

# NASA TECH BRIEF

## NASA Headquarters



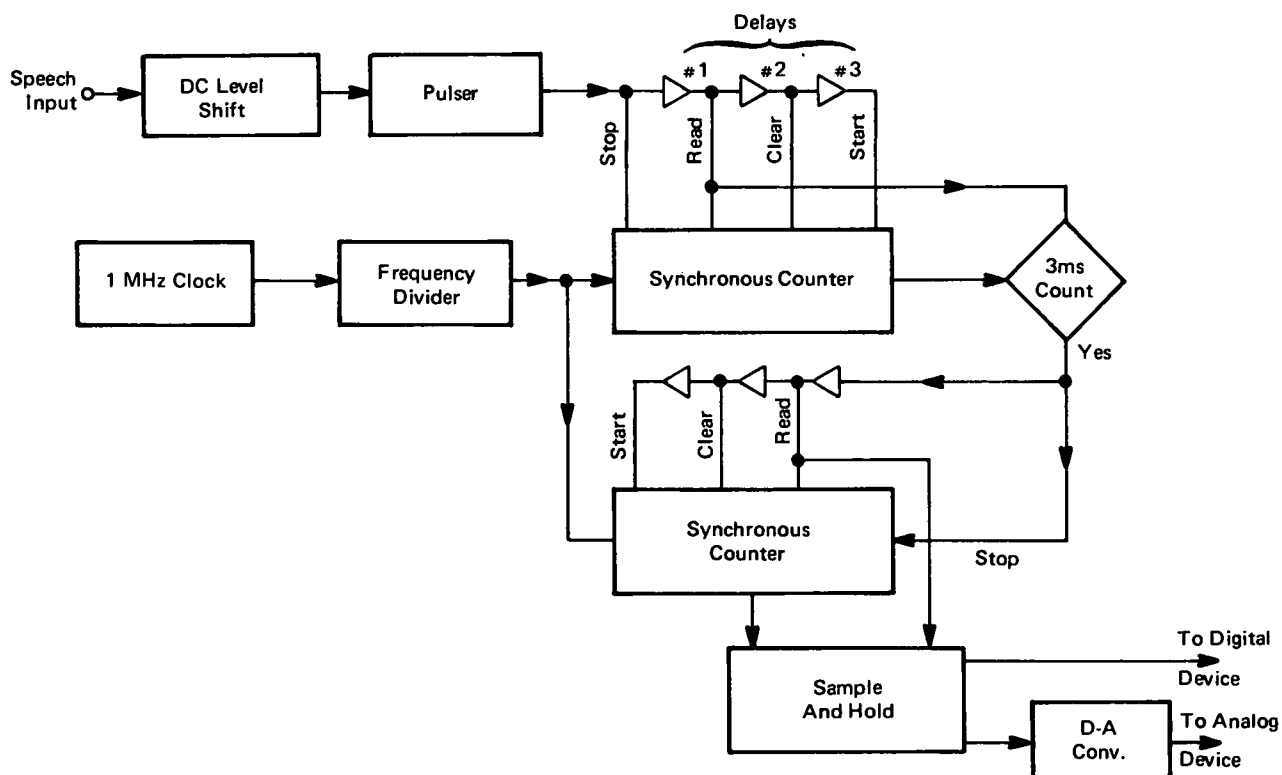
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### Speech Therapy and Voice Recognition Instrument

The instrument shown by the block diagram automatically extracts the time between glottal pulses (present during the voiced portions of speech) from the complex time-pressure waveform of natural speech, and automatically separates the voiced and nonvoiced portions of speech. The system should prove useful in speech pathology, for examining variations in vocal excitation for diagnostic purposes, and in speech recognition, for determining voice patterns and pitch changes.

The signal input is either a speech waveform or the derivative of the waveform, taken usually from a microphone output. A threshold device senses the waveform at a value approximately 30% either above or below the

average value, and produces a time marker when a negative-going transition occurs through the defined threshold. The time between consecutive time markers is measured, and an algorithm is applied to these intervals. The first time interval between the time markers is compared to a reference "stop number" of approximately 3-ms duration. If the interval is greater than the stop number, the interval is defined as an output and is processed accordingly. If it is less than the stop number, the first interval is added to the second interval to form a continuing sum. The second interval is then compared to the stop number; if it is greater than the stop number, the sum is recorded as output. If it is less, the continuing sum is added to the third interval, and so on.



(continued overleaf)

Each time an output occurs, the continuing sum is reset to zero, and the algorithm is repeated. The output is a series of times which are direct measurements of interglottal intervals. Because of the sampling method, nonvoice portions of speech result in large time intervals which are easily distinguished from the glottal intervals.

The electronic system is readily implemented with standard digital circuitry. The output may be recorded on a variety of visual devices such as a cathode ray oscilloscope for average values, while pictures of high-persistence displays may be used to define exact interval times.

**Note:**

Requests for further information may be directed to:  
Technology Utilization Officer  
Code KT  
NASA Headquarters  
Washington, D. C. 20546  
Reference: B72-10652

**Patent status:**

NASA has decided not to apply for a patent.

Source: J. Cohen and M. L. Babcock of  
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