ELECTRONIC CASINO

by **WALLER M. SCOTT**

NOTE TO READERS
This is not a construction article! We have not seen an assembled version of the Electronic Casino. However, this story does contain enough information to enable a reader who expects to do a bit of experimenting to build the unit. If you do build your own version of the Electronic Casino, we'd appreciate receiving a glossy photo of the assembled unit and will publish it in our Letters column. —**Editor**

THIS IS A CONTINUATION OF AN ARTI-cle that began last month. You'll need the March issue for diagrams of the power supply and audio amplifier used for the sound effects of each game.

High card

Fig. 6 describes an electonic deck of cards used in a game of High Card. Cards 2 through ace can be drawn; however, no indication of suit is provided.

Instead of depressing a switch, this game is played by inserting a finger or other object into a slot in the panel containing a LED and phototransistor. The LED is normally on which keeps the phototransistor turned on through the optical coupling between the two. When an object breaks the light path in this photosensor, Q20 turns on control transistor Q21 which starts a familiar three gate oscillator. The output of this three-gate oscillator clocks a 15-counter which has 13 states for the 13 cards and 2 states which are reset states. The counter is reset to state 1 when the game is turned on. No card number is displayed at this time. After the first card is drawn by triggering the photosensor with a finger, the oscillator clocks the counter at a several MHz rate. The counter goes through the sequence 2,3,4, ... 12,13,14,2,3, ... over and over. Count number 15 exists for only a few nanoseconds while the counter is reset back to count 2.

The A,B,C, and D flip-flop outputs are decoded according to the particular count number in the repeating sequence. Counts 2 through 9 correspond to cards 2 through 9. These counts are decoded by a 7447 7-segment de-code/driver integrated circuit. A 7-segment LED display is driven by the 7447 to display the characters representing cards 2 through 9. Cards 10 through ace are decoded by TTL gates and through 7416 display drivers, display the special characters representing cards 10 through ace.

At the time the oscillator starts sorting through the "deck of cards" Q22 and Q23 are turned on energizing the circuit of Q24 which is a phase-shift oscillator operating at approximately 1

BINARY COUNTER

COUNT NO.	CARD	SYMBOL
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	
10	10	
11	JACK	
12	QUEEN	
13	KING	
14	ACE	

+5V
Q21
7400
7420
DRAW
4.7K
Q20
150Ω
220Ω
10K
LED
PHOTOTRANSISTOR
100pF
+5V
A
B
C
D
Q22
4.7K
Q23
+5V
25μF
180K
J A A K Ā
J B B K B̄
J C C K C̄
J D D K D̄
7473
7473
7400
15K
+5V
10μF
PLACE FINGER IN SLOT TO DRAW A CARD

P4
1 → +5V DC
2
3
100K
3.3K
0.1μF
0.1μF
Q24
470Ω
470Ω
0.1μF
1 MEG
(DECAYING 1 kHz TONE GENERATED WHEN CARD IS DRAWN.)
φ-SHIFT OSC

DIODES ARE SCHEMATIC REPRESENTATIONS OF LED READOUT SEGMENTS

7420
CT. 10
Ā
B
C̄
D
10
HIGH CARD

7447
+5V
14
3
7
A
B
1
C
2
D
4
15
7
13 a
12 b
11 c
10 d
9 e
f
g
14
+5V
33Ω a
33Ω b
33Ω c
33Ω d
33Ω e
33Ω f
33Ω g
33Ω D.P.

CARD DISPLAY

CT. 11
A
B
C̄
D
11
7416

CT. 12
Ā
B̄
D
C
12
7430

CT. 13
A
B̄
C
D
13
COUNT NO.
7420

CT. 14
Ā
B
C
D
14
COUNTER DECODE

7416
7416
a
b
c
d
e
f
g
D.P.

12
10
14
a
11
12
13
14
b
10
11
12
c
13
14
d
10
12
13
e
14
f
10
13
14
g
12
D.P.
DECIMAL POINT

LED READOUT

a
f b
g
e c
d D.P.

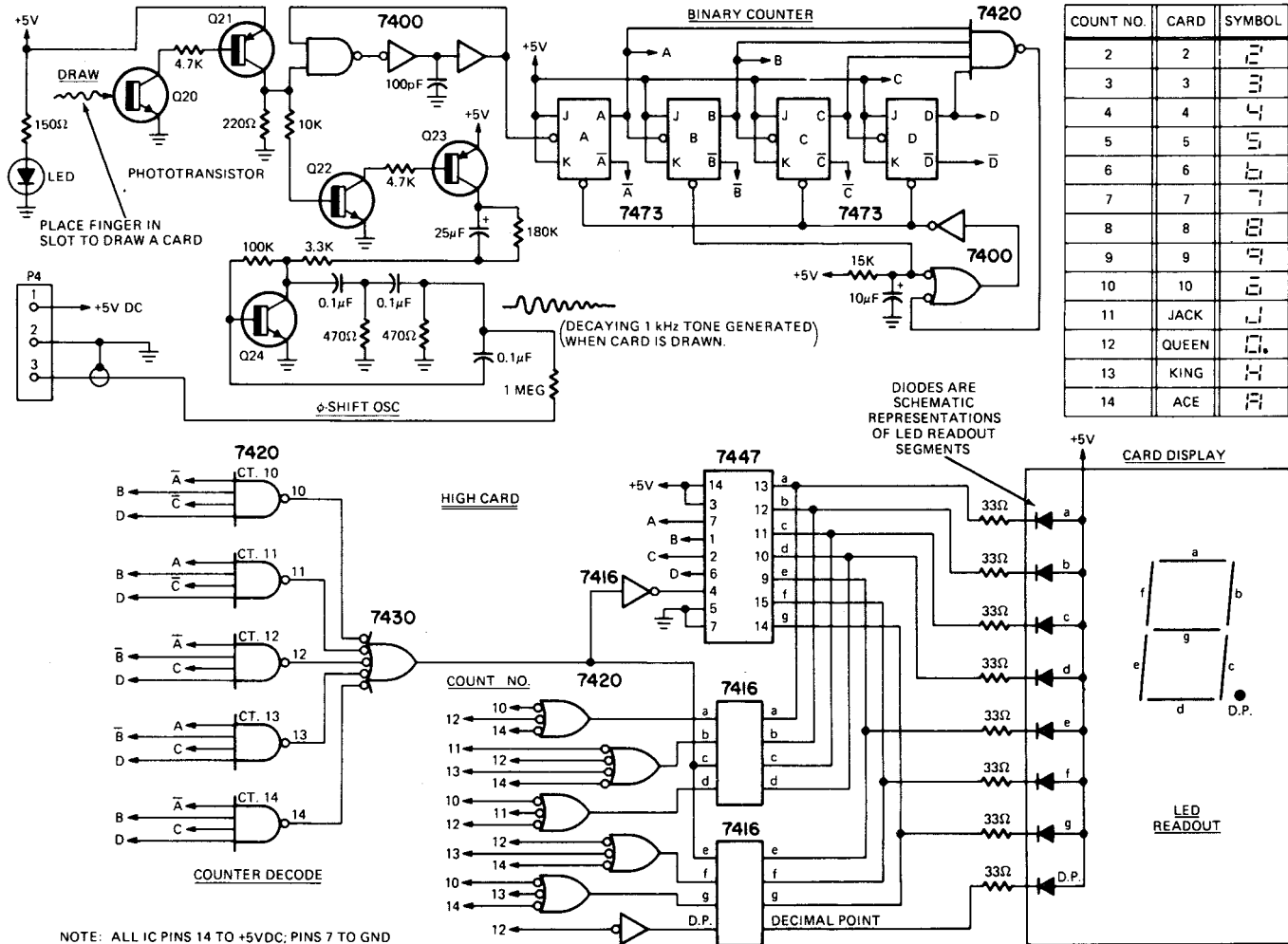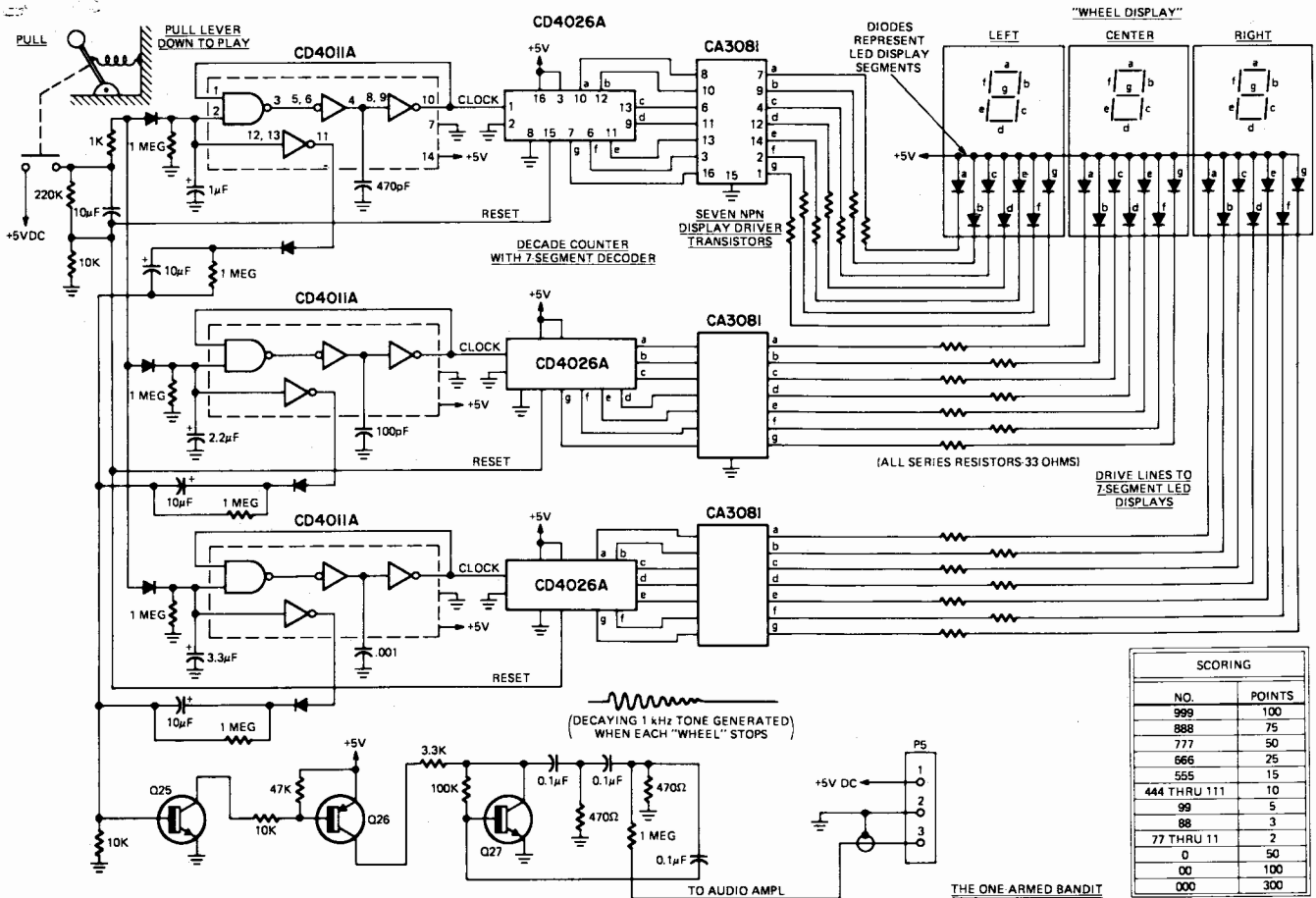NOTE: ALL IC PINS 14 TO +5VDC; PINS 7 TO GND

FIG. 6.—HIGH CARD—a game that indicates any one of the 13 cards of a suit at random. At the flick of a finger, the "card" drawn appears on a 7-segment readout.

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FIG. 7—THE ONE-ARMED BANDIT simulates the old familiar slot machine, in sight and sound. You don't need coins, just add the power supply and amplifier shown last month.

KHz. The output of this oscillator is coupled to the audio amplifier. The 1-kHz tone decays in amplitude as the 25-μF capacitor (in series with the collector of Q23) charges up. Thus the tone is heard immediately upon inserting a finger in the slot to DRAW a card.

This "deck of cards" could be used for the game of "21", as well as high card, and perhaps others. One thing nice about this card game—you never have to shuffle the cards!

The one-armed bandit

The circuit of Fig. 7 depicts a desparado who is famous for relieving you of your coins. In this economy version the Bandit can be awakened by merely pulling the big lever marked PULL—no coins required.

CMOS (Complimentary Metal-Oxide Semiconductor) logic circuits are used in this game. These IC's require only a few microwatts of power per gate function. High noise immunity and availability of complex function IC's are other advantages.

Upon pulling the lever and closing the PULL switch, three separate 3-gate oscillators are started. The output pulses of these oscillators are at different frequencies and are used to drive three decade counters. These counters continue counting 0-1-2- 8-9-0,

etc. until the switch is opened and the three separate timing capacitors discharge. For example, when the 1-μF capacitor discharges, the HIGH is removed from the first 3-gate oscillator input and oscillation stops.

Each decade counter chip contains a BCD to 7-segment decoder. The decoded decimal number, represented in binary form by the counter, is fed from the device in the form of a—g segment drive signals to an LED display. The three oscillator/counter chains drive three different displays representing the left, center, and right wheels of a slot machine. The timing capacitor values are chosen to cause the left "wheel" to stop first, then the center, and the right last.

A phase-shift oscillator is switched on by a CMOS gate and control transistors Q25 and Q26 just as each oscillator stops. This oscillator provides a decaying 1-kHz tone to the audio amplifier when each "wheel" stops. A suggested scoring chart is provided in Fig. 6 to aid in playing the One-Armed Bandit game.

Undoubtedly, by now, some of the more ingenious among you have wondered how to convert this circuit to one which requires coins for operation and pays off in same. To paraphrase all good textbooks, this conversion is left

as an exercise to the gambler!

Summary

The various schematics show resistor and capacitor values as well as TTL part numbers. the CMOS IC's are identified with RCA part numbers. Other sources of these IC's are becoming available. All diodes can be small-signal types with appropriate PIV and current ratings, except for the power supply diodes. Transistors are small-signal switching types except for the +5Vdc series pass transistor and solenoid driver which should be Motorola MJE520's, or similar npn power transistors. Depending on circuit layout and wiring, the various flip-flop IC's may require bypass capacitors across their supply voltage and ground pins. Generally, layout is not critical and the Casino can be built in a variety of forms. If you are so inclined, you can add or substitute games of your own design to the five described here.

The Electronic Casino should provide many hours of entertainment while constructing it in breadboard or more permanent fashion. Afterward you will have an electronic gadget which will create considerable interest and provide amusement for yourself, your family, and even your non-electronic friends.

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