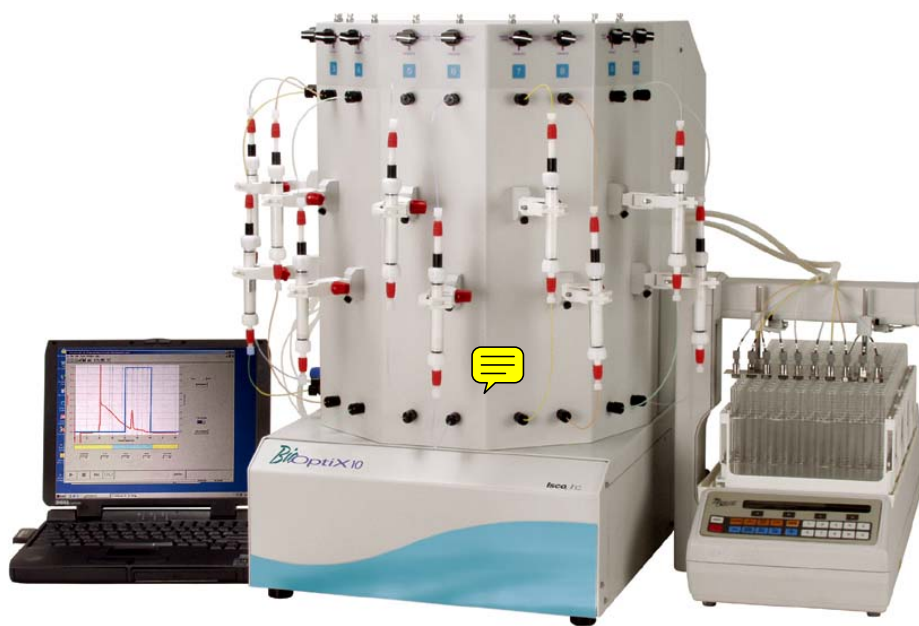


# BioOptix™ 10

## Installation and Operation Guide



#69-5203-150  
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Revision B, September 20, 2005



## Foreword

This instruction manual is designed to help you gain a thorough understanding of the operation of the equipment. Teledyne Isco recommends that you read this manual completely before placing the equipment in service.

Although Teledyne Isco designs reliability into all equipment, there is always the possibility of a malfunction. This manual may help in diagnosing and repairing the malfunction.

If the problem persists, call or e-mail the Teledyne Isco Technical Service Department for assistance. Simple difficulties can often be diagnosed over the phone.

If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by the Customer Service Department, including the use of the **Return Authorization Number** specified. **Be sure to include a note describing the malfunction.** This will aid in the prompt repair and return of the equipment.

Teledyne Isco welcomes suggestions that would improve the information presented in this manual or enhance the operation of the equipment itself.

**Teledyne Isco is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.**

### Contact Information

#### *Customer Service*

Phone: (800) 228-4373 (USA, Canada, Mexico)  
(402) 464-0231 (Outside North America)  
Fax: (402) 465-3022  
Email: IscoCSR@teledyne.com

#### *Technical Service*

Phone: (800) 775-2965 (Analytical)  
(800) 228-4373 (Samplers and Flow Meters)  
Email: IscoService@teledyne.com

Return equipment to: 4700 Superior Street, Lincoln, NE 68504-1398

#### *Other Correspondence*

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Email: IscoInfo@teledyne.com  
Web site: www.isco.com



*General Warnings*

Before installing, operating, or maintaining this equipment, it is imperative that all hazards and preventive measures are fully understood. While specific hazards may vary according to location and application, take heed in the following general warnings:

 **WARNING**

Liquids associated with this instrument may be classified as carcinogenic, biohazardous, flammable, or radioactive. Should these liquids be used, it is highly recommended that this application be accomplished in an isolated environment designed for these types of materials in accordance with federal, state, and local regulatory laws, and in compliance with your company's chemical/hygiene plan in the event of a spill.

 **AVERTISSEMENT**

Eviter de répandre des liquides dangereux. Les liquides qui sont analysés dans cet instrument peuvent être cancérigènes, hasards biologiques, inflammables, ou radioactifs. Si vous devez utiliser tels liquides, il est très recommandé que vous le faites à l'intérieur d'un environnement isolé conçu pour tels liquides. Cet environnement isolé devrait être construit selon les règlements fédéraux, provinciaux, et locaux, aussi que le plan de votre compagnie qui concerne l'évènement d'un accident avec les matières hasardeuses.

 **WARNING**

Avoid hazardous practices! If you use this instrument in any way not specified in this manual, the protection provided by the instrument may be impaired.

 **AVERTISSEMENT**

Éviter les usages périlleux! Si vous utilisez cet instrument d'une manière autre que celles qui sont spécifiées dans ce manuel, la protection fournie de l'instrument peut être affaiblie; cela augmentera votre risque de blessure.

 **WARNING**

If this system uses flammable organic solvents, Teledyne Isco recommends that you place this system in a well-ventilated environment, designed for these types of materials. This environment should be constructed in accordance with federal, state, and local regulations. It should also comply with your organization's plan concerning chemical and hygiene mishaps. In all cases use good laboratory practices and standard safety procedures.

 **AVERTISSEMENT**

Ce système peut utiliser des dissolvants organiques inflammables. Pour réduire le péril qui peut être causé par l'accumulation des vapeurs explosives, Teledyne Isco recommande que vous installiez ce système dans un environnement bien-aéré qui est conçu pour les matières hasardeuses. Cet environnement devrait être construit selon les règlements fédéraux, provinciaux, et locaux. Aussi, il devrait se conformer au plan de votre organisation qui concerne les mésaventures de l'hygiène ou de chimique. En tout cas, utilisez toujours de pratiques bonnes de la laboratoire et des procédures standards de la sûreté.

*Hazard Severity Levels*

This manual applies *Hazard Severity Levels* to the safety alerts. Three levels of severity are described in the sample alerts below.

 **CAUTION**

Cautions identify a potential hazard, which if not avoided, may result in minor or moderate injury. This category can also warn you of unsafe practices, or conditions that may cause property damage.

 **WARNING**









Warnings identify a potentially hazardous condition, which if not avoided, could result in death or serious injury.

 **DANGER**

**DANGER** – limited to the most extreme situations to identify an imminent hazard, which if not avoided, will result in death or serious injury.

*Hazard Symbols*

The equipment and this manual use symbols used to warn of hazards. The symbols are explained below.

<b>Hazard Symbols</b>	
<b>Warnings and Cautions</b>	
	The exclamation point within the triangle is a warning sign alerting you of important instructions in the instrument's technical reference manual.
	The lightning flash and arrowhead within the triangle is a warning sign alerting you of "dangerous voltage" inside the product.
<b>Symboles de sécurité</b>	
	Ce symbole signale l'existence d'instructions importantes relatives au produit dans ce manuel.
	Ce symbole signale la présence d'un danger d'électocution.
<b>Warnungen und Vorsichtshinweise</b>	
	Das Ausrufezeichen in Dreieck ist ein Warnzeichen, das Sie darauf aufmerksam macht, daß wichtige Anleitungen zu diesem Handbuch gehören.
	Der gepfeilte Blitz im Dreieck ist ein Warnzeichen, das Sie vor "gefährlichen Spannungen" im Inneren des Produkts warnt.
<b>Advertencias y Precauciones</b>	
	Esta señal le advierte sobre la importancia de las instrucciones del manual que acompañan a este producto.
	Esta señal alerta sobre la presencia de alto voltaje en el interior del producto.





# BioOptix™ 10

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# BioOptix™ 10

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## *Section 1 Introduction*


### 1.1 Product Overview

The BioOptix™ 10 system performs automated protein purification on as many as ten liquid samples simultaneously. The system has ten independent pumps that keep flow rates properly regulated in each channel, and ten independent detectors so that you can monitor the separation in every channel. The purified sample is collected by a fraction collector—up to 300 fractions per sample for unattended operation, or unlimited fractions for attended purification runs. BioOptix 10 control software lets you quickly locate the fractions of interest.

System highlights include:

- Individual detector on each channel.
- Unique gradient conditions can be used for each channel—great for scouting ideal gradient conditions.
- Repeatable, uniform flow for each sample, regardless of buffer gradient or sample consistency. Ten independent precision pumps provide flow rates from 0.5 to 12 mL/min for each channel.
- Fast and easy sample loading—individual sample introduction lines for each channel.
- Compact size gives you maximum capability in minimum bench space.
- High fraction capacity—
  - collect up to 300 fractions per sample completely unattended,
  - or unlimited fractions by manually replacing filled racks during a run.
- Pumps designed for salt buffers and common solvents ensure long life, low maintenance, no seal rinse fluid needed.

**1.2 System Specifications** Table 1-1 lists the BioOptix 10 specifications.

<b>Table 1-1 BioOptix 10 Specifications</b>	
Dimensions <sup>a</sup>	Height: 69 cm Width: 72 cm Depth: 61 cm
Weight <sup>a,b</sup>	210 kg
Power Requirement <sup>a,c</sup>  The power switch is the disconnect device.	100 VAC ±10%, 2.0 Amps 117 VAC ±10%, 2.0 Amps 234 VAC ±10%, 1.0 Amps
Line Frequency	50 or 60 Hz
Operating Temperature <sup>a</sup>	5 to 40°C
Humidity <sup>a</sup>	When connected to mains power, 95% relative humidity maximum at 5 to 40°C
Gradient Flow Rate Range	0.5 to 12 mL/min
Flow Rate Accuracy	± 5% full scale (using water)
Gradient Accuracy	± 5% full scale (using water)
Gradient Linearity	± 5% full scale (using water)
Operating Pressure	0 to 6.895 bar (0 to 100 psi)
Flow Cell Path Length	2 mm
Detector Wavelength	190 to 360 nm
Detector Noise	$5 \times 10^{-4}$ AU
Detector Drift	$1 \times 10^{-3}$ AU/hr
CE Conformity Specifications <sup>a,d</sup>	Pollution Degree: 2 Installation Category: II Maximum Altitude: 2000 meters

- a. Excludes Foxy 200 Fraction Collector and Windows PC Controller. Refer to the respective manuals for these additional specifications.
- b. Dry weight of the BioOptix 10, excluding connection cables, tubing, and user-supplied buffer containers.
- c. Operating voltage of the BioOptix 10 is factory set.
- d. Refer to the *CE Declaration of Conformity*, at the back of this manual, for applicable standards and test results.

## 1.3 System Controls and Connectors

### 1.3.1 BioOptix 10 Front Panel Controls



Figure 1-1 BioOptix 10 front panel

Table 1-2 BioOptix 10 Front Panel Controls		
Item	Name	Description
1	Manual Sample Inject Port	Injection port for syringe-injected liquid samples.
2	Mode Knob	Configures fluid path for purging, manual sample injection, or purification operation.
3	Column Inlet Port	Allows connection of tubing to column inlet.
4	Column Clamp Position Adjust	Secures column clamp and allows for horizontal and rotational positioning of columns.
5	Column Outlet Port	Allows connection of tubing from column outlet.
6	Column Clamp (Not shown)	Tightens to secure the chromatography column.

### 1.3.2 BioOptix 10 Left-side Controls and Connections

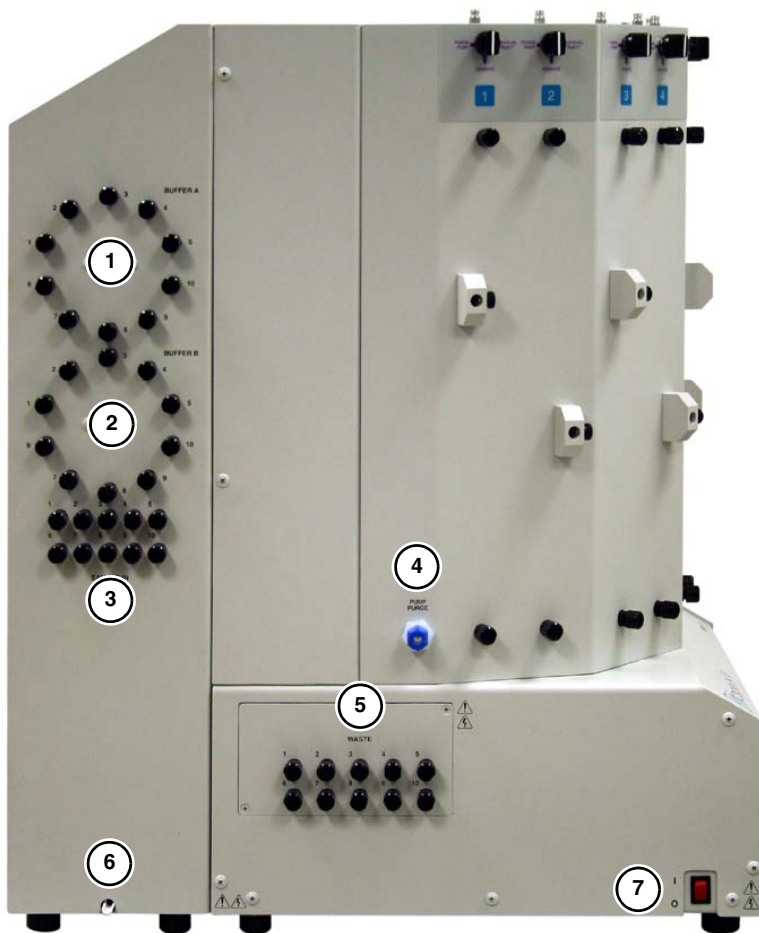


Figure 1-2 BioOptix 10 left-side connections

Table 1-3 BioOptix 10 Left-side Connections		
Item	Name	Description
1	Buffer A Inlet Ports	Ports to accept Buffer A solution for each channel.
2	Buffer B Inlet Ports	Ports to accept Buffer B solution for each channel.
3	Sample In Ports	Ports to accept sample for each channel.
4	Pump Purge Port	When the Mode Knob is in the Purge Pump position, pumped fluids are diverted to this port, bypassing the column, detection, and collection.
5	Waste Ports	Connects to waste collection container(s). Connecting to separate containers allows isolation of waste buffers by each channel, which could be beneficial should a purified sample fail to collect.
6	Internal Drain	Fluid from internal leaks exit the case through this opening. Internal leaks are the result of pump seal failures due to neglected routine maintenance.
7	Power Switch	I = On O = Off



### 1.3.3 BioOptix 10 Right-side Connections



Figure 1-3 BioOptix 10 right-side connections

Table 1-4 BioOptix 10 Right-side Connections		
Item	Name	Description
1	Purified Sample Outlet	Channels 1 through 10 which connect to the Foxy 200 Fraction Collector.

### 1.3.4 BioOptix 10 Rear Panel Controls and Connections

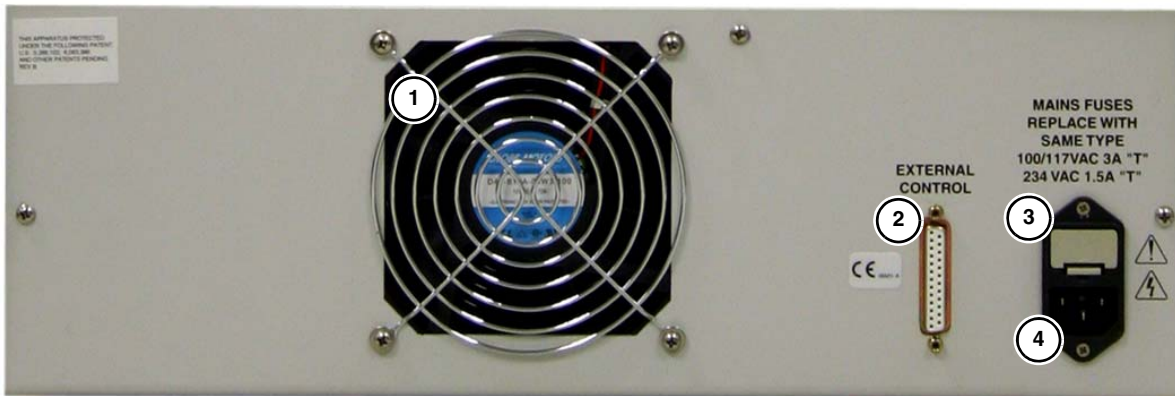


Figure 1-4 BioOptix 10 rear panel controls and connections

**Table 1-5 BioOptix 10 Rear Panel Controls and Connections**

Item	Name	Description
1	Cooling Fan	Ventilates the BioOptix 10 case and cools internal components.
2	External Control Connector	Connects to the Foxy 200 Fraction Collector and computer.
3	Fuses	<p>⚠ Rear Panel Accessible Fuses. Must always be replaced with same type fuses: 100/117 VAC — 3 amp “T” type fuse 234 VAC — 1.5 amp “T” type fuses</p> <p>⚠ Internal fuses are not accessible to the user and should only be replaced by a trained service technician.</p> <p>Pump Drive Board F101 — 4.0 amp “T” type fuse. Power One PS F1 — Not Serviceable. Lamp Drive Board F1 — .375 amp “T” type fuse. Case Bottom Assy F4 — Not Serviceable (T2 primary). F5 — Not Serviceable (T2 secondary). F6 — Not Serviceable (T2 secondary).</p> <p>⚠ The Column Module has an internal 1.2 amp circuit breaker and a thermal breaker that should only be reset by a trained service technician.</p>
4	AC Power Connector	<p>Connects to AC power source. A dedicated power source is recommended.</p> <p>⚠ Mains power cord is the disconnect device.</p>

# BioOptix™ 10

## Section 2 Installation

This section provides instructions for installing the system and preparing it for operation.

The BioOptix 10 system consists of a BioOptix 10 unit, a Foxy 200 Fraction Collector, and a Windows PC running BioOptix 10 software.

 **WARNING**

**The system is heavy. Use a two-person lift to prevent injury.**

### 2.1 Unpacking the BioOptix 10 System

Carefully unpack the shipment and inspect the contents to verify receipt of all components against the packing list. If there is any damage to the shipping carton or any components, contact the shipping agent and Teledyne Isco (or its authorized representative) immediately.

 **WARNING**

**If there is any evidence that the system has been damaged in shipping, do not plug it into the power line. Contact Teledyne Isco or its authorized representative for advice.**

Compare the contents of the boxes with the enclosed packing slip. If there are any shortages, contact Teledyne Isco immediately.

### 2.2 BioOptix 10 Installation

#### 2.2.1 BioOptix 10 Location and Space Requirements

The system should be installed on a work surface capable of supporting the system, and buffer, sample, and waste containers. The system is designed for ambient temperature and cold-room operation. Refer to Table 1-1 for environmental specifications.

The BioOptix 10 unit requires about 3350 square centimeters (520 in<sup>2</sup>) of bench space. Space requirements are shown in Figure 2-1. Space must be left behind the unit for case ventilation and electrical connections. The left side of the unit should be kept clear to access the power switch and for fluid connections.

 **CAUTION**

Ensure there is at least 10 cm (4 inches) of air space on its left side so that the disconnect device (power switch) may be easily accessed in an emergency.

To keep tubing length at a minimum, buffer, sample, and waste collection containers should be placed to the left of the unit. The containers may also be kept behind the unit as long as the containers are accessible.

The Foxy 200 should be installed to the right of the BioOptix 10. The fraction collector requires about 1800 square centimeters (275 in<sup>2</sup>) of bench space. Ensure that the full motion of the fraction collector arm is not obstructed.

The Windows PC may be placed anywhere within 2 meters of the BioOptix 10 unit (the length of the serial control cable).

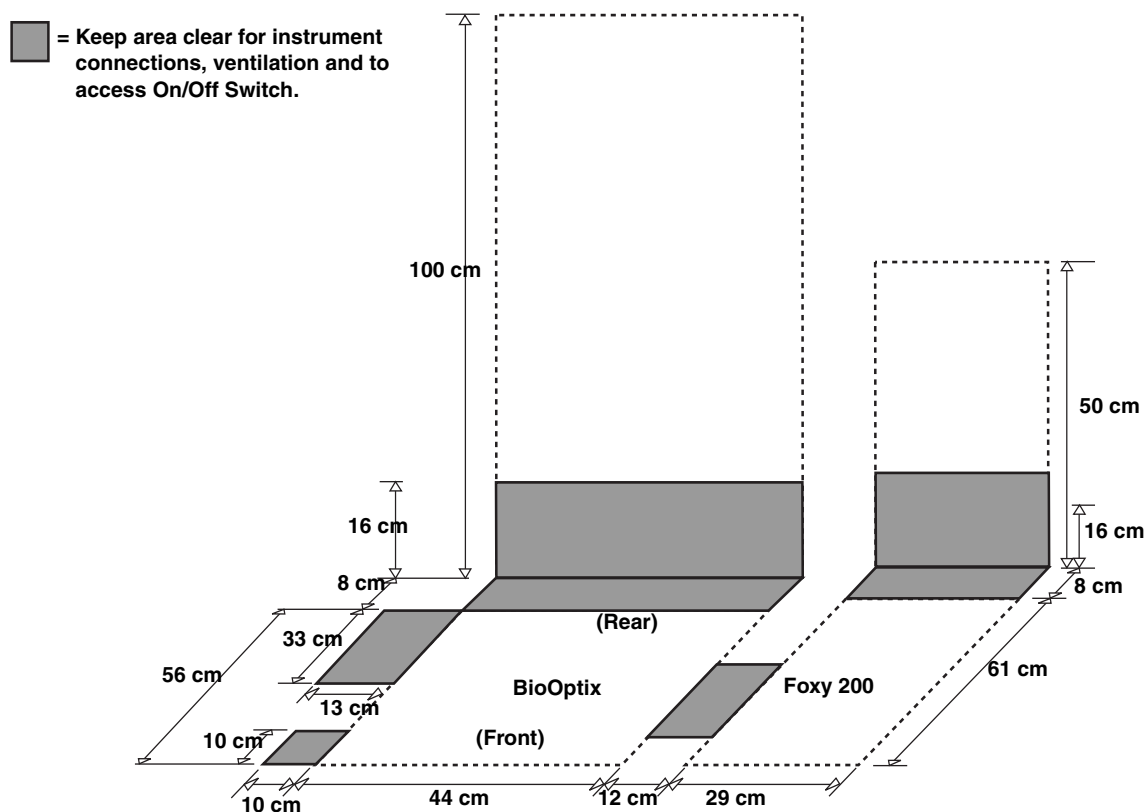


Figure 2-1 System space requirements

### 2.2.2 Electrical Requirements

The operating voltage of the BioOptix 10 is factory set. Refer to the serial number label on the right side panel to determine the electrical requirements.

Teledyne Isco recommends that the BioOptix 10 system runs on a dedicated AC circuit to prevent abnormal conditions that may be caused by high current or electrical noise. The BioOptix 10 and Foxy 200 should be connected to the same circuit to prevent ground loop anomalies.

### 2.2.3 Assembling the BioOptix 10

The BioOptix 10 is shipped in two pieces—a column module and a pump module. After unpacking and inspecting the modules place them as shown in Figure 2-2 on a sturdy work surface. This will allow access to the internal electrical and fluid connections.

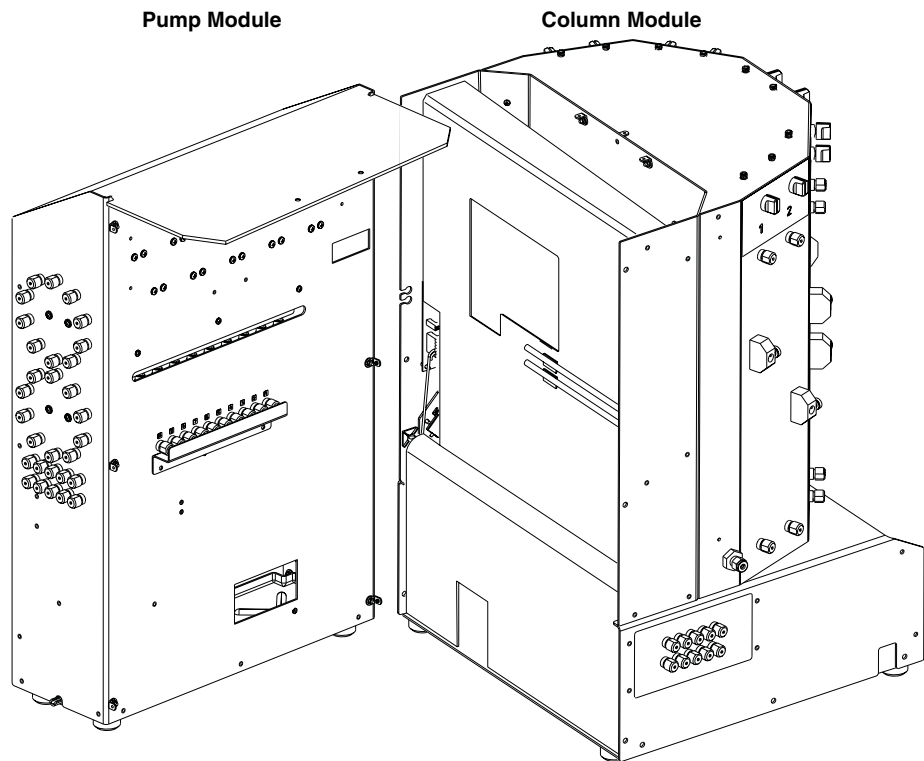


Figure 2-2 Accessing pump and column module internal connections

To complete the connections:

1. Release the two sets of tubes from the retaining clips (Figure 2-3).
2. Remove the four screws securing the back metal plate on the column module (Figure 2-3). Then, lift and remove the plate.

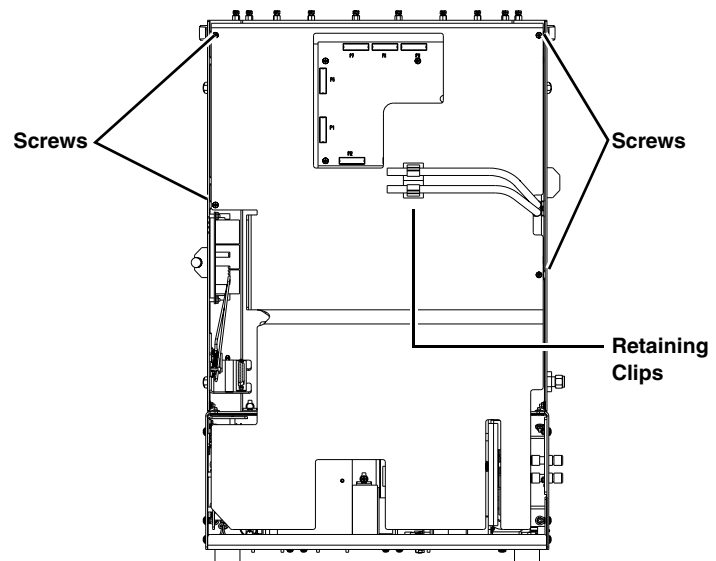


Figure 2-3 Removing the column module back plate

3. While facing the back of the column module, locate the two liquid tubing bundles secured to the lower-left inside case panel. Route these two bundles through the slots at the edge of the panel (Figure 2-4).

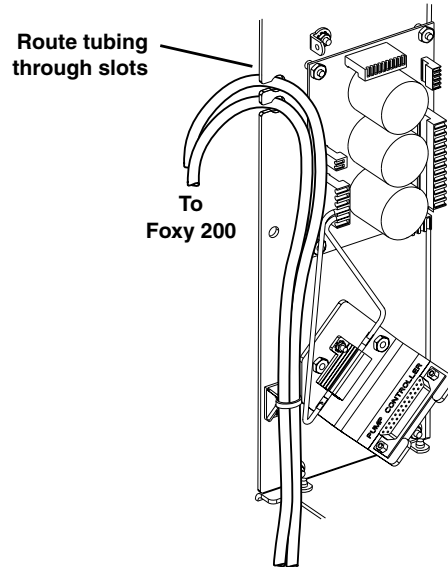


Figure 2-4 Routing the Sample Out lines (column module)

4. Connect the beige 25-pin connector from the pump module to the column module connector labeled Pump Controller. Refer to Figure 2-5.

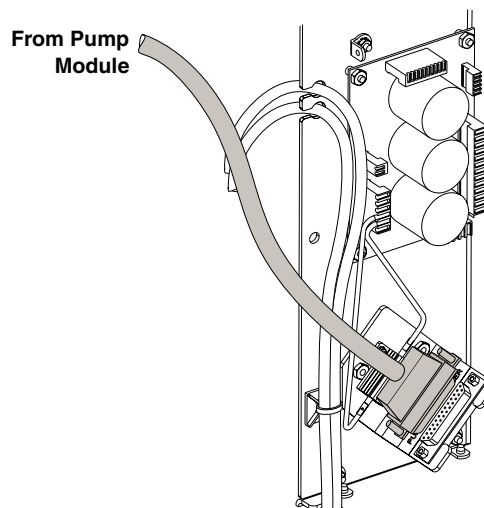


Figure 2-5 Pump controller connection

5. Connect the orange connector labeled BD3 P110 to P110 on the Power Drive Circuit Board (Figure 2-6).

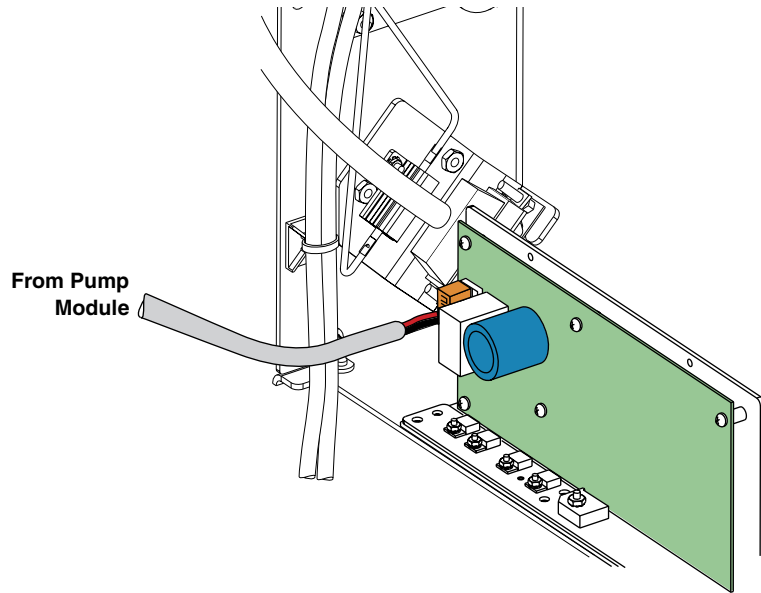


Figure 2-6 P110 Connection on BD3

6. Connect the plug labeled BD1 J106 to J106 on the Controller Circuit Board (Figure 2-7).

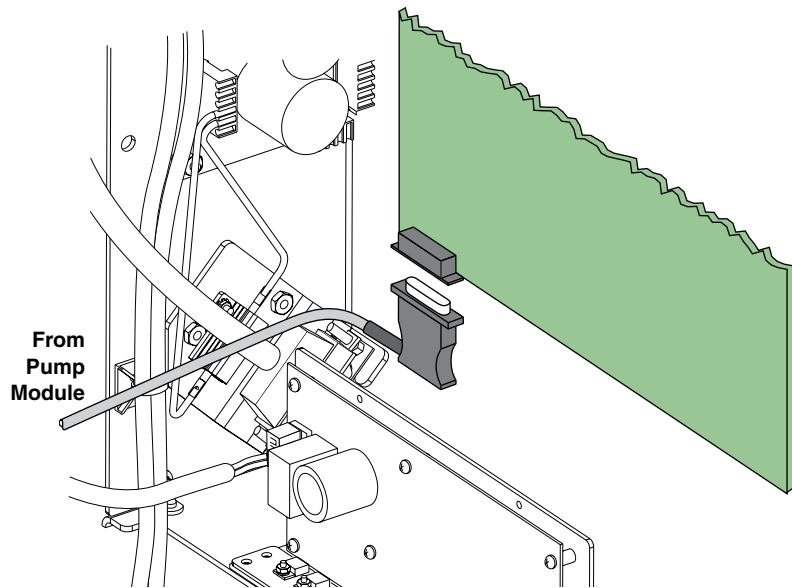


Figure 2-7 J106 Connection on BD1

7. Plug the black power cord from the pump module into the receptacle at the lower part of the column module (Figure 2-8).

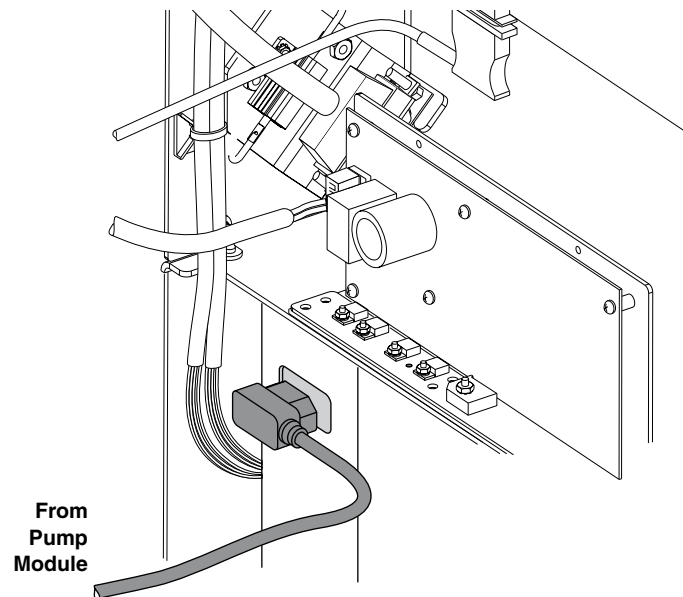


Figure 2-8 AC power connection from pump module

8. Before completing the remaining cable connections, replace the back metal plate on the column module. The openings in the plate will fit around the connections made in steps 3 through 7. Secure the plate with the four screws (Figure 2-3). Then, reattach the tubing to the retaining clips.
9. The remaining ribbon cable connections are routed from the top of the pump module through the opening on the back plate of the column module. Refer to Figure 2-9 and complete the connections, matching the connector labels.

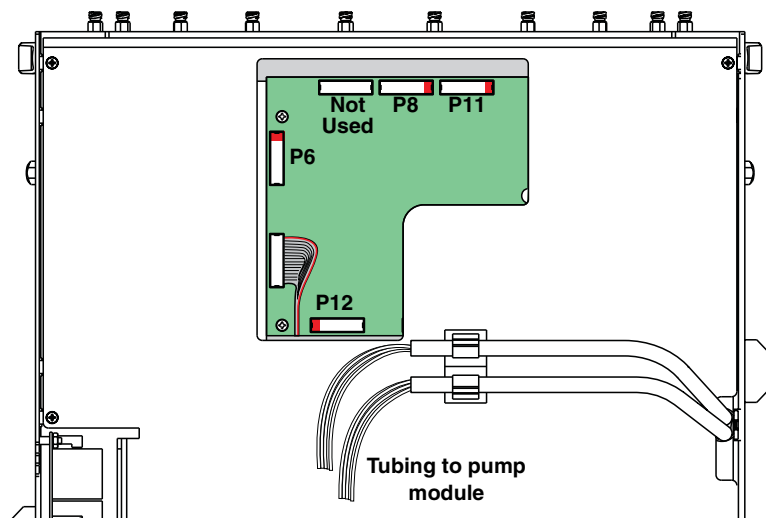


Figure 2-9 Ribbon cable connections  
(top half of column module shown)



10. Connect the tubing from the column module to the pump module. Refer to Figure 2-10.
  - a. Remove the two thumbscrews securing the splash guard to the pump module. Set aside the splash guard.

**✓ Note**

The tubing numbers from the column module match the numbers above the compression fittings on the pump module. (The tubing is visible in Figure 2-9; the compression fittings are visible in Figure 2-10.)

- b. Loosen the nut on the compression fitting, insert the tubing fully into the fitting and finger-tighten the nut. Then, use a wrench to tighten the nut an additional full turn. Repeat for all ten channels.
  - c. Replace the splash guard so that the tubing is routed up and over the guard.

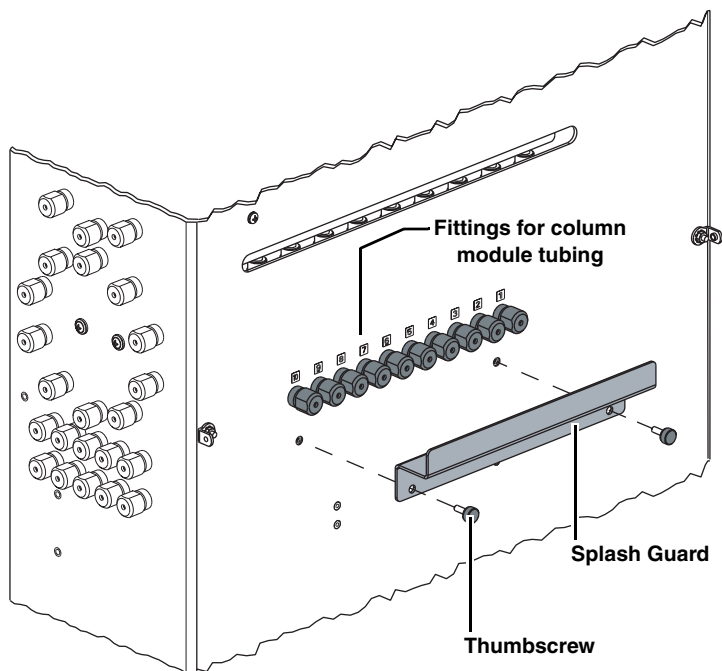


Figure 2-10 Liquid connections  
(pump module shown)

11. Slide the two modules together (Refer to Figure 2-11). Align the eight holes on the upper and side case panels, and secure with screws.

**✓ Note**

Use care to avoid damaging internal tubing and cables. Do not pinch or crimp tubing or cables between modules.

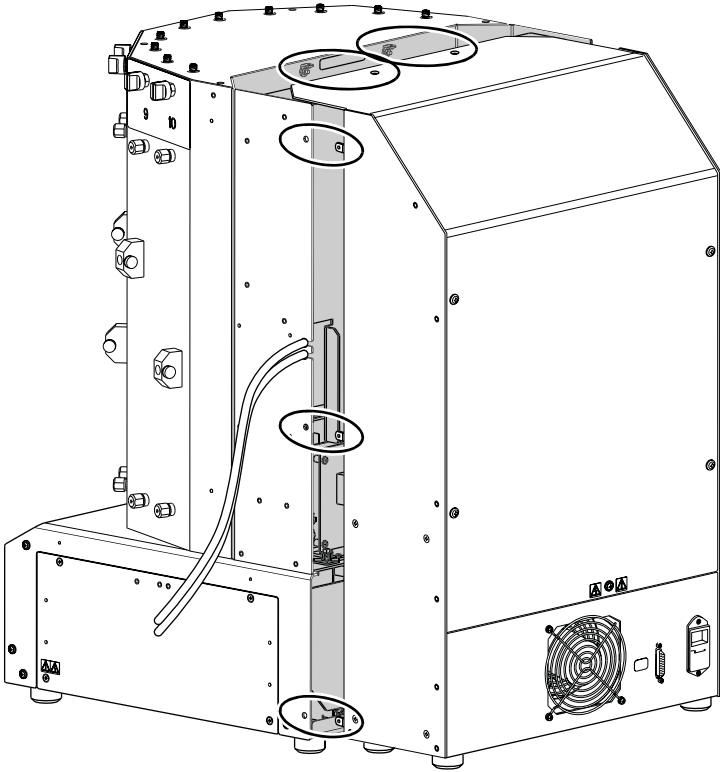


Figure 2-11 Aligning the fasteners

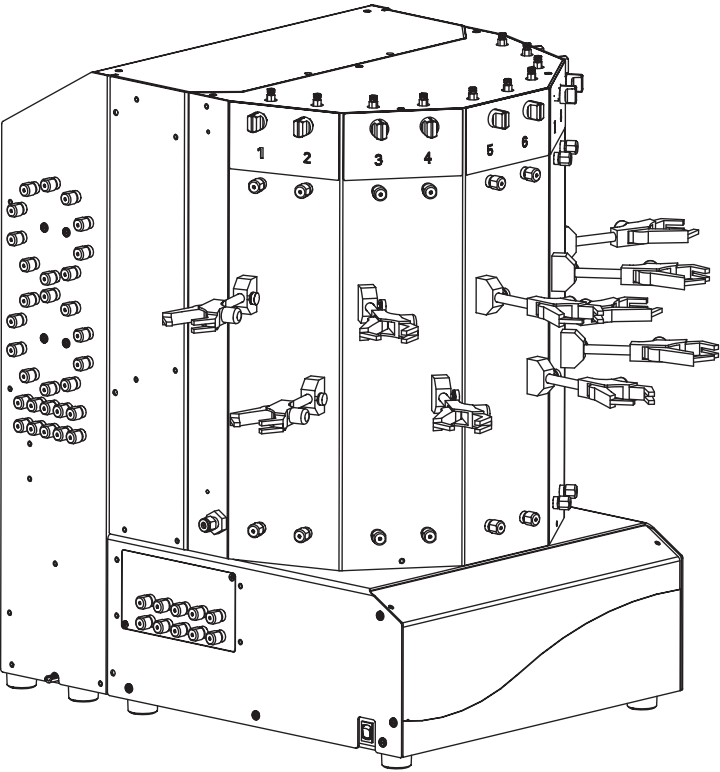


Figure 2-12 Column clamps inserted

12. Ensure the Power Switch is in the Off (“0”) position. Then, connect the AC power cord to the back of the Pump Module. Connect the other end of the power cord to an outlet meeting the electrical requirements listed on the serial number label.
13. Locate the Serial “Y” cable, P/N 60-1020-241 in the Accessories Kit. Connect the 25-pin connector labeled First Instrument Optix to the External Control port on the back of the Pump Module.

The BioOptix 10 may now be positioned on the bench as shown in Figure 2-1.

 **WARNING**

**The system is heavy. Use a two-person lift to prevent injury.**

14. Insert the ten column clamps into the BioOptix 10. Secure the clamps by tightening the thumbscrews against the stainless steel shafts (Figure 2-12).

#### 2.2.4 Assembling the Foxy 200

1. Refer to section 2 of the *Foxy 200 X-Y Fraction Collector* instruction manual. Unpack the Foxy 200 and assemble the arm.

 **Note**

To prevent damage to the ground wire on the fraction collector arm, attach the ten-channel drop former to the arm before proceeding with the arm assembly instructions.

2. Loosen the two thumbscrews and raise the ten-channel drop former assembly to its highest position (Figure 2-13). Retighten the thumbscrews.

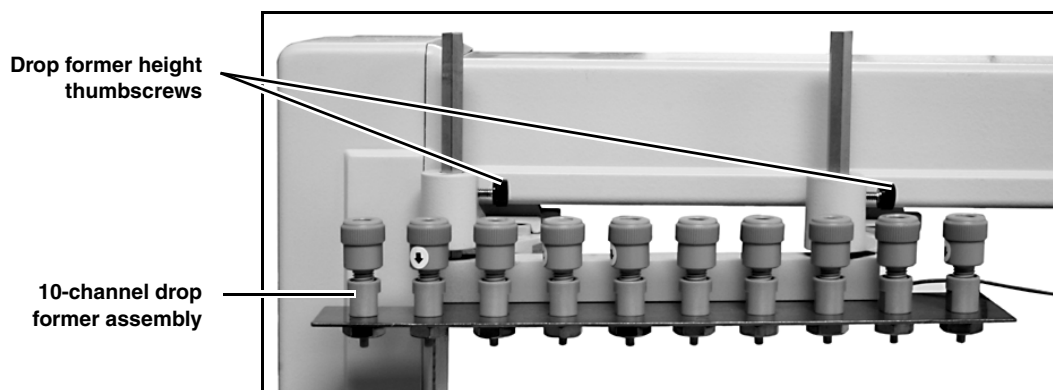


Figure 2-13 Foxy arm

3. Load collection tubes into the racks. Place the racks on the Foxy 200.
4. Loosen the two thumbscrews and lower the ten-channel drop former assembly so that it will clear the collection tubes (Figure 2-13). Retighten the thumbscrews.

5. Connect the AC power cord to the back of the Foxy 200. Connect the other end of the power cord to an outlet meeting the electrical requirements listed on the serial number label.
6. Connect the “Y” Serial Cable end labeled Second Instrument Foxy to the RS-232-C port on the back of the Foxy 200.
7. Place the Foxy 200 to the right of the BioOptix 10 (Figure 2-1). Ensure that the full motion of the fraction collector arm is not obstructed, especially near column positions 9 and 10 on the BioOptix 10.

### 2.2.5 Fluid Connections

Fluid line connections include Buffers, Samples, Waste, Pump Purge, and Foxy. Tubing for the fluid connections is located in the accessory kit, P/N 60-5209-002. The kit includes enough tubing to complete a standard installation. Standard tubing lengths are noted in the following instructions for each connection. This kit also includes a tubing cutter.

Except as noted on the Foxy connections, use the following steps for tubing connections:

1. Loosen the nut on the compression fitting.
2. Insert the tubing fully into the fitting.
3. Finger-tighten the nut.
4. Using a wrench, tighten the fitting an additional full turn.

**Buffer A** – These inlet ports are located on the left side of the BioOptix 10. The ferrules on these inlet ports accept the 0.125" OD tubing, P/N 023-0503-02, found in the accessories kit.

 <b>Note</b>
---

Larger or smaller outside diameter tubing will require different ferrules.

Buffer A solutions may be unique to each channel, or a single solution may be routed to all ten channels.

- If unique buffers will be used on each channel, cut the tubing to length (standard length is 60" or 152 cm) and route the tubing to the buffer solution containers.
- If a common buffer solution will be used for all ten channels, install the Buffer Assembly (P/N 60-5204-064), found in the accessory kit. Figure 2-14 illustrates the Buffer Assembly parts. Figure 2-15 shows the buffer assembly installed on the BioOptix 10.

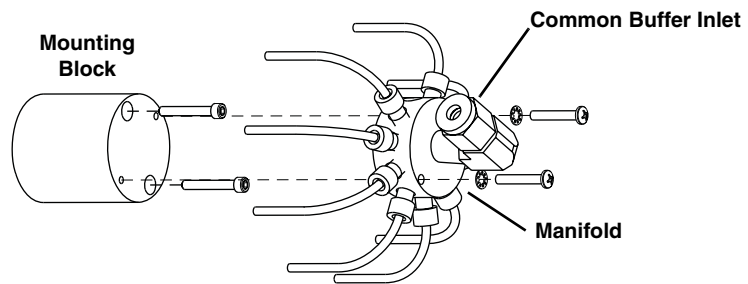


Figure 2-14 Buffer assembly routes a common solution to all ten channels

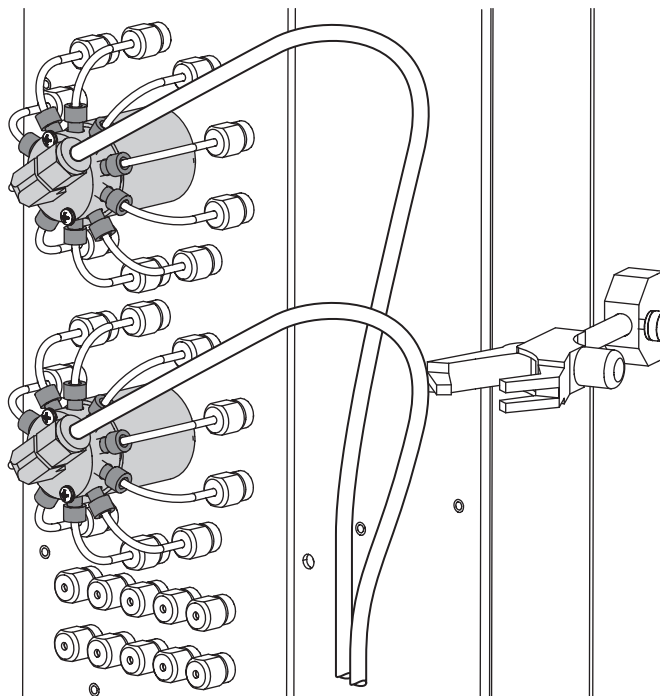


Figure 2-15 Buffer assemblies installed

*To connect the Buffer Assembly:*

- a. Remove the two screws located in the center of the Buffer A inlet ports. (The two exposed holes are used to mount the Buffer Assembly.)
- b. Attach the mounting block to the two holes using the hex head screws.
- c. Attach the manifold to the mounting block with the Phillips screws and lock washers.
- d. Connect the ten Teflon tubes (each 3" long by 0.085 ID) from the manifold to the Buffer A inlet ports.
- e. Cut to length a section of 0.250" OD Teflon tubing (P/N 023-0508-01) from the accessory kit and route the buffer solution to the common inlet. The standard length is 60" or 152 cm.

**Buffer B** – To form gradient buffers during purification, connect Buffer B solution(s) to these ten inlet ports. Perform the steps described in Buffer A above to complete these fluid connections.

**Sample In** – The ferrules on these inlet ports accept the 0.063" OD tubing. The accessory kit contains Teflon tubing of this size in five different colors. Cut the tubing to length (standard length is 36" or 91 cm), insert one end into a Sample In port, and route the other end to the sample container.

**Note**

Although not critical for operation, installing the colored tubing according to the chart below may be helpful should there be a later need to trace the lines or monitor system performance.

<b>Channel Numbers</b>	<b>Color</b>	<b>Part Number</b>
1, 6	Blue	023-0505-06
2, 7	Yellow	023-0505-04
3, 8	Orange	023-0505-03
4, 9	Green	023-0505-05
5, 10	Clear	023-0505-09

**Waste Out** – The ferrules on these inlet ports accept the 0.063" OD tubing listed in Table 2-1, found in the accessories kit. Cut the tubing to length (standard length is 36" or 91 cm). Then, while observing the color-coded channel numbers, insert one end into a Waste Out port, and route to a suitable collection point.

If there might be a need to recover waste fluid (e.g. undetected purified sample), a collection container for each channel is recommended. Isolating waste fluid for each channel can simplify sample recovery.

**Pump Purge** – This port is used when the pumps clear any fluid remaining in the pump. This fluid is cleared before a run is started or during system maintenance. Connect a length of 0.250" OD Teflon tubing (P/N 023-0508-01) and use it to route the pump purge fluid to a suitable collection container. The standard length of tubing is 60" or 152 cm.

**Column Positions** – For initial operation, and when channels are unused during operation, tubing must be inserted between the Column Inlet and Outlet ports. Use the column bypass tube (P/N 60-5203-170) or pieces of clear 0.063" ID tubing (P/N 023-0505-09) from the bulk roll in accessory kit.

**Foxy** – The two bundles of tubing on the right side of the BioOptix 10 connect to the Foxy 200 Fraction Collector. Each color-coded tube is labeled with its channel number and finished with a threaded fitting.

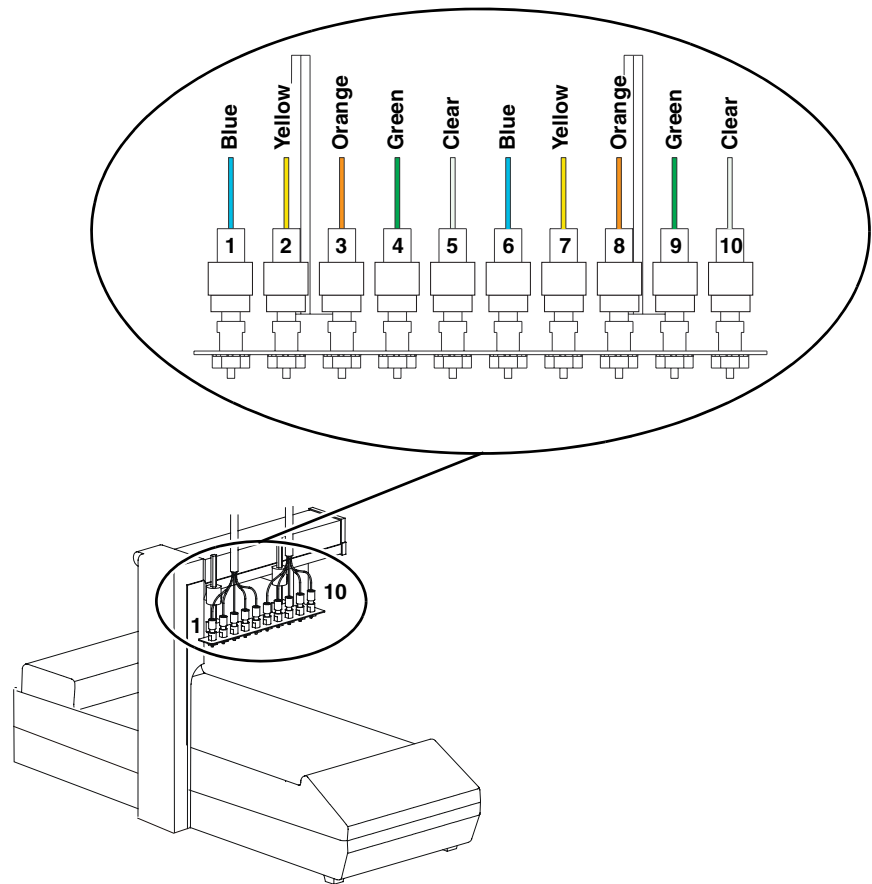


Figure 2-16 Foxy 200 tubing connections

Refer to Figure 2-16 and complete the tubing connections between the BioOptix 10 and the Foxy 200. Thread and finger-tighten the fittings into the ten-channel drop former assembly. After connecting the tubing, peel the adhesive backing from each retainer. Then, attach each retainer to the top of the Foxy 200 arm (Figure 2-17).

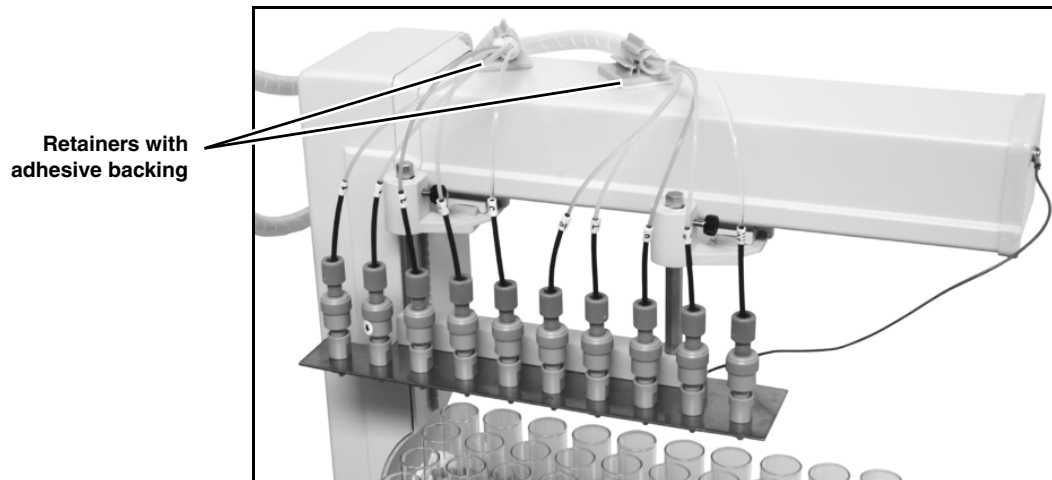


Figure 2-17 Adhesive retainers attached

### 2.2.6 Windows PC Connection

The Windows® personal computer (PC) must meet the following minimum requirements:

Processor:	Pentium, 133 MHz
RAM	32 MB
Hard Drive	20 MB available space
Operating System	Windows® 95, 98, 2000, NT, or XP
Communication Port	One available RS-232 port
CD-ROM	16×
Monitor	VGA or better (640×480 or higher resolution)

The PC should be set up according the manufacturer's instructions. After the PC is fully operational, place it on the workbench within 2 meters of the BioOptix 10.

 **Note**

Greater lengths are possible with a user-supplied DB9 Serial Extension Cable. Total length should not exceed 10 meters.

Connect the "Y" Serial Cable end labeled Computer Serial to the RS-232 Serial Port on the PC.

## 2.3 BioOptix 10 Software Installation

Install the BioOptix 10 Software on the Windows PC.

1. Locate the BioOptix 10 Software CD that was shipped with the system.
2. After turning on the PC, insert the CD into the CD-ROM drive.
3. Using Windows Explorer, locate and open the file named setup.exe on the CD-ROM drive.
4. Follow the on-screen instructions to complete the software installation.

### 2.3.1 Configuring BioOptix 10 Software

After installing the BioOptix 10 software on the PC, the software should be configured to match the hardware of the BioOptix 10 system. To configure the software:

1. Start BioOptix 10 software.

The software installation routine placed an icon on the desktop. Double click this icon to start. Or, you can start the software from the Windows Start button, navigating through Programs>BioOptix 10>BioOptix 10.
2. From the BioOptix 10 menu, select Tools>Configure....
3. Match the Configuration dialog box settings to the hardware.
  - Rack – select the rack size/type that is installed on the system.



- Rack Change Bell – When this option is enabled, the system provides an audible signal while it is waiting for the operator to change the tube rack.
  - Com Port – select the Com Port number to which the “Y” Serial cable is connected to the PC. Refer to the documentation provided with your PC.
  - Fraction Size – type or select the desired fraction size to be collected by the Foxy 200.
  - Stroke Volume – type or select the desired stroke volume of the pump.  
A larger stroke volume will reduced the number of Fill/pump cycles. However, this will limit the possible sample and pumped volumes to a multiple of the stroke volume. A stroke volume of 1 mL allows sample and pumped volumes in increments of 1 mL.
  - Refill Rate – type or select the desired Refill Rate in mL/minute.
  - Pressure Limit – type or select the desired operating pressure limit, in psi. When exceeded, the system will reduce the flow rate until the pressure returns to the normal range.  
This empirical value will vary according to the properties of the stationary and mobile phase. Select a value low enough to limit the flow rate when a column or tubing blockage may be indicated, but high enough to avoid false indications when higher column operating pressures may be the norm.
  - Default Data Directory – Click the Browse button to select a default data directory.
4. Click the Save button to accept the configuration settings and close the dialog box.

## 2.4 BioOptix 10 System Preparation

The system preparation assumes that the instructions in sections 2.1 through 2.3 have been completed. System preparation primes the tubing with buffer solution to ready the BioOptix 10 for a system verification test run.

To prepare the system:

1. Ensure that BioOptix 10 software is configured and running on the connected Windows PC.
2. Turn the Power switch on the left side of the BioOptix 10 to On.
3. Press the Power button on the Foxy 200.
4. Place the Buffer A inlet line(s) into two liters of solution (such as HPLC-grade water or other appropriate buffer solution).
5. Place the Buffer B inlet line(s) into two liters of solution (such as HPLC-grade water or other appropriate buffer solution).

6. Ensure that each channel on the BioOptix 10 has 0.125" OD bypass tubing between the Column Inlet and Outlet ports (Figure 2-18).

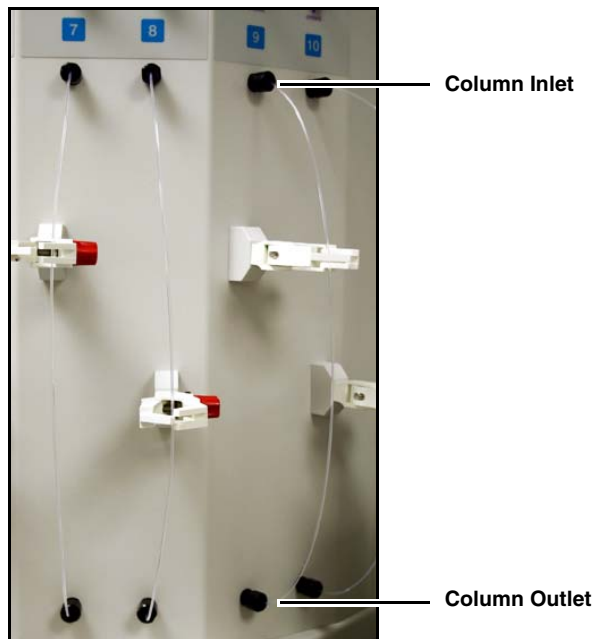


Figure 2-18 Column bypass tubing

7. For each channel, set the mode control knobs to Purge (Figure 2-19).

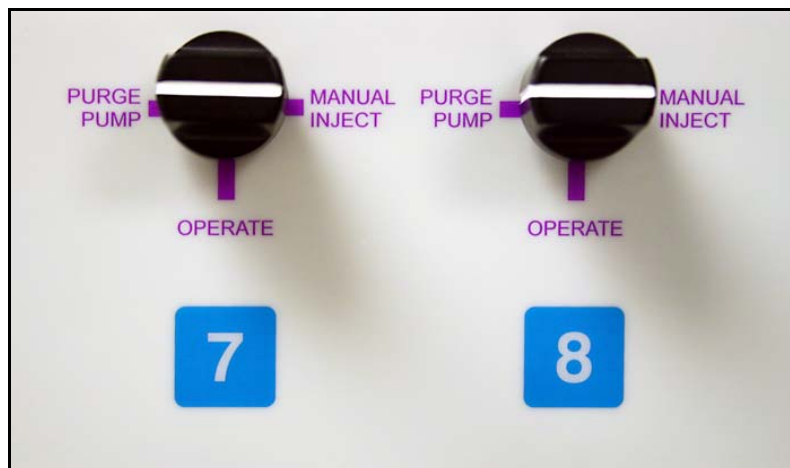


Figure 2-19 Mode control knob

8. From the BioOptix 10 software menu, select Tools>Manual Control. The BioOptix 10 Manual Hardware Control window is displayed (Figure 2-20).

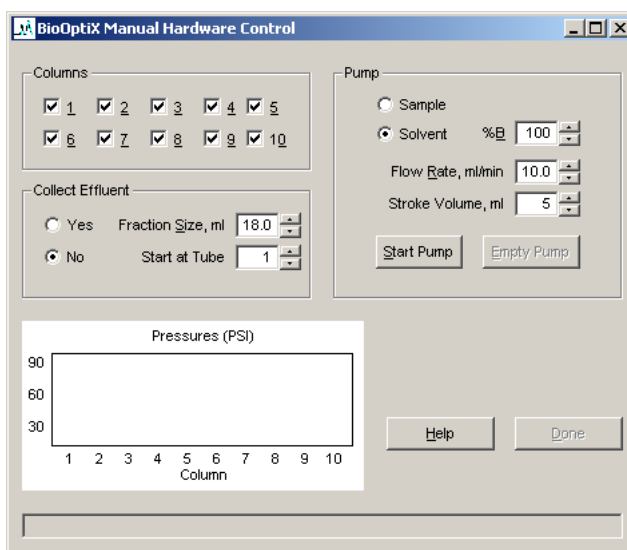


Figure 2-20 BioOptix 10 Manual Hardware Control window

9. In the Columns section of this window, check each channel number that should be primed. Configure the remaining settings to match those shown in Figure 2-20.
10. Click the Start Pump button. Observe the following for each enabled channel:
  - Buffer B solution movement should be visible at the inlet ports on the left side of the BioOptix 10.
  - After passing through the internal pump and valves, Buffer B solution should be visible at the Pump Purge port.
11. Continue to manually pump Buffer B solution through the system and inspect the tubing connections.

If any connections are leaking, use a wrench to tighten the fitting  $\frac{1}{4}$  turn, then check again for leaks. Repeat as necessary.

If no leaks are found, proceed with step 12.
12. Click the Stop Pump button.
13. Change the %B setting to 0 percent.
14. Click the Start Pump button. Monitor the flow of Buffer A through the system. Correct leaks as needed.
15. Click the Stop Pump button.
16. Click the Done button.

The system is ready for operation (Section 3).



# BioOptix™ 10

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## Section 3 Operation

This section provides an introduction to preparing the system and creating files necessary for a purification run. The instructions assume that the system has been set up according to Section 2.

### 3.1 Sample Preparation

The Sample In lines for each channel should be placed into a vessel holding the liquid sample mixture. Sample In lines can be placed into a common sample vessel, or in multiple vessels when unique samples are to be introduced on each channel.

### 3.2 Column Installation

The BioOptix 10 system uses versatile column clamps to hold a variety of columns. The clamps are adjustable, holding column sizes as large as 45 mm (1<sup>3</sup>/<sub>4</sub> in).

 <b>Note</b>
---

User-supplied clamps and apparatus may be used on the system. The mounting holes on the side of the BioOptix 10 accept 9.5 mm (<sup>3</sup>/<sub>8</sub> in) mounting stems.

To install a column, insert the column into the clamp and turn the knob to close the clamp and secure the column.

When inserting any column be sure to observe the flow direction if noted on the column. Orient the column with the inlet at the top and the outlet at the bottom.

#### 3.2.1 Column Tubing and Adapters

Because of the variety of columns that may be used on the BioOptix 10, the system does not include standard fittings. All column fittings and tubing are user-supplied to fit the selected columns.

To install the column tubing:

1. Remove the bypass tubing that was installed to prime/purge the pumps.
2. At each column position, insert a tube with a fitting at the upper column inlet port. Then, connect the fitting to the top of the column.
3. At each column position, insert a tube with a fitting at the lower column outlet port. Then, connect the fitting to the bottom of the column.

### 3.3 BioOptix 10 Software

 **Note**

Refer to On-line Help for specific BioOptix 10 software operating instructions.

#### 3.3.1 Overview

The operation of the BioOptix 10 system is directed by three files:

- Gradient – these files define how a gradient is to be formed from Buffer A and B solutions.
- Method – these files contain the settings that direct the operation of each channel of the system. A method file will reference the settings in a gradient file.
- Experiment – These files contain settings that direct the operation of all channels. Experiment files are based on method file settings. The BioOptix 10 system operation can be started after the experiment settings are defined.

Sections 3.4 through 3.6 describe these files in detail.

### 3.4 Gradients

A gradient file can be created by:

- selecting the File>New>Gradient menu command,
- pressing the Ctrl+G keyboard buttons,
- or by clicking the G toolbar button.

A new gradient file displays an empty two-column table and a plot area (Figure 3-1). The table contains inflection points—points at which the rate of gradient formation change.

The Initial volume row in the table defines the starting mixture, expressed as percent B.

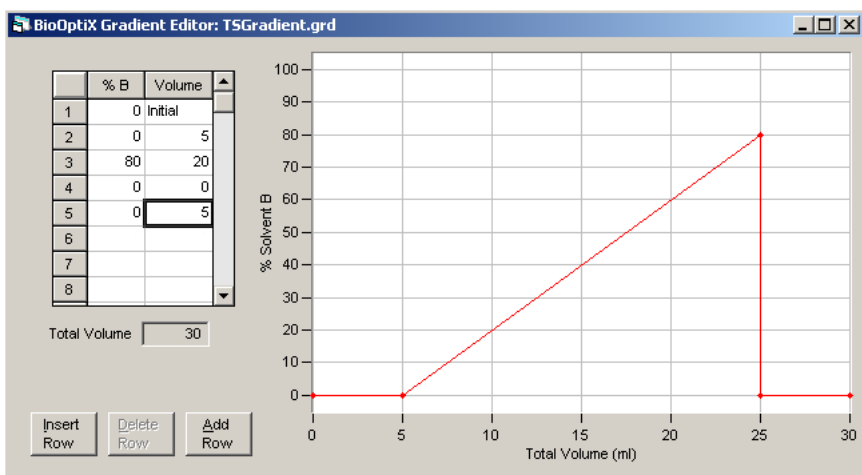


Figure 3-1 Gradient File

 **Note**

The percent B value is the amount of Buffer B solution mixed with Buffer A. A value of zero percent B (0 %B) pumps only Buffer A. Conversely, a value of 100 %B pumps only Buffer B.

All other rows in the table define the %B that will be reached after pumping the listed volume. The system forms a linear gradient between inflection points. This can be observed in Figure 3-1. After pumping the initial 5 mL of 0 %B, a linear gradient is formed, reaching 80 %B after pumping an additional 20 mL.

A gradient file may contain as many as 9 inflection points.

### 3.4.1 Defining a Gradient

To define a gradient:

- Using the table, enter the %B value and the pumped Volume in mL over which that value will be reached. *Or*,
- Click in the plot area to add inflection points to the right of the plot. After adding a point you can click and drag the inflection point to change it.

Note that whenever the table or plot area is edited, both are updated.

The buttons below the table modify the table of inflection points.

- Insert Row – adds a row above the selected row.
- Delete Row – removes the selected row from the table.
- Add Row – adds a row to the end of the table.

Sharp changes can be made in the gradient by entering a row with 0 mL as the pumped volume, followed by another row with the new %B and volume. Pairing rows such as these can be used to form step gradients.

### 3.4.2 Saving the Gradient

To be used in method and experiment files, the gradient file must be saved. Save the gradient by selecting the File>Save menu command. Use a descriptive file name so that it can be located later.

## 3.5 Methods

A method file can be created by:

- selecting the File>New>Method menu command,
- pressing the Ctrl+M keyboard buttons,
- or by clicking the M toolbar button.

A new method file displays a series of tabs. Each tab contains the settings for each block of the method. A block is a segment of the method that pumps buffer solution, loads a sample, or forms a gradient.

### *About Method Templates*

When creating a new method, the BioOptix 10 software configures the blocks of the method file according to a template file—standard.tpl. This template file can be modified to suit your applications, allowing up to ten blocks or tabs. Refer to Appendix A for instructions.

The default method file contains five blocks that are appropriate for use with affinity column purification:

- Equilibrate – conditions the column.
- Load – loads the sample onto the column.
- Wash – washes compounds from the column that do not bind to the column media.
- Elute – pumps a buffer solution to release the purified compounds from the column.
- Post Run – flushes any remaining compounds from the column to prepare the column for the next purification run, storage, or disposal.

### 3.5.1 Equilibrate Settings

This block conditions the column and fills the column with the desired buffer solution for starting the purification.

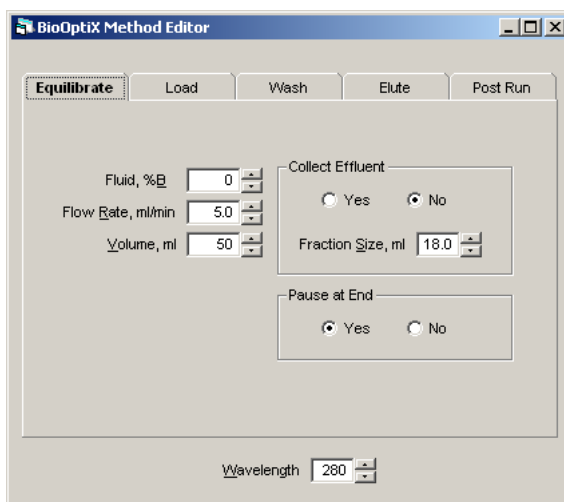


Figure 3-2 Equilibrate tab settings

The Equilibrate tab (Figure 3-2) contains the following:

- Fluid, %B – Enter the desired mix of buffer fluid as a percentage of Buffer B.
- Flow Rate, mL/min – Enter the desired flow rate, from 0.5 to 12 mL/min.
- Volume, mL – Enter the total amount of Buffer fluid to pump during this block.
- Collect Effluent – Select the desired action for effluent fluid as it comes off the column. Selecting No diverts the effluent to a channel waste port. Selecting Yes sends the fluid to the fraction collector. If Yes is selected, enter a fraction size in mL. The fraction collector will advance to the next row of tubes after collecting the entered volume.
- Pause at End – Select Yes to have the system wait for operator intervention after completing this block. Select No to automatically advance to the next block.



Pausing at the end of a block allows for buffer changes or other mechanical adjustments before proceeding with the next block.

- Wavelength – Type or select the desired wavelength from 190 to 360 nm to be used for UV detection. Note that all blocks use the same wavelength.

**Note**

The Equilibrate tab is a “Fluid” block type. See Appendix A.

### 3.5.2 Load Settings

This block loads the sample onto the column.

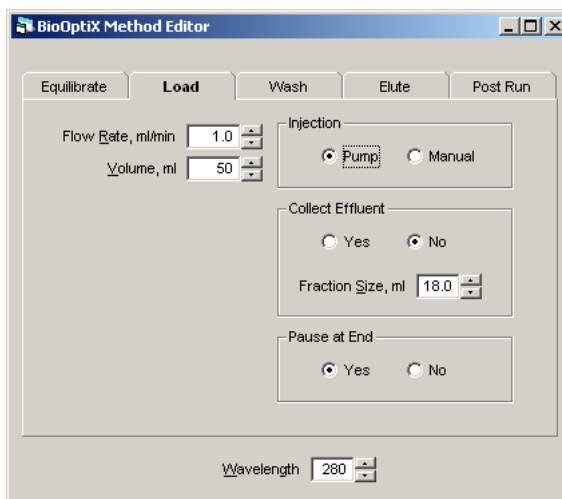


Figure 3-3 Load tab settings

The Sample Load tab (Figure 3-3) contains the following:

- Injection – Select Pump to pump liquid sample from the Sample In ports onto the column. Select Manual to inject the sample from the manual injection ports (located on the top of the BioOptix 10) onto the column. Note that selecting Manual disables the flow rate and volume settings.
- Flow Rate, mL/min – If a Pump injection is selected, enter the desired flow rate in mL/min.
- Volume – If a Pump injection is selected, enter the desired volume in mL.
- Collect Effluent – Select the desired action for effluent fluid as it comes off the column. If Yes is selected, enter the desired fraction size.
- Pause at End – Select Yes to have the system wait for operator intervention after completing this block. Select No to automatically advance to the next block.

**Note**

The Load tab is a “Load” block type. See Appendix A.

### 3.5.3 Wash Settings

This block flushes compounds that did not bind to the affinity media. The Wash tab is a fluid block type, therefore the settings displayed on this tab are the same as the Equilibrate tab. Refer to section 3.5.1 for a discussion on the settings for this tab.

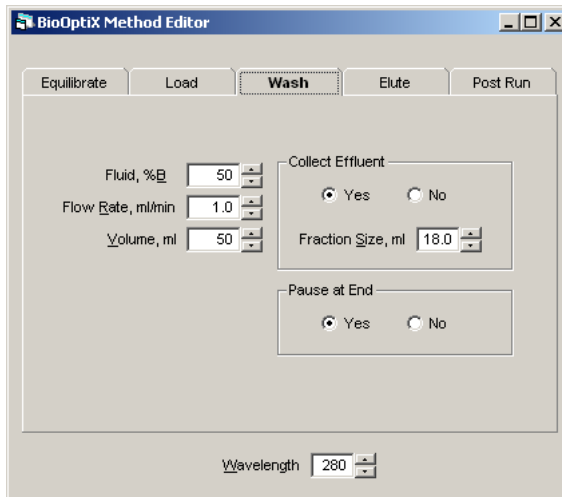


Figure 3-4 Wash tab settings

### 3.5.4 Elute Settings

This block pumps the buffer solutions through the column. The mixture and quantity of buffer solution is defined by the gradient file.

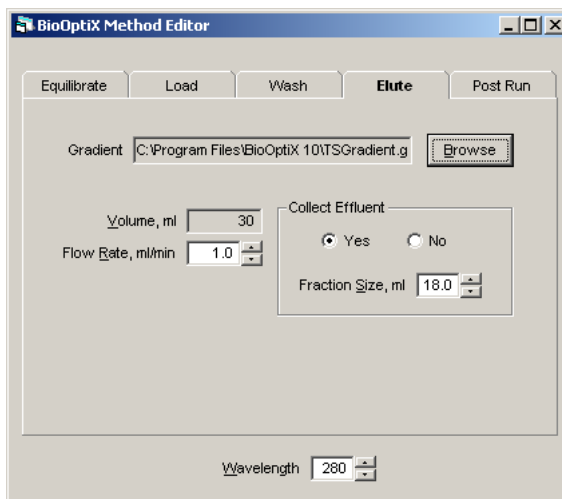


Figure 3-5 Elute tab settings

The Elute tab (Figure 3-5) contains the following:

- Gradient – Click the Browse button to select a gradient file.
- Volume, mL – This is reported by the gradient file.
- Flow Rate mL/min – type or select the desired flow rate.

- Collect Effluent – Select the desired action for effluent fluid as it comes off the column. If Yes is selected, enter the desired fraction size.

**Note**

The Elute tab is a “Gradient” block type. See Appendix A.

### 3.5.5 Flush Settings

This block pumps fluid to flush remaining sample from the column and system tubing. This step can prepare the column for the next purification run, storage, or disposal.

The Flush tab is a fluid block type, therefore the settings displayed on this tab are the same as the Equilibrate and Wash tabs. Refer to section 3.5.1 for a discussion on the settings for this tab.

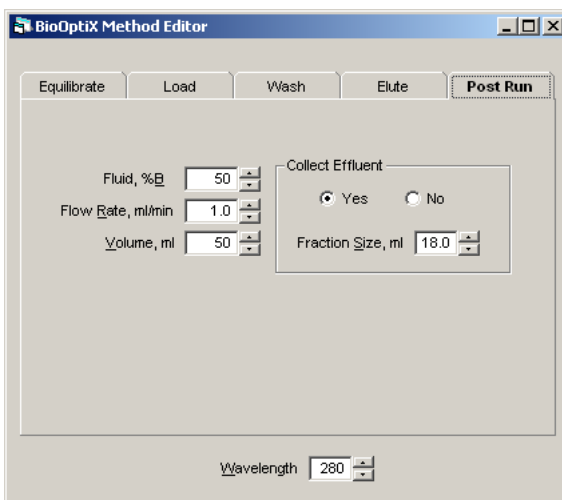


Figure 3-6 Flush tab settings

### 3.5.6 Saving the Method File

To be used in an experiment file, the method file must be saved. Save the method by selecting the File>Save menu command. Use a descriptive file name so that it can be located later.

## 3.6 Experiments

An experiment file can be created by:

- selecting the File>New>Experiment menu command,
- pressing the Ctrl+E keyboard buttons,
- or by clicking the E toolbar button.

Before building and displaying the experiment file, you must select a method file that will be used for all ten channels. In the Select a Method for Experiment dialog box, locate and highlight the method file, then click the Open button.

An experiment file displays operating parameters in a table. Many of the columns in the table are determined by the template file used to create the method file. (Refer to Appendix A for more details on the template file.) Default values will be assigned to the table cells from the method file you’ve chosen.

### 3.6.1 Setting up the Experiment

Before proceeding, determine which BioOptix 10 channel positions will be used during the purification run. Channels that will be in use require that the corresponding rows in the table be completed. Note that to use these positions they should have samples prepared (section 3.1) and columns installed (3.2).

Table rows for unused channels must remain empty.

To set up the experiment:

1. Position the cursor in the Sample Name table cell of the first channel position in use. Enter a descriptive name for the sample. This activates the channel for use in the experiment.

Because the Sample Name also is used as a filename for post-run data, the text you enter in this field must be a Windows-compatible file name.

2. Advance the cursor to the next cell to the right. BioOptix 10 completes the remaining cells in the row using the settings from the method file as defaults.
3. Repeat steps 1 and 2 for all channel positions that will be in use.

The table now is populated with default settings for each channel position in use.

Position	Sample Name	Equilibrate %B	Load ml	Wash %B	Elute Gradient	Post Run %B
1	041129 Batch A	0	10	10	C:\Program Files\BioOptix 10\TSGr...	80
2	041129 Batch B	0	10	10	C:\Program Files\BioOptix 10\TSGr...	80
3	041129 Batch C	0	10	10	C:\Program Files\BioOptix 10\TSGr...	80
4	041129 Batch D	0	10	10	C:\Program Files\BioOptix 10\TSGr...	80
5						
6						
7						
8						
9						
10						

Figure 3-7 Experiment File

### 3.6.2 Editing the Experiment

The table can be edited to create unique purification parameters for each channel. To edit any cell in the table, position the cursor in a cell and enter the new value. You can also select different gradient files by clicking on the [...] button and browsing for the new file. When editing the table note the following:

- Load type values (such as the “Load Column in Figure 3-7) must be a multiple of the stroke volume. Stroke volume is discussed in section 2.3.1.
- If selecting a different gradient file, note that the total volume pumped be the same for all channels in the experiment.

### 3.6.3 Saving the Experiment File

Save the experiment by selecting the File>Save menu command. Use a descriptive file name so that it can be located for later use.

## 3.7 Running the Experiment

With the experiment file open, some BioOptix 10 operation buttons along the bottom of the window are active (Figure 3-8). Buttons will be active or inactive according to the current state of the system.

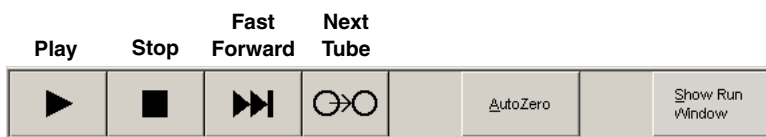


Figure 3-8 BioOptix 10 Operation Buttons

Table 3-1 Operation Buttons	
Button	Description
Play	Click to begin the experiment run. If the Stop button was clicked during the run, clicking the Play button will resume the run.
Stop	Click to suspend the run activity. From this state you click Play to resume the run, or click Fast Forward to skip to the next block or abort the run.
Fast Forward	Click the Fast Forward to skip to the next block or abort the run.
Next Tube	Click this button to advance the fraction collector to the next row. This is useful when there is a need to isolate effluent.
AutoZero	The baseline absorbance trace may shift if buffer solutions are changed mid-run. Click this button to re-zero the absorbance trace.
Show Run Window	Click this button to bring the experiment window for the run in progress to the foreground. If you have several other files (e.g. previous experiments or new methods) open in the BioOptix 10 window this button lets you quickly return to the running experiment.

### 3.7.1 System Operation

To start the experiment, click the Play button. The system begins operation with the first block and proceeds according to the experiment and method files.

Referring to Figure 3-7, this first block would be “Equilibrate” and use the operating parameters specified by the method file (Figure 3-2). The system would pump 0 %B (100% of buffer A) at 5.0 mL/min. The system would pump 50 mL and then pause (Figure 3-9). Similarly, the BioOptix 10 would proceed through the Sample Load, Wash, Elute, and Flush blocks.

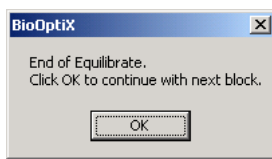


Figure 3-9 Pause at end of block

If the block is set to collect effluent (Figure 3-4), the fraction collector will deposit the fluid in the collection tubes. If a peak is detected, the fraction collector automatically advances to the next row to isolate the fluid. The fraction collector will also automatically advance to the next row of tubes whenever the specified fraction size has been collected.

If the block is not set to collect effluent (Figure 3-2), the BioOptix 10 diverts all pumped fluids to the waste ports.

### 3.7.2 Operation Displays

The window displayed during the run has several features that let you monitor the operation.

At the start of a run, the plot area displays the gradient as a blue line (right Y-axis). The X-axis displays the volume pumped. Below the X-axis is a progress bar. As the run progresses, the absorbance traces is plotted as a red line (left Y-axis).

#### *Zoom and pan*

To the right of the plot area are several controls that can modify the display. The Pan/Zoom switch specifies which action to take when you use the cursor to click and drag across the plot area. In Zoom mode, clicking and dragging across part of the plot area will zoom in on the selected region. In Pan mode, clicking and dragging moves the plot area under the cursor to a new position. The view can be returned to the default view by clicking the Reset Graph button.

#### *Absorbance trace*

In addition to the zoom feature which scales the plot area both horizontally and vertically, the scale of the absorbance trace can be modified alone. To change the left Y-axis Scale, click and select a new value from the pull-down list.

#### *Channel positions*

Channel positions can be displayed in the plot area individually or collectively. Highlight the channels you wish to display. If multiple absorbance traces and gradients are selected, they will be overlaid in the plot area. This can be useful when comparing channels, especially when desiring to monitor the effects of any experimental interventions.

#### *Status bar*

The status bar is located at the bottom edge of the BioOptix 10 window. The fields in this bar display system information and messages during the run.

### 3.7.3 Suspending System Operation

The system automatically stops after completing all blocks. However, the experiment can be paused at any time by clicking the Stop button. This stops the pumps which allows you to refill or change buffers, or make other mechanical adjustments to the system. Click the Play button to resume the experiment.

The Fast Forward button is active after clicking the Stop button. The Fast Forward button allows you to skip to the next block in the experiment or abort the run.

### 3.8 Post-experiment Operation

#### 3.8.1 Pump Flush

At the completion of the experiment, the BioOptix 10 provides the option to flush the pumps (Figure 3-10). The pump flush will pass a wash fluid through the pumps to prevent salts from crystallizing in the system.

 **CAUTION**

Salts will cause premature wear to the internal components and eventually pump failure.

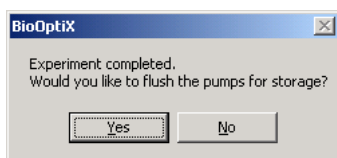


Figure 3-10 Pump flush option

*Flush the pumps for storage*

If another experiment will be started immediately, this flush can be skipped. Otherwise, if the system will remain idle for a few hours or even overnight, the pump flush is recommended.

1. Click the Yes option to flush the pumps. This opens the BioOptix 10 flush window (Figure 3-11).

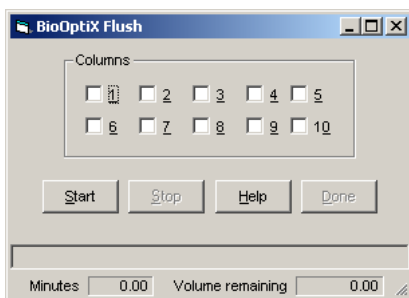


Figure 3-11 Flush window

2. Select the channels to be flushed.

3. Select a wash fluid. The wash fluid must be compatible with the buffer system and of sufficient strength to dissolve salts. If this solution is different than the buffers, move the Buffer In lines to the wash fluid container.
4. For all selected channel positions, turn the Mode knob to the purge pump position.
5. Click the Start button to begin the flush routine.  
The BioOptix 10 flushes the pumps.
6. When the routine is finished, return the Mode knobs to the Operate position.

The flush routine can be modified to meet your application's needs. To modify the pump flush select the Tools>Edit Pump Flush menu command. This command opens a window that allows you to change the flush volume, flow rate, Buffer A and B mixing, and the stroke volume. Click the Save button to save your changes.

### 3.8.2 Saving Run Data

The BioOptix 10 software automatically saves the run data and chromatograms using the experiment name as the filename. Two types of files are saved: ".lst" and ".run" files.

This run data can be retrieved and viewed at a later time using BioOptix 10 software. To do so, select the File>Open menu command or click the Open toolbar button. Multiple channels from the experiment can be opened by select the ".lst" file. Individual channels can be viewed by opening a ".run" file.

Viewing the run data and chromatograms is very similar to the operation displays described in section 3.7.2.

The run data and chromatograms displayed in the active window may be exported in various formats for archiving and sharing.

- Hard copies can be produced by selecting the File>Print menu command or clicking the Print toolbar button. Before printing you can also change the page setup (File>Page Setup...) and preview the page (File>Print Preview).
- Other file formats can be produced using the File>Save As menu command. These formats are:
  - DOC—Microsoft Word format that includes the run data and chromatogram.
  - RTF—Rich Text Format that includes the run data and chromatogram. This format can be opened with many word-processing programs.
  - PDF—Portable Document Format that is an electronic file similar in appearance to the hard copy output. Viewing PDF files require Adobe's Acrobat Reader, a free download from [www.adobe.com](http://www.adobe.com).
  - TXT—Text-only format that lists the run parameters and history. This format does not support chromatogram data.



### **3.8.3 AutoReports**

After the run the BioOptix 10 can automatically print the purification run results or save the file in a format listed in section 3.8.2. To automatically receive the hard copies or save the files, select the Tools>AutoReport menu command and modify the settings.



# BioOptix™ 10

## Section 4 System Maintenance

### 4.1 Periodic Maintenance

The BioOptix 10 system's internal components have been selected for long life and low maintenance. To maintain the system, the only required periodic maintenance is to flush the pumps daily. The pump flush passes a wash fluid through the pumps to prevent salt buffers from crystallizing in the system.

#### CAUTION

Salts will cause premature wear to the internal components and eventually equipment failure. Flush the pumps daily to prevent damage.

The BioOptix 10 system provides the option to flush the pump at the end of a purification run (see section 3.8). If the system will remain idle for a few hours or even overnight, a pump flush following the run is recommended.

The pump flush can also be initiated from a menu command.

#### *Daily Pump Flush*

1. Select Tools>Edit Pump Flush and review the settings. Save any changes you've made.
2. Ensure the Buffer In lines are placed in containers of wash fluid.

#### Note

Select a wash fluid that is strong enough to dissolve salts. The wash fluid must also be miscible with buffer solution remaining in the system from the previous run.

3. Select the Tools>Pump Flush menu command. This opens the BioOptix 10 flush window (Figure 4-1).
4. Check the pump channels to be flushed. Then, click the Start button.

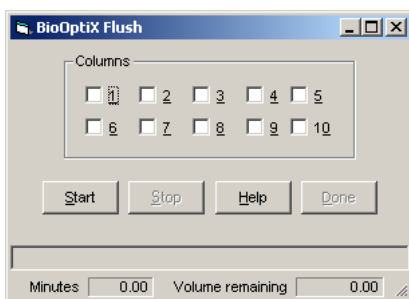


Figure 4-1 Flush window

The BioOptix 10 system pumps the wash fluid, flushing the Buffer In lines, gradient formation components, pump, and purge lines. (See Figure B-6 in Appendix B.)

## 4.2 Exterior Cleaning

For general cleaning of the enclosure, use distilled water with a mild detergent. Use isopropyl alcohol for tougher stains. Avoid rubbing vigorously or using aggressive solvents like acetone on printed areas.

### CAUTION

Do not immerse the instrument in a water bath. The instrument is not watertight and this action could damage the internal electronics.

## 4.3 Piston Seal Replacement

Should pump performance degrade, the piston seals should be replaced.

To replace the piston seals:

### WARNING

**Risk of electric shock. Disconnect power before servicing. Only trained personnel may open the case enclosure.**

### WARNING

**Earth ground bonding connector. Do not remove or disconnect.**



1. Remove the rear cover (item 1, Figure 4-2) by unfastening the nine screws located on the top and back of the BioOptix 10.
2. Unfasten the bottom 2 screws and rotate the valve assembly up. Slide the slide lock over to catch and hold the valve assembly.
3. Remove the upper valve assembly (item 2, Figure 4-2) by unfastening the four screws. After removing, the valve assembly can be rotated upward and placed on top of the system with the cables and tubing still attached.
4. Remove the drip tray (item 3, Figure 4-2).
5. Remove the four screws (item 4, Figure 4-2) that secure the pump assembly to the side panel.
6. Remove the pan head screw from the top mounting tab (Figure 4-3).
7. Remove the  $\frac{7}{64}$ " Allen head screw from the bottom mounting tab.
8. Lift the pump assembly up and out of the case.

### Note

Do not disconnect tubing or wires. They are long enough to allow access to all sides of the pump assembly.

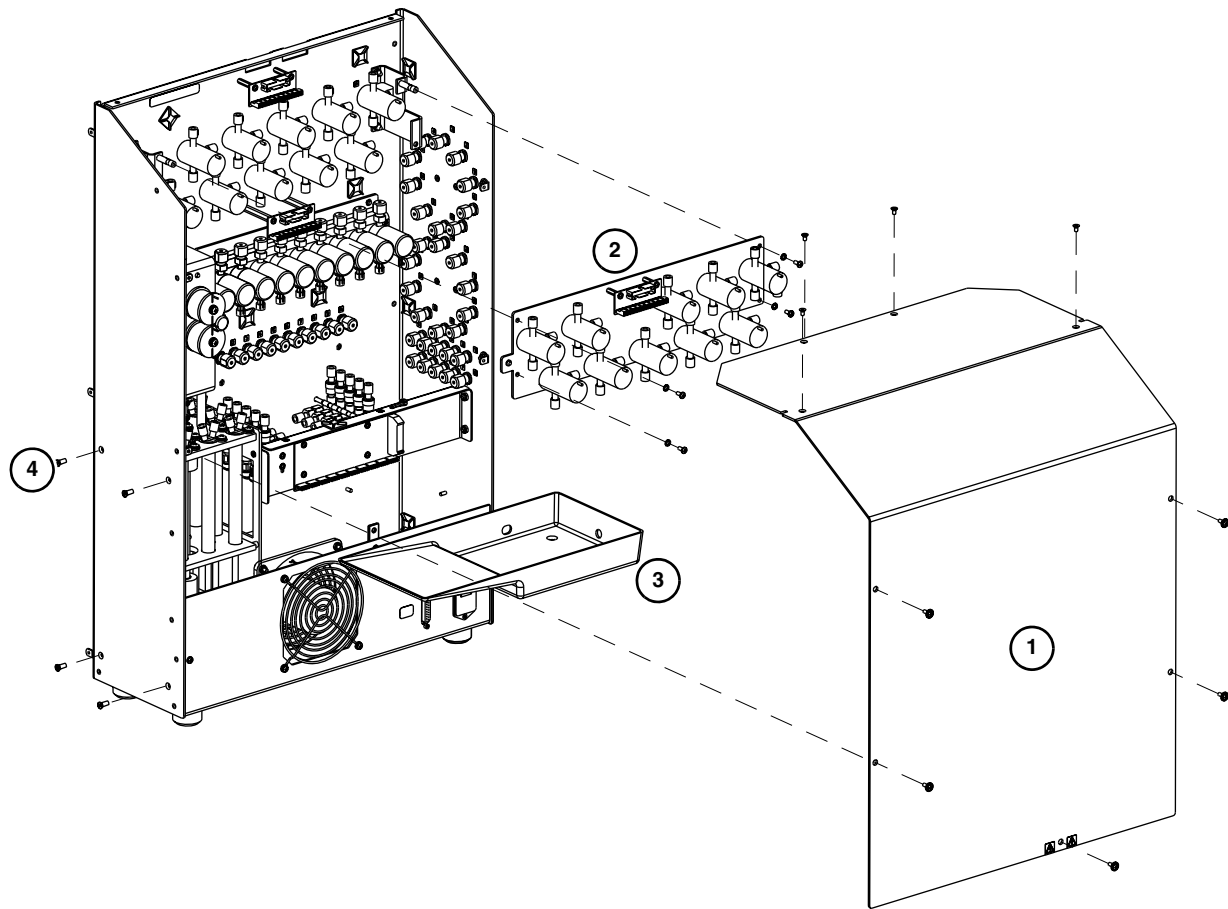


Figure 4-2 Access the pump assembly

**Note**

Refer to Figure 4-3 for the following steps.

9. Remove the bottom retainer plate.
10. On the top of the pump assembly, remove the two 10-32  $\times$   $\frac{3}{8}$ " pan head screws and lock washers.
11. Lift the piston plug and top O-ring from the glass cylinder.
12. Remove the glass cylinder and bottom O-ring. This exposes the push rod and seal.
13. The push rod shaft has two slots for a wrench. Hold the push rod at the slots with a  $\frac{3}{16}$ " wrench and remove the #6 screw and washers from the bottom of the push rod.
14. Lift the push rod out of the assembly.
15. Using care to avoid damaging the push rod, cut the seal with a sharp blade. Then, pull the seal off the push rod.
16. Place the replacement seal upside-down on a firm, flat surface (Figure 4-4).

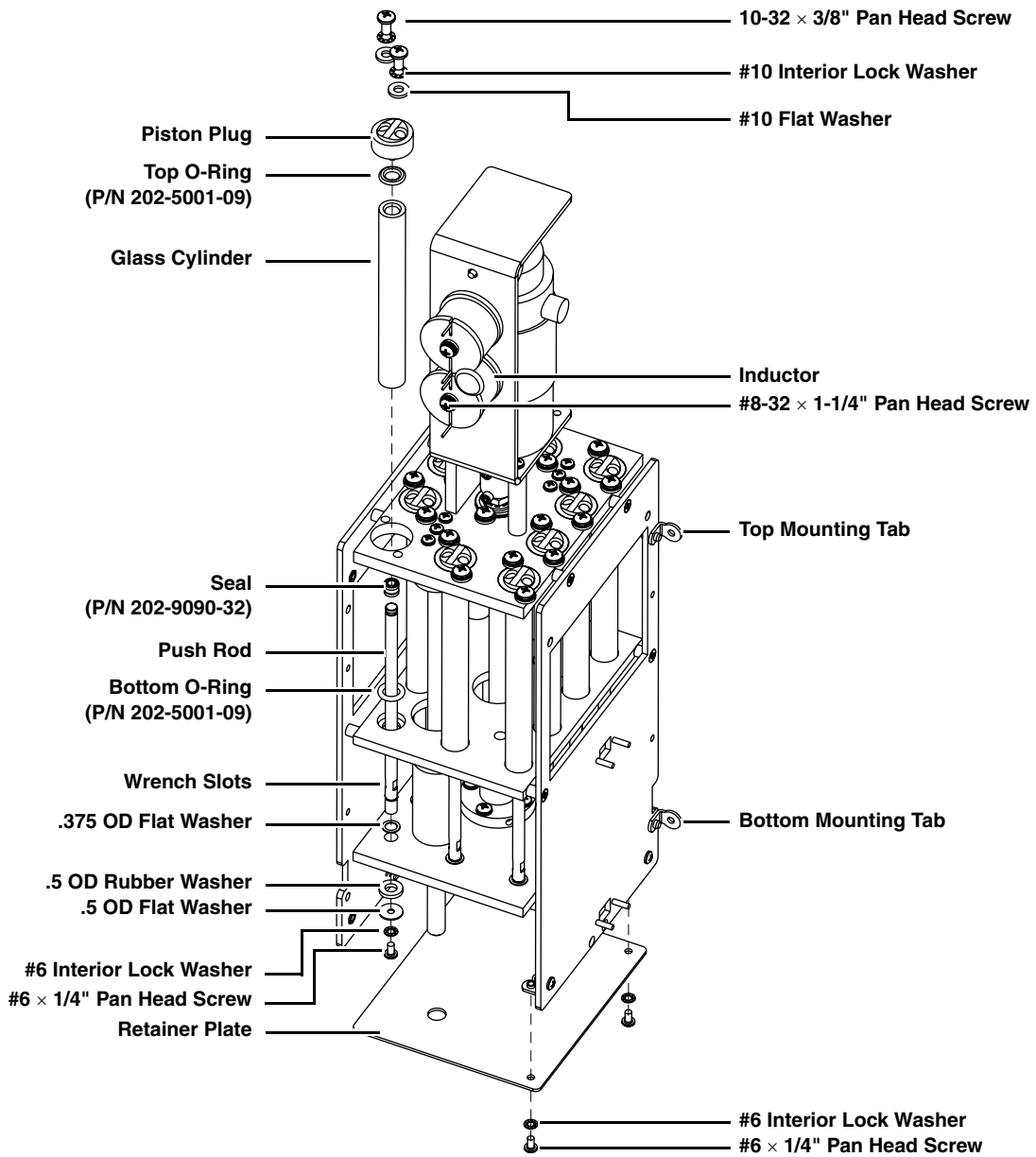


Figure 4-3 Pump assembly components

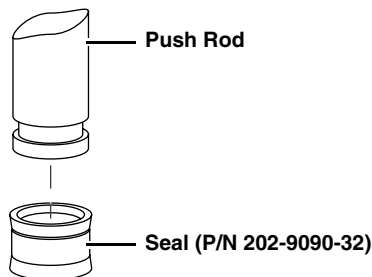


Figure 4-4 Attach seal to push rod

17. Hold the push rod upside-down and insert it into the opening on the seal. Apply downward force until the seal snaps onto the push rod.
18. Refer to Figure 4-3 and reassemble the pump channel using new O-rings at the top and bottom of the glass cylinder.
19. Repeat steps 10 through 18 for the remaining channels.

 **Note**

Channel six is located below the inductor. To remove the glass cylinder on this channel, first remove the inductor by unfastening the #8 pan head screw and internal lock washer.

20. After replacing the seals and O-rings on all channels, place the pump back into the case. Then, secure the pump:
  - a. Insert and tighten the pan head screw with lock washer into the top mounting tab (Figure 4-3).
  - b. Insert and tighten the Allen head screw with lock washer into the bottom mounting tab.
  - c. Insert and tighten the four screws with lock washer through the side of the case (item 4, Figure 4-2).
21. Place the drip tray (item 3, Figure 4-2) back into the system.
22. Return the upper valve assembly (item 2, Figure 4-2) to its original location and secure with the mounting hardware.
23. Place the back cover (item 1, Figure 4-2) on the BioOptix 10 and secure it with the mounting hardware.

 **Note**

The seal replacement procedure is complete. Perform a pump flush (see section 4.1) to prime the system.

## 4.4 Deuterium Lamp Replacement

If peak amplitude of a standard sample (see section 4.5, *Troubleshooting*) degrades over time, or if the baseline is noisy on all channels, the deuterium lamp may need to be replaced.

 **WARNING**

**Risk of electric shock. Disconnect power before servicing. Only trained personnel may open the case enclosure.**

 **WARNING**

**Risk of damage to eyesight and skin. Wear ultraviolet (UV) light eye protection and protect skin from exposure if the deuterium lamp is operating.**

**CAUTION**

Hot surfaces may cause burns. The UV lamp and nearby surfaces are hot.

To remove the lamp:

1. Remove the two screws that secure the waste port mounting plate (Figure 4-5). The optical assembly is located behind this plate.

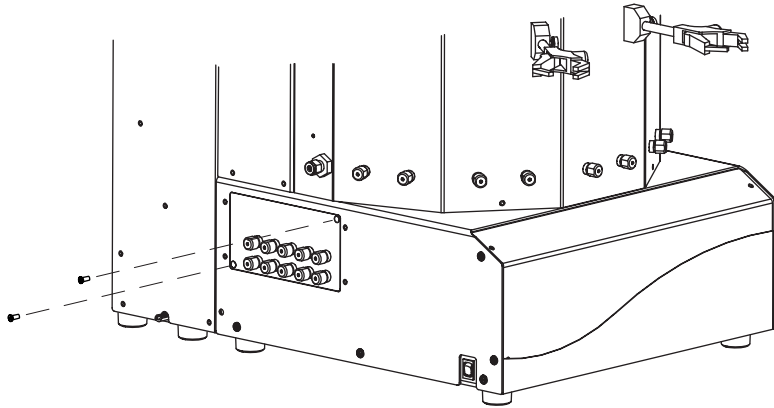


Figure 4-5 Waste port mounting plate

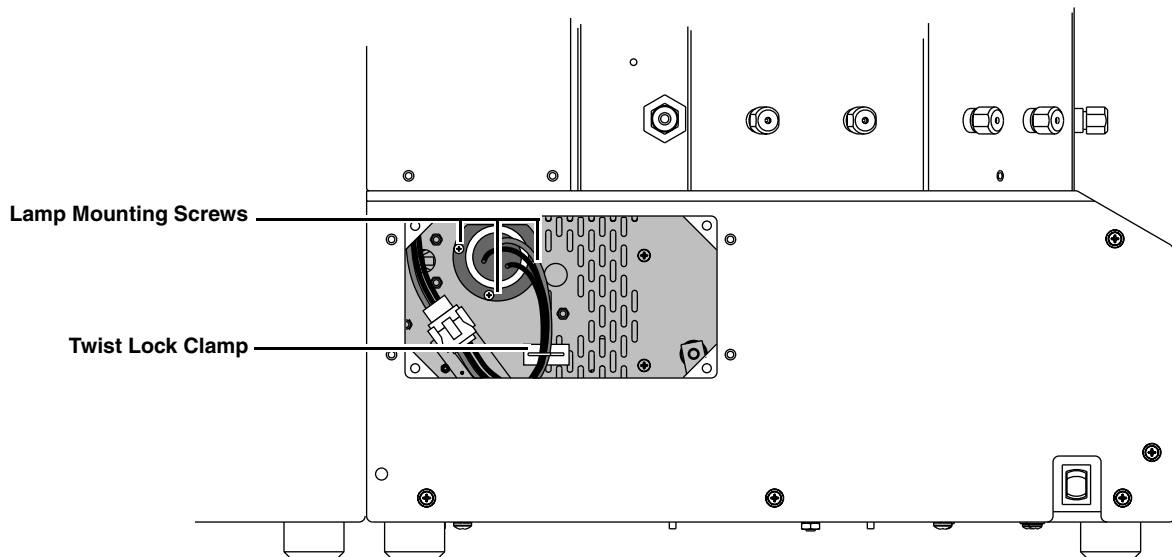


Figure 4-6 Deuterium lamp location

2. Disconnect the wiring connector.
3. Release the twist lock cable clamp.
4. Remove the three lamp mounting screws.
5. Carefully pull the lamp straight out from the optical assembly.



*Replacing the lamp*

To install the new lamp:

 **CAUTION**

Contaminants on the glass bulb will shorten the life span. Oil from your skin is one such contaminant. Wear clean cotton gloves when handling the deuterium lamp.

1. Carefully insert the replacement bulb (part number 69-5203-014) into the optical assembly and secure it with the lamp mounting hardware.
2. Route and secure the wires through the twist lock clamp.
3. Reconnect the wiring connector.
4. Replace the waste port mounting plate and secure it with the hardware.

## 4.5 Troubleshooting

Overall performance troubleshooting can be simplified if you maintain a system log that includes the number and type of samples that are separated.

If any difficulties or abnormal results are noted, they should be indicated in the log to assist in diagnosing any system problems.

It is worthwhile to maintain a standard sample that can be run periodically to check the overall performance of the system.

If you notice in your log that detector responses have changed, or you are running samples and the absorbance readings are not what you think they should be, you should run a standard.

If you run a standard sample and obtain the expected results, the problem is not being caused by the instrument. You can then examine other causes for your problem, such as the column or mobile phase.

### 4.5.1 Operating Problems

<b>Table 4-1 Common Problems</b>	
<b>Problem</b>	<b>Causes</b>
Overpressure on one or more channels	Sample precipitated (crashed) in column or solid phase cartridge. Tubing is kinked. Injection valve is set at an incorrect position.
No peaks detected	Incorrect wavelength.
Dripping in unused column positions	Lines not purged after last use. Slight leakage from contaminants in check valves. This is usually not detrimental to performance. Column bypass tubes should be used on unused channels.
System will not prime	Prime all channels to overcome the added minute leakage in each channel. Make sure the bypass tubes are in place on all channels. Inlet lines clogged; insufficient filtering. Inlet lines are not securely connected. Air leakage at internal fitting.

#### 4.5.2 Leaks

If leaks occur or if solid material is observed around a fitting, determine the source of the leak and tighten the fitting.

#### **Note**

When you tighten a fitting, make sure that you do not overtighten it. Overtightening a fitting may lead to permanent damage and require replacement of the fitting.

#### 4.5.3 Electrical

1. If your instrument stops working, check the line cord connection.
2. If the line cord is connected properly, check the fuses in the power input module located on the BioOptix 10 rear panel. These are time delay fuses (T-type) and rated according to the mains input power voltage:
  - 100 to 129 VAC mains input: 2.0 A fuse
  - 215 to 264 VAC mains input: 1.0 A fuse.Always replace with the same type.

#### 4.5.4 Inaccessible Fuses

#### **WARNING**

**Risk of electrical shock. Disconnect the electrical power before opening the rear panel or otherwise gaining access inside the equipment. Only trained service personnel may gain access to the interior.**

Internal fuses are not accessible to the user and should only be replaced by a trained service technician.

Pump Drive Board	F101 — 4.0 amp “T” type fuse.
Power One PS	F1 — Not Serviceable
Lamp Drive Board	F1 — .375 amp “T” type fuse.
Case Bottom Assy	F4 — Not Serviceable (T2 primary). F5 — Not Serviceable (T2 secondary). F6 — Not Serviceable (T2 secondary).

#### 4.5.5 Inaccessible Breakers

The Column Module has an internal 1.2 amp circuit breaker that protects the lamp circuits and a thermal breaker to protect the deuterium lamp. These should only be reset if the lamp fails to light.

#### **WARNING**

**Risk of electrical shock. Disconnect the electrical power before opening the rear panel or otherwise gaining access inside the equipment. Only trained service personnel may gain access to the interior.**

**⚠ WARNING**

**Risk of damage to eyesight and skin. Wear ultraviolet (UV) light eye protection and protect skin from exposure if the deuterium lamp is operating.**

**⚠ CAUTION**

Hot surfaces may cause burns. The UV lamp and nearby surfaces are hot.

To reset the circuit breaker, separate the pump and column modules (see section 2). Locate the circuit breaker illustrated in Figure 4-7 and press the button.

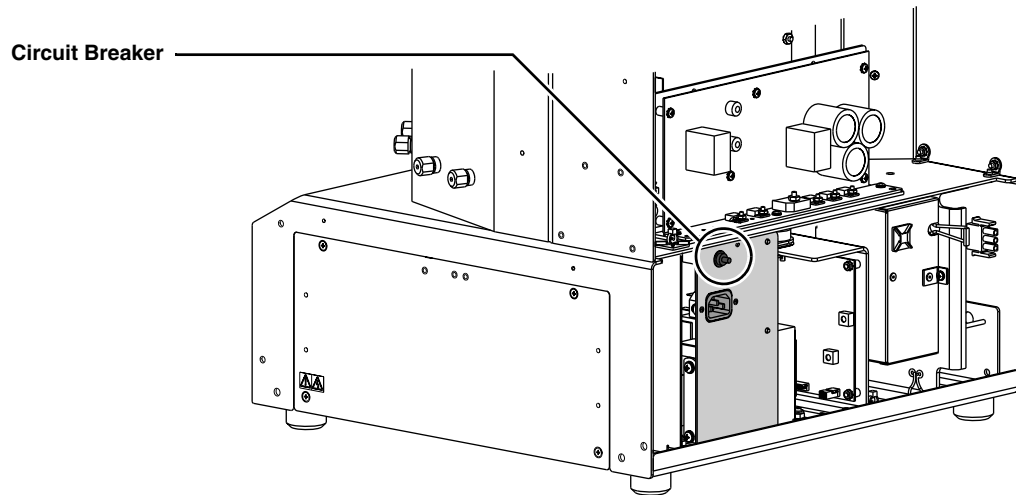


Figure 4-7 Circuit breaker location

The thermal breaker is located behind the waste port panel (Figure 4-6). To reset the breaker, open the panel and locate the reset switch (Figure 4-8). Insert a small flat blade screwdriver into the opening and push the switch in to the right.

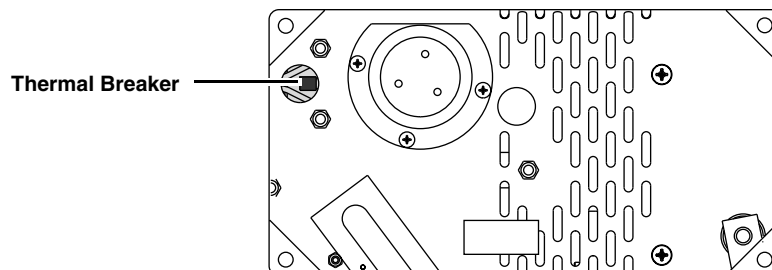


Figure 4-8 Thermal breaker location

#### 4.6 Service Department

If you have a problem with the instrument or need parts information, contact Isco's Service Department. If you write, please include all pertinent information that may be helpful in solving your problem. Address your letter to:

**Teledyne Isco, Inc.**  
Service Department  
P.O. Box 82531  
Lincoln, NE 68505

Before deciding to return the unit for factory repair, we suggest that you call the Service Department. Often a problem can be solved in the field with just a little extra help from our service technicians. Our telephone number is:

Toll free: (800) 228-4373 (USA and Canada)  
(402) 464-0231

If you prefer, you can send an e-mail detailing your problem to:

[service@isco.com](mailto:service@isco.com)

Other contact information can be obtained from our Web site at:

<http://www.isco.com>

#### 4.7 How to Ship Returns

Be sure all parts and hardware are back in place before packing. Wrap the unit in heavy paper or put it in a plastic bag. If the original shipping carton is not available, put the wrapped unit in a strong cardboard box at least six inches longer in each basic dimension than the unit itself. Fill the box equally around the unit with resilient packing material (shredded paper, bubble pack, expanded foam chunks, *etc.*). Seal the box with strapping tape or gummed cloth tape and ship it to the address given on the warranty page. The warranty at the end of the manual describes the conditions under which Teledyne Isco will pay surface shipping costs.

It is very important that the unit be well-packaged for shipping and fully insured. Damage claims must be resolved by you and the carrier. Damage in shipment due to inadequate packing can delay the repair and return of the unit to you.

# BioOptix™ 10

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## *Appendix A Method Templates*

When creating a new method, the BioOptix 10 software configures the blocks of the method file according to a template file. This template file can be modified, allowing it to be customized for many applications.

A method can have as few as one block or as many as ten. A block can be created to pump an isocratic mix of buffers, pump a gradient mix of buffers, or load a sample. These differing types of blocks can occur in any desired order.

The BioOptix 10 software installation creates one template file—Standard.tpl. Additional template files can be created to tailor a method to the application.

When creating template files, please note that the BioOptix 10 software only reads the file named Standard.tpl that appears in the same folder as the biooptix.exe program file. Therefore when maintaining multiple templates, consider:

- keeping template files with different names in the same folder as the biooptix.exe file. Rename the desired template file as Standard.tpl when needed.
- keeping multiple files, each named as Standard.tpl in separate, uniquely named subfolders. Copy the desired template file to the same folder as the biooptix.exe file as needed.

A combination of these file maintenance techniques may also be practical. However with any file maintenance technique, care should be taken to prevent overwriting the content of a template file that may be required for future use.

### **A.1 Opening the Template**

The Standard.tpl file is an ASCII text file that can be opened with a simple text editor such as Notepad. (Notepad is typically installed as part of the Microsoft® Windows® operating system.)

#### **Note**

Word-processing programs such as Microsoft Word® are not recommended for viewing and editing the template file. Programs such as these may embed other elements (formatting commands, for example) in the file. This may cause errors in method files created by the template.

The steps below refer to Microsoft Windows 2000. Other versions of Windows will be similar. To open the template file:

1. Start the text editor. From the Windows Start button, select Programs>Accessories>Notepad.

2. From Notepad's menu select File>Open.
3. Change the Files of type pull-down list to All files.
4. Use the Open dialog box to locate the Standard.tpl file. Default installations of BioOptix 10 software place this in the Program Files folder on the hard drive. Typically the path is C:\Program Files\BioOptix 10\Standard.tpl.

Notepad will then display the contents of the template file. The Standard.tpl file installed with the BioOptix 10 software is shown in Figure A-1.

```
[Blocks]
Count=5

[Block1]
Name="Equilibrate"
Type="Fluid"
AskPause="Yes"

[Block2]
Name="Load"
Type="Load"
AskPause="Yes"

[Block3]
Name="Wash"
Type="Fluid"
AskPause="Yes"

[Block4]
Name="Elute"
Type="Gradient"
AskPause="No"

[Block5]
Name="Post Run"
Type="Fluid"
AskPause="No"

[Other]
Wavelength=280
```

Figure A-1 Installed Standard.tpl file

**Tip:**

You can instruct Windows to always open a .tpl file with Notepad or other text editor. To do so:

1. Open Windows Explorer and locate the file named Standard.tpl.
2. Highlight the file and right-click to display menu options.
3. Select the Open With... option. Windows will display a list of programs.
4. Highlight Notepad or the preferred text editor.

5. Check the box labeled Always use this program to open these files.
6. Click OK.

After doing so, double-clicking on any file with the .tpl filename extension will open it in the selected text editor.

## A.2 Modifying the Template

Once open in a text editor, the template file can be modified. Refer to Figure A-2 and the discussion following for instructions on modifying the template.

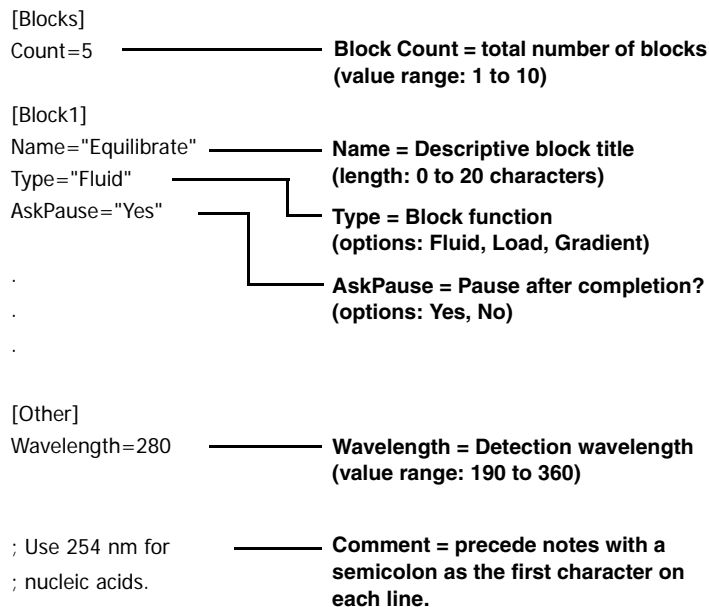


Figure A-2 Customizable values in the Standard.tpl file

After modifying the template, save the file. If saved as Standard.tpl in the same folder as the biooptix.exe program file, all new method files will be created according to your changes.

### A.2.1 General Editing Rules

There are three types of changes that can be made to the file.

- **Numeric values** – Numeric values follow an equal sign and do not use quotes. Enter a numeric value within the acceptable range.  
Count=5 in Figure A-2 is an example of a numeric value.
- **Text entries** – Text entries are enclosed in quotes and follow an equal sign. Enter text between the quotes, observing the string length or option requirements. Any printing ASCII character may be used. Nonprinting characters such as returns, line feeds, tabs, must be avoided. Entries are not case-sensitive.  
Name="Equilibrate" in Figure A-2 is an example of a text entry.
- **Comments** – Comments can be added to the file to annotate changes, special instructions, author info, etc.  
; Use 254 nm... in Figure A-2 is an example of a comment.

Additional rules should be observed and are described in the following sections.

#### A.2.2 [Blocks]

The count in this section should equal the total number of blocks in the template. When generating a method, the number of tabs created will equal the count value. The acceptable value range is 1 to 10.

#### A.2.3 [Blockn]

This section specifies what information appears on a tab. A separate [Blockn] must be used for each tab in the method file, incrementing n by one (Block1, Block2, Block3, ... Block10). The n value determines the tab order.

The contents of a Blockn include:

- **Name** – This text entry is used to label the tab. Up to 20 characters can be used to provide a descriptive title.
- **Type** – This text entry is limited to three options which determine the controls that will appear on the tab.
  - **Fluid** – This type provides controls for pumping an isocratic mix of buffer solution. An example of a Fluid tab can be seen in Figure 3-2.
  - **Load** – This type provides controls to pump liquid sample onto the column, or to allow a manual injection. An example of a Load tab can be seen in Figure 3-3.
  - **Gradient** – This type is used to reference a Gradient file and provides controls for the flow rate. An example of a Gradient tab can be seen in Figure 3-5.
- **AskPause** – This text entry enables the option to Pause at End of the block. If this block in the method should allow a choice to pause the operation, enter Yes. Enter No to disable the choice. When disabled, the BioOptix 10 automatically proceeds to the next block.

#### A.2.4 [Other]

This section contains the UV detection wavelength setting. This value assigns a default wavelength for the method. Note that all blocks use the same wavelength setting.



# BioOptix™ 10

## Appendix B Fluid Path Diagrams

This appendix contains simplified diagrams of the plumbing and valves internal to the BioOptix 10 system. Various operating states are depicted for a single channel. A complete plumbing diagram can be found in Figure B-7.

An understanding of fluids paths can be helpful when designing custom template files (Appendix A), manually controlling the system, or troubleshooting.

The valves in the diagrams are:

- **Buffer**—This valve switches between Buffer A and Buffer B to produce the correct mix (%B) of buffer solution.
- **Sample**—This valve allows the pump to draw either sample from the Sample In ports or buffer solution.
- **Channel**—This valve controls allows fluid to be pumped only when the channel is active.
- **Mode**—This manually-controlled front-panel valve has three positions:
  - Operate—passes fluid from the pump to the column.
  - Manual Inject—directs injected fluid onto the column.
  - Purge Pump—diverts fluid from the pump to a purge port that is common to all channels.
- **Effluent**—This valve sends the effluent to the Foxy fraction collector or to the channel's waste port.

### B.1 Fluid-type Blocks

Fluid blocks pump buffer solution through the column (Figure B-1).

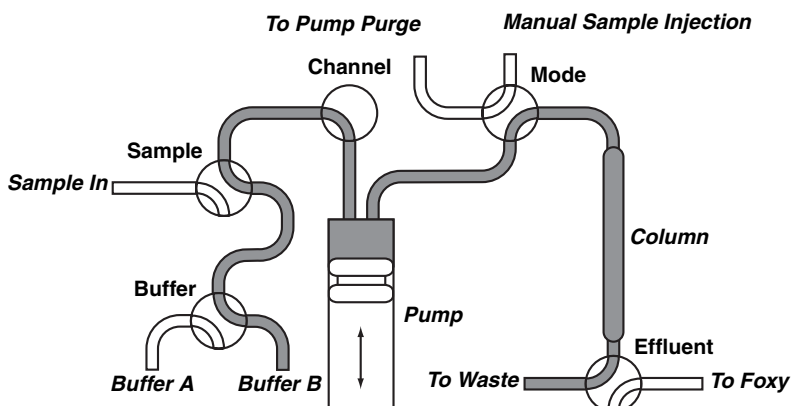


Figure B-1 Fluid path for Fluid-type blocks

While the system is running a fluid-type block:

- The Buffer valve switches between buffers A and B to produce the correct mix.
- The Sample valve allows only buffer solution to pass.
- If the channel is active, the Channel valve allows the fluid to be pumped. If the channel is inactive, the valve prevents fluid from being pumped (Figure B-2).
- The Mode valve is in the Operate position.
- The Effluent valve can direct the fluid to waste or to the fraction collector. Directing the effluent to waste is practical when the fluid block is in the experiment for column equilibration. Collecting the effluent may be desirable if the fluid may contain something of interest (e.g. during a column wash).

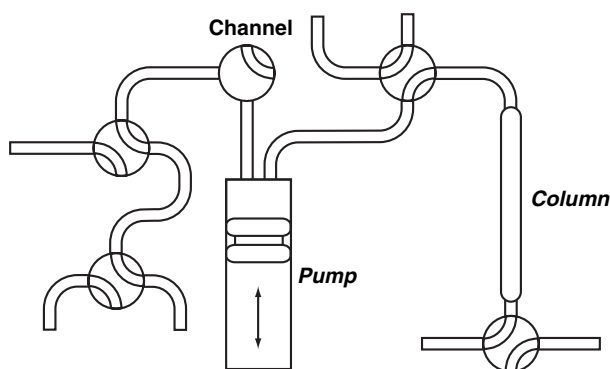


Figure B-2 Inactive channel

## B.2 Load-type Blocks

Load blocks apply the sample onto the column. There are two modes that can be selected in the Method file—Pump or Manual injection.

Pump injections draw liquid sample from the Sample In port and routes it to the column (Figure B-3). The Mode valve should be in the Operate position; the Effluent valve can either collect the fluid or divert it to the channel's Waste port.

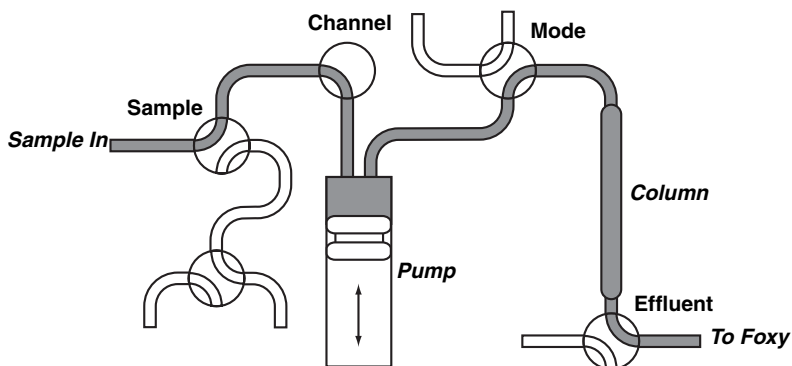


Figure B-3 Fluid path for Load-type blocks -  
Pump injections

Manual injections do not operate the pump. The system pauses for the operator to turn the Mode valve to the Manual Inject position. The liquid sample is then forced through the injection port on top of the BioOptix 10 system. The liquid sample is introduced directly onto the column (Figure B-4).

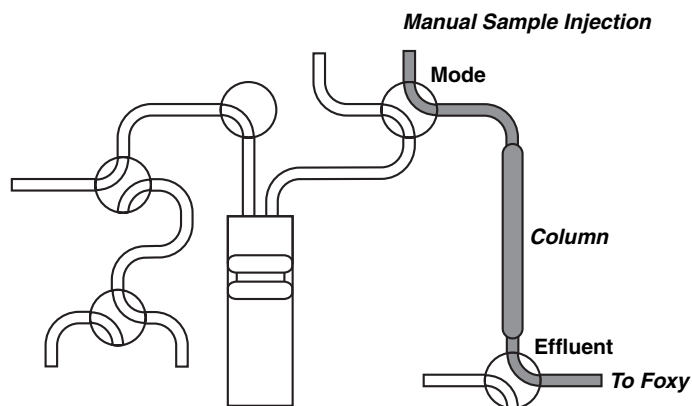


Figure B-4 Fluid path for Load-type blocks - Manual injections

### B.3 Gradient-type Blocks

Gradient blocks are similar to fluid-type blocks (Figure B-5). The Buffer valve switches between buffers A and B to produce the correct mix.

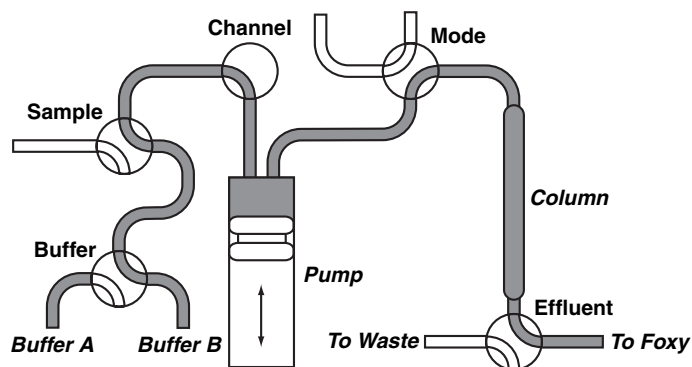


Figure B-5 Fluid path for Gradient-type blocks

### B.4 Pump Flush

A Pump Flush should be done whenever the system will be idle for more than a few hours. (See sections 3.8 and 4.1.) The flush removes salts from the Buffer in lines to the Mode knob (Figure B-6).

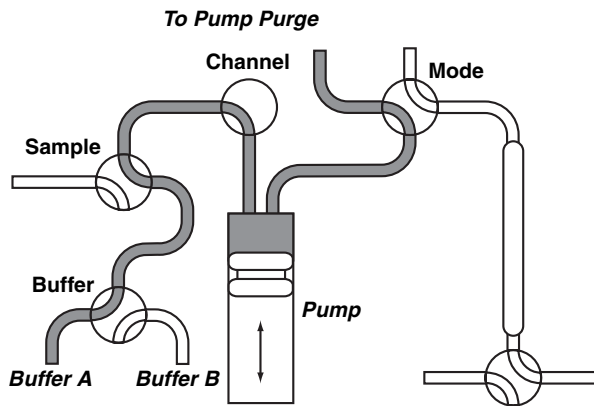
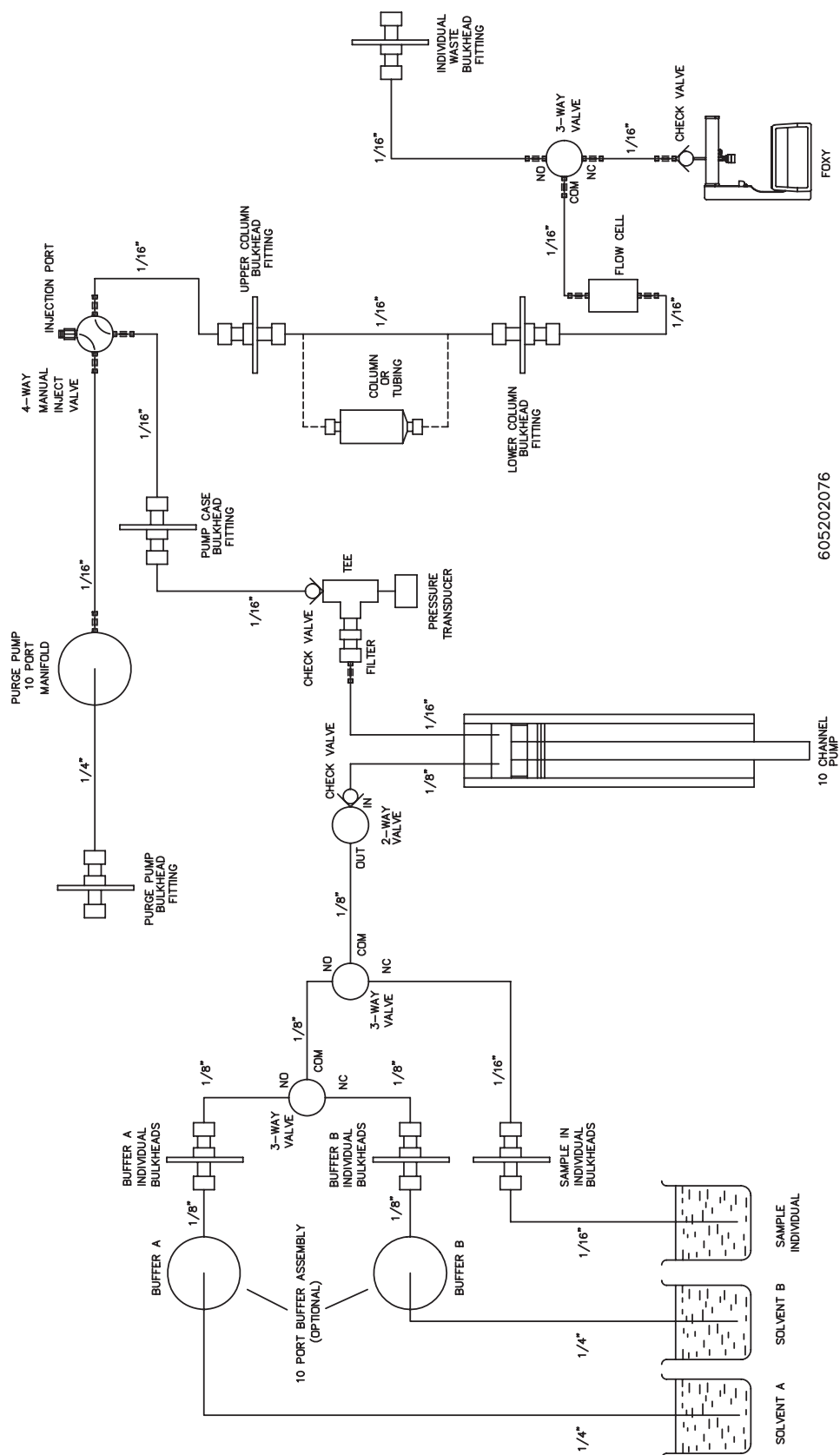


Figure B-6 Pump flush

### B.5 Plumbing Diagram

A complete plumbing diagram can be found on the following page.



605202076

Figure B-7 BioOptix 10 Plumbing Diagram



# BioOptix™ 10

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## *Appendix C Replacement Parts Lists*

Replacement parts are called out in illustrations in this section. Reference the call-outs in the accompanying tables to determine the part number for the item.

Replacement parts can be purchased by contacting Teledyne Isco's Customer Service Department.

**Teledyne Isco, Inc.**

Customer Service Department

P.O. Box 82531

Lincoln, NE 68501 USA

Phone: (800) 228-4373

(402) 464-0231

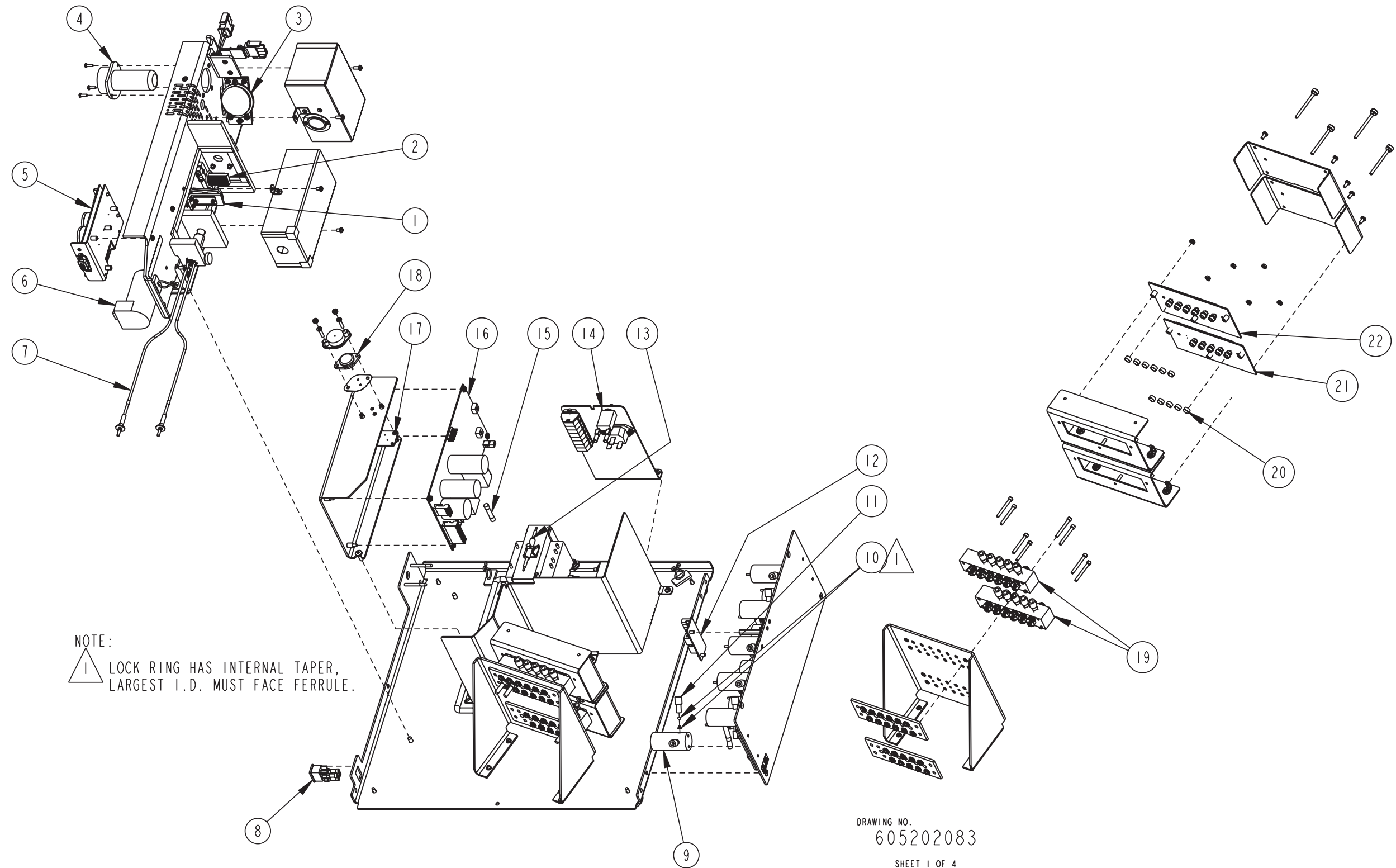
FAX:(402) 465-3022

E-mail:[info@isco.com](mailto:info@isco.com)





C.1 Detector Assembly



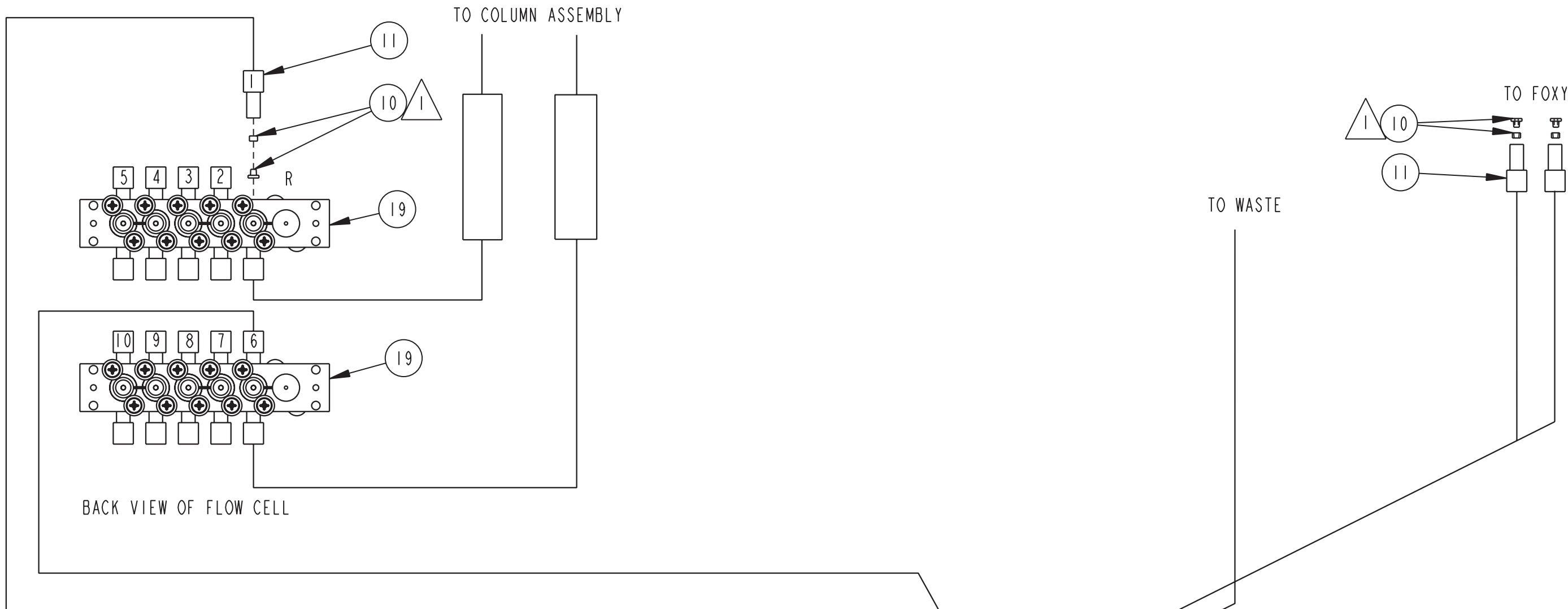
NOTE:  
 △ LOCK RING HAS INTERNAL TAPER,  
 LARGEST I.D. MUST FACE FERRULE.

DRAWING NO.  
605202083

SHEET 1 OF 4

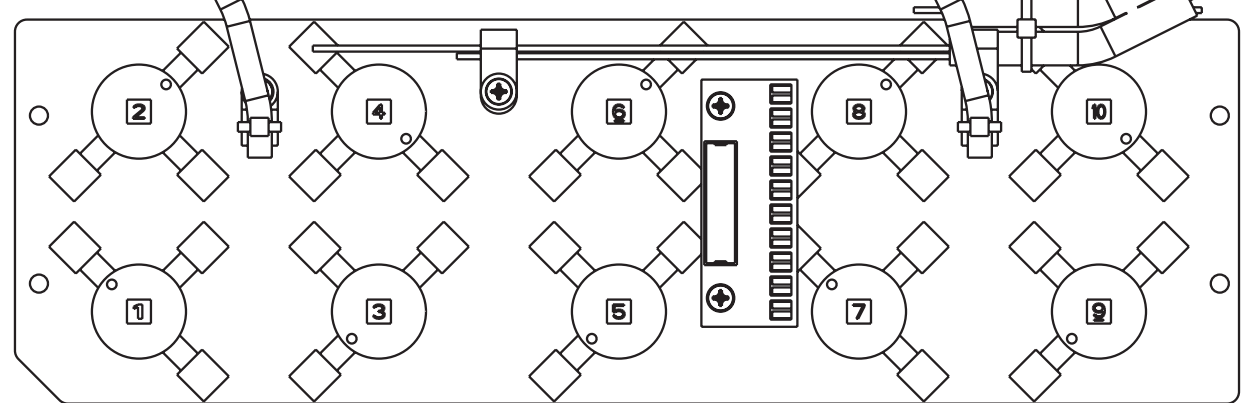
REPLACEMENT PARTS LIST  
DETECTOR ASSEMBLY

<b>REPLACEMENT PARTS LIST</b>		
<b>TELEDYNE ISCO, INC.</b>		
		605202083
		SHEET: 2 OF 4
	REV:	DATE: 05171
ITEM NO.	PART NUMBER	DESCRIPTION
1	601844231	FOCUSING MIRROR ASSEMBLY
2	601844209	GRATING ASSEMBLY
3	601844195	CONDENSING MIRROR ASSEMBLY
4	695203014	LAMP
5	605205040	MOTOR DRIVE CIRCUIT BOARD
6	605204048	MOTOR ASSEMBLY
7	695203004	FIBER OPTICS CABLE
8	410730401	SWITCH
9	605204032	VALVE ASSEMBLY
10	605204043	2 PIECE 1/16 ID FERRULE (PACK OF 10)
11	605204044	1/16 ID, LONG NUT (PACK OF 10)
12	605205041	VALVE CIRCUIT BOARD
13	411031238	PIGTAIL FUSE
14	412025012	CIRCUIT BREAKER
15	411031150	FUSE .3 AMP SB
16	605205042	LAMP POWER CIRCUIT BOARD
17	141901407	SOCKET, TO-3 SEMI-COND, CASE STYLE
18	402023442	TRANSISTOR, MOTOROLA 2M3442
19	605204023	5 CHANNEL FLOW CELL WITH REFERENCE
20	605203102	OPTICAL SHIELD
21	605205044	DETECTOR PREAMP CBA, 5 CHANNEL
22	605205043	DETECTOR PREAMP CBA, 6 CHANNEL
NOTE: 1. For current prices and quotations on parts, contact Isco Service Department. 2. This list is subject to change without notice.		



NOTE:

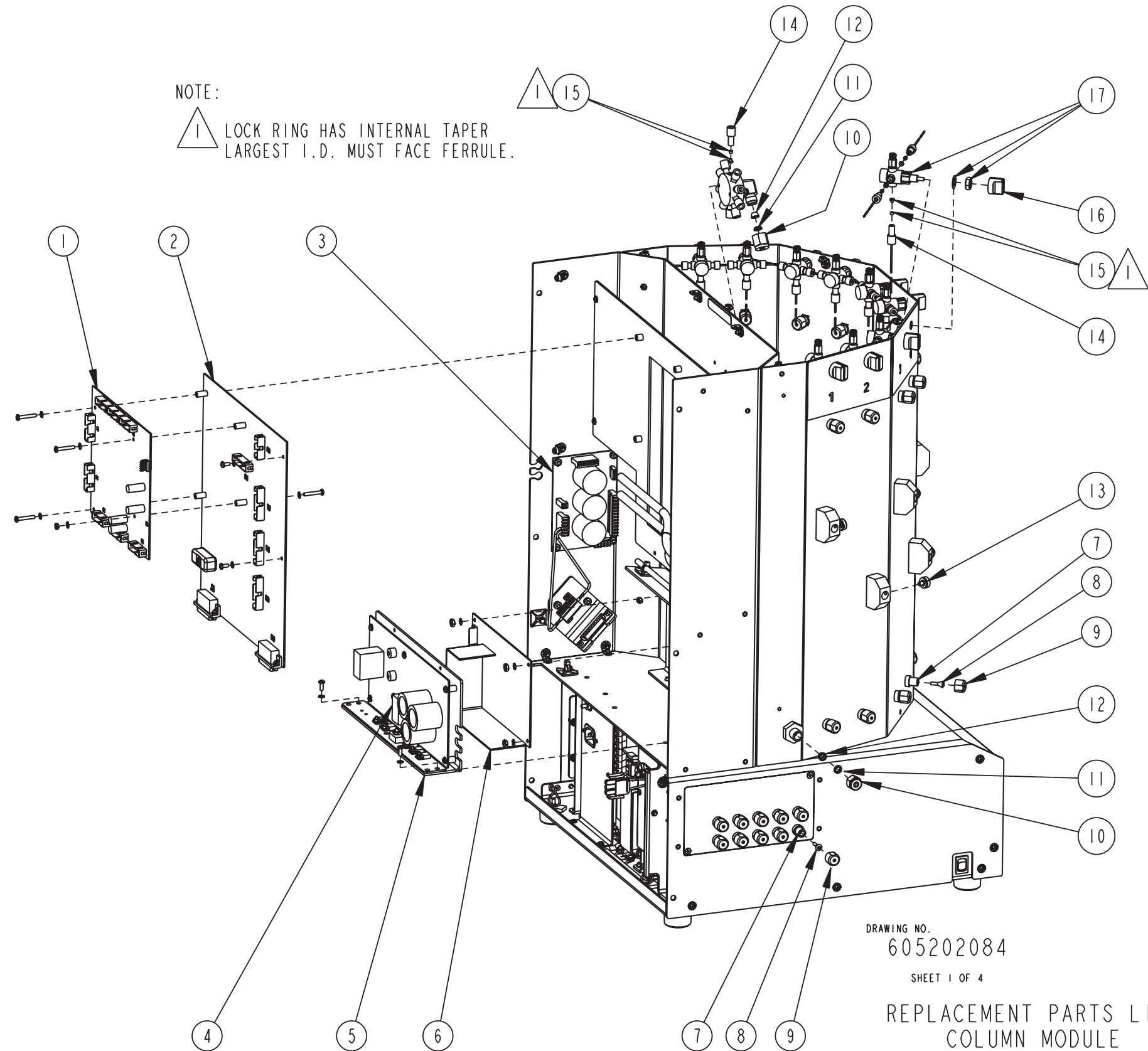
1 LOCK RING HAS INTERNAL TAPER, LARGEST I.D. MUST FACE FERRULE.



COLOR CODE		
CHANNEL	COLOR	ITEM NUMBER
1 & 6	BLUE	26
2 & 7	YELLOW	24
3 & 8	ORANGE	23
4 & 9	GREEN	25
5 & 10	CLEAR	27



C.2 Column Module

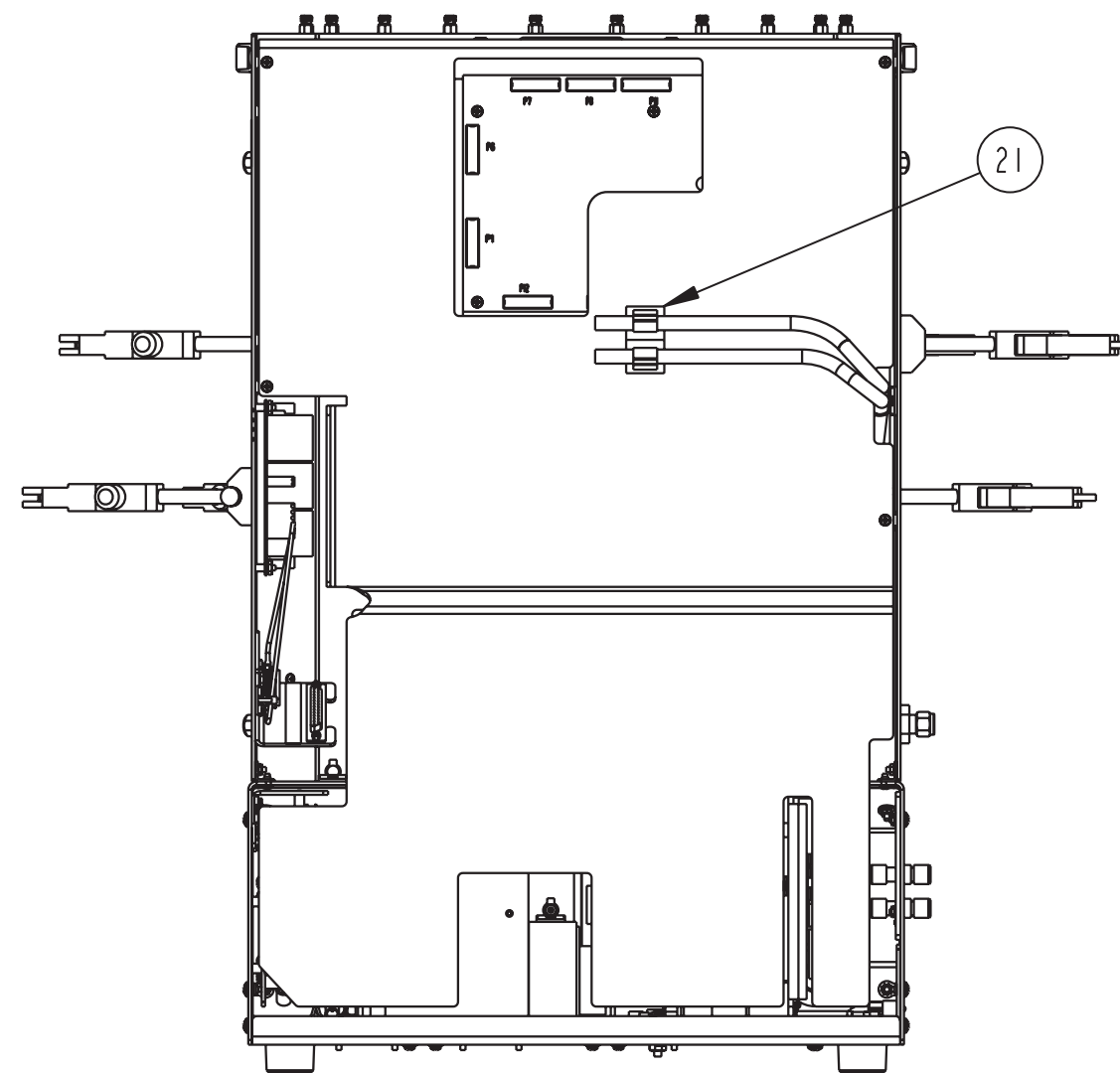
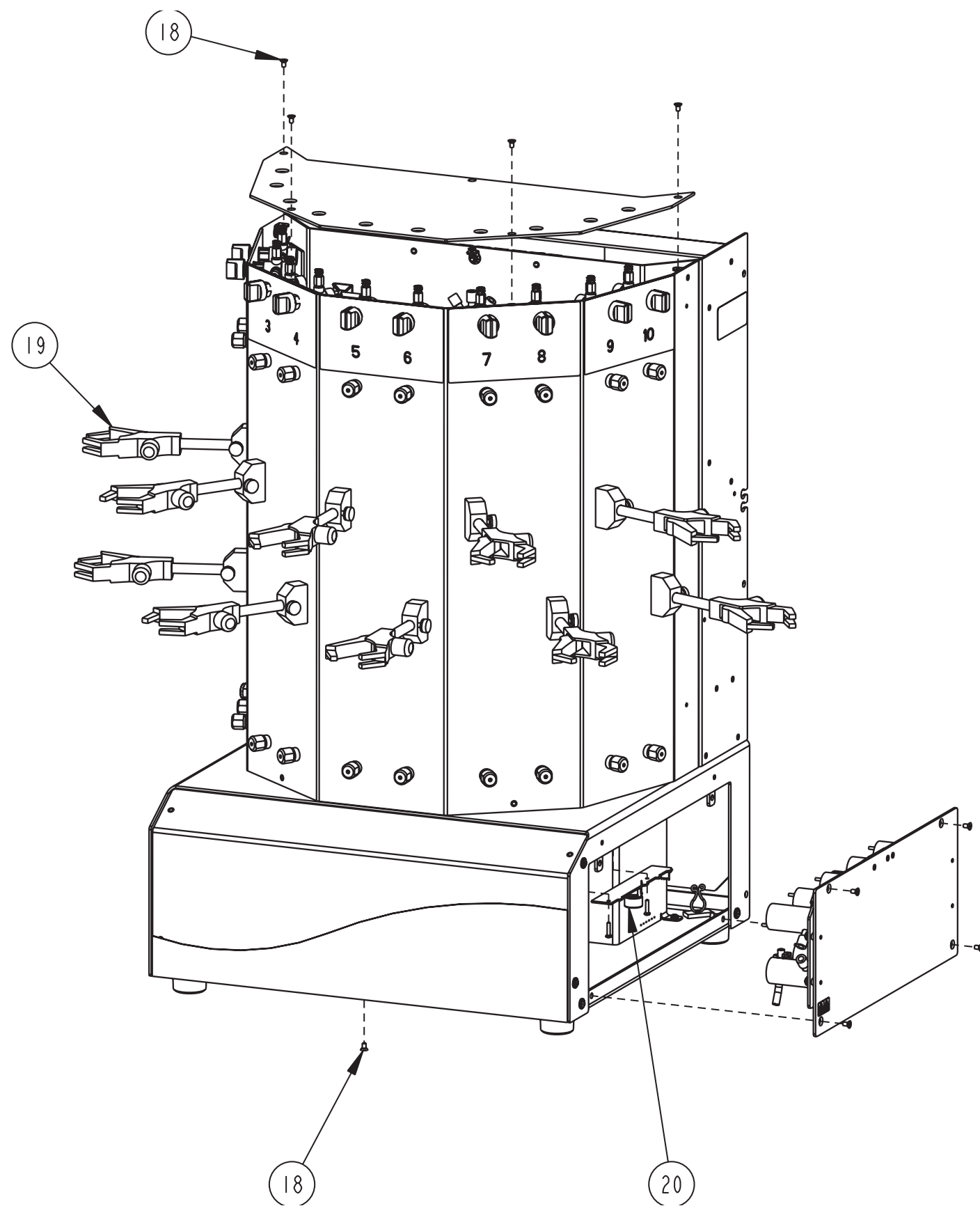


DRAWING NO.  
605202084

SHEET 1 OF 4

REPLACEMENT PARTS LIST  
COLUMN MODULE

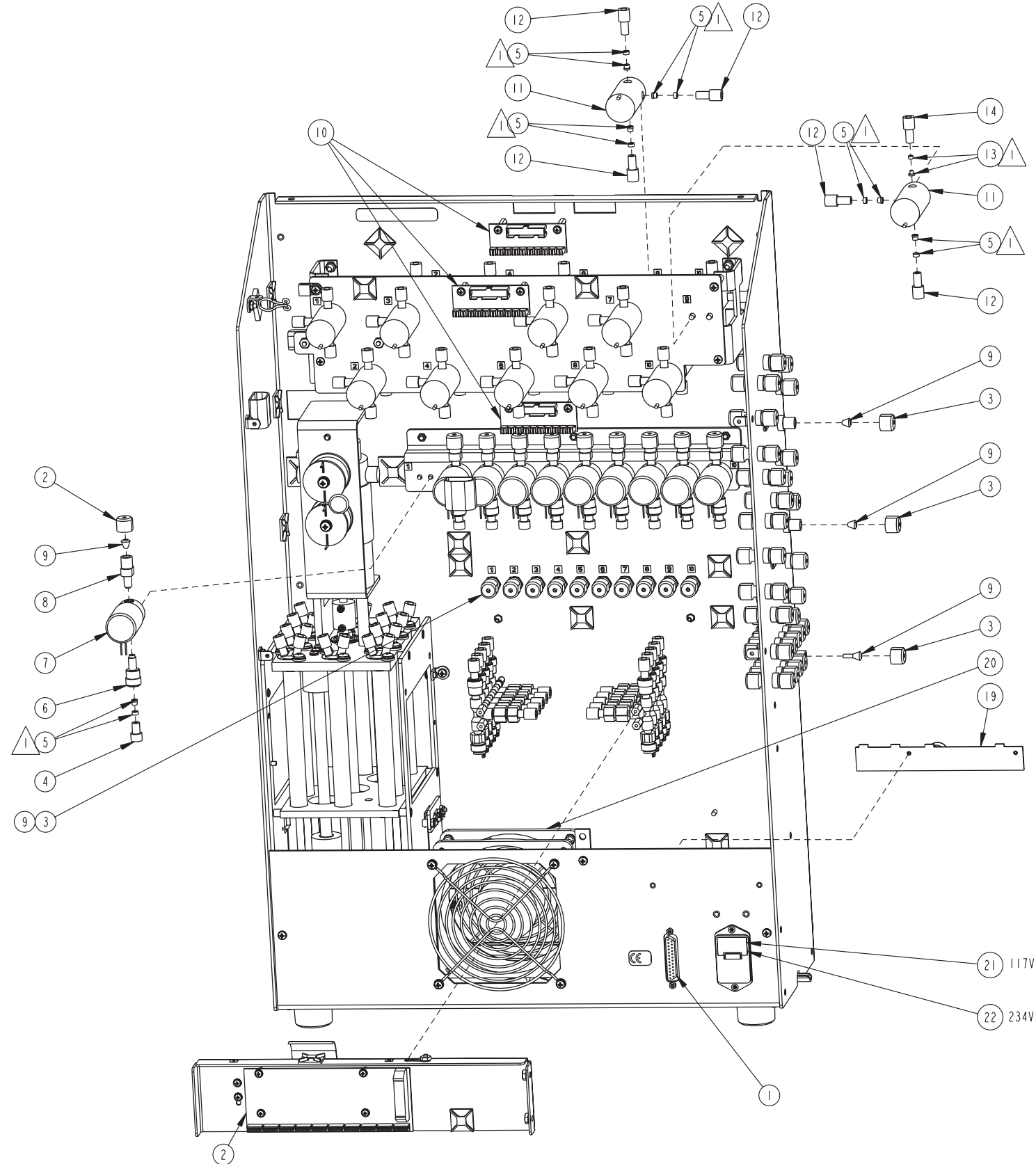
<b>REPLACEMENT PARTS LIST</b>		
<b>TELEDYNE ISCO, INC.</b>		
		605202084
		SHEET: 2 OF 4
		REV:      DATE: 05171
ITEM NO.	PART NUMBER	DESCRIPTION
1	605205054	INTERFACE I/O CIRCUIT BOARD
2	605205050	CONTROLLER CIRCUIT BOARD
3	605205048	POWER DISTRIBUTION CIRCUIT BOARD
4	411031270	FUSE 4.0 AMP SB
5	605205047	PUMP DRIVE CIRCUIT BOARD
6	341000211	POWER SUPPLY
7	602273088	BULHEAD UNION
8	600084014	1.5 MM FERRULE (PACK OF 10)
9	605204037	CONNECT NUT (PACK OF 10)
10	209016362	1/4 OD NUT, PFA
11	209016363	1/4 OD BACK FERRULE, PFA
12	209016364	1/4 OD FRONT FERRULE, PFA
13	605204040	CAP SCREW ASSEMBLY
14	605204044	1/16 ID NUT (PACK OF 10)
15	605204043	2 PIECE 1/16 ID FERRULE (PKG OF 10)
16	180001901	KNOB
17	605204051	VALVE W/ LUER FITTING
NOTE: 1. For current prices and quotations on parts, contact Isco Service Department. 2. This list is subject to change without notice.		








C.3 Pump Module



NOTE:  
 LOCK RING HAS INTERNAL TAPER,  
 LARGEST I.D. MUST FACE FERRULE.

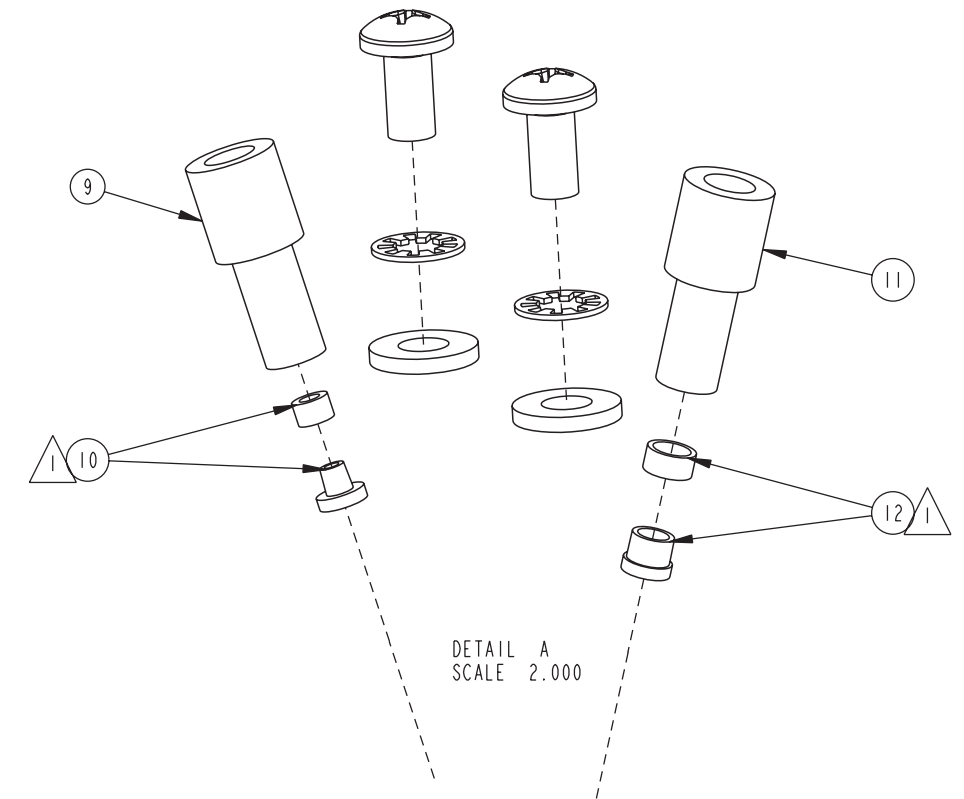
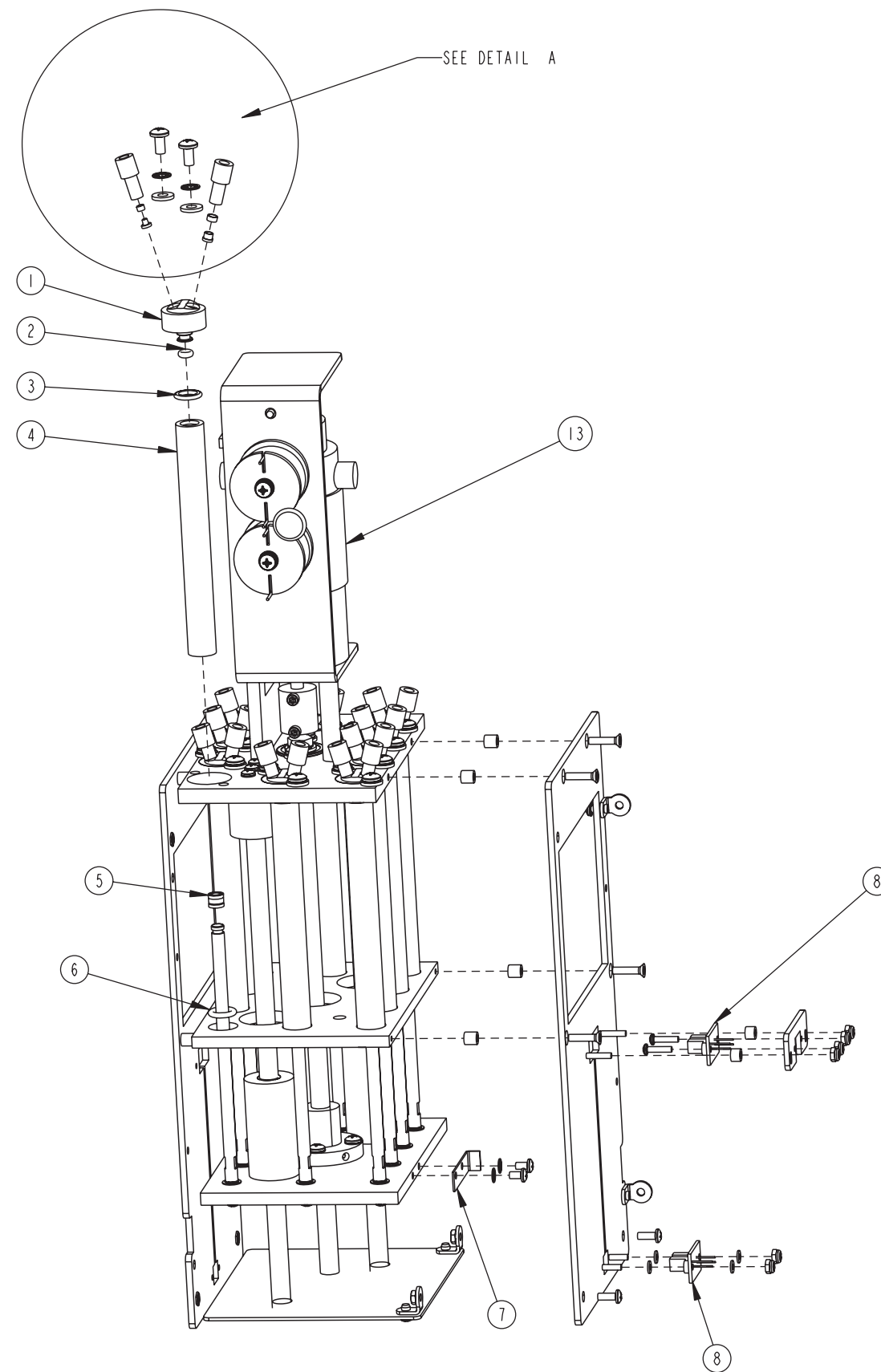
DRAWING NO.  
605202085  
SHEET 1 OF 5

REPLACEMENT PARTS LIST  
PUMP MODULE

21 117V  
22 234V

REPLACEMENT PARTS LIST			605202085
TELEDYNE ISCO, INC.			SHEET: 2 OF 5
		REV:	DATE: 05171
ITEM NO.	PART NUMBER	DESCRIPTION	
1	141400101	25 PIN SUB-D CONNECTOR	
2	605205051	PRESSURE TRANSDUCER CIRCUIT BOARD	
3	605204037	LEAD CONNECTOR NUT (PACKAGE OF 10)	
4	209016389	SHORT NUT FOR 1/6 TUBING	
5	605204041	2-PIECE FERRULE FOR 1/8 TUBING (10)	
6	209016421	OUTLET CHECK VALVE	
7	605204034	2-WAY VALVE	
8	600643254	VALVE CONNECTOR	
9	600084014	1/16 & 1/8 FERRULES (PKG OF 10)	
10	605205041	VALVE CIRCUIT BOARD ASSEMBLY	
11	605204032	3-WAY VALVE	
12	605204042	NUT FOR 1/8 TUBING (PKG OF 10)	
13	605204043	2 PIECE FERRULE FOR 1/6 TUBING (10)	
14	605204044	NUT FOR 1/16 TUBING (PKG OF 10)	
15	605203144	FILTER FRIT RETAINING NUT	
16	209016422	20 MICRON FRIT	
17	605203143	FILTER HOLDER	
18	605204063	PRESSURE TRANSDUCER ASSEMBLY	
19	605205045	GAS SENSOR CIRCUIT BOARD ASSEMBLY	
20	605204065	FAN	
21	411031170	3 AMP FUSE (100 & 117 VOLT UNITS)	
22	411031156	1.5 AMP FUSE (234 VOLT UNITS)	
23	023050503	1/16 ORANGE TUBING (PER INCH)	
24	023050504	1/16 YELLOW TUBING (PER INCH)	
25	023050505	1/16 GREEN TUBING (PER INCH)	
26	023050506	1/16 BLUE TUBING (PER INCH)	
NOTE: 1. For current prices and quotations on parts, contact Isco Service Department. 2. This list is subject to change without notice.			

REPLACEMENT PARTS LIST			605202085
TELEDYNE ISCO, INC.			SHEET: 3 OF 5
		REV:	DATE: 05171
ITEM NO.	PART NUMBER	DESCRIPTION	
27	023050509	1/16 CLEAR TUBING (PER INCH)	
28	023050302	1/8 CLEAR TUBING (PER INCH)	
NOTE: 1. For current prices and quotations on parts, contact Isco Service Department. 2. This list is subject to change without notice.			



NOTE:

△ LOCK RING HAS INTERNAL TAPER,  
LARGEST I.D. MUST FACE FERRULE.

605202085

SHEET: 5 OF 5

## REPLACEMENT PARTS LIST

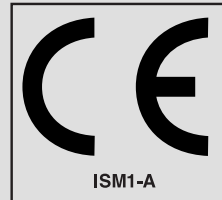
TELEDYNE ISCO, INC.

REV:      DATE: 05171

ITEM NO.	PART NUMBER	DESCRIPTION
1	605203127	PISTON PLUG
2	202907008	.176 ID O-RING
3	202500109	.299 ID O-RING
4	695203132	CYLINDER
5	202909032	SEAL
6	202300110	.362 ID O-RING
7	605203155	FLAG (WORKS WITH PLATE WITH SLOT)
	605203049	FLAG (WORKS WITH PLATE WITHOUT SLOT)
8	605204016	SENSOR ASSEMBLY
9	605204044	NUT OF 1/16 TUBING (PKG OF 10)
10	605204043	2-PIECE FERRULE FOR 1/16 TUBING (10)
11	605204042	NUT OF 1/8 TUBING (PKG OF 10)
12	605204041	2-PIECE FERRULE FOR 1/8 TUBING (10)
13	304000005	MOTOR

NOTE: 1. For current prices and quotations on parts, contact Isco Service Department.  
 2. This list is subject to change without notice.

# DECLARATION OF CONFORMITY



Application of Council Directive: 89/336/EEC – The EMC Directive  
73/23/EEC – The Low Voltage Directive

Manufacturer's Name: Teledyne Isco, Inc.  
Manufacturer's Address: 4700 Superior, Lincoln, Nebraska 68504 USA  
Mailing Address: P.O. Box 82531, Lincoln, NE 68501

Equipment Type/Environment: Laboratory Equipment for Light Industrial/Commercial Environments

Trade Name/Model No: Bio Optix 10 System

Year of Issue: 2005

Standards to which Conformity is Declared: EN 61326-1998 EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use  
EN 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Standard	Description	Severity Applied	Performance Criteria
EN61000-4-2	Electrostatic Discharge	Level 2 - 4kV contact discharge Level 3 - 8kV air discharge	B B
EN61000-4-3	Radiated RF Immunity	80 MHz to 1000MHz 80% AM at 1kHz Level 1 - 1V/m	A
EN61000-4-4	Electrical Fast Transient	Level 2 - 1kV on ac lines	B
EN61000-4-5	Surge on AC Lines	1kV common mode, 500V differential mode	B
EN61000-4-6	Conducted RF on AC lines	150 kHz to 80 MHz, 1V rms, 80% modulated	B
EN61000-4-11	Voltage Dips/Short Interruptions	0.5 cycle, each polarity/100%	B
CISPR11/ EN 55011	RF Emissions	Group 1, Class A Industrial, Scientific, and Medical Equipment	
EN61000-3-2, 3-3	Harmonic, Flicker		

We, the undersigned, hereby declare that the design of the equipment specified above conforms to the above Directive(s) and Standards as of September 7, 2005.

William Foster  
USA Representative



William Foster  
Director of Engineering  
Teledyne Isco, Inc.  
4700 Superior Street  
Lincoln, Nebraska 68504

Phone: (402) 464-0231  
Fax: (402) 464-4543

60-5202-054  
Rev.



# ***Teledyne Isco One Year Limited Factory Service Warranty \****

Teledyne Isco warrants covered products against failure due to faulty parts or workmanship for a period of one year (365 days) from their shipping date, or from the date of installation by an authorized Teledyne Isco Service Engineer, as may be appropriate.

During the warranty period, repairs, replacements, and labor shall be provided at no charge. Teledyne Isco's liability is strictly limited to repair and/or replacement, at Teledyne Isco's sole discretion.

Failure of expendable items (e.g., charts, ribbon, tubing, lamps, glassware, seals and filters), or from normal wear, accident, misuse, corrosion, or lack of proper maintenance, is not covered. Teledyne Isco assumes no liability for any consequential damages.

Teledyne Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose.

This warranty applies only to products sold under the Teledyne Isco trademark and is made in lieu of any other warranty, written or expressed.

No items may be returned for warranty service without a return authorization number issued from Teledyne Isco.

This warranty does not apply to the following products: Process Analyzers, SFX 3560 SFE Extractor, 6100 VOC Sampler.

The warrantor is Teledyne Isco, Inc.  
4700 Superior, Lincoln, NE 68504, U.S.A.

**\* This warranty applies to the USA and countries where Teledyne Isco Inc. does not have an authorized dealer. Customers in countries outside the USA, where Teledyne Isco has an authorized dealer, should contact their Teledyne Isco dealer for warranty service.**

*In the event of instrument problems, always contact the Teledyne Isco Service Department, as problems can often be diagnosed and corrected without requiring an on-site visit. In the U.S.A., contact Teledyne Isco Service at the numbers listed below. International customers should contact their local Teledyne Isco agent or Teledyne Isco International Customer Service.*

## **Return Authorization**

A return authorization number must be issued prior to shipping. Following authorization, Teledyne Isco will pay for surface transportation (excluding packing/crating) both ways for 30 days from the beginning of the warranty period. After 30 days, expense for warranty shipments will be the responsibility of the customer.

**Shipping Address:** Teledyne Isco, Inc. - Attention Repair Service  
4700 Superior Street  
Lincoln NE 68504 USA

**Mailing address:** Teledyne Isco, Inc.  
PO Box 82531  
Lincoln NE 68501 USA

**Phone:** Repair service: (800)775-2965 (lab instruments)  
(800)228-4373 (samplers & flow meters)  
Sales & General Information (800)228-4373 (USA & Canada)

**Fax:** (402) 465-3001

**Email:** [service@isco.com](mailto:service@isco.com) **Web site:** [www.isco.com](http://www.isco.com)



