

AssayMAP Bravo Syringe Replacement

User Guide

Original Instructions



Agilent Technologies

Notices

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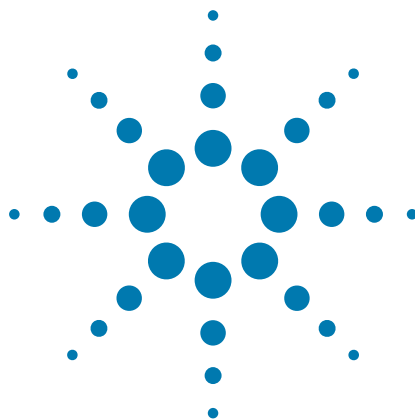
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 A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the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

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AssayMAP Bravo Syringe Replacement User Guide

This guide describes how to replace defective syringes in the Bravo 96AM Head using the AssayMAP Syringe Replacement Kit.

This guide contains the following topics:

- “About this guide” on page 2
- “Before you start” on page 4
- “Uninstalling the Bravo 96AM Head from the Bravo Platform” on page 6
- “Uninstalling syringes from the head” on page 8
- “Installing the replacement syringes and reassembling the head” on page 15
- “Installing the Bravo 96AM Head in the Bravo Platform” on page 23
- “Starting up the AssayMAP Bravo Platform” on page 25
- “Priming and washing the syringes” on page 25
- “Verifying the replaced syringes” on page 27



About this guide

Who should read this guide

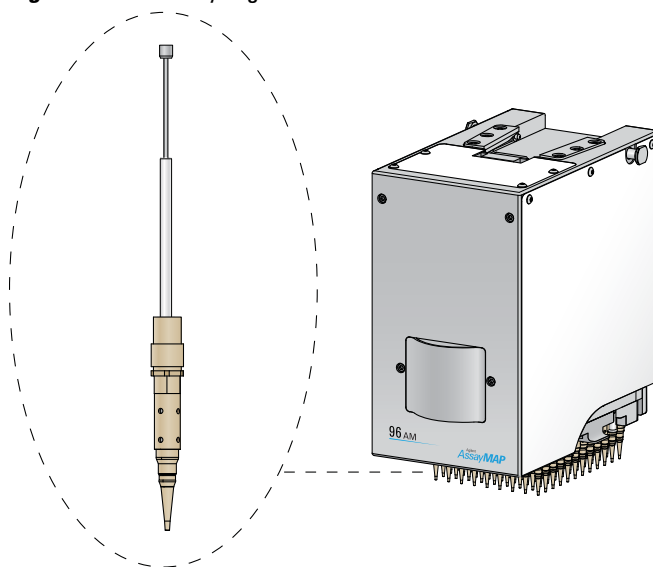
The instructions in this guide assume that you have the following:

- An understanding of the AssayMAP Bravo Platform
- Familiarity with the Protein Sample Prep Workbench
- Experience in working on mechanical equipment that includes ESD-sensitive components.

What this guide covers

This guide describes how to replace the AssayMAP syringes in the Bravo 96AM Head.

Figure Detail of syringe in the Bravo 96AM Head



A syringe requires replacement if:

- It fails the Syringe Test



- The probe is visibly damaged (for example, a bent probe) so that it is not possible to run the Syringe Test.

Related guides

- *Syringe Test instructions*. Describes the Syringe Test Kit, how to run the test, and how to analyze the results.
- *Bravo Automated Liquid Handling Platform Safety and Installation Guide*. Describes potential safety hazards and how to avoid them. This guide also describes how to install the Bravo Platform.
- *Bravo Automated Liquid Handling Platform User Guide*. Describes how to set up, operate, and maintain the Bravo Platform. This guide also describes the Bravo 96AM Head for the AssayMAP Bravo Platform.

Accessing the user documentation

You can access the user documentation in the Protein Sample Prep Workbench as follows:

- *Application user guides*. In the **Protein Sample Prep Workbench**, click **Utility Library**, locate the utility of interest, and then click **Instructions**.
- *Utility instructions*. In the **Protein Sample Prep Workbench**, click **Literature Library**, locate the topic of interest, and then click **Open**.

Alternatively, you can access the user documentation in the *VWorks Knowledge Base* using either of the following methods:

- On the Windows desktop, click **Start > All Programs > Agilent Technologies > VWorks > User Guide > VWorks Knowledge Base**.
- Go to <http://www.agilent.com/chem/askb>.

Before you start

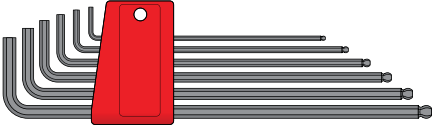




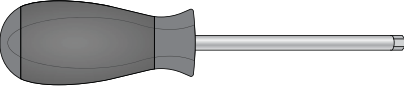




WARNING The probes of the Bravo 96AM Head are sharp and can scratch you if they brush across your hand. A probe scratch can expose you to any contaminants remaining on the probes. Wear gloves and use extreme caution to avoid brushing against the probes.

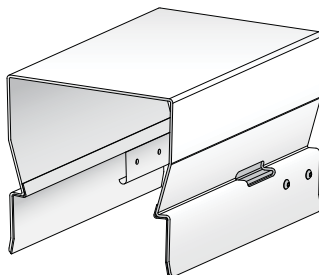


WARNING Possible broken glass! The glass syringes in the Bravo 96AM Head can break and expose you to potential cut hazards. Wear gloves and use extreme caution when handling the glass syringes.

Ensure that you have the required tools and materials listed in the following table.

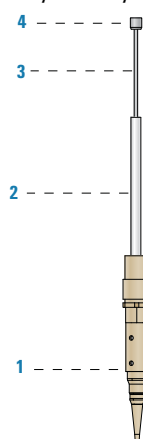
Tools and materials	Description	Part Number	Quantity
Syringe Replacement Kit	Includes the following tools and materials.	Agilent G5409-68002	1 kit
<ul style="list-style-type: none"> 1.5- to 5-mm hex wrenches 		–	1 set
<ul style="list-style-type: none"> Combination wrench, 1/8-in, 6-point 		–	1 each
<ul style="list-style-type: none"> Socket, 1/4-in sq 		–	1 each
<ul style="list-style-type: none"> Square direct driver, 1/4-in 		–	1 each
<ul style="list-style-type: none"> Torque Driver Adapter, 1/4-in sq 		–	1 each
<ul style="list-style-type: none"> Torque Driver Handle and Torque Setter, 15-80 in-oz 	 	–	1 set
<ul style="list-style-type: none"> AssayMAP Syringe Assembly 	 You can purchase additional syringes using this part number.	Agilent G5496-60007	10 pack

Tools and materials	Description	Part Number	Quantity
Head stand, series 3 (not provided)	The storage stand that protects the Bravo 96AM Head syringe probes. The stand is included with the Bravo 96AM Head.	–	1
Labware (not provided)	Use one of the following for the syringe washing and priming protocol:		1
	• 12-Column, Low-Profile Reservoir, Natural PP	Seahorse 201280-100	
	• 8-Row, Low-Profile Reservoir, Natural PP	Seahorse 201282-100	
	• 96 V11 Manual Fill Reservoir	Agilent G5498B#049	
Gloves, such as nitrile (not provided)	Protects your hands from contact with potential residual contaminants and sharp glass.	–	–
ESD wrist strap, grounded (not provided)	Prevents potential damage to the ESD-sensitive components inside the Bravo 96AM Head.	–	–



Refer to the following figure for the syringe components that are referenced in the following procedures.

Figure AssayMAP syringe components: (1) probe, (2) barrel, (3) piston rod, (4) piston button

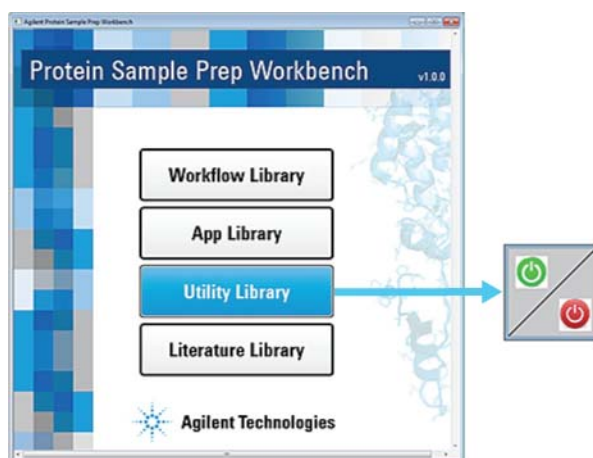


Uninstalling the Bravo 96AM Head from the Bravo Platform

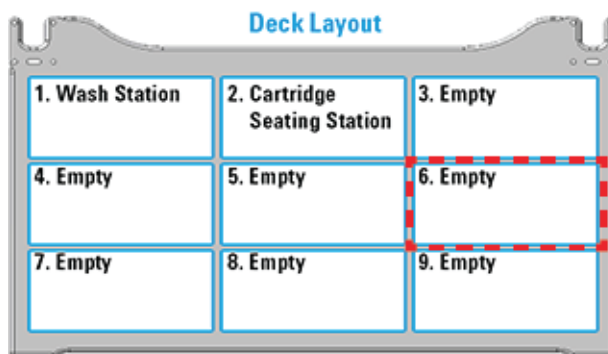
CAUTION Placing the probes of the Bravo 96AM Head (bottom of head) on any surface can damage the probes. To protect the probes when the head is not mounted on the Bravo Platform, place the top of the head on a clean, stable surface so that the probes are facing upward. For storage, use the storage stand.

To remove the head from the Bravo Platform:

- 1 Put on gloves to protect your hands from potential exposure to sharp edges and any residual contaminants.
- 2 Ensure that the syringes are empty as follows:
 - a In the **Protein Sample Prep Workbench**, open the **Utility Library**.
 - b In the **System Startup/Shutdown** utility, run the **Startup** protocol.

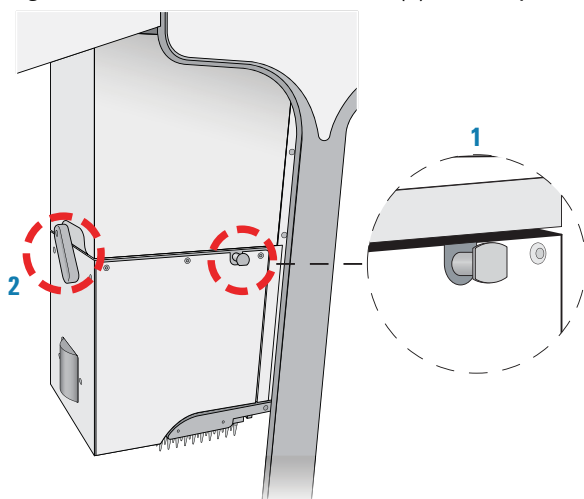


- 3 On the side of the Bravo Platform, press the power switch to the **off (o)** position.
- 4 Gently, move the Bravo head manually to position it over deck location 6, which will provide easier access for removing the head.



- 5 To unlock the mounted head, refer to the following figure:
 - a Pull out and twist the (1) two head-retainer pins one-quarter turn (90°) so that they remain retracted.
Note: The straight edge of the retainer pins should be horizontal.
 - b Turn the (2) head lock counterclockwise until it clicks into position.

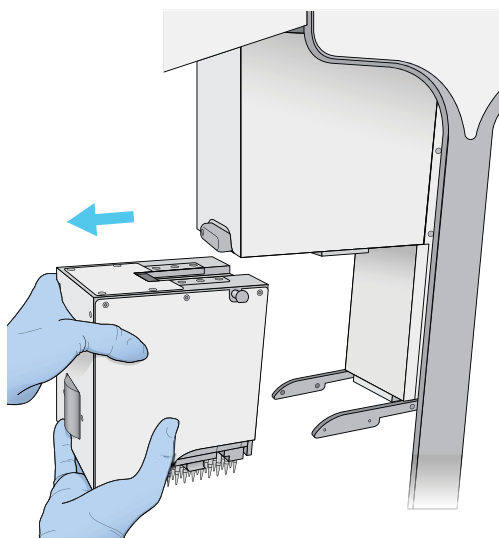
Figure Installed Bravo 96AM Head: (1) retainer pin and (2) head lock



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

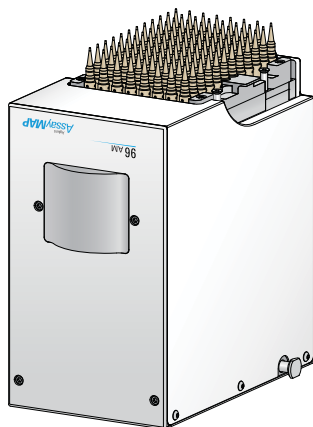
CAUTION Support the head securely without touching the probes. Dropping the head or bumping the probes will damage the syringes.

Figure Uninstalling the Bravo 96AM Head



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

Figure Bravo 96AM Head upside down



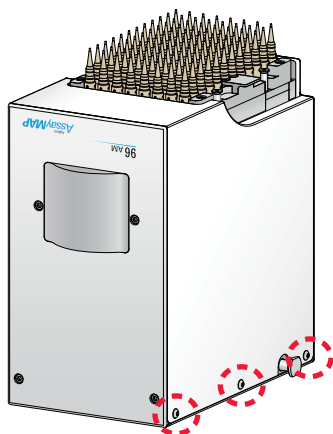
Uninstalling syringes from the head

CAUTION The electronic components inside the head are sensitive to static electricity. To prevent potential damage to the head, wear a grounded wrist strap and avoid contact with the electronic components.

To uninstall syringes from the head:

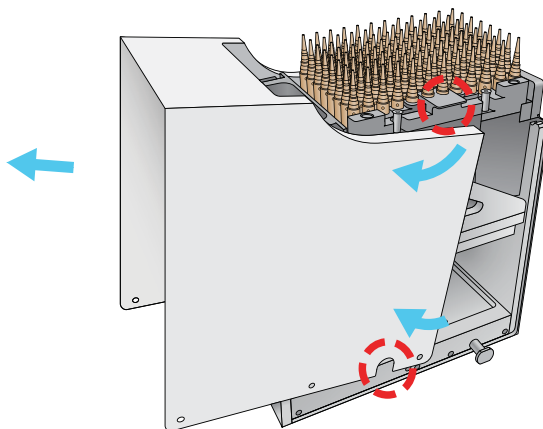
- 1 If you have not already done so, put on gloves to protect your hands from potential exposure to sharp edges and any residual contaminants.
- 2 Remove the exterior cover from the head, as follows:
 - a Using the 2-mm hex wrench, uninstall the six screws (three on each side) that secure the exterior cover to the head.

Figure Screw locations on head cover



- b Lift the cover up and slide it towards the front of the head until you can remove the cover from the head.

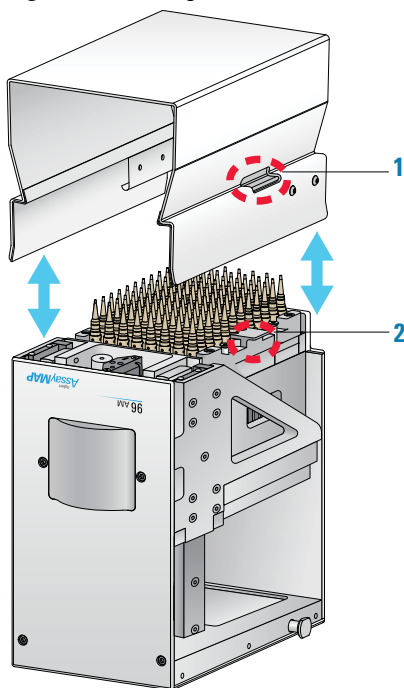
Figure Removing the cover from the head



Note: You may use the retainer-pin cutouts in the cover to spread the cover slightly to clear the front plate of the head.

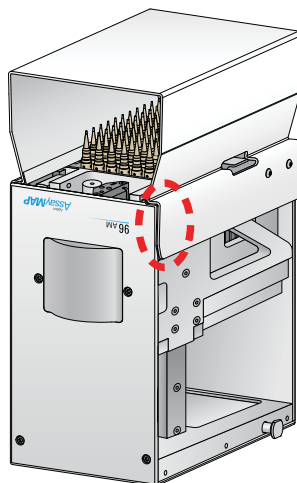
- 3 Carefully, install the head stand on the head, and then invert the stand-and-head assembly, as follows:
 - a Place the stand onto the head, guiding the (1) side cutouts of the stand onto the (2) side tabs on the head, as the following figure shows. Use care to avoid touching the probes.

Figure Installing the stand on the head



- b** Ensure that the edge of the stand is slightly recessed from the front cover plate.

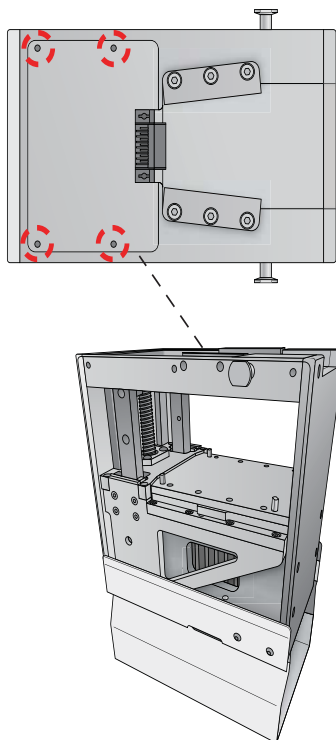
Figure Head stand recessed slightly from the head front plate



- c** Using care to hold the head and the stand together, invert the assembly so that the head is resting on the stand and the stand is resting on a clean, stable surface.
- 4** Using the 2-mm hex wrench, remove the four screws that secure the printed-circuit board (PCB) cover to the top of the head. Remove the PCB cover.

Note: You may insert the hex wrench under the notch in the PCB cover to lift the cover out of the recess.

Figure Screw locations (four) on PCB cover (top view)



- 5 Using the 3-mm hex wrench, remove the eight attachment screws that secure the piston capture plate. Remove the piston capture plate and elastomer.

Note: If the elastomer sticks to the piston locking plate, peel the elastomer off of the piston locking plate.

Figure Piston capture plate attachment screws (eight)

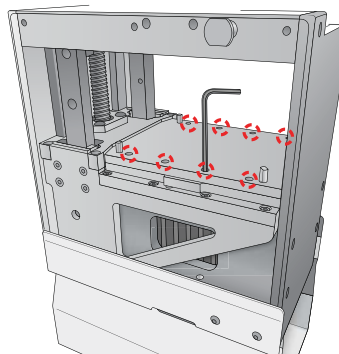
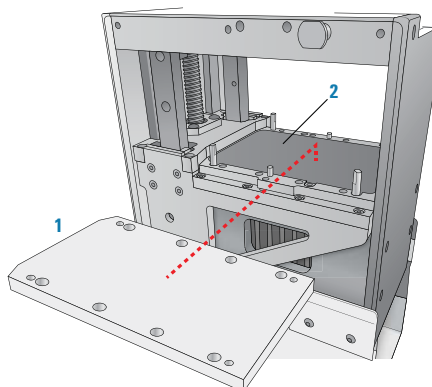
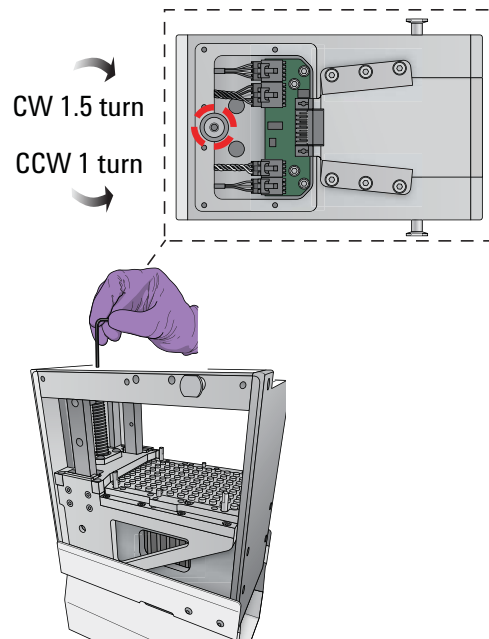


Figure Removal of (1) piston capture plate and (2) elastomer on the piston locking plate



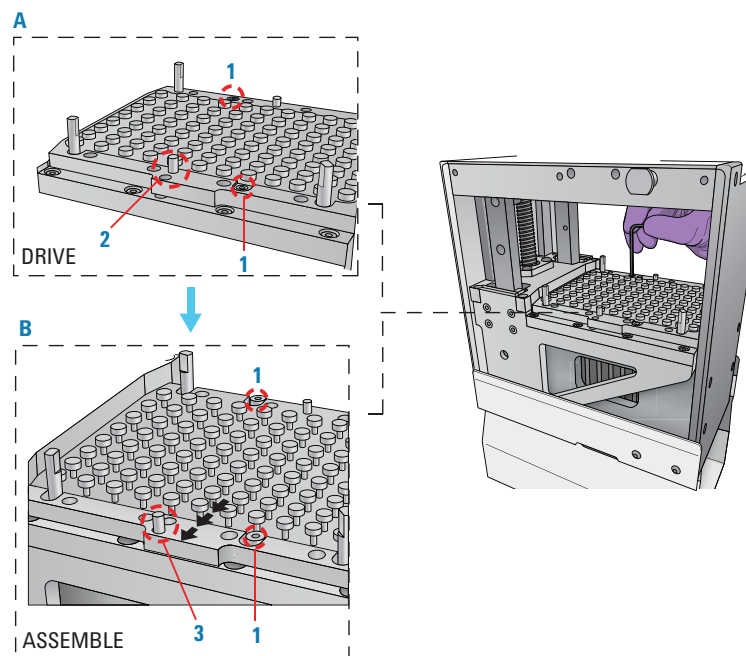
- 6 To raise the syringe pistons, insert the 3-mm hex wrench into the end of the ball screw and turn it, as follows:
- a Clockwise (CW) 1.5 turns
 - b Counterclockwise (CCW) 1 turn

Figure Piston ball screw location on the head (top view)



7 Refer to the following figure and release the piston buttons as follows:

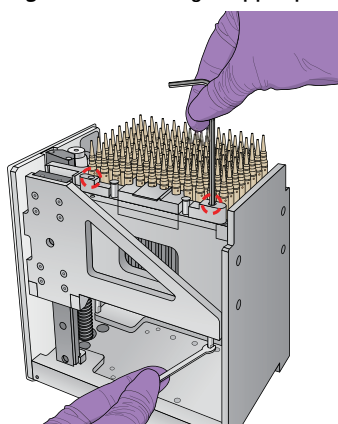
Figure Piston locking plate: (1) screws (two), (2) pin in DRIVE hole, and (3) and pin in ASSEMBLE hole



- a** Using the 2.5-mm hex wrench, loosen, but do not remove the two screws (figure, 1); one on each side of the piston locking plate.
- b** Remove the pin from the DRIVE hole (figure, 2).
- c** Slide the piston locking plate to the ASSEMBLE position (figure, B).

- d Insert the pin into the ASSEMBLE hole (figure, 3).
 - e Using the 2.5-mm hex wrench, tighten the two screws (figure, 1); one on each side of the piston locking plate.
 - f Remove the pin from the ASSEMBLE hole, and set it aside temporarily until you reassemble the head.
- 8 Using care to hold the head and stand together, invert the head-and-stand assembly so that the probes are facing up and the top of the head is sitting on a clean, stable surface. Remove the head stand.
- 9 Remove the cartridge stripper plate as follows:
- a Using the 2.5-mm hex wrench remove the four screws, one in each of the four corners of the head, that fasten the stripper plate to the stripper plate guide pins. Use the 1/8-in open-end wrench to prevent the guide pin from rotating, as the following figure shows.

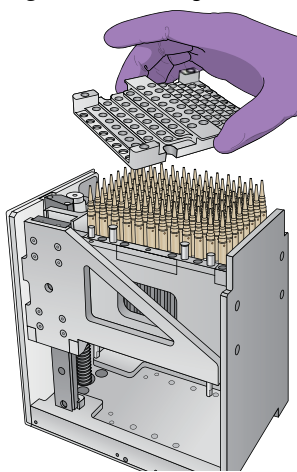
Figure Removing stripper plate screws (four)



- b Using care to avoid touching the syringe probes, lift the stripper plate off the array of syringes. If necessary, rock the stripper plate gently to free it from the guide pins.

CAUTION Be careful not to bump and damage any of the syringe probes.

Figure Removing the cartridge stripper plate

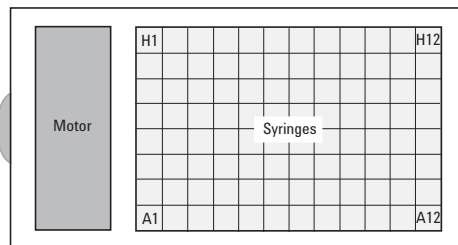


IMPORTANT Inspect the guide pins and stripper plate for any contaminants or corrosion. If contaminants or corrosion are present, clean the stripper plate and guide pins using standard laboratory wipes and isopropyl alcohol.

10 Remove the defective syringes as follows:

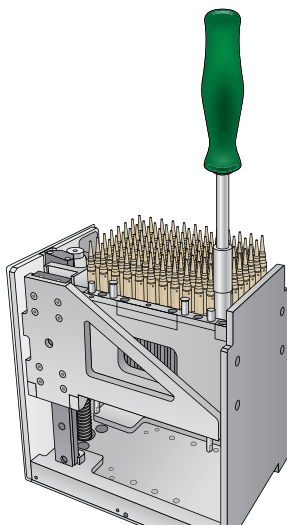
- a Identify the syringe that you are replacing. Looking down at the head with the drive mechanism to the left and the array of syringes to the right, the A1 position is in the bottom left corner, as the following figure shows.

Figure Orientation of syringe array in head



- b Use the direct driver and 1/4-in socket to unscrew and remove the syringe being replaced. Ensure that the piston rod is removed with the rest of the syringe assembly.

Figure Syringe removal using direct driver and socket



IMPORTANT Inspect the syringe for loose or broken glass. If broken glass is present, invert the head to remove any remaining glass debris.



WARNING Possible broken glass! The glass syringes in the Bravo 96AM Head can break and expose you to potential cut hazards. Wear gloves and use extreme caution when handling the glass syringes.

Repeat this step for each syringe to be removed.

Installing the replacement syringes and reassembling the head

CAUTION The syringes are fragile and can break. Be careful when handling the syringes.

To install the replacement syringes and reassemble the head:

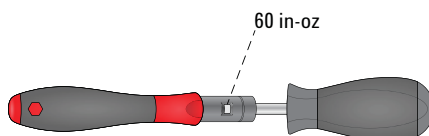
- 1 Insert the replacement syringe into the head as follows:
 - a Extend the syringe piston until the overall length of the syringe assembly is about 6 inches (15 cm), as the following figure shows.

Figure Syringe with piston extended



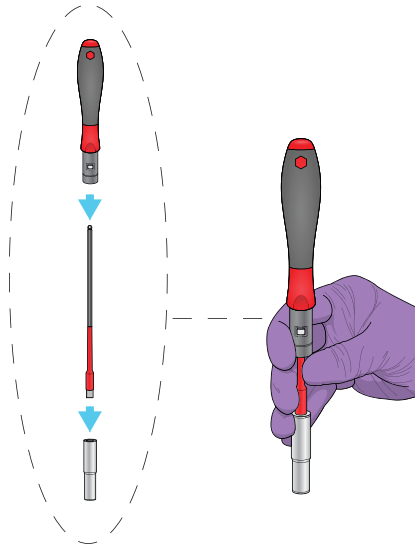
- b Insert the replacement syringe into the head. Ensure that the button on the end of the piston rod passes through the retaining plate and protrudes beyond the capture plate.
- 2 Prepare the torque driver and socket, as follows:
 - a Adjust the torque setting on the torque driver handle to 60 in-oz using the torque setter adjustment tool, as the following figure shows.

Figure Setting the torque in the torque driver handle



- b Assemble the torque driver handle, socket adapter, and 1/4-in socket. Ensure that you hold the adapter securely in the handle, as the following figure shows, to keep the socket adapter from falling out.

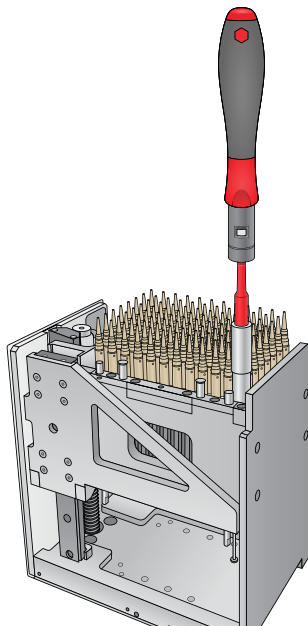
Figure Assembling and holding the torque driver-and-socket assembly



CAUTION The socket adapter does not snap into the torque driver handle. Be sure to hold the socket adapter securely and prevent it from falling out and damaging the syringes.

- c** Using the torque driver-and-socket assembly, tighten the syringe to 60 in-oz. The torque driver will “slip” and provide an audible click once the torque has been achieved.

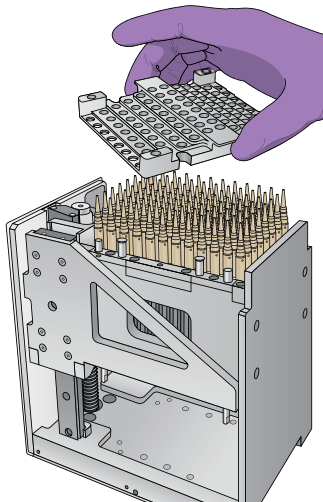
Figure Syringe install using torque driver-and-socket assembly



Repeat this step for each syringe to be installed.

- 3 To reassemble the head, install the cartridge stripper plate, as follows:
- a Using care to avoid touching the syringe probes, align the stripper plate directly above the probes, and then slide the stripper plate down over the probes.

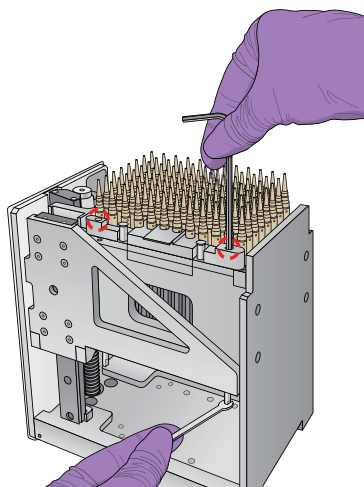
Figure Installing the stripper plate



CAUTION Be careful not to bump and damage any of the syringe probes.

- b Using the 2.5-mm hex wrench, install the four screws (one in each corner) that fasten the stripper plate to the stripper plate guide pins. Use the 1/8-in open-end wrench to prevent the guide pin from rotating, as the following figure shows.

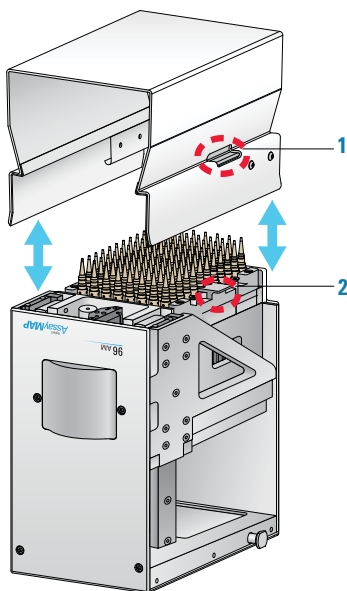
Figure Installing the stripper plate screws (four)



IMPORTANT Tighten the screws until snug. Do not over tighten the screws.

- 4 Carefully, install the head stand on the head, and then invert the stand-and-head assembly, as follows:
 - a Place the stand onto the head, guiding the (1) side cutouts in the stand onto the (2) side tabs on the head, as the following figure shows. Use care to avoid touching the probes.
 - b Ensure that the edge of the stand is recessed slightly from the front cover plate.

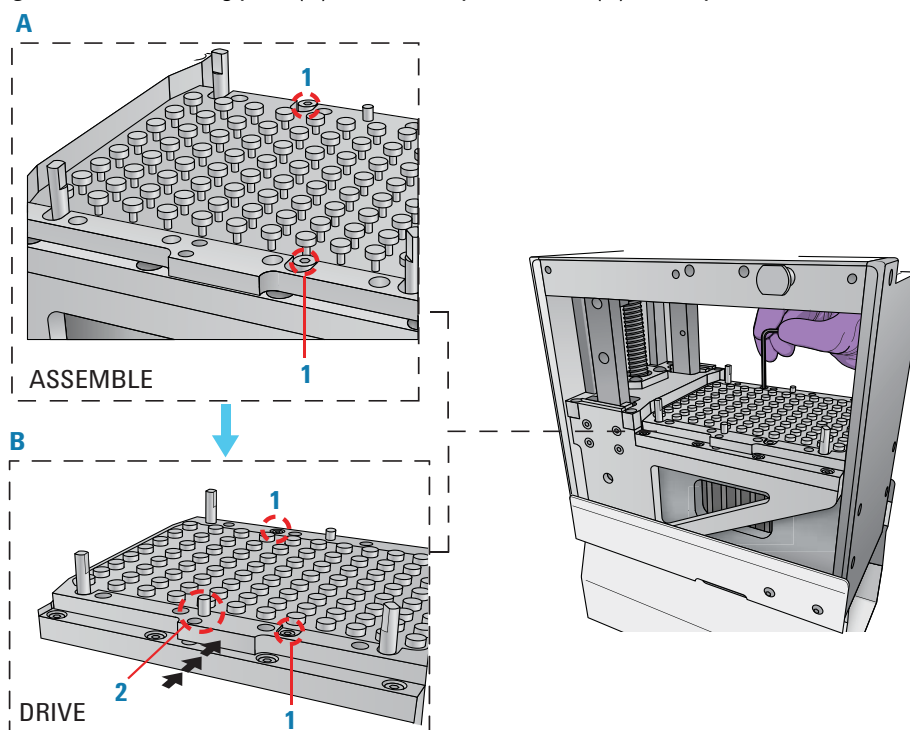
Figure Installing stand on head: (1) stand cutouts and (2) head side tabs



- c Using care to hold the head and stand together, invert the assembly so that the head is resting on the stand and the stand is resting on a clean, stable surface.

- 5 Refer to the following figure to capture the piston buttons in the piston locking plate:

Figure Piston locking plate (A) ASSEMBLE position and (B) DRIVE position



- a Using the 2.5-mm hex wrench, loosen, but do not remove, the two screws (figure, 1); one on each side of the piston locking plate.
 - b Slide the piston locking plate to the DRIVE position (figure, B).
 - c Locate the pin that you set aside previously (step 7, [Uninstalling syringes from the head](#)). Install the pin in the DRIVE hole (figure, 2).
 - d Using the 2.5-mm hex wrench, retighten the two screws (figure, 1); one on each side of the sliding piston locking plate.
- 6 Install the piston capture plate as follows:
- a Carefully, push down on the piston rods of the replaced syringes with your fingers until the replaced syringe pistons are level with the rest of the syringe pistons.

1 AssayMAP Bravo Syringe Replacement User Guide

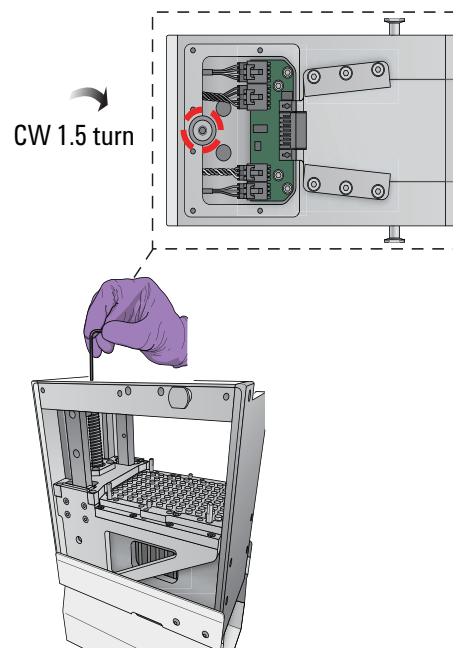
Installing the replacement syringes and reassembling the head

Figure Pushing down on piston rod of replaced syringe



- b** Insert the 3-mm hex wrench into the ball screw, and then turn it clockwise (CW) 1.5 turns to raise the drive plate up so that the piston buttons are recessed in their pockets.

Figure Piston ball screw location on the head (top view)

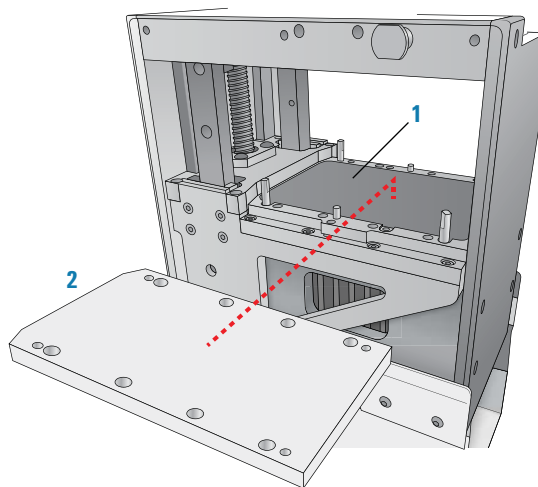


- c** Place the elastomer (1) on top of the piston buttons, as the following figure shows.

Note: If the elastomer is stuck to the piston capture plate, use your fingers to peel it off the plate.

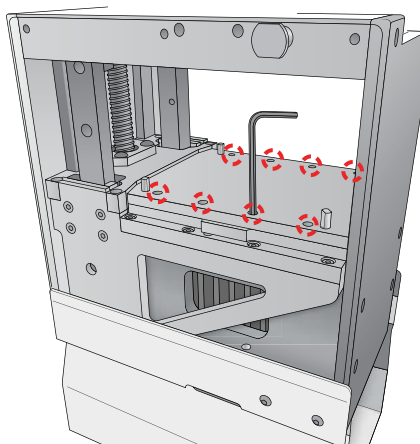
- d** Install the piston capture plate (2) atop the elastomer, aligning the chamfered corners on the plate with the corresponding shape on the head.

Figure Installed (1) elastomer on the piston locking plate and (2) piston capture plate installation



- e** Using the 3-mm hex wrench, install the eight retaining screws that secure the piston capture plate, as follows:
- Incrementally, tighten each screw alternating from one side of the head to the other, until all eight screws are installed.
 - Ensure that you tighten the screws equally to fully compress the elastomer, so that the plate contacts the body of the head.

Figure Piston capture plate attachment screws (eight)

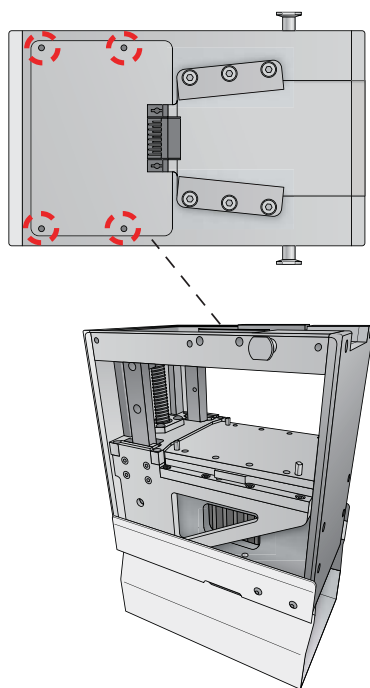


- 7** Install the PCB cover on top of the head. Use the 2-mm hex wrench to tighten the four screws that secure the PCB cover.

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Installing the replacement syringes and reassembling the head

Figure Screw locations (four) on PCB cover (top view)

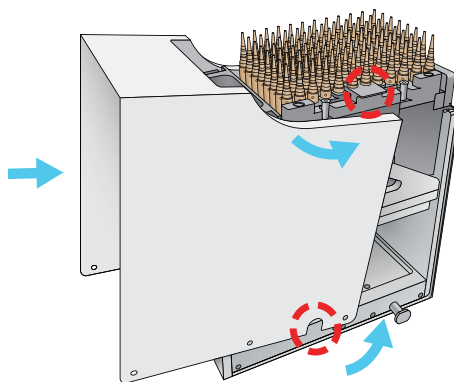


8 Carefully, invert the head-and-stand assembly, so that the top of the head is resting on a clean, stable surface. Remove the stand from the head.

9 Install the head cover, as follows:

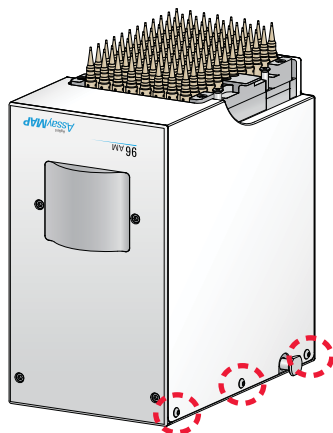
- a** Carefully, guide the cover onto the head. Take care to slide the sides of the cover under the side tabs on the head, and position the cutouts of the cover over the head retaining pins.

Figure Reinstalling head cover



- b** Using the 2-mm hex wrench, install the six screws to secure the cover.

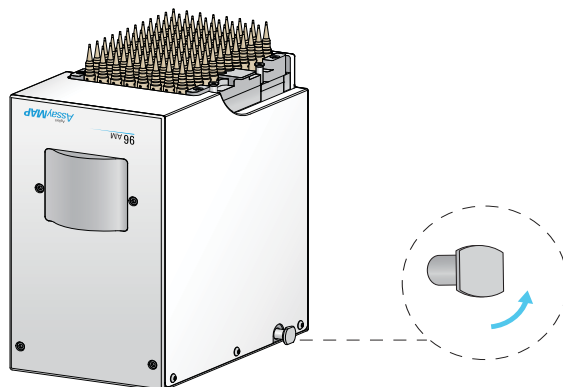
Figure Screw locations on head cover



Installing the Bravo 96AM Head in the Bravo Platform

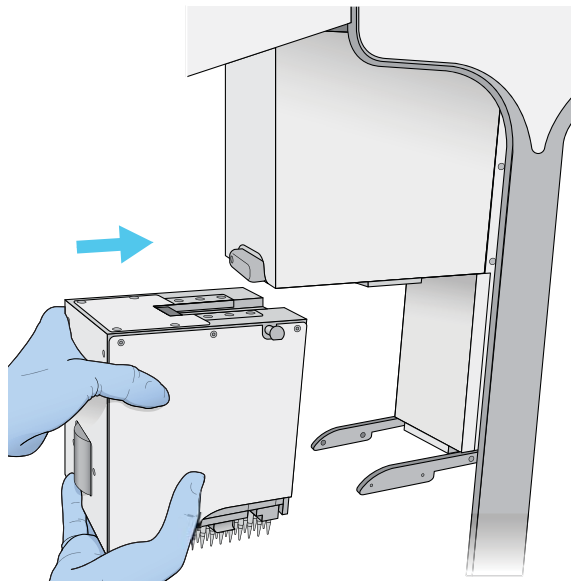
To install the Bravo 96AM Head:

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



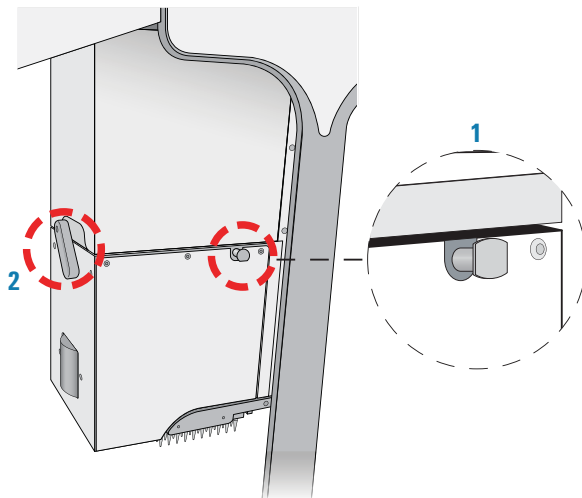
- 2 With your left hand, firmly grip the left side of the head. Place your right hand under the flat area just to the left of the syringe array to support the weight of the head.
- 3 While supporting the head with your hands, slide the head onto the Bravo head mount. Press the head firmly into place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

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



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

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




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

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

Starting up the AssayMAP Bravo Platform

To start up the system:

- 1 Check the levels of the wash station source and waste carboys, and fill or empty as required.
- 2 Turn on the AssayMAP Bravo Platform, Pump Module, and the Peltier Thermal Station Controller, if included.
- 3 Start the **Protein Sample Preparation Workbench**, and open the **Utility Library**.
- 4 Open the **System Startup/Shutdown** utility .
- 5 Click **Run Startup** to initialize the AssayMAP Bravo Platform and accessories.



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

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

Priming and washing the syringes

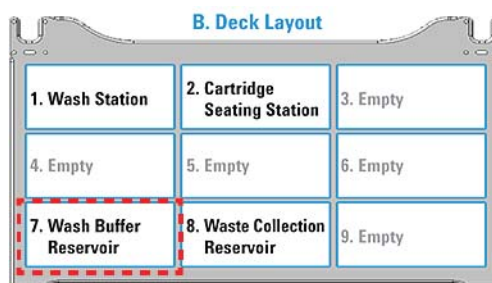
Use the following procedure to prepare the new syringes for use. The procedure primes and washes the syringes for 50 cycles.

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)
12- Column, Low-Profile Reservoir, Natural PP	6 mL/column
8-Row, Low-Profile Reservoir, Natural PP	8 mL/row
96 V11 Manual Fill Reservoir	60 mL

- b Place the filled labware on the Bravo deck at deck location 7.



- 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.

1 AssayMAP Bravo Syringe Replacement User Guide

Priming and washing the syringes

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

- 3 In the **Protein Sample Preparation Workbench**, open the **Utility Library**, and then open the **Syringe Wash** utility



- 4 In the **Labware Table** area, select the labware for **Deck Location 7** that matches the filled labware from [step 1](#).

Note: Deck Location 8 will not be used in this configuration. Leave the labware selection at the default setting (12 Column, Low Profile Reservoir, Natural PP). Do not place labware on the deck at this location.


- 5 Under **Application Settings**, set the following for **Wash syringes using the Wash Buffer Reservoir**:

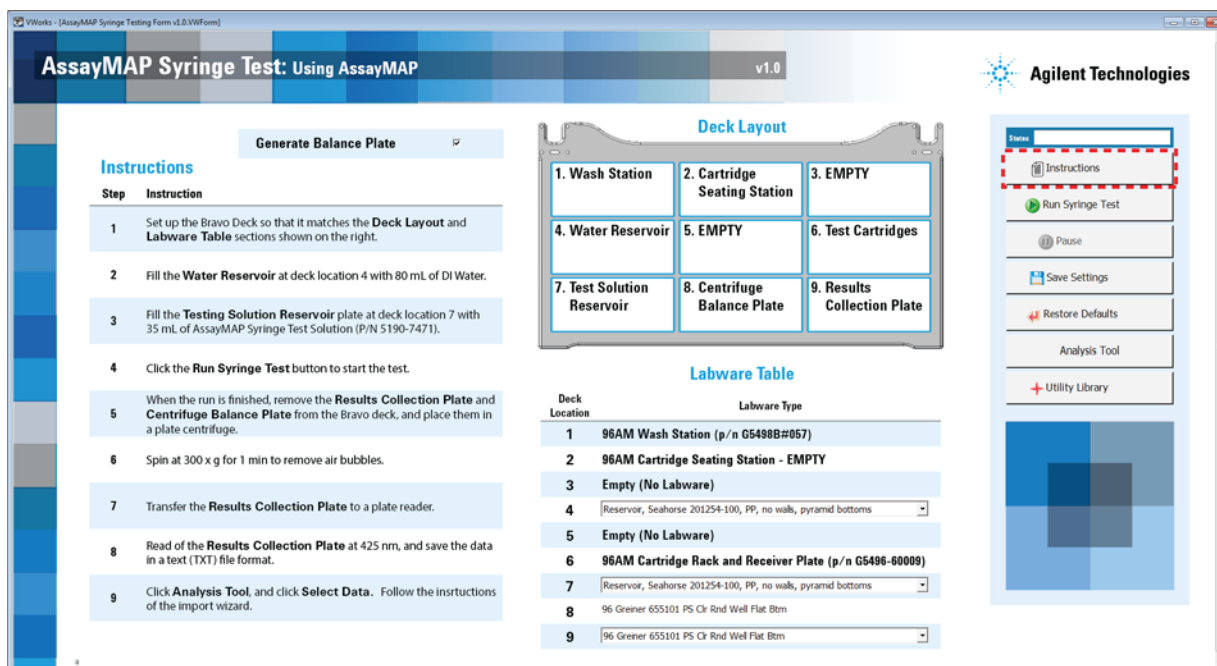
Setting	Value
Wash Volume (µL)	200
Wash Rate (µL/sec)	200
Number of Wash Cycles	20
Dispense Washes to	Wash Reservoir at Location 7
Conduct single syringe wash at Wash Station between washes from the Wash Buffer Reservoir?	Clear the check box

- 6 Click **Run Syringe Wash**.
- 7 Repeat [step 4](#) to [step 6](#) using the same settings for another 20 wash cycles.
- 8 Repeat the wash ([step 4](#) to [step 6](#)), except change the **Number of Wash Cycles** to 10.

Verifying the replaced syringes

To verify that the syringes in the head are performing properly:

- 1 Obtain the AssayMAP Syringe Test Kit (Agilent G5496-60050).
- 2 In the **Protein Sample Preparation Workbench**, open the **Utility Library**, and then open the **Syringe Test** utility .
- 3 Follow the instructions to perform the Syringe Test. See [“Accessing the user documentation” on page 3](#).



AssayMAP Syringe Test: Using AssayMAP v1.0

Instructions

Step	Instruction
1	Set up the Bravo Deck so that it matches the Deck Layout and Labware Table sections shown on the right.
2	Fill the Water Reservoir at deck location 4 with 80 mL of DI Water.
3	Fill the Testing Solution Reservoir plate at deck location 7 with 35 mL of AssayMAP Syringe Test Solution (P/N 5190-7471).
4	Click the Run Syringe Test button to start the test.
5	When the run is finished, remove the Results Collection Plate and Centrifuge Balance Plate from the Bravo deck, and place them in a plate centrifuge.
6	Spin at 300 x g for 1 min to remove air bubbles.
7	Transfer the Results Collection Plate to a plate reader.
8	Read of the Results Collection Plate at 425 nm, and save the data in a text (TXT) file format.
9	Click Analysis Tool , and click Select Data . Follow the instructions of the import wizard.

Deck Layout

1. Wash Station	2. Cartridge Seating Station	3. EMPTY
4. Water Reservoir	5. EMPTY	6. Test Cartridges
7. Test Solution Reservoir	8. Centrifuge Balance Plate	9. Results Collection Plate

Labware Table

Deck Location	Labware Type
1	96AM Wash Station (p/n G5498B#057)
2	96AM Cartridge Seating Station - EMPTY
3	Empty (No Labware)
4	Reservoir, Seahorse 201254-100, PP, no walls, pyramid bottoms
5	Empty (No Labware)
6	96AM Cartridge Rack and Receiver Plate (p/n G5496-60009)
7	Reservoir, Seahorse 201254-100, PP, no walls, pyramid bottoms
8	96 Greiner 655101 PS Cr Rnd Well Flat Btm
9	96 Greiner 655101 PS Cr Rnd Well Flat Btm

Agilent Technologies

Instructions
Run Syringe Test
Pause
Save Settings
Restore Defaults
Analysis Tool
Utility Library



User Guide

G5409-90021

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