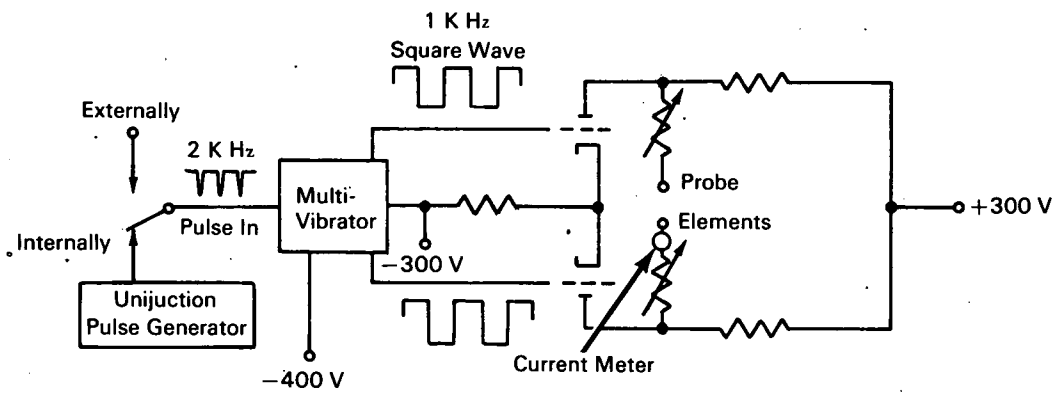
NASA TECH BRIEF

Glow Discharge Density Sensor Probe Life Is Extended



The problem:

Instability of dc-excited glow discharge-type density sensors has resulted in poor signal-to-noise ratios plus high electrode sputtering rates. The poor signal-to-noise ratios interfere with accurate system output analysis while the high sputtering rates result in shorting of the electrodes by buildup of metal deposited on the cathode. Low frequency rf transmitters producing sinusoidal ac excitation have been used but involve large quantities of expensive equipment and exhibit very critical adjustment problems.

The solution:

Excitation of the glow discharge probes by use of a high peak-to-peak voltage square wave capable of frequency variation from dc to 5 KHz. This results in good probe life plus output stability over a wide range.

How it's done:

The square wave excitation is provided by a bistable multivibrator driving a pair of 6L6 vacuum tubes with the probes direct-coupled to the plates of the tubes. Bias to the square wave generator provides voltage to the probes with a small (ideally zero) dc component relative to the density test cell ground, thus reducing proximity effects. Probe current metering is accomplished by a bridge rectifier and milliameter inserted in the probe circuit so that average probe current is indicated due to the ballistic galvanometer action. Due to the capacitance in the probe leads, meter circuit, and output tube plates, a current pulse, much higher than the average current, is obtained during the switching portion of the square wave. This current pulse is readily repeatable so long as the probe physical and electrical parameters are not changed. The capacitive effect is of benefit in that it causes the current to rise rapidly through the Townsend discharge region to the point where a self-sustained, normal glow is obtained. Current measured during this normal discharge is readily related to density of the medium within which the probes are discharged.

(continued overleaf)

Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10229

Patent status:

Inquires about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: R. A. Mahugh
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Marshall Space Flight Center
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