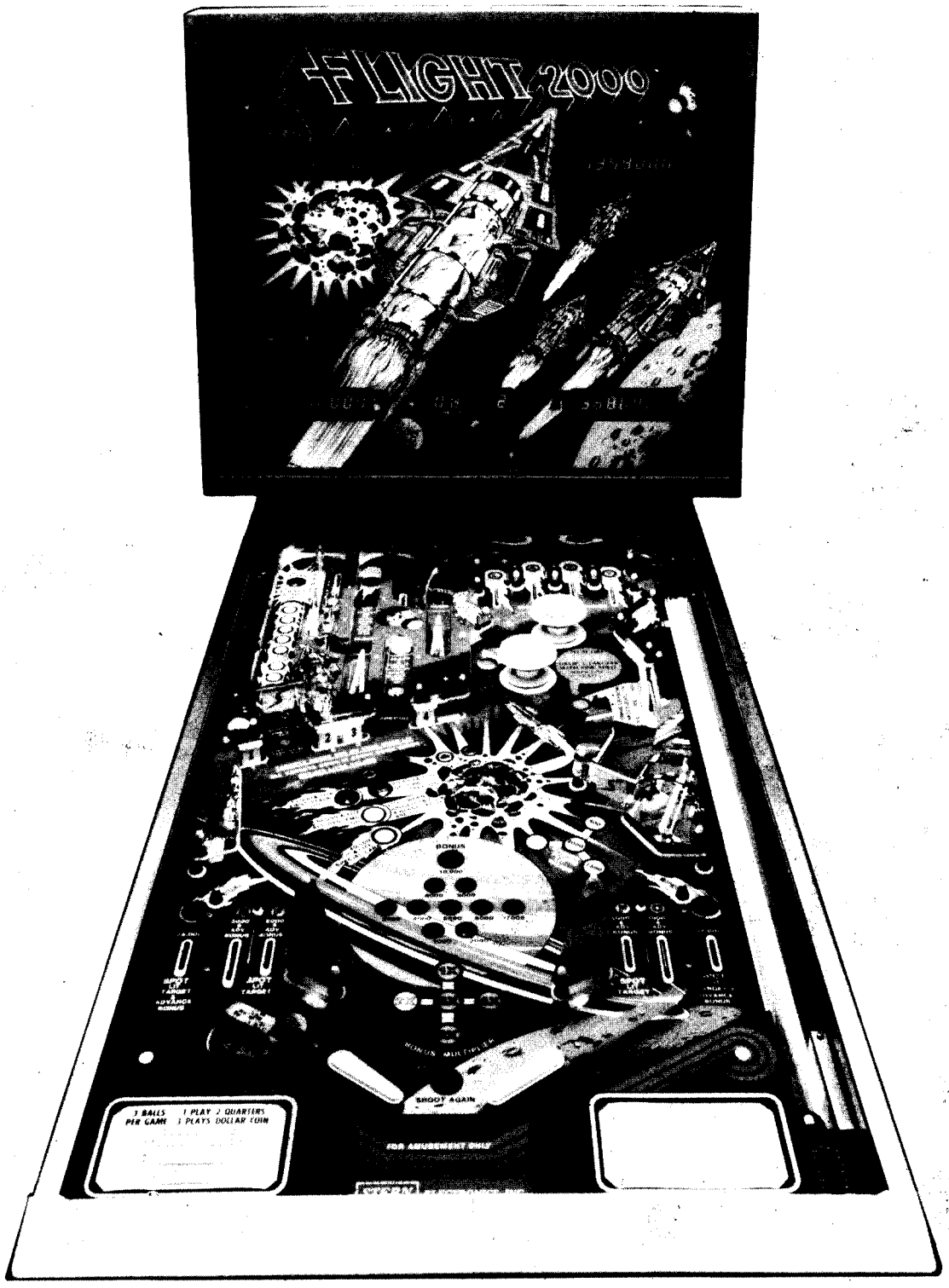

STERN®
ELECTRONICS, INC.
1725 Diversey Parkway, Chicago, Illinois 60614
(312) 935-4600, Telex 25-4657
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I. INSTALLATION

Assemble the game as follows:

Bolt legs to cabinet. Using flat washers under bolt heads, bolt back box to cabinet. Feed cable connectors and ground braid through cable port in back box. Screw ground braid to braid in back box. Insert connectors so they are completely seated on printed circuit board assemblies.

On all games there are some items that must be checked after shipment. Making these visual inspections 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 switches should always be adjusted after game is set on location and leg levelers are adjusted.

Visual inspections before plugging in line cord:

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

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

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

NOTE

TO PROTECT SOLID STATE COMPONENTS BEFORE TOUCHING ANY COMPONENT IN THE BACK BOX, DISCHARGE ANY POSSIBLE STATIC BUILD-UP BY TOUCHING ANY GROUND CIRCUIT, e.g. SIDE ARMOR, GROUND BRAID.

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 times and then will be dimly lit. Accompanying each flash is one note (total of seven), this indicates proper MPU game operation conditions.

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. 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 "Match/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

Stern 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.

ELECTRONIC PIN BALL GAME

DISPLAY DRIVER ASSEM'S:-

1ST, 2ND, 3RD & 4TH PLAYERS, CREDITS AND MATCH/BALL IN PLAY.

(SEE BACK-RACK GLASS FOR LOCATIONS)

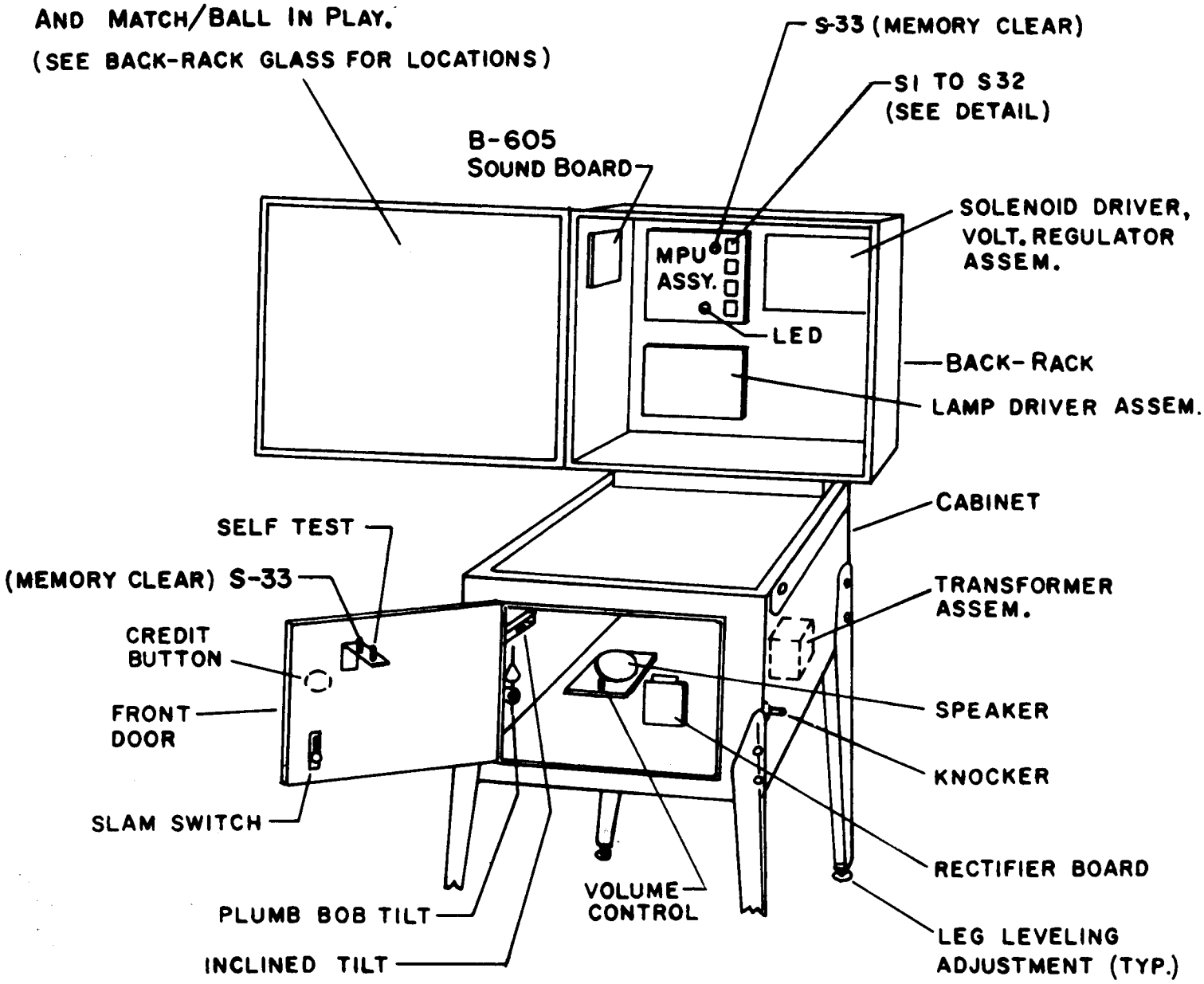
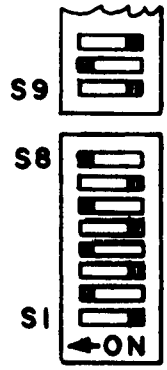


FIGURE 1



DETAIL S1-S32
MPU ASS'Y.

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 lites will flash in a programmed attract mode, "HIGH SCORE" lite is lit, player displays flash high score to date, numbers 1 to 7 will display from right to left, all 7's will flash, "HIGH SCORE" lite 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 shooter lane. 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 back box is advanced one position. The bonus score starts at ** points. The outhole kicker moves the ball to the shooter lane 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. A random "Match" number appears and the "Match" light becomes lit. If the match number is the same as the last two digits in the player's score a free game can be awarded (*).

Extra ball won during the course of the game is played immediately after the player's regular ball enters the outhole. The player-up and/or ball in play is not advanced for extra ball play. Bonus score is added to the player's score, the bonus is reset to ** and the bonus multiplier earned is restored (memory) or reset (*) before the game moves the extra ball for play.

At the end of the game, a "High Game" is flashed on all players scores. If the "High Game" is beat, this feature(*) can award up to 3 free games.

Tilting while playing the game results in loss of the ball in play. The flippers, thumper-bumper, etc., go "dead". Bonus score is not added. 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 outhole kicker moves the ball to the shooter lane.

Slamming the machine results in the loss of the game. All feature lights go out and the game becomes "dead" through a built-in time delay circuit. The purpose of the time delay circuit is to discourage abuse of the machine. After the delay, the "Game Over" light lites "Shoot Again" lite flashes and the game is ready for play. The time delay occurs anytime one of the slam switches is made to contact.

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.

*Some tunes and features can be disabled by operator if so desired.

**Bonus starts at 1,000

See back box adjustments.

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/MATCH 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 to right
4th		Solenoid test - continuous sequence of solenoids pulsed with solenoid driver transistor, "Q" number displayed
5th	Flashing O if all switches open	Switch test - switch I.D. No. displays if closed

IV. B. BOOKKEEPING FUNCTIONS

TEST SWITCH PUSH NUMBER	BALL/MATCH DISPLAY	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 Special Awards	00 to 999999
20th	15	N/U	00
21st	16	Total level 1 passed	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 a "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 or 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 Match/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 Match/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 pusing 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 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.

RECOMMENDED SETTING

	3 BALL	5 BALL
1st Level	500,000	900,000
2nd Level	840,000	1,460,000
3rd Level	———	———
High Score To Date	1,200,000	2,000,000

VI. FEATURE OPERATION AND SCORING

To help explanation, playfield switches involved will be called out. See "Switch Identification" (Pg. 18) 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
18, 19, 20, 21	Upper Right Rollovers	By 1,000
23, 24	Inner Return Lanes	By 1,000
17, 22	Outer Return Lanes	By 1,000
36, 37	Outlanes	By 1,000
(2) 17	Top Stand-Up Targets	By 1,000

BONUS MULTIPLIER

Pl. Sw. No.	Location	Advance Multiplier
38	Center Lane Stand-Up Target	Increases Multiplier by 1x (to 15x max.)
25, 26, 27	Right Bank Drop Targets	Increases Multiplier by 1x When All Three 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 Apollo 1 & 2 lites are lit (See Note #1), two balls are in the Apollo lane, B-L-A-S-T-O-F-F is lit and the countdown is made in order–third ball will release the three balls into play.

SPECIAL
"Special" 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).

SPECIAL COLLECTED

Pl. Sw. No.	Location	Award (Lites Special)
36, 37	Outlanes	B-L-A-S-T-O-F-F Must Be Spotted Twice
38	Center Lane Stand-Up Target	40,000/ Special Lite Must Be Lit and 5-4-3-2-1 Must Be Counted Down Again.

AWARD

	MPU Sw. No. 31	32
NO AWARD	OFF	OFF
SHOOT AGAIN	OFF	ON
100,000	ON	OFF
REPLAY	ON	ON

SPECIAL ADJUSTMENTS
"Special" can be adjusted so there is only one Special per game or one Special 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 Stand-Up Target (Pl. Sw. No. 38).

SHOOT AGAIN COLLECTED
"Shoot Again" can be awarded by means of the SPECIAL 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".

RIGHT DROP TARGETS (Pl. Sw. No. 25, 26, 27)
Hitting all three targets down increases bonus multiplier and value of right spin target. Hitting all three targets down with one hit when purple lite is on (See Note #2) scores 50,000.

RIGHT SPIN TARGET (Pl. Sw. No. 5)
Scores lit value (starts at 500 to 5,000 max.). It can be adjusted to reset with each new ball. (See MPU Sw. No. 22)

LEFT SPIN TARGET (Pl. Sw. No. 4)
Scores 200 each spin or 500 per BLASTOFF Letter that is lit when purple lite is on (lites after B-L-A-S-T-O-F-F and countdown are made).

SLING SHOTS (Pl. Sw. No. 9, 10, 11, 12)
Scores 10 points. (See Note #2)

THUMPER BUMPERS (Pl. Sw. No. 13 & 14)
Scores 1,000 for three ball and 100 for five ball.

CENTER LANE STAND-UP (Pl. Sw. No. 38)
Scores 25,000, increases bonus multiplier, awards SPECIAL when red lite is lit, and spots B-L-A-S-T when yellow lite is lit (lites after B-L-A-S-T-O-F-F and countdown are made).

UPPER RIGHT ROLLOVERS (Pl. Sw. No. 18-21)
Scores 5,000, spots letters L-A-S-T, and advances bonus.

OUTER RETURN LANES (Pl. Sw. No. 17 & 22)
Scores 3,000, spots letters B & O, and advances bonus.

TOP RIGHT STAND-UP TARGETS (Pl. Sw. No. (2) 17)
Scores 3,000, spots letter B, and advances bonus.

INNER RETURN LANES (Pl. Sw. No. 23 & 24)
Scores 5,000, spots letters F & F, spots lit drop target, and advances bonus. Game can be adjusted so hitting one F spots both F's. (See MPU Sw. No. 13)

OUTLANES (Pl. Sw. No. 36 & 37)
Scores 25,000, spots lit target, advances bonus, and awards SPECIAL when lit.

1-5 DROP TARGETS (Pl. Sw. No. 29-32)
Scores 500 or 5,000 when arrow is lit. The lit arrow indicates next target to be hit. Hitting all five targets down in countdown order scores Apollo 1, Apollo 2, All Systems Go, and 40,000/Special values when they are lit.

OUTHOLE (Pl. Sw. No. 33)
Scores bonus plus (times the bonus multiplier).

"RELEASE NEXT ROCKET" SWITCH (Pl. Sw. No. 40)
Located in top trapped ball area, releases next ball when B-L-A-S-T-O-F-F and countdown are made.

FIRST STAGE KICKOUT (Pl. Sw. No. 15)
Scores 10,000 and scores 5,000 for each blastoff letter lit after B-L-A-S-T-O-F-F and countdown are made.

SECOND STAGE KICKOUT (Pl. Sw. No. 16)
Scores 10,000

BALL LAUNCHER (Pl. Sw. No. 29)
Scores 10,000 and advances Apollo 1 & 2 lites.

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 launcher to light Apollo 1 & 2 lites or Apollo 1 & 2 lights can light for next game or next player if they are already in launcher. (See MPU Sw. No. 24)

NOTE #2
Slingshots alternate lighting the SPECIALS and the purple Right 3 Bank Drop Target 50,000 value lite on and off.

VII. CREDIT/COIN AND GAME ADJUSTMENTS

A. Playfield Post Adjustments:

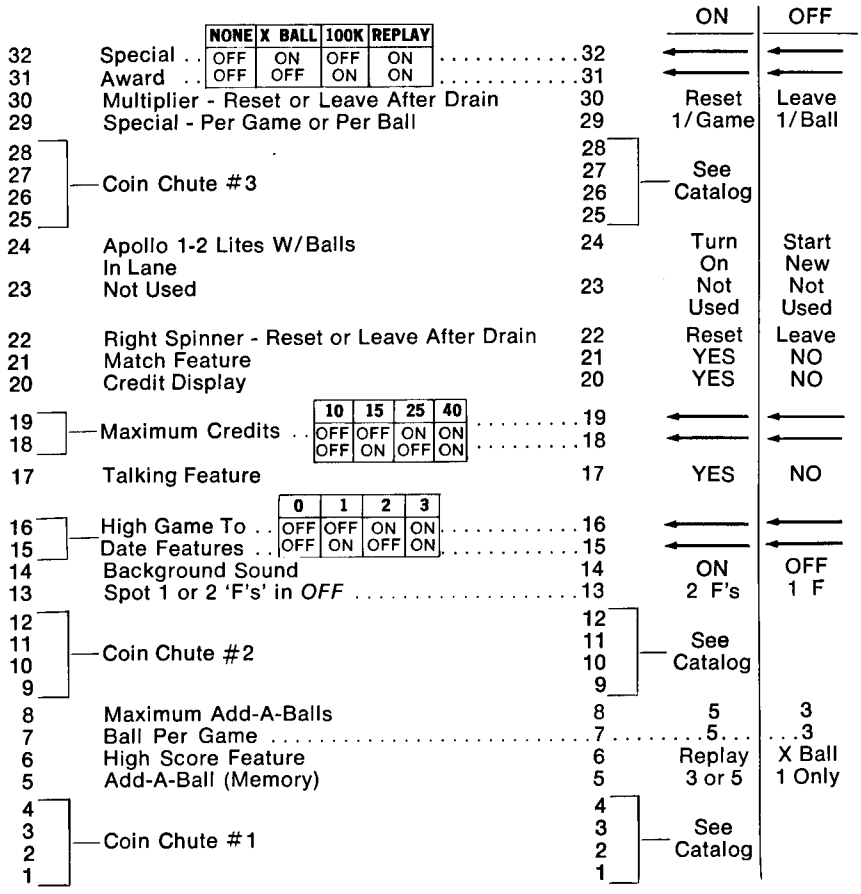
Posts that control left and right outlane openings on playfield can be moved to make access to outlanes conservative or liberal for ball to enter. (See Fig. 3).

Conservative entry will decrease playing time and scoring.
Liberal entry will increase playing time and scoring.

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.

FLIGHT 2000 SWITCH ASSIGNMENT



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

SWITCH No. 1 (BLU)	4	3	2	1		
SWITCH No. 2 (BRN-WHITE)	12	11	10	9		
SWITCH No. 3 (RED-WHITE)	28	27	26	25	**CREDITS**	**COIN**
	OFF	OFF	OFF	OFF	1	1
	OFF	OFF	OFF	ON	2	
	OFF	OFF	ON	OFF	3	
	OFF	OFF	ON	ON	4	
	OFF	ON	OFF	OFF	5	
	OFF	ON	OFF	ON	6	
	OFF	ON	ON	OFF	7	
	OFF	ON	ON	ON	10	
	ON	OFF	OFF	OFF	14	

				CREDITS	**COINS**	**SEQUENCE OF CREDITS PER COIN**			
						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	OFF	
3	ON	OFF
5	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
Replay	ON

BALL PER GAME:

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

SPOT 1 OR 2 "F" LITES:

The number of "F's" in B-L-A-S-T-O-F-F can be spotted as follows:

"F" LITES	MPU SWITCH 13
1 "F"	OFF
2 "F's"	ON

BACKGROUND SOUND:

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

SOUND	MPU SWITCH 14
OFF	OFF
ON	ON

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
1 Free Game	ON	OFF
2 Free Games	OFF	ON
3 Free Games	ON	ON

TALKING FEATURE:

The "Talking Feature" during game play can be controlled as follows:

TALKING FEATURE	MPU SWITCH 17
NO	OFF
YES	ON

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	OFF	OFF
15	ON	OFF
25	OFF	ON
40	ON	ON

CREDIT DISPLAY:

CREDIT DISPLAY	MPU SWITCH 20
YES	ON
NO	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 player's score a free game is awarded. The MATCH feature creates an incentive to play.

MATCH	MPU SWITCH 21
ON	ON
OFF	OFF

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
Retain	ON

APOLLO 1 & 2 LITES:

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

APOLLO LITES	MPU SWITCH 24
Left Off	OFF
Turn On	ON

NO. OF SPECIALS:

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

REPLAYS	MPU SWITCH 29
1 Per Ball	OFF
1 Per Game	ON

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
Reset	ON

SPECIAL AWARD:

AWARD	MPU SWITCHES	
	31	32
No Award	OFF	OFF
Extra Ball	OFF	ON
100,000 Points	ON	OFF
Replay	ON	ON