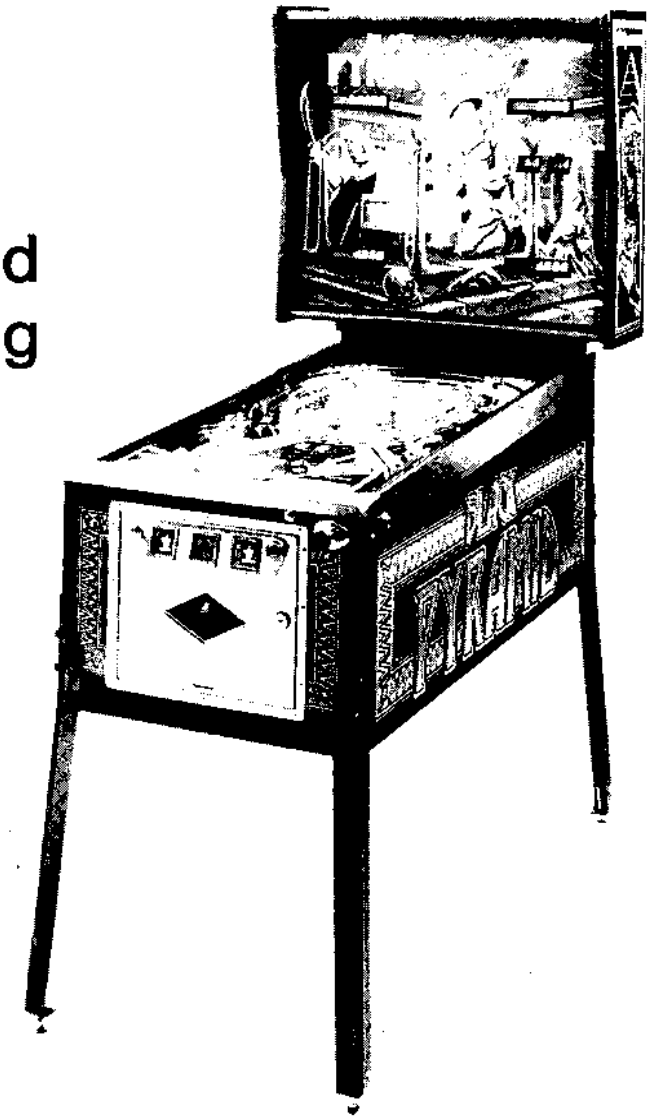
GAME No. 0A44
Form No. 0A44-00300-0000

BLACK PYRAMID

Parts and Operating Manual



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Bally MIDWAY MFG. CO.

July 11, 1984

S E R V I C E B U L L E T I N

GAME: BLACK PYRAMID

SUBJECT: ATTRACT MODE SOUND & CORRECTION ON PAGE SEVEN (7) OF THE GAME MANUAL

In order to shut off the attract mode sound, Dip Switch No. #30 on the MPU Board must be turned off. Please add this information to Page 7 of your game manual.

Also, on Page 7 the last switch setting for the Left Lane Extra Ball Build Up Adjustment (SW#7 on SW#8 on 50K) should read 'Most Liberal'.

Pete Gustafson
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PG/dd

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GAME # 1120-E POWER PLAY

Installation and General Game Operation Instructions

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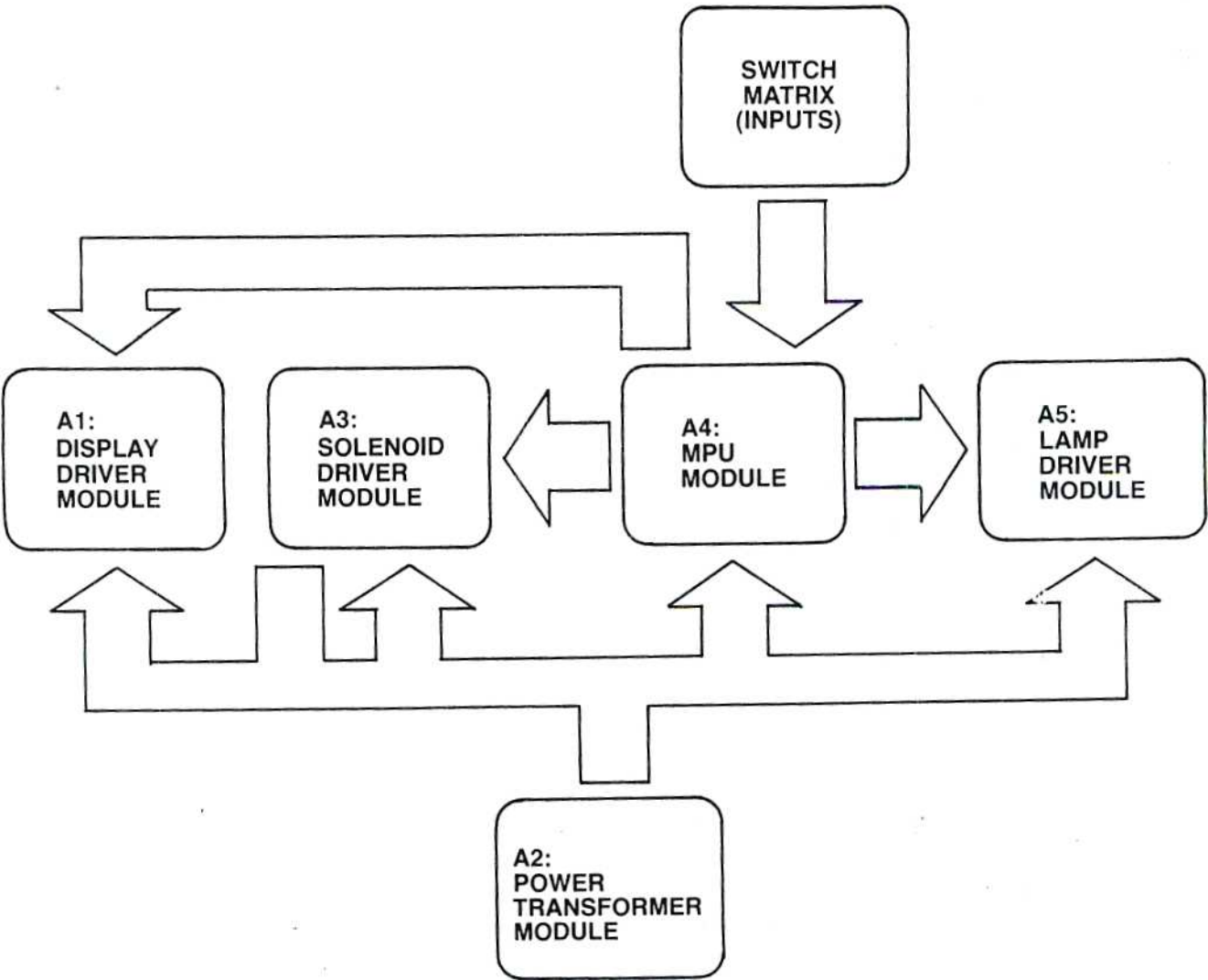
BLOCK DIAGRAM—ELECTRONIC PINBALL GAME



I. INSTALLATION

Assemble the game as follows:

Bolt legs to cabinet. Bolt back box to cabinet. Use flat washers under bolt heads. Gently feed cable connectors and ground braid through cable port in back box. Screw ground braid to braid in back box. Carefully and fully insert connectors on printed circuit assemblies.

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. Cable connectors may be loosened, switches (especially tilt switches) may go out of adjustment. Plumb bob tilt switch should always be adjusted after game is set on location and leg levelers are adjusted.

Visual inspections before plugging in line cord:

1. Check that all cable connectors are completely seated on printed circuit assemblies.
2. Check that cables are clear of all moving parts.
3. Check for any wires that may have become disconnected.
4. Check switches for loose solder or other foreign material that may have come loose in shipment and could cause shorting of contacts.
5. Check wires on coils for proper soldering. Cold solder connections may not show up in factory inspection, but vibration in shipment may break contact.
6. Check that fuses are firmly seated and making good contact.
7. Check the transformer for any foreign material shorting across wiring lugs.
8. Check wiring of transformer to correspond to location voltage. See figure 1.

Check adjustment of the three (normally open) tilt switches:

1. Panel tilt on bottom of playfield panel.
2. Plumb bob tilt on left side of cabinet near front door.
3. Ball tilt above plumb bob tilt. Insert the smaller ball (15/16" dia.) into the ball tilt assembly, and adjust the bracket so the ball will roll free to contact the switch blade, if front of cabinet is raised.

TRANSFORMER CONNECTION INSTRUCTIONS

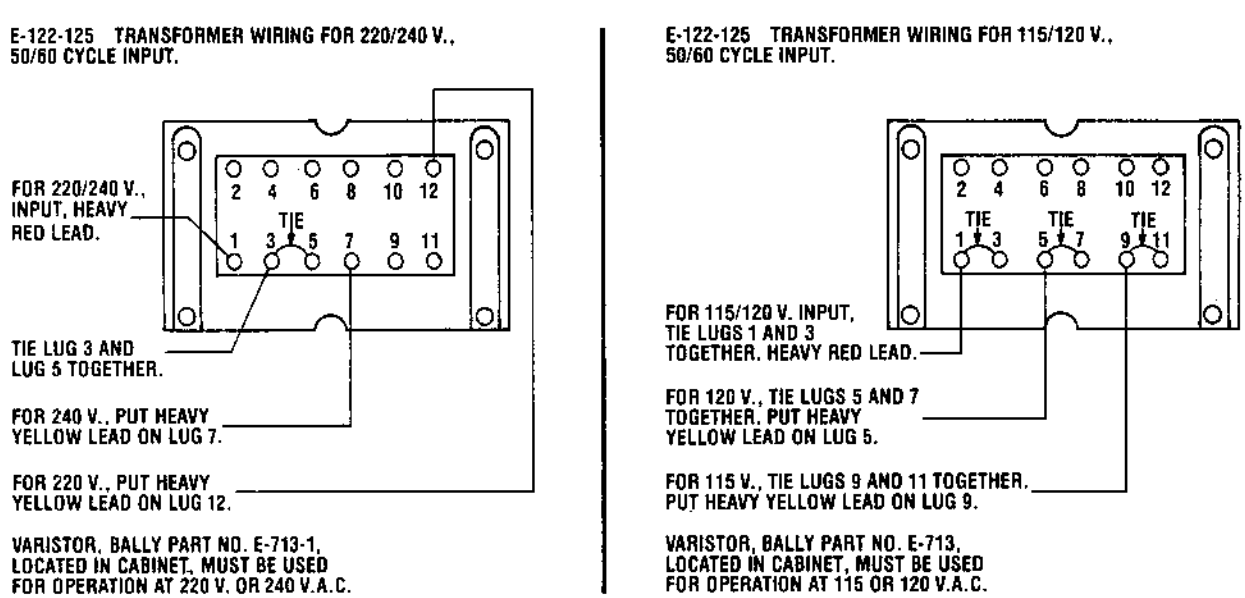


FIGURE I. TRANSFORMER

(PART OF POWER—TRANSFORMER MODULE A2, LOCATED IN BACK BOX).

II. GENERAL GAME OPERATION

Place ball into playfield by outhole.

Coin game. Coin should be rejected. Plug in line cord. Move power ON-OFF master switch at bottom right front corner of cabinet to 'ON' position. The game will play a power-up tune to announce game-readiness. Drop targets are reset, scores are set to zero, alternating with the 'High Game to Date,' and the game is ready for play. Coin game. The game should accept the coin and post credits* for coins accepted (adjustable). Pressing the credit button on the door will cause the outhole kicker to serve the ball to the shooter alley. The 1st player-up lite is lit. A game-up tune* is played to announce play-readiness. The bonus score is advanced to 1000 points.

One player is posted each additional time the credit button is pressed (one to four can play). The credits are reduced by one each time the credit button is pressed until the credits are reduced to zero.

Shooting the ball initiates play. Rebound switches score 10 points. Thumper-bumpers, when not lit, score 10 points.

The game awards all points earned by the player. If spinner is turning and scoring when the ball hits a target, the spinner and the target scores are awarded.

When the ball enters the outhole, the bonus score is added to the total score. The player-up and/or ball in play on the back box is advanced one position. The bonus score is advanced to 1000 points. The outhole kicker serves the ball to the shooter alley and play is resumed. This continues until each player has played the allowable number of balls per game (adjustable). At this time the 'Game Over' light is lit. A random Match* number appears and the 'Match' light is lit. If the number is the same as the last two digits in a player's score, a free game is awarded.

Extra balls won during the course of the game are played immediately after the player's regular ball enters the outhole. The player-up and/or ball in play on the back box are not advanced for extra ball play. Bonus score is added to the player's score and the bonus is set to 1000 points before the game serves the extra ball for play.

At the end of the game, a 'High Game to Date' is alternately flashed with all 4 player scores. If the 'High Game to Date' is beat, this feature* awards free games.

Tilting the game results in loss of a ball. The flippers, thumper-bumpers, etc., go 'dead.' Bonus points are not scored. The purpose of the tilt penalty is to discourage the player from jostling the machine in an attempt to prolong play. Game action becomes normal after the ball kicker assembly serves the ball to the shooter alley.

Slamming the machine results in loss of the game. All feature lights go out, the game goes 'dead,' and a time delay occurs. The purpose of the time delay is to discourage unnecessary abuse of the machine. After the delay, the 'Game Over' light lites and the power-up tune is played. The time delay occurs anytime one of the slam switches is made to contact. There is one factory installed slam switch on the front door. (Any number of slam switches could be installed by the operator, to meet his individual requirement.) The switch should be adjusted to have approximately 1/16" gap between the contacts. The weighted blade should be adjusted to attain the desired sensitivity. Decreasing the gap between contacts will make the switch more sensitive. Opening the gap will reduce sensitivity.

*Some tunes and features can be disabled by operator if so desired. See Back Box Adjustments.

III. BOOKKEEPING FUNCTIONS

The game is designed to help the operator perform certain accounting functions. The game can display the number of total plays and replays (free games). It can display the number of coins dropped down each coin chute. The bookkeeping functions are displayed on all player score displays simultaneously. An identification number, 05 to 11 appears on the Match/Ball in Play window as follows:

05— 00 to— 40 = Current Credits
*06—10000 to—999999 = Total Plays (Payed & Free Games)
*07—10000 to—999999 = Total Replays (Free Games)
08— 00 to—999999 = Total times 'High Game to Date' is beat
*09—10000 to—999999 = Coins Dropped thru Coin Chute #1
*10—10000 to—999999 = Coins Dropped thru Coin Chute #2**
*11—10000 to—999999 = Coins Dropped thru Coin Chute #3**

The game displays the first bookkeeping entry if the Self-Test button (See Fig. III) on the inside of the front door is pressed nine times. Alternately push and release the Self-Test button at one second intervals. The number 05 appears in the 'Match/Ball in Play' window. Current credits appear on the player score displays. Each additional press of the button causes the next entry to be displayed.

After the data in each bookkeeping register is recorded, it can be set to zero simply by pressing switch button S33, located on A4, the MPU module in the back box. (See Fig. III). Any or all registers can be cleared by alternating between the Self-Test button and the switch button on the MPU module. The operator is given this option as a possible convenience and can elect to use or not use it as his needs direct.

Pressing the button once more with the eleventh entry displayed causes the game to play the power-up tune and light the Game-Over light.

*The 10,000 level is pre-set at the factory; can be set to zero, initially, if desired.

**If Coin Chute is not used in game, number displayed (if other than 00) on Player Score displays has no significance.

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IV. FEATURE OPERATION & SCORING

A. BONUS SCORE FEATURE:

A bonus score of 1000 to 29,000 points may be scored. The game starts with a bonus score of 1000 points. The bonus score advances one step at a time each time the ball rolls over the top rollover button, rolls over lit right or lit left alley rollover buttons (see F below), hits the center target (see I below), rolls over the midfield rollover button or goes through either right or left return lane. The bonus advances three steps at a time each time the ball goes into the top saucer (see E below), or when either bank of (4) drop targets is knocked down (see C below).

B. BONUS COLLECT AND BONUS MULTIPLIER:

When the ball goes into the outhole: The lit bonus score is added to the player's total score; If the 2X lite is lit, the bonus score is added to the player's total score twice; If the 3X lite is lit, the bonus score is added three times; If the 5X lite is lit, the bonus score is added five times. A tilt nullifies the bonus score.

C. DROP TARGET FEATURE:

Each drop target scores 300 points. When either bank of (4) targets is knocked down, 3000 points and 3 bonus advances are scored and the feature corresponding to the lit *Drop Target Lite* is awarded. The award is controlled by S14 and includes a bonus multiplier as shown:

	BONUS MULTIPLIER & FEATURES AWARDED	
Drop Target Bank	**Switch 14 OFF** (Conservative)	**Switch 14 ON** (Liberal)
1st time either Target Bank down	2X	2X
2nd time either Target Bank down	3X	3X
3rd time either Target Bank down	5X	5X & X-Ball (See Note 1)
4th time either Target Bank down	X-Ball (See Note 1)	Special
5th time either Target Bank down & each additional time	Special	Special

Note 1: X-Ball = 50,000 if Same Player Shoots Again is lit.

DROP TARGET LIBERAL/CONSERVATIVE ADJUST:

Switch #22 controls the resetting of the drop target banks.

Switch #22 ON (Liberal)	=	**Only the bank** of (4) targets knocked down resets.
Switch #22 OFF (Conservative)	=	Knocking down either bank of (4) targets will reset **both banks.**

D. SPECIAL: REPLAY/X-BALL/NOVELTY MODES:

Switch #31 & #32 give the operator flexibility to award a Replay, Extra Ball or score (Novelty) when a Special is scored, (outlanes and Drop Targets). The following chart explains the settings.

Switch Positions		**S31, S32, ON** REPLAY	**S31, OFF S32, ON** X-Ball	**S31, S32, OFF** Novelty
Drop Target X-Ball	=	X-Ball	X-Ball (See Note 1)	50,000
Drop Target Special	=	Replay	50,000	50,000
Scoring Thresholds	=	Replay	X-Ball	No Award
Outlane Special	=	Replay	X-Ball (See Note 1)	50,000

E. TOP SAUCER FEATURE:

A ball in the top saucer scores indicated value, advances to next step, scores 3 bonus advances and kicks out. When the top saucer lites reach 15,000, the outlane **Special Lites** lite according to the following:

	SWITCH #29	**SWITCH #30**
Both Outlane Special lites ON **constantly.** (Liberal)	ON	ON
Outlane Special Lites **Alternate** on Multiple Score. (Conservative)	OFF	ON
Outlane Special Lites DO NOT Lite. (Novelty)	OFF	OFF

Note 1: X-Ball = 50,000 if Same Player Shoot Again is lit.

F. RIGHT & LEFT ALLEY ROLLOVER BUTTON ADJ.:

Each of the six right/left alley rollover buttons advance the outhole bonus when lit. The left alley rollover buttons are lit by a ball entering the top saucer when the 6000 lite is lit; The right alley rollover buttons by a ball entering the top saucer when the 12,000 lite is lit. Each button scores as follows:

	Switch #15
100 Points lit or not lit (Conservative)	OFF
1000 Points lit or not lit (Liberal)	ON

G. THUMPER-BUMPER ADJ.:

Each of (3) Thumper Bumpers score 1000 points when lit and 100 points when not lit. They are controlled as follows:

	Switch #23
All Bumpers ON **constantly** (Liberal)	ON
1 bottom; 2 top bumpers **alternate** ON/OFF with each multiple score (Conservative)	OFF

H. SLAP-SHOT FLIPPERS:

Slap Shot Flippers, located just below each bank of drop targets offer the player additional ball control and slap shot at each drop target assembly.

I. PLAY MORE POST:

The Play-More post is activated (upped) by a ball rolling over the top rollover button or striking the center target. The post is deactivated (downed) by either of two centrally located rollover buttons, a ball through either return lane or a tilt.

V. GAME ADJUSTMENTS

A. Playfield Panel Post Adjustments:

Posts that control left and right outlane opening on panel can be moved to make access to outlanes easier or harder for ball to enter. See Figure II.

Easier entry will decrease playing time and scoring (conservative).
Harder entry will increase playing time and scoring (liberal).

B. Back Box Game Adjustments:

Each game has thirty-two switches located on A4, the MPU module, located in the back box, that allow play to be customized to the location. See Figure III. Credits per coin, maximum credits, credit display, balls per game, match feature, high game feature, special award and melody are selectable by means of the switches. The switches are contained in four-sixteen lead packages numbered S1-8, S9-16, S17-24 and S25-32 for easy identification. The "ON" toggle position is marked on the assembly. **Turn off power before making adjustments.**

Credits/Coin Adjustments:

The credits per coin are selectable by means of S25-S28 for coin chute #2. The switch settings and resultant credits/coin are as follows:

S28	S27	S26	S25	Credits/Coin
OFF	OFF	OFF	OFF	Same as Coin Chute #1 Settings
OFF	OFF	OFF	ON	1/1 Coin
OFF	OFF	ON	OFF	2/1 Coin
OFF	OFF	ON	ON	3/1 Coin
OFF	ON	OFF	OFF	4/1 Coin
OFF	ON	OFF	ON	5/1 Coin
OFF	ON	ON	OFF	6/1 Coin
OFF	ON	ON	ON	7/1 Coin
ON	OFF	OFF	OFF	8/1 Coin
ON	OFF	OFF	ON	9/1 Coin
ON	OFF	ON	OFF	10/1 Coin
ON	OFF	ON	ON	11/1 Coin
ON	ON	OFF	OFF	12/1 Coin
ON	ON	OFF	ON	13/1 Coin
ON	ON	ON	OFF	14/1 Coin
ON	ON	ON	ON	15/1 Coin

The credits given per coin are selectable by means of switches 1-5 incl., for coin chute #1 and switches 9-13 incl., for coin chute #3. Thirty-one different credit ratios are available for each coin chute. The switch settings and resultant credits/coin are listed below.

CREDITS/COIN ADJUSTMENTS

COIN CHUTE #1 (HINGE SIDE) OR #3	SWITCHES 5	4	3	2	1	CREDITS/COIN
	13	12	11	10	9	
	OFF	OFF	OFF	OFF	OFF	3/2 COINS**
	OFF	OFF	OFF	OFF	ON	3/2 COINS**
	OFF	OFF	OFF	ON	OFF	1/COIN
	OFF	OFF	OFF	ON	ON	1/2 COINS*
	OFF	OFF	ON	OFF	OFF	2/COIN
	OFF	OFF	ON	OFF	ON	2/2 COINS*
	OFF	OFF	ON	ON	OFF	3/COIN
	OFF	OFF	ON	ON	ON	3/2 COINS*
	OFF	ON	OFF	OFF	OFF	4/COIN
	OFF	ON	OFF	OFF	ON	4/2 COINS*
	OFF	ON	OFF	ON	OFF	5/COIN
	OFF	ON	OFF	ON	ON	5/2 COINS*
	OFF	ON	ON	OFF	OFF	6/COIN
	OFF	ON	ON	OFF	ON	6/2 COINS*
	OFF	ON	ON	ON	OFF	7/COIN
	OFF	ON	ON	ON	ON	7/2 COINS*
	ON	OFF	OFF	OFF	OFF	8/COIN
	ON	OFF	OFF	OFF	ON	8/2 COINS*
	ON	OFF	OFF	ON	OFF	9/COIN
	ON	OFF	OFF	ON	ON	9/2 COINS*
	ON	OFF	ON	OFF	OFF	10/COIN
	ON	OFF	ON	OFF	ON	10/2 COINS*
	ON	OFF	ON	ON	OFF	11/COIN
	ON	OFF	ON	ON	ON	11/2 COINS*
	ON	ON	OFF	OFF	OFF	12/COIN
	ON	ON	OFF	OFF	ON	12/2 COINS*
	ON	ON	OFF	ON	OFF	13/COIN
	ON	ON	OFF	ON	ON	13/2 COINS*
	ON	ON	ON	OFF	OFF	14/COIN
	ON	ON	ON	OFF	ON	14/2 COINS*
	ON	ON	ON	ON	OFF	15/ COIN
	ON	ON	ON	ON	ON	15/2 COINS*

*No Credits until second coin is dropped.
**One Credit for first coin. Two Credits for second coin provided that no scoring occured between 1st and 2nd coin drops. If scoring occured, second coin gives one credit

MAXIMUM CREDITS:

The maximum credits accepted by the machine limits the number of games that can be accumulated by coining, by winning replays or both. The maximum number of credits is selectable by means of switches 17, 18 and 19. Eight credits limits are available. Switch settings are listed below.

MAXIMUM CREDITS	SWITCHES 19	18	17
5	OFF	OFF	OFF
10	OFF	OFF	ON
15	OFF	ON	OFF
20	OFF	ON	ON
25	ON	OFF	OFF
30	ON	OFF	ON
35	ON	ON	OFF
40	ON	ON	ON

BALLS PER GAME:

# BALLS/GAME	SWITCH 16
5	ON
3	OFF

MATCH FEATURE:

When the Match Feature is ON, a random number appears in the 'Match/Ball in Play' window and the word MATCH is illuminated. If the number matches the tens digit in a player's score, a free game is awarded. The Match feature creates an incentive to play.

MATCH	SWITCH 21
ON	ON
OFF	OFF

CREDIT DISPLAY:

CREDITS DISPLAYED	SWITCH 20
YES	ON
NO	OFF

HIGH SCORE FEATURE:

The game is designed to award an Extra Ball or Free Game at each of the three score levels. See Front Door Game Adjustments.

AWARD	SWITCH 32	SWITCH 31
REPLAY	ON	ON
EXTRA BALL	ON	OFF
NO AWARD	OFF	OFF

MELODY OPTION:

The game is designed to play several melodies to announce power-up, game-up, etc. The tunes are intended to attract attention to the game and increase game usage. The tunes are controlled by switch 8.

TUNES	SWITCH 8
ON	ON
OFF	OFF

HIGH GAME TO DATE FEATURE:

The game is designed to award free games as an option if high game to date is beat. Each time this happens, the winning score becomes the new high game score to beat. This score is displayed on all 4 player score displays at the end of each game as an incentive to play. Recommended setting is underlined.

HIGH GAME TO DATE FEATURE	SWITCH 7	SWITCH 6
No Award	OFF	OFF
One Credit	OFF	ON
Two Credits	ON	OFF
<u>Three Credits</u>	<u>ON</u>	<u>ON</u>

C. Front Door Game Adjustments:

High Score Feature Adjustments:

The game is designed to award an extra ball (option) or a free game at each of three score levels. The recommended levels are on the score card in the game.

Any level from 10,000 to 990,000 can be set, as desired. It is also possible to reset or turn off (00) any or all of the levels, if desired.

1. Push and release Self-Test button (see Figure III) at one second intervals approximately five times or until number 01 appears on the Match/Ball in Play display.

2. The number on the Player Score Displays is the score level*. It can be increased, if desired, by holding the credit button in. To decrease the score level, reset to '00' and then hold the credit button in. Release the credit button when the desired number appears. Note that the level changes 10,000 points at a time. If the number '00' is left on the displays, the high score feature is eliminated for that level.

3. Repeat steps 1 and 2 for the second and third score levels. The number '02' and '03' on the Match/Ball in Play display are for the second and third levels, respectively.

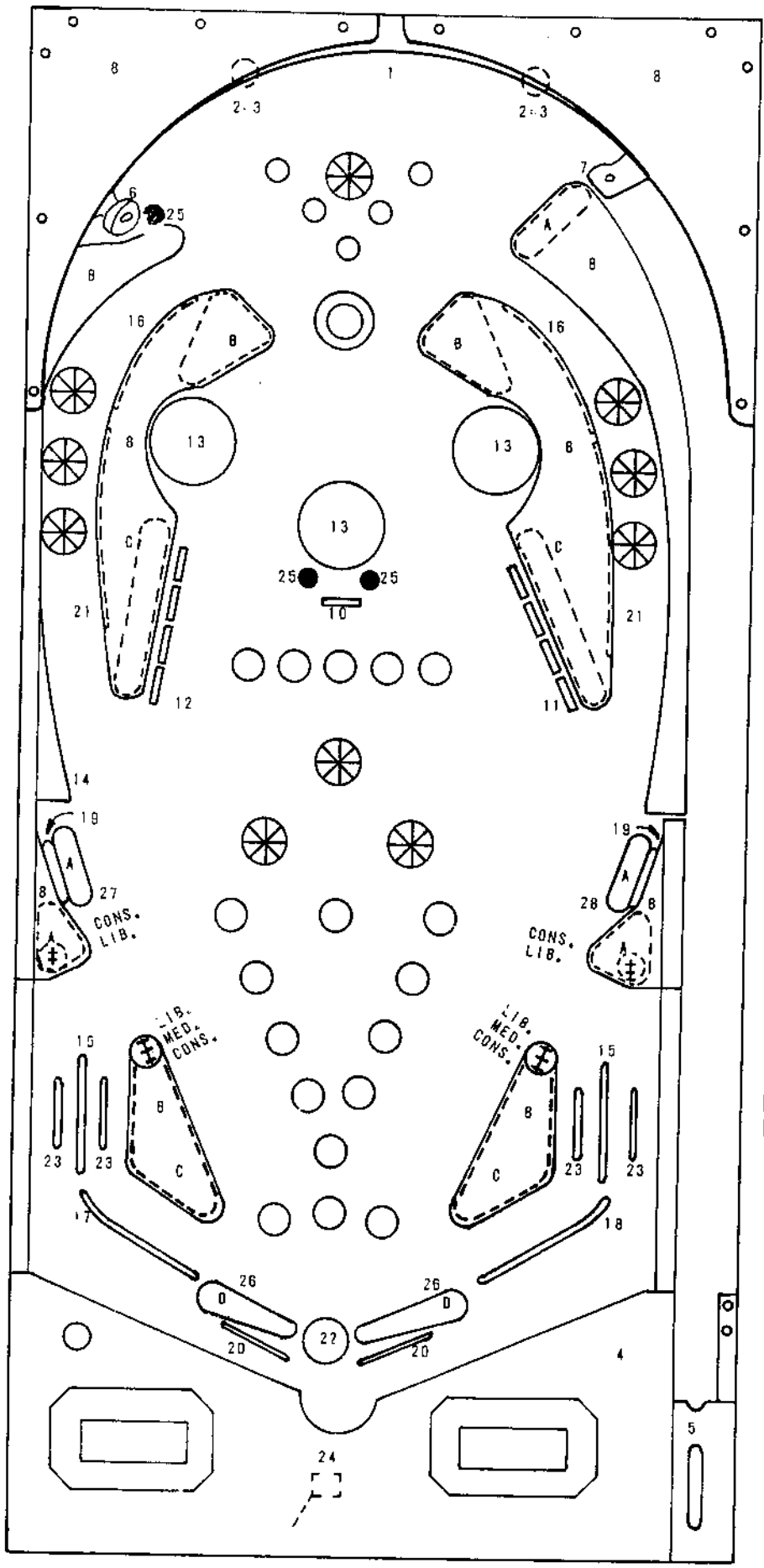
High Game to Date Feature:

The game is designed to award free games when 'High Game to Date' is beat.

It is recommended that the level, which will build with game play, be periodically reset to the factory recommended level to encourage game play. The adjustment procedure is the same as for the High Score Feature Adjustment, Steps 1 and 2. Continue pushing the Self-Test button until the number '04' appears on the Match/Ball in Play display and then do Step 2.

Any level from '00' to 990,000 can be set as described. It is to be noted that '00' does **not** turn off the feature, as it does on High Score feature. The feature is turned off by positioning switches S6 and S7 to the 'OFF' position, and 'ON' by positioning switches as discussed under "Back Box Game Adjustments.

*Can be quickly set to '00' by pressing S33 on the MPU assembly in the back box. See Figure III.



#1120-E POWER PLAY

RUBBER PARTS

A.	R-521-1	1" DIA.	(7)
B.	R-521-2	1½" DIA.	(2)
C.	R-521-4	2½" DIA.	(6)
D.	R-406-3	FLIPPERS	(2)
E.	R-243-	5/16" DIA.	(2)

PANEL PARTS

1.	ARCH RAIL	M-1774
2.	RAIL POST (2)	C-907
3.	RAIL POST CAP (2)	C-908
4.	BOTTOM ARCH	P-5871-56
5.	SHOOTER GAUGE	P-6359-22
6.	BALL REBOUND	ASE-493-6
7.	BALL GATE (R)	A-1475-9
8.	SCREENED PLASTICS	M-1330-142
9.	CLEAR PLASTICS	A-2890-132
10.	TARGET ASSEMBLY	ASE-2911-20
11.	DROP TARGET ASSY. (R)	ASE-2795-42
12.	DROP TARGET ASSY. (L)	ASE-2795-43
13.	THUMPER CAP ASSY. (3)	A-3713-37
14.	GUIDE RAIL ASSY.	A-3032-30
15.	GUIDE WIRE (2)	M-121-18
16.	GUIDE WIRE (2)	M-121-30
17.	GUIDE WIRE	M-121-43
18.	GUIDE WIRE	M-121-44
19.	GUIDE WIRE (2)	M-121-46
20.	GUIDE WIRE (2)	M-121-53
21.	GUIDE WIRE (2)	M-121-68
22.	PLAY-MORE POST ASSY.	ASE-2553-6
23.	ROLLOVER WIRE (4)	ASE-2806
24.	OUTHOLE WIRE	ASE-2806-21
25.	MINI POST & RUBBER ASSY. (3)	ASE-2836-1
26.	FLIPPER & SHAFT ASSY. (2)	ASE-2214-24
27.	FLIPPER & SHAFT ASSY.	ASE-2214-25
28.	FLIPPER & SHAFT ASSY.	ASE-2214-26

CONS.— CONSERVATIVE
MED. — MEDIUM
LIB. — LIBERAL

INDICATES MOVABLE POSTS FOR SCORING ADJUSTMENTS

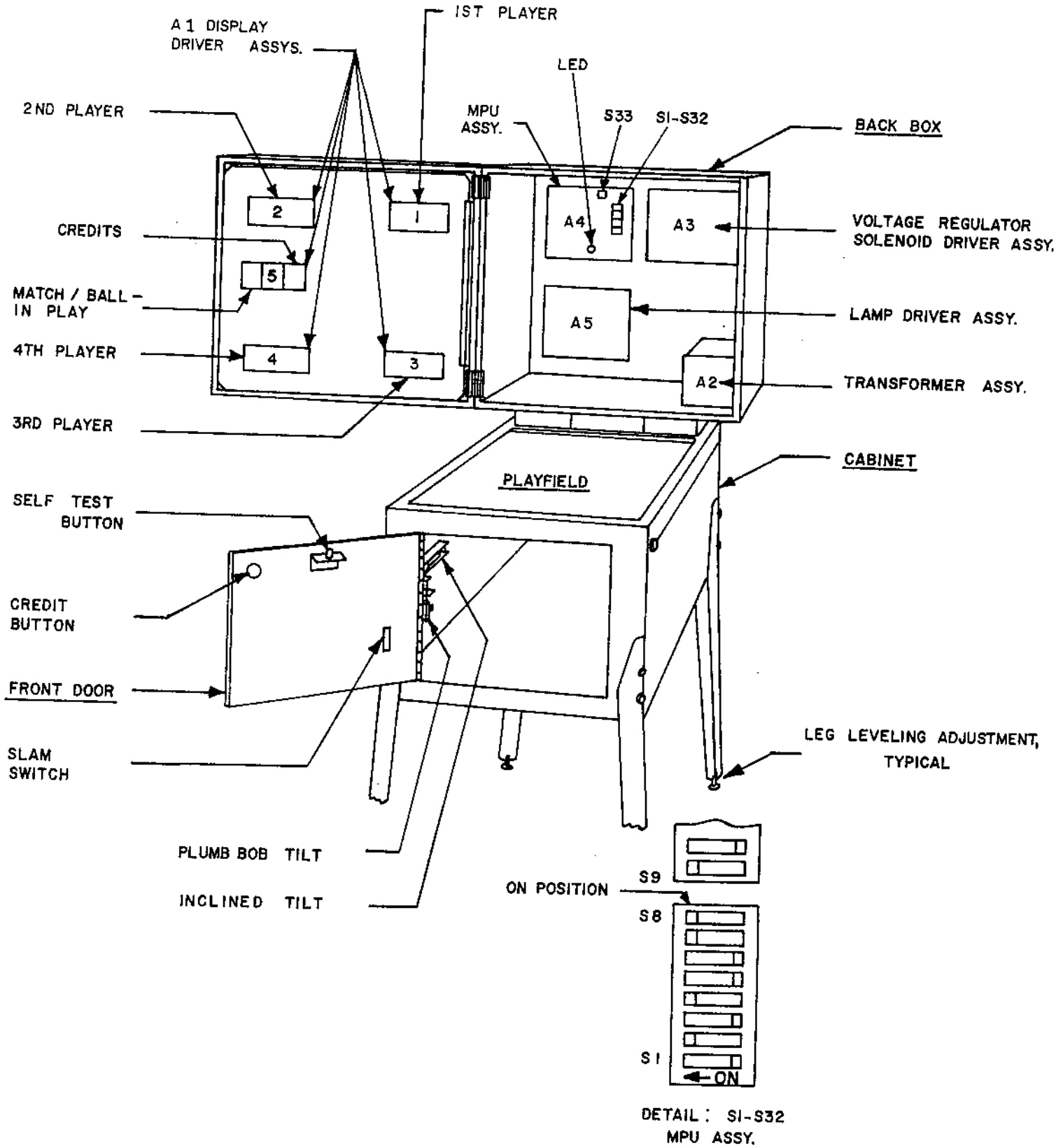


FIGURE III. ELECTRONIC PIN BALL MACHINE

Recommended:

Instruction, Score Cards and High Score feature settings to be used on **POWER PLAY ELECTRONIC, 1120-E.**

3-BALL

REPLAYS

Instruction Card	M-1508-70-D
Score Card	M-1508-70-H
*Score Card	M-1508-70-AO

1 Replay at 250,000
1 Replay at 420,000

EXTRA BALL

Instruction Card	M-1508-70-E
Score Card	M-1508-70-AE

1 Extra Ball at 210,000
1 Extra Ball at 330,000

5-BALL

REPLAYS

Instruction Card	M-1508-70-D
Score Card	M-1508-70-G W/70-W
*Score Card	M-1508-70-AN W/70-W

1 Replay at 330,000
1 Replay at 490,000

EXTRA BALL

Instruction Card	M-1508-70-E
Score Card	M-1508-70-AG

1 Extra Ball at 250,000
1 Extra Ball at 370,000

*USE FOR END OF GAME REPLAY AWARD. USE WITH INSERT CARDS (7), M-1508-68B

(ALL PLAYFIELD POSTS IN MEDIUM POSITION)

ADDITIONAL CARDS

REPLAYS

M-1508-70-P	170,000	340,000	
M-1508-70-Q	190,000	360,000	
M-1508-70-R	210,000	380,000	
M-1508-70-S	230,000	400,000	
M-1508-70-T	270,000	440,000	
M-1508-70-U	290,000	460,000	
M-1508-70-V	310,000	470,000	
M-1508-70-W	330,000	490,000	
M-1508-70-X	350,000	510,000	
M-1508-70-Y	370,000	530,000	
M-1508-70-Z	390,000	550,000	
M-1508-70-I	240,000	370,000	480,000
M-1508-70-J	260,000	390,000	500,000
M-1508-70-K	280,000	400,000	510,000
M-1508-70-L	300,000	420,000	530,000
M-1508-70-M	320,000	440,000	550,000
M-1508-70-N	360,000	480,000	590,000
M-1508-70-O	380,000	500,000	610,000

EXTRA BALL

M-1508-70-AA	130,000	250,000
M-1508-70-AB	150,000	270,000
M-1508-70-AC	170,000	290,000
M-1508-70-AD	190,000	310,000
M-1508-70-AE	210,000	330,000
M-1508-70-AF	230,000	350,000
M-1508-70-AG	250,000	370,000
M-1508-70-AH	270.000	390,000
M-1508-70-AI	290,000	410,000
M-1508-70-AJ	300,000	420,000
M-1508-70-AK	320,000	440,000
M-1508-70-AL	330,000	450,000
M-1508-70-AM	340,000	460,000

INSTRUCTION CARD, NOVELTY
M-1508-70-F

BLANKS (3)

High Game to Date Recommended levels: (Reset Periodically)

3-Ball	500,000
5-Ball	570,000

#1120-E POWER PLAY

RECOMMENDED SETTINGS

	3-BALL	5-BALL
Thumper Bumpers	Sw. 23 ON	Sw. 23 OFF
Rollover Buttons	Sw. 15 ON	Sw. 15 OFF
Drop Target Reset	Sw. 22 OFF	Sw. 22 OFF
Drop Target X-Ball	Sw. 14 OFF	Sw. 14 OFF
Outlane	Sw. 29 OFF	Sw. 29 OFF
	Sw. 30 ON	Sw. 30 ON

The following chart gives recommendations for three typical types of operation.

	3-BALL	5-BALL
REPLAY		
Instruction Card	M1508-70-D	M-1508-70-D
Score Card	M-1508-70-AO	M-1508-70-AN W/70-W
Major Mode	Sw. 31, 32, ON	Sw. 31, 32, ON
Match	Sw. 21 ON	Sw. 21 ON
High Score to Date	Sw. 6, 7, ON	Sw. 6, 7, ON
X-BALL		
Instruction Card	M-1508-70-E	M-1508-70-E
Score Card	M-1508-70-H with AE	M-1508-70-G with AG
Major Mode	Sw. 31 OFF	Sw. 31 OFF
	Sw. 32 ON	Sw. 32 ON
Match	Sw. 21 OFF	Sw. 21 OFF
High Score to Date	Sw. 6, 7, OFF	Sw. 6, 7, OFF
NOVELTY		
Instruction Card	M-1508-70-F	M-1508-70-F
Major Mode	Sw. 31, 32, OFF	Sw. 31, 32, OFF
Match	Sw. 21 OFF	Sw. 21 OFF
High Score to Date	Sw. 6, 7, OFF	Sw. 6, 7, OFF

ASSEMBLY ADJUSTMENTS:

GENERAL:

All switch assemblies consist of leaf springs, contacts, separators, plastic tubing and screws to hold them to the mounting surface. Before attempting to adjust a switch assembly, make sure that these screws are tight. If not, tighten screw closest to the contact end of the leaf spring first. This will prevent the assembly from being secured in such a manner that the leaf springs tend to fan out. In general, all leaf springs are adjusted for a 1/16" gap in the open position and .010" overtravel or wipe in the closed position. All contacts should be in good condition. Unless otherwise instructed, they should be dry or non-lubricated. All contacts should be free of dust and dirt. Contacts, with the exception of the flipper button switch assemblies, are plated to resist corrosion. Filing or burnishing breaks the finish and encourages corrosion. Clean by closing the contacts over a clean piece of paper (e.g. a business card) and wiping gently until the contacts are clean. For the flipper button switch assemblies **ONLY:** Tarnish can be removed with a contact file followed by a burnishing tool. Severely pitted contacts must be replaced as an assembly. In general, contacts need be cleaned or replaced and adjusted only when they are found to be a source of game malfunction.

X. SERVICE PARTS:

A parts catalogue is available upon request. The catalogue is illustrated and lists all replacement parts for each game manufactured by Bally. Requests should be addressed to:

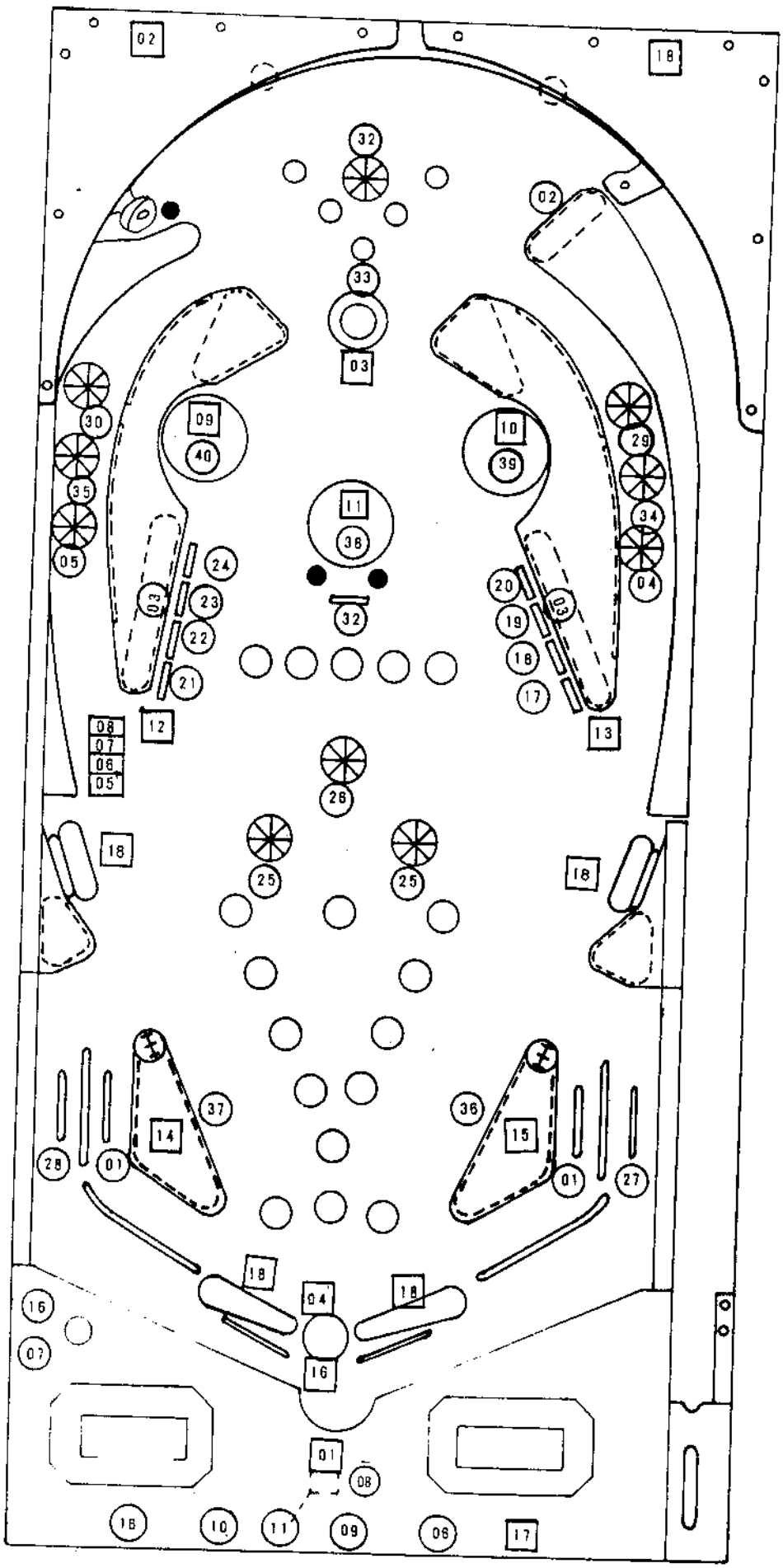
BALLY MANUFACTURING CORPORATION
2640 WEST BELMONT AVENUE
CHICAGO, ILLINOIS 60618
ATTN: PARTS DEPARTMENT

SERVICE HINTS:

The Bally playfield has an improved tuff-coat finish with excellent wearing properties. Its life expectance, as well as play appeal, can be extended by periodic cleaning of the playfield.

DO: Bally recommends you clean your playfield with Wildcat #125 (Wildcat Chemical Co., 1333 W. Seminary Drive, Ft. Worth, Texas 76115). Wildcat #125 is a combination cleaner and polish. Bally has tried and tested this product and found it to be very effective. If Wildcat #125 is not available, Bally suggests you ask your Distributor to order it. Inspect and hand polish the ball in a clean cloth. A chipped ball must be replaced. It can ruin the finish on the playfield in a short period of time.

DON'T: Use water in large quantities, highly caustic cleaners, abrasive cleaners or cleaning pads on the playfield. Do not allow a wax or polish build up. Waxes yellow with age and spoil play appeal.



INDICATES SWITCH ASSEMBLY IDENTIFICATION NUMBERS.
NOTE: Cabinet; 07, 16
Door; 06, 09, 10, 11, 16

INDICATES SOLENOID IDENTIFICATION NUMBERS.
NOTE: Cabinet; 05, 06, 07, 08
Door; 17
Back Box; 02, 18

GAME #1120-E POWER PLAY

SOLENOID IDENTIFICATION TABLE

SELF-TEST #	SOLENOID IDENTIFICATION
01	OUTHOLE KICKER
02	KNOCKER
03	TOPHOLE SAUCER
04	POST DOWN
05	CHIME 10
06	CHIME 100
07	CHIME 1000
08	CHIME, EXTRA
09	LEFT THUMPER BUMPER
10	RIGHT THUMPER BUMPER
11	BOTTOM THUMPER BUMPER
12	LEFT DROP TARGET
13	RIGHT DROP TARGET
14	LEFT SLINGSHOT
15	RIGHT SLINGSHOT
16	POST UP
17	COIN LOCKOUT DOOR
18	K1 RELAY (FLIPPER ENABLE)

SWITCH ASSEMBLY SELF-TEST DISPLAY NUMBERS

SELF-TEST #	SWITCH DESCRIPTION
01	L & R FLIPPER FEEDER LANES
02	50 POINT REBOUND
03	10 PT. DROP TAR. REB. (2)
04	RT. R.O. BUTTON LANE (BOT)
05	LFT. R.O. BUTTON LANE (BOT)
06	CREDIT BUTTON
07	TILT (3)
08	OUTHOLE
09	COIN III (RIGHT)
10	COIN I (LEFT)
11	COIN II (MIDDLE, IF USED)
16	SLAM (2)
17	RT. DROP TAR. D (BOTTOM)
18	RT. DROP TAR. C
19	RT. DROP TAR. B
20	RT. DROP TAR. A (TOP)
21	LEFT DROP TAR. D (BOTTOM)
22	LEFT DROP TAR. C
23	LEFT DROP TAR. B
24	LEFT DROP TAR. A (TOP)
25	DOWN POST R.O. BUTTON (2)
26	CENTER ROLLOVER BUTTON
27	RIGHT OUTLANE
28	LEFT OUTLANE
29	RIGHT R.O. BUTTON LANE (TOP)
30	LEFT R.O. BUTTON LANE (TOP)
32	TOP HOLE SAUCER
33	TOP R.O. BUTTON & CENTER TAR.
34	RIGHT R.O. BUTTON LANE (CENTER)
35	LEFT R.O. BUTTON LANE (CENTER)
36	RIGHT SLINGSHOT
37	LEFT SLINGSHOT
38	BOTTOM THUMPER BUMPER
39	RIGHT THUMPER BUMPER
40	LEFT THUMPER BUMPER

C) If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)

3C) **SYMPTOM:** One or several displays always off.

ACTION: **A)** Do 3AA, AB, AC, and AD.

B) Repeat 3BB and BC, if necessary.

4A) **SYMPTOM:** Solenoid(s) do(es) not pull-in during course of game.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) three times.

B) If game was correct, each solenoid would be energized. A number is flashed on the Player Score displays as each solenoid is pulsed. Note any numbers that do not have the sound of a solenoid associated. See Solenoid Identification Table, Page 17 and Figure V.

C) Carefully lift the playfield (or open the back box) to gain access to the solenoid. Turn power OFF. Inspect the solenoid.

D) If a lead is broken off, repair. Repeat A & B. If game is correct, it is now ready for play.* If solenoid wiring was correct, turn power OFF.

E) Replace Solenoid Driver/Voltage Regulator module A3. See CAUTION NOTE 3AB.

F) Repeat AA & AB. If game is correct, it is now ready to play.* If game is not correct, turn power OFF.

G) Replace MPU module A4. See CAUTION NOTE, 1C.

H) Repeat A & B. If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement Procedure. (See Parts List.)

4B) **SYMPTOM:** Solenoid(s) always energized—Note: If impulse solenoids (chimes, ball ejects, slingshots, thumper-bumpers, etc.) are energized continuously, they are subject to damage. Limit troubleshooting to one minute with power ON, followed by **five minutes with power OFF.** Repeat as necessary. Replace damaged solenoids.

ACTION: Do 4AA, AB, AE, AF and if necessary, AG and AH.

5) **SYMPTOM:** Feature (Drop Targets, etc.) does not score.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) four times.

B) If the game is correct, Match/Ball in Play display would flash '0.' If a number appears on the Player Score displays, see Switch Assembly Identifcation Table, Page 17 and Figure V.

C) Carefully lift the playfield. Locate the switch assembly identified from the number. Visually inspect the switch assembly. If the contacts are 'stuck', regap them to 1/16". See section under ADJUSTMENTS. Repeat A & B. If the game is correct, it is now ready to play.* If game is not correct, turn the power OFF.

D) Replace MPU module A4. See CAUTION NOTE 1, C.

E) Repeat A & B. If the game is correct, it is now ready to play.* If the game is not correct, refer to Module Replacement Procedure. (See Parts List.)

6) **SYMPTOM:** Game blows fuse(s) repeatedly.

ACTION: See Module Replacement Procedure. F.O. 560

*Turn power On-Off switch OFF and then ON.

1A) **SYMPTOM:** Game does not play power-up tune when power is turned on. General Illumination is present.

ACTION: **A)** Turn power OFF. Open back box. Locate light emitting diode (LED) on MPU module A4.

B) Turn Power ON. LED must flash 7X to indicate that module A4 is good. Correct flash sequence is flicker/flash-pause-and then six more flashes and LED goes out.

C. If LED does not come on, or does not flash, or flashes, but less than 7X, turn off power. Replace MPU module A4.

CAUTION: **Replacement MPU Module must have same Part Number or incorrect operation will result! See Parts List for MPU Module Part Number.**

Turn power ON.

D) If game is correct, it is now ready for play. If game is not correct, refer to Module Replacement procedure. (See Parts List.)

2A) **SYMPTOM:** Not all feature lamps light during game play.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) once. If the game is correct, **all** feature lamps flash ON and OFF.

B) Carefully raise playfield or open back box to gain access to lamps.

C) Replace bulbs that do not flash.

D) If game is correct, it is now ready for play.

E) If game is not correct, turn power OFF. Replace Lamp Driver Module A5. Turn power ON and repeat A.

F) If game is correct, if is now ready for play.*

G) If game is not correct, turn power OFF. Replace MPU module A4. See CAUTION, 1C. Turn power ON and repeat A.

H) If game is correct, it is now ready for play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)

2B) **SYMPTOM:** One or some switched lamps always ON.

ACTION: Repeat 2AA, AB, AE, and AF and, if necessary AG & AH.

3A) **SYMPTOM:** Display digits improper on **one** or **several,** but less than all Display Driver module(s), A1. Improper: One or several segments always OFF, digits mottled or several segments or digit(s) always ON.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) twice. If the game is correct, each digit on each Display Driver Module A1 (5 used/game) displays the count 1-9 and 0 continuously in all 6 digit positions. Note defective Display Driver modules.

B) Turn power OFF.

CAUTION: High Voltage is supplied to the Display Driver Modules, A1, from the Solenoid Driver/Voltage Regulator Module A3. Wait 30 seconds for High Voltage to Bleed Off.

C) Replace Display Driver module(s) A1. Turn power ON. Repeat A.

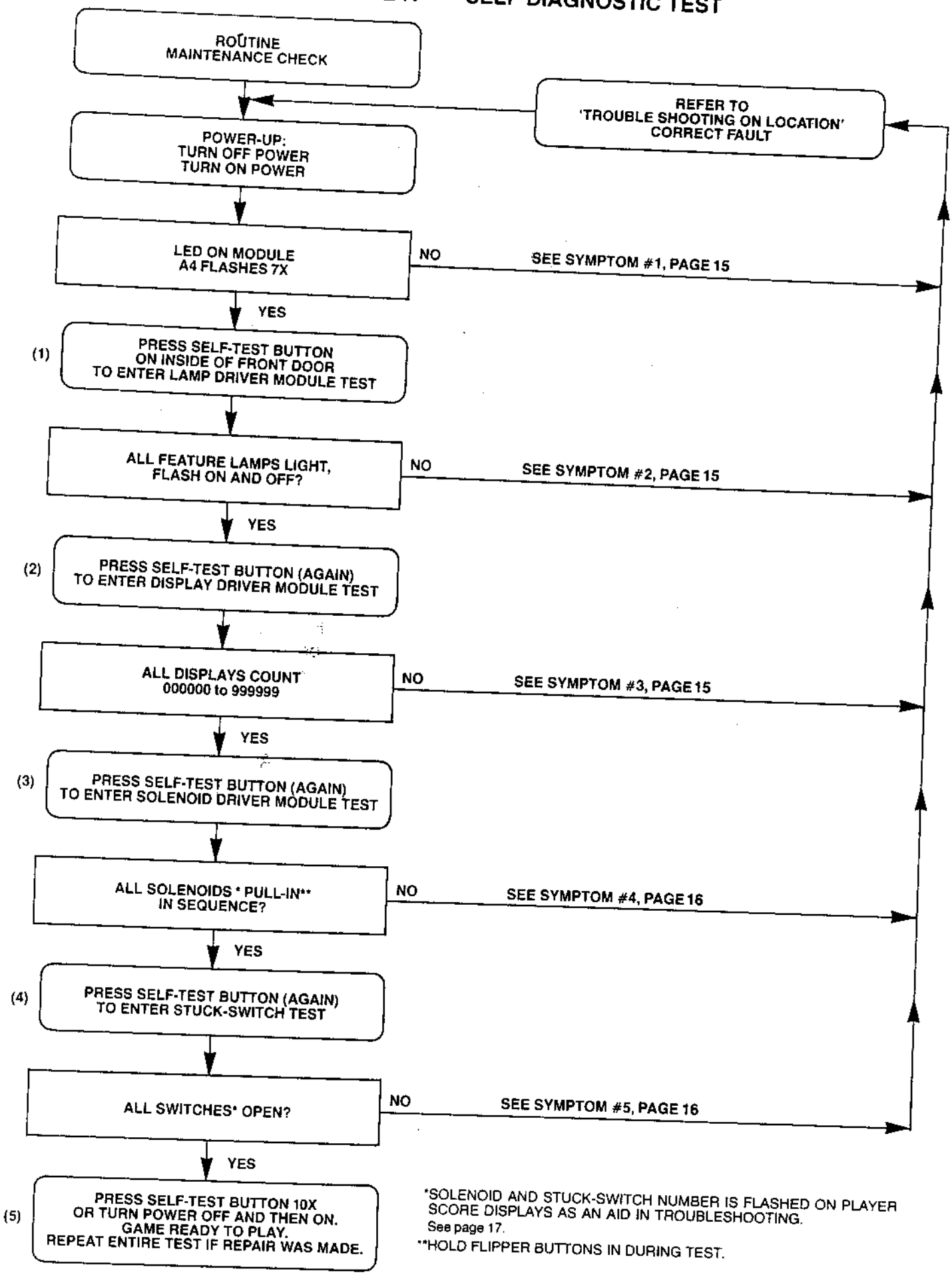
D) If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)

3B) **SYMPTOM:** **All** displays improper (all five display Driver modules). Improper: Digit(s) always on or off/segment(s) always on or off, all displays.

ACTION: **A)** Repeat 3AA, and AB.

B) Replace MPU module A4. See CAUTION NOTE, 1C. Turn power ON. Repeat A.

FIGURE IV SELF DIAGNOSTIC TEST



*SOLENOID AND STUCK-SWITCH NUMBER IS FLASHED ON PLAYER SCORE DISPLAYS AS AN AID IN TROUBLESHOOTING. See page 17.

**HOLD FLIPPER BUTTONS IN DURING TEST.

VIII. ROUTINE MAINTENANCE ON LOCATION:

Self-Test routines are written into the game design. They are particularly useful for routine maintenance. The tests are described below. The first test is automatic and occurs on power-up. This test causes the MPU module A4 to examine itself for failures. Seven flashes of an LED indicates proper operation. The second series of self-diagnostic tests causes the MPU to 'exercise' each of the other modules in such a way as to make their faults, if any, obvious. See Figure III and Page ii.

It is recommended that these tests be used several times a week to check out the games before play. If faults are discovered, they may be corrected on location if the operator has a stock of replacement modules. See "Trouble Shooting on Location."

MPU Module Self-Test:

At power on, the LED on the MPU module flashes once. (Flicker-Flash). After a pause, it flashes six more times and goes out. A power-up tune is played to announce game readiness. This indicates proper MPU operating condition and successful completion of the power-up test.

Game Self-Diagnostic Tests:

1. Pressing the Self-Test button inside the door initiates the Self-Test routine. See Figures III and IV. All switched lamps flash off and on continuously.

2. Pressing the Self-Test button again causes each digit on each display to cycle from 0 thru 9, and repeat continuously.

3. Pressing the Self-Test button again causes each solenoid to be energized, one at a time, in a continuous sequence. Hold both flipper buttons 'in' during this test. The number appearing on the Player Score displays is the same as the number assigned to the solenoid. The sound of a solenoid pulling-in as a number appears indicates proper operation. The absence of sound is improper. If sound is absent, see Page 17 for help in Solenoid identification.

4. Pressing the Self-Test button again causes the MPU to search each switch assembly for stuck contacts. If any are found, the number of the first set encountered is flashed on the Player Score displays. The number remains until the fault is cleared. See Page 17 for help in Stuck Switch identification. Other numbers may follow if more stuck contacts are present. If there are no stuck switches, the Match/Ball in Play display flashes '0.'

5. Pressing the Self-Test button eleven more times causes the MPU to step thru the threshold and bookkeeping functions described previously and finally to repeat the power-up test. For more rapid exit to power-up, turn the game off, then on. The game is now ready to play.

After successful completion of the Self Diagnostic Test procedure, set the game up for play. Exercise each rollover, thumper-bumper, slingshot, etc., by hand until each switch assembly on the playfield has been checked for proper operation. If actuating a switch assembly results in intermittent or no response, clean contacts by gently closing them on a clean business card or piece of paper and wiping until they wipe clean. Regap, if necessary, to 1/16". **Do not burnish or file Gold Plated Switch Contacts.**

IX. TROUBLESHOOTING ON LOCATION

The game is designed to make troubleshooting easy. Several simple procedures are given herein that cover the greatest percentage of game failures. They are written for an operator on location and require module replacement. (See Figure III) Symptoms and the action to be taken are given for each type of problem.

If the problem is more complicated and is not solved by following this procedure, more detailed procedures are available from Bally. See the Parts List for ordering information.

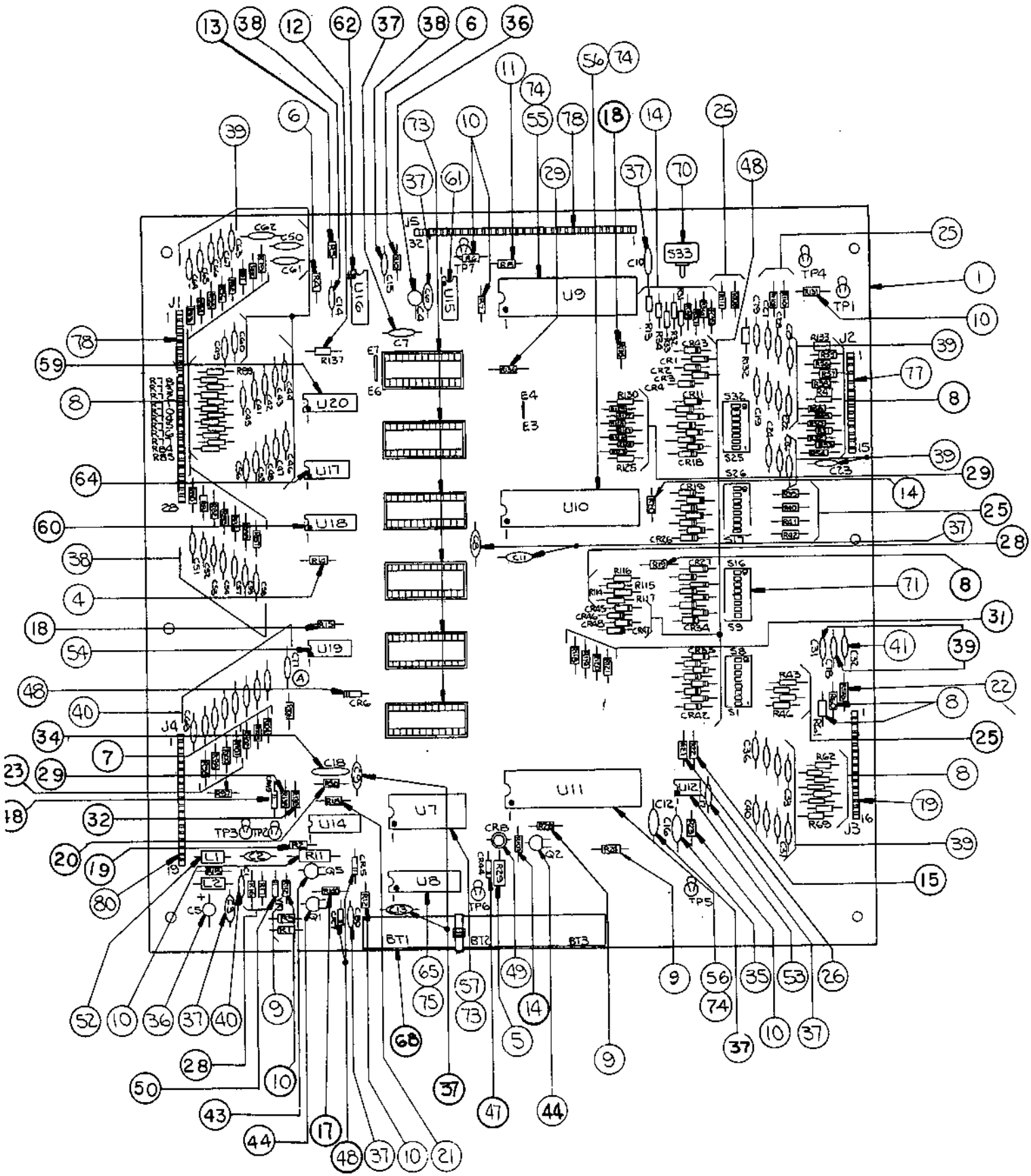
XI. PARTS LIST
#1120-E POWER PLAY

	PART NUMBER
MISCELLANEOUS	
Transformer (Domestic or Export)	E-122-125
Bulbs, #44	E-125-22
ASSEMBLY COILS	
Chimes (4)	CN-31-2000
Coin Lockout	FO-36-7000
Flipper Left & Right (4)	AQ-25-500/ 34-5050
Knocker	AR-26-1200
Outhole Kicker	AN-26-1200
Saucer	AO-27-1300
Thumper-Bumper (3)	AN-26-1200
Sling-Shot (2)	AN-26-1200
Play-More Post (UP)	GA-31-2000
(DOWN)	AN-26-1200
PLAYFIELD PARTS	See Figure II
Unit Coils	
Drop Target (Reset) (2)	NO-26-1900
MODULES	
Lamp Driver A5	AS-2518-14
Display Driver A1 (5 Used)	AS-2518-15
Solenoid Driver/Voltage Regulator A3	AS-2518-16
MPU A4	AS-2887-5
Transformer & Rectifier A2	AS-2877-1
Rectifier Board (Part of A2)	AS-2518-18
REPAIR PROCEDURES/AIDS	
Module & Component Replacement	F.O. 560
AID (Assistance in Diagnostics) Kit, used with F.O. 560	KIT #485

MODULE COMPONENTS
SEE MODULE PARTS LIST

MODULE COMPONENT STARTER KITS
(Each Kit contains an assortment of the most needed electronic parts for use in Module repair.)
Kit #490—Rectifier Board (Part of A2)
Kit #503—MPU Board A4 (Less Memory U1-U6)
Kit #492—Solenoid Driver/Voltage Regulator A3
Kit #493—Display Driver A1
Kit #494—Lamp Driver A5

AS-2518-17 MPU MODULE



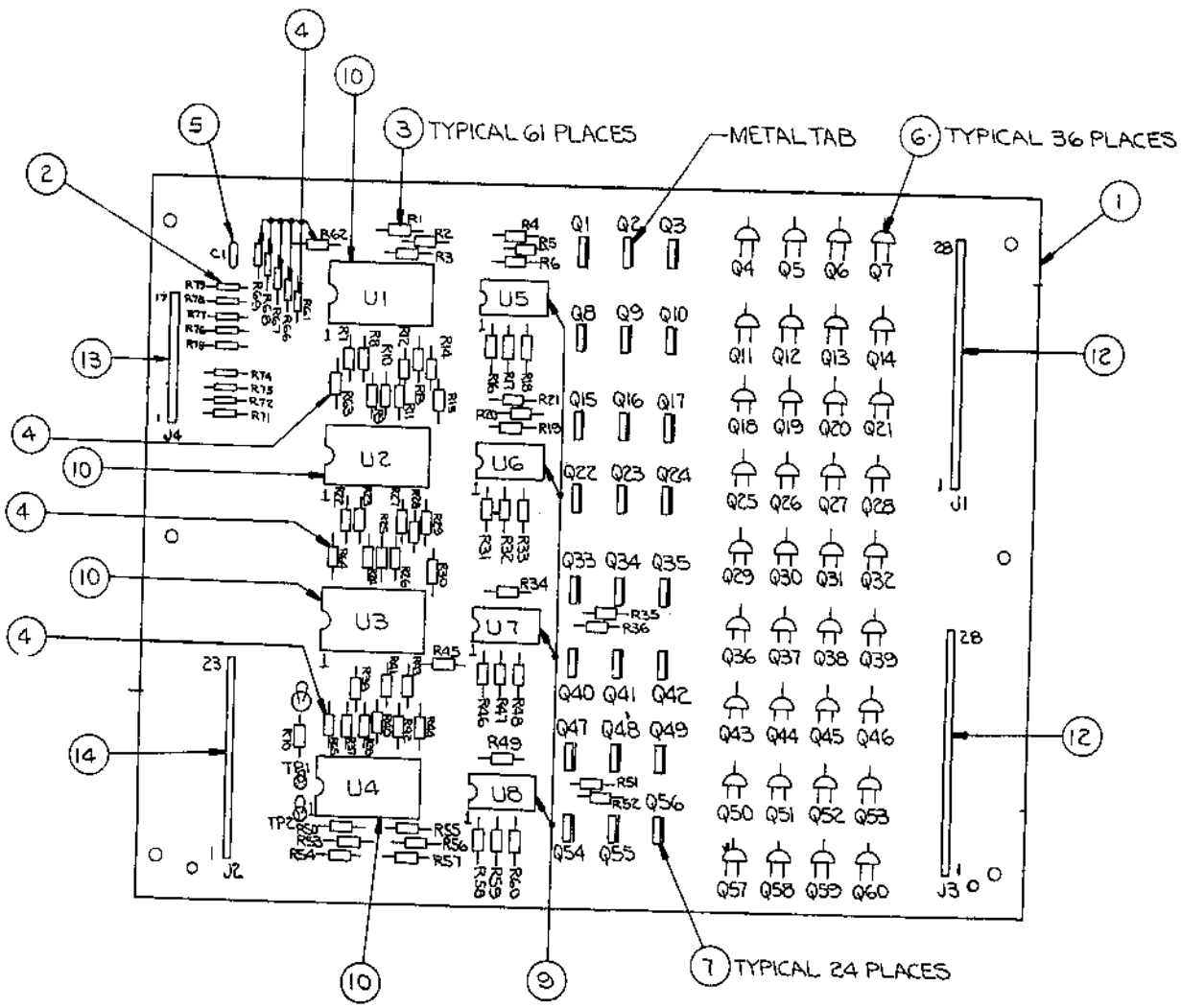
A4: MPU MODULE
COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A4 (see note 1)	AS-2887-5	MPU Module Complete. Power Play
2	A4 (see note 2)	AS-2518-17	MPU Module less Program Memory, U1-6 incl.
3-32	See Schematic		Resistors, See schematic for value.
34	C18	E-00586-0019	Capacitor, .05 MFD, 100V
35	C16	E-00586-0023	Capacitor, .1 MFD, 100V
36	C4, C5	E-00586-0073	Capacitor, 4.5 MFD, 25V
37	C3, C6-C13, C17	E-00586-0065	Capacitor, .01 MFD, 500V
38	C14, C15, C79, C41-C67	E-00586-0067	Capacitor, 470 PFD, 1kv
39	C19-C31, C78, C33-C40	E-00586-0069	Capacitor, 390 PFD, 1kv
40	C1, C2, C68-C77	E-00586-0070	Capacitor, 820 PFD, 1kv
41	C32	E-00586-0077	Capacitor, 3000 PF, 1kv
43	Q5	E-00585-0023	Transistor PNP (MPS-3702)
44	Q1, Q2	E-00585-0031	Transistor (2N3904)
47	CR44	E-00587-0006	Diode (IN4004)
48	CR1-CR7, CR11-CR43, CR45-CR48	E-00587-0014	Diode (IN4148)
49	CR8	E-00679	LED (Green)
50	VR1	E-00598-0008	Diode Zener (8.2V, IN9598)
52	L1, L2	E-00604-0003	Inductor, 22 Micro Hy.
53	U12	E-00620-0004	Timer (555)
54	U19	E-00620-0005	Quad 2 Input (4011)
55	U9	E-00620-0028	MPU I.C. (6800)
56	U10, U11	E-00620-0029	PIA I.C. (6820)
57	U7	E-00620-0030	RAM I.C. (6810)
59	U20	E-00620-0032	HEX Buffer I.C. (14502B)
60	U14, U18	E-00620-0033	HEX Inverter (4049B)
61	U15	E-00620-0034	Quad Memory Driver (MC3459L)
62	U16	E-00620-0035	Dual Monostable (9602)
64	U17	E-00620-0041	Quad 2 Inputs (74L00N)
65	U8	E-00620-0042	RAM (C MOS, P5101L-3)
68	BT1, BT2, BT3	E-00628-0003	Battery
70	S33	E-00658-0001	Push Button Switch
71	S1-S8, S9-S16, S17-S24, S25-S32	E-00677	DIP Switch
73		E-00712	24 Pin Socket
74		E-00712-0001	40 Pin Socket
75		E-00712-0003	22 Pin Socket
77	J2	E-00715	15 Pin Wafer Connector
78	J4, J5	E-00715-0004	28 Pin Wafer Connector
79	J3	E-00715-0017	16 Pin Wafer Connector
80	J1	E-00715-0018	19 Pin Wafer Connector
81	J5	E-00715-0023	4 Pin Wafer Connector

NOTE 1:
When ordering, fill in dash number. For example, AS-2887-1: FREEDOM, AS-2887-2: NIGHT RIDER, AS-2887-3: EVEL KNIEVEL, AS-2887-4: EIGHT BALL, AS-2887-5: POWER PLAY

NOTE 2:
Order replacement memory chips U1-U6, by specifying game, socket and part number stamped on chip.

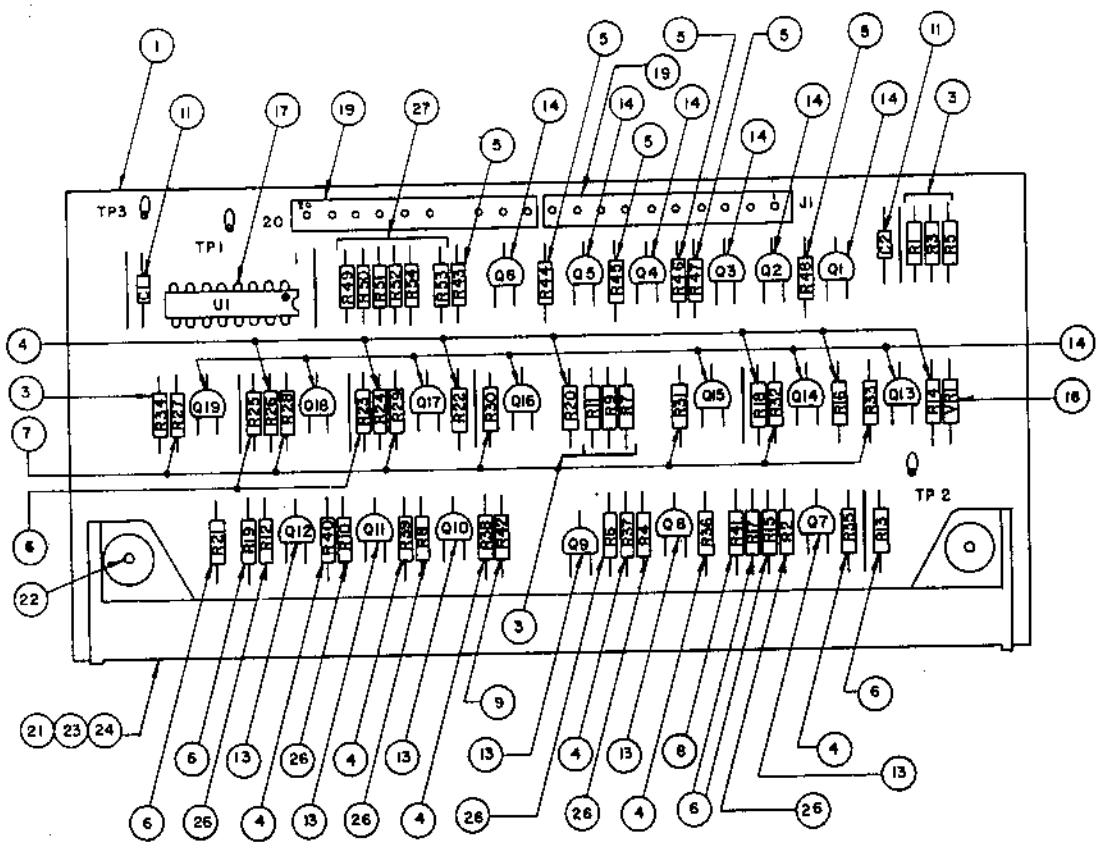
AS-2518-14 LAMP DRIVER MODULE



A5: LAMP DRIVER MODULE
COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A5	AS-2518-14	Lamp Driver Module, Complete
2	R71-R79	E-105-242	Resistor, 20kΩ , 5%, ¼W
3	R1-R60, R70	E-00105-0237	Resistor, 2kΩ, 5%, ¼W
4	R61-R69	E-00105-0256	Resistor, 2.2MΩ, ¼W
5	C1	E-00586-0065	Capacitor, .01 MFD, 500V
6	Q4-Q7, Q11-Q14, Q18-Q21, Q25-Q32, Q36-Q39, Q43-Q46, Q50-Q53, Q57, Q58, Q59, Q60	E-00585-0014	SCR, 2N5060
7	Q1-Q3, Q8-Q10, Q15-Q17, Q22-Q24, Q33-Q35, Q40-Q42, Q47-Q49, Q54-Q56	E-00585-0029	SCR, MCR106-1
9	U5-U8	E-00620-0007	I.C., Buffer, CD4050AE
10	U1-U4	E-00620-0037	I.C., Decoder, 14514B
12	J1, J3	E-00715-0004	28 Pin Wafer Connector
13	J1	E-00715-0013	17 Pin Wafer Connector
14	J4	E-00715-0014	23 Pin Wafer Connector

AS-2518-21 DISPLAY DRIVER MODULE

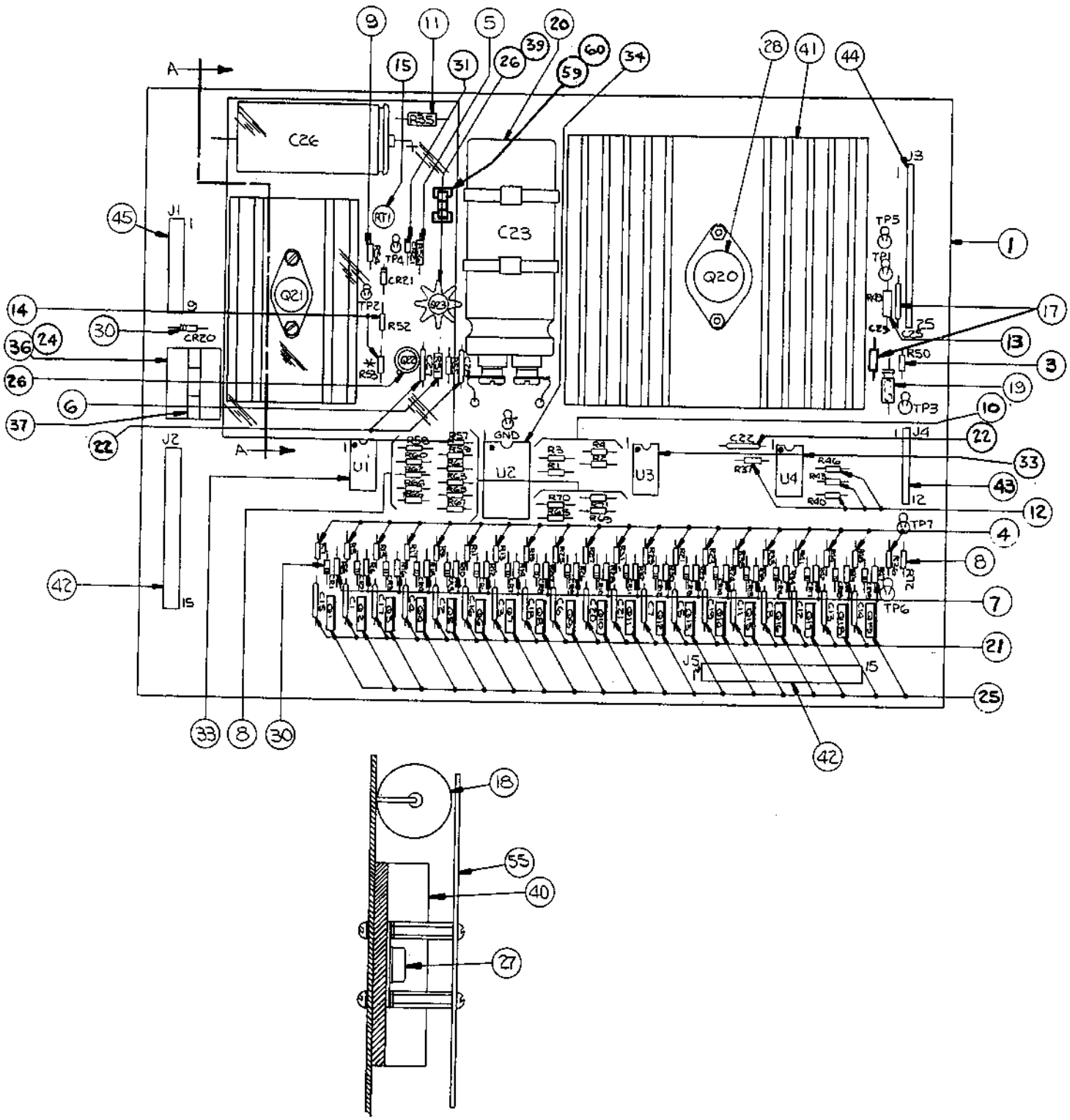


A1: DISPLAY DRIVER MODULE
COMPONENT PARTS LIST

ITEM	QTY.	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	1		P-2948-296	P.C. Board, M-645-392
3	7	R1, R3, R5, R7, R9, R11, R34	E-105-226	Resistor, 100K Ω
4	13	R14, R16, R18, R20, R22, R24, R26, R35, R36, R37, R38, R39, R40	E-105-227	Resistor, 300K Ω
5	6	R43, R44, R45, R46, R47, R48	E-105-228	Resistor, 9.1K Ω
6	7	R13, R15, R17, R19, R21, R23, R25	E-105-229	Resistor, 1.5K Ω
7	7	R27, R28, R29, R30, R31, R32, R33	E-105-230	Resistor, 1K Ω
8	1	R41	E-105-231	Resistor, 39K Ω
9	1	R42	E-105-271	Resistor, 240K Ω
10				
11	2	C1, C2	E-586-65	Capacitor, .01 MFD
13	6	Q7, Q8, Q9, Q10, Q11, Q12	E-585-32	Transistor (2N5401)
14	13	Q1, Q2, Q3, Q4, Q5, Q6, Q13, Q14, Q15, Q16, Q17, Q18, Q19	E-585-33	Transistor (MPS-A42)
16	1	VR1	E-598-7	Zener Diode, 110V
17	1	U1	E-620-38	I.C. Decoder
18				
19	2	J1	E-715-11	10 Pin Wafer Pin Connector
21	1	DS1	E-680	Digital Display Panel
22	2		M-1836	Hi-Lo Screw, W/H
23	1		P-2399	Display Mounting (Top)
24	1		P-2399-1	Display Mounting (Bottom)
26	6	R2, R4, R6, R8, R10, R12	E-105-287	Resistor, 2.2K Ω
27	6	R49, R50, R51, R52, R53, R54	E-105-242	Resistor, 20K Ω
28	As Req'd			Wire Jumper

NOTE: INTERCHANGEABLE WITH AS-2518-15

AS-2518-22 SOLENOID DRIVER/VOLTAGE REGULATOR MODULE

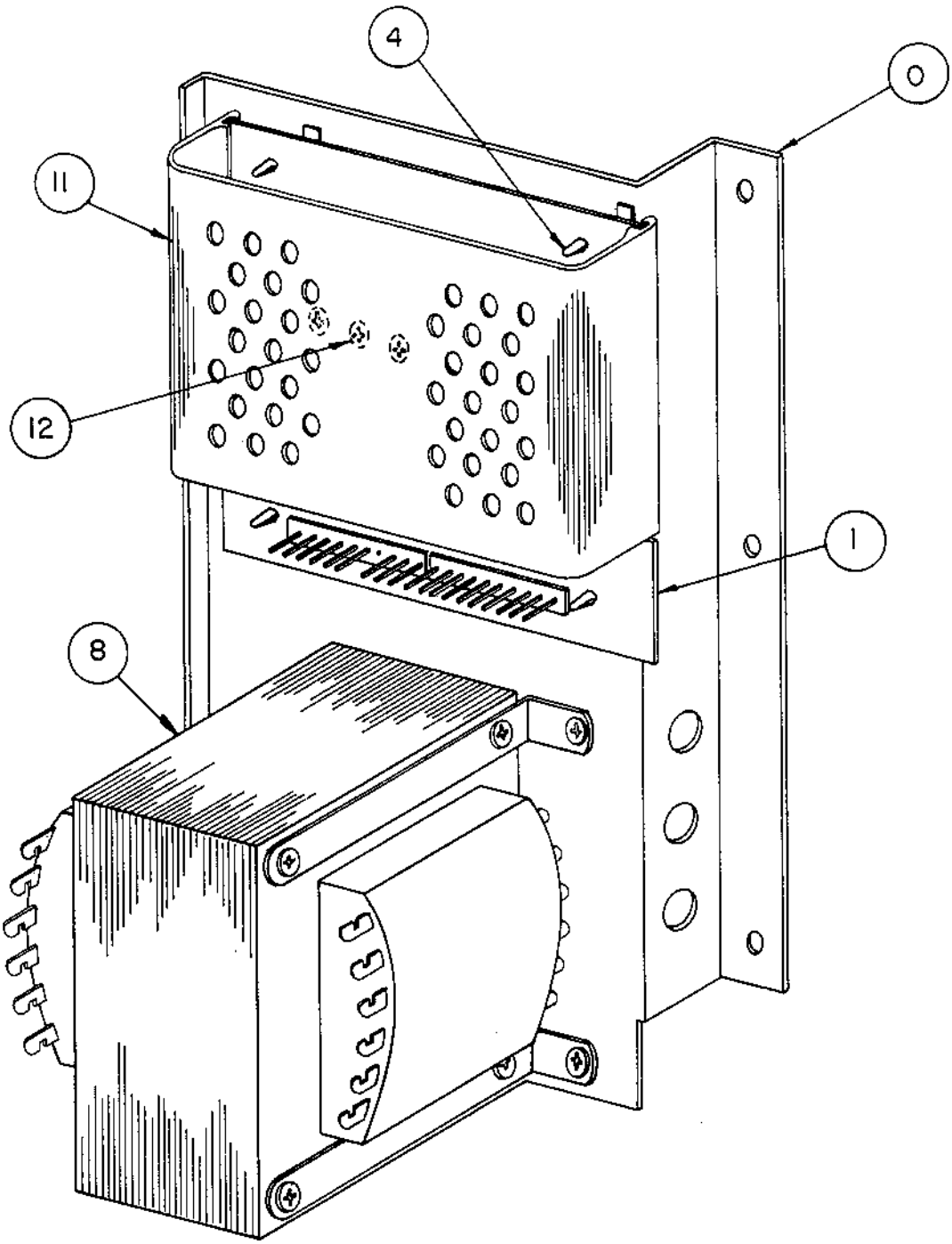


NOTE: INTERCHANGEABLE WITH AS-2518-16

A3: SOLENOID DRIVER/VOLTAGE REGULATOR MODULE
COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A3	AS-2518-22	Solenoid Driver/Voltage Regulator Module, Complete
3-14	Resistors		Resistor, See Schematic for value.
15	RT1	E-00599-0014	Pot. (Linear) 25K
17	C25	E-00586-0014	Capacitor, .1 MFD, 20V
18	C25, C29	E-00586-0059	Capacitor, 160 MFD, 350V
19	C24	E-00586-0063	Capacitor, 2 MFD @ 25V
20	C23	E-00586-0062	Capacitor, 11700 MFD, 20V
21	C1-C8, C11-C21	E-00586-0064	Capacitor, .002 MFD, 1kv
22	C22, C27, C28	E-00586-0065	Capacitor, .01 MFD, 500V
24	K1	E-00146-0795	Relay, Printed Circuit
25	Q1-Q19	E-00585-0034	Transistor, SE9302
26	Q22, Q23	E-00585-0041	Transistor, 2N3440
27	Q21	E-00585-0042	Transistor, 2N3584
28	Q20	E-00710	+5V Regulator, LAS1405 or 78H05KC or LM323K
30	CR1-CR21	E-00587-0015	Diode (IN4004)
31	VR1	E-00598-0010	Diode, Zener 140V, IN5275A
33	U1, U3, U4	E-00681	I.C. Transistor Array, CA3081
34	U2	E-00620-0039	I.C. Binary to 1/16 Decoder, 74L154
36		E-00592-0002*	Relay Socket
37		M-1839*	Relay Holder
39		E-00682	Heat Sink, TO5
40		E-00682-0001	Heat Sink, TO66
41		E-00682-0002	Heat Sink, TO3 Case
42		E-00715-0013	15 Pin Wafer Connector
43		E-00715-0016	12 Pin Wafer Connector
44		E-00715-0020	25 Pin Wafer Connector
45		E-00715-0021	9 Pin Wafer Connector
55		M-1837	Shield-Plexiglass
59		E-00148-0021	Fuse Clips
60	F1	E-00133-0029	Fuse 8 AG-3/16 Amp.

*USED WITH ITEM 24, E-00146-0791, PLUG IN RELAY ONLY

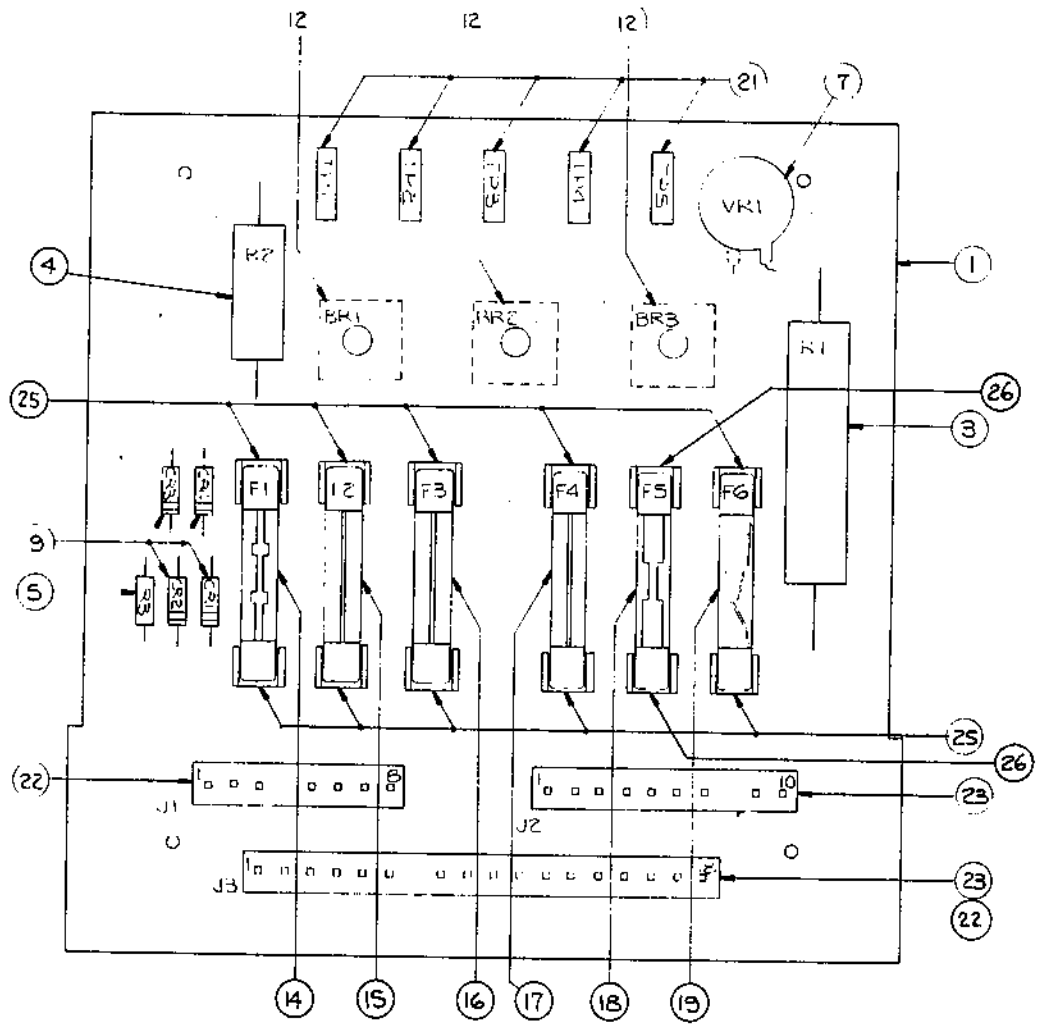


A2: POWER TRANSFORMER MODULE

COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
0	A2	AS-2877-1	Power Transformer Module, Complete
1		AS-2518-18	Rectifier Board Assembly
4		M-1829-2a	Circuit Board Support (4 Req'd.)
8		E-00122-0125c	Transformer 120/240V, 50/60 Hz
11		P-2692b	P.C.B Cover
12		M-1834	Heat Sink Compound

AS-2518-18 RECTIFIER BOARD ASSEMBLY



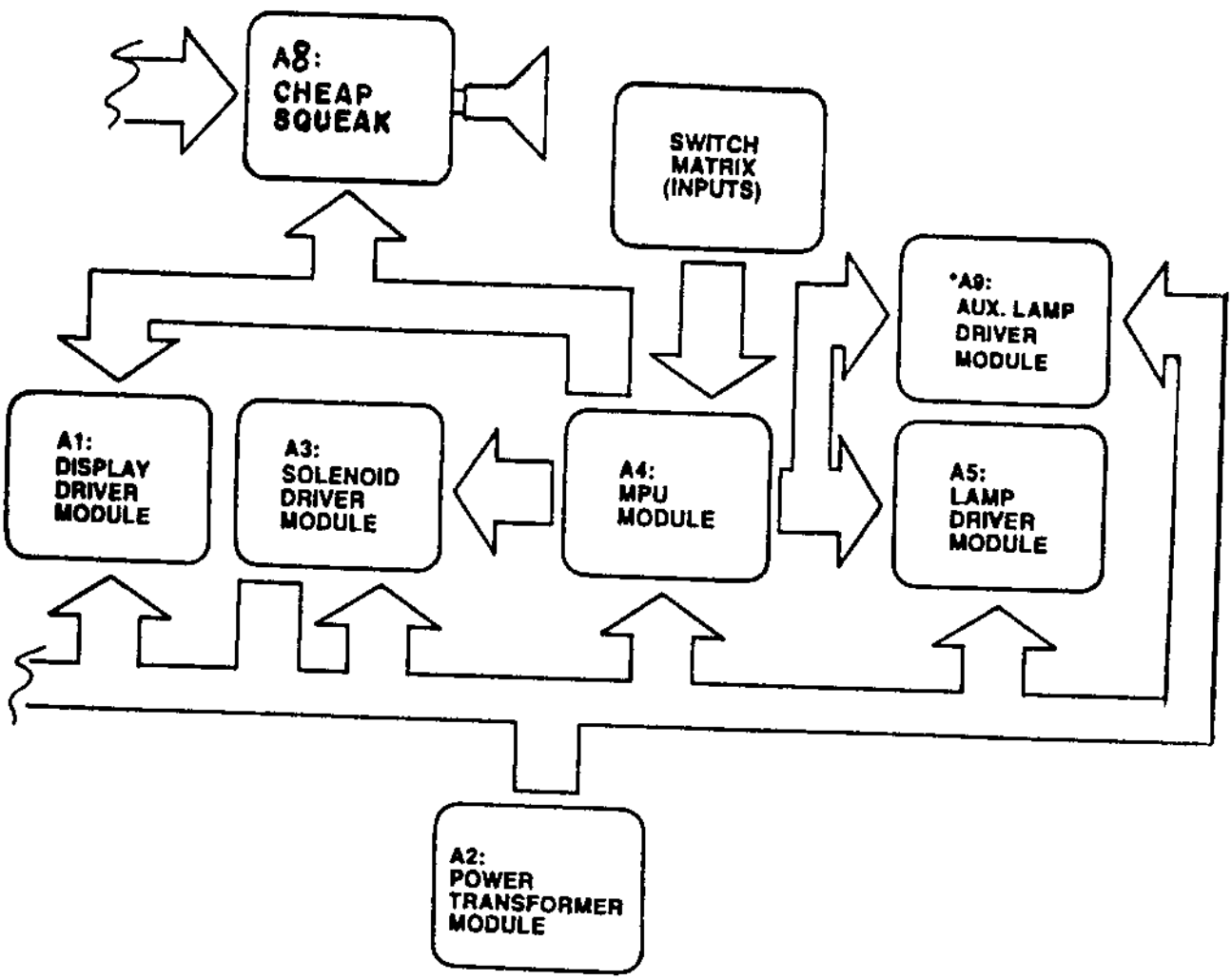
RECTIFIER BOARD ASSEMBLY
(Part of)
A2: POWER TRANSFORMER MODULE
COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	P/O A2	AS-2518-18	Rectifier Board Assembly, Complete
3	R1	E-00104-0092	Resistor, 10%, 600 Ohm, 10W
4	R2	E-00104-0091	Resistor, 25 Ohm, 5W
5	R3	E-00105-0226	Resistor, 5%, 100K Ohm, ¼W
7	VR1	E-00623	Varistor
9	CR1, CR2, CR3, CR4	E-00587-0006	Diode (IN4004)
12	BR1, BR2, BR3	E-00602-0003	Bridge Rectifier (VJ248 VARO)
14	F1	E-00133-0010	Fuse, 10A, 32V, 3AG
15	F2	E-00133-0028	Fuse, 3/4A, 250V, 3AG, S.B.
16	F3	E-00133-0004	Fuse, 4A, 32V, 3AG
17	F4	E-00133-0005	Fuse, 5A, 32V, 3AG
18	F5	E-00133-0027	Fuse, 20A, 32V, 3AG
19	F6	E-00133-0024	Fuse, 3A, 3AG, S.B.
21		E-00684	Test Point
22	J1, J3	E-00715-0010	8 Pin Wafer Connector
23	J2, J3	E-00715-0011	10 Pin Wafer Connector
25		E-00148-0021	Fuse Clips
26		E-00148-0022	Fuse Clips

Installation and General Game Operation Instructions

INDEX

BLOCK DIAGRAM—ELECTRONIC PINBALL GAME



I. INSTALLATION

Assemble the game as follows:

Bolt legs to cabinet. Bolt back box to cabinet. Use flat washers under bolt heads. Gently feed cable connectors and ground braid through cable port in back box. Screw ground braid to braid in back box. Carefully and fully insert connectors on printed circuit assemblies.

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. Cable connectors may be loosened, switches (especially tilt switches) may go out of adjustment. Plumb bob tilt switch should always be adjusted after game is set on location and leg levelers are adjusted.

Visual inspections before plugging in line cord:

1. Check that all cable connectors are completely seated on printed circuit assemblies.
2. Check that cables are clear of all moving parts.
3. Check for any wires that may have become disconnected.
4. Check switches for loose solder or other foreign material that may have come loose in shipment and could cause shorting of contacts.
5. Check wires on coils for proper soldering. Cold solder connections may not show up in factory inspection, but vibration in shipment may break contact.
6. Check that fuses are firmly seated and making good contact.
7. Check the transformer for any foreign material shorting across wiring lugs.
8. Check wiring of transformer to correspond to location voltage. See figure 1.

Check adjustment of the three (normally open) tilt switches:

1. Panel tilt on bottom of playfield panel.
2. Plumb bob tilt on left side of cabinet near front door.
3. Ball tilt above plumb bob tilt. Insert the smaller ball (15/16" dia.) into the ball tilt assembly, and adjust the bracket so the ball will roll free to contact the switch blade, if front of cabinet is

TRANSFORMER CONNECTION INSTRUCTIONS

REFER TO POWER SUPPLY SCHEMATIC IN GAME MANUAL FOR TABLE "A"

115 VAC, 2-8, 3-6, 7-10
120 VAC, 2-8, 4-6, 7-11
220 VAC, 4-8, 7-9
240 VAC, 4-8, 7-11

PART OF POWER–TRANSFORMER MODULE A2, LOCATED IN LOWER CABINET

II. GENERAL GAME OPERATION

Place ball into playfield by outhole.

Coin game. Coin should be rejected. Plug in line cord. Move power ON-OFF master switch at bottom right front corner of cabinet to 'ON' position. The game will play a power-up tune to announce game-readiness. Drop targets are reset, scores are set to zero, alternating with the 'High Score to Date,' and the game is ready for play. Coin game. The game should accept the coin and post credits* for coins accepted (adjustable). Pressing the credit button on the door will cause the outhole kicker to serve the ball to the shooter alley. The 1st player-up lite is lit. A game-up tune* is played to announce play-readiness.

One player is posted each additional time the credit button is pressed (one to four can play). The credits are reduced by one each time the credit button is pressed until the credits are reduced to zero.

Shooting the ball initiates play.

The game awards all points earned by the player. If spinner is turning and scoring when the ball hits a target, the spinner and the target scores are awarded.

When the ball enters the outhole, the bonus score is added to the total score. The player-up and/or ball in play on the back box is advanced one position. The outhole kicker serves the ball to the shooter alley and play is resumed. This continues until each player has played the allowable number of balls per game (adjustable). At this time the 'Game Over' light is lit. A random Match* number appears and the 'Match' light is lit. If the number is the same as the last two digits in a player's score, a free game is awarded.

Extra balls won during the course of the game are played immediately after the player's regular ball enters the outhole. The player-up and/or ball in play on the back box are not advanced for extra ball play. Bonus score is added to the player's score before the game serves the extra ball for play.

Scoring over 10,000,000 gives "High Score to Date" award.
At the end of the game, a 'High Score to Date' is alternately flashed with all 4 player scores. If the 'High Score to Date' is beat, this feature* awards free games.

Tilting the game results in loss of a ball. The flippers, thumper-bumpers, etc., go 'dead.' Bonus points are not scored. The purpose of the tilt penalty is to discourage the player from jostling the machine in an attempt to prolong play. Game action becomes normal after the ball kicker assembly serves the ball to the shooter alley.

Slamming the machine results in loss of the game. All feature lights go out, the game goes 'dead,' and a time delay occurs. The purpose of the time delay is to discourage unnecessary abuse of the machine. After the delay, the 'Game Over' light lites and the power-up tune is played. The time delay occurs anytime one of the slam switches is made to contact. There are two factory installed slam switches, on the front door, and one on left side of cabinet. (Any number of slam switches could be installed by the operator, to meet his individual requirement.) The switch should be adjusted to have approximately 1/16" gap between the contacts. The weighted blade should be adjusted to attain the desired sensitivity. Decreasing the gap between contacts will make the switch more sensitive. Opening the gap will reduce sensitivity.

*Some tunes and features can be disabled by operator if so desired. See Back Box Adjustments.

NOTE: Scoring and feature units will differ from game to game.

III. BOOKKEEPING FUNCTIONS

The game is designed to help the operator perform certain accounting functions. The game can display the number of total plays and replays (free games). It can display the number of coins dropped down each coin chute. The bookkeeping functions are displayed on all player score displays simultaneously. An identification number, 05 to 15, appears on the Match/Ball in Play window as follows:

05— 00 to— 40 = Current Credits
*06— 10000 to—99999 = Total Plays (Payed & Free Games)
*07— 10000 to—99999 = Total Replays (Free Games)
08— 00 to—99999 = Game Percentage
09— 00 to—99999 = Total times 'High Score to Date' is beat
*10— 10000 to—99999 = Coins Dropped thru Coin Chute #1
*11— 10000 to—99999 = Coins Dropped thru Coin Chute #2**
*12— 10000 to—99999 = Coins Dropped thru Coin Chute #3**
*13— 00 to—99999 = Number of Specials awarded from Panel Specials Only
*14— 00 to—99999 = Number of minutes of Game Play
*15— 00 to—99999 = Number of Service Credits

The game displays the first bookkeeping entry if the Self-Test button (See Fig. III) on the inside of the front door is pressed ten times. Alternately push and release the Self-Test button at one second intervals. The number 05 appears in the 'Match/Ball in Play' window. Current credits appear on the player score displays. Each additional press of the button causes the next entry to be displayed.

After the data in each bookkeeping register is recorded, it can be set to zero simply by pressing switch button S33, located on A4, the MPU module in the back box (See Fig. III), or by pressing the Coin Chute #3 switch. Any or all registers can be cleared by alternating between the Self-Test button and the switch button S33 on the MPU module or Coin Chute #3 switch. The operator is given this option as a possible convenience and can elect to use or not use it as his needs direct.

Pressing the button 5 more times causes the game to play the power-up tune and light the Game Over light.

Service credits are designed to allow the serviceman to test the game under actual play conditions without disturbing the bookkeeping records that reside at identification numbers 06, 07, 10, 11 and 12.

To obtain Service Credits, push and release the Self-Test switch until identification number 05 appears in the 'Match/Ball in Play' window. Hold in the Credit button until the desired number of Service Credits (up to five) appears on the player score displays.

NOTE: If, upon accessing identification number 05, a number of credits greater than five is displayed, pressing the credit button has no effect.

Identification number 15 is reserved as a record of the number of Service Credits used.

*The 10,000 level is pre-set at the factory; can be set to zero, initially, if desired.

**If Coin Chute is not used in game, number displayed (if other than 00) on Player Score displays has no significance.

NOTE: If "Total Play" register is reset to zeroes then "Total Replays" register should also be reset to zeroes to maintain the game percentage value.

BLACK PYRAMID
Feature Operation & Scoring

A) Top Saucer Feature
B-L-A-C-K arrows continue to flash back & forth. Their values are as follows:

From left to right 1st arrow score 25,000 spots "B" on black bonus, 2nd arrow score 5,000 flash left bumper and spots "L" on black bonus. 3rd arrow score 5,000, opens gate and spots "A" on black bonus. 4th arrow scores 5,000, flash right bumper and spots "C" on black bonus. 5th arrow score 25,000 and spots "K" on black bonus.

B) Bumpers Feature
Score 100 points unlit 1,000 points lit and 3,000 points when flashing.

C) 3 In Line Drop Target Feature
Score 5000 points each and respectively lite the 2X-3X and 5X bonus multipliers.

D) Right Roll Up Line Feature
After the drop targets were knocked down score as follows:

Black arrow immediately will start flashing if black bonus was not completed. Rolling on the button will complete all 5 lites on black bonus and pyramid bonus, and the lane at this point will either score 50,000 points every time button is lit, or will alternate with Black Pyramid for completion of more of that feature depending on switch option #24.

E) Left Roll Up Lane Feature
Roll over button scores as follows:

20,000, 30,000, 40,000, 50,000, X-Ball and Spl plus each time spot—a lite either on 200,000 pts. lite, or a lite on black bonus lite.

F) Swinger Target Feature
Spots any unlit star and unlit 200,000 lite, however, if the arrow lines up with a lit lite, target will spot a lite on black bonus.

Liting the last light on 200,000 will automatically award the player with 200,000 points. Completing the feature with one lit star will double the 200,000 value and completing the feature with 2 stars lit triples the 200,000 value, and also will give an automatic replay.

SPECIAL REPLAY/X-BALL/NOVELTY MODES
Self-test positions 16 and 17 give the operator flexibility to award a replay ball or score (Novelty) when a special is scored. A combination of X-Ball, Novelty can be obtained through the following chart.

	Set to "03"	Set to "02"	Set to "01"
Self-test position 16	AWARD	AWARD	AWARD
Playfield X-Balls and Specials	REPLAY	X-BALL*	50,000
Swinger Target Special Arrow	REPLAY	X-BALL*	50,000
Bonus Special	REPLAY	*	50,000
Left Lane Special	X-BALL	X-BALL**	25,000
Left Lane X-Ball	Set to "03"	SET TO "02"	SET TO "01"
Self-test Position 17	AWARD	AWARD	AWARD
	REPLAY	X-BALL**	25,000
Scoring Thresholds			

*50,000 if same player shoot again is lit.
**25,000 if same player shoot again is lit.

V. GAME ADJUSTMENTS

A. Playfield Panel Post Adjustments:

Posts that control left and right outlane opening on panel can be removed to make access to outlanes easier or harder for ball to enter. See Figure II.

Easier entry will decrease playing time and scoring (conservative).
Harder entry will increase playing time and scoring (liberal).

B. Back Box Game Adjustments:

Each game has thirty-two switches located on A4, the MPU module, located in the back box, that allow play to be customized to the location. See Figure III. Credits per coin, maximum credits, credit display, balls per game, match feature, high game feature, special award and melody are selectable by means of the switches. The switches are contained in four-sixteen lead packages numbered S1-8, S9-16, S17-24, and S25-32 for easy identification. The "ON" toggle position is marked on the assembly. **Turn off power before making adjustments.**

Credits/Coin Adjustments:

The credits per coin are selectable by means of S17-S20 for coin chute #2 (Center). The switch settings and resultant credits/coin are as follows:

S20	S19	S18	S17	Credits/Coin
OFF	OFF	OFF	OFF	Same as Coin Chute #1 Settings
OFF	OFF	OFF	ON	1/1 Coin
OFF	OFF	ON	OFF	2/1 Coin
OFF	OFF	ON	ON	3/1 Coin
OFF	ON	OFF	OFF	4/1 Coin
OFF	ON	OFF	ON	5/1 Coin
OFF	ON	ON	OFF	6/1 Coin
OFF	ON	ON	ON	7/1 Coin
ON	OFF	OFF	OFF	8/1 Coin
ON	OFF	OFF	ON	9/1 Coin
ON	OFF	ON	OFF	10/1 Coin
ON	OFF	ON	ON	11/1 Coin
ON	ON	OFF	OFF	12/1 Coin
ON	ON	OFF	ON	13/1 Coin
ON	ON	ON	OFF	14/1 Coin
ON	ON	ON	ON	15/1 Coin

The credits given are selectable by means of switches 1-5 incl., for coin chute #1 and switches 9-13 incl., for coin chute #3. Thirty-one different credit ratios are available for each coin chute. The switch settings and resultant credits/coin are listed below.

CREDITS/COIN ADJUSTMENTS

COIN CHUTE	SWITCHES					CREDITS	CREDITS	CREDITS	CREDITS	CREDITS	
#1 (HINGE SIDE)	5	4	3	2	1						
OR #3	13	12	11	10	9						
(RIGHT SIDE)	OFF	OFF	OFF	OFF	OFF	1/1 Coin					
	OFF	OFF	OFF	OFF	ON	2/1 Coin					
	OFF	OFF	OFF	ON	OFF	3/1 Coin					
	OFF	OFF	OFF	ON	ON	4/1 Coin					
	OFF	OFF	ON	OFF	OFF	5/1 Coin					
	OFF	OFF	ON	OFF	ON	6/1 Coin					
	OFF	OFF	ON	ON	OFF	7/1 Coin					
	OFF	OFF	ON	ON	ON	8/1 Coin					
	OFF	ON	OFF	OFF	OFF	9/1 Coin					
	OFF	ON	OFF	OFF	ON	12/1 Coin					
	OFF	ON	OFF	ON	OFF	14/1 Coin					
	OFF	ON	OFF	ON	ON	1/2 Coins*					
	OFF	ON	ON	OFF	OFF	2/2 Coins*					
	OFF	ON	ON	OFF	ON	3/2 Coins*					
	OFF	ON	ON	ON	OFF	4/2 Coins*					
	OFF	ON	ON	ON	ON	5/2 Coins*					
	ON	OFF	OFF	OFF	OFF	6/2 Coins*					
	ON	OFF	OFF	OFF	ON	7/2 Coins*					
	ON	OFF	OFF	ON	OFF	8/2 Coins*					
	ON	OFF	OFF	ON	ON	9/2 Coins*					
	ON	OFF	ON	OFF	OFF	12/2 Coins*					
	ON	OFF	ON	OFF	ON	14/2 Coins*					3/2
	ON	OFF	ON	ON	OFF	1/1st Coin	2/2nd Coin				3/4
	ON	OFF	ON	ON	ON	0/1st Coin*	1/2nd Coin	1/3rd Coin	1/4th Coin		3/4
	ON	ON	OFF	OFF	OFF	0/1st Coin*	1/2nd Coin	0/3rd Coin**	2/4th Coin		5/4
	ON	ON	OFF	OFF	ON	1/1st Coin	1/2nd Coin	1/3rd Coin	2/4th Coin		7/4
	ON	ON	OFF	ON	OFF	1/1st Coin	2/2nd Coin	1/3rd Coin	3/4th Coin		7/4
	ON	ON	OFF	ON	ON	1/1st Coin	2/2nd Coin	2/3rd Coin	2/4th Coin		1/3
	ON	ON	ON	OFF	OFF	0/1st Coin***	0/2nd Coin***	1/3rd Coin			1/4
	ON	ON	ON	OFF	ON	0/1st Coin**	0/2nd Coin**	0/3rd Coin**	1/4th Coin		1/5
	ON	ON	ON	ON	OFF	0/1st Coin****	0/2nd Coin****	0/3rd Coin****	0/4th Coin****	1/5th Coin	2/5
	ON	ON	ON	ON	ON	0/1st Coin***	0/2nd Coin***	1/3rd Coin	0/4th Coin****	1/5th Coin	

*No Credits until 2nd coin is dropped.
**No Credits until 4th coin is dropped.
***No Credits until 3rd coin is dropped.
****No Credits until 5th coin is dropped.

0A44 BLACK PYRAMID
GAME FEATURE OPTIONS

Bonus Special Per Game						
Liberal	SW 6	ON	Unlimited Spls Earned			
Conservative	SW 6	OFF	Only 1 Spl Earned			
Left Lane Extra Ball Build Up Adjustment						
Most Conservative	SW 7	OFF	SW 8	OFF	90K	
Conservative	SW 7	ON	SW 8	OFF	80K	
Liberal	SW 7	OFF	SW 8	ON	70K	
Most Conservative	SW 7	ON	SW 8	ON	50K	
M & I Return Lanes						
Liberal	SW 14	ON	Lanes Tied Together			
Conservative	SW 14	OFF	Lanes Separated			
Left Roll Up Lane 20,000 pts.						
Liberal	SW 21	ON	Initially Lit			
Conservative	SW 21	OFF	Initially Unlit			
Bonus Spl						
Most Liberal	SW 22	ON	SW 23	ON	Spl On w/60K	
Liberal	SW 22	OFF	SW 23	ON	Spl On w/120K	
Conservative	SW 22	ON	SW 23	OFF	Spl ON after 120K	
Conservative	SW 22	OFF	SW 23	OFF	Spl On after 120K	
Right Lane 50,000 pts.						
Liberal	SW 24	ON	50 K Alternatives with Black Pyramid Arrows			
Conservative	SW 24	OFF	50K does not Alternate with Black Pyramid Arrows			

C. FRONT DOOR GAME ADJUSTMENTS

High Score Feature Adjustments:

The game is designed to award an extra ball (option) of a free game at each of three score levels. The recommended levels are on the score card in the game.

Any level from 10,000 to 990,000 can be set, as desired. It is also possible to reset or turn off (00) any or all of the levels, if desired.

1. Push and release Self-Test button (See Figure III) at one second intervals approximately six times or until identification number 01 appears on the 'Match/Ball in Play' display.

2. The number on the Player Score Displays is the score level.* It can be increased, if desired, by holding the credit button in. To decrease the score level, hold the credit button in and depress and rlease the Self-Test button. Release the credit button when the desired number appears. Note that the level changes 10,000 points at a time. If the number '00' is left on the displays, the high score feature is eliminated for that level.

3. Repeat steps 1 and 2 for the second and third score levels. The identification numbers '02' and '03' on the Match/Ball in Play display are for the second and third levels, respectively.

High Score to Date and 10,000,000 Feature:

The game is designed to award free games when 'High Score to Date' is beat, or if the player exceeds 10,000,000 points.

It is recommended that the level, which will build with play, be periodically reset to the factory recommended level to encourage game play. The adjustment procedure is the same as for the High Score Feature Adjustment, Steps 1 and 2. Continue pushing the Self-Test button until the identification number '04' appears on the 'Match/Ball in Play' display and then do Step 2.

Any level from '00' to 9,990,000 can be set as described. It is to be noted that '00' does NOT turn off the feature, as it does on High Score feature. The feature is turned off by self test position 19 as discussed under 'Back Box Game Adjustments.'

SELF TEST SETUP FOR 16-19:

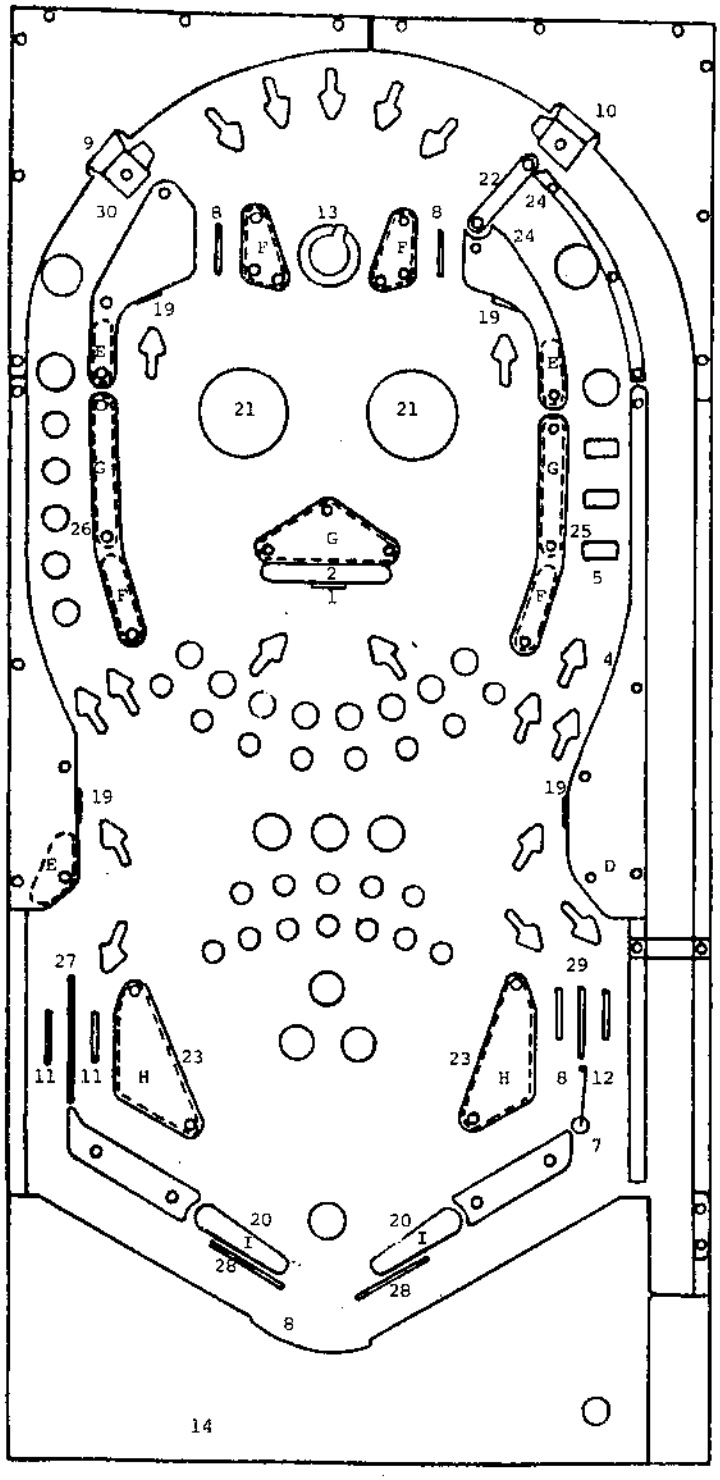
To set up positions 16-19 push and release self test button till 16 shows on match/ball in play. Now pulse replay button for recommended setup from "00" thru "03." Repeat for positions 17, 18 or 19.

SOUND

In addition to game sounds, there is also a Master Volume Control located on the front door. (refer to page 10)

Please note that these module volume controls should be adjusted prior to setting the control on the front door.

*Can be quickly set to '00' by pressing S33 on the MPU assembly in the back box or Coin Chute switch #3. (See Figure III.)



OA44 BLACK PYRAMID RUBBER PARTS

A.	17-41-633	(2) POST
B.	17-41-637	(10) POST
C.	17-41-641	(2) POST
D.	17-41-642	(1) ¾" DIA.
E.	17-41-643	(3) 1" DIA.
F.	17-41-644	(4) 1½" DIA.
G.	17-41-645	(3) 2" DIA.
H.	17-41-646	(2) 2½" DIA.
I.	17-41-687	(2) FLIPPER (AMBER)

PANEL TOP PARTS

1.	Swinger Target Assy.	AA44-00012-0
2.	Slide Guide Assy.	AA44-00021-0
3.	Ball Guide Assy.	AA44-00025-0
4.	Ball Guide Assy.	AA44-00026-0
5.	3-In Line Drop Target	AA44-00028-0
6.	Eject Hole Assy.	AA44-00034-0
7.	Free Gate Relay Assy.	AA44-00036-0
8.	Wire Actuator Assy.	A331-00042-0
9.	Ball Gate Assy. (Left)	A360-00022-0
10.	Ball Gate Assy. (Right)	A360-00023-0
11.	Wire Actuator Assy. (Right)	A360-00216-0
12.	Wire Actuator Assy. (Right)	A390-00044-0
13.	Wire Actuator Assy.	A360-00217-0
14.	Top Mounted Kicker (Ball Rtn)	A360-00234-0
15.	Switch & Diode Assy.	A360-00239-0
16.	Switch & Diode Assy.	A360-00241-0
17.	Switch & Diode Assy.	A360-00243-0
18.	Switch & Diode Assy.	A360-00244-0
19.	Target SW, Brkt. & Diode Assy.	A390-00034-0
20.	Mold Flipper Assy.-Wht-Purch.	A967-00031-0
21.	Thumper Bumper Assy.	A967-00053-0
22.	Ball Gate Wire Assy.	A967-00057-0
23.	Slingshot Kicker Coil Assy.	A967-00059-0
24.	Ball Guide Wire 6 19/64	A44-00100-0
25.	Ball Guide Wire 6 9/32 RT	A44-00106-0100
26.	Ball Guide Wire 6 9/32 LT	A44-00106-0200
27.	Ball Guide Wire L 3 5/8"	360-00175-0106
28.	Buffer Wire L 2 3/8"	360-00175-5300
29.	Ball Guide Wire 2"	360-00175-5600
30.	Ball Guide Wire 2 7/8"	360-00175-6500

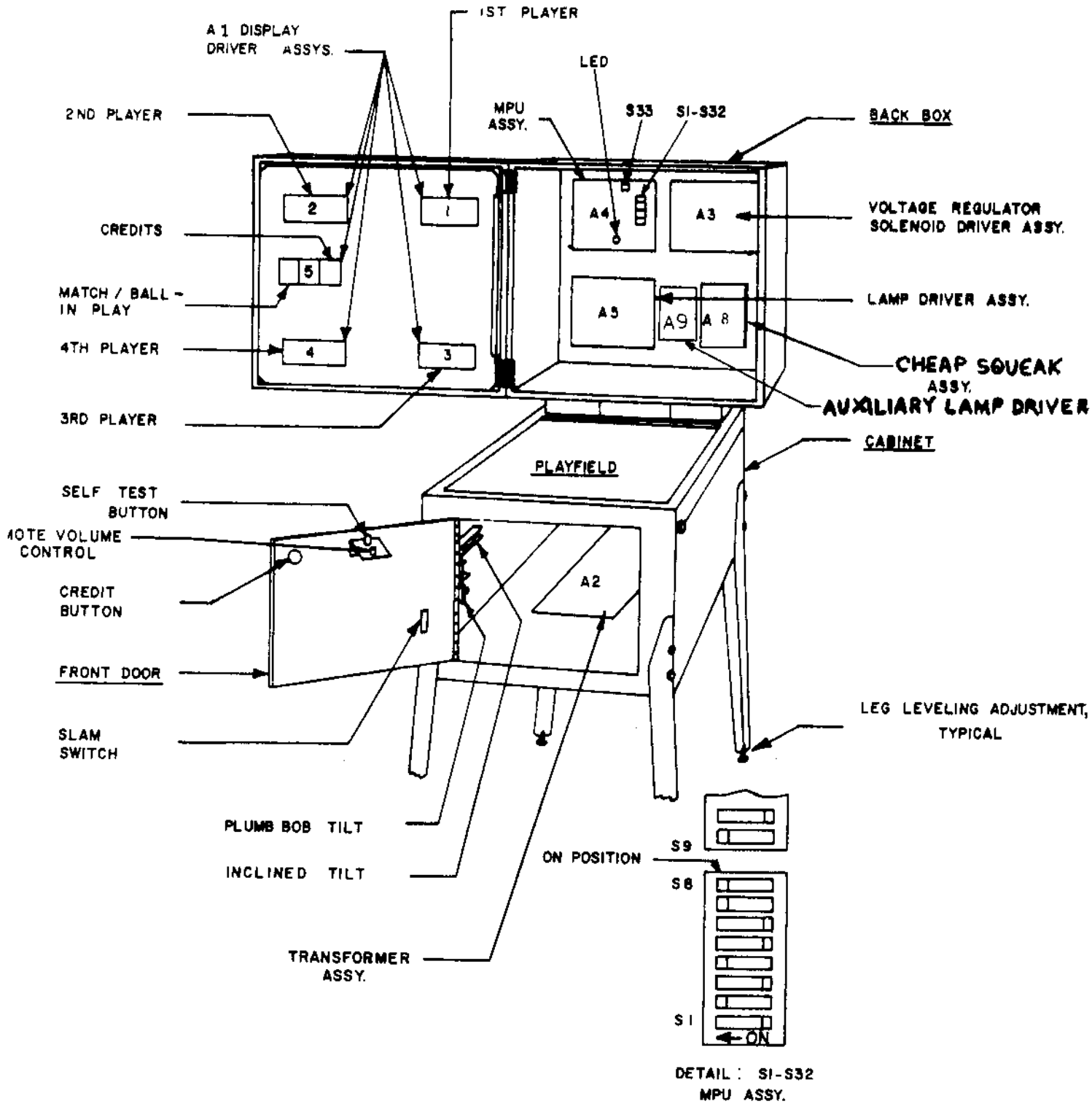


FIGURE III. ELECTRONIC PIN BALL MACHINE

RECOMMENDED

Instructions, Score Cards and High Score Feature Settings
to be used on **Black Pyramid 0A44**

REPLAYS
Instruction Card — M-051-00A44-A030
Score Card — M-051-00A44-A038

1 Replay at 1,220,000
1 Replay at 2,400,000

3-BALL

REPLAYS
Instruction Card — M-051-00A44-A030
Score Card — M-051-00A44-A039

1 Replay at 2,000,000
1 Replay at 3,000,000

5-BALL

EXTRA BALL
Instruction Card — M-051-00A44-A031
Score Card — M-051-000A44-A039
W/M-051-000A44-A073

1 Extra Ball at 2,300,000
1 Extra Ball at 3,400,000

ADDITIONAL CARDS

REPLAYS

M-051-00A44-A040	700,000	1,600,000
M-051-00A44-A041	800,000	1,700,000
M-051-00A44-A042	900,000	1,800,000
M-051-00A44-A043	1,000,000	1,900,000
M-051-00A44-A044	1,000,000	2,000,000
M-051-00A44-A045	1,100,000	2,100,000
M-051-00A44-A046	1,200,000	2,200,200
M-051-00A44-A047	1,200,000	2,300,000
M-051-00A44-A048	1,200,000	2,500,000
M-051-00A44-A049	1,300,000	2,500,000
M-051-00A44-A050	1,400,000	2,600,000
M-051-00A44-A051	1,500,000	2,700,000
M-051-00A44-A052	1,600,000	2,800,000
M-051-00A44-A053	1,700,000	2,800,000
M-051-00A44-A054	1,800,000	2,900,000
M-051-00A44-A055	1,900,000	2,900,000
M-051-00A44-A056	2,000,000	3,200,000
M-051-00A44-A057	2,100,000	3,300,000
M-051-00A44-A064	2,200,000	3,500,000
M-051-00A44-A065	2,300,000	3,600,000
M-051-00A44-A066	2,400,000	3,800,000
M-051-00A44-A067	2,500,000	4,000,000

EXTRA BALL

M-051-00A44-A072	1,900,000	3,100,000
M-051-00A44-A073	2,300,000	3,400,000
M-051-00A44-A074	2,500,000	3,700,000
M-051-00A44-A075	2,700,000	3,900,000

Instruction Card Novelty

M-051-00A44-A032
M-051-00A44-A037
M-051-00A44-A036

BLANKS (3)
High Game to date recommended levels:
(reset periodically)
3 BALL 2,700,000
5 BALL 3,200,000

Black Pyramid OA44

RECOMMENDED SWITCH SETTING FOR 3 AND 5 BALL

		3 Ball	5 Ball
BONUS SPL PER GAME	SW 6	ON	ON
UNLIMITED			
LEFT LANE EXTRA-BALL	SW 7	ON	OFF
LITE ON	SW 8	ON	ON
M & I RETURN LANES	SW 14	OFF	OFF
LEFT LANE 20K LITE	SW 21	ON	ON
BONUS SPL ON	SW 22	ON	OFF
	SW 23	ON ON	
RIGHT LANE 50K	SW 24	ON	OFF
ALTERNATE			
BALLS PER GAME	SW 31	OFF	ON
	SW 32	OFF	OFF

REPLAYS	**3-BALL**	**5-BALL**
Instruction Card	M-051-00A44-A030	M-051-00A44-A030
Score Cards	M-051-00A44-A038	M-051-00A44-A039
Major Mode	Self-Test Position 16, 17 Set to "03"	Self-Test Position 16, 17 Set to "03"
Match	Sw.28 ON	SW.28 ON
High Score to Date	Self-Test Position 19 Set to "03"	Self-Test Position 19 Set to "03"

X-BALL	
Instruction Card	M-051-00A44-A031
Score Card	M-051-00A44-A039- W/M-051-00A44-A073
Major Mode	Self-Test Position 16, 17 Set to "02"
Match	SW.28 OFF
High Score to Date	Self-Test Position 19 Set to "00"

Novelty		
Instruction Card	M-051-00A44-A032	M-051-00A44-A032
Score Card	M-051-00A44-A036	M-051-00A44-0037
Major Mode	Self-Test Position 16, 17 Set to "01"	Self-Test Position 16, 17 Set to "01"
Match	SW.28 OFF	SW.28 OFF
High Score to Date	Self-Test Position 19 Set to "00"	Self-Test Position 19 Set to "00"

VIII. ROUTINE MAINTENANCE ON LOCATION:

Self-Test routines are written into the game design. They are particularly useful for routine maintenance. The tests are described below. The first test is automatic and occurs on power-up. This test causes the MPU module A4 to examine itself for failures. Seven flashes of an LED indicates proper operation. The second series of self-diagnostic tests causes the MPU to 'exercise' each of the other modules in such a way as to make their faults, if any, obvious. See Figure III and Page ii.

It is recommended that these tests be used several times a week to check out the games before play. If faults are discovered, they may be corrected on location if the operator has a stock of replacement modules. See "Trouble Shooting on Location."

MPU Module Self-Test:

At power on, the LED on the MPU module flashes once. (Flicker-Flash.) After a pause, it flashes six more times and goes out. A power-up tune is played to announce game readiness. This indicates proper MPU operating condition and successful completion of the power-up test.

Game Self-Diagnostic Tests:

1. Pressing the Self-Test button inside the door initiates the Self-Test routine. See Figures III and IV. All switched lamps flash off and on continuously.

2. Pressing the Self-Test button again causes each digit on each display to cycle from 0 thru 9, and repeat continuously.

3. Pressing the Self-Test button again causes each solenoid to be energized, one at a time, in a continuous sequence. Hold both flipper buttons 'in' during this test. The number appearing on the Player Score displays is the same as the number assigned to the solenoid. The sound of a solenoid pulling-in as a number appears indicates proper operation. The absence of sound is improper. If sound is absent, see Page 17 for help in Solenoid identification.

4. Pressing Self-Test button again causes the sound module to play same tune repeatedly.

5. Pressing the Self-Test button again causes the MPU to search each switch assembly for stuck contacts. If any are found, the number of the first set encountered is flashed on the Player Score displays. The number remains until the fault is cleared. See Page 17 for help in Stuck Switch identification. Other numbers may follow if more stuck contacts are present. If there are no stuck switches, the Match/Ball in Play display flashes '0'.

6. Pressing the Self-Test button 20 more times causes the MPU to step thru the threshold and bookkeeping functions described previously and finally to repeat the power-up test. For more rapid exit to power-up, turn the game off, then on. The game is now ready to play.

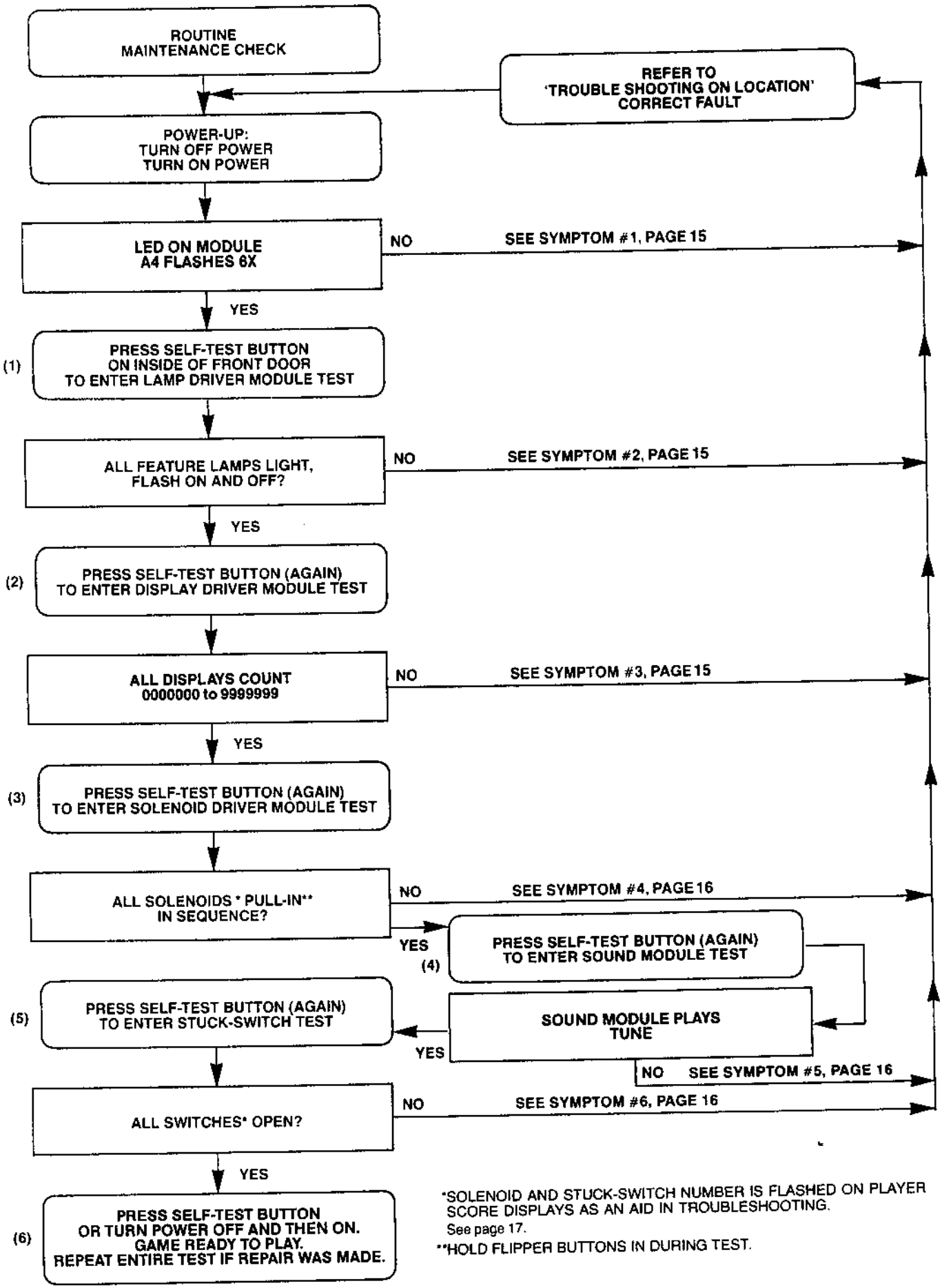
After successful completion of the Self Diagnostic Test procedure, set the game up for play. Exercise each rollover, thumper-bumper, slingshot, etc., by hand until each switch assembly on the playfield has been checked for proper operation. If actuating a switch assembly results in intermittent or no response, clean contacts by gently closing them on a clean business card or piece of paper and wiping until they wipe clean. Regap, if necessary, to 1/16". **Do not burnish or file Gold Plated Switch Contacts.**

IX. TROUBLESHOOTING ON LOCATION

The game is designed to make troubleshooting easy. Several simple procedures are given herein that cover the greatest percentage of game failures. They are written for an operator on location and require module replacement. (See Figure III) Symptoms and the action to be taken are given for each type of problem.

If the problem is more complicated and is not solved by following this procedure, more detailed procedures are available from Bally. See the Parts List for ordering information.

FIGURE IV. SELF-DIAGNOSTIC TEST MPU A4



*SOLENOID AND STUCK-SWITCH NUMBER IS FLASHED ON PLAYER SCORE DISPLAYS AS AN AID IN TROUBLESHOOTING.
See page 17.

**HOLD FLIPPER BUTTONS IN DURING TEST.

1A) **SYMPTOM:** Game does not play power-up tune when power is turned on. General Illumination is present.

ACTION: **A)** Turn power OFF. Open back box. Locate light emitting diode (LED) on MPU module A4.

B) Turn Power ON. LED must flash 7X to indicate that module A4 is good. Correct flash sequence is flicker/flash-pause-and then six more flashes and LED goes out.

C. If LED does not come on, or does not flash, or flashes, but less than 7X, turn off power. Replace MPU module A4.

CAUTION: **Replacement MPU Module must have same Part Number or incorrect operation will result! See Parts List for MPU Module Part Number.**

Turn power ON.

D) If game is correct, it is now ready for play. If game is not correct, refer to Module Replacement procedure. (See Parts List.)

2A) **SYMPTOM:** Not all feature lamps light during game play.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) once. If the game is correct, **all** feature lamps flash ON and OFF.

B) Carefully raise playfield or open back box to gain access to lamps.

C) Replace bulbs that do not flash.

D) If game is correct, it is now ready for play.

E) If game is not correct, turn power OFF. Replace Lamp Driver Module A5. Turn power ON and repeat A.

F) If game is correct, if is now ready for play.*

G) If game is not correct, turn power OFF. Replace MPU module A4. See CAUTION, 1C. Turn power ON and repeat A.

H) If game is correct, it is now ready for play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)

2B) **SYMPTOM:** One or some switched lamps always ON.

ACTION: Repeat 2AA, AB, AE, and AF and, if necessary AG & AH.

3A) **SYMPTOM:** Display digits improper on **one** or **several,** but less than all Display Driver module(s), A1. Improper: One or several segments always OFF, digits mottled or several segments or digit(s) always ON.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) twice. If the game is correct, each digit on each Display Driver Module A1 (5 used/game) displays the count 1-9 and 0 continuously in all 6 digit positions. Note defective Display Driver modules.

B) Turn power OFF.

CAUTION: High Voltage is supplied to the Display Driver Modules, A1, from the Solenoid Driver/Voltage Regulator Module A3. Wait 30 seconds for High Voltage to Bleed Off.

C) Replace Display Driver module(s) A1. Turn power ON. Repeat A.

D) If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)

3B) **SYMPTOM:** **All** displays improper (all five display Driver modules). Improper: Digit(s) always on or off/segment(s) always on or off, all displays.

ACTION: **A)** Repeat 3AA, and AB.

B) Replace MPU module A4. See CAUTION NOTE, 1C. Turn power ON. Repeat A.

C) If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement procedure. (See Parts List.)

3C) **SYMPTON:** One or several displays always off.

ACTION: **A)** Do 3AA, AB, AC, and AD.

B) Repeat 3BB and BC, if necessary.

4A) **SYMPTOM:** Solenoid(s) do(es) not pull-in during course of game.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) three times.

B) If game was correct, each solenoid would be energized. A number is flashed on the Player Score displays as each solenoid is pulsed. Note any numbers that do not have the sound of a solenoid associated. See Solenoid Identification Table, Page 17 and Figure V.

C) Carefully lift the playfield (or open the back box) to gain access to the solenoid. Turn power OFF. Inspect the solenoid.

D) If a lead is broken off, repair. Repeat A & B. If game is correct, it is now ready for play.* If solenoid wiring was correct, turn power OFF.

E) Replace Solenoid Driver/Voltage Regulator module A3. See CAUTION NOTE 3AB.

F) Repeat AA & AB. If game is correct, it is now ready to play.* If game is not correct, turn power OFF.

G) Replace Sound Module A8.

H) Repeat AA and AB if game is correct. It is now ready to play. If game is not correct, turn power OFF."

I) Replace MPU module A4. See CAUTION NOTE, 1C.

J) Repeat A & B. If game is correct, it is now ready to play.* If game is not correct, refer to Module Replacement Procedure. (See Parts List.)

4B) **SYMPTOM:** Solenoid(s) always energized—Note: if impulse solenoids (ball ejects, slingshots, thumper-bumpers, etc.) are energized continuously, they are subject to damage. Limit troubleshooting to one minute with power ON, followed by **five minutes with power OFF.** Repeat as necessary. Replace damaged solenoids.

ACTION: Do 4AA, AB, AE, AF, AG, AH and if necessary, AI and AJ.

5) **SYMPTOM:** No Sound.

ACTION: **A)** With Power ON, open front door, press Self-Test switch four times.

B) Turn volume control clockwise to Max.

C) If correct, sound will be heard. If incorrect, try seating speaker lead connector (J2) and input connector (J1).

D) If correct, sound will be heard. If incorrect, refer to Module Replacement procedure."

6) **SYMPTOM:** Feature (Drop Targets, etc.) does not score.

ACTION: **A)** With power ON, open front door. Press button (Self-Test switch) five times.

B) If the game is correct, Match/Ball in Play display would flash '0.' If a number appears on the Player Score displays, see Switch Assembly Identification Table, Page 17 and Figure V.

C) Carefully lift the playfield. Locate the switch assembly identified from the number. Visually inspect the switch assembly. If the contacts are 'stuck,' regap them to 1/16". See section under ADJUSTMENTS. Repeat A & B. If the game is correct, it is now ready to play.* If game is not correct, turn the power OFF.

D) Replace MPU module A4. See CAUTION NOTE 1, C.

E) Repeat A & B. If the game is correct, it is now ready to play.* If the game is not correct, refer to Module Replacement Procedure. (See Parts List).

7) **SYMPTOM:** Game blows fuse(s) repeatedly.

ACTION: See Module Replacement Procedure. F.O. 560

*Turn power On-Off switch OFF and then ON.,

GAME #A44 BLACK PYRAMID
SOLENOID IDENTIFICATION TABLE

Self Test #	SOLENOID IDENTIFICATION	Self Test #	SOLENOID IDENTIFICATION
01	LEFT SLINGSHOT	07	OUTHOLE
02	RIGHT SLINGSHOT	08	KNOCKER
03	LEFT THUMPER BUMPER	09	GATE
04	RIGHT THUMPER BUMPER	10	COIN LOCKOUT DOOR
05	SAUCER	11	K1 RELAY (FLIPPER ENABLE)
06	DROP TARGET RESET		

SWITCH ASSEMBLY SELF—TEST DISPLAY NUMBERS

Switch Self Test #	DESCRIPTION	Switch Self Test #	DESCRIPTION
01	LEFT SLINGSHOT	17	TOP LEFT BUMPER LANE
02	RIGHT SLINGSHOT	18	"P" TARGET
03	LEFT THUMPER BUMPER	19	"Y" TARGET
04	RIGHT THUMPER BUMPER	20	"R" TARGET
05	SWINGER TARGET	21	"A" TARGET
06	CREDIT BUTTON	22	"M" RETURN LANE
07	SAUCER	23	"I" RETURN LANE
08	OUTHOLE	24	TOP RIGHT BUMPER LANE
09	COIN III (RIGHT)	25	
10	COIN I (LEFT)	26	
11	COIN II (MIDDLE)	27	
12	30 POINT REBOUND (2)	28	GATE OUT LANE
13	TOP LEFT R.O. BUTTON	29	LEFT OUT LANE
14	TOP RIGHT R.O. BUTTON	30	2X IN LINE DROP TARGET
15	TILT	31	3X IN LINE DROP TARGET
16	SLAM	32	5X IN LINE DROP TARGET

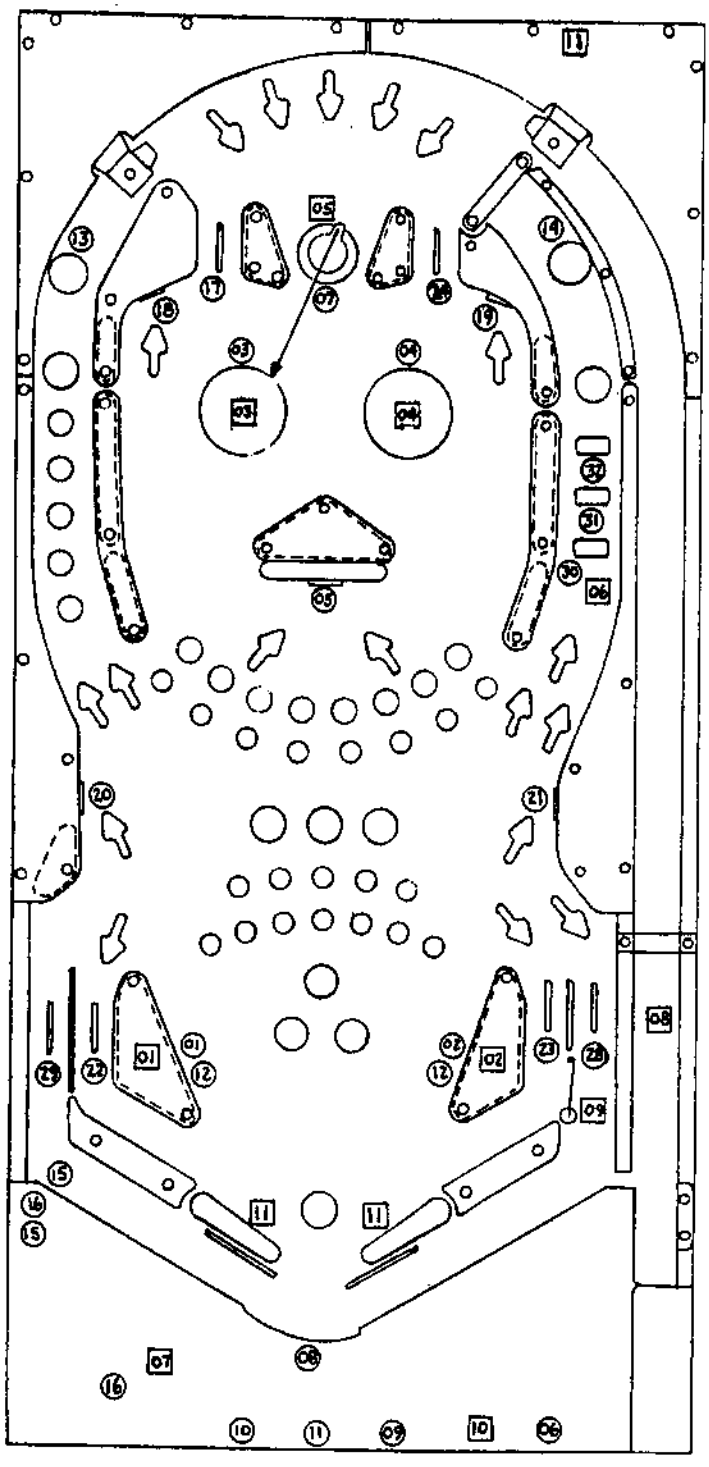


FIGURE V

#OA44 Black Pyramid

○ INDICATES SWITCH ASSEMBLY IDENTIFICATION NUMBERS
○ NOTE: CABINET: 15, 16,
DOOR: 06, 09
10, 11, 16

□ INDICATES SOLENOID IDENTIFICATION NUMBERS
NOTE: DOOR: 10
BACKBOX: 11
CABINET: 08

VECTOR SHOWING FOR EJECT SAUCER

BALL SHOULD EXIT TO RIGHT SIDE OF LEFT THUMPER AS SHOWN

ASSEMBLY ADJUSTMENTS:

GENERAL:

All switch assemblies consist of leaf springs, contacts, separators, plastic tubing and screws to hold them to the mounting surface. Before attempting to adjust a switch assembly, make sure that these screws are tight. If not, tighten screw closest to the contact end of the leaf spring first. This will prevent the assembly from being secured in such a manner that the leaf springs tend to fan out. In general, all leaf springs are adjusted for a 1/16" gap in the open position and .010" over-travel or wipe in the closed position. All contacts should be in good condition. Unless otherwise instructed, they should be dry or non-lubricated. All contacts should be free of dust and dirt. Contacts, with the exception of the flipper button switch assemblies, are plated to resist corrosion. Filing or burnishing breaks the finish and encourages corrosion. Clean by closing the contacts over a clean piece of paper (e.g., a business card) and wiping gently until the contacts are clean. For the flipper button switch assemblies **ONLY:** Tarnish can be removed with a contact file followed by burnishing tool. Severely pitted contacts must be replaced as an assembly. In general, contacts need be cleaned or replaced and adjusted only when they are found to be a source of game malfunction.

X. SERVICE PARTS:

A parts catalogue is available upon request. The catalogue is illustrated and lists all replacement parts for each game manufactured by Bally. Requests should be addressed to:

BALLY MIDWAY MFG. CO.
10601 WEST BELMONT AVENUE
FRANKLIN PARK, ILLINOIS 60131
ATTN: PARTS DEPARTMENT

SERVICE HINTS:

The Bally playfield has an improved tuff-coat finish with excellent wearing properties. Its life expectance, as well as play appeal, can be extended by periodic cleaning of the playfield.

DO: Bally recommends you clean your playfield with Wildcat #125 (Wildcat Chemical Co., 1333 W. Seminary Drive, Ft. Worth, Texas 76115). Wildcat #125 is a combination cleaner and polish. Bally has tried and tested this product and found it to be very effective. If Wildcat #125 is not available, Bally suggests you ask your Distributor to order it. Inspect and hand polish the ball in a clean cloth. A chipped ball must be replaced. It can ruin the finish on the playfield in a short period of time.

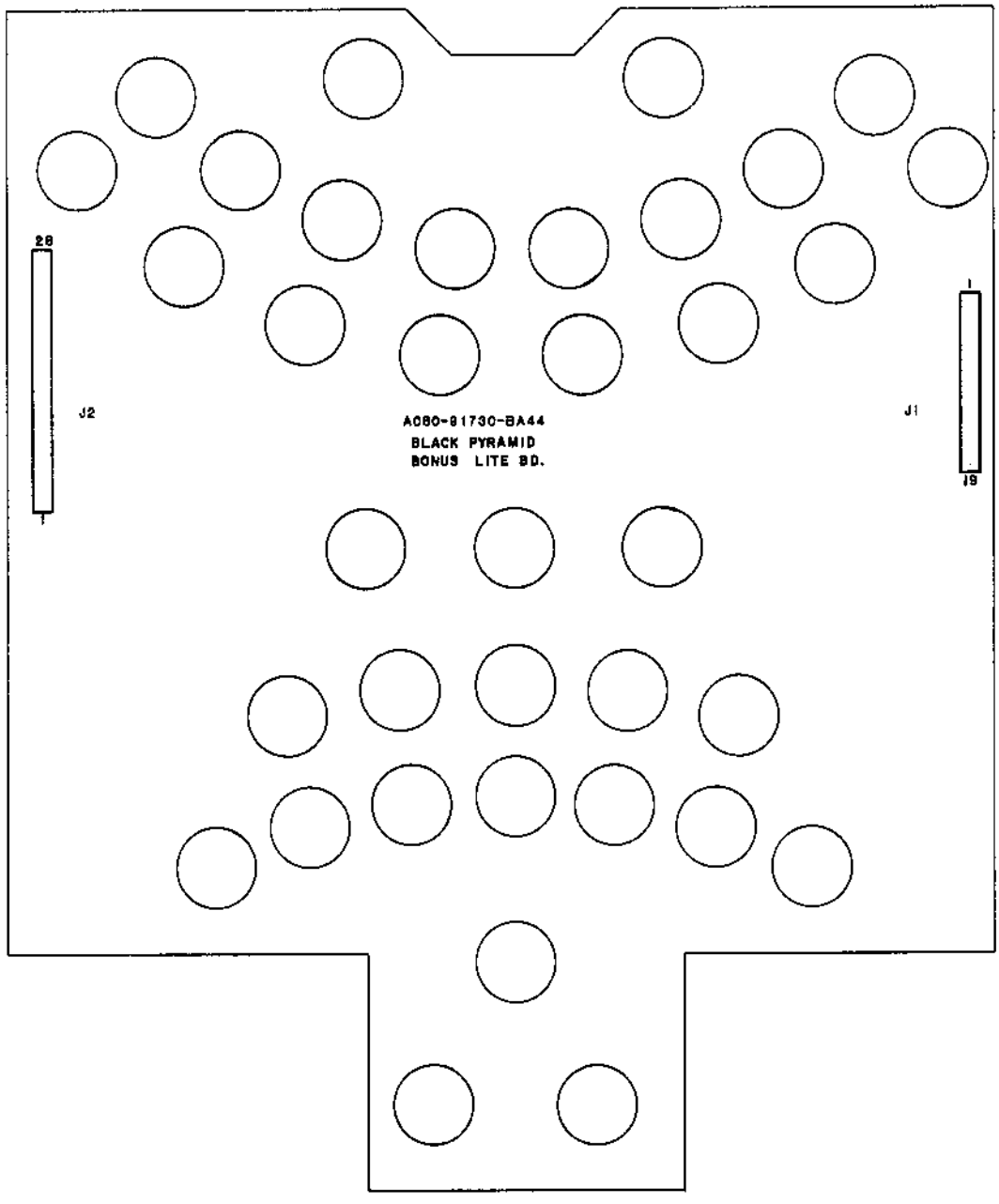
DON'T: Use water in large quantities, highly caustic cleaners, abrasive cleaners or cleaning pads on the playfield. Do not allow a wax or polish build up. Waxes yellow with age and spoil play appeal.

XI. PARTS LIST
BLACK PYRAMID OA44

MISCELLANEOUS	MIDWAY PART NUMBER	BALLY PART NUMBER
Transformer (Domestic or Export)	MT00-00115-A000	E-122-142
Bulbs, #555	0017-00003-0484	E-125-73
Fuse, 1 Amp. 3 AG Slow Blow (Playfield Solenoid Protection)	0017-00003-0103	E-133-44
Swinging Target Motor	AA44-00012-0000	
ASSEMBLY COILS		
Coin Lockout	A360-00208-0000	FO-36-7000
Flipper (2)	A360-00045-0000	AQ-25-500/ 34-4500
In-Line Drop Target Reset	A360-00209-000	NO-26-1900
Knocker	A360-00046-0000	AR-26-1200
Outhole Kicker	A360-00044-0000	AN-26-1200
Thumper Bumper (2)	A360-00044-0000	AN-26-1200
Saucer	A360-00211-0000	AO-27-1300
Gate	A390-00027-0000	GA-34-4000
Slingshot (2)	A360-00046-0000	AO-26-1200
PLAYFIELD PARTS See Figure II		
MODULES		
Lamp Driver A5	A084-91613-A000	AS-2518-23
Display Driver A1 (4 used)	A084-91617-A000	AS-2518-58
Display Driver A1 (1 used)	A084-91491-A000	AS-2518-21
MPU A4	A084-91624-AA44	
Transformer & Rectifier A2	A365-00040-0100	
Rectifier Board (Part of A2)	A084-91616-A000	AS-2518-54
Cheap Squeak	A084-91603-AA44	
Auxiliary Lamp Driver A9	A084-91614-A000	AS-2518-43
REPAIRS PROCEDURES/AIDS		
Module & Component Replacement		F.O. 560-1
AID (Assistance in Diagnostics) Kit, used with F.O. 560-1		KIT #485-1

MODULE COMPONENTS
SEE MODULE PARTS LIST

MODULE COMPONENT STARTER KITS
(Each kit contains an assortment of the most needed electronic parts for use in Module repair.)
KIT #558—For Rectifier Board (Part of A2)
KIT #503—For MPU Board A4 (less Memory U1-U6)
KIT #492—For Solenoid Drive/Voltage Regulator A3
KIT #493—For Display Drive A1
KIT #494—For Lamp Drive A3



DESIGNATION NO.	DESCRIPTION
J1	19 PIN RT ANGLE CONN
J2	28 PIN RT ANGLE CONN
P.C.B.	A080-91730-BA44

DESCRIPTION	QTY	DESIGNATION NO.	PART NUMBER
19 PIN RT ANGLE CONN	1	J1	3CCC-16468-AF02
28 PIN RT ANGLE CONN	1	J2	3CCC-16468-AE02
P.C.B.			A080-91730-BA44

PROJECT ENG: A. AARSTAD

THIS DWG IS CONFIDENTIAL & PROPERTY OF MIDWAY MFG CO

DIM. TOLERANCES UNLESS OTHERWISE SPEC
CONCENTRICITY T I R .002
FRACTIONAL ± 1/64
DECIMAL ± .005
HOLE DIA + .002 – .000
ANGLE ± 1/2°
DO NOT SCALE DWG.

BLACK PYRAMID

M.M. 5/9/84

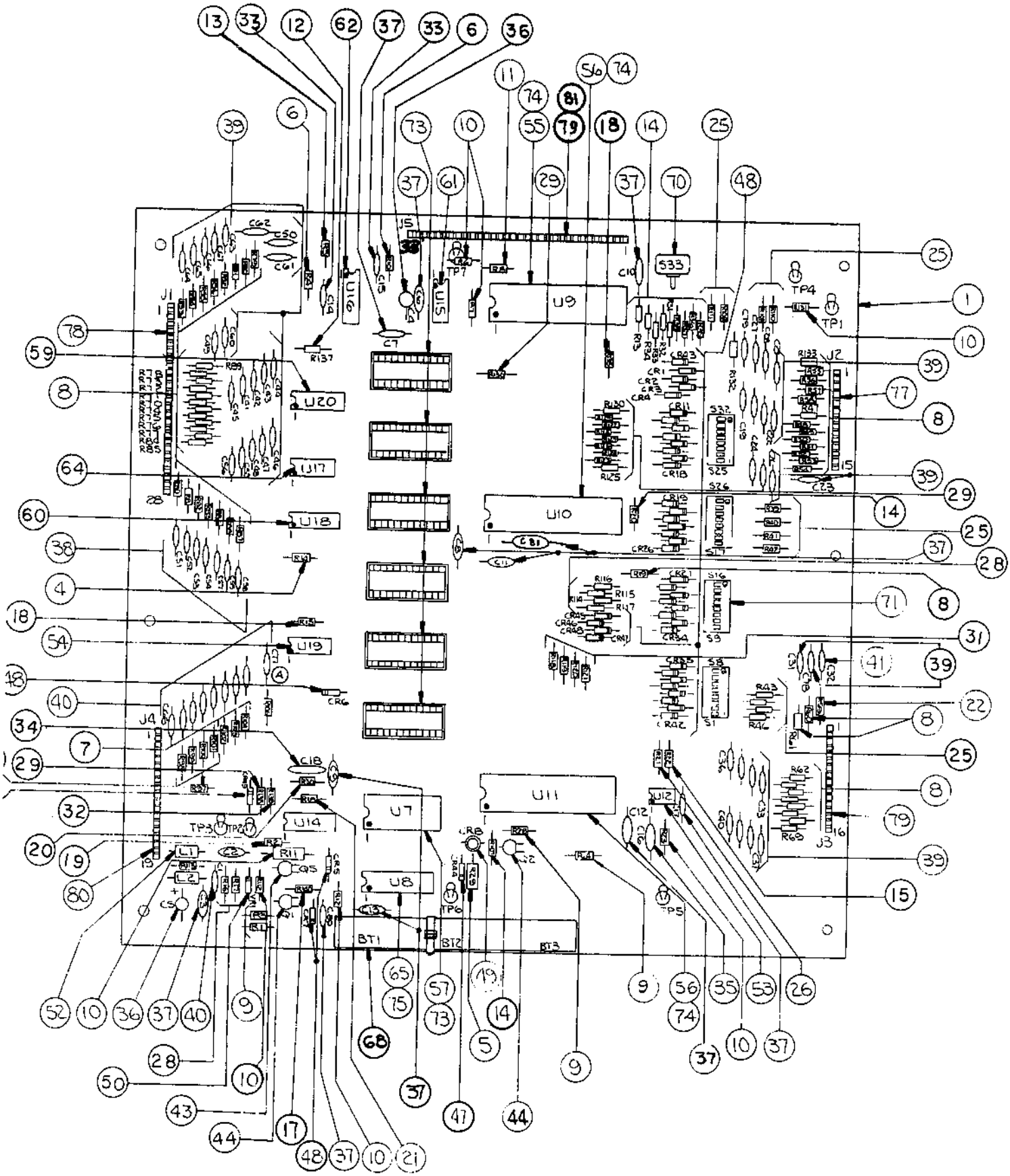
MIDWAY MFG. CO.
FRANKLIN PK., IL. 60131
A BALLY CO

BONUS LITE BD.
ASSEMBLY DRWG
A080-91730-BA44

REVISIONS

PART NO
M0-5-1-0-0-A-4-4-8-0-1-0

A082-91624-A000 MPU MODULE



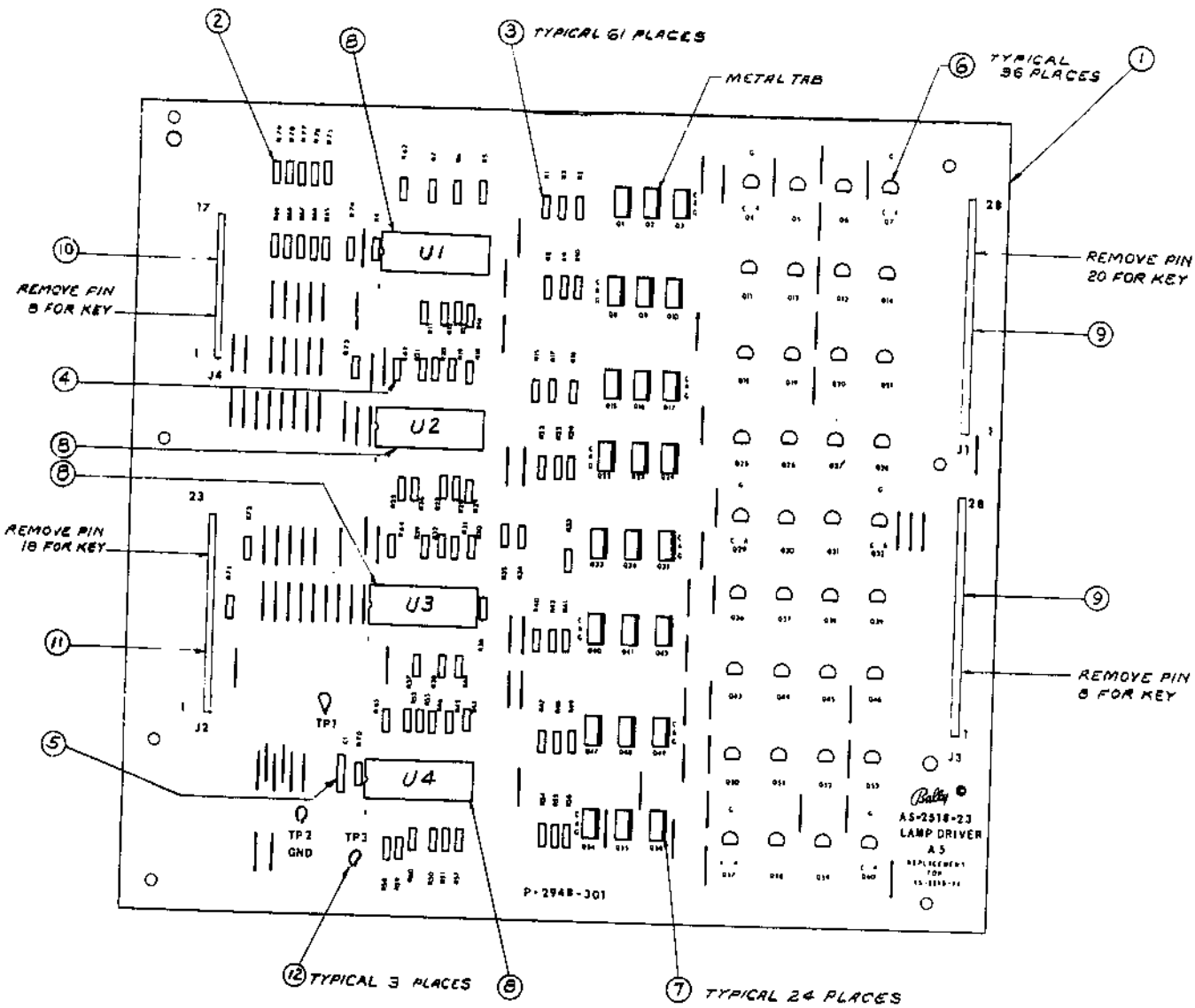
A4: MPU MODULE

COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A4 (see note 1)	A084-91624-AA44	MPU Module Complete
2	A4 (see note 2)	A082-91624-A000	MPU Module less Program Memory, U1-6 incl.
3-32	See Schematic		Resistors, See schematic for value
33	C14, C15	E-00586-0067	Capacitor, 470 PFD, 1kv
34	C18	E-00586-0088	Capacitor, .05 MFD, 16V
35	C16	E-00586-0081	Capacitor, .1 MFD, 100V
36	C4, C5	E-00586-0073	Capacitor, 4.5 MFD, 25V
37	C3, C6-C13, C17, C81	E-00586-0085	Capacitor, .01 MFD, 25V
38	C79, C41-C67	E-00586-0083	Capacitor, 470 PFD, 50V
39	C19-C31, C78, C33-C40	E-00586-0082	Capacitor, 390 PFD, 50V
40	C1, C2, C68-C77	E-00586-0084	Capacitor, 820 PFD, 50V
41	C32	E-00586-0077	Capacitor, 3000 PF, 1 kv
43	Q5	E-00585-0023	Transistor PNP (MPS-3702)
44	Q1, Q2	E-00585-0031	Transistor (2N3904)
47	CR44	E-00587-0006	Diode (IN4004)
48	CR1-CR7, CR11-CR43, CR45-CR49, CR52	E-00587-0014	Diode (IN4148)
49	CR8	E-00679	LED (Green)
50	VR1	E-00598-0008	Diode Zener (8.2V, IN9598)
52	L1, L2	E-00604-0003	Inductor, 22 Micro Hy.
53	U12	E-00620-0004	Timer (555)
54	U19	E-00620-0005	Quad 2 Input (4011)
55	U9	E-00620-0028	MPU I.C. (6800)
56	U10, U11	E-00620-0029	PIA I.C. (6820)
57	U7	E-00620-0030	RAM I.C. (6810)
59	U20	E-00620-0032	HEX Buffer I.C. (14502B)
60	U14, U18	E-00620-0033	HEX Inverter (4049B)
61	U15	E-00620-0034	Quad Memory Drive (MC3459L)
62	U16	E-00620-0035	Dual Monostable (9602)
64	U17	E-00620-0041	Quad 2 Inputs (74L00N)
65	U8	E-00620-0042	RAM (C MOS, P5101L-3)
68	BT1, BT2, BT3	E-00628-0003	Battery
70	S33	E-00658-0001	Push Button Switch
71	S1-S8, S9-S16, S17-S24, S25-S32	E-00677	DIP Switch
73		E-00712	24 Pin Socket
74		E-00712-0001	40 Pin Socket
75		E-00712-0003	22 Pin Socket
77	J2	E-00715	15 Pin Wafer Connector
78	J1	E-00715-0004	28 Pin Wafer Connector
79	J3, J5	E-00715-0017	16 Pin Wafer Connector
80	J4	E-00715-0018	19 Pin Wafer Connector
81	J5	E-00715-0024	17 Pin Wafer Connector

NOTE: Order replacement memory chips U1-U6, specifying game, socket and part number stamped on chip.

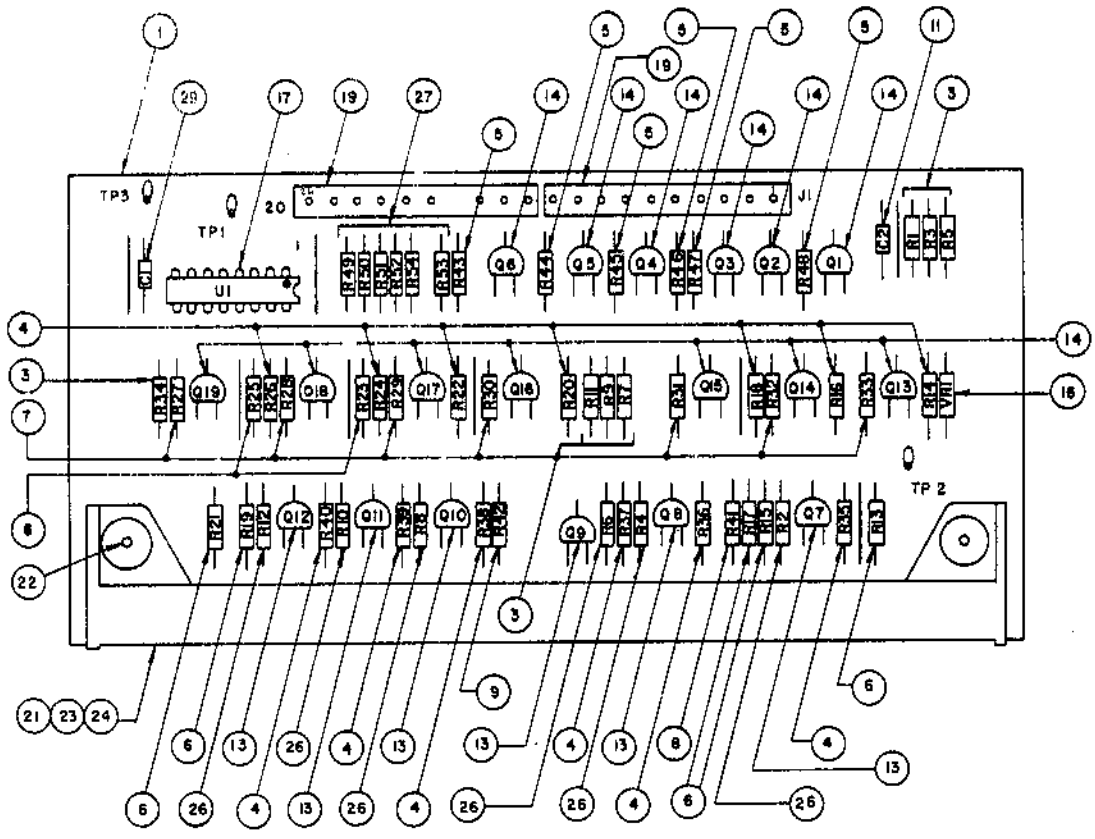
AS-2518-23 LAMP DRIVER MODULE



A5: LAMP DRIVER MODULE
COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A5	AS-2518-23	Lamp Driver Module, Complete
2	R71-R79	E-00105-242	Resistor, 20kΩ, 5%, ¼ W
3	R1-R60, R70	E-00105-0237	Resistor, 2kΩ, 5%, ¼ W
4	R61-R69	E-00105-0256	Resistor, 2.2MΩ, ¼ W
5	C1	E-00586-0065	Capacitor, .01 MFD, 500V
6	Q4-Q7, Q11-Q14, Q18-Q21, Q25-Q32, Q36-Q39, Q43-Q46, Q50-Q53, Q57-Q60	E-00585-0014	SCR, 2N5060
7	Q1-Q3, Q8-Q10, Q15-Q17, Q22-Q24, Q33-Q35, Q40-Q42, Q47-Q49, Q54-Q56	E-00585-0029	SCR, MCR106-1
8	U1-U4	E-00620-0037	I.C., Decoder, 14514B
9	J1, J3	E-00715-0004	28 Pin Wafer Connector
10	J4	E-00715-0024	17 Pin Wafer Connector
11	J2	E-00715-0014	23 Pin Wafer Connector
12	TP1, TP2, TP3	P-05399	Test Clip

AS-2518-21 CREDIT DISPLAY DRIVER MODULE

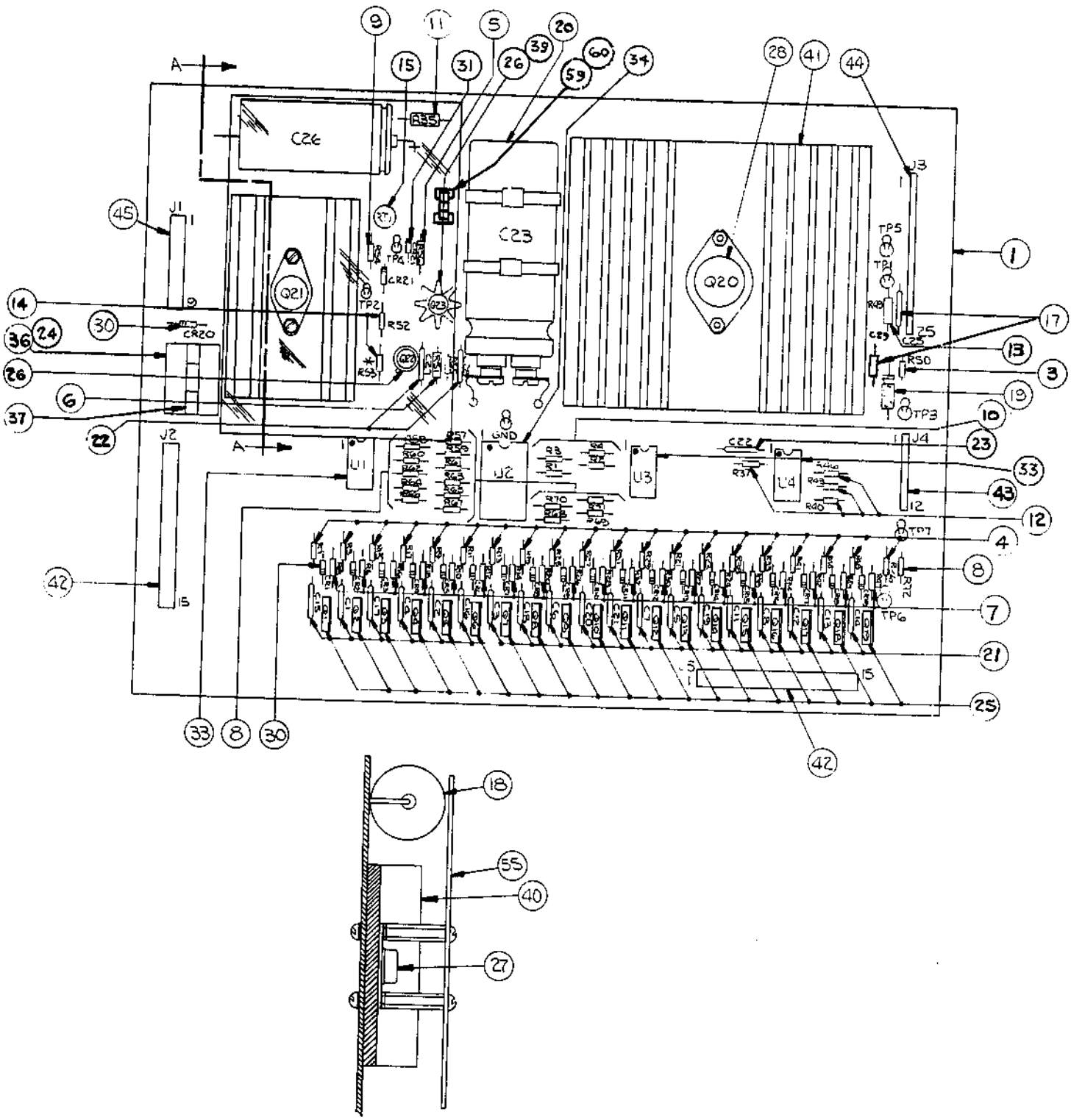


A1: 6 DIGIT DISPLAY DRIVER MODULE
COMPONENT PARTS LIST

ITEM	QTY.	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	1	A1	AS-2518-21	6 Digit Display Driver, Complete
3	7	R1, R3, R5, R7, R9, R11, R34	E-105-331	Resistor, 100K Ω
4	13	R14, R16, R18, R20, R22, R24, R26, R35, R36, R37, R38, R39, R40	E-105-227	Resistor, 300K Ω
5	6	R43, R44, R45, R46, R47, R48	E-105-228	Resistor, 9.1K Ω
6	7	R13, R15, R17, R19, R21, R23, R25	E-105-229	Resistor, 1.5K Ω
7	7	R27, R28, R29, R30, R31, R32, R33	E-105-222	Resistor, 1.2K Ω
8	1	R41	E-105-231	Resistor, 39K Ω
9	1	R42	E-105-271	Resistor, 240K Ω
10				
11	1	C2	E-586-65	Capacitor, .01 MFD, 500V
13	6	Q7, Q8, Q9, Q10, Q11, Q12	E-585-32	Transistor (2N5401)
14	13	Q1, Q2, Q3, Q4, Q5, Q6, Q13, Q14, Q15, Q16, Q17, Q18, Q19	E-585-33	Transistor (MPS-A42)
16	1	VR1	E-598-7	Zener Diode, 110V
17	1	U1	E-620-38	I.C. Decoder
18				
19	2	J1	E-715-34	10 Pin Wafer Pin Connector
21	1	DS1	E-680	Digital Display Panel
22	2		M-1836	Hi-Lo Screw, W/H
23	1		P-2399	Display Mounting (Top)
24	1		P-2399-1	Display Mounting (Bottom)
26	6	R2, R4, R6, R8, R10, R12	E-105-287	Resistor, 2.2K Ω
27	6	R49, R50, R51, R52, R53, R54	E-105-242	Resistor, 20K Ω
28	As Req'd			Wire Jumper
29	1	C1	E-586-85	Capacitor, .01 MFD, 25V

NOTE: INTERCHANGEABLE WITH AS-2518-15

AS-2518-22 SOLENOID DRIVER/VOLTAGE REGULATOR MODULE



NOTE: INTERCHANGEABLE WITH AS-2518-16

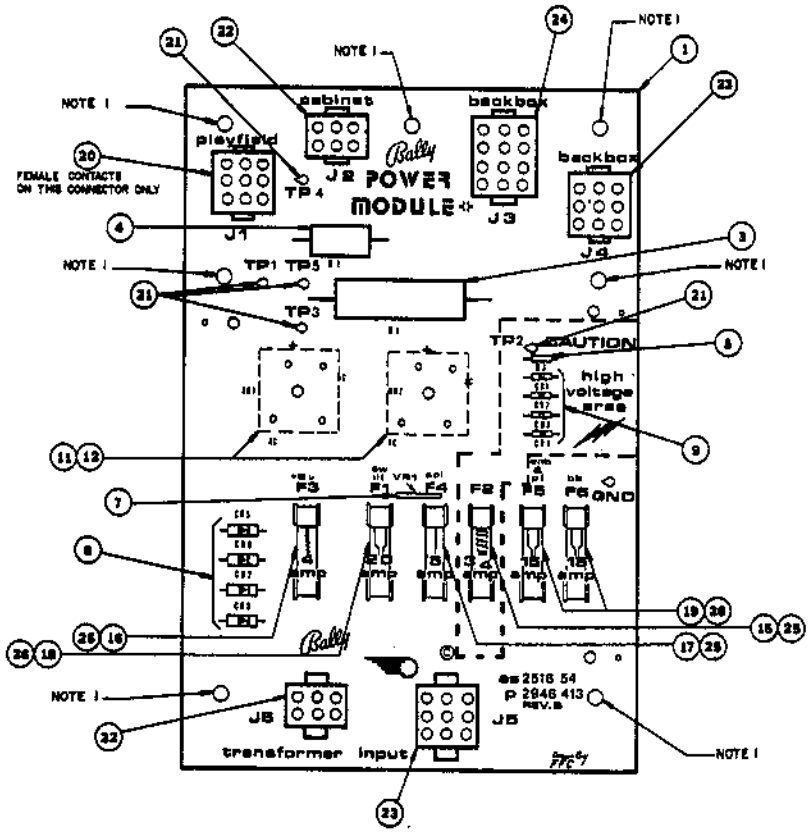
A3: SOLENOID DRIVER/VOLTAGE REGULATOR MODULE

COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
1	A3	AS-2518-22	Solenoid Driver/Voltage Regulator Module, Complete
3-14	Resistors		Resistor, See Schematic for value.
15	RT1	E-00599-0014	Pot. (Linear) 25K
17	C25, 29	E-00586-0014	Capacitor, .1 MFD, 20V
18	C26	E-00586-0059	Capacitor, 160 MFD, 350V
19	C24	E-00586-0063	Capacitor, 2 MFD @ 25V
20	C23	E-00586-0062	Capacitor, 11700 MFD, 20V
21	C1-C8, C11-C21	E-00586-0064	Capacitor, .002 MFD, 1kv
22	C27, C28	E-00586-0065	Capacitor, .01 MFD, 500V
24	K1	E-00146-0795	Relay, Printed Circuit
25	Q1-Q19	E-00585-0034	Transistor, SE9302
26	Q22, Q23	E-00585-0041	Transistor, 2N3440
27	Q21	E-00585-0042	Transistor, 2N3584
28	Q20	E-00710	+5V Regulator, LAS1405 or 78H05KC or LM323K
30	CR1-CR21	E-00587-0015	Diode (IN4004)
31	VR1	E-00598-0010	Diode, Zener 140V, IN5275A
33	U1, U3, U4	E-00681	I.C. Transistor Array, CA3081
34	U2	E-00620-0039	I.C. Binary to 1/16 Decoder, 74L154
36		E-00592-0002*	Relay Socket
37		M-1839*	Relay Holder
39		E-00682	Heat Sink, TO5
40		E-00682-0001	Heat Sink, TO66
41		E-00682-0002	Heat Sink, TO3 Case
42		E-00715-0039	15 Pin Wafer Connector
43		E-00715-0016	12 Pin Wafer Connector
44		E-00715-0020	25 Pin Wafer Connector
45		E-00715-0033	9 Pin Wafer Connctor
55		M-1838	Shield-Plexiglass
59		E-00148-0021	Fuse Clips
60	F1	E-00133-0029	Fuse 8 AG-3/16 Amp.
23	C22	E-00586-0085	Capacitor, .01 MFD, 25V

*USED WITH ITEM 24, E-00146-0791, PLUG IN RELAY ONLY

AS-2518-54 RECTIFIER BOARD ASSEMBLY

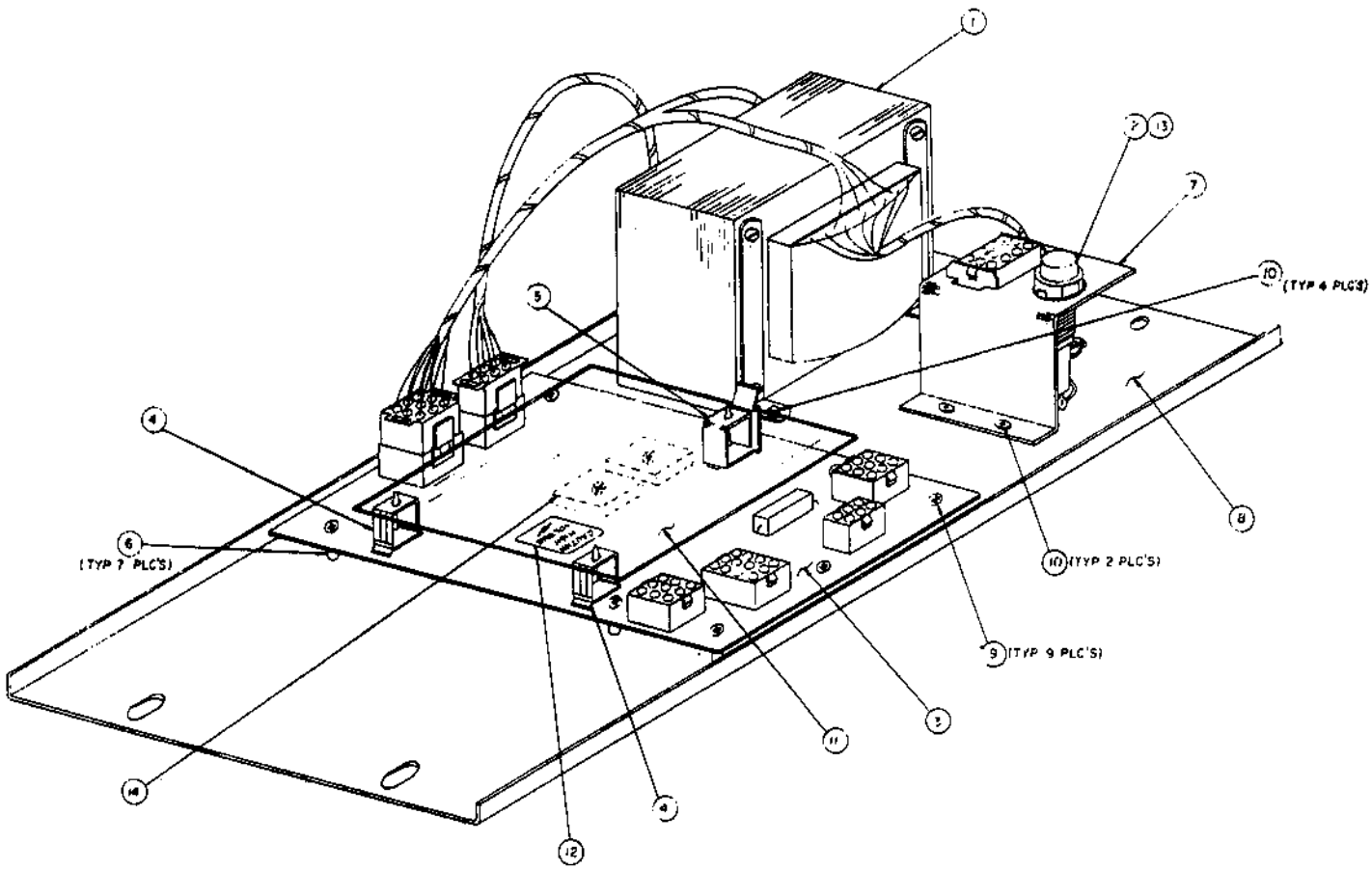


(Part of) A2: POWER TRANSFORMER MODULE
COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
0	A2	A365-00040-0100	Power Transformer Module, Complete
1	P/O A2	AS-2518-54	Rectifier Board Assembly, Complete
3	R1	E-00104-0092	Resistor, 10%, 600 Ohm, 10W
4	R2	E-00104-0091	Resistor, 25 Ohm, 5W
5	R3	E-00105-0226	Resistor, 5%, 100K Ohm, ¼W
7	VR1	E-00623	Varistor
8	CR5, CR6, CR7, CR8	E-00587-22 or 24	3A Diode
9	CR1, CR2, CR3, CR4	E-00587-0015	Diode (IN4004)
10			
11	Used with BR1-2	P-1973-480	Spacer
12	BR1, BR2	E-00602-0007	Bridge Rectifier
15	F2	E-00133-0028	Fuse, ¾A, 250V, 3AG
16	F3	E-00133-0004	Fuse, 4A, 32V, 3AG
17	F4 NOTE 1	E-00133-0005	Fuse 5A, 32V, 3AG
18	F1	E-00133-0027	Fuse, 20A, 32V, 3AG
19	F5, F6	E-00133-0015	Fuse, 15A, 32V, 3AG
20	J1	E-806-9	9 CKT Socket Header
21	TP1, 2, 3, 4, 5	P-05399	Test Clip
22	J2, J6	E-805-6	6 CKT Pin Header
23	J4, J5	E-805-9	9 CKT Pin Header
24	J3	E-805-12	12 CKT Pin Header
25	F2, 3, 4	E-00148-0021	Fuse Clips
26	F1, 5, 6	E-00148-0022	Fuse Clips (Low Resistance)

NOTE 1—All games with 4 or more flippers use 7A

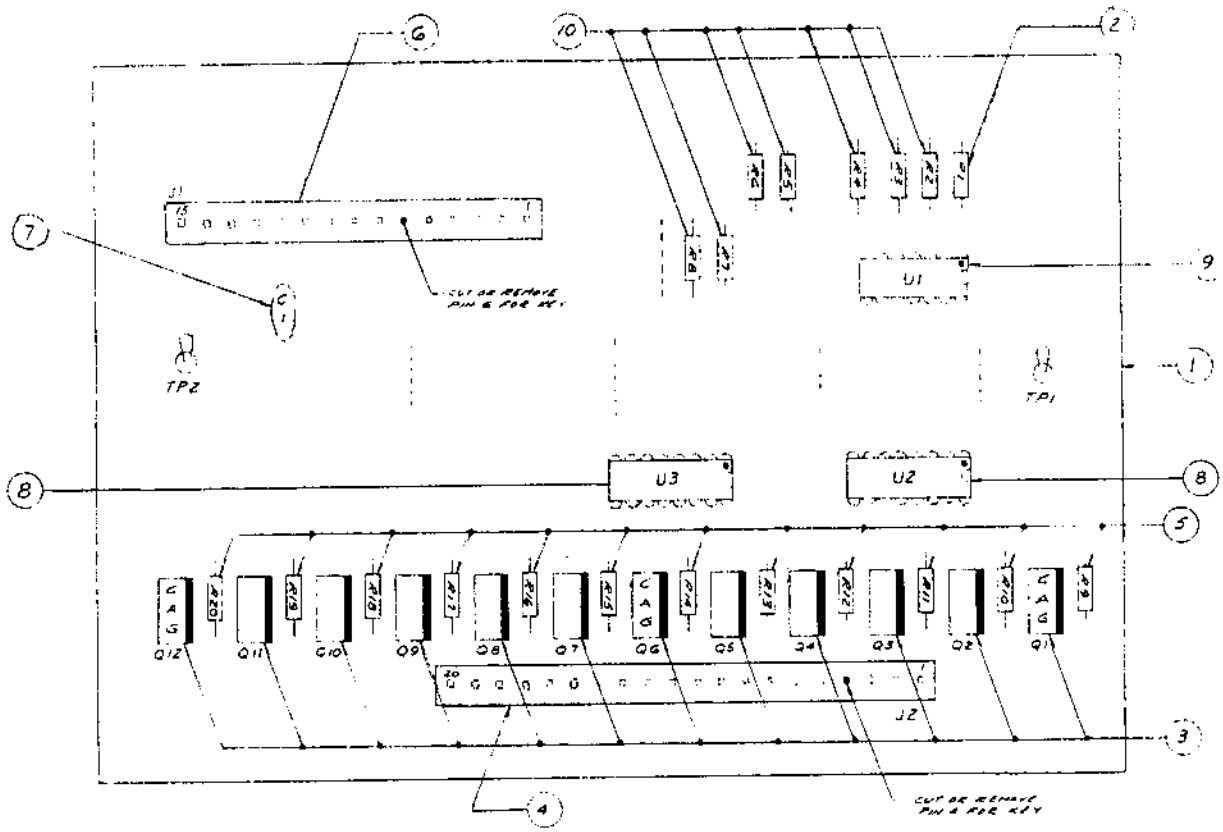
A2: POWER TRANSFORMER MODULE



COMPONENT PARTS LIST

ITEM	REFERENCE DESIGNATION	BALLY PART #	DESCRIPTION
0	A2	A365-00040-0100	Power Transformer Module, Complete
1		AS-3071-2	Transformer
2		E-148-25	Fuse Holder
3	A2	AS-2518-54	Power Module Assy.
4		M-1829-4	Hinged Support
5		M-1829-3	Edge Holder
6		M-1829-5	Spacer
7		P-6442-244b	Fuse & Connect Brkt.
8		P-6442-246	Chassis
9		RLPP-832-1812	Screw
10		RLPP-1032-1806	Screw
11		P-2692-2	Shield
12		M-469-936a	High Voltage Sticker
13		E-133-24	3A S.B. Fuse
14		M-1834	H. S. Compound

AS-2518-43 AUXILIARY LAMP DRIVER



A9: AUXILIARY LAMP DRIVER
COMPONENT PARTS LIST

ITEM	QTY.	REFERENCE DESIGNATION	BALLY PART NO.	DESCRIPTION
1	1	A9	AS-2518-43	Auxiliary Lamp Driver, Complete
2	1	R1	E-105-173	Resistor 2.2 Meg. Ω
3	12	Q1 Thru Q12	E-585-29	SCR MCR 106-1
4	2	J2	E-715-34	10 Pin Wafer Pin Connector
5	12	R9 Thru R20	E-105-237	Resistor 2K Ω
6	1	J1	E-715-39	15 Pin Wafer Pin Connector
7	1	C1	E-00586-0065	Capacitor .01 MFD
8	2	U3, U2	E-620-84	MC14555B Binary 1 to 4
9	1	U1	E-620-85	MC14013B Dual D Flip Flop
10	7	R2 Thru R8	E-105-242	Resistor 20K Ω

MAXIMUM CREDITS:
The maximum credits accepted by the machine limits the number of games that can be accumulated by coining, by winning replays or both. The maximum number of credits is selectable by means of switches 25 and 26. Four credit limits are available. Switch settings are listed below.

MAXIMUM CREDITS	SWITCHES 26	25
10	OFF	OFF
15	OFF	ON
25	ON	OFF
40	ON	ON

BALLS PER GAME:

# BALLS/GAME	SWITCHES 32	31
5	OFF	ON
4	ON	OFF
3	OFF	OFF
2	ON	ON

MATCH FEATURE:
When the Match Feature is ON, a random number appears on the Match/Credit window and the word Match is illuminated. If the number matches the tens digit in a player's score, a free game is awarded. The Match Feature creates an incentive to play.

MATCH	SWITCH 28
ON	ON
OFF	OFF

CREDIT DISPLAY:

CREDITS DISPLAYED	SWITCH 27
YES	ON
NO	OFF

HIGH SCORE FEATURE:
The game is designed to award an Extra Ball or Free Game at each of the two or three score levels. See Front Door Game Adjustments.

AWARD	SELF-TEST POSITION 16	SELF-TEST POSITION 17
REPLAY	SET TO "03"	SET TO "03"
EXTRA BALL	SET TO "02"	SET TO "02"
NOVELTY	SET TO "01"	SET TO "01"
NO AWARD	SET TO "00"	SET TO "00"

For combinations of replay/X-ball/Novelty Modes see page 4A "K. Special Replay/X-ball/Novelty Modes."

HIGH SCORE TO DATE OR OVER 10,000,000 SCORE FEATURE:
The game is designed to award free games as an option if high score to date is beat or player exceeds 10,000,000 points. Each time this happens, the high score will reset to 1,999,990 as new high score to beat. This score is displayed on all 4 player score displays at the end of each game as an incentive to play. Recommended setting is underlined.

HIGH SCORE TO DATE FEATURE	SELF-TEST POSITION 19
No Award	SET TO "00"
One Credit	SET TO "01"
Two Credits	SET TO "02"
<u>Three Credits</u>	SET TO "03"

State and local laws may regulate the use of the above features, and they have been designed to allow for appropriate adjustment in order to conform to such requirements.

BALLY/MIDWAY'S BLACK PYRAMID
U.R. #A44
ROM/EPROM PART NUMBERS

UNPROGRAMED MPU A084-91624-A000
PROGRAMED MPU A084-91624-AA44

POS.	MIDWAY PART NUMBER
U2	0A44-00803-0002
U6	0A44-00803-0001

JUMPERS	IN	OUT
E4-E12	**	
E7-E8	**	
E10-E11	**	
E13A-E14	**	
E29-E33	**	
E31-E32	**	
E16A-E34	**	

UNPROGRAMED CHEAP SQUEAK A084-91603-C000
PROGRAMED CHEAP SQUEAK A084-91603-AA44

POS.	MIDWAY PART NUMBER
U3	0A44-00803-0003
U4	0A44-00803-0004

JUMPERS	IN	OUT
JW1		**
JW2		**
JW3		**
JW4		**
JW5		**
JW6	**	
JW7		**
JW8		**
JW9	**	
JW10		**
JW11		**
JW12	**	

REVISIONS

5/4/84	RELEASE FOR PRODUCTION	