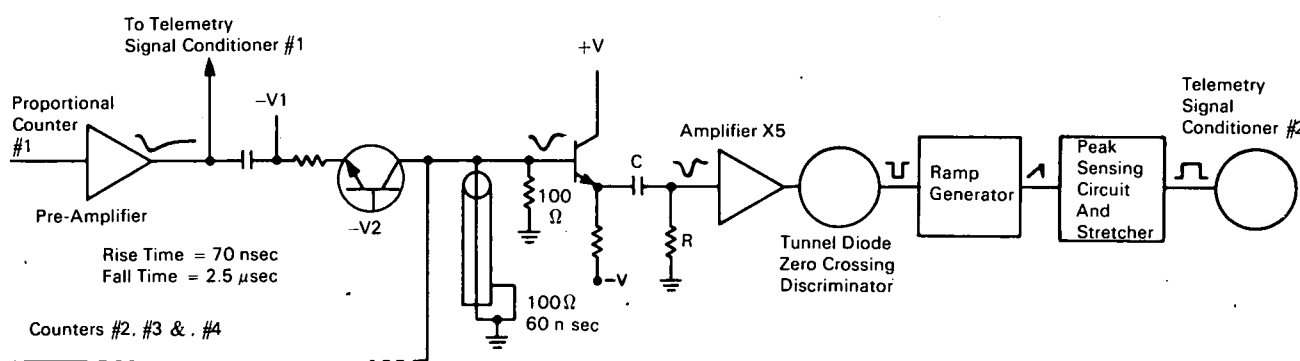


# NASA TECH BRIEF



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## Reduction of Background in an X-Ray Proportional Counter



Block Diagram of the Rise Time Discrimination System

### The problem:

To design a proportional counter with increased sensitivity for high resolution X-ray surveys and locating weak cosmic X-ray sources, while reducing non-X-ray background.

### The solution:

Rise time discrimination, using a charge sensitive preamplifier with high gain and large bandwidth combined with a zero crossing discriminator.

### How it's done:

It is thought that the basis for the discrimination originates in the difference in path length between a photoelectron and an energetic particle depositing the same amount of energy in the counter. This results in a difference in rise time between the corresponding output signals.

The system as shown in the figure consists of a pre-amplifier with a charge sensitive input section of 4

transistors and a pair of transistors which perform as a high gain video amplifier. The finite bandwidth of the preamps limits the rise time of the X-ray signals to a minimum of 7 nsec and differentiates the output by a time constant of 2.5 μsec. Two output signals emerge from the pre-amp. One is used for pulse height analysis and the other is routed to a mixer which receives inputs from 4 independent detectors before reaching the rise time discriminator.

The output of the mixer is clipped by a 100 ohm, 60 nsec shorted lumped constant delay line. After amplification, the signal is applied to the zero crossing detector. The output is a fast rising and falling waveform of a nearly constant width for all X-ray energies above 2 keV. This width is converted to an amplitude using the ramp generator. Subsequently the signal is amplified, delayed 3 μsec and stretched to a width of 1000 μsec before passing to the telemetry transmitter.

(continued overleaf)

**Note:**

The following documentation may be obtained from:

Clearinghouse for Federal Scientific  
and Technical Information  
Springfield, Virginia 22151  
Single document price \$3.00  
(or microfiche \$0.65)

Reference: NASA-CR-96716 (N68-34803)  
A Continuation of a Program of High  
Angular Resolution Studies of Celestial  
X-Ray sources.

**Patent status:**

No patent action is contemplated by NASA.

Source: P. Gorenstein and Stanley P. Mickiewicz  
American Science and Engineering, Inc.  
under contract to  
NASA Headquarters  
(HQN-10253)