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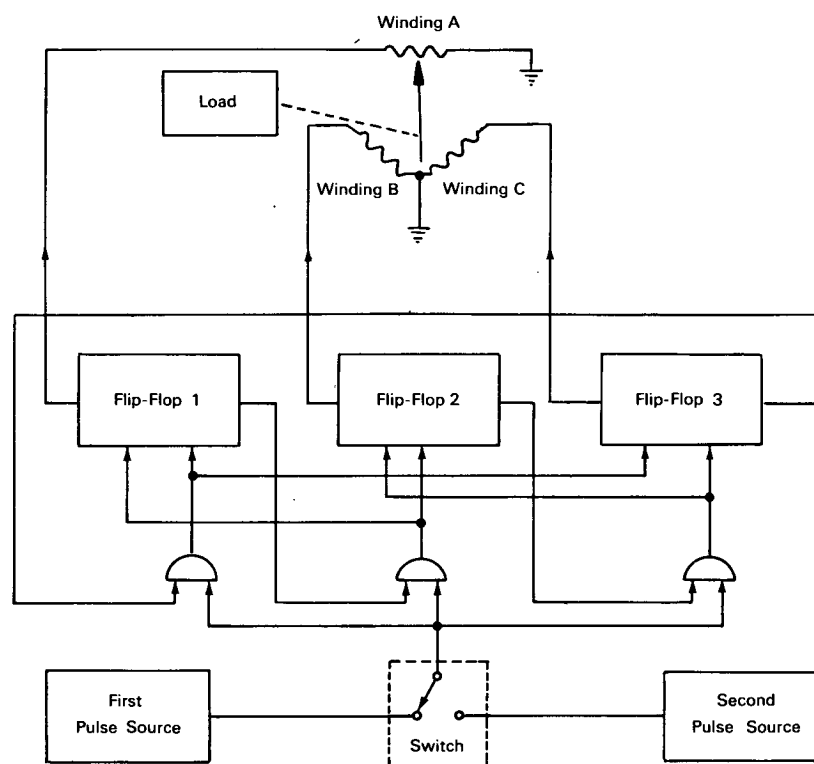
Brief 66-10101

# NASA TECH BRIEF



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## Ring Counter Circuit Switches Multiphase Motor Direction of Rotation



### The problem:

To reverse the direction of rotation of a multiphase motor without changing the phase wiring of the supply current source. Present relay-operated systems are bulky and present maintenance problems due to contact arcing and burning.

### The solution:

A solid-state three-phase counter in which the phase sequence of the counter and hence the direction of rotation of the motor are readily reversible.

### How it's done:

The three flip-flops have high current output terminals connected to the three individual phase windings of the three-phase motor, which is a stepper or indexing motor having a permanent magnet rotor that aligns itself with the field produced by the winding that is energized.

In operation, the pulse sources each supply pulses at a repetition rate of 180 per second since the motor is 60 cps, three phase. With the switch connected to

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the first pulse source, the initial pulse turns flip-flop 1 on and current is applied to winding A of the motor. The second pulse switches flip-flop 1 off and flip-flop 2 on, thus removing current from motor winding A and applying it to motor winding B. The third pulse switches flip-flop 2 off and flip-flop 3 on, removing current from motor winding B and applying it to motor winding C. The fourth pulse switches flip-flop 3 off and flip-flop 1 on and the sequence is repeated.

To reverse the motor direction of rotation, the switch is connected to the second pulse source and the above-described action is reversed with flip-flops 3, 2, and 1 being turned on and off in that order, thus powering motor windings C, B, and A in that order.

**Patent status:**

Title to this invention covered by U.S. Patent No. 3,112,433 has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)) to Space Technology Laboratories, Inc., One Space Park, Redondo Beach, California.

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