

# AEROTRAK™ 9000 Nanoparticle Aerosol Monitor Theory of Operation

Application Note ITI-100

The patented AEROTRAK™ 9000 Nanoparticle Aerosol Monitor\* is based on diffusion charging of sampled particles, followed by detection of the charged aerosol using an electrometer. An aerosol sample is drawn into the instrument continuously at a rate of 2.5 L/min. The flow is split with 1 L/min passing through two filters (a carbon and a HEPA) and an ionizer and 1.5 L/min of aerosol sample flow.

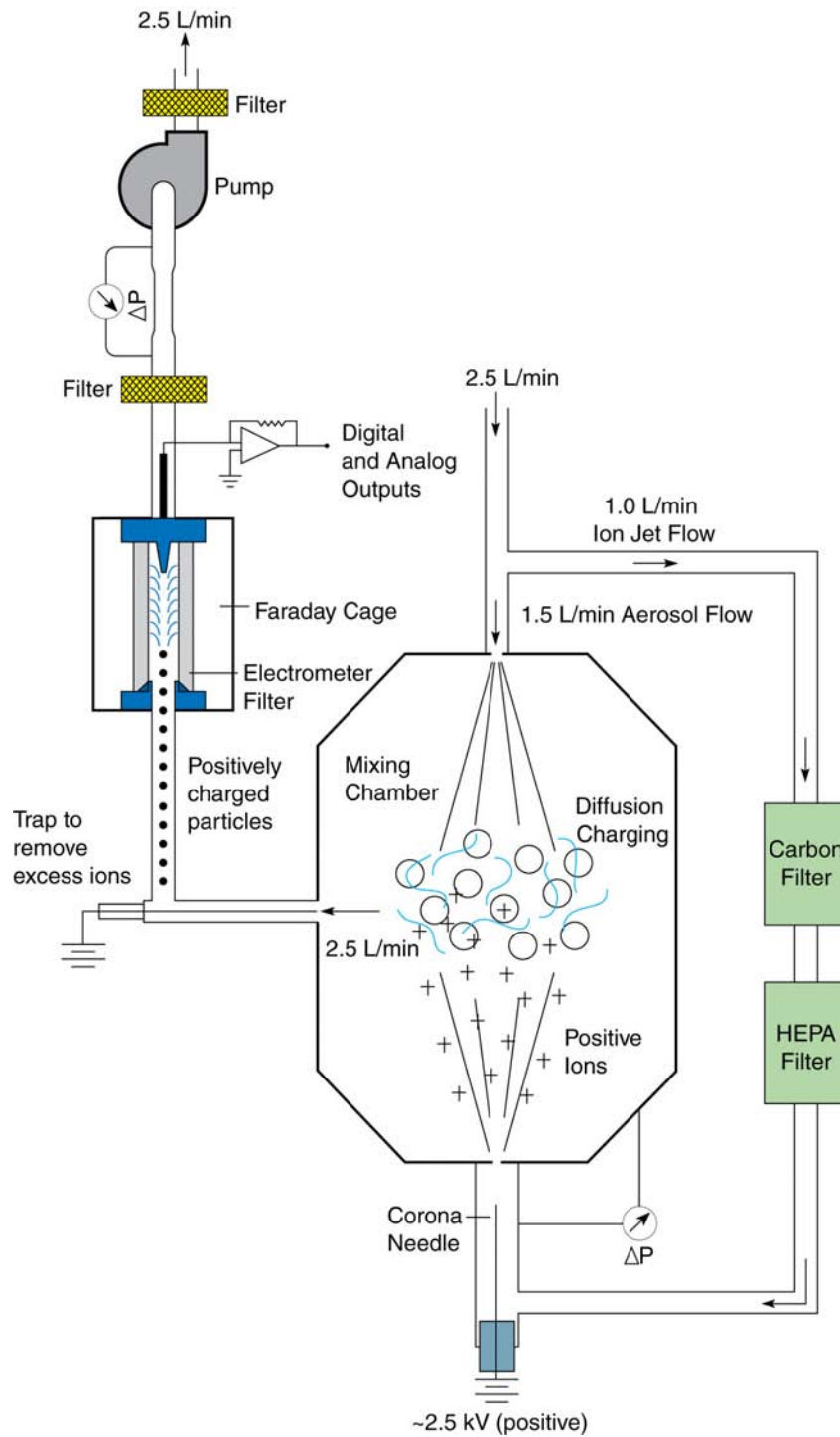
The flow streams are merged in a mixing chamber where particles in the aerosol flow mix with the ions carried by the filtered clean air. This patented *counter-flow diffusion charging*\*\* brings the aerosol particles into a defined, charged state. The separation of particles from direct interaction with the corona needle and/or the strong field near it reduces particle loss and makes the charging process more efficient and reproducible. The charged aerosol then passes through an ion trap to remove excess ions and charged aerosol. The aerosol then moves onto an electrometer for charge measurement. In the electrometer, current is passed from the particles to a conductive filter and measured by a very sensitive amplifier. A microprocessor controls the instrument flows and measures various operational parameters and converts the electrometer measurement into surface area concentration in units of square micrometers per cubic centimeter ( $\mu\text{m}^2/\text{cc}$ ).

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\*U.S. Patents 6,544,484 and 7,812,306

\*\*U.S. Patent No. 6,544,484





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