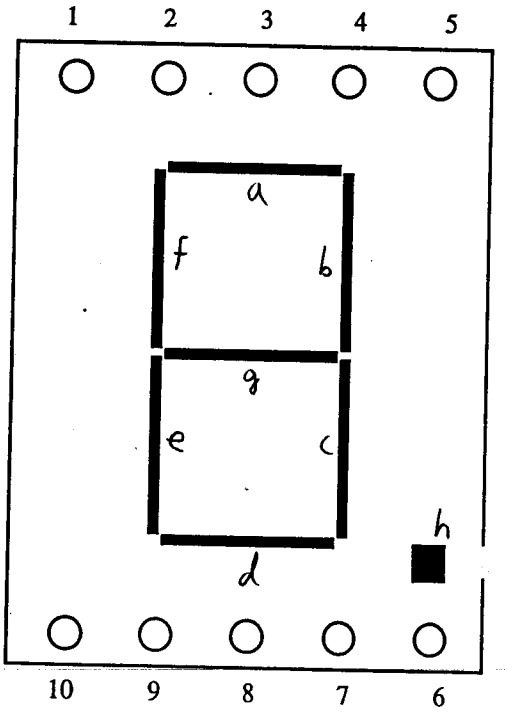
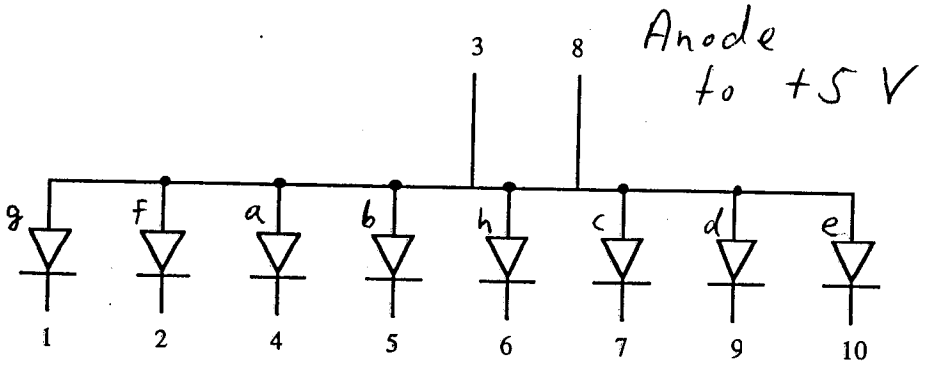
R. Kozick
ELEC 105

7- segment Pin Diagram



(A)



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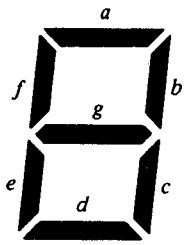
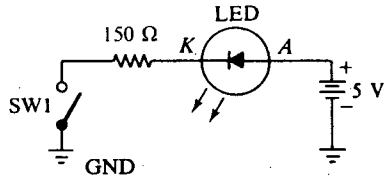
7-Segment Display



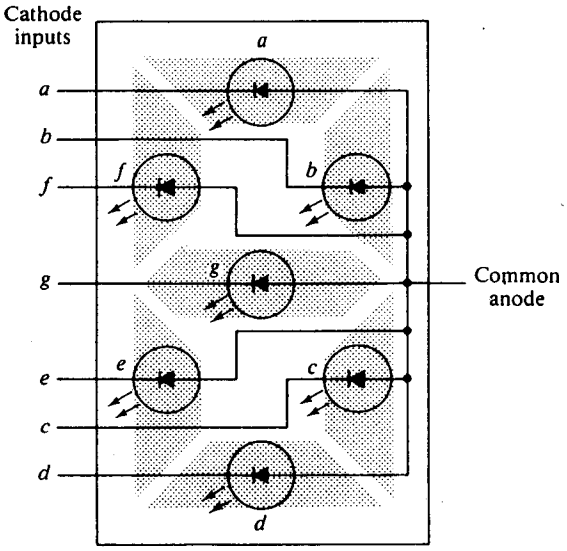
(*a*) Segment identification

(*b*) Decimal number with typical display

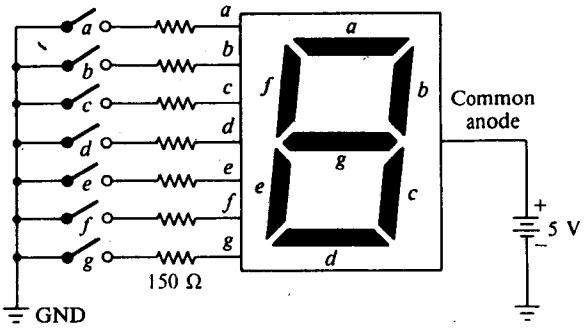
Fig. 7-10 Seven-segment display



(*a*) Operation of a light-emitting diode (LED)

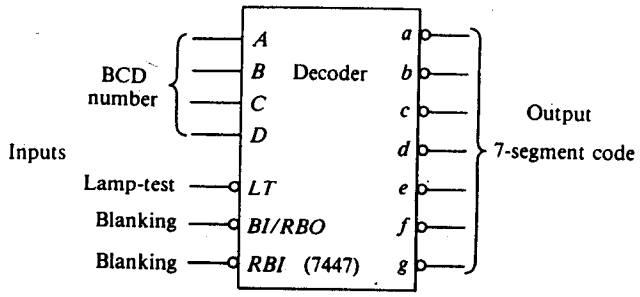


(*b*) Wiring of seven-segment LED display



(*c*) Operating seven-segment LED display

Fig. 7-11



(*a*) Logic symbol

Decimal or function	Inputs						*BI/RBO*	Outputs							Note
	LT	*RBI*	*D*	*C*	*B*	*A*		*a*	*b*	*c*	*d*	*e*	*f*	*g*	
0	H	H	L	L	L	L	H	ON	ON	ON	ON	ON	ON	OFF	1
1	H	X	L	L	L	H	H	OFF	ON	ON	OFF	OFF	OFF	OFF	
2	H	X	L	L	H	L	H	ON	ON	OFF	ON	ON	OFF	ON	
3	H	X	L	L	H	H	H	ON	ON	ON	ON	OFF	OFF	ON	
4	H	X	L	H	L	L	H	OFF	ON	ON	OFF	OFF	ON	ON	
5	H	X	L	H	L	H	H	ON	OFF	ON	ON	OFF	ON	ON	
6	H	X	L	H	H	L	H	OFF	OFF	ON	ON	ON	ON	ON	
7	H	X	L	H	H	H	H	ON	ON	ON	OFF	OFF	OFF	OFF	
8	H	X	H	L	L	L	H	ON	ON	ON	ON	ON	ON	ON	
9	H	X	H	L	L	H	H	ON	ON	ON	OFF	OFF	ON	ON	
10	H	X	H	L	H	L	H	[illegible]							
11	H	X	H	L	H	H	H								
12	H	X	H	H	L	L	H								
13	H	X	H	H	L	H	H								
14	H	X	H	H	H	L	H								
15	H	X	H	H	H	H	H								
BI	X	X	X	X	X	X	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	2
RBI	H	L	L	L	L	L	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	3
LT	L	X	X	X	X	X	H	ON	ON	ON	ON	ON	ON	ON	4

H = HIGH level, L = LOW level, X = irrelevant

Notes: 1. The blanking input (*BI*) must be open or held at a HIGH logic level when output functions 0 through 15 are desired. The ripple-blanking input (*RBI*) must be open or HIGH if blanking of a decimal zero is not desired.
2. When a LOW logic level is applied directly to the blanking input (*BI*), all segment outputs are OFF regardless of the level of any other input.
3. When ripple-blanking input (*RBI*) and inputs *A*, *B*, *C*, and *D* are at a LOW level with the lamp-test input HIGH, all segment outputs go OFF and the ripple-blanking output (*RBO*) goes to a LOW level (response condition).
4. When the blanking input/ripple-blanking output (*BI/RBO*) is open or held HIGH and a LOW is applied to the lamp-test input, all segment outputs are ON.

(*b*) Truth table (*Reprinted by permission of Texas Instruments, Inc.*)

Fig. 7-12 Commercial 7447 BCD–to–seven-segment decoder/driver

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Remember to include resistors when connecting 7447 to 7-segment display:

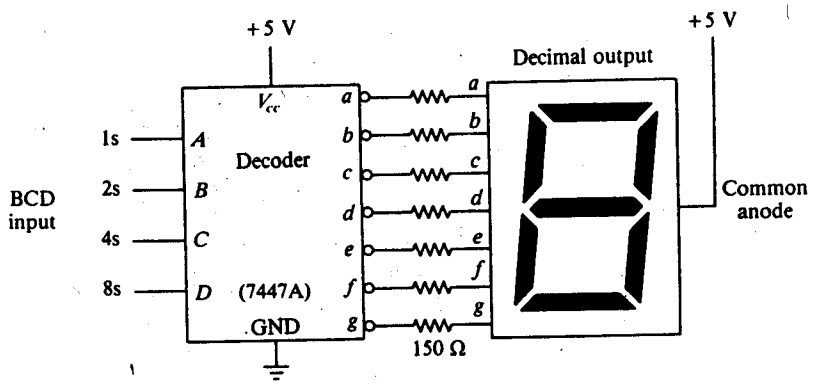


Fig. 7-13 Wiring of decoder and seven-segment LED display

"Timing diagram" for 74163 counter:

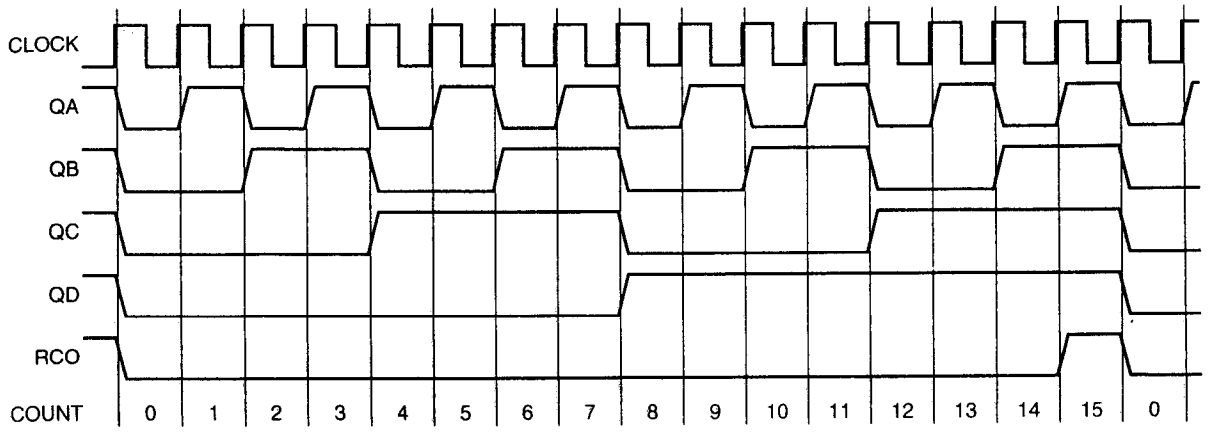


Figure 9–17 Clock and output waveforms for a free-running divide-by-16 counter.

Counter

Table 9–1 State table for a 74x163 4-bit binary counter.

Inputs				Current State				Next State			
/CLR	/LD	ENT	ENP	QD	QC	QB	QA	QD*	QC*	QB*	QA*
0	x	x	x	x	x	x	x	0	0	0	0
1	0	x	x	x	x	x	x	D	C	B	A
1	1	0	x	x	x	x	x	QD	QC	QB	QA
1	1	x	0	x	x	x	x	QD	QC	QB	QA
1	1	1	1	0	0	0	0	0	0	0	1
1	1	1	1	0	0	0	1	0	0	1	0
1	1	1	1	0	0	1	0	0	0	1	1
1	1	1	1	0	0	1	1	0	1	0	0
1	1	1	1	0	1	0	0	0	1	0	1
1	1	1	1	0	1	0	1	0	1	1	0
1	1	1	1	0	1	1	0	0	1	1	1
1	1	1	1	0	1	1	1	1	0	0	0
1	1	1	1	1	0	0	0	1	0	0	1
1	1	1	1	1	0	0	1	1	0	1	0
1	1	1	1	1	0	1	0	1	0	1	1
1	1	1	1	1	0	1	1	1	1	0	0
1	1	1	1	1	1	0	0	1	1	0	1
1	1	1	1	1	1	0	1	1	1	1	0
1	1	1	1	1	1	1	0	1	1	1	1
1	1	1	1	1	1	1	1	0	0	0	0

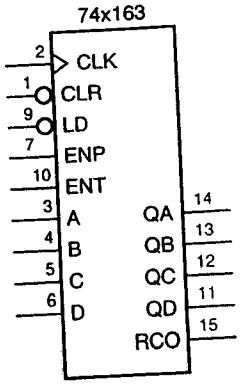
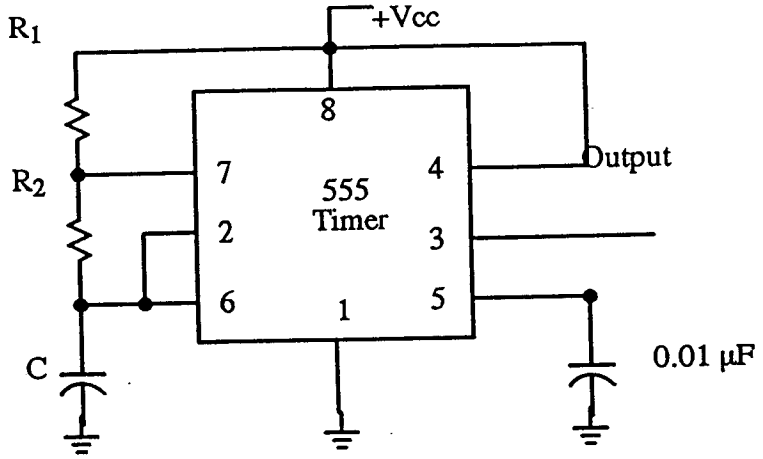


Figure 9–15
Traditional logic symbol for the 74x163.

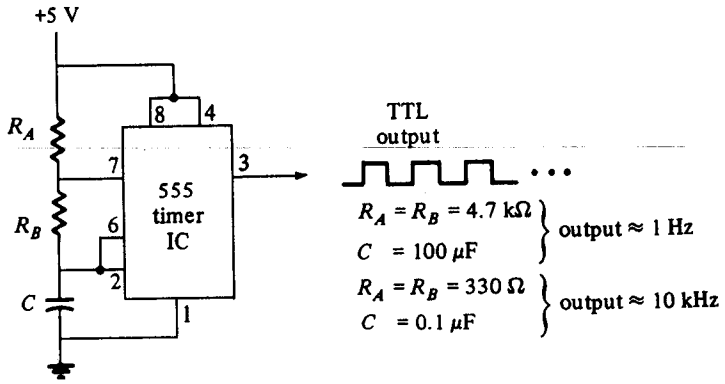
CLOCK

555 Timer

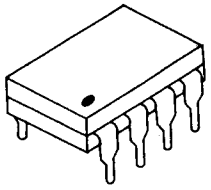
Many digital systems require a regular sequence of pulses. The 555 chip can be used to provide this type of signal with a frequency that is set by the designer. The following circuit produces a regular sequence of pulses at the output (pin 3) of the 555 chip. (For more description of the 555 chip and some other ways that it can be used, see pages 220–226 of Tokheim.)



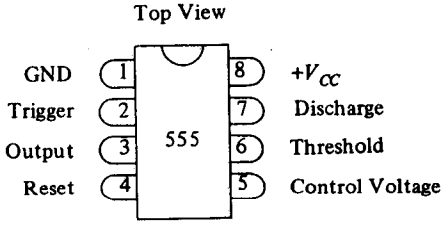
The frequency of the output pulse train is $1.443 / [(R_1 + 2R_2)C]$ Hz, and the "duty cycle" (the percentage of time the pulse train equals 1) is $(R_1 + R_2) / (R_1 + 2R_2)$. Choose the parameters in this circuit so that you get about 1 or 2 pulses per second. Set up the circuit, and connect an LED to the output. The LED should blink about once or twice per second.



(*a*) 555 timer IC wired as an astable MV



(*b*) 555 timer DIP IC



(*c*) 555 timer pin diagram

Fig. 9-23

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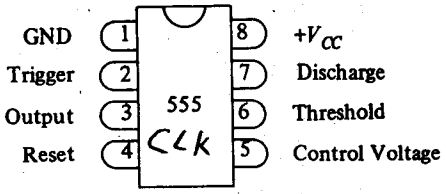
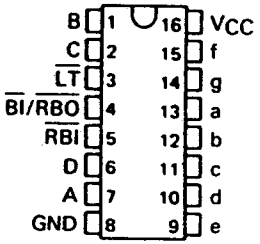
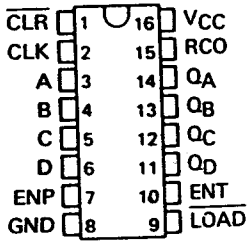
Digital Stopwatch Wiring Diagram

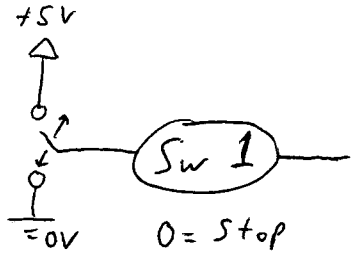


7447 Binary to 7-segment converter

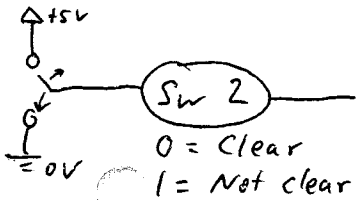


74163 Counter

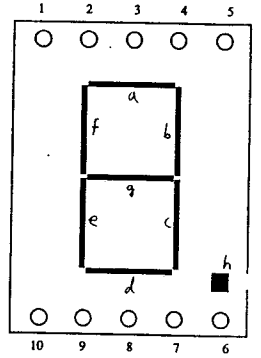




0 = Stop
1 = Start



0 = Clear
1 = Not clear



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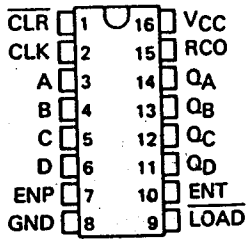
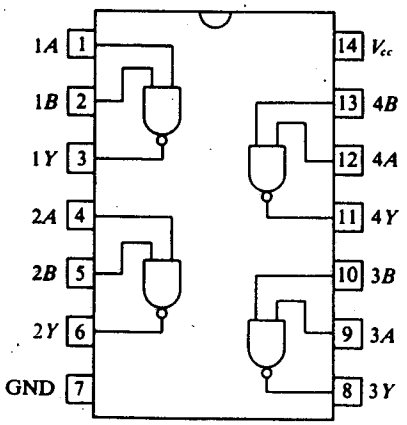
Wiring the 74163 to Count to ten [0, 1, ..., 9, 0, 1, ...]

74163 Counter



An IC with 4 NAND gates:



(a) Pin diagram for a 7400 IC