ELECTROSTATIC CLASSIFIER MODEL 3080 OPTIONAL POSITIVE HIGH VOLTAGE POWER SUPPLY

Why Positive?

The default polarity for the high voltage (HV) power supply in the Model 3080 Electrostatic Classifier is negative. This results in a measurement of the positively-charged particles using the Long or Nano Differential Mobility Analyzer (DMA), which is historically how most differential mobility analysis has been done. However, when the equilibrium bi-polar charge distribution is considered (Figure 1) it is clear that there are actually more (about 30% higher) negatively charged particles than positively charged particles. For this reason, and for other basic research applications involving charge study, an optional positive HV power supply (PN 1030354) is available from TSI to size classify negatively charged particles. The Model 3080 Classifier can easily accommodate either polarity supply.

Equilibrium Bi-Polar Charge Distribution

D_p (nm)	-2	-1	0	+1	+2	Comparison -1 to +1
10	0	5.03	90.96	4.02	0	125%
20	0.02	11.14	80.29	8.54	0.01	130%
50	1.13	22.94	58.10	17.20	0.63	133%
70	2.80	26.02	49.99	19.53	1.57	133%
100	5.67	27.42	42.36	20.75	3.24	132%
130	8.21	27.30	37.32	20.85	4.77	131%
200	12.18	25.54	29.96	19.65	7.21	130%
300	14.56	22.71	24.16	17.51	8.65	130%
500	15.09	18.60	18.28	14.33	8.95	130%
700	14.29	15.94	15.15	12.27	8.46	130%
1000	12.86	13.33	12.36	10.24	7.59	130%

More Negative!

Figure 1: From A. Wiedensohler: "An Approximation of the Bipolar Charge Distribution for Particles in the Submicron Size Range", *Journal of Aerosol Science,* **Vol. 19, No. 3, pp. 387-389, 1988.**

Step-by-Step Instructions: Replacing Negative HV Power Supply with Positive HV Power Supply

The location of the HV power supply in the Classifier is shown in Figure 2 and the optional positive HV power supply is shown in Figure 3.
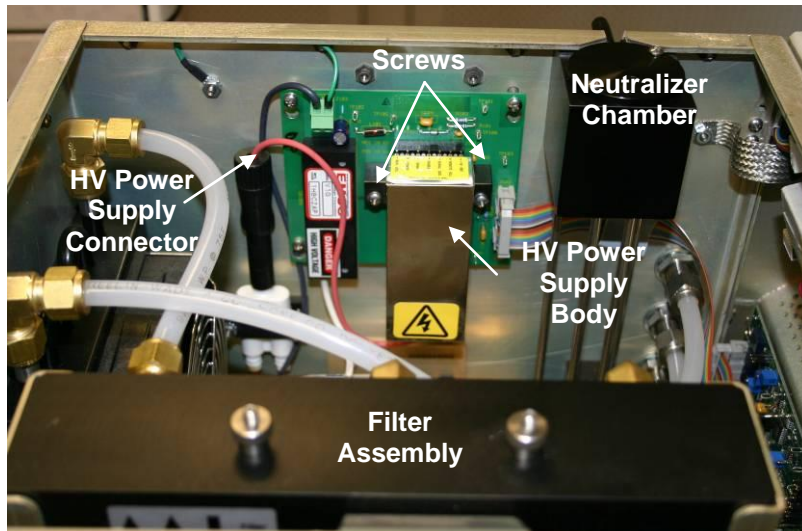

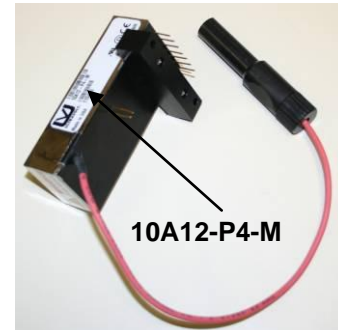**Figure 2. Location of HV Power Supply in 3080 Electrostatic Classifier**

Figure 3. Positive HV Power Supply

The two different polarity HV power supplies can be identified by their different model numbers:

        Negative polarity HV power supply: 10A12-**N**4-M (Default)
        Positive polarity HV power supply: 10A12-**P**4-M (Optional)

Follow the steps below to replace the negative HV power supply with the positive HV power supply in the 3080 Electrostatic Classifier:

1. Turn off the power of the 3080 and disconnect the electrical power cable.

2. Remove the cabinet cover of the 3080 by loosening the 7 screws securing the cover (the screws do *not* have to be removed)

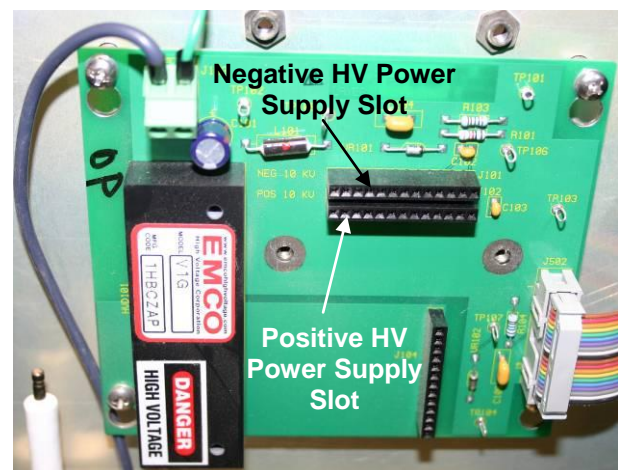
Figure 4. Removing Power Supply

Figure 5. Electrical Board after Power Supply is removed

3. Disconnect the long black HV power supply connector by pulling it up and then loosen the two screws on the sides of the HV power supply body from the mounting bracket (Figures 2 and 4).

4. Grab the sides of the HV power supply body and pull it carefully away from the electrical board until it is fully removed (Figure 5).

5. Push in the positive HV power supply onto the electrical board with the line of 7 pins seated in the **bottom** horizontal slot on the board and two side pins seated in the vertical slot on the board. The mounting holes for the two screws will help to align the module in the correct socket.

   Note: The default negative HV power supply seats into the top horizontal slot while the optional positive HV power supply seats into the bottom horizontal slot.

6. Fix the HV power supply onto the board by screwing the two screws into the mounting bracket.

7. Connect the HV power supply connector (red wire) onto the white post on the left side of the electrical board (Figure 6).
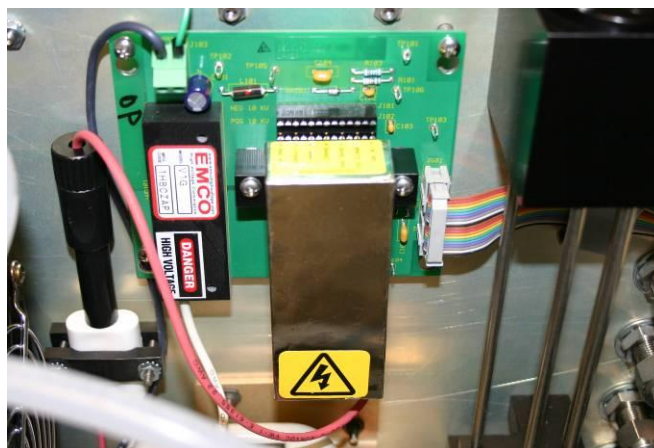

Figure 6. Optional Positive HV Power Supply Installed

8. Put the instrument cover back on and tighten the 7 screws to fix the cover.

9. Plug in the power cable and turn on the instrument.

10. When the instrument is first powered up, the bottom line of the front panel display shows:

<div align="center">

High Voltage Check: In process

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The 3080 Electrostatic Classifier first looks for the default negative HV power supply and then a relay click can be heard once the 3080 determines that it can not find the negative HV power supply. It then starts to look for the positive HV power supply. After the 3080 finds and checks the positive power supply, the front panel display will show:

<div align="center">

High Voltage Check: <u>Passed</u>

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11. Now the 3080 Classifier is ready to be used to size-classify negatively-charged particles.

Important! If you are using the 3080 Classifier as part of a TSI Scanning Mobility Particle Sizer™ (SMPS™) spectrometer and using the Aerosol Instrument Manager® software to collect particle size distribution data, ensure that in the "SMPS Properties" box the HV polarity is switched to positive because positive and negative particles have different charging efficiencies.

Please contact TSI if you have any questions.