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KITCORP
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GAMATRON
MANUAL

GAMATRON is a conversion kit for Bally standard body solid state pinball machines with the normal Bally size backbox.

The kit contains:

- 1 - Playfield with harness
- 1 - Backglass
- 1 - Pinstar Sound Memory board (PSM board) with two cables attached. One is plugged in board; one is soldered onto board.
- 4 - #44 lightbulbs
- 4 - Light sockets
- 10 - Screws (2 sizes)
- 6 - Red gels
- 1 - Sheet black plastic "0" and solid rectangles
- 1 - Set of cabinet decals, including left & right back box and left & right cabinet
- 6 - Richco printed circuit board mounts
- 1 - Red wire with terminal on each end
- 1 - 2 wire harness with connector
- 1 - 4 wire harness with connector. 2 wires are attached to volume control
- 1 - Ribbon cable with 40 pin connectors on each end (cable is plugged into Pinstar Sound Memory board. This is one of two cables attached to PSM board)
- 1 - Approximately 6 feet of wire for installation of "0" lights next to 6 digit score readouts
- 3 - Pinballs
- 2 - Heavy duty cabinet flipper switches
- 2 - 3 inch leg levelers to replace 2 inch levelers on rear legs (IMPORTANT)
- 1 - 8 amp slo blo fuse for F4 of Power Supply Board
- 1 - ball shooter tip
- 1 - Manual
- 3 - Extra Score Cards

The exclusive United States and Canadian distributor for GAMATRON is

KITCORP
2250 Elmhurst Road
Elk Grove Village, IL 60007
312-228-0451

For installation questions, call KITCORP

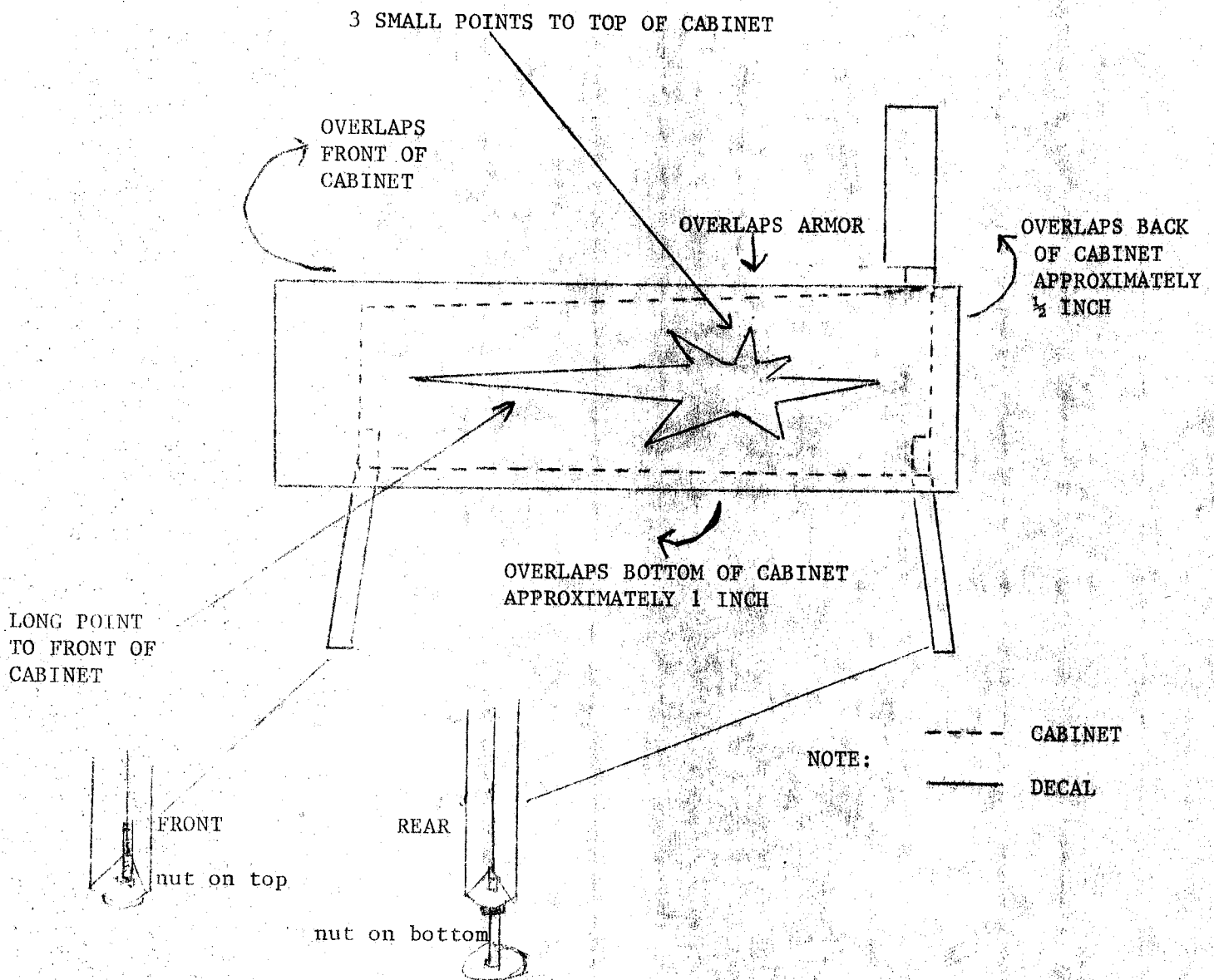
Hereafter the Pinstar Sound Memory Board may be referred to as "PSM board".

NOTE

The printed circuit boards in the pinball game you are converting must work 100%.

Have your distributor test all printed circuit boards before starting the conversion to GAMATRON.

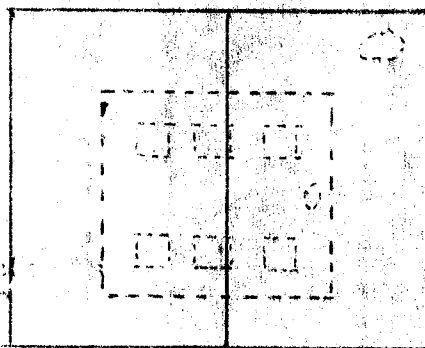
ILLUSTRATION 1



IMPORTANT!!!

Adjust leg levelers so game has maximum slant. Gamatron is designed to play at $5\frac{1}{2}$ degrees of slant. Bally cabinets have $3\frac{1}{2}$ degrees of slant.

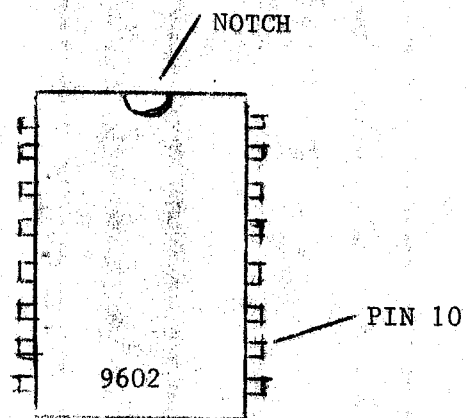
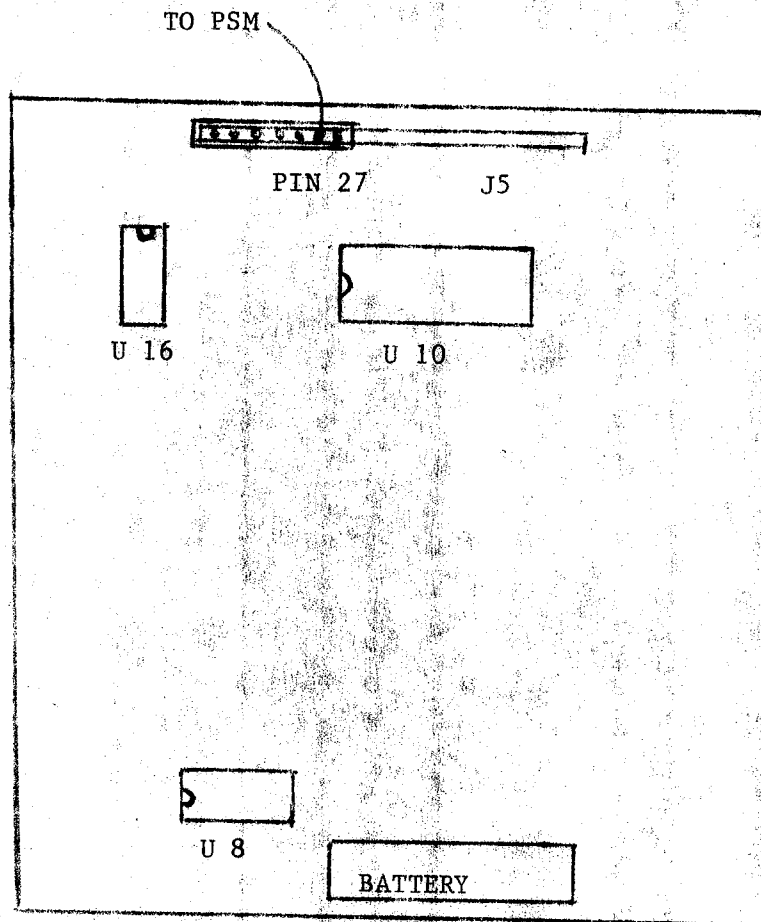
Operating with too little slant changes the play of the game drastically. IT WILL DECREASE EARNINGS.



CABINET DECALS OVERLAP FRONT OF CABINET AND MEET IN MIDDLE OF FRONT

ILLUSTRATION 2

MPU BOARD



GAMATRON INSTALLATION INSTRUCTIONS

A. GAME PREPARATION

1. Before you start to convert your old game, BE SURE your pinball game WORKS 100%. Run it through the self-test. If you are not sure, have the boards tested on a Bally or Stern test fixture made for this purpose. Many old games did not use all the components on the printed circuit boards (such as driver transistors on the Solenoid Driver Board), but GAMATRON requires that all printed circuit boards work 100%. Be sure all cables are intact, the coin switches are working, tilt mechanisms are OK, etc. Before you proceed, UNPLUG THE GAME. In addition, if the playfield glass is badly scratched, replace it.
2. Unplug and remove the old playfield. Remove the playfield hold-down brackets from the underside of the playfield. Save the brackets and screws. You will need them later. Vacuum out the inside of the cabinet and remove old debris.
3. Part of the old game's left wood support for the playfield may have to be sawed out to clear GAMATRON drop target bank. From the front of the cabinet measure 17" and 26", marking each of these measurements. Cut out the wood support between these marks. This piece usually can be knocked out easily with a hammer and chisel.
4. Remove the old backglass. Take off the black plastic channels around the sides and the silver channel along the bottom. Save these for a later step.
5. Disconnect the Bally sound board and remove the wires from the speaker, OR disconnect the chimes. In addition, disconnect the KNOCKER.
6. Wash down the game cabinet thoroughly, including the backbox. Paint the backbox outside BLACK. Also, paint black the top three inches of the INSIDE of the game cabinet (this will show above the new playfield when it is installed).

NOTE: If you are using paint other than spray paint (such as acrylic latex, which we do not recommend), you may have to prepare the cabinet surface with a DEGLOSSER which removes the gloss from glossy enamel paint. Otherwise the new paint may not stick. Deglosser is available at any hardware or paint store.

Let the paint dry before proceeding.

7. Apply the decals to the backbox. The long point of the star should point up. Two decals are supplied for each side of the backbox. These should overlap the top, bottom and back of the backbox. We suggest that you staple these overlapping parts to the backbox.

8. Remove the legs and ball shooter. Take one of the two long

cabinet decals supplied. Position it so that the long point of the star points towards the front of the game, and the three small points, point up. Position the side decal so that the bottom of the decal overlaps the bottom of the cabinet by about 1-2 inches and the back by about 1/2 inch. This way the top of the decal will overlap the side armor at the correct angle to cover all parts of the cabinet. Remove the backing and apply decal (see illustration 1). Repeat this procedure with the cabinet decal for the other side. You may want to wet down the sides of the cabinet with some slightly soapy water or plain water first, so that you can easily move the decal around. Once it's positioned correctly, squeegee the water out. Use an X-acto knife or sharp razor blade and trim the decal around the side armor, coin door, and ball shooter hole.

We suggest you STAPLE the overlapping edges of the decal to the underside and back of the cabinet. Re-install the ball shooter.

8. Find the two new 3 inch leg levelers (casters). Put these into the BACK legs of the game. Turn them all the way UP and re-install. Turn the levelers on the front, all the way DOWN and re-install back on the game. The game front should be as low as possible and the back as high as possible. (See illustration 1.)

9. Find the two NEW heavy-duty cabinet flipper switches and replace the OLD cabinet flipper switches. The old flipper switches are not strong enough for GAMATRONs high-powered flippers.

10. Install the new ball-shooter tip.

B. BACKGLASS AND BACKBOX

1. Lay the new backglass face down on a work surface. Find the five red rectangular transparent plastic pieces (called "gels"). Use a damp soft cloth to wipe the "gels" and backglass windows to remove dust and static electricity. Don't use anything but water.

2. Using narrow clear tape (Scotch "Magic" tape or something similar), tape a red "gel" over each of the score display openings on the backglass. Tape all four sides of each gel to seal them. THERE ARE SIX GELS; YOU WILL ONLY NEED FIVE.

3. FOR GAMES WITH SEVEN-DIGIT DISPLAYS: The windows for the score displays on the new backglass are longer than the windows on the old backglass. You will need to cover the space at the right end. (Be sure the red gels are already in place.)

To do this, find the plastic rectangular piece with the black squares and zeroes. Cut out four of the black squares. Carefully scotch tape each one over the right end of each window, so only the score display is visible through each window. Trim off excess so plastic squares don't overlap the edges of the windows.

FOR GAMES WITH SIX DIGIT DISPLAYS: Find the four lamp sockets, screws, and green wire provided. Screw a lamp socket to the right of

each of the four score displays. These will be used to underlight "dummy" zeroes. Wire each of the lamps to the nearest general illumination sockets inside the backbox door, using short pieces of the green wire provided, and running the wire through the score display cutouts in the backbox door.

Find the plastic piece with the black squares and cut out FOUR of the squares with zeroes. Use a very small piece of tape and tape a zero to the right end of each of the score display windows. These are "dummy" zeroes and will be backlit with added lamp sockets. Once you have installed the new lamp sockets, come back and adjust the "dummy" zero so that it lines up with the other digits in the display. Tape the top and bottom of each plastic so that each piece fits completely within the window. Move the lamp so the filament illuminates the center of the zero.

Disconnect and remove 1st player-up, 2nd player-up, 3rd player-up and 4th player-up lights. Remove light shields around these lights. (Some games do not have these lights.)

Put new lamps into the sockets you have just installed.

Finally, find connector J1 on the MPU board. Remove wires in positions 1 through 6. Move each of these wires DOWN one space on the connector so that these wires now occupy positions 2 through 7. If there are wires only in positions 1 through 5, move them to occupy 2 through 6. If there are wires in positions 1 through 7, remove the wire in 7 and tape it with electrical tape; it is not used.

On the Ball in Play display, find the wire in position 8 and remove it. Tape it up with electrical tape. Remove the wires at positions 4, 5, 6, and 7 and move them over one to occupy positions 5 through 8. Find the wire with different type connectors at each end. Plug one end into position 4 of the Ball in Play display, and the other end into connector J1 on the MPU at position 1.

4. On the inside of the backbox door, disconnect the wires to the following lights: High Score to Date; Ball in Play; Match; and coin 1, 2, 3, and 4 lights. Rewire these sockets to general illumination lights.

Replace all the general illumination lamps in the backbox with new lamps for a fresher look.

C.ELECTRONICS PREPARATION

1. Mount the Pinstar Sound-Memory board (PSM board) on the left inside of the backbox to the left of the MPU using the board mounts provided. Mount it with the flat capacitor at the TOP and the two connectors at the BOTTOM.

2. Remove the 6800 microprocessor IC from the socket at U9 on the MPU board. Plug it into the UPPER 40-pin socket on the PSM board. Be sure that the notch at one end of the IC lines up with the notch in

the 40-pin socket. Be careful not to bend any pins as you plug it into the socket.

3. Carefully cut and lift pin 10 of the 9602 IC at U16 on the MPU board (see illustration 2). Unplug and remove the IC at U8 near the battery. This is a RAM, designated as 5501 or 5101. Unplug and remove all the old game ROMS or EPROMS in sockets U1 through U6.

4. Remove fuse at F4 on rectifier board and replace with 8 amp slo blo fuse (included in kit).

5. Unscrew and remove the protective cage around the transformer and set it aside. On the transformer, between terminal 5 and 7, there is a jumper wire. Clip this or unsolder it and remove it. Unsolder the wire from terminal 5 and solder it to terminal 9. Between terminals 9 and 11, solder in a jumper wire. Reinstall the protective cage. This gives the solenoids a greater voltage and makes the playfield action more lively.

6. Take the wire from the PSM board with the 7-pin connector. Plug this into the MPU connector J5 (at the top of the MPU), all the way at the left end, so that the wire goes to pin 27 of J5 (see illustration 2). J5 may have 32, 33, or 34 pins, so be careful.

7. On the MPU connector J3, remove the wire at pin 3, and SPLICE into the wire at pin 2 on the same connector J3.

8. Find the harness that has a black and a red wire with a 6-pin connector at one end and stripped ends at the other. This is the PSM connector J1. Plug one end into the PSM board at J1 with the red wire to the left. Take the red wire and SPLICE the stripped end into the wire at pin 12 of MPU connector J4. Take the black wire and splice it into the wire at pin 19 of MPU connector J4. This provides 12 volts to the PSM board.

9. Find the harness with 4 wires, a 9-pin connector at one end, and two free wires plus a volume control pot at the other end. Plug the connector into the PSM board. Run the wires through the backbox into the game cabinet. Solder the wire ends onto the speaker in the game.

If there is no speaker in the game, you will have to provide one and mount it in the game. Cut a large hole for the speaker and cover it with a grill. Mount the speaker. Mount the volume pot with a cable tie near the front of the game.

TIPS: Don't substitute the grill with a bunch of holes drilled into the cabinet. This reduces the sound quality. You will also get much better sound if you use an inexpensive car speaker (\$10 or more) in place of the original game speaker. The better the speaker, the better the sound.

10. Plug one end of the ribbon cable into the microprocessor socket (U9) on the MPU. Be sure that the red line on the ribbon cable goes over the notch on the socket; normally the red line should be at the

left of the socket.

11. Find the playfield hold-down brackets that you saved, and mount them onto the GAMATRON playfield. Mounting locations are factory spotted.

Drop the playfield into the cabinet. Pull the cables up through the backbox and plug the connectors into the boards as designated. NOTE: There are two different connectors on the cable to the rectifier board. Plug in whichever fits; cover the other connector with tape.

12. On the GAMATRON cable, find the loose wires that have the following colors: grey, grey-black, and grey-red. Then go to the Lamp Driver Assembly connector J2 and find the following wires: the wire at pin 11; pin 10; and pin 21. Remove each wire, with the pins, one at a time, and plug them into these loose wires as follows:

Take the wire from pin 11 and plug it into the connector at the end of the loose grey wire. Take the wire from pin 10 with the pin, and plug it into the connector of the loose grey-black wire. Lastly, take the wire from pin 21, with the pin, and plug it into the connector of the loose grey-red wire. These connectors should plug into each other neatly. Insulate the connectors with electrical tape. Pin 11 goes to Game Over light. Pin 10 goes to Tilt light. Pin 21 goes to Shoot Again light. NOTE: some games have an inexpensive connector at J2 with no removable pins. In this case, you'll have to clip the connectors off all the loose wires and SPLICE THEM TOGETHER instead of plugging them.

Disregard the remaining two wires.

13. On the GAMATRON cable, find the loose red, blue, yellow-red, and brown-yellow wires. Then, go to the game Solenoid Driver board and find the following wires from the connector J2: pin 1, 2, 7, and 8. Remove these wires WITH THE PINS, one at a time, and connect as follows: J2 pin 1 into the connector on the red wire; pin 2 into the connector on the blue wire; pin 7 into the connector on the yellow-red wire; and pin 8 into the connector on the brown-yellow wire. Insulate these connectors with electrical tape. NOTE: some games have an inexpensive connector at J2 with no removable pins. In this case, you'll have to clip the connectors off all the loose wires and SPLICE THEM TOGETHER instead of plugging them.

14. Set the MPU board dip switch settings. Recommended settings are shown on the following chart.

15. Double check your connections before powering the game up. Drop the THREE balls into the game, and power up. Most of the solenoids will click until all three balls are in the outhole, when it will go into the attract mode.

Put the black plastic and silver metal extrusions on GAMATRON backglass. Older games use 3/16" glass, and newer games used 1/8" glass. The GAMATRON backglass is 1/8". If the game you are

SWITCH ASSIGNMENT

						ON	OFF
32	WOW	NONE	X BALL	100K	REPLAY		
31	Award	NR	*	-	NR	X	X
30	Multiplier - Reset or Leave After Drain					NR	X
29	WOWS - Per Game or Per Ball						X
28	Coin Chute #3						X
27							X
26							X
25							X
24	Missile 1-2 lites W/Balls					X	
23	In Lane						
	Not Used						X
22	Right Spinner - Reset or Leave After Drain					NR	X
21	Add 10% Replay					NR	X
20	Credit Display					X	
19	Maximum Credits	10	15	25	40	X	
18		*	-	NR	NR	X	
17						Not Used	X
16	High Game To	0	1	2	3	X	
15	Date Features	NR	-	*	-	X	
14	Background Sound					X	
13	Tie R & O return lanes					tie	X separate
12	Coin Chute #2						X
11							X
10							X
9							X
8	Maximum Add-A-Balls						X
7	Ball Per Game						X
6	High Score Feature					X	
5	Add-A-Ball (Memory)					NR	X
4	Coin Chute #1						X
3							X
2							X
1							X

converting has 3/16" glass, put tape around edges so that the extrusions fit tight.

16. Set score-to-beat levels (replay levels), including high score-to-date. Use the switch on the coin door to set these, same as the old Bally game. Recommended settings are as follows.

	RECOMMENDED SETTING	
	3 BALL	5 BALL
1st Level	850,000	1,400,000
2nd Level	NR	NR
3rd Level	NR	NR
High Score to Date	1,200,000	2,000,000

II. ROUTINE MAINTENANCE ON LOCATION

Self tests, which are programmed into the design of the game, are very helpful. As with any solid state piece of equipment the three prong grounding receptacle is an important piece part of the game, that must not be tampered with and must be used properly.

MPU MODULE SELF-TEST:

During power-up, the MPU assembly tests itself, which can visibly be seen by the flashing of a LED on the board. When the game is turned on, the LED will flash, have a pause, flash again, a longer pause, then flash five more time and then will be dimly lit. Accompanying each flash is one note (total of seven), this indicates proper MPU game operation conditins.

GAME SELF-DIAGNOSTIC TESTS:

Pressing the Self-Test button inside the coin door activates the game into its "Self-Diagnostic Test."

1. BURN-IN TEST - All outputs tested.
2. FEATURE LAMPS - All feature lamps will flash on and off continuously, determining any burnt lamps.
3. DISPLAYS - Each digit on all displays will cycle from 0 thru 9, then a number 8 will shift left to right. This test will recycle continuously.
4. SOLENOIDS - Each solenoid will be energized, one at a time, in a continuous sequence. (Holding both flipper buttons "in" during this test will cause the flipper coils to be energized.) The number appearing on the "Player Score" display is the same as the number assigned to the solenoid and also the same transistor number on the SDU board. The sound of a solenoid pulling-in as a number appears indicates proper operation (providing transistor is being used), the absence of a solenoid sound shows a fault. If sound is absent, see Solenoid I.D.I page in book for help in Solenoid Identification. (After the solenoids are tested, the game sounds are tested.)
5. SWITCHES - The MPU will look at each switch assembly for stuck contacts. (Flipper Button and flipper End of Stroke switches are not

included). If there are any stuck, the lowest number encountered is flashed on the Player Score displays. The number remains until the fault is corrected. See Switch I.D. page in book for help in switch identification. Other numbers may follow if more stuck contacts are present. If there are no stuck switches, the "Ball in Play" display flashes '0'. DO NOT BURNISH OR FILE GOLD PLATED SWITCH CONTACTS.

6. GAME LEVELS AND BOOKKEEPING FUNCTIONS - Pressing the Self-Test button eighteen more times causes the MPU to step thru the game levels and bookkeeping functions and finally to repeat the power-up test. To bypass these functions, turn the game off, then on. The game is now ready to play, after the MPU Self-Test.

CONTACT SWITCH ADJUSTMENTS

All contact switches should be adjusted to have a gap 1/16" in the open position, and have .010" overtravel closed. All contact switches (except for flipper buttons & flipper end of stroke switches) are gold plated to resist corrosion and SHOULD NOT BE FILED OR BURNISHED. If contacts have dirt or dust on them, a clean piece of paper should be used to clean them, by closing the contacts and wiping gently.

FLIPPER BUTTON & FLIPPER SWITCHES ONLY. Tarnish or pitted contacts can be corrected with a contact file followed by a burnishing tool. Severely pitted contact must be replaced as an assembly.

PLAYFIELD

Our playfields have a durable long life playing finish. Its life expectancy, as well as playing appeal can be greatly extended by periodic cleaning. Inspect and hand polish the ball with a clean cloth. A chipped ball must be replaced, as it will ruin the finish on the playfield. (DO NOT USE WATER IN LARGE QUANTITIES, HIGHLY CAUSTIC CLEANERS, ABRASIVE CLEANERS OR CLEANING PADS ON THE PLAYFIELD SURFACE.

III. GENERAL GAME OPERATION

PLACE BALL INTO PLAYFIELD BY OUTHOLE:

COIN GAME. Coin should be rejected. Plug in line cord. (For proper game operation grounding circuit must be used). Move power ON-OFF toggle switch at bottom right front corner of cabinet to "ON" position. Seven singular tones will be heard to indicate game-readiness. Feature lights will flash in a programmed attract mode. Player displays flash high score to date, numbers 1 to 7 will display from right to left, all 7's will flash, "HIGH SCORE" goes off, previous played scores are flashed, "Coin lock-out coil" is energized and game is ready for play. Coin Game. The game should accept the coin and post credits for coins accepted (*). Pressing the credit button on the door will reset drop targets and cause the outhole kicker to move the ball to the runway. The first player display will flash 00.

One player is registered each 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.
(Credit button is in-operative after 4 players are registered).
Shooting the ball initiates play.

When the ball enters the outhole, the bonus score is added to the player's score. The player-up and/or ball in play on the backbox is advanced one position. The bonus score starts at ** points. The outhole kicker moves the ball to the runway and play is resumed. This continues until each player has played the allowable number of balls per game (3 or 5). At this time the "Game Over" light becomes lit.

Tilting while playing the game results in loss of the ball in play. The flippers, pop-bumper, etc., go "dead". Bonus score is not added. Game action becomes normal after the outhole kicker moves the ball to the runway.

There is a slam switch on the front door, one on the tilt board. (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 gap between contacts will make the switch more sensitive. Opening the gap will reduce sensitivity.

IV. SELF TEST AND BOOKKEEPING FUNCTIONS

The game is designed to help the operator perform certain diagnostic tests as well as accounting functions as follows:

IV. A. SELF TEST

TEST SWITCH PUSH NUMBER	BALL IN PLAY DISPLAY	DESCRIPTION
1st		Burn in test-all outputs tested.
2nd		Lamp test-all feature lamps on and off
3rd		Display test-all digits display 000000 thru 999999 then an 8 shifts from left right
4th		Solenoid test-continues sequence of solenoids pulsed with solenoid driver transistor, "Q" number displayed
5th	Flashing 0 if all switches open	Switch I.D. No. displays if closed

852,000
1,020,000
1,200,000

IV. B. BOOKKEEPING FUNCTIONS

TEST SWITCH	BALL IN PLAY	DESCRIPTION	DISPLAYS
6TH	01	1ST THRESHOLD (HIGH SCORE)	
7TH	02	2ND THRESHOLD (HIGH SCORE)	
8TH	03	3RD THRESHOLD (HIGH SCORE)	
9TH	04	CURRENT HIGH GAME THRESHOLD	
10TH	05	CURRENT CREDITS	00 TO 40
11TH	06	TOTAL PLAYS	00 TO 999999
12TH	07	TOTAL REPLAYS	00 TO 999999
13TH	08	TOTAL TIMES HIGH SCORE IS PASSED	00 TO 999999
14TH	09	NUMBER OF COINS THRU CHUTE NO. 2	00 TO 999999
15TH	10	NUMBER OF COINS THRU CHUTE NO. 1	00 TO 999999
16TH	11	NUMBER OF COINS THRU CHUTE NO. 3	00 TO 999999
17TH	12	TOTAL BALLS PLAYED	00 TO 999999
18TH	13	TOTAL EXTRA BALLS AWARDED	00 TO 999999

19TH	14	TOTAL PLAYFIELD WOW AWARDS	00 TO 999999
20TH	15	N/U	00
21ST	16	TOTAL LEVEL 1 PASSED (SCORE TO	
		BEAT	00 TO 999999
22ND	17	TOTAL LEVEL 2 PASSED	00 TO 999999
23RD	18	TOTAL LEVEL 3 PASSED	00 TO 999999

V. FRONT DOOR GAME ADJUSTMENTS:

HIGH SCORE FEATURE ADJUSTMENTS:

The game is designed to award an "Extra Ball" or "Free Game" (option) at three score levels. (See High Score Feature.) The recommended levels are listed below.

Any level from 10,000 to 9,990,000 can be set, as desired. It is possible to reset or turn off (00) any or all of the levels, if desired.

1. Push and release Self-Test button at one second intervals six times or until number 01 appears on the Ball in Play display.
2. The number on the Player Score Displays is the first 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 High Score 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 high score levels. The number '02' and '03' on the Ball in Play display are for the second and third levels, respectively.

HIGH GAME TO DATE FEATURE:

The game is designed to award up to 3 free games (option) when "High Score to Date" is beat. For the recommended, factory preset level, see below.

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 Adjustments, Steps 1 and 2. Continue pushing the Self-Test button until the number '04' appears on the 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 can be turned off by positioning the correct MPU switches.

*Can be quickly set to '00' by pressing S33 on the MPU assembly in the back box or front door.

VI. FEATURE OPERATION AND SCORING

To help explanation, playfield switchs involved will be called out.
See "Switch Identification" for location of playfield switches.

BONUS SCORE FEATURE:

Game starts at 1,000. Maximum bonus 10,000.

BONUS ADVANCEMENT

PL.SW.NO.	LOCATION	ADVANCE BONUS
17, 19, 22,	UPPER ROLLOVERS	BY 1,000
24, 33	RETURN LANES	BY 1,000
36, 37	OUTLANES	BY 1,000
21	TOP STATIONARY	
	TARGETS	BY 1,000
18, 20	BOTTOM STATIONARY	
	TARGETS	BY 1,000

BONUS MULTIPLIER

PL.SW.NO.	LOCATION	ADVANCE MULTIPLIER
38	CENTER LANE	INCREASES MULTIPLIER BY 1x
	STATIONARY	(TO 15x MAX.)
	TARGET	
25, 26, 27	RIGHT BANK	INCREASES MULTIPLIER BY 1x
	DROP TARGETS	WHEN ALL 3 TARGETS HIT (TO 15x MAX)

Bonus multiplier can be adjusted to be reset after each new ball. See MPU SW. #30.

BONUS COLLECTED:

Outhole (Pl.Sw.No.33) When the ball enters the outhole bonus score (times the multiplier) is collected. The bonus resets to 1,000.

THREE BALL FEATURE

When Lock 1 and Lock 2 are lit, G-A-M-A-T-R-O-N is lit and the countdown is made in order-third ball in ball walker holes will release the three balls into play.

WOW

WOW can be awarded by means of three switches; the Center Lane Stand-Up Target (Pl.Sw.No.38), and the two outlanes (Pl.Sw. NO. 37 & 36).

WOW COLLECTED

PL.SW.NO.	LOCATION	AWARD (LITES SPECIAL)
36, 27	OUTLANES	G-A-M-A-T-R-O-N MUST BE SPOTTED TWICE
38	RED STATIONARY	40,000 WOW LITE MUST BE LIT AND
	TARGET	5-4-3-2-1 MUST BE COUNTED DOWN AGAIN

AWARD

	MPU SW.NO.	
	31	32
NO AWARD-NOT RECOMMENDED	OFF	OFF
SHOOT AGAIN-RECOMMENDED	OFF	ON
100,000	ON	OFF
REPLAY-NOT RECOMMENDED	ON	ON

WOW ADJUSTMENTS

WOW can be adjusted so only one WOW per game can be collected or one WOW per ball. (See MPU Sw. No 29.)

SHOOT AGAIN

"Shoot Again" can be awarded by means of four switches; the launcher (Pl.Sw.No. 39), the two outlanes (Pl.Sw.No. 36 & 37) and the Center Lane Stationary Target (Pl. Sw. No. 38).

SHOOT AGAIN COLLECTED

"Shoot Again" can be awarded by means of the WOW feature on game (See MPU Sw. 31 & 32). "Shoot Again" can also be awarded by means of the HIGH SCORE FEATURE (See MPU Sw. 6). Putting ball into the first two empty spots in walker (Pl.Sw.No. 39) awards "Shoot Again" and delivers an additional ball to runway.

RIGHT DROP TARGETS (Pl.Sw.No. 25,26,27)

Hitting all three targets down increases bonus multiplier and value of right spinner. Hitting all three targets down with one hit when blue lite is on scores 50,000.

RIGHT SPINNER (Pl.Sw. No.5)

Scores lit value (starts at 50 to 5,000 max.). It can be adjusted to reset with each new ball. (See MPU Sw. No. 22)

LEFT SPINNER (Pl.Sw.No.4)

Scores 200 each spin or 500 per GAMATRON letter that's lit when blue lite is on (lites after missiles have been fired)

KICKING RUBBER (Pl.Sw.No.9,10,11,12)

Scores 10 points.

POP BUMPER (Pl.Sw.No.13&14)

Scores 1,000 for three ball and 100 for five ball.

RED CENTER STATIONARY TARGET (Pl.Sw.No.38)

Scores 25,000 increases bonus multiplier, awards WOW when red lite is lit. (flashes after missiles have been fired)

UPPER ROLLOVERS (Pl.Sw.No.18-21)

Scores 5,000 spots letters G-A-M and advances bonus.

YELLOW STATIONARY TARGETS

Scores 3,000, spots A-T-N and advances bonus

RETURN LANES (Pl.Sw.No.23&24)

Scores 5,000 spots letters R & O, spots lit drop target, and advances bonus. Game can be adjusted so hitting either R or O spots both.

OUTLANES (Pl.Sw.No.36&36)

Scores 25,000, spots lit target, advances bonus, and awards WDW when lit.

1-5 DROP TARGETS (Pl.Sw.No.29-32)

Scores 500 or 5,000 when lit. The flashing light indicates next target to be hit. Hitting all five targets down in countdown order arms missile 1, missile 2, lites all systems go, fires missiles, and 40,000 WDW values when they are lit.

OUTHOLE (Pl.Sw.No.33)

Scores bonus plus (times the bonus multiplier).

LAUNCH DETECTOR SWITCH (Pl.Sw.No.40)

Located in top missile launch area. Activates ball walker when fire missiles is lit.

MISSILE 1 LAUNCHER (Pl.Sw.No.15)

Scores 10,000 and scores 5,000 for each letter lit after fire missiles is lit.

MISSILE 2 LAUNCHER (Pl.Sw.No.16)

Scores 10,000

BALL LAUNCHER (PL.SW.NO.29)

Scores 10,000 and lites lock 1 and lock 2.

HIGH SCORE FEATURE

Up to three replays or shoot agains awarded for surpassing three different high score levels. (See MPU Sw.No.6).

HIGH GAME TO DATE

Up to three replays awarded for surpassing high game score to date (See MPU Sw. No. 15&16).

NOTE #1

Player must place two balls in ball walker holes to light 1 & 2 or Lock 1 and Lock 2 lights can light for next game or next player if they are already in walker. (See MPU Sw.No.24).

Note #2

Kicking rubbers alternate lighting the WOWS and the blue Right 3 Bank Drop Target 50,000 value lites on & off.

VII. CREDIT/COIN AND GAME ADJUSTMENTS

A. PLAYFIELD POST ADJUSTMENTS:

Posts that control left and right outlane openings on playfield can be moved to make access to outlanes conservative or liberal for ball to enter.

Liberal (wide) entry into outlanes will increase playing time and scoring. Conservative (narrow) entry into outlanes will increase playing time and scoring. Factory adjustment is in center position. NOTE: Before changing post adjustments, verify you are operating the game at a 5 1/2 degree slant.

B. BACK BOX GAME ADJUSTMENTS:

Each game has thirty-two switches located on the MPU module, located in the back box, that allows play to be customized to the location. (See Fig. 1). Credits per coin, maximum credits, credit display, balls (3 or 5) per game, match feature, high game feature, special award, maximum extra balls and background sound are selectable by means of 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" position is marked on the assembly. TURN OFF POWER BEFORE MAKING ADJUSTMENTS. MAKE ADJUSTMENTS BEFORE TURNING POWER BACK ON.

CREDITS/COIN ADJUSTMENTS:

The credits given are selectable by means of MPU switches. Sixteen credit ratios are available. The MPU switch settings and resultant credits/coin are as follows:

CREDITS/COIN ADJUSTMENTS SWITCHES

SW. 1	4	3	2	1		
SW. 3	12	11	10	9		
SW. 2	28	27	26	25		
					CREDITS	COIN
	OFF	OFF	OFF	OFF	1	
	OFF	OFF	OFF	ON	2	
	OFF	OFF	ON	OFF	3	
	OFF	OFF	ON	ON	4	
	OFF	ON	OFF	OFF	5	1
	OFF	ON	OFF	ON	6	
	OFF	ON	ON	OFF	7	
	OFF	ON	ON	ON	10	
	ON	OFF	OFF	OFF	14	

SEQUENCE OF CREDITS PER COIN

				CREDITS	COINS	1	2	3	4
ON	OFF	OFF	ON	1	2	0	1		
ON	OFF	ON	OFF	3	2	1	2		
ON	OFF	ON	ON	5	2	0	5		
ON	ON	OFF	OFF	7	2	0	7		
ON	ON	OFF	ON	3	4	0	1	0	2
ON	ON	ON	OFF	5	4	1	1	1	2
ON	ON	ON	ON	7	4	1	2	1	3

If two or three coin chutes are adjusted the same for multiple coins, credits will increase as if dropped in same chute. Credit sequence will reset when:

- 1) credit button is pressed
- 2) any points are scored

ADD-A-BALL (MEMORY)

This adjustment can store in memory 3 or 5 "Add-A-Balls."

ADD-A-BALL (MEMORY)	MPU SWITCHES
	5 8
1 Only Recommended	OFF
3 Not Recommended	ON OFF
5 Not Recommended	ON ON

HIGH SCORE FEATURE:

The game is designed to award an Extra Ball or Free Game at one, two or three high score levels. See Front Door Game Adjustments

AWARD	MPU SWITCH 6
Extra Ball	OFF OK
Replay	ON Recommended

BALL PER GAME:

NO. OF BALLS PER GAME	MPU SWITCH 7
3	OFF Recommended
5	ON OK

TIE R & O RETURN LANE LITES:

LITES	MPU SWITCH 13
1 Separate	OFF OK
2 Ties Together	ON Recommended

BACKGROUND SOUND:

The background sound during game play can be controlled as follows:

SOUND	MPU SWITCH 14
OFF	OFF Not Recommended
ON	ON Recommended

HIGH GAME TO DATE FEATURE:

The game is designed to award up to 3 free games as an option of high score 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.

AWARD	MPU SWITCHES
	15 16
Novelty	OFF OFF Not Recommended
1 Free Game	ON OFF OK
2 Free Games	OFF ON Recommended
3 Free Games	ON ON OK

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 are adjustable by means of switches 18 and 19. Four credit limits are available.

MAXIMUM CREDITS	MPU SWITCHES
	18 19
10 Recommended	OFF OFF
15 OK	ON OFF
25 Not Recommended	OFF ON

40 Not Recommended ON ON

CREDIT DISPLAY

CREDIT DISPLAY	MPU SWITCH 20
YES	ON
NO	OFF

ADD 10% REPLAY

When this feature is on, a random number appears in the "Ball in Play" window at the end of a game. If the number matches the tens digit in player's score a free game is awarded.

ADD 10% REPLAY	MPU SWITCH 21
ON Not Recommended	ON
OFF Recommended*	OFF

* If player free play percentage is too low, it is recommended that a lower score to beat be employed rather than this feature.

RIGHT SPINNER:

"Spinner Scores Lit Values" can be retained from ball to ball or adjusted to start fresh for each ball.

RIGHT SPINNER LITES	MPU SWITCH 22
Start Fresh	OFF Not Recommended
Retain	ON Recommended*

LOCK 1 & LOCK 2 LITES:

Lites can be turned on or left off with captive ball (or balls) in Ball Walker Holes at start of game.

LOCK 1 & LOCK 2	MPU SWITCH 24
Left off	OFF Not Recommended
Turn On	ON Recommended*

NO. OF WOWS

The number of WOWS per game can be limited as follows:

WOWS	MPU SWITCH 29
1 Per Ball	OFF Recommended*
1 Per Game	ON Not Recommended*

BONUS MULTIPLIER RESET:

The bonus multiplier during the course of the game can be retained from ball to ball or can be adjusted to start fresh for each ball.

BONUS MULTIPLIER	MPU SWITCH 30
Retain	OFF Recommended*

1.	1-WAY GATE BRACKET	04-00015	
	1-WAY GATE WIRE	06-00005	
2.	3 BANK DROP TARGET		
	COMPLETE ASSY.	10-10595N	
	TARGET	03-10003A	
	SPRING-SMALL	06-20002A	
	RESET SPRING-LG.	06-20005A	
	SWITCHES	17-90001N	
	COIL-LG. BOBBIN	26-1900*	26-1900*
	DIODE 1N5402	21-00001N	
	SOLENOID PLUNGER		
	LINE ASSY.	10-10055	
	COIL STOP ASSY.	10-00052A	
3.	STATIONARY TARGET		
	& SWITCH ASSY.		
	COMPLETE YELLOW	10-10597N	15-1282
4.	STATIONARY TARGET		
	& SWITCH ASSY.		
	COMPLETE RED	10-10596N	15-1283
5.	KICKING RUBBER ASSY.		
	COMPLETE	10-10598N	
	PLUNGER SPRING	06-30004A	
	COIL	21-50005B	27-1400
	DIODE-1N5402	25-00001N	
	COIL STOP & BRACKET	10-0009A	
	SOLENOID PLUNGER &		
	LINK ASSY.	10-1000TA	
6.	SLOT KICKER ASSY.		
	COMPLETE	10-10599N	
	SPRING	06-30004A	
	COIL	21-50005B	27-1400
	DIODE-1N5402	25-00001N	

COIL STOP & BRACKET	10-0009A		
SOLENOID PLUNGER & LINK ASSY.	10-10001A		
7. BALL WALKER ASSY. COMPLETE	10-10601N		
BALL WALKER LEVER (HOLDS 3 CAMS TOG.)	04-1223B		
PLUNGER SPRING	06-30005		
COIL	21-50004	29-2000	
DIODE-1N5402	21-00001N		
CAM BRACKET			
CAM BRACKET	04-01214		
COIL STOP & BRACKET	10-00009		
SOLENOID PLUNGER & LINK ASSY.	10-10001		
8. SPINNER	10-00033A		
SPINNER BRACKET	04-00016A		
SWITCH ACTUATOR WIRE	06-00003A		
SWITCH			
9. FLIPPER ASSY. COMPLETE RIGHT		15-3579	
COMPLETE LEFT		15-3580	
FLIPPER		15-087801	
PLUNGER SPRING		19-721500	
END OF STROKE SW.		15-357800	
COIL W/DIODE FL-1		15-12960	2450/ 34/4700
SOLENOID PLUNGER LINK			
10. POP BUMPER ASSY. COMPLETE		15-358500	
CAP-RED		15-088002	
PLUNGER SPRING		15-3448	
SWITCH		15-128100	
COIL W/DIODE PB-1		05-129700	25-1000
RING		19-021300	
BASE		19-7205	
11. 5 BANK DROP TARGET COMPLETE ASSY.		15-357600	
INDIVIDUAL TARGETS		15-350900	
PLUNGER SPRING		15-344800	
SWITCH		15-357500	
COIL W/DIODE DT-1	2150007	05-129500	29-2000
(2 REQ.)	&		
LARGE BOBBIN	25-00001N		PLUS DIODE
SOLENOID PLUNGER			

& LINK ASSY.	10-10055
12. OUTHOLE ASSEMBLY	
COMPLETE ASSY.	10-10608N
PLUNGER SPRING	06-30004
CAM SPRING	06-20010
COIL	21-50004
DIODE-1N5402	25-10021
COIL STOP ASSY.	10-00009
SOLENOID PLUNGER	
& LINK ASSY.	10-10001
13. FLIPPER CABINET SWITCH	01-1935-00

ALL COILS MUST HAVE 1N5402 HIGH CURRENT DIODE.

RUBBER SIZES ARE INDICATED ON PLAYFIELD UNDER PLAYFIELD PLASTICS.
*LARGE BOBBIN

			SOLENOIDS
I.D. NO.	TRANS NO.	JACK	DESCRIPTION
1	Q1	J2-9	TOP RIGHT KICKING RUBBER
3	Q3	J2-5	POP BUMPER
4	Q4	J1-5	5 BANK DROP TARGET RESET RELAY*
5	Q5	J2-10	BOTTOM LEFT KICKING RUBBER
6	Q6	J2-11	BOTTOM RIGHT KICKING RUBBER
13	Q13	J5-12	BALL WALKER
14	Q14	J5-11	OUTHOLE
15	Q15	J3-5	FLIPPER ENABLE RELAY
16	Q16	J5-8	3 BANK DROP TARGET RESET
17	Q17	J5-7	RIGHT SLOT KICKER
18	Q18	J5-3	LEFT SLOT KICKER
19	Q19	J2-8	COIN LOCKOUT
20 THRU 29			ELECTRONIC SOUND

*NOTE: TRANSISTOR ACTIVATES RELAY WHICH FEEDS 43 VOLTS DIRECTLY TO BOTH RESET COILS
SEE FOLLOWING CHART

SWITCH
SYMBOL

SWITCH
NO.



SWS. #1, 2, & 3 NO DIODE
ALL OTHER SWITCHES USE
DIODE IN4004



SWITCH I.D.

(J2-3)

(J3-3)

(J2-1)

(J2-2)

SWITCH
NO.

JACK
NO.

DESCRIPTION

CHUTE (LEFT)

CHUTE (RIGHT)

CHUTE (LEFT)

SPINNER (L)

SPINNER (R)

CREDIT BUTTON

TILTS

SLAM & VIB. TILTS

NOT USED

RIGHT TOP

LEFT BOTTOM KICKING RUBBER

RIGHT BOTTOM KICKING RUB.

NOT USED

POP BUMPER

LEFT SLOT KICKER

RIGHT SLOT KICKER

SWITCH
NO.

17

18

19

20

21

22

23

24

JACK
NO.

J2-8

J2-9

J2-10

J2-11

J2-12

J2-13

J2-14

J2-15

DESCRIPTION

G ROLLOVER

T TARGET

A ROLLOVER

O ROLLOVER

A TARGET

M ROLLOVER

N TARGET

R ROLLOVER

TOP

MID.

BOT.

#1

#2

#3

#4

#5

RIGHT

DROP

TARGET

DROP

TARGETS

J2-8

J2-9

J2-10

J2-11

J2-12

J2-13

J2-14

J2-15

OUT HOLE (CENTER)

OUT HOLE (LEFT)

LEFT OUT LANE

RIGHT OUT LANE

RED CENTER STATIONARY

BALL

LAUNCH DETECTOR

J2-9

J2-10

J2-11

J2-12

J2-13

J2-14

J2-15

SWITCH
NO.

17

18

19

20

21

22

23

24

JACK
NO.

J2-8

J2-9

J2-10

J2-11

J2-12

J2-13

J2-14

J2-15

DESCRIPTION

G ROLLOVER

T TARGET

A ROLLOVER

O ROLLOVER

A TARGET

M ROLLOVER

N TARGET

R ROLLOVER

TOP

MID.

BOT.

#1

#2

#3

#4

#5

RIGHT

DROP

TARGET

DROP

TARGETS

J2-8

J2-9

J2-10

J2-11

J2-12

J2-13

J2-14

J2-15

OUT HOLE (CENTER)

OUT HOLE (LEFT)

LEFT OUT LANE

RIGHT OUT LANE

RED CENTER STATIONARY

BALL

LAUNCH DETECTOR

J2-9

J2-10

J2-11

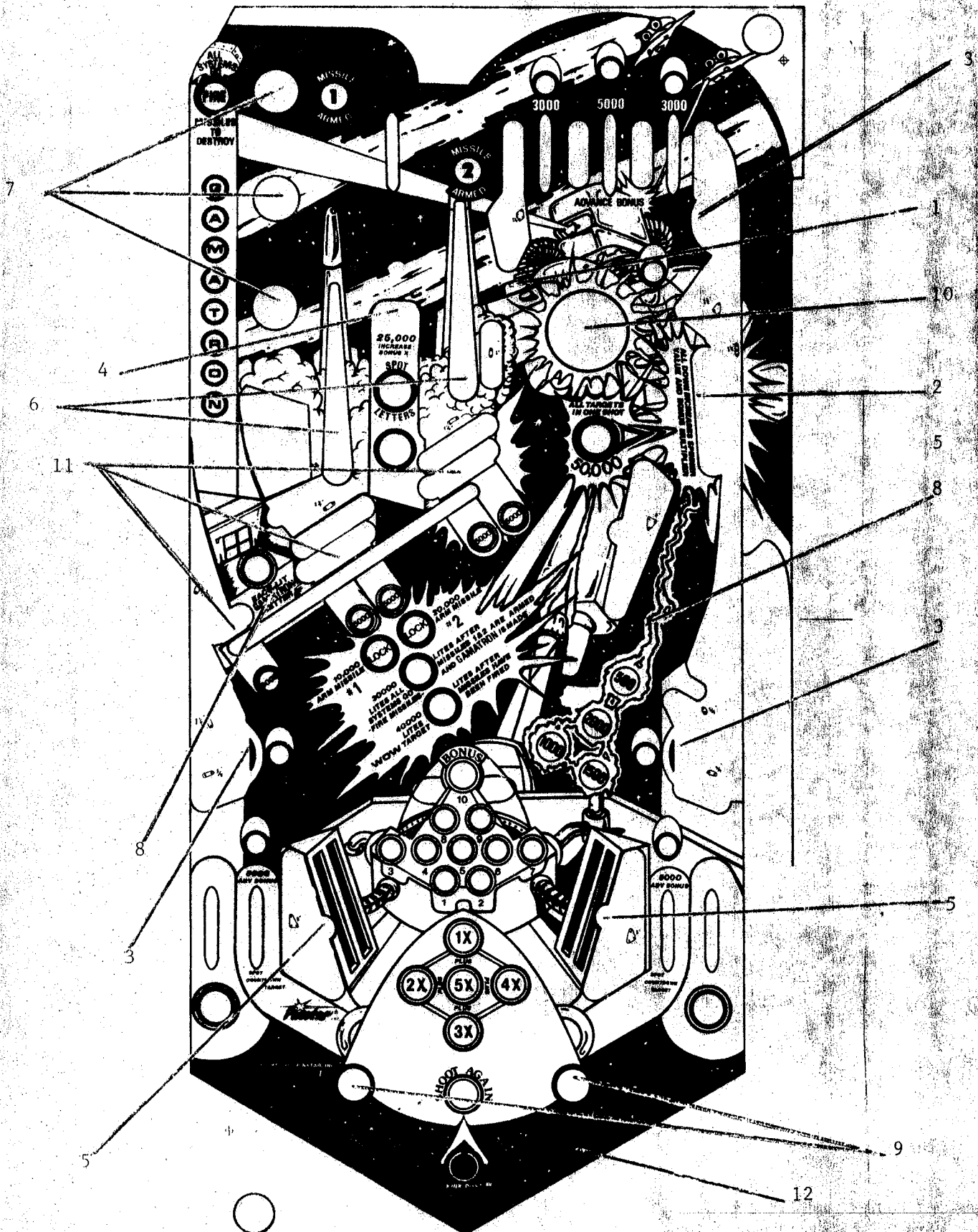
J2-12

J2-13

J2-14

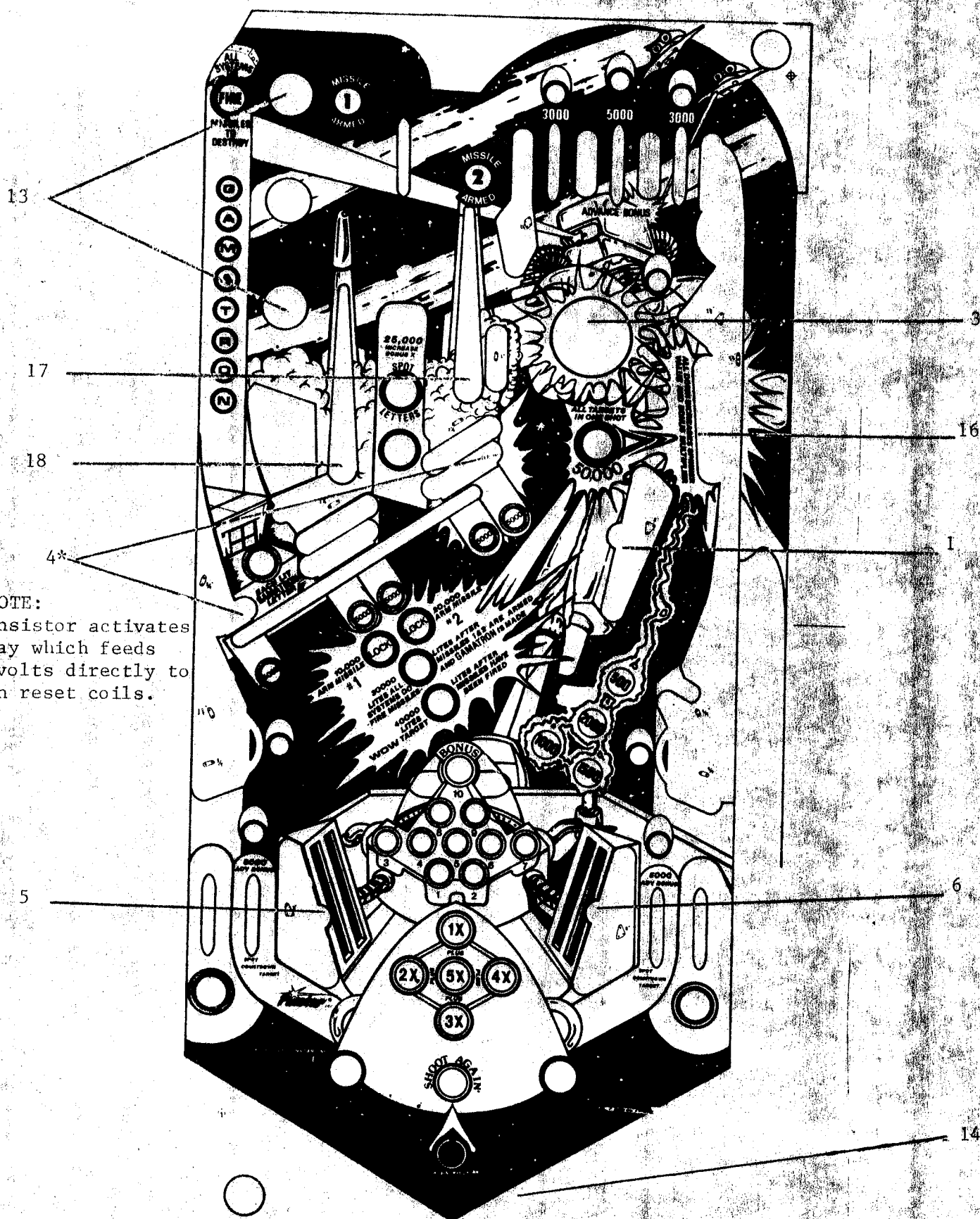
J2-15

PLAYFIELD PARTS



- NOT ON PLAYFIELD:
- 15. - Flipper Enable Relay
- 19 - Coin Lock Out

SOLENOIDS

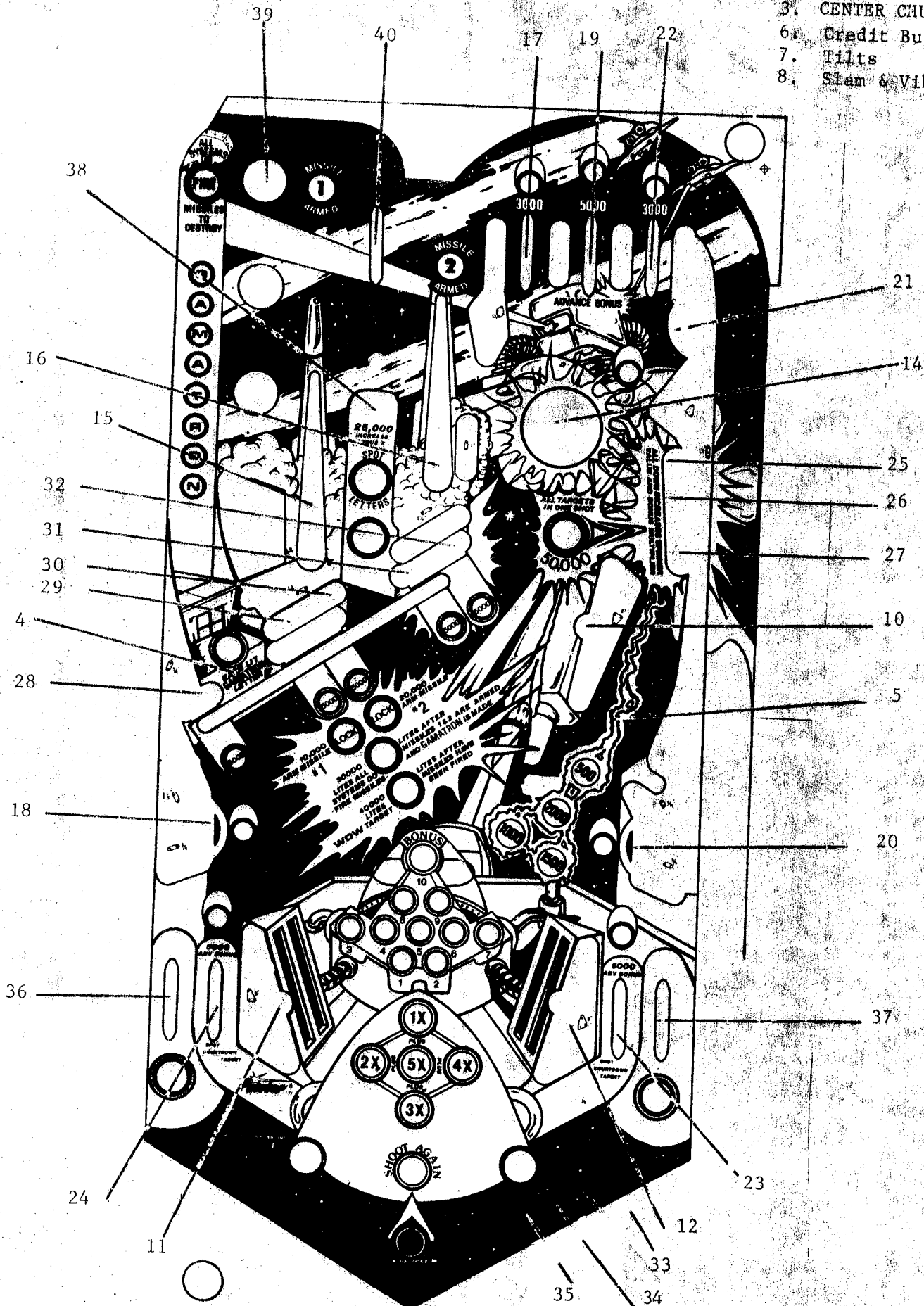


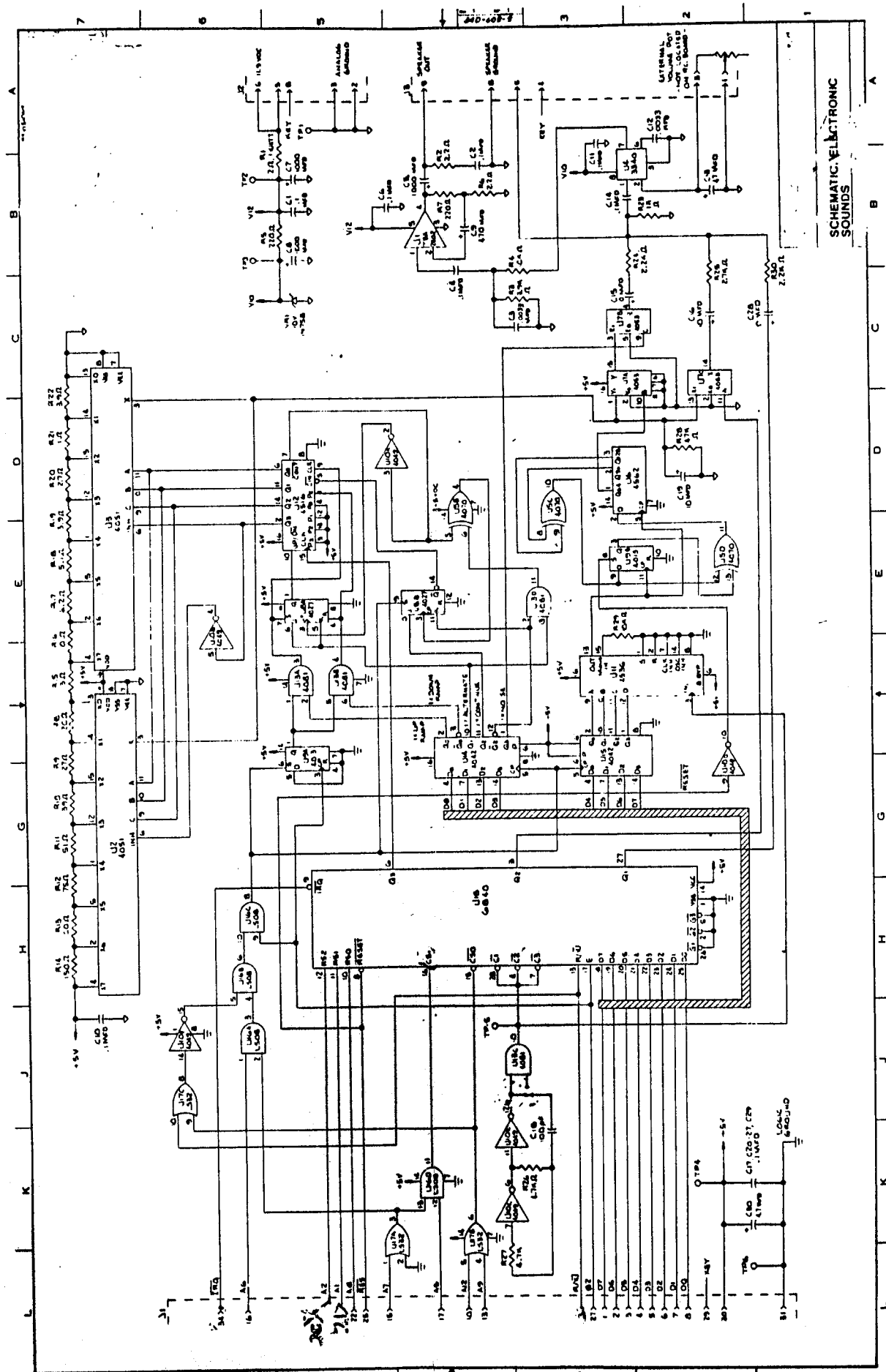
*NOTE:
Transistor activates
relay which feeds
43 volts directly to
both reset coils.

SWITCHES

SWITCHES NOT ON PLAYFIELD

1. Left Chute
2. RIGHT CHUTE
3. CENTER CHUTE
6. Credit Button
7. Tilts
8. Slam & Vib Tilts





PSM BOARD : SOUND SECTION

9602

NOTE: The capacitor is a special capacitor designed to replace the nickel-cadmium battery used on pinball boards. Do not substitute with any other type capacitor.