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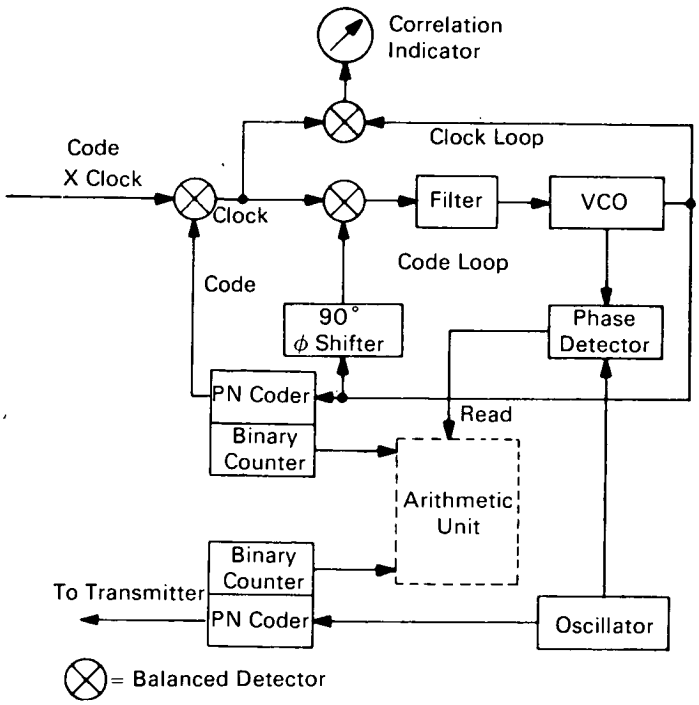
Brief 70-10060

NASA TECH BRIEF

Ranging Code Processor



Functional Elements of Ranging Subsystem

A system has been devised that offers a novel method of extracting range data from pseudorandom-coded range radar used to track a moving body. In this system, pseudorandom binary waveforms, with favorable correlation properties, are transmitted and their reflections received and processed. The period of these waveforms or codes is greater than the round-trip propagation time for the longest distance to be measured. The received code is correlated with the transmitted code and the resultant phase difference is recorded to give an accurate measure of the distance to the moving body. A high frequency (1 MHz) is used to derive the phase difference, and thereby the range, with high resolution. The 1-MHz code corresponds roughly to 1 Hz per meter of range, giving 1-meter resolution.

Referring to the figure, it is proposed to operate the two binary counters in parallel with the receiver and transmitter pseudorandom number code generators (PN coders). The binary counters operate off the same clock as the PN coders. An arbitrary phase of a coder is extracted (gated out) to preset its associated binary counter to an arbitrary phase. Whatever phase is chosen for the transmitter set must be the same for the receiver. A set consists of one coder and its associated binary counter. The binary counters perform functions similar to look-up tables in a general purpose computer processing arrangement. However, this special purpose arrangement has inherent speed advantages over general purpose computer processing. The mathematical operation of subtracting the binary number held in the receiver counter from that in the transmitter counter is accomplished by computer circuitry contained in the arithmetic unit.

The measure of phase delay between the receiver and transmitter coders is continuously updated upon phase coincidence between the transmitter and receiver clocks. Output from the phase detector then constitutes the sampling or READ command. The phase detector is connected to compare the phase relationship between the transmitter clock (oscillator) and the receiver clock (VCO). Upon coincidence, the arithmetic unit is commanded to subtract the contents of the receiver binary counter from the contents

(continued overleaf)

of the transmitter binary counter and to display the result in proper range units. The rate at which the continuously updated readout changes is a measure of the velocity of the tracked moving object.

Notes:

1. This development is in conceptual stage only, and as of the date of publication of this Tech Brief, neither a model nor prototype has been constructed.
2. Requests for further information may be directed to:

   Technology Utilization Officer
   NASA Pasadena Office
   4800 Oak Grove Drive
   Pasadena, California 91103
   Reference: B70-10060

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,447,155), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to NASA, Code GP, Washington, D.C. 20546.

Source: T. O. Anderson of
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