

## 2-IC circuit decodes quadrature waveforms

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With this simple 2-chip circuit, you can detect the direction of movement of any transducer that produces a quadrature waveform. A shaft equipped with a position encoder is one such device; the encoder provides information that indicates incremental clockwise or counterclockwise rotation or no measurable rotation.

The position encoder's outputs, A and B (Fig 1a), go to Fig 1b's circuit for decoding; each signal enters a 2-bit shift register constructed from a pair of the 74L374's flip flops. A clock signal shifts the information, so the shift registers always contain both old and new samples of A and B. These four samples then specify a 4-bit address to the PROM, via inputs A<sub>0</sub> through A<sub>3</sub>, to select a stored byte that indicates direction of movement, no movement or an error condition. A switch on the PROM's fifth address line, A<sub>4</sub>, determines whether movement in a particular direction is considered positive or negative.

The 32 bytes of data in the PROM program (Fig 2) contain only four values: 1 to indicate movement in the negative direction, 2 to indicate movement in the

ADDRESS	DATA	ADDRESS	DATA
0	03 NO COUNT	10	03 NO COUNT
1	01 DOWN	11	02 UP
2	02 UP	12	01 DOWN
3	03 NO COUNT	13	03 NO COUNT
4	02 UP	14	01 DOWN
5	FF ERROR	15	FF ERROR
6	FF ERROR	16	FF ERROR
7	01 DOWN	17	02 UP
8	01 DOWN	18	02 UP
9	FF ERROR	19	FF ERROR
A	FF ERROR	1A	FF ERROR
B	02 UP	1B	01 DOWN
C	03 NO COUNT	1C	03 NO COUNT
D	02 UP	1D	01 DOWN
E	01 DOWN	1E	02 UP
F	03 NO COUNT	1F	03 NO COUNT

Fig 2—A 32-byte PROM program contains data values that indicate positive or negative movement, no movement or an error.

positive direction, 3 to indicate no movement and FF<sub>H</sub> to indicate an illegal-address condition caused by a problem such as noise or a phase error. Positive movement thus produces a pulse on output D<sub>0</sub>, while negative movement puts a pulse on D<sub>1</sub>. Lines D<sub>2</sub> through D<sub>7</sub> are LOW unless an error occurs.

By connecting outputs D<sub>0</sub> and D<sub>1</sub> to a counter (such as a 74193), you can use this circuit to track a device's position. You can also implement a second tracker by adding one PROM chip, because the circuit uses only half of the 74L374.

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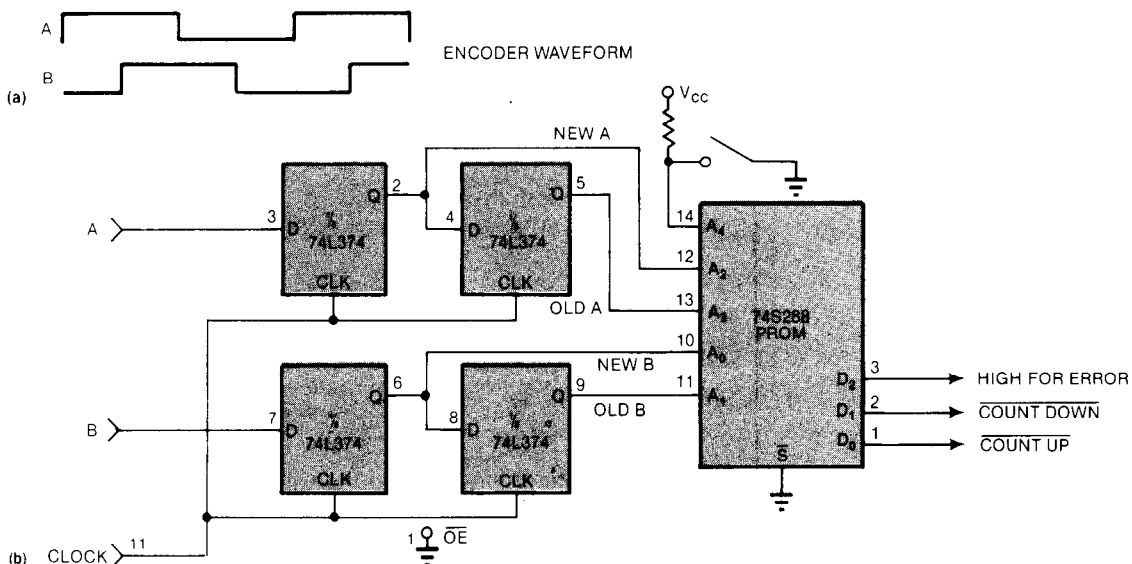


Fig 1—Quadrature waveforms A and B (a) enter a decoding circuit (b), which determines direction of movement of the transducer that generates the waveforms.