Microprocessor converts pot position to digits

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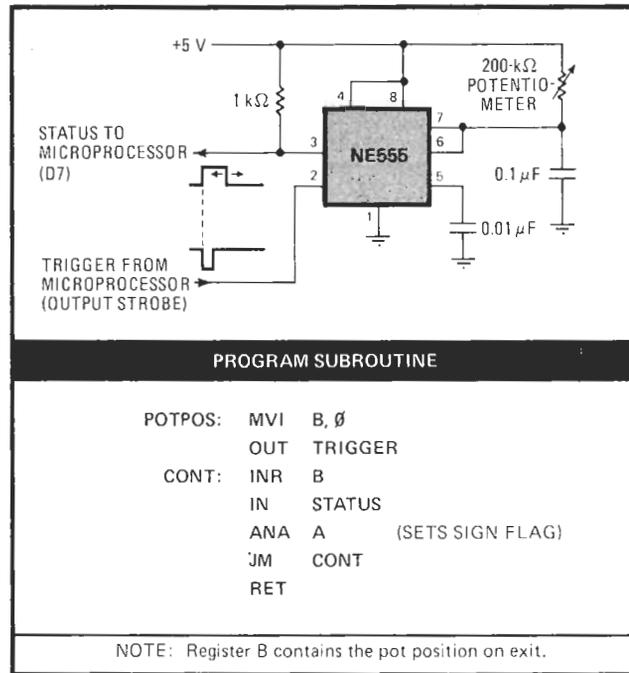*Aeronutronic Ford Corp., Palo Alto, Calif.*

A few bytes of program in an 8008/8080 microprocessor, plus a 555 integrated-circuit timer, can convert the position of a potentiometer into a digital value. The arrangement is both economical and convenient when the position data is an input to a system already using the microprocessor, such as an industrial control system or a video game.

As the figure shows, a strobe pulse from the microprocessor triggers a 555 connected as a one-shot multivibrator. The output from the 555 stays high for a period of time that is proportional to the resistance of the pot. To measure this time period, the processor increments an internal register for as long as its input (D7) from the 555 remains high.

When data on the pot position is required, the microprocessor program calls up the POTPOS subroutine, which uses four flags, the accumulator, and the B register. In this subroutine, as the table shows, the processor:

1. Sets register B to 0.
2. Triggers the 555.
3. Increments register B.
4. Inputs the status of the 555 to bit D7 of the accumulator.
5. Sets a sign flag minus if status is high.
6. Jumps back to step 3 if flag is minus.
7. Returns to main program if flag is not minus.

Upon return to the main program, register B contains a number that measures the 555 output pulse duration and hence is a digital representation of the pot position.

PROGRAM SUBROUTINE		
POTPOS:	MVI	B, Ø
	OUT	TRIGGER
CONT:	INR	B
	IN	STATUS
	ANA	A (SETS SIGN FLAG)
	JM	CONT
	RET	

NOTE: Register B contains the pot position on exit.

Where is the pot? Potentiometer position is digitized by one-shot multivibrator and subroutine for the 8008/8080 microprocessors. When program calls subroutine, processor triggers one-shot and measures output pulse duration (which is proportional to resistance of pot). Register B stores this value for use in computation of next step in a TV game, process control, etc.

When the hardware and software are used on an 8008 system with a 2.5-microsecond clock, the B register digital output varies from 2 to 65 Hex, i.e., has 100 different values, as the potentiometer is varied across its range. The values of the pot and the timing capacitor can be modified to suit the speed of the processor and the desired range of the digitized output.