

Gilson
223 Sample Changer
User's Guide

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Declaration of Conformity

Application of Council Directives:

89/336/EEC, 73/23/EEC

Standards to which Conformity is Declared:

EN61326, EN61000-3-3, EN61000-3-2, EN61010-1

Manufacturer's Name Gilson, Inc.

Manufacturer's Address 3000 W. Beltline Highway
Middleton, WI 53562

EC Office Address Gilson S.A.S.
19 Avenue des Entrepreneurs, B.P. 45
95400 Villiers-le-Bel, France

Type of Equipment Laboratory Equipment

Model **223 Sample Changer**

Beginning with Serial Number: **199F5001**

Month and Year of Manufacture: **June 1995**

I, the undersigned, hereby declare that the equipment
specified above conforms to the above Directives and Standards.



Place: Middleton, WI (USA)

Issue Date: January 1996

Michael Jacquot
Senior Vice President
Corporate Technology Development

Introduction

The Gilson 223 Sample Changer is an XYZ robot that can automate sample handling procedures. It is controlled via a program running on a computer or Keypad Controller.



Unpacking

The 223 Sample Changer arrives with all major components already assembled except for auxiliary parts such as the vertical arm, probe, tray, racks, etc. Keep the original container and packing assembly in case the sample changer must be returned.

Standard Equipment

Once the sample changer and accessories are unpacked, you should have the following:

- 223 Sample Changer and *User's Guide*
- Vertical arm
- Accessory package with terminal block connectors, fuse drawers, fuses, power cords, serial cable, and 3 feet of 7 mm ID Tygon tubing
- 223 Utility Programs CD-ROM

Accessories

Based on your requirements, you also received additional accessories such as:

- probe
- holder/guide kit
- tray
- tray spacers
- support bar
- rinse station
- rack holder
- racks
- liquid level detection cable
- diverting valve
- filler port
- transfer port kit
- tubing/cable support rod
- GSIOC cable
- RS-232 cable
- Keypad Controller
- syringe pump or peristaltic pump

If necessary, refer to [Appendix A](#) for reference numbers.

Introduction

Customer Service

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

If you need assistance and are in the United States please contact your regional Gilson representative or call the Gilson Customer Service Department at 800-445-7661 or 608-836-1551.

You can also contact the Gilson Customer Service Department via its electronic mail (e-mail) address: service@gilson.com. Outside the United States, contact your Gilson representative for assistance. Specific contact information can be found on the Gilson website at www.gilson.com.

To help us serve you quickly and efficiently, please refer to **Before calling us** on page 5-8.

Technical Specifications

The following information is subject to change without notice.

Warning: Changes or modifications to the sample changer not expressly approved by Gilson could void the factory-authorized warranty.

The sample changer has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC commercial environment. The sample changer generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of the sample changer in a residential area is likely to cause harmful interference; in which case, the user will be required to correct the interference at the user's own expense.

Shielded cables must be used with the sample changer to ensure compliance with the Class A FCC limits.

<i>Technical Specification</i>	<i>Definition</i>																			
Arm speed	<p>>250 mm/sec (>9.85 in/sec) in X/Y dimension</p> <p>Z dimension has five programmable speeds for upward and downward movement:</p> <table> <thead> <tr> <th><i>Index</i></th> <th><i>Speed (mm/sec)</i></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>19.9</td> <td></td> </tr> <tr> <td>2</td> <td>30.2</td> <td>Default for level seeking</td> </tr> <tr> <td>3</td> <td>61.8</td> <td></td> </tr> <tr> <td>4</td> <td>126.9</td> <td>Default for normal travel</td> </tr> <tr> <td>5</td> <td>247.3</td> <td></td> </tr> </tbody> </table>		<i>Index</i>	<i>Speed (mm/sec)</i>		1	19.9		2	30.2	Default for level seeking	3	61.8		4	126.9	Default for normal travel	5	247.3	
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1	19.9																			
2	30.2	Default for level seeking																		
3	61.8																			
4	126.9	Default for normal travel																		
5	247.3																			
Contact control	Four inputs (accepts contact closure, TTL, or open-collector signals), four relay outputs, and one switched +12V DC output (500 mA max)																			
Environmental conditions	<p>Indoor use</p> <p>Altitude: Up to 2000 m</p> <p>Temperature range: 5 - 40° C</p> <p>Air pressure: 75 –105 kPa</p> <p>Pollution degree: 1 or 2 in accordance to IEC 66</p> <p>Humidity: Maximum relative humidity 80% for temperatures up to 31° C, decreasing linearly to 50% relative humidity at 40° C</p>																			
Front panel	One yellow LED																			
Horizontal motion strength	<p>X: 2 kg (5 lbs)</p> <p>Y: 1.5 kg (3 lbs)</p>																			

Technical Specifications

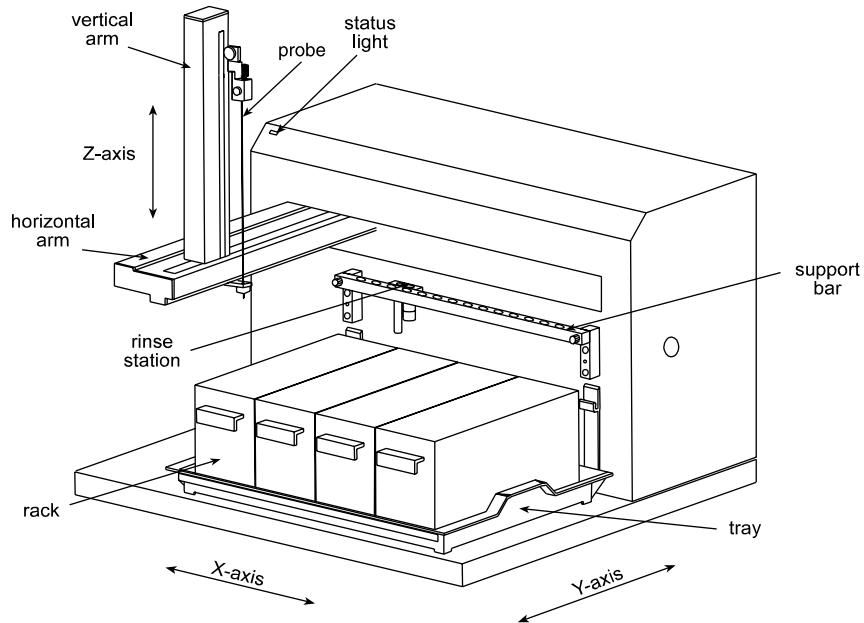
Liquid level sensing	Capacitive
Manufacturing standards	<p>Safety certification:</p> <ul style="list-style-type: none"> • UL 1262 • CSA C22.2 –No. 151 • IEC 1010-1 <p>EMC/EMI certification:</p> <ul style="list-style-type: none"> • EN 61326:1997 • EN 61000-3-2:1995 • EN 61000-3-3:1995 • FCC Part 15 Class A
Physical space requirement (w x d x h)	<p>53.5 x 43.7 x 60.0 cm (21.1 x 17.2 x 24.0 in)*</p> <p>*Maximum height. Z-arm height is adjustable to accommodate vessel heights between 1 and 150 mm (dependent on installed Z-arm).</p>
Power requirements	<p>Frequency: 50 to 60 Hz</p> <p>Voltage: 90-120 V or 220-240V, mains voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage</p> <p>Current rating: One 2.0A fuse for 90-120V or two 2.0A fuses for 220-240V</p>
Probe positioning performance	<p>Accuracy: +/- 1.0 mm in the XYZ dimensions</p> <p>Repeatability: +/- 0.25 mm in the XYZ dimensions</p>
Probe rinse	Probe rinsing occurs through a dedicated rinse station for rinsing the inside and outside of the probe
Number of racks	Up to four Code 20- or Code 30-series racks
Sample changer type	XYZ with stationary rack design

Software control	Computer control via RS-232 or GSIOC and Gilson control software Local control via Gilson Keypad Controller
Vertical punch strength	1 kg (2 lbs)
Weight	18.6 kg (41 lbs)

Installation

2

This section describes how to set up the 223 Sample Changer. The diagram below shows a possible configuration of the sample changer.

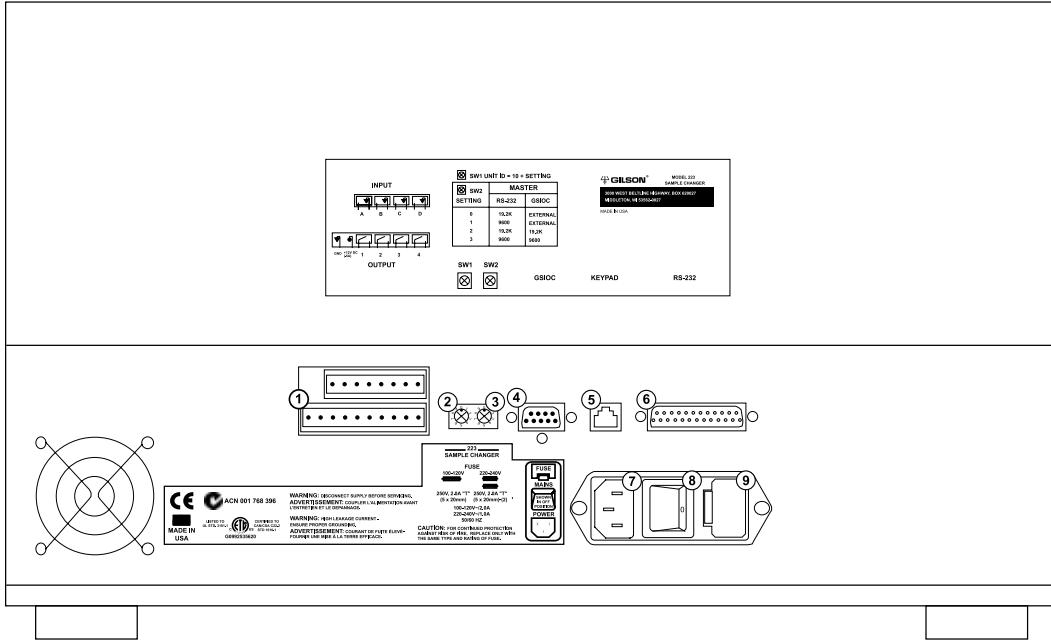


Rear Panel

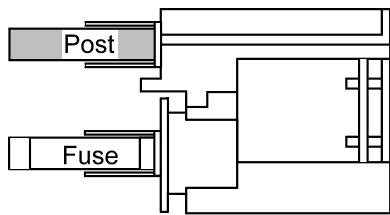
The following pages describe how to make rear panel connections. Before operating the sample changer, you must connect it to one of the following:

- to a computer's RS-232 port; the computer is the master device.
- to a Keypad Controller; the Keypad Controller is the master device.
- to the Gilson Serial Input/Output Channel (GSIOC); the GSIOC is the master device. In this configuration, a Gilson 506C System Interface is connected to a computer via an RS-232 cable. The sample changer and other GSIOC-compatible modules are connected to the system interface via GSIOC cable(s).

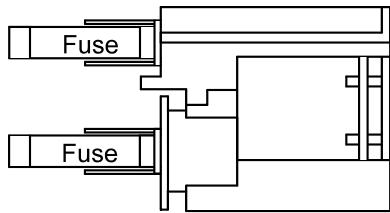
You also must install the fuse(s) and connect the sample changer's power cord to an outlet. Contact connections are optional.



- 1 Input/Output (I/O) contact ports
- 2 Unit ID selector
- 3 Baud rate selector
- 4 Gilson Serial Input/Output Channel (GSIOC) port
- 5 Keypad port
- 6 RS-232 port
- 7 Power receptacle
- 8 Power switch
- 9 Fuse drawer

Fuses

Fuse installation for
100/120 voltage



Fuse installation for
220/240 voltage

Fuses

You receive the sample changer without any fuses installed.

- 1 Locate the accessory package containing the fuse drawer appropriate for your line voltage. Discard the other fuse drawer.
- 2 Locate the accessory package containing the 2.0 amp 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.
- 4 Insert the fuse drawer into its receptacle in the sample changer. See rear panel diagram on page [2-3](#).

The RS-232 port is used to transfer information between the sample changer and a computer. For the location of the RS-232 port, refer to the diagram on page [2-3](#).

Using the computer, you can run programs that control the sample changer. See [Section 3](#) for more information.

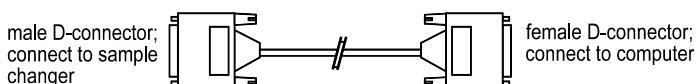
Be sure your computer is turned off before making any connections.

To connect your computer to the sample changer, you need an RS-232 cable. Obtain a cable with D-connectors that are appropriate for the sample changer and your computer. The sample changer requires a 25-pin male D-connector. Refer to the rear panel of your computer or its documentation to determine which type of D-connector it requires.

Connecting the RS-232 Cable

Attach the male end of the RS-232 cable to the RS-232 port located on the rear panel of the sample changer. Tighten the retaining screws.

Attach the other end of the RS-232 cable to the computer's RS-232 port. (Do not mistake it for the female 25-pin parallel printer port!) Again, tighten the retaining screws.



Keypad

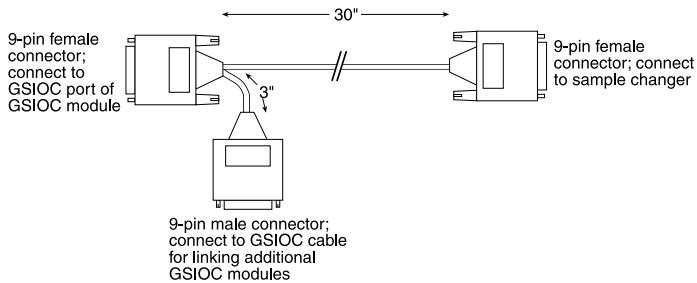
The Keypad port is used to connect a Keypad Controller to the sample changer. Connect the keypad's coiled cable to the sample changer's Keypad port. For the location of the Keypad port, refer to the diagram on page [2-3](#).

Using the keypad, you can run programs that control the sample changer. See *Section 3* for more information.

GSIOC

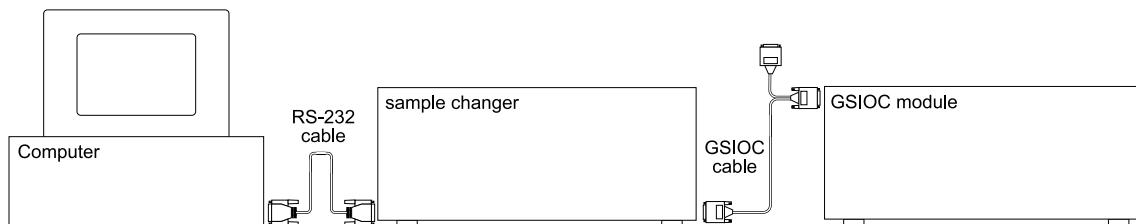
The GSIOC port enables you to link a GSIOC-compatible module to the sample changer and control both devices via a program executed on the computer or Keypad Controller.

- 1 Locate the accessory package with the GSIOC cable.



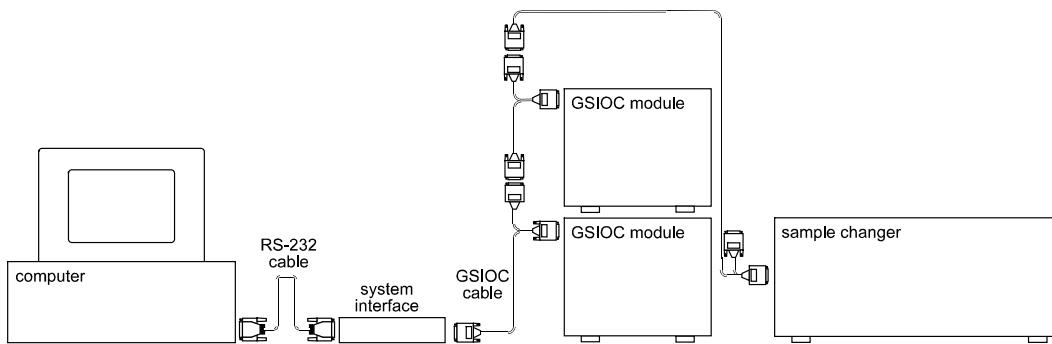
- 2 Connect the female connector, located individually at one end of the cable, into the GSIOC port of the sample changer. Tighten the retaining screws.
- 3 Connect the other female connector, located on the same end as the male connector, to the GSIOC module. Tighten the retaining screws.
- 4 If you are connecting another GSIOC module, use the male connector to join another GSIOC cable and make the necessary connection to the next GSIOC module.

The following diagram shows the cabling connections between a computer, sample changer, and GSIOC module.



GSIOC

If the GSIOC is the master device, the GSIOC port also enables you to link the sample changer and other GSIOC-compatible modules. In this configuration, a 506C System Interface is connected to a computer via an RS-232 cable. The sample changer and other GSIOC-compatible modules are connected to the system interface by linking GSIOC cables. If necessary, use the GSIOC cable (ordered separately, reference 36078143) to connect the sample changer to the GSIOC. Use the diagram below as a reference.

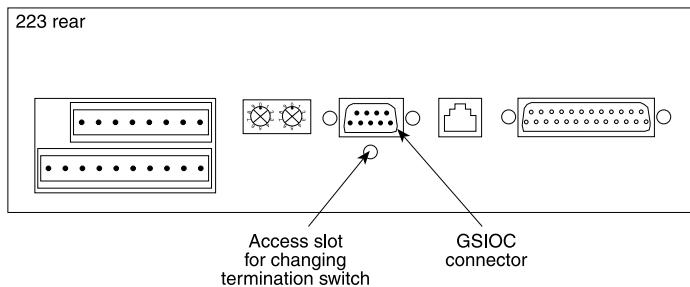


Changing Termination Switch

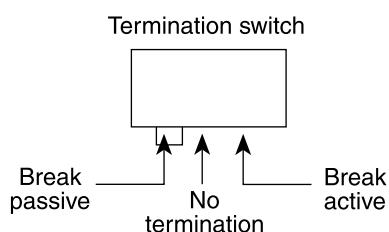
If you are controlling the sample changer via a GSIOC connection, you must change the position of the termination switch. The termination switch is inside of the sample changer and has three positions: break passive, no termination, and break active. The default position is break passive which is appropriate if you are controlling the sample changer via an RS-232 connection. However, for GSIOC control, you must place the switch in the no termination position.

To change the position of the termination switch:

- 1 Turn off the power to the sample changer.
- 2 Locate the access slot in the rear panel. Refer to the following diagram.



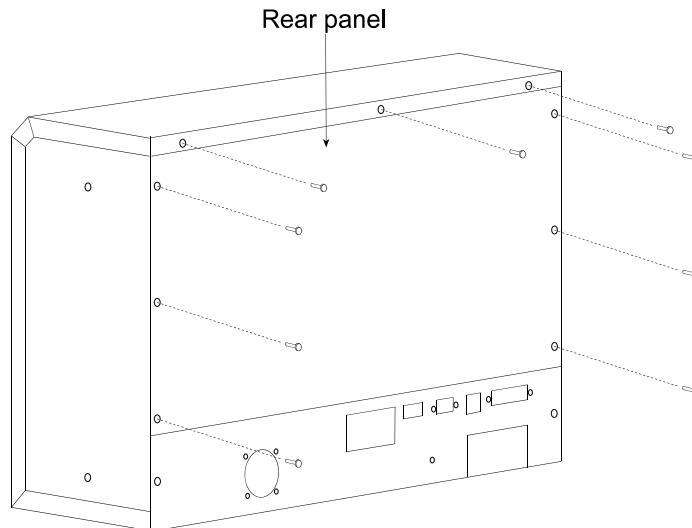
- 3 Insert a small screwdriver into the access slot.
- 4 Use the screwdriver to move the switch from its default left position (break passive position) to the center position (no termination position). The right position is the break active position. Refer to the following diagram.



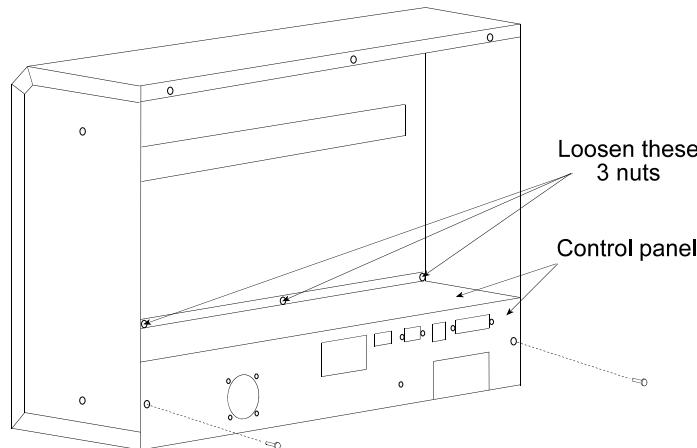
Alternate method for changing the termination switch

If your sample changer does not have an access slot on its rear panel, follow these steps to change the position of the termination switch:

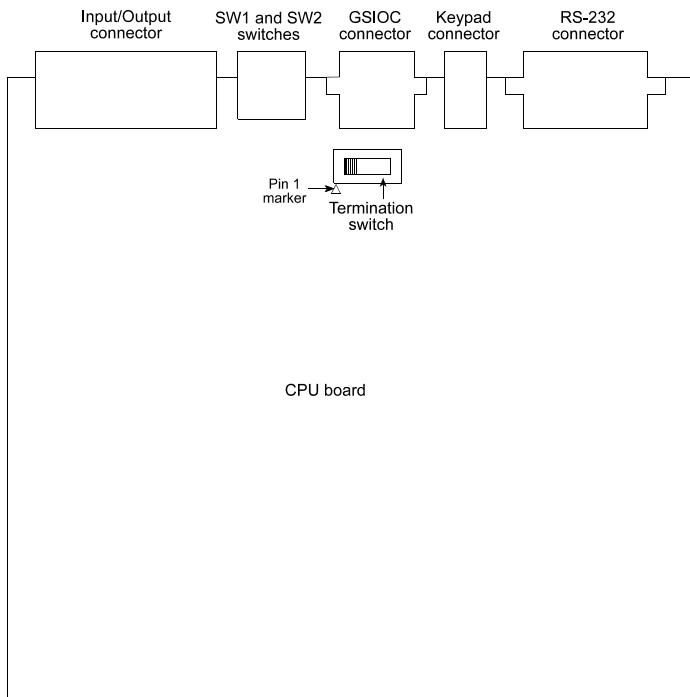
- 1 Turn off power and disconnect the power cord to the sample changer.
- 2 Remove the nine screws that secure the rear panel and then remove the rear panel. Refer to the following diagram.



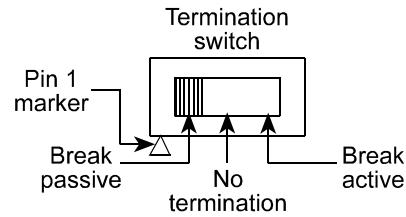
- 3 Locate the control panel. It includes the sample changer's connectors and switches. Refer to the following diagram.



- 4 Loosen the three internal nuts that secure the control panel to the front of the sample changer. And, remove the two screws that secure the control panel to the back side of the sample changer.
- 5 Remove the control panel by tilting it downward to free it from the three screws that secure it to the front of the sample changer. And, then pull the control panel away from the sample changer.
- 6 Turn over the control panel so you can see its components.
- 7 Locate the termination switch. The switch is below the GSIOC connector. Refer to the following diagram.



- 8 Move the termination switch to the break active position. Refer to the following diagram.
- 9 Reinstall the control panel and tighten its screws.
- 10 Reinstall the rear panel and tighten its screws.
- 11 Connect the power cord and turn on power to the sample changer.



Input/Output Contacts

You can use the input and output contacts found on the rear panel of the sample changer to control peripheral devices. Refer to the diagram on page 2-3 for the location of the input/output ports.

Inputs

The sample changer has connections for four inputs. All of the inputs are paired, and each of the pairs includes a GROUND reference (↓).

The contact input pairs are labeled A, B, C, and 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 sample changer has connections for five outputs. All of the outputs are paired.

Pins 1 and 2 supply ground and a +12V DC output. **Do not use this output unless the receiving device can accept 12V power. Do not allow more than 500 mA load.**

Pins 3 through 10 are paired, isolated-relay contact closures and are labeled 1, 2, 3, and 4.

Items You Need to Make Connections

To make connections, you need the following:

- 2-conductor cable (22 - 30 gauge for each wire)
- wire insulation stripper
- small-blade screwdriver

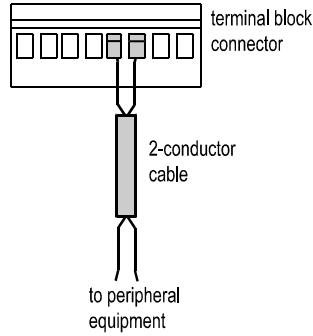
Making Connections

To prepare and make connections with the 2-conductor cable:

- 1 Cut the cable into pieces of appropriate length.
- 2 Strip about 1.1 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 slots while the one for outputs has ten.
- 4 Insert each wire into the appropriate slot on the terminal block connector. Push the wire all the way in; then tighten its corresponding pin screw.

Note: When making connections, be sure to maintain the correct orientation of the terminal block connector relative to the port. This is especially important if making connections to the +12V DC output.

- 5 Connect the terminal block connector to the sample changer. 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.



Power Cord

Locate the appropriate power cord for your line voltage. Discard the other power cord.

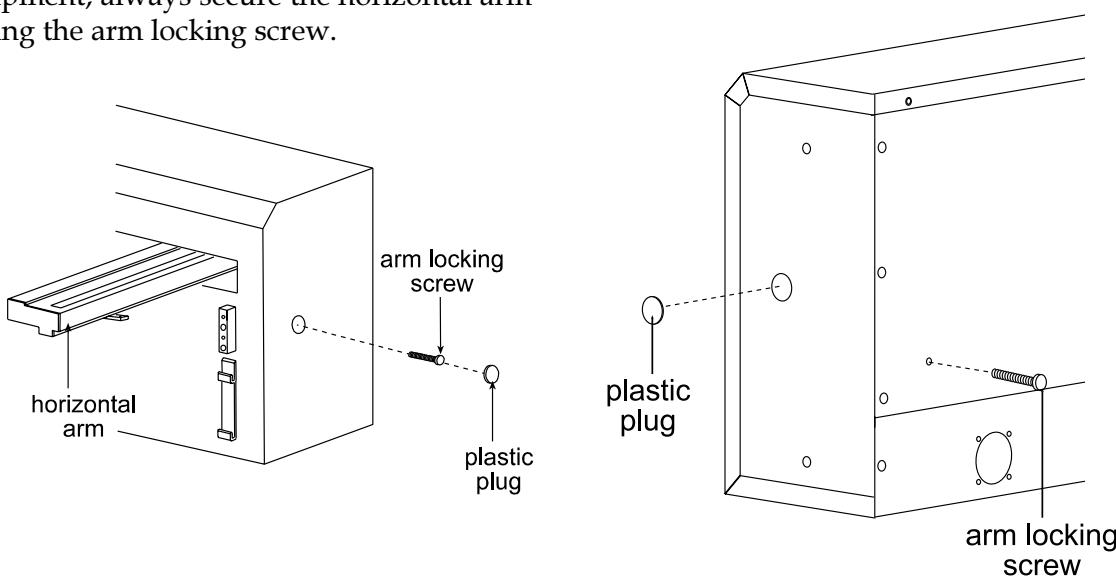
Use the power cord to connect the sample changer to an AC power source.

Arm Locking Screw Removal

During shipment, a screw locks the horizontal arm into place.

- 1 Locate and remove the black plastic plug located on the right side panel of the sample changer.
- 2 With your left hand, hold the horizontal arm into place.
- 3 Using a Phillips screwdriver, remove the arm locking screw, located inside the sample changer.
- 4 Insert the arm locking screw into its storage location on the rear panel.
- 5 Replace the plastic plug on the side panel.
- 6 Ensure that the horizontal arm can move by pushing it to the left as far as it will go.

Before packing the sample changer for shipment, always secure the horizontal arm using the arm locking screw.

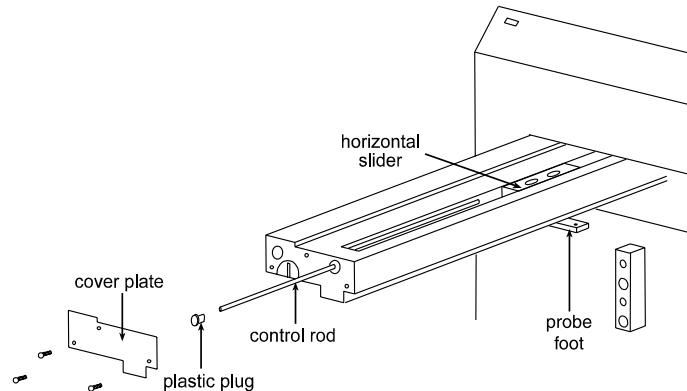


Vertical Arm Installation

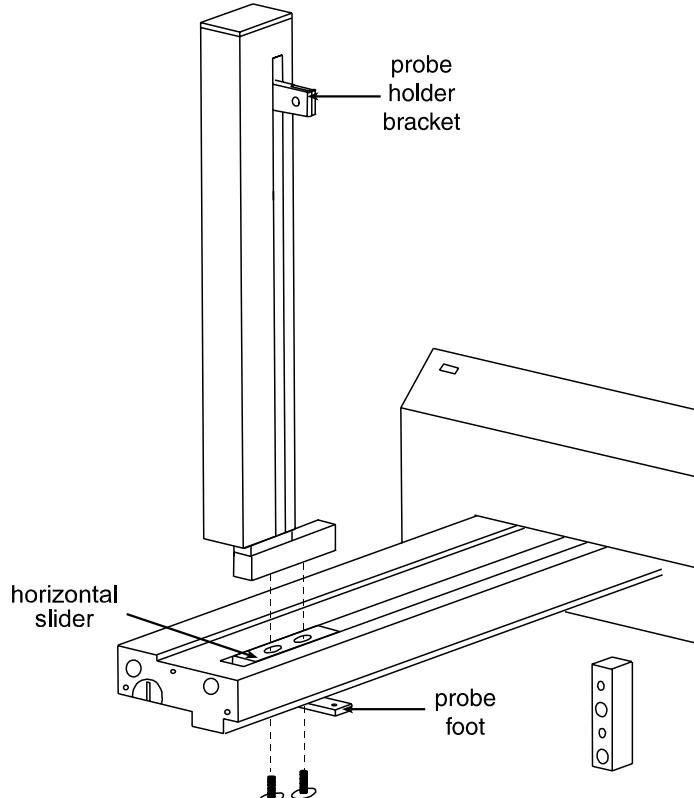
Before installing or changing the vertical arm, check that the power is turned off and the power cord is disconnected from the power socket. Also ensure that the arm locking screw has been removed and the horizontal arm can move.

To install the vertical arm:

- 1 Remove the cover plate from the front of the horizontal arm by removing its three screws.
- 2 Locate the hexagonal-shaped control rod and horizontal slider by looking down into the horizontal arm. See first diagram below.
- 3 Using your finger, press on the control rod where it passes through the horizontal slider. At the same time, pull the probe foot towards the front of the horizontal arm. This causes the white plastic plug and control rod to move forward slightly. When the white plastic plug is no longer flush with the front of the horizontal arm, remove it and the control rod from the horizontal arm.
- 4 Pull the probe foot, towards the front of the horizontal arm, as far as it will go.



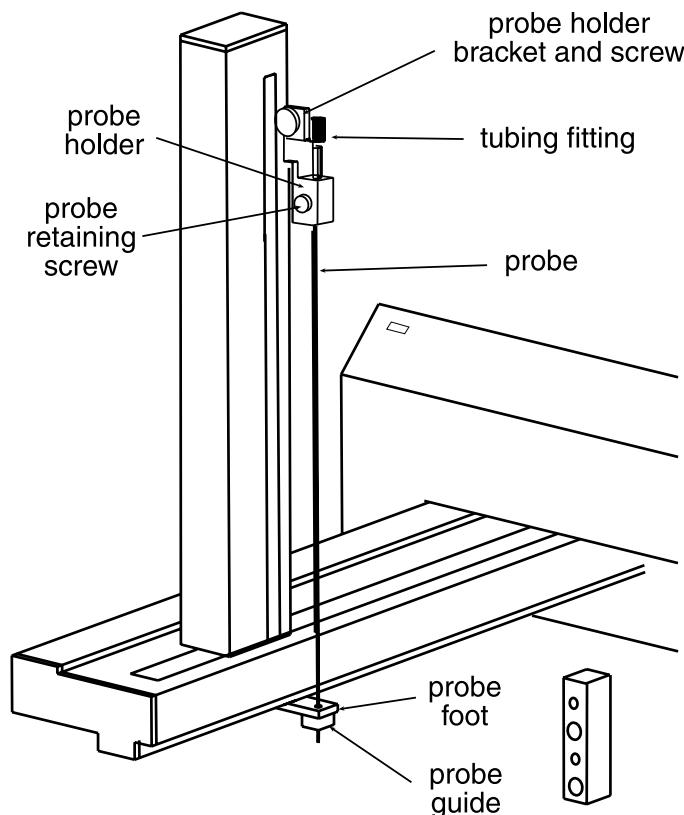
- 5 Position the vertical arm onto the horizontal slider. When viewed from the front of the sample changer, the vertical arm's probe holder bracket is on the right.
- 6 Use the supplied screws to secure the vertical arm to the horizontal slider. The screws insert into the bottom of the mounting holes in the horizontal slider. You may need to move the vertical arm back and forth slightly to align its mounting holes with those in the horizontal slider.
- 7 Re-insert the control rod as far as it will go. While inserting the control rod, you may need to rotate it back and forth slightly to get it to pass through the gearing and motor drive socket in the horizontal slider.
- 8 Applying pressure at the vertical arm's base, push the vertical arm to the back of the horizontal arm.
- 9 While slightly moving the probe holder bracket up and down, push the control rod until it clicks into position.
- 10 Re-insert the white plastic plug.
- 11 Re-attach the cover plate to the front of the horizontal arm.



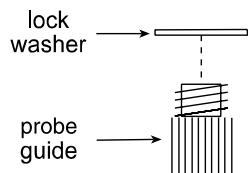
Probe Installation

Locate the accessory packages containing the probe and the probe holder/guide kit.

When installing the probe, refer to the following diagram that shows where the probe, probe holder, and probe guide are installed on the sample changer.



Installing Probe Guide



To install the probe guide:

- 1 Place the metal lock washer onto the probe guide.
- 2 Screw the probe guide with lock washer into place on the bottom side of the probe foot.

Installation

Installing Probe Holder

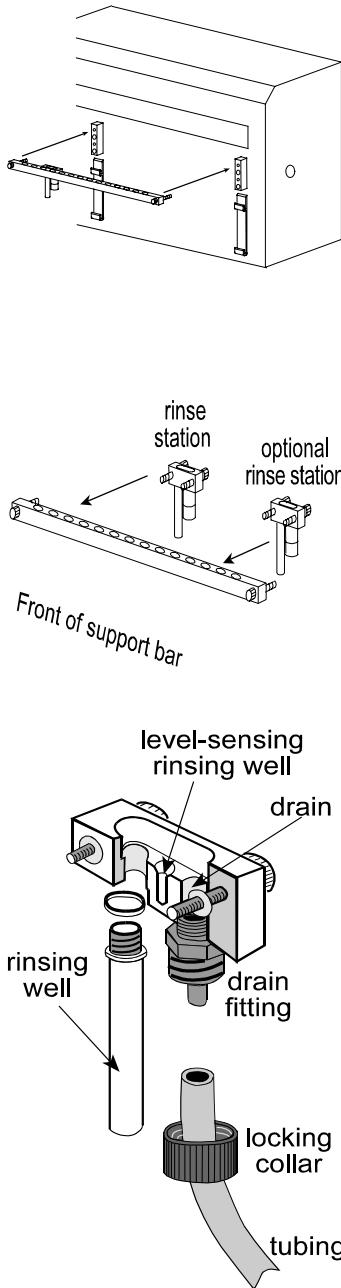
To install the probe holder, slide it into place on the probe holder bracket and secure with the supplied screw.

Installing Probe

To install the probe:

- 1 Slide the probe into the tubing fitting.
- 2 Connect the transfer tubing from the dilutor, if installed, to the tubing fitting.
- 3 Slide the probe assembly into the probe holder on the vertical arm making sure that the probe is centered over the probe guide.
- 4 Secure the probe by tightening the probe retaining screw.

Rinse Station and Support Bar Installation



Rinse Station and Support Bar Installation

The support bar attaches to the front face of the sample changer. Its rear contains mounting holes for rinse stations and its top contains mounting holes for transfer ports and filler ports.

Note: If you ordered rack holder (reference 1907142) or rack holder (reference 1907143), the support bar is part of the rack holder assembly. Attach any rinse stations, transfer ports, or filler ports to the rack holder's support bar.

- 1 Attach the rinse station(s) to the support bar. If using only one rinse station, the default position for the rinse station is the left side of the support bar when the bar is attached to the sample changer.

From left to right, the ports in a rinse station are the rinsing well, level-sensing rinsing well, and drain.

To attach tubing to the drain, locate the Tygon drain tubing (reference 470321803) or Isoversinic drain tubing (reference 13420034). Remove the locking collar from the drain fitting. Slide the tubing through the locking collar. Attach the tubing to the drain fitting. Then screw the collar onto the drain fitting. Place the other end of the tubing in a drain receptacle, located lower than the tray.

If you ordered a flow-through rinsing well, remove the rinsing well and attach the flow-through rinsing well in its place. Then attach tubing (reference 470331206) to the flow-through rinsing well and connect the other end to a liquid source.

- 2 Attach the support bar to the front of the sample changer using the knurled screws.

Tray Installation

The tray positions the racks and any accessories that fit onto the bed of the sample changer. It also contains liquid spills, such as those caused by overflowing vessels. The tray can be installed in an upper or lower position on the sample changer's bed depending on the size of tubes being used.

Lower Position

If you are using tubes that are more than 100 mm in height, install the tray in the lower position on the tray mounting brackets. Make sure that it fits securely and that the drain outlet is located at the left rear of the tray. Attach one end of the drain tubing (reference 470343706) to the drain outlet and place the other in a drain receptacle, located lower than the tray.

Upper Position

If using tubes that are less than 100 mm in height:

- 1 Screw the tray spacers into place. See diagram below.

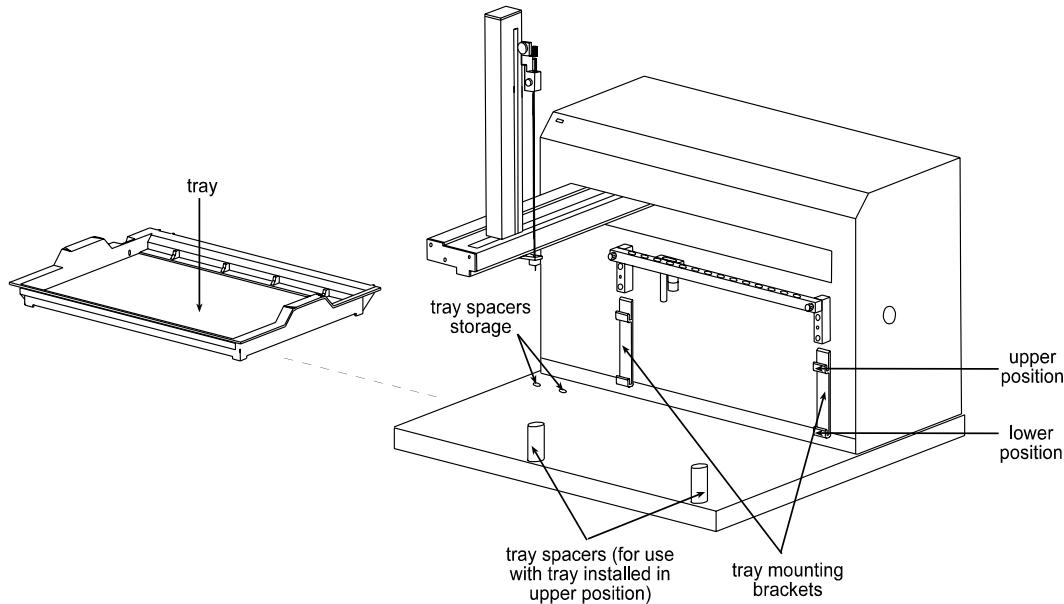
Note: When not being used, screw the tray spacers into the holes located in the left rear of the sample changer's bed.

- 2 Place the tray on top of the tray spacers making sure it fits securely in the tray mounting brackets and that the drain outlet is located at the left rear of the tray. Attach one end of the drain tubing (reference 470343706) to the drain outlet and place the other in a drain receptacle, located lower than the tray.

Tray Installation

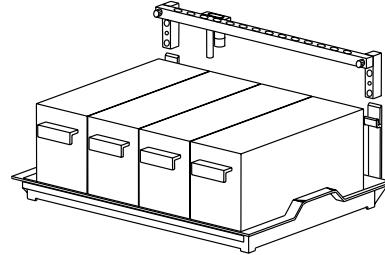
Tray Removal

To remove the tray, first lift it straight up and then bring it towards you.



Rack Installation

The sample changer is equipped to hold up to four Code 20-series or thermostated Code 30-series racks. Place each rack into the tray so the rack is perpendicular to the front panel of the sample changer. The rack code assigned to the rack should face you. (See [Appendix B](#) for a list of racks available for the sample changer.)



To use a Code 0, 7, 8, or 9 rack, you must install rack holder reference 1907143. To use Code 30P-series racks, you must install rack holder reference 1907142. Installing rack holder reference 1907143 or reference 1907142 is described on the next page.

To use microplates, you must install microplate holder reference 1907151. See page 2-25.

Accessory Installation

Rack Holder

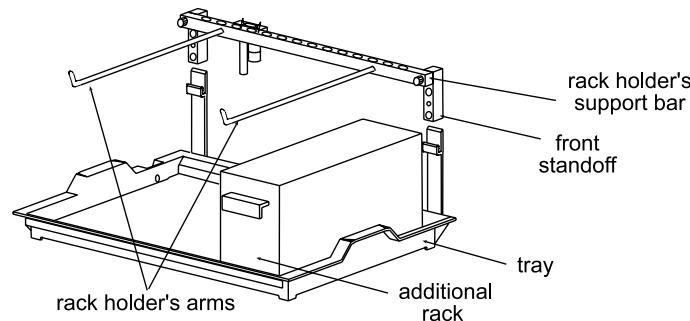
Installing a rack holder enables you to position a single rack sideways within the sample changer's work area. A Code 0, 7, 8, or 9 rack requires rack holder reference 1907143. A Code 30P-series rack requires rack holder reference 1907142.

Note: You can also install one Code 30-series rack on rack holder reference 1907142.

Before installing the rack holder, you may need to remove the support bar from the sample changer. Then remove any rinse stations, filler port, and transfer ports from the support bar and place each one in the corresponding location on the rack holder's support bar.

Connect the rack holder's support bar to the upper position of the front standoffs of the sample changer (in the same position that the previous support bar was located). Place the rack onto the rack holder's arms. A Code 20- or 30-series rack can be placed on the tray in the far right position.

Note: If the 85 mm rinsing well is installed on the rinse station, install the tray in the lower position.



Installation

Microplate Holder

To use microplates with the sample changer, you must install the microplate holder. You can use standard or deep well microplates.

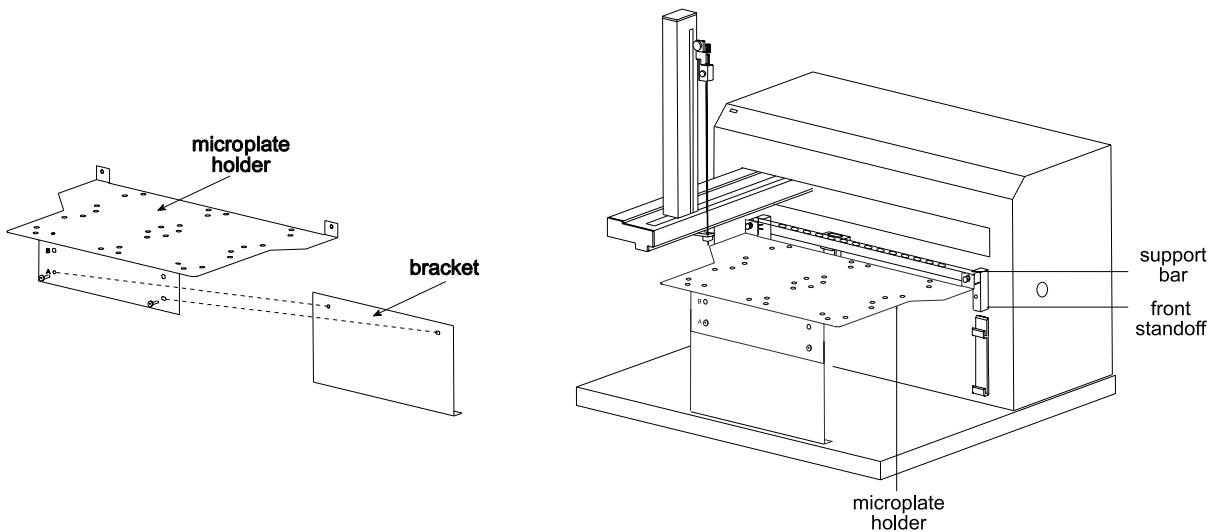
A bracket must be attached to the microplate holder before the microplate is installed. Assembly and installation of the microplate holder depends on the type of microplates to be used. Refer to the appropriate instructions below.

Instructions for standard microplates

For standard microplates:

- 1 Align the lower set of holes (labeled A) in the microplate holder with the holes in the metal bracket. Insert the supplied Phillips-head screws and tighten.
- 2 If installed, remove the polypropylene tray.
- 3 Install the microplate holder, in the upper position on the front standoffs, using the two knurled screws.

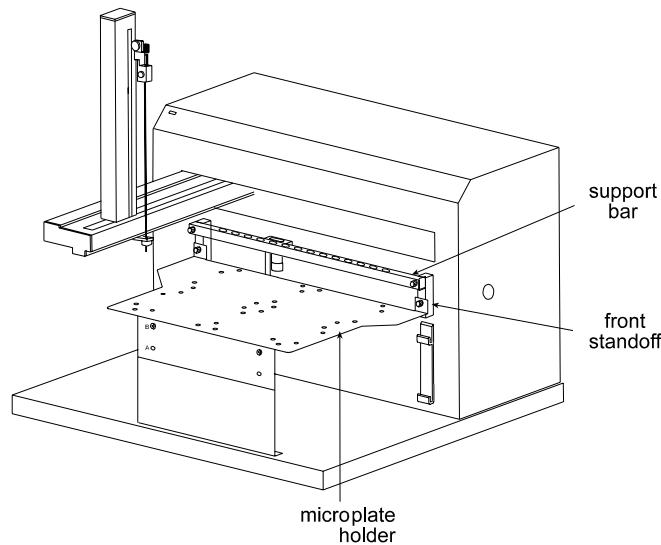
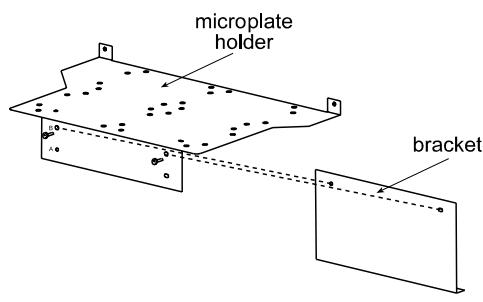
Note: If a support bar is installed, install the rack holder in front of the support bar.



Instructions for deep well microplates

For deep well microplates:

- 1 Align the upper set of holes (labelled B) in the microplate holder with the holes in the metal bracket. Insert the supplied Phillips-head screws and tighten.
- 2 If installed, remove the polypropylene tray.
- 3 Install the microplate holder, in the lower position of the front standoffs, below the support bar if installed. Use the two knurled screws supplied with the microplate holder.

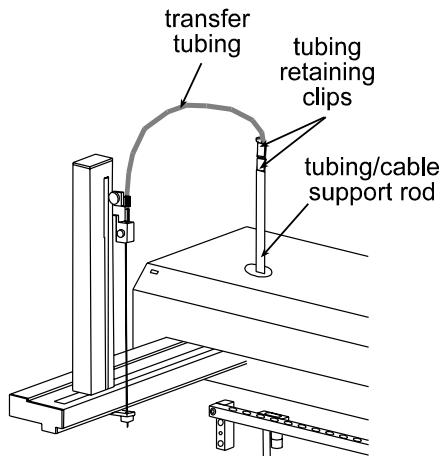


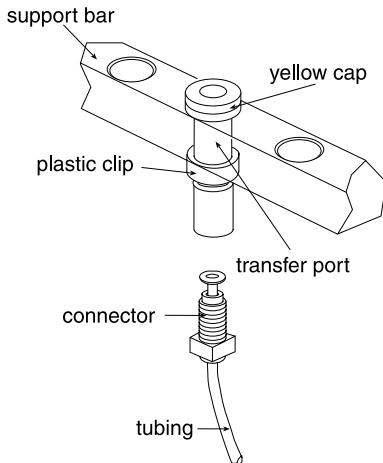
Tubing/Cable Support Rod

The tubing/cable support rod restrains excess transfer tubing. Place the tubing/cable support rod on top of the sample changer. A magnet at the bottom of the rod holds it into place on top of the sample changer.

Snap the transfer tubing between the probe and dilutor into the small grooves on the clips installed on the tubing/cable support rod. (You may need to pry the grooves apart using a flatblade screwdriver before snapping the tubing into place.) Also remember to leave enough tubing to account for the movement of the probe.

Gather any excess transfer 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 sample changer.



Accessory Installation**Transfer Port**

To install a transfer port:

- 1 Place the transfer port in any mounting hole on the support bar.
- 2 Screw the male tubing connector into the bottom of the transfer port.
- 3 Fit a yellow cap to the top of the transfer port.
- 4 Connect the other end of the tubing to a filter and place it in a solvent or sample bottle. Make sure the solvent or sample bottle is at the same level as or higher than the sample changer's tray.
- 5 Fix the plastic clip onto the transfer port.

Using transfer ports

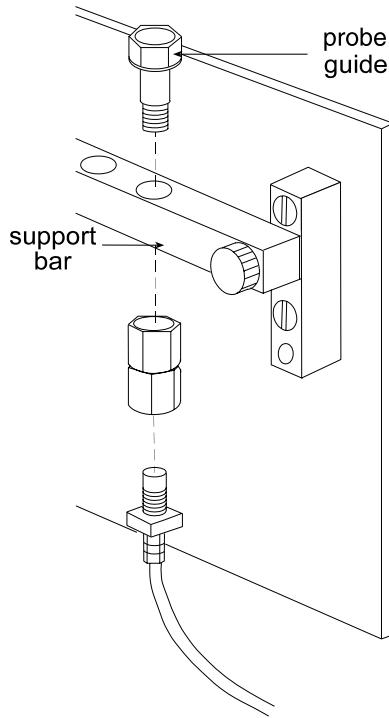
Be aware of the following when using transfer ports:

- Place the solvent or sample bottle at the same level as or higher than the tray.
- Use a beveled edge constricting probe.
- Prime each transfer port before use.

Filler Port

When a sample is prepared, it can be injected into a peripheral instrument via a filler port which can be installed on the support bar. Refer to the diagram when installing the filler port.

- 1 Separate the probe guide from the filler port assembly by unscrewing it. The probe guide has a hexagonal head.
- 2 Insert the probe guide into a mounting hole on the support bar and tighten.
- 3 Attach the bottom portion of the filler port assembly to the probe guide.

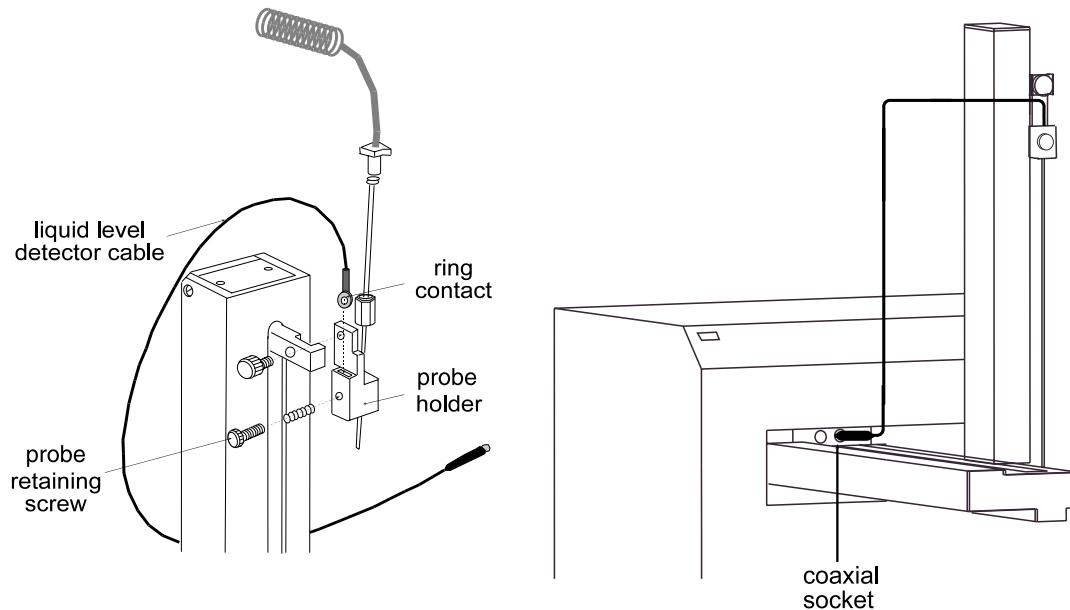


Liquid Level Detector

The liquid level detector detects when the probe has reached the liquid surface. This permits the program controlling the sample changer to calculate the change in the liquid level so the tip of the probe remains a predetermined distance below the liquid's surface.

To install the liquid level detector cable:

- 1 Remove the probe retaining screw from the probe holder.
- 2 Slide the ring contact of the liquid level detector cable into the slot provided on the probe holder.
- 3 Secure the probe retaining screw.
- 4 Plug the end of the cable into the coaxial socket.



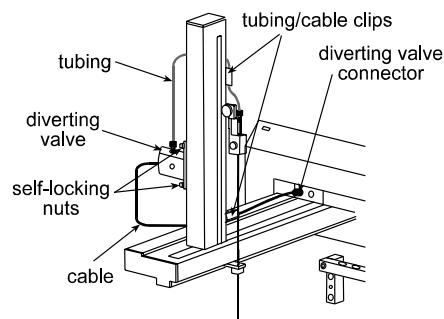
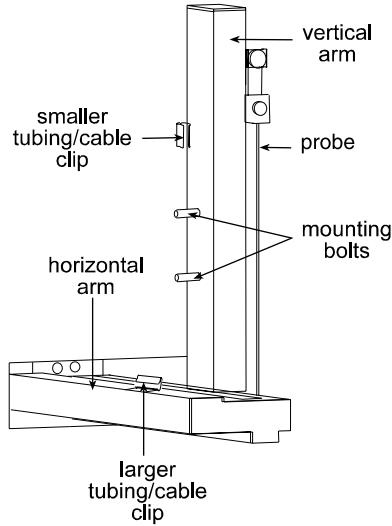
To disconnect the cable from the front face of the sample changer, you need to pull the collar on the connector towards you before you can detach the connector.

Installation

Diverting Valve

To install the diverting valve:

- 1 Turn off power to the sample changer and, if installed, its dilutor.
- 2 If installed, disconnect the dilutor's transfer tubing from the probe.
- 3 Locate the larger tubing/cable clip supplied with the diverting valve. Attach the clip to the left of the vertical arm, in the center of the horizontal arm.
- 4 Locate the smaller tubing/cable clip. Attach the clip to the back of the vertical arm (the side that faces the rear panel of the sample changer); position the clip approximately 1/3 of the distance from the top of the vertical arm to its bottom.
- 5 Remove the protective covers from the bolts located on the left side of the vertical arm.
- 6 Attach the valve to the left side of the vertical arm by inserting the mounting bolts through the two holes on the valve's mounting bracket. Secure the valve using the two self-locking nuts. When placing the nuts onto the bolts, the plastic side faces outward. Use a 5/16" wrench to fully tighten the nuts.
- 7 Snap the diverting valve's cable into the tubing/cable clip attached to the horizontal arm. Then connect the cable to its connector on the front face of the sample changer.
- 8 Since the top port of the diverting valve is the common port, attach one end of the supplied tubing to the top port and the other end to the probe. Snap the tubing into the tubing/cable clip attached to the back of the vertical arm. If necessary, lower the probe so you can route the tubing through the clip.
- 9 Attach the transfer tubing from each dilutor to the side ports.



Unit ID and Baud Rate Selection

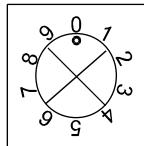
Use the SW1 selector to choose a different unit ID and the SW2 to choose a different baud rate. These selectors are located on the sample changer's rear panel; see page [2-3](#) if necessary.

Unit ID

The unit ID identifies the sample changer to software packages that can issue GSIOC commands to the sample changer.

At the factory, the unit ID is set to 10. There is no need to change this number unless it is the same as that assigned to another GSIOC device that is 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 10 plus the selected number.

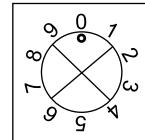
Baud Rate

As a default, the baud rate selector is set to 0 for identifying a baud rate of 19200 for keypad or computer control, or for identifying an external clock for GSIOC control.

The baud rate for the Keypad Controller is 19200 so do not modify the SW2 selection if a keypad is connected to the sample changer.

If your computer's baud rate is 9600, change the setting for the SW2 selector to 1 or 3.

- 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 1 or 3.



If the GSIOC is the master device and the GSIOC source does not have a clock (for example, a Macintosh computer), change the setting to 2 or 3 using the procedure above.

Operation

3

The 223 Sample Changer is controlled as follows:

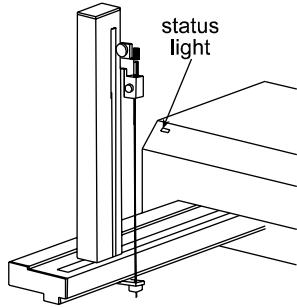
- Via a method running on a personal computer. You create the method using 735 Sampler Software or 709 Sampler Manager Software. All are ordered separately. See [*Appendix A, Replacement Parts and Accessories*](#) for reference numbers.
- Via an executable file running on a Gilson Keypad Controller. You create the executable file using the Gilson 709 Sampler Manager Software (ordered separately, reference 2106243).

If you have not already done so, install 735 Sampler Software or 709 Sampler Manager Software. Refer to the *User's Guide* included with the software.

Start Up

Start Up

To start the sample changer:



- 1 Make sure the sample changer is connected to a power source.
- 2 Turn on the sample changer using the power switch located on the rear panel. The status light on the front panel becomes lit.

If the status light begins blinking, there is a problem with the sample changer. See page [5-6](#).

The sample changer is controlled by programs executed from a personal computer or Gilson Keypad Controller.

Program for Windows NT users

The computer is connected to the sample changer via an RS-232 cable. Refer to [Section 2, Installation](#) for correct installation of the RS-232 cable between the sample changer and the computer.

The following utility program is supplied on the 223 Utility Program CD-ROM supplied with your sample changer.

223 Setup Utility - Specifies configuration parameters for the sample changer.

Programs for Gilson Keypad Users

The following programs are copied to your computer's disk as part of the 709 Sampler Manager Software installation procedure and can be used if you are controlling the sample changer via the Gilson keypad.

Note: 709 Sampler Manager Software will not run under Windows NT.

The Pascal versions of these programs are also copied to the computer as part of the software's installation. You can modify them as required using the software.

- SET_223.EXE
- CONTACT.EXE
- XYZ_TEST.EXE
- POSN_223.EXE

Running Programs from the Keypad

A Gilson Keypad Controller can be used as an alternate interface between the user and the sample changer. The keypad is connected to the sample changer via a coiled cable. Refer to [Section 2](#) for correct installation of the cable to the Keypad port, located on the sample changer's rear panel.

The keypad consists of:

- an 8-line, 40-character display (white characters on a blue background)
- numeric keypad with an ENTER key
- four cursor direction keys
- four programmable soft keys
- three function keys, HELP, ESC, CLEAR
- 3 1/2" disk drive with protective cover

Supplied with the 709 Sampler Manager Software installation disks is the 223 Keypad disk that contains the programs listed on page 3-3 and the files listed below. In order to run an executable file from the keypad, the disk on which the program is stored must contain the following files.

- MGSIOC.SYS
- AUTOEXEC.BAT
- CONFIG.SYS
- MENU.EXE

An optional program to set the time and date is also provided on the disk but is not required to run programs controlling the sample changer. Files for this optional program are DAYTIME.EXE and DAYTIME.TXT.

To copy your sample changer program(s) onto the keypad disk use the Windows Explorer in Microsoft Windows.

Operation

The MENU.EXE program allows you to view and select one of up to 100 executable files stored on the disk. If you have more than 100 files and you want to maintain your keypad disk, move the utility programs and example programs to another disk or to a computer for storage.

To run an executable file, enter the number of the program corresponding to the menu selection and press ENTER. To stop a program, follow the program-specific instructions on stopping the program.

If a program prompts you for a yes or no (Y/N) response, press 1 on the keypad to indicate yes or 0 to indicate no.

Checking Configuration Options

The sample changer comes from the factory with its configuration already set. Configuration information is stored in the non-volatile memory (NV-RAM) of the sample changer. Prior to using the sample changer for the first time, review and adjust the default configuration to ensure it is correct for your setup.

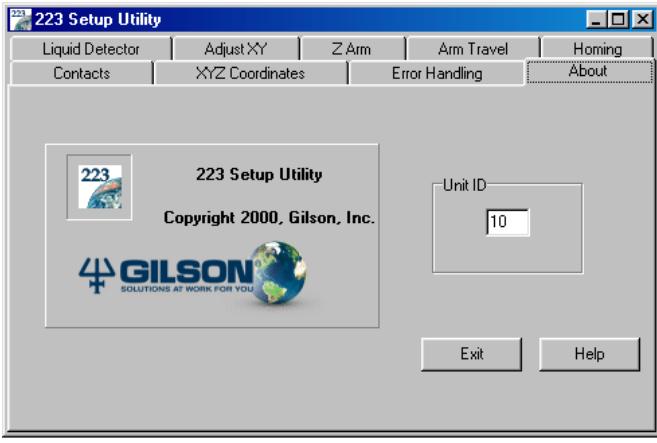
The 223 Setup Utility program allows you to review and if necessary change the configuration options set for the sample changer.

When you execute the 223 Setup Utility from the computer, the following tabs appear:

- About
- Error Handling
- Arm Travel
- XYZ Coordinates
- Contacts
- Homing
- Adjust XY
- Liquid Detector
- Z-Arm

Following is a description of each of the tabs.

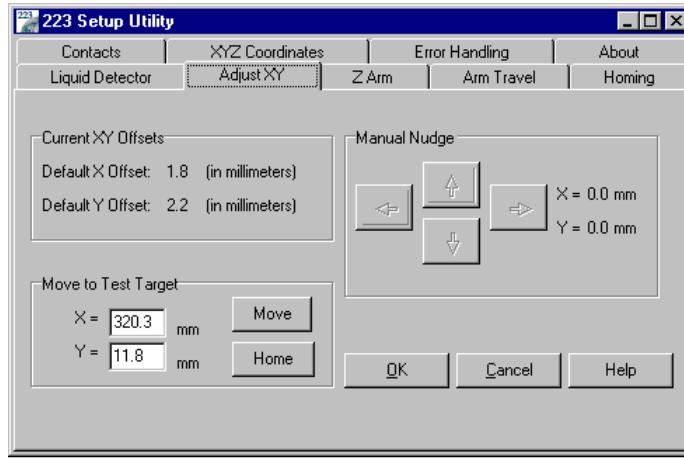
About



The About tab allows you to indicate the unit ID of the instrument being configured so the 223 Setup Utility can communicate with that instrument.

This tab also lists software version and copyright information for the 223 Setup Utility.

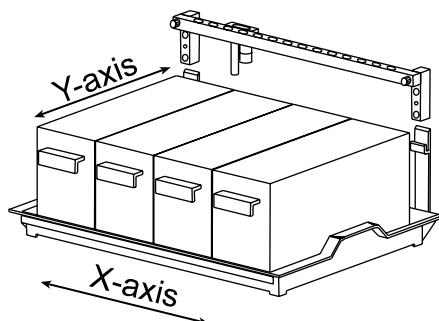
Adjust XY



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 transfer port, filler port, 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(s) need(s) to be adjusted in the X or Y direction:

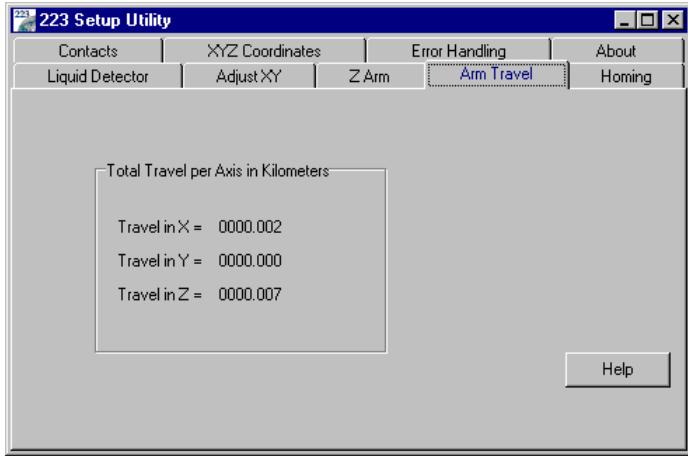


- 1 Select a test point.
- 2 Click on *Move*. When the probe reaches the target site, the software relaxes the Z Arm so you can manually raise and lower the probe for visual alignment confirmation on the target site.
- 3 If the probe is not aligned over the target location, use the Manual Nudge arrow buttons to move the probe in the appropriate X or Y direction.
- 4 To store changes to the X and Y offsets, click *Ok*.

Or, to display the X and Y offsets currently set in the instrument's memory, click *Cancel*.

- 5 Click *Home* to home the instrument.

Arm Travel



The Arm Travel tab displays the XYZ travel in kilometers.

Liquid Detector



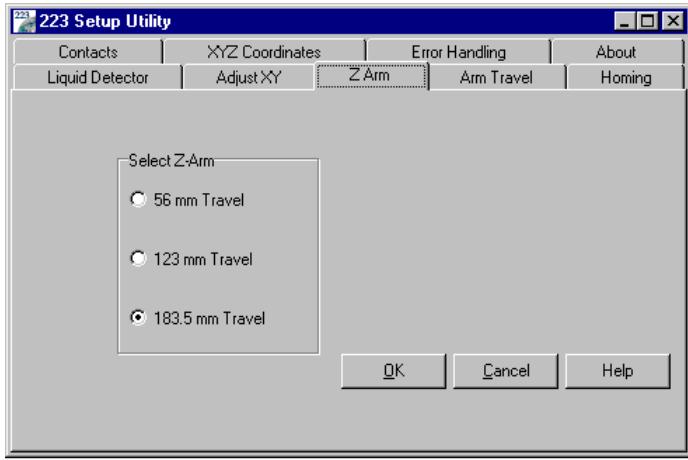
The Liquid Detector tab allows you to adjust the sensitivity of liquid detection. The factory default setting is 3%.

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 sample changer's memory, click *Ok*.

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

Z Arm

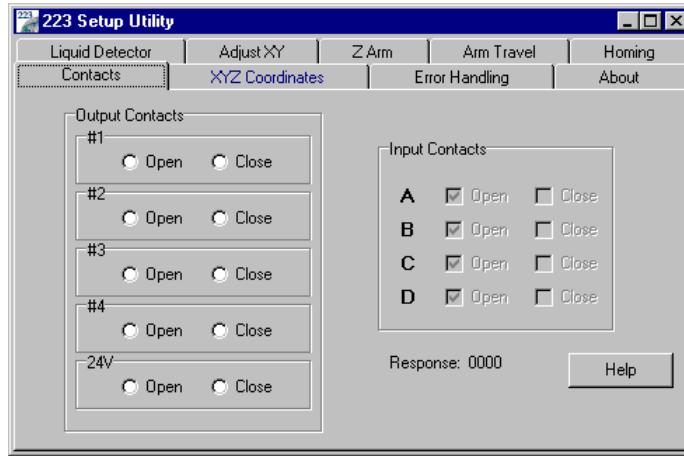


Use the Z Arm tab to identify the size of the installed Z Arm. Setting the size of the Z Arm controls the amount of travel in the Z-axis.

To store the selected Z-height settings to the sample changer's memory, click *Ok*.

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

Contacts

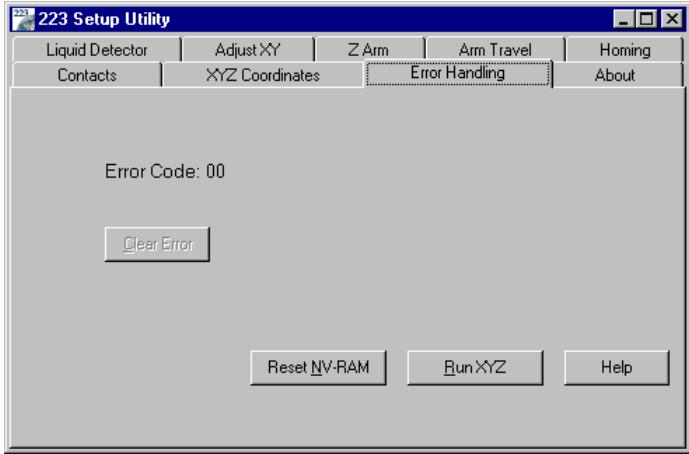


The Contacts tab allows you to toggle output contacts to determine if the correct contact connections have been made to peripheral devices to be controlled by the 223 Sample Changer.

Before using this tab, you need to connect the peripheral device's inputs to the appropriate output pair on the sample changer. If necessary, refer to *Section 2* for information on making contact connections.

To exit the software, click on *Done*.

Error Handling



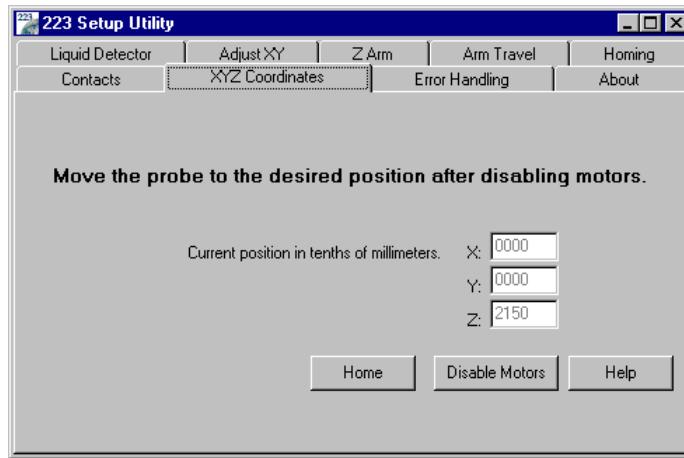
This tab displays the current error when the instrument is in an error state. For error solutions, refer to [Section 5, Troubleshooting](#) in the *223 Sample Changer User's Guide*. To clear the error, click *Clear error*.

Click *Reset NV-RAM* to reset the configuration options to the factory defaults.

Click *Run XYZ* to demonstrate the capabilities of the sample changer by performing an XYZ test. The XYZ test moves the probe to several locations.

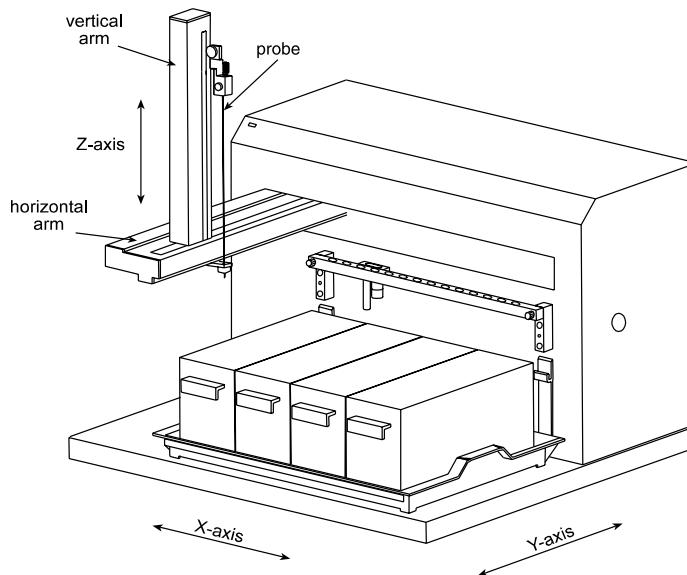
Warning! Remove the probe before running this test!

XYZ Coordinates

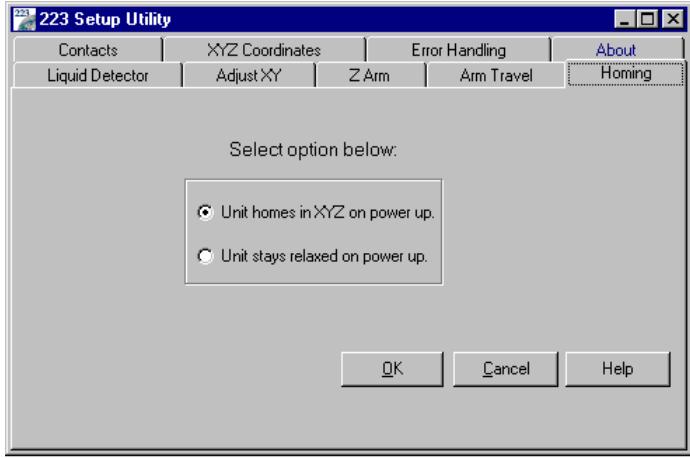


Use this tab to identify the X, Y, Z coordinates of locations on the sample changer's work area and Z coordinate of the probe's tip.

First, click *Disable Motors*. Then, manually move the horizontal and vertical arms to a location on the sample changer's work area. Finally, manually lower or raise the probe to the appropriate height. The 223 Setup Utility displays the X, Y, and Z coordinates.



Homing



This tab allows you to choose whether the instrument should home when powered up (click *Unit homes in XYZ on power up.*) or whether the motors in the arm should be disabled when the instrument powers up (click *Unit stays relaxed on power up.*).

Maintenance

4

To obtain optimum performance and maximum life from the sample changer, keep it well-maintained.

This section contains some general guidelines for maintaining your sample changer.

Cleaning the Sample Changer

The sample changer 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 sample changer, wipe the instrument using a dry, clean cloth.

Replacing Parts

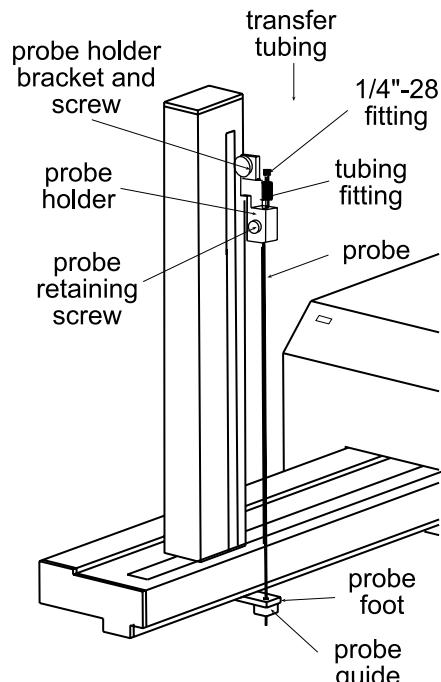
Replacing the Probe

Refer to the appropriate instructions below depending on whether your replacing the probe with one of the same type or one of a different type.

Installing same type of probe

To install a replacement probe of the same type that is currently installed:

- 1 Remove the transfer tubing's 1/4"-28 fitting from the tubing fitting.
- 2 Loosen the probe retaining screw and remove the probe and tubing fitting from the probe holder.
- 3 Remove the old probe from the tubing fitting and insert the replacement probe.
- 4 Slide the probe assembly into the probe holder making sure that the probe is centered over the probe guide.
- 5 Secure the probe by tightening the probe retaining screw.
- 6 Re-attach and tighten the transfer tubing's 1/4"-28 fitting.



Installing different type of probe

To install a different type of probe, you may need to obtain a different probe holder and guide for the probe. See [Appendix A](#).

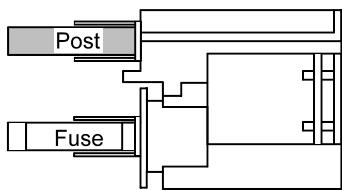
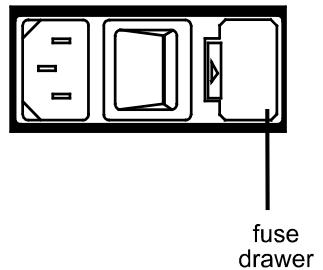
- 1 Remove the transfer tubing's 1/4"-28 fitting from the tubing fitting.
- 2 Loosen the probe retaining screw and remove the current probe and tubing fitting.
- 3 Unscrew the current probe guide from probe foot. Then screw the new probe guide into place.
- 4 Remove the screw securing the probe holder to the bracket and then pull the probe holder from the bracket. Insert the new probe holder into the bracket and secure using the screw.
- 5 Install the new probe into the tubing fitting. Slide the probe assembly into the probe holder making sure that the probe is centered over the probe guide. Secure the probe by tightening the probe retaining screw.
- 6 Re-attach and tighten the transfer tubing's 1/4"-28 fitting.

Replacing a Fuse

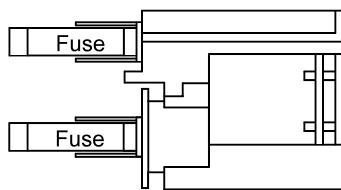
A blown fuse may indicate the existence of another problem in the instrument. If the replacement fuses blow, do not try others.

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 2-3 if necessary.
- 3 Insert a small screwdriver into the notch located at the left of the fuse drawer.
- 4 Twist the screwdriver to open and remove the fuse drawer. The fuse drawer contains one 2.0A "T" Slo-Blo fuse (5 x 20 mm size) for a 100/120 voltage selection. It contains two 2.0A fuses for a 220/240 voltage selection.



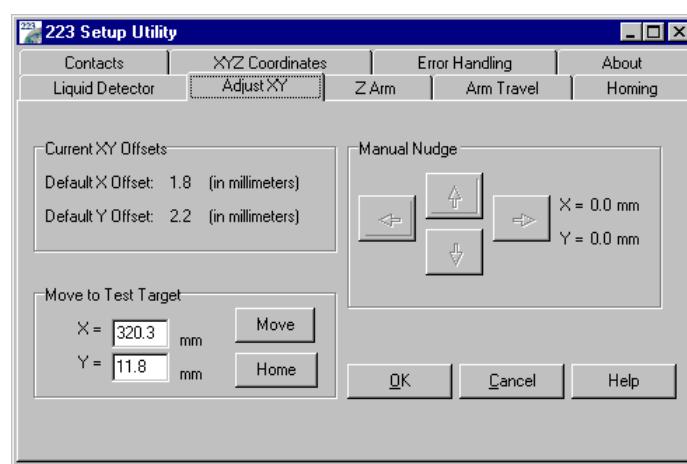
Fuse installation for
100/120 voltage



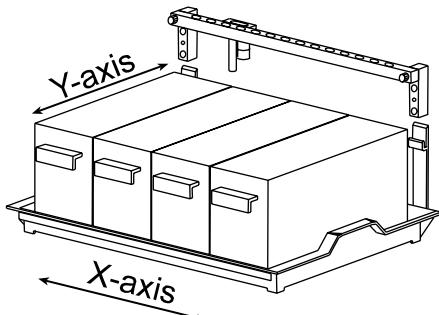
Fuse installation for
220/240 voltage

- 5 Remove the old fuse(s) and insert the new fuse(s).
- 6 Insert the fuse drawer into its receptacle in the sample changer.

Checking Position Alignment



The 223 Setup Utility (Adjust XY tab), described in *Section 3*, 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 transfer port, filler port, 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(s) need(s) to be adjusted in the X or Y direction:

- 1 Select a test point.
- 2 Click on *Move*. When the probe reaches the target site, the software relaxes the Z Arm so you can manually raise and lower the probe for visual alignment confirmation on the target site.
- 3 If the probe is not aligned over the target location, use the Manual Nudge arrow buttons to move the probe in the appropriate X or Y direction.
- 4 To store changes to the X and Y offsets, click *Ok*.

Or, to display the X and Y offsets currently set in the instrument's memory, click *Cancel*.

- 5 Click *Home* to home the instrument.

Transporting the Sample Changer

When moving the sample changer:

- 1 Re-install the arm locking screw using the following procedure. Refer to the diagrams on page 2-7 if necessary.
 - a) Turn off the sample changer.
 - b) Move the horizontal arm to the right as far as it will go.
 - c) Locate and remove the arm locking screw from its storage location on the rear panel.
 - d) Remove the plastic plug located on the right side panel.
 - e) While holding the horizontal arm in its far right position, install the arm locking screw into place inside the sample changer.
 - f) Replace the plastic plug.
- 2 Lift the sample changer by grasping the base. Do not use the horizontal arm as a handle.

If packaging the sample changer for shipment, remove the vertical arm. To remove the vertical arm, refer to the diagrams on pages 2-16 and 2-17 and follow the instructions below.

- 1 Disconnect the transfer tubing from the probe.
- 2 Loosen the probe retaining screw and remove the probe.
- 3 Remove the plate from the front of the horizontal arm by removing its three screws.
- 4 Locate the hexagonal-shaped control rod by looking down into the horizontal arm. Lightly press on the rod with your finger and push the rod towards you. When the end of the rod is no longer flush with the end of the horizontal arm, grasp the rod and completely remove it.
- 5 While holding the vertical arm, loosen the two screws, on the underside of the horizontal arm, that secure the vertical arm. Remove the vertical arm.
- 6 Re-insert the control rod as far as it will go. While inserting the rod, you may need to rotate the rod back and forth slightly to get it to pass through the vertical arm's gearing and motor drive socket.
- 7 Re-attach the plate to the front of the horizontal arm.

Troubleshooting

5

Error Messages

<i>Error</i>	<i>Description</i>	<i>Solution</i>
15	NV-RAM checksum is invalid	<ul style="list-style-type: none">Send the buffered ~9 GSIOC command to reset the NV-RAM and initialize to the default value. Run SET_223.EXE or the 223 Setup Utility program to check configuration options.Replace the NVM.
20	X motor position error	<ul style="list-style-type: none">Cycle power to the sample changer.Check for obstructions.
21	Y motor position error	<ul style="list-style-type: none">Cycle power to the sample changer.Check for obstructions.
22	Z motor position error	<ul style="list-style-type: none">Cycle power to the sample changer.Check for obstructions.
23	X sensor inactive	Check if the sensor disk is bent. Then contact the Gilson Customer Service Department.
24	Y sensor inactive	Check if the sensor disk is bent. Then contact the Gilson Customer Service Department.
25	Z sensor inactive	Check if the sensor disk is bent. Then contact the Gilson Customer Service Department.
26	X target position out of range	Correct the error in the program controlling the sample changer.
27	Y target position out of range	Correct the error in the program controlling the sample changer.
28	Z target position out of range	Send the immediate Q command using the GSIOC Utility Program to read the travel range. Correct the error in the program controlling the sample changer.
29	X-offset out of range	Run SET_223.EXE or the 223 Setup Utility (Adjust XY tab) program to correct the problem. If the problem persists, contact the Gilson Customer Service Department.

- | | | |
|----|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 30 | Y-offset out of range | Run SET_223.EXE or the 223 Setup Utility (Adjust XY tab) program to correct the problem. If the problem persists, contact the Gilson Customer Service Department. |
| 31 | Z-offset out of range | Run SET_223.EXE or the 223 Setup Utility (Adjust XY tab) program to correct the problem. If the problem persists, contact the Gilson Customer Service Department. |

Mechanical Problems

Probe not finding tube center

Probe may be bent. Straighten or replace the probe.

The sample changer may be misaligned. Perform the position alignment procedure described on page [4-6](#).

Electrical Problems

Input functions not operating

Make sure connections into the terminal block connector are secure.

Make sure the terminal block connector is secure in input/output port.

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 \emptyset activates).

Confirm that the device supplying the input signal to the sample changer is working.

Check logic of controlling program.

Output functions not operating

Make sure connections into the barrier strip are secure.

Make sure the terminal block connector is secure in the input/output port.

Check connections for proper pin assignments.

Output from the sample changer should be compatible with the device to which it is interfaced. Outputs are contact closures.

Check logic of controlling program.

Status light not illuminated

Ensure power is turned on.

Check AC power cord connections.

Try different AC outlet.

Check fuse(s); replace if necessary.

Check all sample changer connections.

Status light blinking

Check for obstructions to horizontal or vertical arms or probe.

Restart controlling program.

Check for error code from sample changer.

Issue buffered ~9 command to reset NV-RAM and initialize default parameters. See *Appendix C* for more information on GSIOC commands.

Contact the Gilson Customer Service Department.

Sample changer blows fuses

Contact the Gilson Customer Service Department.

Liquid Level Detector Problems

Not detecting liquid level

Ensure that the liquid level detector cable is plugged in.

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 223 Setup Utility or SET_223.EXE.

Check that the liquid level sensing switch is in the correct position. Follow the liquid level detector cable to where it is plugged in. The liquid level sensing switch is to the right of the connector. Make sure the switch is in the right position.

Call the Gilson Customer Service Department if this is caused by faulty circuitry.

Repair and Return Policies

Before calling us

Gilson Customer Service personnel will be able to serve you more efficiently if you have the following information:

- the serial number and model number of the equipment involved
- 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 workstation 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 Gilson or your authorized representative.

Non-warranty repair

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

Troubleshooting

Rebuilt exchange

For some units, rebuilt exchange components are available. Contact Gilson for details.

Return procedure

In the United States, contact the Gilson 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 Gilson regarding proper method of shipment. No responsibility is assumed by Gilson 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. Ship to:

Gilson, Inc.
Attention: Customer Service
(indicate the authorization here)
3000 W. Beltline Highway
Middleton, WI 53562

Outside the United States, contact your Gilson representative for return procedures.

Replacement Parts and Accessories

A

For reference numbers for available racks, refer to [Appendix B](#).

Vertical Arms

190610	183 mm vertical arm
190611	123 mm vertical arm
190613	56 mm vertical arm

Probes for 183 mm Vertical Arm – Stainless Steel

27067361	Beveled edge probe (not septum-piercing); 220.5 x 1.5 x 1.1 mm.
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).
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).
27067362	Side-entry probe (septum-piercing); 220.5 x 1.5 x 1.1 mm.

Teflon

27067369	Teflon-coated probe for non-metal applications; (220 x 0.9 mm ID).
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Replacement Parts and Accessories**Probes for 123 mm Vertical Arm – Stainless Steel**

27067211	Beveled-tip probe (not septum-piercing); 160.5 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (reference 19061040).
27067213	Tapered-tip probe (not septum-piercing); 160.5 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (reference 19061040).
27067212	Side entry-tip probe (septum-piercing); 160.5 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (reference 19061040).
27067272	Beveled edge probe for use with transfer ports (not septum-piercing); 160.5 x 1.5 x 1.1 mm. Requires probe holder/guide kit (reference 19061040).
27067235	Beveled edge probe (septum-piercing); 162 x 0.7 x 0.42 mm. Requires probe sleeve (reference 27067236) and probe holder/guide kit (reference 19061040).
27067236	Probe sleeve for septum-piercing probe; 133 x 2 x 0.8 mm (reference 27067235). Requires probe holder/guide kit (reference 19061040).
27067231	Beveled edge probe (not septum-piercing); 162 x 0.7 x 0.42 mm. Requires sleeve (reference 27067232) and probe holder/guide kit (reference 19061040).
27067232	Probe sleeve for non-septum-piercing probe (reference 27067231). Requires probe holder/guide kit (reference 19061040).
27067276	Flat tipped probe for drop transfer; 165 x 0.7 x 0.4 mm. Requires probe sleeve (reference 27067277). Requires probe holder/guide kit (reference 19061040).
27067277	Probe sleeve for flat-tipped probe, 155 mm, without "V" cut at top. Requires probe holder/guide kit (reference 19061040).
27067238	Grooved septum-piercing probe (sleeve not required), 162 x 0.7 x 0.4 mm ID. Requires 1.6 mm probe guide insert (reference 27067239).

Titanium

27067237	Titanium beveled edge probe (septum-piercing); 162 x 0.7 x 0.42 mm. Requires probe sleeve (reference 27067236). Requires probe holder/guide/kit (reference 19061040).
27067236	Probe sleeve for septum-piercing probe (reference 27067237).

Appendix

Teflon

27067218	Teflon-coated probe for non-metal applications; 157.5 x 0.9 mm ID (22 GA). Requires probe holder/guide kit (19061041).
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Double Probe Kit

27167215	Double probe kit; allows different simultaneous or successive liquid handling operations in same test tube. Requires 3-way valve. Includes flat tipped probe (181.5 x 1.5 x 1.1 mm ID), triangular flat tipped probe (169.5 x 2.5 x 1.1 mm ID), Teflon connector, probe holder & probe guide
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Probes for 56 mm Vertical Arm – Stainless Steel

27067131	Beveled edge probe (septum-piercing); 95 x 0.7 x 0.42 mm. Requires probe sleeve (reference 27067132) and probe holder/guide/kit (reference 19061040).
27067132	Probe sleeve for septum-piercing probe (reference 27067131)
27067113	Constricting tip probe; 93.5 x 1.5 x 1.1 mm. Requires probe holder/guide kit (reference 19061040).

Titanium

27067133	Beveled edge probe (septum-piercing); 95 x 0.7 x 0.42 mm. Requires probe sleeve (reference 27067132) and probe holder/guide/kit (reference 19061040).
27067132	Probe sleeve for septum-piercing probe (reference 27067133)

Adjustable Probe Sleeve

27067267	Adjustable probe sleeve for septum-piercing probes, stainless steel; 160 x 1.2 x 0.8 mm ID. Cut to required length according to probe length and sample vial
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Replacement Parts and Accessories**Probe Holder/Guide Kits**

19061040	Probe holder/guide kit; includes probe holder, guide and probe connecting nut (reference 27072001) for 1.5 mm outer diameter probes.
19061041	Probe holder/guide kit; includes probe holder, guide and probe connecting nut (reference 23074002) for Teflon probes.

Transfer Tubing

2954583	1.1 ml coiled FEP tubing, 2200 x 1.6 x 0.8 mm ID
2954671	3 ml coiled FEP tubing, 1.5 mm ID.
29425066	5 ml coiled FEP tubing, 1.5 mm ID.
2954672	10 ml coiled FEP tubing, 1.5 mm ID
49943392	200 µl FEP transfer tubing, 1000 x 1.6 x 0.5 mm
49942392	440 µl FEP transfer tubing, 1000 x 1.6 x 0.8 mm
49948392	2800 µl FEP transfer tubing, 1000 x 3 x 2 mm
F1410153	Coupling for 1/4"-28 fitting, PVDF
27072001	Probe connecting nut for 1.5 mm probe; connects probe and transfer tubing
23074002	Probe connecting nut for Teflon probe; connects probe and transfer tubing

Rinse Stations and Accessories

2707251L	Rinse station with 85 mm rinsing well and locking collar
2707261L	Rinse station with 45 mm rinsing well and locking collar
2707263	Polypropylene rinsing well, 45 mm
2707253	Polypropylene rinsing well, 85 mm
2707252	Polypropylene rinsing well, flow-through
29501017	Plastic locking collars to connect drain tubing to rinse station drain; package of 6
470331206	Tubing for flow-through rinsing well (3/16 ID x 5/16 OD); per foot
470321803	Tygon tubing for rinse station drain (5/32 ID x 7/32 OD); per foot
470343706	Tygon tubing for polypropylene tray drain (5/16 ID x 7/16 OD); per foot
13420034	Isoversinic drain tubing for rinse station drain (7 mm ID); per foot
4701177592	Rinse station tubing, Isoversinic, 4.5 mm ID (6 mm OD), per foot. For rinse stations with locking collar

Appendix

Control Options

210677352	735 Sampler Software for NEBULA™ Series products and XL samplers. The Windows™-based relational database designed software controls the 223 Sample Changer, 215 Nebula Series liquid handlers and Autoinjectors, 234 and 235 Autoinjectors, 231 XL, 232 XL and 233 XL Sampling Injectors, ASPECT™ XL, XLI and XL4 Solid Phase Extraction Systems, the 221 XL and 222 XL Liquid Handlers via a graphical user interface, the Quad-Z 215 and the SPE 215 System. Requires Microsoft Windows™ 98 or NT and serial cable. Computer requirements are Pentium 600 MHz, 64 Mb RAM, 50Mb hard disk space available and CD ROM minimum configuration.
2106171	706 GSIOC Programmer's Tool Kit for MS DOS-based systems
270230	XL Keypad
36083121	Serial Cable, 25-pin/25-pin
36083122	Serial Cable, 9-pin/25-pin (most common)
36083123	Serial Cable Adapter, 9-pin/25-pin

Safety Shield

1907175	223 Safety Shield kit. Encloses sides and front of 223 working area.
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Accessories

2749767	Filler port to transfer samples from the 223 Sample Changer to another instrument
49944107	0.3 mm ID Teflon Tubing; 10 feet plus 2 end fittings. To connect filler port to other instrument.
49942107	0.8 mm ID Teflon Tubing; 10 feet plus 2 end fittings. To connect filler port to other instrument.
2954709	Transfer port accessory set for 1 port. Includes one polyamide molded transfer port, PTFE inlet tubing (1000 x 3 x 2 mm ID) with filter, PE disposable sealing caps & instruction leaflet
2954714	Replacement transfer port; does not include inlet tubing, extra sealing caps or instruction leaflet
2954833	Sealing caps for transfer ports; package of 1000
190711	Diverting valve assembly for 223 Sample Changer. Includes mounting bracket, tubing and two tubing/cable clips
1907111	Diverting valve for 223 Sample Changer
030722	Tubing to connect diverting valve and 223 probe

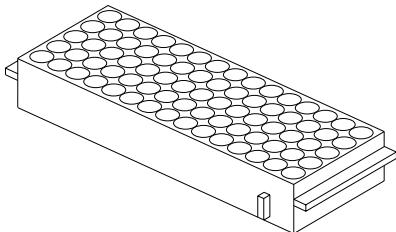
Replacement Parts and Accessories**Replacement Parts**

1907141	Support bar for mounting rinse station(s), transfer port(s) and filler port.
27072001	Probe connecting nut for 1.5 mm probes
23074002	Probe connecting nut for Teflon probe
190712	Level sensing cable.
190713	Tubing/cable support rod.
2507023	Tubing retaining clip for support rod.
638308513	Terminal block connector, 8-pin.
638310513	Terminal block connector, 10-pin.
709910206	2-conductor interconnect wire, 6'
36078143	Shielded GSIOC cable, 30"
6730204007	Fuse; 2 amp (250V) T-type, 5 mm x 20 mm
36083122	Serial cable, IBM AT-type, 9-pin female to 25-pin male

Racks

B

You can configure the sample changer with a variety of rack types and sizes. The sample changer can hold a maximum of four Code 20-Series racks or thermostated Code 30-Series racks.

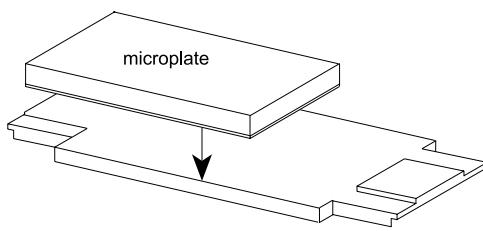
Racks**Code 0 rack**

For 80 vessels

Material: polypropylene

Vessels and maximum capacity: 12 x 32 mm tubes (9 ml)

Reference number: 270430

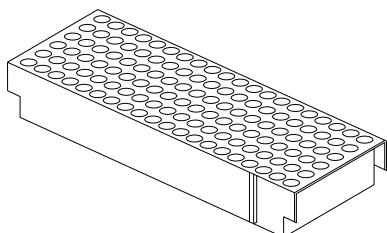
**Code 7 rack holder**

For one 96-well microtiter plate

Vessel capacity: 0.3 ml/well

Reference number: 2707401

Note: Requires installation of rack holder (reference 1907143). See *Section 2*.

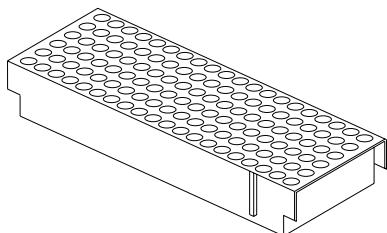
**Code 8 rack**

For 120 vessels

Material: polypropylene

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

Reference number: 270438

**Code 9 rack**

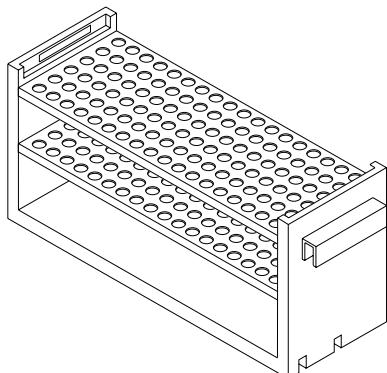
For 120 vessels

Material: polypropylene

Vessels and maximum capacity: 7 x 40 mm tubes (0.7 ml)

Reference number: 270439

Note: Requires installation of rack holder (reference 1907143). See *Section 2*.

**Code 20 rack**

For 108 vessels

Material: polypropylene

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

Reference number: 150425

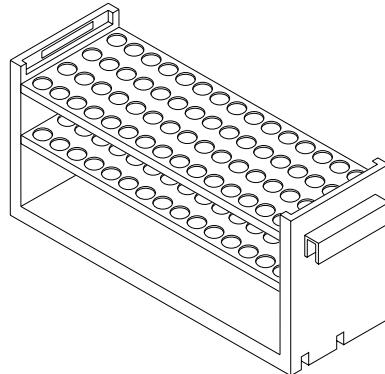
Code 21 rack

For 60 vessels

Material: polypropylene

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

Reference number: 150422



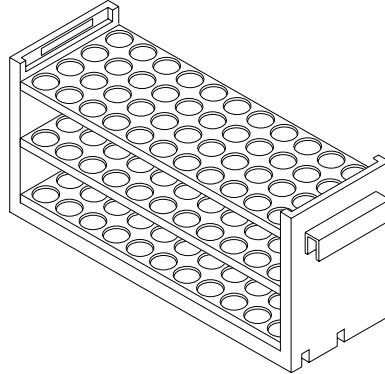
Code 22 rack

For 44 vessels

Material: polypropylene

Vessels and maximum capacity: 18 x 150 mm tubes (25 ml)

Reference number: 150424



Code 22U rack

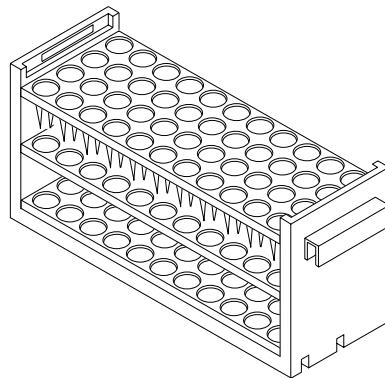
For 44 vessels

Material: polypropylene

Vessels and maximum capacity: from 10 x 75 mm tubes (3.5 ml) to 18 x 180 mm tubes (32 ml)

Reference number: 150498

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



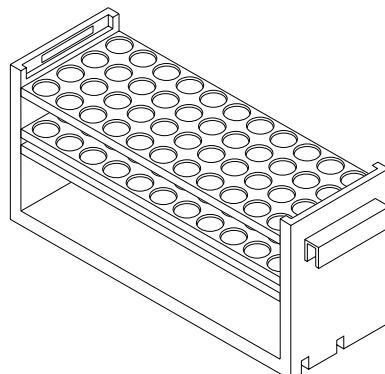
Code 23 rack

For 44 vessels

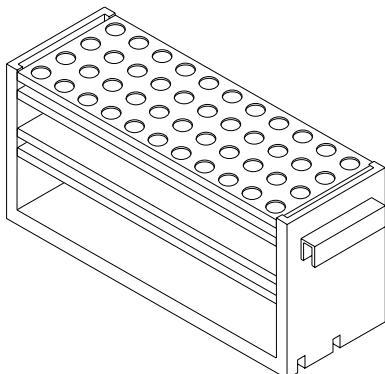
Material: polypropylene

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

Reference number: 150426



Racks



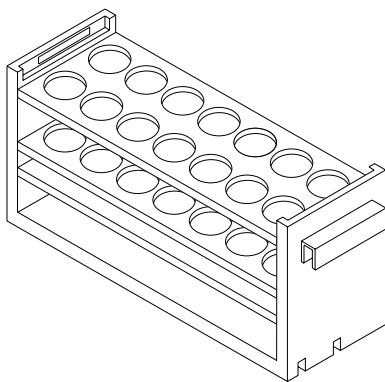
Code 23W rack

For 44 Waters WISP vials

Material: polypropylene and stainless steel

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

Reference number: 150426



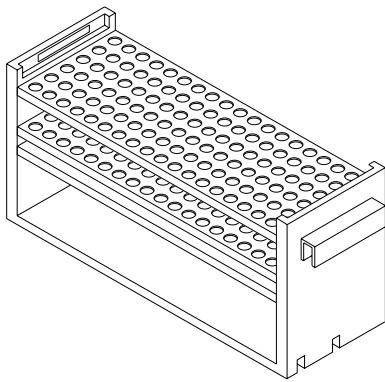
Code 24 rack

For 14 scintillation vials

Material: polypropylene

Vessels and maximum capacity: 28 x 60 mm (20 ml)

Reference number: 150427



Code 28 rack

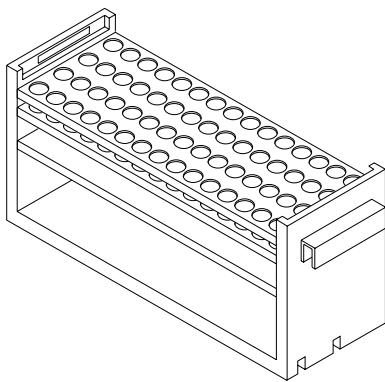
For 108 vessels

Material: polypropylene

Vessels and maximum capacity: 10 x 65 mm tubes (3 ml)

10 x 75 mm tubes (3.5 ml)

Reference number: 150420



Code 29 rack

For 60 vessels

Material: polypropylene

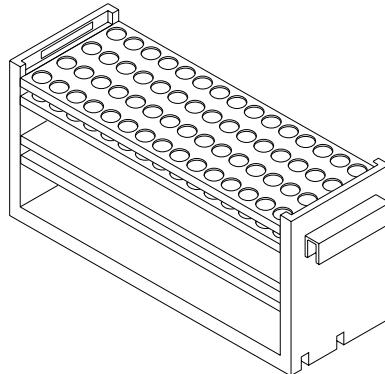
Vessels and maximum capacity: 12 x 75 mm tubes (5 ml)

13 x 75 mm tubes (6 ml)

Reference number: 150429

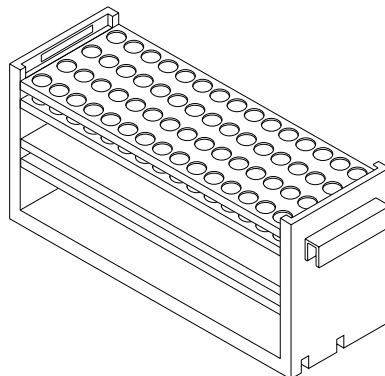
Code 29 LE rack

For 60 large (1.5 ml) Eppendorf vials
Material: polypropylene and stainless steel
Vessels and maximum capacity: 11 x 40 mm (1.5 ml)
Reference number: 2704342



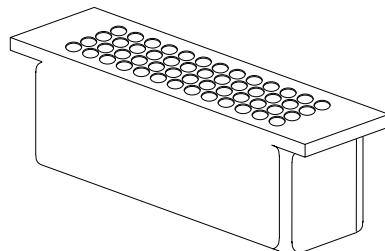
Code 29 SE rack

For 60 small (0.5 ml) Eppendorf vials
Material: polypropylene and stainless steel
Vessels and maximum capacity: 7 x 30 mm (0.5 ml)
Reference number: 2704341



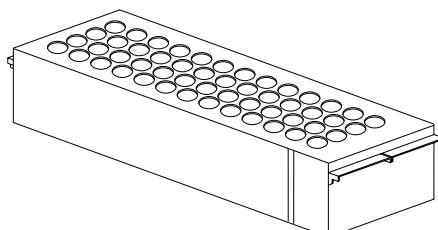
Code 30 rack

For 60 vessels
Material: aluminum
Vessels and maximum capacity: 12 x 32 mm vials (2 ml)
Reference number: 2704430

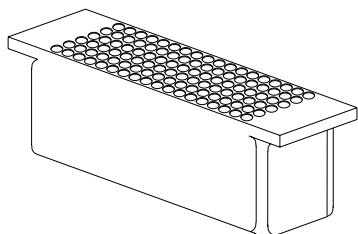


Code 30P rack

For 60 vessels
Material: polypropylene
Vessels and maximum capacity: 12 x 32 mm vials (2 ml)
Reference number: 2704530P
Note: Requires installation of rack holder 1907142. See [Section 2](#).



Racks



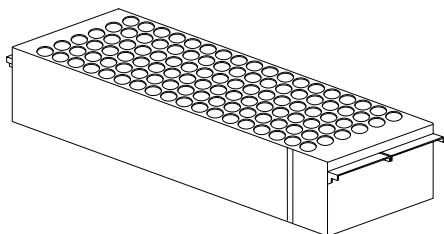
Code 31 rack

Thermostated rack for 108 vessels

Material: aluminum

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

Reference number: 2704431



Code 31P rack

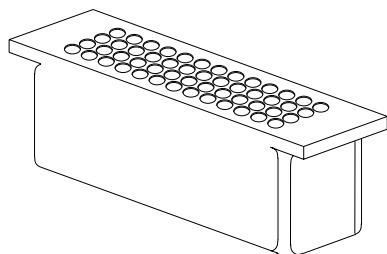
For 108 vessels

Material: polypropylene

Vessels and maximum capacity: 7 x 40 mm tubes (0.7 ml)

Reference number: 2704531P

Note: Requires installation of rack holder (reference 1907142). See [Section 2](#).



Code 32 rack

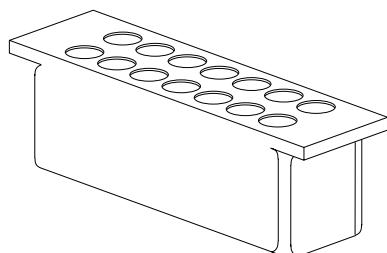
Thermostated rack for 60 vessels

Material: aluminum

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

13 x 100 mm tubes (9 ml)

Reference number: 2704432



Code 33 rack

Thermostated rack for 14 scintillation vials

Material: aluminum

Vessels and maximum capacity: 28 x 60 mm (20 ml)

Reference number: 2704433

Code 33P rack

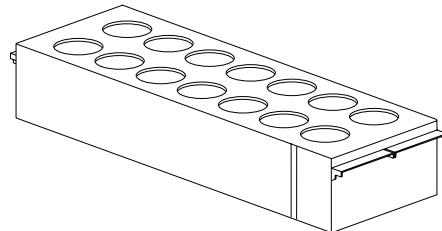
For 14 scintillation vials

Material: polypropylene

Vessels and maximum capacity: 28 x 60 mm (20 ml)

Reference number: 2704533P

Note: Requires installation of rack holder
(reference 1907142). See [Section 2](#).



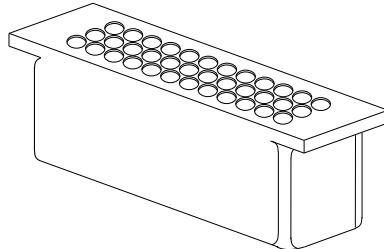
Code 34 rack

Thermostated rack for 36 Waters WISP vials

Material: aluminum

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

Reference number: 2704434



Code 34P rack

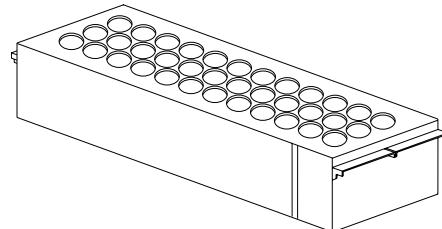
For 36 Waters WISP vials

Material: polypropylene

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

Reference number: 2704534P

Note: Requires installation of rack holder
(reference 1907142). See [Section 2](#).



Code 35P rack

For 71 vessels and one scintillation vial

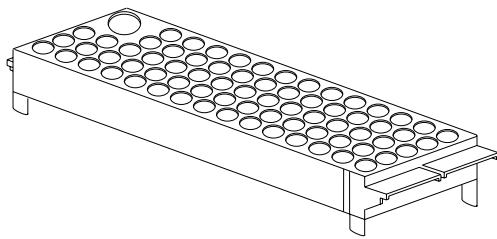
Material: polypropylene

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

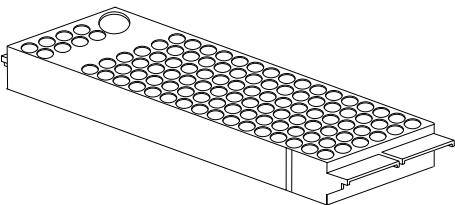
28 x 60 mm (20 ml)

Reference number: 2704535P

Note: Requires installation of rack holder
(reference 1907142). See [Section 2](#).



Racks



Code 36P rack

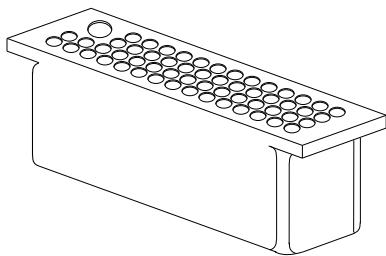
For 120 microvials and one scintillation vial

Material: polypropylene

Vessels and maximum capacity: 7 x 40 mm (0.7 ml)
28 x 60 mm (20 ml)

Reference number: 2704536P

Note: Requires installation of rack holder (reference 1907142). See [Section 2](#).



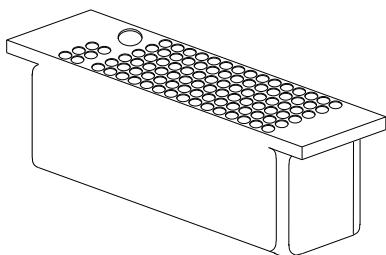
Code 37 rack

Thermostated rack for 56 vessels and one scintillation vial

Material: aluminum

Vessels and maximum capacity: 12 x 32 mm (2 ml)
28 x 60 mm (20 ml)

Reference number: 2704437



Code 38 rack

Thermostated rack for 96 microvials and one scintillation vial

Material: aluminum

Vessels and maximum capacity: 7 x 40 mm (0.7 ml)
28 x 60 mm (20 ml)

Reference number: 2704438

GSIOC Commands

C

The GSIOC is a communications interface that enhances the power of the sample changer. It incorporates an EIA RS-485 interface and allows up to 32 slave devices to be controlled from a single master device.

Each slave device is identified by a unique number that must be known to the device and to the master device. The default ID code of the sample changer is 10.

To control the sample changer via the GSIOC interface, you need the following:

- a Personal Computer with Microsoft Windows 98 or NT and any Gilson control software or 706 Device Driver Software installed
- an unused RS-232 communication port

From the computer, you:

- specify the sample changer as the instrument to control by indicating its unit ID
- issue commands that set operating parameters, control operation, or request information from the sample changer.

GSIOC Commands

There are two kinds of commands that you can send over the GSIOC:

- **Buffered commands** send instructions to the sample changer. These commands are executed one at a time.
- **Immediate commands** request status information from the sample changer. These commands are executed immediately, temporarily interrupting other commands in progress.

GSIOC Command List

In the command list below, the GSIOC command must be entered in the proper upper or lower case format. If a buffered command requires additional information, you see *italicized* text next to the command. The description of the command identifies what you need to enter in place of the italicized parameter. Also note that if a parameter is optional, it appears within brackets, [].

I - Immediate
B - Buffered

<i>Command</i>	<i>Type</i>	<i>Description</i>
%	I	Returns the character string: "223Vx.yz", where x, y, and z identify the software version for the sample changer.
\$	I	Returns a "\$" and resets the sample changer to its power-up state.
@	I	Reads non-volatile memory (NV-RAM) at current address. Returns "AA=xxxx" where: AA - Value is the address (0 - 39). xxxx - Data at the address. Current address is incremented after response is returned.

<code>@AA[=xxxx]</code>	B	Sets the value at NV-RAM address where: AA - Value is the address (0 - 39, see list below). xxxx - (Optional) Data at the address.
<code>~n</code>	B	Sets test mode. Indicate one of the following for n: 1 - Performs XYZ test. Must be run without probe from the home position. 9 - Resets NV-RAM and initializes to defaults.
9	I	Reads contact input event FIFO. If the queue is empty, “ 000000” is returned. If the queue is not empty, returns “Xttttt” where: X - State of the four contact inputs: 1 for closed, 0 for open. See table below. ttttt - Time in 10 ms units since the last buffered 9 command.
		$\begin{array}{lcccccc} \text{if } X = & \text{then} & A = & B = & C = & D = \\ @ & & 0 & 0 & 0 & 0 \\ A & & 1 & 0 & 0 & 0 \\ B & & 0 & 1 & 0 & 0 \\ C & & 1 & 1 & 0 & 0 \\ D & & 0 & 0 & 1 & 0 \\ E & & 1 & 0 & 1 & 0 \\ F & & 0 & 1 & 1 & 0 \\ G & & 1 & 1 & 1 & 0 \\ H & & 0 & 0 & 0 & 1 \\ I & & 1 & 0 & 0 & 1 \\ J & & 0 & 1 & 0 & 1 \\ K & & 1 & 1 & 0 & 1 \\ L & & 0 & 0 & 1 & 1 \\ M & & 1 & 0 & 1 & 1 \\ O & & 0 & 1 & 1 & 1 \\ P & & 1 & 1 & 1 & 1 \end{array}$
		Whenever the status of a contact input changes, the state of all four contacts and the time since the last buffered 9 command was issued are stored in the event FIFO.
9	B	Clears the contact event FIFO and resets the contact input event timer.

GSIOC Commands			
a	I	Returns X travel length in Kilometers.	
b	I	Returns Y travel length in Kilometers.	
c	I	Returns Z travel length in Kilometers.	
e	I	Reads the current error number. Returns "n" which identifies the error number; see page 5-2 for listing of errors. If no error has occurred, returns 0.	
e	B	Clears error number.	
Exyz	B	Sets X, Y, and Z motor status:	
		x - 0 for disable or 1 for enable X motor. y - 0 for disable or 1 for enable Y motor. z - 0 for disable or 1 for enable Z motor.	
		For example, the following command disables the motors: E000.	
H	B	Moves probe to home position.	
I	I	Reads status of input contacts. Returns "cccc" where:	
		cccc - Status of input contacts A, B, C, D: 1 if the contact is closed (shorted), 0 if open.	
J	I	Reads status of output contacts and +12 V external auxiliary power. Returns "ccccc" where:	
		cccc - Status of output contacts 1, 2, 3, and 4: 1 if the output is connected, 0 if disconnected. p - Status of +12 V external auxiliary power: 1 if connected, 0 if disconnected.	
		Auxiliary power is off when sampler changer is turned on.	
Jcccc[p]	B	Sets status of output contacts and +12 V external auxiliary power.	
		cccc - Output contacts 1, 2, 3, and 4: 1 to connect, 0 to disconnect, X for no change. p - (Optional) Auxiliary power: 1 to connect, 0 to disconnect, X for no change.	

<code>jc[ttt]</code>	B	Pulses an output contact: c - Number of the output contact, 1 - 4. ttt - Duration of the pulse in tenths of seconds; default is 1.
<code>Lx</code>	B	Sets liquid level sensing threshold frequency based on current frequency and data at NV-RAM frequency threshold field. x - H for high frequency setting or L for low frequency.
<code>M</code>	I	Reads X, Y, Z motor status. Returns "xyz". For each motor status, you see "U" for unpowered, "P" for powered, "R" for running, or "E" for error.
<code>n</code>	I	Reads the actual frequency of liquid level detector oscillator. Returns "ffff" which is frequency in Hz.
<code>N</code>	I	Reads the liquid level detector output. Returns "Iffff" where: I - A for air or L for liquid. ffff - Current sensitivity threshold frequency in Hz.
<code>Nffff</code>	B	Sets the liquid level sensing threshold frequency (ffff) in Hz.
<code>P</code>	I	Reads the XYZ position in tenths of millimeters, based on the internal encoder wheel.
<code>Q</code>	I	Reads the Z travel range. Returns "min - max" where: min - Lowest position in tenths of millimeters. max - Highest position in tenths of millimeters.
<code>S</code>	I	Reads the command in the synchronization buffer. Returns " " if buffer is empty.
<code>Smm</code>	B	Sends a synchronized buffered command (mm) that is executed when the sample changer is quiescent. Sending a command can overwrite unexecuted, existing commands. If you send this command without indicating a parameter (mm), the buffer is cleared.

GSIOC Commands

vzzzz,sss	B	For tracking liquid height, raises or lowers the Z height of the probe at the designated speed: zooo - Z height in tenths of millimeters. sss - speed, in tenths of millimeters per second, at which to move the probe.
V	I	Reads diverting valve status. Returns one of the following: 0 - Valve status off; the port connected to the probe is the one facing the rear of the sample changer. 1 - Valve status on; the port connected to the probe is the one facing you. When you turn off the sample changer, the valve status is set to off.
Vx	B	Sets status of diverting valve. For <i>x</i> , indicate "1" for on or "0" for off. See V command above for a description of "1" and "0".
x	I	Reads X motor status. Returns one of the following: "U" for unpowered, "P" for powered, "R" for running, or "E" for error.
X	I	Reads the X- and Y-axis locations of the probe, based on the microstep position. Returns "xxxx/yyyy" which is X- and Y-axis locations in tenths of millimeters.
Xxxxx[/yyyy]	B	Sets new X- and Y-axis positions for the probe where: xxxx - X-axis position in tenths of millimeters. yyyy - Y-axis position in tenths of millimeters.
y	I	Reads Y motor status. Returns one of the following: "U" for unpowered, "P" for powered, "R" for running, or "E" for error.

Y	I	Reads the Y-axis location of the probe, based on the microstep position. Returns "yyyy" which is the location in tenths of millimeters.												
Yyyyy	B	Sets new Y-axis position for the probe where: yyyy - Y-axis position in tenths of millimeters.												
z	I	Reads Z motor status. Returns one of the following: "U" for unpowered, "P" for powered, "R" for running, or "E" for error.												
zppp[s]	B	For use with liquid level sensing, sets new Z-axis position for the probe. pppp - Z-axis position in tenths of millimeters. If liquid level detection is on, movement of the probe is stopped if liquid is detected before this position is reached. s - Speed index of 1 to 5; default is 4. See table below. <table border="0"><tr><td style="padding-right: 20px;"><i>s</i></td><td><i>Speed (mm/sec)</i></td></tr><tr><td>1</td><td>19.9</td></tr><tr><td>2</td><td>30.2 (default for liquid level sensing)</td></tr><tr><td>3</td><td>61.8</td></tr><tr><td>4</td><td>126.9 (default for normal travel)</td></tr><tr><td>5</td><td>247.3</td></tr></table>	<i>s</i>	<i>Speed (mm/sec)</i>	1	19.9	2	30.2 (default for liquid level sensing)	3	61.8	4	126.9 (default for normal travel)	5	247.3
<i>s</i>	<i>Speed (mm/sec)</i>													
1	19.9													
2	30.2 (default for liquid level sensing)													
3	61.8													
4	126.9 (default for normal travel)													
5	247.3													
Z	I	Reads the Z-axis location of the probe, based on the microstep position. Returns "zzzz" which is the location in tenths of millimeters.												
Zzzzz[s]	B	Sets new Z-axis position for the probe where: zzzz - Z-axis position in tenths of millimeters. Even if liquid level sensing is on, the probe is moved to this position. s - Speed index of 1 to 5; default is 4. See table above.												

