

# One NOR gate starts shift-register loop

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A circulating shift register with a single logic 1 in the loop is required in cyclic-triggering operations such as sampling transducers in time-sharing telemetry. Systems for starting this type of circuit are often complex, but the arrangement shown here simply uses a NOR gate with the four-stage shift register.

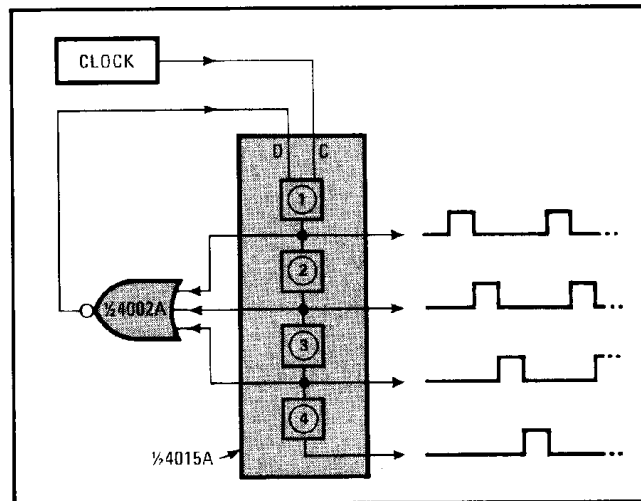
As the waveforms show, the output terminals of the 4015A shift register go high in a continuing sequence from stage one through stage four and then back to stage one again. The 4002A three-input NOR gate starts this operation and keeps it going.

The input terminals of the NOR gate are connected to the first three output terminals of the shift register. When these terminals are at logic 0, the output terminal of the gate is at logic 1, which is brought to the data input terminal (D) of the register. The next clock pulse transfers the logic 1 at D into the first stage of the register. When at least one of the inputs to the gate is a logic 1, the output from the gate is a 0, which is presented to the register input. Thus, after a maximum of three clock pulses, a single 1 is circulating.

This circuit requires no external timing to introduce

the single 1 into the loop and no resetting. If external noise introduces errors, they are automatically corrected. Extension of the system to more than four shift-register stages is straightforward: outputs from all but the last stage are fed into a NOR gate that, in turn, feeds the D input of the first stage in the register. □

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**C-MOS ring circuit.** Arrangement of NOR gate and four-stage shift register provides a pulse output that circulates to each of the output terminals in sequence, moving from one stage to the next as the clock cycles. The two C-MOS ICs determine performance level.