

featuring our unique

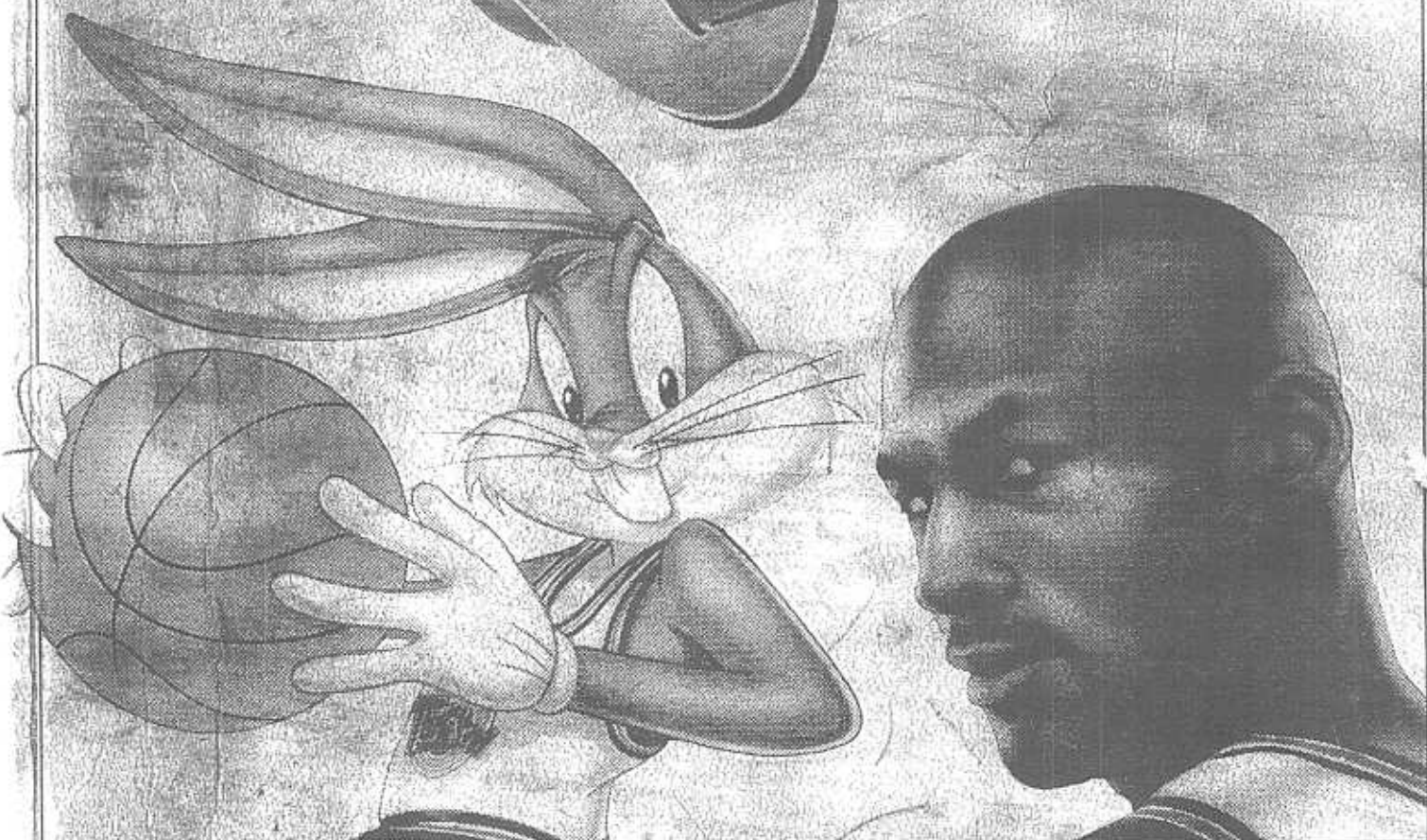
**Find-It-In-Front:
Dr. Pinball Section**



SEGA
PINBALL, INC.
10th ANNIVERSARY

Warner Bros.

SPACE JAMTM



Joe Blackwell
Technical Support
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**Please call us at 1-800-542-5377 or
1-708-345-7700 for Technical Support.**

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780-5043-00

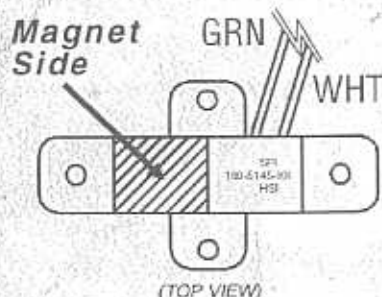
WOW! Look what's new at Sega Pinball!



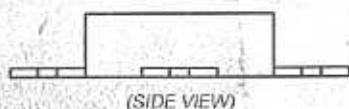
We continually strive to decrease the amount of maintenance required on the playfield like improving the reliability of playfield switches and the accuracy of switch closures during game play. This of course, satisfies both the needs of the operator and the player!

How do we do this?! Simplify, simplify, simplify... — how many times have we said this and found that it really works! In **Apollo 13**, we introduced the first Switch Membrane Switch Assembly used in the 8-Ball Trough Assembly and since then, have had almost no failures. In **Golden Eye** we had introduced the Modular Happ Controls Stand-Up Target and are continuing to use it with great success. Now...in **Space Jam**...

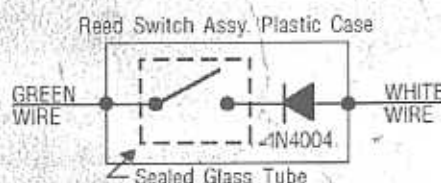
Introducing The New Reed Switch Ball Sensor!



(TOP VIEW)



(SIDE VIEW)



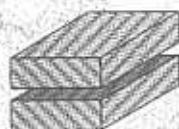
Shown below is the *Theory of Operation* for this *new sensor* which can be used in any Roll-Over or Roll-Under Switch application. In this game we are utilizing them on the Plastic & Steel Ramp Assemblies as Ramp Enter and Exit Switches and to sense if a Basket Shot was Made from the Steel Ramp.

The advantage is that this sensor has much greater accuracy than *standard switches*, has a built-in Diode (1N4004) and requires no adjustments or maintenance at all. The only special requirement is the use of **non-magnetic fasteners**. We are currently using **non-magnetic stainless steel screws** but brass and aluminum will also work. The reason for this is, a fastener that is **not** made of *non-magnetic material* can become magnetized and affect the balanced magnetic field within the sensor of the Reed Switch Assembly. This can affect the accuracy with which it senses the ball.

Overview of this switch: Consists of a Diode (1N4004) and a HSR-042 Reed Switch. The Cable Wiring Harness has the Green Wire going to the switch and the White Wire going to the Anode side of the Diode. The Contact Rating is 100 Volts AC/DC, 0.2 Amps AC/DC, 4 Watts (Resistance Load) & 2 Watts (Inductive Load). The Temperature Operation Range: 0-150° F.

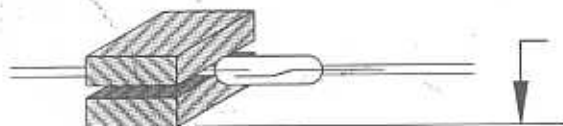
Theory of Operation

Here's how it works:



Two magnets of equal strength creating a balanced magnetic field.

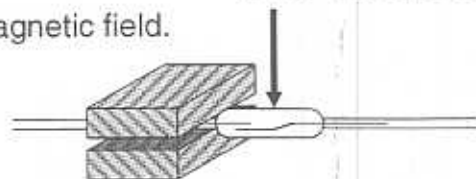
The Reed Switch is positioned in the balanced field.



As a pinball passes in close proximity to the bottom magnet, it disturbs the balanced field. The lower magnet is strengthened by the presense of the pinball, thus operating the Reed Switch contacts.

The Reed Switch contacts are hermetically sealed in a glass tube, filled with inert gas to provide long life with stable electrical and operating characteristics. The magnets, the glass tube (with contacts), the Green & White Wires & Diode are sealed in the Plastic Reed Switch Housing in soft epoxy.

Glass Tube with contacts





BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs



Display Power Supply Bd.

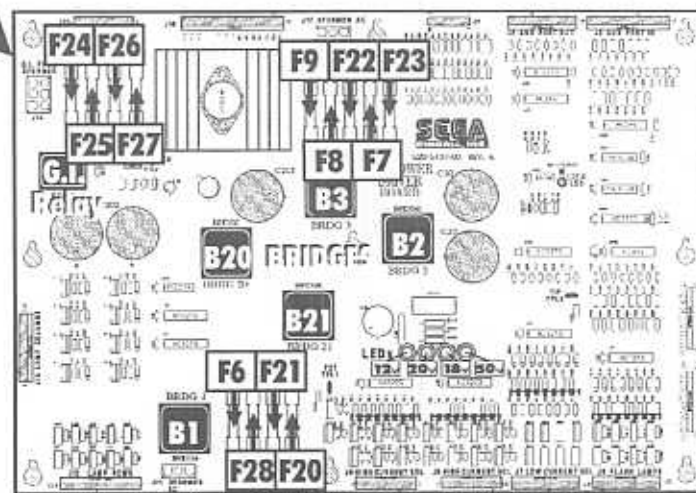
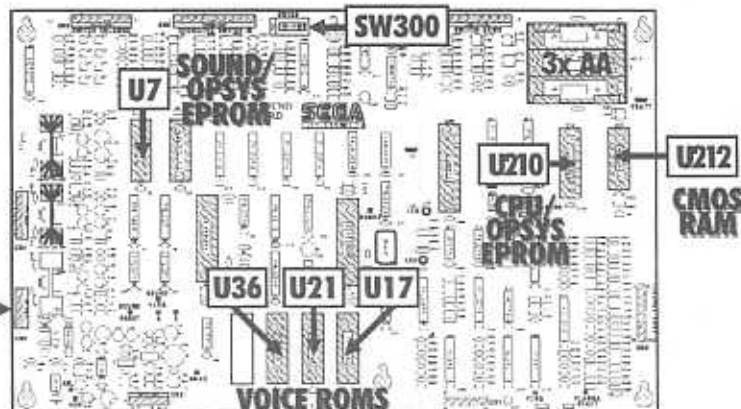
CPU / Sound Board

No Fuses

I/O Power Driver Board

Display Controller Board

No Fuses



QUICK REFERENCE FUSE CHART

Backbox Fuses DISPLAY POWER SUPPLY BOARD

F1 3/4A 250v S.B. 90v DC High Voltage Display

I/O POWER DRIVER BOARD

F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Pwr. Coils / Magnet (Magna Jump)
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	3A 250v S.B.	50v DC	Magnet (Magna Hoop)
F21	3A 250v S.B.	50v DC	Coils
F22	8A 250v S.B.	18v DC	Controlled Lamps
F23	4A 250v S.B.	5v DC	Logic
F24	5A 250v S.B.	6.3v AC	G.I. Lamp (Upper Playfield)
F25	5A 250v S.B.	6.3v AC	G.I. Lamp (Lower Left Playfield)
F26	5A 250v S.B.	6.3v AC	G.I. Lamp (Lwr. Rt. P/F & Coin Door)
F27	5A 250v S.B.	6.3v AC	G.I. Lamp (Upper Playfield)
F28	3A 250v S.B.	24v AC	Not Used / Spare

Cabinet Fuses SERVICE (AC) OUTLET BOX (CABINET BOTTOM)

Main Fuse Line: 1X 8A 250v S.B. (Int'l) 2X 5A 250v S.B.

Under Playfield Fuses FOR FLIPPERS & MAGNETS

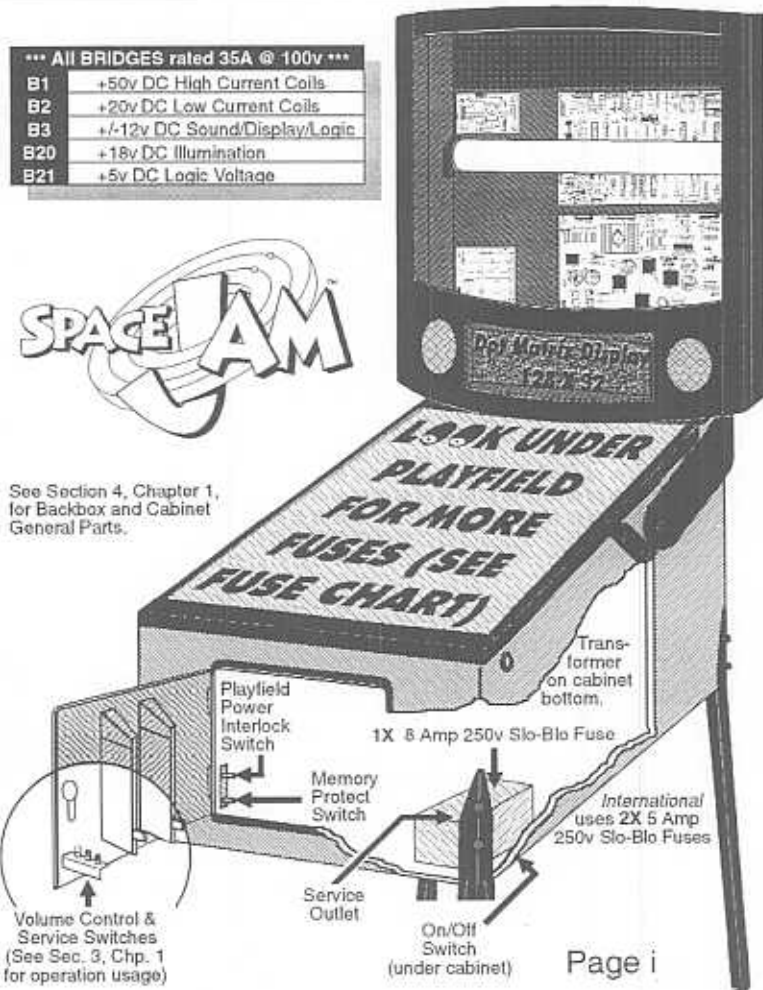
n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU/YEL++RED/YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY/YEL++RED/YEL)
n/a	3A 250v S.B.	50v DC	Magna Hoop (BLU/BLK++VIO/YEL)
n/a	3A 250v S.B.	50v DC	Magna Jump (BRN/VIO++VIO/YEL)

*** All BRIDGES rated 35A @ 100v ***

B1	+50v DC High Current Coils
B2	+20v DC Low Current Coils
B3	+/-12v DC Sound/Display/Logic
B20	+18v DC Illumination
B21	+5v DC Logic Voltage



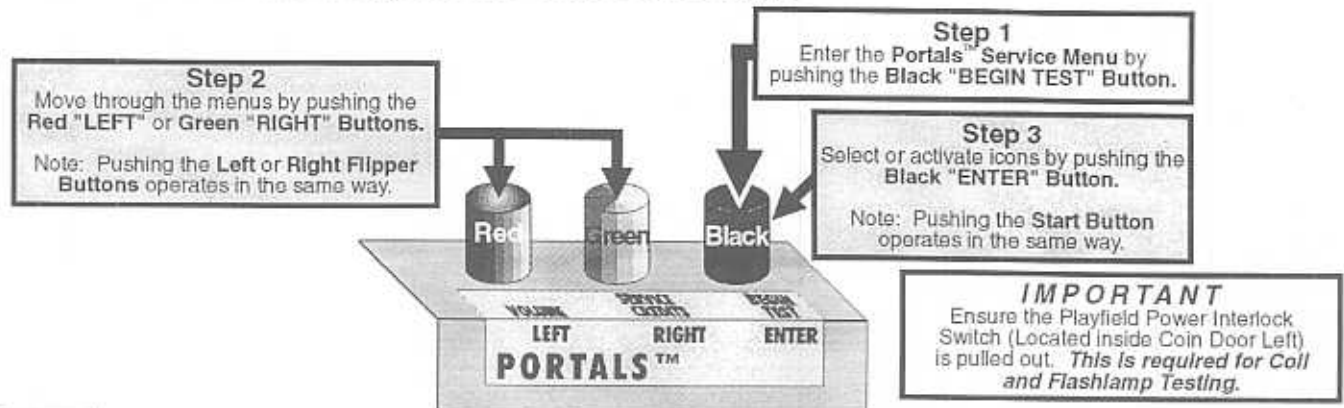
See Section 4, Chapter 1,
for Backbox and Cabinet
General Parts.



(Correction Note: F7 & F20 were corrected after the the Backbox Fuse Label was made.)

FIND-IT-IN-FRONT: DR. PINBALL SECTION

The key technical data from various parts of the manual was extracted and combined into the "Find-It-In-Front: Dr. Pinball Section." This new section will assist the technician in locating important technical information needed to troubleshoot the machine. To get into the **Portals™ Service Menu**:



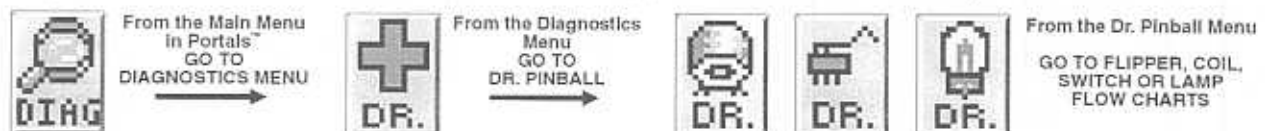
We are introducing in our **Portals™ Service Menu** a new icon and diagnostic aid called **Dr. Pinball** (Flow Chart Menus). This is a feature that will allow the operator/technician to utilize the power of the micro-processor assisting in troubleshooting a problem with the machine.

★ ★ ★ ★ HOW IT WORKS ★ ★ ★ ★

First, the operator/technician must enter the Service Mode (for a complete description of the **Portals™ Service Menu** and **ICONS** see Section 3, Chapter 1). To get into the Service Menu Mode: • Power-up game (if not already) & open the Coin Door. • On the Coin Door is the **Portals™ Service Switch Set (Red, Green & Black Buttons)**. Push down the **Black "BEGIN TEST" Button**. Looking at the Video Display you will momentarily see the introductory screen "Service Menu" with a satellite flying from right to left pulling a banner "**Portals™ © 1996 SEGA PINBALL, INC.**", followed by the **MAIN MENU**.

While in the **MAIN MENU**, select the "**DIAG**" *Icon*, then select the Cross "**DR.**" *Icon*. This will bring you (the operator / technician) into **DR. PINBALL** (Flow Chart Menus) which offers you a choice of four sub-menus: Flipper "**DR.**", Coil "**DR.**", Switch "**DR.**" and Lamp "**DR.**" *Icons*. Selecting a particular sub-menu will give you a choice of which specific Flipper, Coil, Switch or Lamp circuit needs to be diagnosed. The display will now ask a question or give a procedure to follow such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When **Dr. Pinball** asks a question or request a procedure the **Dr.** will expect a response such as "no" or "yes" (see below examples of the *Mini-Icons* which will prompt the operator). You the operator/technician must respond by using your **Flipper Buttons** to "**SELECT**" a *Mini-Icon* and the **Start Button** to "**ENTER**" your selection.

Note: The "**Portals**" service switches located on the coin door can also be used to select and enter *Mini-Icons*. In switch test this is required since flipper and start switches are part of the test.



The following are the *Mini-Icons* with explanations for the **Dr. Pinball** Sub-Menus:



INSTALL 5 BALLS!



is a 5-Ball Game!

* DIAGNOSTIC AIDS *

The *display reads* "OPERATOR ALERT..." — A message displayed during Game Mode or Power-Up to alert the operator of a problem.

OPERATOR ALERT works by monitoring any *switch activated coil* that has the potential to trap a ball when disabled (e.g. in the Auto Launch, Scoop, Eject, etc.). If this assembly has a closed switch indicating a ball is stuck or the switch is *stuck closed*, the CPU Board will activate the coil ten times*. If the switch remains closed, the game will display a message indicating there is a problem (e.g. "OPERATOR ALERT AUTOLAUNCH NOT WORKING"). This not only warns the operator of a problem immediately, but indicates exactly where the operator should look to resolve it.

The *display flashes* "OPEN THE COIN DOOR" — This indicates that CMOS RAM memory (CPU Loc. U212) has been corrupted.

This is caused by either failure in memory (e.g. batteries are dead or faulty RAM) or upon installation of updated version of code. Opening the Coin Door will initiate a Factory Restore, by opening the Memory Protect Switch. Check battery voltage at CMOS RAM with power off.

CPU DIP SWITCH SETTINGS, LOC. SW300 CPU/SOUND BOARD CUSTOM FACTORY ADJUSTMENTS BY COUNTRY*

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
USA *	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
AUSTRIA	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BELGIUM	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BRAZIL	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
CANADA	ON								
	OFF								

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
FRANCE	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
GERMANY	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
ITALY	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
JAPAN	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
NETHERLANDS (Holland / Dutch)	ON								
	OFF								

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
NORWAY	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWEDEN	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWITZERLAND	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
UK	ON								
	OFF								

*All countries not noted use the "USA Setting"



ROM SUMMARY TABLE

I.C. NAME	TYPE	BOARD NAME	LOC.	PART N°
Game ROM	1MB	CPU / Sound Board	U210	965-0229-43
Voice ROM 1	4MB	CPU / Sound Board	U17	965-0230-43
Voice ROM 2	4MB	CPU / Sound Board	U21	965-0231-43
Voice ROM 3	4MB	CPU / Sound Board	U36	965-0232-43
Voice ROM 4	Not Used	CPU / Sound Board	U37	Not Used
Sound EPROM	512K	CPU / Sound Board	U7	965-0233-43
Display EPROM	4MB	Display Controller Bd.	ROM Ø	965-0234-43
Display EPROM	Not Used	Display Controller Bd.	ROM 3	Not Used



From the Main Menu
In Portals
GO TO DIAGNOSTICS
MENU



From the Diagnostics
Menu
GO TO SWITCH
MENU



From the Switch
Menu
GO TO SWITCH OR
ACTIVE SWITCH TEST



From the Switch
Menu
GO TO DEDICATED
SWITCH TEST

SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive)	1 Q1 GRN-BRN CN5-P1	2 Q2 GRN-RED CN5-P3	3 Q3 GRN-ORG CN5-P4	4 Q4 GRN-YEL CN5-P5	5 Q5 GRN-BLK CN5-P6	6 Q6 GRN-BLU CN5-P7	7 Q7 GRN-VIO CN5-P8	8 Q8 GRN-GRY CN5-P9
Row (Return)								
1 U400 WHT-BRN CN7-P9	NOT USED	NOT USED	3-BANK DROP BOTTOM	TOP BASKET ENTER	(S)PACE JAM S-U	SUPER DUPER JACKPOT S-U	TOP TURBO BUMPER	LEFT OUTLANE
2 U400 WHT-RED CN7-P8	4TH COIN SLOT	NOT USED	3-BANK DROP MID	NOT USED	SP(ACE) JAM S-U	EXTRA BALL S-U	LEFT TURBO BUMPER	LEFT RETURN LANE
3 U400 WHT-ORG CN7-P7	6TH COIN SLOT	5-BALL TROUGH #1 (LEFT)	3-BANK DROP TOP	TOP BASKET MADE	SP(ACE) JAM S-U	RIGHT ORBIT TOP	RIGHT TURBO BUMPER	LEFT SLINGSHOT
4 U400 WHT-YEL CN7-P6	RIGHT COIN SLOT	5-BALL TROUGH #2	NOT USED	RIGHT RAMP S-U LEFT	SP(ACE) JAM S-U	RIGHT ORBIT BOTTOM	NOT USED	RIGHT OUTLANE
5 U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA	5-BALL TROUGH #3	NOT USED	RIGHT RAMP S-U RIGHT	SP(ACE) JAM S-U	JUMP BALL VUK	NOT USED	RIGHT RETURN LANE
6 U401 WHT-BLU CN7-P3	LEFT COIN SLOT	5-BALL TROUGH #4	RIGHT RAMP ENTER	SKILL SHOT BASKET	SPACE (J)AM S-U	WABBIT HOLE VUK	START BUTTON	RIGHT SLINGSHOT
7 U401 WHT-VIO CN7-P2	5TH COIN SLOT	5-BALL TROUGH VUK OPTO	RIGHT RAMP EXIT	NOT USED	SPACE (J)AM S-U	LEFT ORBIT BOTTOM	SLAM TILT	NOT USED
8 U401 WHT-GRY CN7-P1	NOT USED	SHOOTER LANE	CAPTIVE BALL	NOT USED	SPACE (J)AM S-U	LEFT ORBIT TOP	PLUMB BOB TILT	NOT USED

GND	Ground
IC U206 INPUTS	BLK CN6-P11
1 GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON DS-1
2 GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S. (End-of-Stroke) DS-2
3 GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON DS-3
4 GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S. (End-of-Stroke) DS-4
5 NOT USED CN6-P7	NOT USED DS-5
6 GRY-BLU CN6-P8	#6 VOLUME (RED BUTTON) (Normal) (In Test: LEFT) DS-6
7 GRY-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (Normal) (In Test: RIGHT) DS-7
8 GRY-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (Normal) (In Test: ENTER) DS-8



From the Diagnostics
Menu
GO TO LAMP
MENU



From the Lamp
Menu
GO TO SINGLE
LAMP TEST



From the Lamp
Menu
GO TO TEST
ALL LAMPS



From the Lamp
Menu
GO TO ROW OR
COLUMN TEST

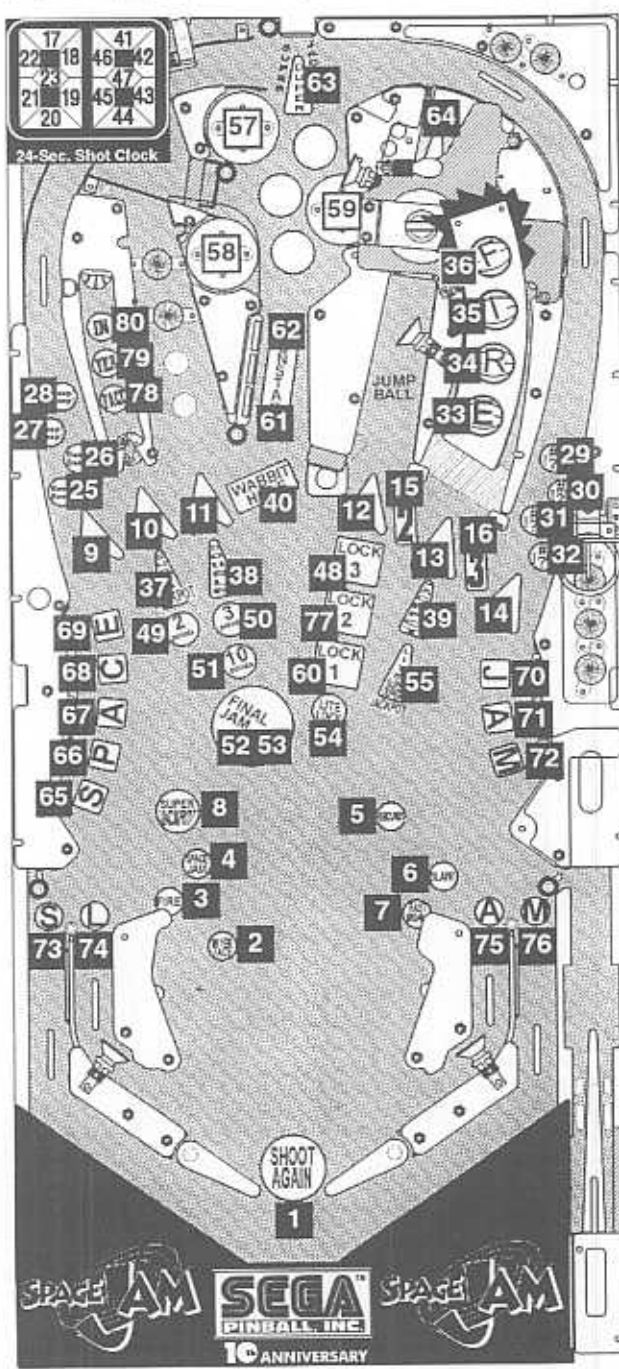
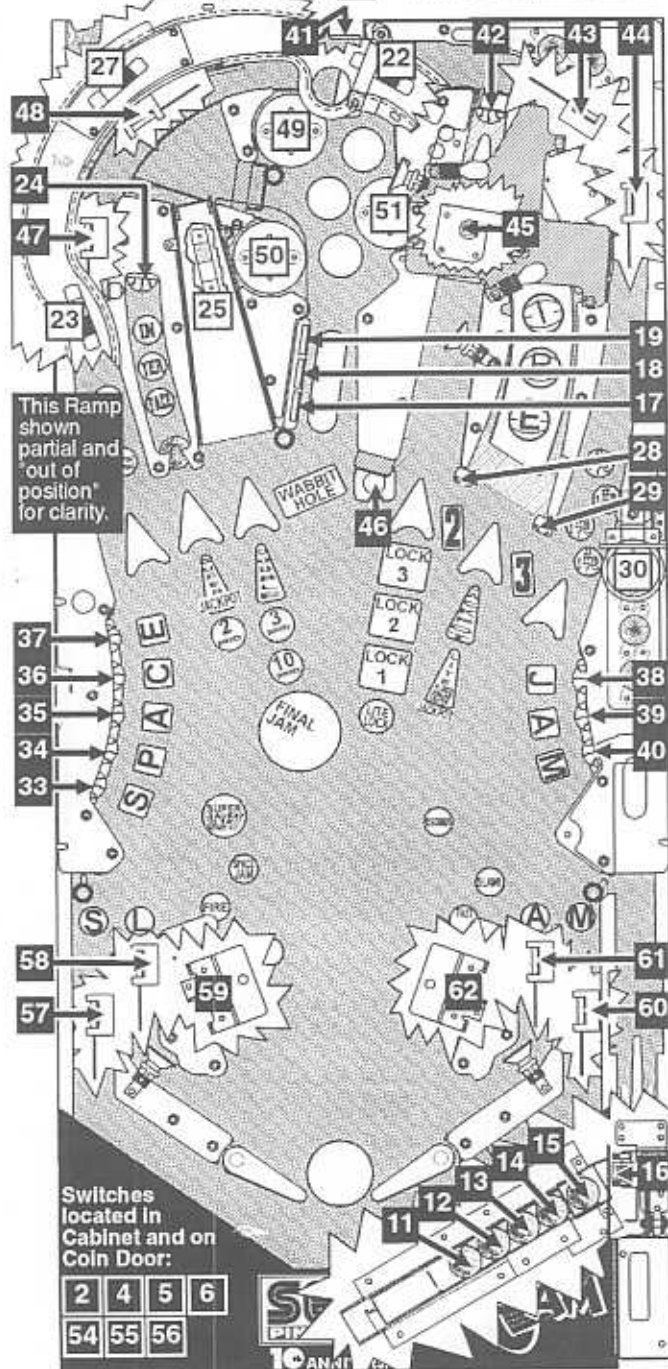
LAMP MATRIX GRID

Column (18V)	1: U17 YEL-BRN J13-P9	2: U16 YEL-RED J13-P8	3: U15 YEL-ORG J13-P7	4: U14 YEL-BLK J13-P6	5: U13 YEL-GRN J13-P5	6: U12 YEL-BLU J13-P4	7: U11 YEL-VIO J13-P3	8: U10 YEL-GRY J13-P1
Row (GND)								
1: Q33 RED-BRN J12-P1	SHOOT AGAIN #44 Bulb 1	GRID: IN YER FACE #44 Bulb 2	GRID: FIRE #44 Bulb 3	GRID: SPACE JAM #44 Bulb 4	GRID: REBOUND #44 Bulb 5	GRID: SLAM #44 Bulb 6	GRID: FAST BREAK (2) 3 #44 Bulb 7	GRID: SUPER JACKPOT #44 Bulb 8
2: Q34 RED-BLK J12-P2	LEFT ORBIT ARROW #555 Bulb 9	CAPTIVE BALL ARROW #555 Bulb 10	BASKET RAMP ARROW #555 Bulb 11	JUMP BALL ARROW #555 Bulb 12	RIGHT RAMP ARROW #555 Bulb 13	RIGHT ORBIT ARROW #555 Bulb 14	(2) 3 #555 Bulb 15	2 (3) #555 Bulb 16
3: Q35 RED-ORG J12-P3	LEFT 7-SEG MENT 'A' Red LED 17	LEFT 7-SEG MENT 'B' Red LED 18	LEFT 7-SEG MENT 'C' Red LED 19	LEFT 7-SEG MENT 'D' Red LED 20	LEFT 7-SEG MENT 'E' Red LED 21	LEFT 7-SEG MENT 'F' Red LED 22	LEFT 7-SEG MENT 'G' Red LED 23	NOT USED 24
4: Q36 RED-YEL J12-P4	L ORBIT BEEP 1 (BOTTOM) #555 Bulb 25	L ORBIT BEEP 2 #555 Bulb 26	L ORBIT BEEP 3 #555 Bulb 27	L ORBIT BEEP 4 (TOP) #555 Bulb 28	R ORBIT 4 (TOP) #555 Bulb 29	R ORBIT 3 #555 Bulb 30	R ORBIT 2 #555 Bulb 31	R ORBIT 1 (BOTTOM) #555 Bulb 32
5: Q37 RED-GRN J12-P5	FIR (E) #44 Bulb 33	FI (R) E #44 Bulb 34	F (I) RE #44 Bulb 35	(F) IRE #44 Bulb 36	SUPER JACKPOT #555 Bulb 37	DOUBLE #555 Bulb 38	JACKPOT #555 Bulb 39	WABBIT HOLE #44 Bulb 40
6: Q38 RED-BLU J12-P6	RIGHT 7-SEG MENT 'A' Red LED 41	RIGHT 7-SEG MENT 'B' Red LED 42	RIGHT 7-SEG MENT 'C' Red LED 43	RIGHT 7-SEG MENT 'D' Red LED 44	RIGHT 7-SEG MENT 'E' Red LED 45	RIGHT 7-SEG MENT 'F' Red LED 46	RIGHT 7-SEG MENT 'G' Red LED 47	LOCK 3 #555 Bulb 48
7: Q39 RED-VIO J12-P8	2 POINTS #555 Bulb 49	3 POINTS #555 Bulb 50	10 POINTS #555 Bulb 51	FINAL JAM #555 Bulb 52	FINAL JAM #555 Bulb 53	LITE LOCK #555 Bulb 54	LITE SUPER DUPER JACKPOT #555 Bulb 55	NOT USED 56
8: Q40 RED-GRY J12-P9	TOP TURBO BUMPER #555 Bulb 57	LEFT TURBO BUMPER #555 Bulb 58	RIGHT TURBO BUMPER #555 Bulb 59	LOCK 1 #555 Bulb 60	MONSTARS (BOTTOM) #44 Bulb 61	MONSTARS (TOP) #44 Bulb 62	SUPER DUPER JACKPOT #44 Bulb 63	EXTRA BALL #44 Bulb 64
9: Q41 RED-WHT J12-P10	(S)PACE JAM #555 Bulb 65	S(P)ACE JAM #555 Bulb 66	SP(A)CE JAM #555 Bulb 67	SPA(C)E JAM #555 Bulb 68	SPAC(E) JAM #555 Bulb 69	SPACE (J)AM #555 Bulb 70	SPACE J(A)M #555 Bulb 71	SPACE JA(M) #555 Bulb 72
10: Q42 RED J12-P11	(S) LAM #44 Bulb 73	S(L)AM #44 Bulb 74	SL(A)M #44 Bulb 75	SLA(M) #44 Bulb 76	LOCK 2 #555 Bulb 77	IN YER (FACE) #44 Bulb 78	IN (YER) FACE #44 Bulb 79	(IN) YER FACE #44 Bulb 80

SWITCH MATRIX GRID LOCATIONS

LAMP MATRIX GRID LOCATIONS

Legend Note: = Switches/Lamps mounted above playfield. = Switches/Lamps mounted below the playfield.



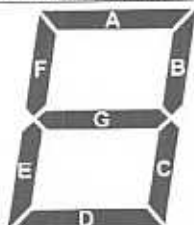
TYPICAL SWITCH SCHEMATIC

DEDICATED SWITCH SCHEMATIC

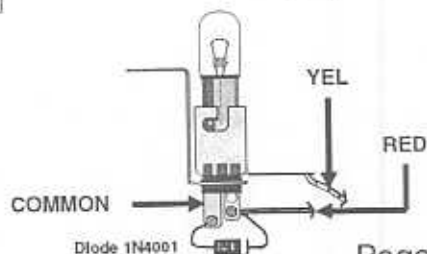
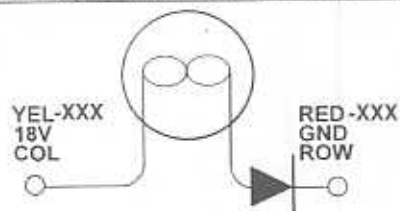
TYPICAL LAMP SCHEMATIC



TYPICAL 7-SEGMENT



NOTE:
This Game features a 2-Digit 24-Second Shot Clock (located over the Magna-Hoop Assembly). Each segment is wired into the Lamp Matrix (see previous page).



Find-It-In-Front: Dr. Pinball

Space Jam™

Page v



From the Main Menu
in Portals
GO TO DIAGNOSTICS
MENU



From the Diagnostics
Menu
GO TO COIL
MENU



From the Coil
Menu
GO TO COIL
TEST



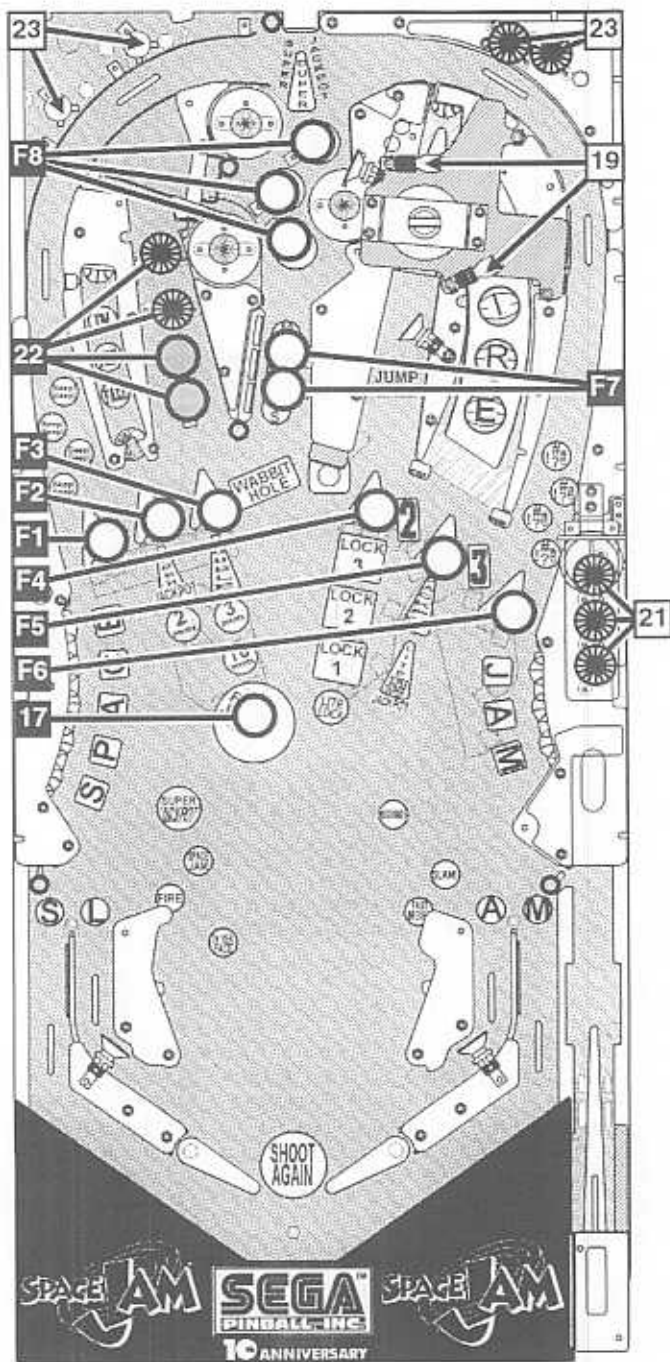
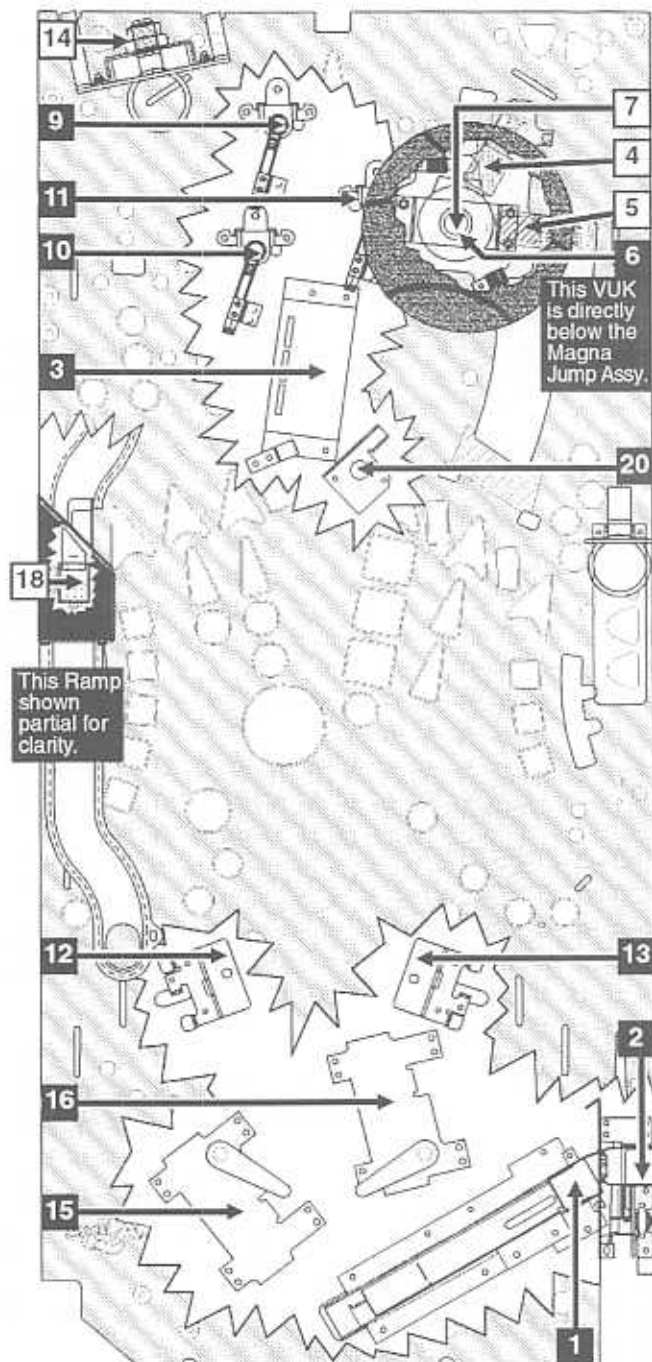
From the Coil
Menu
GO TO CYCLING
COILS

COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v	24-940 090-5035-00B
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v	23-800 090-5001-00T
#3	3-BANK DROP TARGET RESET	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v	23-800 090-5001-00T
#4	JUMP BALL TOP KICKER	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#5	JUMP BALL RIGHT KICKER	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#6	JUMP BALL VUK	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#7	JUMP BALL MAGNET	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	BRN BLK	J7-P1	20v	22-650 090-5042-01
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v	N/A
High Current Coils Group 2		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#9	TOP TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#10	LEFT TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#14	BASKET MAGNET	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	VIO-YEL BLK	J10-P3	50v	22-650 090-5042-01
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v	22-900 090-5020-20T
Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#17	FLASH FINAL JAM*1	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	ORG	J6-P10	20v	#906 165-5004-00
#18	RAMP DIVERTER	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v	32-1800 090-5031-00
#19	FLASH JUMP BALL*2	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	ORG	J6-P10	20v	#906 165-5004-00
#20	WABBIT HOLE VUK	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v	24-940 090-5036-00B
#21	FLASH SKILL*3	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	ORG	J6-P10	20v	#89 165-5000-89
#22	FLASH BASKET RAMP*4	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	ORG	J6-P10	20v	#89 165-5000-89
#23	FLASH TOP-LT*2 TOP-RT*2	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	ORG	J6-P10	20v	#89 165-5000-89
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v	5v Meter (If Required)
Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Bulb Type
#F1	FLASH L ORBIT ARROW*1	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v	#906 165-5004-00
#F2	FLASH C-BALL ARROW*1	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v	#906 165-5004-00
#F3	FLASH B RAMP ARROW*1	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v	#906 165-5004-00
#F4	FLASH JBALL ARROW*1	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v	#906 165-5004-00
#F5	FLASH R RAMP ARROW*1	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v	#906 165-5004-00
#F6	FLASH R ORBIT ARROW*1	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v	#906 165-5004-00
#F7	FLASH 3 BANK DROP *2	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v	#89 165-5000-89
#F8	FLASH POPS*3	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v	#89 165-5000-89

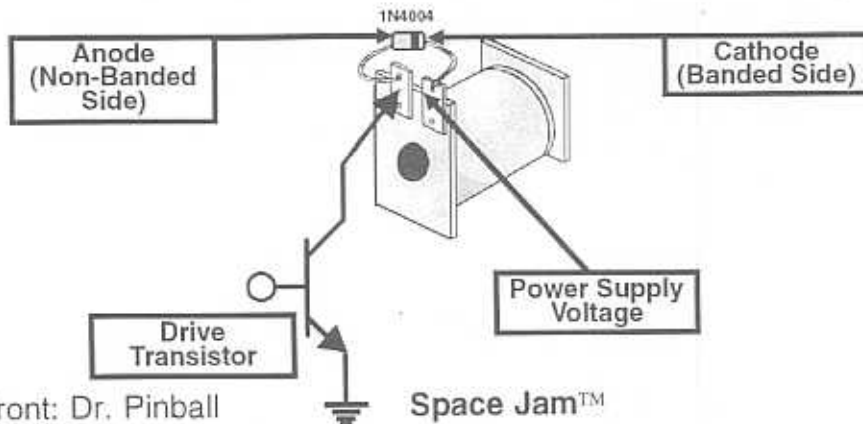
COIL LOCATIONS

FLASH LAMP LOCATIONS

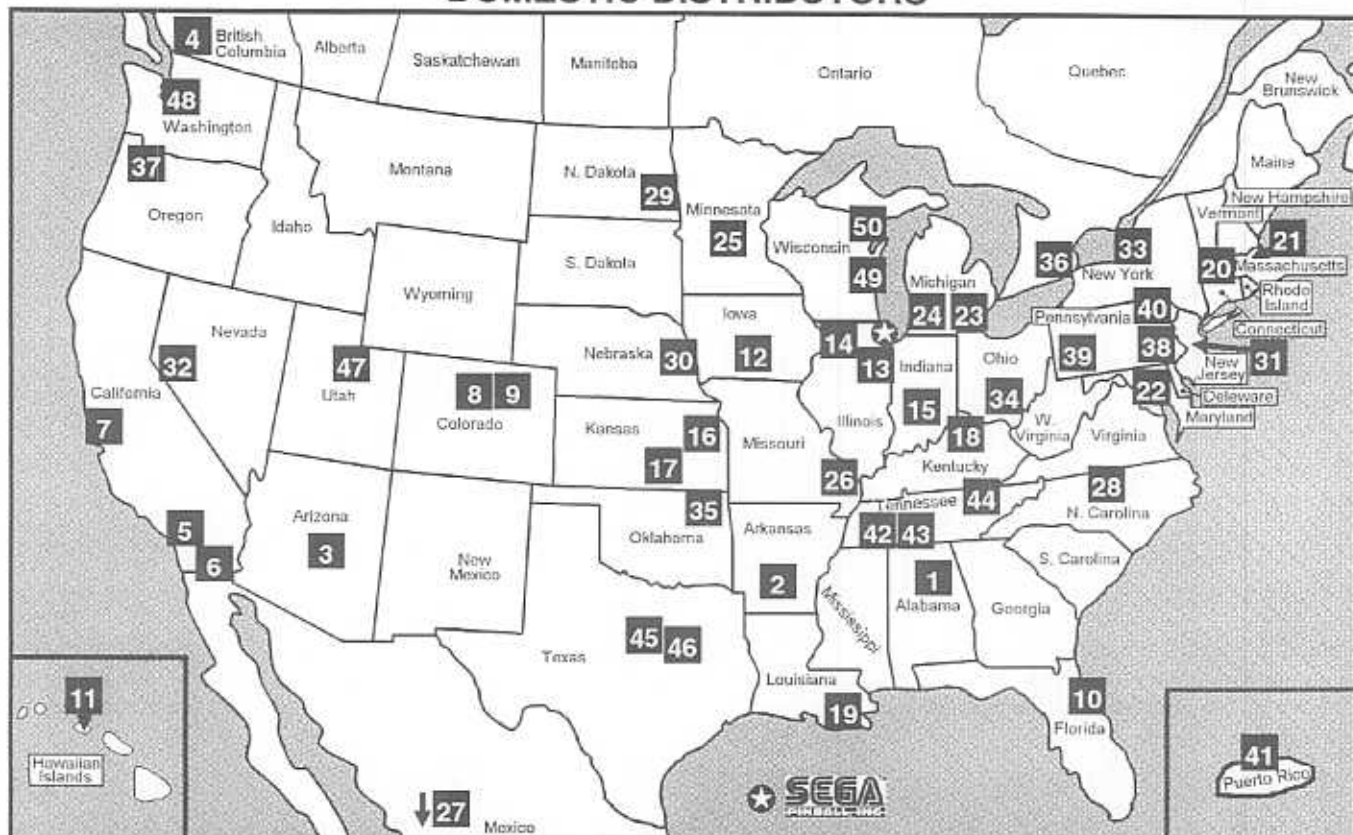


Legend Note: = Coil/Flash Lamp mounted above playfield. = Coil/Flash Lamp mounted below the playfield. = Bulb goes through hole in the playfield. = Bulb is under playfield insert. = Bulb under Mini-Mar (Light Cover).

TYPICAL COIL WIRING



DOMESTIC DISTRIBUTORS

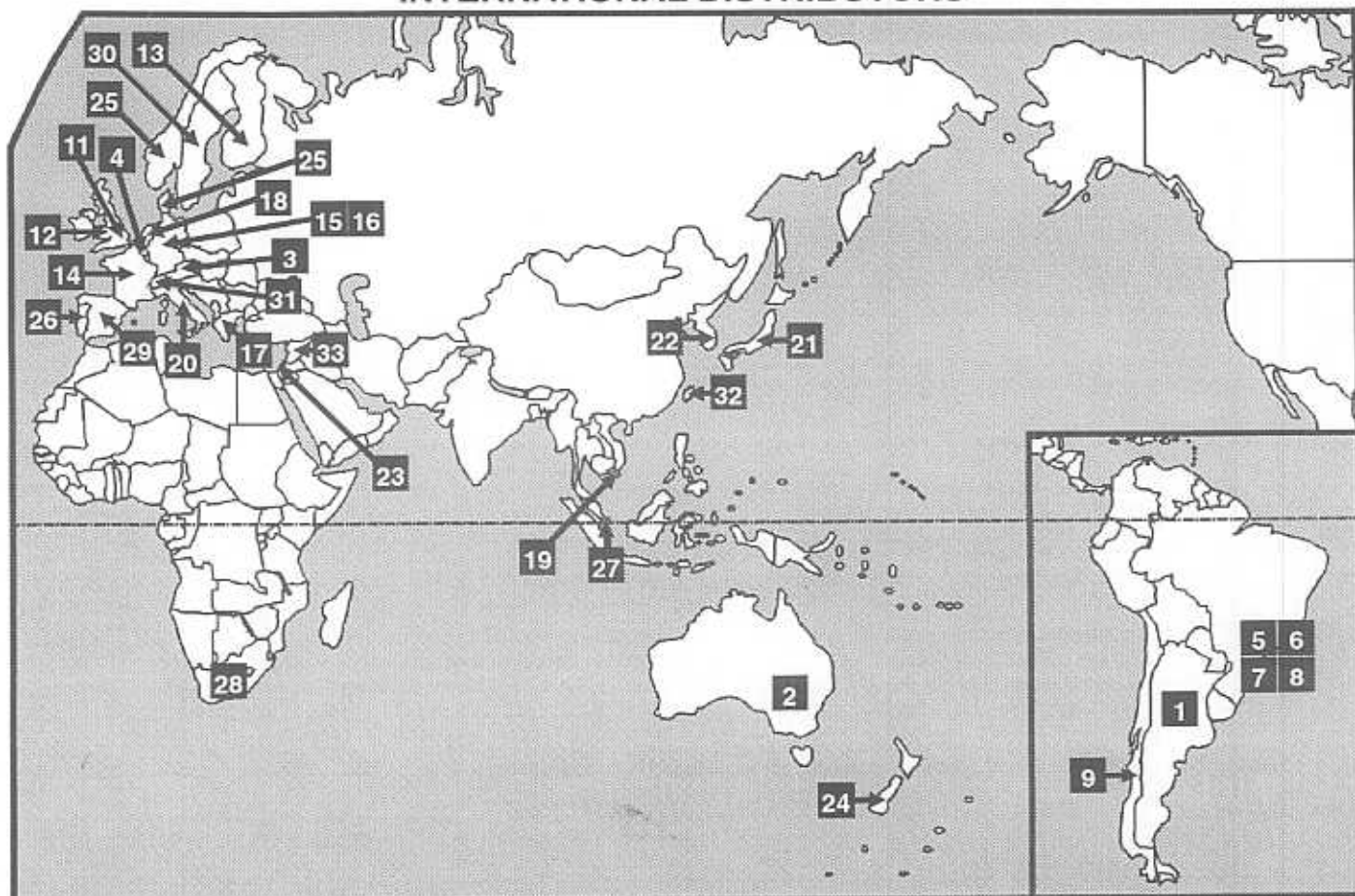


#	STATE/PROVINCE AND CITY	NAME	PHONE	#	STATE/PROVINCE AND CITY	NAME	PHONE
1	AL Birmingham	Birmingham Vending	205-324-7526	26	MO St. Louis	J. & J. Distributing	314-645-3393
2	AR N. Little Rock	Godwin Distributing	501-753-1138	27	MX Col. Napoles	James Industries	011-525-543-1174
3	AZ Phoenix	Betson Pacific	602-233-0190	28	NC Archdal	Operators Distributing	910-884-5714
4	BC Burnaby (Can.)	Can. Coin Machine	604-420-4008	29	ND Fargo	M.H. Associates, Inc.	701-282-7877
5	CA Buena Park	Betson Pacific	714-228-7500	30	NE Omaha	Greater American Dist.	402-553-2812
6	CA San Diego	Betson Pacific	619-459-0871	31	NJ Springfield	Mondial Int'l. Dist.	201-467-9700
7	CA S. San Francisco	Betson Pacific	415-952-4220	32	NV Reno	Reno Game Sales	702-829-2080
8	CO Denver	Col. Game Exchange	303-893-4300	33	NY Rochester	Mondial Dist.	716-586-1100
9	CO Denver	Mountain Coin	303-427-2133	34	OH Cincinnati	Atlas Distributing	513-771-1909
10	FL Orlando	Birmingham Vending	407-425-1505	35	OK Tulsa	Galaxy Distributing, Co.	918-835-1166
11	HI Ewa Beach	50th State Coin Op.	808-682-4561	36	ON Rexdale (Can.)	New Way Sales	416-674-8000
12	IA Des Moines	Greater American Dist.	515-244-2828	37	OR Portland	American Coin	503-233-7000
13	IL Chicago	Atlas Distributing	312-276-5005	38	PA Bensalem	Mondial Int'l. Dist.	215-638-1122
14	IL Inverness	James Industries	708-358-8000	39	PA Pittsburgh	Mondial Int'l. Dist.	412-881-8804
15	IN Indianapolis	J. & J. Distributing	317-899-2530	40	PA Wilkes-Barre	Roth Novelty	717-824-9994
16	KS Lenexa	Bird Distributing	913-888-8877	41	PR Carolina	James Industries	809-253-7149
17	KS Wichita	United Distributing	316-263-6181	42	TX Memphis	Games Sales Co., Inc.	901-525-8351
18	KY Louisville	Kentucky Coin Machine	502-966-5266	43	TN Memphis	Green G.A.M.E.S.	901-353-1000
19	LA Metairie	New Orleans Novelty	504-888-3500	44	TN Nashville	Sammons-Pennington	615-244-3020
20	MA E. Long Meadow	Gekay Sales	413-525-2700	45	TX Corsicana	Master Sales	903-874-4740
21	MA Norwood	Mondial Int'l. Dist.	617-769-9966	46	TX Dallas	Commercial Music	214-741-6381
22	MD Baltimore	Automated Services	410-646-4100	47	UT Salt Lake City	Struve Distributing	801-328-1636
23	MI Farmington Hills	Atlas Distributing	810-615-1703	48	WA Seattle	American Coin	206-764-9020
24	MI Wyoming	Atlas Distributing	616-241-1472	49	WI Green Bay	Pioneer Sales & Svc.	414-468-5200
25	MN Bloomington	Hanson Distributing	612-884-6604	50	WI Menomonee Falls	Pioneer Sales & Svc.	414-781-1420



For Parts and Service, call your local distributor. The numbered locations are general areas. View table and map for corresponding numbered distributor. If your state/province does not have a distributor, call the nearest state/province. Distributors and phone numbers are subject to change. Call Sega Pinball, Inc. Technical Support with any questions or if your distributor cannot help you, at 1-800-542-5377 (USA or Canada or elsewhere at 1-708-345-7700).

INTERNATIONAL DISTRIBUTORS



#	COUNTRY AND CITY	NAME	PHONE (-011)	#	COUNTRY AND CITY	NAME	PHONE (-011)
1	Argentina, Urquiza	Florenzia	54-232-5532	18	Holland, Sittart	Veltmeijer Automaten	31-46-526-4444
2	Australia, Matraville	Amusement Machine Dist.	61-2-316-6000	19	Hong Kong, Kwai Fong	Bondeal Limited	85-2-487-9089
3	Austria, Ansfelden	TAB Austria	43-72-297-8040	20	Italy (RSM), Serravalle	Technoplay Sa	39-54-990-0361
4	Belgium, Brussels	Splin S.A.	32-4-162-7677	21	Japan, Tokyo	Data East, Corp.	81-35-370-0708
5	Brazil, Sao Paulo	Parkland	55-11-792-42864	22	Korea, Seoul	Myung Sun Trading	82-2-771-0461
6		Topway Commercial	55-11-278-6838	23	Lebanon, Beirut	Tinker Int'l. Corp.	35-7961141-3688
7		Unimax	55-11-533-5615	24	New Zealand, Auckland	Amco Machine Supp.	64-9-846-7606
8		Universe	55-11-575-0731	25	Norway, Oslo	Vendomatic	47-2-216-0830
9	Chile, Santiago	Cuinsa	56-2-696-0167	26	Portugal, Amadora	Jacinto & Martins	35-11-495-1868
10	Denmark, Glostrup	Dau Dansk	45-3-670-1087	27	Singapore, Singapore	Valibel Technologies	65-748-8404
11	England, London	Electrocoin	44-81-965-6899	28	South Africa, Lalucia	Unimac	27-3-152-5544
12	So. Wales, Cardiff	Electrocoin	44-22-261-5100	29	Spain, Madrid	Dast Pim	34-1-541-7112
13	Finland, Espoo	Pelika Ray Oy	35-804-37091	30	Sweden, Bromma	A-Gruppen Holding	46-8-704-6570
14	France, Aubervilliers	PLF Sa	33-14-811-3131	31	Switzerland, Harkingen	Novomat Ag	41-6-261-4061
15	Germany, Berlin	Bally Wulff	49-3-062-0020	32	Taiwan ROC, Taipei Hsien	Laxan Corp.	88-62-299-1722
16	Germany, Hannover	Bally Wulff	49-511-358-5343	33	Turkey, Iclevent-Istanbul	Emperyal	90-212-663-2081
17	Greece, Athens	Alpha Distributing	30-1-554-1608				



International Distributors

For Parts and Service, call your local distributor. The numbered locations are general areas. View table and map for corresponding numbered distributor. If your country does not have a distributor, call the nearest country. Distributors and phone numbers are subject to change. Call Sega Pinball, Inc. Technical Support with any questions or if your distributor cannot help you, at 1-708-345-7700.

Space Jam™

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POWER REQUIREMENTS



This game **must be connected to a properly grounded outlet to reduce shock hazard** & insure proper game operation. See Sec. 5, Chp. 3, Cabinet Schematics & Troubleshooting (XFRMR Power Wiring Diagram), for transformer connections required for **Normal, High, and Low Line** conditions.



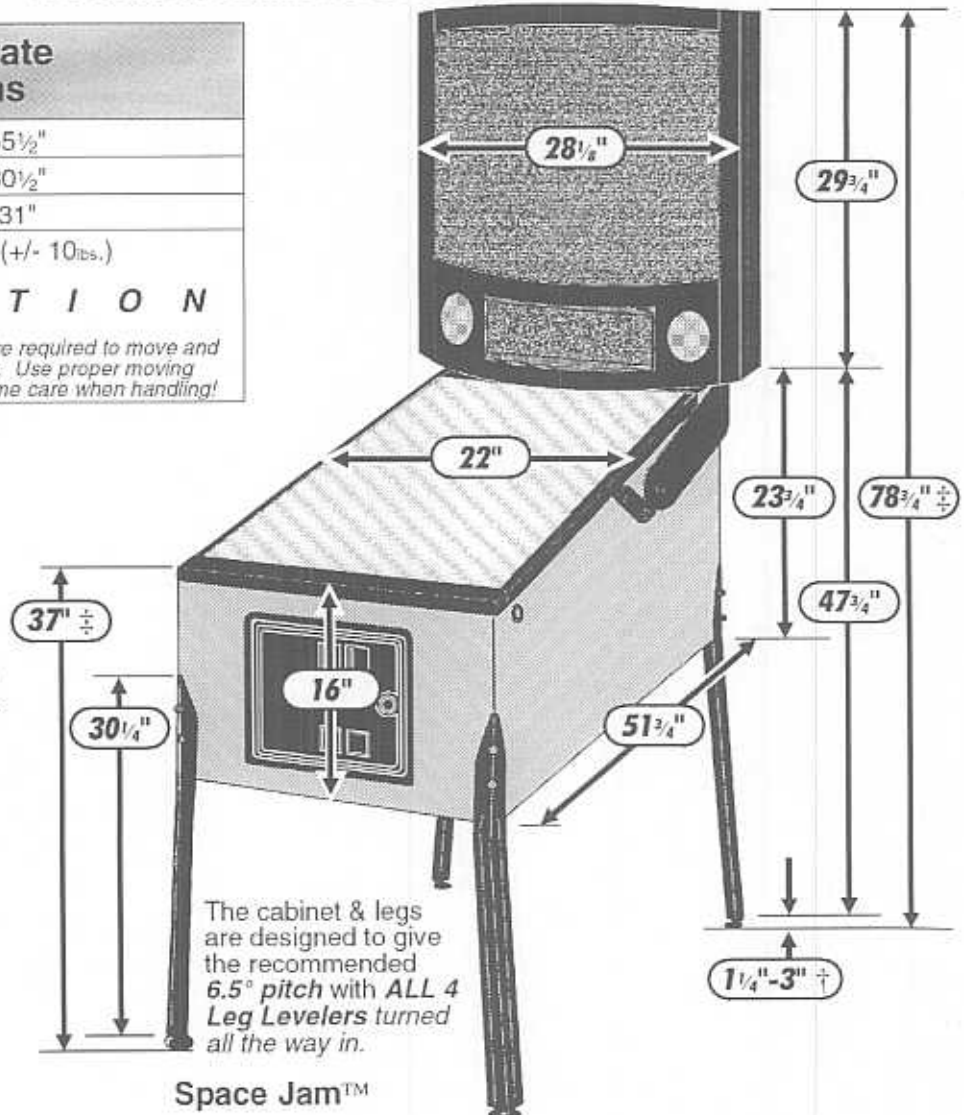
Normal Line:		110v AC - 125v AC @ 60Hz	
Domestic		AVG OPERATION	MAX OPERATION
uses an 8AMP 250v Slo-Blo Fuse.		CURRENT: 2.8AMP WATTAGE: 329w	CURRENT: 8AMP WATTAGE: 940w
High Line:		218v AC - 240v AC @ 50Hz	
Export		AVG OPERATION	MAX OPERATION
uses 2 X 5AMP 250v Slo-Blo Fuses; (*England & Hong Kong use an 8amp 250v S/B Fuse.)		CURRENT: 1.8AMP WATTAGE: 412w	CURRENT: 5AMP 8AMP* WATTAGE: 1145w 1832w*
			England & Hong Kong use an 8A F.
Low Line:		95v AC - 108v AC @ 50Hz / 60Hz	
Export Japan Only		AVG OPERATION	MAX OPERATION
uses an 8AMP 250v Slo-Blo Fuse.		CURRENT: 2.6AMP WATTAGE: 264w	CURRENT: 8AMP WATTAGE: 812w

TRANSPORTATION

To reduce the possibility of damage, observe **ALL** precautions whenever transporting the game. Lower the back-box and secure it to the cabinet with the Microfoam Shipping Sheet sandwiched between — **SAVE & USE THIS MICROFOAM SHIPPING SHEET** for future use (Part N° 705-5017-00). Remove the legs and secure the game within the transporting vehicle. Ref. Sec. 1, Chp. 1, Game Set-Up for assembly/disassembly procedures.

OVERALL DIMENSIONS † ‡

Shipping Crate Dimensions	
Height:	55½"
Width:	30½"
Depth:	31"
Weight:	300lbs. (+/- 10lbs.)
CAUTION At least 2 people are required to move and maneuver game. Use proper moving equipment & extreme care when handling!	



Notes:

- † The Leg Levelers can add up to 1¾" **MORE** to the overall height.
- ‡ The overall **FRONT & BACK** dimensions reflect the added +1¼" height from the Leg Levelers turned all the way in.



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See Sections 3 & 5, Table Of Contents, for details of that Section and it's Chapters.

WOW! Look what's new at Sega Pinball! *Introducing*..... Inside Front

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Limited Warranty, Cautions, Warnings & Notices Inside Back

Game Set-Up

Game Assembly Procedures

(Reference Find-It-In-Front: Dr. Pinball, taking note of pages ii, iii & 2)

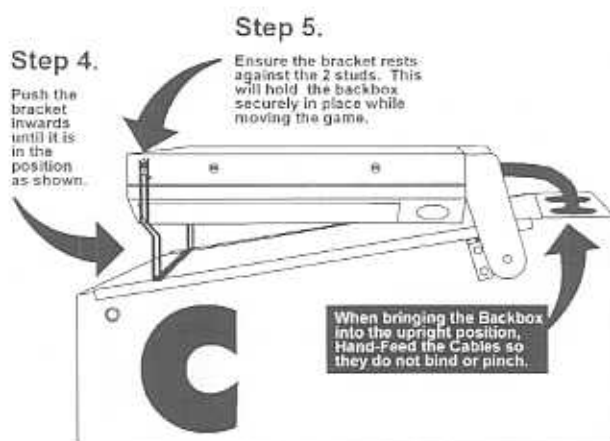
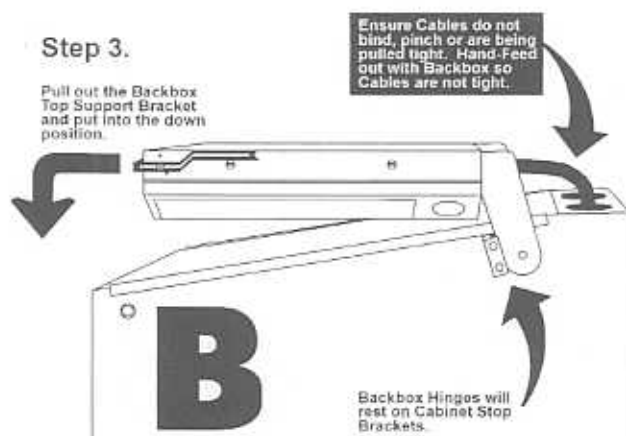
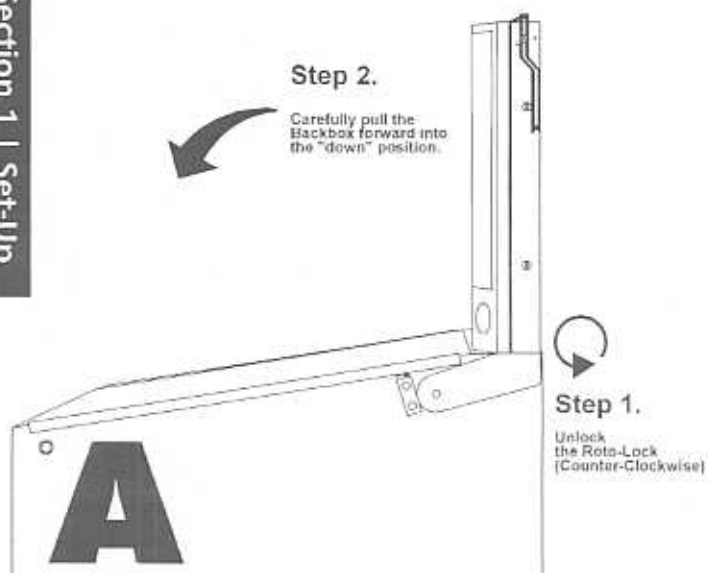
1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton. **CAUTION: At least 2 people are required to move and maneuver game. Use proper moving equipment & extreme care when handling. Pinball game is 300 lbs.+.**
2. Remove all packing material. **Save for future transportation the Microfoam Shipping Sheet (705-5017-00) used to cradle the Metal Backbox against the Playfield glass while shipping.** 4 cabinet legs & levelers (attached) are in the corner packing material of the crate. A large Allen Wrench (use for securing the backbox) is inserted and taped to the rear of the cabinet. Miscellaneous parts are in the cash box.
3. Support rear of cabinet and attach rear legs using two leg bolts for each leg. Support front of cabinet and attach front legs using two leg bolts for each leg.
4. While assuring that no cables are being pinched, carefully raise the backbox and secure it in its upright position with the Allen Wrench in the hole in the back of the cabinet and rotating the wrench 270° ($\frac{3}{4}$ turn).
5. Remove the backbox keys from the playfield glass, unlock and carefully remove the backglass. Set the backglass aside.
6. Check all connectors in the backbox for loose wire terminations. Reseat any loose wire by pushing in on the terminal. Push on all connectors plugged into the CPU/Sound Board, I/O Power Driver Board, and the Display Power to check that they are properly seated. Ensure Fluorescent Light Tube is seated correctly. Check that all fuses are seated properly.
7. Carefully remove the playfield glass and set it aside.
8. Remove all shipping tie downs, shipping blocks, packing foam, shipping instruction pages, etc. (if any) inside the cabinet. **READ ALL PRINTED INFORMATION!** Shipping instructions, labels and/or decals describe warnings, cautions, and/or important information specific to the game.
9. Raise the playfield and support it, by lifting the Prop Rod on the Right Side of the Cabinet and placing the notched end into the hole on the under playfield. See the illustration "Easy Access Service System" opposite this page.
10. Check all cabinet cables and connector terminations on the playfield Light Boards.
11. Remove the Plumb Bob tilt from the parts package and install on the pendulum wire on the inside left of the cabinet. Check the plumb tilt and adjust as required. See Section 4, Chapter 1, Parts Identification & Location.
12. Lower the playfield and ensure game is level side-to-side by adjusting Leg Levelers, if required. See the illustration "Leg Leveler Adjustment" opposite this page.
13. With the Leg Levelers turned all the way in (1.25" from floor to bottom of leg), the game pitch is 6.5°; depending on the condition of the floor, adjust the Leg Levelers as required.

The playfield incline affects difficulty of play. Use the recommended incline; Game difficulty is best varied using game adjustments.

14. If desired, perform any self tests at this time. See Section 3, Chapter 1, Portals™ Service Menu Introduction, and Chapter 2, Go To Diagnostics Menu, for instructions on how to enter "Begin Play Test" and "Game Specific" to test components on the game.
15. Carefully reinstall and lock the backglass.
16. **INSTALL 5 BALLS** on the playfield near the outhole and carefully reinstall the playfield glass. (Amount of balls are always specified on decal attached to the lock down assembly.)
17. If desired, make Game Pricing (Standard and/or Custom) and Add-A-Ball, Novelty, or X-Ball Play adjustments at this time. See Section 3, Chapter 4, Go To Adjustments Menu, for instructions on how to enter adjustments. Follow instructions in the tables provided in the manual for suggestions of customizing changes.



How to Secure the Backbox for Transporting



See Section 4, Chapter 1, Backbox - General Parts, for part numbers.

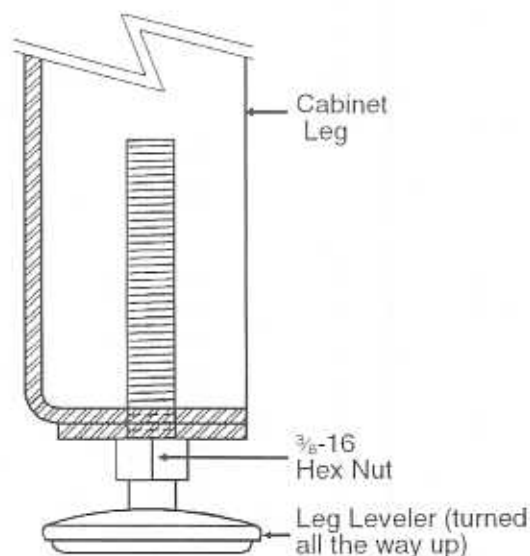
Leg Leveler Adjustment

This cabinet is designed to automatically have a 6.5° pitch without any Leg Leveler adjustment!

Attach the four (4) Leg Assemblies to cabinet corners with the eight (8) leg bolts provided. See Section 4, Chapter 1, Cabinet - General Parts, for part numbers.

YOUR PLAYFIELD PITCH IS NOW AT 6.5° AS REQUIRED FOR PROPER GAME PLAY!

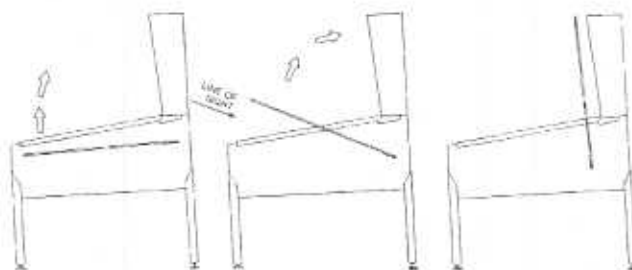
Verify 6.5° pitch. Minor adjustment(s) may be necessary depending on the location floor being level.



For custom adjustment greater than 6.5° can be achieved by turning out the rear leg leveler(s), however, it is not recommended.

Easy Access Service System - 1 Position

Carefully lift the playfield **using the left and right ball guides** upward (when lifted high enough support the bottom of the playfield with your hands) until the playfield is completely upright against the backbox. The playfield will "lock" into position with the Keeper Bracket in the cabinet. Push the release button to bring playfield down. **Reverse procedure when service is complete.**



Game Operation & Features

Start of Game Features

Starting a Normal Game

Insert coin(s). The game generates a sound for the first coin & for each subsequent coin with the display indicating the number of credits posted. Press the **START BUTTON** and a start-up sound is produced, and the posted credits are reduced by one. If the last Game Specific Adjustment, Novice Mode Enabled, is changed to **YES** (Default = **NO**), the display awaits choice from player 1 to select **REGULAR GAME** rules or **NOVICE GAME** rules with the *flipper buttons*. If the player *does not select rules*, the game will default to **Regular Rules**. After selection (or time-out default to Regular Game) subsequent players can be added (**up to 6 can play!**) by pressing the **START BUTTON** before the end of ball 1. **Note 1:** The subsequent players will play the same game (Novice or Regular) determined by Player's 1 choice.

The display now indicates the player or # of players selected from the total depressions of the **START BUTTON**. The display indicates the ball in play, and a ball is served to the *Shooter Lane*. An introduction is shown followed by Skill Shot Graphics. Pressing the **START BUTTON** after ball 1 of any player will start a new game (if credits are available), *but only* if the **START BUTTON** is depressed for 2-3 seconds. This delay is to avoid accidental "re-starts" of a game. (Note: Any 1/2 credit remaining during game play after the end of ball 1, or power down, will be eliminated.)

Starting Team Play (Doubles!)

Team Play is a four player game. The totals for players 1 & 3 (Team 1) and players 2 & 4 (Team 2) are displayed individually as well as the combined score for both teams. Team Play only works in a 4-Player game. In all other cases, the individual scores are shown.

Starting League/Tournament Play

After credit is posted, while holding in the **LEFT FLIPPER BUTTON**, press the **START BUTTON**. League Play has now begun. The differences between Normal Game Play and League/Tournament Play are: There is no "auto-percentaging" (awarding extra balls, specials, etc. to players with very low scores on the second or third ball). Mystery Features are awarded in a set order rather than random in Normal Game Play. Percentage Game Features are not automatically advanced as they are for the Regular Play Features.

Starting Pinball Wizard Play

After credit is posted, while holding in the **RIGHT FLIPPER BUTTON**, press the **START BUTTON**. Pinball Wizard Play has now begun. The same as League/Tournament Play, but ooooooh! so much gosh darn harder!

During Game Features

Feature Mode & Combination Shots

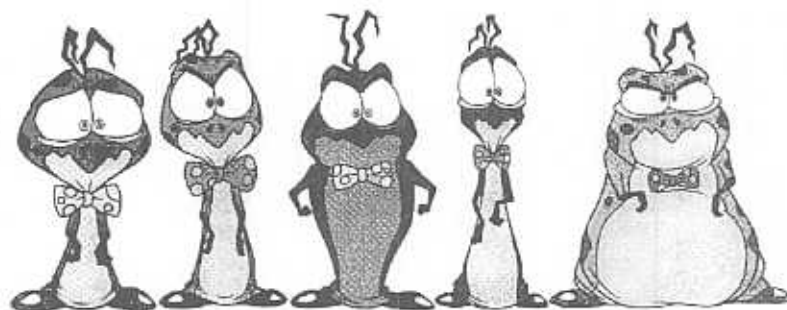
Features are lit on the playfield and started by completing certain play shots (e.g. completion of target banks, orbit(s), ramp(s) and/or any combination of the shots). Combination shots (combos) are a series of shots completed in many different variations. For example, a shot to the Ramp with the ball being returned to the Left Inlane then immediately shot to the Orbit of the playfield returning to a Flipper and then shot to another Ramp would be a hard combo shot worthy of many points. These combinations vary per game. For feature modes & combos certain points or awards are given after completion. Watch the Dot Display for feature details, etc.

Multiball

Multiball is started after completion of certain Feature Modes or may be a mode itself depending on game rules and play. Multiball may vary with the amount of balls used in Multiball depending on game style. Typically, if Multiball play was short, a "restart" option is given. Watch the Dot Display for instructions on the restart.

Replay Feature

Replay awards are given as the player exceeds a High Score Level during game play. This can be adjusted with Adjustment 3, Replay Awards (Default=CREDIT, adjustable). Players exceeding the High Score Levels can receive a **CREDIT**, an **EXTRA BALL**, or **SPECIAL**. Adjust to **NONE** if a replay award is not desired.



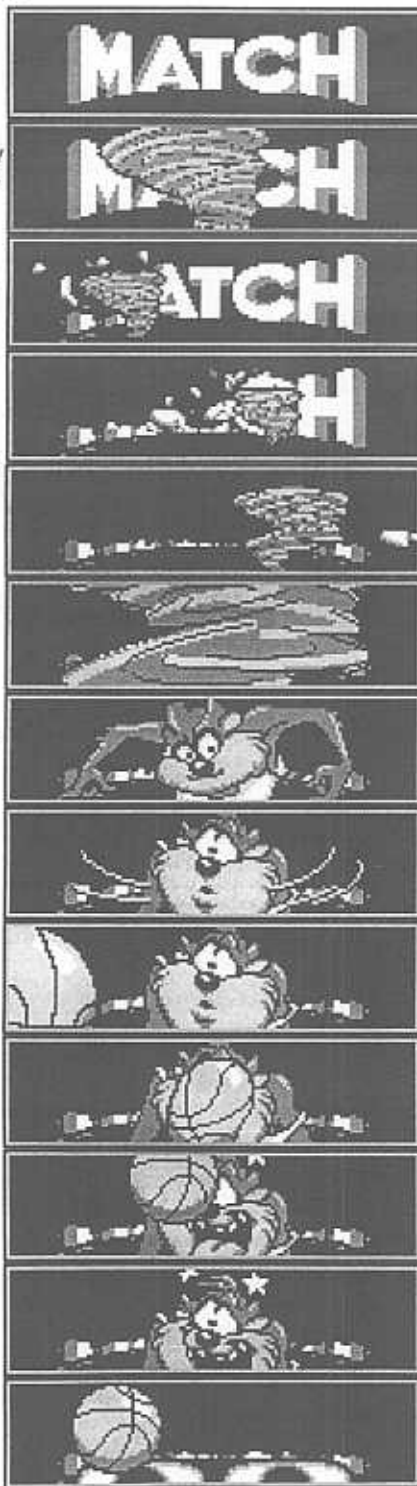
End of Game Features

Game Endings

When all player(s) have played all balls (including any Extra Balls), the game ends. If power is interrupted during the course of a game, it will end that game (*see Starting a Normal Game*). Closure of the Plumb Bob Tilt Switch according to the number of tilts set (Default = 2, adjustable) or its prolonged closure will end the current Ball-In-Play. Closure of the Slam Tilt Switch on the coin door ends the current game(s).

Match Feature

At the end of each ball, earned bonuses are collected. At the end of the last ball of a game (including any extra balls, if applicable), earned bonuses are collected, then the system produces a random 2-digit number (a multiple of 10; 00 to 90). Matching the last two digits of the player's score with this number awards a credit. In Adj. 11, Match Percentage (Default=7%, adjustable) can be changed from 0-10%. Changing the percentage to 0% displays the "Match Animation" at the end of the game, however, will never match (to award a credit). Changing this adjustment to OFF will not display the "Match Animation" nor award a credit.



Entering Initials

If player achieved a new high score in any of the 3 categories (Regular, Novice or Wizard), the player may enter his/her initials. To enter your initials, use the left & right flipper buttons to choose letter or character as seen on the Dot Display. Hitting the Start Button locks in the letter or character and proceeds to the next letter. The game then proceeds into the *Game-Over Mode* and then to the *Attract Mode*. A custom message (adjustable) can be displayed during the *Attract Mode*.

Manual Percentaging

This game is equipped with a Manual Percentage Adjustment. As with our previous games, you can either set operator adjustments for a replay percent or you can set a fixed replay score. See Section 3, Chapter 4, Adjustments, Adjustment 1 & 2.

If you set operator adjustments for a particular replay percent, the game will compute a recommended score to keep the game at that replay percentage. If a change is recommended and the game coin door is opened, the display will indicate if the replay is too high or low and make a sound to alert the operator. By pressing the start button, the score to beat will be changed to a more appropriate level. If you close the coin door or enter the **Portals™ Service Menu**, no score change will be made.

You may choose to ignore the recommended change; for example, you may not think last week's players were the usual crowd. Just close the door and the message will disappear without altering the existing level. Or you may choose to make a different score to beat adjustment; this is done by utilizing Adj. 2, Replay Levels.

Space Jam™
Starring Michael Jordan,
Bugs Bunny & Friends!

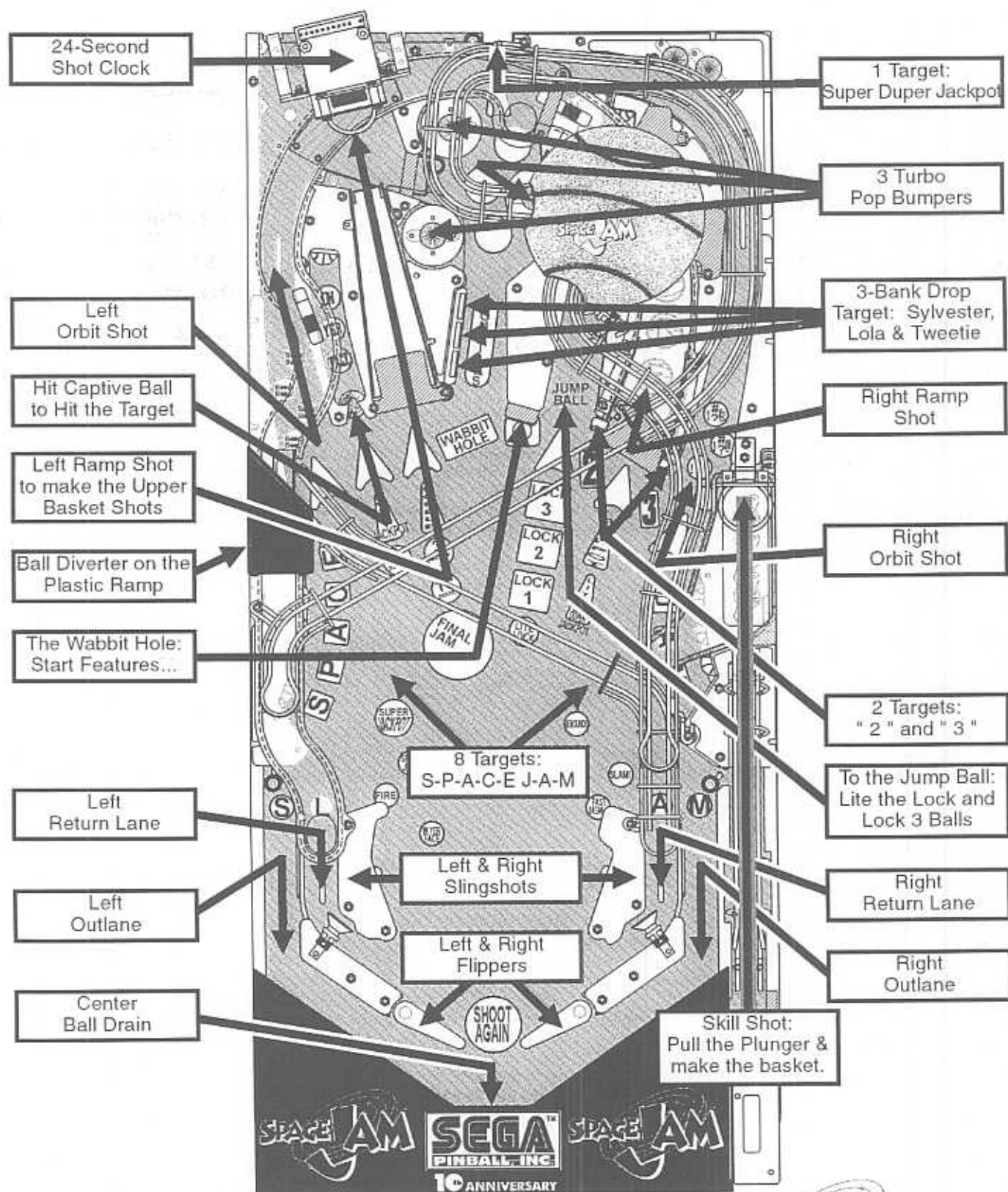


Let's get ready to JAM!

Space Jam Game Rules

Overview

Below is the *Space Jam Playfield Shot Map* showing the Major Shots in this game. For component names & parts, review Section 4, Chapters 1 & 2. The rules in this chapter are numbered and divided into three groups: Single Ball Play, Multiball & Jackpots, and Extra Features.



Space Jam Game Rules

Instruction Card

Below is a copy of the game instruction card which is included with every game. If this card is lost or damaged, simply copy this page and cut out the instruction card as a temporary replacement until a new card is ordered. (Suggestion: Copy & cut along the dotted line and fold in the center. This will keep the "copy" sturdy.)

Copy & Cut

Section 2 | Rules

Fold

Fold



SKILL SHOT Select desired award with flippers, then plunge ball through the *Shooter Lane Basket*.

BASKETBALL POINTS Earn basketball points by shooting the *Left Ramp Basket* for 3 points or the *Captive Ball* for 2 points. Earn *Bonus Features* at the point levels shown (*Lite Extra Ball*, etc.)

MULTIBALL Shoot the *JUMP BALL* to *Lite Locks* and advance towards *Multiball*. Shoot *flashing shots* to score *Jackpots* and advance to *Super Jackpot* and *Super Duper Jackpot*!

PLANETS Complete all 7 planets surrounding *Michael Jordan* to advance towards *Final Jam Mode*. Each planet is lit as follows:

- ① SPACE JAM complete *S-P-A-C-E J-A-M Targets*.
- ② FIRE complete the *Right Ramp*.
- ③ IN YER FACE complete the *Captive Ball*.
- ④ SUPER JACKPOT score a *Super Jackpot* during *Multiball*.
- ⑤ REBOUNDS awarded by crossing a *Pop Bumper* threshold.
- ⑥ FASTBREAK complete the *Taz & Roadrunner Orbits*.
- ⑦ SLAM complete the 4 bottom *S-L-A-M Lanes* to increase the *Bonus Multiplier*. *Hint: use the Flipper Buttons to rotate the unlit lanes.*



Note to Beginners: To score better, shoot at ((FLASHING SHOTS))
Be sure to LOOK UP at the Dot Display for instructions when possible.

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Part N° 755-5143-00 USA

The remainder of this chapter contains the detailed **Space Jam** Game Rules. Please read through them for a better understanding of the operation of this game. Some game rules, point values and/or features may change as production continues. The changes, if any, will be describe in manual addendums, if warranted. Please note that some adjustments (see Section 3, Chapter 4, Adjustments) are designed to customize game play, (i.e. making it harder or easier as players get more familiar with the game).

Code revisions and updates may change as production continues. Code updates will be made available to distributors via ROM, diskette or modem. Changes, if any, will be described with the code updates. See the end of this manual for "Appendix A - Pinball Game Firmware Table," for the latest revision code for all games prior to this game.

See the end of this manual for the "Glossary of Terms," of words and acronyms you may not understand. If an acronym or expression is not in this glossary, please call our Technical Support Department, so we may add it in the next game manual. Any other suggestions or comments are always welcome!



SINGLE BALL PLAY



Skill Shot

Use the **flippers** to select 1 of 4 **Awards** shown in the **display**. Plunge the ball through the **Shooter Lane Basket** to collect the award.



Basketball Points

Besides regular pinball scoring, **Space Jam** also tracks your **Basketball Points**. **Basketball Points** are scored by shooting the **Captive Ball** for 2 **Points** and the **Left Ramp Basket** for 3 **Points**. Total points scored are displayed along with the next award points threshold. Crossing award thresholds gives the player **Bonus Features**, such as **Lite Extra Ball**, etc. The game acknowledges **Multiple Baskets In-a-Row** on the **Display**. The **Attract Mode Displays** the initials of the Player who has shot the most baskets in a row!



On Fire

Lite the **F-I-R-E Lamps** by shooting the **Right Ramp**. Spelling **F-I-R-E** starts the **ON FIRE Mode**, a 24-Second **Timed Mode**, where each basket scored at the **Left Ramp Basket** is worth 10 **Basketball Points**. Watch the 24-Second **Shot Clock** before time runs out!



Super Jam

Complete **S-P-A-C-E** and **J-A-M Stand-Up Basketball Targets** to start **SUPER JAM**, a **Timed Mode**, where the player must complete 6 shots on the playfield. Each shot is accompanied by **Jordan** making 1 of 6 different spectacular jams on the **Display**.



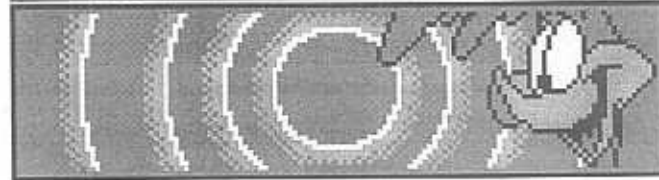
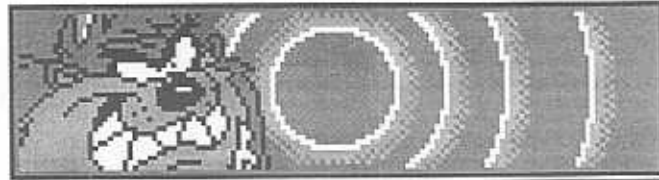
Playfield Overview
& Game Rules

SINGLE BALL PLAY



Bonus Multiplier

Completing **S-L-A-M Lanes** (The **Right & Left Outlane** and **Right & Left Return Lanes**) advances the **Bonus Multiplier**. **HINT:** Use the **flippers** to rotate the **unlit lanes**.



Fast Break Hurry-Up

Complete the **Orbit Shots** (**Tazmanian Devil & Road Runner**) to start the **FAST BREAK Hurry-Up**, a **Timed Mode**, where the player shoots the **Right Ramp** as often as possible before time expires to earn the rapidly changing award value shown in the **Display**.



Pop Bumpers

Pop Bumpers score 1,000 **Points** per **Pop**. At each **Pop Threshold**, **Pop Awards** are increased by 1,000 **Points** to a maximum of 10,000 **Points** per **pop**. As **Pop Thresholds** are achieved, the player also receives 100K, 200K, etc. to a maximum of 900K. The next **Pop Threshold** appears in the **Display** as **Pop Bumper Hits** are scored.



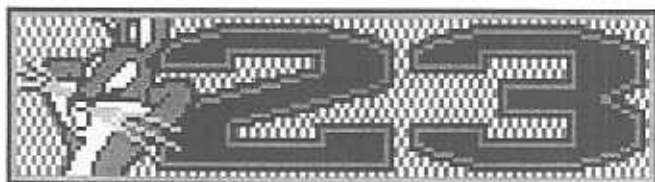
Super Pops

When **Super Pops** are active, the player receives 20,000 **Points** per **pop**. All **Pop Scoring Thresholds**, **Awards**, and **Bonus Features** remain the same.



Page 7

SINGLE BALL PLAY



Wabbit Hole

Lite Jordan's Jersey Number by completing the "2" and "3" Stand-Up Targets located at the Right Ramp to activate the Wabbit Hole Mystery Feature. Enter the lit Wabbit Hole to collect the Bonus Awards and other Timed Features.



Timed Features

Various Basketball Timed Features exist in the game. These can be started from the Skill Shot, Wabbit Hole, or by crossing a Pop Bumper or Basketball Scoring Threshold. The Next 5 Rules (11 - 15) explain these Timed Features.



In Yer Face

Complete the Drop Targets to start IN YER FACE. Shoot the Captive Ball up to 3 times before time expires to collect 200K, then 300K, and finally 400K Points.



SINGLE BALL PLAY



1-on-1

Help Michael Jordan make 6 incredible Baskets by completing the 6 major shots in the game as they lite 1 at a time. (The big Red Arrows will guide the way!) Hurry, before time runs out!



Defense

Shoot any Drop Target (Sylvester, Tweety or Lola) within 20-seconds to lock-in the Countdown Value shown in the Display. If successful, the player gets another 20-seconds to shoot any of the 6 major shots (watch those Red Arrows!) as many times as possible to repeatedly earn this value.

MULTIBALL & JACKPOTS



2-on-2

A 2-Ball Multiball Mode. Shoot the flashing Jump Ball or Right Ramp Shot, then make a basket from the Left Ramp. Repeat this sequence as often as possible to Collect Big Points. This Mode ends when one or both balls drain.



Full Court Frenzy

A 5-Ball Multiball Mode in which each of the 6 major shots in the game score a base 200K Point Jackpot. Every switch closure adds 2,500 Points to the Jackpot which continues to grow and grow! The Mode ends when only 1 ball remains in play.



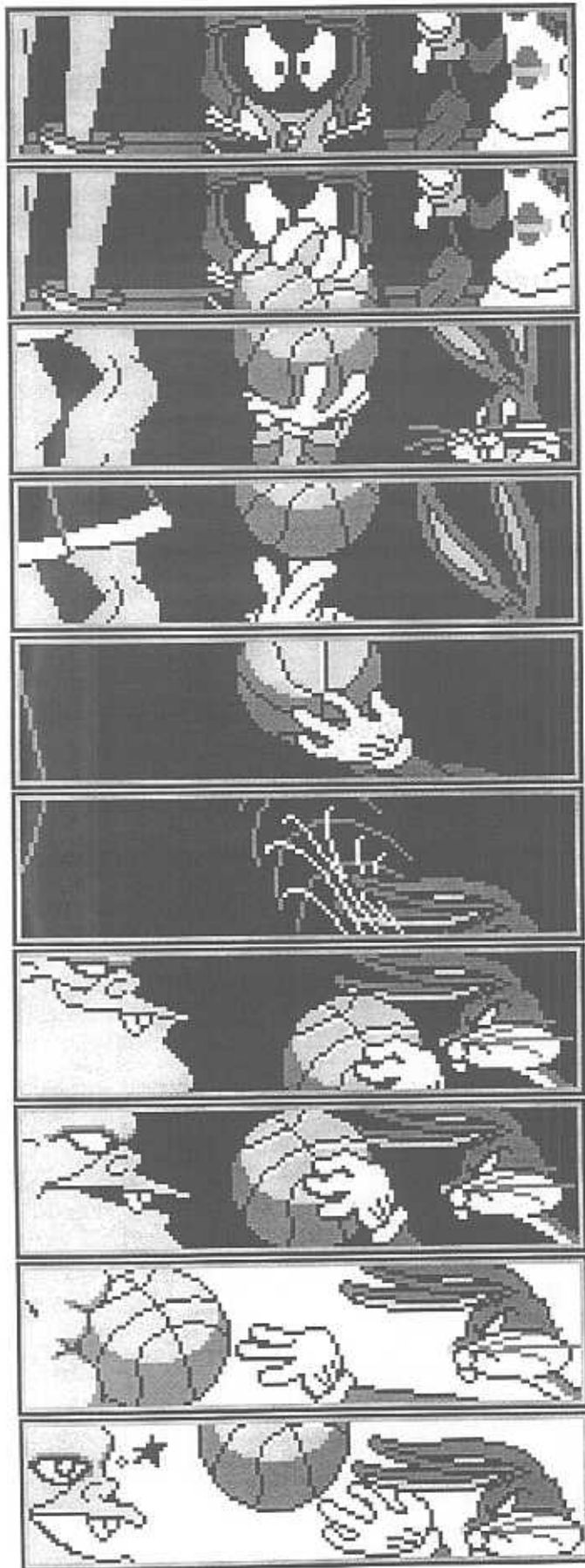
Lite the Lock: 1 - 2 - 3

Shoot the JUMP BALL (Lite Lock, Lock 1, Lock 2, Lock 3) to advance towards Multiball. Once Multiball starts, shoot the Right Ramp for a Jackpot or the Left Ramp Basket for a Double Jackpot. Doing this lights 3 more Jackpots at the Left Orbit, Right Orbit, and at the Jump Ball. Completing these 3, lites the Super Jackpot at the Captive Ball. Completing this then lites the "Lite Super Duper Jackpot" Lamp at the Right Ramp. Shoot the Right Ramp to start the "Super Duper Jackpot" Mode, a timed mode, where the player must shoot the Super Duper Jackpot Target located at the center top of the playfield. Score it and play continues back at the first Jackpot.



Multiball Restart

Players may be offered a chance to restart Multiball if they performed like a bench-warmer. Shoot the Jump Ball before the timer expires for a 2nd chance to play Multiball.



Playfield Overview
& Game Rules



Final Jam

The game has 7 Planets located around Michael Jordan. The Planets denote various game features:

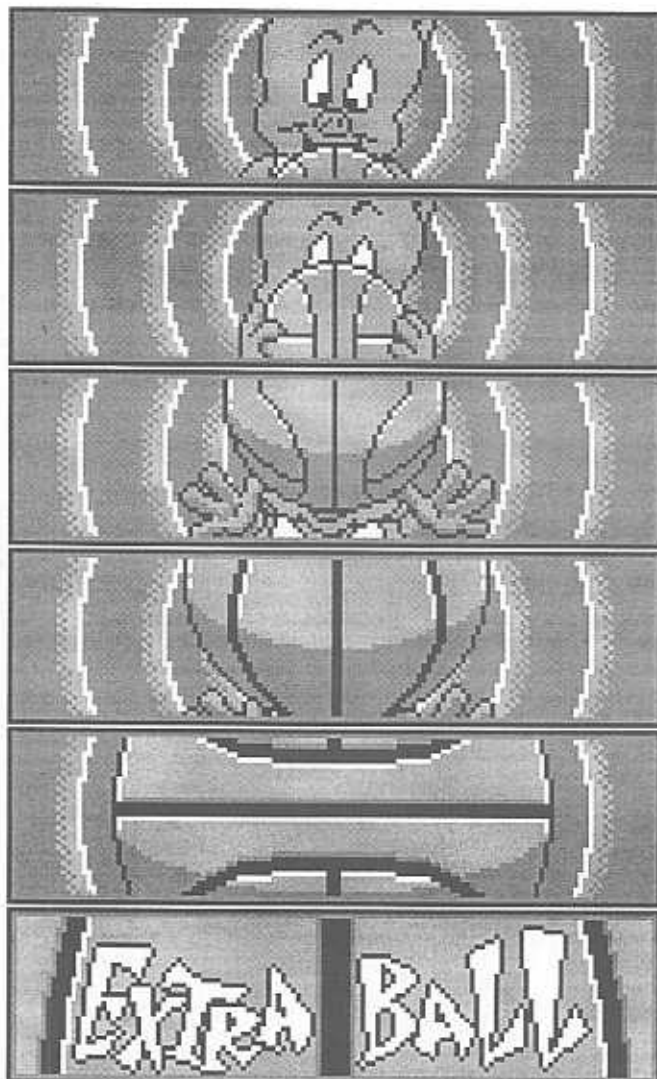
- 1. **SPACE JAM** is lit by completing S-P-A-C-E J-A-M.
- 2. **F-I-R-E** is lit by playing **ON FIRE**.
- 3. **IN YER FACE** is lit by completing 3 hits on the Captive Ball.
- 4. **SUPER JACKPOT** is lit by scoring a **Super Jackpot** during **Multiball**.
- 5. **REBOUNDS** is lit by crossing a **Pop Bumper Award Threshold**.
- 6. **SLAM!** is lit by completing the **Return Lanes & Outlanes**.
- 7. **FAST BREAK** is lit by completing the **Tazmanian Devil & Road Runner Orbits**.

When the player has lit all 7 Planets, **FINAL JAM** will lite at the **Left Ramp**. Make a **Basket** from the **Left Ramp** to start **FINAL JAM**.

In **FINAL JAM**, the player gets 60-Seconds of continuous **5-Ball Multiball** play. Shooting the **Left Ramp** for a **Basket** collects a **Final Jam Jackpot**. However, if the player can **Lock-a-Ball** in either the **Wabbit Hole** or the **Jump Ball Hole**, the **Jackpot Value** will be **DOUBLED** for a brief period. If a player can **Lock-a-Ball** in **Both Holes**, the **Jackpot Value** will be **TRIPLED** for a brief period. After 60-Seconds, the **flippers** are **turned off**, all remaining balls will drain. Then, 1-Ball is **placed back into play** and the **game continues...**



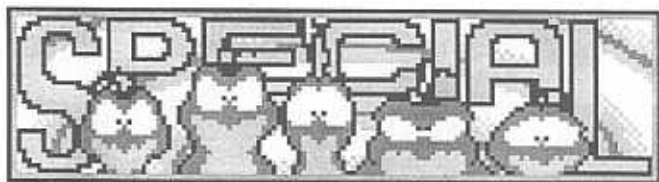
EXTRA FEATURES



Extra Ball

Extra Balls can be lit or earned by crossing a **Basketball Scoring Threshold**, by completing the **S-L-A-M Lanes**, from the **Wabbit Hole**, or by completing the **IN-YER-FACE**

Mode.



Special

Specials can be lit or earned by crossing a **Pop Bumper** or **Basketball Scoring Threshold**, or from the **Wabbit Hole**.

EXTRA FEATURES



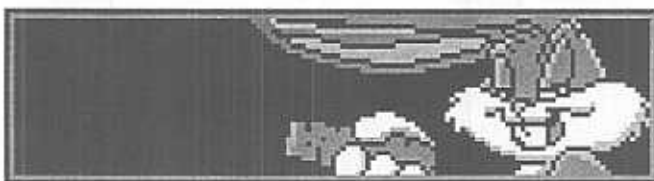
Combination Shots

Space Jam features several **Multi-Way Combos**. These **Combo Shots** involve natural sequences of key shots in the game. Several undocumented difficult combos may also be present.



End of Ball Bonus

Players receive 10K for each **Basket**, **Left & Right Orbits** and **Right Ramp** shot made, plus 30K for each **Planet** collected at the end of each ball in play. **Other Special Bonus** Calculations may be present.



At The Buzzer

When you **Jam with Monstars**, rules and point values are subject to change without notice! Remember, no game is over until the final buzzer sounds!



Portals™ Service Menu Introduction


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Bullet Legend:

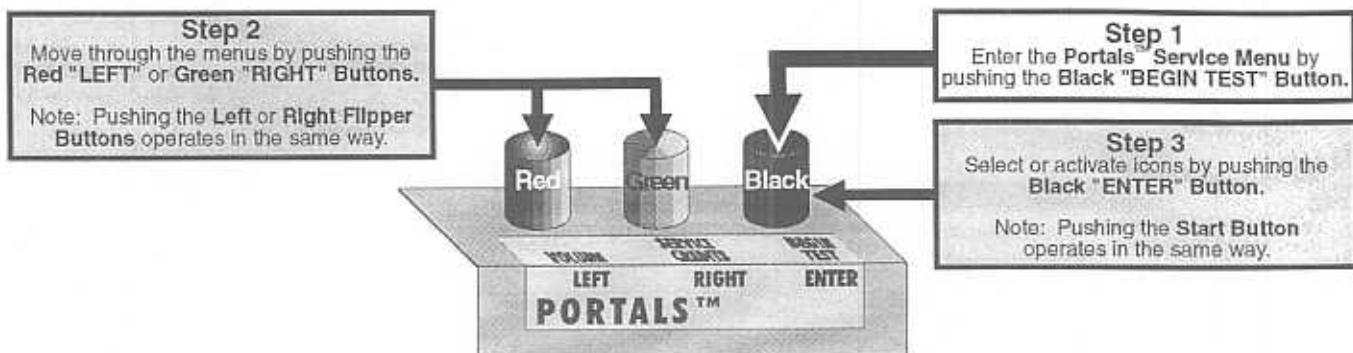
- From Main Menu, Level 1.
- From Sub-Menu, Level 2.
- From Sub-Menu, Level 3.
- Added Information / Instruction.



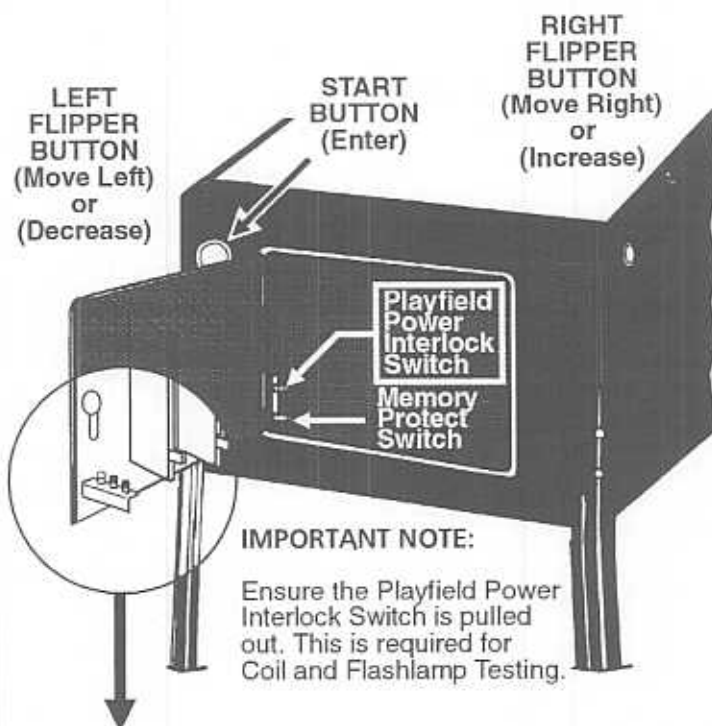
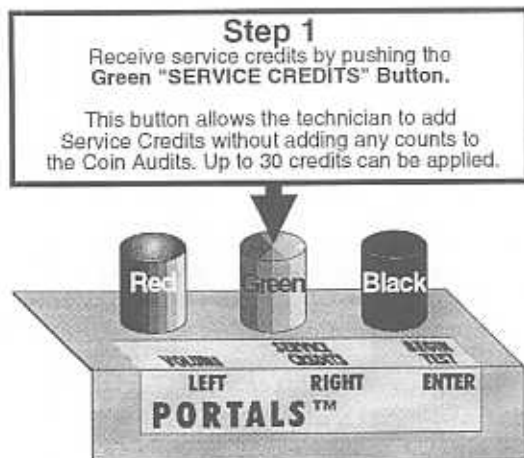
Service Switch Set (Red, Green & Black Buttons) Access & Use

Open Coin Door and view Service Switch Set (see figures below). The Memory Protect Switch is now disabled; when changing adjustments, leave the coin door open, so changes can be made. **Please ensure the Playfield Power Interlock Switch is pulled out for Coil and Flashlamp testing (this is required).**

① Entering Portals™ Service Menu (will not operate in Volume Mode):



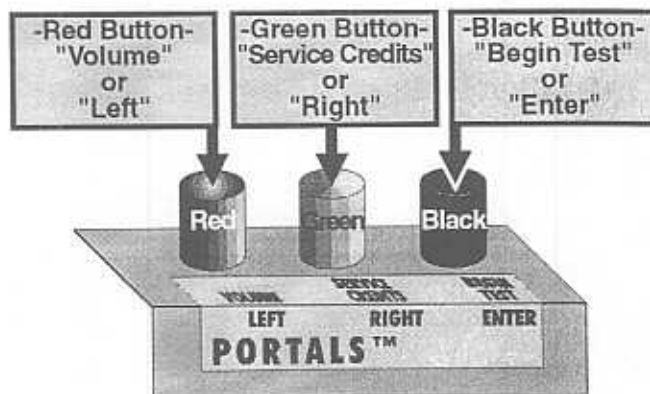
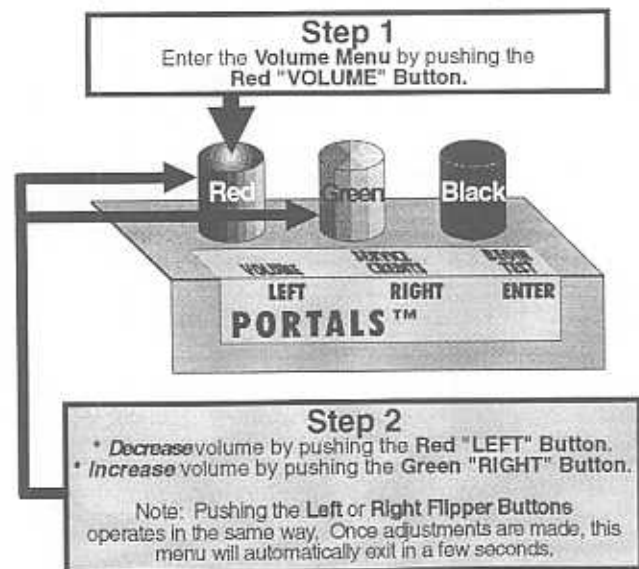
② Adding Service Credits (will not operate in Service or Volume Modes):



IMPORTANT NOTE:

Ensure the Playfield Power Interlock Switch is pulled out. This is required for Coil and Flashlamp Testing.

③ Entering the Volume Menu (will not operate in Service Mode):

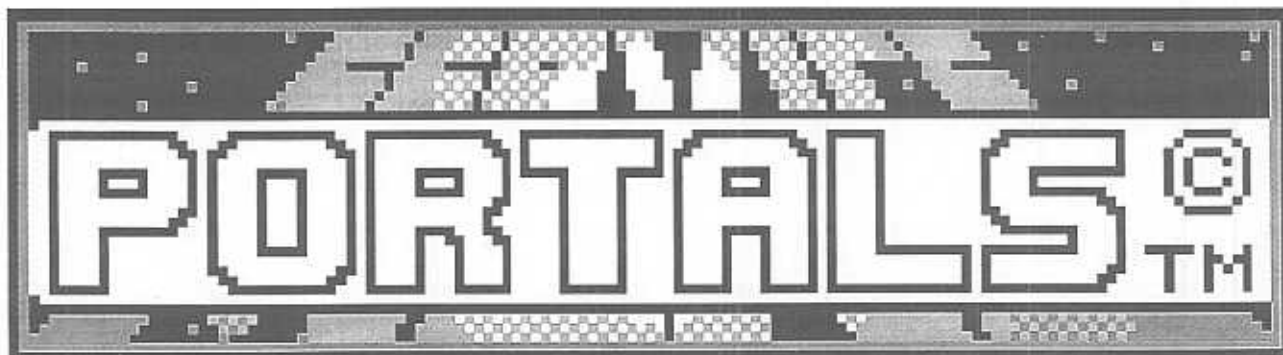


How to Use This Section

This section will cover all functions available in the **Portals™ Service Menu** in a *Step-By-Step* process. This section is divided into chapters which coincide with the **MAIN MENU**. The following pages in this chapter will instruct the operator on how to move through the menus. It's simple, easy and fun to use!

To get into the Service Menu Mode: • Power-up game (if not already) & open the Coin Door. • On the Coin Door is the Service Switch Set (**Red, Green & Black Buttons**). Push down the **Black "BEGIN TEST" Button**.

Looking at the Video Display you will momentarily see the introductory screen "Service Menu" with a satellite flying from right to left pulling a banner "Portals™ © 1996 SEGA PINBALL, INC.," followed by the **MAIN MENU**:



The Coin Door may be closed for security, however, please note with the Coin Door closed, the game's **MEMORY PROTECT** is enabled; *meaning any changes that are made will be not be written to memory*. If changing adjustments is required, ensure the Coin Door is open.

Use the **Red "LEFT" & Green "RIGHT" Buttons** (or **Left & Right Flipper Buttons**) to move the selected **ICON** left or right, and the **Black "ENTER" Button** (or **Start Button**) to activate the selected **ICON**. The use of the Service Switch Set (**Red, Green, & Black Buttons**) is required in Switch Test or Active Switch Test, as the **Start & Flipper Buttons** are a part of this test.

For diagnostic purposes, be sure the **Playfield Power Interlock Switch** is pulled out so **Playfield Power** is not disabled.

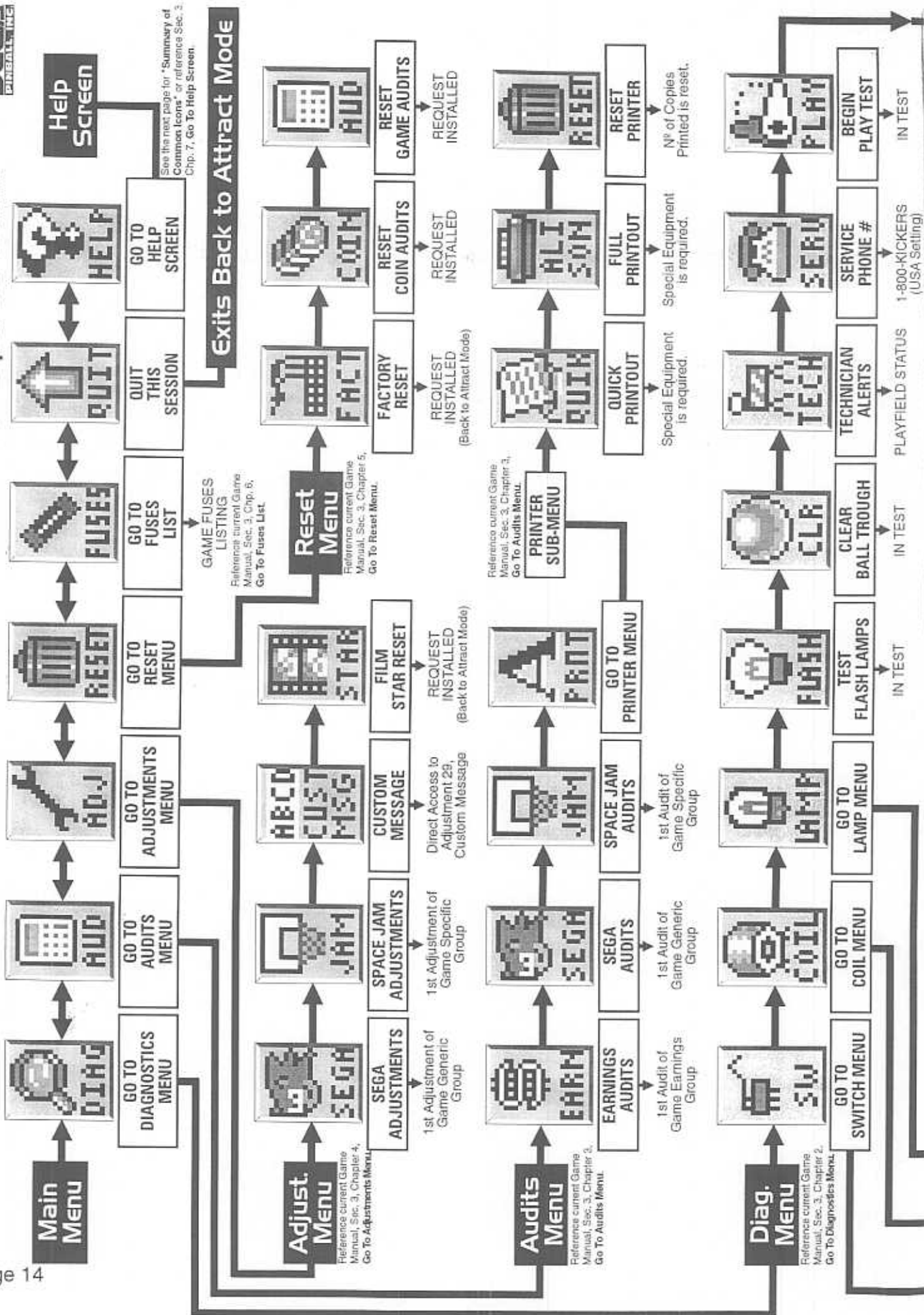
The **MAIN MENU** now appears with the "DIAG" *Icon* (**DIAGNOSTICS MENU**) flashing:

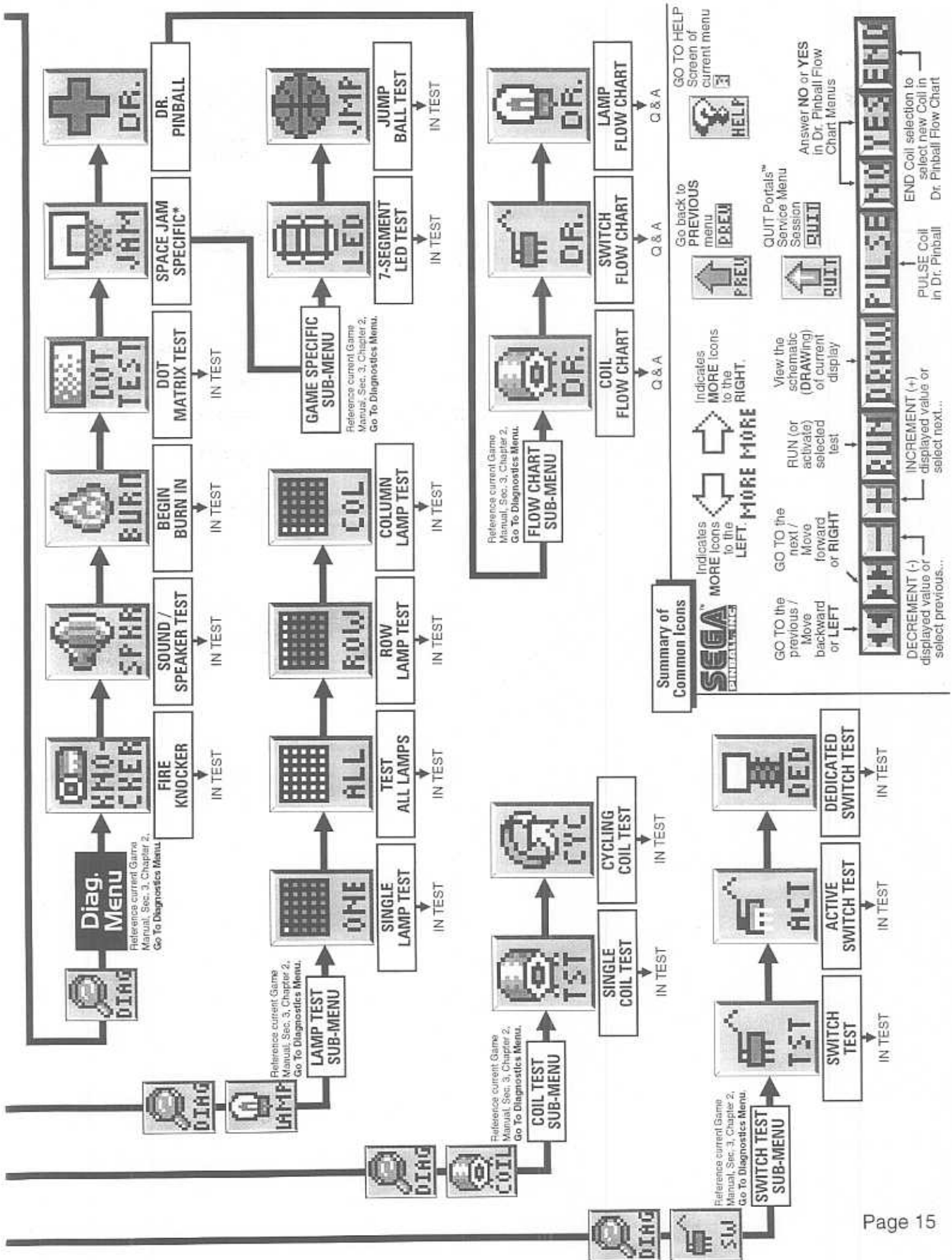


As the operator views the Menu Screen(s), the   **MORE MORE** symbols indicates that there are more *Icons* to select in each direction. The *Icon* selected will blink. Pushing the **Black "ENTER" Button** (or **Start Button**) will select the *Icon* and the Menu Screen will change to the menu selected. Select the **"PREV"** *Icons* to move backwards through the menu levels. Select the **"QUIT"** *Icon* to completely exit the Service Mode.

View the **Portals™ Service Menu Icon Tree** on the next pages for a complete overview of all menus used in this system. View the last chapter (HELP) if more information is required. Selecting the **"QUIT"** *Icon* with the **Red "LEFT"** or **Green "RIGHT" Buttons** (or either **Flipper Button**), then pressing the **Black "ENTER" Button** (or **Start Button**) will exit the Service Mode. This applies to the large and small **"QUIT"** *Icons*.

The **chapters** in this **section**, which coincide with the **MAIN MENU**, will also provide more detailed information which could not fit in the display. Use both the manual and the display to help customize, troubleshoot and/or diagnose faults, if any.





Portals™ Service Menu Example

This example will demonstrate activation of *Icons* in the **DIAGNOSTICS MENU**. The example will show activation of the "SW" *Icon* (GO TO SWITCH MENU). In this menu, the switches can be tested individually and also all active switches can be tested. Use the same technique to access all the *Icons* in the **Portals™ Service Menu**. Follow **Portals™ Service Menu Icon Tree** on the previous pages as a guide to help navigate through the entire system (Also, go to the chapter in this manual explaining the icon(s) selected.).

If the display is in any other menu other than the **MAIN MENU**, use the Red "LEFT" & Green "RIGHT" Buttons to select the "PREV" *Icon* and press the Black "ENTER" Button to activate the **ICON** thus moving back to the previous menu. Do so until **MAIN MENU** appears.

Chapters 2 through 7 will cover all menu items within the **Portals™ Service Menu**. The *Icon* is shown preceding the text. Find the *Icon* in the **Portals™ Service Menu** by navigating with the Red or Green Buttons. Each chapter started is from the **MAIN MENU**. Within the chapter, the sub-menu's will be covered sequentially with their explanation & function. If the operator "gets lost", select and activate the "PREV" *Icon* until the display indicates **MAIN MENU**. For more help, see Chapter 7.



The "MORE" symbols are indicating that "more icons" are available which don't appear in the display and which way to move the selection to view the *Icons*.



Important Note:



PREV

Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. Help, Schematic Display, etc.), press any service button to exit to the previous menu or sub-menu.



QUIT

Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.

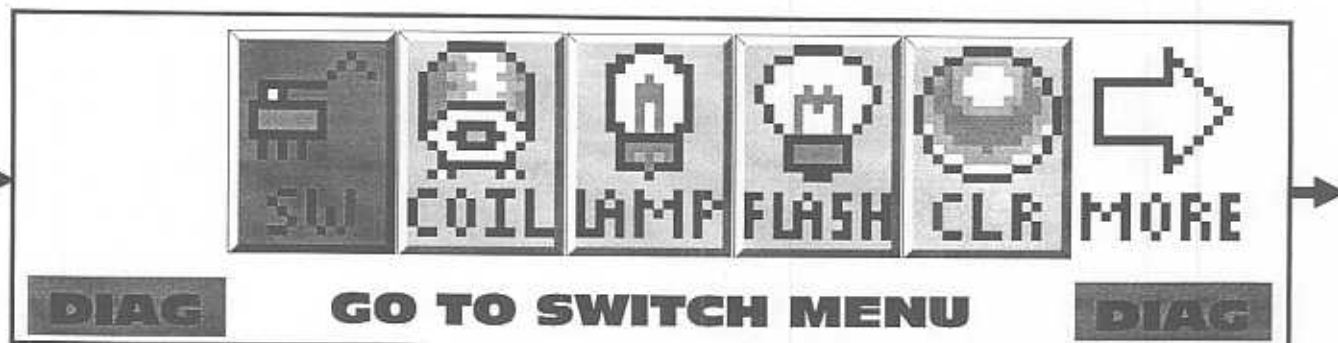


Selecting & activating the "HELP" *Icon* will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

Example: From the **MAIN MENU**, use the Red "LEFT" or Green "RIGHT" Buttons to select the "DIAG" *Icon* (GO TO DIAGNOSTICS MENU).

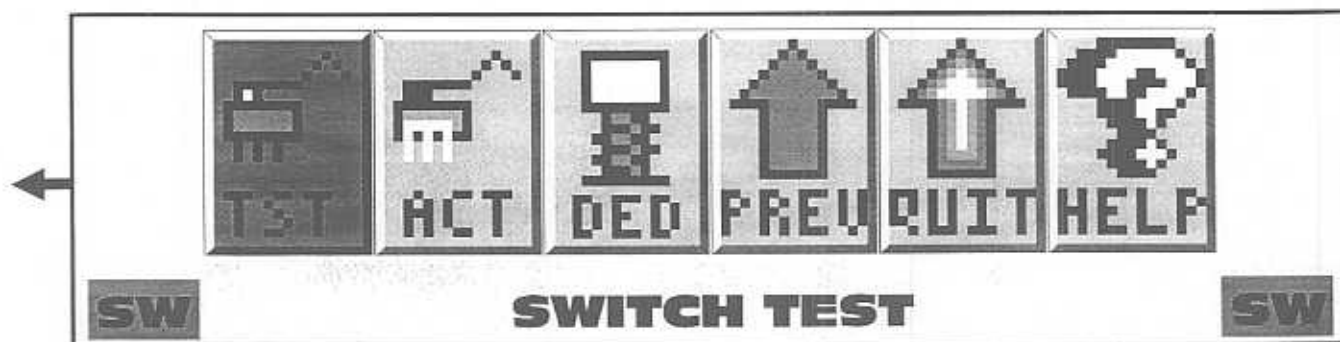


Press the Black "ENTER" Button to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

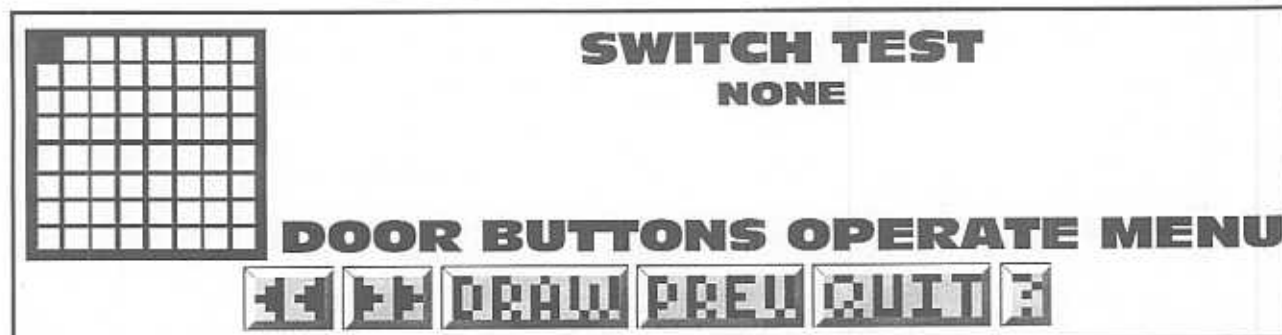


The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (GO TO SWITCH MENU) flashing. Press the Black Button to activate this icon. This will bring up the **SWITCH TEST MENU**.

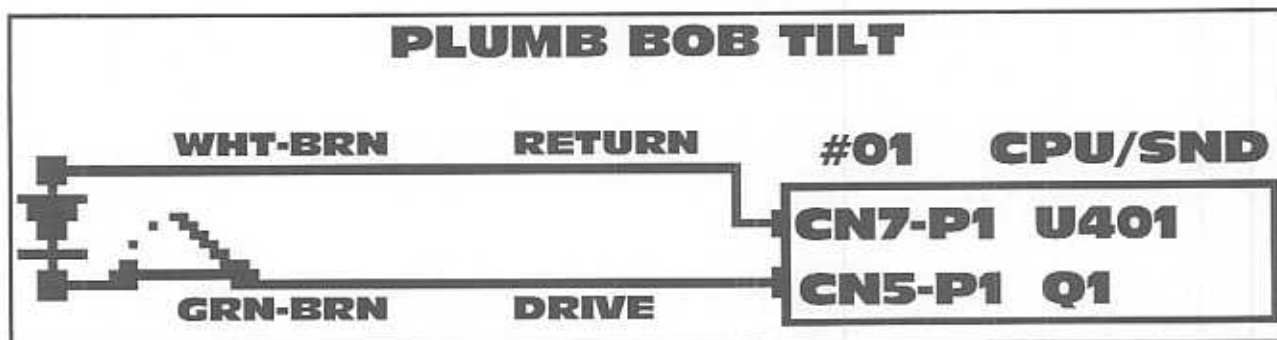
The **SWITCH TEST MENU** now appears with the "TST" *Icon* (SWITCH TEST) flashing:
Press the **Black "ENTER" Button** to *activate* this icon. This will bring up the Switch Test Display.



The Switch Test Display now appears.



All switches can be tested one at a time (When possible, use a pinball to close any playfield switches; rolling the ball at Stand-Up Targets or over/under switches is suggested. Use finger for all non-playfield switches.) As each switch is closed, the respective Switch Matrix Grid Position (1-64) will be lit. To view the schematic for the switch selected, press the **Red** or **Green Buttons** to select the "DRAW" *Icon*. Press the **Black Button** to *activate* this icon. This will bring up the **Switch Schematic Display** for the switch being closed.



An example is shown with Switch #01, Plumb Bob Tilt, selected. The display describes the switch in the Switch Matrix which includes the name of the switch, the Return (Row) Wire and the Drive (Column) Wire, drive transistor, the part number (not shown in the above example) and the "Pin-Outs" from the CPU/Sound Board.

While in Switch or Active Switch Tests, the **Flipper & Start Buttons** are deactivated. Use the **Red "LEFT," Green "RIGHT" and/or Black "ENTER" Buttons** to select and activate the "MINI-ICONS" at the bottom of the display. In Switch Test, if the "Left Arrow" or "Right Arrow" *Icon* is activated, the display will go to the previous tests (Active and Dedicated Switch Tests). Use the **Red or Green Buttons** to change the selected **ICON** to "PREV" *Icon*. Press the **Black "ENTER" Button** to go to the previous menu.

Note:

In **Dedicated Switch Test**, the **Flipper & Start Buttons** are to be used instead of the **Red, Green & Black Service Buttons**, as these buttons are deactivated for this test.

Exit out of the sub-menu by activating the big "PREV" *Icon* in the menu. This will bring up the **DIAGNOSTICS MENU**. The Switch Test Session is now complete. See the next page about exiting the **Portals™ Service Menu**.

Exiting the Portals™ Service Menu

All *Icons* will be covered in the chapters of this section with the exception of the "QUIT" *Icon*, in the MAIN MENU. Both the large and small *Icons* if selected and activated, will exit the user from the Portals™ Service Menu. The display will return back to the ATTRACT MODE! To re-enter the Portals™ Service Menu follow the instructions at the beginning of this chapter.



If more help is required, see Chapter 7 of this section, and view the various help displays in the game.

Your Notes

Go To Diagnostics Menu

Special Note: If the *display flashes "OPEN THE COIN DOOR"* the game is indicating that memory has been corrupted. This is caused by either failure in memory (e.g. batteries are dead and/or faulty RAM) or upon installation of updated version of game code. Opening the Coin Door will initiate a *Factory Restore*, by opening the *Memory Protect Switch*. Check battery voltage at CMOS RAM with the power off.

Overview

The **Portals™ Service Menu System** provides tests for sounds, display, lamps, switches and coils. Each feature may be tested manually or automatically after entering the **Portals™ Service Menu** (see Chapter 1 of this section). Select the "DIAG" *Icon* from the **MAIN MENU** to go to the **DIAGNOSTICS MENU**. The automatic tests (e.g. Cycling Coils, Flash Lamps, etc.) may be used for a quick verification of automatic test functions and the manual tests (Begin Play Test, Single Lamp/All/Row/Column Tests, etc.) may be used for troubleshooting.

During game play, activation of switches and operation of coils with associated switches are monitored. If the CPU Board does not detect a switch transition ("Stuck Open" / "Stuck Closed") for 50 games, it is considered faulty. When operation of a coil should close or open a switch and does not, the coil is considered faulty. In the Attract Mode, faulty switches and coils (if any) are reported (Select the "TECH" *Icon*, Technician Alerts, from the **DIAGNOSTICS MENU**). Note that reporting of an unused switch does not constitute a problem and that a bad coil could mean that the associated switch requires adjustment.



GO TO DIAGNOSTICS MENU

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the "DIAG" *Icon* in the **MAIN MENU** with either **Flipper** or **Red "LEFT" & Green "Right" Buttons** (upon entry of the **Portals™ Service Menu**, the system defaults with the selection of the "DIAG" *Icon* flashing) and press the **Start** or **Black "ENTER" Buttons**. The **DIAGNOSTICS MENU** appears.



The "MORE" symbols are indicating that "more icons" are available which don't appear in the display and which way to move the selection to view the *Icons*.



Important Notes:



Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.



In Diagnostics, selecting & activating the "-" or "+" *Icons* moves test forwards/backwards.



Selecting & activating the "RUN" *Icon* repeats the test on the coil or flash lamp left off at.



Selecting & activating the "ARROW" *Icons* moves between tests in the sub-menu.



Selecting & activating the "DRAW" *Icon* will show the schematic for that switch or coil.

Some tests require navigation through the menu(s) and selection of the *Icons* with the **Red "LEFT," Green "RIGHT" and Black "ENTER" Buttons**. This is required in Switch and Active Switch Tests, as the **Flipper** and **Start Buttons** are a part of the test.

In Coil Test, ensure the **Power Interlock Switch** is pulled out. (See **Access & Use** of Chapter 1 of this section for the location.) If the switch is not pulled out, the coils and flash lamps cannot be tested (32v DC and 50v DC are disabled). Closing the Coin Door will automatically reset this switch. Coils and Flash Lamps are checked manually in Coil Test. To automatically check coils, go to Cycling Coils from the **COIL TEST MENU**. To automatically check flash lamps, go to Flash Lamp Test, from the **DIAGNOSTICS MENU**.



GO TO SWITCH MENU

From the **DIAGNOSTICS MENU**, select the "SW" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER"** **Button**. Switches are configured in an 8 x 8 Matrix of Columns (Switch Drives) and Rows (Switch Returns) with up to 64 switches possible. The Switch Test Menu consists of three parts: Switch Test, Active Switches, and Dedicated Switch Test.

Note: The Flipper & Start Buttons are deactivated during Switch Tests.



Switch Test

To initiate, from the **SWITCH MENU**, select the "TST" *Icon* with the **Red** or **Green Button** & press the **Black Button**. In Switch Test, close each switch and observe the display. The display will describe the switch in the Switch Matrix, which includes the switch name, Return (Row) Wire, Drive (Column) Wire, Part N^o, and the "Pin-Outs" from the CPU/SOUND Board. When the switch is released, the information of the last switch closed will remain in the display until another switch is closed or the test is exited. To view the switch schematic, select the mini "DRAW" *Icon* with the **Red** or **Green Button** & press the **Black Button**.



Active Switch Test

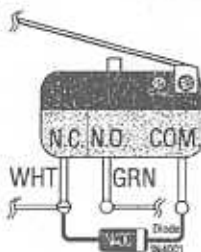
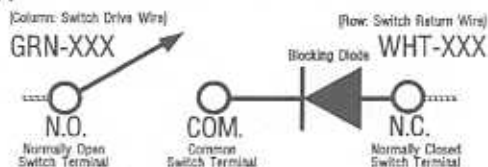
To initiate, from the **SWITCH MENU**, select the "ACT" *Icon* with either **Red** or **Green Button** & press the **Black Button**. If still in a previous test, select the "PREV" *Icon* to return to Switch Menu or selecting either of the "ARROW" *Icons* will move through the tests. If any switches are stuck closed (or made from the presence of a pinball), the display sequences through the Switch Names, Return (Row) Wire, Drive (Column) Wire, Drive Transistor, Part N^o, and the "Pin-Outs" from the CPU/SOUND Board. This cycle continues until all switches are cleared or until the test is exited.



Dedicated Switch Test

To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either **Flipper Button** & press the **Start Button** (The service switches are deactivated during this test.). The display will describe the switch which includes the Switch Name, Return (Row) Wire, Drive (Column) Wire, Part N^o, and the "Pin-Outs" from the CPU/SOUND Board.

Typical Switch Schematic & Side View



Dedicated Switch Schematic



SWITCH MATRIX GRID

Column (Drive)	1 Q1 GRN-BRN CN5-P1	2 Q2 GRN-RED CN5-P3	3 Q3 GRN-ORG CN5-P4	4 Q4 GRN-YEL CN5-P5	5 Q5 GRN-BLK CN5-P6	6 Q6 GRN-BLU CN5-P7	7 Q7 GRN-VIO CN5-P8	8 Q8 GRN-GRY CN5-P9
Row (Return)								
1 U400 WHT-BRN CN7-P9	NOT USED	NOT USED	3-BANK DROP BOTTOM	TOP BASKET ENTER	(S)PACE JAM S-U	SUPER DUPER JACKPOT S-U	TOP TURBO BUMPER	LEFT OUTLANE
2 U400 WHT-RED CN7-P8	4TH COIN SLOT	NOT USED	3-BANK DROP MID	NOT USED	(S)PACE JAM S-U	EXTRA BALL S-U	LEFT TURBO BUMPER	LEFT RETURN LANE
3 U400 WHT-ORG CN7-P7	6TH COIN SLOT	5-BALL TROUGH #1 (LEFT)	3-BANK DROP TOP	TOP BASKET MADE	(S)PACE JAM S-U	RIGHT ORBIT TOP	RIGHT TURBO BUMPER	LEFT SLINGSHOT
4 U400 WHT-YEL CN7-P6	RIGHT COIN SLOT	5-BALL TROUGH #2	NOT USED	RIGHT RAMP S-U LEFT	(S)PACE JAM S-U	RIGHT ORBIT BOTTOM	NOT USED	RIGHT OUTLANE
5 U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA	5-BALL TROUGH #3	NOT USED	RIGHT RAMP S-U RIGHT	(S)PACE JAM S-U	JUMP BALL VUK	NOT USED	RIGHT RETURN LANE
6 U401 WHT-BLU CN7-P3	LEFT COIN SLOT	5-BALL TROUGH #4	RIGHT RAMP ENTER	SKILL SHOT BASKET	(S)PACE JAM S-U	WABBIT HOLE VUK	START BUTTON	RIGHT SLINGSHOT
7 U401 WHT-VIO CN7-P2	5TH COIN SLOT	5-BALL TROUGH VUK OPTO	RIGHT RAMP EXIT	NOT USED	(S)PACE JAM S-U	LEFT ORBIT BOTTOM	SLAM TILT	NOT USED
8 U401 WHT-GRY CN7-P1	NOT USED	SHOOTER LANE	CAPTIVE BALL	NOT USED	(S)PACE JAM S-U	LEFT ORBIT TOP	PLUMB BOB TILT	NOT USED

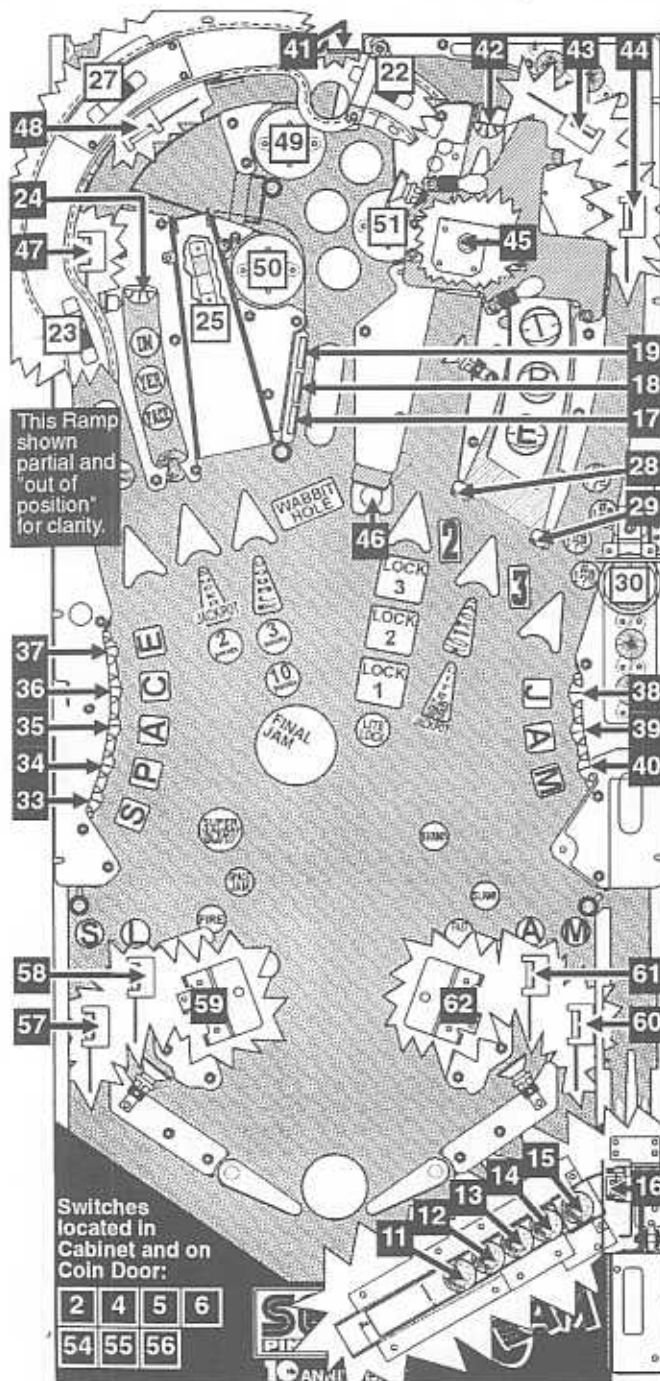
Dedicated Switches

GND IC U206 INPUTS	Ground BLK CN6-P1, -P11
1 GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON DS-1
2 GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S (End-of-Stroke) DS-2
3 GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON DS-3
4 GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S (End-of-Stroke) DS-4
5 NOT USED CN6-P7	NOT USED DS-5
6 GRY-BLU CN6-P8	#6 VOLUME (RED BUTTON) (Normal) (In Test: LEFT) DS-6
7 GRY-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (Normal) (In Test: RIGHT) DS-7
8 GRY-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (Normal) (In Test: ENTER) DS-8



Switch Matrix Descriptions with Part Numbers and Locations †

The switch locations correspond with the Switch N° in the table below and the Switch Matrix Grid.



Legend Note:

□ = Switches mounted above playfield.

■ = Switches mounted below playfield.

* The following switches are located in the cabinet and are not noted in the diagram above:

2 3 4 5 6 7 54 55 56

The following switches are not used:

1 8 9 10 20 21 26 31 32

52 53 63 64

Sw. N°	Col. N°	Row N°	Switch Matrix Description	Part N°
Note: The ¥ Coin Switch (for Japan) is 180-5091-00				
1	1	1	NOT USED	
2*	1	2	4TH COIN SLOT	180-5024-00
3*	1	3	6TH COIN SLOT	(Future Use)
4*	1	4	RIGHT COIN SLOT	
5*	1	5	CENTER COIN SLOT / DBA	180-5024-00
6*	1	6	LEFT COIN SLOT	
7*	1	7	5TH COIN SLOT	(Future Use)
8	1	8	NOT USED	
9	2	1	NOT USED	
10	2	2	NOT USED	
11	2	3	5-BALL TROUGH #1 (LEFT)	
12	2	4	5-BALL TROUGH #2	180-5119-00
13	2	5	5-BALL TROUGH #3	
14	2	6	5-BALL TROUGH #4	
15	2	7	5-BALL TROUGH VUK OPTO	TRANS REC
16	2	8	SHOOTER LANE	520-5124-00
17	3	1	3-BANK DROP BOTTOM	500-6096-00
18	3	2	3-BANK DROP MID	
19	3	3	3-BANK DROP TOP	180-5104-00
20	3	4	NOT USED	
21	3	5	NOT USED	
22	3	6	RIGHT RAMP ENTER	180-5145-00
23	3	7	RIGHT RAMP EXIT	
24	3	8	CAPTIVE BALL	500-6118-00
25	4	1	TOP BASKET ENTER	180-5145-00
26	4	2	NOT USED	
27	4	3	TOP BASKET MADE	180-5145-00
28	4	4	RIGHT RAMP S-U LEFT	500-6138-02
29	4	5	RIGHT RAMP S-U RIGHT	
30	4	6	SKILL SHOT BASKET	180-5159-00
31	4	7	NOT USED	
32	4	8	NOT USED	
33	5	1	(S)PACEJAM S-U	
34	5	2	S(P)ACEJAM S-U	
35	5	3	SP(A)CEJAM S-U	
36	5	4	SPA(C)EJAM S-U	500-6118-00
37	5	5	SPAC(E)JAM S-U	
38	5	6	SPACE(J)AM S-U	
39	5	7	SPACEJ(A)M S-U	
40	5	8	SPACEJA(M) S-U	
41	6	1	SUPER DUPER JACKPOT S-U	500-5232-02
42	6	2	EXTRA BALL S-U	500-6118-00
43	6	3	RIGHT ORBIT TOP	500-5707-00
44	6	4	RIGHT ORBIT BOTTOM	
45	6	5	JUMP BALL VUK	180-5116-00
46	6	6	WABBIT HOLE VUK	
47	6	7	LEFT ORBIT BOTTOM	500-5707-00
48	6	8	LEFT ORBIT TOP	
49	7	1	TOP TURBO BUMPER	180-5015-03
50	7	2	LEFT TURBO BUMPER	
51	7	3	RIGHT TURBO BUMPER	
52	7	4	NOT USED	
53	7	5	NOT USED	
54*	7	6	START BUTTON	500-6090-06
55*	7	7	SLAM TILT (On Coin Door)	180-5022-00
56*	7	8	PLUMB BOB TILT	HANGER CONTACT
57	8	1	LEFT OUTLANE	500-5707-00
58	8	2	LEFT RETURN LANE	
59	8	3	LEFT SLINGSHOT	180-5054-00
60	8	4	RIGHT OUTLANE	500-5707-00
61	8	5	RIGHT RETURN LANE	
62	8	6	RIGHT SLINGSHOT	180-5054-00
63	8	7	NOT USED	
64	8	8	NOT USED	



GO TO COIL MENU

From the **DIAGNOSTICS MENU**, select the "COIL" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. The coils are listed in groups. The first 2 groups are the High Current Coils. The next group is the Low Current Coils. The next group is the Flash Lamps. The remaining coils are special coils. These coils are listed in a Coils Detailed Chart Table following the Playfield Coil & Flash Lamp Locations.



Single Coil Test

To initiate, from the **COIL MENU**, select the "TST" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Ensure the **Power Interlock Switch** is pulled out. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Coil Test from #1 (The test runs through Coils 1-24 and Flash Lamps F1-F8; some Flash Lamps may be positioned within Coils 1-24.). Press the **Black Button** on the "+" *Icon*, as each coil is selected, the display will describe the coil or flash lamp name with the corresponding number, the wire with colors, the "Pin-Outs" from the I/O Power Driver Board, the coil voltage and gauge-turns (e.g. 23-800). Press the **Black Button** again to move forward in the test. To test and view a particular coil or flash lamp, select the "RUN" *Icon* and press the **Black Button**. Each time the **Black Button** is pushed, the coil or flash lamp will fire on the playfield and/or backbox, with the display indicating the coil or flash lamp information. Continue with the same procedure to run through the entire test.



Cycling Coil Test

To initiate, from the **COIL MENU**, select the "CYC" *Icon* with either **Red** or **Green Button** and press the **Black Button**. If still in a previous test, select the "PREV" *Icon* to return to Coil Menu or selecting either of the "ARROW" *Icons* will move to Cycling Coil Test (selecting again will return to Coil Test). The test pulses each regular coil or flash lamp sequentially (cycling) on the playfield and backbox. The display indicates "CYCLING COILS."

Playfield Flash Lamp Locations

Type	Description
#17 FLASH	FINAL JAM*1 (#906)
#19 FLASH	JUMP BALL*2 (#906)
#21 FLASH	SKILL*3 (#89)
#22 FLASH	BASKET RAMP*4 (#89)
#23 FLASH	TOP-LT*2 TOP-RT*2 (#89)
#F1 FLASH	L ORBIT ARROW*1 (#906)
#F2 FLASH	C-BALL ARROW*1 (#906)
#F3 FLASH	B RAMP ARROW*1 (#906)
#F4 FLASH	JBALL ARROW*1 (#906)
#F5 FLASH	R RAMP ARROW*1 (#906)
#F6 FLASH	R ORBIT ARROW*1 (#906)
#F7 FLASH	3 BANK DROP*2 (#89)
#F8 FLASH	POPS*3 (#89)

Legend Note:

□ = Flash Lamps mounted above playfield.

■ = Flash Lamps mounted below playfield.

Spots Actual Location:

● = Bulb goes through hole in the playfield.

○ = Bulb is under playfield insert.

⊙ = Bulb under Mini-Mar (Light Cover).

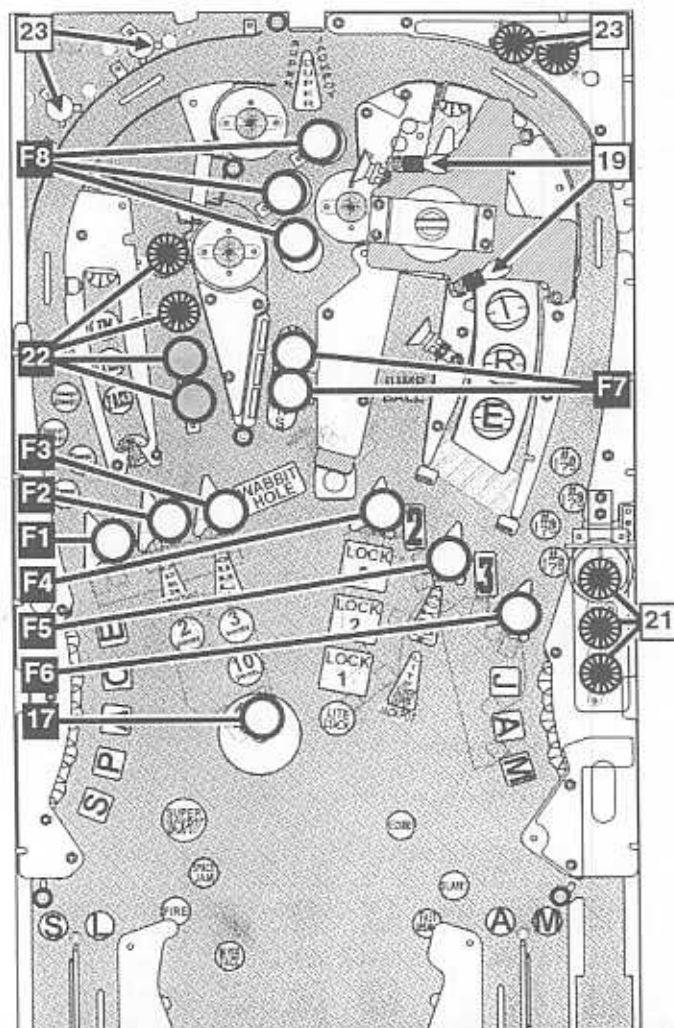
The following bulbs are used for Flash Lamps (see table above for bulb usage).



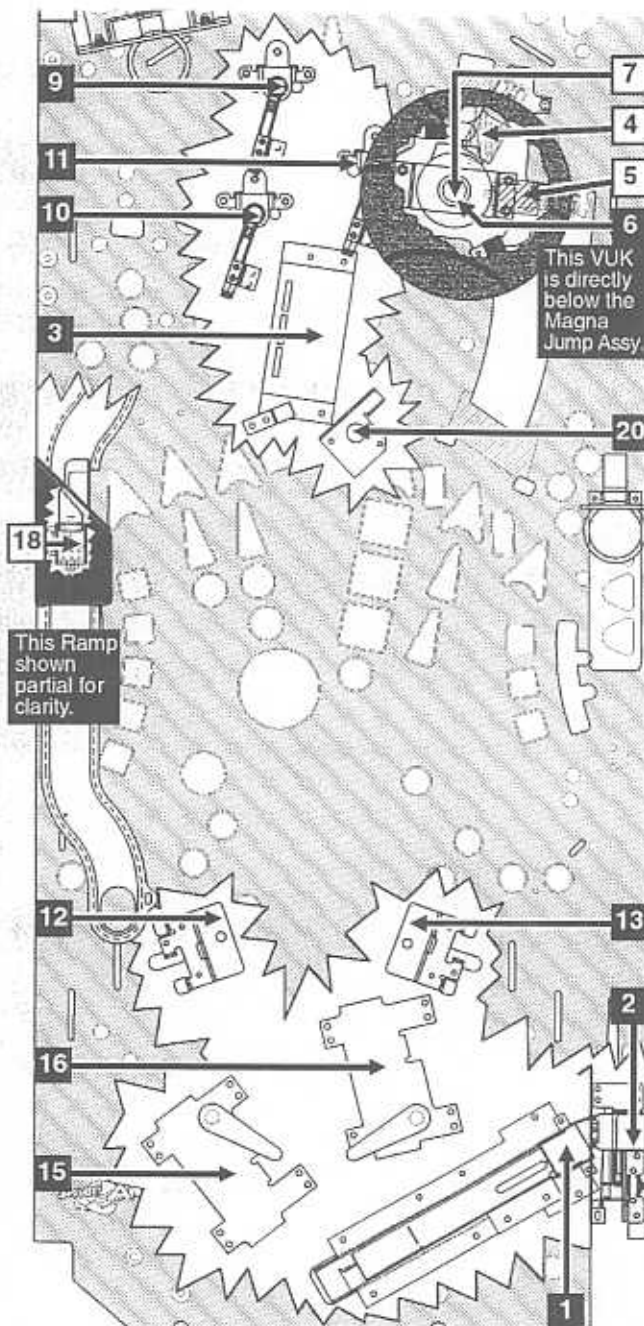
#89 Bulb
(Bayonet)
165-5000-89



#906 Bulb
(Wedge Base)
165-5004-00



There are no Flash Lamps below this statement note.



COIL 1	TROUGH UP-KICKER (VUK) (24-940)
COIL 2	AUTO LAUNCH (50V) (23-800)
COIL 3	3-BANK DROP TARGET RESET (23-800)
COIL 4	JUMP BALL TOP KICKER (24-940)
COIL 5	JUMP BALL RIGHT KICKER (24-940)
COIL 6	JUMP BALL VUK (24-940)
COIL 7	JUMP BALL MAGNET (22-650)
COIL 8	(EUROPEAN TOKEN DISPENSER)
COIL 9	TOP TURBO BUMPER (26-1200)
COIL 10	LEFT TURBO BUMPER (26-1200)
COIL 11	RIGHT TURBO BUMPER (26-1200)
COIL 12	LEFT SLINGSHOT (26-1200)
COIL 13	RIGHT SLINGSHOT (26-1200)
COIL 14	BASKET MAGNET (22-650)
COIL 15	LEFT FLIPPER (50v RED/YEL) (22-1080)
COIL 16	RIGHT FLIPPER (50v RED/YEL) (22-900)
COIL 17	FLASH FINAL JAM*1 (See prev. pg.)
COIL 18	RAMP DIVERTER (32-1800)
COIL 19	FLASH JUMP BALL*2 (See prev. pg.)
COIL 20	WABBIT HOLE VUK (24-940)
COIL 21	FLASH SKILL*3 (See previous page)
COIL 22	FLASH BASKET RAMP*4 (See previous page)
COIL 23	FLASH TOP-LT*2 TOP-RT*2 (See prev. page)
COIL 24	(OPTIONAL COIN METER)

Legend Note:

- = Coils mounted above playfield.
- = Coils mounted below playfield.

(All coil locations are used)

The following coils are optional:

8 **24**

COILS DETAILED CHART TABLE

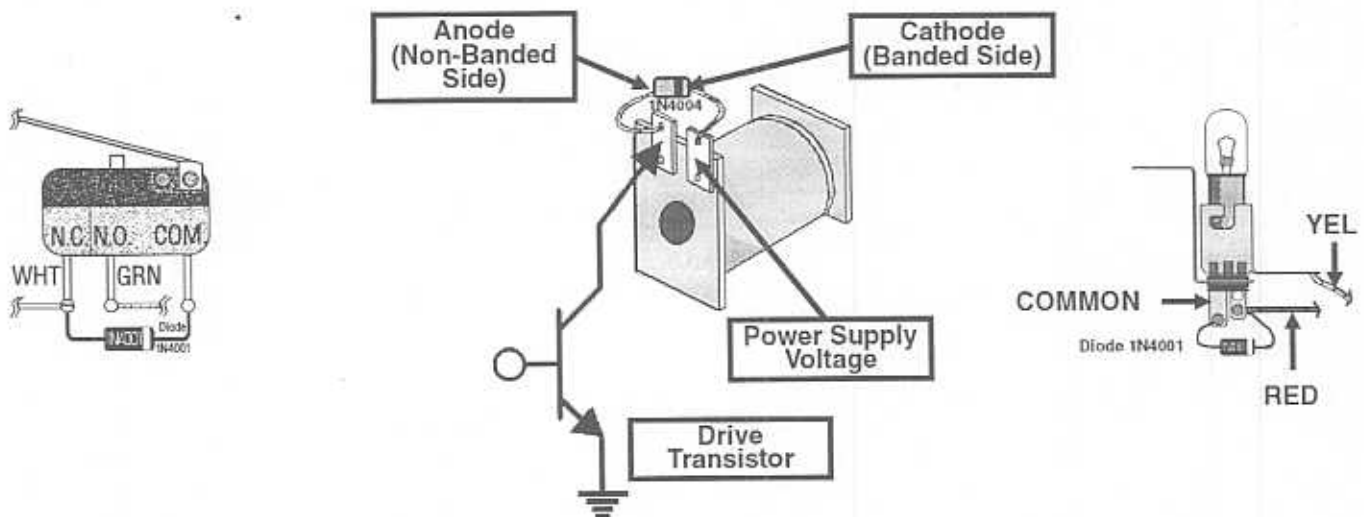
High Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v	23-800 090-5001-00T
#3	3-BANK DROP TARGET RESET	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v	23-800 090-5001-00T
#4	JUMP BALL TOP KICKER	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#5	JUMP BALL RIGHT KICKER	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#6	JUMP BALL VUK	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v	24-940 090-5036-00B
#7	JUMP BALL MAGNET	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	BRN BLK	J7-P1	20v	22-650 090-5042-01
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v	N/A
High Current Coils Group 2		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#9	TOP TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#10	LEFT TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v	26-1200 090-5044-00T
#14	BASKET MAGNET	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	VIO-YEL BLK	J10-P3	50v	22-650 090-5042-01
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v	22-900 090-5020-20T
Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#17	FLASH FINAL JAM*1	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	ORG	J6-P10	20v	#906 165-5004-00
#18	RAMP DIVERTER	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v	32-1800 090-5031-00
#19	FLASH JUMP BALL*2	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	ORG	J6-P10	20v	#906 165-5004-00
#20	WABBIT HOLE VUK	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P5	BRN	J7-P1	20v	24-940 090-5036-00B
#21	FLASH SKILL*3	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	ORG	J6-P10	20v	#89 165-5000-89
#22	FLASH BASKET RAMP*4	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	ORG	J6-P10	20v	#89 165-5000-89
#23	FLASH TOP-LT*2 TOP-RT*2	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	ORG	J6-P10	20v	#89 165-5000-89
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v	5v Meter (if Required)



Coils Detailed Chart Table

	Flash Lamps (FLASH)	Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Bulb Type
#F1	FLASH L ORBIT ARROW*1	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v	#906 165-5004-00
#F2	FLASH C-BALL ARROW*1	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v	#906 165-5004-00
#F3	FLASH B RAMP ARROW*1	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v	#906 165-5004-00
#F4	FLASH JBALL ARROW*1	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v	#906 165-5004-00
#F5	FLASH R RAMP ARROW*1	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v	#906 165-5004-00
#F6	FLASH R ORBIT ARROW*1	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v	#906 165-5004-00
#F7	FLASH 3 BANK DROP *2	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v	#89 165-5000-89
#F8	FLASH POPS*3	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v	#89 165-5000-89

TYPICAL SWITCH, COIL & LAMP WIRING





GO TO LAMP MENU

From the **DIAGNOSTICS MENU**, select the "LAMP" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. Controlled lamps are configured in an 8 x 10 Matrix of Columns (Lamp Drives) and Rows (Lamp Returns) with up to 80 lamps possible. The Lamp Test Menu consists of four parts: Single Lamp Test, Test All Lamps, Row Lamp Test and Column Lamp Test.



Single Lamp Test

To initiate, from the **LAMP MENU**, select the "ONE" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Lamp Test from Column 1, Row 1, Switch 1. Press the **Black Button** on the "+" *Icon*, as each lamp is selected, the lamp will light at its location on the playfield as well as the display, indicating the Lamp Matrix Grid position, lamp name with the corresponding number, Return (Row) Wire & Color, Drive (Column) Wire & Color, and associated drive transistors. Press the **Black Button** again to move forward in the test. To test and view a particular lamp, select the "RUN" *Icon* and press the **Black Button**. Each time the **Black Button** is pushed, the lamp will light-up on the playfield, with the display indicating the lamp information. Continue with the same procedure to run through the entire test.

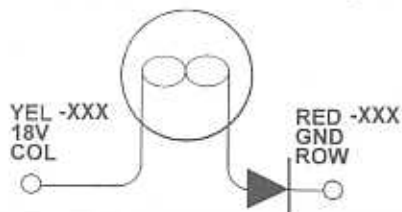


Test All Lamps

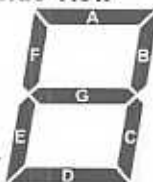
To initiate, from the **LAMP MENU**, select the "ALL" *Icon* with either **Red** or **Green Button** and press the **Black Button**. If still in Single Lamp Test (or any 1 of the 4 tests), select the "PREV" *Icon* to return to Lamp Menu or selecting either of the "ARROW" *Icons* will move through the tests, keep activating until Test All Lamps is displayed. The display will indicate "ALL LAMPS ON" and the lamps on the playfield will be lit, alternating between the rows in the Lamp Matrix.

Continued on the next page with Row & Column Lamp Tests.

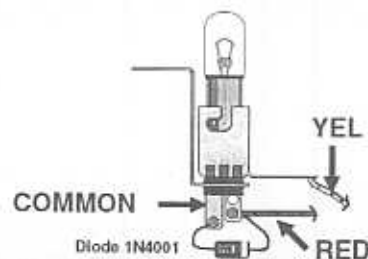
Typical Lamp Schematic, 7-Segment Address & Lamp Side View



NOTE:
This Game features a 2-Digit 24-Second Shot Clock (located over the Magna-Hoop Assembly). Each segment is wired into the Lamp Matrix (see below for position numbers).



LAMP MATRIX GRID



Column (18v)	1: U17 YEL-BRN J13-P9	2: U16 YEL-RED J13-P8	3: U15 YEL-ORG J13-P7	4: U14 YEL-BLK J13-P6	5: U13 YEL-GRN J13-P5	6: U12 YEL-BLU J13-P4	7: U11 YEL-VIO J13-P3	8: U10 YEL-GRY J13-P1
Row (GND)								
1: Q33 RED-BRN J12-P1	SHOOT AGAIN #44 Bulb 1	GRID: IN YER FACE #44 Bulb 2	GRID: FIRE #44 Bulb 3	GRID: SPACE JAM #44 Bulb 4	GRID: REBOUND #44 Bulb 5	GRID: SLAM #44 Bulb 6	GRID: FAST BREAK #44 Bulb 7	GRID: SUPER JACKPOT #44 Bulb 8
2: Q34 RED-BLK J12-P2	LEFT ORBIT ARROW #555 Bulb 9	CAPTIVE BALL ARROW #555 Bulb 10	BASKET RAMP ARROW #555 Bulb 11	JUMP BALL ARROW #555 Bulb 12	RIGHT RAMP ARROW #555 Bulb 13	RIGHT ORBIT ARROW #555 Bulb 14	(2) 3 #555 Bulb 15	2 (3) #555 Bulb 16
3: Q35 RED-ORG J12-P3	LEFT 7-SEG MENT 'A' Red LED 17	LEFT 7-SEG MENT 'B' Red LED 18	LEFT 7-SEG MENT 'C' Red LED 19	LEFT 7-SEG MENT 'D' Red LED 20	LEFT 7-SEG MENT 'E' Red LED 21	LEFT 7-SEG MENT 'F' Red LED 22	LEFT 7-SEG MENT 'G' Red LED 23	NOT USED #555 Bulb 24
4: Q36 RED-YEL J12-P4	L ORBIT BEEP 1 (BOTTOM) #555 Bulb 25	L ORBIT BEEP 2 #555 Bulb 26	L ORBIT BEEP 3 #555 Bulb 27	L ORBIT BEEP 4 (TOP) #555 Bulb 28	R ORBIT 4 (TOP) #555 Bulb 29	R ORBIT 3 #555 Bulb 30	R ORBIT 2 #555 Bulb 31	R ORBIT 1 (BOTTOM) #555 Bulb 32
5: Q37 RED-GRN J12-P5	FIR (E) #44 Bulb 33	FI (R) E #44 Bulb 34	F (I) RE #44 Bulb 35	(F) IRE #44 Bulb 36	SUPER JACKPOT #555 Bulb 37	DOUBLE #555 Bulb 38	JACKPOT #555 Bulb 39	WABBIT HOLE #44 Bulb 40
6: Q38 RED-BLU J12-P6	RIGHT 7-SEG MENT 'A' Red LED 41	RIGHT 7-SEG MENT 'B' Red LED 42	RIGHT 7-SEG MENT 'C' Red LED 43	RIGHT 7-SEG MENT 'D' Red LED 44	RIGHT 7-SEG MENT 'E' Red LED 45	RIGHT 7-SEG MENT 'F' Red LED 46	RIGHT 7-SEG MENT 'G' Red LED 47	LOCK 3 #555 Bulb 48
7: Q39 RED-VIO J12-P8	2 POINTS #555 Bulb 49	3 POINTS #555 Bulb 50	10 POINTS #555 Bulb 51	FINAL JAM #555 Bulb 52	FINAL JAM #555 Bulb 53	LITE LOCK #555 Bulb 54	LITE SUPER DUPER JACKPOT #555 Bulb 55	NOT USED #555 Bulb 56
8: Q40 RED-GRY J12-P9	TOP TURBO BUMPER #555 Bulb 57	LEFT TURBO BUMPER #555 Bulb 58	RIGHT TURBO BUMPER #555 Bulb 59	LOCK 1 #555 Bulb 60	MONSTARS (BOTTOM) #44 Bulb 61	MONSTARS (TOP) #44 Bulb 62	SUPER DUPER JACKPOT #44 Bulb 63	EXTRA BALL #44 Bulb 64
9: Q41 RED-WHT J12-P10	(S)PACE JAM #555 Bulb 65	S(P)ACE JAM #555 Bulb 66	SP(A)CE JAM #555 Bulb 67	SPA(C)E JAM #555 Bulb 68	SPAC(E) JAM #555 Bulb 69	SPACE (J)AM #555 Bulb 70	SPACE (J)A)M #555 Bulb 71	SPACE JA(M) #555 Bulb 72
10: Q42 RED J12-P11	(S) LAM #44 Bulb 73	S(L)AM #44 Bulb 74	SL(A)M #44 Bulb 75	SLA(M) #44 Bulb 76	LOCK 2 #555 Bulb 77	IN YER (FACE) #44 Bulb 78	IN (YER) FACE #44 Bulb 79	(IN) YER FACE #44 Bulb 80





Row & Column Lamp Tests

To initiate, from the **LAMP MENU**, select the "COL" icon with either Red "LEFT" or Green "RIGHT" Button and press the **Black Button**. If still in a previous test, select the "PREV" icon to return to Lamp Menu or selecting either of the "ARROW" icons will move through the tests, keep activating until Row or Column Lamp Test (whichever desired) is displayed. In this test, each set of lamps in each row or column of the Lamp Matrix (respective to each test) will light-up on the playfield and is indicated in the display.

Lamp Matrix Grid Locations

The lamp locations correspond with the Lamp Number in the Lamp Matrix Grid on the previous page.

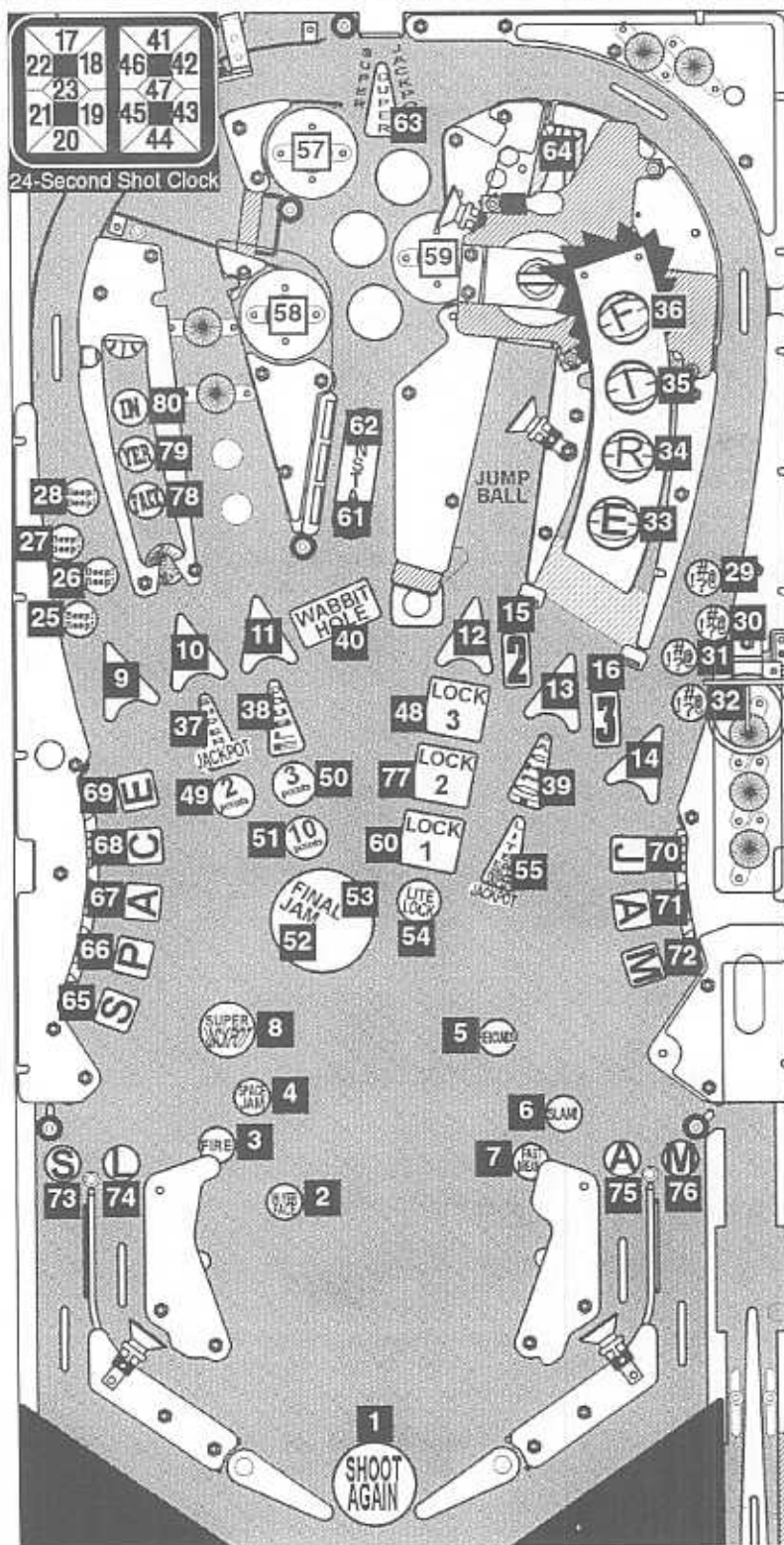
Legend Note:

□ = Lamps mounted above playfield.

■ = Lamps mounted below playfield.

The following Lamps are not used:

24 56



The following Bulb is used on the Light Boards and Pop Bumpers:



#555 Bulb (Wedge)
165-5002-00

The following Bulb is used in the remainder of the matrix:



#44 Bulb (Bayonet)
165-5000-44



TEST FLASH LAMPS

From the **DIAGNOSTICS MENU**, select the "FLASH" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate "CYCLING FLASHERS" and all the flash lamps will cycle continuously until the test is exited. This test is allows the technician to easily spot any burned-out bulbs and replace them.



CLEAR BALL TROUGH

From the **DIAGNOSTICS MENU**, select the "CLR" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. This is provided to allow the technician a simple method of removing the balls from the trough and also, to test functionality of the trough, ensuring proper trough operation. After selecting this *Icon* the display will show a graphic of the ball trough with balls in the trough with it's corresponding switch number. Select the "RUN" *Icon* to eject the ball in the first position. Simultaneously, the display and the playfield will eject the ball to the Trough Up-Kicker, eject from the Trough Up-Kicker into the Shooter Lane and will be ejected onto the playfield where the technician can easily retrieve the pinball or allow the ball(s) to re-enter the trough to continue Clear Ball Trough Test.

⚠ Caution: Continuous use of above test may overheat the Trough Up-Kicker Coil. ⚠



TECHNICIAN ALERT

From the **DIAGNOSTICS MENU**, select the "TECH" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate if there are any faulty switches (i.e., switches that are normally closed but remain open or open switches that have not been closed (activated) in 50 games.)



SERVICE PHONE

From the **DIAGNOSTICS MENU**, select the "SERV" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate a phone number (number is different for each country dip switch setting) to call if technical assistance is required.



BEGIN PLAY TEST

From the **DIAGNOSTICS MENU**, select the "PLAY" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the technician can test certain play functions to insure all switch activated coils function without entering game play. For example, by rolling the ball over the left outlane switch, the Laser Kick should fire. If it kicks to early or too late, the switch actuator should be adjusted to compensate for this error. If it fails to fire, use the Switch Test or Coil Test to help determine the cause of the failure. During this function, similar tests may be performed on the "Ejects", Slingshots, Vertical Up-Kickers, Pop Bumpers, etc. in the game. For unique Play Test functions, select the "GAME SPECIFIC" *Icon* in the **DIAGNOSTICS MENU**.



FIRE KNOCKER

From the **DIAGNOSTICS MENU**, select the "KNOCKER" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. The digitally mastered "Knocker" is sounded.



SOUND / SPEAKER TEST

From the **DIAGNOSTICS MENU**, select the "SPKR" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. The BSMT 2000 Sound System produces true digital stereo sound from Backbox & Cabinet Speakers or "Mono" on the Cabinet Speaker (when used by itself). After selecting this *Icon*, select the "-" or "+" *Icons* and press the **Black "ENTER" Button** to activate the first test. Repeat to visually see & hear all tests. Select the "RUN" *Icon* to activate the test chosen without moving to the next test.

During Sound Tests, the display shows the speaker identification and the corresponding sound(s). The sound functions allow verification that both channels are functioning properly & that the speaker connections are correct.



Speaker Phase Testing

Connections to each of speakers are polarized and each must be connected appropriately for the best quality sound. If one speaker has the positive and negative connections reversed with respect to the other one, bass frequencies will not be produced properly and the overall sound quality will be poor.

To test for proper speaker phasing, use the sound test to cycle through the Backbox & Cabinet, and Backbox Sine (repeated) functions. If the Cabinet Sine produces more volume and bass than the Left Sine, the speakers are connected properly. If it produces the same or less, one speaker is connected improperly. To isolate and correct reversed speaker connections, one of two methods may be used.

1. Check each speaker for polarity markings. If the speakers have polarity markings, verify that the Backbox Speaker RED/WHT Wire and the Cabinet Speaker YEL/WHT Wire is connected to the negative (-) terminal.
2. Disconnect the speaker output connector from the CPU / Sound Board and connect a 1.5-volt battery across each speaker pair one at a time while observing the speakers. Make sure the positive battery terminal is connected to the positive lead (CN4, Pin-3 (RED/BLK) or Pin-6 (YEL/BLK)) each time. As the connection is made, check speaker cone movement; proper connections are indicated by outward movement.

Auto / Manual Tests	Sounds Produced
Speaker Test	Tone
Sound/OPSYS EPROM (Loc. U7)	Level 1-3 (Music Test)
Voice ROM 1 (Loc. U17)	Speech Pattern 1

Auto / Manual Tests	Sounds Produced
Voice ROM 2 (Loc. U21)	Speech Pattern 2
Voice ROM 3 (Loc. U36)	Speech Pattern 3
Voice ROM 4 (Loc. U37)	Not Used



BEGIN BURN IN

From the **DIAGNOSTICS MENU**, select the "BURN" *Icon* with either Red "LEFT" or Green "RIGHT" **Button** and press the Black "ENTER" **Button**. After selecting this *Icon* the Begin Burn-In Test will start. At this stage the game will exercise all CPU I/O Functions (Dot Matrix Display Test, Coil Testing, Lamp Testing, Sound, etc.). This is provided to constantly exercise sounds, coils, etc... Cumulative Burn-In minutes will be displayed. To reset Burn-In minutes to 00, select the "RESET" *Icon* in the **MAIN MENU** and select the "FACT" *Icon* (Factory Reset). See Chapter 5, Go To Reset Menu, of this section.



DOT MATRIX TEST

From the **DIAGNOSTICS MENU**, select the "DOT TEST" *Icon* with either Red "LEFT" or Green "RIGHT" **Button** and press the Black "ENTER" **Button**. After selecting this *Icon* the Dot Matrix Test immediately begins. The display will immediately illuminate & cycle for 1 pass of each test continuously for each of the following tests:

1. Illuminates 1 vertical column of dots, turning it off & illuminating the next column, until each column has been individually lit, while the other columns are off.
2. Illuminates 1 horizontal row of dots, turning it off & illuminating the next row, until each row has been individually lit, while the other rows are off.
3. Illuminates all the dots, except for one column from left to right.
4. Illuminates all the dots, except for one row from top to bottom.
5. Illuminates every other dot lit, in both the rows and columns.
6. Illuminates all dots at 30%, 70% & 100% brightness.

Note: Pressing any button will exit the test & return to **DIAGNOSTICS MENU**.

Dot Matrix Display Explained

The display utilizes a Micro-Processor Control Board mounted in piggyback fashion to the Dot Matrix Display (128 X 32) Driver Board. The purpose behind this board is to provide more information to the operator as well as displaying graphics to the player.

The board is controlled by a 6809E Microprocessor and its personality ROM (Unique to the Game). It receives Data, Reset & Clock Information from the CPU/Sound Board via the ribbon cable and sends back multiple Status and Busy Signals to the CPU. This is to insure synchronized communication between the CPU and the Display Controller Board. The Drivers for the rows and columns are provided on 5 surface mounted integrated circuits on the Dot Matrix Display Driver Board.





SPACE JAM SPECIFIC

From the **DIAGNOSTICS MENU**, select the "JAM" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the technician can test and adjust any game specific function(s) from the sub-menu. Similar to "BEGIN PLAY TEST," this menu is used to test the game specific features. The features are the 7-Segment LED Test and the Jump Ball Test.



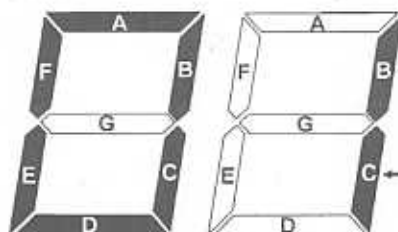
7-Segment LED Test

To initiate, from the **SPACE JAM SPECIFIC MENU**, select the "LED" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. These digits are controlled by the Lamp Matrix. The Left Digit is controlled by Lamp Matrix positions 17-23 and the Right Digit is controlled by Lamp Matrix positions 41-47 (Note: To test only individual segments of each digit, go to the Lamp Menu, Single Lamp Test.) In 7-Segment LED Test, press the **Start Button** to operate both Digits starting with "01." To make "01", the segments in the Left Digit "A", "B", "C", "D", "E" and "F" are lit (Lamp Matrix position 17-22) and the segments in the Right Digit "B" and "C" are lit (Lamp Matrix positions 42 & 43). Continue to press the **Start Button** to make "02", "03", ...all the way through "99". As the individual numbers are tested and shown in the display, simultaneously the digits will be lit in the clock above the Magna Hoop Assembly (see Sec. 4, Chapter 2, Overview, for location of assemblies).

EXAMPLE:

To make "01" the Left Digit (0) needs the following segments to be lit:

Segments A, B, C, D, E and F are lit by Lamp Matrix Positions 17-22 (Columns 1-6, Row 3).



To make "01" the Right Digit (1) needs the following segments to be lit:

Segment B is lit by Lamp Matrix Position 42 (Column 2, Row 6), and

Segment C is lit by Lamp Matrix Position 43 (Column 3, Row 6).



Jump Ball Test

To initiate, from the **SPACE JAM SPECIFIC MENU**, select the "JMP" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. In Jump Ball Test, roll the ball into the **JUMP BALL VUK (Coil #6)** (This VUK is located under the "Basketball Cover", upper right corner of the playfield). Press the **Start Button** to fire the VUK, shooting the ball up into the **JUMP BALL MAGNET (Coil #7)** above. The Magnet will hold the ball until the **Left or Right Flipper Button** is pressed. The **Left Flipper Button** will fire the **JUMP BALL RIGHT KICKER (Coil #5)** sending the ball on the Large "U" Wire Ramp, returning the ball to the Left Flipper. The **Right Flipper Button** will fire the **JUMP BALL TOP KICKER (Coil #4)** sending the ball on the Right Wire Ramp, returning the ball to the Right Flipper. This test is designed to ensure the Kicker Coils are firing and hitting the ball "at center". Make adjustments as required.

ALSO NOTE: In Game Over/Attract Mode the VUK, Magnet & Kicker Coils will function automatically when a ball is placed in the VUK. Pressing the **Left Flipper Button** will fire the JUMP BALL RIGHT KICKER sending the ball to the Left Flipper; pressing the **Right Flipper Button (or no button at all)** will fire the JUMP BALL TOP KICKER sending the ball to the Right Flipper.

Your Notes





DR. PINBALL (FLOW CHART MENUS)

To initiate, from the **DIAGNOSTICS MENU**, select the Cross "DR." *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This will bring you (the operator / technician) into **DR. PINBALL (Flow Chart Menus)** which offers you a choice of three sub-menus: Coil "DR.," Switch "DR." and Lamp "DR." *Icons*. Selecting a particular sub-menu will give you a choice of which specific Coil (any and all coil assemblies such as flippers, VUKs, magnets, etc.), Switch or Lamp circuit needs to be diagnosed. The display will now ask a question or give a procedure to follow such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When Dr. Pinball asks a question or request a procedure the Dr. will expect a response such as "no" or "yes" (see below examples of the *Mini-Icons* which will prompt the operator). You the operator/technician must respond by using your **Flipper Buttons** to "SELECT" a mini-icon and the **Start Button** to "ENTER" your selection.

The following are the *Mini-Icons* with explanations for the Dr. Pinball Sub-Menus to follow:



→ Select a Coil, Lamp, Switch or Flipper to diagnose with "-" or "+" *Icon*; Then select the "RUN" *Icon* to activate the choice. "PREV" goes back to previous question. "QUIT" exits Portals completely. Help "?" gives direction on button usage.



→ Seen when question is being asked on the Display. Select "YES" or "NO" to answer question given. "END" lets you select a new item to test. "PREV", "QUIT" and "?" (see first example above).



→ Seen when diagnosis is given. Select any *Icon* for your next step. "END" lets you select a new item to test. "PREV", "QUIT" and "?" (see first example above).



→ In Coil Flow Chart Menu, select "PULSE" to pulse the coil selected. "END" lets you select a new item to test. "PREV", "QUIT" and "?" (see first example above).



Coil Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Coil "DR." *Icon* with either the **Red or Green Button** and press the **Black Button**. This is the Coil Flow Chart. Follow the questions, answering by using the *Mini-Icons* in the display.



Switch Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Switch "DR." *Icon* with either the **Red or Green Button** and press the **Black Button**. This is the Switch Flow Chart. Follow the questions, answering by using the *Mini-Icons* in the display.



Lamp Flow Chart

To initiate, from the **DR. PINBALL MENU**, select the Lamp "DR." *Icon* with either the **Red or Green Button** and press the **Black Button**. This is the Lamp Flow Chart. Follow the questions, answering by using the *Mini-Icons* in the display.



SPACE JAM

GAME AUDIT TABLE

Copy for Field Audit Tracking Performance (Use blank columns to fill-in Audit Info.).



EARNINGS AUDITS 1-12

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
1 TOTAL PAID CREDITS		5 COINS THRU LEFT SLOT		9 TOTAL COINS	
2 FREE GAME PERCENTAGE		6 COINS THRU RIGHT SLOT		10 TOTAL EARNINGS	
3 AVERAGE BALL TIME		7 COINS THRU CENTER SLOT		11 METER CLICKS	
4 AVERAGE GAME TIME		8 COINS THRU 4TH SLOT		12 SOFTWARE METER	



SEGA AUDITS 13-55

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
13 TOTAL BALLS PLAYED		28 1M—1.99M SCORES		43 TOTAL REGULAR PLAYS	
14 TOTAL EXTRA BALLS		29 2M—3.99M SCORES		44 AVG. REGULAR GAME TIME	
15 EXTRA BALL PERCENT		30 4M—7.99M SCORES		45 REGULAR GAME MBALLS	
16 REPLAY 1 AWARDS		31 8M—11.99M SCORES		46 REGULAR GAME REPLAYS	
17 REPLAY 2+ AWARDS		32 12M+ SCORES		47 TOTAL NOVICE PLAYS	
18 TOTAL REPLAYS		33 AVERAGE SCORES		48 AVG. NOVICE GAME TIME	
19 REPLAY PERCENT		34 SERVICE CREDITS		49 NOVICE GAME MBALLS	
20 TOTAL SPECIALS		35 BALL SEARCH STARTED		50 NOVICE GAME REPLAYS	
21 SPECIAL PERCENT		36 LOST BALL FEEDS		51 AVG. NOVICE BALL SAVES	
22 TOTAL MATCHES		37 LOST BALL GAME STARTS		52 LEFT FLIPPER USED	
23 HIGH SCORE AWARDS		38 LEFT DRAINS		53 RIGHT FLIPPER USED	
24 HIGH SCORE PERCENT		39 CENTER DRAINS		54	
25 TOTAL FREE PLAYS		40 RIGHT DRAINS		55	
26 TOTAL PLAYS		41 SLAM TILTS			
27 0—999K SCORES		42 TOTAL BALLS SAVED			



SPACE JAM AUDITS 56-99

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
56 LEFT ORBITS		72 2+ MBALL START		88 BONUS HELD	
57 RIGHT ORBITS		73 MULTIBALL RESTART LIT		89 SLAM (RETURN LANES)	
58 LEFT RAMP		74 MBALL RESTARTED		90 SUPER POPS LIT	
59 RIGHT RAMP		75 MBALL JACKPOT 1		91 2X SCORING	
60 CAPTIVE BALL HITS		76 MBALL JACKPOT 2		92	
61 JUMP BALL SHOTS		77 SUPER JACKPOT		93	
62 WABBIT HOLE SHOTS		78 SUPER DUPER JACKPOT		94	
63 3-BANK COMPLETED		79 FINAL JAM		95	
64 SPACEJAM COMPLETED		80 FAST BREAK		96	
65 RAMP TARGETS COMP.		81 ON FIRE		97	
66 WABBIT HOLE AWARDS		82 DEFENSE		98	
67 SKILL SHOT MADE		83 ONE ON ONE		99	
68 SKILL SHOT MISSED		84 TWO ON TWO			
69 LOCK LIT		85 FULL COURT FRENZY			
70 MBALL READY		86 IN YER FACE			
71 MULTIBALL START		87 VIDEO MODE			

CPU Version:
Display Version:
Date Audited:
Audited By:

Location:



Go To Audits Menu

Overview

The **Portals™ Service Menu System** provides 89 Audit Functions for accounting purposes and for evaluation of game difficulty adjustments. The Audit Functions are divided into 3 groups. The 1st group, **Earnings (Coin) Audits**, are the first 12 most-used audits. The 2nd group, **Sega Audits**, are the game play generic audits 13-55. The 3rd group, **ID4 Audits**, are the game play specific audits 56-89; Audits 54-55 are currently **Not Used**, allowing for **Future Expansion**, if any. If the code version is upgraded, view Audits in the display and write the audit(s) in the blank(s) if any audit(s) were added. Each group may be viewed in the **Portals™ Service Menu** (see Chapter 1, Portals Introduction, of this Section). View all audits with the **Game Audit Table** provided (on the prev. page).



GO TO AUDITS MENU

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the **"AUD" Icon** in the **MAIN MENU** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **AUDITS MENU** appears.

Important Notes:



Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the **"PREV" Icons**. If no **Icons** appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



Selecting & activating the **"QUIT" Icon** from any display will exit the Service Session.



Selecting & activating the **"HELP" Icon** from any display will show a help screen. (An explanation of each **Mini-Icon** at that level will cycle continuously until any active button is pressed.)



Selecting & activating the **"ARROW" Icons** selects the next or previous audit in the group.



EARNINGS AUDITS (1-12)

From the **AUDITS MENU**, select the **"EARN" Icon** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the **"RIGHT ARROW" Icon** to view the 1st audit in this group. Continue to select either of the **"ARROW" Icons** to view each audit one at a time. The display will describe the audit number, the audit name, and the audit total or value. The current audit will remain in the display until the next audit is chosen or when the sub-menu is exited.

Au. Nº	Audit Name	Audit Definition
Au. 1	Total Paid Credits	Provides the total number of paid credits.
Au. 2	Free Game Percentage	This percentage is derived from dividing Audit 25, Total Free Plays, by Audit 26, Total Plays.
Au. 3	Average Ball Time	In seconds, the average ball time is derived from the total play time divided by Audit 13, Total Balls Played.
Au. 4	Average Game Time	The average game time is expressed in minutes and seconds.
Au. 5	Coins Thru Left Slot	Provides the total number of times this Coin Switch (Sw. 6) was closed.
Au. 6	Coins Thru Right Slot	Provides the total number of times this Coin Switch (Sw. 4) was closed.
Au. 7	Coins Thru Center Slot	Provides the total number of times this Coin Switch (Sw. 5) was closed.
Au. 8	Coins Thru 4th Slot	Provides the total number of times this Coin Switch (Sw. 2) was closed.
Au. 9	Total Coins	Provides the total amount of coins registered through all the slots.
Au. 10	Total Earnings	The total cash value accumulated since the last <i>Factory Restore</i> occurred (see Chapter 5, Go to Reset Menu, of this section).
Au. 11	Meter Clicks	Provides the total number of money clicks accumulated. (Based on the country's lowest coin denomination used for the game credit.)
Au. 12	Software Meter	Provides the continuing total of Meter Clicks. This audit cannot be reset; the display shows the constant addition of Meter Clicks.



SEGA AUDITS (13-55)

From the AUDITS MENU, select the "SEGA" Icon with either Red "LEFT" or Green "RIGHT" Button and press the Black "ENTER" Button. Select and activate the "RIGHT ARROW" Icon to view the 1st audit in this group. Continue to select either of the "ARROW" Icons to view each audit one at a time. The display will describe the audit number, the audit name, and the audit total or value. The current audit will remain in the display until the next audit is chosen or when the sub-menu is exited.

Au. N°	Audit Name	Audit Definition
Au. 13	Total Balls Played	Provides the total number of regular and extra balls.
Au. 14	Total Extra Balls	Provides the total number of extra balls awarded.
Au. 15	Extra Balls Percent	Provides the percentage total from dividing Audit 14, Total Extra Balls, by Audit 26, Total Plays.
Au. 16	Replay 1 Awards	Provides the total awards (Credit, Extra Ball, Or Audit) for level 1.
Au. 17	Replay 2+ Awards	Provides the total awards (Credit, Extra Ball, Or Audit) for level(s) 2 or higher.
Au. 18	Total Replays	Provides the total awards (Credits, Extra Balls, Or Audit Only) for exceeding replay score levels.
Au. 19	Replay Percent	Provides the percentage total from dividing Audit 18, Total Replays, by Audit 26, Total Plays. The percentage reflects replay total awards for exceeding replay score levels.
Au. 20	Total Specials	Provides the total awards (Credits, Extra Balls, Or Scores) for making specials.
Au. 21	Special Percent	This percentage is derived from dividing Audit 20, Total Specials, by Audit 26, Total Plays.
Au. 22	Total Matches	Provides the total credits awarded for matching the last two digits of the score with the system-generated Match Number at the end of the game. Percentage of match credits is adjustable from 0% to 10% by Ad. 11, Match Percentage, if enabled. (See Chapter 4, Go to Adjustments Menu, of this section.)
Au. 23	High Score Awards	Provides the total credits awarded for exceeding the High-Score-To-Date scores.
Au. 24	High Score Percent	This percentage is derived from dividing Audit 23, High Score Awards, by Audit 26, Total Plays.
Au. 25	Total Free Plays	Provides the total free credits for replays, High-Score-To-Date, Specials, and Match.
Au. 26	Total Plays	This total is derived by adding the sum of Audit 1, Total Paid Credits, and Audit 25, Total Free Plays. Note that free credits are not recorded in the Audit until they are actually used.
Au. 27	0—999K Scores	Provides the total number of games the Player's final score was between 0 and 999,990 points.
Au. 28	1M—1.99M Scores	Provides the total number of games the Player's final score was between 1,000,000 and 1,999,990 points.
Au. 29	2M—3.99M Scores	Provides the total number of games the Player's final score was between 2,000,000 and 3,999,990 points.
Au. 30	4M—7.99M Scores	Provides the total number of games the Player's final score was between 4,000,000 and 7,999,990 points.
Au. 31	8M—11.99M Scores	Provides the total number of games the Player's final score was between 8,000,000 and 11,999,990 points.
Au. 32	12M+ Scores	Provides the total number of games the Player's final score was over 12,000,000 points.
Au. 33	Average Scores	This total is derived from adding the Final Score of each game to a table and dividing this sum by Audit 26, Total Plays.
Au. 34	Service Credits	Provides the total number of times this Dedicated Switch (DS-7) was closed, not in the Portals™ Service Menu. (See Chapter 1, Introduction [Access & Use] for instructions on how to receive Service Credits.)
Au. 35	Ball Search Started	Provides the total number of times the game performed a ball search.
Au. 36	Lost Ball Feeds	Provides the total number of times the game added a ball to play when it could not find a ball after ball search.





Sega Audits Continued.

Audit Name		Audit Definition
Au. 37	Lost Ball Game Starts	Provides the total number of times the game started with a ball missing from the ball trough at the start of a game.
Au. 38	Left Drains	Provides the total number of times this Rollover Switch (Sw. 57) was closed.
Au. 39	Center Drains	Provides the total number of times the game ball had drained with the last switch closed was not Sw. 57 or Sw. 60.
Au. 40	Right Drains	Provides the total number of times this Rollover Switch (Sw. 60) was closed.
Au. 41	Slam Tilts	Provides the total number of times this Contact Switch (Sw. 55) was closed.
Au. 42	Total Balls Saved	Provides the total number of times this feature was used. This feature is enabled at the start of each ball and is disabled as soon as the ball makes contact with 5 game switches or allocated time expired.
Au. 43	Total Regular Plays	Provides the total number of times Regular Games were played.
Au. 44	Avg. Regular Game Time	Provides the average game time of Regular played games.
Au. 45	Regular Game MBalls	Provides the number of times this feature was played in a Regular Game.
Au. 46	Regular Game Replays	Provides the total number of times this feature was awarded in a Regular Game.
Au. 47	Total Novice Plays	Provides the total number of times Novice Games were played.
Au. 48	Avg. Novice Game Time	Provides the average game time of Novice played games.
Au. 49	Novice Game MBalls	Provides the total number of times this feature was played in a Novice Game.
Au. 50	Novice Game Replays	Provides the total number of times this feature was awarded in a Novice Game.
Au. 51	Avg. Novice Ball Saves	Provides the average number of times this feature was used to maintain the ball time criteria for a Novice Game.
Au. 52	Left Flipper Used	Provides the total number of times this Dedicated Switch (DS-1) was closed.
Au. 53	Right Flipper Used	Provides the total number of times this Dedicated Switch (DS-3) was closed.
Au. 54		This audit is Not Used , allowing for Future Expansion , if any.
Au. 55		This audit is Not Used , allowing for Future Expansion , if any.



SPACE JAM AUDITS (56-99)

From the AUDITS MENU, select the "JAM" Icon with either Red "LEFT" or Green "RIGHT" Button and press the Black "ENTER" Button. Select and activate the "RIGHT ARROW" Icon to view the 1st audit in this group. Continue to select either of the "ARROW" Icons to view each audit one at a time. The display will describe the audit number, the audit name, and the audit total or value. The current audit will remain in the display until the next audit is chosen or when the sub-menu is exited.

Au. N°	Audit Name	Audit Definition
Au. 56	Left Orbits	Provides the total number of times this feature was completed. (Multiple variations of switch closures are used to determine this.)
Au. 57	Right Orbits	Provides the total number of times this feature was completed. (Multiple variations of switch closures are used to determine this.)
Au. 58	Left Ramp	Provides the total number of times this feature was completed. (Multiple variations of switch closures are used to determine this.)
Au. 59	Right Ramp	Provides the total number of times this feature was completed. (Multiple variations of switch closures are used to determine this.)
Au. 60	Captive Ball Hits	Provides the total number of times this feature Stand-Up Target Switch (Sw. 24) was closed.
Au. 61	Jump Ball Shots	Provides the total number of times this feature VUK Switch (Sw. 45) was closed.
Au. 62	Wabbit Hole Shots	Provides the total number of times this feature VUK Switch (Sw. 46) was closed.





Space Jam Audits Continued.

Audit Name		Audit Definition
Au. 63	3-Bank Completed	Provides the total number of times these feature 3-Bank Drop Target Switches (Sw. 17, 18 & 19) were closed.
Au. 64	Space Jam Completed	Provides the total number of times these feature Stand-Up Target Switches (Sw. 33, 34, 35, 36, 37, 38, 39 & 40) were closed.
Au. 65	Ramp Targets Completed	Provides the total number of times these feature Stand-Up Target Switches (Sw. 28 & 29) were closed.
Au. 66	Wabbit Hole Awards	Provides the total number of times this feature was awarded.
Au. 67	Skill Shot Made	Provides the total number of times this feature Rollover Switch (Sw. 30) was closed after the ball was plunged at beginning of ball play.
Au. 68	Skill Shot Missed	Provides the total number of times this feature Rollover Switch (Sw. 30) was not closed after the ball was plunged at beginning of ball play.
Au. 69	Lock Lit	Provides the total number of times this feature was lit.
Au. 70	MBall Ready	Provides the total number of times Lock 3 was lit awaiting Multiball.
Au. 71	Multiball Start	Provides the total number of times this feature was played.
Au. 72	2+ MBall Start	Provides the total number of times Multiball was played more than once by a single player in one game.
Au. 73	Multiball Restart Lit	Provides the total number of times Multiball was played and no Jackpots were collected.
Au. 74	Multiball Restarted	Provides the total number of times Multiball was restarted after Multiball Restart was lit.
Au. 75	MBall Jackpot 1	Provides the total number of times this feature was awarded after completing the lit arrows (Ramp & Basket).
Au. 76	MBall Jackpot 2	Provides the total number of times this feature was awarded after completing the lit arrows (Left Orbit & Right VUK).
Au. 77	Super Jackpots	Provides the total number of times this feature was awarded after completing the lit arrow (Captive Ball).
Au. 78	Super Duper Jackpot	Provides the total number of times this feature was awarded after first completing all previous Jackpots & then Sw. 41 S-U Target was closed.
Au. 79	Final Jam	Provides the total number of times this feature was played after completing all <i>Planet Features</i> .
Au. 80	Fast Break	Provides the total number of times this feature was played after completing 4 Left & 4 Right Orbits and then the Right Ramp.
Au. 81	On Fire	Provides the total number of times this feature was played after completing 4 Right Ramps (F-I-R-E will light up).
Au. 82	Defense	Provides the total number of times this Mystery Feature was played after the Wabbit Hole Switch (VUK Sw. 46) was closed.
Au. 83	One on One	Provides the total number of times this Mystery Feature was played after the Wabbit Hole Switch (VUK Sw. 46) was closed.
Au. 84	Two on Two	Provides the total number of times this Mystery Feature was played after the Wabbit Hole Switch (VUK Sw. 46) was closed.
Au. 85	Full Court Frenzy	Provides the total number of times this Mystery Feature was played after the Wabbit Hole Switch (VUK Sw. 46) was closed.
Au. 86	In Yer Face	Provides the total number of times this feature was played. (Multiple variations of switch closures are used to determine this.)
Au. 87	Video Mode	Provides the total number of times this feature was played.
Au. 88	Bonus Held	Provides the total number of times this feature was awarded.
Au. 89	Slam (Return Lanes)	Provides the total number of times this feature was played after closing either feature Rollover Switches (Sw. 58 & 61).
Au. 90	Super Pops Lit	Provides the total number of times this feature was lit.
Au. 91	2X Scoring	Provides the total number of times this feature was awarded.
Au. 92- Au. 99		These audit are Not Used , allowing for Future Expansion , if any, and/or proprietary use for programming.





GO TO PRINTER MENU

From the **AUDITS MENU**, select the "PRNT" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** Button and press the **Black "ENTER"** Button. The **PRINTER MENU** appears.



Special equipment is required for this Sub-Menu

The **Portals™ Service Menu System** provides 3 Audit Printing Adjustment Functions to print information on a "Hand-Held" printer, download game information to a Laptop PC or clear the printout count. A printer interface board, hand-held printer and/or a special software program is required to run this menu. Entering this menu and selection/activation of the *Icons* without this equipment/software will not affect the game.



Quick Printout Adjustment (49) (Printer Interface)

From the **PRINTER MENU**, select the "QUIK" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the printout. Only the **Earnings Audits** can be printed out to a "Hand-Held" Printer.



Full Printout Adjustment (50) (Alison Interface)

From the **PRINTER MENU**, select the "ALISON" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the download. A special software program and a Lap Top PC is required. All game audits (**Earnings**, **Sega** & **Game Specific**) can be retrieved.



Nº of Copies Printed Adjustment (51)

From the **PRINTER MENU**, select the "RESET" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the clear the "Nº of copies printed" count total.

RESETTING AUDIT NOTES:



Audit Note: 1st Way to Reset Audits

To reset audits, from the **MAIN MENU**, select the "ADJ" *Icon*. See Chapter 4, Go to Adjustments Menu, of this section.



Select the "SEGA" *Icon*, from the **ADJUSTMENT MENU**, and advance to Adj. 8, Reset Coin Audits, with the "RIGHT ARROW" *Icon*. Select the "+" *Icon* to change setting to **YES**. When enabled, the **Coin Audits** (5-11) will be reset to zero.

Advance to Adj. 9, Reset Game Audits, with the "RIGHT ARROW" *Icon*. Select the "+" *Icon* to change setting to **YES**. When enabled, *all the audits* will be reset to zero, except for the **Coin Audits** (5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero).



Audit Note: 2nd Way to Reset Audits

To reset audits, from the **MAIN MENU**, select the "RESET" *Icon*. See Chapter 5, Go to Reset Menu, of this section.



Selection of the "COIN" *Icon*, from the **RESET MENU**, will reset the **Coin Audits** (5-11) to zero.



Selection of the "AUD" *Icon*, from the **RESET MENU**, will reset all audits to zero, except for the **Coin Audits** (5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero).



SPACE JAM

GAME ADJUSTMENT TABLE

Some adjustments have a "Drop-Down" Table where further customization is required.



SEGA ADJUSTMENTS 1-43

Adjustment Name		Factory Setting	Adjustment Name		Factory Setting
1	REPLAYS: FIXED/MANUAL <i>"Drop-Down"</i>	10%	23	DEFAULT HIGH SCORE #3	19,500,000
2	REPLAY LEVELS <i>"Drop-Down"</i>	1	24	DEFAULT HIGH SCORE #4	18,000,000
3	REPLAY AWARD	CREDIT	25	DEFAULT HIGH SCORE #5	16,500,000
4	FREE GAME LIMIT	5	26	DEFAULT HIGH SCORE #6	15,000,000
5	EXTRA BALL LIMIT	3	27	HSTD RESET COUNT	2,000
6	GAME DIFFICULTY <i>"Drop-Down"</i>	MODERATE	28	FREE PLAY	NO
7	GAME PRICING <i>"Drop-Down"</i>	USA7	29	CUSTOM MESSAGE	ON
8	RESET COIN AUDITS	NO	30	ATTRACT MODE SOUNDS	ON
9	RESET GAME AUDITS	NO	31	FLASH LAMP POWER	NORMAL
10	RESET HIGH SCORES	NO	32	COIL PULSE POWER	NORMAL
11	MATCH PERCENTAGE	9%	33	KNOCKER VOLUME	NORMAL
12	BALLS PER GAME	3	34	MINIMUM GAME TIME	OFF
13	TILT WARNINGS	1	35	NOVICE MODE ENABLED	NO
14	REPLAY BOOST	YES	36	GAME RESTART	YES
15	CREDIT LIMIT	30	37	EXTRA BALL PERCENTAGE	25%
16	ALLOW HIGH SCORES	YES	38	BILL VALIDATOR	NO
17	HIGH SCORE #1 AWARDS	1	39	TOURNAMENT MODE	NONE
18	HIGH SCORE #2 AWARDS	0	40	EURO. TOKEN DISP.	OFF
19	HIGH SCORE #3 AWARDS	0	41	SPECIAL MEMORY	YES
20	HIGH SCORE #4 AWARDS	0	42	LOCATION ID	00
21	DEFAULT HIGH SCORE #1	24,000,000	43	GAME ID	00
22	DEFAULT HIGH SCORE #2	21,000,000			



SPACE JAM DAY ADJUSTMENTS 44-48

Adjustment Name		Factory Setting	Adjustment Name		Factory Setting
44	MBALL RESTART	MODERATE			
45	EXTRA BALL MEMORY	ON			
46	QUALIFY LOCKS CRITERION	MODERATE			
47	ORBIT RULE CRITERION	MODERATE			
48	ON FIRE RULE CRITERION	MODERATE			



Go To Adjustments Menu

Overview

The **Portals™ Service Menu System** provides 48 Adjustment Functions to vary game difficulty or to customize (e.g. Adjusting: High Score Levels; Number of balls per game; Game Pricing; Default High Scores; et cetera). The Adjustment Functions are divided into 2 groups. The 1st group, **Sega Adjustments**, are the game play generic adjustments (1-43). The 2nd group, **Space Jam Adjustments**, are the game play specific adjustments (44-48). Each group may be viewed manually after entering the **Portals™ Service Menu** (see Chapter 1, Introduction, of this Section). All adjustments can be viewed at a glance with the **Game Adjustment Table** provided on the previous page. If a value is changed, the display will indicate **REQUEST INSTALLED**.



GO TO ADJUSTMENTS MENU

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the **"ADJ" Icon** in the **MAIN MENU** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **ADJUSTMENTS MENU** appears.

Important Notes:



Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the **"PREV" Icons**. If no **Icons** appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



Selecting & activating the **"QUIT" Icon** from any display will exit the Service Session.



Selecting & activating the **"HELP" Icon** from any display will show a help screen. (An explanation of each **Mini-Icon** at that level will cycle continuously until any active button is pressed.)



In Adjustments, selecting & activating the **"-" Icon** decrements the value setting. Selecting & activating the **"+" Icon** increments the value setting.



Selecting & activating the **"ARROW" Icons** selects the next or previous adj. in the group.



SEGA ADJUSTMENTS (1-43)

From the **ADJUSTMENTS MENU**, select the **"SEGA" Icon** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the **"RIGHT ARROW" Icon** to view the 1st adjustment in this group. Continue to select either of the **"ARROW" Icons** to view each adjustment one at a time. Select either the **"-"** or **"+" Icons** to change the value, if desired. The display will describe the adjustment number, the adjustment name, and the adjustment total or value. The current adjustment will remain in the display until the next adjustment is chosen or when the sub-menu is exited.

Adj. Nº	Adjustment Name	Adjustment Definition
Adj. 1	Replays: Fixed / Manual	Adjust for percentage of awards for Replay Levels (1% through 50%). Lower the automatic value to 0% and the display will indicated Fixed. Replays may be adjusted either for fixed levels or for a system-adjusted manual percentage of replay awards. Four levels may be selected. Adjustments allow awarding of a credit or an extra ball as each level is exceeded. With the manual percentage feature, if the actual replay percentage is higher or lower than that desired, the game computes new recommended manual percentage score(s). When the coin door is subsequently opened the player displays indicate the recommended level and a sound is made to alert the operator of a potential change. This new level is entered into adjustments simply by pressing the Black "ENTER" Button . (If the coin door is closed or the operator enters the Portals™ Service Menu, the replay level is not changed.)
Adj. 2	Replay Levels	Adjust the number of replay levels to be active (1 to 4). Once the number of Replay Levels has been selected, a "Drop-Down" Table appears showing Replay Level 1. Adjust Replay Level 1 between 100M - 9.99B. Adjust Replay Level 2, 3 and/or 4 respectively.
Adj. 3	Replay Award	Set for replays to award: CREDIT, EXTRA BALL, NONE or SPECIAL (When score threshold is achieved, a Playfield Special is lit.)



Sega Adjustments Continued.

Adjustment Name		Adjustment Definition
Adj. 4	Free Game Limit	Adjust the max. # of <i>Free Games</i> that may be accumulated per game; 0 - 9.
Adj. 5	Extra Ball Limit	Adjust the max. # of <i>Extra Balls</i> that may be accumulated per game; 1 - 9 or OFF.
Adj. 6	Game Difficulty	Set to EXTRA EASY , EASY , MODERATE , HARD or EXTRA HARD . (Note: Additional game features which are not adjusted may also change when adjusting this adjustment; see below table.) Default is MODERATE . Any one of the INSTALL settings (in a "Drop-Down" Table) for this adjustment may be activated to automatically select settings for multiple adjustments affecting game difficulty. Select and activate the "-" or "+" icons to choose the difficulty level required. After activation, the individual adjustments may be readjusted, if desired. Refer to the Install Adjustment Table below for details.

Adjustments which change when set to:	Adj. 6 Extra Easy	Adj. 6 Easy	Adj. 6 Moderate	Adj. 6 Hard	Adj. 6 Extra Hard
(44) MBall Restart	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(45) Extra Ball Memory	ON	ON	ON	ON	OFF
(46) Qualify Locks Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(47) Orbit Rule Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(48) On Fire Rule Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD

Play Rules: Novelty & 5-Ball, plus Add-A-Ball Settings

The following three combinations are recommended for situations where local laws restrict certain game features regarding the use of replays or the number of balls per game:

Novelty Play Rules - Set to establish recommended settings for no Free Play or Extra Balls:

Adj.	Adjustment Name	Setting	Adj.	Adjustment Name	Setting
1	Replays: Fixed/Manual	Fixed	5	Extra Ball Limit	00
2	Replay Levels	None	11	Match Percentage	Off
3	Replay Award	None	17	High Score #1 Awards	1
4	Free Game Limit	0	18	High Score #2 Awards	0

5-Ball Play Rules - Set to establish recommended settings for 5-Ball Play:

Adj.	Adjustment Name	Setting	Adj.	Adjustment Name	Setting
1	Replays: Fixed/Manual	07%	5	Extra Ball Limit	3
2	Replay Levels	1	11	Match Percentage	4
3	Replay Award	Credit	12	Balls Per Game	5
4	Free Game Limit	5	17	High Score #1 Awards	1
			18	High Score #2 Awards	0

Add-A-Ball Settings -To disable awarding of credits and provide awards with an Extra Ball:

Adj.	Adjustment Name	Setting	Adj.	Adjustment Name	Setting
3	Replay Award	Extra Ball	16	Allow High Scores	No
4	Free Game Limit	00	17-20	High Score #1 - #4 Awards	0
11	Match Percentage	Off			

Adj. 7 Game Pricing

There are two methods available for coin switch programming: Standard & Custom. Standard pricing uses a single adjustment as seen in the first display. See the Standard Pricing Table. If "Custom" is selected, a "Drop-Down" Table appears. Select a pricing scheme shown in the **Custom Pricing Table** as seen below.

With Adjustment 7 set to **CUSTOM** operating the **Black "Enter" Button** again initiates a drop down menu representing coin switch pulses for the LEFT, CENTER, RIGHT and 4TH Coin Slots. The prescribed the number of pulses are required for 1 Credit. For example, if *Left Coin Pulses*, was set to 02 and *Coin Switch Pulses Required for 1 Credit*, to 01 a coin in the Left Slot would produce 2 Credits. Further, if *Left Coin Pulses*, was set to 01 and *Coin Switch Pulses Required for 1 Credit*, to 02, 2 Coins in the Left Slot would be required for 1 Credit.

Coin Switch Pulses Required for Bonus Credit may be set to post bonus credits when a minimum amount of coins are inserted at one time. For example, if *Left Coin Pulses* was set to 01, *Coin Switch Pulses Required for 1 Credit* to 01 and *Coin Switch Pulses Required for Bonus Credit* to 04, 1 Credit would be posted for each of the first 3 Coins in the Left Slot and 2 Credits for the 4th Coin.





Sega Adjustment 7 Continued.

Standard/Custom Pricing - Set for the desired pricing scheme from the Standard Pricing Table as indicated on the Dot Matrix Display. For Custom Pricing, set to **CUSTOM**. When set to **CUSTOM**, the following adjustments are utilized to tailor each individual coin chute:

Left Coin Switch Pulses	Set the number of pulses registered for closure of the Left Coin Switch; 00 to 99.
Right Coin Switch Pulses	Set the number of pulses registered for closure of the Right Coin Switch; 00 to 99.
Center Coin Switch Pulses	Set the number of pulses registered for closure of the Center Coin Switch; 00 to 99.
4th Coin Switch Pulses	Set the number of pulses registered for closure of the Fourth Coin Switch; 00 to 99.
Coin Switch Pulses Required for 1 Credit	Set the number of pulses required to post one credit; 00 to 99.
Coin Switch Pulses Required for Bonus Credit	Set the number of pulses required to award the 1st Bonus credit(s); 00 to 99.
Coin Switch Pulses Required for 2nd Bonus Credit	Set the number of pulses required to award the 2nd Bonus credit; 00 to 99.
Credits awarded for 1st Bonus	Set the number of credits awarded for achieving the first Bonus level; 00 to 99.

Custom Pricing Table

Coin Mechanisms				<<< Adjustments >>>								
LEFT	CENTER	RIGHT	4TH	Plays/Coins	LEFT Pulses	CENTER Pulses	RIGHT Pulses	4TH Pulses	Pulses /Credit	Pulses /Bonus	Pulses /2nd Bonus	Credit /1st Bonus
25¢	\$1.00	25¢	N/U	1/25¢ 3/50¢ 1/25¢ 5/\$1.00 1/25¢ 6/\$1.00	01 01 05	04 04 20	01 01 05	00 00 00	01 01 04	02 04 20	00 00 00	01 01 01
5SCH	10SCH	10SCH	N/U	1/10 S 1/10 S 4/30 S	01 04	02 08	02 08	00 00	02 06	00 00	00 00	00 00
10p	50p	£1	20p	1/30p 2/50p 5/£1 1/50p 3/£1 1/30p 4/£1	01 01 01	06 05 05	15 15 12	02 02 02	03 05 03	00 00 00	00 00 00	00 00 00
20¢	N/U	\$1.00	N/U	1/60¢ 2/\$1.00	01	00	05	00	03	05	00	01

Below and the following page is the **Standard Pricing Select Table** for the individual countries listed. The **Pricing Scheme** is determined in two ways - 1: The CPU/Sound Board Dip Switch (Sw. 300) Setting; and, 2: The Country Setting Option. For each country listed, the Dip Switch Setting is shown (Column 1). At this time, not all countries have a *unique* Dip Switch Setting. For the countries without a unique setting, the USA Setting (or all positions in the "OFF" position) is used. In lieu of determining the best **Pricing Scheme** for your location, "pre-sets" were made available which would best suit any given situation. If the Factory Default setting is not the selection you feel is best for your location, choose any of the other pre-set settings. If any of these settings do not suit your needs, then **CUSTOM PRICING** will need to be accomplished (however, any "custom" changes made here will be lost after a **FACTORY RESET** so it is suggested to write down your unique set-up).

The Standard Pricing Select Table Explained:

Column 1: CPU/Sound Board Dip Switch 300 Settings: (self-explanatory). **Column 2:** Country Setting Option: The different available pre-sets are listed. **Columns 3-6:** Coin Mechanisms - These show the coinage through the available slots on the Coin Doors. Different countries use different Coin Doors. For example, USA style Coin Doors, which have only 2 coin acceptors (left & right) may utilize the "Center" slot cable for an optional Bill Validator. Different Coin Doors may have up to 4 coin acceptors. **Columns 7-10:** Pricing Scheme Explained - Shows the number of plays received for the monies required determined by the setting selected.

Standard Pricing Select Table

CPU/SOUND BOARD DIP SWITCH 300 SETTINGS									COUNTRY SETTING OPTION † ‡		Coin Mechanisms				Pricing Scheme Explained																														
											COINS THRU ... SLOT:				Number of "Plays" for Price Amount Shown																														
											LEFT	CENTER	RIGHT	4TH																															
<table><tr><td>Pos.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>ON</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>OFF</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>									Pos.	1	2	3	4	5	6	7	8	ON									OFF									USA1		25¢	\$1.00	25¢		1 /25¢			
									Pos.	1	2	3	4	5	6	7	8																												
									ON																																				
									OFF																																				
									USA2		25¢	\$1.00	25¢	1 /50¢	2 /75¢	3 /\$1.00																													
									USA3		25¢	\$1.00	25¢	1 /50¢																															
									USA4		25¢		25¢	1 /50¢																															
USA5		25¢	\$1.00	25¢	1 /50¢	5 /\$2.00																																							
USA6		25¢	\$1.00	25¢	1 /50¢	2 /'4 X 25¢	3 /\$1.00 Bill	← Used to promote the Bill Validator																																					
USA7 †		25¢	\$1.00	25¢	1 /50¢	4 /\$1.50	6 /\$2.00																																						

Pos.	1	2	3	4	5	6	7	8
ON								
OFF								

Used to promote the Bill Validator



Standard Pricing Select Table - (Continued)

CPU/SOUND BOARD DIP SWITCH 300 SETTINGS		COUNTRY SETTING OPTION † ‡	Coin Mechanisms				Pricing Scheme Explained		
			COINS THRU ... SLOT:				Number of "Plays" for Price Amount Shown		
			LEFT	CENTER	RIGHT	4TH			
Pos. 1 2 3 4 5 6 7 8			For all of USA Settings, see previous page (the USA Default Setting is repeated below):						
ON		USA †	25¢	\$1.00	25¢		1 / 50¢	4 / \$1.50	6 / \$2.00
OFF									
Pos. 1 2 3 4 5 6 7 8		Austria †	5S	10S	10S		1 / 10S	2 / 15S	3 / 20S
ON									
OFF									
Pos. 1 2 3 4 5 6 7 8		Australia 1 ‡	20¢	\$A 1	\$A 2		1 / \$A 1	2 / \$A 2	
ON									
OFF		Australia 2 ‡	20¢	\$A 1	\$A 2		1 / \$A 1	2 / \$A 2	
Pos. 1 2 3 4 5 6 7 8									
ON		Belgium †	5 BF	20 BF	50 BF		1 / 20 BF	3 / 50 BF	
OFF									
Pos. 1 2 3 4 5 6 7 8		Brazil †	This country uses unique Tokens and/or Debit Cards only (pricing varies).						
ON			1 'coin'	4 'coins'	1 'coin'		1 / 2 coins'		
OFF									
Pos. 1 2 3 4 5 6 7 8		Canada †	25¢	25¢	Can\$ 1		1 / 50¢	2 / 75¢	3 / Can\$ 1
ON									
OFF									
Pos. 1 2 3 4 5 6 7 8		Denmark 1 ‡	1 DKr	5 DKr	10 DKr	20 DKr	1 / 3 DKr	2 / 5 DKr	
ON									
OFF		Denmark 2 ‡	1 DKr	5 DKr	10 DKr	20 DKr	1 / 2 DKr	3 / 5 DKr	7 / 10DKr
Pos. 1 2 3 4 5 6 7 8									
ON		Finland †	1 Fmk	5 Fmk			1 / 5 Fmk	4 / 10 Fmk	
OFF									
Pos. 1 2 3 4 5 6 7 8		France 1 ‡	1 Fr	5Fr	10 Fr	20 Fr	1 / 3 Fr	2 / 5 Fr	5 / 10 Fr
ON									
OFF		France 2	1 Fr	5 Fr	10 Fr	20 Fr	1 / 5 Fr	3 / 10 Fr	7 / 20 Fr
Pos. 1 2 3 4 5 6 7 8									
ON		France 3	1 Fr	5 Fr	10 Fr	20 Fr	1 / 3 Fr	2 / 5 Fr	4 / 10 Fr
OFF									
Pos. 1 2 3 4 5 6 7 8		Germany 1	1 DM	2 DM	5 DM		1 / 1 DM	6 / 1 X 5 DM	
ON									
OFF		Germany 2	1 DM	2 DM	5 DM		1 / 2 DM	2 / 3 DM	3 / 4 DM
Pos. 1 2 3 4 5 6 7 8									
ON		Germany 3 †	1 DM	2 DM	5 DM		1 / 2 DM	2 / 3 DM	3 / 4 DM
OFF									
Pos. 1 2 3 4 5 6 7 8		Germany 4	1 DM	2 DM	5 DM		1 / 1 DM	6 / 5 DM	
ON									
OFF									
Pos. 1 2 3 4 5 6 7 8		Greece ‡	50 Dr		100 Dr		1 / 50 Dr	3 / 100 Dr	
ON									
OFF									
Pos. 1 2 3 4 5 6 7 8		Hong Kong †	1 HK\$	2 HK\$	5 HK\$		1 / 5 HK\$		
ON									
OFF									
Pos. 1 2 3 4 5 6 7 8		Hungary ‡	10 Ft	10 Ft	20 Ft		1 / 20 Ft	3 / 40 Ft	
ON									
OFF									
Pos. 1 2 3 4 5 6 7 8		Italy 1 †	500 Lit		500 Lit		1 / 500 Lit		
ON									
OFF		Italy 2	500 Lit		500 Lit		1 / 1000 Lit	3 / 2000 Lit	
Pos. 1 2 3 4 5 6 7 8									
ON		Japan 1 †			100¥		1 / 100¥		
OFF		Japan 2			100¥		1 / 100¥	3 / 200¥	
Pos. 1 2 3 4 5 6 7 8									
ON		Korea ‡	100 Won		100 Won		1 / 100 Won		
OFF									
Pos. 1 2 3 4 5 6 7 8		Netherlands 1	1 Fls.	1 Fls.	2.5 Fls.		1 / 1 Fls.	3 / 2.5 Fls.	
ON									
OFF		Netherlands 2 †	1 Fls.	2.5 Fls.	5 Fls.		1 / 1 Fls.	3 / 2.5 Fls.	6 / 5 Fls.
Pos. 1 2 3 4 5 6 7 8									
ON		New Zealand 1 ‡	\$NZ 1		\$NZ 2		1 / \$NZ 1	2 / \$NZ 2	
OFF		New Zealand 2 ‡	\$NZ 1		\$NZ 2		1 / \$NZ 1	3 / \$NZ 2	
Pos. 1 2 3 4 5 6 7 8									
ON		Norway 1 †	10 NKr	5 NKr	20 NKr		2 / 10 NKr	1 / 5 NKr	4 / 20 NKr
OFF		Norway 2	10 NKr	5 NKr	20 NKr		1 / 10 NKr	3 / 20 NKr	
Pos. 1 2 3 4 5 6 7 8									
ON		Spain †	100 Pts		500 Pts		1 / 100 Pts	6 / 500 Pts	
OFF									
Pos. 1 2 3 4 5 6 7 8		Sweden 1 †	1 SKr	5 SKr	10 SKr		1 / 10 SKr	2 / 15 SKr	3 / 20 SKr
ON									
OFF		Sweden 2	1 SKr	5 SKr	10 SKr		1 / 5 SKr		
Pos. 1 2 3 4 5 6 7 8									
ON		Switzerland 1 †	1 SwF	2 SwF	5 SwF		1 / 1 SwF	6 / 5 SwF	
OFF		Switzerland 2	1 SwF	2 SwF	5 SwF		1 / 1 SwF	3 / 2 SwF	9 / 5 SwF
Pos. 1 2 3 4 5 6 7 8									
ON		UK 1	10p	50p	1£	20p	1 / 50p	3 / 1£	
OFF		UK 2	10p	50p	1£	20p	1 / 40p	3 / 1£	
Pos. 1 2 3 4 5 6 7 8									
ON		UK 3 †	10p	50p	1£	20p	1 / 50p		
OFF									

Notes: † Indicates Factory Default for that setting. ‡ Indicates a USA Dip Switch Setting (all positions in the "OFF" position).



Sega Adjustments Continued.

Adjustment Name		Adjustment Definition
Adj. 8	Reset Coin Audits	Default is NO . Select the "+" Icon to change to YES . ⚠ When enabled, all <i>Coin Audits</i> (Audits 5-11), will be reset to zero.
Adj. 9	Reset Game Audits	Default is NO . Select the "+" Icon to change to YES . ⚠ When enabled, all audits will be reset to zero, except for the <i>Coin Audits</i> (Audits 5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero).
Adj. 10	Reset High Scores	When enabled (set to YES) the High Score Levels and associated initials will be restored to the backup settings when the "+" Icon is selected and activated.
Adj. 11	Match Percentage	Set Match percent from 00% to 10% or OFF . At 00% the match display occurs at the end of the game but never awards a credit.
Adj. 12	Balls Per Game	Adjust the number of balls per game; 2 to 5 . Default is 3 .
Adj. 13	Tilt Warnings	Adjust the number of plumb bob tilt switch closures before the ball in play is tilted; 1 , 2 , 3 or OFF .
Adj. 14	Replay Boost	Set to YES or NO . When set to YES , exceeding a replay will set a temporary replay level for each time a replay level is surpassed. This new level will equal the previous replay level (when the replay was awarded) plus 50 Million for each following game, until the replays have all been played. At this time the previous level is resumed.
Adj. 15	Credit Limit	Adjust the maximum number of credits that may be posted; 4 to 50 . Default is 30 .
Note: There are 4 of the 6 High Score Levels with associated player initials that are displayed during the attract mode. This provides a High-Score-To-Date feature. When players exceed these levels, the player initials may be entered to replace the previous ones. These levels may be adjusted to award credits and to be reset to backup values after a selected number of games.		
Adj. 16	Allow High Scores	Set to enable (set to YES) or disable the four high score levels by setting to zero.
Adj. 17	High Score #1 Awards	Adjust the number of awards (0 to 4) awarded for exceeding level 1 (the highest of the four levels).
Adj. 18	High Score #2 Awards	Adjust the number of awards (0 to 3) awarded for exceeding level 2.
Adj. 19	High Score #3 Awards	Adjust the number of awards (0 to 2) awarded for exceeding level 3.
Adj. 20	High Score #4 Awards	Adjust the number of awards (0 to 1) awarded for exceeding level 4.
Adj. 21-26	Default High Score #1 - #6	Adjust the score level to which the world record, (level 1) (the highest of the four levels) may be altered. This adjustment is not affected by Adj. 27, HSTD Reset Count. Adjust the backup score to which levels 2 - 6 may be reset, respectively.
Adj. 27	HSTD Reset Count	HSTD (High Score To Date). Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments; 100 to 9,900 or OFF (no reset or adjustment). Default is 2,000 .
Adj. 28	Free Play	When set to YES , no coins are required for games.
Adj. 29	Custom Message	Set to ON or OFF . When set to ON , this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to CHANGE selecting the "+" Icon. Using either of the Flipper Buttons or the "RED" and/or "GREEN" Buttons, select either of the "ARROW" Icons. Press the "BLACK" Button (<i>Request Installed</i> blinks at the top of the display and the letter A is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or "RED" or "GREEN" Buttons). With the desired letter indicated, depress the Start Button to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the "BLACK" Button.
Adj. 30	Attract Mode Sounds	Set to ON or OFF . When set to ON , attraction sounds are played between games.





Sega Adjustments Continued.

	Adjustment Name	Adjustment Definition
Adj. 31	Flash Lamp Power	Set to NORMAL , DIM or OFF . When set to NORMAL the flash lamps are active, when DIM the flash lamps impulse power is reduced by 25% and when OFF the flash lamps will not flash.
Adj. 32	Coil Pulse Power	Set to NORMAL , HARD or SOFT . When HARD the coil pulse power is increased by 12.5% of the normal pulse rate. When set to SOFT the coil pulse power is decreased by 12.5% of the normal pulse rate. These adjustments are provided to compensate for Low Line or High Line voltage conditions where the solenoids appear to kicking too weak or too hard. Adjust as required.
Adj. 33	Knocker Volume	Set to NORMAL , LOW or OFF . Default is NORMAL . When set to LOW , the volume is decreased 50%. When set to OFF , no sound is heard when the "knocker" is sounded.
Adj. 34	Minimum Game Time	Set between 0:01 - 8:59 for minimum game time. Default is OFF . If the last ball in play drains prior to what the game time is set for, another ball will be served into the shooter lane and normal play will continue. Subsequent balls will continue to do be served into the shooter lane if the last ball still drains prior to and up until minimum game time is satisfied.
Adj. 35	Novice Mode Enabled	Set to YES or NO . Default is YES . When set to YES , before game play, the player can choose Novice Play (a 1-Ball Game with a guaranteed play time). NOVICE GAME rules give the player a guaranteed minimum game time - if the ball drains before the time is up, it will be returned to the player . When the ball drains after the time is up, the game ends). When set to NO , this feature is turned off, and defaults to Regular Game Play.
Adj. 36	Game Restart	Set to YES or NO . When set to YES , a new game may be started during any ball after the first ball is completed (if credits are available). (Note-Pressing start during the first ball will add additional players.) When set to NO , the game disables the Start Button after the first ball until the final ball is in play. Review Section 2, Chapter 1, Game Operations & Features for details.
Adj. 37	Extra Ball Percentage	Set from 0 to 50 . Allows the operator to adjust how frequently the Extra Ball feature is made available to the player.
Adj. 38	Bill Validator	Set to YES or NO . When set to YES , the display, in game attract mode, will show an "Insert Bill Animation." When set to NO , the display, in game attract mode will show "Insert Coin Animation."
Adj. 39	Tournament Mode	Set to NONE , PINBALL EXPO , IFPA-PAPA or HOME . Tournament Mode determines the default conditions to quickly prepare a game for tournament play. When this setting is changed all audits will be reset and all adjustments will be initiated to the particular style selected. The game will then return to <i>Game Over Attract Mode</i> , as if a <i>Factory Reset</i> had been performed. NONE - Same as a Factory Reset conditions. IFPA - Straight 50¢ play, No Replay, No Extra Ball, No High Scores, 2 Tilt Warnings and No Match. PINBALL EXPO-PAPA - Same as IFPA settings except <i>Free Play is enabled</i> . HOME - Sets game for Free Play, Extra Ball Play, No Replay, 10% Match & 30% Extra Ball.
Adj. 40	Euro. Token Disp.	Set to ON or OFF . When set to ON , the operator can enable the "knocker" cable in the cabinet to drive an external device (e.g. European Token Dispenser) without the game giving a replay.
Adj. 41	Special Memory	Set to YES or NO . When set to YES , the lit 'Special' light will be retained in memory from ball to ball for the same player. When set to NO , the lit 'Special' light will go out at the end of each ball.
Adj. 42	Location ID	00 to 9999 . Allows the operator to assign a location identification number to the audit print-out sheet. (Will not be affected by Factory Reset.) See the end of Chp. 3, Go To Audits Menu & Chp. 5, Go to Reset Menu (this section) for more details on Factory Reset & Printing.
Adj. 43	Game ID	00 to 9999 . Allows the operator to assign a game identification number to the audit print-out sheet. (Will not be affected by Factory Reset.) See the end of Chp. 3, Go To Audits Menu & Chp. 5, Go to Reset Menu (this section) for more details on Factory Reset & Printing.





SPACE JAM ADJUSTMENTS (44 - 48)

From the **ADJUSTMENTS MENU**, select the **"JAM" Icon** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the **"RIGHT ARROW" Icon** to view the 1st adjustment in this group. Continue to select either of the **"ARROW" Icons** to view each adjustment one at a time. Select either the **"-"** or **"+" Icons** to change the value, if desired. The display will describe the adjustment number, the adjustment name, and the adjustment total or value. The current adjustment will remain in the display until the next adjustment is chosen or when the sub-menu is exited.

Adj. N°	Adjustment Name	Adjustment Definition
Adj. 44	MBall Restart	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how Multiball can restart.
Adj. 45	Extra Ball Memory	Set to ON or OFF . Default is ON . When set to ON , the lit 'Extra Ball' light will be retained in memory from ball-to-ball for the same player. When set to OFF , the lit 'Extra Ball' light will go out at the end of each ball.
Adj. 46	Qualify Locks Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the Qualify Locks Feature is played.
Adj. 47	Orbit Rule Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the Orbit Rule Feature is played.
Adj. 48	On Fire Rule Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the On Fire Feature is played.





Custom Message

To go directly to Adjustment 29, Custom Message, from the **ADJUSTMENT MENU**, select the "CUST MESS" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Set the feature to **CHANGE** selecting the "+" *Icon*. Using either of the Flipper Buttons or the **"RED"** and/or **"GREEN" Buttons**, select either of the **"ARROW" Icons**. Press the **"BLACK" Button** (*Request Installed* blinks at the top of the display and the letter **A** is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or **"RED"** or **"GREEN" Buttons**). With the desired letter indicated, depress the **Start Button** to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the **"BLACK" Button**.



Film Star Reset

To reset the game with special settings (not the normal Factory Setting), from the **ADJUSTMENT MENU**, select the "STAR" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This setting is determined to be ideal for the home environment. See Chapter 5, Go to Reset Menu, of this section, to change to factory defaults if changes made are not desired.

RESETTING & PRINTING ADJUSTMENTS NOTES:

Adjustment Note: Resetting Adjustments



To reset adjustments, from the **MAIN MENU** select the "RESET" *Icon*. See Chapter 5, Go to Reset Menu, of this section.



Selection of the "FACT" *Icon*, from the **RESET MENU**, will reset all adjustments to the *Factory Settings* (except for Proprietary Adjustments). The display will return to the **Attract Mode**. To perform any other functions, the system must be entered again by pressing the **Black "BEGIN TEST" Button** on the coin door (see Chapter 1, Introduction, of this section).



Adjustment Note: Printing Audit Information

To print audits, from the **AUDITS MENU** select the "PRNT" *Icon*. See Chapter 3, Go to Audits Menu, at the end of that section (*special equipment is required*).



Selection of the "QUIK" *Icon*, from the **PRINTER MENU**, will start a quick print.



Selection of the "ALISON" *Icon*, from the **PRINTER MENU**, will start a Full Printout (Downloads to a PC).



Selection of the "RESET" *Icon*, from the **PRINTER MENU**, will reset the total N° of copies value to zero.

Go To Reset Menu

Overview

The **Portals™ Service Menu System** provides three (3) functions to reset adjustments and/or audits back to the **Factory Setting**. See Chapter 3, Go to Audits Menu, and Chapter 4, Go to Adjustments Menu, for the Game Audits & Adjustments Information. If a Factory Reset is performed, the Service Session is exited and returns to the Attract Mode. If reset of Coin or Game Audits is performed, the display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**. Please note that once reset, all customized settings are lost! Certain audits and adjustments however cannot be reset (refer to the details below).



GO TO RESET MENU

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the **"RESET" Icon** in the **MAIN MENU** with either **Red "LEFT" or Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **RESET MENU** appears.

Important Notes:



Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the **"PREV" Icon**.



Selecting & activating the **"QUIT" Icon** from the display will exit the Service Session.



Selecting & activating the **"HELP" Icon** from the display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



FACTORY RESET

From the **RESET MENU**, select the **"FACT" Icon** with either **Red or Green Button** and press the **Black Button**. **⚠ All adjustments will be reset to Factory Settings (except for Proprietary Adjustments)**. The display will indicate **REQUEST INSTALLED** and exit the Service Session. See Chapter 4, Go to Adjustments Menu, of this section, for the **Factory Settings** in the **Game Adjustment Table**.



RESET COIN AUDITS

From the **RESET MENU**, select the **"COIN" Icon** with either **Red or Green Button** and press the **Black Button**. **⚠ All Coin Audits (See Fig. 1) will be reset to Factory Settings**. The display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**. Coin Audits can also be reset from the **ADJUSTMENTS MENU, SEGA ADJUSTMENT 8**. See Chapter 4, Go to Adjustments Menu, of this section. After selecting this *Icon*, all of the **Coin Audits (5-11)** are reset to zero.



RESET GAME AUDITS

From the **RESET MENU**, select the **"AUD" Icon** with either **Red or Green Button** and press the **Black Button**. **⚠ All Game Audits (See Fig. 2) will be reset to Factory Settings**. The display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**. Game Audits can also be reset from the **ADJUSTMENTS MENU, SEGA ADJUSTMENT 9**. See Chapter 4, Go to Adjustments Menu, of this section. After selecting this *Icon*, all of the **Audits** are reset to zero, except for the **Coin Audits (Audits 5-11)** and **Audit 12, Software Meter**. Audit 12 is the only audit which cannot be reset.

Fig. 1

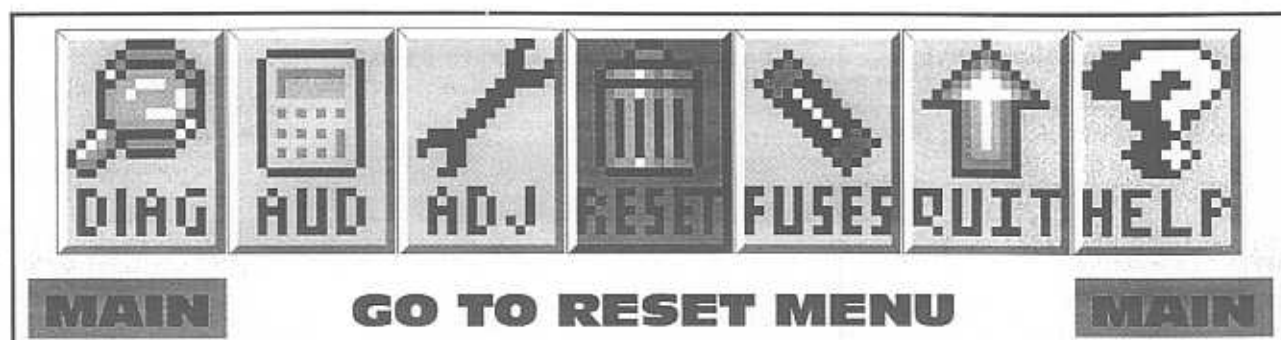
• Reset Coin Audits	
Earnings Audits (Coin Audits Only 5-11)	
Au. N°	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder of the Audits.

Fig. 2

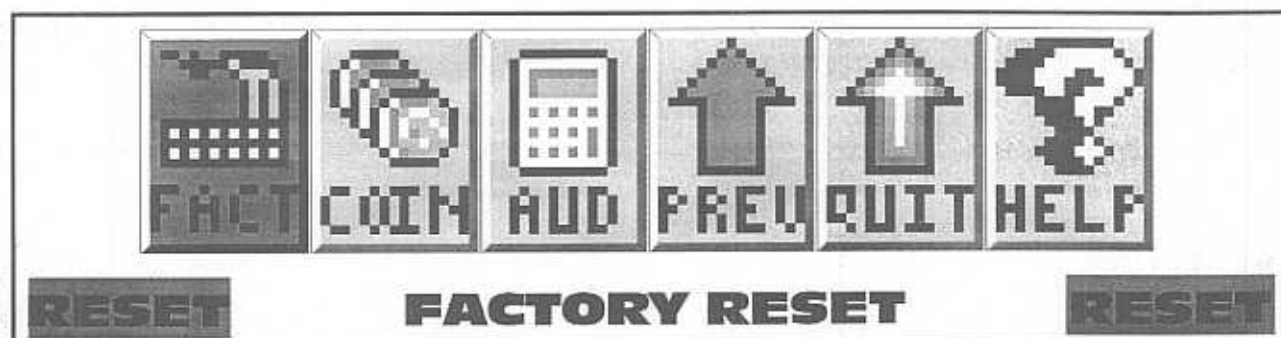
• Reset Game Audits	
Earnings (1-4), Generic/Specific Audits (13+)	
Au. N°	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder of the Audits.

Example:

From the **MAIN MENU**, use the **Red** or **Green** Buttons to select the "RESET" *Icon* (GO TO RESET MENU).



Press the **Black Button** to activate this **ICON**. This will bring up the **RESET MENU**.



The **RESET MENU** now appears with the "FACT" *Icon* (**FACTORY RESET**) flashing:

CAUTION: IF CUSTOMIZED SETTINGS ARE MADE TO THE GAME, DO NOT PRESS THE START BUTTON OR THESE SETTINGS WILL BE LOST!

Press the **Black Button** to activate this **ICON**. This will reset all adjustments back to *Factory Settings*.

REQUEST INSTALLED

The **REQUEST INSTALLED** now appears momentarily and the *Service Session* is automatically exited with the display returning to the **ATTRACT MODE**.

If the "COIN" or "AUD" *Icons* are chosen and activated, the affected audits (see previous page) will be reset, the display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**.

Go To Fuses List

Overview

The Portals™ Service Menu System provides a current Fuse List for this game. The fuses are located in the Backbox (on the Display Power Supply Board and the I/O Power Driver Board), and also in the Cabinet (under the playfield by the Flippers and/or by any unique assembly, such as magnets). See the front of this manual (pg. i) for the complete Fuse List in the *Quick Reference Fuse Chart* and note the drawings.



GO TO FUSES LIST

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the "FUSES" *Icon* in the **MAIN MENU** with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st fuse in this group. Continue to select either of the "ARROW" *Icons* to view each fuse one at a time. The display will describe the fuse identification number (e.g. F1, F6, F7, etc.), location of fuse (i.e. Backbox: Board name located on; or Cabinet: Under the playfield or in Service Outlet), rating of fuse (e.g. 5A 250v S.B. - i.e. 5 Amp, 250 volt, Slo-Blo), and 'use of fuse' (e.g. 90v DC High Voltage Display Power, etc.). The current fuse listed will remain in the display until the next fuse is chosen or when the sub-menu is exited.

Important Notes:



Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.



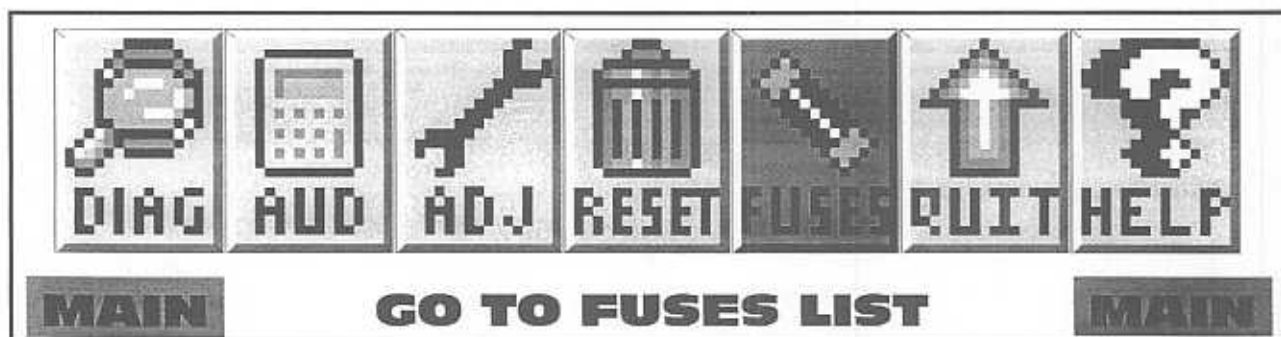
Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



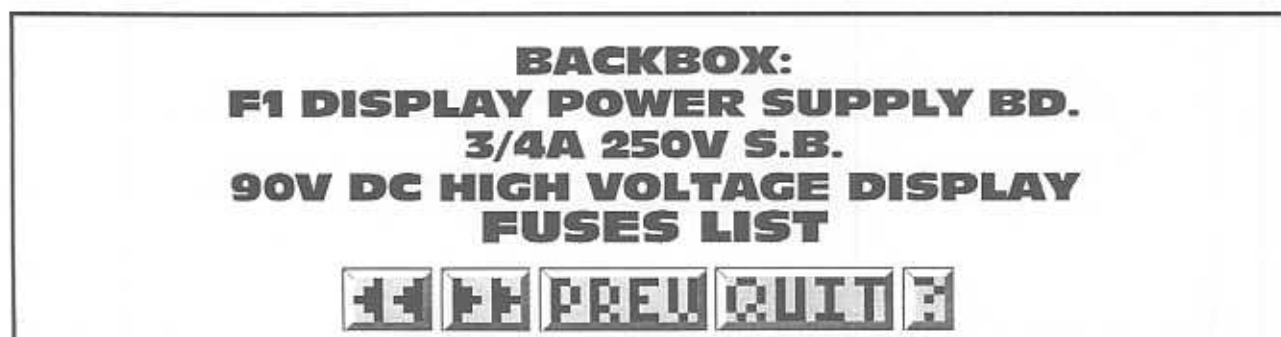
Selecting & activating the "ARROW" *Icons* selects the next /previous fuse in this group.

Example:

From the **MAIN MENU**, use the **Red** or **Green Buttons** to select the "FUSES" *Icon* (GO TO FUSES LIST).



Press the **Black Button** to activate this **ICON**. This will bring up the **FUSES LIST**.





PORTALS™ SERVICE MENU PROBLEM/SOLUTION TABLE

Use this table for a quick simple solution(s) guide. For more technical assistance view Section 5.



PROBLEM	SOLUTION
Will not enter the Service Mode after depressing the Black "BEGIN TEST" Button .	• Check the Service Switch(es) (Red, Green & Black Buttons) for loose connections or bad Ground. • Check the associated wiring harness to/from the CPU Board Connector CN14. • Check CPU Board, possibly failed.
Service Buttons (Red, Green and Black) are nonfunctional.	• Check the Service Switches for poor connections or broken wires.
The display blanks out.	• Check the Dot Matrix Display for loose wiring harness connections. • Check Bridge Rectifier 3 & 8 Amp Slo Blo Fuse. Refer to Section 5, Chapter 4, Schematics & Troubleshooting.
Icons " <i>scroll</i> " along continuously in the MAIN MENU .	• If the Service Switch Set and/or the Coin Door was replaced, ensure the Locking Mechanism on the Green Button is removed. If the Green Button "clicks" and locks into an up/down position, the Green Button has this lock switch. Remove it. (Ref. to Service Bulletin #74.)
The Start and Flipper Buttons do not select or activate <i>Icons</i> in the SWITCH TEST MENU .	• This is normal. These switches are deactivated, as they are a part of the Switch Test. Use the Red "LEFT" or Green "RIGHT" & Black "ENTER" Buttons in this Sub-Menu (See Chapter 1).
Can't move selection of <i>Icon</i> with the Left and/or Right Flipper Buttons .	• Check the Flipper Buttons for loose connections or bad Ground and refer to the Game Manual Flipper Troubleshooting Flowchart. • This is normal only in Diagnostic's Switch & Active Switch Tests (see previous Problem).
Some <i>Icons</i> appear non-functional in the PRINTER MENU(S) .	• If no printing equipment is connected, the "-" <i>Icon</i>, "+" <i>Icon</i> and "RUN" <i>Icon</i> will appear not to function (See Chapter 5).
Some <i>Icons</i> appear non-functional in the GAME SPECIFIC MENU under the DIAGNOSTICS MENU .	• If there is no other test under this Menu, the "Left Arrow" & "Right Arrow" <i>Icons</i> will appear not to function. The remaining <i>Icons</i> should function as normal. Note: If there is no Game Specific Special Test, the "GAME SPECIFIC" <i>Icon</i> will not invoke another display.
The display returns to the ATTRACT MODE exiting the Service Session from the FACTORY RESET MENU .	• This is normal. After a FACTORY RESET, the Service Session is automatically exited (See Chapter 4).
In COIL TEST MENU , the coils and flashlamps do not fire after activating the "RUN" <i>Icon</i> .	• Ensure the POWER INTERLOCK SWITCH (See figure on front inside cover) is pulled out.
In Portals™ Service Menu , the volume cannot be adjusted with the Red or Green Buttons .	• The Volume adjustment can only be made when the Service Menu is exited. The Volume Mode is entered by pressing the Red "VOLUME" Button. Then use the Red or Green Button to increase/decrease volume. (Red "LEFT" decrements; Green "RIGHT" increments.)
In Portals™ Service Menu , the display seems to lock up, or the Help Display appears to be non-functional.	• If you cannot clear the situation by exiting back one Menu, exit completely out of the Portals™ Service Menu, and re-enter. If the problem persists, call Tech. Support for additional help.



Go To Help Screen

Overview

The **Portals™ Service Menu System** provides help screens in each display (except if the display is in a testing mode). Each screen is basic and some terms may vary. At the beginning of each chapter in this section, *Icons* are shown and described to give detail of the particular function of the individual *Icons*. The table on the previous page was designed to help answer some questions of situations which may arise.



GO TO HELP SCREEN

With the game in the Attract Mode, open the Coin Door and press the **Black "BEGIN TEST" Button**. Select the **"HELP" Icon** in the **MAIN MENU** with either **Red "LEFT" or Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **HELP SCREEN** appears cycling through the different icon usages pertinent to that menu level.

MENU HELP SCREEN
USE THE RED OR GREEN BUTTONS
TO CHANGE THE SELECTED ICON.
PRESS THE BLACK BUTTON TO
ACTIVATE THE SELECTED ICON.
THE FLIPPER & START BUTTONS
FUNCTION IN THE SAME WAY.

Important Notes:



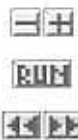
Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the **"PREV" Icons**. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



Selecting & activating the **"HELP" Icon** from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



Selecting & activating the **"QUIT" Icon** from any display will exit the Service Session.



These **"Mini-Icons"** vary in functionality depending in what sub-menu they are used. Refer to the beginning of each chapter in this section for the function they serve in that menu or select the **"HELP" Icons** in the display where the *Icon* in question is being used.



Review Chapter 1, Introduction:

How to enter the **Portals™ Service Menu**. The chapter outlines the entire **Portals™ Service Menu**. View the **Icon Tree** in this manual which describes the names and menu descriptions of each *Icon*. View the display, after selecting and activating either of the **"HELP" or "?" Icons**.

Review Chapter 2, Go to Diagnostics Menu:

Find all the tests needed to troubleshooting the game.

Review Chapter 3, Go to Audits Menu:

Gather play information and printing functions (downloading).

Review Chapter 4, Go to Adjustments Menu:

Customize the game to vary difficulty of play or to change functions of the game.

Review Chapter 5, Go to Reset Menu:

Reset audits and adjustments to Factory Settings.

Review Chapter 6, Go to Fuses Menu:

View the location & descriptions of the game fuses (the same information is referenced in the Fuse Chart Table on pg. i).

This concludes the **Portals™ Service Menu**. Review the Table of Contents at the beginning of this manual, and the detailed Table of Contents for Section 3 to quickly find the information required. The remainder of the sections in this manual will cover all the parts in this game and provide helpful information to aide in troubleshooting. If questions still arise after reading this section completely, call our Technical Support Department.

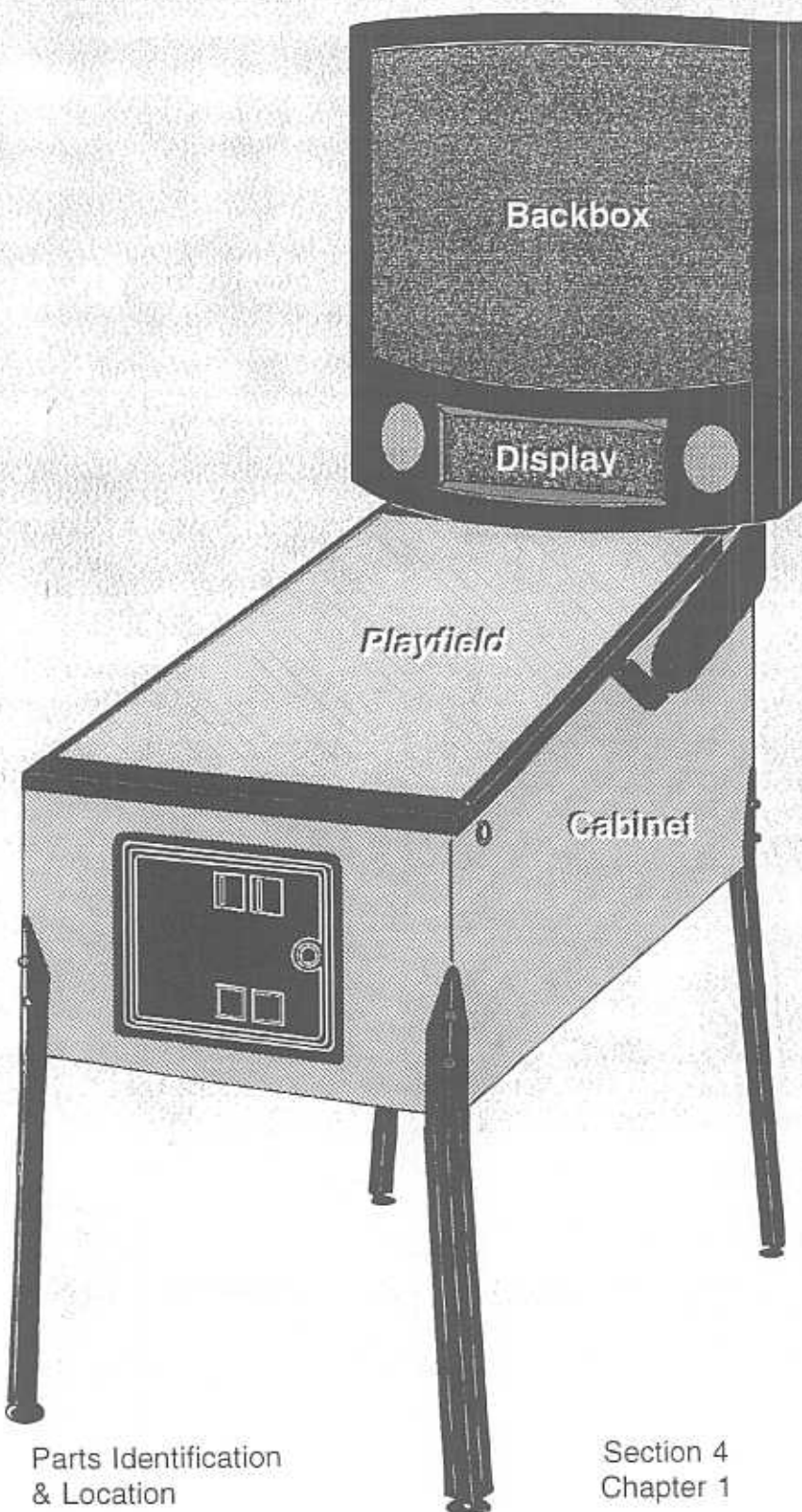
Your Help Notes:



Parts Identification & Location (The Pink Pages)

Overview

This section provides the part numbers and locations of all the components in the pinball machine. The parts are arranged in basically 3 groups: Backbox, Cabinet, and Playfield. Generic parts which may change as production continues (quantity and/or size) are listed together. Quantities greater than 0 indicates that the part is used in this game. Since quantity changes *may occur*, an item indicating "0" may be used. Compare the item which needs to be replaced with the drawings provided (the posts, sockets, bulbs and rubber rings are drawn actual size). Major Assemblies & Ramps are detailed in the Blue Pages, Chapter 2, Assembly Drawings.



Parts Identification
& Location

Section 4
Chapter 1

Section 4 Table of Contents

Chapter 1 (The Pink Pages)

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and Misc. Bulbs

Small Bayonet Type Bulb..... 66
and Sockets

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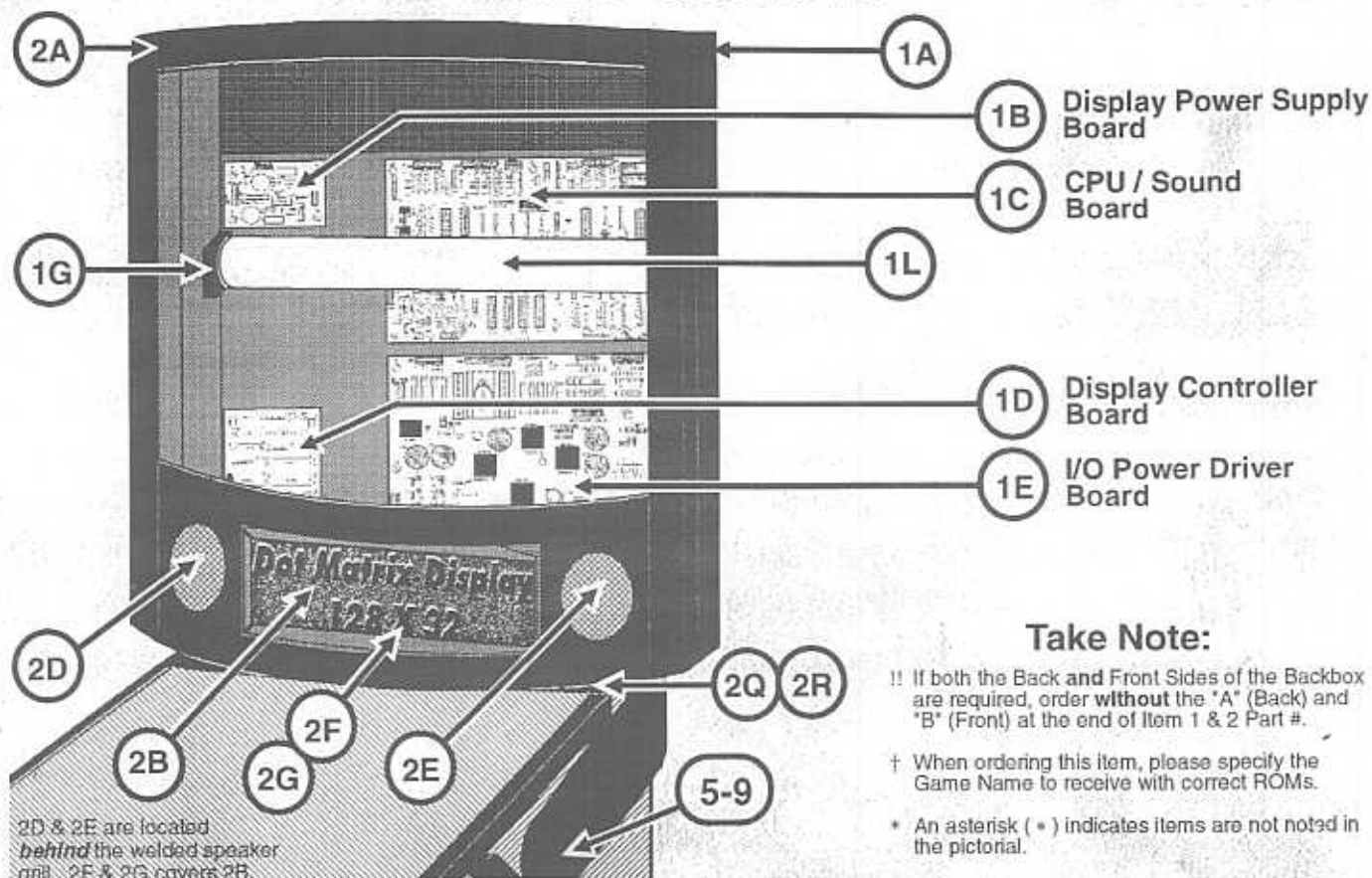
Drawings (Major Assy.) . 71-80, 84

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Backbox - General Parts



Take Note:

!! If both the Back and Front Sides of the Backbox are required, order **without** the "A" (Back) and "B" (Front) at the end of Item 1 & 2 Part #.

† When ordering this item, please specify the Game Name to receive with correct ROMs.

* An asterisk (*) indicates items are not noted in the pictorial.

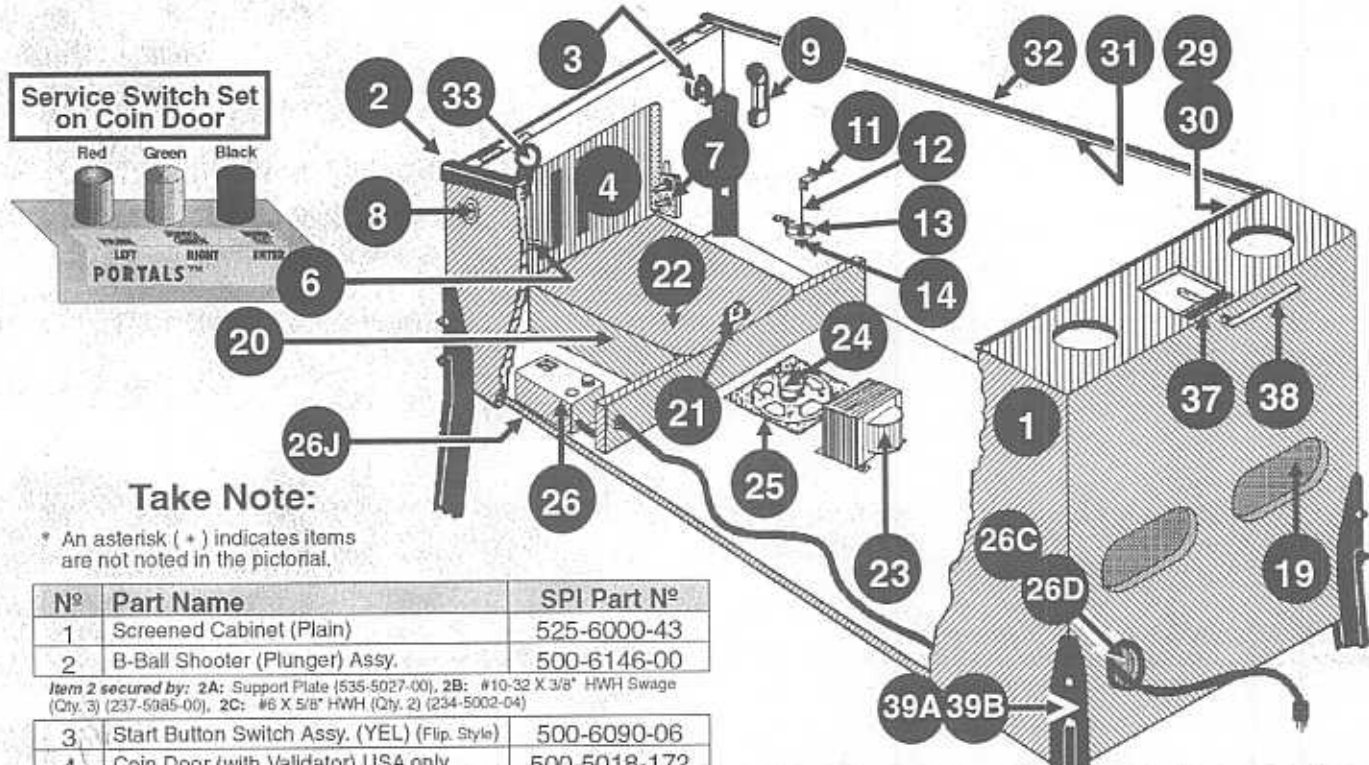
Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Back Side Metal Backbox Assembly	505-6002-43-43A	2	Front Side Metal Backbox Assembly	505-6002-43-43B
ORDERING ABOVE (ITEM 1) ASSEMBLY PART Nº WILL INCLUDE:			ORDERING ABOVE (ITEM 2) ASSEMBLY PART Nº WILL INCLUDE:		
1A	Welded Metal Backbox (Back Side) Plain	515-6623-00	2A	Welded Metal Backbox (Front Side) Plain	515-6623-01
1B	Display Power Supply Board	520-5138-00	2B	Dot Matrix Display Board 128 X 32	520-5052-00
1C	CPU/Sound Board (Mono)	520-5136-10	2C*	#6-32 X 1/2" PPH Screw (Qty. 4)	232-5202-00
1D	Display Controller Board	520-5055-01	2D	Speaker 4" X 4" Quam (Left Side)	031-5004-00
1E	I/O Power Driver Board	520-5137-01	2E	Speaker Backplate (Right Side Cover)	820-6157-00
1F*	#8-32 X 3/8" HWH (Qty. 26) (use for Items 1B through 1E, & 1CC)	237-5903-00	2F	Dot Matrix Display Butyrate Cover	545-5751-00
1G	Lamp Holder (Self-Locking) (Qty. 2)	077-5214-00	2G	Dot Matrix Display Bazel	545-5752-00
1H*	#6-32 X 3/4" HWH Swage (Qty. 2)	237-5976-05	2H*	Washer - 9/64" X 5/16" X 1/32 (Qty. 2)	242-5017-00
1I*	Starter Base (with Leads)	077-5213-00	2I*	#6-32 Stop Nut (Qty. 8)	240-5005-00
1J*	#4-40 X 3/4" PRH T-25 Screw (Qty. 2)	237-5873-00	2J*	Sega Logo Stick-On Plate	535-7877-00
1K*	Starter - Fluorescent FS2 Light	165-5011-01	2K*	Bracket (Holds Dot Matrix Display)	515-6623-02
1L	Fluorescent Tube - F20T12CW	165-5031-02	2L*	Space Jam Backglass Sub-Assembly	515-5450-00-43
1M*	Ballast Sub-Assembly	500-6143-00-43	Ordering Item 2L Sub-Assy. includes:		
Ordering Item 1M Sub-Assy. includes:			2-Sided Tape (6")		
Ballast - SP2 120v 60Hz 13W (UL)			Backglass - Lexan		
Fluor. Lamp Cable Wiring Harness			Backglass - Space Jam Art Work		
010-5007-00			Backglass - Butyrate Back Cover		
036-5402-15-43			2M*		
1N*	Backbox Lock & Key (Qty. 2)	355-5018-00	#6-32 Stop Nut (Qty. 20) (holds Item 2L)		
1O*	#1 Roto Lock Female	355-5006-02	2N*		
Note: #1 Roto Lock Male (on Cabinet)			#6 Washer (Qty. 20) (fastens with 2M)		
355-5006-01			2O*		
1P*	#10-32 Stop Nut (Qty. 2) (for Item 1O)	240-5203-00	Bracket Top/Bot. (Holds Backglass Assy.)		
1Q*	#10 Washer (Qty. 2) (for Item 1O/P)	242-5003-00	2P*		
1R*	Ribbon Cable, 14-Pin (Disp. Controller Board to Dot Matrix Display Board)	036-5260-03	Bracket Side (Holds Backglass Assy.)		
1S*	Ribbon Cable, 20-Pin (CPU/Sound Bd. to I/O Power Driver Board)	036-5000-04	2Q		
1T*	Ribbon Cable, 26-Pin (CPU/Sound Bd. to Display Controller Board)	036-5001-48	Pedestal Plate		
1U*	Power to Floor. Cable Wiring Harness	036-5414-10-43	2R		
1V*	Display Cable Wiring Harness	036-5409-00-43	#6 X 1/2" PTH (Qty. 4)		
1W*	Speaker Cable Wiring Harness	036-5388-01-43	2S*		
1X*	3/4" Cable Clamp	040-5000-08	Door Stiffener Bracket		
1Y*	1" Cable Clamp (Qty. 11)	040-5000-09	2T*		
1Z*	1/4" Cable Clamp (Qty. 2)	040-5000-03	3/8" X 1/4" Poly. Foam (for side gaps)		
1AA*	1/2" Cable Clamp	040-5000-06	3		
1BB*	#6-32 Stop Nut (Qty. 16) (for Items 1M, 1W-1AA)	240-5005-00	Fuse Description Label (Space Jam)		
1CC*	Top Backbox Shipping Support Bracket	515-6623-07	4		
1DD*	Deflector Pad (Bumper) (Qty. 2)	545-5428-00	#8-32 Stop Nut (Qty. 4) (Secures Item 1 to 2)		
1EE*	Washer 1/4" I.D. X 1" O.D. (Qty. 4)	242-5009-00			
1FF*	#8 Washer (Qty. 2) (Items 1DD-1FF for 1CC)	242-5005-00			

The following items secure the Backbox to the Cabinet:

5	Sq. Neck 1/4"-20 X 7/8" Car. Bolt (Qty. 2)	231-5014-00
6	Hinge Spacer (Qty. 2)	530-5099-00
7	Washer 1/4" I.D. X 7/8" O.D. (Qty. 2)	242-5016-00
8	Washer 1/4" I.D. X 1" O.D. (Qty. 2)	242-5009-00
9	1/4"-20 Flange Nut (Qty. 2)	240-5300-00

For Fuses, Bridges, Relays & ROMs locations, see Dr. Pinball: Find-It-In-Front Section (pg. i).

Cabinet - General Parts



Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.

Nº	Part Name	SPI Part Nº
1	Screened Cabinet (Plain)	525-6000-43
2	B-Ball Shooter (Plunger) Assy.	500-6146-00

Item 2 secured by: 2A: Support Plate (535-5027-00), 2B: #10-32 X 3/8" HWH Swage (Qty. 3) (237-5085-00), 2C: #6 X 5/8" HWH (Qty. 2) (234-5002-04)

3	Start Button Switch Assy. (YEL) (Flip. Style)	500-6090-06
4	Coin Door (with Validator) USA only	500-5018-172

For USA & Coin Switch: 180-5024-00
For JAPAN & Coin Switch: 180-5091-00

Item 4 secured by: 4A: 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 4) (231-5003-00), 4B: 1/4"-20 Flange Nut (Qty. 4) (240-5300-00)

5 *	Slam Tilt Switch (on Coin Door)	180-5022-00
6	Service Switch Set (on Coin Door)	180-5012-03
7	Dual Switch Assembly	500-5808-00

ORDERING ABOVE (ITEM 7) ASSEMBLY PART Nº WILL INCLUDE:

7A*	Mounting Bracket	535-6958-00
7B*	Playfield Power Interlock Switch (Top)	180-5136-00
7C*	Memory Protect Switch (Bottom)	180-5000-00

8	Flipper Button Assembly Red (Qty. 2)	500-5026-32
9	Flipper Cabinet Switch (Qty. 2)	180-5048-01

10 *	Pal Nut for Flipper Button (Qty. 2)	240-5003-00
11	Tilt Hanger Bracket	535-5221-00

12	Tilt Hanger Wire (Attached to *11")	535-5319-00
13	Tilt Contact Wire	535-7563-01

14	Tilt Plumb Bob (Attached to *12")	535-5029-00
15	Pivot Pin Keeper Brkt. (Female) (Qty. 2)	535-7685-00

Note: Pivot Pin Brkt. (Male) (On Playfield): 500-6088-00

Item 15 secured by: 15A: 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (2/per) (231-5003-00), 15B: 1/4"-20 Flange Nut (2/per) (240-5300-00)

16 *	Prop Rod	535-7553-00
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Item 16 secured by: 16A: #10-24 X 1-3/4" Carriage Bolt Sq. Neck (231-5022-00), 16B: #10-24 Nylon Stop Nut (240-5206-00)

17 *	Mylar Carriage Bolt Cover Disc (Qty. 6)	820-5041-00
18 *	Cabinet Stop Bracket (Nylon) (Qty. 2)	545-5763-00

ABOVE (ITEM 18) USES THE FOLLOWING WHEN SECURED:

Hinge Spacer (2 for each): 530-5099-00

Washer 1/4" I.D. X 1" O.D. (2 for each): 242-5009-00

Item 18 secured by: 18A: 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (2/per) (231-5003-00), 18B: 1/4"-20 Flange Nut (2/per) (240-5300-00)

19	Grills 2-1/2" X 18" (Back/Bot.) (Qty. 2)	545-5072-02
20	Cash Box Plastic Bottom	545-5090-00
21	Cash Box Lock Bracket (wire)	535-7562-00
22	Cash Box Cover (Validator)	535-5013-03
23	Transformer	010-5012-00
24	Speaker - Round - 8" ø	031-5005-00
25	Speaker Grill 7" x 7"	545-5072-03

Nº	Part Name	SPI Part Nº
26	Power Input Box Sub-Assy. (no Vol. pot)	515-5360-01

ORDERING ABOVE (ITEM 26) SUB-ASSY. PART Nº WILL INCLUDE:

26A*	Power Box (Plain)	535-5932-00
26B*	Service Outlet (for USA)	180-5008-01
26C	Line Cord 10' ROJ 3" Max.	034-5000-10
26D	Recessed Cup for Line Cord	545-5122-00
26E*	Line Filter	150-5000-00
26F*	Varistor TNR159211KM	150-5001-00
26G*	Fuse 8 Amp (Domestic)	200-5000-05
26H*	Fuse Holder	205-5001-00
26I*	On/Off Switch Plate	535-5224-01
26J	On/Off Switch Toggle (Under Cabinet)	180-5001-00
26K*	Power Box Decal	820-6123-01

27 *	Snap-In Keeper Female (Qty. 2)	355-5016-02
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Note: Snap-In Keeper Male (On Playfield): 355-5016-01

28 *	Catch Bracket (for Item 27) (Qty. 2)	535-7700-00
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Item 28 secured by: 28A: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (2/per) (231-5012-00), 28B: #10-24 Keps Nut (2/per) (240-5207-00)

29	Rear Plastic Ext. Playfield Glass 20-3/8"	545-5038-00
30	Mounting Foam Rubber for Ext.	626-5004-00

31	Plastic Channel Left & Right	545-5017-00
32	Side Armor (Qty. 2) (Left & Right Same)	535-7297-02

Item 32 secured by: 32A: #10-24 X 1" Carriage Bolt Sq. Neck (2/per) (231-5021-00), 32B: #10-24 Hex Nut (2/per) (240-5202-00), 32C: #6 X 5/8" Tamper Proof (237-5047-00)

33	Front Molding Lockdown Assembly	500-5020-01
----	---------------------------------	-------------

Item 33 secured by: 33A: #10-24 X 1-1/4" Carriage Bolt (Qty. 2) (231-5012-00), 33B: #10-24 Keps Nut (Qty. 2) (240-5207-00)

34 *	Front Molding Lockdown Spring	265-5008-00
35 *	Front Molding - Black	500-5757-01-00

36 *	Playfield Glass (T.P.) 21" x 43"	660-5001-00
37	#1 Roto Lock Male	355-5006-01

Note: #1 Roto Lock Female (on Backbox): 355-5006-02

Item 37 secured by: 37A: #10-24 X 1-3/4" Carriage Bolt Sq. Neck (Qty. 2) (231-5022-00), 37B: #10-24 Nylon Stop Nut (Qty. 2) (240-5206-00)

38	Hex Key Allen Wrench 5/16"	777-0001-00
39	Leg Assembly (Qty. 4)	500-5921-50

ORDERING ABOVE (ITEM 39) ASSEMBLY PART Nº WILL INCLUDE:

39A	Leg (Black)	535-5020-50
39B	Leg Leveler 3/8" - 16 X 3"	500-5017-00

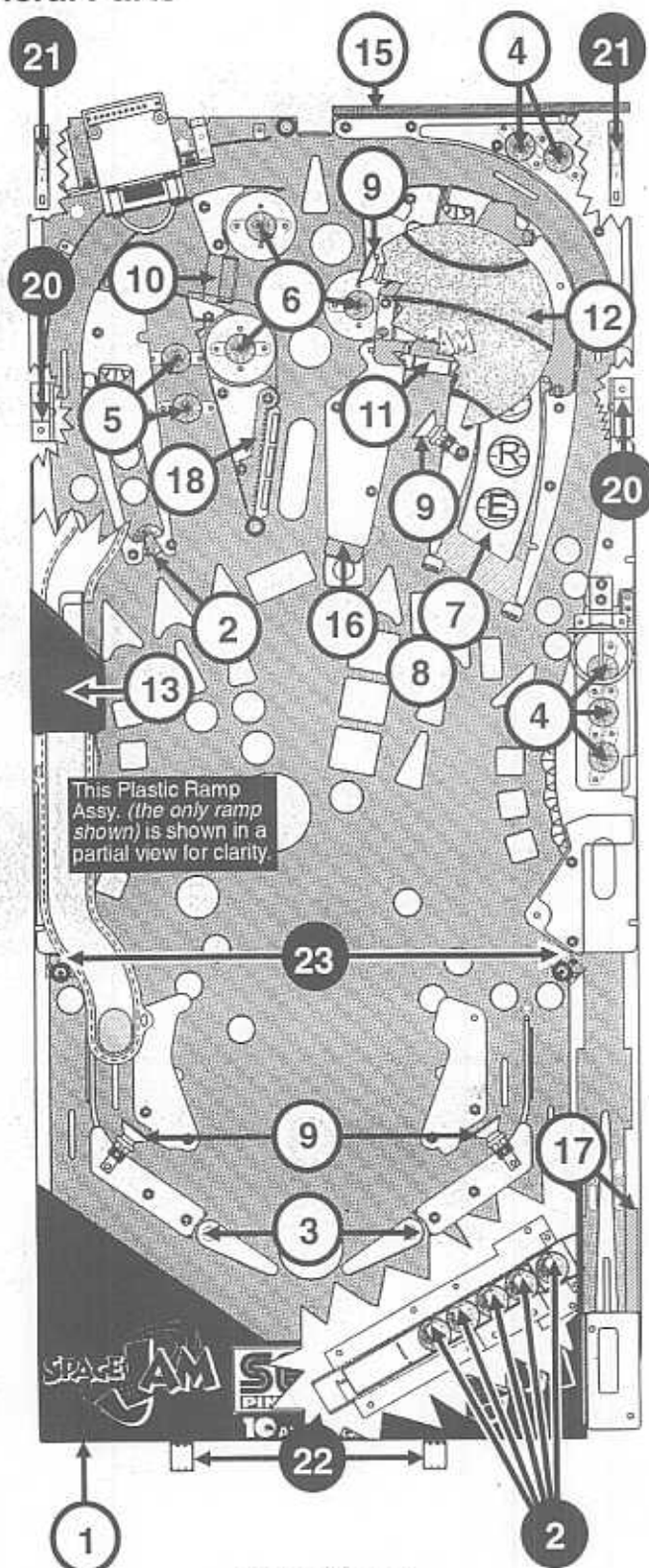
Item 39 secured by: Leg Bolt Back Plate (535-5703-00), and Leg Bolt 3/8" X 16 X 2-1/2" Hex 5/8" Hd. (2/per) (231-5001-01)

Playfield - General Parts

Nº	Above Playfield Name	SPI Part Nº
1	Bottom Arch Assembly (Plastic)	500-6005-00-43
ORDERING ABOVE (ITEM 1) ASSEMBLY PART Nº WILL INCLUDE:		
1A*	Bottom Arch without "Fork" (Plain)	545-5302-08
1B*	#6-32 X 1-1/4" PPH MS (Qty. 2)	237-5608-00
1C*	Spacer 3/4" Plastic 3/8" (Gray) (Qty. 2)	254-5000-07
1D*	#6-32 Nylon Stop Nut (Qty. 2)	240-5005-00
1E*	Bottom Arch Shooter Lane Butyrate -20	830-5906-20
1F*	Nelson Protect Strip 8-9/16" (Qty. 2)	545-5212-02
1G*	Bottom Arch Fence	535-7901-00
2	1-1/16" Steel Balls (Qty. 6)	260-5000-00
3	Flipper & Shaft Assy. White with Sega Saturn™ Logo ©96 (Qty. 2)	515-5133-08-05
4	Mini-Mars Hat Light Cover Clear (Qty. 5)	550-5032-01
5	Mini-Mars Hat Light Cover RED (Qty. 2)	550-5032-02
6	Mini-Mars Hat Light Cover ORG (Qty. 3)	550-5032-07
Note: Each of above Item 6 is riveted one per each Pop Bumper Butyrate Cover (830-5906-12, -13, & -14).		
7	"F - I - R - E" Plastic Light Cover	545-5741-00
8	Rubber Light Cover Amber (Qty. 4)	545-5014-03
Note: Each of above Item 8 covers a #44 Bulb, one per each under each "letter" of Item 7 above.		
9	Light Reflector (Qty. 4)	545-5409-01
10	1-Way Gate Mounting Bracket	535-5269-06
11	Wire Gate (for above)	535-5307-09
12	Basketball Magna Jump Cover	545-5734-00
Note: The above Item 12 is attached to the Magna Jump Assembly, 500-6134-00-43, a Major Assy. (See Section 4, Chapter 2).		
13	Ramp Ball Diverter Cover	545-5740-01
Note: The above Item 13 is attached to the Plastic Ramp Assembly, 500-6116-00-43, a Major Assy. (See Section 4, Chapter 2).		
14 *	Ramp Mounting Bracket (Qty. 4)	515-6508-00
Note: The above Item 14 is used to support the Plastic Ramp (2 on each side of the playfield).		
15	Playfield Back Panel (Plain)	525-5445-00
16	Ball Snubber (Stop)	535-7280-01
17	Shooter Rail Protect Plate	535-6707-01
18	Edge Shield Butyrate -08 Support	535-7918-00

Nº	Below Playfield Name	SPI Part Nº
19 *	VUK Angle Support Bracket	535-7911-00
Note: The above Item 19 is attached to the VUK located directly under the Magna Jump Assembly to ensure the correct angle of the VUK which shoots the ball up to the Magnet.		
20	Pivot Pin Braket (Male) (Qty. 2)	500-6088-00
Note: Pivot Pin Brkt. (Female) (On Cabinet): 535-7685-010		
21	Snap-In Keeper Male (Qty. 2)	355-5016-01
Note: Snap-In Keeper Female (On Cabinet): 355-5016-010		
22	Playfield Hanging Bracket (Qty. 2)	535-5216-03
23	Outline Adjustable Post Plate (Qty. 2)	535-5091-02

P1 *	Playfield Screened (No Parts)	830-5143-00
P2 *	Playfield Complete with all Parts	505-6004-43-43



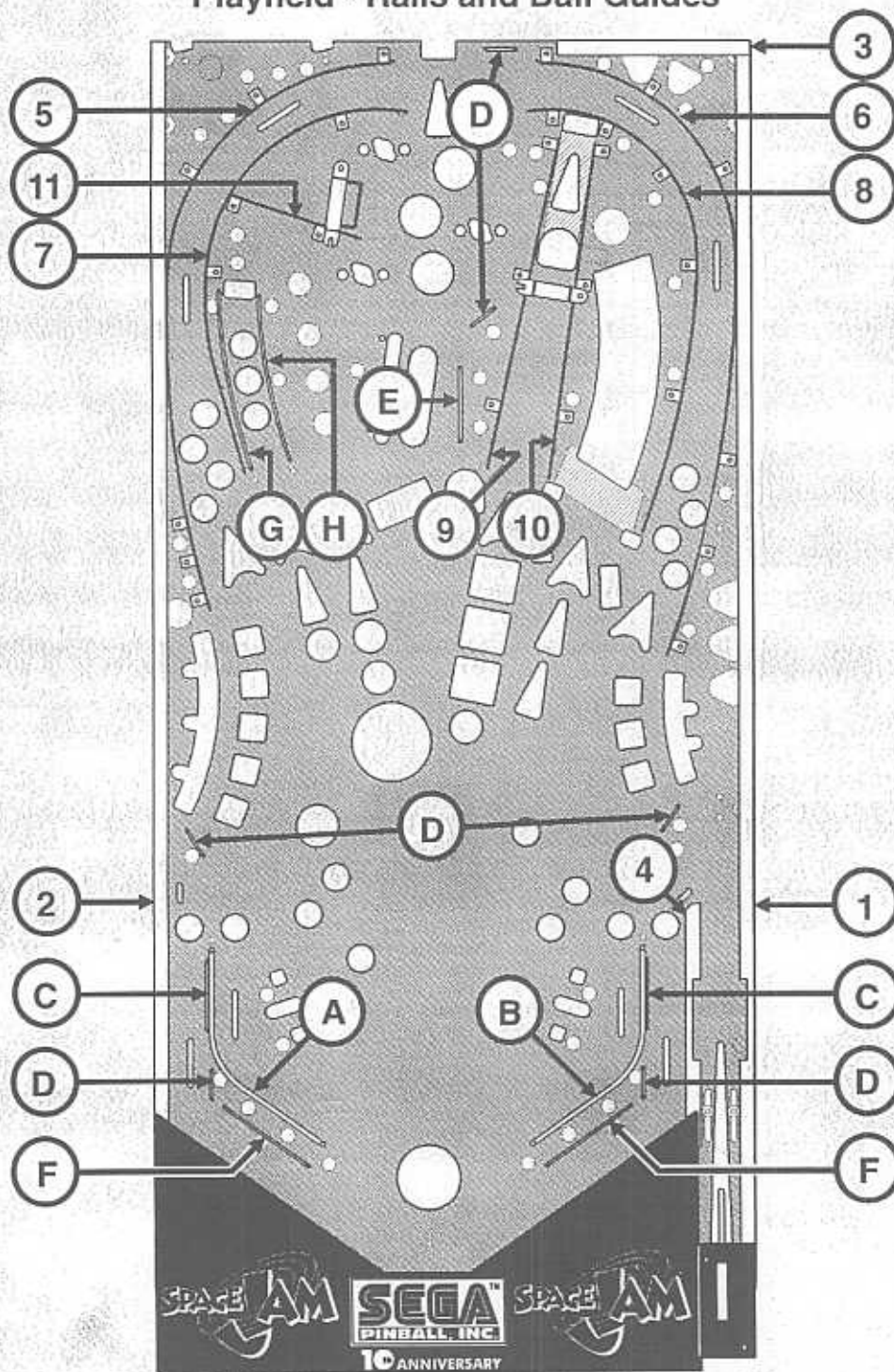
Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.

- For rails & ball guides, butyrate, mylar, decals, rubber parts, switches & targets, metal & plastic posts, sockets & bulbs, see the following pages in this chapter.
- See Section 4, Chapter 2, for balance of items which are part of or attached to a Major Assembly.
- Legend Note:** Items noted with a white circle (①) are mounted above. Items noted with a black circle (●) are mounted below.



Playfield - Rails and Ball Guides



Nº	Wood & Metal Rail Name	SPI Part Nº	Nº	Ball Guides / Wire Forms Name	SPI Part Nº
1	Right Wood Rail (Routed) 41-3/4"	525-5010-15	A	Return Guide Left	535-7560-00
2	Left Wood Rail 38"	525-5007-03	B	Return Guide Right	535-7560-01
3	Top Wood Rail 6-1/2"	525-5007-14	C	Ball Guide Rail (Outline Fence) (Qty. 2)	535-7595-00
4	Wood Rail (Routed) "	525-5441-00	D	Wire Form 1" (Qty. 6)	535-5300-05
5	Flat Rail (Orbit Left)	535-7776-00	E	Wire Form 2-1/2"	535-5300-01
6	Flat Rail (Orbit Right)	535-7777-00	F	Wire Form 3-1/2" (Qty. 2)	535-5300-03
7	Flat Rail (Inner Orbit Left)	535-7778-00	G	Ball Guide #1	535-7789-00
8	Flat Rail (Inner Orbit Right)	535-7779-00	H	Ball Guide #2	535-7790-00
9	Flat Rail (Left of Upper VUK)	535-7780-01			
10	Flat Rail (Right of Upper VUK)	535-7780-02			
11	Flat Rail (Left of Pops)	535-7819-00			

Playfield - Butyrate, Decals and Mylar

Nº	Screened Butyrate Name	SPI Part Nº
	Buty. Sheet Screened (01-21) (Complete)	830-5906-XX
1	Butyrate 1 - Top Right Corner	830-5906-01
2	Butyrate 2 - Top Right Side	830-5906-02
3	Butyrate 3 - Left Side Plastic Ramp	830-5906-03
4	Butyrate 4 - Right Pop	830-5906-04
5	Butyrate 5 - Right Side Plastic Ramp	830-5906-05
6	Butyrate 6 - Left Upper Pop	830-5906-06
7	Butyrate 7 - Left Lower Pop Top	830-5906-07
8	Butyrate 8 - Left Lower Pop Bottom	830-5906-08
9	Butyrate 9 - Top Left Center	830-5906-09
10	Butyrate 10 - Left Side	830-5906-10
11	Butyrate 11 - Right Side	830-5906-11
12	Butyrate 12 - Pop Bumper Top	830-5906-12
13	Butyrate 13 - Pop Bumper Right	830-5906-13
14	Butyrate 14 - Pop Bumper Left	830-5906-14
15	Butyrate 15 - Left Slingshot	830-5906-15
16	Butyrate 16 - Right Slingshot	830-5906-16
17 +	Butyrate 17 - NOT USED	-----
18	Butyrate 18 - Left Return	830-5906-18
19	Butyrate 19 - Right Return	830-5906-19
20	Butyrate 20 - Bottom Arch Shooter Lane	830-5906-20
21 +	Butyrate 21 - Keychain (Space Jam Logo)	830-5906-21

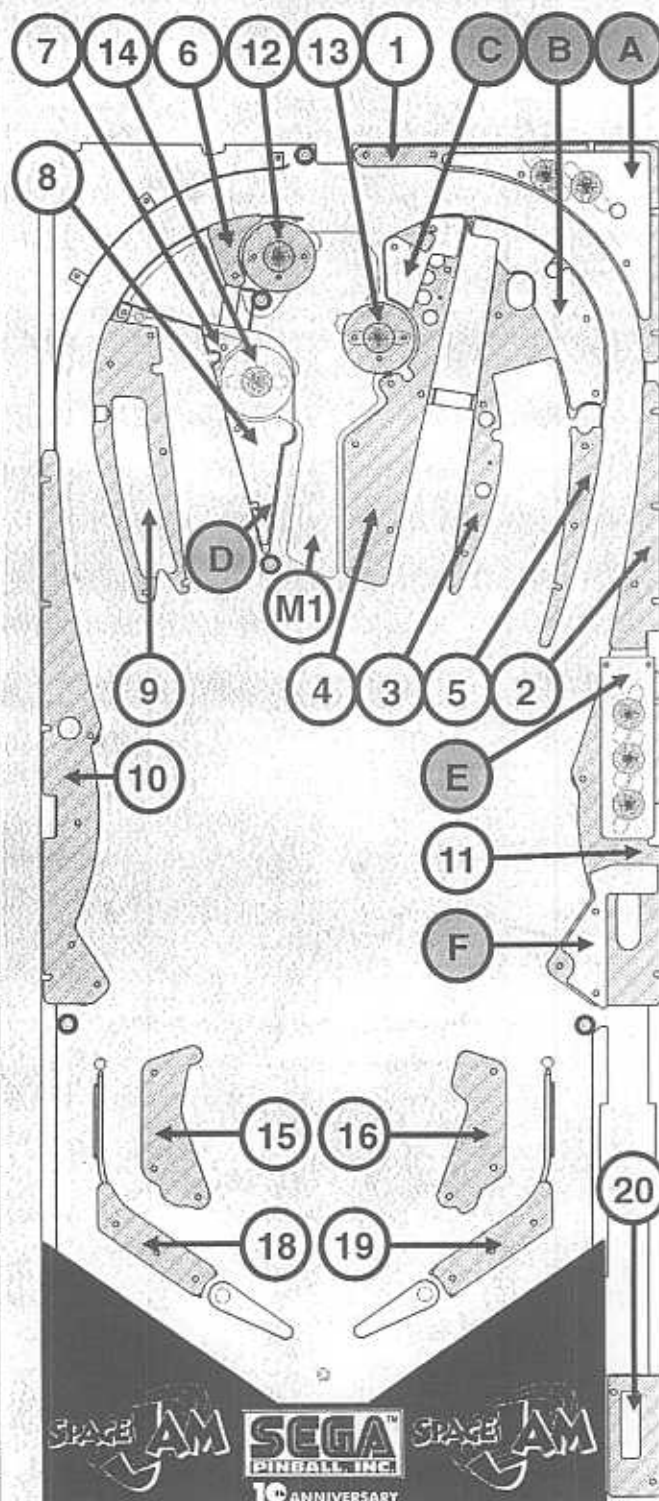
Nº	Clear Butyrate Name	SPI Part Nº
	Buty. Sheet Clear (01-6) (Complete)	830-5909-XX
A	Buty. 01 (covers screened Buty. 1)	830-5909-01
B	Buty. 02 (covers screened Buty. 3)	830-5909-02
C	Buty. 03 (covers screened Buty. 4)	830-5909-03
D	Buty. 04 (covers screened Buty. 7, 8, 14)	830-5909-04
E	Buty. 05 (Skill Shot Basket Cover)	830-5909-05
F	Buty. 06 (covers screened Buty. 11)	830-5909-06

n/a	Cabinet Back Panel Clear Butyrate (This piece is not included with above)	830-5911-00
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Nº	Mylar Name	SPI Part Nº
M1	Space Jam Mylar Pop Bumper Area	820-5865-00
n/a	Mylar Slingshot Area (Qty. 2)	820-5821-00
n/a	Mylar Pad - Ball Drop (Qty. 2)	820-5815-00
n/a	Mylar Cover Discs (Cabinet) (Qty. 6)	820-5041-00

Nº	Space Jam Decal Name	SPI Part Nº
	Space Jam Decal Sheet (Complete)	820-6165-XX
Coin Door: -04 (Portals Service Switch), -06 ("BUGS")		
Bottom Arch: -12 (Center), -13 (Left), -14 (Right), -05 (Install 5 Balls)		
Backbox: -18 (Warning Don't Lean on Door...)		
Misc: -07 ("F-I-R-E"), -09 (Extra Ball Arrow)		
For decals on assemblies, see Sec. 4, Chp. 2 Associated Parts Table on assemblies which have decals (Ramps, Drop Target, etc.)		
n/a	Playfield Back Panel Decal	820-6180-00
n/a	"Space Jam Backbox Fuse Locations"	820-6152-43

Nº	Generic Decal Name	SPI Part Nº
n/a	"Suitable for Indoor Use Only (UL)"	820-6001-01
n/a	"High Voltage Label (UL)" (Qty. 2)	820-6082-01
n/a	"Pricing Decal Sheet"	820-6094-00
n/a	"Power Box Decal - USA"	820-6123-01
n/a	"Danger Coin Door Label (UL)"	820-6140-00
n/a	"UL Listing Label"	820-6141-00
n/a	"Fuse Label (UL)"	820-6143-00
n/a	"Start" (Word & Arrow) Decal	820-6177-00



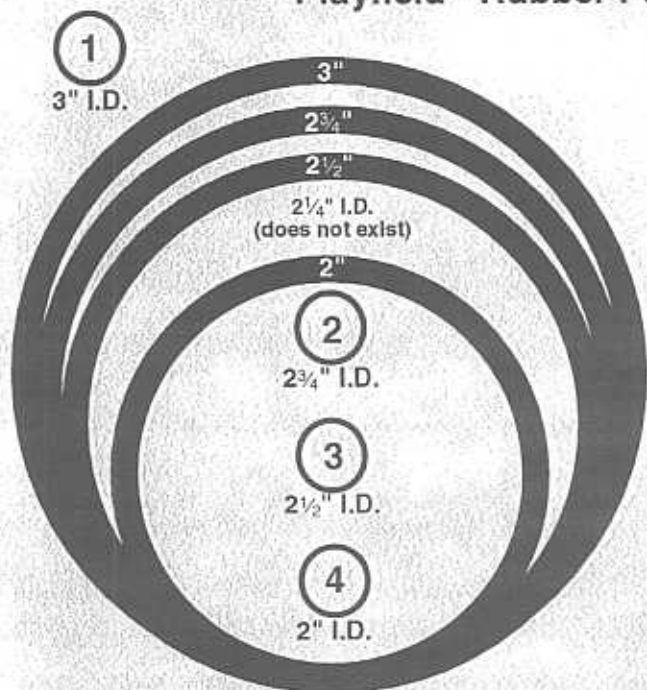
Take Note:

* An asterisk (*) or "n/a" indicates items are not noted in the pictorial.

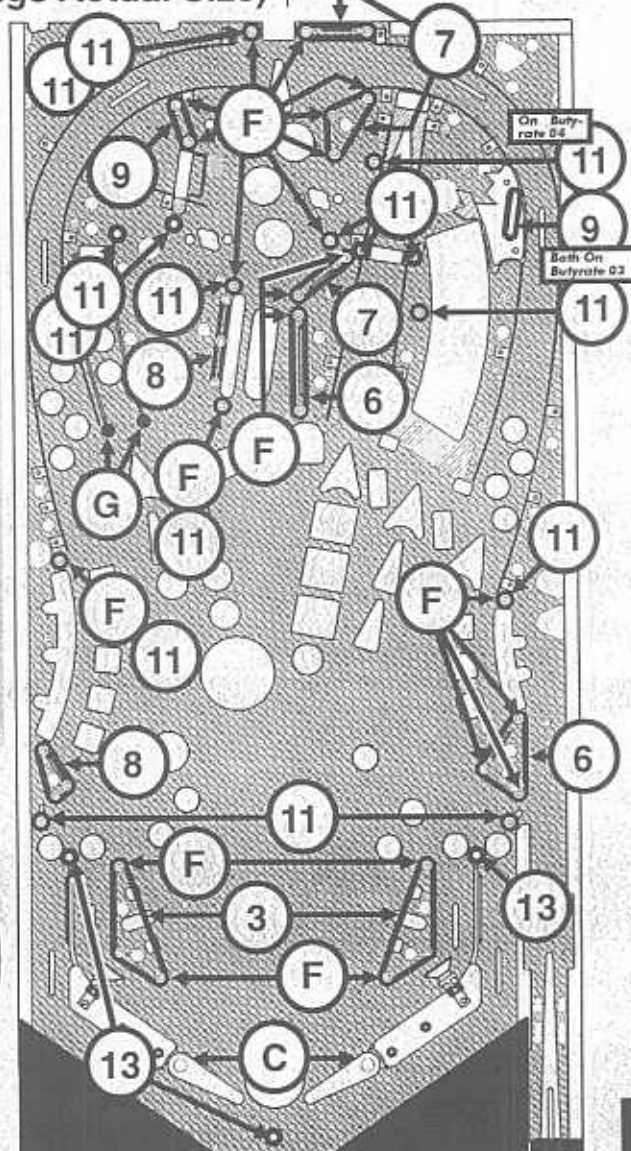
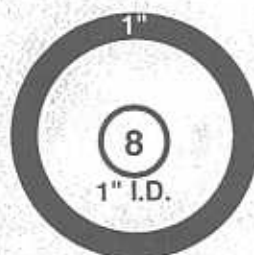
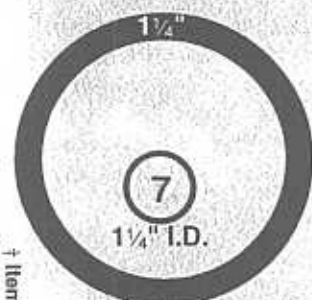
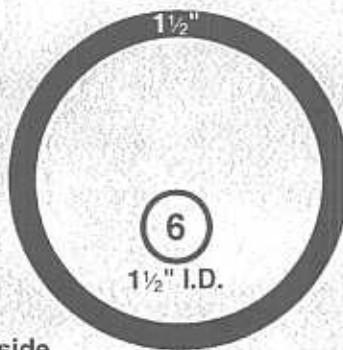
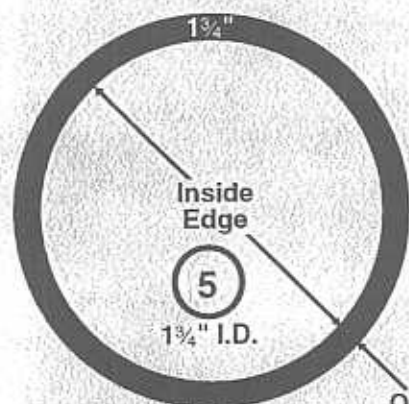
- To order the entire decal, screened butyrate or clear butyrate sheets, use the Part Nº with the "-XX" ending. For individual pieces replace the "-XX" with appropriate last 2-digit number. Attention: Individual pieces may not be available.
- Legend Note:** Items noted with a white circle (①) are mounted above. Items noted with a black circle (●) are "clear" & mounted below (there are no butyrate pieces mounted below in this game); Items with a gray circle (⊙) are "clear" & mounted above.



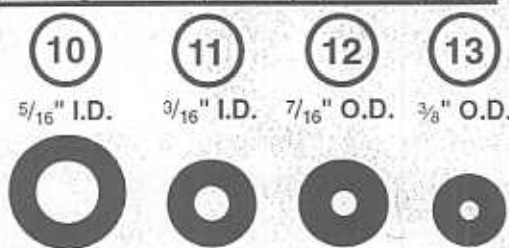
Playfield - Rubber Parts (Rings Actual Size) †



How to measure:
Lay ring over circle of closest size. If you see the outside edge of the circle, move to one ring smaller. With the correct size you will see the inside edge of the circle around the inside of the rubber ring.
Note: The rings will stretch with use. Always go to the size smaller.
(I.D. = Inside Diameter; O.D. = Outside Diameter)



D Rubber Bumpers (Qty. 5) are all located on:
• Trough VUK • Super VUK (X2) • Kick Big (X2)



† Items with Ø Qty. are not used in this game.
Size and/or quantities may change during production.

Nº	Rubber Part Name	QTY.	Part Nº	Nº	Rubber Part Name	QTY.	Part Nº
A	Rubber Bushing (Small)	0	545-5192-00	4	2" I.D. Black Rubber Ring	0	545-5348-08
B	Small Flipper Rubber Ring	0	545-5207-00	5	1 3/4" I.D. Black Rubber Ring	0	545-5348-21
C	Large Flipper Rubber Ring	2	545-5277-00	6	1 1/2" I.D. Black Rubber Ring	2	545-5348-07
D	Rubber Bumper (Grommet)	5	545-5105-00	7	1 1/4" I.D. Black Rubber Ring	3	545-5348-06
E	Bumper Post Rubber	0	545-5009-00	8	1" I.D. Black Rubber Ring	2	545-5348-05
F	Post Rubber (Sleeve Short)	22	545-5151-00	9	3/4" I.D. Black Rubber Ring	2	545-5348-04
G	Post Rubber (Sleeve Tall)	2	545-5308-00	10	5/16" I.D. Black Rubber Ring	0	545-5348-02
1	3" I.D. BLK Rubber Ring	0	545-5348-10	11	3/16" I.D. Black Rubber Ring	17	545-5348-01
2	2 3/4" I.D. Black Rubber Ring	0	545-5348-20	12	7/16" O.D. Black Rubber Ring	0	545-5348-17
3	2 1/2" I.D. Black Rubber Ring	2	545-5348-09	13	3/8" O.D. Black Rubber Ring	3	545-5348-19



Playfield & Cabinet - General Switches †

Nº	Playfield Switch Name	QTY.	Part Nº
1	OPTO Transmitter Switch	1	520-5124-00
	OPTO Receiver Switch	1	520-5125-00
2	Micro Rollover Switch (Ball Trough)	4	180-5119-00
3	Shooter Lane Switch Assembly	1	500-6096-00
ORDERING ABOVE (ITEM 3) ASSEMBLY PART Nº WILL INCLUDE:			
	Micro Switch Bracket #2-56 X 3/8" HWH (Qty. 2)		180-5157-00 535-6173-00 237-5938-00
4	Drop Target Switch	3	180-5104-00
5	Magnet Reed Switch	4	180-5145-00
6	Micro Sw. Rollover Assy. (Rt. Brkt.)	8	500-5707-00
7	Micro Sw. Rollover Assy. (Lt. Brkt.)	0	500-5706-00
8	Turbo Bumper Switch	3	180-5015-03
9	Slingshot Micro Switch	2	180-5054-00
10	Micro Switch	1	180-5159-00
11	Loop Switch (used on VUKs)	2	180-5116-00

These Stand-Up Targets (Items 12-19) are detailed on the next page:

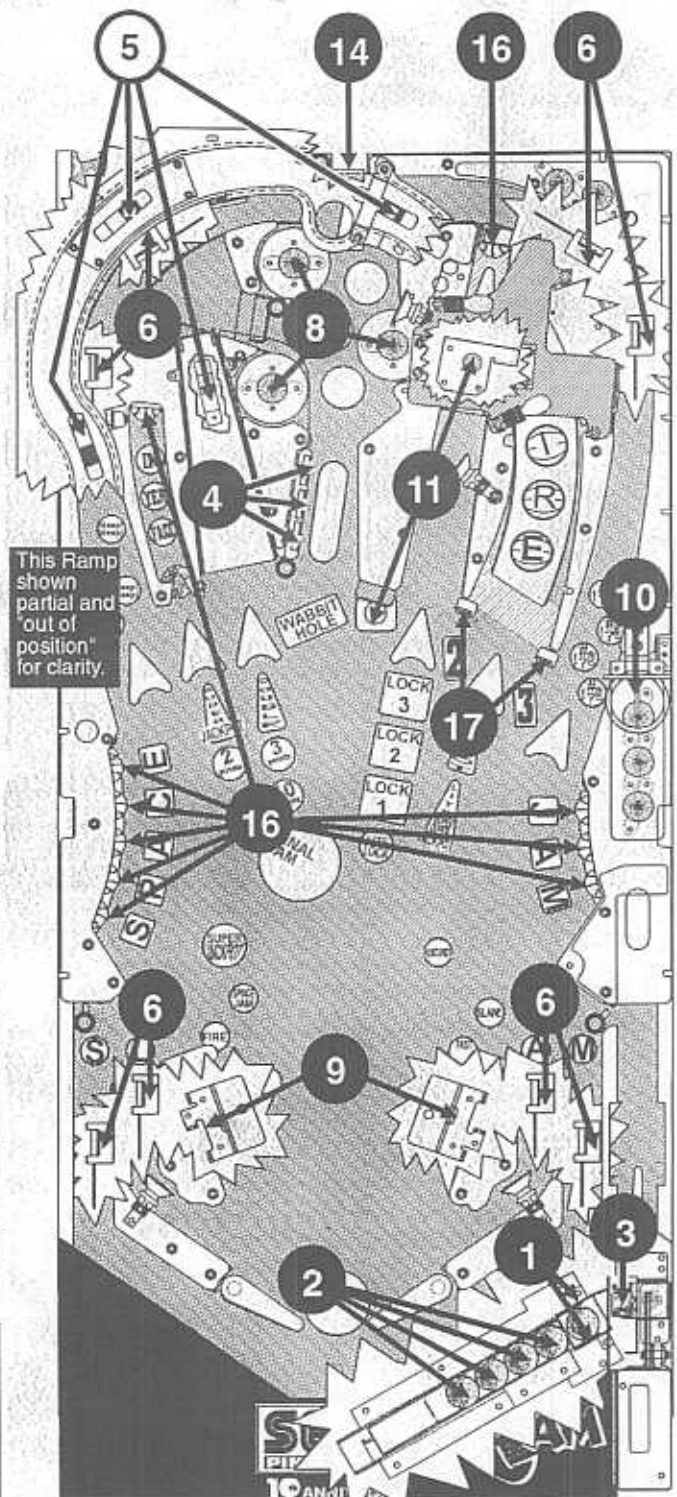
12	Stand-Up Target Round 1"	0	500-5835-XX
13	Stand-Up Target Rect. 1" X 1-1/2"	0	500-5821-XX
14	Stand-Up Target Square 1"	1	500-5232-02
15	Stand-Up Target Narrow Rect.	0	500-5857-XX
16	Basketball Target (B-Ball Design)	10	500-6118-00
17	Modular S-U Target Narrow (RED)	2	500-6138-02
18	Modular Stand-Up Target Round	0	500-6075-XX
19	Modular Stand-Up Target Square	0	500-6139-XX

Nº	Cabinet Switch Name	QTY.	Part Nº
A *	Start Button Sw. Assy. (Yellow Flg. Style)	1	500-6090-06
B *	Coin Door Switch (USA)	4	180-5024-00
C *	Coin Door Switch (¥ Japan)	n/a	180-5091-00
D *	Slam Tilt Switch	1	180-5022-00
E *	Flipper Stack Power Switch	2	180-5048-01
F *	Service Switch Set (3-Button)	1	180-5012-03
G *	Dual Switch Assembly	1	500-5808-00
ORDERING ABOVE (ITEM G) ASSEMBLY PART Nº WILL INCLUDE:			
	Memory Protect Switch		180-5000-00
	Interlock Switch Bracket		180-5136-00 535-6958-00
H *	Service Outlet	1	180-5008-01
I *	On/Off Switch	1	180-5001-00

Plastic Part Color Chart			
Nº	Color Name	Nº	Color Name
-01	Clear	-09	Purple
-02	Red	-10	Fluorescent Orange
-03	Amber	-11	Fluorescent Green
-04	Green	-12	Fluorescent Blue
-05	Blue	-13	Teal Green
-06	Yellow	-14	Gray
-07	Orange	-15	Luminescent
-08	White		

Instructions: Parts (such as targets) end in a 2-digit Nº which corresponds to the color of the part.

The *-XX* in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº, corresponding to the color desired. Not all colors may be available.



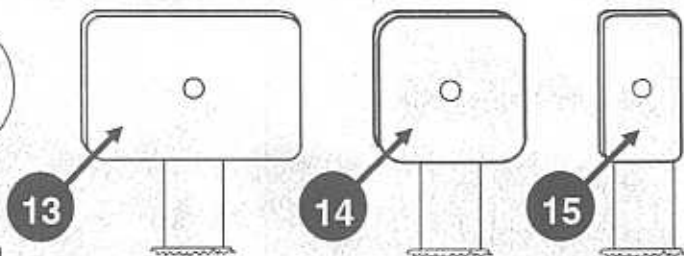
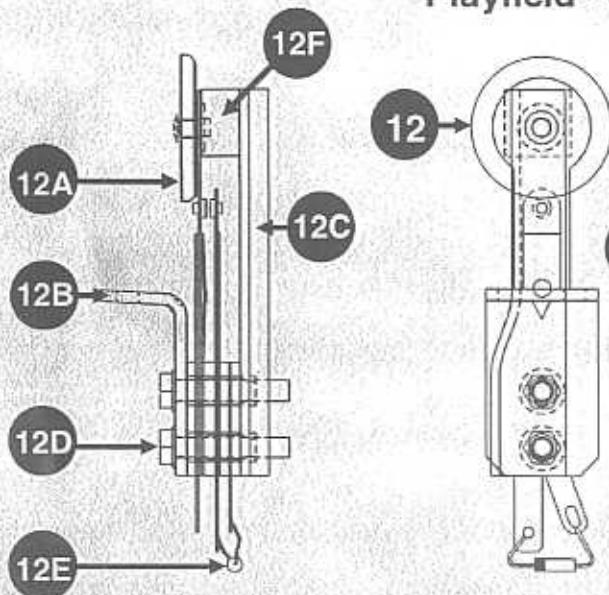
Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.

- For switches used corresponding to the Switch Matrix Grid of this game, see Section 3, Chapter 2, ...Diagnostics.
- For location of the Cabinet Switches, see the beginning of this chapter.
- Legend Note:** Items noted with a white circle (①) are mounted above. Items noted with a black circle (●) are mounted below.

† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Stand-Up Targets †



Nº	Stand-Up (Flat) Target Name	QTY.	Part Nº
12	1' Round Stand-Up Target Assy.	0	500-5835-XX
ORDERING ABOVE (ITEM 12) ASSY. PART Nº WILL INCLUDE:			
12A*	Switch & Target Assy. 1' Round	515-5966-XX	
12B	Mounting Bracket	535-6896-00	
12C	Switch Back Plate	535-6452-00	
12D	6-32 X 3/4 HWH Swage (Qty. 2)	237-5976-05	
12E	Switch Diode, 1N4001	112-5001-00	
12F	Foam Pad	626-5029-00	

* Note: Item 12A, is a riveted Sub-Assy. which includes the following items for reference:
 1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
 3— Rivet 1/8" x X 3/16" (249-5001-00) and 4— 1" Round Target (545-5456-XX).

13	1' X 1 1/2' Stand-Up Rect. Target Assy.	0	500-5321-XX
ORDERING ABOVE (ITEM 13) ASSY. PART Nº WILL INCLUDE:			
13A	Sw. & Target Assy. 1' X 1 1/2' Rect.	515-6027-XX	
Items 13B-F are identical to 12B-F.		Identical to 12B-F.	

* Note: Item 13A, is a riveted Sub-Assy. which includes the following items for reference:
 1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
 3— Rivet 1/8" x X 3/16" (249-5001-00) and 4— Rectangular Target (545-5145-XX).

14	1' Sq. Stand-Up Target Assy. (RED)	1	500-5232-02
ORDERING ABOVE (ITEM 14) ASSY. PART Nº WILL INCLUDE:			
14A	Sw. & Target Assy. 1' Square (RED)	515-5162-02	
Items 14B-F are identical to 12B-F.		Identical to 12B-F.	

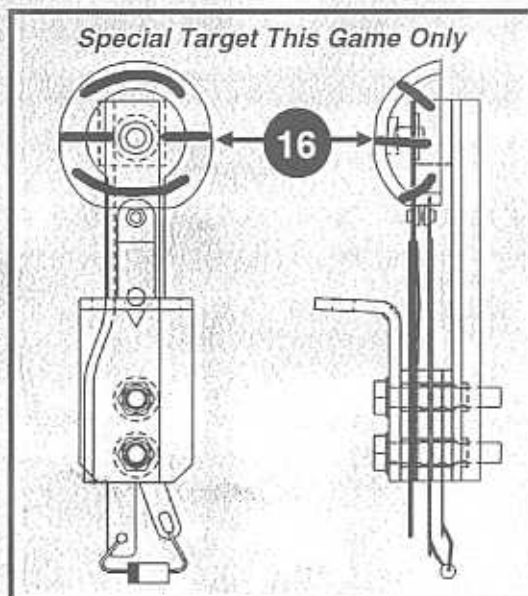
* Note: Item 14A, is a riveted Sub-Assy. which includes the following items for reference:
 1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
 3— Rivet 1/8" x X 3/16" (249-5001-00) and 4— 1" Square Target (RED) (545-5470-02).

15	Narrow Stand-Up Target Assy.	0	500-5835-XX
ORDERING ABOVE (ITEM 15) ASSY. PART Nº WILL INCLUDE:			
15A	Sw. & Target Assy. Narrow	515-5967-XX	
Items 15B-F are identical to 12B-F.		Identical to 12B-F.	

* Note: Item 15A, is a riveted Sub-Assy. which includes the following items for reference:
 1— Stack Switch Square End (180-5132-00), 2— Washer 5/16" (242-5017-00),
 3— Rivet 1/8" x X 3/16" (249-5001-00) and 4— Narrow Target (545-5210-XX).

16	Basketball Stand-Up Target Assy.	10	500-6118-00
ORDERING ABOVE (ITEM 16) ASSY. PART Nº WILL INCLUDE:			
16A	Sw. & Target Assy. Basketball	515-6591-00	
Items 16B-F are identical to 12B-F.		Identical to 12B-F.	

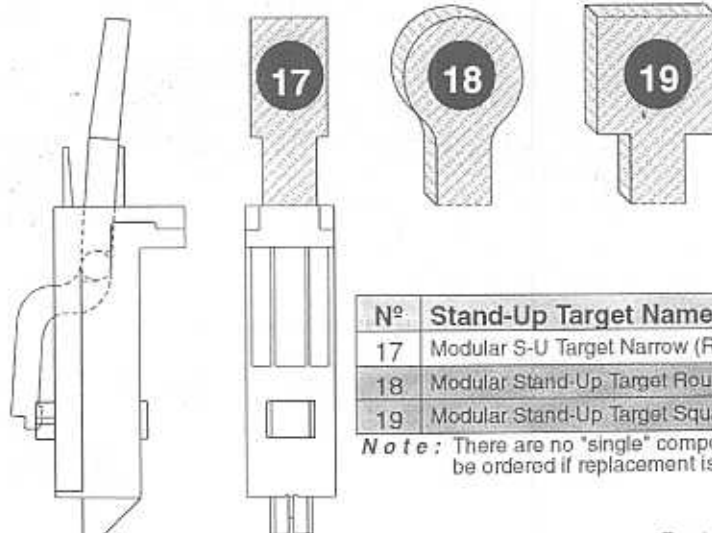
* Note: Item 16A, is a riveted Sub-Assy. which includes the following items for reference:
 1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
 3— Rivet 1/8" x X 3/16" (249-5001-00) and 4— Basketball Style Target (545-5723-XX).



Take Note:

- For switches used corresponding to the Switch Matrix Grid of this game, see Sec. 3, Chp. 2, ...Diagnostics.
- The "-XX" in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº for the color desired. Not all colors may be available.

See the Plastic Part Color Chart on the prev. page.



Nº	Stand-Up Target Name	QTY.	Part Nº
17	Modular S-U Target Narrow (RED)	2	500-6138-02
18	Modular Stand-Up Target Round	0	500-6075-XX
19	Modular Stand-Up Target Square	0	500-6139-XX

Note: There are no "single" components. The entire target must be ordered if replacement is necessary.

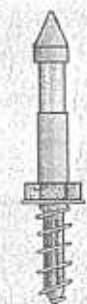
† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Metal Posts and Nuts (Actual Size) †

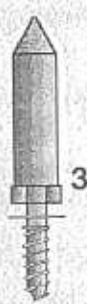


can use 3/16" Rubber Rings 545-5348-01

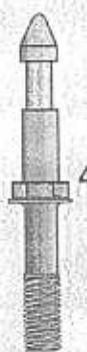
Item 1 Post used in pairs can use 3/4" through 3" Rubber Rings (See Rubber Parts for Part N's)



2

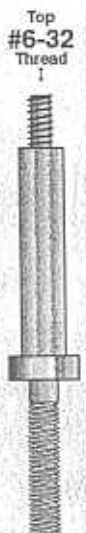


3



4

Bottom
#10-32
Thread



5

Top
#6-32
Thread
Bottom
#8-32
Thread



6

Top
#8-32
Thread
Bottom
#6-32
Thread



7A

Top
#6-32
Thread
Bottom
#6-32
Thread



7B

Shown Below:
• #6-32 Nylon Stop Nut:
240-5005-00



Top & Side Views

Not Shown:
• #6-32 Nylon Stop Nut
with 1/4" Hex Body:
240-5010-00
• #8-32 Nylon Stop Nut:
240-5102-00
• #10-32 Nylon Stop Nut:
240-5203-00

Shown Below:
• #6-32 KEPS Nut
(with Star Washer):
240-5008-00



Bottom & Side Views

Not Shown:
• #6-32 KEPS Nut
with 1/4" Hex Body:
240-5011-00
• #8-32 KEPS Nut:
240-5104-00
• #10-32 KEPS Nut:
240-5208-00

Shown Below:
• #6-32 T-Nut:
240-5002-00



Bottom & Side Views

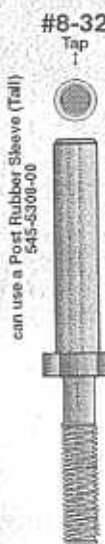
Not Shown:
• #6-32 T-Nut
with Side Cut Off:
240-5002-01
• #8-32 T-Nut:
240-5101-00
• #10-32 T-Nut:
240-5007-00
• #10-32 T-Nut
with Side Cut Off:
240-5205-00

Shown Below:
• #6-32 Hex Nut
(No Star Washer):
240-5004-00



Top View

Not Shown:
• #6-32 Hex Nut:
240-5003-00
• #10-32 Hex Nut:
240-5201-00



8A

can use a Post Rubber Sleeve (Tall)
545-5308-00

Bottom
#10-32
Thread



8B

can use a Post Rubber Sleeve (Tall)
545-5308-00

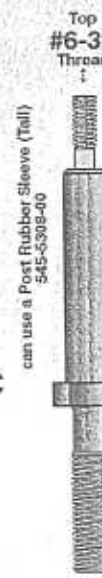
Bottom
#10-32
Thread



8C

can use a Post Rubber Sleeve (Tall)
545-5308-00

Bottom
#10-32
Thread



8D

can use a Post Rubber Sleeve (Tall)
545-5308-00

Bottom
#10-32
Thread



9

Bottom
#6-32
Thread



10

Bottom
#6-32
Thread



11

Bottom
#8-32
Thread

Section 4 | Parts

Nº	Metal Post Name	QTY.	Part Nº	Nº	Metal Post Name	QTY.	Part Nº
1	Stand-Off Double Groove Post (1 1/16")	0	530-5102-00	7B	Post #6-32 Top / Wood Screw Bottom	19	530-5010-02
2	Mini-Post Wood Screw	0	530-5004-00	8A	Post Hex Base #8-32 Tap/#10-32 Bot.	2	530-5332-01
3	Mini-Post Wood Screw (no cut away)	0	530-5004-01	8B	Post Hex Base (No Tap)/#10-32 Bot.	0	530-5332-00
4	Mini-Post #10-32 Bottom	6	530-5005-00	8C	Post Hex Base #8-32 Top/#10-32 Bot.	0	530-5332-02
5	Post #6-32 Top / #8-32 Bottom	0	530-5007-00	8D	Post Hex Base #6-32 Top/#10-32 Bot.	0	530-5332-03
6	Post #8-32 Top / #6-32 Bottom	3	530-5008-00	9	Post #6-32 Tap / #6-32 Bottom	0	530-5127-00
7A	Post #6-32 Top / #6-32 Bottom	30	530-5012-02	10	Post #6-32 Tap / Wood Screw Bottom	0	530-5263-01
				11	Playfield Support #8-32 Top/Bottom	0	530-5285-00

Some other nuts (Not Shown / Not Used with above posts):

• #10-24 T-Nut, 240-5200-00 • #10-24 Hex, 240-5202-00 • #10-24 Nylon Stop, 240-5206-00 • #10-24 KEPS, 240-5207-00
• #6-32 Acorn Cap (WHT), 240-5000-00 • #6-32 Acorn Cap (BLK), 240-5006-00 • #6-32 Wing, 240-5001-00 • #8-32 Wing, 240-5100-00



Playfield - Metal Spacers (Actual Size) †

Items 1-22 #6-32 Tap

1 $\frac{1}{4}"$

2 $\frac{3}{8}"$

3 $\frac{1}{2}"$

4 $\frac{5}{8}"$

5 $\frac{3}{4}"$

6 $\frac{7}{8}"$

7 1"

8 $1\frac{1}{8}"$

9 $1\frac{1}{4}"$

10 $1\frac{1}{2}"$

11 $1\frac{3}{4}"$

12 $1\frac{7}{8}"$

13 2"

14 $2\frac{1}{4}"$

15 $2\frac{3}{8}"$

16 $2\frac{1}{2}"$

17 $2\frac{5}{8}"$

18 $2\frac{3}{4}"$

19 3"

20 $3\frac{1}{8}"$

21 $3\frac{1}{2}"$

Items 23-26

23 4"

24 $4\frac{3}{8}"$

25 $4\frac{5}{16}"$

26 ‡

Note:
With Items 1-6, the tap goes through length of spacer.

With Items 7-26, the tap is up to $\frac{5}{8}"$ deep on each end.

Items 1-24 ($\frac{1}{4}"$ wide) Hex Spacer lengths not seen on this page ($\frac{13}{16}"$, $1\frac{1}{16}"$, $2\frac{1}{16}"$, $2\frac{3}{8}"$, $3\frac{1}{4}"$, $3\frac{7}{8}"$, $4\frac{1}{4}"$ and $4\frac{1}{2}"$ +) are currently not available.

Items 25-26 ($\frac{5}{16}"$ wide) Hex Spacer lengths & Items 27-33 Spacers are only available in the sizes as specified / shown.

‡ Note:
Item 26 is Not Shown due to space available. It is identical to Item 25, but is 6" in length (both Items 25 & 26 Hex Spacers are $\frac{5}{16}"$ wide vs. $\frac{1}{4}"$ wide Hex Spacers (Items 1-24)).

27 $\frac{1}{4}"$

28 $\frac{1}{2}"$

29 $\frac{9}{16}"$

30 $\frac{3}{4}"$

31 $1\frac{1}{8}"$

32 1"

33

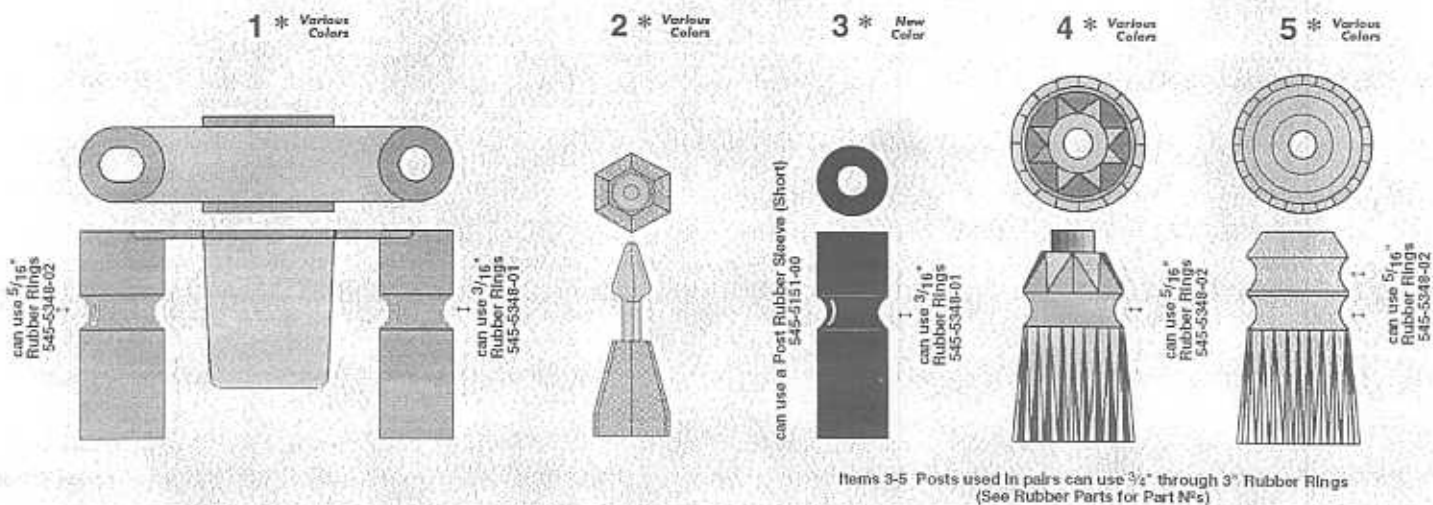
Note Part Number & Material Difference

A Standard USA 9" Ruler is available on the back cover.

† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Nº	Metal Spacer Name	QTY.	Part Nº	Nº	Metal Spacer Name	QTY.	Part Nº
1	$\frac{1}{4}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-00	18	$2\frac{3}{4}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-15
2	$\frac{3}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	3	254-5008-12	19	3" X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	2	254-5008-14
3	$\frac{1}{2}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	10	254-5008-03	20	$3\frac{1}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	1	254-5008-19
4	$\frac{5}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	1	254-5008-02	21	$3\frac{1}{2}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-27
5	$\frac{3}{4}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	3	254-5008-04	22	$3\frac{5}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-25
6	$\frac{7}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-05	23	4" X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	2	254-5008-21
7	1" X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	2	254-5008-06	24	$4\frac{3}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	1	254-5008-29
8	$1\frac{1}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	1	254-5008-17	25	$4\frac{5}{16}"$ X $\frac{5}{16}"$ Hex Spacer #6-32 Tap	0	254-5018-00
9	$1\frac{1}{4}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-11	26	6" X $\frac{5}{16}"$ Hex Spacer #6-32 Tap	4	254-5018-02
10	$1\frac{1}{2}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	2	254-5008-09	27	$\frac{1}{4}"$ X $\frac{5}{16}"$ X .144" I.D. Spacer Tap.	0	254-5014-03
11	$1\frac{3}{4}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	2	254-5008-10	28	$\frac{1}{2}"$ X $\frac{5}{16}"$ X .144" I.D. Spacer Tap.	0	254-5014-00
12	$1\frac{7}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-20	29	$\frac{9}{16}"$ X $\frac{5}{16}"$ X .144" I.D. Spacer Tap.	0	254-5014-04
13	2" X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	4	254-5008-07	30	$\frac{3}{4}"$ X $\frac{5}{16}"$ X .144" I.D. Spacer Tap.	0	254-5014-01
14	$2\frac{1}{4}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-18	31	$1\frac{1}{8}"$ X $\frac{5}{16}"$ X .144" I.D. Spacer Tap.	0	254-5014-02
15	$2\frac{3}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	1	254-5008-28	32	1" X $\frac{5}{16}"$ X .144" I.D. Spacer Tap.	0	254-5001-00
16	$2\frac{1}{2}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	1	254-5008-16	33	Spacer (for Backbox Hinge)	6	530-5099-00
17	$2\frac{5}{8}"$ X $\frac{1}{4}"$ Hex Spacer #6-32 Tap	0	254-5008-08				

Playfield - Plastic Posts and Spacers (Actual Size) †

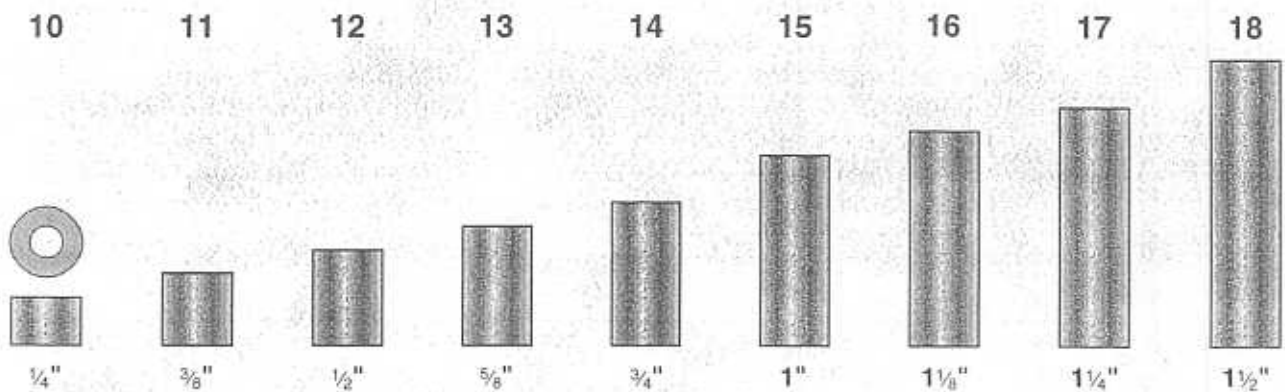
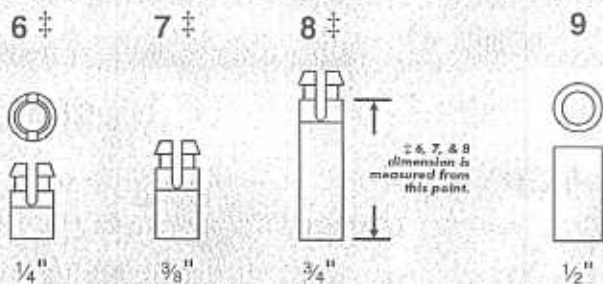


Take Note:

- * Items 1-2 and 4-5 come in various colors, see the Plastic Part Color Chart at the end of Section 4, Chapter 2. Replace the last 2-digits (or -XX) with desired color replacement (These posts may not be available in every color.) Item 3 is currently available in Orange for this game only; normally it is Black.

- ‡ Items 6, 7 & 8 (Light Board Spacers) dimensions are measured from bottom to just under cut-away (see pictorial to the right).

- Items 10-18 Spacers are used in conjunction with Metal Posts (see Items 6, 7A & 7B on that page) and/or a #6-32 1 3/4" PPH Screw (237-5511-00) with a #6-32 Nylon Stop Nut (240-5005-00). These items are only available in the sizes specified / shown.

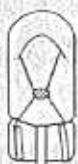


N ^o	Plastic Post/Spacer Name	QTY.	Part N ^o	N ^o	Plastic Post/Spacer Name	QTY.	Part N ^o
1 *	Top Lane Mini-Light Hood	0	550-5061-XX	10	1/4" X 3/8" Spacer Gray	2	254-5000-02
2 *	Mini-Jewel Post	0	550-5052-XX	11	3/8" X 3/8" Spacer Gray	0	254-5000-12
3 *	1 1/16" Single Groove Post (Orange)	68	550-5059-07	12	1/2" X 3/8" Spacer Gray	1	254-5000-01
4 *	Single Groove Jewel Post	0	550-5034-XX	13	3/8" X 3/8" Spacer Gray	0	254-5000-14
5 *	Double Groove Jewel Post	0	545-5209-XX	14	3/4" X 3/8" Spacer Gray	4	254-5000-07
6 ‡	1/4" Slf. Rtn. Spacer White	0	254-5007-02	15	1" X 3/8" Spacer Gray	2	254-5000-04
7 ‡	3/8" Slf. Rtn. Spacer White	21	254-5007-01	16	1 1/8" X 3/8" Spacer Gray	0	254-5000-06
8 ‡	1/2" Slf. Rtn. Spacer White	0	254-5007-03	17	1 1/4" X 3/8" Spacer Gray	0	254-5000-05
9	1 1/2" X 1/4" Spacer White (Narrow)	0	254-5000-03	18	1 1/2" X 3/8" Spacer Gray	3	254-5000-08

† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Playfield - Wedge Base Bulbs, Sockets and Misc. Bulbs (Actual Size) †

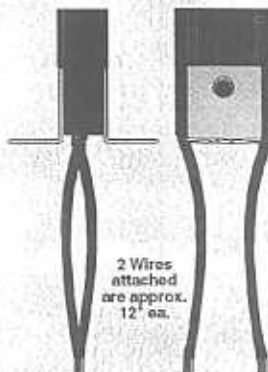
A
#555



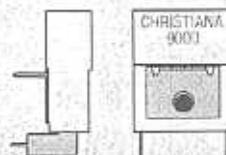
1
This socket is normally used on Light Boards to position bulbs vertically. (Use w/#555 & #906 Bulbs.)



2
This socket is normally used in Pop Bumpers. (Use #555 Bulbs only.)

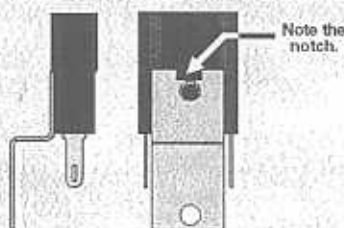


3
This socket is normally used on Light Boards to position bulbs horizontally. (Use w/#555 & #906 Bulbs.)

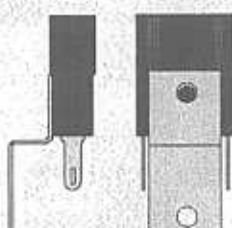


Replacement Note:
Socket color may be either black or white.

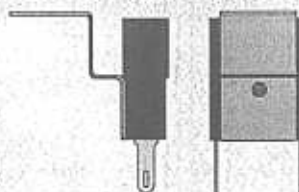
4
This socket is normally used with Reflectors.



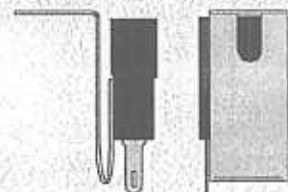
5



6



7

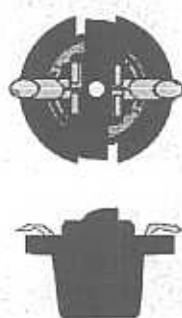


Replacement Note:
If this style socket is desired, order Item 6 for replacement. This socket is not available.

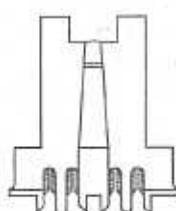
B
#906



8
This socket is sometimes used in conjunction with Mini-Mars or special Butyrate assemblies.



9
This socket was used with an alternate Insert using Insulation Displacement Connection vs. a Soldered-On Connection.



C
Neon



This Neon Bulb is used with Motors for voltage spike suppression.

D
OPTO LED



This OPTO LED (Ultra Bright Red) is used on OPTO Boards only.

† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Nº	#555 Bulb & Socket Name	QTY.	Part Nº	Nº	#906 Bulb & Socket Name	QTY.	Part Nº
A	#555 Wedge Base Bulb	44	165-5002-00	B	#906 Wedge Base Bulb	9	165-5004-00
1	#555 Wedge Base (WB) Socket	9	077-5007-00	8	#906 Wedge Base Socket	0	077-5016-00
2	Turbo Pop Bumper Socket	3	077-5206-00	9	#555/#906 IDC Wedge Base Socket	0	077-5110-00
3	Light Board Laydown WB Socket	35	077-5207-00				
4	Laydown WB Socket (with notch)	6	077-5026-01	Nº	Miscellaneous Bulb Name	QTY.	Part Nº
5	Laydown WB Socket (without notch)	0	077-5026-00	C	Neon NE-2 Bulb (used with Motors)	0	165-5021-00
6	WB Offset Socket (Step-Bracket)	0	077-5029-00	D	LED (MT5000UR) Ultra Bright OPTO	2	165-5100-00
7	WB Offset Socket (use Item 6)	0	077-5029-01				

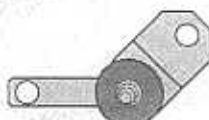
See start of this chapter for Fluor. Bulb & assoc. parts.

Playfield - Small Bayonet Type Bulb and Sockets (Actual Size) †

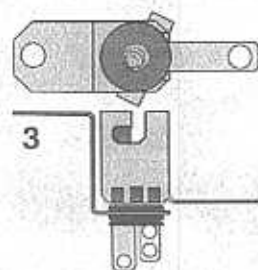
**A
#44**



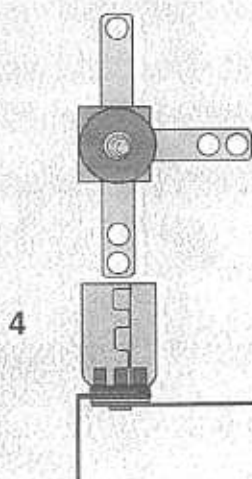
1



2



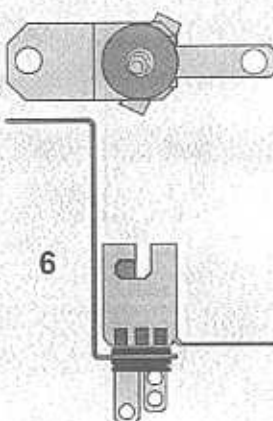
3



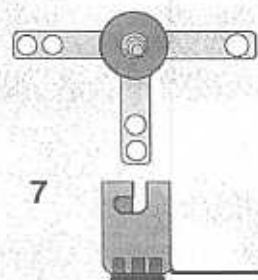
4



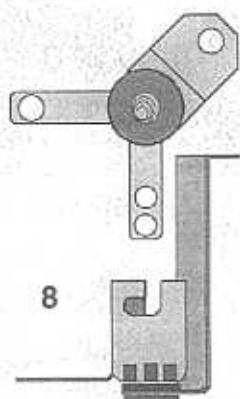
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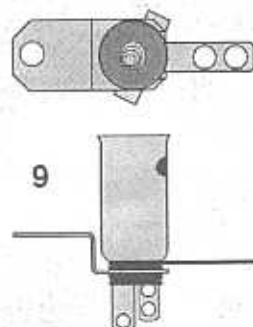
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7

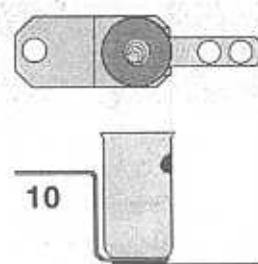
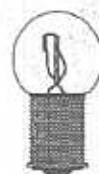


8



9

**B
#455**



10

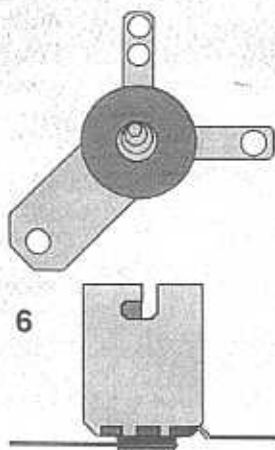
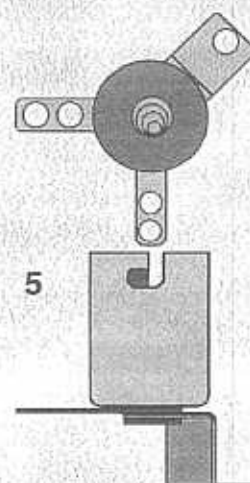
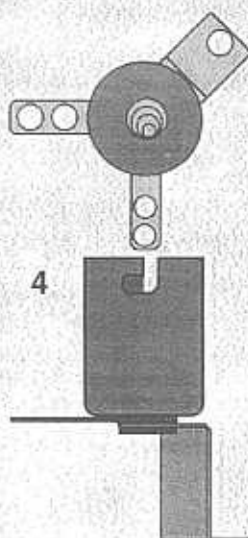
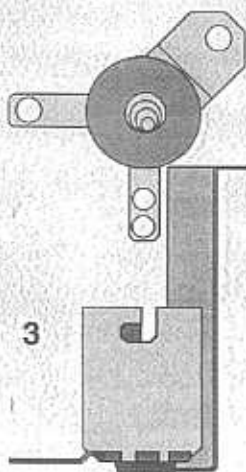
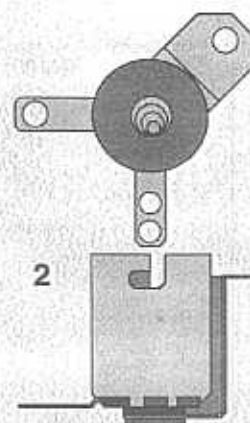
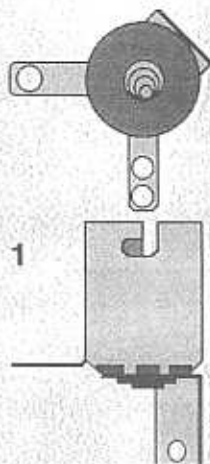
This bulb is normally used in conjunction with this socket (Item 10), but can be used with the other sockets (Items 1-9).

† Items with QTY. are not used in this game. Size and/or quantities may change during production.

Nº	#44 Bulb & Socket Name	QTY.	Part Nº	Nº	#44 Socket Name	QTY.	Part Nº
A	#44 Bulb	66	165-5000-44	7	3-Lug Staple Down Socket	0	077-5001-00
1	2-Lug Staple Down Socket	42	077-5000-00	8	2-Lug Stand-Up Long Socket	0	077-5005-00
2	2-Lug Stand-Up Short Socket	0	077-5002-00	9	3-Lug Stand-Up Long Shell Socket	0	077-5013-00
3	3-Lug Stand-Up Short Socket	0	077-5008-00				
4	3-Lug Laydown Socket	1	077-5006-00	Nº	#455 Bulb & Socket Name	QTY.	Part Nº
5	2-Lug Laydown Socket	0	077-5003-00	B	#455 Twinkle Bulb	0	165-5003-00
6	3-Lug Stand-Up Long Socket	23	077-5009-00	10	1-Lug Stand-Up Long Shell Socket	0	077-5012-00

Playfield - Large Bayonet Type Bulb and Sockets (Actual Size) †

C
#89



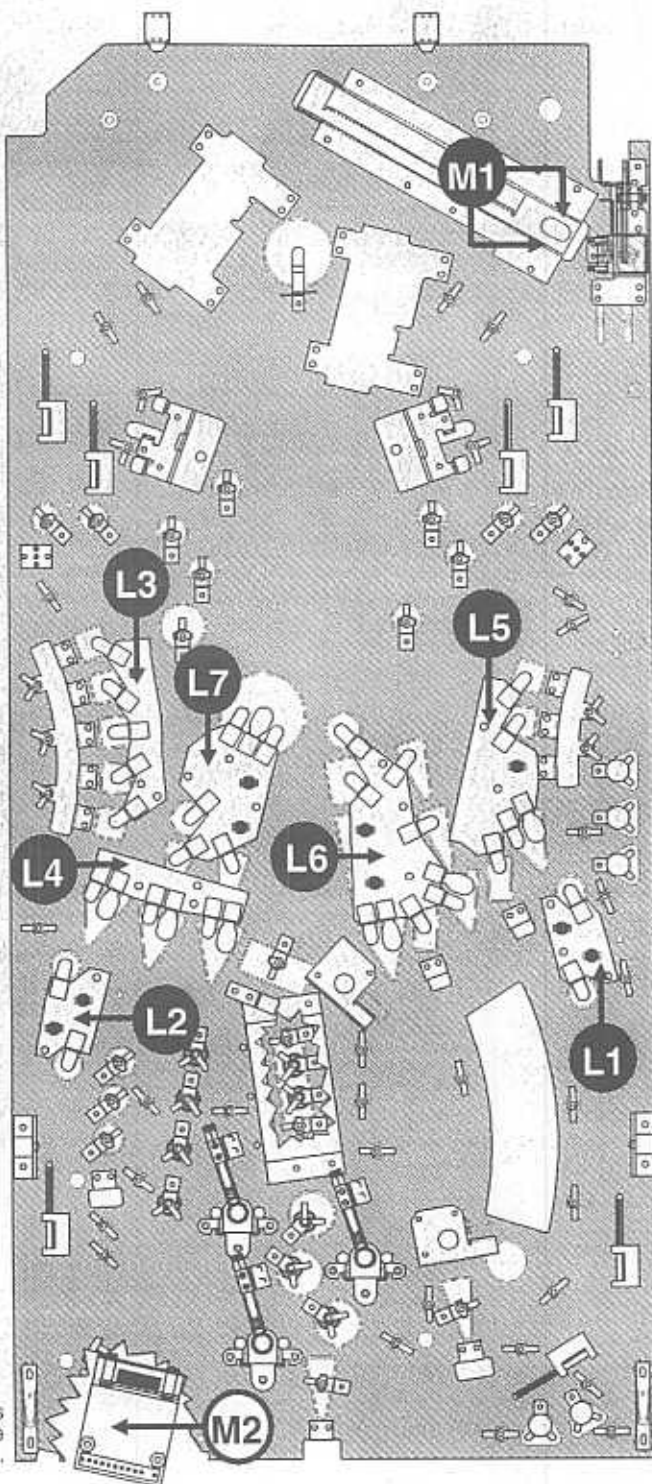
† Items with Ø Qty. are not used in this game.
Size and/or quantities may change during production.

Nº	#89 Bulb & Socket Name	QTY.	Part Nº	Nº	#89 Socket Name	QTY.	Part Nº
C	#89 Bulb	14	165-5000-89	3	2-Lug Stand-Up Long Socket	5	077-5102-00
1	Laydown Standard Socket	0	077-5100-00	4	Stand-Up Socket Rev. Short	0	077-5103-00
2	2-Lug Stand-Up Short Socket	2	077-5101-00	5	2-Lug Stand-Up Small Socket	7	077-5106-00
				6	Straight Leg Socket	0	077-5107-00

Playfield - Light and Miscellaneous Boards

Playfield is shown in the "Up Position" as leaning against the Backbox.

Nº	Light Board Name	SPI Part Nº
L1	Space Jam Light Board Assembly - 1	515-6592-01-43
ORDERING ABOVE (ITEM L1) ASSEMBLY PART Nº WILL INCLUDE:		
—	Light Board -01	520-5151-01
—	#555 Wedge Base Socket (Qty. 2)	077-5007-00
—	#555 Wedge Base Bulb (Qty. 4)	165-5002-00
—	Laydown Wedge Base Socket (Qty. 2)	077-5207-00
—	Spacer 3/8" Plastic Slf. Rtn. (Qty. 3)	254-5007-01
L2	Space Jam Light Board Assembly - 2	515-6592-02-43
ORDERING ABOVE (ITEM L2) ASSEMBLY PART Nº WILL INCLUDE:		
—	Light Board -02	520-5151-02
—	#555 Wedge Base Socket (Qty. 2)	077-5007-00
—	#555 Wedge Base Bulb (Qty. 4)	165-5002-00
—	Laydown Wedge Base Socket (Qty. 2)	077-5207-00
—	Spacer 3/8" Plastic Slf. Rtn. (Qty. 2)	254-5007-01
L3	Space Jam Light Board Assembly - 3	515-6592-03-43
ORDERING ABOVE (ITEM L3) ASSEMBLY PART Nº WILL INCLUDE:		
—	Light Board -03	520-5151-03
—	#555 Wedge Base Bulb (Qty. 5)	165-5002-00
—	Laydown Wedge Base Socket (Qty. 5)	077-5207-00
—	Spacer 3/8" Plastic Slf. Rtn. (Qty. 3)	254-5007-01
L4	Space Jam Light Board Assembly - 4	515-6592-04-43
ORDERING ABOVE (ITEM L4) ASSEMBLY PART Nº WILL INCLUDE:		
—	Light Board -04	520-5151-04
—	#555 Wedge Base Bulb (Qty. 3)	165-5002-00
—	Laydown Wedge Base Socket (Qty. 6)	077-5207-00
—	#906 Wedge Base Bulb (Qty. 3)	165-5004-00
—	Spacer 3/8" Plastic Slf. Rtn. (Qty. 3)	254-5007-01
L5	Space Jam Light Board Assembly - 5	515-6592-05-43
ORDERING ABOVE (ITEM L5) ASSEMBLY PART Nº WILL INCLUDE:		
—	Light Board -05	520-5151-05
—	#555 Wedge Base Socket	077-5007-00
—	#555 Wedge Base Bulb (Qty. 5)	165-5002-00
—	Laydown Wedge Base Socket (Qty. 5)	077-5207-00
—	#906 Wedge Base Bulb	165-5004-00
—	Spacer 3/8" Plastic Slf. Rtn. (Qty. 2)	254-5007-01
L6	Space Jam Light Board Assembly - 6	515-6592-06-43
ORDERING ABOVE (ITEM L6) ASSEMBLY PART Nº WILL INCLUDE:		
—	Light Board -06	520-5151-06
—	#555 Wedge Base Socket (Qty. 2)	077-5007-00
—	#555 Wedge Base Bulb (Qty. 9)	165-5002-00
—	Laydown Wedge Base Socket (Qty. 9)	077-5207-00
—	#906 Wedge Base Bulb (Qty. 2)	165-5004-00
—	Spacer 3/8" Plastic Slf. Rtn. (Qty. 3)	254-5007-01
L7	Space Jam Light Board Assembly - 7	515-6592-07-43
ORDERING ABOVE (ITEM L7) ASSEMBLY PART Nº WILL INCLUDE:		
—	Light Board -07	520-5151-07
—	#555 Wedge Base Socket (Qty. 2)	077-5007-00
—	#555 Wedge Base Bulb (Qty. 7)	165-5002-00
—	Laydown Wedge Base Socket (Qty. 6)	077-5207-00
—	#906 Wedge Base Bulb	165-5004-00
—	Spacer 3/8" Plastic Slf. Rtn. (Qty. 3)	254-5007-01



This PCB Board on the 24-Second Clock Assembly is actually mounted in the cabinet; it is shown in the area it is seen when the playfield is down.

Take Note:

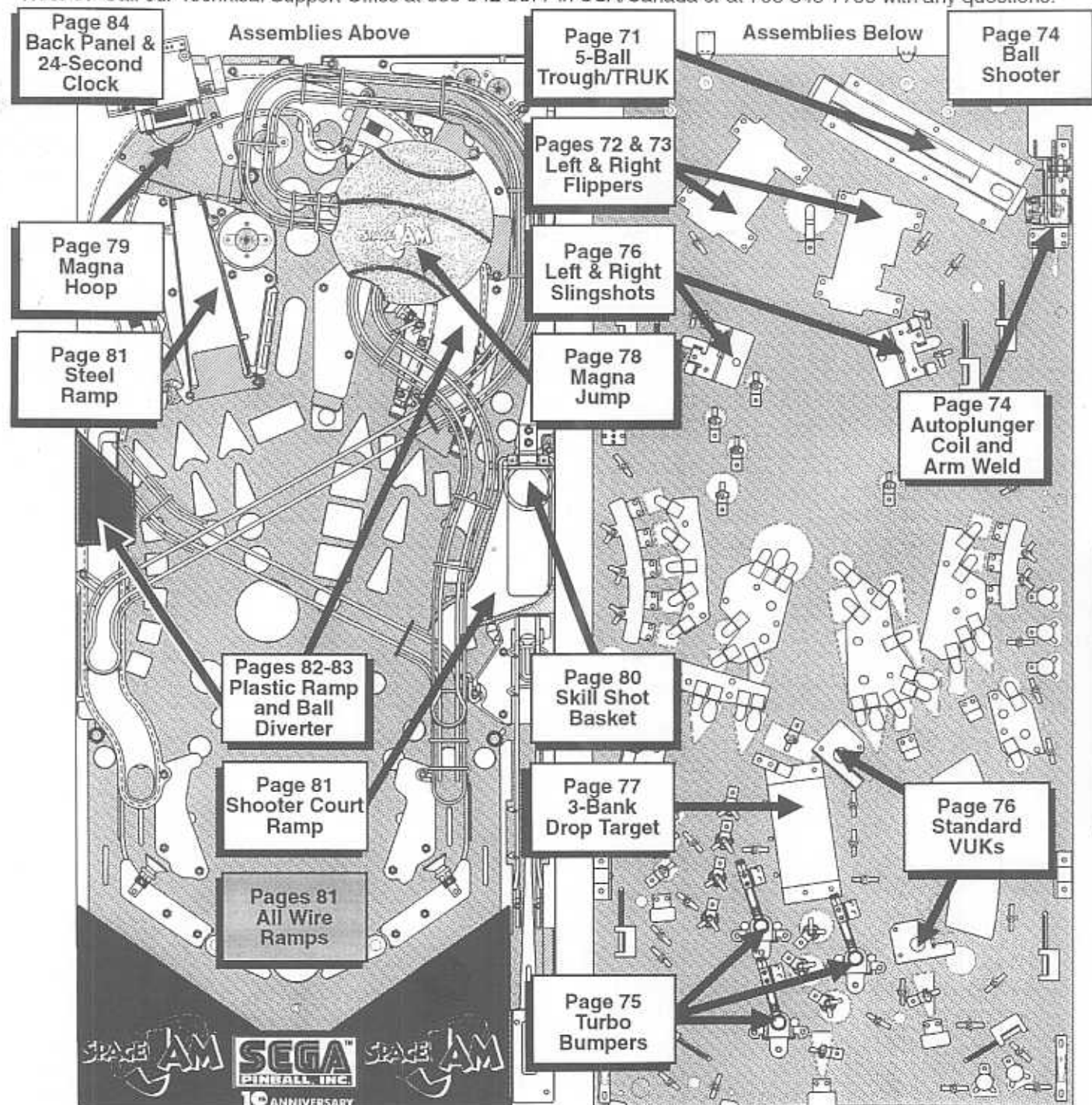
Nº	Miscellaneous Board Name	SPI Part Nº
M1	5-Ball Trough VUK OPTO TRANS REC	520-5124-00
M2	24-Second PCB Board	520-5153-00

- Individual Light Boards can only be ordered as assemblies.
- Sockets, bulbs & spacers may be ordered separately.
- For pictorials of Sockets, Bulbs & Spacers, view previous pages.
- Legend Note:** Items noted with a white circle (①) are mounted above. Items noted with a black circle (●) are mounted below.

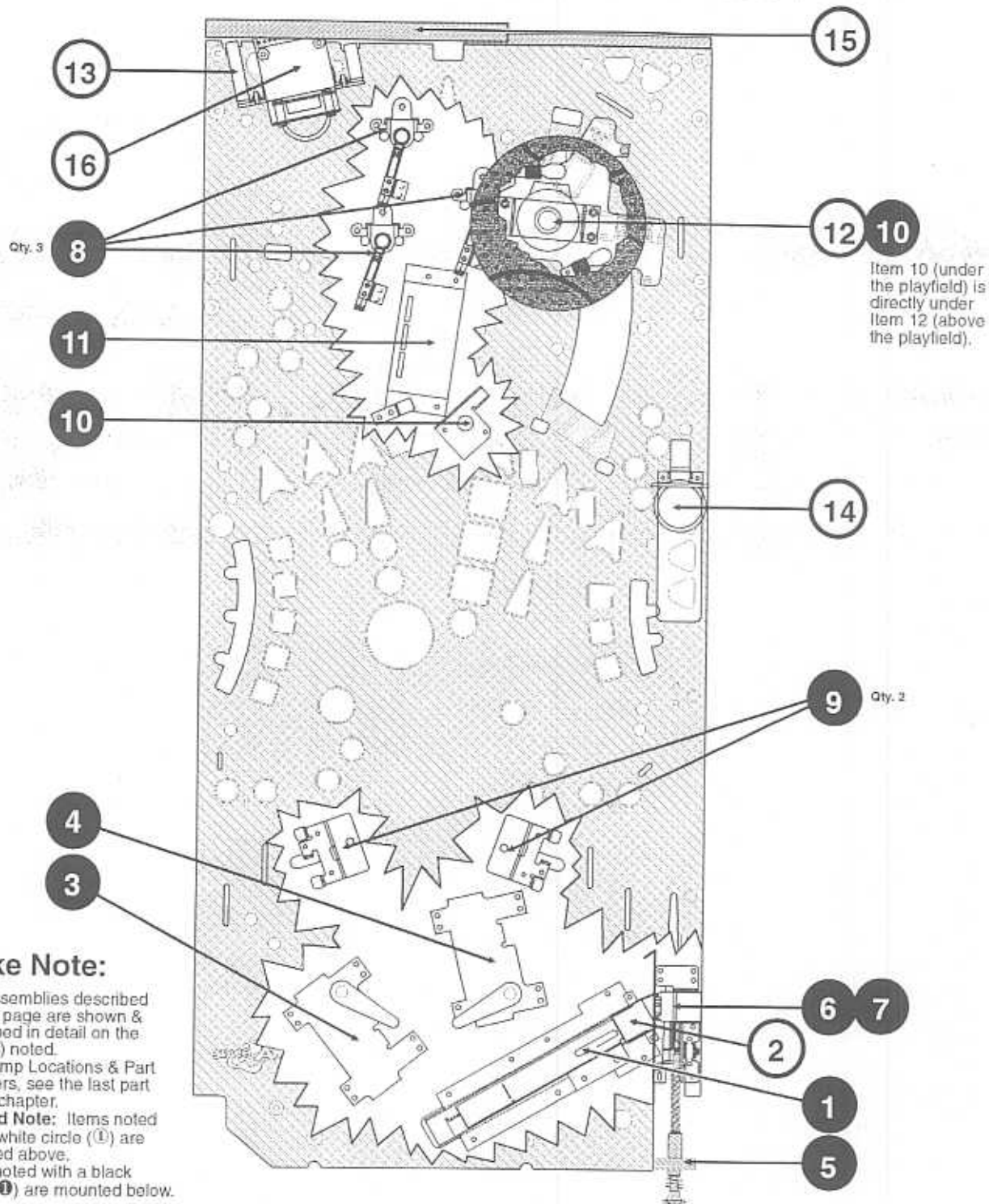
Drawings for Major Assemblies & Ramps (The Blue Pages)

Overview

Drawings are provided for the Major Assemblies in this game. Individual parts of each assembly are numbered, describing the name, quantity & part number. Where multiple parts are riveted and/or assembled as sub-assemblies, the sub-assembly needs to be ordered. **Note 1:** The Turbo Pop Bumpers are only available as individual pieces. **Note 2:** Minor changes may be made during production (e.g. coil size, addition/deletion of minor parts). Always verify the part to be replaced with the Part N° and/or description as noted. Replacement parts may be substituted with revised parts which may have a different Part N°. **Note 3:** Items noted with a white circle (⊙) are mounted above the playfield and items noted with a black circle (●) are mounted below. **Note 4:** Look in the Pink Pages: Chapter 1, of this section for general part numbers or items not described in this chapter. **Note 5:** Call our Technical Support Office at 800-542-5377 in USA/Canada or at 708-345-7700 with any questions.



Major Assemblies - Locations & Part Numbers †



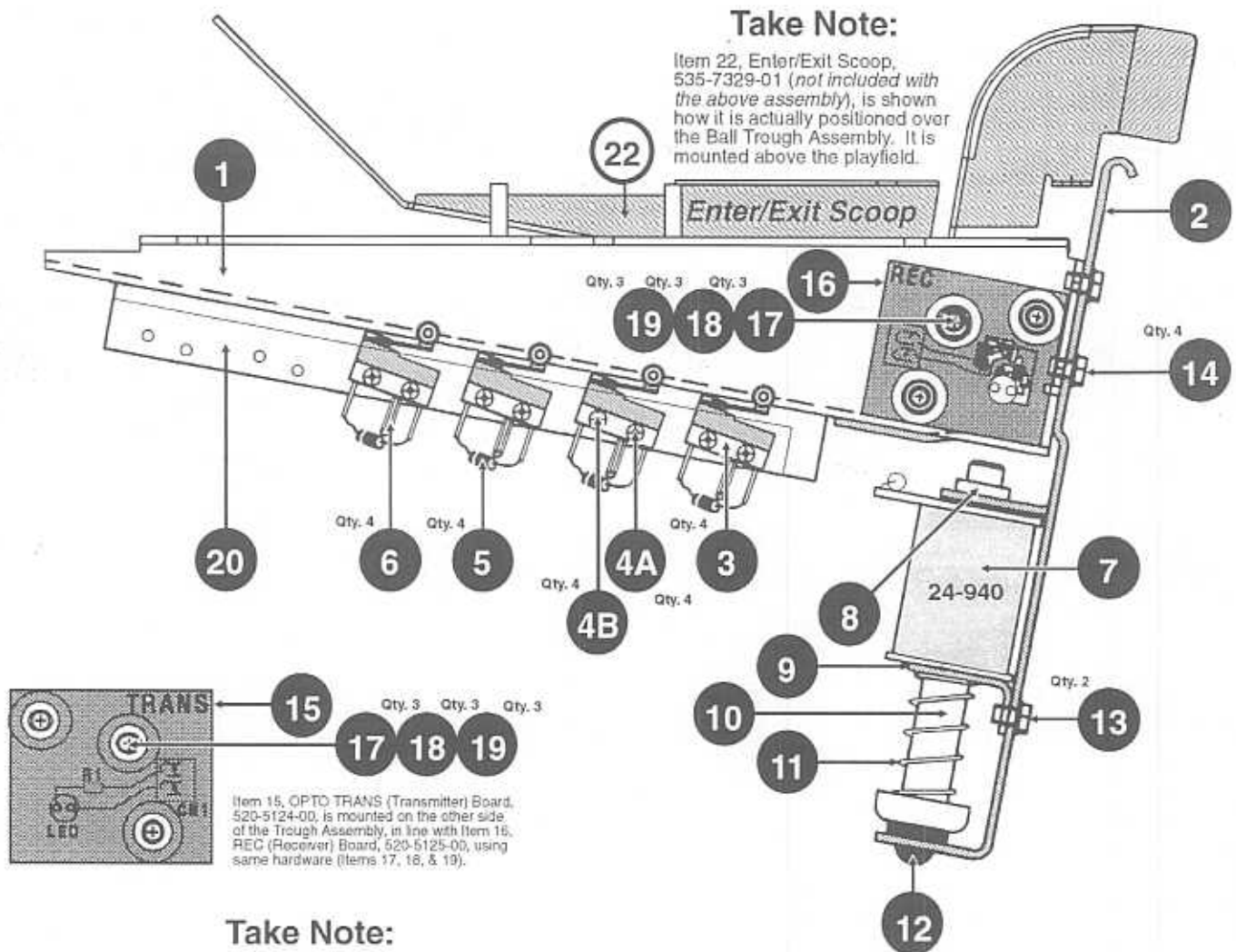
Take Note:

- † The assemblies described on this page are shown & described in detail on the page(s) noted.
- For Ramp Locations & Part Numbers, see the last part of this chapter.
 - Legend Note:** Items noted with a white circle (○) are mounted above. Items noted with a black circle (●) are mounted below.

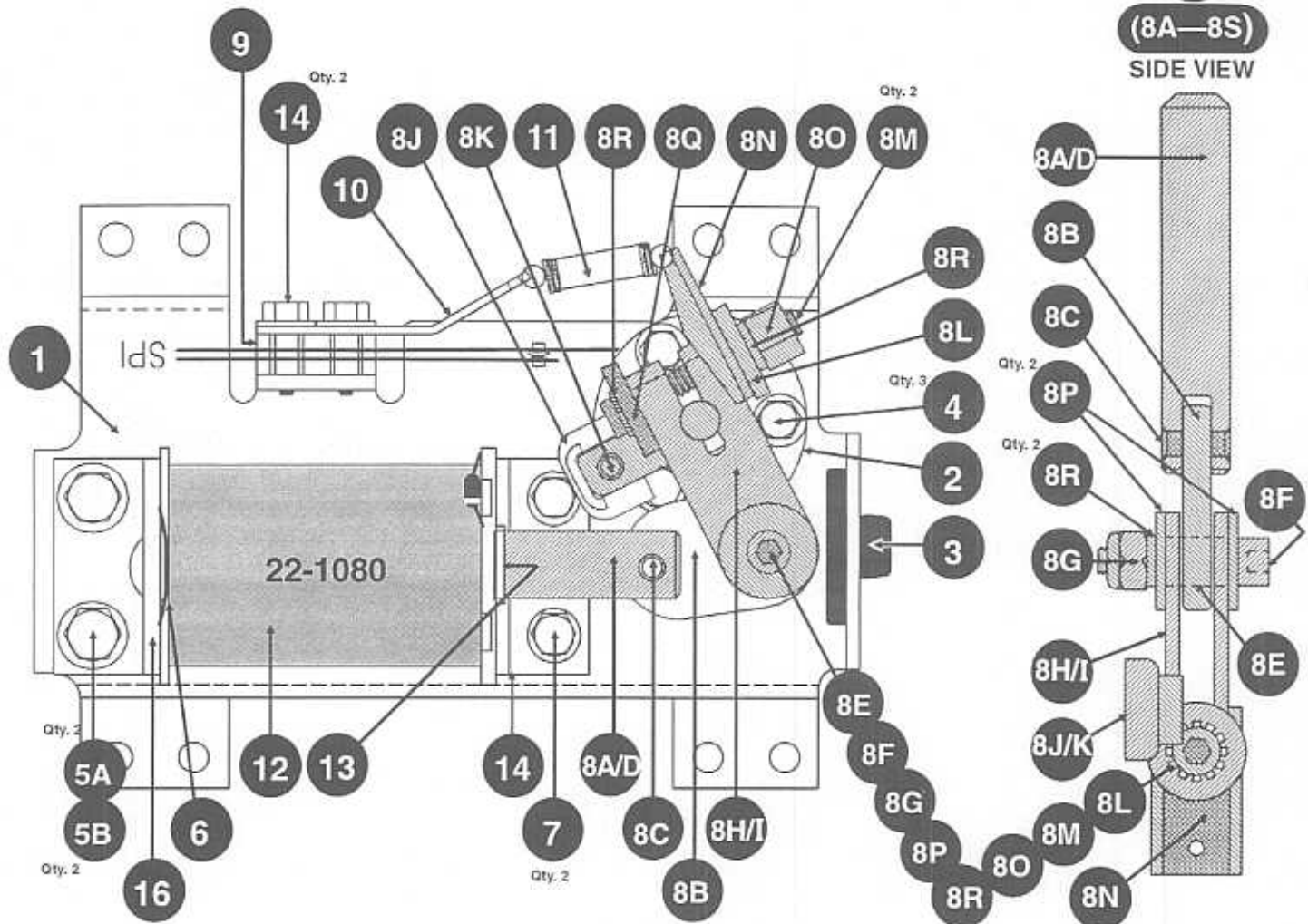
Nº	Assembly Name	PG.†	Part Nº	Nº	Assembly Name	PG.†	Part Nº
1	5-Ball Trough (OPTO) Assembly	pg 71	500-6119-15	9	Slingshot (Lt. & Rt.) Assy. (Qty. 2)	pg 76	500-5849-01
2	Ball Trough Enter/Exit Scoop Assy.	pg 71	535-7329-01	10	Standard VUK Assy. (Qty. 2)	pg 76	500-5839-01
3	Flipper (Left) Assembly	pg 72	500-5944-12	11	3-Bank Drop Target Assembly	pg 77	500-6150-00-43
4	Flipper (Right) Assembly	pg 73	500-5944-01	12	Magna Jump Assembly	pg 78	500-6134-00-43
5	Ball Shooter Assembly	pg 74	500-6146-00	13	Magna Hoop Assembly	pg 79	500-6114-00-43
6	Autoplunger Coil Assembly	pg 74	500-6092-00	14	Skill Shot Basket Assembly	pg 80	500-6125-00-43
7	Autoplunger Arm Weld Assembly	pg 74	500-6091-00	15	Cabinet Back Panel	pg 84	515-6558-00-43
8	Turbo Bumper Ind. Parts (Qty. 3)	pg 75	Individual Parts Only	16	24-Second Shot Clock Assembly	pg 84	500-6155-00-43

Note: For Ramps - Locations & Part Nºs see pages 81-83.

5-Ball Trough (OPTO) Assembly, 500-6119-15 (Items 1-21) and Ball Trough Enter/Exit Scoop, 535-7329-01 (Item 22)



Flipper (Left) Assembly, 500-5944-12 (Items 1-16)



Section 4 | Drawings

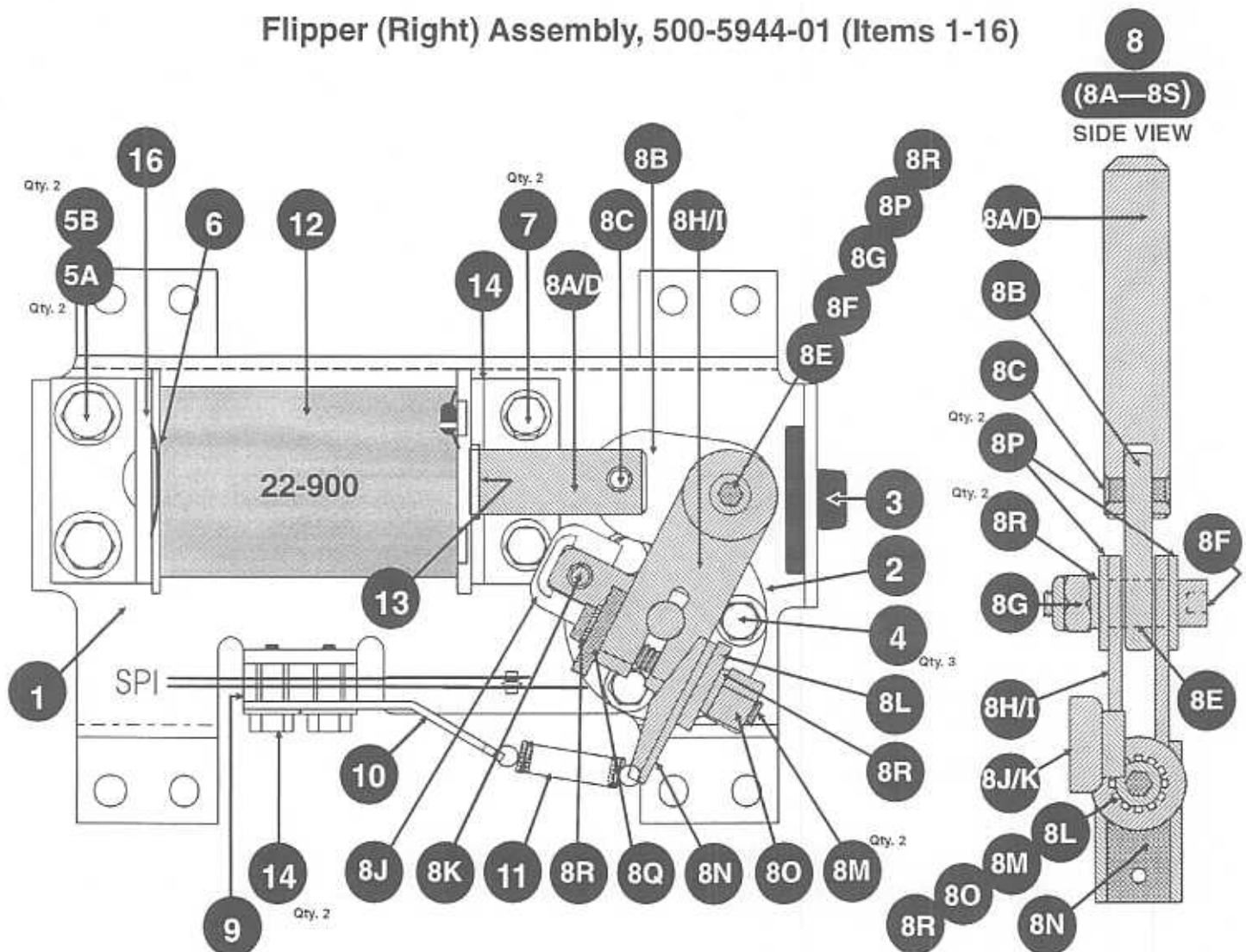
Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Flipper Base (Left)	535-7275-01	9	Power (End of Stroke) Switch	180-5149-00
2	Flipper Bushing	545-5594-00	10	Switch Plate/Spring Return Left Bracket	535-7354-01
3	Deflector Pad (Bumper)	545-5428-00	11	Flipper Return Spring	265-5035-00
4	#6-32 X .38\" HWH TF SWAGE (Qty.3)	237-5976-02	12	Coil, 22-1080 (YEL-GRN)	090-5032-00T
5A	#10-32 X .38\" HWH SWAGE (Qty. 2)	237-5985-00	ORDERING ABOVE (ITEM 12) COIL PART Nº WILL INCLUDE:		
5B	#10 Lock Washer (Qty. 2)	246-5002-00	—	Diode, 1N4004 (positioned at top)	112-5003-00
6	Spring Washer	269-5002-00	13	Coil Sleeve	545-5388-00
7	#8-32 X .38\" HWH TF SWAGE (Qty. 2)	237-5975-00	14	Coil Support Bracket	535-7356-00
8	Plunger, Link & Pawl (Left) Sub-Assy.	515-6518-01	15	#6-32 X 5/8\" HWH SWAGE (Qty.2)	237-5976-04
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:			16	Coil Stop Sub-Assembly	515-6308-01
8A	Flipper Plunger/Link Assembly (ordering 8A includes 8B-8D)	515-6304-01	ORDERING ABOVE (ITEM 16) SUB-ASSY. PART Nº WILL INCLUDE:		
8B	Flipper Link	545-5611-00	—	Coil Stop with with .093\" ø Hole	530-5350-01
8C	Sprol Pin ø 5/32\" X 7/16\" Lg.	251-5015-01	—	Shading Ring	530-5123-00
8D	Flipper Plunger with Flat	530-5349-01	—	Coil Stop Bracket	535-7355-00
8E	Extended Flipper Bushing	530-5139-01	ASSOCIATED PART(S) NOT INCLUDED WITH THE ABOVE ASSEMBLY		
8F	#10-32 X 7/8\" Lg. SOC HD	237-5966-00	Nº	Associated Part Name	SPI Part Nº
8G	#10-32 Nylon Stop Nut	240-5203-00	n/a *	Flipper & Shaft Assy. White with Sega Saturn™ Logo ©1996	515-5133-08-05
8H	Pawl (Mounting Link) (Left) Sub-Assy.	515-6305-01	n/a *	Large Flipper Rubber Ring	545-5277-00
8I	Pawl (Mounting Link) (Left) Plain	535-7271-01			
8J	Switch Actuator	545-5612-00			
8K	Rivet 1/8\" ø X 1/4\" Lg.	249-5003-00			
8L	Washer .105\" THK .203\" I.D. X .63\" O.D.	242-5039-00			
8M	#10-32 SOC HD X 1.25\" Lg. (Qty. 2)	237-5950-01			
8N	Return Bracket	535-7353-00			
8O	#10-32 X 9/32\" Long 3/8\" Hex Nut	240-5209-00			
8P	Wshr. .06\" THK (same I.D./O.D.) (Qty. 2)	242-5038-00			
8Q	Washer .105\" THK .203\" I.D. X .63\" O.D.	242-5039-01			
8R	#10 Star Washer (Qty. 3)	246-5002-00			

Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.

- IMPORTANT:** When replacing Item 8B, Flipper Link, we advise replacing with entire Item 8A, Flipper Plunger/ Link Assembly due to overall wear & tear.
- +++ Check all other components and replace as required. +++

Flipper (Right) Assembly, 500-5944-01 (Items 1-16)



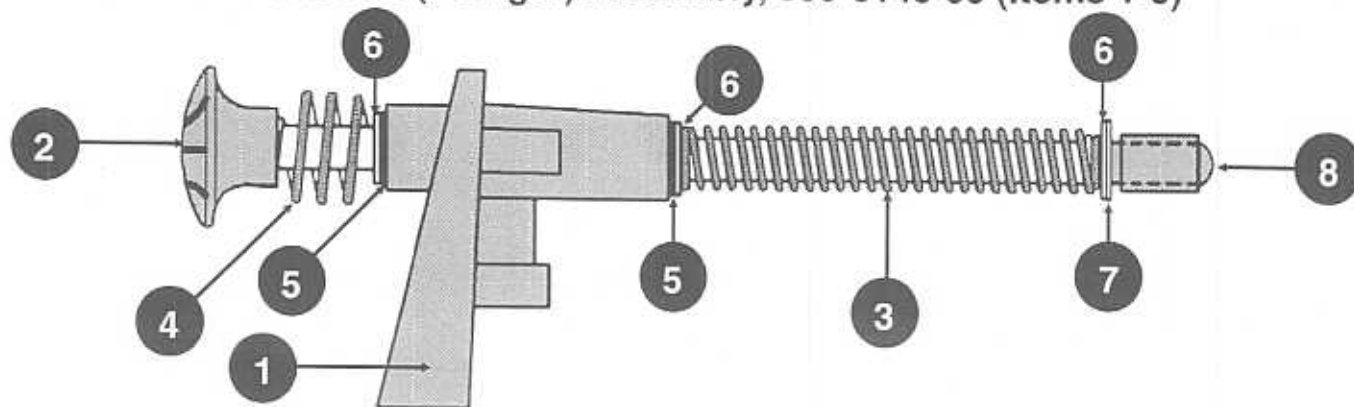
Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Flipper Base (Right)	535-7275-00	9	Power (End of Stroke) Switch	180-5149-00
2	Flipper Bushing	545-5594-00	10	Switch Plate/Spring Return Right Bracket	535-7354-00
3	Deflector Pad (Bumper)	545-5428-00	11	Flipper Return Spring	265-5035-00
4	#6-32 X .38" HWH TF SWAGE (Qty.3)	237-5976-02	12	Coil, 22-900 (YEL)	090-5020-20T
5A	#10-32 X .38" HWH SWAGE (Qty. 2)	237-5985-00	ORDERING ABOVE (ITEM 12) COIL PART Nº WILL INCLUDE:		
5B	#10 Lock Washer (Qty. 2)	246-5002-00	—	Diode, 1N4004 (positioned at top)	112-5003-00
6	Spring Washer	269-5002-00	13	Coil Sleeve	545-5388-00
7	#8-32 X .38 HWH TF SWAGE (Qty. 2)	237-5975-00	14	Coil Support Bracket	535-7356-00
8	Plunger, Link & Pawl (Right) Sub-Assy.	515-6518-00	15	#6-32 X 5/8" HWH SWAGE (Qty.2)	237-5976-04
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:			16	Coil Stop Sub-Assembly	515-6308-01
8A	Flipper Plunger/Link Assembly (ordering 8A includes 8B-8D)	515-6304-01	ORDERING ABOVE (ITEM 16) SUB-ASSY. PART Nº WILL INCLUDE:		
8B	Flipper Link	545-5611-00	—	Coil Stop with with .093" ø Hole	530-5350-01
8C	Sprocket Pin ø 5/32" X 7/16" Lg.	251-5015-01	—	Shading Ring	530-5123-00
8D	Flipper Plunger with Flat	530-5349-01	—	Coil Stop Bracket	535-7355-00
8E	Extended Flipper Bushing	530-5139-01	ASSOCIATED PART(S) NOT INCLUDED WITH THE ABOVE ASSEMBLY		
8F	#10-32 X 7/8" Lg. SOC HD	237-5966-00	Nº	Associated Part Name	SPI Part Nº
8G	#10-32 Nylon Stop Nut	240-5203-00	n/a *	Flipper & Shaft Assy. White with Sega Saturn™ Logo ©1996	515-5133-08-05
8H	Pawl (Mounting Link) (Right) Sub-Assy.	515-6305-00	n/a *	Large Flipper Rubber Ring	545-5277-00
8I	Pawl (Mounting Link) (Right) Plain	535-7271-00			
8J	Switch Actuator	545-5612-00			
8K	Rivet 1/8" ø X 1/4" Lg.	249-5003-00			
8L	Washer .105" THK .203" I.D. X .63" O.D.	242-5039-00			
8M	#10-32 SOC HD X 1.25" Lg. (Qty. 2)	237-5950-01			
8N	Return Bracket	535-7353-00			
8O	#10-32 X 9/32" Long 3/8" Hex Nut	240-5209-00			
8P	Wshr. .06" THK (same I.D./O.D.) (Qty. 2)	242-5038-00			
8Q	Washer .105" THK .203" I.D. X .63" O.D.	242-5039-01			
8R	#10 Star Washer (Qty. 3)	246-5002-00			

Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.

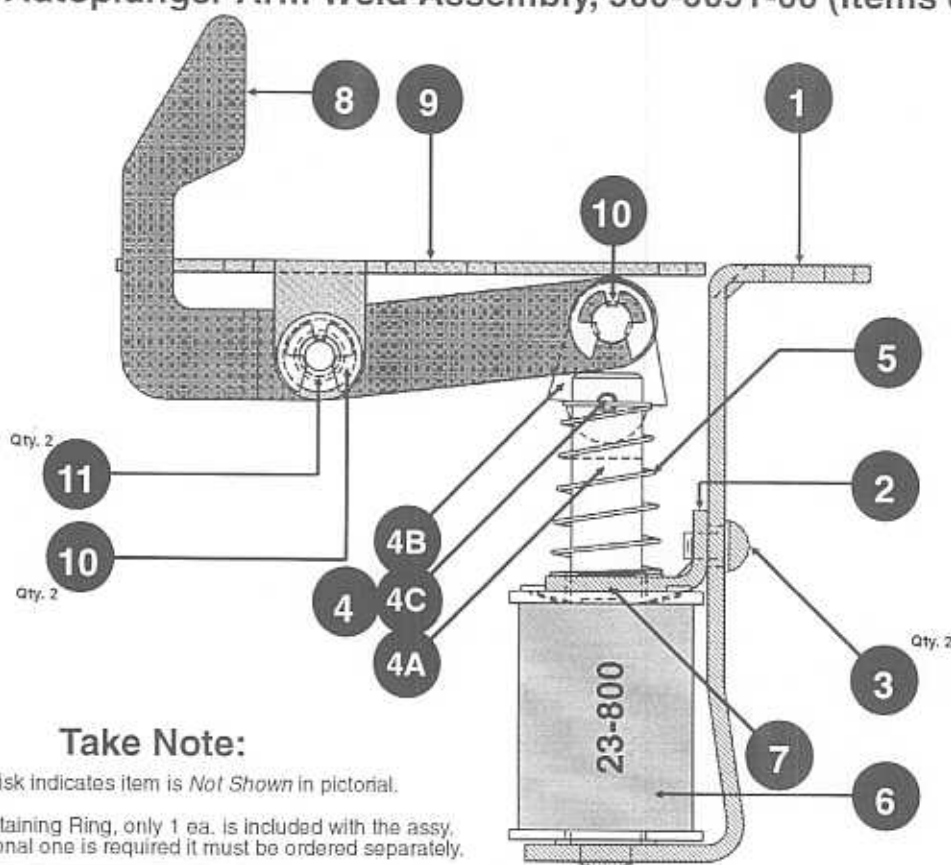
- IMPORTANT:** When replacing Item 8B, Flipper Link, we advise replacing with entire Item 8A, Flipper Plunger/ Link Assembly due to overall wear & tear.
- +++ Check all other components and replace as required. +++

Ball Shooter (Plunger) Assembly, 500-6146-00 (Items 1-8)



Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Housing (Shooter Assembly)	535-5067-02	5	Bushing (Qty. 2)	280-5010-00
2	Rod Assembly Orange B-Ball Knob	515-6557-00	6	Washer (Qty. 3)	242-5014-00
3	Spring Large Green	266-5001-04	7	Retaining Ring	270-5012-00
4	Spring Small	266-5010-01	8	Plunger Tip	545-5276-00

Autoplunger Coil Assembly, 500-6092-00 (Items 1-7), and Autoplunger Arm Weld Assembly, 500-6091-00 (Items 8-11)

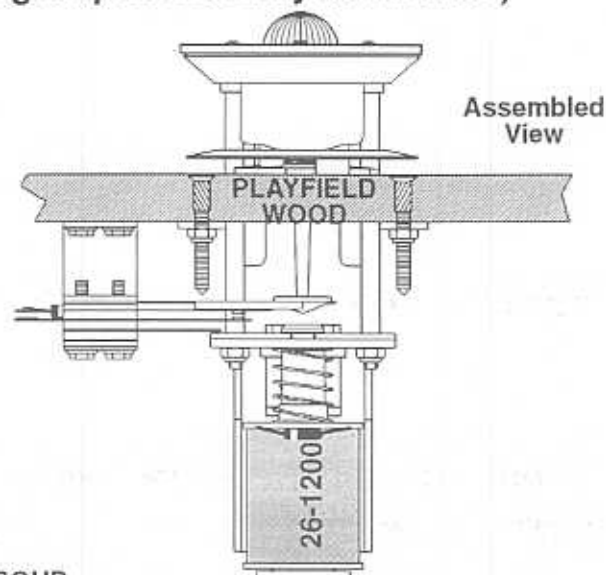
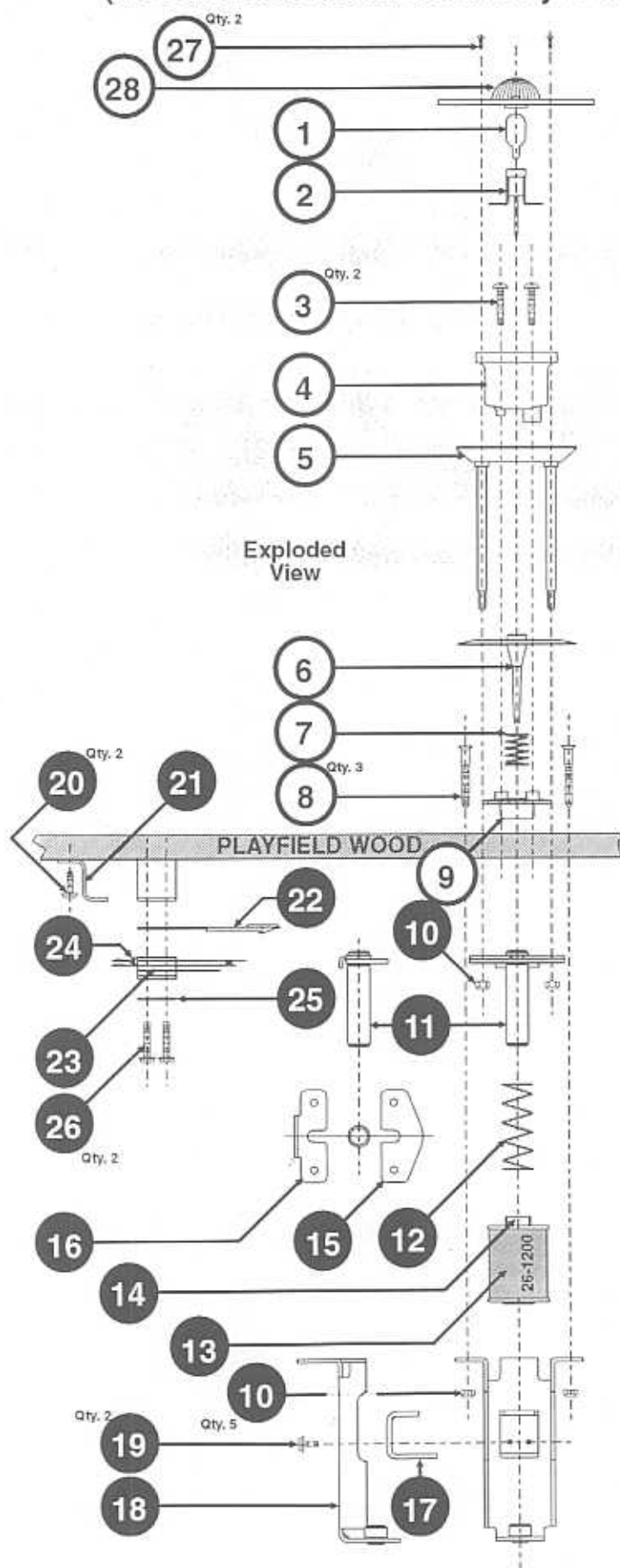


Take Note:

- * An (*) asterisk indicates item is *Not Shown* in pictorial.
1. Item 10, Retaining Ring, only 1 ea. is included with the assy. If the additional one is required it must be ordered separately.

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Autoplunger Coil Bracket Assembly	515-6527-00	5	Compression Return Spring	266-5020-00
2	Coil Retaining Bracket	535-5203-03	6	Coil, 23-800	090-5001-00T
3	#8-32 X 1/4" PR HWS SEMS (Qty. 2)	232-5300-00	ORDERING ABOVE (ITEM 6) COIL PART Nº WILL INCLUDE:		
4	Plunger & Link Assy.	515-5338-00	—*	Diode, 1N4004 (positioned at top)	112-5003-00
ORDERING ABOVE (ITEM 4) ASSEMBLY PART Nº WILL INCLUDE:			7	Coil Sleeve	545-5031-00
4A	Plunger (2')	530-5025-01	8	Arm Weld Assembly	515-6526-00
4B	Plunger Link	545-5293-00	9	Autoplunger Fulcrum	535-7697-00
4C	Roll Pin 1/8"	251-5008-00	10	Retaining Ring (Qty. 2) (1 ea. not incl.)	270-5002-00
			11	Nyliner 1/4" (Qty. 2)	545-5423-00

Turbo Bumper Individual Parts (Items 1-26)
(Not available as an assembly. Parts are grouped for easy reference.)



TOP GROUP

Nº	Part Name	SPI Part Nº
1	#555 Wedge Base Bulb	165-5002-00
2	#555 Wedge Base Socket	077-5206-00
3	#5 X 7/8" PH RH (AB) (Qty. 2)	237-5826-00
4	Bumper Body	545-5197-00
5	Ring Assembly	515-5085-00
6	Bumper Skirt	545-5607-00
7	Bumper Skirt Spring	266-5048-00
8	#6-32 X 1-3/16" Spiral Shank (Qty. 3)	237-5957-00
9	Bumper Base	545-5195-00
10	#6-32 Nylon Stop Nut (Qty. 5)	240-5005-00

BOTTOM GROUP

Nº	Part Name	SPI Part Nº
11	Plunger	530-5348-00
12	Coil Spring	266-5047-00
13	Coil, 26-1200	090-5044-00T
ORDERING ABOVE (ITEM 13) COIL PART Nº WILL INCLUDE:		
—	Diode, 1N4004 (positioned at top)	112-5003-00
14	Coil Sleeve	545-5031-00
15	Fiber Yoke	545-5609-00
16	Metal Yoke	535-7346-00
17	Metal Yoke Stop	535-7347-00
18	Coil Bracket Welded Assembly	515-5939-00
19	#6-32 X 1/4" HWHTF SWAGE (Qty. 2)	237-5976-01

SWITCH GROUP

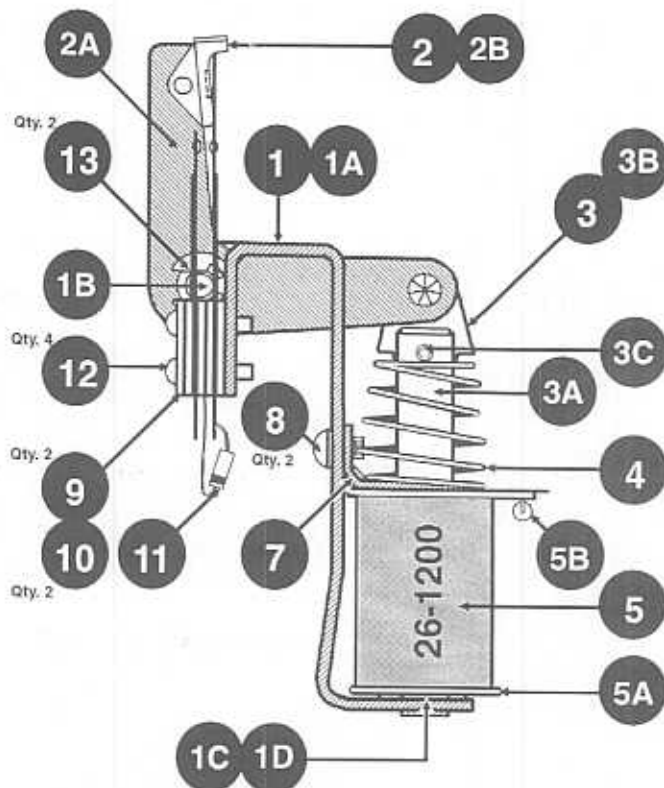
Nº	Part Name	SPI Part Nº
20	#6 X 1/2" HWH (AB) (Qty. 2)	234-5001-02
21	Switch Bracket	535-7342-00
22	Spoon Switch Actuator	545-5610-01
23	Stack Switch	180-5015-03
24	Switch Diode, 1N4001	112-5001-00
25	Switch Plate	535-7344-00
26	#6-32 X 3/4" HWHMS SWAGE (Qty. 2)	237-5976-05

ASSOCIATED GROUP

Nº	Associated Part Name	SPI Part Nº
27	#6 X 3/8" PH RH (PER POP) (Qty. 2)	237-5000-00
28	Pop Butyrate & Orange Dome Assy. #1	515-6620-12
	Pop Butyrate & Orange Dome Assy. #2	515-6620-13
	Pop Butyrate & Orange Dome Assy. #3	515-6620-14

Slingshot (Left & Right) Assemblies, 500-5849-01 (Items 1-13)

Nº	Part Name	SPI Part Nº
1	Slingshot Bracket Assembly	515-5339-01
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:		
1A	Slingshot Bracket	535-5919-01
1B	Hinge Stud	530-5034-01
1C	Armature Stop	530-5017-01
1D	Shading Ring	530-5307-00
2	Arm & Tip Assembly	515-5340-01
ORDERING ABOVE (ITEM 2) COIL PART Nº WILL INCLUDE:		
2A	Arm	515-5341-01
2B	Kicker Tip	545-5216-01
2C	Rivet 1/8" ø x 1/4" Lg.	249-5003-00
3	Plunger & Link Assembly	515-5338-00
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:		
3A	Plunger 2" Lg.	530-5025-01
3B	Plunger Link	545-5293-00
3C	Roll Pin 1/8" ø x 5/8" Lg.	251-5008-00
4	Compression Spring	266-5020-00
5	Coil, 26-1200	090-5044-00T
ORDERING ABOVE (ITEM 5) COIL PART Nº WILL INCLUDE:		
—	Diode, 1N4004 (positioned at top)	112-5003-00
6	Coil Sleeve	545-5031-00
7	Coil Retaining Bracket	535-5203-03
8	#8-32 X 1/4" PPH MS (SEMS) (Qty. 2)	232-5300-00
9	Slingshot Switch (Qty. 2)	180-5054-00
10	Switch Plate (Qty. 2)	535-5045-00
11	Switch Diode, 1N4001 (Qty. 2)	112-5001-00
12	#6-32 X 5/8" HWH SWAGE (Qty. 4)	237-59976-04
13	Retaining Ring 1/4" ø (Qty. 2)	270-5002-00



Standard VUK Assemblies, 500-5839-01 (Qty. 2) (Items 1-14)

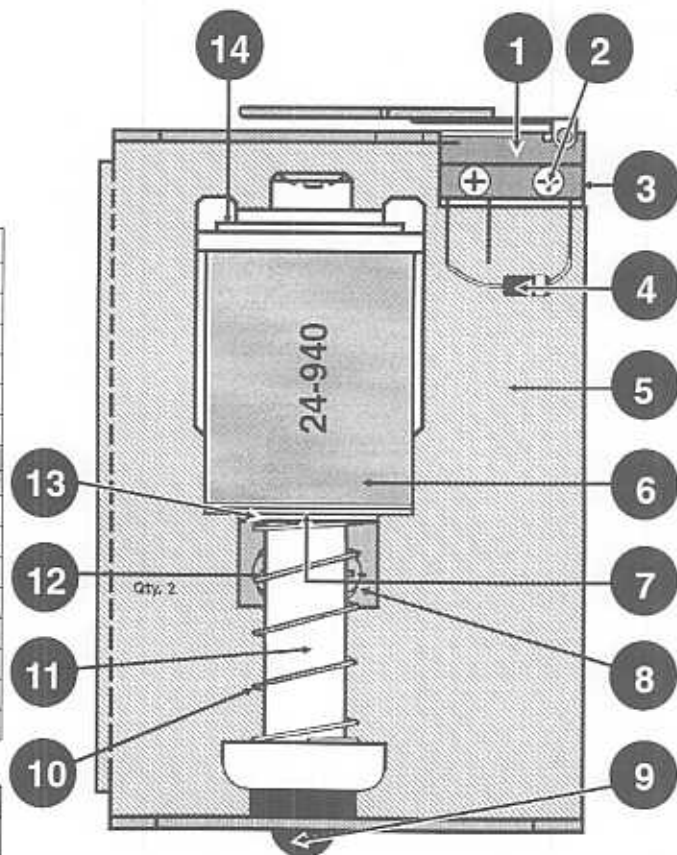
Take Note:

* An (*) asterisk indicates item is *Not Shown* in pictorial.

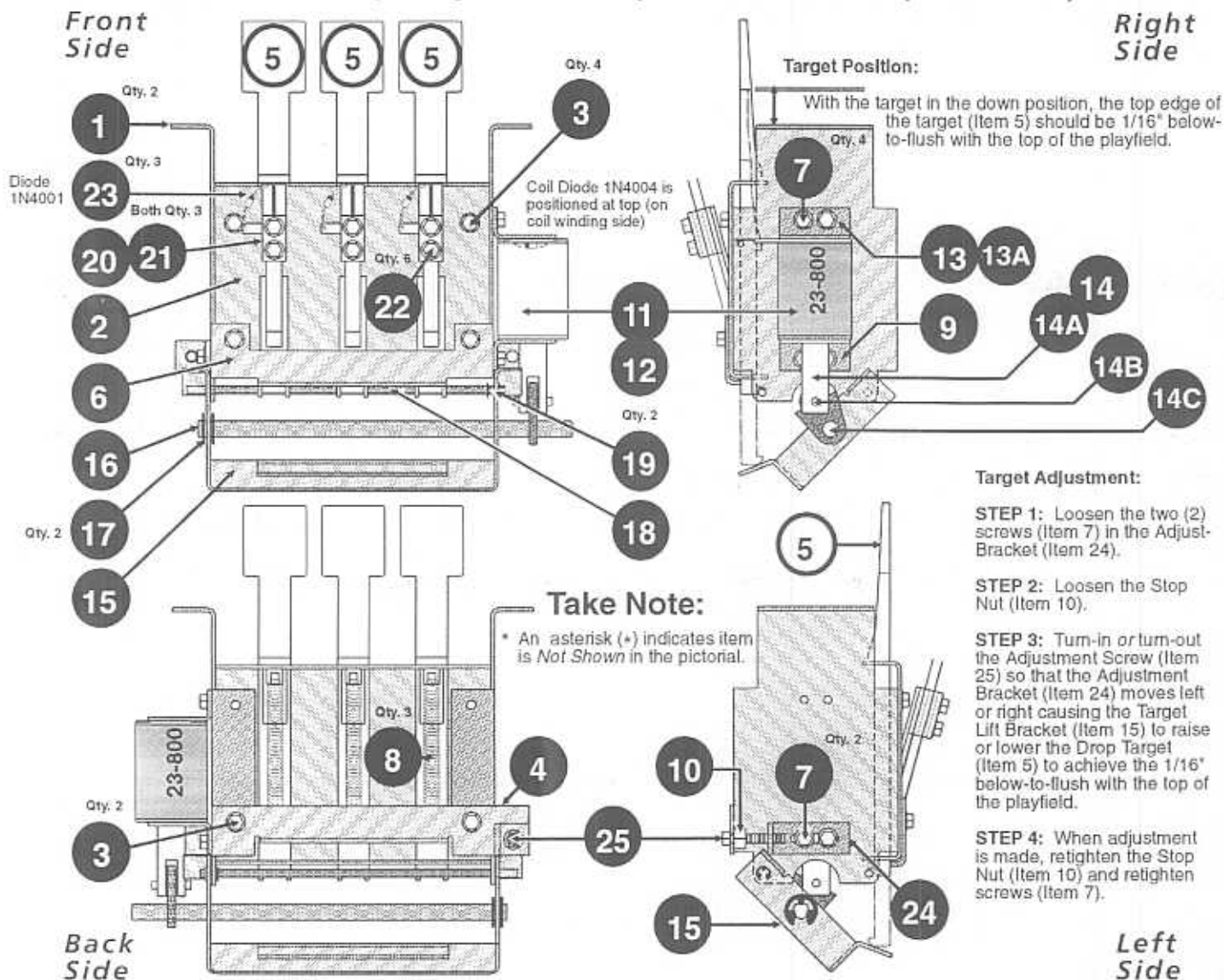
Nº	Part Name	SPI Part Nº
1	Micro Switch (Loop Type)	180-5116-00
2	#2-56 X 1/2" HWH (Qty. 2)	237-5937-00
3	Switch Body Protect Plate	535-6539-00
4	Switch Diode, 1N4001	112-5001-00
5	VUK Bracket	535-6607-00
6	Coil, 24-940	090-5036-00B
ORDERING ABOVE (ITEM 6) COIL PART Nº WILL INCLUDE:		
—*	Diode, 1N4004 (positioned at bottom)	112-5003-00
7	Coil Sleeve	545-5076-00
8	Coil Mounting Bracket	535-5203-03
9	Rubber Bumper (Grommet)	545-5105-00
10	Compression Spring	266-5020-00
11	Plunger Assembly	515-5941-01
12	#8-32 X 1/4" PPH (Lock-Tite) (Qty. 2)	232-5300-00
13	Crescent Spring Washer	269-5002-00
14	Coil Insulation	545-5431-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	SPI Part Nº
n/a *	VUK Angle Support Bracket (For the VUK under the Magna Jump Assy. only.)	535-7911-00



3-Bank Drop Target Assembly, 500-6150-00-43 (Items 1-26)



Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Target End Plate 3-Bank (Qty. 2)	535-6162-00	15	Target Lift Bracket 3-Bank	535-6509-03
2	Target Frame for 3-Bank (unique)	535-6159-01	16	Target Shaft 3-Bank	530-5179-03
3	#8-32 X 3/8" HWH Swage (Qty. 6)	237-5975-00	17	Retaining Ring 1/4" ø (Qty. 2)	270-5002-00
4	Spring Mntg. Brkt. Plate (w/cut-out)	535-6510-03A	18	Pivot Shaft 3-Bank	530-5180-03
5	Plastic Target (Qty. 3)	545-5048-01	19	Retaining Ring 1/8" ø X 3/8" Lg. (Qty. 2)	270-5000-00
6	Target Retaining Bracket (unique)	535-5042-01	20	Drop Target Switch Assembly (Qty. 3)	180-5104-00
7	#6-32 X 3/8" HWH Swage (Qty. 6)	237-5976-02	21	Switch Plate (Qty. 3)	535-5045-00
8	Drop Target Reset Spring (Qty. 3)	265-5003-00	22	#6-32 X 1/2" HWHW Swage (Qty. 6)	237-5976-03
9	Front Coil Support Bracket	535-6154-00	23	Switch Diode, 1N4001 (Qty. 3)	112-5001-00
10	#8-32 Nylon Stop (Nyloc)	240-5102-00	24	Adjustment Bracket	535-6508-00
11	Coil, 23-800	090-5001-00T	25	#8-32 X 7/8" HWH MS Adjustment Screw	237-5890-00
ORDERING ABOVE (ITEM 11) COIL PART Nº WILL INCLUDE:			26 *	Cable Wiring Harness	036-5414-04-43
— Diode, 1N4004 (positioned at top)			112-5003-00		
12	Coil Sleeve	545-5031-00	ASSOCIATED PART(S) NOT INCLUDED WITH THE ABOVE ASSEMBLY		
13	Plunger Stop Assembly	515-5088-00	Nº	Associated Part Name	SPI Part Nº
ORDERING ABOVE (ITEM 13) COIL PART Nº WILL INCLUDE:			n/a *	Drop Target Mounting Strap Bracket	535-7885-00
13A	Plunger Coil Stop Bracket	535-6155-00	n/a *	#8 X 1/2" HWH AB (Blue) (Qty. 5)	234-5101-05
13B*	Bushing	530-5177-00	n/a *	Target Decal Tweetie (Left)	820-6165-01
13C*	Plunger Stop	530-5178-00	n/a *	Target Decal Lola (Center)	820-6165-02
14	Plunger & Link Assembly	515-5338-00	n/a *	Target Decal Sylvester (Right)	820-6165-03
ORDERING ABOVE (ITEM 14) COIL PART Nº WILL INCLUDE:					
14A	Plunger - 2"	530-5025-01			
14B	Roll Pin 1/8" ø X 5/8" Lg.	251-5008-00			
14C	Plunger Link	545-5293-00			

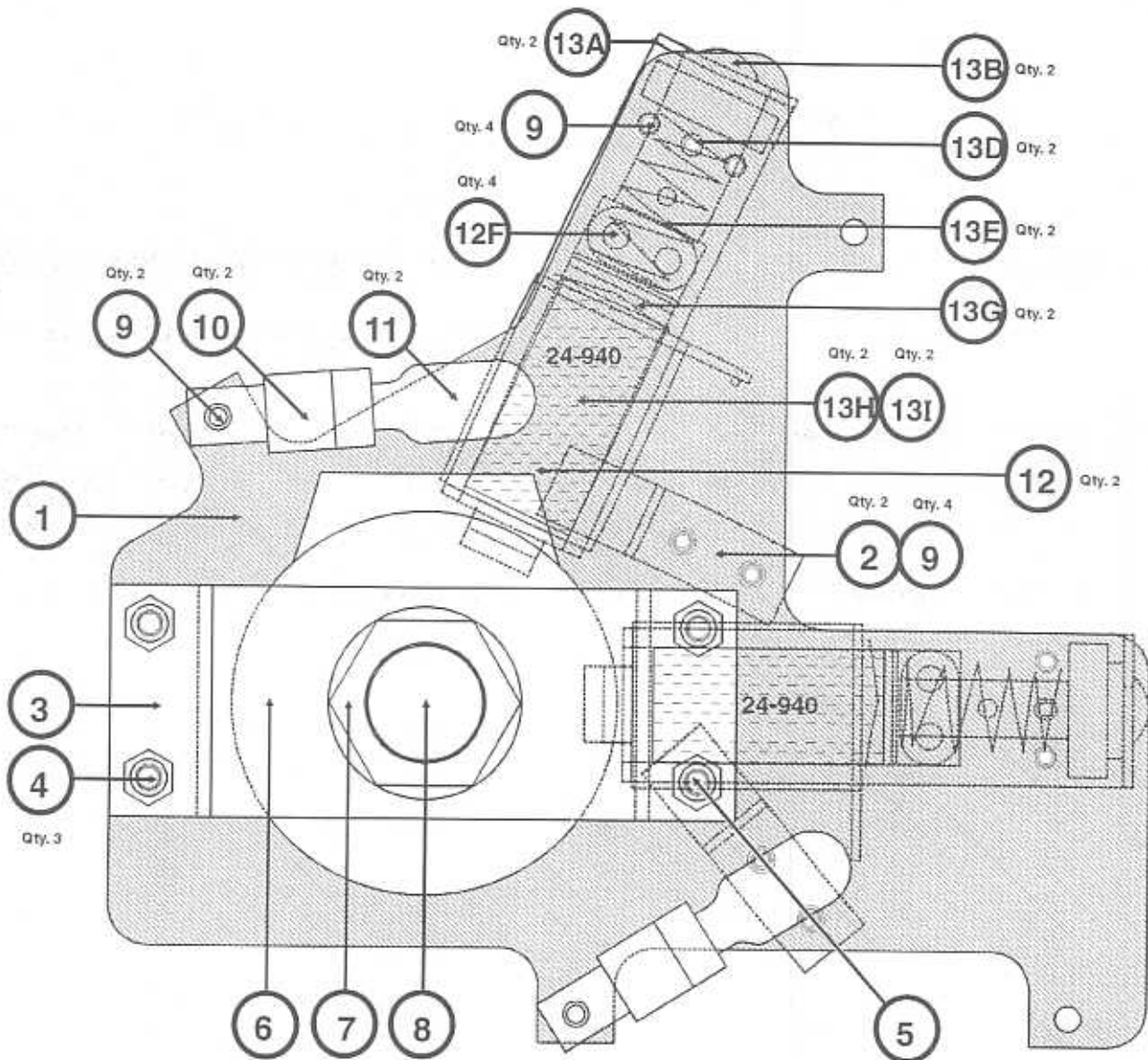
Drawings for Major
Assemblies & Ramps

Section 4
Chapter 2



Page 77

Magna-Jump Assembly, 500-6134-00-43 (Items 1-16)

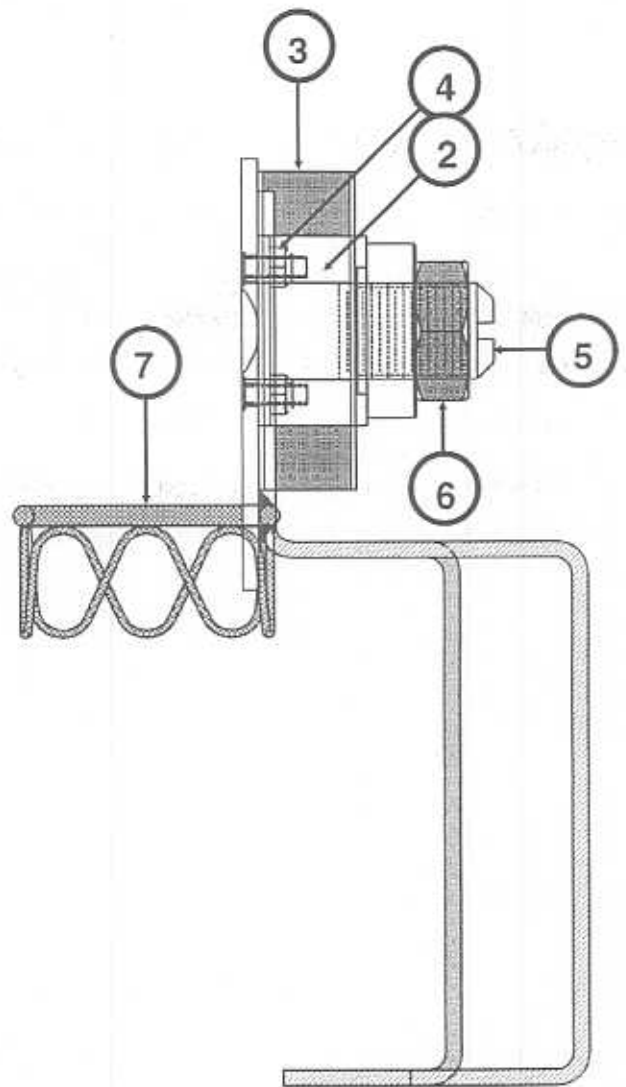
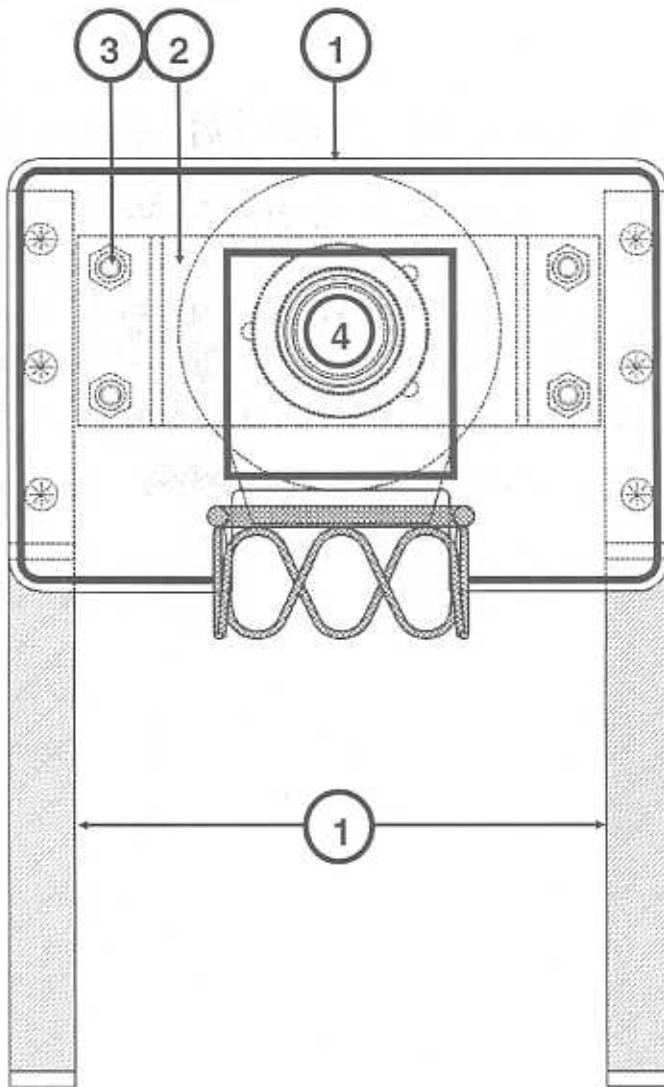


Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorial.

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Magna-Jump Mounting Plate	515-6610-00	13	Kick Big Assemblies (Kickers) (Qty. 2)	500-5862-06
2	Mounting Strap Bracket (Qty. 2)	535-7885-00	ORDERING ABOVE (ITEM 13) COIL PART Nº WILL INCLUDE:		
3	Core Mounting Bracket Assembly	515-6587-00	13A	Frame for Kicker	535-6370-00
4	#8-32 Nylon Stop (Nyloc) (Qty. 3)	240-5102-00	13B	Rubber Bumper (Grommet)	545-5105-00
5	1-3/4" X 1/4" Hex Spacer #6-32 Tap.	254-5008-10	13C	Plunger Assembly	515-5941-01
6	Magnet, 22-650	090-5042-01	13D	Compression Spring	266-5020-00
7	3/4"-16 Hex Nut	240-5315-00	13E	Coil Retainer Bracket	535-5203-01
8	Threaded Core Plug	530-5320-01	13F	#8-32 X 1/4" PPH SEMS (Qty. 2)	232-5300-00
9	#6-32 X 3/8" HWH Swage (Qty. 10)	237-5976-02	13G	Spring Washer	269-5002-00
10	Laydown Wedge Base Socket (Qty. 2)	077-5026-01	13H	Coil, 24-940 (Coil only includes Diode, 1N4004 (112-5003-00) positioned at top)	090-5036-00B
11	#906 Wedge Base Bulb (Qty. 2)	165-5004-00	13I	Coil Sleeve	545-5076-00
12	Spectape 3/4" (.34")	626-5027-00	14 *	Basketball "Cover"	545-5734-00
			15 *	#6-32 X 3/8 PPH (Holds B-Ball)	237-5501-00
			16 *	Cable Wiring Harness	036-5414-05-43

Magna-Hoop Assembly, 500-6114-00-43 (Items 1-7)

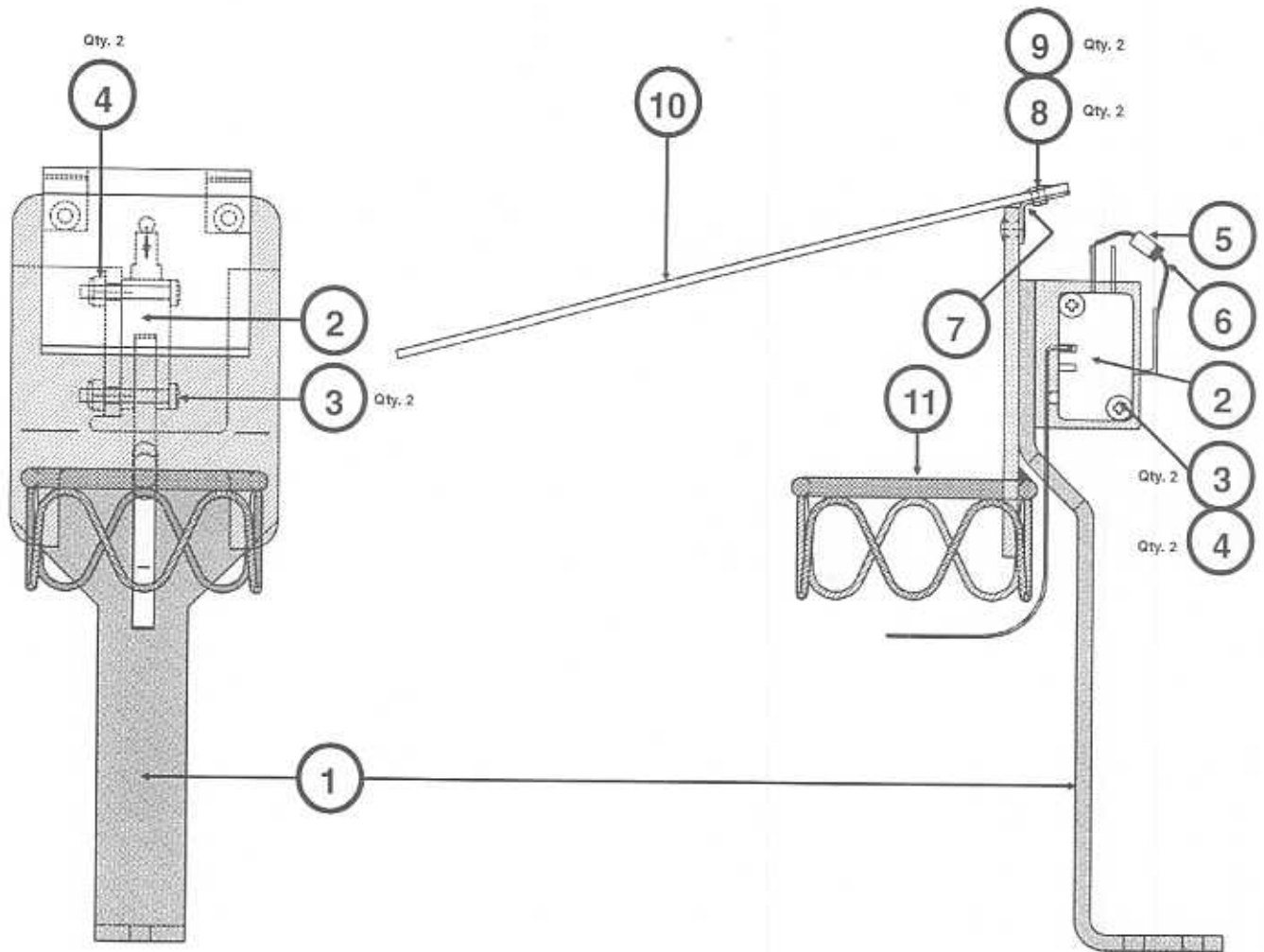


Take Note:

* An asterisk (*) indicates item is *Not Shown* in the pictorial.

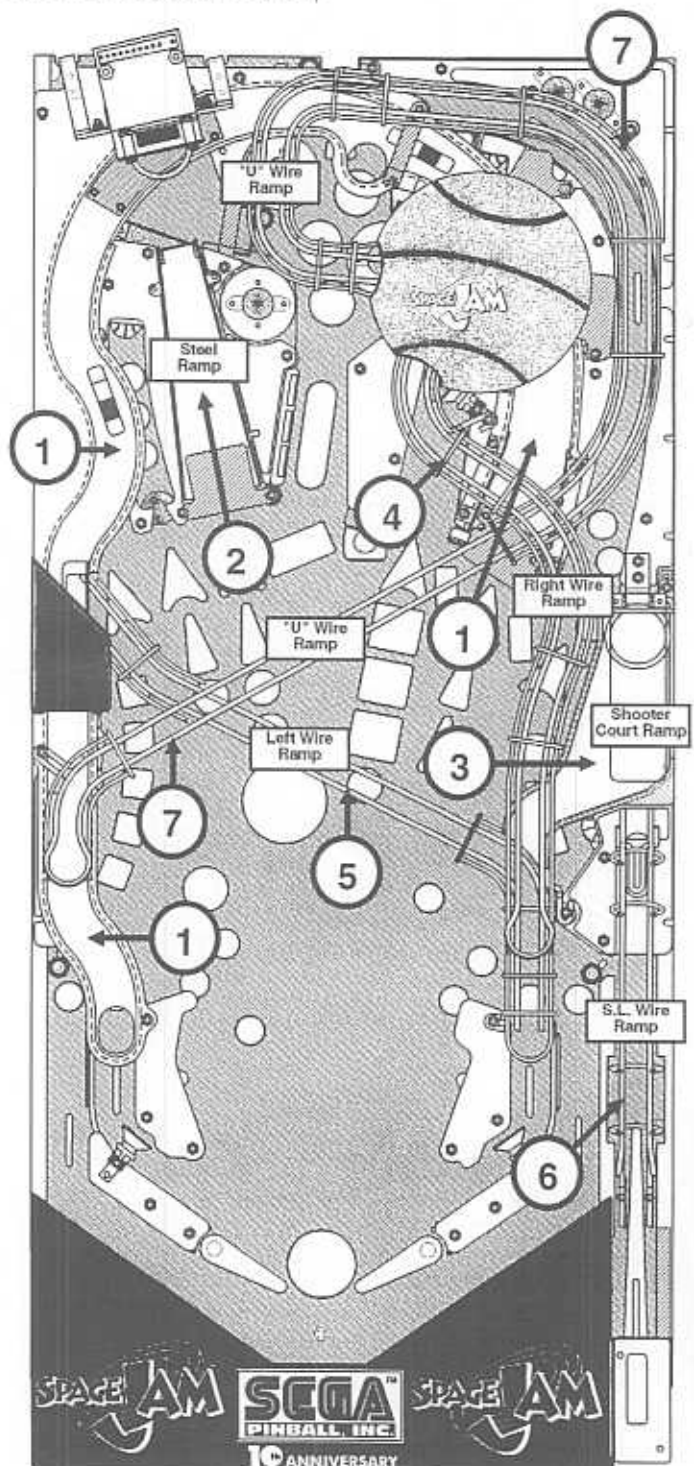
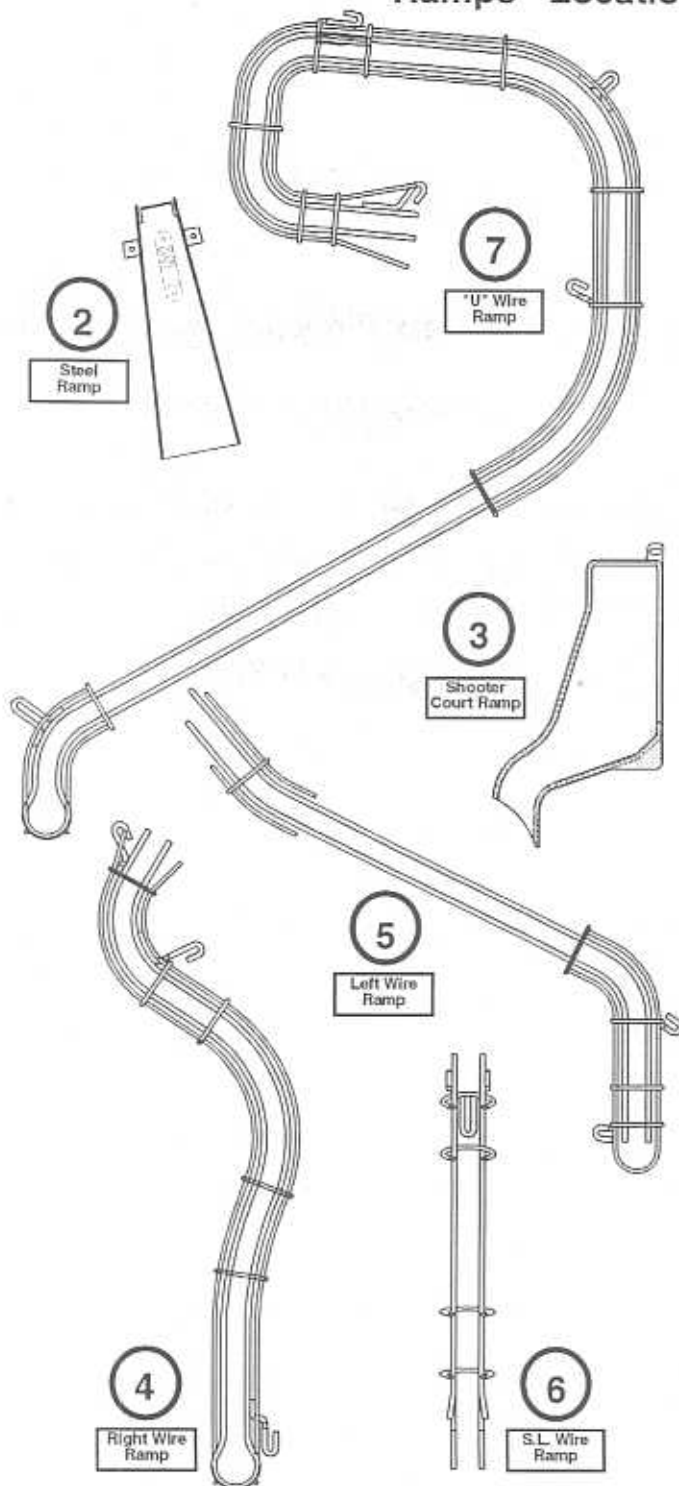
Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Magna-Hoop Weld Assembly	515-6588-00	7	Rim Protector Tubing	545-5773-00
2	Core Mounting Bracket Assembly	515-6587-00	ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY		
3	#8-32 Nylon Stop (Nyloc) (Qty. 4)	240-5102-00	Nº	Associated Part Name	SPI Part Nº
4	Magnet, 22-650	090-5042-01	n/a *	#8 X 1/2" HWH (Qty. 2)	234-5101-05
5	Threaded Core Plug	530-5320-01	n/a *	#8-32 X 5/8 HWH (Qty. 2)	237-5975-03
6	3/4"-16 Hex Nut	240-5315-00	n/a *	Backboard Decal	820-6165-10

Skill Shot Shooter Basket Assembly, 500-6125-00-43 (Items 1-11)



Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Shooter Basket Weld Assembly	515-6604-00	8	Rivet 1/8" ø X 3/16" Lg. (Qty. 4)	249-5001-00
2	Micro Switch	180-5159-00	9	Butyrate -05 Clear	830-5909-05
3	#4-40 3/4" PRH MS Screw (Qty. 2)	237-5863-00	10	#6 Lock Washer (Qty. 2)	246-5000-00
4	#4-40 Nylon Stop Nut (Qty. 2)	240-5303-00	11	Rim Protector Tubing	545-5773-00
5	Diode, 1N4001	112-5001-00	ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY		
6	Shrink Tube (covers diode leads)	605-5002-00	Nº	Associated Part Name	SPI Part Nº
7	Butyrate Cover Bracket	535-5911-02	n/a *	Shooter Court Decal (under above assy.)	820-6165-11

Ramps - Locations & Part Numbers †

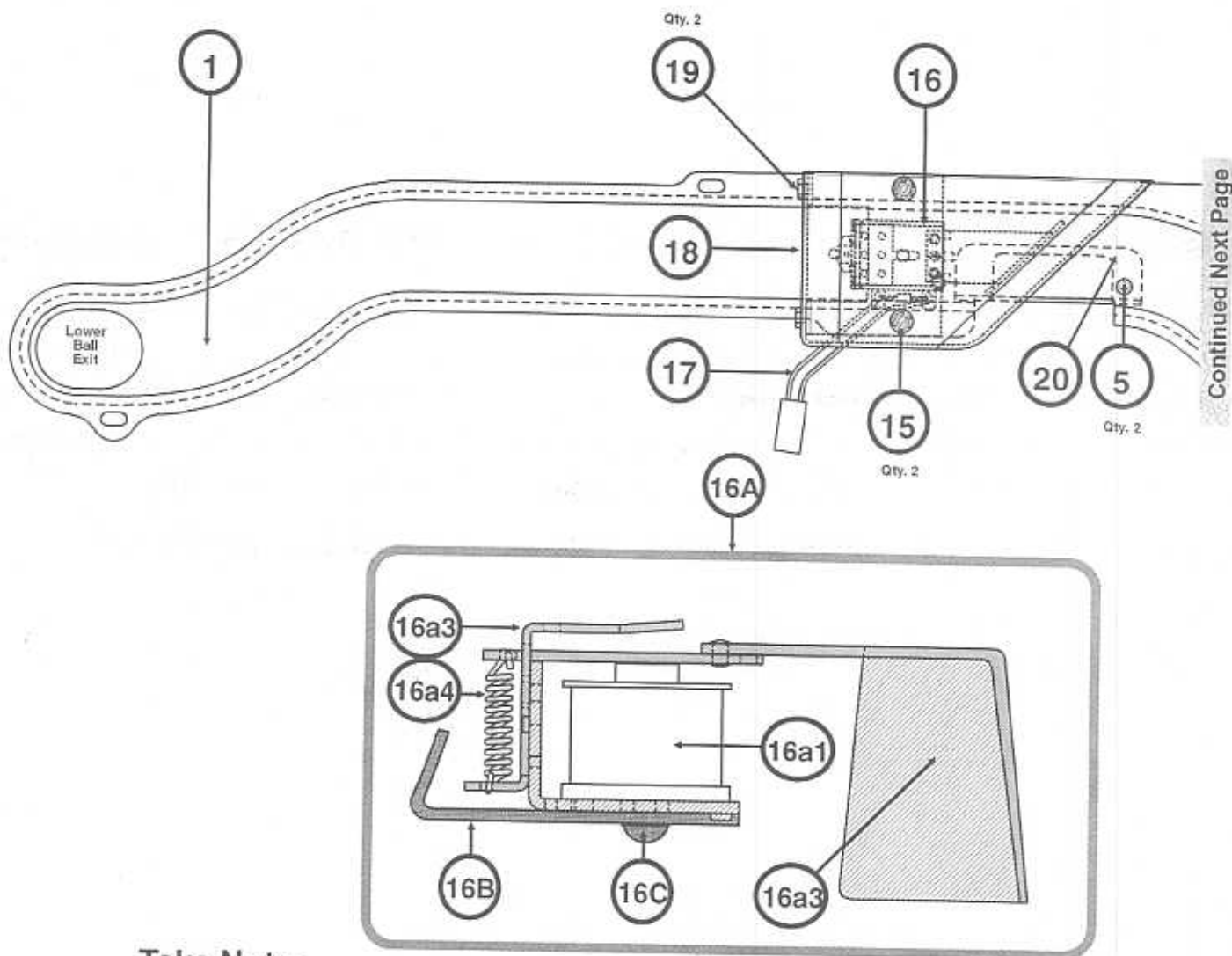


Take Note:

- † The assemblies described on this page are shown and described in detail on the page(s) noted.
 1. For Major Assemblies - Locations & Part Numbers see the beginning of this chapter.
 2. **Legend Note:** Items noted with a white circle (①) are mounted above. Items noted with a black circle (●) are mounted below.

Nº	Ramp Name	PG.†	Part Nº	Nº	Ramp Name	PG.	Part Nº
1	Plastic "Big" Ramp	pg 82	500-6116-00-43	3	Shooter Court "Small" Ramp	n/a	545-5736-00
2	Steel Ramp	n/a	500-6136-00-43	4	Right Side Wire Ramp	n/a	515-6552-01
ORDERING ABOVE (ITEM 2) COIL PART Nº WILL INCLUDE:				5	Left Side Wire Ramp	n/a	515-6553-02
	Steel Ramp (Plain)	535-7818-01		6	Shooter Lane Wire Ramp	n/a	515-6612-00
	Magnet Reed Switch	180-5145-00		7	"U" Wire Ramp	n/a	515-6554-02
	#4-40 Nyloc (Qty. 2)	240-5303-01					
	Cable Wiring Harness	036-5421-01-43					

Plastic Ramp Assembly, 500-6116-00-43 (Items 1-21)



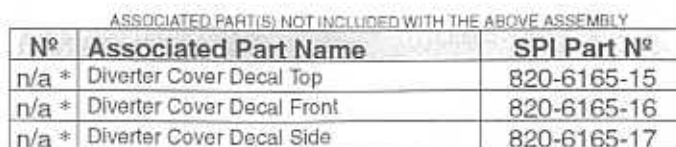
Continued Next Page

Take Note:

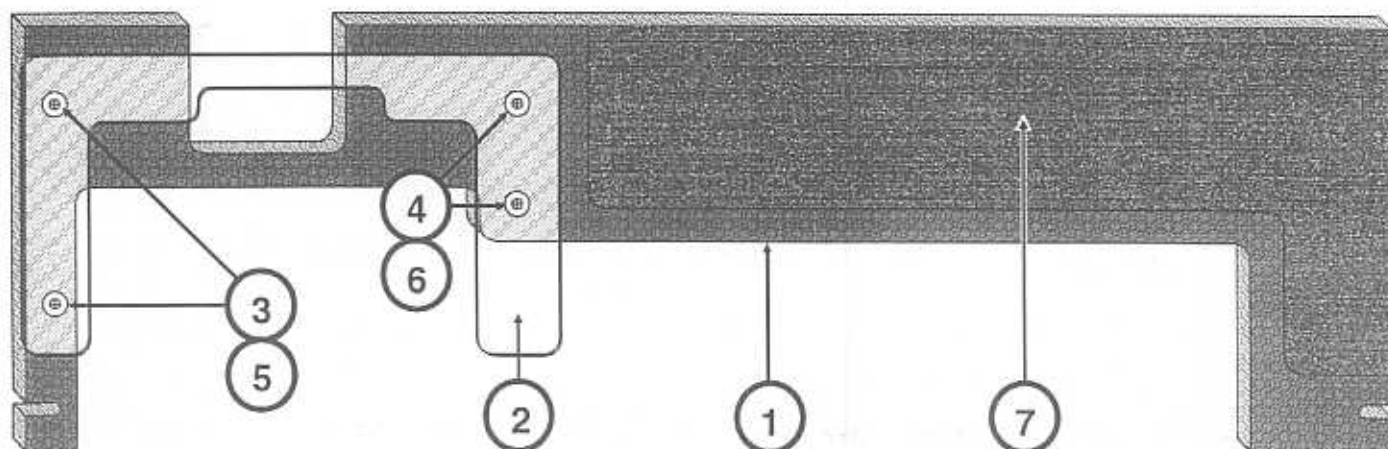
* An asterisk (*) indicates item is Not Shown in the pictorial.

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Plastic Ramp	545-5711-01	13	Wire Gate Mounting Bracket	535-5269-06
2	Ramp Flap	535-7791-00	14	Wire Gate	535-5307-09
3	Rivet 1/8" ø X 3/16" Lg. (Qty. 2)	249-5001-00	15	#8 X 1/2" HWH (Qty. 2)	234-5101-05
4	#6 Lock Washer (Qty. 2)	246-5000-00	16	Coil Bracket Assembly	515-6596-00-43
5	Rivet 1/8" ø X 1/4" Lg. (Qty. 6)	249-5003-00	ORDERING ABOVE (ITEM 16) ASSEMBLY PART Nº WILL INCLUDE:		
6	Ramp Protector Left Side Enter	535-7820-00	16A	Coil & Mounting Sub-Assy.	515-6595-00
7	Ramp Protector Right Side Enter	535-7821-00	16B	Coil Mounting Support Bracket	535-7829-00
8	#6 X 3/8 HWH AB Zinc (Qty. 6)	234-5000-00	16C	#8-32 X 3/8" PPH	232-5301-00
9	Magnet Reed Switch (Qty. 2)	180-5145-00	Ordering Above (Item 16A) Sub-Assembly part Nº Will Include:		
10	#4-40 X 3/8" PFH Stainless (Qty. 4)	237-5983-01	16a1	Coil 32-1800	090-5031-00
11	#4-40 Nylon Stop Nut (Qty. 4)	240-5303-01	16a2	Coil Arm/Armature Welded Assy.	515-6594-00
12	Switch Plate Assembly	515-6619-00-43	16a3	Frame	535-6198-00
ORDERING ABOVE (ITEM 12) ASSEMBLY PART Nº WILL INCLUDE:			16a4	Return Spring	265-5024-00
12A	Ramp Plate	535-7798-01	17	Diverter Coil Cable Wiring Harness	036-5414-02-43
12B	Magnet Reed Switch	180-5145-00	18	Diverter Cover	545-5740-01
12C	#4-40 X 3/8" PPH Stainless (Qty. 2)	237-5983-01	19	#6-32 X 3/8 HWH (Qty. 2)	237-5976-02
12D	#4-40 Nylon Stop Nut (Qty. 2)	240-5303-01	20	Left Wire Ramp Mounting Bracket	535-7817-00
12E	Washer 3/64" X 3/8" X 3/64" (Qty. 2)	242-5019-00	21	Reed Sw. Cable Wiring Harness (Qty. 2)	036-5421-01-43
12F*	Reed Sw. Cable Wiring Harness	036-5421-01-43			

Section 4 | Drawings

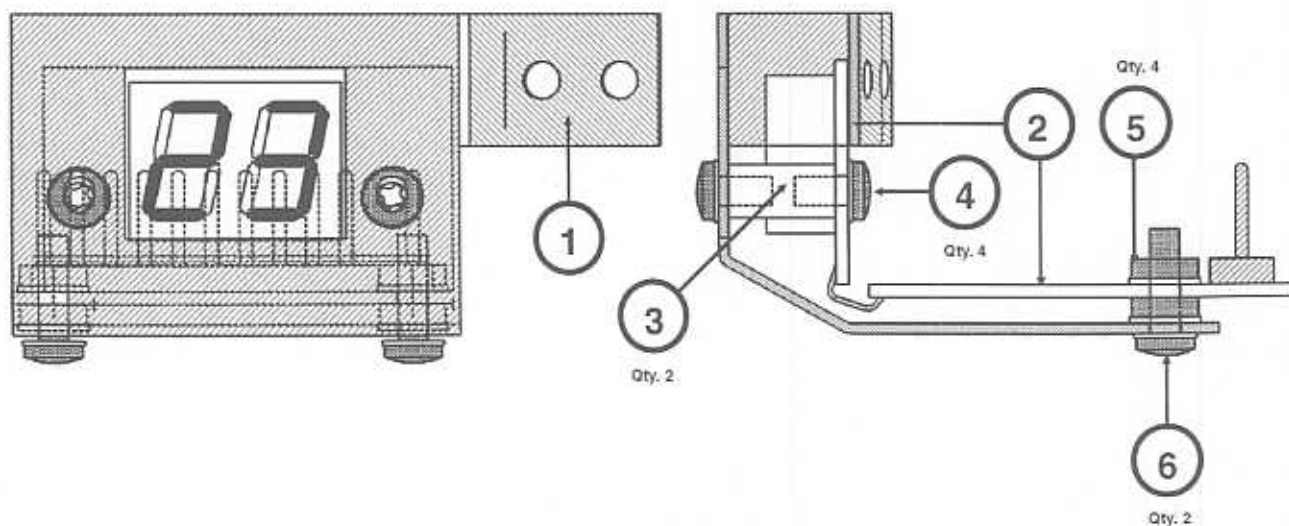


Cabinet Back Panel Assembly, 515-6558-00-43 (Items 1-7) (Mounted in Cabinet Back)



Nº	Part Name	SPI Part Nº	Nº	Associated Part Name	SPI Part Nº
1	Back Panel (Plain)	525-5438-00	ASSOCIATED PART(S) NOT INCLUDED WITH THE ABOVE ASSEMBLY		
2	Back Board Shield (Clear)	830-5911-00	ABOVE ASSEMBLY IS SECURED TO THE CABINET BACK BY:		
3	1-1/2" X 3/8" Spacer Gray (Qty. 2)	254-5000-08	n/a *	#10-32 X 1-1/4" SOC Hd. Cap S. (Qty. 2)	237-5950-00
4	1/4" X 3/8" Spacer Gray (Qty. 2)	254-5000-02	n/a *	#10 Washer - 7/32" X .5" X 1/16" (Qty. 2)	242-5003-00
5	#6 X 2" PPH (Qty. 2)	237-5807-00	n/a *	Playfield Back Panel (Plain)	525-5445-00
6	#6 X 3/4" PPH (Qty. 2)	232-5003-00			
7	Decal (Back Panel)	820-6180-00			

24-Second Shot Clock Assembly, 500-6155-00-43 (Items 1-6) (Mounted in Cabinet Back above Left Side of Cabinet Back Panel)



Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Score Bracket	535-7873-00	4	#6-32 X 1/4" PPH SEMS (Qty. 4)	232-5200-00
2	24-Second Clock PCB	520-5153-00	5	#6-32 Keps Nut (Qty. 4)	240-5008-00
3	1/2" X 1/4" Hex Spcr. #6-32 Tap. (Qty. 2)	254-5008-03	6	#6-32 X 1/2" PPH SEMS (Qty. 2)	232-5202-00

Section 5 Schematics & Troubleshooting



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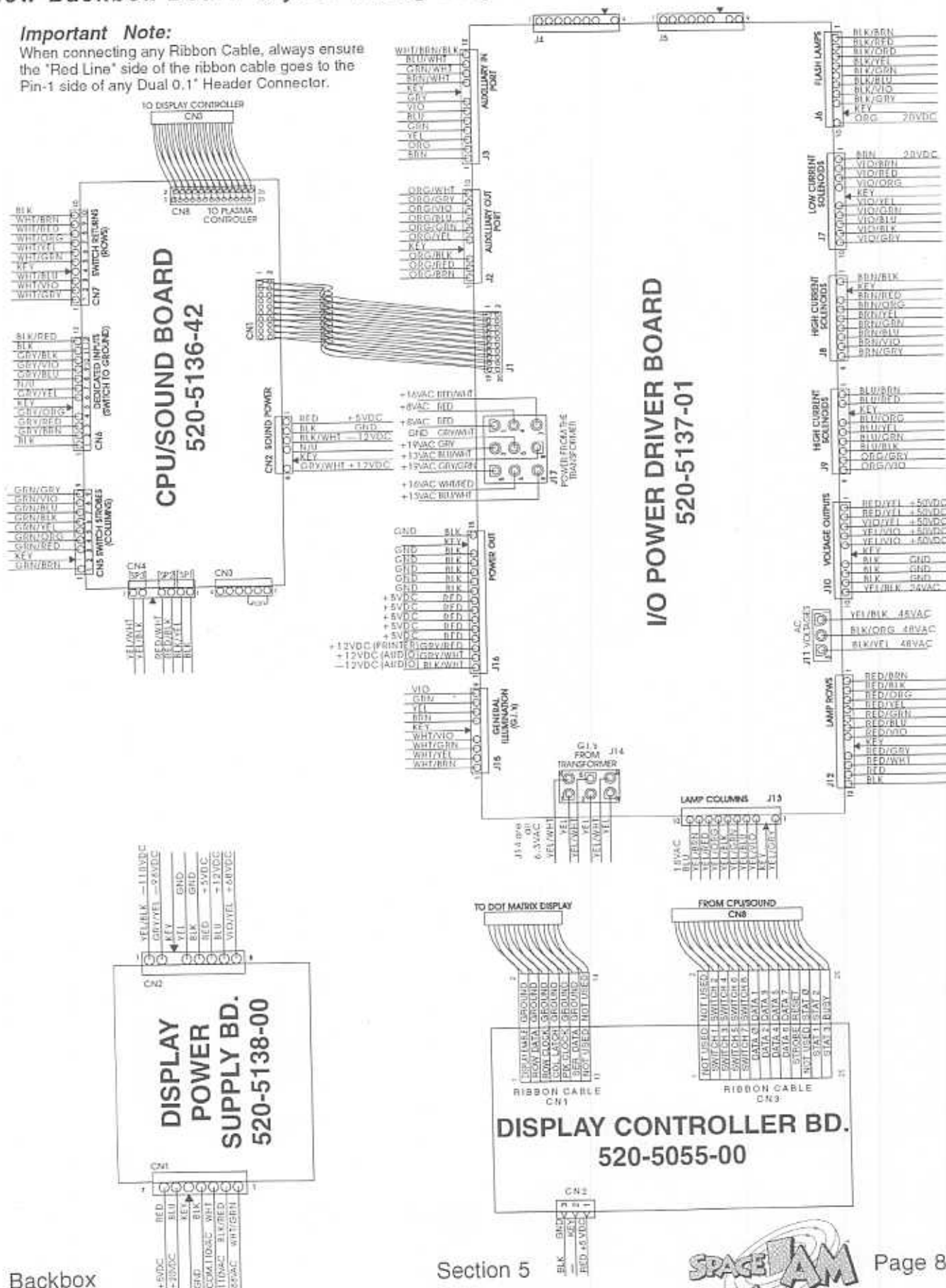


Backbox Wiring

New Backbox Board Layout Wiring Diagram

Important Note:

When connecting any Ribbon Cable, always ensure the "Red Line" side of the ribbon cable goes to the Pin-1 side of any Dual 0.1" Header Connector.



* J2 P3-10 NOJ & J3 P1-P11 NOJ
USED W/OPTIONAL PRINTER HARNESS



Playfield Wiring

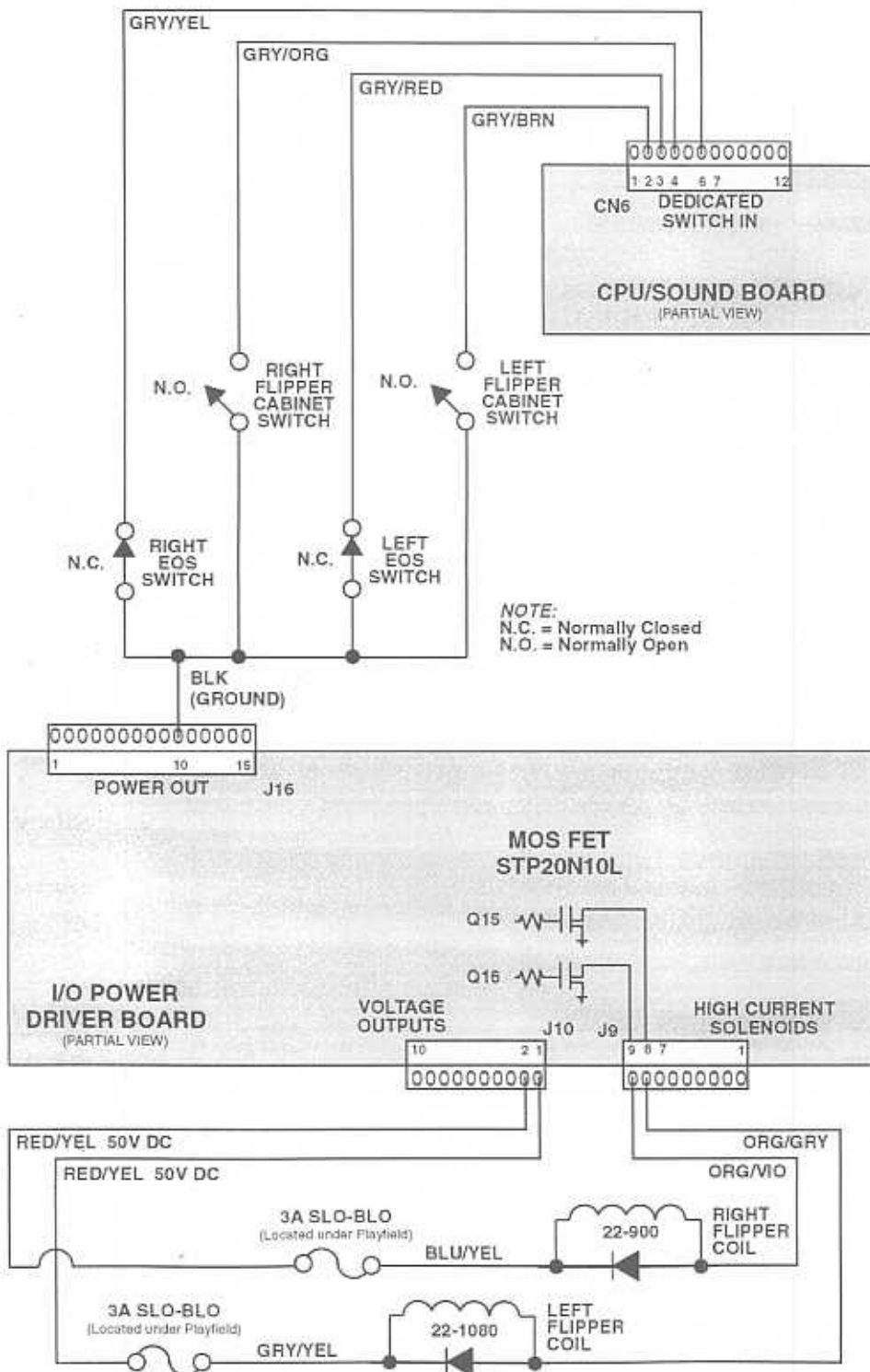
New 2-Flipper Circuit Wiring Diagram (No SSFB Required!)

The **White Star Board System™** has allowed us to *simplify* the flipper circuit to the point where we have *eliminated* the flipper board all together. The flipper circuit is now configured the same as any other solenoid drive circuit.

Technical Overview

Our **New Flipper System** uses one supply voltage (50v DC) for both kick and hold. Once the **Game CPU** detects a flipper cabinet switch closure (during game play) it applies a 40 msec pulse to the gate of the flipper drive transistor (STP20N10L). If it continues to detect a flipper cabinet switch closure (the player holding the button in) it will continue to pulse the flipper drive transistor 1 msec every 12 msec for the duration of the hold cycle.

The **E.O.S. (End-Of-Stroke) Switch** serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The **E.O.S. Switch** is a normally closed switch which opens approximately a 1/16" when the flipper is energized. The **Game CPU** will detect a switch closure if the flipper bat is forced back by a high velocity shot or rebound on the playfield and will apply another 40 msec pulse of 50v DC to the coil.

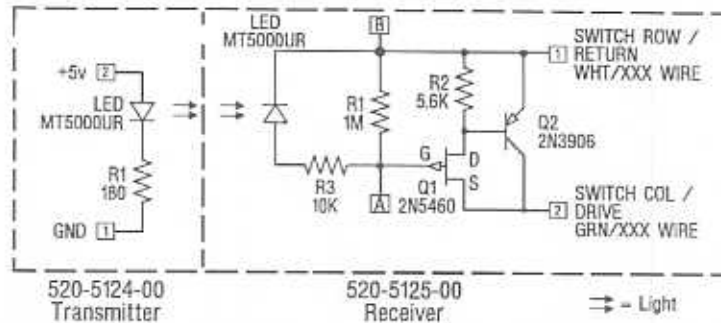


Trough Up-Kicker OPTO Theory of Operation & Schematic

Theory of Operation

As light from the Transmitter falls on the Receiver LED, it generates a Positive Bias Voltage (0.7v to 1.5v) which is applied to the gate of **Q1**, turning **Q1** off. When **Q1** is held off, no current flows through **Q2**'s Base, the transistor is off acting as an **OPEN SWITCH**. When the light is interrupted (**BLOCKED**) **R1** bleeds the gate voltage off of **Q1** allowing it to conduct, switching **Q2** on, which acts as a **CLOSED SWITCH**.

Fig. 1



TAKE NOTE:
LED MT5000UR
(Ultra Bright Red)
Sega Pinball Part N°
165-5100-00

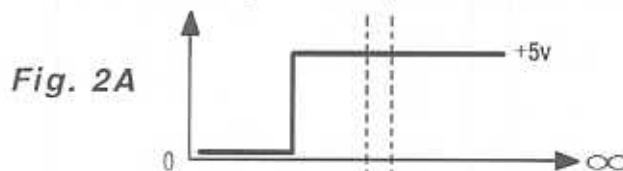
Troubleshooting

1. Volt Meter Test (indicates normal operating condition):

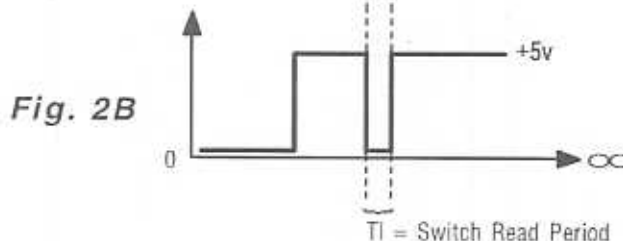
A. **OPEN OPTO** (Light Falling on LED) = **SWITCH OPEN**. Place meter leads across points **A** and **B** (Refer to Schematic Drawing Fig. 1 above). It should read approximately 0.8 - 1.2v DC.

B. **CLOSED OPTO** (Light Blocked) = **SWITCH CLOSED**. Place meter leads across points **A** and **B** (Refer to Schematic Drawing Fig. 1 above). It should read approximately 0.0 - 0.1v DC.

2. Oscilloscope Test (indicates normal operating condition):



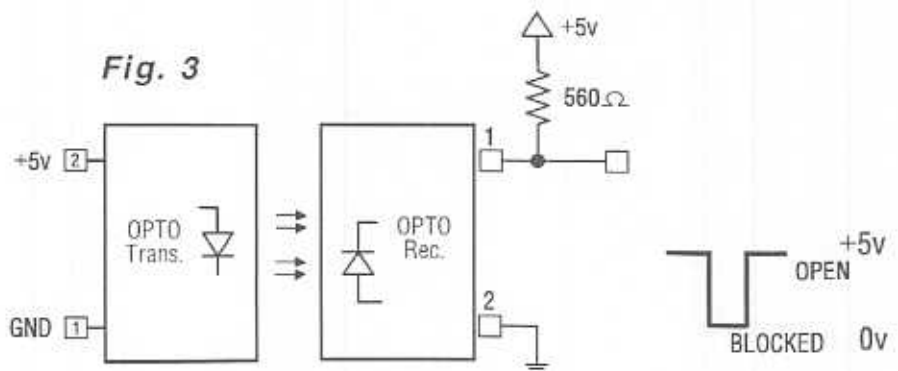
A. **OPEN OPTO** (Light Falling on LED) = **SWITCH OPEN**. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (See Fig. 1). The Scope should display a **STEADY +5v** as shown in Fig. 2A, Wave Form Diagram.



B. **CLOSED OPTO** (Light Blocked) = **SWITCH CLOSED**. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (See Fig. 1). The Scope should display a **PULSE STREAM** indicating **Q2** has switched "On" as shown in Fig. 2B, Wave Form Diagram. This is your Switch Drive Pulse.

3. Bench Test (See Fig. 3 Below):

Disconnect the OPTO Transmitter / Receiver Board from the circuit. Connect one side of a 560Ω Pull-up Resistor to **Pin-1** of the OPTO Receiver Bd. and the other side of the resistor to a 5v DC source. Connect **Pin-2** to GND. Connect a +5v DC source to **Pin-1** of the Transmitter & GND to **Pin-2**. Align with the Receiver OPTO approx. 3" distance. Using your Volt-Meter or an Oscilloscope, monitor **Pin-1** while **BLOCKING** and **UNBLOCKING** the **BEAM** from the Trans. The output will be approx. +5v DC when the **BEAM IS NOT BLOCKED** and approx. 0v when the **BEAM IS BLOCKED**.

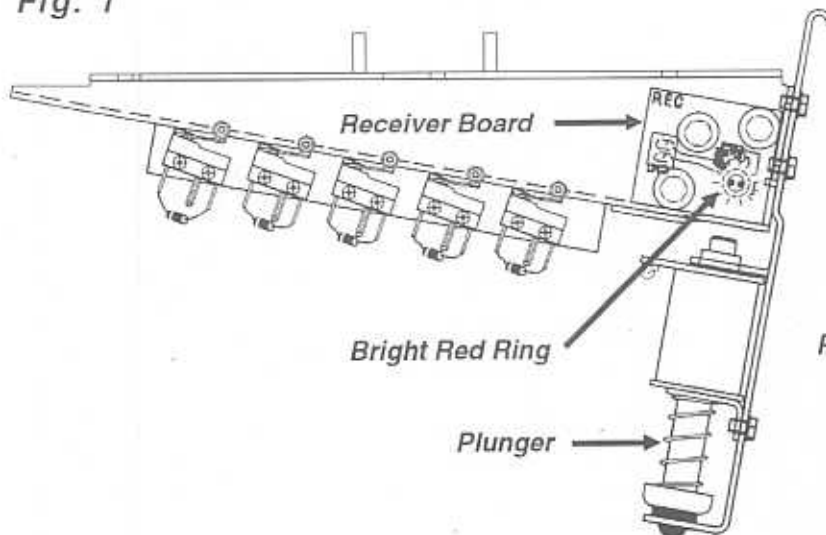


Single Trough OPTO Alignment / Test

When a working OPTO is installed and connected in a game, the transmitter should light when the power is switched on. With the playfield in Service Position #1 (playfield pulled forward resting on the playfield support brackets) and the game on, the light should show up as a "BRIGHT RED RING" through the back of the Receiver Board around the Receiver LED (See Fig. 1). With the game in Switch Test Mode, lifting the Trough Plunger with a fingertip should block the Beam and cause the Switch Position to trigger (See Fig. 2). View Fig. 3a & 3b for a sectional view of the Light Path (note alignment) and what happens as a ball breaks the light beam.

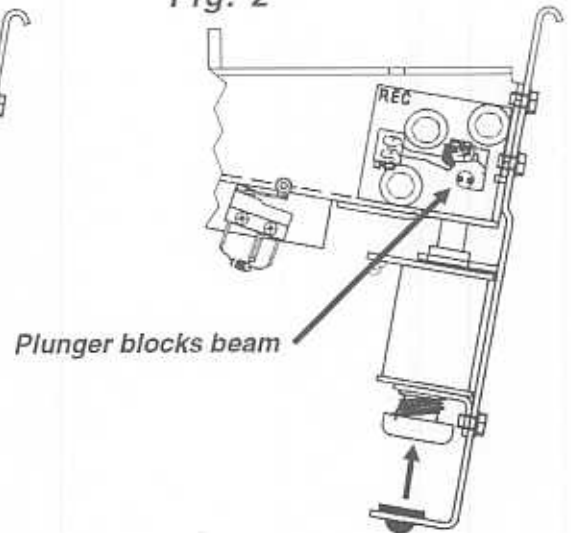
*View facing trough
(with playfield in Service Position #1)*

Fig. 1



*Lift plunger to check
switch as shown.*

Fig. 2



Sectional view from right

Fig. 3a

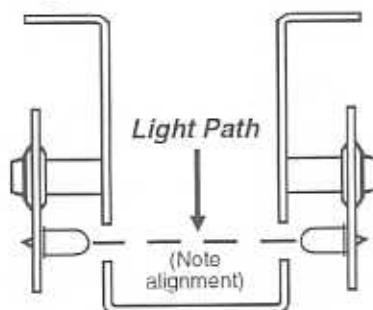
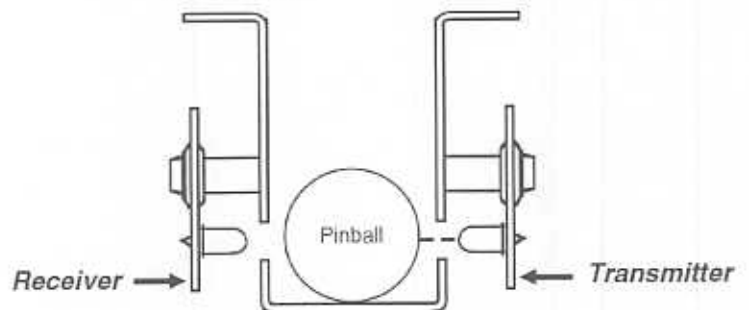


Fig. 3b



IMPORTANT

If replacement of LED is required, insure that is mounted correctly before and after soldering (See Fig. 4a & 4b).

Fig. 4a

**Correct
Position**

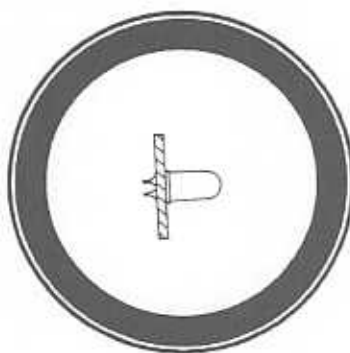
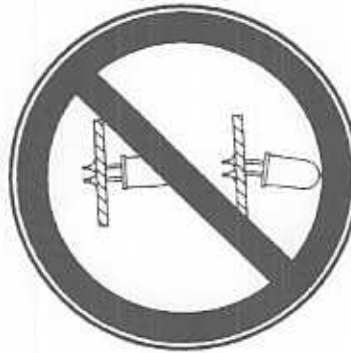
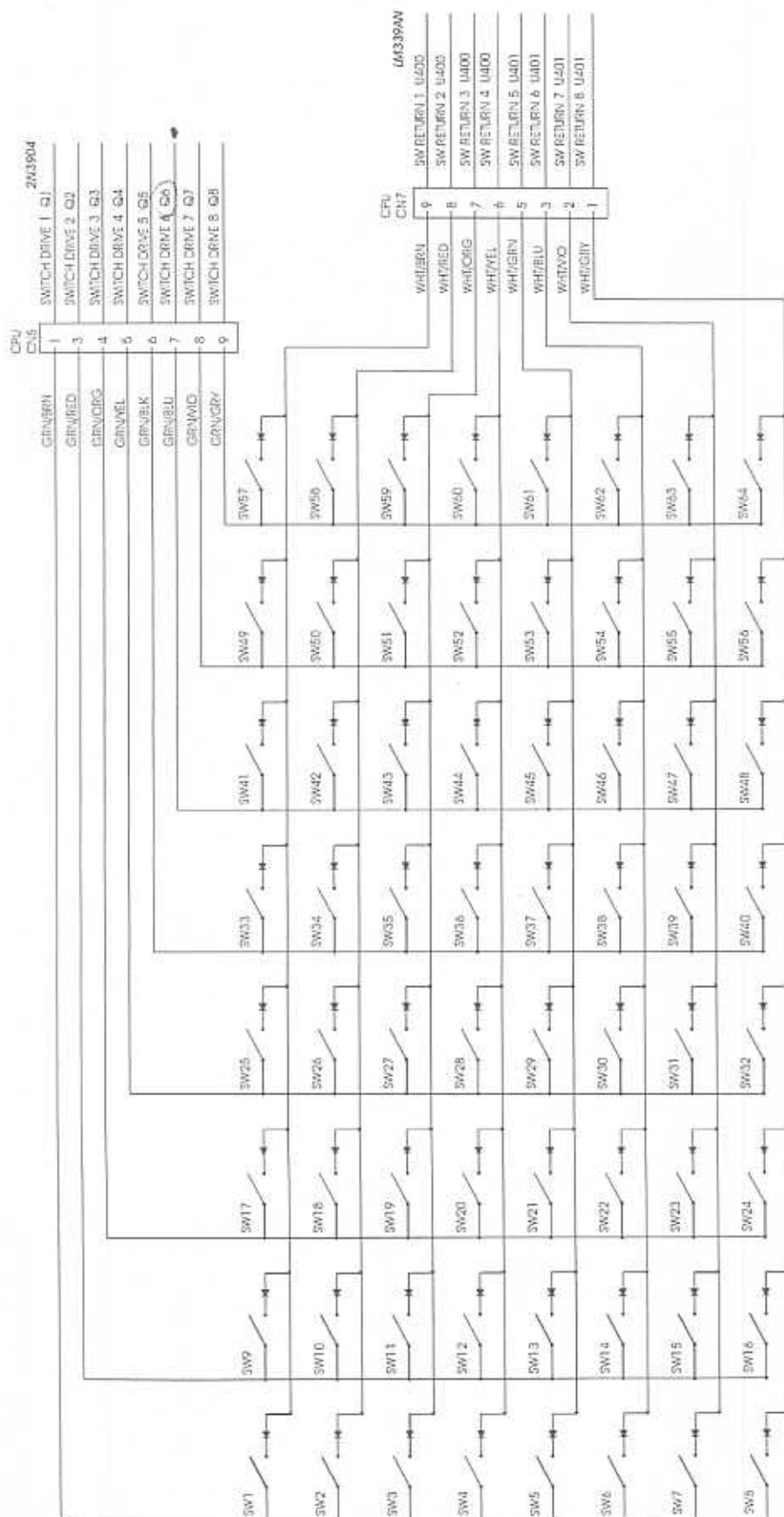


Fig. 4b

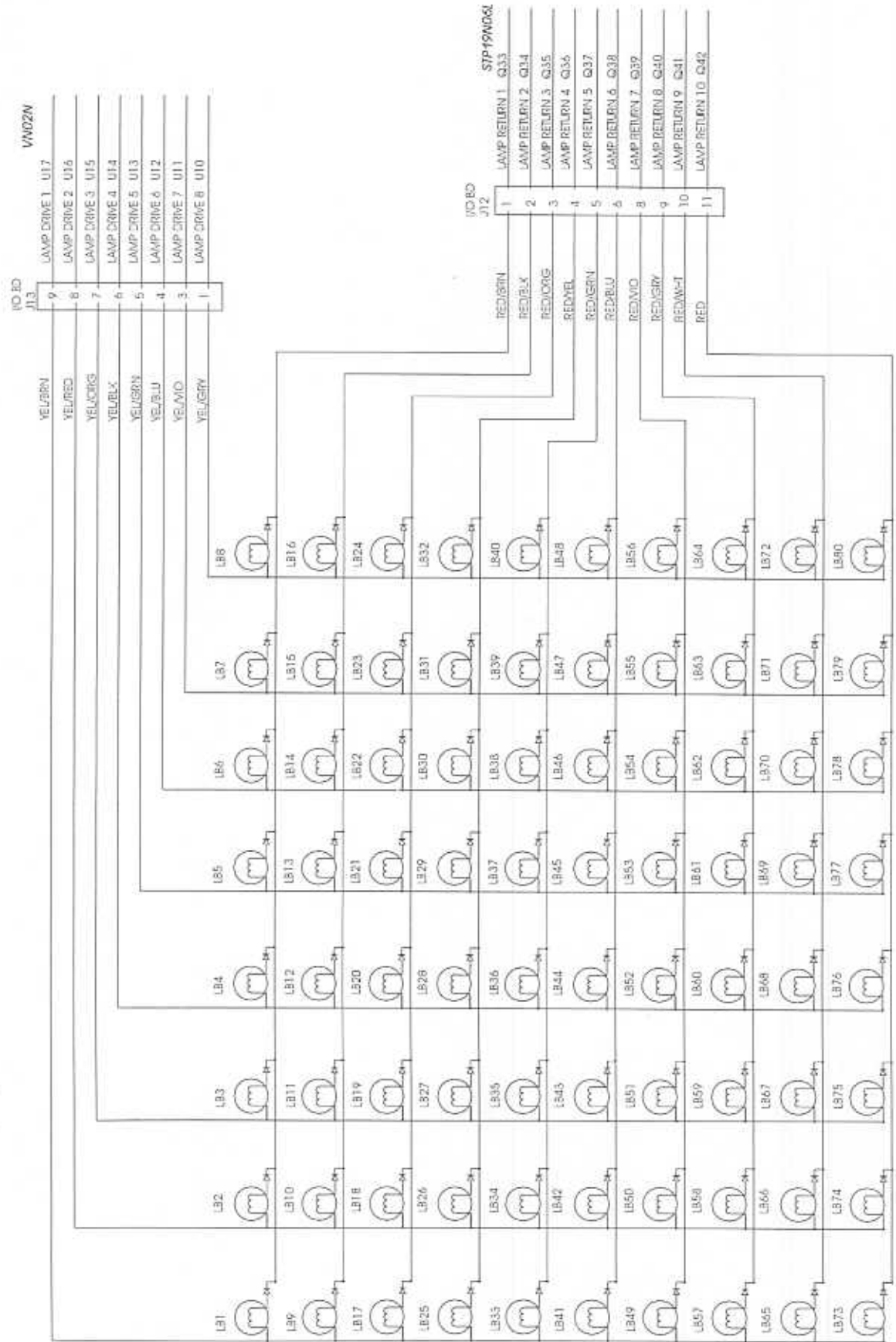
**Incorrect
Position**



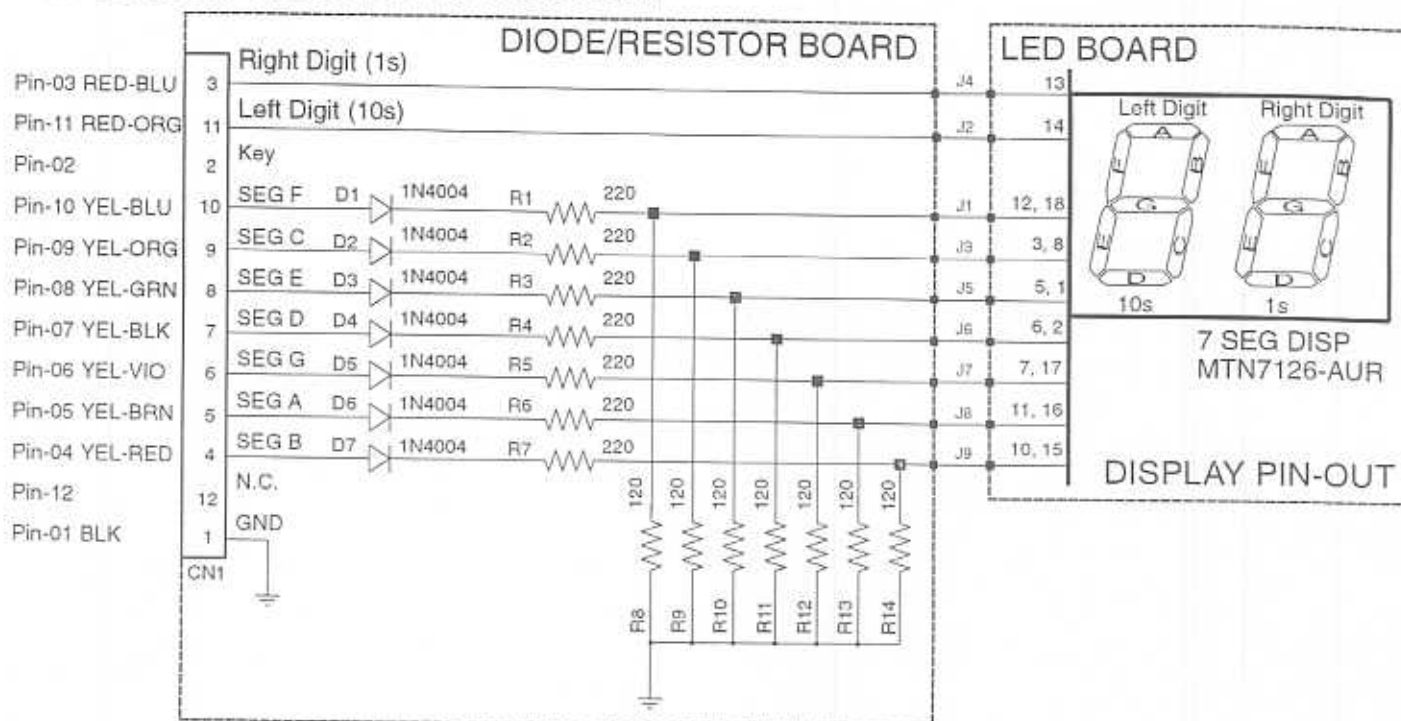
Playfield Switch Wiring Diagram



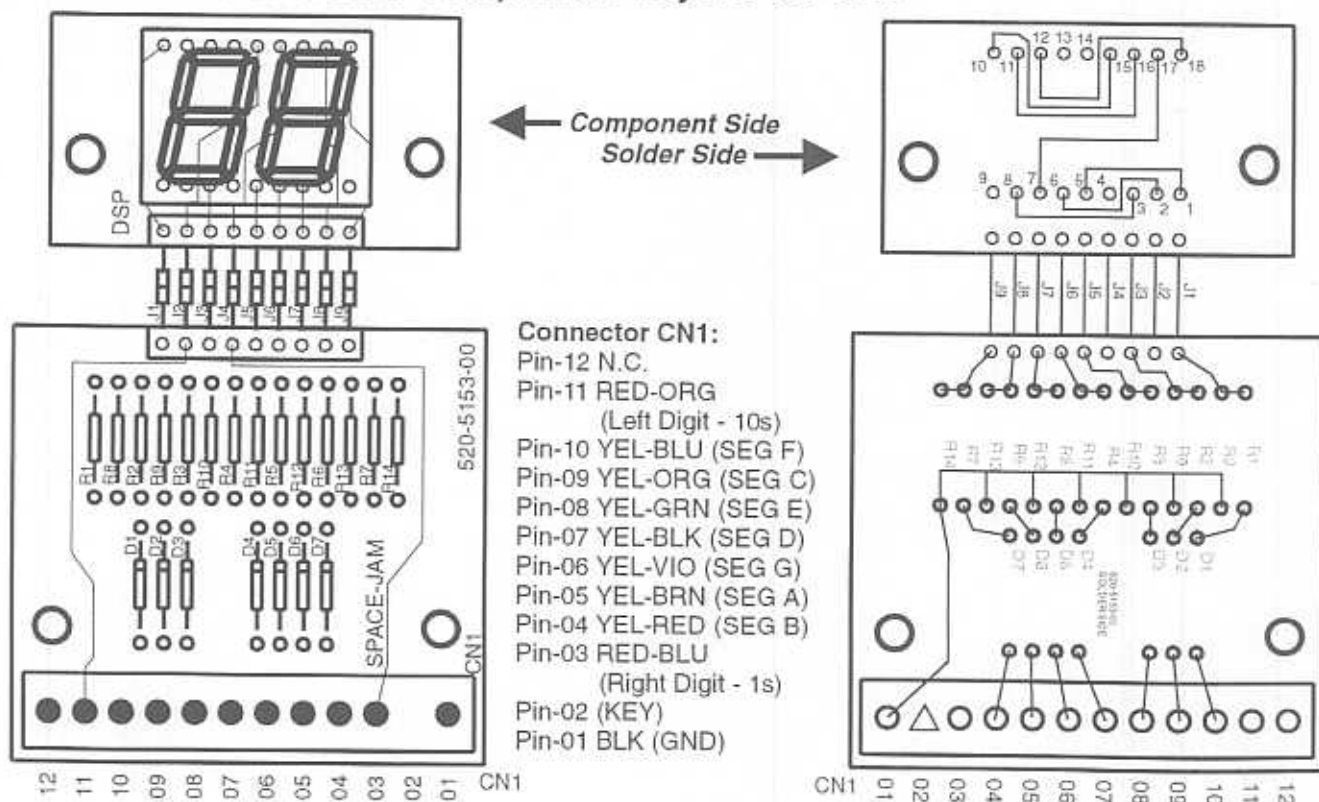
Playfield Lamp Wiring Diagram



24-Second Clock Board Schematic



24-Second Clock Board Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR
1	7	121-5014-00	R1, R2, R3, R4, R5, R6, R7
2	7	121-5030-00	R8, R9, R10, R11, R12, R13, R14
3	7	112-5003-00	D1, D2, D3, D4, D5, D6, D7
4	1	165-5098-00	DSP
5	1	045-5019-00	CN1
6	7	121-5064-00	J1, J2, J3, J4, J5, J6, J7

DESCRIPTION
220Ω, 1/4 W Resistor
120Ω, 1/4 W Resistor
Diode, 1N4004
MAN6940 .560" hi-eff. Red Display
12-Pin .156" Reverse-Mount Straight Connector
.500" Jumpers, Insulated or Zero-ohm.

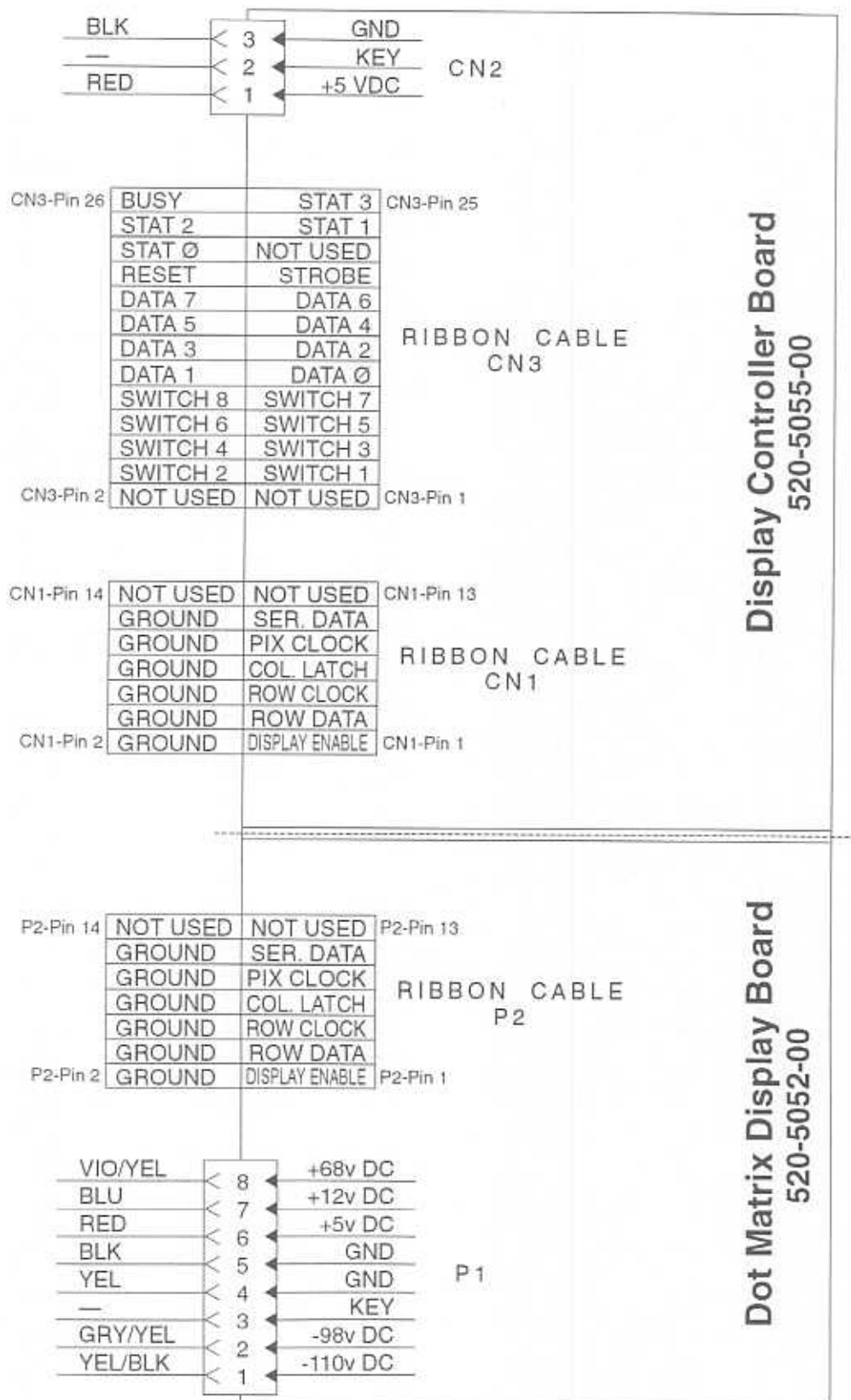
Transformer Power Wiring Diagram

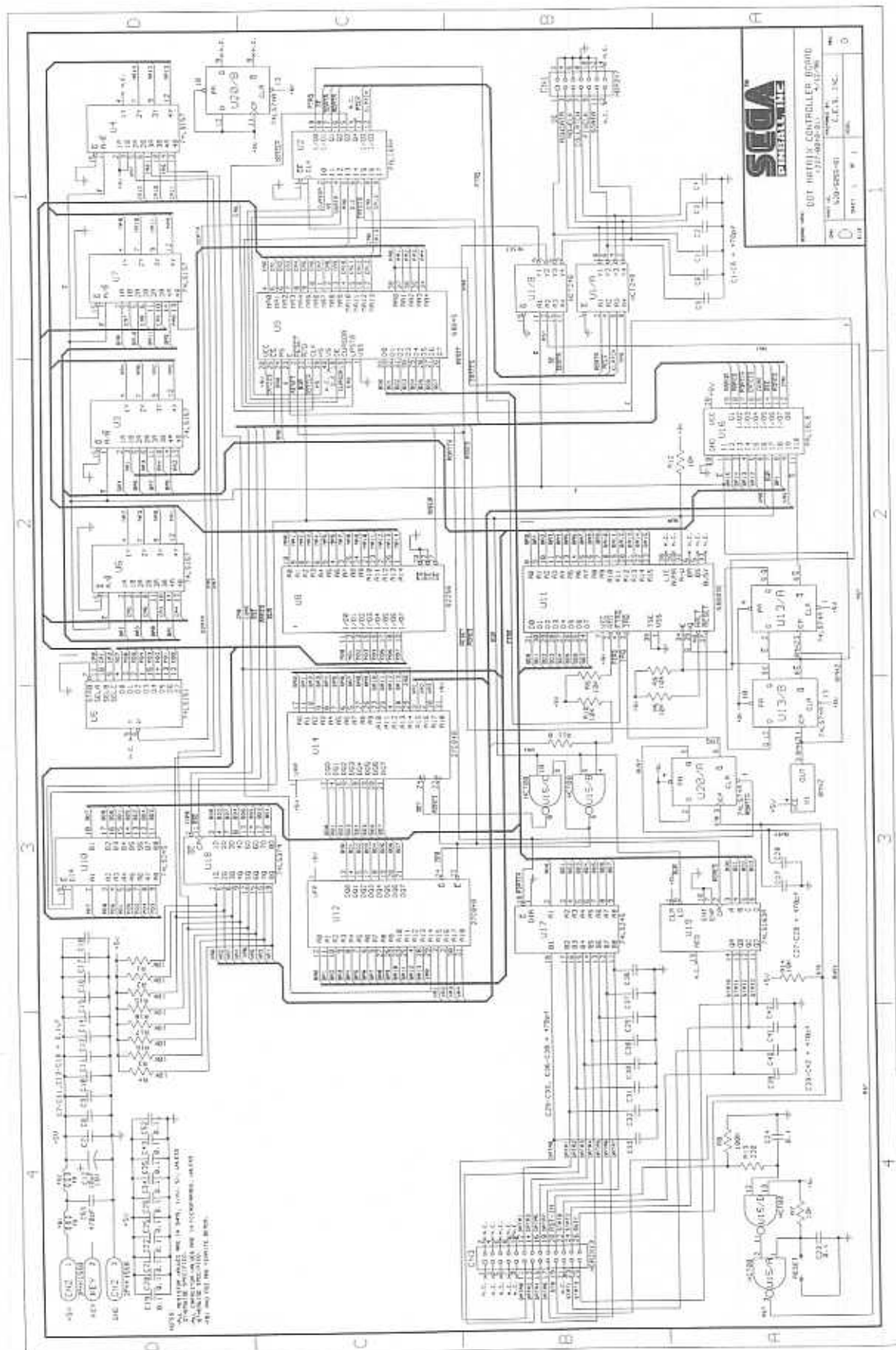


Section 5 | Cabinet

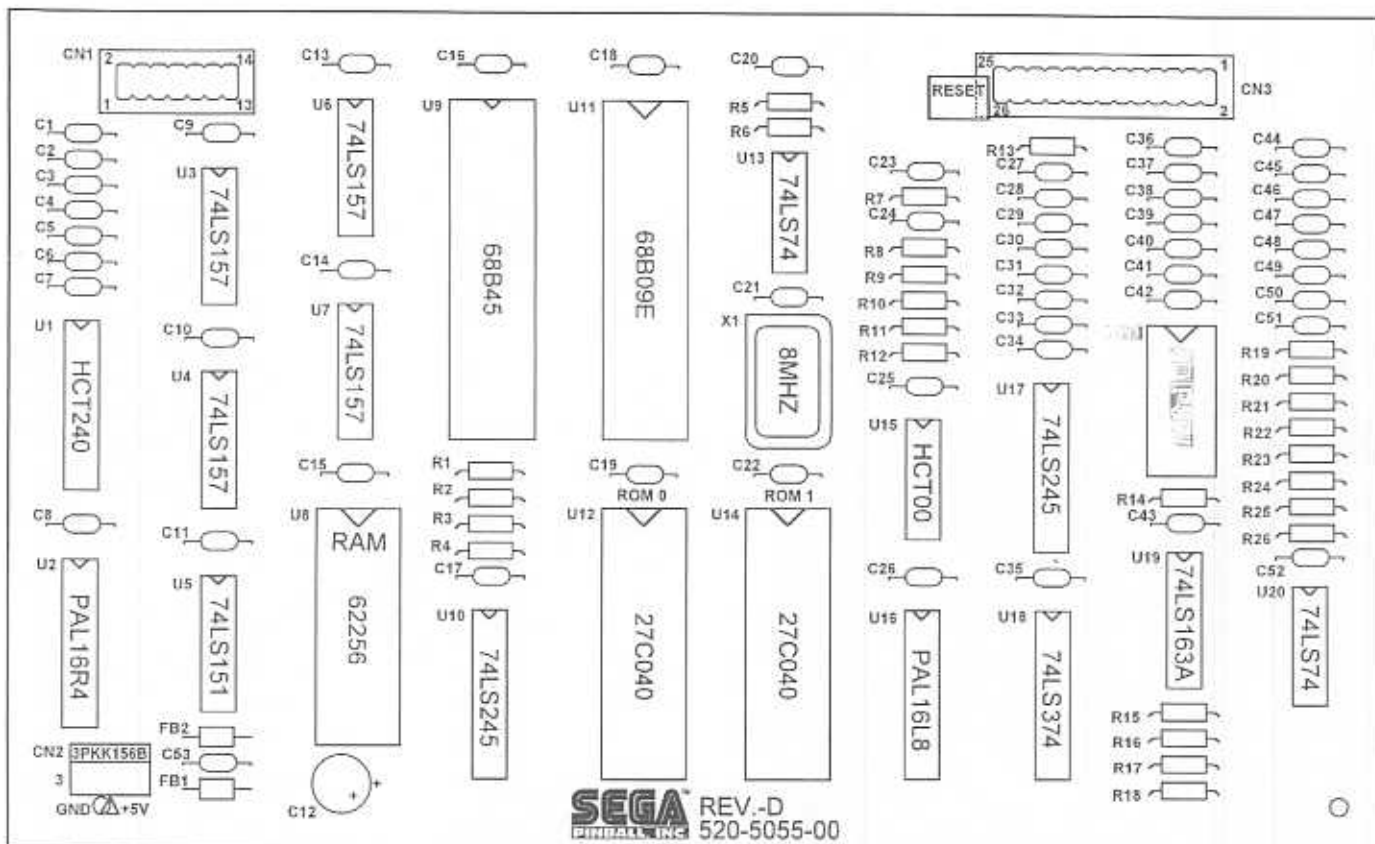
Printed Circuit Boards (PCBs)

Dot Matrix Display/Display Controller Bd. Combined Display Connections





Display Controller Board Component Layout & Parts

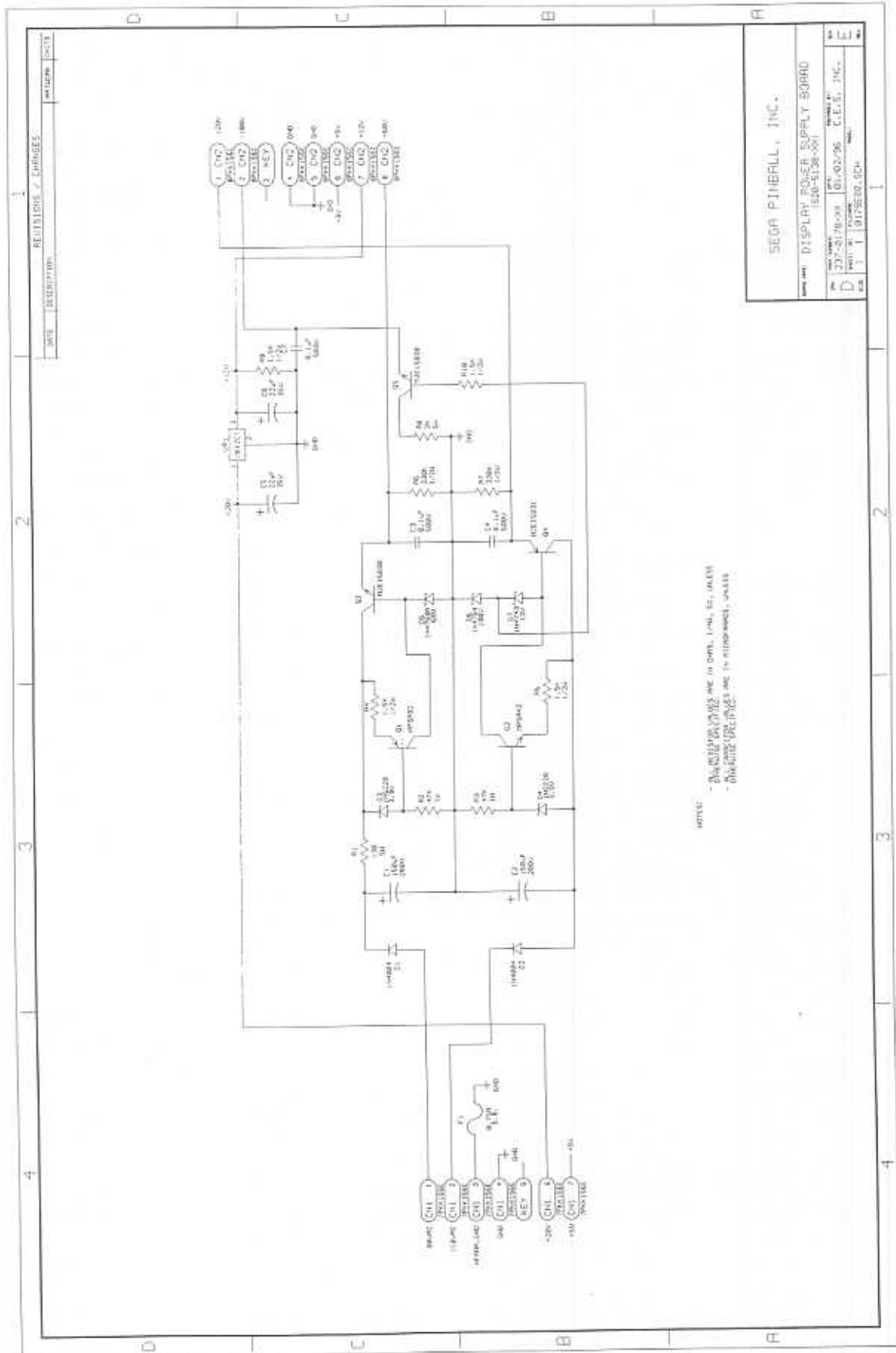


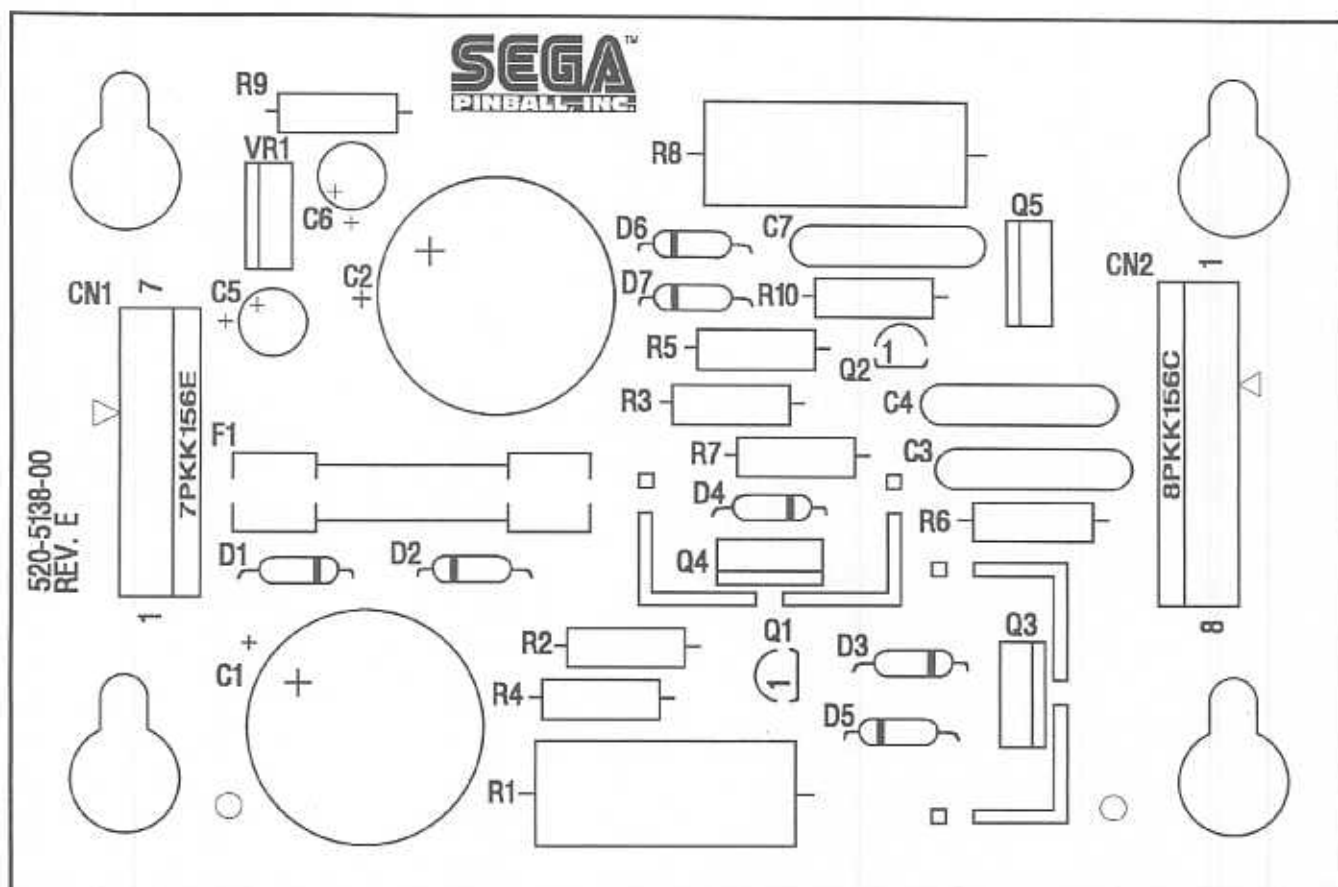
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	2	077-5216-00	U12 U14	32-PIN SOCKET
2	1	100-0397-00	U8	32K X 8 STATIC RAM (62256L-10PC)
3	1	100-0189-01	U11	68B09E
4	1	100-0233-00	U9	68B45
5	1	100-0351-00	U15	74HCT00
6	1	100-5001-00	U1	74HCT240
7	1	100-5000-00	U5	74LS151
8	4	100-0046-00	U3 U4 U6 U7	74LS157
9	1	100-0049-00	U19	74LS163A
10	2	100-0058-00	U7, U10	74LS245
11	1	100-0064-00	U18	74LS374
12	2	100-0037-00	U13 U20	74LS74
13	1	965-0107-00	U16	PAL16L8 (15CN)
14	1	965-0108-00	U2	PAL16R4 (25CN)
15	23	125-5031-00	C7 C8 C9 C10 C11 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C34 C35 C43 C52 R8	.1 mF (104) AXIAL CER. CAP
16	1	121-5051-00	R8	100K OHM 1/4 W C.F. RES. 5%
17	15	121-5011-00	R1 R2 R3 R4 R5 R6 R7 R9 R10 R12 R14 R15 R16 R17 R18	
18	1	121-5014-00	R13	220 OHM 1/4 W C.F. RES. 5%
19	0	Not Used	R19 R20 R21 R22 R23 R24 R25 R26	NOT STUFFED
20	21	125-5028-00	C1 C2 C3 C4 C5 C6 C27 C28 C29 C30 C31 C32 C33 C36 C37 C38 C39 C40 C41 C42 C44 C45 C46 C47 C48 C49 C50 C51 C53	470 pF (471) AXIAL CER. CAP (C44—C51 NOT STUFFED)
21	2	n/a	FB1 FB2	FERRITE BEAD (2743001182)
22	1	125-5015-00	C12	100uF 25V CAP (RADIAL ELEC)
23	1	045-5015-26	CN3	13-PIN DUAL ROW .1" HDR CONN.
24	1	045-5015-03	CN2	3-PIN KK-156 CONN. (540445-3)
25	1	045-5015-02	CN1	7-PIN DUAL ROW .1" HDR CONN.
26	1	140-0013-00	X1	8Mhz CLOCK OSCILLATOR
27	0	Not Used	SW1	NOT STUFFED
28	1	See Page iii Table	U12 U14 (ROM 0)	4MB ROM (U14 NOT STUFFED)



Display Power Supply Board Schematic

Section 5 | PCBs





ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	1	200-5000-10	F1	S.B. 0.75A
2	2	535-5000-11	Q3 Q4	HEATSINKS - AAVID #563002
3	2	125-5041-00	C2 C1	200V 150uF RADIAL LYTIC
4	4	121-5038-00	R10 R9 R5 R4	1/2W 1.5K
5	2	121-5059-00	R7 R6	1/2W 330K
6	2	121-5060-00	R2 R3	1W 47K
7	1	121-5061-00	R1	5W 130
8	1	121-5062-00	R8	5W 2K
9	2	112-0053-00	D3 D4	3.9V 5228
10	1	112-0062-00	D5	68V 4760A
11	1	112-0049-00	D6	100V 4764
12	1	112-0061-00	D7	13V 4743
13	1	110-0100-00	Q1	MPSA92
14	1	110-0082-00	Q2	MPSA42
15	3	125-5035-00	C3 C4 C7	500V 0.1uF CERAMIC DISK
16	1	110-0103-00	Q4	MJE15031
17	2	110-0101-00	Q3 Q5	MJE15030
18	2	125-5003-00	C5 C6	25V 22uF RADIAL LYTIC
19	1	124-5003-00	VR1	7812CT
20	1	045-5015-08	CN2	8pkk156 (PIN3=KEY)
21	2	112-5003-00	D1 D2	1N4004
22	1	045-5015-07	CN1	7PKK156E (PIN5=KEY)
23	2	n/a	Q3 Q4	6/32 KEY NUT
24	2	n/a	Q3 Q4	6/32 X 3/8 SCREW
25	2	205-0004-00	F1	FUSECLIPS

I/O Power Driver Board Theory of Operation

5V Supply:

An AC voltage of approximately 9V comes into the board at [J17-(1-4)] this AC voltage is then full-wave rectified by bridge BRDG 21 and filtered by capacitor C203. The resulting voltage is 11VDC which is inserted into a linear voltage regulator for the output of 5VDC. This 5V regulated voltage can be adjusted by potentiometer R116 the voltage should be set to 5.00V. Besides powering the I/O Board the regulated 5 volts supplies power to the CPU & Sound Board Gas Plasma Display and Plasma Controller Board. Power for these devices comes off the I/O Board on [J16-(4-8)].

+5 +12 +50V +18V +20V LED Indicators:

These DC voltages are derived on the I/O board by rectification and filtering. Each has a LED indicating that power is being supplied to each of these voltage sources. The -12V supply comes from the same transformer winding as the +12V thus it does not have a led indicator. ** Note that the +50V & +20V power sources are turned off by the interlock switches when the coin door is open.

LED	Supply Voltage	LED	Supply Voltage
L2	+5	L200	+20V
L201	+50V	L202	+18V
L203	+12V		

Reset Circuitry:

The I/O will reset in three cases:

1. The CPU is in reset. The CPU's reset signal is fed into the I/O through connector J1 and forces the I/O into reset.
2. The 5V supply has fallen below 4.75V.
3. The watchdog is not being fed by the scanning of the light matrix. More specifically pin 19 of U6 must be toggling once every 50ms to prevent the watchdog from resetting. The scanning of the light matrix is controlled by the CPU through J1.

LED L204 shows the reset state of the I/O board. If this LED is not lit either the 5VDC is below 4.75V or the CPU board is holding the I/O in reset. If the LED is flashing this means that the watchdog is not being feed by the CPU board and the I/O is oscillating into and out of reset. If the LED is continuously on the board is out of reset and communication from the CPU to the lamp matrix is confirmed. Testpoint Blanking is the actual reset signal on the I/O Board. A low voltage indicates that it is in reset this will turn off all Solenoid drivers Flash Lamps Lamp Matrix Drivers Auxiliary Outputs and Flipper Outputs. A high voltage indicates that it is out of reset and normal operation can take place.

Address Decoding:

All Address decoding is done by two 74LS138 (3 of 8 decoder). Both of these must be in operation for the I/O Board to function properly.

Solenoid Drivers & Flash Lamps:

J8 & J9 are high side drivers for driving solenoids and other heavy loads. Each connector has its own buffer driving 8 drivers. J8 & J9 consist of MOSFET drivers 20N10L which can easily & safely be tested by clipping one end of a clip-lead to test point FET TPL1 and then the other to the corresponding gate resistor R1-R16 (see note 1). This will apply 3.4V to the gate of the MOSFET transistor thus switching it on. J7 & J6 each are a bank of 8 low side driver for driving lamps or other lower current solenoids. They use a bipolar power transistor TIP122 which can also be tested by using test point TIP TPL3 and the corresponding resistors R17-R32 (see note 1).

Note 1 * Clip on the resistor side with the white stripe.

** R1 controls Q1 and R2 controls Q etc...

Auxiliary In & Out:

J2 8 CMOS Outputs sometimes used for a printer interface.

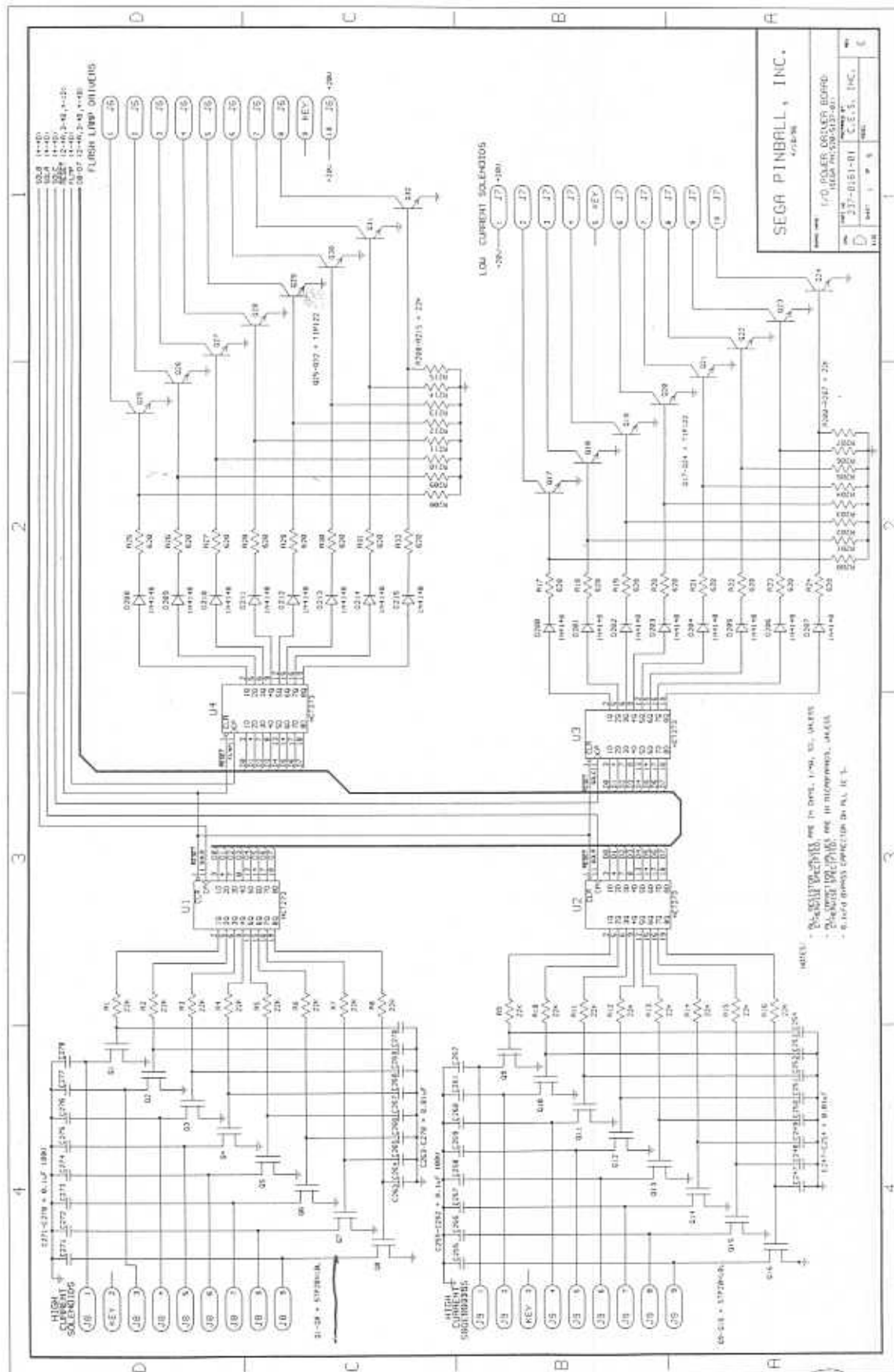
J3 8 CMOS Inputs general purpose inputs.

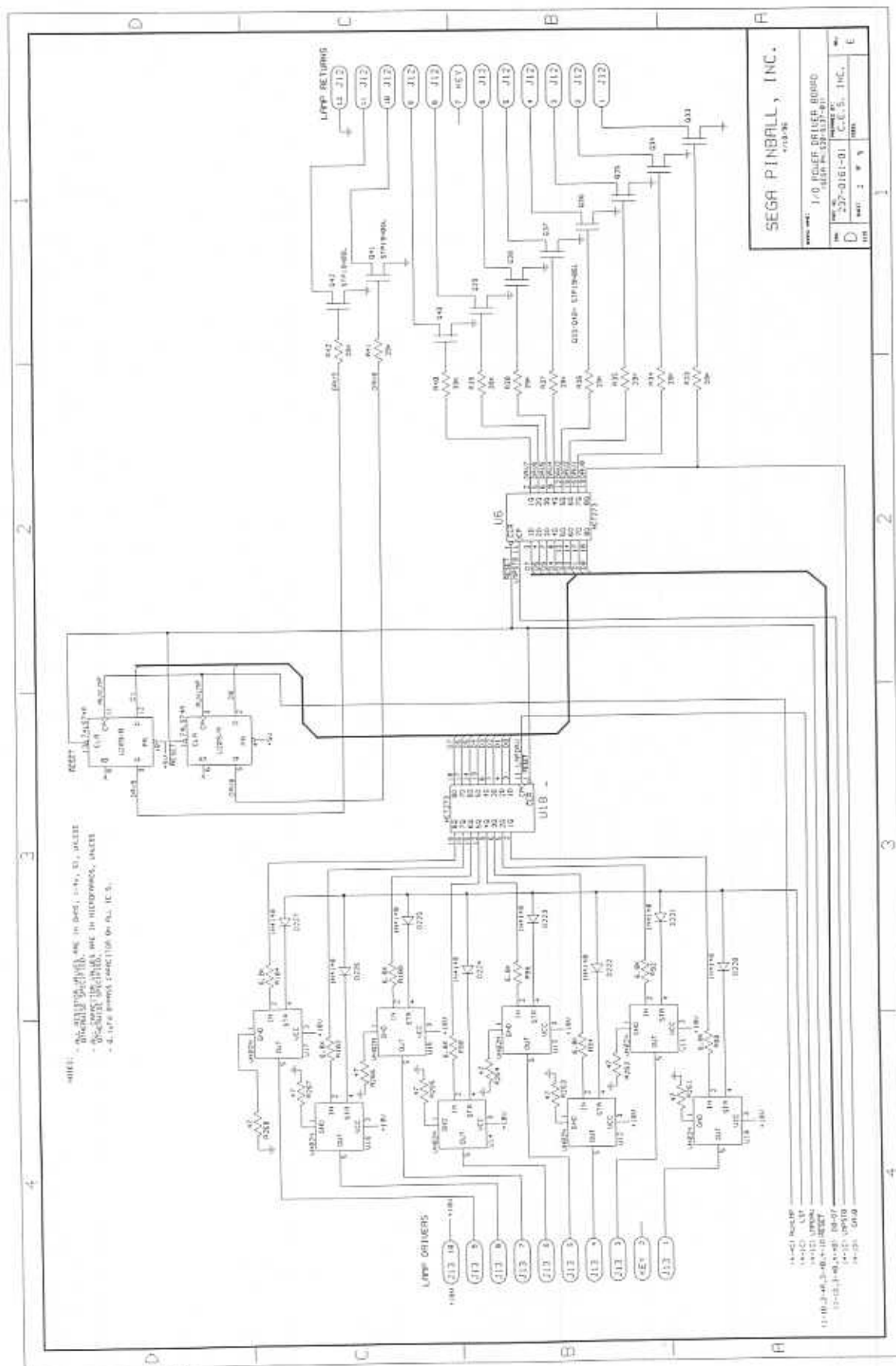
Lamp Matrix:

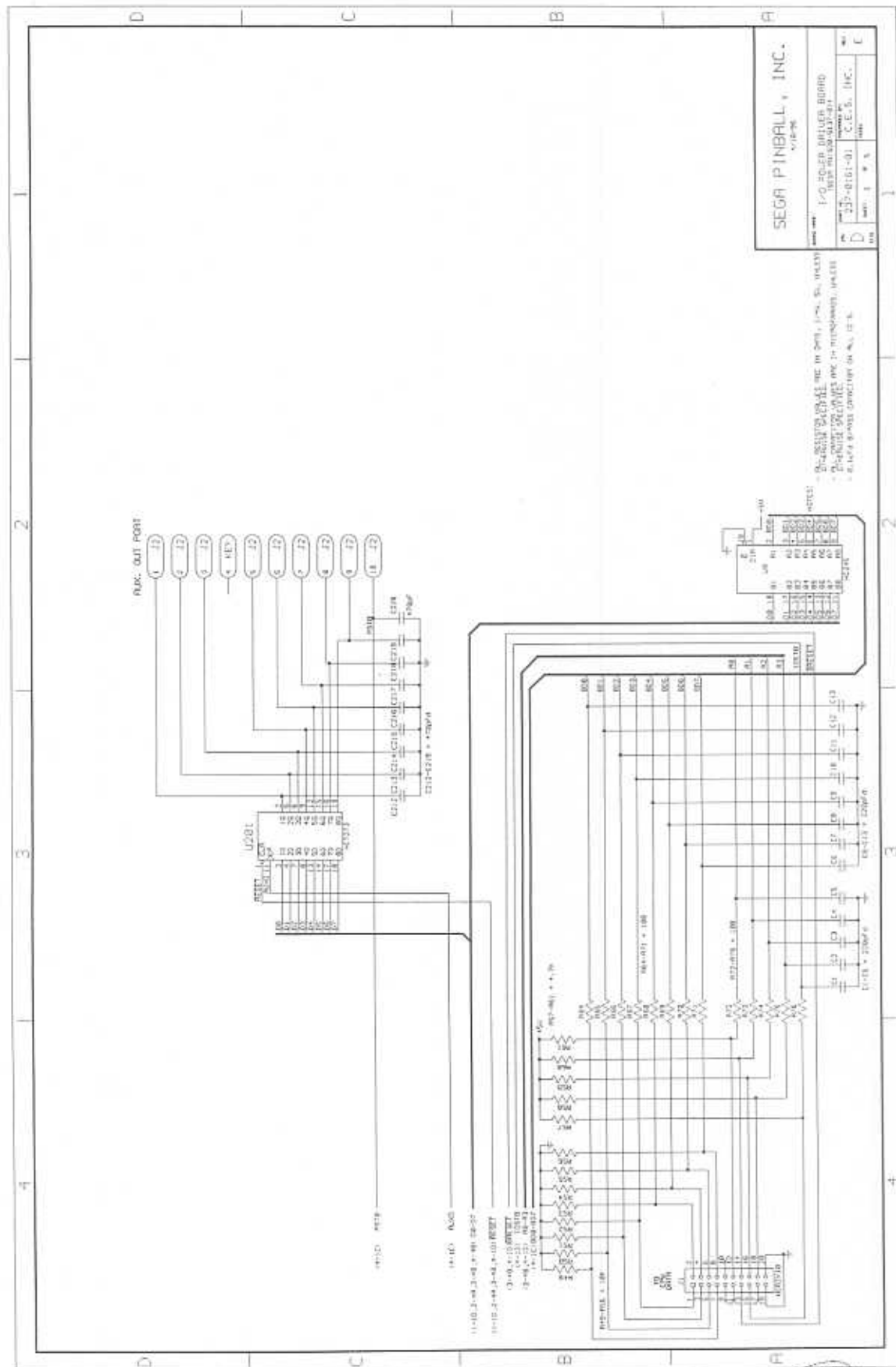
J12 has 10 low side drivers for the lamp strobes which consist of 19N06L MOSFETS. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the I/O from resetting. J13 has 8 high side drivers with each having a status indicator. All the status indicators are logically 'OR'ed together and fed back to the CPU. The status can identify open loads (for example open lamp filaments or intermittent connections) and short circuits. These drivers are also short-circuit protected.

General Illumination (G.I.) Lights:

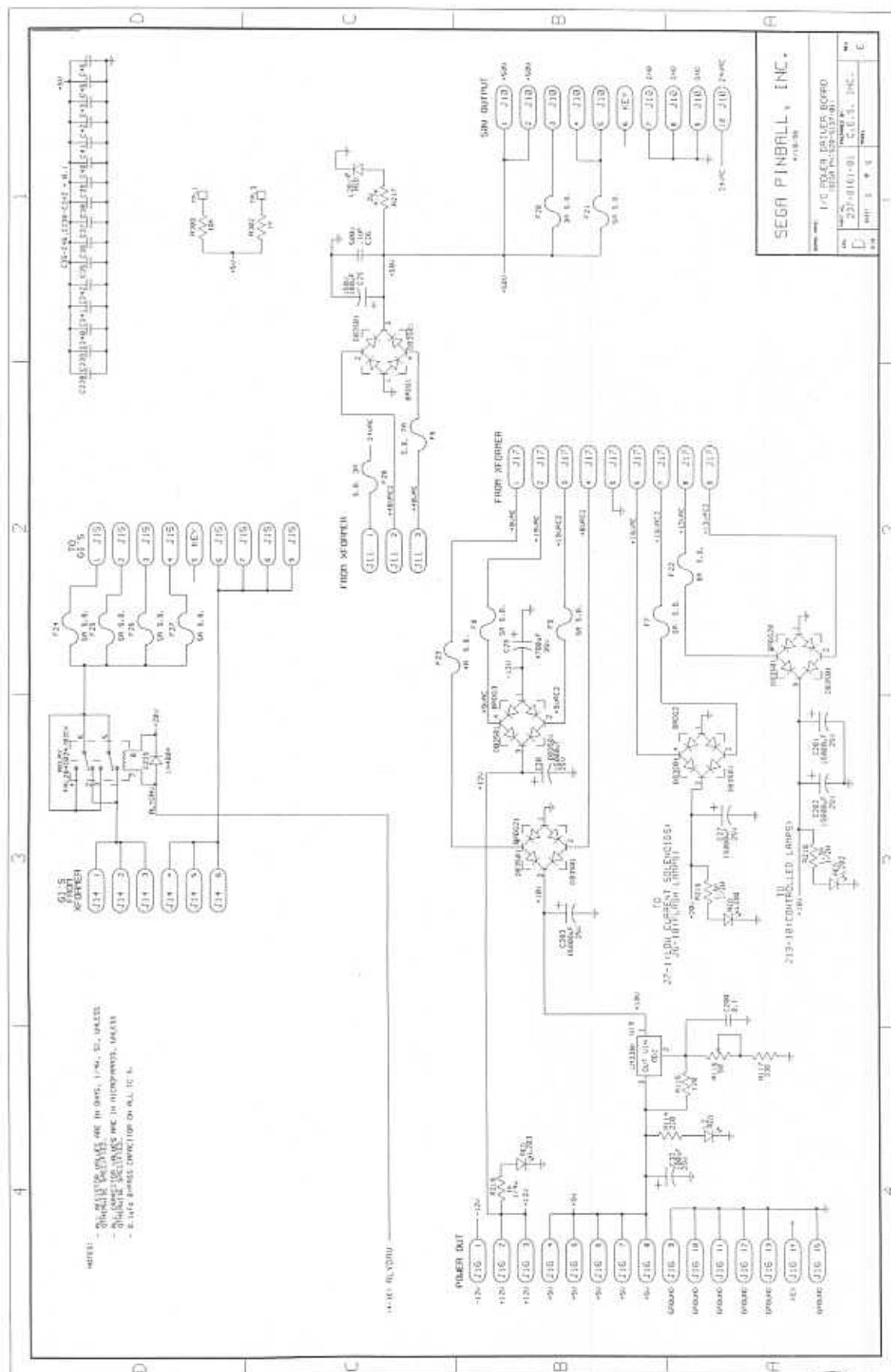
J15 has 6VAC switched on and off by a relay on the I/O Board. The relay is controlled by Q200 which supplies power to the 24V coil winding to activate the relay. There are 4 taps on J15 each fused at 5A for this 6VAC source.



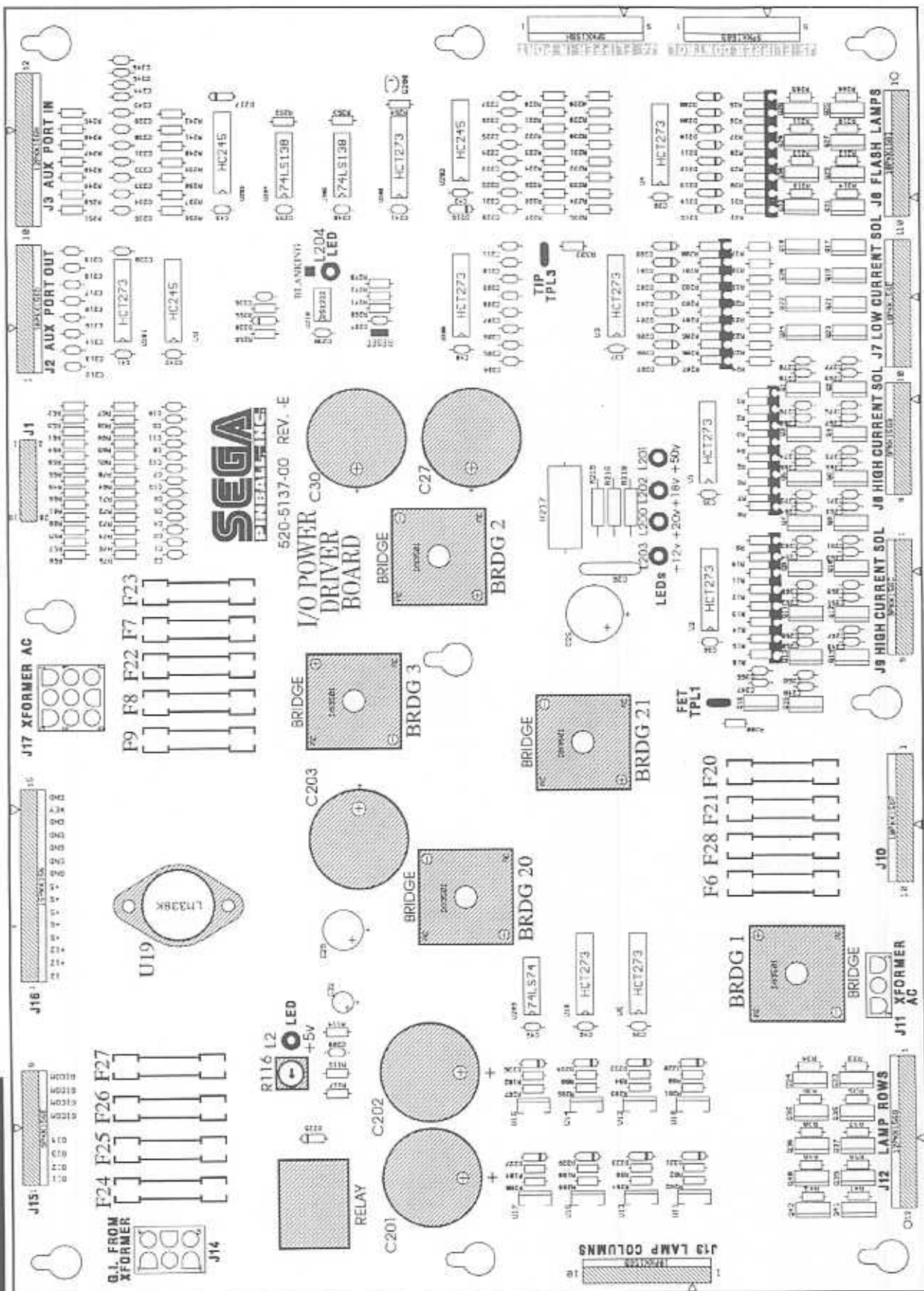








I/O Power Driver Board Component Layout



I/O Power Driver Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	16	125-5027-00	C260 C259 C258 C257 C256 C278 C271 C255	100V 104 (0.1uF)
2	22	125-5028-00	C261 C262 C277 C276 C275 C274 C273 C272 C204 C206 C207 C208 C209 C210 C211 C235 C234 C228 C229 C230 C231 C232 C233 C219 C217 C216 C215 C214 C212 C213 C237 C218 C236 C205 C243 C245 C246 C244	471 (470pF) AXIAL CAP (C204—C11 Not Stuffed)
3	16	125-5029-00	C263 C264 C265 C270 C269 C268 C267 C266 C247 C254 C253 C252 C251 C250 C249 C248 C7 C8 C9 C10 C11 C12 C13 C1 C2 C3 C4 C5 C6	103 (0.01uF)
4	13	125-5030-00	C227 C226 C220 C221 C222 C223 C224 C225	221 (220pF)
5	0	Not Used	C35 C36 C37 C38 C39 C40 C41 C42 C43 C45	Not Stuffed
6	17	125-5031-00	C46 C200 C239 C238 C240 C241 C242	104 (0.1uF)
7	16	110-0106-00	Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q16 Q15 Q14 Q13 Q12 Q11 Q10 Q9	20N10L STP
8	32	121-5042-00	R2 R3 R4 R5 R6 R7 R8 R16 R15 R14 R13 R12 R11 R10 R9 R200 R201 R202 R203 R204 R205 R206 R207 R215 R214 R213 R212 R211 R210 R209 R208 R1	22K
9	16	121-5003-00	R17 R32 R18 R19 R20 R21 R22 R23 R24 R31 R30 R29 R28 R27 R26 R25	620
10	17	121-5045-00	R237 R236 R40 R39 R38 R37 R36 R35 R34 R33 R238 R239 R240 R241 R242 R42 R41	39K
11	13	121-5007-00	R64 R72 R73 R74 R75 R76 R71 R70 R69 R68 R67 R66 R65	100
12	8	121-5029-00	R90 R92 R94 R96 R98 R100 R102 R104	6.8K
13	1	121-5030-00	R115	120
14	0	Not Used	R221 R220 R222 R223 R224 R225 R226 R227	Not Stuffed
15	9	121-5009-00	R254 R248 R249 R250 R251 R232 R246 R247 R245 R233 R234 R235 R230 R231 R228 R229 R302 R262 R261 R263 R264 R265 R266 R267 R268 R269 R114	1K 1/4 W REST. (R228—R235 Not Stuffed)
16	8	121-5032-00	R57 R58 R59 R60 R61 R252 R253 R256 R270 R49	47K 1/4W RESISTOR
17	2	121-5033-00	R271 R56 R55 R54 R53 R52 R51 R50 R255 R300	220K 1/4W RESISTOR
18	8	121-5021-00	R117 R272	4.7K 1/4W RES. (R252 Not Stuffed)
19	11	121-5011-00	U6 U4 U18 U2 U1 U200 U3 U201 U206	10K
20	2	121-5036-00	RESET	330
21	8	100-5019-00	R219	74HCT273 (U200 Not Stuffed)
22	1	Not Used	R218 R216	Not Stuffed
23	1	121-5009-00	F24 F25 F26 F27 F8 F9 F7	1/4W 1K
24	2	121-5038-00	F6	1/2W 1.5K
25	7	200-5000-01	F23	S.B. 5A
26	1	200-5000-03	F22	S.B. 7A
27	1	200-5000-06	F20 F21 F28	S.B. 4A
28	1	200-5000-07	J15	S.B. 8A
29	3	200-5000-08	J16	S.B. 3A
30	1	045-5013-00	U210	9PKK156 (PIN 5=KEY)
31	1	045-5016-00	Q200	15PKK156
32	1	100-5023-00	C32	DS1232
33	1	110-0069-00	J1	2N3904
34	1	125-5032-00	U202 U203	25V 100uF RADIAL LYTIC
35	1	045-5015-01	Q41 Q33 Q34 Q35 Q36 Q37 Q38 Q39 Q40 Q42	20 PIN 0.1 DUAL ROW HEADER
36	1	100-0338-00	L203 L202 L204 L200 L2 L201	74HC245 (U202 Not Stuffed)
37	10	110-0088-00	J2	19N06L STP
38	6	165-5099-00	R116	RED LED
39	1	045-5014-01	Q23 Q22 Q21 Q20 Q19 Q18 Q26 Q27 Q28 Q29	10PKK156 (PIN 4=KEY)
40	1	121-5039-00	Q30 Q31 Q32 Q17 Q25 Q24	50 OHM POT
41	16	110-0067-00	C25	TIP122
42	1	125-5033-00	U9	150V 100uF RADIAL LYTIC
43	1	110-0058-00	C29	74LS245
44	1	125-5034-00	RELAY	35V 4700uF RADIAL LYTIC
45	1	190-5002-00	J5	FRL264D024/02CK RELAY
46	0	Not Used	U209	Not Stuffed
47	1	100-0037-00	J4	74LS74
48	0	Not Used	U204 U205	Not Stuffed
49	2	100-0148-00	C26	74LS138
50	1	125-5035-00	U19	500V .1uF CERAMIC DISK
51	1	100-0356-00	BRDG20 BRDG3 BRDG1 BRDG2 BRDG21	LM338K
52	5	124-5000-00	C202 C203 C201 C30 C27	DB3501
53	5	125-5036-00	D208 D225 D226 D221 D220 D223 D227 D224 D222 D200 D201 D202 D203 D204 D205 D206 D207 D209 D210 D211 D212 D213 D214 D215 D228	25V 15000uF RADIAL LYTIC
54	25	112-0054-00	D217 D216 D229 TPL3 TPL1	1N4148
55	2	112-5003-00	J7	1N4004 (D216 Not Stuffed)
56	2	n/a	J6	TEST POINT WIRE (24ga.) LOOPS
57	1	045-5014-01	U17 U16 U15 U14 U13 U12 U11 U10	10PKK156 (PIN 5=KEY)
58	1	045-5014-01	J11	10PKK156 (PIN 9=KEY)
59	8	110-0089-00	J12	VN02N
60	1	045-0014-03	J17	10-84-4030 (3 PIN MOLEX)
61	1	045-5015-00	BLANKING	12PKK156 (PIN 7=KEY)
62	1	045-0014-09	R217	10-84-4090 (9 PIN MOLEX)
63	1	Not Used	J13	TEST POINT - DO NOT STUFF
64	1	121-5050-00	J14	2W 4.7K SANDBAR
65	1	045-5014-01	J10	10PKK156 (PIN 2=KEY)
66	1	045-0014-06	J3	10-84-4060 (6 PIN MOLEX)
67	1	045-5014-01	J9	10PKK156 (PIN 6=KEY)
68	1	045-5015-00	J8	12PKK156 (PIN 8=KEY)
69	1	045-5013-00	-->	9PKK156 (PIN 3=KEY)
70	1	045-5013-00	U19	9PKK156 (PIN 2=KEY)
71	26	205-0004-00		FUSECLIPS
72	1	n/a		HEATSINK (5v Reg.)



CPU Section:

The CPU is a 68B09E (U209) with up to 8Mbytes of CPU code space (U210). The CPU code is bank selected by the use of U211 and each bank consists of 16Kbytes. 8Kbytes of RAM (U212) is available to the CPU. The RAM is battery backed and has a write protected area. Battery back up is accomplished by 3-AA Cells which have a test point VB to check the battery voltage status. The write protected area consists of 512 Bytes used for storing game settings. This section of RAM can only be written to when the coin door is open. The coin door switch comes into the CPU on CN6-12 and is fed into the address decoding PAL U213. When this memory protect signal is low writes to the protected RAM area are prohibited. Address decoding for the system is accomplished by one PAL U213 and one 1-of-8 decoder U214.

A watchdog is used to monitor the CPU and the 5V supply. If the 5V supply is below 4.75 the watchdog will hold the CPU Board & I/O Board in reset. The watchdog must be fed at a rate of 250ms or faster. The signal used to feed the watchdog comes from the EPROM Bank select signal used to load U211. The CPU has a timer interrupt used as a heartbeat for the system this signal comes from counter U2. The clock for this counter is the CPU Q clock. Clearing the timer interrupt is done by reading the DIP Switch. The timer interrupt can be observed at test point FIRQ. In normal operation "FIRQ" should be toggling at a rate of 976Hz.

The I/O interface CN1 is buffered by 2 HC245 chips. The CPU's reset line is buffered by Q10 and fed over to the I/O through CN1. An I/O strobe signal is feed through CN1-15 and is used to notify the I/O that a valid address is being sent.

Switches:

The Switch Matrix consists of 8 2N3904 Transistors which pull one of 8 strobes 'low' to activate a Single Column of switches. The *Switch Return Signals* are fed into CN7 [SWITCH ROWS] and are highly filtered and compared to a 2.5v reference voltage. The *Switch Return Voltage* must be below 2.5v to make a *Valid Switch Closure*. If *false switches* are appearing, check that none of the 2N3904 Transistors are permanently pulling the *strobe line low*. Only one strobe from CN5 [SWITCH COLUMNS] should be *low at any time*. CN6 [DEDICATED SWITCH IN] is a *Dedicated Bank of Input Switches*. Switches connected to CN6 are connected to ground instead of a strobe and may be read at any time.

Plasma interface:

The data path for communication to and from the Plasma Controller Board is 8 bits wide. There are separate *Input and Output Busses*. The *Input Bus* from the Plasma Controller to the CPU/Sound Board comes in on CN8 [PLASMA CONTROL]-Pins 3-10 and is fed into U200 for input to the CPU's *Data Bus*. Data going out to the controller comes from the CPU's *Data Bus* through U201 and onto CN8-Pins 11-18. Status back from the Plasma Controller comes in on CN8-Pins 22-26 and is fed into U202 for input to the CPU's *Data Bus*. Two control signals that go out to the Plasma Controller are PRES [PLASMA RESET] and CN8-Pin 19 [PSTB - Plasma Strobe]. The Plasma Reset is software controllable through U216/B and also has a test point "Plasma Reset". The *Plasma Strobe Signal* to the controller is generated from U216/A and is used to latch data into the Plasma Controller.

Sound Section:

The audio section consists of a BSMT sound chip U9 Sound EPROMs (U17 U21 U36 U37) 68B09E U6 and Sound Code EPROM U7. The BSMT latches sound EPROM addresses in U13 & U12 for output to the Sound EPROMs. Sound Data from the EPROMs is read through U19 to the BSMT. The EPROMs are bank selected by U22. When the BSMT has sound data to be played out to the speakers it loads 16 bits into a 16 bit shift register made up of U24 & U23. The data stream from the shift register is serially shifted into a stereo 16 bit Digital to Analog Converter (DAC). When the system is operating properly the ws(word select) input of the DAC will be toggling. The ws input is used to latch the right and left channel sound data into the DAC. If the ws line is not oscillating no analog signal will come out of the DAC. The DAC outputs are a controlled current source. These outputs are converted to a voltage by an operational amplifier U30 to form the analog signal. Test points AOR and AOL are the outputs of the operational amplifier. These outputs are then fed directly into three power amplifiers (TDA2030A) or optionally into an analog volume control chip U35 for a potentiometer volume control. The analog section has its own +5V & -5V derived from VR1 & VR2. These separate supply voltages are for the DAC U26 Operational Amplifier U30 and analog volume control U35.

Sound calls are made from the CPU's 68B09E U200 to the sound section by latching data into U5. The sound section's CPU 68B09E (U6) reads in this data and handles the interfacing to the BSMT.

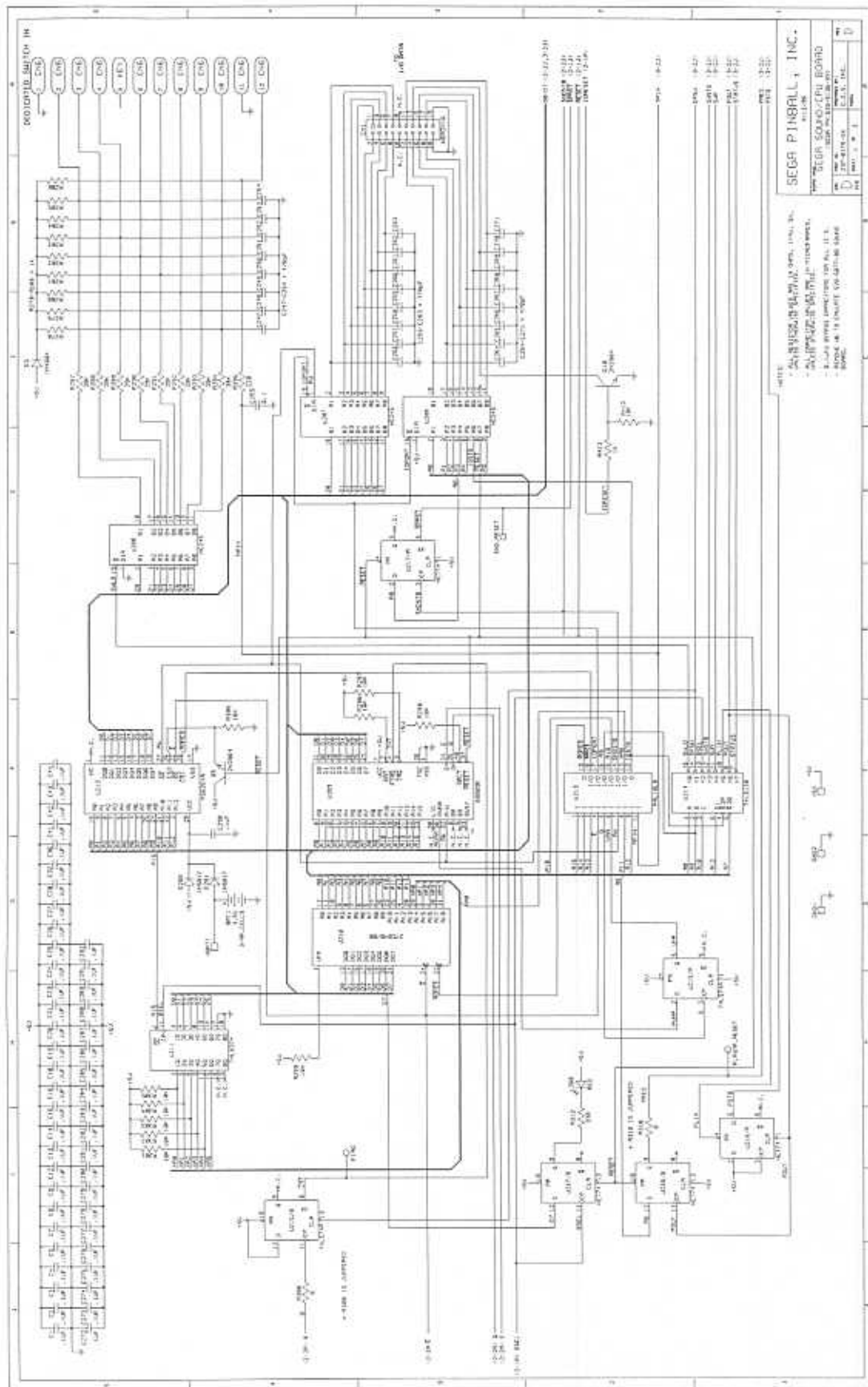
Other Test Points:

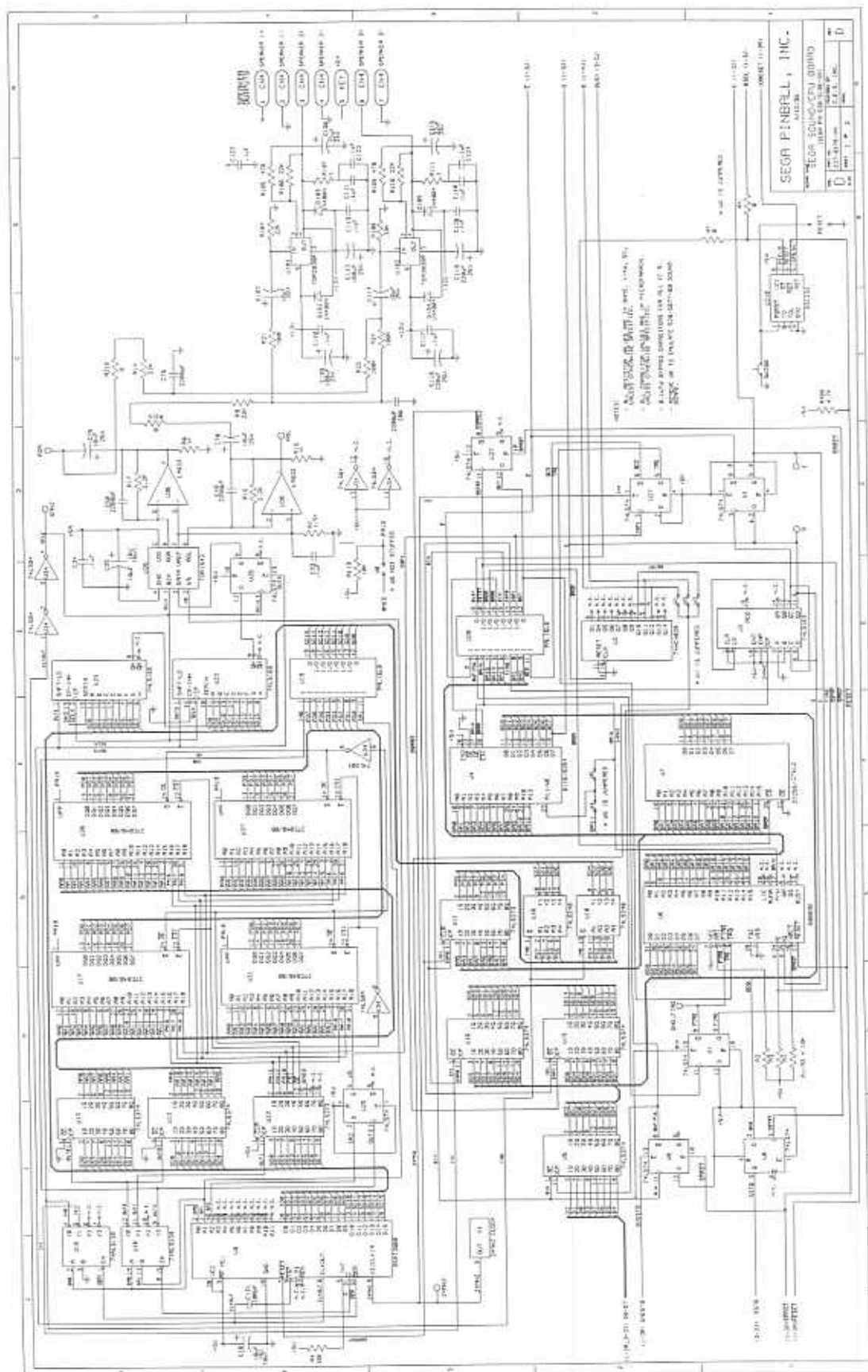
E & Q - The CPU signals for both 68B09E processors. Should be at 2Mhz with Q leading E by 500 nsec.

24Mhz - The oscillator used for the BSMT & derivation of E & Q.

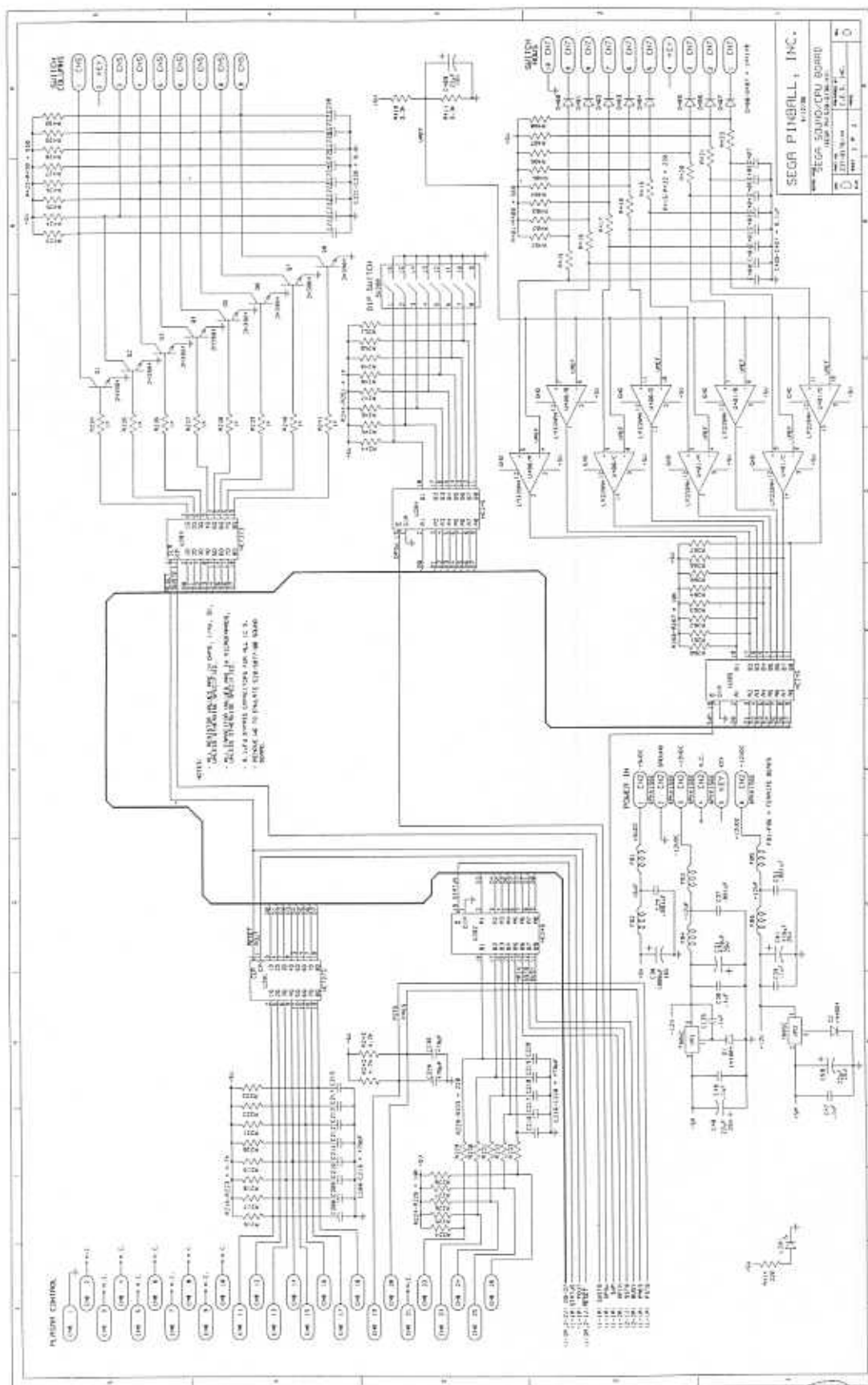
SND-FIRQ - The sound sections CPU interrupt.

6Mhz - This clock is generated internally on the BSMT and is used for shifting the data samples into the DAC.

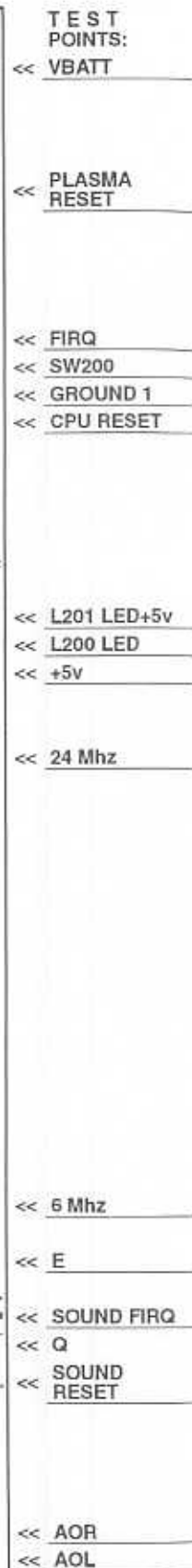




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 FAX: (617) 552-1001



Section 5 | PCBs



CPU/Sound Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	1	124-5001-00	VR2	7805
2	5	121-5051-00	R13 R24 R21 R12 R19 R22	100K 1/4W RES. (R19 Not Stuffed)
3	2	121-5009-00	R111 R103 R107	1K 1/4W RES. (R103 Not Stuffed)
4	38	121-5011-00	R4 R3 R2 R1 R113 R306 R301 R302 R303 R305 R304 R299 R296 R298 R297 R247 R248 R249 R251 R250 R246 R245 R244 R266 R267 R265 R264 R263 R228 R227 R226 R225 R224 R200 R201 R202 R203 R204 R205 R206 R207 R262 R261 R260 R409 R413	10K1/4W RES. (R200-R207 R409 R413 Not Stuffed)
5	5	121-5023-00	R14 R104 R110 R102 R100 R106 R9	22K1/4W RES. (R100 R102 Not Stuffed)
6	20	121-5009-00	R15 R8 R241 R240 R239 R238 R237 R236 R235 R234 R278 R279 R280 R281 R282 R283 R285 R286 R284 R412 R25 R17 R16 R112	1K 1/4W RES.
7	4	121-5043-00	R7	2.2K
8	1	121-5018-00	R105 R101 R109	1.5K
9	2	121-5046-00	R108 R294 R293 R292	470K 1/4W RES. (R101 Not Stuffed)
10	9	121-5045-00	R291 R290 R289 R288 R287	39K
11	1	121-5036-00	R312	330
12	12	n/a	R311 R310 R307 R309 R308 R300 R313 R316 R315 R314 WX WY	0Ω (Jumper Wire 24ga.)
13	15	121-5033-00	R295 R229 R230 R231 R232 R233 R215 R214 R213 R212 R211 R210 R209 R208 R414 R422 R421 R420 R419 R418 R417 R416 R415	220K 1/4W RES. (R208—R215 Not Stuffed)
14	11	121-5021-00	R223 R222 R221 R220 R219 R218 R217 R216 R243 R242 R400	4.7K 1/4W RES.
15	16	121-5047-00	R408 R407 R406 R405 R404 R403 R402 R401 R430 R429 R428 R427 R426 R425 R424 R423 R411 R410	560
16	2	121-5048-00	U3	3.3K 1/4W RES.
17	1	100-0049-00	U7	74LS163
18	1	See Page iii Table	U7	27512 EPROM
19	1	045-5015-07	CN4	7PKK156 (PIN5=KEY)
20	1	Not Used	RESET	DO NOT STUFF
21	5	See Page iii Table	U37 U36 U21 U17 U210	27C040 EPROM
22	2	100-5008-00	U24 U23	74LS165
23	4	125-5017-00	C76 C78 C79 C77	25V 10uF RADIAL LYTIC
24	4	125-5020-00	C59 C101 C108 C115 C40	25V 22uF RADIAL LYTIC (C101 Not Stuffed)
25	2	125-5017-00	C100 C107 C114	35V 10uF RADIAL LYTIC (C100 Not Stuffed)
26	2	125-5015-00	C102 C104 C109 C112	25V 100uF RADIAL LYTIC (C102/104 N.Stffd)
27	1	125-5014-00	C409	16V 22uF RADIAL LYTIC
28	1	100-5016-00	U35	TDA1899
29	1	125-5037-00	C30	16V 1000uF RADIAL LYTIC
30	1	100-0027-00	U34	74LS04
31	1	100-0043-00	U18	74ALS139
32	6	100-0064-00	U16 U12 U13 U15 U211U5	74LS374
33	1	100-0249-00	U2	74HC4020
34	1	100-0149-00	U10	74LS240
35	6	n/a	W2 W3 W1 W4 W5 W6	0Ω (Jumper Wire 24ga.)
36	2	125-5012-00	C81 C31	25V 470uF RADIAL LYTIC
37	2	125-5017-00	C10 C35	16V 10uF RADIAL TANT.
38	2	125-5019-00	C116 C119	25V 220uF RADIAL LYTIC
39	1	045-5015-06	CN2	6PKK156 (PIN 5=KEY)
40	1	140-0011-00	X1	24MHZ
41	1	105-0116-00	U9	BSMT2000
42a	1	965-0136-00	U19	PAL16L8 (Programmed)
42b	1	965-0137-00	U20	PAL16L8 (Programmed)
42c	1	965-6504-00	U213	PAL16L8 (Programmed)
43	5	100-0037-00	U27 U1 U25 U8 U215	74LS74
44	3	125-5043-00	C29 C37 C51	102 (0.001uF)
45	79	125-5031-00	C2 C12 C13 C14 C15 C20 C1 C42 C24 C32 C28 C43 C16 C103 C23 C27 C52 C36 C21 C26 C39 C47 C105 C120 C44 C46 C34 C25 C4 C19 C8 C41 C49 C3 C33 C9 C38 C18 C106 C45 C7 C118 C110 C122 C124 C113 C123 C5 C117 C111 C125 C290 C289 C288 C287 C286 C285 C284 C283 C282 C281 C280 C279 C278 C277 C276 C275 C273 C272 C255 C274 C292 C291 C407 C406 C405 C404 C400 C403 C401 C402 C102 C103 C121	104 (0.1uF) AXIAL CER. CAP (C102 C103 C105 C106 Not Stuffed)
46	1	125-5038-00	C48 C50 C75 C80	101 (100pF)
47	4	125-5039-00	C270 C269 C268 C267 C271 C265 C266 C262	222 (0.0022uF)
48	41	125-5028-00	C261 C260 C259 C263 C256 C257 C258 C249 C248 C247 C254 C250 C251 C252 C220 C219 C218 C217 C216 C215 C213 C212 C211 C210 C209 C208 C200 C201 C202 C203 C205 C206 C207 C230 C229 C253 C214 C204 C264 C408 C221 C222 C223 C225 C226 C227 C228 C224 C408	471 (470pF) CER. CAP (C200—C107, C408 Not Stuffed)
49	8	125-5029-00	CN3	103 (0.01uF)
50	1	045-5015-06	U30	6PKK156
51	1	100-0375-00	U22 U11	LM833
52	2	100-0022-00	D1 D100 D2 D103 D104 D101 D105 D102 D3	74LS273
53	7	112-5003-00	D201 D200	1N4004 (D100 D101 Not Stuffed)
54	2	112-5008-00	D407 D406 D405 D404 D403 D402 D401 D400 D202	1N5817
55	8	112-0054-00	FB6 FB4 FB5 FB2 FB1 FB3	1N4148 (D202 Not Stuffed)
56	6	n/a	VR1	FB
57	1	124-5002-00	U102 U100 U101	7905
58	2	100-5016-20		TDA2030V (U100 Not Stuffed)

THIS PARTS LIST IS CONTINUED ON THE NEXT PAGE.

Section 5 | PCBs

Your Notes

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- **Appendix G, Part Number Prefix Classification Codes 128**
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...gives definitions or explanations of some pinball terms and acronyms.

APPENDIX A Pinball Game Firmware Table

EPROM	Chip Size	Part N°	Ver.	Loc.	Raw Part N°
Laser War					
CPU	(256K)	965-0004-00		C5	960-5007-00
Sound (Old)	(256K)	965-0005-00		J5	960-5007-00
Sound (Old)	(256K)	965-0006-00		J6	960-5007-00
Sound (Old)	(256K)	965-0007-00		J7	960-5007-00
-OR-					
Sound	(256K)	965-0008-00		7F	960-5007-00
Sound 1	(512K)	965-0009-00		6F	960-7001-02
Sound 2	(512K)	965-0010-00		4F	960-7001-02
Secret Service					
CPU	(256K)	965-0011-00	A-6	B5	960-5007-00
CPU	(256K)	965-0012-00	A-6	C5	960-5007-00
Voice 1	(512K)	965-0014-00		6F	960-7001-02
Voice 2	(512K)	965-0015-00		4F	960-7001-02
Sound	(256K)	965-0013-00		7F	960-5007-00
Torpedo Alley					
CPU	(256K)	965-0016-00	A02-1	B5	960-5007-00
CPU	(256K)	965-0017-00	A02-1	C5	960-5007-00
Voice 1	(512K)	965-0019-00		6F	960-7001-02
Voice 2	(512K)	965-0020-00		4F	960-7001-02
Sound	(256K)	965-0018-00		7F	960-5007-00
Time Machine					
CPU	(256K)	965-0021-00	A02-3	B5	960-5007-00
CPU	(256K)	965-0022-00	A02-3	C5	960-5007-00
Voice 1	(512K)	965-0024-00		6F	960-7001-02
Voice 2	(512K)	965-0025-00		4F	960-7001-02
Sound	(256K)	965-0023-00		7F	960-5007-00
Playboy 35th Anniversary					
CPU	(256K)	965-0046-00	A02-3	B5	960-5007-00
CPU	(256K)	965-0047-00	A02-3	C5	960-5007-00
Voice 1	(512K)	965-0049-00		6F	960-7001-02
Voice 2	(512K)	965-0050-00		4F	960-7001-02
Sound	(256K)	965-0048-00		7F	960-5007-00
ABC Monday Night Football					
CPU	(256K)	965-0031-00	A02-7	B5	960-5007-00
CPU	(256K)	965-0032-00	A02-7	C5	960-5007-00
Voice 1	(512K)	965-0034-00		6F	960-7001-02
Voice 2	(512K)	965-0035-00		4F	960-7001-02
Sound	(256K)	965-0033-00		7F	960-5007-00
Robocop					
CPU	(256K)	965-0036-00	A03-4	B5	960-5007-00
CPU	(256K)	965-0037-00	A03-4	C5	960-5007-00
Voice 1	(512K)	965-0039-00		6F	960-7001-02
Voice 2	(512K)	965-0040-00		4F	960-7001-02
Sound	(256K)	965-0038-00		7F	960-5007-00
Phantom of the Opera					
CPU	(256K)	965-0026-00	A03-2	B5	960-5007-00
CPU	(256K)	965-0027-00	A03-2	C5	960-5007-00
Voice 1	(512K)	965-0029-00		6F	960-7001-02
Voice 2	(512K)	965-0030-00		4F	960-7001-02
Sound	(256K)	965-0028-00		7F	960-5007-00
Back to the Future					
CPU	(256K)	965-0041-00	SA-2	B5	960-5007-00
CPU	(256K)	965-0042-00	SA-2	C5	960-5007-00
Voice 1	(512K)	965-0044-00		6F	960-7001-02
Voice 2	(512K)	965-0045-00		4F	960-7001-02
Sound	(256K)	965-0043-00		7F	960-5007-00
The Simpsons					
CPU	(256K)	965-0051-00	A02-7	B5	960-5007-00
CPU	(256K)	965-0052-00	A02-7	C5	960-5007-00
Voice 1	(512K)	965-0054-00		6F	960-7001-02
Voice 2	(512K)	965-0055-00		4F	960-7001-02
Sound	(256K)	965-0053-00		7F	960-5007-00
Checkpoint					
CPU	(256K)	965-0056-00	A1-7	B5	960-5007-00
CPU	(256K)	965-0124-00	A1-7	C5	960-5007-00
Voice 1	(1M)	965-0057-00		F7	960-5009-00
Voice 2	(1M)	965-0058-00		F5	960-5009-00
Sound	(256K)	965-0059-00		F4	960-5007-00
Display	(512K)	965-0060-00	CP80	U8	960-7001-02
Teenage Mutant Ninja Turtles					
CPU	(256K)	965-0061-00	A1.04	B5	960-5007-00
CPU	(256K)	965-0062-00	A1.04	C5	960-5007-00
Voice 1	(1M)	965-0063-00		F5/6	960-5009-00
Voice 2	(1M)	965-0064-00		F4/5	960-5009-00
Sound	(256K)	965-0065-00		F7	960-5007-00
Display	(512K)	965-0066-00	A1.04	U8	960-7001-02
Batman					
CPU	(128K)	965-0067-00	A1.06	B5	960-5006-00
CPU	(256K)	965-0135-00	A1.06	C5	960-5007-00
Voice 1	(2M)	965-0068-00		U17	960-5010-00
Voice 2	(1M)	965-0069-00		U21	960-5009-00
Sound	(256K)	965-0070-00		U7	960-5007-00
Display	(1M)	965-0071-00	A1.06	U8	960-5009-00

EPROM	Chip Size	Part N°	Ver.	Loc.	Raw Part N°
Star Trek 25th Anniversary					
CPU	(512K)	965-0072-00	A2.01	B5	960-7001-02
Voice 1	(2M)	965-0073-00		U17	960-5010-00
Voice 2	(2M)	965-0074-00		U21	960-5010-00
Sound	(256K)	965-0075-00		U7	960-5007-00
Display	(1M)	965-0076-00	A1.09	U8	960-5009-00
Hook					
CPU	(512K)	965-0077-00	A4.08	C5	960-7001-02
Voice 1	(2M)	965-0078-00		U17	960-5010-00
Voice 2	(2M)	965-0079-00		U21	960-5010-00
Sound	(256K)	965-0080-00		U7	960-5007-00
Display	(1M)	965-0081-00	A4.01	U8	960-5009-00
Lethal Weapon 3					
CPU	(512K)	965-0082-00	A2.07	C5	960-7001-02
Voice 1	(2M)	965-0083-00		U17	960-5010-00
Voice 2	(2M)	965-0084-00		U21	960-5010-00
Sound	(256K)	965-0085-00		U7	960-5007-00
Display	(2M)	965-0086-00	A2.06	ROM 0	960-5010-00
Display	(2M)	965-0087-00	A2.06	ROM 1	960-5010-00
(Used on Display PCB 520-5055-00)					
-OR-					
Display	(4M)	965-0087-04	A2.06	ROM 0	960-5015-00
(Used on Display PCB 520-5055-01)					
Star Wars					
CPU	(512K)	965-0119-00	A1.03	C5	960-7001-02
Voice 0	(4M)	965-0132-00		U17	960-5015-00
Voice 1	(2M)	965-0133-00		U21	960-5010-00
Sound	(256K)	965-0131-00		U7	960-5007-00
Display	(2M)	965-0120-00	A1.04	ROM 0	960-5010-00
Display	(2M)	965-0121-00	A1.04	ROM 1	960-5010-00
(Used on Display PCB 520-5055-00)					
-OR-					
Display	(4M)	965-0122-00	A1.05	ROM 0	960-5015-00
(Used on Display PCB 520-5055-01)					
Rocky & Bullwinkle & Friends					
CPU	(512K)	965-0138-00	A1.30	C5	960-7001-02
Voice 0	(4M)	965-0139-00		U17	960-5015-00
Voice 1	(2M)	965-0140-00		U21	960-5010-00
Sound	(256K)	965-0141-00		U7	960-5007-00
Display	(4M)	965-0142-00	A1.30	ROM 0	960-5015-00
Jurassic Park					
CPU	(512K)	965-0143-00	A5.13	C5	960-7001-02
Voice 0	(4M)	965-0144-00		U17	960-5015-00
Voice 1	(2M)	965-0145-00		U21	960-5010-00
Sound	(256K)	965-0146-00		U7	960-5007-00
Display	(4M)	965-0147-00	A5.10	ROM 0	960-5015-00
Last Action Hero					
CPU	(512K)	965-0148-00	A1.12	C5	960-7001-02
Voice 0	(4M)	965-0149-00		U17	960-5015-00
Voice 1	(2M)	965-0150-00		U21	960-5010-00
Sound	(256K)	965-0151-00		U7	960-5007-00
Display	(4M)	965-0152-00	A1.06	ROM 0	960-5015-00
Tales from the Crypt					
CPU	(512K)	965-0157-00	A3.03	C5	960-7001-02
Voice 0	(4M)	965-0158-00		U17	960-5015-00
Voice 1	(2M)	965-0159-00		U21	960-5010-00
Sound	(256K)	965-0160-00		U7	960-5007-00
Display	(4M)	965-0161-00	A3.01	ROM 0	960-5015-00
The Who's Tommy					
CPU	(512K)	965-0162-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0165-00		U17	960-5015-00
Voice 2	(4M)	965-0166-00		U21	960-5015-00
Voice 3	(4M)	965-0167-00		U36	960-5015-00
Voice 4	(4M)	965-0168-00		U37	960-5015-00
Sound	(512K)	965-0164-00		U7	960-7001-02
Display	(4M)	965-0163-00	A4.00	ROM 0	960-5015-00
WWF Royal Rumble					
CPU	(512K)	965-0169-00	A1.06	C5	960-7001-02
Voice 1	(4M)	965-0172-00		U17	960-5015-00
Voice 2	(4M)	965-0173-00		U21	960-5015-00
Voice 3	(4M)	965-0174-00		U36	960-5015-00
Sound	(512K)	965-0171-00		U7	960-7001-02
Display	(4M)	965-0170-00	A1.02	ROM 0	960-5015-00
Guns N' Roses					
CPU	(512K)	965-0175-00	A3.00	C5	960-7001-02
Voice 1	(4M)	965-0178-00		U17	960-5015-00
Voice 2	(4M)	965-0179-00		U21	960-5015-00
Voice 3	(4M)	965-0180-00		U36	960-5015-00
Voice 4	(4M)	965-0181-00		U37	960-5015-00
Sound	(512K)	965-0177-00		U7	960-7001-02
Display	(4M)	965-0176-00	A3.00	ROM 0	960-5015-00

Table continued on the next page.

Table Notes:
Game Revisions can be updated after the production run. This table is accurate as of the printing of this manual. To see if any changes occurred, the next game manual will include updates.
The version stated is USA. If there is a question of what revision number any particular ROM is and the next game manual(s) are not available, call our Technical Support Department.



APPENDIX A

Pinball Game Firmware Table

EPROM	Chip Size	Part N°	Ver.	Loc.	Raw Part N°
Maverick					
CPU	(512K)	965-0182-00	A4.04	C5	960-7001-02
Voice 1	(4M)	965-0186-00		U17	960-5015-00
Voice 2	(4M)	965-0187-00		U21	960-5015-00
Voice 3	(4M)	965-0187-01		U36	960-5015-00
Sound	(512K)	965-0185-00		U7	960-7001-02
Display*	(4M)	965-0183-00	A4.01	ROM 0	960-5015-00
Display*	(4M)	965-0184-00	A4.01	ROM 3	960-5015-00

Mary Shelley's Frankenstein					
CPU	(512K)	965-0188-00	A1.03	C5	960-7001-02
Voice 1	(4M)	965-0192-00		U17	960-5015-00
Voice 2	(4M)	965-0193-00		U21	960-5015-00
Voice 3	(4M)	965-0194-00		U36	960-5015-00
Sound	(512K)	965-0191-00		U7	960-7001-02
Display*	(4M)	965-0189-00	A1.03	ROM 0	960-5015-00
Display*	(4M)	965-0190-00	A1.03	ROM 3	960-5015-00

Baywatch (CPU Board 520-5003-04)					
CPU	(512K)	965-0195-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0195-00		U17	960-5015-00
Voice 2	(4M)	965-0197-00		U21	960-5015-00
Voice 3	(512K)	965-0199-00		U7	960-7001-02
Sound	(4M)	965-0200-00	A4.00	ROM 0	960-5015-00
Display*	(4M)	965-0201-00	A4.00	ROM 3	960-5015-00

Batman Forever (CPU Board 520-5003-04)					
CPU	(512K)	965-0202-00	A3.02	C5	960-7001-02
Voice 1	(4M)	965-0203-00		U17	960-5015-00
Voice 2	(4M)	965-0204-00		U21	960-5015-00
Voice 3	(512K)	965-0205-00		U7	960-7001-02
Sound	(4M)	965-0206-00	A3.00	ROM 0	960-5015-00
Display*	(4M)	965-0207-00	A3.00	ROM 3	960-5015-00

* Note: Display EPROMS (4M) for Maverick thru Batman Forever require an access time of 120 Nsec or faster.



Games herein use the White Star Board System™:

ROM	Chip Size	Part N°	Ver.	Loc.	Raw Part N°
Apollo 13					
CPU / Sound Board:		520-5136-00 (Stereo)			
Game ROM	(1M)	965-0208-00	A5.01	U210	960-5009-00
			\$09FF		
Voice 1	(4M)	965-0209-00		U17	n/a (masked)
Voice 2	(4M)	965-0210-00		U21	n/a (masked)
Voice 3	(4M)	965-0211-00		U36	n/a (masked)
Sound	(512K)	965-0212-00		U7	960-7001-02
Display Controller Bd:		520-5055-01			
Display	(4M)	965-0213-00	A5.00	ROM 0	960-5015-00
			\$B92B		

Golden Eye					
CPU / Sound Board:		520-5136-00 (Stereo)			
Game ROM	(1M)	965-0214-42	A4.04	U210	960-5009-00
			\$3FFF		
Voice 1	(4M)	965-0215-42		U17	n/a (masked)
Voice 2	(4M)	965-0216-42		U21	n/a (masked)
Sound	(512K)	965-0217-42		U7	960-7001-02
Display Controller Bd:		520-5055-01			
Display	(4M)	965-0218-42	A4.00	ROM 0	960-5015-00
			\$E6ED		

Twister					
CPU / Sound Board:		520-5136-10 (Mono)			
Game ROM	(1M)	965-0219-41	A4.05	U210	960-5009-00
			\$E9FF		
Voice 1	(4M)	965-0220-41		U17	960-5015-00
Voice 2	(4M)	965-0223-41		U21	960-5015-00
Sound	(512K)	965-0221-41		U7	960-7001-02
Display Controller Bd:		520-5055-01			
Display	(4M)	965-0222-41	A4.01	ROM 0	960-5015-00
			\$FD01		

ID4: Independence Day					
CPU / Sound Board:		520-5136-10 (Mono)			
Game ROM	(1M)	965-0224-45	A2.02	U210	960-5009-00
			\$9CFF		
Voice 1	(4M)	965-0225-45		U17	960-5015-00
Voice 2	(4M)	965-0226-45		U21	960-5015-00
Sound	(512K)	965-0227-45		U7	960-7001-02
Display Controller Bd:		520-5055-01			
Display	(4M)	965-0228-45	A2.00	ROM 0	960-5015-00
			\$ABF7		

ROM	Chip Size	Part N°	Ver.	Loc.	Raw Part N°
Space Jam					
CPU / Sound Board:		520-5136-10 (Mono)			
Game ROM	(1M)	965-0229-43		U210	960-5009-00
Voice 1	(4M)	965-0230-43		U17	960-5015-00
Voice 2	(4M)	965-0231-43		U21	960-5015-00
Sound	(512K)	965-0232-43		U7	960-7001-02
Display Controller Bd:		520-5055-01			
Display	(4M)	965-0233-43		ROM 0	960-5015-00

GAME CODE IN PRODUCTION

Table Notes:
Game Firmware can be updated after the production run. This table is accurate as of the printing of this manual. To see if any changes occurred, the next game manual will include updates.
The version stated in USA. If there is a question of what revision number any particular ROM is and the next game manual, call our Technical Support Department.

APPENDIX B

Semi-Conductors / Integrated Circuits / Relays Cross-Reference Table

Table N°	Type	Source Number	SEGA PINBALL™	NTE®	ECG®	Radio Shack®	RCA®
RECTIFICATION, BLOCKING AND/OR DAMPENING DIODES							
1	Diode	1N4001	112-5001-00	NTE552	ECG552	— — — —	SK9000
	Diode	1N4004	112-5003-00	NTE116	ECG116	276-1103	SK3312
	Diode	1N5401	112-0056-00	NTE5801	ECG5801	276-1143	SK9004
	Diode	1N5404	112-5004-00	NTE5804	ECG5804	276-1144	SK9007
	Diode	T6A10L	112-5006-01	— — — —	— — — —	— — — —	— — — —
	Diode	FR302	112-5009-00	— — — —	ECG588	— — — —	SK5014
ZENER DIODES							
2	Diode	1N4742A 12v	112-0061-00	NTE142A	ECG142A	276-563	SK12V
	Diode	1N4760B 68v	112-0062-00	NTE5092A	ECG5092A	— — — —	SK68V
	Diode	1N4764 100v	112-0049-00	NTE5096A	ECG5096A	— — — —	SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A	— — — —	SK3A9
	Diode	1N5234B 6.2v	112-0047-00	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	— — — —	SK110X
	Diode	1N6267A 6.8v	112-5011-00	— — — —	ECG4902	— — — —	— — — —
	Diode	1N4752A 33v	112-5010-00	— — — —	— — — —	— — — —	SK33V
	Diode	1N4736 6.8v 1w	112-5007-00	— — — —	— — — —	— — — —	— — — —
TRANSISTORS - TYPE FET, NPN, PNP AND/OR SCR							
3	FET Trans.	STP20N10L	110-0106-00	— — — —	— — — —	— — — —	— — — —
	FET Trans.	STP19N06L	110-0088-00	— — — —	— — — —	— — — —	— — — —
	FET Trans.	VN02	110-0089-00	— — — —	— — — —	— — — —	— — — —
	NPN Trans.	2N4401	— — — —	NTE85	ECG85	276-2009	SK3124A
	NPN Trans.	2N6427	110-0070-00	NTE48	ECG48	— — — —	SK4906
	NPN Trans.	MJE340	110-0071-00	NTE157	ECG157	— — — —	SK3747
	NPN Trans.	MPSA42	110-0082-00	NTE287	ECG287	— — — —	SK3232
	NPN Trans.	2N3904	110-0069-00	NTE123	ECG123	— — — —	— — — —
	NPN Trans.	TIP122	110-0067-00	NTE261	ECG261	276-2068	SK3896
	NPN Trans.	MJE15030	110-0101-00	NTE375	ECG375	— — — —	SK9118
	PNP Trans.	2N5401	110-0078-00	NTE288	ECG288	— — — —	SK3434
	PNP Trans.	MJE15031	110-0103-00	NTE292	ECG292	— — — —	SK3441
	PNP Trans.	MJE350	110-0072-00	NTE374	ECG374	— — — —	SK9042
	PNP Trans.	MPSA92	110-0100-00	NTE288	ECG278	— — — —	SK3434
	PNP Trans.	TIP42	110-0068-00	NTE332	ECG332	— — — —	SK9236
	PNP Trans.	TIP32C	110-0081-00	NTE292	ECG292	— — — —	SK3441
	PNP Trans.	TIP36C	110-0077-00	NTE393	ECG393	— — — —	SK3961
	SCR Trans.	2N5060	110-0074-00	NTE5400	ECG5400	276-1067	SK3950
BRIDGE RECTIFIERS (BR)				Comments:			
4	BR (Present)	DB or CM3501	112-0052-00	For White Star I/O Bds., BR = 35 Amp @ 100v P.I.V.			
	BR (Old)	MDA2501	112-0054-00	BR = 25 Amp @ 100v P.I.V.			
	BR (Old)	MDA3502	112-0057-00	BR = 35 Amp @ 200v P.I.V.			
RELAYS				Comments:			
5	Relay	FRL-264 D024/02CK	190-5002-00	For PPB, Power Supply, & White Star I/O Boards, Relay = 24v DC 10 Amp DPDT			
	Relay	FRL-264 D006/04CV	190-5001-00	For CPU Boards, Relay = 6v DC 5 Amp 4 Pole DT			

APPENDIX C

CPU Jumper Table

Game Name	Game Mfg. Date and Manual PN	CPU Ver.	EPROM Position	Jumpers Installed	Jumpers Removed
1. Laser War	MAY 87 780-5001-00	1	5C	J4, J6a, J7a	J5, J6, J7b
2. Secret Service	MAR 88 780-5002-00	2	5B, 5C	J4	J5
3. Torpedo Alley	AUG 88 780-5003-00	2	5B, 5C	J4	J5
4. Time Machine	DEC 88 780-5004-00	2	5B, 5C	J4	J5
5. Playboy 35th Anniversary	MAY 89 780-5005-00	2	5B, 5C	J4	J5
6. ABC Monday Night Football	SEP 89 780-5007-00	2	5B, 5C	J4	J5
7. Robocop	NOV 89 780-5006-00	2	5B, 5C	J4	J5
8. Phantom of the Opera	JAN 90 780-5008-00	2	5B, 5C	J4	J5
9. Back to the Future	JUN 90 780-5009-00	3	5B, 5C	J4	J5
10. The Simpsons	SEP 90 780-5012-00	3	5B, 5C	J4	J5
11. Checkpoint	FEB 91 780-5010-00	3	5B, 5C	J4	J5
12. Teenage Mutant Ninja Turtles	MAY 91 780-5017-00	3	5B, 5C	J4	J5
13. Batman	JUL 91 780-5011-00	3	5B, 5C	J4	J5
14. Star Trek 25th Anniversary	OCT 91 780-5014-00	3	5C	J5	J4
15. Hook	JAN 92 780-5019-00	3	5C	J5	J4
16. Lethal Weapon 3	JUN 92 780-5026-00	3	5C	J5	J4
17. Star Wars	OCT 92 780-5024-00	3	5C	J5	J4
18. Rocky & Bullwinkle & Friends	FEB 93 780-5022-00	3	5C	J5	J4
19. Jurassic Park	APR 93 780-5020-00	3	5C	J5	J4
20. Last Action Hero	AUG 93 780-5027-00	3	5C	J5	J4
21. Tales from the Crypt	NOV 93 780-5018-00	3	5C	J5	J4
22. The Who's Tommy	FEB 94 780-5028-00	3	5C	J5	J4
23. WWF Royal Rumble	MAY 94 780-5023-00	3	5C	J5	J4
24. Guns N' Roses	JUL 94 780-5029-00	3	5C	J5	J4
25. Maverick	SEP 94 780-5031-00	3	5C	J5	J4
26. Mary Shelley's Frankenstein	DEC 94 780-5036-00	3	5C	J5	J4
27. Baywatch	MAR 95 780-5033-00	3	5C	J5	J4
28. Batman Forever	JUL 95 780-5038-00	3	5C	J5	J4

Game Name	Game Mfg. Date and Manual PN	CPU Ver.	EPROM Position	Jumpers Installed	Jumpers Removed
29. Apollo 13	NOV 95 780-5044-00	—	U210	n/a	n/a
30. Golden Eye	FEB 96 780-5042-00	—	U210	n/a	n/a
31. Twister	APR 96 780-5041-00	—	U210	n/a	n/a
32. ID4: Independence Day	JUL 96 780-5045-00	—	U210	n/a	n/a
33. Space Jam	OCT 96 780-5043-00	—	U210	n/a	n/a

† Additional Information for Installed / Removed Jumpers (List 1-28 only):

Board Combinations with ROM at Location 5C (Game 1, Ver1) Installed J1b, J3, J4, J6a, J7a & J8 Removed J1a, J2, J5, J6 & J7b

Board Combinations w/ ROM at Locations 5B, 5C (Game 1, Ver2) Installed J1b, J3, J4, J5a, J6a, J7b & J8 Removed J1a, J2, J5, J5b, J6b, & J7a

Board Combinations w/ ROM at Locations 5B, 5C (Games 2-12, Ver2/3) Installed J1b, J3, J4, J5b, J6b, J7b & J8 Removed J1a, J2, J5, J5a, J6a & J7a

Board Combinations with ROM at Locations 5C (Games 14+, Ver3) Installed J1b, J3, J5, J5b, J6b, J7b & J8 Removed J1a, J2, J4, J5a, J6a & J7a

* Version 1 has a 2K RAM which is a 24-pin IC in Position 5D; Versions 2 & 3 have a 8K RAM which is a 28-PIN IC in Position 5D.

APPENDIX D Board Type Table

Game Name	Flipper	Sound	Power Supply	Display X-Digit
Laser War	2-Flipper Board Not Required	<i>initial:</i> 520-5002-00 <i>replaced with:</i> 520-5002-02 520-5002-01 was not used.	520-5000-00	Master: 520-5004-00 plus: 7 Digit Alpha/Numeric 520-5005-00 (Qty. 2) 7 Digit Numeric 520-5006-00 (Qty. 2) 4 Digit Numeric 520-5007-00
Secret Service	3-Flipper Board Not Required	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Torpedo Alley	3-Flipper Board Not Required	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Time Machine	2-Flipper Board Not Required	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Playboy 35th Anniversary	520-5033-00 2-Flip. (for 100 games)	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
ABC Monday Night Football	520-5033-00 2-Flip. (for 100 games)	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
Robocop	520-5033-00 2-Flipper	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
Phantom of the Opera	520-5033-00 2-Flipper	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
Back to the Future	520-5033-00 2-Flipper	520-5002-02	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined
The Simpsons	520-5033-00 2-Flipper	520-5002-03	520-5000-00	520-5030-00 16 Digit Alpha/Numeric Combined

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller
Checkpoint	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Teenage Mutant Ninja Turtles	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Batman	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Star Trek 25th Anniversary	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Hook	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Lethal Weapon 3	520-5033-00 2-Flipper	520-5050-01	520-5047-01	520-5052-00 128 X 32	520-5055-00
Star Wars	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00
Rocky & Bullwinkle & Friends	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00
Jurassic Park	520-5076-00 3-Flipper	520-5050-02	520-5047-02	520-5052-00 128 X 32	520-5055-00
Last Action Hero	520-5070-00 2-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-00
Tales from the Crypt	520-5076-00 3-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-01
The Who's Tommy	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01
WWF Royal Rumble	520-5070-00 (Qty. 2) 4-Flipper (2X2)	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01

Table continued on the next page.



APPENDIX D Board Type Table

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller
Guns N' Roses	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01
Maverick	520-5076-00 3-Flipper	520-5050-03	520-5047-03	520-5075-00 192 X 64	520-5092-01
Mary Shelley's Frankenstein	520-5076-00 3-Flipper	520-5077-00	520-5047-03	520-5075-00 192 X 64	520-5092-01
Baywatch	520-5080-00 (Qty. 2) 4-Flipper (2X2)	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01
Batman Forever	520-5076-00 3-Flipper	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01



Games hereon use the White Star Board System™:

Game Name	Flipper	I/O Power Driver	CPU / Sound †	Display Power Supply	Dot Matrix Display	Display Controller
Apollo 13	520-5070-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32	520-5055-01
Golden Eye	520-5070-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32	520-5055-01
Twister	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
ID4: Independence Day	3-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
Space Jam	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01

† **Note:** To order Game Specific CPU/Sound Board please specify Game Name; -00 = Stereo; -10 = Mono.

APPENDIX E

Generic Coil Cross-Reference Guide † ‡

STANDARD COILS				FLIPPER COILS			SPECIAL COILS	
GA-TURNS	SPI PART N°	GA-TURNS	SPI PART N°	GAUGE-TURNS	COLOR	SPI PART N°	GA-TURNS	SPI PN°
20-400	090-5021-00	25-1240	090-5034-00	21-900	RED	090-5020-10	Magnet:	
22-500	090-5017-00	26-1200	090-5044-00T †	22-750/30-2600 ‡	N/A	090-5011-00	22-650	090-5042-00
22-600	090-5023-00		090-5044-00B †	22-900	YELLOW	090-5020-20T †		
23-600	090-5014-00	26-1500	090-5045-00	22-1080	YEL/GRN	090-5032-00T †	Mini-Coil:	
23-700	090-5022-00	27-1300	090-5003-00			090-5032-00B †	32-1800	090-5031-00
23-750	090-5019-00	27-1400	090-5015-00	23-600/30-2600 ‡	N/A	090-5000-00	NOTE: Coil Part N°s <i>Do Not Include</i> Coil Sleeves.	
23-800	090-5001-00T †	27-1500	090-5004-00	23-620/30-2600 ‡	N/A	090-5006-00		
	090-5001-00B †	28-1050	090-5046-00	23-700/30-2600 ‡	N/A	090-5013-00		
23-840	090-5005-00	29-1100	090-5007-00	23-800/30-2600 ‡	N/A	090-5012-00		
23-870	090-5009-00	29-2000	090-5016-00	23-900	GREEN	090-5020-30		
23-1200	090-5008-00			23-1100	ORANGE	090-5030-00	† Coil Part N°s ending with a "T" signifies the Diode is on the top of the lug (on the coil-winding side); ...ending with a "B" signifies the Diode is on the bottom of the lug.	
23-765	090-5037-03			24-1200	WHITE	090-5039-00		
24-900	090-5002-00			24-1570	N/A	090-5025-00		
24-940	090-5036-00T †			25-1600	BLUE	090-5040-00		
	090-5036-00B †			25-1800	BLU/GRN	090-5041-00	‡ These coils are dual-wound.	

Flipper Coil Table

GAME NAME	Number of Flippers	LOWER FLIPPERS		UPPER FLIPPERS	
		SPI N° / Coil Gauge-Turns & Color		SPI N° / Coil Gauge-Turns & Color	
		Left	Right	Left	Right
Laser War	2	090-5011-00 22-750/30-2600	SAME	Not Used	Not Used
Secret Service	3	090-5006-00 23-620/30-2600	SAME	Not Used	090-5006-00 23-620/30-2600
Torpedo Alley	3	090-5011-00 22-750/30-2600	090-5013-00 23-700/30-2600	Not Used	090-5012-00 23-800/30-2600
Time Machine	2	090-5011-00 22-750/30-2600	SAME	Not Used	Not Used
Playboy 35th Anniversary ††	2	090-5020-02 22-900 -YEL-	SAME	Not Used	Not Used
ABC Monday Night Football ††	2	090-5020-02 22-900 -YEL-	SAME	Not Used	Not Used
Robocop	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Phantom of the Opera	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Back to the Future	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
The Simpsons	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Checkpoint	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Teenage Mutant Ninja Turtles	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Batman	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Star Trek 25th Anniversary	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Hook	2	090-5030-00 23-1100 -ORG-	090-5020-30 23-900 -GRN-	Not Used	Not Used
Lethal Weapon 3	2	090-5030-00 23-1100 -ORG-	SAME	Not Used	Not Used
Star Wars	2	090-5032-00 22-1080 -YEL/GRN-	SAME	Not Used	Not Used

†† A very small % of these games used a 090-5020-20 coil which used a proto-type Solid State Flipper System. The two types of coils both are 22-900 coils; the only difference being the addition of the 1N5404 Diode on the (-02) coils which was used in the Deger Design.

Table continued on the next page.



APPENDIX E Flipper Coil Table

GAME NAME	Number of Flippers	LOWER FLIPPERS		UPPER FLIPPERS	
		SPI N° / Coil Gauge-Turns & Color		SPI N° / Coil Gauge-Turns & Color	
		Left	Right	Left	Right
Rocky & Bullwinkle & Friends	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Jurassic Park	3	090-5020-30 23-900 -GRN-	SAME	Not Used	090-5030-00 23-1100 -ORG-
Last Action Hero	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Tales from the Crypt	3	090-5032-00 22-1080 -YEL/GRN-	SAME	Not Used	090-5041-00 25-1800 -BLU/GRN-
The Who's Tommy	3	090-5020-30 23-900 -GRN-	SAME	090-5041-00 25-1800 -BLU/GRN-	Not Used
WWF Royal Rumble	4	090-5032-00 22-1080 -YEL/GRN-	SAME	090-5041-00 25-1800 -BLU/GRN-	SAME
Guns N' Roses	3	090-5032-00 22-1080 -YEL/GRN-	SAME	090-5030-00 23-1100 -ORG-	Not Used
Maverick	3	090-5032-00 22-1080 -YEL/GRN-	SAME	Not Used	090-5032-00 22-1080 -YEL/GRN-
Mary Shelley's Frankenstein	3	090-5030-00 23-1100 -ORG-	SAME	Not Used	090-5030-00 23-1100 -ORG-
Baywatch	4	090-5030-00 23-1100 -ORG-	090-5020-30 23-900 -GRN-	090-5025-00 24-1570 -N/A-	090-5030-00 23-1100 -ORG-
Batman Forever	3	090-5032-00 22-1080 -YEL/GRN-	090-5020-20 22-900 -YEL-	Not Used	090-5020-30 23-900 -GRN-
Apollo 13	2	090-5032-00 22-1080 -YEL/GRN-	SAME	Not Used	Not Used
Golden Eye	2	090-5032-00 22-1080 -YEL/GRN-	SAME	Not Used	Not Used
Twister	2	090-5020-20 22-900 -YEL-	090-5032-00 22-1080 -YEL/GRN-	Not Used	Not Used
ID4: Independence Day	3	090-5032-00 22-1080 -YEL/GRN-	SAME	Not Used	090-5020-30 23-900 -GRN-
Space Jam	2	090-5020-20 22-900 -YEL-	090-5032-00 22-1080 -YEL/GRN-	Not Used	Not Used

APPENDIX F

Motor Specification Table

Game Name	Function	Specifications	Part N°
Laser War Secret Service Torpedo Alley Time Machine Playboy 35th Anniversary	No motors were used on the games listed on the shaded lines.		
ABC Monday Night Football	Goal Post Up/Down	Motor 24v A.C. 60 RPM CW	515-5222-00
Robocop			
Phantom of the Opera	Organ Up/Down	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
Back to the Future The Simpsons			
Checkpoint	Shaker	Johnson Motor (Vibrator)	041-5002-00
	Mag Wheel (in Backbox)	Motor D.C. (KEN)	041-5005-00
Teenage Mutant Ninja Turtles	Spinning Pizza Ball Deflector	Gear Motor 24v A.C. 325 RPM CW	515-5397-00
Batman	Bar Target Up/Down	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
Star Trek 25th Anniversary	Swinging Target	Bowman Motor 24v 22½ RPM	515-5534-00
	Transporter F/X	Gear Motor 24v A.C. 3.5 RPM	500-5421-00
	Cooling Fan for Transporter F/X	4½" Motor 12v	041-5014-00
Hook			
Lethal Weapon 3	Spinning Light	Motor 2.5v A.C. 4000 RPM CCW	041-5017-00
Star Wars	Bar Target Up/Down	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
	R2D2 Robot Movement	Bowman Motor 24v A.C. 22½ RPM CW	515-5571-00
	Death Star Rotation	Bowman "G" Motor 24v A.C. 60hz 6 RPM CW	515-5570-00
Rocky & Bullwinkle & Friends	Nell Log "Cutting Blade" Movement	Autotrol Model E Motor 24v 60hz 4W 3 RMP CCW	041-5023-00
Jurassic Park	Shaker	Johnson Motor Vibrator	041-5002-00
	T-Rex Left/Right Movement	Multi Motor 5v D.C.	041-5025-00
	T-Rex Up/Down Movement	Bowman Motor 24v 11 RPM CW	041-5026-00

Table Continued on the next page.

APPENDIX F

Motor Specification Table

Game Name	Function	Specifications	Part N°
Last Action Hero	Crane Left/Right Movement	Multi Prod. #3312 Motor OSC 12v D.C.	041-5027-00
	Shaker	Motor Vibrator	041-5029-00
Tales from the Crypt	Shaker	Motor Vibrator	041-5029-00
	Tombstone Up/Down	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
The Who's Tommy	Mirror Up/Down	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Flipper Blinders	Servo Motor (94102)	041-5032-00
	Spinning Airplane Propellers	Motor D.C.	041-5033-00
WWF Royal Rumble	Shaker	Motor Vibrator	041-5029-00
Guns N' Roses			
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
Baywatch			
Batman Forever	Cannon Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00
Apollo 13	Rocket Up/Down Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00
	Moon Unit Up/Down Movement	Multi Products Motor 24v A.C. 50/60Hz 3W 6 RPM CCW	515-6487-00
	Shaker	Motor Vibrator	041-5029-00
Golden Eye	Satellite Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CW	515-6528-00
Twister	Magnet Spinner	Multi Products Motor 24v A.C. 50/60Hz 3W 325 RPM CCW	515-6347-00
	Back Box Fan for Tornado Wind	Multi Products Motor 24v A.C. 50/60Hz 3W 3600 RPM CW	515-6531-00
ID4: Independence Day	Alien Head Open/Close Movement	Servo Motor (94322)	041-5045-00
Space Jam			

APPENDIX G

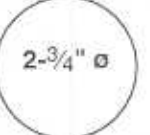
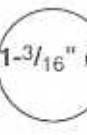
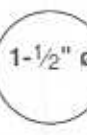
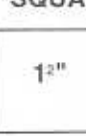
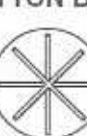
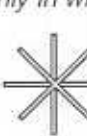
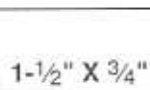
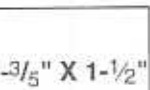
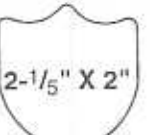
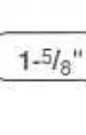
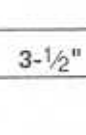
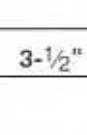
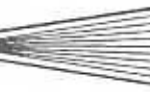
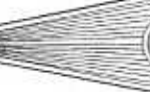
Part Number Prefix Classification Codes

I.	ELECTRICAL SOURCE AND ENERGY AND SIGNAL CONVERTERS
	010- Transformers
	031- Speakers
	090- Solenoids
II.	CONDUCTORS, CONNECTORS AND INSULATORS
	034- Line Cords
	036- Cable and Harness Assemblies
	041- Motors
	045- Connectors (All Types)
	077- Lamp Sockets
III.	CIRCUITS AND CIRCUIT ELEMENTS
	100- ICs
	110- Transistors
	112- Diodes
	121- Resistors
	123- Resistors (Variable & Adjustable)
	125- CAPS
	140- Crystals
	165- Light Bulbs
	180- Switches
	190- Relays
IV.	BOLTS, SCREWS, NUTS, AND WASHERS
	231- Bolts
	232- Screws (Pan Head)
	234- Screws (HXW)
	237- Screws (Misc.)
	240- Nuts (Misc.)
	242- Washers (Flat, Round)
	244- Washers (Split Lock)
	246- Washers (Lockers, External Tooth)
V.	MECHANICAL COMPONENTS
	249- Rivets
	251- Pins (Dowel)
	254- Stand-Offs, Spacers and Shims
	260- Steel Ball
	265- Springs (Extension)
	266- Springs (Compression)
	269- Springs (Washers - Belleville, Wave)
	280- Grommets and Bushing
VI.	HANDLES, LOCKS, CATCHES & LATCHES, KEYS & HINGES
	355- Handles, Locks, Catches & Latches and Keys
	390- Hinges
VII.	FABRICATED PARTS (IN-HOUSE ASSEMBLIES)
	500- End Product (Systems and Models)
	515- Sub-Assemblies
	520- P.C. Boards
	522- Display Glass
	525- Wood Parts
	530- Screw Machined Parts
	535- Fabricated Parts
	545- Molded (Extruded) Parts (Rubber Rings, Molded Plastic)
	550- Molded (Inserts)
VIII.	BULK MATERIALS
	600- Braided Ground Wire
	601- Stranded Wire
	602- Ribbon Cable
	605- Sleeving (Shrink Tubing)
	626- Foam Rubber
IX.	MISCELLANEOUS
	705- Packing & Shipping Items
	820- Decals and Labels (Sets & Misc.)
	820- Butyrate
	900- Game Posters
	960- EPROM (Raw Part)
	965- EPROM (Programmed Part)



APPENDIX H

Playfield Inserts (Plastic Light Covers)

Patterns: STARBURST  STIPPLE 	STARBURST CIRCULAR  550-5000-XX	STARBURST CIRCULAR  550-5001-XX	STARBURST CIRCULAR  550-5002-XX	STARBURST CIRCULAR  550-5003-XX	STARBURST CIRCULAR  550-5004-XX
STARBURST CIRCULAR  550-5005-XX	STARBURST CIRCULAR  550-5006-XX	PLAIN CIRCULAR  550-5007-XX	PLAIN CIRCULAR  550-5008-XX	PLAIN CIRCULAR  550-5009-XX	PLAIN CIRCULAR  550-5010-XX
PLAIN CIRCULAR  550-5011-XX	PLAIN CIRCULAR  550-5012-XX	STIPPLE CIRCULAR  550-5048-XX	STIPPLE 1" SQUARE  550-5019-XX	ROLLOVER BUTTON BASE  550-5026-XX	WHITE STAR (only in white)  545-5015-00
STIPPLE RECTANGULAR  550-5018-XX	STIPPLE RECTANGULAR  550-5051-XX	STARBURST RECTANGULAR  550-5044-XX	PLAIN RECTANGULAR  550-5049-XX	PLAIN RECTANGULAR  550-5050-XX	PLAIN RECTANGULAR  550-5063-XX
STARBURST MINI SHIELD  550-5024-XX	STARBURST LARGE SHIELD  550-5025-XX	MINI HOT DOG  550-5020-XX	BEVEL HOT DOG  550-5021-XX	PLAIN HOT DOG  550-5022-XX	BANANA  550-5023-XX
STARBURST ARROW-SHORT  550-5013-XX	STARBURST ARROW-LARGE  550-5014-XX	STARBURST ARROW-HEAD  550-5015-XX	STARBURST BULLET  550-5016-XX	STARBURST TRIANGLE  550-5017-XX	

Note: The shapes and sizes shown above are not to scale. Some shapes may no longer be available in every color.

Plastic Part Color Chart (As applicable for all parts which can come in various colors.):
The "-XX" should be replaced with the following 2-digit number for the color desired.

-01: CLEAR	-06: YELLOW	-11: FLUORESCENT GREEN
-02: RED	-07: ORANGE	-12: FLUORESCENT BLUE
-03: AMBER	-08: WHITE	-13: TEAL GREEN
-04: GREEN	-09: PURPLE	-14: GRAY
-05: BLUE	-10: FLUORESCENT ORANGE	-15: NEW: LUMINESCENT

GLOSSARY OF TERMS

A	Followed after a number means "Amp." or Ampage in an expression relating to an electrical object. (e.g. 8A).
AC	Acronym: Alternating Current.
Adj.	Abbreviation: Adjustment(s).
Au.	Abbreviation: Audit(s).
BOT	Abbreviation: Bottom.
Bridge Rectifier	A configuration of a diode that allows current to flow in one direction producing both positive and negative pulsating DC Voltages.
COLOR CODING	See Appendix H, Color Chart (Bottom) or Section 4, Chapter (last page).
Combination (Combo)	[Shot]. Any variable pinball shot(s) made successively.
CMOS	Short for COSMOS (Complementary Symmetry M.O.S.); Complementary Metal-Oxide Semi-Conductor.
CN	Abbreviation: Connector (e.g. CN5-P3).
CT	Abbreviation: Center.
DC	Abbreviation: Direct Current.
DT	Abbreviation: Drop Target(s).
EB	Acronym: Extra Ball.
Eject	Playfield surface device to kick ball back into play.
EPROM	Acronym: Erasable Programmable Read Only Memory. Can be erased using UV Light and re-programmed.
e.g.	Abbreviation: Latin- Exempli gratia. For Example.
EOS	Acronym: End-of-Stroke.
G.I.	Abbreviation: General Illumination (Lamps).
IC	Acronym: Integrated Circuit (As in after 24-Pin IC)
i.e.	Abbreviation: Latin- Id est. That is.
LT	Abbreviation: Left.
Laser Kick	A coil/plunger used above the playfield to kick pinball back into play.
LED	Light emitting diode.
Loop	[Shot] Continuously up a ramp and back to the flipper.
Lwr.	Abbreviation: Lower.
Orbit	[Shot] From the left or right flipper around the back rail of the playfield back to the flipper.
MB	Acronym: Magnet Board.
M-BALL or MBALL	Abbreviation: Multiball™.
MID	Abbreviation: Middle
Non-Reflexive	See Reflexive.
No. or N° or #	Abbreviation: Number
NPF	Acronym: No Problem Found.
N.C. or NC	Abbreviation: Normally Closed.
N.O. or NO	Abbreviation: Normally Open.
PCB	Acronym: Printed Circuit Board
PIA LED	Acronym: Peripheral Interface Adapter. This is a diagnostic LED on the CPU; it should not be lit during normal operation of a pinball game.
Plumb Bob Tilt	Weight on Tilt Assembly.
Pop(s)	Another term for Turbo Bumper(s).
PPB	Playfield Power Board (Generic Term to describe Acronym with no true definition).
PSB	Acronym: Power Supply Board



GLOSSARY OF TERMS

P/F	Abbreviation: Playfield
P	Abbreviation: Pin (e.g. CN5-P3).
RAM	Acronym: Random Access Memory. RAM can store input instructions and supply output information.
RED	Abbreviation: Red.
Reflexive/Non-Reflexive (Relating to CPU Boards)	Reflexive —Solenoid Drive Transistor is enabled directly by a switch closure on the solenoid assembly (Ver. 1/2). Non-Reflexive —Solenoid Drive Transistor is enabled by the CPU after reading a switch closure in the Switch Matrix (Ver. 3). Also note: All CPU Boards are backwards compatible (e.g. Jurassic Park/Ver. 3 to Time Machine/ Ver. 2). Swapping a Ver. 2 Board to a Ver. 3 is not possible due to the special solenoids section (i.e. Slingshots, Turbo Bumpers, etc.) changing from REFLEXIVE to NON-REFLEXIVE on Ver. 3 Boards.
Relay	An automatic switch operated by current in a coil.
ROM	Acronym: Read Only Memory. ROM cannot store input instructions but can supply output information. ROM can be programmed only once.
RT	Abbreviation: Right.
RO	Abbreviation: Rollover (switches).
Saucer	See Eject.
Scoop	A hole into the playfield. A metal scoop is in place to guide the ball into the kick-back under the playfield.
Slam Tilt	A switch which closes when the game is slammed into or the Coin Door is slammed shut. Depending on adjustable settings, will cancel game in play when the number of closures required is sufficed.
SMB	Acronym: Shaker Motor Board.
Solenoid	A coil used for Electro Magnetic devices such as relays, flippers, slingshots, etc.
SSFB	Acronym: Solid State Flipper Board.
STEP	Refers to the service switches on the coin door.
S-U	Abbreviation: Stand-Up (targets).
TM	Acronym: Trademark
Transfer	[Shot] Maneuvering the ball in play from one flipper to the other. With flipper in the up position and the ball cradled by that flipper one would activate the flipper button in a quick repetitive manner to bounce the ball to the other side. Skilled players can rebound the ball off the slingshot.
TTL	Acronym: Transistor-Transistor Logic
Upr.	Abbreviation: Upper.
V or v	Abbreviation: Volt(s).
Ver.	Abbreviation: Version.
VUK	Acronym: Vertical Up-Kicker.
X	Acronym: "Times" A multiplier.
Zener Diode	A semi-conductor diode used for voltage regulation. Application depends on reverse break-down voltage.
"-00B"	"B" at the end of Coil Part Numbers signifies that the diode is attached to the bottom of the lug.
"-00T"	"T" at the end of Coil Part Numbers signifies that the diode is attached to the top of the lug (the side nearest the coil-winding).

Parts Order Checklist Notes

[illegible]

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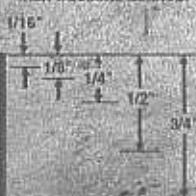
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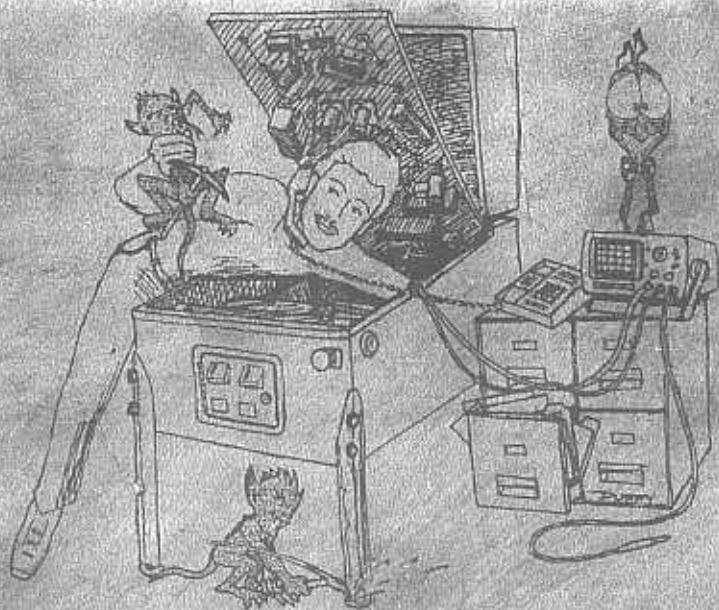
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Inch fractions defined:



Standard USA 9 Inch Ruler (From the top to the bottom edge is 11")



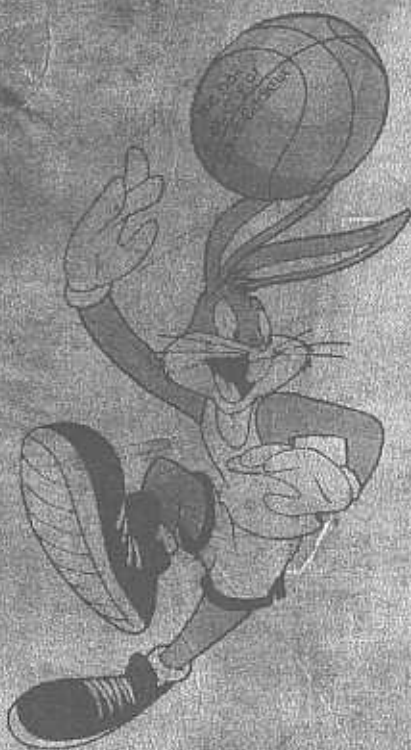
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