



# Flash-150 Binary Chromatography Pump

## Operator's Manual

90-2592 - revision A



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## **WARNING**

If using flammable solvents, Scientific Systems, Inc. recommends locating this pump in a well-ventilated environment designed for the safe handling of these materials. This environment should comply with all federal, state, and local regulations. It should also comply with your organization's safety plan regarding chemical and hygiene mishaps. Good laboratory practices and standard safety procedures should be followed at all times.

## **SAFETY SYMBOLS**



**Earth Ground**



**Caution – Refer to Manual**



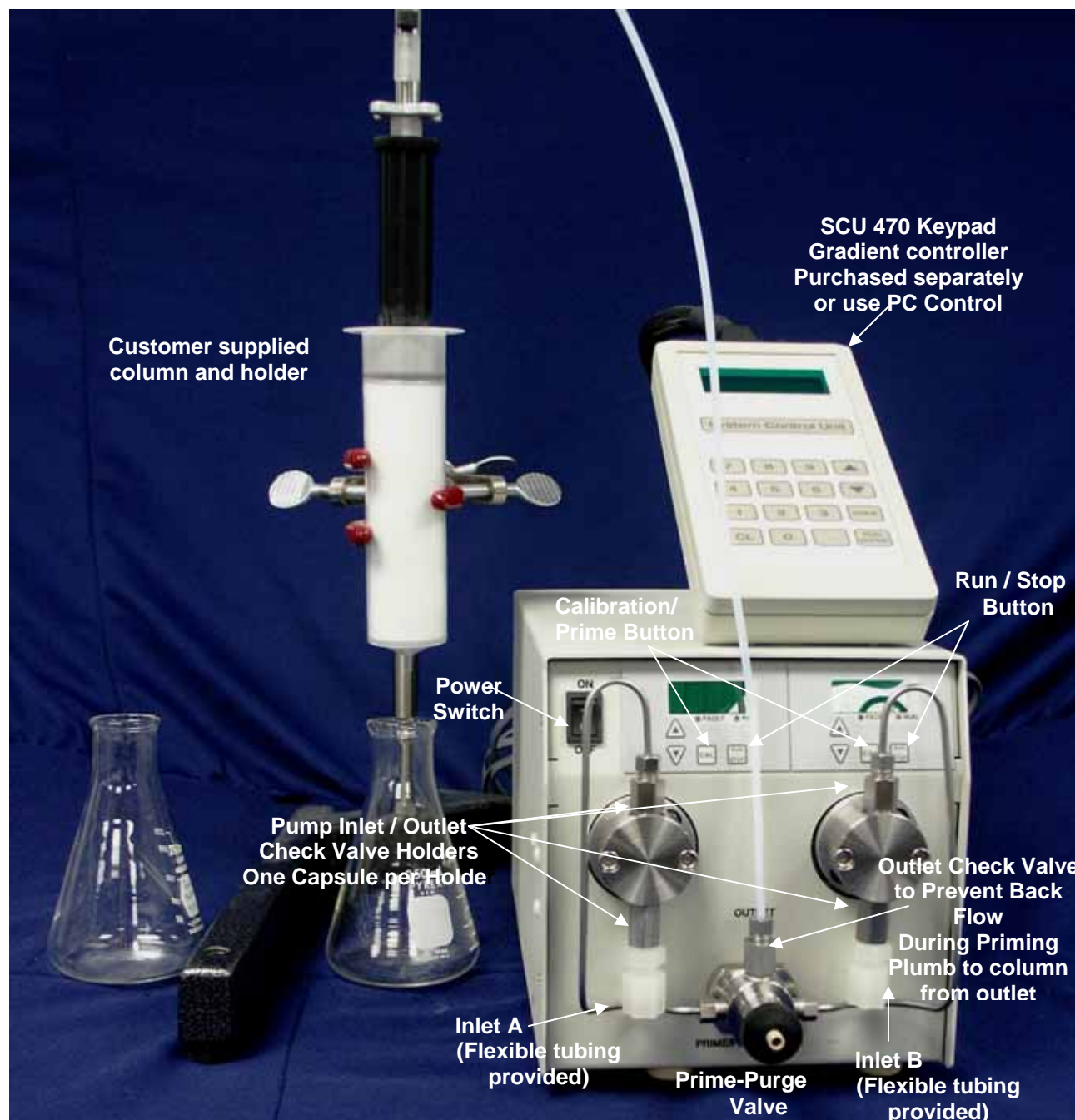
**Caution – High Voltage**



# 1. INTRODUCTION

This operator's manual contains information needed to install, operate, and perform minor maintenance on the **Flash 150 Pump**.

**Typical Flash 150 Application below Showing SCU 470 Controller for gradient control and typical flash column**



## 1.1 Description of the Flash 150 Pump

### High Performance at a Low Cost

- The **Flash 150** pump is specifically designed to meet the binary gradient requirements of most Flash Chromatography applications at a very economical price. Standard features include digital keypad control and RS-232 interface.

### Wide / Accurate Flow & Pressure Range

- The **Flash 150** is two single piston, positive displacement (piston) pumps that delivers precise flow rates up to 150 ml/minute each. Flow accuracy is constant across the flow range, regardless of backpressure (up to 200 psi).

### Easy Maintenance

- All Scientific Systems pumps are known for fast, easy maintenance. Check valves and seals (the only items that may require replacement) are readily accessible.

### The Best Performance per Investment

- Superior to Gear, Diaphragm and Peristaltic pumps, the **Flash 150** utilizes HPLC pump technology, providing greater performance at an equivalent cost to lesser functioning products.

### Features

- Single head rapid refill Design for High Flow & Low Pulsation
- Ceramic Pistons and High Performance UHMWPE, HPLC-grade Seals
- Ceramic Ball & Seat Check Valves
- Universal Voltage Input: **100 – 240 VAC / 50 – 60 Hz**
- Constant Flow Performance with Varying Back Pressure
- Accurate Flow Rate and No Loss of Prime with Hexane, Methylene Chloride and other Light Solvents
- Combination Prime-Purge Valve / "T" / Single-Port Outlet (1/8")
- Additional Outlet Check Valve to Prevent Backflow during Priming
- All-Stainless Steel Fluid Path (unless otherwise indicated – pistons, check valves & seals)
- Fluid Path Isolated from Electrical Components
- Interactive Digital Keypad, RS-232 PC Control & Monitoring, 75 ml/min prime purge function
- Fine-Tune Flow Calibration Set-Up Function: **2% increments to ±10% at 150 ml/min.**

## Flash 150 Pump

- *EZChrom* Driver available
- *SCU 470* controller available

### 1.2 Wetted Pump Materials

Pump heads, check valve bodies, and tubing are fabricated from Grade 316 Stainless Steel. All of these parts have been thoroughly cleaned and passivated. Other materials are zirconia, ruby, sapphire, and aluminum oxide (check valve internals and piston). The piston seal is constructed primarily of Ultra High Molecular Weight Polyethylene (UHMWPE) with a Stainless Steel internal spring. The inlet manifold is constructed of Teflon and the tubing is 1/4-inch FEP.

### 1.3 Specifications for the Pump

**Flow Rate:** 0.1 – 150.0 ml/min for each pump

**Max. Pressure:** 200 psi (across the flow range)

**Flow Accuracy:**  $\pm 3\%$  (10 – 250 ml/min) (Note: May vary with solvent)

**Supply Voltage Rating:** 100 – 240 VAC

**Frequency:** 50 – 60 Hz

**Current Rating:** 1/2 A

**Dimensions:** 7.0" W x 12.0" D x 7.5" H

**Weight:** 20 lbs



## 2. Installation

### 2.1 Unpacking and Inspection

Prior to opening the shipping container, inspect it for damage or evidence of mishandling. If it has been damaged or mishandled, notify the carrier before opening the container. Once the container is opened, inspect the contents for damage. Any damage should be reported to the carrier immediately. Save the shipping container. Check the contents against the packing list.

### 2.2 Location/Environment

The preferred environment for the **Flash 150 Pump** is normal laboratory conditions. The area should be clean and have a stable temperature and humidity. The specific temperature and humidity conditions are 10 to 30 °C and 20% to 80% relative humidity. The instrument should be located on a stable flat surface with surrounding space for ventilation and the necessary electrical and fluid connections.

(Reference IEC 1010 installation category II, and Pollution degree 2 environment)

### 2.3 Fluid Connections & Priming

There are only 3 connections to be made. At the Inlet Manifolds, connect the flexible inlet tubing provide with the system. The fitting is 1/8" NPT for 1/4-inch tubing (FEP) with compression fitting.

At the Outlet, remove the black protective cap. Install your 1/8-inch Stainless Steel tubing with high pressure CPI (Parker) nut & ferrule.

**OUTLET**  
Install your 1/8-inch  
Stainless Steel tubing  
with high pressure CPI  
(Parker) nut & ferrule

**INLET**  
Install flexible inlet  
tube (provided).  
Fitting is 1/8" NPT for  
1/4-inch tubing (FEP)



## Flash 150 Pump

**Next, prime each pump, as shown below.**

- Turn power on.
- Open prime purge valve by turning counterclockwise 2 complete turns
- Draw on syringe until approximately 15 mL of fluid comes through.
- Continue to draw on syringe until no bubbles are seen.
- Close prime purge valve.
- To aid in priming, the pump may be run by pressing the Cal button. However, this is generally not required.
- Note: The **Flash 150** pump does not have a Prime button but the Cal button serves this purpose and sets the flow rate to 75 ml/min.

The Cal button is used to Prime pump at 75 ml/min

Place syringe on Prime Purge Valve open 1.5 turns and draw fluid



## 2.4 Electrical Connection

The system utilized Universal Switching Power Supplies, and will accept voltages from 90 – 240 VAC, 50-60 Hz.

**WARNING:** Do not bypass the safety ground connection as a serious shock hazard could result.

## 2.5 Solvent Preparation

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 out-gassing and cavitation. Filtration of HPLC solvents is also required.

### 2.5.1 Cavitation

Cavitation occurs when inlet conditions restrict the flow of solvent and vapor bubbles are formed during 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.

Placing the solvent reservoirs below the pump level also promotes 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.

### 2.5.2 Filtration

Solvent filtration is good practice for the reliability of the **Flash 150** Pump. Solvents should be filtered with a 0.5 micron filter prior to use. This ensures that no particles will interfere with the reliable operation of the piston seals and check valves. Solvents in which buffers or other salts readily precipitate out will need to be filtered more often. After filtration, the solvents should be stored in a closed, particulate-free bottle.

**Note:** During operation, the supplied stainless steel inlet filter should be used.

## 2.6 Instrument Installation

### 2.6.1 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. These steps minimize pressure losses on the inlet side of the pump during refill and help to avoid bubble formation. These steps are particularly important when using high vapor pressure solvents (hexane, methylene chloride, etc.). Mobile phases should be filtered and covered. (See Section 2.4.)

## 2.7 Preparation for Storage or Shipping

### 2.7.1 *Isopropanol Flush*

Disconnect the outlet tubing from the pump. Place the inlet filter in isopropanol. Use a syringe to draw a minimum of 50 ml through the pump. Pump a minimum of 5 ml of isopropanol to exit. Leave the inlet tubing connected to the pump. Place the inlet filter in a small plastic bag and attach it to the tubing with a rubber band. Plug the outlet port with the shipping plug or leave a length of outlet tubing on the pump or cover the outlet port with plastic film.

### 2.7.2 *Packaging for Shipping*

**CAUTION:** Reship in the original carton, if possible. If the original carton is not available, wrap the pump in several layers of bubble wrap and cushion the bottom, top, and all four sides with 2" of packaging foam. Although heavy, an HPLC pump is a delicate instrument and must be carefully packaged to withstand the shocks and vibration of shipment.

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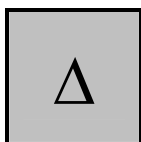
## 3. OPERATION

### 3.1 Pump Front Panel Controls and Indicators

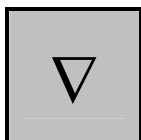
#### 3.1.1 Digital Display

Each pump has a 3-digit display which shows the pump flow rate (mL/min). The display is also used for various Power-Up settings (see below).

#### 3.1.2 Digital Display Pump Keypad



When pressed, this button increases the flow rate.



When pressed, this button decreases the flow rate.



Used for Flow Rate Calibration. This is a Power-Up setting and is fixed while power is supplied to the unit. See below. Acts as Prime button and sets flow to 75 ml/min in normal operation.



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

Fast And Slow Button Repeat On The Up And Down Arrow Buttons: If the UP-ARROW or DOWN-ARROW button is held down for more than approximately one half of a second, the button press will repeat at a slow rate of approximately 10 times a second. Once slow button repeat has begun, fast button repeat can be initiated by using a second finger to press down the second arrow button. During fast button repeat, the button press will repeat at a rate of approximately 100 times a second. Switching back and forth between repeat speeds can be accomplished by pressing and releasing the second arrow button while keeping the first arrow button held down.

#### 3.1.3 Power-Up Flow Rate Calibration

The **Flash 150** includes a calibration feature to improve flow rate accuracy for the wide variety of solvents that may be used with the pump.

The Flash 150 is intended to be operated with backpressure greater than 10 PSI

This unit includes an in-line check valve which is necessary for the pumps reliable operation.

## Flash 150 Pump

Flow calibration is based on water, with the in-line Pressure Regulator (75 PSI) installed just after the pumps outlet.

Flow calibration can be adjusted to incorporate flow characteristics of various solvents, by using a “Cal” number, which is built into the pumps programming.

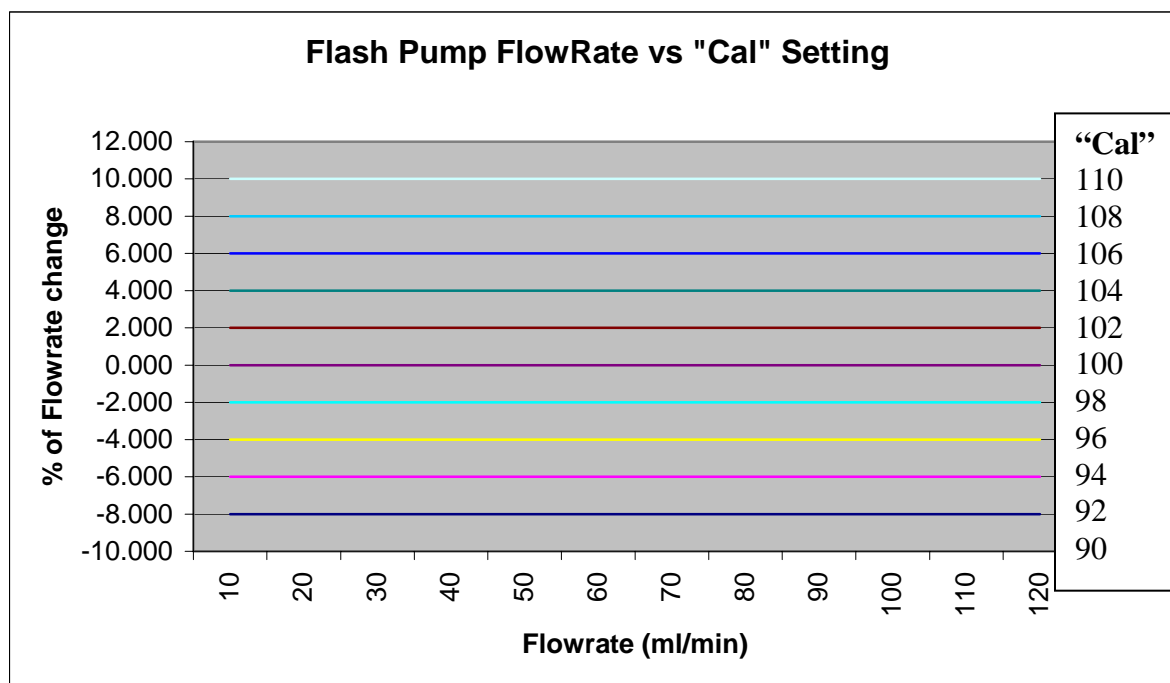
The function is available at power up for the pump.

While turning on the power depress the Prime key (may be unlabeled on early models).

Factory default is “100”( % of factory setting). And resetting the pump will reset this variable to “100”.

Increase or decrease this by using the UP or DOWN arrow keys.

Each step will change the actual flow at 125 ml/min by 1% across the flow rate range.



Serial Communication can be used to change the “Cal” setting.

See manual for protocol.

The command for the calibration is p $cx$ . (i.e. PC10 for factory value, PC20 for a 10% increase or PC00 for a 10% decrease)

### 3.1.4 Power-up Configuration

**Non-volatile Memory Reset:** If the pump is operating erratically, there is the possibility that the memory has been corrupted. To reset the memory and restore the pump to its default parameters, press and hold the UP-ARROW

## Flash 150 Pump

button when the power is switched on. Release the button when the display reads "rES". The parameters stored in non-volatile memory, i.e., the flow rate, the pressure compensation, the voltage/frequency select, the lower pressure limit, and the upper pressure limit will be set to the factory default values. The head type setting is the only parameter not changed by the non-volatile memory reset function. If the firmware is upgraded to a newer version, a non-volatile memory reset will automatically occur the first time the power is switched on.

### **Keys to Hold Down**

UP ARROW & RUN/STOP

UP ARROW

PRIME

### **Routine Enabled**

Display Software Version

Reset to Factory Settings

Set Flow Compensation

### **3.1.5 Power-Up Tests**

Display Software Version Mode: The software version can be displayed during power-up by pressing and holding the RUN/STOP and the UP-ARROW buttons when the power is switched on. Release the buttons when the display reads "UEr". The decimal point number displayed on the display is the software version. To exit this mode, press the RUN/STOP button.

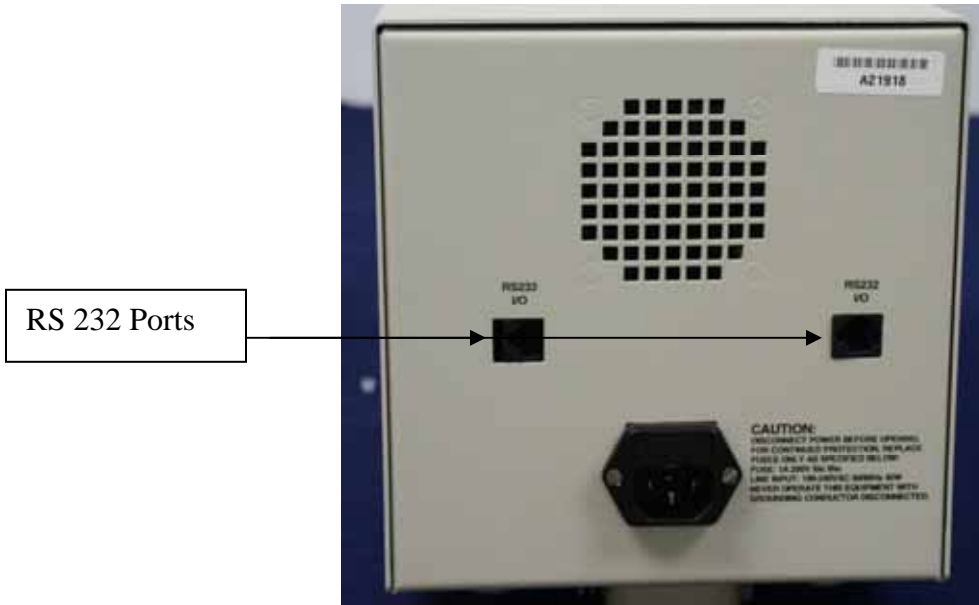
### **3.1.6 Prime Function**

Cal button normal operation mode: The Cal button in normal operation sets the pump to the prime mode at 150 ml/min. To get out of the prime mode press the run stop button.

## **3.2 Rear Panel Remote Input**

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

## Flash 150 Pump



See Appendix A for details on connection and operation.

### 3.3 Symbols

The following symbols may appear on back panel of the unit:



**Caution:** To avoid electrical shock and possible injury, remove the power cord from the back panel of this equipment before performing any type of service procedures.



#### **Earth Ground**

**Note:** The user shall be made aware that, if equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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## 4. MAINTENANCE

Cleaning and minor repairs of the **Flash 150** 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.

### 4.1 Pump Heads and Piston Seals

#### 4.1.1 Removing the Pump Head

1. Turn OFF the power to the **Flash 150** pump.
2. Remove the inlet line from the mobile phase reservoir, or remove the line from the inlet manifold by turning the white Teflon nut. This nut will generally loosen by hand.
3. Using a suitable wrench, remove the outlet line from the outlet check valve but turning the nut.
4. 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.

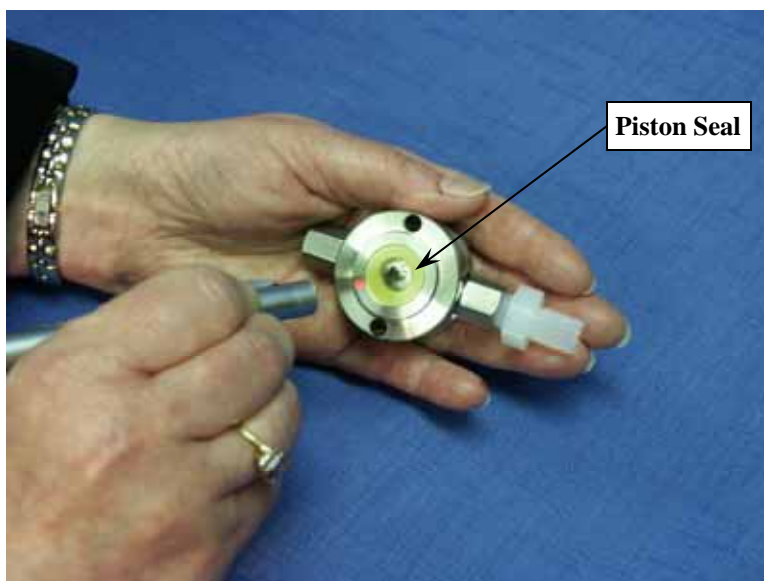
5. Carefully separate the pump head from the pump. Move the pump head straight out from the pump and remove it from the piston. Be careful not to break or damage the piston. Also remove the seal from the piston if they did not stay in the pump head.



### 4.1.2 Replacing Piston 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.

The correct replacement seal kit is shown in the List of Replacement Parts (Section 5 of this manual). The kit contains seals, a seal insertion/removal tool, a pad to clean the piston when changing the seal and instructions.



Note: If you choose to remove the piston seal, you should have a new one on hand to install after cleaning. It is not recommended that you reinstall the used piston seal since it is 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.

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

The pump head and check valves may be further cleaned using a laboratory 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.

## Flash 150 Pump

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

### Removing the Seals

1. Remove the pump head as described above.
2. Insert the flanged end of the seal insertion/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 above.

### 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.

### Replacing the Seal

1. Place a high pressure replacement seal on the rod-shaped end of the seal insertion/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 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 in the reverse order of removal.

### 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 the back pressure of about 10 psi or higher and a flow rate of about 50 ml/min.

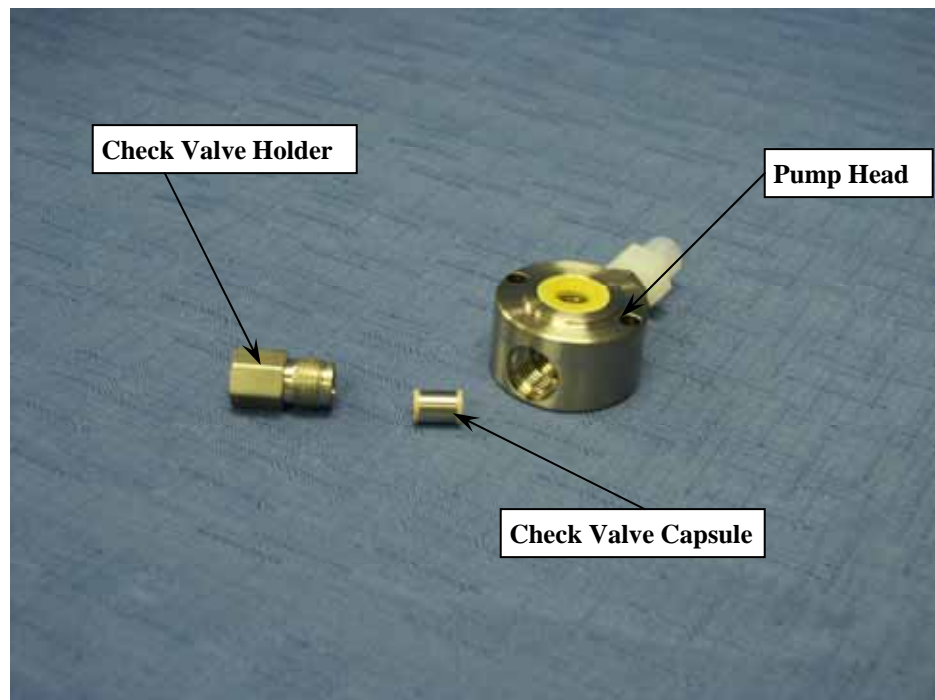
## 4.2 Pump Check Valve Cleaning and Replacement

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 20 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, the check valve should be replaced.

Using a suitable wrench, remove the check valve holder from the pump head. The check valve capsule will then be accessible as shown.

The correct replacement check valve kit is shown in the List of Replacement Parts (Section 5 of this manual). Ensure that the replacement check valve capsule is installed in the same orientation as the old check valve.

NOTE: Replace the check valve capsule in the prime purge valve in the same manner as those in the head.



To complete the installation, torque the check valve holder to 75 inch-pounds.

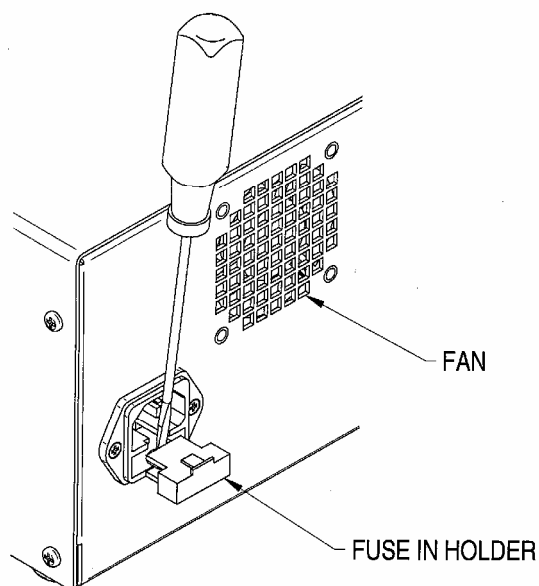
## 4.3 Lubrication

The **Flash 150** Pump has no 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.

#### 4.4 Fuse Replacement

Three fuses protect the **Flash 150** Pump. Two of the fuses are located in the power entry module at the rear of the cabinet and are in series with the AC input line. The other fuse is located on the circuit board and is in series with the 24 VDC supply.

Troubleshooting the fuses is straightforward. If the power cord is plugged in and the on/off power entry switch is on and the display does not light, check the two fuses in the power entry module. To gain access to these fuses, gently pry off the cover plate with a small flat-bladed screwdriver. Replace with fuses of the correct rating: 1 Amp slow-blo fuse, 2 required.



#### 4.5 Service Department

The **Flash 150** pump is designed for years of trouble-free operation with only routine maintenance outlined in this manual. However, if you have a problem with the pump or need parts information, contact the Scientific Systems' Service Department.

Scientific Systems, Inc.  
Attn: Service Department  
349 N. Science Park Road  
State College, PA 16803  
Toll free: 800-441-4752  
service@ssihplc.com  
[www.ssihplc.com](http://www.ssihplc.com)

#### 4.6 How to Ship Returns

Prior to returning the pump for factory repair, please contact the Service Department at Scientific Systems, Inc. Often problems can be solved in the field without the time and expense involved in factory repair.

If returning the pump for service is required, the Service Department will issue a Returned Goods Authorization number (RGA#). This number should be displayed prominently on the shipping box to expedite repairs.

Additionally, an *Instrument Contamination Form* needs to accompany the pump for its return. This form is available in the Service area of our website [www.ssihplc.com](http://www.ssihplc.com).

**Caution:** Reship the pump in original carton, if possible. If the original carton is not available, wrap the pump in several layers of bubble wrap and cushion the bottom, top, and all four sides with 2” of packaging foam. Although heavy, an HPLC pump is a delicate instrument and must be carefully packaged to withstand the shocks and vibration of shipment.

#### 4.7 Purchasing Parts

Section 6 lists the most commonly requested replacement parts for field maintenance or repair. These are normally stocked items available for immediate shipment. Virtually all components of the **Flash 150** pump are available, but delays in shipping may be expected for those un-stocked items.

Contact the Service Department at Scientific Systems, Inc. for parts information.

## 5. Troubleshooting

### Quick Guide to Problem Solving

| You Notice                                                                                                                                                        | This May Mean                                                                                                                                                        | Possible Cause                                                                                                                                                                                                                                                               | You Should                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Uneven pressure trace.</li> <li>2. Pressure drops.</li> <li>3. No flow out the outlet check valve.</li> </ol>           | <ol style="list-style-type: none"> <li>1. Bubble in check valve.</li> <li>2. Leaks in system.</li> <li>3. Dirty check valve.</li> <li>4. Bad check valve.</li> </ol> | <ol style="list-style-type: none"> <li>1. Solvent not properly degassed.</li> <li>2. Fittings are not tight.</li> <li>3. Mobile phase not properly filtered.</li> <li>4. Particles from worn piston seal caught in check valve.</li> <li>5. Plugged inlet filter.</li> </ol> | <ol style="list-style-type: none"> <li>1. Check to be certain that mobile phase is properly degassed.</li> <li>2. Check connections for leaks by tightening fittings.</li> <li>3. Prime the system directly from the outlet check valve.</li> <li>4. Clean or replace the check valves. See Section 5.4.</li> <li>5. Clean or replace inlet filter. See Section 5.1.1.</li> </ol> |
| <ol style="list-style-type: none"> <li>1. Uneven pressure trace.</li> <li>2. Pressure drops.</li> <li>3. Fluid between the pump head and the retainer.</li> </ol> | <ol style="list-style-type: none"> <li>1. Leaks in system.</li> <li>2. The piston seal or diaphragm is worn.</li> </ol>                                              | <ol style="list-style-type: none"> <li>1. Fittings not tight.</li> <li>2. Long usage time since last seal / diaphragm change.</li> <li>3. Salt deposits on seal or diaphragm (especially if buffered aqueous mobile phases are used).</li> </ol>                             | <ol style="list-style-type: none"> <li>1. Check all connections for leaks.</li> <li>2. Replace piston seal &amp; diaphragm. See Sections 5.2 and 5.3.</li> <li>3. Check the piston for salt deposits. Clean as necessary. See Section 5.2.4.</li> </ol>                                                                                                                           |
| <p>Pump makes a loud clanging or slapping noise (intermittent contact with cam).</p>                                                                              | <p>Piston carrier is catching in piston guide.</p>                                                                                                                   | <ol style="list-style-type: none"> <li>1. Cap nut screws on the pump head are loose.</li> <li>2. Seal(s) are worn.</li> <li>3. Piston guide is worn</li> </ol>                                                                                                               | <ol style="list-style-type: none"> <li>1. Check cap nut screws on pump head. Tighten if necessary.</li> <li>2. Replace seals.</li> <li>3. Replace piston guide and seals. See Sections 5.2 and 5.3.</li> </ol>                                                                                                                                                                    |
| <p>No power when pump turned ON.</p>                                                                                                                              | <p>Blown fuses in the power entry module.</p>                                                                                                                        | <ol style="list-style-type: none"> <li>1. Power surge.</li> <li>2. Internal short.</li> </ol>                                                                                                                                                                                | <ol style="list-style-type: none"> <li>1. Replace only with the appropriate fuses (1A for 100/110 Vac or 1/2A for 220/240 Vac).</li> <li>2. Contact service technician if problem persists.</li> </ol>                                                                                                                                                                            |
| <p>Front panel appears OK but pump motor does not run.</p>                                                                                                        | <p>Blown fuse on the circuit board.</p>                                                                                                                              | <ol style="list-style-type: none"> <li>1. Power surge.</li> <li>2. Internal short.</li> </ol>                                                                                                                                                                                | <ol style="list-style-type: none"> <li>1. Replace only with the appropriate fuse.</li> <li>2. Contact service technician if problem persists.</li> </ol>                                                                                                                                                                                                                          |



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## 6. List of Replacement Parts

| Part Number   | Description                              | Comments                                          |
|---------------|------------------------------------------|---------------------------------------------------|
| <b>880453</b> | Check Valve Capsule, 3/16" (5 per pack)  | 2 required per head<br>1 required for prime/purge |
| <b>880257</b> | Aqueous Seal, Flanged 3/8" (4 per pack)  | 1 required per head                               |
| <b>880101</b> | Replacement Control Board                | Re-use EPROM                                      |
| <b>880803</b> | Fuse 1A, Slow-Blo, 5x20 mm (10 per pack) | 2 required                                        |
| <b>880512</b> | Allen Nut, 10-32, SS (4 per pack)        | 2 required per head                               |
| <b>880971</b> | Micro Front Panel PCB                    | 1 required per pump                               |
| <b>880660</b> | Replacement Prime/Purge Valve Stem       | 1 required                                        |
| <b>880705</b> | Inlet Filter Assembly                    | 1 required per pump                               |



## APPENDIX A

### A.1 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 Appendix A for details on connection and operation.

#### A.1.1 Hardware Implementation

The RS-232 I/O serial communications 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:

| <u>Pin</u> | <u>Function</u>              |
|------------|------------------------------|
| 1, 6       | Ground                       |
| 2          | DSR (Input)                  |
| 3          | RXD (Input to Series I pump) |
| 4          | TXD (Output from pump)       |
| 5          | DTR (Output)                 |

Special wiring considerations: Use the following chart for interfacing the Series I pump serial communications port to either a 25-pin or 9-pin serial COM port on the computer.

| <u>Pump (RJ11)</u> | <u>Signal</u> | <u>IBM (DB25)<sup>a</sup></u> | <u>IBM (DB9)<sup>b</sup></u> |
|--------------------|---------------|-------------------------------|------------------------------|
| 1, 6               | Ground        | 7                             | 5                            |
| 2                  | DSR           | 20                            | 4                            |
| 3                  | RXD           | 2                             | 3                            |
| 4                  | TXD           | 3                             | 2                            |
| 5                  | DTR           | 6                             | 6                            |

<sup>a</sup> Jumper pins 4, 5, and 8 on DB25.  
<sup>b</sup> Jumper pins 1, 7, and 8 on DB9.

| <b>Cable</b>           | <b>Part Number</b> |
|------------------------|--------------------|
| Modular Cable          | 12-0677            |
| Adapter RJ-11 to DB9   | 12-0672            |
| Adapter RJ-11 to DB-25 | 12-0671            |

#### A.1.2 Hand-Shaking

The Series I 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.

## Flash 150 Pump

### A.1.3 Command Interpreter

The Series I 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:

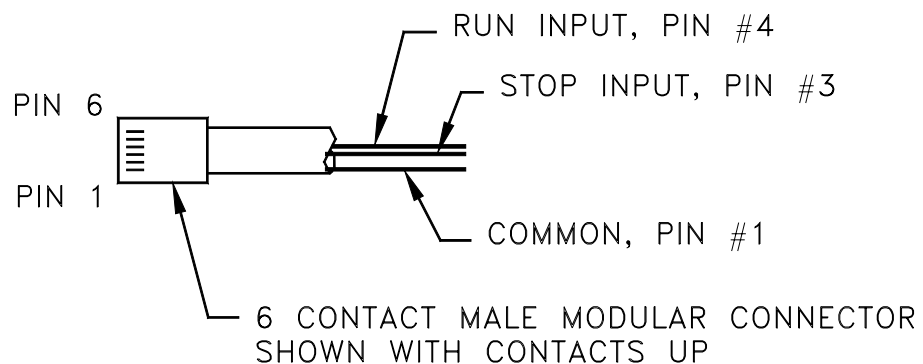
| Command | Response                                  | Comments                                                                                                                                                                                                                                                                                         |
|---------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RU      | OK/                                       | Sets the pump to the RUN state.                                                                                                                                                                                                                                                                  |
| ST      | OK/                                       | Sets the pump to the STOP state.                                                                                                                                                                                                                                                                 |
| 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/<br>(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/<br>(x.xx or xx.xx) | Reads the current pump setup, where:<br>x.xx or xx.xx = Flowrate in mL/min<br>y = Run status (0 = stopped, 1 = running)                                                                                                                                                                          |
| ID      | OK,vx.xx SR1X firmware/                   | Identifies the pump type and EPROM revision x.xx                                                                                                                                                                                                                                                 |
| RF      | OK,x/                                     | Reads the motor stall fault status, where:<br>x = 0 if no fault<br>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 Fluid compensation value, where xx = the calibration setting as a percent change in the flowrate (see section 3.1.3), Factory setting is "10"<br>i.e., xx = 01 for a calibration of 91% of factory flow, xx=10 for 100% of factory flow, xx=20 for calibration of 120% of factory flow. |
| RC      | OK,x/<br>(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:<br>x = 4 for a stainless steel Flash pump head<br>The pump is stopped; and initialized, when the head type is changed.                                                                                                                                           |
| RH      | OK,x/                                     | Reads the pump head type, where:<br>x = 4 for a stainless steel Flash pump head                                                                                                                                                                                                                  |

## Flash 150 Pump

|    |                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PI | OK,a.aa,b,c,d,1,0,0,0,0,0,e,<br>f,g,h,0,i,j,1/<br><br>(a.aa or aa.aa)<br>(c or cc) | Reads the current pump setup, where:<br>a.aa, aa.aa = Flowrate in mL/min<br>b = Run status (0 = stopped, 1 = running)<br>c or cc = Pressure compensation<br>d = Pump head type (1 = steel, 2 = plastic)<br>e = Priming (0 = no, 1 = yes)<br>f = Keypad lockout (0 = no, 1 = yes)<br>g = Pump run input (0 = inactive, 1 = active)<br>h = Pump stop input (0 = inactive, 1 = active)<br>i = Control mode (0 = LOCAL, 1 = REMOTE)<br>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.                                                                                                                                                                                                                                                                                                                                                                                                                             |
|    |                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### A.2 RUN/STOP

A brown, modular, 6-position, female connector (marked REMOTE I/O) on the rear of the cabinet allows access to the PUMP-RUN, PUMP-STOP and COM functions. The pump will RUN when the PUMP-RUN is connected (pulsed) to the COM (low) connection. The pump will STOP when the PUMP-STOP is connected (pulsed) to the COM (low) connection. The connection positions on the receptacle are #1 - COM, #3 - STOP IN, #4 - RUN IN. The other connections are not implemented in this unit and, to avoid malfunctions, wires in these positions should be insulated from all other conductors. If a modular cable is not supplied with the unit, one can be constructed from this description and the following diagram.





## **Warranty (Pumps and Column Ovens)**

The product described in this manual, other than seals, check valves, inlet/outlet filters, pistons, and pulse damper, is warranted against defective material and workmanship for a period of three (3) years from the date of shipment. Seals and valves, whether sold independently or as component parts of other products, are warranted against defective material and workmanship for a period of ninety (90) days from date of shipment. In the event of such a defect, SSI will repair or replace the product or necessary parts therein, at its discretion, and such repair or replacement shall be the sole remedy of this warranty. This warranty is subject to the following conditions:

1. Any servicing of the products must be performed by trained personnel.
2. The products must not be subjected to abuse or improper installation or application.
3. Warranty does not extend past thirty (30) days for transducer calibration, voltage calibration, and similar features that may be part of the product.
4. This warranty shall be void as to any products exposed to:
  - (i) highly corrosive chemicals including, but not limited to halide acids, halide salts, concentrated organic or inorganic acids and their salts, any concentrated chemical that will complex metal ions, and carbon tetrachloride which can contain significant amounts of hydrochloric acid; Tetrahydrofuran and high concentrations of chlorinated solvents (PEEK components);
  - (ii) foreign materials in the driving media or pumped media;
  - (iii) application of pressures beyond published ratings.

**THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THIS DESCRIPTION. SSI neither assumes, nor authorizes any person to assume for it, any other liability in connection with the sale and use of the products.**

**DAMAGES ARE LIMITED STRICTLY TO REPLACEMENT OF THE PRODUCTS. SSI EXPRESSLY DISCLAIMS LIABILITY FOR INCIDENTAL AND CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THE PRODUCTS.**

Claims covered by this warranty will be honored when presented within 30 days from discovery of defect.