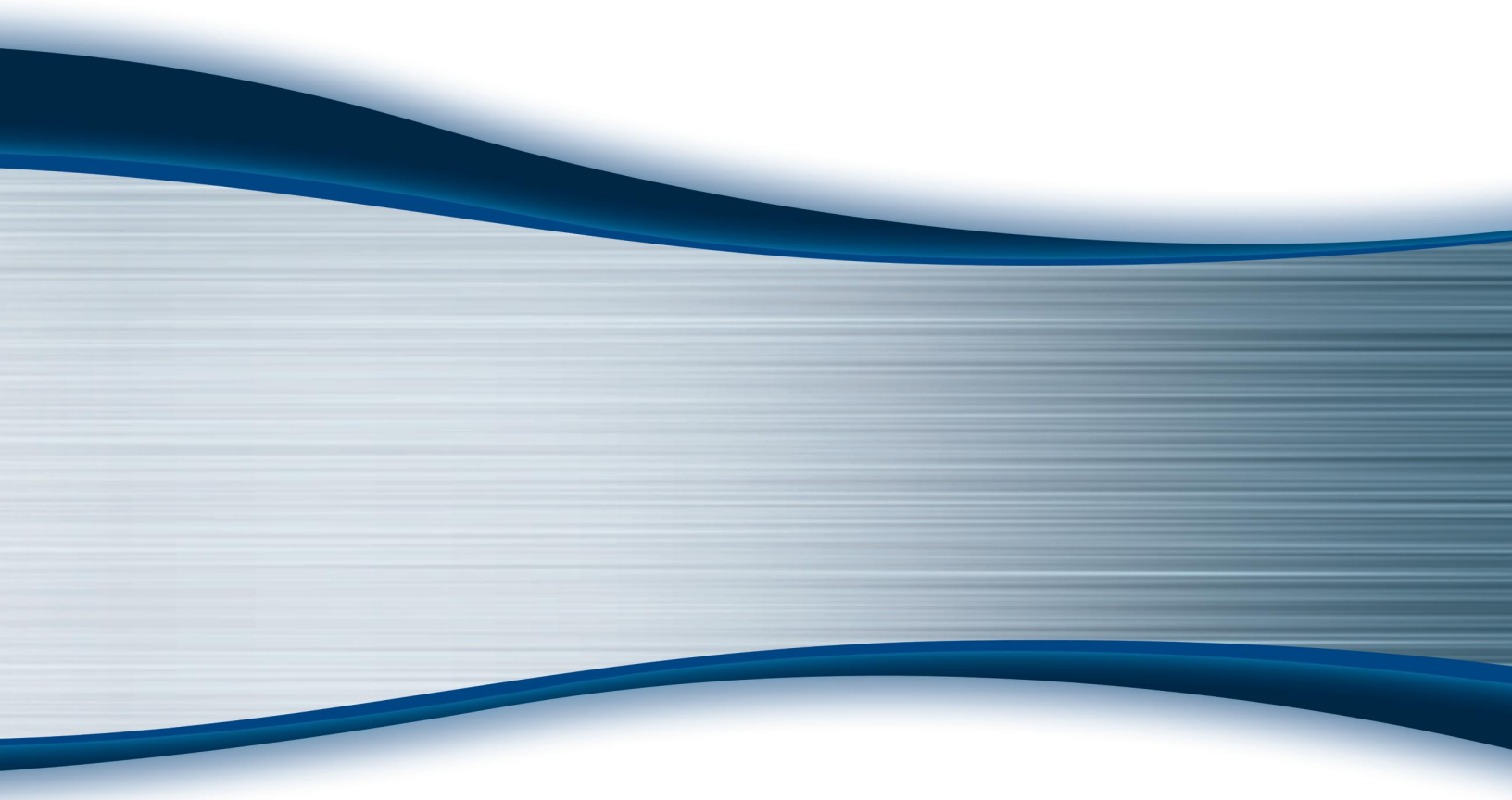
215 Liquid Handler
User's Guide



GILSON

215 Liquid Handler
User's Guide

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Safety

Read this section before installing and operating the 215 Liquid Handler.

The 215 Liquid Handler is intended to be used in a laboratory environment by trained technical personnel.

For safe and correct use of this instrument, it is recommended that both operating and service personnel follow the instructions contained in this guide when installing, cleaning, and maintaining the liquid handler.

The following safety precautions must be observed during all phases of operation, service, and repair of the instrument. Failure to comply with these precautions or with specific warnings elsewhere in this user's guide violates safety standards of design, manufacture, and intended use of the liquid handler. Gilson assumes no liability for the customer's failure to comply with these requirements.

The 215 Liquid Handler has been certified to UL, CSA, and CE Safety standards.

The following electronic and hazard symbols may appear on the instrument:

Symbol	*Explanation*
~	Alternating current Courant alternatif Wechselstrom
⎓	Direct current Courant continu Gleichstrom
	Protective conductor terminal Borne de terre de protection Schutzleiteranschluss
|	Electrical power ON Sous tension Netzschalter ein
O	Electrical power OFF Hors tension Netzschalter aus
	Caution Attention Vorsicht
	Caution, risk of electric shock Attention, risque de choc électrique Vorsicht, Elektroschockgefahr
	Caution, hot surface Attention, surface chaude Vorsicht, heiße Oberfläche
	Fuse Fusible Sicherung
	Keep hands clear of probe Garder les mains éloignees de l'aiguille Halten Sie Hände fein von der Nadel

The following safety notices may appear in this document:

⚠WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, may result in serious injury
⚠CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury
NOTICE	NOTICE indicates a potentially hazardous situation which, if not avoided, may result in equipment damage

Voltage

Access to the rear panel is necessary. The liquid handler must be detached from all voltage sources before service, repair, or exchange of parts.

For normal operation, the liquid handler is to be grounded through the AC line cord provided. Failure to do so can result in a potential shock hazard that could result in serious personal injury.

Use only fuses with the rated current and of the specified type as listed on the rear panel of the instrument.

The instrument must only be operated with the voltage specified on the rear panel label of the instrument using a grounded AC line cord.

Probes

While operating the liquid handler, keep hands clear of probe to avoid risk of personal injury by piercing.

Because the probe installed on the Z-arm may contain a dangerous substance, do not interfere in the work area of the instrument until the liquid handler has completed its procedures.

Solvents

Observe safe laboratory practices when handling solvents. If dangerous liquids are used, adequate protection such as proper ventilation, safety glasses, etc., should be used.

Refer to the Material Safety Data Sheets for the solvents before use.

Replacement Parts

Be sure to use only original replacement parts, mentioned in ***Chapter 4, Maintenance*** and ***Appendix A, Replacement Parts and Accessories***. Do not repair or change parts which are not listed in this user's guide. If it is necessary to change parts not listed, please contact your Gilson-authorized representative.

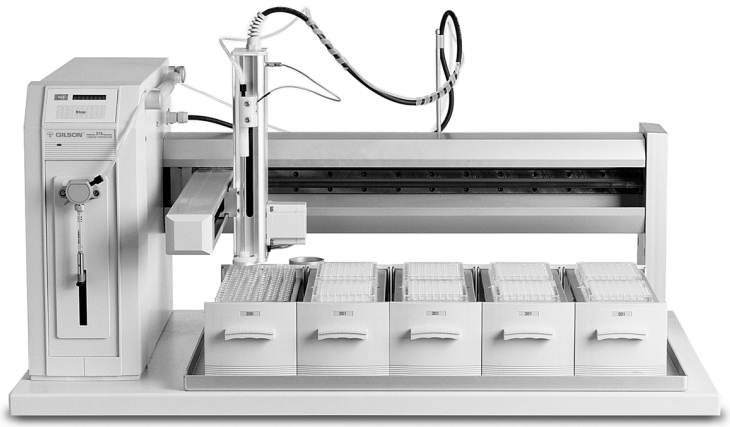
Introduction 1

This chapter provides information on the following topics:

- **Description**
- **Unpacking**
- **Customer Service**
- **Technical Specifications**

Description

The 215 Liquid Handler is a large-bed liquid handler used for performing dilutions, aliquoting solutions, mixing, plate reformatting, reconstituting samples, and more. It accommodates more than 330 racks to hold virtually any type of sample vessel, and has a punch strength capable of piercing thick or thin septa and microplate mats. The 215 Liquid Handler is intended to be used in a laboratory environment by trained technical personnel.



Unpacking

The 215 Liquid Handler is delivered with most major components already assembled. Keep the original container and packing assembly in case the liquid handler must be returned.

The 215 Liquid Handler and its components are shipped in two containers:

- One container holds the auxiliary items, such as locator plate, tubing, probes, syringes, rinse inserts, Z-arm, and any other accessories you may have ordered with your system.
- The other container holds the 215 Liquid Handler.

To remove the liquid handler from its container:

1 Grasp the free end of the strapping around the box. Pull away from the box. Be alert when it releases as the strapping is very taut. Repeat for the second piece of strapping.

2 Remove the caps on each side of the box.

3 Lift the outer box off and away from the liquid handler.

4 Remove the box labeled “PARTS ENCLOSED” and set aside.

5 Lift the unit off its base platform and place it on a lab bench or cart.

⚠CAUTION Gilson recommends that two people lift the liquid handler off the base of the packing container.

NOTICE Do not attempt to lift the instrument from the Y-arm (the horizontal arm). Always lift the instrument from its base.

a) Using the two cutouts for hand holds, place a hand at the base of the packing container.

b) Grip the liquid handler under the base plate.

c) Lift the unit up and out of the foam packing material. The side containing the electronics cabinet is the heavier side.

Standard Equipment

After the instrument and accessories containers have been unpacked, you should have the following:

- 215 Liquid Handler (part number 2510121) or
  215 Liquid Handler without Pump (part number 2510191)
- 215 Utility Programs CD
- power cords
- cable support rod
- tubing support rod
- liquid level detection cable
- GSIOC cable
- terminal block connectors
- fuses
- locator plate
- fuse drawers

Documentation

The following documents are included with the 215 Liquid Handler.

- 215 Liquid Handler Documentation CD
- Declaration of Conformity
- Installation Qualification/Operational Qualification Procedures

Accessories

Based upon your configuration, you also received additional accessories, most ordered separately.

Syringe Pump

If you ordered the 215 Liquid Handler with a syringe pump, the syringe pump is installed and the syringe valve, vent tubing, and inlet tubing are supplied.

Syringe

Order the syringe separately.

Part Number	*Description*
25025341	100 µL syringe
25025342	250 µL syringe
25025347	500 µL syringe
25025343	1 mL syringe
25025344	5 mL syringe
25025345	10 mL syringe
25025346	25 mL syringe

Z-Arm

The liquid handler is supplied with a 125 mm Z-arm and Z-height adjustment tool.

Optionally, substitute a 175 mm Z-arm.

Part Number	*Description*
250615/2	SUBSTITUTE 175 MM VERTICAL ARM ON 215

Rinse Station

The Gilson 215 Liquid Handlers are supplied with a rinse station and a waste bottle. A rinse station insert is required, but not included, as there are six options to choose from:

Part Number	*Description*
25245532	Shallow-pocket rinse station insert, closed-bottom, for applications where the probe is only immersed in a few millimeters of the sample; for use with 125 mm Z-arm.
25245533	Deep-pocket rinse station insert, closed-bottom, allows for deeper insertion of the probe into the rinse well, resulting in a greater area of the outside of the probe to be rinsed; for use with 125 mm Z-arm.
25245531	Flow-through rinse station insert, open-bottom, for flowing rinse applications; for use with 125 mm Z-arm.
25245542	Shallow-pocket rinse station insert, closed-bottom, for applications where the probe is only immersed in a few millimeters of the sample; for use with 175 mm Z-arm.
25245543	Deep-pocket rinse station insert, closed-bottom, allows for deeper insertion of the probe into the rinse well, resulting in a greater area of the outside of the probe to be rinsed; for use with 175 mm Z-arm.
25245541	Flow-through rinse station insert, open-bottom, for flowing rinse applications; for use with 175 mm Z-arm.

Locator Plate

The liquid handler is supplied with a 5-position locator plate.

Optionally, if using only Code 20- or 30-series racks, order the 7-position locator tray:

Part Number	*Description*
2504627	Locator tray for installing up to seven Code 20- or 30-series racks on the locator plate.

Or, if using an 818 AutoMix, order the 6-position locator plate:

Part Number	*Description*
25045513	LOCATOR PLATE, 6 POSITION, 215

Control Software

The 215 Liquid Handler is fully supported in both TRILUTION® LC Software and TRILUTION® LH Software.

Part Number	*Description*
210631Rxx	TRILUTION® LC Software
210630Rxx	TRILUTION® LH Software

RS-232 Cable

The 215 Liquid Handler is supplied with a GSIOC cable for connecting the liquid handler to other instruments.

Optionally, order an RS-232 cable to connect the liquid handler to the computer.

Part Number	*Description*
36083122	Serial cable, IBM AT-type, 9-pin female to 25-pin male

Transfer Tubing

Order transfer tubing separately.

Part Number	*Description*
499421202	1.5 mL FEP tubing; 0.8 mm ID x 10 feet
499424012	1 mL coiled FEP tubing, 0.8 mm ID.
499474032	3 mL coiled FEP Tubing, 0.8 mm ID, for 215
499474052	5 mL coiled FEP transfer tubing; 1.5 mm ID
499474102	10 mL coiled FEP tubing; 1.5 mm ID x 24 feet
499474252	25 mL coiled FEP tubing; 1.5 mm ID x 50 feet

Probe

A probe is required, but not included, as there are many options to choose from. Refer to ***Appendix A, Replacement Parts and Accessories*** for part numbers.

Probe Holder/Guide Kit

A probe holder/guide kit is required, but not included, as there are several options to choose from:

Part Number	*Description*
253640	Probe holder/guide kit; includes probe holder and guide for 1.8 mm outer diameter probes.
253641	Probe holder/guide kit; includes probe holder and guide for 1.5 mm outer diameter probes.
253642	Probe holder/guide kit; includes probe holder and guide for 1.3 mm outer diameter probes.
253643	Probe holder/guide kit; includes probe holder and guide for 2.0 mm outer diameter probes.
253645	Probe holder/guide kit; includes probe holder and guide for 2.7 mm outer diameter probes.

Racks

Based on your requirements, you'll need racks. Refer to ***Appendix B, Racks*** for part numbers.

Injection Module

To configure the 215 Liquid Handler for automatic HPLC injection, order an injection module.

Part number	*Description*
251511	819 Injection Module
251551	845Z Injection Module
251552	845ZPREP™ Injection Module

Fraction Collection Valve

To configure the 215 Liquid Handler for fraction collection, order a fraction collection valve package.

Part number	*Description*
251772	215 Low Pressure Valve Package (High Mount), includes low pressure valve, valve mounting assembly, and plumbing package required to plumb a 215 Liquid Handler/819 Injection Module as a fraction collector. For flow rates up to 20 mL/min.
251773	215 Prep FC Package (High Mount), includes valve, valve mounting assembly, and plumbing package required to plumb a 215 Liquid Handler/819 Injection Module as a fraction collector. For flow rates 20–200 mL/min, use a probe with an internal diameter of 0.8 mm or larger.
251774	215 Prep FC Package (Low Mount), valve, valve mounting assembly, valve bracket assembly, probe guide foot, and plumbing package required to plumb a 215 Liquid Handler/819 Injection Module as a fraction collector. For flow rates up to 200 mL/min.

Customer Service

Gilson, Inc. and its worldwide network of authorized representatives provide customers with the following types of assistance: sales, technical support, applications, and instrument repair.

If you need assistance, please contact your Gilson-authorized representative. Specific contact information can be found at www.gilson.com. To help us serve you quickly and efficiently, please refer to **Before Calling Us** on page 5-11.

Technical Specifications

Please be aware of the following before operating the liquid handler.

NOTICE Changes or modifications to the liquid handler not expressly approved by Gilson could void the warranty.

This instrument complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This instrument may not cause harmful interference, and (2) this instrument must accept any interference received, including interference that may cause undesired operation.

Shielded cables must be used with the liquid handler to ensure compliance with the FCC Class A limits.

Technical Specification	*Definition*
Arm Speed	>45.7 cm/sec (>18 in/sec) in X dimension >40.6 cm/sec (>16 in/sec) in Y dimension
Communication Interface	RS-232 or GSIOC; Four inputs (contact closure, TTL, or open-collector), four relay outputs, and one switched +24V DC 1A output
Dimensions (W x D x H)	91 x 61 x 56cm (36 x 24 x 22 in)* *Maximum height. Z-arm height is adjustable to accommodate vessel heights between 1 and 150 mm (dependent on installed Z-arm)
Display Panel	8-character display
Environmental Conditions	Indoor use Altitude: up to 2000 m Temperature range: 5°–40°C Air pressure: 75–105 kPa Humidity: Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
Front Panel	START and emergency STOP soft keys
Horizontal Motion Strength	X: 5 kg (11 lbs) Y: 7 kg (15 lbs)

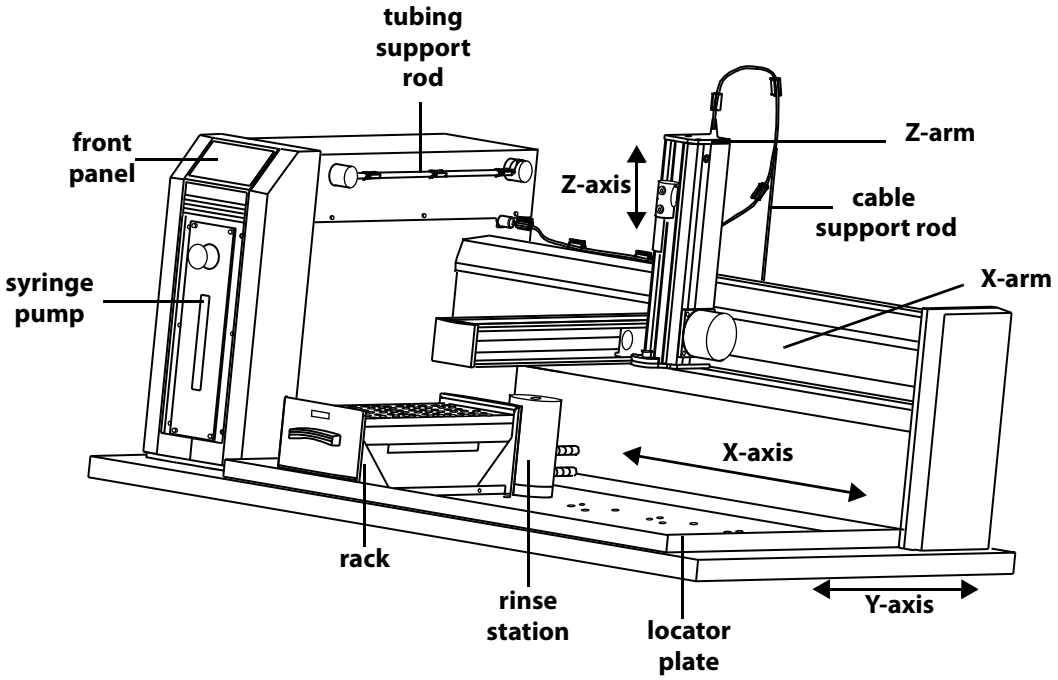
Technical Specification	*Definition*	
Injection Carryover	<0.1% Contact Gilson Customer Service to learn what methods and conditions were used to obtain this value	
Liquid Level Sensing	Capacitive or conductive	
Locator Plate Capacity	Up to seven racks depending on the locator plate and racks used; for more information, see ***Appendix B, Racks***	
Power Requirements	Frequency: 50/60 HZ Voltage: 100–120 V or 220–240V, mains voltage fluctuations not to exceed ±10% of the nominal voltage Current rating: 2.0A for 100–120 or 1.0A for 220–240V	
Probe Positioning Performance	Accuracy: ±0.5 mm in X/Y dimensions ±1 mm in Z dimension Repeatability: ±0.25 mm in X/Y/Z dimension	
Probe Rinse	Probe rinsing occurs through a dedicated rinse station for rinsing the inside and outside of the probe Optional inserts for shallow pocket, deep pocket, and flowing rinse	
Reproducibility	Liquid Handling	1.37% CV with 50 µL of water
	Injection	<0.9% CV with 1 mL syringe and total loop filling method
	Contact Gilson Customer Service to learn what methods and conditions were used to obtain the values	
Safety Approvals/ EMC Compliance	Certified to UL, CSA, CE, and C-Tick Safety/EMC standards	
Sampler Type	X/Y/Z with stationary rack design	
Software	Gilson TRILUTION® Software	

Technical Specification	*Definition*	
Syringe Capacity / Flow Rates	***Syringe Size***	***Maximum Flow Rate for Water***
	100 µL	3.37 mL/min
	250 µL	8.43 mL/min
	500 µL	16.87 mL/min
	1000 µL	33.75 mL/min
	5000 µL	100.00 mL/min
	10000 µL	100.00 mL/min
	25000 µL	100.00 mL/min
Syringe Pump	Internal integral high-precision single piston syringe pump	
Vertical Punch Strength	5 kg (11 lbs)	
Volumetric Accuracy	Liquid Handling: 99.7% with 50 µL of water Contact Gilson Customer Service to learn what methods and conditions were used to obtain this value	
Weight	40 kg (89 lbs)	

Installation 2

This chapter takes you through the steps for setting up your 215 Liquid Handler, which includes:

- **Locator Plate Installation**
- **Armlock Removal**
- **Z-Arm Installation**
- **Probe Installation**
- **Syringe Installation**
- **Plumbing Connections**
- **Rack Setup**
- **Final Z-Arm Adjustment**
- **Rear Panel Connections**



Locator Plate Installation

The locator plate serves two functions:

- Positions the racks and accessories that fit onto the bed of the liquid handler.
- Contains liquid spills, such as those caused by overflowing vessels.

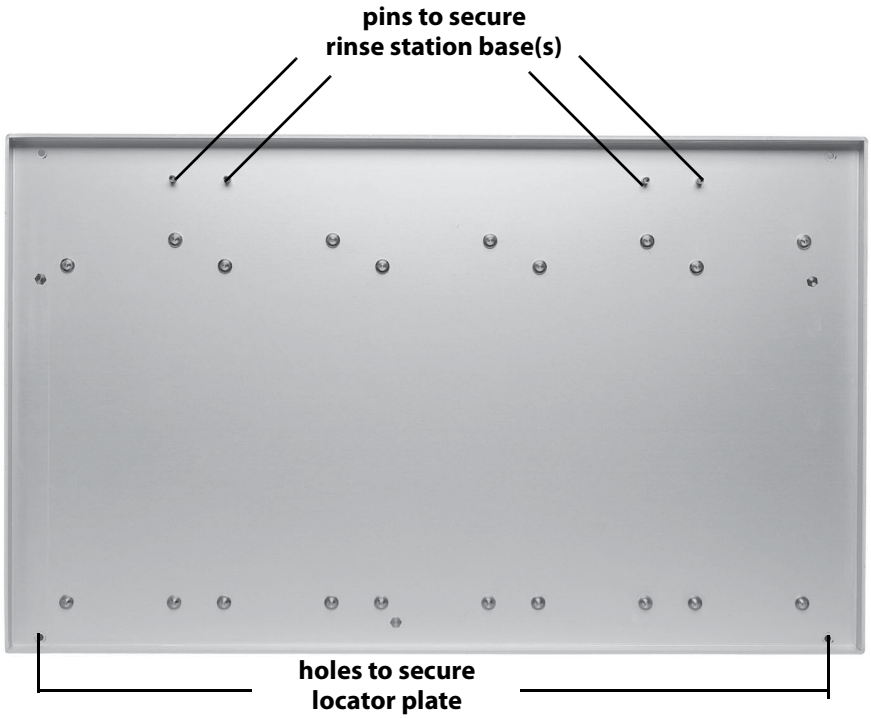
The locator plate and its four mounting screws are shipped in a separate box with the liquid handler's accessories.

To install the locator plate onto the instrument bed:

1 Make sure the locator plate's rinse station base is at the rear of the instrument. The locator plate will only install in this orientation.

2 Align the four corner holes of the locator plate with the four holes on the instrument bed and lower the plate onto the bed.

3 Using a Phillips screwdriver, secure the locator plate using the four mounting screws.



Armlock Removal

The armlock on the liquid handler secures the Y-arm during shipment. You must remove the armlock prior to installing the Z-arm and operating the instrument. If the armlock is not removed, the liquid handler cannot move in the X direction. This results in an error state during operation.

NOTICE If you need to move the liquid handler, always reinstall the armlock. This safeguards against mechanical damage.

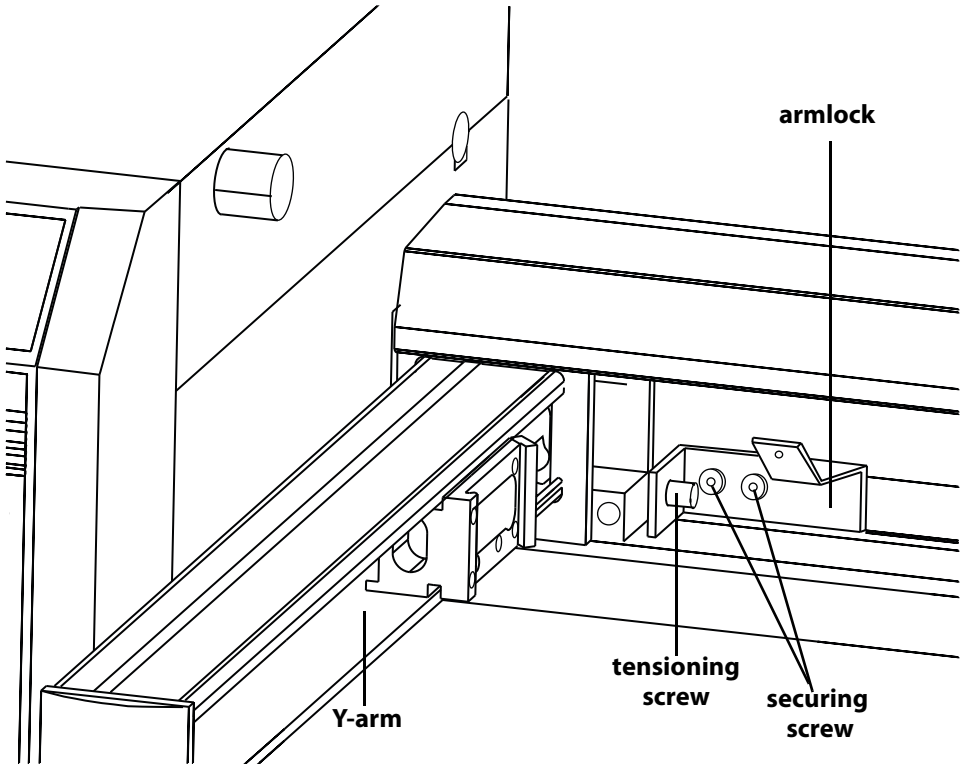
To remove the armlock:

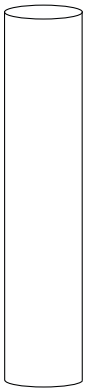
1 Remove the cardboard label in front of the armlock.

2 Using the 9/64" ball driver, loosen the tensioning screw that immobilizes the Y-arm.

3 Using the 9/64" ball driver, remove the two remaining screws that hold the armlock in place.

4 Remove the armlock and store it and the ball driver for future use.





Z-height adjustment tool

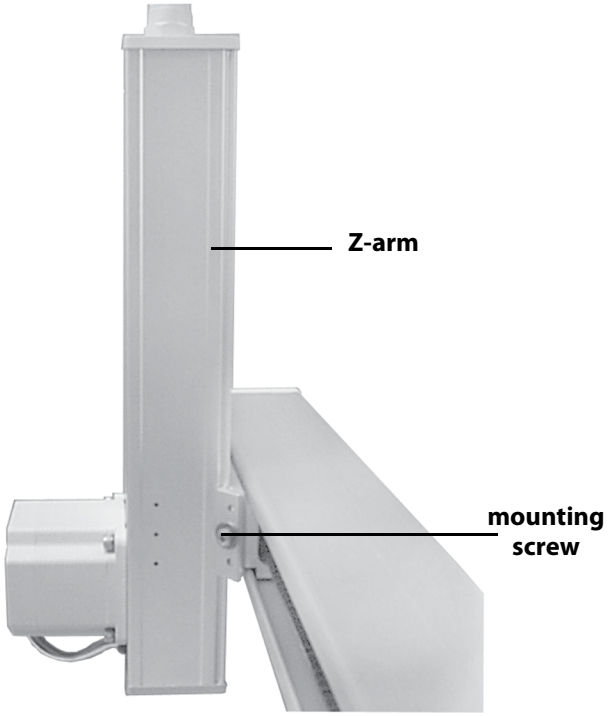
Z-Arm Installation

Follow these steps to install the Z-arm:

1 Locate the Z-arm and the Z-height adjustment tool that was shipped with the Z-arm.

2 Locate the Z-arm mounting bracket on the Y-arm and then slide it forward for easier access to the mounting screw.

3 Using a Phillips screwdriver, loosen the mounting screw. (Turn counterclockwise to loosen.)

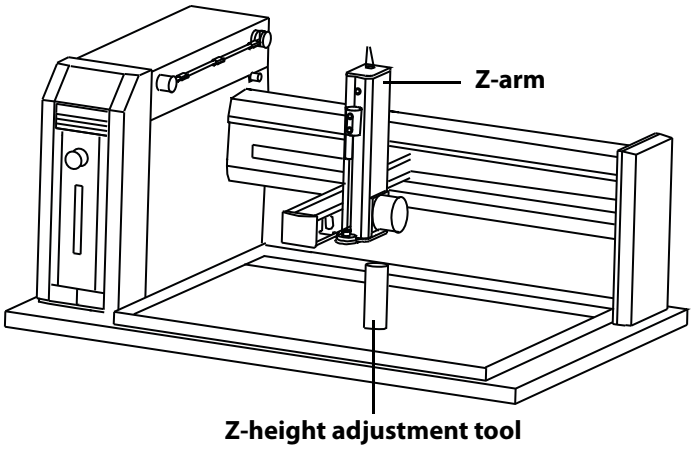


4 Partially pull out the bracket. Do not remove completely.

5 Place the Z-arm into the mounting bracket. Insert one side of the Z-arm into place at a time.

6 Tighten the mounting screw on the Z-arm mounting bracket, but leave it loose enough so that the Z-arm can slide up and down.

7 Place the Z-height adjustment tool on one of its ends near the center of the locator plate (if necessary, remove any racks or accessories before doing this).



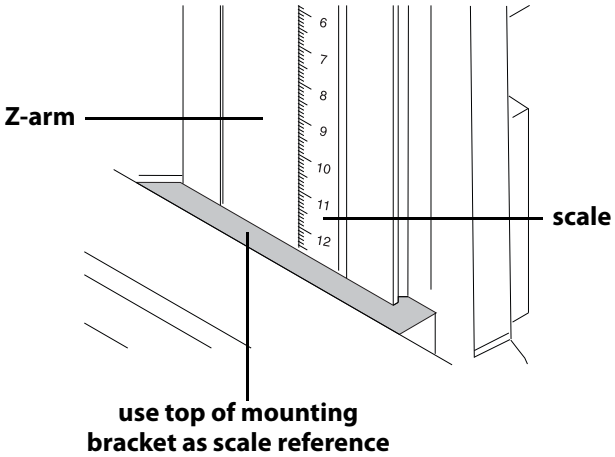
8 Manually move the arm so the Z-arm is centered over the Z-height adjustment tool.

9 While holding Z-height adjustment tool flat against the locator plate, use the other hand to lower the Z-arm until it lightly rests on the adjustment tool.

10 Tighten the screw on the mounting bracket until the Z-arm is secure.

11 While holding the adjustment tool in place, slide the Z-arm off the tool. Ensure that the bottom of the Z-arm lightly rubs against the adjustment tool as it moves.

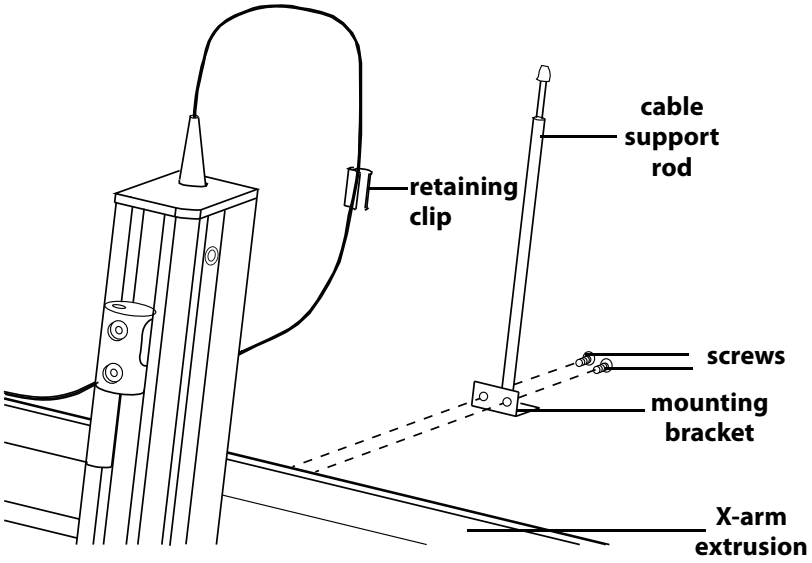
12 Note the installed height of the Z-arm using the graduated scale located on one side of the arm and note it on this page. This clamp height is required when setting up parameters for the Z Height in the 215 Setup Utility as described on page 3-14.



13 Store the Z-height adjustment tool.

Install the Z-Arm Cable Support Rod

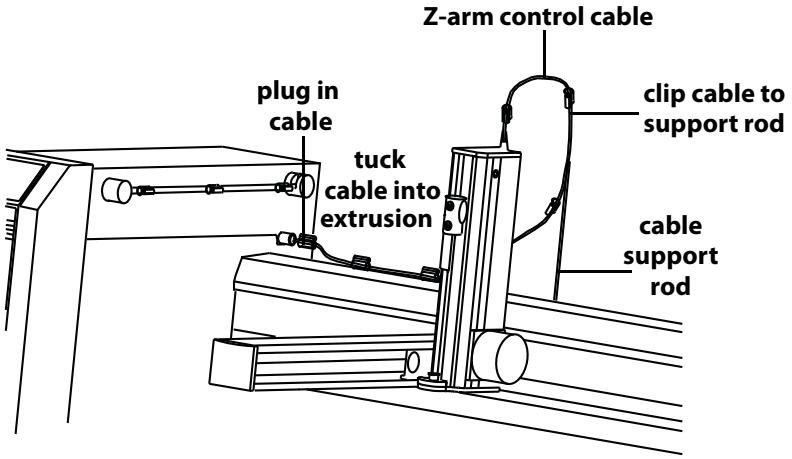
Use the two Phillips screws to attach the mounting bracket and cable support rod to the rear of the X-arm extrusion.



Z-Arm Connection

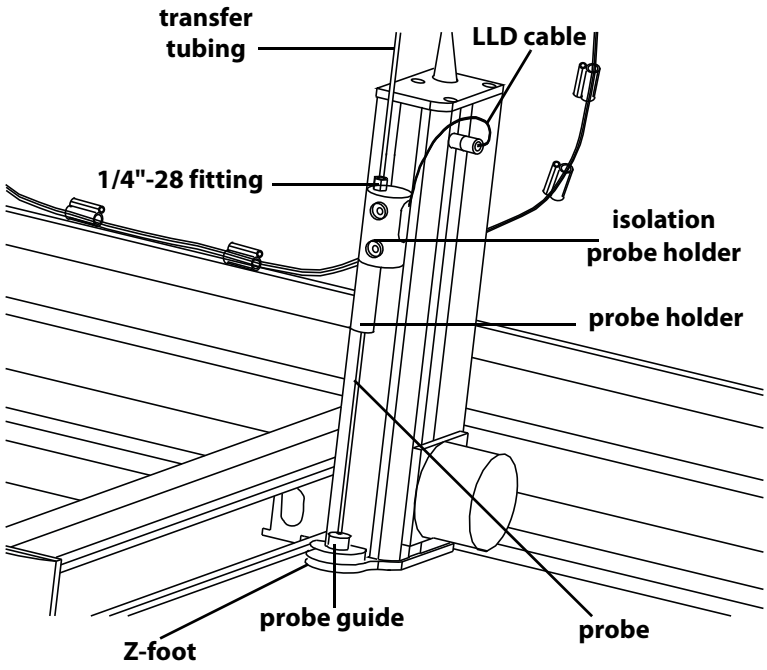
Plug the Z-arm control cable into the back topside of the control cabinet. The control cable should be tucked into the groove located in the top of the X-arm extrusion. The retaining clip that is already on the control cable should be snapped onto the top of the cable support rod. Refer to diagram below.

The control cable is correctly installed when the arm is extended to the extreme X and Y direction and the cable has enough slack.



Probe Installation

There are different probes available for use on the 215 Liquid Handler. Depending upon the application, purchase the appropriate probe and probe holder/guide kit. When installing the probe, probe holder, and probe guide, refer to the following procedures and diagram that shows where they are installed on the liquid handler.



Install the Probe Guide

The probe guide is installed on the top of the Z-foot.

1 Place the probe guide into the opening in the top of the Z-foot.

2 Use the two Phillips screws to secure the probe guide to the Z-foot.

Install the Probe Holder

To install the probe holder, screw it into the bottom of the isolation probe holder.

Install the Probe

Insert the probe into the top of the isolation probe holder and pull it through the holder until the tip of the probe is in the probe guide.

Install the Liquid Level Detection (LLD) Cable

To install the liquid level detection (LLD) cable:

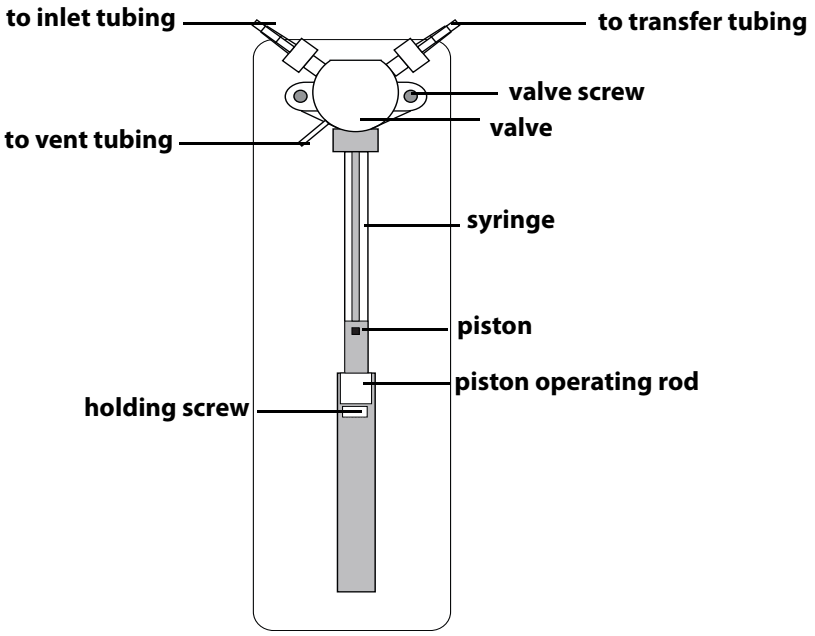
1 Plug the quick connector into the socket located on the Z-arm.

2 Place the metal slot end of the cable over the metal tab on the isolation probe holder.

Syringe Installation

If your liquid handler has a built-in syringe pump, the piston operating rod will be shipped in the down position. If the rod is not in the down position, please refer to the instructions on changing a syringe in ***Chapter 4, Maintenance***. Those instructions detail how to lower the rod.

NOTICE The following procedure is important for correct syringe piston alignment. Improper alignment may cause premature piston seal failure.



1 Remove the valve and syringe from their packages.

2 Lubricate the piston with diluent to reduce piston seal friction during syringe installation.

3 Loosely screw the syringe into the valve. Do not fully tighten.

4 Loosely attach the valve to the syringe pump with the supplied screws.

5 Pull down the piston so it comes into contact with the piston operating rod and then firmly tighten the piston holding screw.

6 Fully tighten the valve screws to secure the valve.

7 Fully tighten the syringe to the valve.

Note: Remember the size of the syringe you are installing for later software configuration. (You can write the size in the margin here for reference.) See **Syringe Options** on page 3-10.

Plumbing Connections

Inlet and Vent Tubing Installation

If your liquid handler includes a syringe pump, you received inlet tubing and vent tubing.

1 Install the 1/4"-28 fitting of the 2 mm ID tubing (part number 3645357) to the inlet side of the syringe pump. Refer to the diagram for **Syringe Installation** on page 2-9, if necessary.

2 Place the filtered end of the assembly into the bottle containing the diluent or probe rinse solution.

Note: To lengthen the inlet tubing, use the supplied tubing (part number 49948392) and coupling (part number F1410153).

3 Slip the vent tubing (supplied with the syringe valve) onto its port on the valve. For the location of the vent, refer to diagram for **Syringe Installation** on page 2-9.

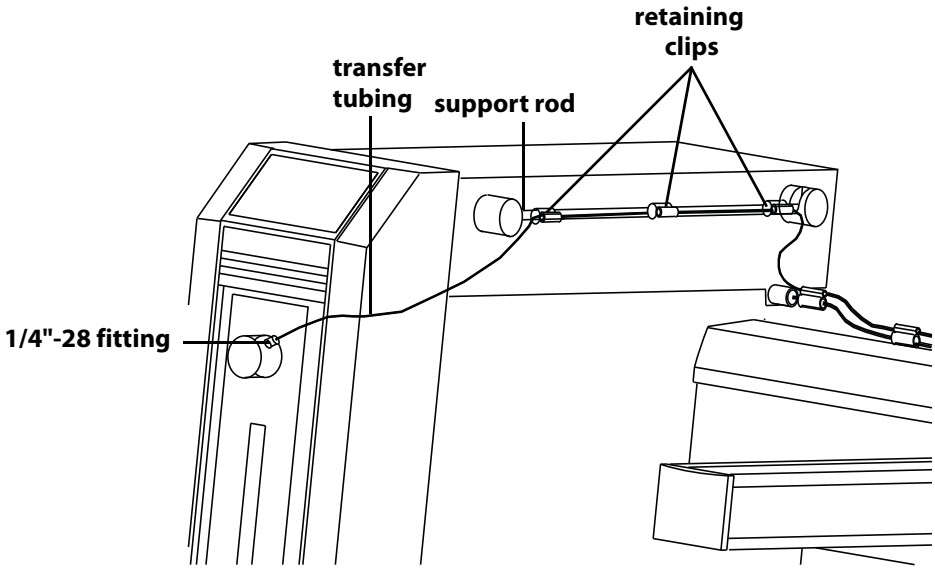
Transfer Tubing Installation

You can install straight or coiled transfer tubing. Refer to the appropriate instructions.

Straight Tubing Installation

Follow these installation instructions if using the straight transfer tubing (part number 499421202):

1 Snap three tubing retaining clips onto the tubing support rod. Equally space the clips.



2 Install the tubing support rod in its brackets on the control cabinet. Insert the front end of the rod into the hole before placing the back end of the rod in its cradle.

3 Snap three tubing retaining clips onto the Z-arm control cable. Equally space the clips.

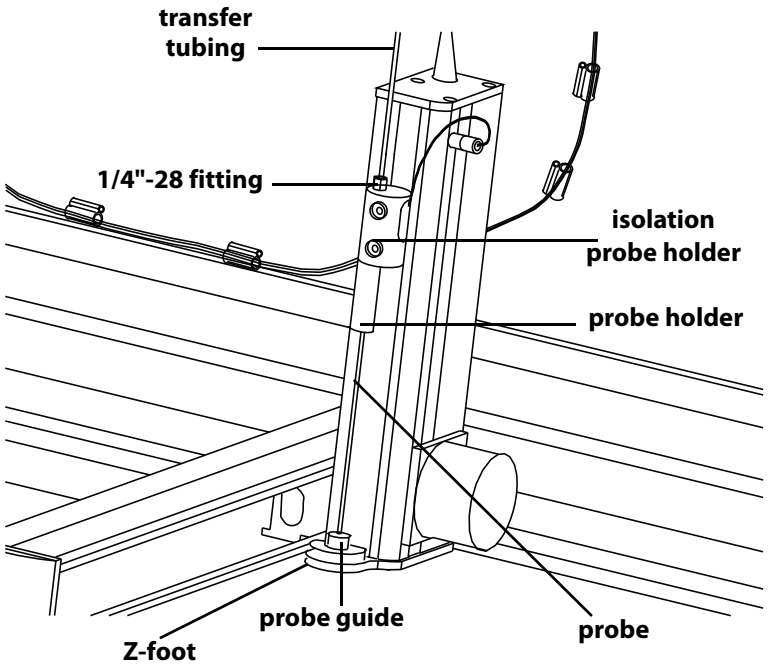
4 Snap the tubing into the small grooves on the clips installed on the tubing support rod and Z-arm control cable.

Note: You may need to pry the grooves apart using a flatblade screwdriver before snapping the tubing into place.

5 Gather any excess tubing into a coil to minimize the length of tubing and secure the coil using a twist tie. Position the excess tubing in a convenient location near the rear of the liquid handler.

6 Connect one end of the transfer tubing to the transfer tubing side of the syringe pump. Finger-tighten.

7 Connect the other end to the top of the isolation probe holder. Firmly tighten this fitting since it holds the probe in place.

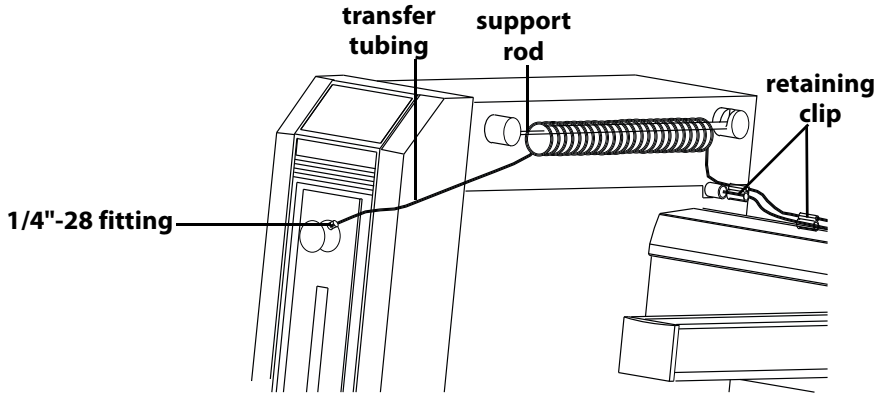


Coiled Tubing Installation

Follow these installation instructions if using coiled transfer tubing:

1 Slide the coiled section of the tubing over the tubing support rod. Position the tubing so that the shorter piece of straight tubing is toward the syringe pump.

2 Install the tubing support rod in its brackets on the control cabinet. Insert the front end of the rod into the hole before placing the back end of the rod in its cradle.



3 Snap three tubing retaining clips onto the Z-arm control cable. Equally space the clips.

4 Snap the long, straight section of the coiled tubing into the small groove on the clips that are installed on the Z-arm control cable.

Note: You may need to pry the grooves apart using a flatblade screwdriver before snapping the tubing into place.

5 Connect one end of the transfer tubing to the transfer tubing side of the syringe pump. Finger-tighten.

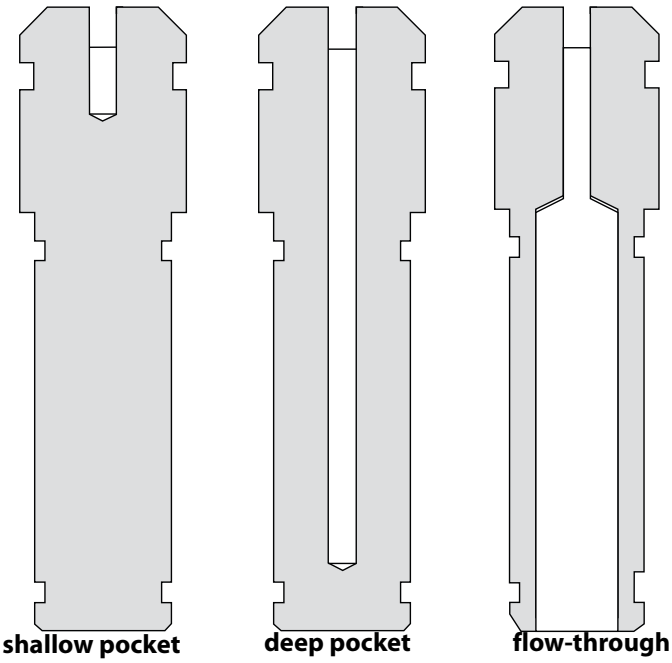
6 Connect the other end to the top of the isolation probe holder. Firmly tighten this fitting since it holds the probe in place. (Refer to diagram on page 2-12.)

Rinse Station and Drain Waste Tubing Installation

Clean the probe using the rinse station. To eliminate liquid cross contamination, the rinsing procedure pumps an excess volume of diluent or probe washing solution through the probe and out into the rinse station. The small diameter of the rinse station inserts allow the outside of the probe to be washed along with the inside.

There are three types of rinse station inserts available for the liquid handler:

- Shallow-pocket insert - This is a closed bottom rinse insert that is used for applications where the probe is only immersed in a few millimeters of the sample.
- Deep-pocket insert - This is a closed bottom rinse insert. This type of insert allows for a deeper insertion of the probe into the rinse well resulting in a greater area of the outside of the probe to be rinsed.



Cross sections of rinse inserts

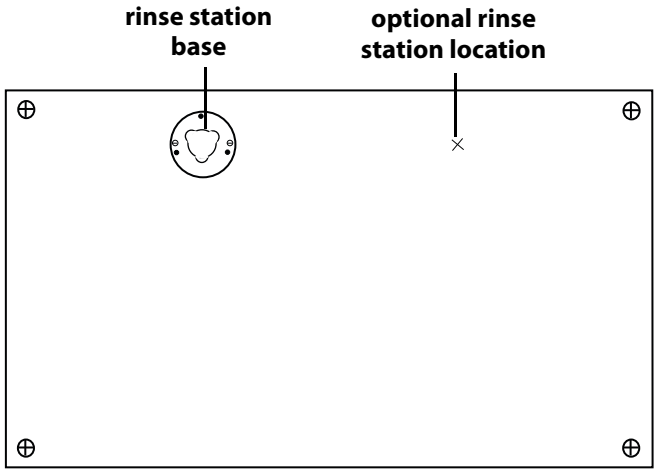
- Flow-through insert - This insert is used in applications where a rigorous wash of the probe's exterior is required. A second source of liquid is pumped to the rinse station when this insert is used.

It may be necessary to vary the types and volumes of probe wash solutions to most efficiently eliminate carryover of particular compounds. Generally, the smaller the volume of probe wash solution used, the faster your automated liquid handling protocol.

Install the Rinse Station

The base of one rinse station is shipped already secured to the locator plate and is located at the rear of the locator plate. The locator plate can hold an optional second rinse station or you can move the rinse station base to the alternate location.

Note: If you purchased the optional 6-position locator plate, the rinse station base is located in the center rear of the locator plate and there are two additional (alternate) rinse station locations.



Before installing the rinse station, make sure the locator plate has been properly installed with the installed rinse station base located at the rear of the instrument bed.

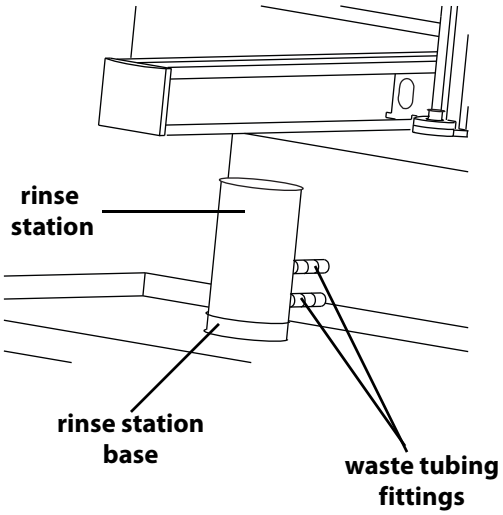
Gilson recommends that the rinse station be installed so that its tube fittings are pointing toward the rear of the liquid handler. That orientation is the one shipped from the factory.

To install the rinse station housing onto the base, follow these steps:

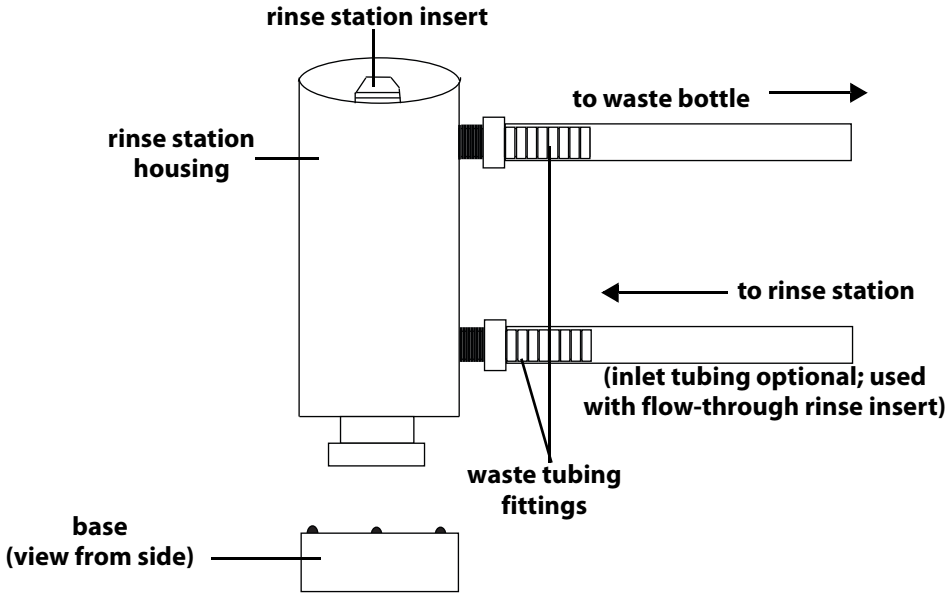
1 Align the triangle of the housing to the base.

2 Insert the housing into the base.

3 Press down and turn 60 degrees. The rinse station is secure when you feel the housing snap into place.



4 If satisfied with the standard orientation, follow steps 5, 6, and 7. See **Change the Orientation (Optional)** on page 2-17 if the current location of the waste tubing fittings will obstruct the installation of non-standard racks or other accessories.



5 Install the rinse station insert by pressing the insert down into the housing until it snaps into place. You may want to lubricate the o-ring on the rinse station insert with water before pressing it into the housing.

6 Connect the waste tubing to the rinse station housing by twisting the tubing onto the barbed connectors on the rinse housing until secure.

7 Connect the other end of the waste tubing to the two-liter waste bottle. The waste bottle lid has a matching quick connect fitting that mates with the tubing's quick connect fitting.

Note: Make sure the waste bottle is placed in a location that is lower than the instrument bed.

Change the Orientation (Optional)

To reorient the direction of the rinse tube fittings:

1 Press down on the rinse station housing.

2 Rotate the housing 120 degrees clockwise or counterclockwise. The housing is secure when you feel it snap into place.

3 Install the rinse station insert by pressing the insert down into the housing until it snaps into place.

4 Connect the waste tubing to the rinse station housing by twisting the tubing onto the barbed connectors on the rinse housing until secure.

5 Connect the other end of the waste tubing to the two-liter waste bottle. The waste bottle lid has a matching quick connect fitting that mates with the tubing's quick connect fitting.

Note: Make sure the waste bottle is placed in a location that is lower than the instrument bed.

Rack Setup

The liquid handler is equipped to locate Code 20-, 30-, 200-, 300-, and 500-series racks. See ***Appendix B, Racks*** for a list of racks available for the liquid handler.

Depending on the racks to be used, refer to the appropriate procedures.

Note: If the optional 6-position locator plate is installed and racks are placed in the far right or left positions of the plate, the liquid handler cannot access all of the tubes in the racks. The far right and left positions are for installing two Gilson 818 AutoMix modules onto the liquid handler. Refer to the 818 AutoMix User's Guide for AutoMix and rack placement instructions.

Code 20- or 30-Series Racks

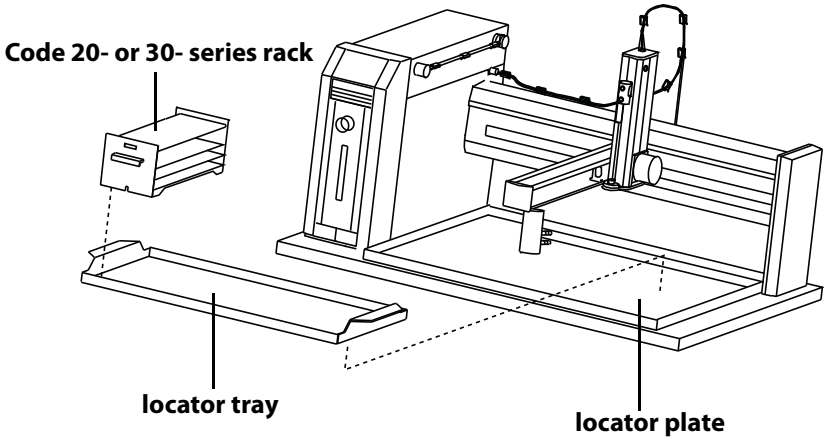
If all your racks are Code 20- or 30-series racks, follow the steps below.

Note: This configuration is not available for a 6-position locator plate.

1 Install a locator tray (TRAY FOR 7 CODE 20- OR 30-SERIES RACKS, part number 2504627) onto the locator plate of the liquid handler.

- For Code 20-series racks, the handles face the front.
- For Code 30-series racks, the hose fittings should face the back.

2 Position each rack onto the locator tray. Install up to seven racks using this tray.



Code 200-, Code 300-, and Code 500-Series Racks

If all racks are Code 200-, 300-, or 500-series racks, place them directly onto the locator plate:

1 Orient the rack so that the code number (for example, 200) is facing forward.

2 Fit the rack on the locator plate so that the slots and holes on the underside of the rack align with the pins on the locator plate.

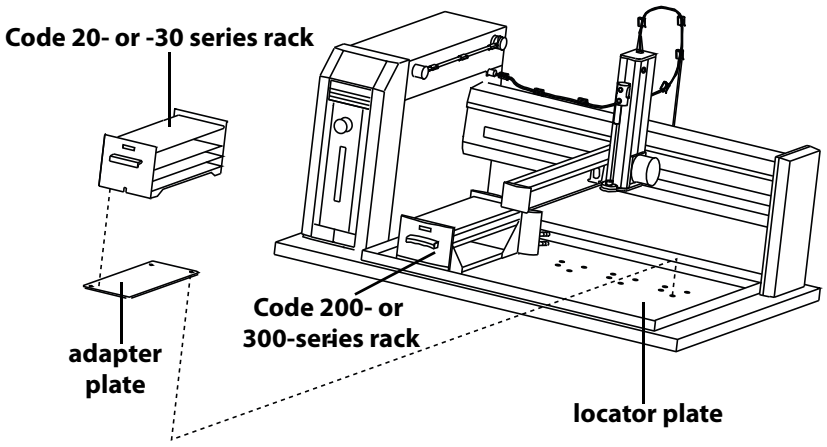
Code 200- or 300-Series and 20- or 30-Series Racks

To use a combination of Code 200-or 300-series and 20- or 30-series racks on the locator plate:

1 Install each Code 200-or 300-series rack as described previously.

2 For each Code 20- or 30-series rack, place an adapter plate onto the locator plate. Fit the plate so that the slots on the adapter plate align with the pins on the locator plate.

3 Place the 20- or 30-series rack onto the adapter plate.



Final Z-Arm Adjustment

Follow these steps to verify that the Z-arm has been clamped high enough for the configuration:

1 Manually move the arm within the working area of the locator plate.

2 Verify that the arm passes approximately 5 mm above the top of the tallest vessel in a rack and above the rinse station.

3 If the arm passes freely and is not obstructed, continue the installation by making rear panel connections as described in the next section.

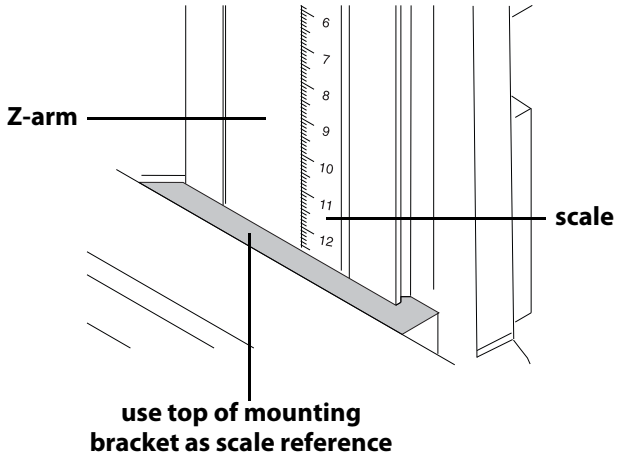
If the arm does not clear vessels or the rinse station:

a) Loosen the mounting screw so that the Z-arm can move up and down.

b) Raise the Z- arm up to clear the vessels and rinse station by a minimum of 5 mm.

c) Tighten the screw on the mounting bracket until the Z-arm is secure.

4 Note the installed height of the Z-arm using the graduated scale located on one side of the arm and note it on this page. Be sure to enter this new clamp height when setting up parameters for the Z Height in the 215 Setup Utility as described on page 3-14.



Rear Panel Connections

Rear Panel Diagram

1 Input/Output ports

2 Gilson Serial Input/Output Channel (GSIOC) port

3 Keypad port (not used)

4 RS-232 port

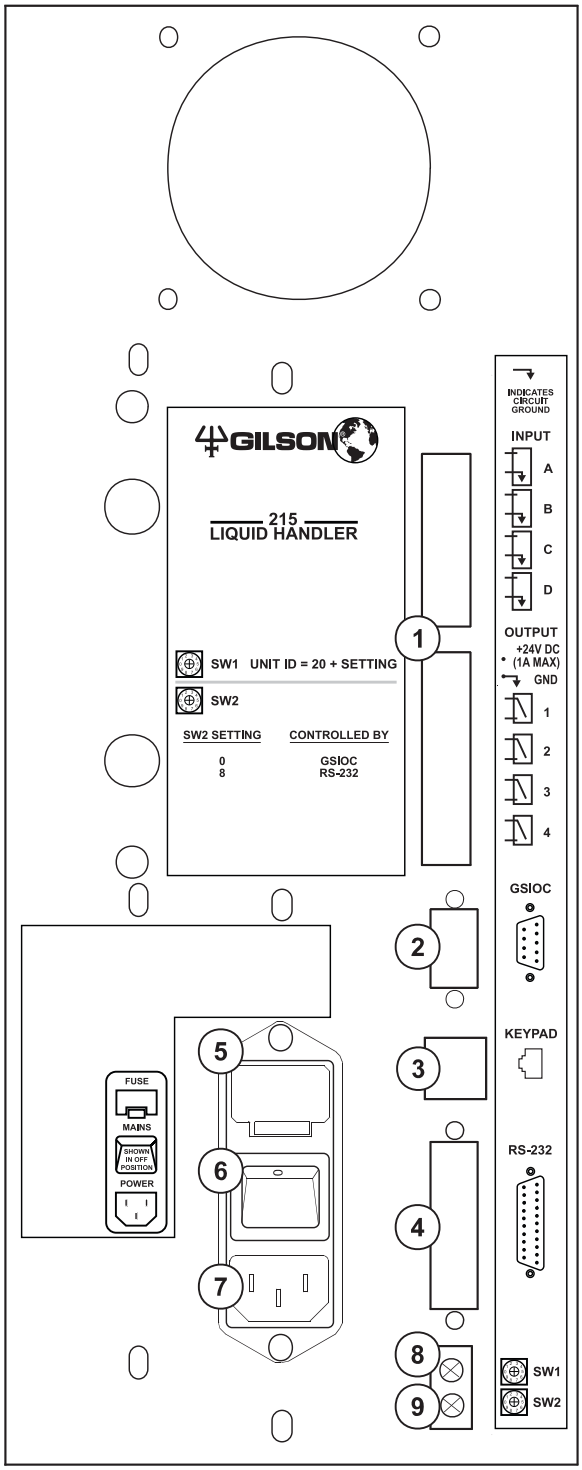
5 Fuse drawer

6 Power switch

7 Power receptacle

8 SW1 (unit ID) selector

9 SW2 (control) selector



Input/Output Ports

You can use the input and output contacts found on the rear panel of the liquid handler to control peripheral devices. Refer to the **Rear Panel Diagram** on page 2-21 for the location of the input/output ports.

Inputs

The input terminal block of the liquid handler has four contacts. All of the inputs are paired, and each pair includes a GROUND reference ( ).

The contact input pairs are labeled A–D.

A contact is connected if it has a short across the input or is held low by a TTL output or other device.

Never connect voltages higher than 5V DC to an input. When using TTL signals, be sure to match GROUND connections.

Outputs

The output terminal block has five contacts. All of the outputs are paired.

Pins 1 and 2 supply ground and a +24V DC output. Do not use this output unless the receiving device can accept 24V power.

Outputs labeled 1–4 are paired, isolated-relay contact closures.

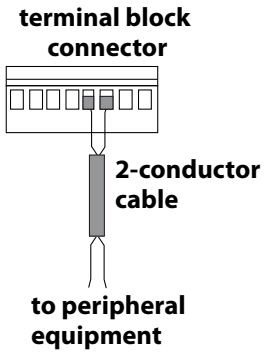
Make Connections

The following are needed to make connections:

- terminal block connectors
- 2-conductor cable (22 - 30 gauge for each wire)

  You can purchase a 6-foot piece of suitable cable (part number 709910206) or a package of 5 cables with identification markers (part number 36078155) from Gilson.
- wire insulation stripper
- small-blade screwdriver

To make connections using the 2-conductor cable:



1 Cut the cable into pieces of appropriate length.

2 Strip about 0.25 cm of insulation from each end of the cable.

3 Locate the appropriate green terminal block connector in the accessory package. The connector for inputs has eight terminals while the one for outputs has ten.

4 Insert each wire into the appropriate terminal on the terminal block connector. Push the wire all the way in and then tighten its corresponding pin screw.

Note: When making connections, be sure to maintain the correct orientation of the connector relative to the port. This is especially important if making connections to the +24V DC output.

5 Connect the terminal block connector to the liquid handler. The wires will be facing left and the pin screws will be facing you as you look at the rear of the instrument. Push the connector in as far as it will go. It is designed to fit snugly into its receptacle.

6 Connect the opposite ends of the wires to the other device(s). Be sure to match GROUND connections.

7 Label each cable to identify the purpose of the connection.

RS-232 Port

The RS-232 port is used to transfer information between the liquid handler and a computer. For the location of the RS-232 port, refer to the **Rear Panel Diagram** on page 2-21.

To connect your computer to the liquid handler, you need an RS-232 cable.

Connect the RS-232 Cable

Be sure your computer is turned off before making any connections.

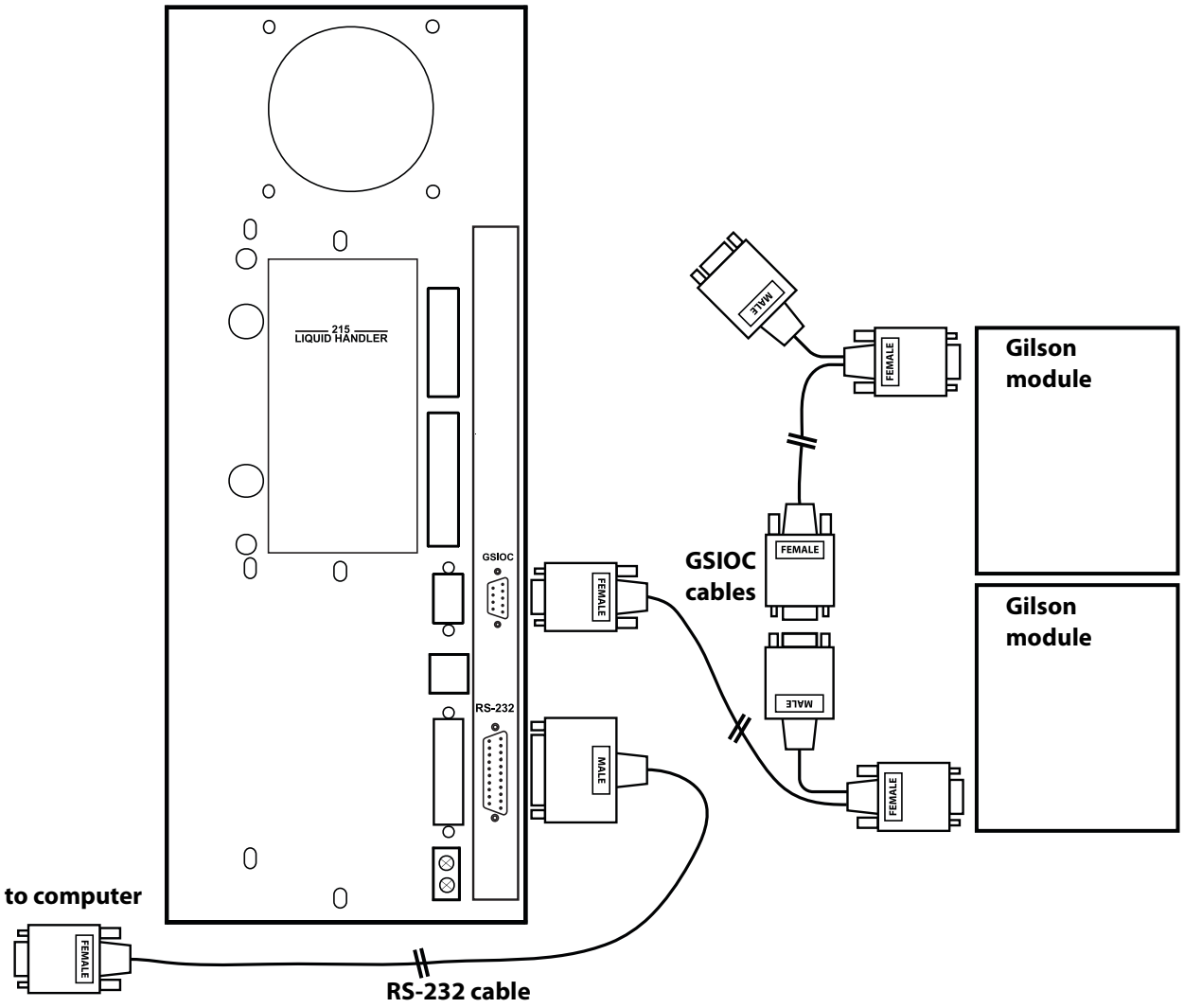
Attach the 25-pin, male end of the RS-232 cable to the RS-232 port located on rear panel of the 215 Liquid Handler. Tighten the retaining screws.

Attach the female end of the RS-232 cable to the computer's RS-232 serial communications port. Tighten the retaining screws.

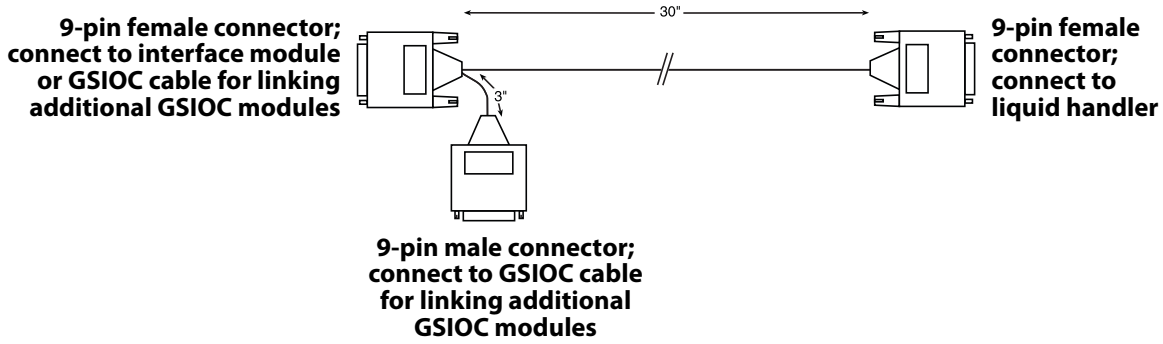
GSIOC Port

Use the GSIOC cable to link other instruments to the liquid handler and control all from one computer. A GSIOC cable has two 9-pin female connectors and one 9-pin male connector.

The following diagram shows the cabling connections between a computer, liquid handler, and GSIOC module.



Connect the female connector, located individually at one end of the cable, into the GSIOC port of the liquid handler. Tighten the retaining screws. (Refer to diagram below.)



Connect the other female connector, located on the same end as the male connector, to the Gilson module. Tighten the retaining screws.

If you are connecting more than one Gilson module, use the male connector to attach an additional GSIOC cable. Use the female connectors to connect each Gilson module.

Cables should be arranged in a linear fashion. Any "Y-branching" from the main GSIOC cable may increase noise.

SW1 (Unit ID) Selector

Use the SW1 selector to choose a different unit ID. Refer to the **Rear Panel Diagram** on page 2-21 for the location of the selector.

The unit ID identifies the liquid handler to Gilson software packages that can issue GSIOC commands to the liquid handler.

The unit ID is set to 22. There is no need to change this number unless it is the same as that assigned to another Gilson instrument that's also connected along the GSIOC.

To change the unit ID:

1 Gently insert a small flat blade screwdriver into the SW1 selector on the rear panel and turn it.

2 Align the white dot with one of the indicated numbers. The unit ID is 20 plus the selected number.

SW2 (Control) Selector

Use the SW2 selector to set the liquid handler for GSIOC control. For the location of the selector, refer to the diagram on page 2-21.

The SW2 selector is set to 8, indicating that the liquid handler is set for RS-232 control.

Change the setting to 0 (zero) if the liquid handler is connected via the GSIOC to a Gilson system and is being controlled by Gilson control software.

To change the control setting:

1 Gently insert a small flat blade screwdriver into the SW2 selector on the rear panel and turn it.

2 Align the white dot with one of the indicated numbers.

Fuse Installation

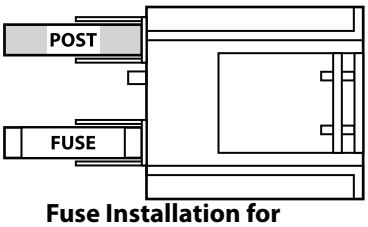
You received the liquid handler without any fuses installed.

To install the fuses:

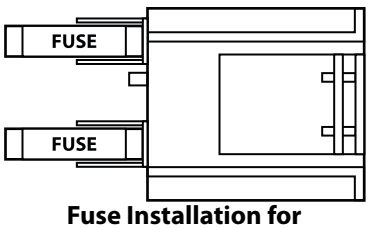
1 Locate the accessory package containing the fuse drawer appropriate for your line voltage.

2 Locate the accessory package containing the 2.5A "T" Slo-Blo (5 x 20 mm size) fuses.

3 Install the fuse(s) into the fuse drawer. The fuse drawer for 100/120V accepts one fuse. The fuse drawer for 220/240V accepts two fuses.



Fuse Installation for 100/200 voltage



Fuse Installation for 220/240 voltage

4 Insert the fuse drawer into its receptacle in the liquid handler. For the location of the receptacle, refer to the **Rear Panel Diagram** on page 2-21.

Power Cord Connection

Locate the appropriate power cord for your line voltage.

Use the power cord to connect the liquid handler to a power source.

Operation 3

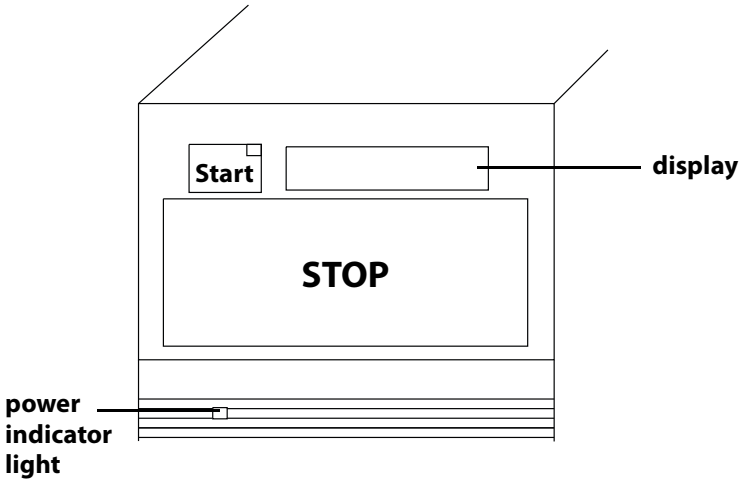
Both TRILUTION® LC Software and TRILUTION® LH Software provide programmed control of the 215 Liquid Handler.

This chapter provides the following information:

- A description of the **Front Panel** of the liquid handler
- How to **Start Up** the liquid handler
- How to use the **215 Setup Utility**
- Instructions for using the **215 Priming Utility**
- How to **Test the Liquid Handler's Contacts**

Front Panel

The front panel of the liquid handler contains a Start button, Stop button, display, and power indicator light.



Start Button

The Start button can be used to home the XYZ-arm when the liquid handler is first powered up or when the motors for the XYZ-arm have been relaxed. When pressed, the yellow display light is turned on.

Stop Button

The Stop button is a large touch-sensitive pad that can be used to stop the liquid handler and also relax the motors for the XYZ-arm so that you can easily lift the probe and move the arm. When pressed, the yellow display light is turned off.

In a situation where an emergency stop is required, pressing the Stop button immediately stops the liquid handler. The stop button is designed to be sensitive enough that if you just brush it with your hand, it activates.

Display

The 8-character display shows the current status of the liquid handler and any error codes as they are encountered. Your program can also contain instructions for showing 8-character messages on the display when the program is run.

Refer to ***Chapter 5, Troubleshooting*** for a list of current error codes and required actions.

Power Indicator Light

This indicator becomes lit when you turn on power to the liquid handler using the power switch located on the rear panel. Refer to the **Rear Panel Diagram** on page 2-21, if necessary.

Start Up

To start the liquid handler:

1 Make sure that the armlock has been removed.

2 Make sure that the liquid handler is connected to a power source.

3 Turn on the liquid handler using the power switch located on the rear panel. Refer to the **Rear Panel Diagram** on page 2-21, if necessary. The power indicator light on the front panel illuminates.

When power is turned on, the liquid handler beeps and displays the current version of its installed firmware. This message appears for about one second before the display returns to a blank state.

In order to determine what PROM version is installed in your liquid handler, you may need to turn the unit off then on again and watch the display for the version number to appear.

4 After the liquid handler powers up, press the Start button. This initiates the homing sequence that allows the liquid handler to determine its mechanical reference positions. The sequence takes approximately one minute to complete.

While the homing sequence progresses, the display shows *Homing*. When the sequence completes, the display is blank.

215 Utility Programs

The 215 Utility Programs CD-ROM, provided with your liquid handler, supplies the following utility programs:

215 Setup Utility - Specifies configuration parameters for the liquid handler.

215 Priming Utility - Primes the transfer tubing.

215 Contact Test Utility - Enables you to test contact connections.

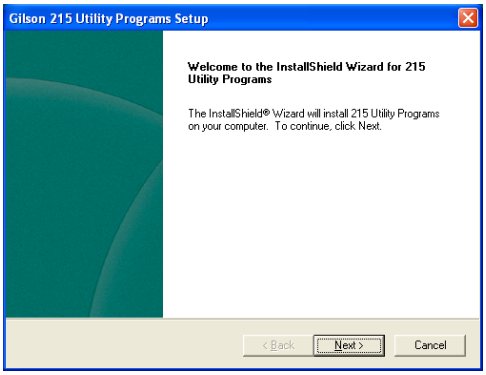
215 Injection Z-Height Utility - Enables you to adjust the height of the Z-arm when used with an 819 Injection Module.

Install 215 Utility Programs

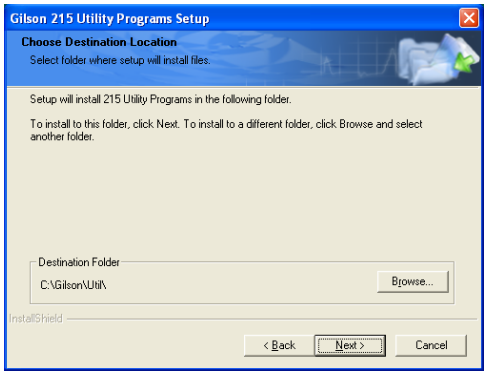
Follow the on-screen instructions.

When prompted, restart the computer.

1



2



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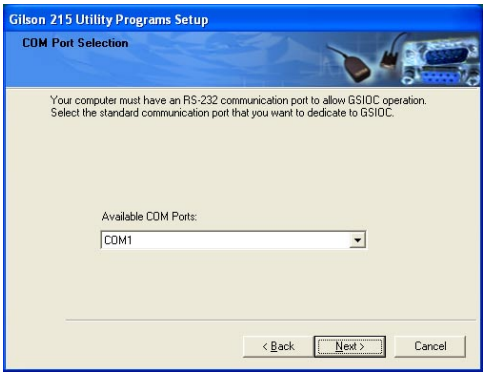

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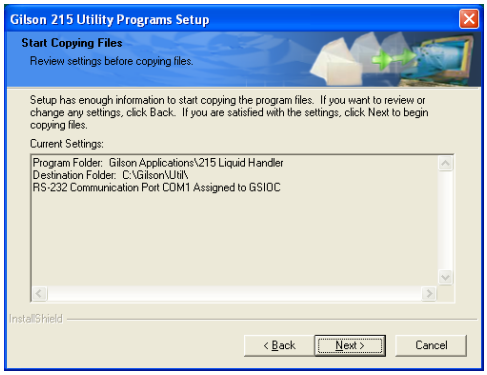

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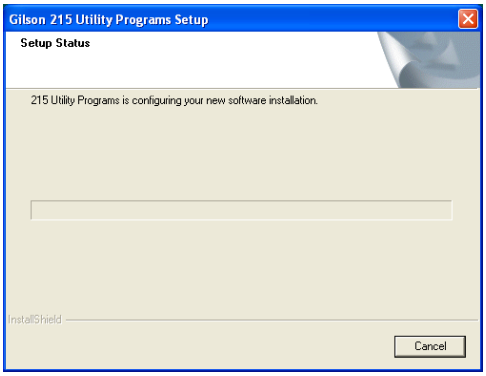

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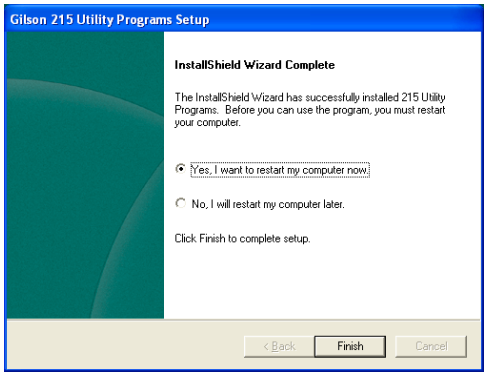


Start Utility Programs

Windows® 2000/XP

For communication to occur, the 215 Liquid Handler must be connected via an RS-232 or GSIOC to RS-232 connection to the computer. For information about making these connections, see ***Chapter 2, Installation***.

To start a utility program, click **START** | **ALL PROGRAMS | GILSON APPLICATIONS | 215 Liquid Handler** and then select a utility program from the list.

Help

On-line help is included for the 215 Utility Programs. The on-line help describes commands and dialogs displayed in the software and the procedures needed to perform tasks.

Click 

to display help about the dialog box.

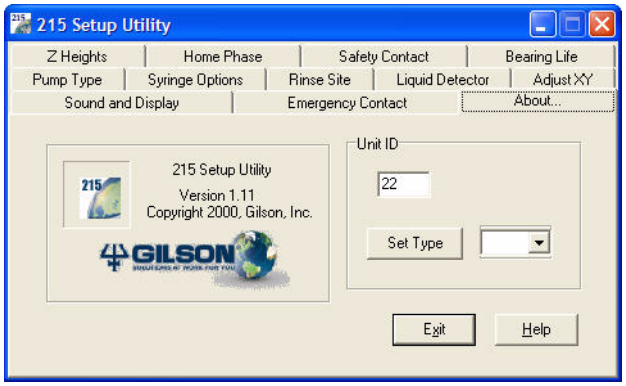
215 Setup Utility

The liquid handler comes with its configuration set by Gilson. Configuration information is stored in the non-volatile memory of the liquid handler. Prior to using the liquid handler for the first time, it is important to review and adjust the default configuration to make sure it is correct for your application.

The following pages describe how to configure a liquid handler using the 215 Setup Utility. Refer to the online help for assistance.

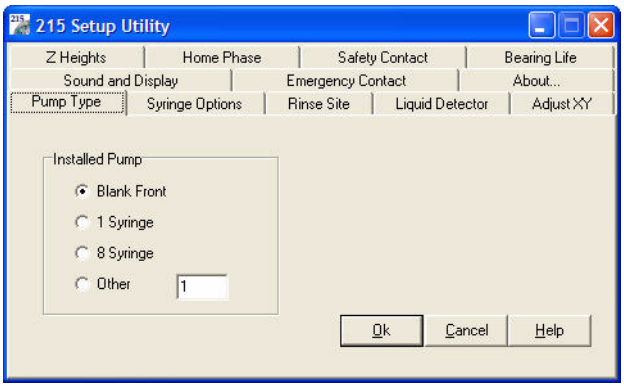
The 215 Setup Utility allows you to review and if necessary change the configuration options set for the liquid handler.

When you execute the Utility program from your computer, the following screen with menu tabs appears:



Section	*Described on*
Pump Type	page 3-9
Syringe Options	page 3-10
Rinse Site	page 3-11
Liquid Detector	page 3-12
Adjust XY	page 3-13
Sound and Display	page 3-17
Emergency Contact	page 3-17
About...	page 3-18
Z Heights	page 3-14
Home Phase	page 3-15
Safety Contact	page 3-16
Bearing Life	page 3-16

Pump Type



Use the Pump Type tab to set the type of syringe pump installed in the instrument. If the pump type actually installed does not match the setting indicated here, an error will occur during operation.

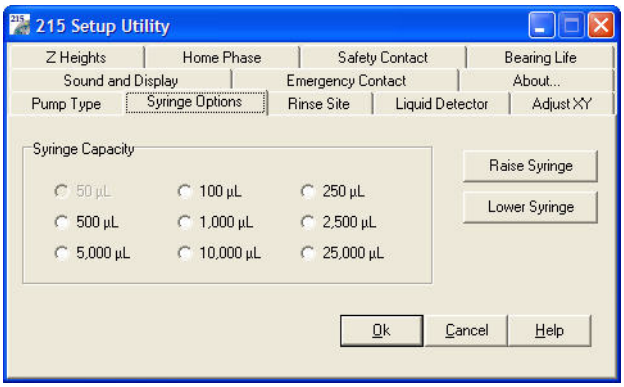
Pump type selections are:

- Blank Front (no syringe pump is installed)
- 1 Syringe
- 8 Syringe (not used for the 215 Liquid Handler)
- Other (for future use)

To store the pump type to memory, click **OK**.

To display the pump type currently set in the memory, click **Cancel**.

Syringe Options



Under the Syringe Options tab, you indicate the size of the installed syringe or click the Lower Syringe button so you can install a new syringe.

Use the option buttons to select the correct syringe size in microliters. If you do not know the size of the syringe installed, check the container in which the syringe was shipped for size information. An incorrect setting can cause improper volumes to be aspirated or dispensed during liquid handler operation or can cause an error to occur.

To store the syringe capacity to memory, click **OK**.

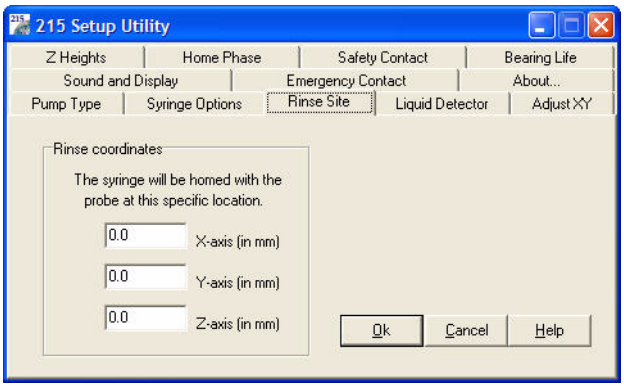
To display the syringe capacity currently set in the memory, click **Cancel**.

Clicking **Lower Syringe** facilitates replacement of a new syringe by causing the syringe piston to move to the bottom of its stroke.

Clicking **Raise Syringe** facilitates replacement of a new syringe by causing the syringe piston to move to the top of its stroke.

Rinse Site

The instrument stores the location of a rinse site in memory. This allows the instrument to move to this location before homing the syringe and prevents the spilling of waste liquid or rinse diluent.



Depending on the instrument's configuration, refer to the appropriate information below for reviewing and changing rinse site information.

The factory default rinse site is 114.4 mm in X, 3.8 mm in Y, and 100 mm in Z. These coordinates are for a rinse station, with a shallow-pocket rinse insert, installed on the left-side of a 5-position locator plate. Change the Z coordinate to a value from 55 to 65 mm if a deep-pocket insert is installed or to 50 mm if a flow-through rinse insert is installed.

If the rinse station has been moved to the right side of the 5-position locator plate, change the X coordinate to 473.1 mm. Leave the Y coordinate at 3.8 mm. Change the Z coordinate to a value from 55 to 65 mm if a deep-pocket insert is installed or to 50 mm if a flow-through rinse insert is installed.

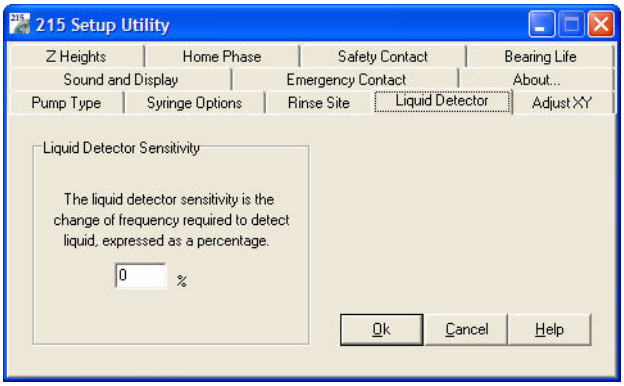
If a 6-position locator plate is installed, change the X coordinate to the appropriate value, listed below. Leave the Y coordinate at 3.8 mm. Change the Z coordinate to a value from 55 to 65 mm if a deep-pocket insert is installed or to 50 mm if a flow-through rinse insert is installed.

Rinse station location	***X coordinate***
Left (factory default)	169.3 mm
Center	288.9 mm
Right	408.0 mm

To store the rinse site coordinates to memory, click **OK**.

To display the rinse site coordinates currently set in the memory, click **Cancel**.

Liquid Detector



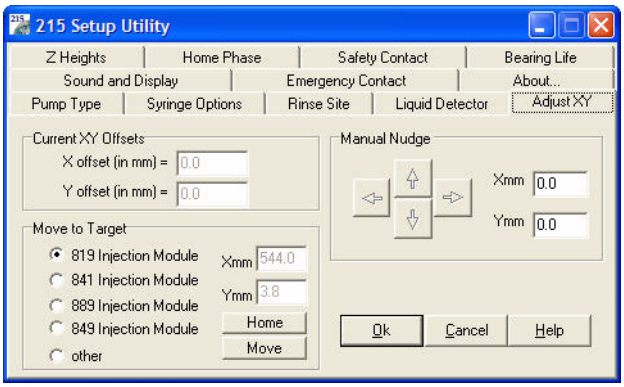
The Liquid Detector tab allows you to adjust the sensitivity of liquid detection. The factory default setting is 6%.

Raising the percentage suppresses false liquid detection while lowering the percentage increases sensitivity for situations where liquid is harder to detect. By lowering the probe so it touches the liquid for one of your samples, you can manually test the current sensitivity of the liquid detection. In this manner, you can observe the amount of change you might expect with each sample.

To store the sensitivity setting to the liquid handler's memory, click **OK**.

To display the sensitivity setting currently set in the liquid handler's memory, click **Cancel**.

Adjust XY



The Adjust XY tab allows you to test whether the instrument is properly adjusted and to make minor adjustments to the X- and Y-axis offsets if needed. You may need to use the options under this tab if the probe is not accessing the injection port of the injection module installed or the vessels in the installed racks.

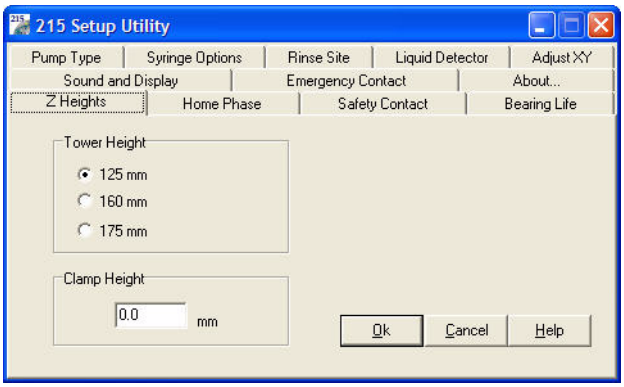
The X offset and Y offset text boxes display the current offsets stored in the instrument's memory.

To determine if the probe needs to be adjusted in the X or Y direction:

Select the model of the injection module that is on your 215 or select other for a user-defined test point. The default X,Y coordinates are shown next to the model number.

Injection Module	***Coordinates***
819:	X-coordinate: 544.0 mm Y-coordinate: 3.8 mm If the model 819 is not installed next to the right support use the following coordinates: X coordinate: 351.1 mm Y coordinate: 1.3 mm
841:	X-coordinate: 475.3 mm Y-coordinate: 3.8 mm
849:	X-coordinate: 336.1 mm Y-coordinate: 3.8 mm
other:	

Z Heights



Use the Z Heights tab to identify the size of the installed Z-arm and the height at which the Z arm is clamped.

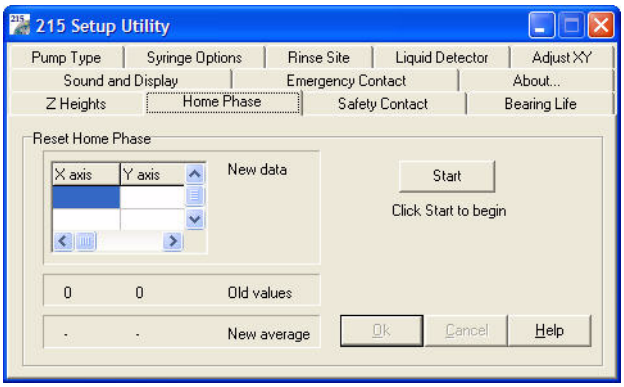
Use the option buttons to select the correct tower height in millimeters.
Setting the tower height of the Z-arm determines the amount of possible travel in the Z-axis. If you do not know the height of the tower installed, check the Z-arm for a label or the container in which the tower was shipped for height information. An incorrect setting could cause the probes to be damaged during liquid handler operation.

The Z-arm can be clamped at an adjustable height over the locator plate. You can set this height so that the liquid handler is able to properly find heights that you specify. Type the clamp height in millimeters. A clamp height of 0 mm means the bottom of the Z-arm is flat on the locator plate.

To store the selected Z-height settings to the liquid handler's memory, click **OK**.

To display the Z-height settings currently set in the liquid handler's memory, click **Cancel**.

Home Phase



Use the Home Phase tab to display the current X and Y phase of the instrument.

Clicking **Start** causes the liquid handler to perform the phase procedure. This procedure consists of the liquid handler homing itself 10 times.

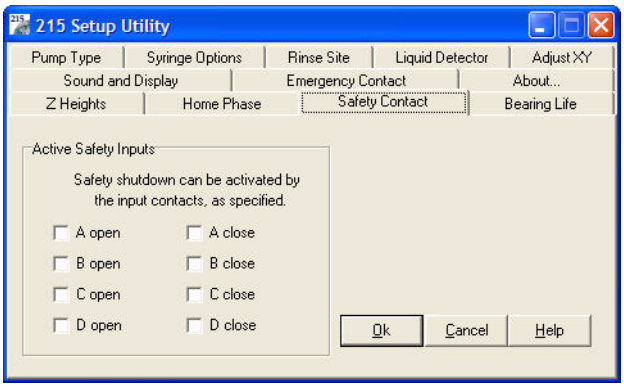
The liquid handler finds out where home is located by "feeling" for the back and left walls of the unit. The liquid handler expects to find these walls in the same place each time. If it does not, you will get an error. If this error was caused by an obstruction, just clear the obstruction and try again. If the problem does not clear or if a change is made to the mechanics, you will probably need to repeat this option to find the true home location.

Once the process completes, the spreadsheet displays the values generated from each phase procedure.

To store the new phases to the memory, click **OK**.

To display the home phase information currently set in the 215's memory, click **Cancel**.

Safety Contact

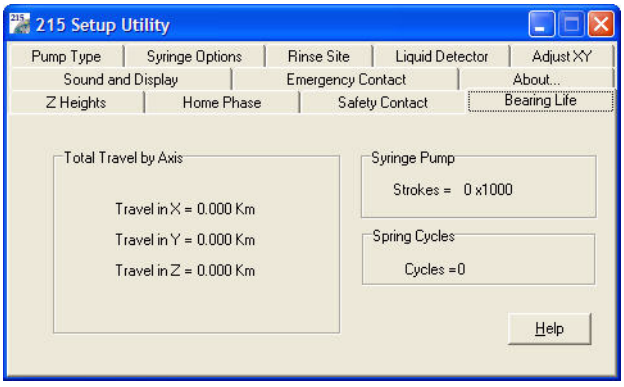


The instrument has provisions for connecting safety devices that your application may require, as long as they present a contact closure or TTL type interface. The Safety Contact tab allows you to specify which input contact is connected to the safety device and what is the active state of that device. The function of the safety contact is equivalent to pressing the Stop button on the instrument's front panel.

To use this option, choose one or more of the check boxes and then click **OK** to store the information to memory.

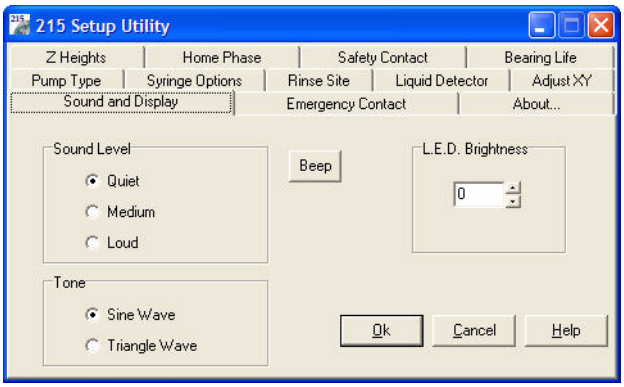
Or, to display the safety contacts currently set in the instrument's memory, click **Cancel**.

Bearing Life



The Bearing Life tab displays the XYZ travel in kilometers, the number of full strokes performed by the syringe pump (if applicable). Spring Cycles is not applicable to the 215 Liquid Handler.

Sound and Display



Use the options in the Sound / Display tab to adjust the brightness of the display, sound level, and tone.

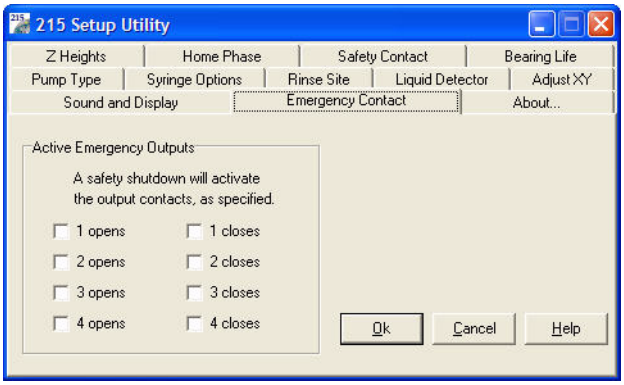
Clicking **Beep** tests the sound level and tone that are currently selected.

For the LED brightness, you can select a range of 0 through 7 where 0 is the dimmest and 7 is the brightest. Default setting is 5.

To store the selected options to memory, click **OK**.

Or, to display the options currently set in the memory, click **Cancel**.

Emergency Contact

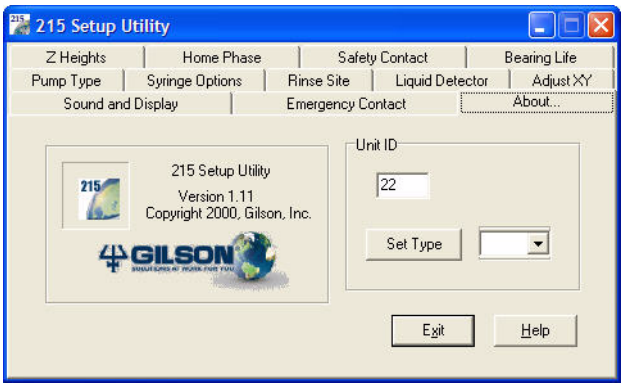


The emergency contact option provides for sending a signal to a peripheral device (such as a Gilson 818 AutoMix) whenever the 215's Stop button is pressed or safety input is activated.

To store changes to the emergency contacts, click **OK**.

To display the emergency contact(s) currently set in the 215's memory, click **Cancel**.

About...



The About tab allows you to indicate the unit ID of the instrument being configured so the 215 Setup Utility can communicate with that instrument.

This tab also lists software version and copyright information for the 215 Setup Utility.

The Set Type button allows you to manually set the type of 215 you are using. Unless the Non-Volatile RAM has been cleared, this information will appear automatically.

Next to the "Model 215 Unit ID" text box you will see the following:

215	= 215vX.XX
215 without pump	= 215NOPvX.XX

To change this setting, click the drop down menu next to the Set Type button and select the appropriate 215 type. Click **Set Type** to accept the change.

215 Priming Utility

The 215 Priming Utility primes your syringe and transfer tubing lines with liquid from your syringe pump's reservoir. Gilson recommends using the 215 Priming Utility before using the liquid handler for the first time or if the liquid handler has not been used for some time. Using the software will eliminate air in the transfer tubing.

Start the Priming Cycle

In the software, indicate a priming speed (in milliliters per minute). Then click on the **Prime** option button. Before priming begins, the liquid handler homes the probe and then moves it to the rinse station. When the probe is at the rinse station, priming begins.

Pause the Priming Cycle

You can pause the priming cycle at any time by clicking on the **Pause** option button. If a pause is activated while the syringe is in a downward motion, the software stops the syringe at the bottom of its stroke. If a pause is activated while the syringe pump is in an upward motion, the software stops the syringe at the top of its stroke. When you pause the priming cycle, 'Pause' appears on the liquid handler's display. To continue the priming cycle, click on the **Prime** option button.

Stop the Priming Cycle

To terminate priming, click the **Stop** option button. This causes the syringe to home.

Exit the Software

Click **Done** to close the software.

Test the Liquid Handler's Contacts

The 215 Contact Test Utility program allows you to activate output contacts that determine if the correct contact connections are made to peripheral devices controlled by the liquid handler. It also identifies the state of input contacts.

Before using this program, you need to connect the peripheral device's inputs to the appropriate output pair on the liquid handler. If necessary, refer to **Input/Output Ports** on page 2-22 for information on making contact connections.

While the 215 Contact Test Utility program is running, the program continuously displays the state of outputs and inputs. When an output contact is active, a check displays next to the output contact and when inactive, it remains blank. For example, to activate output contact 24V, click the toggle box next to 24V. A check displays indicating 24V is active. Click the toggle for an active output contact and it becomes inactive.

To exit the software, click **Done**.

Maintenance 4

To obtain optimum performance and maximum life from the 215 Liquid Handler, it is important to keep the instrument well-maintained.

The 215 Liquid Handler is intended to be used in a laboratory environment by trained technical personnel.

This chapter contains the following information to help you to maintain your liquid handler:

- **Helpful Hints**
- **Cleaning**
- **Replace Parts**
- **Check Position Alignment**
- **Transport the Liquid Handler**

Helpful Hints

In order to keep your liquid handler at peak performance, Gilson recommends that you do the following:

- Change or clean the piston seals and tubing regularly to maintain maximum syringe pump performance.
- Do not cycle the syringe pump without fluid. Doing this causes excessive piston seal wear.
- Flush the syringe pump, probe housing, and rinse stations daily with distilled or deionized water. On a weekly basis, flush these instruments with a 10% solution of bleach or weak detergent.
- If bubbles remain in the syringe after priming, clean the syringe with alcohol.
- Check periodically to ensure that all fittings are tight.
- Check that the syringe is tight in the syringe pump valve fitting.
- Wipe up all spills immediately.
- Cold fluids may cause leakage; warm fluids to room temperature before running them through the system.

Cleaning

Clean the Liquid Handler

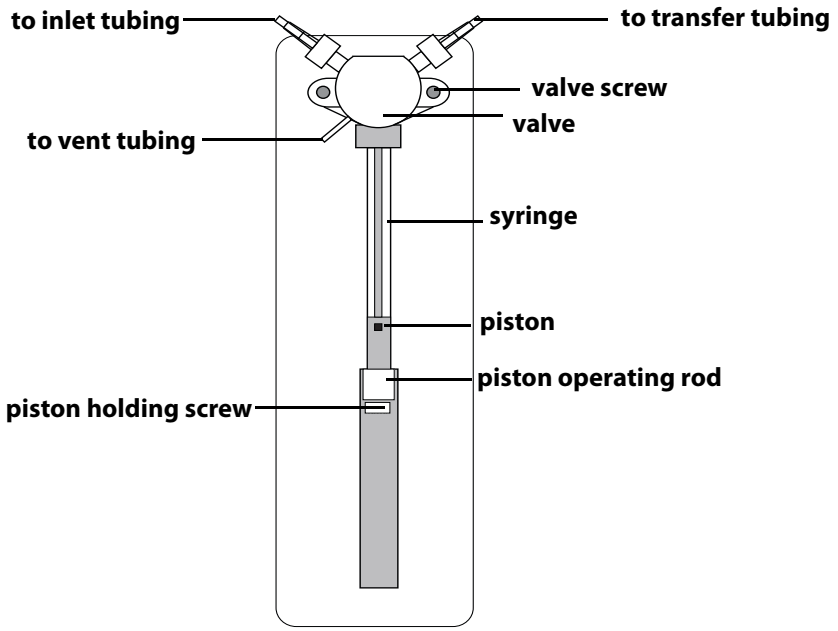
The liquid handler should be cleaned occasionally using a dry, clean cloth. Or, if necessary, use a cloth dipped in soapy water. If liquid is accidentally spilled on the liquid handler, wipe the instrument using a dry, clean cloth.

Clean the Syringe

If your liquid handler is equipped with a syringe pump, it may be necessary to clean the syringe. Cleaning the syringe is needed when some or all of the following occurs:

- Corrosive or hazardous liquids have been pumped
- Possible back flow of liquids into the waste tubing
- Leakage
- Aspiration of samples or reagents into the syringe

To clean the syringe, follow the procedures on the next page and use the diagram below as a reference.



Remove the Syringe

The following procedures use the 215 Setup Utility.

To remove the syringe:

1 Disconnect the syringe piston from the piston operating rod by unscrewing the piston holding screw on the underside of the rod.

2 Start the 215 Setup Utility, described on page 3-8.

3 Select the Syringe Options tab. The option button for the installed syringe size is selected. Click **Lower Syringe**. This causes the piston operating rod to descend as the syringe pump aspirates from the reservoir. The syringe pump will stop at the bottom of its stroke, switching the valve to the outlet position.

4 After the syringe has been lowered, unscrew and remove the syringe from the valve.

Clean the Syringe

After the syringe has been removed, it can be cleaned:

⚠CAUTION To prevent injury, observe good laboratory practices when handling solvents. Know the physical and chemical properties. Refer to the Material Safety Data Sheets for the solvents used.

1 Place the syringe in a beaker containing methanol. Then aspirate and dispense several volumes of methanol through the syringe.

2 Place the syringe in a beaker containing distilled or deionized water. Then aspirate and dispense several volumes of water through the syringe.

3 Hold the syringe housing in one hand. Clean the syringe using a non-abrasive cloth dampened with alcohol. Remove the piston and clean the piston with a non-abrasive cloth dampened with alcohol.

4 Dry the syringe and piston using a clean, lint-free cloth.

Reinstall the Syringe

When the syringe is clean, reinstall it:

1 Lubricate the piston with reservoir solvent to reduce friction on the piston seals during reinstallation.

2 Fully tighten the syringe into the valve.

3 In the 215 Setup Utility, select the Syringe Options tab. The option button for the installed syringe size is selected. Click **Raise Syringe**. This causes the piston operating rod to ascend. The syringe pump will stop at the top of its stroke.

4 Firmly tighten the piston holding screw to secure the syringe piston.

Clean the Fluid Path

Depending upon your use of the liquid handler, it may be necessary to flush the entire fluid path. When flushing the fluid path it is recommended to use a volume that is equal to ten times the syringe volume plus the transfer tubing volume.

flush volume = (10 * syringe volume) + transfer tubing volume

It's important to clean the fluid path if you won't be using the liquid handler for a while or if you're using a solution with a high salt concentration for a probe wash or as a diluent.

⚠CAUTION To prevent injury, observe good laboratory practices when handling solvents. Know the physical and chemical properties. Refer to the Material Safety Data Sheets for the solvents used.

Refer to the instructions below:

1 Prime the fluid path with distilled or deionized water.

2 Flush the fluid path with 30% ethanol. The fluid path has now been cleaned appropriately for weekend storage (or longer).

3 Prime and flush the fluid path with distilled or deionized water before running applications.

Cleaning Methods

Depending on the samples or reagents that come into contact with the fluid path, you may need to vary your cleaning methods accordingly. Use the following cleaning protocols as references and make any changes to them as required for the samples and reagents being pumped for your application.

Proteins and peptides - Follow this procedure if the fluid path is in contact with proteins and peptides:

⚠CAUTION To prevent injury, observe good laboratory practices when handling solvents. Know the physical and chemical properties. Refer to the Material Safety Data Sheets for the solvents used.

1 Prime the fluid path with distilled or deionized water.

2 Flush the fluid path using a weak detergent solution.

3 Pause the priming sequence.

4 After 30 minutes, resume flushing and priming the fluid path using distilled or deionized water to pump the remaining detergent from the tubing into a waste container.

5 When you're satisfied that the entire fluid path has been flushed with water, end the priming sequence.

Acidic compounds, basic compounds, or salt solutions - Follow this procedure if the fluid path is in contact with acidic compounds, basic compounds, or salt solutions:

⚠CAUTION To prevent injury, observe good laboratory practices when handling solvents. Know the physical and chemical properties. Refer to the Material Safety Data Sheets for the solvents used.

1 Prime the fluid path with distilled or deionized water.

2 Flush the fluid path using a 0.1N NaOH solution.

3 Pause the priming sequence.

4 After 10 minutes, resume priming the fluid path using distilled or deionized water. Prime until the fluid path has been flushed with water.

5 Pause the priming sequence.

6 Prime the fluid path using a 0.1N HCl solution.

7 Pause the priming sequence.

8 After 10 minutes, resume priming the fluid path using distilled or deionized water.

Biological fluids - Follow this procedure if the fluid path is in contact with biological fluids such as blood products:

⚠CAUTION To prevent injury, observe good laboratory practices when handling solvents. Know the physical and chemical properties. Refer to the Material Safety Data Sheets for the solvents used.

1 Prime the fluid path with distilled or deionized water.

2 Make a solution of 10% bleach by adding one part of commercial bleach to nine parts of water.

3 Flush the fluid path using the bleach solution.

4 Pause the priming sequence.

5 After 30 minutes, resume priming the fluid path using distilled or deionized water to pump the remaining bleach solution from the tubing into a waste container.

Clean the Valve

Clean the syringe pump's valve with a nonabrasive cloth after any of the following situations have occurred:

- Corrosive or hazardous liquids have been pumped
- Possible back flow of liquids into the waste tubing
- Leakage

Remove the Valve

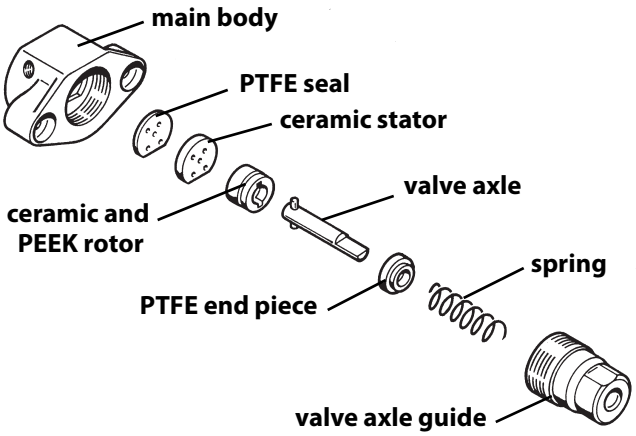
To clean the valve, first remove it from the syringe pump:

1 Disconnect the inlet, transfer and vent tubing from the valve.

2 Disconnect the syringe from the valve.

3 Remove the valve from the front panel by removing the two securing screws.

Disassemble the Valve



1 Hold the valve body firmly in one hand. Using a 17 mm open-ended wrench, turn the valve axle guide counterclockwise and separate the two halves.

2 Pull the valve axle away from the valve main body.

3 Separate the ceramic stator from the ceramic rotor.

4 Tap the valve axle guide against a solid level surface to remove the spring and PTFE end piece.

Note: Do not remove the ceramic stator from the valve main body.

Clean and Reinstall the Valve

The disassembled parts of the valve can be cleaned using a non-abrasive cloth dampened with alcohol.

1 Dry the components using a clean, lint-free cloth.

2 Reassemble the valve parts by reversing the above procedure.

3 Reinstall the syringe and valve.

Replace Parts

Tubing

It is important to keep all tubing clean and free of crimps. Tubing that has become dirty, blocked or crimped can result in poor accuracy and precision, loss of air gap, or the syringe stalling.

Replace both the transfer tubing and inlet tubing as needed. See ***Appendix A, Replacement Parts and Accessories*** for part numbers for replacement tubing. For tubing installation procedures, see ***Chapter 2, Installation***.

Piston Seal

To change the syringe pump's piston seal, refer to the instructions on the following pages. For part numbers for replacement seals, contact your Gilson-authorized representative.

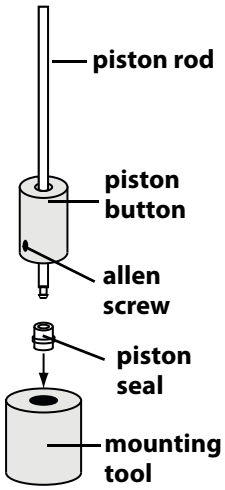
100 and 250 µL Syringes

1 Remove the syringe from the pump as described on page 4-4.

2 Slide the piston out of the syringe barrel.

3 Remove the piston seal from the piston rod by carefully pinching the piston seal with a pair of pliers and gently pulling the piston seal off the piston rod.

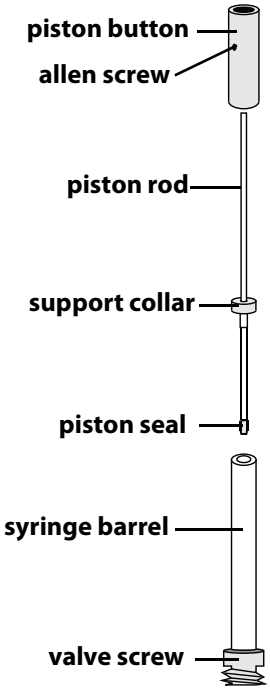
NOTICE Take care not to damage the end of the piston rod when removing the seal. (It is possible to remove the seal by pinching it between the thumb and forefinger nails and pulling.)



4 Remove any remaining debris of the original piston seal from the end of the rod.

5 The 100 µL and 250 µL pistons have a narrow rod that may be damaged if handled incorrectly. In order to fit a new piston seal without unduly bending the piston rod, undo the Allen screw that secures the piston button to the piston rod. Slide the button down the piston rod to within 10 mm of the end of the rod where the new piston seal is to be mounted and re-tighten it in position.

6 Put the new piston seal in its recess in the piston seal mounting tool. The 100 µL and 250 µL piston seals use the same tool. One face of the tool has a recess for the 100 µL piston seal, the other face has a recess for the 250 µL piston seal.



7 Hold the piston button and gently push the end of the piston rod into the new piston seal.

8 Remove the piston assembly from the piston seal holder. Slacken the piston button and slide it away from the piston rod.

9 Dip the piston seal in distilled water and slide the piston assembly into the syringe.

10 Hold the syringe upright with the threaded end of the syringe resting on a flat, clean surface. Slide the piston into the syringe until the piston stops (the seal is level with the end of the syringe).

11 **For the 100 µL piston only,** insert the support collar as shown on the right. The support collar should be replaced after 60,000 strokes.

12 Slide the piston button against the body of the syringe and tighten the Allen screw that secures the piston button onto the piston rod.

13 Slide the piston up and down in the syringe five or six times to ensure a smooth operation between the piston and syringe.

14 Remount the syringe on the pump as described on page 4-4.

500 µL Syringes

1 Remove the syringe from the pump as described on page 4-4.

2 Slide the piston out of the syringe barrel.

3 Remove the piston seal from the piston rod by carefully pinching the piston seal with a pair of pliers and gently pulling the piston seal off the piston rod.

NOTICE Take care not to damage the end of the piston rod when removing the seal. (It is possible to remove the seal by pinching it between the thumb and forefinger nails and pulling.)

4 Remove any remaining debris of the original seal from the end of the piston rod.

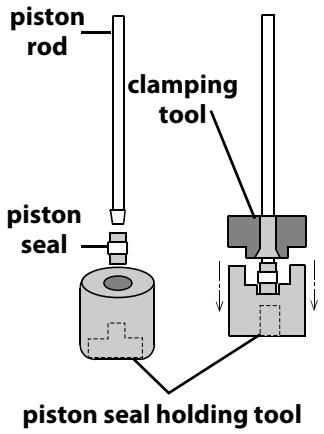
5 Put the new piston seal in its recess in the piston seal holding tool.

6 Turn the tool upside down and place the piston assembly as shown in the figure at right.

7 Slacken the piston button and remove it from the piston rod. Slide the clamping tool down the piston rod and press the two tools firmly against each other. A slight rotation of the clamping tool ensures a correct fitting.

8 Remove the tools away from the piston assembly.

9 Dip the piston seal in distilled water and slide the piston into the syringe.



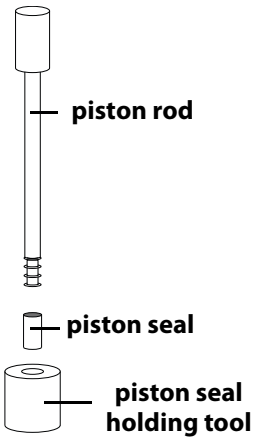
10 Hold the syringe upright with the threaded end of the syringe resting on a flat, clean surface. Slide the piston into the syringe until the piston stops (the seal is level with the end of the syringe).

11 Slide the piston button against the body of the syringe and tighten the Allen screw that secures the piston button onto the piston rod.

12 Slide the piston up and down in the syringe five or six times to ensure a smooth operation between the piston and syringe.

13 Make sure of the presence of the plastic cover when re-mounting the syringe on the pump.

14 Remount the syringe on the pump as described on page 4-4.



1 mL Syringes

1 Remove the syringe from the pump as described on page 4-4.

2 Slide the piston out of the syringe barrel.

3 Remove the piston seal from the piston rod by carefully pinching the piston seal with a pair of pliers and gently pulling the piston seal off the piston rod.

NOTICE Take care not to damage the end of the piston rod when removing the seal. (It is possible to remove the seal by pinching it between the thumb and forefinger nails and pulling.)

4 Remove any remaining debris of the original seal from the end of the piston rod.

5 Put the new piston seal in its recess in the piston seal holding tool.

6 Holding the piston rod firmly, gently push the end of the piston rod into the new piston seal until the rod is clamped in the piston seal.

7 Remove the piston assembly from the holding tool.

8 Dip the piston seal in distilled water and slide the piston into the syringe.

9 Hold the syringe upright with the threaded end of the syringe resting on a flat, clean surface. Slide the piston into the syringe until the piston stops (the seal is level with the end of the syringe).

10 Slide the piston button against the body of the syringe and tighten the Allen screw that secures the piston button onto the piston rod.

11 Slide the piston up and down in the syringe five or six times to ensure a smooth operation between the piston and syringe.

12 Remount the syringe on the pump as described on page 4-4.

5 mL and 10 mL Syringes

1 Remove the syringe from the pump as described on page 4-4.

2 Slide the piston out of the syringe barrel.

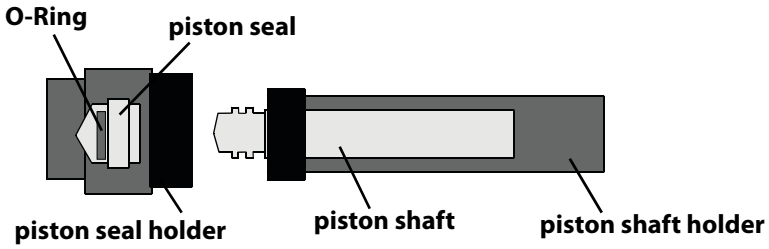
3 Remove the piston seal from the shaft by carefully pinching the piston seal with a pair of pliers and gently pulling the piston seal off the shaft.

NOTICE Take care not to damage the end of the piston rod when removing the seal. (It is possible to remove the seal by pinching it between the thumb and forefinger nails and pulling.)

4 Remove any remaining debris of the original piston seal from the end of the shaft.

5 Insert the new piston seal in the recess of the piston seal holder. Make sure that the aperture is facing outward and the O-ring is inside the seal.

6 Place the piston shaft in the piston shaft holder, see figure below.



7 Screw the two parts of the tool together until tight.

8 Unscrew the tool, the piston seal should be correctly seated on the shaft.

9 Dip the piston seal in distilled water and slide the piston into the syringe.

10 Slide the piston up and down in the syringe five or six times to ensure a smooth operation between the piston and syringe.

11 Remount the syringe on the pump as described on page 4-4.

25 mL Syringes

1 Remove the syringe from the pump as described on page 4-4.

2 Slide the piston out of the syringe barrel.

3 Hold the piston seal firmly in one hand and unscrew the seal from the piston shaft.

4 Screw a new piston seal on the shaft.

5 Slide the piston into the syringe barrel and complete the piston seal fitting by screwing the shaft until the piston seal turns with the piston shaft.

6 Dip the piston seal in distilled water and slide the piston up and down in the syringe barrel five or six times to ensure a smooth movement between the piston and syringe.

7 Remount the syringe on the pump as described on page 4-4.

Syringe

If necessary, refer to the diagram on page 4-4 while performing the procedures below. The following procedures use the 215 Setup Utility.

Remove the Syringe

1 Disconnect the syringe piston from the piston operating rod by unscrewing the piston holding screw on the underside of the rod.

2 Start the 215 Setup Utility, described on page 3-8.

3 Select the Syringe Options tab. The option button for the installed syringe size is selected. Click **Lower Syringe**. This causes the piston operating rod to descend as the syringe pump aspirates from the reservoir. The syringe pump will stop at the bottom of its stroke, switching the valve to the outlet position.

4 After the syringe has been lowered, unscrew and remove the syringe from the valve.

Install the New Syringe

1 Fully tighten the replacement syringe into the valve.

2 Start the 215 Setup Utility, described on page 3-8.

3 Select the Syringe Options tab. The option button for the installed syringe size is selected. Click **Lower Syringe**. This causes the piston operating rod to descend as the syringe pump aspirates from the reservoir. The syringe pump will stop at the bottom of its stroke, switching the valve to the outlet position.

Note: If you installed a new syringe of a different size than the one you replaced, select the new syringe capacity and then click **OK** to store the syringe capacity to memory.

4 Firmly tighten the piston holding screw to secure the syringe piston.

Valve

Remove the Valve

1 Disconnect the inlet, transfer, and vent tubing from the valve.

2 Disconnect the syringe from the valve as described on page page 4-14.

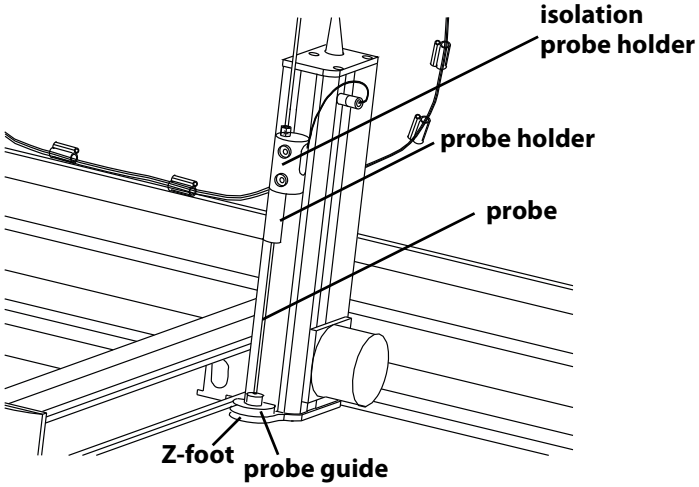
3 Remove the valve from the front panel by removing the two securing screws.

Install the New Valve

1 Re-install the syringe and the replacement valve by following the instructions on page page 2-9.

2 Reconnect the inlet, transfer, and vent tubing to the newly installed valve.

Probe



To install a replacement probe:

1 Remove the transfer tubing's 1/4"-28 fitting connected to the top of the isolation probe holder.

2 Grasp the current probe and push it up through the top of the isolation probe holder.

3 Verify that the installed probe holder and probe guide are appropriate for the probe to be installed. If installing a new probe holder and probe guide:

   a) Remove the current probe guide from the opening in the top of the foot by unscrewing the two Phillips screws. Then place the new probe guide into the top of the foot and secure it using the screws.

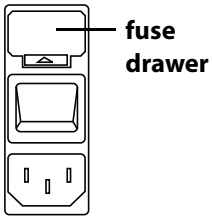
   b) Remove the current probe holder by unscrewing it from the bottom of the isolation probe holder. Then install the new probe holder by screwing it into the isolation probe holder.

4 Install the new probe by pushing it through the top of the isolation probe holder. Make sure the tip of the probe sits inside the probe guide.

5 Replace and tighten the 1/4"-28 fitting.

Fuse

A blown fuse may indicate the existence of another problem in the instrument. If the replacement fuses blow, do not try additional fuses. Contact your Gilson-authorized representative. See **Before Calling Us** on page 5-11.



To change a fuse, follow these steps.

1 Disconnect the power cord from the power outlet and from the rear panel receptacle.

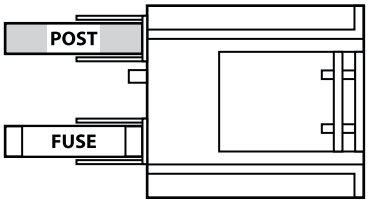
2 Locate the fuse drawer on the rear panel. See page 2-21 if necessary.

3 Insert a small screwdriver into the notch under the fuse drawer.

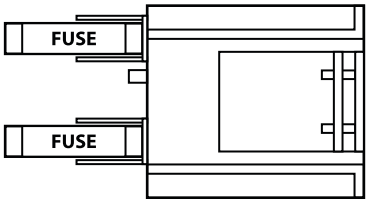
4 Twist the screwdriver to open and remove the fuse drawer. The fuse drawer contains one 2.5A "T" Slo-Blo fuse (5 x 20 mm size) for a 100/120 voltage selection. It contains two 2.5A fuses for a 220/240 voltage selection.

5 Remove the old fuse(s) and insert the new fuse(s).

6 Insert the fuse drawer into its receptacle in the liquid handler.



Fuse drawer for 100–120 voltage selection



Fuse drawer for 220–240 voltage selection

Check Position Alignment

The 215 Setup Utility, described in ***Chapter 3, Operation***, allows you to test whether the liquid handler is properly aligned and to make minor adjustments to the X-axis and Y-axis offsets if needed. For example, after changing the probe, alignment should be reviewed. To check the current alignment and make adjustments as needed, select the Adjust X&Y tab.

The X offset and Y offset text boxes display the current offsets stored in the instrument's memory.

Select the model of the injection module that is on your Multiple Probe 215 Liquid Handler (likely an 849 Injection Module) or select other for a user-defined test point. The default X,Y coordinates are shown next to the model number.

Injection Module	***Coordinates***
849:	X-coordinate: 336.1 mm Y-coordinate: 3.8 mm
other:	

Transport the Liquid Handler

When moving the liquid handler to another location or when sending it in for service, do not use the Y-arm as a handle. Reinstall the armlock (see page 2-3) and always lift the liquid handler from the base.

Troubleshooting 5

This chapter provides information on the following topics:

Error Messages

Error	*Description*	*Solution*
10	Invalid Pump Type	Run 215 Setup Utility to correct the problem.
11	Undefined syringe size	Run the 215 Setup Utility to correct the problem.
12	Pump not found	Contact your Gilson-authorized representative.
13	Syringe speed out of range	This can be caused by an incorrect syringe size setting. Run the 215 Setup Utility (Syringe Options tab) to check that the correct syringe capacity was selected. If you do not know the size of the syringe installed, check the container the syringe was shipped in for size information. Or, the requested aspirate or dispense speed is too fast for the installed syringe. Refer to the table listing the maximum flow rates on page 1-13 and then change the speed accordingly in the control software.
14	Invalid syringe volume	Requested aspirate or dispense volume is too large for syringe installed. Modify the syringe aspirate and dispense volumes in the program controlling the liquid handler. An incorrect syringe size setting can also cause improper volumes to be aspirated or dispensed during operation or can cause an error to occur. Run the 215 Setup Utility (Syringe Options tab) to check that the correct syringe capacity was selected.
15	NV-RAM checksum is invalid	• Send the buffered ~9 GSIOC command to reset the NV-RAM and initialize to the default value. Run the 215 Setup Utility. • Replace the main board.
16	X scale factor is invalid	Contact your Gilson-authorized representative.

Error	*Description*	*Solution*
17	Y scale factor is invalid	Contact your Gilson-authorized representative.
18	Z scale factor is invalid	Contact your Gilson-authorized representative.
20	X motor position error	Turn power on/off to the liquid handler.
21	Y motor position error	Turn power on/off to the liquid handler.
22	Z motor position error	Turn power on/off to the liquid handler.
24	X target less than minimum X	Send the immediate Q command using the GSIOC Utility to read the travel range. Correct the error in the program controlling the liquid handler.
25	X target more than maximum X	Send the immediate Q command using the GSIOC Utility to read the travel range. Correct the error in the program controlling the liquid handler.
26	Y target less than minimum Y	Send the immediate Q command using the GSIOC Utility to read the travel range. Correct the error in the program controlling the liquid handler.
27	Y target more than maximum Y	Send the immediate Q command using the GSIOC Utility to read the travel range. Correct the error in the program controlling the liquid handler.
28	Z target less than minimum Z	Send the immediate Q command using the GSIOC Utility to read the travel range. Correct the error in the program controlling the liquid handler.
29	Z target more than maximum Z	Send the immediate Q command using the GSIOC Utility to read the travel range. Correct the error in the program controlling the liquid handler.
30	X encoder inactive	Contact your Gilson-authorized representative.

Error	*Description*	*Solution*
31	Y encoder inactive	Contact your Gilson-authorized representative.
32	Z position sensor inactive	Contact your Gilson-authorized representative.
33	Safety contact activated	Release contact; restart.
34	X home phase is invalid	Run the 215 Setup Utility to correct the problem.
35	Y home phase is invalid	Run the 215 Setup Utility to correct the problem.
36	X and Y home phases are invalid	Run the 215 Setup Utility to correct the problem.
40	Gilson m402 invalid valve position	This is caused by the valve stem not turning properly or the encoder not registering properly. Try operating without a valve. If that fails, you will probably need a new module. If that works, check the valve assembly for smooth operation. If necessary, replace valve.
41	Gilson m402 valve missing	Contact your Gilson-authorized representative.
42	Gilson m402 undefined valve command	Try operating without a valve. If that fails, you will probably need a new module. If that works, check the valve assembly for smooth operation. If necessary, replace valve.
43	Gilson m402 valve communication error	Try operating without a valve. If that fails, you will probably need a new module. If that works, check the valve assembly for smooth operation. If necessary, replace valve.
44	Gilson m402 valve unit busy	Try operating without a valve. If that fails, you will probably need a new module. If that works, check the valve assembly for smooth operation. If necessary, replace valve.

Error	*Description*	*Solution*
45	Gilson m402 syringe overload	• Slow down flow rate indicated for aspirate and dispense commands in the program controlling the liquid handler. • Use less viscous liquid. • Use larger ID transfer tubing.
46	Gilson m402 syringe missing	Try operating without a valve. If that fails, you will probably need a new module. If that works, check the valve assembly for smooth operation. If necessary, replace valve.
47	Gilson m402 undefined syringe command	Try operating without a valve. If that fails, you will probably need a new module. If that works, check the valve assembly for smooth operation. If necessary, replace valve.
48	Gilson m402 syringe communication error	Replace the syringe pump.
49	Gilson m402 syringe unit busy	Replace the syringe pump

Mechanical

Probe No Longer Finding Tube Center

- Probe may be bent. Straighten or replace the probe.
- Liquid handler may be misaligned. Perform the position alignment procedures, described on page 4-18.

Electrical

Input Functions Not Operating

- Make sure connections into the terminal block connector are secure.
- Make sure the terminal block connector is secure in the input/output ports.
- Check connections for proper pin assignments.
- Be sure pins from external devices are assigned correctly.
- Check polarity of input. Inputs should be a contact closure. If not, it must be TTL level (logic 0 activates).
- Confirm that source supplying input to the liquid handler is working.

Output Functions Not Operating

- Make sure connections into the terminal block connector are secure.
- Make sure the terminal block connector is secure in the input/output ports.
- Check connections for proper pin assignments.
- Output from the liquid handler should be compatible with the device to which it is interfaced. Outputs are contact closures.

Unit Not Operational

- Make sure power is turned on.
- Check power cord connections.
- Try different outlet.
- Check fuse(s); replace if necessary.
- Check all liquid handler connections and make sure that the unit is plugged in.

Unit Blows Fuses

A blown fuse may indicate the existence of another problem in the instrument. If the replacement fuses blow, don't try others. Contact your Gilson-authorized representative. See **Before Calling Us** on page 5-11.

Tubing and Syringe Pump

Instrument Will Not Draw in Reagent

- Make certain all fittings are tight.
- Check valve fitting threads on the syringe pump. Replace if damaged.

No Fluid Being Dispensed

- Make sure the syringe is tight in the valve fitting.
- If tubing is kinked or blocked, replace defective tubing.
- Replace the syringe pump valve if damaged. Turn the power to the liquid handler off and then on to re-initialize.

Reagent Being Pulled Back Into Reservoir

- Replace the syringe pump valve if damaged. Turn the power to the liquid handler off and then on to re-initialize.

Air Gap Breaks Up

- When aspirating a liquid, if the air gap breaks up, check to see if the tubing is the correct size.
- Reduce speed of aspiration.
- Increase size of air gap.
- Clean or replace any dirty tubing.

Syringe Bubbles

- Make sure that all tubing fittings are tight and air-free.
- Make sure the syringe pump syringe is tightened onto the valve.
- Clean the syringe if dirty. Refer to page 4-3.
- If any of the syringe pump valve fittings are damaged, replace the valve.

Fluid Leak

- Replace any worn piston seals on the syringe piston. Instructions are supplied with replacement seals.
- Clean syringe pump valve. Refer to page 4-7.
- Allow reagents to warm to room temperature before using.

Incorrect Aspirating and Dispensing

- Check for leaks on all fittings and tubes leading to the probe.
- Tighten or replace fittings on inlet and transfer tubing as needed.
- Replace the syringe pump valve if damaged. Turn the power to the liquid handler off and then on to re-initialize.

Syringe Stalls

- If the syringe on the syringe pump stalls, there may be a blockage in the tubing or valve. Inspect all tubing and the valve.
- If the syringe stalls due to an accelerated aspirate or dispense rate, reduce the rate in the program controlling the liquid handler.

Poor Accuracy

- Worn piston seals and tubing can cause the liquid handler to perform with poor volumetric accuracy and precision. If the aspirate and dispense speeds are too fast, slow down the speeds to adapt to the tubing and probe type.

Liquid Level Detector

Liquid Level Detector Not Detecting Liquid Level

- Ensure that the level sensing cable is plugged in.
- Check sensitivity setting in the 215 Setup Utility.
- Check if liquid is detectable. Liquid level detection works only if there is electrical conductivity in your liquid. Liquid level detecting will not work with most non-polar liquids. For intermediate polarity liquids and polar liquids, check the sensitivity setting in the 215 Setup Utility.

Repair and Return Policies

Before Calling Us

Gilson-authorized representatives will be able to serve you more efficiently if you have the following information:

- the serial number and model number of the instruments involved. The serial number is visible on the inside right support of the liquid handler.
- the installation procedure you used
- list of concise symptoms
- list of operating procedures and conditions you were using when the problem arose
- list of other devices connected to the liquid handler and a description of those connections
- list of other electrical connections in the room

Warranty Repair

Units covered under warranty will be repaired and returned to you at no charge. If you have any questions about applicability, please contact your local distributor.

Non-Warranty Repair

For out-of-warranty repairs, contact your local distributor. A Customer Service representative will discuss service options with you and can assist in making arrangements to return the equipment, if necessary.

Rebuilt Exchange

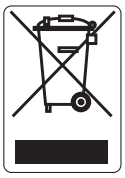
For some units, rebuilt exchange components are available. Contact your local distributor for details.

Return Procedure

Contact your local distributor's Customer Service Department to obtain authorization before returning any Gilson equipment. To return a piece of equipment:

- Carefully pack the unit to prevent damage in transit. Check with your distributor regarding proper method of shipment. No responsibility is assumed by Gilson or your distributor for damage caused by improperly packaged instruments. Indicate the authorization on the carton and on the packing slip.
- Always insure for the replacement value of the unit.
- Include a description of symptoms, your name, address, phone number, and purchase order to cover repair costs, return and shipping charges, if your institution requires it.

Unit End-of-Life



When a unit reaches the end of its useful life, refer to www.gilson.com for directions and information on the end-of-life policy. This is in accordance with the European Union Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

Replacement Parts and Accessories A

Part Number	*Description*
2510121	215 Liquid Handler
2510191	215 Liquid Handler without Pump

Syringes

Part Number	*Description*
25025341	100 µL syringe
25025342	250 µL syringe
25025347	500 µL syringe
25025343	1 mL syringe
25025344	5 mL syringe
25025345	10 mL syringe
25025346	25 mL syringe

Probes

Probes for 125 mm Z-Arm

Part Number	*Description*
2507234	Septum-piercing probe; side-entry, capacitive level-sensing, stainless steel, strain-relief design. Dimensions: 274 x 1.8 x 0.8 mm ID (tip dimensions: 12 x 1.3 mm OD, entry hole center is 3.5 mm from tip). Compatible with 819 Injection Module; requires injection port (part number 25051015). Requires probe holder/guide kit (part number 253640).
2507235	Septum-piercing probe; side-entry, vented, capacitive level-sensing, stainless steel, strain-relief design. Dimensions: 274 x 1.8 x 0.8 mm ID (tip dimensions: 12 x 1.3 x mm OD, entry hole center is 3.5 mm from tip). Compatible with the 819 Injection Module; requires injection port (part number 25051015). Requires probe/holder guide kit (part number 253640).
2507236	Septum-piercing, short pencil-point probe; vented at 14 mm, side-entry, vented at 72 mm, capacitive level sensing, stainless steel. Dimensions: 272 x 1.8 x 0.8 mm ID. Compatible with the 819 Injection Module; requires injection port (part number 25051015). Requires probe holder/guide kit (part number 253640).
2507237	Septum-piercing, pencil-point probe; vented at 72 mm, side-entry, capacitive level sensing, stainless steel. Dimensions: 273 x 1.8 x 0.8 mm ID. Compatible with 819 Injection Module; requires injection port (part number 25051015). Requires probe holder/guide kit (part number 253640).
2507244	Septum-piercing probe; deflected tip, capacitive level-sensing, stainless steel, strain-relief design. Dimensions: 274 x 1.8 x 0.8 mm ID (tip dimensions: 12 x 1.3 mm OD, bevel cut entry hole). Requires probe holder/guide kit (part number 253640).
2507245	Septum-piercing probe; deflected tip, vented, capacitive level-sensing, stainless steel, strain-relief design. Dimensions: 274 x 1.8 x 0.8 mm ID (tip dimensions: 12 x 1.3 mm OD, bevel cut entry hole).Requires probe holder/guide kit (part number 253640).
2507242	Septum-piercing probe; deflected tip, capacitive level-sensing, stainless steel with Teflon-coated liquid path, strain-relief design. Dimensions: 274 x 1.8 x 0.8 mm ID (tip dimensions: 12 x 1.3 mm OD, bevel cut entry hole). Requires probe holder/guide kit (part number 253640).
2507243	Septum-piercing probe; deflected tip, vented, capacitive level-sensing, stainless steel with Teflon-coated liquid path, strain-relief design. Dimensions: 274 x 1.8 x 0.8 mm ID (tip dimensions 12 x 1.3 mm OD, bevel cut entry hole). Requires probe holder/guide kit (part number 253640).

Part Number	*Description*
27067361	Non septum-piercing probe; bevel tip, capacitive level-sensing, stainless steel. Dimensions: 220.5 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (part number 253641).
2507414	Non septum-piercing probe; constricted tip, capacitive level-sensing, stainless steel. Dimensions: 220 x 1.3 x 0.8 mm ID (tip dimensions: 1.5 x 0.9 x 0.45 mm ID). Compatible with 819 Injection Module; requires injection port (part number 25051015). Requires probe holder/guide kit (part number 253642).
27067373	Non septum-piercing probe; constricted tip, capacitive level-sensing, stainless steel. Dimensions: 221 x 1.5 x 1.1 mm ID (tip dimensions: 2 x 1.1 x 0.4 mm ID). Compatible with 819 Injection Module; requires injection port (part number 2954640). Requires probe holder/guide kit (part number 253641).
27067374	Non septum-piercing probe; constricted bevel tip, capacitive level-sensing, stainless steel. Dimensions: 221 x 1.5 x 1.1 mm ID (tip dimensions: 2 x 1.1 x 0.4 mm ID). Compatible with 819 Injection Module; requires injection port (part number 2954640). Requires probe holder/guide kit (part number 253641).
2507252	Micro septum-piercing probe; constricted 45° bevel tip, capacitive level-sensing, stainless steel. Dimensions: 220 x 1.5 x 1.1 mm ID (tip dimensions: 10 x 0.7 x 0.4 mm ID). Compatible with 819 Injection Module; requires injection port (part number 2954640). Requires probe holder/guide kit (part number 253641).
2507256	Beveled-tip probe, stainless steel, grooved septum-piercing; 221 x 1.5 x 0.4 mm ID. Compatible with 819 Injection Module; requires injection port (part number 2954640). Requires probe holder/guide kit (part number 253641).
27067383	PROBE, SP, 221 x 1.5 x 0.4 mm, BEVEL, GROOVE, 28.73 µL VOLUME
27067375	Non-septum-piercing probe: beveled-tip, Teflon-coated stainless steel. Dimensions: 221 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (part number 253641).
27067382	Beveled-tip probe, stainless steel, grooved septum-piercing. Dimensions: 221 x 2.0 x 0.8 mm ID (tip dimensions: 2.1 x 1.5 x 0.8 mm ID, 100 µL volume).
251646	Inert gas probe assembly (for maintaining an inert atmosphere inside sealed vessel), beveled tip, stainless steel, strain-relief design. Dimensions: 274 x 1.8 x 0.8 mm ID. Includes probe holder/guide kit.

Probes for 175 mm Z-Arm

Part Number	*Description*
2507214	Non septum-piercing probe; constricted tip, capacitive level-sensing, stainless steel. Dimensions: 269 x 1.8 x 1.4 mm ID (tip dimensions: 1.5 x 1.2 x 0.8 mm ID). Requires probe holder/guide kit (part number 253640).
2507215	Non septum-piercing probe; constricted tip, capacitive level-sensing, stainless steel. Dimensions: 269 x 1.3 x 0.8 mm ID (tip dimensions: 1.5 x 0.9 x 0.45 mm ID). Compatible with 819 Injection Module; requires injection port (part number 25051015). Requires probe holder/guide kit (part number 253642).
2507216	Non septum-piercing probe, bevel tip, capacitive level sensing, stainless steel. Dimensions: 269 x 1.5 x 1.1 mm ID (tip dimensions: 1.6 x 1.2x 0.8). Compatible with 819 Injection Module; requires injection port (part number 2954674). Requires probe holder/guide kit (part number 253641).
2507253	Micro septum-piercing probe; constricted 45° bevel tip, capacitive level sensing, stainless steel. Dimensions: 269 x 1.5 x 1.1 mm ID (tip dimensions: 10 x 0.7 x 0.4 mm ID). Compatible with 819 Injection Module; requires injection port (part number 270728). Requires probe holder/guide kit (part number 253641).
2507254	Non septum-piercing probe; flat tip, capacitive level-sensing, stainless steel. Dimensions: 269 x 1.8 x 1.4 mm ID. Requires probe holder/guide kit (part number 253640)
2507255	Non septum-piercing probe, bevel tip, capacitive level sensing, stainless steel. Dimensions: 269 x 1.5 x 0.4 mm ID. Compatible with 819 Injection Module; requires injection port (part number 2954640). Requires probe holder/guide kit (part number 253641).
2507555	Inert non septum-piercing probe; Teflon-covered stainless steel. Dimensions: 269 x 2.7 x 0.8 mm ID (tip dimensions: 5 x 1.5 mm OD). Requires probe holder/guide kit (part number 253645).
25075551	Non septum-piercing probe; straight tip. Dimensions: 256.6 x 2.7 x 0.8 mm ID. Requires probe holder/guide kit (part number 253645)
25073645	Beveled tip, capacitive level-sensing, stainless steel. Dimensions: 269 x 1.3 x 0.8 mm ID. Beveled tip pierces thin septa (use part number 26017050 for thick septa). Compatible with 819 Injection Module; requires injection port (part number 25051015). Requires probe holder/guide kit (part number 253642).

Probe Holder/Guide Kits

Part Number	*Description*
253640	Probe holder/guide kit; includes probe holder and guide for 1.8 mm outer diameter probes.
253641	Probe holder/guide kit; includes probe holder and guide for 1.5 mm outer diameter probes.
253642	Probe holder/guide kit; includes probe holder and guide for 1.3 mm outer diameter probes.
253643	Probe holder/guide kit; includes probe holder and guide for 2.0 mm outer diameter probes.
253645	Probe holder/guide kit; includes probe holder and guide for 2.7 mm outer diameter probes.

Transfer Tubing

Part Number	*Description*
499421202	1.5 mL FEP tubing; 0.8 mm ID x 10 feet
499424012	1 mL coiled FEP tubing, 0.8 mm ID.
499474032	3 mL coiled FEP Tubing, 0.8 mm ID, for 215
499474052	5 mL coiled FEP transfer tubing; 1.5 mm ID
499474102	10 mL coiled FEP tubing; 1.5 mm ID x 24 feet
499474252	25 mL coiled FEP tubing; 1.5 mm ID x 50 feet

Rinse Station

Part Number	Description
250782	Complete rinse station; includes rinse station base and body, Tygon tubing, and waste bottle with lid and quick-connect fitting. Order rinse station insert separately.

Rinse Station Inserts

Part Number	Description
25245532	Shallow-pocket rinse station insert, closed-bottom, for applications where the probe is only immersed in a few millimeters of the sample; for use with 125 mm Z-arm.
25245533	Deep-pocket rinse station insert, closed-bottom, allows for deeper insertion of the probe into the rinse well, resulting in a greater area of the outside of the probe to be rinsed; for use with 125 mm Z-arm.
25245531	Flow-through rinse station insert, open-bottom, for flowing rinse applications; for use with 125 mm Z-arm.
25245542	Shallow-pocket rinse station insert, closed-bottom, for applications where the probe is only immersed in a few millimeters of the sample; for use with 175 mm Z-arm.
25245543	Deep-pocket rinse station insert, closed-bottom, allows for deeper insertion of the probe into the rinse well, resulting in a greater area of the outside of the probe to be rinsed; for use with 175 mm Z-arm.
25245541	Flow-through rinse station insert, open-bottom, for flowing rinse applications; for use with 175 mm Z-arm.

Waste Bottle and Accessories

Part Number	Description
23077333	Y-connector to connect two rinse stations to one waste bottle
23077310	Organon waste bottle (2 liter) with lid and quick-connect fitting
470343706	Tygon tubing (5/16" ID x 7/16" OD) for connection between rinse station and waste bottle; per foot
23077332	Quick-connect fitting to connect Tygon tubing to Organon waste bottle

Racks

For part numbers for available racks, refer to ***Appendix B, Racks***. To create your own code 200-style rack, order the blank rack kit (part number 254461) and rivet gun (part number 4391002).

Rack Accessories

Part Number	*Description*
2504621	Adapter plate for installing Code 20- or 30-series rack on locator plate
2504632	Adapter rack for Code 0, 8, or 9 rack
2504627	Locator tray for installing up to seven Code 20- or 30-series racks on the locator plate.
2704429	Thermostating cuvette. Holds one Code 30, 31, 32, 33, or 34 rack. Requires circulating water bath for temperature control.
2759502	832 Temperature Regulator for electrically controlled sample heating or cooling; 100/120V, 50/60 Hz. Controls up to two 832 Thermostating Cuvettes. Order 832 Thermostating Cuvettes and thermostated racks separately.
2759550	832 Thermostating Cuvette. Holds one Code 30, 31, 32, 33, or 34 rack. Requires 832 Temperature Regulator.
27044307	Rack cover for Code 30 rack; stainless steel. Holds vial in rack wells when cooling samples.
27044317	Rack cover for Code 31 rack; stainless steel. Holds vials in rack wells when cooling samples.
27044347	Rack cover for Code 34 rack; stainless steel. Holds vials in rack wells when cooling samples.

Cables, Connectors, and Fuses

Part Number	Description
6730254007	2.5A, T-2.5 Slo-Blo fuse
25064040	Level-sensing cable
36083121	Serial cable, IBM PS/2-type, 25 to 25 pin
36083122	Serial cable, IBM AT-type, 9-pin female to 25-pin male
36083123	Serial cable adapter, 9-pin female to 25-pin male
36078143	Shielded GSIOC cable, 30"
638308512	Terminal block connector, 8-pin
638310512	Terminal block connector, 10-pin
709910206	2-conductor interconnect wire, 6', for making contact connections

Armlock

Part Number	Description
2509211	Armlock with hex screw
4311403	9/64" ball driver (hex wrench for armlock)

Z-Height Adjustment Tools

Part number	Description
25051094	125 mm Z-height adjustment tool Use this tool to adjust a 125 mm Z-arm on a 215 Liquid Handler for use with the 819 Injection Module; no Gilson 818 AutoMix is installed on the 215 Liquid Handler.
25051095	175 mm Z-height adjustment tool Use this tool to adjust a 175 mm Z-arm on a 215 Liquid Handler for use with the 819 Injection Module. Or, use this tool to adjust a 125 mm Z-arm when a Gilson 818 AutoMix is installed along with the injection module on the 215 Liquid Handler.
95260002	270 mm Z-height adjustment tool Use this tool to adjust the Z-arm on a 215 SW Liquid Handler for use with the 819 Injection Module.

Racks B

The 215 Liquid Handler can be configured with a variety of rack types and sizes. The following pages describe the racks that can be purchased for use on the liquid handler. Refer to ***Chapter 2, Installation*** for rack installation procedures.

Locator Plate Capacity

<table>
<tr><th>Racks</th><th>LOCATOR PLATE, 215 STANDARD (part number 25045511)</th><th></th><th>LOCATOR PLATE, 6 POSITION, 215 (part number 25045513)</th><th></th><th>TRAY FOR 7 CODE 20- OR 30-SERIES RACKS (part number 2504627)*</th><th></th></tr>
<tr><td>Code 0, 8, 9</td><td>Up to five racks
Each rack requires an adapter plate (part number 2504621) and an adapter rack (part number 2504632)</td><td rowspan="6">Any combination of these racks, totalling five, can be used</td><td>Up to three racks when one AutoMix is installed or up to two racks when two AutoMixes are installed
Each rack requires an RH1 rack heightener (part number 25045514), adapter plate (part number 2504621), and an adapter rack (part number 2504632)</td><td rowspan="6">Any combination of these racks can be used</td><td>Up to seven racks
Each rack requires an adapter rack (part number 2504632)</td><td rowspan="3">Any combination of these racks, totalling seven, can be used</td></tr>
<tr><td>Code 20-series</td><td rowspan="2">Up to five racks
Each rack requires an adapter plate (part number 2504621)</td><td rowspan="2">Up to three racks when one AutoMix is installed or up to two racks when two AutoMixes are installed
Each rack requires an RH1 rack heightener (part number 25045514) and adapter plate (part number 2504621)</td><td rowspan="2">Up to seven racks</td></tr>
<tr><td>Code 30-series</td></tr>
<tr><td>Code 200-series
Code 242 Peltier
Code 300-series
Code 600-series
Code 85X Peltier</td><td>Up to five racks</td><td>Up to three racks when one AutoMix is installed or up to two racks when two AutoMixes are installed
Each rack requires an RH1 rack heightener (part number 25045514)</td><td colspan="2" rowspan="5">N/A</td></tr>
<tr><td>Code 502</td><td>Up to two racks
One position left available for the addition of a Code 0, 8, or 9 rack with adapter plate and rack, or
Code 20-series or 30-series rack with adapter plate, or Code 200-series, or 300-series rack</td><td rowspan="3">N/A</td></tr>
<tr><td>Code 505, 505H
Code 542</td><td>One rack
One position left available for the addition of a Code 0, 8, or 9 rack with adapter plate and rack, or
Code 20-series or 30-series rack with adapter plate, or Code 200-series, or 300-series rack</td></tr>
<tr><td>Code 517</td><td>One rack</td></tr>
<tr><td>818 AutoMix</td><td>One AutoMix</td><td>Up to two AutoMixes</td></tr>
<tr><td colspan="7">* Install TRAY FOR 7 CODE 20- OR 30-SERIES RACKS (part number 2504627) on LOCATOR PLATE, 215 STANDARD (part number 25045511)</td></tr>
</table>

Code 0 rack

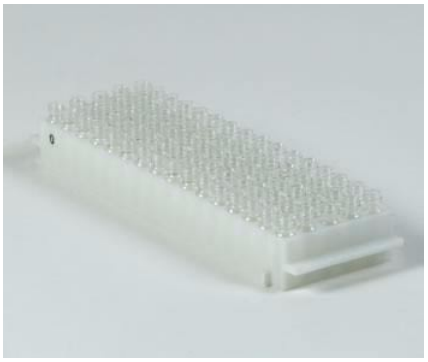
For 80 vessels

Material: polypropylene

Vessels and maximum capacity: 12 x 32 mm tubes (2 mL)

Part number: 270430

Required accessories: adapter plate (part number 2504621) and adapter rack (part number 2504632)



Code 8 rack

For 120 vials

Material: polypropylene

Vessels and maximum capacity: 6 x 32 mm tubes (0.3 mL)

Part number: 270438

Required accessories: adapter plate (part number 2504621) and adapter rack (part number 2504632)

Code 9 rack

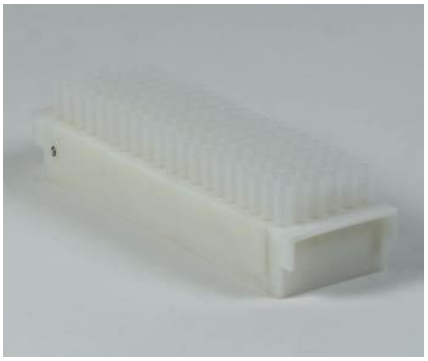
For 120 vials

Material: polypropylene

Vessels and maximum capacity: 7 x 40 mm vials (0.7 mL)

Part number: 270439

Required accessories: adapter plate (part number 2504621) and adapter rack (part number 2504632)



Code 20 rack

For 108 vessels

Material: polypropylene

Vessels and maximum capacity: 10 x 100 mm tubes (4.5 mL)

Part number: 150425

Required accessories: adapter plate (part number 2504621)

Code 21 rack

For 60 vessels

Material: polypropylene

Vessels and maximum capacity: 13 x 100 mm tubes (9 mL)

Part number: 150422

Required accessories: adapter plate (part number 2504621)

Code 22 rack

For 44 tubes

Material: polypropylene

Vessels and maximum capacity: 18 x 100 mm tubes (25 mL)
18 x 150 mm tubes (32 mL)

Part number: 150424

Required accessories: adapter plate (part number 2504621)

Code 22U rack

For 44 vessels

Material: polypropylene

Vessels and maximum capacity: from 10 x 100 mm tubes (3.5 mL) to 18 x 180 mm tubes (32 mL)

Part number: 150498

Required accessories: adapter plate (part number 2504621)

Note: Each of the reception cavities contains four positioning and retaining clips.

Code 23 rack

For 44 mini-scintillation vials

Material: polypropylene

Vessels and maximum capacity: 17 x 55 mm vials (6.8 mL)
17 x 65 mm vials (8 mL)

Part number: 150426

Required accessories: adapter plate (part number 2504621)

Code 23W rack

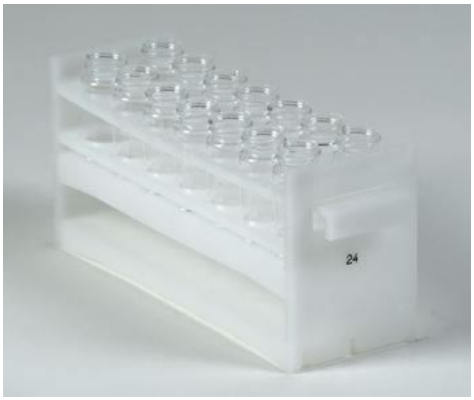
For 44 WISP-style vials

Material: polypropylene and stainless steel

Vessels and maximum capacity: 15 x 45 mm vials (4 mL)

Part number: 270433

Required accessories: adapter plate (part number 2504621)



Code 24 rack

For 14 scintillation vials

Material: polypropylene

Vessels and maximum capacity: 28 x 57 mm vials (20 mL)
28 x 60 mm vials (20 mL)

Part number: 150427

Required accessories: adapter plate (part number 2504621)

Code 28 rack

For 108 vessels

Material: polypropylene

Vessels and maximum capacity: 10 x 65 mm tubes (3 mL)
10 x 75 mm tubes (4 mL)

Part number: 150420

Required accessories: adapter plate (part number 2504621)

Code 29 rack

For 60 vessels

Material: polypropylene

Vessels and maximum capacity: 12 x 75 mm tubes (5 mL)
13 x 75 mm tubes (6 mL)

Part number: 150429

Required accessories: adapter plate (part number 2504621)

Code 30 rack

For 60 vessels

Material: aluminum

Vessels and maximum capacity: 12 x 32 mm vials (2 mL)

Part number: 2704430

Required accessories: adapter plate (part number 2504621) and thermostating cuvette (part number 2704429) **or** thermostating cuvette (part number 2759550) and 832 Temperature Regulator (part number 2759502)

Code 31 rack

Thermostated rack for 108 vessels

Material: aluminum

Vessels and maximum capacity: 7 x 40 mm vials (0.7 mL)

Part number: 2704431

Required accessories: adapter plate (part number 2504621) and thermostating cuvette (part number 2704429) **or** thermostating cuvette (part number 2759550) and 832 Temperature Regulator (part number 2759502)

Code 32 rack

Thermostated rack for 60 tubes

Material: aluminum

Vessels and maximum capacity: 13 x 65 mm tubes (6 mL)

Part number: 2704432

Required accessories: adapter plate (part number 2504621) and thermostating cuvette (part number 2704429) **or** thermostating cuvette (part number 2759550) and 832 Temperature Regulator (part number 2759502)

Code 33 rack

Thermostated rack for 14 scintillation vials

Material: aluminum

Vessels and maximum capacity: 28 x 57 mm vials (20 mL)

Part number: 2704433

Required accessories: adapter plate (part number 2504621) and thermostating cuvette (part number 2704429) **or** thermostating cuvette (part number 2759550) and 832 Temperature Regulator (part number 2759502)

Code 34 rack

Thermostated rack for 36 WISP-style vials

Material: aluminum

Vessels and maximum capacity: 15 x 45 mm vials (4 mL)

Part number: 2704434

Code 200 rack

For 96 VACUTAINER® tubes

Material: aluminum

Vessels and maximum capacity: 13 x 100 mm tubes (9 mL)

Part number: 2504600

Code 201 rack

For two microplates, two microcentrifuge tubes, and two 13 x 100 mm tubes

Material: aluminum

Vessels and maximum capacity: 96 well microplates
microcentrifuge tubes (1.5 mL)
13 x 100 mm tubes (9 mL)

Part number: 2504601

Code 201H rack

For two 96-well microplates with hold-down covers, two vials, and two tubes

Material: aluminum

Vessels and maximum capacity: 13 x 100 mm tubes (9 mL)

Part number: 2504601H

Code 202 rack

For 96 VACUTAINER tubes

Material: aluminum

Vessels and maximum capacity: 10.25 x 45 mm (1.5 mL)

Part number: 2504602

Code 203 rack

For 96 tubes

Material: aluminum

Vessels and maximum capacity: 10 x 64 mm tubes (3 mL)
10 x 75 mm tubes(3.5 mL)

Part number: 2504603

Code 204 rack

For 27 scintillation vials

Material: aluminum

Vessels and maximum capacity: 28 x 57 mm vials (20 mL)

Part number: 2504604

Code 204F rack

Rack with funnel drain assembly

For 24 scintillation vials

Material: aluminum

Vessels and maximum capacity: 28 x 57 mm vials (20 mL)

Part number: 2504604F

Requires 215 Prep FC Valve, Low Mount (part number 251774)

Code 205 rack

For two deep-well microplates, two microcentrifuge tubes, and two 13 x 100 mm tubes

Material: aluminum

Vessels and maximum capacity: 96 deep-well microplates
microcentrifuge tubes (1.5 mL)
13 x 100 mm tubes (9 mL)

Part number: 2504605

Code 205H rack

For two deep-well microplates with hold-down covers

Material: aluminum

Vessels and maximum capacity: 13 x 100 mm tubes (9 mL)

Part number: 2504605H

Code 206 rack

For 96 VACUTAINER tubes

Material: aluminum

Vessels and maximum capacity: 13 x 75 mm tubes (4 mL)

Part number: 2504606

Code 207 rack

For 75 VACUTAINER tubes

Material: aluminum

Vessels and maximum capacity: 16 x 100 mm tubes (12 mL)

Part number: 2504607

Code 208 rack

For 70 tubes

Material: aluminum

Vessels and maximum capacity: 18 x 100 mm tubes (15 mL)
18 x 150 mm tubes (25 mL)

Part number: 2504608

Code 209 rack

For 96 vials

Material: aluminum

Vessels and maximum capacity: 12 x 32 mm vials (2 mL)

Part number: 2504609

Code 210 rack

For 75 VACUTAINER tubes

Material: aluminum

Vessels and maximum capacity: 16 x 75 mm tubes (10 mL)

Part number: 2504610

Code 211 rack

For 9 round screw-cap bottles

Material: aluminum

Vessels and maximum capacity: 48 x 113 mm bottles (125 mL)

Part number: 2504611

Code 211F rack

Rack with funnel drain assembly

For 8 round screw-cap bottles

Material: aluminum

Vessels and maximum capacity: 48 x 113 mm bottles (125 mL)

Part number: 2504611F

Requires 215 Prep FC Valve, Low Mount (part number 251774)

Code 211H rack

For 9 round screw-cap bottles with hold-down cover

Material: aluminum

Vessels and maximum capacity: 48 x 113 mm bottles (125 mL)

Part number: 2504611H

Code 212 rack

For 96 VacuTainer tubes

Material: aluminum

Vessels and maximum capacity: 48 13 x 100 mm tubes (9 mL)
48 13 x 75 mm tubes(4 mL)

Part number: 2504612

Note: Place the shorter tubes into the notched tube locations.

Code 213 rack

For 74 VacuTainer tubes

Material: aluminum

Vessels and maximum capacity: 16 x 100 mm 37 tubes (12 mL)
16 x 75 mm 37 tubes (10 mL)

Part number: 2504613

Note: Place the shorter tubes into the notched tube locations.

Code 214 rack

For 96 VacuTainer tubes

Material: aluminum

Vessels and maximum capacity: 10.25 x 47 mm 48 tubes (2.5 mL)
10.25 x 64 mm 48 tubes (3 mL)

Part number: 2504614

Note: Place the shorter tubes into the notched tube locations.

Code 216 rack

For 60 WISP vials

Material: aluminum

Vessels and maximum capacity: 15 x 45 mm vials (4 mL)

Part number: 2504616

Code 217 rack

For 96 tubes

Material: aluminum

Vessels and maximum capacity: 10 x 75 mm tubes (4 mL)

Part number: 2504617

Code 218 rack

For 96 standard or deep-well microplate and tubes

Material: aluminum

Vessels and maximum capacity: 10 x 75 mm (4 mL)

Part number: 2504618

Code 219 rack

For 27 vials

Material: aluminum

Vessels and maximum capacity: 30 x 95 mm vials (4 mL)

Part number: 2504619

Code 220 rack

For 70 vials

Material: aluminum

Vessels and maximum capacity: 17 x 55 mm vials (6.8 mL)
17 x 65 mm vials (8 mL)

Part number: 2504620

Code 222 rack

For 27 conical bottom tubes

Material: aluminum

Vessels and maximum capacity: 30 x 115 mm tubes (50 mL)

Part number: 2504622

Code 222F rack

Rack with funnel drain assembly

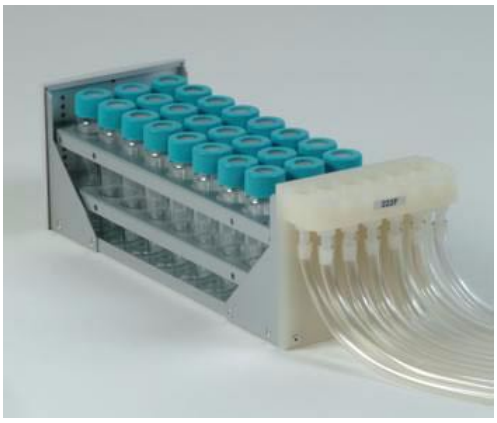
For 24 conical bottom tubes

Material: aluminum

Vessels and maximum capacity: 30 x 115 mm tubes (50 mL)

Part number: 2504622F

Requires 215 Prep FC Valve, Low Mount (part number 251774)



Code 223 rack

For 96 tubes with screw caps

Material: aluminum

Vessels and maximum capacity: 16 x 100 mm tubes (10 mL)

Part number: 2504623

Code 224 rack

For 192 vials

Material: aluminum

Vessels and maximum capacity: 8.5 x 41 mm vials

Part number: 2504624

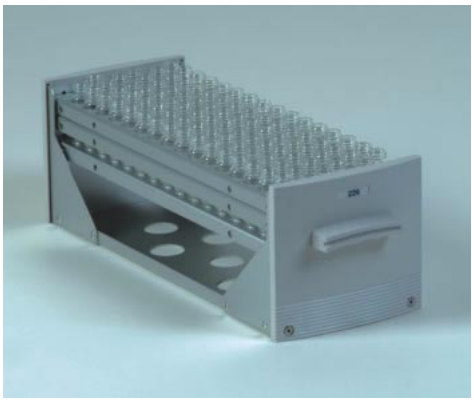
Code 225 rack

For 45 vials

Material: aluminum

Vessels and maximum capacity: 25 x 150 mm vial (45 mL)

Part number: 2504625



Code 226 rack

For 96 WISP-style vials

Material: aluminum

Vessels and maximum capacity: 15 x 45 mm vials (4 mL)

Part number: 2504626

Code 228 rack

For four reagent bottles

Material: aluminum

Vessels and maximum capacity: 4 (500 or 700 mL)

Part number: 2504628

Code 237 rack

For two 384- or 96-well, shallow, flat-bottomed microplates
Material: aluminum

Vessels and maximum capacity: 384-well microplates
Part Number: 2504637

Code 300 rack

For 96 deep-well microplates and one cartridge
Material: aluminum
Part number: 2504300

Code 301 rack

For 96 shallow-well microplates and one cartridge
Material: aluminum
Part number: 2504301

Code 302 rack

For 48 cartridges and 48 vials
Material: aluminum

Vessels and maximum capacity: 12 x 32mm vials (2 mL)
Part number: 2504302

Code 303 rack

For 48 cartridges and 48 vials
Material: aluminum

Vessels and maximum capacity: 12 x 32 mm vial (2 mL)
Part number: 2504303

Code 304 rack

For 48 cartridges and 48 tubes
Material: aluminum

Vessels and maximum capacity: 12 x 75 mm tube (5 mL)
Part number: 2504304

Code 305 rack

For 32 cartridges and 32 vials
Material: aluminum

Vessels and maximum capacity: 15 x 45 mm vial (4 mL)
Part number: 2504305

Code 306 rack

For 20 cartridges and 20 tubes
Material: aluminum

Vessels and maximum capacity: 12 x 75 mm tube (5 mL)
Part number: 2504306

Code 307 rack

For 20 cartridges and 20 vials
Material: aluminum

Vessels and maximum capacity: 15 x 45 mm WISP vial (4 mL)
Part number: 2504307

Code 502 rack

For 100 vials
Material: aluminum

Vessels and maximum capacity: 12 x 32mm (2 mL)
Part number: 2504652

Code 505 rack

For 10 standard or deep-well microplates

Material: aluminum

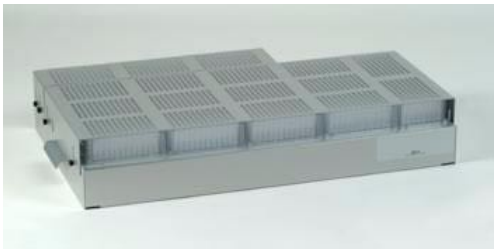
Part number: 2504651

Code 505H rack

For 10 standard or deep-well microplates with hold-down covers

Material: aluminum

Part number: 2504651H



Code 517 rack

For 17 microplates with hold-down cover

Material: aluminum

Part number: 2504653

Code 641 rack

For 24 vials
Material: aluminum
Vessels and maximum capacity: 28 x 100 mm vials (45 mL)
Part number: 2504641

Code 642 rack

For 48 tubes
Material: aluminum
Vessels and maximum capacity: 16 x 78 mm tubes
Part number: 2504642

Code 643 rack

For 2 solid phase and solution phase reaction block
Material: aluminum
Part number: 2504643

Code 644 rack

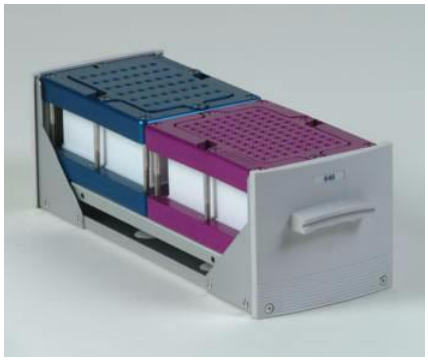
For 2 solid phase and solution phase reaction blocks
Material: aluminum
Part number: 2504644

Code 645 rack

For 2 solid phase and solution phase multitemperature reaction blocks w/gas manifold

Material: aluminum

Part number: 2504645



Code 646 rack

For 2 solid phase and solution phase multitemperature reaction block

Material: aluminum

Part number: 2504646

Code 647 rack

For 4 Robbins Scientific Flexchem™ solid phase synthesis reaction block

Material: aluminum

Part number: 2504647

Peltier Racks

Code 242 Peltier rack

For 2 shallow, flat-bottom, 96-well microplates

Material: aluminum

Part number: 25146331

Note: Order Peltier Controller (part number 2515331) and junction box (part number 2505332) separately.

Code 542 Peltier rack

For 10 shallow, flat-bottom, 96-well microplates

Material: aluminum

Part number: 2514542

Note: Order Peltier Controller (part number 2515331) separately.

Code 852 Peltier rack

For two Becton Dickinson Falcon 96-well, shallow-well assay plates. U-bottom style

Material: aluminum

Part number: 2514852

Note: Order Programmable Peltier Controller (part number 2515850) separately.

Code 853 Peltier rack

For 96 12x32 mm 2 mL, flat-bottom vials

Material: aluminum

Part number: 2514853

Note: Order Programmable Peltier Controller (part number 2515850) separately.

Code 854 Peltier rack

For two Ritter or Beckman 96-well, deep-well microplates

Material: aluminum

Part number: 2514854

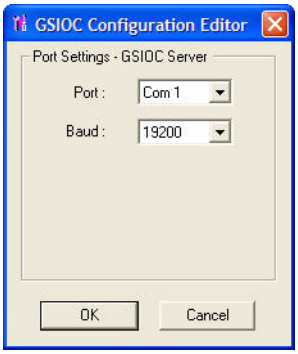
Note: Order Programmable Peltier Controller (part number 2515850) separately.

GSIOC Configuration Editor C

The GSIOC Configuration Editor enables you to modify COM (serial communications) port and baud rate information. Or, you can use this editor if incorrect information appears in the GSIOC Utility window.

1 Locate the GSIOC Configuration Editor (GSCONFIG.EXE) using Windows Explorer or the shortcut at **Start—Programs—Gilson Applications—Utilities—GSIOC Configuration Editor**. During installation, this editor was stored to C:\GILSON\UTIL unless the installation path was changed.

2 Start the editor. The GSIOC Configuration Editor window appears.



3 In the Port box, indicate the computer's serial communications port (COM) port to which the Gilson interface instrument (such as the liquid handler or 506C System Interface) is connected.

4 Click 19200 or 9600 to select the baud. The baud is the rate of data transmission between the computer and the Gilson instrument.

5 Click OK to save the changes. A message box appears indicating that the computer must be restarted before any changes become effective.

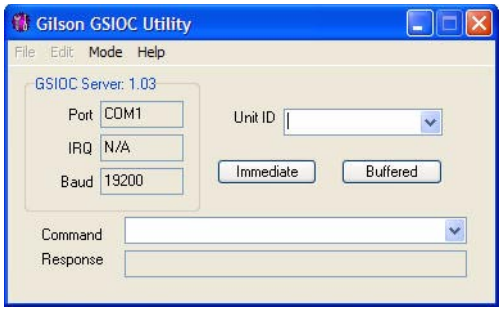
GSIOC Utility D

The GSIOC Utility allows you to issue commands to Gilson GSIOC instruments. Your Gilson-authorized representative may ask you to use this utility to verify that an instrument is connected correctly to the computer. For communication to occur, the Gilson instrument must be connected via an RS-232 connection to the computer or connected via a GSIOC connection to a Gilson interface instrument that is connected to the computer.

Start the GSIOC Utility

1 Locate the GSIOC Utility (GSUTIL32.EXE) using Windows Explorer or the shortcut at **Start > (All) Programs > Gilson Applications > Utilities > GSIOC Utility**. During installation, this utility was stored to C:\GILSON\UTIL unless the installation path was changed.

2 Start the utility. The GSIOC Utility window appears.



Review the Port and Baud Information

In the GSIOC Utility window, review the COM port and baud information. If any information is incorrect or missing, close the GSIOC Utility and use the GSIOC Configuration Editor to update the information. Refer to ***Appendix C, GSIOC Configuration Editor***.

Listing GSIOC Instruments

Using the GSIOC Utility, you can determine the instruments currently connected to the computer.

In the Mode menu, select **Scan!**

The Unit ID list box displays the unit IDs and the version of the connected instruments. If any connected instruments are missing from the list, ensure that the proper RS-232 or GSIOC connection exists between the computer and the instruments, and that the instruments do not have duplicate unit ID numbers.

Basic Mode

In the Basic mode, immediate and buffered GSIOC commands can be sent to specific Gilson instruments.

Review the Port, IRQ, and Baud information in this window. If any information is incorrect or missing, close the GSIOC Utility and use the GSIOC Configuration Editor to update the information.

There are two drop-down menus in the Basic mode of the Gilson GSIOC Utility: Mode Menu and Help Menu.

Basic Mode Buttons and Features

Immediate Button

Sends an immediate command to the Unit ID selected.

Immediate commands request status information from an instrument. These commands are executed immediately, temporarily interrupting any command in progress.

You can find a list of valid immediate commands for each instrument in its commands list or user's guide.

Buffered Button

Sends a buffered command to the Unit ID selected.

Buffered commands send instructions to an instrument. These commands are executed one at a time.

You can find a list of valid buffered commands for each instrument in its commands list or user's guide.

Command Field

Where the command to be sent is specified. For more information on sending commands, see **Send an Immediate Command** on page D-16 or **Send a Buffered Command** on page D-16.

Response Field

Returns a response to an immediate or buffered command.

The response to a successfully completed buffered command is “ok”.

Refer to the user’s guide for the Gilson instrument for a description of the valid response to immediate commands.

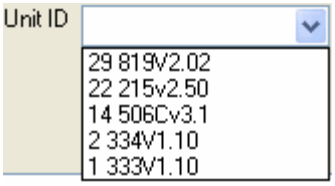
The response to an unsuccessfully completed immediate or buffered command is “#error”.

Basic Mode Menus

Mode Menu

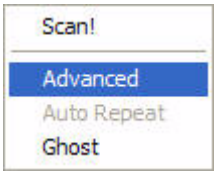
There are three options in the Mode menu: Scan!, Advanced, and Ghost.

Scan!



The Scan! option on the Mode menu allows you to scan for GSIOC instruments. After a scan, the Unit ID list box displays the unit IDs and the version of the connected instruments. If any connected instruments are missing from the list, ensure that the proper RS-232 or GSIOC connection exists between the computer and the instruments, and that the instruments do not have duplicate Unit ID numbers.

Advanced



The advanced option in the Mode menu allows you to switch between the Basic and Advanced modes. A check mark means that the GSIOC Utility is in Advanced mode.

Ghost

The Ghost option in the Mode menu makes the GSIOC Utility window transparent (and always on top). This allows you to view another window behind the Utility. The Utility will remain fully functional in the Ghost mode.

Help Menu

Help Topics

When selected, the Help window for the Gilson GSIOC Utility appears.

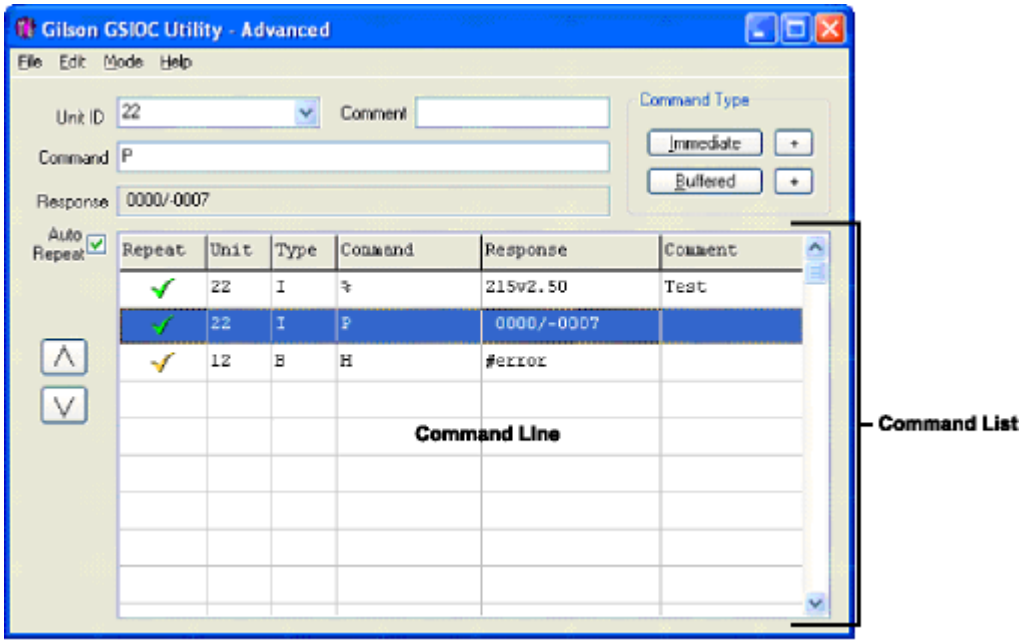
About

When selected, the About window appears.

This window displays the version of the Gilson GSIOC Utility, the GSIOC32.DLL, and the GSIOC Server or Driver; and the Port, IRQ, and Baud set by the GSIOC Configuration Editor.

Advanced Mode

In the Advanced mode, immediate and buffered GSIOC commands can be sent to specific Gilson instruments. In this mode, immediate and buffered commands with comments can be saved to a command list to be used as needed. The command lines can be repeated automatically to monitor the status of the instrument.



Review the Port, IRQ, and Baud information by selecting About... from the Help menu. If any information is incorrect or missing, close the GSIOC Utility and use the GSIOC Configuration Editor to update the information.

There are four drop-down menus in the Advanced mode of the Gilson GSIOC Utility: File Menu, Edit Menu, Mode Menu, and Help Menu.

Advanced Mode Buttons and Features

+ Button

The [+] next to [Immediate] is used to insert an immediate command in the command list. For more information, see **Insert an Immediate Command** on page D-14.

The [+] next to [Buffered] is used to insert a buffered command in the command list. For more information, see **Insert a Buffered Command** on page D-15.

Arrow Up or Arrow Down Button

These buttons ([∧] or [∨]) are used to change the position of a command in the command list.

To move a command

Highlight the command in the command list and use [∧] to move the command up in the list or [∨] to move the command down in the list.

Immediate Button

Sends an immediate command to the Unit ID selected. The Comment field is not used.

Selecting the Immediate button will not add the command to the command list.

For more information, see **Send an Immediate Command** on page D-16.

Buffered Button

Sends a buffered command to the Unit ID selected. The Comment field is not used.

Selecting the Buffered button will not add the command to the command list.

For more information, see **Send a Buffered Command** on page D-16.

Response Field

Returns a response to an immediate or buffered command.

The response will become gray after 15 seconds if no response is registered.

The response to a successfully completed buffered command is “ok”.

Refer to the user’s guide for the Gilson instrument for a description of the valid response to the immediate commands.

The response to an unsuccessfully completed immediate or buffered command is “#error”.

To send a command line

Double-click on the Unit, Type, Command, Response, or Comment field to send the immediate or buffered command for that specific command line.

Command Line Column Headings

Repeat

A green check mark (✓) in the Repeat column means that an immediate command will automatically repeat when the Auto Repeat option is checked. Double-click on the Repeat field to select or deselect the Auto Repeat for that command line.

A yellow check mark (✓) in the Repeat column means that a buffered command will automatically repeat when the Auto Repeat option is checked. Double-click on the Repeat field to select or deselect the Auto Repeat option for that command line.

Unit

This is the Unit ID for the instrument in the command line.

Type

I - Immediate Command, B - Buffered Command

Command

This is the GSIOC command for the command line.

Response

This is the GSIOC response when the command line is initiated with a double-click on the Unit, Type, Command, Response, or Comment field. The response will become gray after 15 seconds if no response is registered.

Comment

This is an optional comment that can be added to the command line.

Advanced Mode Menus

File Menu

There are four options in the File menu: Open, Save, Save As..., and Exit.

Open

The Open option in the File menu allows you to open previously created command lists (GSUTIL32 files). The extension for a GSUTIL32 file is .GSU.

Save

The save option in the File menu allows you to save the Advanced commands to GSUTIL32.GSU. The GSUTIL32.GSU file is automatically created in the location where GSUTIL32.EXE is stored.

The Advanced commands will automatically be saved to GSUTIL32.GSU if the Gilson GSIOC Utility is exited without saving.

The GSUTIL32. GSU is automatically opened when the Advanced mode is selected from the Mode menu.

Save As...

The Save As... option on the File menu allows you to save the Gilson GSIOC Utility commands that are currently defined. The file's name and path must be specified.

Exit

Closes the Gilson GSIOC Utility software.

Edit Menu

There are four options in the Edit Menu: Insert Immediate, Insert Buffered, Selection, and Font....

Insert Immediate

The Insert Immediate option in the Edit menu allows you to insert an immediate command in the command list. The new command will be added to the last line in the command list.

The GSIOC Command will not be inserted if there is already a command line in the list with the same Unit ID and Command.

For more information, see **Insert an Immediate Command** on page D-14.

Insert Buffered

The Insert Buffered option in the Edit menu allows you to insert a buffered command in the command list. The new command will be added to the last line in the command list.

The GSIOC Command will not be inserted if there is already a command line in the list with the same Unit ID and Command.

For more information, see **Insert a Buffered Command** on page D-15.

Selection

Delete (Ctrl + D)

Deletes the highlighted command from the command list.

Up (Ctrl + U)

Moves the highlighted command up in the command list.

Down (Ctrl + D)

Moves the highlighted command down in the command list.

Execute (Ctrl + E)

Executes the highlighted command.

Repeat (Ctrl + R)

Adds or removes the repeat option for the highlighted command.

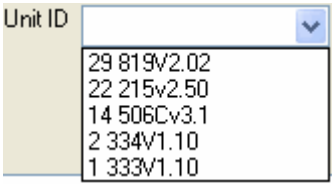
Font...

The Font... option on the Edit menu allows you to change the font options for the command list fields and headers, as well as the Unit ID, Comment, and Command text boxes.

Mode Menu

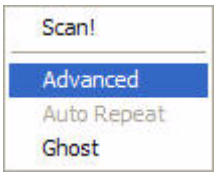
There are four options in the Mode menu: Scan!, Advanced, Auto Repeat, and Ghost.

Scan!



The Scan! option on the Mode menu allows you to scan for GSIOC instruments. After a scan, the Unit ID list box displays the unit IDs and the version of the connected instruments. If any connected instruments are missing from the list, ensure that the proper RS-232 or GSIOC connection exists between the computer and the instruments, and that the instruments do not have duplicate Unit ID numbers.

Advanced



The advanced option in the Mode menu allows you to switch between the Basic and Advanced modes. A check mark means that the GSIOC Utility is in Advanced mode.

Auto Repeat

The Auto Repeat option on the Mode menu allows you to repeat command lines that appear in the command list.

A command line will only repeat if a check mark appears in the Repeat field. A check mark can be added by double-clicking on the Repeat field and selecting the Auto Repeat check box.

Starting from the top command line, this mode will refresh one repeating command line every 1/10th of a second. For example, if there are ten command lines with Repeat selected, each of these command lines will be initiated every second.

Auto Repeat mode is useful for monitoring the instrument using immediate commands and is designated in the Repeat field with a green check mark.

Auto Repeat mode is not intended to be used as a programming tool with buffered commands. Repeating buffered commands will be executed at a fixed time interval regardless if a command has finished. For this reason, the check mark in the buffered command line is yellow.

Auto Repeat mode can be selected from the Mode menu or by selecting the check box next to Auto Repeat.

Auto Repeat is deselected by default with the Advanced mode is first opened. When Gilson GSIOC Utility - Advanced is saved or closed, the status of Auto Repeat is saved.

Ghost

The Ghost option in the Mode menu makes the GSIOC Utility window transparent (and always on top). This allows you to view another window behind the Utility. The Utility will remain fully functional in the Ghost mode.

Help Menu

Help Topics

When selected, the Help window for the Gilson GSIOC Utility appears.

About

When selected, the About window appears.

This window displays the version of the Gilson GSIOC Utility, the GSIOC32.DLL, and the GSIOC Server or Driver; and the Port, IRQ, and Baud set by the GSIOC Configuration Editor.

Commands

Immediate Command

Immediate commands request status information from an instrument. These commands are executed immediately, temporarily interrupting any command in progress.

You can find a list of valid immediate commands for each instrument in its commands list or user's guide.

Buffered Command

Buffered commands send instructions to an instrument. These commands are executed one at a time.

You can find a list of valid buffered commands for each instrument in its commands list or user's guide.

Insert an Immediate Command

There are two ways to insert an immediate command in Advanced mode.

Using the Edit Menu

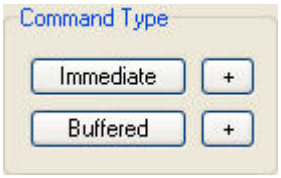
1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type a Command and Comment. (The comment is optional.)

3 Select Insert Immediate from the Edit menu. The new command will be inserted at the bottom of the command list.

Note: The command will not be inserted if there is already a command line in the list with the same Unit ID and command.

Using the + Button



1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type a Command and Comment. (The comment is optional.)

3 Click the + button next to the Immediate button. The new command will be inserted at the bottom of the command list.

Note: The command will not be inserted if there is already a command line in the list with the same Unit ID and command.

Insert a Buffered Command

There are two ways to insert a buffered command in Advanced mode.

Using the Edit Menu

1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type a Command and Comment. (The comment is optional.)

3 Select Insert Immediate from the Edit menu. The new command will be inserted at the bottom of the command list.

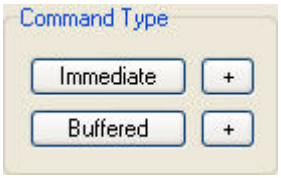
Note: The command will not be inserted if there is already a command line in the list with the same Unit ID and command.

Using the + Button

1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type a Command and Comment. (The comment is optional.)

3 Click the + button next to the Buffered button. The new command will be inserted at the bottom of the command list.



Note: The command will not be inserted if there is already a command line in the list with the same Unit ID and command.

Send an Immediate Command

Basic Mode

1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type (or select) a Command.

3 Click Immediate.

Advanced Mode

Using the Immediate button

1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type a Command and Comment. (The comment is optional.)

3 Click Immediate.

Using Execute from the Edit menu

1 Highlight the command to be sent in the command list.

2 Choose Selection from the Edit menu and select Execute. (Or, type Ctrl + E.)

Using the command list

Double-click on the command line of the command you want to send.

Send a Buffered Command

Basic Mode

1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type (or select) a Command.

3 Click Buffered.

Advanced Mode

Using the Buffered button

1 From the Unit ID drop-down box, select the unit ID of the instrument to send the command to.

2 Type a Command and Comment. (The comment is optional.)

3 Click Buffered.

Using Execute from the Edit menu

1 Highlight the command to be sent in the command list.

2 Choose Selection from the Edit menu and select Execute. (Or, type Ctrl + E.)

Using the command list

Double-click on the command line of the command you want to send.