

## Enabling Sheath Gas Capability on PV/DPV-550 PicoView Sources

The PV-SG-550 and PV-SG-550U sheath gas upgrade kits for PicoView models PV-550 and DPV-550 can extend your available flow rates into the microspray region (1-10  $\mu\text{L}/\text{min.}$ ) or be used to assist droplet formation in highly aqueous mobile phases while running at nanospray flow rates. For use with PicoFrit columns or uncoated PicoTip and TaperTip emitters, the sheath gas module is compatible with the uncoated tip module (UTM) found in the PV-550 and DPV-550 PicoView models. Installing the sheath gas upgrade kit involves replacing the existing electronics housing assembly (PV-SG-550U only) with a sheath gas enabled electronics housing assembly. This upgrade enables you to use the sheath gas supply from the mass spectrometer and control the flow of sheath gas through the mass spectrometer control software (XCalibur). PicoView PV-550 and DPV-550 systems purchased after January 1, 2011 require only the PV-SG-550 Sheath Gas Kit to enable their system with sheath gas capability.

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ATTENTION: Later models of PV-550 Standard PicoView and DPV-550 Digital picoView are factory-equipped with the sheath gas-enabled electronics box. If your PicoView source is already equipped with the correct electronics box (see Figures 2A-2D) and you have purchased the PV-SG-550 kit, skip the sections on changing the electronics box and proceed to Sheath Gas Module Assembly on page 5.

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### Features

- Easy-to-load design supports PicoFrit columns, PicoTip and TaperTip emitters
- Compatible with variable lengths of fused silica
- Coaxial PEEK sheath nozzle for low-pressure, ambient temperature sheath gas
- Gas delivered by 1/16" OD tubing for universal connectivity
- User-determined sheath nozzle distance for optimal control

### The PV-SG-550U sheath gas upgrade kit for PV/DPV-550 contains the following components:

Refer to Figure 1A

- (1) Sheath gas enabled electronics housing assembly
- (2) 6-32 x 5/16" Flat head screws
- (1) 5/64" Allen wrench
- (1) Sheath gas tee (includes 1x U-428 stainless steel tee, 1x F-242 green SealTight FEP tubing sleeve, 3x F-192 SealTight ferrules, 1x F-195 SealTight nut, 2x F-194 stainless steel 10-32 nuts and 1x F-231 PEEK sheath nozzle)
- (1) Sheath gas tee module with mounting thumb screw
- (9) F-242 sleeves (not shown in Figure 1)
- (1) P-240 flangeless ferrule for gas tubing connection with sheath gas enabled electronics housing assembly
- (1) LT-111 nut with gas tubing, ready for connection to sheath gas enabled electronics housing assembly
- (1) Box of pre-cut TaperTip emitters, 15 cm length (P/N TT360-20-15CT-N-5, not shown)
- (1) 3' Length of Teflon PFA tubing

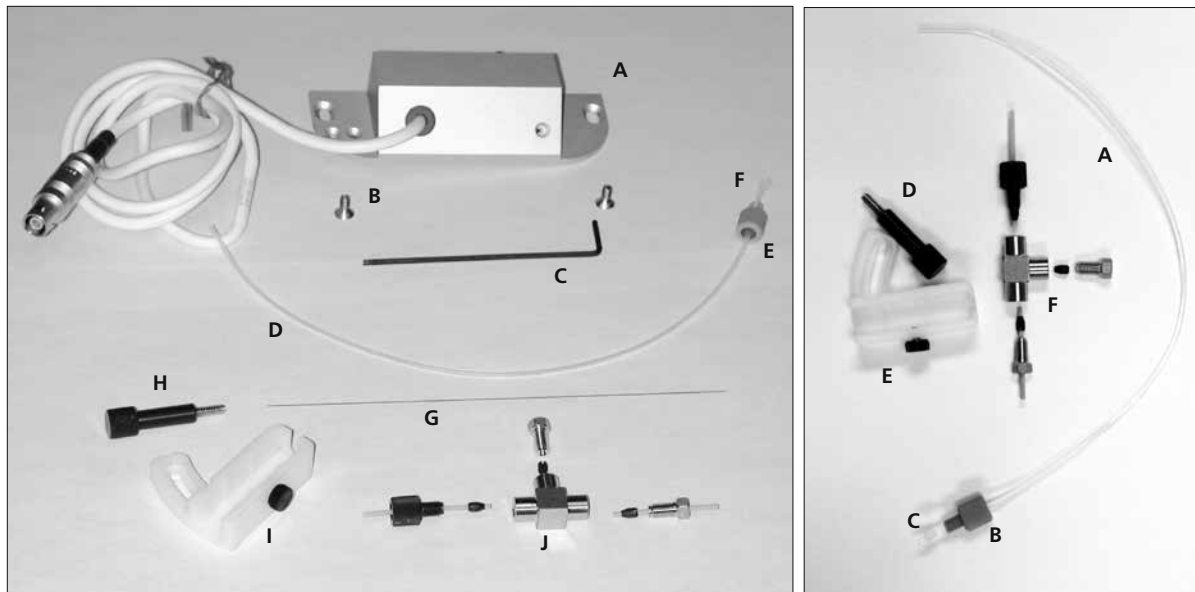


Figure 1A: A) Sheath gas enabled electronic housing; B) flat head screws for securing the electronic housing assembly on the interface flange; C) 5/64" Allen wrench; D) 1/16" OD Teflon PFA tubing; E) LT-111 nut; F) P-240; G) TT360-20-15-N TaperTip; H) mounting screw for sheath gas tee holder; I) Sheath gas tee holder; J) sheath gas tee with the sleeves and ferrules

Figure 1B: A) 1/16" OD Teflon PFA tubing; B) LT-111 nut; C) P-240 ferrule, D) mounting screw for sheath gas tee holder; E) Sheath gas tee holder; F) sheath gas tee with the sleeves and ferrules

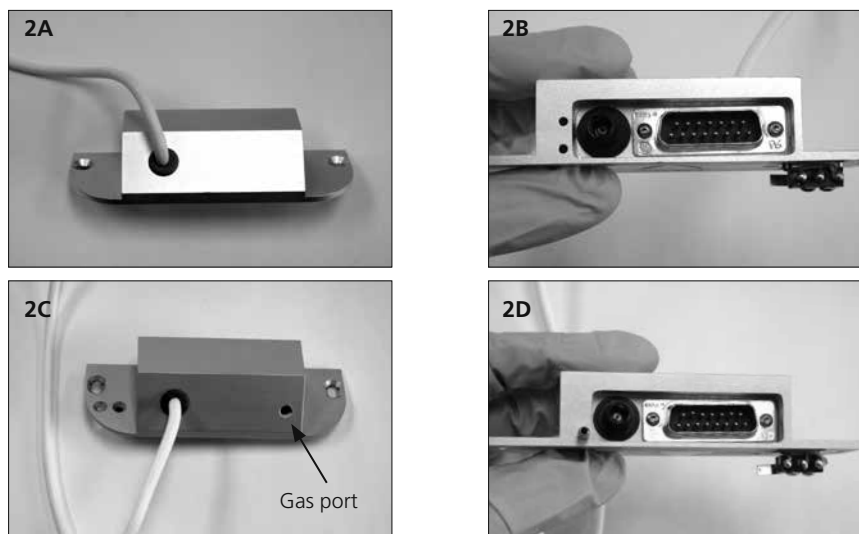


Figure 2: Comparison of the standard electronics housing assembly and the sheath gas enabled electronics housing assembly 2A: standard electronics housing assembly front side; 2B: and back side; 2C: sheath gas enabled electronics housing assembly front side, and 2D: back side. Newer models of PicoView sources will already have the sheath gas-enabled electronics boxes shown in 2C/2D.

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**The PV-SG-550 sheath gas upgrade kit for PV/DPV-550 contains the following components:**

Refer to Figure 1B

- (1) Sheath gas tee (includes 1x U-428 stainless steel tee, 1x F-242 green SealTight FEP tubing sleeve, 3x F-192 SealTight ferrules, 1x F-195 SealTight nut, 2x F-194 stainless steel 10-32 nuts and 1x F-231 PEEK sheath nozzle)
- (1) Sheath gas tee module with mounting thumb screw
- (9) F-242 sleeves (not shown in Figure 1)
- (1) P-240 flangeless ferrule for gas tubing connection with sheath gas enabled electronics housing assembly
- (1) LT-111 nut with gas tubing, ready for connection to sheath gas enabled electronics housing assembly
- (1) Box of pre-cut TaperTip emitters, 15 cm length (P/N TT360-20-15CT-N-5)
- (1) 3' Length of Teflon PFA tubing

**Removing the PicoView Source from the Mass Spectrometer**

To install the sheath gas enabled electronics housing assembly onto the PicoView source, the standard electronics housing assembly must be first removed. To easily and safely remove and replace the electronics housing assembly, the PicoView must be removed from the mass spectrometer.

**Placing the Mass Spectrometer into Standby Mode**

Use the following procedure to put the mass spectrometer into standby mode (refer to the mass spectrometer operator manual provided by Thermo Scientific for additional details).

1. Wait until data acquisition, if any, is complete
2. Turn off the flow of sample solution, if any, from the LC or syringe pump to the PicoView source.
3. From the Tune Plus window, choose Control from the menu bar, then either choose Standby or click the On/Standby button to put the MS detector in standby. The system LED on the front panel of the MS detector will be illuminated orange.

**Disconnecting the PV-550 Standard PicoView Source**

1. Disconnect the BNC cable and power cable from the high resolution CCD camera
2. Stop the LC pump and disconnect the LC tubing from the PicoView source
3. Disconnect the fiber optic bundle from the fiber optic coupler
4. Disconnect the high voltage cable from the voltage module
5. Unlock the two latches which are connecting the PicoView source with the interface flange
6. Once the latches are unlocked, gently slide the PicoView source away from the mass spectrometer and off of the interface flange

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Note: Hold the source with both hands and support the source from the bottom. Be careful when sliding the source away from the mass spectrometer because the source is quite heavy.

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7. Store the source in a secure place

### Disconnecting the DPV-550 Digital PicoView Source

1. Exit the PV Acquire GUI by selecting the EXIT button
2. Select YES if you would like to save new values to the Configuration File
3. Disconnect the USB cable from the digital camera
4. Disconnect the Digital Divert serial cable from the digital camera (if installed)
5. Disconnect the serial cable connecting the X-axis motor to the computer
6. Disconnect the fiber optic bundle from the fiber optic coupler
7. Stop the LC pump and disconnect the LC tubing from the PicoView source
8. Disconnect the high voltage cable
9. Unlock the two latches which are connecting the PicoView source with the interface flange
10. Gently slide the PicoView source away from the mass spectrometer and off of the interface flange
11. Store the source in a secure place

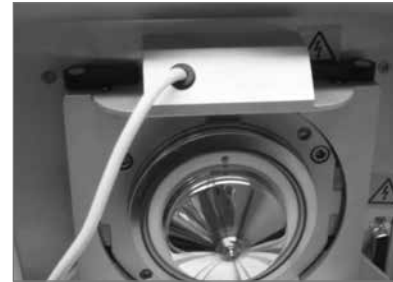


Figure 3A: Interface flange installed on LTQ – interface flange levers locked in place



Figure 3B: Interface flange levers are open – the Interface flange is ready to be removed.

### Disconnecting the interface flange

1. Rotate the interface flange locking levers outwards to 90° (Figures 3A-B)
2. Pull the interface flange away from the mass spectrometer

### Installing the sheath gas enabled electronics housing assembly

1. Remove the two 6-32 x 5/16" flat head screws securing the electronics housing assembly onto the interface flange. The screws are located next to each of the interface flange levers (Figure 4A).
2. Once the screws are removed, the electronics housing assembly will easily slide away from the interface flange (Figure 4B)
3. Align the sheath gas enabled electronics housing assembly with the interface flange so the front edge of the electronics housing is flush with the interface flange (Figures 5A-B)
4. Secure the sheath gas enabled electronics housing assembly onto the interface flange using the two 6-32 x 5/16" flat head screws provided (Figure 6)



Figure 4A: Removing one of the 6-32 x 5/16" flat head screw securing the electronics housing assembly onto the interface flange



Figure 4B: Interface flange with the electronics housing assembly removed

**Installing the interface flange onto the Mass Spec**

1. Ensure the interface flange locking levers are open, pointing towards the user and away from the MS detector (Figure 3B)
2. Remove the red protective cover from the voltage connector on the electronics housing assembly
3. Align the two guide pin holes at the base of the interface flange with the guide pins on the face of the MS detector
4. Gently push the interface flange onto the detector face plate
5. Ensure that the interface flange is flush against the front of the face plate
6. Rotate the flange locking levers 90° inward towards the inlet of the mass spectrometer to lock the flange into place (Figure 3A)

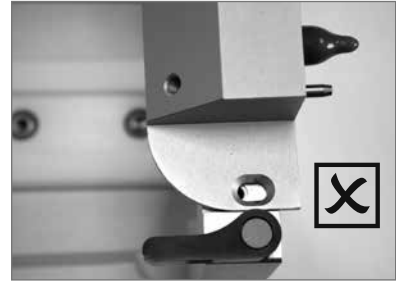


Figure 5A: Incorrect alignment of the sheath gas enabled electronics housing assembly and the interface flange

**Installing the PV-550 PicoView Source onto the Mass Spec**

1. Carefully align the PicoView base onto the slide base of the interface flange
2. With the PicoView mounted on the interface flange, gently slide the assembly toward the MS detector face plate
3. Reconnect the BNC cable and power cable to the camera
4. Reconnect the fiber optic bundle with the fiber optic coupler
5. Reconnect the LC tubing from the LC pump to the PicoView source and start the LC pump

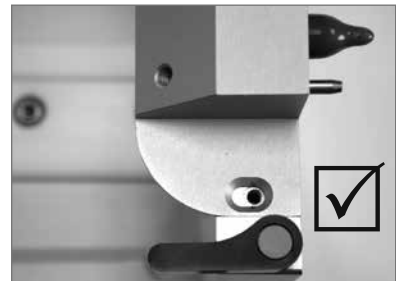


Figure 5B: Proper alignment of the electronics housing assembly with the interface flange

**Installing the DPV-550 PicoView Source onto the Mass Spec**

1. Carefully align the PicoView base onto the slide base of the interface flange
2. With the PicoView mounted on the interface flange, gently slide the assembly toward the MS detector face plate
3. Reconnect the USB cable to the digital camera
4. Reconnect the Digital Divert serial cable to the digital camera (if installed)
5. Reconnect the serial cable connecting the X-axis motor to the computer
6. Launch the PV Acquire software application
7. Load the saved Configuration File with the correct COM port assignment when the software prompts you to do so
8. Select 'Yes' when the software asks you if you would like to Home the stage (ensure the manual knobs are set to the détente position before initiating a Home command)
9. Reconnect the fiber optic bundle from the fiber optic coupler
10. Reconnect the LC tubing to the PicoView source and start the LC pump



Figure 6: Securing the electronics housing assembly onto the interface flange

## Sheath Gas Module Assembly

The sheath gas module for PicoView models PV-550 and DPV-550 enables the use of coaxial sheath gas when using PicoFrit columns, PicoTip or TaperTip emitters from New Objective. The economical, easy-to-use design is based on a conventional 1/16" bore stainless steel tee. Just thread the PicoFrit, PicoTip or TaperTip (distal end first) through the tee. Then mount the tee on the XYZ platform. Electrical contact is made at the distal end of the emitter inside the conventional uncoated tip module (UTM). The advantage of this design is that it adds no extra connections or volume to the flow path and allows for different length columns and emitters. For safety reasons, this module is not compatible with standard- or distal- coated PicoTips.

### Plumbing the Sheath Gas Tee

Refer to Figure 7

1. Loosen the F-195 PEEK nut securing the SealTight fitting by 1/2 to 2 turns
2. Remove a TaperTip or SilicaTip emitter from its packaging using the tweezers provided
3. Feed the distal end of the emitter into and through the PEEK sheath nozzle until it comes through the SealTight sleeve (Figure 8)
4. Pull the distal end of the emitter through the SealTight sleeve until the tip of the emitter protrudes 0.5 to 2.0 mm past the end of the PEEK sheath nozzle (Figure 9)
5. Tighten the SealTight nut to lock the tip in place and ensure a gas-tight seal

Note: The PEEK sheath nozzle can be used to protect the fragile tip of the emitter. To protect the tip from breaking while assembling the UTM, simply pull the tip of the emitter into the PEEK sheath nozzle so the tip is recessed inside the PEEK sheath nozzle. Tighten the F-195 SealTight nut to lock the tip in place. Loosen the SealTight nut and gently push the tip forward till it protrudes 0.5 to 2.0 mm past the end of the PEEK sheath nozzle, when you are ready to collect data. Remember to securely tighten the SealTight nut to lock the emitter in place. This is important in preventing the emitter from sliding forward and potentially breaking the tip.

**WARNING:** The nuts and ferrules must be loose when sliding the emitter through the sheath gas tee. Never tighten any of these ferrules without fused silica tubing plumbed into the

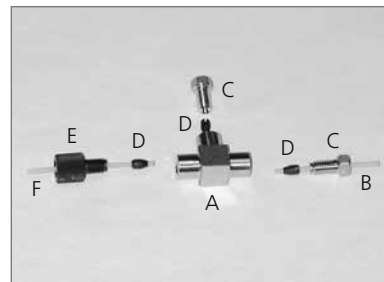


Figure 7: Components of sheath gas tee; A) sheath gas tee, U-428 SS; B) F-231 PEEK sheath gas nozzle; C) F-194 SS 10-32 SealTight nut; D) F-192 PEEK SealTight ferrule; E) F-195 PEEK SealTight nut; F) F-242 FEP SealTight tubing sleeve

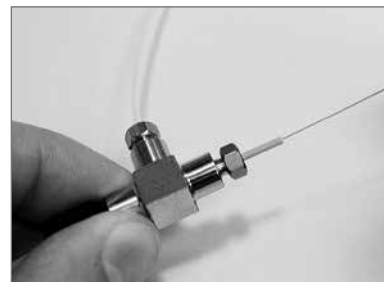


Figure 8: Feed the emitter, distal-end first, through the PEEK nozzle (Figure 2 from PV-2 tech note).



Figure 9: The tip of the emitter protrudes 0.5 to 2.0 mm past the PEEK sheath nozzle

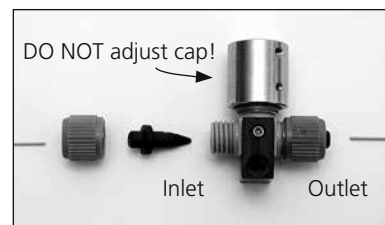


Figure 10: Orientation of the micro tee for assembly

fittings and tubing sleeves. If you tighten the nut and ferrule without fused silica tubing plumbed into the fittings, you will over-tighten the ferrule-tubing sleeve combo. Over-tightening these fittings will permanently damage them and they will need to be replaced.

## Plumbing the MicroTee

The modified MicroTee joins the transfer line to the PicoTip® and supplies the high voltage.

1. Using the MicroTee provided with your PicoView, orient the MicroTee so that the platinum electrode is facing away from the user and the set screws are visible (Figure 10)
2. Unscrew the nuts and remove the black ferrules from the posts of the MicroTee
3. Thread the distal end of the PicoTip tubing through a green MicroTight sleeve (Upchurch P/N F-185), which is used for assembly with 360 µm OD tubing
4. Thread the sleeved PicoTip through the fitting nut and a black MicroFerrule (Figure 11A)
5. Cleave the distal end of the PicoTip after the tubing is threaded through the sleeve, nut, and ferrule
6. Slip the end of the tubing into the right post of the MicroTee until the tubing and sleeve seat against the bottom ledge inside the post
7. Screw the nut finger-tight onto the MicroTee (Figure 11B)
8. Insert the distal end of the fused-silica transfer line through a green MicroTight sleeve, then through the nut and the black MicroFerrule (Figure 12A)
9. Carefully trim the end of the transfer line
10. After trimming, insert the assembly back into the microtee, seat the transfer line, ferrule, and sleeve against the PicoTip, and finger-tighten the nut (Figure 12B)
11. Gently pull on tubing ends to ensure the connection is tight
12. Check for leaks by running solvent through the tubing at the expected operating pressure. Leaks will be apparent if solvent collects at the exposed ends of the sleeves.
13. The sheath gas assembly is now ready to be put onto the magnetic stage plate (Figure 13)

## Connecting the Sheath Gas Tubing with the Sheath Gas Tee

1. Remove the F-194 10-32 SS nut and F-192 SealTight ferrule from the top of the sheath gas Tee

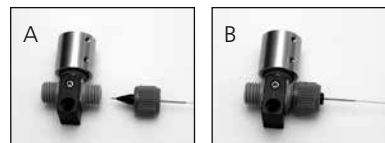


Figure 11A: Assembling the nut, ferrule, sleeve and PicoTip; 11B Securing the PicoTip assembly into the MicroTee

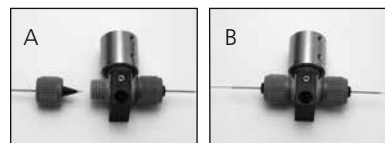


Figure 12A: Assembling the nut, ferrule, sleeve and transfer line 12B: Securing the transfer line assembly into the MicroTee

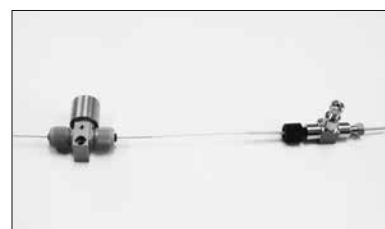


Figure 13: Completed sheath gas assembly



Figure 14A: Connecting the sheath gas tubing to the sheath gas tee

2. Feed the Teflon sheath gas tubing provided through the nut and ferrule (Figure 14A)
3. Insert the tubing/nut/ferrule assembly into the sheath gas tee (Figure 14B)
4. Tighten the nut till finger tight
5. Secure the tubing using a ¼" wrench by tightening the nut another ¼ turn
6. Gently tug the tubing and make sure that the gas tubing is properly secured



Figure 14B: Sheath gas tee with sheath gas tubing installed.

### Installing the Sheath Gas Tee Assembly on the Magnetic Stage Plate

1. Insert the sheath gas tee into the sheath gas tee module and secure the tee in place with the set screw (Figure 15)
2. Position the UTM onto the magnetic stage plate and insert the MicroTee (Figure 16A)
3. Position the sheath gas tee module in the forward position on the magnetic stage plate and secure the holder with the mounting screw (Figure 16A)
4. Place the lid on the UTM and secure the lid with the locking screw (Figure 16B)

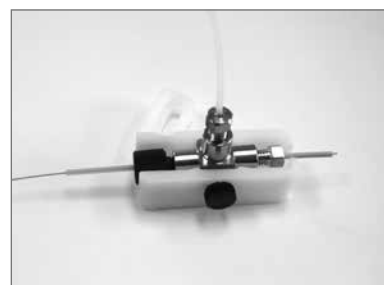


Figure 15: Fully assembled sheath gas tee secured into the sheath gas tee module

Note: Alignment of the UTM cover is critical. Misalignment of the cover may damage the internal spring contact mechanism. Ensure the cover is correctly aligned with the base before applying pressure and securing the cover with the fingeright screw provided.

### Connecting the Sheath Gas Tubing to the Mass Spectrometer

1. If the stage plate was removed from the PicoView source, install the stage plate onto the magnetic stage (Figure 17)
2. Take the sheath gas tubing and measure the distance between the sheath gas tee and the sheath gas inlet on the electronics housing assembly (Figure 18A)
3. Cut off the excess tubing ensuring the cut is clean and square. The tubing should be long enough that it loops and does not add additional stress to the connection.
4. Slide the tubing through the LT-111 flangeless nut provided
5. Slip the P-240 flangeless ferrule over the tubing with the tapered part of the ferrule facing towards the nut (Figure 18B)
6. Insert the tubing with the nut and ferrule pair into the threaded sheath gas port

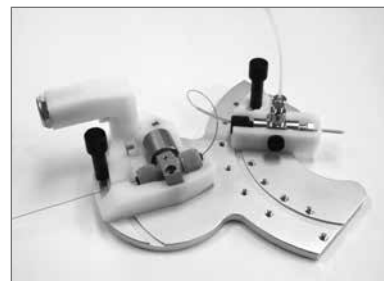


Figure 16A: Uncoated Tip Module showing the MicroTee in its correct orientation

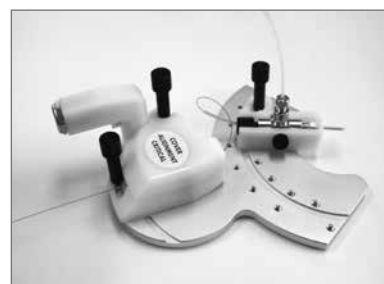


Figure 16B: Lid correctly installed on Uncoated Tip Module



7. Tighten the nut while applying slight pressure onto the tubing (Figure 18C)

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Note: Make the sheath gas connection when the PicoView source is not locked onto the interface flange. This will allow you to move the PicoView source back making the sheath gas port accessible.

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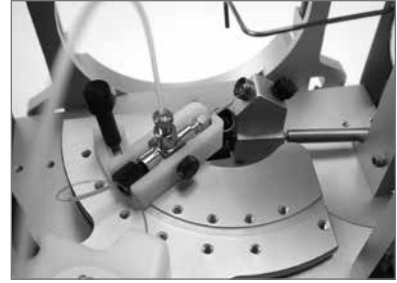


Figure 17: Magnetic stage plate with the sheath gas tee installed on in the PicoView source.

### Completing the Assembly

1. Thread the high-voltage cable from the mass spectrometer through the opening in the left side of the housing.
2. Connect the cable to the UTM by pushing it into the cable jack and turning the locking ring clockwise until it is tight
3. Close the transparent top cover on the PicoView source
4. Slide the PicoView, mounted on the interface flange base, gently towards the face plate of the mass spectrometer. A groove located at the top left of the flange will lock the cover down when the source is pushed firmly against the interface flange and interlock switch.
5. Ensure the lower portion of the mounting brackets line up with the associated latches mounted on the base of the PicoView source. If they do not, check to make sure the PicoView is properly mounted onto the interface flange slide base.
6. Fasten the two latches on the bottom of the PicoView base and gently lock them into place
7. Adjust the stage plate position using either the manual knob controls or through the PV Acquire™ stage control panel until the tip is approximately 2–5 mm from the mass spectrometer inlet

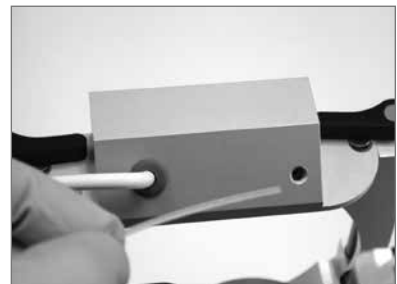


Figure 18A: Measuring the distance between the sheath gas tee and the sheath gas port

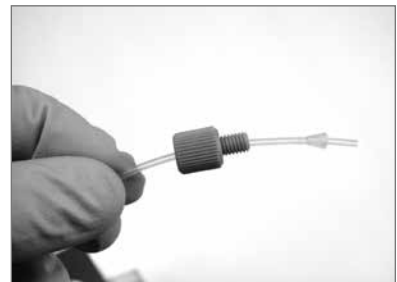


Figure 18B: Sheath gas tubing with the nut and flangeless ferrule positioned correctly



Figure 18C: Inserting the sheath gas tubing into the sheath gas port on the sheath gas enabled electronics housing assembly

