

# Ball & Paddle

## FEATURES

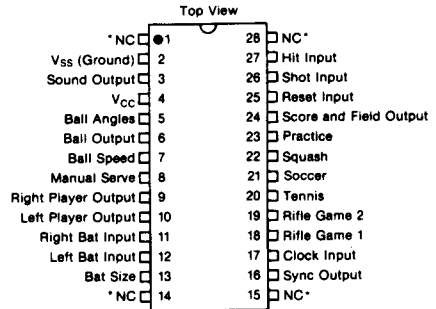
- 6 Selectable Games—Tennis, soccer, squash, practice and two rifle shooting games
- 625 Line (AY-3-8500) and 525 Line (AY-3-8500-1) versions
- Automatic Scoring
- Score display on T.V. Screen, 0 to 15
- Selectable Bat Size
- Selectable Rebound Angles
- Selectable Ball Speed
- Automatic or Manual Ball Service
- Action Sounds
- Shooting Forwards in Soccer Game
- Visually defined area for all Ball Games.

## DESCRIPTION

The AY-3-8500 and AY-3-8500-1 circuits have been designed to provide a TV games function which gives active entertainment using a standard domestic television receiver.

The circuit is intended to be battery powered and a minimum number of external components are required to complete the system.

## PIN CONFIGURATION 28 LEAD DUAL IN LINE



\*Do not use as tie point.

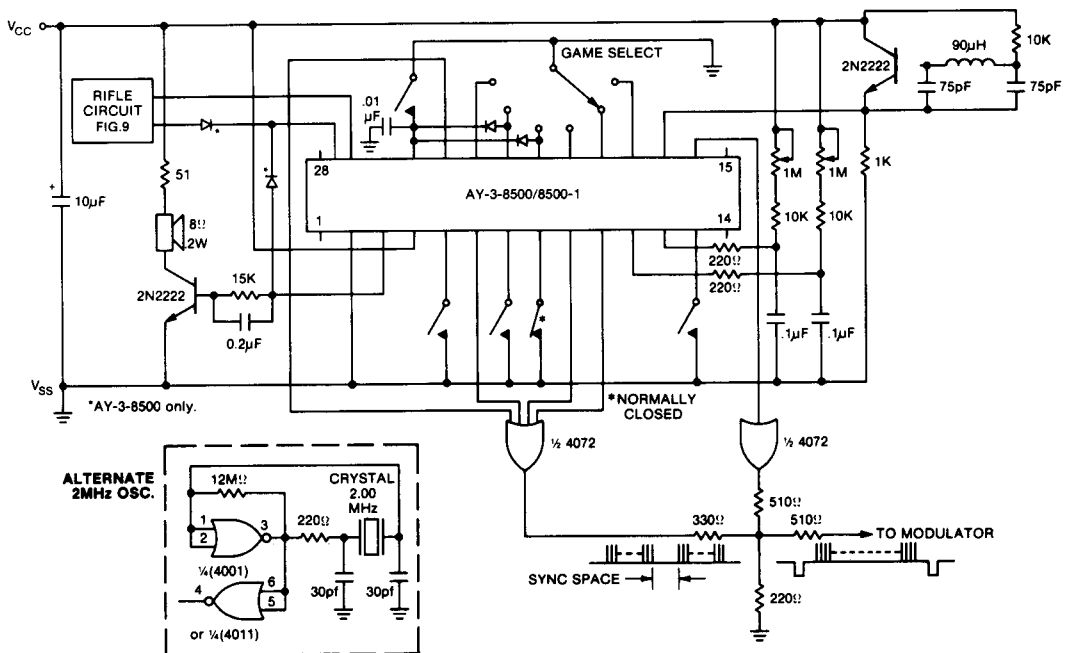


Fig. 1 BLACK AND WHITE IMPLEMENTATION

VIDEO

**PIN FUNCTIONS (Pin numbers in parentheses)****V<sub>SS</sub> (2)**

Negative supply input, nominally 0V(GND).

**Sound Output (3)**

The hit (32ms pulse/976Hz tone), boundary reflection (32ms pulse/488Hz tone) and score (32ms pulse/1.95KHz tone) sounds are output on this pin.

**V<sub>CC</sub> (4)**

Positive supply input.

**Ball Angles (5)**

This input is left open circuit (Logic '1') to select two rebound angles and connected to V<sub>SS</sub> (Logic '0') to select four rebound angles. When two angles are selected they are  $\pm 20^\circ$ , when four are selected they are  $\pm 20^\circ$  and  $\pm 40^\circ$ .

**Ball Output (6)**

The ball video signal is output on this pin.

**Ball Speed (7)**

When this input is left open-circuit, low speed is selected (1.3 seconds for ball to traverse the screen). When connected to V<sub>SS</sub> (Logic '0'), the high speed option is selected (0.65 seconds for ball to traverse the screen).

**Manual Serve (8)**

This input is connected to V<sub>SS</sub> (Logic '0') for automatic serving. When left open circuit (Logic '1') the game stops after each score. The serve is indicated by momentarily connecting this input to V<sub>SS</sub>.

**Right Player Output/Left Player Output (9,10)**

The video signals for the right and left players are output on separate pins.

**Right Bat Input/Left Bat Input (11,12)**

An R-C network connected to each of these inputs controls the vertical position of the bats. Use a 10K resistor in series with each pot.

**Bat Size (13)**

This input is left open circuit (Logic '1') to select large bats and connected to V<sub>SS</sub> (Logic '0') to select small bats. For a 19" T.V. screen, large bats are 1.9" and small bats are 0.95" high.

**Sync Output (16)**

The T.V. vertical and horizontal sync signals are output on this pin. See Fig. 2

**Clock Input (17)**

The 2MHz master timing clock is input to this pin. The exact frequency is  $2.012160 \pm 1\%$ .

**Rifle Game 1, Rifle Game 2, Tennis, Soccer, Squash, Practice (18 thru 23)**

These inputs are normally left open circuit (Logic '1') and are connected to V<sub>SS</sub> (Logic '0') to select the desired game.

**Score and Field Output (24)**

The score and field video signal is output on this pin.

**Reset (25)**

This input is connected momentarily to V<sub>SS</sub> (Logic '0') to reset the score counters and start a new game. Normally left open circuit.

**Shot Input (26)**

This input is driven by a positive pulse output of a monostable to indicate a "shot".

**Hit Input (27)**

This input is driven by a positive pulse output of a monostable which is triggered by the shot input if the target is on the sights of the rifle.

NOTE: The "Shot" and "Hit" inputs have on-chip pull-down resistors to V<sub>SS</sub>. All other inputs (except the "Bat" inputs) have on-chip pull-up resistors to V<sub>CC</sub>.

VIDEO

**ELECTRICAL CHARACTERISTICS****Maximum Ratings\***

Voltage on any Pin with Respect to V<sub>SS</sub>Pin..... -0.3 to +12V  
Storage Temperature Range ..... -20°C to +70°C  
Ambient Operating Temperature Range ..... 0°C to +40°C

**Standard Conditions (unless otherwise noted)**

V<sub>CC</sub> = +6 to +7V

V<sub>SS</sub> = 0V

Operating Temperature (T<sub>A</sub>) = 0°C to +40°C

\* Exceeding these ratings could cause permanent damage to the device. This is a stress rating only and functional operation of this device at these conditions is not implied — operating ranges are specified in Standard Conditions. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Data labeled "typical" is presented for design guidance only and is not guaranteed.

Characteristics at 25°C and V <sub>CC</sub> = +6 Volts	Min	Typ	Max	Units	Conditions
<b>Clock Input</b>					
Frequency	1.99	2.01	2.03	MHz	Maximum clock source impedance of 1K to V <sub>CC</sub> or V <sub>SS</sub> .
Logic '0'	0	—	0.5	V	
Logic '1'	V <sub>CC</sub> -2	—	V <sub>CC</sub>	V	
Pulse Width — Pos.	—	200	—	ns	
Pulse Width — Neg.	—	300	—	ns	
Capacitance	—	10	—	pF	V <sub>IN</sub> = 0V, F = 1MHz
Leakage	—	100	—	μA	
<b>Control Inputs</b>					
Logic '0'	0	—	0.5	V	Max contact resistance of 1K to V <sub>SS</sub>
Logic '1'	V <sub>CC</sub> -2	—	V <sub>CC</sub>	V	
Input Impedance	—	1	—	M Ω	Pull up to V <sub>CC</sub>
Rifle Input	—	1	—	M Ω	Pull down to V <sub>SS</sub>
<b>Outputs</b>					
Logic '0'	—	—	1	V	I <sub>out</sub> = 0.5mA
Logic '1'	V <sub>CC</sub> -2	—	—	V	I <sub>out</sub> = 0.1mA
<b>Power Supply Current</b>	—	40	60	mA	at V <sub>CC</sub> = +7V

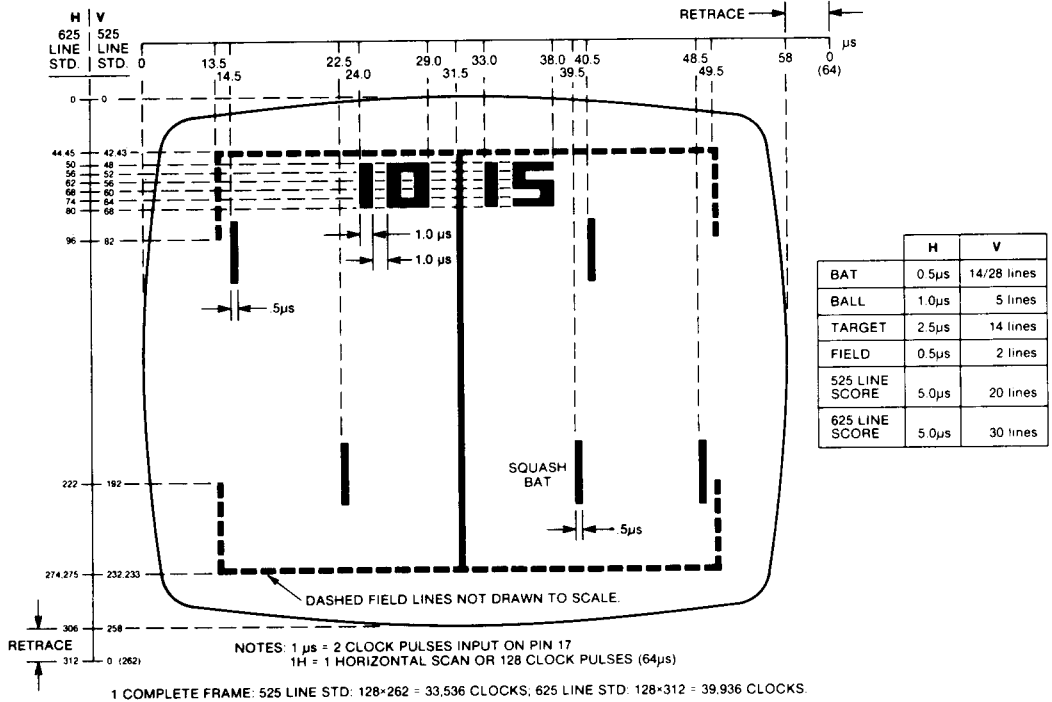


Fig. 2 LOCATION OF DATA OUTPUT PULSES

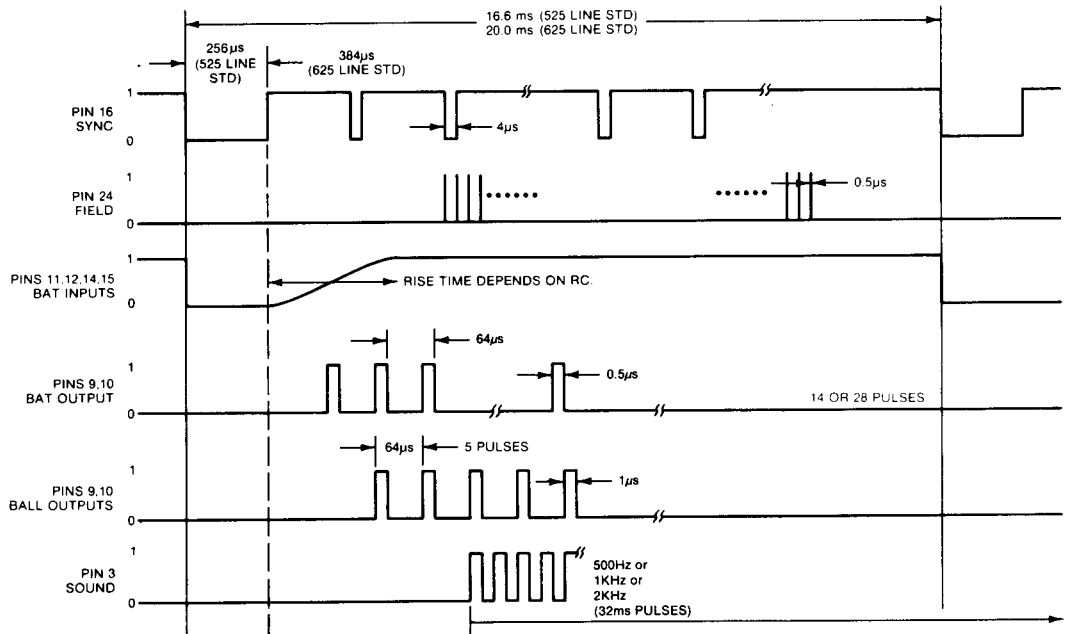


Fig. 3 TIMING DIAGRAM