NASA TECH BRIEF

Regulated-Current DC Power Supply for Gaseous-Discharge Lamps

The problem:

Design and development of an improved controlled-current dc power supply to provide a high degree of stability in gaseous-discharge lamps.

The solution:

A controlled-current source having a high output resistance. Such a power supply has been tested successfully for feeding continuous-flow hydrogen lamps in vacuum-ultraviolet photometric equipment; it can be used also with low-pressure sealed lamps.

How it's done:

The new power supply has an output resistance higher by several orders of magnitude than the dynamic and static resistance of the lamp from direct current to the high-frequency region. The recovery time is short, and the regulation is very smooth, without overshoot, in order to prevent extinction of the lamp during transients. The stray capacitance, in parallel with the lamp, has been kept as low as possible so that the lamp is prevented from operating as a relaxation oscillator.

The current can be adjusted between 10 and 110 mA with a precision 10-turn potentiometer; it can be read directly on the dial. A 10-ohm precision shunt enables monitoring of the current with an external voltmeter; the shunt terminals are brought to two test points on the front panel, the negative side of the shunt being grounded. Depression of the "ignition" button applies a 2-kV, 60-Hz half-wave to the lamp to ensure proper ignition. The state of the lamp ("on" or "off") is indicated on the control panel of the power supply.

A passive LRC radio-frequency filter, mounted as close as possible to the lamp, prevents lamp-generated noise from disturbing the power supply. Moreover the filter limits very efficiently the current flowing through the lamp when combustion of impurities or foreign gases on the electrodes produces arcs; thus the amount of metallic vapors projected into the optical system is reduced.

The apparently novel ignition system requires no thyratron or high-voltage relay; the diode switch connects the lamp, once it is ionized, to the main rectifier without current break and without voltage or current transients. The external filter also is believed to be new; its ability to stop large transients makes the power supply an almost ideal controlled-current source up to the high-frequency region.

One alternative simplified version, already tested, is intended to replace the ac transformer for low-pressure mercury lamps when the 120-Hz modulation of the light sources is a major inconvenience — in the testing of star-trackers, for example.

Note:

Requests for further information may be directed to:

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Patent status:

No patent action is contemplated by NASA.

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