NASA TECH BRIEF

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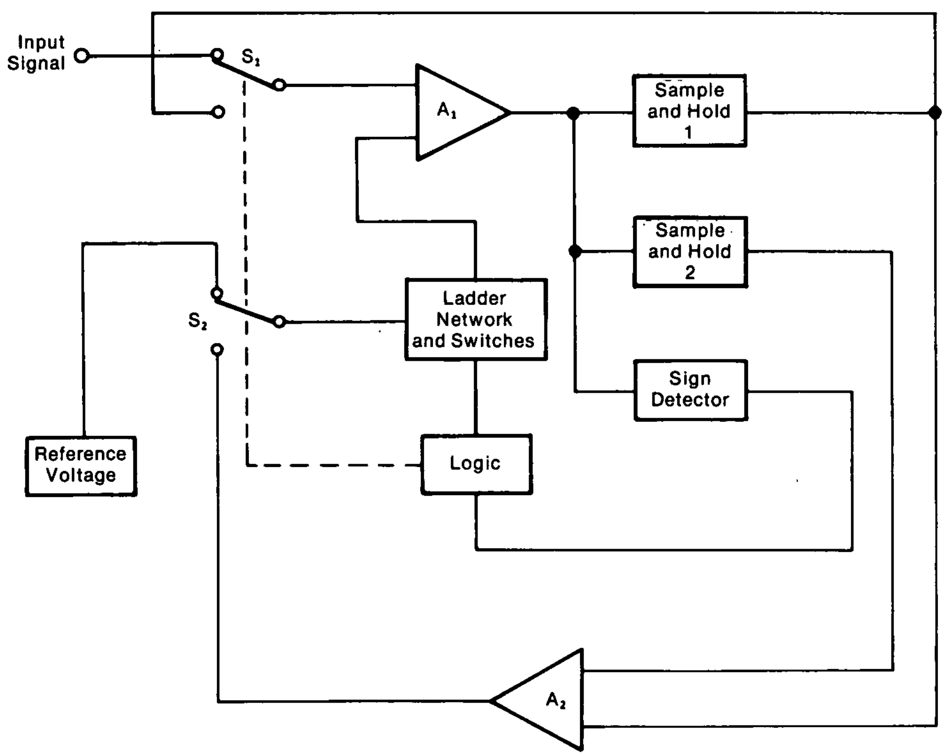
Highly-Stable Analog-to-Digital Converter

A highly-stable, 13-bit analog-to-digital converter (ADC) has been developed for use in a pulse-height analyzer of a gamma-ray telescope. Four units are currently working in a balloon-borne telescope system. When tested, these units showed an integral linearity of 0.05 percent and a differential linearity of less than 2 percent.

A simplified block diagram of the ADC is shown in the figure. The input signal is fed to amplifier A_1 through switch S_1 at the start of conversion. By successive approximation, the logic sets the input to the ladder network so that the ladder output voltage is just below the input signal. The difference between the input and the ladder output is amplified by A_1 and stored in the sample-and-hold circuit 1. Next, the ladder driver circuitry is stepped so that the output increases by one bit and is just above the input signal. The difference is again amplified by A_1 but this time is stored in the sample-and-hold circuit 2.



Simplified Block Diagram of ADC

(continued overleaf)

The output of sample-and-hold 1 through S_1 becomes the input for the second half of the conversion. The difference between sample-and-holds 1 and 2 is the difference between the ladder output level just above the input signal and the one just below; this difference amplified by A_2 becomes the reference voltage for the second half of the conversion. The second conversion is then done by successive approximation, using the same circuitry as for the first.

Note:

Requests for further information may be directed to:

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Reference: TSP75-10277

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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Categories: 01 (Electronics - Components and Circuitry)
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