

CorSolutions Microfluidic Probe Station

Tool Features:

- Probe fittings (compression, piercing needle, conductive and plug) for rigid and soft substrates
- Table and chucks to connect to most port configurations (top, bottom or side ports)
- Underside alignment CCD camera and diffused lighting
- 2 computer-controlled PeriWave pumps (accurate flow between 0.1 – 50 $\mu\text{L}/\text{min}$)
- Sample injection loop (variable volume)
- Non-reactive FEP and PEEK tubing (except for pump rollers)
- Nikon stereomicroscope with 10-63X magnification and LED ring top lighting
- CCD camera and iSolution Lite image software (capture, measurement and manipulation)
- Link to CNF intranet for transferring large files

This tool is intended to be used for:

- prototyping and characterizing fluidic devices (with approved solutions or biologics)
- cleaning, preparing or functionalizing fluidic devices with aqueous solutions (protein buffers, ethanol, water, detergents, etc.).
- documenting flow characteristics and performance (simple bead-based velocimetry)

This tool is currently NOT intended for:

- experiments that run longer than 12 hours**
- experiments with unapproved biological samples**
- fluorescent microscopy experiments**

Quick Guide

1. Log on, power on, and connect to pumps via the software.
2. Plumb the lines.
3. Load samples and buffers.
4. Assemble the probes and arms and insert tubing and gaskets.
5. Mount the chuck, device and probes on the table.
6. Adjust the probe arm height and connect to ports on the device.
7. Use the image capture software for pictures, movies and measurements.
8. Detach the device. Flush the tubing with water, and then clear out the tubing.
9. Put the probes, arms and gaskets away.
10. Shut down and log off CORAL.

Log on, power on, and connect to pumps via the software.

Log onto CORAL.

Log on to CNF USER account on the computer (no password).

Switch the tool on using the RESET button on the left of the large Belkin Surge protector.

Turn the pumps on at their switches in the back if the green lights on their front is not lit.

Open the CorSolutions Pump software (icon on desktop), and connect to the pumps.

Plumb the lines.

- 1) *Tubing is expensive, so it should be re-used. Tubing is NOT pristine for experiments.*
- 2) *Yellow lines 2 and 3 (see below) are made of reactive silicone so proteins or dye solutions should be avoided, if possible. If your buffer contains these, purchase tubing from CNF and install it.*
- 3) *Do not pass particles through lines 1 – 4 (see below). Particles could plug the flow sensor.*
- 4) *Yellow line 3 (see below) must be 1/32" (dark red) for accurate flow sensor control.*
- 5) *Purchase and install green injection valve lines 5, 7 and 8 (see below). Use a fresh syringe to load line 5.*

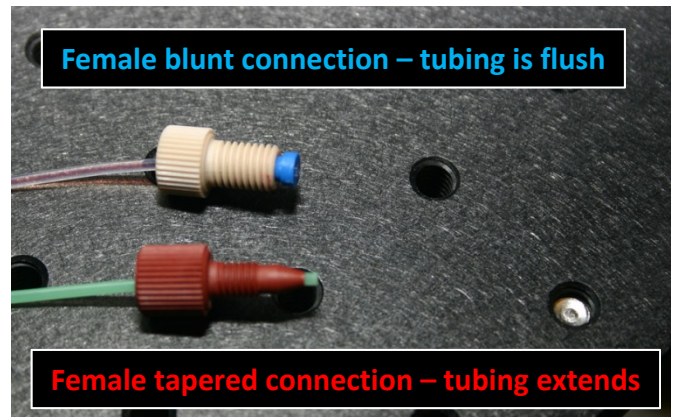
DO NOT OVERTIGHTEN TAPERED CONNECTORS, OR THEY WILL LEAK.

Thread flat and tapered connectors as shown.

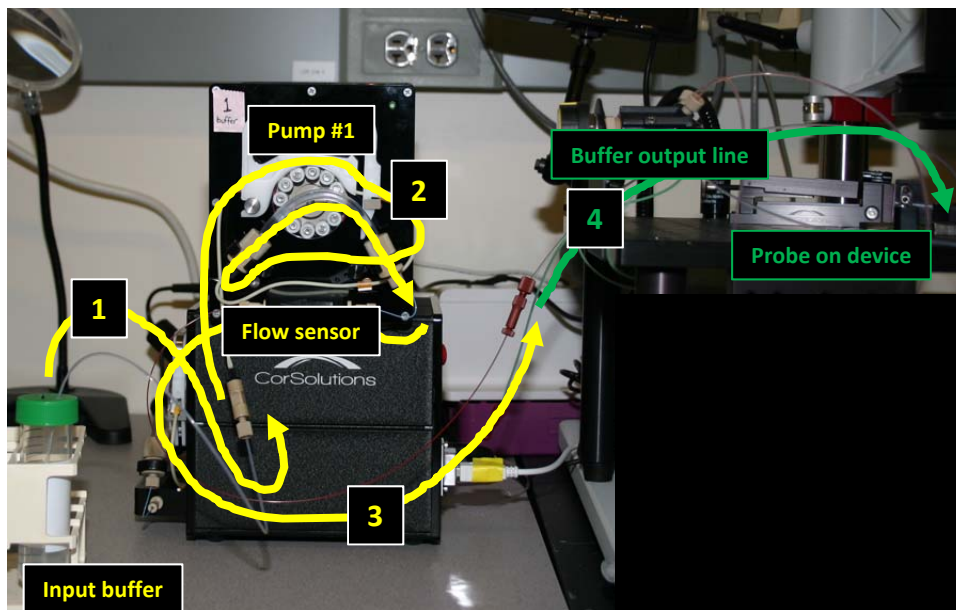
-Tapered connectors: extend the tubing past the end of the male connector by a centimeter. Insert the tubing and connector into the female connector, press the tubing against the female connector, and then withdraw the tubing by a millimeter. It should still extend past the end of the male connector as you screw in the connector.

-*If the tubing extends too far, it may plug the line.*

-*If the tubing doesn't extend past the connector, it will crimp and leak & destroy the end.*



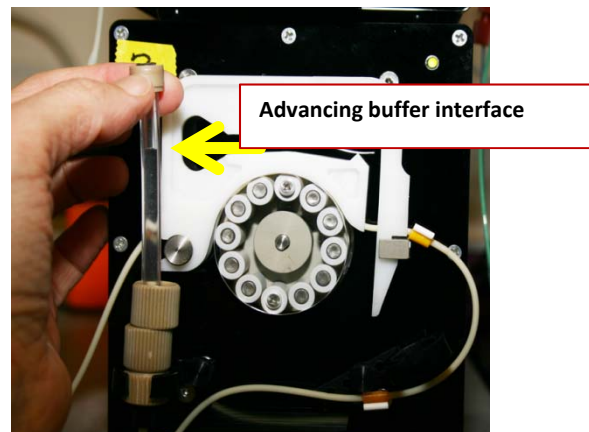
Setup for buffer pump #1



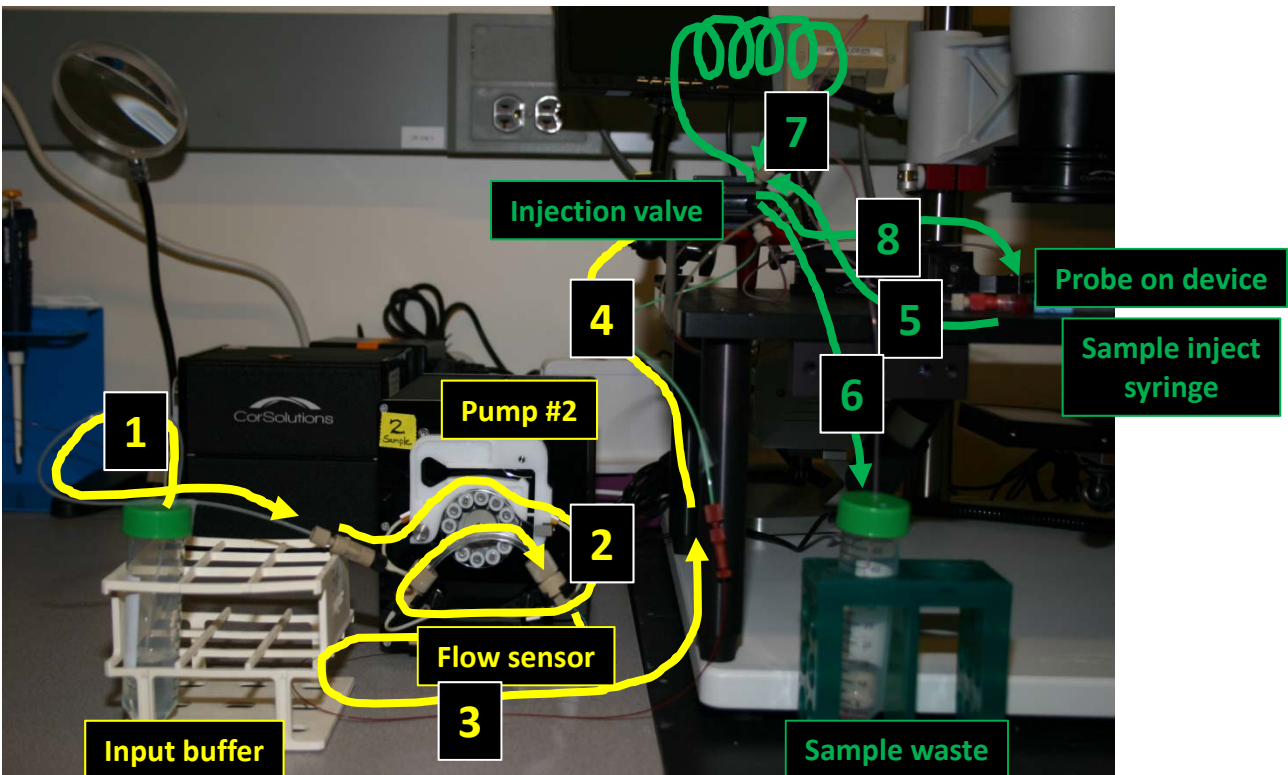
Load samples and buffers.

For the tubing through the pumps (segments 1-4):

- Place the end of the input buffer line 1 into the buffer.
- Place the output tube into a waste collection container, or place the probe arm over a paper towel.
- Run the pump in purge mode at a fast rate (50-500 $\mu\text{L}/\text{min}$) to send the buffer into the lines. If there is air in the large silicone tubing (line 2) at the pump, detach the right end of the large tubing, and hold the end up to allow air bubbles to escape while the buffer is moving through. Tap on the tubing to dislodge small bubbles.
- When the segment has completely filled, reattach it, and continue to pump buffer through the lines.

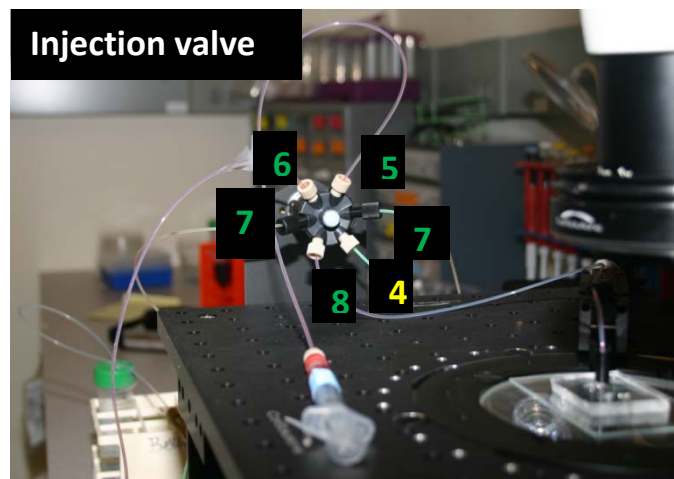


Setup for sample pump #2

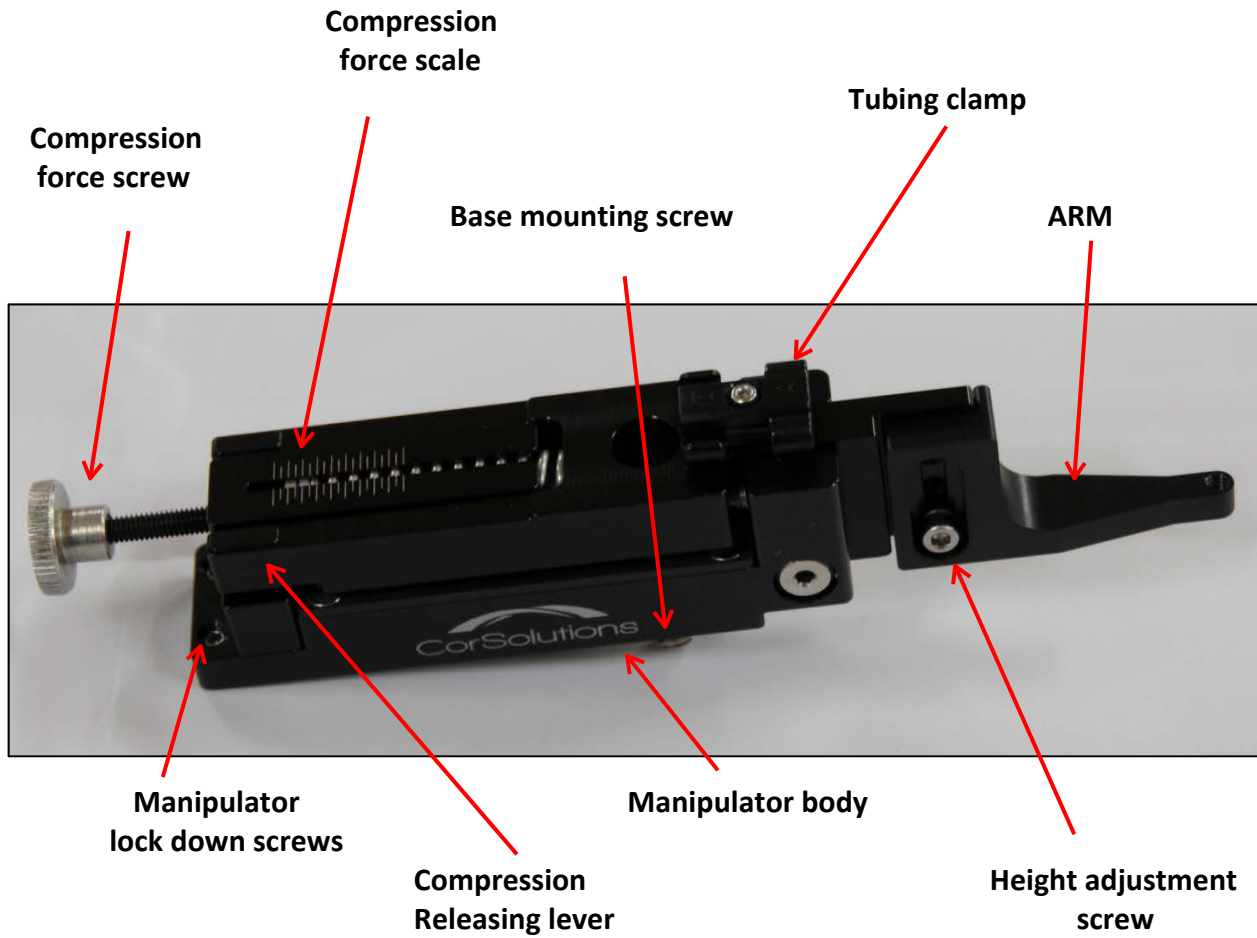


For the sample injection port:

- Change the injection loop tubing (7) and loop output tubing (8), if necessary.
- Load the sample & a bolus of air in a fresh syringe. Attach it to the injection input tubing (5).
- Turn the injection port dial towards the "load" position.
- Chase fluid out of the injection loop (7) and waste line (6) with air from the syringe.
- Send the sample into the sample input (5), sample loop (7) until it runs out of the waste line (6).
- Add another bolus of air to demarcate the end of your sample in the loop (7).
- Turn the injection port dial to the 'inject' position. When the pump runs, it will chase your sample out of the loop (7) and into the sample output line (8) with input buffer (line 1).



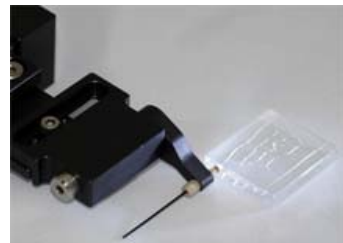
Assemble the appropriate probes and arms.



for 1/16" tubing



for 1/32" tubing



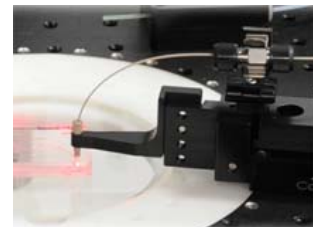
for side ports



for longer reach



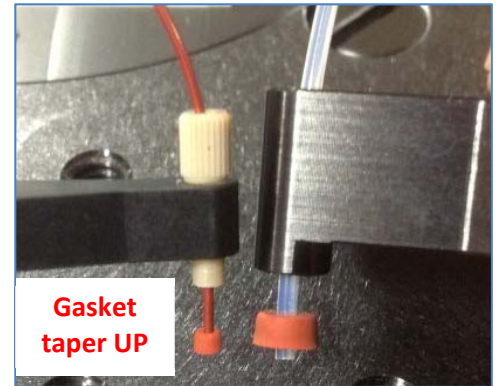
for piercing PDMS



for applying a current to the fluid stream

Insert tubing & gaskets into the arms.

Thread the tubing through the arm.
Place the gasket over the tube with the taper going into the arm.
(The wide end of the gasket should face the device.)



Mount the probes, chuck and device on the table.

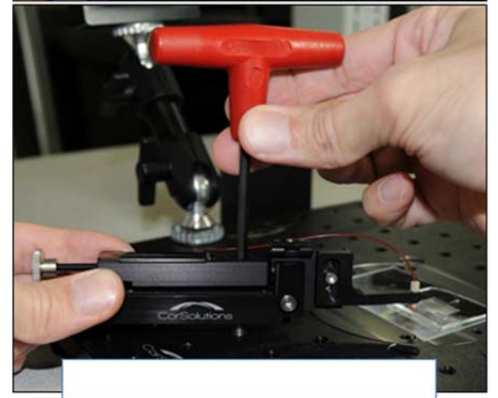
The screws holding the chucks are loosened & tightened with the penny. DO NOT OVERTIGHTEN.

Tilt the probe to slide the mounting screw forward.
Insert the Allen key into the head of the screw.



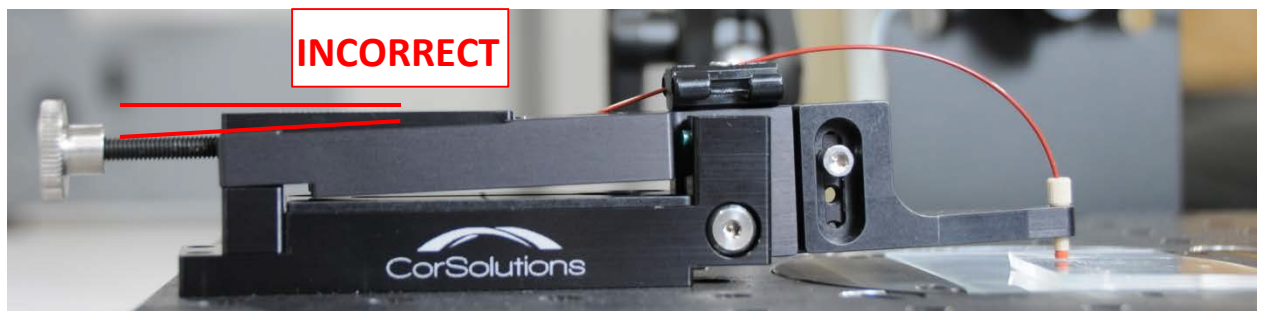
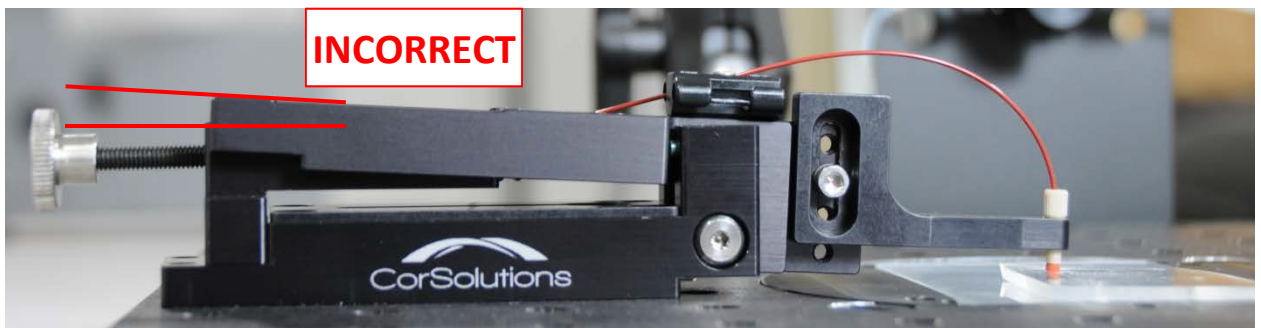
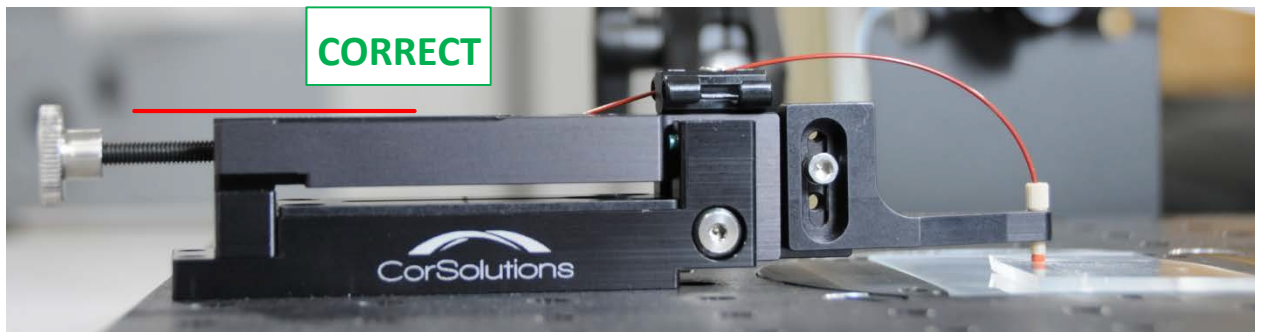
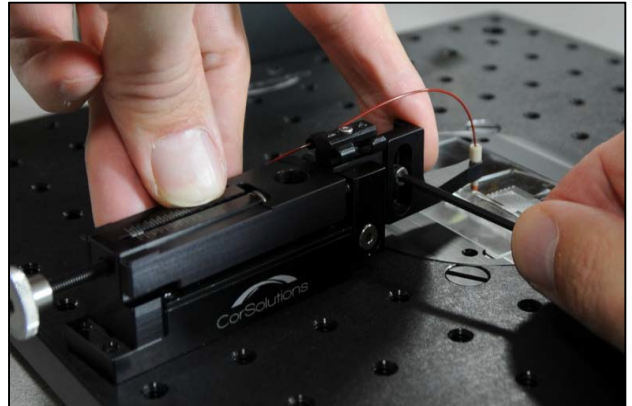
Choose a hole on the table and screw the probe into place and tighten GENTLY. Over-tightening will break the probe!

(To demount, slide the probe all the way back until the screw is in line with the access hole. Loosen with the Allen key.)



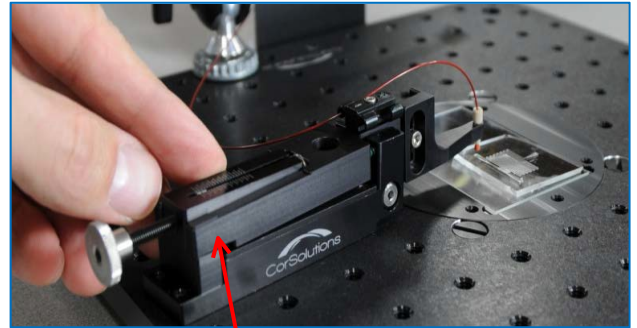
Adjust the probe arm height.

Dial the compression force to 0.
Loosen the arm height adjustment screw.
Hold the compression lever level, and adjust the arm height so that the gasket rests on the device.
Gently tighten the arm height screw.



Connect the probe to a port on your device.

With the compression force at 0, push down on the compression lever, and position the gasket over a port. Release the compression lever. Use the underside camera to watch the gasket seal.



Compression lever

Set the compression by dialing the compression screw clockwise. Use as little compression as necessary.

Note this compression force if you are going to connect to this device multiple times.



compression screw

Use the image capture software for pictures, movies and measurements.

Open iSolution Lite.

Click the camera button to open the **Image Capture** window

The capture device should be iCM3.0.

Click the **Preview** button for a live image.

Adjust the stereoscope and camera to center the device.

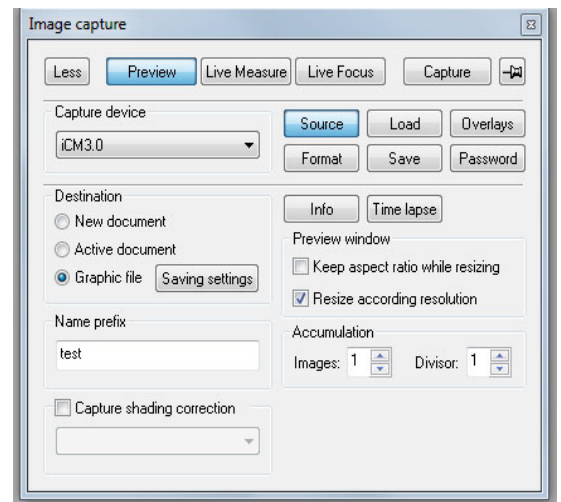
Adjust the physical lighting:

Bottom lighting = best

Reflected light = good

Top, non-reflected lighting = worst

The higher the magnification, the dimmer the lighting.



Click the **Source** button to adjust the image lighting, contrast white balance, etc.

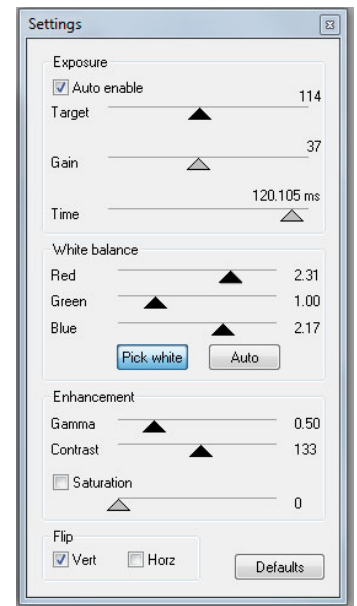
A good place to start:

-Check the enable box in Exposure.

-Click the “white pick” button and select a white area on the image.

-Uncheck the box for saturation.

-Save the settings to use them again on a similar device or another day.



Click the **Format** button to select the size of saved files (1025 x 768 recommended for images)

Saving settings button - screen for resolution, destination file, etc.

Select a destination and file type

z: drive is for intranet file share (7 days storage).

Detach your device and clean the tubing with 70% ethanol followed by water.

Flush your device with an appropriate cleaning solution/water.

Remove your device. Press the probe arm compression lever, and slide each probe away.

Put the output end of the tubing in a waste receptacle.

Flush out the tubing with water and then 70% ethanol.

Turn the sample injection valve to load. And flush these lines with water, followed by 70% ethanol.

Remove your sample injection loop (7). Replace it with the general CNF sample injection loop.

Leave a container of water at all input tubing ends.

Shut down and log off CORAL.

-Dial down the light supply for the underside diffuser.

-Turn the power off at the reset switch on the Belkin Surge protector.

-Exit the iSolution and CorSolutions applications.

-Leave the computer powered on.

-Cover the station with the dust cover.

-Log off on CORAL.