APPENDIX III

HV BREAKDOWN CONSIDERATIONS

Air is subject to dielectric breakdown when the probe-to-surface spacing is small and the difference in voltage between the probe and the surface under test is high. A destructive arc-over can occur damaging the surface under test and/or the sensitive circuitry of the probe. Under normal operating conditions this is usually not a problem as the probe housing is driven to a voltage essentially identical to the unknown and the difference in voltage is very close to zero.

Under normal circumstances the Model 279 ISOPROBE® Electrostatic Voltmeter can follow the unknown voltage up to its high voltage amplifier limits — a few hundred volts above its specified range of ±3000 volts.

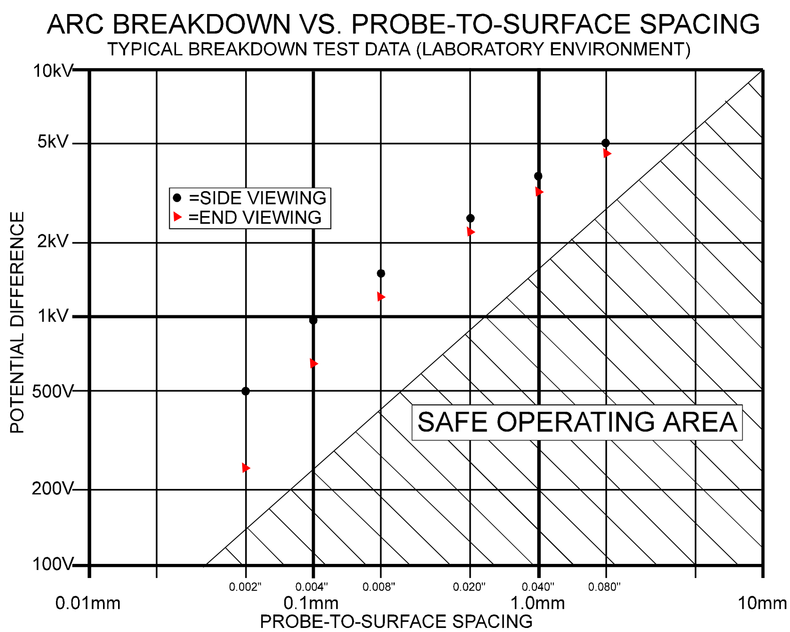

Figure A-II-1

APPENDIX IV

ACHIEVING SPACING INDEPENDENCE

Eliminating Zero Shift Over a Large Probe-to-Surface Spacing Range

This instrument's basic operating principle is to null the electric field between a surface under measurement and the sensitive electrode in the probe. When the potential of the surface under measurement is zero, the instrument drives the sensitive electrode and the probe housing (a reference surface) to zero potential, thereby nulling the electric field between the probe and the surface under measurement.

Ideally, only the surface under measurement contributes to this process. However, if other voltage sources exist in the vicinity of the sensitive electrode, which are independent of the unknown to be measured, offsets are produced. Such voltage sources include contact potential differences among internal probe parts, small specs of charged dust, etc. The ZERO1 control is provided to counter such offsets by applying a voltage directly to the sensitive electrode.

The influence of these voltage sources is usually not the same at all probe-to-surface separations. Their influence will vary in proportion to the probe-to-surface separation and will cause the instrument zero offset voltage to vary with probe-to-surface spacing changes. This effect can be minimized to afford a high degree of zero stability over a range of spacing changes. This is known as spacing independence.

The following procedure is used to optimize the spacing independence of the instrument:

1. Position the probe at the minimum spacing to the surface under test. Apply zero volts to the surface under test.
2. Switch the instrument to the OPERATE mode and adjust the GAIN for a critically damped or somewhat over-damped condition.
3. Adjust the ZERO2 control for a zero output voltage from the instrument.
4. Re-position the probe to the maximum spacing from the surface under test.
5. Adjust the ZERO1 control for a zero output voltage from the instrument.
6. Return the probe to the minimum spacing to the surface under test.
7. Repeat steps 3 through 7 until the zero shift is minimized to the desired level.