

ELx405™

**Microplate Washer
Instructions for Use**

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Part Number 7101037

Revision F

BioTek® Instruments, Inc.

Notices

BioTek® Instruments, Inc.

P.O. Box 998, Highland Park

Winooski, Vermont 05404-0998 USA

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Contact Information

BioTek® Instruments, Inc.

P.O. Box 998, Highland Park
Winooski, Vermont 05404-0998 USA

Customer Service and Sales

Internet: www.biotek.com
Phone: 888-451-5171 (toll free in the U.S.)
802-655-4740 (outside the U.S.)
Fax: 802-655-7941
E-Mail: customercare@biotek.com

Service/TAC

Phone: 800-242-4685 (toll free in the U.S.)
802-655-4740 (outside the U.S.)
Fax: 802-654-0638
E-Mail: tac@biotek.com

European Coordination Center/ Authorized European Representative

BioTek® Instruments GmbH
Kocherwaldstrasse 34
D-74177 Bad Friedrichshall
Germany

Internet: www.biotek.de
Phone: +49 (0) 7136 9680
Fax: +49 (0) 7136 968 111
E-Mail: info@biotek.de

Instructions for Use Requirements

This document fulfills the basic needs of persons operating this device, according to the requirements of the In Vitro Diagnostic Directive for “Instructions for Use.” Some of the device’s higher-level functions, such as programming and advanced troubleshooting, are described in the *ELx405 Operator’s Manual*.

Intended Use Statement

The ELx405 Microplate Washer provides microplate priming, washing, dispensing, and aspiration for ELISA, fluorescence and chemiluminescence immunoassays, cellular and agglutination assays. The washer can operate as a stand-alone instrument or with standard robotic systems, such as BioTek’s BioStack Microplate Stacker.

If the instrument has an “IVD” label it may be used for clinical and non-clinical purposes, including research & development. If there is no such label the instrument may only be used for research & development or other non-clinical purposes.

Quality Control

It is considered good laboratory practice to run laboratory samples according to instructions and specific recommendations included in the assay package insert for the test to be conducted. Failure to conduct Quality Control checks could result in erroneous test data.

Warnings



Operate the instrument on a level, stable surface away from excessive humidity.

When operated in a safe environment according to the instructions in this document, there are no known hazards associated with the instrument. However, the operator should be aware of certain situations that could result in serious injury; these vary depending on the instrument type. See *Hazards* and *Precautions*.

Strict adherence to instrument maintenance and qualification procedures is required to ensure accurate dispense volumes and risk-free operation.

Hazards

The following hazard warnings are provided to help avoid injury:



Warning! Power Rating. The instrument's power cord must be connected to a power receptacle that provides voltage and current within the specified rating for the system. Use of an incompatible power receptacle may produce electrical shock and fire hazards.

Warning! Electrical Grounding. Never use a plug adapter to connect primary power to the instrument. Use of an adapter disconnects the utility ground, creating a severe shock hazard. Always connect the power cord directly to an appropriate receptacle with a functional ground.

Warning! Service. Only qualified technical personnel should perform service procedures on internal components.

Warning! Accessories. Only accessories which meet the manufacturer's specifications shall be used with the instrument.

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, abort the program and turn the instrument off. Wipe up all spills immediately. Do not operate the instrument if internal components have been exposed to fluid.

Warning! Unspecified Use. Failure to operate the equipment according to the guidelines and safeguards specified in this manual could result in a hazardous condition.

Warning! Direct Drain Waste. If installed, the direct drain waste system pumps waste fluids from the washer directly into a sink or tank, and, potentially into public waste water systems. Because the waste may be a biohazard, you must ensure compliance with your local or national government's laws regarding safe disposal of the waste.

Warning! Ultrasonic Energy. Ultrasonic energy is present in the ultrasonic cleaner reservoir (if equipped) when AUTOCLEAN programs are running. Avoid putting your fingers in the bath. Ultrasonic energy, in this application, can be destructive to human tissue.

Warning! Software Quality Control. The operator must follow the manufacturer's assay package insert when modifying software parameters and establishing wash methods. Failure to conduct quality control checks could result in erroneous test data.



Warning! Internal Voltage. Always turn off the power switch and unplug the power cord before cleaning 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 chemically resistant rubber gloves and apron.



Warning! Pinch Hazard. Some areas of the instrument or its components can present pinch hazards when the instrument is operating. Depending on the instrument or component, these areas are marked with one of the symbols shown here. Keep hands/fingers clear of these areas when the instrument is operating.

Precautions

The following precautions are provided to help avoid damage to the instrument:



Caution: Service. The instrument should be serviced by BioTek authorized personnel. Only qualified technical personnel should perform service procedures on internal components.

Caution: Spare Parts. Only approved spare parts should be used for maintenance. The use of unapproved spare parts and accessories may result in a loss of warranty and potentially impair instrument performance or cause damage to the instrument.

Caution: Environmental Conditions. Do not expose the instrument to temperature extremes. For proper operation, ambient temperatures should remain within the range listed in the *Specifications* section. Performance may be adversely affected if temperatures fluctuate above or below this range. Storage temperature limits are broader.

Caution: Sodium Hypochlorite. Do not expose any part of the instrument to the recommended diluted sodium hypochlorite solution (bleach) for more than 20 minutes. Prolonged contact may damage the instrument surfaces. Be certain to rinse and thoroughly wipe all surfaces.

Caution: Buffer Solution. Although many precautions have been taken to ensure that the instrument is as corrosion-proof as possible, the instrument is not sealed and liquids can seep into sensitive components. Make sure that any spilled buffer solution is wiped off the instrument. Prolonged exposure to salt solution may corrode parts of the microplate carrier, movement rail, springs, and other hardware.



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, 40% formaldehyde, and 20% sodium hydroxide. Never use acetic acid, DMSO, or other organic solvents. These chemicals may cause severe damage to the instrument. Use of wash buffers containing acetic acid is limited to instruments with PN 68098 Teflon® valves. Contact BioTek for more information and prior to using other questionable chemicals. See also the **Chemical Compatibility** list in the Operator's Manual.

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

Caution: Disposal. This instrument contains printed circuit boards and wiring with lead solder. Dispose of the instrument according to Directive 2002/96/EC, "on waste electrical and electronic equipment (WEEE)," or local ordinances.

Caution: Warranty. Failure to follow preventive maintenance protocols may **void the warranty**.

Caution: Shipping Hardware. All shipping hardware (e.g., manifold shipping bracket) must be removed before operating the instrument and reinstalled before repackaging the washer for shipment.

Caution: High Flow Pump Installation. DO NOT plug the High Flow vacuum pump cable into a wall outlet! Use the adapter provided with the pump to connect the pump to the accessory outlet on the back of the instrument. See the installation instructions.

Caution: Waste Sensor Port on ELx405. (For customers who have purchased the BioStack Microplate Stacker for use with the washer.) Although the waste sensor port on the back of the washer is the same type as the 24-VDC power connector on the back of the BioStack, if an external 24-VDC power supply is plugged into the washer's port, **it will permanently damage internal components**.

Caution: Electromagnetic Environment. Per IEC 61326-2-6 it is the user's responsibility to ensure that a compatible electromagnetic environment for this instrument is provided and maintained in order that the device will perform as intended.

Caution: Electromagnetic Compatibility. Do not use this device in close proximity to sources of strong electromagnetic radiation (e.g., unshielded intentional RF sources), as these may interfere with the proper orientation.

CE Mark



❖ See the Declaration of Conformity for more specific information.

Directive 2004/108/EC: Electromagnetic Compatibility

Emissions - Class A

The system has been type tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1 Class A for Radiated Emissions and Line Conducted Emissions.

Verification of compliance was conducted to the limits and methods of EN 55011 - (CISPR 11) Class A. In a domestic environment it may cause radio interference, in which case you may need to mitigate the interference.

Immunity

The system has been type-tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1 and EN 61326-2-6 for Immunity. Verification of compliance was conducted to the limits and methods of the following:

- EN 61000-4-2 Electrostatic Discharge
- EN 61000-4-3 Radiated EM Fields
- EN 61000-4-4 Electrical Fast Transient/Burst
- EN 61000-4-5 Surge Immunity
- EN 61000-4-6 Conducted Disturbances
- EN 61000-4-11 Voltage Dips, Short Interruptions and Variations

Directive 73/23/EEC: Low Voltage (Safety)

The system has been type-tested by an independent testing laboratory and was found to meet the requirements of this Directive. Verification of compliance was conducted to the limits and methods of the following:

EN 61010-1, "Safety requirement for electrical equipment for measurement, control and laboratory use. Part 1, General requirements."

EN 61010-2-081, "Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes."

Directive 2002/96/EC: Waste Electrical and Electronic Equipment

Disposal Notice: This instrument contains printed circuit boards and wiring with lead solder. Dispose of the instrument according to Directive 2002/96/EC, “on waste electrical and electronic equipment (WEEE)” or local ordinances.

Directive 98/79/EC: In Vitro Diagnostics (if labeled for this use)

- Product registration with competent authorities.
- Traceability to the U.S. National Institute of Standards and Technology (NIST).
- EN 61010-2-101, “Particular requirements for in vitro diagnostic (IVD) medical equipment.”

Electromagnetic Interference and Susceptibility

USA FCC CLASS A

RADIO AND TELEVISION INTERFERENCE

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

In order to maintain compliance with FCC regulations shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and television reception.

Canadian Department of Communications Class A

This digital apparatus does not exceed Class A limits for radio emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numérique de la Class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

User Safety






This device has been type-tested by an independent laboratory and found to meet the requirements of the following:

- Underwriters Laboratories UL 61010-1, "Safety requirements for electrical equipment for measurement, control and laboratory use; Part 1: General requirements."
- Canadian Standards Association CAN/CSA C22.2 No. 61010-1, "Safety requirements for electrical equipment for measurement, control and laboratory use; Part 1: General requirements."
- EN 61010 Standards, see the **CE Mark** section.

Safety Symbols

Some of these symbols appear on the instrument or accessories:

 <p>Alternating current Courant alternatif Wechselstrom Corriente alterna Corrente alternata</p>	 <p>Both direct and alternating current Courant continu et courant alternatif Gleich - und Wechselstrom Corriente continua y corriente alterna Corrente continua e corrente alternata</p>
 <p>Direct current Courant continu Gleichstrom Corriente continua Corrente continua</p>	 <p>Earth ground terminal Borne de terre Erde (Betriebserde) Borne de tierra Terra (di funzionamento)</p>
 <p>On (Supply) Marche (alimentation) Ein (Verbindung mit dem Netz) Conectado Chiuso</p>	 <p>Protective conductor terminal Borne de terre de protection Schutzleiteranschluss Borne de tierra de protección Terra di protezione</p>
 <p>Off (Supply) Arrêt (alimentation) Aus (Trennung vom Netz) Desconectado Aperto (sconnessione dalla rete di alimentazione)</p>	 <p>Caution (refer to accompanying documents) Attention (voir documents d'accompagnement) Achtung siehe Begleitpapiere Atención (vease los documentos incluidos) Attenzione, consultare la doc annessa</p>
 <p>Warning, risk of electric shock Attention, risque de choc électrique Gefährliche elektrische schlag Precaución, riesgo de sacudida eléctrica Attenzione, rischio di scossa elettrica</p>	 <p>Warning, risk of crushing or pinching Attention, risque d'écrasement et pincement Warnen, Gefahr des Zerquetschens und Klemmen Precaución, riesgo del machacamiento y sejeción Attenzione, rischio di schiacciare ed intrappolarsi</p>
 <p>Warning, hot surface Attention, surface chaude Warnen, heiße Oberfläche Precaución, superficie caliente Attenzione, superficie calda</p>	 <p>Warning, potential biohazards Attention, risques biologiques potentiels Warnung! Moegliche biologische Giftstoffe Atención, riesgos biológicos Attenzione, rischio biologico</p>

	<p>In vitro diagnostic medical device Dispositif médical de diagnostic in vitro Medizinisches In-Vitro-Diagnostikum Dispositivo médico de diagnóstico in vitro Dispositivo medico diagnostico in vitro</p>		<p>Separate collection for electrical and electronic equipment Les équipements électriques et électroniques font l'objet d'une collecte sélective Getrennte Sammlung von Elektro- und Elektronikgeräten Recogida selectiva de aparatos eléctricos y electrónicos Raccolta separata delle apparecchiature elettriche ed elettroniche</p>
	<p>Consult instructions for use Consulter la notice d'emploi Gebrauchsanweisung beachten Consultar las instrucciones de uso Consultare le istruzioni per uso</p>	 	<p>Laser radiation: Do not stare into beam Rayonnement laser: Ne pas regarder dans le faisceau Laserstrahlung: Nicht in den strahl blicken Radiación de láser: No mire fijamente al rayo Radiazione di laser: Non stare nel fascio</p>



Installation

Package Contents

❖ Part numbers and package contents are subject to change. Contact BioTek Customer Care with questions.

Description		PN
Power cord (part numbers vary according to country of use)		Varies
RS-232 serial cable (instrument-specific version is provided)		75053
		75034
USB cable (only shipped with compatible instruments)		75108
Microplate carrier (part numbers vary according to model)		Varies
Mist shield and thumbscrews – model dependent		7102209
		7102239
		19965
Dust cover		7342066
Storage case for accessory 96-tube manifold		7102136
Manifold shipping bracket	All models except Deep Well	7102152
	Deep Well models	7102240
Hardware for manifold shipping bracket	Screws (all models)	19143
	Flat washers (all models)	17054
	Lock washers (all models)	16016
9/64" (3.57 mm) hex wrench for removing shipping bracket, manifold		48434
Spare fuses		46055
Stylus set – wire plungers for cleaning dispense and aspirate tubes		-
ELx405 Operator's Manual		7101000

Unpack and Inspect the Instrument



Save all packaging materials. If the ELx405 is shipped to the factory for repair or replacement, it must be carefully repackaged, according to the instructions in the Operator's Manual, using the original packing materials. Using other forms of commercially available packing materials, or failing to follow the repackaging instructions may **void your warranty**. Improper packaging the results in damage to the instrument may lead to additional charges. If the original packing materials have been damaged, replacements are available from BioTek.

For customers who purchased the **Buffer Switching** valve module and the **Vacuum Filtration** model washer, the control module must also be returned with the ELx405 to ensure the washer meets performance specifications when used with the module. Use the original packaging materials for the control module, also.

The ELx405 washer and its accessories are securely packaged in custom-designed shipping materials to protect against damage during shipping. Inspect the shipping box, packaging, instrument, and accessories for signs of damage. **If the washer is damaged:** Notify the carrier and your manufacturer's representative. Keep the shipping cartons and packing material for the carrier's inspection. BioTek will arrange for repair or replacement of your instrument immediately.

Unpack the boxes containing the washer and other equipment:

- Vacuum pump and accessories
 - Buffer Switching valve module and accessories
 - Vacuum Filtration module and accessories
 - HT2 models with additional 96-tube manifold: The washer is shipped with the 192-tube manifold installed; the 96-tube manifold is packaged in a special case and included in the accessories.
1. Place the washer on a level surface.
 2. Take note of the manifold shipping bracket and follow instructions on page 16 for removing the bracket.
 3. If applicable, place the Buffer Switching or the Vacuum Filtration module and its accessories on a level surface and follow setup instructions.
 4. Store all the shipping materials for the washer and the accessories in a safe place for potential future use.

Remove the Manifold Shipping Bracket



Important! The washer is shipped with a protective **manifold shipping bracket**. Remove this bracket before using the washer and **reinstall** it prior to shipping to avoid irreparable damage to the manifold. Failure to remove and reinstall the shipping bracket may **void your warranty**.

❖ **Vacuum Filtration** models: Follow instructions to **Install the Side Bracket** on page 28 before removing the shipping bracket.

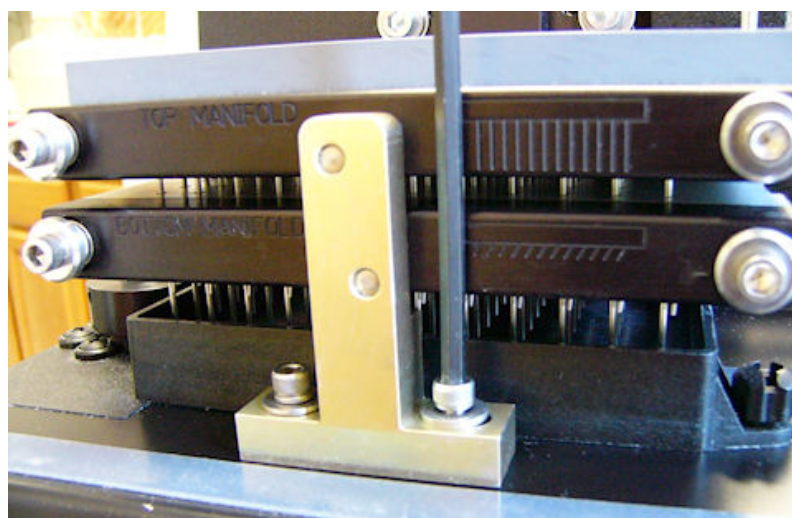


Figure 1: Removing the Manifold Shipping Bracket

1. Using the 9/64" (3.57 mm) hex wrench supplied, unscrew the cap screws at the base of the shipping bracket and remove it.
2. To store the bracket, mount it on the back of the instrument using the same screws.



Figure 2: Mount the shipping bracket on the back panel, on the studs provided next to the Fluid In port.

Deep Well models: The hardware is taller than shown, but can still be stored on the back of the instrument.

Set Up the Washer

Be sure to comply with the recommended guidelines for optimizing performance in the *ELx405 Operator's Manual* after installing the instrument and before running it.

Operating Environment



Avoid excessive humidity. Condensation directly on the sensitive electronic circuits can cause the instrument to fail internal self-checks.

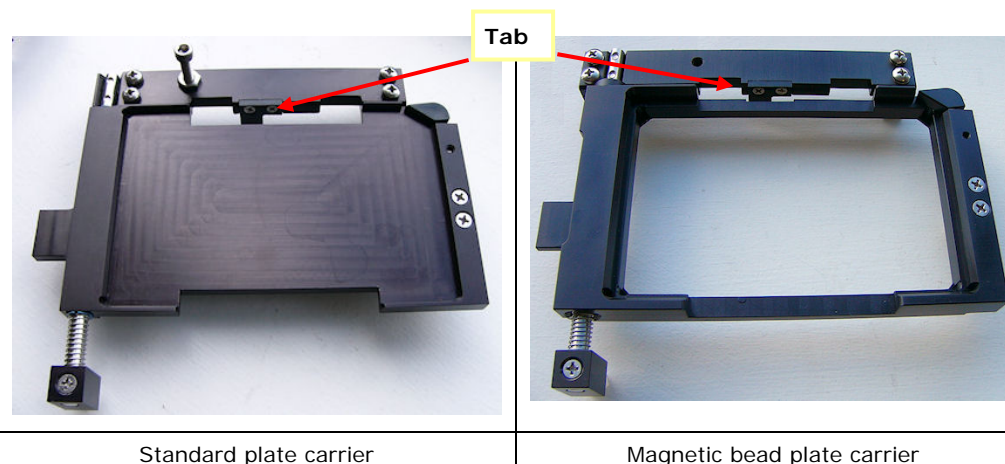
The washer is sensitive to extreme environmental conditions. For optimal operation, install the washer on a level surface, in an area where ambient temperatures between 15°C to 30°C (59°F to 86°F) can be maintained, away from excess humidity: 10% to 85% (non-condensing).

Installing the Microplate Carrier



The underside of the microplate carrier has a serial number which must match the washer's serial number. If the numbers do not match, call BioTek TAC immediately.

1. Line up the tab on the underside of the carrier with the slot on the carrier transport block.
2. Snap the two carrier rail guides onto the transport rail. The tab should sit in the slot.



Standard plate carrier

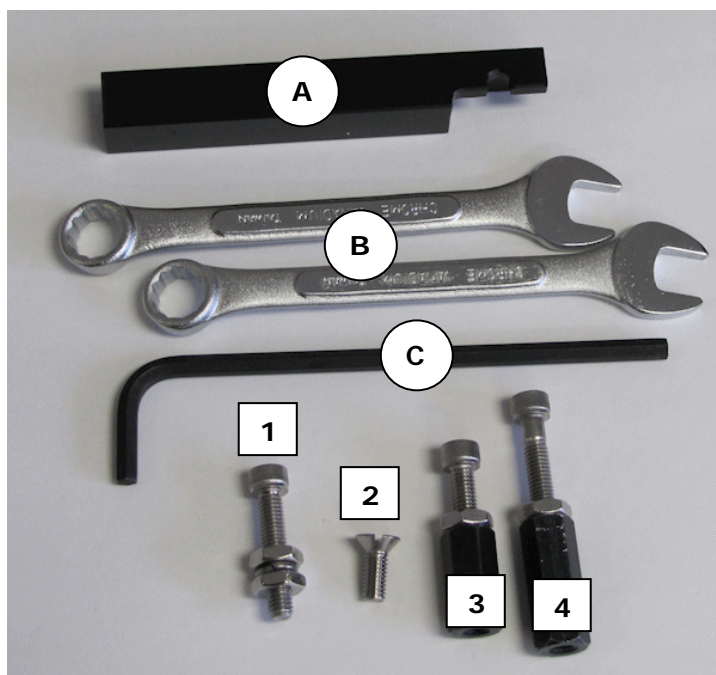
Magnetic bead plate carrier

Deep Well Models: Install the Manifold Stop Screw

The ELx405 needs a taller manifold stop screw when processing deep-well plates and typically to perform magnetic bead assays. Follow these instructions to install and adjust an additional stop screw. Locate the kit (PN 7100093) shipped with any ELx405 Deep Well microplate washer with a dual 96-deep-tube manifold.

❖ These instructions also apply to magnetic bead models.

This accessory kit includes:



A	Adjustment tool (jig) for positioning manifold stop screw
B	Two 3/8" wrenches
C	One 5/32" Allen wrench
1	Spare standard stop screw for magnetic-bead assays
2	Small Phillips-head screw to support deep-well stop screws
3	Smaller deep-well stop screw
4	Taller deep-well stop screw

Three stop screws of varied heights are provided:

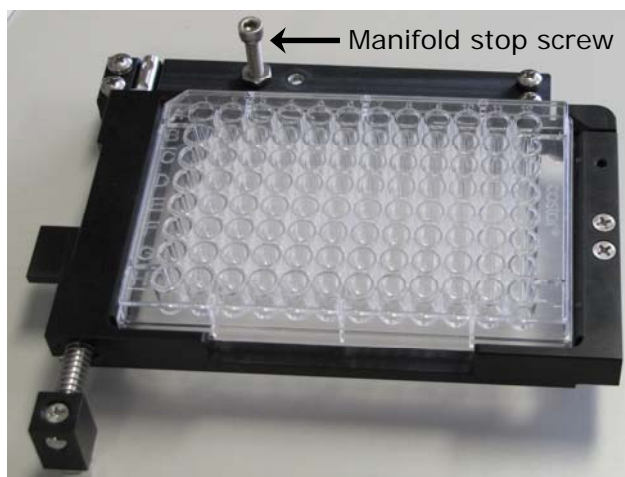
- One Spare Stop Screw: the shortest screw with two adjustable nuts and a lock washer is ideal for magnetic-bead assays in standard 96- and 384-well plates;
- Two Deep-Well Stop Screws: two screws on top of large spacers for processing deep well plates.

Philips-head screwdriver: you must provide a screwdriver to install the deep-well stop screws.

About the stop screw:

The washer's microplate carrier is equipped with a manifold stop screw that prevents the bottom dispense manifold from contacting the microplate during operation.




The plate carrier ships with one screw installed for use with standard-height microplates (14.35 mm). When using significantly taller microplates and/or a magnet, a taller manifold stop screw (in most cases) must be used.



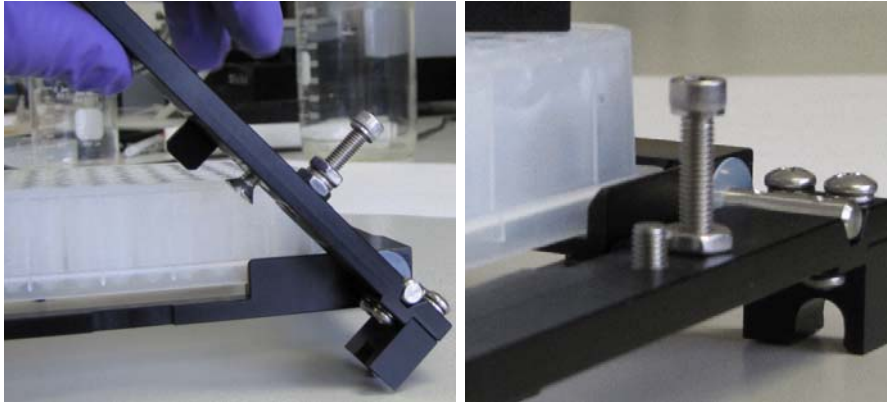
The additional stop screws are designed to make it easy to switch between setups for plates of different heights. Two stop screws can be installed at any time, allowing you to retain the standard height screw while installing and removing the taller screw to accommodate special plates/vessels.

To determine the height of the manifold stop screw:

1. Pick the additional stop screw to use to support your microplate or vessel:

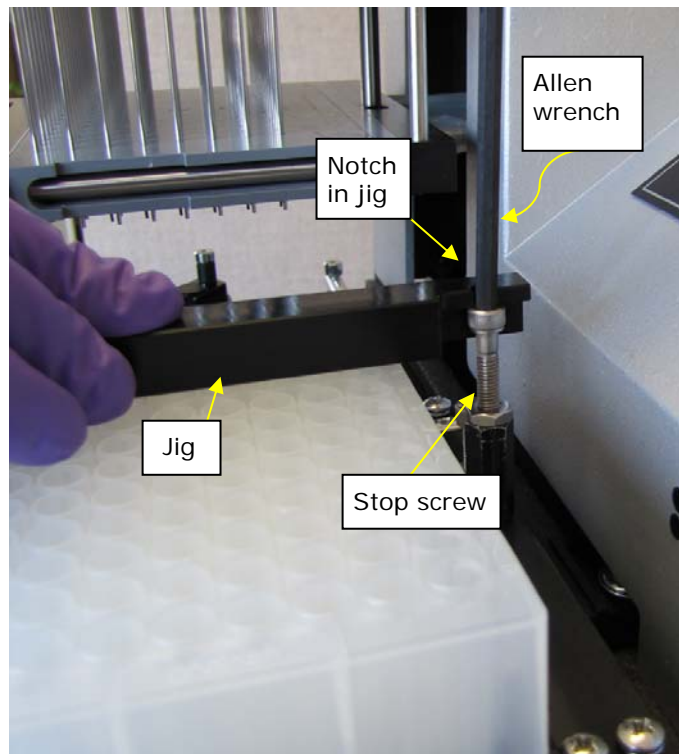
Plate Type	Stop Screw	Plate Height Range
Standard plates with magnet	 Spare stop screw	Up to 19 mm
Deep well plates similar to Corning 384-well round-bottom Polypropylene block (PN 3964 and 3965)	 Smaller deep well stop screw	19 mm – 29 mm
Deep well plates similar to Corning 96-well storage block (PN 3960 and 3961) and 96 Deep Well Cluster Tubes (PN 4410 and 4411)	 Taller deep well stop screw	29 mm – 50 mm

2. Deep Well Stop Screws only: install the small Philips-head screw in the hole next to the standard stop screw to make a post on which to install a stop screw:



- Remove the carrier from the instrument.
 - Lift the arm of the carrier that holds the stop screw to access the underside of the hole and insert the small screw.
 - Use the Philips-head screwdriver to fully tighten the screw.
 - Reinstall the microplate carrier on the instrument.
3. All Stop Screws: Install the spare stop screw in the spare hole, or for deep-well plates, on the screw (inserted in the previous step).

4. Insert the magnet and plate or the deep well microplate (or other special vessel) in the carrier.
5. Place the adjustment tool or jig on top of the microplate/vessel, with the notched end above the additional stop screw.
6. Hold the jig level as you use the Allen wrench to raise or lower the screw head until it sits just below the notch in the jig.



The jig defines the proper height of the stop screw

- Tighten the nut to secure the screw's position. This will "lock" the nuts in place and allow you to easily remove/replace the screw using just your fingers, without affecting its height setting. **Deep well stop screws:** release the spacer to remove it from the carrier.

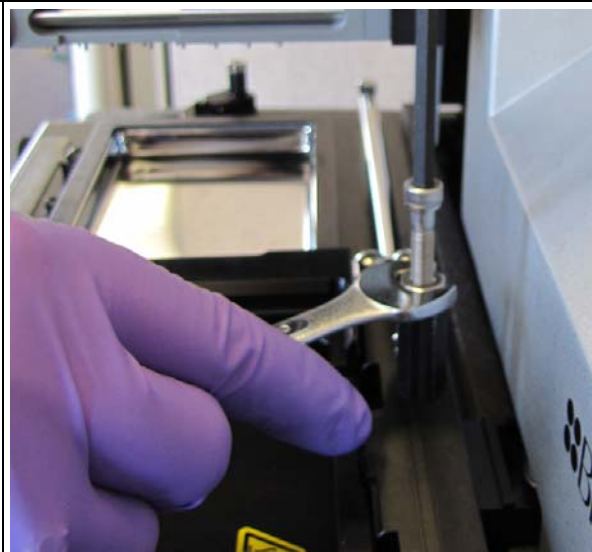
Spare Stop Screw



One wrench per nut to tighten top one

Use the Allen wrench to hold the screw in place while you lower the bottom nut until it touches the carrier. Then, using the two wrenches, hold the bottom nut in place and turn the top nut clockwise to tighten it. Ensure the washer between the screws is fully compressed.

Deep Well Stop Screw



Use the Allen wrench to hold the screw in place while using a wrench to tighten the nut (on top of the spacer) to secure the screw's height.

Connect the Vacuum Pump, Tubes, and Bottles



Important! When using the **BioStack Microplate Stacker** do **not** plug the external 24-VDC power supply that came with the BioStack into the waste sensor port! See **Figure 3** for the location of this port.

All tubing, cables, and fittings for the waste and supply systems must be properly connected. **Figure 3** illustrates the instrument rear panel and the locations of the ports and connections for the waste and supply systems: top photo for instruments with basecode PN 7100227; bottom photo for instruments with basecode PN 7100242.

Before connecting the tubes and bottles: Rinse all waste and supply bottles with deionized or distilled water before connecting them to the waste and supply tubing. This rinsing eliminates particles that may have collected during packing or unpacking.

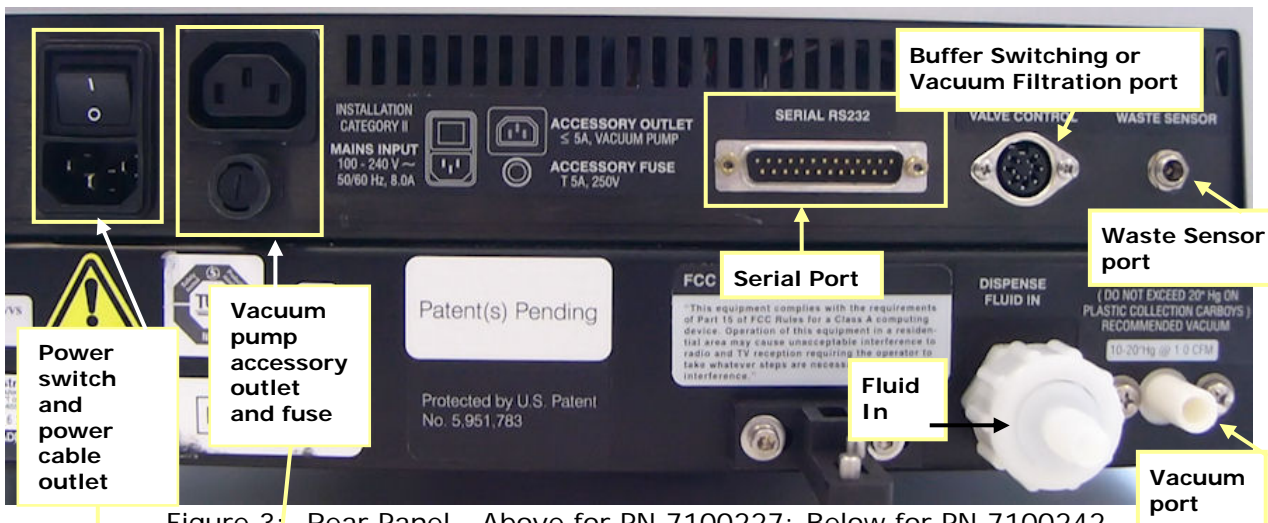





Figure 3: Rear Panel - Above for PN 7100227; Below for PN 7100242



Plug the:	Into this outlet:
ELx405 power cable	Power cable outlet (under power switch)
Vacuum pump power cable	Vacuum pump "accessory outlet"
Waste sensor cable from waste bottle connected to vacuum pump	Waste Sensor port
Tube from waste bottle without the waste sensor.	Vacuum port (in bottom right corner)
For vacuum filtration models, a Y-connector is used to connect its "intermediate waste system" to this main waste system.	
Optional:	
Computer cable: serial or USB	Appropriate COM port
BioStack serial cable	Serial COM port
Buffer Switching control cable	Valve Control or designated port
Vacuum Filtration control cable	Valve Control or designated port

Waste System

	<p>Important! If you are installing the ELx405 Direct Drain Waste System, refer to the installation instructions that came with the system. Please note that the ELx405 Select and HT models do not support the Direct Drain Waste System.</p>
	<p>Warning! Direct Drain Waste. If installed, the direct drain waste system pumps waste fluids from the washer directly into a sink or tank, and, potentially into public waste water systems. Because the waste may be a biohazard, you must ensure that you are in compliance with your local or national government's laws regarding safe disposal of the waste.</p>
	<p>Caution: Vacuum Pump Installation. DO NOT plug the vacuum pump cable into a wall outlet! Use the adapter provided with the pump to connect it to the Accessory Outlet on the back of the washer. This allows the washer to regulate the pump, turning it on and off as specified by the protocol, rather than running continuously.</p> <p>For standard pumps and high flow vacuum pumps that shipped prior to December 2005 when using large bottles: set the Vacuum Dissipation Delay to prevent problems with the pump. Set the delay at 10 seconds when using 10-liter bottles, and 20 seconds when using 20-liter bottles. Refer to Vacuum Dissipation Delay in Chapter 3 of the Operator's Manual for instructions.</p>

- ❖ The waste tubes have colored bands that match similarly colored dots next to the inlet/outlet ports on the waste bottle caps to ensure the correct connection of the tubing.

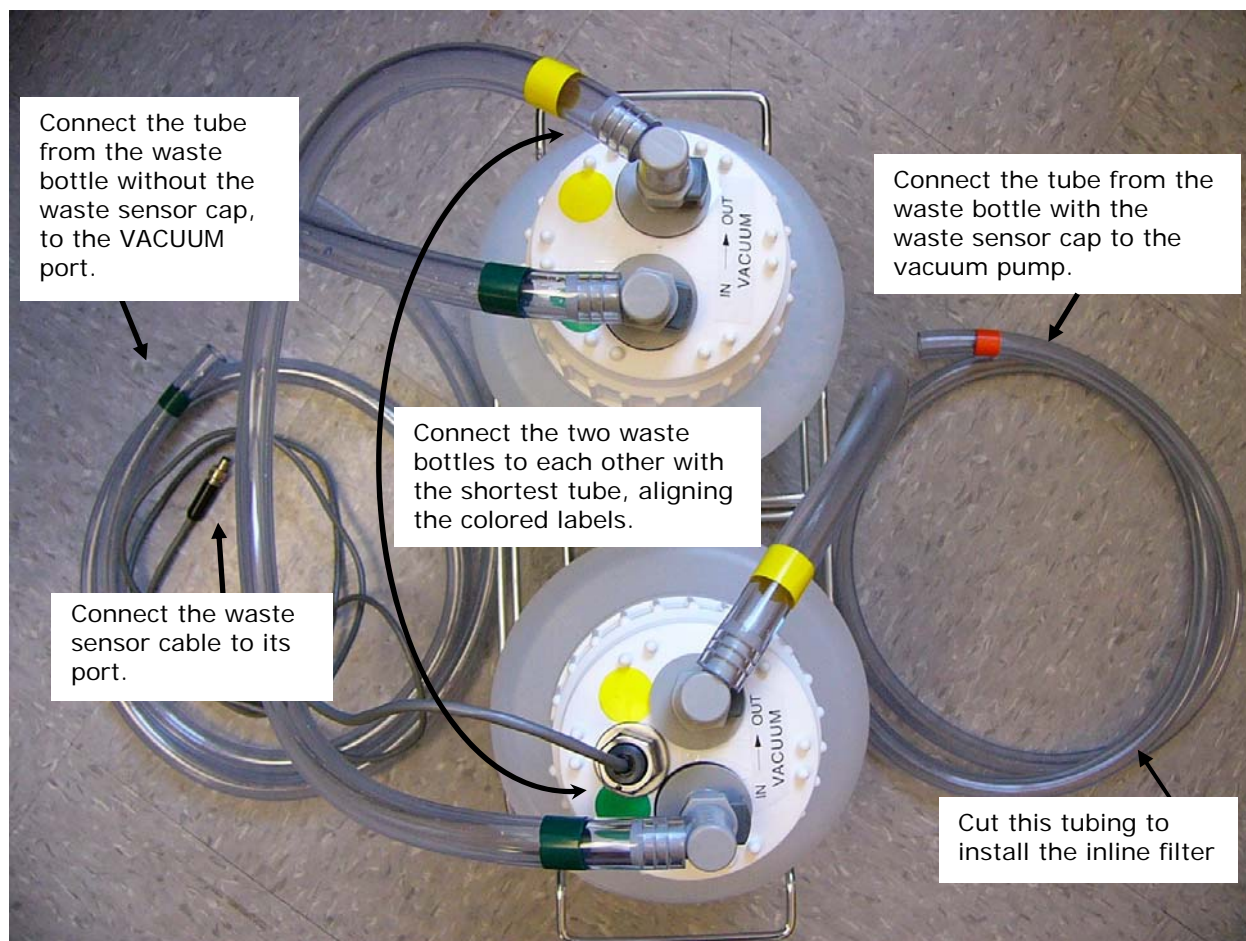


Figure 4: Waste System

Three lengths of tubing are shipped with the waste module:

Tubing:	Connects:
Short tube with yellow and green bands	The two waste bottles to each other
Long tube with green bands on both ends	Bottle without sensor to Vacuum port
Long tube with yellow and orange bands	Bottle with waste sensor to the vacuum pump

1. Locate the quick-release caps shipped inside the waste bottles and attach the tubing to them as follows:
2. Connect the waste bottles to each other using the shortest length of tubing, matching the colored bands on the tubing to colored dots on the caps.
3. Attach the waste sensor cable to the **Waste Sensor** port on the back of the washer.
4. Attach the tube from the **waste bottle with the waste sensor** in its cap to the vacuum pump.

- Attach the tube from the **waste bottle that does NOT have the waste sensor** in its cap to the **Vacuum** port on the back of the instrument. (Follow the special instructions below when setting up the Vacuum Filtration module.)



- Important!** When installing BioTek's vacuum pump, connect the pump's AC power cable to the vacuum pump **Accessory Outlet** on the back of the instrument. (Use the accessory outlet adapter provided, if applicable.)
- Place the waste bottles and vacuum pump on the same horizontal plane as the instrument or below it, such as the floor beneath the work surface. This will help optimize performance.
- Make sure the waste bottle's caps are well sealed.

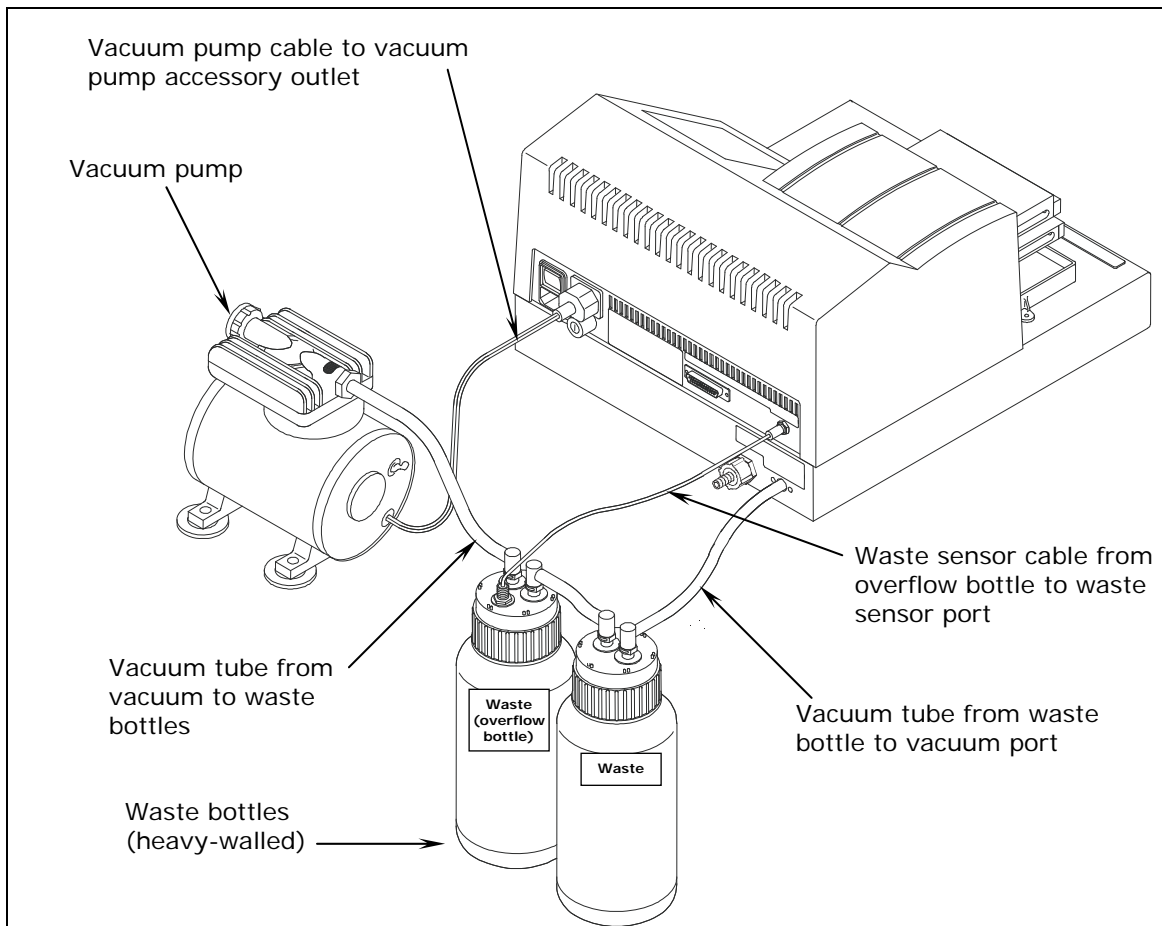


Figure 5: Washer with Vacuum Pump and Waste Tubing Connections

Install the Vacuum Line Filter (Optional)

Installing this inline vacuum pump filter is recommended to prevent fluids or vapors from reaching and damaging the vacuum pump. Install the hydrophobic filter between the overflow waste bottle (with the waste sensor) and the vacuum pump.

1. Cut the tubing approximately 4" to 6" from the vacuum pump end or half way between the waste bottle and the vacuum pump.
2. Note the flow direction arrow on the filter. Point it **toward the vacuum pump** and insert the filter in the tubing.

If the waste bottle overflows, check the filter for trapped fluid. If fluid is found in the filter, remove the filter and drain using the small white nut on the filter. Tighten the white nut and reinstall the filter.

Fluid Supply System with Buffer Switching (valve module)

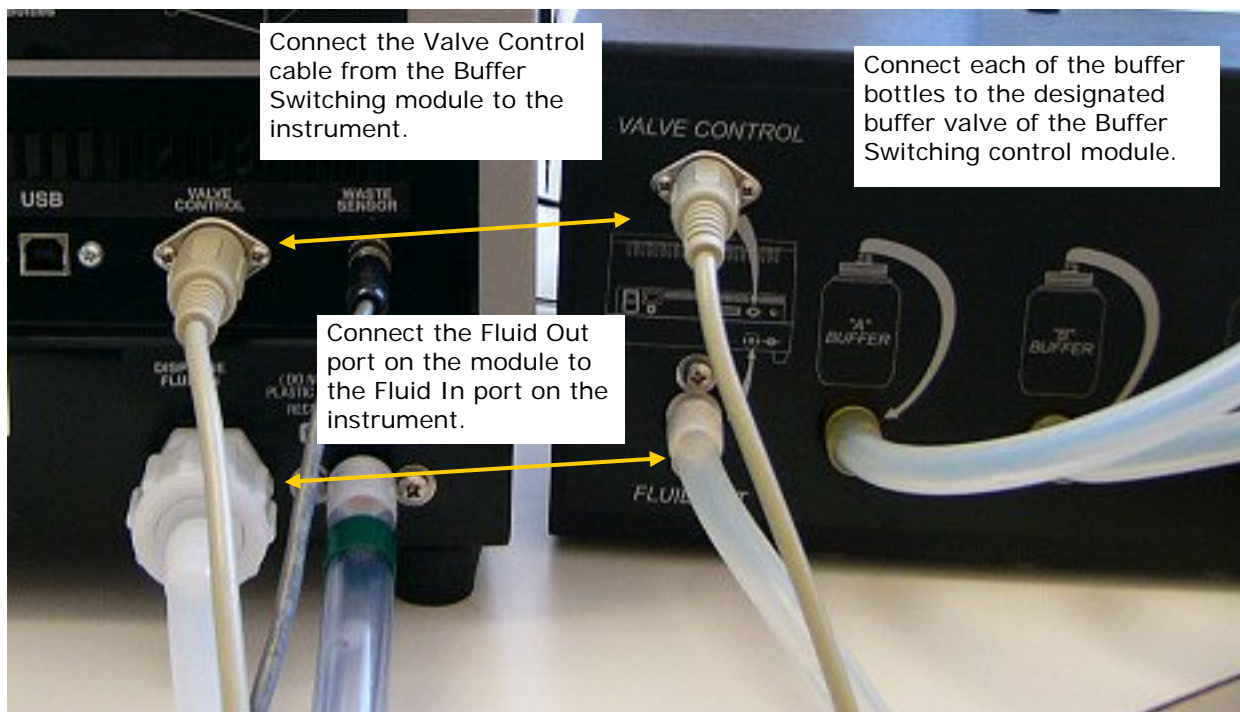


Figure 6: Buffering Switching System

1. Connect the module cable from the round **Valve Control** or **Buffer Switching** port on the module to the corresponding **Valve Control** or **Buffer Switching** port on the back of the instrument.
2. Place the four supply bottles and valve module on the same surface as the instrument to optimize performance.

3. Connect the tubing from one of the supply bottles to “A” Buffer in the valve module.
4. Repeat step 3 with the other three supply bottles for “B,” “C,” and “D” Buffers.
5. Connect the 6-foot (1.83 Meter) tubing from the valve box **Fluid Out** port to the **Dispense Fluid In** port on the instrument’s rear panel. This tubing can be cut to the optimal length required for the installation.

Fluid Supply System (without Buffer Switching module)

1. There is one supply tube. Connect one end to the Dispense Fluid In port and the other end to the supply bottle.
2. Place the supply bottle on the same horizontal plane as the washer.

Install the Vacuum Filtration Module

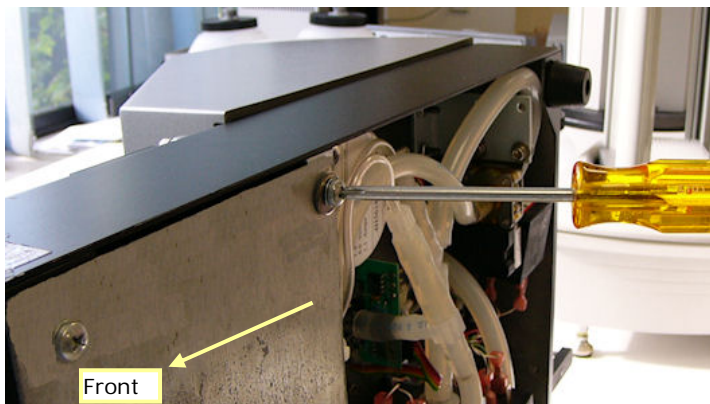


Figure 7: Vacuum Filtration Plate Carrier and Control Module

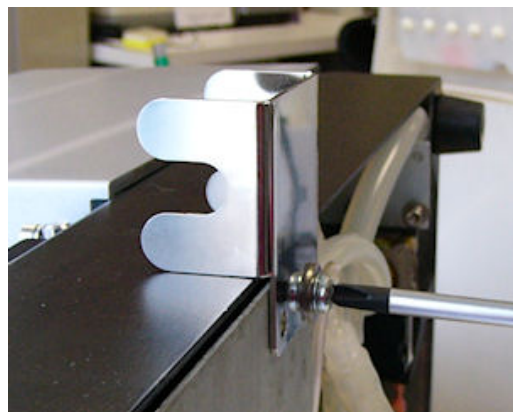
ELx405 models equipped with **Vacuum Filtration** to perform filter plate assays, i.e., evacuate fluid from filter bottom microplates, require these installation steps:

1. Install a bracket on the right, underside of the washer to hold the vacuum filtration tubing;
2. Connect the “intermediate” waste tubing to three ports on the control module and to the intermediate waste bottle;
3. Connect the module to the main waste system;
4. Install the special plate carrier and change the instrument setting;
5. Connect the control module to the instrument.

1. Install the Side Bracket



Remove screw at the back of the panel



Use screw to install the bracket

Required: Philips screwdriver

1. Gently tip the ELx405 onto its left side and hold it securely.
2. Remove the screw and washer at the rear edge of the bottom panel, as shown above, using the Philips screwdriver.
3. Align the slotted hole in the bracket with the revealed screw hole and use the same screw and washer to secure the bracket in place. Only one of the two holes in the bracket is used; this is sufficient for its purpose.
4. Return the washer to its normal position.

2. Connect the Intermediate Waste System

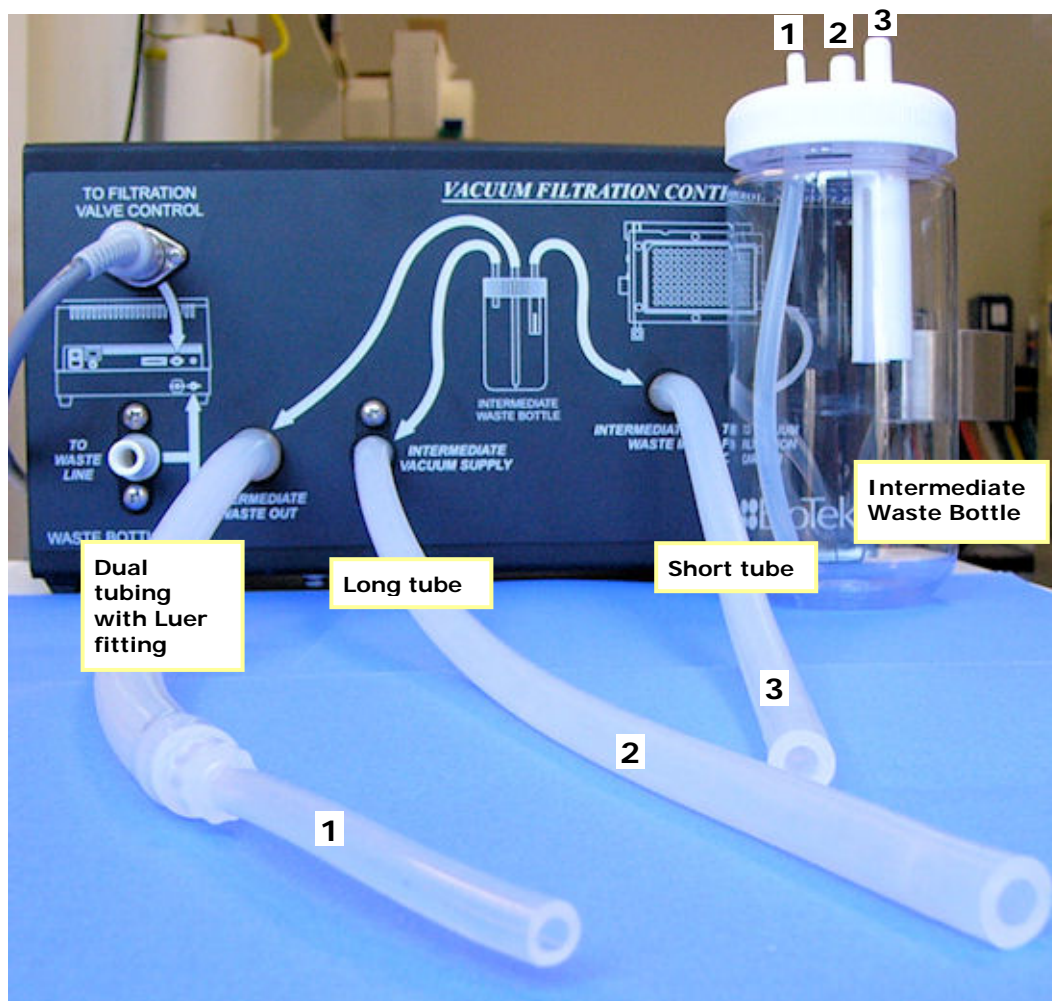


Figure 8: Intermediate Waste System Setup

For this step you will need the **Vacuum Filtration** tubing, intermediate waste bottle, and the control module. Review the tubing map on the front of the control module. It is a good guide for this step.

Three lengths of tubing are supplied to set up the control module. Connect the tubing to the control module and to the intermediate waste bottle cap:

	Tubing	Control Module	Waste Bottle Cap
1	Dual tubing connected by Luer fitting, approx. 15"/38.1 cm	Intermediate Waste Out	Smallest nipple with long interior tube
2	Long single tube, approx. 15"/38.1 cm	Intermediate Vacuum Supply	Nipple without a tube inside the bottle
3	Short single tube, approx. 12"/30.48 cm	Intermediate Waste In	Nipple with the wide, split-tube extension in the bottle

❖ Two other quite distinct tubing sets are used in subsequent steps.

1. Put the intermediate waste bottle into the bracket on the side of the control module.
2. Connect the tubing with the Luer fitting to the port labeled Intermediate Waste Out and to the smallest nipple on the waste bottle cap.
3. Connect the longest single tube to the port labeled Intermediate Vacuum Supply and to the nipple without a tube inside the bottle.
4. Connect the shortest tube to the port labeled Intermediate Waste In and to the waste bottle cap nipple with the wide, split-tube extension inside the bottle.

3. Connect to Waste System

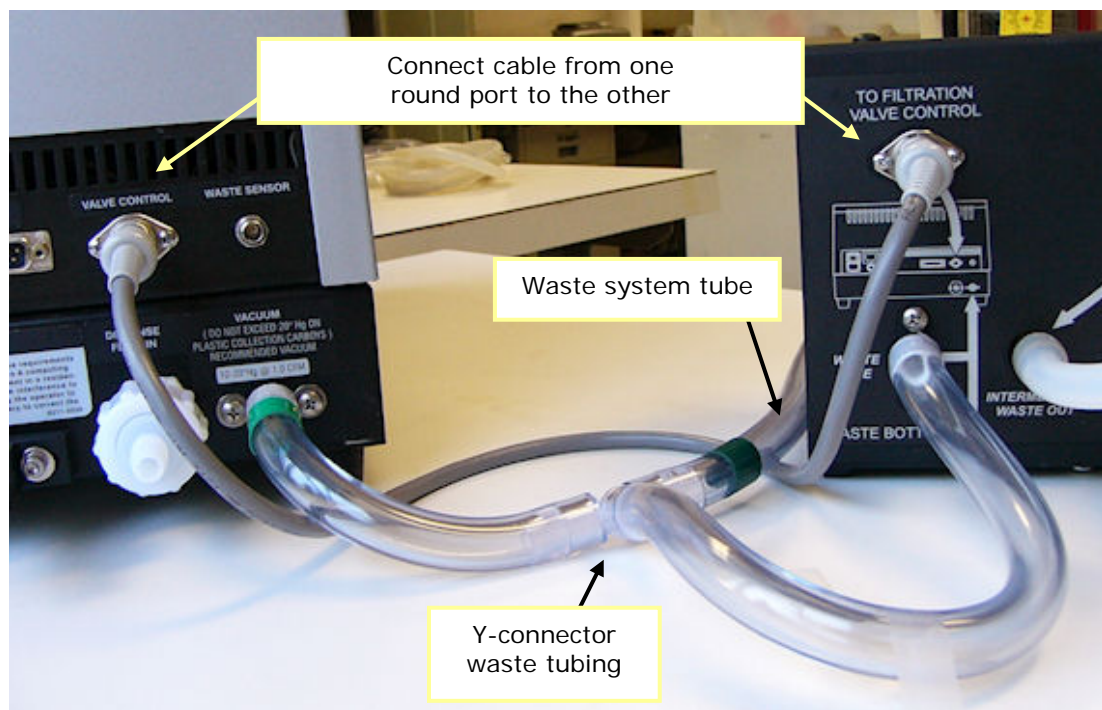


Figure 9: Connecting the **Vacuum Filtration** module to the washer

1. Locate the Y-connection of waste tubing shipped with the **Vacuum Filtration** module. This is provided to connect the control module to the washer's main waste system.
2. Remove the main waste system tubing from the Vacuum port on the back of the washer (waste tube with green bands on both ends), if it is installed. Plug it into the barbed fitting of the Y-connector waste tubing.
3. Connect the branch of the Y-connector that does not have a green band (tube with no tape) to the control module port labeled To Waste Line.
4. Connect the other end of the Y-connector (with green band), to the Vacuum port on the back of the washer.

4. Connect Plate Carrier and Change Instrument Setting

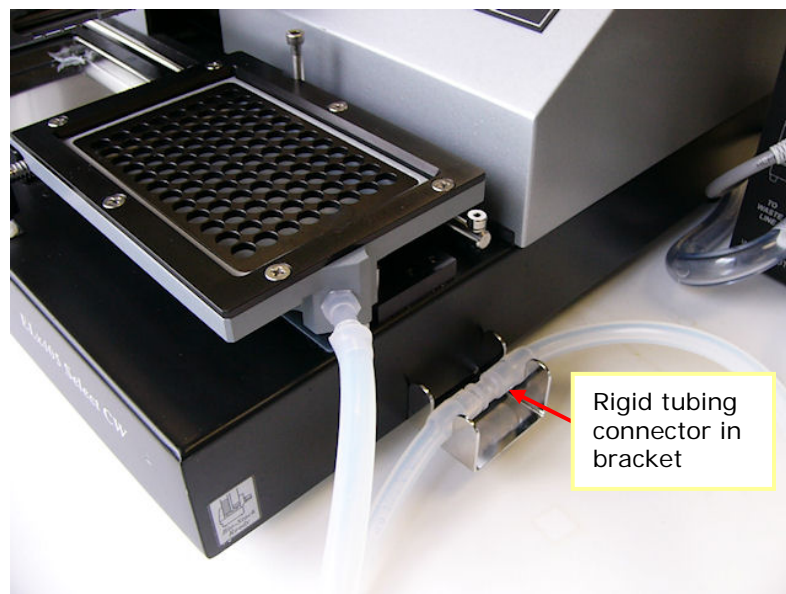


Figure 10: Vacuum Filtration Plate Carrier (and bracket for holding tubing)

1. Locate the longest length of tubing shipped with the module. It is made from two tubes joined by a rigid connector.
2. Connect the shorter end to the special plate carrier for vacuum filtration.
3. Connect the longer end to the control module port labeled To Vacuum Filtration Carrier.
4. Tuck the rigid connector into the bracket you installed on the side of the instrument.
5. Change the instrument setting:

Using the	Description
Keypad	<ol style="list-style-type: none"> 1. Press UTIL > SETUP > MORE > MORE > MORE 2. Select CARRIER 3. Select VAC
LHC	<ol style="list-style-type: none"> 1. Select Tools> Instrument Utilities 2. Click Configuration Data 3. For Carrier Selection, select Vacuum Filtration

Important: Always set the carrier selection to match the installed hardware, regardless of the type of plate processing you are doing.

5. Connect the Vacuum Filtration Control Module to the Washer

Connect the supplied cable from the round port labeled **To Filtration Valve Control** on the control module to the corresponding **Valve Control** port on the back of the instrument. (See Figure 3.)

Attach the Mist Shield

1. Loosen the two thumbscrews in the front base of the instrument, directly in front of the washer manifold and priming trough.
2. Align the mist shield so the notches sit on the thumbscrews. Except for the Deep Well models, rest the other side of the mist shield on the two posts above the manifold.
3. Finger-tighten the thumbscrews to hold the shield in place.

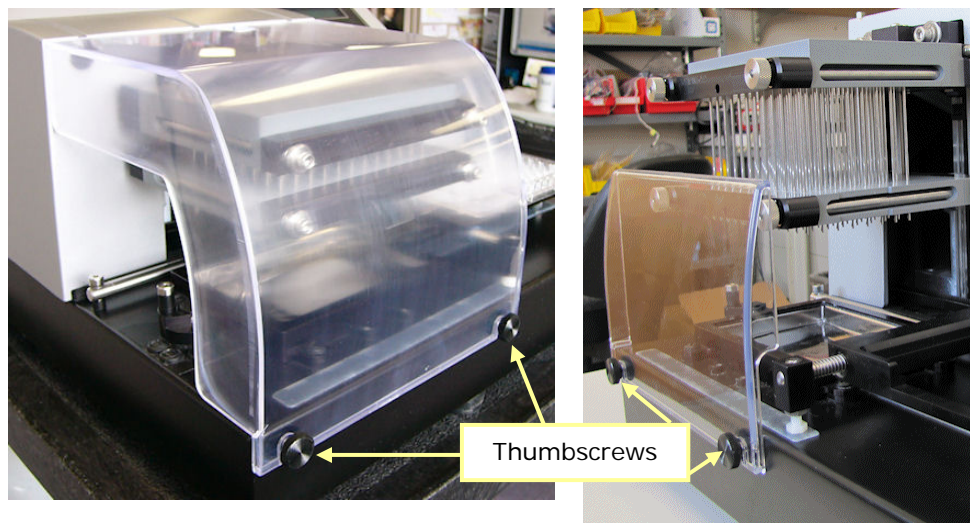


Figure 11: Attaching the Mist Shield

❖ Loosen the thumb screws and lift the mist shield straight up, **not** towards you, to remove it.

Connect the Power Cord



Warning! Power Rating. The ELx405 must be connected to a power receptacle that provides voltage and current within the specified rating for the system. Use of an incompatible power receptacle may produce electrical shock and fire hazards.



Warning! Electrical Grounding. Never use a plug adapter to connect primary power to the ELx405. Use of an adapter disconnects the utility ground, creating a severe shock hazard. Always connect the system power cord directly to an appropriate receptacle with a functional ground.

The ELx405 has a built-in switching power supply that automatically adjusts for input voltage in the range of 100-240 V~ at 50-60 Hz.

1. Insert the power cable into the power cable socket in the rear panel of the washer.
2. Insert the three-prong plug into an appropriate three-prong receptacle that has a functional ground.

Install the LHC Software/Connect to Computer (Optional)

The ELx405 can be controlled with software running on a host computer: **Liquid Handling Control (LHC) Software**. Please refer to the *LHC Installation Guide* for complete installation and setup instructions. The LHC installs needed components, like the **ELx405 Interface Software** and **BioStack PC Control Software**.

Connect the USB or Serial Cable to the Host Computer

❖ Not all instruments ship with both USB and serial cables.

If using the serial cable: Plug one end into the **RS232** serial port on the rear of the instrument and the other end into an available port on the computer.

If using the USB cable: Plug one end into the **USB** port on the rear of the instrument and the other end into an available port on the computer.

- If the computer is connected to the internet, turn on the instrument. Windows® may automatically locate and install the necessary USB drivers (follow the instructions provided on the screen).
- If the above option does not work, install the drivers using the supplied “Virtual USB Com Port” driver software CD. Instructions are provided with the CD.

❖ The ELx405's keypad must be displaying its “Main Menu” for the LHC to communicate with it.

❖ Controlling the BioStack: Both the washer and the BioStack must be connected to the computer to use the LHC to control them.

Verify Performance

Before using the ELx405 for the first time, verify that it is operating properly.

- When using the LHC, make sure the ELx405 is connected to the PC and both are powered up.
- When running standalone, turn on the ELx405.

Using the keypad:

1. Select **UTIL > TESTS > SLFCHK**.

Using the LHC:

1. Click the [Name](#) link on the main page and select the ELx405.
2. Define the COM [Port](#) used to connect the ELx405 to the computer and Test Communication.
 - **Pass:** proceed to the next step.
 - **Fail:** check the Com Port setting. See “About Com Ports” in the LHC Help.
3. In the ELx405 Settings dialog that opens, specify the Model and Manifold Type that is installed, and click OK.
4. Select **Tools > Instrument Utilities**
5. On the General Settings tab, click the **Reset Instrument** button.

Test results

- **Pass:** a passing message is displayed.
- **Fail:** an error message is displayed. If this happens, note the error code and refer to the **Error Codes** section in the Operator’s Manual to determine its cause. If the problem is something you can fix, turn off the instrument, fix the problem, and then turn the washer back on. Otherwise, contact BioTek’s Technical Assistance Center.

Run 'Prime' and 'Wash' Protocols

To verify installation was completed successfully and there are no leaks in the system, run a prime protocol to remove air from the tubing, and then run a simple wash protocol.

You'll need about one liter of deionized (DI) water and a microplate. The microplate type depends on the washer model and manifold installed on it:

- **All ELx405 models except HT:** a 96-well, flat-bottomed microplate (Corning Costar® #3590 or similar). This includes **Deep Well** models.
 - **Any HT model with the 192-tube manifold installed:** a 384-well microplate (Nunc #236108 or similar).
1. Fill the supply bottle (bottle 'D' if Buffer Switching is installed) with approximately one liter of deionized water.
 2. Place the microplate on the carrier, with well A1 in the left rear corner.
 3. Run the **Prime** protocol:
 - From the main menu, select **RUN > PRIME**.
 - Press the **Options** key until **P_DAY_RINSE** appears, and then press the **ENTER** key to select it.
 - Press the **Start** key to run the protocol.
 - When priming is complete, press the **Main Menu** key.
 4. Run the **Wash** protocol:
 - From the main menu, select **RUN > WASH**.
 - Select **COSTAR_FLAT** or **192NUNC_384** (HT models) (Press the **Options** key to cycle through the available protocols.)
 - Press **ENTER** to select it and then **Start** to run the protocol.
 5. When washing is complete, press **Main Menu**.




Preparing the Washer to Operate with the BioStack

If you purchased the BioStack Microplate Stacker, it ships with special alignment hardware in an accessory package. Refer to the *ELx405 Operator's Manual* and *BioStack Operator's Manual* for complete setup, installation, and configuration instructions.

Repackaging and Shipping

Refer to the “Repackaging and Shipping” section in the *ELx405 Operator’s Manual* for complete instructions.

If the original packing materials have been damaged or lost, contact BioTek to order replacements.

	<p>Important! HT models with the accessory 96-tube dual manifold: If you must return the washer to BioTek for service or repair, install the 192-tube manifold and protective shipping bracket, and ship the 96-tube manifold in its special packaging. For instructions on changing the manifolds, see the <i>Changing the Manifolds</i> appendix in the Operator’s Manual.</p>
	<p>Warning! If the washer has been exposed to potentially hazardous material, decontaminate it to minimize the risk to all who come in contact with the washer during shipping, handling and servicing. Decontamination prior to shipping is required by the U.S. Department of Transportation regulations.</p>
	<p>Important! Failure to fasten the manifold in place with the shipping bracket before shipment can result in irreparable manifold damage.</p>



Getting Started

- ❖ This section contains basic instructions for operating the ELx405 Microplate Washer and its software via the washer's keypad. Refer to the ELx405 Operator's Manual for more detailed instructions, as well as guidelines for ensuring optimal washer performance and information on Magnetic Bead and Vacuum Filtration protocols.
- ❖ If you are using BioTek's Liquid Handling Control ("LHC") software refer to its help system for operational instructions.

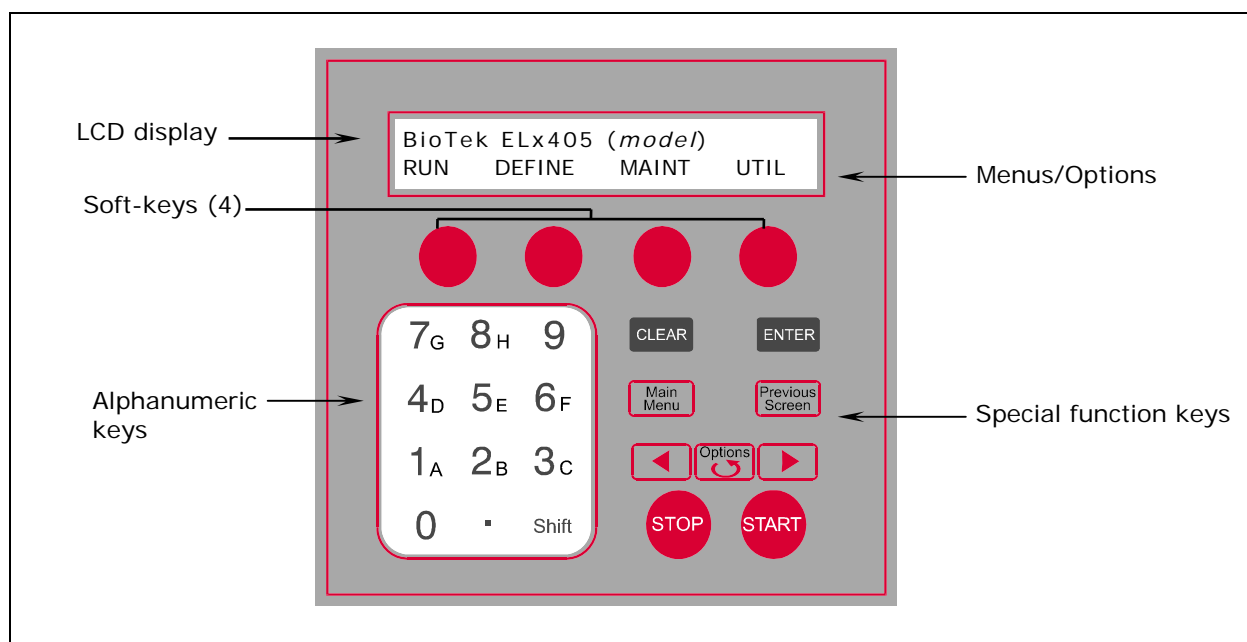
Turn on the ELx405

To turn the ELx405 on, press the power switch on the washer's rear panel. The keypad will remain inactive while the washer performs a self-test.

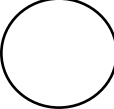



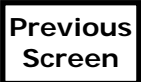





If the self-test fails, the washer will beep and the display will show an error code. Note the error code and then press **STOP** to stop the beeping. Refer to the *ELx405 Operator's Manual* to interpret these codes.

Contact BioTek Instrument's Technical Assistance Center for further assistance with troubleshooting. Refer to the contact information in the Preface of this manual.

ELx405 Front Panel



Keypad Description

	The keypad has four Soft-keys , one below each selectable menu option. Press a Soft-key to choose a menu selection.	
	Delete an entry.	
Save the current screen settings and advance to the next screen in a series.		
Exit the current screen and return to the Main Menu .	Move to a previous menu.	
Move the cursor to the right in the display.	Move the cursor to the left in the display.	
	To scroll through the different options within a program, Options or Shift+Options . Press ENTER to select the current option.	
	Stop a washer program.	
Start a washer program.		

Wash

To run a Wash program, follow the menu path and respond to prompts:

RUN → WASH → To select a wash program, press **Options** or enter its number.
 Prime the washer? → If Yes, select the **Prime** program. (This is recommended.)
 Follow the prompts: Place Plate In Carrier or Connect Reagent Bottle (depending on model) and Press <Start> Key (when you are ready to run the program).

When the program is completed, you can rerun it or choose another program:

Wash program complete. **NEW/REPEAT** (Select New to run a different program.)

Option & Description	Models	Action/Comments
Select Wash Program Select a Wash program to run.	All	Press Options to cycle through the available Wash programs.
Select Reagent Bottle Select the supply source for this program.	All	Select bottle A, B, C, or D. This only appears if the washer is equipped with Buffer Switching.
Prime the Washer? Choose to run a prime program before starting the wash program.	All	This only appears after power-up and before a Prime, Dispense, or Wash program has been run.
New/Repeat Action to take after program is complete.	All	Start a new program or repeat the last one.

❖ To define, edit, copy, or delete a Wash program, refer to the **ELx405 Operator's Manual**.

Prime

To run a Prime program, follow the menu path and respond to prompts:

RUN → SELECT PROGRAM TYPE → PRIME → **SELECT PRIME PROGRAM** →
CONNECT REAGENT BOTTLE AND PRESS <START> KEY →
 PRIME PROGRAM RUNNING. PRESS <STOP> KEY TO QUIT →
 PRIME PROGRAM COMPLETE. **NEW REPEAT**

Option & Description	Models	Action/Comments
Select Prime Program Select a Prime program to run.	All	Press Options to cycle through the available Prime programs.
New/Repeat Action to take after program is complete.	All	Start a new program or repeat the last one.

❖ To define, edit, copy, or delete a Prime program, refer to the ***ELx405 Operator's Manual***.

Dispense

To run a Dispense program, follow the menu path and respond to prompts:

RUN → SELECT PROGRAM TYPE → DISP → **SELECT DISP PROGRAM** →
 PRIME THE WASHER? → NUMBER OF STRIPS →
 PLACE PLATE IN CARRIER AND PRESS <START> KEY →
 DISPENSE PROGRAM RUNNING. PRESS <STOP> KEY TO QUIT →
 DISP PROGRAM COMPLETE. **NEW REPEAT**

Option & Description	Models	Action/Comments
Select Disp Program Select a Dispense program to run.	All	Press Options to cycle through the available Dispense programs.
New/Repeat Action to take after program is complete.	All	Start a new program or repeat the last one.

❖ To define, edit, copy, or delete a Dispense program, refer to the *ELx405 Operator's Manual*.

Aspiration

To run an Aspiration program, follow the menu path and respond to prompts:

```
RUN → SELECT PROGRAM TYPE → MORE → ASPIR →
SELECT ASPIR PROGRAM →
PLACE PLATE IN CARRIER AND PRESS <START> KEY →
ASPIR PROGRAM RUNNING. PRESS <STOP> KEY TO QUIT →
ASPIR PROGRAM COMPLETE. NEW REPEAT
```

Option & Description	Models	Action/Comments
Select Aspir Program Select an Aspiration program to run.	All	Press Options to cycle through the available Aspiration programs.
New/Repeat Action to take after program is complete.	All	Start a new program or repeat the last one.

❖ To define, edit, copy, or delete an Aspiration program, refer to the *ELx405 Operator's Manual*.

Soak

- A soak begins after the wash buffer is dispensed to the wells. In some assays, a soak cycle enhances washing by allowing extra reaction time for binding.
- A Soak program cannot run on its own; it must be included in a **Link** program.
- Soak parameters can also be defined within a Wash program under Method.

❖ To define, edit, copy, or delete a Soak program, refer to the *ELx405 Operator's Manual*.

Setup Utilities/Configuration

To access the **Setup** Utilities, start at the Main Menu and select **UTIL → SETUP**. The **EDIT SETUP** screen will appear with the following options: **RS232, SENSOR, ADJUST, PARK, BIOSTACK, DISP, PLATE, VACUUM, MANIFOLD**. Some options are described below; for more options, refer to the *Operator's Manual*.

Sensor System (SENSOR)

The **SENSOR** feature allows you to activate or deactivate the detection systems on the washer, however, BioTek recommends keeping the sensor detection systems **activated**.

Exceptions:

- If you wish to run a prime program using air instead of fluid, deactivate the vacuum detection, fluid detection, and flow detection sensors, to avoid getting errors.
- When using BioTek's Direct Drain Waste System, deactivate the waste detection sensor.

To change the status of a detection system, follow the menu path below:

```
UTIL → SETUP → SENSOR → VACUUM DETECTION (YES/NO) →  
WASTE DETECTION (YES/NO) → FLUID DETECTION (YES/NO) →  
FLOW DETECTION (YES/NO) → FILTER VAC DETECT (YES/NO)
```

Adjust Utility (ADJUST)

The **ADJUST** utility allows the user to view the positions of the aspirate and dispense tubes in relation to the microwells, and “single-step” the carrier or manifold axes through their offset ranges to select the best offset. For example, use the Adjust Utility to determine the most effective setting for the Horizontal Dispense Position in a Wash program.

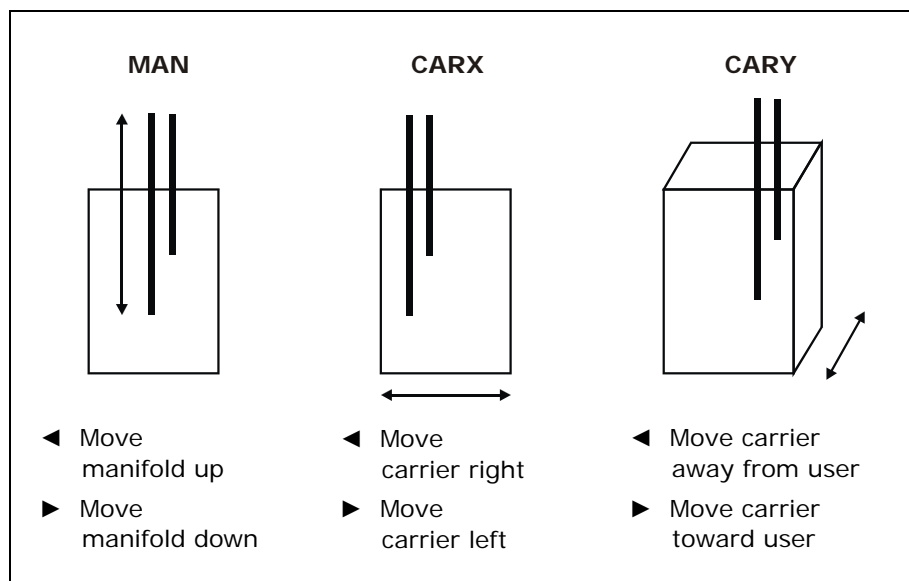
1. Place a microplate on the carrier.
2. To view aspirate/dispense tube positions or adjust an offset, follow the menu path below.

```
UTIL → SETUP → ADJUST → PLATE TYPE →  
ADJUSTMENT POSITION → AXIS
```

3. From the **PLATE TYPE** screen, choose **96** or **384** for the Select, Select CW, and HT/96-tube manifold (PLATE TYPE does not appear in the standard ELx405 or HT with the 192-tube manifold installed.)
4. At the **ADJUSTMENT POSITION** screen, select a tube position: **ASPIR** (aspiration) or **DISP** (dispense). Only one tube position may be viewed at a time.
5. At the **AXIS** selection screen, choose an axis. The top line of the display indicates which axis is active, and the offset position of that axis. The axis options are model-dependent, as follows:

MAN	Manifold (up/down movement)	All models
CARX	Carrier x-axis (left/right movement)	All models
CARY	Carrier y-axis (front/back movement)	Select, Select CW, HT

6. Press the ◀ (reverse) key to single-step the offset in a negative direction, and the ▶ (forward) key to single-step the offset in a positive direction. See the examples below.
7. When the desired offset position is found, record the position number for later use when selecting an offset for a wash, dispense, or aspirate program.
8. To choose a different axis, press **Previous Screen**. To quit the Adjust utility, press **Main Menu**.



Park Utility (PARK)

Before repackaging the instrument, the **PARK** utility must be used to position the manifold to the priming trough aspirate height in preparation for installing the manifold shipping bracket. To park the washer, start at the Main Menu and select the following; the manifold will immediately move to the Park or “pre-defined” position.

UTIL → SETUP → MORE → **PARK**

BioStack Utilities (BIOSTACK)

Select **BIOSTACK** to display the Stacker’s **UTILITIES** screen. The washer can then be configured for proper operation with the BioStack, by selecting the **CONF** (Configuration), **ALIGN** (Alignment), and **VERIFY** (Verification) utilities. Refer to your BioStack Operator’s Manual for instructions if you are operating the washer with the BioStack.

UTIL → SETUP → MORE → **BIOSTACK** → BIOSTACK UTILITIES →
CONF ALIGN VERIFY

Delay After Dispense (DISP)

A **Delay After Dispense** feature enables you to change the value for the delay period between dispensing and aspirating in Wash programs. The delay range is 0 to 2000 msec, with a default value of 1000 msec.

To change the delay period, select the following:

UTIL → SETUP → MORE → MORE → **DISP** → DELAY AFTER DISP

Plate Clear Height (PLATE)

Plate Clearance Height represents the travel height when processing plates. It must be sufficient to raise the manifold tubes high enough above the plate to prevent crashes when the plate carrier moves. The valid height range varies depending on the instrument model. Learn more about Z-axis or height settings on page **Error!** **Bookmark not defined..**

The plate clear height value also defines the default dispense height parameter in protocols. The dispense height is set 1.27 mm (10 steps) lower than the plate clear height when you create a protocol.

- Standard plate clear height: for processing standard plates, the valid height range is 12 (3.048 mm) to 255 (32.39 mm) but this maximum value is not

appropriate for all instruments. This value is applied when the protocol's plate type is standard 96 or 384.

- **Deep plate clear height:** for processing deep-well plates, the default height value, 405 (51.44 mm) is sufficient for the tallest deep-well plates supported, 50 mm. This value is applied when the protocol's Plate Type is a deep-well plate.

To change the plate clearance height, select:

UTIL → SETUP → MORE → MORE → **PLATE** → PLATE TYPE CATEGORY: STD or DEEP

Vacuum Dissipation Delay (VACUUM)

The **Vacuum Dissipation Delay** feature enables you to change the value for vacuum dissipation delay at the completion of a program. The delay range is 1 to 50 sec with a default value of 5 seconds. Increasing the delay prevents the **High Flow vacuum pump** as well as **standard vacuum pumps** from drawing excess current and blowing the auxiliary 5-amp fuse (PN 46055).

- **High Flow vacuum pumps shipped in December 2005 and later:** The Vacuum Dissipation Delay should not need to be increased. In fact, this Delay can successfully be reduced to the 1-second minimum, to enable true high throughput processing of large wash runs.
- **High Flow vacuum pumps shipped before December 2005:** A delay of 10 seconds is recommended when using the High Flow pump with 10-liter bottles; a delay of at least 20 seconds is recommended when using the High Flow Pump with 20-liter bottles.
- **Standard vacuum pumps:** Increase the delay to match your waste container, 1 second per liter. If you have a 10-liter waste bottle, set the delay to 10 seconds.

To change the vacuum dissipation delay, select the following:

UTIL → SETUP → MORE → MORE → **VACUUM** → VAC DISSIPATE DELAY

The **Delay After Dispense** and **Vacuum Dissipation Delay** features allow for overall faster plate processing, which may be useful for high-throughput microplate washing, for example, when the washer is used in conjunction with the BioStack or other automated system. For standalone use, BioTek does not recommend changing these parameters from the default setting, **unless** you are increasing the vacuum dissipation delay for the High Flow vacuum pump. If this is the case, please contact TAC if you need assistance with changing the these parameters.

Manifold Selection (MANIFLD)

For washers that support two types of manifolds:

- ELx405 HT2 models support the dual 192-tube manifold and the dual 96-tube manifold.
- ELx405 Select can be upgraded to an HT and then support the dual 192-tube manifold and the dual 96-tube manifold.
- To support Deep Well models, a third manifold type is selectable: 96-tube deep well manifolds.

This **Manifold Selection** parameter must be set to **96** or **192** to correctly process plates. This parameter must be changed each time the manifold is changed.

For example, the HT2 is shipped with the 192-tube manifold installed and the 96-tube packaged as an accessory. If the 192-tube manifold is removed and the 96-tube installed, the manifold selection parameter must be changed from 192 to 96. See the ***Changing the Manifolds*** appendix in the Operator's Manual for complete instructions.

To view or change the Manifold Selection parameter, select the following:

UTIL → SETUP → MORE → MORE → MORE → **MANIFOLD** →
MANIFOLD SELECTION 96 or 192 (96DEEP is for special models)

Carrier Selection (CARRIER)

For **Vacuum Filtration models**, after physically changing microplate carriers, from the standard magnetic bead carrier to the vacuum filtration carrier, or vice versa, you must tell the instrument which one is currently installed. When the special carrier with vacuum filtration capability is installed, choose **VAC**. Otherwise, select **Standard**.

UTIL → SETUP → MORE → MORE → MORE → **CARRIER** →
CARRIER SELECTION STD or VAC

Important: The vacuum filtration plate carrier can be used to process regular microplates. Always set the carrier selection to match the installed hardware, regardless of the type of plate processing you are doing.

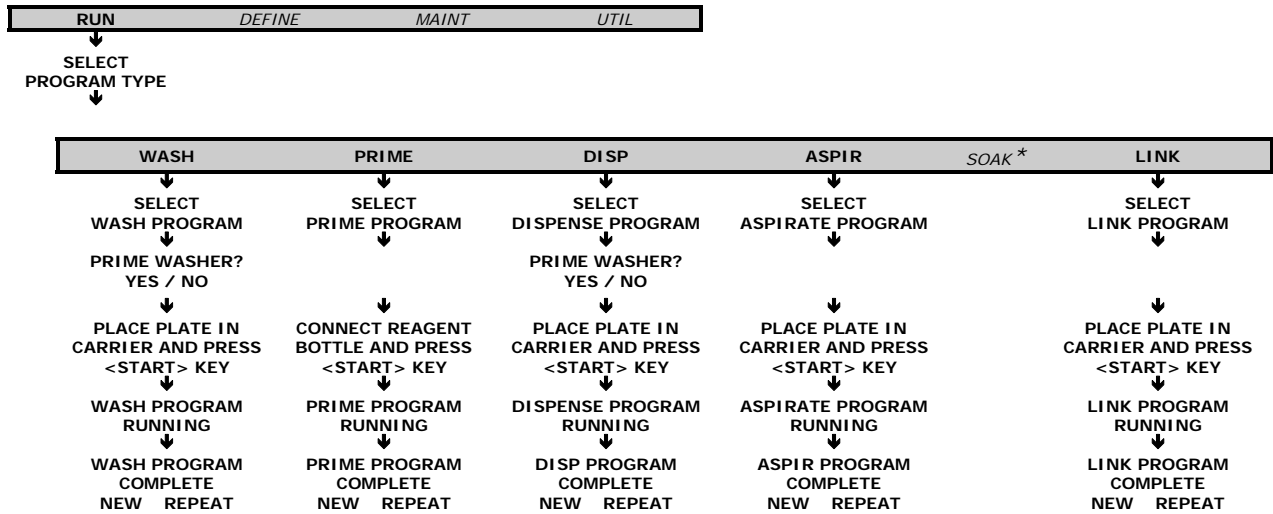
CW+ Control (CW+)

This setting is applicable only to Select CW cell wash models when using low flow dispense rates 10 CW and 11 CW. Generally, the optimal instrument configuration for cell wash assays includes installation of the **CW+ Dispense Manifold** and enabling this control with the default 100 msec setting. A minor adjustment to the duration setting may improve the performance of certain instruments.

On the contrary, if the CW+ Dispense manifold is not installed, better performance will be achieved by disabling this setting.

ELx405 Washer Menu Maps

Main Menu (RUN function path)



New or Repeat

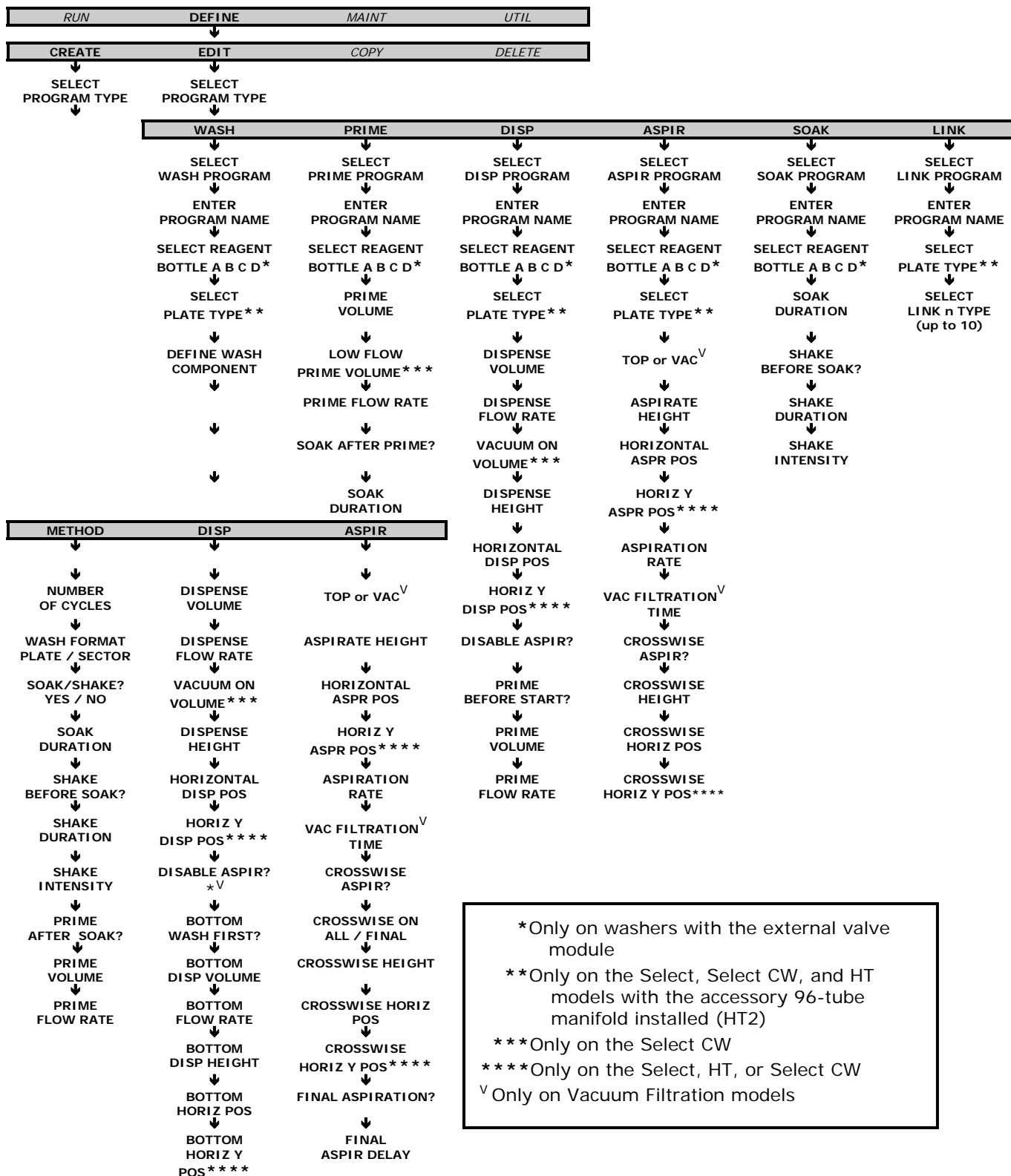
At the end of a run, the ELx405 offers **New** or **Repeat**.

When the **NEW** option is selected at the end of a run, control is returned to the corresponding “Select Program” screen. For example, when NEW is selected after a Wash, the program returns to the Select Wash Program screen.

When the **REPEAT** option is selected, the protocol is re-run.

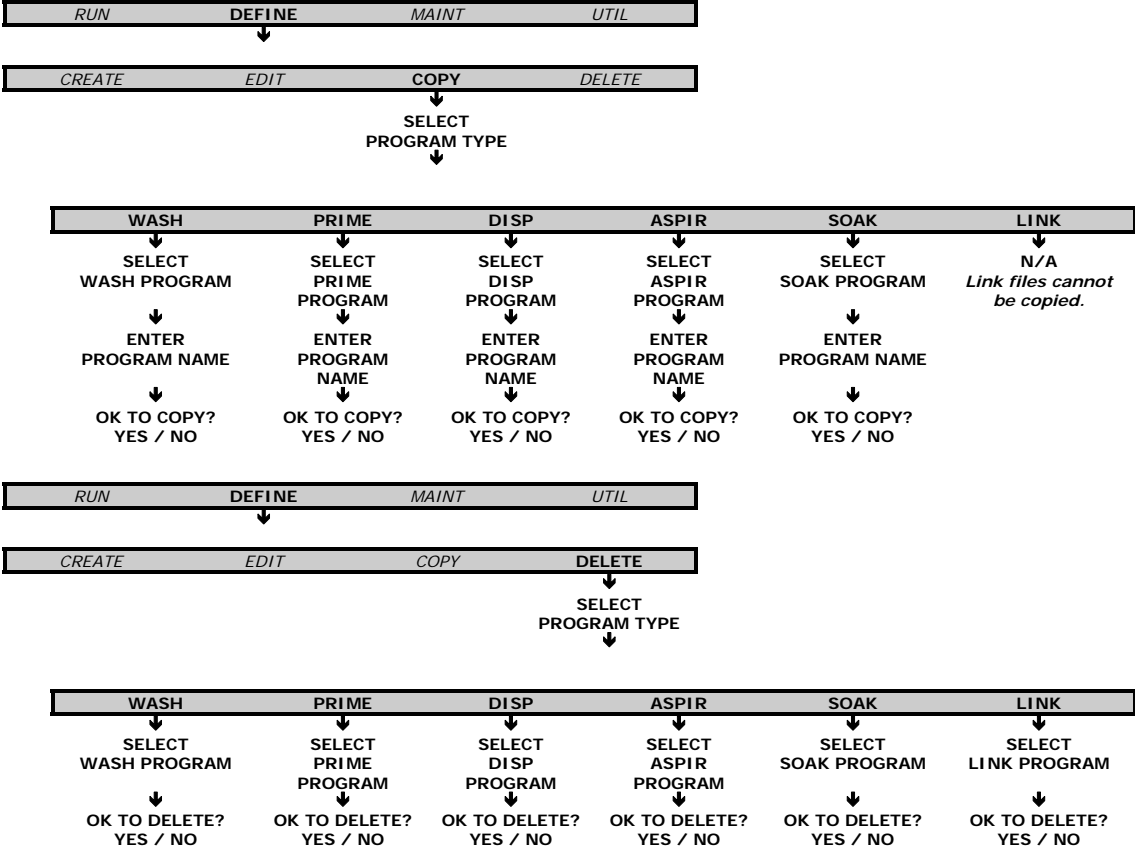
- ❖ A Soak protocol cannot be run independently; it must be included in a Link program. A Soak/Shake step can be included in a Wash protocol or you can define a Soak protocol and then LINK it to other protocols.

Main Menu (DEFINE function path for Create and Edit)

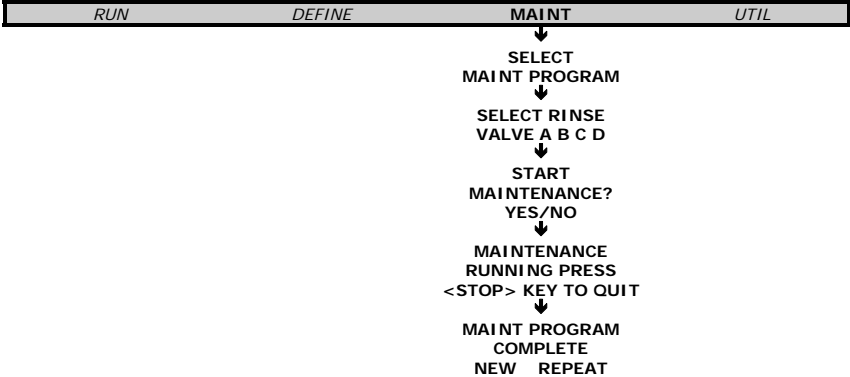


* Only on washers with the external valve module
 ** Only on the Select, Select CW, and HT models with the accessory 96-tube manifold installed (HT2)
 *** Only on the Select CW
 **** Only on the Select, HT, or Select CW
 ^ Only on Vacuum Filtration models

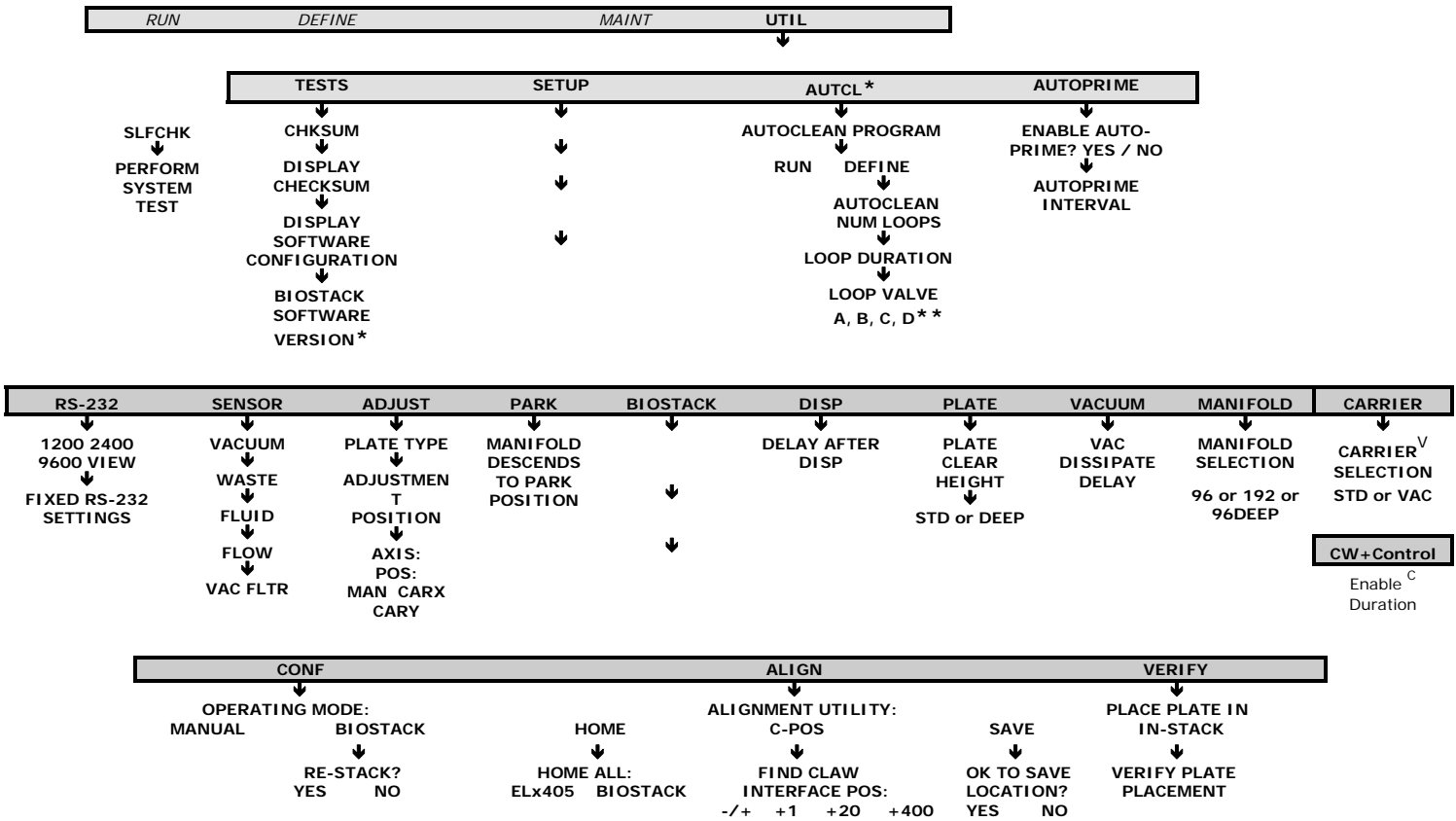
Main Menu (DEFINE function path for Copy and Delete)



Main Menu (MAINT, UTIL function path)



Main Menu (UTIL function path)



*AUTCL options available only in models with the Ultrasonic Advantage™ (ultrasonic cleaner)
 **Only on washers with Buffer Switching
^v Only on Vacuum Filtration models
^cCW+ Control: For Select CW models only. Enable the option when the “CW+ Dispense Manifold” installed, otherwise, disable setting.

Maintenance

Overview

A **Preventive Maintenance (PM)** regimen for the ELx405 includes rinsing and soaking the fluid path and cleaning the washer's various components.

The chart on the next page summarizes BioTek's recommended maintenance tasks and approximately how often each task should be performed. Daily and periodic routines and minimal guidelines for frequency are listed. Beyond that, it is difficult for BioTek to recommend a fixed frequency for each task to be performed. The risk and performance factors of your assays should determine the frequency with which to conduct these tasks.

Therefore, BioTek recommends you develop a maintenance schedule for your washer based on the characteristics of the fluids used and the washer's activity level.

- ❖ It is important to note that the risk and performance factors associated with your assays may require that some or all of the procedures be performed more frequently than presented in this schedule.
- ❖ To prepare the washer for storage or shipment, or to replace components, refer to the *ELx405 Operator's Manual*.

Recommended Maintenance Schedule

TASKS	FREQUENCY				
	Daily	Overnight/ Multi-Day	Weekly	Periodic/ Monthly	Before Storage/ Shipment
Rinse/Soak the Fluid Path					
Run DAY_RINSE	√	√			
Run AUTOPRIME	√				
Run OVERNIGHT_LOOP		√			
Run RINSE_AND_SOAK		√			
Remove protein residuals and fungi growth, (if necessary)	√		√	√	
Clean Components					
Check/empty waste bottle	√				√
Clean bottles				√	√
Clean plate carrier system			√		√
Clean carrier transport arm			√		√
Clean manifold and mist shield				√	√
Clean aspirate and dispense tubes				√	√
Run AUTOCLEAN (Ultrasonic Advantage™)				√	√
Clean fluid inlet filter				√	√
Decontaminate the Washer					
Decontaminate external surfaces				√	√
Run DECONTAMINATION				√	√
Prepare the Washer for Storage or Shipment					
Run LONG_SHUTDOWN					√
Replace Components					
Replace o-rings, and channel-end seals	<i>As Needed</i>				

Required Materials

For rinsing/soaking the fluid path, and for cleaning the components:






- Deionized or distilled water
- Sodium hypochlorite (NaClO or bleach)
- 70% isopropyl alcohol (or ethanol)
- Dispense and aspirate tube styluses (supplied with the washer)
- Phillips head screwdriver
- 9/64" (3.57 mm) hex wrench (supplied with the washer)
- Lint-free disposable towels
- Dish soap or other mild cleaner
- Soft-bristled brush
- Protective gloves, biohazard trash bags, lab coat, safety glasses, surgical mask

For replacing o-rings and channel-end seals:

- O-rings (PN 49941)
- Channel-end seals (PN 49486)

- ❖ In the following cleaning procedures, when not otherwise specified, "water" means use either deionized or distilled water.
- ❖ Unless otherwise instructed, **always** connect a supply bottle containing deionized or distilled water to the washer before running the Maintenance programs.
- ❖ Replace the o-rings on a yearly basis. The rubber plugs on the channel-end seals should be replaced if they show signs of cracking or drying out. See the *ELx405 Operator's Manual* for instructions.

Warnings & Precautions

	<p>Warning! Internal Voltage. Turn off and unplug the instrument for all maintenance and repair operations.</p>
	<p>Caution! Chemical Compatibility with Washers. Some chemicals may cause irreparable damage to washers. The following chemicals have been deemed safe for use in washers: buffer solutions (such as PBS), saline, surfactants, deionized water, 70% ethyl, isopropyl, or methyl alcohol, 40% formaldehyde, and 20% sodium hydroxide.</p> <p>Never use DMSO or other organic solvents. These chemicals may cause severe damage to the instrument. See Appendix C, <i>Chemical Compatibility</i>, for more information. Use of wash buffers containing acetic acid is limited to washers upgraded with BioTek part number 68098 Teflon® valves.</p> <p>Contact BioTek for upgrade information and prior to using other questionable chemicals.</p>
	<p>Warning! Wear protective gloves when handling contaminated instruments. Gloved hands should be considered contaminated at all times; keep gloved hands away from eyes, mouth, nose, and ears.</p>
	<p>Warning! Mucous membranes are considered prime entry routes for infectious agents. Wear eye protection and a surgical mask when there is a possibility of aerosol contamination. Intact skin is generally considered an effective barrier against infectious organisms; however, small abrasions and cuts may not always be visible. Wear protective gloves when handling contaminated instruments.</p>
	<p>Important! Do not immerse the instrument, spray it with liquid, or use a “wet” cloth on it. Do not allow water or other cleaning solution to run into the interior of the instrument. If this happens, contact BioTek’s Technical Assistance Center.</p>

Rinse/Soak the Fluid Path

Daily Maintenance

Daily maintenance involves flushing the washer with an appropriate reagent or deionized water throughout the day. Routinely rinsing the washer helps to prevent the aspirate and dispense tubes from clogging between washes. The recommended **rinsing frequency** depends on the wash solutions currently in use:

- If a solution containing surfactant is used throughout the day, the rinsing procedure should be performed if the washer is idle for more than 3 hours.
- If the solution does not contain surfactant, consider rinsing at least once an hour.

The **DAY_RINSE** and **AUTOPRIME** programs described in the *ELx405 Operator's Manual* satisfy daily maintenance requirements.

As an alternative, consider using **AUTOPRIME**, which can be enabled to automatically prime the washer after it has been idle for a user-specified amount of time. The volume, buffer valve, flow rate, and soaking parameters are specified in the **AUTOPRIME** program. **AUTOPRIME** is recommended when the washer is used intermittently throughout the day, to keep the manifold tubes in a wetted condition.

- ❖ "AUTPRM" appears in models with the Ultrasonic Advantage™.
- ❖ AutoPrime does not replace pre-priming the washer before running a wash or dispense program.

The AutoPrime feature is disabled by default. To enable it:

- Select **UTIL → AUTOPRIME (or AUTPRM) → YES**.
- Enter the **interval** from **10** to **600** minutes, to indicate how often you want the AutoPrime program to run.
- Press **ENTER** and then return to the Main Menu.

The next time a program is run, AutoPrime will be enabled and priming will occur each time the washer has been idle for <interval> minutes.

- To disable the AutoPrime feature, select **UTIL → AUTOPRIME (or AUTPRM) → NO**.
- To **halt** AutoPrime, press the **STOP** key.
- To **view** or **edit** the **AUTOPRIME** program parameters, select **DEFINE → EDIT → PRIME** and press the **Options** key to select **AUTOPRIME**. Edit the parameters as desired. The *ELx405 Operator's Manual* describes the AutoPrime program parameters and ranges.

Overnight/Multi-Day Maintenance

Overnight/multi-day maintenance involves flushing all wash solution out of the instrument, and then periodically rinsing and soaking the tubes to keep them moist. If the washer will be left idle for a period of time (such as overnight or over a weekend), run this program to soak the tubes for several hours at a time.

The **OVERNIGHT_LOOP** and **RINSE_AND_SOAK** programs described in the *ELx405 Operator's Manual* satisfy overnight/multi-day maintenance requirements.



Important! Keep the manifold in a wetted condition to ensure proper evacuation of fluid. BioTek recommends changing the Soak Duration to 18 hours for overnights and weekends when the washer is not being used. This will decrease flow problems and is a more trouble-free way to operate the washer.

- The OVERNIGHT_LOOP program requires the washer to remain turned on.
- As an alternative, run RINSE_AND_SOAK and turn off the washer after the soak begins. This leaves the tubes soaking in the priming trough until the instrument is turned on again.

Removing Protein Residuals and Fungi Growth







Important! Solutions containing proteins, such as bovine serum albumin (BSA), will compromise the washer's performance over time unless a strict maintenance regime is adhered to. **Do not use alcohol to flush out BSA.**

Refer to the *ELx405 Operator's Manual* for instructions.

Clean Components

Periodic Maintenance

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

	<p>Warning! Internal Voltage. Turn off and unplug the washer for all cleaning operations.</p>
	<p>Important! 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. The use of any lubricant on the fluid handling components will interfere with the aspirate and dispense performance, and may cause irreparable damage to these components.</p>
	<p>Important! When cleaning components:</p> <ul style="list-style-type: none"> • Do not immerse the instrument, spray it with liquid, or use a “wet” cloth on it. • Do not allow the cleaning solution to run into the interior of the instrument. (If this happens, contact the BioTek TAC.) • Do not expose any part of the instrument to the recommended diluted sodium hypochlorite solution (bleach) for more than 20 minutes. Prolonged contact may damage the instrument surfaces. • Be certain to rinse and thoroughly wipe all surfaces. • Do not soak the keypad. Instead, moisten a clean cloth with deionized or distilled water and wipe the keypad. Dry it immediately with a clean, dry cloth.
	<p>HT models with the accessory 96-tube manifold (HT2): Perform periodic maintenance on the manifold (96-tube or 192-tube) most frequently in use. Ensure that the washer is configured for operation with the installed manifold (refer to the “Operation” chapter in the <i>ELx405 Operator’s Manual</i>.)</p>

Cleaning the Bottles

- Clean and rinse the supply bottles with deionized water before the first use, before each refill, and, periodically, as necessary, to prevent bacteria growth.
- Empty the waste bottle often (at least daily), and firmly seat the waste bottle fittings.
- Rinse the covers every time the wash or rinse bottles are filled.
- Accumulated algae, fungi, or mold may require decontamination.

❖ To ensure that fluid does not back up into the vacuum pump during operation, always operate the washer with the waste sensor cable installed and the waste detection sensor enabled. If fluid collects in the overflow bottle, thoroughly rinse the level-switch assembly and bottle. Exception: The waste detection sensor must be turned off when using BioTek's Direct Drain Waste System. Refer to the "ELx405 Direct Drain Installation" document (PN 7101069) that was shipped with the Direct Drain system for instructions.

- Check the white hex nuts securing the quick-disconnects to the bottle cap to ensure they are not loose or corroded.

Cleaning the Plate Carrier System

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

1. Turn the washer on and wait for the System Self Test to complete. Turn the washer off when the manifold and tubes are resting above the priming trough ("home" position). Disconnect the power cable.
2. Carefully lift the carrier up and off the horizontal transport rail(s).
3. Clean the carrier, rails, and glide strips, using mild detergent and hot water, 70% isopropyl alcohol, or ethanol. Clean the priming trough as well, if necessary.

❖ **Select** and **HT** models: Take extra care to clean the spring-loaded transport arm that allows these models to move the plate forward and back (Y-axis). The arm fits into the left side of the plate carrier as you face the washer. If more intensive cleaning is required (for example, if reagent has spilled and dried on the stainless steel shaft), see the *ELx405 Operator's Manual* for thorough cleaning instructions.

❖ **Vacuum Filtration** and **Magnetic Bead** models: handle the special plate carrier with care. **Do not submerge** it when extra cleaning is needed. Flush it out with warm water by holding it under a running faucet for a few seconds and dry it immediately and completely. Avoid getting water in the transport arm bearings.

4. If detergent was used, wipe the components with a cloth moistened with water. Use a clean, dry cloth to dry the components.
5. To replace the carrier, line up the pin on the underside of the carrier with the slot on the carrier transport. Snap the two carrier rail guides onto the rail. The pin should sit in the slot.

Cleaning the Manifold, Mist Shield, and Tubing

Regular rinsing helps to keep the manifold clean, the aspiration and dispense tubes clear, and extends the life of the tubing.

If you suspect a particular problem is related to the manifold (for example, clogged tubes can result in poor or uneven aspiration or dispensing), you should perform a thorough cleaning of the dispense and aspirate tubes and channels. When necessary, follow the DECONTAMINATION procedure to disinfect the manifold and tubing.

To clean the manifold, mist shield, and tubing:

1. Run the system “dry”:
 - Select **UTIL → SETUP → SENSOR** and set VACUUM DETECTION, FLUID DETECTION, and FLOW DETECTION to **NO**.
 - Connect an empty supply bottle and prime the washer until the tubing is empty.
 - **Important!** Set the vacuum, fluid, and flow detection sensors back to **YES**.
2. Turn off the washer and disconnect the power cable.
3. Moisten a lint-free disposable towel with water, or with water and mild detergent. **Do not soak the cloth.**
4. Remove the mist shield if it is attached. Wipe the inside and outside surfaces of the mist shield. Wipe the top surface of the instrument base, and all exposed surfaces of the instrument.
5. If detergent was used, wipe all surfaces with a cloth moistened with water.
6. Use a clean, dry cloth to dry all wet surfaces.

❖ Use extra care when removing the Select, Select CW, and HT dual manifolds. Hold the two manifolds together as a single unit when removing or replacing.

7. Using the 9/64” (3.57 mm) hex wrench, remove the screws, washers, and springs that hold the manifold(s) in place. Carefully remove the manifold(s) and end plates.

❖ Avoid pressing the stylus against the sides of the tubes during cleaning. This can cause the tubes to bend, which may negatively affect dispense precision.

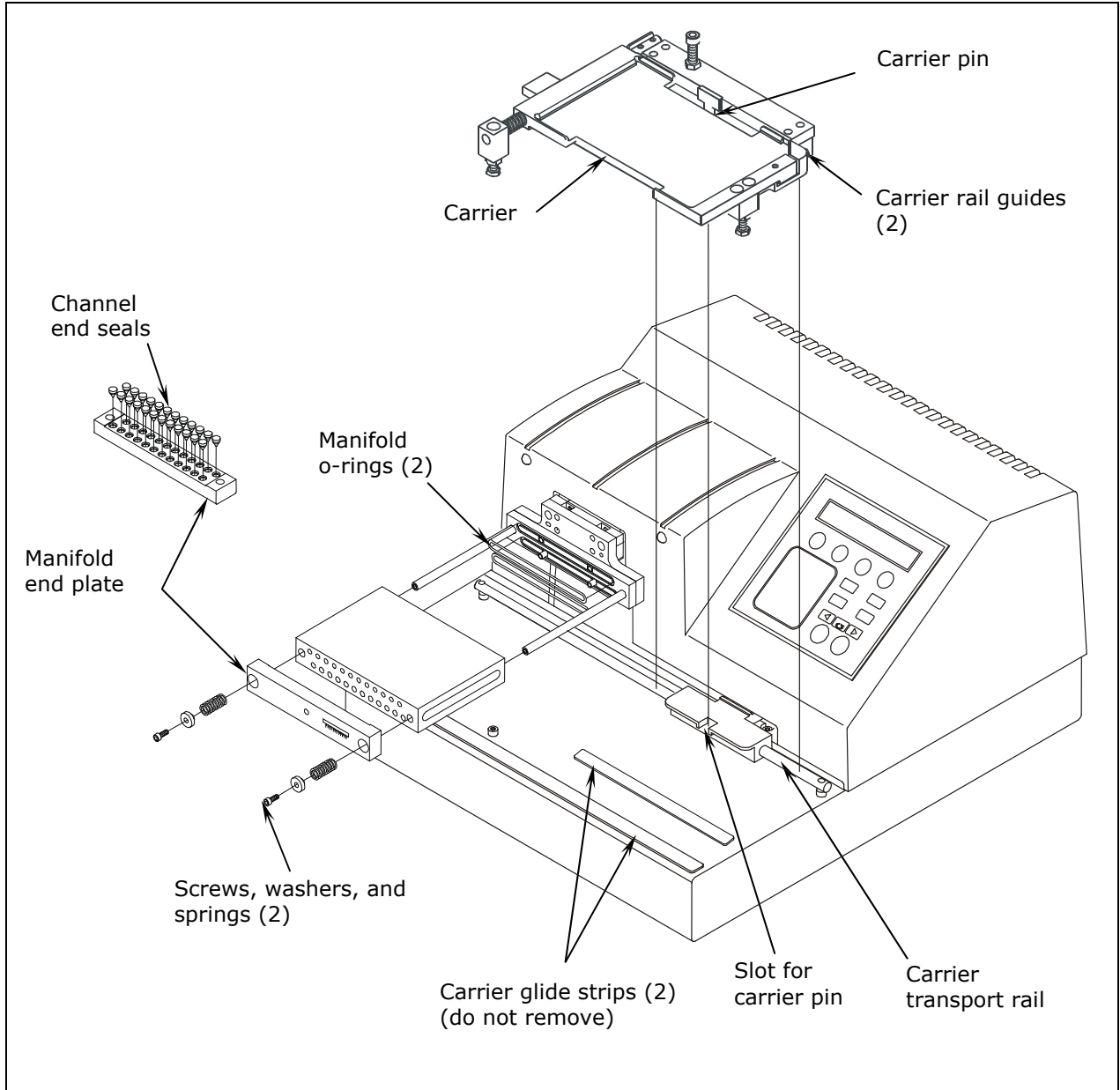
8. Using a soft-bristled brush, thoroughly clean the outside of the manifold(s). Clean the insides of each tube with the appropriate stylus (aspirate/dispense). Flush hot water through the cross channels.
9. Rinse the manifold with deionized or distilled water. Check to see if water comes out of all dispense and aspirate tubes. If not, soak the manifold in hot, soapy water and repeat.



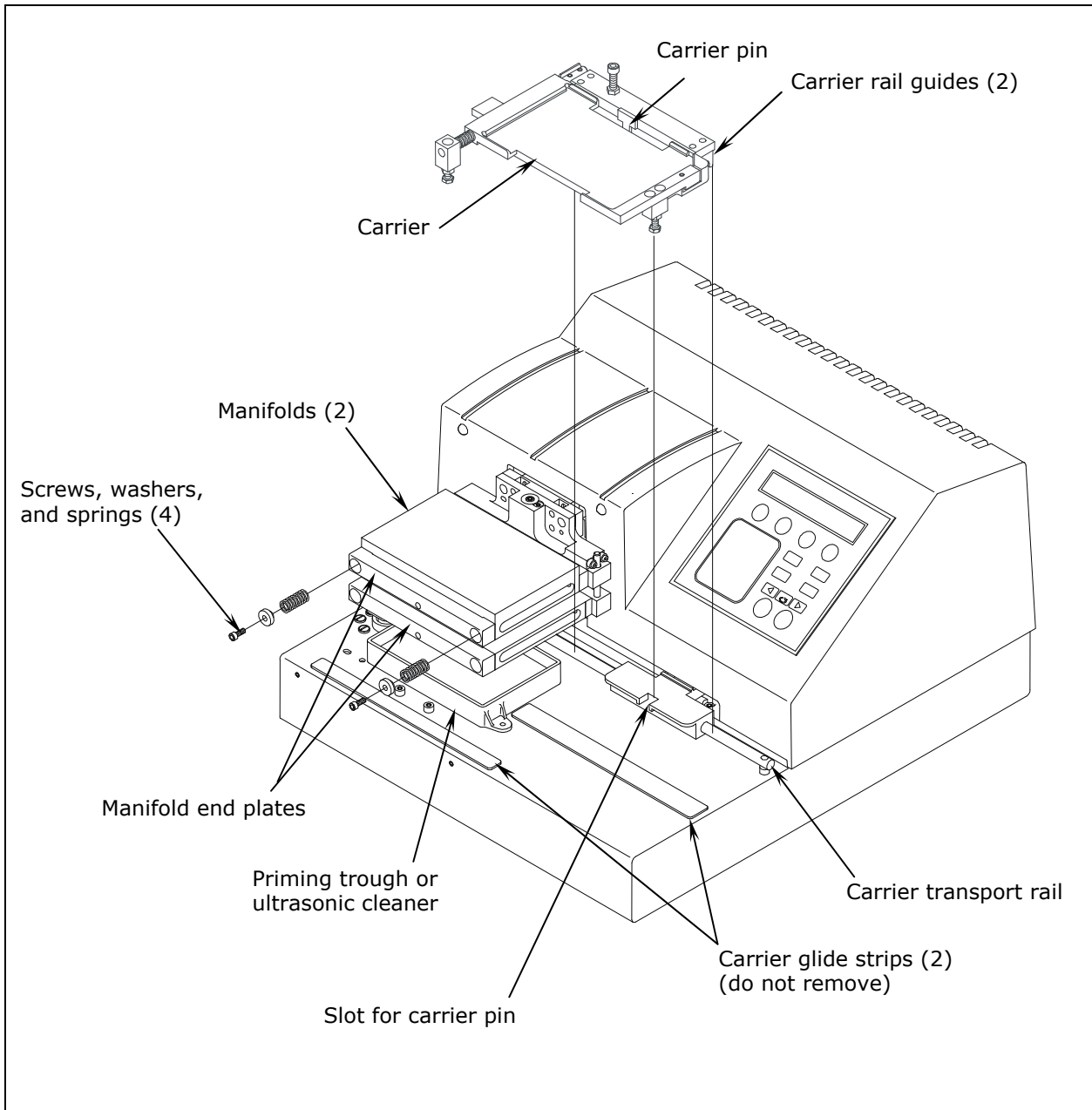
Caution. When reinstalling the manifold, only tighten the screw-washer-spring assembly that holds it in place until you feel the mechanical stop. You will damage the instrument if you continue tightening past this point, and will **void your warranty**.

10. When satisfied, reassemble the manifold and end plates, making sure that the two o-rings are in place prior to reassembly. **Do not overtighten the manifold screws.**
11. Re-attach the mist shield; finger-tighten the two thumbscrews.
12. Reconnect the power cable and turn on the washer.
13. Prime the system with deionized water by running DAY_RINSE or a similar Maintenance or Prime program. Watch for leaks. If fluid leaks out of the back of the instrument, firmly seat the tubing. If fluid leaks from the manifold, try disassembling and carefully reassembling.
14. Verify aspirate/dispense performance visually or by performing the **Evacuation Efficiency Test** and/or **Dispense Precision Test** in the ELx405 Operator's Manual.

- ❖ Replace the o-rings as needed. Replace the channel-end seals (rubber plugs) if they show signs of cracking or drying out. Refer to the ELx405 Operator's Manual for instructions.
- ❖ For additional cleaning, an ultrasonic bath may be used, or the AUTOCLEAN program may be run (models with the Ultrasonic Advantage™ only; see the AUTOCLEAN section).
- ❖ DO NOT AUTOCLAVE the manifold!





Carrier and Manifold Placement in the ELx405 Model



Carrier and Manifold Placement in the Select, Select CW, and HT Models

❖ The ultrasonic cleaner is available in Ultrasonic Advantage™ models only. Do not try to remove the ultrasonic cleaner! Only BioTek authorized service personnel should remove the cleaner for maintenance or repair.

AUTOCLEAN (for Ultrasonic Advantage™ models only)

	<p>Warning! Ultrasonic energy is present in the cleaning reservoir when an AUTOCLEAN program is running. Do not put your fingers in the bath! Ultrasonic energy can be destructive to human tissue.</p>
	<p>Ensure that adequate room exists in the vacuum bottle and adequate volume is available in the supply bottle before running AUTOCLEAN!</p>

Ultrasonic Advantage models feature a built-in ultrasonic cleaner that provides enhanced periodic maintenance capabilities by using ultrasonic pulses in a water bath to clean residuals from the manifold tubes. The cleaner consists of a stainless steel reservoir with an ultrasonic transducer bonded to the bottom of the reservoir. The reservoir is mounted on the washer in the same position as the priming trough in other models.

The onboard **AUTOCLEAN (AUTCL)** function in the Utility menu enables you to define and run an ultrasonic cleaning program that includes one or more cleaning “loops.” Use multiple loops if you want to clean with more than one type of fluid.

Refer to the *ELx405 Operator’s Manual* for complete instructions.

❖ **Do not** remove the ultrasonic cleaner! Only BioTek authorized service personnel should remove the ultrasonic cleaner for maintenance or repair.

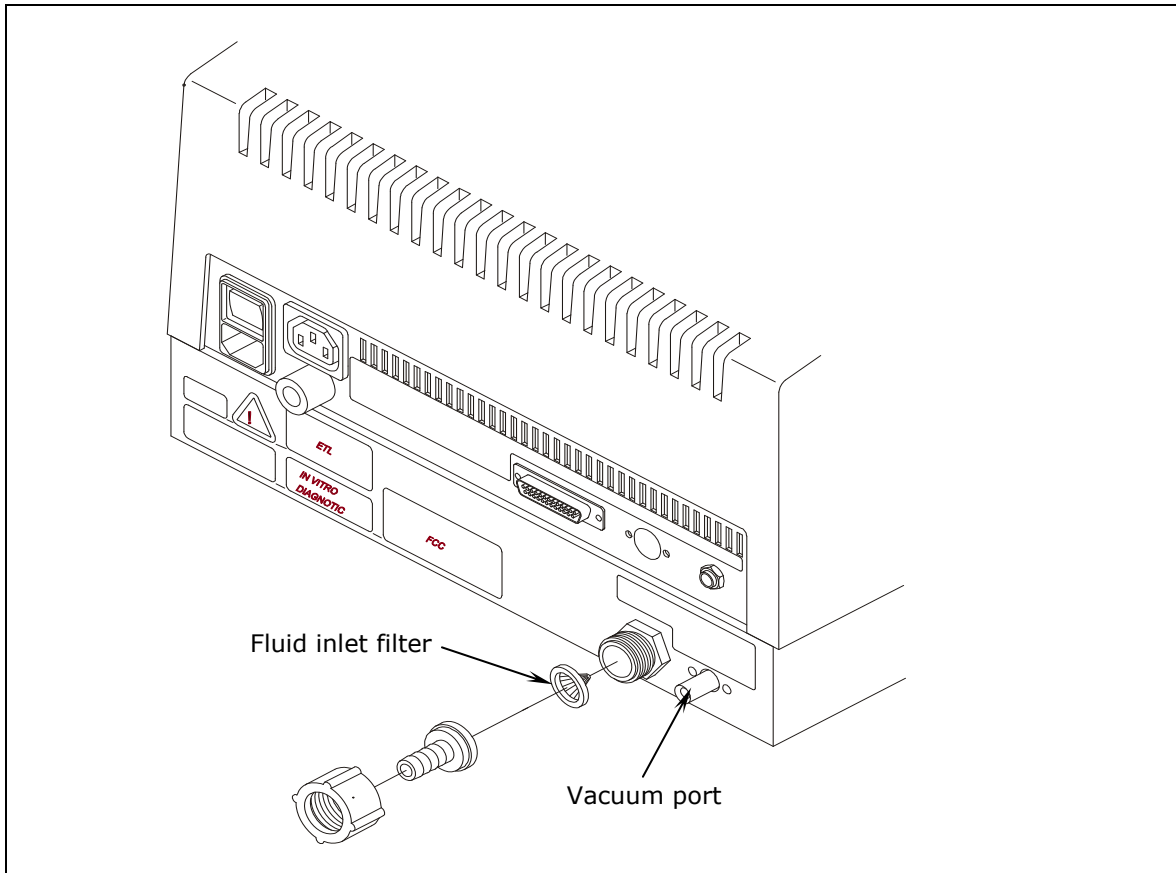
Cleaning the Fluid Inlet Filter



Warning! Internal Voltage. Turn off and unplug the washer for all cleaning operations.

Periodically clean the fluid inlet filter on the rear panel of the instrument:

1. Unscrew the fluid inlet fitting from the back of the washer.
2. Note the orientation of the filter in the fitting (the cone-shaped end of the filter points “in” toward the instrument) and then remove the filter from the fitting.
3. Wash the filter with hot water and a soft-bristled brush.
4. Rinse the filter, then replace it in the fitting and reinstall onto the rear of the instrument.







Cleaning the Fluid Inlet Filter



Decontaminate the Washer

Any laboratory instrument that has been used for research or clinical analysis is considered a biohazard and requires decontamination prior to handling.




Decontamination minimizes the risk to all who come into contact with the instrument during shipping, handling, and servicing. Decontamination is required by the U.S. Department of Transportation regulations. Persons performing the decontamination process must be familiar with the basic setup and operation of the instrument.

The recommended **frequency for decontamination** is at least monthly, and before shipment of the instrument to BioTek for calibration or repair.

	<p>Important! BioTek Instruments, Inc. recommends the use of the following decontamination solutions and methods based on our knowledge of the instrument and recommendations of the Centers for Disease Control and Prevention (CDC). Neither BioTek nor the CDC assumes any liability for the adequacy of these solutions and methods. Each laboratory must ensure that decontamination procedures are adequate for the Biohazard(s) they handle.</p>
	<p>Warning! Internal Voltage. Turn off and unplug the instrument for all decontamination operations.</p>
	<p>Do not immerse the instrument, spray it with liquid, or use a “wet” cloth. Do not allow the cleaning solution to run into the interior of the instrument. If this happens, contact the BioTek Service Department. Do not soak the keypad.</p>
	<p>Wear prophylactic gloves when handling contaminated instruments. Gloved hands should be considered contaminated at all times; keep gloved hands away from eyes, mouth, nose, and ears. Eating and drinking while decontaminating instruments is not advised.</p>

	<p>Mucous membranes are considered prime entry routes for infectious agents. Wear eye protection and a surgical mask when there is a possibility of aerosol contamination. Intact skin is generally considered an effective barrier against infectious organisms; however, small abrasions and cuts may not always be visible. Wear protective gloves when performing the decontamination procedure.</p>
	<p>HT models with the 96-tube manifold (HT2): For routine maintenance, decontaminate the manifold (96- or 192-tube) most frequently in use. For shipment of the instrument to BioTek for calibration or repair, decontaminate both manifolds.</p>

Procedure for External Surfaces of the Instrument

	<p>The bleach solution is caustic; wear gloves and eye protection when handling this solution.</p>
	<p>Caution! Be sure to check the percent NaClO of the bleach you are using; this information is printed on the side of the bottle. Commercial bleach is typically 10% NaClO; if this is the case, prepare a 1:20 dilution. Household bleach is typically 5% NaClO; if this is the case, prepare a 1:10 dilution.</p>
	<p>Do not prepare a stronger bleach solution than described here. Extended exposure to high concentrations of bleach can deteriorate some waste system components.</p>

1. Turn the washer off and disconnect the power cord. Empty the waste bottle.
2. Prepare an aqueous solution of 0.5% sodium hypochlorite (NaClO, or bleach). As an alternative, 70% isopropyl alcohol (or 70% ethanol) may be used if the effects of bleach are a concern.

❖ **Isopropyl alcohol** is not recommended for removing **proteins** (such as bovine serum albumin).

3. Moisten a cloth with the bleach solution or alcohol. **Do not soak the cloth.**



- Wipe the keypad (do not soak). Wipe again with a clean cloth moistened with deionized or distilled water. Dry immediately with a clean, dry cloth.
 - Remove the washer's mist shield if it is attached. Wipe the inside and outside surfaces of the mist shield. Wipe the plate carrier, top surface of the instrument's base, supply bottles and tubing, and all exposed surfaces of the instrument.
4. Wait 20 minutes. Moisten a cloth with DI or distilled water.
 - Wipe the inside and outside surfaces of the mist shield. Wipe the plate carrier, top surface of the instrument's base, supply bottles, tubing, bottle covers and all exposed surfaces of the instrument that have been cleaned with the bleach solution or alcohol.
 5. Use a clean, dry cloth to dry all wet surfaces.
 6. Reassemble the instrument as necessary.
 7. Discard the used gloves and cloths using a Biohazard trash bag and an approved Biohazard container.

Decontamination Procedure for Tubing and Manifold

The recommended onboard Maintenance program is DECONTAMINATION. This program flushes and soaks the supply tubing and manifold with disinfectant, then flushes the system with rinse, and finally purges the system of fluid.

The LONG_SHUTDOWN program primes and soaks the washer with the Prime Volumes and Soak Durations specified in the P_DECON1 and P_DECON2 prime programs. The Prime Volume and Prime Flow Rate parameters for these Prime programs can be edited for optimum cleaning. The Soak Duration cannot be edited.

❖ Two supply bottles are required for this procedure: one for disinfectant, and one for rinse.

	<p>Caution! Be sure to check the percent NaClO of the bleach you are using; this information is printed on the side of the bottle. Commercial bleach is typically 10% NaClO; if this is the case, prepare a 1:20 dilution. Household bleach is typically 5% NaClO; if this is the case, prepare a 1:10 dilution.</p>
	<p>Do not prepare a stronger bleach solution than described here. Extended exposure to high concentrations of bleach can deteriorate some waste system components.</p>

1. Perform the decontamination procedure described in the previous section.

2. Turn the washer off and disconnect the power cord.
3. Empty the waste bottle.
4. Prepare an aqueous solution of 0.5% sodium hypochlorite (NaClO, or bleach).
5. Fill one supply bottle with at least 400 mL of bleach solution (disinfectant).
6. Fill another supply bottle with at least 800 mL of deionized water (rinse).
7. If the washer is equipped with Buffer Switching, connect the supply bottles:
Valve A: Disinfectant bottle, **Valve B:** Rinse solution bottle
8. Reconnect the power cord and turn on the washer.
9. To run the **DECONTAMINATION** program, follow this sequence:

❖ While this program is running, periodically check the display panel and follow the instructions.

Washer **not** equipped with Buffer Switching:

MAINT → SELECT MAINT PROGRAM: → **DECONTAMINATION** →
CONNECT DISINFECTANT AND PRESS <**START**> KEY
RUNNING: DECONTAMINATION/ DISINFECTING →
CONNECT RINSE BOTTLE AND PRESS <**START**> KEY

Washer equipped with **Buffer Switching**:

MAINT → SELECT MAINT PROGRAM: → **DECONTAMINATION** →
DISINFECTANT VALVE? **A B C** or **D** → RINSE VALVE?
A B C or **D** → START MAINTENANCE? **YES**

Alternate Decontamination Procedure

If you are unable to run the DECONTAMINATION program due to a system failure, refer to the ELx405 Operator's Manual for an alternate alternate decontamination procedure to disinfect the internal tubing and manifold.

Prepare for Storage or Shipment

Before the washer is shipped or stored, the entire system should be rinsed and soaked with disinfectant and then purged of all fluid. Refer to the ELx405 Operator's Manual for instructions.



Instrument Testing

System and Checksum Tests



The information from the System and Checksum Tests is important if you need to contact BioTek.

The **System Self Test** and **Checksum Test** are performed automatically whenever the washer is powered on. They can also be run manually via the washer's keypad.

System Self Test

The System Self Test checks the vacuum (when run manually), manifold, and manifold-to-carrier positioning.

To run the System Self Test:

At the Main Menu, select UTIL → TESTS → **SELFCHK**.

The following screen will appear while the test is running:

```
SYSTEM TEST RUNNING. . .  
PLEASE WAIT. . . .
```

If the test passes, the Main Menu will be displayed.

If the test fails, the washer will beep repeatedly and the display will show an error code. If this happens, write down the error code and then press the **Stop** key on the keypad to stop the beeping. Look up the error code in the **ELx405 Operator's Manual** to determine its cause.

If the problem is something you can fix, turn off the washer, fix the problem, and then turn the washer back on.

If the cause is not something you can fix, contact BioTek's Technical Assistance Center.

Checksum Test

The Checksum Test compares the on-board software with an internally recorded checksum value to ensure the program has not become corrupted.

To run the Checksum Test:

At the Main Menu, select UTIL → TESTS → **CHKSUM**.

The first screen will display the **onboard (basecode) software** part number, version number, and checksum:



```
7100xxx Version x.xx  
CODE CHECKSUM: (xxxx)
```

After a few seconds, a second screen will display the **assay software** part number and version number:

```
7100xxx Version x.xx
```

The Main Menu will be displayed after the test is finished.

Liquid Tests

	<p>Refer to the <i>ELx405 Operator's Manual</i> for complete instructions for performing the Liquid Tests and for worksheets to record test results.</p>
	<p>HT models with the accessory 96-tube manifold: Ensure that the washer is configured for operation with the correct manifold (96 or 192). Failure to set the correct manifold type in the software before operating the washer may damage the manifold and void your warranty.</p>

Evacuation Efficiency Test

The Evacuation Efficiency test measures the **residual volume** (mean residual weight) per well after aspiration. The lower the residual per well, the better the evacuation efficiency of the washer.

A known solution is dispensed into all wells of a previously weighed microplate. The aspiration program is run and the plate is reweighed in order to calculate the total residual fluid based on the weight difference. The total residual fluid weight is divided by 96 or 384 as appropriate to obtain the **mean residual weight**.

Dispense Precision Test

The Dispense Precision Test measures the **variability of the volumes dispensed** from tube to tube across the manifold. In this test, a blue dye solution is dispensed into a microplate. The optical density of each well is measured at 630 nm and the background at 450 nm is subtracted to account for scratches on the plate or particulates in the well. The average error percentage is calculated and the amount dispensed to each well is calculated.

Acceptance is based on the **%CV** (%Coefficient of Variation), or the ratio of the standard deviation of the distribution of fluid volumes in the wells to the mean value of volume per well. The lower the %CV, the better the uniformity across the manifold.

Annual Buffer Switching Test: The Dispense Precision test is conducted for the external Buffer Switching valve module to ensure that each valve (A, B, C, D) is calibrated to deliver the same volume of fluid.



Specifications

Specifications

Microplates	
96-well plates/strips	ELx405, Select, Select CW, HT2 (with the Dual/96 manifold installed)
384-well plates	Select, Select CW, all HT models
Most rigid 96- & 384-well filter plates	Vacuum Filtration models support rigid filter bottom plates with 0.45 μm to 1.2 μm filter pore size
96- & 384-format deep-well plates/cluster tubes, up to 50 mm tall	ELx405 Select, Select CW – Deep Well (“D”) models
Electrical	
Voltage Range:	100 to 240 V \sim at 50 to 60 Hz, \leq 8.0 A
Accessory Outlet:	\leq 5.0 A, used for vacuum pump
Physical	
Dimensions:	Depending on model, up to: 17” D x 14” W x 11” H (43.2 cm x 35.6 cm x 27.9 cm)
Weight:	\leq 30 lb (13.5 kg)
Environmental	
Operating Temperature:	15 to 30°C (59 to 86°F)
Relative Humidity:	10% to 85% (non-condensing)
Manifold Type	Compatible with
Single manifold with 96 sets of aspirate and dispense tubes arranged in an 8x12 array to process 96-well microplates. (‘Single/96’)	ELx405 (standard)
Two manifolds, one with 96 aspirate tubes (deep tubes for “D” models) and another with 96 dispense tubes to process 96- and 384-well plates. (‘Dual/96’)	Select, Select CW, and HT2
Two manifolds, one with 192 aspirate tubes and one with 192 dispense tubes to process 384-well plates. (‘Dual/192’)	All HT models
Other	
Waste bottle volume:	4, 10, or 20 liters, depending on the accessory package
Supply bottle volume:	3.7 liters
User interface (LCD):	2 line x 24-character LCD display, 25 alphanumeric keys

Performance Specifications

Average Residual Volume (Evacuation Efficiency)		
Single/Dual 96-Tube Manifolds (including deep-tube manifolds)	ELx405 Select Select CW HT2	Average residual volume in the microwells is $\leq 2 \mu\text{L}$ per well (or $\leq 5 \mu\text{L}$ for washer serial numbers < 204272), after a 3-cycle wash, when 300 μL of deionized water with 0.1% Tween 20 [®] , or buffer equivalent, is dispensed per well into a Costar [®] 96-well flat-bottomed plate. The aspirate height adjustment is optimized for the plate prior to testing.
Dual 192-Tube Manifold	All HT models	Average residual volume in the microwells is $\leq 2 \mu\text{L}$ per well after a 3-cycle wash, when 100 μL of deionized water with 0.1% Tween 20, or buffer equivalent, is dispensed per well into a Costar 384-well flat-bottomed plate. The aspirate height adjustment is optimized for the plate prior to testing.
Vacuum Filtration	96-Well Filter Plates	Average increased weight of the plate is $\leq 1.2 \text{ grams}$ after dispensing 300 μL of deionized water per well into a Millipore [®] MSHVN4450 96-well 0.45 μm plates (PN 98258) and vacuum aspirated for 30 seconds at vent diameter 0.047" (no plug) and blotted on a paper towel.
	384-Well Filter Plates	Average increased weight of the plate is $\leq 04.0 \text{ grams}$ after dispensing 80 μL of deionized water per well into a Millipore [®] MZFCN0W10 384-well 1.2 μm plates (PN 98287) and vacuum aspirated for 10 seconds at vent diameter 0.047" (no plug) and blotted on a paper towel.
Deep Well Model	96 Deep Well Plate	Average residual volume in the microwells shall be $\leq 2 \mu\text{L}$ per well after a 3 cycle wash, when 2000 μL of deionized water with 0.1% Tween 20 solution is dispensed per well into a Corning [®] 96 Polypropylene Storage Block, part number 3960 or 3961.

Dispense Precision		
Single/Dual 96-Tube Manifolds (including deep-tube manifolds)	ELx405 Select Select CW HT2	$\leq 3.0\% \text{ CV}$ (or $\leq 4.0\% \text{ CV}$ for washer serial numbers < 204272), when dispensing 300 μL per well of deionized water with 0.1% Tween 20, with FD&C #1 blue dye at a rate of 300 μL per well, per second into a Costar 96-well flat-bottomed plate. The absorbance of the solution is read at 630 nm and 450 nm reference.
Dual 192-Tube Manifold	All HT models	$\leq 4.0\% \text{ CV}$ when dispensing 80 μL per well of deionized water with 0.1% Tween 20, with FD&C #1 blue dye at a rate of 102 μL per well, per second (rate 5) into a Costar 384-well flat-bottomed plate. The absorbance of the solution is read at 630 nm and 450 nm reference.