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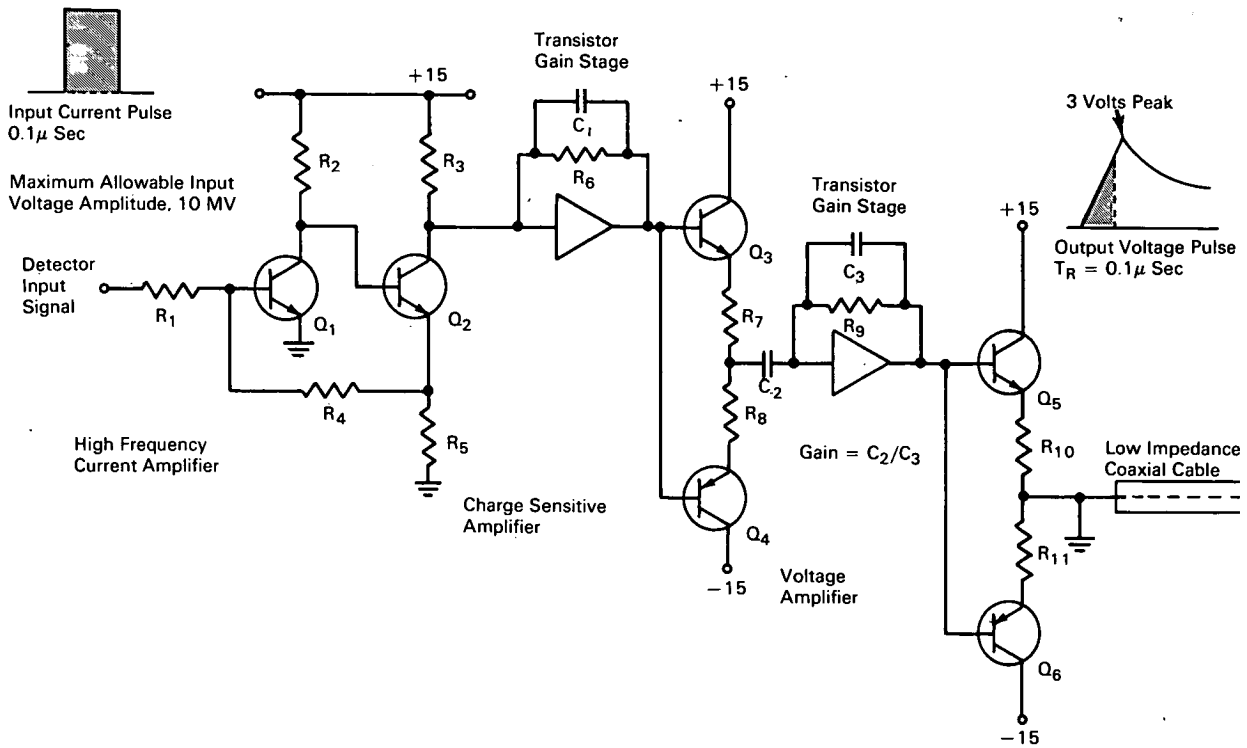
Current Pulse Amplifier Transmits Detector Signals with Minimum Distortion and Attenuation



The problem:

To amplify current pulses from a boron-trifluoride neutron sensitive detector located adjacent to a nuclear reactor. The current pulses must be sent over a coaxial cable several hundred feet in length to the amplifier with negligible distortion. The amplifier output must be transmitted over the cable with minimum loss of pulse amplitude at counting rates of 100 kHz.

The solution:

An amplifier that translates the square pulses generated by the neutron detector to slower, long exponential decay pulses. These pulses can be transmitted over long coaxial cables with minimum distortion and loss of frequency.

How it's done:

The pulse amplifier consists of three modules. The high frequency current amplifier module serves as a

(continued overleaf)

preamplifier for the boron trifluoride detector. It utilizes a dc coupled feedback double, comprised of two transistors and associated components. The overall current gain of this module is about 4.5, and the bandwidth is of the order of 10 MHz. This bandwidth permits amplification of narrow pulses (100 nanoseconds) without distortion.

The charge sensitive amplifier module produces an output voltage pulse having an amplitude which is proportional to both the magnitude and duration of the input current pulse. The voltage amplifier module shapes the output pulse so that it has a decay time of about 5 microseconds and drives the low impedance coaxial cable.

Notes:

1. Signals have been transmitted satisfactorily over several hundred feet of RG-59/M cable (0.242 inch diameter).
2. This circuit may be useful in high counting rate applications.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   AEC–NASA Space Nuclear Propulsion Office
   U.S. Atomic Energy Commission
   Washington, D.C. 20545
   Reference: B67-10347

Patent status:

No patent action is contemplated by AEC or NASA.

Source: N. E. Bush
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