

COSMIL WARS



**AN ALL ELECTRONIC
COCKTAIL PINBALL
MACHINE**

FEATURES:

- ★ Micro Computer, Solid State Circuitry
- ★ Two Player game with Individual L.E.D. Score Readouts
- ★ 6 Electronic Sounds—Adjustable Volume
- ★ Rapid-change Electronic Bonus
- ★ Flashing Record High Score Memory
- ★ All Metal Cabinet
- ★ Scoring up to 1 Million
- ★ "Free Game" Credits
- ★ "Free Ball" Bonus
- ★ Convertible to "Add-A-Ball"
- ★ End of Game "Match" Scoring

COFFEE-MAT

251 SOUTH 31st STREET • KENILWORTH, N. J. 07033

PLUS:

Pedestal Base (Optional)
Height with Base is 40"

DIMENSIONS:

H: 30¼", L: 42", W: 30¼"
Weight: 170 lbs.

DISTRIBUTED BY:

TABLE OF CONTENTS

	Page
I. Installation	3
II. Game Operation	7
3 or 5 Ball Game	8
Add—A—Ball	8
III. Sound Tone and Volume Controls	10
VI. Maintenance and Adjustment	10
Tilt Adjustment	11
Cleaning Contact Points	11
Switch Adjustments	12 thru 15
V. Coin Acceptor Installation and Wiring	17
VI. Periodic Preventive Maintenance	17
VII. Trouble Analysis and Self Test Program	18
Game Start	18
Solenoids	18
Digit Displays	20
Controlled Lamps	21
Switches	22
Self Test	23
VIII. Circuit Description and Adjustments	25
IX. Wiring Diagrams	Supplement

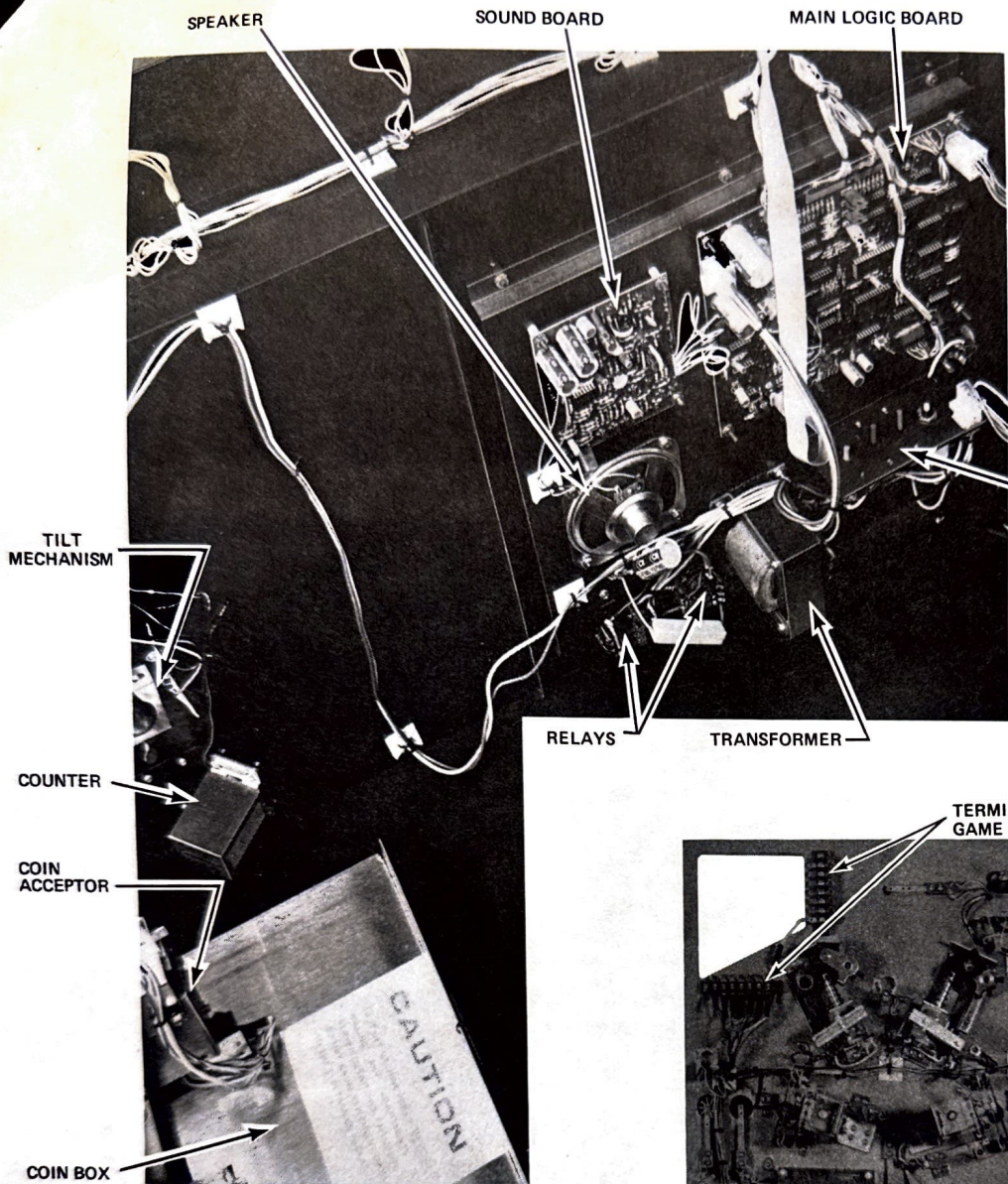
I. INSTALLATION

1. After unpacking, cut the wire tie and remove the keys hanging from the ball shooter.
2. Open the coin box door, cut the wire tie and remove the cash box.
3. Remove the parts bag from the cash box; return the cash box to the machine.
4. The parts bag in the cash box contain one steel ball, four leveler legs, and spare parts.
5. Install the leveler legs in the threaded nuts on the bottom of the machine. Level the machine from left to right first; then set the rear legs approximately 1/4 inch higher than the front. (Test by placing the ball on the glass top. The ball should roll toward the player end, straight down).
6. Put the spare parts back into the cabinet for storage.
7. Using the key, open the top cover, make sure the support bracket locks (on left side of cover - see fig. #1).
8. Raise the playfield. Be sure the support bracket locks (bracket on right side - see fig. #2).
9. Adjust tilt mechanism to desired setting. Remove shipping tape and see page 12 in the owner's manual for adjustment procedure.
10. Set the "Balls per game" switch to (3) three or (5) five balls per game. (CAUTION: This step should never be done when machine is turned on.) The switch is located on the main logic board. Push the switch to the right for (3) three ball game - left for (5) five ball game. (see fig. #4 for location of switch.)
11. On all games, there are certain items that should be checked after shipment. These are visual inspections which may avoid time consuming service work later. Minor troubles caused by abusive handling in shipment are unavoidable.

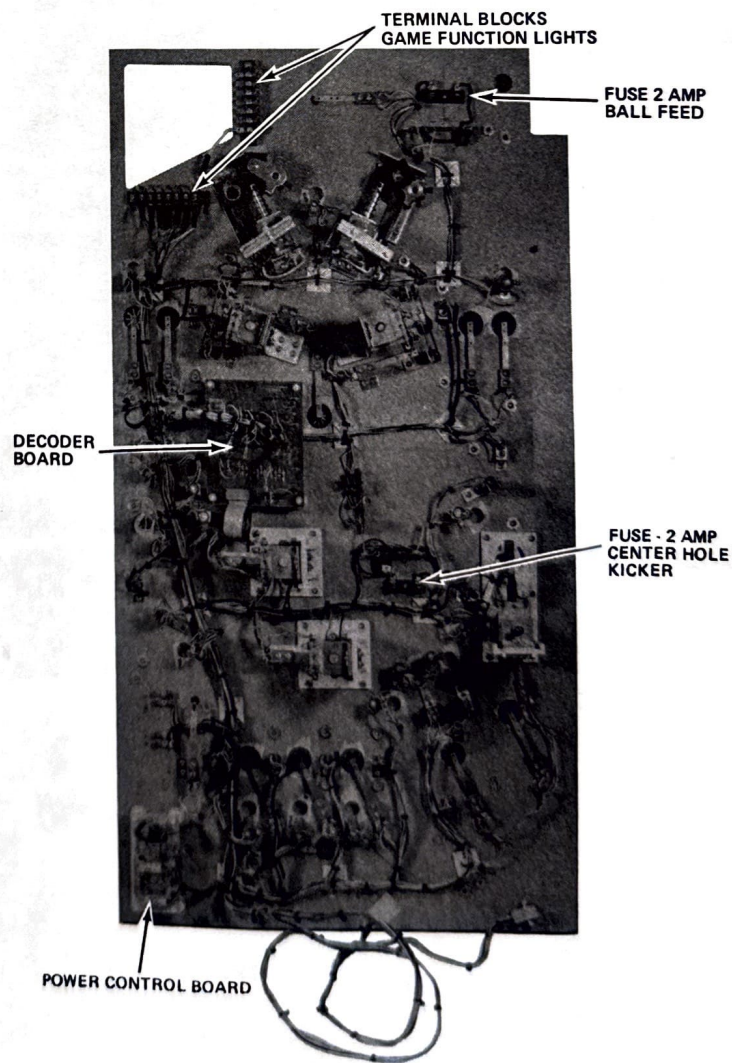
Visual inspections before plugging in line cord;

- a. Check that all cable connectors are completely seated on printed circuit assemblies.
 - b. Check that cables are clear of all moving parts.
 - c. Check for any wires that may have become disconnected.
 - d. Check switches for loose solder or other foreign material that may have come loose in shipment and could cause shorting of contacts.
 - e. Check wires on coils for proper soldering. Cold solder connections may not show up in factory inspection, but vibration in shipment may break contact.
 - f. Check that fuses are firmly seated and making good contact.
12. Lower the play field (see fig. #2).
 13. Put the steel "play ball" on play field.
 14. Close and lock the top cover. (See figure #1)
 15. Close and lock the coin door.
 16. Plug the machine into an outlet.
 17. Insert coin and test play machine.

CAUTION: Damage to the Electronics will occur if during service the 28VDC solenoid power is shorted to the +5V computer power. This will happen during switch adjustment if proper care is not taken. Damage may also occur due to high static discharge to the Electronics.



COSMIC WARS – INTERIOR



COSMIC WARS – BOTTOM OF PLAYFIELD

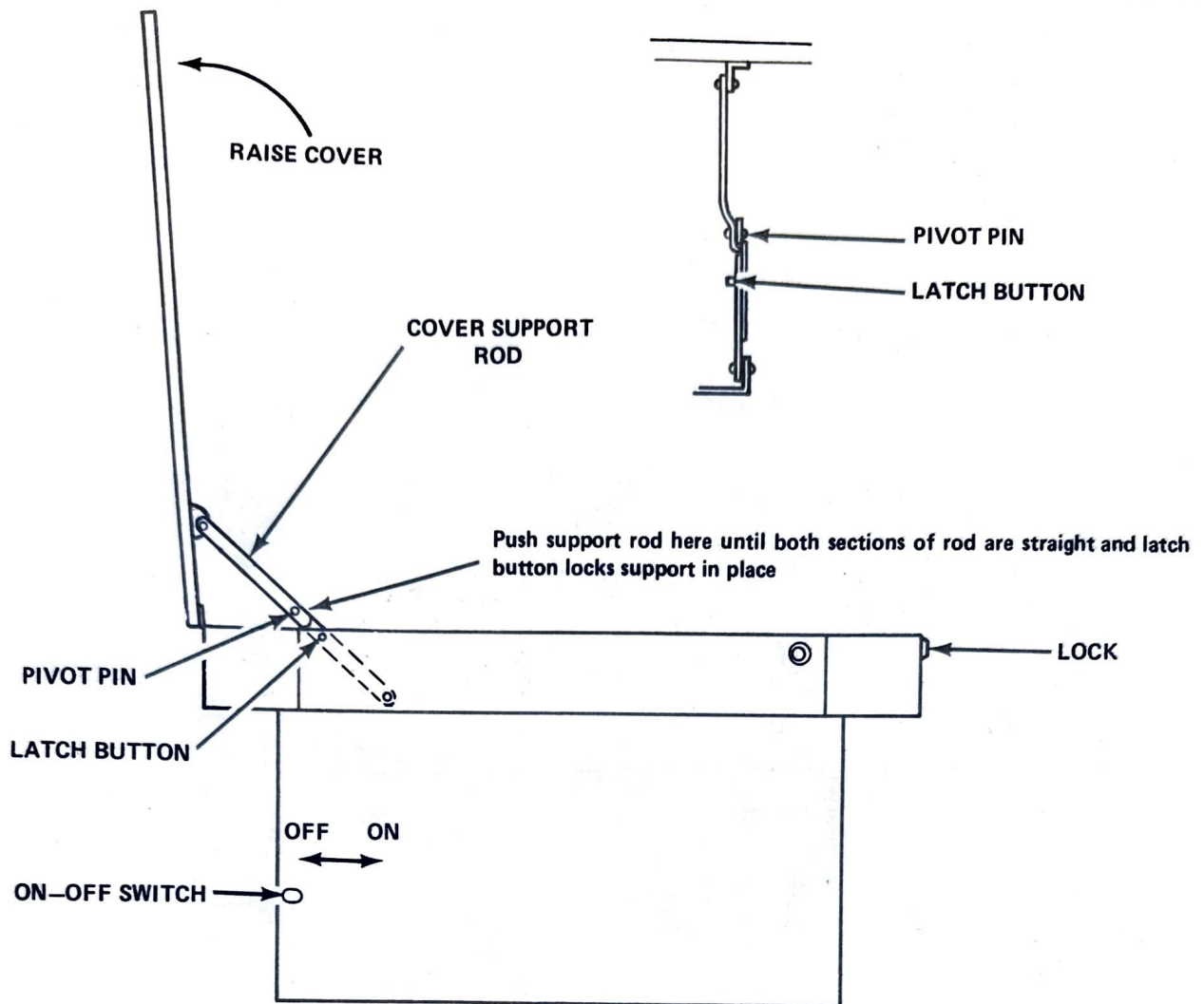


FIG. #1 – TOP COVER SUPPORT

1. To open cover:
 - a. Insert key in lock and turn key 90° clockwise.
 - b. Stand on left side of machine. Raise cover at player end and push at pivot point until cover support rods are straight and latch button locks support rods.
2. To close cover:
 - a. Support weight of cover with right hand and push latch button on rod with fingers on left hand to release latch.
 - b. Pull support rod toward player end of machine at pivot pin and lower cover.
 - c. Press down on cover above lock and turn key 90° counterclockwise to engage lock.

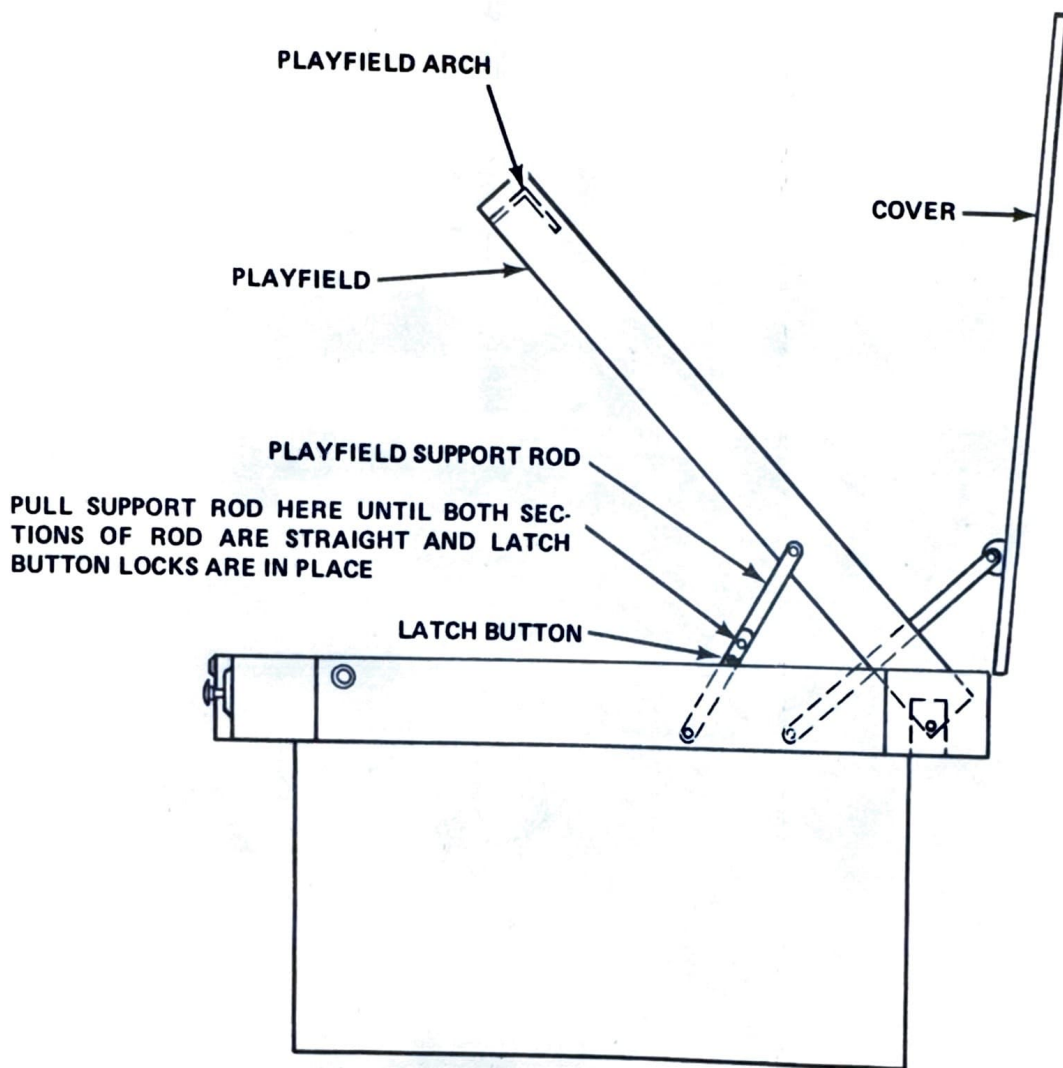


FIG. #2 – PLAY FIELD SUPPORT

1. To raise play field, stand in player position and:
 - a. Open cover per instructions.
 - b. Raise play field at player end and pull at pivot point until support rod sections are straight and latch button locks support rod.
2. To lower play field, stand in player position and:
 - a. Support play field with left hand and push latch button with thumb on right hand to unlatch support rod, and push pivot pin away from you.
 - b. Lower play field into cabinet and press down until play field bottoms.

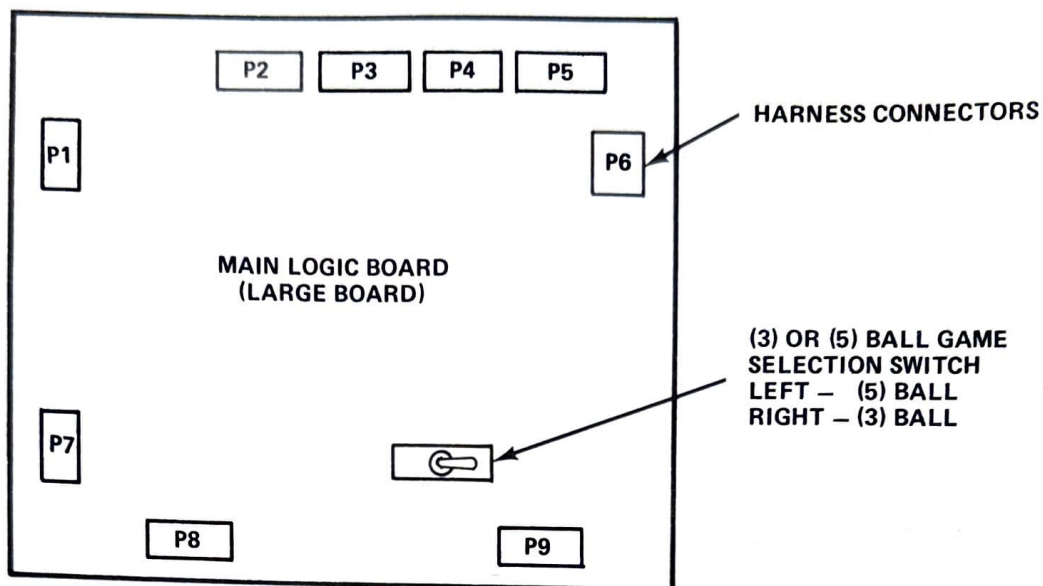


FIG. #4 - SWITCH LOCATION FOR SELECTING (3) BALL OR (5) BALL GAME

II. GAME OPERATION

Turn on the Main power switch located on the left side, near the lower rear of the cabinet.

Upon power ON, the general illumination lamps light immediately. After approximately three seconds the electronics package initializes and the following occurs;

1. The hole kicker, kicks.
2. The sound system issues a noise.
3. These controlled lamps are lit,
 - a. Three "1000 when Lit" Lights
 - b. "Lights Side Hole," Light
 - c. "High Score" Light (Flashing @ 2 Sec)
4. All L. E. D. displays read zero.

In addition, all playfield switches and solenoid power devices are inactive.

At this time as well as during game over and zero credits, the only input the electronics will accept is the coin switch. For each coin inserted, the game will issue one credit on the credit indicator, issue a tone, and increment the coin counter by one.

After credit is established a game may be begun by depressing the reset switch (located on the front left corner of the game). The first depression of the reset switch feeds the ball to the ball shooter, lights the "1st player up" light, lights the "1st player in game" light, and subtracts one from the credit display.

The game is now ready for play. If, however, a two player game is desired, the second player can be posted by another depression of the reset switch (providing credits are present).

CAUTION: After the ball is in play, depression of the reset switch will be interpreted as the start of a new game.

All playfield switches function as indicated on the playfield artwork. Each switch adds the indicated score value to the present players score. The unmarked values are 500 points for the sling kickers and 100 points for the stand-up switches.

In addition to the score values some switches control various "Bonus" features.

The word "Change" refers to the alternation of the following lamps;

- Five "1000 when lit" lamps
- One "lights side hole when lit" lamp
- One "lights extra ball lane when lit" lamp

A free ball is earned by first striking the "extra ball target" when its light is lit. This will light the two "Extra Ball" lanes. Then actuate either of the extra ball lane roll over switches.

50,000 points are earned by first striking the "light side hole target" when its light is lit. This will light the side hole light. Then when the ball enters the side hole, 50,000 points are scored.

A Plumb Bob Tilt mechanism is provided in the box to detect excessive game manipulation.

A tilt condition deactivates the playfield for the duration of the ball in play. The only exception is the side hole which will eject the ball but not award points.

3/5 BALL OPERATION

A single switch is provided on the Main Logic Board to select between a 3 ball game or a 5 ball game. With power off, move the switch left for 5 ball or right for 3 ball operation (see fig. #4).

The "High Score" feature is reset at Power Off. As long as the game is left on, the previous High Score is remembered and alternated with the "Player one's" score display during game over. When the High Score lamp is lit the High Score is displayed, otherwise the 1st players score from the previous game is displayed.

FREE CREDIT OR FREE BALL CONVERSION

A free ball conversion kit is supplied in the cash box of each game. It consists of one integrated circuit (P.N. 22800) and one game instructions overlay.

The game is shipped from the factory awarding one free credit for:

1. Exceeding 200,000 points
Exceeding 400,000 points
Exceeding 500,000 points
2. Achieving a match with the random match number at game over.

The game can be "reprogrammed" to free ball operation as follows:

1. Turn off the main power switch.
2. Carefully remove the integrated circuit IC12 (P.N. 22799) from its socket on the main logic board. see fig 6 for location.
3. Insert the new IC12 (P.N. 22800) into the socket on the main logic board. see figures 5 and 6 for orientation.
4. Locate and place the game instruction overlay on the arch over the free credits instructions.
5. Turn on the main power switch.

The game operation will now be:

1. One free ball for exceeding 200,000 points
One free ball for exceeding 400,000 points
One free ball for exceeding 500,000 points
2. Match score is non-functional.

Converting the game back to free credit operation is done in the same manner, just reversed.

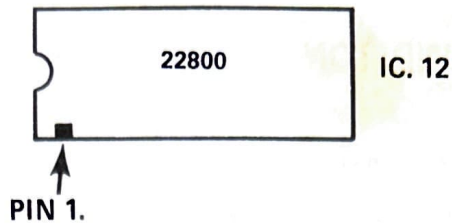


Fig. 5 PROM FOR ADD-A-BALL CONVERSION

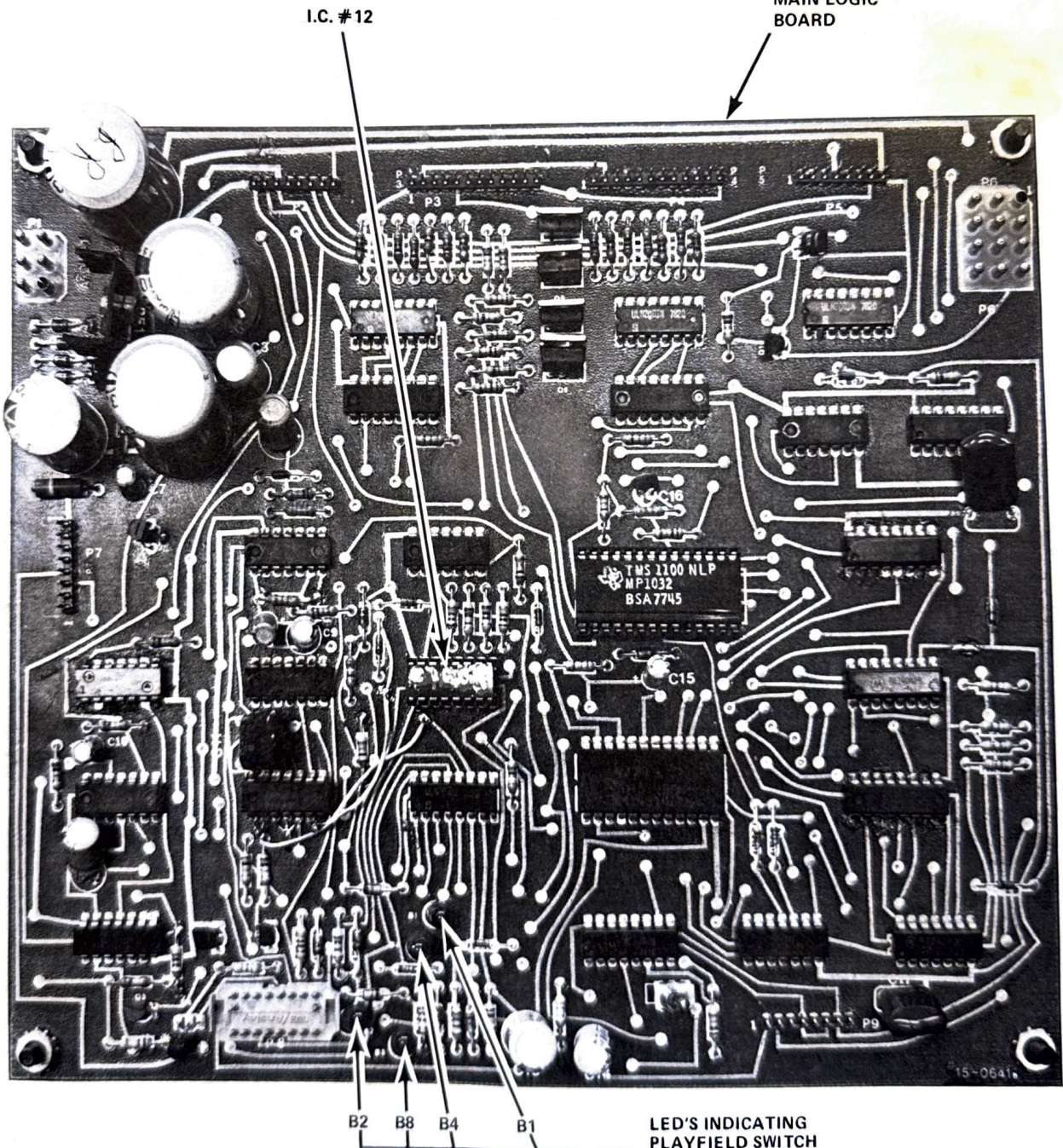


FIG. #6 - MAIN LOGIC BOARD
ADD-A-BALL CONVERSION (IC #12)

III. SOUND TONE AND VOLUME ADJUSTMENTS

Rotate volume control switch on sound board to obtain desired volume of the sounds.

Rotate low tone control switch and high tone control switch to set desired tones.

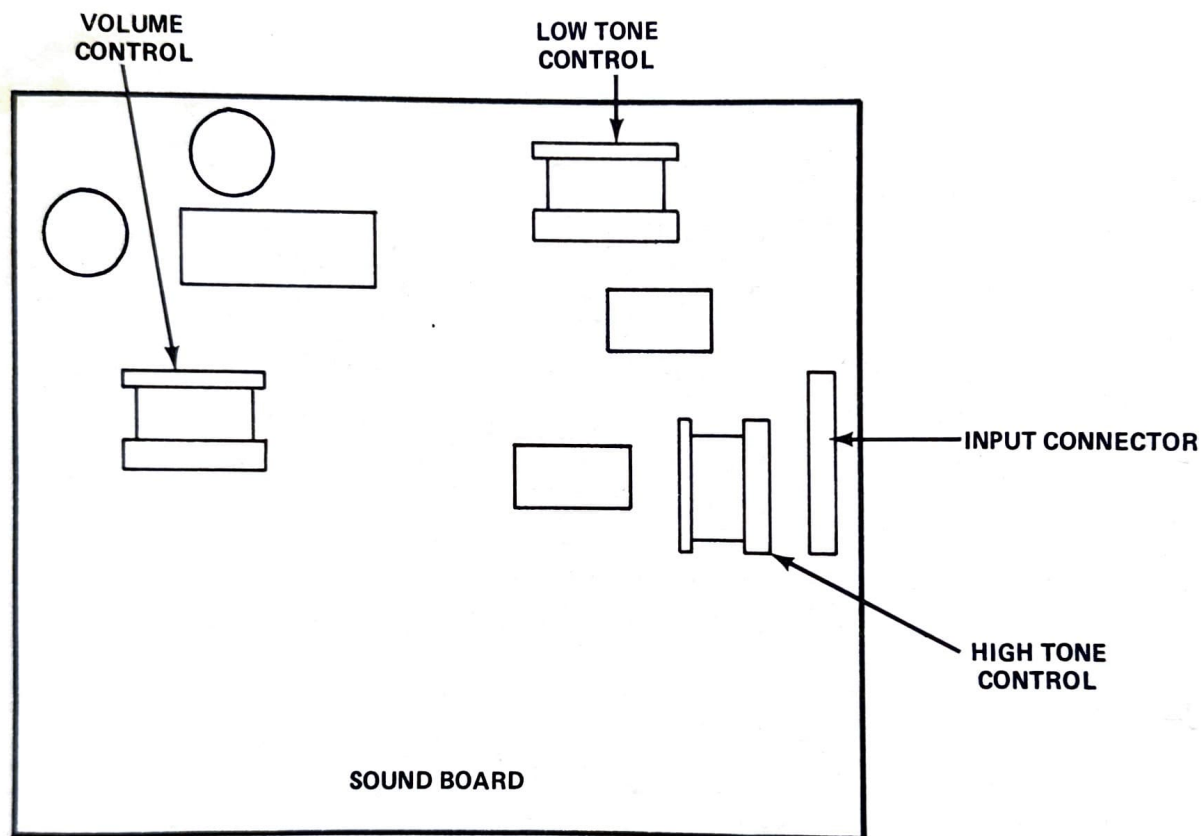


FIGURE #7 – SOUND BOARD – ADJUSTMENT LOCATION

IV. MAINTENANCE AND ADJUSTMENT

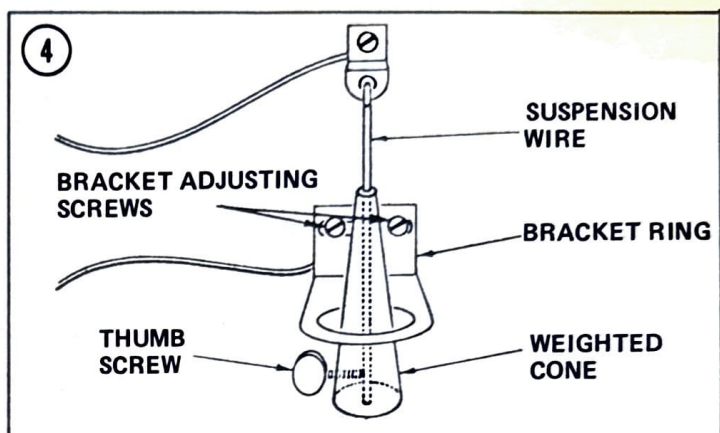
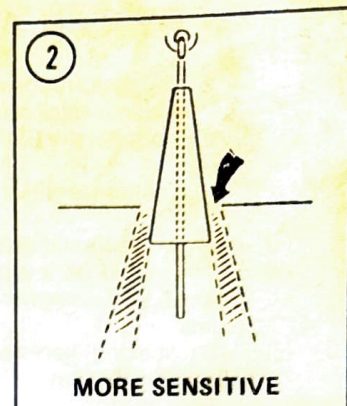
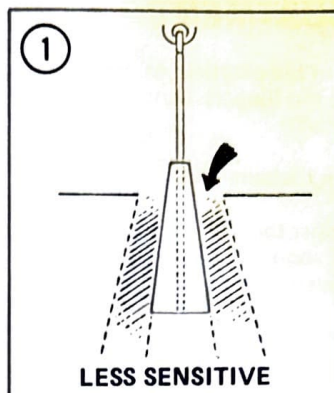
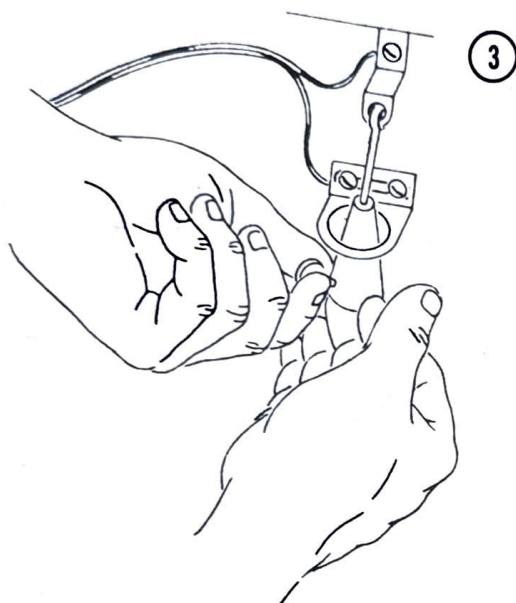
This section indicates the adjustment of each switch on the playfield. Switches should be checked and adjusted when required, to provide good action during games.

NOTE – Some switches must not be adjusted without first turning power off. When making adjustments proceed carefully so that the adjusting tool does not create contact between various voltages on switch and solenoid components – **SERIOUS DAMAGE TO THE ELECTRONIC CONTROL BOARDS WILL RESULT.**

ADJUSTING TILT

The Tilt mechanism is located inside the playfield cabinet. The weighted cone can be moved up and down on the suspension wire. The higher the cone, the more sensitive the tilt. The lower the cone, the less sensitive the tilt. See illustrations 1 and 2 at right.

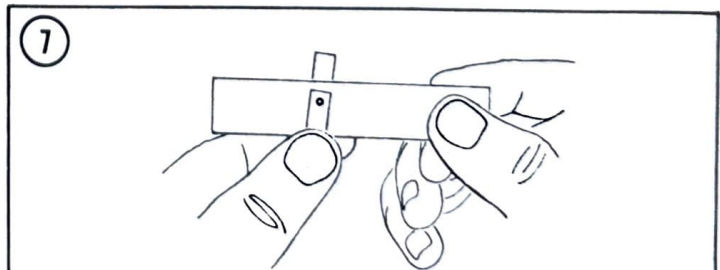
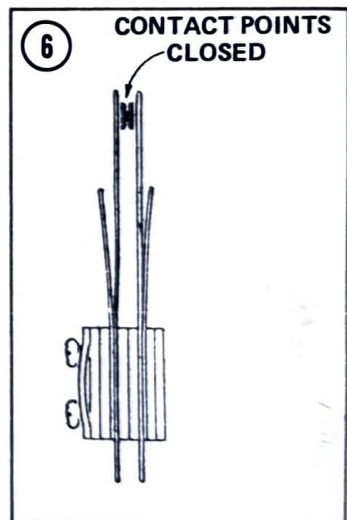
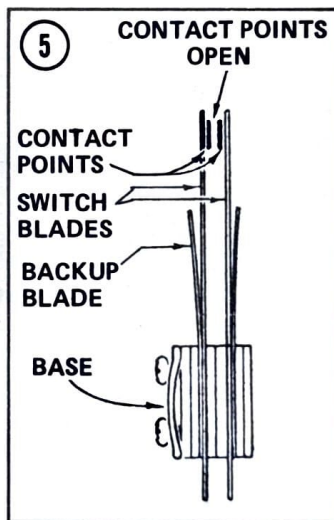
To adjust tilt, loosen thumb screw on cone. Slide cone up or down on suspension wire to desired level. Tighten thumb screw. If cone is not hanging in center of bracket ring, loosen 2 bracket screws and slide bracket side to side until cone is centered. Tighten bracket screws. See illustrations 3 and 4 below.



SWITCH ADJUSTMENTS

The scoring and action of this game is controlled by switches which open and close as the ball hits and rolls over various points on the playfield. These switches will need minor adjustments from time to time. Switch adjustment is not complicated when you understand their operation and read the instructions in this manual carefully.

A switch is simply two contact points on blades of spring steel. When the contact points touch electricity passes thru activating the sounds and scoring. When there is a space between the contacts, no electricity passes. See illustrations 5 and 6 at right.



CLEANING CONTACT POINTS

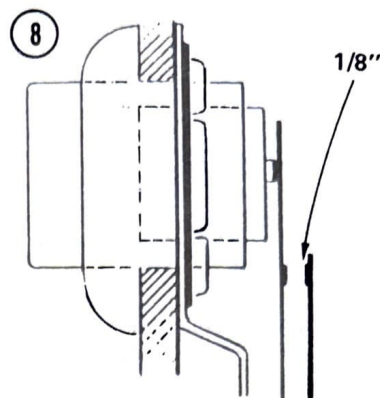
Contact points may get dirty or oxidize, especially if game is not played for a long period. To clean contacts place a narrow strip of plain writing paper between the contacts, press contacts together gently and pull paper through. See illustration 7.

BUTTON SWITCH ADJUSTMENT

Three Button Switches are located in the playfield cabinet. Buttons on the cabinet sides control the flippers. Button on the front panel controls the Game Start.

All 3 Button Switches are adjusted in the same way:

- Inside blade should rest against the plastic button.
- There should be a gap of about 1/8-inch (thickness of two nickels) between the two contact points.
- After making necessary adjustments, check by depressing button—contact points should touch. Release button—contact points should be separated.
- See illustration 8.

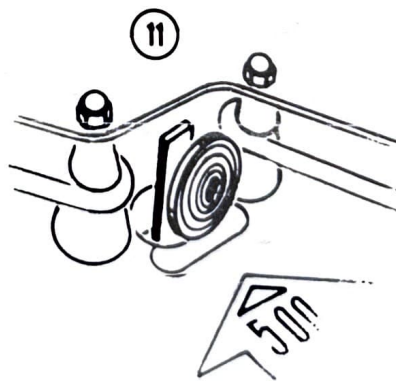
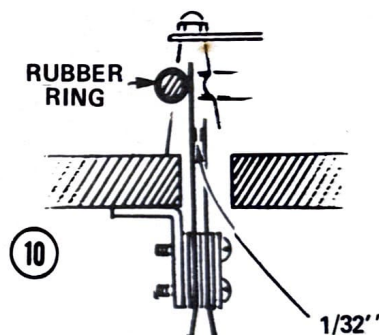
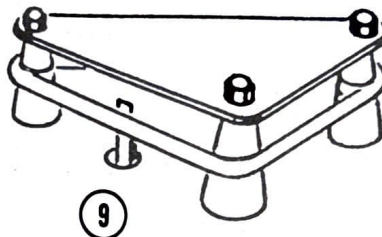


STAND-UP SWITCH ADJUSTMENT

These switches can be seen from the top side of the playfield, behind rubber rings. Switches beside slingshot kicker activate slingshots. Other switches advance score.

Stand-up switches are adjusted on the underside of the playfield as follows:

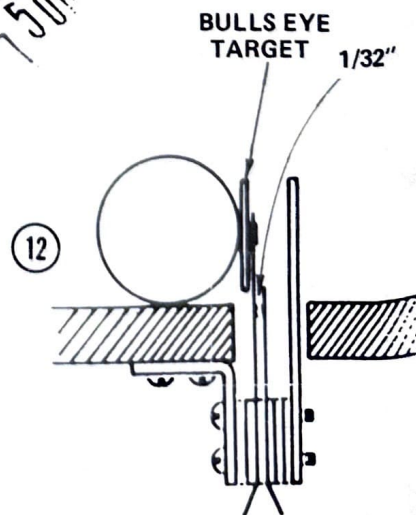
- Outside blade should be just touching the rubber ring.
- There should be a gap of about 1/32-inch (thickness of a dime) between the two contact points.
- If contact points cannot be seen clearly, remove the plastic cover by unscrewing the cap nuts.
- See illustrations 9 and 10.



BULLS EYE TARGET SWITCH ADJUSTMENT

Bulls Eye Target switches are adjusted on the underside of the playfield as follows:

- Blade on which the Bulls Eye is attached needs no adjustment.
- There should be a gap of about 1/32-inch (thickness of a dime) between the two contact points.
- See illustrations 11 and 12.

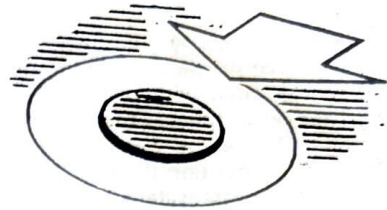


BUTTON ROLL-OVER SWITCH ADJUSTMENT

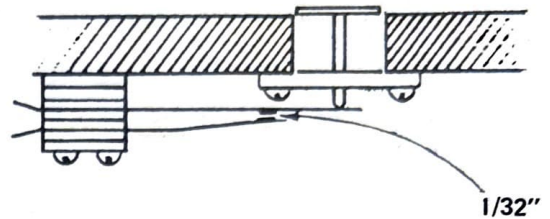
Button Roll-over Switches are adjusted on the underside of the playfield as follows:

- Long blade should be just touching the plastic tip.
- Gap between contact points should be about 1/32-inch (thickness of a dime).
- After making necessary adjustments, check by lightly pressing the plastic button from the top side of the playfield. When depressed, contact points should touch. When released, contact points should be separated.
- See illustrations 13 and 14.

13



14



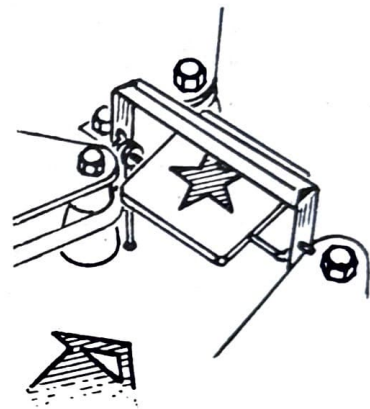
1/32"

SPINNER TARGET SWITCH ADJUSTMENT

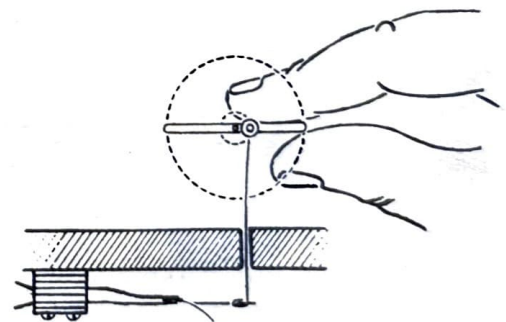
Spinner Target Switch is adjusted on the underside of the playfield as follows:

- Turn Spinner Target from top side of playfield so face of target is horizontal to playfield surface. In this position the contact points should be touching. If they do not touch, adjust short switch blade.
- Release Spinner Target. There should now be a gap between the contact points.
- Do not adjust the long switch blade.
- See illustrations 15 and 16.

15



16



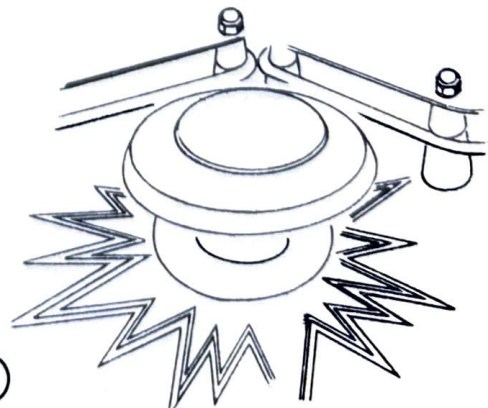
CONTACT POINTS CLOSED

THUMPER-BUMPER SWITCH ADJUSTMENT

Thumper Bumper switches are adjusted on the underside of the playfield. There are two switches, one mounted on top of the other. They are adjusted as follows:

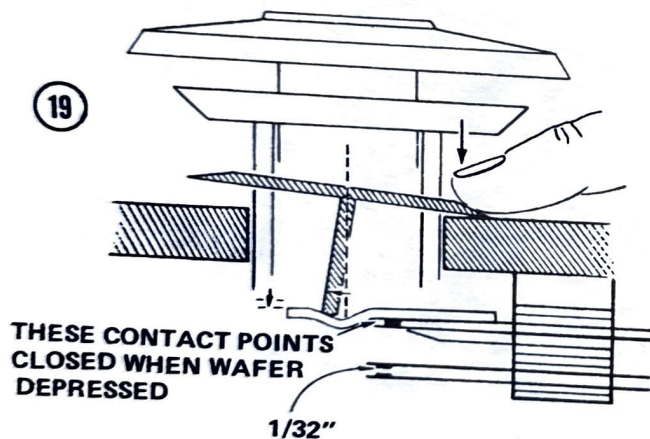
- First look at the switch closest to the underside of the playfield surface. There should be a gap between the contact points of about 1/32-inch (thickness of a dime).
- Adjust only the short blade. Do not adjust the long blade.

17

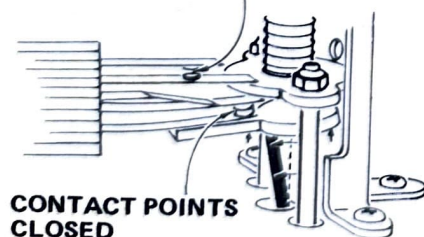


- (c) After making necessary adjustment, check by depressing the red plastic wafer from the top side of the playfield. Hold with one finger so that the edge of the wafer touches the playfield surface at one point. The entire wafer should not be depressed. In this position the contact points should be touching. Release wafer—contact points should now be separated.
- (d) Now look at the switch furthest away from the playfield surface. There should be a gap between the contact points of about 1/32-inch (thickness of a dime).
- (e) Adjust only the short blade. Do not adjust the long blade.
- (f) After making necessary adjustment, check by pulling the two steel rods toward the coil. Contact points should be touching. Release rods—contact points should now be separated.
- (g) See illustrations 17 thru 20.

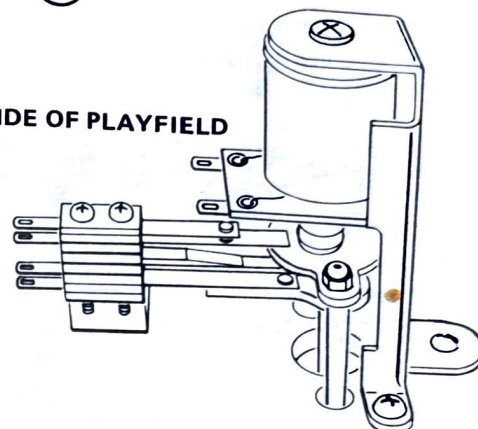
NOTE: ONLY ADJUST THESE CONTACTS WITH POWER OFF



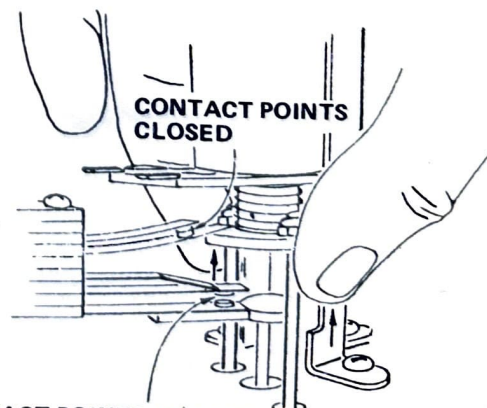
THESE CONTACT POINTS REMAIN
OPEN WHEN WAFER DEPRESSED



18
UNDERSIDE OF PLAYFIELD

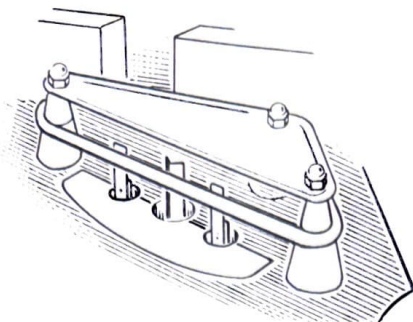


20



THESE CONTACT POINTS REMAIN
OPEN WHEN PLUNGER DEPRESSED

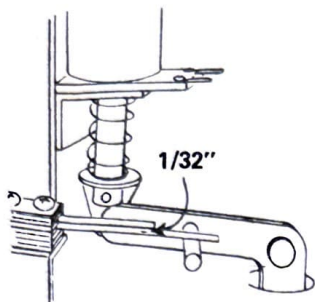
21



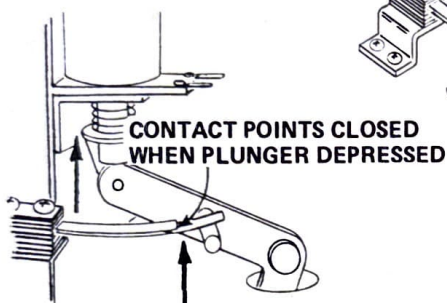
SLINGSHOT KICKER SCORE SWITCH ADJUSTMENT

Slingshot Kicker score switches are adjusted on the underside of the playfield as follows:

- Turn power off.
- There should be a gap of about 1/32-inch (thickness of a dime).
- Adjust short blade only. Do not adjust long blade.
- After making necessary adjustment, check by pulling back on vertical steel shaft. Contact points should be touching. Release—contact points should now be separated.
- See illustrations 21 thru 23.

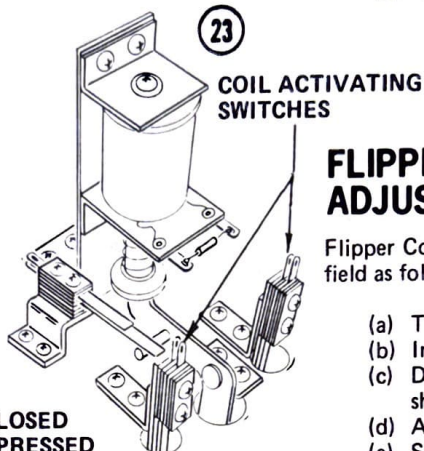


22



CONTACT POINTS CLOSED
WHEN PLUNGER DEPRESSED

23

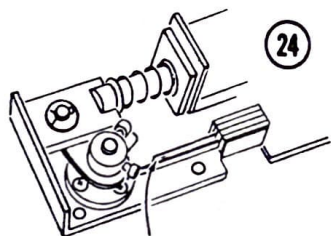


COIL ACTIVATING
SWITCHES

FLIPPER COIL SWITCH ADJUSTMENT

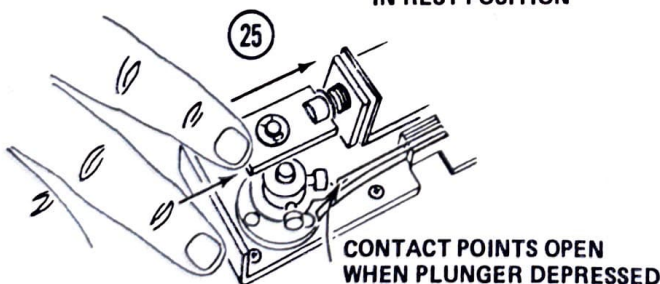
Flipper Coil switches are adjusted on the underside of playfield as follows:

- Turn power off.
- In rest position contact points should be touching.
- Depress steel plunger rod into coil. Contact points should separate near end of stroke.
- Adjust long blade.
- See illustrations 24 and 25.



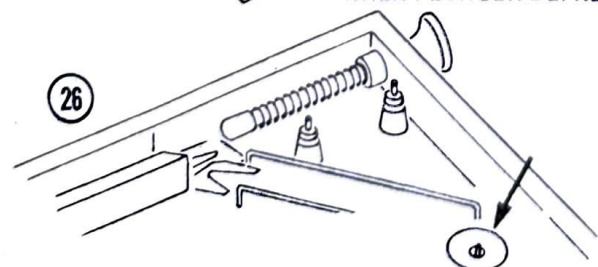
24

CONTACT POINTS CLOSED
IN REST POSITION



25

CONTACT POINTS OPEN
WHEN PLUNGER DEPRESSED

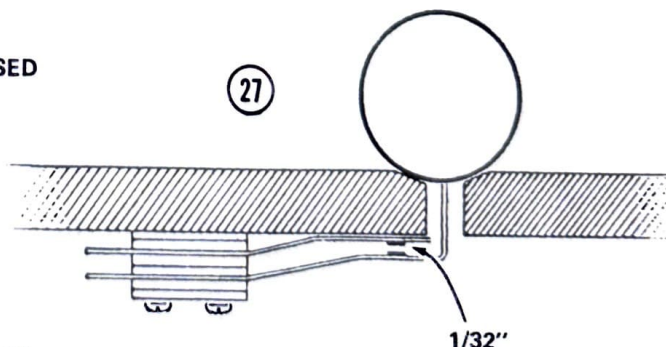


26

BALL RETURN AND OUTHOLE SWITCH ADJUSTMENT

Both switches are adjusted on the underside of the playfield as follows:

- Short blade should touch the under surface of playfield.
- There should be a gap of about 1/32-inch (thickness of a dime) between the contact points when ball is on switch.
- After making necessary adjustment, check by holding steel ball in the ball return depression on the top side of the playfield. Contact points should open. Remove ball—contact points should now be connected.
- See illustrations 26 and 27.



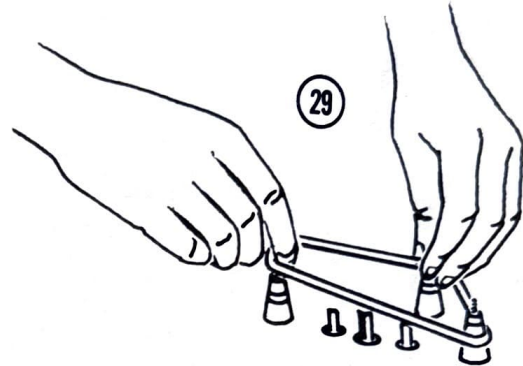
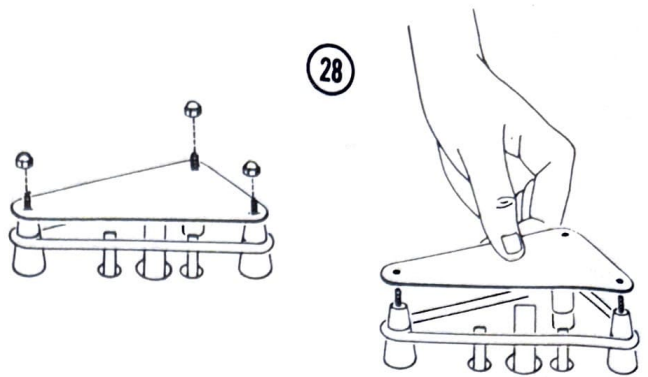
27

1/32"

RUBBER RING REPLACEMENT

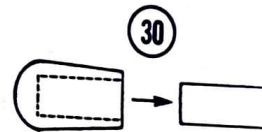
Rubber Rings do not need to be replaced often. Even with heavy play you will probably not have to replace rings more than once a year. Dirty rubber rings can be wiped clean with a soft, lint-free cloth dampened slightly with any mild non-abrasive detergent.

To replace rubber rings unscrew the cap nuts that hold plastic covers in place. Lift off plastic cover. Slip rubber ring off support posts. See illustrations 28 thru 29. Place new rubber ring on support posts, making sure ring is seated in the holding grooves on each post. Replace plastic cover. Fasten with cap nuts.



RUBBER TIP REPLACEMENT

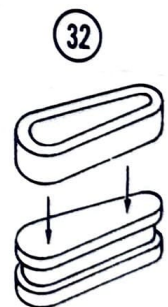
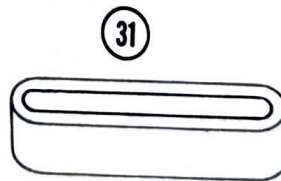
This tip will require replacement more frequently than the rubber rings. See illustration 30.



FLIPPER RUBBER REPLACEMENT

Large Rubber Rings encircle each flipper located near the bottom of the playfield. See illustration 31.

Flipper Rubber need not be replaced often. The ball hits only one side of the flipper bar. When rubber shows wear, we recommend rotating the rubber ring so that unused back side faces front. When full ring needs replacement, simply pull rubber ring upward from flipper bar. New rubber ring is then placed on bar from the top. See illustrations 31 and 32.

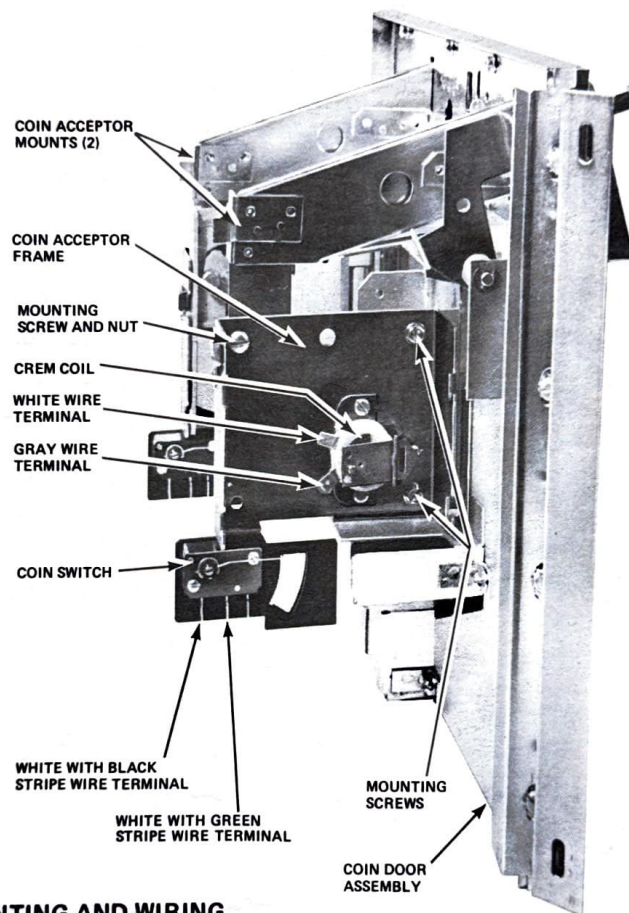


V. COIN ACCEPTOR INSTALLATION AND WIRING

Cosmic Wars games shipped to foreign countries requiring special coin acceptors to accept the local coins, may sometimes be shipped without coin acceptors. The machine is designed to use the Coinco series 10-coin acceptor. The illustration below indicates the mounting screw locations and wire connections to the CREM coils and coin switches.

Two coin acceptors are mounted on the coin door of the machine. The CREM coils of each coin acceptor are wired in parallel with white wire on one terminal of the coils and gray wire to the other terminal of the coils.

The coin switches of each coin acceptor are wired in parallel. The white wire with green stripe is connected to the "common" terminal of the coin switch and the white wire with the black stripe is connected to the "normally open" terminal on the coin switch.



COIN ACCEPTOR MOUNTING AND WIRING

VI. PERIODIC PREVENTIVE MAINTENANCE

Service calls and game downtime can be avoided by periodic checks on the game. Some areas to be checked are as follows:

1. Check tightness of posts and components which receive the impact of the ball during play.
 - a) Ball gates at top of machine
 - b) Thumper bumpers
 - c) Posts on each side of outhole kicker
 - d) Wire guides and rails
 - e) Rubber rings (stretching and looseness)
 - f) Flipper arms
2. Check all lights.
3. Clean the playfield.
4. Clean the glass.
5. Check tightness of flipper and reset buttons (nuts inside cabinet).
6. Ball shooter (check nuts on inside of cabinet).

VII TROUBLE ANALYSIS AND SELF TEST PROGRAM

The following is intended as an aid to trouble shooting a cosmic wars pin game. Consulting schematic/wiring diagrams 22851 through 22857 as well as the "Self Test" section of this manual will also be of assistance.

SYMPTOM: NO ILLUMINATION UPON POWER ON

CAUSE

ACTION

- | | |
|------------------------------------|---|
| 1. Machine not plugged in. | |
| 2. Outlet is dead | 2. Check fuse or circuit breaker on line going to the machine outlet. |
| 3. Machine circuit breaker tripped | 3. Reset all four circuit breakers located on power supply chassis. Turn machine on. |
| 4. Loose connection | 4. Check all internal connectors for proper seating. |
| 5. Broken wire/bad power switch | 5. Check for proper A.C. Voltages at switch and transformer. (See power supply schematic diagram 21590) |

SYMPTOM: GENERAL ILLUMINATION WORKS ELECTRONICS DO NOT INITIALIZE

CAUSE

ACTION

- | | |
|---|--|
| 1. 28V circuit breaker tripped | 1. Reset circuit breaker |
| 2. Foreign material is lodged in relays | 2. Inspect and clean both open frame relays on the power supply chassis. |
| 3. Loose connector | 3. Check P1 connector on logic board for proper seating |
| 4. Broken wire | 4. Check P1 connector and associated terminations at power supply. |

SOLENOIDS

SYMPTOM: NO SOLENOIDS OPERATE

CAUSE

ACTION

- | | |
|--------------------------------|--|
| 1. 28V circuit breaker tripped | 1. Reset Breaker.
If breaker will not reset, inspect the machine for shorts or burned out solenoids. |
| 2. Loose connector | 2. Inspect power supply P1 for proper seating. |
| 3. Broken connection | 3. Inspect power supply and playfield wiring.
Pink = 28VDC
Gray = Ground
Violet = Controlled Ground |

SYMPTOM: SYMPTOM: SIDE HOLE KICKER DOES NOT KICK, BUT IS NOT BURNED OUT

CAUSE

ACTION

- | | |
|---------------|--|
| 1. Blown Fuse | 1. Check and replace the 2A. fuse and see the "burned out solenoid" section for failure cause. |
|---------------|--|

2. Loose or broken connection

3. Bad driver strip

4. Bad Main Logic Board

2. Inspect connections at the Main Logic Board, Decoder Board "Out Sol" Connection, and all connections at the solenoid and driver strip.

3. Replace

4. Replace

**SYMPTOM: SIDE HOLE KICKER KICKS,
NO OTHER SOLENOID OPERATES (CONTROLLED GROUND PROBLEM)**

CAUSE

1. Loose or broken connection

2. Controlled ground board is not energizing

ACTION

1. Inspect wiring at the controlled ground board and all solenoids.

2. The following checks should be made before replacing the controlled ground board.

a. +5VDC @ the +5V lug

b. +5VDC @ the credit lug when the coin switch is depressed

c. +5VDC @ the start lug when the reset switch is depressed

d. Both game over and tilt lights should be off and approx. 7 VDC measured at the tilt and game over lugs.

e. Ground at the GND lug

f. If the board is operating the cont. GND. lug will measure approx. 1.5VDC if not it will be +30VDC.

**SYMPTOM: ANY SOLENOID DEVICE PULLS IN BUT WILL NOT RELEASE
TURN POWER OFF IMMEDIATELY**

CAUSE

1. Solenoid mechanically binding

2. Solenoid burned out

ACTION

1. If the solenoid remains "stuck" with power off the problem is mechanical. Close visual inspection should reveal loose or bent hardware.

2. Replace solenoid coil and see "burned out solenoid" section for coorective action

**SYMPTOM: SOLENOID BURNED OUT
SIDE HOLE OR BALL FEED**

NOTE: IF EITHER OF THESE SOLENOIDS ARE BURNED OUT, IMPROPER FUSING MUST HAVE OCCURRED. THESE SOLENOIDS SHOULD BE PROTECTED BY A 2AMP FUSE.

CAUSE

1. Loose connectors on main logic board

2. Bad driver strip

3. Bad main logic board

ACTION

1. Inspect and seat all main logic board connectors

2. Replace

3. Replace

**SYMPTOM: SOLENOID BURNED OUT
SLING KICKERS, POP BUMPER, FLIPPERS**

CAUSE

1. Stuck switch

ACTION

1. Adjust and/or replace switch and solenoid coil

DIGIT DISPLAYS

SYMPTOM: ANY INDIVIDUAL SEGMENT OF AN INDIVIDUAL DIGIT FAILS TO ILLUMINATE

CAUSE

1. Bad L.E.D.

ACTION

1. Replace L.E.D. Board

SYMPTOM: CENTER THREE DIGITS DO NOT DISPLAY ZEROES ON POWER UP (ONE OR MORE)

CAUSE

1. Loose or broken connections

ACTION

1. Check P2, P5 and P9 on Main Logic Board for improper seating or broken wires. Check connector on center digit board for improper seating or broken wires.

2. Bad L.E.D. Board

2. Replace

3. Bad Main Logic Board

3. Replace

SYMPTOM: PLAYERS SCORE, UNITS AND TENS DIGITS DO NOT ILLUMINATE ONE PLAYER

CAUSE

1. Loose or broken connection

ACTION

1. Inspect L.E.D. Harness for proper connector seating and loose wires

2. Bad L.E.D. Board

2. Replace

BOTH PLAYERS

CAUSE

1. No general illumination power

ACTION

1. Check for 6.3 VAC at the playfield faston connectors.

2. Loose or broken connection

2. Inspect LED. Harness for proper connector seating and loose wires.

3. Both L.E.D. Boards are bad

3. Replace

SYMPTOM: PLAYERS SCORE, HUNDREDS THROUGH HUNDRED THOUSANDS DIGITS DO NOT OPERATE PROPERLY

CAUSE

1. Loose or broken connections

ACTION

1. Inspect the entire L.E.D. harness (from main logic board to the L.E.D. boards) for proper seating and broken wires

2. If only one player, bad L.E.D. board

2. Replace

3. If both players, bad Logic Board or bad L.E.D. Boards

3. Replace

CONTROLLED LAMPS

SYMPTOM: GAME OVER, PLAYERS 1 AND 2, PLAYERS UP 1 AND 2, HIGH SCORE, SAME PLAYER EXTRA BALL LAMPS ARE ILLUMINATED, AND SOUND.

CAUSE

1. Loose or disconnected P5 connector on main Logic Board
2. P5 Inserted backwards in Main Logic Board
3. Broken wire
4. Foreign material lodged in relays

ACTION

1. Make sure P5 is seated properly in Logic Board
2. Check to see that the white/black/brown wire is to the front of the machine.
3. Check connections on P5 connector at Logic Board, and J1 connector at credit, match, and ball displays.
4. Inspect and clean all contacts on both relays mounted on power supply Chassis

SYMPTOM: TILT, PLAYERS 1 AND 2, PLAYER UP 1 AND 2, SAME PLAYER AND EXTRA BALL LAMPS ARE ILLUMINATED.

CAUSE

1. No - 10VDC

ACTION

1. Replace Main Logic Board

If any individual controlled lamp functions do not operate as indicated in the self test instructions and table 1, the following action should be taken:

SYMPTOM: IF ANY OF THE CONTROLLED LAMPS DO NOT EXTINGUISH AT THE PROPER TIME.

CAUSE

1. Shorts
2. Bad Main Logic Board

ACTION

1. Check harness for chaffed wires, and/or shorts
2. Replace

SYMPTOM: IF ANY OF THE CONTROLLED LAMPS DO NOT ILLUMINATE AT THE PROPER TIME.

CAUSE

1. Bad Bulbs
2. Bad wiring/Loose connections
3. Bad Main Logic Board

ACTION

1. Check and Replace
2. Check harness for cut wires, bad soldering, and defective lamp sockets.
3. Replace

The following list of lamp names are "controlled" lamps;

1. Same Player
2. Outhole Lamp
3. Extra Ball Lane (Left and Right)
4. 100/1000 (Left and Right)
5. 1000 and light outhole lamp
6. Spinner
7. 1000 and light extra ball lanes

8. Tilt
9. Game over
10. Player 1 in game
11. Player 2 in game
12. Player 1 up
13. Player 2 up
14. High Score

SWITCHES STARTUP

SYMPTOM: NO RESPONSE FROM A PARTICULAR SWITCH

CAUSE

1. Switch not making contact
2. Loose or broken connection

ACTION

1. Inspect and adjust switch for proper actuation.
2. Inspect associated switch wiring

NOTE: If this is a Logic input switch, close the switch and observe the L.E.D.'s on the Main Logic Board for the proper code. (See table two)

SYMPTOM: LOGIC SWITCH CODE IS INCORRECT

CAUSE

1. Shorted or open switch
2. Bad Decoder Board
3. Bad Main Logic Board

ACTION

1. Inspect all other switches for proper adjustment (all switches except the ball return and the center hole switch are "normally open")
2. Replace
3. Replace

SYMPTOM: LOGIC SWITCH CODE IS CORRECT BUT THE WRONG RESPONSE IS ACHIEVED

CAUSE

1. Bad P.R.O.M.
2. Bad Main Logic Board

ACTION

1. Replace
2. Replace

step	score	match	ball	credit	issues sound	tilt	player 1 up	player 2 up	1 player	2 player	extra ball lane	same player	lights extra ball lane	lights center hole	100/1000	100/1000	spinner	side hole
0	000000	0	1	0			x		x					x		x		
1	111100	1	2	0	x	x		x		x	x	x	x		x		x	x
2	222200	2	3	0										x		x		
3	333300	3	4	0	x	x					x	x	x		x		x	x
4	444400	4	5	0										x		x		
5	555500	5	6	0	x	x					x	x	x		x		x	x
6	666600	6	7	0										x		x		
7	777700	7	8	0	x	x					x	x	x		x		x	x
8	888800	8	9	0										x		x		
9	999900	9	9	0	x	x					x	x	x		x		x	x
10	099900	9	9	0										x		x		
11	199900	9	9	0	x	x					x	x	x		x		x	x
12	299900	9	9	0										x		x		
13	399900	9	9	0	x	x					x	x	x		x		x	x
14	499900	9	9	0										x		x		
15	599900	9	9	0	x	x					x	x	x		x		x	x

X indicates sound or light

TABLE I – SELF TEST – NUMERIC DISPLAY AND CONTROLLED LAMP ILLUMINATION SEQUENCE

SELF TEST

Incorporated within the Electronics software is a test program. This test is entered as follows:

1. Turn the power switch off
2. Connect a "clip lead" from the COM terminal to the "B9" terminal (see Fig. 8) on the playfield decoder board.
3. Turn the power switch on.

The numeric displays and controlled lamps are exercised as indicated in the table 1. To terminate the self test:

1. Turn the power switch off
2. Remove the clip lead
3. Turn the power switch on.

The following items are not tested by the self test program. They are however, easily checked as follows:

1. The coin counter and credit display should increase once for each depression of either coin switch. The credit indicator will stop at 9. In addition a tone is generated by the electronics for each credit.
2. The High Score Lamp should be flashing at a 2 second rate at all times except during the play of a game.
3. The game over lamp should be lit at the end of each game.
4. All switches can be manually activated to verify proper operation.

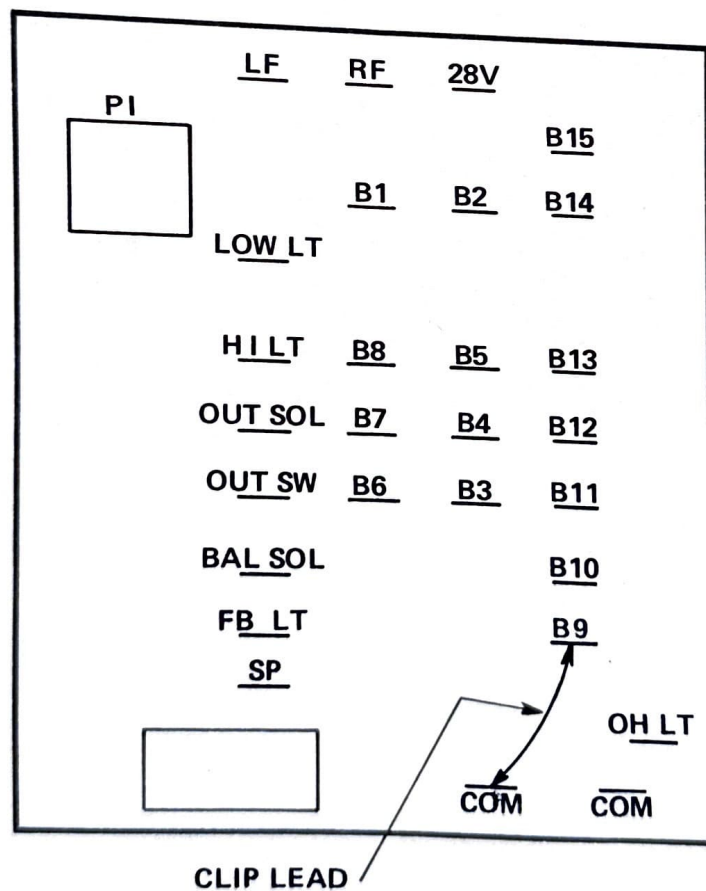


Figure #8 – DECODER BOARD "CLIP LEAD" LOCATION FOR SELF TEST

VIII CIRCUIT DESCRIPTION AND ADJUSTMENTS

A complete set of schematics and wiring diagrams are provided in this manual. The following is a brief description of the electronic circuits and adjustments.

1. The A.C. line voltage is converted to various AC and DC voltages needed by the system. Four circuit breakers are provided to protect against overload conditions. The circuit breakers are located on the lower left hand wall inside the machine. Their functions are:
 1. (Forwardmost breaker) 1.5 AMP – 10v
 2. 7.0 AMP – +5v
 3. 7.0 AMP – 6.3v
 4. 7.0 AMP – 30v
2. The six electronic sounds are produced by the sound generation circuit board. Due to component drift, the two "scoring chimes" may occasionally need adjustment. Two potentiometers are provided for this purpose (see Fig. 7). The other four sounds are produced by a single voltage controlled oscillator which does not require adjustment. The third control on the sound board (see Fig. 7) is a volume control.
3. The main logic board contains all of the control circuits for the game. The TMS 1100 microcomputer is the controlling logic element. In general terms the system operates as follows:

After power on, reset and initialization, the microcomputer is "IDLE". When a switch is closed (with the exception of ball return and center hole), it feeds +5 volts to the diode matrix board. The signal is then encoded and sent as an address to the "Input Prom" (IC12) on the main logic board. The TMS 1100 then reads a multiplicity of information associated with that switch. The switch "Address" list is included as table 2. There are four L.E.D.'s on the main logic board which will illuminate to display the "Address" for a given closed switch. See Fig. # 6 for L.E.D. locations.

Based on the information read, the TMS 1100 will output the appropriate lights, digits, solenoids and sounds.

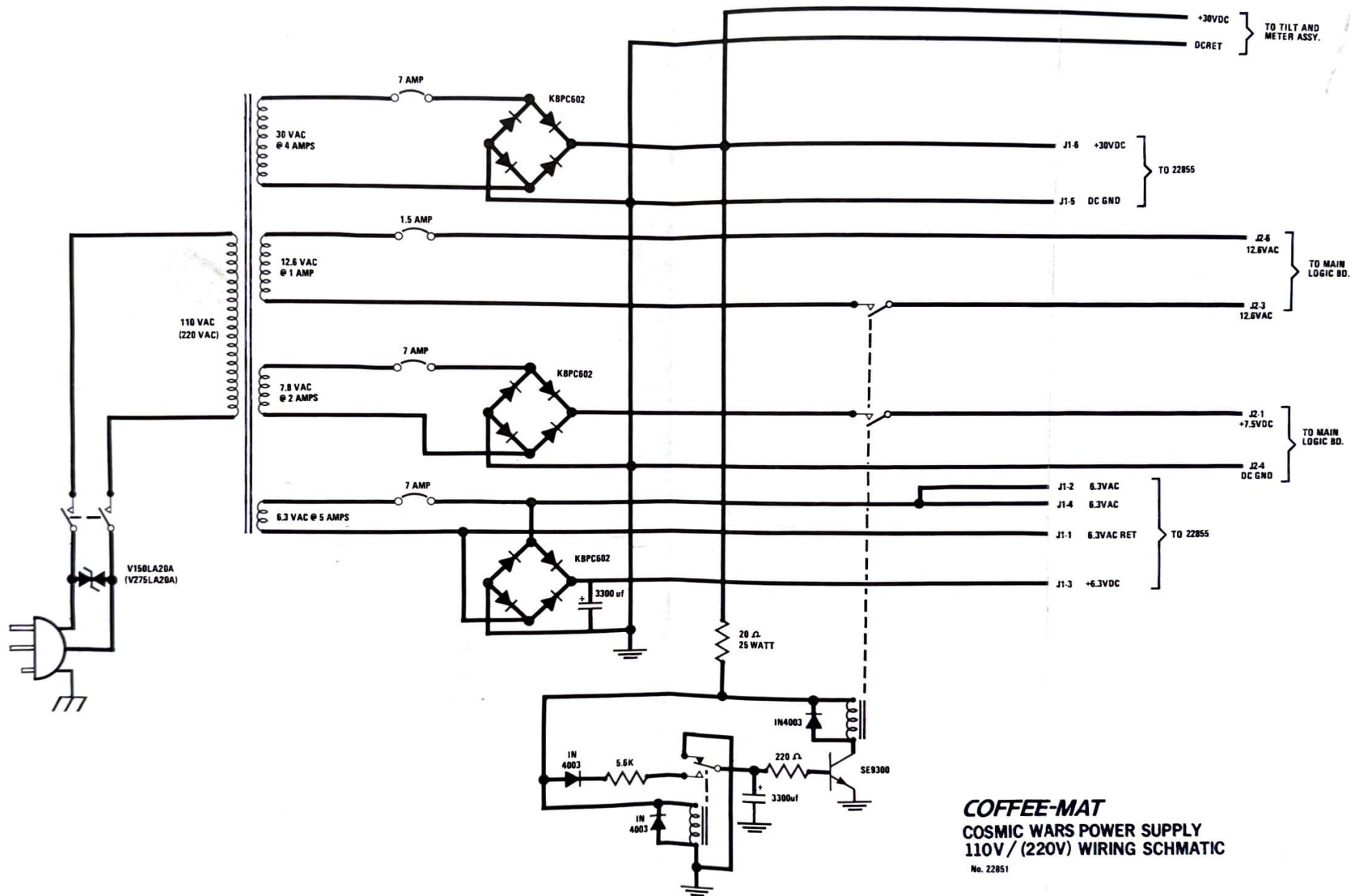
CONTACT LIST

CONTACT	L.E.D. ON MAIN LOGIC BOARD			
	B1	B2	B4	B8
1000 and Light Ex. Ball	L	x	x	x
500	x	L	x	x
100/1000	L	L	x	x
Outhole switch	x	x	x	x
1000 and Light Side Hole	L	x	L	x
100/1000	x	L	L	x
500 and Change	L	L	L	x
1000 and Ex. Ball when lit	x	x	x	L
Self Test	L	x	x	L
1000 + Ex B1 when lit	x	L	x	L
Tilt	L	L	x	L
Ball Return	x	x	x	x
Credit	L	x	L	L
Start	x	L	L	L
100	L	L	L	L

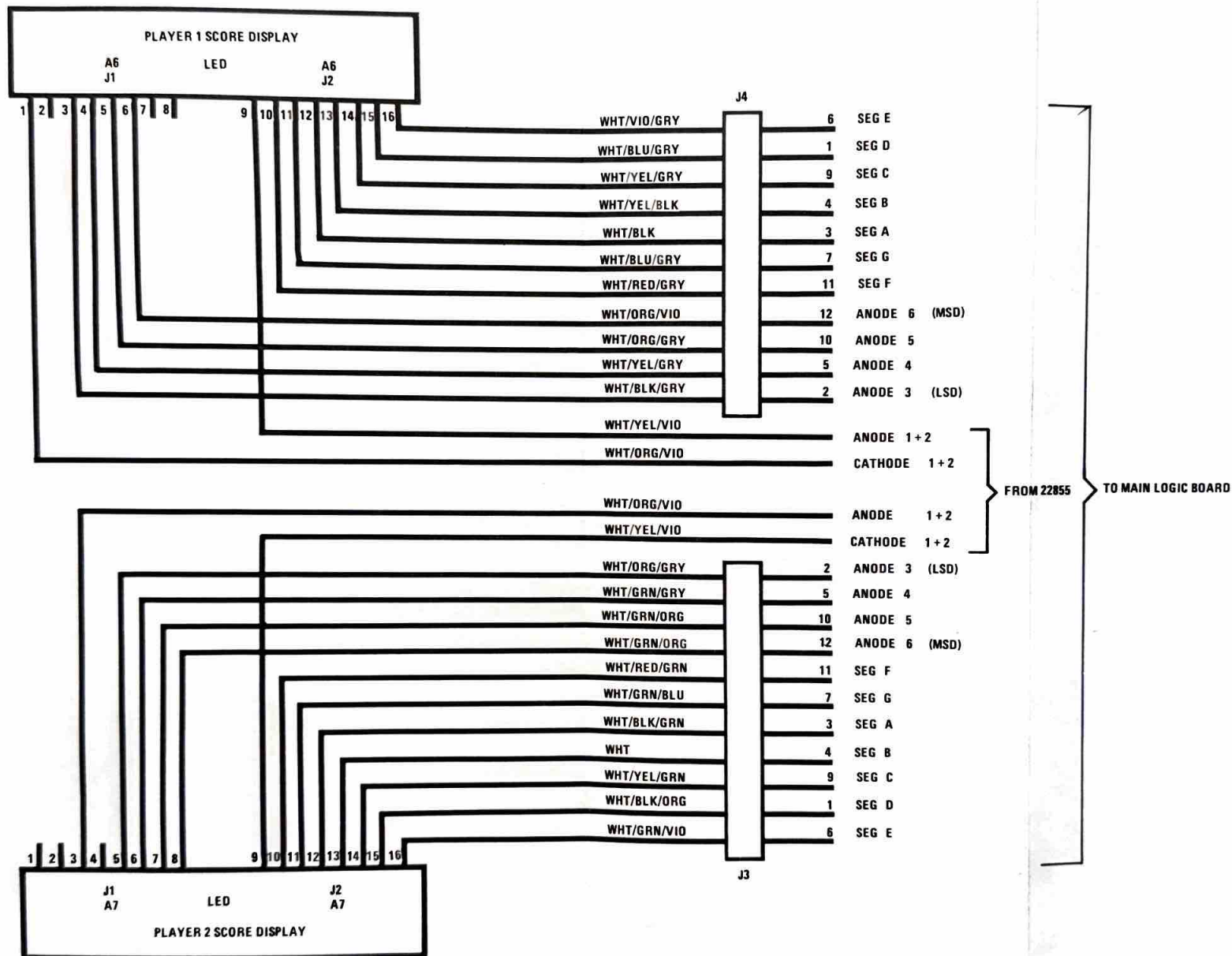
L – Lighted

x – Not Lighted

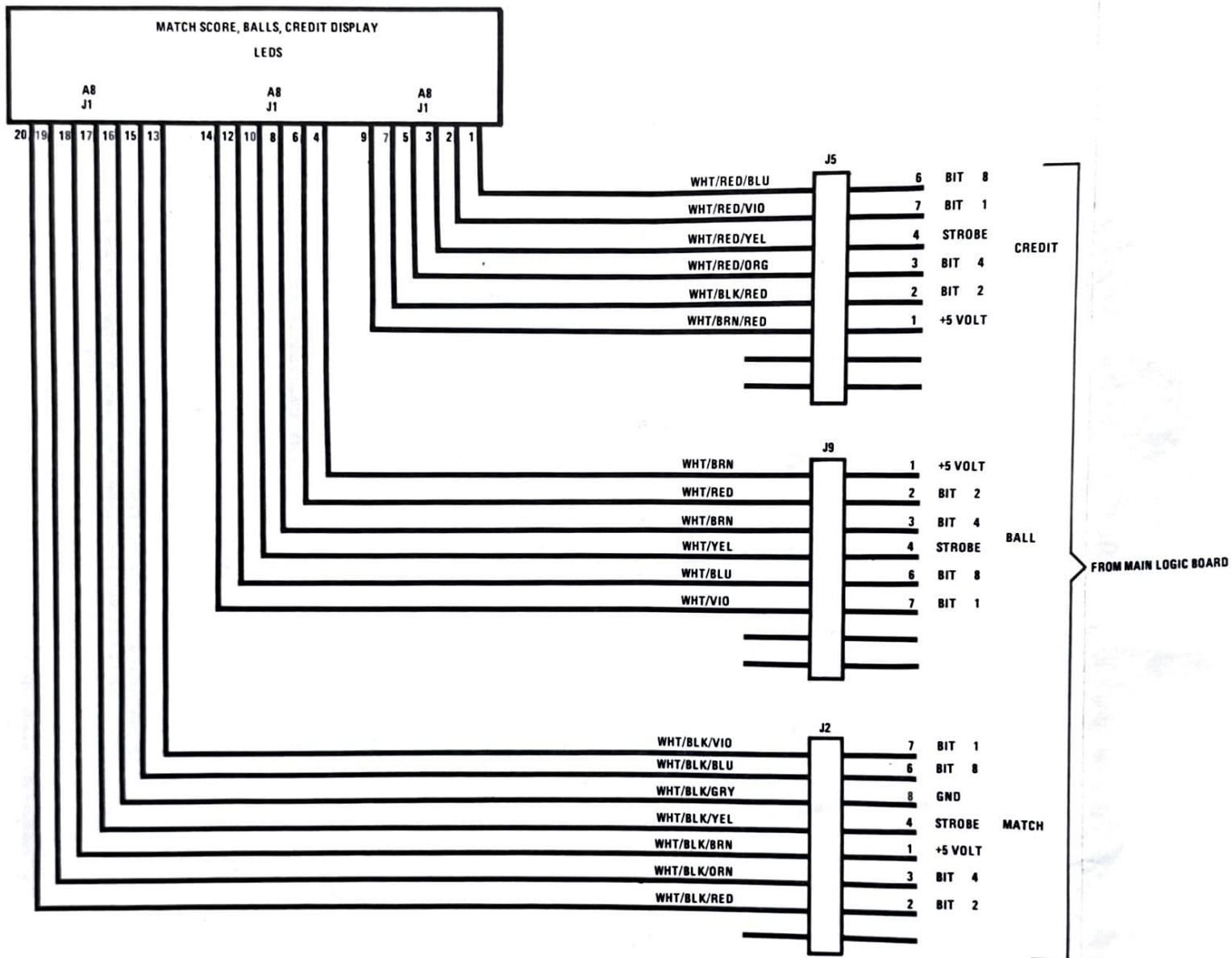
TABLE TWO



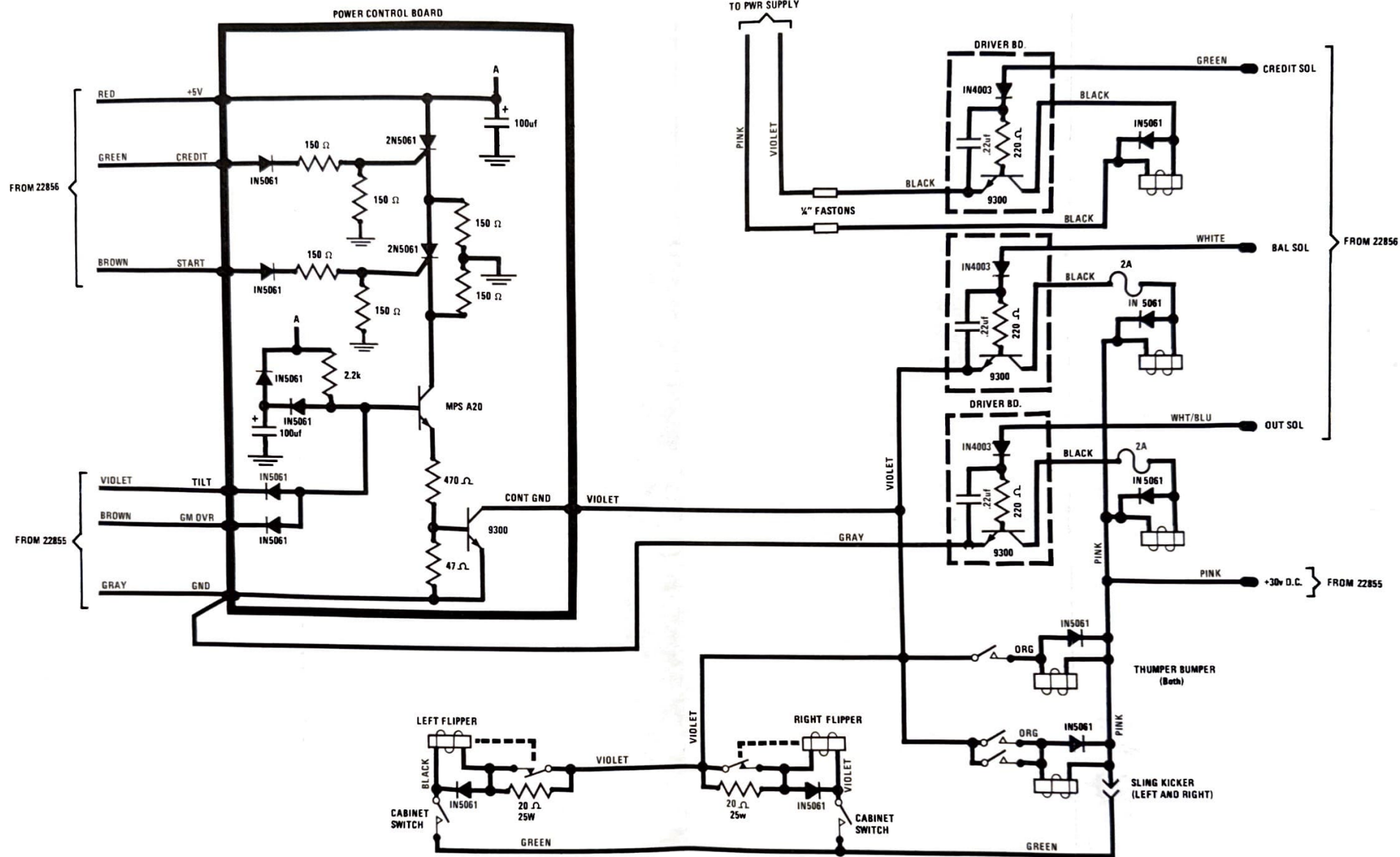
COFFEE-MAT
COSMIC WARS POWER SUPPLY
110V / (220V) WIRING SCHEMATIC
No. 22851



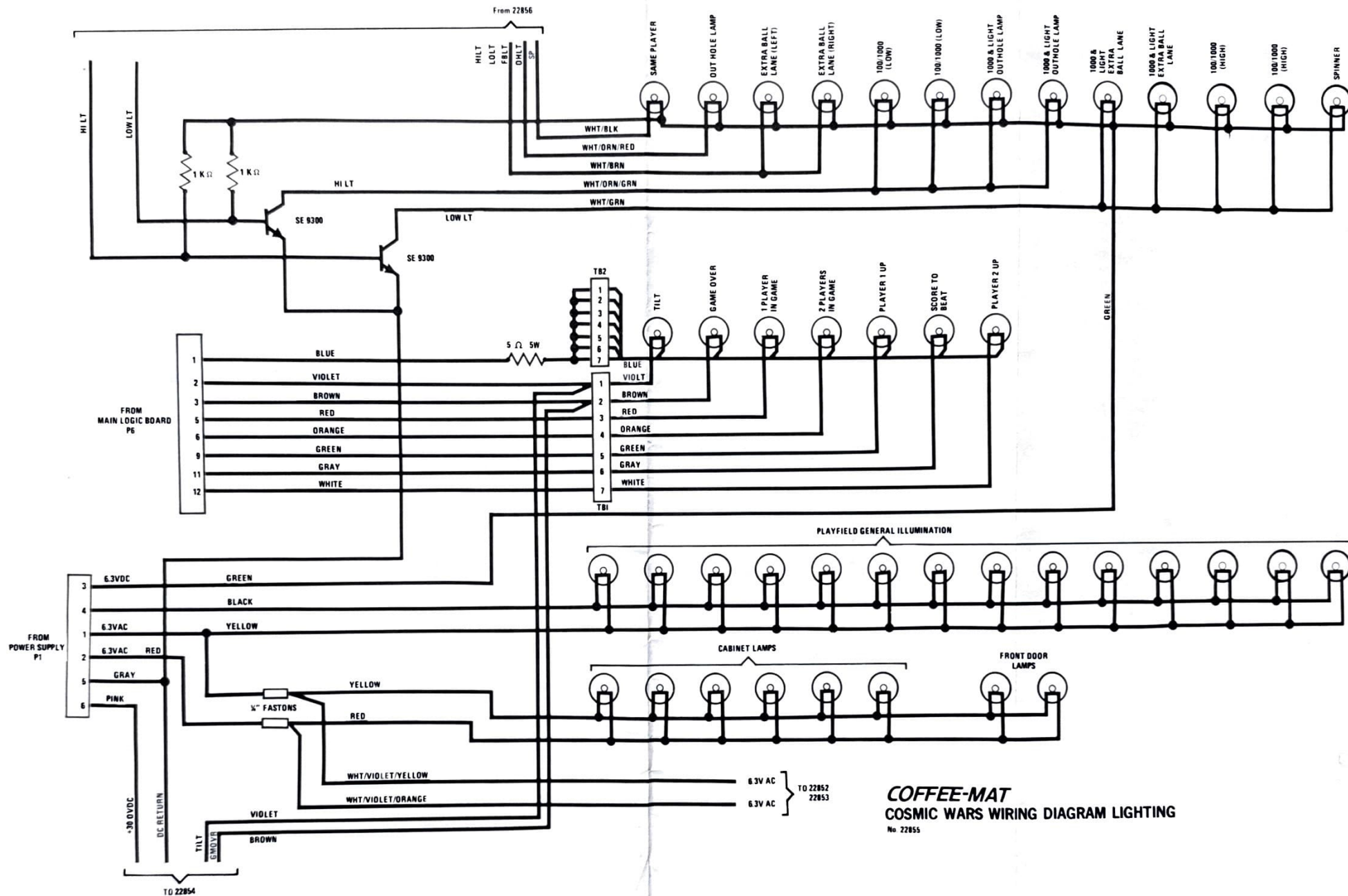
COFFEE-MAT
COSMIC WARS WIRING DIAGRAM 6 DIGIT DISPLAYS



COFFEE-MAT
COSMIC WARS - SINGLE DIGIT DISPLAYS WIRING DIAGRAM
 # 22853

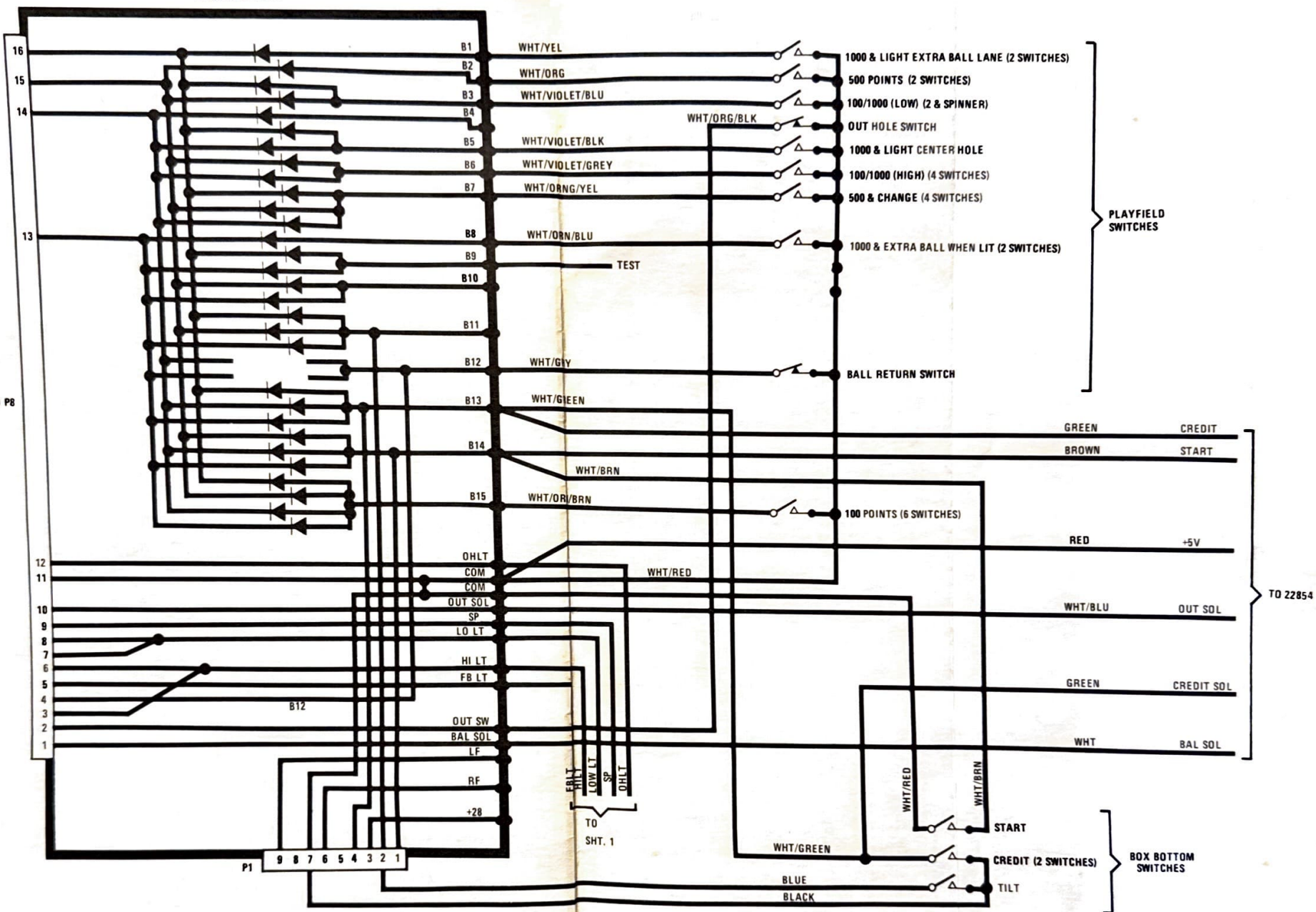


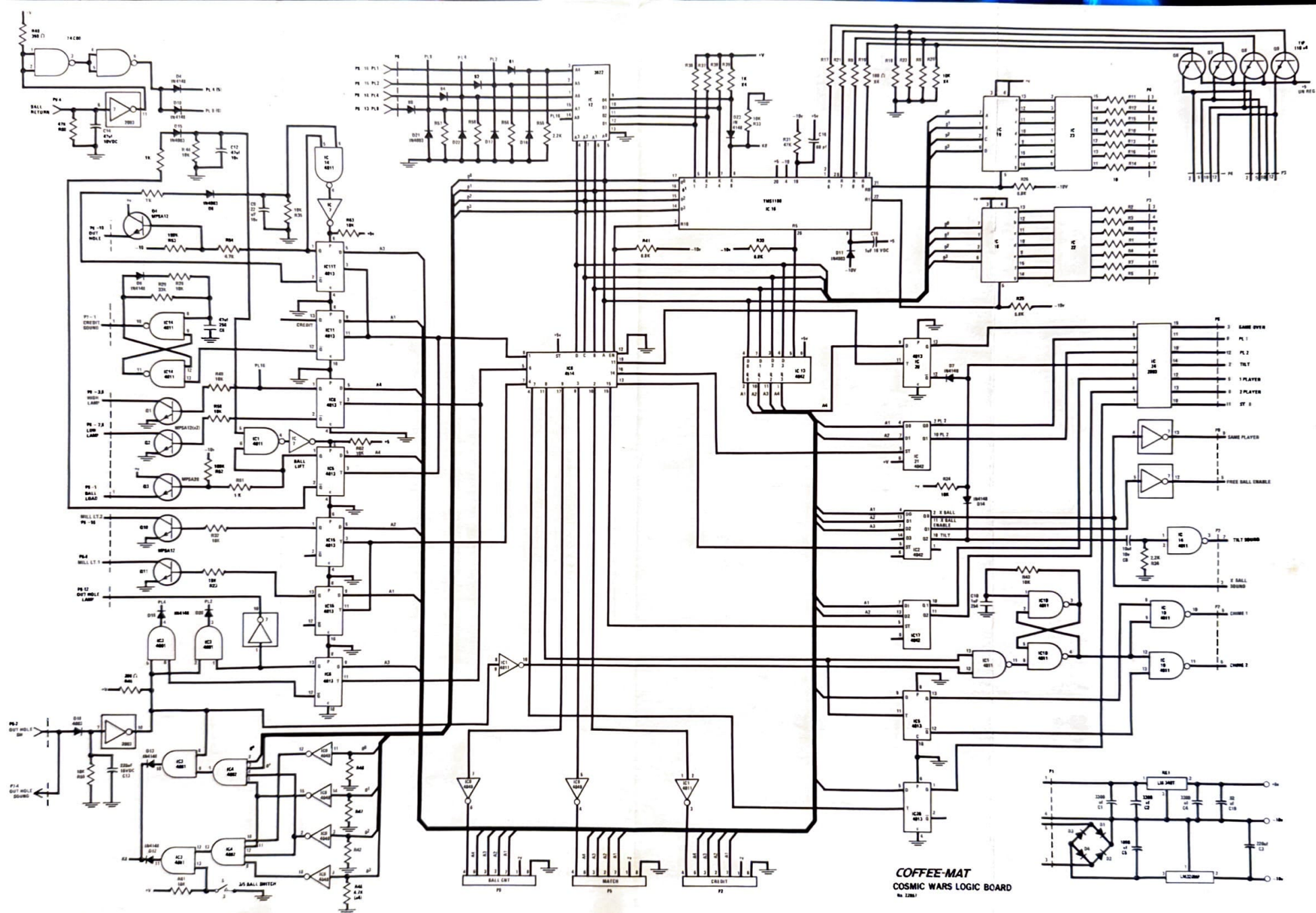
COFFEE-MAT
COSMIC WARS - SOLENOID OPERATED DEVICES WIRING SCHEMATIC
 No. 22854



COFFEE-MAT
COSMIC WARS WIRING DIAGRAM LIGHTING
 No 22855

FROM MAIN LOGIC BOARD P8





COFFEE-MAT
COSMIC WARS LOGIC BOARD
No. 12867

HOW TO ORDER PARTS

SPARE PARTS

When ordering spare parts *always use our designated part number and part description*. This will facilitate the filling of your order and expedite receiving the parts in your plant.

REPLACEMENT OR REPAIRS

All parts returned for replacement or repairs should include a note listing the serial number of the machine, your name, address, and your opinion as to what is wrong with the part. There will be a charge of \$1.00 for checking and testing if problem has not been listed. Complete information will expedite the return of the part.

RETURNING PARTS FOR CREDIT

Credit will be allowed only on those parts covered by the warranty and if the part has not been subjected to any accident, abuse or misuse. Where modifications have been made by the factory to improve the operation of the machine, upon notification, new parts will sometimes be sent and charged to the operator, and full or partial credit will be made on the return of the obsolete part to the factory. In order to receive credit, parts must be returned within fifteen days of shipment of replacement.

WHERE TO SEND ORDERS AND PARTS

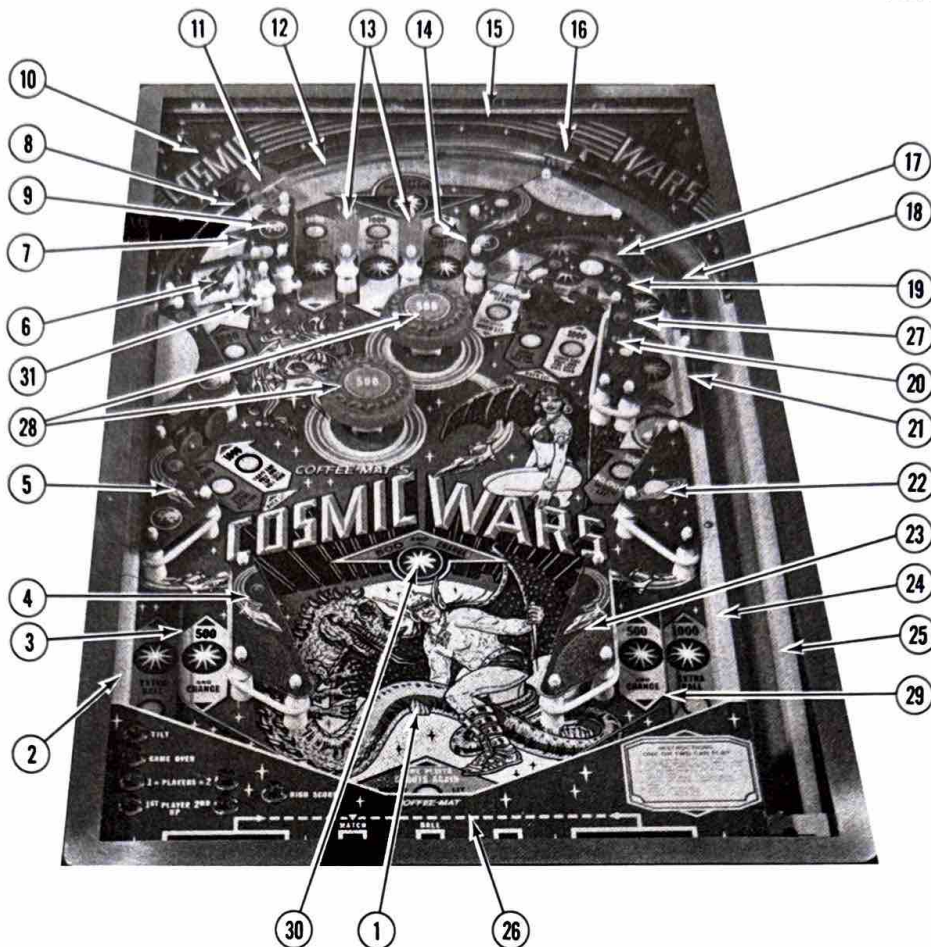
COFFEE-MAT
251 So. 31st Street
Kenilworth, N.J. 07033
Attention: Parts Department

PARTS PAGES

1. Playfield Assembly (EE)
2. Playfield Assembly (EF)
3. Ball Return Arch Assembly (EC)
4. Ball Shooter Assembly (DJ)
5. Power Supply Assembly (DN)
6. Front Door Assembly (AR)
7. Flipper Assembly (DL)
8. Ball Feed Assembly (DM)
9. Slingshot Kicker Assembly (DO)

PLAYFIELD ASSEMBLY

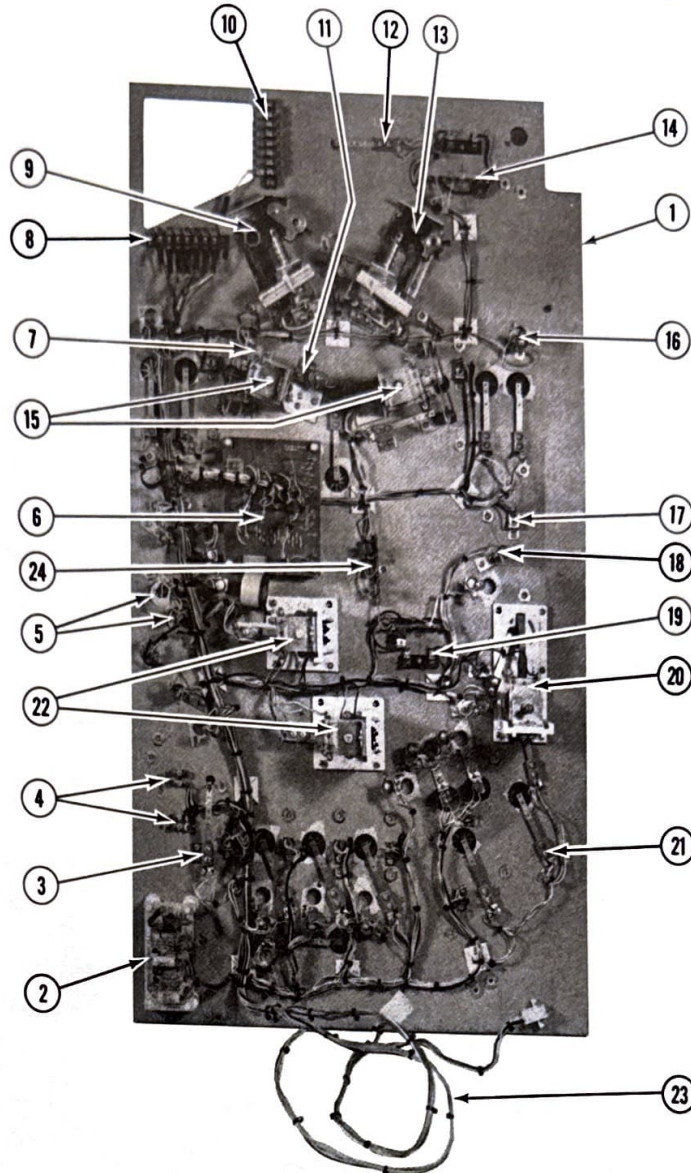
Part No. 22700



1.	22701	Board Assy	11.	19934-2	Ball Gate Left	22.	22194	Shield Middle Right
2.	19769	Side Runner, Left		1K2J2	6-32x5/8 Screw		19249	Hex Collar Stud
3.	22742	Wireform SS, Left		9E2D1	Lock Washer #6		17333	Large Post
4.	22191	Shield Lower SS. Left	12.	19761	Top Wire Hoop		21587	Rubber Button
	19249	Hex Collar Stud		21237-2	6x1/2 Screw Hi Riser		19651	Nail
	17333	Large Post	13.	17322-3	2-1/8 Guide Rail		17456-9	White Ring 3 1/2
	21587	Rubber Button		19249	Hex Collar Stud	23.	22192	Shield Lower SS Right
	17456-9	White Ring		17333	Large Post		19249	Hex Collar Stud
	19651	Nail		21587	Rubber Button		17333	Large Post
5.	22193	Shield, Middle Left		17457	5/16 Special Rubber		21587	Rubber Button
	19249	Hex Collar Stud	14.	17321-3	2-1/8 Side Guide Rail		19651	Nail
	17333	Large Post	15.	19771	Top Runner (Not Seen)		17456-9	White Ring 3 1/2
	21587	Rubber Button	16.	19934-1	Ball Gate Rt.	24.	19772	Center Runner
	17456-6	White Ring 2"		1K2J2	Scr. #6-32x5/8		19750-7	6x1 1/2 Wood Screw
	17456-9	White Ring 3 1/2"		9E2D1	#6 Lock Washer	25.	19770	Side Runner Right
	19651	Nail	17.	22765	Out Hole Arch Guide	26.	21352	Ball Feed Assy (Not Seen)
6.	19785	Spinning Target Assy.		21237-2	#6x1/2 Screw Hi Riser		21237-2	6x1/2 Screw, Hi Riser
	19249	Hex Collar Stud	18.	19766	Wireform #1 8 1/4 (Not Seen)		22185	Ball Guide (Not Seen)
	17333	Large Post					21237-2	6x1/2 Screw, Hi Riser
	17457	5/16 Special Ring	19.	22768	Wire Form OH Kick RD (Not Seen)		22777	Ball Return Arch Assy
	21587	Rubber Button				27.	22766	Out Hole Side Guide (Not Seen)
7.	22771	Wire Form Spin Target (Not Seen)	20.	22196	Shield, Outhole		21237-2	#6x1/2 Screw, Hi Riser
8.	19765	Wire Form #3 6 1/2"		19249	Hex Collar Stud	28.	22792	Thumper Cap Disc.
9.	22195	Shield Upper Left		17333	Large Post		17940-3	#4 x 5/8 Wood Screw
	19249	Hex Collar Stud		21587	Rubber Button		19509	Thumper Ring
	17333	Large Post		19651	Nail	29.	22767	Wire Form SS Right
	21587	Rubber Button		17457	5/16 Special Ring	30.	17362	Rollover Button Insert (12 Req.)
	17457	5/16 Special Ring		17456-6	White Ring	31.	19759	Mini Post (3 Req.)
10.	22197	Shield Top Arch	21.	17802	Hex Hd Stud (Not Seen)		19760	Mini Rubber
	19750-7	Scr. Wood #6x1 1/2						

PLAYFIELD ASSEMBLY

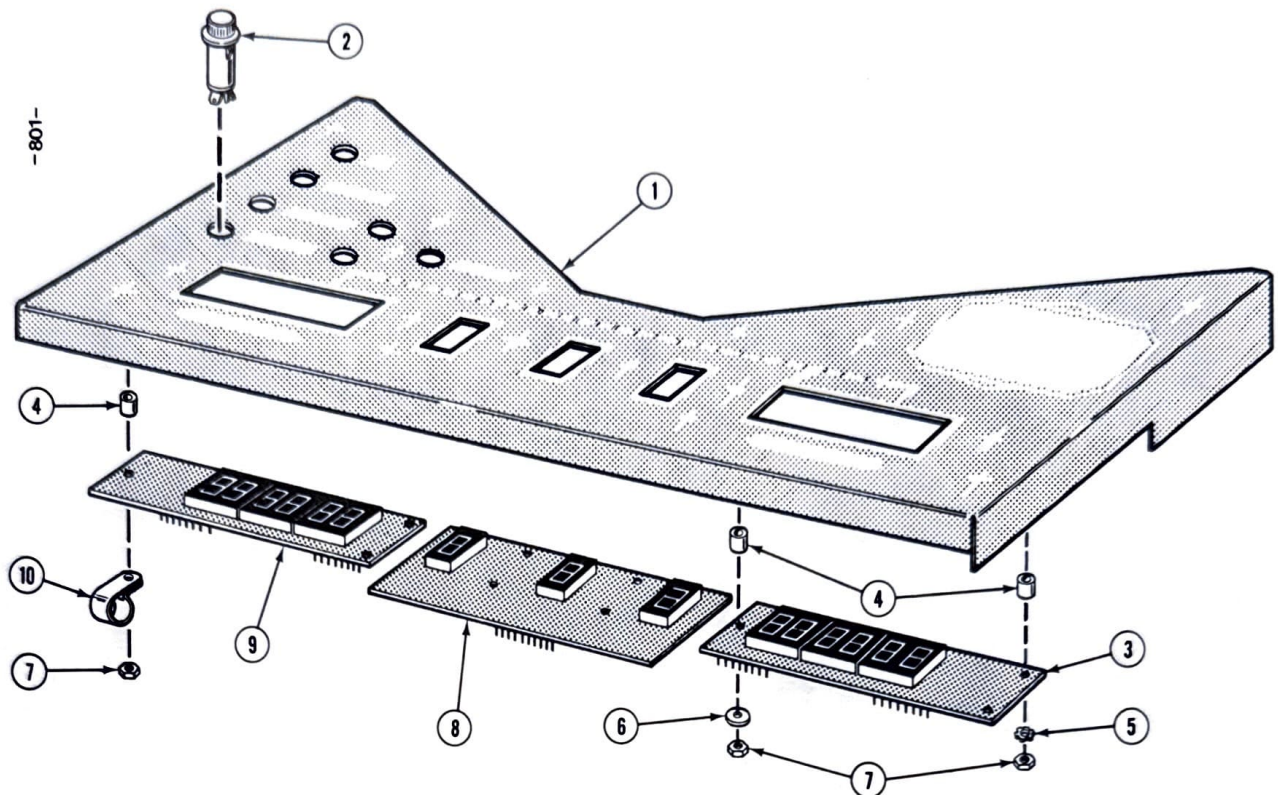
Part No. 22700



1.	22701	Board Assy	8.	21034	Terminal Strip	16.	17312	Lamp holder Control (13 Req.)
2.	21065	Power Control Board		21237-2	6x½ Screw Hi Riser		17547	Control Lamp
	17802	Hex Head Stud (4 Req.)	9.	21050-1	Flipper Main Assy. L.H.		21237-2	6x½ Screw Hi Riser
	17334	Small Post (4 Req.)		21237-2	6x½ Screw Hi Riser	17.	19274	Lamp holder Light Panel (11 Req.)
	3K1D1	6-32 Nut (4 Req.)	10.	17460-1	Flipper Ring		17547	Control Lamp
3.	19784	Spin Target Sw.		21672	Terminal Strip Buss		21337-1	6x3/8 Screw Hi Riser
	1H19G2	5-40x¼ Screw	11.	21237-2	6x½ Screw Hi Riser		19525	Stand Up Switch (4 Req.)
	21237-2	6x½ Screw Hi Riser		19535	Slingshot Counter Switch Assy. (2 Req.)	18.	21237-2	6x½ Screw Hi Riser
	19534	Zee Bracket	12.	21237-2	6x½ Screw High Riser	19.	17550-3	Fuse 32V 12 Amp (2 Req.)
4.	19872	Faston Terminal 4 prong		19783	Ball Eject/Outsole Switch		17551	Fuse Block
	21237-1	6x3/8 Screw Hi Riser	13.	17950-6	6x¾ Wood Screw		17950-3	6x½ Wood Screw
5.	19525	Bullseye Target Sw. (4 Req.)		21050-2	Flipper Main Assy. R.H.	21.	19492	Leaf Switch (12 Req.)
	21237-2	6x½ Screw Hi Riser		21237-2	6x½ Screw Hi Riser		17950-6	6x¾ Wood Screw
6.	21380	Decoder Board Assy.	14.	17460-1	Flipper Ring	22.	22762	Thumper Main Assy. (2 Req.)
	17802	Hex Head Stud		19927	Ball Eject Driver Ckt. (2 Req.)		21237-2	6x½ Screw Hi Riser
	17334	Small Post		21237-2	6x½ Screw Hi Riser	23.	22845	Playfield Harness
	3K1D1	6-32 Nut	15.	19522	Slingshot Kicker Assy. (2 Req.)	24.	22846	Hi-Lo Terminal Switch
7.	19523	Kicker Switch w/Bkt. (4 Req.)		21237-2	6x½ Screw Hi Riser		21237-1	6x3/8 Screw Hi Riser
	21237-2	6x½ Screw Hi Riser						

BALL RETURN ARCH ASSEMBLY

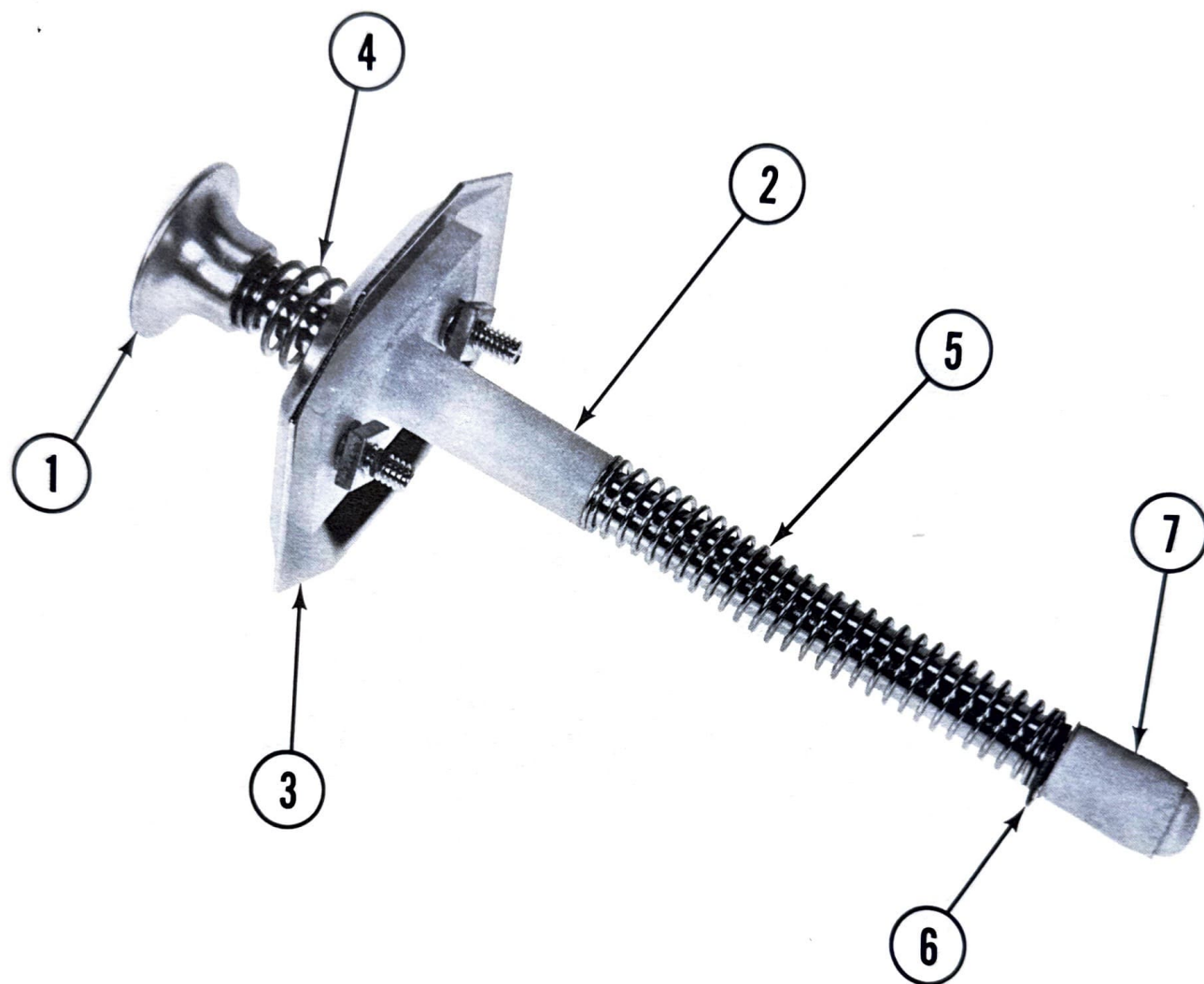
Part No. 22777



- | | | |
|-----|-------|----------------------------------|
| 1. | 22778 | Ball Return Arch. Silkscreen |
| 2. | 21066 | Lamp, Red pilot (7 Req.) |
| 3. | 21021 | 6 Digit Display - Right |
| 4. | 21253 | Spacer (10 Req.) |
| 5. | 9C2D1 | Washer, Lock Ext. Tooth (8 Req.) |
| 6. | 17798 | Washer, Flat Fiber (1 Req.) |
| 7. | 3F1D2 | Nut Hex #4-40 (10 Req.) |
| 8. | 21019 | Center Display Module |
| 9. | 21020 | 6 Digit Display Left |
| 10. | 7995 | Clamp Cable (3/8 Dia.) |
| 11. | 21345 | Display Harness (Not Shown) |

BALL SHOOTER ASSEMBLY

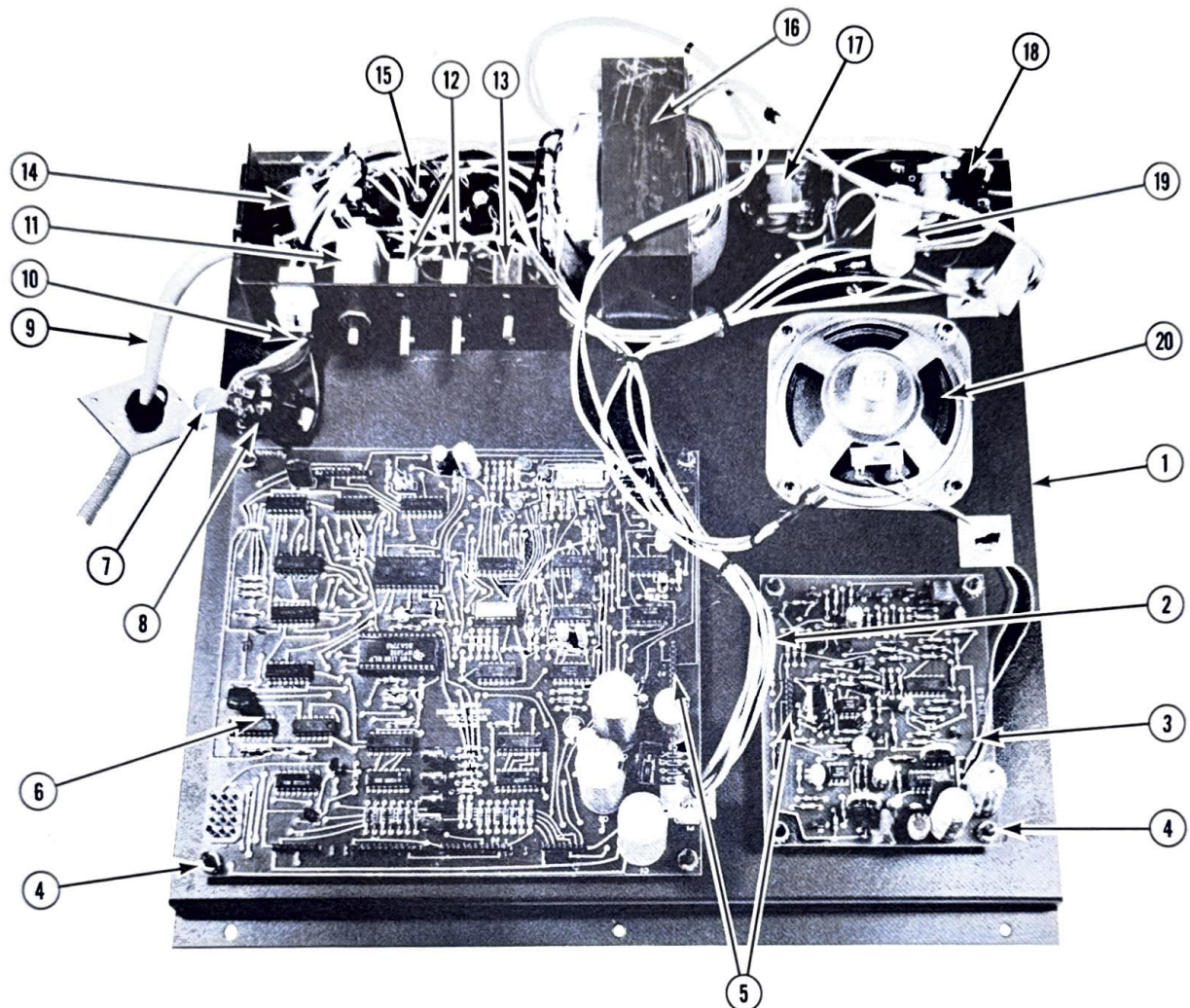
Part No. 21025



- | | | |
|----|-------|---------------------------|
| 1. | 19961 | Rod & Knob Assy. |
| 2. | 19308 | Rod Guide |
| 3. | 21026 | Face Plate W/A |
| 4. | 17946 | Spring |
| 5. | 21027 | Spring |
| 6. | 8W2B4 | Walde's "E" Ring 3/8 Dia. |
| 7. | 17459 | White Shooter Tip |

POWER SUPPLY ASSEMBLY

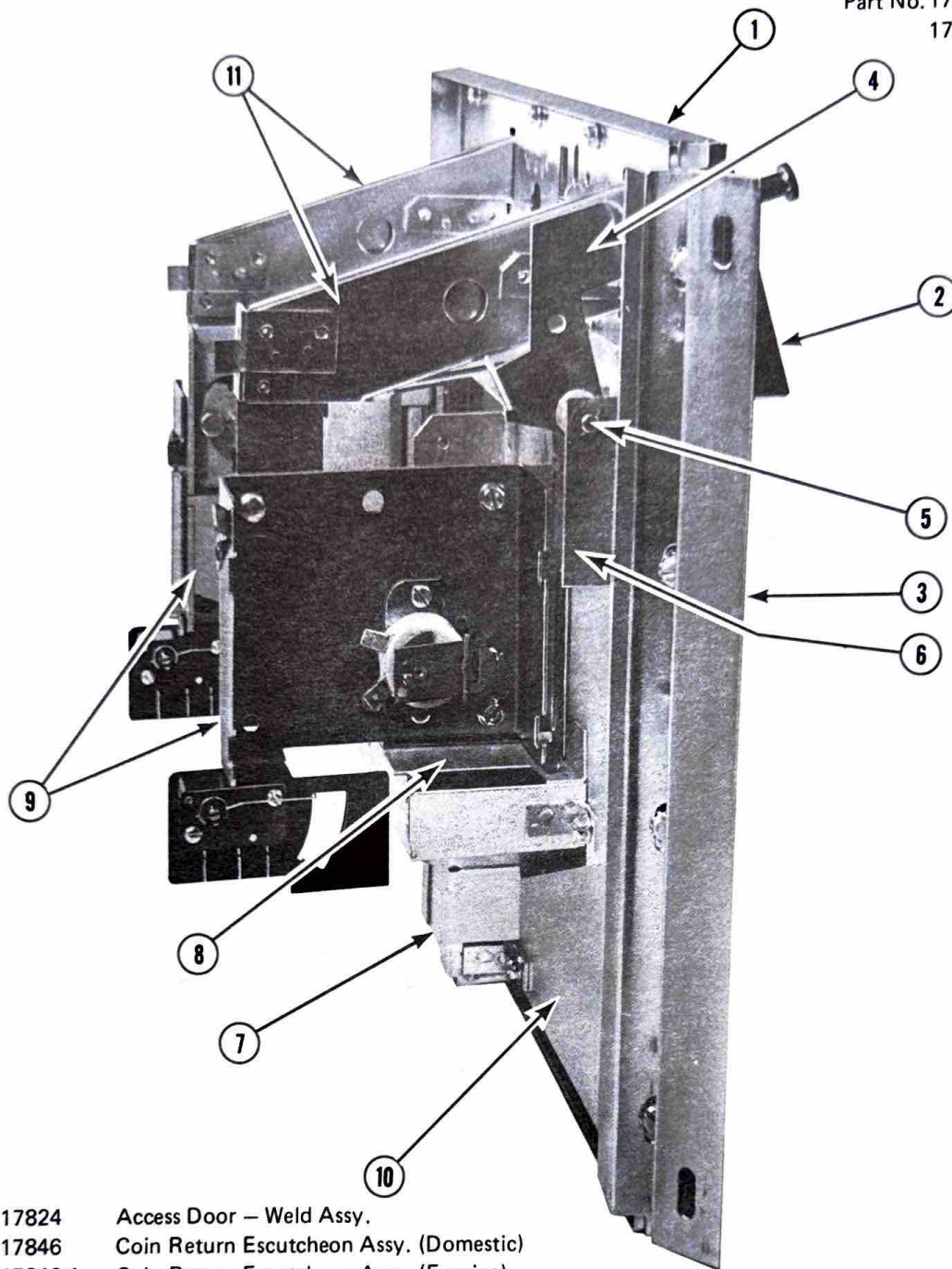
Part No. 22774



- | | | | | | |
|-----|-------|------------------------------|-----|-------|---------------------------------|
| 1. | 19740 | Power Supply Bracket | 15. | 19849 | Bridge Rectifier |
| 2. | 21773 | Power Supply Harness | | 1F2G2 | 4-40x½ Screw |
| 3. | 19832 | Sound Generator PC Bd. | | 3F1D1 | 4-40 Nut Hex |
| 4. | 17639 | Stand off | 16. | 19844 | Transformer Power Supply (110V) |
| | 3L2D1 | 8-32 Nut, Hex Sems | | 3P2D1 | 10-32 Nut, Hex Sems |
| 5. | 21366 | Sound Generator Cable | | 1P2E2 | 10-32x3/8 Screw |
| 6. | 22755 | Main Logic PC Board. | 17. | 19837 | Relay 2 Assy. |
| 7. | 19852 | Varistor V150LA20BMOV (110V) | | 1K2E2 | 6-32x3/8 Screw |
| 8. | 16554 | Switch DP ST | | 9E2D1 | Lockwasher Ext. Tooth #6 |
| 9. | 19203 | Power Cord Set Assy. (110V) | 18. | 19917 | Relay 1 Assy |
| 10. | 8021 | Bushing, Snap-In | | 1K2E2 | 6-32x3/8 Screw |
| 11. | 21409 | Circuit Breaker 7 Amp. | | 9E2D1 | Lockwasher Ext. Tooth #6 |
| 12. | 19847 | Circuit Breaker 7 Amp | 19. | 19913 | Power Supply Term Strip Assy. |
| 13. | 19848 | Circuit Breaker 1.5 Amp | | 2G7E2 | #6B x 3/8 Screw |
| 14. | 21688 | Terminal Strip/Cap Assy. | 20. | 19857 | Speaker |
| | 3L2D1 | Nut Hex Sem 8-32 | | 3L2D1 | 8-32 Nut, Hex Sems |

FRONT DOOR ASSEMBLY

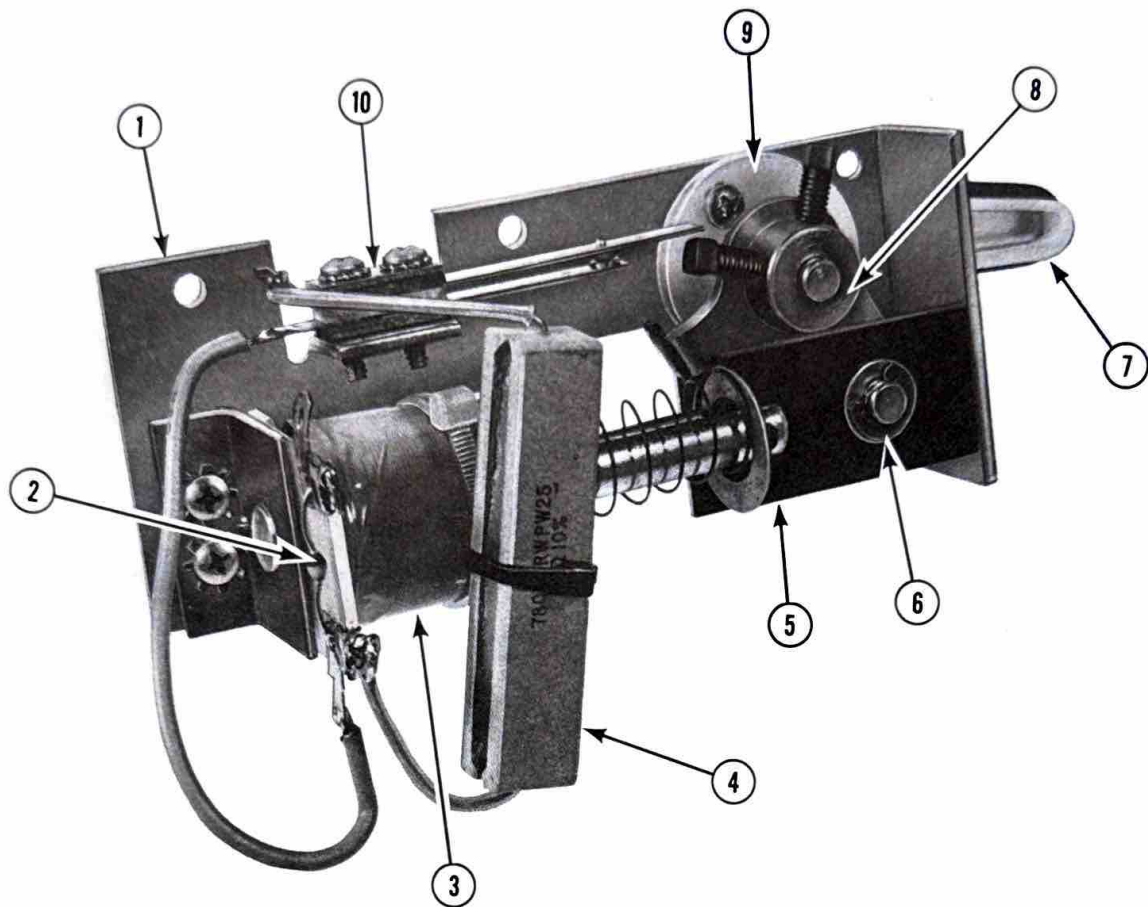
Part No. 17857-1 Dom.
17857-2 For.



- | | | | |
|-----|---------|---|--|
| 1. | 17824 | Access Door – Weld Assy. | |
| 2. | 17846 | Coin Return Escutcheon Assy. (Domestic) | |
| | 17846-1 | Coin Return Escutcheon Assy. (Foreign) | |
| | 2M7E2 | # 8B x 3/8 Screw | |
| 3. | 17840 | Hinge – Access. Door | |
| | 1L2E2 | # 8-32 x 3/8 Screw | |
| 4. | 17858 | Lever Arm Assy. | |
| | 17861 | Lever – Coin Return | |
| 5. | 17862 | Pin-Reject Lever | |
| | 8J2B7 | E-Ring | |
| 6. | 17868 | Coin Return Lever Mtg. | |
| | 2M7E2 | # 8B x 3/8 Screw | |
| 7. | 17810 | Coin Return Chute w/a | |
| | 2M7E2 | # 8B x 3/8 Screw | |
| 8. | 17863 | Baffle Return Chute | |
| | 17864 | Adapter Plate-Baffle | |
| | 2M7E2 | # 8 x 3/8 Screw | |
| 9. | 17556 | Coin Changer (Domestic) | |
| | 21730 | Coin Changer (Dutch Guilder) | |
| | 21731 | Coin Changer (Eng. 10 Pence) | |
| | 21732 | Coin Changer (Swiss 1 Franc) | |
| | 21733 | Coin Changer (German Deutsch mark) | |
| 10. | 17830 | Door Reinforcement – Weld Assy. | |
| | 2M7E2 | # 8 x 3/8 Screw | |
| 11. | 17815 | Coin Chute Inside Channel w/a | |
| | 17819 | Coin Chute Outside Channel w/a | |
| | 2M7E2 | # 8 x 3/8 Screw | |
| 12. | 21976 | Lock, Cocktail Pinball (Not shown) | |
| | 21221 | Cam Front Door Lock | |

FLIPPER ASSEMBLY

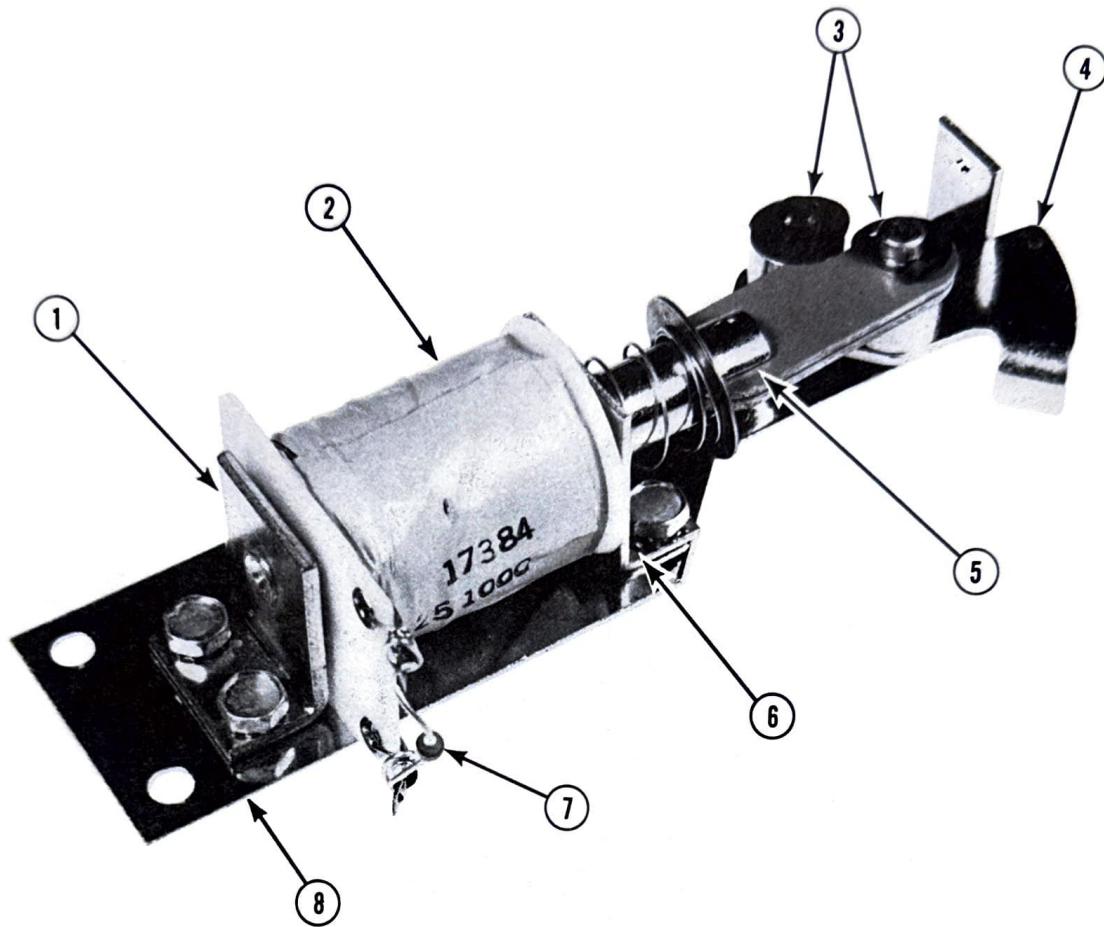
Part No. 21050-1 L.H.
21050-2 R.H.



- | | | |
|-----|---------|----------------------------|
| 1. | 21948 | Mounting Plate Assy. Left |
| | 21949 | Mounting Plate Assy. Right |
| 2. | 18534-2 | Diode |
| 3. | 21936 | Coil Assy. |
| 4. | 19911 | Resistor |
| 5. | 21952 | Plunger Assy. |
| 6. | 8N287 | "E" Ring |
| 7. | 21954 | Flipper Assy. |
| 8. | 21950 | Activating Cam Assy Left |
| | 21951 | Activating Cam Assy Right |
| 9. | 21947 | Nylon Bushing |
| 10. | 19478-1 | Flipper Switch Right |
| | 19478-2 | Flipper Switch Left |

BALL FEED ASSEMBLY

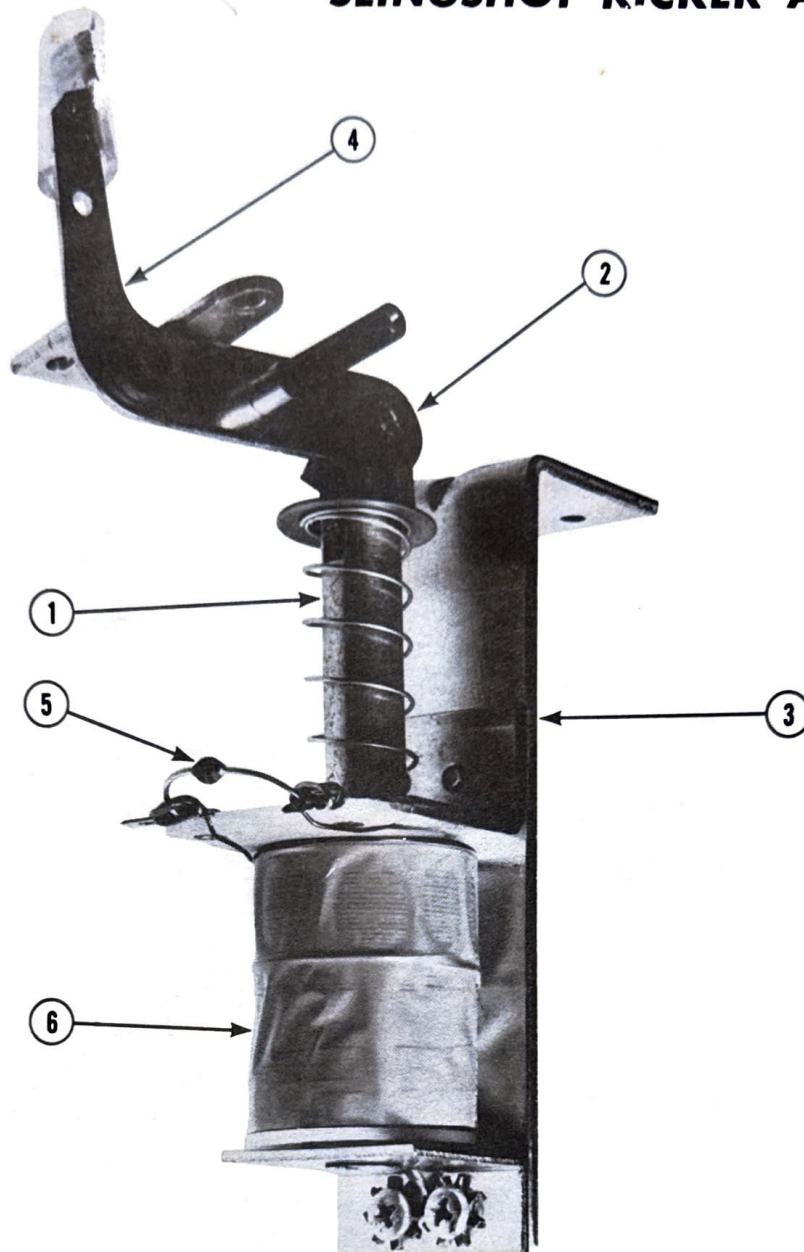
Part No. 21352



- | | | |
|----|---------|-------------------|
| 1. | 17350 | Plunger Stop Assy |
| 2. | 17384 | Coil Assy |
| 3. | 8N2B7 | "E" Ring |
| 4. | 17424 | Ball Feed Assy |
| 5. | 21960 | Plunger Assy |
| 6. | 17352 | Coil Mtg. Bracket |
| 7. | 18534-2 | Diode |
| 8. | 17423 | Mtg. Plate Assy |

SLINGSHOT KICKER ASSEMBLY

Part No. 19522



- | | | |
|----|---------|-----------------------|
| 1. | 21943 | Plunger Assy. |
| 2. | 8N2B7 | "E" Ring |
| 3. | 21956 | Mounting Bracket Assy |
| 4. | 21957 | Kicker Arm Assy |
| 5. | 18534-2 | Diode |
| 6. | 21936 | Coil Assy |

Jan., 1979
DO

COSMIC WARS