

V. AIDS TO COMPUTATION

A. Shaft Position Indicator, Reversible Counters

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Radar pulse forming and gating techniques have been applied in the design of 3 new components of a high-speed electronic computer.

1. Direction sensitive pulse generator. A photoelectric actuated pulse generator has been designed which recognizes the direction of rotation of a shaft as well as the extent of its motion. The system furnishes pulses to 2 output channels, one channel receiving pulses caused by clockwise rotation while the other receives pulses only for counter-clockwise rotation. The model constructed produces a pulse for each 2 degrees of motion; however, if sound track techniques are applied an angular subdivision of a hundredth of a degree should be readily possible. The maximum permissible pulse rate is over 200,000 pulses per sec.

2. Reversible binary counter. A binary counter has been developed that responds to subtracting pulses as well as adding pulses. When operated in connection with the pulse generator the counter reading is always a measure of the true shaft position with respect to an initial zero, irrespective of the irregularity of the previous shaft motion. The maximum permissible counting rate is about 100,000 pulses per second and this can be extended if desirable. Carry-over time between counter stages is less than $1/10 \mu$ sec.

3. Reader. This circuit gives the counter reading in the form of a pulse wave form binary number. The reader receives "clock" pulses at microsecond intervals and sends out a wave form number to the computer each time the counter indication changes.

While the pulse generator and reversible counter have been considered primarily in connection with a shaft position indicator, the principles developed can be used for other situations involving two-directional motion and differential counting. For instance, the method should be useful for counting interference fringe changes caused by the motion of an interferometer union.

A preliminary technical discussion was given in the March 15th edition of these reports. Technical Report No. 3 of this Laboratory will present complete details. Drawings A36, A37, and A38 give final circuits.