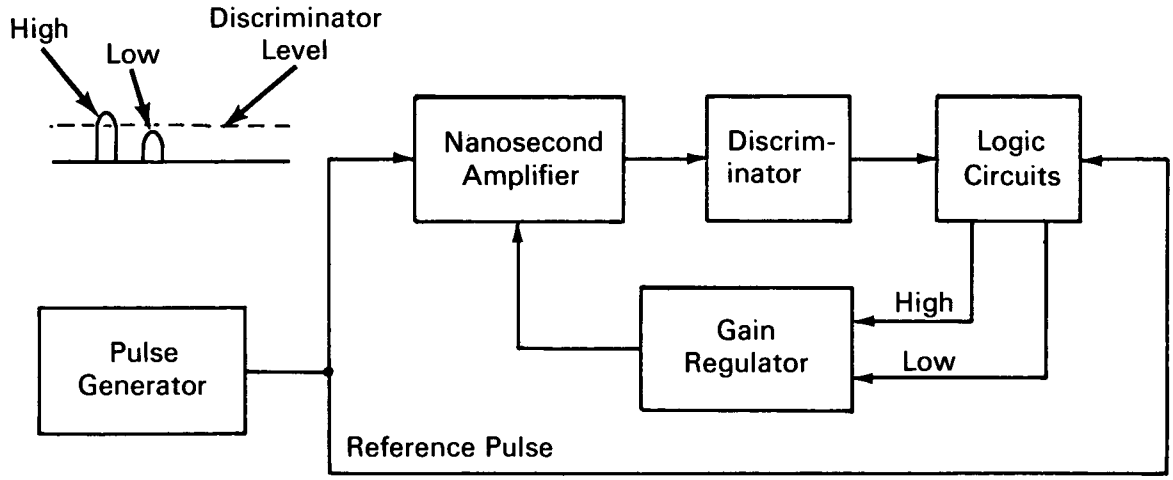
November 1966

Brief 66-10500

AEC-NASA TECH BRIEF

AEC-NASA Tech Briefs describe innovations resulting from the research and development program of the U.S. AEC or from AEC-NASA interagency efforts. They are issued to encourage commercial application. Tech Briefs are published by NASA and may be purchased, at 15 cents each, from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Digital System Provides Superregulation of Nanosecond Amplifier–Discriminator Circuit



The problem:

To provide stable gain characteristics for nanosecond amplifiers used in counting applications.

The solution:

A feedback system employing a digital logic comparator to detect and correct amplifier drift.

How it's done:

The amplifier-regulator system consists of a pulse generator, logic circuits, discriminator, and a gain regulator. The pulse generator supplies alternately high- and low-amplitude pulses. The amplitude of the low pulse is just below the level of the disciminator and will not normally pass through the discriminator. The amplitude of the high pulse is just above the level of the discriminator and will normally pass through it.

These pulses are fed to the input of the amplifier and the logic circuits. The output of the disciminator is fed to the input of the logic circuits. The logic circuits consist of splitter circuits, coincidence circuits, and anticoincidence circuits.

When a low pulse is generated, a reference pulse is sent to a coincidence logic circuit. If the gain of the amplifier is correct, there will be no corresponding low-amplitude pulse from the discriminator and no output from the coincidence circuit. When a high pulse is generated, a reference pulse is sent to an anticoincidence logic circuit. If the amplifier gain is correct, the discriminator will pass the pulse and no output will come from the anticoincidence circuit. If the gain of the amplifier increases, the discriminator will pass the low-amplitude pulses and a signal will result from the coincidence circuit. If the gain of the amplifier decreases, the high-amplitude pulses will be blocked by the discriminator and a signal will result from the anticoincidence circuit. The high and low

(continued overleaf)

outputs from the logic circuits, corresponding to increases and decreases in amplifier gain, are fed to a gain regulator which corrects the gain of the amplifier appropriately.

Notes:

1. By employing additional anticoincidence logic, the regulation circuit may be applied to the amplifier and discriminator while they are mounted in an operable circuit, so that long term continuous regulation may be achieved.
2. By employing the digital logic comparator system, gain excursions can be held within the amplifier noise width, typically 40-60 microvolts to input of amplifiers of 100 MHz bandwidth. In addition, the reference pulses are held to a few microvolts per week drift.
3. Inquiries concerning this innovation may be directed to:

   Office of Industrial Cooperation
   Argonne National Laboratory
   9700 S. Cass Avenue
   Argonne, Illinois 60439
   Reference: B66-10500

Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

Mr. Geoge H. Lee, Chief
Chicago Patent Group
U.S. Atomic Energy Commission
Chicago Operations Office
9800 S. Cass Avenue
Argonne, Illinois 60439

Source: K. G. Forges
Reactor Engineering Division
(ARG-61)