

New!
Find-It-In-Front
Dr. Pinball Section



SEGA™
PINBALL, INC.



**THIS IS A SAMPLE GAME
MANUAL PHOTOCOPY. SOME
TECHNICAL INFORMATION,
DRAWINGS AND/OR SCHEMATICS
MAY NOT YET BE AVAILABLE.**

GOLDENEYE

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

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.



We are introducing in our Portals™ Service Menu a new icon and diagnostic aid called Dr. Pinball (Flow Chart Menu). 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 ★ ★ ★ ★

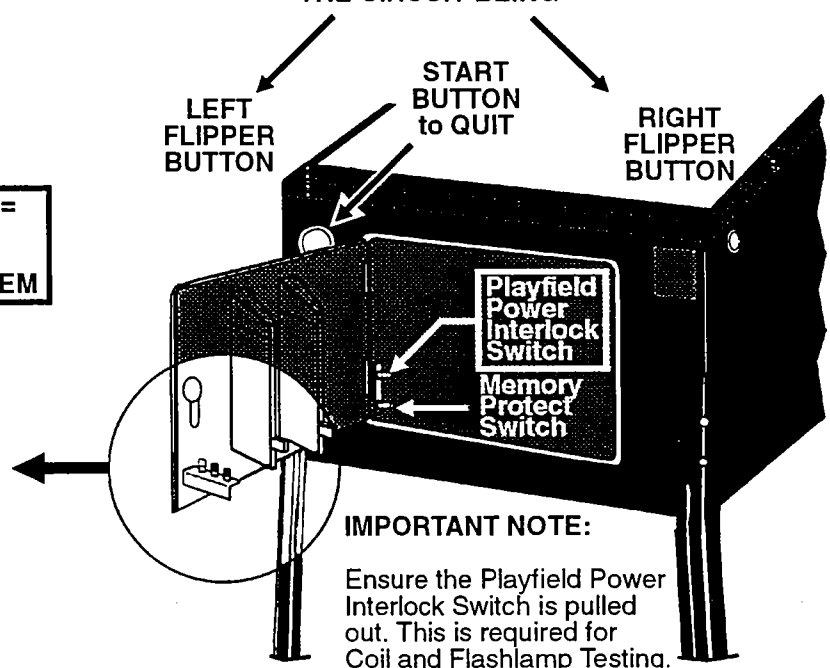
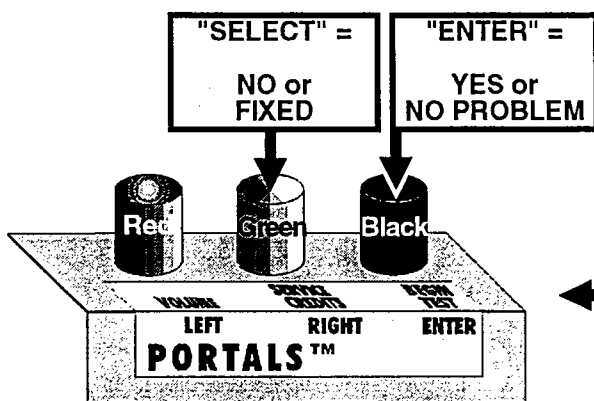
First, the operator/technician must enter the Service Mode (for a complete description of the Portals™ Service Menu and ICONS see Section 3, Chapter 1). To get into the Service Menu Mode: • Power-up game (if not already) & open the Coin Door. • On the Coin Door is the Service Switch Set (Red, Green & 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™ © 1995 SEGA PINBALL, INC.", followed by the MAIN MENU.

While in the MAIN MENU, select the "DIAG" Icon, then select the "DR" Icon. This will bring the operator/technician into the FLOW CHART MENU which offers the operator/technician a choice of four sub-menus: Flipper, Coil, Switch and Lamp. Selecting a particular sub-menu will give the operator/technician a choice of which specific lamp, switch or coil 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 "YES, NO, FIXED or NO PROBLEM" (see figure below) which you the operator/technician must input by using the Green "SELECT" (RIGHT) and/or Black "ENTER" Buttons on the coin door. The Flipper Buttons can be used to activate the particular circuit being diagnosed and in the MAIN MENU to select a menu item. The Start Button will allow the operator/technician to quit at anytime.

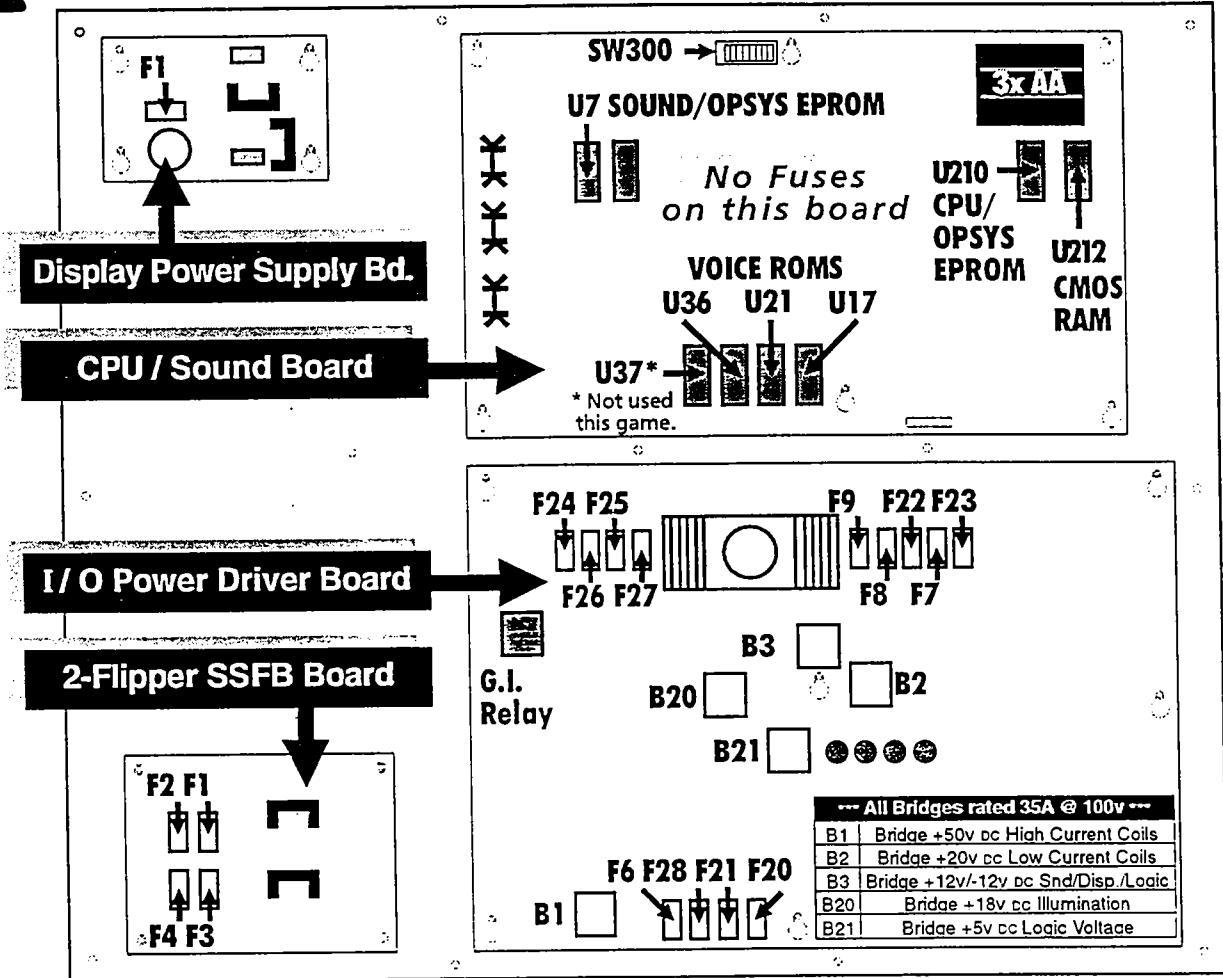
Note:

Button selections below are for Dr. Pinball Flow Chart Menu usage.

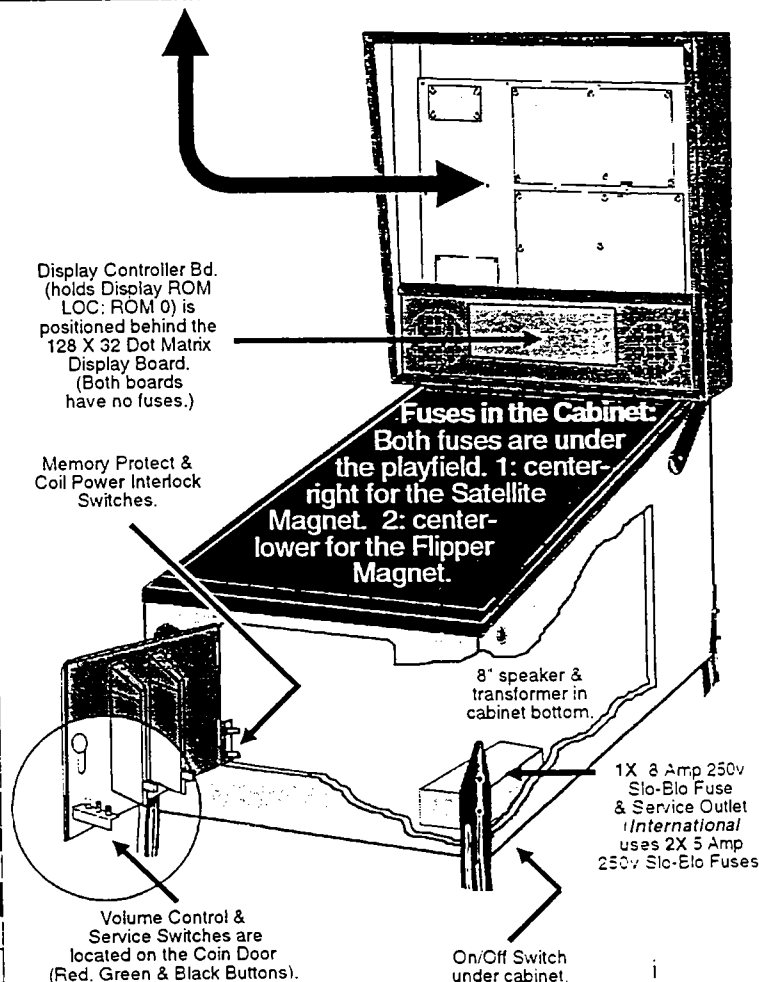
FLIPPER BUTTONS ARE USED TO SELECT MENU ITEMS AND TO ACTIVATE THE CIRCUIT BEING



NEW BACKBOX LAYOUT, FUSE & RELAY LOCATIONS



QUICK REFERENCE FUSE CHART	
Backbox Fuses	
DISPLAY POWER SUPPLY BOARD	
F1	3/4A 250v Slo-Blo 90v DC High Voltage Display
2-FLIPPER SSFB BOARD	
F1	3A 250v Slo-Blo 50v DC Output (all fuses) Lower Right Flipper
F2	3A 250v Slo-Blo 9v AC Holding
F3	3A 250v Slo-Blo 50v DC Output Lower Left Flipper
F4	3A 250v Slo-Blo 9v AC Holding
I/O POWER DRIVER BOARD	
F6	7A 250v Slo-Blo 50v DC Primary High Power Coils & Flippers
F7	5A 250v Slo-Blo 20v DC Low Power Coils
F8	5A 250v Slo-Blo 12v DC Logic Power
F9	5A 250v Slo-Blo 12v DC Logic Power
F20	Not Used
F21	3A 250v Slo-Blo 50v DC Coils
F22	8A 250v Slo-Blo 18v DC Controlled Lamps
F23	4A 250v Slo-Blo 5v DC Logic
F24	5A 250v Slo-Blo 6.3v AC G.I. Lamp Insert Left
F25	5A 250v Slo-Blo 6.3v AC G.I. Lamp Lower Half Playfield
F26	5A 250v Slo-Blo 6.3v AC G.I. Lamp Insert Right & Coin Door
F27	5A 250v Slo-Blo 6.3v AC G.I. Lamp Upper Half Playfield
F28	3A 250v Slo-Blo 24v Special Relay/Motors (24v Motor)
SERVICE OUTLET BOX (CABINET BOTTOM)	
Main Fuse Line: 1X 8A 250v Slo-Blo (Int'l) 2X 5A 250v Slo-Blo	
OTHER	
r/a	3A 250v Slo-Blo 50v DC Satellite Magnet
r/a	3A 250v Slo-Blo 50v DC Flipper Magnet



INSTALL 5 BALLS! GOLDENEYE 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 GOLDENEYE: CUSTOM FACTORY ADJUSTMENTS BY COUNTRY*



From the Main Menu
In Portals™
GO TO DIAGNOSTICS
MENU



From the Diagnostics
Menu
GO TO SWITCH
MENU



From the Switch
Menu
GO TO DIP
SWITCH TEST

*All countries not noted
below use the "USA CPU
Country Setting"

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		●	●	●	●	●	●	●
BELGIUM	ON	●							
	OFF	●	●	●	●	●	●	●	●
CANADA	ON	●							
	OFF		●	●	●	●	●	●	●
ENGLAND	ON	●		●					
	OFF	●	●	●	●	●	●	●	●

CPU COUNTRY SETTING	Pos.	1	2	3	4	5	6	7	8
FRANCE	ON	●	●						
	OFF	●		●	●	●	●	●	●
GERMANY	ON	●	●						
	OFF	●		●	●	●	●	●	●
HOLLAND (DUTCH) & NETHERLANDS	ON	●		●					
	OFF	●	●	●	●	●	●	●	●
ITALY	ON			●					
	OFF	●	●	●	●	●	●	●	●

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

ROM (EPROM/MASKED) SUMMARY TABLE

I.C. NAME	TYPE	BOARD NAME	LOC.	PART N°
Game ROM	1MB	CPU / Sound Board	U210	965-0208-00
Voice Masked ROM 1	4MB	CPU / Sound Board	U17	965-0209-00
Voice Masked ROM 2	4MB	CPU / Sound Board	U21	965-0210-00
Voice Masked ROM 3	4MB	CPU / Sound Board	U36	965-0211-00
Voice Masked ROM 4	Not Used	CPU / Sound Board	U37	Not Used
Sound EPROM	512K	CPU / Sound Board	U7	965-0212-00
Display EPROM	4MB	Display Controller Bd.	ROM Ø	965-0213-00
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 CN5-1	2 Q2 GRN-RED CN5-3	3 Q3 GRN-ORG CN5-4	4 Q4 GRN-YEL CN5-5	5 Q5 GRN-BLK CN5-6	6 Q6 GRN-BLU CN5-7	7 Q7 GRN-VIO CN5-8	8 Q8 GRN-GRY CN5-9
Row (Return)	1 WHT-BRN CN7-9 PLUMB BOB TILT 1 9 17 25 33 41 49 57	FIRE BUTTON	RIGHT RAMP EXIT	LEFT 5-BANK BOTTOM	2-BANK BOTTOM	LEFT TURBO BUMPER	NOT USED	LEFT OUTLANE
2 WHT-RED CN7-8 4TH COIN SLOT 2 10 18 26 34 42 50 58	5-BALL TROUGH #1 (LEFT)	CENTER RAMP EXIT	LEFT 5-BANK MID-BOT	2-BANK TOP	BOTTOM TURBO BUMPER	SCOOP	RIGHT OUTLANE	
3 WHT-ORG CN7-7 START BUTTON 3 11 19 27 35 43 51 59	5-BALL TROUGH #2	RIGHT RAMP ENTER	LEFT 5-BANK MIDDLE	NOT USED	RIGHT TURBO BUMPER	RIGHT TOP LANE	LEFT RETURN LANE	
4 WHT-YEL CN7-6 RIGHT COIN SLOT 4 12 20 28 36 44 52 60	5-BALL TROUGH #3	SATELLITE HOME	LEFT 5-BANK MID-TOP	NOT USED	RIGHT 5-BANK TOP	MIDDLE TOP LANE	RIGHT RETURN LANE	
5 WHT-GRN CN7-5 CENTER COIN SLOT / DBA 5 13 21 29 37 45 53 61	5-BALL TROUGH #4	NOT USED	NOT USED	NOT USED	RIGHT 5-BANK MID-TOP	LEFT TOP LANE	LEFT SLINGSHOT	
6 WHT-BLU CN7-3 LEFT COIN SLOT 6 14 22 30 38 46 54 62	5-BALL TROUGH #5 (RIGHT)	NOT USED	LEFT STAND-UP	NOT USED	RIGHT 5-BANK MIDDLE	CENTER RAMP ENTER	RIGHT SLINGSHOT	
7 WHT-VIO CN7-2 SLAM TILT 7 15 23 31 39 47 55 63	5-BALL TROUGH VUK OPTO	SATELLITE MAGNET BOARD	RIGHT STAND-UP	EJECT STAND-UP	RIGHT 5-BANK MID-BOT	TOP LANE ENTER	LT FLIPPER BUTTON VIA Q7 (ON SSFB)	
8 WHT-GRY CN7-1 NOT USED 8 16 24 32 40 48 56 64	SHOOTER LANE	FLIPPER MAGNET BOARD	LEFT RAMP MADE	LEFT RAMP ENTER	RIGHT 5-BANK BOTTOM	TANK TRAP DOOR	RT FLIPPER BUTTON VIA Q5 (ON SSFB)	

IC U206 INPUTS	Ground
1 GRY-BRN CN6-2	NOT USED DS-1
2 GRY-RED CN6-3	NOT USED DS-2
3 GRY-ORG CN6-4	NOT USED DS-3
4 GRY-YEL CN6-6	NOT USED DS-4
5 GRY-GRN CN6-7	NOT USED DS-5
6 GRY-BLU CN6-8	Normal: Vclurme In Test: Left RED BUTTON DS-6
7 GRY-VIO CN6-9	Normal: Service Credits In Test: Right GRN BUTTON DS-7
8 GRY-BLK CN6-10	Normal: Eegin Test In Test: Enter BLK BUTTON 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: U10 YEL-BRN J13-1	2: U11 YEL-RED J13-3	3: U12 YEL-ORG J13-4	4: U13 YEL-BLK J13-5	5: U14 YEL-GRN J13-6	6: U15 YEL-BLU J13-7	7: U16 YEL-VIO J13-8	8: U17 YEL-GRY J13-9
Row (GND)	1: Q33 RED-BRN J12-1 MILITARY INTELLIGENCE HQ #44 Bulb 1	EJECT HURRY-UP #44 Bulb 2	ELECTRO MAGNETIC PULSE #44 Bulb 3	SEVERNAYA STATION #44 Bulb 4	TANK CHASE #44 Bulb 5	PETYA STATION #44 Bulb 6	CAT AND MOUSE #44 Bulb 7	NERVE GAS #44 Bulb 8
2: Q34 RED-BLK J12-2 NOT USED 9	RIGHT OUTLANE #44 Bulb 10	RIGHT RETURN LANE #44 Bulb 11	LEFT RETURN LANE #44 Bulb 12	SHOOT AGAIN #44 Bulb 13	JUMP RAMP #44 Bulb 14	GOLDENEYE #44 Bulb 15	MISCHA SATELLITE #44 Bulb 16	
3: Q35 RED-ORG J12-3 SCOOP BOTTOM #44 Bulb 17	SCOOP TOP #44 Bulb 18	LEFT TURBO BUMPER #44 Bulb 19	RIGHT RAMP ARROW #44 Bulb 20	RIGHT RAMP TOP #44 Bulb 21	RIGHT RAMP BOTTOM #44 Bulb 22	2-BANK BOTTOM #44 Bulb 23	2-BANK TOP #44 Bulb 24	
4: Q36 RED-YEL J12-4 LEFT STAND-UP LEFT #44 Bulb 25	LEFT STAND-UP RIGHT #44 Bulb 26	BOT. TURBO BUMPER #44 Bulb 27	EJECT BOTTOM #44 Bulb 28	EJECT TOP #44 Bulb 29	LEFT TOP LANE #44 Bulb 30	MIDDLE TOP LANE #44 Bulb 31	RIGHT TOP LANE #44 Bulb 32	
5: Q37 RED-GRN J12-5 LEFT OUTLANE #44 Bulb 33	RIGHT RAMP ENTER #44 Bulb 34	LEFT RAMP #44 Bulb 35	LEFT RAMP TOP #44 Bulb 36	MID. RAMP BOTTOM #44 Bulb 37	MID. RAMP TOP #44 Bulb 38	UNDER RAMP TOP #44 Bulb 39	UNDER RAMP BOT. #44 Bulb 40	
6: Q38 RED-BLU J12-6 RIGHT TURBO BUMPER #44 Bulb 41	SCOOP ARROW #44 Bulb 42	LEFT RAMP ARROW #44 Bulb 43	NARROW ESCAPE #44 Bulb 44	LT. 5-BANK MID-TOP #44 Bulb 45	LT. 5-BANK MIDDLE #44 Bulb 46	LT. 5-BANK MID-BOT #44 Bulb 47	LT. 5-BANK BOTTOM #44 Bulb 48	
7: Q39 RED-VIO J12-8 HELICOPTER #44 Bulb 49	CENTER RAMP ENTER LEFT #44 Bulb 50	CENTER RAMP ENTER RIGHT #44 Bulb 51	RT. 5-BANK BOTTOM #44 Bulb 52	RT. 5-BANK MID-BOT #44 Bulb 53	RT. 5-BANK MIDDLE #44 Bulb 54	RT. 5-BANK MID-TOP #44 Bulb 55	RT. 5-BANK TOP #44 Bulb 56	
8: Q40 RED-GRY J12-9 START BUTTON #44 Bulb 57	BEHIND EJECT S-U #44 Bulb 58	ABOVE EJECT S-U #44 Bulb 59	LOCK 1 #44 Bulb 60	LOCK 2 #44 Bulb 61	RIGHT FIRE MISSILE #44 Bulb 62	LEFT FIRE MISSILE #44 Bulb 63	NOT USED #44 Bulb 64	
9: Q41 RED-WHT J12-10 100 MILLION #44 Bulb 65	75 MILLION #44 Bulb 66	50 MILLION #44 Bulb 67	25 MILLION #44 Bulb 68	HELICOPTER SPOTLITE #44 Bulb 69	NOT USED #44 Bulb 70	NOT USED #44 Bulb 71	GOLDENEYE (E) #44 Bulb 72	
10: Q42 RED J12-11 (G)OLDENEYE #44 Bulb 73	(O)LDENEYE #44 Bulb 74	(L)DEN-EYE #44 Bulb 75	(D)EN-EYE #44 Bulb 76	GOLD(E)N-EYE #44 Bulb 77	GOLDE(N)-EYE #44 Bulb 78	GOLDEN-(E)YE #44 Bulb 79	GOLDEN-(Y)E #44 Bulb 80	



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
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-4/5	50v	23-800 090-5001-01
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-4/5	50v	24-940 090-5036-01
#3	NOT USED	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	---	---	N/A
#4	POWER SCOOP	Q4	I/O Pwr. Drvr.	BRN-YEL	J8-P5	YEL-VIO	J10-4/5	50v	23-800 090-5001-01
#5	NOT USED	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	J10-4/5	50v	N/A
#6	NOT USED	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	BRN	---	---	N/A
#7	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	---	---	N/A
#8	(OPTIONAL REPLAY KNOCKER DRIVE LINE)	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-4/5	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
#9	LEFT TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#10	BOTTOM TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#14	TANK KICKER	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-4/5	50v	23-800 090-5001-01
#15	LEFT FLIPPER ENABLE	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	GRY-YEL	J10-4/5	50v	22-1080 090-5032-00
#16	RIGHT FLIPPER ENABLE	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	BLU-YEL	J10-4/5	50v	22-1080 090-5032-00

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
#17	5-BALL TROUGH LOCK BALL	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-1	20v	25-1240 090-5034-00
#18	UP-DOWN RAMP PLUNGER	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-1	20v	27-1500 090-5034-00
#19	NOT USED	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	---	---	N/A
#20	SATELLITE LAUNCH RAMP	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-1	20v	27-1500 090-5034-00
#21	SATELLITE MOTOR RELAY	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-1	20v	24V DC 10A DPDT
#22	TANK TRAP DOOR	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-1	20v	27-1500 090-5034-00
#23	NOT USED	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	---	---	N/A
#24	(OPTIONAL COIN METER)	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	BRN	J16-7	5v	5v Meter if required

FLIPPER COILS

SSFB #	Flipper Coil	Cabinet Switch	Switch Drive	Switch Return	E.O.S.	GND	Flipper 50vDC Power	Flipper 8vAC Hold	Flipper Coil Output
SSFB 1	Lwr. Rt. Flipper 22-1080	BLU-VIO SSFB CN1-7	GRN-GRY CPU CN8-9 TO SSFB CN1-4	WHT-GRY CPU CN10-1 TO SSFB CN1-3	BRN-VIO RT. EOS SW. TO CN1-1	BLK CPU CN5 TO CN1-6	BLK-WHT PPB J7-1, -5 to SSFB CN2-11, 12	GRY-GRN-GRY P/S CN1-10, -11, to SSFB CN2-9, 10	50v Q2, Q3, 8vAC CN2-7, 8 SR1
SSFB 1	Lwr. Lt. Flipper 22-1080	BLU-GRY SSFB CN1-10	GRN-GRY CPU CN8-9 TO SSFB CN1-4	WHT-VIO CPU CN10-2 TO SSFB CN1-5	BRN-GRY LT. EOS SW. TO CN1-9	BLK CPU CN5 TO CN1-6	BLK-WHT PPB J7-1, -5 to SSFB CN2-11, 12	GRY-GRN-GRY P/S CN1-10, -11, to SSFB CN2-9, 10	50v Q2, Q10, 8vAC R2 CN2-4, 5



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

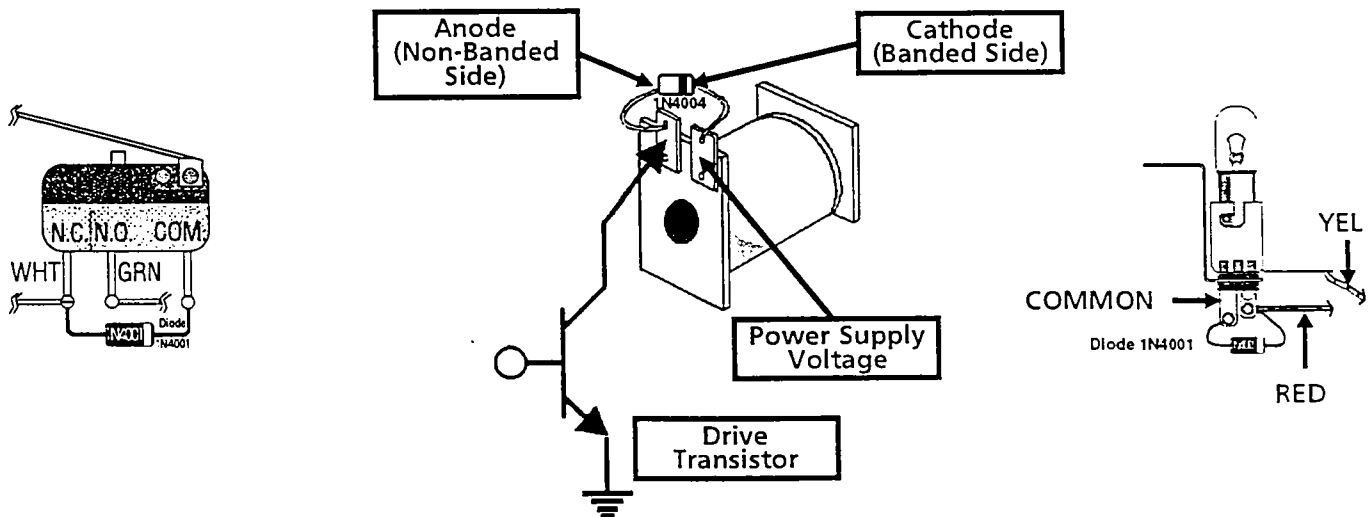
Coils Detailed Chart Table Continued

Flash Lamps (FLAMP)		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	
#1	Bottom L&R	X2	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v	2X #906 165-5204-00 1X #89 165-5200-89
	Backbox Insert	X1								
#2	Lower Flipper Magnet	X1	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v	1X #906 165-5204-00 2X #89 165-5200-89
	Backbox Insert	X2								
#3	Lower Left	X2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v	2X #906 165-5204-00 1X #89 165-5200-89
	Backbox Insert	X1								
#4	Satellite	X2	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v	4X #89 165-5200-89
	Backbox Insert	X2								
#5	Lower Right Playfield	X2	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v	4X #89 165-5200-89
	Backbox Insert	X2								
#6	Helicopter	X1	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v	2X #89 165-5200-89
	Backbox Insert	X1								
#7	Upper Left	X1	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v	4X #89 165-5200-89
	Backpanel	X2								
#8	Backbox Insert	X1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v	4X #89 165-5200-89
	Upper Right	X2								
#8	Backpanel	X1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v	4X #89 165-5200-89
	Backbox Insert	X1								

Aux. Data Line

		Driver Output Board LOC: Under Playfield	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage
#1	Magnet Grab Satellite ???	Magnet Driver	BLUE	P4	YEL-VIO	P3	50v
#2	Magnet Hold Flippers ???	Magnet Driver	BLUE	P4	YEL-VIO	P3	50v

TYPICAL SWITCH, COIL & LAMP WIRING





POWER REQUIREMENTS



This game *must be connected to a properly grounded outlet to reduce shock hazard* and insure proper game operation. See Section 5, Chapter 1, Cabinet Schematics & Troubleshooting (AC Power Wiring Diagram), for transformer connections required for Normal, High, and Low Line conditions.

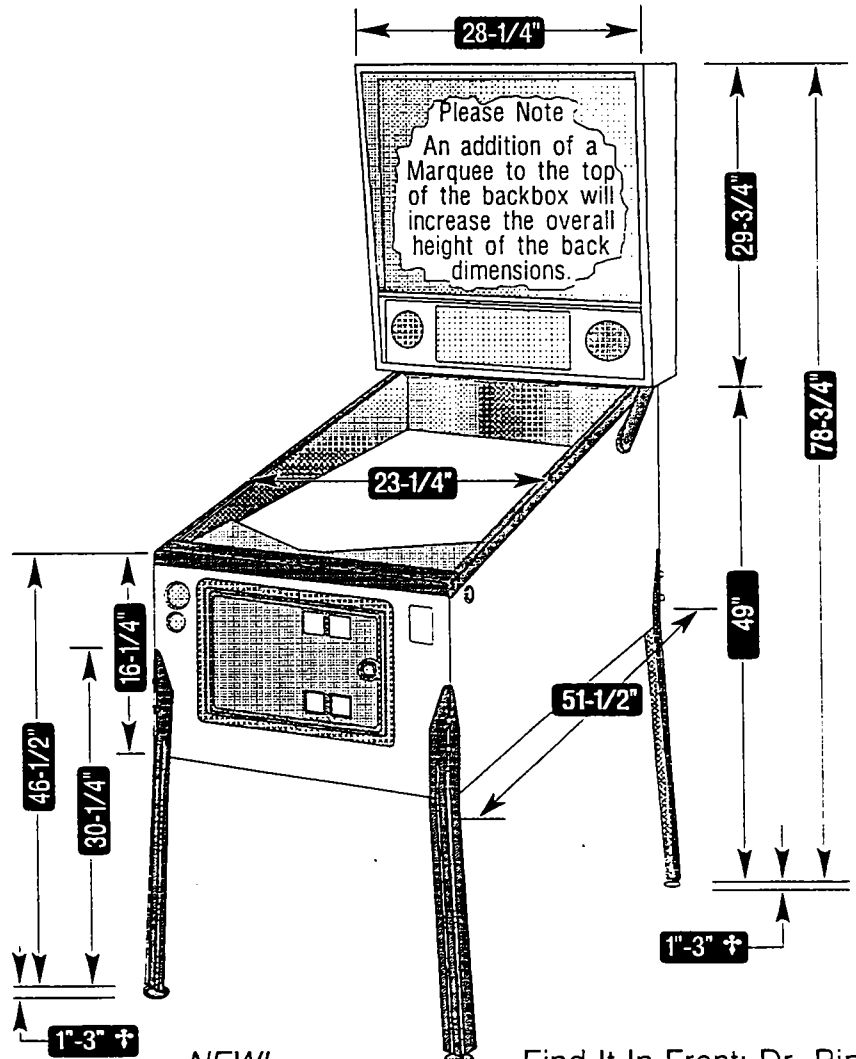
Normal Line:		110v AC - 125v AC @ 60Hz	
Domestic uses an 8AMP 250v Slo-Blo Fuse.	AVG OPERATION	MAX OPERATION	
	CURRENT: 2.8AMP WATTAGE: 329W	CURRENT: 8AMP WATTAGE: 940W	
High Line:		218v AC - 240v AC @ 50Hz	
Export uses 2 X 5AMP 250v Slo-Blo Fuses. (*England & Hong Kong use an 8AMP 250v S/B Fuse.)	AVG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

TRANSPORTATION

To reduce the possibility of damage, observe the following precautions whenever transporting the game. Lower the backbox and secure it to the cabinet. Remove the legs and secure the game within the transporting vehicle. Reference Section 1, Chapter 1, Game Set-Up for assembly (for disassembly reverse instruction order).

OVERALL DIMENSIONS †

Shipping Crate Dimensions	
Height:	55½"
Width:	30½"
Length:	31"
Weight:	250lbs. (+/- 10lbs.)



† Note:

The Leg Levelers can add up to two (2) inches to the overall height of the front & back dimensions.

The cabinet is designed to give a 6.5° pitch with the Leg Levelers turned all the way in.

007[™] GOLDENEYE 007[™]

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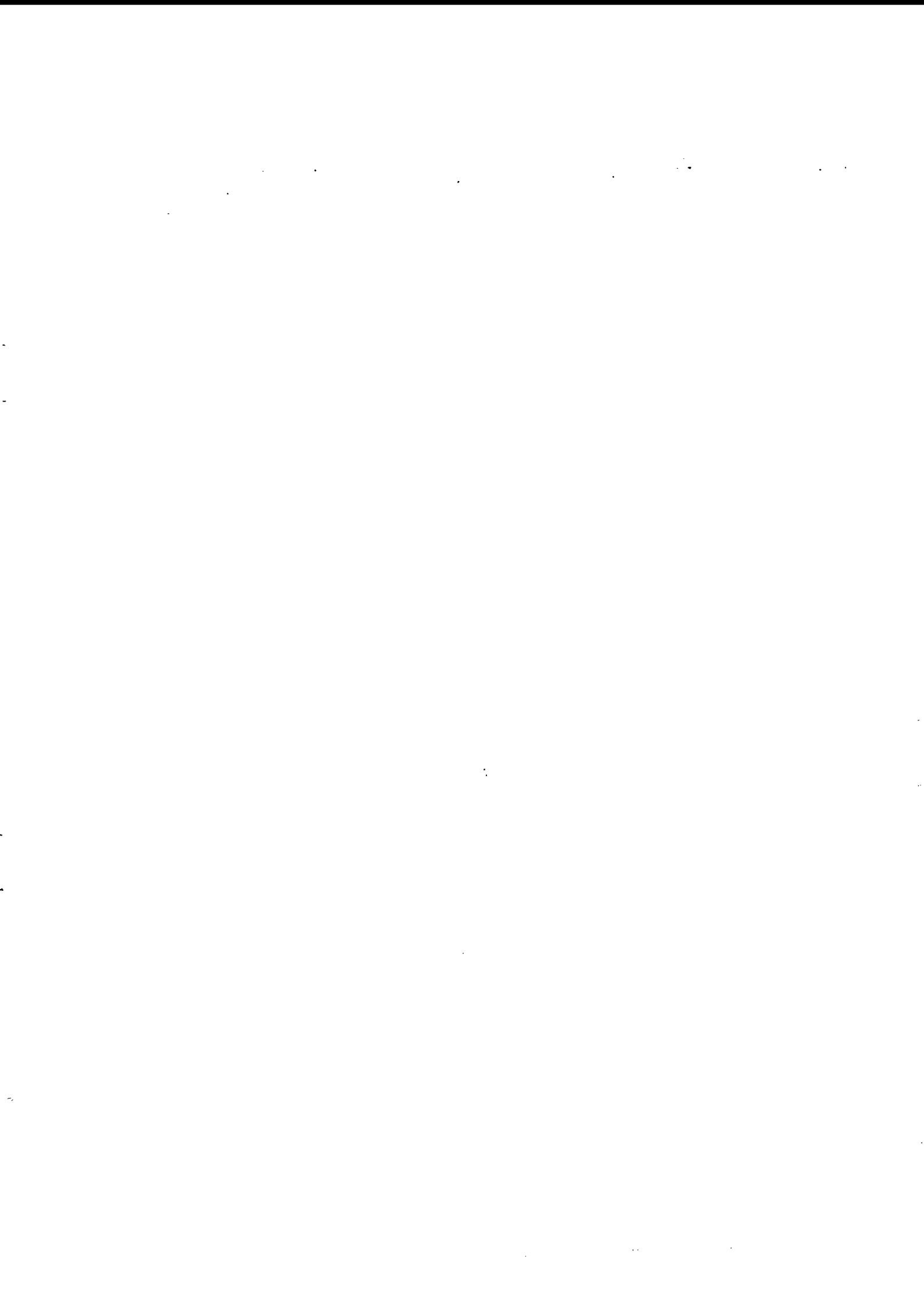




*in memory of
and dedicated to*

Jack Bushell





Game Set-Up

Game Assembly Procedures

(Refer to the Illustrations on the inside front cover and pages ii & 2)

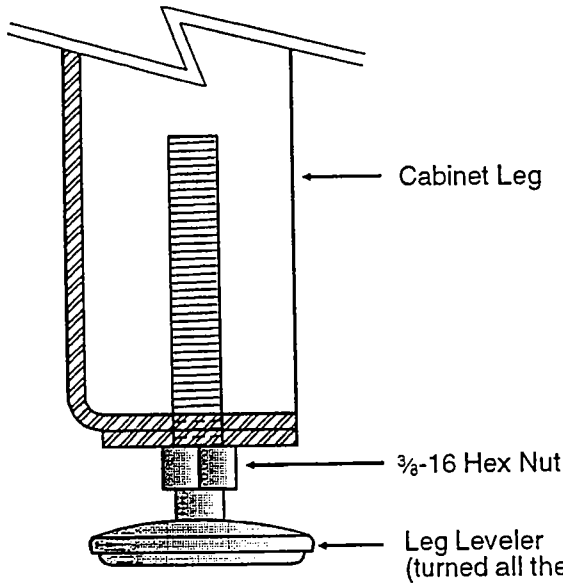
1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton.
2. Remove all packing material. 4 cabinet legs & levelers (attached) are in the corner packing material of the crate. A large Allen 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.
4. Support front of cabinet and attach front legs using two leg bolts for each leg.
5. 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° (¾ turn).
6. Remove the backbox keys from the playfield glass, unlock and carefully remove the backglass. Set the backglass aside. Undo latch on the Backbox Light Insert and slowly swing open (can be removed).
7. 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, Display Power Supply Board, and 2- (or 3-) Solid State Flipper Board to check that they are properly seated.
8. Check that all fuses are seated properly.
9. Carefully remove the playfield glass and set it aside.
10. Remove all shipping tie downs, shipping blocks, packing foam, shipping instruction pages, etc. (if any). **READ ALL PRINTED INFORMATION!** Shipping instructions, labels and/or decals describe warnings, cautions, and/or important information specific to the game.
11. Raise the playfield and support it, by lifting the Stay Arm 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.
12. Check all cabinet cables and playfield Lamp Boards connector terminations.
13. Remove the Plumb Bob tilt from the parts package and install on the pendulum wire on the inside left of the cabinet. See Section 4, Chapter 1, Parts Identification & Location.
14. 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.
15. With the Leg Levelers turned all the way in, 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.

16. Check the plumb tilt and adjust as required.
17. If desired, perform any self tests at this time. See Section 3, Chapter 1, Portals™ Service Menu Introduction, and Chapter 2, Diagnostics, for instructions on how to enter "Begin Play Test" and "Game Specific" to test components on the game.
18. Slowly swing Backbox Light Insert closed and secure latch. Carefully reinstall and lock the backglass.
19. **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.)
20. 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, Adjustments, for instructions on how to enter adjustments. Follow instructions in the tables provided in the manual for suggestions of customizing changes.

Leg Leveler Adjustment

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



STEP 1

Assemble all (4) legs and levelers as shown in the diagram. Be sure the leveler is turned all the way in.

STEP 2

Attach leg assemblies to cabinet with leg bolts provided.

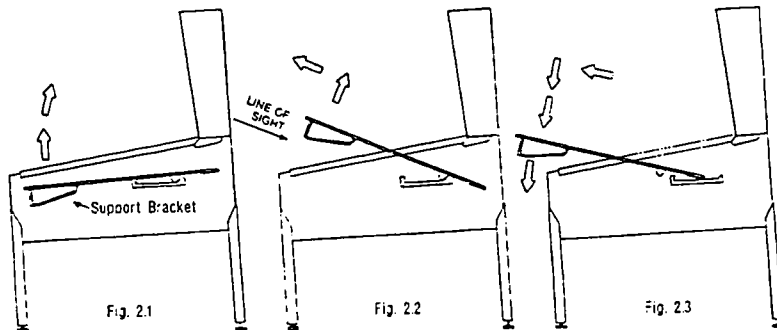
YOUR PLAYFIELD PITCH IS NOW AT 6.5° AS REQUIRED FOR PROPER GAME PLAY!

STEP 3

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

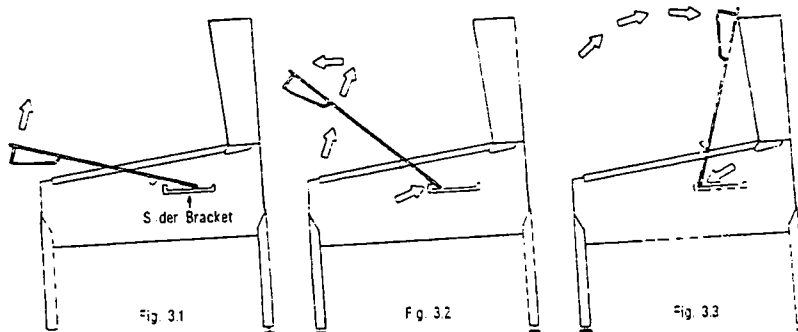


Service Position 1

This position is useful to service:

Trough Switches, Connectors at back of cabinet, Cleaning the Playfield, etc.

Lift the playfield **using the left and right ball guides** upward (Fig. 2.1) until the playfield support brackets can be seen to clear cabinet front (Fig. 2.2). At this time, pull playfield toward the front of the cabinet, checking that the mechanical components clear the cabinet front (Fig. 2.3). Then rest the playfield on the support brackets at the front channel of cabinet. **Reverse procedure when service is complete.**



Service Position 2

This position is useful to service:

All Playfield Bottom Components, Cabinet Components, etc.

With the playfield at rest (Fig. 3.1), hold sides of playfield and pull toward the front of the cabinet (approx. 6" to 8"), until resistance is felt from the slider brackets located on either side of the cabinet (Fig. 3.2). At this time, swivel playfield toward the backbox, then rest on top edge of the backbox. **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(s) with the display indicating the number of credit(s) posted. Press the **START BUTTON** and a start-up sound is produced, and the posted credit(s) are reduced by one. 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. **Note 2:** This feature can be adjusted with Adj. ##, Name of Adjustment. Default is On. Set to Off to turn off this feature.

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 ½ 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 does not work with less than or more than 4 players. 1-, 2-, 3-, 5- & 6-Player games, 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

Video Mode

Our games feature elaborate video modes and video graphics. Don't forget to watch the display for hints or feature demonstrations. The video modes require the player to play on-screen. When in video mode, the ball-in-play is "held" (usually in a Scoop, Eject Saucer or lock of some sort). The interactive video play requires the player to use the flipper buttons to play the mode.

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 is 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 Video 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 Video 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 Ball Buyin's), the game ends. If power is interrupted during the course of a game, it will end that game (see *Starting a Normal Game*). Depending on the number of tilts set (Default=2, adjustable), or prolonged closure of the Plumb Bob Tilt Switch, tilts the 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 Visual Display. Hitting the Start Button locks the letter or character in. Proceed with the 2nd & 3rd 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 Manual Percentage Adjustment. As previously with our 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.

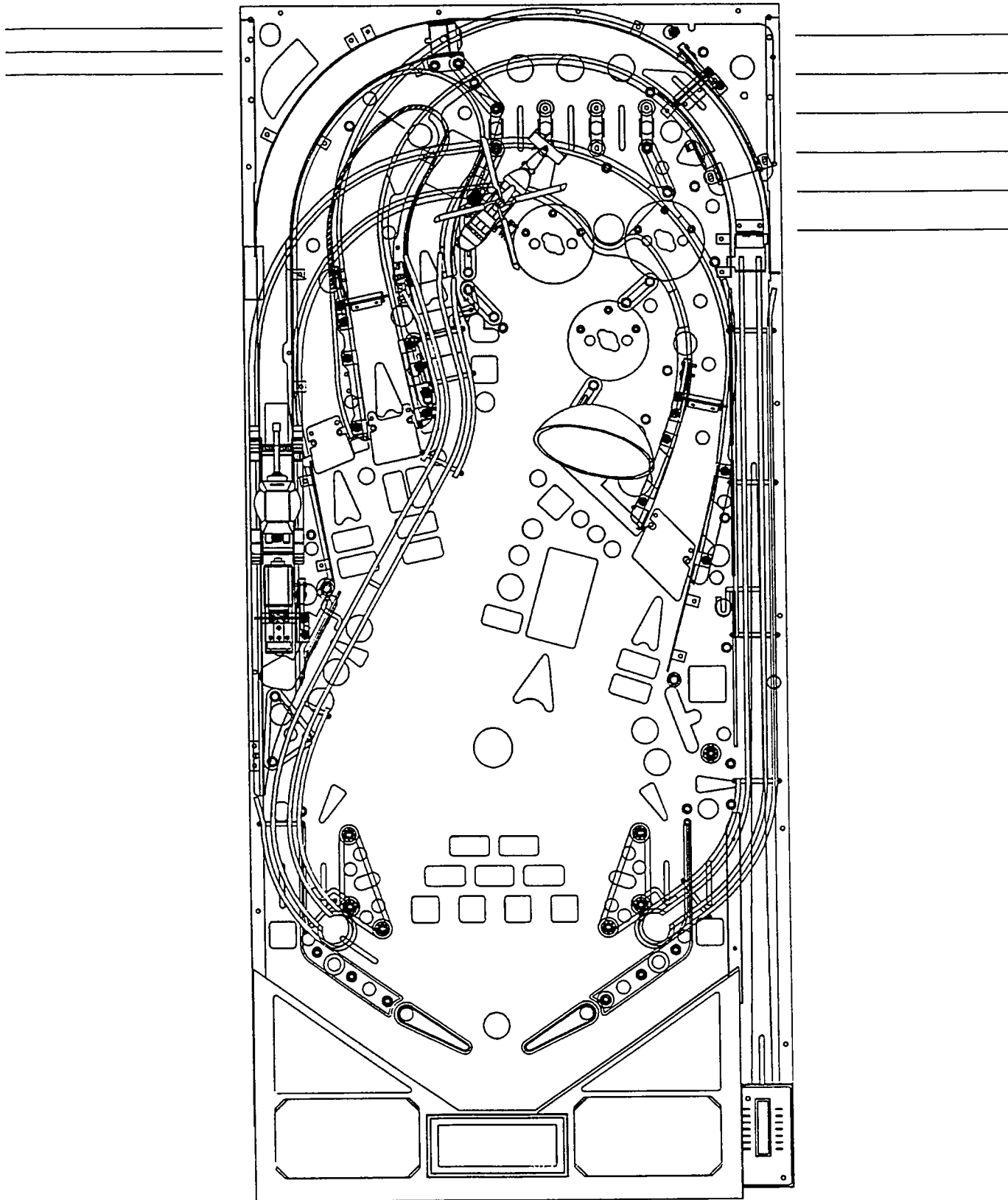
If you set operator adjustments for a particular replay percent, the game will compute a recommended score to keep the game at that replay percentage. If a change is recommended and the game coin door is opened, the display will indicate if the replay is too high or low and make a sound to alert the operator. By pressing the start button, the score to beat will be changed to a more correct 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.

GOLDENEYE Game Rules

Overview

Below is the GOLDENEYE Playfield with all of its component locations indicated (for details on these parts, see Section 4). Read over the components below to help in understanding the effects of the game rules. The rules are numbered and divided into four groups: **Single Ball Play**, **Multiball & Jackpots**, **007 Missions**, and **Secret Agent Game Rule Notes**.



GOLDENEYE 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.)

Section 2 | Rules

Copy & Cut

Fold

GOLDENEYE

SATELLITE MULTIBALL: Shoot center target to light locks at center ramp. After scoring two locks, shoot left ramp to raise satellite ramp - then shoot the satellite dish for 5 Ball Multiball.

TANK MULTIBALL: Shooting center target after two locks, lights the right ramp for 3 Ball Multiball.

007 ENCOUNTERS: Shoot center hole when lit to start flashing feature.

BEGINNERS' GUIDE TO SEGA PINBALLS:

- SELECT NOVICE RULES FOR GUARANTEED PLAY TIME.
- TO SCORE MORE, SHOOT WHAT'S FLASHING!
- PLAY MULTIBALL AS OFTEN AS POSSIBLE!
- GLANCE AT DOT DISPLAY DURING GAME!

Sega Pinball, Inc.™ & © 1996 Goldeneye © 1995 007 Gun logo™ & © 1962 Danjaq, Inc. & United Artists Corp. All Rights Reserved. 755-5142-00

Fold

The remainder of this chapter are the detailed GOLDENEYE Game Rules. Please read through 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 "Glossary of Terms," for words or acronymns 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

001



GAME RULES SELECT:

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*. (Note: Subsequent players will play the game style chosen by player 1.)

NOVICE GAME rules give the player a guaranteed minimum game time - *if the ball drains before this time is up, it will be returned to the player*. When the ball drains after time is up, the game ends.

002



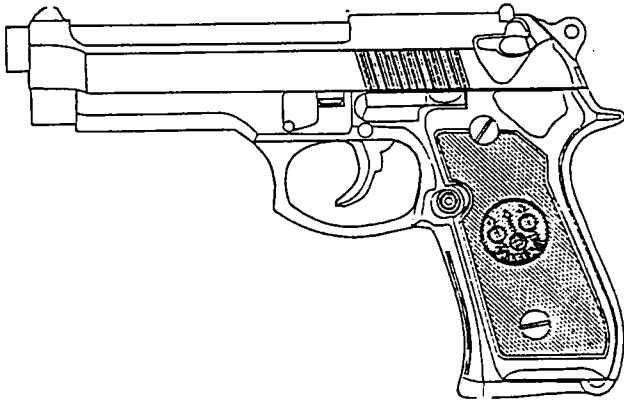
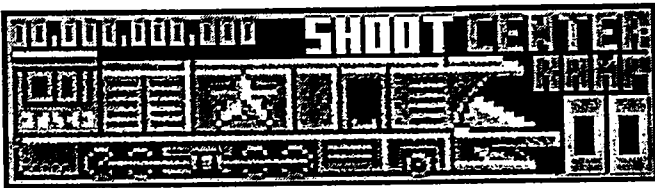
SKILL SHOT SELECT:

Select one of the three items shown in the display:

003





GOLDENEYE

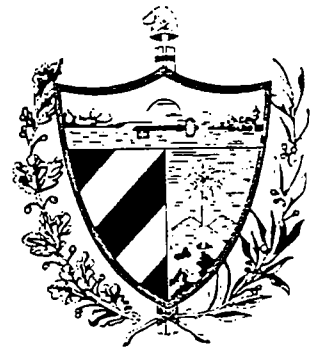


Q's GAME RULE NOTES

Q1  **COMBINATION SHOTS**
GOLDENEYE GOLDENEYE 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.

Q2  **END-OF-BALL BONUS CALCULATION**
GOLDENEYE The BONUS is calculated as the sum of:
BONUS A + BONUS B + BONUS C + BONUS D = TOTAL BONUS There is no cap on the TOTAL BONUS. However, if all of the above are zero, a TOTAL BONUS of 1M will be awarded. There is no *Bonus Multiplier* in this game, though players can earn a **DOUBLE BONUS** (2X Bonus at the end of the current ball only). Normally, *Bonus Totals* will reset at the start of each new ball, but a **HOLD BONUS** is available from *Mystery*.

Q3  **COVERT OPERATION WARNING!**
GOLDENEYE Just like any covert operation, rules and point values are subject to change without notice. *Call Q!*



Portals™ Service Menu Introduction

*Section 3
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Bullet Notes:

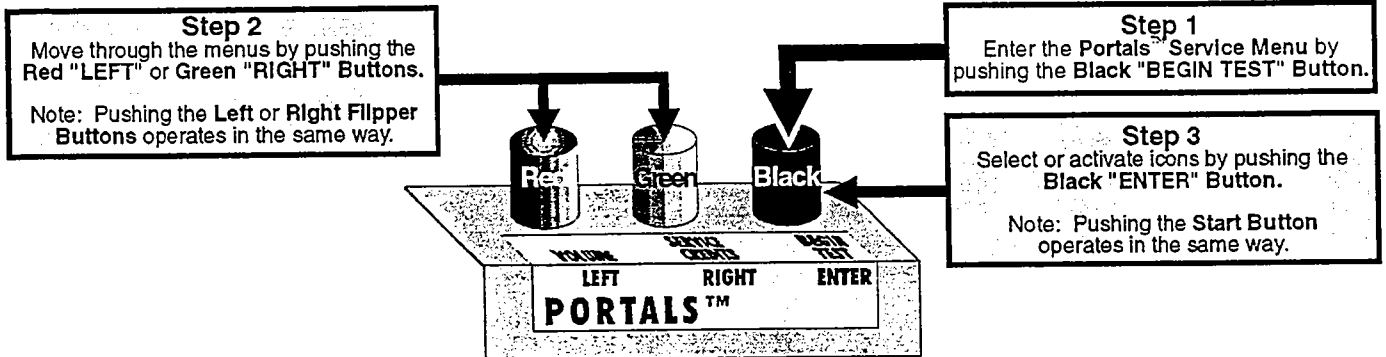
- From Main Menu, Level 1.
- From the Sub-Menu, Level 2.

- From the Sub-Menu, Level 3.
- ☐ Added Information/Instruction.

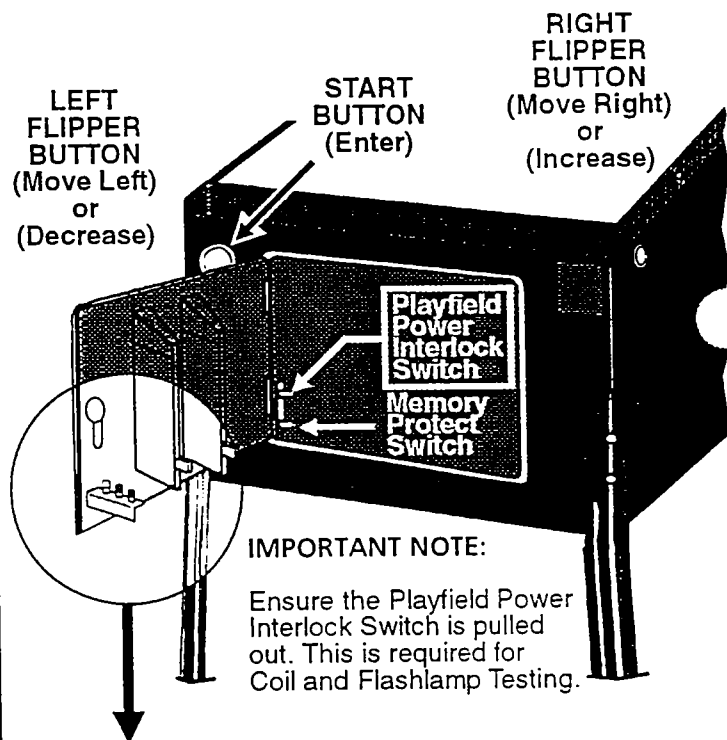
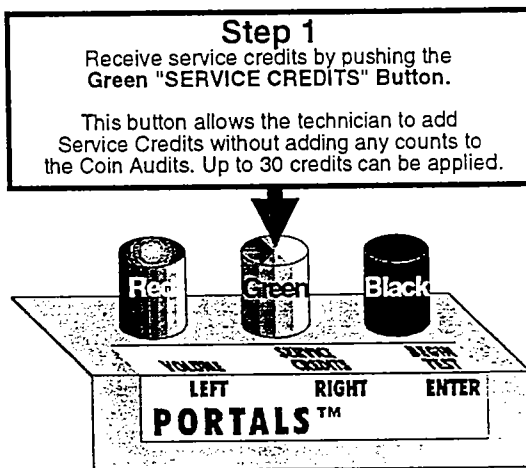
Service Switch Set (Red, Green & Black Buttons) Access & Use

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):



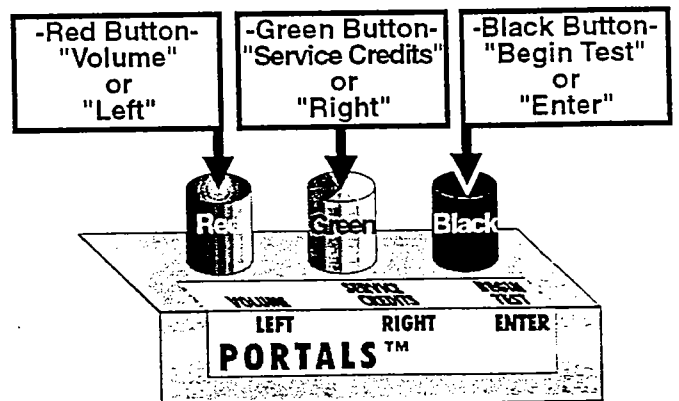
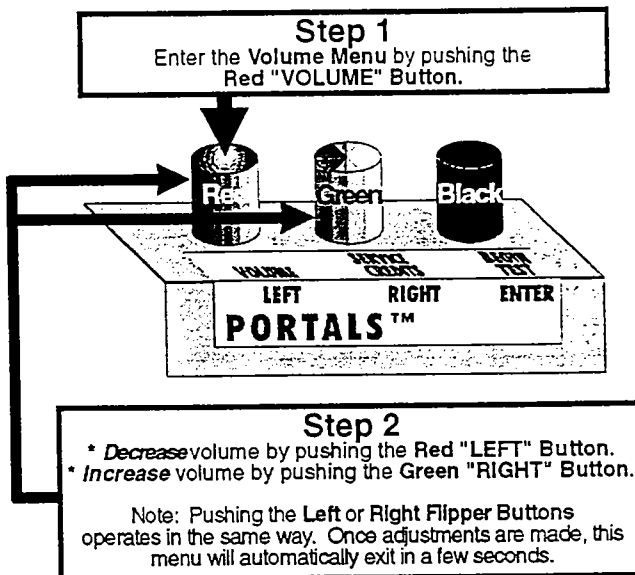
② Adding Service Credits (will not operate in Service or Volume Modes):



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):

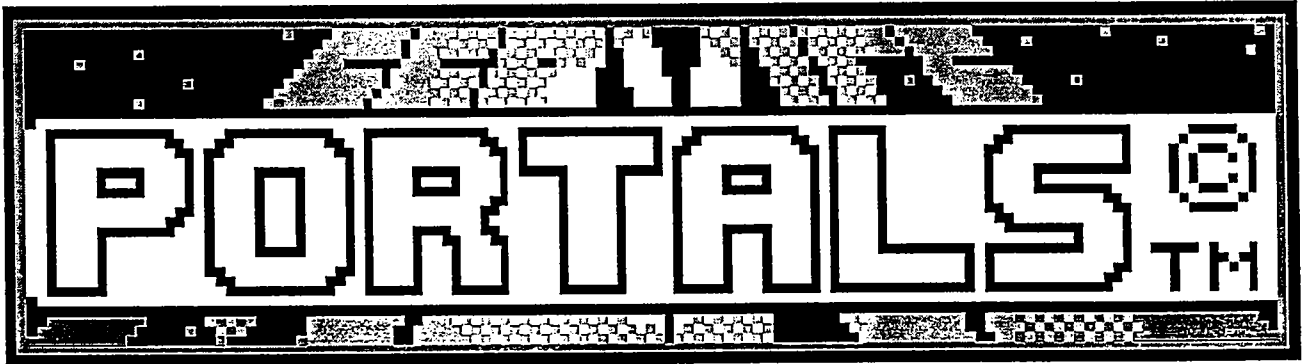


How to Use This Section

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™ © 1995 SEGA PINBALL, INC.", followed by the **MAIN MENU**:

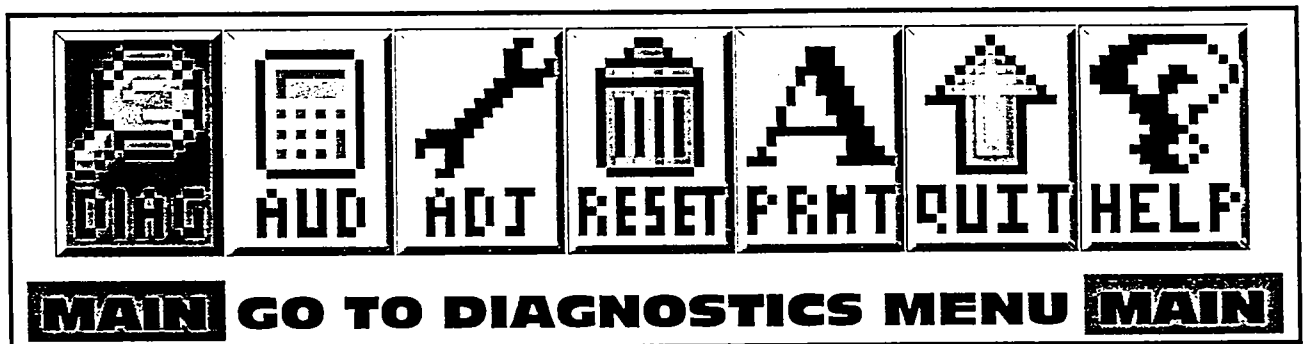




The Coin Door may be closed for security, however, please note with the Coin Door closed, the game's *MEMORY PROTECT* is enabled; *meaning any changes that are made will be not be written to memory*. If changing adjustments is required, ensure the Coin Door is open.

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:

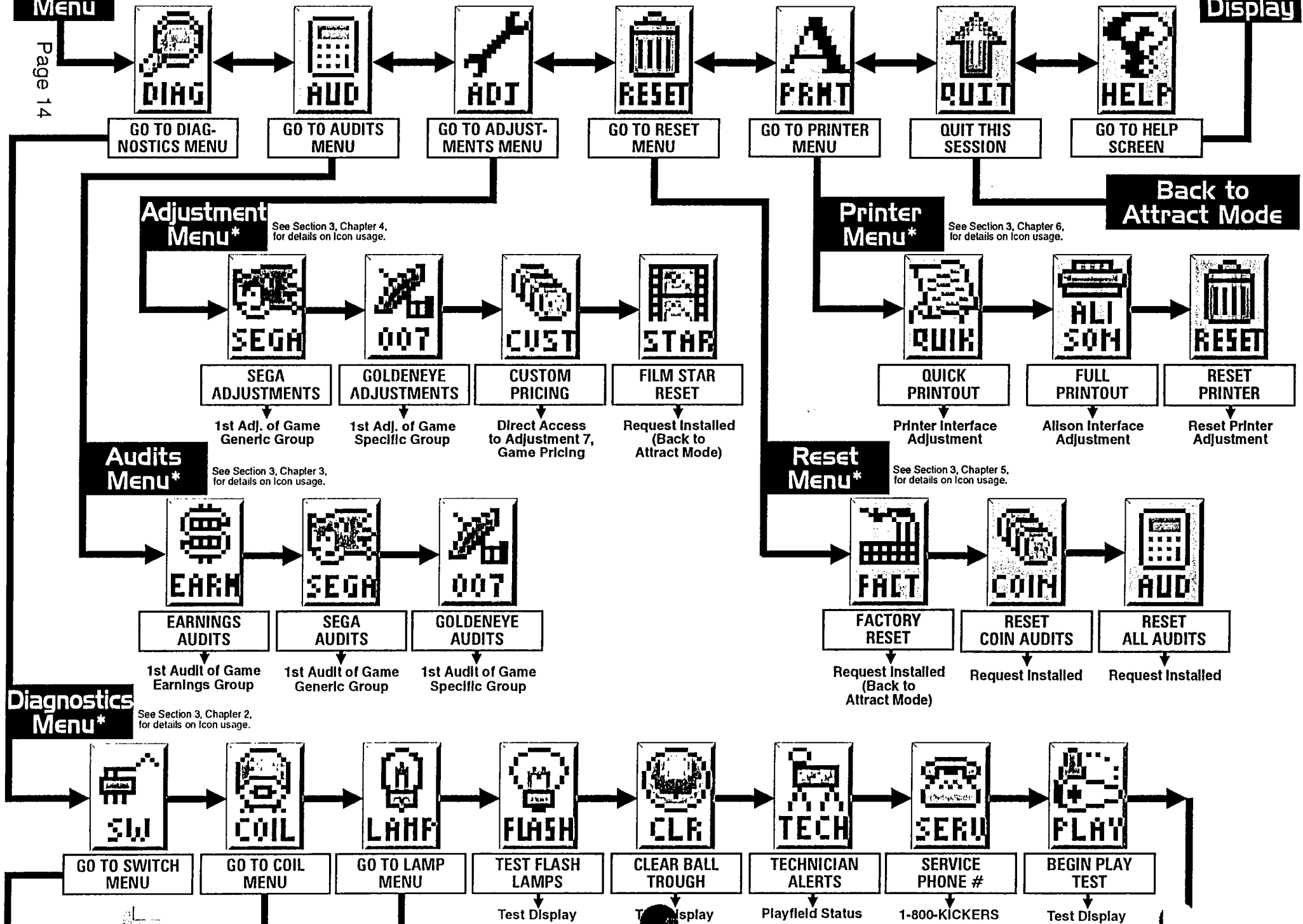


As the operator views the Menu Screen(s), the   symbols indicates that there are more *Icons* to select in each direction. The *Icon* selected will blink. Pushing the Black "ENTER" Button (or Start Button) will select the *Icon* and the Menu Screen will change to the menu selected. Select the "PREV" *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 Icon Tree





MORE

Indicates more icons to the left.



MORE

Indicates more icons to the right.

See Section 3, Chapter 1, for detailed explanations of the Portals™ Service Menu.

See the remaining chapters for detailed explanations of all the icons in the menus.

Switch Menu*

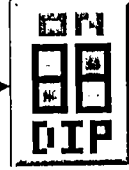
See Section 3, Chapter 2, for details on icon usage.



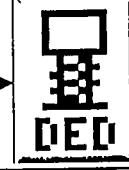
SWITCH TEST



ACTIVE SWITCH TEST



DIP SWITCH TEST



DEDICATED SWITCH TEST

Lamp Menu*

See Section 3, Chapter 2, for details on icon usage.



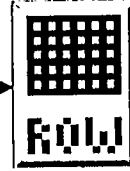
SINGLE LAMP TEST

Test Display



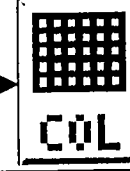
TEST ALL LAMPS

Test Display



ROW LAMP TEST

Test Display

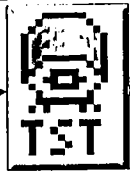


COLUMN LAMP TEST

Test Display

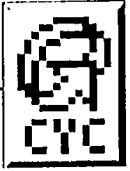
Coil Menu*

See Section 3, Chapter 2, for details on icon usage.



COIL TEST

Test Display



CYCLING COILS

Test Display



KNOCKER TEST

Test Display



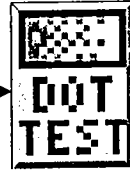
SOUND / SPEAKER TEST

Test Display



BEGIN BURN IN

Test Display



DOT MATRIX TEST

Test Display



GOLDENEYE SPECIFIC**

Test Display



FLOW CHART MENU

Dr. Pinball Switch, Coil and Flipper Flow Charts.

**Note: If more than one Game Specific Test exists, a Sub-Menu will appear displaying Game Specific Test Icons. See Section 3, Chapter 2 (near end), for details.

*Common Sub-Menu Icons

Go to the previous Audit / Adjustment / or Diagnostic

Move backward or left

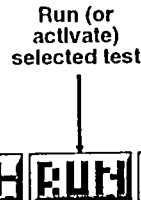


Go to the next Audit / Adjustment / or Diagnostic

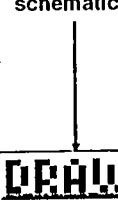
Move forward or right



Run (or activate) selected test



View the current schematic



Go back to the previous menu



Exit Portals™ Service Menu Session



Go to the Help Screen of the current menu



Increment displayed value or select next...

Decrement displayed value or select previous...

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*.



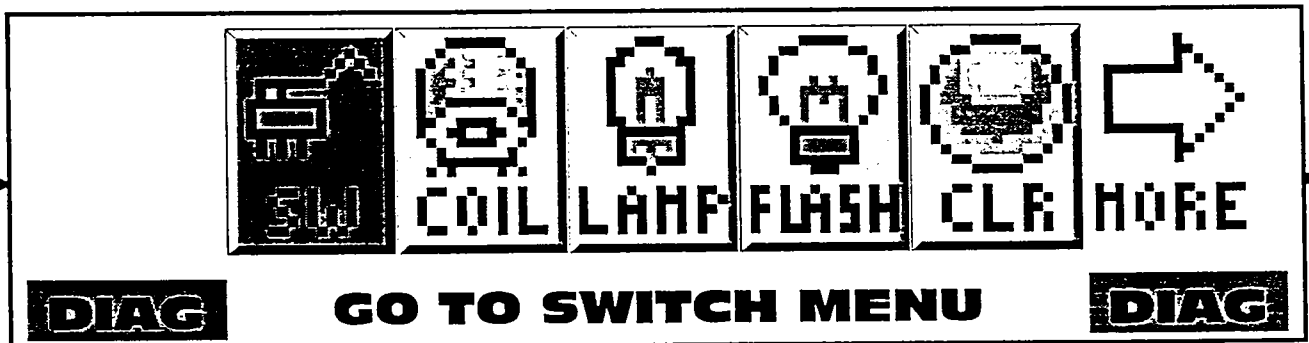
HELP

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).

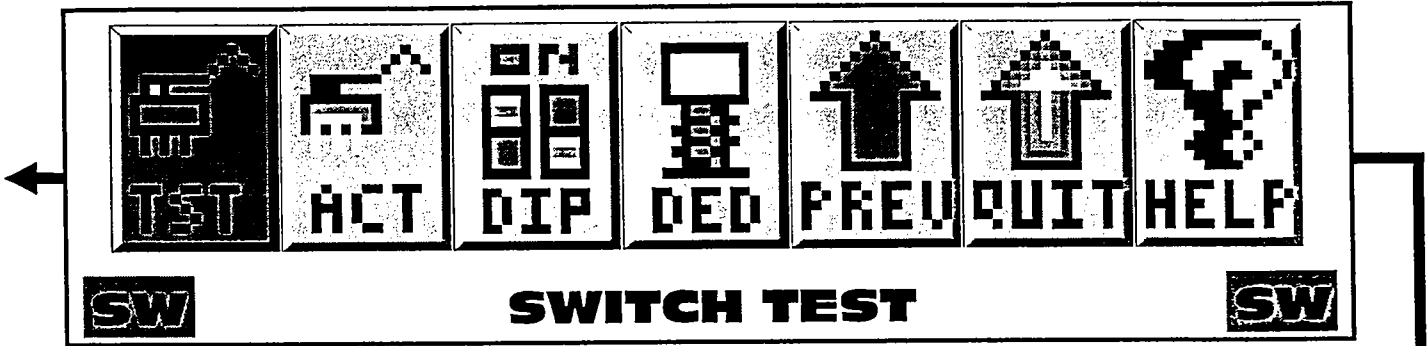


Press the Black "ENTER" Button to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

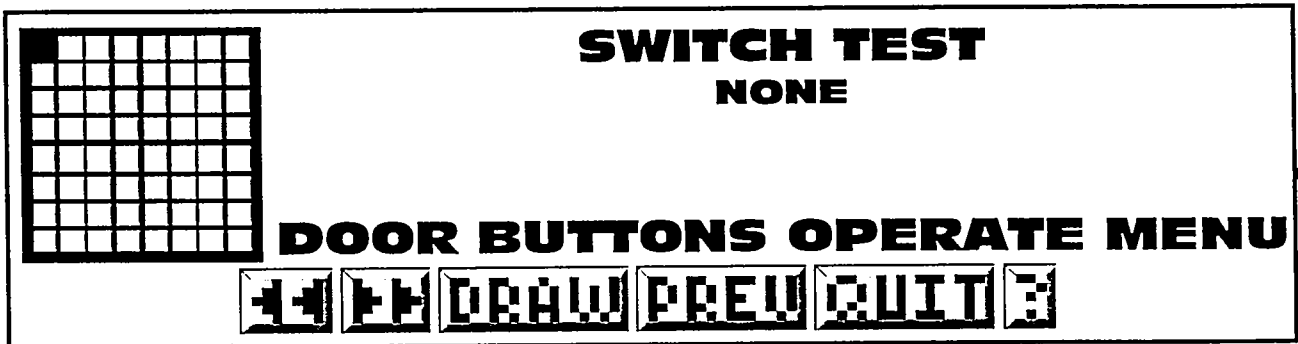


The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (GO TO SWITCH MENU) flashing. Press the Black Button to activate this icon. This will bring up the **SWITCH TEST MENU**.

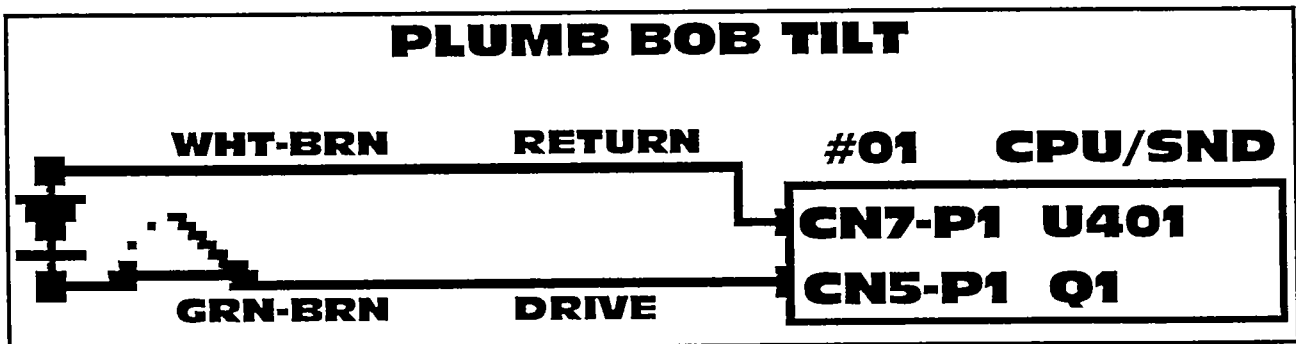
The SWITCH TEST MENU now appears with the "TST" *Icon* (SWITCH TEST) flashing:
 Press the Black "ENTER" Button to *activate* this icon. This will bring up the Switch Test Display.



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, Dip & 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.

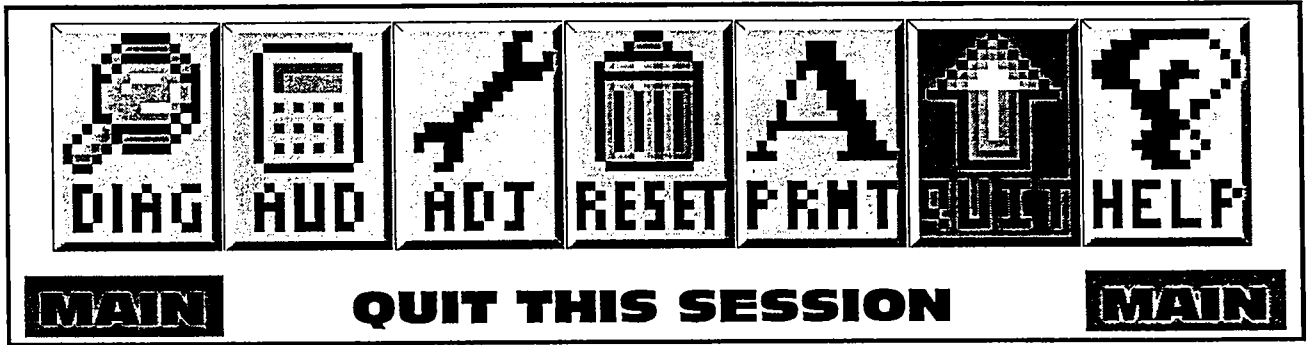
Note:

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

Blank lined area for notes, consisting of 18 horizontal lines.

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 "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 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 for 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 four parts: Switch Test, Active Switches, Dip Switch Test 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.



Dip Switch Test

To initiate, from the **SWITCH MENU**, select the "DIP" *Icon* with either Red or Green Button & press the Black Button. The display will indicate the Dip Switch Positions & the country setting the game is set to (e.g. USA, Germany, England, etc.). See the "Find-It-In Front: Dr. Pinball Section" for Dip Switch Settings.

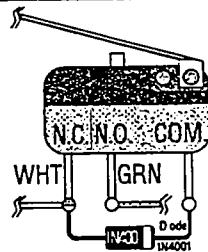
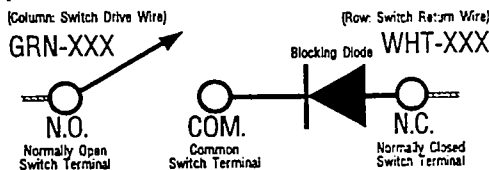


Dedicated Switch Test

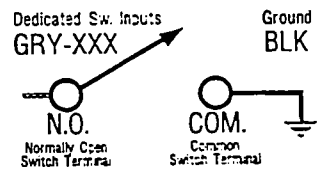
To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either Flipper Button & press the Start Button (The service switches are deactivated during this test.). The display will describe the switch which includes the switch name, Return (Row) Wire, Column Wire, Part N^o, and the "Pin-Outs"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

Section 3 | Diags.

Typical Switch Schematic & Side View



Dedicated Switch Schematic



SWITCH MATRIX GRID

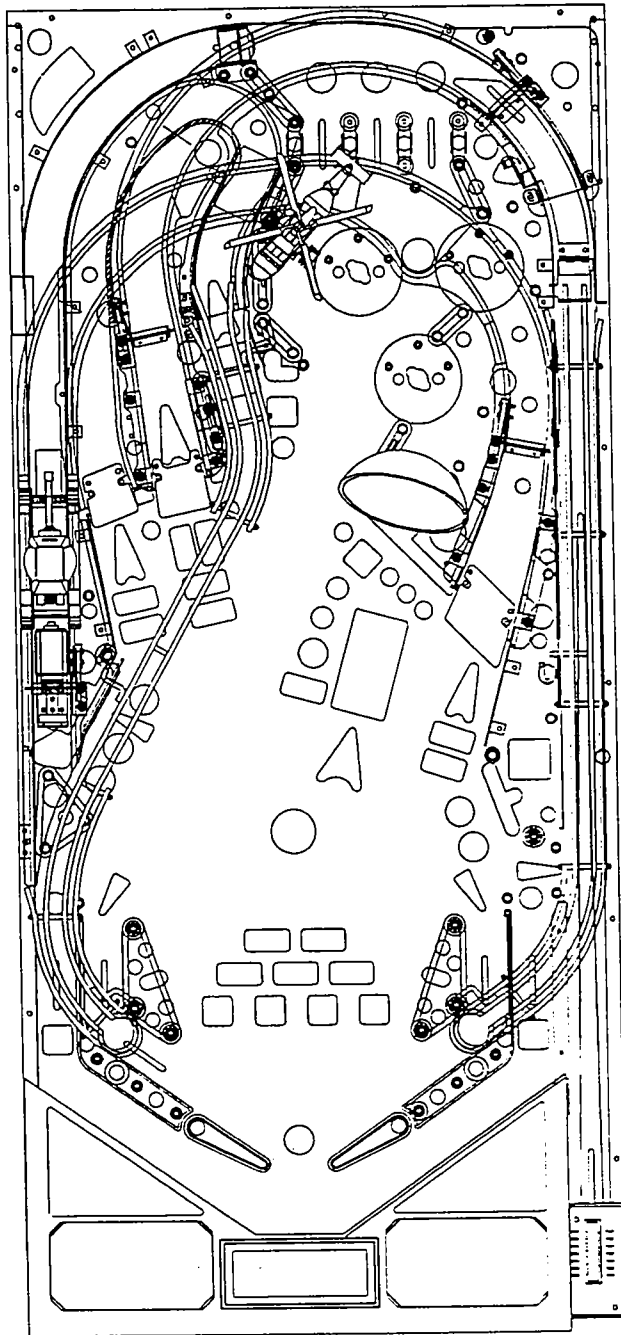
Column (Drive)	1 Q1 GRN-BRN CN5-1	2 Q2 GRN-RED CN5-3	3 Q3 GRN-ORG CN5-4	4 Q4 GRN-YEL CN5-5	5 Q5 GRN-BLK CN5-6	6 Q6 GRN-BLU CN5-7	7 Q7 GRN-VIO CN5-8	8 Q8 GRN-GRY CN5-9
1 WHT-BRN CN7-9	PLUMB BOB TILT 1	FIRE BUTTON 9	RIGHT RAMP EXIT 17	LEFT 5-BANK BOTTOM 25	2-BANK BOTTOM 33	LEFT TURBO BUMPER 41	NOT USED 49	LEFT OUTLANE 57
2 WHT-RED CN7-8	4TH COIN SLOT 2	5-BALL TROUGH #1 (LEFT) 10	CENTER RAMP EXIT 18	LEFT 5-BANK MID-ECT 26	2-BANK TOP 34	BOTTOM TURBO BUMPER 42	SCOOP 50	RIGHT OUTLANE 58
3 WHT-ORG CN7-7	START BUTTON 3	5-BALL TROUGH #2 11	RIGHT RAMP ENTER 19	LEFT 5-BANK MIDDLE 27	NOT USED 35	RIGHT TURBO BUMPER 43	RIGHT TOP LANE 51	LEFT RETURN LANE 59
4 WHT-YEL CN7-6	RIGHT COIN SLOT 4	5-BALL TROUGH #3 12	SATELLITE HOME 20	LEFT 5-BANK MID-TOP 28	NOT USED 36	RIGHT 5-BANK TOP 44	MIDDLE TOP LANE 52	RIGHT RETURN LANE 60
5 WHT-GRN CN7-5	CENTER COIN SLOT / DBA 5	5-BALL TROUGH #4 13	NOT USED 21	NOT USED 29	NOT USED 37	RIGHT 5-BANK MID-TOP 45	LEFT TOP LANE 53	LEFT SLINGSHOT 61
6 WHT-BLU CN7-3	LEFT COIN SLOT 6	5-BALL TROUGH #5 (RIGHT) 14	NOT USED 22	LEFT STAND-UP 30	NOT USED 38	RIGHT 5-BANK MIDDLE 46	CENTER RAMP ENTER 54	RIGHT SLINGSHOT 62
7 WHT-VIO CN7-2	SLAM TILT 7	5-BALL TROUGH VUK OPTO 15	SATELLITE MAGNET BOARD 23	RIGHT STAND-UP 31	EJECT STAND-UP 39	RIGHT 5-BANK MID-BOT 47	TOP LANE ENTER 55	LT FLIPPER BUTTON VIA Q7 (CN SSFB) 63
8 WHT-GRY CN7-1	NOT USED 8	SHOOTER LANE 16	FLIPPER MAGNET BOARD 24	LEFT RAMP MADE 32	LEFT RAMP ENTER 40	RIGHT 5-BANK BOTTOM 48	TANK TRAP DOOR 56	RT FLIPPER BUTTON VIA Q5 (CN SSFB) 64

Dedicated Switches

IC U206 INPUTS	Ground
1 GRY-BRN CN6-2	NOT USED DS-1
2 GRY-RED CN6-3	NOT USED DS-2
3 GRY-ORG CN6-4	NOT USED DS-3
4 GRY-YEL CN6-6	NOT USED DS-4
5 GRY-GRN CN6-7	NOT USED DS-5
6 GRY-BLU CN6-8	Normal: Volume In Test: Left REJECTION DS-6
7 GRY-VIO CN6-9	Normal: Service Credits In Test: Right REJECTION DS-7
8 GRY-BLK CN6-10	Normal: Begin Test In Test: Enter BLK BUTTON DS-8

Switch Matrix Descriptions with Part Numbers and Locations †

The switch locations correspond with the Switch N^o in the table below and the Switch Maxtrix Grid.



Legend Note:

□ = Switches located above playfield.

■ = Switches located below playfield.

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



The following switches are not used:



Sw. N ^o	Col. N ^o	Row N ^o	Switch Matrix Description	Part N ^o
1	1	1	* PLUMB BOB TILT (See Section 4, Chapter 1)	
2	1	2	* 4TH COIN SLOT (On Coin Door)	
3	1	3	START BUTTON (Left of Coin Door) RED	500-5026-07
4	1	4	* RIGHT COIN SLOT (On Coin Door)	180-5024-00
5	1	5	* CENTER COIN SLOT / DBA	180-5024-00
6	1	6	* LEFT COIN SLOT (On Coin Door)	180-5024-00
7	1	7	* SLAM TILT	180-5022-00
8	1	8	NOT USED	
9	2	1	FIRE BUTTON	180-5111-00
10	2	2	5-BALL TROUGH #1 (LEFT)	180-5119-00
11	2	3	5-BALL TROUGH #2	180-5119-00
12	2	4	5-BALL TROUGH #3	180-5119-00
13	2	5	5-BALL TROUGH #4	180-5119-00
14	2	6	5-BALL TROUGH #5 (RIGHT)	180-5119-00
15	2	7	#5-BALL TROUGH VUK OPTO (TRANS) (FEED)	520-5124-00 520-5125-00
16	2	8	SHOOTER LANE	500-570X-00
17	3	1	RIGHT RAMP EXIT	180-5087-00
18	3	2	CENTER RAMP EXIT	180-5087-00
19	3	3	RIGHT RAMP ENTER	180-5087-00
20	3	4	SATELLITE HOME	180-5052-00
21	3	5	NOT USED	
22	3	6	NOT USED	
23	3	7	SATELLITE MAGNET BOARD	See Magnet
24	3	8	FLIPPER MAGNET BOARD	Ecard Layout
25	4	1	LEFT 5-BANK BOTTOM	515-5162-00
26	4	2	LEFT 5-BANK MIDDLE-BOTTOM	515-5162-00
27	4	3	LEFT 5-BANK MIDDLE	515-5967-00
28	4	4	LEFT 5-BANK MIDDLE TOP	515-5162-00
29	4	5	NOT USED	
30	4	6	LEFT STAND-UP	515-5967-00
31	4	7	RIGHT STAND-UP	515-5967-00
32	4	8	LEFT RAMP MADE	180-5087-00
33	5	1	2-BANK BOTTOM	515-5162-00
34	5	2	2-BANK TOP	515-5162-00
35	5	3	NOT USED	
36	5	4	NOT USED	
37	5	5	NOT USED	
38	5	6	NOT USED	
39	5	7	EJECT STAND-UP	515-5967-00
40	5	8	LEFT RAMP ENTER	180-5087-00
41	6	1	LEFT TURBO BUMPER	180-5015-03
42	6	2	BOTTOM TURBO BUMPER	180-5015-03
43	6	3	RIGHT TURBO BUMPER	180-5015-03
44	6	4	RIGHT 5-BANK TOP	515-5162-00
45	6	5	RIGHT 5-BANK MIDDLE TOP	515-5162-00
46	6	6	RIGHT 5-BANK MIDDLE	515-5162-00
47	6	7	RIGHT 5-BANK MIDDLE BOTTOM	515-5967-00
48	6	8	RIGHT 5-BANK BOTTOM	515-5162-00
49	7	1	NOT USED	
50	7	2	SCOOP	180-5057-00
51	7	3	RIGHT TOP LANE	500-570X-00
52	7	4	MIDDLE TOP LANE	500-570X-00
53	7	5	LEFT TOP LANE	500-570X-00
54	7	6	CENTER RAMP ENTER	180-5087-00
55	7	7	TOP LANE ENTER	Verby
56	7	8	TANK TRAP DOOR	Verby
57	8	1	LEFT OUTLANE	500-570X-00
58	8	2	RIGHT OUTLANE	500-570X-00
59	8	3	LEFT RETURN LANE	500-570X-00
60	8	4	RIGHT RETURN LANE	500-570X-00
61	8	5	LEFT SLINGSHOT	180-5054-00
62	8	6	RIGHT SLINGSHOT	180-5054-00
63	8	7	* LEFT FLIPPER POWER SWITCH BUTTON VIA Q7 ON THE SSFB	180-5122-00
64	8	8	* RIGHT FLIPPER POWER SWITCH BUTTON VIA Q5 ON THE SSFB	180-5122-00

Section 3 | Diags.



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.



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 #1 - #34+). 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.

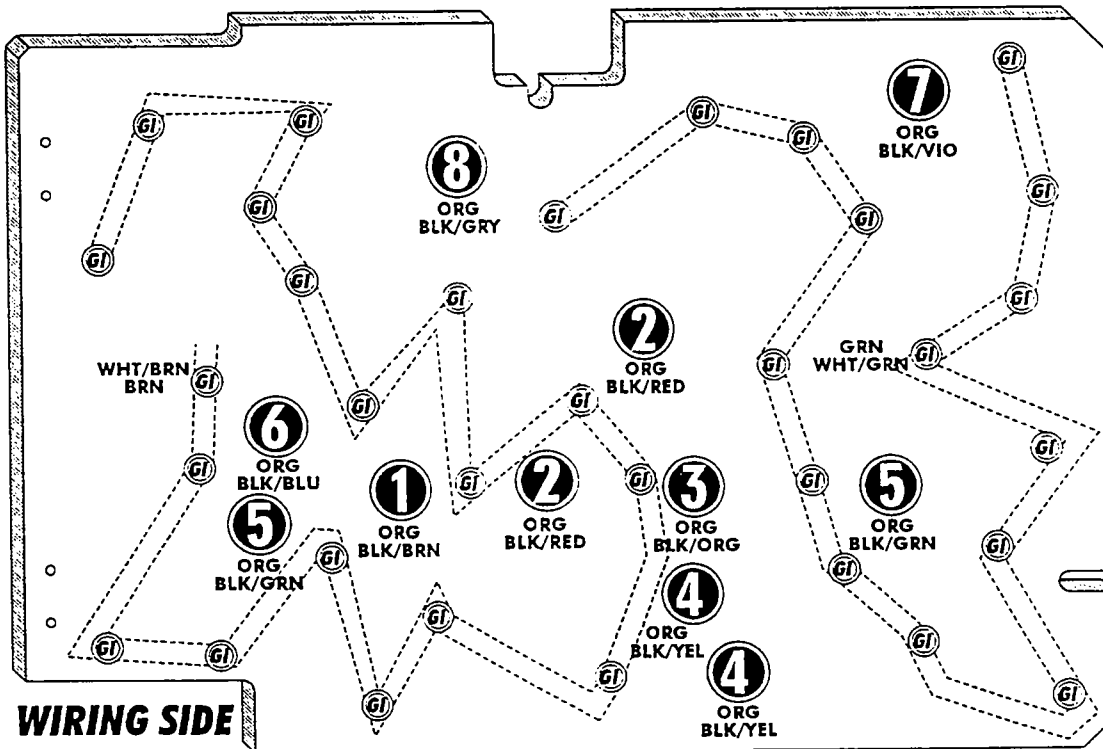


Cycling Coil Test

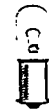
To initiate, from the **COIL MENU**, select the "CYC" *Icon* with either Red or Green Button and press the Black Button. If still in a previous test, select the "PREV" *Icon* to return to Coil Menu or selecting either of the "ARROW" *Icons* will move to Cycling Coil Test (selecting again will return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

Backbox Insert Flash Lamp Locations

Below are the flash lamp locations in the Backbox Insert (General Illumination (GIs) Lamps are also shown for reference). The flash lamp locations correspond with the coil numbers as seen in the Coil Test. The table below indicates the numbers for the flash lamps in the backbox. See the next page for flash lamps on the playfield.



GI = General Illumination



#44 Bulb (Bayonet) 165-5000-44

#44 Bulb uses 2-Lug Socket (077-5000-00).

= Flash Lamp (FLAMP)



#89 Bulb (Bayonet) 165-5000-89

#89 Bulb uses a Stand-Up Short Socket (077-5101-00).

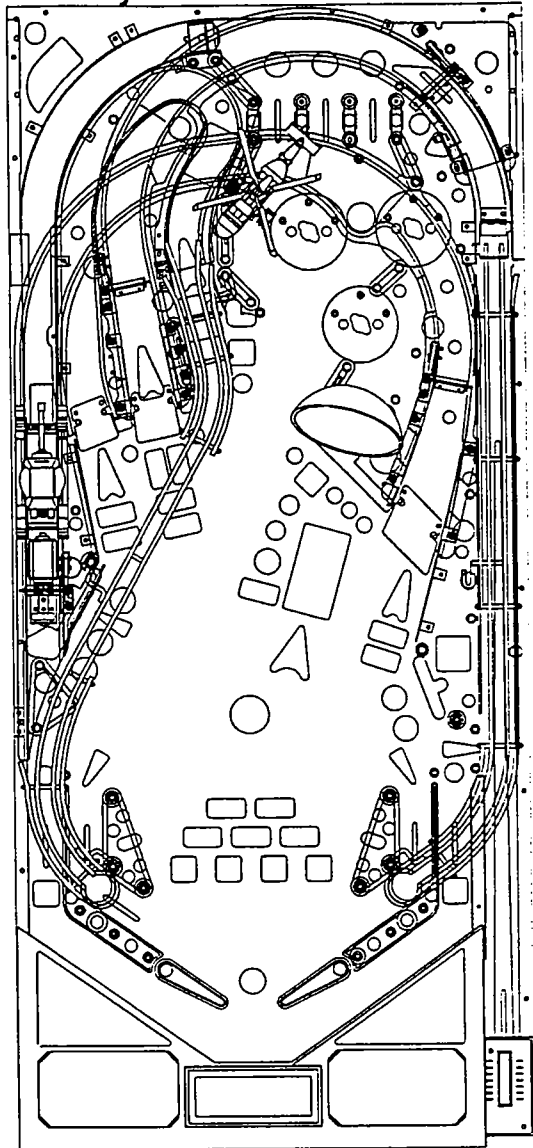
Type	Qty.
FLAMP 1	Insert X1
FLAMP 2	Insert X2

Type	Qty.
FLAMP 3	Insert X1
FLAMP 4	Insert X2

Type	Qty.
FLAMP 5	Insert X2
FLAMP 6	Insert X1

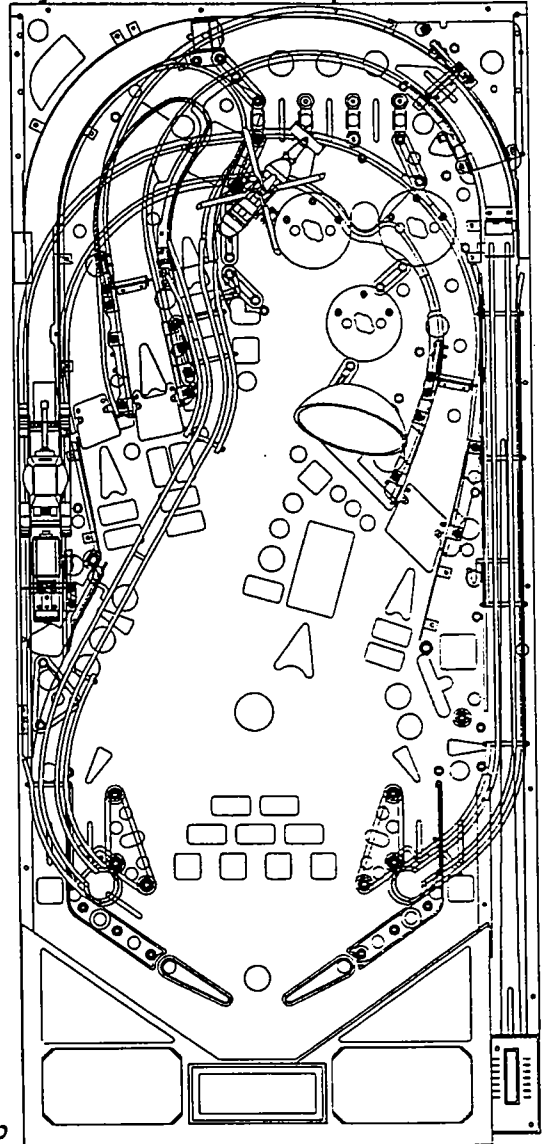
Type	Qty.
FLAMP 7	Insert X1
FLAMP 8	Insert X1

Playfield Coil Locations



Type	Coil Description
COIL 1	TROUGH UP-KICKER (VUK) (23-800)
COIL 2	AUTO LAUNCH 50V (24-940)
COIL 3	NOT USED
COIL 4	POWER SCOOP(23-800)
COIL 5	NOT USED
COIL 6	NOT USED
COIL 7	NOT USED
COIL 8	(EXTERNAL REPLAY KNOCKER DRIVE LINE)
COIL 9	LEFT TURBO BUMPER (26-1200)
COIL 10	BOTTOM 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	TANK KICKER (23-800)
COIL 15	LEFT FLIPPER ENABLE
COIL 16	RIGHT FLIPPER ENABLE
COIL 17	5-BALL TROUGH LOCK BALL (25-1240)
COIL 18	UP-DOWN RAMP PLUNGER (27-1500)
COIL 19	NOT USED
COIL 20	SATELLITE LAUNCH RAMP (##-###)
COIL 21	SATELLITE MOTOR RELAY
COIL 22	TANK TRAP DOOR (27-1500)
COIL 23	NOT USED
COIL 24	(OPTIONAL COIN METER)

Playfield Flash Lamp Locations



Flash Lamp (FLAMP)



#89 Bulb
(Bayonet)
165-5000-89



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

Legend Note:

□ = Coils or Flash Lamps located above playfield.

■ = Coils or Flash Lamps located below playfield.

The following coils are not used:

3 5 6 7 8 19 23 24

Type	Flash Lamps Description & Qty.
FLAMP 1	BOTTOM L&R X2, INSERT X1
FLAMP 2	LWR. FLIP. MAGNET X1, INSERT X2
FLAMP 3	LOWER LEFT X2, INSERT X1
FLAMP 4	SATELLITE X2, INSERT X2
FLAMP 5	LWR. RIGHT P/F X2, INSERT X2
FLAMP 6	HELICOPTER X1, INSERT X1
FLAMP 7	UPR. LT. X1, BACKPANEL X2, INSERT X1
FLAMP 8	UPR. RT. X2, BACKPANEL X1, INSERT X1

See previous pg. for Backbox Insert Flash Lamp Locations.

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
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-4/5	50v	23-800 090-5000-01
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-4/5	50v	24-940 090-5036-01
#3	NOT USED	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	---	---	N/A
#4	POWER SCOOP	Q4	I/O Pwr. Drvr.	BRN-YEL	J8-P5	YEL-VIO	J10-4/5	50v	23-800 090-5000-01
#5	NOT USED	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	J10-4/5	50v	N/A
#6	NOT USED	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	BRN	---	---	N/A
#7	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	---	---	N/A
#8	(OPTIONAL REPLAY KNOCKER DRIVE LINE)	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-4/5	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
#9	LEFT TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#10	BOTTOM TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-4/5	50v	26-1200 090-5044-00
#14	TANK KICKER	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-4/5	50v	23-800 090-5000-01
#15	LEFT FLIPPER ENABLE	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	GRY-YEL	J10-4/5	50v	22-1080 090-5032-00
#16	RIGHT FLIPPER ENABLE	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	BLU-YEL	J10-4/5	50v	22-1080 090-5032-00
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
#17	5-BALL TROUGH LOCK BALL	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-1	20v	25-1240 090-5034-0L
#18	UP-DOWN RAMP PLUNGER	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-1	20v	27-1500 090-5004-00
#19	NOT USED	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	---	---	N/A
#20	SATELLITE LAUNCH RAMP	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-1	20v	27-1500 090-5004-00
#21	SATELLITE MOTOR RELAY	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-1	20v	24V DC 10A DPDT
#22	TANK TRAP DOOR	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-1	20v	27-1500 090-5004-00
#23	NOT USED	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	---	---	N/A
#24	(OPTIONAL COIN METER)	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	BRN	J16-7	5v	5v Meter (if required)

Section 3 | Diags.

FLIPPER COILS

SSFB #	Flipper Coil	Cabinet Switch	Switch Drive	Switch Return	E.O.S.	GND	Flipper 50vDC Power	Flipper 8vAC Hold	Flipper Coil Output
SSFB 1	Lwr. Rt. Flipper 22-1080	BLU-VIO SSFB CN1-7	GRN-GRY CPU CN8-9 TO SSFB CN1-4	WHT-GRY CPU CN10-1 TO SSFB CN1-3	BRN-VIO RT. EOS SW. TO CN1-1	BLK CPU CN5 TO CN1-5	BLK-WHT PPB J7-1, -5 to SSFB CN2-11, 12	GRY-GRN-GRY P/S CN1-10, -11, to SSFB CN2-9, 10	50v Q2, Q3, 8v SR1 CN2-7, 8
SSFB 1	Lwr. Lt. Flipper 22-1080	BLU-GRY SSFB CN1-10	GRN-GRY CPU CN8-9 TO SSFB CN1-4	WHT-VIO CPU CN10-2 TO SSFB CN1-5	BRN-GRY LT. EOS SW. TO CN1-9	BLK CPU CN5 TO CN1-6	BLK-WHT PPB J7-1, -5 to SSFB CN2-11, 12	GRY-GRN-GRY P/S CN1-10, -11, to SSFB CN2-9, 10	50v Q2, Q10, 8v R2 CN2-4, 5



Sega Adjustments Continued.

Adjustment Name	Adjustment Definition
Adj. 8 Reset Coin Audits	Default is NO . Select the "+" <i>Icon</i> 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 "+" <i>Icon</i> 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 "+" <i>Icon</i> 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 .
<p>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.</p>	
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 "+" <i>Icon</i> . The letter A is indicated in the first position in the display. Vary the letter by operating the left and right flippers. 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.
Adj. 30 Attract Mode Music	Set to ON or OFF . When set to ON , attraction music is 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 <i>increased</i> by 12.5% of the normal pulse rate. When set to SOFT the coil pulse power is <i>decreased</i> 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 Minimum Game Time	Default is OFF . Set between 0:01 - 8:59 for minimum game time. 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. 34 To Be Determined	
Adj. 35 To Be Determined	
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 " <i>Insert Bill Animation</i> ". When set to NO , the display, in game attract mode will show " <i>Insert Coin Animation</i> ".
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 game over attract mode, as if a Factory Reset 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 Free Play is enabled. HOME -Sets game for Free Play, extra ball play, no replay, 10% Match & Extra Ball percent 30% .
Adj. 40 Ext. Replay Klocker	Set to ON or OFF . When set to ON , the operator can enable the knocker in the cabinet to drive an external device 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 Chp. 5, Go to Reset Menu & Chp. 6, Go to Printer Menu, of 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 Chp. 5, Go to Reset Menu & Chp. 6, Go to Printer Menu, of this section for more details on Factory Reset & Printing.



GOLDENEYE ADJUSTMENTS (44-##)

From the **ADJUSTMENTS MENU**, select the "007" *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. 44	MBall Restart	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is EASY . 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	Multiball Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how Multiball is started.
Adj. 47	Orbit Rule Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the Orbit Features are played.
Adj. 48	Mode Start Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the different modes are played.
	To Be Determined	To be determined.
	To Be Determined	To be determined.
	To Be Determined	To be determined.
	To Be Determined	To be determined.
	To Be Determined	To be determined.
Adj.	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). When set to NO , this feature is turned off, and defaults to Regular Game Play.

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:



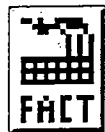
Exit any sub-menu and return to the MAIN MENU by selecting & activating the "PREV" *Icon*.



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

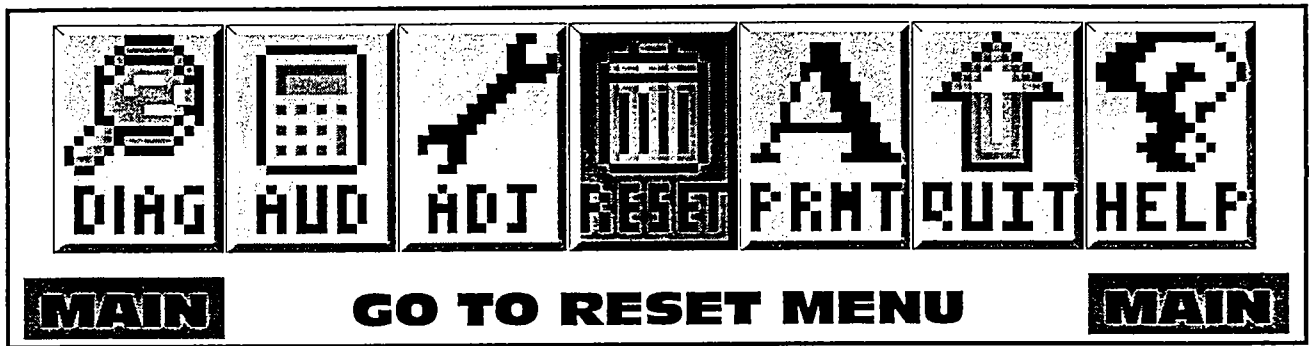
• Reset Coin Audits	
Earnings Audits (Coin Audits Only 5-11)	
Au. N ^o	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder of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

Fig. 2

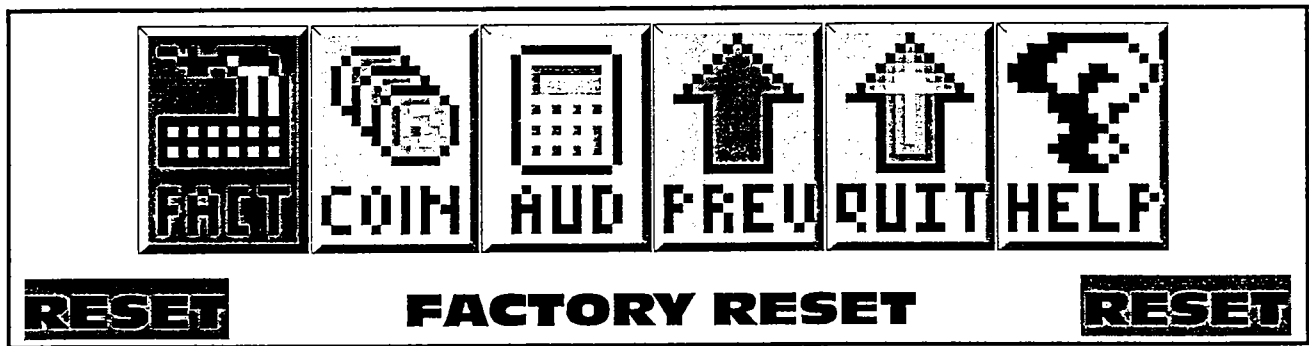
• Reset Game Audits	
Earnings (1-4), Generic/Specific Audits (13+)	
Au. N ^o	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder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



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 Printer Menu

Overview

SPECIAL EQUIPMENT IS REQUIRED FOR THIS MENU

The Portals™ Service Menu System provides 3 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.



GO TO PRINTER MENU

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

Important Notes:



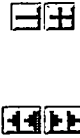
Exit any sub-menu and return to the MAIN MENU by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



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 printer adjustments, selecting & activating the "-" or "+" *Icons* is necessary to start a printout or download.



Selecting & activating the "ARROW" *Icons* selects the next /previous *Icon* in the sub-menu.



QUICK PRINTOUT ADJUSTMENT (55) (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 (56) (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 (57)

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.



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 .	<ul style="list-style-type: none"> • Check the Service Switch(es) 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.	<ul style="list-style-type: none"> • Check the Service Switches for poor connections or broken wires.
The display blanks out.	<ul style="list-style-type: none"> • Check the Dot Matrix Display for loose wiring harness connections. • Check Bridge Rectifier 3 & 8 Amp Slo Blo Fuse. Refer to the Game Manual.
Icons " <i>scroll</i> " along continuously in the MAIN MENU .	<ul style="list-style-type: none"> • 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 "<i>clicks</i>" 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 .	<ul style="list-style-type: none"> • 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).
Some <i>Icons</i> appear non-functional in the PRINTER MENU(S) .	<ul style="list-style-type: none"> • 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 .	<ul style="list-style-type: none"> • 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 .	<ul style="list-style-type: none"> • This is normal. After a FACTORY RESET, the Service Session is automatically exited (See Chapter 4).
In COIL TEST MENU , the coils and flashlamps <i>do not</i> fire after activating the "RUN" <i>Icon</i> .	<ul style="list-style-type: none"> • Ensure the POWER INTERLOCK SWITCH (See figure on front inside cover) <i>is pulled out</i>.
Can't move selection of <i>Icon</i> with the Left and/or Right Flipper Buttons .	<ul style="list-style-type: none"> • Check the Flipper Buttons for loose connections or bad Ground and refer to the Game Manual Flipper Troubleshooting Flowchart.
In Portals™ Service Menu , the volume cannot be adjusted with the Red or Green Buttons.	<ul style="list-style-type: none"> • 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.)

Section 3 | 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, on 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, to find all the tests needed to troubleshooting the game.

Review Chapter 3, Go to Audits Menu, and Chapter 4, Go to Adjustments Menu, to gather play information and to customize the game to vary difficulty of play or to change functions of the game.

Review Chapter 5, Go to Reset Menu, to reset audits and adjustments to Factory Settings.

Review Chapter 6, Go to Printer Menu, to start downloading or printing functions. Special equipment is required for this function.

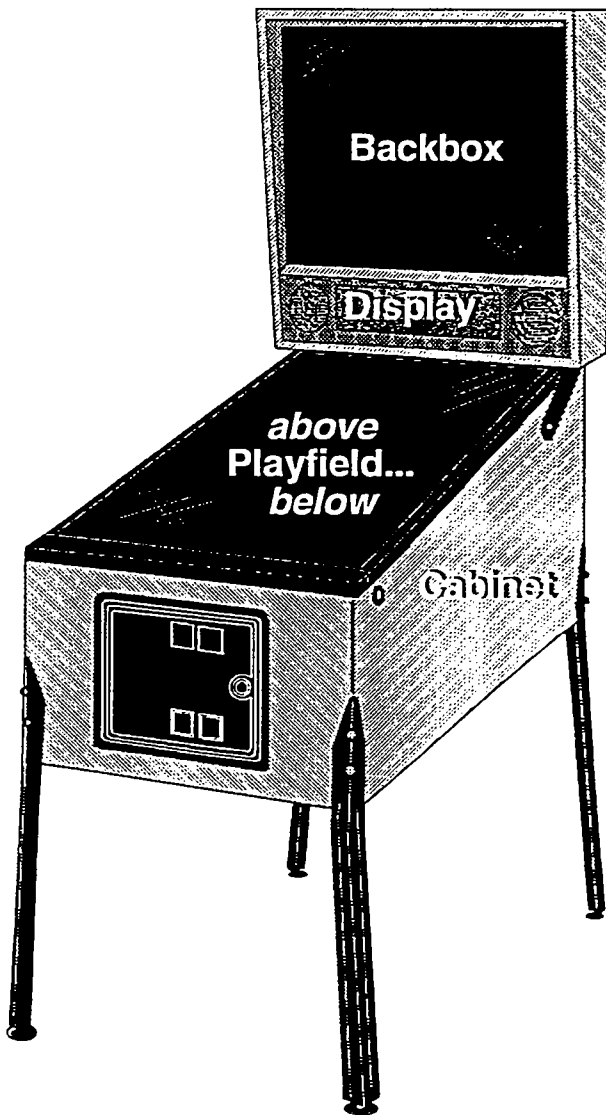
This concludes the Portals™ Service Menu. Review the Table of Contents at the beginning of this manual, and the detailed Table of Contents for Section 3 to quickly find the information required. The remainder of the sections in this manual will cover all the parts in this game and provide helpful information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

**Parts Identification & Location
(The Pink Pages)**

Overview

This section provides the part numbers and locations of the elements in the pinball game. The parts are arranged in basically four groups: Backbox, Cabinet, Above and Below Playfield. (Some parts may be considered both above & below the playfield. The part will be grouped where it is predominant.) Generic parts which may change as production continues (quantity and/or size) are listed together. The quantity indicates if that 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. Some parts which are complex (made up of numerous parts) will be noted in detail in Chapter 2, Assembly Drawings.

*Section 4, Chapter 1
Table of Contents*



Backbox

General Parts 54
Backbox Bulbs & Sockets 65-67

Cabinet

General Parts 55

Above Playfield

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Rails & Ball Guides 58
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Rubber Parts (*Actual Size*) 61
Metal Posts & Spacers (*Actual Size*) 62
Plastic Posts & Spacers (*Actual Size*) 63
Wedge Bulbs & Sockets (*Actual Size*) 65
Bayonet Type Bulbs & Sockets (*Actual Size*) 66-67

Below Playfield

Wedge Base Bulbs & Sockets (*Actual Size*) 65
Bayonet Type Bulbs & Sockets (*Actual Size*) 66-67
Lamp Boards 64

Section 4 - Parts

Backbox - General Parts

Removal of...:

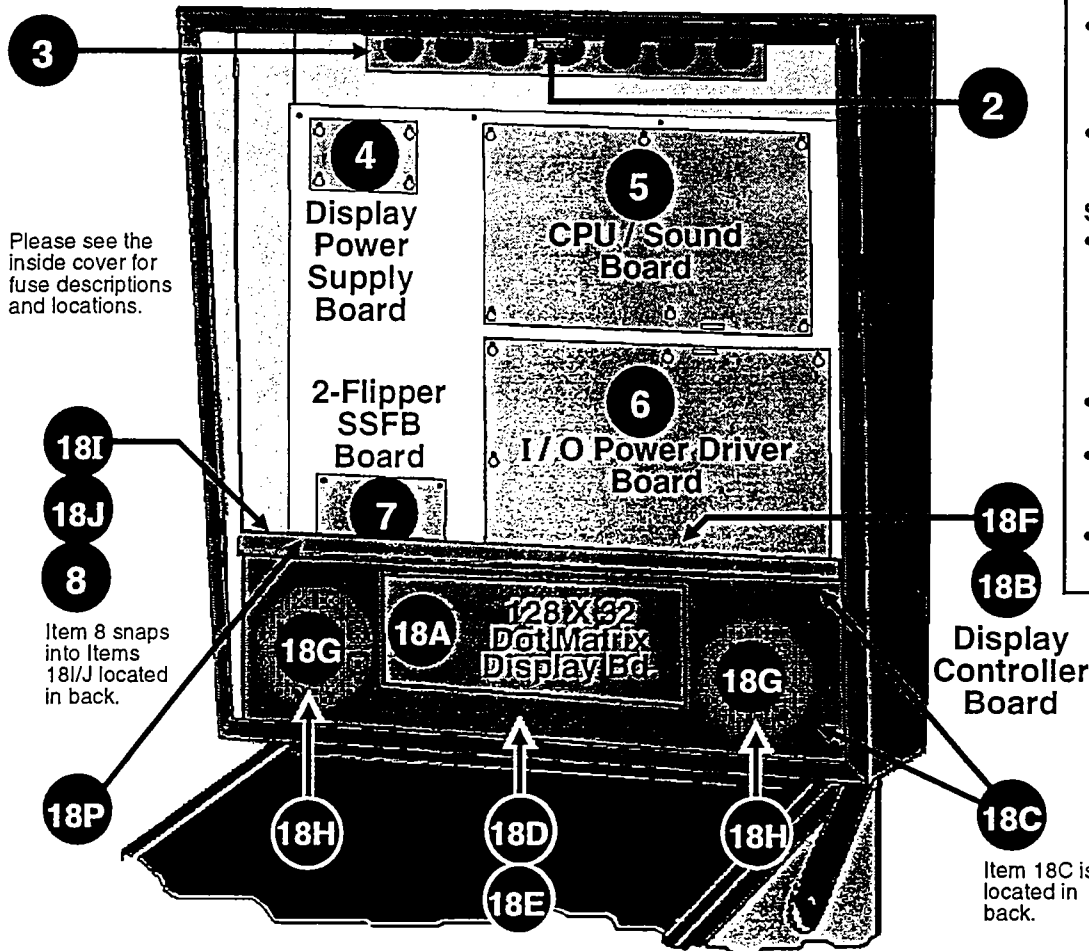
Insert (Item 9):

(Not Shown)

- Undo latch (Item 10) & swing completely open.
- Disconnect wire harness.
- Push up insert until female hinges (Item 12) are freed from male hinges (Item 11).
- Reverse procedure to reinstall.

Speaker Panel (Item 18):

- On the upper left of the panel, push down on the Push Button Release Assy. (Item 18I) releasing the Lock Pin (Item 8) & swing back.
- Disconnect wire harness.
- Lift out right side of panel/hinges (18C) from the backbox..
- Reverse procedure to reinstall.



Please see the inside cover for fuse descriptions and locations.

18I

18J

8

Item 8 snaps into Items 18I/J located in back.

18P

18H

18D

18E

18H

18F

18B

Display Controller Board

18C

Item 18C is located in back.

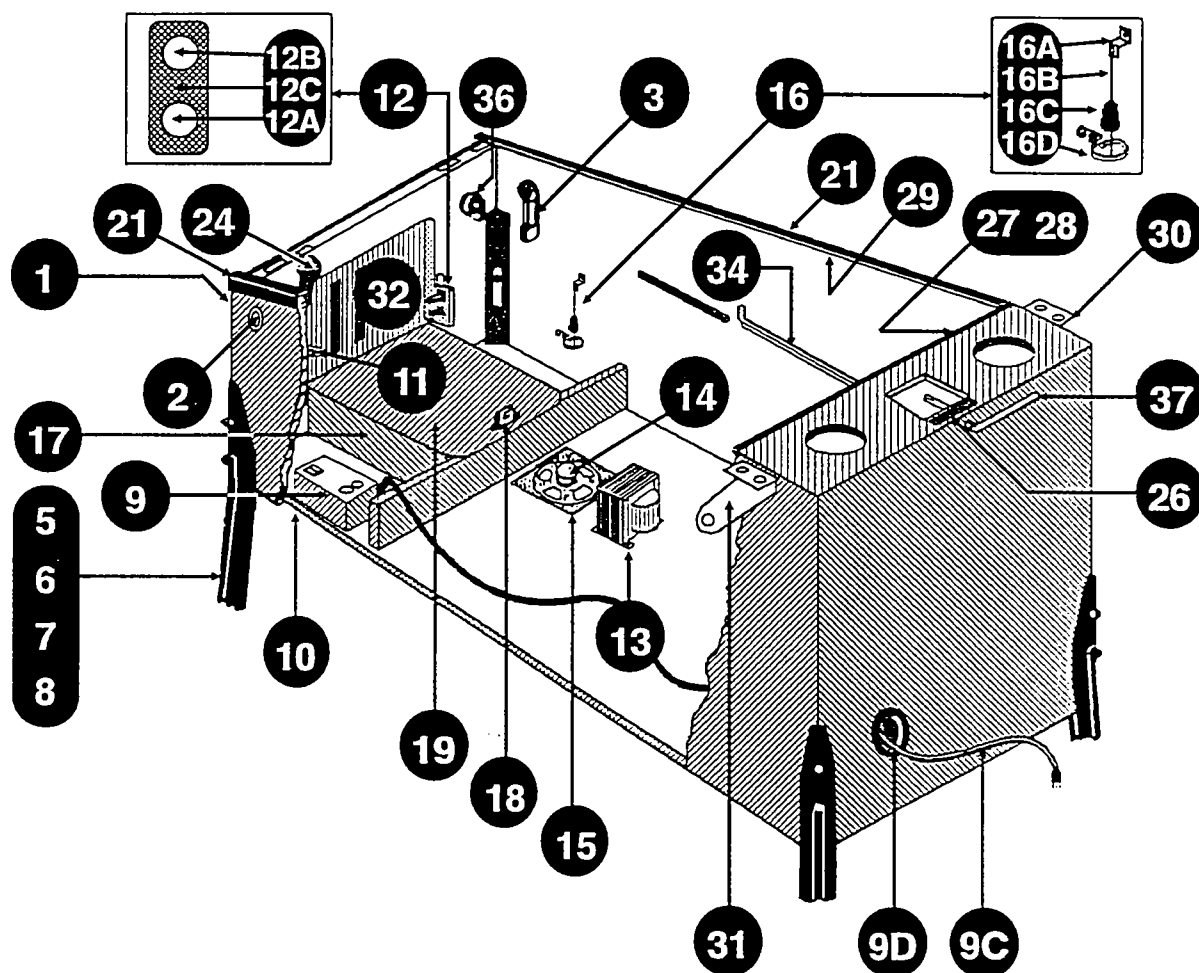
Item 18B is located behind 18A. Item 18F is located between Items 18B & 18A.

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Backbox Header (Not Used)		18	Goldeneye Speaker Panel Assembly	500-5995-00-42
2	Back Box Lock	355-5008-00	ORDERING ABOVE (ITEM 18) ASSEMBLY PART Nº WILL INCLUDE:		
3	7-Vent Hole Grill 2½" x 18"	545-5072-02	A	128 X 32 Dot Matrix Display Bd. ††	520-5052-00
4	Display Power Supply Board †	520-5138-00	B	Display Controller Board †	520-5055-01
5	CPU / Sound (2 X 4MB) Board †	520-5136-42	C	Panel Hinge (Female) (Qty. 2)	390-5026-00
6	I / O Power Driver Board †	520-5137-00	D	Speaker Panel (Hinged)	525-5365-03
7	2-Flipper SSFB Board	520-5080-00	E	Goldeneye Speaker Plexi w/Artwork	830-5643-00
8	Lock Pin / Lock Pin Bracket Assy.	500-5916-01	F	Static Shield	535-6437-00
ORDERING ABOVE (ITEM 8) ASSEMBLY PART Nº WILL INCLUDE:			G	Speakers 4X4 Quam 89-9572 (Qty. 2)	031-5004-00
—	Lock Pin	530-5397-00	H	Goldeneye Speaker Grill w/Artwork (Qty. 2)	830-5644-00
—	Lock Pin Bracket	535-7554-00	I	Push Button Release Assembly	515-6481-00
—	3/8" - 24 Jam Nut (Qty. 2)	240-5319-00	J	Push Button Release Bracket	535-7582-00
9 *	Goldeneye Backbox Light Insert Assy. *	505-6003-42-42	K *	7/16" X 1/4" Self-Adhesive Foam 2.6 Ft.	625-5026-00
10 *	Lights Insert Slide Latch Special *	535-7554-00	L *	Ground Straps X.XX*. (replace *-XX* with the inches required; e.g. 4" = *-04", etc.)	600-5006-XX
11 *	Lights Insert Hinge Male (Qty. 2) *	390-5014-01	M *	3-Lug Stand-Up Long Socket (Qty. 9)	077-5009-00
12 *	Lights Insert Hinge Female (Qty. 2) *	390-5014-00	N *	#44 Bulb (Qty. 9)	165-5000-44
13 *	Backglass Clear 26½" x 19¾" *	660-5018-00	O *	Sq. Light Covers. (See Color Chart at end of Sec. 4, Chp. 2 & replace the *-XX* w/the number.)	550-5019-XX
14 *	Goldeneye Backglass Artwork *	830-5242-00	P	Top Channel Glass Retainer	545-5452-02
15 *	Plastic Extrusion 26 7/16" *	545-5018-08	19 *	Ribbon Cable, 14-Pin * (Display Controller Bd. to Dot Matrix Display Bd.)	036-5260-00
16 *	18¾" Plastic Extrusion * (Qty. 2)	545-5018-09	20 *	Ribbon Cable, 20-Pin * (CPU/Sound Bd. to I/O Power Driver Board)	036-5000-04
17 *	Glass Channel 26 7/16" *	545-5021-02	21 *	Ribbon Cable, 26-Pin * (CPU/Sound Bd. to Display Controller Board)	036-5001-00
			22 *	Fuse Description Decal	820-6152-42

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

† When ordering PC Boards with ROMS, please specify the Game.
†† Indicate Manufacturer.

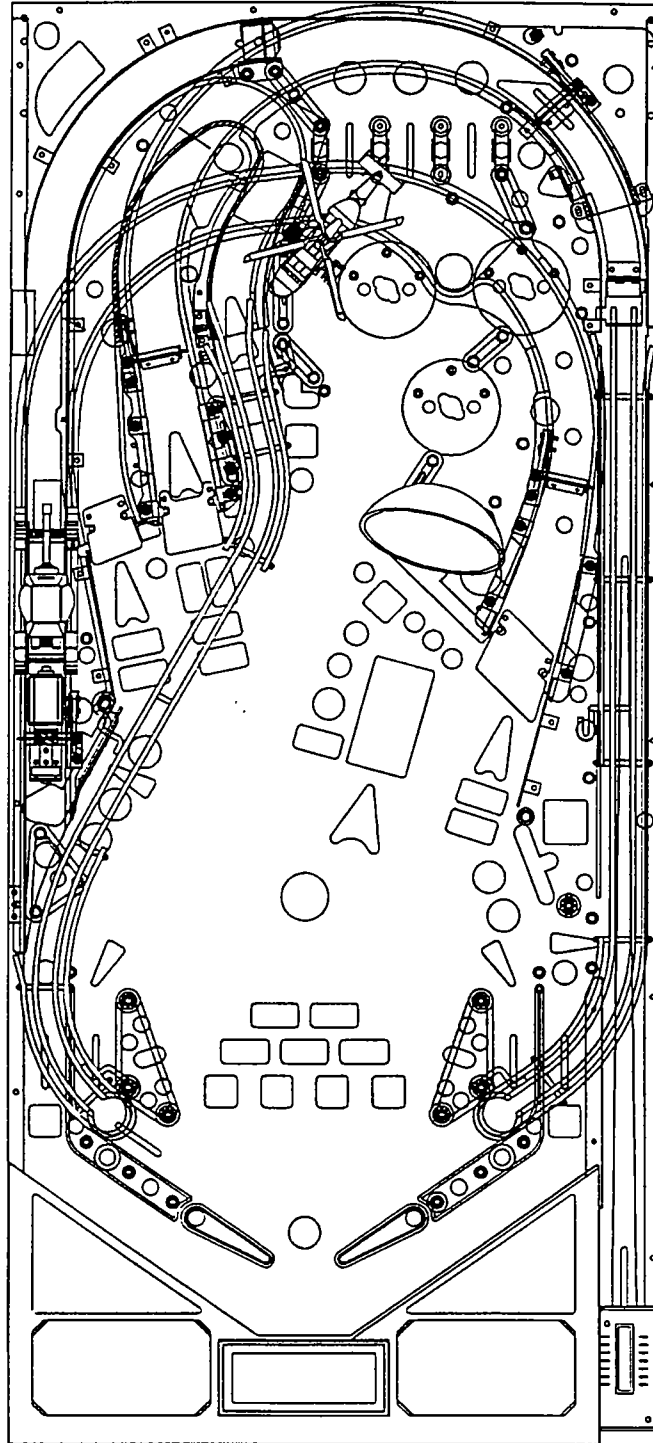
Cabinet - General Parts



Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	*007* Gun Assy. (See Sec. 4, Chp. 2)	500-5698-01	16	Plumb Bob Tilt Assembly	500-5023-00
2	Flipper Button Assembly Red (Qty. 2)	500-5026-32	ORDERING ABOVE (ITEM 16) ASSEMBLY PART Nº WILL INCLUDE:		
3	Flipper Power Switch, Left	180-5122-00	16A	Tilt Hanger Bracket	535-5221-00
4 *	Flipper Power Switch, Right *	180-5122-00	16B	Tilt Hanger Wire (Attached to *16A*)	535-5319-00
5	Leg (Black) (Qty. 4)	535-5020-50	16C	Tilt Plumb Bob (Attached to *16B*)	535-5029-00
6	Leg Bolt 3/8" - 16 x 2 1/2" Hex 5/8" Hd. (Qty. 8)	231-5001-01	16D	Tilt Contact Wire	535-7563-01
7	Leg Bolt Back Plate (Qty. 4)	535-5703-00	17	Cash Box Plastic Bottom	545-5090-00
8	Leg Leveler 3/8" - 16 X 3" (Qty. 4)	500-5017-00	18	Cash Box Lock Bracket (wire)	535-7562-00
9	Power Box Sub-Assembly	515-5360-00	19	Cash Box Cover (Validator)	535-5013-03
ORDERING ABOVE (ITEM 9) SUB-ASSY. PART Nº WILL INCLUDE:			20 *	Playfield Glass (T.P.) 21" x 43" *	660-5001-00
9A	Power Box	535-5932-00	21	Side Armor - Left & Right	535-7297-00
9B	Service Outlet (US)	180-5008-01	24	Front Molding Lockdown Assembly	500-5020-01
9C	Line Cord 10' ROJ 3" Max.	034-5000-10	25 *	Front Molding - Black *	500-5757-01-00
9D	Recessed Cup for Line Cord	545-5122-00	26	#1 Roto Lock Male, (Female -02) *	355-5006-01
9E	Line Filter	150-5000-00	27	Rear Plastic Ext. Playfield Glass 20 3/8" *	545-5038-00
9F	Varistor TNR159211KM	150-5001-00	28	Mounting Foam Rubber for Ext.	626-5001-00
9G	Fuse 8 Amp (Domestic)	200-5000-05	29	Plastic Channel Left & Right	545-5017-00
9H	Fuse Holder	205-5001-00	30	Backbox Hinge Left	515-5987-00
9I	Power Box Decal	820-6123-00	31	Backbox Hinge Right	515-5987-01
10	Power Sw. DPST Toggle (Under Cab.)	180-5001-00	32	Coin Door (with Validator) USA only	500-5018-171
11	Service Switch Set (RED, GRN, BLK BUTTONS)	180-5012-03	33 *	Slide & Pivot Support Bracket Right *	535-5989-00
12	Dual Switch Assembly	500-5808-00	34	Slide & Pivot Support Bracket Left	535-5990-00
ORDERING ABOVE (ITEM 13) ASSEMBLY PART Nº WILL INCLUDE:			35 *	Playfield Support Bar (Stay Arm) *	535-5019-00
12A	Memory Protect Switch	180-5000-00	36	Start Button Switch Assembly (Orange)	500-5728-07
12B	Interlock Switch	180-5136-00	37	Hex Key Allen Wrench 5/16"	777-0001-00
12C	Bracket	535-6958-00			
13	Transformer	010-5011-00			
14	Speaker - Round - 8" ø	031-5005-00			
15	Speaker Grill 7" x 7"	535-6830-00			

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

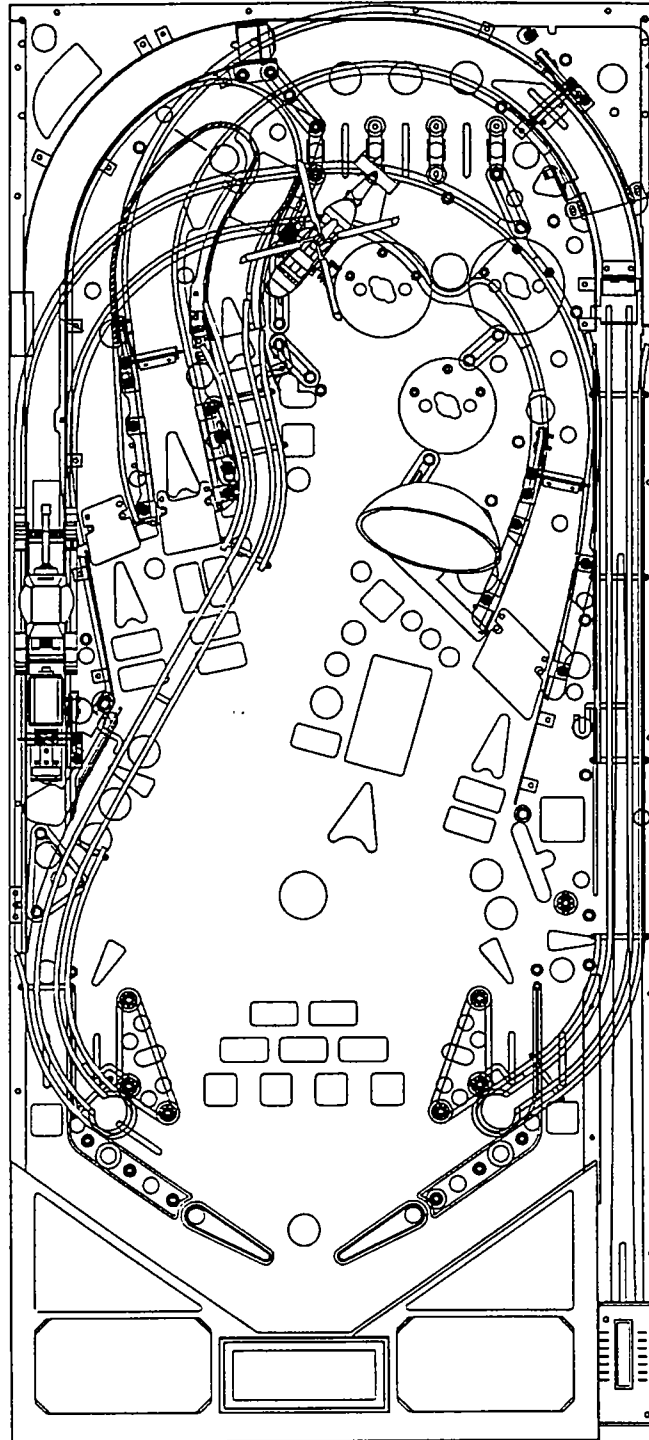
Playfield - Major Assemblies †



Nº	Assembly Name	PG.†	Part Nº	Nº	Assembly Name	PG.†	Part Nº
1 *	*007* Gun Assembly	pg 70	500-5698-01	10	Power Scoop Assembly	pg 76	500-5862-00-42
2	Auto Ball Launch Assembly	pg 70	500-5477-01-42	11	Kick Big Assembly	pg 76	500-5862-00-42
3	5-Ball Trough Assembly	pg 71	500-5989-05-42	12	Tank Trap Door Plunger Assy.	pg 77	500-5940-01-42
4	Lock Ball Assembly	pg 71	500-5684-01	13	Satellite Launch Ramp Assembly	pg 77	500-6004-00-42
5	Ball Trough Enter/Exit Scoop Assy.	pg 71	533-7329-00	14	Satellite Assembly	pg 78	500-6000-00-42
6A	Flipper Assembly, Lower Right	pg 72	500-5944-02	15	Satellite Motor Base Assembly	pg 79	500-5982-00-42
6B	Flipper Assembly, Lower Left	pg 73	500-5944-12	16	Up-Down Metal Ramp Plunger Assy.	pg 80	500-6058-00-42
7	Turbo Bumper Assemblies (Qty. 3)	pg 74	See Sec. 4, Chp. 2	17	Back Panel Assembly	pg 85	500-6001-00-42
8	Slingshot Assemblies (Qty. 2)	pg 75	500-5849-01	18	Between Flipper Magnet Assy.	pg 85	See Sec. 4, Chp. 2
9	Tank Kick Big Assembly	pg 75	500-5862-02-42	Note: An asterisk (*) indicates items are either in / on the cabinet.			

† See Section 4, Chapter 2, Assembly Drawings (with indicated page #) to identify the components of each assembly above.

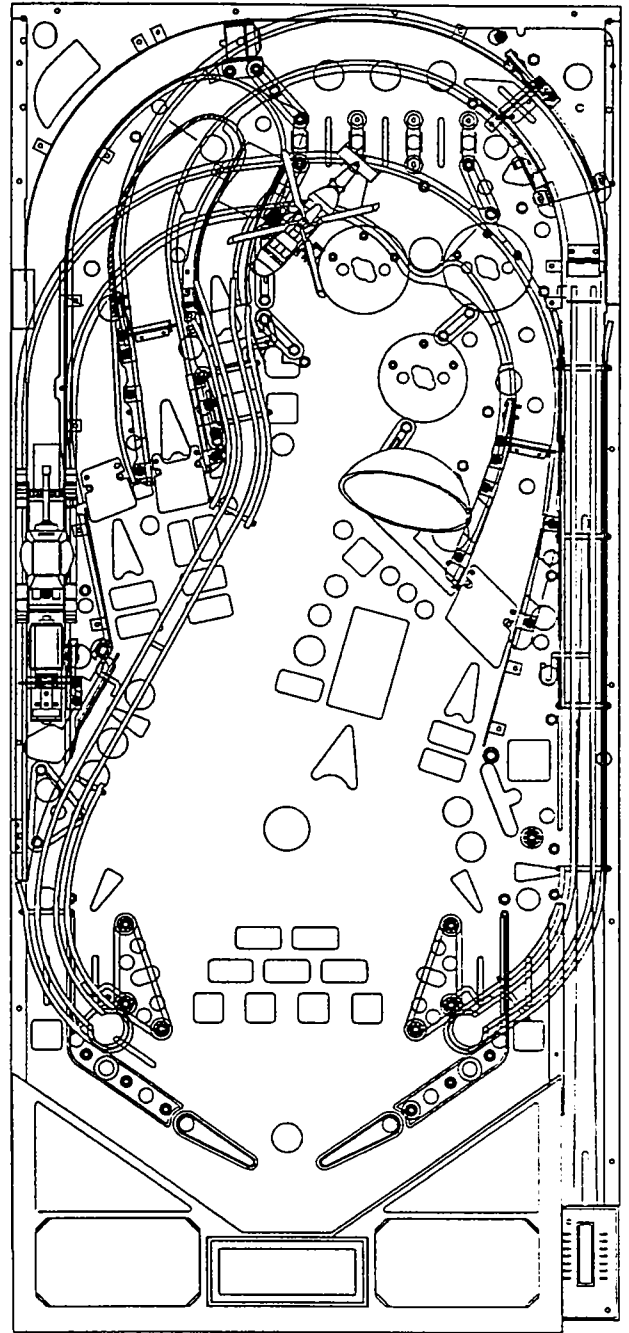
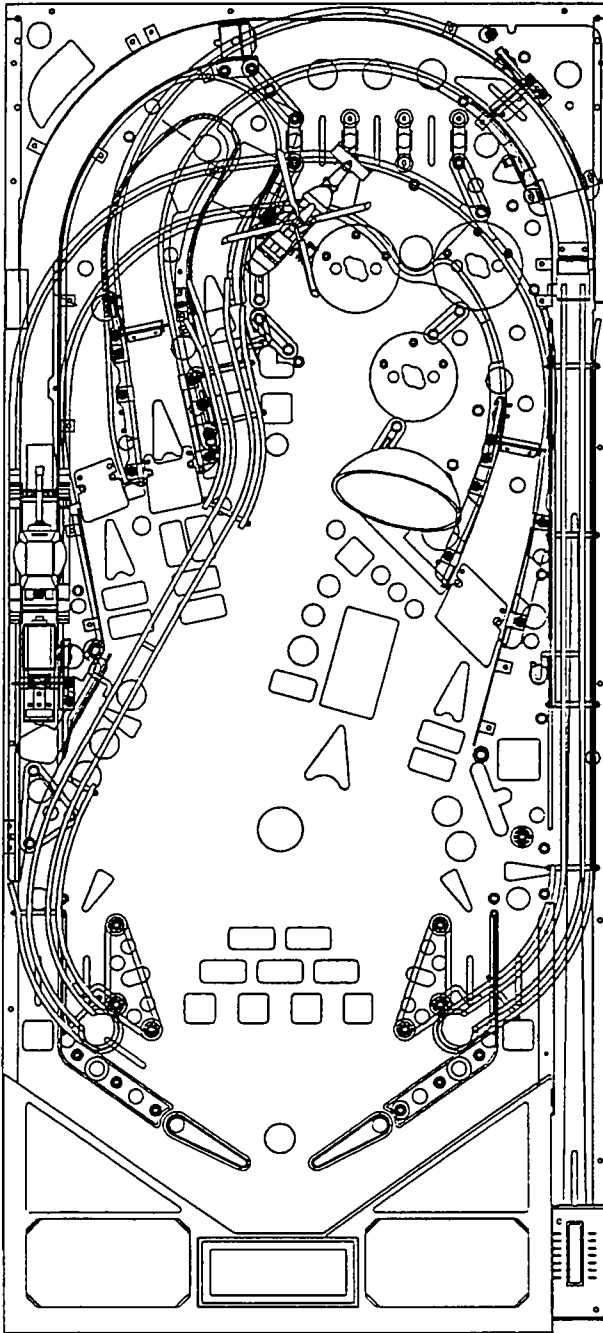
Playfield - Ramps †



Nº	Plastic/Steel Ramp Name	PG. †	Part Nº	Nº	Wire Ramp Name	PG. †	Part Nº
1	Left Plastic Ramp Assembly	pg 81	500-5997-00-42	4	Up-Down Metal Ramp & Flat Rail Assy.	pg 80	500-6052-00-42
2	Right Plastic Ramp Assembly	pg 82	500-5998-00-42	5	Center/Left Return Wire Ramp	n/a	515-6335-00
3	Center Plastic Ramp Assembly	pg 84	500-5999-00-42	6	Right Return Wire Ramp	n/a	515-6336-01

† See Section 4, Chapter 2, Assembly Drawings, for breakdowns.

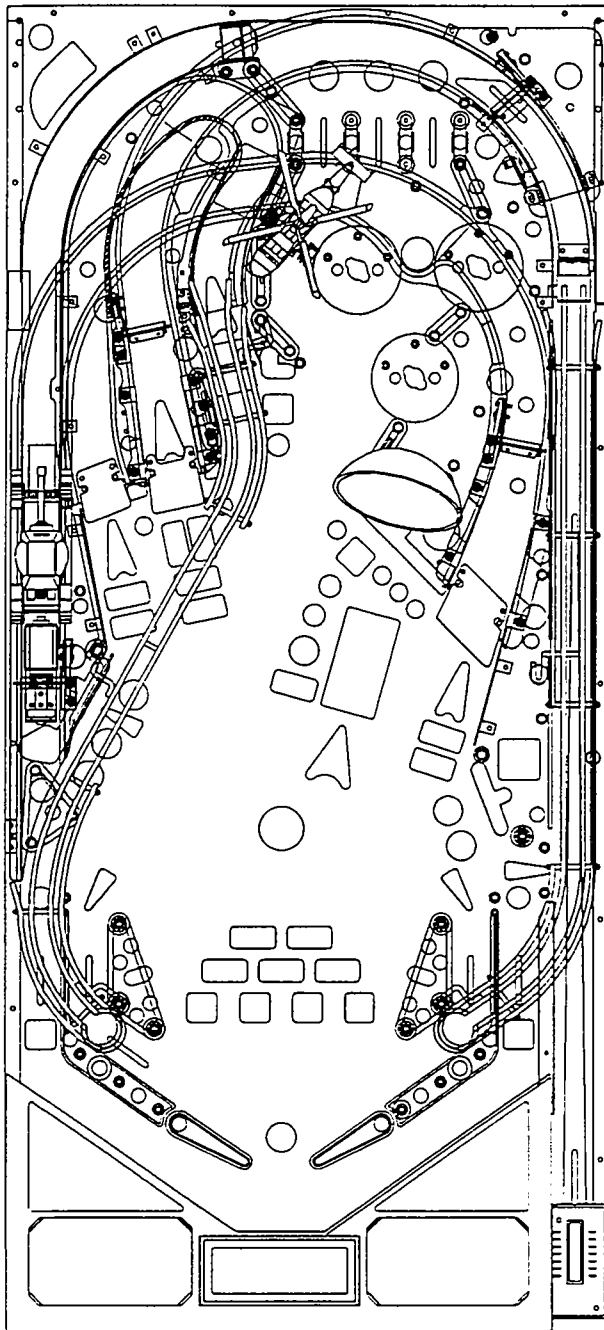
Playfield - Rails and Ball Guides



Nº	Rail Name	SPI Part Nº
1	Flat Metal Rail (#5)	535-7366-00
2	Flat Metal Rail (#6)	535-7367-00
3	Flat Metal Rail (#7)	535-7368-02
4	Flat Metal Rail (#9)	535-7583-00
5	Flat Metal Rail (#10)	535-7526-00
12	Wood Rail Right Side	525-5411-00
13	Wood Rail (Short) Right Outlane	525-5413-00
14	Wood Rail Left Side	525-5412-00

Nº	Ball Guides / Wire Forms Name	SPI Part Nº
A	Return Lane Ball Guide Long Clear (Qty. 2)	550-5037-01
B	Ball Guide Rail 5-3/4" (Qty. 2)	535-5356-00
C	Ball Guide Rail 4-1/2"	535-5356-14
D	1" Wire Form (Qty. 4)	535-5300-05

Playfield - Butyrate, Decals and Mylar



Nº	Screened/Clear Butyrate Name	SPI Part Nº
	Butyrate Sheet Screened/Clear (1-22)	830-5482-XX

Note: To order entire sheet use above number with *-XX* for individual pieces replace the *-XX* with appropriate number.
 Attention: Individual pieces may not be available.

1	Playfield Right Side	830-5482-01
1A *	Playfield Right Side Upper Level *	830-5482-01A
2	Playfield Left Side	830-5482-02
3	Right Return Lane	830-5482-03
4	Left Return Lane	830-5482-04
5	Right Slingshot	830-5482-05
6	Left Slingshot	830-5482-06
7 *	Key Chain Style A *	830-5482-07
8	Lower Right Pop Bumper	830-5482-08
9	Center Plastic Ramp	830-5482-09
9A *	Center Plastic Ramp Upper Level *	830-5482-09A
10	Top Right Pop Bumper	830-5482-10
10A *	Top Right Pop Bumper Upper Level *	830-5482-10A
11	Bottom Arch Shooter Lane Cover	830-5482-11
12	Playfield Top Left Corner	830-5482-12
13	Playfield Top Right Corner	830-5482-13
14 *	Key Chain Style B *	830-5482-14
15 *	Key Chain Style C *	830-5482-15
16	Cabinet Back Protect	830-5482-16
17	Back Panel Protect	830-5482-17
18	*Lock Ball* Sign	830-5482-18
19	*Tank Multiball* Sign	830-5482-19
20	*--* Sign	830-5482-20
21 *	Not Used	
22	Ramp Cover	830-5482-22

The following last 2-digits were not used on 830-5482-XX: -21
 Note: An asterisk (*) indicates items are not noted in the pictorial.

Nº	Decal Name	SPI Part Nº	Nº	Mylar Name	SPI Part Nº
D1 *	Complete Decal Sheet for GOLDENEYE	820-6132-XX	M1 *	Mylar Sheet Complete for GOLDENEYE	820-5853-XX

Note: To order entire sheet use above number with *-XX*;
 Attention: Individual decals may not be available.

Above Mylar Sheet contains the pieces for the Pop Bumper area, Satellite Launch Ramp area, and TBD

Some main decals are: -01 Center Ramp; -02, -03, -13 Pop Bumpers; -04 Satellite Launch Ramp; -05 Right Ramp; -07 Arch Center; -09 Arch Left; -11 Arch Right; -20 *007* Sign; -22 Left Flipper Bat; -23 Right Flipper Bat; all decals note the 2-digit number on the decal.

M2 *	Mylar Carriage Bolt Covers (Qty. 2)	820-5041-00
M3 *	Mylar Pad-Return Lane Ball Drop (Qty. 2)	820-5815-00
M4 *	Mylar Slingshot Protect (Qty. 2)	820-5821-00

Playfield - General Parts

Nº	Above Playfield Part Name	SPI Part Nº
1	Bottom Arch Assembly (Plastic)	500-6005-00-42

ORDERING ABOVE (ITEM 1) ASSEMBLY PART Nº WILL INCLUDE:

	Bottom Arch (Plain)	545-5302-07
	#6 X 3/8" PPH (Qty. 3)	232-5000-00
	Bottom Arch Shooter Lane Cover	830-5482-11
2 *	1 1/16" Steel Balls (Qty. 5) *	260-5000-00
3	Pop Bumper Cap Red (Qty. 3)	550-5057-02
5	Right Flipper & Shaft Assy. White with Sonic the Hedgehog™ Logo	515-5133-01-03
6	Left Flipper & Shaft Assembly White with Sonic the Hedgehog™ Logo	515-5133-01-04
7	Mini-Mars Light Cover Red (Qty. 2)	550-5031-02
8	Mini-Mars Light Cover Yellow (Qty. 2)	550-5031-06
9 *	Rubber Light Cover Green (Qty. 3) *	545-5014-04
10 *	Rubber Light Cover Yellow (Qty. 1) *	545-5014-06
11 *	Rubber Light Cover Orange (Qty. 2) *	545-5014-07
12	Top Lane Mini-Hoods Red (Qty. 4)	550-5061-02
13	Module Stand-Up Target Clear	500-6075-00
14	1-Way Ball Gate & Mtg. Brkt. Assembly	500-6071-00-42

ORDERING ABOVE (ITEM 14) ASSY. PART Nº WILL INCLUDE:

	1-Way Ball Gate Mounting Bracket	535-7656-00
	1-Way Ball Gate Flap	535-7668-00
	1-Way Ball Gate Rebound Hinge	535-5372-03

15	Satellite Dish - Screened	545-5627-04
----	---------------------------	-------------

Note: The above item is part of the Satellite Assy., 500-6000-00-42, a Major Assembly. See Section 4, Chapter 2, for balance of items.

16	Spot Light Reflector	545-5409-01
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Note: The above item is a part of the Center Plastic Ramp Assy., 500-5999-00-42, a Major Assembly. See Section 4, Chapter 2, for balance of items (or any other items attached to the ramp).

17	Helicopter	545-5672-00
----	------------	-------------

18	Tank	545-5673-00
----	------	-------------

Note: The above items are a part of the Right Plastic Ramp Assy., 500-5998-00-42 a Major Assembly. See Section 4, Chapter 2, for balance of items (or any other items attached to the ramp).

Nº	Below Playfield Part Name	SPI Part Nº
23	Playfield Hanging Bracket (Qty. 2)	535-5216-03
24	Playfield Support Slide Bracket (Qty. 2)	535-6862-02
25	Edge Slide Bracket (Qty. 2)	535-5988-00
26	Pivot Pin Bracket Assembly (Qty. 2)	500-5329-00

ORDERING ABOVE (ITEM 25) ASSY. PART Nº WILL NOT INCLUDE:

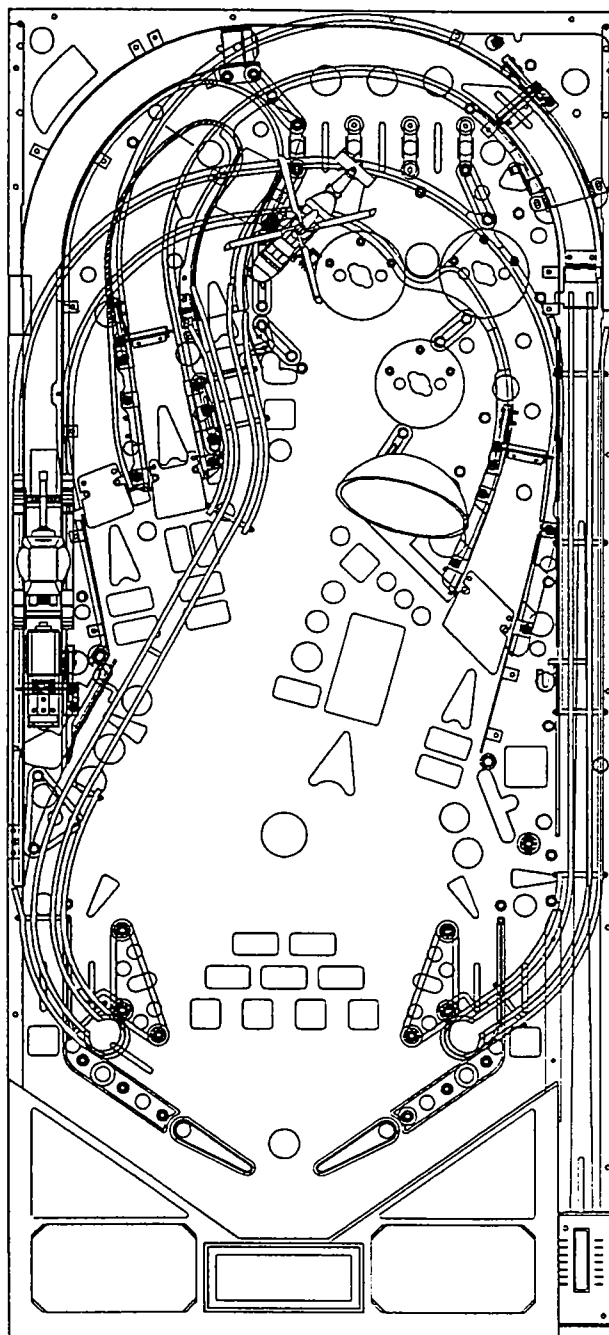
	Pivot Bracket Screws (Qty. 4)	237-5907-00
	T-Nuts (Qty. 4)	240-5101-00

27	Outlane Adjustable Post Plate	535-5091-00
----	-------------------------------	-------------

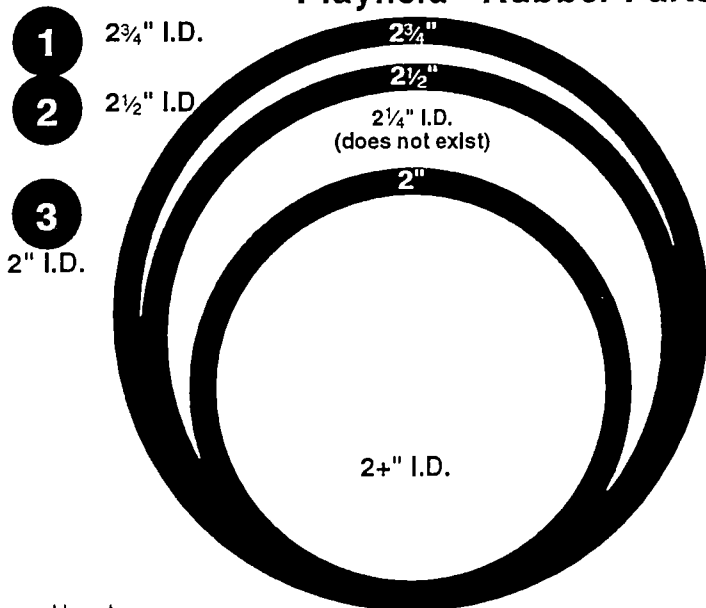
Nº	The Playfield	SPI Part Nº
P1 *	Playfield Screened (No Parts) *	830-5142-00
P2 *	Playfield Complete with all Parts *	505-6004-42-42

Note: An asterisk (*) indicates item is not noted in the illustration.

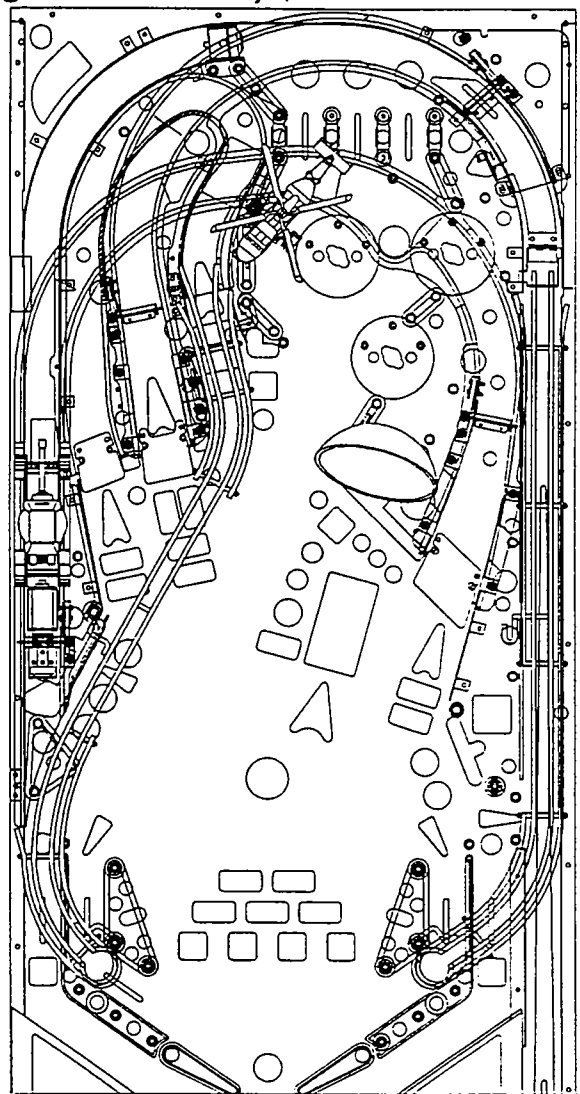
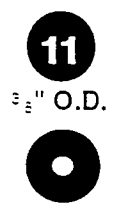
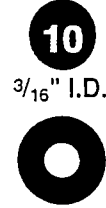
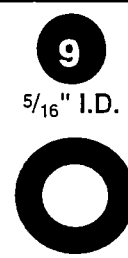
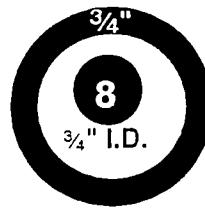
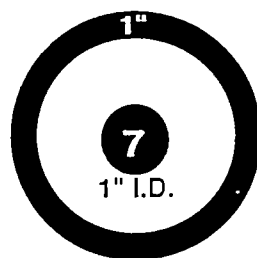
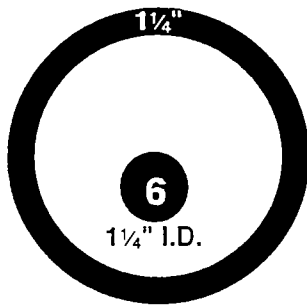
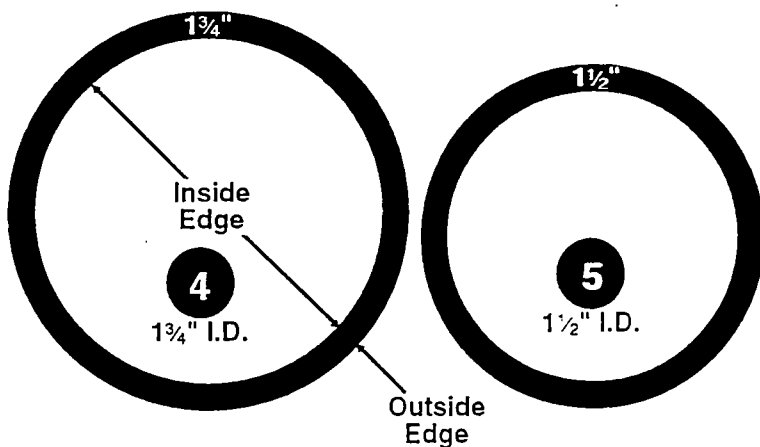
For rubber parts, metal & plastic posts see the following pages in this chapter.



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. Please note: The rings will stretch with use. Always go to the size smaller. (I.D.=Inside Diameter; O.D.=Outside Diameter)



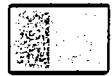
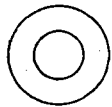
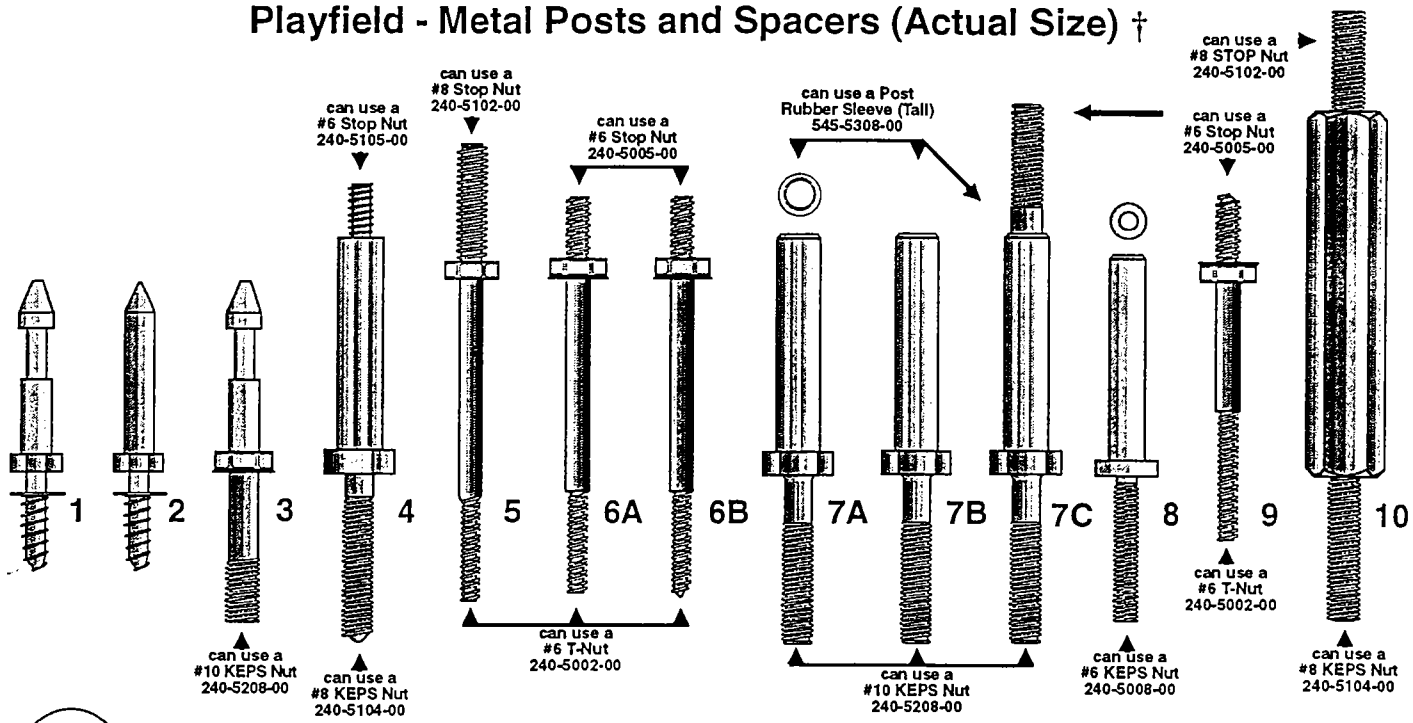
D Rubber Bumpers (Qty. 5) are all located on the following assemblies:
• Auto Ball Launch • Lock Ball • Trough VUK
• Tank Kick Big • Power Scoop

Nº	Rubber Part Name	QTY.	Part Nº	Nº	Rubber Part Name	QTY.	Part Nº
A	Rubber Bushing (Small)	0	545-5192-00	3	2" I.D. Black Rubber Ring	0	545-5348-08
B	Small Flipper Rubber Ring	0	545-5207-00	4	1 3/4" I.D. Black Rubber Ring	0	545-5348-21
C	Large Flipper Rubber Ring	2	545-5277-00	5	1 1/2" I.D. Black Rubber Ring	1	545-5348-07
D	Rubber Bumper (Grommet)	5	545-5105-00	6	1 1/4" I.D. Black Rubber Ring	5	545-5348-06
E	Bumper Post Rubber	0	545-5009-00	7	1" I.D. Black Rubber Ring	2	545-5348-05
F	Post Rubber (Sleeve Short)	0	545-5151-00	8	3/4" I.D. Black Rubber Ring	2	545-5348-04
G	Post Rubber (Sleeve Tall)	0	545-5308-00	9	5/16" I.D. Black Rubber Ring	4	545-5348-02
1	2 3/4" I.D. Black Rubber Ring	0	545-5348-20	10	3/16" I.D. Black Rubber Ring	4	545-5348-01
2	2 1/2" I.D. Black Rubber Ring	2	545-5348-09	11	3/8" O.D. Black Rubber Ring	8	545-5348-19
				12	3" I.D. BLK Rubber Ring (Not Shown)	0	545-5348-10

Note: Size and/or quantities may change during production.

† Items with 0 Qty. are not used in this game.

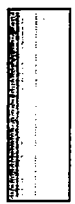
Playfield - Metal Posts and Spacers (Actual Size) †



11

34* Item 34 is not used in this game. Use back cover for measurement.
45/16"

Illustration Note:
Tapped Posts and Spacers show one example of the top view for each type.



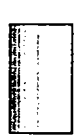
12



13



14



15



16



17



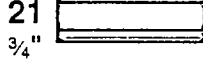
18



19



20



21



22



23



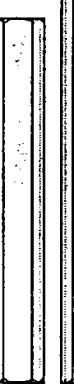
24



25



26



27



28



29



30



31

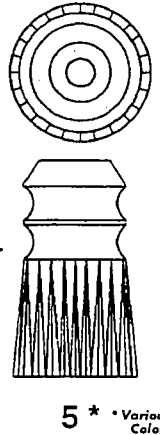
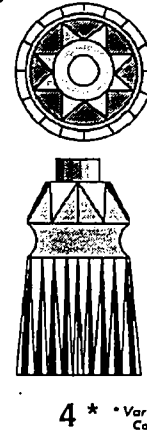
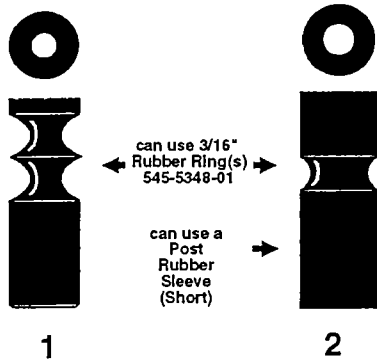
Nº	Metal Post/Spacer Name	QTY.	Part Nº	Nº	Metal Post/Spacer Name	QTY.	Part Nº
1	Mini-Post-Wood Threaded	1	530-5004-00	16	Spacer 3/4" Long X 5/16" X .144 I.D.	0	254-5014-01
2	Mini-Post-Wood Thd. No Cut-Away	0	530-5004-01	17	Spacer 1 1/8" Lg. X 5/16" X .144 I.D.	5	254-5014-02
3	Mini-Post-Machine Threaded	5	530-5005-00	18	Spacer 1/4" Hex Tapped 6-32	1	254-5008-00
4	Bumper Post-Machine Threaded	0	530-5007-00	19	Spacer 1/2" Hex Tapped 6-32	9	254-5008-03
5	Post Fastening Screw Lg. #8-32 Top	4	530-5008-00	20	Spacer 5/8" Hex Tapped 6-32	1	254-5008-02
6A	Post Machine Screw #6-32 Top	18	530-5012-02	21	Spacer 3/4" Hex Tapped 6-32	1	254-5008-04
6B	Post Wood Screw #6-32 Top	0	530-5010-02	22	Spacer 1" Hex Tapped 6-32	0	254-5008-06
7A	Bumper Post Hex Base #8-32 Tap.	2	530-5332-01	23	Spacer 1 1/8" Hex Tap. 6-32	0	254-5008-17
7B	Bumper Post Hex Base Untapped	0	530-5332-00	24	Spacer 1 1/4" Hex Tapped 6-32	2	254-5008-11
7C	Bumper Post Hex Base w/#8-32 Male	0	530-5332-02	25	Spacer 1 1/2" Hex Tapped 6-32	3	254-5008-09
8	Bumper Post 6-32 Tapped	0	530-5127-00	26	Spacer 1 3/4" Hex Tapped 6-32	0	254-5008-10
9	Post Machine Screw	0	530-5263-01	27	Spacer 1 7/8" Hex Tapped 6-32	0	254-5008-20
10	Mini-Playfield Support	0	530-5285-00	28	Spacer 2" Hex Tapped 6-32	1	254-5008-07
11	Spacer Backbox Hinge	2	530-5099-00	29	Spacer 2 1/4" Hex Tapped 6-32	1	254-5008-18
12	Spacer 1" Lg Metal 5/16" X .144 I.D.	0	254-5001-00	30	Spacer 2 1/2" Hex Tapped 6-32	0	254-5008-16
13	Spacer 1/4" Long X 5/16" X .144 I.D.	3	254-5014-03	31	Spacer 2 5/8" Hex Tapped 6-32	0	254-5008-08
14	Spacer 1/2" Long X 5/16" X .144 I.D.	5	254-5014-00	32	Spacer 3" Hex Tapped 6-32	2	254-5008-14
15	Spacer 9/16" Long X 5/16" X .144 I.D.	0	254-5014-04	32	Spacer 4" Hex Tap. 6-32	0	254-5008-21
				33	Hex Spacer 45/16" X .144 I.D.	0	254-5018-00

Note: Size and/or quantities may change during production.

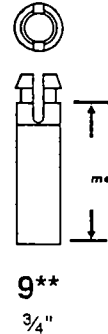
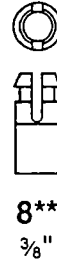
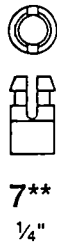
† Item's with Ø Qty. are not used in this game.

Playfield - Plastic Posts and Spacers (Actual Size) †

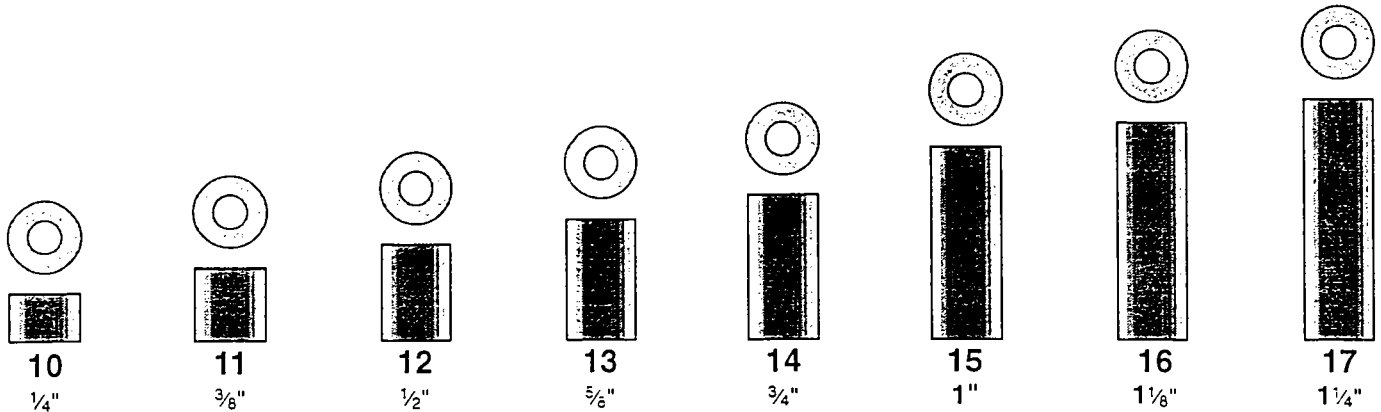
Items 1-5 Posts used in pairs can use a 3/4" through 3" Rubber Rings.
(See Rubber Parts for Part N^os.)



Items 7-9 Spacers are normally used with Light Boards.



Items 10-17 Spacers are used in conjunction with Metal Posts (Items 5, 6A & 6B) and/or a #6-32 1 1/4 PHIL PH Screw (237-5511-00) with #6 Stop Nuts (240-5005-00).



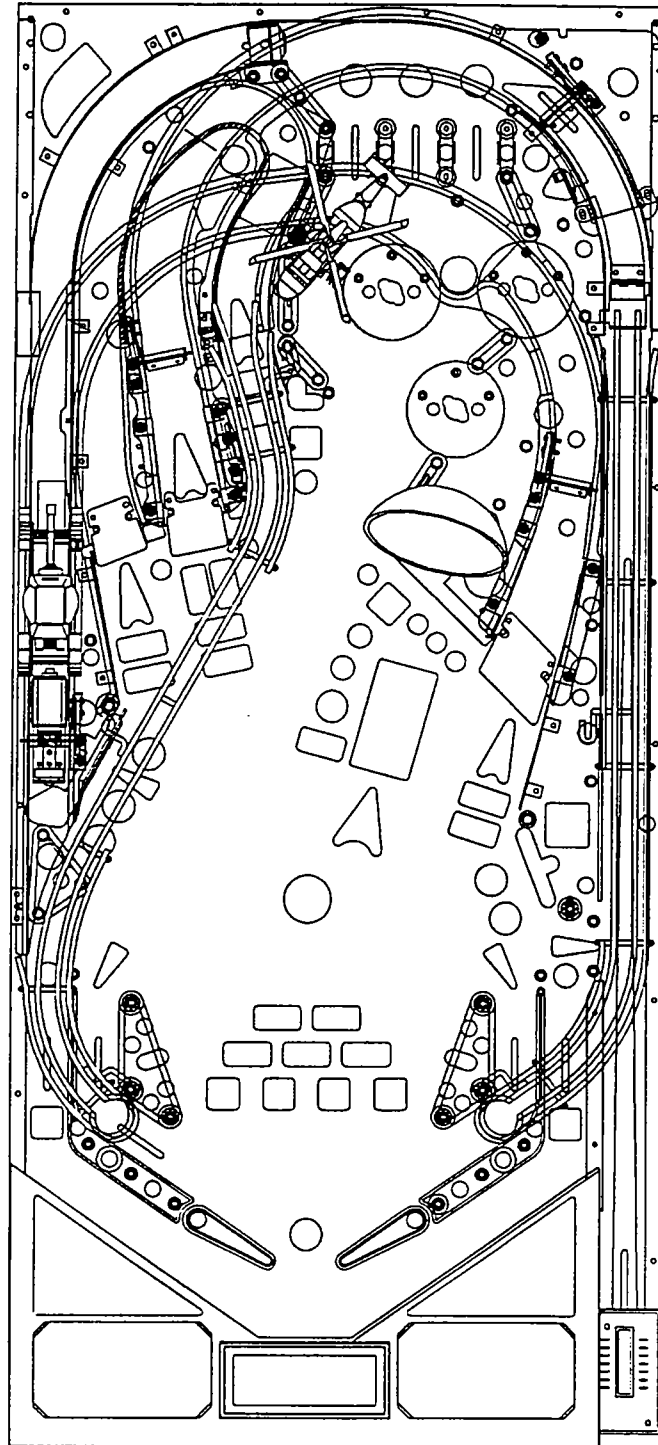
- * Items 3, 4 & 5 (Jewel Posts) come in various colors. see the Plastic Part Color Chart at the end of Section 4, Chapter 2. Replace the last 2-digits with desired color replacement.
- ** Items 7, 8 & 9 (Light Board Spacers) dimensions are measured from bottom to just under cut-away (see pictorials above).

† Items with Ø Qty. are not used in this game.

N ^o	Plastic Post/Spacer Name	QTY.	Part N ^o	N ^o	Plastic Post/Spacer Name	QTY.	Part N ^o
1	Stand-Off Double Groove 1-1/16"	2	530-5102-01	9 **	Spacer 3/4" Plastic Slf. Rtn. SRS6-12-01	0	254-5007-03
2	Plastic Post (Black)	0	550-5059-00	10	Spacer 1/4" Plastic 3/8" (Gray)	0	254-5000-02
3 *	Mini-Jewel Post Clear	4	550-5052-01	11	Spacer 3/8" Plastic 3/8" (Gray)	0	254-5000-12
4 *	Small Jewel Post Clear	7	550-5034-01	12	Spacer 1/2" Plastic (Gray) 3/8"	0	254-5000-01
5 *	Double Rubber Jewel Post	0	545-5209-XX	13	Spacer 5/8" Plastic 3/8" (Gray)	0	254-5000-14
6	Spacer 1/2" Plstc. Narrow (White) 3/8"	0	254-5000-03	14	Spacer 3/4" Plastic 3/8" (Gray)	1	254-5000-07
7 **	Spacer 1/4" Plastic Slf. Rtn. SRS6-4-01	4	254-5007-02	15	Spacer 1" Plastic 3/8" (Gray)	2	254-5000-04
8 **	Spacer 3/8" Plastic Slf. Rtn. SRS6-6-01	32	254-5007-01	16	Spacer 1 1/8" Plastic 3/8" (Gray)	0	254-5000-06
				17	Spacer 1 1/4" Plastic 3/8" (Gray)	0	254-5000-05

Note: Size and/or quantities may change during production.

Playfield - Boards: Light, Magnet Processor / Driver and Auxiliary Relay †

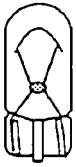


Nº	Board Name	SPI Part Nº	Nº	Board Name	SPI Part Nº
	GOLDENEYE Light Boards (01-08)	520-5128-XX	L5	GOLDENEYE Light Board 5	520-5128-05
L1	GOLDENEYE Light Board 1	520-5128-01	L6	GOLDENEYE Light Board 6	520-5128-06
L2	GOLDENEYE Light Board 2	520-5128-02	L7	GOLDENEYE Light Board 7	520-5128-07
L3	GOLDENEYE Light Board 3	520-5128-03	L8	GOLDENEYE Light Board 8	520-5128-08
L4	GOLDENEYE Light Board 4	520-5128-04			
Note: To order all 8 pieces (01-08) use above number with "-XX"; for individual pieces replace the "-XX" with appropriate number. Attention: Individual pieces may not be available.			M1	Magnet Processor / Driver Board	520-5143-00
			A1	Auxiliary Relay Board	520-5010-00

#555 Bulbs are used on the Light Boards; see the next page for bulb and socket part numbers.

Playfield - Wedge Base Type Bulbs and Sockets (Actual Size) †

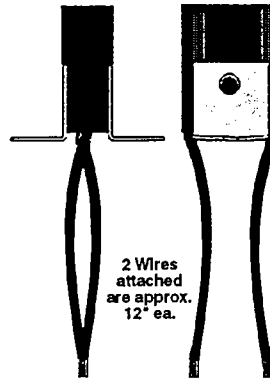
A
#555



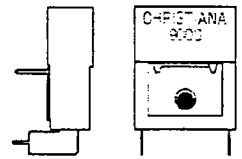
1
This socket is normally used on Lamp Boards to position bulbs vertically. (Use w/#555 & #906 Bulbs.)



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

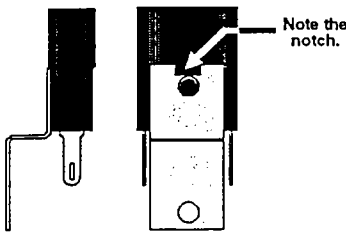


3
This socket is normally used on Lamp Boards to position bulbs horizontally. (Use w/#555 & #906 Bulbs.)

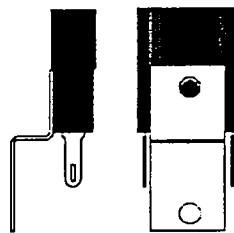


Replacement Note:
Socket color may be either black or white

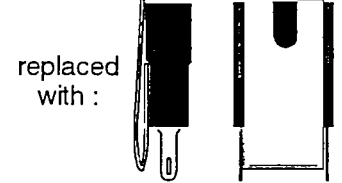
4
This socket is normally used with Reflectors.



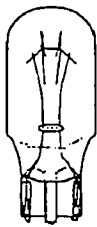
5



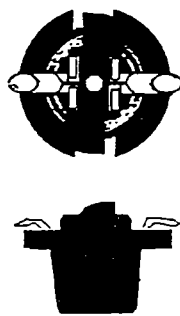
6



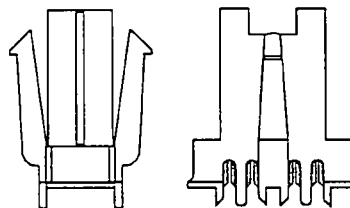
B
#906



7
This socket is sometimes used in conjunction with Mini-Mars or special Butyrate assemblies.



8
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 Motor Assemblies for voltage spike suppression.

† Items with Ø Qty. are not used in this game.

Nº	Bulb & Socket Name	QTY.	Part Nº	Nº	Bulb & Socket Name	QTY.	Part Nº
A	#555 Wedge Base Bulb	54	165-5002-00	B	#906 Wedge Base Bulb	0	165-5004-00
1	555 Wedge Base Socket	42	077-5007-00	7	906 Wedge Base Socket	0	077-5016-00
2	Turbo Pop Bumper Socket	3	077-5206-00	8	555/906 IDC Wedge Socket	0	077-5110-00
3	Lamp Board Laydown Wedge Base	0	077-5207-00				
4	Laydown Wedge Base L/R Black	0	077-5026-01				
5	Laydown Wedge Base Black	3	077-5026-00	Nº	Bulb Name (used w/motors)	QTY.	Part Nº
6	Wedge Offset Brckt. Socket 2-Styles	4	077-5029-00	C	Neon NE-2 Bulb	1	165-5021-00

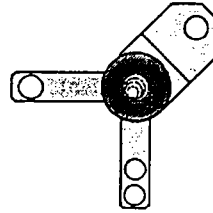
Note: Size and/or quantities may change during production.

Playfield - Bayonet Type Bulbs and Sockets (Actual Size) †

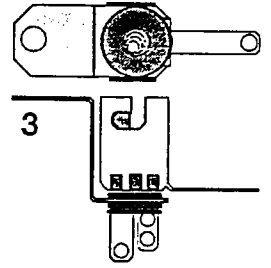
A
#44



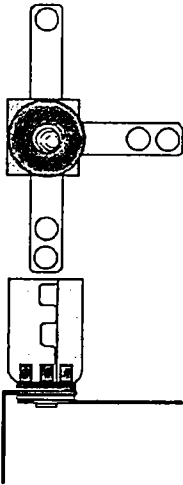
1



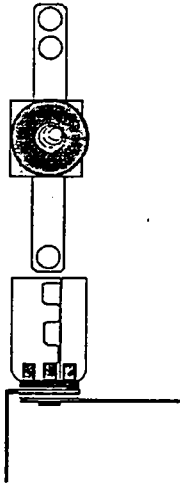
2



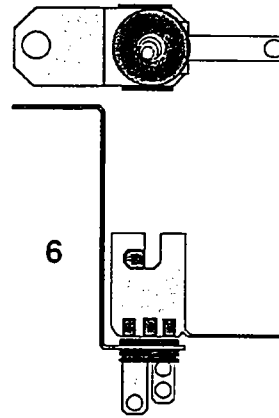
3



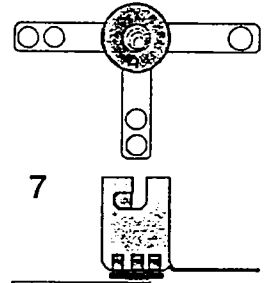
4



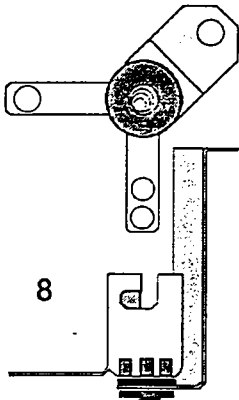
5



6



7



8

B
#455



9

This bulb is normally used in conjunction with socket 9, but can be used with sockets 1-8.

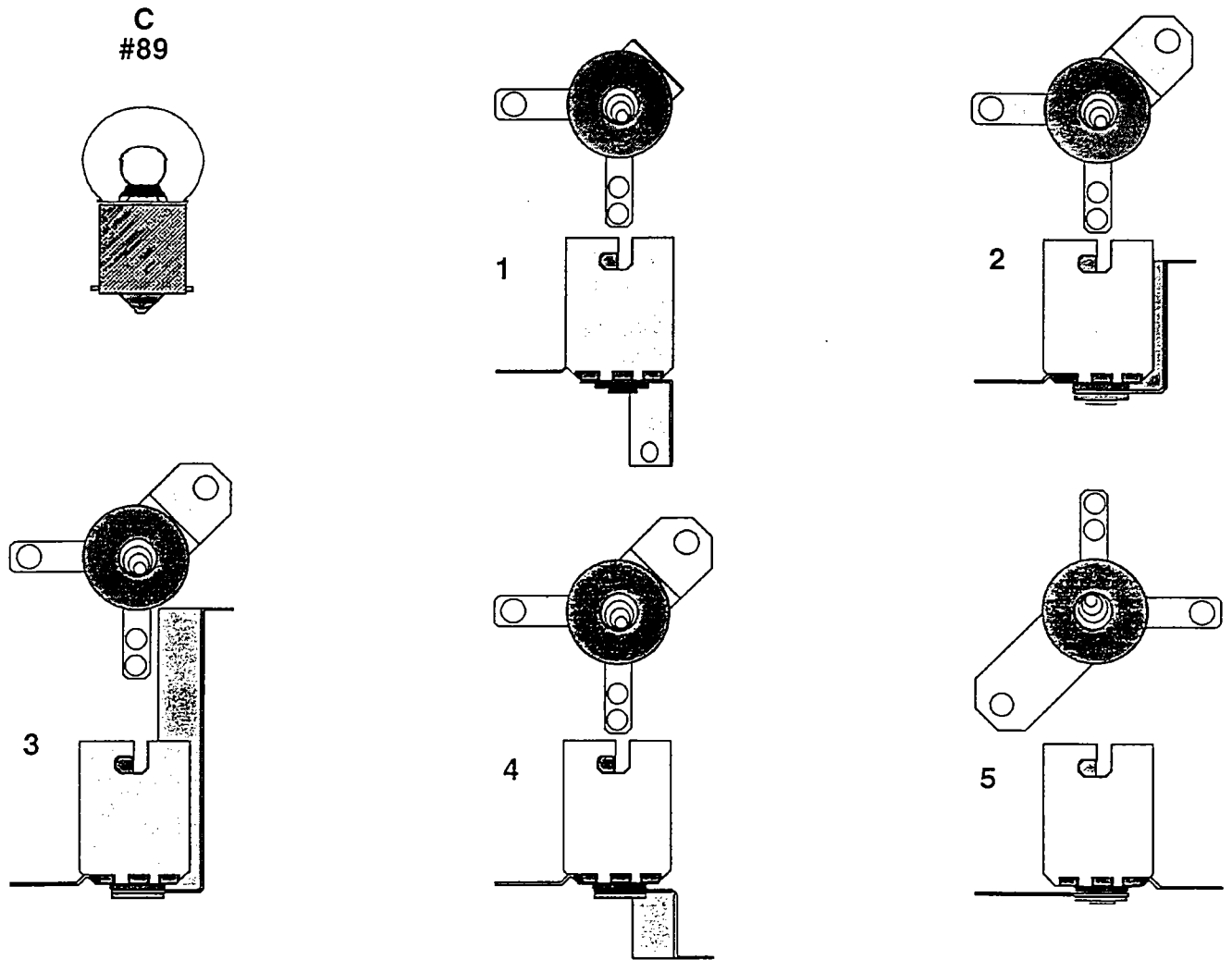
Section 4 | Parts

Nº	Bulb & Socket Name	QTY.	Part Nº	Nº	Bulb & Socket Name	QTY.	Part Nº
A	#44 Bulb	94	165-5000-44	6	3-Lug Stand-Up Long Socket	19	077-5009-00
1	2-Lug Staple Down Socket	66	077-5000-00	7	3-Lug Staple Down Socket	0	077-5001-00
2	2-Lug Stand-Up Short Socket	7	077-5002-00	8	2-Lug Stand-Up Long Socket	0	077-5005-00
3	3-Lug Stand-Up Short Socket	0	077-5008-00				
4	3-Lug Laydown Socket	2	077-5006-00	B	#455 Twinkle Bulb	10	165-5003-00
5	2-Lug Laydown Socket	0	077-5003-00	9	1-Lug Stand-Up Long Socket	10	077-5012-00

Note: Size and/or quantities may change during production.

Q Qty. are not used in this game.
† Item

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



† Items with Ø Qty. are not used in this game.

Section 4 | Parts

Nº	Bulb & Socket Name	QTY.	Part Nº	Nº	Bulb & Socket Name	QTY.	Part Nº
C	#89 Bulb	29	165-5000-89	3	2 Lugs Stand-Up Long Socket	2	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	27	077-5101-00	5	Straight Leg Socket	0	077-5107-00

Note: Size and/or quantities may change during production.

Parts Order Checklist Notes

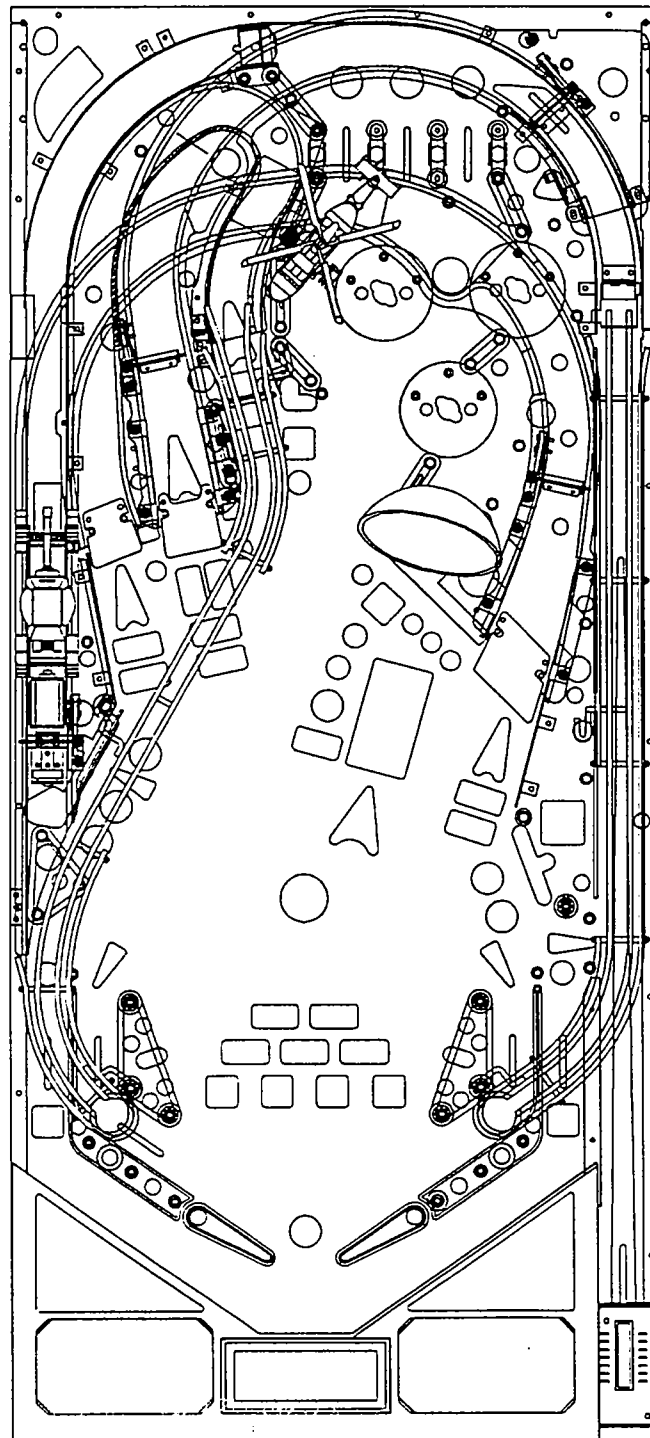
Date Ordered	Part Nº	Qty.	Description	Date Received

Assembly Drawings (The Blue Pages)

Overview

This chapter expands Chapter 1 of this section (The Pink Pages). The Part Numbers for all Major Assemblies are provided and can be ordered as a complete assembly (exception: Turbo Bumper Parts). Each assembly is broken down, describing the individual parts and/or sub-assemblies (with the part numbers) which can be ordered separately. Where multiple parts are riveted or assembled as sub-assemblies the sub-assembly needs to be ordered. The drawings show the location of the individual parts. Note that minor changes may be made during production (e.g. coil size, addition or deletion of minor parts). Always verify the part to be replaced with the part number and/or description as noted. Replacement parts may be substituted with revised parts which may have a different part number. Any questions, call our Technical Support Dept. (1-800-KICKERS USA & Canada or 708-345-7700).

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Section 4 | Drawings

"007" Gun Assembly 500-5698-01

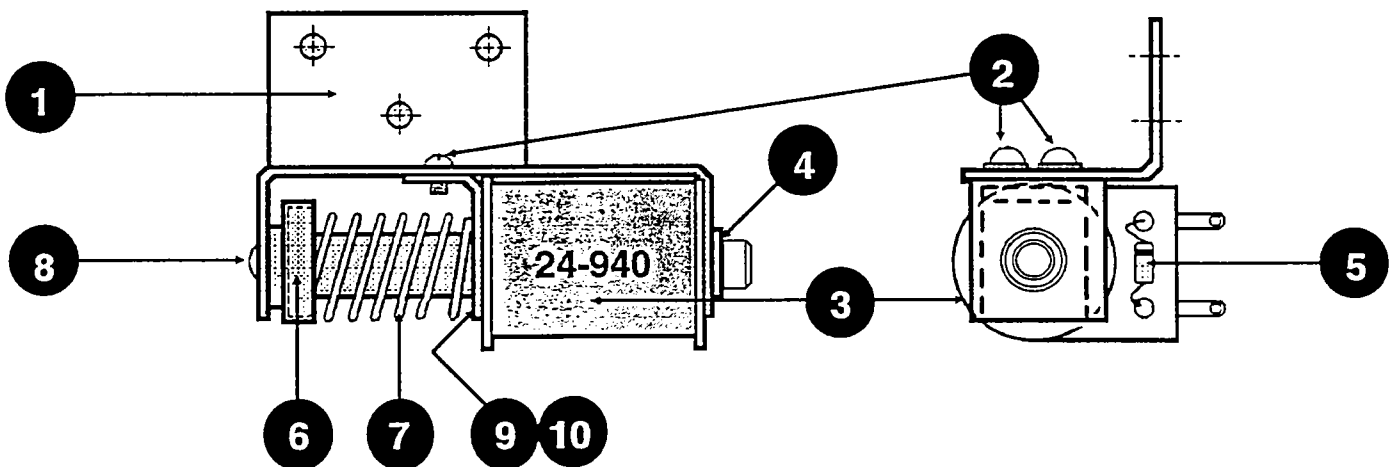
Nº	Part Name	SPI Part Nº
1	Gun Handle Left (Molded)	545-5429-00
2	Gun Handle Right (Molded)	545-5429-01
3	Trigger	545-5408-00
4	#8-32 X 1/2 Screw (Gun) (Qty. 4)	237-5900-00
5	Micro Switch	180-5111-00
6	#4-40 X 9/16 Screw (Switch) (Qty. 2)	237-5901-00
7	Spring (Switch)	266-5037-00
8	Mounting Plate Welded Assembly	n/a

Note: The above Item 8 cannot be ordered. If replacement of this piece is required, the entire assembly (500-5698-01) must be ordered.

Nº	Associated Part Name	SPI Part Nº
n/a	1/4-20 X 1-1/4 Crg. Bolt Sq. Neck (Qty. 2)	231-5003-00
n/a	Flange Nut (Qty. 4)	240-5300-00
n/a	Split Lock Washer 1/4 (Qty. 4)	244-5000-00
n/a	Gun Switch Cable	036-XXXX-XX

Auto Ball Launch (Shooter Lane) Assembly 500-5477-01-42

Section 4 | Drawings

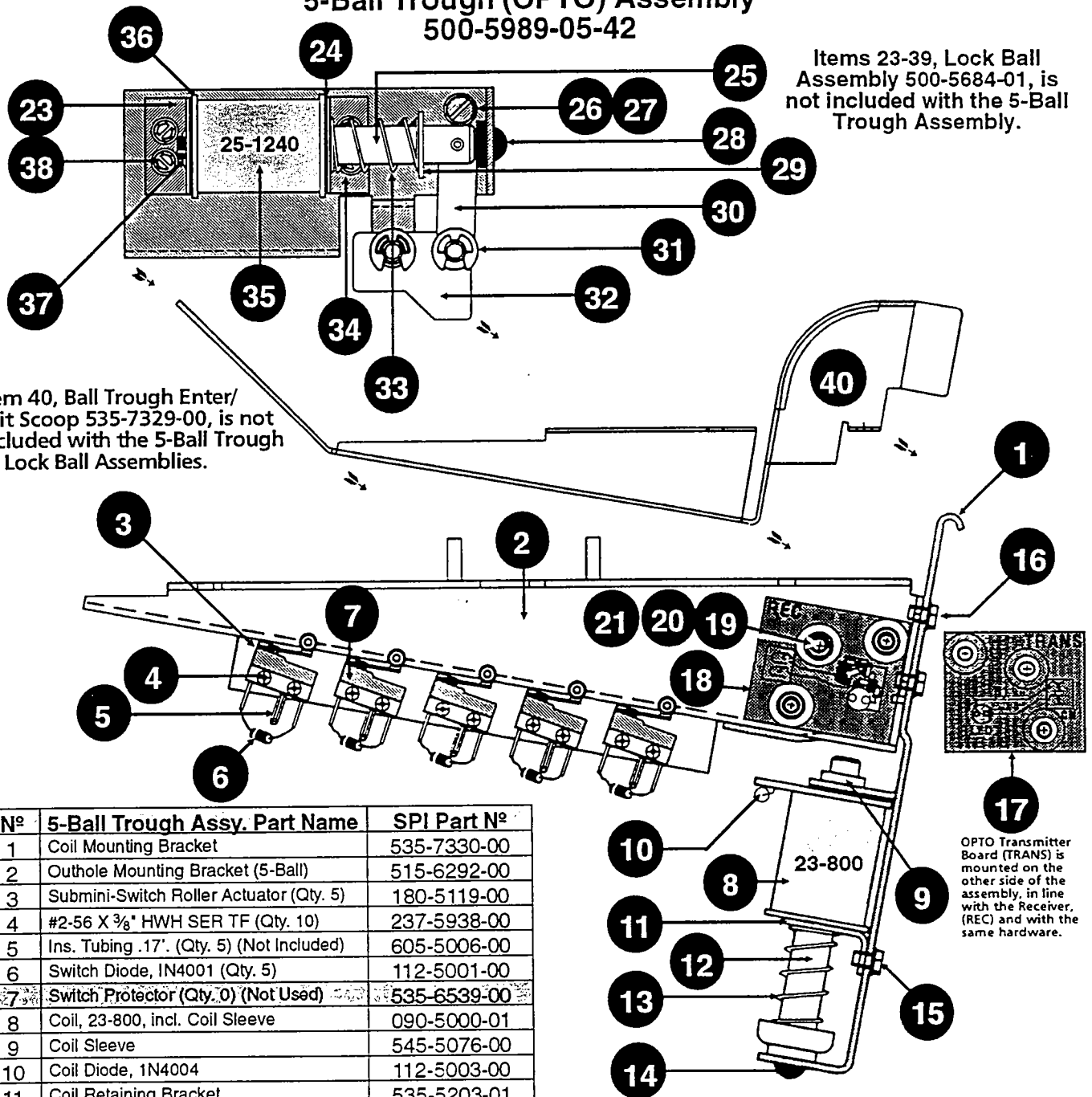


Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Coil Mounting Bracket	535-6385-00	6	Plunger Assembly	515-5000-02
2	8-32 X 1/4" PPH SEMS (Qty. 2)	232-5300-04	7	Relay Spring	266-5020-00
3	Coil, 24-940, incl. Coil Sleeve	090-5036-01	8	Rubber Bumper (Grommet)	545-5105-00
4	Coil Sleeve	545-5076-00	9	Coil Retainer Bracket	535-5203-01
5	Diode, 1N4004	112-5003-00	10	Spring Washer	266-5002-00

5-Ball Trough (OPTO) Assembly 500-5989-05-42

Items 23-39, Lock Ball Assembly 500-5684-01, is not included with the 5-Ball Trough Assembly.

Item 40, Ball Trough Enter/Exit Scoop 535-7329-00, is not included with the 5-Ball Trough or Lock Ball Assemblies.

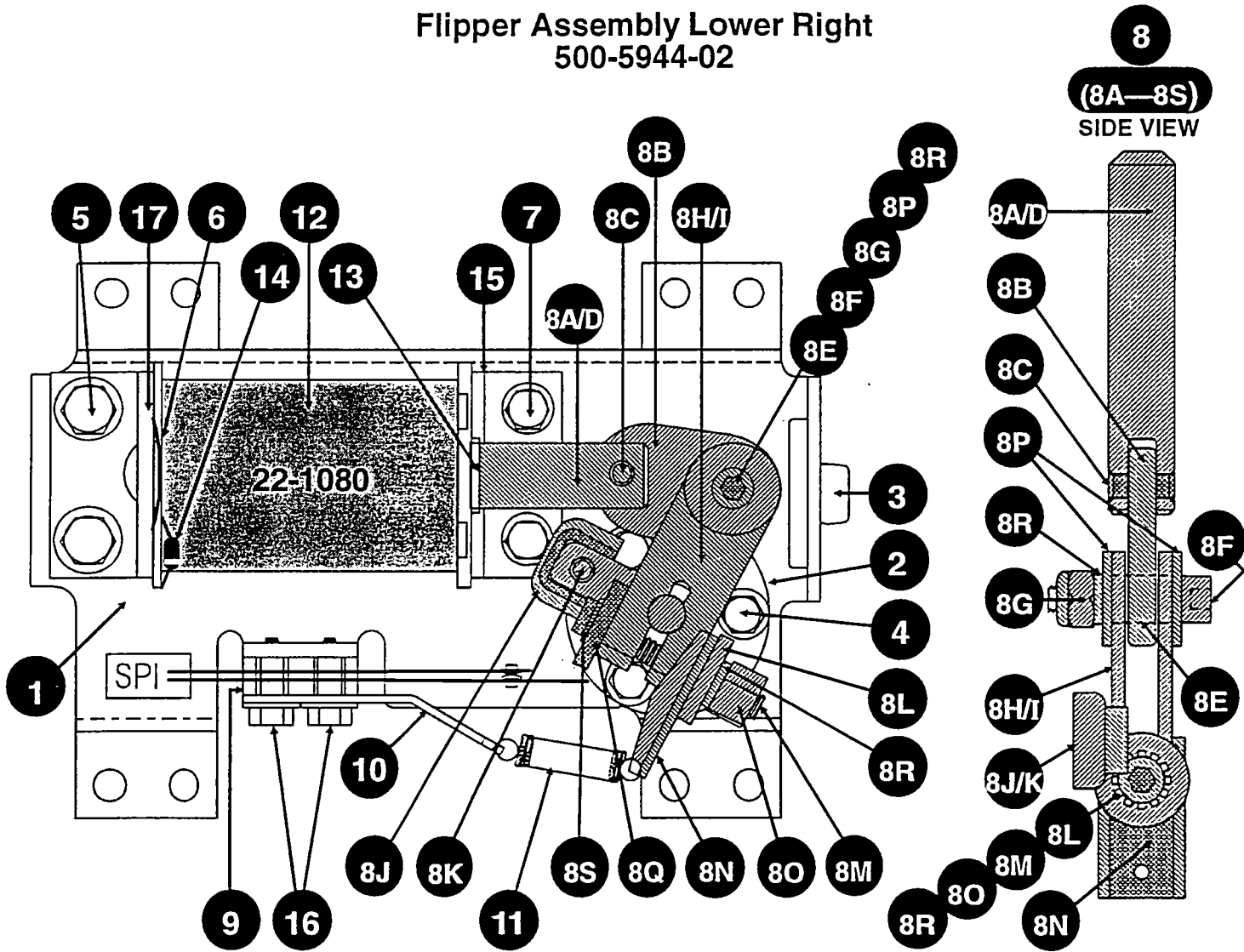


Nº	5-Ball Trough Assy. Part Name	SPI Part Nº
1	Coil Mounting Bracket	535-7330-00
2	Outhole Mounting Bracket (5-Ball)	515-6292-00
3	Submini-Switch Roller Actuator (Qty. 5)	180-5119-00
4	#2-56 X 3/8" HWH SER TF (Qty. 10)	237-5938-00
5	Ins. Tubing .17" (Qty. 5) (Not Included)	605-5006-00
6	Switch Diode, 1N4001 (Qty. 5)	112-5001-00
7	Switch Protector (Qty. 0) (Not Used)	535-6539-00
8	Coil, 23-800, incl. Coil Sleeve	090-5000-01
9	Coil Sleeve	545-5076-00
10	Coil Diode, 1N4004	112-5003-00
11	Coil Retaining Bracket	535-5203-01
12	Plunger Assembly	515-5941-01
13	Compression Spring	266-5020-00
14	Rubber Bumper (Grommet)	545-5105-00
15	#8-32 X .25" HWH SER MS (Qty. 2)	237-5964-00
16	#8-32 X 3/8" HWH TF (Qty. 4)	237-5967-00
17	OPTO Transmitter (TRANS) Board	520-5124-00
18	OPTO Receiver (REC) Board	520-5125-00
19	OPTO PCB Tube Spacer (Qty. 6)	530-5308-02
20	OPTO PCB Rubber Grommet (Qty. 6)	545-5518-00
21	#6-32 X 5/8" HWH TF (Qty. 6)	237-5928-00
22 *	Ball Trough Wire Harness (Not Shown)	036-5386-05
Nº	Lock Ball Assembly Part Name	SPI Part Nº
23	Core Stop Assembly	515-5088-00
24	Lock Ball Bracket Assembly	515-5817-01
25	Plunger 27/32" X 2.25" LG	530-5250-01

Nº	Lock Ball Assy. Part Name	SPI Part Nº
26	Plastic Spacer	545-5400-00
27	#8-32 PPH X 1" LG	232-5606-00
28	Rubber Bumper (Grommet)	545-5105-00
29	Retaining Ring 7/16" ø Shaft	270-5005-00
30	Link, Lock Ball	545-5058-00
31	Retaining Ring, 1/4" ø (Qty. 2)	270-5002-00
32	Lock Ball Cam Assembly	515-5815-01
33	Compression Spring	266-5000-00
34	Coil Retaining Bracket	535-6658-00
35	Coil, 25-1240, incl. Coil Sleeve	090-5034-00
36	Coil Sleeve	545-5411-00
37	Coil Diode, 1N4004	112-5003-00
38	#6-32 HWH TC X .38 LG (Qty. 4)	237-5898-00
39 *	Lock Ball Wiring Harness (Not Shown)	036-5301-01
40	Ball Trough Enter/Exit Scoop	535-7329-00

Note: An asterisk (*) indicates item is not depicted in pictorial.

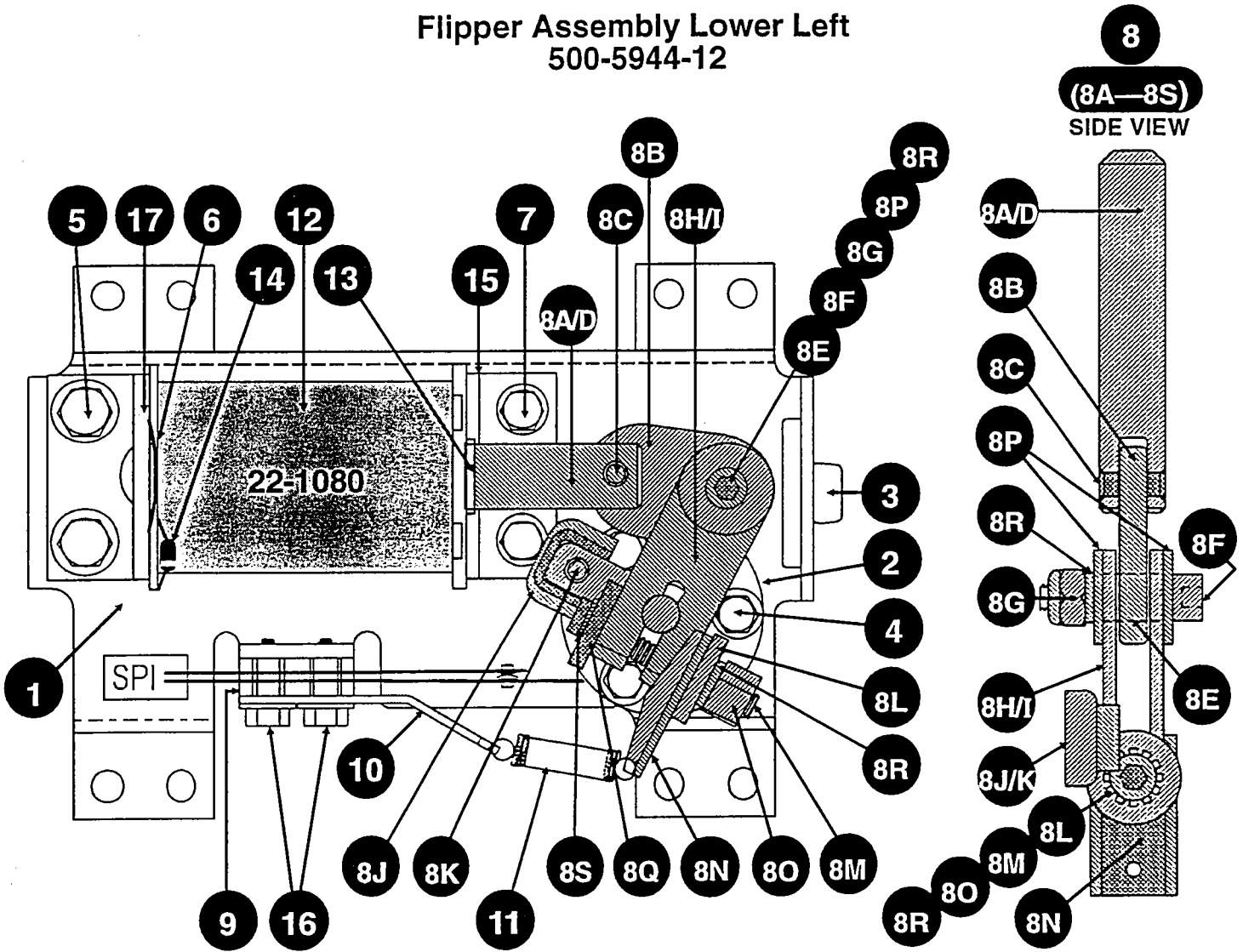
Flipper Assembly Lower Right 500-5944-02



Section 4 | Drawings

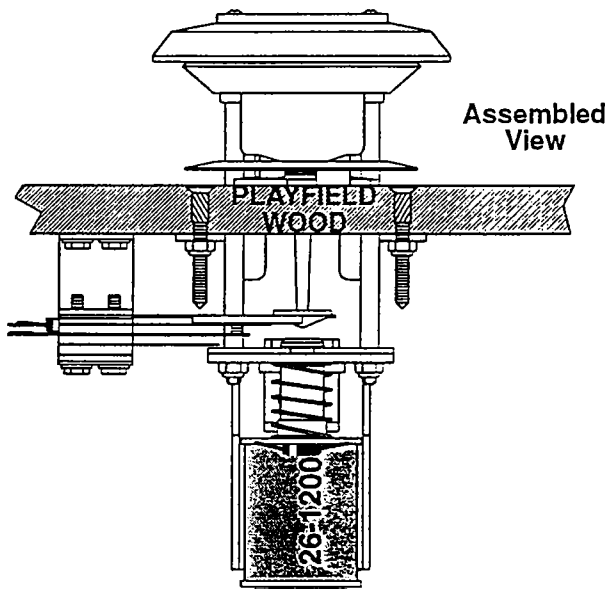
Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Flipper Base	535-7275-00	9	Power (End of Stroke) Switch	180-5149-00
2	Flipper Bushing	545-5594-00	10	Switch Plate/Spring Return Bracket	535-7354-00
3	Deflector Pad (Bumper)	545-5428-00	11	Flipper Return Spring	265-5035-00
4	#6-32 X .38" Lg. HWH TF SERR (Qty.3)	237-5910-01	12	Coil 22-1080 (YEL-GRN) incl. Coil Sleeve	090-5032-00
5	#10-32 X .38" Lg. HWH TF SERR (Qty. 2)	237-5961-00	13	Coil Sleeve	545-5388-00
6	Spring Washer	269-5002-00	14	Coil Diode, 1N4004	112-5003-00
7	#8-32 X .38 Lg. HWH TF (Qty. 2)	237-5967-00	15	Coil Support Bracket	535-7356-00
8	Plunger, Link & Pawl Sub-Assembly	515-6518-00	16	#6-32 X .63" HWH TF (Qty.2)	237-5928-00
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:		17	ORDERING ABOVE (ITEM 17) SUB-ASSY. PART Nº WILL INCLUDE:		
8A	Flipper Plunger/Link Assembly (ordering A includes B-D)	515-6304-01	--- Coil Stop with Hole 530-5350-00 --- Shading Ring 530-5123-00 --- Coil Stop Bracket 535-7355-00		
8B	Flipper Link	545-5611-00	IMPORTANT: When replacing Item 8B, Flipper Link, we advise replacing with entire Item 8A, Flipper Plunger/ Link Assembly due to overall wear & tear.		
8C	Spirol Pin ø.156 X 1/2" Lg.	251-5015-00	*** Check all other components and replace as required. ***		
8D	Flipper Plunger with Flat	530-5349-01	ASSOCIATED PART(S) NOT INCLUDED WITH THE ABOVE ASSEMBLY		
8E	Extended Flipper Bushing	530-5139-01	Nº	Associated Part Name	SPI.Part Nº
8F	#10-32 X 7/8" Lg. SOC HD	237-5966-00	n/a	Right Flipper Bat & Shaft Assy. Color: WHITE W/SONIC THE HEDGEHOG™ Logo	515-5133-01-03
8G	#10-32 Nylon Stop Nut	240-5203-00	n/a	Right Flipper Bat Decal	820-6132-23
8H	Pawl (Mounting Link) Sub-Assembly	515-6305-00			
8I	Pawl (Mounting Link) only	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)	237-5950-00			
8N	Return Bracket	535-7353-00			
8O	#10-32 X 3/32" 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	#10-32 Split Lock Washer (Qty. 2)	244-5003-00			
8S	#10 Star Washer	246-5002-00			

Flipper Assembly Lower Left 500-5944-12

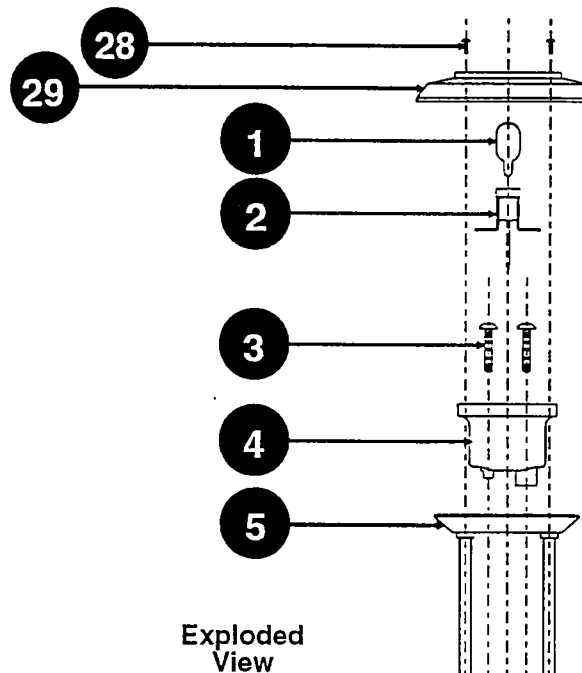


Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Flipper Base	535-7275-01	9	Power (End of Stroke) Switch	180-5149-00
2	Flipper Bushing	545-5594-00	10	Switch Plate/Spring Return Bracket	535-7354-00
3	Deflector Pad (Bumper)	545-5428-00	11	Flipper Return Spring	265-5035-00
4	#6-32 X .38" Lg. HWH TF SERR (Qty.3)	237-5910-01	12	Coil 22-1080 (YEL-GRN) incl. Coil Sleeve	090-5032-00
5	#10-32 X .38" Lg. HWH TF SERR (Qty. 2)	237-5961-00	13	Coil Sleeve	545-5388-00
6	Spring Washer	269-5002-00	14	Coil Diode, 1N4004	112-5003-00
7	#8-32 X .38 Lg. HWH TF (Qty. 2)	237-5967-00	15	Coil Support Bracket	535-7356-00
8	Plunger, Link & Pawl Sub-Assembly	515-6518-01	16	#6-32 X .63" HWH TF (Qty.2)	237-5928-00
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:			ORDERING ABOVE (ITEM 17) SUB-ASSY. PART Nº WILL INCLUDE:		
8A	Flipper Plunger/Link Assembly (ordering includes B-D)	515-6304-01	—	Coil Stop with Hole	530-5350-00
8B	Flipper Link	545-5611-00	—	Shading Ring	530-5123-00
8C	Spiral Pin ϕ .156 X 1/2" Lg.	251-5015-00	—	Coil Stop Bracket	535-7355-00
8D	Flipper Plunger with Flat	530-5349-01	IMPORTANT: When replacing Item 8B, Flipper Link, we advise replacing with entire Item 8A, Flipper Plunger/ Link Assembly due to overall wear & tear.		
8E	Extended Flipper Bushing	530-5139-01	*** Check all other components and replace as required. ***		
8F	#10-32 X 7/8" Lg. SOC HD	237-5966-00	ASSOCIATED PART(S) NOT INCLUDED WITH THE ABOVE ASSEMBLY		
8G	#10-32 Nylon Stop Nut	240-5203-00	Nº	Associated Part Name	SPI Part Nº
8H	Pawl (Mounting Link) Sub-Assembly	515-6305-01	n/a	Left Flipper Bat & Shaft Assy. Color: WHITE W/SONIC THE HEDGEHOG™ LOGO	515-5133-01-04
8I	Pawl (Mounting Link) <i>only</i>	535-7271-01	n/a	Left Flipper Bat Decal	820-6132-22
8J	Switch Actuator	545-5612-00			
8K	Rivet 1/8" ϕ 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)	237-5950-00			
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	#10-32 Split Lock Washer (Qty. 2)	244-5003-00			
8S	#10 Star Washer	246-5002-00			

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



Assembled
View



Exploded
View

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

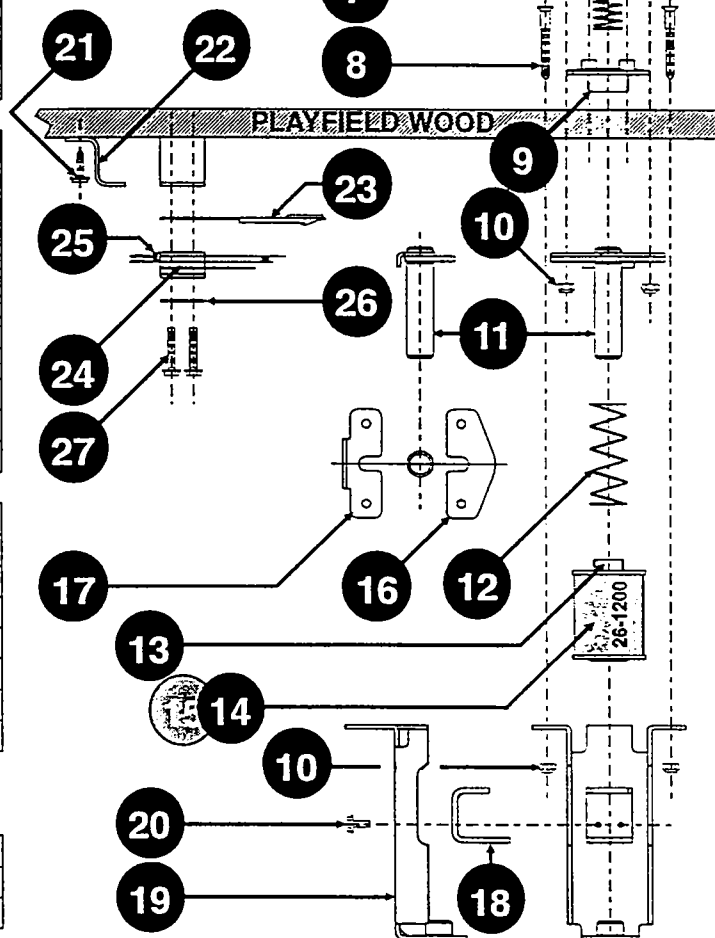
Nº	Part Name	SPI Part Nº
11	Plunger	530-5348-00
12	Coil Spring	266-5047-00
13	Coil Sleeve	545-5031-00
14	Coil 26-1200, incl. Coil Sleeve	090-5044-00
15	Coil Diode, 1N4004 (Not Shown)	112-5003-00
16	Fiber Yoke	545-5609-00
17	Metal Yoke	535-7346-00
18	Metal Yoke Stop	535-7347-00
19	Coil Bracket Sub-Assembly	515-5939-00
20	#6-32 X 1/4" HWHTF (SERR) (Qty. 2)	237-5952-00

SWITCH GROUP

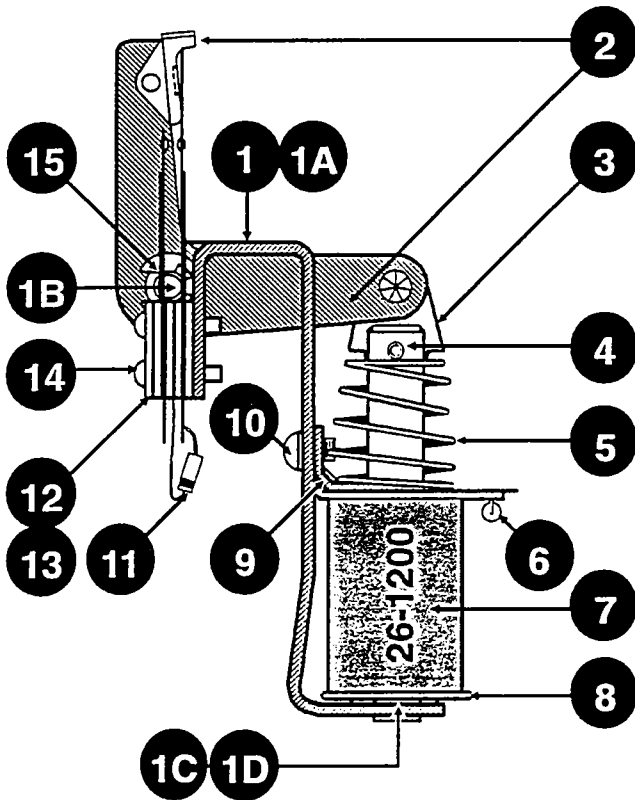
Nº	Part Name	SPI Part Nº
21	#6 X 1/2" HWH (AB) (Qty. 2)	234-5001-02
22	Switch Bracket	535-7342-00
23	Spoon Switch Actuator	545-5610-01
24	Stack Switch	180-5015-03
25	Switch Diode, 1N4001	112-5001-00
26	Switch Plate	535-7344-00
27	#6-32 X 3/4" HWHMS (SERR) (Qty. 2)	237-5958-00

ASSOCIATED GROUP

Nº	Part Name	SPI Part Nº
28	#4 X 3/4" PH RH (T25) (Qty. 2)	237-5873-00
29	Plastic Bumper Cap Cover Red (Qty. 3)	550-5057-02

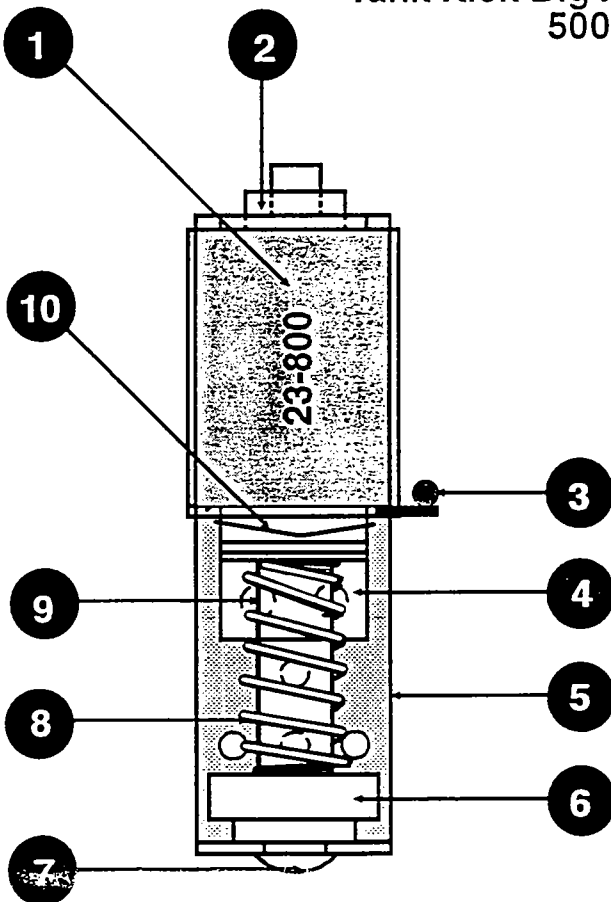


Slingshot Assemblies (Left & Right) 500-5849-01



Nº	Part Name	SPI Part Nº
1	Slingshot Bracket Assembly	515-5339-01
ORDERING ABOVE (ITEM 1) SUB-ASSY PART Nº WILL INCLUDE:		
A	Slingshot Bracket	535-5919-01
B	Hinge Stud	530-5034-01
C	Armature Stop	530-5017-01
D	Shading Ring	530-5307-00
2	Arm & Tip Assembly	515-5340-01
3	Armature Link	545-5062-00
4	Plunger & Link Assembly	515-5338-00
5	Compression Spring	266-5020-00
6	Coil Diode, 1N4004	112-5003-00
7	Coil 26-1200, incl. Coil Sleeve	090-5044-00
8	Coil Sleeve	545-5031-00
9	Coil Retaining Bracket	535-5203-03
10	#8-32 X 1/4" Screw (Qty. 2)	232-5300-00
11	Switch Diode, 1N4001	112-5001-00
12	Slingshot Switch (Qty. 2)	180-5054-00
13	Tension Switch Plate (Qty. 2)	535-7344-00
14	#6-32 X 3/4" HWH (SER) Zinc (Qty. 4)	237-5958-00
15	Retaining Ring 1/4" ø (Qty. 2)	270-5002-00

Tank Kick Big Assembly (Under Tank) 500-5862-02-42

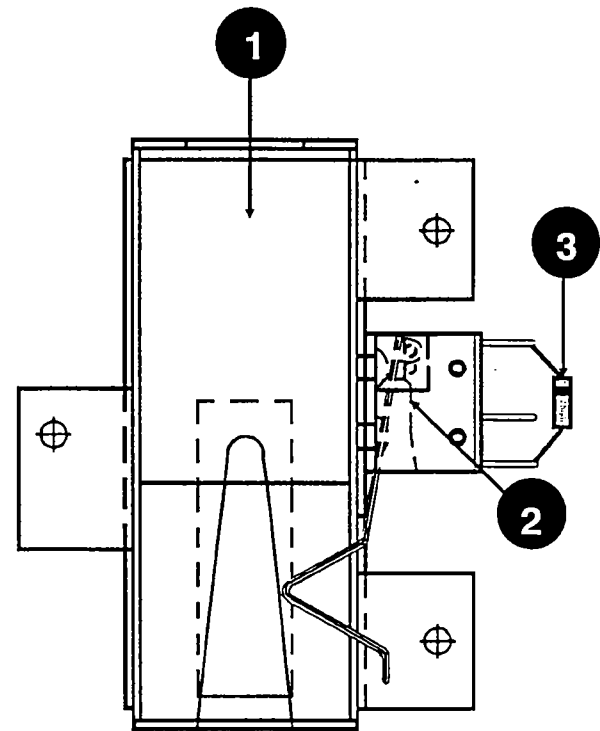


Nº	Part Name	SPI Part Nº
1	Coil 23-800, incl. Coil Sleeve	090-5001-01
2	Coil Sleeve	545-5076-00
3	Diode, 1N4004	112-5003-00
4	Coil Retainer Bracket	535-5203-01
5	Frame	535-6730-00
6	Plunger Assembly	515-5000-02
7	Rubber Grommet	545-5105-00
8	Spring	266-5020-00
9	8-32 X 1/4" SEMS (Qty. 2)	232-5300-04
10	Spring Washer	269-5002-00

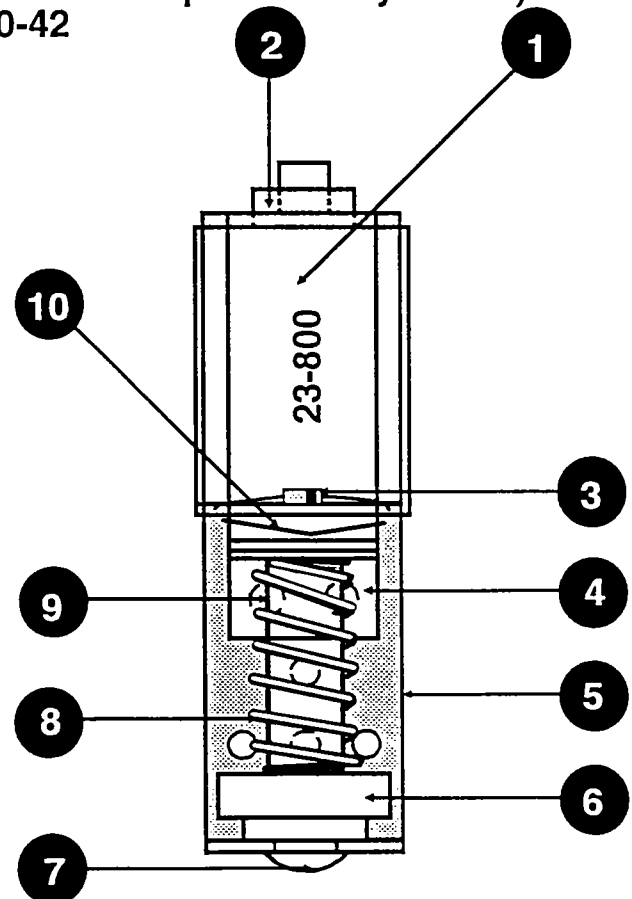
Power Scoop Assembly (Operates with Kick Big Assembly below) 500-5809-00-42

Please Note:
The Power Scoop & Kick Big Assemblies
work in conjunction with each other but are
separate assemblies.

Nº	Part Name	SPI Part Nº
1	Power Scoop Weld Assembly	515-6022-00
2	Micro Switch	180-5057-00
	Switch Protect Plate	535-6539-00
	#2 Lockwasher (Qty. 2)	244-5001-00
	#2-56 Hex Nut (Qty. 2)	240-5301-00
	Micro Switch Bracket	535-6173-00
	#2-56 PHMS (Qty. 2)	237-5937-00
	#6-32 PPH (Qty. 2)	232-5200-00
3	Diode 1N4004	112-5003-00



Kick Big Assembly (Operates with Power Scoop Assembly above) 500-5862-00-42



Nº	Part Name	SPI Part Nº
1	Coil 23-800, incl. Coil Sleeve	090-5001-01
2	Coil Sleeve	545-5076-00
3	Diode, 1N4004	112-5003-00
4	Coil Retainer Bracket	535-5203-01
5	Frame	535-6730-00
6	Plunger Assembly	515-5000-02
7	Rubber Grommet	545-5105-00
8	Spring	266-5020-00
9	8-32 X 1/4 PPH (Qty. 2)	232-5300-00
10	Spring Washer	269-5002-00

Tank Trap Door Plunger Assembly 500-5940-01-42

Nº	Part Name	SPI Part Nº
1	Bracket & Armature Stop Assembly	515-6435-00
2	Coil Retainer (Qty. 2)	535-5203-01
3	#8-32 X 1/4 PPH MS SEMS (Qty. 4)	232-5300-00
4	Coil 27-1500, incl. Coil Sleeve	090-5004-00
5	Coil Sleeve	545-5411-00
6	Diode, 1N4004	112-5003-00
7	Plunger Sub-Assembly	515-6483-00
8	Comp. Spring	266-5020-00
9	Retaining Ring 7/16 ø	270-5005-00
10	Nyliner 7/16 ø	545-5418-00
11	Trap Door (Diverter) Wire	535-7565-00

Satellite Launch Ramp Assembly 500-6004-00-42

Nº	Part Name	SPI Part Nº
1	Up-Down Ramp Sub-Assembly	515-6384-00
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:		
1A	Lift Ramp Shaft	530-5362-01
1B	Skill Shot Flap	535-7430-02
1C	Pivot Bracket	515-6482-00
1D	Lift Ramp Floor	515-6362-01
1E	Rivet 1/8 ø X 5/32 Lg. (Qty. 2)	249-5009-01
1F	Rivet 1/8 ø X 1/8 Lg. (Qty. 2)	249-5008-01
1G	Retaining Ring 1/4 (Qty. 2)	270-5002-00
1H	Nyliner 1/4 (Qty. 2)	545-5050-00
1I	Deflector Plate	535-7410-02
2	Lift Ramp Plunger Assembly	515-6494-00
ORDERING ABOVE (ITEM 2) SUB-ASSY. PART Nº WILL INCLUDE:		
2A	Bracket	
2B	Coil Retaining Bracket (Qty. 2)	
2C	Coil xx-xxx, incl. Coil Sleeve	
2D	Coil Sleeve	
2E	Diode, 1N4004	515-6493-00
2F	Plunger & Link Assembly	
ORDERING ABOVE (ITEM 2F) SUB-ASSY. PART Nº WILL INCLUDE:		
	Plunger	530-5400-00
	Link	535-7671-00
	Roll Pin 1/8 ø X 5/8 Lg.	251-5008-00
3	Retaining Ring 1/4 ø	270-5002-00
4	Bracket	535-7385-00

Satellite Assembly

500-6000-00-42

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Magnet Bracket Assembly	515-6342-03	5	#6-32 X 1/2 PFH MS (Qty. 2)	237-5918-00
2	Magnet (22-600)	090-5042-01	6	#6-32 Nylon Nut (Qty. 2)	240-5203-00
3	Threaded Core Plug	530-5320-01	7	Cover Plate	535-7674-00
4	Satellite Dish (Screened)	545-5627-04	8	3/4-16 Hex Nut	240-5315-00

Satellite Motor Base Assembly 500-5982-00-42

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Motor Mounting Bracket	535-7389-02	8	#4-40 X 5/8 HWH MS (SERR) (Qty. 2)	237-5945-00
2	Motor (24v AC 6 RPM) Assembly	515-6528-00	9	#6-32 X 3/8 PPH MS (SEMS) (Qty. 2)	232-5201-00
ORDERING ABOVE (ITEM 2) SUB-ASSY. PART Nº WILL INCLUDE:			10	#6-32 X 3/8 HHW MS (Qty. 3)	237-5910-00
2A	Neon Bulb (Not Shown)	165-5021-00	11	Retaining Ring 1/4 Shaft (Qty. 4)	270-5002-00
2B	Capacitor .1 MFD 500V Disc (Not Shown)	130-5000-00	12	#8-32 X 1/2 PPH MS	237-5602-00
3	Flipper Bushing	545-5594-00	13	#8-32 X 3/8 Set Screw (Cup Point)	237-5839-00
4	Cam Bushing Assembly	515-6334-01	14	Pivot Mounting Shaft	530-5358-02
5	Crank Arm Assembly	515-6333-01	15	Switch Cable (Sw. 20 Home)	036-5390-18
6	Cam Link	535-7393-01	<i>Operation Note: The bulb (Item 2A) is used for spike suppression and the capacitor (Item 2B) is used to eliminate line noise.</i>		
7	Switch (Motor Cam)	180-5052-00			

Up-Down Metal Ramp Plunger Assembly 500-6058-00-42

Nº	Part Name	SPI Part Nº
1	Bracket & Armature Stop Assembly	515-6435-00
2	Coil Retainer Bracket (Qty. 2)	535-5203-01
3	#8-32 X 1/4 PPH MS SEMS (Qty. 4)	232-5300-00
4	Coil 27-1500, incl. Coil Sleeve	090-5004-00
5	Coil Sleeve	545-5411-00
6	Diode, 1N4004	112-5003-00
7	Comp. Spring	266-5034-00
8	Retaining Ring 7/16 ø Shaft	270-5005-00
9	Nyliner 7/16 ø Shaft	545-5418-00
10	Plunger & Link Assembly	515-6492-00
ORDERING ABOVE (ITEM 10) SUB-ASSY. PART Nº WILL INCLUDE:		
	Lift Ramp Plunger	530-5385-00
	Link	545-5293-00
	1/8 X 5/8 Lg. Roll Pin	251-5008-00

Up-Down Metal Ramp & Flat Rail Assembly 500-6052-00-42

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Flat Rail (#1)	515-6310-02	5	Ramp Flap	535-7559-01
2	Platform Assembly	515-6464-00	6	Retaining Ring 1/4 ø (Qty. X)	270-5002-00
3	Ramp Floor Assembly	55-6463-00	7	#8-32 X 1/2 HWH MS (SEMS) (Qty. X)	237-5905-00
4	Rivet 1/8 ø X 5/32 Lg.	249-5009-00			

**Left Plastic Ramp Assembly
500-5997-00-42**

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Left Plastic Ramp	545-5615-00	10	Exit Gate Sub-Assembly	515-6490-00
2	Ramp Flap (#3)	535-7608-01	ORDERING ABOVE (ITEM 10) SUB-ASSY. PART Nº WILL INCLUDE:		
3	Rivet 1/8 ø X 5/32 Lg.	249-5009-00	10A	Gate Bracket	535-7613-01
4	Lock Washer #6 (Qty. 2)	246-5000-00	10B	Wire Form	535-6304-03
5	Ramp Protector (Left Side)	535-7618-00	10C	Micro Switch	180-5087-00
6	Ramp Protector (Right Side)	535-7619-00	10D	Diode, 1N4001	112-5001-00
7	#6 X 3/8 HWH AB (Qty. 8)	234-5000-00	10E	#2-56 X 3/8 HWH MS (Qty. 2)	237-5938-00
8	Left Ramp Ent. Cable Assembly	036-5390-04	11	Entrance Gate Sub-Assembly	515-6490-01
9	Left Ramp Main Cable Assembly	036-5390-06	ORDERING ABOVE (ITEM 11) SUB-ASSY. PART Nº WILL INCLUDE:		
			11A	Gate Bracket	535-7613-02
			11B-E	Identical to 10B-10E	See 10B - 10E

Right Plastic Ramp Assembly

500-5998-00-42

Nº	Part Name	SPI Part Nº
1	Right Plastic Ramp	545-5621-00
2	Ramp Flap (#1)	535-7609-01
3	Rivet 1/8 ø 5/32 Lg. (Qty. 2)	249-5009-00
4	Lock Washer #6 (Qty. 2)	246-5000-00
5	Ramp Protector (Left Side Entrance)	535-7620-00
6	Ramp Protector (Right Side Entrance)	535-7621-01
7	#6 X 3/8 HWH AB (Qty. 11)	234-5000-00
8	Exit Gate Sub-Assembly	515-6490-00
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:		
8A	Gate Bracket	535-7613-01
8B	Wire Form	535-6304-03
8C	Micro Switch	180-5087-00
8D	Diode, 1N4001	112-5001-00
8E	#2-56 X 3/8 HWH MS (Qty. 2)	237-5938-00
9	Entrance Gate & Sign Assembly	515-6490-02
ORDERING ABOVE (ITEM 9) SUB-ASSY. PART Nº WILL INCLUDE:		
9A	Gate Bracket	535-6303-02
9B	Wire Form	535-6304-03
9C	Micro Switch	180-5087-00
9D	Diode, 1N4001	112-5001-00
9E	#2-56 X 3/8 HWH MS (Qty. 2)	237-5938-00
9F	#6 X 3/8 HWH AB (Qty. 2)	234-5000-00
9G	Butyrate Sign Sub-Assembly	515-6489-19
ORDERING ABOVE (ITEM 9G) SUB-ASSY. PART Nº WILL INCLUDE:		
	Butyrate -19 "Tank Multiball"	830-5482-19
	Wedge Offset Socket	077-5029-00
	#555 Wedge Base Bulb	165-5002-00
	Rivet 1/8 ø X 5/32 Lg.	249-5009-00
	Lock Washer #6	246-5000-00
	Rubber Light Cover Green	545-5014-04
10	Hex Spacer 1/2 Lg. (Qty. 2)	254-5008-03

Right Plastic Ramp Assembly Continued 500-5998-00-42

Section 4 | Drawings

Nº	Part Name	SPI Part Nº
11	Bracket	535-7587-00
12	Door Plate	535-7588-00
13	Trap Door Shaft	530-5395-00
14	Nyliner 1/4 (Qty. 2)	545-5050-00
15	Nyliner 1/8	545-5335-00
16	Retaining Ring 1/4 Shaft (Qty. 2)	270-5002-00
17	#6-32 X 3/8 PFH MS (Qty. 2)	237-5850-00
18	#6-32 X 1/4 PFH MS (Qty. 2)	237-5853-00
19	Right Ramp Exit Cable Assembly	036-5390-07
20	Right Ramp Entrance Cable Assembly	036-5390-03
21	#6-32 X 3/8 PPH MS (SEMS) (Qty. 4)	232-5201-00
22	Butyrate (Clear)	830-5482-22
23	Helicopter Assembly	500-6074-00
ORDERING ABOVE (ITEM 23) ASSEMBLY PART Nº WILL INCLUDE:		
23A	Helicopter	545-5672-00
23B	#6-32 X .50 PPH Center Screw	232-5202-00
23C	#6-32 X .38 PPH Back Screw	232-5000-02
23D	Helicopter Bracket	535-7647-00
23E	Laydown Wedge Base L/R Black Socket	077-5026-01
23F	#555 Wedge Base Bulb	165-5002-00
23G	Rubber Light Cover Green	545-5014-04
23H	Cable Harness	036-5390-14
24	Right Ramp Decal	820-6151-05
25	Tank Sub-Assembly	515-6519-00
ORDERING ABOVE (ITEM 25) SUB-ASSY. PART Nº WILL INCLUDE:		
25A	Tank	545-5673-00
25B	Tank Bracket (Qty. 2)	535-7673-00
25C	#6 X .38 HWH (Qty. 2)	243-5000-00

Center Plastic Ramp Assembly

500-5999-00-42

Section 4 | Drawings

Nº	Part Name	SPI Part Nº
1	Center Plastic Ramp	545-5619-01
2	Ramp Protector (Right Side Entrance)	535-7675-00
3	Ramp Protector (Left Side Entrance)	535-7676-00
4	#6 X 3/8 HWH AB (Qty. 11)	234-5000-00
5	Exit Gate Assembly	515-6490-01
ORDERING ABOVE (ITEM 5) SUB-ASSY. PART Nº WILL INCLUDE:		
5A	Gate Bracket	535-7613-02
5B	Wire Form	535-6304-03
5C	Micro Switch	180-5087-00
5D	Diode, 1N4001	112-5001-00
5E	#2-56 X 3/8 HWH MS (Qty. 2)	237-5938-00
6	Entrance Gate & Sign Assembly	515-6490-03
ORDERING ABOVE (ITEM 6) SUB-ASSY. PART Nº WILL INCLUDE:		
6A	Gate Bracket	535-6303-02
6B	Wire Form	535-6304-03
6C	Micro Switch	180-5087-00
6D	Diode, 1N4001	112-5001-00
6E	#2-56 X 3/8 HWH MS (Qty. 2)	237-5938-00
6F	#6 X 3/8 HWH AB (Qty. 2)	234-5000-00
6G	Butyrate Sign Sub-Assembly	515-6489-19
ORDERING ABOVE (ITEM 6G) SUB-ASSY. PART Nº WILL INCLUDE:		
	Butyrate -18 "Lock Ball"	830-5482-18
	Wedge Offset Socket (Qty. 2)	077-5029-00
	#555 Wedge Base Bulb (Qty.2)	165-5002-00
	Rivet 1/8 ø X 5/32 Lg. (Qty. 2)	249-5009-00
	Lock Washer #6 (Qty. 2)	246-5000-00
	Rubber Light Cover Orange (Qty. 2)	545-5014-07
7	Center Ramp Flap	535-7645-00
8	Rivet 1/8 ø X 5/32 Lg. (Qty. 2)	249-5009-00
9	Lock Washer #6	246-5000-00
10	Center Ramp Exit Cable Assembly	036-5390-02
11	Center Ramp Entrance Cable Assembly	036-5390-05
12	Spot Light Assembly	500-5818-02
ORDERING ABOVE (ITEM 12) ASSEMBLY PART Nº WILL INCLUDE:		
12A	Laydown Wedge Base L/R Black Socket	077-5026-01
12B	#555 Wedge Base Bulb	165-5002-00
12C	Rivet 1/8 ø X 1/8 Lg. (Nickel)	249-5008-00
12D	Reflector	545-5409-01
12E	#6 X 3/8 HWH AB	234-5000-00
12F	Cable Harness	036-5390-10
13	Mini-Jewel Post Clear	550-5052-01

**Back Panel Assembly
500-6001-00-42**

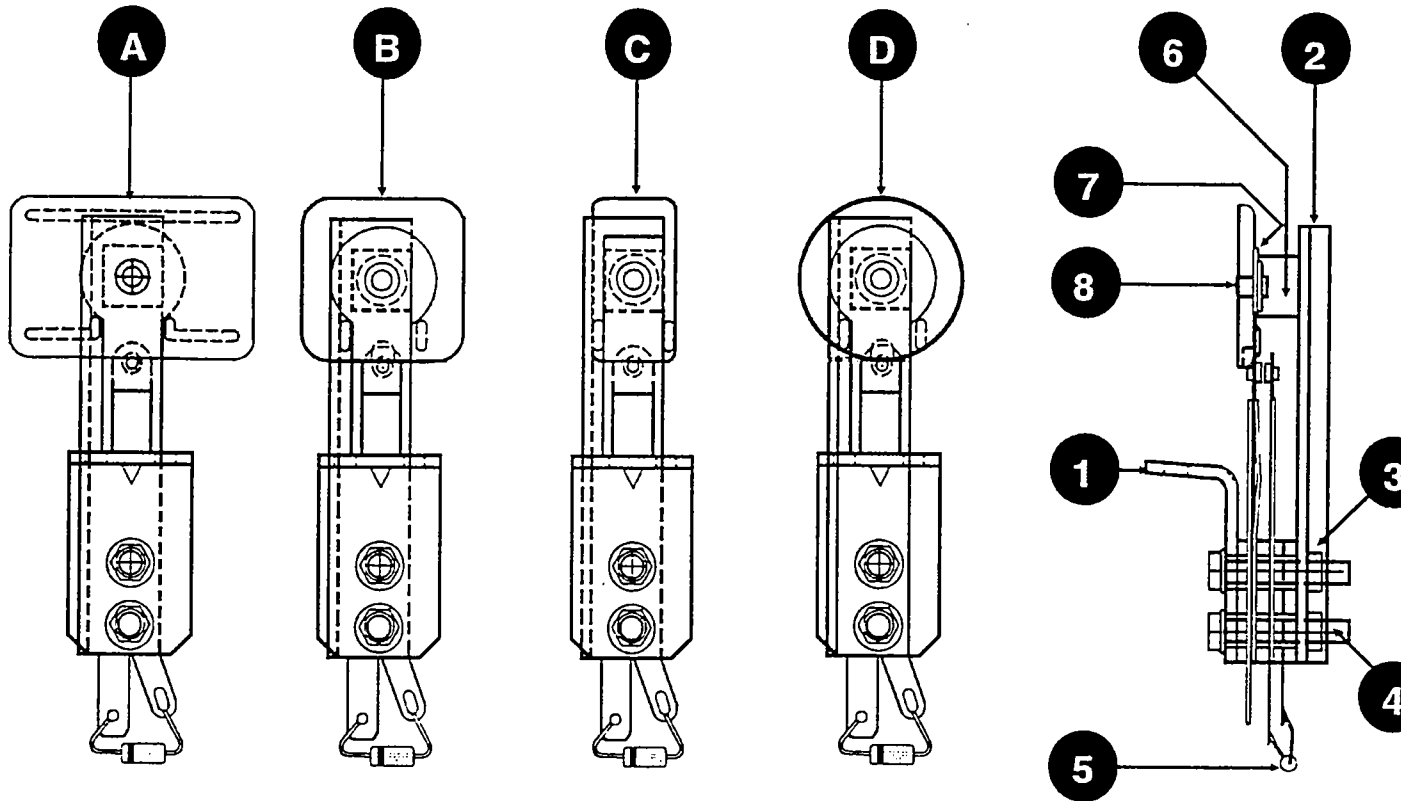
Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Back Panel - GOLDENEYE Plain	525-5393-01	5	#89 Bayonet Bulb	165-5000-89
2	Mini-Mars Light Cover Red (Qty. 2)	550-5031-02	6	#6 X 3/8 HWH AB (Qty. 6)	234-5000-00
3	Mini-Mars Light Cover Yellow	550-5031-06	7	Butyrate -17 Back Panel Screened	830-5482-17
4	Stand-Up, Short Socket (Qty. 3)	077-5101-00	8	#6 X 1/2 PPH A (Qty. 11)	237-5805-00

Between Flipper Magnet Individual Parts
(Not available as an assembly. Located under playfield between flippers)

Nº	Part Name	SPI Part Nº	Nº	Part Name	SPI Part Nº
1	Welded Bracket Assembly	515-6141-00	3	Threaded Core	530-5320-00
2	3/4-13 Flex Nut	240-5315-00	4	Magnet (22-600)	090-5042-00

Stand-Up Target Assemblies: †

500-5321-XX 1" X 1-1/2" Rectangle	500-5232-XX 1" Square	500-5857-XX Narrow Rectangle	500-5835-XX 1" Round	All
(Front View)	(Front View)	(Front View)	(Front View)	(Side View)



Nº	Switch & Target Name	QTY.	Part Nº	Nº	Part Names for A, B, C & D	Part Nº
A	Sw. & Target Assy. 1" X 1 1/2" Rect. (Flat)	0	515-6027-XX	1	Mounting Bracket	535-6896-00
B	Switch & Target Assembly 1" Square (Flat)	10	515-5162-XX	2	Switch Back Plate	535-6452-00
C	Sw. & Target Assy. Narrow Rectangle (Flat)	7	515-5967-XX	3	6-32 Nyloc	240-5010-00
D	Switch & Target Assembly 1" Round (Flat)	0	515-5966-XX	4	6-32 X 3/4 HWH Ser. (Type C) (Qty. 2)	237-5958-00
				5	Switch Diode, 1N4001	112-5001-00
				6	Foam Pad	626-5029-00
				7	Washer 5/16"	242-5017-00
				8	Rivet 1/8" ø X 3/16"	249-5001-00

† Items with a 0 quantity are not used in this game. The following are the color breakdowns for items B & C (replace the "-XX"):
 B: X2 "-08, WHT", X3 "-05, BLU", X1 "-04, GRN"
 C: X1 "-06, YEL", X6 "-04, GRN"

NOTE: THIS GAME ONLY, AN ADDITIONAL SPECIAL TARGET WAS USED:
 Module Stand-Up Target Clear, 500-6075-01
 Please Note: Individual parts are not available. The whole assembly must be ordered.
 See this section. Chapter 1. General Parts, for location of this target.

Plastic Part Color Chart

(As applicable for all parts which are available in various colors.)
 The "-XX" should be replaced with the following 2-Digit Number for the color desired:

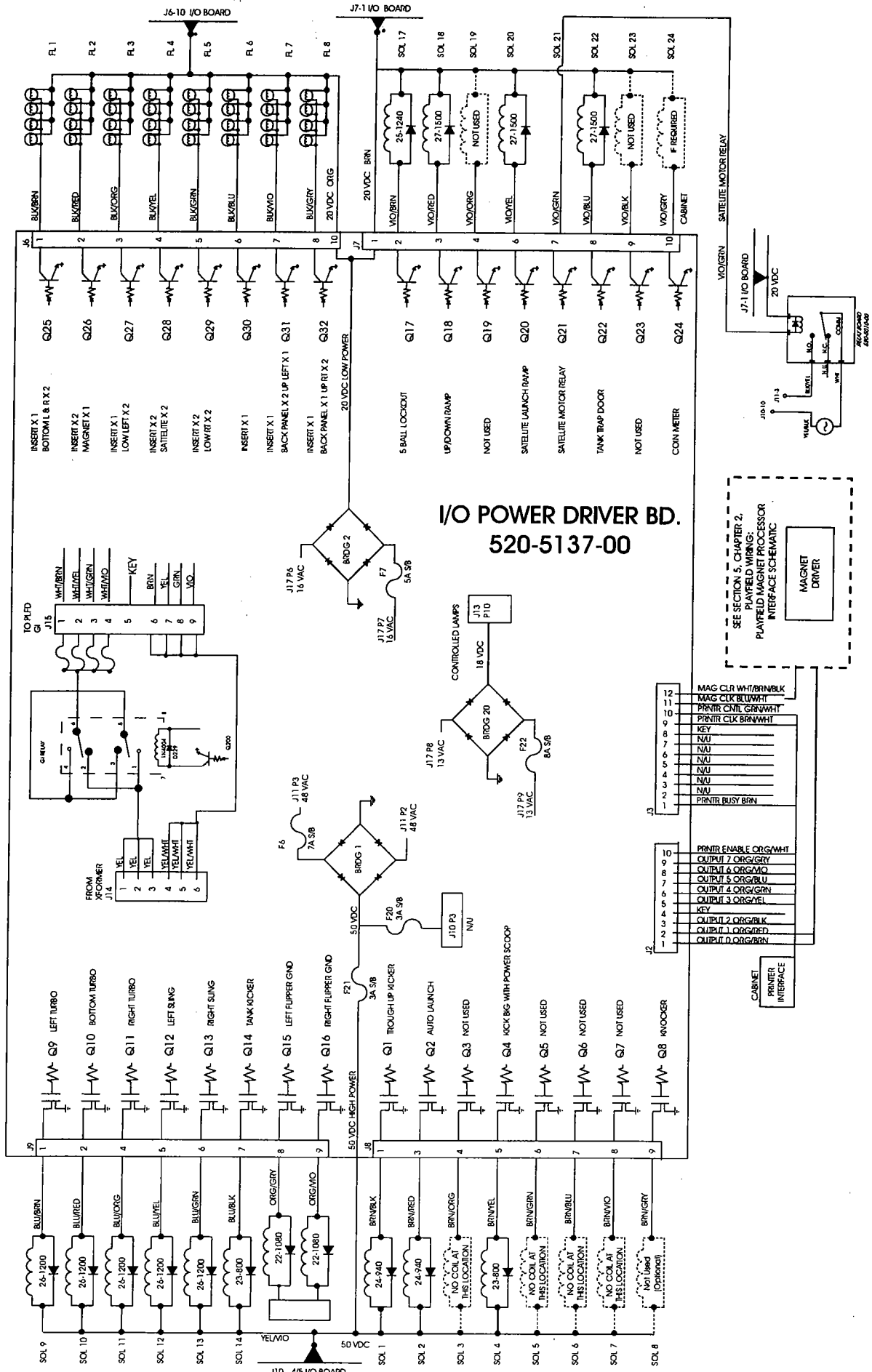
-01: Clear	-06: Yellow	-11: Fluorescent Green
-02: Red	-07: Orange	-12: Fluorescent Blue
-03: Amber	-08: White	-13: Teal Green
-04: Green	-09: Purple	-14: Gray
-05: Blue	-10: Fluorescent Orange	-15: Luminescent

Schematics & Troubleshooting

Section 5
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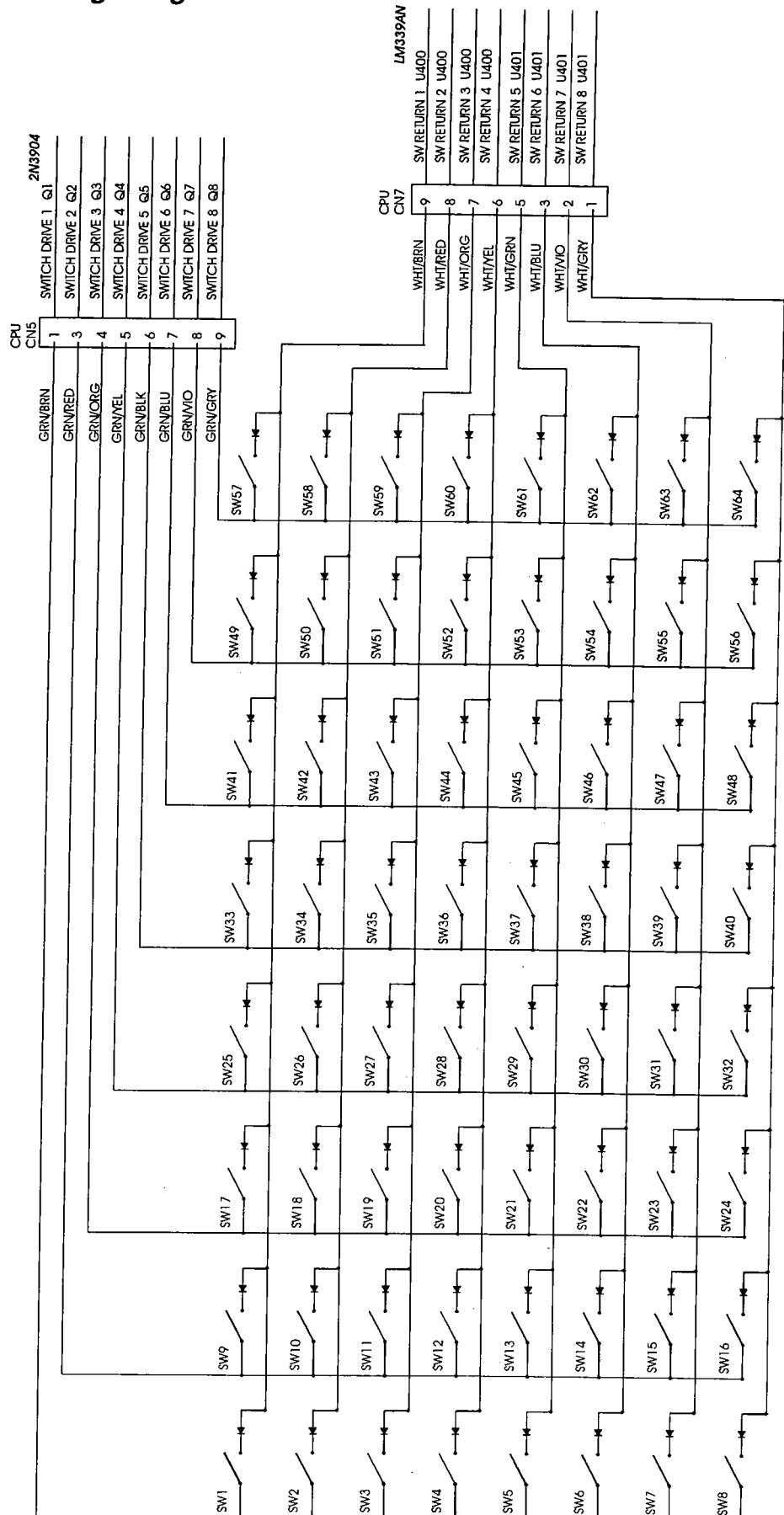
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Backbox I/O Power Driver Board Detailed Wiring Diagram

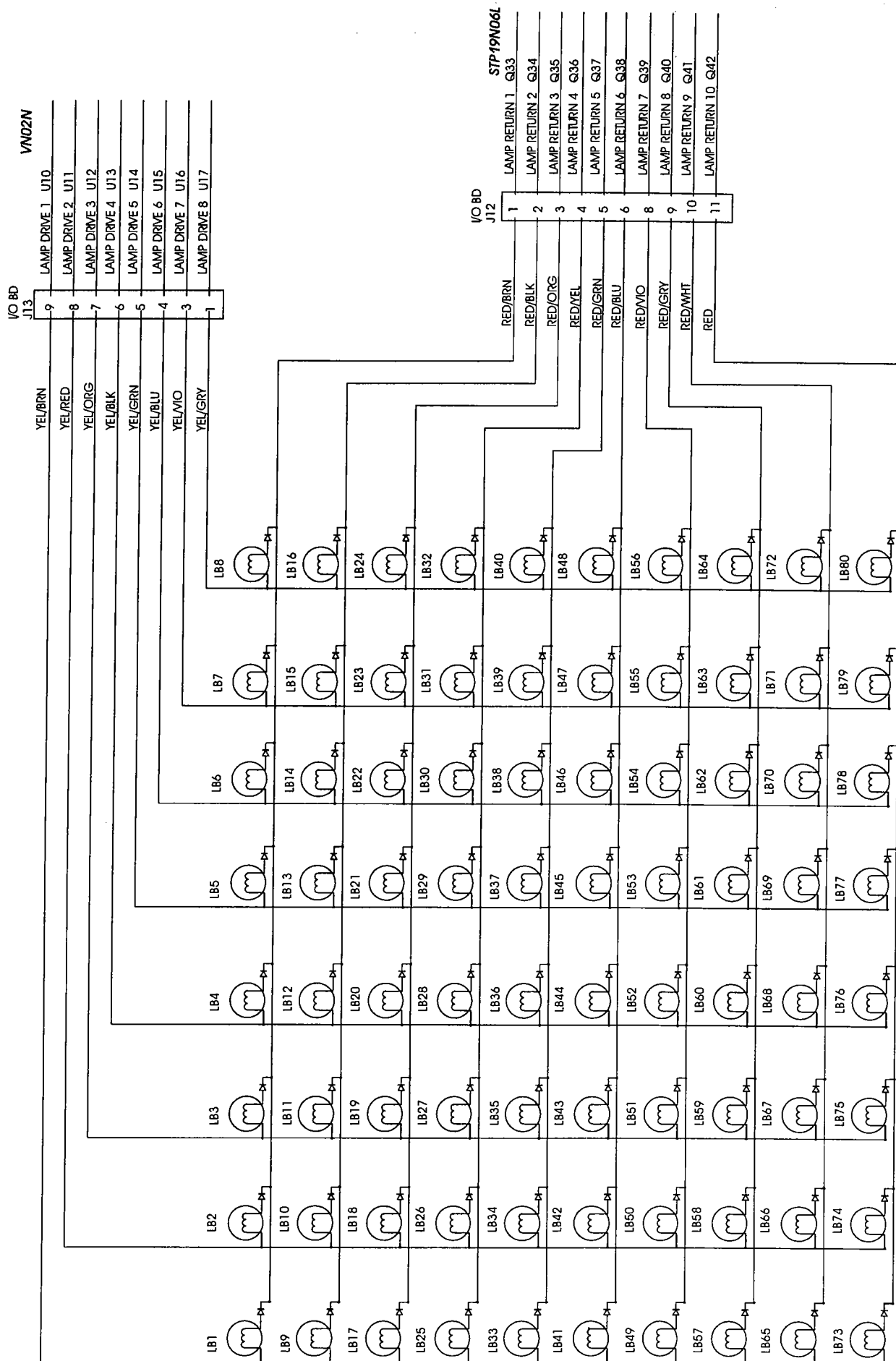


Section 5 | Backbox

Playfield Wiring Diagram

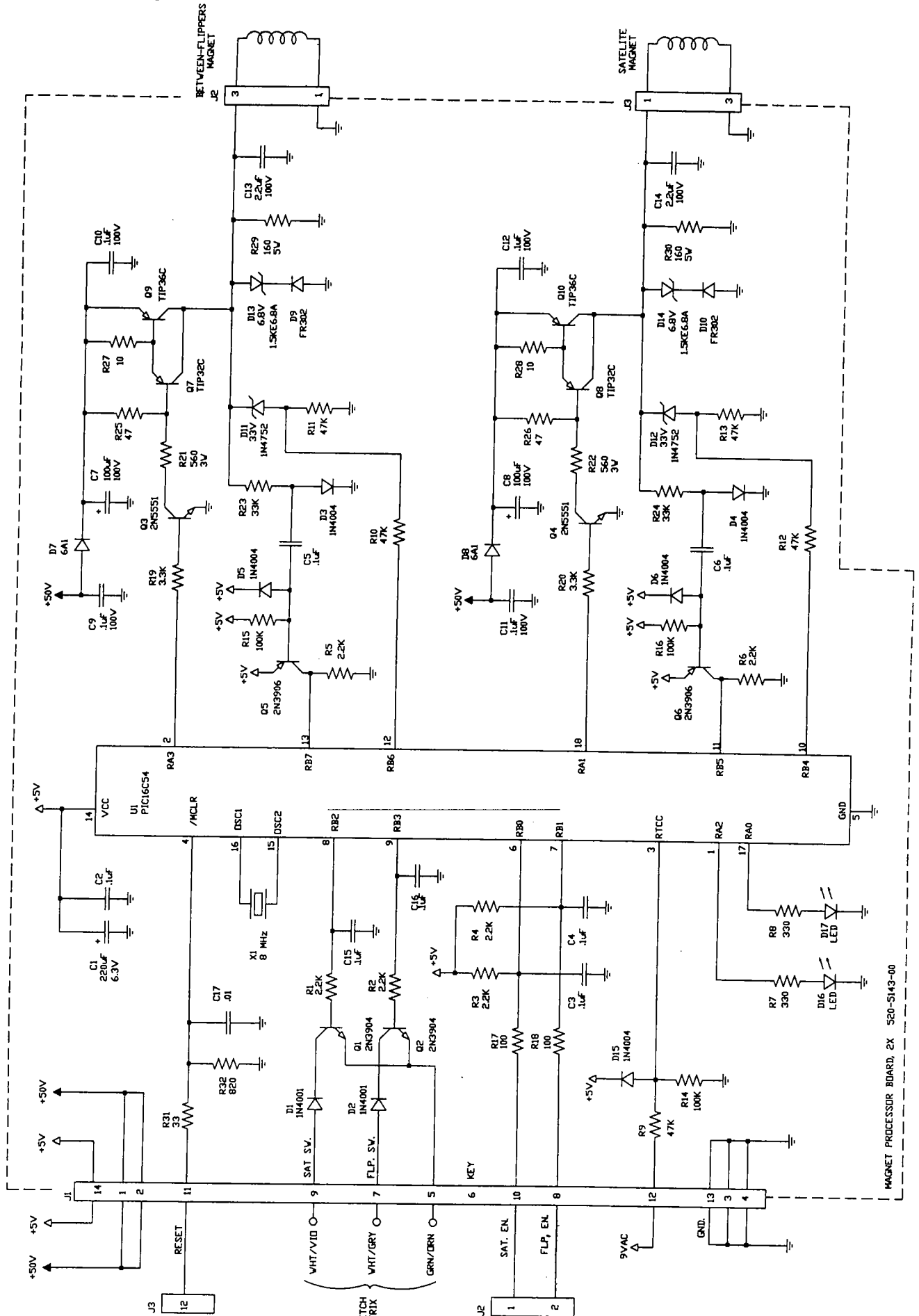


Playfield Lamp Wiring Diagram



Section 5 | Playfield

Playfield Magnet Processor Interface



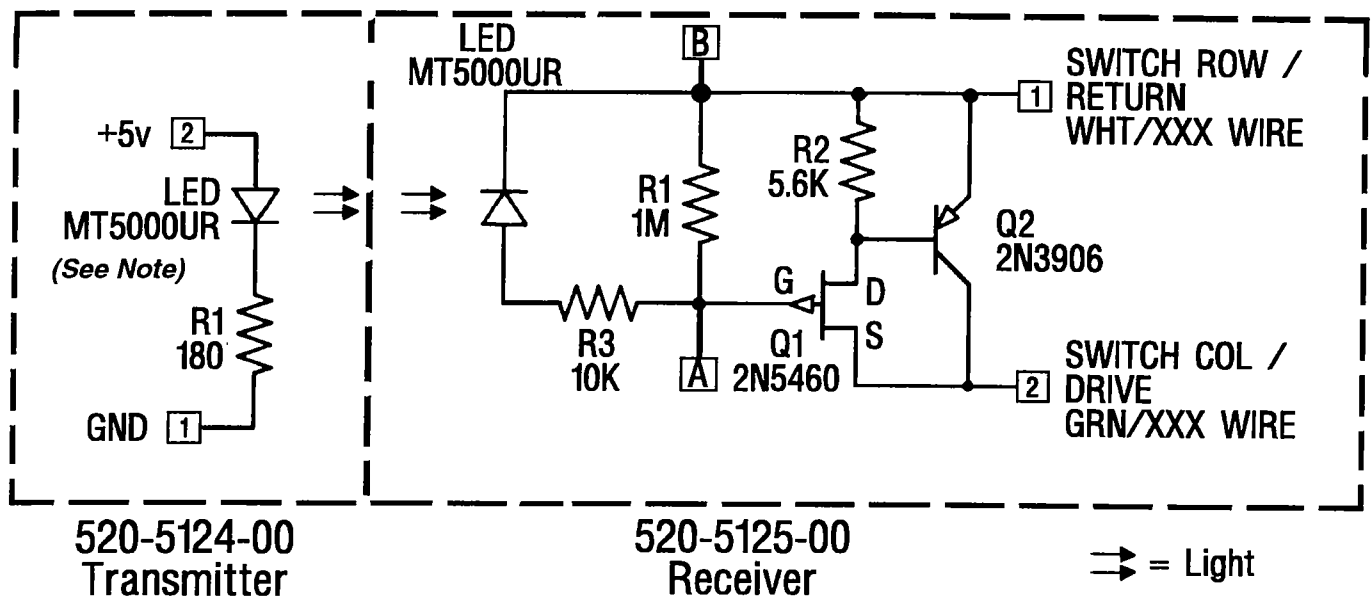
MAGNET PROCESSOR BOARD, 2X 520-5143-00

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



Note: The RADIO SHACK part number for the LED MT5000UR is 276-087.

Troubleshooting

(The following tests indicate normal operating conditions)

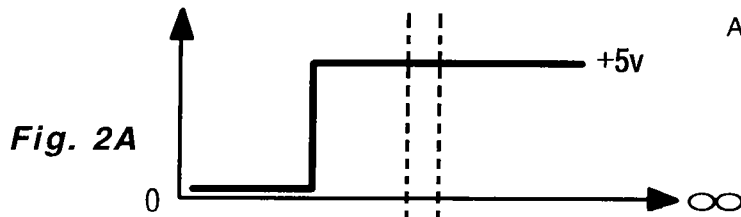
1. Volt Meter Test:

- 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.

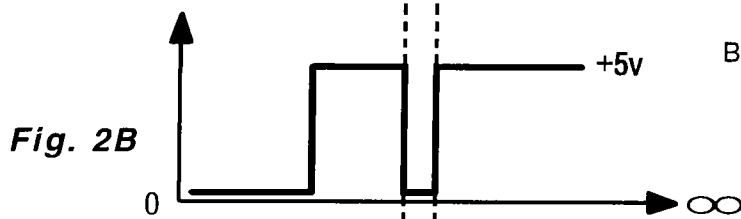
Trough Up-Kicker OPTO Theory of Operation & Schematic

Troubleshooting Continued

2. Oscilloscope Test:



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



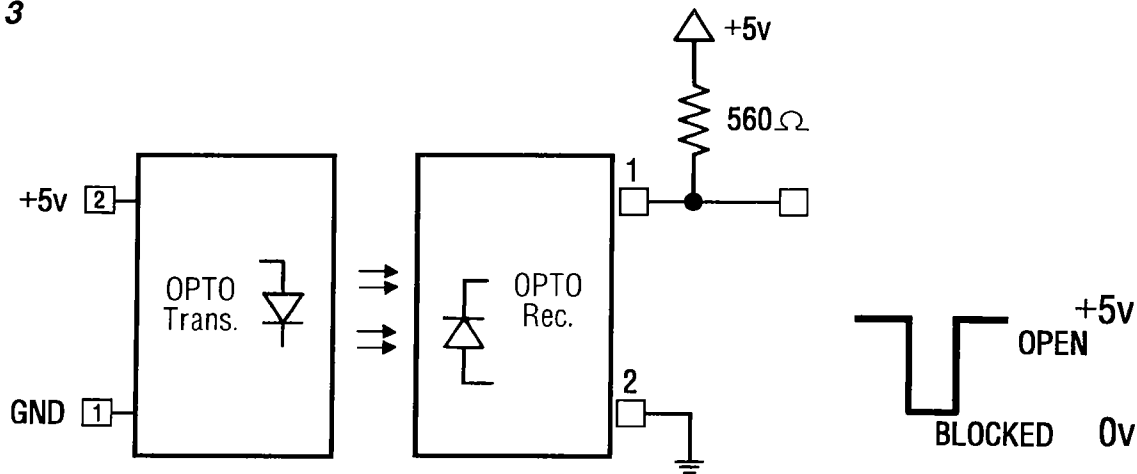
B. **CLOSED OPTO** (Light Blocked) = **SWITCH CLOSED**. Place Scope lead at **Pin-1** of OPTO Rec. Bd. with Scope Grounded. (See Fig. 1). The Scope should display a **PULSE STREAM** indicating Q2 has switched "On" as shown in Fig. 2B, Wave Form Diagram. This is your Switch Drive Pulse.

TI = Switch Read Period

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 Ground. Connect a +5v DC source to **Pin-1** of the Transmitter and GND to **Pin-2**. Align with the Receiver OPTO approximately 3" distance. Using your Volt-Meter or an Oscilloscope, monitor **Pin-1** while **BLOCKING** and **UN-BLOCKING** the **BEAM** from the Transmitter. The output will be approximately +5v DC when the **BEAM** is **not BLOCKED** and approximately 0 volts when the **BEAM** is **BLOCKED**.

Fig. 3

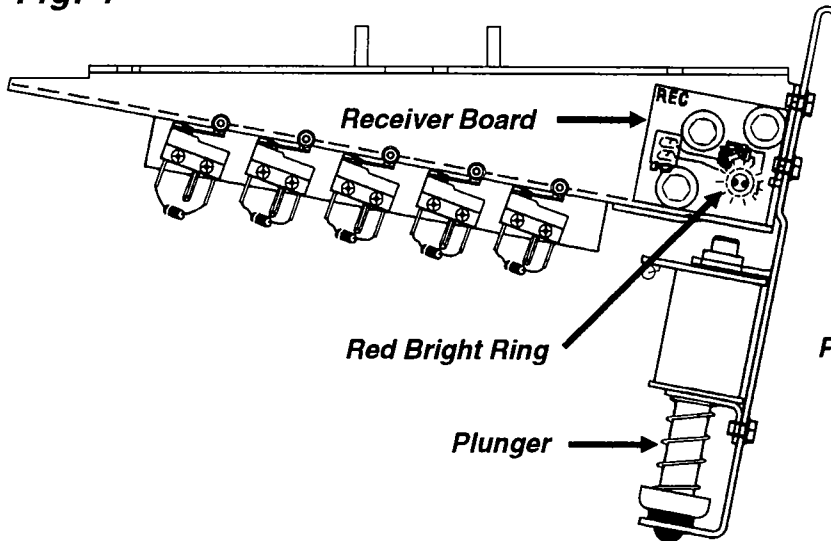


Single Trough OPTO Alignment / Test

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 "RED BRIGHT 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.

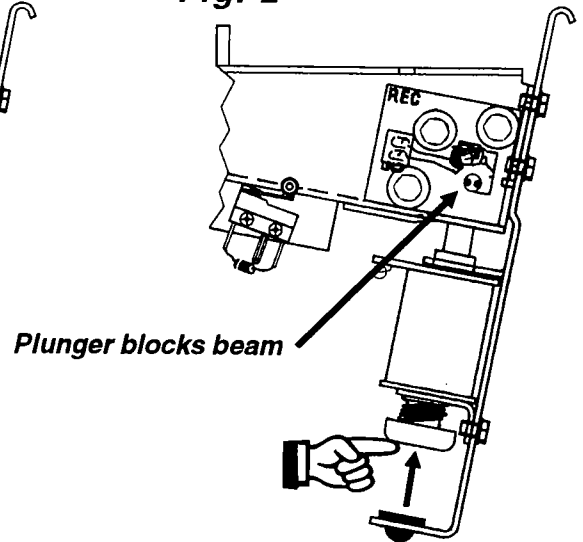
**View facing trough
(with playfield in Service Position #1)**

Fig. 1



**Lift plunger to check
switch as shown.**

Fig. 2



Sectional view from right

Fig. 3a

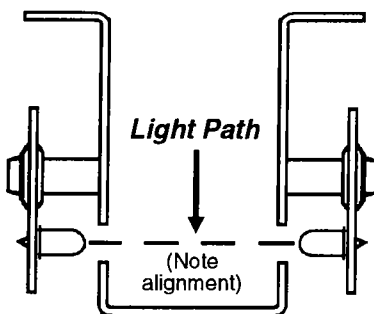
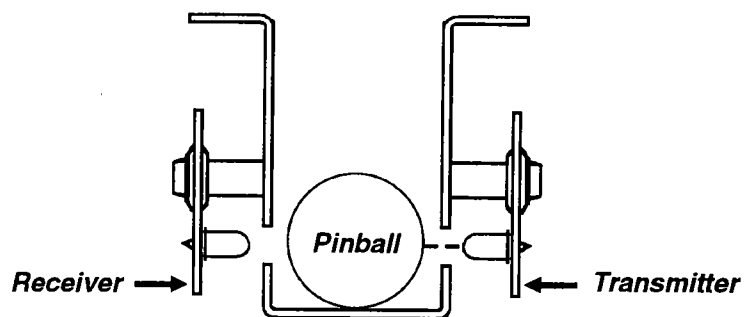


Fig. 3b



IMPORTANT

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

Fig. 4a

**Correct
Position**

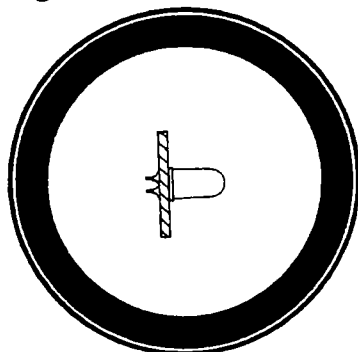
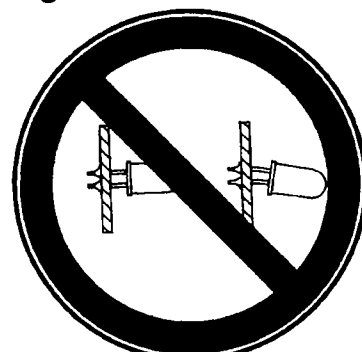
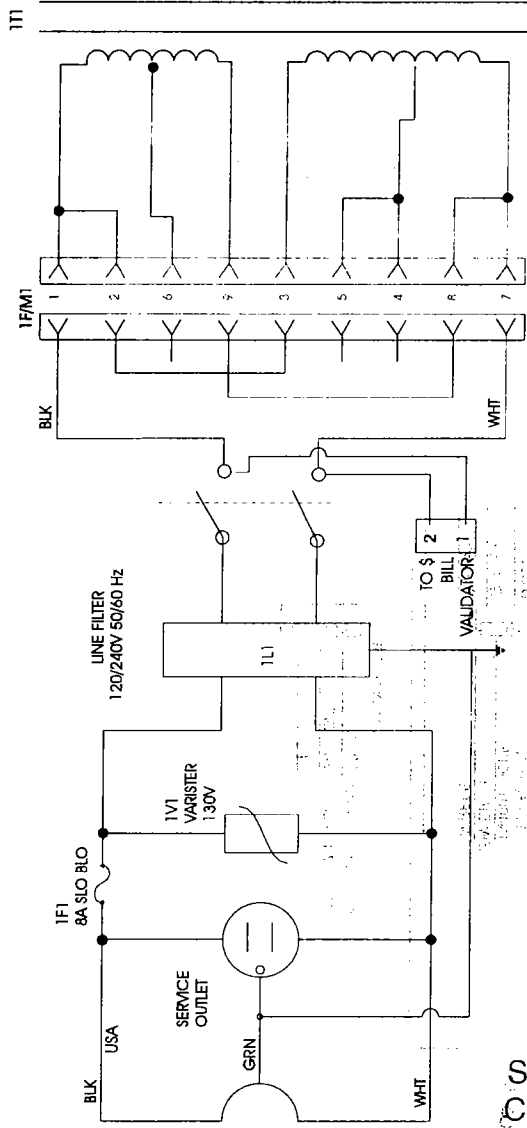
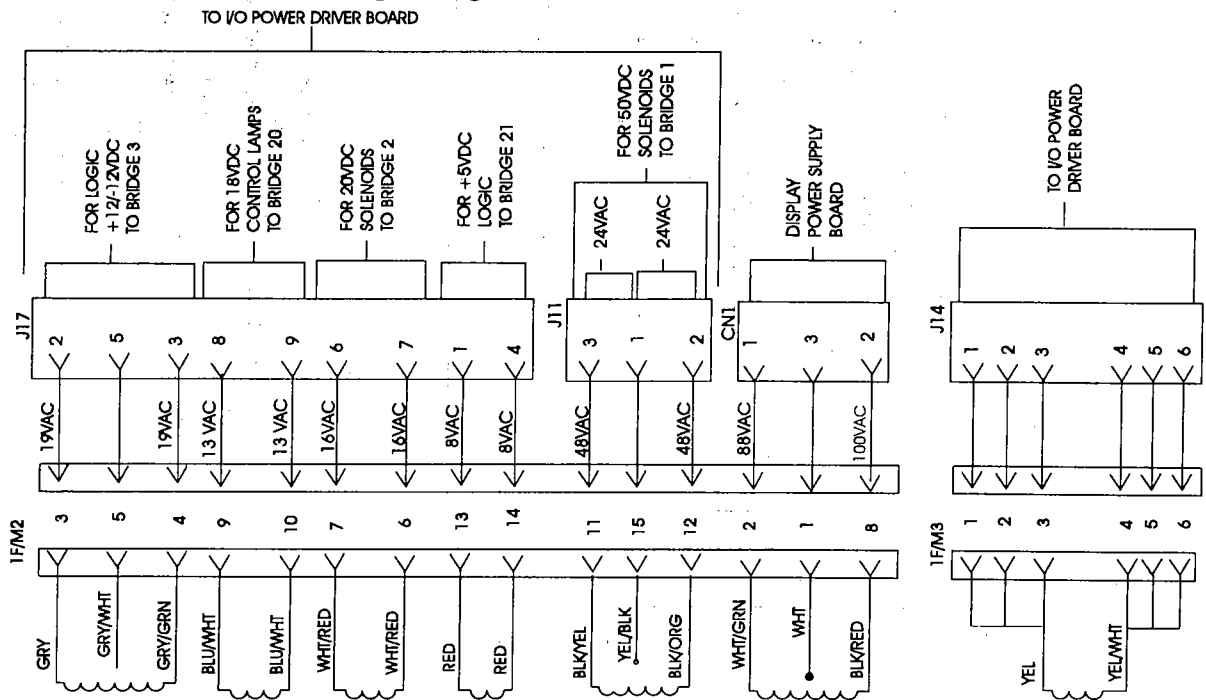


Fig. 4b

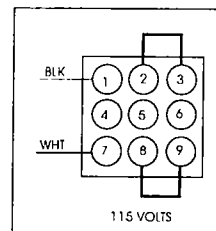
**Incorrect
Position**



Cabinet Wiring Transformer Power Wiring Diagram

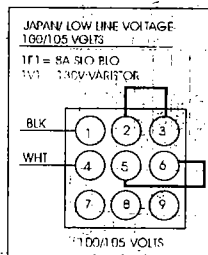
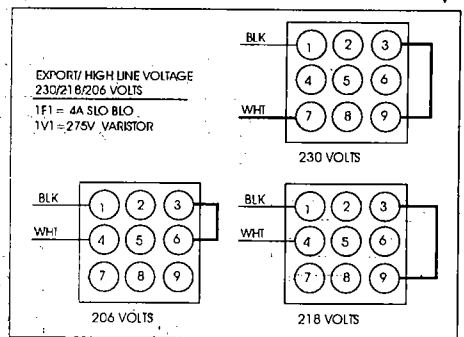


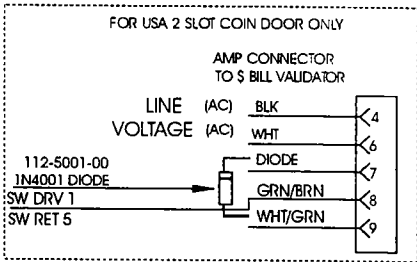
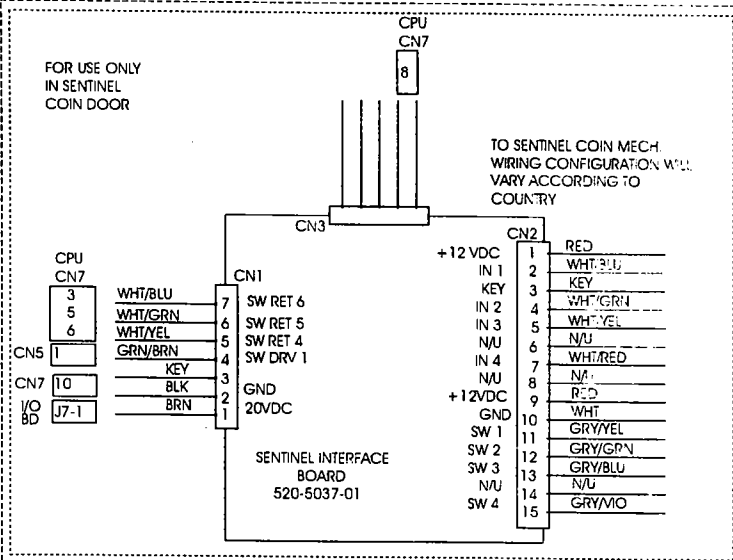
JUMPERS FOR VOLTAGE VARIATION



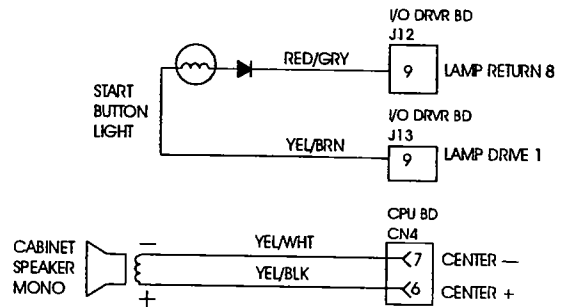
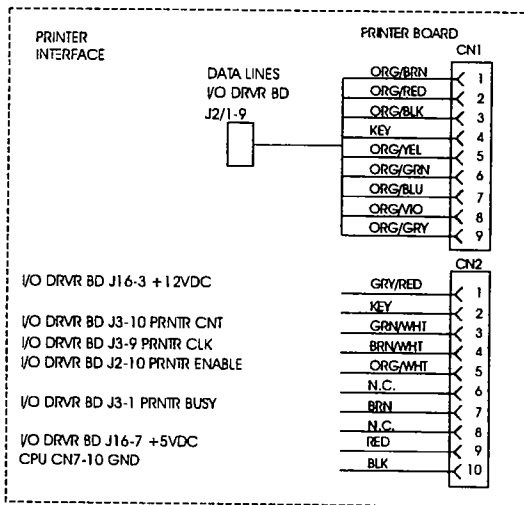
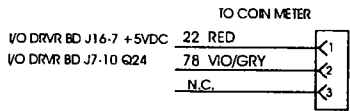
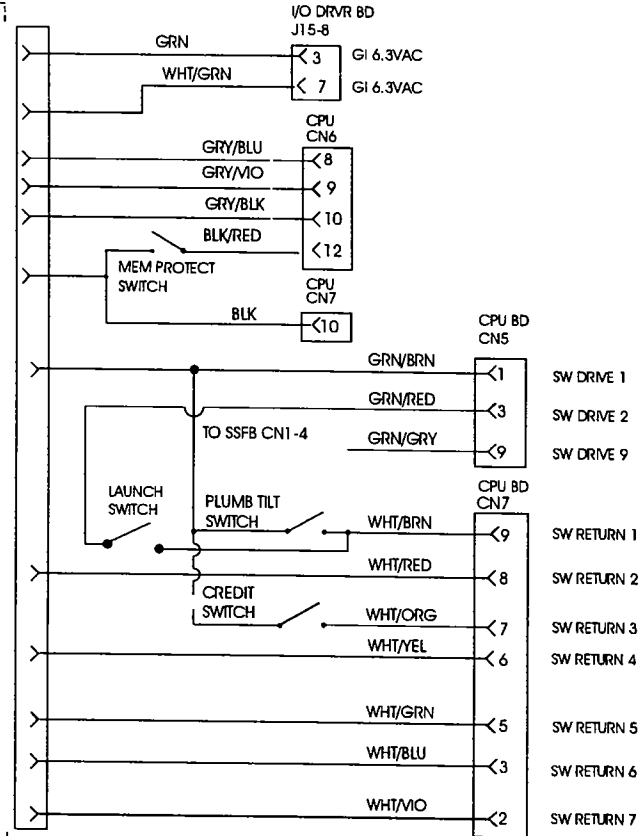
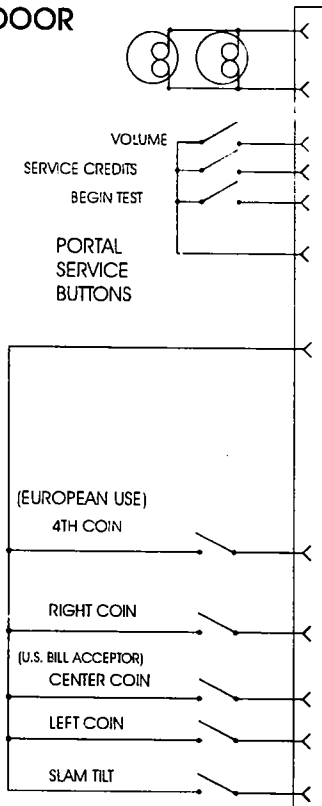
<<<
CONFIGURATION FOR DOMESTIC 115V
>>>

<<< CONFIGURATION OF 220V OR LOWER LINE VOLTAGES FOR INTERNATIONAL USE >>>



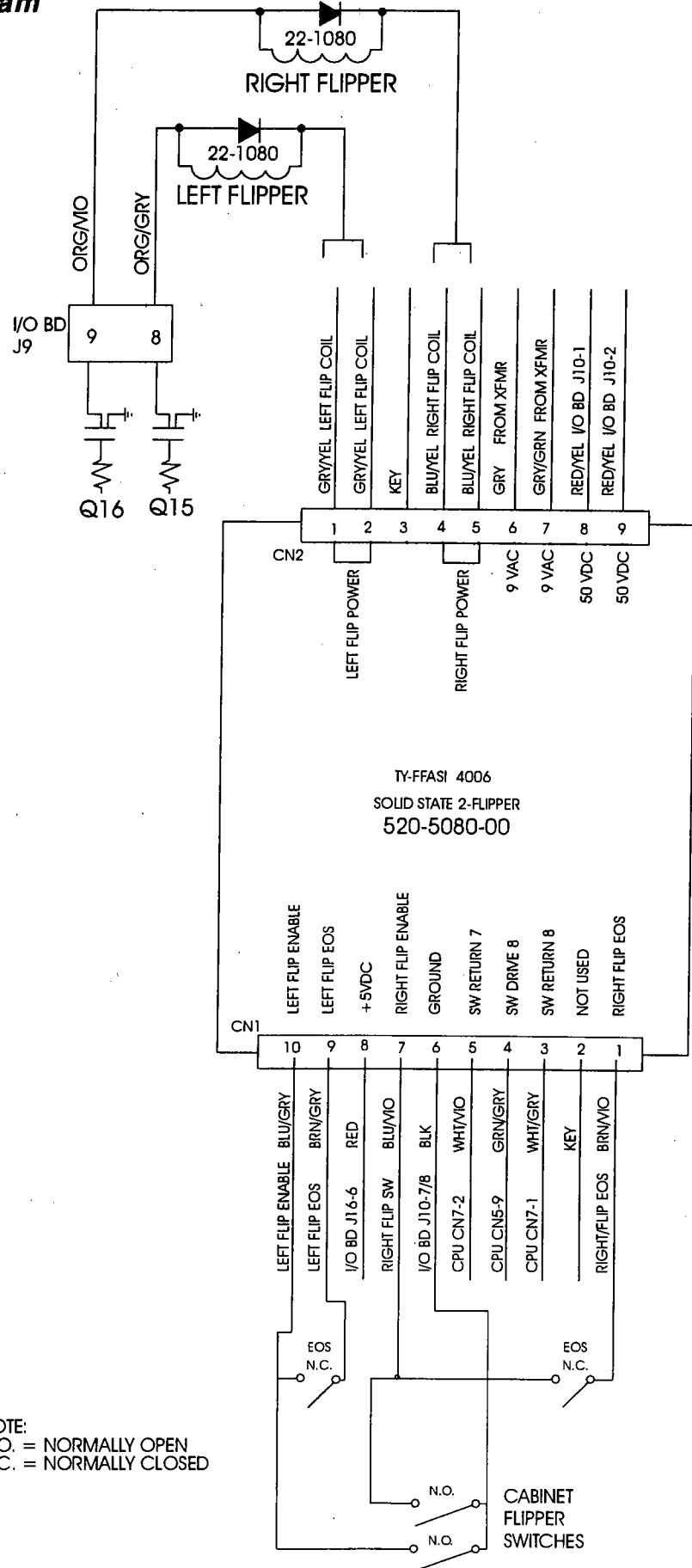


COIN DOOR



Printed Circuit Boards (PCBs)

2-Flipper Wiring Diagram



NOTE:
 N.O. = NORMALLY OPEN
 N.C. = NORMALLY CLOSED

New Solid State Flipper Board

We have redesigned our **Solid State Flipper Board (SSFB)** so that a misadjustment or failure of the **End-of-Stroke (EOS) Switch** will not affect the operation of the flippers. The flippers will still work! The **EOS Switch** is strictly an added feature, not a functional part of the circuit (see EOS Switch Theory of Operation).

Theory of Operation for the Solid State Flippers

The Solid State Flipper Board is a Multiple Flipper Solenoid Driver Circuit. Each solenoid driver circuit contains a One Shot Timer, a 50V Driver, and an 8V Driver.

Looking at one circuit, Schmidt NAND gates U1A, U1b, and U1D make up the One Shot Timer. The timer length is controlled by R10, R33 and C2. The output of the timer is gated at U1C with the buffered switch input from Q6. The output of U1C controls the 50V driver circuit consisting of Q4, Q1, Q2, Q3, and D1. As long as the flipper button is activated, Q6 will keep the 8V driver circuit, SR1, on.

The 50 volts provides the actuation power to the flipper solenoid while the 8 volts provides the holding power.

Theory of Operation for the EOS Switch

The **End of Stroke (EOS) Switch** used in our flipper circuit is a Gold Peened Contact, Blade Switch Assembly, mounted on the flipper assembly.

Electrically, it is connected in series with the Cabinet Flipper Switch and the Flipper EOS input on the Solid State Flipper Board (SSFB) connector CN1 which enables the 50 Volt DC Drive Circuit.

Referring to the Flipper Wiring Diagram, one side of the Flipper Cabinet Switch is connected to ground (BLK-Wire), the other side (BLU-VIO Wire) is connected to the flipper switch input on the SSFB Connector CN1 which enables your 9 Volt DC holding voltage and is connected in series to the EOS switch which is a normally closed switch.

The function of the EOS Switch is to prevent the flipper bat from being knocked back by a high velocity shot on the playfield. If while holding the flipper in the up position, the bat is moved back 1/16" or more, the EOS Switch will close giving the coil another 50 Volt pulse.

EOS Switch Adjustment

The switch contacts should be adjusted so that when the solenoid is energized, the contacts stay closed for almost the full travel of the plunger. The contacts should open 1/16" before the plunger bottoms out or reaches maximum travel.

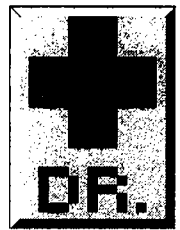
Troubleshooting Tips

The only indication of a problem you will have is the player complaining that when the flipper bat is being held in the up position, a high velocity shot from one of the playfield solenoids causes the ball to hit the flipper bat and physically knock it back. This will not occur if the EOS Switch is working. Check switch for alignment and continuity, replace if necessary.

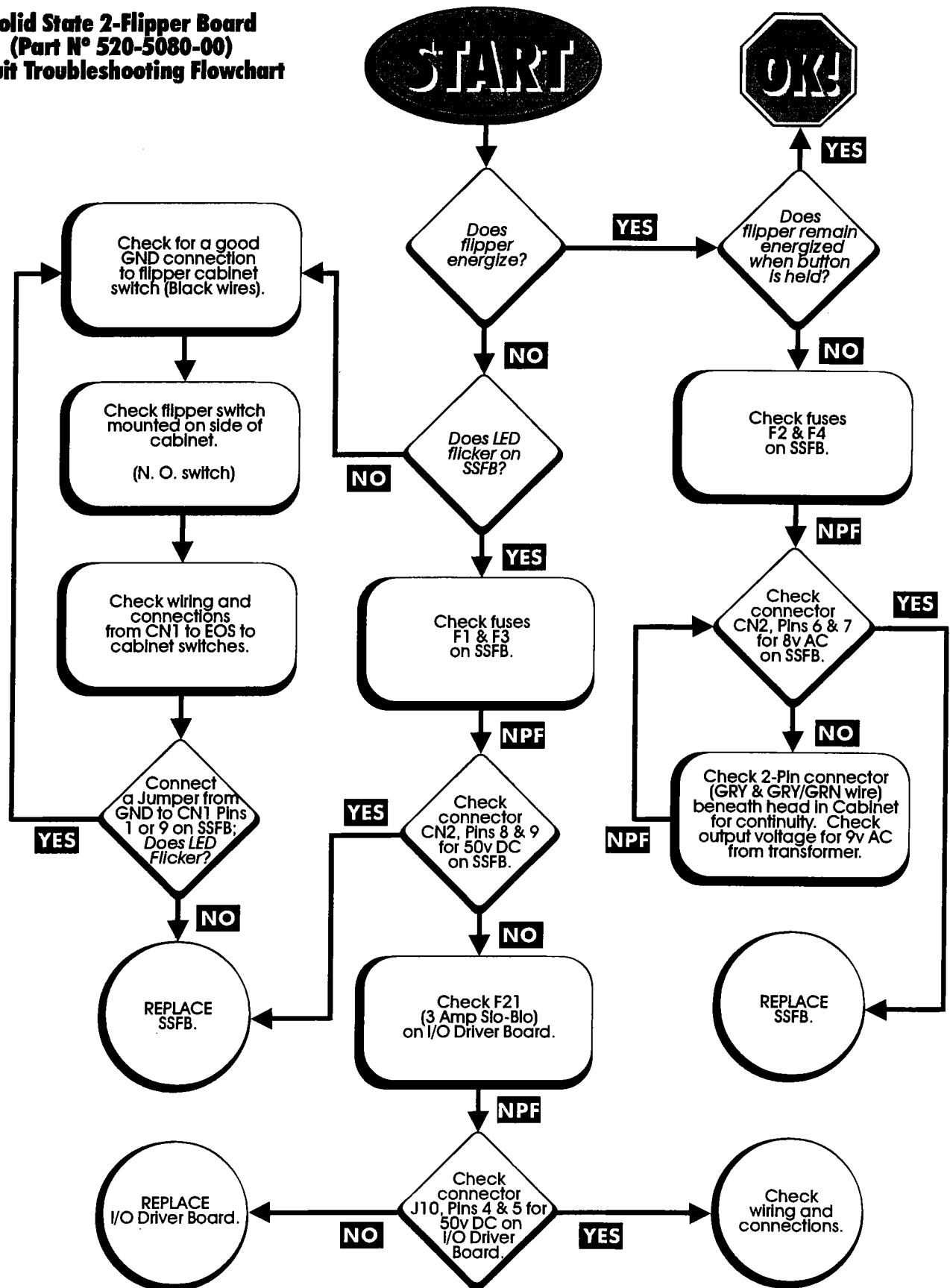


Note:

See the inside cover and the end of Section 3, Chapter 2, Diagnostics, for information on the Dr. Pinball option through the **Portals™ Service Menu** for additional information and help through an additional flow chart.



**Solid State 2-Flipper Board
(Part N° 520-5080-00)
Circuit Troubleshooting Flowchart**

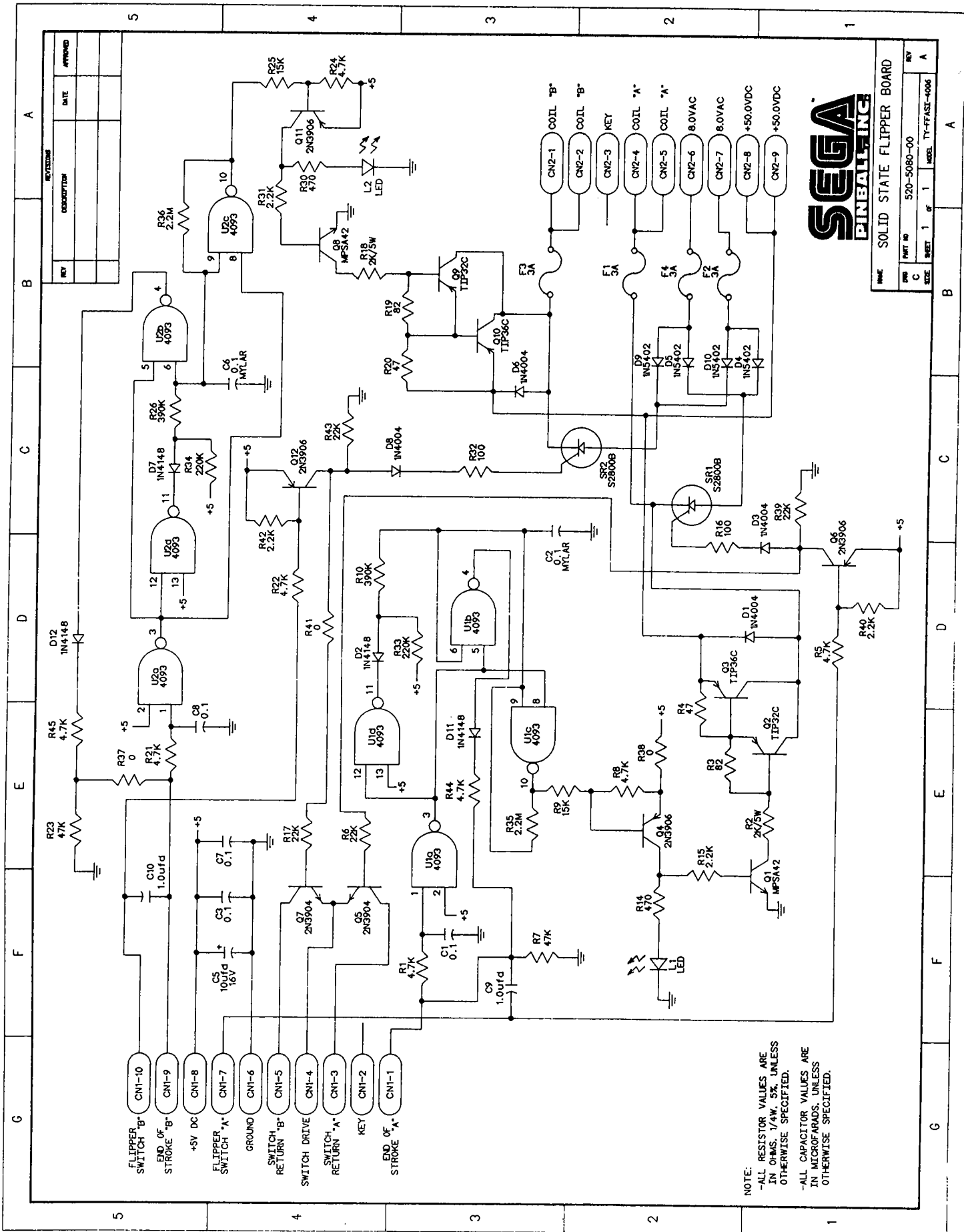


SEE GLOSSARY OF TERMS FOR UNKNOWN ACRONYMS.

FOR FURTHER REFERENCE, SEE 2-FLIPPER WIRING DIAGRAM.

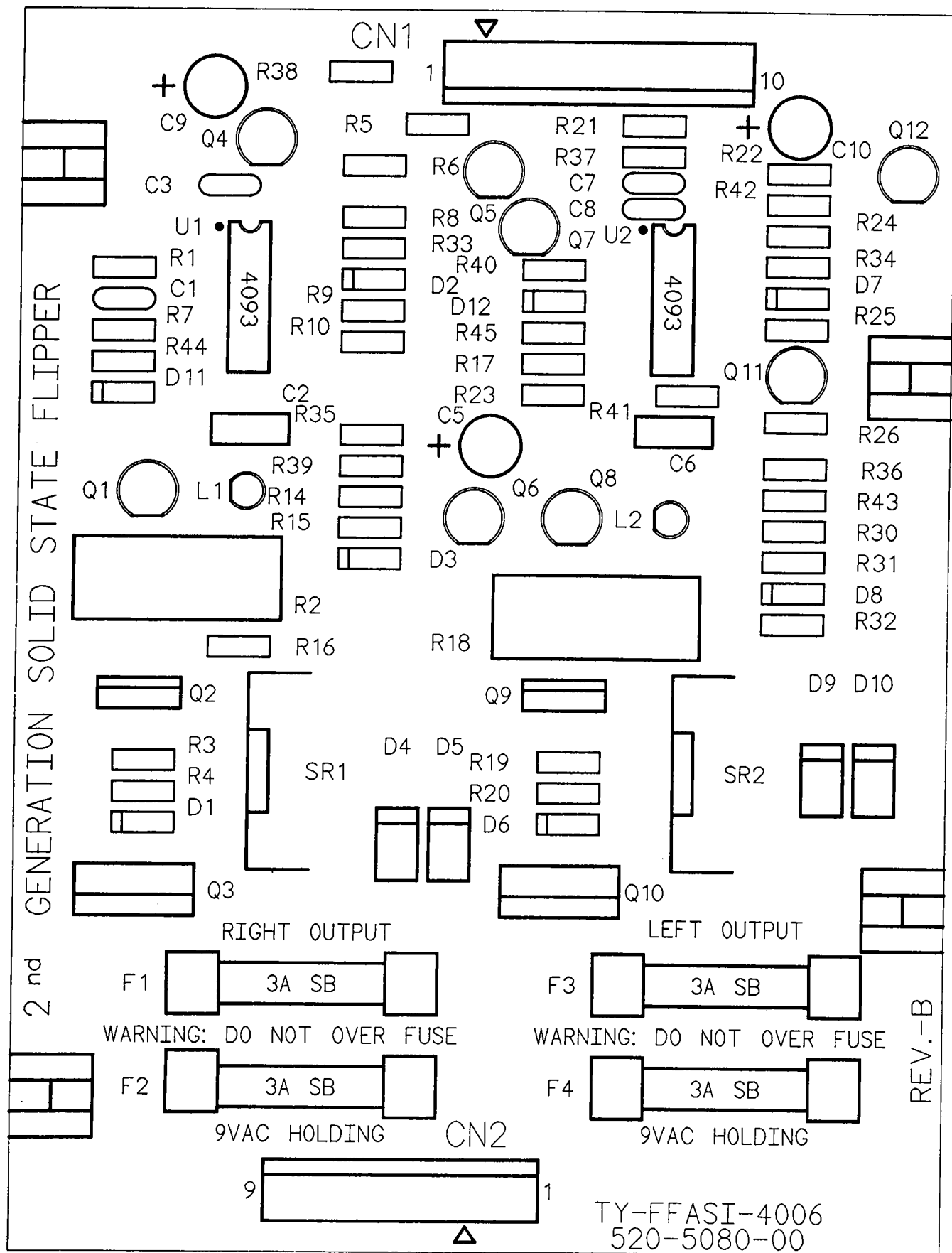
Section 5 | PCBs

Solid State Flipper Board Schematic

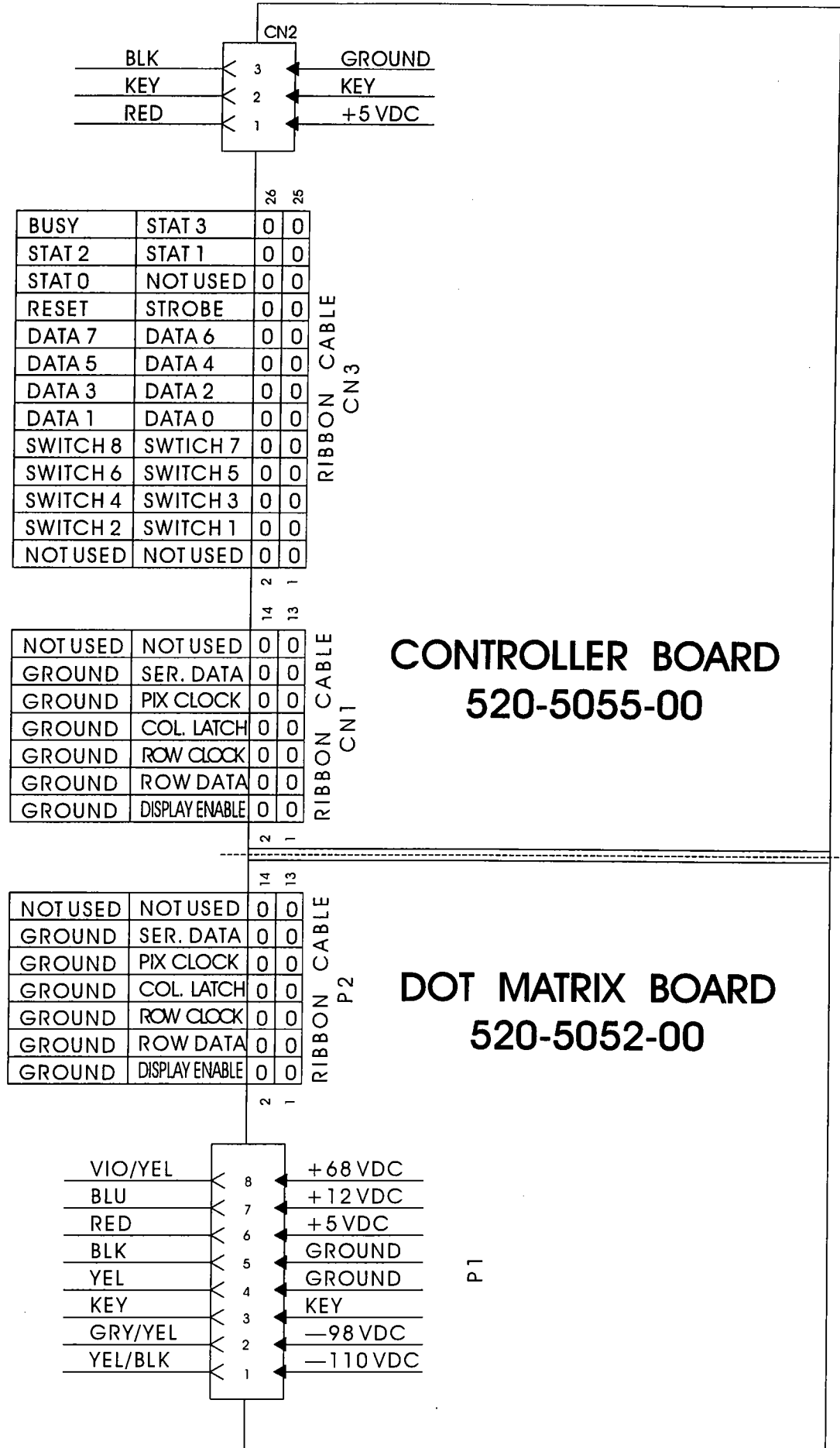


Section 5 | PCBs

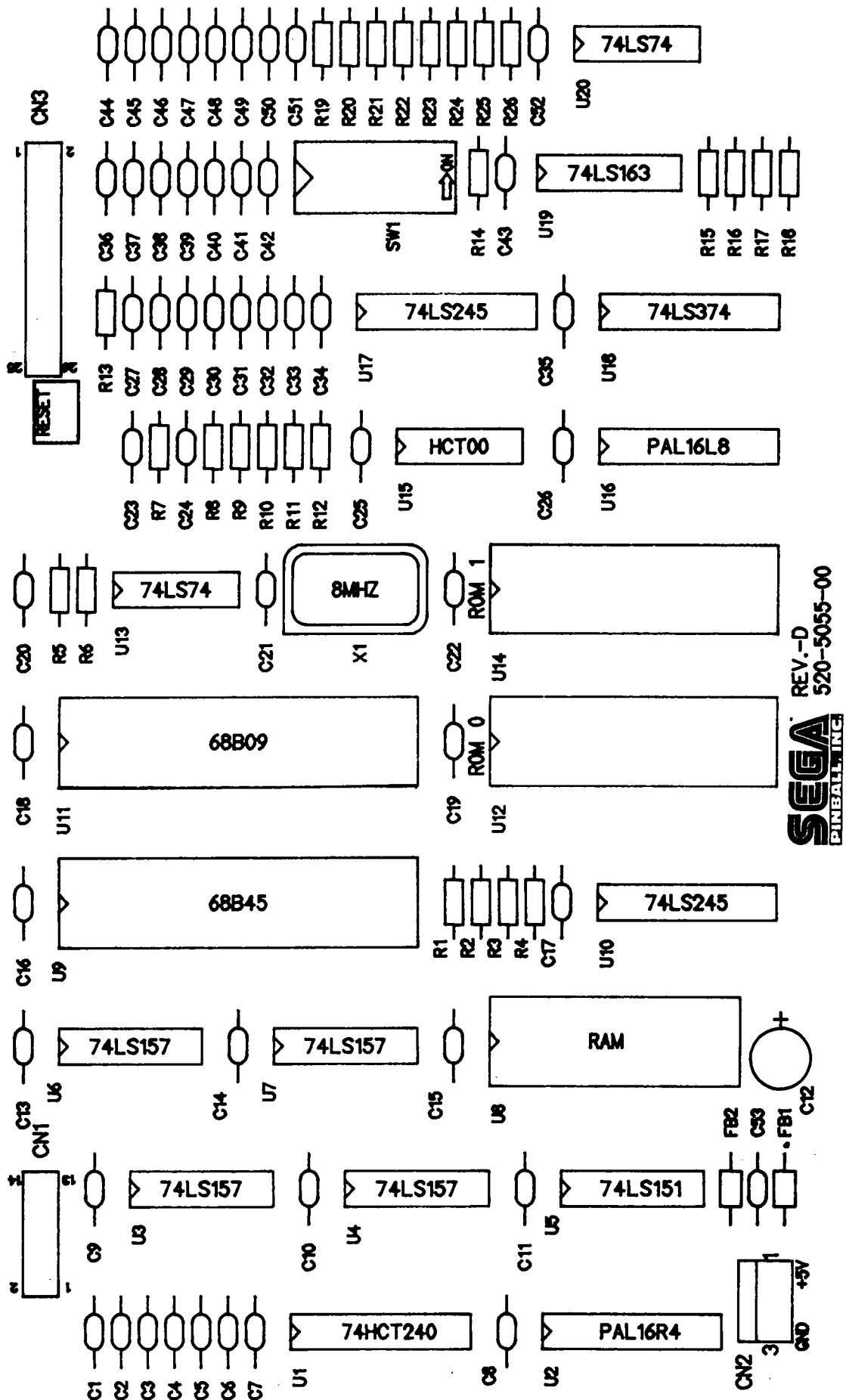
Solid State Flipper Board Component Layout



Dot Matrix & Controller Board Combined Display Connections

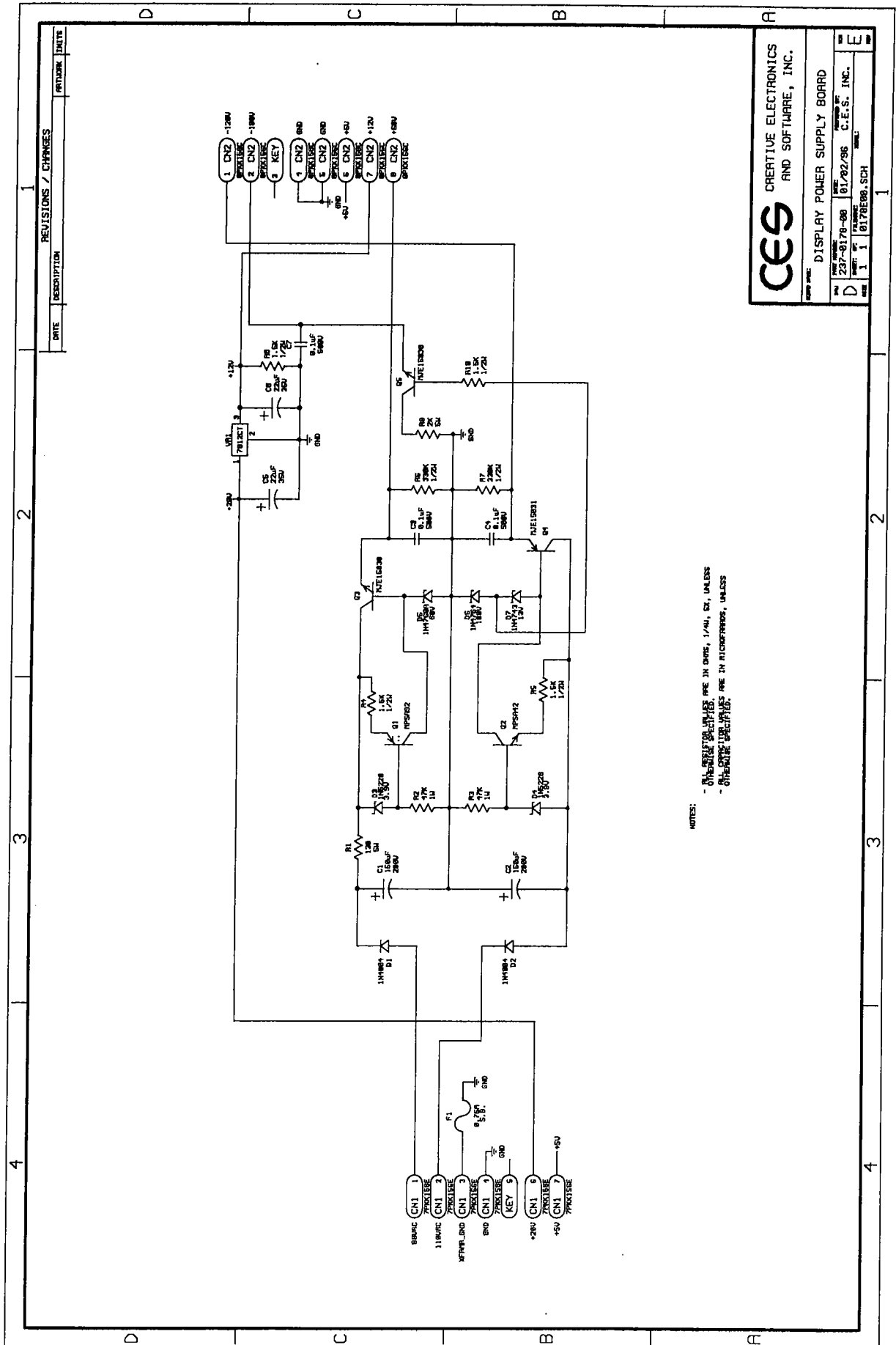


Display Controller Board Component Layout



SEGA PINEAPPLE INC.
REV.-D
520-5055-00

Display Power Supply Board Schematic



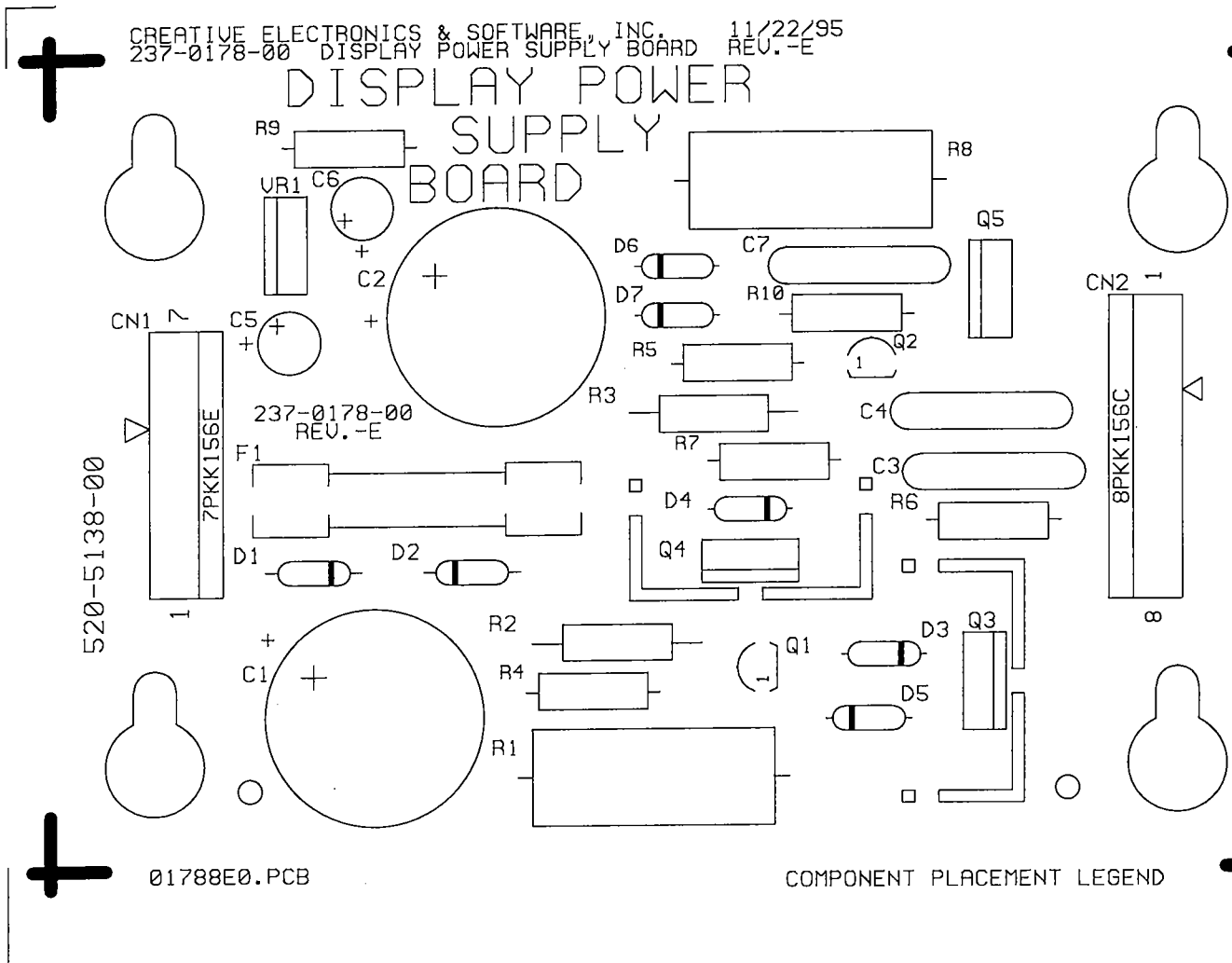
NOTES:
 - DIMENSIONS ARE IN DIMS, 1/4", ET, UNLESS OTHERWISE SPECIFIED.
 - ALL OTHER DIMENSIONS ARE IN MICRODIMENSIONS, UNLESS OTHERWISE SPECIFIED.

CES CREATIVE ELECTRONICS AND SOFTWARE, INC.

DATE	DESCRIPTION	REVISIONS / CHANGES	ARTWORK	DATE
D	237-0170-00	01/02/95	C.E.S. INC.	
REV	1	0178E00.SCH		

Section 5 | PCBs

Display Power Supply Board Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	1	Note:	F1	S.B. 0.5A
2	2		Q3 Q4	HEATSINKS - AAVID #563002
3	2	Part Numbers are not yet yet availabe.	C2 C1	200V 150uF RADIAL LYTIC
4	4		R10 R9 R5 R4	1/2W 1.5K
5	2		R7 R6	1/2W 330K
6	2		R2 R3	1W 47K
7	1		R1	5W 130
8	1		R8	5W 2K
9	2		D3 D4	3.9V 5228
10	1		D5	68V 4760A
11	1		D6	100V 4764
12	1		D7	13V 4743
13	1		Q1	MPSA92
14	1		Q2	MPSA42
15	3		C3 C4 C7	500V 0.1uF CERAMIC DISK
16	1		Q4	MJE15031
17	2		Q3 Q5	MJE15030
18	2		C5 C6	25V 22uF RADIAL LYTIC
19	1		VR1	78-12CT
20	1		CN2	8pkk156 (PIN3=KEY)
21	2		D1 D2	1N4004
22	1		CN1	7PKK156E (PIN5=KEY)
23	2		Q3 Q4	6/32 KEY NUT
24	2		Q3 Q4	6/32 X 3/8 SCREW
25	2		F1	FUSECLIPS

Section 5 | PCBs

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 fed 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 (1 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 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.

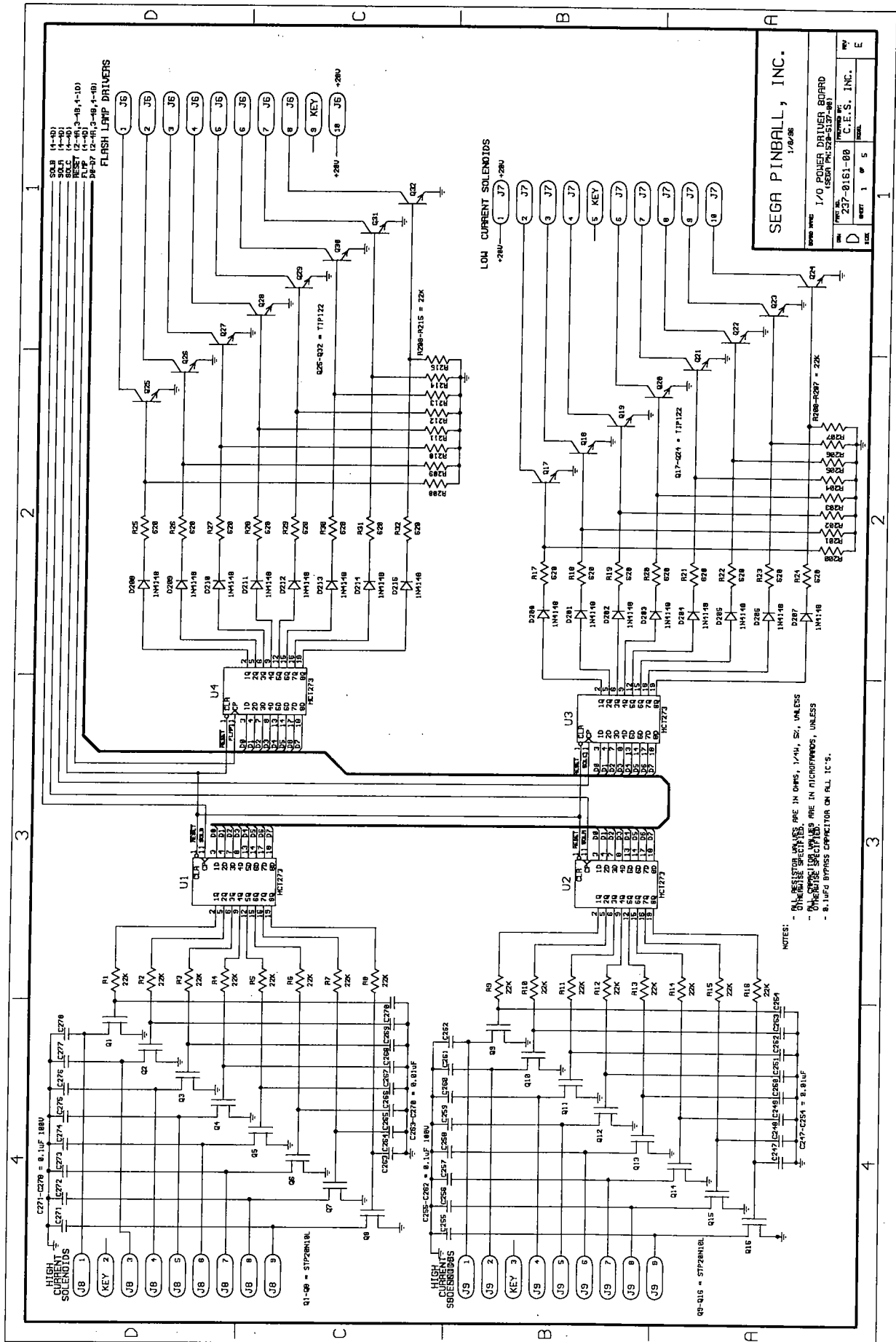
Lamp Matrix:

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 Schematic (Sheet 1 of 5)



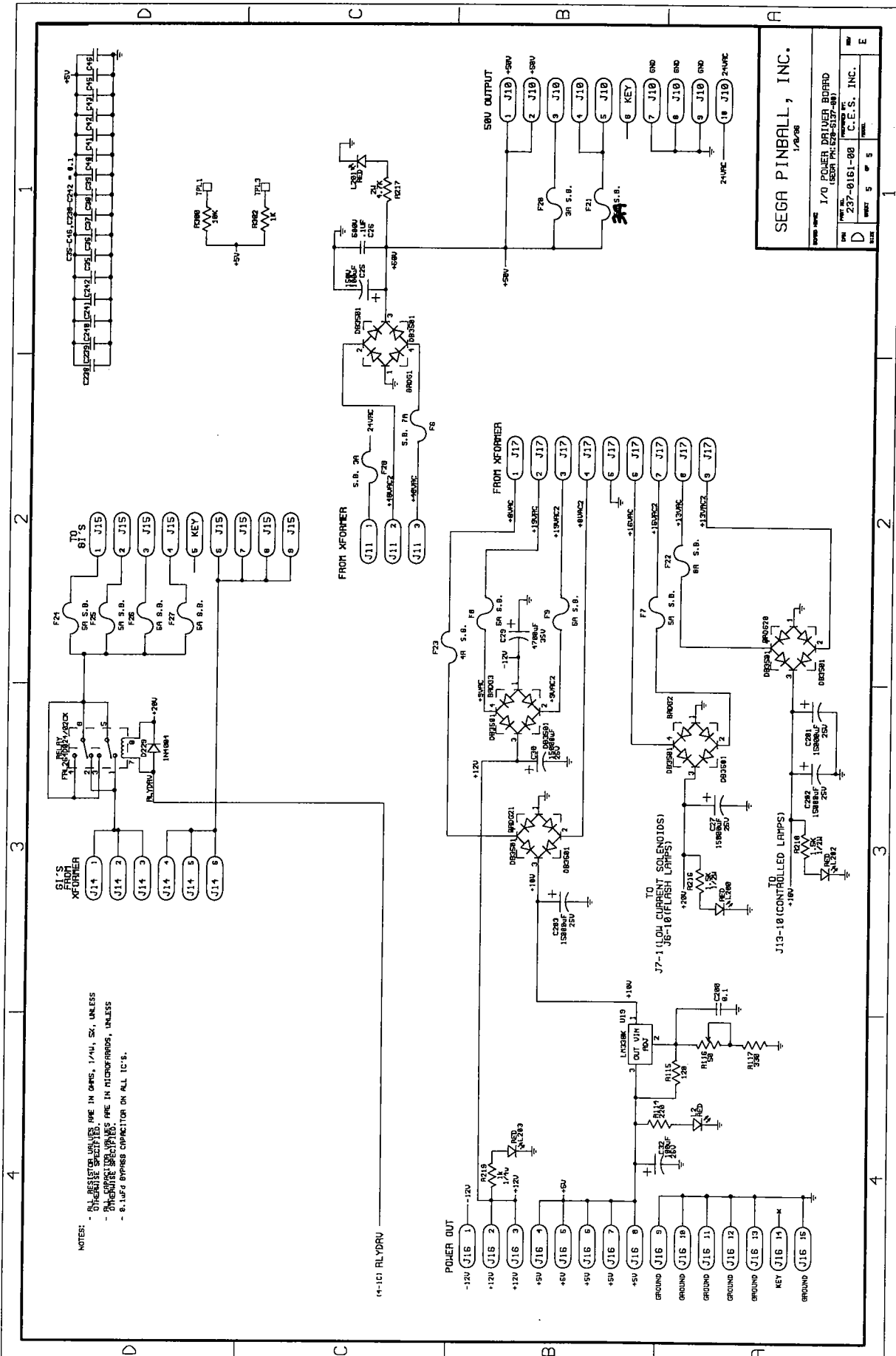
SEGA PINBALL, INC.
1/10/86

REV	DATE	BY	CHK
D	1/10/86		

I/O POWER DRIVER BOARD
USBR PRS52P-512P-981
237-9161-00 C.E.S., INC.

NOTES:
- ON RESISTOR VALUES ARE IN OHMS, 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ON RESISTOR VALUES ARE IN MICROHMS, UNLESS OTHERWISE SPECIFIED.
- 0.1UF BYPASS CAPACITOR ON ALL IC'S.

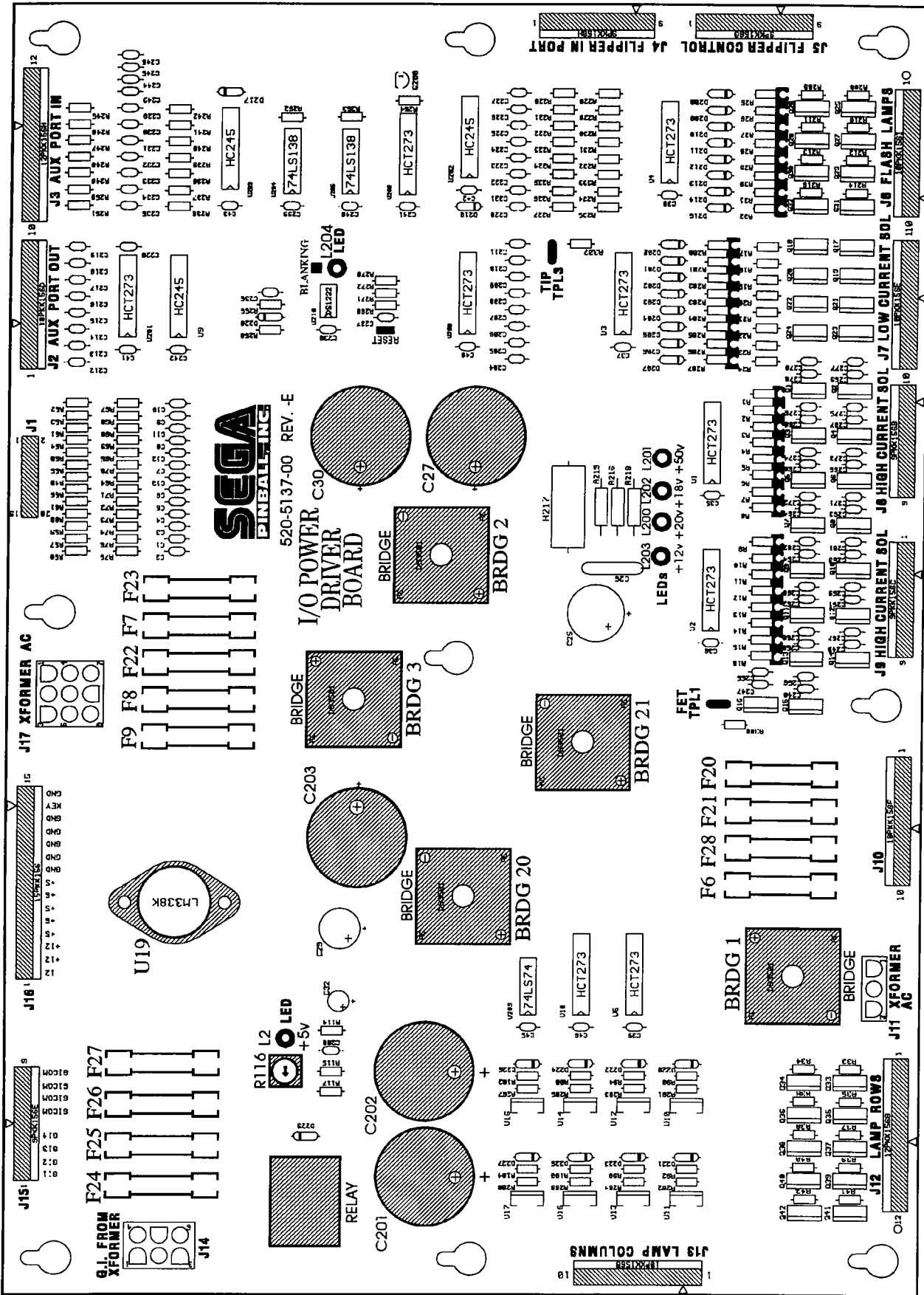
I/O Power Driver Board Schematic (Sheet 5 of 5)



SEGA PINBALL, INC.
1/4/78

BOARD NAME	I/O POWER DRIVER BOARD	REV	1
DESIGNER	(SEGA) PHILIP (237-48)	DATE	1/4/78
PROJECT NO.	237-0161-08	WORKSHEET NO.	5 OF 5
DATE		WORKSHEET	

I/O Power Driver Board Component Layout



TEST POINTS:

- ◀ TIP TPL3
- ◀ BLANKING
- ◀ L204 LED
- ◀ RESET
- ◀ L201 LED+50v
- ◀ L202 LED+18v
- ◀ L200 LED+20v
- ◀ L200 LED+12v
- ◀ FET TPL1
- ◀ L2 LED +5v
- ◀ R116 POT

Section 5 | PCBs

I/O Power Driver Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
1	16	Note: Part Numbers are not yet available.	C260 C259 C258 C257 C256 C278 C271 C255	100V 104 (0.1uF)
2	30		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)
3	16		C263 C264 C265 C270 C269 C268 C267 C266 C247 C254 C253 C252 C251 C250 C249 C248	103 (0.01uF)
4	13		C7 C8 C9 C10 C11 C12 C13 C1 C2 C3 C4 C5 C6	221 (220pF)
5	8		C227 C226 C220 C221 C222 C223 C224 C225	102 (0.001uF)
6	17		C35 C36 C37 C38 C39 C40 C41 C42 C43 C45 C46 C200 C239 C238 C240 C241 C242	104 (0.1uF)
7	16		Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q16 Q15 Q14 Q13 Q12 Q11 Q10 Q9	20N10L
8	32		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		R17 R32 R18 R19 R20 R21 R22 R23 R24 R31 R30 R29 R28 R27 R26 R25	620
10	17		R237 R236 R40 R39 R38 R37 R36 R35 R34 R33 R238 R239 R240 R241 R242 R42 R41	39K
11	13		R64 R72 R73 R74 R75 R76 R71 R70 R69 R68 R67 R66 R65	100
12	8		R90 R92 R94 R96 R98 R100 R102 R104	6.8K
13	1		R115	120
14	8		R221 R220 R222 R223 R224 R225 R226 R227	47K
15	17		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
16	8		R57 R58 R59 R60 R61 R252 R253 R256 R270 R49	47K
17	2		R271 R56 R55 R54 R53 R52 R51 R50 R255 R300	10K
18	9		R117 R272	330
19	11		U6 U4 U18 U2 U1 U200 U3 U201 U206	HCT273
20	2		RESET	DO NOT STUFF
21	9		R219	1/4W 1K
22	1		R218 R216	1/2W 1.5K
23	1		F24 F25 F26 F27 F8 F9 F7 F21	S.B. 5A
24	2		F6	S.B. 7A
25	8		F23	S.B. 4A
26	1		F22	S.B. 8A
27	1		F20 F28	S.B. 3A
28	1		J15	9PKK156 (PIN 5=KEY)
29	2		J16	15PKK156
30	1		U210	DS1232
31	1		Q200	2N3904
32	1		C32	25V 100uF RADIAL LYTIC
33	1		J1	20 PIN 0.1 DUAL ROW HEADER
34	1		U202 U203	HC245
35	1		Q41 Q33 Q34 Q35 Q36 Q37 Q38 Q39 Q40 Q42	19N06L
36	2		L203 L202 L204 L200 L2 L201	RED LED
37	10		J2	10PKK156 (PIN 4=KEY)
38	6		R116	50 OHM POT
39	1		Q23 Q22 Q21 Q20 Q19 Q18 Q26 Q27 Q28 Q29	TIP122
40	1		Q30 Q31 Q32 Q17 Q25 Q24	
41	16		C25	150V 100uF RADIAL LYTIC
42	1		U9	74LS245
43	1		C29	35V 4700uF RADIAL LYTIC
44	1		RELAY	FRL264D024/02CK RELAY
45	1		J5	9PKK156 (PIN 7=KEY)
46	1		U209	74LS74
47	1		J4	9PKK156 (PIN 8=KEY)
48	1		U204 U205	74LS138
49	2		C26	500V .1UF CERAMIC DISK
50	1		U19	LM338K
51	1		BRDG20 BRDG3 BRDG1 BRDG2 BRDG21	DB3501
52	5		C202 C203 C201 C30 C27	25V 15000uF RADIAL LYTIC
53	5		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 D217 D216 D229	1N4148
54	25		TPL3 TPL1	1N4004
55	3		J7	TEST POINT LOOPS
56	2		J6	10PKK156 (PIN 5=KEY)
57	1		U17 U16 U15 U14 U13 U12 U11 U10	10PKK156 (PIN 9=KEY)
58	1		J11	VN02N
59	8		J12	10-84-4030 (3 PIN MOLEX)
60	1		J17	12PKK156 (PIN 7=KEY)
61	1		BLANKING	10-84-4090 (9 PIN MOLEX)
62	1		R217	TEST POINT - DO NOT STUFF
63	1		J13	2W 4.7K SANDBAR
64	1		J14	10PKK156 (PIN 2=KEY)
65	1		J10	10-84-4060 (6 PIN MOLEX)
66	1		J3	10PKK156 (PIN 6=KEY)
67	1		J9	12PKK156 (PIN 8=KEY)
68	1		J8	9PKK156 (PIN 3=KEY)
69	1		J8	9PKK156 (PIN 2=KEY)
70	1		U19	FUSECLIPS
71	26			HEATSINK
72	1			

CPU/Sound Board Theory of Operation

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 eight stobes low to activate a single column of switches. The switch return signals are fed into CN7 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 closer. If false switches are appearing check that none of the 2N3904 transistors are permanently pulling the strobe line low. Only one strobe from CN5 should be low at any time. CN6 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 is 8bits wide. There are separate input and output busses. The input bus from the plasma controller to the CPU comes in on [CN8-(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-(11-18)]. Status back from the plasma comes in on [CN8-(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 PSTB (Plasma Strobe). 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:

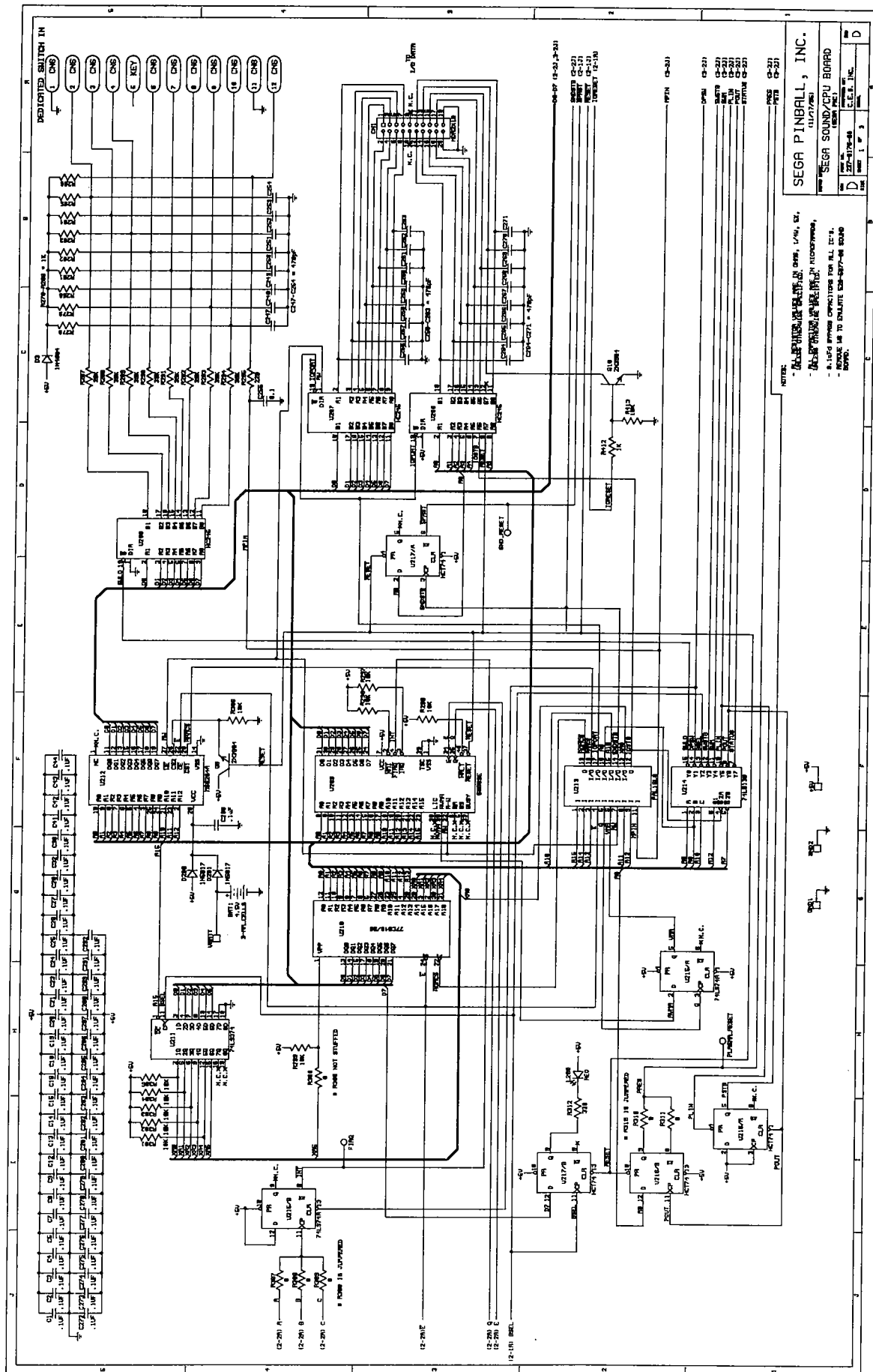
E & Q - The CPU signals for both 68B09E processors. Should be at 2Mhz with Q leading E by 500 nsec.

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 th DAC.

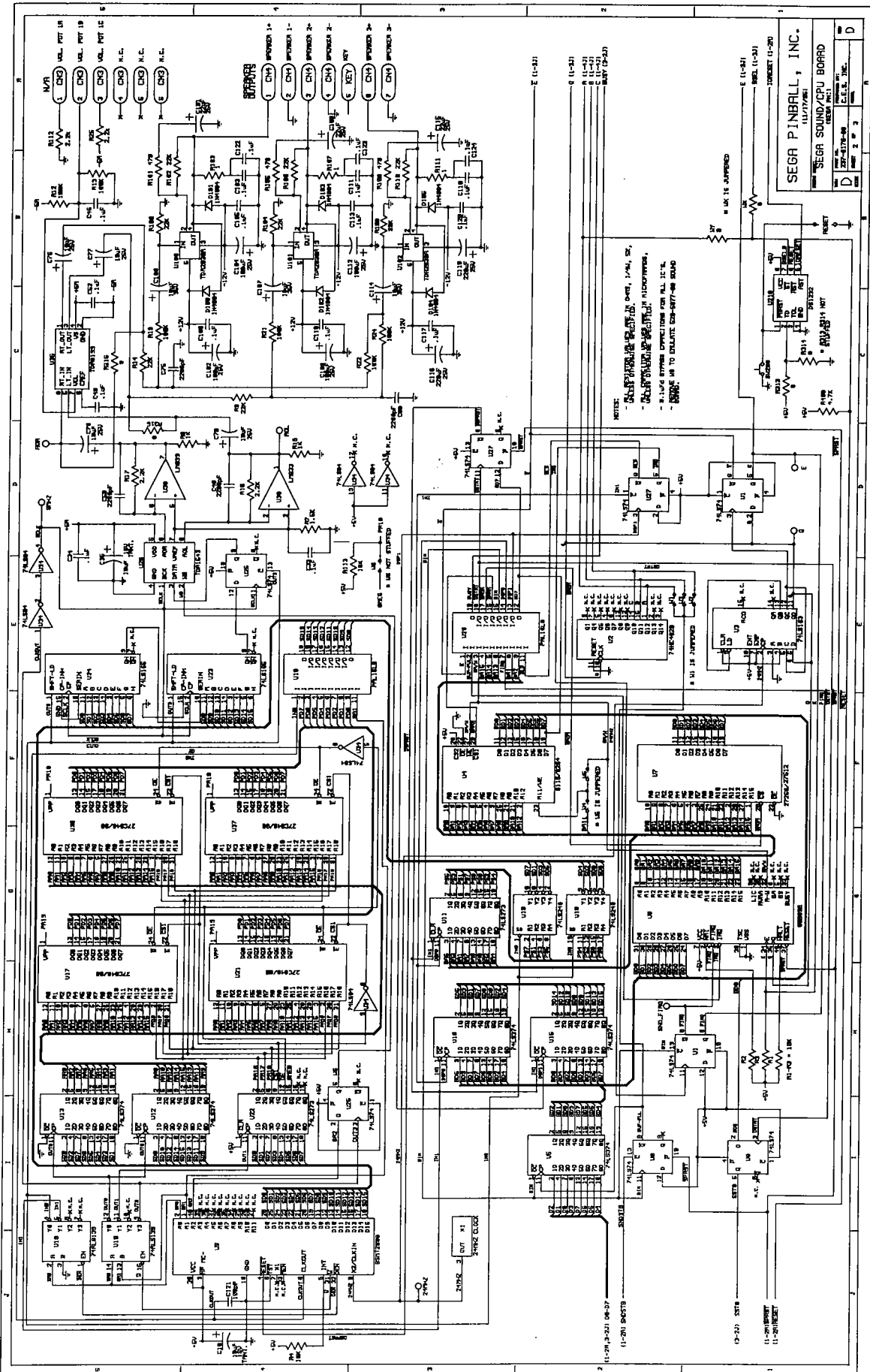
CPU/Sound Board Schematic (Sheet 1 of 3)



SEGA PINBALL, INC.
 SEGA SOUND/CPU BOARD
 227-227-88 8040
 C.E.S. INC.

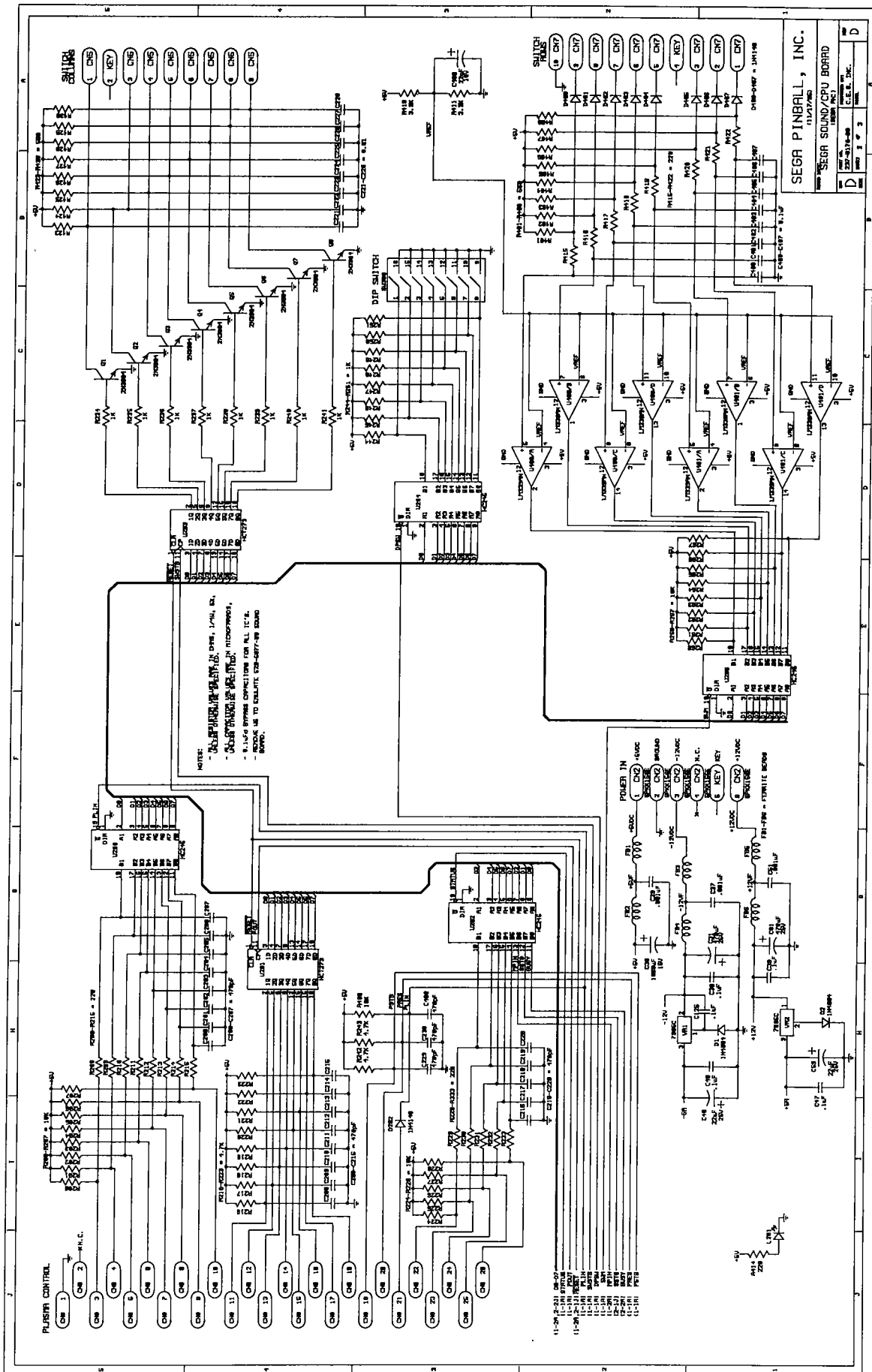
NOTE: ALL PARTS ARE MANUFACTURED BY ORS, L/44, S1.
 ALL PARTS ARE MANUFACTURED BY ORS, L/44, S1.
 A 10% TOLERANCE SHOULD BE USED FOR ALL IC'S.
 REMOVE ME TO ENLARGE 227-227-88 8040 8040

CPU/Sound Board Schematic (Sheet 2 of 3)



Section 5 | PCBs

CPU/Sound Board Schematic (Sheet 3 of 3)



Appendix

Appendixes A through H

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- **Appendix A, Pinball Game Firmware Table**126-127
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- **Appendix B, Semi-Conductors / Integrated Circuits / Relay Cross-Reference Table** 128
...describes diodes and transistors with Source N^o, Sega Pinball Inc. Part N^o, NTE N^o, ECG N^o, Radio Shack Part N^o (If applicable) and RCA Part N^o (If applicable).
- **Appendix C, CPU Jumper Table** 129
...provides the Game Manufactured Date and Manual Part N^o, the CPU version, the ROM Position, and the Jumpers Installed and Removed.
- **Appendix D, Board Type Table**.....130-131
...provides Part N^o for Flipper Boards, Old Board System (Sound, Power Supply) and New Board System (I/O Power Driver, CU/Sound, Display Power Supply) and Display Boards.
- **Appendix E, Generic Coil Cross-Reference Guide and Flipper Coil Table**132-133
...provides the Coils used with Part N^o and Gauge-Turns (of the coil).
- **Appendix F, Motor Specification Table**134-135
...provides all the Motor information used on the games (Motor Type, Function and Part N^o).
- **Appendix G, Part Number Prefix Classification Codes** 136
...explains how our Part Numbers are developed to help sort parts easier.
- **Appendix H, Playfield Inserts (Plastic Light Covers)** 137
...gives a pictorial view with the name and part number of all the inserts used (also gives the Color Code Chart).
- **Glossary of Terms**138-139
...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°	ROM	Chip Size	Part N°	Ver.	Loc.	Raw Part N°
The Who's Tommy						Golden Eye					
CPU	(512K)	965-0162-00	A4.00	C5	960-7001-02	CPU / Sound Board:					
Voice 1	(4M)	965-0165-00		U17	960-5015-00	Game ROM (1M)	965-0214-42		IN PRODUCTION	U210	960-5009-00
Voice 2	(4M)	965-0166-00		U21	960-5015-00	Voice 1 (4M)	965-0215-42			U17	n/a (masked)
Voice 3	(4M)	965-0167-00		U36	960-5015-00	Voice 2 (4M)	965-0216-42			U21	n/a (masked)
Voice 4	(4M)	965-0168-00		U37	960-5015-00	Sound (512K)	965-0217-42			U7	960-7001-02
Sound	(512K)	965-0164-00		U7	960-7001-02	Display Controller Board:					
Display	(4M)	965-0163-00	A4.00	ROM 0	960-5015-00	Display (4M)	965-0218-42			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						
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	(512K)	965-0195-00	A4.01	C5	960-7001-02						
Voice 1	(4M)	965-0196-00		U17	960-5015-00						
Voice 2	(4M)	965-0197-00		U21	960-5015-00						
Voice 3	(Correction Note: 2M/U36 was not used in this game.)										
Sound	(512K)	965-0199-00		U7	960-7001-02						
Display*	(4M)	965-0200-00	A4.01	ROM 0	960-5015-00						
Display*	(4M)	965-0201-00	A4.01	ROM 3	960-5015-00						
Batman Forever											
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						
Sound	(512K)	965-0205-00		U7	960-7001-02						
Display*	(4M)	965-0206-00	A3.00	ROM 0	960-5015-00						
Display*	(4M)	965-0207-00	A3.00	ROM 3	960-5015-00						
New Board System Starts Here											
ROM	Chip Size	Part N°	Ver.	Loc.	Raw Part N°						
Apollo 13											
CPU / Sound Board:											
Game ROM (1M)		965-0208-00	A4.00	U210	960-5009-00						
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 Board:											
Display (4M)		965-0213-00	A4.01	ROM 0	960-5015-00						

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

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 or what revision number any particular ROM is and the next game manual(s) are not available, call our Technical Support Department.

APPENDIX B

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

Table 1 Diodes	Source N°	SEGA PINBALL SM Part N°	NTE N°	ECG N°	Radio Shack® Part N°	RCA® Part N°
Rectification, Blocking and/or Dampening						
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

Table 2 Diodes	Source N°	SEGA PINBALL SM Part N°	NTE N°	ECG N°	Radio Shack® Part N°	RCA® Part N°
Zener						
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

Table 3 Bridge Rectifiers	Source N°	SEGA PINBALL SM Part N°	Comments			
Bridge Rectifier	CM3501	112-0052-00	35 Amp @ 100v P.I.V.			
Bridge Rectifier	MDA2501	112-0054-00	25 Amp @ 100v P.I.V.			
Bridge Rectifier	MDA3502	112-0057-00	35 Amp @ 200v P.I.V.			

Table 4 Transistors	Source N°	SEGA PINBALL SM Part N°	NTE N°	ECG N°	Radio Shack® Part N°	RCA® Part N°
Transistor	2N4401	-----	NTE85	ECG85	276-2009	SK3124A
Transistor	2N5060, SCR	110-0074-00	NTE5400	ECG5400	276-1067	SK3950
Transistor	2N5401	110-0078-00	NTE288	ECG288	-----	SK3434
Transistor	2N6427	110-0070-00	NTE48	ECG48	-----	SK4906
Transistor	MJE15031	110-0103-00	NTE375	ECG375	-----	SK9118
Transistor	MJE340	110-0071-00	NTE157	ECG157	-----	SK3747
Transistor	MJE350	110-0072-00	NTE374	ECG374	-----	SK9042
Transistor	MPSA92	110-0100-00	NTE288	ECG278	-----	SK3434
Transistor	MPSA42	110-0082-00	NTE287	ECG287	-----	SK3232
Transistor	NPN, 2N3904	110-0069-00	NTE85	ECG85	276-2009	SK3124A
Transistor	NPN, TIP122	110-0067-00	NTE261	ECG261	276-2068	SK3896
Transistor	PNP, TIP42	110-0068-00	NTE332	ECG332	-----	SK9236
Transistor	TIP32C	110-0071-00	NTE292	ECG292	-----	SK3441
Transistor	TIP36C	110-0077-00	NTE393	ECG393	-----	SK3961

Table 5 Relays	Source N°	SEGA PINBALL SM Part N°	Comments			
PPB Relay	FRL264 P024/02CK	190-5002-00	24v DC 10 Amp DPDT			
Power Supply Relay	FRL264 P024/02CK	190-5003-00	24v DC 10 Amp DPDT			
CPU Relay	-----	190-5001-00	6v DC 5 Amp 4 Pole			

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	5B, 5C	J4 J5a J6a	J5 J5b J6b
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.	ROM 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

† 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	NO FLIPPER BOARD (NFB) 2-Flipper	<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	NFB 3-Flipper	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Torpedo Alley	NFB 3-Flipper	520-5002-02	520-5000-00	520-5014-01 7 Digit Alpha/Numeric Combined
Time Machine	NFB 2-Flipper	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 Used
Teenage Mutant Ninja Turtles	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Used
Batman	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Used
Star Trek 25th Anniversary	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Used
Hook	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Used
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

NEW 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

APPENDIX E

Generic Coil Cross-Reference Guide

SEGA PINBALL™ Part N°	Gauge- Turns	SEGA PINBALL™ Part N°	Gauge- Turns	SEGA PINBALL™ Part N°	Gauge- Turns	SEGA PINBALL™ Part N°	Gauge- Turns
090-5000-00	22-700	090-5011-00	22-750	090-5020-00	Not Used	090-5030-00	23-1100
090-5001-00	23-800	090-5012-00	26-800	090-5020-01	21-900	090-5032-00	22-1080
090-5001-01	23-800	090-5013-00	23-700	090-5020-02	22-900	090-5034-00	25-1240
090-5002-00	24-900	090-5014-00	23-600	090-5020-10	21-900	090-5036-00	24-940
090-5003-00	27-1300	090-5015-00	27-1400	090-5020-20	22-900	090-5036-01	24-940
090-5004-00	27-1500	090-5016-00	29-2000	090-5020-30	23-900	090-5037-03	23 $\frac{1}{2}$ -765
090-5005-00	23-840	090-5017-00	22-500	090-5021-00	20-400		
090-5006-00	23-800	090-5018-00	23-800	090-5022-00	23-700	090-5041-00	25-1800
090-5008-00	23-1200	090-5019-00	23-750	090-5023-00	22-600	090-5046-00	28-1050
				090-5025-00	24-1570		

Flipper Coil Table

Game Name	Flipper: Lower Right SEGA PINBALL™ Part N° w/Ga.-Turns	Flipper: Lower Left SEGA PINBALL™ Part N° w/Ga.-Turns	Flipper: Upper Right SEGA PINBALL™ Part N° w/Ga.-Turns	Flipper: Upper Left SEGA PINBALL™ Part N° w/Ga.-Turns
Laser Wars	090-5011-00 22-750/30-2600	SAME AS LOWER RIGHT	Not Used	Not Used
Secret Service	090-5006-00 23-620/30-2600	SAME AS LOWER RIGHT	SAME AS LOWER RIGHT	Not Used
Torpedo Alley	090-5013-00 23-700/30-2600	090-5011-00 22-750/30-2600	090-5012-00 26-800	Not Used
Time Machine	090-5011-00 22-750/30-2600	SAME AS LOWER RIGHT	Not Used	Not Used
Playboy 35th Anniversary †	090-5020-02 22-900	SAME AS LOWER RIGHT	Not Used	Not Used
ABC Monday Night Football †	090-5020-02 22-900	SAME AS LOWER RIGHT	Not Used	Not Used
Robocop	090-5020-20 22-900	SAME AS LOWER RIGHT	Not Used	Not Used
Phantom of the Opera	090-5020-20 22-900	SAME AS LOWER RIGHT	Not Used	Not Used
Back to the Future	090-5020-20 22-900	SAME AS LOWER RIGHT	Not Used	Not Used
The Simpsons	090-5020-20 22-900	SAME AS LOWER RIGHT	Not Used	Not Used
Checkpoint	090-5020-20 22-900	SAME AS LOWER RIGHT	Not Used	Not Used
Teenage Mutant Ninja Turtles	090-5020-30 23-900	SAME AS LOWER RIGHT	Not Used	Not Used
Batman	090-5020-30 23-900	SAME AS LOWER RIGHT	Not Used	Not Used
Star Trek 25th Anniversary	090-5020-30 23-900	SAME AS LOWER RIGHT	Not Used	Not Used
Hook	090-5020-30 23-900	090-5030-00 23-1100	Not Used	Not Used
Lethal Weapon 3	090-5030-00 23-1100	SAME AS LOWER RIGHT	Not Used	Not Used
Star Wars	090-5032-00 22-1080	SAME AS LOWER RIGHT	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	Flipper: Lower Right SEGA PINBALL™ Part N° w/Ga.-Turns	Flipper: Lower Left SEGA PINBALL™ Part N° w/Ga.-Turns	Flipper: Upper Right SEGA PINBALL™ Part N° w/Ga.-Turns	Flipper: Upper Left SEGA PINBALL™ Part N° w/Ga.-Turns
Rocky & Bullwinkle & Friends	090-5020-30 23-900	SAME AS LOWER RIGHT	Not Used	Not Used
Jurassic Park	090-5020-30 23-900	SAME AS LOWER RIGHT	090-5030-00 23-1100	Not Used
Last Action Hero	090-5020-30 23-900	SAME AS LOWER RIGHT	Not Used	Not Used
Tales from the Crypt	090-5032-00 22-1080	SAME AS LOWER RIGHT	090-5041-00 25-1800	Not Used
The Who's Tommy	090-5020-30 23-900	SAME AS LOWER RIGHT	Not Used	090-5041-00 25-1800
WWF Royal Rumble	090-5032-00 22-1080	SAME AS LOWER RIGHT	090-5041-00 25-1800	SAME AS UPPER RIGHT
Guns N' Roses	090-5032-00 22-1080	SAME AS LOWER RIGHT	Not Used	090-5030-00 23-1100
Maverick	090-5032-00 22-1080	SAME AS LOWER RIGHT	090-5032-00 22-1080	Not Used
Mary Shelley's Frankenstein	090-5030-00 23-1100	SAME AS LOWER RIGHT	090-5030-00 23-1100	Not Used
Baywatch	090-5020-30 23-900	090-5030-00 23-1100	SAME AS LOWER LEFT	090-5025-00 24-1570
Batman Forever	090-5020-20 22-900	090-5032-00 22-1080	090-5020-30 23-900	Not Used
Apollo 13	090-5032-00 22-1080	SAME AS LOWER RIGHT	Not Used	Not Used
Golden Eye	090-5032-00 22-1080	SAME AS LOWER RIGHT	Not Used	Not Used

APPENDIX F Motor Specification Table

Game Name	Function	Specifications	Part N°
Laser Wars 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	Bowman Model E Motor 24v 11 RPM 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	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	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 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





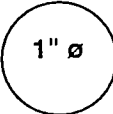
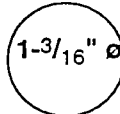
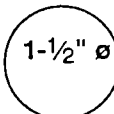
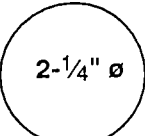
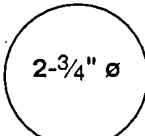

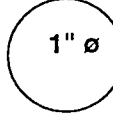
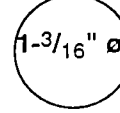
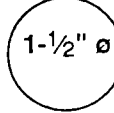
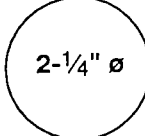
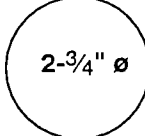
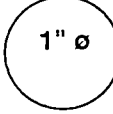
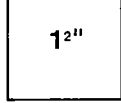
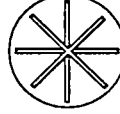
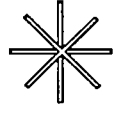
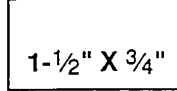
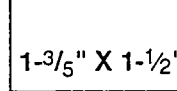
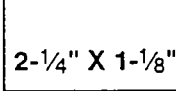
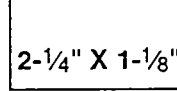
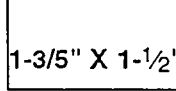
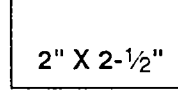
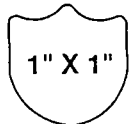
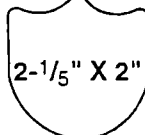
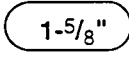
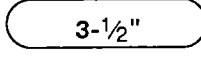
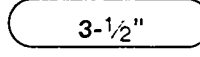

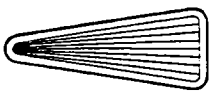
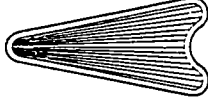
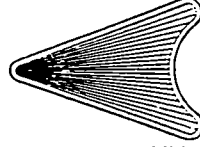


APPENDIX G

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

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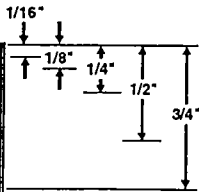


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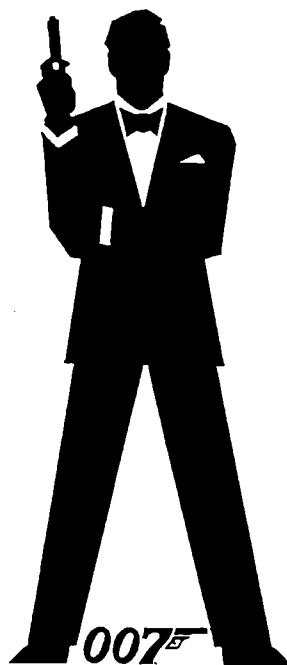
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Standard USA 9 Inch Ruler (From the top to the bottom edge is 11")



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 PINBALL, INC.

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