

STAR BATTLE

GENERAL INSTRUCTIONS

COFFEE - MAT

KENILWORTH, NEW JERSEY

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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 three steel balls, 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 $\frac{1}{4}$ 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. Install two captive balls (see Fig. #2).
9. Raise the playfield. Be sure the support bracket locks (bracket on right side - see fig. #3).
10. Adjust tilt mechanism to desired setting. Remove shipping tape and see page 2 in the owner's manual for adjustment procedure.
11. 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)
12. 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.

- 13. Lower the play field (see fig. #3).
- 14. Put the steel "play ball" (ball #3) on play field.
- 15. Close and lock the top cover. (See figure #1)
- 16. Close and lock the coin door.
- 17. Plug the machine into an outlet.

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.

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 center hole kicker, kicks.
2. The sound system issues a noise.
3. These controled lamps are lit,
 - a. Left side 1000 when lit light
 - b. Lights center hole when lit light
 - c. Hight score light (Flashing at a 2 second rate)
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;

- Three 1000 when lit lamps
- One lights center hole when lit lamp
- One lights extra ball lane when lit lamp

A free ball is earned by first striking the left "Captive Ball" 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 right "Captive Ball" when its light is lit. This will light the center hole light. Then place the ball in the center hole.

There are two ways to achieve extra "Free" credits.

1. During the play of a game a credit is awarded for exceeding each of the following score values:
 1. 100,000
 2. 300,000
 3. 500,000
2. At the end of each game a random number is generated by the electronics. This number is displayed in the "Match Score" window. If either players hundreds digit matches this number, a credit is awarded.

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 center 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.

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. 5) on the playfield decoder board.
3. Turn the power switch on.

The numeric displays and controled lamps are exersized 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 increment 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.

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	right side 1000	left side 1000	spinner	center 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 active

TABLE I

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.	5.0 AMP - 29v

See schematic diagram 21589 for 110VAC or 21590 for 220VAC

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. 6). 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. 6) is a volume control.

See schematic diagram 21596

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 (see schematic diagram 21595). 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.

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

CONTACT LIST

CONTACT	B1	B2	B4	B8
500 + Change	L	x	x	x
500	x	L	x	x
1000 + Light outhole	L	L	x	x
Outhole switch	x	x	x	x
100	L	x	L	x
100/1000 Right side	x	L	L	x
100/1000 Left side	L	L	L	x
1000 + Light Ex B1	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 + Change	L	L	L	L

L - Lighted

x - Not Lighted

TABLE TWO

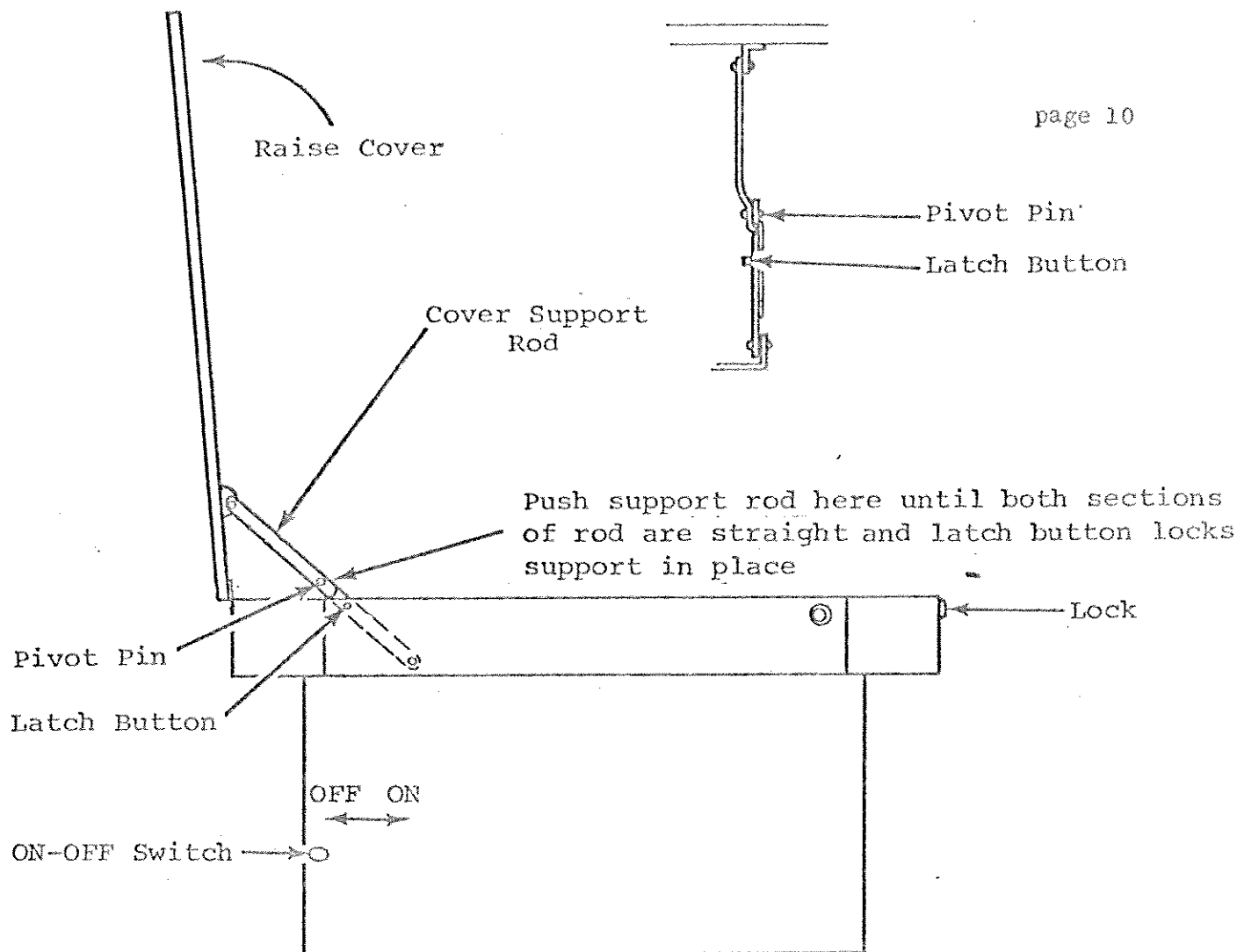


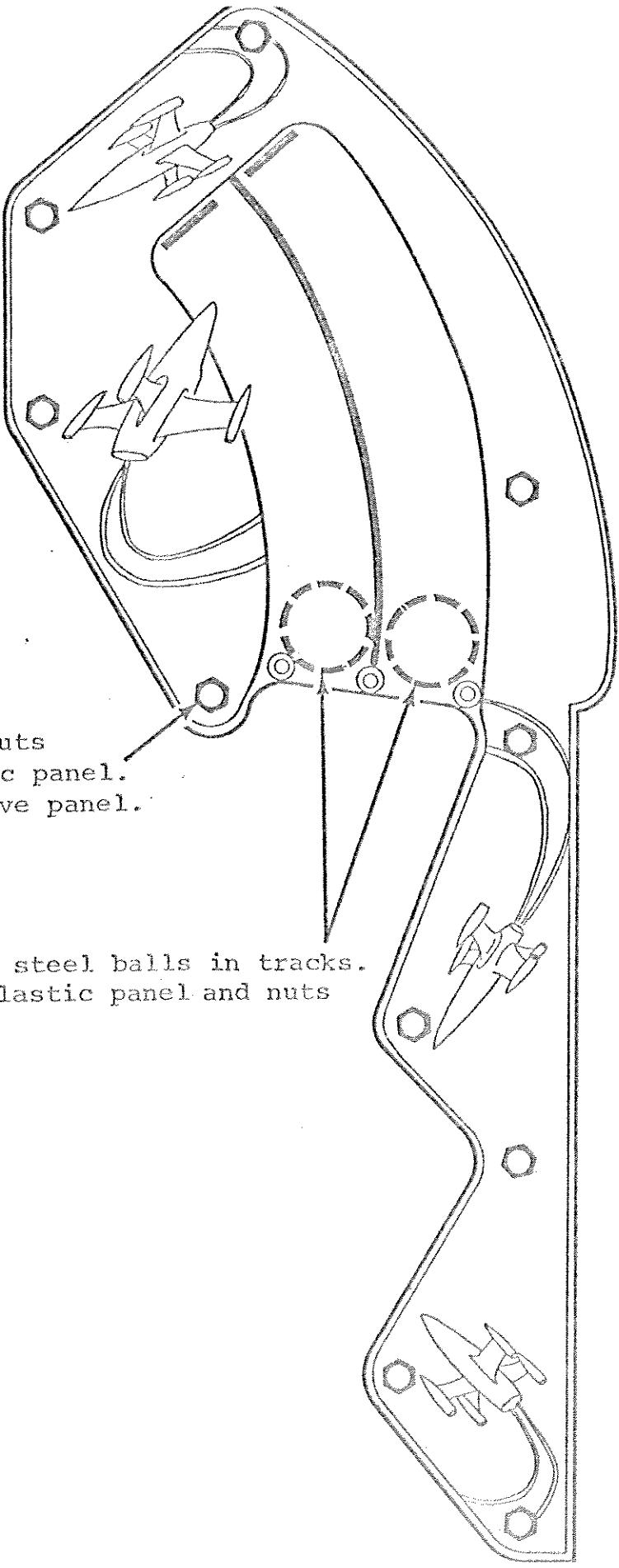
Fig. #1 - Top Cover Support

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° counter-clockwise to engage lock.



Remove acorn nuts
holding plastic panel.
(10) nuts remove panel.

The diagram shows a complex mechanical assembly, likely a control panel or housing, with various components and fasteners. A plastic panel is shown being removed from the top section. The panel is held in place by ten acorn nuts. The diagram also shows the internal components, including two steel balls in tracks, which are to be installed after the panel is removed. The bottom section of the assembly is shown with a plastic panel being reinstalled. The diagram is a line drawing with various components labeled with letters and numbers.

Install (2) steel balls in tracks.
Reinstall plastic panel and nuts

Fig. #2 - Installing Captive Balls

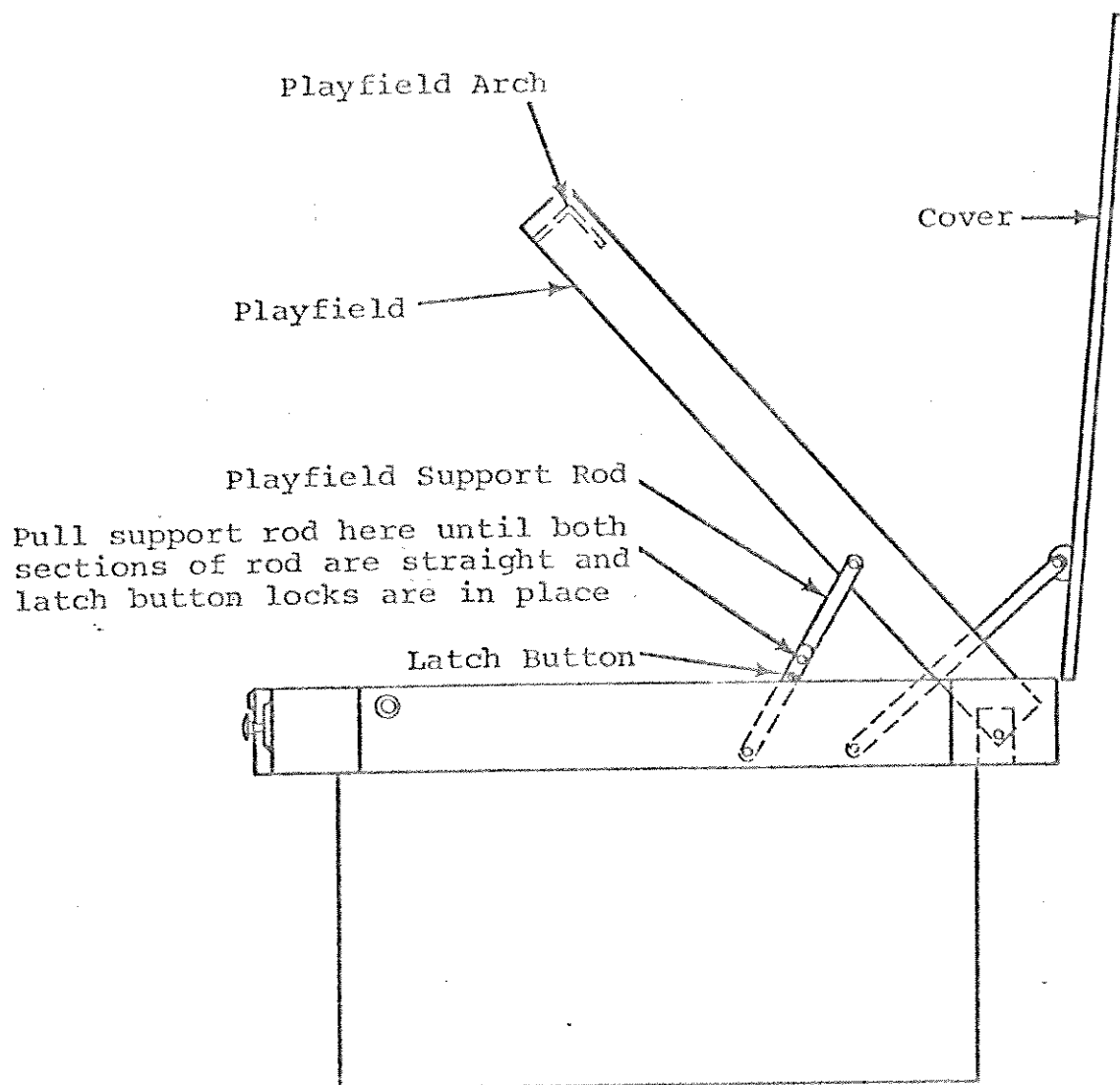


Fig. #3 - Play Field Support

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.

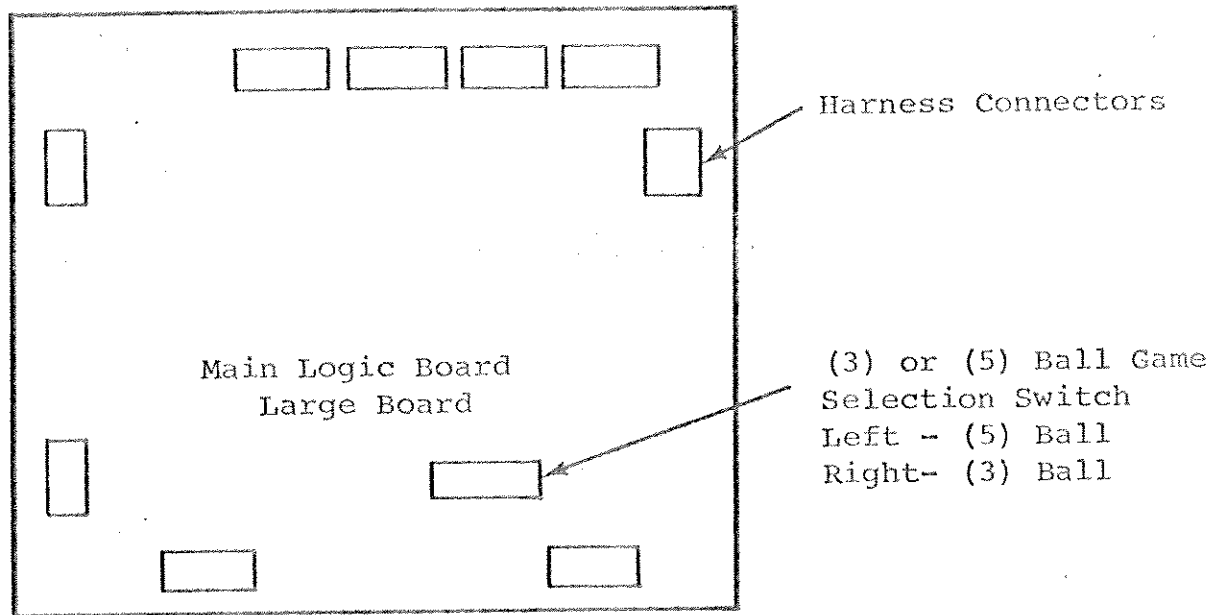


Fig. #4 - Switch Location for Selecting (3) Ball or (5) Ball Game

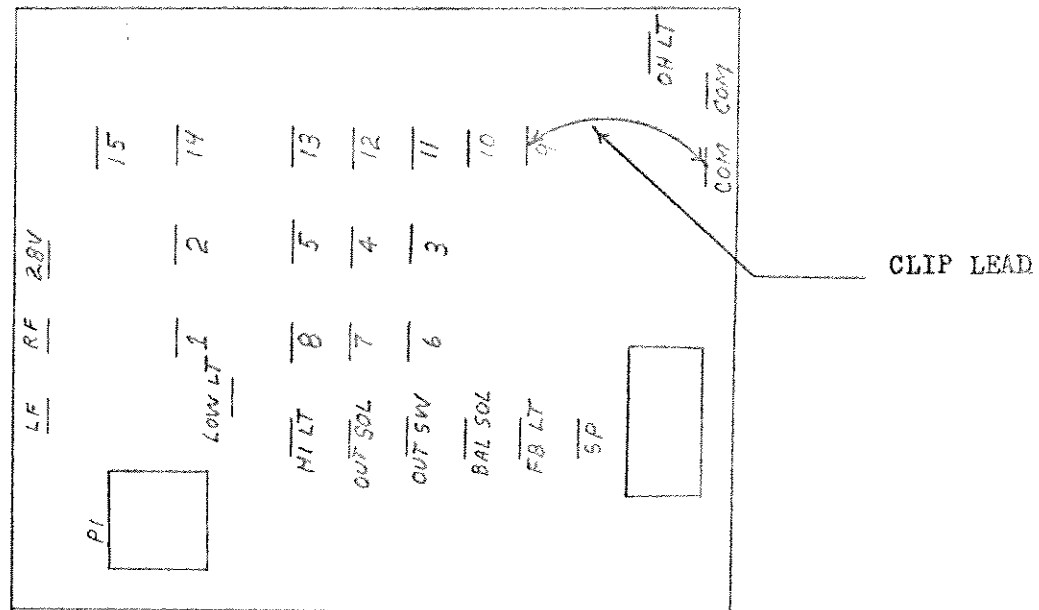


Figure #5 - Decoder Board "Clip Lead" Location

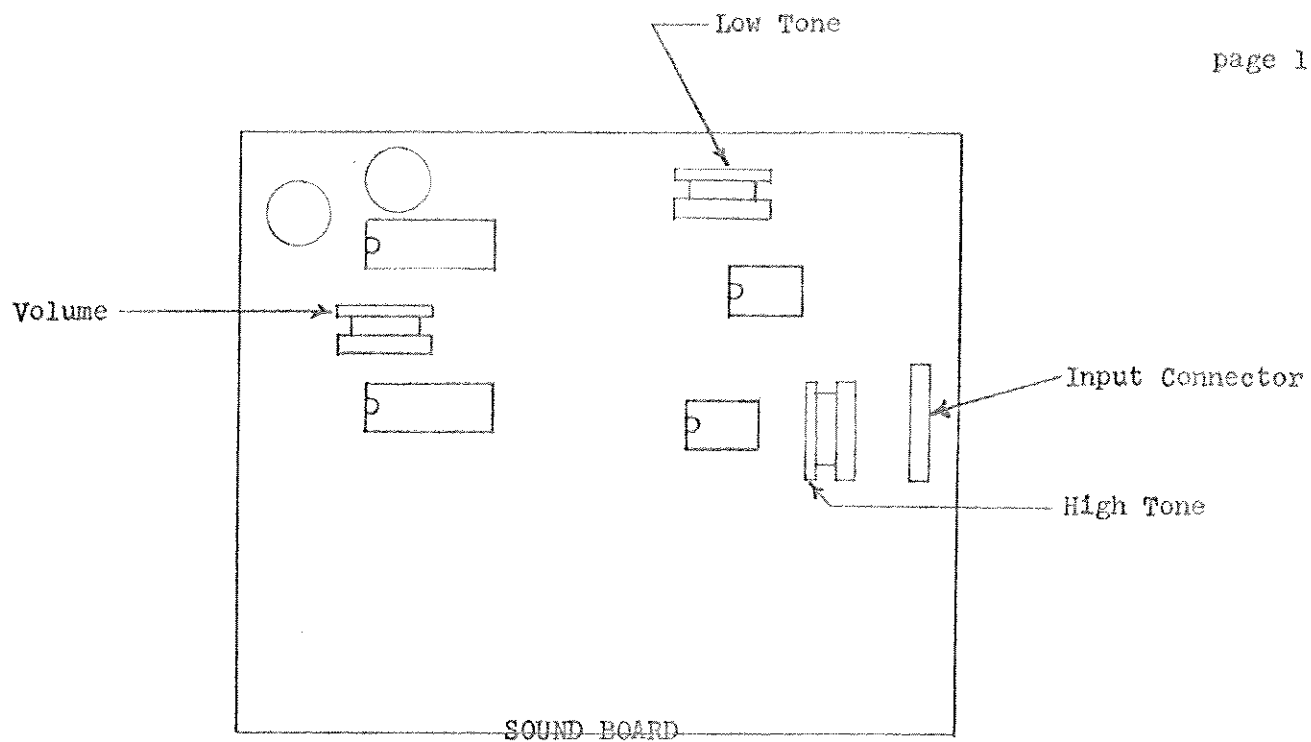


Figure #6 - Sound Board Adjustment Location

V

TROUBLE SHOOTING AID

The following is intended as an aid to trouble shooting a star battle pingame. Consulting schematic/wiring diagrams 21589 through 21597 as well as section III (Self Test) of this manual will also be of assistance.

A

INITIALIZATION

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 DOES 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 BD for proper seating |
| 4. Broken wire | 4. Check P1 connector and associated terminations at power supply. |

B

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: CENTER HOLE KICKED DOESN'T 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

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

3. Bad driver strip

3. Replace

4. Bad Main Logic Board

4. Replace

SYMPTON: CENTER 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 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 aprox. 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 solnoid coil and see burned out solenoid section for corrective action

SYMPTOM: SOLENOID BURNED OUT
CENTER 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
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

C

DIGIT DISPLAYS

SYMPTOM: ANY INDIVISUAL 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
2. Loose or broken connection
3. Both L.E.D. Boards are bad

ACTION

1. Check for 6.3 VAC at the playfield faston connectors.
2. Inspect LED.Harness for proper connector seating and loose wires.
3. Replace

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

CAUSE

1. Loose or broken connections
2. If only one player, bad L.E.D. board
3. If both players, bad Logic Board or bad L.E.D. Boards

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. Replace
3. Replace

D

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.

CAUSEACTION

1. Loose or disconnected P5 connector on
main Logic Board

1. Make sure P5 is seated properly
in Logic Board.

2. P5 Inserted backwards in Main Logic
Board

2. Check to see that the white/
black/brown wire is to the
front of the machine.

3. Broken wire

3. Check connections on P5
connector at Logic Board, and
J1 connector at credit, match,
and ball displays.

4. Foreign material lodged in relays

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.

CAUSEACTION

1. No - 10VDC

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:ACTION

1. Shorts

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

2. Bad Main Logic Board

2. Replace

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

CAUSE

ACTION

- | | |
|---------------------------------|--|
| 1. Bad Bulbs | 1. Check and Replace |
| 2. Bad wiring/Loose connections | 2. Check harness for cut wires, bad soldering, and defective lamp sockets. |
| 3. Bad Main Logic Board | 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

E

SWITCHES

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