Buck HPLC System Packing List
BLC-10 Isocratic Series

_____ BLC-10 system voltage serial number

all systems include the following:

- Manual
- C18 analytical column 15 or 25 cm
- sample preparation kit including:
  - HPLC test mix and chromatogram report
  - 100 uL syringe
  - luer lock syringe
- fittings kit including:
  - solvent delivery line assembly
  - column to flowcell assembly
  - waste line assembly
  - flush tubing assembly
  - spare fitting and shipping plugs

BLC-10 Upgrade options:

_____ stainless steel construction BLC-SS

_____ high pressure option to 5000 psi

Peaksimple Chromatography Data System (system will contain <u>one</u> of the following):

_____ model 203 single channel serial control voltage serial number

Data Station upgrade options:

_____ model 202 four channel serial control voltage serial number

_____ model 302 six channel USB control voltage serial number

BLC-10 / 20 HPLC & Peak-Simple Data Station Mini-Guide

HPLC Hardware SET-UP & PLUMBING Procedure:

[1] Unpack the HPLC and remove the Installation Kit. Make sure injection valve is fully rotated to load position. [2] Prepare your solvent by mixing 700ml. HPLC-Grade Methanol and 300ml. HPLC-Grade Water. Degas mixture by sparging with Helium or by sonicating in an Ultrasonic Bath and/or filter through a metal disk to remove the gas bubbles.

[3] Connect the Solvent Delivery Line (5' of 1/8" Clear Teflon tubing with a filter on one end and a flat fitting on the other) to the Inlet check valve on the Pump Head (lower ¼-28 fitting). Drop the end with the filter into the Solvent Bottle [4] Take the Brown 1/16" PEEK tubing coming out of the HPLC unit and insert into a 10/32 red finger-tight fitting with a beige ferrule, attach this to the Inlet End of the Analytical Column and tighten.

[5] Connect the Column to Flowcell Line (18" of 1/16" Brown PEEK with a 10/32 red fingertight fitting on each end) by attaching one end to the Outlet End of the Analytical Column and the other into the Lower Port on the Detector Flow Cell.

(On BLC-10 line is 8"; right side of flow cell is inlet, use the ¼-28 short black fitting with the blue flangeless ferrule).

[6] Connect the Waste Line (5' of 1/16" Clear Teflon with a 10/32 red fingertight fitting on one end and a Backpressure regulator on the other) by attaching to the upper port on the Detector Flow Cell. (On BLC-10 connect using a ¼-28 short black fitting with blue flangeless ferrule). The other end has a BackPressure Regulator to minimize bubbles from forming in the Flow Cell. Drop this end into the Solvent Waste bottle.

[7] Insert the 5ml. Syringe into Prime/Purge Valve (luer-lock fitting). Open valve about ½ turn (counter-clockwise) and slowly pull the Solvent through the Valve till the Syringe fills. Close the Valve (Clockwise) remove the Syringe, discard solvent. Repeat 4 or 5 times until no more air bubbles appear in syringe.

[8] Install pump flush lines by first installing the outlet line (the one with the luer-lock fitting) on the top of the pump. Next, install the inlet line at the bottom of the pump. Prepare Flushing Solution by mixing 100 ml Methanol and 400 ml HPLC-Grade Water. Place the inlet tubing into flush solution. With the 5-ml syringe, draw solution through the luer lock fitting of the outlet tubing until bubbles no longer appear in either line. (4 or 5 syringe draws is usually sufficient). Place outlet tubing into flush solution. Make sure both inlet and outlet tubing are both submerged when pump is in use. (Use of flushing solution will increase pump life especially when using a buffered mobile phase).

[9] Turn ON the HPLC unit, start pump at 1.5ml/minute. Wait till solvent appears in the Waste bottle. Check system for any leaks or air bubbles; reduce the flow to 1.25ml/minute. When the Absorance on the display stabilizes (usually ~15 min) press the Autozero button on the front panel. Instrument is ready for use.

Data-Station & Software Installation Procedure:

[1] Plug the power cord for the box into the appropriate socket (110V U.S., 220V international).

[2] Plug the 9-pin computer cable into the back of the Data Station box and into an available serial port on the back of your PC computer. Use com 1, if available.

[3] Plug the 15 pin data cable from the data station into the instrument back panel and secure using a small slotted screwdriver.

[4] Turn on the data station power switch located on the back panel (step not necessary on single channel type).

[5] Start your computer and load Windows (either 3.1/3.11 or 95/98).

[6] Load the Peaksimple Disk into your PC and install the software using setup file.

[7] Software will automatically load onto your hard disk and set up a program icon for you.

Peak-Simple Set-up Procedures (basic):

[1] Double-click on the Peaksimple Icon. A blank chromatogram screen will appear, maximize. Click on edit then overall and match the com port setting to your computer port. Set default display period at 0.0 for start and 12.0 for end.

Click OK when finished. (Use 0.0 start and 8.0 end for BLC-10 w/ 15cm column)

[2] Click on edit then channels to display the channel controls window. On the left side of the channel controls window are 3 boxes in channel 1 marked active, display, and integrate. Mark all 3 X for the HPLC.

[3] Click on the box marked details and check main under trigger group for channel 1. Make sure the remote start box is checked. Set end time for 12 min. Change description to BLC-10/20 Flowcell. Click OK when done. (Use 8.0 min. as end time for BLC-10 w/ 15cm column)

[4] Click on events then add. From event details screen click H, make sure the on button is checked, set event time to 0.001, and then click OK. Next click add again and check H, but this time uncheck the on button, set the event time to 0.030 then click OK. Click add again and select zero, set the event time to 0.050 then click OK. Click save and name the file default.evt.

[5] Click on postrun and fill in a file name for the run. Click OK when done.

[6] Click OK to leave the channel controls window and you will be returned to main screen and you will see the words stand by followed by a millivolt reading from the detector.

[7] Click file then save control file, make sure the filename is default.con then click OK.

Operation Procedure (Sample runs & Peak Identification of Test Mix):

Warning! - Do not operate pump above 1.5 ml/min with the 25cm column. (2.25mL/Min with 15cm column).This will exceed the pressure rating of the pump and could damage your HPLC system.

[1] Bring flow of Solvent up to 1.25ml/min. Let detector stabilize (about 15 min). Press the Autozero button, rotate valve to LOAD and load Sample Loop with 2x100uL injections of Sample solution.

[2] To start a run, rotate valve to INJECT. The display in the upper right hand corner will change from standby to running in red letters. If not, press the spacebar to start run. You can stop the run at any time by pressing the end key on the keyboard or click on acquisition then stop+postrun**.** After 15 seconds rotate inject valve back to load.

[3] When the run is finished select the peaks you wish to calibrate by holding the cursor on the peak (shown by red circle at top) and pressing the right mouse button which will display a window of options. Use the left mouse button to select add component. A bar will appear over the peak. The bar can be shifted left to right by clicking and holding in the center of the bar and dragging it to where you want. You can change the length of the bar by clicking and holding on either end and moving left or right. You can also move the baseline up or down during a run by clicking on it and holding then moving the mouse pointer up or down.

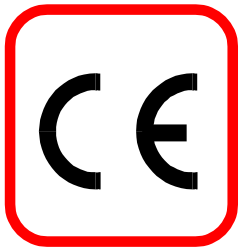
[4] Click the right mouse button again to pull up the menu and click on edit component. The start and end times will fill in automatically. Fill in the Name, Peak # and any other information that you want under the component details screen then click OK. If you hold the cursor over the peak then press and hold the left mouse button a box will appear showing the peak name, retention time, peak area and a concentration if you have typed one in. If no data appears this indicates that the software has not recognized the peak and you will need to change the parameters under area reject in the channel controls/details/integrate screen to a lower value. If the peak is not being integrated properly you will need to change the values for peak detection sensitivity in that same screen. 95% and 60% should work well for most chromatograms. Make sure Integrate is ON.

[5] When the chromatogram is finished go to file then print. Select the channel you want to print and put an X next to print Header, Chromatogram and Report. Fill in any desired information under Header. Select “screen limits” under Chromatogram. Click format next to print report and select, at the very least, retention time and area under the available table. These items should already appear under the selected column on the right but if they don’t, highlight and click on the forward arrows. If you would like to remove something from the selected column highlight it and click on the back arrows. Check to see that the correct info is selected under printer setup, click OK when finished then click on print.

PN: DS050-0003

MODEL BLC-10/10C/11C
SERIES
INTEGRATED ISOCRATIC HPLC SYSTEM

OPERATOR'S MANUAL



Rev G 3226

Rev G
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TABLE OF CONTENTS

Page PART A GENERAL

PART D MISCELLANEOUS

PART A: GENERAL

Section 1.0 Introduction

1.1 General This manual contains information for the installation, operation, and minor maintenance of the BLC-10/10C/11C Series integrated isocratic HPLC system.

1.2 Layout. This manual is divided as follows:

Part A - Sections 1.0 through 4.0 contain general system information and safety warnings.

Part B - Sections 5.0 through 8.0 contain information on the integrated fixed wavelength detector.

Part C - Sections 9.0 through 14.0 contain information on the BLC-10/10C/11C liquid handling system: pump, prime/purge valve, pulse damper, and injection valve.

Part D - Sections 15.0 through 19.0 contain information on power management, shipping, troubleshooting, and accessory, spare, and replacement parts.

1.3 Graphics Conventions. The following symbols and graphics are used in this manual to alert the operator to essential information.

Electrical Shock Hazard - Information is necessary to prevent operator injury due to electrical shock.

Caution - Information is necessary to prevent operator injury or equipment damage due to mechanical, heat or chemical condition(s).

Shadow Box or

NOTE - Information concerning operator required action or for optimizing instrument performance.

1.4 BLC-10/10C/11C Features

The BLC-10 is a 254 nm wavelength ONLY operating system. The BLC-10C and the BLC-11C are 254 nm and 280 nm interchangeable lamp and filter assembly systems.

Detector. The detector incorporated in the BLC-10/10C/11C is one of BUCK SCIENTIFIC Instruments' high quality, low cost, UV-VIS Fixed Wavelength detectors.

Totally Integrated --- minimizes cost, weight, and footprint of the system.
Wavelengths --- standard 254 nm (BLC-10/10C) or 280 nm (BLC-11C). Other wavelengths optional with the "C" series.
Analytical and Preparative Flowcells --- available to cover most industrial and biochemical applications.

Pump. The pump used in the BLC-10/10C/11C is representative of a class of devices where pressures above 3000 PSI are not required. Standard features are:
Disposable Head Assembly --- can be changed in the manner of a few minutes. Heads are constructed mainly of high performance plastics and housing material assuring long life in most environments.
Positive Seal Washing --- extends seal life by removing salts and wetting the seal.
Wide Flow Rate Range --- from 0.01 ml/min. to 10.0 ml/min. at pressures up to 3000 PSI; permits analytical, as well as small scale preparative applications.

Pulse Damper --- diaphragm-type reduces pulsations in the system, and permits use of a single piston pump.
Integrated Prime/Purge Valve --- enables more accuracy in chromatography start-up.
Injection Valve --- with 0.0625" fittings; port diameter of 0.016"; 20 µl PEEK™ sample loop; PAEK™ stator material.
Sample Injection Port --- external with Delrin™ and TFE™ wetted parts.
Voltage Selection --- simple, external user access.

1.5 Common Applications

The BLC Series was designed to offer high performance liquid chromatography (HPLC) separations at minimum expense. This unit can be used for most routine and specific isocratic separations. It provides the analytical chemist, the chromatographer, and quality assurance personnel with a low cost, high quality alternative to today's high priced systems.

The pump's PEEK construction permits using the instruments for biochemical and industrial analytical applications. The system's relatively low price, compared to all other isocratic systems currently available, makes it ideal for undergraduate and secondary school use where a basic understanding of chemistry, and in particular chemical instrumentation, is being taught. This system's operation is simple and straight forward, yet provides a scholastic challenge to students.

The instrument's small footprint and its relatively light weight permit its transportability. This is ideal for environmental field testing, as well as quality control procedures and dedicated industrial process monitoring and control.

1.6 Warranty

No other warranty exists, expressed or implied, except as shown here and in Buck Scientific Instruments' Conditions of Sale.

Fitness to a particular application must be determined by the user.

Parts & labor are warranted for one (1) year, provided the unit is not damaged by improper use, abuse or by chemical spill. Exceptions to this warranty are:

The flowcell and all tubing supplied with the instrument which are warranted at the time of installation only.

The lamp is warranted for one (1) year. If the Lamp fails within the first 6 months of operation, the lamp will be replaced at no charge. From six to twelve months a charge will be prorated.

Request a Return Authorization (RA) before returning any parts.

Return defective unit to your Dealer/Representative for repair. Clean/sterilize all components prior to shipment. No parts will be accepted which present a health or safety hazard to service personnel. Repaired unit will be returned via parcel service or mail.

1.7 BLC-10/10C/11C Specifications

Detector:

Wavelengths:	BLC-10 254 nm BLC-10C 254 nm interference filter; BLC-11C 280 nm filter; options: 365, 420, 505 nm, and others (inquire)
Lamp (BLC-10):	254 nm, 6 in low pressure mercury (Hg) lamp
Lamp (BLC-10C):	254 nm low pressure PSLS Hg lamp
Lamp (BLC-11C):	285 nm phosphor coated PSLS Hg lamp; other lamps available (above)
Flow Cells	
Analytical:	7mm pathlength, 10µl volume, 200 PSI; wetted materials: PEEK body, quartz windows, Tefzel™ ferrules, 1/16" O.D. tubing
Preparative:	2.5 mm pathlength, 44 µl volume, 200 PSI; wetted materials: quartz cell, Tefzel ferrules, 1/8" O.D. tubing
Semi-Preparative:	2.0 mm pathlength, 4 µl volume, 1500 PSI; wetted materials: PEEK body, sapphire windows, Tefzel ferrules, 1/8" O.D. tubing
Linearity:	Better than 2%
Stability (Drift):	Less than 2.5×10^{-4} AU/Hr (at 254 nm and constant temperature).
Noise:	Less than 2.5×10^{-5} AU (5×10^{-5} AU peak to peak at 254nm).
Recorder Output Ranges:	From 0.005 to 1.0 AU full scale (10 mV)
Integrator Output:	1.0 V/AU
Front Panel:	Range selection, Autozero, Event Mark

Pump:

Flow Rate:	0.01 to 10.0 mL/min
Pressure:	0-3000 PSI for a 10 mL head; Accuracy - 6 2% of full scale pressure
Flow Accuracy:	6 2% at midpoint of flow
Flow Precision:	0.5% RSD
Pulsation:	6 1% at 5mL/min and 2000 PSI with pulse damper (10 mL SS head)

Front Panel: Flowrate display; Run/Stop Key; Scrolling Keys for increasing/ decreasing flow rate; Prime Key; Status LED's Pump Run and Fault Indicators; Compressibility set-up

Integrated Prime/Purge Valve:

PEEK with 0.0625" port diameter and fittings; 5000 PSI; wetted materials: PEEK, Teflon™ and Tefzel

Pulse Damper:

Biocompatible with 0.0625" fittings; mobile phase in contact with damper: 1.2 mL at 6000 PSI; wetted materials: PEEK and inert diaphragm; compressible fluid: isopropanol

Injection Valve:

PAEK with 0.0625" fittings; port diameter of 0.016"; 20 µl PEEK sample loop; PAEK stator material; panel-mounted nylon Sample Injection Port for 22-24 guage HPLC needles

System:

Rear Panel: RS-232 for remote pump control; D-type, 15 position female connector for detector recorder/ integrator output and remote control, pressure (on some models)
Power: 100, 110/115, 220/230V factory preset
Dimensions: 7" H x 10" W x 16.5" D Shipping
Weight: 31 lbs

Tubing used in the biocompatible system:

Inlet Flush Tubing: 1/8" ID, 1/4" OD Polyurethane
Outlet Flush Tubing: 1/8" ID, 1/4" OD Polyurethane
Inlet Solvent Tubing: 1/8" OD, 0.085 ID, TFE
Pump Head Outlet to Prime/Purge Valve Inlet Tubing: 1/16" OD, 0.030 ID PEEK
Prime/Purge Valve Outlet to Pulse Damper Inlet Tubing: 1/16" OD, 0.010 ID PEEK
Pulse Damper Outlet to Injection Valve Port: 1/16" OD, 0.010 ID PEEK
Sample Injection Port to Injection Valve Port: 1/16" OD, 0.031 ID TFE
Injection Valve Sample Loop: 1/16" OD, 0.015 ID PEEK
Injection Valve Port to Column: 1/16" OD, 0.010 ID PEEK (with black vinyl cap)
Injection Valve Port to Waste: 1/16" OD, 0.030 ID TFE
Column to Detector Flowcell Inlet: 1/16" OD, 0.010 ID TFE (with black vinyl cap)
Detector Flowcell Outlet to Waste: 1/16" OD, 0.030 ID TFE

Section 2.0 SYSTEM ORIENTATION

2.1 Control Panel

Controls for the BLC-10/10C/11C HPLC system are on the front of the hinged metal panel located on the front of the unit (Figure 1). Each function is described in the detector and the pump sections. Additional controls are described in the Remote paragraphs of those same sections. The pump flowrate display LED, the detector absorbance display LED, and the 1.000 Range LED should be lighted when the power is turned ON.

For best results, operate the unit with the control panel cover closed and secured. Screw the thumbscrew into the column channel to secure the cover.

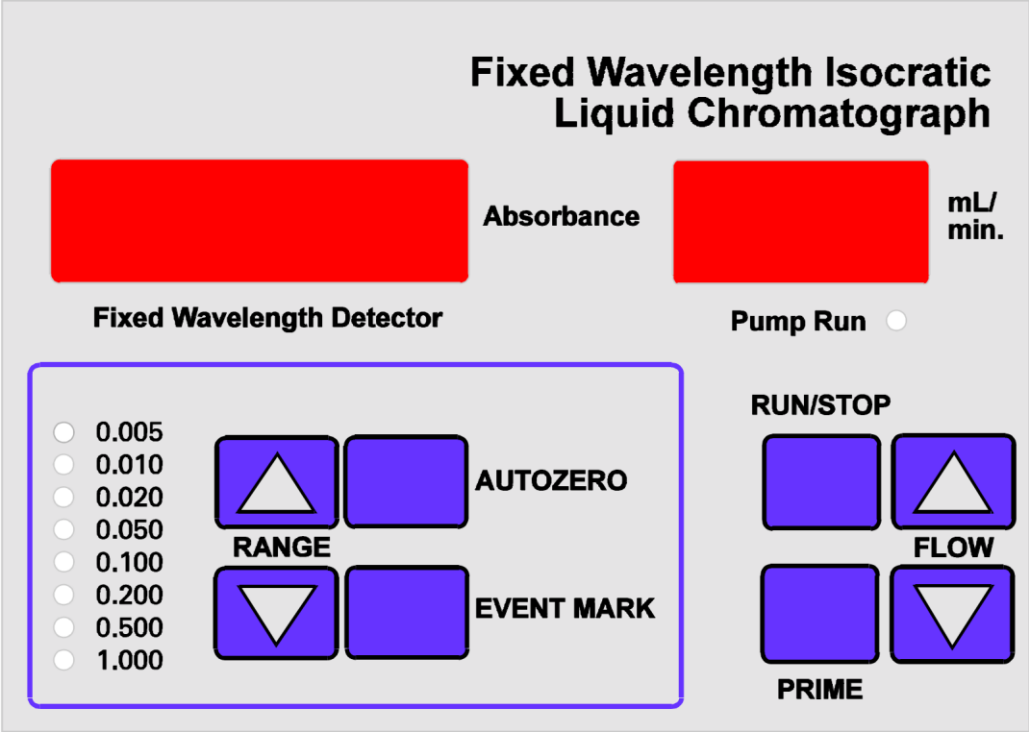


Figure 1 Control Panel

2.2 Front Panel

The front panel or chassis front is partially covered by the control panel. Figure 2 shows the front panel and a portion of the control panel's hinge bracket. All major parts of the system have been installed except for the column, flush tubing, and solvent tubing. The column clips are in the column channel.

Notice the UV warning label. Do not remove the flowcell or operate the unit with the cover off without turning the power off. UV energy will cause skin burning and damage to the eyes. See the detector section for additional discussion.

Do not operate the pump and liquid system without eye protection since liquids are under pressure.

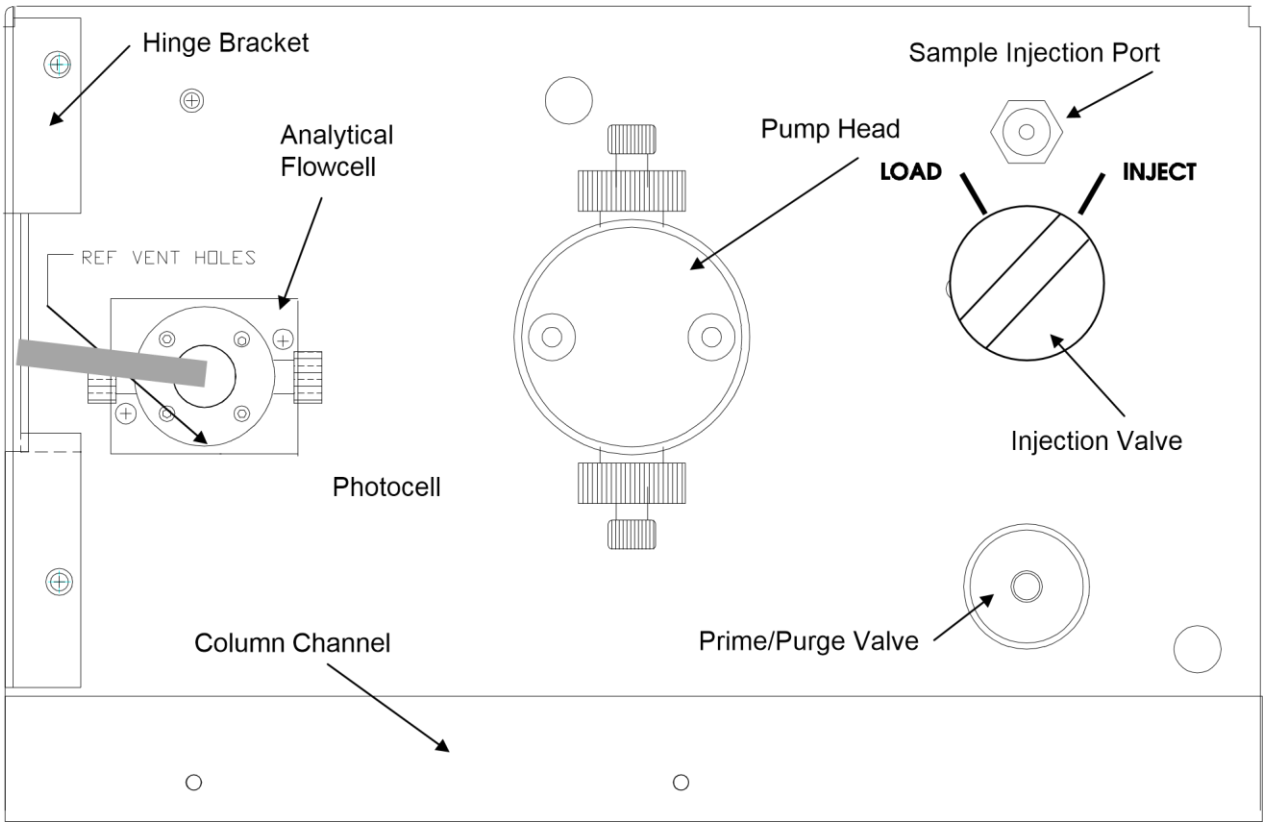


Figure 2 Front Panel

2.3 Rear Panel

The rear panel or chassis rear is shown at Figure 3.

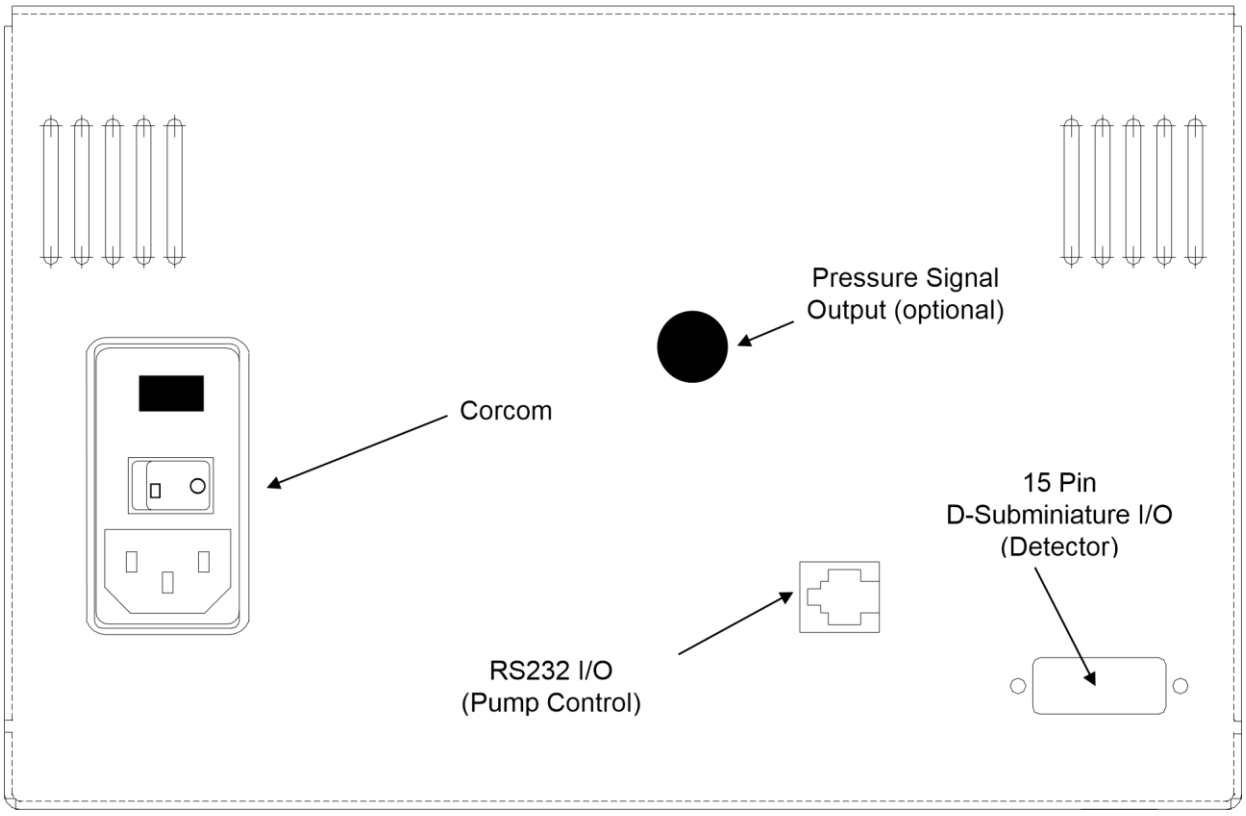


Figure 3 Rear Panel

Notice the UV warning label. Do not remove the flowcell or operate the unit with the cover off without turning the power off. UV energy will cause skin burning and damage to the eyes. See the detector section for additional discussion.

Notice the electrical operation label near the Corcom™ fixture. Fuse information is displayed for standard 115VAC and standard 230VAC supplies.

The Corcom may be programmed for 110/115 or 220/240 volt operation. No other power changes are required in the system.

The system should have been fused for your electrical power supply. See the Fuse Changing/Replacement section in Part D for additional details.

Section 3.0 Safety

This system has been designed with user and application safety in mind. The following are the safety features and their purposes of the BLC-10/10C/11C:

Grounding plug on AC power cord must be plugged into a grounded wall outlet;

Factory supplied power transformer - do not substitute;
Enclosure/Cabinet - for electrical grounding and shielding, protection from liquid spray, UV energy blockage, and to minimize stray light;
Detector Lamp Tape - to limit UV damage to internal components and to reduce the risk of UV exposure to operators and maintenance personnel.

WARNINGS:

Do Not Try To Defeat Any BLC-10/10C/11C System Safety Features

Do not attempt any electrical repairs without unplugging the power cord Unplug the power cord before opening the cabinet lid.
Do not remove or defeat the grounding pin on the power plug.
Do not attempt to defeat power grounds.
Do not defeat any of the system's other grounding schemes.
Contact an electrician if you are not sure of wall outlet voltage or grounding.
Do not operate the unit with the cabinet lid off or unscrewed.
Do not power the detector if there is no lamp installed/connected. The lamp ballast will be damaged.
The liquid system is under injury-causing high pressure.
Do not operate the pump or liquid system without eye protection.
Exercise safe practices when using solvents, especially under pressure.
Tubing may weaken with time, pressure and solvents. Inspect periodically.
Ensure liquid fittings and connections are tight to avoid spraying solvents.
Do not look at the UV energy source. Damage to the eyes will occur.
Exposure to UV energy will also cause *sunburn* to skin.

Section 4.0 INSTALLATION

4.1 PACKING LIST (Standard for BLC-10/10C/11C)

BLC-10 Chromatograph with 254 nm lamp, 110/115V [DS015-0001], *220/240V [DS015-0001-1]*; or
BLC-10C 254 nm PSLS lamp and filter 110/115V [DS015-0018], *220/240V [DS015-0018-1]*; or
BLC-11C 280 nm PSLS lamp and filter 110/115V [DS015-0019], *220/240V [DS015-0019-1]* with:

Analytical Flowcell Assembly [DS010-0003-1]
UV Photocell Assembly (usually attached to the flowcell) [DS010-0026-3]
Accessory Package - BLC-10/10C/11C [DS010-0050] includes:
Recorder/Integrator Cable [DS 010-0024]...1 ea Hex Key Wrenches:
for Photocell Set Screw - .050" [DS 540-0001] ...1 ea
for Flowcell Sockethead Cap Screws - 3/32" [DS 540-0004] ...1 ea
Spare Fuses-Corcom (115V): 5 x 20 mm, SLO-BLO, 250V, 1A [DS430-0007]...2 ea
Spare Fuses-Corcom (230V): 5 x 20 mm, SLO-BLO, 250V, 1/2A [DS430-0008]...2 ea
Spare Fuses-Detector: 5 x 20 mm, FAST, 250V, 200mA [DS430-0012]...2 ea
Spare Fuse-Pump: 5 x 20 mm, FAST, 250V, 5A [DS430-0006]...1 ea Tubing:
Inlet Flush Assembly [DS010-0069]...1 ea
Outlet Flush Assembly [DS010-0070]...1 ea
Solvent Inlet Filter Assembly [DS010-0072]...1 ea
Syringe, Luer Lok, 30 cc [DS443-0001]...1 ea
Column Plug, Outlet Check Valve and Pulse Damper, 1/16" [DS250-0028]...3 ea

Replacement Column Clips [DS250-0025] ...2 ea
Tubing Clamp [DS250-0036] ...1 ea
Power Cord 115V [DS610-0004] **or** 230V [DS610-0005]...1 ea
Operating Manual (this document) [DS 050-0003] ...1 ea

NOTES:

1. Part numbers shown above are for shipped kits. Parts numbers shownelsewhere in the manual are for replacement/spare part ordering.
2. Items indicated in the manual with the word "optional" are not supplied unlessspecifically ordered (additional cost).

4.2 INSTALLATION

4.2.1 General

1. After opening the shipping container, inspect the packaging for additional damage.Record damage in the event a claim needs to be filed.
2. Check the packing list above to ensure all items were shipped.

CAUTION: Do not pick up the BLC-10/11 by the plastic control panel enclosure (with overlay). Hold on to the base of the chassis or to the column channel.

3. Place the unit in a ventilated area to avoid heat build-up.
4. Ensure that the factory set voltage setting is correct for the power supply. If it isdifferent, consult the fuse changing section of this manual or contact your dealer.
5. See Section 10.2 for instructions on installing tubing. Once all the tubing has beeninstalled, place the tubing clamp where it can best control the most tubes. Pull the release paper from the adhesive and affix the clamp.
6. The column plugs provided in the accessory kit are to be used in the event the unit, orthe pump, or the pulse damper needs to be shipped without the tubing

The system requires only a column, recorder or integrator, and solvents to begin running.

4.2.2 Column (not included)

1. The BLC system was designed to use a short 6.5" column. If a longer column is used,the fittings will stick out from one end of the column channel. Consult the column instructions for properly installing the column to the tubing coming from the Injection Valve and going to the Detector Flowcell. No fittings are provided for attaching the column to the BLC tubing. Normally 1/16" I.D. 10-32 or the equivalent metric fittings are required.

2. Remove and save the black vinyl caps covering the tubing from the injection valve andto the flowcell.

3. Place the column in the column clips and push the column to the bottom so that it isfirmly held by the clips. The clips may be locked by twisting the balls at the top together. The clips may be lowered for traveling.

4.2.3 Recorder/Integrator. Attach the recorder/integrator cable provided with the BLC system using the wire hook-up instructions on the cable for the appropriate data device.

4.2.4 Solvents. See the pump section for details on attaching the flush and solvent tubing.

4.2.5 Problems. If problems are encountered, consult the individual component section or the Troubleshooting Guide in Part D.

CAUTION!

DO NOT OPERATE THE PUMP WITHOUT THE FLUSH TUBING AS THE SEAL MAY BE DAMAGED, **ESPECIALLY IF BUFFERS ARE USED**.

NOTE: USE ONLY ORGANIC SOLVENTS TO BREAK-IN NEW SEALS. BUFFER SOLUTIONS AND SALT SOLUTIONS SHOULD NEVER BE USED TO BREAK-IN NEW SEALS.

PART B: FIXED WAVELENGTH DETECTOR

Section 5.0 Description of the UV Detector

5.1 Introduction

This instrument is a fixed wavelength spectrophotometer that uses a flow-through cell to measure solute concentration in liquid streams. A special signal processing system converts the signal from a photodetector to a voltage directly proportional to concentration (absorbance). An autozero system provides push-button nulling of the output voltage level. There are output connections for a computing integrator at a fixed level of 1 volt per absorbance unit. In addition, there is an output with eight levels of sensitivity provided for a 10 millivolt strip chart recorder.

5.2 Operating Principles

Photon energy supplied by a low pressure mercury source lamp (253.7 nm line) is passed through a flowcell to a photodetector. For the BLC-11C a 280 nm phosphor lamp and filter are used instead of the 254 nm lamp. Electronic circuitry comprised of a differential logarithmic amplifier and signal conditioning system processes the photometric signal to provide an output voltage proportional to absorbance of the solution in the flowcell. Output sensitivity is a function of flowcell pathlength, concentration, and molecular extinction coefficient of the substance in solution (Beer's law). For measurements at other wavelengths, optional photodetectors, special wavelength conversion phosphors and optical filters are required. The lamp is powered by a special high frequency ballast for stability and low noise.

5.3 Operating Wavelengths

The wavelength for the BLC-10 is 254 nm only. The BLC-10C is 254 nm with an interference filter and is convertible to other wavelengths.

The BLC-11C measures at 280 nm; spectral energy supplied by the low pressure mercury lamp (253.7 nm line) is passed through a wavelength conversion phosphor and a 280 nm interference filter. It is also convertible to other wavelengths.

Other wavelength lamp/filter conversion kits are available for the BLC-10C/11C models by special order. Please inquire through your Dealer/Sales Representative

5.4 Flow-Through Fluid Cells (Flowcells)

Various pathlengths are available. The standard cell for Analytical HPLC has a pathlength of 7.0 mm and an illuminated volume of 10 µL. The analytical flowcell is standard on the BLC-10s.

Preparative (Prep) cells are available with a pathlengths of 2.5 mm (44 µL volume) and the Semi-prep with 2.0 mm (4 µL volume).

Wetted materials are chosen for chemical resistance as shown below:

Analytical cell:	PEEK body & tubing, quartz windows, Teflon tubing, and Tefzel ferrules.
Prep cell:	Quartz cylinder & Teflon tubing, Tefzel or Teflon ferrules.
Semi-Prep:	PEEK body, sapphire windows, Teflon tubing, and Tefzel ferrules.

5.5 Limits to Performance

Solvents and/or mobile phases must be selected that will be compatible with the materials of construction (see list of materials above) for safety, proper operation and to prevent damage to the components of the flowcell and analytical system.

Backpressure on flowcell:

- Analytical - 200 PSI maximum.
- Preparative - 200 PSI maximum.
- Semi-Prep - 1500 PSI maximum

Linearity depends upon the correspondence between absorbance maximum of the sample substance and measurement wavelength. For optimum performance these should be matched as close as possible. Also, at absorbances above 0.5 AU, linearity can be expected to be less than at lower absorbances.

Noise & drift are affected adversely by many factors including:

- Non-degassed mobile phases;
- Entrapped gas bubbles in the flowcell;
- Certain gradient combinations;
- Large or rapid temperature changes in the environment or fluids;
- Accumulation of residues in the flowcell;
- Mobile phases which absorb energy at the measurement wavelength;
- Faulty check valves in the pump;
- Chemical vapors in the atmosphere;
- Contaminated (dirty) windows and/or filter;
- Insufficient time allowed for warm-up of lamp and electronics;
- Source lamp aging or damage; and,
- Improper grounding (including ground loops).

Section 6.0 - INSTALLATION AND OPERATION

6.1 Orientation of the Detector

To simplify description of the detector component locations, the following terminology is used:

Control Panel - The surface where the controls and switches are located.
Front Panel - The surface where the flowcell is located.
Rear Panel - The surface where the electrical and input/output connectors are located.

The view below shows the flowcell and photocell orientation in relation to the pump head and the column channel. Please note that the orientation of the photocell lead is in line with the tubing fittings of the flowcell.

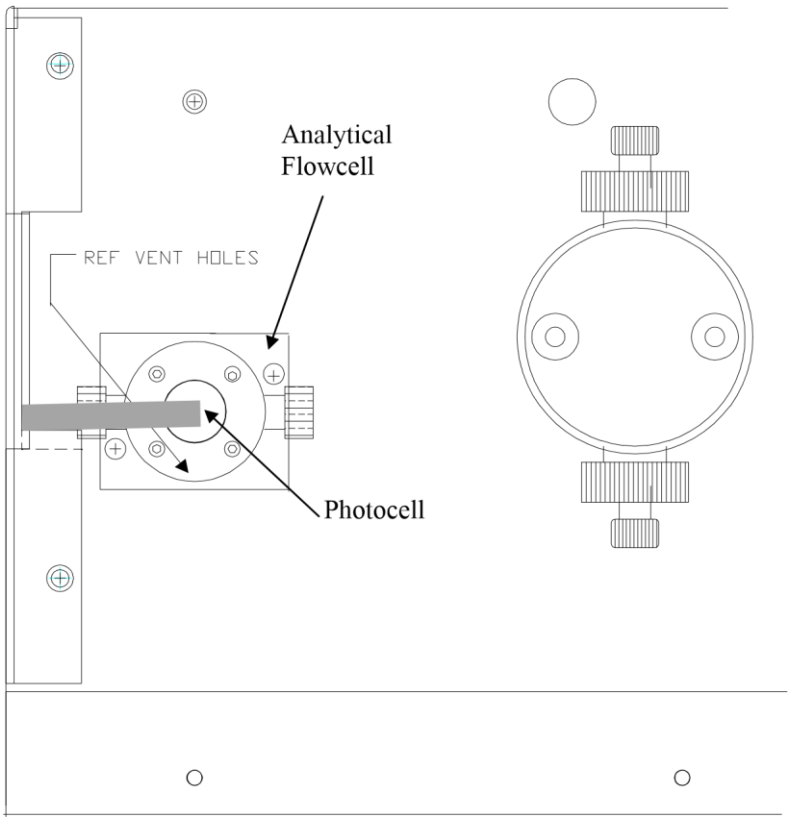
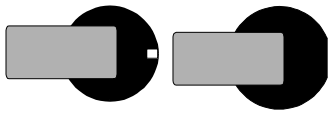


Figure 4 Detector-side View, Front Panel

6.2 Flowcell and Tubing Connections

Mount the flowcell with the reference side drain holes in the cell holder pointing down (see Figure 4). See Figure 6 for flowcell configuration. The set screws should be at 12 and 3 o'clock.

Install the photocell so that the notch or flat is in the right hand position (see diagram at right). The photocell is held in place with two nylontipped setscrews. The right side setscrew should be tightened into the notch or on to the flat first. There is no need to overtighten the setscrews. Do not use any other kind of setscrews or they may cause ground loop problems.



Notch Flat
Photocell

Use flangeless (Upchurch) or flanged (Cheminert™ or Omnifit™, etc.) fittings. Plastic tubing such as PEEK or Tefzel may also be used.

It is a good idea to check the tightness of the fittings occasionally to prevent leaks. Do not overtighten.

! **NOTE:** Metallic tubing requires special strain relief considerations. Contact your dealer/sales representative for details.

6.3 AC Power

AC power is required for operation of this instrument. The unit is internally wired to the transformer and is grounded to operate at 115 VAC. No 230 VAC adjustment is required except at the Corcom.

> ***CAUTION:*** **Do not remove or defeat the grounding pin on the power plug. Contact an electrician if you are not sure whether the wall outlet is properly grounded.**

6.4 Controls

Figure 5 highlights the controls of the BLC-10/11 Fixed Wavelength UV Detector. Individual graphics are shown with the specific descriptions.

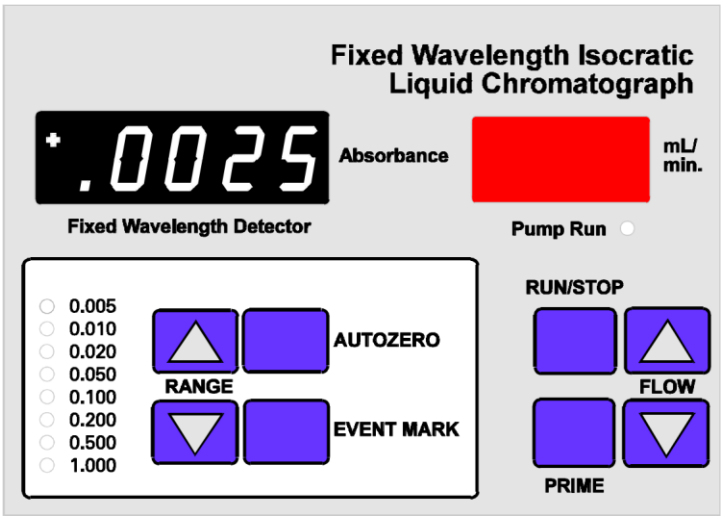


Figure 5 Detector-side, Control Panel

Power ON/OFF (Rear Panel) - Switch to the ON position [**I**] to operate the entire system.

Range UP (Control Panel) - Press anytime to change recorder range. The detector "wakes up" in the 1.000 AU position. Actuation does not affect the integrator output level.

Range DOWN (Control Panel) - Press anytime to change recorder range. Actuation does not affect the integrator output level.

NOTE: A sudden shift in the recorder position is normal when changing the range.

AUTOZERO

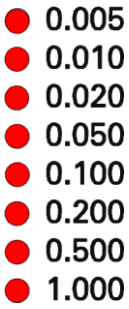
Autozero (A/Z) (Control Panel) - Press anytime to return output signal level to the baseline position. The autozero affects both the recorder and integrator outputs.

EVENT MARK

Event Mark (Control Panel) - Press to trigger an "event mark" on the recorder. The Event Mark should deflect the recorder approximately 1 to 3% full scale, depending on recorder pen speed.

6.5 Indicators

6.5.1 Range Selection Status



Absorbance ranges (8 red/orange LEDs).

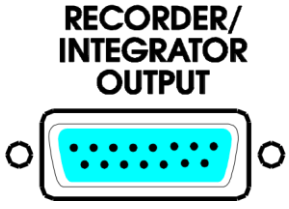
Power On is indicated by one of the red/orange Range LEDs being lighted.
The LEDs display the full scale output range (AUFS) to a recorder attached to the Recorder/Integrator Cable on the rear panel. The range selected does not affect the 1V/AU output to an integrator.

6.5.2 Absorbance Display

Absorbance

When powered ON, the Absorbance Display will be lighted. The display will output both positive and negative voltages, with a range of .0000 to 1.999 absorbance units (AU).

6.6 Input/output Connectors



15-position female subminiature D-type on rear panel for:
Recorder - 10 mV full scale range
Integrator - 1.0 V full scale equivalent to 1.0 Absorbance
Remote Control - Contact closure inputs (see Section 7 of this manual for details).

6.7 Power-on Warm-up

The unique architecture of the BLC-10 and BLC-10C/11C, which integrates a complete UVVIS detector in the same cabinet as the HPLC pumping system, may require an additional warm-up period as compared to most systems which isolate the detector from other heat producing

electronics. As a result please allow the measurement electronics and the source lamp a minimum of 45 to 60 minutes warm-up prior to initiating your chromatographic run.

If the unit still shows instability please contact your dealer. The warm-up requirement should be reduced with the continued use of the instrument.

If the photocell is unplugged from the signal processor circuit board after the unit has been powered on, the measurement circuit may lock up. To ensure that the circuit is functioning correctly, restart the unit.

6.8 Recorder/Integrator Cable

The cable supplied has a 15-position male subminiature D-type connector on one end and stripped and tinned leads on the other. The colors of the wires are associated with their purpose:

		(DB-15M)
Black	- Integrator [-] (grounded to chassis internally)	(Pin 4)
Red	- Integrator [+]	(Pin 9)
Green	- Recorder [-]	(Pin 11)
White	- Recorder [+] (Pin 1) Green/Yellow - Shield (grounded to system chassis)	

The recorder cable is also marked with the wire connections.

! ***IMPORTANT FOR BEST OPERATION:***

Connect the Green/Yellow wire to the *shield* or *guard* terminal of the recorder or integrator, if present. **Do not attach this wire to a ground terminal on the Recorder or Integrator.**

Section 7 - REMOTE CONTROL (ACCESSORY CABLE)

7.1 External Control

One of the BLC-10 series detector's key attributes is that it enables the operator to remotely control the detector with a personal computer (PC). This section outlines the remote control features and the 15-pin D Subminiature (DB) connections.

In order to avoid damaging the detector and voiding the warranty due to improper wiring, it is strongly recommended that a factory supplied ***Universal Remote Control RFSP Cable*** Assembly (PN: ***025-0268***) be obtained from your Dealer/Sales Representative. If you will use the detector with the *Star-Chrom* HPLC Management System, then order a double ended cable (PN: ***025-0268-1***). The remote cable assembly combines to the 15-pin D Subminiature Male Connector (DB-15M) a Recorder/Integrator cable with an additional 10 wire cable.

In order to ensure that the remote control works properly with your PC (and to avoid damaging your PC) it is recommended that a technician qualified to install interactive instrument control devices be contacted to assist in selection of the correct interface module for your computer system.
Contact companies such as Keithley Metrabyte, National Instruments, or your data acquisition system supplier and provide them with the technical information in the table below.

7.2 Remote Operation of the BLC-10 Series

The following detector functions may be controlled through the remote cable:

7.2.1 Autozero (Digital Input)

The Autozero function is the same as the Front panel AUTOZERO button. It returns the output signal level to the baseline position for recorders, integrators, and automated systems.

7.2.2 Lamp On / Lamp Off Control (Digital Input)

The Lamp On/Off function enables the operator to turn the lamp OFF during times when measurements are not being made but the detector remains ON. This function helps to conserve lamp life. Once the lamp is turned back on, sufficient time must be allowed for the lamp to warm up and to stabilize.

7.2.3 Event Mark (Digital Input/Output)

This function enables the operator to trigger a voltage spike to the recorder. It does not affect an integrator. It may also be used to detect that the internal event mark function has been triggered by the front panel pushbutton or another device on this line. For the BLC-10 that would be from pushing the Front panel Event Mark Button or from activation of a injection valve equipped with a position sensor (see Injection Valve section).

7.2.4 Offset (Analog Output)

The Offset function measures the amount of coarse autozero required to compensate for flowcell imbalance. Possible uses include the detection of protein or other deposit buildups on the flowcell windows.

7.2.5 Photocell Energy - Sample & Reference (Analog Output)

Sample Energy and Reference Energy from the photocell may be monitored with these outputs. This facilitates external diagnosing of suspected flowcell or photocell problems if changes from factory specifications/measurements are observed.

7.3 Remote Control Technical Details

7.3.1 Recorder/Integrator and Remote Connections

Signal Name	DB-15M Pin No./External Wire Color, Cable	Logic or Analog	Description	DB-15F Internal IDC Wire No.
Recorder (+)	1 / White, Rec/Int Cable	Analog output	Output to 10 mV strip chart recorder, positive terminal	1
Recorder (-)	11 / Green, Rec/Int Cable	Analog output	Output to strip chart recorder negative terminal, at analog ground potential	6
Integrator (+)	9 / Red, Rec/Int Cable	Analog	Output to integrator or data system positive terminal, 1 volt per absorbance	2
Integrator (-)	4 / Black,	Analog	Output to integrator or data system	7
	Rec/Int Cable	output	negative terminal, internally adjustable from zero to 200 mV	
Shield (Drain Wire)	Connector Backshell / Green-Yellow, Rec/Int Cable	Detector Chassis Ground	Cable shield, ground potential, tie to recorder or integrator guard if available, do not tie to chassis ground	none

Digital Ground	2 / Black, Remote Cable	Digital	Signal return wire, logic low	3
Autozero	8 / Orange, Remote Cable	Digital input	Starts autozero sequence to balance (null) integrator and recorder outputs	15
Offset	5 / Red, Remote Cable	Analog output	Voltage proportional to last autozero balance operation (for flowcell diagnostics)	9
Sample Energy Out	7 / White, Remote Cable	Analog output	Remote sample energy monitoring (photocell)	13
Reference Energy Out	15 / Violet, Remote Cable	Analog output	Remote reference energy monitoring (photocell)	14
Event Mark (Start Data)	10 / Blue, Remote Cable	Digital input & output (see below)	Generates a marking pulse on the recorder output; also used to start data collection when used with Star-Chrom	4
Lamp On/Off Control	13 / Brown, Remote Cable	Digital input	Remote lamp shut down	10
Spare	3 / Gray, Remote Cable	Not used		5
Spare	6 / Green, Remote Cable	Not used		11
Spare	14 / Yellow, Remote Cable	Not used		12

7.3.2 Alternate Uses of Pins/Wires

Certain of the Remote Cable 15-pin DB Connector (DB-15M) pins and wires may be reprogrammed (see below). The different functions include Range Up, Range Down, and Range Reset (to least sensitive recorder range); however you may lose Energy readings and/or Lamp On/Off functions.

Additionally, a customized cable to enable a 200 mV per absorbance output to an integrator or data system positive terminal may be ordered. Consult Factory for options.

7.3.3 Technical Discussion

The output impedance of the integrator (+) terminal is less than 100 ohms, the recorder output (+) terminal is 5.0K ohms or less depending upon the range selected. All digital inputs are to be driven with a momentary open collector or contact closure to digital ground; active LOW; open circuit voltage is approximately +5 V. Contact closure time should be between 10 and 200 milliseconds to assure proper actuation of the remote function.

Optical isolation is recommended to prevent ground loop noise being induced into the measurement system.
The Autozero selection may be actuated by a momentary external contact closure. Using opto-isolators or isolated relay contacts are the preferred methods of providing external control since no ground loops are created (a potential source of noise) and release time of the contact is predictably fast.

Open collector logic drivers may be used. However, since the common of the logic circuit must be tied to power ground of the detector, a ground current between the controlling

device and the detector may be induced into the measurement circuit. Please be aware that a ground loop may occur that increases measurement noise.

Lamp Off requires that the circuit be pulled low to ground (green/yellow) and held for the period that *Lamp Off* is required.

Event mark signal is both a logic input and an output (open collector OR or "party line"). Data systems may use this signal output to begin data collection when a front panel EVENT pushbutton is pressed, injection valve position sensor, or an external signal is received (consult Factory).

Caution: Disconnect the power cord from AC power (mains) when it is necessary to open the instrument cover to make any internal changes or to perform maintenance.

Alternate uses for remote control connections require program jumper changes from factory default positions. Consult the Factory for further information.

7.4 Circuit Protection

Although the detector's circuitry has static protection, it is best to avoid static discharge to any line. Each controlled circuit has a **4.7K** pull-up resistor to an internal **+5 V**. A pull-down to logic low discharges a 0.1 uF capacitor through a 100 ohm resistor on the signal processor PC board of the detector.

Section 8.0 - SAFETY AND MAINTENANCE

8.1 Safety

This system has been designed with user and application safety in mind. The following are the safety features and purposes of the BLC-10/11 detector:

Enclosure - for UV blockage, electrical grounding & shielding, and to minimize stray light;

Lamp Tape/Sheath - to limit UV damage to internal components and to reduce risk of UV exposure to operators and maintenance personnel.

! **NOTE:** ***Do Not Try To Defeat Any Safety Feature***

8.2 MAINTENANCE

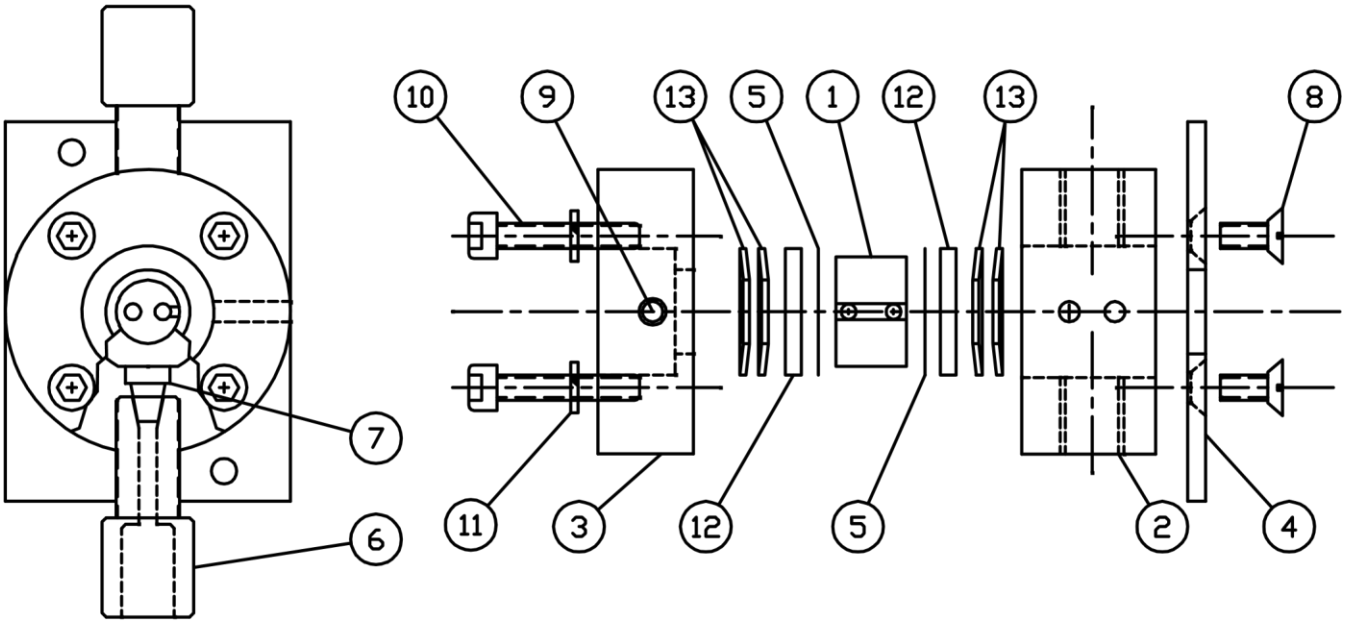
8.2.1 Electrical

Disconnect the instrument from the power outlet before attempting any maintenance **(including flowcell removal).**

Avoid chemical or mechanical damage to cables and the enclosure.

Do not substitute components such as power transformer or internal electrical components.

There are no user serviceable parts inside the enclosure. Refer servicing of the internal components of the detector to a competent maintenance technician.



DS010-0003

Power supply jumper - factory setting only. Power supply is user set at the Corcom on the Rear Panel.

8.2.2 Chemical

Clean up any chemical or solvent spills immediately.

Do not allow liquids to get into the detector enclosure.

8.2.3 UV Radiation

Disconnect power cord from the power outlet before removing the flowcell or performing any maintenance inside the BLC-10/11 Chromatograph.

Wear UV protective goggles or safety glasses with side shields if the lamp must be operated during maintenance of the internal PC board or while the flowcell is removed.

8.2.4 Cleaning the Flowcell

Use a syringe to clean the flowcell with solvents or other chemical solutions. DRAW THE LIQUID into the cell. DO NOT FORCE the cleaning solution into the cell. A luer adapter attached to the flowcell tubing facilitates connecting the syringe, thereby reducing the likelihood of leaks.

DS010-0003

If the flowcell must be disassembled for cleaning or to replace items, use the diagram at Figure 6 and in the table below.

Figure 6 Exploded View of Flowcell

ITEM QTY PART NO.* DESCRIPTION

1	1	040-0002	Flowcell Body, 7mm Path, 10 µL Vol, PEEK
2	1	040-0029	Cell Holder
3	1	040-0030	Cell Clamp
4	1	040-0013	Cell Mount
5	2	040-0005**	Cell Gasket, 0.005" Thick, TFE
6	2	250-0001	Nut, Flangeless, 1/16" Tubing, Delrin
7	2	250-0002	Ferrule, Flangeless, 1/16" Tubing, Tefzel
8	4	281-0015**	Screw, Machine, Flathead, Phillips, 4-40 X 1/4" Long, SS
9	2	281-0066**	Setscrew, Socket Cup, 4-40 x 1/4" Long,Nylon-Tipped, SS
10	4	281-0014**	Screw, Sockethead Cap Screw, 4-40 x 9/16" Long, SS
11	4	282-0001**	Lockwasher, Split, #4, SS
12	2	380-0001**	Window, Quartz, 1/2" Diameter
13	4	282-0003**	Spring, Belleville, SS

* See Part D for Spare Part Numbers ** Included in Flowcell Rebuild Kit, DSPN 025-0045

8.2.5 Replacing the BLC-10 Lamp (254 nm Bayonet Pin Style)

CAUTION!! Due to the unit's unique design, the following precautions are necessary:

1. **Do not operate the unit with the cover open.**
2. **Do not look at the lamp without UV A/B/C protective glasses.**
3. **Do not operate the unit without a lamp in the sockets or the ballast will be damaged.**
4. **Do not touch areas of parts which are exposed to or are part of the light path or flowpath.Fingerprints and other particulate matter absorb UV energy and may degrade performance of the detector.**
5. **Do not attempt any repairs or parts replacement without unplugging the power cord.Both electrical shock and UV eye hazards are present.**

1. Turn power off. Unscrew cover screws and remove cover. Remove the flowcell. Donot remove the photocell.

(Removing the Lamp Shield)

2. The lamp shield was designed to provide the operator some protection from harmfulultraviolet (UV) rays as well as provide some stray light blocking capability. Locate lamp shield. It is to the left front of the unit. Because of the compactness of the unit, the lamp shield is very tightly positioned. The shield is held in place by two #4 flathead Phillips screws and by a dimple at the top of the shield which mates with a hole in the top rim of the chassis. Using a long 1pt Phillips head screwdriver, remove the screws from the base of the lamp shield at the floor of the chassis. Disengage the dimple by pushing down on the shield and up on the case simultaneously. Loosen the top screw of the lamp bracket [just above the flowcell] slightly if the dimple sticks.

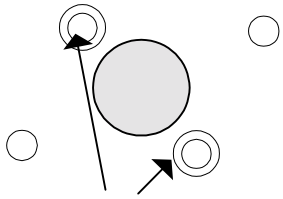
3. Once the screws are removed and the dimple is disengaged, work from the front of theunit. Rotate the shield clockwise so that it just clears the detector signal processor board (the outer PCB) keeping the lamp power wires in the cutout. If the lamp shield is hindered by the signal processor bracket, loosen or remove the front screw at the base of the signal processor bracket located on the underside of the chassis so that it can move out of the path of the lamp shield.

4. Remove the lamp bulb by rotating it until the bayonet pins are exposed, then lift thebulb out of the sockets.
5. Remove the new lamp from its protective packaging. Place the lamp pins in thesockets and rotate the bulb so that the exposed area of the bulb faces the flowcell.

8.2.6 Replacing the BLC-10C and BLC-11C Pencil Style Lamp System (PSLS) Lamps and Filters

DETECTOR FLOWCELL

6. Close the lamp shield following the reverse procedures for opening the unit.



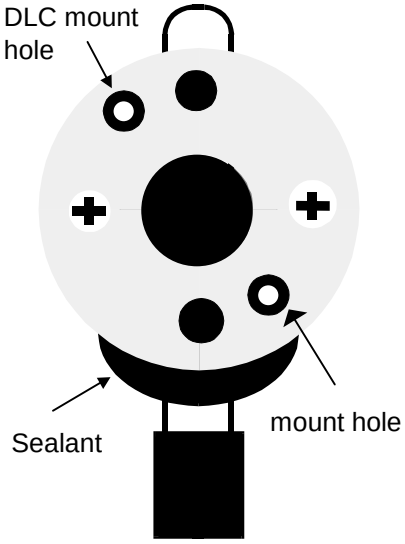
1. Opening the unit. Open the unit as above.
2. Remove the Lamp Shield as above.
3. To remove another installed PSLS lamp/filter kit, unplug the red lampplug (gray cable) at the black power supply on the rear of the PCB

bracket. Hold on to the lamp/filter assembly and unscrew the two 4-40 x Filter Assembly 1/4 in. flathead screws on the outside of the front panel at the flowcell. Screws

Front Panel View

Set the screws aside. Remove the assembly and store it in a clean sealed container. **Do not touch** the filter or lamp surfaces. **Do not touch** the exposed prongs on the power supply plug.

(Installing a PSLS Conversion Kit)

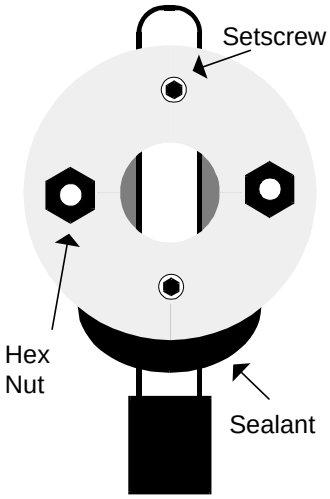


4. Remove the 254nm conversion assembly from its protectivepack. Do not touch the filter or lamp surfaces. Do not loosen the lamp setscrews. Hold on to the lamp/filter assembly and position the lamp/filter assembly on the lamp inside of the front panel as shown to the right, so that the two open screw holes are aligned with the holes in the panel. Insert and tighten the small 4-40 flathead screws into the panel and the filter holder. Plug the red lamp plug in to the black power supply. Note the friction lock on the plug should be facing the white plastic receptacle.

(Replacing a PSLS Lamp Assembly) DLC

5. To remove the Lamp Assembly, unplug the red lamp plug atthe black power supply. Remove the entire lamp/filter assembly as in 3 above. Do not loosen the setscrews. Remove the lamp assembly by unscrewing the two #4 hex nuts and internal tooth lockwashers (ITLW) on the rear of the assembly. Set the lamp aside and wrap it in the clean protective packaging. Dispose of an old lamp according to local ordinances. Return a defective lamp to your Dealer/Sales Representative.

(Replacing a PSLS Filter Assembly)



6. To remove the Filter Assembly, remove the entire lamp/filterassembly as in 3 above, then remove the lamp assembly as in 5 above. If you are replacing the filter, unscrew the lamp holder 440 x 1 1/4 in stainless steel flathead screws. Examine the filter for fingerprints and particulate matter. Clean the filter with a 50 to 70% Isopropyl Alcohol and water solution and a lint-free tissue.

7. Place the lamp assembly on to the long 4-40 screws of thefilter holder, with the silvered surface of the filter facing the bulb (dark/colored side faces the flowcell). Reinstall the ITLWs and hex nuts. Remount the lamp/filter assembly to the unit as in 3 above. Plug the red lamp plug (orange wires) in to the black power supply. Note the friction lock on the plug should be facing down.

(Closing the unit)

8. Close the lamp shield, and then the cover following the reverse procedures for openingthe unit.

8.2.7 Calibration

Absorbance Adjustment - A maintenance technician is required. Factory procedures are required. A calibration standard for the installed wavelength (see below).

Calibration Standard - A fluid placed in the flowcell with known absorbance value. It must be stable to UV energy and is best when prepared fresh, i.e. diluted from a stock solution.

8.2.8 Replaceable Parts (see Part D)

Flowcell Assembly - Prep or Analytical

Mercury Source Lamp (Maintenance technician)

Wavelength Conversion Filters (if so equipped)

PC boards (Maintenance technician)

PART C: BLC-10/10C/11C SERIES LIQUID AND SAMPLE HANDLING SYSTEM

Section 9.0 Introduction

This section of the manual contains information needed to operate and perform service on the BLC-10/10C/11C Series Pump.

9.1 Description of the BLC-10/10C/11C Series Liquid Handling System

9.1.1 Pump Features

The pump used in the BLC-10/10C/11C Series of integrated HPLC systems is designed for routine analyses.
The flow rate of the pump can be set in 0.01 mL increments from 0.01 to 9.99 mL/min with a precision of 0.2%.
Low flow modulation of the reciprocating, single-piston pump is achieved with an advanced electronic rapid-refill design, programmed stepper motor acceleration, and an auxiliary pulse damper.
The Pump includes:

- Rapid refill which reduces pulsations
- Self-flushing piston wash
- Biocompatible pump head
- LED front panel readout of flow rate
- PRIME button for rapid solvent change
- Flow adjustment in 10 microliter increments

9.1.2 Wetted Materials

Wetted surfaces in the pump head include ruby, sapphire and inert polymers.

9.1.3 Self-Flushing Pump Head

The self-flushing pump head (Figure 7) provides continuous washing of the region behind the primary high pressure seal without the inconvenience of a manual flush or a gravity feed arrangement. This is important as a microscopic layer of mobile phase fluid always wets the area between the piston and seal in an HPLC pump. ***When buffered mobile phases are used in a standard pump head, this layer evaporates behind the seal and deposits crystals on the piston. These crystals abrade the pump seal and cause premature seal failure, leakage, and can possibly damage the pump.*** The self-flushing pump head uses a diaphragm and check valves to create an actively pumped flow in the area behind the high pressure pump seal, which washes away the film of mobile phase before crystals can precipitate. The flush check valves are built in to pumphead (*INLET CHECK VALVE* and *OUTLET CHECK VALVE* in Figure 7). The inlet and outlet flush tubing assemblies included in the Accessory Kit, shown in Figure 8, attach to the barbed connectors on the self-flush housing. The Outlet Flush Tubing is equipped with a luer fitting which can be mated with the syringe also in the Accessory Kit to prime the flush system.

The Solvent Inlet Filter Assembly (010-0072) tubing, with 1/4-28 flangeless fittings, attaches to the Pumphead INLET CHECK VALVE (see Figure 14).

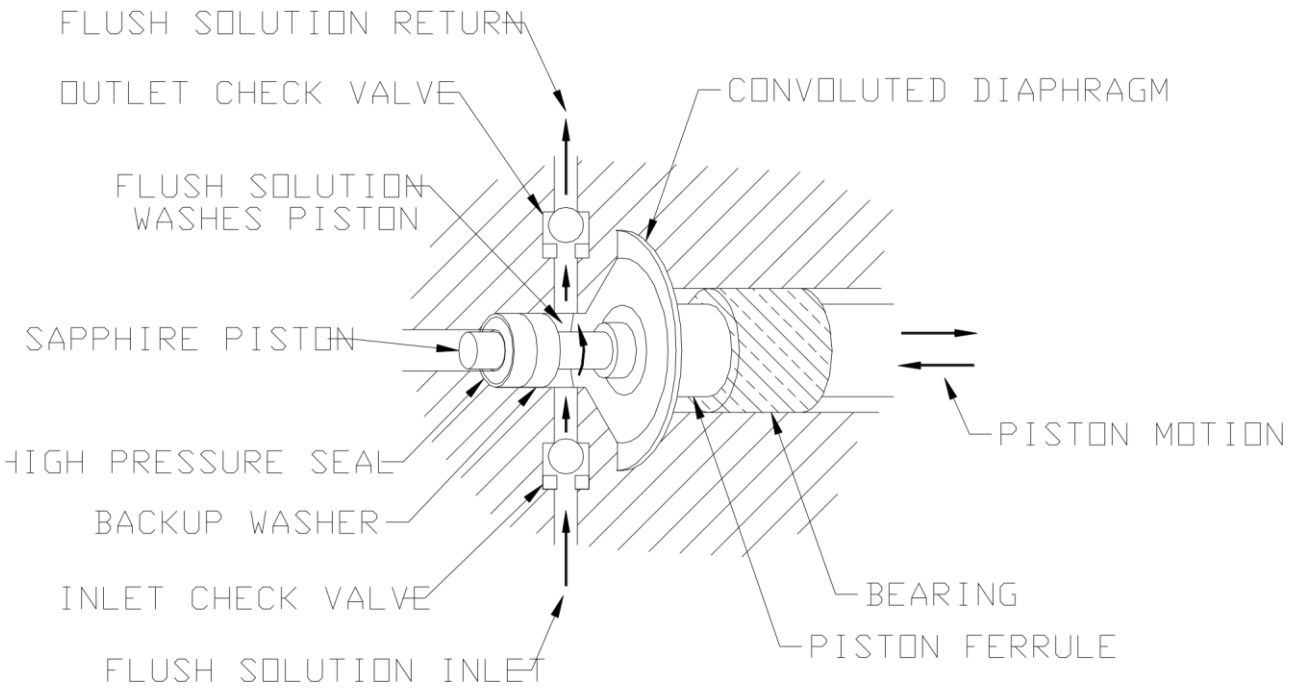


Figure 7 Self-Flushing Pump Head

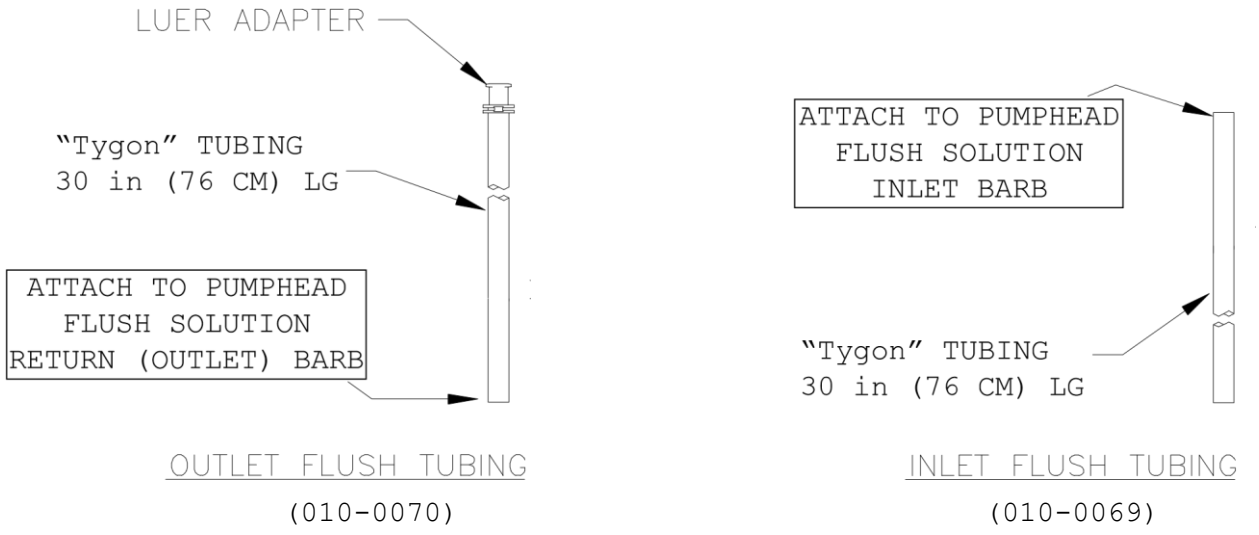


Figure 8 Self-Flushing Tubing Assemblies

Section 10.0 Installation

10.1 Solvent Preparation

The use of proper solvent preparation will prevent a great number of pumping problems. The most common problem is bubble formation, which may affect the flow rate consistency. Aside

from leaky fittings, the problem of bubble formation arises from two sources: solvent outgassing and cavitation. Filtration of HPLC solvents is also required.

10.1.1 Solvent Outgassing and Sparging

Solvent outgassing occurs because the mobile phases contain dissolved atmospheric gases, primarily N2 and O2. These dissolved gases should be removed by degassing the mobile phase before or during use. The best practical technique for degassing is to sparge the solvents with helium. Because helium is sparingly soluble in HPLC solvents, other gases dissolved in the solvent diffuse into the helium bubbles and are swept from the system. Solvent filtration is not an effective alternative to helium degassing.

Sparge the solvent vigorously for 10 to 15 minutes before using, then maintain a trickle sparge during use. The sparged solvent must be continually blanketed with helium to maintain solvent degassing. If you degas solvents only before use, remember that atmospheric gases will dissolve back into the mobile phase within four hours. The helium grade should be 99.9+%. Standard laboratory grade is satisfactory.

When mixing water and organic solvents (like methanol or acetonitrile), the mixture holds less dissolved gas than either pure component holds, so there is a strong tendency for outgassing to occur. Sparging to reduce the amount of dissolved gas is critical in this case, and even with sparging some outgassing may be observed. Many separations will still give consistent results in the presence of these bubbles. **A back pressure regulator (50-100 psi) after the detector flow cell will usually prevent bubbles from generating baseline noise**.

CAUTION: DO NOT EXCEED THE MAXIMUM PRESSURE RATING FOR THE DETECTOR'S FLOWCELL

***WARNING*: ALWAYS RELEASE PRESSURE FROM THE PUMP SLOWLY. A RAPID PRESSURE RELEASE COULD CAUSE THE PULSE DAMPER DIAPHRAGM TO RUPTURE.**

If it is necessary to further reduce the outgassing due to solvent mixing, try helium blanketing. Helium blanketing keeps the mobile phase reservoirs pressurized to 2 to 3 psi with helium.

10.1.2 Cavitation

Cavitation occurs when inlet conditions restrict the flow of solvent and vapor bubbles are formed on the inlet stroke. The key to preventing cavitation is to reduce inlet restrictions. The most common causes of inlet restrictions are crimped inlet lines and plugged inlet filters. Inlet lines with tubing longer than 48" (120 cm) or with tubing of less than 0.085" (2 mm) ID may also cause cavitation.

Placing the solvent reservoirs below the pump level may also cause cavitation. The optimal location of the reservoirs is slightly above the pump level, but it is adequate to have them on the same level as the pump.

10.1.3 Filtration

The solvents must always be filtered with a 0.5 micron filter prior to use. The removal of particles is necessary to ensure reliable operation of the piston seals. Solvent filtration is good practice for the reliability of other components in the HPLC system as well.

Insoluble impurities are a source of particulate matter. Solvents should always be filtered after they have been mixed, especially in the case when buffers are used. After filtering, the solvents should be stored in a closed, particulate-free bottle.

Once the solvents have been filtered, they do not need to be filtered daily providing that bacterial growth or a reaction that produces an insoluble product does not occur. If solvents have been on the shelf for more than one week it is good practice to filter them again prior to use.

10.1.4 Wetted Materials

The portion of the biocompatible pump head of the BLC-10/10C/11C Series pump that contacts mobile phase is manufactured of sapphire, ruby, or inert polymers (PEEK). Ensure that the mobile phase does not affect the materials used in the system. Other materials are listed throughout the manual.

10.2 Instrument Installation

10.2.1 Mobile Phase Reservoirs

The mobile phase reservoir should be placed at the same level or slightly higher than the pump, never below the pump, and the inlet tubing should be as short as practical; this minimizes pressure losses on the inlet side of the pump during refill. Because significant pressure losses cause bubble formation during refill, these steps are particularly important when using high vapor pressure solvents (hexane, methylene chloride, etc.). Mobile phases should be degassed, filtered and covered. (See also Section 10.1 above.)

10.2.2 Self-Flush Solution

Self-flush heads require 250-500 mL of 20% methanol in water as a flushing solution. A pH indicator that will indicate the concentration of salts in the solution is recommended as a reminder to change the solution. This flush solution should be replaced with a fresh solution weekly to avoid frequent pump maintenance.

10.2.3 Inlet Tubing and Filters

The Solvent Inlet Filter Assembly (010-0072) tubing used in the BLC-10/10C/11C Series pumps is 0.085" ID X 1/8" OD. The inlet line is supplied in a 24" length, and is made of a fluoropolymer material (TFE). Remove the black shipping plug from the INLET CHECK VALVE housing of the pumphead and attach the open end of the TFE tubing with the flangeless 1/4-28 nut and clear ferrule (flat side to the end of the tubing) in to the check valve housing. Place the filter in the mobile phase reservoir. Store the black plug fitting with other shipping materials.

10.2.4 Outlet Tubing

Outlet tubing (supplied with the pump) has a 1/16" outer diameter. It is biocompatible PEEK with a 0.030" inner diameter and is used before the injection valve. PEEK tubing with a 0.010" inner diameter is used after the injection valve. The tubing must be cut squarely with no burrs. The tube itself should not be crimped, and the center hole must be open. Biocompatible tubing may be cut with a plastic tubing cutter or razor knife. Stainless steel should be cut with a mechanical tubing cutter. Refer to Figure 9 shown below.

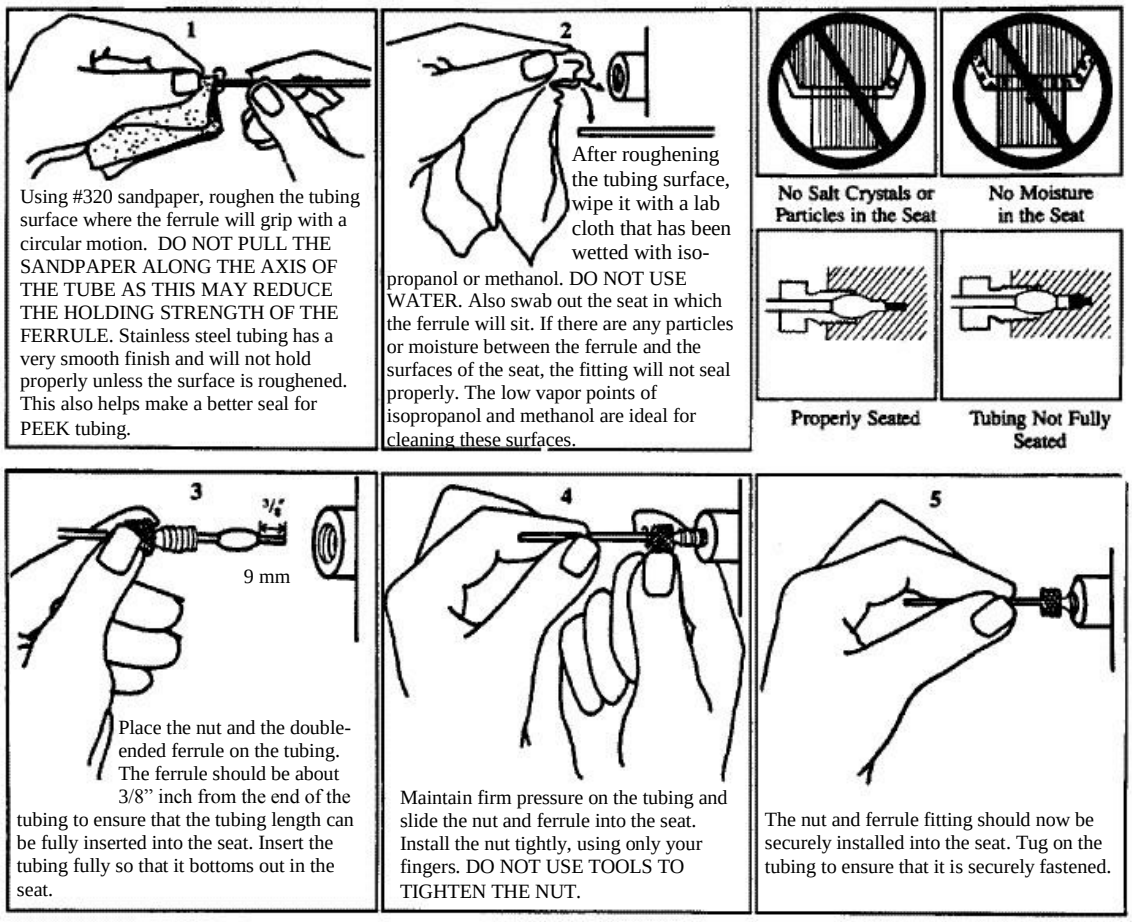


Figure 9 Nut and Ferrule Preparation

10.2.5 Prime/Purge Valve

The prime purge valve is mounted to the front panel. Two 1/16" high pressure ports are provided with nuts and ferrules with 1/16" PEEK tubing. One of these ports (left) is connected to the pump outlet tubing and the other to the pulse damper.

CAUTION: When you press the PRIME key, the pump will run at the maximum flow rate. **BE SURE THAT THE PRIME/PURGE VALVE IS OPEN.**

10.2.6 Priming the Pump and Flushing the Lines

10.2.6.1 Self-Flush Tubing (010-0069 and 010-0070)

Attach the tubing to the self-flush inlet and outlet barbed connector. Place the inlet flush line in the self-flush solution. To prime the flush lines, connect the priming syringe (443-0001) to

the luer connector on the outlet flush tubing assembly (Figure 8), then apply suction until the line is filled with flush solution. Place the outlet line in the flush solution. Secure both flush lines in the flush solution container so they stay immersed during pump operation.

10.2.6.2 Priming the Pump with the Prime/Purge Valve

1. With the prime/purge valve closed firmly (fully clockwise), high pressure flow will beconfined between the pump and the pulse damper and injection valve.
2. When the valve is open (counter clockwise) 1/2 to 1 full turn, the pressure will be ventedand flow will exit through the drain port in the stem assembly. A syringe connected to the valve luer port will collect the mobile phase released.
3. Applying suction with the luer tip priming syringe at the drain port will purge air bubblesfrom the pump/reservoir lines, provided there are no open valves or lines downstream at the injector/column interface.
4. To prime the pump, draw about 20 to 30 mL of mobile phase.

10.3 The Injection Valve

The C2 injection valve (Figure 10) has 6 ports. A 20 µl loop of material similar to the stator is furnished with the valve. Other varieties of loop sizes are available in several different materials.

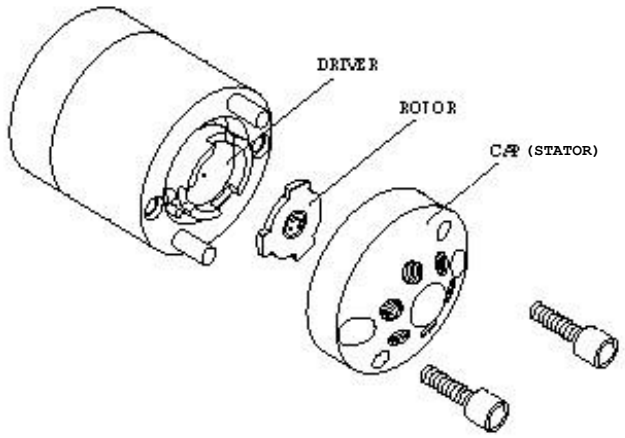


Figure 10 Model C2 Injection Valve

10.3.1 Precautionary Handling

All surfaces must be kept clean and free of contaminants to prevent valve damage. Open ports and fittings cause unnecessary risk of particulate matter entering the valve and scratching sealing surfaces, which is the most frequent cause of premature valve failure.

10.3.1.1 Rotor Materials

Type E for Biocompatible Stators. A polyaryletherketone/PTFE composite which is typically used with PAEK stators in high pressure valves. It cannot be used in prolonged contact with high concentrations of sulfuric and nitric acids, DMSO, THF, or liquid methylene chloride.

Type H for Stainless Steel Stators. A standard for typical HPLC applications in which pressures are around 5000 psi and temperatures are not more than 75°C. [optional]

10.3.1.2 Stator (Valve Cap) Materials

PAEK. Composite material which resists all common HPLC solvents and dilute acids and bases. However, concentrated or prolonged use of halogenated solvents may cause the polymer to swell. Avoid concentrated sulfuric or nitric acids (over 10%). [standard]

HPLC Grade Stainless Steel. Due to design requirements, several special grades of stainless steel may be used where "HPLC grade" is noted. The specific types include Nitronic 60, Type 316 stainless steel, and Type 316L stainless steel. [optional]

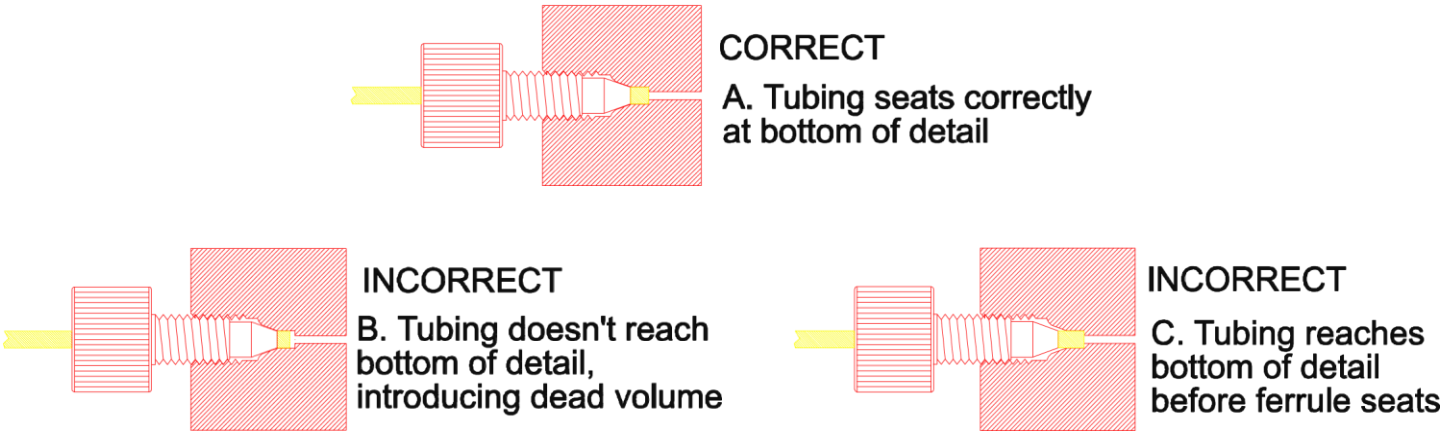
10.3.2 Fitting Instructions

The most common source of particulate and chemical contamination is tubing which has not been properly cleaned before installation in the valve. To avoid this problem, make certain that all tubing ends are free of burrs and cut square with the tube axis. Chemical and/or mechanical cleaning may be required. Make certain that tubes are seated completely before forming the ferrule on the tube. This insures minimum connection volume.

Do not use any fittings except those supplied by the factory. Differences in pilot depth yield unswept volume.

The injection valve fitting is made to minimize dead volume. The valve is comprised of five parts: a female zero volume compression fitting which reduces/eliminates ID distortion, the valve cap, a male nut, a ferrule, and a length of tubing (see Figure 11) Leak-tightness and integrity of the fitting is dependent upon tubing preparation and proper assembly.

Figure 11 Injection Valve Fittings



Section 11.0 Operating the Pump

11.1 Controls and Indicators

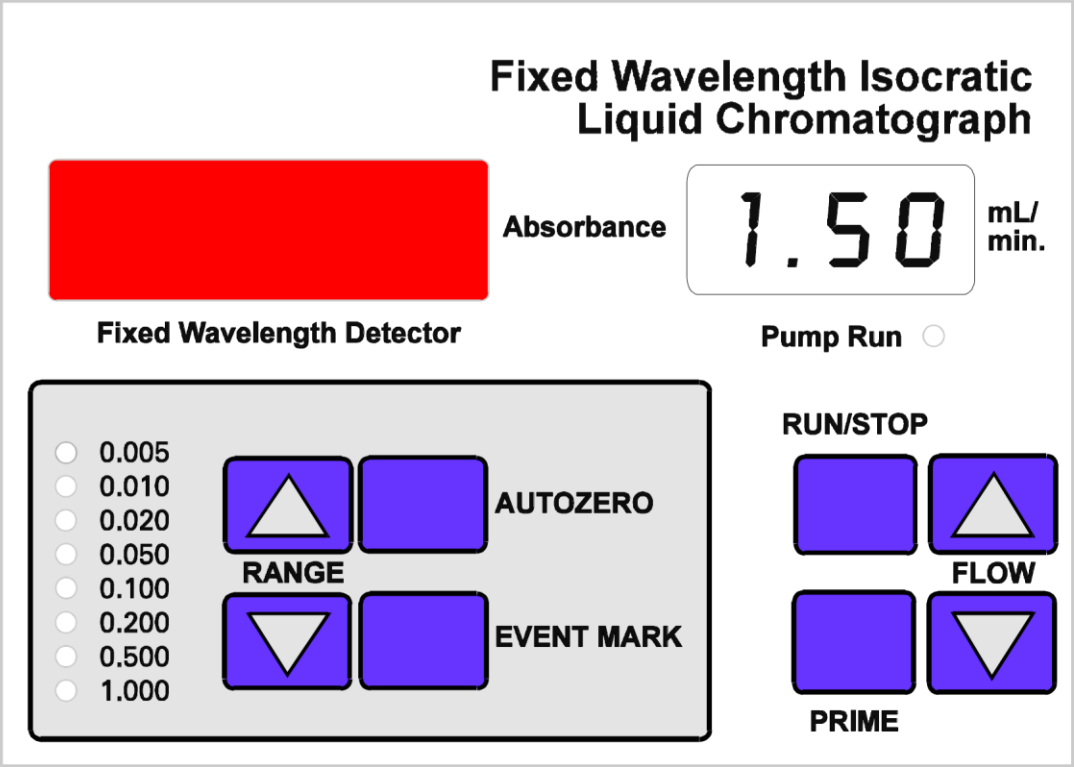


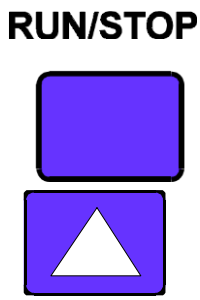
Figure 12 BLC-10/10C/11C Series Pump-side Control Panel

11.1.1 Control Panel

11.1.1.1 Digital Display

The 3-digit display shows the pump flow rate (mL/min) when operating. It also should be lighted to show that the power to the pump is on.

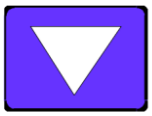
11.1.1.2 Operation Keys



When pressed, this key alternately starts and stops the pump.

When pressed, this key increases the flow rate.

FLOW



When pressed, this key decreases the flow rate.

PRIME

When the PRIME key is pressed, the pump runs at the maximum flow rate for the pump head. It will stop when any key is pressed.

Pressure Compensation

On power-up, press the PRIME button on the front panel while pressing the Power On switch on the rear of the pump. The pump will display a number from 0 to 25. This represents the running pressure of the pump from 0 psi to 2500 psi. Each digit represents 100 psi. To change the pressure compensation number use the up arrow and down arrow buttons. When you have selected the correct pressure compensation press the RUN button to return to normal operation of the pump.

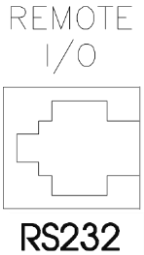
CAUTION: When you press the PRIME key, the pump will run at the maximum flow rate. Be sure the outlet tubing is disconnected from the column and directed to a waste reservoir.

11.1.1.3 Status LEDs

PUMP RUN 

The PUMP RUN lights to indicate that the pump is running.

11.2 Rear Panel Remote Input



An RS-232C modular jack is provided on the back panel. A computer, with appropriate software, can be used as a remote controlling device for pump operation via this connection.

See section 12.2.3 for details on connection and operation.

Section 12. Theory of Operation

12.1 Mechanical Operation

12.1.1 Liquid System Flow Path

The flow path of the BLC - 10/10C/11C is from the inlet reservoir filter to the inlet check valve, through the pump head, out the outlet check valve, into the system to the prime/purge valve,

the pulse damper, the injection valve, out the front of the system to the column, to the detector flowcell (covered earlier), and out to waste.

12.1.2 Pump Cycle

The pump cycle consists of two phases, the pumping phase, when fluid is metered out of the pump at high pressure, and the refill phase, when fluid is rapidly drawn into the pump.

During the pumping phase, the pump piston moves forward at a programmed speed; this results in a stable flow from the pump. The piston is driven by an eccentric bearing which is directly driven by the motor.

At the end of the pumping phase, the pump enters the refill phase. The piston quickly retracts, refilling the pump head with solvent, and the piston begins to move forward again as the pumping phase begins. The motor speed is increased greatly during refill to reduce the refill time and to precompress the solvent at the beginning of the pumping phase. Since the output flow completely stops during refill, a pulse damper is necessary to provide the lowest pulsation due to any refill flow variations.

To achieve stable operation of the check valves a back-pressure of at least 25 psi is recommended.

12.1.3 Prime/Purge Valve

The integrated prime/purge valve has been specifically designed for use in HPLC systems requiring the use of biocompatible components. In the closed position, two interconnected 1/16" ports allow through flow from the pump to the system at pressures to 5000 psi.

In the open position, a low pressure seal confines flow at near-ambient pressures to a drain port that is incorporated directly into the valve stem having a luer taper. Applying suction at the drain port will purge air bubbles from the pump and reservoir lines (provided there are no open valves to lines down-stream at the injector/column interface). When the valve is closed, high-pressure flow is directed to the system. Leak-tight shut-off is provided by a soft tip which is protected from accidental damage by a metal stop.

The prime/purge valve is designed to last indefinitely with a minimum of maintenance, only Teflon, Tefzel and Peek contact the mobile phase. Should it become necessary, the inexpensive seals are easily replaced from the front of the panel without having to disconnect tubing.

12.1.4 Pulse Damping

The diaphragm pulse damper consists of a compressible fluid (isopropanol) held in an isolated cavity, and an inert, but flexible diaphragm that is in contact with the mobile phase. During the pumping phase of the pump cycle, the fluid pressure of the mobile phase displaces the diaphragm, compressing the fluid in the cavity and storing energy. During the pump refill phase the pressure on the diaphragm is reduced and the compressed fluid expands, releasing the energy it has stored, which helps to maintain the flow rate and pressure. The amount of mobile phase in contact with the pulse damper is small, only 0.9 mL at 2500 psi, and the geometry used ensures that the flow path is completely swept, so solvent "memory effects" are virtually eliminated.

To be effective, the pulse damper requires a back-pressure of approximately 500 psi or greater. If the application does not generate such pressures a length of small bore tubing (restrictor) can be used between the pulse damper and the application.

12.1.5 The BLC-10/10C/11C 6 Port Injection Valve - Model C2

The C2 valve standard specifications are 5000 psi at 75°C. Valve lifetime typically exceeds 50,000 cycles before requiring a rotor replacement. Port size is 0.016 in (0.4 mm). This diameter is the best choice in routine liquid chromatography, using 2 mm ID or larger columns. All connections for the high pressure valve are made with fittings designed to minimize zero dead volume, and should only be made with supplied nuts and ferrules.

The BLC-10/10C/11C valve is available in either biocompatible PAEK (standard) or in stainless steel (optional). PAEK is a range of VICI proprietary polyaryletherketone-based composites (e.g. PEEK and others) for valve and fitting components.

The basic design involves a flat rotor which is engraved with slots which connect the ports. A stator is held at a constant, pre-set force against the rotor.

With the valve in **LOAD** position, sample flows through the external loop while the mobile phase flows directly through to the chromatographic column. When the valve is switched to **INJECT** position, the sample contained in the sample loop and valve flow passage is displaced by the mobile phase and is carried into the column.

Note: The flow direction of the mobile phase through the loop is configured opposite (backflush) to the flow direction during the loading of the loop (Last-In First-Out).

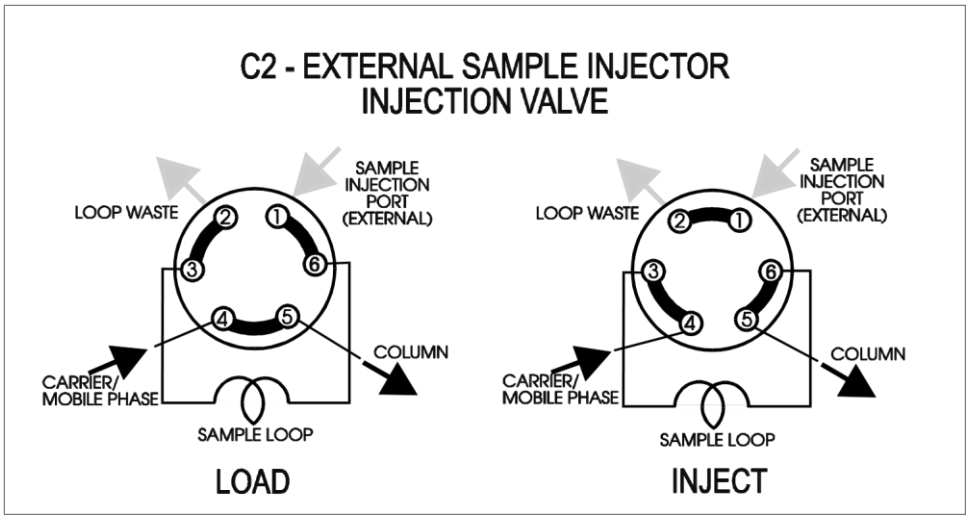


Figure 13 Injection Valve Flow Diagram

12.1.6 Sample Injection Port

The sample injection port is constructed of Nylon and 0.031" TFE tubing. The port will accept either a 24 or 22 gauge syringe needle (not provided with the system). The port is connected to the injection valve sample inlet port.

Examine the port periodically for damage caused by sharpened tips. A standard **blunt end** HPLC syringe needle is recommended.

12.1.7 Injection Valve Position Sensor (Optional)

Some units may be equipped with a Position Sensor (optional accessory). The position sensor is identified by its black handle and ring marked with the white letters "0" (LOAD) and "1" (INJECT). The sensor is attached to the display or signal processor of the detector.

The sensor provides continuous closure when the valve is in the INJECT ("1") position. This causes an event mark (spike) on a chart recorder when using the standard
Recorder/Integrator Cable supplied with the unit. This is equivalent to pushing the EVENT button on the front panel. The contact stays "closed" until the valve is moved. The sensor will cause another spike on the recorder trace when the handle is returned to the LOAD ("0") position.

When used with the Buck Scientific Remote Cable, the closure signal is sent out the cable to activate a relay in the chromatography system software PC card or on an integrator. This may be used to signal that the injection has occurred and/or to start a chromatograph or the data system.

The contact is +5V in the LOAD position and 9V in the INJECT position. See the Remote Control Section of the Detector for additional information.

12.2 Electronic Control

12.2.1 Microprocessor Control

The pump is controlled by hybrid microprocessor circuitry which (1) provides control signals to the motor drive circuitry, (2) interfaces with the keyboard/display, (3) receives signals from the refill flag, and (4) provides external input/output (RS-232) interfacing. Firmware programming is stored in an EPROM.

An eccentric cam provides refill in a fraction of the full cam cycle. The remaining revolution of the cam provides piston displacement for output flow of the mobile phase. In addition to the rapid refill characteristics of the drive, the onset of refill is detected by an infrared optical sensor as a partial disc rotates through it. The microprocessor changes the refill speed of the motor to an optimum for the set flow rate. At 1 mL/min, the refill is more than five times faster than with the motor operating at constant speed. The optimum refill minimizes the resulting pulsation while avoiding cavitation effects in the solvent entering the pump head.

The flow rate of any high pressure pump can vary depending on the operating pressure and the compressibility of the fluid being pumped. The pump is calibrated at 1000 psi using a 90:10 mixture of water and isopropanol.

12.2.2 Power Supply

Power for the pump is provided by the system's isolation transformer which receives 110/120 volts AC from the Corcom. Selection between 110/115 and 220/240 is accomplished by changing the fuses at the Corcom. A different transformer is supplied for use at 100 volts AC.

12.2.3 Remote Interfacing

An RS-232C modular jack is provided on the back panel of the BLC-10/10C/11C. A computer, with appropriate software, can be used as a remote controlling device for pump operation via this connection. However, this RS-232 controls the pump only. It does not relate in any fashion to the detector outputs.

12.2.3.1 Hardware Implementation

The REMOTE INPUT serial I/O port is configured for 9600 baud, 8 data bits, 1 stop bit, and no parity. The connector is a standard RJ-11 modular telephone type jack. The pinout is:

Pin	Function
1, 6	Ground
2	DSR (Input)
3	RXD (Input toBLC-10/10C/11C Series pump)
4	TXD (Output from pump)
5	DTR (Output)

Special wiring considerations: Use the following chart for interfacing the BLC-10/10C/11C Series pump serial I/O port to either a 25-pin or 9-pin serial I/O COM port on the computer.

Pump (RJ11)	Signal	IBM (DB25)[a]	IBM (DB9)[b]
1, 6	Ground	7	5
2	DSR	20	4
3	RXD	2	3
4	TXD	3	2
5	DTR	6	6

[a] Jumper pins 4, 5, and 8 on DB25.

[b] Jumper pins 1, 7, and 8 on DB9.

12.2.3.2 Hand-Shaking

The BLC-10/10C/11C Series pump uses hardware handshaking. The pump will not transmit on the TXD output if the DSR input is at a low logic level. And, the pump will not receive on the RXD input when the DTR output is at a low logic level. A low logic level is -3.0 to -15 volts, and a high logic level is 3.0 to 15 volts.

12.2.3.3 Command Interpreter

The BLC-10/10C/11C Series pump's high level command interpreter receives and responds to command packets. The pump will not send a message except when prompted, and it will send a response to every message as described below.

Each command is characterized by a unique two-letter command code, and only one command can be issued per line. Case is not important; that is, the command codes "CC" "Cc" "cC" and "cc" are all equivalent. Command strings sent by the pump are terminated by the "/" character. The command packets are as follows:

Command	Response	Comments

FLxxx	OK/	Sets the flowrate to x.xx or xx.x mL/min where the range is fixed for the pump head size, i.e., for 0.01 to 9.99 mL/min xxx = 001 to 999.
FOxxxx	OK/	Sets the flowrate to xx.xx mL/min, i.e., for 0.01 to 10.00 mL/min xxxx = 0001 to 1000.
CC	OK,0,x.xx/ (x.xx or xx.xx)	Reads the pump flowrate in mL/min. The format is x.xx for all flowrates except 10.0 mL/min which is xx.xx.
CS	OK,x.xx,0,0,PSI,0,y,1/ (x.xx or xx.xx)	Reads the current pump setup, where: x.xx or xx.xx = Flowrate in mL/min y = Run status (0 = stopped, 1 = running)
ID	OK,vx.xx SR1X firmware/	Identifies the pump type and EPROM revision x.xx
SF	OK/	Puts the pump in fault mode. Turns on the FAULT LED and stops the pump immediately.
RF	OK,x/	Reads the motor stall fault status, where: x = 0 if no fault x = 1 during a fault condition
KD	OK/	Disables the keypad. (Default status at power-up is enabled.)
KE	OK/	Enables the keypad.
PCxx	OK/	Sets the pressure compensation value, where xx = the operating pressure (in PSI divided by 100), eg 0 PSI xx = 00, 2500 PSI xx = 25.
RC	OK,x/ (x or xx)	Reads the pressure compensation value in hundreds of PSI, i.e., for 0 PSI x = 0, for 2500 PSI xx = 25.
HTx	OK/	Sets the pump head type, where: x = 1 for a stainless steel 10 mL/min pump head x = 2 for a plastic 10 mL/min pump head Pump is stopped; and pressure compensation initialized when head changed.
RH	OK,x/	Reads the pump head type, where: x = 1 for a stainless steel 10 mL/min pump head x = 2 for a plastic 10 mL/min pump head
PI	OK,a.aa,b,c,d,1,0,0,0,0,0 ,e,f,g,h,0,i,j/ (a.aa or aa.aa) (c or cc)	Reads the current pump setup, where: a.aa, aa.aa = Flowrate in mL/min b = Run status (0 = stopped, 1 = running) c or cc = Pressure compensation d = Pump head type (1 = steel, 2 = plastic) e = Priming (0 = no, 1 = yes) f = Keypad lockout (0 = no, 1 = yes) g = Pump run input (0 = inactive, 1 = active) h = Pump stop input (0 = inactive, 1 = active) i = Control mode (0 = LOCAL, 1 = REMOTE) j = Motor stall fault (0 = no, 1 = yes)
RE	OK/	Resets the pump configuration to its default power-up state.
#	(no response)	Clears all characters from the command buffer.

Section 13.0 PUMP MAINTENANCE

Cleaning and minor repairs of the BLC-10/10C/11C Series pump can be performed as outlined below.

Lower than normal pressure, pressure variations, or leaks in the pumping system can all indicate possible problems with the piston seal, piston, or check valves. Piston seal replacement could be necessary after 1000 hours of running time.

13.1 Filter Replacement

Inlet filters should be checked periodically to ensure that they are not becoming plugged and restricting the flow (which would cause cavitation and flow loss in the pump). Two things which can plug an inlet filter are microbe growth and dirty solvents. To prevent microbe growth, try to use at least 10-20% organic solvent in the mobile phase, or add a growthinhibiting compound. If you pump 100% water or an aqueous solution without any inhibitors, microbes will grow in the inlet filter over time, even if you make fresh solution every day. Always use well-filtered, HPLC grade solvents for your mobile phase.

13.2 Pump Heads

As a guide to pump head assembly, the standard pump head is shown in Figure 14.

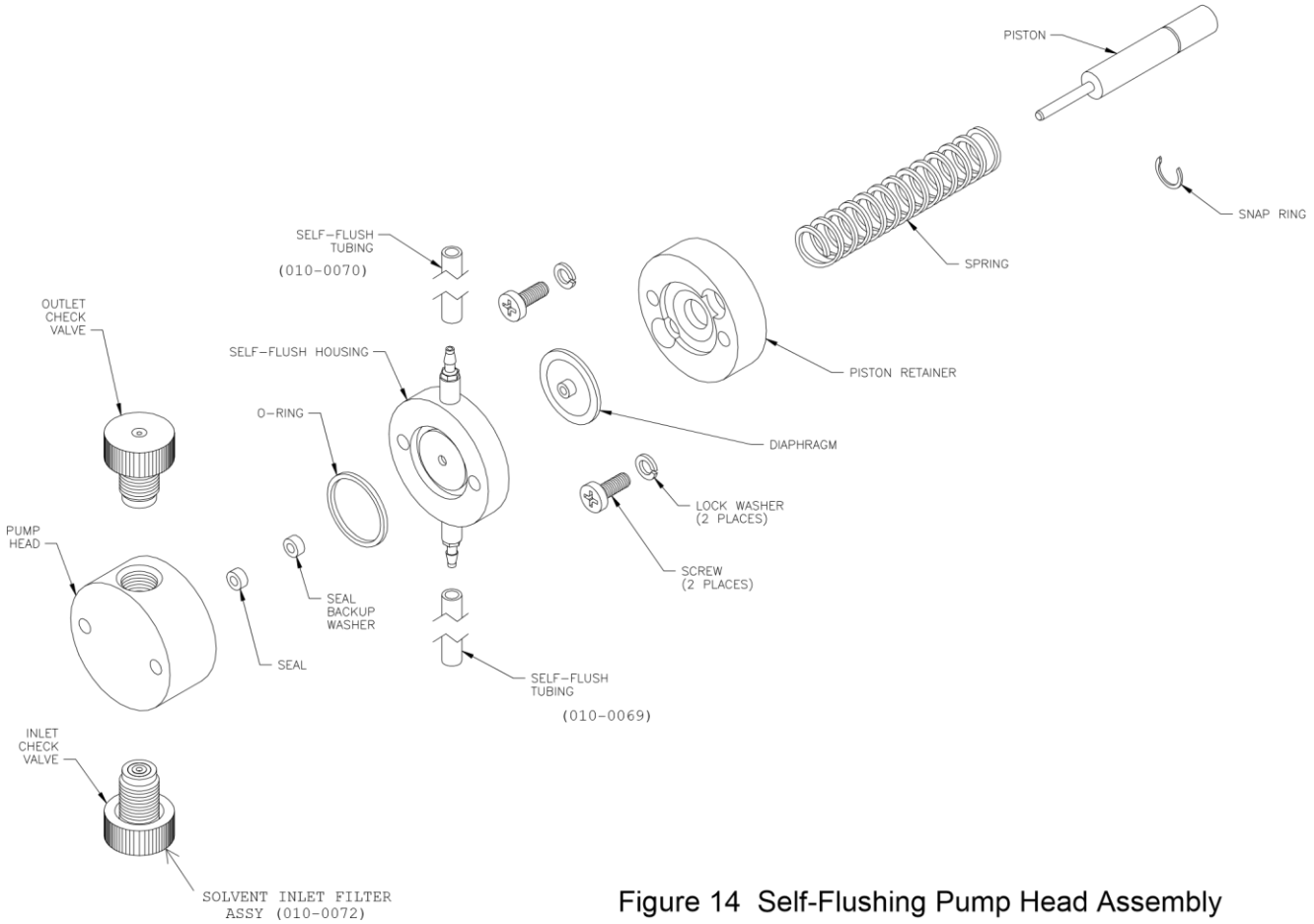


Figure 14 Self-Flushing Pump Head Assembly

13.2.1 Removing the Pump Head

1. Momentarily turn the pump ON and quickly turn it OFF upon hearing the refill stroke. This reduces the extension of the piston and decreases the possibility of piston breakage. 2. Turn OFF the power to the BLC-10/10C/11C Series pump. Unplug the power cord.

3. Remove the inlet line and filter from the mobile phase reservoir (to avoid siphoning). Becareful not to damage the inlet filter or crimp the Teflon tubing.

4. Remove the self-flush lines from the flush reservoir. If you elect to remove the lines fromthe self-flush housing, mark the outlet (top) location on the housing.

5. Optionally remove the outlet line from the outlet check valve.
6. Carefully remove the two knurled nuts at the front of the pump head.

> **CAUTION:** Be careful not to break the piston when removing the pump head. Twisting the pump head can cause the piston to break.

7. Carefully separate the pump head from the pump. Move the pump head straight out fromthe pump and remove it from the piston. Be careful not to break or damage the piston. Also remove the seal and seal backup washer from the piston if they did not stay in the pump head. Remove the O-ring.
8. Carefully separate the self-flush housing from the pump. Move the flush housing straightout from the pump and remove it from the piston. Be careful not to break or damage the piston. Also remove the self-flush diaphragm from the piston by carefully grasping the sealing flange on two sides and sliding it straight out on the piston being careful not to exert side pressure that may break the piston.

13.2.2 Piston Seals

13.2.2.1 Replacing Seals

Lower than normal pressure, pressure variations, and leaks in the pumping system can all indicate possible problems with the piston seal. Depending on the fluid or mobile phase used, piston seal replacement is often necessary after 1000 hours of running time.

A replacement biocompatible seal kit [DS025-0006] contains one seal, one backup washer, a seal insertion/removal tool, a diaphragm and a pad to clean the piston when changing the seal.

13.2.2.2 Conditioning New Seals

Note: Use only organic solvents to break-in new seals. **BUFFER SOLUTIONS AND SALT SOLUTIONS SHOULD NEVER BE USED TO BREAK-IN NEW SEALS.**

Using a restrictor coil or a suitable column, run the pump with a 50:50 solution of isopropanol (or methanol) and water for 30 minutes at 2000 psi back pressure and at less than 3 mL/min flow rate.

13.2.3 Cleaning the Pump Head Assembly Components

Note: If you choose to remove the piston seal or self-flush diaphragm, you should have a new set on hand to install after cleaning. It is not recommended that you reinstall the used piston seal or diaphragm since they are likely to be scratched and damaged during removal and would not provide a reliable seal if reused. If you decide to remove the seal, use only the flanged end of the plastic seal removal tool supplied with the seal replacement kit, and avoid scratching the sealing surface in the pump head. See Section 13.2.3.1 and 13.2.3.3 for seal removal and installation instructions.

1. Inspect the piston seal cavity in the polymer pump head. Remove any foreign materialusing a cotton swab or equivalent, and avoid scratching the sealing surfaces. Be sure no fibers from the cleaning swab remain in the components.

2. The pump head, check valves, and flushing housing may be further cleaned using alaboratory grade detergent solution in an ultrasonic bath for at least 30 minutes, followed by

rinsing for at least 10 minutes in distilled water. Be sure that all particles loosened by the above procedures have been removed from the components before reassembly.

CAUTION: When cleaning check valves, be sure that the ball is not against the seat in the ultrasonic bath. This may destroy the precision matched sealing surface and the valve will not check. (see also Section 13.3)

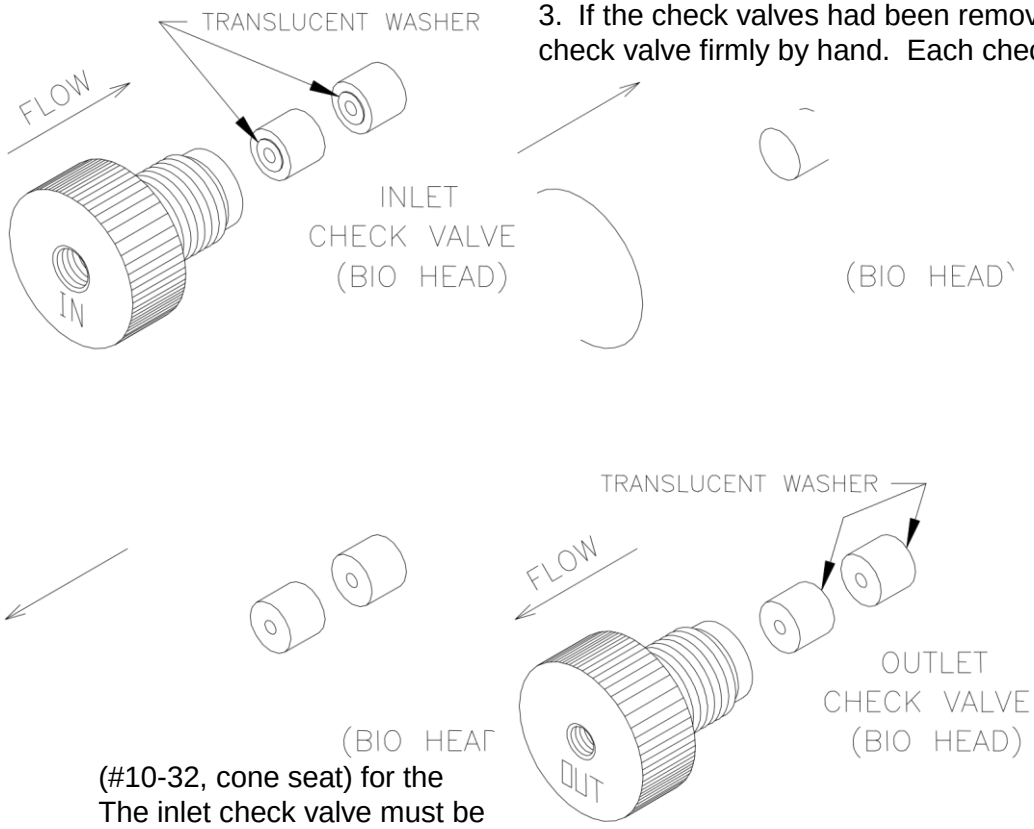


Figure 15 Check Valves

3. If the check valves had been removed, tighteneach check valve firmly by hand. Each check valve assembly contains two capsules (Figure 15). The sapphire seat in each capsule must be oriented downward in all cases in the final pump assembly.

Note: The inlet check valve (**IN**) has a larger opening (1/4"-28, flat-bottom seat) for the 1/8" inlet tubing; the outlet check valve (**OUT**) has a smaller opening 1/16" outlet tubing. connected at the (#10-32, cone seat) for the The inlet check valve must be bottom opening of the pump head.

If the piston seal has been removed, insert a new seal as described in Section 13.2.2, then continue with Section 13.2.5 to replace the pump head.

13.2.3.1 Removing the Piston Seal

1. Remove the pump head as described inSection 13.2.1.
2. Insert the flanged end of the sealinsertion/removal tool into the seal cavity on the pump head. Tilt it slightly so that flange is under the seal and pull out the seal.

CAUTION: Using any other "tool" will scratch the finish.

3. Inspect, and if necessary, clean the pump head as described in Section 13.2.3.

13.2.3.2 Cleaning the Piston

It is not necessary to remove the piston from the housing to clean the piston. Use the scouring pad included in the seal replacement kit to clean the piston. Gently squeeze the piston within a folded section of the pad and rub the pad along the length of the piston. Rotate the pad frequently to assure the entire surface is scrubbed. Do not exert pressure perpendicular to the length of the piston, as this may cause the piston to break. After scouring, use a lint-free cloth, dampened with alcohol, to wipe the piston clean.

13.2.3.3 Installing/Re-installing the Piston Seal

1. Place a high pressure replacement seal on the rod-shaped end of the sealinsertion/removal tool so that the spring is visible when the seal is fully seated on the tool. Insert the tool into the pump head so that the open side of the seal (metal spring) enters first, facing the high pressure cavity of the pump head. Be careful to line up the seal with the cavity while inserting. Then withdraw the tool, leaving the seal in the pump head. When you look into the pump head cavity, only the polymer portion of the seal should be visible.
2. Attach the pump head as described in Section 13.2.5.
3. Condition the new seal as described in Section 13.2.2.1.

13.2.4 Changing the Piston

1. Remove the pump head as described in Section 13.2.1.
2. With your thumb pressing the piston retainer against the pump housing, remove the twoPhilips head screws from the retainer. Do not allow the spring pressure to force the retainer away from the housing as the screws are loosened.
3. After both screws have been removed, slowly allow the spring pressure to push theretainer out of the housing. Gently pull the retainer straight out and carefully remove it from the piston and threaded rods. Gently pull the spring straight out of the housing and remove.
4. Grasp the metal base of the piston assembly so that you avoid exerting any pressureperpendicular to the length of the piston, and gently pull it from the pump housing.
5. Remove the snap ring from the groove on the old piston and place it into the groove on thenew piston.
6. Place a small amount of high quality grease on the back end of the metal base of thepiston assembly. Grasp the metal base of the piston assembly near the front so that you avoid exerting any pressure perpendicular to the length of the piston, and gently slide it into the pump housing.
7. Gently slide the spring over the piston assembly and back into the pump housing.Carefully align the retainer and gently push it straight in against the spring force until the retainer is against the housing. If misalignment with the piston occurs, wiggle while pushing the retainer to align the piston & retainer.
8. Hold the retainer flush against the housing with your thumb. Insert and tighten the Philipshead screws. Do not allow the spring pressure to force the retainer away from the housing. Insure that there are no gaps between the retainer and the housing.
9. Attach the pump head as described in Section 13.2.5.

13.2.5 Replacing the Pump Head

1. Contact your dealer for replacement part information.
2. Gently place diaphragm onto piston with center hub protruding towards you. Pushdiaphragm all the way back into recess and against metal base of piston. Do not exert pressure perpendicular to the length of the piston, as this may cause the piston to break.
3. Carefully align the self-flush housing on the pump housing bolts and gently slide it intoplace on the pump. Make sure that the Inlet valve is on the bottom and the Outlet valve is on the top.
4. Replace the O-ring onto the pump head. Replace the piston seal and backup washer ifthe came out of the pump head. Align the pump head and carefully slide it into place on the housing bolts. Be sure that the Inlet valve is on the bottom and the Outlet valve is on the top. Do not force the pump head into place.
5. Finger tighten both knurled nuts on to the housing bolts. To tighten firmly, alternately turnnuts 1/4 turn while gently wiggling the pump head to center it.
6. Reattach the solvent inlet and outlet lines and the flush lines. Change the flush solution.

13.2.6 Lubrication

Except as indicated in 13.2.4 #6 above, the BLC-10/10C/11C Series pump has no other lubrication requirements. The bearings in the pump housing and piston carrier are permanently lubricated and require no maintenance. Keeping the interior of the pump free of dirt and dust will extend the pump's useful life.

13.3 Check Valves - Cleaning and Replacing

Many check valve problems are the result of small particles interfering with the operation of the check valve. As a result, most problems can be solved by pumping a strong solution of liquid laboratory grade detergent through the check valves at a rate of 1 mL/min for one hour. After washing with detergent, pump distilled water through the pump for fifteen minutes. Always direct the output directly to a waste beaker during cleaning.

If this does not work, attempt to clean the check valves using an ultrasonic cleaner (see Section 13.3.2 #2 and the note, and #3)

If there is still no improvement after both cleanings, the check valve(s) should be replaced.

13.4 Fuse Replacement

The pump fuse is located on the circuit board and is in series with the 38 Vdc supply. If the front panel appears to function normally but the pump motor does not run, check the fuse located on the circuit board. See Part D.

WARNING: Unplug power cord before removing cabinet lid.

Section 14.0 Other Liquid System Maintenance

14.1 Pulse Damper

14.1.1 Removing the Pulse Damper

1. Make certain that the system has been depressurized. Unplug the power cord andremove the cover.

WARNING: There are potentially lethal voltages inside the BLC-10/10C/11C case. Disconnect the line cord before removing the cover. Never bypass the power grounds.

2. Disconnect the tubing from the pulse damper.
3. Remove the four screws that secure the pulse damper from the underside of the pump.
4. Remove the pulse damper.

14.1.2 Pulse Damper Refurbishing

Refurbishing the pulse damper is a time-consuming procedure. You may want to return the pulse damper to have it rebuilt. Do not attempt to refill or refurbish the pulse damper until you have a refurbishing kit. Instructions are furnished with the kit.

14.1.3 Pulse Damper Installation

1. Position the pulse damper, aligning it with the four mounting holes in the bottom of thecabinet. Direct the side seal to the right side of the chassis.
2. From the underside of the pump cabinet, tighten the four screws with lockwashers tohold the pulse damper in place.
3. Connect the tubing from the prime/purge valve (right side) to the port at the left side ofthe pulse damper. Connect the line to the injection valve to the other port, toward the right side.
4. Replace the cover on the BLC-10/10C/11C.

14.2 Prime/Purge Valve

If maintenance is required, you may obtain a seal replacement kit [DS025-0008] from your dealer. Instructions are provided in the kit, which also contains hex key, Teflon seal rings, and Tefzel tips.

To clean or check the valve remove the stem assembly from the valve. With the pump off, remove the suction line from the reservoir and remove the valve stem assembly from the valve by unscrewing stem-knob and the hex mounting nut by turning them counter-clockwise. The nut will remain on the stem assembly. Catch any drainage from the valve body in a suitable container.

Clean the stem and the ports as necessary. If required, replace the valve seals according to the kit instructions. Replace the stem assembly into the valve body and turn clockwise five times. Tighten the mounting nut securely in place with a 9/16" wrench, and continue turning the stem assembly (about two more turns) until the tip is seated.

If the tubing is removed, place the nut and then the ferrule on the tubing. The ferrule should be about 3/8" from the end of the tubing to insure that the tubing length can be fully inserted into the seat. Insert the tube so the tubing bottoms against the seat. Hand tighten the nuts.

Reconnect the reservoir and start the pump to purge the valve for a few minutes. Close the valve firmly to seat the tip seal. Check for leakage by pumping to the desired operating pressure and observing the drain port.

14.3 Injection Valve

Cleaning the injection valve can often be accomplished by flushing all the lines with appropriate solvents. Do not disassemble the valve unless system malfunction is definitely isolated to the valve.

When repairs are required, all that's necessary for rotor access is the removal of the two screws retaining the stator. Remove the old rotor and replace it, put the screws back in and tighten them, and the valve is ready for use at the factory-set pressure specification. **In the event of damage to the stator, replacements or factory refinishing are available.**

14.3.1 Cleaning and Rotor Replacement - Disassembly Procedures

1. Use a 9/64" hex driver to remove the socket head screws which secure the cap on thevalve.
2. To ensure that the sealing surface of the cap is not damaged, rest it on its outer face.Or, if the tubing is still connected, leave it suspended by the tubing. Examine the stator sealing surface for scratches. If scratches are visible the stator must be replaced. Return it to the factory for possible rework. If it is repaired, a partial credit will be issued.
3. With your fingers or a small tool, gently pry the rotor away from the driver.
4. Examine the rotor sealing surface for scratches. If scratches are visible to the nakedeye, the rotor must be replaced.
5. If no scratches are visible, clean all the parts thoroughly with an appropriate solvent,taking care not to scratch any surface. One of the most common problems in HPLC is the formation of buffer crystals, which are usually water-soluble. It is not necessary to dry the rotor or stator.

14.3.2 Cleaning and Rotor Replacement - Reassembly Procedures

1. Replace the rotor in the driver, making sure that the rotor sealing surface with itsengraved flow passages is facing out. The pattern is asymmetrical to prevent improper placement.

2. Replace the cap. Insert the two socket head screws and tighten them gently until bothare snug. Do not over-tighten them - the screws simply hold the assembly together and do not affect the sealing force, which is automatically set as the screws close the cap against the rotor and valve body.

3. Test the valve by pressurizing the system. If it doesn't hold pressure, the valve shouldbe returned to the factory for repair or replacement.

14.4 Tubing Preparation

NOTE: This procedure is applicable for all tubing used in the BLC-10/10C/11C.

14.4.1 Cutting and Polishing

Make certain that all tubing ends are cut square with the tube axis, and that both the ID and the OD are thoroughly deburred.

Inspect the end of the tubing where the ferrule will seat for visible scratches which are not acceptable. Scratches behind the front edge of the ferrule will not interfere with the integrity of the fitting. Minor scratches can often be eliminated by folding a small piece of fine emery cloth or wet-or-dry sandpaper (200 to 400 grit) around the end of the tubing and rolling the tubing between two fingers. This leaves concentric axial lines in the area where the ferrule seats, which, while not ideal, are less likely to cause a leak than longitudinal scratches.

NOTE: Electropolishing is generally not successful as a repair for bad tubing, as it often simply rounds off the edges of a scratch without removing it.

14.4.2 Cleaning

After it has been polished, the tubing should be cleaned to remove residual shavings and grit from the sandpaper. This is best accomplished by using a syringe or pipette to force a solvent such as methyl or isopropyl alcohol or acetone through the tubing and then drying it with clean, dry compressed air or carrier gas.

CAUTION: Exercise good laboratory safety practices when using solvents, particularly when subjecting them to pressure.

14.5 Fitting Assembly

1. Slide the nut and ferrule onto the tubing in the order shown in Figure 11.
2. Insert this assembly into the fitting detail, screwing the nut in two or three turns by hand.
3. Push the tubing all the way forward into the detail so that it seats firmly. This isessential for a proper zero dead volume connection.
4. Manually turn the nut into the detail until it is finger tight.
5. Using the appropriate wrench, turn the nut 1/4 turn (90°) past the point where the ferrule first starts to grab the tubing. Fittings larger than 1/8" will require more than 1/4 turn (as much as 120°). The amount of force required can vary considerably due to the friction between the nut and the threads and the composition and wall thickness of the tubing used. Because of these variables a torque specification is unreliable.
6. Remove the fitting and inspect it. When made up properly, the ferrule may be free tospin axially on the tubing, but should have no lateral movement along the tubing. If the ferrule moves laterally, reinstall the fitting into the detail and tighten it another 1/8 turn past finger tight.
7. Remove, reinspect, and repeat, if necessary.

PART D: MISCELLANEOUS

Section 15.0 Power Management 15.1 General

CAUTION: Do not remove or defeat the grounding pin on the power plug. Contact an electrician if you are not sure whether the wall outlet is properly grounded.

15.1.1 AC Power

The BLC-10/10C/11C's AC power configuration is shown at the rear panel on the Corcom above the power cord inlet hole. Plug the AC power plug into a ***grounded***, operating 115 VAC outlet (or 230 VAC if so required).

A different power system must be supplied for use at 100 volts AC

15.1.2 DC Power Supply

DC power for the system (detector and pump) is provided by the BLC-10/10C/11C's isolation transformer. The Corcom power module manages voltages for 110/115 or 220/240 volts AC. Selection is accomplished as described below.

15.2 Power Entry Module

15.2.1 Description

The BLC-10/10C/11C Corcom power entry model (referred to as "the Corcom"), provides dual voltage selection integrated into the fuse holder. It has a SPST switch for switching mode power supplies (jumper types) designed for the dual primary transformer.

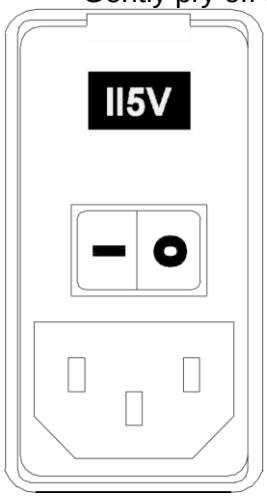
The fuse holder can hold two 5 x 20 mm (supplied). 250V fuses are required.

The Corcom provides general filtering for both line-to ground and line-to-line noise and will generally allow compliance with FCC and EC limits for line power supplies.

The Corcom also provides an RF shield of the filter components. The shield covers the filter portion of the module and increases performance of the filter by protecting the components from radiated noise. The shield improves RF ground connection to the case.

15.2.2 Changing Voltages (Conversion)

WARNING: Unplug the power cord before checking fuses.



Gently pry off the Corcom panel cover plate with a small flatbladed screwdriver to access to the voltage fuses. Remove the fuses and set them aside. Check the replacement fuses to ensure that they are for the correct voltage conversion (see below). Rotate the fuse holder 180° to make the voltage conversion. Seat the correct fuses into the clips on the holder. Smaller 5 x 20 mm fuses must be located towards the rear of the fuse holder. Reinsert the power entry fuse holder with the correct voltage showing through the small window.

15.3 Fuse Replacement

Five fuses protect the BLC-10/10C/11C system. Two of the fuses are located in the power entry module (Corcom) at the rear of the cabinet and are in series with the AC input line. One fuse is located on the pump control circuit board and is in series with the 38 Vdc supply. The last two are located on the detector signal processor circuit board and are in series with the on-board 10VAC transformer.

Troubleshooting the fuses is straightforward. If the power cord is plugged in and the on/off power entry switch is on, and the pump display and a detector Range LED do not light, check the two fuses in the power entry module.

WARNING: Unplug power cord before checking fuses.

To gain access to the Corcom fuses, gently pry off the cover plate with a small flat-bladed screwdriver. Replace with fuses of the correct rating shown below. Smaller 5 x 20 mm fuses must be seated in the rear of the fuses holder. Insert the power entry fuse holder with the correct voltage showing through the small window.

WARNING: Unplug power cord before removing cabinet lid.

If the pump front panel appears to function normally but the pump motor does not run, check the fuse located on the circuit board. Replace it with a pump fuse as shown below.

If the detector front panel is not lighted but the pump display is, check the fuses located on the signal processor circuit board. Replace defective fuses with a detector fuse below.

Fuse, Corcom 115V, 5 x 20 mm, SLO-BLO, 250V, 1A
Fuse, Corcom 230V, 5 x 20 mm, SLO-BLO, 250V, 1/2A
Fuse, Detector, 5 x 20 mm, FAST, 250V, 200mA
Fuse, Pump, 5 x 20 mm, FAST, 250V, 5A

Front panel failures may also be caused by a connector which has become dislodged from the circuit board.

16.0 Preparation for Storage or Shipping 16.1 Isopropanol Flush

Disconnect the flush tubing from the pump. Insert the inlet filter into isopropanol. Use the syringe to draw a minimum of 50 mL through the pump. Pump a minimum of 5 mL of isopropanol to exit.

16.2 Storage

Place the inlet filter in a small plastic bag and attach it to the tubing with a rubber band. Seal the solvent inlet port with the 1/8" shipping plug and place the cap at the column end of the tubing.

Clean the detector with an Isopropanol solution. Then drain and dry it and its tubing.

16.3 Shipping

Depending on the conditions and length of time the system will be in transit, the BLC10/10C/11C can be shipped with the tubing connected to the pump and the pulse damper. Other wise, flush the pump and seal it with the 1/8" and 1/16" plugs. Flush and seal the pulse damper with the remaining two 1/16" plugs. Drain and dry the rest of the system. Ship the column according to the manufacturer's instructions.

CAUTION: Reship in the original carton, if possible. If the original carton is not available, wrap the system in several layers of bubble wrap and cushion the bottom, top, and all four sides with 2" of packaging foam. Although heavy, the BLC10/10C/11C is a delicate instrument and must be carefully packaged to withstand the shock and vibration of shipment.

Section 17.0 Troubleshooting Guide

You Notice	This May Mean	Possible Cause	You Should
1. Uneven pressuretrace. 2. Pressure drops. 3. No flow out theoutlet check valve.	1. Bubble incheck valve. 2. Leaks insystem. 3. Dirty checkvalve. 4. Bad checkvalve.	1. Solvent not properlydegassed. 2. Fittings are not tight. 3. Mobile phase not properlyfiltered. 4. Particles from worn pistonseal caught in check valve. 5. Plugged inlet filter.	1. Check to be certain that mobile phase isproperly degassed. 2. Check connections for leaks by tighteningfittings. 3. Prime the system directly from the outletcheck valve. 4. Clean or replace the check valves. SeeSections 13.2.3 and 13.3. 5. Clean or replace inlet filter. See Section 13.1.
1. Uneven pressuretrace. 2. Pressure drops. 3. Fluid between thepump head and the retainer.	1. Leaks insystem. 2. The pistonseal or diaphragm is worn.	1. Fittings not tight. 2. Long usage time since lastseal / diaphragm change. 3. Salt deposits on seal ordiaphragm (especially if buffered aqueous mobile phases are used).	1. Check all connections for leaks. 2. Replace piston seal & diaphragm. SeeSections 13.2.1 through 13.2.3. 3. Check the piston for salt deposits. Clean asnecessary. See Section 13.2.3.2.
Pump makes a loud clanging or slapping noise (intermittent contact with cam).	Piston carrier is catching in piston guide.	1. Cap nut screws on the pumphead are loose. 2. Seal(s) are worn. 3. Piston guide is worn	1. Check cap nut screws on pump head. Tighten if necessary. 2. Replace seals. 3. Replace piston diaphragm and seals. SeeSections 13.2.2 and 13.2.4.

No power when pump turned ON.	Blown fuses in the power entry module.	1. Power surge. 2. Internal short.	1. Replace only with the appropriate fuses (1Afor 100/110 Vac or 1/2A for 220/240 Vac). 2. Check board.
Front panel appears OK but pump motor does not run.	Blown fuse on the circuit board.	1. Power surge. 2. Internal short.	1. Replace only with the appropriate fuse . 2. Check board.
PEEK fittings or components leak.	Interference with fittings seal	1. Film of fluid betweensurfaces. 2. Salt crystals betweensurfaces. 3. Scratches in mating surfaces.	1. Clean and dry mating surfaces. 2. If scratched, replace defective part.
Self-flush heads leak flush solution.	Flush area not sealed.	1. Large (Size 016) O-ring isflattened and no longer seals. 2. Head not sufficientlytightened. 3. Scratches in mating surfaces. 4. Leaky self-flush seal.	1. Replace O-ring. 2. Tighten head. 3. Replace leaky parts.
Blue Liquid appears in the solvent line.	Ruptured Pulse Damper diaphragm.	Rapid decrease in pressure.	Replace Ruptured Pulse Damper diaphragm. Order repair kit from Dealer/ Sales Representative.
Spurious noise in the detector readout	Dirty Flowcell. Air in line. Bad lamp. External influence	1. Leak in system. 2. Incomplete chromatographyin previous run. 3. Lamp at end of useful life or isdamaged in transit. 4. Torque on the chassis 5. Temperature fluctuation	1. Check system for leaks. 2. Use back pressure if necessary. 3. Clean cell with acid wash then rinse withsolvent being used. 4. Change/replace lamp. 5. Ensure control panel is closed. 6. Attempt to stabilize ambient temperature.

Section 18.0 Accessories, Replacement and Spare Parts

18.1 Detector

	PART NO.	NOTES
REPLACEMENT ENERGY SOURCES		RSP, Tech
Lamp, 254 nm with UV blocking tape (BLC-10 Bayonet Style)	025-0024	
Lamp Assembly, 254nm (PSLS - "C" Series)	025-0143	
Lamp Assembly, 280nm (PSLS)	025-0144	
Lamp Assembly, 365nm (PSLS)	025-0145	
Lamp Assembly, 420nm (PSLS)	025-0146	
Lamp Assembly, 505nm (PSLS)	025-0147	
WAVELENGTH CONVERSION KITS/REPLACEMENT FILTERS		
254nm Conversion Kit (Lamp/Filter) (PSLS)	025-0138	
280nm Conversion Kit (Lamp/Filter) (PSLS)	025-0139	
365nm Conversion Kit (Lamp/Filter) (PSLS)	025-0140	
420nm Conversion Kit (Lamp/Filter) (PSLS)	025-0141	
505nm Conversion Kit (Lamp/Filter) (PSLS)	025-0142	

280nm Filter (PSLS)	025-0002	
365nm Filter (PSLS)	025-0003	
420nm Filter (PSLS)	025-0004	
505nm Filter (PSLS)	025-0005	
254nm Filter (PSLS)	025-0148	
Other Wavelength Conversion Kits/Lamps/Filters	Contact Dealer	
FLOWCELL ASSEMBLIES		
Analytical: 7mm, 13 µL, PEEK	025-0022	RSP
Prep, 2.5 mm, 44 µL, 1/8 tubing	025-0021	RSP
Semi-Prep, 2.0 mm, 4 µL, 1/16 tubing, PEEK	025-0085	RSP
FLOWCELL FITTINGS & TUBING		
Nut, Flangeless, Delrin, 1/16" ID 10pc/pkg	025-0047	RSP
Ferrule, Flangeless, Tefzel, 0.030" ID 10pc/pkg	025-0048	RSP
Tubing, TFE Teflon, 1/16" OD, 0.010" ID 5ft	025-0066	RSP
Tubing, TFE Teflon, 1/16" OD, 0.030" ID 5ft	025-0050	
Nut, Flangeless, Delrin, 1/8" ID (Prep) 10pc/pkg	025-0051	
Ferrule, Flangeless, Tefzel, 1/8" ID (Prep & Inlet Filter) 10pc/pkg	025-0052	
Tubing, TFE Teflon, 1/8" OD, .062" ID, Blk (Prep) 5ft	025-0054	
FLOWCELL PARTS		
Flowcell Rebuild Kit (Analytical) Includes: windows/ gaskets/screws,/washers/springs	025-0045	RSP
Window, Analytical flowcell, PEEK [380-0001] 10pc/pkg	025-0030	RSP
Gasket, Analytical flowcell TFE Teflon [040-0005] 10pc/pkg	025-0031	RSP
Body, Analytical flowcell[040-0002]	025-0032	
Clamp, Analytical flowcell [040-0030]	025-0033	
Holder, Analytical flowcell [040-0029]	025-0034	
Belleville Spring [282-0003] 20pc/pkg	025-0035	
Cell mount [040-0013]	025-0046	
Quartz cylinder, Prepcell	025-0015	

Continued on next page

LEGEND: RSP = Recommended spare part Tech = Maintenance Technician Recommended

	PART NO.	**NOTES**
PHOTOCELL ASSEMBLIES		
UV - 254, 280 and 365 nm	025-0023	RSP, Tech
VISIBLE Wavelength	025-0020	Tech

RECORDER/INTEGRATOR CABLE	025-0026	
REMOTE CONTROL CABLE, *UNIVERSAL*	025-0268	
REMOTE CONTROL CABLE, *Star-Chrom*™ (Double Ended)	025-0268-1	
PC BOARDS	Contact Dealer	Tech

18.2 Liquid Handling

PUMP

Check Valve Capsules, Replacement, PEEK 2pc/pkg	025-0007	RSP
Piston assembly, 10 mL	025-0010	
Piston seal kit, 10 mL	025-0006	
Cable Adapter RJ-11 to DB25	025-0058	
Cable Adapter RJ-11 to DB9	025-0059	
Modular RS-232 Cable	025-0060	
PC BOARDS	Contact Dealer	Tech

TUBING AND OTHER FITTINGS

Tubing, PEEK, 1/16" OD, 0.030" ID 5ft	025-0049	
Tubing, PEEK, 1/16" OD, 0.010" ID 5ft	025-0061	
Tubing, TFE Teflon, 1/8" OD, .085" ID (Inlet Filter) 5ft	025-0053	
Solvent Inlet filter Assembly, 20 micron	025-0067	
Replacement 20 micron filter elements for 025-0067 10pc/pkg	025-0029	RSP
Nut (pump), 1/16" (for outlet tubing) 10pc/pkg	025-0012	RSP
Ferrule, double-ended, 1/16" (for tubing) 10pc/pkg	025-0013	RSP
Plug, column #10-32, PEEK 10pc/pkg	025-0062	
Plug, column 1/4"-28, PEEK 10pc/pkg	025-0063	
Nut, flangeless, 1/8" ID, PEEK (Inlet Filter) 10pc/pkg	025-0068	
PULSE DAMPER REPAIR KIT	025-0009	
PRIME/PURGE VALVE SEAL KIT	025-0008	

INJECTION VALVE

Ferrule, C2 ,Injection Valve, PEEK 10pc/pkg	025-0040	
Nut, 1/16" C2, Injection Valve, PEEK 10pc/pkg	025-0042	
Sample loop, 20 ul, Replacement, C2, Injection Valve, PEEK	025-0064	
Rotor, Replacement, C2, Injection Valve, PEEK	025-0065	

Stator, Replacement, C2, Injection Valve, PEEK	Contact Dealer	
FUSES:		
Fuse, Detector, 5 x 20 mm, FAST, 250V, 200mA 20pc/pkg	025-0118	RSP
Fuse, Pump, 5 x 20 mm, FAST, 250V, 5A 20pc/pkg	025-0055	RSP
Fuse, Corcom 115V, 5 x 20 mm, SLO-BLO, 250V, 1A 20pc/pkg	025-0056	RSP
Fuse, Corcom 230V, 5 x 20 mm, SLO-BLO, 250V, 1/2A 20pc/pkg	025-0057	RSP
POWER CORD, N. AMERICA, NEMA 5-15/IEC320	025-0091	
POWER CORD, INTERNATIONAL, CEE 7STD/IEC 320	025-0108	

Continued on next page

LEGEND: RSP = Recommended spare part Tech = Maintenance Technician Recommended **PART NO. NOTES**

REPLACEMENT ACCESSORY KIT (Cable, Tools, Clips, Fuses)	025-0011
OPERATOR'S MANUAL (Paper Copy)	050-0003
TRANSPORT CASE, SUITCASE STYLE	025-0038
TRANSPORT CASE, RUGGED ATA STYLE	025-0039

LEGEND: RSP = Recommended spare part Tech = Maintenance Technician Recommended

Section 19.0 Trademarks

Trademarks used in this manual are for identification purposes only and are the property of their respective trademark owners:

Delrin, Teflon and Tefzel - duPont;
PEEK - ICI;
Cheminert, PAEK - VICI/Valco;
Omnifit - Omnifit Corp.;
Corcom - Corcom, Inc.