

PULSE REPETITION FREQUENCY MONITOR WITH VARIABLE
UPPER AND LOWER LIMITS^{*}

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In process control it is often required to check that the frequency of a pulse train (PRF) is within specified limits. Figure 1, using two IC's only, provides the required solution. The circuit has two channels; the upper channel will latch when the PRF exceeds the limits; the lower channel acts similarly when the PRF falls below specifications, see Fig. 2. Moreover, the upper channel will detect a single extraneous pulse, e.g., generated by noise, while the lower channel will detect a single missing pulse.

The circuit operates as follows:

(i) Upper Channel. A pulse train is applied to the CLK terminal of J-K flip-flop FF1, and simultaneously to the single shot SS1. The latter produces a positive pulse of duration $T1 = \frac{1}{PRF_{max}}$ that is fed back to the J-terminal of FF1. As long as $PRF < PRF_{max}$, the pulse at J of FF1 will return to zero before the subsequent pulse of the input train has arrived. Otherwise FF1 will be set.

(ii) Lower Channel. The pulse is applied to a re-triggable monostable SS2 with $T2 = \frac{1}{PRF_{min}}$, where T2 is the output of SS2 for one input only. When $PRF < PRF_{min}$, Q of SS2 will return to zero; the trailing edge sets FF2.

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LED's are shown as fault indicators. The outputs from FF1, FF2 can be OR'ed to actuate an audio signal, e.g. "Sonalert." Fault indication will persist until the push button resets the circuit.

A minor modification permits monitoring the number of occurrences of $PRF < PRF_{\min}$, $PRF > PRF_{\max}$, missing pulses, and too many pulses. These functions are effected simply by connecting FF1 and FF2 as T flip-flops (J and K tied to Vcc), and following the output of each FF with a binary or decimal counter.

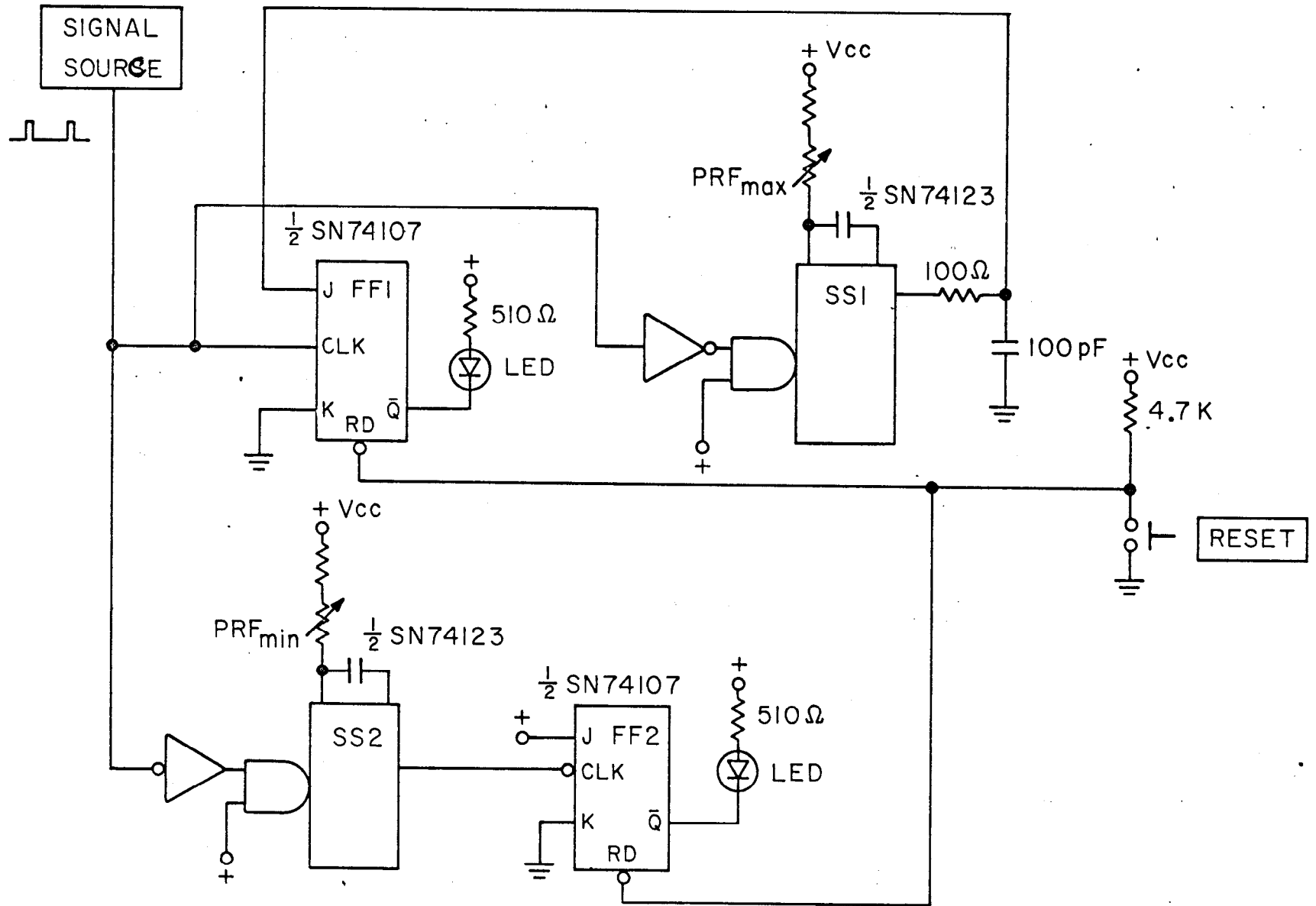


Fig. 1

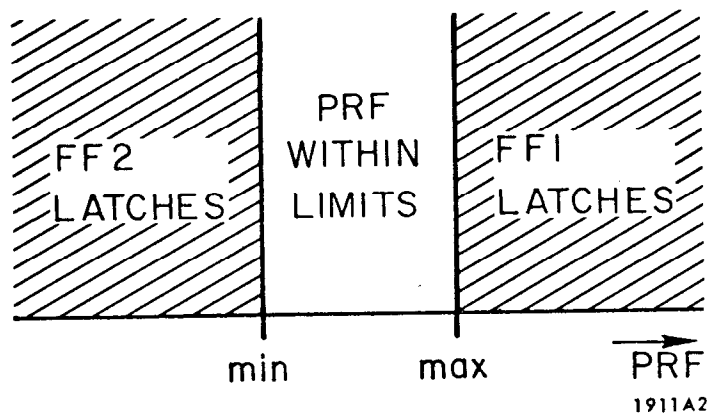


Fig. 2