NASA TECH BRIEF

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CIRCUS—A Digital Computer Program for Transient Analysis of Electronic Circuits

The problem:

To provide a means for studying the effect of transient nuclear radiations on electronic circuits, since it is necessary to prevent damage to or spurious output from many types of circuits.

The solution:

A computer program which simulates the time domain response of an electronic circuit to an arbitrary forcing function. CIRCUS uses a charge-control parameter model to represent each semiconductor device. When given the primary photocurrent induced in the semiconductor devices, the transient behavior of a circuit in a radiation environment can be determined.

How it's done:

Since any circuit is completely defined by the component values and by the way in which the components are interconnected, it is apparent that a digital computer can be used to construct the circuit equations from a physical circuit description. CIRCUS follows this approach, setting up the time-domain equations from a topological description of the network. CIRCUS finds the steady-state initial conditions by setting the differential equations to zero, then evaluates the transient solution by numerical integration of the differential equations.

The program output includes the input data and columnar listings of network variables vs time. Virtually any circuit variable including currents and voltages internal to the semiconductor devices, may be displayed. Although no plotting capability is ordinarily supplied with CIRCUS, provisions have been made for saving variables on tape for subsequent plotting or further analysis by other programs.

Notes:

1. This program is written in Fortran H and Assembler for use on the IBM 360 computer.
2. Inquiries should be made to:
    COSMIC
    Computer Center
    University of Georgia
    Athens, Georgia 30601
    Reference: B68-10416

Patent status:

No patent action is contemplated by NASA.

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