

223 Sample Changer User's Guide

Table of Contents

Safety

Lifting Safety-3

Voltage Safety-3

Solvents Safety-3

Probes..... Safety-3

Replacement Parts Safety-3

Sécurité

Levage Safety-3

Tension..... Safety-3

Solvants Safety-3

Aiguilles Safety-3

Pièces détachées..... Safety-3

1 Introduction

Description 1-2

Unpacking 1-3

 Standard Equipment..... 1-3

 Accessories..... 1-4

Technical Specifications 1-8

2 Installation

Arm Locking Screw Removal	2-2
Vertical Arm Installation	2-3
Probe Installation	2-4
Install Probe Guide	2-4
Install Probe Holder	2-4
Install Probe	2-4
Rinse Station and Port Bar Installation	2-5
Tray Installation	2-6
Lower Position	2-6
Upper Position	2-6
Tray Removal	2-6
Rack Installation	2-7
Antlers for Code 0- or Code 30-Series Rack	2-7
Microplate Holder	2-7
Accessory Installation	2-10
Tubing/Cable Support Rod	2-10
Transfer Port	2-10
Filler Port	2-10
Liquid Level Detector	2-11
Diverting Valve	2-11
Rear Panel Connections	2-12
Rear Panel Diagram	2-12
RS-232 Port	2-12
GSIOC Port	2-13
Input/Output Ports	2-14
SW 1 (Unit ID) Selector	2-15
SW2 (Baud Rate/Configuration) Selector	2-15
Fuse Installation	2-15
Power Connection	2-15

3 Operation

Start Up	3-2
223 Setup Utility	3-3
About	3-3
Homing	3-4
Adjust XY	3-4
Arm Travel	3-5
Liquid Detector	3-5
Z-Arm	3-5
Contacts	3-6
Error Handling	3-6
XYZ Coordinates	3-7

4 Maintenance

Clean the Sample Changer	4-2
Part Replacement	4-3
Probe	4-3
Fuse	4-4
Check Position Alignment	4-5
Transport the Sample Changer	4-6
Move the Sample Changer	4-6
Ship the Sample Changer	4-6

5 Troubleshooting

Error Messages	5-2
Mechanical	5-3
Probe Not Finding Tube Center	5-3
Electrical	5-3
Input Functions Not Operating	5-3
Output Functions Not Operating	5-3
Indicator Light Not Illuminated	5-3
Indicator Light Blinking	5-3
Sample Changer Blows Fuses	5-3
Liquid Level Detector	5-4
Not Detecting Liquid Level	5-4

A Replacement Parts and Accessories

Vertical Arms	A-1
Probes.....	A-1
Probes for 183 mm Vertical Arm—Stainless Steel	A-1
Probes for 183 mm Vertical Arm—Teflon	A-1
Probes for 123 mm Vertical Arm—Stainless Steel	A-2
Probes for 123 mm Vertical Arm—Titanium.....	A-2
Probes for 123 mm Vertical Arm—Teflon	A-2
Probes for 56 mm Vertical Arm—Stainless Steel.....	A-2
Probes for 56 mm Vertical Arm—Titanium.....	A-2
Double Probe Kit	A-3
Probe Sleeves	A-3
Probe Holder/Guide Kits.....	A-3
Transfer Tubing	A-4
Rinse Stations and Accessories	A-4
Control	A-4
Safety Shield.....	A-5
Accessories	A-5
Replacement Parts	A-5

B Racks

Safety

The instrument is intended to be used in a laboratory by trained technical personnel. For safe and correct use, both operating and service personnel should follow the instructions contained in the user's guide when installing, cleaning, and maintaining the instrument.

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

The instrument has been certified to safety standards required in Canada, Europe, and the United States. Refer to the rear panel label on the instrument or the Declaration of Conformity document for the current standards to which the instrument has been found compliant.

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

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

The following safety notices may appear in this document:

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

Lifting

The instrument exceeds the weight one person can lift safely. Two or more people are required to lift the instrument safely. Refer to the Technical Specifications for the weight. Always lift the instrument from the base and follow any unpacking instructions provided with the instrument.

Voltage

Access to the rear panel is necessary. The instrument must be detached from all voltage sources before service, repair, or exchange of parts. For normal operation, the instrument is to be grounded through the AC line cord and power supply provided. Failure to do so can result in a potential shock hazard that could result in serious personal injury.

Use only fuses with the rated current and of the specified type as listed on the rear panel label on the instrument. The instrument must only be operated with the voltage specified on the rear panel label of the instrument and with the grounded AC line cord and power supply provided.

Solvents

Observe safe laboratory practices when handling solvents. If working with hazardous solvents or flammable liquids, ensure that there is proper ventilation and that adequate protection such as safety glasses, gloves, and protective clothing are used.

If dangerous liquids are used, precautions should be taken to limit potential hazards from leaks and/or spillage through the use of a non-flammable tray or use of a fume hood, etc.

If there is the potential of explosive gases being developed, a fume hood or other means should be used to safely manage that risk.

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

Probes

Keep hands clear of probe to avoid risk of personal injury by piercing while operating the instrument. Because the probe installed on the Z-arm may contain dangerous substances, do not interfere in the work area of the instrument until it has completed its procedures.

Replacement Parts

Be sure to use only replacement parts mentioned in the user's guide. Do not repair the instrument or change parts not listed in the user's guide.







Sécurité

L'instrument est destiné à une utilisation en laboratoire, par un personnel technique qualifié . Pour une utilisation correcte et en toute sécurité, il est nécessaire que le personnel qui utilise et réalise la maintenance de l'instrument, suive les instructions contenues dans ce guide lors de l'installation, le nettoyage et la maintenance de l'instrument.




Les consignes de sécurité suivantes doivent être respectées durant toutes les phases de fonctionnement, d'entretien ou de réparation de l'instrument. Le non-respect de ces précautions ou des avertissements spécifiques mentionnés dans ce guide compromet les normes de sécurité de conception, de fabrication et d'utilisation prévue de l'instrument. Gilson décline toute responsabilité en cas d'incapacité du client à se conformer à ces exigences.

Le détecteur a été certifié conformément aux normes de sécurité en vigueur au Canada, en Europe et aux Etats-Unis. Merci de vous reporter aux indications mentionnées sur le panneau arrière de l'instrument ainsi qu'au document de Déclaration de Conformité aux normes pour lesquelles l'instrument a été déclaré conforme.

Les symboles électroniques et de dangers suivants peuvent apparaître sur l'instrument:

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

Les notes de sécurité suivantes peuvent apparaître dans ce document:

 WARNING	WARNING indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures graves
 CAUTION	CAUTION indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures à modérées
 NOTICE	NOTICE indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut entraîner des dégâts matériels

Levage

Cet instrument dépasse le poids maximum pouvant être manipulé en toute sécurité par une seule personne. Deux personnes au moins sont nécessaires pour soulever l'appareil en toute sécurité. Soulevez-le toujours en le saisissant par sa base et veillez à respecter les consignes de déballage fournies avec l'instrument.

Tension

L'accès au panneau arrière doit être libre. L'instrument doit être déconnecté de sa source d'alimentation avant toute opération d'entretien, de réparation ou de remplacement de pièces. En fonctionnement normal, l'instrument doit être relié à la terre par le cordon secteur et l'alimentation fournis. Le non-respect de cette consigne peut entraîner un risque de choc électrique pouvant occasionner de graves blessures.

Utiliser exclusivement des fusibles dont l'intensité et le type sont spécifiés sur l'étiquette située sur le panneau arrière de l'instrument. L'instrument doit être utilisé uniquement à la tension indiquée sur l'étiquette au dos de l'appareil, avec le cordon d'alimentation avec mise à la terre et l'alimentation fournis.

Solvants

Respectez les Bonnes Pratiques de Laboratoire lors de la manipulation de solvants. Si des liquides dangereux sont utilisés, assurez-vous que la ventilation est adéquate et portez en permanence un équipement de protection individuelle (EPI) adapté, tel que : lunettes, gants et vêtements de protection.

Si des liquides dangereux sont manipulés, des précautions doivent être mises en œuvre pour limiter les risques de fuites ou débordements comme l'utilisation d'un plateau ignifugé, d'une hotte, etc.

S'il existe un risque potentiel d'émanation de gaz explosif, une hotte ou tout autre moyen doit être prévu pour gérer ce risque en toute sécurité.

Reportez-vous aux Fiches de Données de Sécurité relatives aux solvants avant toute utilisation.

Aiguilles

Lors du fonctionnement de l'instrument, veillez à garder les mains éloignées de l'aiguille pour éviter tout risque de blessure par perforation. L'aiguille positionnée sur le bras Z pouvant contenir des substances dangereuses, n'intervenez pas dans la zone de travail de l'instrument jusqu'à ce qu'il ait achevé sa procédure en cours.

Pièces détachées

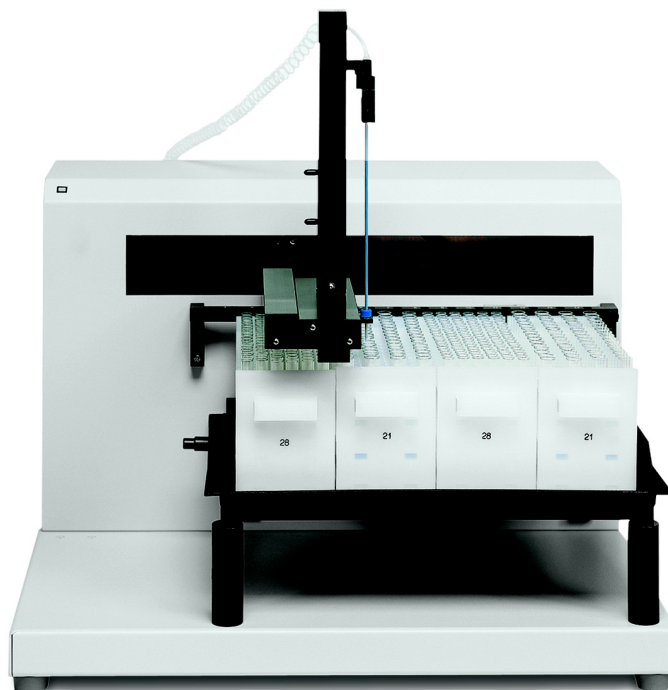
Assurez-vous de n'utiliser exclusivement que les pièces détachées mentionnées le guide d'utilisation. Ne tentez pas de réparer ou remplacer des pièces ne figurant pas dans ce guide.

This chapter provides information on the following topics:

- [Description](#)
- [Unpacking](#)
- [Technical Specifications](#)

Description

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



223 Sample Changer

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

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

- 223 Sample Changer
- drain tubing
- terminal block connectors
- power cords
- fuses
- fuse drawer
- 223 Utility Programs CD

Documentation

The following documents are included with the 223 Sample Changer:

- 223 Sample Changer Documentation CD
- Declaration of Conformity

Based on your requirements, you may have received the following document:

- IQ/OQ Procedures

Accessories

Based on your requirements, you also received additional accessories, ordered separately:

Dilutor

Choose between an optional 402 Syringe Pump, Minipuls Evolution® Peristaltic Pump, or MINIPULS® 3 Peristaltic Pump to add aspirating and dispensing flexibility.

<i>Part Number</i>	<i>Description</i>
F410511	402 Single Syringe Pump

RS-232 Serial Cable

Use an RS-232 cable to transfer information between the sample changer and a computer.

<i>Part Number</i>	<i>Description</i>
36083122	SERIAL CABLE, 9-PIN/25-PIN

GSIOC Cable

Use a GSIOC cable to connect other instruments to the sample changer and then control all from one computer.

<i>Part Number</i>	<i>Description</i>
36078143	Shielded GSIOC cable, 30"

Vertical Arm

A vertical arm is required, but not included, as there are three options to choose from:

<i>Part Number</i>	<i>Description</i>
190610	183 mm vertical arm
190611	123 mm vertical arm
190613	56 mm vertical arm

Probe Holder Guide Kit

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

<i>Part Number</i>	<i>Description</i>
19061040	Probe holder/guide kit; includes probe holder, guide and probe connecting nut (part number 27072001) for 1.5 mm outer diameter probes.
19061041	Probe holder/guide kit; includes probe holder, guide and probe connecting nut (part number 23074002) for Teflon probes.

Port Bar

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

<i>Part Number</i>	<i>Description</i>
1907141	Port bar for mounting rinse station(s), transfer port(s), and filler port

Rinse Station

Rinse stations are available in two depths:

<i>Part Number</i>	<i>Description</i>
2707251L	Rinse station with 85 mm rinsing well
2707261L	Rinse station with 45 mm rinsing well

For a flowing rinse, replace the deep rinsing well with a flow-through rinsing well.

<i>Part Number</i>	<i>Description</i>
2707252	Polypropylene rinsing well, flow-through

Transfer Port

Transfer ports are mounted on the top of the port bar.

<i>Part Number</i>	<i>Description</i>
2749767	Transfer port

Liquid Level Detection Cable

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.

<i>Part Number</i>	<i>Description</i>
190712	Level sensing cable

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.

<i>Part Number</i>	<i>Description</i>
190713	Tubing/cable support rod

Safety Shield

A safety shield encloses the sides and front of the sample changer working area.

<i>Part Number</i>	<i>Description</i>
1907175	223 Safety Shield kit

2-conductor Wire

2-conductor wire is required when making contact connections.

<i>Part Number</i>	<i>Description</i>
709910206	2-conductor interconnect wire, 6 feet.

Diverting Valve

A diverting valve can be mounted on the sample changer.

<i>Part Number</i>	<i>Description</i>
190711	Diverting valve assembly for 223 Sample Changer. Includes mounting bracket, tubing, and two tubing/cable clips

Transfer Tubing

Based on your requirements, you also received transfer tubing, ordered separately. Refer to [Appendix A, Replacement Parts and Accessories](#) for part numbers.

Probes

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

Racks

Based on your requirements, you also received racks, ordered separately. Refer to [Appendix B, Racks](#) for part numbers.

Tray/Tray Spacers

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.

<i>Part Number</i>	<i>Description</i>
19041001	Generic black pan with drain assy

If using tubes that are less than 100 mm in height, the tray will be installed in the upper position and tray spacers will be required.

<i>Part Number</i>	<i>Description</i>
190710	Tray spacers for installing polypropylene tray in upper position, package of 2

Antlers

To use Code 0- or Code 30-series racks, a port bar with antlers must be installed.

<i>Part Number</i>	<i>Description</i>
1907142	Port bar 223 antlers code 30-series
1907143	Port bar 223 antlers code 0-series for one Code 0, 7, 8, or 9 rack

Microplate Holder

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

<i>Part Number</i>	<i>Description</i>
1907151	Holder for four standard or deep-well microplates

Technical Specifications

Please be aware of the following before operating the sample changer.

- NOTICE** Changes or modifications to the liquid handler not expressly approved by Gilson could void the warranty.
- This instrument complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This instrument may not cause harmful interference, and (2) this instrument must accept any interference received, including interference that may cause undesired operation.
- Shielded cables must be used with the sample changer to ensure compliance with the FCC Class A limits.

223 Sample Changer

Technical Specification	Definition		
Arm Speed	X/Y: 25 cm/sec (9.9 in./sec) Z dimension has five programmable speeds for upward and downward movement:		
	Index	Speed (cm/sec)	Speed (in./sec)
	1	2.0	0.79
	2	3.0	1.18
			Default for level seeking
	3	6.2	2.44
	4	12.7	5.00
		Default for normal travel	
5	24.7	9.72	
Communication Interface	RS-232 or GSIOC; Four inputs (accepts contact closure, TTL, or open-collector signals), four relay outputs, and one switched +12V DC output (500 mA max)		
Dimensions (W x D x H)	53.5 x 43.7 x 60 cm (21.1 x 17.2 x 24 in)* *Maximum height. Z-arm height is adjustable to accommodate vessel heights between 1 and 150 mm (dependent on installed Z-arm).		
Environmental Conditions	Indoor use Altitude: up to 2000 m Temperature range: 5°–40°C Air pressure: 75–105 kPa Humidity: Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C		
Front Panel	One yellow indicator light		
Horizontal Motion Strength	X: 2 kg (5 lbs.) Y: 1.5 kg (3 lbs.)		
Liquid Level Sensing	Capacitive		
Power Requirements	Frequency: 50 to 60 Hz Voltage: 100–120V or 220–240V, mains voltage fluctuations not to exceed ±10% of the nominal voltage		
Technical Specifications - 223 Sample Changer (Page 1 of 2)			

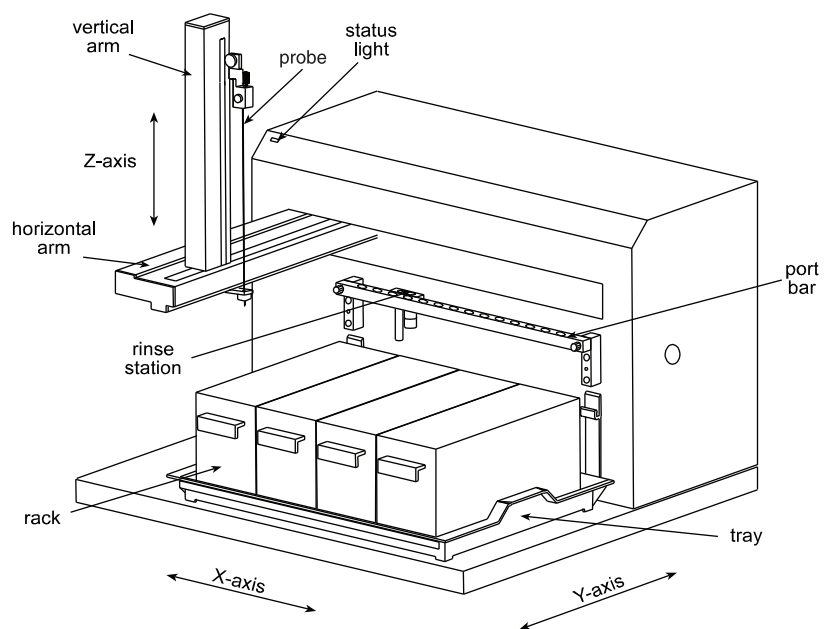
223 Sample Changer (Continued)

Technical Specification	Definition
Probe Positioning Performance	Accuracy: ±1 mm in the XYZ dimensions Repeatability: ±0.25 mm in the XYZ dimensions
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
Safety and Compliance	The sample changer has been certified to safety standards specified for Canada, Europe, and the United States. Refer to the instrument rear panel label and the Declaration of Conformity document for the current standards to which the instrument has been tested.
Sampler Type	X/Y/Z with stationary rack design
Vertical Punch Strength	1 kg (2 lbs.)
Weight	18.6 kg (41 lbs.)
Technical Specifications - 223 Sample Changer (Page 2 of 2)	

This chapter details the steps for setting up the 223 Sample Changer, which includes:

- [Arm Locking Screw Removal](#)
- [Vertical Arm Installation](#)
- [Probe Installation](#)
- [Rinse Station and Port Bar Installation](#)
- [Tray Installation](#)
- [Rack Installation](#)
- [Accessory Installation](#)
- [Rear Panel Connections](#)

The diagram below shows a possible configuration of the sample changer.



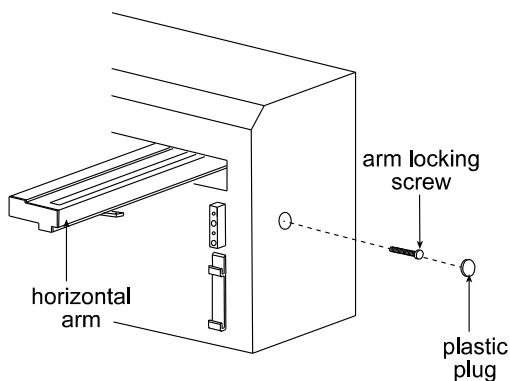
Arm Locking Screw Removal

The armlock on the sample changer secures the Y-arm during shipment. Remove the armlock prior to installing the vertical arm and operating the instrument. If the armlock is not removed, the sample changer cannot move in the X direction. This results in an error state during operation.

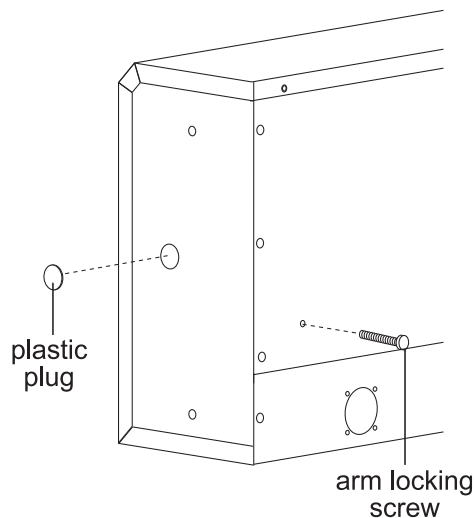
NOTICE If you need to move the sample changer, always reinstall the armlock. This safeguards against mechanical damage.

To remove the armlock:

- 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 in 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.



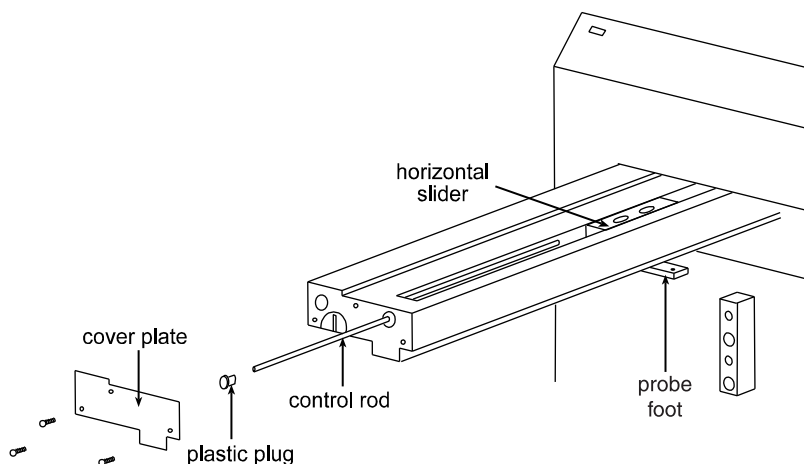
- 5 Replace the plastic plug on the side panel.
- 6 Ensure that the horizontal arm can move by pushing it to the left as far as it will go.

Vertical Arm Installation

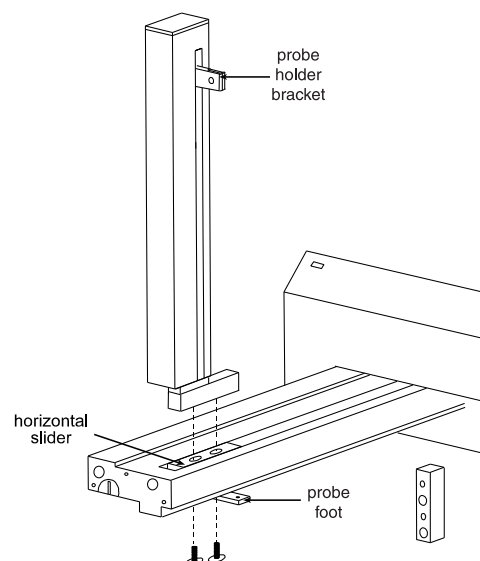
Before installing or changing the vertical arm, check that the power is turned off and the power cord is disconnected from the power source. Also ensure that the arm locking screw has been removed and the horizontal arm can move.

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.

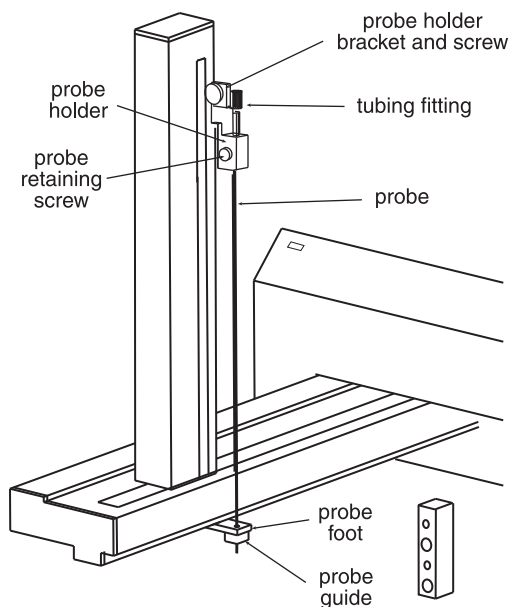


- 3 Using your finger, press on the control rod where it passes through the horizontal slider. At the same time, pull the probe foot towards the front of the horizontal arm. This causes the white plastic plug and control rod to move forward slightly. When the white plastic plug is no longer flush with 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

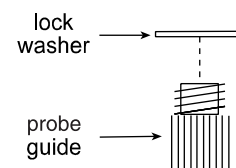
When installing the probe, refer to the following diagram that shows where the probe, probe holder, and probe guide are installed on the sample changer.



Install 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.



Install Probe Holder

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

Install 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 Port Bar Installation

The port bar attaches to the upper position of the front standoffs 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 the port bar with antlers for Code 30-series racks (part number 1907142) or the port bar with antlers Code 0-series for one Code 0, 7, 8, or 9 rack (part number 1907143), the port bar is part of the antlers' assembly. Attach any rinse stations, transfer ports, or filler ports to the port bar with antlers.

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

From left to right, the ports in a rinse station are the inside rinse position/drain, outside shallow rinse position, and outside deep rinse or flow-through rinse position.

The **Inside Rinse** position is for rinsing the inside of the probe and as a drain. Liquid is purged out of the probe to the drain.

The **Outside Shallow Rinse** position is used for rinses after the probe has only been immersed in a few millimeters of sample.

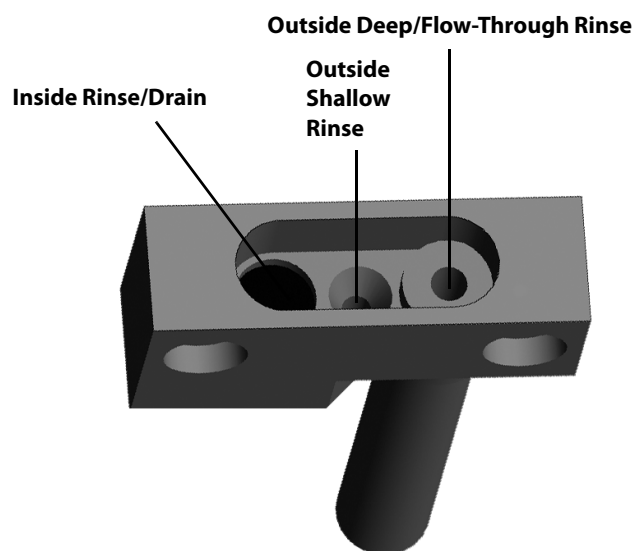
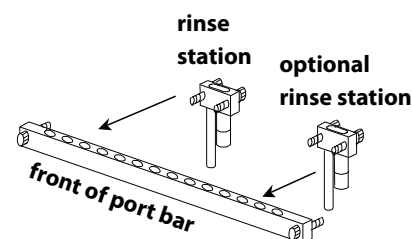
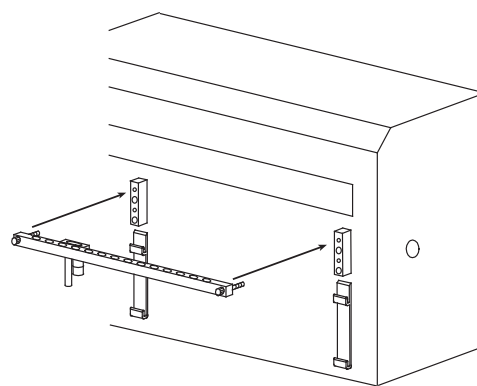
The **Outside Deep/Flow-Through Rinse** position allows for deeper insertion of the probe into the rinse well, resulting in a greater area of the outside of the probe to be rinsed. This position is also used in applications where a rigorous wash of the probe's exterior is required. In those applications, an open-ended rinsing well is used and is connected to a second source of liquid that is pumped to the rinse station.

Note: When installing the rinse station on the right side of the port bar, the positions are reversed (for example, the drain is on the right).

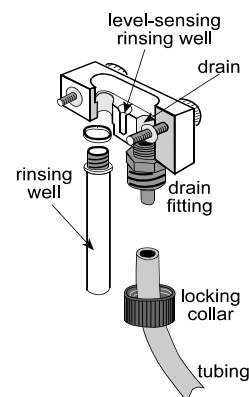
To attach tubing to the drain, locate the drain tubing (part number 470321803). Remove the locking collar from the drain fitting. Slide the tubing through the locking collar. Attach the tubing to the drain fitting. Then screw the collar onto the drain fitting. Place the other end of the tubing in a drain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

If you ordered a flow-through rinsing well (part number 2707252), remove the deep rinsing well and attach the flow-through rinsing well in its place. Then attach tubing (part number 470331206) to the flow-through rinsing well and connect the other end to a liquid source (a peristaltic pump, for example).

- 2 Attach the port bar to the upper position of the front standoffs on the front of the sample changer using the knurled screws.



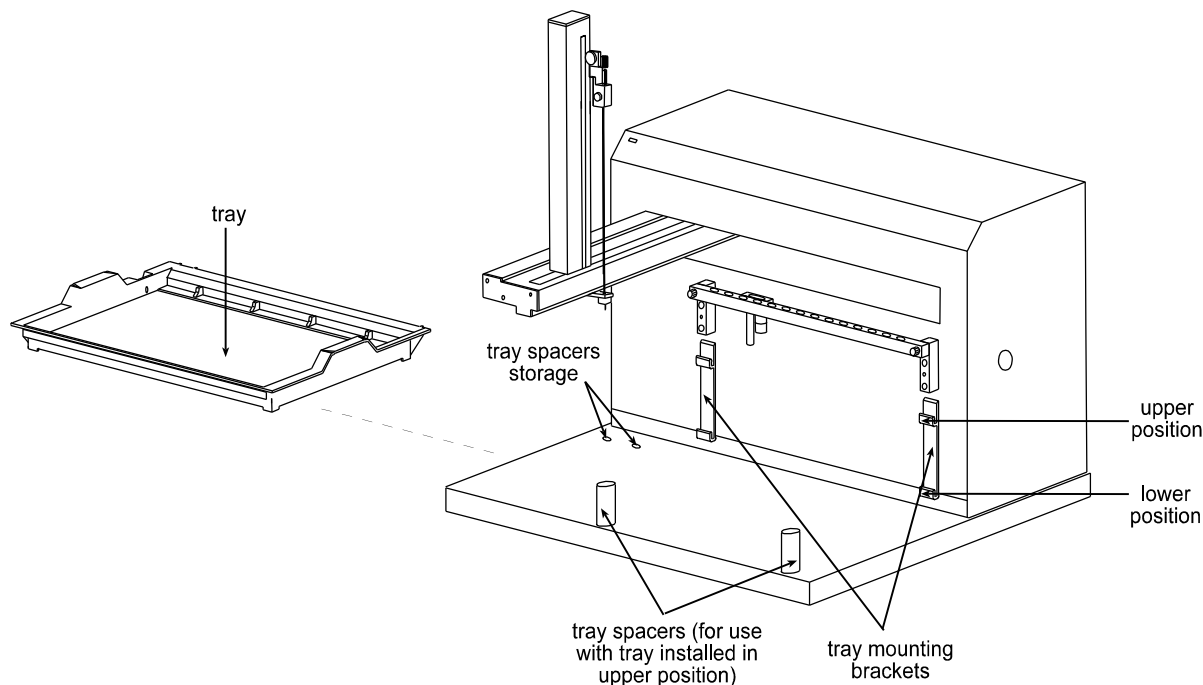
Rinse Positions (Left)



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.

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



Tray Installation Diagram

Lower Position

If you are using 85 mm rinsing well or 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 (part number 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 (part number 190710) into place; refer to the [Tray Installation Diagram](#) above.

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

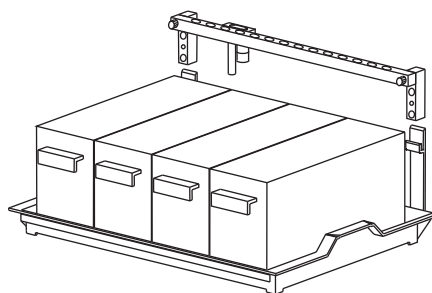
- 2 Place the tray on top of the tray spacers making sure it fits securely in the tray mounting brackets and that the drain outlet is located at the left rear of the tray. Attach one end of the drain tubing (part number 470343706) to the drain outlet and place the other in a drain receptacle, located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

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, Racks](#) for a list of racks available for the sample changer.)

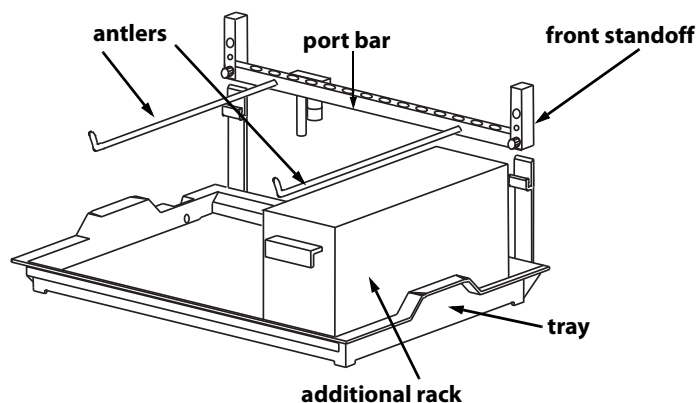


Antlers for Code 0- or Code 30-Series Rack

Installing antlers enables you to position a single rack sideways within the sample changer's work area. To use a Code 0, 7, 8, or 9 rack, you must install the port bar with antlers Code 0-series for one Code 0, 7, 8, or 9 rack (part number 1907143). To use a Code 30- or 30P-series rack horizontally, you must install the port bar with antlers Code 30-series (part number 1907142).

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

Connect the antlers' port bar to the lower position of the front standoffs of the sample changer. Place the rack onto the antlers. A Code 20- or 30-series rack can be placed on the tray in the far right position.



Microplate Holder

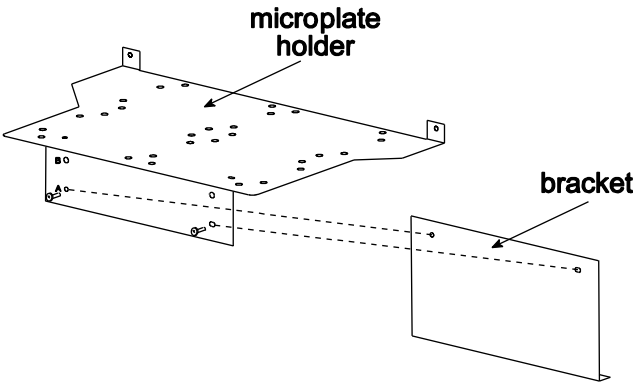
To use microplates with the sample changer, you must install the microplate holder (part number 1907151). You can use standard or deep-well microplates.

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 on the next few pages.

Instructions for Standard Microplates

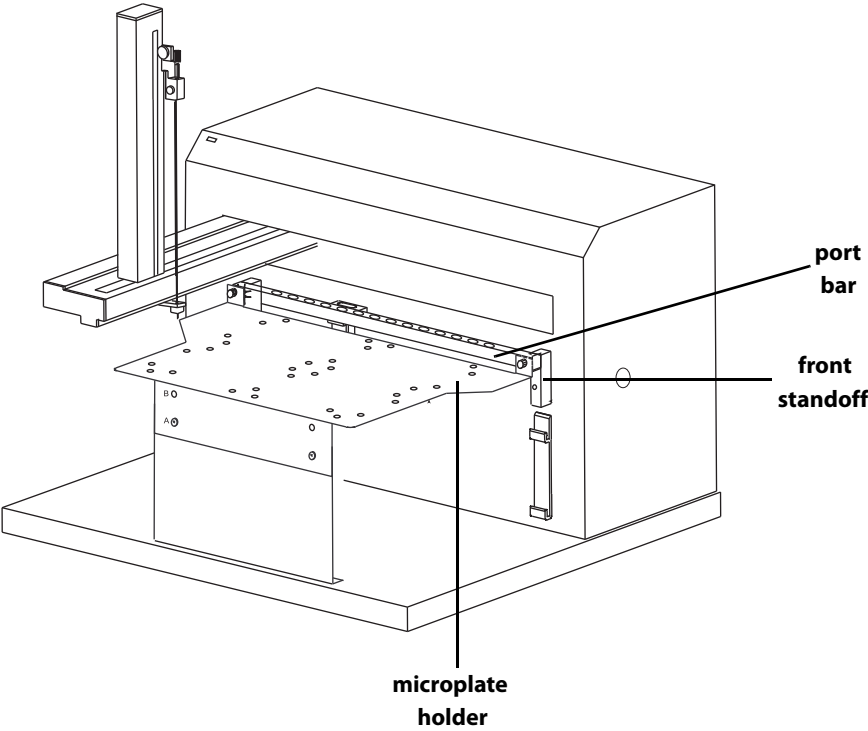
For standard microplates:

- 1 Align the lower set of holes (labeled A) in the microplate holder with the holes in the metal bracket. Insert the supplied Phillips 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.

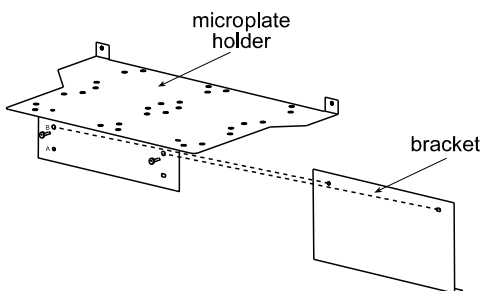
Note: If a port bar is installed, install the microplate holder in front of the port bar.



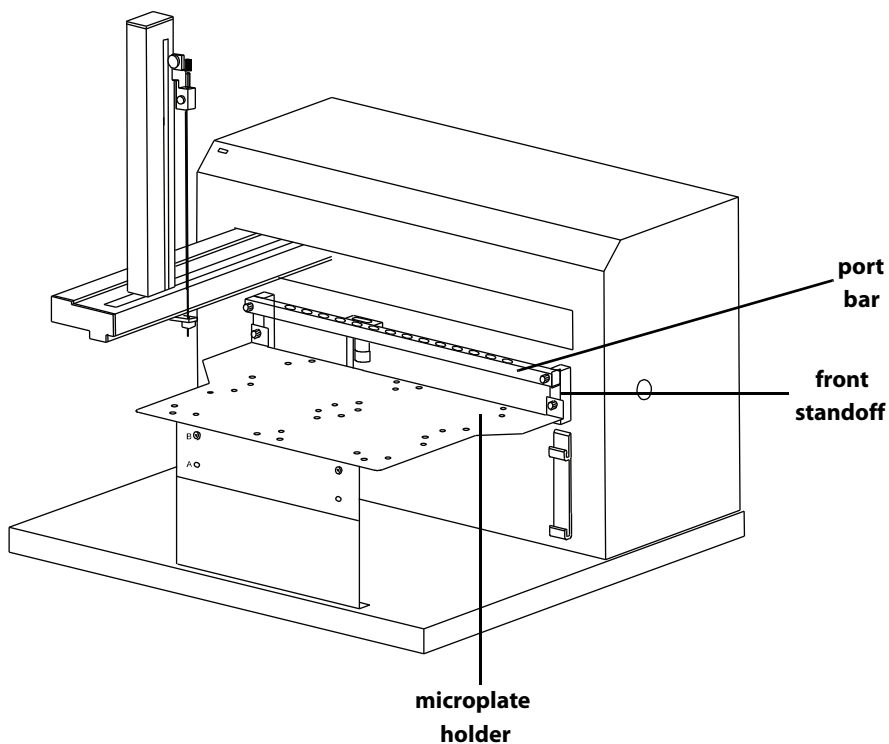
Instructions for Deep-Well Microplates

For deep-well microplates:

- 1 Align the upper set of holes (labeled B) in the microplate holder with the holes in the metal bracket. Insert the supplied Phillips 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 port bar if installed. Use the two knurled screws supplied with the microplate holder.



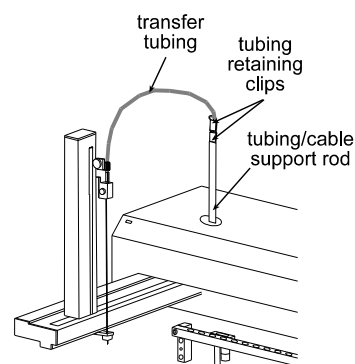
Accessory Installation

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 flat-blade screwdriver before snapping the tubing into place.) Also remember to leave enough tubing to allow for the movement of the probe.

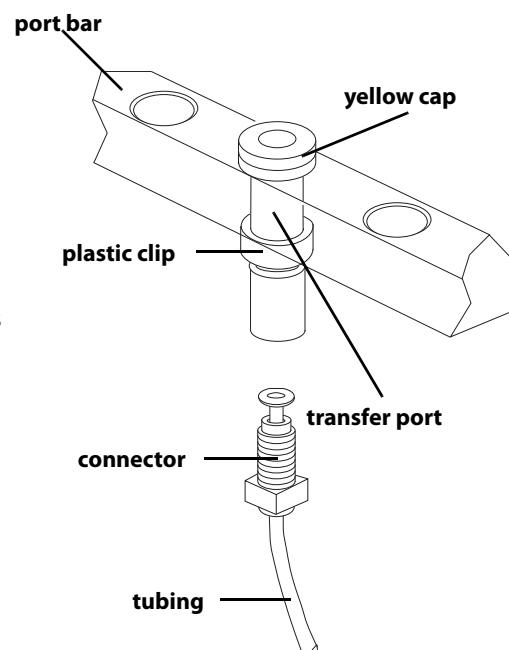
Gather any excess transfer tubing into a coil to minimize the length of tubing and secure the coil using a twist tie. Position the excess tubing in a convenient location near the rear of the sample changer.



Transfer Port

To install a transfer port:

- 1 Place the transfer port in any mounting hole on the port 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

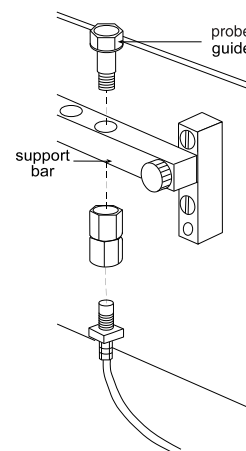
Be aware of the following when using transfer ports:

- 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 port 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 port bar and tighten.
- 3 Attach the bottom portion of the filler port assembly to the probe guide.

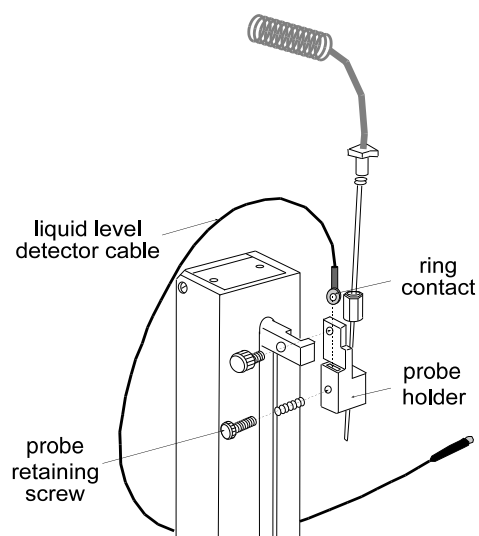


Liquid Level Detector

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.



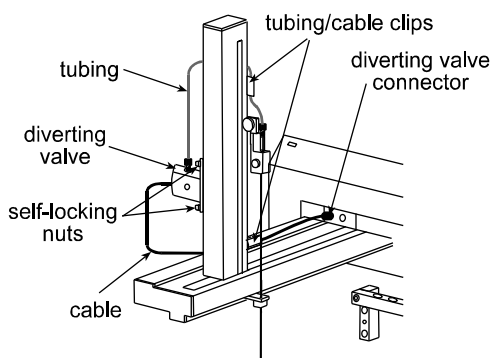
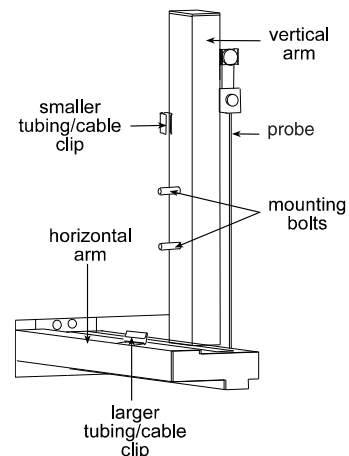
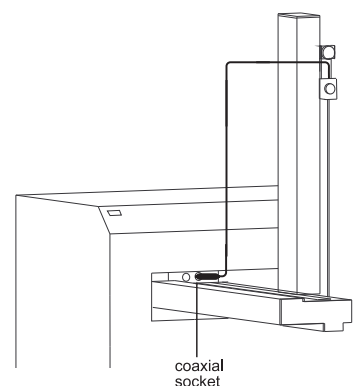
Disconnect LLD Cable

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.

Diverting Valve

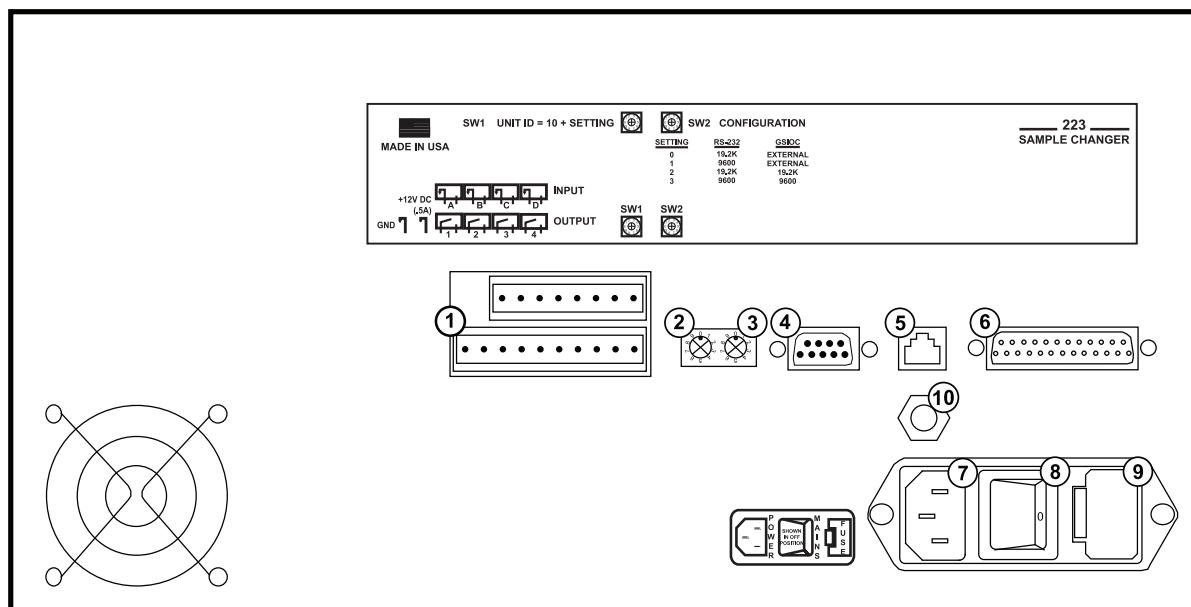
To install the diverting valve:

- 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 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.



Rear Panel Connections

Rear Panel Diagram



- 1 Input/Output (I/O) contact ports
- 2 SW1 (unit ID) selector
- 3 SW2 (baud rate/configuration) 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
- 10 Keypad power

RS-232 Port

The RS-232 port is used to transfer information between the sample changer and a computer. For the location of the RS-232 port, see [Rear Panel Diagram](#) on page 2-12.

To connect your computer to the sample changer, you need an RS-232 cable.

Connect the RS-232 Cable

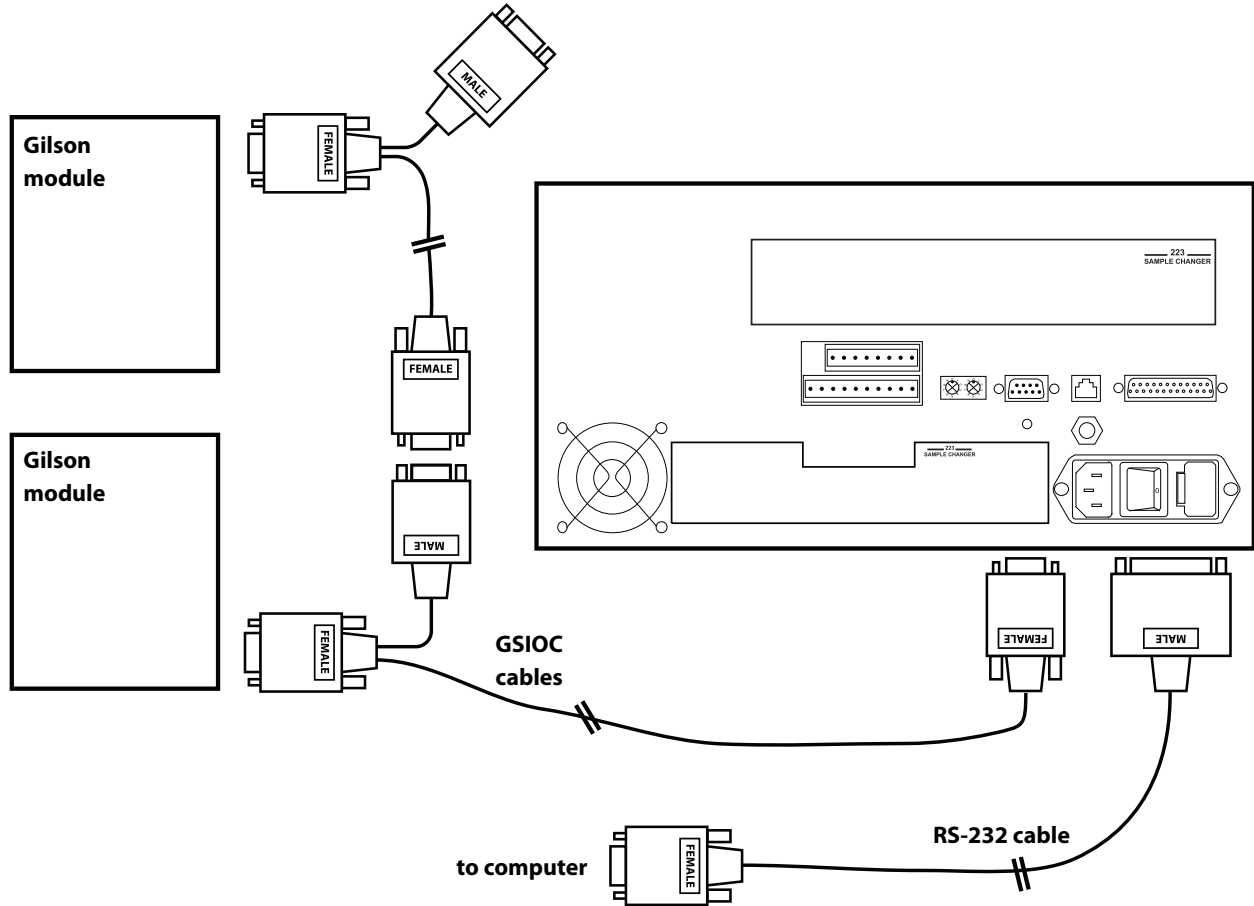
Attach the 25-pin, male end of the RS-232 cable to the RS-232 port located on the rear panel of the sample changer. Tighten the retaining screws.

Connect the 9-pin, female end of the RS-232 cable to the computer's RS-232 serial communications port. Tighten the retaining screws.

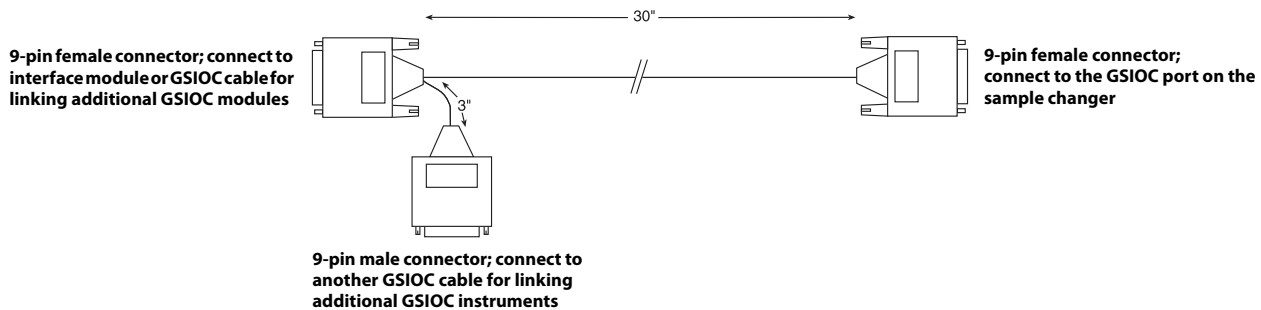
GSIOC Port

Use a GSIOC cable to connect other instruments to the sample changer and then control all from one computer. A GSIOC cable has two 9-pin female connectors and one male connector.

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



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



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

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

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

Input/Output Ports

You can use the input and output contacts found on the rear panel of the sample changer to control peripheral devices. Refer to the [Rear Panel Diagram](#) on page 2-12 for the location of the input/output ports.

Inputs

The input terminal block of the sample changer has four contacts. 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 output terminal block has four contacts. All of the outputs are paired.

The contact outputs are labeled 1, 2, 3, and 4.

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.

Make Connections

The following are needed to make connections:

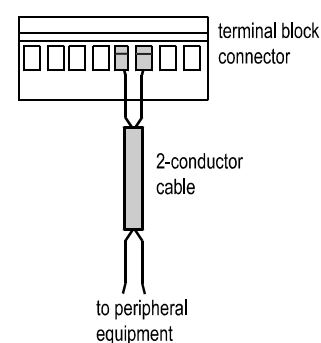
- terminal block connector
- 2-conductor cable (22–30 gauge for each wire)
- wire insulation stripper
- small-blade screwdriver

To make connections using the 2-conductor cable:

- 1 Cut the cable into pieces of appropriate length.
- 2 Strip about 3 mm 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 and 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.



SW 1 (Unit ID) Selector

Use the SW1 selector to choose a different unit ID. For the location of the selector, refer to the [Rear Panel Diagram](#) on page 2-12.

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

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 Gilson instrument 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.

SW2 (Baud Rate/Configuration) Selector

Use the SW2 selector to choose a different baud rate. For the location of the selector, refer to the [Rear Panel Diagram](#) on page 2-12.

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

For additional baud rate selections, refer to the rear panel label on the sample changer.

To change the baud rate/configuration setting:

- 1 Gently insert a small flat-blade screwdriver into the SW2 selector on the rear panel and turn it.
- 2 Align the white dot with one of the indicated numbers.

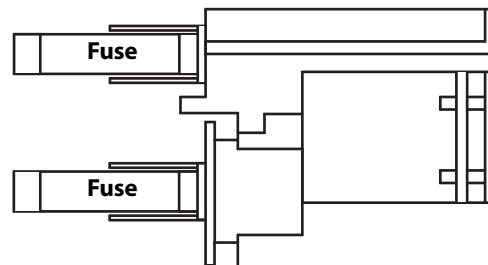
Fuse Installation

- 1 Locate the fuse drawer and two of the supplied fuses.
- 2 Insert the fuses in the fuse drawer.
- 3 Insert the fuse drawer into its receptacle on the rear panel.

Power Connection

Locate the appropriate power cord for your line voltage.

Use the power cord to connect the sample changer to a power source.



This chapter provides the following information:

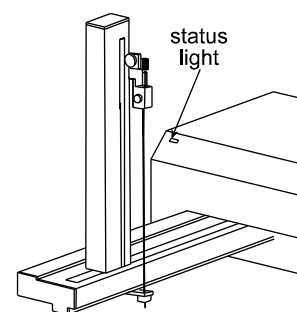
- How to [Start Up](#) the sample changer
- How to use the [223 Setup Utility](#)

Start Up

To start the sample changer:

- 1 Make sure that the arm locking screw has been removed.
- 2 Make sure the sample changer is connected to a power source.
- 3 Power the sample changer ON using the power switch located on the rear panel. The indicator light on the front panel illuminates.

If the indicator light begins blinking, there is a problem with the sample changer. See [Indicator Light Not Illuminated](#) on page 5-3.



223 Setup Utility

The sample changer is controlled by programs executed from a computer.

The computer is connected to the sample changer via an RS-232 cable. Refer to [RS-232 Port](#) on page 2-12 for correct installation of the RS-232 cable between the sample changer and the computer.

The following utility program is supplied on the 223 Sample Changer Utility Programs CD supplied with your sample changer.

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

The sample changer comes with its configuration set by Gilson. 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, it is important to review and adjust the default configuration to ensure that it is correct for your application.

The 223 Setup Utility 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 screen with menu tabs appears:

- [About](#)
- [Error Handling](#)
- [Arm Travel](#)
- [XYZ Coordinates](#)
- [Contacts](#)
- [Homing](#)
- [Adjust XY](#)
- [Liquid Detector](#)
- [Z-Arm](#)



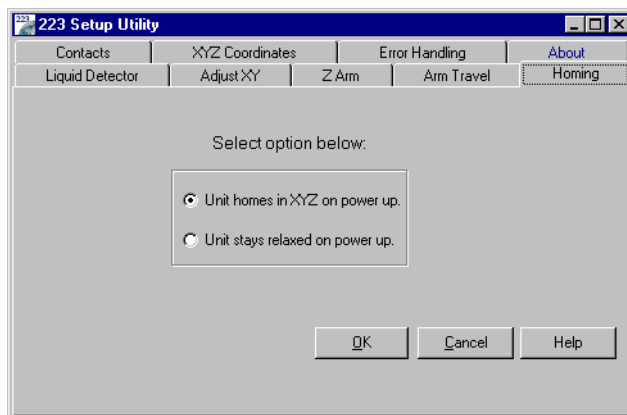
About

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.



Homing



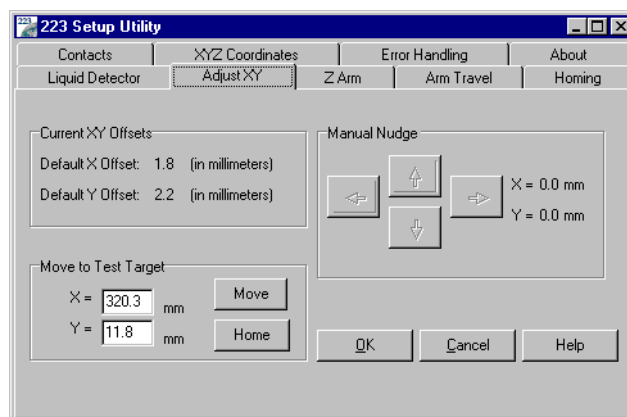
This tab allows you to choose whether the instrument should home when powered up (select **Unit homes in XYZ on power up.**) or whether the motors in the arm should be disabled when the instrument powers up (select **Unit stays relaxed on power up.**)

Adjust XY

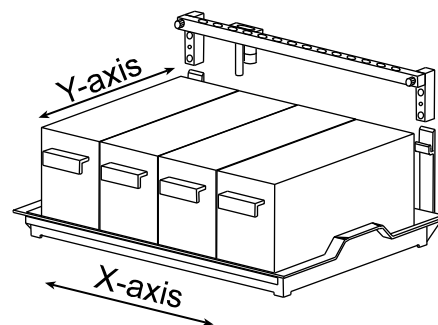
The Adjust XY tab allows you to test whether the instrument is properly adjusted and to make minor adjustments to the X- and Y-axis offsets if needed. You may need to use the options under this tab if the probe is not accessing the transfer port, filler port, or the vessels in the installed racks.

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

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

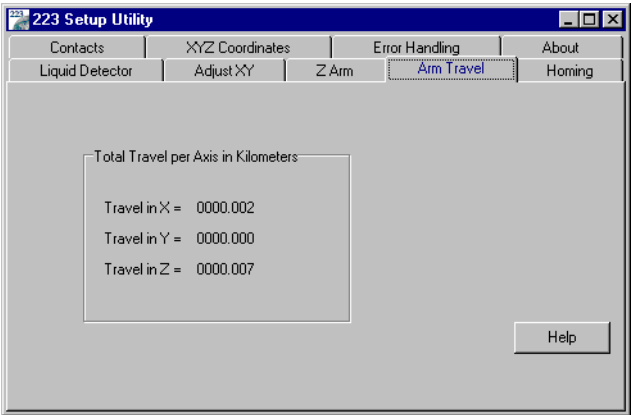


- 1 Select a test point.
- 2 Click **Move**. When the probe reaches the target site, the software relaxes the Z-arm so you can manually raise and lower the probe for visual alignment confirmation on the target site.
- 3 If the probe is not aligned over the target location, use the Manual Nudge arrow 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.



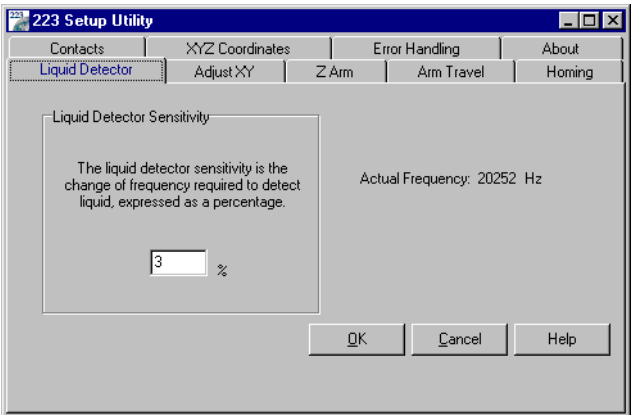
Liquid Detector

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**.

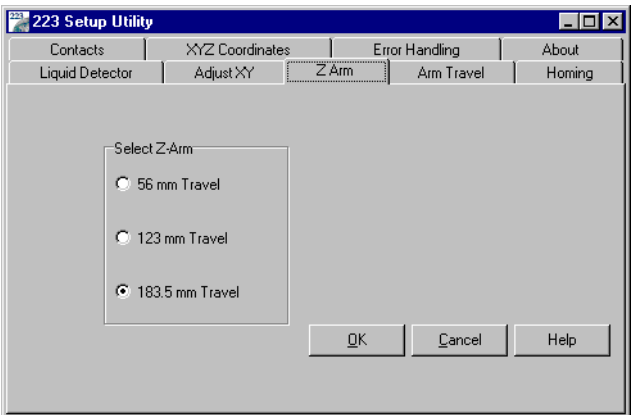


Z-Arm

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 [Input/Output Ports](#) on page 2-14 for information on making contact connections.

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

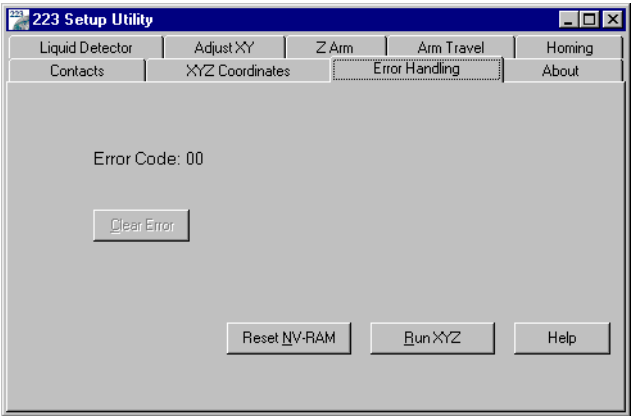
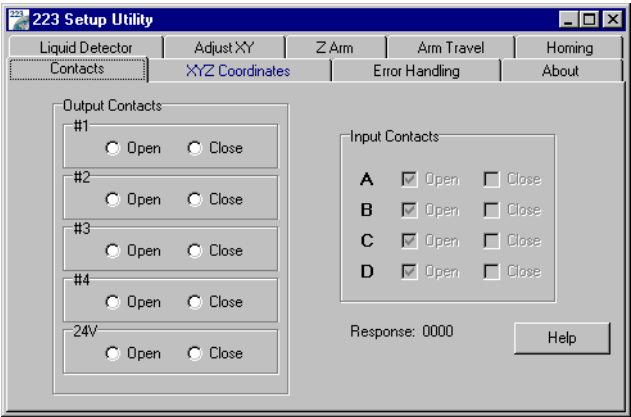
Error Handling

This tab displays the current error when the instrument is in an error state. For error solutions, refer to [Chapter 5, Troubleshooting](#). To clear the error, click **Clear Error**.

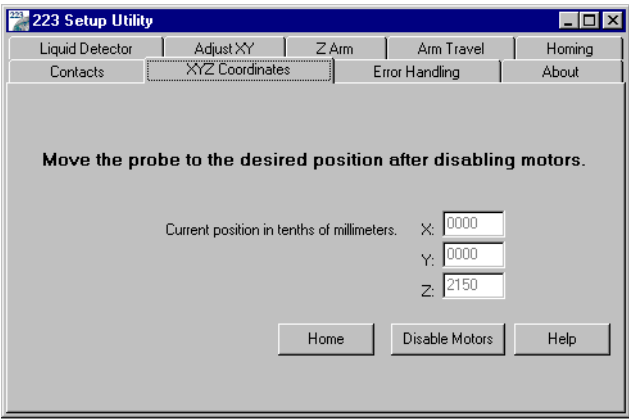
Click **Reset NV-RAM** to reset the configuration options to the factory defaults.

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.

NOTICE Remove the probe before running this test!

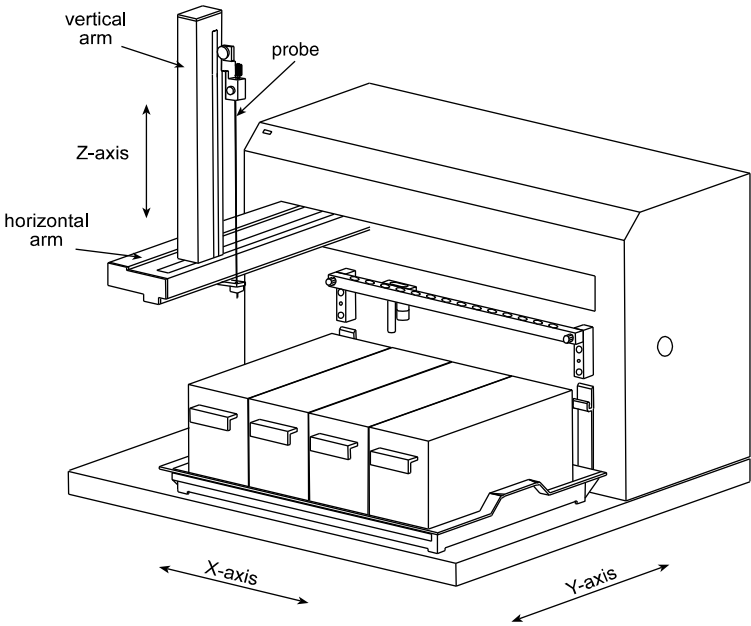


XYZ Coordinates



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.



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

The 223 Sample Changer is intended to be used in a laboratory environment by trained technical personnel.

This chapter contains the following information to help you maintain your sample changer:

- [Clean the Sample Changer](#)
- [Part Replacement](#)
- [Check Position Alignment](#)
- [Transport the Sample Changer](#)

Clean 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.

Part Replacement

Probe

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

Install Same Type of Probe

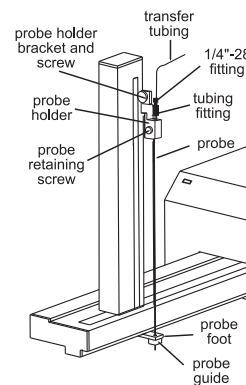
To install a replacement probe of the same type that is currently installed:

- 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.

Install 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, Replacement Parts and Accessories](#).

- 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.



Fuse

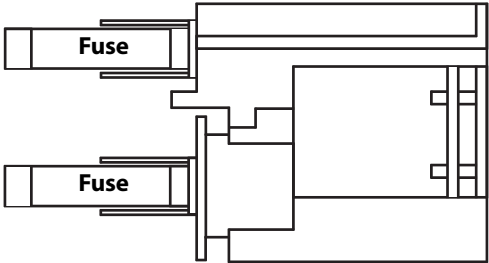
Refer to the instructions when replacing the fuses. The table contains part numbers for the replacement fuse and fuse drawer.

Part Number	Description
6730204007	FUSE, 2.0 AMP T-2 SLO-BLO
6770100411	FUSE DRAWER

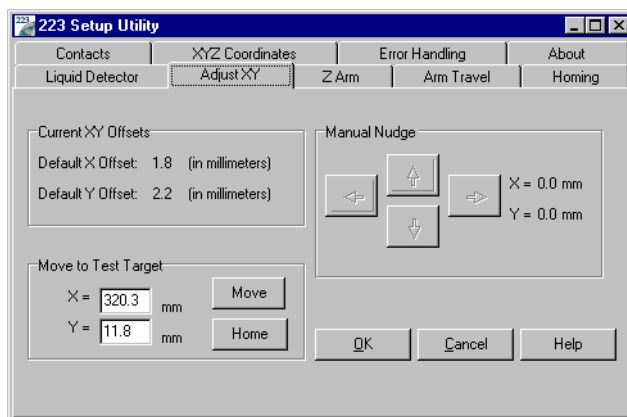
To change a fuse, follow these steps.

- 1 Power off the instrument and disconnect the power cord.
- 2 Locate or order replacement fuses. (Extras were provided with the instrument.)
- 3 Place a small screwdriver or a fingernail under the tab on the fuse drawer to detach it.
- 4 Remove the fuse drawer from its receptacle on the rear panel.
- 5 Replace both fuses. Use only fuses with the rated current and specified type as listed in this user’s guide and on the rear panel of the instrument.
- 6 Insert the fuse drawer into its receptacle on the rear panel.

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



Check Position Alignment



The 223 Setup Utility (Adjust XY tab), described on [page 3-4](#), 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.

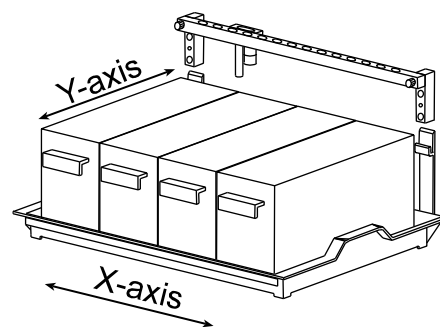
The X offset and Y offset text boxes display the current offsets stored in the instrument's memory.

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

- 1 Select a test point.
- 2 Click **Move**. When the probe reaches the target site, the software relaxes the vertical 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.



Transport the Sample Changer

Move 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 2-2](#) 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.

NOTICE

Do not use the horizontal arm as a handle. Always lift the instrument from its base.

Ship the Sample Changer

If packaging the sample changer for shipment, remove the vertical arm. To remove the vertical arm, refer to the diagrams on [page 2-2](#) 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.

This chapter provides information on the following topics:

- [Error Messages](#)
- [Mechanical](#) Troubleshooting
- [Electrical](#) Troubleshooting
- [Liquid Level Detector](#) Troubleshooting

Error Messages

To obtain the current error code number, send the immediate e command using the GSIOC Utility.

Error	Description	Solution
15	NV-RAM checksum is invalid	Send the buffered ~9 GSIOC command to reset the NV-RAM and initialize to the default value. Run the 223 Setup Utility program to check configuration options.
20	X motor position error	Cycle power to the sample changer. Check for obstructions.
21	Y motor position error	Cycle power to the sample changer. Check for obstructions.
22	Z motor position error	Cycle power to the sample changer. Check for obstructions.
23	X sensor inactive	Check if the sensor disk is bent.
24	Y sensor inactive	Check if the sensor disk is bent.
25	Z sensor inactive	Check if the sensor disk is bent.
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 and then correct the error in the program controlling the sample changer.
29	X-offset out of range	Run the 223 Setup Utility (Adjust XY tab) to correct the problem.
30	Y-offset out of range	Run the 223 Setup Utility (Adjust XY tab) to correct the problem.
31	Z-offset out of range	Run the 223 Setup Utility (Adjust XY tab) to correct the problem.

Mechanical

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 4-5](#).

Electrical

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 ports.
- Check connections for proper pin assignments.
- Be sure pins from external devices are assigned correctly.
- Check polarity of input. Inputs should be a contact closure. If not, it must be TTL level (logic 0 activates).
- Confirm that the device supplying the input signal to the sample changer is working.

Output Functions Not Operating

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

Indicator Light Not Illuminated

- Ensure power is turned on.
- Check power cord connections.
- Try different outlet.
- Check fuses; replace if necessary.
- Check all sample changer connections.

Indicator Light Blinking

- Check for obstructions to horizontal or vertical arm or probe.
- Check for error code from sample changer.
- Issue buffered ~9 command to reset NV-RAM and initialize default parameters.

Sample Changer Blows Fuses

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

Liquid Level Detector

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.
- 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.

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

Vertical Arms

<i>Part Number</i>	<i>Description</i>
190610	183 mm vertical arm
190611	123 mm vertical arm
190613	56 mm vertical arm

Probes

Probes for 183 mm Vertical Arm—Stainless Steel

<i>Part Number</i>	<i>Description</i>
27067361	Beveled-edge probe (not septum-piercing); 220.5 x 1.5 x 1.1 mm.
27067373	Non septum-piercing probe; constricting tip, 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; constricting beveled-tip, 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.

Probes for 183 mm Vertical Arm—Teflon

<i>Part Number</i>	<i>Description</i>
27067369	Teflon-coated probe for non-metal applications. Dimensions: 220 x 0.9 mm ID.

Probes for 123 mm Vertical Arm—Stainless Steel

Part Number	Description
27067211	Beveled-tip probe; 160.5 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (part number 19061040).
27067213	Tapered-tip probe; 160 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (part number 19061040).
27067212	Side-entry probe (septum-piercing); 160.5 x 1.5 x 1.1 mm ID. Requires probe holder/guide kit (part number 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 (part number 19061040).
27067235	Beveled-edge probe (septum-piercing); 162 x 0.7 x 0.42 mm. Requires probe sleeve (part number 27067236) and probe holder/guide kit (part number 19061040).
27067231	Beveled-edge probe (not septum-piercing); 162 x 0.7 x 0.42 mm. Requires sleeve (part number 27067232) and probe holder/guide kit (part number 19061040).
27067276	Flat-tipped probe for drop transfer; 165 x 0.7 x 0.4 mm. Requires probe sleeve (part number 27067277). Requires probe holder/guide kit (part number 19061040).
27067238	Grooved septum-piercing probe, 162 x 0.7 x 0.4 mm ID. Requires 1.6 mm probe guide insert (part number 27067239).

Probes for 123 mm Vertical Arm—Titanium

Part Number	Description
27067237	Titanium beveled-edge probe (septum-piercing); 162 x 0.7 x 0.42 mm. Requires probe sleeve (part number 27067236). Requires probe holder guide/kit (part number 19061040).

Probes for 123 mm Vertical Arm—Teflon

Part Number	Description
27067218	Teflon-coated probe for non-metal applications; 157.5 x 0.9 mm ID (22 GA). Requires probe holder/guide kit (part number 19061041).

Probes for 56 mm Vertical Arm—Stainless Steel

Part Number	Description
27067131	Beveled-edge probe (septum-piercing); 95 x 0.7 x 0.42 mm. Requires probe sleeve (part number 27067132) and probe holder guide/kit (part number 19061040).
27067113	Constricting tip probe; 93.5 x 1.5 x 1.1 mm. Requires probe holder/guide kit (part number 19061040).

Probes for 56 mm Vertical Arm—Titanium

Part Number	Description
27067133	Beveled-edge probe (septum-piercing); 95 x 0.7 x 0.42 mm. Requires probe sleeve (part number 27067132) and probe holder guide/kit (part number 19061040).

Double Probe Kit

<i>Part Number</i>	<i>Description</i>
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), connector, probe holder and probe guide.

Probe Sleeves

<i>Part Number</i>	<i>Description</i>
27067132	Probe sleeve for septum-piercing probe
27067232	Probe sleeve for non-septum-piercing probe. Requires probe holder/guide kit (part number 19061040).
27067236	Probe sleeve for septum-piercing probe; 133 x 2 x 0.8 mm. Requires probe holder/guide kit (part number 19061040).
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.

Probe Holder/Guide Kits

<i>Part Number</i>	<i>Description</i>
19061040	Probe holder/guide kit; includes probe holder, guide and probe connecting nut (part number 27072001) for 1.5 mm outer diameter probes.
19061041	Probe holder/guide kit; includes probe holder, guide and probe connecting nut (part number 23074002) for Teflon probes.

Transfer Tubing

Part Number	Description
499424012	TUBING, COILED, 1 mL, 0.8 mm ID
499421202	TRANSFER TUBING,1.5 mL FEP, 0.8 mm x10FT
499474032	TUBING, COILED, 3 mL, .8 mm ID, FEP
499474052	TUBING, COILED, 5 mL, 1.5 mm ID, FEP
499474102	TUBING, COILED, 10 mL, 1.5 mm ID X 24FT
499474252	TUBING, COILED, 25 mL, 1.5 mm ID X 50FT
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

Part Number	Description
2707251L	Rinse station with 85 mm rinsing well
270726	Rinse station
2707261L	Rinse station with 45 mm rinsing well
2707263	Polypropylene rinsing well, 45 mm
2707253	Polypropylene rinsing well, 85 mm
2707252	Polypropylene rinsing well, flow-through
29501017	Cable ties 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.

Control

Part Number	Description
2106171	706 GSIOC Device Driver Software (Programmer's Tool Kit) for MS DOS-based systems. Includes tools for programmers to write computer programs to control Gilson instruments: the GSIOC Device Driver to extend MS DOS or PC DOS to use Gilson devices, and sample programs written in BASICA, Turbo Pascal, Microsoft Pascal and C which demonstrate how to write programs to address Gilson instruments. Use with Model 605 RS-232 Adapter or 506C System Interface Module.
36083122	Serial Cable, 9-pin/25-pin (most common)

Safety Shield

<i>Part Number</i>	<i>Description</i>
1907175	223 Safety Shield kit. Encloses sides and front of 223 working area.

Accessories

<i>Part Number</i>	<i>Description</i>
1907151	Holder for four standard or deep-well microplates
1907142	Port bar 223 antlers code 30-series
1907143	Port bar 223 antlers code 0-series for one Code 0, 7, 8, or 9 rack
2704429	Thermostating cuvette: one required per Code 30-series thermostated rack.
2949694	Rack Heightener for series 30P racks
2749767	Injection port for 221/222 XL Liquid Handlers and transfer port for the 223 Sample Changer.
49942107	0.8 mm ID Teflon Tubing; 10 feet plus 2 end fittings. To connect filler port to other instrument.
190711	Diverting valve assembly for 223 Sample Changer. Includes mounting bracket, tubing, and two tubing/cable clips
2954829	1 mL sealing caps for transfer ports 50/P
190710	Tray spacers for installing polypropylene tray in upper position, package of 2
709910206	2-conductor interconnect wire, 6 feet.

Replacement Parts

<i>Part Number</i>	<i>Description</i>
1907141	Port bar for mounting rinse station(s), transfer port(s), and filler port
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
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
19041001	Generic black pan with drain assy

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.

To make your own rack, order the Polypropylene unperforated rack kit (part number 150499).

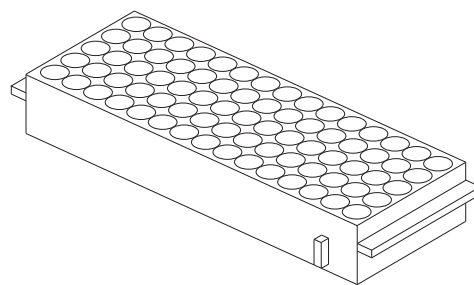
Code 0 rack

For 80 vessels

Material: polypropylene

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

Part number: 270430



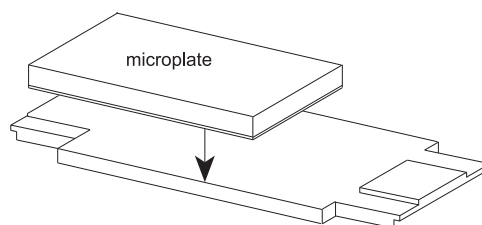
Code 7 rack holder

For one 96-well microplate

Vessel capacity: 0.3 mL/well

Part number: 2707401

Note: Requires installation of rack holder (part number 1907143).
See [Chapter 2, Installation](#).



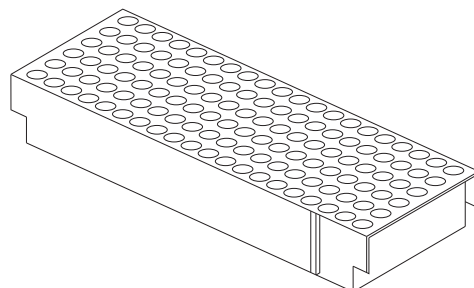
Code 8 rack

For 120 vessels

Material: polypropylene

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

Part number: 270438



Code 9 rack

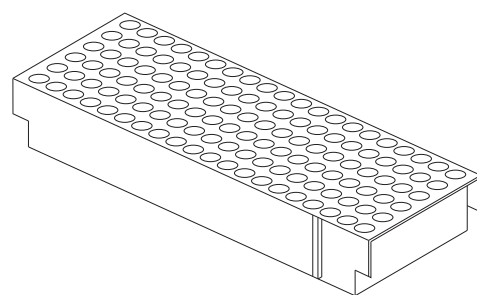
For 120 vessels

Material: polypropylene

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

Part number: 270439

Note: Requires installation of rack holder (part number 1907143).
See [Chapter 2, Installation](#).



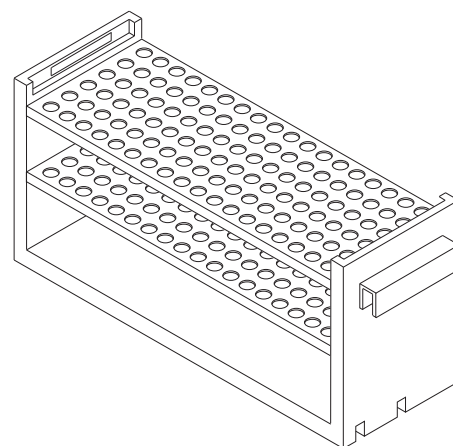
Code 20 rack

For 108 vessels

Material: polypropylene

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

Part number: 150425



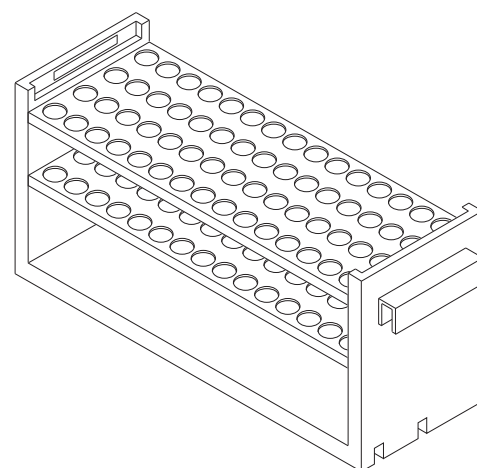
Code 21 rack

For 60 vessels

Material: polypropylene

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

Part number: 150422



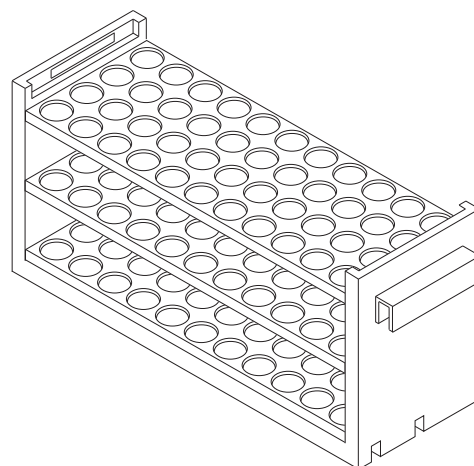
Code 22 rack

For 44 vessels

Material: polypropylene

Vessels and maximum capacity: 18 x 150 mm tubes (25 mL)
18 x 180 mm tubes (32 mL)

Part number: 150424



Code 22U rack

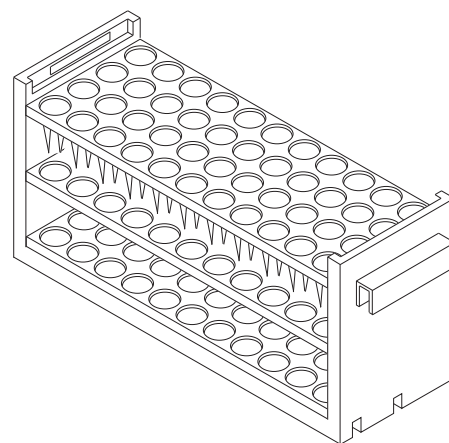
For 44 vessels

Material: polypropylene

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

Part number: 150498

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



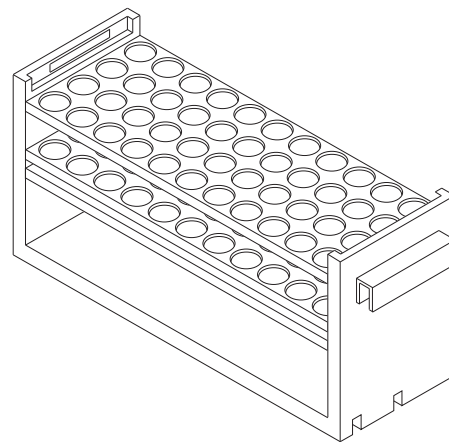
Code 23 rack

For 44 mini-scintillation vials

Material: polypropylene

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

Part number: 150426



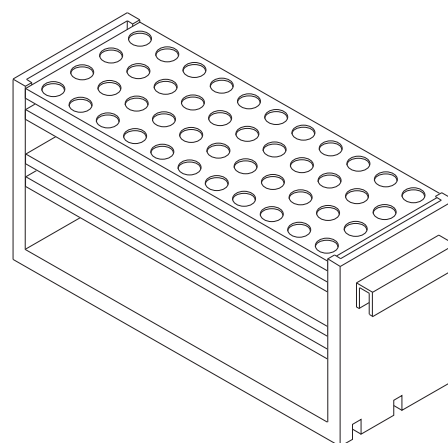
Code 23W rack

For 44 WISP-style vials

Material: polypropylene and stainless steel

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

Part number: 270433



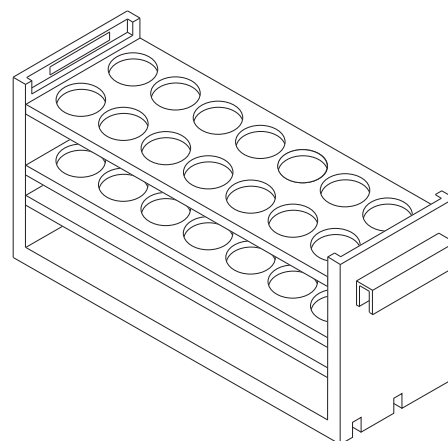
Code 24 rack

For 14 scintillation vials

Material: polypropylene

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

Part number: 150427



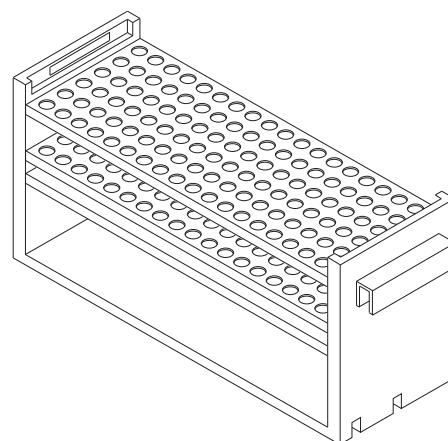
Code 28 rack

For 108 vessels

Material: polypropylene

Vessels and maximum capacity: 10 x 65 mm tubes (3 mL)
10 x 75 mm tubes (3.5 mL)

Part number: 150420



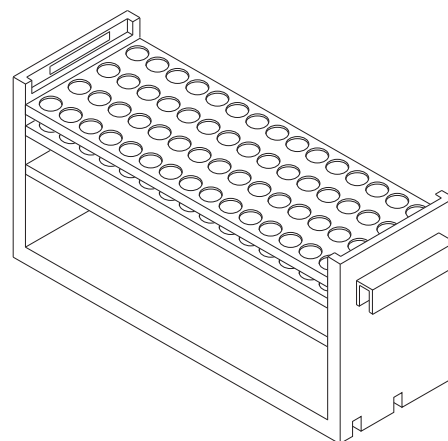
Code 29 rack

For 60 vessels

Material: polypropylene

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

Part number: 150429

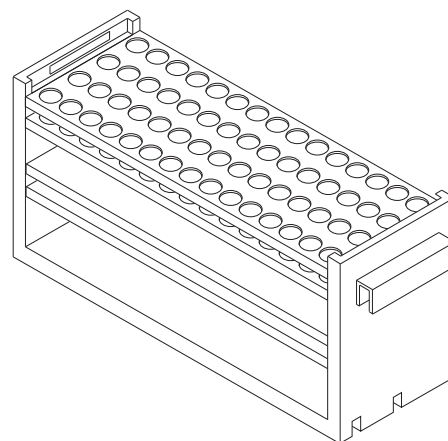
**Code 29 LE rack**

For 60 large (1.5 mL) vials

Material: polypropylene and stainless steel

Vessels and maximum capacity: 11 x 40 mm (1.5 mL)

Part number: 2704342

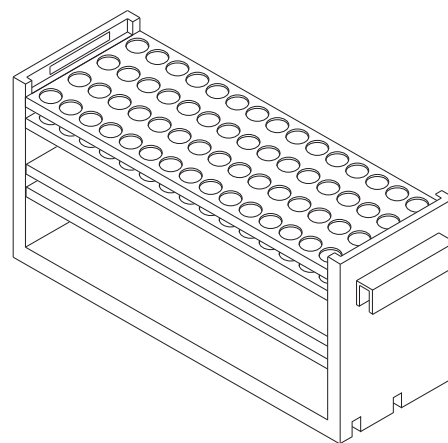
**Code 29 SE rack**

For 60 small (0.5 mL) vials

Material: polypropylene and stainless steel

Vessels and maximum capacity: 7 x 30 mm (0.5 mL)

Part number: 2704341

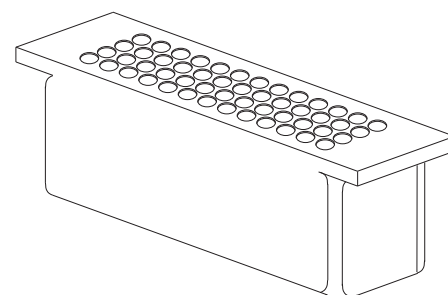
**Code 30 rack**

For 60 vessels

Material: aluminum

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

Part number: 2704430



Code 30P rack

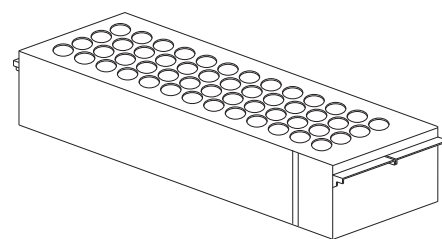
For 60 vessels

Material: polypropylene

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

Part number: 2704530P

Note: Requires installation of rack holder (part number 1907142).
See [Chapter 2, Installation](#).



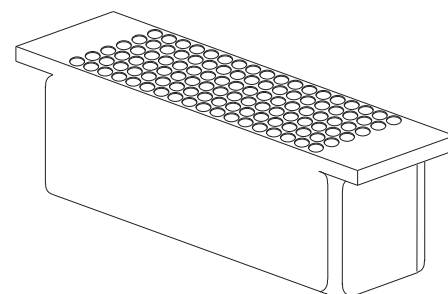
Code 31 rack

Thermostated rack for 108 vessels

Material: aluminum

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

Part number: 2704431



Code 31P rack

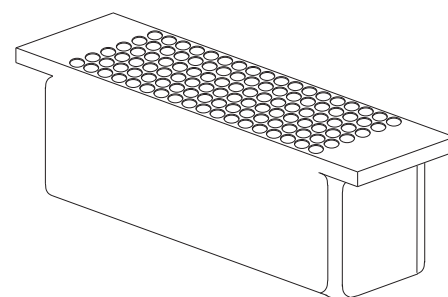
For 108 vessels

Material: polypropylene

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

Part number: 2704531P

Note: Requires installation of rack holder (part number 1907142).
See [Chapter 2, Installation](#).



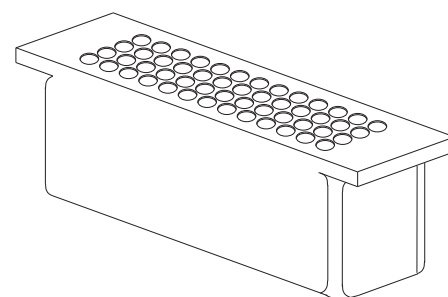
Code 32 rack

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)

Part number: 2704432



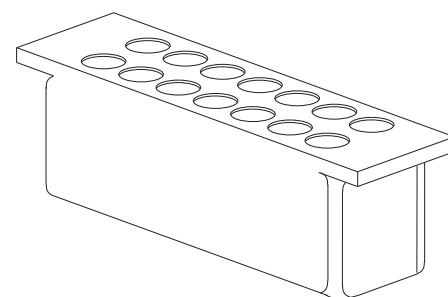
Code 33 rack

Thermostated rack for 14 scintillation vials

Material: aluminum

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

Part number: 2704433



Code 33P rack

For 14 scintillation vials

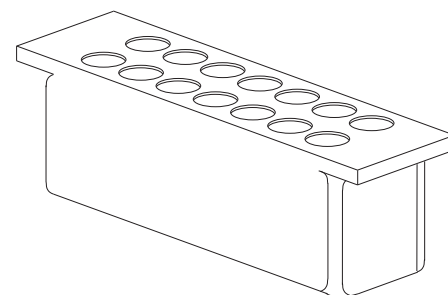
Material: polypropylene

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

Part number: 2704533P

Note: Requires installation of rack holder (part number 1907142).

See [Chapter 2, Installation](#).



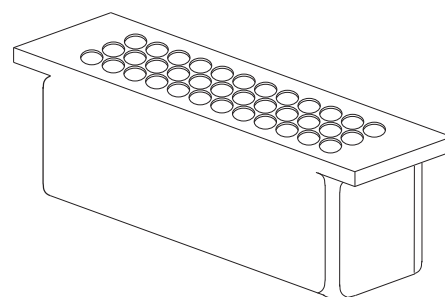
Code 34 rack

Thermostated rack for 36 WISP-style vials

Material: aluminum

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

Part number: 2704434



Code 34P rack

For 36 WISP-style vials

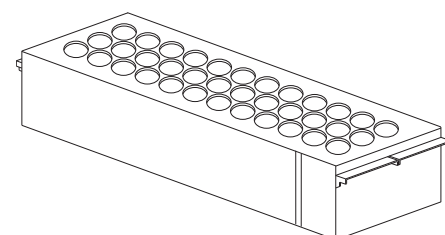
Material: polypropylene

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

Part number: 2704534P

Note: Requires installation of rack holder (part number 1907142).

See [Chapter 2, Installation](#).



Code 35P rack

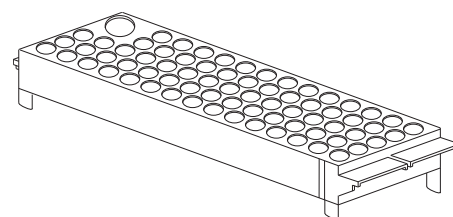
For 71 vessels and one scintillation vial

Material: polypropylene

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

Part number: 2704535P

Note: Requires installation of rack holder (part number 1907142). See [Chapter 2, Installation](#).



Code 36P rack

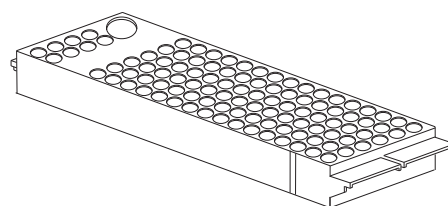
For 120 microvials and one scintillation vial

Material: polypropylene

Vessels and maximum capacity: 7 x 41 mm (0.7 mL)
28 x 60 mm (20 mL)

Part number: 2704536P

Note: Requires installation of rack holder (part number 1907142). See [Chapter 2, Installation](#).



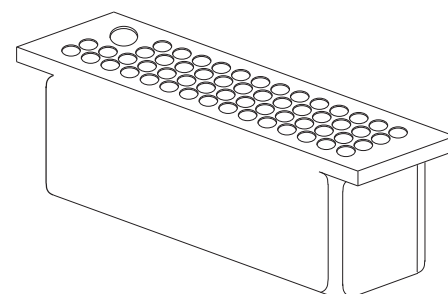
Code 37 rack

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)

Part number: 2704437



Code 38 rack

Thermostated rack for 96 microvials and one scintillation vial

Material: aluminum

Vessels and maximum capacity: 7 x 41 mm (0.7 mL)
28 x 60 mm (20 mL)

Part number: 2704438

