

Making Connections

This note provides instructions on connecting standard-length 5 cm distal or standard coated PicoTips® to a transfer line or capillary column. “PicoTip” refers to any of New Objective’s high-quality tips for electrospray ionization, such as SilicaTips™, PicoFrits®, and TaperTips™.

NOTE: Users must take care when tightening the MicroTight® fittings, making sure to only tighten enough to prevent leaks from occurring. Due to the delicate nature of some fused-silica tubing, it is possible to damage the tubing if the fittings are overtightened.

Loading the MicroTight® Union

- 1) Remove the MicroTight® Union from the PicoView® components box. Unscrew and remove the compression fittings from both ends of the union.
- 2) Screw the white gauge plug finger-tight on to one end of the union. Thread the fused-silica transfer line through a green MicroTight sleeve. The appropriate sleeve size is 0.002-0.003 inches greater than the OD of the capillary tubing. Use the green MicroTight sleeves with 360 um OD tubing. After the transfer line passes through a green sleeve, thread it through one of the compression fittings. Figure 2 shows the union loaded with the white gauge plug on the right and fused-silica tubing threaded through a tubing sleeve and a compression fitting. Cleave the end of the tubing and slip it into the union until both the tubing and the sleeve ends seat against the gauge plug inside the union. Screw the compression fitting finger-tight into the union, as shown in Figure 3.
- 3) Remove the gauge plug and return it to the PicoView components box.
- 4) Carefully trim a new green MicroTight sleeve to a length of approximately 14 mm, as shown in Figure 4. The shorter sleeve will allow the coating on the PicoTip to contact the conductive elastomer inside the CTM.
- 5) Choose a PicoTip from the assortment sent with PicoView. Although either coating style, the standard coating (-CE-) or the distal coating (-D-), will work, if flow rates permit, the distal coating is recommended due to its immunity to arcing.
- 6) Insert the back, or distal, end of the PicoTip through the trimmed sleeve and through the other compression fitting. When properly installed, the tip end should extend 15-20 mm past the end of the fitting when it is tight. This will afford optimal positioning of the PicoTip within the adjustment range of the stage plate. Using a ruler, measure and note the distance the tip extends from the fitting. Remove the fitting/sleeve/PicoTip assembly and carefully trim the back end of the PicoTip so the extension of the tip beyond the fitting is 15-20 mm. Cleave the remaining portion from the back end of the PicoTip. See Figures 5A and B.



Figure 1 MicroTight® union, gauge plug, and compression fittings

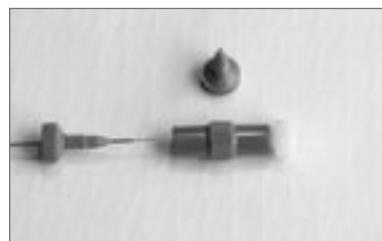


Figure 2 MicroTight® union with gauge plug and compression assembly ready to load



Figure 3 MicroTight® union with gauge plug and compression assembly loaded



Figure 4 Union, compression fitting, and MicroTight® sleeve cut to 14 mm

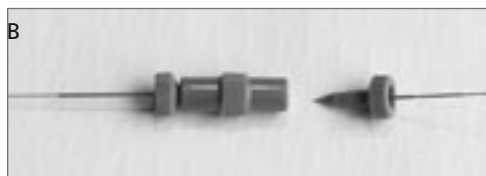
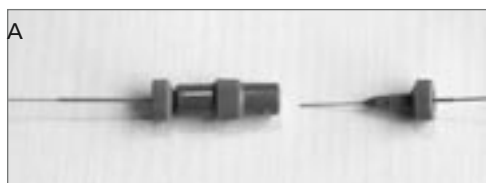


Figure 5 PicoTip™ in fitting, before (A) and after (B) trimming to length



Figure 6 A fully assembled MicroTight® union

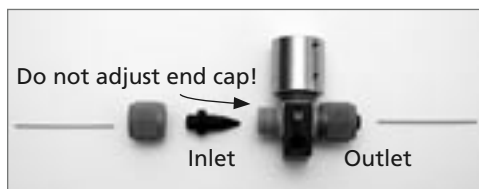


Figure 7 MicroTee with sleeves



Figure 8 Fitting nut, MicroFerrule, and sleeve threaded by PicoTip

- After trimming, reinsert the assembly into the union, seat the PicoTip and sleeve against the transfer line or column tubing, and tighten the compression fitting finger-tight. Pull gently on the tubing to ensure the connection is tight. Figure 6 depicts the fully assembled union.

CAUTION: Always use chemical- and puncture-resistant gloves and ASNI-approved safety glasses when handling fused-silica tubing.

Supplying High Voltage

Plumbing the MicroTee

- The MicroTee joins the transfer line to the PicoTip® and supplies the high voltage. Orient the MicroTee as shown in Figure 7 so that the platinum electrode is facing away from the user and the setscrews are visible. Unscrew the nuts and remove the black MicroFerrules from the posts of the MicroTee.

WARNING: Do not loosen the setscrews or remove the electrode cap, as this may damage the electrode. The solvent will not become charged and an electrospray will not form.

- Thread the end of the PicoTip tubing through a green MicroTight sleeve, which is used for assembly with 360 um OD tubing. Make sure the PicoTip does not extend past the tubing sleeve end that will be inserted into the MicroTee. Thread the sleeved PicoTip through the fitting nut and a black MicroFerrule, as shown in Figure 8.
- Cleave the end of the PicoTip after the tubing is threaded through the sleeve, nut, and ferrule. (Refer to Tech Note FS-1 for cleaving technique.) Slip the end of the tubing through the right post of the MicroTee, as viewed in Figure 9A, until the tubing and sleeve seat against the bottom ledge inside the post, as shown in Figure 9B. Screw the nut finger-tight onto the MicroTee.
- Insert the distal end of the fused-silica transfer line through a green MicroTight sleeve, then through the nut and the black MicroFerrule, as shown in Figure 10A. Carefully trim the end of the transfer line. After trimming, insert the assembly back into the MicroTee, seat the transfer line, ferrule, and sleeve against the PicoTip, and finger-tighten the nut, as shown in Figure 10B. Gently pull on the tubing end to ensure the connection is tight. 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.

Plumbing the ZDV Union

NOTE: This option is not recommended with PicoFrit® columns.

- 1) Remove the ZDV union from the PicoView® components box. Orient the union as shown in Figure 11 so that the “T” bracket is facing away from the user. Unscrew the nuts and remove the ferrules from the union.
- 2) Insert a green SealTight™ sleeve through the ferrule and nut. Thread a PicoTip through the sleeve/ferrule/nut assembly, as shown in Figure 12A. Cleave the end of the PicoTip after the tubing is threaded through the sleeve, ferrule, and nut.
- 3) Slip the end of the tubing into the right side of the union until the ferrule and sleeve seat against the bottom ledge inside the union (Figure 12B). Screw the nut finger-tight into the union. Do not tighten enough to compress the sleeve.

NOTE: Be careful not to touch the tip to any surface.

- 4) Trim 5 mm from the end of a green SealTight™ sleeve and insert the sleeve through the ferrule and nut. Thread the back end of the fused-silica transfer line through the sleeve/ferrule/nut assembly. Cleave the back end of the transfer line and slip it into the left side of the union until the transfer line/ferrule/sleeve assembly seats against the PicoTip. Tighten the nuts on both ends of the union. Pull gently on the tubing to ensure the connections are tight. Figure 13 depicts a fully assembled ZDV union.

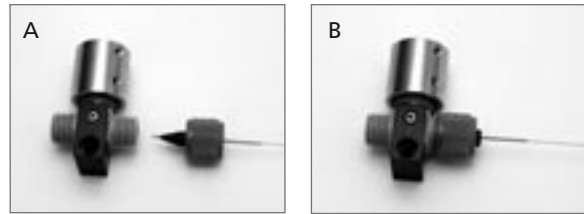


Figure 9 Assembling the nut, ferrule, sleeve, and PicoTip® (A) and securing finger-tight into the MicroTee (B)

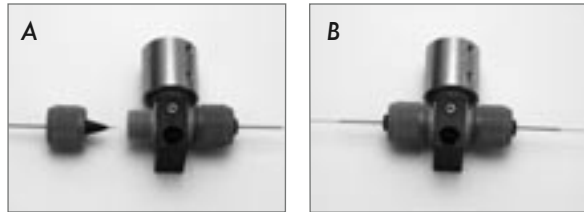


Figure 10 (A) Assembling the nut, ferrule, sleeve, and transfer line and (B) securing into the MicroTee



Figure 11 ZDV union assembly

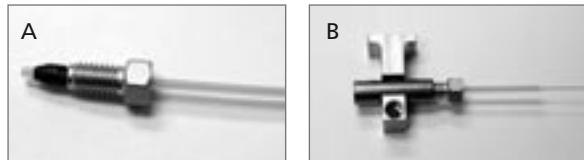


Figure 12 Assemble the nut, ferrule, sleeve, and PicoTip (A) and secure finger-tight into union (B)



Figure 13 ZDV union assembled

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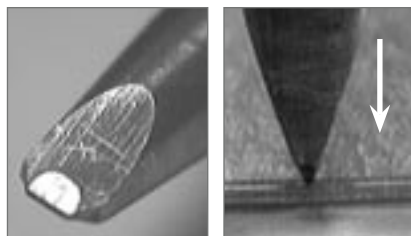


FIGURE 14 (A) Close-up view of diamond-blade cleaving tool, and (B) Cleaving tool in proper position

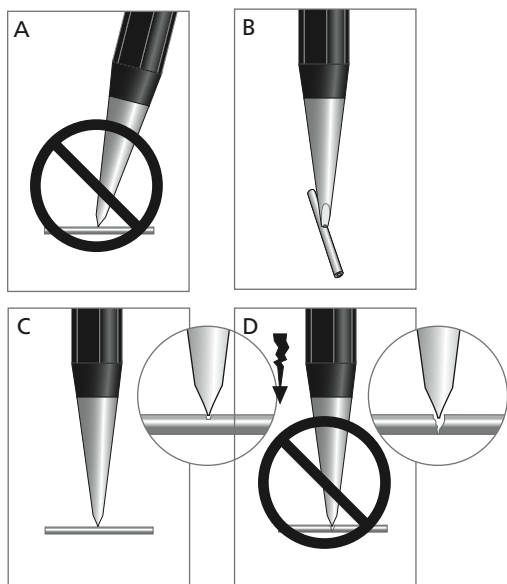


FIGURE 15 (A) Improper cutting angle (B) Align cleaving tool perpendicular to tubing (C) Press down gently, scoring tubing (D) Too much downward pressure will crush tubing, producing particles that can cause tubing to clog

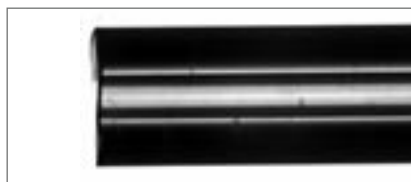


FIGURE 16 Typical cleave. (Polyimide coating was removed after cleaving for clarity of image.)

Cleaving Fused-Silica

Proper cleaving of fused-silica tubing is a critical but often overlooked operation in the preparation of emitters and columns prior to use. A flat, smooth cleave is essential for maintaining low dead volume connections with other sections of fused-silica tubing. It is also critical that cleaving does not generate flow-stopping particulate matter. Cleaving is best accomplished with a high-quality diamond chip or sapphire cleaving tool. New Objective's 1 mm wide diamond-blade cleaving tool, shown in Figure 14A, has been selected to provide a consistent, flat cleave with a minimum of particulate generation. Inexpensive carbide scribing tools are not recommended, since they generally result in poor-quality (i.e., ragged) cleaved end faces that generate many fine particles.

WARNING: Handling of fused-silica tubing and emitters can result in serious personal injury, including skin and eye injury. Use safety glasses or goggles meeting ANSI Z87.1-1989 requirements or the equivalent. Puncture- and chemical-resistant gloves should be worn at all times.

Procedure

1. Place the tubing to be cut on a flat, clean surface and position the cleaving tool perpendicular to the tubing surface, as shown in Figures 15B and 15C. The long axis of the blade should be perpendicular to the tubing bore (Figure 15B).
2. Gently press straight down; DO NOT use a sawing motion when pressing the blade. You only need to nick the surface of the polyimide coating (Figure 15C). Be careful not to force the blade through the tubing, which will generate a ragged end and many particles (Figure 15D).
3. Pull gently on the tubing along its axis; it should easily separate at the point of contact. If it does not, repeat the procedure with a little more force. A typical cleave of 360 μm OD, 75 μm ID fused-silica tubing is shown in Figure 16. Residual surface irregularity is on average less than or equal to 10 μm .

Inspection of the distal end of the tip for particle contamination using a light microscope with transmitted light at 100x magnification is highly recommended. New Objective sells an accessory kit that contains all the high-quality tools (cleaver, special forceps, ruler, etc.) you will need to properly handle fused-silica emitters, columns, and tubing. Please see our catalog or Web site for a full description of our Micro Tool Kit (order number TIP-KIT). A more precise rotary cutting tool is also available from New Objective (order number FSC-001). This tool utilizes a diamond blade with a thumb wheel mechanism to properly score the fused-silica tubing.