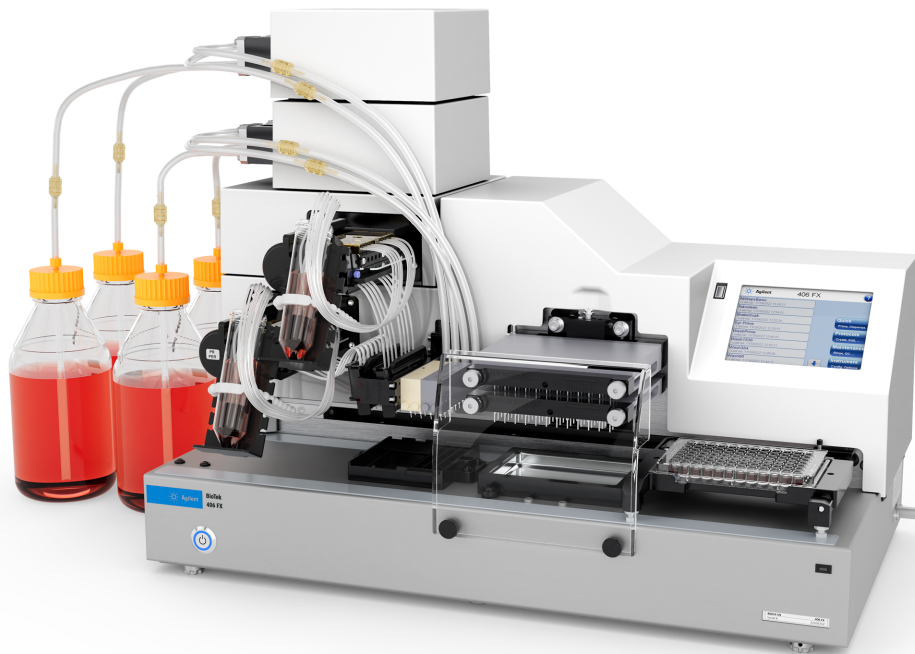




Agilent BioTek 406 FX Microplate Washer Dispenser **User Manual**



ERRATA NOTICE: This document contains references to BioTek. Please note that BioTek is now Agilent. For more information, go to www.agilent.com/lifesciences/biotek.

Notices

Document Identification

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Software Revision

This document is valid for the 3.0 revision or higher of the Agilent Liquid Handling Control (LHC) and compatible programs until superseded.

Instrument Manufacturing



Manufactured by
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CAUTION

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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.

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2 Introduction

This chapter introduces the 406 FX and provides instructions for contacting Technical Support.

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2 Introduction

Introducing the 406 FX Microplate Washer Dispenser

Introducing the 406 FX Microplate Washer Dispenser

The 406 FX offers up to three devices in one instrument: a microplate Washer, a peristaltic pump dispenser (the "Peri-pump"), and a dual Syringe pump dispenser. One or both dispensers are provided with every 406 FX.

One model is available: 406FX--SN.

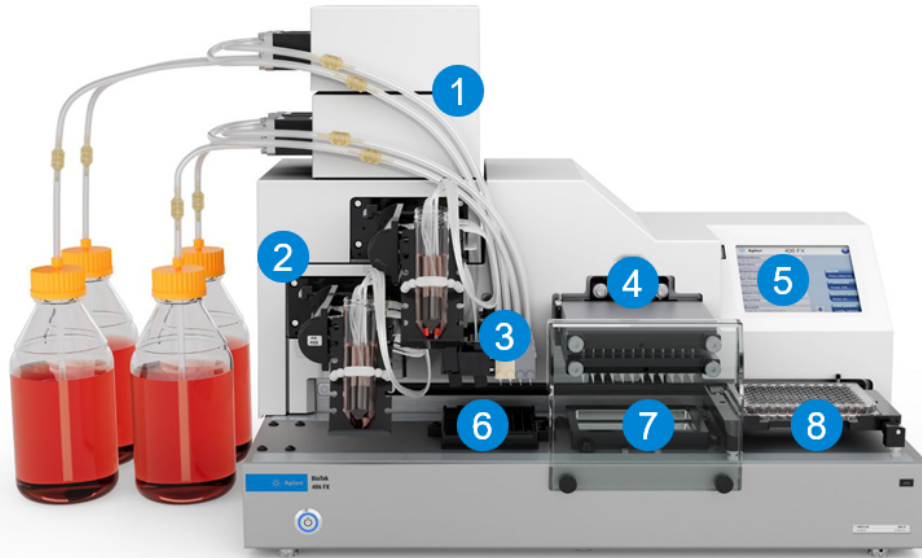


Figure 2-1: 406 FX Washer Dispenser

| Device/Component | Description |
|---|--|
| 1 Syringe Dispensers | Syringe-pump dispensers, each with an 8-, 16- or 32-tube manifold. Up to two syringe pumps may be connected. |
| 2 Peri-pump Dispensers | Peristaltic, 8-channel dispensers with an entirely visible fluid path. Shown with optional secondary Peri-pump. |
| 3 Dispense arm | Holds the Peri-pump Tip Holder and the Syringe dispenser manifolds. |
| 4 Washer manifold | 96- or 192-tube devices aspirate and dispense fluid; or 128-tube manifold aspirates fluid from 1536-well plates. |
| 5 Touchscreen | On-board instrument control. |
| 6 Priming trough | Waste reservoir for collecting priming fluid for the Peri-pump and Syringe dispensers. |
| 7 Ultrasonic cleaning and priming trough Mist shield | All models support AutoClean ultrasonic cleaning of the washer. |
| 8 Plate Carrier | Holds standard microplates for processing. |

Package Contents

| Description | Part number |
|--|-------------|
| Power supply, 24 V DC | 02285 |
| External Vacuum Pump Switch Box (with control cable) | 2120505 |
| USB cable | 75108 |
| Microplate carrier | 2120508 |
| Mist shield and 2 thumbscrews | 2122074 |
| Reagent bottle holder | 7212034 |
| Reagent bottle holder step, 2 count. | 7212035 |
| Phillips screwdriver for removing dispenser arm shipping bracket | 01188 |
| Syringe priming trough | 2122043 |
| Peri-pump priming trough, 2 | 7182043 |
| 406 FX User Manual, on USB flash drive | 2121000N |

Accessory Pack

| Description | Part number |
|---|-------------|
| Hex wrench, 9/64" for removing washer manifold shipping bracket | 48434 |
| Hex wrench, 1/16" for removing magnets from syringe manifolds and for adjusting manifold stop screw | 48713 |
| Phillips screwdriver 0.3 mm OD, for Peri-pump cassette calibration | 98268 |
| Disposable syringe, 10 cc Luer, for Peri-pump cassette maintenance | 49919 |
| Stylus, .012 OD no color, for cleaning 192-tube dispense manifold | 7772029 |
| Stylus, .018 OD yellow, for cleaning washer and Syringe manifold dispense tubes, and 128-tube aspirate manifold tubes | 7772030 |
| Stylus, .031 red, for cleaning washer manifold aspirate tubes | 7772033 |
| Manifold stop height set tool for adjusting manifold stop screw | 2122136 |
| Shipping set | 2123008 |

Optional Accessories

General Instrument Accessories

| Description | PN |
|---|--|
| Agilent liquid testing solutions for instrument qualification tests | Wetting Agent Blue Test Dye 7773002 7773001 |
| Liquid Handling Control Software 3.0 | 5330209 |

2 Introduction

Optional Accessories

Washer Accessories

| Description | Part Number |
|--|-------------|
| Complete dispense/waste system 4 L bottles | 2120531 |
| Complete dispense/waste system High Flow 4 L bottles | 2120532 |
| Complete dispense/waste system High Flow 10 L bottles | 2120533 |
| Complete dispense/waste system High Flow 20 L bottles | 2120534 |
| Vacuum System Complete Assembly 115V/230V, 4 L bottles | 7100746S |
| High Flow Vacuum System Complete Assembly 115V/230V, 4 L bottles | 7100753S |
| Complete Direct Drain Waste System, 115V/230V, 4L bottles | 1170560S |
| Complete Direct Drain High Flow Waste System 115V/230V, 4 L bottles | 1170562 |
| Direct drain waste system upgrade kit, 115V/230V, 4 L bottles (For use with any complete waste system) | 1170561S |
| Complete dispense system. 4 L, Assembly | 2120535 |
| Complete dispense system. 10 L, Assembly | 2120536 |
| Complete Waste System 115V/230V, 4 L bottles | 7100746S |
| High Flow Vacuum System, Complete Assembly 115V/230V, 4 L bottles | 7100753S |
| Vacuum Set with Level Sense Assembly, 4 L | 7100543S |
| Vacuum Set with Level Sense Assembly, 10 L | 7100582S |
| Vacuum Pump Assembly 115V/230V | 7103035 |
| High Flow Vacuum Pump Assembly 115V/230V | 7100754 |

Repackaging and Shipping Instructions

Please read the information provided below before preparing the instrument for shipment.

- Contact Technical Support before returning equipment for service.
- Decontamination prior to shipment is required by the U.S. Department of Transportation regulations.
- If the instrument has been exposed to potentially hazardous material, decontaminate it to minimize the risk to all who come in contact with the instrument during shipping, handling, and servicing. The Maintenance section contains decontamination instructions.
- Install the shipping hardware (see next section).
- The instrument's packaging design is subject to change. If the instructions in this document do not apply to the packaging materials you are using, contact Technical Support for guidance.
- Be sure to use packaging materials supplied by the manufacturer. Other forms of commercially available packaging are not recommended and can void the warranty.
- If the packaging materials have been damaged or lost, or if the same set has been used more than four times, order replacements.

CAUTION

Shipping Hardware. All shipping hardware must be removed before operating the instrument and reinstalled before repackaging the instrument for shipment.

Prepare the instrument for shipping:

| LHC | Touch screen |
|---|--|
| <ol style="list-style-type: none"> 1 Select Tools > Instrument Utilities > Washer 2 Select the shipping bracket link under Service Functions. | <ol style="list-style-type: none"> 1 Select Instrument > Next > Next > Other. 2 Select Park Manifold. |
| <ol style="list-style-type: none"> 3 Remove the Peri-pump's cassette and the Syringe dispensers' manifolds. 4 Wrap rubber bands around the Peri-pump pump heads 5 Remove the plate carrier and put it in the accessories box. 6 Uninstall and repack separately the Syringe pump and its accessories, if applicable. 7 Slide the transport rail into position next to the dispense arm. It will be secured in place by one of the shipping brackets. | |

Reinstall the shipping hardware by reversing the steps described to [Remove the Shipping Hardware](#).

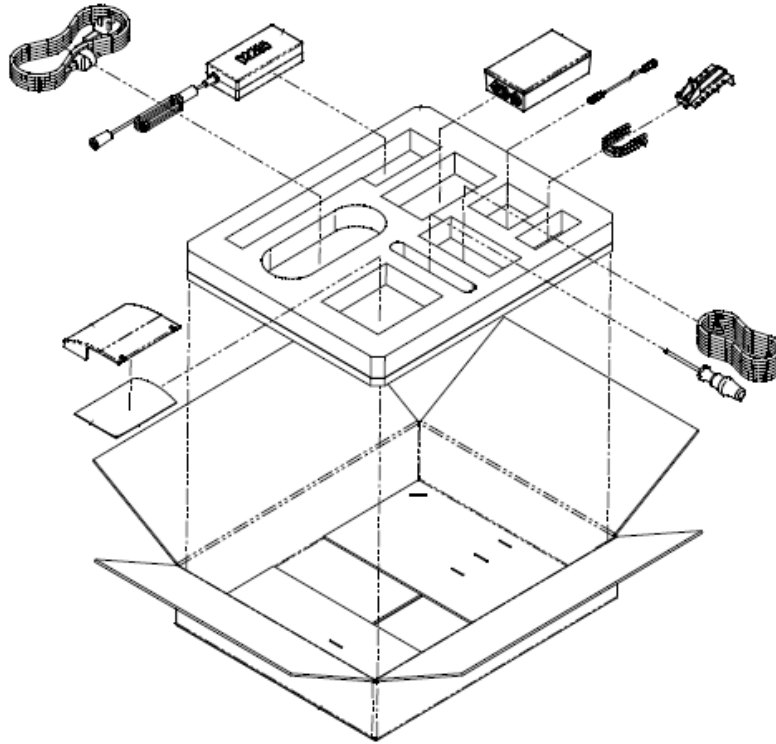
NOTE

The instrument's packaging design is subject to change over time. If the instructions in this section do not appear to apply to the packaging materials you are using, please contact Agilent Technical Support for guidance.

3 Installation

Repackaging and Shipping Instructions

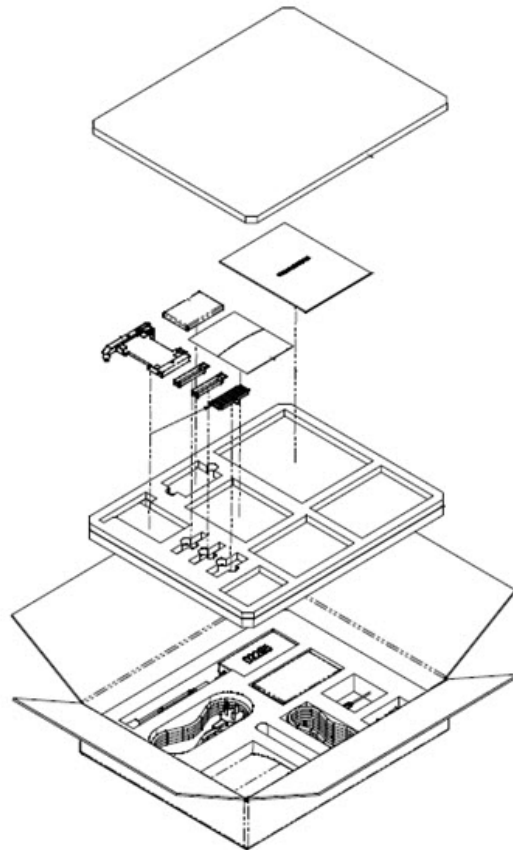
- 1 Repack the instrument accessories box bottom tray, placing each item into its designated slot.



3 Installation

Repackaging and Shipping Instructions

- 2 Repack the instrument accessories box top tray, placing item into its designated slot.
- 3 Place this tray in the box and cover with the tray cover.

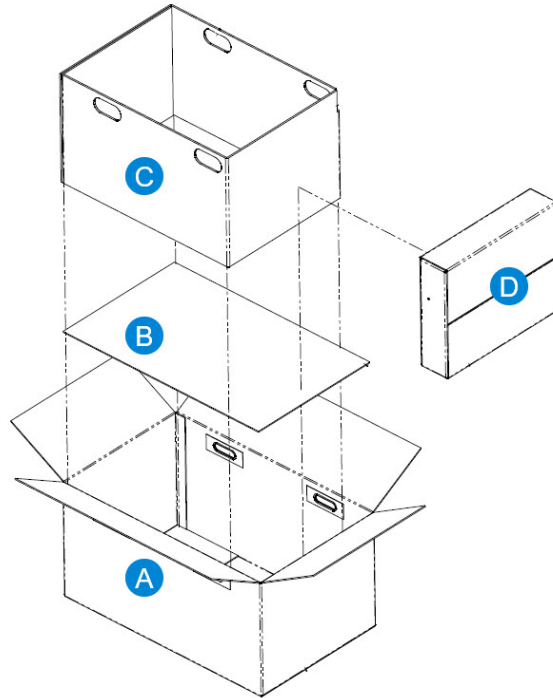


- 4 Close the flaps and tape shut.
- 5 Prepare the main box for the instrument and accessories

3 Installation

Repackaging and Shipping Instructions

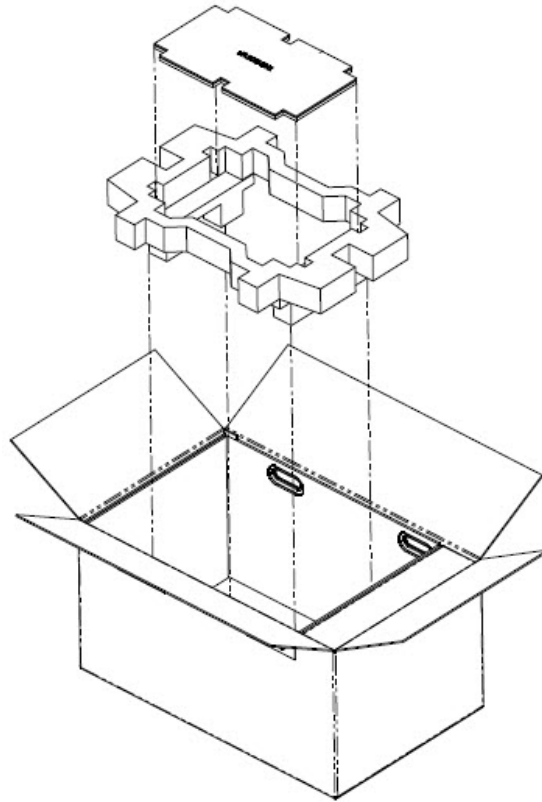
- 6 Place the instrument box (A) on a flat, sturdy surface and insert the bottom (B).
- 7 Insert the box insert (C) so that the handholds of the insert align with the outer box. This insert will not fill the entire space.
- 8 Place the prepared accessories box (D) between the insert and the box as see below.



3 Installation

Repackaging and Shipping Instructions

- 9 Place the bottom shipping foam insert into the box and then place the bottom into the foam insert. These support the instrument during shipping.



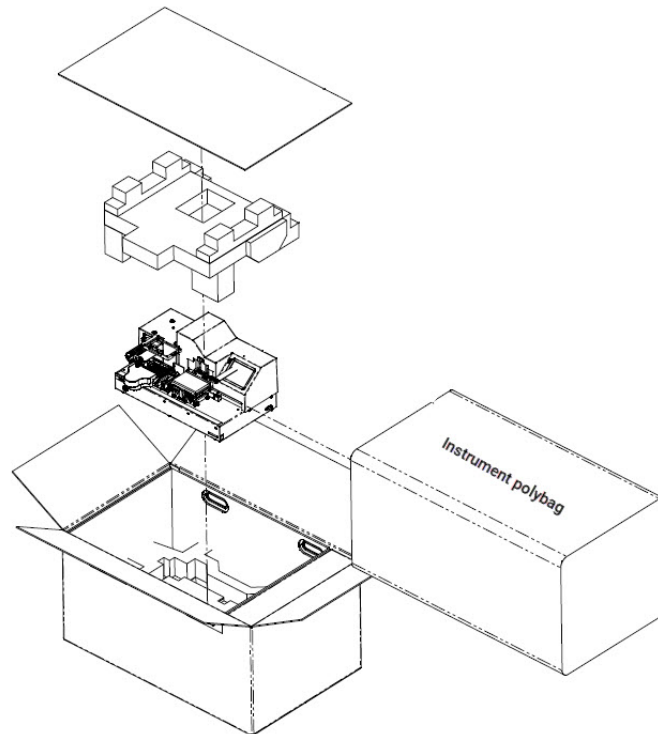
IMPORTANT

The instrument is heavy. Have another person help you with the next packing steps to avoid damage to the instrument.

3 Installation

Repackaging and Shipping Instructions

- 10 Place the instrument in the poly bag.
- 11 Carefully place the instrument in the box, fitting it into the bottom foam insert.
- 12 Place the top foam insert on top of the instrument and then place the cardboard over it.

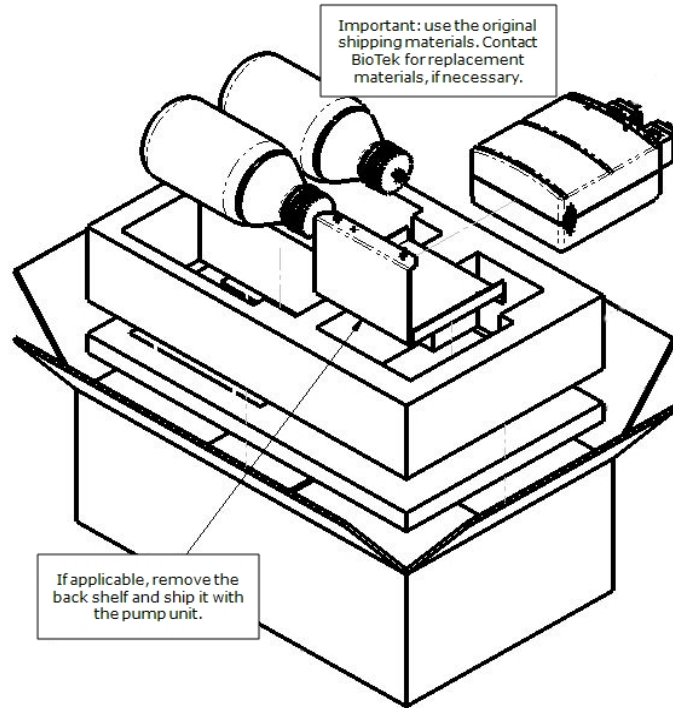


- 13 Securely tape up the box for shipment.

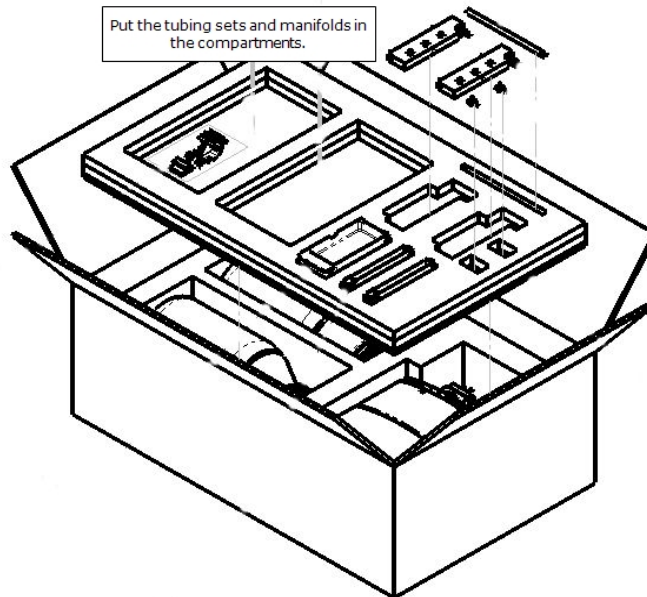
3 Installation
Repacking the Syringe Dispenser

Repacking the Syringe Dispenser

After preparing the instrument for shipping, and reversing the installation steps, pack the Syringe dispenser as shown here:



Fill the foam tray with the Syringe dispenser accessories and place the tray on top of the inner foam box containing the pump and supply bottles.





5 Maintenance

Properly maintaining the 406 FX is the key to reliable performance.

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5 Maintenance

Removing Protein Residuals and Fungi Growth

Removing Protein Residuals and Fungi Growth

CAUTION

Bovine Serum Albumin. Solutions containing proteins, such as bovine serum albumin (BSA), will compromise instrument performance over time unless a strict maintenance protocol is adhered to.

When using protein solutions or similar fluids, Agilent recommends performing the following procedures to thoroughly flush out protein particles and other contaminants from the fluid path.

Also note some components can be autoclaved to sterilize them.

NOTE

Four-liter volumes specified in the following are approximate amounts.

Daily Practice with buffer and deionized water:

If the 406 FX is idle between plates for longer than 45 minutes, flush the proteins using buffer. Use buffer for the AutoPrime, as well, for immediate reuse of the instrument. Otherwise, if the tubes will be allowed to dry, flush the system with DI water to remove the buffer:

- 1 Fill a supply bottle with buffer solution. Connect the bottle to the Buffer A port or to the syringe dispenser.
- 2 Run the applicable **DAY_RINSE** protocol.
- 3 Enable AutoPrime for 60-minute intervals.

NOTE

Flush the buffer from the system using DI water when the device will be idle for an extended period, that is, repeat steps 1 and 2 using water.

At the end of the day:

- 1 Fill a supply bottle with buffer for each device (washer or syringe). Connect the bottle to the Buffer **A** port for the washer or to the appropriate Syringe dispenser port.
- 2 Run the applicable **DAY_RINSE** protocol three times.
- 3 Fill a supply bottle with deionized water and repeat steps 1 and 2.
- 4 Perform your regular Overnight/Multi-Day Maintenance routine.

Weekly or As Needed, use NaOH and HCl to remove proteins:

- 1 Flush the system with 0.1-0.5 N* NaOH (sodium hydroxide), followed by neutralization with an equivalent normality (0.1-0.5 N) of HCl (hydrochloride).
- 2 Rinse well with deionized water to remove the HCl.
- 3 Run the applicable **W-DAY_RINSE** protocol three times with deionized water if you plan to use the device immediately.

NOTE

* N = Normal solution, which contains 1 'gram equivalent weight' (gEW) of solute per liter of solution. The gram equivalent weight is equal to the molecular weight expressed as grams divided by the 'valency' of the solute.

5 Maintenance

Periodic Maintenance

Alternatively, use an Enzyme-Active Detergent:

- 1 Mix an enzyme-active detergent according to the manufacturer's directions to fill two four-liter supply bottles.
- 2 Run the **W-DECONTAMINATE** or **S-DECONTAMINATE** protocol, as appropriate, based on the syringe channel.

NOTE

Follow the on-screen prompts and messages. **Delay** messages contain instructions and information to help you walk through the procedure.

- 3 Respond to the **Delay** message and when ready, press **Continue**.
- 4 When the protocol is completed, determine if the appropriate Decontaminate protocol needs to be run again and repeat as necessary.
- 5 When the process is completed, connect a bottle containing four liters of deionized water and run **W-DAY_RINSE** or **S-DAY_RINSE** as appropriate, based on the syringe channel, three times to flush the system.
- 6 Repeat the procedure for the other Syringe dispensers as appropriate.

Direct Drain Only: Clean the Waste Bottle Filter

Periodically clean the direct-drain waste bottle filter (part number 01310):

WARNING

Direct Drain Waste Bottle Filter: Handle with care! When cleaning the waste bottle filter, be aware of any potential biohazards and handle appropriately.

- 1 Open the bottle and lift the cap and its tubing up and out of the bottle.
- 2 Remove the fluid filter at the bottom of the tubing.
- 3 Wash the filter with hot water and a soft-bristle brush, if necessary.
- 4 Rinse the filter and reinstall it.



Periodic Maintenance

Periodic maintenance involves cleaning the components on a regular basis to keep the instrument running efficiently and in compliance with performance specifications. The recommended **frequency for cleaning components** is *at least monthly*. The risk and performance factors associated with your assays may require that some or all procedures be performed more frequently.

WARNING

Internal Voltage. Always turn off the power switch and unplug the power supply before cleaning

5 Maintenance

Periodic Maintenance

the outer surface of the instrument.

WARNING



Potential Biohazards. Some assays or specimens may pose a biohazard. Adequate safety precautions should be taken as outlined in the assay's package insert. Always wear safety glasses and appropriate protective equipment, such as chemical-resistant rubber gloves and apron.

WARNING

Liquids. Avoid spilling liquids on the instrument; fluid seepage into internal components creates a potential for shock hazard or instrument damage. If a spill occurs while a program is running, stop the program and turn off the instrument. Wipe up all spills immediately. Do not operate the instrument if internal components have been exposed to fluid.

CAUTION

Liquids. Do not immerse the instrument, spray it with liquid, or use a dripping-wet cloth on it. Do not allow water or other cleaning solution to run into the interior of the instrument. If this happens, contact Technical Support. Do not soak the touch screen.

CAUTION

Lubricants. Do not apply lubricants to moving parts. Lubricant on components in the carrier compartment will attract dust and other particles, which may cause the instrument to produce an error. Do not apply lubricants to manifold o-rings, channel-end seals, bottle cover seals, any tubing connection, or any surface that is a part of the fluid path.

CAUTION

Chemical Compatibility. Some chemicals may cause irreparable damage to the instrument. The following chemicals have been deemed safe for use in the instrument: buffer solutions (such as PBS), saline, surfactants, deionized water, 70% ethyl, isopropyl, or methyl alcohol, and 20% sodium hydroxide. Never use acetic acid, DMSO, or other organic solvents. These chemicals may cause severe damage to the instrument.

CAUTION

Caution: Bovine Serum Albumin. Solutions containing proteins, such as bovine serum albumin (BSA), will compromise instrument performance over time unless a strict maintenance protocol is adhered to.

Perform these maintenance tasks regularly:

- [Clean the Bottles below.](#)
- [Clean the Plate Carrier on the facing page.](#)
- [Peri-pump Dispenser Maintenance on page 175.](#)
- [Syringe Dispenser Maintenance on page 178.](#)

Clean the Bottles

- Clean and rinse the supply bottles with deionized water before the first use, before each refill, and as necessary, to prevent bacteria growth.
- Empty the waste bottle often (at least daily), and firmly seat the waste bottle stopper.
- Rinse the covers every time the wash or rinse bottles are filled.
- Accumulated algae, fungi, or mold may require decontamination.
- Check the hex nuts securing the quick-disconnects to the bottle cap to ensure they are not loose or corroded.

NOTE

To ensure that fluid does not back up into the vacuum pump during operation, always operate the instrument with the **waste sensor cable** installed and the **waste detection sensor** enabled (the

5 Maintenance

Periodic Maintenance

sensor is enabled by default).

NOTE

If fluid collects in the **overflow bottle**, thoroughly rinse the level-switch assembly and bottle.

Clean the Plate Carrier

If liquid has overflowed onto the plate carrier, transport rail, or glide strips, some buildup may occur and prevent the microplate from seating correctly on the carrier. This buildup can interfere with plate transport. Weekly cleaning is recommended.

- 1 Turn the instrument off.
- 2 Lift the carrier up and off the transport rail.
- 3 Clean the carrier, rails, and glide strips using mild detergent and hot water, 70% isopropyl alcohol, or ethanol. Clean the priming trough, too.
- 4 If detergent was used, wipe the components with a cloth moistened with water. Use a clean, dry cloth to dry the components.
- 5 Reinstall the carrier:
 - Place it on the transport rail so the slot on its base fits into the **Y-axis Carrier Arm**.
 - If necessary, release the spring-loaded microplate clamp in the back left corner of the carrier to level the carrier on the base.

Clean the Exterior Surfaces and Mist shield

- 1 Turn off the instrument and disconnect the power cable.
- 2 Moisten a lint-free disposable towel with water or with water and mild detergent. **Do not soak the cloth.**
- 3 Remove the mist shield if it is attached. Wipe the inside and outside surfaces of the mist shield with the towel. Wipe the top surface of the instrument base and all exposed surfaces of the instrument.
- 4 If detergent was used, wipe all surfaces with a water-moistened cloth.
- 5 Use a clean, dry cloth to dry all wet surfaces.

Autoclavable Components

Autoclaving is an efficient method of sterilizing instrument components. It is a good alternative to some of the decontamination procedures for qualified items.

| Do autoclave: | Do NOT autoclave: |
|---|---|
| Peri-pump cassette* | Washer manifolds |
| 16-Tube and Low-density plate-type-specific Syringe dispenser manifolds | Plate carrier |
| Priming trough inserts | 32-Tube Syringe dispenser manifolds |
| Syringe pump head (glass/stainless steel) | 8-Tube Syringe dispenser manifolds (gray block holds two manifolds, 16 tubes total) |

Chemical Compatibility

For your own safety and to ensure the instrument's long life, follow these guidelines when choosing compounds to use.

Important: Avoid continuous contact with harsh chemicals. A best practice is to rinse all components with deionized/distilled water after contact with any strong acid, base, or solvent.

Materials listed as 1-20 in **Table 1** are cross-referenced as headings 1-20 in **Table 2**. Table 1 indicates which component contains the material using **P** for Peri-pump, **S** for the dual Syringe dispensers, and **W** for the washer module.

Table 1: Material Where Used

| # | Material | Where Used |
|----|-------------------------------------|---|
| 1 | 304 Stainless Steel | W Inlet screen, feeder tube to manifold, vacuum switch, fluid pump, direct-drain inlet screen |
| 2 | 316 Stainless Steel | P Steel dispense tips, pump rollers, carrier rails, cassette bolts |
| | | S Dispense tubes, syringe piston, cylinder head and fittings, check valve spring, aspirate tubes, aspirate arm release button |
| | | W Fluid inlet filter, feeder tube to manifold, vacuum switch, fluid pump, and vacuum filtration pressure regulator components |
| 3 | Aluminum | Instrument main structural plate |
| | | P Center Holder, Tube Tensioner, pump head, dispense arm |
| 4 | Borosilicate Glass | S Syringe cylinder, supply bottles (autoclavable models only) |
| 5 | Brass | P Threaded inserts in Center Holder and Tip Holder |
| 6 | EP (Ethylene Propylene) | S Check-valve o-rings (organic solvent tubing set) |
| | | W Inlet valve, vacuum switch |
| 7 | ETFE (Ethylene tetrafluoroethylene) | S Manifold fitting |
| 8 | Neoprene | W Manifold channel-end seals |
| 9 | Nylon | W Inlet fitting, vacuum switch adjustment screw, carrier leveling feet |
| 9 | Polyethylene | S W Supply Bottle |
| 10 | Polycarbonate | Plate carrier |
| | | P Plate positioning dog, peristaltic pump cover latch |
| | | W Vacuum switch |
| 11 | Polyethylene | W Buffer bottle |
| 12 | Polypropylene | P Molded dispense tips |
| | | S Bottle cap and fittings, check valves (organic solvent tubingset) |
| | | W Outlet fitting, fittings in bottles, inline fittings, float ball, vacuum filtration pressure gauge components, direct-drain module fittings |
| 13 | Polystyrene | Assay plates, mist shield |
| | | P Peristaltic pump cover, RFID antenna cover |
| | | W Flow sensor |
| 14 | PTFE (polytetrafluoroethylene) | S Syringe seal |
| | | W Optional check valves (PN: 68098) for fluid pump |
| 15 | CPVC (Polyvinyl chloride) | W Inlet screen, inlet valve, manifold, waste sensor, ball retainer, vacuum filtration carrier, system orifice, and pressure regulator, direct drain bottle sensor |

| # | Material | | Where Used |
|----|------------------------|---|---|
| 16 | Ryton PPS | P | Tube Organizer, priming trough, priming trough insert, RAD 8-to-1 chute |
| | | S | Manifold, manifold plugs, priming trough insert |
| | | W | Outlet valve, fluid pump, inlet valve, direct-drain fluid pump |
| 17 | Santoprene | W | Fluid pump, direct-drain pump check valves |
| 18 | Silicone | P | Tubing |
| | | S | Tubing, manifold o-rings, check valve o-rings |
| | | W | Inlet tubing, outlet tubing, o-rings, vacuum filtration pressure regulator tubing and o-rings, direct-drain module tubing |
| 19 | Ultem (polyetherimide) | P | Center Holder, Tube Tensioner, Tip Holder |
| | | S | Check-valves |
| | | W | Outlet valve, cell wash inlet valve, vacuum filtration valve, direct-drain valve |
| 20 | Viton | W | Outlet valve, direct-drain valve |

| Chemical | 1-20 represent Materials listed above in the Where Used List | | | | | | | | | | | | | | | | | | | |
|---------------------------|--|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Sodium Hypochlorite <20% | C | D | A | D | B | A | A | C | A | A | A | A | A | C | B | B | A | C | B | B |
| Sodium Hypochlorite 0.50% | B | D | A | D | B | A | A | C | A | A | A | A | A | C | B | A | A | C | B | A |
| Sulfuric Acid <10% | B | B | A | N | A | C | A | A | A | A | A | A | A | C | A | A | A | A | C | A |
| Trichloroethylene | B | D | N | N | N | A | D | N | D | C | D | A | D | A | D | D | D | A | D | D |
| Virkon 10% | A | D | A | N | A | N | A | A | A | A | A | N | A | A | A | N | A | A | A | N |

* Acetone is not recommended for use with Agilent instruments.

† Exposure to DMSO and Acetonitrile may cause the silicone tubing to swell, increasing the volume of fluid Dispensed. The magnitude of this effect will vary with concentration and exposure. Re-calibration of the cassette may be required.