Remove the four rubber feet from the base of the Bravo deck.

Figure Bottom view of Bravo deck

4 On the bottom of the Bravo deck, install the two risers, one on each side. Use the four screws and washers provided to install each riser. Tighten the screws as follows:

a Tighten the screws at the top first, and then tighten the screws at the bottom, as the following figures show.

b Tighten the screws until snug, and ensure that the risers are flush to the base of the Bravo deck.

Figure Top screw located at inner hole

Figure   Bottom screw located at outer hole

5   Ensure the risers are installed securely, and the outside edges of the risers are flush with the Bravo base.

6   Lift the Bravo Platform up onto the risers using proper lifting techniques.

WARNING   **Attempting to lift the Bravo device without assistance could cause personal injury and result in equipment damage. Request assistance and use proper lifting techniques when lifting the Bravo device.**

Figure   Bravo Platform on risers with no deck platepads
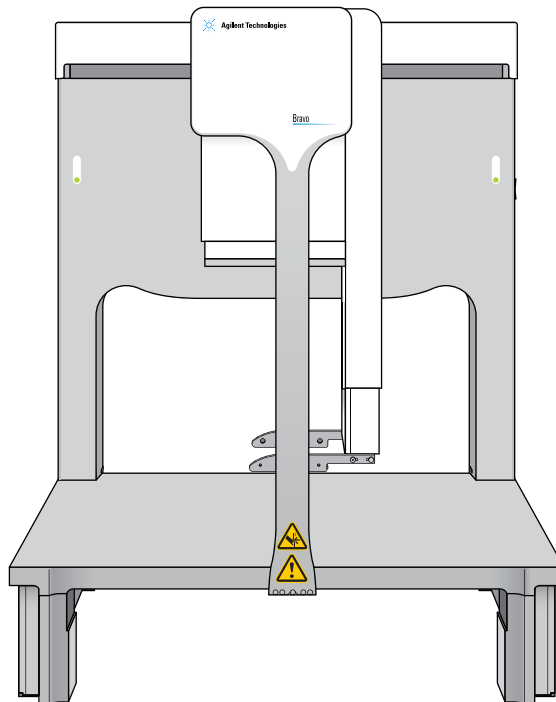
Ensure that the instrument and riser assembly does not wobble and that it sits flat on the table. If the Bravo Platform has any wobble or the risers have uneven seating, replace or realign and tighten the risers.

Ensure that you provide 30.48-cm (12-inch) clearance behind the Bravo Platform.

IMPORTANT	Make sure that you remove the *y*-axis shipping stop from the Bravo head mount. For instructions, see the *Bravo Platform Unpacking Guide*.

IMPORTANT	Before you install any platepads or accessories, use a clean lint-free cloth to wipe the Bravo deck and ensure that it is clean.

Before you install the AssayMAP head

About the tip-box stripper pins

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 figure shows.

Figure   Bravo 96AM Head (upside down) with stripper pins retracted
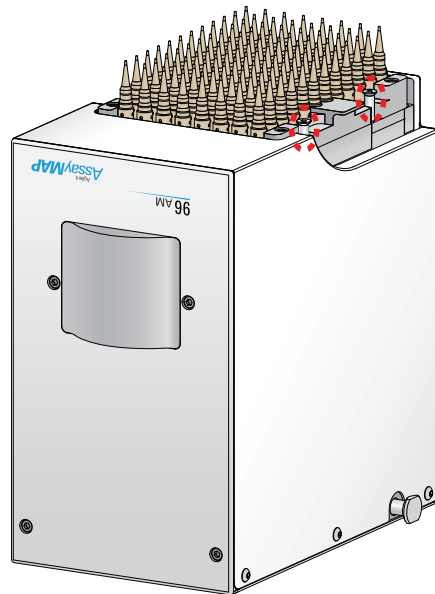
If necessary, perform the following procedure to retract the stripper pins.

For instructions on how to install the Bravo 96AM Head, see the *Bravo Platform Safety and Installation Guide*.

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.**

Figure   Bravo 96AM Head with tip-box stripper pins retracted (left) and extended (right)
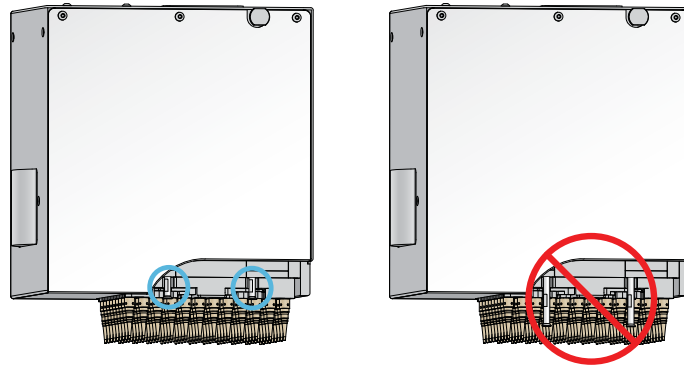
Removing the head from the storage stand

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's 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
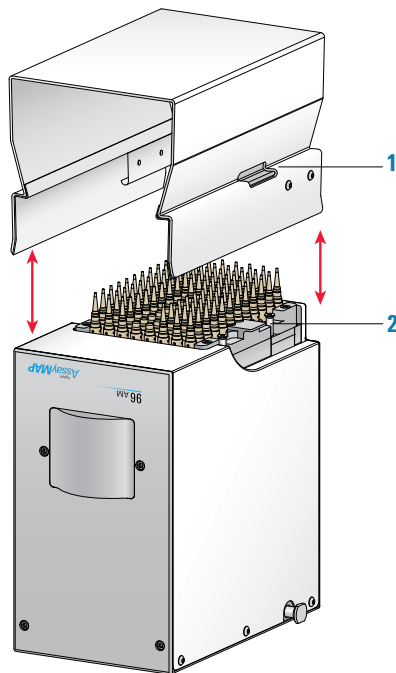
Retracting the tip-box stripper pins

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 Place the Bravo 96AM Head upside down on a stable surface, so that the probes are facing up and the front of the 96AM Head (logo side) is facing you.

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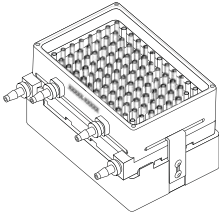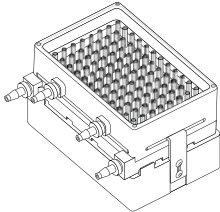
IMPORTANT If the pin hits a stop before it retracts completely, the pin locking mechanism is above instead of below the locking dowel. While removing any downward pressure on the pin head, gently rotate the pin in quarter-turn increments until you feel the pin drop into the seated position.

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 Wash Station and Pump Module

The AssayMAP Bravo Platform requires one of the following wash station models:

Wash station name, Agilent part number (internal part number)	Description	AssayMAP cartridge compatibility
96 Channel Wash Station, G5498B#90 (G5409-60125)	Equipped with 96 white, wide-bore chimneys and a bracketed platepad to secure it.	5 µL or 25 µL cartridges
96AM Wash Station, **G5498B#57** (11961-311)	Equipped with 96 chimneys and a bracketed platepad to secure it.	5 µL cartridges If the site plans to use the 25 µL cartridges, this wash station must be retrofitted with the white, wide-bore chimneys (part number G5409-68004). The wide-bore chimneys are white plastic, whereas the normal-bore chimneys are a semi-clear plastic. For details on how to retrofit this wash station with the wide-bore chimneys, see the *96 Channel Wash Station Maintenance Guide*.

Before you start

CAUTION   **To prevent a potential collision, ensure that the wash station has the wide bore chimneys when using the 25 µL cartridges.**

Use the following workflow.

Step	For this task...	See...
1	Ensure that the wash station chimneys are in good condition.	"Wash station inspection" on page 16
2	Install the bracketed platepad and the 96AM Wash Station at deck location 1.	"Installing the Wash Station and Pump Module" on page 15
3	Set up the tubing configuration.	"Tubing connections for wash station" on page 19
4	Connect the tubing and the Pump Module power and communication cables.	"Routing the tubing" on page 21

Wash station inspection

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

- In good condition and free of deformities. The chimneys must not be damaged, such as those shown in the figure (possibly from a head collision).

- 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 chimney is taller than the others, use your thumb to press down on the chimney so that it touches the bottom surface (hard stop) of the wash station. Use care when seating the chimney to avoid damaging it.

Good condition chimneys and consistent chimney height are critical for proper wash station function. To replace damaged chimneys, see the *96 Channel Wash Station Maintenance Guide*.

Figure   Close up views of wash station chimneys

Good condition chimneys	Damaged chimneys
Standard-bore chimneys	

Wide-bore chimneys

Installing the wash station

Before you start

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

Ensure that you have the following:

- Wash station and the platepad with brackets
- Pump Module 2.0
- Tubing kit with inline filter
- Hex driver for 2-mm screws

Ensure that you install the wash station at deck location 1.

Figure   Wash station installed at deck location 1
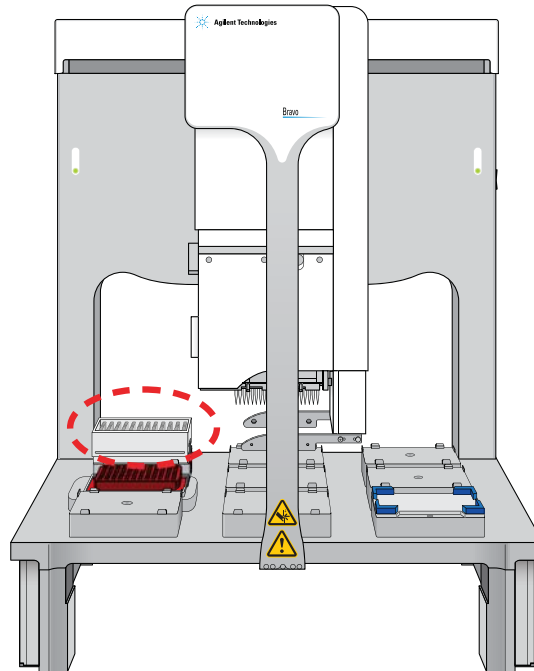
To install the wash station:

1   At deck location 1, install the bracketed platepad. Use the supplied screw to secure the platepad to the deck.

Ensure the platepad crosshairs are oriented towards the northwest corner of the deck, as the following figure shows.

Figure   Deck location 1 (top view) showing crosshairs orientation
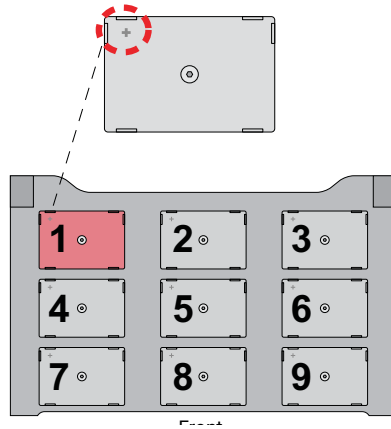
2   On the platepad side that is next to the crosshairs, use a hex driver to uninstall the two 2-mm screws and remove the bracket.

Note: The wash station is easier to install if you remove the outer bracket, and then replace the bracket after the wash station is in position.

Figure   Bracket next to platepad crosshairs
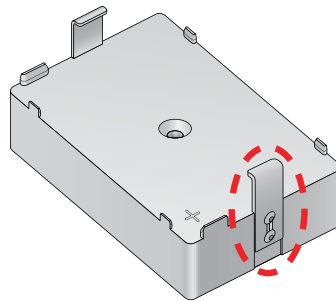
3   Install the wash station on the platepad as follows:

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 inner bracket into the wash station's horizontal side slot.

c   Re-install the bracket that you removed in step 2 on the outer side of the platepad. 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
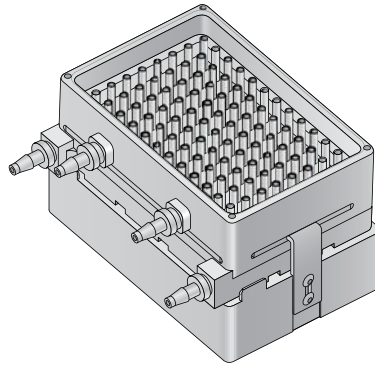
Tubing connections for wash station

The following figure shows the AssayMAP Bravo tubing connections for the wash station. 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   96AM Wash Station fill line (A) and empty line (B)
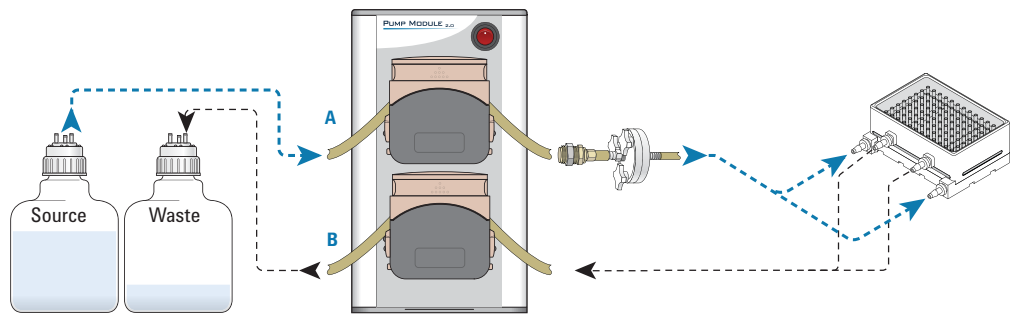
To ensure proper chimney filling and waste emptying characteristics for the wash station, ensure that you use the proper tubing combination for the Pump Module. See the following figure and table.

Figure Tubing configuration
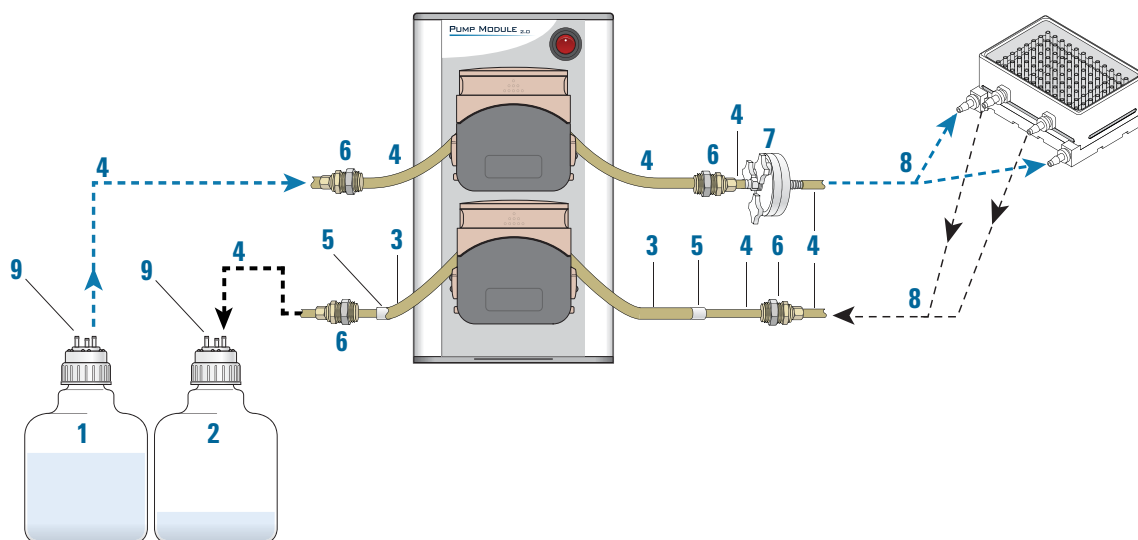
Item	Component	Description
1	Source bottle	Supplies the fill liquid for the wash station.
2	Waste bottle	Collects the waste liquid that is pumped from the reservoir.
3	Tubing, 8-mm (5/16-in)	The length of tubing in the lower pump head, which is used for emptying the wash station. The larger diameter 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 or vacuum from building up inside the bottle. Plug a quick-disconnect in the open hole in each bottle. If an extra quick-disconnect fitting is not available, loosen the lid to allow air to vent.

Routing the tubing

Refer to the preceding table and figure, and use the following procedure to route the wash station tubing.

To route the tubing:

1   Prepare two 3-way (Y-connector) tubing assemblies and connect them to the wash station, as follows:

   a   Cut two 10.16-cm (4-inch) lengths of the 1/4-inch tubing, and place one length each on two of the three barbed ends of a 1/4-inch 3-way connector (**a**). Cut a third length of tubing to attach to the third barbed end of the 3-way connector.

   b   Attach the two free ends of the prepared 3-way tubing assembly to the wash station outlet ports, as the following figure (**b**) shows.
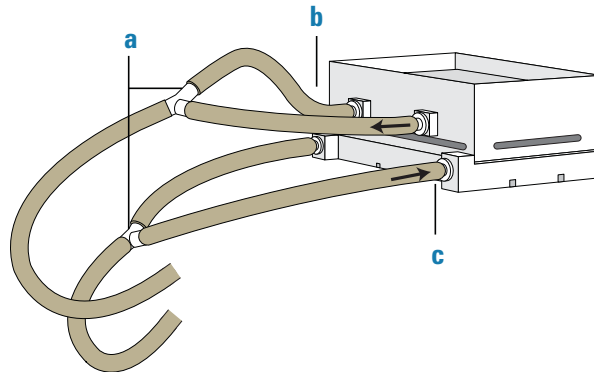
   c   Repeat step a to create a second 3-way tubing assembly, and attach it to the wash station inlet ports (**c**). Secure the tubes on the inlet ports using tubing clamps.

2   For the top pump, prepare an approximately 20.32- to 25.4-cm (8- to 10-inch) length of 1/4-inch tubing, and insert quick-connect fittings on both ends.

3   Place this tubing assembly within the top pump head, as follows:
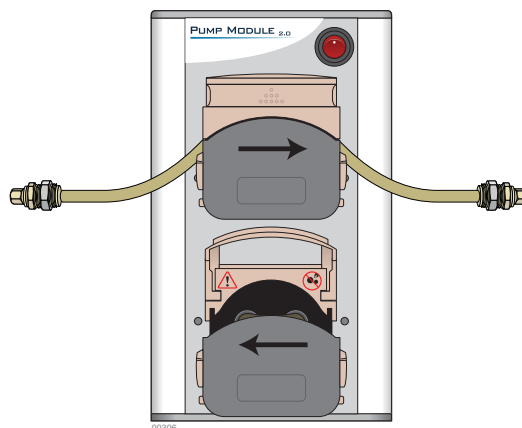
   a   Lift up the flip-top cover on the pump head so that it is fully open.

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

Figure   Open pump head (side view) with fully open clamp and clamp dial
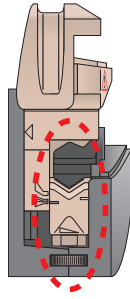
c   Insert the length of tubing so that it gently arches over the rollers. Ensure the tubing is located in the center of the tube clamps (V-grooves) on either side of the pump head, and then carefully lower the cover.

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

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

4   For the bottom pump:

a   Prepare an approximately 20.32- to 25.4-cm (8- to 10-inch) length of 5/16-inch tubing, and insert a union connector (figure, **a**) on each end.

b   Connect a 10.16-cm (4-inch) length of 1/4-inch tubing (**b**) to each of the union connectors.

c   Connect quick-disconnect fittings (**c**) to the free end of each 1/4-inch tubing section.

d   Place this tubing assembly within the bottom pump head. Refer to step 3 for the detailed procedure.
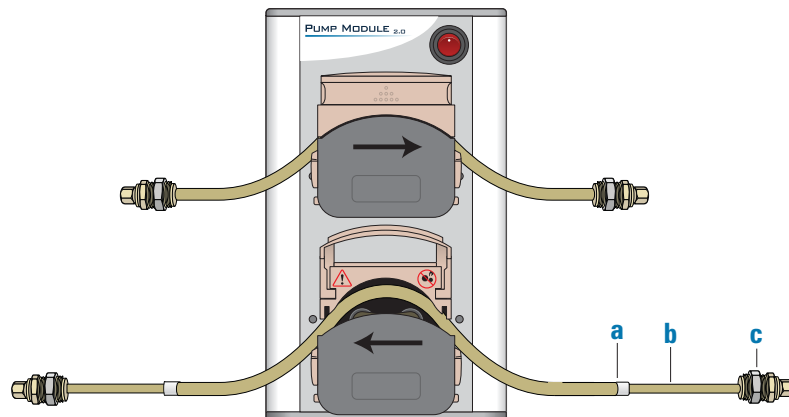
5   Connect the tubing from the Pump Module to the wash station tubing as follows:

    a   Cut two lengths of the 1/4-inch tubing, approximately 61- to 91.4-cm (2- to 3-foot) long each.

    b   Connect one of these tubing sections to the tubing assembly from the bottom pump (outlet line).

    c   Cut the remaining length of tubing (from step a) in the middle, and install the inline pump filter onto the cut ends. Connect this tubing assembly to the top pump (inlet line).

IMPORTANT   Ensure that the filter is oriented so that the three thumbscrews face toward the Pump Module.
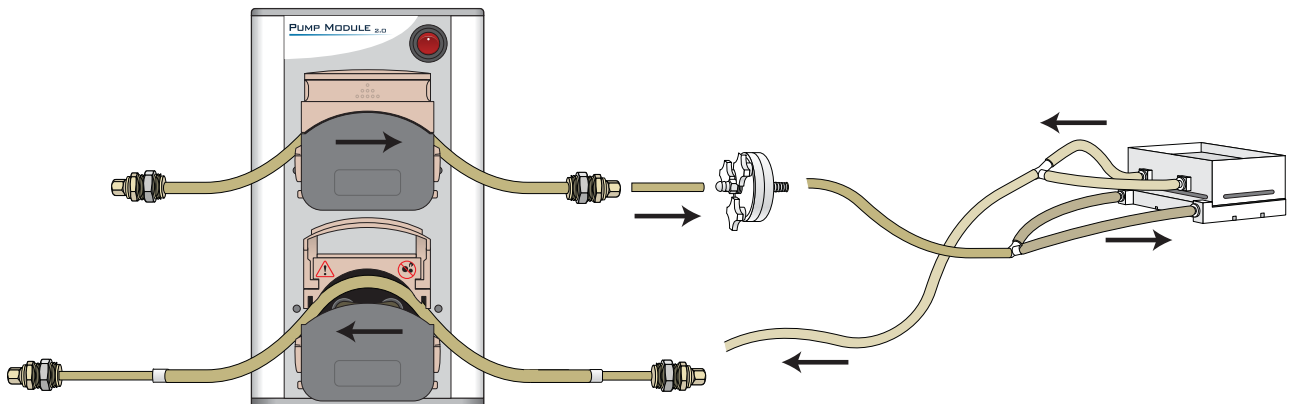
    d   Connect the inlet and outlet lines from the Pump Module to the corresponding lines on the wash station.

6   Connect the tubing from the Pump Module to the source and waste carboys as follows:

    a   Prepare the source carboy:

        Cut a length of the 1/4-inch tubing measured for the distance from the source bottle to the Pump Module. Allow plenty of slack in the tubing.

        Place the appropriate quick-disconnect fitting on each end on this tubing. Connect one end of the tubing to the output port of the source carboy and connect the other end to the tubing assembly in the top pump (inlet line).

    b   Prepare the waste carboy:

        Cut a length of the 1/4-inch tubing measured for the distance from the waste carboy to the Pump Module. Allow plenty of slack in the tubing.

        Place the appropriate quick-disconnect fitting on each end on this tubing. Connect one end of the tubing to the output port of the waste carboy, and connect the other end to the tubing assembly in the bottom pump (outlet line).

c Use the fitting provided in the tubing kit to vent the carboys as the following figure shows. The vent prevents pressure or vacuum from building up inside the bottle.

Connecting the Pump Module

To connect the Pump Module:

1 At the Bravo rear connector panel, connect the Pump Module RJ-45 cable to the Pump I/O port (**1**), as the following figure shows. Connect the other end of the cable to the COM IN port (**2**) on the rear of the Pump Module.
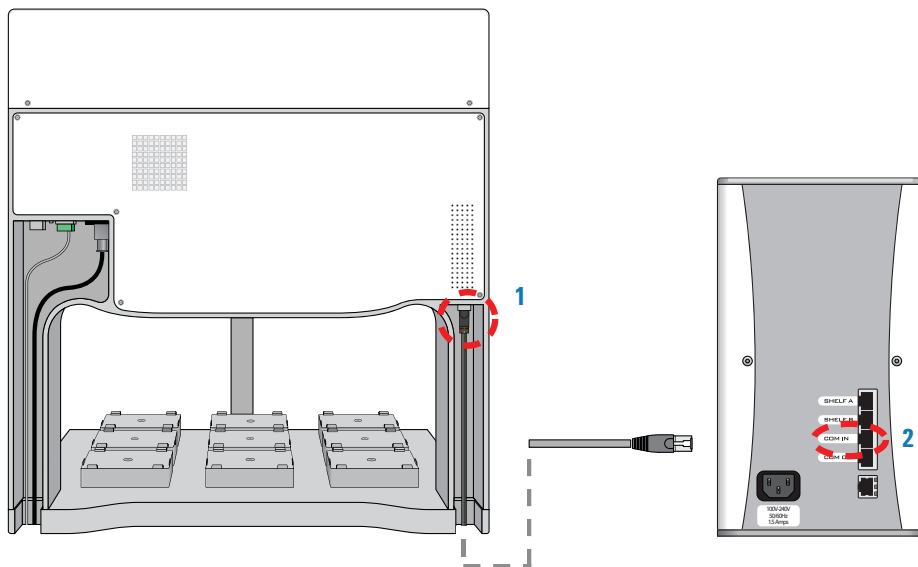
2 Connect the Pump Module power cord between the AC connector on the Pump Module and an AC outlet with a grounded circuit.

For detailed installation instructions, see the *Pump Module User Guide*.

Installing the standard platepads

The platepad has a crosshairs for setting the pipette head teachpoints in one corner, as the following figure (**1**) shows.
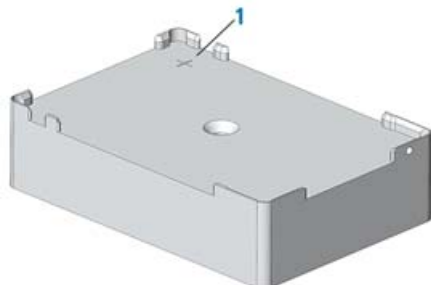
Install the standard platepads at the Bravo deck locations specified for your configuration. The standard configuration uses platepads at deck locations 2, 3, and 5–8.
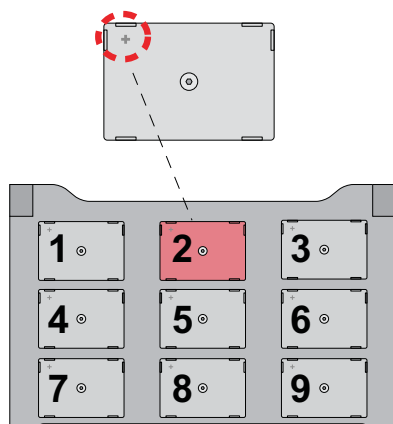
Before you start

Make sure you have the following:

- Platepad
- Flathead cap screw, M6 x 40 mm

Procedure

To install a platepad:

1   With the crosshairs toward the back side of the device, align the pins in the bottom of the platepad with the holes on the deck.

Make sure the pins are inserted correctly and the accessory sits level on the deck.

2   Secure the platepad to the deck using the screw provided.

3   Ensure that the setscrews in the platepad tabs are recessed and not protruding into the plate nest. Use a 1.5-mm hex wrench to back out any protruding setscrews.

| IMPORTANT | A protruding setscrew will prevent proper seating of the labware in the platepad. |

Figure Setscrew in platepad tab
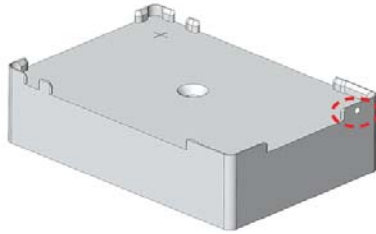
Note: You will verify the deck configuration in the corresponding Bravo profile and set the teachpoint for the deck location in a subsequent procedure.

Installing the Peltier Thermal Station

To accommodate the height of the Peltier Thermal Station below the Bravo deck, risers are required. The Peltier Thermal Station is too tall to sit at deck level and must be installed in a deck cutout. The following figure shows the assembled Peltier Thermal Station with the custom plate nest.

Figure Assembled Peltier Thermal Station with custom plate nest
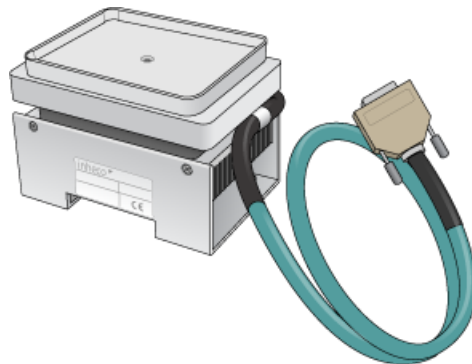
Before you start

| CAUTION | **Ensure that the connector end of the cable on the Peltier Thermal Station does not knock against the metallic table top or other areas as it could get permanently damaged. Handle the Peltier Thermal Station cable with care during all stages of installation.** |

Ensure you have the following:
- Peltier Thermal Station assembly (including four M2.5 bolts and one M3 flathead cap screw)
- Hex drivers

- Inheco STC Controller, power and communication cables, and Inheco user documentation for the STC Controller

Carefully handle the cable of the Peltier Thermal Station during removal from the box, as the following figure shows.
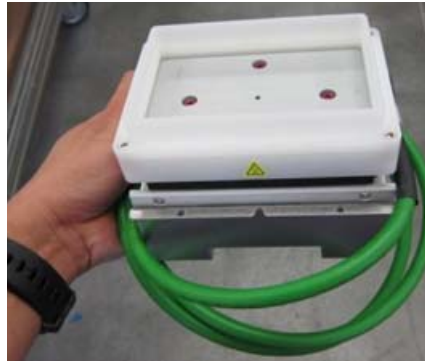
Use the following workflow.

Step	For this task...	See...
1	Install the Peltier Thermal Station.	"Installing the Peltier Thermal Station in the Bravo deck" on page 27
2	Connect the STC Controller.	"Connecting the STC controller" on page 30

Installing the Peltier Thermal Station in the Bravo deck

Use the following procedure to install the Peltier Thermal Station at deck location 4.

To install the Peltier Thermal Station:

1 Uninstall the platepad, if applicable, from deck location 4.

   To uninstall a platepad, remove the M6 flathead screw from the center of the platepad. Remove the platepad from the deck.

2 Remove the cutout cover. Use a hex driver to uninstall the four M3 screws that attach the cutout cover to the deck.

   Figure Cutout cover on the Bravo deck
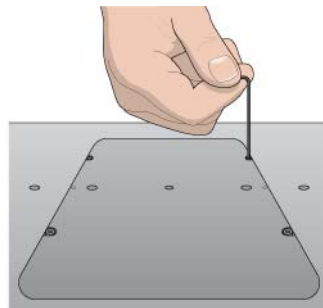
3 Uninstall the plastic interface from the top of the Peltier Thermal Station by removing the four screws located at the four corners.

Figure   Plastic interface on the top of the Peltier Thermal Station assembly
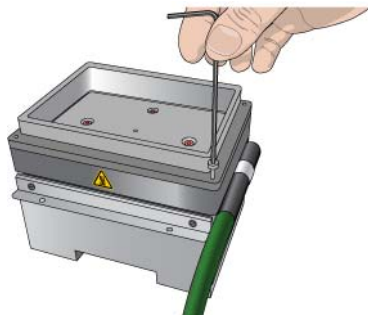
Figure   Peltier Thermal Station assembly with plastic interface removed
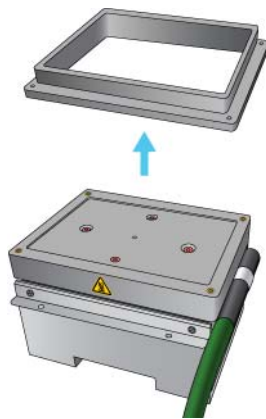
4 Perform the following steps to place the Peltier Thermal Station assembly into the cutout hole, and then position the bracket:

Figure   Bracket, Peltier Thermal Station assembly, and deck cutout
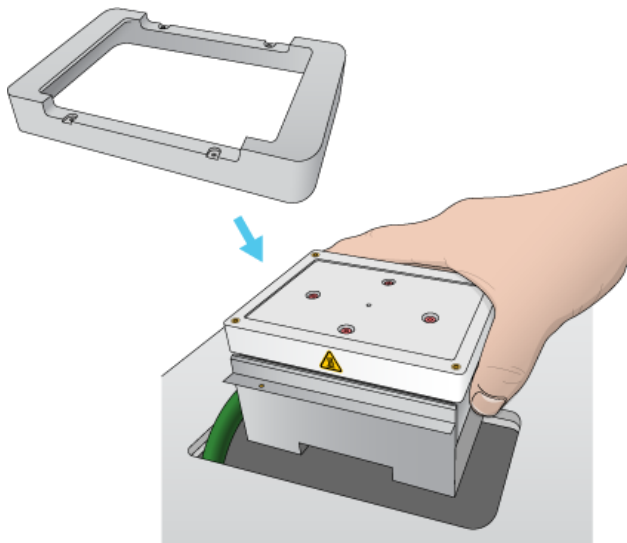
a Carefully slide the cable into the cutout hole first before you place the Peltier Thermal Station assembly into the cutout.

b Ensure that the safety label ⚠ faces the front of the Bravo deck.

c Press and hold from the bottom to squeeze in the metal as you insert the Peltier Thermal Station assembly into the hole.

d Position the bracket over the top of the assembly, and ensure the bracket is seated on the deck surface.

e If there is slight resistance when fitting the assembly into the cutout or when positioning the bracket, you may use a rubber mallet to tap the metallic base or bracket into place.

CAUTION **Using too much force with a rubber mallet can damage the Peltier Thermal Station.**

Figure Tapping the Peltier Thermal Station bracket in place
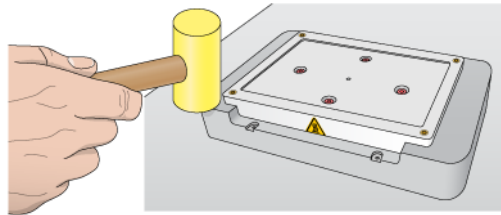
f Ensure that the Peltier Thermal Station sits flush in the cutout and that the bracket is seated on the Bravo deck.

5 Use a hex driver to install the four M2.5 bolts that secure the bracket to the deck.

Figure Securing the Peltier Thermal Station to the deck
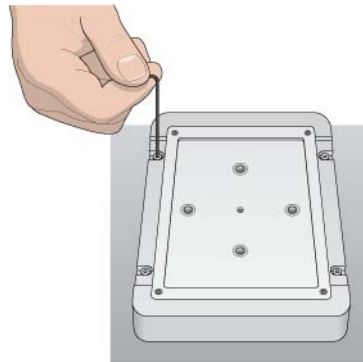
6   Install the custom plate nest on the top of the Peltier Thermal Station as follows:

    a   Orient the plate nest so that the crosshairs (+) is towards the back of the deck.

    b   Position the plate nest and ensure that it is fully seated.

    c   Install the M3 screw in the center of the plate nest to secure it to the Peltier Thermal Station.

Figure   Installing the custom plate nest
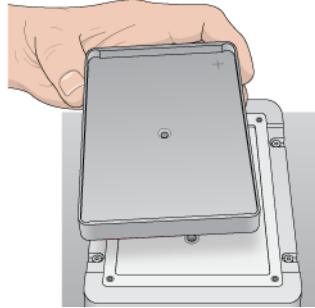
7   Connect the cable from the Peltier Thermal Station to the Inheco STC controller.

Connecting the STC controller

The following figure shows the Inheco STC Controller.

Figure   STC Controller front and rear views
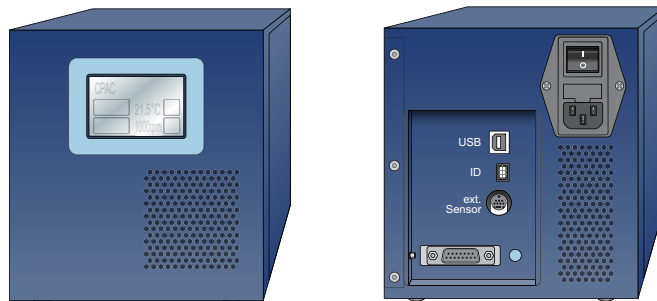
To connect the STC Controller:

1   Install the CPAC communications board in the STC Controller.

CAUTION   **The communication boards can be damaged by electrostatic discharge. Only individuals qualified to handle ESD devices should perform this procedure. Ensure that you follow all antistatic precautions while installing the boards in the controller.**

Three screws secure the access panel cover to the STC Controller. Ensure that the board locks into its slot connector in the STC Controller. For more details on the STC Controller, see the Inheco user documentation.

2   Connect the STC Controller to the computer using the provided USB cable.

3   Connect the STC Controller power cable to an AC outlet.

4   Set the controller power switch to the **On** (*I*) position.

Installing and connecting the Orbital Shaking Station

The following figure shows the Orbital Shaking Station, which has its own control module.

Figure   Orbital Shaking Station with control module and adapter pad
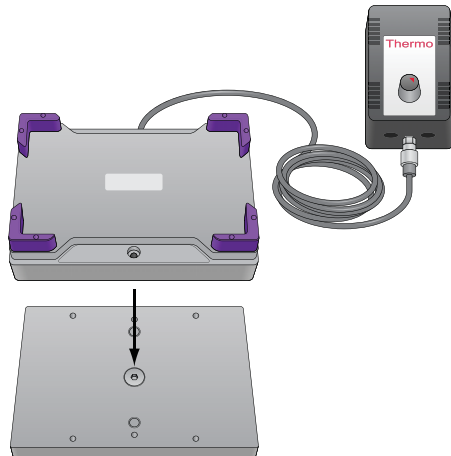
For a full description of the Orbital Shaking Station, see the manufacturer's documentation.

Before you start

Make sure you have the following:

- Orbital Shaking Station and the control module
- Adapter pad (supplied with the Orbital Shaking Station)
- Hex drivers
- M6 x 12-mm flathead screw that holds the adapter pad to the deck (supplied with the Orbital Shaking Station)
- Two M3 x 18-mm socket-head cap-screws that attach the Orbital Shaking Station to the adapter pad (supplied with the Orbital Shaking Station)

Use the following procedure to install the Orbital Shaking Station at deck location 9. Ensure that no platepad is installed at deck location 9. If necessary, uninstall the platepad by removing the M6 screw in the center of the platepad.

Figure   Deck locations (top view)
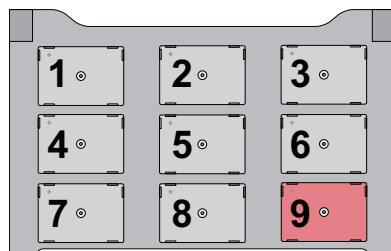
Installing the Orbital Shaking Station

To install the Orbital Shaking Station:

1 Position the adapter pad at the designated deck location, aligning the dowel pins with the corresponding holes in the deck.

Make sure the adapter pad sits level on the deck.

2 Insert the M6 x 12-mm flathead screw into the center of the adapter pad and tighten the screw.
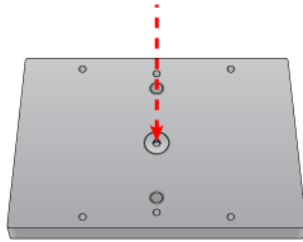
3 Place the Orbital Shaking Station atop the adapter pad so that the cable is towards the back of the Bravo deck.

Make sure the station is completely centered on top of the adapter pad and sits level.

4 Insert the two M3 x 18-mm socket-head cap screws into the holes at the front and back end of the adapter pad and use a 2.5-mm hex driver to tighten the screws.

Tighten the screws evenly to ensure the feet on the bottom of the Orbital Shaking Station are pressed evenly into the adapter pad, and the station remains level.

Note: The feet of the Orbital Shaking Station are compressible, and these screws do not reach a hard stop as a result.
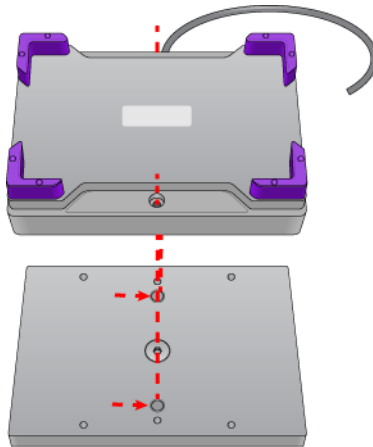
CAUTION The Orbital Shaking Station can shift slightly when tightening. Ensure that the sides of the Orbital Shaking Station are parallel to the sides of the adapter plate. If the Orbital Shaking Station is rotated, it could cause the Bravo gripper to collide with the accessory.

Connecting an Orbital Shaking Station

To connect an Orbital Shaking Station with its own control module:

1   Route the Orbital Shaking Station cable off the deck and connect it to the control module that contains the power plug. See following figure, item **1**.

2   Connect the serial cable with the red stripe to the leftmost port on the control module (figure, item **2**). Connect the other end of the cable to the serial port, if available, on the controlling computer.

IMPORTANT   Connecting the Orbital Shaking Station to a serial port on the computer provides more reliable communication than using a USB-to-serial adapter. If a serial port is not available, use a USB-to-serial adapter.

3   On the control module, ensure that the knob is turned fully counterclockwise so that the red arrow (**3**) is pointing to the RS-232 setting.

4   Connect the control module power connector (**4**) to an AC outlet with a grounded circuit.

5   Turn on and test the Orbital Shaking Station as follows:

    a   On the control module, turn the knob clockwise to the maximum position, and verify that the Orbital Shaking Station vibrates.

    b   Slowly, turn the knob back counterclockwise to the minimum position until the station stops vibrating but is not fully off.

6   Place the pipettor teaching plate on the Orbital Shaking Station. Verify that the plate fits within the four corner tabs but has no extra space.

Figure   Pipettor teaching plate
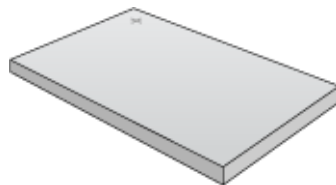
If necessary, use the supplied hex driver to adjust the fit of the four corner tabs. Do not overtighten.

Alternatively, you may use a sample microplate instead of the teaching plate.

Note: Before the accessory is ready for use, you will verify the deck configuration in the corresponding Bravo profile and set the teachpoint for the accessory location.

Using a USB-to-serial connection

If you are using a USB-to-serial connection, complete the set up as follows.

To complete the set up for the USB-to-serial connection:

1 If a driver is required, install the appropriate driver. Follow the instructions on the CD supplied with the USB adapter.

2 Write down the COM port assignment for the Orbital Shaking Station. See the following procedure for instructions.

The computer auto assigns the COM port for the connection, which may be different than the COM port specified in the AssayMAP profiles. To resolve conflicts, you may do either of the following:

- Update the settings in the AssayMAP profiles to match the new COM port assignment.
- Use the Device Manager to reassign the COM port so that the number matches the settings in the AssayMAP profiles.

IMPORTANT The COM port assignment must be 9 or lower. Otherwise, the AssayMAP Bravo Platform will not recognize the connection.

To view the current COM port assignments:

1 From the **Microsoft Windows** desktop, open the **Device Manager**. The Device Manager can be accessed from the Control Panel. For detailed instructions, see the Microsoft Windows user documentation.

2 In the **Device Manager**, expand **Ports (COM & LPT)**. The list of COM ports appear.

Figure Ports (COM & LPT) area of the Device Manager window

AssayMAP Bravo Platform Installation Guide

3 Setting up the computer and software

Agilent

Setting up the computer and installing the software

Setting up the computer

For computer requirements, see the software release notes.

If the Agilent-supplied computer is being set up for the first time, you must set up the Microsoft Windows operating system.

To set up a new Agilent-supplied computer:

1 Turn on the computer and monitor. An automated setup procedure runs to prepare the computer.

2 When the **Set Up Windows** wizard opens, enter the requested information in each screen based on the customer's preferences.

3 Ensure that Microsoft Excel 2016 or later version is installed.

Note: Microsoft Excel is required for the Protein Sample Prep Workbench calculators. Agilent Technologies does not supply Microsoft Excel.

Turning on the instrument

To turn on the AssayMAP Bravo Platform:

1 Ensure that the Bravo Platform is connected according to the instructions in the *Bravo Platform Safety and Installation Guide*.

2 To turn on the Bravo instrument, press the power switch to the **on (|)** position.
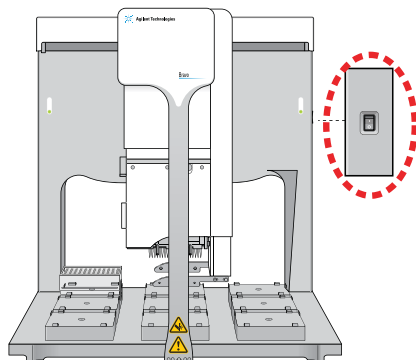
The green light on the switch is illuminated when the Bravo Platform is on.

Setting up the computer LAN

WARNING Connecting the Bravo Platform to a company or general network can potentially cause injury. Remote computer operators might accidentally initiate an operation that causes the robot to move unexpectedly, possibly injuring nearby lab personnel. Avoid connecting the Bravo Platform to a company or general network. Ensure that anyone with access to the Bravo Platform is trained in the potential hazards and how to avoid them.

IMPORTANT Verify the LAN connection to the instrument before connecting to any other networks. If the computer will be connected to the house LAN, make sure the computer has a second network adapter. The second network adapter can have a dynamic IP address.

To set up the computer LAN:

1   From the Windows desktop, go to **Control Panel > Network and Sharing Center**.

2   In the **Network and Sharing Center** window, locate and click **Sub Network** or **Local Area Connection**, as applicable.

Note: Depending on the setup, the name of the network can vary, for example, instead of Sub Network, it might be Local Area Connection.
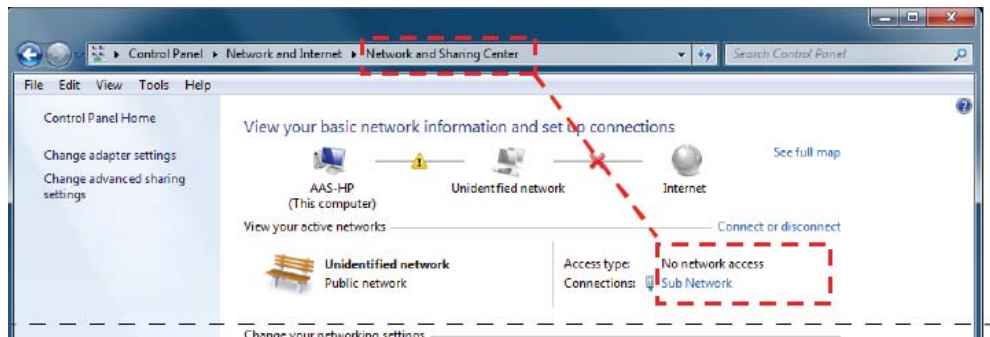
3 In the **Sub Network Status** or **Local Area Connection Status** dialog box that opens, click **Properties**.
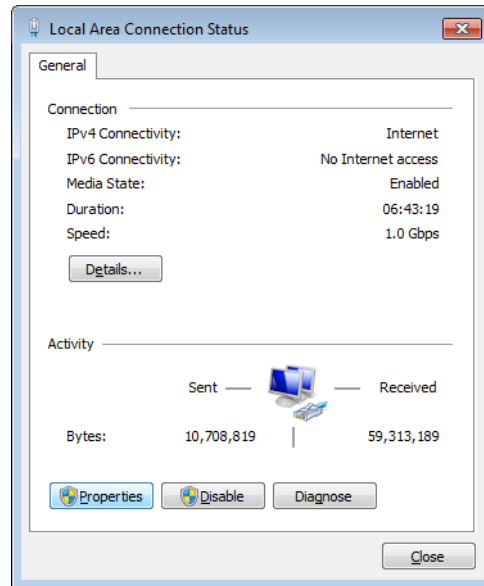
4 In the **Properties** dialog box, do the following:

a Clear the check box of **Internet Protocol Version 6 (TCP/IPv6)**.

b Select **Internet Protocol Version 4 (TCP/IPv4)**.

c Click **Properties.**

Figure Local Area Connection Properties dialog box
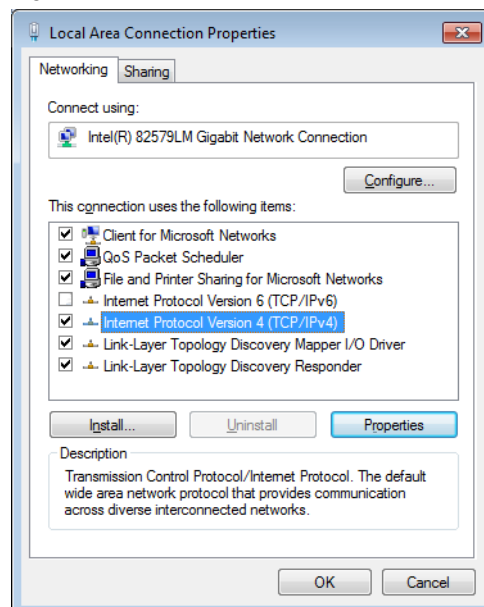
Note: The name of the Ethernet adapter can vary depending on the computer model.

AssayMAP Bravo Platform Installation Guide

5   In the **Internet Protocol Version 4 (TCP/IPv4)** dialog box:

a   Select **Use the following IP address**.
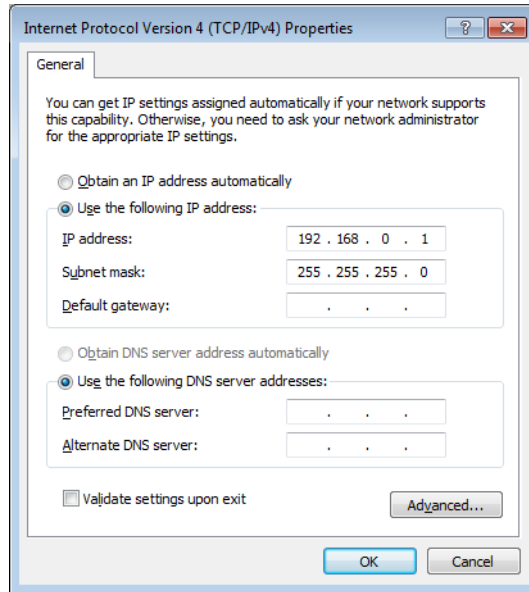
b   In the **IP address** boxes, type the following:
192.168.0.1.

IMPORTANT   The specified static IP address is required for the connection.

c   Press the TAB key. The subnet mask populates automatically to display the following:
255.255.255.0

d   Click **OK**.

Installing the software

Install the following software versions (or later) using one of the following procedures:

Software	Version
VWorks Automation Control	13.1.5
Protein Sample Prep Workbench	3.2

To install the software on a computer that contained previous versions of the VWorks and Protein Sample Prep Workbench software:

1   Create backup copies of the following items for safekeeping:
    - Copy the Workbench folder at C:\VWorks Workspace\Workbench.
    - Export the full set of Velocity11 registry keys.

2   Uninstall any previous versions of the following software:
    - Protein Sample Prep Workbench or AssayMAP Launch Pad
    - VWorks software

    Note: In Microsoft Windows 10, go to **Settings > Apps & features**, select the name of the software application, and then click **Uninstall**.

3   See the *AssayMAP Protein Sample Prep Workbench Upgrade Guide* for a detailed procedure of how to install the VWorks software and the Protein Sample Prep Workbench.

To install the software on a new (clean) computer:

1   See the VWorks release notes for the VWorks installation instructions. The software installation also includes the following:
    - Agilent Software Verification Tool
    - Agilent Bravo IQOQ Test Utilities

2   Follow the instructions in the release notes for the Protein Sample Prep Workbench.

Turning on the platform and setting up the VWorks software

Before you start

You must set up the AssayMAP Bravo Platform in the VWorks software before you can safely run the protocols in the Protein Sample Prep Workbench. Make sure that you perform the following steps in the order given to set up the AssayMAP Bravo Platform.

WARNING **To avoid potential injury and damage to the device, only personnel trained in how to teach the AssayMAP Bravo Platform should perform the setup procedures.**

Workflow

Step	For this task...	See...
1	If you have not already done so, turn on the AssayMAP Bravo Platform.	"Turning on the AssayMAP Bravo Platform" on page 41
2	Understand the device profile requirements	"Device profile requirements" on page 42
3	Start the VWorks software, establish communication with the device, and then verify the device profile settings for this installation.	"Verifying the profile settings and configuration" on page 43

Turning on the AssayMAP Bravo Platform

To turn on the platform:

1   If you have not already done so, turn on any accessories, such as the Pump Module. If applicable, ensure that the Inheco STC Controller and the control module for the Orbital Shaking Station are turned on.

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 (|)** position.

Device profile requirements

Each AssayMAP application requires a specific Bravo device file and profile. The device profile specifies the head type (Bravo 96AM Head), Ethernet communication settings for the device, the configuration of the platepads and accessories on the deck, and the associated teachpoints for the specific combination of instrument and Bravo 96AM Head.

Each device profile is associated with a device file. The following table lists the device files and associated profiles installed with the Protein Sample Prep Workbench v3.2.

Table   AssayMAP device files and associated profiles

Device file name	Profile name	AssayMAP applications
AssayMAP Bravo.dev	AssayMAP 1 profile	Affinity Purification
		Affinity Purification: Aspiration Mode
		Immobilization
GlykoPrep-Plus_AM Bravo.dev	GlykoPrep-Plus profile	N-Glycan Sample Prep applications
AM Peptide Sample Prep.dev	AssayMAP Peptide Sample Prep profile	Fractionation
		IMAC Cartridge Customization
		In-Solution Digestion: Multi-Plate
		On-Cartridge Reaction
		Peptide Cleanup
		Peptide Cleanup: Aspiration Mode
		Phosphopeptide Enrichment
		Protein Cleanup
InSolution Digestion-AM Bravo.dev	Single Plate InSolution Digestion	In-Solution Digestion: Single Plate

Device file name	Profile name	AssayMAP applications
Normalization-AM Bravo.dev	AssayMAP Normalization	Normalization, Serial Dilution, Reformatting *Note:* These utilities have a deck layout that includes plate risers at deck locations 2 and 6.

The device profile must specify the correct deck configuration and the associated teachpoints for the Bravo deck layout.

IMPORTANT   If other liquid-handling heads will be used on the AssayMAP Bravo Platform, such as a 96LT Head, ensure that you verify the corresponding device files and profiles for the those liquid-handling heads. For details, see the *Bravo Platform User Guide*.

Verifying the profile settings and configuration

Ensure that you complete the following workflow for all device profiles in the Protein Sample Prep Workbench.

Step	For this task...	See...
1	Ensure the device file references the correct profile and the profile settings are correct.	"Verifying the profile settings" on page 43
2	Ensure the deck configuration in the profile matches the physical AssayMAP Bravo deck.	"About verifying the deck configuration in the profile" on page 47

Verifying the profile settings

IMPORTANT   Ensure that the Protein Sample Prep Workbench is closed.

To verify the profile settings:

1   Start the VWorks software.

You can click the VWorks desktop icon or use the Start menu on the Windows desktop to start the VWorks software.

2   Ensure that Simulation is off.
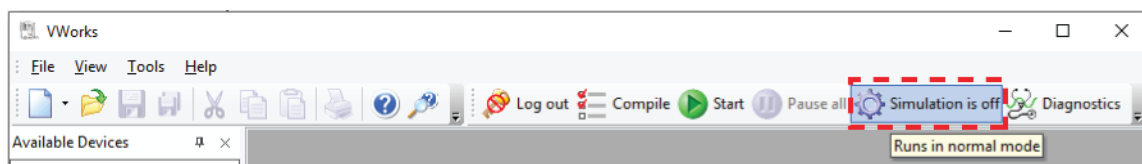
3 In the VWorks window, open the corresponding AssayMAP device file for the profile that you are verifying.

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

The device files are installed in the following default location:

C:\VWorks Workspace\Workbench\Device Files

4 Click **No** when the **Would you like to initialize devices now?** message appears.
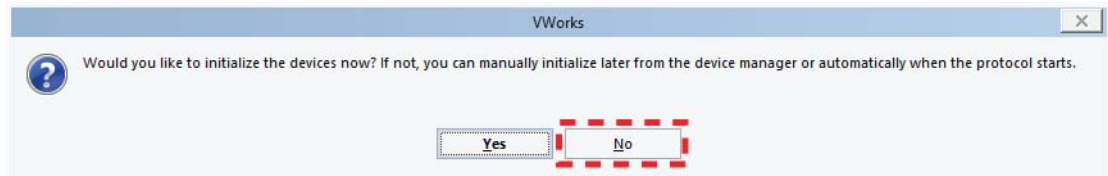
5 In the *<name>*.dev tab, ensure that the **Profile** selection is correct.

Device file name	Profile name
AssayMAP Bravo.dev	AssayMAP 1
GlykoPrep-Plus_AM Bravo.dev	GlykoPrep-Plus
AM Peptide Sample Prep.dev	AssayMAP Peptide Sample Prep
InSolution Digestion-AM Bravo.dev	Single Plate InSolution Digestion
Normalization-AM Bravo.dev	AssayMAP Normalization

If necessary, select the correct name from the **Profile** list, and then click the **Save** icon.

Figure   AssayMAP Bravo.dev tab and Profile setting for AssayMAP 1
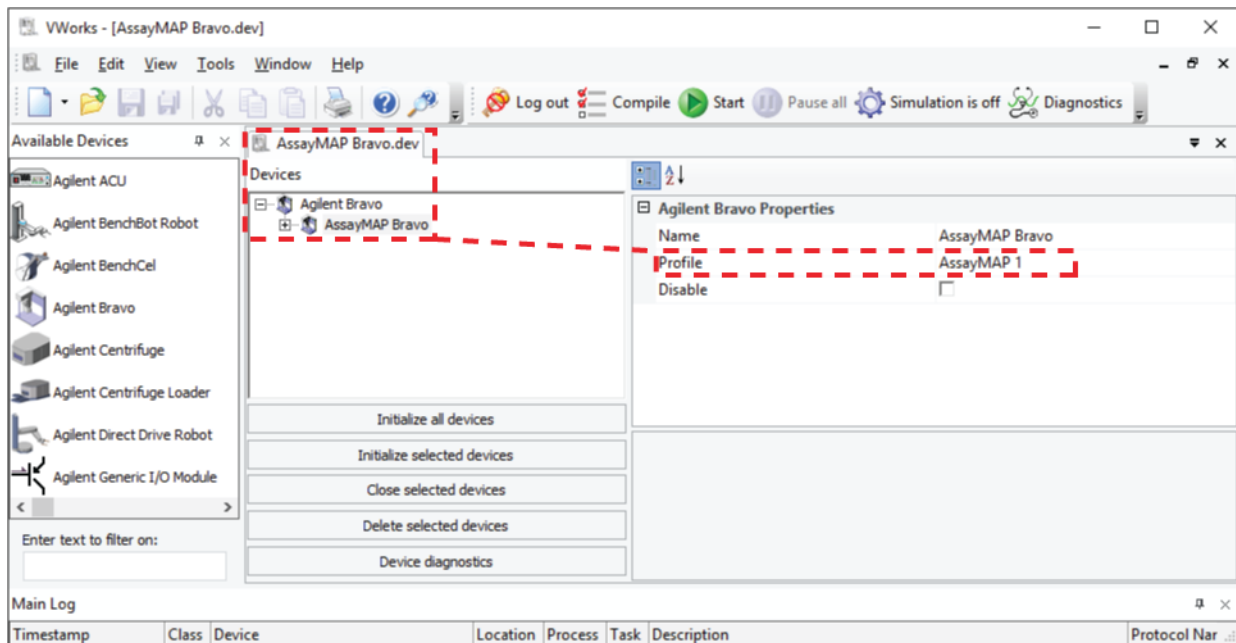
6 In the *<name>*.dev tab, click **Device diagnostics**. The Bravo **Diagnostics** dialog opens.

7 In the **Profiles** tab, verify the **Profile name**.

8   Verify the following **Head Information** properties.
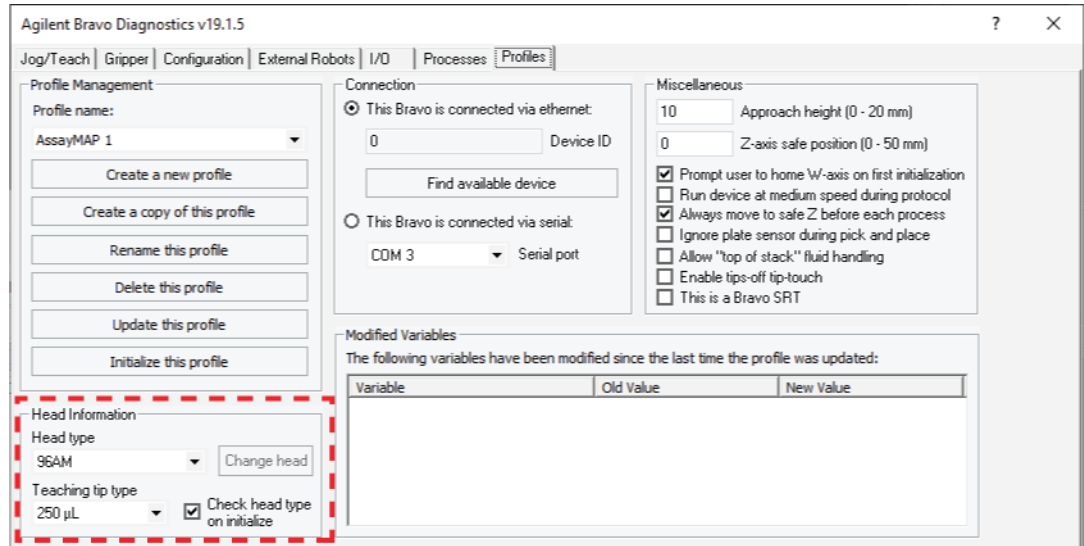
Property	Setting
Head type	96AM
Teaching tip type	250 μL
Check head type on initialize	☑ selected

9   In the **Connection** area, select **This** Bravo **is connected via ethernet**, and then click **Find available device** to select the device to associate with the profile.

In the **Discovered BioNet Devices** dialog box that appears, perform the following tasks:
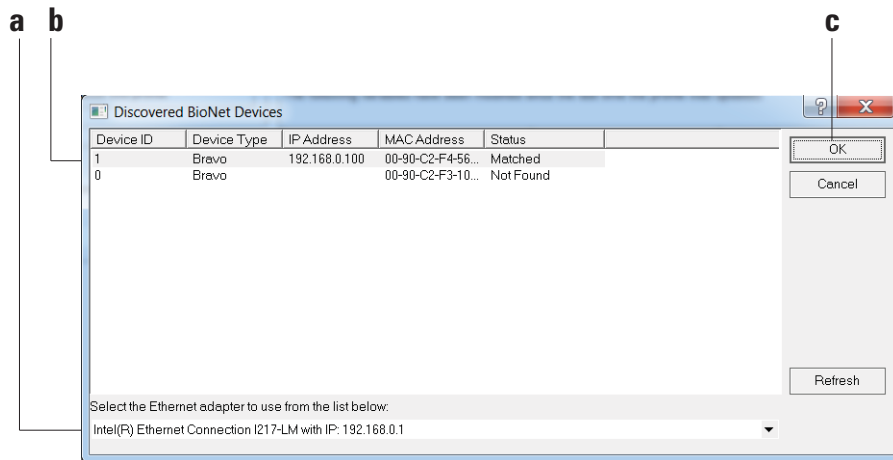
a   Click the **Select the Ethernet adapter to use from the list below**, and select the correct adapter for the device connection.

b   In the list of devices that appear, select the Bravo device. If multiple Bravo devices are on the network, use the **MAC Address** to identify the Bravo device for this profile. To successfully communicate with the Bravo device, the **Status** column must display **New** or **Matched**.

    c   Click **OK**.

10 In the **Miscellaneous** area, verify the property settings. The following figure shows the settings for each profile.

11 If you have made any changes, click **Update this profile**.

Figure   Miscellaneous area of the Profiles tab showing variations in property settings for different AssayMAP profiles

About verifying the deck configuration in the profile

- **Autofill Station at deck location 1**. Controls pumping the liquid to and from the wash station. This configuration is required for all AssayMAP applications and included in all AssayMAP profiles by default.

- Heating Shaking Station **at deck location 4**. Controls the Peltier Thermal Station (also known as the CPAC Ultraflat).

  Note: The Heating Shaking Station configuration is required for any heating or shaking accessory that is controlled by an STC or MTC controller.

- Orbital Shaking Station **at deck location 9**. Controls the Orbital Shaking Station.

The following table describes the requirements for each profile.

Profile	Verification tasks	See...
AssayMAP 1 profile	By default, the AssayMAP 1 profile includes only the Autofill Station (wash station) as an accessory configuration. All other deck locations are configured as standard platepads. **IMPORTANT** If the Peltier Thermal Station and Orbital Shaking Station are installed on the AssayMAP Bravo deck, you configure the corresponding deck locations for these accessories in the AssayMAP 1 profile.	"Verifying the Autofill Station configuration (wash station)" on page 49
GlykoPrep-Plus profile	By default, the GlykoPrep-Plus profile includes the following configurations: - Autofill Station (wash station) - Heating Shaking Station for the Peltier Thermal Station (location 4) - Orbital Shaking Station (location 9) **IMPORTANT** If these accessories are not installed on the AssayMAP Bravo deck, you configure the corresponding deck locations for a standard platepad.	- "Verifying the Autofill Station configuration (wash station)" on page 49 - "Verifying the Peltier Thermal Station configuration" on page 51 - "Verifying the Orbital Shaking Station configuration" on page 53
AssayMAP Peptide Sample Prep profile	By default, the AssayMAP Peptide Sample Prep profile includes the following configurations: - Autofill Station (wash station) - Heating Shaking Station for the Peltier Thermal Station (location 4) - Orbital Shaking Station (location 9) **IMPORTANT** If these accessories are not installed on the AssayMAP Bravo deck, you configure the corresponding deck locations for a standard platepad.	- "Verifying the Autofill Station configuration (wash station)" on page 49 - "Verifying the Peltier Thermal Station configuration" on page 51 - "Verifying the Orbital Shaking Station configuration" on page 53

Profile	Verification tasks	See...
Single Plate InSolution Digestion profile	By default, the Single Plate InSolution Digestion profile includes the following configurations: • Autofill Station (wash station) • Heating Shaking Station for the Peltier Thermal Station (location 4) • Orbital Shaking Station (location 9) **IMPORTANT** If these accessories are not installed on the AssayMAP Bravo deck, you configure the corresponding deck locations for a standard platepad. In addition to the physical accessories, this profile includes a Lid Hotel configuration at deck locations 3 and 7. Even though standard platepads are installed at these deck locations, the Lid Hotel configuration enables the locations for Delidding and Relidding tasks.	• "Verifying the Autofill Station configuration (wash station)" on page 49 • "Verifying the Peltier Thermal Station configuration" on page 51 • "Verifying the Orbital Shaking Station configuration" on page 53
AssayMAP Normalization profile	By default, the AssayMAP Normalization profile includes the following configurations: • Autofill Station (wash station) • Heating Shaking Station for the Peltier Thermal Station (location 4) **IMPORTANT** If Peltier Thermal Station is not installed on the AssayMAP Bravo deck, you configure the corresponding deck location for a standard platepad. The AssayMAP Normalization profile also includes accessory teachpoints at deck locations 2 and 6 for the Bravo Plate Riser accessory, which must be verified and adjusted if necessary. The Bravo Plate Riser has no configuration settings.	• "Verifying the Autofill Station configuration (wash station)" on page 49 • "Verifying the Peltier Thermal Station configuration" on page 51

Verifying the Autofill Station configuration (wash station)

IMPORTANT Use the following procedure to verify the Autofill Station configuration settings in every AssayMAP profile.

All the supplied profiles already include the Autofill Station configuration. You perform the following steps to ensure that the setup is correct.

Verifying the Autofill Station configuration in a profile

To verify the Autofill Station configuration in a profile

1   In Bravo Diagnostics, ensure the correct profile is selected in the **Profiles** tab.

2   In the **Configuration** tab, verify that the deck image shows a Pump Module at deck location 1.

Note: The AssayMAP 1 profile has no other accessories configured by default, but you will be adding those accessories in a subsequent procedure. The other profiles have accessories at deck locations 4 and 9, by default.
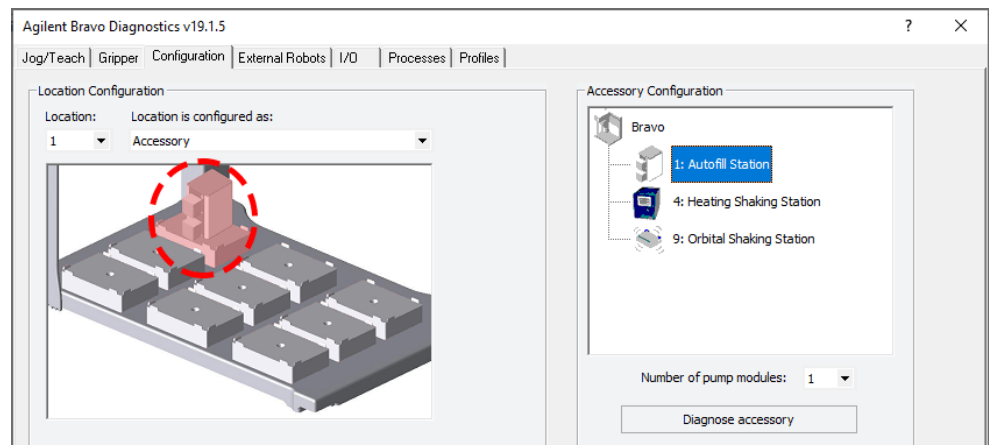
3   To verify the settings, right-click deck location 1 in the image. In the shortcut menu that appears, click **Configure location > Accessory**. The Bravo Accessories Wizard opens.

4   In the **Location for accessory** list, verify the location and then click **Next**.

5 In the **Accessory already configured** page, click **Yes, reconfigure existing accessory**, and then click **Next**.

```
Bravo Accessories Wizard                    ?    ×
─ Accessory already configured ──────────────────────
  Accessory already exists at this location
  Reconfigure existing accessory?

  ATTENTION: Accessory's state will be reset!
  ⊙ Yes, reconfigure existing accessory
  ○ No, configure location with a new accessory



                  << Back    Next >>        Cancel
```

6 Verify the following property settings in the **Autofill Station properties** table, and then click **Next**.

Autofill station properties	Setting
Fill module	1
Pump for filling	Pump 1
Direction for filling	Forward
Empty module	1
Pump for emptying	Pump 2
Direction for emptying	Reverse
Use Weigh Station?	No
Weigh Station module number	1

7 Click **Finish**. The Bravo Accessories Wizard closes.

8 If you made any changes to the configuration settings, click the **Profiles** tab, and then click **Update this profile** to save the changes.

Verifying the Peltier Thermal Station configuration

IMPORTANT	If the Peltier Thermal Station is installed in the AssayMAP Bravo Platform, use the following procedures to configure and test the accessory in every profile.

Verifying the Peltier Thermal Station configuration in a profile

To verify the Peltier Thermal Station configuration in a profile:

1 In Bravo Diagnostics, ensure the correct profile is selected in the **Profiles** tab.

2 In the **Configuration** tab, verify that the deck image shows a Heating Shaking Station icon at deck location 4.
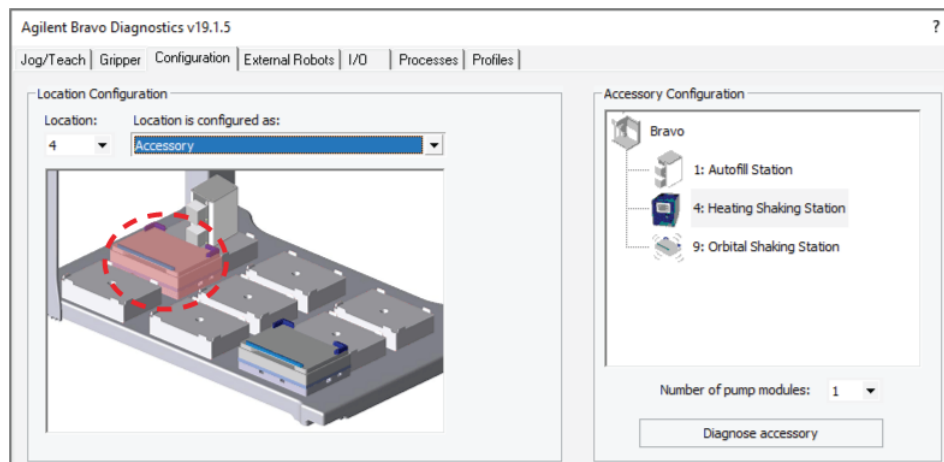
3 To verify the settings, right-click deck location 4 in the image. In the shortcut menu that appears, click **Configure location > Accessory**. The Bravo Accessories Wizard opens.

4 In the **Location for accessory** list, verify that location 4 is selected, and then click **Next**.

   • If the **Choose Accessory** page appears, select the **Heating Shaking Station**, and then click **Next**.

- If the **Accessory already configured** page appears, click **Yes, reconfigure existing accessory**, and then click **Next**.

```
Bravo Accessories Wizard                          ?    ×

┌─Accessory already configured─────────────────────────┐
│ Accessory already exists at this location            │
│ Reconfigure existing accessory?                      │
│                                                      │
│ ATTENTION: Accessory's state will be reset!          │
│ ⦿ Yes, reconfigure existing accessory                │
│ ○ No, configure location with a new accessory        │
│                                                      │
│                                                      │
│                                                      │
│                                                      │
│                                                      │
│                                                      │
│                                                      │
│                                                      │
│        << Back      Next >>           Cancel         │
└──────────────────────────────────────────────────────┘
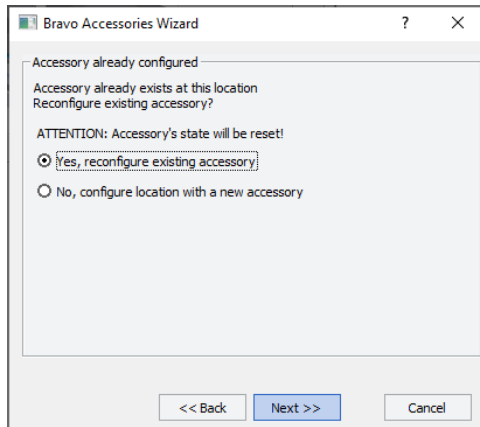```
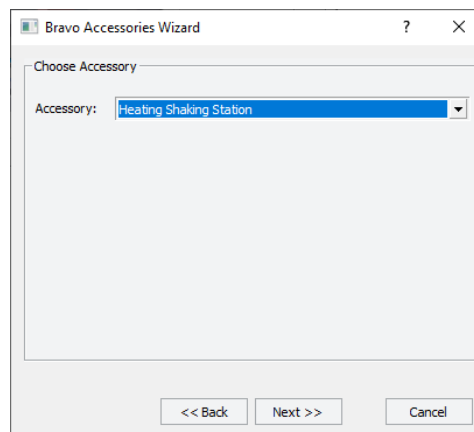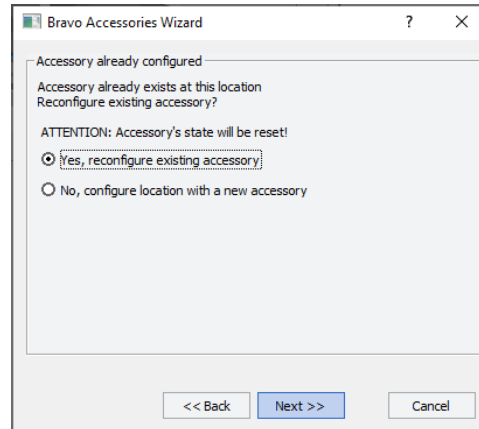
**5** Verify the following settings in the **Properties** table, and then click **Next**.

| Properties | Setting |
| --- | --- |
| MTCSTC Id | 0 |
| Type | STC |
| Slot Id | 1 |

*Note:* The Inheco STC Controller ships with an MTCSTC Id setting of 0. However, this setting may have been changed on demo units for use with multiple devices. Use the DIP switches on the back of the STC Controller to determine what the actual Id setting is and make changes if necessary. See the manufacturer's user documentation for more information.

**6** Click **Finish**. The Bravo Accessories Wizard closes.

**7** When the accessory configuration message appears, click **Yes** to move the teachpoint to a safe height.

**8** If you made any changes to the configuration settings, click the **Profiles** tab, and then click **Update this profile** to save the changes.

# Verifying the Orbital Shaking Station configuration

**IMPORTANT** If the Orbital Shaking Station is installed in the AssayMAP Bravo Platform, use the following procedures to configure and test the accessory in every profile.

## Verifying the Orbital Shaking Station configuration in a profile

*To verify the Orbital Shaking Station configuration in a profile:*

1 In Bravo Diagnostics, ensure the correct profile is selected in the **Profiles** tab.

2 In the **Configuration** tab, verify that the deck image shows a Orbital Shaking Station icon at deck location 9.
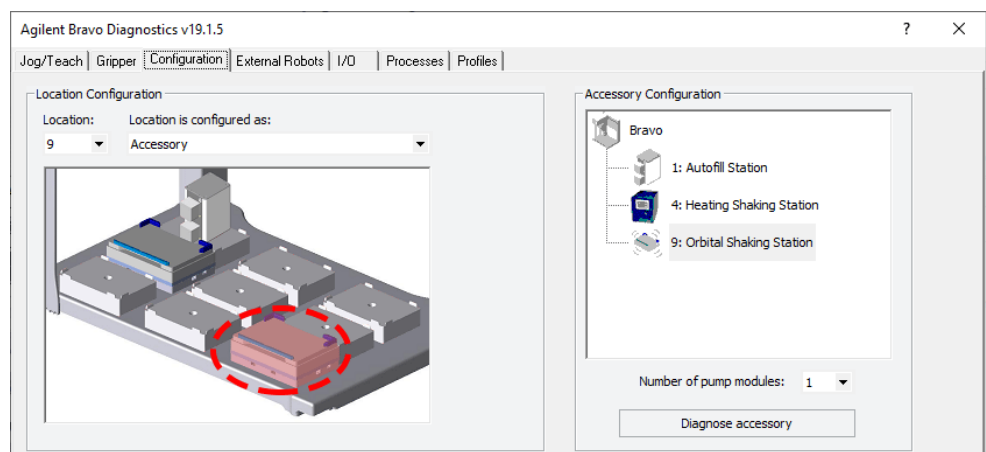


3 To verify the settings, right-click deck location 9 in the image. In the shortcut menu that appears, click **Configure location > Accessory**. The Bravo Accessories Wizard opens.

4 In the **Location for accessory** list, verify that the location is 9, and then click **Next.**

5 In the **Accessory already configured** page, click **Yes, reconfigure existing accessory**, and then click **Next.**

- If the **Choose Accessory** page appears, select the **Heating Shaking Station**, and then click **Next**.
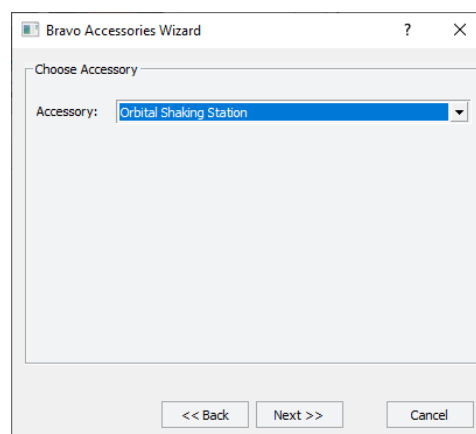
- If the **Accessory already configured** page appears, click **Yes, reconfigure existing accessory**, and then click **Next**.
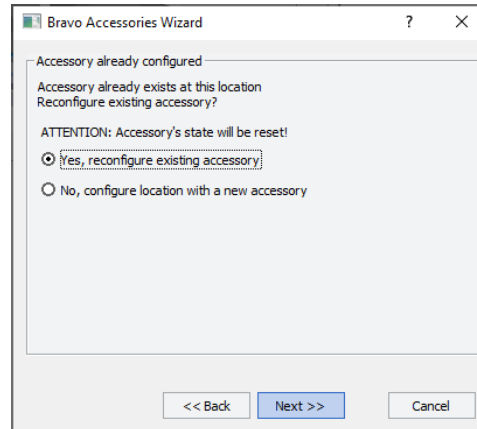


6   In the **Properties** table, verify the Serial Port number and Module Number, and then click **Next**.

| Property | Setting |
|---|---|
| Serial Port | 1* |
| Module Number | 1 |

*The Serial Port parameter will be automatically defined when a USB-to-serial adapter is connected to the computer. You might need to lookup the port assigned to this device in the Windows Device Manager.

*Note:* Occasionally, a port number is reassigned for a USB-to-serial connection if you disconnect and reconnect the accessory. If this happens, you must verify that the correct Serial Port is set in each profile.

7   Click **Finish**. The Bravo Accessories Wizard closes.

8   If the accessory configuration message appears, click **Yes** to move the teachpoint to a safe height.

9   If you made any changes to the configuration settings, click the **Profiles** tab, and then click **Update this profile** to save the changes.

# Initializing the profile that you are verifying

Initializing the profile establishes communication with the AssayMAP Bravo Platform and accessories. You will initialize a profile to test the accessory settings and verify the gripper adjustment for that profile.

## Before you start

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

## Initializing the profile in Bravo Diagnostics

*To initialize the profile:*

1  In the **Profiles** tab, ensure that the correct profile is selected, and then click **Initialize this profile** to start initializing the selected profile.
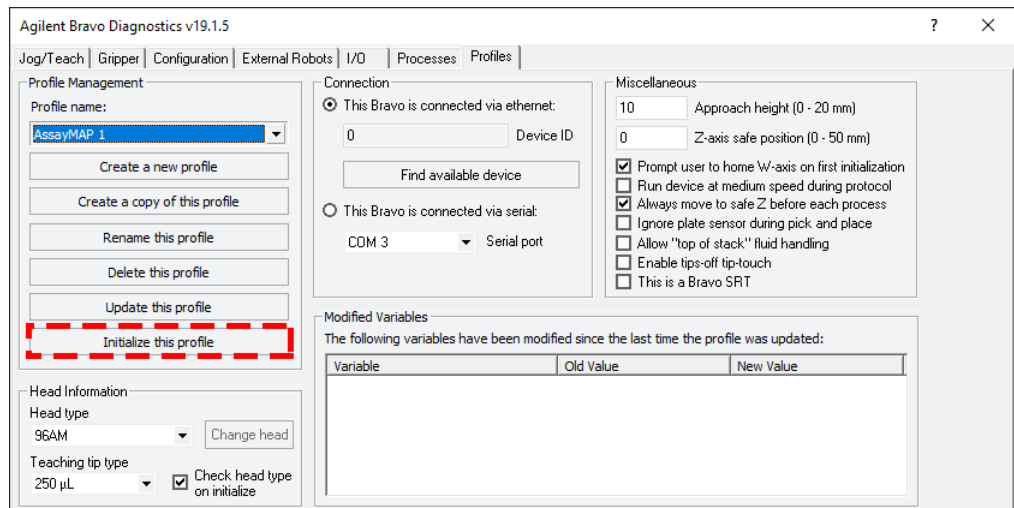


2  If the **There appears to be a plate present** error message appears, click **Ignore and Continue** to continue the homing process.

3  When the **verify that it is safe to home the W-axis** message appears, click **Retry** to continue homing the *w*-axis.
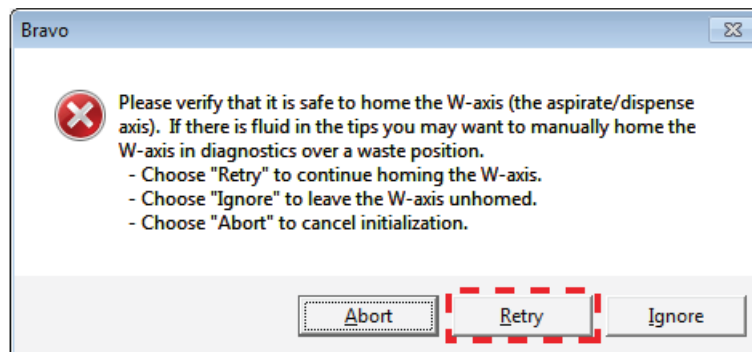
# Testing the accessories

## Before you start

Ensure that you have verified the accessory configuration in the given profile before you perform the following workflow.

| Step | Task | See … |
|------|------|-------|
| 1 | Initialize the AssayMAP 1 profile. | "Initializing the profile in Bravo Diagnostics" on page 55 |
| 2 | Test the communication with the accessories. | Procedures in this topic |
| 3 | Initialize the next profile. | "Initializing the profile in Bravo Diagnostics" on page 55 |
| 4 | Test the communication with the accessories. | Procedures in this topic |
| 5 | Repeat steps 3 and 4 for each of the remaining profiles. | — |

## Testing the Pump Module

Use the following procedure to test the communication with the Pump Module. In a subsequent verification procedure, you will run the Startup utility, which will test the functioning of the Pump Module and wash station using liquid.

### To test the communication with the Pump Module:

1 Ensure that the Pump Module is on.

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

   *Note:* While the pump heads are open, no liquid will pump in the subsequent steps.

3   In the **Configuration** tab, click the **Autofill Station** icon, and then click **Diagnose accessory**. The Bravo Accessory Diagnostics dialog box opens.
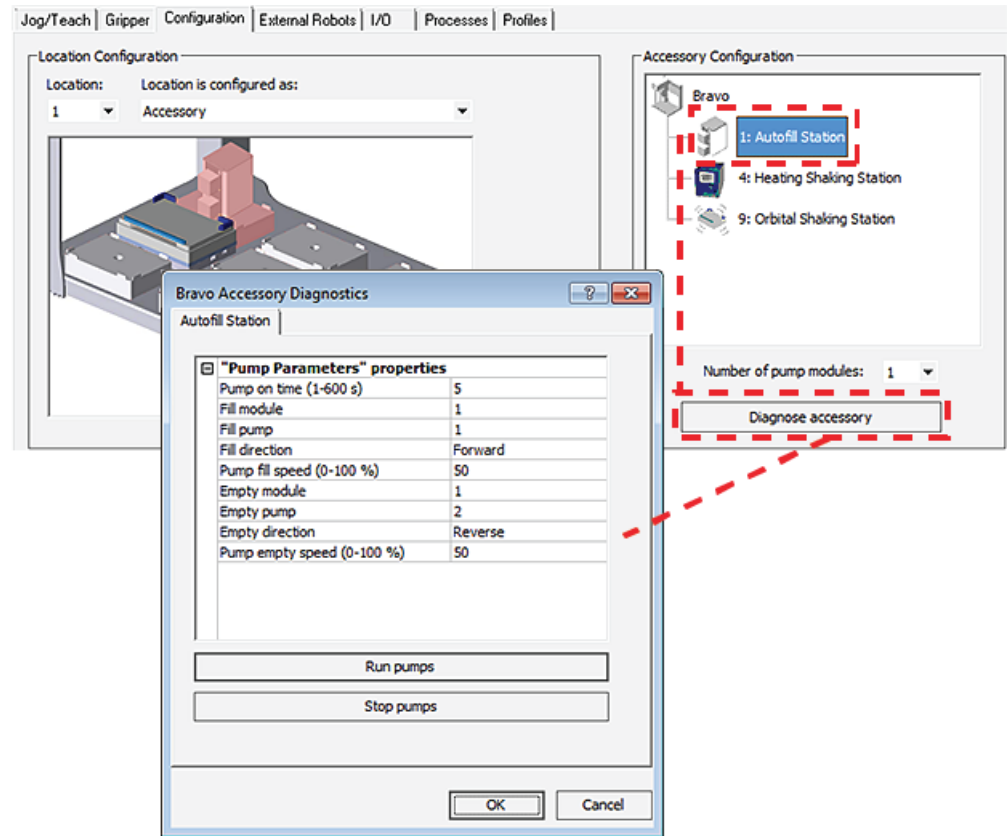


4   Click **Run pumps**.

5   Verify that the pumps run. While they are running, verify that the pumps are spinning in the correct directions:

   • Top pump should be spinning clockwise.

   • Bottom pump should be spinning counter-clockwise.

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

## Testing the Peltier Thermal Station

*To test the Peltier Thermal Station:*

1   Ensure that the MTC Controller is on.

2   In the **Accessory Configuration** area, click the **Heating Shaking Station** icon for deck location 4, and then click **Diagnose accessory**. The Bravo Accessory Diagnostics dialog box opens.
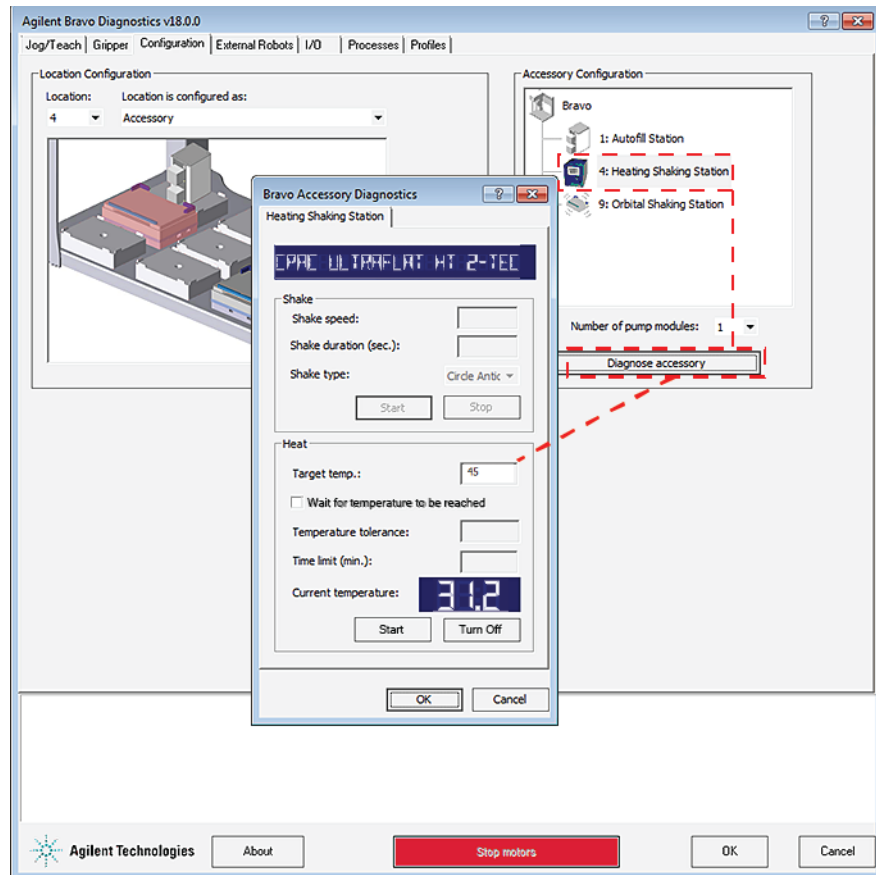


3   In the Bravo **Accessory Diagnostics** dialog box, verify that the correct device (CPAC Ultraflat) appears in the display at the top.

4   In the **Heat** area, set the parameters to test the temperature function:

   a   In the **Target temp** box, type the temperature (°C).

   For example, set the CPAC at deck location 4 to 45 °C.

   b   Click **Start**.

   c   At the Peltier Thermal Station on the deck, verify that the accessory operates correctly.

   You can also monitor the readout in the **Current temperature** display.

   d   Click **Turn Off** to stop the heating or cooling, and click **OK** to close the dialog box.

### Testing the Orbital Shaking Station

*To test the Orbital Shaking Station:*

**1** In the **Accessory Configuration** area, click the Orbital Shaking Station icon, and then click **Diagnose accessory**. The Bravo Accessory Diagnostics dialog box opens.
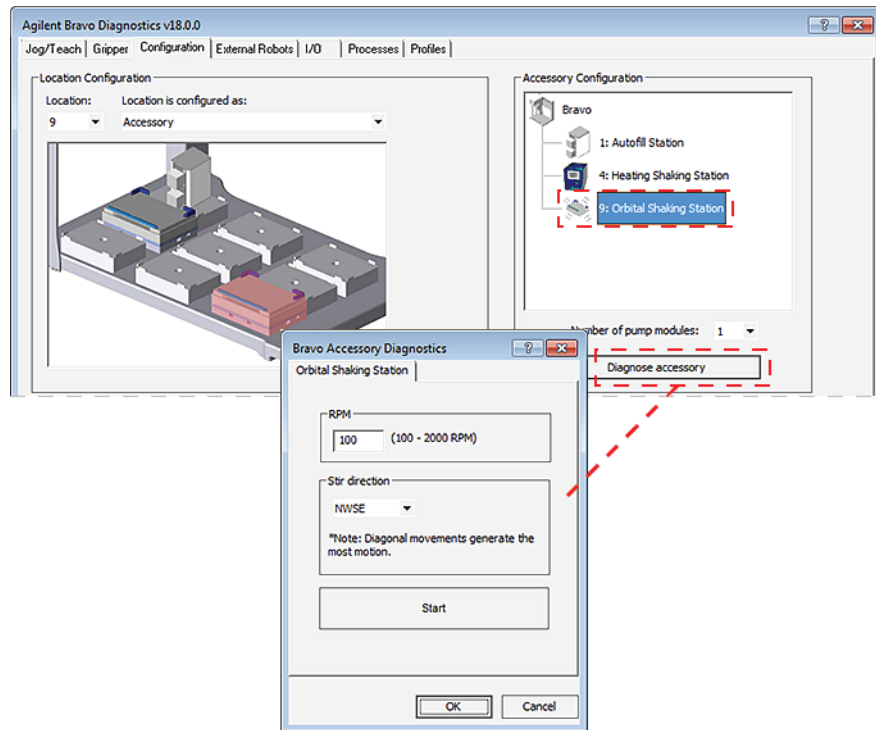


**2** Type the **RPM**, select the **Stir direction**, and then click **Start**.

**3** At the Orbital Shaking Station on the deck, verify that the accessory operates correctly.

**4** In the Bravo **Accessory Diagnostics** dialog box, click **Stop**, and then click **OK**.

**IMPORTANT** Ensure that you verify the profile settings and test the accessories in each of the other profiles before you set the teachpoints.

# 4 Setting the teachpoints

# Teaching part 1: Setting teachpoints in AssayMAP 1 profile

## About this topic

This topic describes how to set the teachpoints in the AssayMAP 1 profile. After you set the teachpoints in this profile, you will run a teachpoint-update protocol to automate the teachpoint adjustments for all the other profiles in the Protein Sample Prep Workbench.

Alternatively, you can follow a manual workflow to set the teachpoints for all nine deck locations in every device profile in the Protein Sample Prep Workbench. For details, see "Workflow for setting teachpoints in each profile manually" on page 106.

## Teachpoint requirements

A teachpoint is a set of axial coordinates that define a location to which the Bravo head moves. Each of the nine deck locations has a teachpoint.

**CAUTION** **Using a profile that is associated with teachpoints from a different instrument can result in a hardware collision and cause equipment damage. Ensure that you verify the teachpoints associated with each profile for your specific instrument and Bravo 96AM Head.**

**IMPORTANT** Every device profile in the Protein Sample Prep Workbench must be adjusted to the correct teachpoints for the specific AssayMAP Bravo Platform that you are installing.

## Before you start

**WARNING** **To avoid potential injury and damage to the device, only personnel trained in how to teach the Bravo Platform should perform the procedures in this topic.**

**WARNING** **The red Stop motors button in Bravo Diagnostics does not perform an immediate stop. The Bravo head can continue to move in the same direction at the same speed after you click the button. To perform an emergency stop, press the red button on the emergency-stop pendant.**

**CAUTION** **To prevent the head from crashing into an accessory, be sure to start the accessory teaching process from the safe z-axis point above the accessory location. This is especially important if you use the Set all teachpoints based upon selected teachpoint feature.**

**IMPORTANT** Make sure that you remove all labware from the deck except for the wash station at deck location 1. The wash station remains installed at deck location 1 in the following procedure while you set the teachpoint for deck location 2. In a subsequent procedure, you will adjust the wash station teachpoint at deck location 1.

Ensure that you have the required resources:

•   250-µL pipette tip

**IMPORTANT**   Ensure that the pipette tip is new and in good condition.

•   0.010-inch (0.254 mm) feeler gauge

This gauge is used to set the vertical distance between the pipette tip and top of the crosshairs mark on the platepad or accessory.
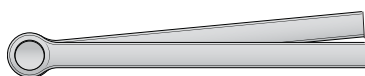
The following procedures assume that you have basic knowledge of the Bravo teaching process and have been trained to teach the Bravo Platform.

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

Ensure the following:

•   All Workbench profiles have been configured correctly. See "Verifying the profile settings and configuration" on page 43.

•   The Protein Sample Prep Workbench software is not open.

•   In the VWorks software, Simulation is off.
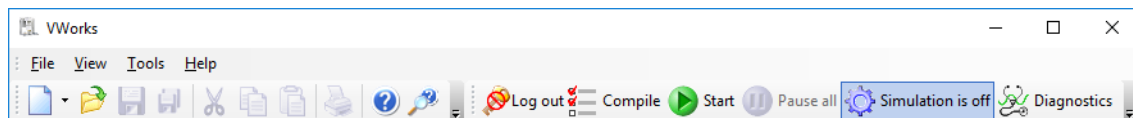


## Workflow for setting the teachpoints

| Step | For this task... | See... |
|------|------------------|--------|
| 1 | In the Bravo Diagnostics dialog box, initialize the AssayMAP 1 profile. | "Initializing the profile that you are verifying" on page 55 |
| 2 | Set the teachpoint for deck location 2 and derive the remaining teachpoints for the AssayMAP 1 profile. | "Setting the teachpoint for deck location 2 and deriving the remaining teachpoints" on page 64 |
| 3 | Adjust the accessory location teachpoints for the AssayMAP 1 profile. | "Teaching part 2: Adjusting teachpoints for accessories" on page 67 |
| 4 | Use the AssayMAP Update Teachpoints protocol to update the remaining profiles. | "Teaching part 3: Updating other profiles based on AssayMAP 1" on page 73 |

### Setting the teachpoint for deck location 2 and deriving the remaining teachpoints

*To set the teachpoints:*

1   Manually seat a 250-µL pipette tip on probe A1 (back left corner of the Bravo 96AM Head). Ensure that the pipette tip locks into place with the probe.

Ensure a standard platepad is installed at deck location 2.

2   In the **Bravo Diagnostics** dialog box, click the **Jog/Teach** tab.
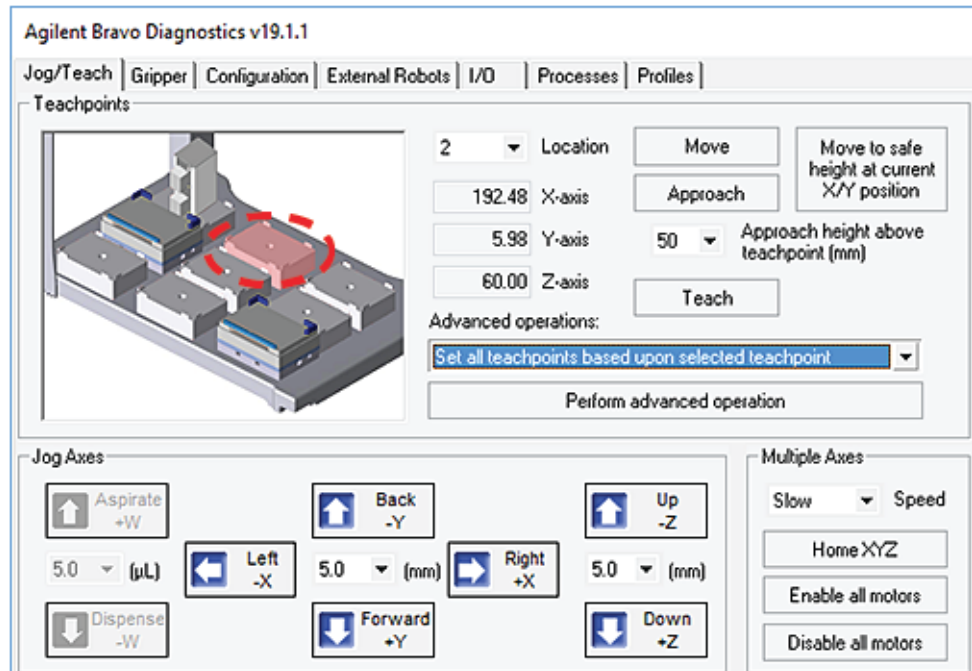


3   In the image of the Bravo deck in the upper left corner, click **Location 2**.

4   Carefully, use the **Jog Axes** controls to adjust the position of the pipette tip above the crosshairs on platepad 2. Use incrementally smaller jog increments as you jog the pipette tip down closer to the crosshairs.

As the pipette tip moves down along the *z*-axis towards the crosshairs, the following error message appears. Visually inspect the clearance remaining between the tip and the crosshairs. If the tip is not yet at the crosshairs, adjust the jog increment as required, and click **Ignore** to continue jogging the head down.

**CAUTION**   **Before you click Ignore in the error message, verify that enough space remains to continue jogging the head down. Jogging the head down too far will result in a collision and cause equipment damage.**
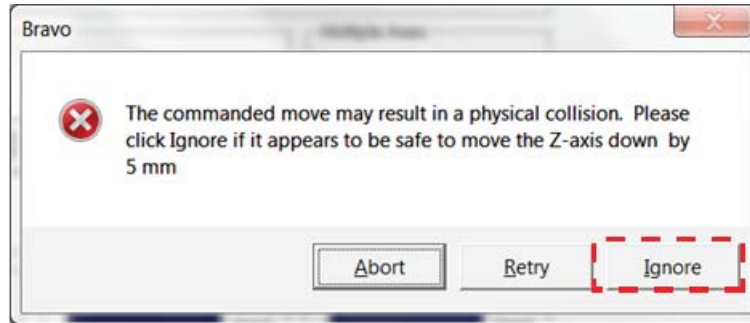
*Note:* This error message appears every time you jog in the z-axis to a point that is lower than the default *z*-axis teachpoint (60.00 mm).

5    When the pipette tip is 1–2 mm above the crosshairs, do the following:

   **a**    Verify that the A1 pipette tip is perfectly centered above the platepad crosshairs in the *x*- and *y*-axes.

   **b**    Set the **Jog Axes Up/Down** increment to 0.2-mm. Carefully, jog the head down in 0.2-mm increments just until the feeler gauge cannot fit under the pipette tip.

   **c**    Raise the head by 0.05-mm increments until you reach the lowest possible height that allows the 0.010-inch feeler gauge to slide under the pipette tip without deflecting it.

6    Click **Teach**.

7    To derive the teachpoints for the remaining locations from deck location 2:

   **a**    In the **Advanced operations** list, select **Set all teachpoints based upon the selected teachpoint**.

   **b**    Ensure that deck location 2 is still selected, and then click the **Perform advanced operations**.

   **c**    Click **OK** in the confirmation message.

## Fine tuning the teachpoints

***To fine tune the automatically derived teachpoints:***

1    In the **Jog/Teach** tab image of the Bravo deck, click **Location 3**.

2    In the **Approach height above teachpoint** list, select **10**, and then click **Approach**.

   The Bravo head moves to deck location 3 and moves down so that the pipette tip is approximately 10 mm above the platepad crosshairs.

3    Carefully, use the **Jog Axes** controls to adjust the position of the A1 pipette tip above the crosshairs. Use incrementally smaller jog increments as you jog the tip down closer to the crosshairs.

4    When the pipette tip is 1–2 mm above the crosshairs, do the following:

   **a**    Verify that the A1 pipette tip is perfectly centered above the crosshairs in the *x*- and *y*-axes.

   **b**    Set the **Jog Axes Up/Down** increment to 0.2-mm. Carefully, jog the head down in 0.2-mm increments just until the feeler gauge cannot fit under the pipette tip.

   **c**    Raise the head by 0.05-mm increments until you reach the lowest possible height that allows the 0.010-inch feeler gauge to slide under the pipette tip without deflecting it.

**5**   Click **Teach**.

**6**   Repeat steps 1 to 5 for deck locations 4, 5, 6, 7, and 8.

| IMPORTANT | If the Peltier Thermal Station is installed at deck location 4, ensure that the plate nest is empty and the PCR plate insert is not installed. |
| --- | --- |

**7**   Adjust the teachpoints for the accessory locations. See "Teaching part 2: Adjusting teachpoints for accessories" on page 67.

# Teaching part 2: Adjusting teachpoints for accessories

This topic includes the following procedures:

- "Teaching the Orbital Shaking Station at deck location 9" on page 67
- "Teaching the 96AM Wash Station at deck location 1" on page 68
- "Adjusting the teachpoint at deck location 2 for the Cartridge & Tip Seating Station" on page 71

## Teaching the Orbital Shaking Station at deck location 9

If the Orbital Shaking Station is installed at deck location 9, a teachpoint adjustment is required. Use the following procedure to set the teachpoint for the Orbital Shaking Station at deck location 9.

### Before you start

Ensure that you have the following:

- Pipettor teaching plate (G5550-17692). The teaching plate is a 10-mm thick metal plate that fits in the plate nest of an accessory. The teaching plate has a crosshairs in one corner, as the following figure shows.

*Figure*   Pipettor teaching plate
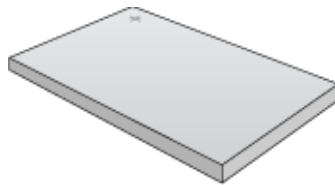


- 250-µL pipette tip seated on probe A1 (back left corner) of the Bravo 96AM Head.

**IMPORTANT**   Ensure that the pipette tip is new and in good condition.

- 0.010-inch (0.254 mm) feeler gauge

  This gauge is used to set the vertical distance between the pipette tip and top flat surface of the Orbital Shaking Station.
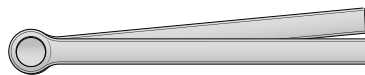


### To teach the Orbital Shaking Station at deck location 9:

1  Place the teaching plate in the plate nest of the Orbital Shaking Station. Ensure that the crosshairs is at the back left corner and facing upward.

   Press down on the teaching plate so that the bottom touches the top surface of the plate nest.

2  In the **Jog/Teach** tab, and click **Location 9**.

3  In the **Approach height above teachpoint** box, type **15**, and then click **Approach**.

   The Bravo head moves to deck location 9 and moves down so that the pipette tip is approximately 5 mm above the crosshairs on the 10-mm teaching plate.

4   Carefully, use the **Jog Axes Down +Z** control to move the pipette tips down until the pipette tip is 1−2 mm from the crosshairs, and then use the **Jog Axes X/Y** controls to center the A1 tip above the crosshairs.

5   When the A1 tip is perfectly centered above the crosshairs, click **Teach** to save this value temporarily.

6   Click the **Move to safe height at current X/Y position**. Remove the teaching plate from the Orbital Shaking Station.

7   Ensure that deck location 9 is still selected, and then click **Move**. The head moves down so that the tip is approximately 10 mm above the top surface of the plate nest in the Orbital Shaking Station.

8   Use the **Down +Z** control to lower the pipette head incrementally.

9   When the pipette tip is 1−2 mm above the flat surface of the Orbital Shaking Station, do the following:

   a   Set the **Down +Z i**ncrement to 0.2 mm. Carefully, jog the head down in 0.2-mm increments just until a 0.254-mm (0.010-inch) feeler gauge cannot fit under the pipette tip.

   b   Raise the head by 0.05-mm increments until you reach the lowest possible height that allows the feeler gauge to slide under the pipette tip without deflecting it.

   *Note:* Alternatively, you may use the **Jog Axes** controls to move the head down in the *z*-axis until the pipette tip is as close as possible to the top surface of the plate nest, without making contact.

10   Click **Teach** to set the new teachpoint values for deck location 9.

11   To save the new teachpoint for this location, click the **Profiles** tab, and then click **Update this profile.**

## Teaching the 96AM Wash Station at deck location 1

**CAUTION**   **Failure to remove the pipette tip from the A1 probe will cause the pipette tip to collide with the wash station chimney, damaging the Bravo 96AM Head and 96AM Wash Station. Ensure that you remove the pipette tip before starting the procedure.**

For this procedure, you will center the syringe probes above the wash station chimneys to adjust the *x*- and *y*-axes for the teachpoint, but you will use the existing *z*-axis teachpoint.

***To teach the 96AM Wash Station:***

1   If you have not already done so, remove the pipette tip from probe A1.

**IMPORTANT**   Ensure that the 250-µL tip remains selected as the Teaching tip type in the Profiles tab. Ensure that no pipette tips or cartridges are seated on the Bravo 96AM Head.

2   In the Bravo **Diagnostics Jog/Teach** tab, click **Location 1**.
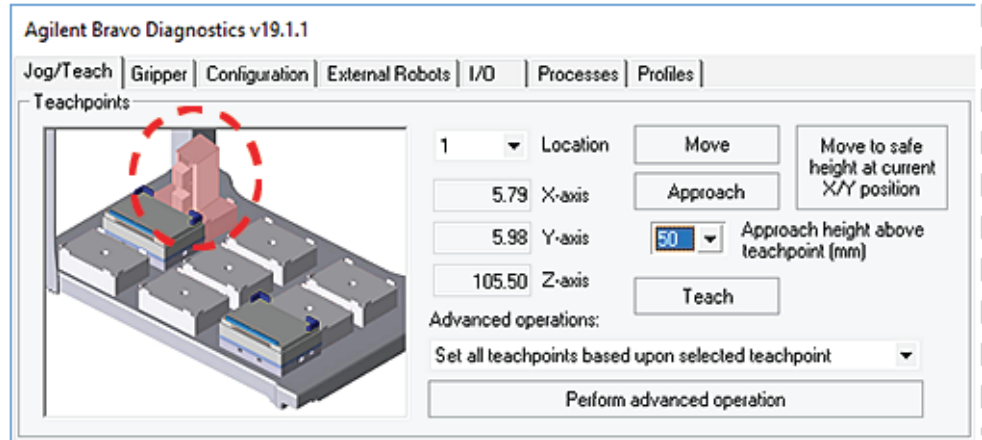
*Note:* Additional accessories will appear in the image if you have configured them in this profile.

**3** 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.
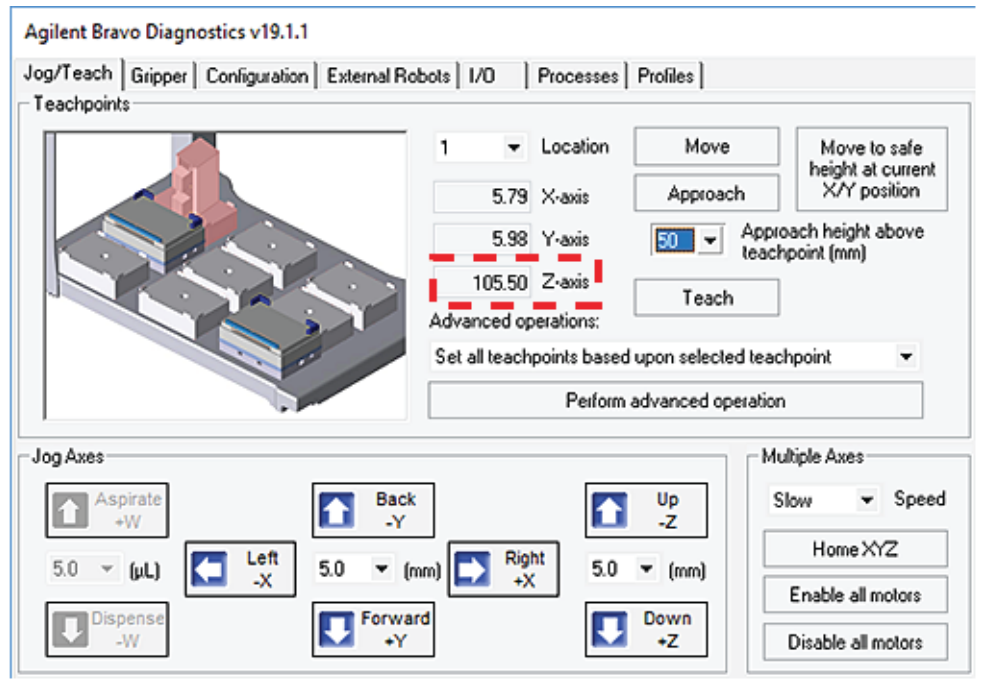


**4** In the **Approach height above teachpoint** box, type **50**, and then click **Approach**.
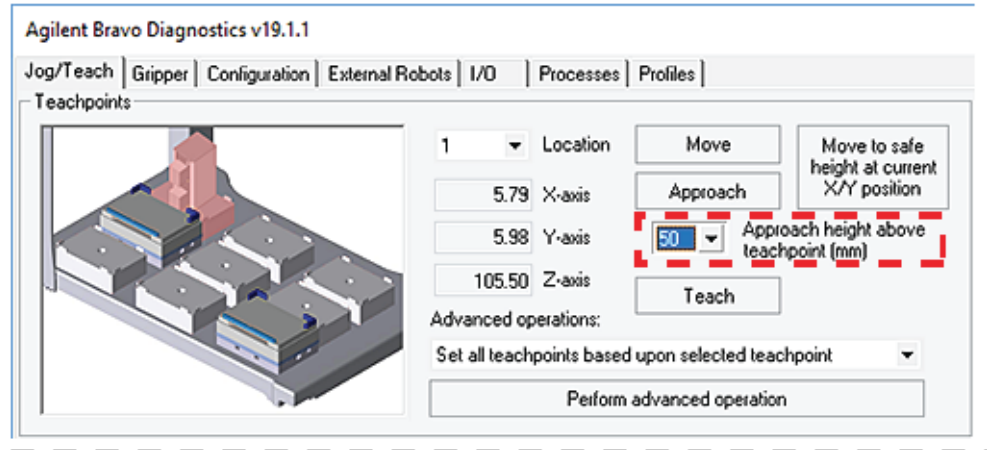
5   Carefully, use the **Jog Axes** controls to position the syringe probes so that they are perfectly centered over the corresponding chimneys in the wash station.

The tips of the probes should be approximately 1 mm above the tops of the chimneys.

6   When the probes and chimneys are perfectly aligned, use the **Jog Axes** controls to move the head down slowly along the *z*-axis to the original **Z-axis** teachpoint value that you recorded in step 3.

*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 value that was written down from above, click **Teach** to set the new teachpoint for deck location 1.
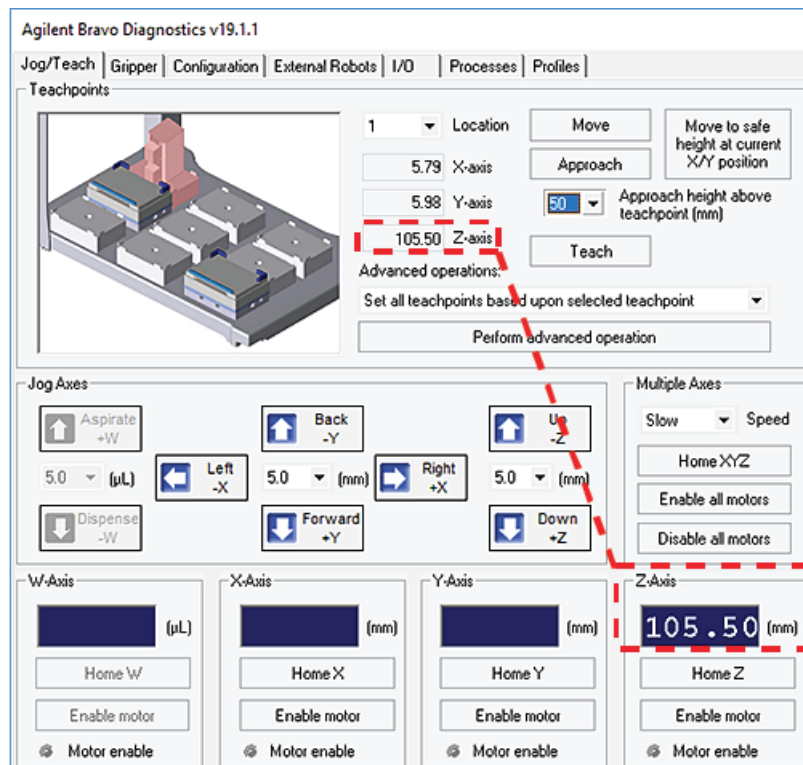
**8**    Click the **Move to safe height at current X/Y** position to remove the probes from the wash station chimneys, and return the head to the safe Z-height.

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

### Adjusting the teachpoint at deck location 2 for the Cartridge & Tip Seating Station

You adjust the teachpoint for deck location 2 to enhance the precision of the probes as they move into the cartridges or pipette tips in the Cartridge & Tip Seating Station.

| IMPORTANT | Ensure that no pipette tips or cartridges are seated on the Bravo 96AM Head. Ensure that the 250-µL tip remains selected as the Teaching tip type in the Profiles tab. |

*To adjust the teachpoint for the Cartridge & Tip Seating Station:*

**1**    Ensure that no labware is on the deck other than the wash station at deck location 1.

**2**    In the Bravo **Diagnostics Jog/Teach** tab, click **Location 2**.

**3**    Write down the value that appears in the **Z-axis** box for location 2. You will use this value in a later step.
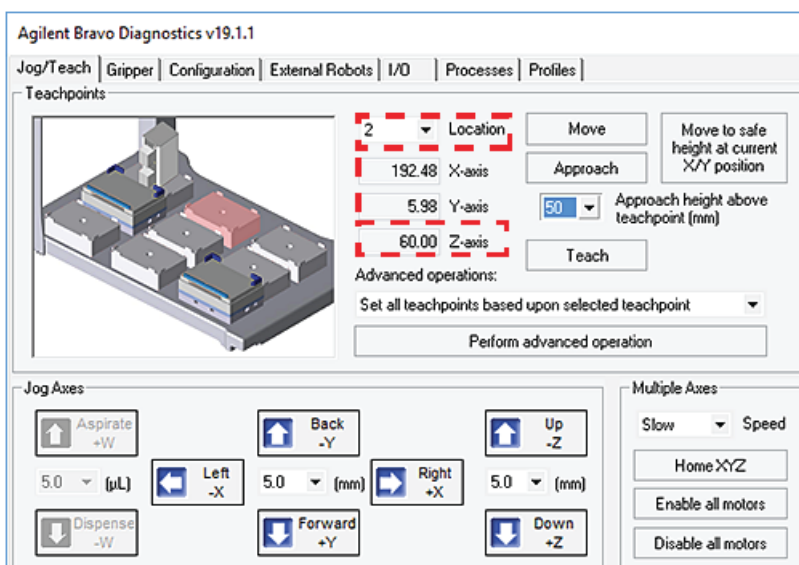


*Note:* Additional accessories will appear in the image if you have configured them in this profile.

**4**    In the **Approach height above teachpoint (mm)** list, select **50**, and then click **Approach**.

**5**    Using care to avoid touching the head probes, place the Cartridge & Tip Seating Station on the platepad at deck location 2. Ensure that the station is fully seated on the platepad.
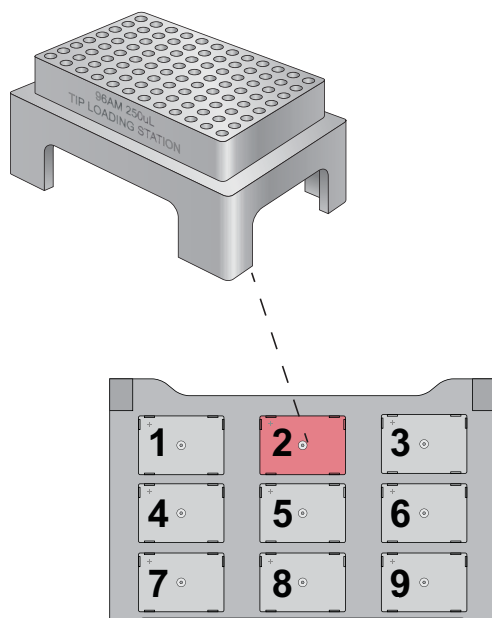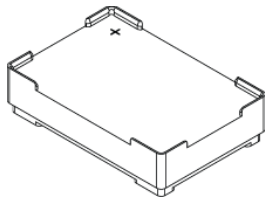
**6**   Carefully, use the **Jog Axes** controls to jog the head down incrementally to the Cartridge & Tip Seating Station.

**7**   When the syringe probes are just above the wells, use the **Jog Axes** controls for the *x*- and *y*-axes to position the probes so that they are perfectly centered within the openings of the corresponding wells in the Cartridge & Tip Seating Station.

**8**   When the probes are perfectly centered within the well openings:

**a**   Click **Teach** to save these values temporarily.

**b**   Click **Move to safe height at current X/Y position** to return the head to a safe *z*-axis height.

**9**   Remove the Cartridge & Tip Seating Station from the deck.

**10**   Carefully, use the **Down +Z** control to jog the head down incrementally until the value in the **Z-axis** box matches the value that you noted in step 3.

**11**   Click **Teach** to set the new teachpoint.

**12**   In the **Profiles** tab, click **Update this profile**.

# Teaching part 3: Updating other profiles based on AssayMAP 1

The AssayMAP Teachpoint Update protocol will guide you through the process of setting teachpoints for all other profiles in the Protein Sample Prep Workbench based on the AssayMAP 1 profile.

Several of the profiles included in the Protein Sample Prep Workbench require special teachpoint adjustments for accessories that will be placed on specific Bravo deck locations, which are listed in the following table. The AssayMAP Teachpoint Update protocol automatically makes these teachpoint adjustments.

***Table***   Special adjustments automatically performed by Teachpoint Update protocol

| Profile | Deck location | Teachpoint adjustments for accessories |
|---|---|---|
| GlykoPrep-Plus | 4 | Raises the teachpoint *z*-axis coordinate by 4.4 mm to accommodate the height of the Red PCR Insert on the Peltier Thermal Station.  |
| AssayMAP Normalization | 2, 6 | Raises the teachpoint *z*-axis coordinate by 28.5 mm at these deck locations to accommodate the height of the Bravo Plate Riser.  |

## Before you start

Ensure that you have completed the following procedures:

Ensure that you have the required resources:

- AssayMAP Teachpoint Update protocol (.pro) installed in the following location:

    C:\VWorks Workspace\Workbench\Protocols\AssayMAP Teachpoint Update v1p0.pro
- 250-µL pipette tip

**IMPORTANT**   Ensure that the pipette tip is new and in good condition.

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

## Starting the AssayMAP Teachpoint Update protocol

***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**.
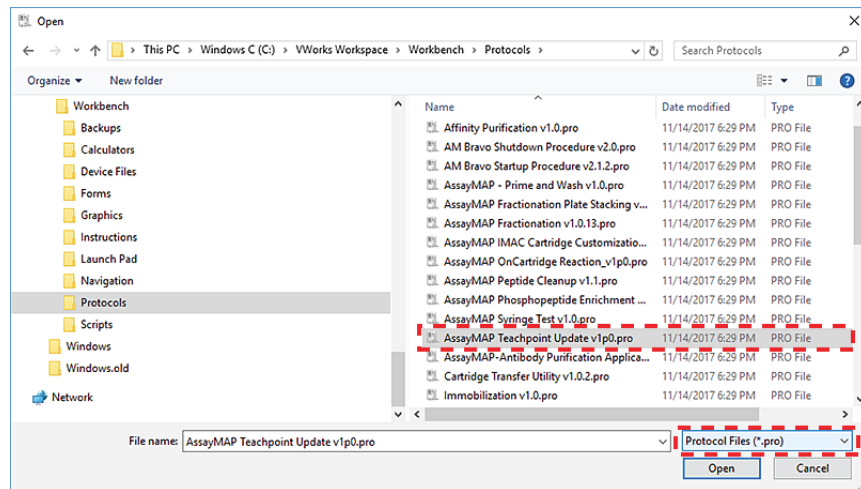


**3**  When the following VWorks initialization message appears, click **Yes**.
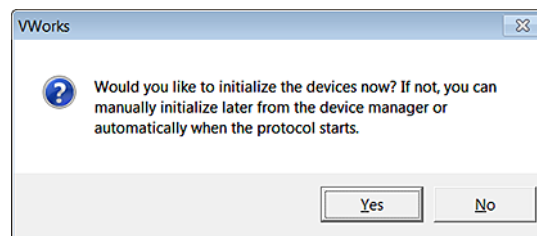


The AssayMAP Bravo.dev file opens, and the AssayMAP 1 profile initializes.

**4**  Ensure that the AssayMAP Teachpoint Update protocol is open in the VWorks window, and then click **Start**.
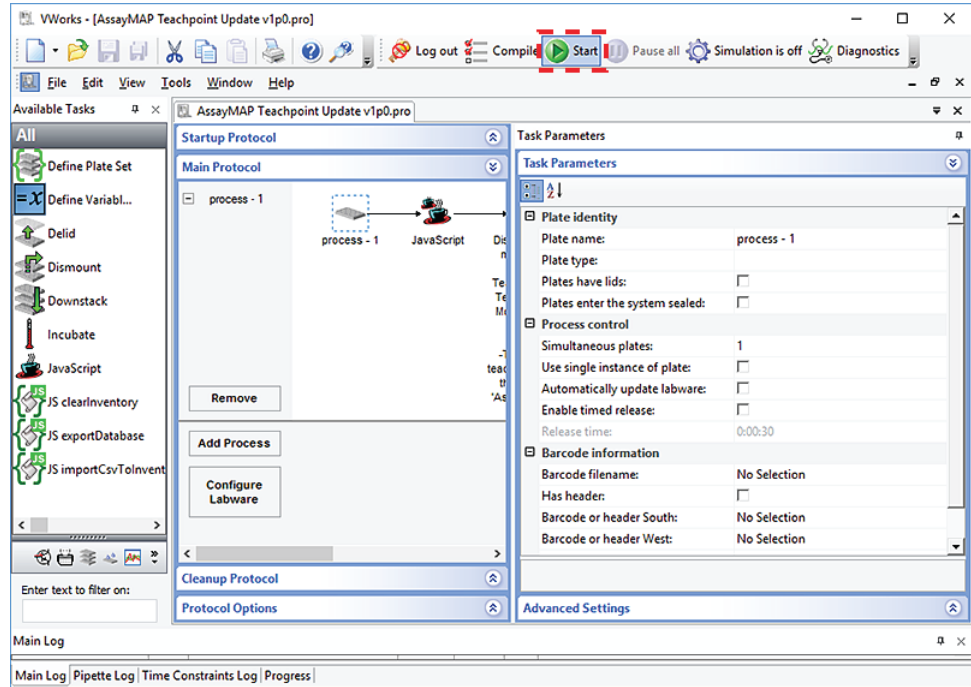
**5**  In the **Run Configuration** dialog box, click **Finish** to start the protocol.
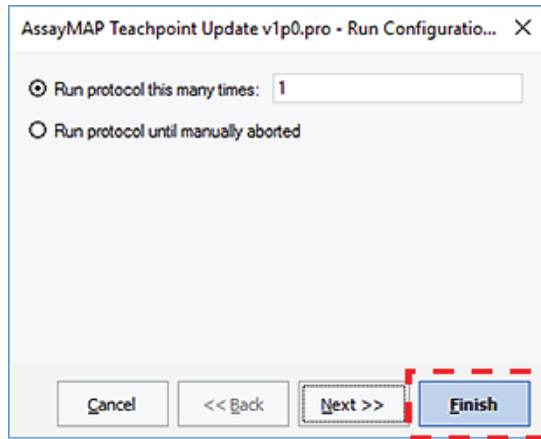


**6**  When the **Update Teachpoints** dialog box appears, click **Continue** update teachpoints in all the other workbench profiles based on the AssayMAP 1 profile.

**Update Teachpoints**

Teach Point Modification Utility:

-To modify teachpoints for the profile 'AssayMAP Bravo', click 'Pause & Diagnose' and then select 'Diagnostics'.

-To refresh teachpoints for all profiles based on the 'AssayMAP Bravo' profile click 'Continue'.

[ Pause and Diagnose ]    [ Continue ]
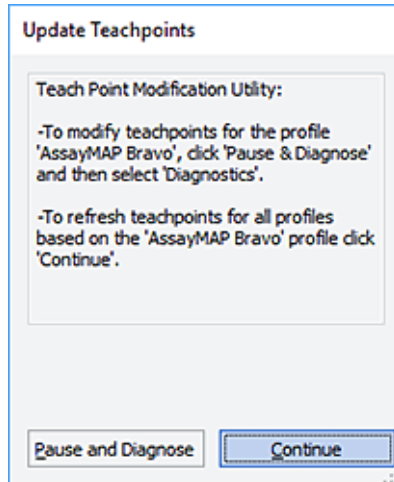
**7**   When the **WARNING** dialog box appears, click **Continue** to update the teachpoints in all the Workbench profiles based on the AssayMAP 1 profile teachpoints.

**WARNING**

The Teach Points for all AssayMAP Profiles included in the Protein Sample Prep Workbench will now be updated to reflect changes made in the AssayMAP 1 profile:

Are you sure that you want to Update the Teachpoints for All Profiles?

-To update all teachpoints, click 'Continue'

-To cancel the teachpoint update, click 'Pause & Diagnose' and then select 'Abort'.

[ Pause and Diagnose ]    [ Continue ]

**IMPORTANT**   After the protocol completes the update process, make sure that you verify the setup. See "Verification workflow" on page 84.

# Checking and adjusting the gripper offset

To pick up and place labware correctly, the gripper fingers must be positioned at equal distances from the long sides of the labware on a platepad.

**IMPORTANT**    Use the procedures in this section to adjust the gripper *y*-axis offset and test the gripper performance in every profile.

## Before you start

**IMPORTANT**    Before you adjust the gripper *y*-axis offset, ensure that the pipettor teachpoints (*x*-, *y*-, and *z*-axes) have been verified and no pipette tips or cartridges are installed on the head.

Make sure that:

- The Bravo gripper fingers are in good condition and aligned with the head. Perform a visual inspection to ensure the gripper fingers are not bent.
- The gripper pads (black rubber) are in place on the gripper fingers and in good condition. Ensure the gripper pads are not partially ripped off or pulled askew.

Use the following workflow:

| Step | Task | See … |
|------|------|-------|
| 1 | Initialize the AssayMAP 1 profile. | "Initializing the profile that you are verifying" on page 55 |
| 2 | Adjust the gripper y-axis offset, and then write down the **Y offset** value. | "Adjusting the gripper y-axis offset" on page 78 |
| 3 | Test the gripper pick-and-place operations. | "Testing the gripper pick-and-place operations" on page 81 |
| 4 | Initialize the next profile. | "Initializing the profile that you are verifying" on page 55 |
| 5 | Adjust the gripper y-axis offset using the **Y offset** value that you noted in step 2. | "Adjusting the gripper y-axis offset" on page 78 |
| 6 | Test the gripper pick-and-place operations. | "Testing the gripper pick-and-place operations" on page 81 |
| 7 | Repeat steps 4–6 for each of the remaining profiles. | — |

### Adjusting the gripper y-axis offset

Use deck location 8 (front center) for the following procedure.

**IMPORTANT**    Ensure that you use a standard platepad for the following procedure.

***To adjust the gripper y-axis offset:***

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

2  In the **Labware** list, select **None**.

3  In the deck image, click a deck location where a standard platepad is installed. The location should be easily accessible, for example in the front row or a corner.
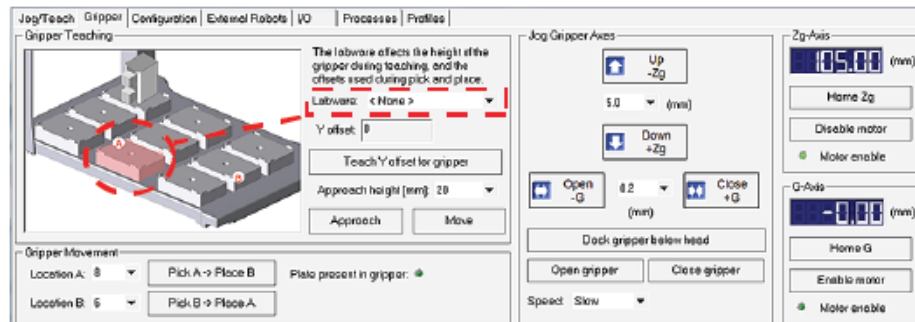


4  Click **Move** to move the gripper to the previously saved teachpoint for the selected location.

The Bravo head moves above the deck location, and the gripper assembly extends down (*Zg*-axis) so that the gripper fingers are just above the top surface of the platepad.

AssayMAP Bravo Platform Installation Guide
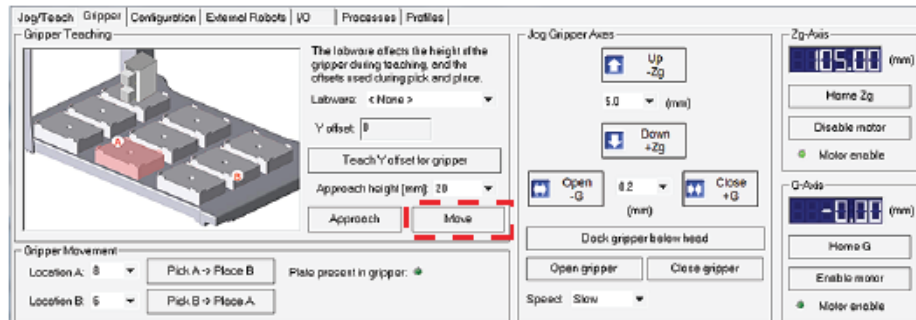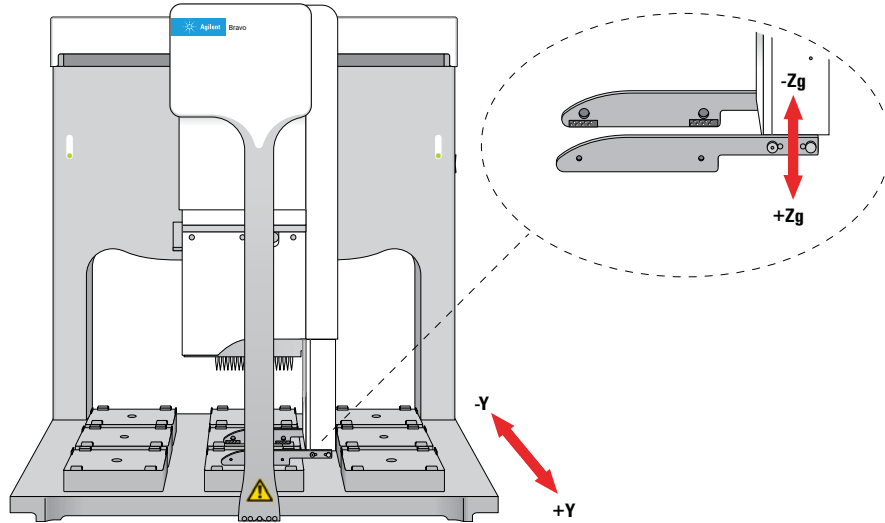
**5** Visually inspect the spacing between the black rubber gripper pads and the sides of the platepad (*y*-axis). Make sure that all the gripper pads have clearance so that the gripper can move down without colliding with the platepad.

*Figure*   Gripper pad clearance from sides of platepad (top view)
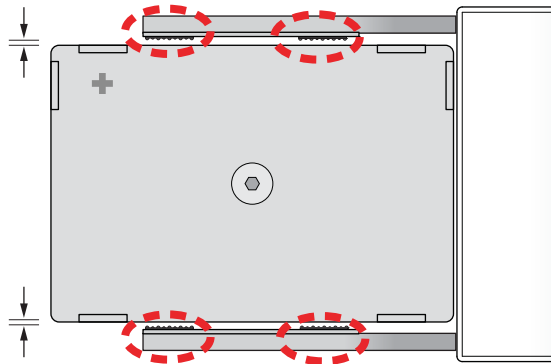


**6** If the gripper pads are touching or overlapping on one side of the platepad, do the following to adjust the clearance:

**a** Click the **Jog/Teach** tab, and ensure that the deck location you selected in step 3 is still selected.

**b** Under **Jog/Axes**, set the **Back -Y/Forward +Y** increment to a small enough size, such as 0.2 mm.

**CAUTION**   Make sure you use small enough jog increments to prevent any gripper collisions, which could damage the gripper.
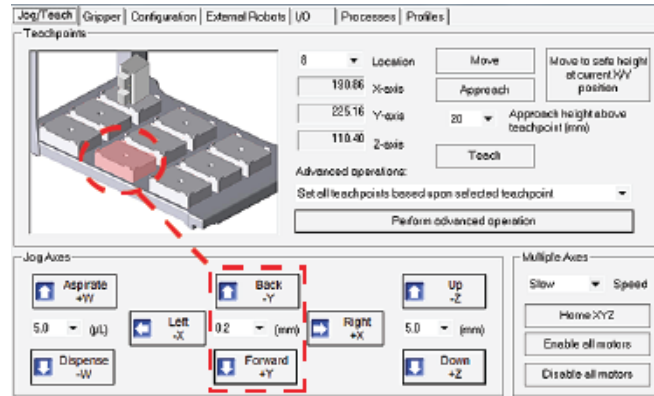
c   Click **Back -Y** or **Forward +Y** as required to adjust the gripper *y*-axis position so that the gripper pads will clear the sides of the platepad when you jog down in the next step.

When the following message appears, click **OK**.
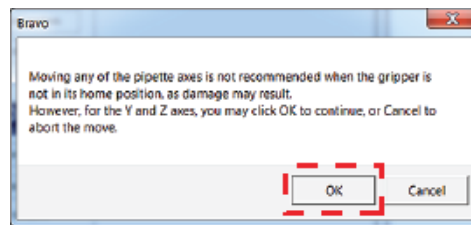


7   After ensuring that the gripper pads will not collide with the platepad, set the **Down +Z** increment to **5.0 mm**, and then click **Down +Z**.

**CAUTION**   **Make sure you do not jog the gripper down more than 5.0 mm at this stage. Jogging down farther will result in a gripper collision with the setscrew on the platepad, which could damage the gripper.**

When the following message appears, click **OK**.
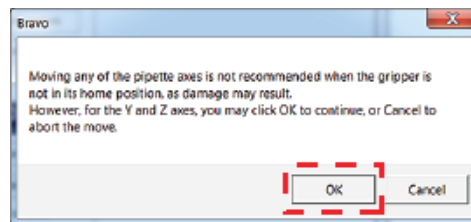


At this stage, the gripper fingers should be next to the sides of the platepad.

8   Fine tune the gripper alignment as follows:

a   In the **Gripper** tab, set the **Close +G** increment to a small value, such as 0.2 mm, and then click **Close +G** so that you can clearly see the alignment of the gripper pads with the platepad.
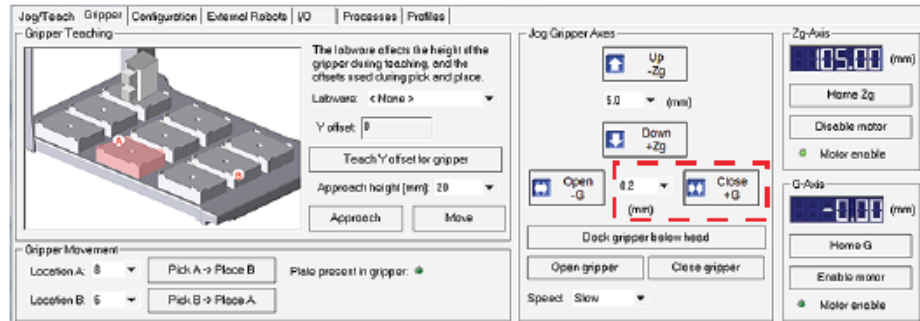
**IMPORTANT**   **Do not** click **Close gripper**. Otherwise, you must redo the procedure.

   **b**   In the **Jog/Teach** tab, set the *y*-axis increment to 0.2 mm, and then use the **Back -Y** and **Forward +Y** buttons to position the gripper so that the fingers are at equal distances around the platepad.

Ensure the pair of gripper pads on each side are as close as possible to the sides of the platepad without actually touching the platepad.

*Note:* If a gripper finger is not perfectly straight, one of its gripper pads may be closer than the other to the side of the platepad, as the following figure shows. In this case, adjust the *y*-axis using the gripper pad closest to the platepad and the diagonally opposite gripper pad for reference.

*Figure*   Example of diagonally opposite gripper pads (top view)
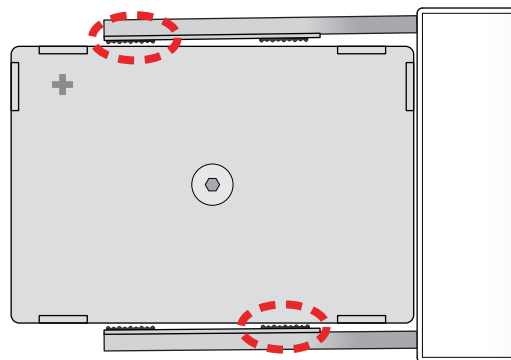


**9**   In the **Gripper** tab, click **Teach Y offset for gripper**.

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

*Note:* Write down the **Y offset** value. You can use this same value to update the remaining profiles.

## Testing the gripper pick-and-place operations

For this procedure, you will use the gripper to move a labware between deck locations 7 and 8.

Ensure that you have a microplate for this test, for example:

96 Greiner 650201, U-Bottom Standard, PolyPro

*To test the gripper pick-and-place operations:*

**1**  Place a microplate on a platepad at the deck location where you are starting the test.

**2**  In Bravo **Diagnostics**, click the **Gripper** tab.

**3**  In the **Labware** list, select the name of the labware type you are using.

**4**  Select the location for the move:

    **a**  In the **Location A** list, select the current deck location of the labware.

    **b**  In the **Location B** list, select the deck location to which the labware will move.

**5**  Set the **Speed** to **Slow**.

**6**  Click **Pick A -> B** to pick up the microplate from deck location A and place it on deck location B. Click **Pick B -> A** to pick up the microplate from deck location B and place it on deck location A.
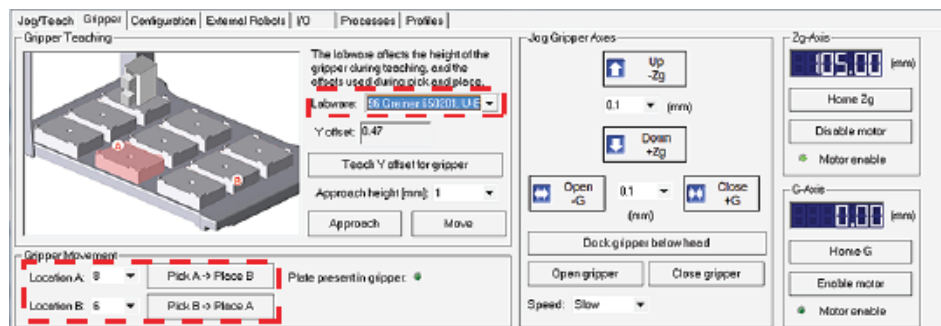


**7**  Repeat steps 4 and 6 for the remaining deck locations where the gripper will be transferring labware.

**8**  Set the **Speed** to **Fast**, and repeat steps 4, 6, and 7.

**9**  Make sure that the gripper holds the microplate securely and keeps it level while moving the microplate from location to location.

If the gripper performs the operation without problem, no further adjustment is required.

If the gripper has problems performing the operations, the solution to the problems depends on the cause. Carefully inspect the gripper finger alignment and the condition of the gripper pads. Ensure that the labware definition is correct for the selected labware. See the *Bravo Platform User Guide* or the *Bravo Platform Service Guide* for details.

# 5 Verifying the installation and setup

# Verification workflow

After the AssayMAP Bravo Platform is set up in the VWorks software, perform the following steps in the order given to verify the installation and setup.

| Step | For this task... | See... |
|------|------------------|--------|
| 1 | Ensure that the Light Curtain, pendant, and shields are installed. | "About installing the Bravo pendant, Light Curtain, and shields" on page 84 |
| 2 | Open the Protein Sample Prep Workbench and access the Utility Library. | "Opening the Workbench and accessing the utilities" on page 86 |
| 3 | Run the Startup utility. | "Running the Startup utility" on page 87 |
| 4 | Test the safety equipment. | "Testing the safety equipment" on page 89 |
| 5 | Run the Syringe Wash utility for 60 cycles. | "Washing the syringes to prepare for first time use" on page 91 |
| 6 | Perform a test run of the Affinity Purification protocol. | "Performing a test run" on page 93 |
| 7 | Run the Syringe Test utility. | "Running the Syringe Test utility" on page 103 |
| 8 | Run the Shutdown utility. | "Running the Shutdown utility" on page 104 |

# About installing the Bravo pendant, Light Curtain, and shields

**WARNING**  **Moving-parts hazards are accessible through the front, rear, and side openings of the Bravo Platform. To prevent potential injury, ensure that the safety equipment is installed and in good working condition.**

Ensure that the following are installed properly. For instructions, see the *Bravo Platform Safety and Installation Guide*.

- *Emergency-stop pendant.* Ensure that the pendant and its cable are in good condition and connected to the Pendant port on the junction box.
- *Light Curtain.* Ensure the lightpost transmitter (TX) and receiver (RX) cables are connected and that the light beams are aligned correctly.
- *Bravo front, side and rear shields.* Ensure that the accessory tubing and cabling is routed off the Bravo deck through the access windows in the side and rear shields.

**Figure**    AssayMAP Bravo Platform with Light Curtain and emergency-stop pendant
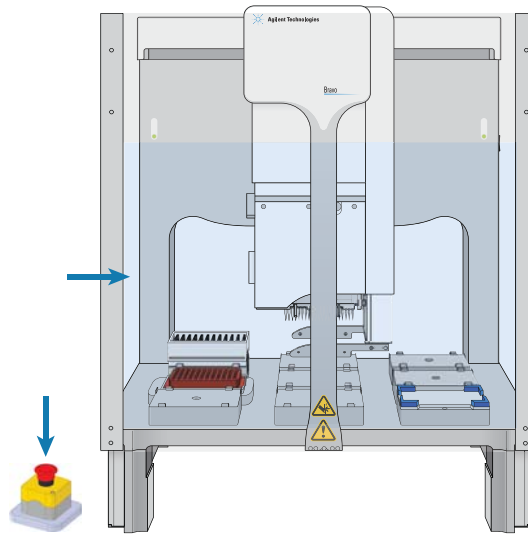


**Figure**    Bravo rear shield with access window covers installed
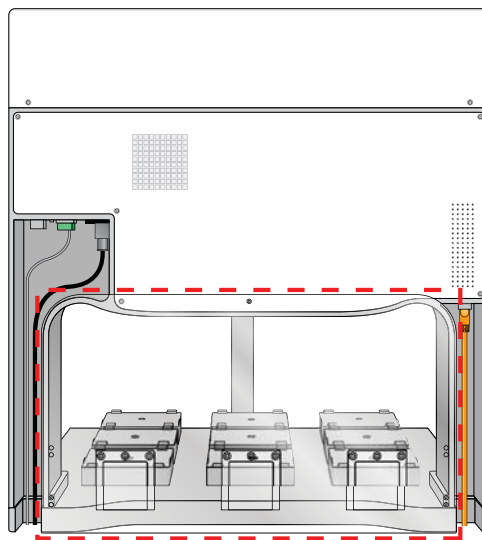
# Opening the Workbench and accessing the utilities

## Opening the Protein Sample Prep Workbench

*To open the Protein Sample Prep Workbench:*

On the Windows desktop, double-click the Protein Sample Prep Workbench icon.



Alternatively, on the Windows desktop, click **Start** ▦ **> Agilent Technologies > Protein Sample Prep Workbench**.
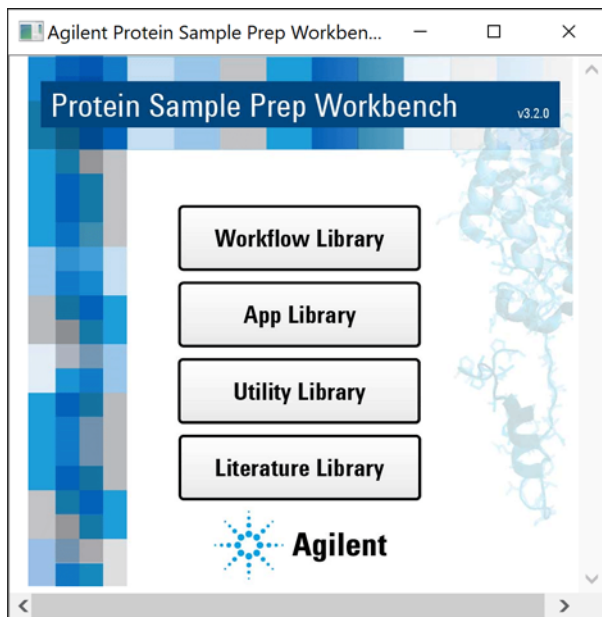


## Accessing a workbench utility

*To access a utility:*

1   In the Protein Sample Prep Workbench, do one of the following:

   • If you have not yet logged in, click **Utility Library**. The VWorks software starts, and then the User Authentication dialog box opens.
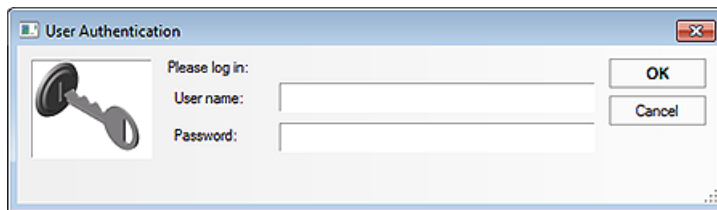
   

   Type your VWorks user name and password, and then click **OK**.

*Note:* The default login user name is `administrator`.
The default password is `administrator`.

- If you have already logged in to the software, click the **Utility Library** button in any of the other libraries of the Protein Sample Prep Workbench.

**2**   In the **Utility Library**, locate the name of the utility you want to use, and then click **Utility** to open the utility.

***Figure***   Utility Library in the Protein Sample Prep Workbench
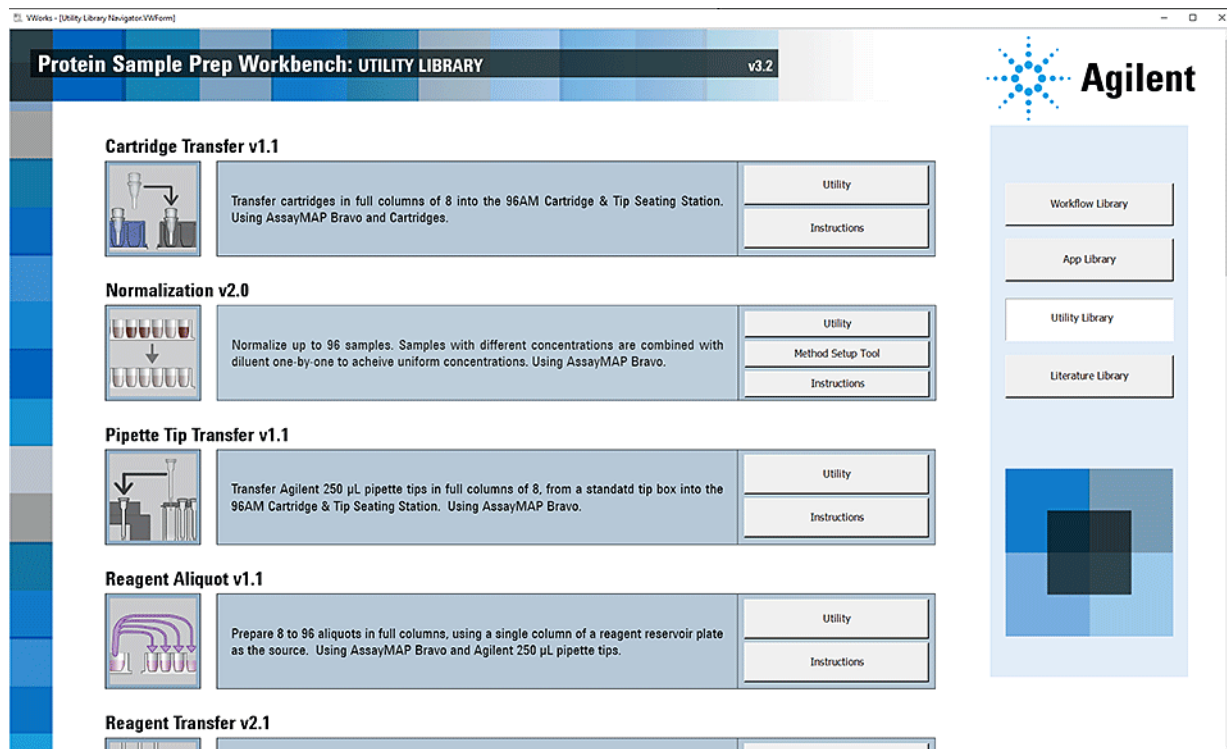


**3**   Click **Instructions** to display the user guide for the corresponding utility.

# Running the Startup utility

**WARNING**   If you touch any of the moving parts or attempt to move labware while the Bravo Platform is in operation, the device could pinch, pierce, or bruise you. Keep your fingers, hair, clothing, and jewelry away from the device while it is in motion.

The Startup utility initializes the AssayMAP Bravo Platform and primes the wash lines from the Pump Module.

***To run the Startup utility:***

**1**   Open the **Utility Library**, locate the **System Startup/Shutdown** utility, and then click **Utility**.

**System Startup/Shutdown v2.2**

Conduct startup and shutdown procedures for the AssayMAP Bravo. Using AssayMAP Bravo.

Utility
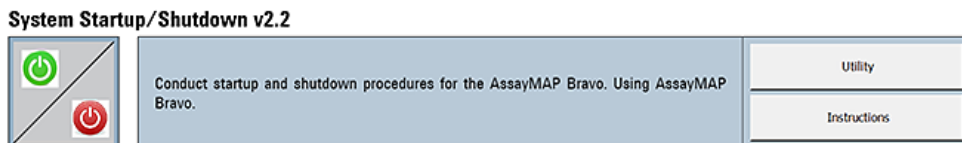
Instructions

**2**  Click **Instructions**.

**3**  Follow the instructions to run the Startup utility.

Use the following settings to provide plenty of time to prime the lines and observe the flow through the wash station chimneys:

| Startup Options | Value | |
|---|---|---|
| Number of Syringe Wash Cycles | 3 | |
| Wash Station Prime Duration | 60 | sec |

**4**  During the priming step, ensure that fluid flows out of the top of each chimney. Check for any damaged chimneys in the wash station.

Click **Continue** to complete the Startup protocol.

When all the chimneys are flowing, the device is ready for operation.

| Troubleshooting problems | Probable cause and solution |
|---|---|
| Fluid does not flow out of a chimney. | A trapped air bubble can block the fluid flow out of a chimney.<br><br>***To clear the bubble:***<br><br>**1**  Form a seal between the top of the problematic chimney and a 1000-µL pipette, and then draw the liquid out at a medium speed.<br><br>**2**  Run the Startup protocol again to determine if the bubble was successfully removed.<br><br>**3**  Repeat if necessary. |
| Chimney deformity or irregularity | Chimney irregularities can result from a collision between the head and the wash station.<br><br>To replace damaged chimneys, see the instructions in the *96 Channel Wash Station Maintenance Guide*. |

# Testing the safety equipment

## Performing an emergency stop to test the safety equipment

The AssayMAP Bravo Platform has a safety interlock circuit that is designed to protect operators from moving-parts hazards. The interlock circuit must be closed for the AssayMAP Bravo Platform to operate. The pendant and the Light Curtain are connected to the interlock circuit. Pressing the red button on the pendant or interrupting the Light Curtain trips the interlock circuit, causing the motion of the Bravo head to stop.

**CAUTION** **Using the safety interlock to stop the Bravo Platform might result in an interrupted protocol run that cannot be resumed or recovered. Do not interrupt the Light Curtain or press the red button on the pendant to perform a routine stop. To pause and continue a run, use the Pause button in the form. For detailed instructions on how to recover from errors, see the** *AssayMAP Bravo Platform Error Recovery Guide*.

*To test the emergency stop feature:*

1   Open the **Utility Library**, locate the **Cartridge Transfer** utility, and then click **Utility**.
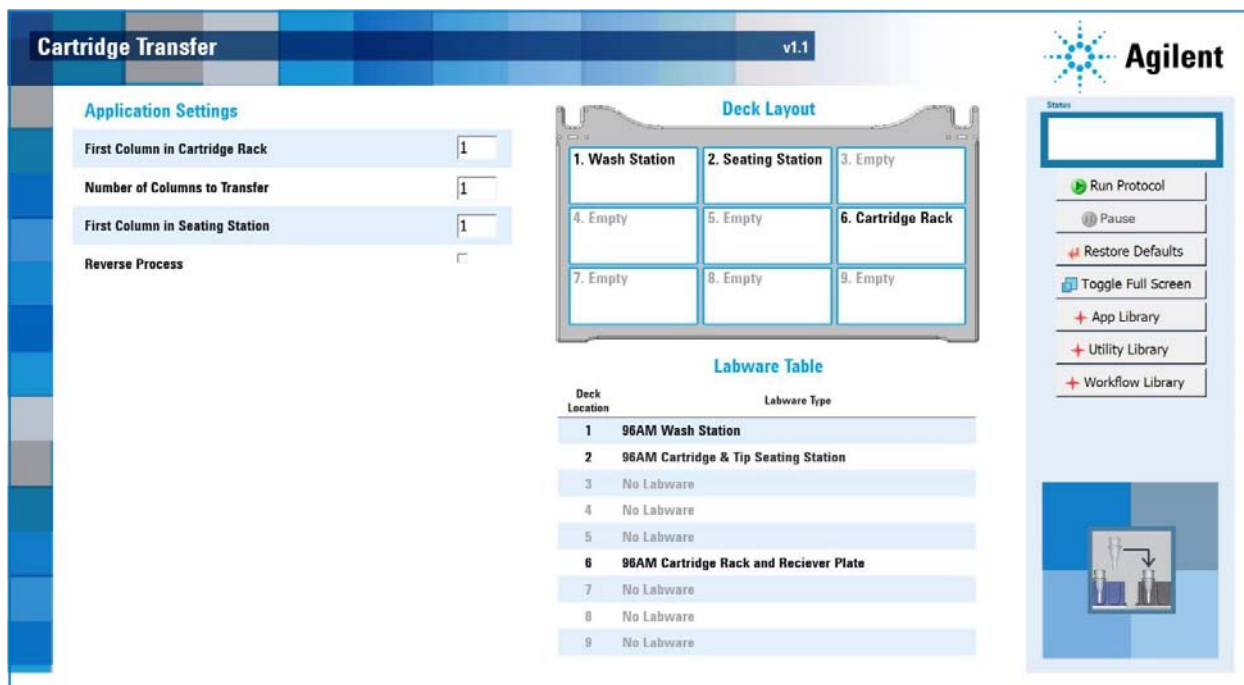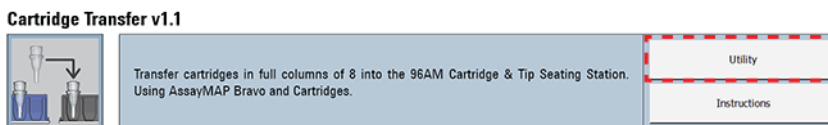
**2**   In the **A. Application Settings** area, specify the following settings for the run:

| Setting | Value |
| --- | --- |
| First Column in Cartridge Rack | 1 |
| Number of Columns to Transfer | 12 |
| First Column in Seating Station | 1 |

**3**   Click **Run Protocol** to start the run.

**4**   As soon as the Bravo head starts to move away from its position above the wash station and towards deck location 6, press the red button on the pendant.
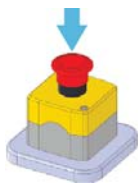


The Bravo head stops moving and an error message appears.

**5**   To recover from the emergency stop:

**a**   At the emergency-stop pendant, turn the red button clockwise. The spring-loaded button pops up.
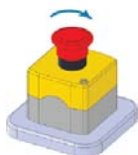


**b**   In the **AssayMAP** Bravo **Error** dialog box, click **Abort** to end the protocol.

**c**   Run the Startup utility again to reset the system. For details, see "Running the Startup utility" on page 87.

**6**   Click **Run Protocol** to start another run.

**7**   As soon as the Bravo head starts to move away from its position above the wash station and towards deck location 6, use a pencil to interrupt the Light Curtain.

The Bravo head stops moving and an error message appears.

**8**   To recover from the emergency stop:

**a**   Ensure that no objects are in the path of the Light Curtain.

**b**   In the **AssayMAP** Bravo **Error** dialog box, click **Abort** to end the protocol.

**c**   Run the Startup utility again to reset the system. For details, see "Running the Startup utility" on page 87.

# Washing the syringes to prepare for first time use

Use the following procedure to prepare the new syringes for use. The procedure primes and washes the syringes for 60 cycles.

## Before you start

Ensure that you have the following required materials.

| Item | Name (manufacturer and part number) |
|------|--------------------------------------|
| One labware for wash buffer | Use one of the following labware:<br>• Reservoir, Seahorse 201254-100, PP, no walls, pyramid bottom (Agilent 201254-100)<br>• 12-Column Low-Profile Reservoir (Agilent 201280-100)<br>• 8-Row Low-Profile PolyPro Reservoir (Agilent 201282-100) |
| Deionized water | Not applicable |

## Procedure

***To prime and wash the syringes:***

**1** Set up the Wash Buffer Reservoir as follows:

   **a** Fill one of the following labware with the corresponding amount of deionized water.

| Labware | Minimum volume (mL) |
|---------|---------------------|
| Reservoir, Seahorse 201254-100, PP, no walls, pyramid bottom | 50 mL |
| 12-Column, Low-Profile Reservoir | 6 mL/column |
| 8-Row Low-Profile PolyPro Reservoir | 8 mL/row |

   **b** Place the filled labware on Bravo deck location 4.
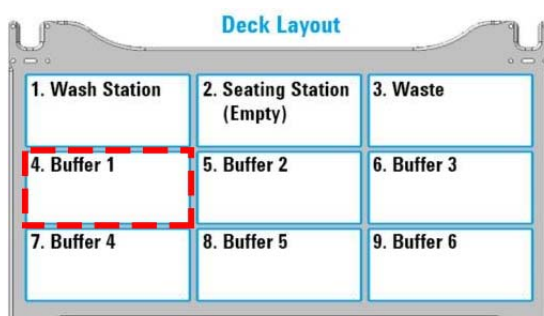


**2** Ensure that the deck is clear of other labware, except the wash station at deck location 1 and the 96AM Cartridge & Tip Seating Station at deck location 2.

Make sure the 96AM Cartridge & Tip Seating Station empty. (The station should not contain cartridges or pipette tips.)

**3** Open the **Syringe Wash** utility  .



**4** In the **Labware Table** area, select the labware for **Deck Location 4** that matches the filled labware from step 1.

*Note:* Deck locations 3 and 5–9 will not be used in this configuration. Leave the labware selections at the default setting for these locations. Do not place labware on the deck at these locations.

**5** Under **Wash Settings**, set the following:

| Setting | Value |
| --- | --- |
| Initial Syringe Washes | 0 |
| Final Syringe Washes | 0 |

*AssayMAP Bravo Platform Installation Guide*

**6** For **Wash 1**, set the following:

| | Buffer | Wash Type | Volume (μL) | Cycles | Rinse after Each Cycle | Flow Rate (μL/sec) | Wash Cycles |
|---|---|---|---|---|---|---|---|
| Wash 1 | 1 | Cycle in Reservoir ▾ | 250 | 20 | ☐ | 200 | 0 |

| Setting | Value |
|---|---|
| Buffer | 1 |
| Wash Type | Cycle in Reservoir |
| Volume (μL) | 250 |
| Cycles | 20 |
| Rinse after Each Cycle | Clear the check box |
| Wash Rate (μL/sec) | 200 |
| Wash Cycles | 0 |

**7** For **Wash 2**–**Wash 6**, set **Wash Cycles** to **0**.

**8** Click **Run Protocol**.

**9** After the protocol finishes, leave everything in place, and click **Run Protocol** again.

**10** After the protocol finishes, leave everything in place, and click **Run Protocol** for the third time.

# Performing a test run

To verify that the profile is configured and taught correctly for the installed hardware, you should perform a test run of the Affinity Purification protocol. For the test run, you use the AssayMAP Resin-Free cartridges instead of packed cartridges, and you do not use any labware on the Bravo deck.

## Before you start

Ensure that you have the required materials.

***Table*** Required materials

| Item | Part number |
|---|---|
| AssayMAP Resin-Free cartridge rack<br>*Note:* The protocol will not run if the cartridges are missing.<br><br>**IMPORTANT** Ensure that these resin-free cartridges are **not** the ones from the AssayMAP Syringe Test Kit. Using damaged resin-free cartridges for the AssayMAP syringe test could impact the syringe test results. | Agilent G5496-60009 |
| Deionized water in the source bottle for the Pump Module | Not applicable |

## Transferring the cartridges to the 96AM Cartridge & Tip Seating Station

The cartridges must be in the Cartridge & Tip Seating Station before you run the Affinity Purification protocol. You can use the Cartridge Transfer utility to move full columns of AssayMAP Cartridges from the cartridge rack to the Cartridge & Tip Seating Station.

### Before you start

Make sure the Bravo deck is set up as follows:

- The empty Cartridge & Tip Seating Station is at deck location 2.
- The 96AM Cartridge Rack and Receiver Plate is at deck location 6 and contains 12 full columns of 8 cartridges each. Make sure you remove the lid.
- The 96AM Wash Station or the later model 96 Channel Wash Station is at deck location 1.
- All other deck locations are empty.

*Figure*    Bravo deck layout (top view)
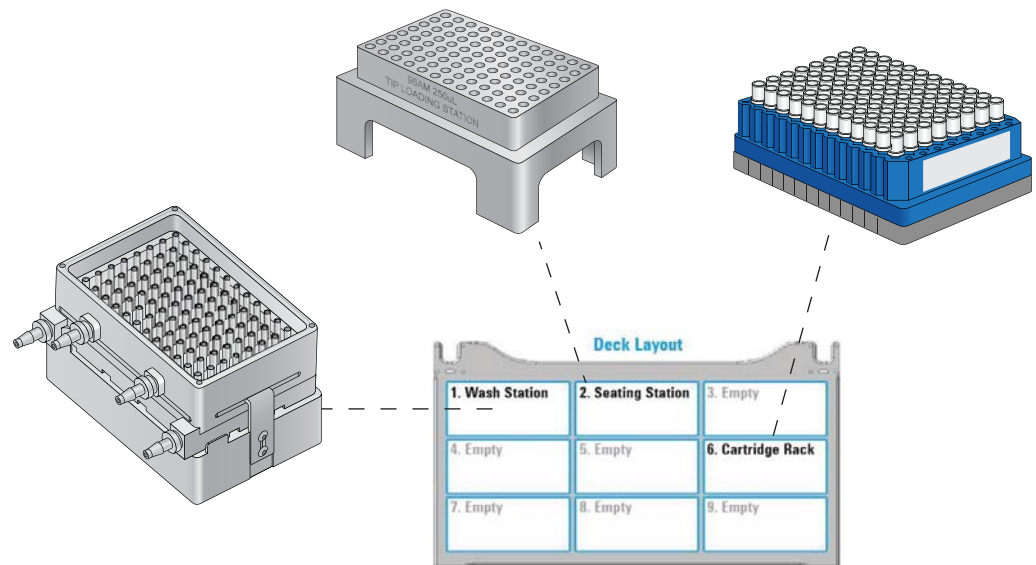


### *To transfer the cartridges:*

**1**  Open the **Utility Library**, locate the **Cartridge Transfer** utility, and then click **Utility**.

2   In the **Application Settings** area, specify the following settings for the run:

| Setting | Value |
| --- | --- |
| First Column in Cartridge Rack | 1 |
| Number of Columns to Transfer | 12 |
| First Column in Seating Station | 1 |

3   Confirm that the physical layout on the AssayMAP Bravo deck matches the **Deck Layout** and **Labware Table** sections of the form.

4   Ensure that the labware are properly seated in the platepads.

**CAUTION**   Improperly seated labware can cause a hardware collision, resulting in equipment damage. Ensure that all labware are properly seated within the alignment features of their respective platepads.

5   Click **Run Protocol** to start the run.

To monitor the progress of the run, check the **Status** box in the upper right corner of the form.

6   When the run is finished, remove the 96AM Cartridge Rack and Receiver Plate from deck location 6.

## Performing a test run of the Affinity Purification protocol

| IMPORTANT | For this test run, you will not use any additional labware. Ensure that the only items on the deck are the wash station at deck location 1 and the Cartridge & Tip Seating Station containing the Resin-Free cartridges at deck location 2. |
|---|---|

*To perform a test run of the Affinity Purification protocol:*

1   In the **Protein Sample Prep Workbench**, open the **App Library** and locate **Affinity Purification**. Click **App** to open the application.

**Affinity Purification v2.0**

| | This is the recommended Affinity Purification application. Enrich for target molecules using Protein A, Protein G, or user-defined affinity cartridges. All reagents flow from the cup to the tip of the cartridges in dispense mode. Using AssayMAP Bravo and Cartridges. | App |
|---|---|---|
| | | Quick Start Guide |
| | | Calculator |

The Affinity Purification application opens.
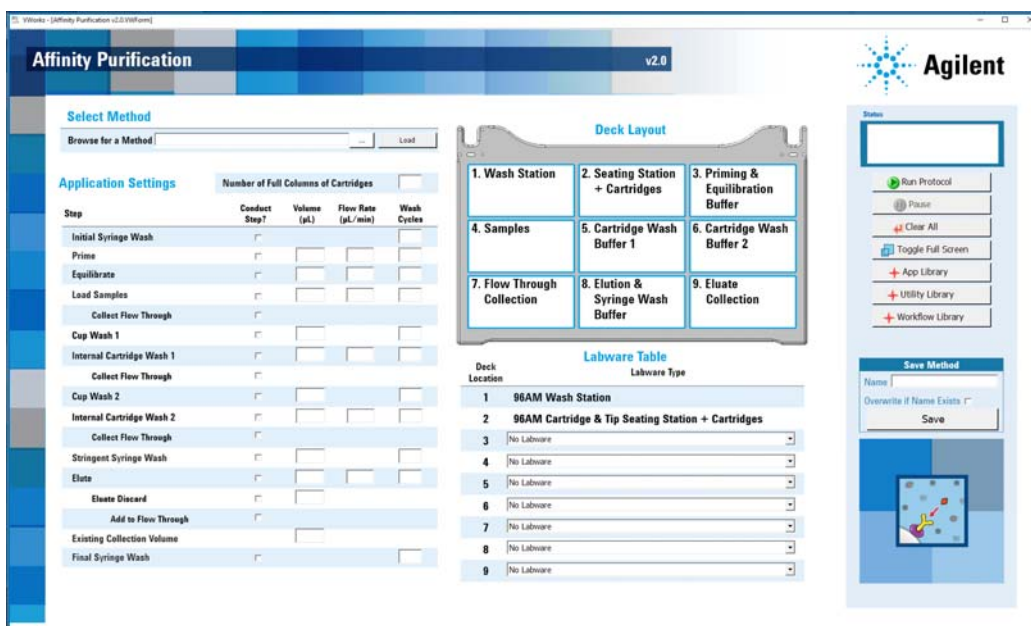


2   Under **Select Method**, click [ ... ]. In the **Open** dialog box, locate following folder:

C:/VWorks Workspace/Methods/AM Affinity Purification 2.0

Select the following method file for the standard size cartridge:

5uL Cartridge Default Settings.js
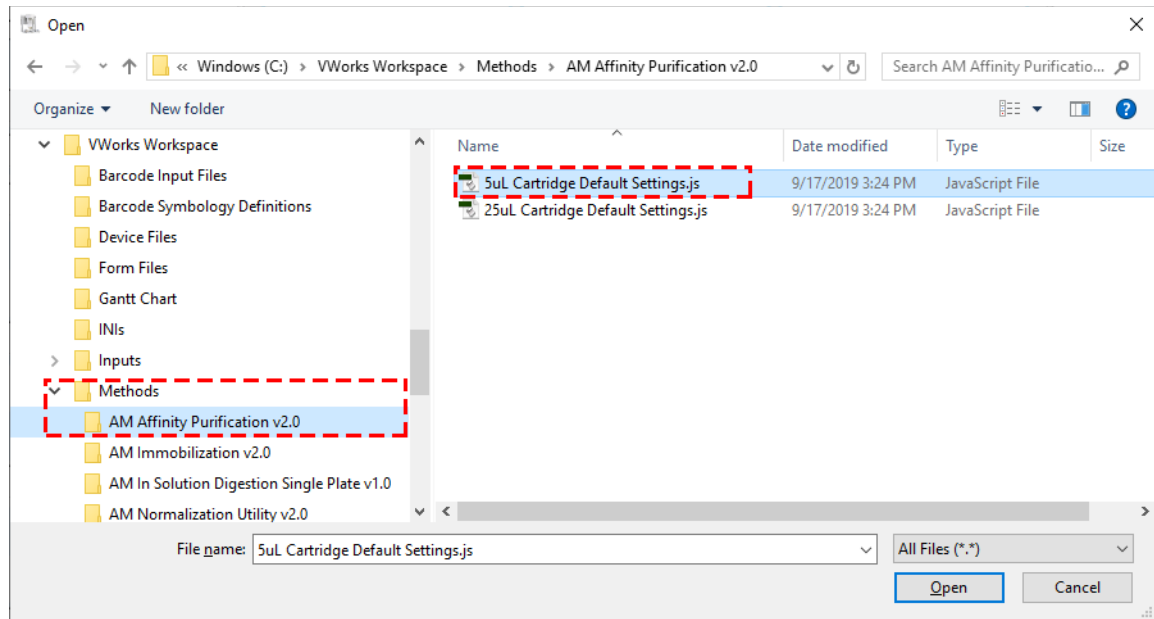
In the Affinity Purification form, click **Load** to display all the settings associated with the selected method.



**3**    Make sure the **Status** box displays the **5uL Cartridge Default Settings loaded successfully** message.

**4** Under **Application Settings**, change the settings as shown in the following figure:

**Application Settings** — Number of Full Columns of Cartridges: 12

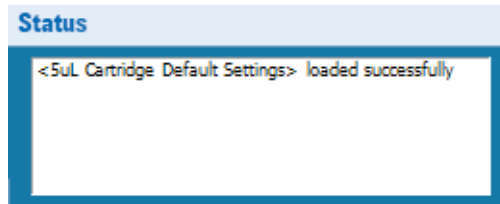| Step | Conduct Step? | Volume (µL) | Flow Rate (µL/min) | Wash Cycles |
|---|---|---|---|---|
| Initial Syringe Wash | ✔ | | | 1 |
| Prime | ✔ | 100 | 500 | 1 |
| Equilibrate | ✔ | 50 | 500 | 1 |
| Load Samples | ✔ | 100 | 500 | 1 |
| Collect Flow Through | ✔ | | | |
| Cup Wash 1 | ✔ | 25 | | 1 |
| Internal Cartridge Wash 1 | ✔ | 50 | 500 | 1 |
| Collect Flow Through | ☐ | | | |
| Cup Wash 2 | ✔ | 25 | | 1 |
| Internal Cartridge Wash 2 | ✔ | 50 | 500 | 1 |
| Collect Flow Through | ☐ | | | |
| Stringent Syringe Wash | ✔ | 50 | | 1 |
| Elute | ✔ | 25 | 500 | 1 |
| Eluate Discard | ☐ | 0 | | |
| Add to Flow Through | ☐ | | | |
| Existing Collection Volume | | 0 | | |
| Final Syringe Wash | ✔ | | | 1 |

**a** Set the **Number of Full Columns of Cartridges** to **12**.
**b** Set the **Flow Rate (µL/min)** to **500** for each applicable step
**c** Set the **Wash Cycles** to **1**.

**5** In the **Labware Table** area, use the default settings for the labware selections.

**Labware Table**

| Deck Location | Labware Type |
|---|---|
| 1 | 96AM Wash Station |
| 2 | 96AM Cartridge & Tip Seating Station + Cartridges |
| 3 | 12 Column, Low Profile Reservoir, Natural PP |
| 4 | 96 Eppendorf 30129300, PCR, Full Skirt, PolyPro |
| 5 | 12 Column, Low Profile Reservoir, Natural PP |
| 6 | 12 Column, Low Profile Reservoir, Natural PP |
| 7 | 96 Eppendorf 30129300, PCR, Full Skirt, PolyPro |
| 8 | 12 Column, Low Profile Reservoir, Natural PP |
| 9 | 96 Eppendorf 30129300, PCR, Full Skirt, PolyPro |

6   Click **Run Protocol** to start the run.

The protocol run starts and checks for conflicting step selections. The protocol with the 500-µL/min flow rate should take less than 15 minutes to complete.

7   During the test run, observe the automation movements of the Bravo 96AM Head to assess whether any problems occur. Make a note of any problems. See the following table for the sequence of movements.

To monitor the progress of the run, check the **Status** box.

To pause the run, click **Pause**. The task currently in progress finishes before the protocol pauses.

You can use the Cartridge Transfer utility to transfer the cartridges from the seating station back to the cartridge rack.

*Table*   Automation movements during the Affinity Purification protocol

| Protocol step | Head moves to deck location... | Action |
|---|---|---|
| Start protocol | 2 | Parks any cartridges that may have been mounted on the head from a protocol that had been previously aborted. |
| | 1 | Dispenses any liquid remaining in the syringes into the wash station. |
| Initial Syringe Wash | 1 | Washes the syringes the specified number of times. |
| Prime | 3 | Aspirates 10 µL of Priming Buffer for the cartridge air-gap prevention step. |
| | 2 | Dispenses the 10 µL of buffer into the cartridge cups and exercises the cartridges off task. |
| | 3 | Aspirates the Priming Buffer. |
| | 2 | Mounts the cartridges on the head. |
| | 1 | Dispenses the Priming Buffer through the cartridges into the wash station. |
| | 2 | Parks the cartridges in the seating station. |
| | 1 | Washes the syringes at the wash station. |
| Equilibrate | 3 | Aspirates the Equilibration Buffer. |
| | 2 | Mounts the cartridges on the head. |
| | 1 | Dispenses the Equilibration Buffer through the cartridges to equilibrate. |
| | 2 | Parks the cartridges in the seating station. |
| | 1 | Washes the syringes at the wash station. |

| Protocol step | Head moves to deck location... | Action |
| --- | --- | --- |
| Load Samples | 4 | Aspirates samples into the syringes. |
| | 1 | Washes the exterior of the syringe probes at the wash station. |
| | 2 | Mounts the cartridges on the head. |
| | 7 | Dispenses sample through the cartridges to load sample. Collect flow-through in the Flow Through Collection plate. |
| | 1 | Washes the cartridge exteriors at the wash station. |
| | 2 | Parks the cartridges at the seating station. |
| | 1 | Washes the syringes at the wash station. |
| Cup Wash 1 | 5 | Aspirates Cartridge Wash Buffer 1 into the syringes. |
| | 2 | Performs the cup wash and exercises the cartridges off task. |
| | 1 | Dispenses the buffer at the wash station. |
| | 1 | Washes the syringes at the wash station. |
| Internal Cartridge Wash 1 | 5 | Aspirates 10 µL of Cartridge Wash Buffer 1 for the cartridge air-gap prevention step. |
| | 2 | Dispenses the 10 µL of buffer into the cartridge cups and exercises the cartridges off task. |
| | 5 | Aspirates Cartridge Wash Buffer 1 into the syringes. |
| | 2 | Mounts the cartridges on the head. |
| | 1 | Dispenses 25 µL Cartridge Wash Buffer 1 through the cartridges at the Load Samples flow rate for the sample chase step. |
| | 1 | Dispenses Cartridge Wash Buffer 1 through the cartridges for the Internal Cartridge Wash step. |
| | 1 | Washes the exterior of the cartridge tips at the wash station. |
| | 2 | Parks the cartridges at the seating station. |
| | 1 | Washes the syringes at the wash station. |
| Cup Wash 2 | 6 | Aspirates Cartridge Wash Buffer 2 into the syringes. |
| | 2 | Performs a cup wash and exercises the cartridges off task. |
| | 1 | Dispenses buffer at the wash station. |
| | 1 | Washes the syringes at the wash station. |

| Protocol step | Head moves to deck location... | Action |
|---|---|---|
| Internal Cartridge Wash 2 | 6 | Aspirates 10 µL of Cartridge Wash Buffer 2 for the cartridge air-gap prevention step. |
| | 2 | Dispenses the 10 µL of buffer into the cartridge cups and exercises the cartridges off task. |
| | 6 | Aspirates Cartridge Wash Buffer 2 into the syringes. |
| | 2 | Mounts the cartridges on the head. |
| | 1 | Dispenses Cartridge Wash Buffer 2 through the cartridges. |
| | 1 | Washes the exterior of the cartridge tips at the wash station. |
| | 2 | Parks the cartridges at the seating station. |
| | 1 | Washes the syringes at the wash station. |
| Stringent Syringe Wash | 8 | Aspirates the Stringent Syringe Wash Buffer (Elution Buffer). |
| | 1 | Dispenses the buffer at the wash station. |
| | 1 | Washes the syringes at the wash station. |
| Elute | 8 | Aspirates the Elution Buffer. |
| | 2 | Mounts the cartridges. |
| | 9 | Elutes the samples into the Eluate Collection plate. |
| | 1 | Washes the cartridge exteriors at the wash station. |
| | 2 | Parks the cartridges at the seating station. |
| | 9 | Mixes eluates. |
| | 1 | Washes the syringes at the wash station. |
| | 2 | Aspirates excess liquid from the cartridge cups, and exercise the Cartridges Off mechanism. |
| | 1 | Dispenses liquid to waste and perform a syringe wash at the wash station. |
| Final Syringe Wash | 1 | Washes the syringes at the wash station. |

# Running the Syringe Test utility

You use the AssayMAP Syringe Test Kit to evaluate all the syringes in the head concurrently while the Bravo 96AM Head is mounted on the AssayMAP Bravo Platform.

## Required reagents, labware, and equipment

| Item | Required items | Description | Part number |
|------|----------------|-------------|-------------|
| 1 | Syringe Test Kit | Contains materials and reagents to perform 20 tests of the 96 syringes in the Bravo 96AM Head. | G5496-60050 |
| 2 | 96-well microplate, (2 per test) | Flat bottom, clear polystyrene microplate for test sample collection. | • Greiner 655101<br>• Nunc 269620<br>• Corning 9017 |
| 3 | Open reservoir, (2 per test) | Open reservoir to hold water and diluted test solution. | • Agilent G5498B #049<br>• Agilent 201254-100<br>• Axygen RES-SW96-LP |
| 4 | Microplate centrifuge | Centrifuge with a microplate rotor capable of achieving 500 x g | Not applicable |
| 5 | Microplate reader | Spectrophotometer capable of detecting absorbance at 425 nm in a 96-well microplate and generating a text (TXT) file of the data.<br><br>*Note:* Although 425 nm is optimal, 405 nm is also acceptable. | NA |

## Workflow

***To run the Syringe Test utility:***

**1** Open the **Utility Library**, locate the **Syringe Test** utility, and then click **Utility**.
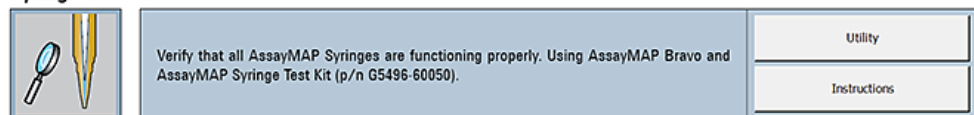


**2** Click **Instructions**.

**3** Follow the instructions to run the Syringe Test.

**4** If required, replace defective syringes, and then rerun the Syringe Test to confirm all the syringes are functioning properly.

# Running the Shutdown utility

You should run the Shutdown utility after every application protocol run, if the AssayMAP Bravo Platform will not be in use for 1 hour or longer, and before shutting down the device overnight.

The Shutdown utility prepares the AssayMAP Bravo Platform for idle time by:

- Washing the syringes the specified number of wash cycles.
- Aspirating 200 µL of Syringe Storage Liquid into the syringes. The Syringe Storage Liquid prevents residual reagents from forming salts and corroding the syringe seals.

## Workflow

***To run the Shutdown utility:***

**1** Open the **Utility Library**, locate the **System Startup/Shutdown** utility, and then click **Utility**.

**System Startup/Shutdown v2.2**

| | | |
|---|---|---|
| ⏻ / ⏻ | Conduct startup and shutdown procedures for the AssayMAP Bravo. Using AssayMAP Bravo. | Utility |
| | | Instructions |
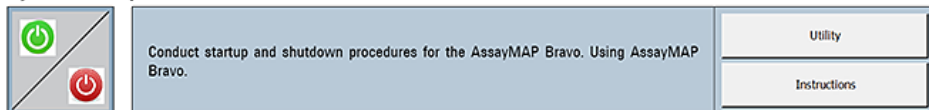
**2** Click **Instructions**.

**3** Follow the instructions to run the Shutdown utility.

# A Manually updating teachpoints in each profile

This appendix contains the following topics:

# Workflow for setting teachpoints in each profile manually

### About this topic

Every device profile in the Protein Sample Prep Workbench must be adjusted to the correct teachpoints of the specific AssayMAP Bravo Platform. You can use the following workflow to set the teachpoints for all nine deck locations in every device profile manually.

Alternatively, for a semi-automated workflow, see "Teaching part 1: Setting teachpoints in AssayMAP 1 profile" on page 62.

### Before you start

Ensure that all device profiles in the Protein Sample Prep Workbench have been installed, and that they are configured correctly. See "Verifying the profile settings and configuration" on page 43.

> **CAUTION**   **Using a profile that is associated with teachpoints from a different instrument can result in a hardware collision and cause equipment damage. Ensure that you verify the teachpoints associated with each profile for your specific instrument and Bravo 96AM Head.**

### Workflow for manually setting teachpoints

| Step | For this task... | See... |
|---|---|---|
| 1 | Initialize the AssayMAP 1 profile. | "Initializing the profile that you are verifying" on page 55 |
| 2 | In the AssayMAP 1 profile, set the teachpoint for deck location 2 and derive the teachpoints for the other eight deck locations automatically. | "Teaching part 1: Setting teachpoints in AssayMAP 1 profile" on page 62 |
| 3 | Fine tune the derived teachpoints. | "Fine tuning the teachpoints" on page 65 |
| 4 | *Normalization profile only*. If the Bravo Plate Riser is installed at deck locations 2 and 6, adjust the teachpoint at these locations to accommodate the extra height. | "Adjusting the teachpoint for the Bravo Plate Riser" on page 107 |
| 5 | *GlykoPrep-Plus profile only*. If the Peltier Thermal Station is installed at deck location 4, adjust the teachpoint to accommodate the red PCR plate insert. | "Adjusting the teachpoint for the red PCR plate insert" on page 109 |
| 6 | *Orbital Shaking Station only*. If the accessory is installed at deck location 9, fine tune the teachpoint. | "Teaching the Orbital Shaking Station at deck location 9" on page 67 |
| 7 | Adjust the teachpoint for the 96AM Wash Station. | "Teaching the 96AM Wash Station at deck location 1" on page 68 |

| Step | For this task... | See... |
|------|------------------|--------|
| 8 | Adjust the teachpoint for the 96AM Cartridge & Tip Seating Station. | "Adjusting the teachpoint at deck location 2 for the Cartridge & Tip Seating Station" on page 71 |
| 9 | Adjust the gripper *y*-axis offset. | "Checking and adjusting the gripper offset" on page 77 |
| 10 | Repeat steps 1 to 9 for every device profile in the Protein Sample Prep Workbench. | — |

# Adjusting the teachpoint for the Bravo Plate Riser

Use the following procedures only if the deck configuration contains the Bravo Plate Risers, for example, the AssayMAP Normalization profile.

## Bravo Plate Riser description

The Bravo Plate Riser is a 2.84-cm tall deck accessory that you can place atop a standard platepad on the Bravo deck. The Bravo Plate Riser requires a teachpoint adjustment in the Bravo profile to ensure that the Bravo head moves to the correct height at the location where the Bravo Plate Riser is installed.

The following figure shows the Bravo Plate Riser, which has a crosshairs in one corner to facilitate adjusting the teachpoint.

*Figure*   Bravo Plate Riser
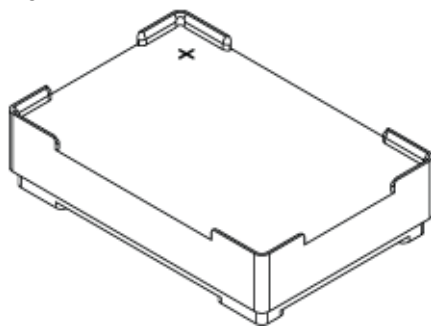


**CAUTION**   **Placing the Bravo Plate Riser at a deck location that does not have the corresponding teachpoint in the device profile will result in a collision, causing equipment damage. Ensure that the device profile includes the corresponding teachpoint for any deck location where the Bravo Plate Riser is installed.**

## About the AssayMAP Normalization profile

The AssayMAP Normalization profile (Normalization-AM Bravo.dev) includes teachpoints for the Bravo Plate Riser at deck locations 2 and 6. However, you should adjust the teachpoints on your instrument and verify the teachpoints before running the Normalization application for the first time.

***Figure***   Normalization profile Bravo Plate Riser deck locations
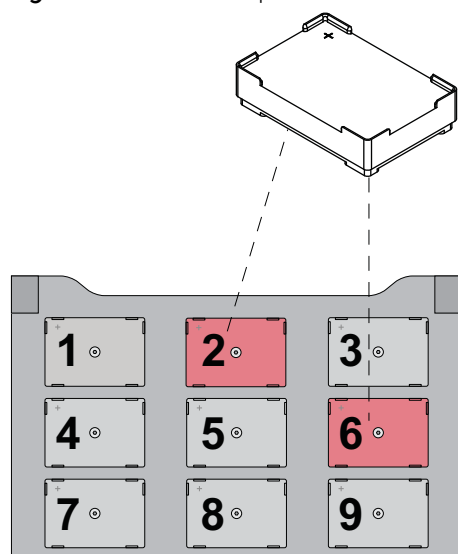


| IMPORTANT | When setting the teachpoint, ensure that a 250-µL pipette tip is seated on probe A1 (back left corner) of the Bravo 96AM Head. |
|---|---|

## Adjusting the teachpoint for the Bravo Plate Riser

Use the following procedure to adjust a standard platepad teachpoint to accommodate the Bravo Plate Riser.

*To adjust the teachpoint for the Bravo Plate Riser:*

1   Place the Bravo Plate Riser on the platepad at the corresponding deck location. Ensure that the Bravo Plate Riser is oriented so that the crosshairs is at the back left corner.

   Press down on the Bravo Plate Riser so that it is seated on the platepad.

2   In the **Jog/Teach** tab, click the **Location** list, and then select the deck location that you are teaching.

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

   The Bravo head moves to the selected deck location, and then moves down so that the tip is approximately 22 mm above the crosshairs on the Bravo Plate Riser.

4   Carefully, use the **Jog Axes** controls to move the head down in smaller and smaller increments until the pipette tip is about 1 mm above the crosshairs on the Bravo Plate Riser.

   Visually inspect the alignment to determine if the left-to-right (X) and front-to-back (Y) positions of the tip are centered above the crosshairs on the Bravo Plate Riser. If necessary, use the **Jog Axes** controls (Left, Right and Forward, Back) to center the A1 tip above the crosshairs.

5   Carefully, use the **Jog Axes** controls to move the head down in tiny increments until the pipette tip is as close as possible to the crosshairs on the Bravo Plate Riser without touching the surface.

6   Click **Teach** to set the new teachpoint values for the deck location.

7   To save the new teachpoint for this location, click the **Profiles** tab, and then click **Update this profile.**

8    Repeat this procedure for the other deck location where the Bravo Plate Riser will be installed.

## Verifying the teachpoint for the Bravo Plate Riser

Use the following procedure to verify the adjusted teachpoint for the Bravo Plate Riser.

1    Ensure that the Bravo Plate Riser is securely seated on the platepad at the corresponding deck location. Ensure that the Bravo Plate Riser is oriented so that the crosshairs is at the back left corner.

2    In the **Jog/Teach** tab, click the **Location** list, and then select the deck location you are teaching.

3    Click **Move**, The Bravo head moves to the selected deck location so that the tip is at the crosshairs on the Bravo Plate Riser.

4    Visually inspect the alignment to ensure that the tip is centered from left to right and front to back.

| CAUTION | A hardware collision can occur if you initialize a device profile that does not include the teachpoints for the Bravo Plate Riser while the Bravo Plate Riser remains on the deck. Ensure that you remove the Bravo Plate Riser from the deck when initializing a different device profile. |
|---|---|

# Adjusting the teachpoint for the red PCR plate insert

## About this topic

Use the following procedure only if the deck configuration includes the Peltier Thermal Station and you plan to use the red PCR plate insert.

The AssayMAP GlykoPrep-plus applications require the red PCR plate insert to be present in the plate nest of the Peltier Thermal Station for the entire workflow. Use the following teaching procedure to accommodate this requirement for deck location 4 in the GlykoPrep-plus profile.
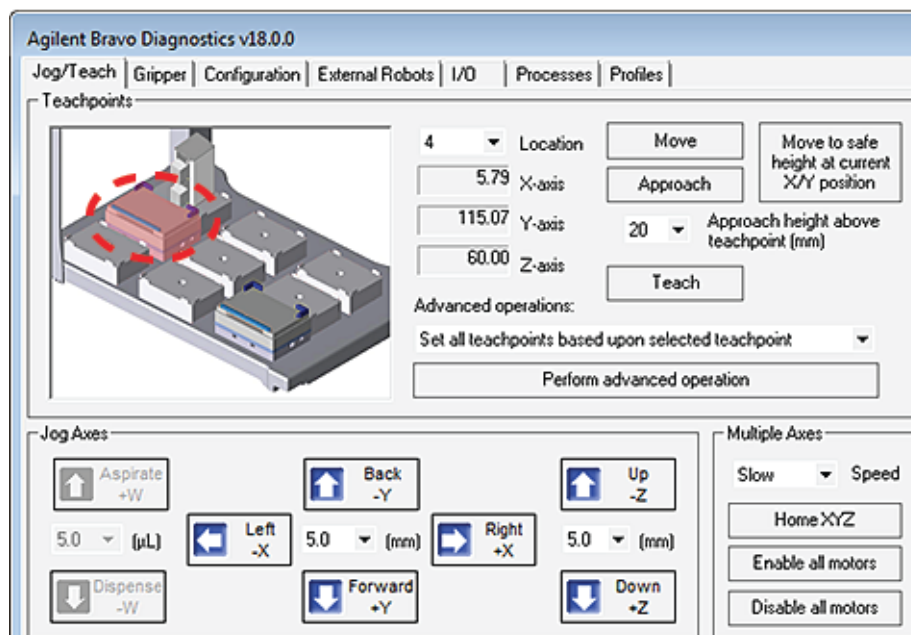
*Figure*    PCR plate insert



| IMPORTANT | Ensure that the PCR plate insert is not installed in the Peltier Thermal Station at deck location 4 for the following teaching procedure. |
|---|---|

## Adjusting the teachpoint for the PCR plate insert

*To adjust the teachpoint for the PCR plate insert:*

**1**  In the **Jog/Teach** tab, click **Location 4**.



**2**  Click **Move** to move the head to the previously defined teachpoint for location 4.

**3**  Using the Jog Axes controls, jog the head up (-Z) by exactly 4.4 mm.

For example, if the value for the teachpoint's Z-axis coordinate from the fine tuning was 104.00 mm, the new value after adjusting by 4.4 mm will be 99.60 mm.

**4**  Click **Teach** to set the new teachpoint.

**5**  To save the new teachpoint for this location, click the **Profiles** tab, and then click **Update this profile.**

## In This Guide

This guide describes how to

- Install the AssayMAP Bravo Platform
- Set up the software
- Set the teachpoints
- Verify the platform

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