

## Dave's Vis-U-Etch 7 Calibration Procedure

Before calibrating a Vis-U-Etch it is necessary to understand how it works and confirm that there aren't any hardware failures.

The input monitor indicates how much light is passing through the incoming etchant before the chemicals are added, while the output monitor indicates how much light is passing through the etchant after chemicals are added. Since the output monitor is located after the injector, where the etchant is exposed to vacuum, its reading is of significance only while chemistry is being added, and spends much of the time off-scale low (no bars lit, or a value of 0 in service mode 6).

These meters work together, but perform separate functions. The input monitor controls when regeneration starts depending upon the transparency or lack of transparency of the etchant. When the input meter drops to 4 bars lit (<55), and the output monitor is at zero, regeneration will begin. Regeneration will be complete once the input value climbs above 55 (5 bars or more are lit). The output monitor guides the controller to select the correct chemical to add by measuring the strength of reaction to each chemical added. If the chemical being added causes the output monitor go above half-scale, (>128 or 11 bars or more lit), the Vis-U-Etch will continue to add that chemical until either the output monitor falls below 11 bars (indicating the chemical being added is no longer required), or until the input monitor determines that the chemistry added has enabled the etchant to become transparent again, so that it no longer requires further addition of chemistry.

The most common calibration error is caused by the output monitor being set too high. If any combination of chemical additions can make the output monitor go full-scale (all 20 bars and the off scale LED lit) then it is not set too low. In other words, turn the output calibration as low as it can be and still get the output monitor to go to full-scale.

The normal range for the input calibration is 5 to 120. The calibration should never be set less than 3, but can be set up to the maximum of 255.

The normal range for the output calibration is 0 to 120.

Step 1: (Note: For first time setup only, skip this step if you are checking the calibration of a working Vis-U-Etch.) Set the input and output calibration to their factory default (25) using service modes 4 and 6.

Step 2: Set the acid and oxidizer toggle switches to their center-off position.

Step 3: Verify that the input monitor shows less than 1/4 scale (5 or fewer bars lit) and the output monitor is off-scale low (no bars lit and a value of 0 (zero)). If necessary etch until the input meter shows less than 1/4 scale.

Step 4: Manually add acid for 3 seconds while watching the output monitor (set acid switch to "Manual" for 3 seconds, then "Off").

Did the output monitor go above half-scale (11 bars or more)?

Note: Remember the answer for use in step 7 "analysis".

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Wait to proceed with the next step until all the chemical added clears out of the system, returning the output monitor to the off-scale low condition.

Step 5: Manually add oxidizer for 3 seconds while watching the output monitor (set oxidizer switch to "Manual" for 3 seconds, then "Off").

Did the output monitor go above half scale (11 bars or more)?

Note: Remember the answer for use in step 7 "analysis".

Wait to proceed with the next step until all the chemical added clears out of the system, returning the output monitor to the off-scale low condition.

Step 6: Manually add both acid and oxidizer for 3 seconds at the same time while watching the output monitor.

Did the output monitor go to full-scale (all 20 bars and the "Off Scale" LED lit)?

Note: Remember the answer for use in step 7 "analysis".

Step 7: Analysis:

7A: Is the output calibration too low? If the answer from step 6 is "NO", the output calibration is too low. If increasing the output calibration raises the value above zero then the input calibration is also too low. Increase both adjustments by 10% then start over with step 2.

7B: Is the output calibration too high? If the answer from steps 4 AND 5 is yes then the output calibration is too high. Decrease the output calibration by 10% then start over with step 2.

7C: Is the output calibration correct? Thinking about the results from steps 4, 5 and 6, does the output monitor go past half-scale when the correct chemical is added and stay below half-scale when the chemical that is not needed is added? If so then calibration is complete.

Note: When the etchant is getting the chemical it needs to regenerate, the output monitor should swing full-scale (all 20 bars and the "Off Scale" LED lit).

Note: When a chemical is being added that is not needed (i.e. acid when oxidizer or both are required, oxidizer when acid or both are required) the output monitor MUST NOT go past half scale (127 or 10 bars). This is an indication that the output is calibrated too high.

Note: If calibration adjustments are necessary, adjust the calibration using service modes 4 and 6 by about %10, then recheck calibration starting with step 2.

Note: The power setting controls the LED drive current from 80uA to 20mA which is calculated as  $(\text{Power} + 1) \times 80\text{uA}$ . Some light cells do not light below a power setting of 2 or 3 while many are bright with the power set to zero. For some metals the light source is not visible light (i.e. Inferred for Chromium)