BioFocus®
Capillary Electrophoresis/Mass Spectrometer Interface
Instruction Manual Addendum

This is an addendum to the BioFocus® Capillary Electrophoresis Systems Instruction Manual for the electrospray interface option for mass spectrometry. This addendum also gives added service information for the system, for the use of trained service personnel.

Table of Contents

Section 1.0 Introduction

1.1 General Description & Theory of Operation

The interface consists of a Capillary Cartridge Assembly Kit, additional parts to interface the capillary to the electrospray head, electronic parts to enable proper supply of electrospray current and sensing of capillary current, and optionally, a cart to hold and adjust the position of the BioFocus instrument.

The BioFocus performs electrophoretic separations normally, as described in the BioFocus System Instruction Manual. This interface provides a means to extend the capillary out of the BioFocus and into the electrospray interface of the mass spectrometer (MS). Inside the electrospray interface, the capillary end is surrounded by a sheath "make-up" flow as shown in Figure 1. The electrolyte in the sheath liquid completes the electrophoresis circuit. Optionally, a sheath gas can be used to reduce the formation of a corona discharge.

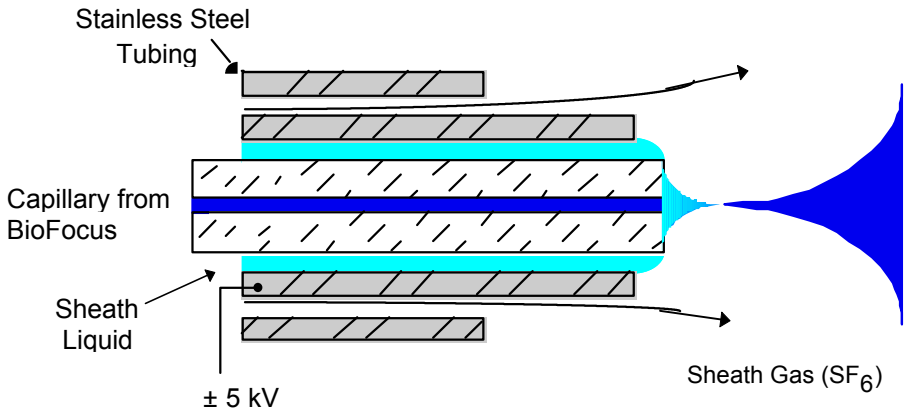

Figure 1. Sheath Flow and Sheath Gas Surround Capillary.

Sample bands migrate through the capillary, past the detector window, and continue to the end of the capillary. The capillary end is inside the electrospray interface. When the electrospray voltage is applied, a spray is formed consisting of the ions from the running buffer, sheath liquid, and sample. Desolvated ions formed during this process are subsequently accelerated into the mass spectrometer.

The complete CE/MS interface is shown as an exploded diagram in the diagram section of this manual and shows the mechanical parts. The liquid coupling is released and the outlet electrode is removed from the BioFocus cartridge holder. The User-Assembled Cartridge is fitted with a long capillary, enclosed in tubing for liquid temperature control. Coolant flows through the tube contained in the cartridge to a coupling junction, and then returns through another tube to the released cartridge liquid coupling. The end of

the capillary protrudes through the coupling junction and into the electrospray head. The junction slides on a support for capillary adjustment in the head.

The electronic parts consist of a modified Main Processor PCB, a modified feedthrough plate with switch and cabling, and a current bias resistor. Normally, BioFocus instruments sense and report capillary return current on the lowest two of three ranges (up to 50 µA), and delivered capillary current on the highest range (50 to 300 µA). It is not feasible to measure the returned current when running the capillary to an electrospray interface because the MS power supply and the electrospray head are grounded separately. Further, the electrospray current would also change the returned current reading in any case. The modified board allows for sensing of low and medium range delivered current when the switch is in the MS position, and return current through the outlet electrode in the CE position. The bias resistor allows two power supplies to be connected to a single load and maintain regulation. Without the resistor, under some conditions, the electrospray power supply would have to sink current instead of source current, and would lose regulation.

The Capillary Electrophoresis portion of the system works in a normal fashion, and peaks are detected at the window in the usual way by UV or visible absorbance. Upon leaving the capillary, sample migrates into the electrospray where it can be further analyzed. The only precaution from the CE side is that care must be exercised to prevent flow in the capillary caused by pressure differences. The vertically adjustable cart can accommodate a small range of pressure by adjusting the hydraulic pressure head.

The CE buffer used must be compatible with the electrospray system. The mass spec manufacturer's information should be consulted to avoid damage.

1.2 Specifications

Cartridge	Modified User Assembled
Capillary Length	70 cm minimum (total length)
Capillary Size	350 µm to 370 µm OD
Coolant	Distilled Water (for voltages below 20 kV) or Fluorinert™
Systems Supported	Finnegan ESI Probe Assembly, P/N 70005-60065
Bias Resistor	100 MΩ, 8 kV maximum
Current Sensing	
Accuracy	± 2 µA (mass spec mode)
Resolution	.02 µA on the 0-5 µA range .2 µA on the 5-50 µA range 2 µA on the 5-50 µA range

Maximum CE Current Ranges
For Positive CE Voltages:

$$Range = 100mA^{1} - \frac{ElectroSprayVoltage}{100 \times 10^{6}}$$

[1] The 100 µA is limited by the Finnegan system.

For Negative CE Voltages:

$$Range = \frac{ElectroSprayVoltage}{100 \times 10^{6}}$$

Section 2 Installation

2.1 Unpacking & Familiarization

All parts are contained in two boxes. Unpack and identify the parts of the kit per the list below. For ease of identification, most parts are illustrated in the diagram section. Note that the coolant port is a permanently attached part of the cartridge body.

ACCESSORIES BOX	**800-5676-01**	
Cartridge, Mass Spec	800-577-01	2 ea. assembled with unwindowed capillaries in albums
Coupling Tee Support	920-9304, 920-9305	
5 Snap Cases		
Inlet Seal Fitting	800-5674	2 ea.
Red Silicone Seal	920-9140	8 ea.
Optical Bench, Mass Spec	920-9261	
Retainer Wedge	920-9143	4 ea.
Retainer Pin, Mass Spec	920-9309	2 ea.
6-32 Set Screw	910-0824	
Retainer Pin	920-5691	2 ea.
Green 10-32 Tefzel Plug	920-2228	
1/4-28 Set Screw	910-1524	
6-32 x 1/4 Pan Head Screw	910-0681	
Outlet Barb Fitting	800-5675	2 ea.
Inlet Barb Fitting	920-4237	2 ea.
Ceramic Cleaving Square	910-9543	
Sandpaper	920-9147	
Inlet Seal Installation Tool	910-9203	
Bias Resistor Box	800-5759	
Ground Cable	900-1772	
Coupling Tee, Finnegan	920-9306	
PEEK Sleeve	910-4165	2 ea.
Polyurethane Foam Swabs	910-9541	3 ea.
1/8 Hex Key	920-9527	
Vacuum Grease	800-5662	
Long Fingertight Fitting	920-9303	
Cutting Allignment Tool	920-9113	
Outlet Adapter Assembly		
Outlet Adapter Liquid Coupling	920-9268	
Outlet Adapter	920-9255	
Friction Pin	920-9309	
Tubing	920-9155	12.5 inches
Ported Fitting, 3/32 Barb to 10-32	920-9274	
Coolant Return Assembly		
Swivel Fitting with 3/32 Barb	920-9273	2 ea.
Tubing	920-9155	11.4 inches
Tubing, 1/16 ID x 1/8 OD	920-9155	4 meters

Capillary, 50µm id, 360 µm OD, 1m	148-3062	2 ea. uncoated, with window
PTFE Guide Tube	920-9145	
User Manual	400-5009	

BOX 2: Interface and System Upgrade

Main PCB, Modified, MS	800-5563-01
Feedthrough plate, Modified, MS	800-5944

2.2 Physical Installation

The BioFocus instrument should be located as close to the electrospray head as possible. Leave enough room to open and close the carousel compartment door on the BioFocus, and to open and close the electrospray interface. If your purchase included the hydraulic cart from Bio-Rad, you can easily move the instrument into position. Make sure the BioFocus is centered on the top of the cart.

2.3 Electronics Installation

Notice: The electronics installation described in 2.2.1 and 2.2.2 below should only be done by Bio-Rad trained service personnel.

2.3.1 Modified Main Printed Circuit Board

1. Turn the BioFocus off, and unplug the power cord from the instrument at the back panel.

2. Remove the top cover by unscrewing the screw at the top of the back panel, opening the cartridge compartment, sliding the cover back, and lifting it off.

3. If the Main Printed Circuit board, 800-5563, is revision H or earlier, it needs to be replaced with the modified printed circuit board 800-5563-01. This board is held in place on the back panel by the mounting hardware for the 25 pin D connector, and by a screw to a bracket on the inside of the instrument.

Inspect the D connector hardware to see if mounting nuts are used. If so, care must be taken to prevent dropping the nuts into the chassis. On a BioFocus 3000, if these nuts are present, it is best to remove the Motor Driver and Motor Controller PCBs together first for easier access. Note the location of cable connectors before removing them from the PCB's.

Refer to Figure 2. Change out the Main Processor PCB, reinstall the other boards if they were removed, and reinstall all of the connectors. Be sure to observe the polarity of P2 on the end of the Motor Driver PCB. There will be a new connector, P8, at the end of the modified Main Processor PCB for the cable coming from the CE-MS select switch on the modified feedthrough plate.

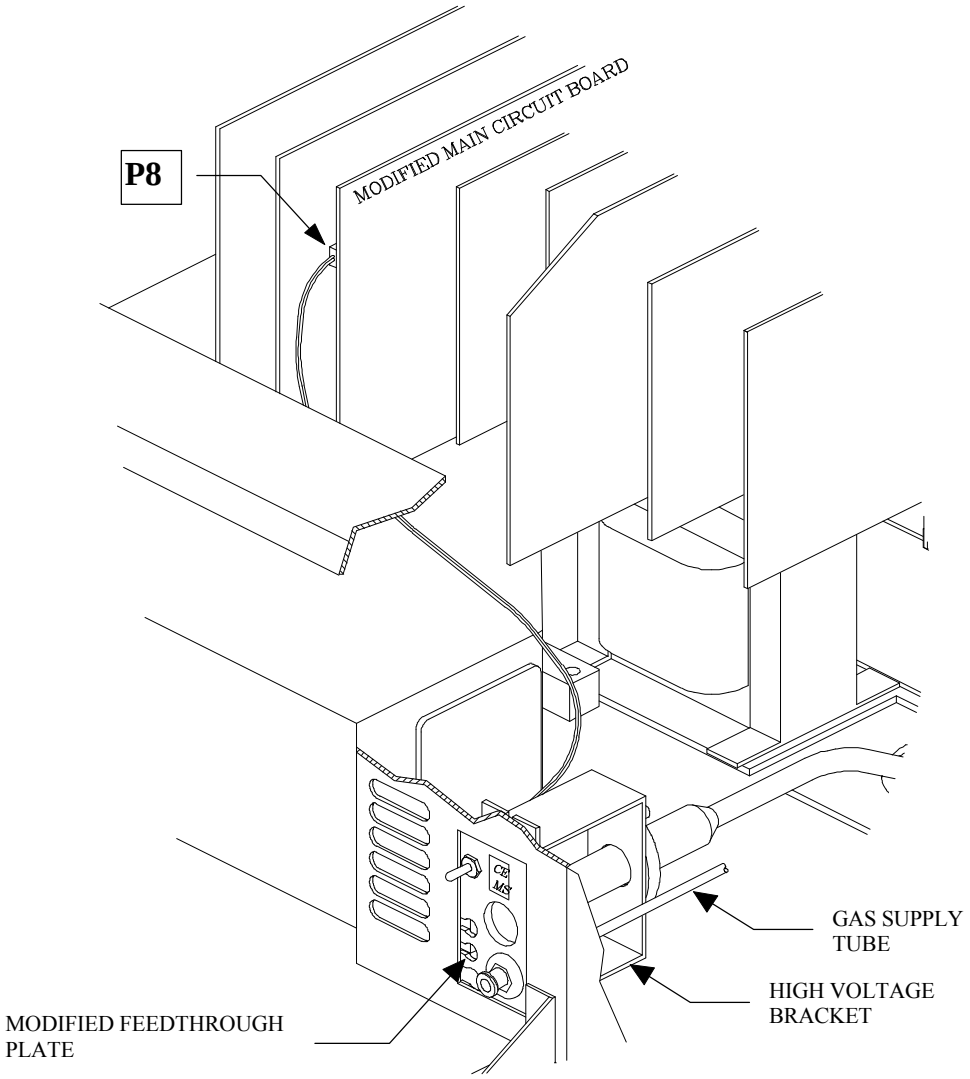

Figure 2. Installing the Switch Plate Assembly

2.3.2 Switch Plate and Cable

Next, it is necessary to replace the feedthrough plate with a modified plate with a switch on it, and to plug the cable from the switch into the modified Main Processor PCB.

1. In the cartridge compartment, from the front of the instrument, remove the high voltage plug and the luer lock gas connection which go to the pressure chamber.

2. From behind the bulkhead, disconnect the HV bracket by gently pressing down on the top of the bracket until it unlocks, then lift it back and up.

3. Slide the two wires and cable which go through the feedthrough plate off the plate with their grommets.

4. At this point, the only thing still attached to the plate is the gas supply tube. Lift the plate out, and cut the supply line close to the bulkhead fitting at the back of the plate.

5. Install the gas supply tube on the bulkhead fitting of the modified feedthrough plate.

6. Put the modified feedthrough plate close to where it mounts in the bulkhead, and slide the wires and cable with grommets on to the plate.

7. Put the modified feedthrough plate into position, and reinstall the HV connector bracket, making sure to dress all wires away from the high voltage connector and near the chassis.

8. Reconnect the gas line and the high voltage plug on the front of the plate.

9. Plug the CE-MS selector switch cable into the connector, P8, on the modified Main Processor PCB.

10. Check for loose connections and make sure cables are properly routed, avoiding mechanical interference and keeping the cables away from the HV connector.

11. Install the top cover, and power cord.

12. Test the operation of the BioFocus, including the current reading in both the MS mode (delivered current) and the normal mode (returned current on the two lower ranges).

2.3.3 Grounding Cable

Using the 6-32 screws included, connect one end of the inter-instrument grounding cable to the chassis ground connection on the back of the BioFocus as shown in the exploded diagram in the diagram section. Connect the other end of the inter-instrument grounding cable to the Finnegan Adapter Support as shown.

2.3.4 Bias Resistor

Make sure all power is off on the BioFocus and the electrospray before installing the Bias Resistor!

The Finnegan HV cable on the electrospray head has Lemo locking connectors. Unscrew the lock at the back of the plug, and pull back the sleeve to unlock. Remove the plug from the electrospray head and plug into the socket on the Bias Resistor box. Install the Lemo plug at the end of the Bias Resistor HV cable into the Lemo socket on the face of the electrospray head. Lock both connectors before operation. The length of the Bias Resistor Box HV cable is long enough to dress the cable and box off to the side and away from the interface assembly.

2.4 Capillary Assembly

The MS User Cartridge Assembly Kit is very similar to the standard Cartridge Assembly Kit (p/n 148-3050). If you are familiar with the standard assembly procedure, the MS procedure is easy to learn. The cartridge body is almost the same, but there is only one Coolant Port. The other significant difference is that the Optical Bench Lock is replaced with the MS Coolant Interface and a Silicone Seal.

Note: The optical bench for the MS Assembly is slightly different from the standard one, so the parts are not interchangeable.

A new system is shipped with an uncoated capillary, this capillary should be removed before assembly, because it will not work with an electrospray. All parts are cleaned and lubricated so that assembly can start at step 2 below.

Step 1. Clean parts if necessary.

Unless the parts are new you should clean them. Clean inlet seal, inlet and outlet barb fittings, optical bench, retainer wedge and coolant interface with high grade methanol. The O-rings on the inlet seal and outlet barb fitting are lubricated with a thin film of vacuum grease and should be regreased after being cleaned with methanol (see step 16). Wash the optical bench and retaining wedges separately from the other parts to avoid contamination with vacuum grease residue. Allow parts to air dry, or use clean, dry compressed nitrogen. After cleaning, insert the optical bench into the optical bench seat from the front with the slit accessible from the front of the cartridge and oriented to the right. The optical bench must be fully inserted into the front of the cartridge body; the square flange should be in contact with the seating surface.

Step 2. Cut the polyurethane tubing.

Cut an appropriate length of polyurethane tubing. Determine the length from the following table. Take care when cutting the tubing, because the tubing length is the most critical dimension for setting capillary length.

Capillary Length Normal BioFocus Operation	Effective Length Inlet to Detector	Tubing Length Required.
24 cm	19.4 cm	10.1 cm
36 cm	31.4 cm	16.1 cm
50 cm	45.4 cm	36.1 cm

Flare both ends of the tubing with the flare tip of the alignment tool (Figure 3) while grasping the tubing with the small piece of sandpaper provided. Insert the outlet barb fitting into one end of the tubing and the inlet barb fitting into the other end. Make sure that the barb tapers are fully inserted so that the end of the tubing completely covers the barb.

Figure 3. Alignment Tool

To facilitate the insertion of the capillary, lay the tubing straight on the working surface and tape each end down. An alternative to taping the tubing to the working surface is to use the PTFE guide tubing to facilitate the insertion of the capillary.

Step 3. Cut the capillary.

Determine the desired length from the inlet to the detector window, and the desired total length. The length after the window must be at least 50 cm to allow positioning of the electrospray head. (**NOTE;** You can always shorten the length of capillary from the BioFocus to the MS after installation, if you are unsure of the length required to reach the MS, leave excess capillary.)

Capillary Length Normal BioFocus Operation	Effective Length Inlet to Detector	Minimum Length Required.
24 cm	19.4 cm	78 cm
36 cm	31.4 cm	90 cm
50 cm	45.4 cm	104 cm

The Minimum length required includes 4 cm of working length and assumes 50 cm to reach the electrospray interface.

The capillary is cut using the white ceramic tile included in the kit. Hold the tile at about a 45 degree angle to the capillary and lightly score the surface with a single stroke. **The goal is to cut through the polyimide cladding without completely severing the capillary.** Gently bend the capillary to break it at the scored point.

Step 4. Make the detector window. (Not required if capillary has window.)

Remove the polyimide cladding from a 0.6 cm section of the capillary at the appropriate position. The cladding can be removed using heat or acid; contact the capillary manufacturer for details. Clean and dry the detection window with methanol.

The distance from the capillary inlet to the window depends on the length of separation you want to run. Add 2 cm to this distance to give yourself some working room. For example, if you want to have 24 cm to the window, make the window 26 cm from the end of the capillary.

Avoid touching the detection window; small amounts of finger oils or other contaminants will cause baseline drift.

Step 5. Install the outlet seal and tubing for the cartridge.

Insert the capillary inlet end into the flat side of a silicone seal (Figure 4). Push the silicone seal up to the detection window, but not over it. For short or medium lengths the capillary may be inserted directly into the polyurethane tubing. Insert the inlet end of the capillary into the outlet barb fitting and through the polyurethane tubing until the silicone seal reaches the outlet barb fitting. If the capillary sticks during insertion, rotating it while inserting may help.

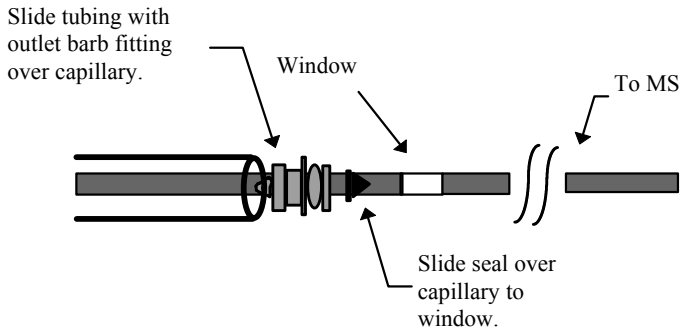

Figure 4. Installing the Outlet Seal and Fitting

Note: For long capillary lengths, the PTFE capillary guide tube may be used to facilitate insertion of the capillary. The PTFE guide tubing is intended to be reused and should not be cut shorter than the original one meter length.

The PTFE guide tube is inserted into the polyurethane tubing from the inlet barb fitting end all the way to the outlet barb fitting. As stated above, do not cut off excess PTFE tubing extending from the inlet barb fitting. Next, thread the inlet end of the capillary through the outlet barb fitting and into the PTFE guide tube (inside the polyurethane tube). The capillary should now easily slide into the PTFE tubing until the silicone seal reaches the outlet barb fitting. While holding the outlet end of the capillary in place, remove the PTFE guide tube by pulling it from the inlet end.

Step 6. Untape the outlet end of the tubing.

If the capillary is short, it may be easier to untape both ends at this point.

Step 7. Thread capillary into cartridge body.

Make sure that the O-rings on the outlet barb have a thin film of vacuum grease on them (new ones are already greased). While holding the outlet barb fitting, use the outlet guide at the top of the cartridge to carefully thread the outlet end of the capillary into the outlet port, through the cartridge body and optical bench. Insert the outlet barb fitting into the outlet port with the wings oriented so that it becomes fully seated. Twist the fitting one quarter turn to lock the wings into place.

Carefully pull the capillary from either the inlet or outlet side of the polyurethane tubing to center the detection window in the middle of the optical bench. If the capillary sticks,

straighten the polyurethane tubing and tape it to the working surface. The capillary will slide through a straightened polyurethane tube.

Step 8. Insert retainer wedge.

Insert the thin side of the retainer wedge (with the raised dot facing up) into the slit in the optical bench and firmly press into place. Inspect the optical path for any gaps between the capillary and the retainer wedge or optical bench. The retainer wedge must be tightly in place.

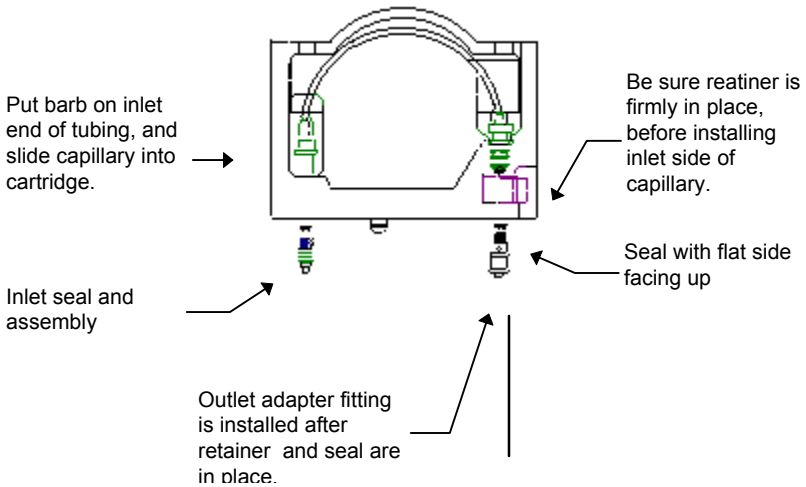

Figure 5. Cartridge Assembly

Step 9. Install outlet seal and adapter.

Thread a silicone seal, flat end first, onto the outlet end of the capillary, and then the outlet adapter fitting, threads first. Slide both the seal and the coolant interface along the whole length of the capillary to the cartridge, and start the threads into the cartridge body. Slide a tightening tool (included with kit) over the capillary to engage the flats on the bottom of the outlet adapter. While pressing the optical bench into the front of the cartridge body, screw in the coolant interface until finger tight. **IMPORTANT: Do not tighten more than necessary. Overtightening can damage the optical bench and cartridge body.** Remove the tightening tool.

Step 10. Thread capillary inlet.

Using the inlet guide at the top of the cartridge, thread the inlet end of the capillary through the inlet port, then press the inlet barb fitting firmly into the luer fitting of the inlet port.

Step 11. Install silicone seal and fitting.

Thread a silicone seal onto the inlet end of the capillary with the flat side of the seal facing the cartridge.

The inlet seal fitting can be screwed in with fingers only or by using the installation tool. Either end of the tool may be used to fit over the inlet seal fitting. Thread the inlet seal

onto the end of the capillary and screw it into the cartridge until snug. **DO NOT OVER TIGHTEN.** Doing so may damage the silicone seal which will compromise the performance of the cartridge at high voltages. Use methanol to clean the exposed portion of the capillary

When disassembling the cartridge, the small silicone seal and an O-ring might be retained inside the cartridge. The O-ring should be carefully removed and put back on the inlet seal before reassembling. The silicone seal can be left in place unless it has been damaged and is causing current leakage. When removing either part, care must be taken not to damage the threads inside the cartridge body. The silicone seal can be safely removed using a short length of capillary as a tool to pick it out.

Step 12. Cut the inlet capillary to the correct length.

Insert the capillary **inlet** in the alignment tool so that the bottom of the cartridge is flush with the end of the alignment tool. Gently draw the white ceramic square through the alignment tool's 45° cutting guide to score the capillary. Use the thumb and forefinger to quickly flick the excess capillary away. This technique produces a clean, square end to the capillary. (The outlet will be trimmed later, after insertion in the electrospray head.)

NOTE: Do not cut the outlet end of the capillary!

2.5 Cartridge Installation

General Precautions

Before inserting the cartridge into the BioFocus instrument, use an application swab to apply a thin film of vacuum grease to the O-rings on the coolant ports. Also, on the BioFocus instrument, check the hole on the left side of the bottom of the cartridge holder where the inlet end of the capillary will be inserted (the inlet electrode/pressure chamber). This is a high voltage area, and it is critical that it be kept clean of buffer residue, dirt and dust. Contamination or damage in this area may cause current leakage, arcing and baseline noise at high voltages.

Significant spiking of the baseline may be due to contaminants in the high voltage area of the cartridge holder. The inlet electrode housing should be removed and carefully cleaned. Care must be taken to avoid bending the electrode. Follow directions in the BioFocus manual. Also, the outside of the white vial holders of the inlet carousel should be cleaned periodically.

Step 1. Install tubing from BioFocus to MS.

Before installing the capillary, the liquid cooling tubing must be installed. Cut two lengths of polyurethane tubing long enough to reach from the BioFocus to the electrospray interface. One length will be used for the capillary and coolant fluid, the other will be used to return the coolant fluid to the BioFocus. Push the outlet adapter liquid coupling onto the tubing. If necessary, use the flaring end of the alignment tool.

Slide the liquid coupling up into the outlet adapter, and hold it in place by putting the friction pin into the side of the outlet adapter.

Step 2. Remove outlet electrode.

Remove the outlet electrode by slightly loosening the silver knurled knob located in the cartridge area near the photodiode. Once the knob is loosened, the electrode can be removed by reaching up from the carousel area, pulling the electrode slightly to the left and then down.

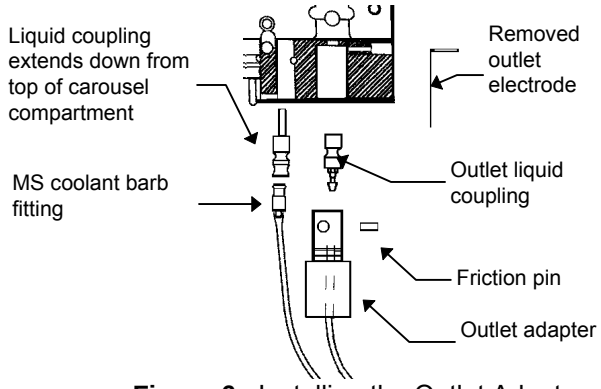

Figure 6. Installing the Outlet Adapter

Step 3. Install the outlet adapter.

Push the outlet adapter up into the outlet electrode area. Be sure to center the white stripe on the outlet adapter towards the front of the instrument. Let the tubing from the outlet adapter hang down the front of the BioFocus.

Step 4. Install the cartridge.

The important part of installing the cartridge is to thread the capillary through the length of tubing attached to the outlet adapter. First thread the capillary through the PTFE guide tube, and then through the polyurethane tubing. It may help to put the capillary down while you thread the tubing.

Step 5. Install the coolant return line.

The coolant return line connects to the liquid coupling on the BioFocus. Remove the pin retainer that holds the outlet liquid coupling in place and gently pull down on it from the carousel compartment. Place the MS coolant barb fitting onto one end of the second length of polyurethane tubing from step 1. Connect the barb to the liquid coupling.

Step 6. Connect the coolant line and capillary to coupling tee.

The coupling tee serves to divert the cooling fluid back to the BioFocus and to allow the capillary end to extend out into the electrospray. Route the capillary and coolant return lines through the small hole on the top, right side of the carousel compartment.

Taking care not to break the capillary, secure the ported fitting onto the polyurethane tubing, and slide the silicone seal over the capillary end.

Push the ported fitting into the coupling tee so that the capillary extends out the other side. Secure the ported fitting to the coupling tee by turning the coupling tee. Do not overtighten.

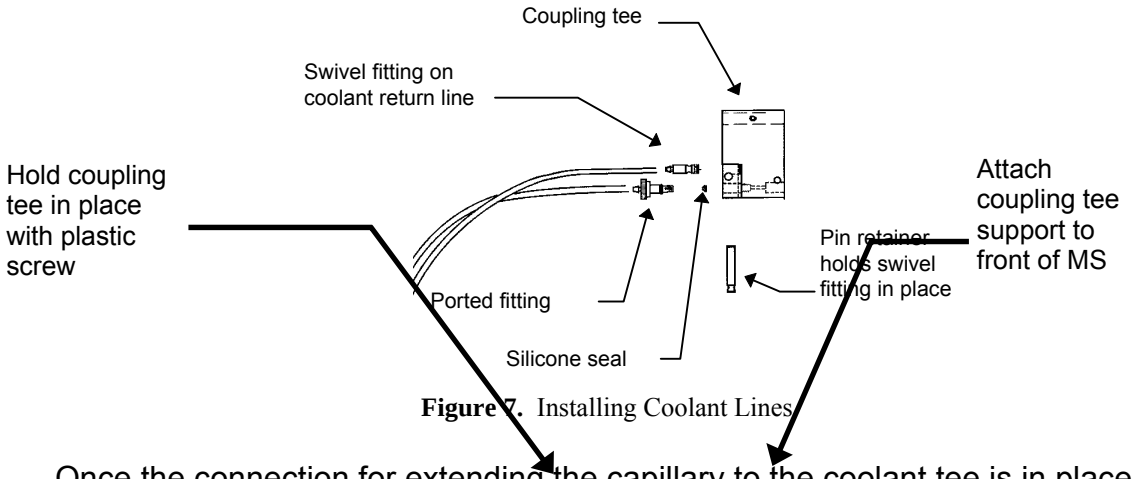

Figure 7. Installing Coolant Lines

Once the connection for extending the capillary to the coolant tee is in place, connect a swivel fitting on the end of the return coolant tubing and push it into the coupling tee. The swivel fitting is held in place by the pin retainer.

Step 7. Test the Cartridge Installation.

Before connecting to the electrospray, it is a good idea to test the cartridge installation. Lay the coupling tee on a flat surface and run the pressure diagnostic from the BioFocus software using your running buffer on the input side. (Refer to the BioFocus software manual for instructions.) If the capillary is intact, you will soon see a small drop of buffer coming out of the end of the capillary.

If the pressure diagnostic shows no damage to the capillary, run the coolant diagnostic to verify the coolant is working correctly. It is normal to see a few bubbles in the coolant line. If the cartridge cooling cools to 15 degrees within two minutes, the coolant lines are connected satisfactorily. If it does not cool correctly, look for the source of bubbles in the coolant lines and ensure the fittings are tight.

2.6 Connection to Electrospray Injector

The coupling tee attaches to the front of the electrospray interface by sliding onto the coupling tee support. The coupling tee support is attached to the electrospray interface as shown in the Figure 8.

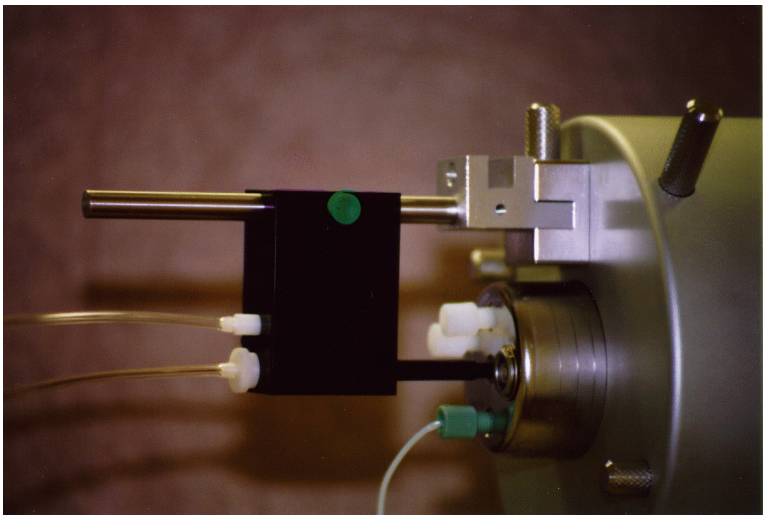

Figure 8. Coupling Tee Mounted on Electrospray Interface

Put the long Fingertight reverse nut and sleeve onto the capillary. With the capillary extended through the coupling tee, put the coupling tee onto the coupling tee support. Allow the capillary to slide through the electrospray hole marked "Sample".

Position the capillary end so that it is flush with the end of the injection needle inside the electrospray. Do not extend the capillary end more than 1 mM beyond the end of the injection needle.
With the capillary positioned, lock the coupling tee in place by tightening the screw provided.

Section 3 Operation

Before attempting any operation of the electrospray or the BioFocus, be sure that the parts are correctly installed and that the grounding wire is attached. Do not run the high voltage of the BioFocus system without closing the electrospray chamber. Make sure any unions in plastic lines to the ports of the electrospray head are grounded.

It is assumed below that the installation described in section 2 has been done.

To achieve satisfactory results with a new analysis, it is recommended that both the CE and the electrospray be tested. These may be done independently.

With the electrospray head open, go to pressure diagnostics on the BioFocus and do a purge with the buffer to be used. Use any vial position for the outlet vial, but set the inlet vial to the position with the buffer. Note that a small drop forms at the end of the capillary. For most buffers, a small piece of absorbent wipe can be wetted with buffer and placed over the end of the electrospray needle to form a ground contact to test CE electrical parameters. For corrosive buffers, use material which is inert. Close the electrospray chamber. Go to electrical diagnostics. Test the system at the desired operating voltage, again selecting the run buffer vial. Check that the current is stable, and monitor the detector baseline for stability. If desired, it is possible to do a CE run and observe the peaks without the presence of electrospray.

Turn off the BioFocus high voltage, open the chamber and remove the piece of absorbent material and dry the electrospray needle. Close the chamber, and start the electrospray. Optimize electrospray voltage, sheath flow liquid and sheath flow gas, if any. If necessary, stop and adjust the position of the electrospray point, or the position of the capillary in the electrospray needle, and reoptimize for stable ion current. It is possible to fill the entire capillary with buffer containing a small amount of sample and induce some migration of the sample ions with a CE potential to get a good optimization. After the parameters are established, purge and do the run.

The time of migration to the mass spectrometer can be calculated from multiplying the peak migration time to the absorbance window by the ratio of the total capillary length to the distance from the inlet to the window. The position of the window is 1.1 cm from the bottom edge of the cartridge.

Section 4 Service

4.1 Troubleshooting

For CE current or voltage error messages, check the CE/MS switch position on the modified feedthrough plate to the right of the cartridge. Also check the integrity of the inter-instrument grounding wire. Erratic or no current could also indicate a broken capillary. If significant spiking of the baseline occurs, it may be due to surface contaminants in the high voltage area of the cartridge holder. The inlet electrode housing should be removed and carefully cleaned. Care must be taken to avoid bending the inlet electrode. Follow directions in the BioFocus manual.

4.2 Maintenance

Follow the maintenance described in the Biofocus instruction manual.

4.3 Service Parts Ordering Information

Catalog	Description
148-6072	Inlet Seal Fitting, 5 each
148-6073	Inlet Barbed Fitting, 5 each
148-6074	Outlet Barbed Fitting, 5 each
148-6075	Silicone Seal, 10 each
148-6077	Tubing, Polyurethane for capillary coolant, 12 feet (4 meters)
148-6081	Tubing, PTFE for capillary guide, 3 feet (1 meter)
148-6082	Ceramic Square for cleaving Capillary
148-6083	Installation Tool for Inlet Seal Fitting
148-6084	Alignment Tool

To Order or for Technical Service Call: **1-(800) 4BIORAD**
1-(800) 424-6723