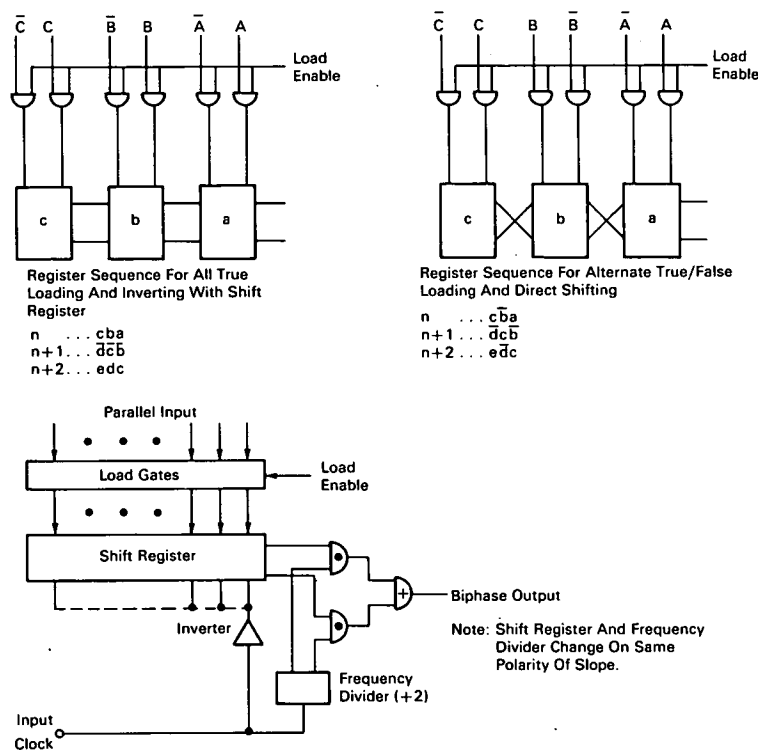July 1968

Brief 68-10241

NASA TECH BRIEF

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Parallel-to-Serial Biphase-Data Converter

Register Sequence For All True Loading And Inverting With Shift Register

n   . . . c b a
n+1 . . . $\overline{d}\overline{c}\overline{b}$
n+2 . . . e d c

Register Sequence For Alternate True/False Loading And Direct Shifting

n   . . . c$\overline{b}$a
n+1 . . . $\overline{d}$c$\overline{b}$
n+2 . . . e$\overline{d}$c

Note: Shift Register And Frequency Divider Change On Same Polarity Of Slope.

A data converter has been designed to produce a serial biphase output signal from parallel input data. Alternate bits are loaded into a shift register in complement form so that the bits appear at the end of the shift register in a true-complement form sequence. Use of a simple "exclusive-or" and a frequency divider generates the biphase signal with no timing "race" conditions. The logic illustrated generates biphase by (1) causing an output midbit voltage transition for each frequency divider change by forcing a change in

comparison state of the "exclusive-or" output gates, and (2) causing the shift register output stage to change state (hence comparison state) for two sequential bits of the same state and to remain the same (no comparator change) to generate a change in output bit state.

The shift register and frequency divider flip-flops change state on the same polarity of input slope. With an inverter placed between the frequency divider input and shift register input, the frequency divider

changes states one-half bit period before the shift register receives a clock pulse. Both frequency divider and shift register are closed at the input clock rate.

Notes:

1. Logical state of a bit is decided by either (a) loading the parallel data alternately true and false, or (b) coupling shift stages so that a stage assumes the logical inverse of the preceding stage for each shift pulse. Shift operation occurs on one clock pulse slope while the count operation occurs on the other.

2. Inquiries concerning this innovation may be directed to:

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> Houston, Texas 77058
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Patent status:

No patent action is contemplated by NASA.

> Source: R. D. Truelove
> of North American Aviation, Inc.
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