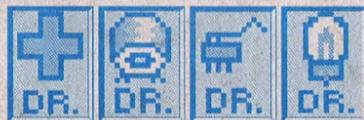


featuring our Portals Service Menu
and our unique

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



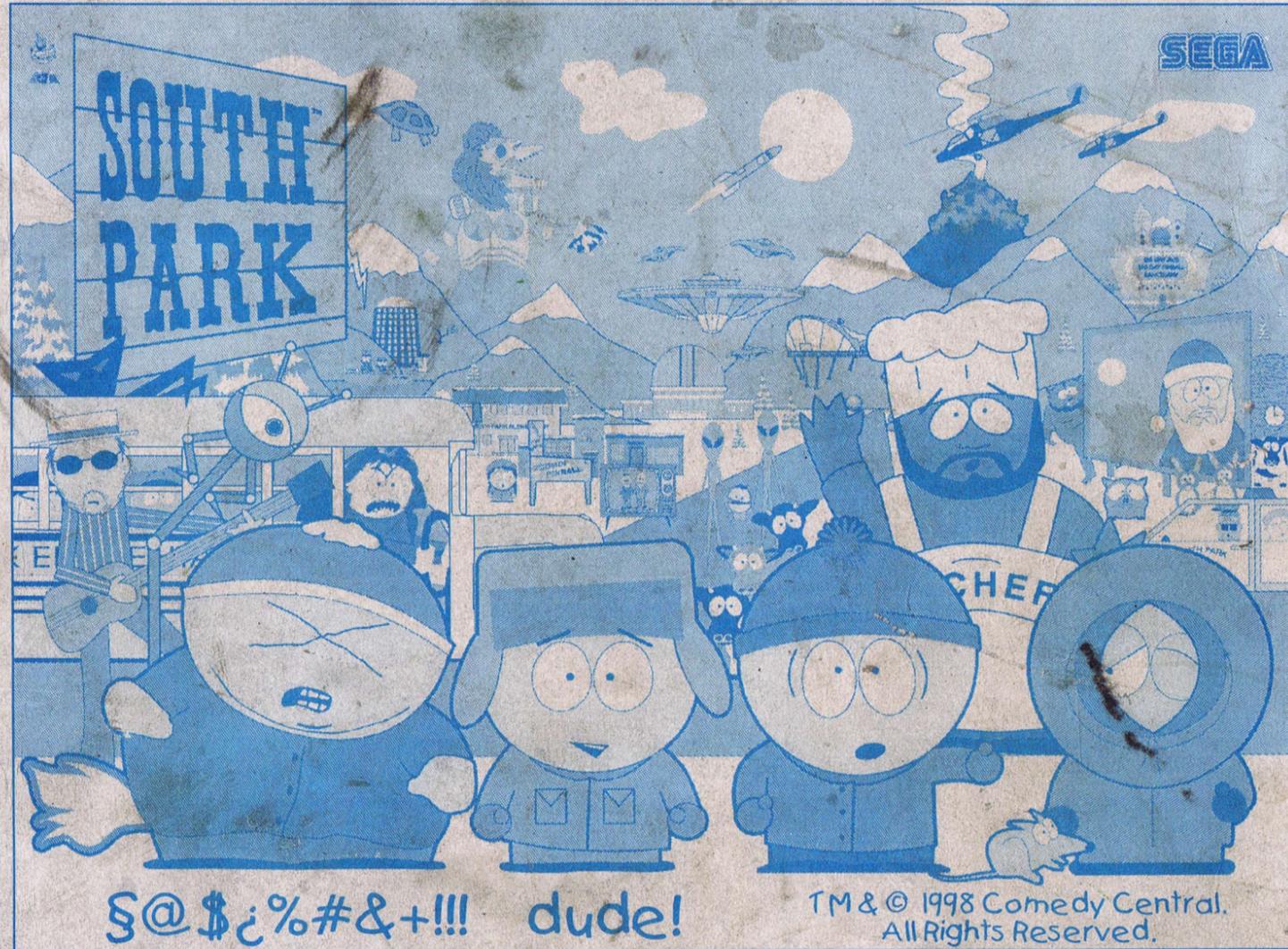
NO YES END PREV QUIT

SEGA™ PINBALL, INC.



**TO DISABLE GRAPHIC ADULT ORIENTED SPEECH SET
ADJUSTMENT 56 (ADULT SPEECH ENABLED) TO "NO".**

REFER TO SECTION 3, CHAPTER 1, PORTALS SERVICE MENU INTRODUCTION FOR HELP.



§@ \$ % # & + !!! dude!

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

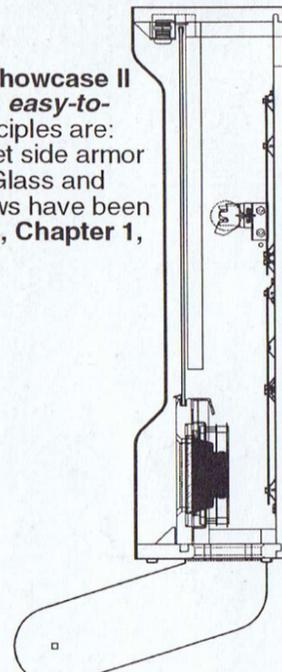
①
SPI PN: 780-5071-01

WOW! Look what's new at Sega Pinball!

THE BACK BOX: First introduced in *Lost In Space™* Pinball is the *Sega Showcase II* Backbox! An innovative and **bold look!** A Backbox using a single lock and an **easy-to-remove** Back Glass & Speaker Panel / Dot Matrix Display. The operating principles are: it still folds down (using the original allen wrench key) and lays upon the cabinet side armor molding. And, you can service the PCBs from either side of the game. Back Glass and Speaker Panel / Dot Matrix Display cleaning and removal is easier. The reviews have been great, just look at your own game! For more on Backbox Parts, see **Section 4, Chapter 1, Parts Identificaition (The Pink Pages)**.

MODULAR STAND-UP TARGETS:

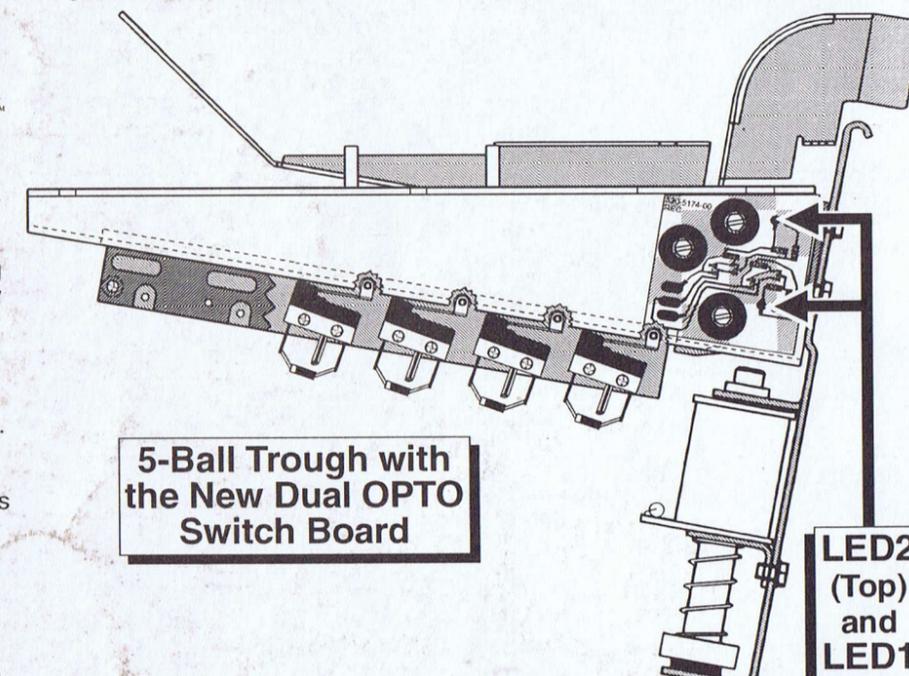
See **Appendix I** in this manual (at the back). You can now buy just the Target Insert instead of the entire Target Assembly (if just the Target Insert is broke). Target Assemblies which are "Rear Mounted" (reversed) would use the same SPI Part N° but add an "R" to the end.



2

When you order the Target Insert(s) from your distributor, it should come with an *Assembly / Disassembly Instruction Sheet*. If it does not, ask your distributor for a copy of **Sega Pinball, Inc. Service Bulletin N° 110** (or call Technical Support at below numbers). You can also use *Service Bulletin N° 110* to reverse the Target Insert installation if you have spare "regular" mounted targets (the Switch Actuator would need to be reversed as well). **Appendix I** will give details on the Part N°s & the Colors the targets are available in.

TROUGH DUAL OPTO BOARDS: We have been using **Single OPTO Switch Boards** in our Ball Troughs (as the switch for the Trough Up-Kicker) for a long while now and with great success! Through long-term field testing and design we have produced the **Dual OPTO Switch Board**. Why? Increased reliability and handling of the flow of pinballs in and out of the Ball Trough. In our past games *Baywatch™* through *Viper™* the Ball Trough Design used only a **Single OPTO Switch** at the Trough Up-Kicker. This designed proved itself reliable. However, as we strive continuously for improvements, we have found by using a **Dual OPTO Switch Board** it will now act as a monitoring device in the event a "double-ball" stack occurs at the Trough Up-Kicker (a double-ball stack is when a ball sits upon the top of the bottom ball over the Trough Up-Kicker). First introduced in *Lost In Space™* the **Dual OPTO Switch Board** will identify this and allow ball transition to process faster and fluently. For more on troubleshooting, see **Section 3, Chapter 2, Go To Diagnostics Menu** (then Go To Switch Menu) or **Section 5, Chapter 4, Printed Circuit Boards (PCBs), Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic, ...Component Layout & Parts, OPTO Troubleshooting and Trough Dual OPTO Boards Alignment (Test for LED1 & LED2)**.



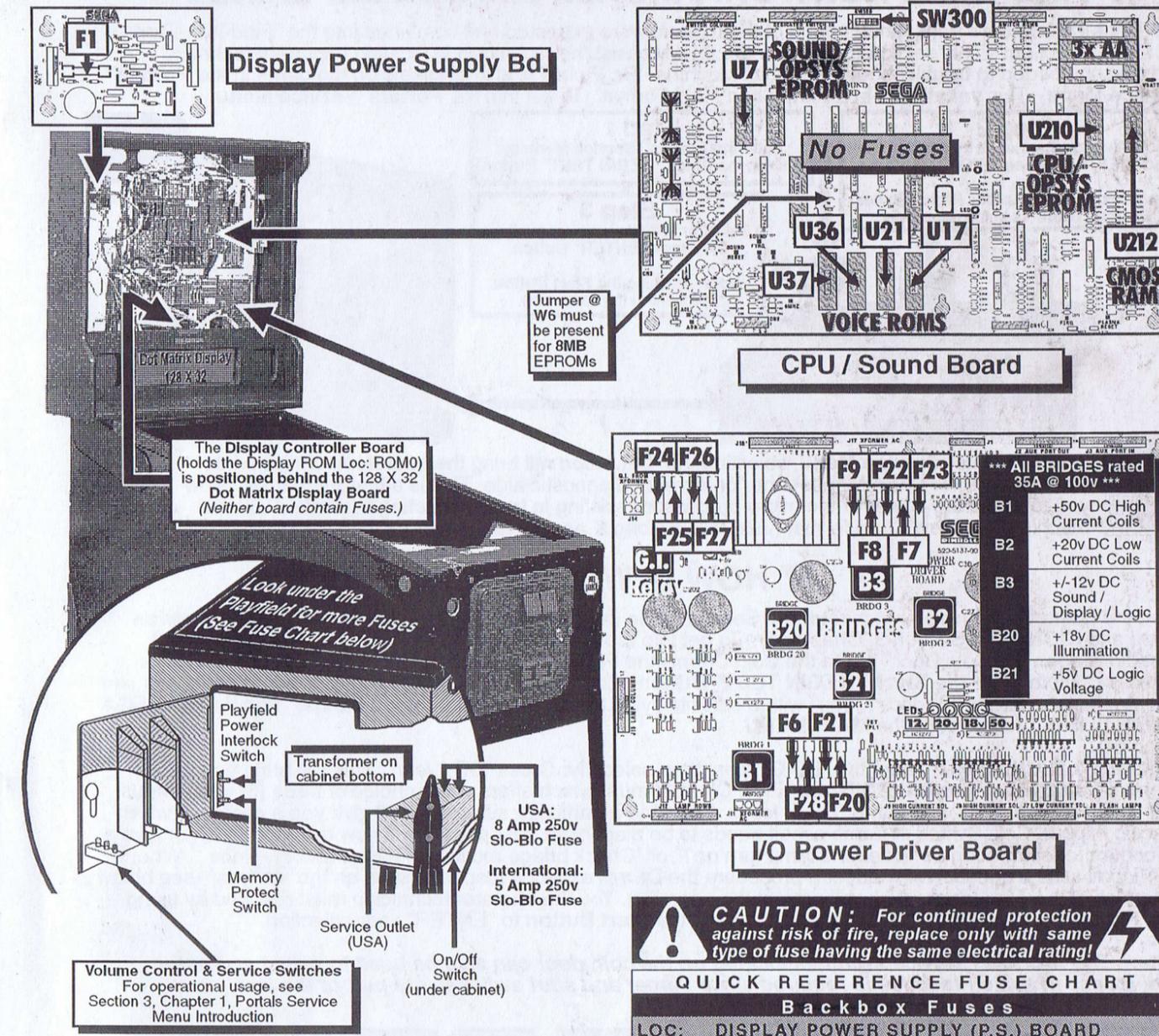
3

When you order the Target Insert(s) from your distributor, it should come with an *Assembly / Disassembly Instruction Sheet*. If it does not, ask your distributor for a copy of **Sega Pinball, Inc. Service Bulletin N° 110** (or call Technical Support at below numbers). You can also use *Service Bulletin N° 110* to reverse the Target Insert installation if you have spare "regular" mounted targets (the Switch Actuator would need to be reversed as well). **Appendix I** will give details on the Part N°s & the Colors the targets are available in.

New to our Pinball Games?

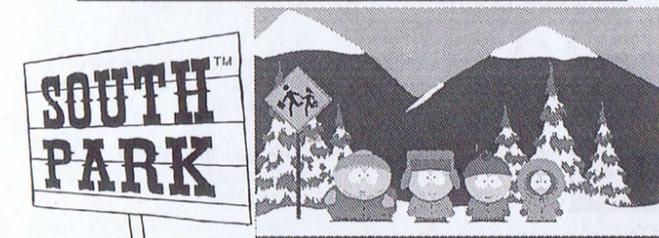
Don't forget to go over **Section 3, Chapter 1, Portals™ Service Menu Introduction**. If using *Diagnostics...very useful!* And, as always, if you get stuck? Comments? Questions? Call Technical Support at 800-542-5377 or 708-345-7700.

BACKBOX LAYOUT LOCATIONS: FUSES, BRIDGES, RELAYS & ROMs



CAUTION: For continued protection against risk of fire, replace only with same type of fuse having the same electrical rating!

QUICK REFERENCE FUSE CHART			
Backbox Fuses			
LOC: DISPLAY POWER SUPPLY (P.S.) BOARD			
F1	3/4A 250v S.B.	90v DC	High Voltage Display
LOC: I / O POWER DRIVER BOARD			
F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	3A 250v S.B.	50v DC	Not Used / Spare
F21	3A 250v S.B.	50v DC	Coils
F22	8A 250v S.B.	18v DC	Controlled Lamps
F23	4A 250v S.B.	5v DC	Logic
F24	5A 250v S.B.	6.3v AC	G.I. Lamps (BRN-WHT to WHT-BRN)
F25	5A 250v S.B.	6.3v AC	G.I. Lamps (YEL to WHT-YEL)
F26	5A 250v S.B.	6.3v AC	G.I. Lamps (GRN to WHT-GRN)
F27	5A 250v S.B.	6.3v AC	G.I. Lamps (VIO to WHT-VIO)
F28	3A 250v S.B.	24v AC	Not Used / Spare
Cabinet Fuses			
LOC: SERVICE (AC) OUTLET BOX (Cabinet Bottom)			
n/a	8A 250v S.B.	115v AC	Main Fuse Line (Domestic or USA)
n/a	5A 250v S.B.	220v AC	Main Fuse Line (International)

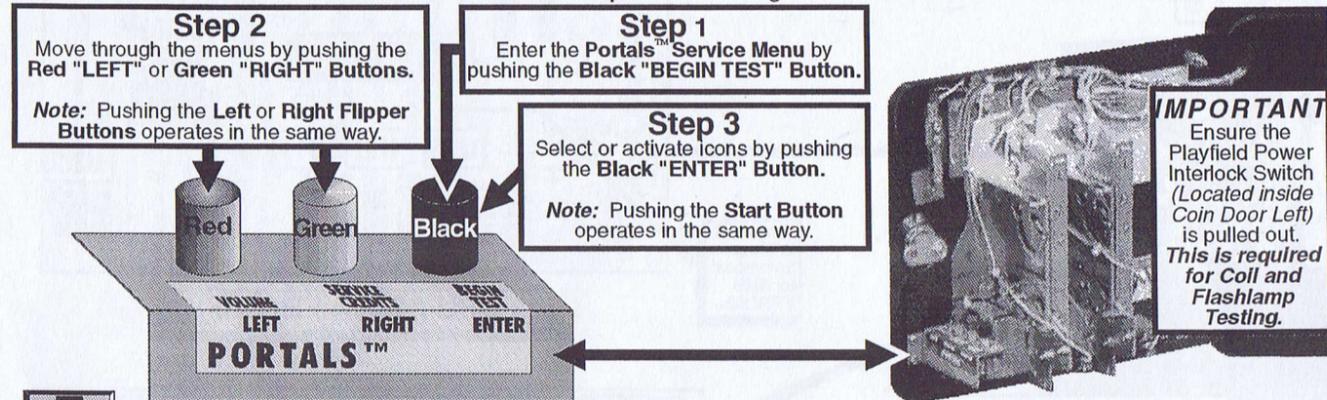


QUICK REFERENCE FUSE CHART			
South Park Playfield Fuses			
LOC: UNDER PLAYFIELD (By Assemblies Listed)			
n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU-YEL↔RED-YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY-YEL↔RED-YEL)

DR. Pinball Find-It-In-Front: DR. Pinball

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

The key technical data from various parts of the manual were extracted and combined into the "Find-It-In-Front: Dr. Pinball Section." This section (pages DR. ① - ⑩) will assist the technician in locating important technical information needed to troubleshoot the Pinball Machine. Dr. Pinball is also available on the game in the **Portals™ Service Menu**. This variation is in a Flow Chart Help Format. To get into the **Portals™ Service Menu**:



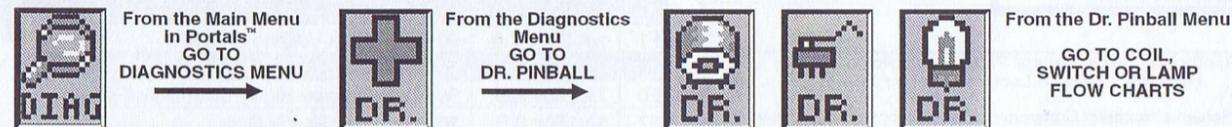
In our **Portals™ Service Menu**, selecting the "DR." *Icon* will bring the operator/technician into Dr. Pinball (Flow Chart Menus), the "on-screen" diagnostic aide. This is a feature that will allow you to utilize the power of the micro-processor assisting in troubleshooting a problem with the machine in a Flow Chart format (*Just follow along & answer the questions.*).

▼ HOW IT WORKS ▼

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

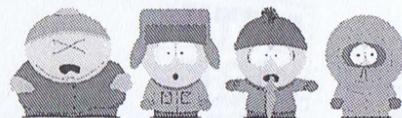
While in the **MAIN MENU**, select the "DIAG" *Icon*, then select the Cross "DR." *Icon*. This will bring you (the operator / technician) into **DR. PINBALL** (Flow Chart Menus) which offers you a choice of three (3) Sub-Menus: Coil "DR.," Switch "DR.," and Lamp "DR." *Icons*. Selecting a particular sub-menu will give you a choice of which specific Flipper, Coil, Switch or Lamp circuit needs to be diagnosed. The display will now ask a question or give a procedure to follow such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When Dr. Pinball asks a question or request a procedure the Dr. will expect a response such as "no" or "yes" (see below examples of the *Mini-Icons* which will prompt the operator). You the operator/technician must respond by using your **Flipper Buttons** to "SELECT" a *Mini-Icon* and the **Start Button** to "ENTER" your selection.

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

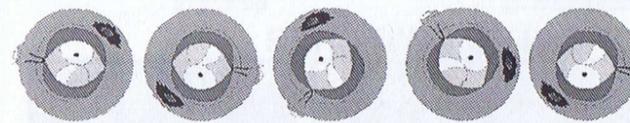


The following are the *Mini-Icons* with explanations for the Dr. Pinball Sub-Menus:

	Select a Coil, Lamp, Switch or Flipper to diagnose with "-" or "+" icon; Then select the "RUN" icon to activate the choice. "PREV" goes back to previous question. "QUIT" exits Portals completely.
	Seen when question is being asked on the Display. Select "YES" or "NO" to answer question given. "END" lets you select a new item to test.
	Seen when diagnosis is given. Select any icon for your next step. "?" gives Help.
	In Coil Flow Chart Menu, select "PULSE" to pulse the coil selected.



INSTALL 5 BALLS!



This is a 5-Ball Pinball children...



▼ 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 AUTO LAUNCH NOT WORKING"). This not only warns the operator of a problem immediately, but indicates exactly where the operator should look to resolve it.

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

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

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

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
USA *	ON								
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
FRANCE	ON	▲	▲						
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
AUSTRIA	ON	▲							
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
BELGIUM	ON	▲							
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
BRAZIL	ON	▲	▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CANADA	ON	▲	▲						
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
GERMANY	ON	▲	▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
JAPAN	ON	▲		▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
NETHERLANDS (HOLLAND / DUTCH)	ON		▲						
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
NORWAY	ON	▲	▲						
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
SWEDEN	ON	▲	▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
SWITZERLAND	ON	▲	▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
UK	ON	▲	▲						
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
UK FOR NEW 50p, 2p COIN MECH	ON	▲	▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼

*All countries not noted use the "USA Setting"

▼ ROM SUMMARY TABLE ▼

* Note: The CPU/Sound Board must have a Jumper at W6 to accept 8MB ROMs.

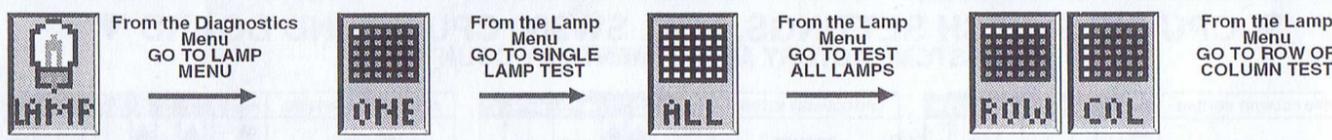
I.C. NAME	TYPE	BOARD NAME	LOC.	PART N8
Game ROM	1MB	CPU / Sound Board	U210	965-0301-71
Voice ROM 1 *	8MB	CPU / Sound Board	U17	965-0302-71
Voice ROM 2 *	8MB	CPU / Sound Board	U21	965-0303-71
Voice ROM 3 *	8MB	CPU / Sound Board	U36	965-0304-71
Voice ROM 4 *	8MB	CPU / Sound Board	U37	965-0305-71
Sound EPROM	512K	CPU / Sound Board	U7	965-0306-71
Display EPROM	4MB	Display Controller Bd.	ROM 0	965-0307-71
Display EPROM	Not Used	Display Controller Bd.	ROM 1	Not Used





SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8	GND	Ground
Row (Return)	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9	IC U206 INPUTS	BLK CN6-P1, -P11
1: U400	LEFT BUTTON (UK ONLY) on Cabinet side	NOT USED	LEFT 5-BANK BOTTOM	RIGHT RAMP ENTER	NOT USED	NOT USED	LEFT TURBO BUMPER	LEFT OUTLANE	1: U206	#1 LEFT FLIPPER BUTTON in Cabinet side DS-1
2: U400	4TH COIN SLOT On Coin Door	5-BALL TROUGH #1 (LEFT)	LEFT 5-BANK #2	RIGHT RAMP EXIT	RIGHT 3-BANK BOTTOM	KENNY OPTO	RIGHT TURBO BUMPER	LEFT RETURN LANE	2: U206	#2 LEFT FLIPPER E.O.S (End-of-Stroke) in Cabinet side DS-2
3: U400	6TH COIN SLOT On Coin Door	5-BALL TROUGH #2	LEFT 5-BANK #3	NOT USED	RIGHT 3-BANK MIDDLE	UNDER-TROUGH (TOILET)	BOTTOM TURBO BUMPER	LEFT SLINGSHOT	3: U206	#3 RIGHT FLIPPER BUTTON in Cabinet side DS-3
4: U400	RIGHT COIN SLOT On Coin Door	5-BALL TROUGH #3	LEFT 5-BANK #4	NOT USED	RIGHT 3-BANK TOP	UNDER-TROUGH (KENNY)	NOT USED	RIGHT OUTLANE	4: U206	#4 RIGHT FLIPPER E.O.S (End-of-Stroke) in Cabinet side DS-4
5: U401	CENTER COIN SLOT / DBA On Coin Door	5-BALL TROUGH #4	LEFT 5-BANK TOP	NOT USED	POP BUMPER TARGET LT	SVUK	NOT USED	RIGHT RETURN LANE	5: U206	NOT USED DS-5
6: U401	LEFT COIN SLOT On Coin Door	5-BALL TROUGH VUK OPTO	CENTER 3-BANK LEFT	NOT USED	POP BUMPER TARGET RT	VUK	START BUTTON Cabinet Front	RIGHT SLINGSHOT	6: U206	#6 VOLUME (RED BUTTON) (In Test: LEFT) on Coin Door DS-6
7: U401	5TH COIN SLOT On Coin Door	5-BALL STACKING OPTO	CENTER 3-BANK MIDDLE	NOT USED	LEFT ORBIT (TO VUK)	SLAM TILT On Coin Door	NOT USED	NOT USED	7: U206	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) on Coin Door DS-7
8: U401	RIGHT BUTTON (UK ONLY) on Cabinet side	SHOOTER LANE	CENTER 3-BANK RIGHT	NOT USED	UNDER-TROUGH SVUK	PLUMB BOB TILT Inside Cabinet	NOT USED	NOT USED	8: U206	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) on Coin Door DS-8

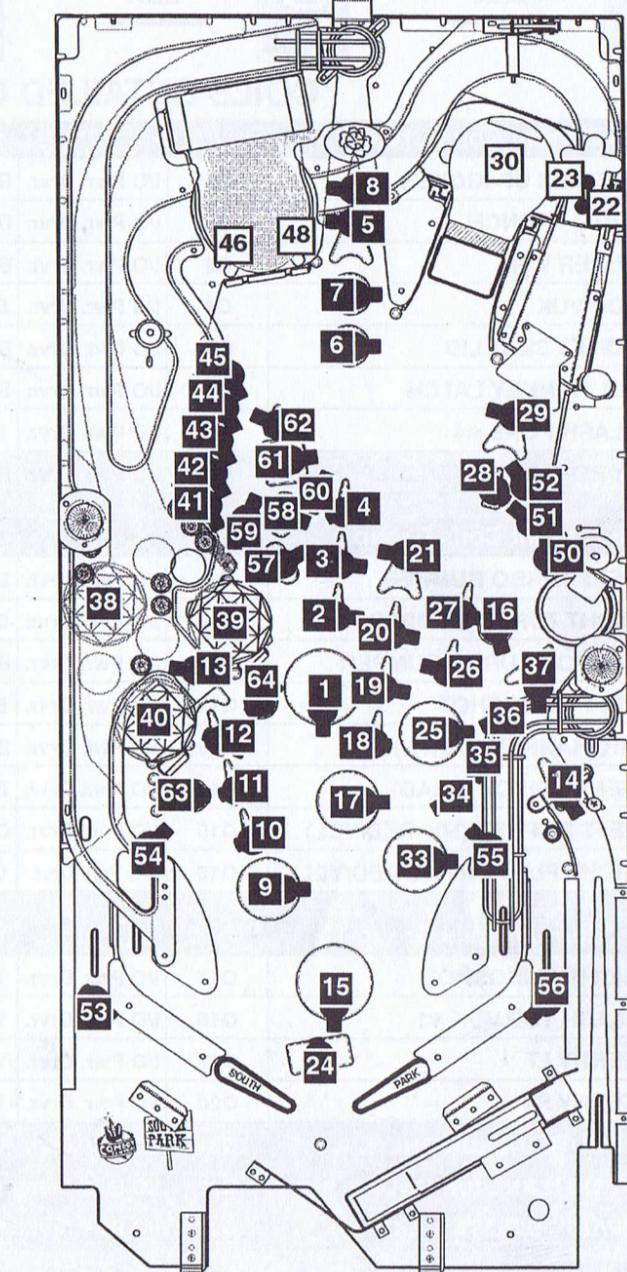
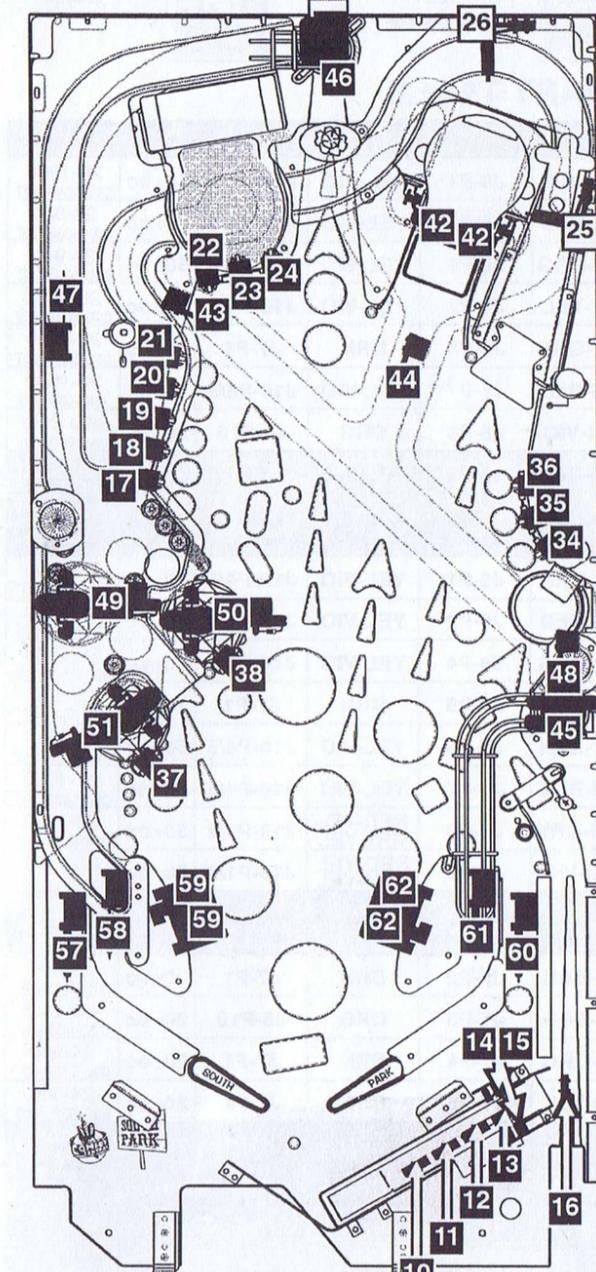


LAMP MATRIX GRID

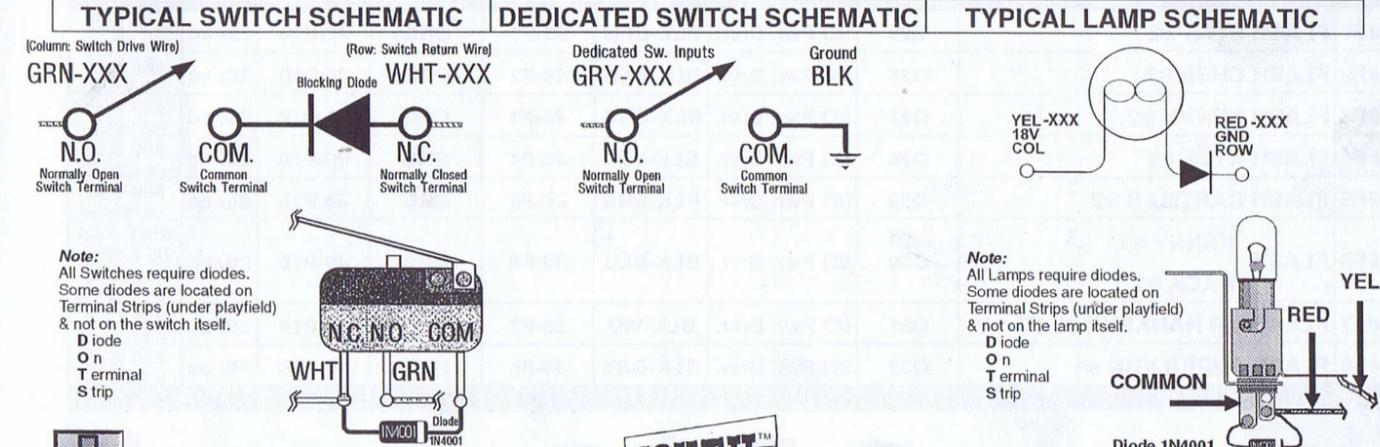
Column (18V)	1: U17	2: U16	3: U15	4: U14	5: U13	6: U12	7: U11	8: U10
Row (GND)	YEL-BRN J13-P9	YEL-RED J13-P8	YEL-ORG J13-P7	YEL-BLK J13-P6	YEL-GRN J13-P5	YEL-BLU J13-P4	YEL-VIO J13-P3	YEL-GRY J13-P1
1: Q33	CHEF FACE #2	CHEF #3	CHEF #3	CHEF #4	CHEF ARROW #5	MYSTERY #6	SPOOKY VISION #7	EXTRA BALL #8
2: Q34	STAN FACE #9	STAN #2	STAN #3	STAN #4	STAN ARROW #13	SKILL SHOT #14	VOLCANO #15	ANAL PROBE #16
3: Q35	KENNY FACE #17	KENNY #2	KENNY #3	KENNY #4	KENNY ARROW #21	SUPER JACKPOT #22	MULTIBALL READY #23	SOUTH PARK SIGN #24
4: Q36	KYLE FACE #25	KYLE #2	KYLE #3	KYLE #4	KYLE ARROW #29	KENNY ASSEMBLY #30	NOT USED #31	NOT USED #32
5: Q37	CARTMAN FACE #33	CARTMAN #2	CARTMAN #3	CARTMAN #4	CARTMAN ARROW #37	LEFT TURBO BUMPER #38	RIGHT TURBO BUMPER #39	BTTM TURBO BUMPER #40
6: Q38	LEFT 5-BANK BOTTOM #41	LEFT 5-BANK #2	LEFT 5-BANK #3	LEFT 5-BANK #4	LEFT 5-BANK TOP #45	TOILET S-U LT #46	NOT USED #47	TOILET S-U RT #48
7: Q39	NOT USED #49	RT. 3-BANK BOTTOM #50	RT. 3-BANK MIDDLE #51	RT. 3-BANK TOP #52	LEFT OUTLANE #53	LEFT RETURN LANE #54	RIGHT RETURN LANE #55	RIGHT OUTLANE #56
8: Q40	MR. HANKEY: BOTTOM #57	MR. HANKEY: BODY #58	MR. HANKEY: LT HAND #59	MR. HANKEY: RT HAND #60	MR. HANKEY: HEAD #61	MR. HANKEY: HAT #62	POP BUMPER TARGET LT #63	POP BUMPER TARGET RT #64
9: Q41	NOT USED #65	NOT USED #66	NOT USED #67	NOT USED #68	NOT USED #69	NOT USED #70	NOT USED #71	NOT USED #72
10: Q42	NOT USED #73	NOT USED #74	NOT USED #75	NOT USED #76	NOT USED #77	NOT USED #78	NOT USED #79	NOT USED #80

SWITCH MATRIX GRID LOCATIONS

LAMP MATRIX GRID LOCATIONS



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

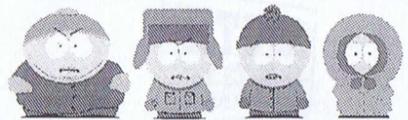




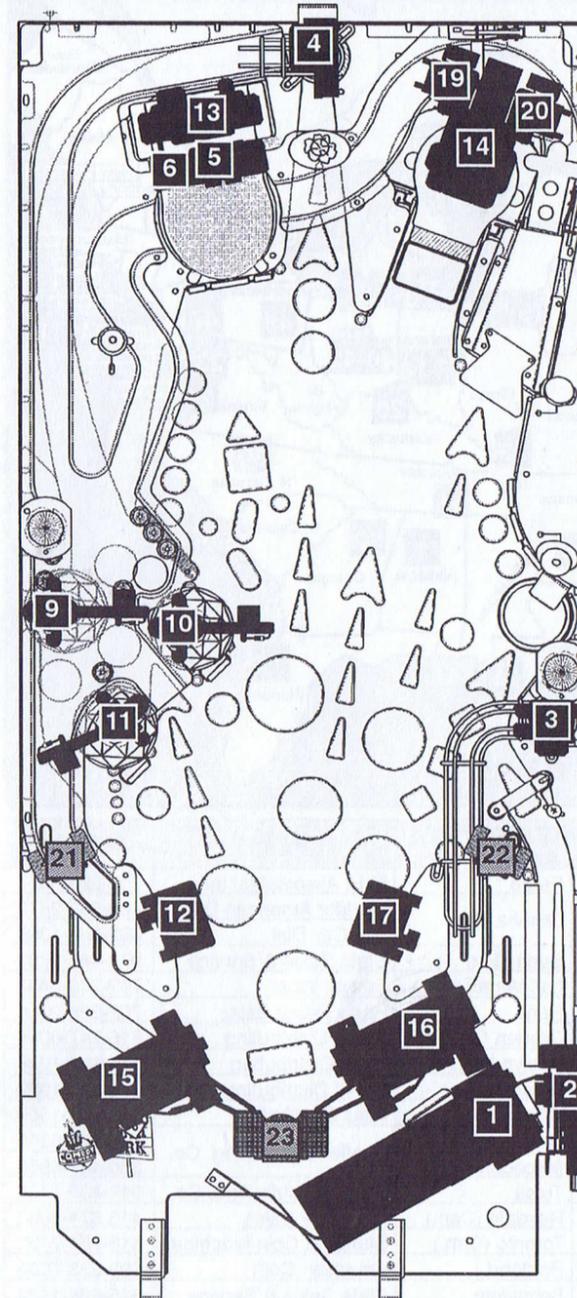
COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00T
#3	SUPER VUK	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00T
#4	TOP VUK	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#5	TOILET SEAT LID	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#6	MR. HANKEY LATCH	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v DC	29-1000 090-5059-00
#7	FLASH POPS *4	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	DL4SS 515-8076-01
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-P4/5	50v DC	26-1200 090-5044-00T
#10	RIGHT TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#11	BOTTOM TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	BRN	J7-P1	20v DC	23-800 090-5001-00T
#13	MR. HANKEY (DOWN)	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#14	KENNY PIVOT (DEAD)	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v DC	22-1080 090-5032-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
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 Bulb or Meter
#17	RIGHT SLINGSHOT	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	23-800 090-5001-00T
#18	FLASH TOP VUK *1	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#19	KENNY LT	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	J7-P1	20v DC	24-940 090-5036-00T
#20	KENNY RT	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v DC	24-940 090-5036-00T
#21	LT OUTLANE (UK ONLY)	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	28-1050 090-5046-00
#22	RT OUTLANE (UK ONLY)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	28-1050 090-5046-00
#23	UP/DOWN POST (UK ONLY)	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	Meter 5v 091-5000-00
Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Bulb Type
#F1	FLASH STAN *2	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F2	FLASH CHEF *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F3	FLASH KENNY *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F4	FLASH KYLE *2	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F5	FLASH CARTMAN *2	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F6	FLASH KENNY *1 BACK *2	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#906 Bulb 165-5004-00 #89 Bulb 165-5000-89
#F7	FLASH MR HANKEY/TOILET *2	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F8	FLASH SUPER VUK *1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89

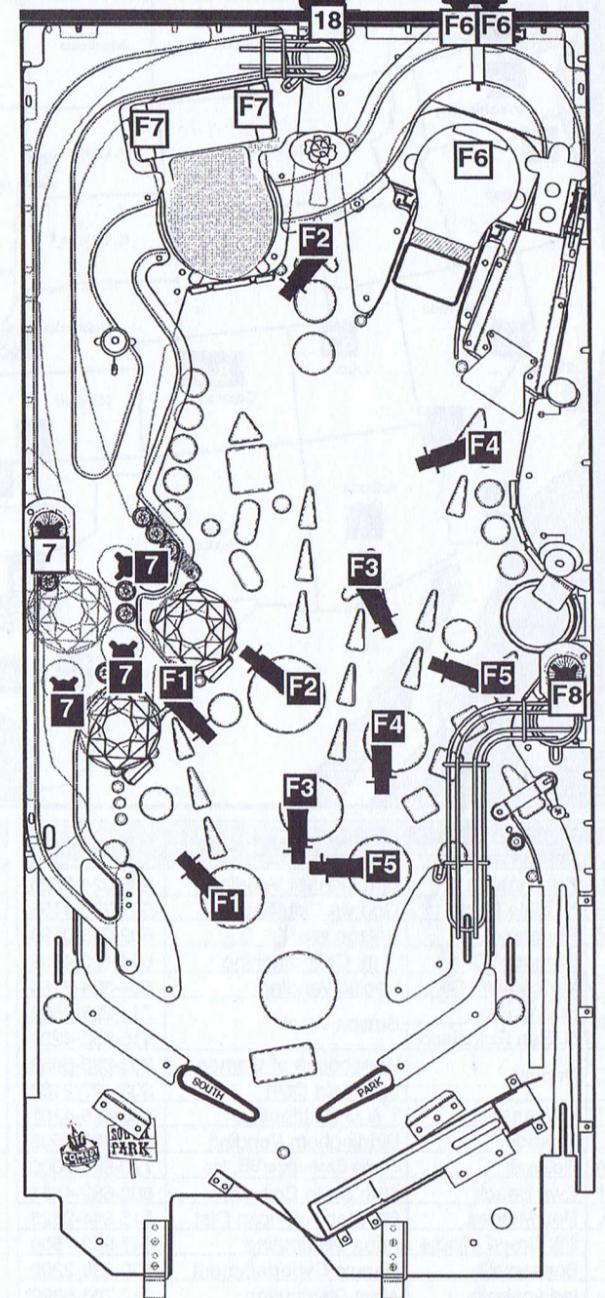
Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are Flash Lamps F1-F8 ONLY. Test all others in Single or Cycling Coil Tests.



COIL LOCATIONS

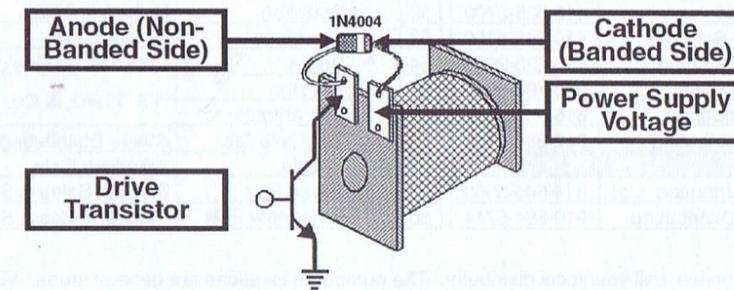


FLASH LAMP LOCATIONS



Legend Note: = Coils/Flashes mounted above playfield. = Coils/Flashes mounted below the playfield.

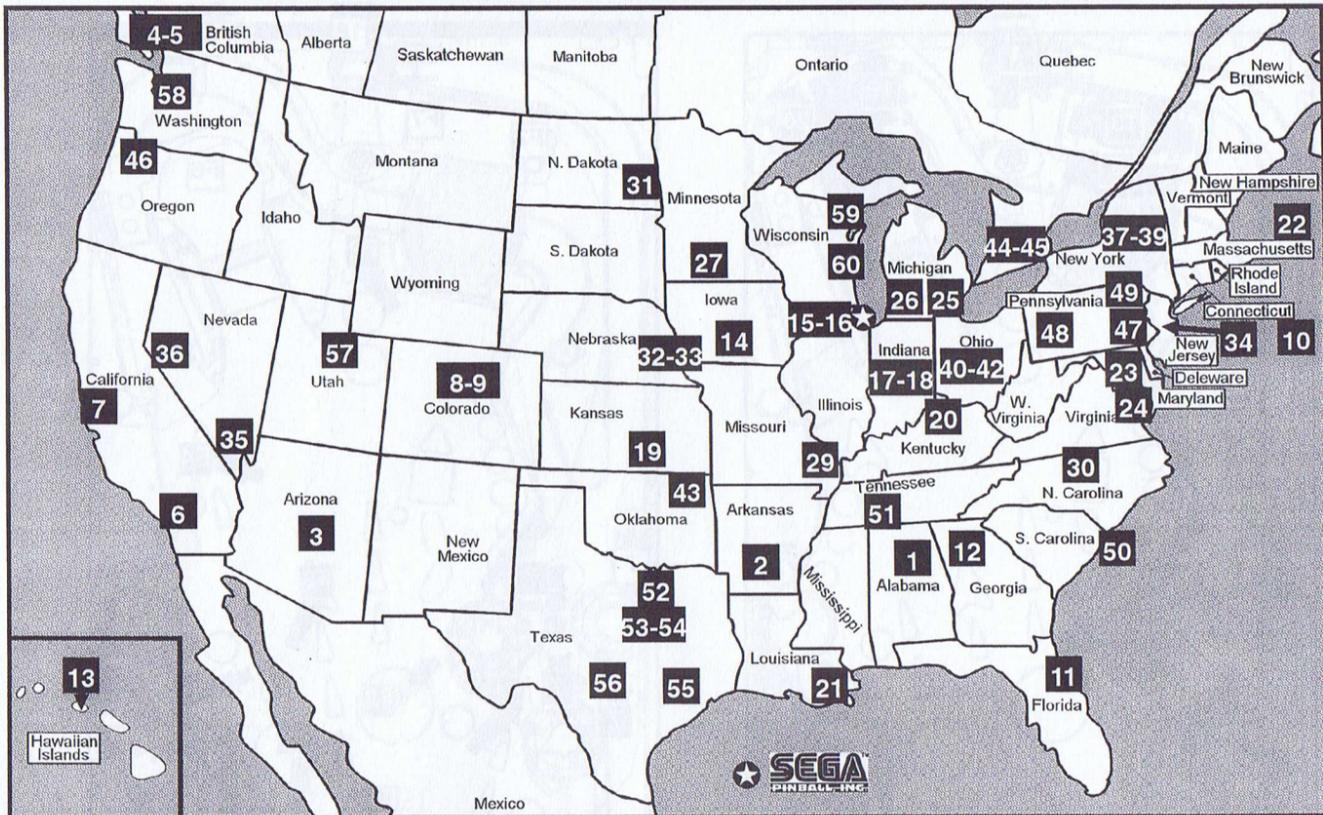
TYPICAL COIL WIRING



Note: All Coils require diodes. Some diodes are located on Terminal Strips (under playfield) & not on the coil itself.
 D iode
 O n
 T ermi-
 n al
 S trip



DOMESTIC PINBALL & REDEMPTION DISTRIBUTORS

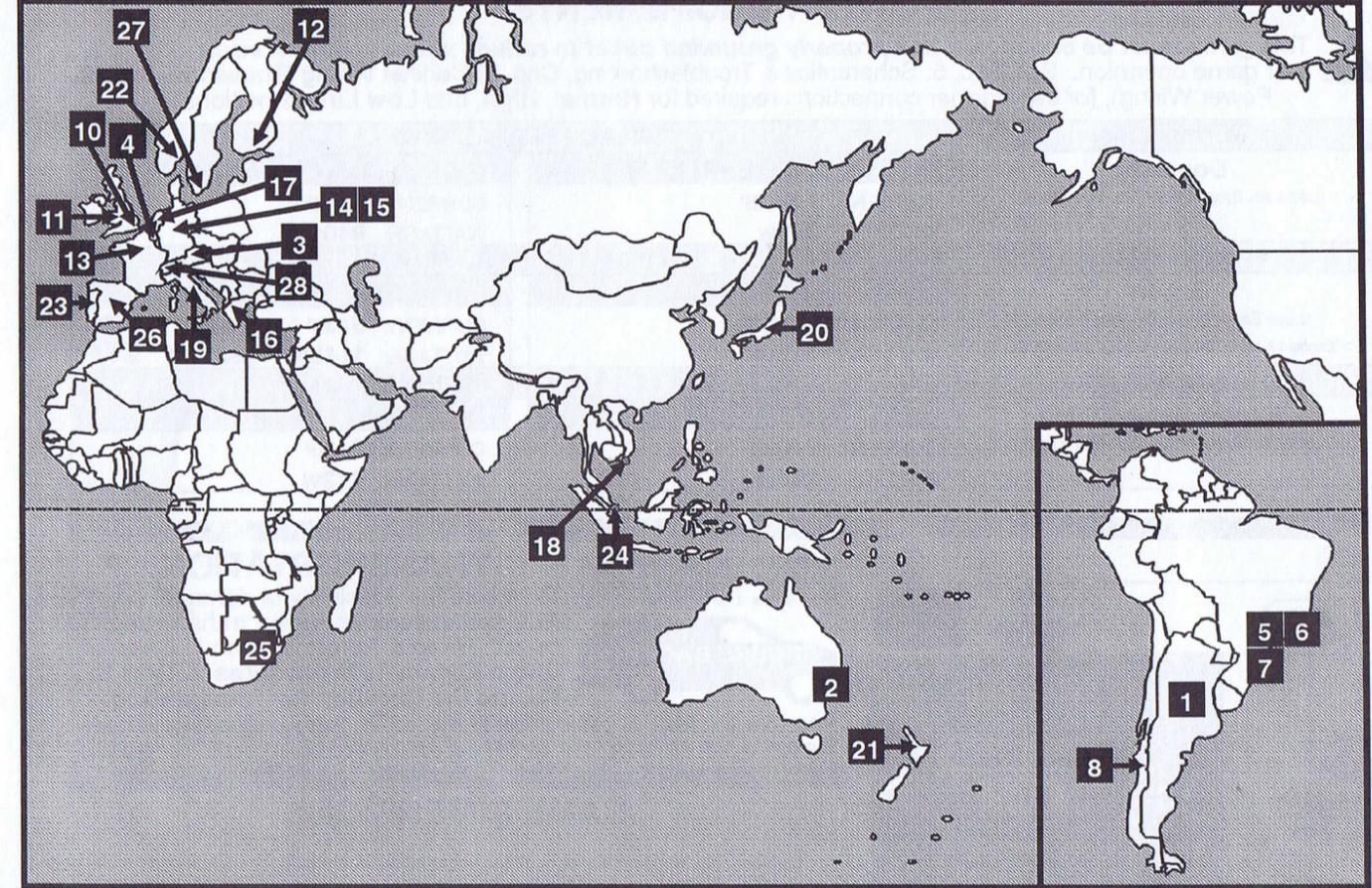


#	STATE/PROVINCE AND CITY	NAME	PHONE	#	STATE/PROVINCE AND CITY	NAME	PHONE
1	AL Birmingham	Birmingham Vending	205-324-7526	31	ND Fargo	M.H. Associates, Inc.	701-282-7877
2	AR N. Little Rock	Godwin Distributing	501-753-1138	32	NE Omaha	Greater American Dist.	402-553-2812
3	AZ Phoenix	Betson West	602-233-0190	33	NJ Springfield	Mid-City Dist.	402-341-5300
4	BC Burnaby (Can.)	Can. Coin Machine	604-420-4008	34	NV Las Vegas	State Sales & Service	973-467-9700
5	CA Vancouver (Can.)	Pacific Vending	604-324-2164	35	OH Reno	Betson West	702-740-8484
6	CA Buena Park	Betson West	714-228-7500	36	NY Garden City Park	Reno Game Sales	702-829-2080
7	CA S. San Francisco		415-952-4220	37	NY Roslyn Heights	T & M Distributing	516-747-0034
8	CO Denver	Warehouse of Games	303-893-8652	38	NY Syracuse	Deith Distributing	516-621-1234
9	CT Williamamantic	Mountain Coin	303-427-2133	39	OH Cincinnati	T & M Distributing	315-432-1932
10	FL Orlando	T & M Distributing	860-456-4231	40	OH Columbus	Atlas Distributing	513-771-1909
11	GA Roswell	Birmingham Vending	407-425-1505	41	OH Macedonia	Shaffer Distributing, Co.	614-421-6800
12	HI Ewa Beach	Game Exchange/SE, Inc.	770-594-0000	42	OK Tulsa	Galaxy Distributing, Co.	918-835-1166
13	IA Des Moines	50th State Coin Op.	808-682-4561	43	ON Rexdale (Can.)	New Way Sales	416-674-8000
14	IL Elk Grove Village	Greater American Dist.	515-244-2828	44	ON Toronto (Can.)	Starburst Coin Machines	416-251-2122
15	IN Bensenville	Atlas Distributing	847-952-7500	45	OR Portland	American Coin	503-233-7000
16	IN Indianapolis	Namco Cyberainment	630-238-2200	46	PA Bensalem	State Sales & Service	215-638-1122
17	IN Indianapolis	Atlas Distributing	317-786-6892	47	PA Pittsburgh	Green Coin	412-881-8804
18	IN Indianapolis	Shaffer Distributing, Co.	317-899-2530	48	PA Wilkes-Barre	Superior	717-824-9994
19	KS Wichita	United Distributors, Inc.	316-263-6181	49	SC Myrtle Beach	Green Coin	803-629-1900
20	KY Louisville	Atlas Distributing	502-966-5266	50	TN Memphis	Green G.A.M.E.S.	901-353-1000
21	LA Metairie	AMA Distributors, Inc.	504-835-3232	51	TX Carrollton	Nickels & Dimes	972-492-3262
22	MA E. Long Meadow	Gekay Sales	413-525-2700	52	TX Corsicana	Master Sales	903-874-4740
23	MD Baltimore	Automated Services	410-646-4100	53	TX Dallas	Commercial Music	214-741-6381
24	MD Baltimore	Weiner Distributing	410-525-2600	54	TX Houston	H.A. Franz, & Co.	713-523-7366
25	MI Redford	Atlas Distributing	313-794-4880	55	TX San Antonio		210-226-6322
26	MI Wyoming	Atlas Distributing	616-241-1472	56	UT Salt Lake City	Struve Distributing	801-328-1636
27	MN Bloomington	Hanson Distributing	612-884-6604	57	WA Seattle	American Coin	206-764-9020
28				58	WI Green Bay	Pioneer Sales & Svc.	920-468-5200
29	MO St. Louis	Shaffer Distributing, Co.	314-645-3393	59	WI Menomonee Falls	Pioneer Sales & Svc.	414-781-1420
30	NC Archdal	Operators Distributing	910-884-5714	60			

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



INTERNATIONAL DISTRIBUTORS



#	COUNTRY AND CITY	NAME	PHONE (-011)	#	COUNTRY AND CITY	NAME	PHONE (-011)
1	Argentina, Urquiza	Florencia	54-232-5532	15	Germany, Hannover	Bally Wulff	49-511-358-5343
2	Australia, Matraville	Amusement Mach. Dist.	61-29-316-6000	16	Greece, Athens	Greece Coin	30-1-554-1608
3	Austria, Grazerstrasse	Rupp Austria	43-34-528-6105	17	Holland, 's-Hertogenbosch	Érrel Industries	31-73-645-6111
4	Belgium, Brussels	Splin S.A.	32-43-62-7677	18	Hong Kong, Kwai Fong	Bondeal Limited	85-2-487-9089
5	Brazil, Sao Paulo	Parkland	55-11-792-42864	19	Italy (RSM), Serravalle	Technoplay Sa	39-54-990-0361
6	Brazil, Sao Paulo	Unimax	55-11-533-5615	20	Japan, Tokyo	Data East, Corp.	81-35-370-0708
7		Universe	55-11-575-0731	21	New Zealand, Auckland	Amco Machine Supp.	64-9-846-7606
8	Chile, Santiago	Cuinsa	56-2-696-0167	22	Norway, Oslo	Vendcomatic	47-2-216-0830
9		Universe Electronics	56-2-235-7822	23	Portugal, Amadora	Jacinto & Martins	35-11-495-1868
10	England, London	Electrocoin	44-181-965-2055	24	Singapore, Singapore	Valibel Technologies	65-748-8404
11	So. Wales, Cardiff	Electrocoin	44-22-261-5100	25	South Africa, Lalucia	Unimac	27-3-152-5544
12	Finland, Espoo	Pelika Ray Oy	35-8-943-7091	26	Spain, Madrid	Sente S.A.	34-1-541-7112
13	France, Aubervilliers	PLF Sa	33-14-811-3131	27	Sweden, Malmo	Truemax AB	46-40-153-635
14	Germany, Berlin	Bally Wulff	49-3-062-0020	28	Switzerland, Harkinggen	Novomat Ag	41-62-398-4061

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



POWER REQUIREMENTS

! This game *must be connected to a properly grounded outlet to reduce shock hazard* & insure proper game operation. See Sec. 5, Schematics & Troubleshooting, Chp. 3, Cabinet Wiring (Transformer Power Wiring), 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 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*
Low Line:	95v AC - 108v AC @ 50Hz / 60Hz	
	CURRENT: 2.6AMP WATTAGE: 264W	CURRENT: 8AMP WATTAGE: 812W
Export Japan Only	95v AC - 108v AC @ 50Hz / 60Hz	
uses an 8AMP 250v Slo-Blo Fuse.	AVG OPERATION	MAX OPERATION
	CURRENT: 2.6AMP WATTAGE: 264W	CURRENT: 8AMP WATTAGE: 812W

BEFORE TRANSPORTING



REMOVE THE LEGS & SECURE THE GAME WITHIN THE TRANSPORTING VEHICLE. SAVE AND RETAIN ALL PRINTED INFORMATION ON THE GAME.

TRANSPORTATION

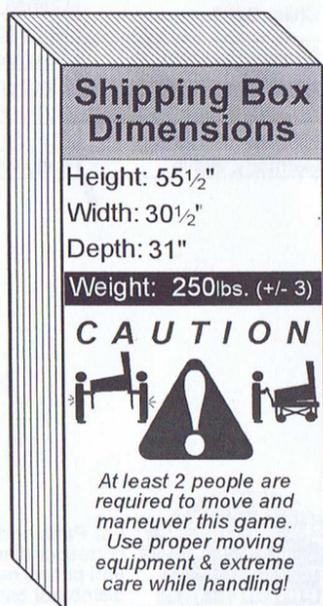
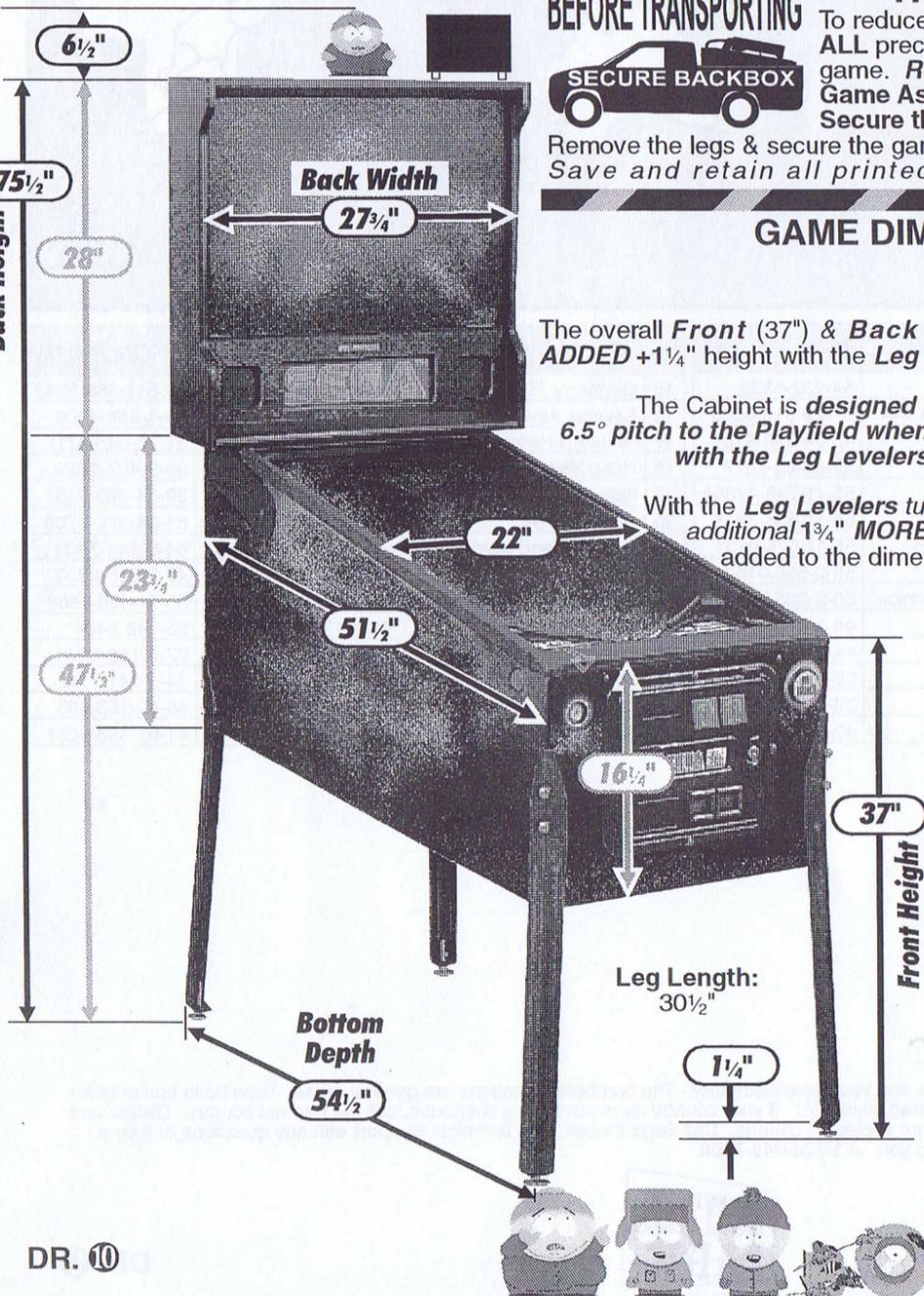
To reduce the possibility of damage, observe ALL precautions whenever transporting the game. *Read & follow Section 1, Chapter 1, Game Assembly Procedures, & How to Secure the Backbox for Transporting.*

GAME DIMENSIONS

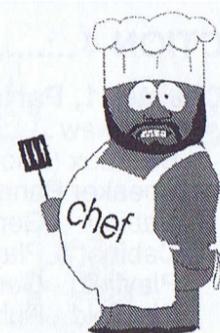
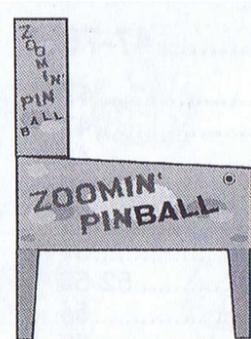
The overall **Front** (37") & **Back** (75½") dimensions reflect the **ADDED +1¼"** height with the **Leg Levelers** turned all the way in;

The Cabinet is *designed to give the recommended 6.5° pitch to the Playfield when all four (4) Legs are installed with the Leg Levelers turned all the way in.*

With the **Leg Levelers** turned all the way **out**, an additional **1¼" MORE** to the overall height should be added to the dimensions.



Find-It-In-Front:
Dr. Pinball



General Table of Contents

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

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

- * Backbox Layout Locations: Fuses, Bridges, Relays & ROMs..... DR. ①
- * Find-It-In-Front: Dr. Pinball Section Explained..... DR. ②
- * Install 5-Balls * Diagnostic Aides * CPU DIP Switch Settings * ROM Summary Table..... DR. ③
- * Switch Matrix Grid & Dedicated Switches * Lamp Matrix Grid..... DR. ④
- * Switch & Lamp Matrix Grid Locations * Typical Switch, Dedicated Switch & Lamp Schematics..... DR. ⑤
- * Coils Detailed Chart Table..... DR. ⑥
- * Coil & Flash Lamp Locations * Typical Coil Wiring..... DR. ⑦
- * Domestic Pinball & Redemption Distributors DR. ⑧
- * International Distributors..... DR. ⑨
- * Power Requirements * Transportation * Game Dimensions..... DR. ⑩

Game Manual General Table of Contents i-ii

SECTION 1 1-2

- Chapter 1, Game Set-Up..... 1
 - Game Assembly Procedures..... 1
 - * How to Secure the Backbox for Transporting * Leg Leveler Adjustment * Easy Access Service System - 3 Positions..... 2

SECTION 2 3-4

- Chapter 1, Game Operation & Features..... 3
 - * Start of Game Features * During Game Features * End of Game Features 3-4
 - * Instruction Card 4

SECTION 3 5-46

- Chapter 1, Portals™ Service Menu Introduction..... 5
 - Portals™ Service Menu Table of Contents (View for an outline of this section) 5
 - * Portals™ Service Menu Access & Use * How to Use This Section..... 6-7
 - Portals™ Service Menu Icon Tree 8-9
 - Portals™ Service Menu Example 10-11
- Chapter 2, Go To Diagnostics Menu 12-25
- Chapter 3, Go To Audits Menu 26-31
- Chapter 4, Go To Adjustments Menu 32-40
- Chapter 5, Go To Reset Menu 41-42
- Chapter 6, Go To Fuses List 43-44
- Chapter 7, Go To Help Screen 45-46

General Table of Contents Continued on the Next Page



January 1999



Chapter 1, Parts Identification & Location (The Pink Pages)..... 47

Overview 47
 Backbox (Showcase II) Assembly 48
 Speaker Panel Assy. for the Backbox (Showcase II) & Associated Parts 49
 Cabinet - General Parts 50
 Cabinet & Playfield - Switches 51
 Playfield - General Parts (Below) & Playfield - General Parts (Above) 52-53
 Playfield - Rubber Parts (Rings Actual Size) 54
 Playfield - Plastic (Butyrate), Decals and Mylar 55
 Playfield - Rails and Ball Guides 56
 Playfield - Metal Posts and Nuts (Actual Size) 57
 Playfield - Metal Spacers (Actual Size) 58
 Playfield - Plastic Posts and Spacers (Actual Size) 59
 Playfield - Small Bayonet Type Bulbs and Sockets (Actual Size) 60
 Playfield - Large Bayonet Type Bulb and Sockets (Actual Size) 61
 Playfield - Wedge Base Bulbs and Sockets (Actual Size) 62

Chapter 2, Drawings for Major Assemblies & Ramps (The Blue Pages)..... 63

Overview 63
 Ball Shooter (Plunger) Assembly, 500-6146-00-04 (Top) 64
 Autoplunger Coil Assy., 500-6092-02 and Arm Weld Assy., 500-6091-00 (Bot) 64
 5-Ball Trough Assembly, 500-6318-25 and A.P.: Ball Trough Enter/Exit Scoop 65
 Flipper (Left) Assembly, 500-5944-14 and A.P.: Yellow Flipper Bat & Shaft Assy. 66
 Flipper (Right) Assembly, 500-5944-04 and A.P.: Yellow Flipper Bat & Shaft Assy. 67
 Turbo (Pop) Bumper Top Assy., 515-6459-01 (Qty. 3) and A.P.: Red Pop Cap (Qty. 3)..... 68
 Turbo (Pop) Bumper Switch Assy., 515-6459-03 (Qty. 3)..... 68
 Turbo (Pop) Bumper Bottom Assy., 515-6459-04 (Qty. 3)..... 68
 Left & Right Slingshot Assemblies, 500-5849-00 (Qty. 2) (Top) 69
 VUK (Right Style) Assembly, 500-6290-01 (Bot) 69
 Toilet & Frame Assembly, 500-6360-00-71 70-71
 Toilet Lid Coil Assembly, 500-6392-00-71 70-71
 Mr. Hankey & Tank Lid Lift Coil Assembly, 500-6391-00-71 70-71
 Kenny Assembly, 500-6358-00-71 72-73
 Super VUK Assembly, 500-6184-04-71 74
 Under-Trough Assembly, 500-6385-00-71 (Top) 75
 OPTO Assembly, 500-6242-02-71 (Bot) 75
 Left Ramp Assembly, 500-6389-00-71 76
 Right Ramp Assembly, 500-6383-00-71 77
UK ONLY OPTIONAL: Left & Right Outlane Ball Deflector Assemblies, 500-5788-03 (Qty. 2)..... (Top) 78
UK ONLY OPTIONAL: Up/Down Post Assembly, 500-6293-00..... (Bot) 78

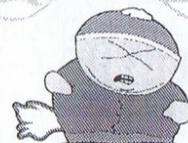
SECTION 5 79-110

➤ *Schematics & Troubleshooting Table of Contents (outline of this section)..... 79*
Chapter 1, Backbox Wiring (The Yellow Pages) 81-82
Chapter 2, Playfield Wiring (The Yellow Pages) 83-86
Chapter 3, Cabinet Wiring (The Yellow Pages) 87-88
Chapter 4, Printed Circuit Boards (PCBs) (The Yellow Pages) 89-110

APPENDIXES A-I 111-126

Appendixes A-I Table of Contents (outline of this section) 111
 Appendixes A-I 112-124
 Plastic Part Color Chart..... (Bottom) 123 + (Top) 124
 Glossary of Terms 125
 Parts Order Checklist Notes..... 126

Limited Warranty, Cautions, Warnings & Notices Inside Back



January 1999

Game Set-Up

Game Assembly Procedures

(Reference Find-It-In-Front: Dr. Pinball)

1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton. **CAUTION: At least 2 people are required to move and maneuver game. Use proper moving equipment & extreme care while handling. Pinball game is 250 lbs.+.** Refer to DR. 10 for Power Requirements, Transportation and Game Dimensions.
2. Remove all packing material. The four (4) Cabinet Leg Assemblies (Leg Levelers are 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. Leg Bolts, Steel Balls and any miscellaneous parts are in the cash box.
3. Support rear of cabinet and attach rear legs using two leg bolts for each leg. Support front of cabinet and attach front legs using two leg bolts for each leg.
4. While assuring that no cables are being pinched, carefully raise the backbox and secure it in its upright position with the Allen Wrench in the hole in the back of the cabinet and rotating the wrench 270° (¾ turn).
5. Remove the Coin Door Keys from the playfield glass, and open the Coin Door. Remove the Backbox Keys hanging inside the Coin Door, unlock the Backbox and open.
6. Check all connectors in the backbox for loose wire terminations. Reseat any loose wire by pushing in on the terminal. Push on all connectors plugged into the CPU/Sound Board, I/O Power Driver Board, and the Display Power Bd. to check that they are properly seated. Ensure Fluorescent Light Tube is seated correctly. Check that all fuses are seated properly. Close and lock the Backbox and secure its' keys back inside the Coin Door.
7. Remove the Front Molding & carefully remove the playfield glass and set it aside.
8. Remove all shipping tie downs, shipping blocks, packing foam, shipping instruction pages, etc. (if any) inside the cabinet. **READ ALL PRINTED INFORMATION!** Shipping instructions, labels and/or decals describe warnings, cautions, and/or important information specific to the game.
9. Raise the playfield and support it, by lifting the Prop Rod (located either on the left or right side, inside the cabinet) and placing the notched end into the hole on the under playfield. See the illustration "Easy Access Service System" opposite this page.
10. Visually inspect all cabinet cables and connector terminations; ensure no wires or cables are pinched and that cable harnesses are not pulled tight.
11. Remove the Plumb Bob tilt from the parts package and install on the pendulum wire on the inside left of the cabinet. Check the plumb tilt and adjust as required. See Section 4, Chapter 1, Parts Identification & Location.
12. Lower the playfield and ensure game is level side-to-side by adjusting Leg Levelers, if required. See the illustration "Leg Leveler Adjustment" opposite this page.
13. With the Leg Levelers turned all the way in (1.25" from floor to bottom of leg), the game pitch is 6.5°; depending on the condition of the floor, adjust the Leg Levelers as required.

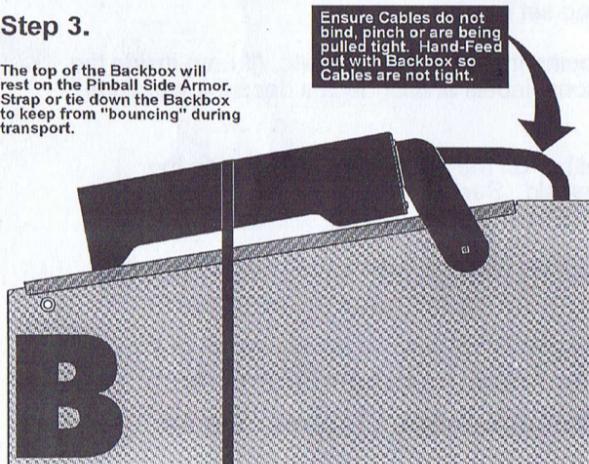
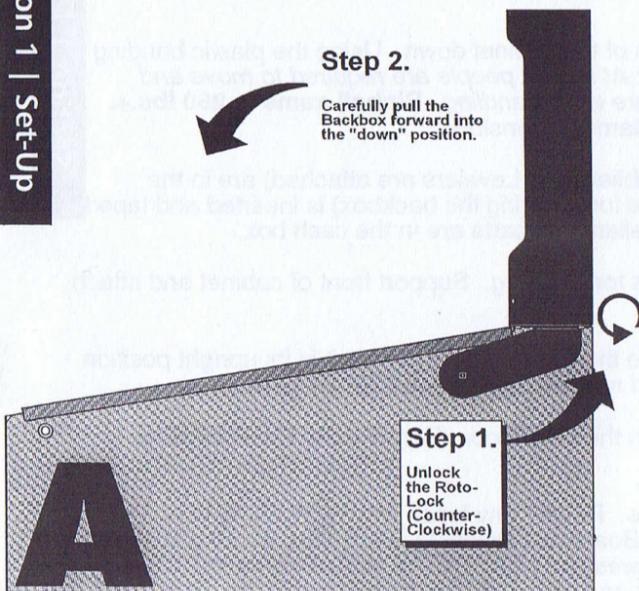
The playfield incline affects difficulty of play. Use the recommended incline; Game difficulty is best varied using game adjustments.

14. If desired, perform any self tests at this time. See Section 3, Chapter 1, Portals™ Service Menu Introduction, and Chapter 2, Go To Diagnostics Menu, for instructions on how to enter "Begin Play Test" and "Game Specific" to test components on the game.
15. **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.)
16. If desired, make Game Pricing (Standard and/or Custom) and Add-A-Ball, Novelty, or X-Ball Play adjustments at this time. See Section 3, Chapter 4, Go To Adjustments Menu, for instructions on how to enter adjustments. Follow instructions in the tables provided in the manual for suggestions of customizing changes.

➔ Per  "The appliance has to be placed in a horizontal position."
 "This appliance is not to be cleaned by a Water Jet."



How to Secure the Backbox for Transporting



See Section 4, Chapter 1, Backbox (Back Side/Front Side) Assemblies, for part numbers.

Leg Leveler Adjustment

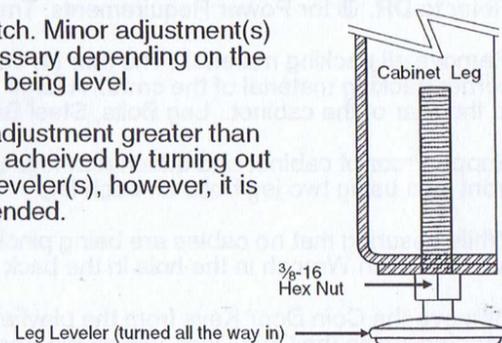
This cabinet is designed to automatically have a 6.5° pitch without any Leg Leveler adjustment!

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

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

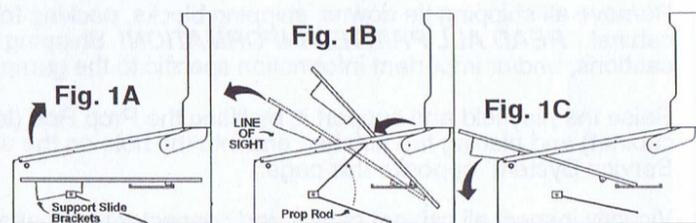
Verify 6.5° pitch. Minor adjustment(s) may be necessary depending on the location floor being level.

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



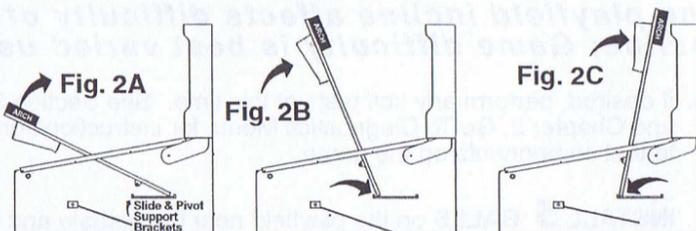
Easy Access Service System - 3 Positions

Carefully lift the playfield *using the Left and Right Ball Guides* upward.



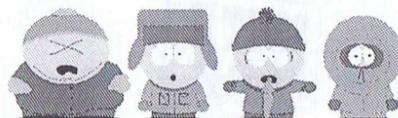
Positions 1 & 2

When lifted high enough, the *Playfield Support Slide Brackets* (Fig. 1A) can be seen & can clear the cabinet front. At this time, pull the playfield toward the front of the cabinet, checking that the mechanical components clear the cabinet front, then rest the playfield on the *Playfield Support Slide Brackets* at the front channel of cabinet (Fig. 1C); Or, the *Prop Rod* (located on the right inside of cabinet) can be used by positioning the *Prop Rod* end into the receiving playfield hole (Fig. 1B).



Position 3

With the playfield at rest, hold the sides & pull toward the front of the cabinet (approx. 6" to 8"), until resistance is felt from *Edge Slide Brackets* stopping against the *Slide & Pivot Support Brackets* located on either side of the cabinet (Fig. 2A). At this time, *swivel the playfield* toward the Backbox, then rest on the top edge (Fig. 2B & 2C).



Section 2

Chapter 1 of 2

Game Operation & Features

Start of Game Features

Starting a Normal Game

Insert coin(s). The game generates a sound for the first coin & for each subsequent coin with the display indicating the number of credits posted. Press the **START BUTTON** and a start-up sound is produced, and the posted credits are reduced by one. Subsequent players can be added (**up to 6 can play!**) by pressing the **START BUTTON** before the end of ball 1 (with sufficient credit in the game).

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 and/or instructions. Pressing the **START BUTTON** after ball 1 of any player will start a new game (if credits are available), **but only** if the **START BUTTON** is depressed for 2-3 seconds. This delay is to avoid accidental "re-starts" of a game. (Note: Any 1/2 credit remaining during game play after the end of ball 1, or power down, will be eliminated.)

Starting Team Play (Doubles!)

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

Starting League/Tournament Play

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

Starting Pinball Wizard Play

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

During Game Features

Feature Mode & Combination Shots

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

Multiball

Multiball is started after completion of certain Feature Modes or may be a mode itself depending on game rules/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 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: **CREDIT**, **EXTRA BALL**, or **SPECIAL**. Adjust to **NONE** if a replay award is not desired.

Video Mode

The video modes *may* require the player to "play on-screen". The interactive video play *may* require the player to use the flipper buttons to play the mode.

End of Game Features

Game Endings

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

Match Feature

At the end of each ball, earned bonuses are collected. At the end of the last ball of a game (including any extra balls, if applicable), earned bonuses are collected, then the system produces a random 2-digit number (a multiple of 10; 00 to 90). Matching the last 2 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.

Continued Next Page.



Entering Initials

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

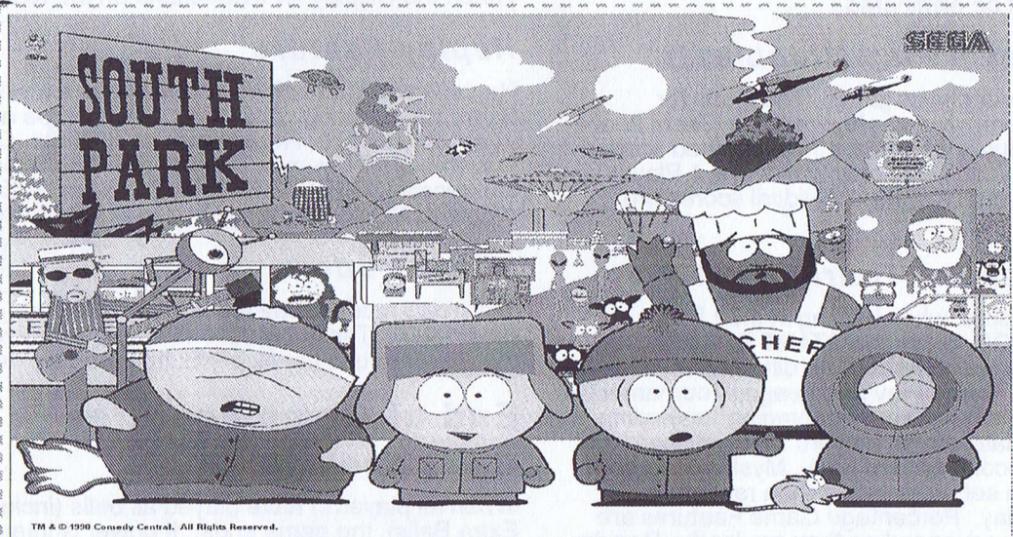
Manual Percentaging

This game is equipped with a Manual Percentage Adjustment. As with our previous games, you can either set operator adjustments for a replay percent or you can set a fixed replay score. See Section 3, Chapter 4, Go To Adjustments Menu, Adjustments 1 & 2. If you set operator adjustments for a particular replay percent, the game will compute a recommended score to keep the game at that replay percentage. If a change is recommended and the game coin door is opened, the display will indicate if the replay is too high or low and make a sound to alert the operator. By pressing the Start Button, the score to beat will be changed to a more appropriate level. If you close the Coin Door or enter the **Portals™ Service Menu**, no score change will be made. You may choose to ignore the recommended change; for example, you may not think last week's players were the usual crowd. Just close the door and the message will disappear without altering the existing level. Or you may choose to make a different score to beat adjustment; this is done by utilizing Adj. 2, Replay Levels.

Instruction Card

Below is a COPY of the game instruction card which is included with every game. If your 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 to keep the "COPY" sturdy.)

COPY & CUT



FOLD HERE

SKILL SHOT Collect *Flashing Light* on the side **Targets** for points. Use **Flippers** to *change lights*.

MULTIBALL Shoot **Targets** below **Toilet** until completed. Then shoot **Ramp** to begin *Multiball*.

FEATURES Shoot a **Character** the indicated number of times to **START Feature**:

- ★ **STAN** Shoot **STAN** to collect **Jackpots**. Collect indicated **Jackpots** to "Complete."
- ★ **CHEF** Shoot **Flashing Shots** to collect awards. Complete all **Flashing Shots** to "Complete."
- ★ **KYLE** Shoot **Ramp** to "Complete."
- ★ **KENNY** Shoot **KENNY** to collect award and "Complete."
- ★ **CARTMAN** Shoot **CARTMAN** to collect award. Collect indicated awards to "Complete."

Note: If the face of a character is lit solid, then he has been completed.
If the face of a character is flashing, then he has been "Played but not completed."

SPOOKY VISION Playing all character's features, lights **CHEF Shot** for **SPOOKY VISION**. During *Spooky Vision*, completing all shots increases **Jackpot**.

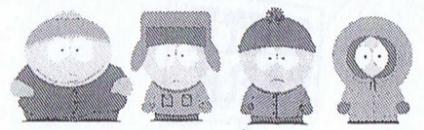
VOLCANO Completing all character's features, lights **CHEF Shot** for **VOLCANO**. During *Volcano*, complete all characters (each shot three (3) times) to receive **WIZARD AWARD**.

EXTRA BALL *Mystery* or *Consolation* may light **Extra Ball**.

SPECIAL *Consolation* or *Features* may light **Special**.

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

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Portals™ Service Menu Introduction

Section 3
Table of Contents

Chapter 1, • INTRODUCTION5

PORTALS™ Service Switch Set Access & Use / How to Use This Section.....6-7

Portals™ Service Menu Icon Tree8-9

Portals™ Service Menu Example and Exiting the Portals™ Service Menu..... 10-12

Chapter 2, • GO TO DIAGNOSTICS MENU..... 13

DIAG

- **Go To Switch Menu 14**
- **Switch Test / Active Switch Test / Dedicated Switch Test 14**
- ✕ Switch Matrix Grid & Dedicated Switches 14
- ✕ Switch Matrix Grid Descriptions with Part Numbers and Locations..... 15
- **Go To Coil Menu 16**
- **Single Coil Test / Cycling Coil Test 16**
- ✕ Coil & Flash Lamp Descriptions 16
- ✕ Coil & Flash Lamp Locations 17
- ✕ Coils Detailed Chart Table 18
- ✕ Backbox I/O Power Driver Board Detailed Wiring Diagram..... 19
- **Go To Lamp Menu 20**
- **Single Lamp Test / Test All Lamps / Row & Column Lamp Tests 20**
- ✕ Lamp Matrix Grid 20
- ✕ Lamp Matrix Grid Locations..... 21
- **Test Flash Lamps 22**
- **Clear Ball Trough 22**
- **Technician Alert..... 22**
- **Service Phone #..... 22**
- **Begin Play Test..... 22**
- **Fire Knocker 22**
- **Sound / Speaker Test 22**
- ✕ Speaker Phase Testing..... 23
- **Begin Burn In..... 23**
- **Dot Matrix Test & Dot Matrix Display Explained..... 23**
- **South Park Specific (Mr. Hankey Test)..... 24**
- **Dr. Pinball (Flow Chart Menus: Coil, Switch & Lamp)..... 25**

Chapter 3, • GO TO AUDITS MENU 27

AUD

- ✕ Game Audit Table 26
- **Earnings Audits (Audits 1-12) 27**
- **Sega Audits (Audits 13-55)..... 28-29**
- **South Park Audits (Audits 56-99)..... 29-31**
- **Go To Printer Menu 31**
- **...Printer Interface, ...Alison Interface, ...Nº of Copies Printed (Adjustments)..... 31**

Chapter 4, • GO TO ADJUSTMENTS MENU..... 33

ADJ

- ✕ Game Adjustment Table 32
- **Sega Adjustments (Adjustments 1-48)..... 33-37**
- **South Park Adjustments (Adjustments 49+) 38**
- **Custom Message (Direct Access to Adjustment 34)..... 40**
- **Film Star Reset (Special Factory Reset Settings for the Home Environment)..... 40**

Chapter 5, • GO TO RESET MENU..... 41

RESET

- **Reset Coin Audits / Reset Game Audits / Factory Reset..... 41**
- ✕ Example..... 42

Chapter 6, • GO TO FUSES LIST 43

FUSES

- **Go To Fuses List 43**
- ✕ Example and Backbox Layout Locations: Fuses, Bridges, Relays & ROMs 43-44

Chapter 7, • Go To Help Screen..... 45

HELP

- **Go To Help Screens (Multi-Level) 45**
- ✕ Problem / Solution Table..... 46



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. **Important:** The **Playfield Power Interlock Switch** must be pulled out for electro-mechanical device testing (this is required).

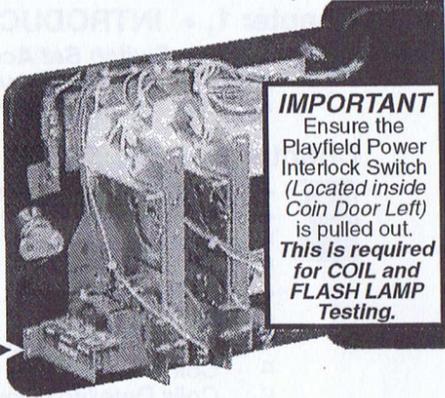
① Entering Portals™ Service Menu (will not operate in Volume Mode):

Step 2
Move through the menus by pushing the Red "LEFT" or Green "RIGHT" Buttons.
Note: Pushing the Left or Right Flipper Buttons operates in the same way.

Step 1 (Black Button 1st)
Enter the Portals™ Service Menu by pushing the Black "BEGIN TEST" Button.

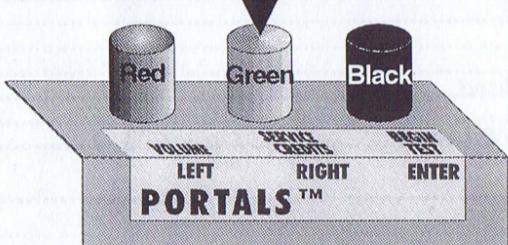
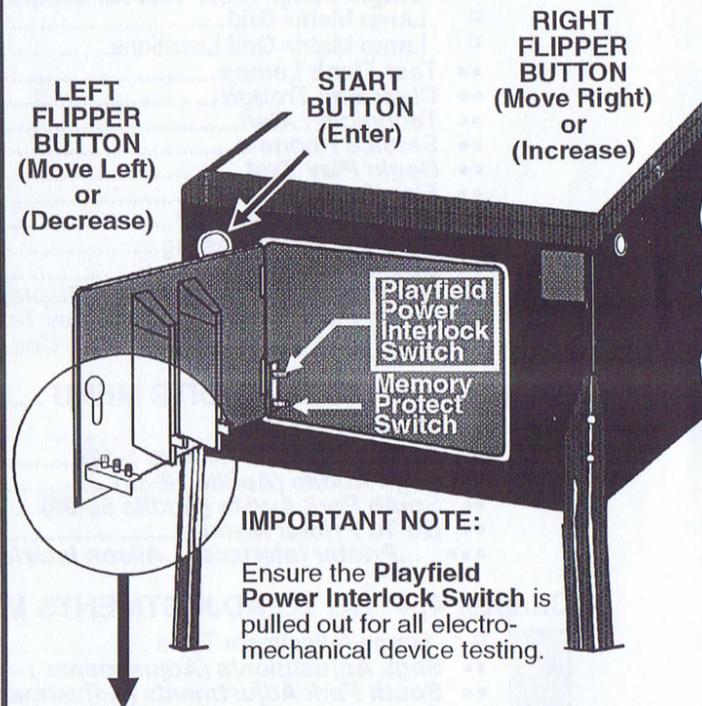
Step 3
Select or activate icons by pushing the Black "ENTER" Button.
Note: Pushing the Start Button operates in the same way.

IMPORTANT
Ensure the Playfield Power Interlock Switch (Located inside Coin Door Left) is pulled out. **This is required for COIL and FLASH LAMP Testing.**



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

Step 1 (Green Button 1st)
Receive service credits by pushing the Green "SERVICE CREDITS" Button.
This button allows the technician to add Service Credits without adding any counts to the Coin Audits. Up to 30 credits can be applied.

LEFT FLIPPER BUTTON (Move Left) or (Decrease)

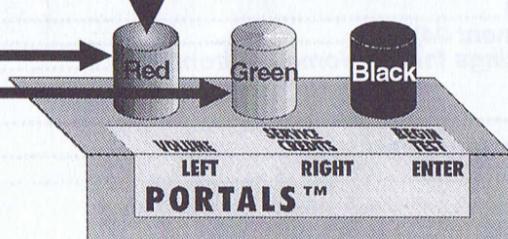
START BUTTON (Enter)

RIGHT FLIPPER BUTTON (Move Right) or (Increase)

IMPORTANT NOTE:
Ensure the Playfield Power Interlock Switch is pulled out for all electro-mechanical device testing.

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

Step 1 (Red Button 1st)
Enter the Volume Menu by pushing the Red "VOLUME" Button.

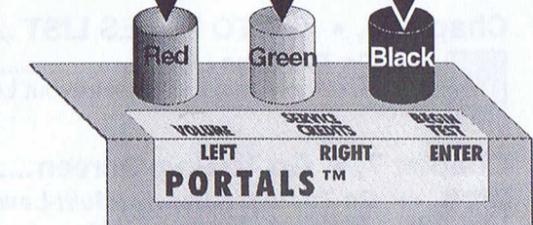


Step 2
* Decrease volume by pushing the Red "LEFT" Button.
* Increase volume by pushing the Green "RIGHT" Button.
Note: Pushing the Left or Right Flipper Buttons operates in the same way. Once adjustments are made, this menu will automatically exit in a few seconds.

-Red Button- "Volume" or "Left"

-Green Button- "Service Credits" or "Right"

-Black Button- "Begin Test" or "Enter"

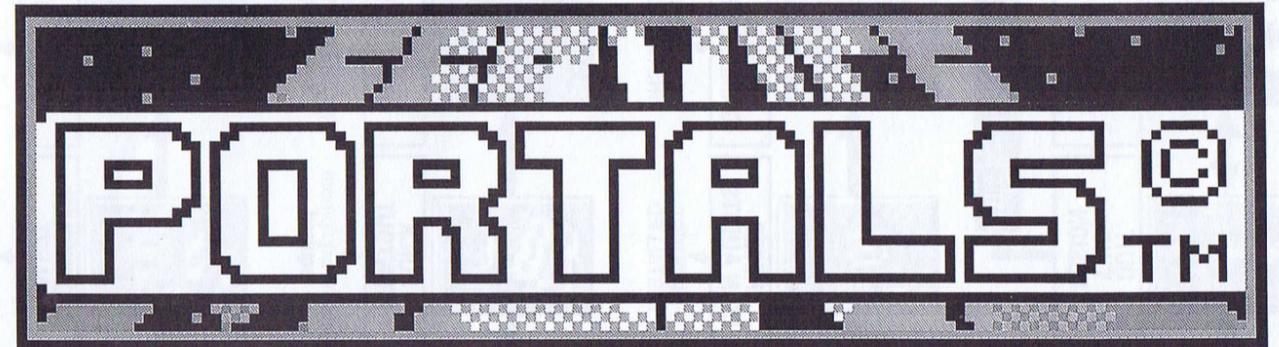


How to Use This Section

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™ ©" followed by the MAIN MENU:

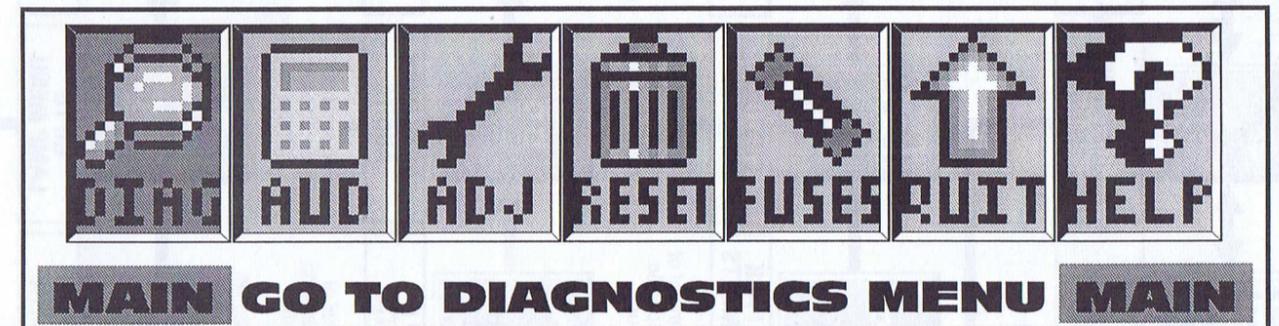


The Coin Door may be closed for security, however, please note with the Coin Door closed, the game's **MEMORY PROTECT** is enabled; *meaning any changes that are made will not be written to memory.* If changing adjustments is required, ensure the Coin Door is open.

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

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

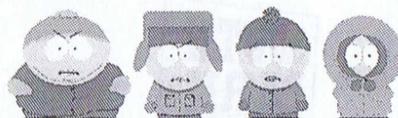
The **MAIN MENU** now appears with the "DIAG" *Icon* (DIAGNOSTICS MENU) flashing:



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

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

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



Portals™ Service Menu Example

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

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

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



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



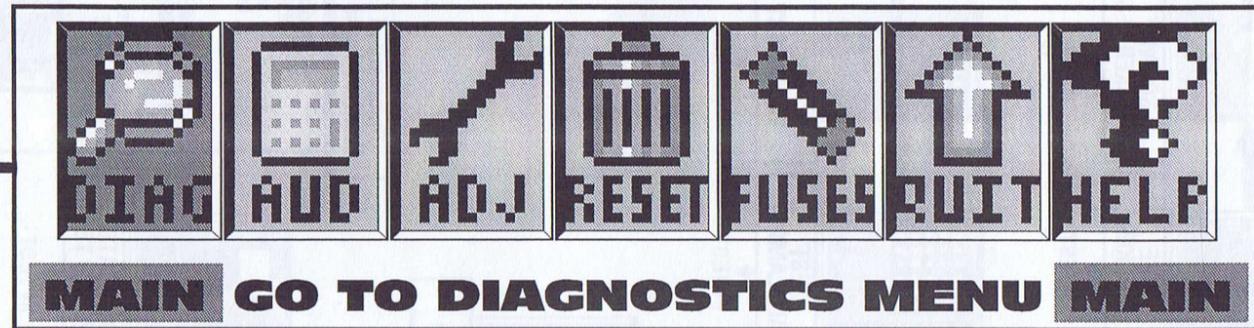
Important Note:

 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.

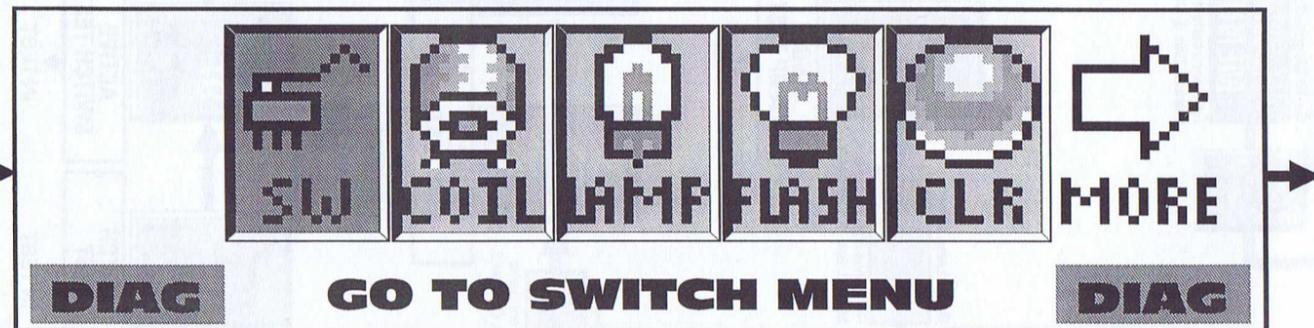
 Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.

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

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

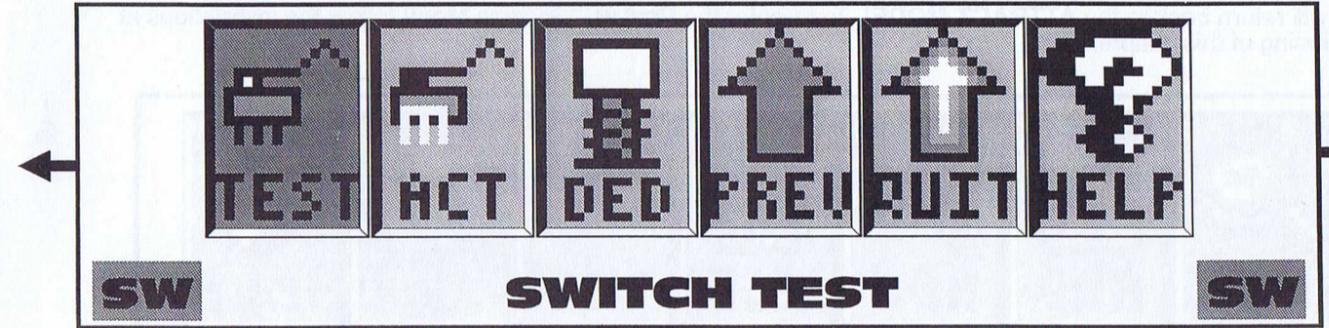


Press the **Black "ENTER" Button** to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

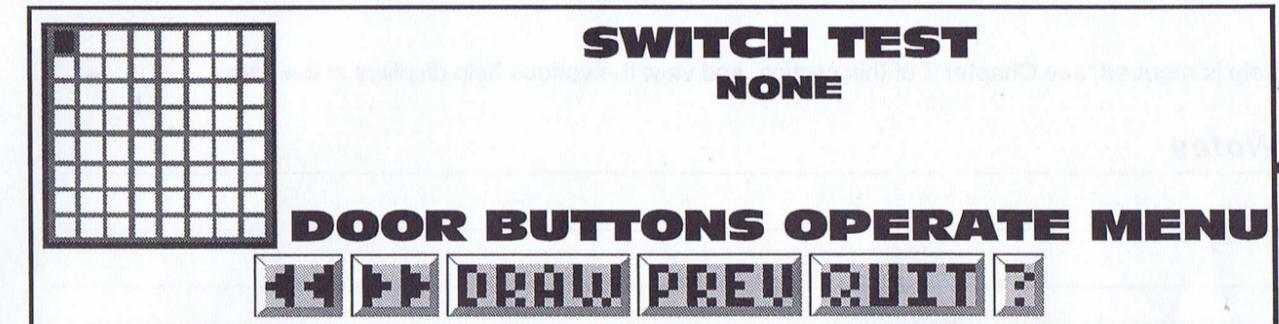


The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (GO TO SWITCH MENU) flashing. Press the **Black Button** to activate this icon. This will bring up the **SWITCH TEST MENU**.

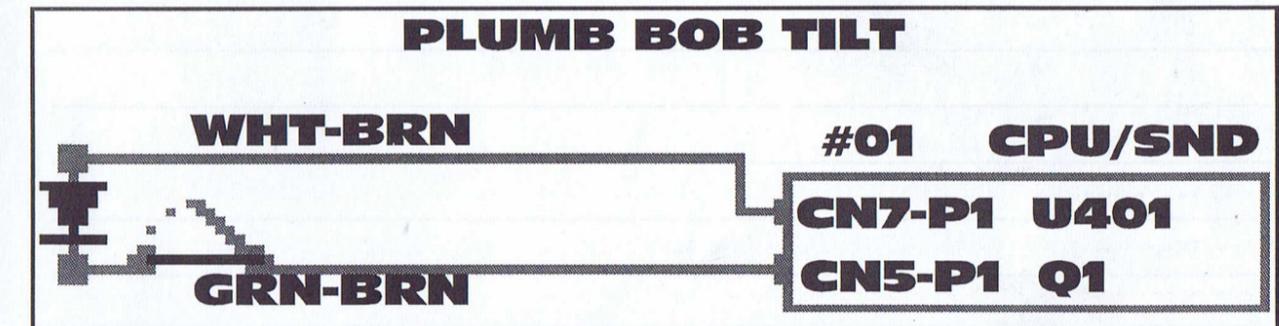
The **SWITCH TEST MENU** now appears with the "TEST" *Icon* (SWITCH TEST) flashing: Press the **Black "ENTER" Button** to activate this icon. This will bring up the **Switch Test Display**.



The **Switch Test Display** now appears.



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



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

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

Note:

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

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





Go To Switch Menu

From the **DIAGNOSTICS MENU**, select the "SW" *Icon* with either Red "LEFT" or Green "RIGHT" **Button** and press the **Black "ENTER" Button**. Switches are configured in an 8 x 8 Matrix of Columns (Switch Drives) and Rows (Switch Returns) with up to 64 switches possible. The Switch Test Menu consists of three (3) parts: Switch Test, Active Switches, and Dedicated Switch Test.

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



Switch Test

To initiate, from the **SWITCH MENU**, select the "TEST" *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 "DRAW" *Mini-Icon* with the Red or Green **Button** & press the **Black Button**.



Active Switch Test

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



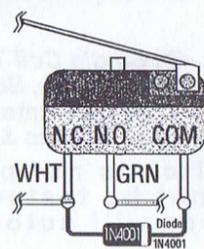
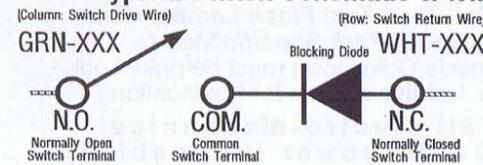
Dedicated Switch Test

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

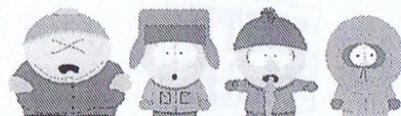
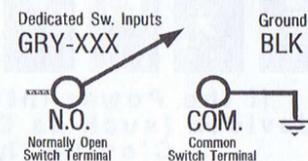
SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8	GND	Ground
Row (Return)	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9	IC U206 INPUTS	BLK CN6-P1, -P11
1: U400	LEFT BUTTON (UK ONLY) on Cabinet side	NOT USED	LEFT 5-BANK BOTTOM	RIGHT RAMP ENTER	NOT USED	NOT USED	LEFT TURBO BUMPER	LEFT OUTLANE	1: U206	#1 LEFT FLIPPER BUTTON in Cabinet side DS-1
2: U400	4TH COIN SLOT	5-BALL TROUGH #1 (LEFT)	LEFT 5-BANK #2	RIGHT RAMP EXIT	RIGHT 3-BANK BOTTOM	KENNY OPTO	RIGHT TURBO BUMPER	LEFT RETURN LANE	2: U206	#2 LEFT FLIPPER E.O.S (End-of-Stroke) in Cabinet side DS-2
3: U400	6TH COIN SLOT	5-BALL TROUGH #2	LEFT 5-BANK #3	NOT USED	RIGHT 3-BANK MIDDLE	UNDERTROUGH (TOILET)	BOTTOM TURBO BUMPER	LEFT SLINGSHOT	3: U206	#3 RIGHT FLIPPER BUTTON in Cabinet side DS-3
4: U400	RIGHT COIN SLOT	5-BALL TROUGH #3	LEFT 5-BANK #4	NOT USED	RIGHT 3-BANK TOP	UNDERTROUGH (KENNY)	NOT USED	RIGHT OUTLANE	4: U206	#4 RIGHT FLIPPER E.O.S (End-of-Stroke) in Cabinet side DS-4
5: U401	CENTER COIN SLOT / DBA	5-BALL TROUGH #4	LEFT 5-BANK TOP	NOT USED	POP BUMPER TARGET LT	SVUK	NOT USED	RIGHT RETURN LANE	5: U206	#5 NOT USED GRY-GRN CN6-P7 DS-5
6: U401	LEFT COIN SLOT	5-BALL TROUGH VUK OPTO	CENTER 3-BANK LEFT	NOT USED	POP BUMPER TARGET RT	VUK	START BUTTON	RIGHT SLINGSHOT	6: U206	#6 VOLUME (RED BUTTON) (In Test: LEFT) on Coin Door DS-6
7: U401	5TH COIN SLOT	5-BALL STACKING OPTO	CENTER 3-BANK MIDDLE	NOT USED	NOT USED	LEFT ORBIT (TO VUK)	SLAM TILT	NOT USED	7: U206	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) on Coin Door DS-7
8: U401	RIGHT BUTTON (UK ONLY) on Cabinet side	SHOOTER LANE	CENTER 3-BANK RIGHT	NOT USED	NOT USED	UNDERTROUGH SVUK	PLUMB BOB TILT	NOT USED	8: U206	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) on Coin Door DS-8

Typical Switch Schematic & Wiring

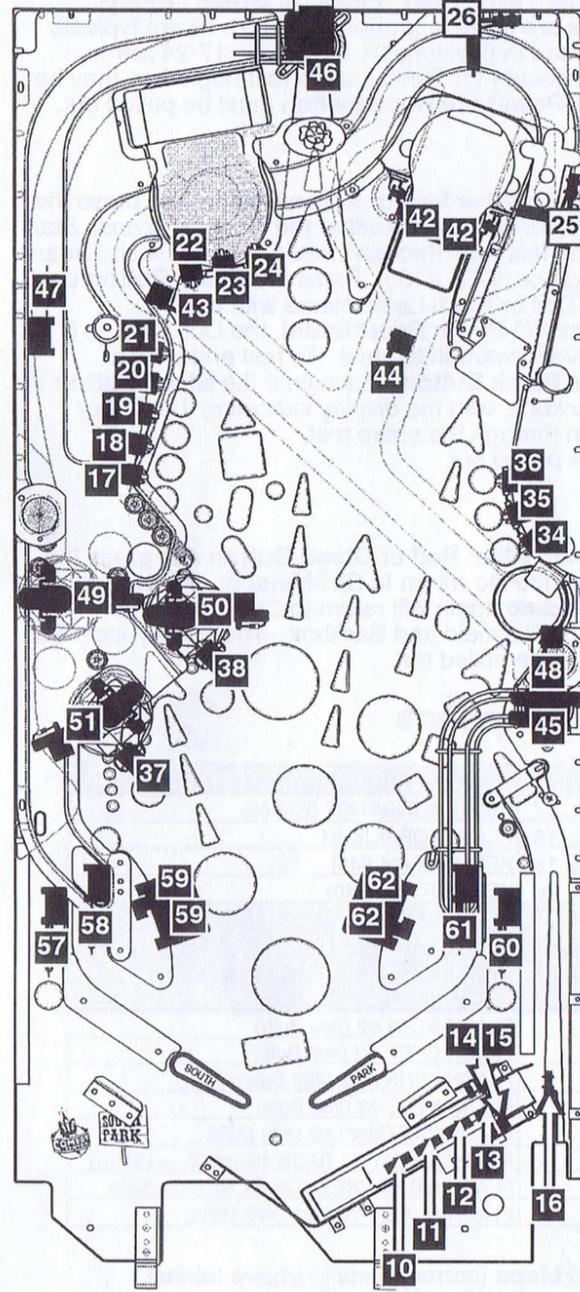


Dedicated Switch Schem.



Switch Matrix Grid Descriptions with Part Numbers and Locations

The Switch locations correspond with the Switch N^o in the Part Number Table shown & the Switch Matrix Grid (previous page).



Sw. N ^o	Col. N ^o	Row N ^o	See Notes	Switch Matrix Description	Part N ^o
Note: The ¥ Coin Switch (for Japan) is 180-5091-00					
1	1	1		LT BUTTON (UK ONLY)	180-5160-00
2*	1	2		4TH COIN SLOT	180-5024-00
3*	1	3		6TH COIN SLOT	(Future Use)
4*	1	4		RIGHT COIN SLOT	
5*	1	5		CENTER COIN SLOT / DBA	180-5024-00
6*	1	6		LEFT COIN SLOT	
7*	1	7		5TH COIN SLOT	(Future Use)
8	1	8		RT BUTTON (UK ONLY)	180-5160-00
9	2	1		NOT USED	
10	2	2		5-BALL TROUGH #1 (LEFT)	
11	2	3		5-BALL TROUGH #2	180-5119-02
12	2	4		5-BALL TROUGH #3	
13	2	5		5-BALL TROUGH #4	
14	2	6	‡	5-BALL TROUGH VUK OPTO	BOT TRANS: 520-5173-00 BOT REC: 520-5174-00
15	2	7	‡	5-BALL STACKING OPTO	TOP TRANS: 520-5173-00 TOP REC: 520-5174-00
16	2	8	DOTS	SHOOTER LANE	180-5157-00
17	3	1	R	LEFT 5-BANK BOT. (Purp. Sq. Rear Mnt.)	
18	3	2	R	LEFT 5-BANK #2 (Purple Sq. Rear Mnt.)	
19	3	3	R	LEFT 5-BANK #3 (Purple Sq. Rear Mnt.)	500-6139-09R
20	3	4	R	LEFT 5-BANK #4 (Purple Sq. Rear Mnt.)	
21	3	5	R	LEFT 5-BANK TOP (Purp. Sq. Rear Mnt.)	
22	3	6	R	CENTER 3-BANK LT. (Grn. Nar. Rear Mnt.)	500-6138-04R
23	3	7		CENTER 3-BANK MID. (Red Rect. Fwd.)	500-6228-02
24	3	8		CENTER 3-BANK RT. (Grn. Narrow Fwd.)	500-6138-04
25	4	1		RIGHT RAMP ENTER	
26	4	2		RIGHT RAMP EXIT	180-5087-00
27	4	3			
28	4	4			
29	4	5			
30	4	6		NOT USED	
31	4	7			
32	4	8			
33	5	1			
34	5	2	R	RT 3-BANK BOT. (Flo.Grn. Rnd. Rear Mnt.)	
35	5	3	R	RT 3-BANK MID. (Flo.Grn. Rnd. Rear Mnt.)	500-6075-11R
36	5	4	R	RT 3-BANK TOP (Flo.Grn. Round Rear Mnt.)	
37	5	5		POP BUMPER TARGET LT (Flo. Grn. Sq.)	500-6139-11
38	5	6		POP BUMPER TARGET RT (Flo. Grn. Sq.)	
39	5	7			
40	5	8		NOT USED	
41	6	1			
42	6	2		KENNY (OPTO) TRANS REC	520-5082-00 520-5083-01
43	6	3		UNDERTROUGH (TOILET)	
44	6	4		UNDERTROUGH (KENNY)	180-5057-00
45	6	5	DOTS	SVUK (Super Vertical Up-Kicker Switch)	180-5052-00
46	6	6	DOTS	VUK (Vertical Up-Kicker Switch)	180-5116-01
47	6	7		LEFT ORBIT (TO VUK)	500-6227-02
48	6	8		UNDERTROUGH SVUK	180-5057-00
49	7	1		LEFT TURBO BUMPER	
50	7	2		RIGHT TURBO BUMPER	180-5015-03
51	7	3		BOTTOM TURBO BUMPER	
52	7	4			
53	7	5		NOT USED	
54*	7	6		START BUTTON (Red)	500-6090-02
55*	7	7		SLAM TILT (On Coin Door)	180-5022-00
56*	7	8		PLUMB BOB TILT HANGER CONTACT	535-5319-00 535-7563-01
57	8	1		LEFT OUTLANE (Rt. Mount R/O)	500-6227-02
58	8	2		LEFT RETURN LANE (Rt. Mnt. R/O)	
59	8	3		LEFT SLINGSHOT (Double-Switch)	180-5054-00
60	8	4		RIGHT OUTLANE (Rt. Mount R/O)	500-6227-02
61	8	5		RIGHT RETURN LANE	
62	8	6		RIGHT SLINGSHOT (Double-Switch)	180-5054-00
63	8	7			
64	8	8		NOT USED	

‡ Sw. 14 / Sw. 15 have both REC/TRANS on 1 board respectively.
"R" : The "R" following the Part Number on Stand-Up Targets means reverse (rear) mounted Target & Switch Actuator.
DOTS: Diode On Terminal Strip, if noted.

Legend Note:

- = Switches mounted above playfield.
- = Switches mounted below playfield.

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

- 2 4 5 6 54 55 56
9 27-33 39-41 52-53 63-64

Switches for UK only: 1 + 8





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. Coils 01-16 are typically High Current Coils (although Low Current Coils may be used in positions 01-07). Coils 17-24 are typically Low Current Coils. The remaining positions (F1-F8) are typically for Flash Lamps (although they may be used any positions 01-24, read **Single Coil Test**). **Important:** The **Power Interlock Switch** must be pulled out.



Single Coil Test

To initiate, from the **COIL MENU**, select the "TEST" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Ensure the **Power Interlock Switch** is pulled out. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Coil Test from #1 (The test runs through Coils 1-24 and Flash Lamps F1-F8; *Note: Some Flash Lamps are used in Coil Positions; this game: #7 & #18.*) 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 & 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.

Important: The **Power Interlock Switch** must be pulled out.



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." **Important:** The **Power Interlock Switch** must be pulled out.

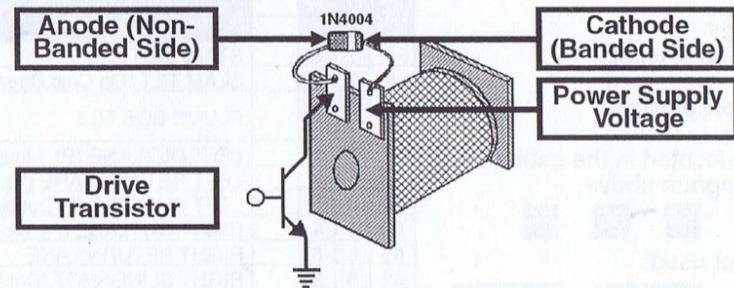
Coil & Flash Lamp Descriptions

Type	Coil / Flash Lamp Descriptions
COIL 1	TROUGH UP-KICKER (VUK) (26-1200)
COIL 2	AUTO LAUNCH (50V) (24-940)
COIL 3	SUPER VUK (24-940)
COIL 4	TOP VUK (26-1200)
COIL 5	TOILET SEAT LID (23-1100)
COIL 6	MR. HANKEY LATCH (29-1000)
COIL 7	FLASH POPS *4
COIL 8	(EUROPEAN TOKEN DISPENSER)
COIL 9	LEFT TURBO BUMPER (26-1200)
COIL 10	RIGHT TURBO BUMPER (26-1200)
COIL 11	BOTTOM TURBO BUMPER (26-1200)
COIL 12	LEFT SLINGSHOT (23-800)
COIL 13	MR. HANKEY (DOWN) (23-1100)
COIL 14	KENNY PIVOT (DEAD) (22-1080)
COIL 15	LEFT FLIPPER [50V RED/YEL] (23-1100)
COIL 16	RIGHT FLIPPER [50V RED/YEL] (23-1100)

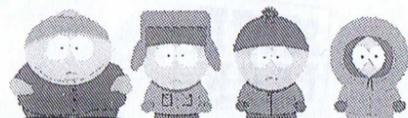
Type	Coil / Flash Lamp Descriptions
COIL 17	RIGHT SLINGSHOT (23-800)
COIL 18	FLASH TOP VUK *1
COIL 19	KENNY LT (24-940)
COIL 20	KENNY RT (24-940)
COIL 21	LT OUTLANE (UK ONLY) (28-1050)
COIL 22	RT OUTLANE (UK ONLY) (28-1050)
COIL 23	UP/DOWN POST (UK ONLY) (23-1100)
COIL 24	(OPTIONAL COIN METER)
#F1	FLASH STAN *2 (#89 Bulb)
#F2	FLASH CHEF *2 (#89 Bulb)
#F3	FLASH KENNY *2 (#89 Bulb)
#F4	FLASH KYLE *2 (#89 Bulb)
#F5	FLASH CARTMAN *2 (#89 Bulb)
#F6	FLASH KENNY *1 BACK *2 (#906 (1) #89 (2))
#F7	FLASH MR HANKEY/TOILET *2 (#89 Bulb)
#F8	FLASH SUPER VUK *1 (#89 Bulb)

See the next three (3) pages for the **Coil & Flash Lamp Location Maps** (corresponds to above tables), **Coils Detailed Chart Table** & the **Backbox I/O Power Driver Board Detailed Wiring Diagram**.

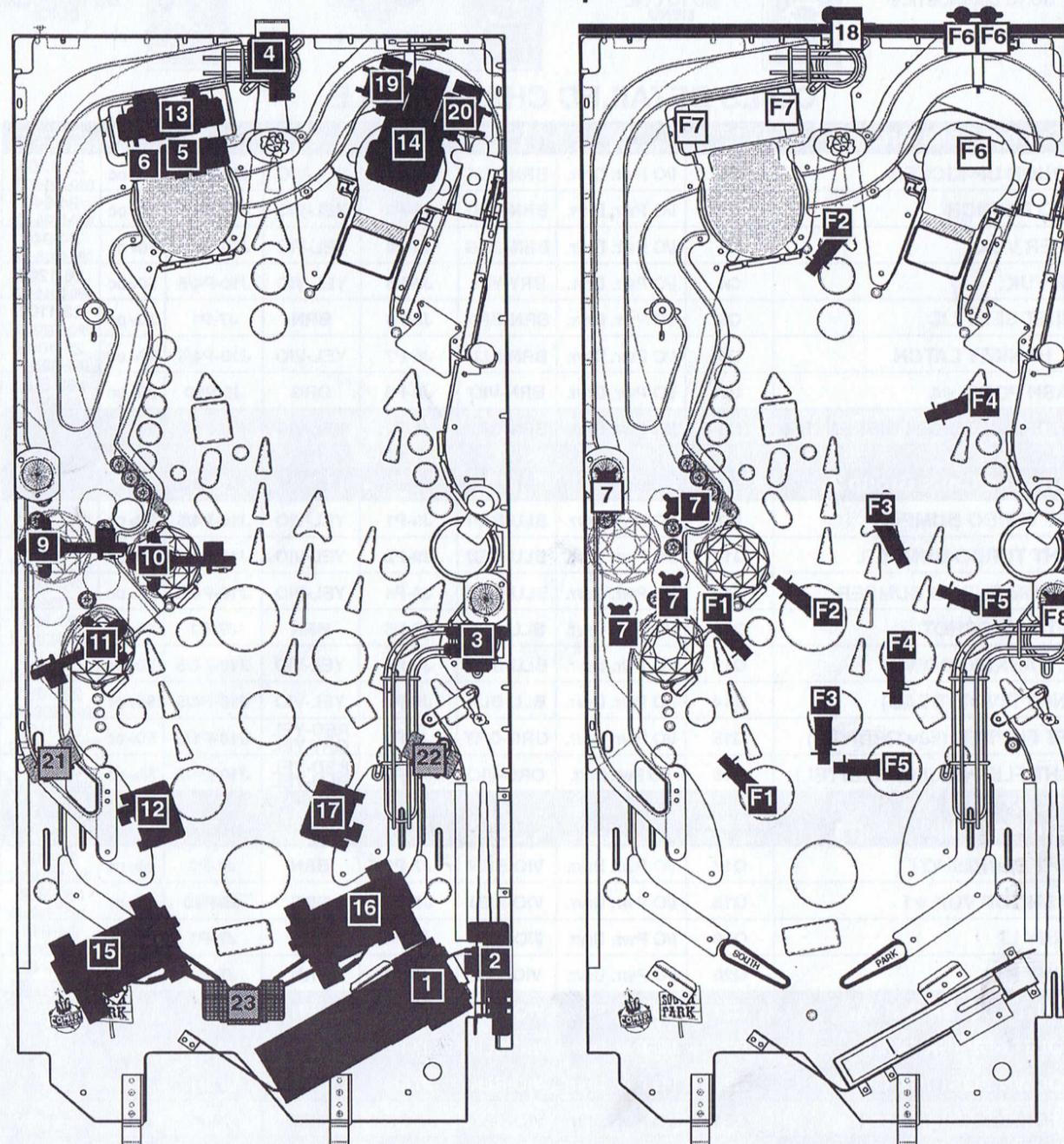
Typical Coil Wiring



Note: All Coils require diodes. Some diodes are located on Terminal Strips (under playfield) & not on the coil itself.
D iode
O n
T ermi-nal
S trip



Coil & Flash Lamp Locations

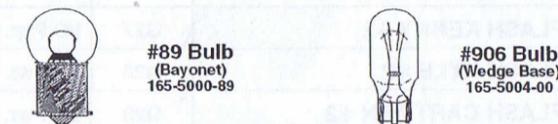


Use the previous page and the following two (2) pages in conjunction with above Coil and Flash Lamp Maps.

Legend Note:

- = Coils and Flash Lamps mounted above playfield.
- = Coils and Flash Lamps mounted below playfield.

The following Bulb Type is used for Flash Lamps:



The following Coils are optional for UK Only:

- 21
- 22
- 23

The following Coils are Optional:

- 08
- 24

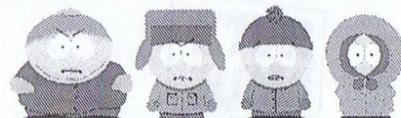




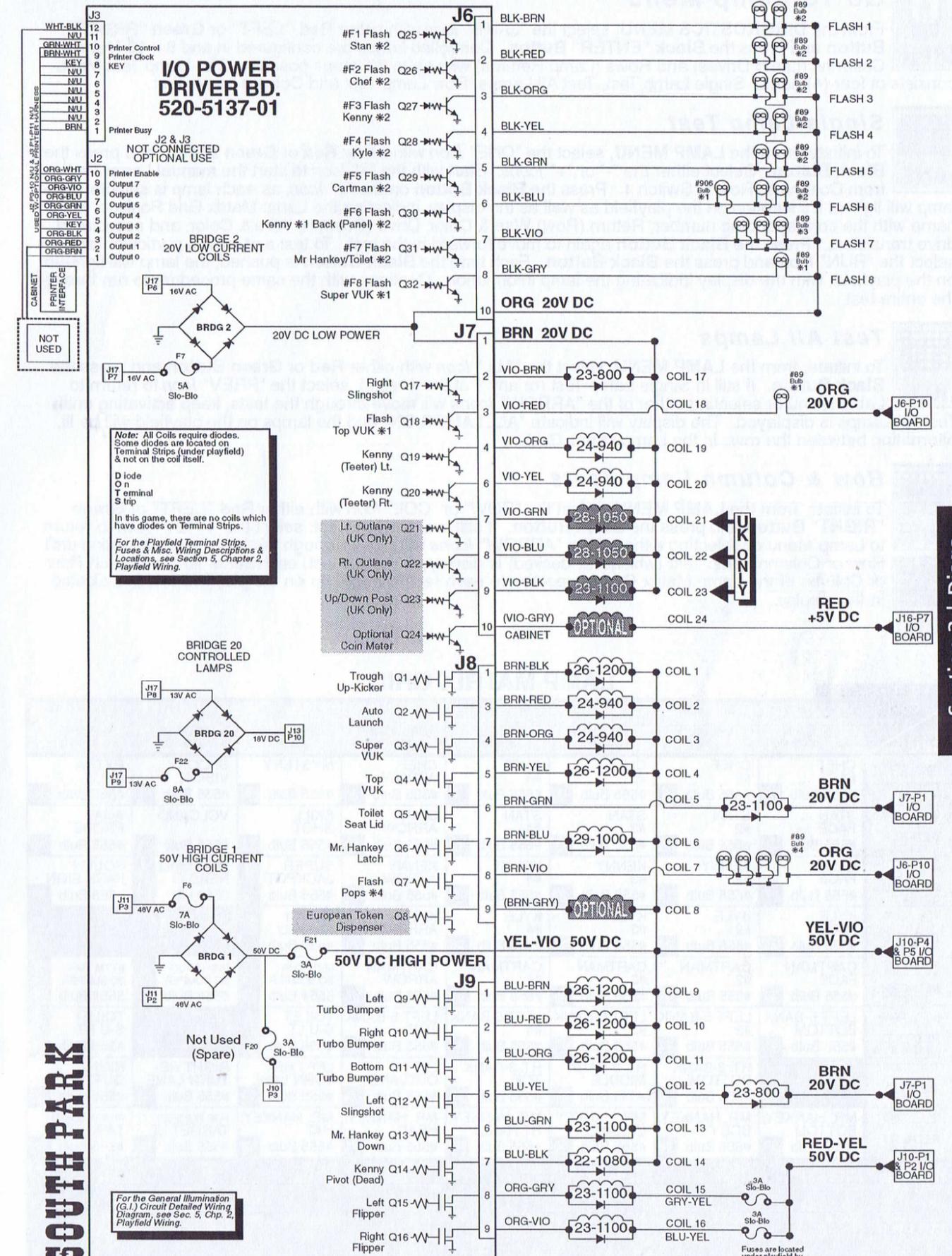
COILS DETAILED CHART TABLE

High Current Coils Group 1									
#	Coil Name	Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00T
#3	SUPER VUK	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00T
#4	TOP VUK	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#5	TOILET SEAT LID	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#6	MR. HANKEY LATCH	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v DC	29-1000 090-5059-00
#7	FLASH POPS *4	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	DL4SS 515-6076-01
High Current Coils Group 2									
#	Coil Name	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-P4/5	50v DC	26-1200 090-5044-00T
#10	RIGHT TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#11	BOTTOM TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	BRN	J7-P1	20v DC	23-800 090-5001-00T
#13	MR. HANKEY (DOWN)	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#14	KENNY PIVOT (DEAD)	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v DC	22-1080 090-5032-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
Low Current Coils Group 1									
#	Coil Name	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 Bulb or Meter
#17	RIGHT SLINGSHOT	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	23-800 090-5001-00T
#18	FLASH TOP VUK *1	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#19	KENNY LT	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	J7-P1	20v DC	24-940 090-5036-00T
#20	KENNY RT	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v DC	24-940 090-5036-00T
#21	LT OUTLANE (UK ONLY)	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	28-1050 090-5044-00
#22	RT OUTLANE (UK ONLY)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	28-1050 090-5045-00
#23	UP/DOWN POST (UK ONLY)	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	Meter 5v 091-5000-00
Flash Lamps (FLASH)									
#	Flash Name	Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Bulb Type
#F1	FLASH STAN *2	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F2	FLASH CHEF *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F3	FLASH KENNY *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F4	FLASH KYLE *2	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F5	FLASH CARTMAN *2	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F6	FLASH KENNY *1 BACK *2	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#906 Bulb 165-5004-00 #89 Bulb 165-5000-89
#F7	FLASH MR HANKEY/TOILET *3	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F8	FLASH SUPER VUK *1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89

Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are Flash Lamps F1-F8 ONLY. Test all others in Single or Cycling Coil Tests.



Backbox I/O Power Driver Board Detailed Wiring Diagram



SOUTH PARK



Section 3 | Diags.



Go To Lamp Menu

From the **DIAGNOSTICS MENU**, select the "LAMP" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. Controlled lamps are configured in an 8 x 10 Matrix of Columns (Lamp Drives) and Rows (Lamp Returns) with up to 80 lamps possible. The Lamp Test Menu consists of four (4) parts: Single Lamp Test, Test All Lamps, Row Lamp Test and Column Lamp Test.



Single Lamp Test

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



Test All Lamps

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



Row & Column Lamp Tests

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



Diode On Terminal Strip		LAMP MATRIX GRID							
Column (18V)	1: U17	2: U16	3: U15	4: U14	5: U13	6: U12	7: U11	8: U10	
Row (GND)	YEL-BRN J13-P9	YEL-RED J13-P8	YEL-ORG J13-P7	YEL-BLK J13-P6	YEL-GRN J13-P5	YEL-BLU J13-P4	YEL-VIO J13-P3	YEL-GRY J13-P1	
1: Q33 RED-BRN J12-P1	CHEF FACE #555 Bulb 1	CHEF #2 #555 Bulb 2	CHEF #3 #555 Bulb 3	CHEF #4 #555 Bulb 4	CHEF ARROW #555 Bulb 5	MYSTERY #555 Bulb 6	SPOOKY VISION #555 Bulb 7	EXTRA BALL #555 Bulb 8	
2: Q34 RED-BLK J12-P2	STAN FACE #555 Bulb 9	STAN #2 #555 Bulb 10	STAN #3 #555 Bulb 11	STAN #4 #555 Bulb 12	STAN ARROW #555 Bulb 13	SKILL SHOT #555 Bulb 14	VOLCANO #555 Bulb 15	ANAL PROBE #555 Bulb 16	
3: Q35 RED-ORG J12-P3	KENNY FACE #555 Bulb 17	KENNY #2 #555 Bulb 18	KENNY #3 #555 Bulb 19	KENNY #4 #555 Bulb 20	KENNY ARROW #555 Bulb 21	SUPER JACKPOT #555 Bulb 22	MULTIBALL READY 555# ulb 23	SOUTH PARK SIGN #555 Bulb 24	
4: Q36 RED-YEL J12-P4	KYLE FACE #555 Bulb 25	KYLE #2 #555 Bulb 26	KYLE #3 #555 Bulb 27	KYLE #4 #555 Bulb 28	KYLE ARROW #555 Bulb 29	KENNY ASSEMBLY #555 Bulb 30	NOT USED 31	NOT USED 32	
5: Q37 RED-GRN J12-P5	CARTMAN FACE #555 Bulb 33	CARTMAN #2 #555 Bulb 34	CARTMAN #3 #555 Bulb 35	CARTMAN #4 #555 Bulb 36	CARTMAN ARROW #555 Bulb 37	LEFT TUR-BO BUMPER 555# Bulb 38	RIGHT TUR-BO BUMPER 555# Bulb 39	BTTM TUR-BO BUMPER 555# Bulb 40	
6: Q38 RED-BLU J12-P6	LEFT 5-BANK BOTTOM #555 Bulb 41	LEFT 5-BANK #2 #555 Bulb 42	LEFT 5-BANK #3 #555 Bulb 43	LEFT 5-BANK #4 #555 Bulb 44	LEFT 5-BANK TOP #555 Bulb 45	TOILET S-U LT #555 Bulb 46	NOT USED 47	TOILET S-U RT #555 Bulb 48	
7: Q39 RED-VIO J12-P8	NOT USED 49	RT. 3-BANK BOTTOM #555 Bulb 50	RT. 3-BANK MIDDLE #555 Bulb 51	RT. 3-BANK TOP #555 Bulb 52	LEFT OUTLANE #555 Bulb 53	LEFT RE-TURN LANE #555 Bulb 54	RIGHT RE-TURN LANE #555 Bulb 55	RIGHT OUTLANE #555 Bulb 56	
8: Q40 RED-GRY J12-P9	MR. HANKEY: BOTTOM #555 Bulb 57	MR. HANKEY: BODY #555 Bulb 58	MR. HANKEY: LT HAND #555 Bulb 59	MR. HANKEY: RT HAND #555 Bulb 60	MR. HANKEY: HEAD #555 Bulb 61	MR. HANKEY: HAT #555 Bulb 62	POP BUMPER TARGET LT #555 Bulb 63	POP BUMPER TARGET RT #555 Bulb 64	
9: Q41 NOT USED RED-WHT J12-P10	NOT USED 65	NOT USED 66	NOT USED 67	NOT USED 68	NOT USED 69	NOT USED 70	NOT USED 71	NOT USED 72	
10: Q42 NOT USED RED J12-P11	NOT USED 73	NOT USED 74	NOT USED 75	NOT USED 76	NOT USED 77	NOT USED 78	NOT USED 79	NOT USED 80	



Lamp Matrix Grid Locations

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

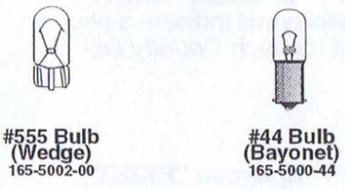
Legend Note:

- = Lamps mounted above playfield.
- = Lamps mounted below playfield.

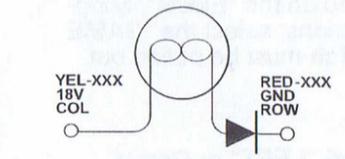
The following Lamps are not used:

- 31 - 32
- 47
- 49
- 65 - 80

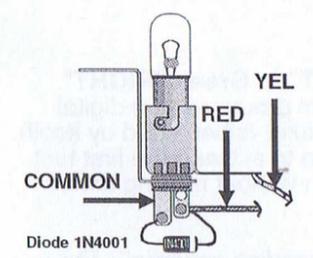
The following Bulbs are used in the Lamp Matrix Grid (See Table Grid on previous page for details):



Typical Lamp Schematic

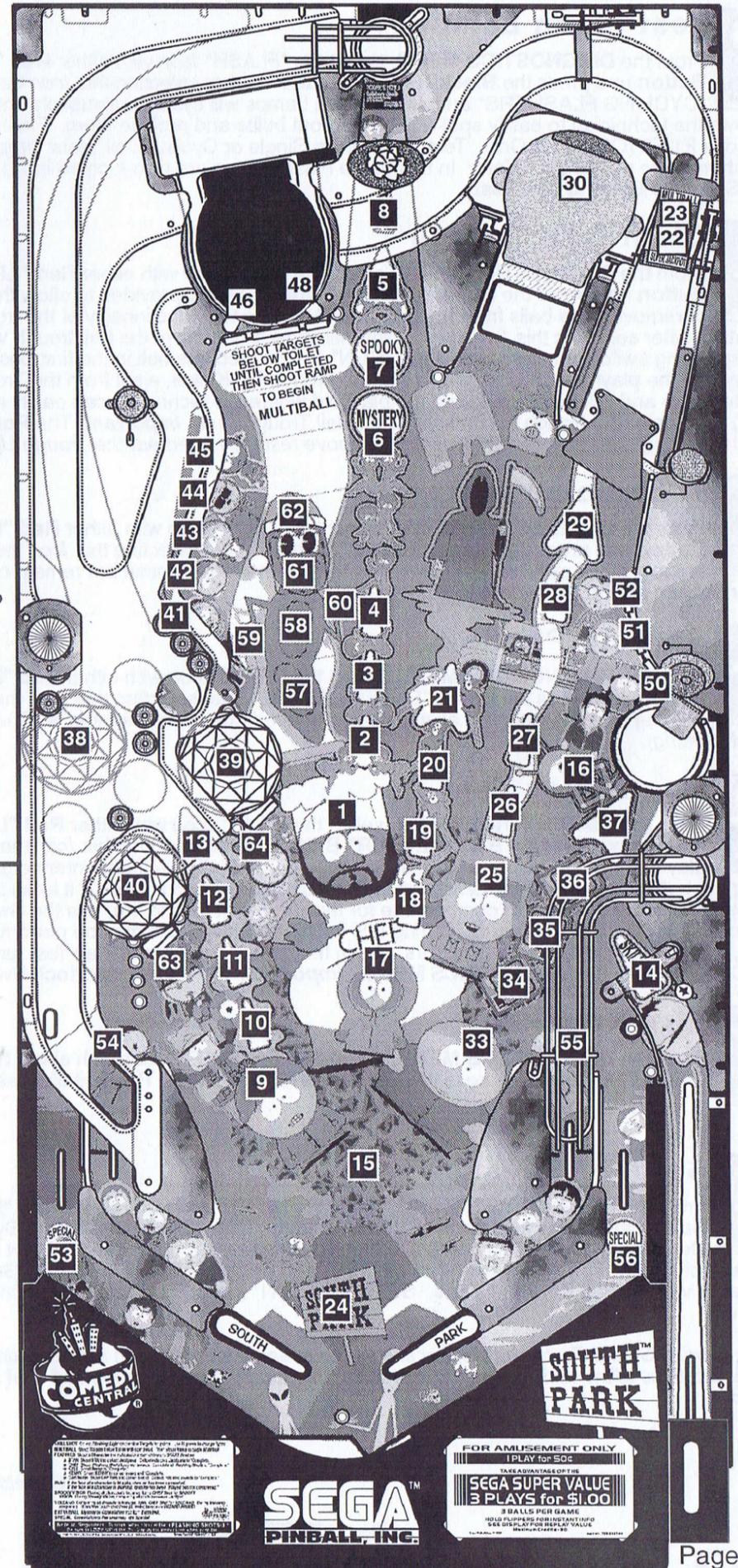


Typical Lamp Wiring



Note:
All Lamps require diodes. Some diodes are located on Terminal Strips (under playfield) & not on the lamp itself.

D iode
O n
T ermi
S trip





Test Flash Lamps

From the **DIAGNOSTICS MENU**, select the "FLASH" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate "CYCLING FLASHERS" and all the Flash Lamps will cycle continuously until the test is exited. This test allows the technician to easily spot any burned-out bulbs and replace them. Flashers tested are Flash Lamps in Positions F1-F8 (Q25-Q32) Only. Test all others in Single or Cycling Coil Tests. **Important:** The **Power Interlock Switch** must be pulled out. **Note:** In this game Flash Lamps are also located in Coil Positions #6 & #7. **TO TEST USE Single or Cycling Coil Tests.**



Clear Ball Trough

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



Technician Alert

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



Service Phone

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



Begin Play Test

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



Fire Knocker

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



Sound / Speaker Test

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

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

Sound / Speaker Test Continued Next Page



Speaker Phase Testing

Continued

Connections to each of speakers are polarized and each must be connected appropriately for the best quality sound. If one speaker has the positive and negative connections reversed with respect to the other one, bass frequencies will not be produced properly and the overall sound quality will be poor. To test for proper speaker phasing, use the sound test to cycle through the Backbox & Cabinet, and Backbox Sine (repeated) functions. If the Cabinet Sine produces more volume and bass than the Left Sine, the speakers are connected properly. If it produces the same or less, one speaker is connected improperly. To isolate and correct reversed speaker connections, one of two methods may be used.

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

Auto / Manual Tests	Sounds Produced
Speaker Test	Tone
Sound/OPSYS EPROM (Loc. U7)	Level 1-3 (Music Test)
Voice ROM 1 (Loc. U17)	Speech Pattern 1
Voice ROM 2 (Loc. U21)	Speech Pattern 2
Voice ROM 3 (Loc. U36)	Speech Pattern 3
Voice ROM 4 (Loc. U37)	Speech Pattern 4

Note: Voice ROMs 1 - 4 = 8MB. The CPU/Sound Board must have a Jumper at W6 to accept 8MB ROMs.



Begin Burn In

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



Dot Matrix Test

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

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

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

Dot Matrix Display Explained

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

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





South Park Specific (Mr. Hankey Test)

To initiate, from the **DIAGNOSTICS MENU**, select the "PARK" *Icon* with either the Red "LEFT" or Green "RIGHT" **Button** and press the Black "ENTER" **Button**. This will bring up the **SOUTH PARK SPECIFIC MENU**. Similar to "BEGIN PLAY TEST," this menu is used to test and adjust Game Specific Features. The feature in this game is **MR. HANKEY TEST**.

MR. HANKEY TEST

PULSE LENGTH: 30



This test allows you to operate the **MR. HANKEY LATCH** (Coil Q6) [UP] and the **MR. HANKEY (DOWN)** (Coil Q13) [DOWN] outside of Game Mode for the purpose of troubleshooting and adjustment.

Test Procedure:

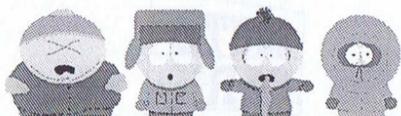
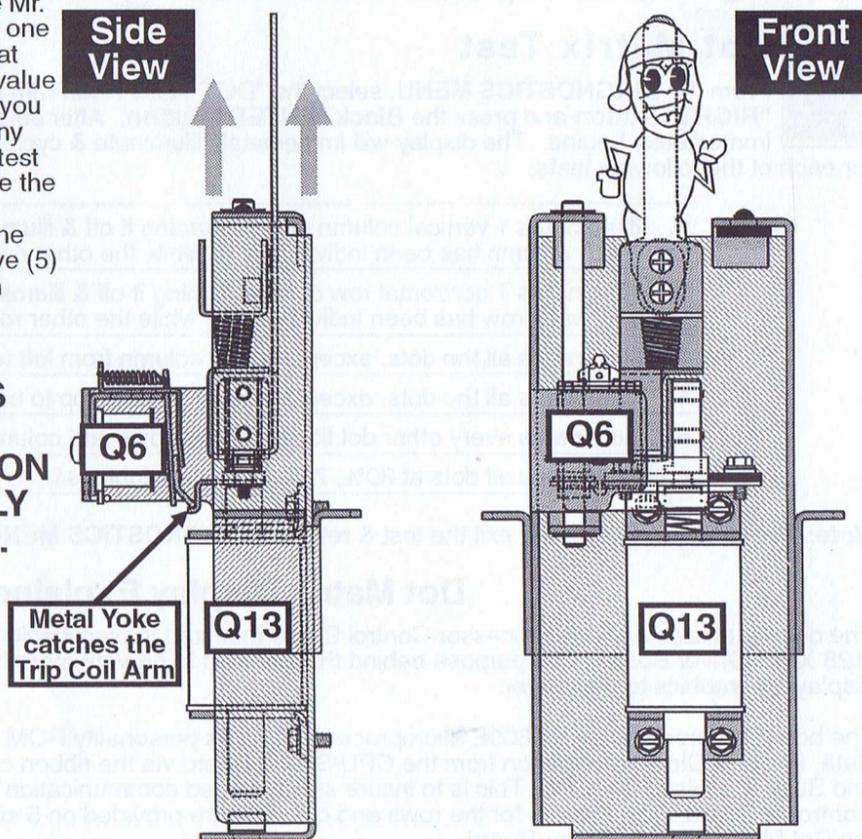
Select the "UP" *Icon* with either the Red "LEFT" or Green "RIGHT" **Button** and press the Black "ENTER" **Button**. This will energize the **MR. HANKEY LATCH** Coil (Q6) releasing the spring loaded Mr. Hankey Device. Select the "DOWN" *Icon* with either the Red "LEFT" or Green "RIGHT" **Button** and press the Black "ENTER" **Button**. The **MR. HANKEY (DOWN)** Coil (Q13) will energize, pulling Mr. Hankey back into the Toilet Tank and re-latching the assembly (...the Metal Yoke on the Plunger catches under the Trip Coil Arm Assembly.).

Adjustment Procedure:

Using the or *Icons* you can vary the strength of the [DOWN] Coil (Q13) (the Display will indicate this.).

The **Adjustment Range** is 10 (SOFT) to 60 (HARD). The **Factory Setting** is 30. Your goal is to have the [DOWN] Coil pull the Mr. Hankey Assembly into the Toilet Tank in one **PULSE** (with no "chattering"). Starting at the lowest value of "10", increment the value by two (2) (e.g. 10-12, 12-14, etc.) until you get a smooth "One-Shot-Pull" without any chattering. Select the "DOWN" *Icon* to test the "pull"; select the "UP" *Icon* to release the Mr. Hankey Assembly so you may try another Pulse Length, if desired. Test the action of this assembly a minimum of five (5) times ensuring each time was a smooth "One-Shot-Pull."

BEFORE EXITING THIS MENU, ENSURE YOU SELECT THE "DOWN" ICON TO PULL THE ASSEMBLY BACK INTO THE TANK.



Dr. Pinball (Flow Chart Menus)

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

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



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



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



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



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



Coil Flow Chart

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



Switch Flow Chart

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



Lamp Flow Chart

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





SOUTH PARK GAME AUDIT TABLE



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



Earnings Audits 1-12

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



S.P.I. Audits 13-55

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
13 TOTAL BALLS PLAYED		28 20M—49.9M SCORES		43	
14 TOTAL EXTRA BALLS		29 50M—69.9M SCORES		44	
15 EXTRA BALL PERCENT		30 70M—99.9M SCORES		45	
16 REPLAY 1 AWARDS		31 100M—129.9M SCORES		46	
17 REPLAY 2+ AWARDS		32 130M+ SCORES		47	
18 TOTAL REPLAYS		33 AVERAGE SCORES		48	
19 REPLAY PERCENT		34 SERVICE CREDITS		49	
20 TOTAL SPECIALS		35 BALL SEARCH STARTED		50	
21 SPECIAL PERCENT		36 LOST BALL FEEDS		51	
22 TOTAL MATCHES		37 LOST BALL GAME STARTS		52 LEFT FLIPPER USED	
23 HIGH SCORE AWARDS		38 LEFT DRAINS		53 RIGHT FLIPPER USED	
24 HIGH SCORE PERCENT		39 CENTER DRAINS		54	
25 TOTAL FREE PLAYS		40 RIGHT DRAINS		55	
26 TOTAL PLAYS		41 SLAM TILTS			
27 0—19.9M SCORES		42 TOTAL BALLS SAVED			

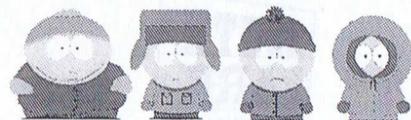


South Park Audits 56-99 (All Audits Subject to Change)

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
56 LEFT ORBIT		72 MBALL RESTARTED		88 VOLCANO STARTED	
57 TOP VUK VIA ORBIT		73 MBALL JACKPOTS		89 VOLCANO COMPLETED	
58 RAMP		74 SUPER JACKPOTS LIT		90 SUPER FART BUMPERS LIT	
59 RIGHT 3-BANK COMP		75 SUPER JACKPOTS		91 POP BUMPER HITS	
60 LEFT 5-BANK COMP		76 CARTMAN MODE STARTED		92 MYSTERY LIT	
61 CENTER 3-BANK HITS		77 CARTMAN MODE COMPLETED		93 MYSTERY SCORED	
62 KENNY OPTO		78 KYLE MODE STARTED		94 SKILL SHOT MADE	
63 KENNY UNDERTROUGH		79 KYLE MODE COMPLETED		95	
64 TOILET UNDERTROUGH		80 KENNY MODE STARTED		96	
65 CARTMAN UNDERTROUGH		81 KENNY MODE COMPLETED		97	
66 SUPER VUK		82 CHEF MODE STARTED		98	
67 TOP VUK		83 CHEF MODE COMPLETED		99	
68 MBALL READY		84 STAN MODE STARTED			
69 MULTIBALL START		85 STAN MODE COMPLETED			
70 2+ MBALL START		86 SPOOKY VISION LIT			
71 MULTIBALL RESTART LIT		87 SPOOKY VISION STARTED			

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

Location:



Go To Audits Menu

Overview

The Portals™ Service Menu System provides 99 Audit Functions for accounting purposes and for evaluation of Game Difficulty Adjustments. The Audit Functions are divided into 3 groups: 1st— Earnings (Coin) Audits, are the first 12 most-used Audits; 2nd— Sega Audits, are the Game Play Generic Audits 13-55; 3rd— South Park Audits, are the Game Play Specific Audits 56-99; Audits left open (blank space in gray, e.g. Audits 43-51, 54 & 55, 95-99) are currently **Not Used**, allowing for **Future Expansion**, if any, or are **Proprietary**. If the code version is upgraded, view Audits in the display & write the audit(s) in the blank(s) if any audit(s) were added. Each group may be viewed in the Portals™ Service Menu (see Chapter 1, Portals Service Menu Introduction, of this Section). View all audits with the Game Audit Table provided on the previous page. Copy page to fill-in important audit information as required.



GO TO AUDITS MENU

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

Important Notes:



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



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



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



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



Earnings Audits (1-12)

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

Au. N°	Audit Name	Audit Definition
Au. 1	Total Paid Credits	Provides the total number of paid credits.
Au. 2	Free Game Percentage	This percentage is derived from dividing Audit 25, Total Free Plays, by Audit 26, Total Plays.
Au. 3	Average Ball Time	In seconds, the average ball time is derived from the total play time divided by Audit 13, Total Balls Played.
Au. 4	Average Game Time	The average game time is expressed in minutes and seconds.
Au. 5	Coins Thru Left Slot	Provides the total number of times Coin Switch (Sw. 6) was closed.
Au. 6	Coins Thru Right Slot	Provides the total number of times Coin Switch (Sw. 4) was closed.
Au. 7	Coins Thru Center Slot	Provides the total number of times Coin Switch (Sw. 5) was closed.
Au. 8	Coins Thru 4th Slot	Provides the total number of times Coin Switch (Sw. 2) was closed.
Au. 9	Total Coins	Provides the total amount of coins registered through all the slots.
Au. 10	Total Earnings	The total cash value accumulated since the last Factory Restore occurred (see Chapter 5, Go to Reset Menu, of this section).
Au. 11	Meter Clicks	Provides the total number of money clicks accumulated. (Based on the country's lowest coin denomination used for the game credit.)
Au. 12	Software Meter	Provides the continuing total of Meter Clicks. This audit cannot be reset; the display shows the constant addition of Meter Clicks.

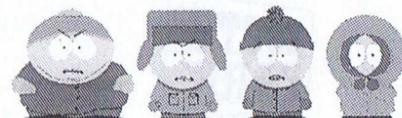




S.P.I. Audits (13-55)

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

Au. N°	Audit Name	Audit Definition
Au. 13	Total Balls Played	Provides the total number of regular and extra balls.
Au. 14	Total Extra Balls	Provides the total number of extra balls awarded.
Au. 15	Extra Balls Percent	Provides the percentage total from dividing Audit 14, Total Extra Balls, by Audit 26, Total Plays.
Au. 16	Replay 1 Awards	Provides the total awards (Credit, Extra Ball, Or Audit) for level 1.
Au. 17	Replay 2+ Awards	Provides the total awards (Credit, Extra Ball, Or Audit) for level(s) 2 or higher.
Au. 18	Total Replays	Provides the total awards (Credits, Extra Balls, Or Audit Only) for exceeding replay score levels.
Au. 19	Replay Percent	Provides the percentage total from dividing Audit 18, Total Replays, by Audit 26, Total Plays. The percentage reflects replay total awards for exceeding replay score levels.
Au. 20	Total Specials	Provides the total awards (Credits, Extra Balls, Or Scores) for making specials.
Au. 21	Special Percent	This percentage is derived from dividing Audit 20, Total Specials, by Audit 26, Total Plays.
Au. 22	Total Matches	Provides the total credits awarded for matching the last two digits of the score with the system-generated Match Number at the end of the game. Percentage of match credits is adjustable from 0% to 10% by Adjustment 11, Match Percentage, if enabled. (See Chapter 4, Go to Adjustments Menu, of this section.)
Au. 23	High Score Awards	Provides the total credits awarded for exceeding the High-Score-To-Date scores.
Au. 24	High Score Percent	This percentage is derived from dividing Audit 23, High Score Awards, by Audit 26, Total Plays.
Au. 25	Total Free Plays	Provides the total free credits for replays, High-Score-To-Date, Specials, and Match.
Au. 26	Total Plays	This total is derived by adding the sum of Audit 1, Total Paid Credits, and Audit 25, Total Free Plays. Note that free credits are not recorded in the Audit until they are actually used.
Au. 27	0—19.9M Scores	Provides the total number of games the Player's final score was between 0 and 19,900,000 points.
Au. 28	20M—49.9M Scores	Provides the total number of games the Player's final score was between 20,000,000 and 49,900,000 points.
Au. 29	50M—69.9M Scores	Provides the total number of games the Player's final score was between 50,000,000 and 69,900,000 points.
Au. 30	70M—99.9M Scores	Provides the total number of games the Player's final score was between 70,000,000 and 99,900,000 points.
Au. 31	100M—129.9M Scores	Provides the total number of games the Player's final score was between 100,000,000 and 129,900,000 points.
Au. 32	130M+ Scores	Provides the total number of games the Player's final score was over 130,000,000 points.
Au. 33	Average Scores	This total is derived from adding the Final Score of each game to a table and dividing this sum by Audit 26, Total Plays.
Au. 34	Service Credits	Provides the total number of times Dedicated Switch (DS-7) was closed, not in the Portals™ Service Menu. (See Chapter 1, Introduction [Access & Use] for instructions on how to receive Service Credits.)
Au. 35	Ball Search Started	Provides the total number of times the game performed a ball search.
Au. 36	Lost Ball Feeds	Provides the total number of times the game added a ball to play when it could not find a ball after ball search.



S.P.I. Audits Continued.

Au. N°	Audit Name	Audit Definition
Au. 37	Lost Ball Game Starts	Provides the total number of times the game started with a ball missing from the ball trough at the start of a game.
Au. 38	Left Drains	Provides the total number of times Rollover Switch 57 was closed.
Au. 39	Center Drains	Provides the total number of times the game ball had drained with the last switch closed was not Sw. 57 or Sw. 60.
Au. 40	Right Drains	Provides the total number of times Rollover Switch 60 was closed.
Au. 41	Slam Tilts	Provides the total number of times Contact Switch 55 was closed.
Au. 42	Total Balls Saved	Provides the total number of times this feature was used. This feature is enabled at the start of each ball and is disabled as soon as the ball makes contact with 5 game switches or allocated time expired.
Au. 43- Au. 51		These audits are Not Used , allowing for Future Expansion , if any, and/or Proprietary (used for programming).
Au. 52	Left Flipper Used	Provides the total number of times Dedicated Switch (DS-1) was closed.
Au. 53	Right Flipper Used	Provides the total number of times Dedicated Switch (DS-3) was closed.
Au. 54- Au. 55		These audits are Not Used , allowing for Future Expansion , if any, and/or Proprietary (used for programming).



South Park Audits (56-99) (All Audits Subject to Change)

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

Au. N°	Audit Name	Audit Definition
Au. 56	Left Orbit	Provides the total number of times this feature was completed. †
Au. 57	Top VUK Via Orbit	Provides the total number of times this feature was completed. †
Au. 58	Ramp	Provides the total number of times this feature was completed. †
Au. 59	Right 3-Bank Comp(leted)	Provides the total number of times this feature was completed. †
Au. 60	Left 5-Bank Comp(leted)	Provides the total number of times this feature was completed. †
Au. 61	Center 3-Bank Hits	Provides the total number of times this feature was completed. †
Au. 62	Kenny OPTO	Provides the total number of times OPTO Switch 42 was closed.
Au. 63	Kenny Undertrough	Provides the total number of times Rollover Switch 44 was closed.
Au. 64	Toilet Undertrough	Provides the total number of times Rollover Switch 43 was closed.
Au. 65	Cartman Undertrough	Provides the total number of times Rollover Switch 48 was closed.
Au. 66	Super VUK	Provides the total number of times SVUK Switch 45 was closed.
Au. 67	Top VUK	Provides the total number of times VUK Switch 46 was closed.
Au. 68	MBall Ready	Provides the total number of times this feature was ready (lit) awaiting Multiball. † ‡
Au. 69	Multiball Start	Provides the total number of times Multiball was played. †
Au. 70	2+ MBall Start	Provides the total number of times Multiball was played more than once by a single player in one game. †
Au. 71	Multiball Restart Lit	Provides the total number of times Multiball was played and no Jackpots were collected. ‡
Au. 72	Multiball Restarted	Provides the total number of times Multiball was restarted after Multiball Restart was lit. ‡
Au. 73	MBall Jackpots	Provides the total number of times this feature was awarded. †
Au. 74	Super Jackpot Lit	Provides the total number of times this feature was lit. ‡

† Multiple variations of switch closures (see Diagnostics) are used to determine completion of the feature stated.
‡ Multiple variations of switch closures (see Diagnostics) are used to determine the lighting of the feature stated.





South Park Audits Continued (All Audits Subject to Change)

Audit Name	Audit Definition
Au. 75 Super Jackpots	Provides the total number of times this feature was awarded. †
Au. 76 Cartman Mode Started	Provides the total number of times this feature was started. †
Au. 77 Cartman Mode Completed	Provides the total number of times this feature was completed. †
Au. 78 Kyle Mode Started	Provides the total number of times this feature was started. †
Au. 79 Kyle Mode Completed	Provides the total number of times this feature was completed. †
Au. 80 Kenny Mode Started	Provides the total number of times this feature was started. †
Au. 81 Kenny Mode Completed	Provides the total number of times this feature was completed. †
Au. 82 Chef Mode Started	Provides the total number of times this feature was started. †
Au. 83 Chef Mode Completed	Provides the total number of times this feature was completed. †
Au. 84 Stan Mode Started	Provides the total number of times this feature was started. †
Au. 85 Stan Mode Completed	Provides the total number of times this feature was completed. †
Au. 86 Spooky Vision Lit	Provides the total number of times this feature was lit. ‡
Au. 87 Spooky Vision Started	Provides the total number of times this feature was started. †
Au. 88 Volcano Started	Provides the total number of times this feature was started. †
Au. 89 Volcano Completed	Provides the total number of times this feature was completed. †
Au. 90 Super Fart Bumpers Lit	Provides the total number of times this feature was lit. ‡
Au. 91 Pop Bumper Hits	Provides the total number of times this feature was completed. †
Au. 92 Mystery Lit	Provides the total number of times this feature was lit. ‡
Au. 93 Mystery Scored	Provides the total number of times this feature was awarded. †
Au. 94 Skill Shot Made	Provides the total number of times this feature was completed. †
Au. 95- Au. 99	At time of printing, these audits are Not Used , allowing for Future Expansion , if any.

† Multiple variations of switch closures (see Diagnostics) are used to determine completion of the feature stated.
‡ Multiple variations of switch closures (see Diagnostics) are used to determine the lighting of the feature stated.

Use the below space for any additions and/or changes, if any (see the Dot Matrix Display):

Au. _____



Go To Printer Menu

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

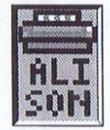
Special equipment is required for this Sub-Menu

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



Adjustment 57, Printer Interface (Quick Printout)

From the **PRINTER MENU**, select the "QUICK" *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.



Adjustment 58, Alison Interface (Full Printout)

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, S.P.I. & Game Specific) can be retrieved.



Adjustment 59, N° of Copies Printed (Reset Printer)

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 "N° of copies printed" count total.

RESETTING AUDIT NOTES:



Audit Note: 1st Way to Reset Audits

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



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

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



Audit Note: 2nd Way to Reset Audits

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



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



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



Section 3 | Audits

Section 3 | Audits



SOUTH PARK

GAME ADJUSTMENT TABLE

Some adjustments have a "Drop-Down" Table for further customization.



S.P.I. Adjustments 1-48

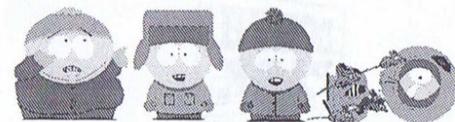
Adjustment Name	USA Default	Your Setting	Adjustment Name	USA Default	Your Setting
1 REPLAYS: FIXED/MANUAL ‡	...10%...		25 DEFAULT HIGH SCORE #5	300,000,000	
2 REPLAY LEVELS ‡	1 ...		26 DEFAULT HIGH SCORE #6	275,000,000	
3 REPLAY AWARD	CREDIT		27 DEFAULT HIGH SCORE #7	250,000,000	
4 FREE GAME LIMIT	05		28 DEFAULT HIGH SCORE #8	225,000,000	
5 EXTRA BALL LIMIT	03		29 DEFAULT HIGH SCORE #9	200,000,000	
6 GAME DIFFICULTY ‡	MODERATE		30 DEFAULT HIGH SCORE #10	175,000,000	
7 GAME PRICING ‡	USA3		31 HSTD RESET COUNT	2,000	
8 RESET COIN AUDITS	NO		32 HIGH SCORE INITIALS	3 Initials	
9 RESET GAME AUDITS	NO		33 FREE PLAY	NO	
10 RESET HIGH SCORES	NO		34 CUSTOM MESSAGE	ON	
11 MATCH PERCENTAGE	9%		35 ATTRACT MODE MUSIC	ON	
12 BALLS PER GAME	03		36 FLASH LAMP POWER	NORMAL	
13 TILT WARNINGS	01		37 COIL PULSE POWER	NORMAL	
14 REPLAY BOOST	YES		38 KNOCKER VOLUME	NORMAL	
15 CREDIT LIMIT	30		39 MINIMUM GAME TIME	OFF	
16 ALLOW HIGH SCORES	YES		40 BKGRND MUSIC VOLUME	01	
17 HIGH SCORE #1 AWARDS	01		41 GAME RESTART	YES	
18 HIGH SCORE #2 AWARDS	00		42 EXTRA BALL PERCENTAGE	25%	
19 HIGH SCORE #3 AWARDS	00		43 BILL VALIDATOR	NO	
20 HIGH SCORE #4 AWARDS	00		44 TOURNAMENT MODE	NONE	
21 DEFAULT HIGH SCORE #1	400,000,000		45 EURO. TOKEN DISP.	OFF	
22 DEFAULT HIGH SCORE #2	375,000,000		46 SPECIAL MEMORY	YES	
23 DEFAULT HIGH SCORE #3	350,000,000		47 LOCATION ID	00	
24 DEFAULT HIGH SCORE #4	325,000,000		48 GAME ID	00	

PLEASE NOTE: All Factory Settings (Defaults) described in the tables above/below and within the Adjustment Definitions are for USA Settings only (CPU/Snd Bd. Dip Sw. 300 Settings 1-8 are all "OFF"). Different countries may have different Factory Settings (Defaults). ‡ Adj. 1, 2, 6 & 7 have "Drop-Down" Tables, see definitions.



South Park Adjustments 49-56

Adjustment Name	USA Default	Your Setting	Adjustment Name	USA Default	Your Setting
49 EXTRA BALL MEMORY	ON		54 UK POST SAVE ENABLED	NO	
50 MBALL RESTART	MODERATE		55 UK COIN MECH. TYPE	CURRENT:	
51 MULTIBALL CRITERION	MODERATE		ADJ. 54 CAN ONLY BE ADJUSTED IF THE GAME HAS THE UK EPROM INSTALLED (UK ONLY). ADJ. 55 CAN ONLY BE ADJUSTED IF USING UK DIP SWITCH OPTION SETTING 2.		
52 TOILET MECH ENABLED	YES		56 ADULT SPEECH ENABLED	YES	
53 KENNY MECH ENABLED	YES		57-59 are Special Audit Adjustments (see previous pg.)		



Go To Adjustments Menu

Overview

The Portals™ Service Menu System provides 56 Adjustment Functions to vary game difficulty or to customize (e.g. Adjusting: High Score Levels; Balls per game; Game Pricing; Default High Scores; etc.). The Adjustment Functions are divided into 2 groups: 1st— S.P.I. Adjustments, are the Game Play Generic Adjustments (1-48); 2nd— South Park Adjustments, are the Game Play Specific Adjustments (49-56); Any Adjustment(s) left open or are currently *Not Used*, are allowing for Future Expansion, if any, or are Proprietary. If the code version is upgraded, view Adjustments in the display & write the adjustment(s) in the blank(s) if any adjustment(s) were added. Each group may be viewed manually after entering the Portals™ Service Menu (see Chapter 1, Portals™ Service Menu Introduction, of this Section). All adjustments can be viewed at a glance with the **Game Adjustment Table** provided on the previous page. If a value is changed, the display will indicate **REQUEST INSTALLED**.



GO TO ADJUSTMENTS MENU

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

Important Notes:



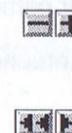
Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



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



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



In Adjustments, selecting & activating the "-" *Icon* decrements the value setting. Selecting & activating the "+" *Icon* increments the value setting.
Selecting & activating the "ARROW" *Icons* selects the next or previous adj. in the group.



S.P.I. Adjustments (1-48)

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

Adj. N°	Adjustment Name	Adjustment Definition
Adj. 1	Replays: Fixed / Manual	Adjust for percentage of awards for Replay Levels (1% through 50%). Lower the automatic value to 0% and the display will indicated Fixed. Replays may be adjusted either for fixed levels or for a system-adjusted manual percentage of replay awards. Four levels may be selected. Adjustments allow awarding of a credit or an extra ball as each level is exceeded. With the manual percentage feature, if the actual replay percentage is higher or lower than that desired, the game computes new recommended manual percentage score(s). When the coin door is subsequently opened the player displays indicate the recommended level and a sound is made to alert the operator of a potential change. This new level is entered into adjustments simply by pressing the Black "ENTER" Button . (If the Coin Door is closed or the operator enters the Portals™ Service Menu, the replay level is not changed.)
Adj. 2	Replay Levels	Adjust the number of replay levels to be active (1 to 4). Once the number of Replay Levels has been selected, a "Drop-Down" Table appears showing Replay Level 1. Adjust Replay Level 1 between 10M - 9.99B. Adjust Replay Level 2, 3 and/or 4 respectively.
Adj. 3	Replay Award	Set for replays to award: CREDIT, EXTRA BALL, NONE or SPECIAL (When score threshold is achieved, a Playfield Special is lit.)





S.P.I. Adjustments Continued.

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

Adjustments which change when set to:	Extra Easy	Easy	Moderate	Hard	Extra Hard
(49) Extra Ball Memory	ON	ON	ON	ON	OFF
(50) MBall Restart	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(51) Multiball Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD

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

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

Novelty Play Rules - Set to establish recommended settings for no Free Play or Extra Balls:					
Adj.	Adjustment Name	Setting	Adj.	Adjustment Name	Setting
1	Replays: Fixed/Manual	Fixed	5	Extra Ball Limit	00
2	Replay Levels	None	11	Match Percentage	Off
3	Replay Award	None	17	High Score #1 Awards	1
4	Free Game Limit	0	18	High Score #2 Awards	0

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

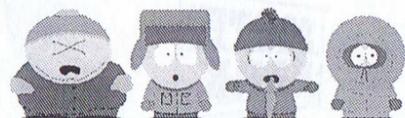
Add-A-Ball Settings -To disable awarding of credits and provide awards with an Extra Ball:					
Adj.	Adjustment Name	Setting	Adj.	Adjustment Name	Setting
3	Replay Award	Extra Ball	16	Allow High Scores	No
4	Free Game Limit	00	17-20	High Score #1 - #4 Awards	0
11	Match Percentage	Off			

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

Adj. 7 Game Pricing

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

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



S.P.I. Adjustment 7 Continued.

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

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

Custom Pricing Table

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

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

The Standard Pricing Select Table Explained:

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

Standard Pricing Select Table

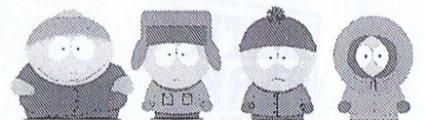
CPU/SOUND BOARD DIP SWITCH 300 SETTINGS	COUNTRY SETTING OPTION	Coin Mechanisms				Pricing Scheme Explained			
		COINS THRU ... SLOT:				Number of "Plays" for Price Amount Shown			
		LEFT	CENTER	RIGHT	4TH				
	USA1	25¢	\$1.00	25¢		1 /25¢			
	USA2	25¢	\$1.00	25¢		1 /50¢	2 /75¢	3 /\$1.00	
	USA3 (Default)	25¢	\$1.00	25¢		1 /50¢			
Pos. 1 2 3 4 5 6 7 8	USA4	25¢		25¢		1 /50¢			
ON	USA5	25¢	\$1.00	25¢		1 /50¢	5 /\$2.00		
OFF	USA6	25¢	\$1.00	25¢		1 /50¢	2 /4 X 25¢	3 /\$1.00 Bill	Used to promote the Bill Validator
	USA7	25¢	\$1.00	25¢		1 /50¢	4 /\$1.50	6 /\$2.00	
	USA8	25¢	\$1.00	25¢		1 /50¢	3 /\$1.00		



Standard Pricing Select Table - (Continued)

CPU DIP SWITCH SETTINGS, Location SW300 CPU/SOUND BOARD		COUNTRY SETTING OPTION † ‡	Coin Mechanisms				Pricing Scheme Explained					
Pos. 1 2 3 4 5 6 7 8			COINS THRU ... SLOT:				Number of "Plays" for Price Amount Shown					
ON			LEFT	CENTER	RIGHT	4TH						
OFF												
Pos. 1 2 3 4 5 6 7 8		Austria †	5S	10S	10S		1/10S	2/15S	3/20S			
Pos. 1 2 3 4 5 6 7 8		Australia 1 ‡	20¢	\$A 1	\$A 2		1/\$A 1	3/\$A 2				
Pos. 1 2 3 4 5 6 7 8		Australia 2 ‡	20¢	\$A 1	\$A 2		1/\$A 1					
Pos. 1 2 3 4 5 6 7 8		Belgium †	5 BF	20 BF	50 BF		1/20 BF	3/50 BF				
Pos. 1 2 3 4 5 6 7 8		Brazil †	This country uses unique Tokens and/or Debit Cards only (pricing varies).				1/2 coins'					
Pos. 1 2 3 4 5 6 7 8		Canada †	25¢	25¢	Can\$ 1		1/50¢	2/75¢	3/Can\$ 1			
Pos. 1 2 3 4 5 6 7 8		Denmark 1 ‡	1 DKr	5 DKr	10 DKr	20 DKr	1/3 DKr	2/5 DKr				
Pos. 1 2 3 4 5 6 7 8		Denmark 2 ‡	1 DKr	5 DKr	10 DKr	20 DKr	1/2 DKr	3/5 DKr	7/10DKr			
Pos. 1 2 3 4 5 6 7 8		Finland ‡	1 Fmk	5 Fmk			1/5 Fmk	4/10 Fmk				
Pos. 1 2 3 4 5 6 7 8		France 1 †	1 Fr	5Fr	10 Fr	20 Fr	1/3 Fr	2/5 Fr	5/10 Fr	11/20 Fr		
Pos. 1 2 3 4 5 6 7 8		France 2	1 Fr	5 Fr	10 Fr	20 Fr	1/5 Fr	3/10 Fr	7/20 Fr			
Pos. 1 2 3 4 5 6 7 8		France 3	1 Fr	5 Fr	10 Fr	20 Fr	1/3 Fr	2/5 Fr	4/10 Fr	9/20 Fr		
Pos. 1 2 3 4 5 6 7 8		Germany 1	1 DM	2 DM	5 DM		1/1 DM	6/1 X 5 DM'				
Pos. 1 2 3 4 5 6 7 8		Germany 2	1 DM	2 DM	5 DM		1/2 DM	2/3 DM	3/4 DM	4/5 DM		
Pos. 1 2 3 4 5 6 7 8		Germany 3 †	1 DM	2 DM	5 DM		1/2 DM	2/3 DM	3/4 DM	5/5 DM		
Pos. 1 2 3 4 5 6 7 8		Germany 4	1 DM	2 DM	5 DM		1/1 DM	6/5 DM				
Pos. 1 2 3 4 5 6 7 8		Greece ‡	50 Dr		100 Dr		1/50 Dr	3/100 Dr				
Pos. 1 2 3 4 5 6 7 8		Hong Kong ‡	1 HK\$	2 HK\$	5 HK\$		1/5 HK\$					
Pos. 1 2 3 4 5 6 7 8		Hungary ‡	10 Ft	10 Ft	20 Ft		1/20 Ft	3/40 Ft				
Pos. 1 2 3 4 5 6 7 8		Italy 1 †	500 Lit		500 Lit		1/500 Lit					
Pos. 1 2 3 4 5 6 7 8		Italy 2	500 Lit		500 Lit		1/1000 Lit	3/2000 Lit				
Pos. 1 2 3 4 5 6 7 8		Japan 1 †			100¥		1/100¥					
Pos. 1 2 3 4 5 6 7 8		Japan 2			100¥		1/100¥	3/200¥				
Pos. 1 2 3 4 5 6 7 8		Korea ‡	100 Won		100 Won		1/100 Won					
Pos. 1 2 3 4 5 6 7 8		Netherlands 1	1 Fls.	1 Fls.	2.5 Fls.		1/1 Fls.	3/2.5 Fls.				
Pos. 1 2 3 4 5 6 7 8		Netherlands 2 †	1 Fls.	2.5 Fls.	5 Fls.		1/1 Fls.	3/2.5 Fls.	6/5 Fls.			
Pos. 1 2 3 4 5 6 7 8		New Zealand 1 ‡	\$NZ 1		\$NZ 2		1/\$NZ 1					
Pos. 1 2 3 4 5 6 7 8		New Zealand 2 ‡	\$NZ 1		\$NZ 2		1/\$NZ 1	3/\$NZ 2				
Pos. 1 2 3 4 5 6 7 8		Norway 1 †	10 NKr	5 NKr	20 NKr		2/10 NKr	1/5 NKr	4/20 NKr			
Pos. 1 2 3 4 5 6 7 8		Norway 2	10 NKr	5 NKr	20 NKr		1/10 NKr	3/20 NKr				
Pos. 1 2 3 4 5 6 7 8		Spain ‡	100 Pts		500 Pts		1/100 Pts	6/500 Pts				
Pos. 1 2 3 4 5 6 7 8		Sweden 1 †	1 SKr	5 SKr	10 SKr		1/10 SKr	2/15 SKr	3/20 SKr			
Pos. 1 2 3 4 5 6 7 8		Sweden 2	1 SKr	5 SKr	10 SKr		1/5 SKr					
Pos. 1 2 3 4 5 6 7 8		Switzerland 1 †	1 SwF	2 SwF	5 SwF		1/1 SwF	6/5 SwF				
Pos. 1 2 3 4 5 6 7 8		Switzerland 2	1 SwF	2 SwF	5 SwF		1/1 SwF	3/2 SwF	9/5 SwF			
Pos. 1 2 3 4 5 6 7 8		UK 1 †	10p	50p	£1	20p	3/£1	7/£2				
Pos. 1 2 3 4 5 6 7 8		UK 2	10p	50p	£1	20p	4/£1	8/£2				
Pos. 1 2 3 4 5 6 7 8		UK 3	10p	50p	£1	20p	1/50p	2/£1	5/£2			
Pos. 1 2 3 4 5 6 7 8		UK 4	10p	50p	£1	20p	1/30p	2/60p	3/90p	4/£1		
Pos. 1 2 3 4 5 6 7 8		UK 5	10p	50p	£1	20p	1/£1	3/£2				
Pos. 1 2 3 4 5 6 7 8		UK 6	10p	50p	£1	20p	3/£2					

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



S.P.I. Adjustments Continued.

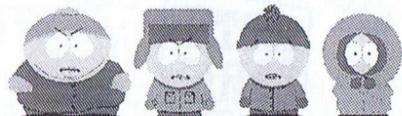
Adjustment Name	Adjustment Definition
Adj. 8 Reset Coin Audits	Default is NO . Select the "+" Icon to change to YES . ⚠ When enabled, all <i>Coin Audits</i> (Audits 5-11), will be reset to zero.
Adj. 9 Reset Game Audits	Default is NO . Select the "+" Icon to change to YES . ⚠ When enabled, all audits will be reset to zero, except for the <i>Coin Audits</i> (Audits 5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero).
Adj. 10 Reset High Scores	When enabled (set to YES) the High Score Levels and associated initials will be restored to the backup settings when the "+" Icon is selected and activated.
Adj. 11 Match Percentage	Set between 0% - 10% or OFF . Default is 9% . At 0% the match display occurs at the end of the game but never awards a credit.
Adj. 12 Balls Per Game	Default is 3 . Adjust the number of balls per game: 02 to 05 .
Adj. 13 Tilt Warnings	Set to 00, 01 or 03 . Default is 01 . Adjust the number of plumb bob tilt switch closures before the ball in play is tilted.
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	Default is 30 . Adjust the maximum number of credits that may be posted: 04 to 50 .
Adj. 16 Allow High Scores	Set to YES or NO . When set to YES if a player exceeds any 1 of the 4 High Scores, the player may receive an award (depending on Adj. 3, Replay Award). Set to NO to disable this feature. There are 10 High Scores that will allow the player to enter their initials (or name) (See Adj. 32, Initials), however, only the top 4 can receive an award if this adjustment is enabled.
Adj. 17 High Score #1 Awards	Adjust the number of awards (00 to 05) awarded for exceeding level 1 (the highest of the four levels).
Adj. 18 High Score #2 Awards	Adjust the number of awards (00 to 03) awarded for exceeding level 2.
Adj. 19 High Score #3 Awards	Adjust the number of awards (00 to 02) awarded for exceeding level 3.
Adj. 20 High Score #4 Awards	Adjust the number of awards (00 to 01) awarded for exceeding level 4.
Adj. 21-30 Default High Score #1 - #10	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. 31, HSTD Reset Count. Adjust the backup score to which levels 2 - 10 may be reset, respectively.
Adj. 31 HSTD Reset Count	Default is 2,000 . 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).
Adj. 32 High Score Initials	Default is 3 INITIALS . When set to 3 INITIALS , player is allowed only 3 initials to input. When set to 10 LETTER NAME , player is allowed to enter 10 initials to input.
Adj. 33 Free Play	When set to YES , no coins are required for game play.
Adj. 34 Custom Message	Set to ON or OFF . When set to ON , this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to CHANGE selecting the "+" Icon. Using either of the Flipper Buttons or the "RED" and/or "GREEN" Buttons, select either of the "ARROW" Icons. Press the "BLACK" Button (Request Installed blinks at the top of the display and the letter A is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or "RED" or "GREEN" Buttons). With the desired letter indicated, depress the Start Button to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the "BLACK" Button.





S.P.I. Adjustments Continued.

Adjustment Name	Adjustment Definition
Adj. 35 Attract Mode Music	Set to ON or OFF . When set to ON , attraction music / sounds are played between games.
Adj. 36 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. 37 Coil Pulse Power	Set to NORMAL , HARD or SOFT . When HARD the coil pulse power is increased by 12.5% of the normal pulse rate. When set to SOFT the coil pulse power is decreased by 12.5% of the normal pulse rate. These adjustments are provided to compensate for Low Line or High Line voltage conditions where the solenoids appear to kicking too weak or too hard. Adjust as required.
Adj. 38 Knocker Volume	Set to NORMAL , LOW or OFF . Default is NORMAL . When set to LOW , the volume is decreased 50%. When set to OFF , no sound is heard when the "knocker" is sounded.
Adj. 39 Minimum Game Time	Set between 0:01 - 14:59 for minimum game time. Default is OFF . If the last ball in play drains prior to what the game time is set for, another ball will be served into the shooter lane and normal play will continue. Subsequent balls will continue to do be served into the shooter lane if the last ball still drains prior to and up until minimum game time is satisfied.
Adj. 40 Bkgrnd (Background) Music Volume	Set between 01 - 15 . Default is 01 . After volume is set via Portals Service Buttons (See Sec. 3, Chp. 1, ...Intro) this adjustment can be utilized to adjust the background music (1 all the way on, 15 all the way off) while keeping the Special Sound FX the same level.
Adj. 41 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. 42 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. 43 Bill Validator	Set to YES or NO . When set to YES , the display, in game attract mode, will show an "Insert Bill Animation." When set to NO , the display, in game attract mode will show "Insert Coin Animation."
Adj. 44 Tournament Mode	Set to NONE , IFPA , EXPO , PAPA or HOME . Tournament Mode determines the default conditions to quickly prepare a game for tournament play. When this setting is changed all audits will be reset and all adjustments will be initiated to the particular style selected. The game will then return to <i>Game Over Attract Mode</i> , as if a <i>Factory Reset</i> had been performed. NONE - Same as a Factory Reset conditions. IFPA - Straight 50¢ play, No Replay, No Extra Ball, No High Scores, 2 Tilt Warnings and No Match. EXPO or PAPA - Same as IFPA settings except <i>Free Play is enabled</i> . HOME - Sets game for Free Play, Extra Ball Play, No Replay, 10% Match & 30% Extra Ball.
Adj. 45 Euro. Token Disp.	Set to ON or OFF . When set to ON , the operator can enable the BRN/BRN-GRY Wires (out of the Main Cabinet Cable Harness, by bottom speaker) to drive an external device (e.g. European Token Dispenser) without the game giving a replay. (Ref. Coil #8 or Q8)
Adj. 46 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. 47 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 <i>Factory Reset</i> .) See the end of this Sec. 3, Chp. 3, Go To Audits Menu, & Chp. 5, Go to Reset Menu, for more details on <i>Factory Reset</i> & Printing.
Adj. 48 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 <i>Factory Reset</i> .) See the end of this Sec. 3, Chp. 3, Go To Audits Menu, & Chp. 5, Go to Reset Menu, for more details on <i>Factory Reset</i> & Printing.



South Park Adjustments (49-56) + (57-59 Special Audit Adj.)

From the **ADJUSTMENTS MENU**, select the "PARK" *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. 49	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. 50	MBall Restart	Set to EXEASY , EASY , MODERATE , HARD or EXHARD . Default is MODERATE . Determines how Multiball can restart.
Adj. 51	Multiball Criterion	Set to EXEASY , EASY , MODERATE , HARD or EXHARD . Default is MODERATE . Determines how the Multiball Feature is started and played.
Adj. 52	Toilet Mech Enabled	Set to YES or NO . Default is YES . When set to YES , the Tank Lid Lift Coil (Mr. Hankey) is operational. When set to NO , the Coil on the assembly is disabled. Use the NO setting, if the Assembly is malfunctioning or is awaiting service and/or repair.
Adj. 53	Kenny Mech Enabled	Set to YES or NO . Default is YES . When set to YES , the Kenny Coils are operational. When set to NO , the Coils on the assembly are disabled. Use the NO setting, if the Assembly is malfunctioning or is awaiting service and/or repair.
Adj. 54	UK Post Save Enabled	///// THIS ADJUSTMENT CAN ONLY BE ADJUSTED IF THE GAME HAS THE UK EPROM INSTALLED FOR UK SETTINGS ///// Set to YES or NO . Default is NO , (UK Default is YES). When set to YES this feature is available when lit. Set to NO to disable this feature. (UK Games have Outlane & Center Post Save Devices which are accessed in a different way. Domestic games should cannot adjust this setting.)
Adj. 55	UK Coin Mech. Type	///// THIS ADJUSTMENT CAN ONLY BE ADJUSTED IF THE GAME HAS THE UK EPROM INSTALLED FOR UK SETTINGS and HAS THE DIP SWITCH SETTING OPTION 2 SET (2,3, & 4 ON) ///// Set to CURRENT: 2 POUND AT #5 if using a Coin Control Mech 74-1129-104U (latest version). Set to OLD: 2 POUND AT #6 if using older version Coin Control Mech 74-1129-104.
Adj. 56	Adult Speech Enabled	Set to YES or NO . Default is YES . When set to YES , the original game program Adult Graphic Sound & Speech is used. When set to NO , the Sound & Speech is suitable for the Family Style Environment.

Special equipment is required for these Adjustments

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

Adj. 57	Printer Interface (Quick Printout)	For explanation see the end of Sec. 3, Chp. 3, Go To Audits Menu where this Adjustment can also be accessed via the "Go To Printer Menu."
Adj. 58	Alison Interface (Full Printout)	For explanation see the end of Sec. 3, Chp. 3, Go To Audits Menu where this Adjustment can also be accessed via the "Go To Printer Menu."
Adj. 59	Nº of Copies Printed (Reset Printer)	For explanation see the end of Sec. 3, Chp. 3, Go To Audits Menu where this Adjustment can also be accessed via the "Go To Printer Menu."



Custom Message

To go directly to **Adjustment 34, Custom Message**, from the **ADJUSTMENT MENU**, select the "CUST MSG" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Set the feature to **CHANGE** selecting the "+" *Icon*. Using either of the Flipper Buttons or the **"RED"** and/or **"GREEN" Buttons**, select either of the **"ARROW" Icons**. Press the **"BLACK" Button** (*Request Installed* blinks at the top of the display and the letter **A** is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or **"RED"** or **"GREEN" Buttons**). With the desired letter indicated, depress the **Start Button** to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the **"BLACK" Button**.

Film Star Reset

To reset the game with *Special Home Settings (not the normal Factory Setting)*, from the **ADJUSTMENT MENU**, select the "STAR" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This *Special Setting* automatically changes **Adjustment 6, Game Difficulty**, to **EASY** and **Adjustment 33, Free Play**, to **YES**. This setting is determined to be ideal for the home environment. See Chapter 5, Go to Reset Menu, of this section, to change to factory defaults if changes made are not desired.

RESETTING & PRINTING ADJUSTMENTS NOTES:

Adjustment Note: Resetting Adjustments

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

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

Adjustment Note: Printing Audit Information

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

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

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

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



Go To Reset Menu

Overview

The **Portals™ Service Menu System** provides three (3) functions to reset adjustments and/or audits back to the *Factory Setting*. See Chapter 3, Go to Audits Menu, and Chapter 4, Go to Adjustments Menu, for the Game Audits & Adjustments Information. If a reset of **Coin** or **Game Audits** is performed, the display will indicate **REQUEST INSTALLED** and return to the **RESET MENU**. If a **Factory Reset** is performed, the display will indicate **REQUEST INSTALLED**, the *Service Session* is exited & returns to the **Attract Mode**. Please note that once reset, all customized settings are lost! Certain *Audits & Adjustments* 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.)

Reset Coin Audits

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

Reset Game Audits

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

Fig. 1

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

Fig. 2

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

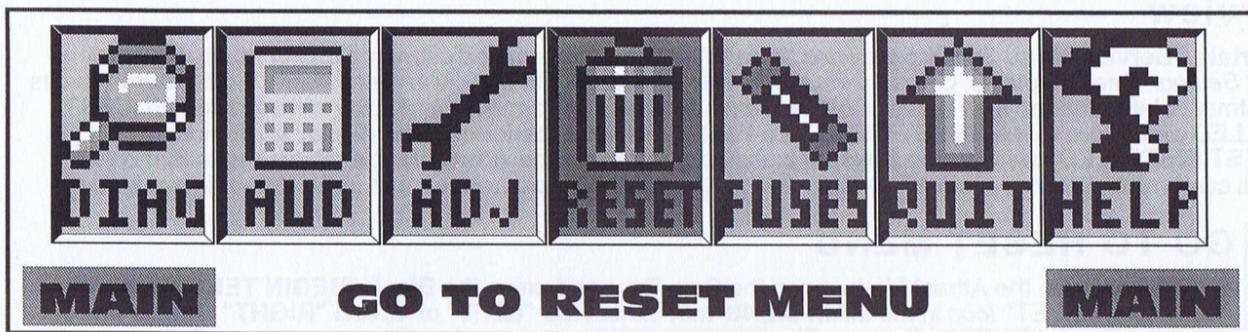
Factory Reset

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**.

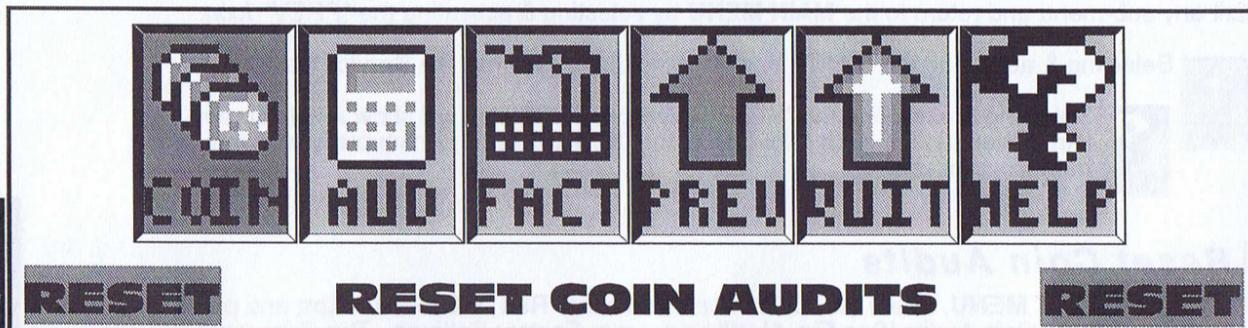


Example:

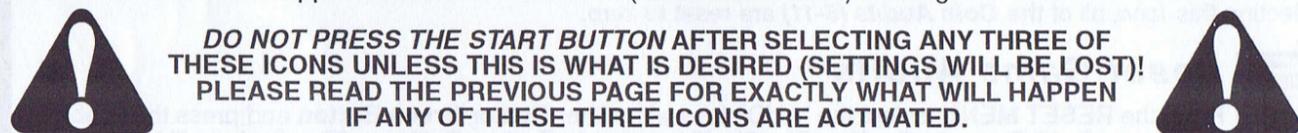
From the MAIN MENU, use the Red or Green Buttons to select the "RESET" Icon (GO TO RESET MENU).



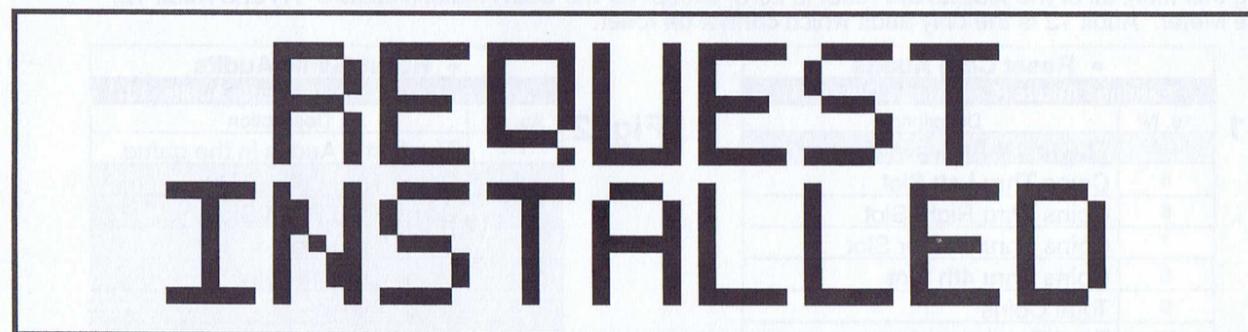
Press the Black Button to activate this ICON. This will bring up the RESET MENU.



The RESET MENU now appears with the "COIN" Icon (RESET COIN AUDITS) flashing:



From the RESET MENU, select any of the Icons ("COIN", "AUD" or "FACT") with either Red or Green Button and press the Black Button to activate the ICON chosen.



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 the display will return to the RESET MENU.

If the "FACT" Icon is chosen and activated, all adjustments will be reset back to the Factory Settings. The display will indicate REQUEST INSTALLED (momentarily), the Service Session is automatically exited and returns to the Attract Mode.



Go To Fuses List

Overview

The Portals™ Service Menu System provides a current Fuse List for this game. The fuses are located in the Backbox (on the Display Power Supply Board and the I/O Power Driver Board), and also in the Cabinet (under the playfield by the Flippers and/or by any unique assembly, such as magnets). See the front of this manual (page DR. 1) for the complete Fuse List in the Quick Reference Fuse Chart and note the drawings.

GO TO FUSES LIST

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

Important Notes:



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



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



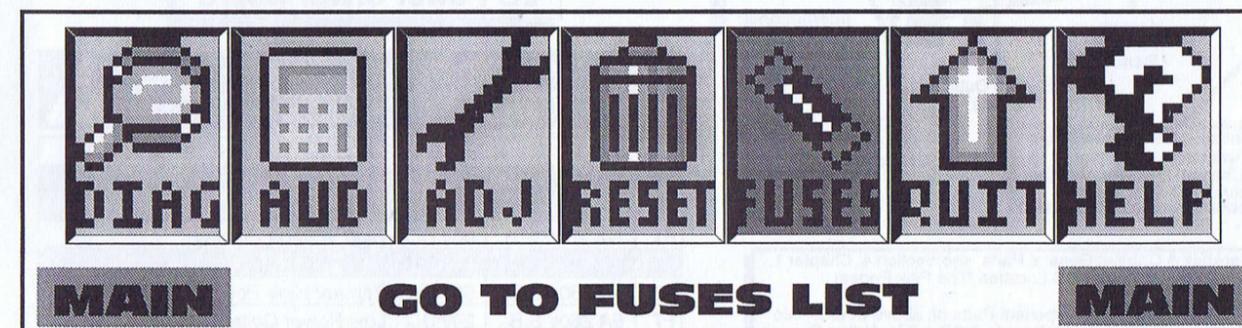
Selecting & activating the "HELP" Icon from any display will show a help screen. (An explanation of each Mini-Icon at that level will cycle continuously until any active button is pressed.)



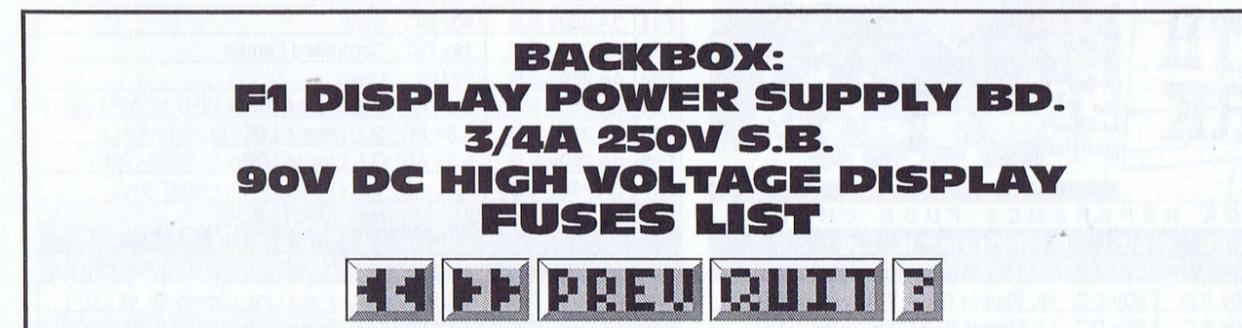
Selecting & activating the "ARROW" Icons selects the next or previous fuse in this group.

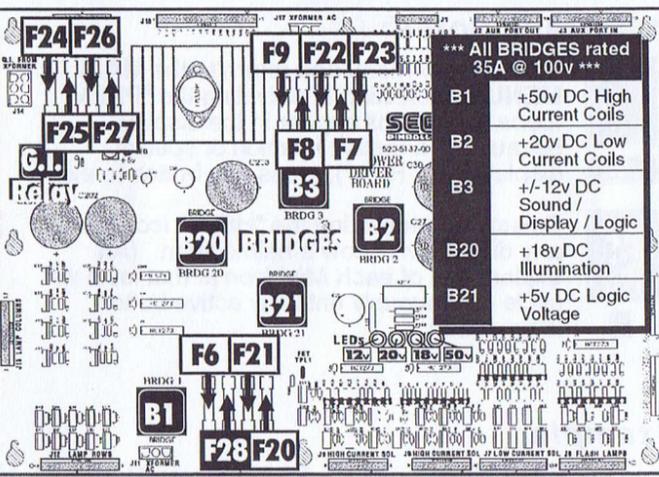
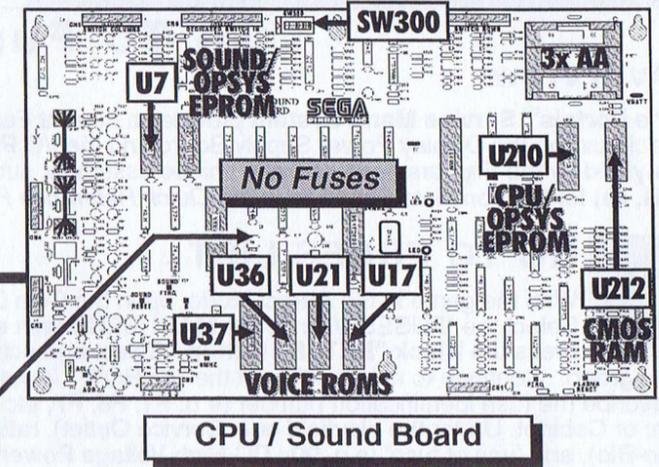
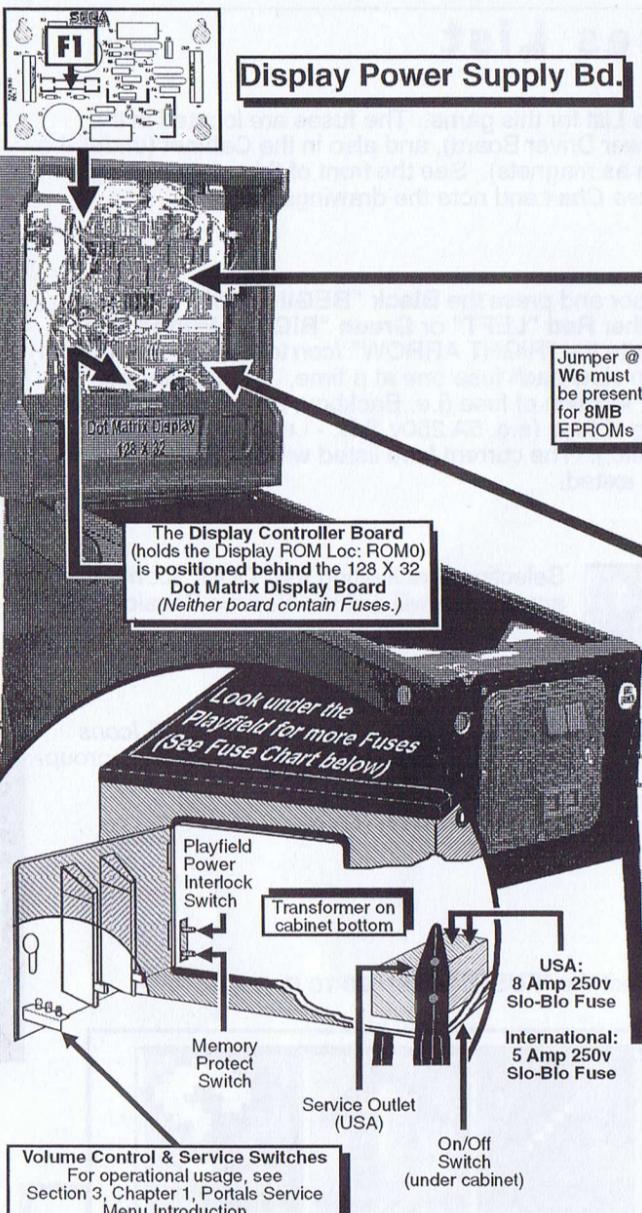
Example:

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



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





CAUTION: For continued protection against risk of fire, replace only with same type of fuse having the same electrical rating!

QUICK REFERENCE FUSE CHART			
Backbox Fuses			
LOC: DISPLAY POWER SUPPLY (P.S.) BOARD			
F1	3/4A 250v S.B.	90v DC	High Voltage Display
LOC: I / O POWER DRIVER BOARD			
F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	3A 250v S.B.	50v DC	Magnets
F21	3A 250v S.B.	50v DC	Coils
F22	8A 250v S.B.	18v DC	Controlled Lamps
F23	4A 250v S.B.	5v DC	Logic
F24	5A 250v S.B.	6.3v AC	G.I. Lamps (BRN-WHT to WHT-BRN)
F25	5A 250v S.B.	6.3v AC	G.I. Lamps (YEL to WHT-YEL)
F26	5A 250v S.B.	6.3v AC	G.I. Lamps (GRN to WHT-GRN)
F27	5A 250v S.B.	6.3v AC	G.I. Lamps (VIO to WHT-VIO)
F28	3A 250v S.B.	24v AC	Not Used / Spare
Cabinet Fuses			
LOC: SERVICE (AC) OUTLET BOX (Cabinet Bottom)			
n/a	8A 250v S.B.	115v AC	Main Fuse Line (Domestic or USA)
n/a	5A 250v S.B.	220v AC	Main Fuse Line (International)

QUICK REFERENCE FUSE CHART

South Park Playfield Fuses

LOC: UNDER PLAYFIELD (By Assemblies Listed)

n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU-YEL↔RED-YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY-YEL↔RED-YEL)

Go To Help Screen

Overview

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

GO TO HELP SCREEN

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

MENU HELP SCREEN

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

Important Notes:



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

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

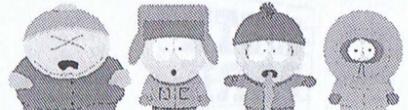


Selecting & activating the "QUIT" Icon from any display will exit the Service Session.

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

- Review Chapter 1, Introduction: How to enter the Portals™ Service Menu. The chapter outlines the entire Portals™ Service Menu. View the Icon Tree in this manual which describes the names and menu descriptions of each Icon. View the display, after selecting and activating either of the "HELP" or "?" Icons.
- Review Chapter 2, Go to Diagnostics Menu: Find all the tests needed to troubleshooting the game.
- Review Chapter 3, Go to Audits Menu: Gather play information and printing functions (downloading).
- Review Chapter 4, Go to Adjustments Menu: Customize the game to vary difficulty of play or to change functions of the game.
- Review Chapter 5, Go to Reset Menu: Reset audits and adjustments to Factory Settings.
- Review Chapter 6, Go to Fuses Menu: View the location & descriptions of the game fuses (the same information is referenced in the Fuse Chart Table on DR. 1).

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



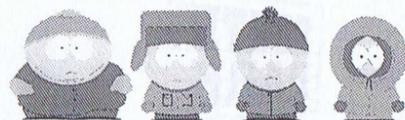


PORTALS™ SERVICE MENU
PROBLEM/SOLUTION TABLE

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) (Red, Green & Black Buttons) for loose connections or bad Ground. • Check the associated wiring harness to/from the CPU Board Connector CN14. • Check CPU Board, possibly failed.
Service Buttons (Red, Green and Black) are nonfunctional.	<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 Section 5, Chapter 4, Schematics & Troubleshooting.
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).
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. • This is normal only in Diagnostic's Switch & Active Switch Tests (see previous Problem).
Some <i>Icons</i> appear non-functional in the PRINTER MENU(S) .	<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 (end) or Chapter 6).
In COIL TEST MENU , the coils and flashlamps do not 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) is pulled out.
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.)
In Portals™ Service Menu , the display seems to lock up, or the Help Display appears to be non-functional.	<ul style="list-style-type: none"> • If you cannot clear the situation by exiting back one Menu, exit completely out of the Portals™ Service Menu, and re-enter. If the problem persists, call Tech. Support for additional help.



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

Overview

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

**Section 4
 Table of Contents**

Chapter 1 (The Pink Pages)
Overview.....47

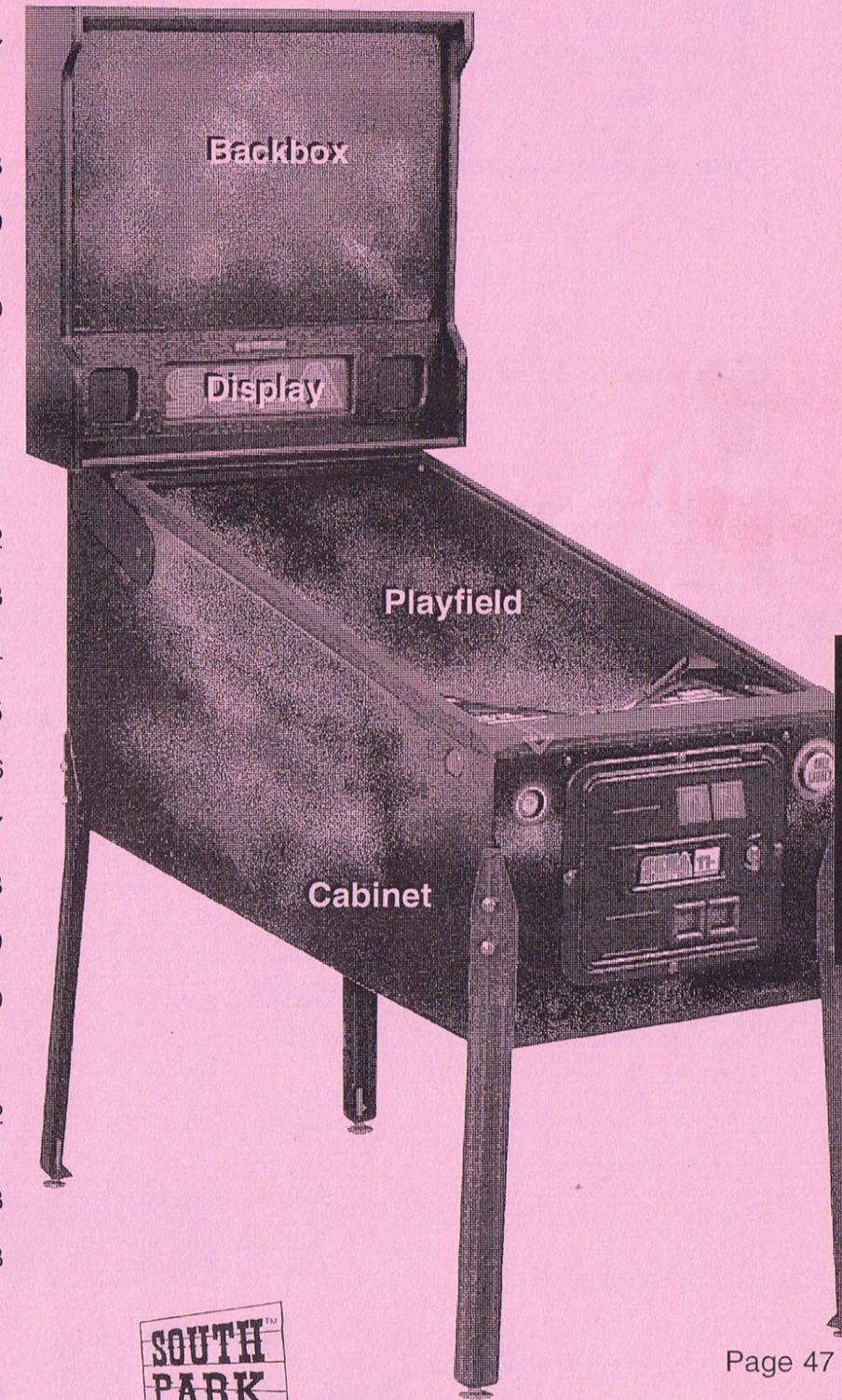
Backbox -
 Backbox (Showcase II) Assy. 48
 Speaker Panel Assy. and
 Assoc. Parts for the Backbox. 49

Cabinet -
 General Parts 50

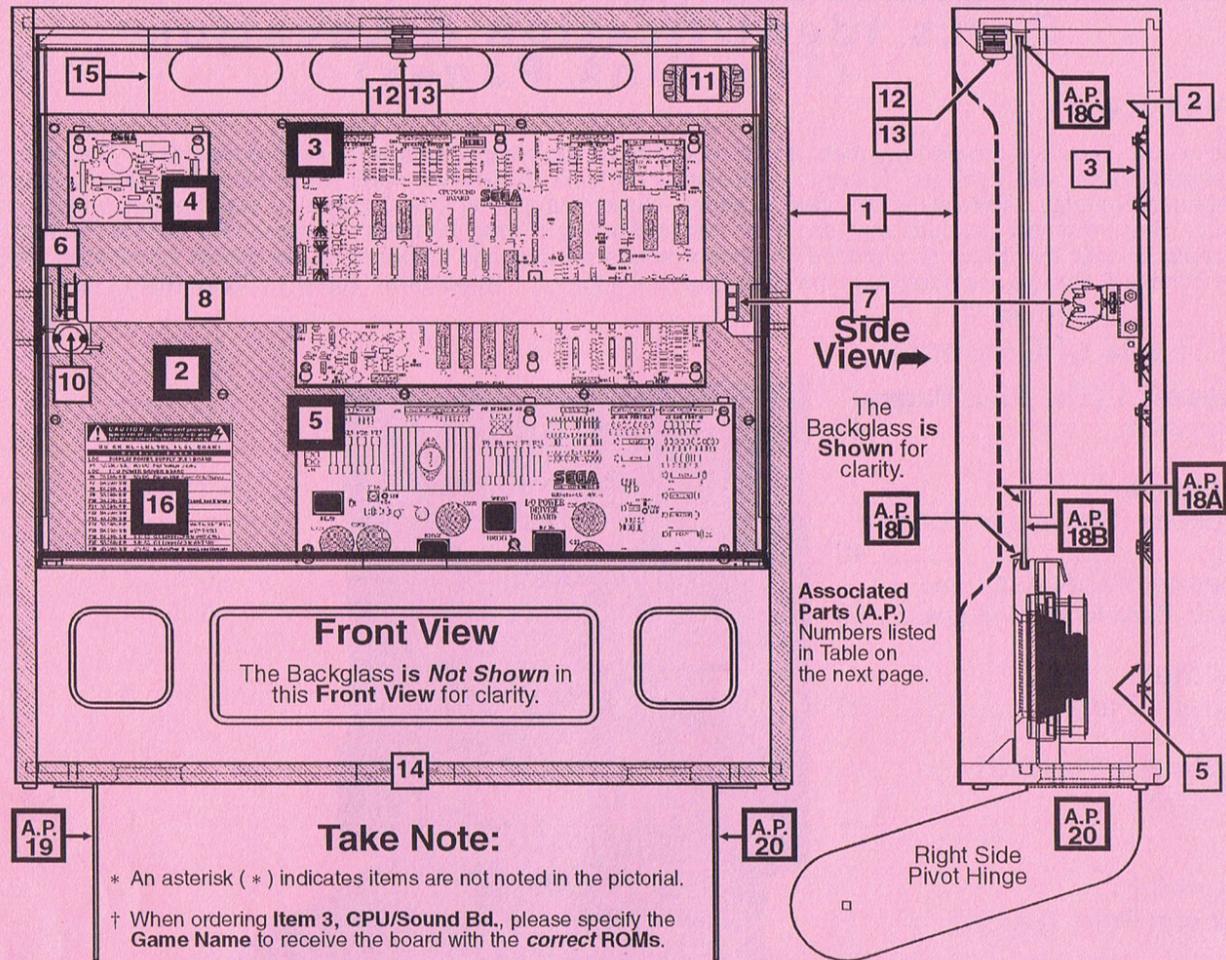
Cabinet & Playfield -
 Switches 51

Playfield -
 General Parts (Below) 52
 General Parts (Above) 53
 Rubber Parts 54
 Plastic, Decals and Mylar 55
 Rails and Ball Guides 56
 Metal Posts and Nuts 57
 Metal Spacers 58
 Plastic Posts and Spacers 59
 Small Bayonet Type Bulbs
 and Sockets..... 60
 Large Bayonet Type Bulb
 and Sockets..... 61
 Wedge Base Bulbs
 and Sockets 62

Chapter 2 (The Blue Pages)
Overview 63
 Major Assembly Drawings
 64-78



Backbox (Showcase II) Assembly, 505-6002-71-71 (Items 1-27)

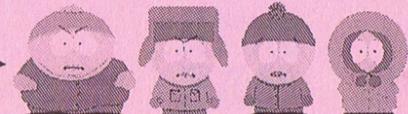


Take Note:

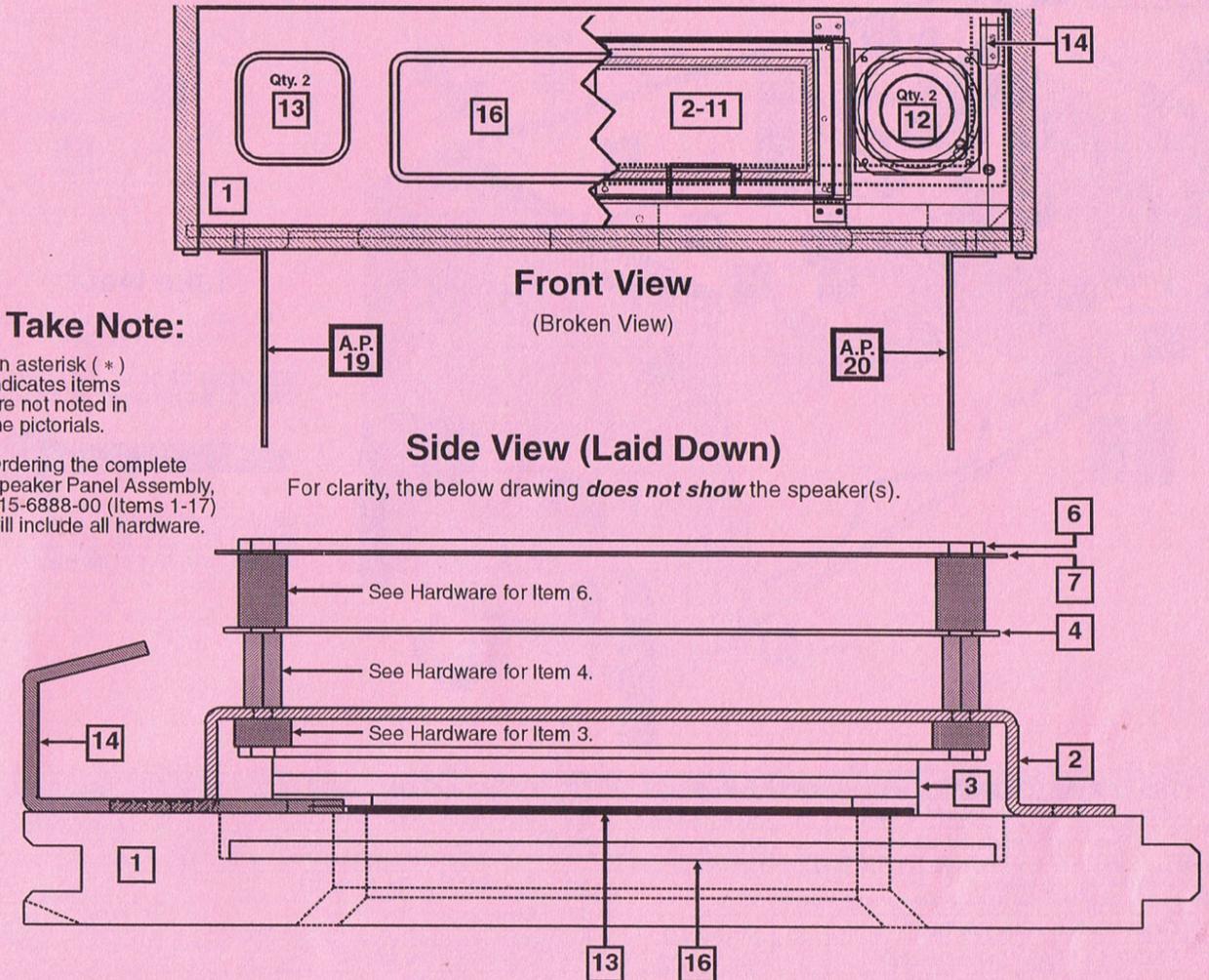
- * An asterisk (*) indicates items are not noted in the pictorial.
- † When ordering **Item 3, CPU/Sound Bd.**, please specify the **Game Name** to receive the board with the **correct ROMs**.

® "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire
 ® Sub-Assembly. **Please Note:** If the ® Sub-Assembly is **not** available, call Technical Support.

Nº	Individual Part Name (Back)	QTY.	SPI Part Nº	Nº	Individual Part Name (Back)	QTY.	SPI Part Nº
1	Backbox Showcase II (Wood)	1	525-5505-20	14	#1 Roto Lock Female (R2-0002-02)	1	355-5006-02
Item 1 is Screened with South Park Art; Item 1 comes with Black T-Molding installed.				Item 14 is secured by: #10-24 X 1-3/4" CBSN (Qty. 1) (231-5022-00), #10-24 X 2" CB (Blk) (Qty. 1) (231-5045-00), #10-24 Keps Nut (Qty. 2) (240-5207-00) and #10 Washer 7/32" ID X .5" OD X 1/16" (Qty. 2) (242-5003-00)			
2	PCB Metal Mounting Plate	1	535-5809-04	Note: #1 Roto Lock Male (on Cabinet) 1 355-5006-01			
Item 2 is secured to Item 1 by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 8) (234-5101-05)				15	Back Vent Grill 2-1/2" X 18"	1	545-5072-02
3 †	CPU/Sound Board (Mono) FCC-FEB98	1	520-5136-16	Item 15 is secured by: Staple 5/16" (Qty. 24) (631-5000-00)			
4	Display Power Supply Board	1	520-5138-00	16	Fuse Description Decal (Generic)	1	820-6152-00
5	I/O Power Driver Board	1	520-5137-01	17*	Fuse Description Decal Game Nº 71	1	820-6152-71
Items 3, 4 & 5 are secured to Item 2 by: #8-32 X 3/8" HWH MS (Qty. 19) (237-5903-00)				18*	Fuse Label (UL)	1	820-6143-00
6	Fluorescent Light Bracket Assy. Left	1	515-6545-01	19*	Backbox Date Label	1	820-5091-00
ORDERING ABOVE (ITEM 6) SUB-ASSY. PART Nº WILL INCLUDE:				20*	Ribbon Cable, 20-Pin	1	036-5000-04
6A	Fluorescent Light Bracket Left	1	535-7739-01	21*	Ribbon Cable, 26-Pin	1	036-5001-80
6B	Lamp Holder (Self-Locking)	1	077-5214-00	Item 20 (20-Pin) connects the CPU/Sound Board to the I/O Power Driver Board.			
6C	#6-32 X 5/8" PPH MS (Sems) Zinc	1	232-5203-00	Item 21 (26-Pin) connects the CPU/Sound Board to the Display Controller Board.			
6D	Starter Base (with Leads)	1	077-5213-00	BACKBOX HEADERS:			
6E	#4-40 X 1/2" PPH MS (Sems) Zinc	2	237-5813-00	22*	1/4" Clamp (Double)	3	040-5000-23
7	Fluorescent Light Bracket Assy. Right	1	515-6545-01	23*	1/2" Clamp (Single)	1	040-5000-06
ORDERING ABOVE (ITEM 7) SUB-ASSY. PART Nº WILL INCLUDE:				24*	3/4" Clamp (Single)	3	040-5000-08
7A	Fluorescent Light Bracket Right	1	535-7739-00	25*	1" Clamp (Single)	5	040-5000-09
7B-7C	Identical to Items 6B-6C above.		See 6B-6C	Items 22-25 secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 12) (234-5101-05)			
Items 6 & 7 are secured by: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 2/per) (231-5012-00) and #10-24 Keps Nut (Qty. 2/per) (240-5207-00)				26	South Park Cartman (6" Figurine)	1	880-5031-00
8	Fluorescent Tube (F20T12CW)	1	165-5031-02	Item 26 is secured by: 1/4"-20 X 2" PPH Bolt (Qty. 1) (237-6000-00), 1/4" Toggle Wing Nut (Qty. 1) (240-5324-00) and Washer 1/4" ID X 1" OD X .049" Thk. (Qty. 1) (242-5009-00)			
9*	3/4" X 3" Reinforced Strapping Tape	1	626-5040-00	Above Item 9 is self-adhesive. It is located on Items 6 & 7. Sold in 12" Lengths only.			
10	Starter - Fluorescent (FS2 Light)	1	165-5011-01	27®	Riveted Backbox Sign Disclaimer	1	515-7008-00-71
11	Ballast SP2/A 120v 60Hz 13W UL	1	010-5007-00	ORDERING ABOVE ® RIVETED ASSY. PART Nº WILL INCLUDE:			
Item 11 is secured to Item 1 by: #6 X 3/8" HWH AB (Zinc) (Qty. 2) (234-5000-00)				27A*	Screened Plastic Piece (Words) -22	1	830-5967-22
12	Lock Mounting Plate	1	535-5860-00	27B*	Sign "L" Bracket	2	535-6072-00
13	Camlock (9231D-2) Cam 430V & Key	1	355-5008-01	27C*	Rivet, 1/8" Ø X 3/16" Lg. (2/per)	4	234-5003-00
Items 12-13 are secured by: #8 X 5/8" TP Torx T20 (Qty. 2) (237-5947-00)				Item 27 is secured by: #6 X 3/4" HWH AB (Zinc) (Qty. 2) (234-5003-00)			



Speaker Panel Assy. for the Backbox (Showcase II), 515-6888-00 (Items 1-17) and Assoc. Parts: Backglass Assembly & Pivot Hinges (Left & Right) (Items 18-20)



Take Note:

- * An asterisk (*) indicates items are not noted in the pictorials.
- 1. Ordering the complete Speaker Panel Assembly, 515-6888-00 (Items 1-17) will include all hardware.

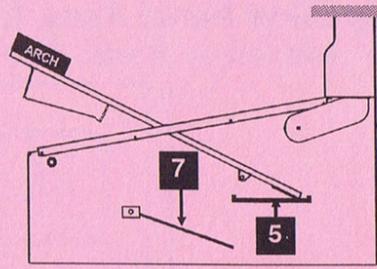
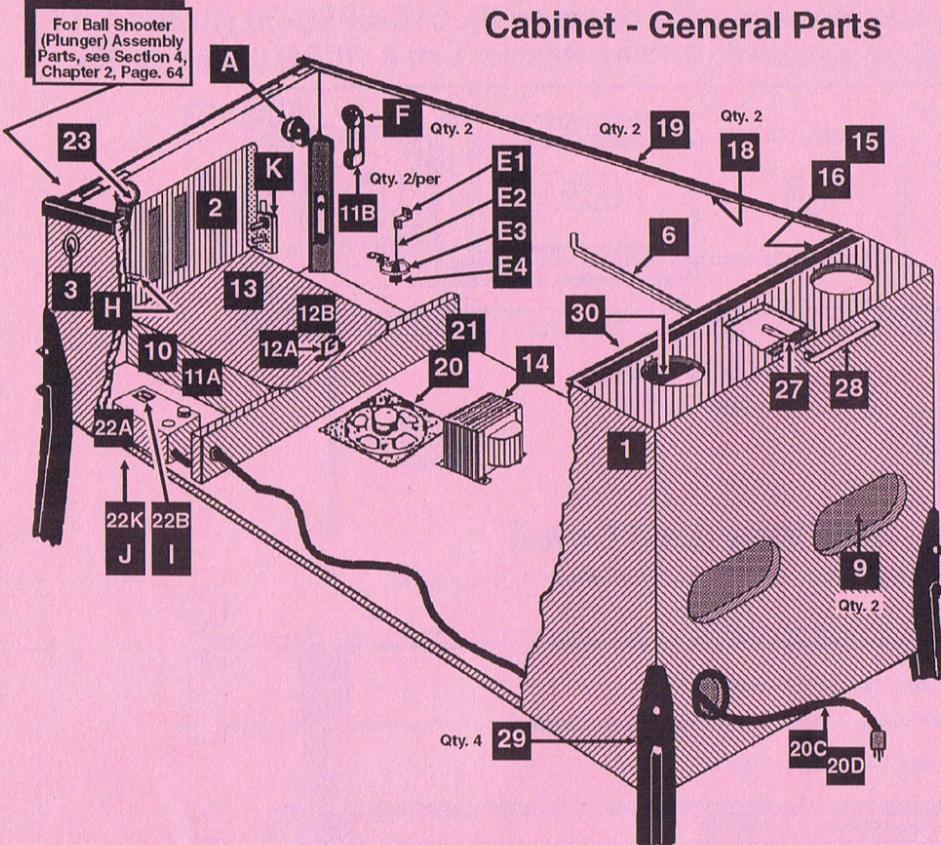
Side View (Laid Down)

For clarity, the below drawing **does not show** the speaker(s).

Nº	Individual Part Name (Front)	QTY.	SPI Part Nº	Nº	Individual Part Name (Front)	QTY.	SPI Part Nº
1	Speaker Panel (for Showcase II)	1	525-5515-00	14	Speaker Panel Hook Bracket	2	535-7009-02
2	Dot Matrix Disp. Bd. Mounting Bracket	2	535-8368-01	Items 12, 13 & 14 secured by: #8 X 3/4" HWH AB (Zinc) (Items 12/13: Qty. 4/per; Item 14: Qty. 2/per) (234-5103-00)			
3	Dot Matrix Display Board 128 X 32	1	520-5052-00	15*	Sega Logo (self-adhesive)	1	535-7877-00
Item 3 secured to Item 2 by (at corners): 3/16" X 3/8" Spacer Gray (Qty. 4) (254-5000-18) and #6-32 X 1/2" HWH Swage (Serr) Zinc (Qty. 4) (237-5976-03)				16	Plastic Shield (Display Cover)	1	545-5884-00
4	Static Shield (Steel Plate)	1	535-6437-00	Item 16 secured to Item 2 by: #6 X 3/8" HWH AB (Zinc) (Qty. 8) (234-5000-00)			
Item 4 secured to Item 2 by: 1/2" X 1/4" Hex Spacer #6-32 Tap (Qty. 4) (254-5008-03) and #6-32 X 1/2" PPH MS (Sems) Zinc (Qty. 2, on Left Side only) (232-5202-00)				17*	Ground Strap (41")	2	600-5006-41
5*	Edge Protector (on Item 4)	2	545-5592-01	The Associated Parts A.P. 18-20 are also noted in the Backbox (Showcase II) Assy. drawings on the previous page.			
6	Display Controller Board FCC-FEB98	1	520-5055-03	ASSOC. PARTS ARE NOT INCLUDED WITH BACKBOX/SPKR. PANEL ASSY'S.			
Item 6 secured to Item 4 by: 1/2" X 5/16" X .144 ID Spacer Tap (Qty. 3) (254-5014-00), #6-32 X 3/4" PPH MS (Sems) Zinc (Qty. 3) (237-5504-00), 1/2" X 1/4" Hex Spacer #6-32 Tap. (Qty. 1) (254-5008-03) and #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5200-00)				Nº	Assoc. Backbox Part Name	QTY.	SPI Part Nº
7	RF Shield	1	820-5092-00	18	Backglass Assembly (Game Nº 71)	1	515-5450-00-71
Item 7 is secured inbetween: "Item 6" and its' mounting hardware described.				ORDERING ABOVE (ITEM 18) SUB-ASSY. PART Nº WILL INCLUDE:			
8*	Ground Strap (25") (on Items 4,6, 12)	2	600-5006-25	18A	Clear Backglass 25.906" X 19.187"	1	660-5038-02
9*	1/2" Clamp (Single) (on Item 4)	1	040-5000-06	18B	Screened Film (Game Nº 71)	1	830-5271-00
10*	Ribbon Cable, 14-Pin	1	036-5260-00	18C	Top Plastic Channel - 26"	1	545-5018-15
Item 10 (14-Pin) connects the Dot Matrix Disp. Board to the Disp. Controller Board.				18D	Bottom Plastic Lift Channel - 26-1/16"	1	545-5021-01
11*	Foam 3/16" Thk. X 1/4" X 36"	3	626-5026-00	18E*	Plastic Edging (Left/Right) - 18-1/8"	2	545-5018-14
Above Item 11 is self-adhesive. Located between Items 3 & 17. Sold in 12" Lengths only.				18F*	Tape (double-sided) (12" Length)	1/2	626-5005-00
12	Speaker (Shld.) 4" 8Ω MG Elec #4060SH	2	031-5004-01	Note: 18F secures 18E to 18A			
13	Speaker Grill (Black w/no Artwork)	2	535-8081-00	19	Pivot Hinge Left	1	535-7999-00
				20	Pivot Hinge Right	1	535-7999-01
				Items 19 & 20 secured to Backbox by: 1/4"-20 X 1-1/4" C.B. Sq. Neck (Qty. 4) (231-5003-00) and 1/4"-20 Flange Nut (Qty. 4) (240-5300-00)			
				Items 19 & 20 secured to Cabinet by: 1/4"-20 X 7/8" Carriage Bolt Sq. Neck (Qty. 2) (231-5014-00), Hinge Spacer (Qty. 2) (530-5099-00), Washer 1/4" I.D. X 7/8" O.D. X 1/8" Yellow (Qty. 2) (242-5016-01), Washer 1/4" I.D. X 1" O.D. (Qty. 2) (242-5009-00) and 1/4"-20 Flange Nut (Qty. 2) (240-5300-00)			



Cabinet - General Parts

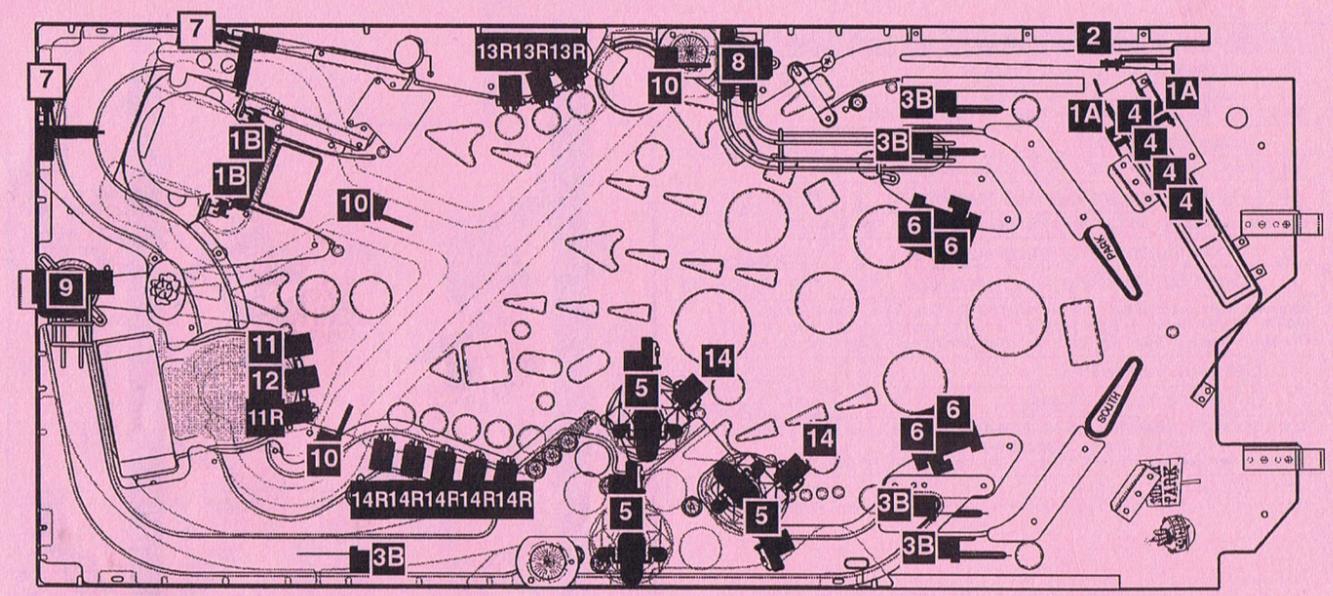


Take Note:

- * An asterisk (*) indicates items are not noted in the pictorial.
- 1. SEE NEXT PAGE FOR CABINET SWITCH NAME PART N° TABLE A-K.
- 2. See Playfield - General Parts (Below), Page 58, for associated brackets attached to the playfield.

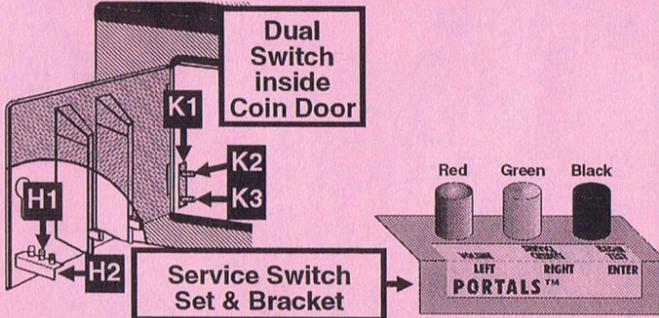
Nº	Cabinet Part Name	QTY.	SPI Part N°	Nº	Cabinet Part Name	QTY.	SPI Part N°
1	Game 71 Screened Cabinet (Plain)	1	525-6000-71	19	Side Armor "with holes" (Lt. & Rt.)	2	535-7297-02
2	Coin Door (with Validator) USA only	1	500-5018-172	Item 19 is secured by: #10-24 X 1" Carriage Bolt Sq. Neck (2/per) (231-5021-00), #10-24 Hex Nut (2/per) (240-5202-00) and #8 X 5/8" T20 Tamper Proof (237-5947-00)			
3	Flipper Button Assembly Red	2	500-5026-32	20	Speaker 8" ø Rd. 8010 4Ω	1	031-5007-00
4*	Pal Nut for Flipper Button (Metal)	2	240-5003-01	21	Speaker Grill 7" X 7"	1	545-5072-03
Item 2 is secured by: 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 4) (231-5003-00) and 1/4"-20 Flange Nut (Qty. 4) (240-5300-00) NOTE: For Coin Door other than USA call Technical Support for SPI Part N°.				Items 20 & 21 are secured by: #6-32 X 1-1/4" Fin Shank Screw (Qty. 4) (237-5883-00) and #6-32 Keps Nut (Qty. 4) (240-5008-00)			
Item 4 is fitted with: O-Ring 11/32" X 7/32" X 1/16" (Qty. 1/per) (545-5850-00)				22	Power Input Box Sub-Assy. (no Vol. pot)	1	515-5360-02
5	Slide & Pivot Support Bracket - Right	1	535-5989-00	ORDERING ABOVE (ITEM 22) SUB-ASSY. PART N° WILL INCLUDE:			
6	Slide & Pivot Support Bracket - Left	1	535-5990-00	22A	Power Box (Plain)	1	535-5932-00
Items 5 & 6 are secured by: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (3/per) (231-5012-00) and #10-24 KEPS Nut (3/per) (240-5207-00)				22B	Service Outlet (for USA)	1	180-5008-01
7	Prop Rod	1	535-7553-00	22C	Line Cord 10' ROJ 3" Max.	1	034-5000-10
Item 7 is secured by: #10-24 X 1-3/4" Carriage Bolt Sq. Neck (231-5022-00), Washer #10 7/32" ID X .5" OD X 1/16" Thk and #10-24 Nylon Stop Nut (240-5206-00)				22D	Recessed Cup for Line Cord	1	545-5122-00
8*	Mylar Carriage Bolt Cover Disc	2	820-5041-00	22E*	Line Filter	1	150-5000-00
9	Grills 2-1/2" X 18" (on Back & Bottom)	2	545-5072-02	22F*	Varistor TNR159211KM	1	150-5001-00
10	Cash Box Plastic Bottom	1	545-5090-00	22G*	Fuse 8 Amp 250v Slo-Blo (Domestic)	1	200-5000-05
11A	1/2" X 3/4" X 1-1/2" Black Foam Rubber Tape	1	626-5004-00	22H*	Fuse Holder	1	205-5001-00
Above Item 11A is self-adhesive. It is located behind Item 10. Sold in 12" Lengths only.				22J*	On/Off Switch Bracket	1	535-8318-00
11B	Foam Strip (2/per Flipper Switch Front/Back)	4	626-5042-00	22K	On/Off Rocker Sw. (Arcoelectric C1350AB)	1	180-5001-01
12A	Cash Box Lock Bracket (wire)	1	535-7562-00	22L*	Power Box + Supplement Decals	1/1	820-6123-01/-04
12B	Large Hair-Pin Clip	1	535-7772-00	22M*	Fuse Label UL Decal	1	820-6143-00
13	Cash Box Cover (Validator)	1	535-5013-03	23	Front Molding Lockdown Assembly	1	500-5020-01
14	Transformer with Ballast Winding	1	010-5012-00	Item 23 is secured by: #10-24 X 1-1/4" Carr. Bolt (Qty. 2) (231-5012-00), #10-24 Keps Nut (Qty. 2) (240-5207-00) and #10 Washer 7/32" ID X 1/2" OD X 1/16" (Qty. 2) (242-5003-00)			
Item 14 is secured by: 1/4"-20 X 5/8" PPH MS (Zinc) (Qty. 4) (237-5854-00) and 1/4" Split Lock Washer (Qty. 4) (244-5000-00) Item 14 Specifications: PFI 103.5 / 115 / 207 / 230V 50/60Hz 750VA Class 130 EPB0				24*	Front Molding Lockdown Spring	1	265-5008-00
15	Rear Glass Channel 20-3/8" Length	1	545-5038-00	25*	Front Molding - Black	1	500-5757-01-00
16	Foam Rubber 3/8" X 3/16" X 20-3/8"	2	626-5001-00	26*	P/F Glass (Tmprd.) 21" X 43" X 3/16"	1	660-5001-00
Above Item 16 is self-adhesive. It is located in Item 15. Sold in 12" Lengths only.				27	#1 Roto Lock Male	1	355-5006-01
17*	Corrugated Tubing 1 1/4" ø (Black), (12')	2	605-5008-00	Note: #1 Roto Lock Female (on Backbox) 1 355-5006-02			
Above Item covers the Cables Wiring Harnesses going into the Backbox from the Cabinet. Sold in 12" Lengths only.				Item 27 is secured by: #10-24 X 1-3/4" Carriage Bolt Sq. Neck (Qty. 2) (231-5022-00) and #10-24 Nylon Stop Nut (Qty. 2) (240-5206-00)			
18	Plastic Channel 42-5/8" Lg. (Lt. & Rt.)	2	545-5017-00	28	Hex Key Allen Wrench 5/16"	1	777-0001-00
				29	Black Leg & Leveler Assembly	4	500-5921-50
				Item 29 is secured by: Leg Bolt Back Plate (535-5703-00) and Leg Bolt 3/8" X 16 X 2-1/2" Hex 5/8" Hd. (2/per) (231-5001-01) To order just a Leg Leveler (3/8" - 16 X 3") use SPI N°: 500-5017-00. A Leg "without" a Leg Leveler is not available.			
				30	Black Plastic Back Panel Shield	1	545-5928-00
				Item 30 is secured by: #6 X 1/2" PPH A Black (Qty. 3) (237-5805-00)			

Cabinet & Playfield - Switches



Take Note:

- * An asterisk (*) indicates items are not noted in the pictorial.
- 1. For switches used corresponding to the Switch Matrix Grid of this game, see Section 3, Chapter 2, ...Diagnostics.
- 2. For location of the Cabinet Switches, see the previous page.
- 3. See Appendix I for color choices, drawings and explanation on Normal & Rear mounted Modular Stand-Up Targets.
- 4. Legend Note: Items noted with a white square □ are mounted above the playfield; items noted with a black square ■ are mounted below the playfield or on/in the cabinet.

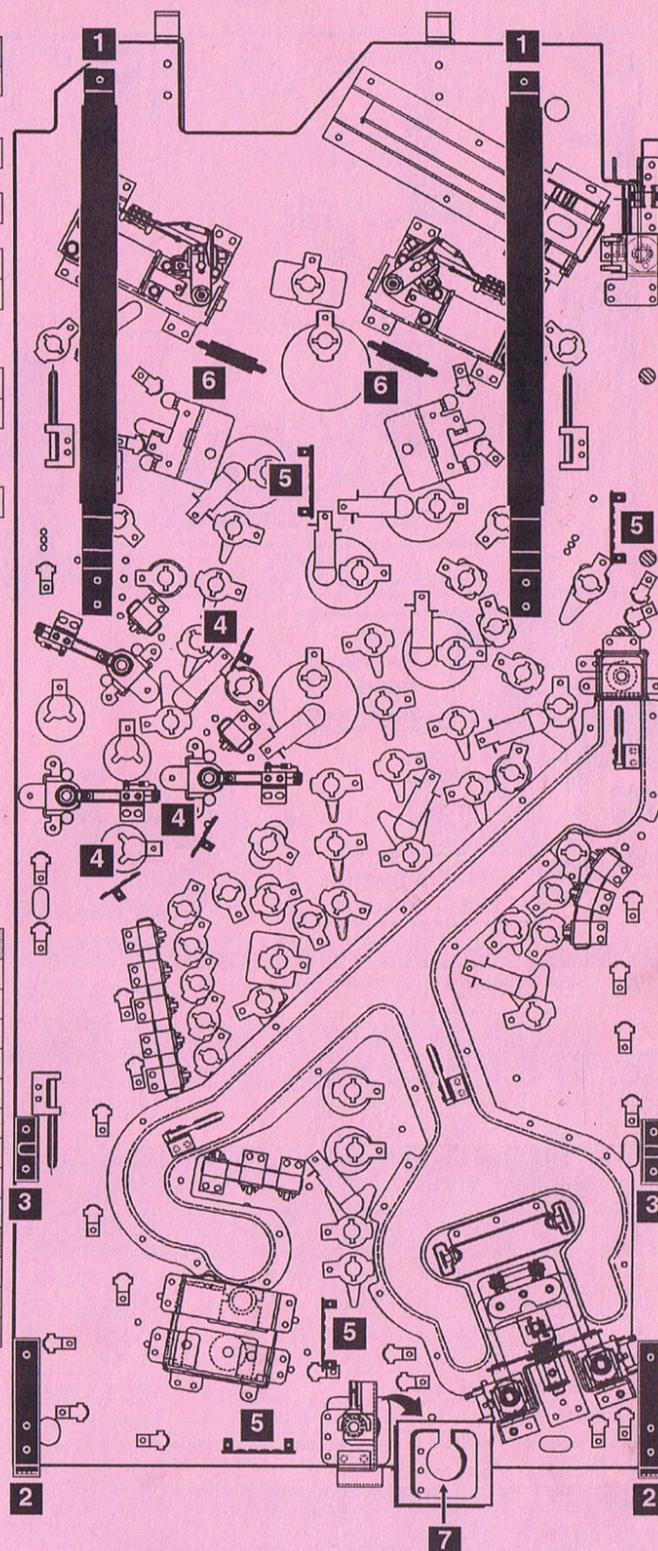


Nº	Cabinet Switch Name	QTY.	Part N°	Nº	Playfield Switch Name	QTY.	Part N°
A	Start Button Sw. Assy. (Red "Flipper" Style)	1	500-6090-02	1A	Dual OPTO TRANS Board	1	520-5173-00
B*	Coin Door Switch (USA)	4	180-5024-00		Dual OPTO REC Board		520-5174-00
	Coin Door Switch (¥ Japan)	n/a	180-5091-00	1B	Long Hop OPTO TRANS Board	1	520-5082-00
C	Large Round Auto Launch Assy.	0	Not Used		Long Hop OPTO REC Board		520-5083-01
D*	Slam Tilt Switch (On Coin Door)	1	180-5022-00	2	Shooter Lane Switch Assembly	1	500-6096-00
E	Cabinet Plumb Bob Tilt Switch	1	n/a	ORDERING ABOVE (ITEM 2) ASSEMBLY PART N° WILL INCLUDE:			
ORDER ONLY INDIVIDUAL PARTS NEEDED (NO ASSY. NUMBER):				2A* Micro Switch 1 180-5157-00			
E1	Tilt Hanger Bracket	1	535-5221-00	2B* Switch Mounting Bracket 1 535-6173-00			
E2	Tilt Hanger Wire (Attached to bracket)	1	535-5319-00	2C* #2-56 X 3/8" HWH MS (Ser) TF 3/16" Hd. 2 237-5938-01			
E3	Tilt Contact Wire	1	535-7563-01	2D* Diode, 1N4001 1 112-5001-00			
E4	Tilt Plumb Bob (Atch'd to hanger wire)	1	535-5029-00	Item 2 is secured by: #6 X 1/2" HWH AB (Zinc) Red (Qty. 2) (234-5001-02)			
F	Flipper Cabinet Sw. - Self-Cleaning	2	180-5160-00	3A	P/F R/O Micro Sw. Assy. (Lt. Mount)	0	500-6227-01
G*	EOS Switch (on Lwr. Flippers)	2	180-5149-00	3B	P/F R/O Micro Sw. Assy. (Rt. Mount)	5	500-6227-02
H	Diagnostics Service Switches (X3)	1	180-5012-03	Item 3B is secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 2/per) (234-5101-05)			
Item H is secured to Diagnostics Switch Bracket (535-6860-01) on Coin Door.				4	Micro Switch (Roller Actuator, Lite-Force)	4	180-5119-02
I	Service Outlet - US	1	180-5008-01	5	Turbo Bumper Switch	3	180-5015-03
J	On/Off Rocker Sw. (Arcoelectric C1350AB)	1	180-5001-01	6	Slingshot Stack (Blade) Switch	4	180-5054-00
Item J is secured to On/Off Sw. Mounting Bracket (535-8318-00) on Cabinet Bottom.				7	Micro Switch (on Roll-Under Gates)	2	180-5087-00
K	Dual Switch Assembly	1	500-5808-00	8	Micro Switch (on Super VUK)	1	180-5052-00
ORDERING ABOVE (ITEM K) ASSEMBLY PART N° WILL INCLUDE:				9	Micro Switch (on VUK, "Y" Actuator)	1	180-5116-01
K1*	Mounting Bracket	1	535-6958-00	10	Micro Switch (High Form, on Under-Trough)	3	180-5057-00
K2	Playfield Power Interlock Sw. (Top)	1	180-5136-00	11	Modular S-U Target Narrow (Green)	1	500-6138-04
K3	Memory Protect Switch (Bottom)	1	180-5000-00	11R	Mod. S-U Target Nar. Rear Mnt. (Green)	1	500-6138-04R
Item K is secured to Cabinet by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 2) (234-5101-05)				12	Modular S-U Target Rectangle (Red)	1	500-6228-02
SEE ABOVE PARTIAL CABINET DRAWING (H & K) AND PREVIOUS PAGE FOR CABINET SWITCH A-K LOCATIONS.				13R	Mod. S-U Trgt. Rnd. Rear Mnt. (Flo-Grn)	3	500-6075-11R
				14	Modular S-U Target Square (Flo-Green)	2	500-6139-11
				14R	Mod. S-U Target Sq. Rear Mnt. (Purple)	5	500-6139-09R
				Items 11-14 are secured by: #8 X 3/4" HWH AB (Zinc) (Qty. 2/per) (234-5103-00)			



Playfield - General Parts (Below)

Nº	Below Playfield Part Name	QTY.	SPI Part Nº
1	Playfield Support Slide Bracket	2	535-6862-02
<i>Item 1 is secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 2/per) (234-5101-05) and #8-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 1/per) (237-5975-03)</i>			
2	Edge Slide Bracket	2	535-5988-00
<i>Item 2 is secured by: #4 X 1/2" PFH (Zinc) (Qty. 3/per) (237-5840-00)</i>			
3	Pivot Pin Bracket Welded Assembly	2	500-5329-00
<i>Item 3 is secured by: #8-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 2/per) (237-5975-03)</i>			
4	Diode Terminal Strip 3-Lug (813) Isolated	3	055-5204-03
5	Diode Terminal Strip 4-Lug (821) Isolated	4	055-5204-04
<i>Items 4 & 5 are secured by: #6 X 3/8 HWH AB Zinc (Qty. 1/per) (234-5000-00). NOTE: 1N4001 Diodes (112-5001-00) are for Switches and/or Lamps. See Section 5, Chapter 2, Playfield Diode Terminal Strip Locations for Diode Usage & Wire Colors.</i>			
6	3A 250v Slo-Blo Fuse	2	200-5000-08
	Fuse Clip Holder (Socket)		205-5000-01
<i>Item 6, Fuse Clip Holder (Socket) 205-5000-01 is part of a set of 12 (205-5000-12). You can order them as Individuals (...-01) or a set of 12 (...-12). Items 6 is secured by: #6 X 1/2" PPH AB (Qty. 1/per) (237-5805-00)</i>			
7	Wood VUK Spacer	1	525-5548-00

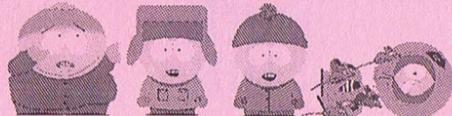


Nº	Miscellaneous Part Name	QTY.	SPI Part Nº
n/a *	3 1/2" Plastic Post (holds cables)	9	545-5253-01
n/a *	Screw Down Cable Tie	4	040-5005-00
n/a *	4" Cable Tie PLT1MXMR	230	040-5001-01
n/a *	5 1/2" Cable Tie PLT1.5I	15	040-5001-02
n/a *	5 1/2" Cable Tie PLT1.5M-XMR	142	040-5001-06
n/a *	Insulating Tubing #18 (Teflon) (12" Long)	1	605-5003-00
n/a *	Heat Shrink Tubing 1/8" Ø (BLK) (12" Lg.)	2	605-5002-00
n/a *	Heat Shrink Tubing 1/8" Ø PUI-24 (12" Lg.)	1	605-5006-00
n/a *	Heat Shrink Tubing 1/4" Ø (CLR) (12" Lg.)	3	605-5004-00
n/a *	Heat Shrink Tubing 1/4" Ø (BLK) (12" Lg.)	0	605-5004-01
n/a *	Split Flex Tubing 1 1/4" Ø (12" Long)	2	605-5008-00
n/a *	Split Flex Tubing 1/4" Ø (12" Long)	5	605-5008-01
n/a *	Split Flex Tubing 1/2" Ø (12" Long)	1	605-5008-02

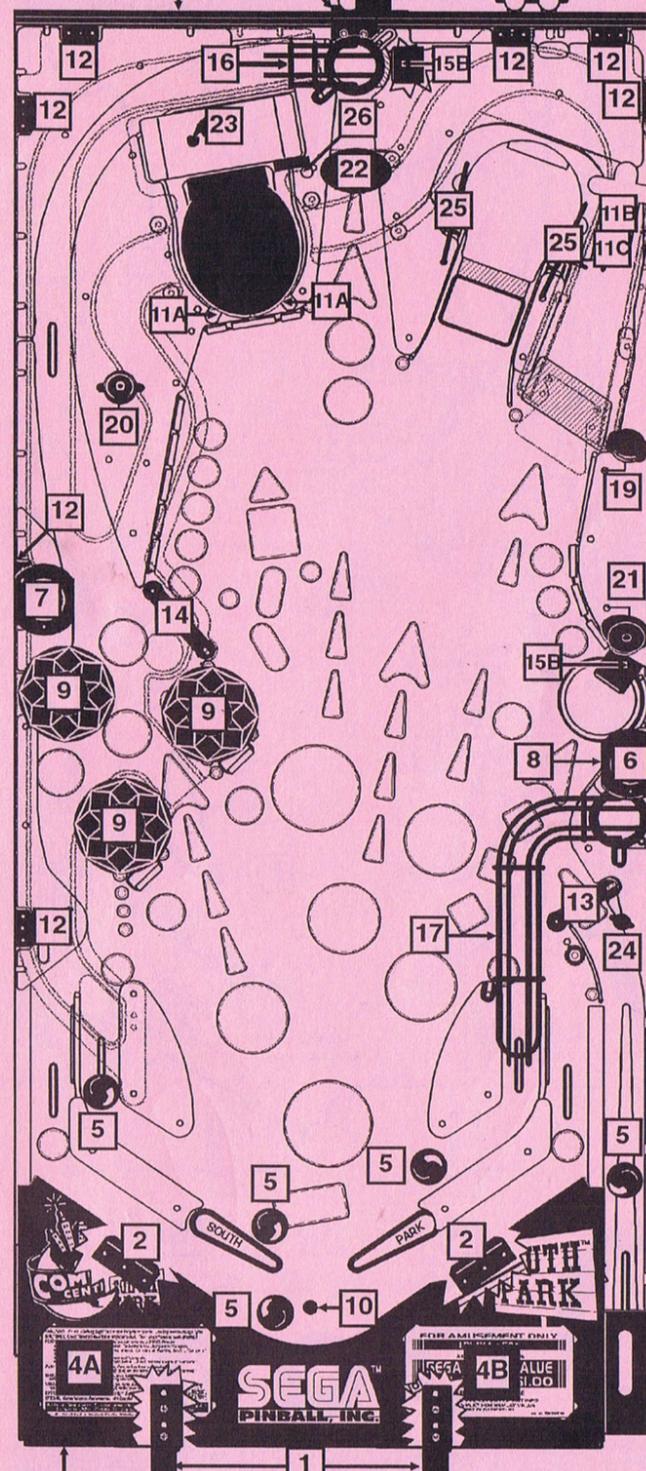
Tubular Note: Tubing is sold by the foot. The quantity shown is a multiple of that amount to cover lengths under 12" in this game. (e.g. a qty. of 6 means there is 5 feet plus up to 11" of tubing.)

Take Note:

- * An asterisk (*) indicates items are not shown on this page.
- 1. For Sockets & Bulbs (drawings & part numbers) see Pgs. 60-62.
- 2. For Major Assemblies, Ramps and/or Under Troughs, see the Blue Pages, Sec. 2, Chp. 2
- 3. For Switches see the previous page.
- 4. Tubing is used to insulate various cables/lugs. Tubing can only be ordered in 12" increments. Cut the amount required for each application. Cut sizes are variable in length. The quantities reflect total lengths required for entire game (averaged up to nearest foot). Quantities may change during production.
- 3. **Legend Note:** Items noted with a black square ■ are mounted below the playfield.



Playfield - General Parts (Above)



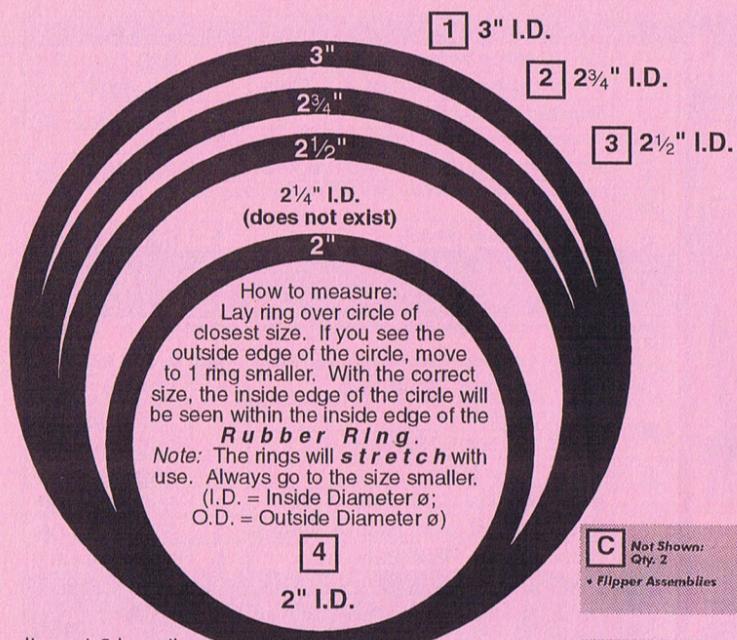
Nº	Above Playfield (P/F) Name	QTY.	SPI Part Nº
n/a *	P/F Screened w/ Inserts & NO Parts	1	830-5100-71
n/a *	P/F Complete w/ Inserts & ALL Parts	1	505-6004-71-71
1	Playfield Hanger Bracket	2	535-8385-00
<i>Item 1 is secured by: #8-32 X 7/8" HWH MS Zinc (Qty. 2/per) (237-5890-00)</i>			
2	Arch Retaining (Hold-Down) Brackets	2	535-8394-00
<i>Item 2 is secured to the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 3/per) (234-5101-05)</i>			
3	Arch Assembly (Metal)	1	500-6005-01
ORDERING ABOVE (ITEM 3) ASSEMBLY PART Nº WILL INCLUDE:			
3A*	Arch (Plain Black Metal) without Fork	1	535-8392-01
3B*	Nelson Protect Strip 8-9/16"	2	545-5212-02
<i>Item 3 is secured to the playfield by: #10-32 X 5/16" PH FL U/C MS STL Zinc (Qty. 2) (237-6013-00) (Note: Decals are not included with the above. See Playfield - Plastic, Decals & Mylar.)</i>			
4A	Instruction Card - South Park	1	755-5171-00
4B	Coin Card (50¢-1)	1	755-5087-50
	Coin Card (50¢-1 75¢-1/2 \$1-3)		755-5087-00
5	1-1/16" Steel Balls	5	260-5000-00
6	Mini-Mars Light Cover Snap-In (Red)	1	550-5030-02
7	Mini-Mars Light Cover Snap-In (Yellow)	1	550-5030-06
8®	Riveted Plastic Piece (Buty.) Assy.	1	515-7009-14-71
ORDERING ABOVE ® RIVETED ASSY PART Nº WILL INCLUDE:			
8A	Screened (Red) Plastic Piece -14	1	830-5967-14
8B*	2-Lug Stand-Up Short Socket	1	077-5101-00
8C*	Rivet, 1/8" Ø X 3/16" Long	1	249-5001-00
9	Pop Bumper Cap Red	3	550-5057-02
10	Plug-Cap (3/16") Black Plastic	1	545-5232-01
11A	Rubber Lite Cover GREEN	2	545-5014-04
11B	Rubber Lite Cover YELLOW	1	545-5014-06
11C	Rubber Lite Cover ORANGE	1	545-5014-07
12	Ramp Mounting Welded Bracket	7	515-6508-00
<i>Item 12 is secured to the Rails by: #6 X 3/4" HWH AB (Zinc) (Qty. 2/per) (234-5003-00)</i>			
13	1-Way Gate Mounting Bracket (Sm.)	1	535-5269-03
	Wire Gate (for above)		535-5307-03
14	1-Way Gate Mounting Bracket (Lg.)	1	535-5269-06
	Wire Gate (for above)		535-5307-09
15A	Snubber Brkt. (Ball Stop) Weldment	1	515-6973-00
15B	Snubber Bracket (Ball Stop) Standard	2	535-8250-01
16	Wire Ramp (Top VUK)	1	515-6971-00
17	Wire Ramp (Bottom SVUK)	1	515-6972-00
18	Black Wood Back Panel (w/Inserts)	1	525-5550-00
19	South Park Kyle (Small Figurine)	1	880-5025-00
20	South Park Stan (Small Figurine)	1	880-5026-00
21	South Park Cartman (Small Figurine)	1	880-5027-00
22	South Park Chef (Small Figurine)	1	880-5028-00
23	South Park Mr. Hankey (Sm. Figurine)	1	880-5029-00
24	South Park Baby Ike (Small Figurine)	1	880-5030-00
<i>Items 19, 21 & 24 are supported by: 1-1/2" Ht. Spring (Qty. 1/per) (265-5058-06); Item 20 is supported by: 1/2" Ht. Spring (Qty. 1) (265-5058-015) Items 19, 20, 21 & 24 require: Clear Plstc. Wshr. .19 X .63 X .03 (Qty. 2/per) (545-6502-00) Items 19, 20, 21 & 24 are secured by: #6 X 3/4" HWH AB (Zinc) (Qty. 1/per) (234-5003-00) For securing hardware for Items 22 & 23 see the Blue Pages for the Assy. its associated with.</i>			
25	Trap Spring (Prevent Ball Traps)	2	265-5051-00
26	Clear Bumper Dot (Self-Adhesive)	1	280-5012-00

Take Note:

- * An asterisk (*) indicates items are not noted in the pictorial.
- ® "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire ® Sub-Assembly. **Please Note:** If the ® Sub-Assembly is not available, call Tech. Support.
- 1. Some unique parts may be included with or associated with a Major Assembly or Ramp Assembly; see the Blue Pages for parts required not appearing on this page. If you still cannot find the part required, call Sega Pinball Technical Support, 1-800-542-5377.
- 2. **Legend Note:** Items noted with a white square □ are mounted above the playfield.

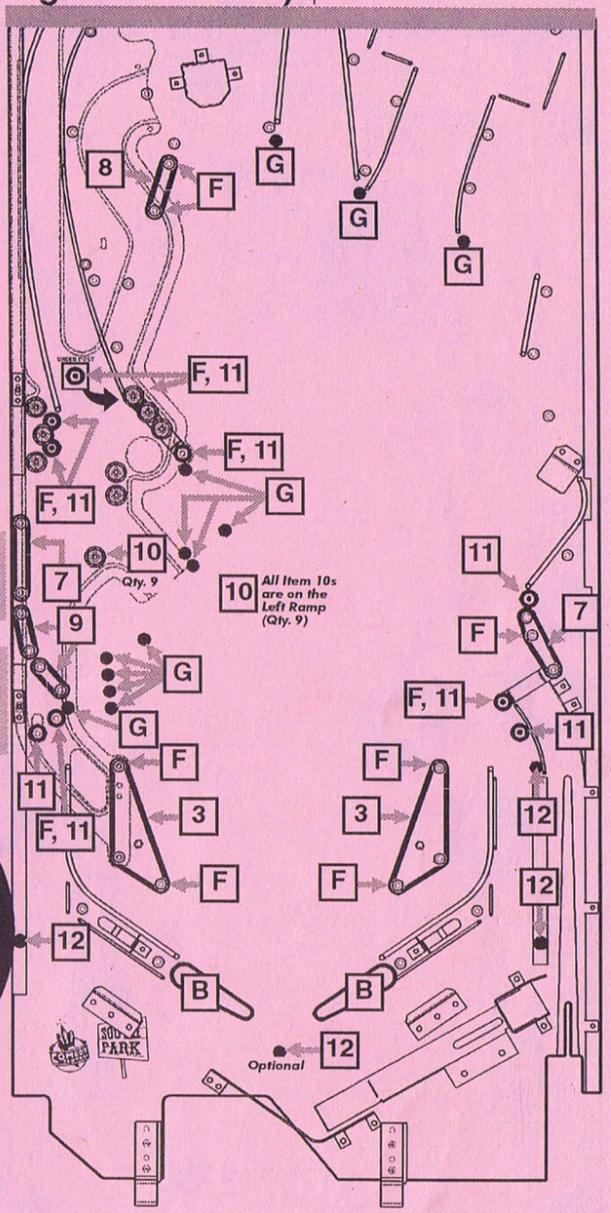
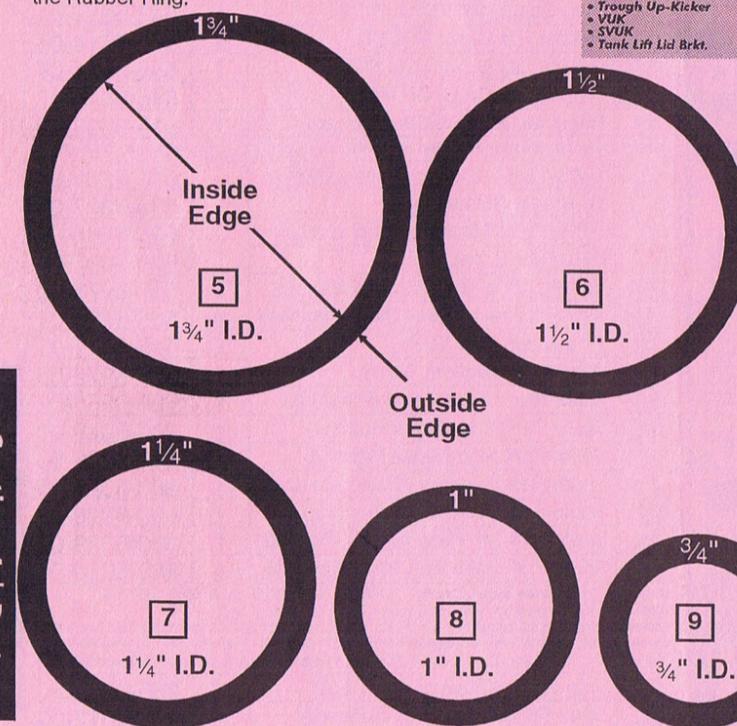


Playfield - Rubber Parts (Rings Actual Size) †



How to measure:
 Lay ring over circle of closest size. If you see the outside edge of the circle, move to 1 ring smaller. With the correct size, the inside edge of the circle will be seen within the inside edge of the Rubber Ring.
 Note: The rings will stretch with use. Always go to the size smaller. (I.D. = Inside Diameter ø; O.D. = Outside Diameter ø)

Items 1-9 have the "size" molded onto the Rubber Ring.



C Not Shown: Qty. 2
 • Flipper Assemblies

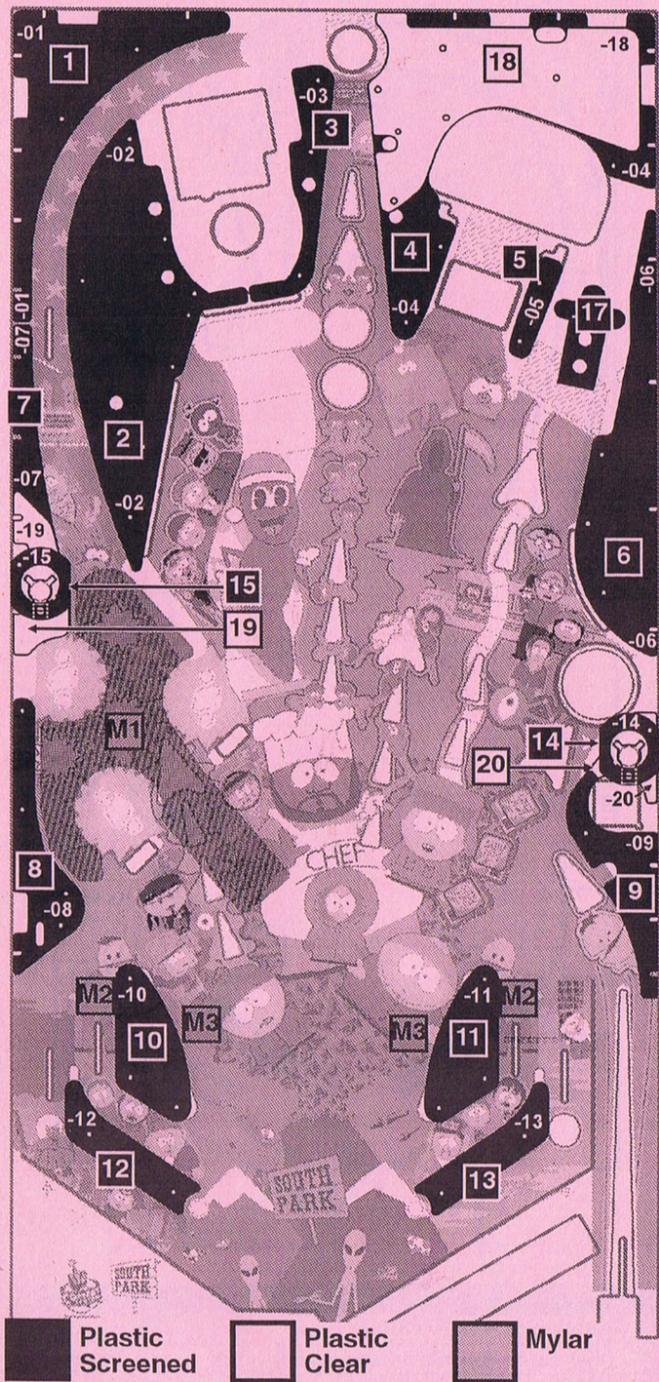
D Not Shown: Qty. 4
 • Trough Up-Kicker
 • YUK
 • SVUK
 • Tank Lift Lid Brkt.

Section 4 | Parts

Nº	Rubber Part Name	QTY.	Part Nº	Nº	Rubber Part Name	QTY.	Part Nº
A	Small Flipper Rubber Ring	0	545-5207-00	4	2" I.D. Black Rubber Ring	0	545-5348-08
B	Large Flipper Black Rubber Ring	2	545-5277-00	5	1¾" I.D. Black Rubber Ring	0	545-5348-21
C*	Rubber Deflector Pad (Bumper)	2	545-5428-00	6	1½" I.D. Black Rubber Ring	0	545-5348-07
D*	Rubber Bumper (Grommet)	4	545-5105-00	7	1¼" I.D. Black Rubber Ring	2	545-5348-06
E	Bumper Post Rubber	0	545-5009-00	8	1" I.D. Black Rubber Ring	1	545-5348-05
F	Post Rubber (Sleeve Short)	13	545-5151-00	9	¾" I.D. Black Rubber Ring	2	545-5348-04
G	Post Black Rubber (Sleeve Tall)	13	545-5308-00	10	5/16" I.D. Black Rubber Ring	9	545-5348-02
1	3" I.D. BLK Rubber Ring	0	545-5348-10	11	3/16" I.D. Black Rubber Ring	9	545-5348-01
2	2¾" I.D. Black Rubber Ring	0	545-5348-20	12	7/16" O.D. Black Rubber Ring	4	545-5348-17
3	2½" I.D. Black Rubber Ring	2	545-5348-09	13	3/8" O.D. Black Rubber Ring	0	545-5348-19



Playfield - Plastic (Butyrate), Decals and Mylar



Nº	Plastic (Butyrate) Name	QTY.	SPI Part Nº
Note: Some pieces are @ clear OR @ riveted.			
1	Top Left Corner (Screened)	1	830-5967-01
2	Left of Toilet (Screened)	1	830-5967-02
3	Right of Toilet (Screened)	1	830-5967-03
4	Top Right Corner (Screened)	1	830-5967-04
5	To Kenny Assy. Rt. Side (Screened)	1	830-5967-05
6	Right Side Playfield (Screened)	1	830-5967-06
7	Left Side Playfield (Screened)	1	830-5967-07
8	Lower Lt. Side Playfield (Screened)	1	830-5967-08
9	Lower Rt. Side Playfield (Screened)	1	830-5967-09
10	Left Slingshot (Screened)	1	830-5967-10
11	Right Slingshot (Screened)	1	830-5967-11
12	Left Return / Outlane (Screened)	1	830-5967-12
13	Right Return / Outlane (Screened)	1	830-5967-13
14@	Right Side Flash (Solid Yellow)	1	830-5967-14
Item 14 has a socket @ riveted to it. If you need this Item 14 with the socket already riveted, see Sec. 4, Chp. 2, ...Major Assemblies & Ramps, Page 76 (Item A.P. 5).			
15@	Left Side Flash (Solid Red)	1	830-5967-15
Item 15 has a socket @ riveted to it. If you need this Item 15 with the socket already riveted, see Playfield - General Parts (Above), Page 53 (Item 8).			
16	Not Used	0	Not Used
17	Ramp Sign [Kenny] (Screened)	1	830-5967-17
18@	Upper Right Corner (Clear) over -04	1	830-5967-18
19@	Left Side Playfield (Clear) over -07	1	830-5967-19
20@	Lwr. Rt. Side Playfield (Clear) over -09	1	830-5967-20
21	Back Panel Cover (Screened)	1	830-5967-21
22@	Backbox Marquee Sign (Screened)	1	830-5967-22
Item 22 has two (2) brackets @ riveted to it. If you need this Item 22 with the brackets already riveted, see Backbox (Showcase II) Assy., Page 48 (Item 27).			
23*	Key Fob (Kenny, Screened)	1	830-5967-23
24*	Key Fob (Mr. Hankey, Screened)	1	830-5967-24
25*	Key Fob (Stan, Screened)	1	830-5967-25
26*	Key Fob (Kyle, Screened)	1	830-5967-26
27*	Key Fob (Cartman, Screened)	1	830-5967-27
28*	Key Fob (Chef, Screened)	1	830-5967-28

Nº	Mylar Name	QTY.	SPI Part Nº
M1	Clear Mylar - Pop Bumper Area	1	820-5876-00
M2	Clear Mylar Square - Return Lane Ball Drop	2	820-5815-00
M3	Clear Mylar - In front of Slingshots	2	820-5821-00
M4*	Black Mylar - Cover Discs (in Cab. hiding bolts)	2	820-5041-00

Nº	Game #60 Decal Name	SPI Part Nº
D1*	#71 Screened Decal Sheet	820-6244-XX

Note: View the last 2-Digit Nº on decal (if applicable) for the desired individual replacement. (Individual pieces may not be available, in which case the entire sheet must be ordered).
 -01 Arch Left (Hold Flipper...); -02 Arch Right (Pull Plunger...); -03 Arch Center (Howdy Hol...)
 -04 Arch Over Plunger; -05 Coin Door (Sega Pinball, Inc.); -06 Install 5 Balls; -07 Portals...
 -08 Rt. Flipper Bat (Park); -09 Lt. Flipper Bat (South); -10 Left Ramp Top Cover; -11 Ramp (Under Chef, Today's Hot Lunch...); -12, -13, -14 Pop Bumper Caps (Yellow/Red Circles all identical); -20 Mr. Hankey Ramp Entrance;
 5-Bank S-U Targets (by Plastic Item 2): -21 Grandpa; -22 Cartman's Mom; -23 Mayor; -24 Ofc. Barbady; -25 Starvin' Marvin;
 Stand-Up Targets by Pop Bumpers: -26 Ned; -27 Mephesto;
 3-Bank S-U Targets (by Plastic Item 6): -28 Wendy; -29 Mr. Garrison; -30 Mr. Macky; -31 Xmas Bulls;
 Not on Game-in Parts Bag: -15 Kenny; -16 Kyle; -17 Stan; -18 Cartman; -19 Arch Center Mr. Hankey Cover-Up (if desired); -34 Chef; -35 Playfield Mr. Hankey Cover-Up (if desired).

Take Note:

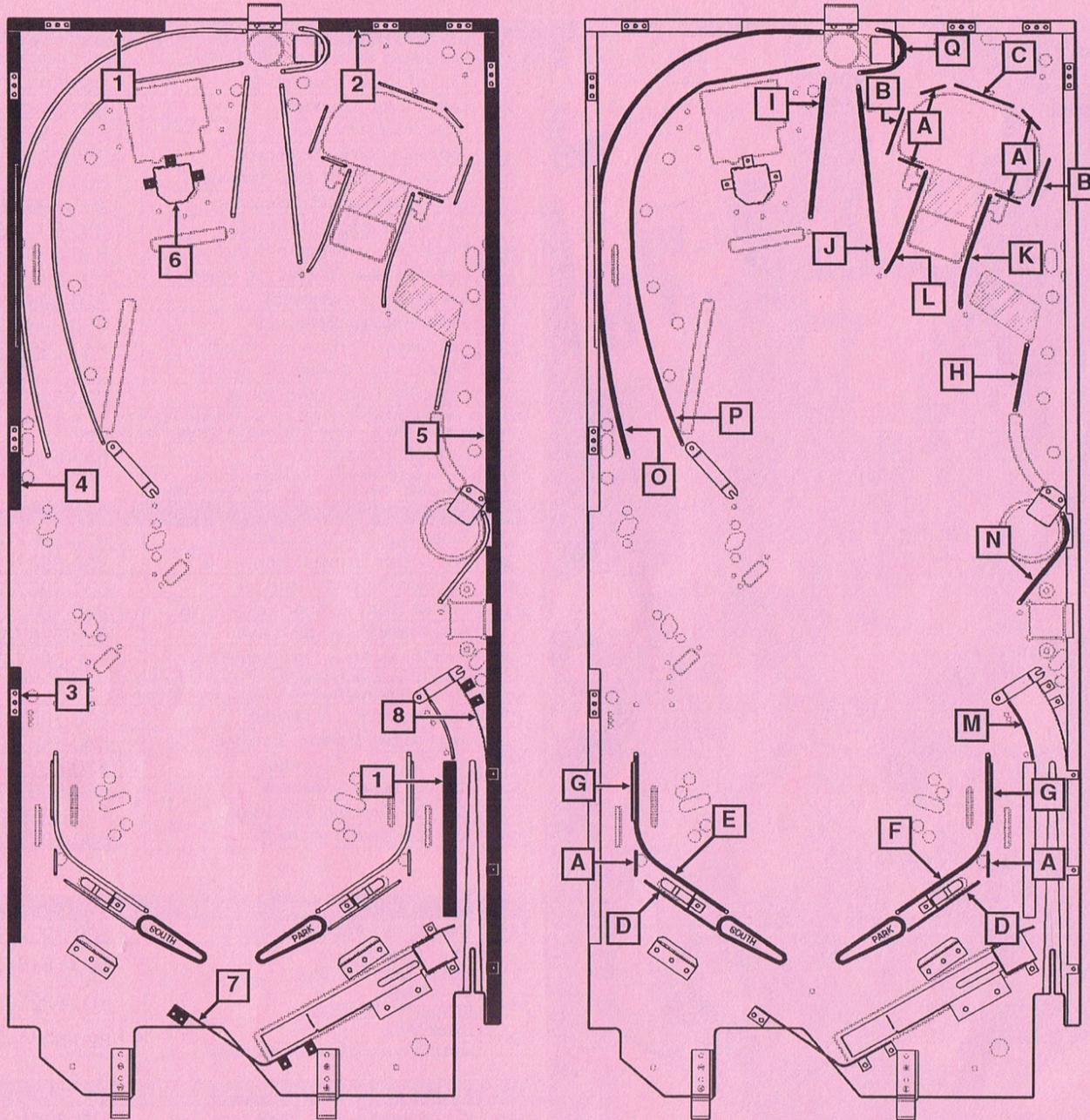
- * An asterisk (*) indicates items are not noted in the pictorial.
- @ "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire @ Sub-Assembly.
- 1. To order the entire Decal or Plastic (Screened or Clear) sheets, use the Part Nº with the "-XX" ending. For individual pieces replace the "-XX" with appropriate last 2-Digit Nº.
 Attention: Individual pieces may not be available.
- 2. Legend Note: Items noted with a black square ■ are Screened; ...a white square □ are @ Clear; ...a gray square ■ are Mylar.

Nº	Generic Decal Names	SPI Part Nº
Power (820-6223-00)	Protective Earth (820-6224-00)	
Generic Backbox Fuse Loc. (820-6152-00)	Fuse Label (UL) (820-6143-00)	
UL Listing Label (820-6141-00)	Danger Coin Door (UL) (820-6140-00)	
Power Box Decal - USA (820-6123-01)	Power Box Decal! Supp. (820-6123-04)	
High Voltage Label (UL) (820-6082-01)	Suitable...Use... (UL) (820-6001-01)	



Section 4 | Parts

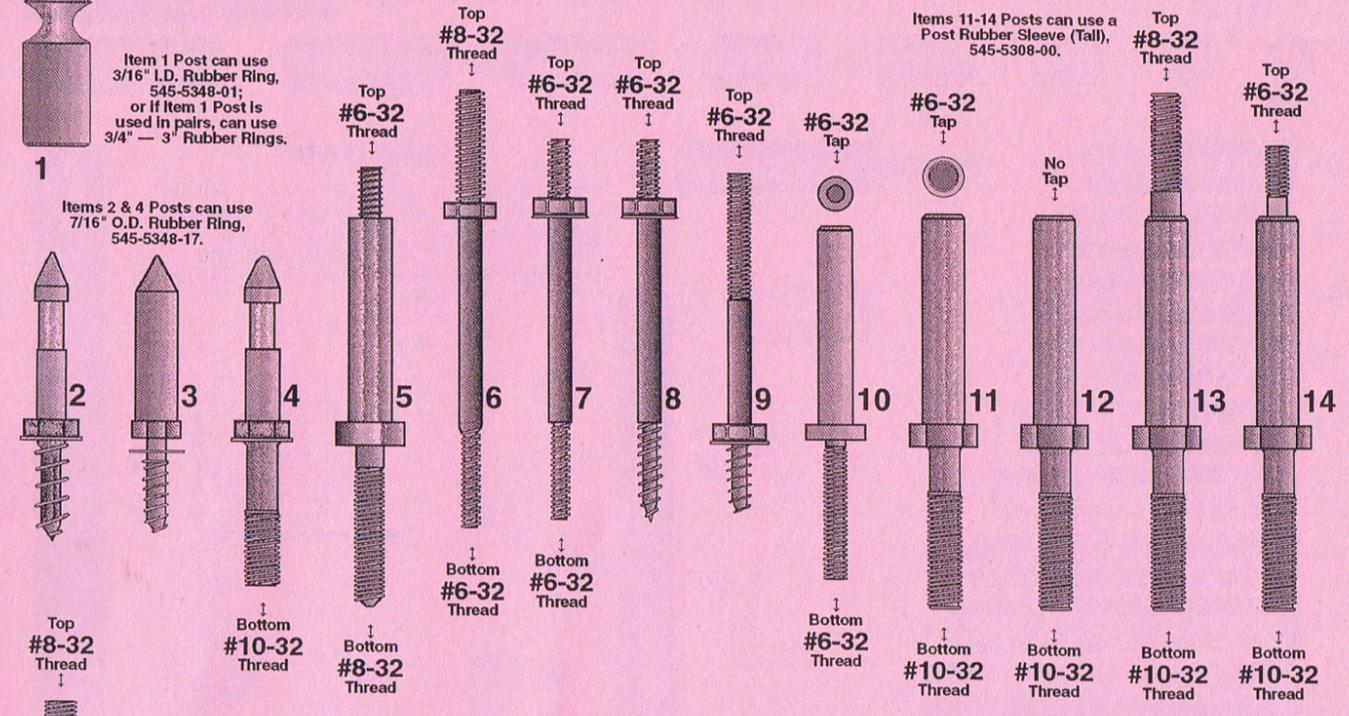
Playfield - Rails and Ball Guides †



Nº	Wood & Metal Rail (MR) Name	QTY.	SPI Part Nº	Nº	Ball Guide Rail (BGR) Name	QTY.	SPI Part Nº
1	Wood Rail - 6-1/2"	2	525-5007-14	E	Ball Guide Rail (Left Return Lane)	1	535-7560-00
2	Wood Rail - 7-3/8"	1	525-5007-40	F	Ball Guide Rail (Right Return Lane)	1	535-7560-01
3	Wood Rail - 11-1/2"	1	525-5007-27	G	Ball Guide Rail (Outlane Fence)	2	535-7595-00
4	Wood Rail (Upper Left Side Playfield)	1	525-5549-00	H	Ball Guide Rail - 2-3/4"	1	535-6492-02
5	Wood Rail (Right Side Playfield)	1	525-5547-00	I	Ball Guide Rail - 5-3/4"	1	535-6492-12
Items 1-5 are secured by: #6 X 1-1/4" PFH A (Zinc) (Qty. 18) (237-5804-00)							
6	Metal Rail Weldment (Toilet Drain)	1	515-6998-00	J	Ball Guide Rail - 7-3/8"	1	535-6492-07
7	Metal Rail (Center Drain under Arch)	1	535-8393-00	K	Ball Guide Rail (Kenny Right)	1	535-8514-01
8	Metal Rail (Shooter Lane Rt. Side)	1	535-8513-00	L	Ball Guide Rail (Kenny Left)	1	535-8515-01
Items 6-8 are secured by: #8 X 1/2" HWH AB Zinc (Blue) (Qty. 12) (234-5101-05)							
Nº	Wire Form (WF) Name	QTY.	SPI Part Nº	Nº	Ball Guide Rail (BGR) Name	QTY.	SPI Part Nº
A	Wire Form - 1"	6	535-5300-05	M	Ball Guide Rail (Shooter Lane Left)	1	535-8516-00
B	Wire Form - 2"	2	535-5300-10	N	Ball Guide Rail (Large Hole Cartman)	1	535-8517-00
C	Wire Form - 2-1/2"	1	535-5300-01	O	Ball Guide Rail (Left Orbit, Outer)	1	535-8518-00
D	Wire Form - 3-1/2"	2	535-5300-03	P	Ball Guide Rail (Left Orbit, Inner)	1	535-8519-00
				Q	Ball Guide Rail (Top VUK)	1	535-8520-00

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

Playfield - Metal Posts (Screws) and Nuts (Actual Size) †

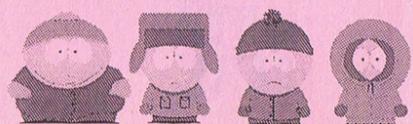


Nut Note: All nuts shown with a "✓" are used in this game. The quantities (not specified) vary. The remaining items listed are not used in this game and are noted for reference only (used in prior games).

Shown Below~	Shown Below~	Shown Below~	Shown Below~	Shown Below~
• #6-32 Nylon Stop Nut: 240-5005-00 ✓	• #6-32 KEPS Nut (with Star Washer): 240-5008-00 ✓	• #6-32 Hex Nut (No Star Washer): 240-5004-00 ✓	• #6-32 T-Nut: 240-5002-00 ✓	• 1/4" X 20 Flange Nut: 240-5300-00 ✓
Top & Side Views	Bottom & Side Views	Top View	Bottom & Side Views	Top & Side Views
Nylon Stop Nuts Not Shown:	KEPS Nuts Not Shown:	Hex Nuts Not Shown:	T-Nuts Not Shown:	Miscellaneous Nuts Not Shown:
• #6-32 (w/ 1/4" Hex Body): 240-5010-00	• #8-32: 240-5102-00 ✓	• #8-32: 240-5103-00	• #8-32 (w/Side Cut Off): 240-5002-01	• Plastic Pal Nut (on Flipper Buttons): 240-5003-00
• #8-32: 240-5102-00 ✓	• #8-32: 240-5104-00	• #10-32: 240-5201-00	• #8-32: 240-5101-00 ✓	• Metal Pal Nut (on Flipper Buttons): 240-5003-01 ✓
• #10-32: 240-5203-00 ✓	• #10-32: 240-5208-00 ✓	• #10-24: 240-5202-00 ✓	• #10-32 (Black Oxide): 240-5007-00	• #6-32 Wing Nut: 240-5001-00
• #10-24: 240-5206-00 ✓	• #10-24: 240-5207-00 ✓	• #10-32 X 3/8": 240-5209-00 ✓	• #10-32 (w/Side Cut Off): 240-5205-00	• #8-32 Wing Nut: 240-5100-00
• #4-40: 240-5303-00 ✓	• #4-40: 240-5318-00	• 3/4-16: 240-5315-00	• #2-56: 240-5301-00	• 1/4"-20 Wing Nut: 240-5302-00
• #4-40 (18/8 Stainless): 240-5303-01	• 5/16"-18: 240-5316-00	• 7/8"-14: 240-5317-00	• #10-24: 240-5200-00	• 1/4"-20 Toggle Wing: 240-5324-00 ✓

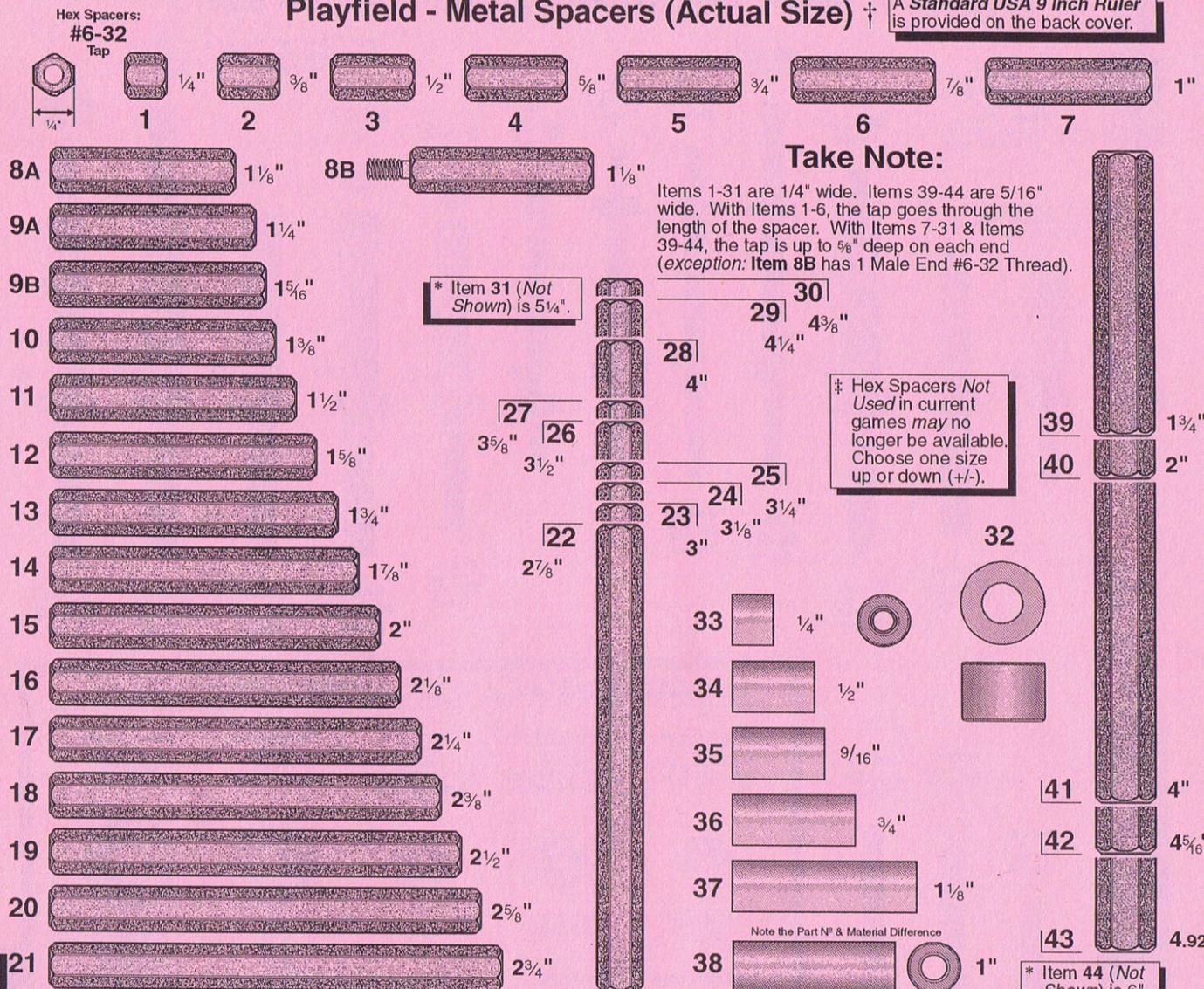
Nº	Metal Post Name	QTY.	SPI Part Nº	Nº	Metal Post Name	QTY.	SPI Part Nº
1	Stand-Off Double Groove Post 1-1/16"	0	530-5102-01	10	Post #6-32 Tap / #6-32 Bottom	0	530-5127-00
2	Mini-Post Wood Screw	6	530-5004-00	11	Post Hex Base #6-32 Tap/#10-32 Bot.	0	530-5332-01
3	Mini-Post Wood Screw (no cut-away)	0	530-5004-01	12	Post Hex Base (No Tap)/#10-32 Bot.	14	530-5332-00
4	Mini-Post Mach. Screw / #10-32 Bot.	1	530-5005-00	13	Post Hex Base #8-32 Top/#10-32 Bot.	0	530-5332-02
5	Post Fasten #6-32 Top / #8-32 Bot.	0	530-5007-00	14	Post Hex Base #6-32 Top/#10-32 Bot.	0	530-5332-03
6	Post Fasten #8-32 Top / #6-32 Bot.	3	530-5008-00	15	Playfield Support #8-32 Top/Bottom	0	530-5285-00
7	Post Fasten #6-32 Top / #6-32 Bot.	21	530-5012-02	16	#6-32 X 3/4" Fin Shank Screw	8	237-5921-02
8	Post Fstn. #6-32 Top / Wood Scr. Bot.	24	530-5010-02	17	#6-32 X 1-1/4" Fin Shank Screw	4	237-5883-00
9	Post #6-32 Top / Wood Screw Bottom	0	530-5263-01	18	#6-32 X 1-3/16" Spirol Fin Shank Scr.	9	237-5957-00

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



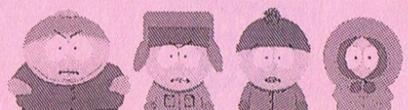
Playfield - Metal Spacers (Actual Size) †

A Standard USA 9 Inch Ruler is provided on the back cover.

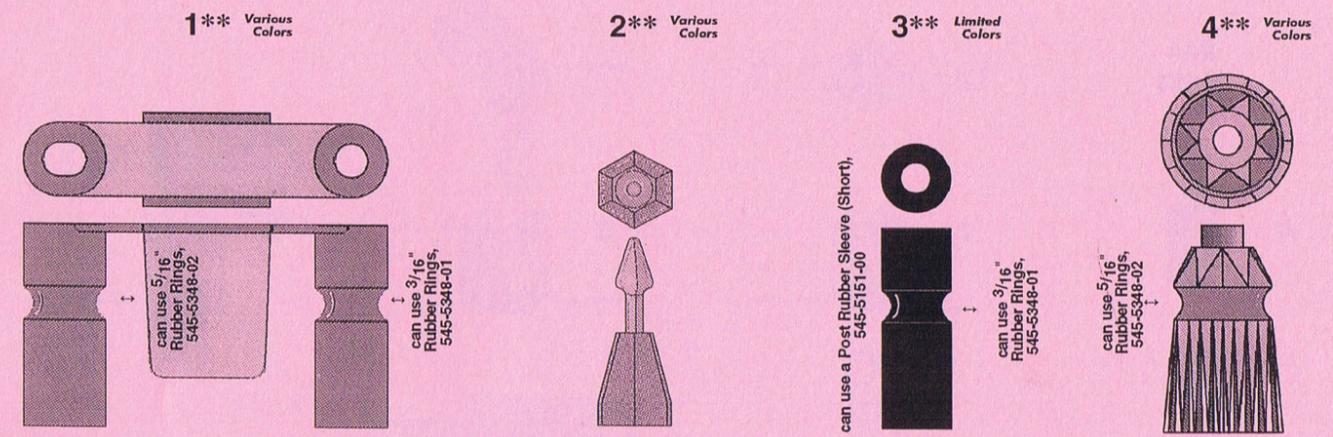


Nº	Metal Spacer Name	QTY.	SPI Part Nº	Nº	Metal Spacer Name	QTY.	SPI Part Nº
1	1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-00	22	2 7/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-31
2	3/8" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-12	23	3" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-14
3	1/2" X 1/4" Hex Spacer #6-32 Tap	7	254-5008-03	24	3 1/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-19
4	5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-02	25	3 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-26
5	3/4" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-04	26	3 1/2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-27
6	7/8" X 1/4" Hex Spacer #6-32 Tap	5	254-5008-05	27	3 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-25
7	1" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-06	28	4" X 1/4" Hex Spacer #6-32 Tap	5	254-5008-21
8A	1 1/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-17	29	4 1/4" X 1/4" Hex Spacer #6-32 Tap	3	254-5008-30
8B	Same as 8A with Male End #6-32	0	254-5024-17	30	4 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-29
9A	1 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-11	31*	5 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-35
9B	1 5/16" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-34	32	3/8" X 1/2" Spacer (Used with Backbox)	2	530-5099-00
10	1 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-33	33	1/4" X 5/16" X .144" I.D. Spacer Tap.	1	254-5014-03
11	1 1/2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-09	34	1/2" X 5/16" X .144" I.D. Spacer Tap.	3	254-5014-00
12	1 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-13	35	9/16" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-04
13	1 3/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-10	36	3/4" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-01
14	1 7/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-20	37	1 1/8" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-02
15	2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-07	38	1" X 5/16" X .144" I.D. Spacer Tap.	0	254-5001-00
16	2 1/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-32	39	1 3/4" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-06
17	2 1/4" X 1/4" Hex Spacer #6-32 Tap	3	254-5008-18	40	2" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-06
18	2 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-28	41	4" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-03
19	2 1/2" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-16	42	4 5/16" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-00
20	2 5/8" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-08	43	4.92" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-04
21	2 3/4" X 1/4" Hex Spacer #6-32 Tap	3	254-5008-15	44*	6" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-02

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



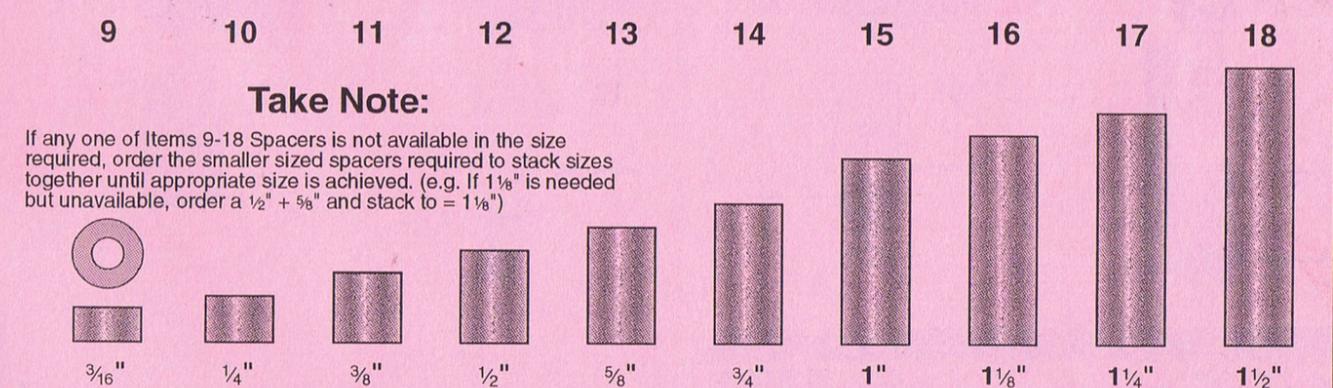
Playfield - Plastic Posts and Spacers (Actual Size) †



Take Note:

PLASTIC PART COLOR CHART					
Nº	Color	Nº	Color	Nº	Color
-00	Black	-06	Yellow	-12	Fluor. Blue
-01	Clear	-07	Orange	-13	Teal Green
-02	Red	-08	White	-14	Gray
-03	Amber	-09	Purple	-15	Luminescent
-04	Green	-10	Fluor. Orange	-16	Gold
-05	Blue	-11	Fluor. Green		

** Items 1, 2 and 4 come in various colors (may not be available in every color). Item 3 is currently only available in the color stated in this game manual (other colors used in prior games may no longer be available). The "-XX" in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº, corresponding to the color desired. Some colors may no longer be available for desired item.



Take Note:

If any one of Items 9-18 Spacers is not available in the size required, order the smaller sized spacers required to stack sizes together until appropriate size is achieved. (e.g. If 1 1/8" is needed but unavailable, order a 1/2" + 5/8" and stack to = 1 1/8")

Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº	Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº
1**	Top Lane Mini-Light Hood	0	550-5061-XX	9	3/16" X 3/8" Spacer Gray (4 for Dot Display)	4	254-5000-18
2**	Mini-Jewel Post	0	550-5052-XX	10	1/4" X 3/8" Spacer Gray	1	254-5000-02
3**	1 1/16" Single Groove Post (Black)	60	550-5059-00	11	3/8" X 3/8" Spacer Gray	0	254-5000-12
4**	Single Groove Jewel Post (Clear)	9	550-5034-01	12	1/2" X 3/8" Spacer Gray	1	254-5000-01
5 ‡	1/4" Sif. Rtn. Spacer White	0	254-5007-02	13	5/8" X 3/8" Spacer Gray	0	254-5000-14
6 ‡	3/8" Sif. Rtn. Spacer White	0	254-5007-01	14	3/4" X 3/8" Spacer Gray	2	254-5000-07
7 ‡	3/4" Sif. Rtn. Spacer White	0	254-5007-03	15	1" X 3/8" Spacer Gray	1	254-5000-04
8	1/2" X 1/4" Spacer White (Narrow)	0	254-5000-03	16	1 1/8" X 3/8" Spacer Gray	0	254-5000-06
				17	1 1/4" X 3/8" Spacer Gray	0	254-5000-05
				18	1 1/2" X 3/8" Spacer Gray	0	254-5000-08

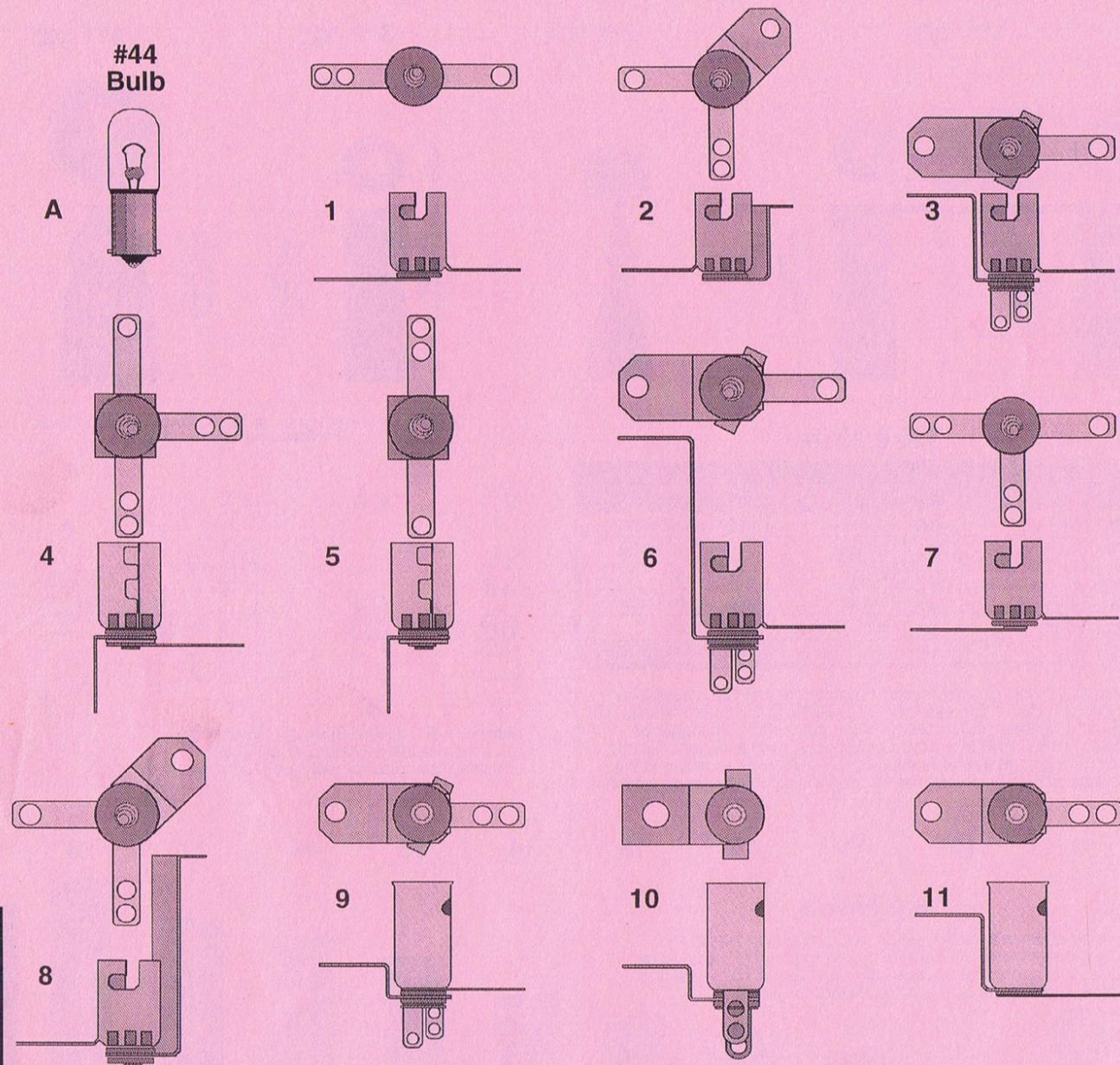
Items 3 & 4 typically secured by: Post Fastening Screw #6-32 Top / #6-32 Bottom (Qty. 1/per) (530-5012-02, Item 7 Page 63) and may use Washer 9/64" X 5/16" OD X 1/32" (Qty. 2/per) (242-5017-00) with a #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00).

Items 10-19 typically secured by: See Items 6, 7 & 8 Page 57 &/or #6-32 1 3/4" PPH MS Zinc Screw (Qty. 1/per) (237-5511-00) and #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00).

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



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



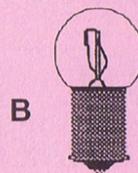
Nº	#44 Bulb & Socket Name	QTY.	SPI Part Nº
A	#44 Bulb	33	165-5000-44
1	2-Lug Staple Down Socket	0	077-5000-00
2	2-Lug Stand-Up Short Socket	0	077-5002-00
3	3-Lug Stand-Up Short Socket	0	077-5008-00
4	3-Lug Laydown Socket	0	077-5006-00
5	2-Lug Laydown Socket	2	077-5003-00
6	3-Lug Stand-Up Long Socket	0	077-5009-00
7	3-Lug Staple Down Socket	0	077-5001-00
8	2-Lug Stand-Up Long Socket	0	077-5005-00
9	3-Lug Stand-Up Long Shell Socket	0	077-5013-00
10	2-Lug Stand-Up Lg. Shell Socket (Gls)	31	077-5031-00
11	1-Lug Stand-Up Long Shell Socket	0	077-5012-00

Nº	#455 Bulb	QTY.	SPI Part Nº
B	#455 Twinkle Bulb	0	165-5003-00

Take Note:

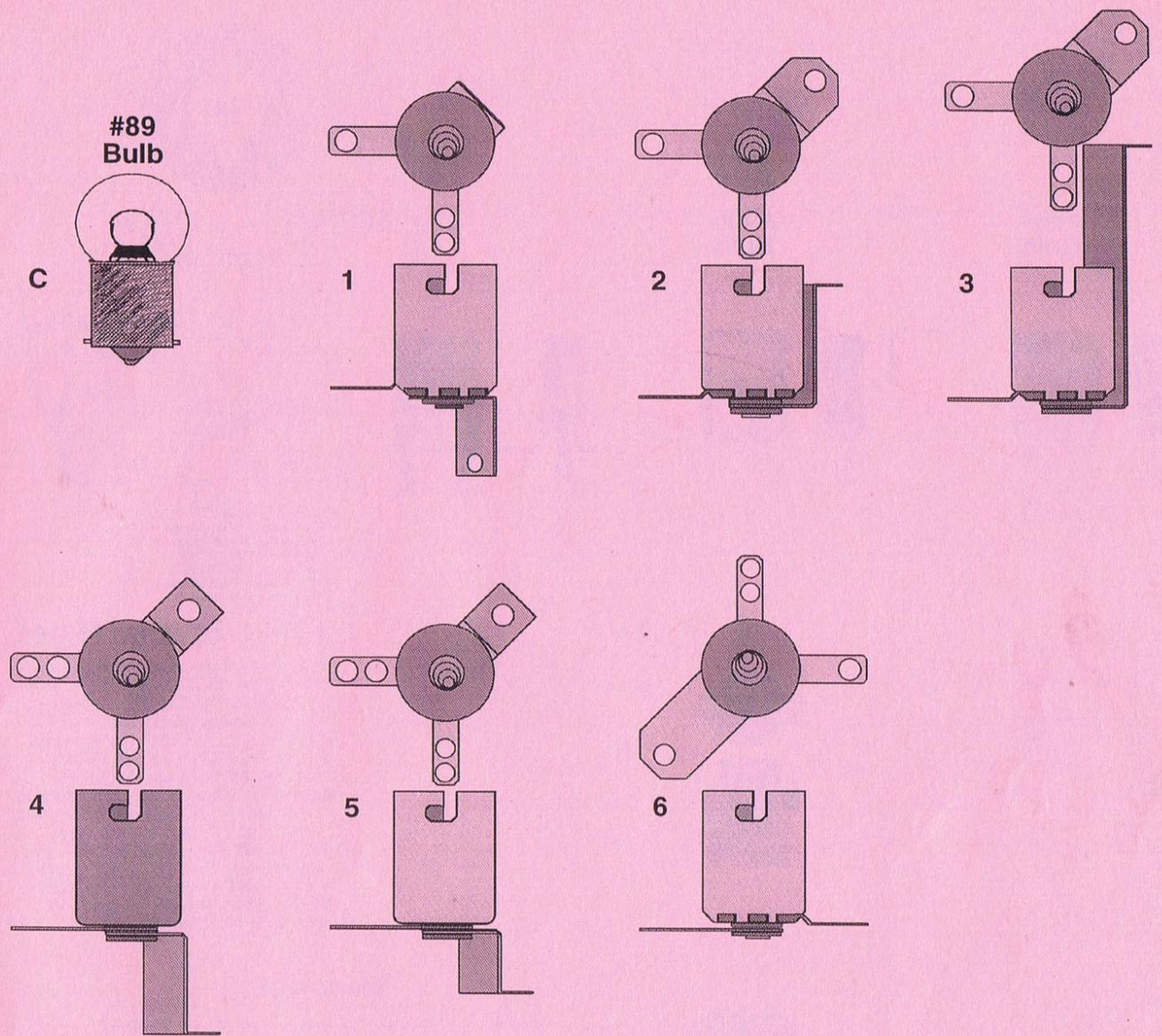
Item B Bulb (#455) is normally used in conjunction with Item 11 Socket, but **can** be used with Items 1-10 Sockets on this page.

#455 Bulb



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

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

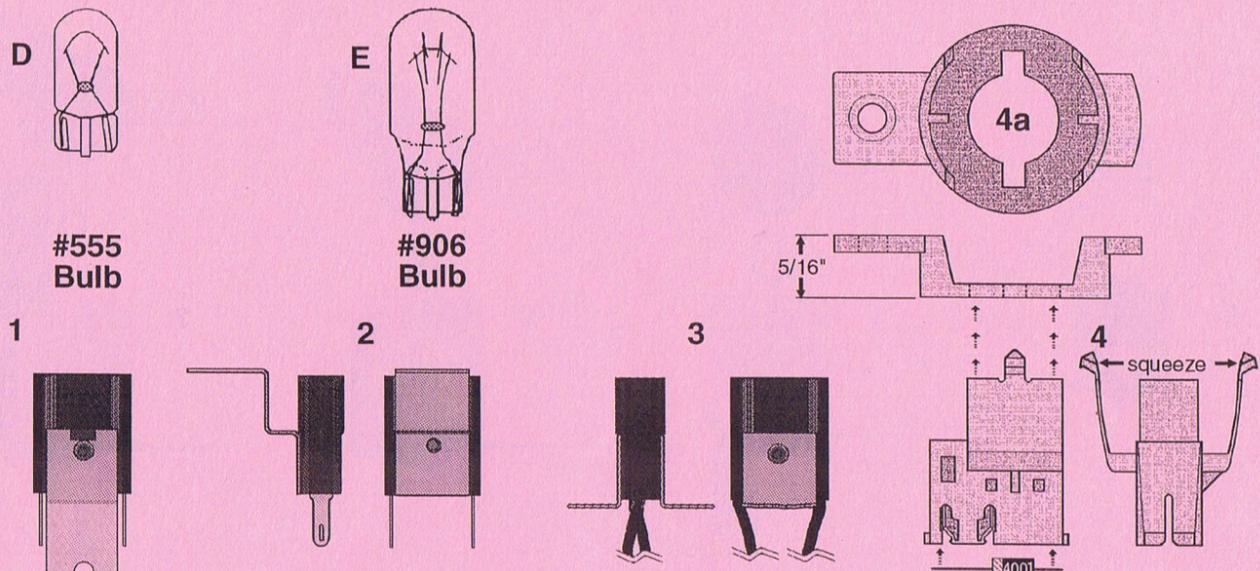


Nº	#89 Bulb & Socket Name	QTY.	SPI Part Nº
C	#89 Bulb	18	165-5000-89
1	Laydown Standard Socket	13	077-5100-00
2	2-Lug Stand-Up Short Socket	2	077-5101-00
3	2-Lug Stand-Up Long Socket	3	077-5102-00
4	Stand-Up Socket Rev. Short	0	077-5103-00
5	2-Lug Stand-Up Small Socket	0	077-5106-00
6	Straight Leg Socket	0	077-5107-00

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



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



This Socket is equipped with a *built-in* Diode, 1N4003, (112-5013-00). However, replacement can be made with Diode, 1N4001, (112-5003-00).

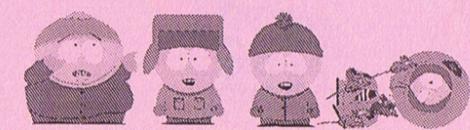
Take Special Note

Item 4 is an Insulation Displacement Connection (IDC) Style Socket. This style is solderless, and has a built-in diode. This socket is secured to the playfield or component by Items 4a and 4b Snap-On Socket Brackets, or may also be snapped into Item 4c Socket Mounting Board where sockets are positioned too close together (clear plastic piece; if used in this game, Item 4c will show a Qty. and Part N^o). Just squeeze the "side arms" of the socket together and pull away from the bracket or mounting board for easy Bulb replacement.

Take Note:

- * An asterisk (*) indicates items are not shown on this page.
 - 1. Item 2 Socket has 2 Wires attached are approximately 12" ea.
 - 2. Item 5 Socket **was** used on PC Light Boards to position bulbs horizontally; Item 5 Socket is secured by soldering into place.
 - 3. Item 6 Socket **was** used on PC Light Boards to position bulbs vertically; Item 6 Socket is secured by "twisting" into place.
 - 4. Item E Bulb (#906) is normally used in conjunction with Item 7 Socket, but **can** be used with Items 1, 2, 4 or 5.
- Note: Always replace with same type bulb in original application.
- 5. See the start of this chapter for Fluor. Bulb & Associated Parts.

N ^o	#555 Bulb & Socket Name	QTY.	SPI Part N ^o	N ^o	#906 Bulb & Socket Name	QTY.	SPI Part N ^o
D	#555 Wedge Base Bulb (Clear)	60	165-5002-00		#906 Wedge Base Bulb (Clear)	1	165-5004-00
1	Laydown #555 Wedge Base Socket	4	077-5026-01		#906 Wedge Base Bulb (Red)	2	165-5004-02
2	#555 Wedge Base Offset Socket	4	077-5029-00	E	#906 Wedge Base Bulb (Amber)	0	165-5004-03
3	#555 W.B. Socket (for Pop Bumper)	3	077-5206-00		#906 Wedge Base Bulb (Blue)	0	165-5004-05
4	#555 IDC Snap-On Socket	52	077-5216-00		#906 Wedge Base Bulb (Yellow)	0	165-5004-06
4a	5/16" Ht. Snap-On Socket Bracket	52	545-5760-18	7	#906 Wedge Base Socket (Twist)	0	077-5016-00
4b *	19/32" Ht. Snap-On Socket Bracket	0	545-5760-19				
4c *	Clear Plastic (Buty.) Socket Mtg. Bd.	0	Not Used				
5	#555 W.B. Socket (Solder Type)	0	077-5207-00				
6	#555 Wedge Base Socket (Twist)	0	077-5007-00				



Drawings for Major Assemblies & Ramps (The Blue Pages)

Overview

Drawings are provided for the Major Assemblies in this game with individual parts of each assembly numbered. Items noted with a white circle (①) are mounted above the playfield; items noted with a black circle (Ⓚ) are mounted below. All numbered parts describe the name, quantity & Part N^o. Associated Parts are noted and/or viewed with the associated Major Assembly. Parts not listed in this chapter are detailed in the Pink Pages, Chapter 1, Parts Identification & Location. Below are drawings of the Playfield (Above & Below) with the Part N^o & Page N^o Highlighted. **Important:** Read all "Take Note:" items.

ASSEMBLIES MOUNTED ABOVE THE PLAYFIELD

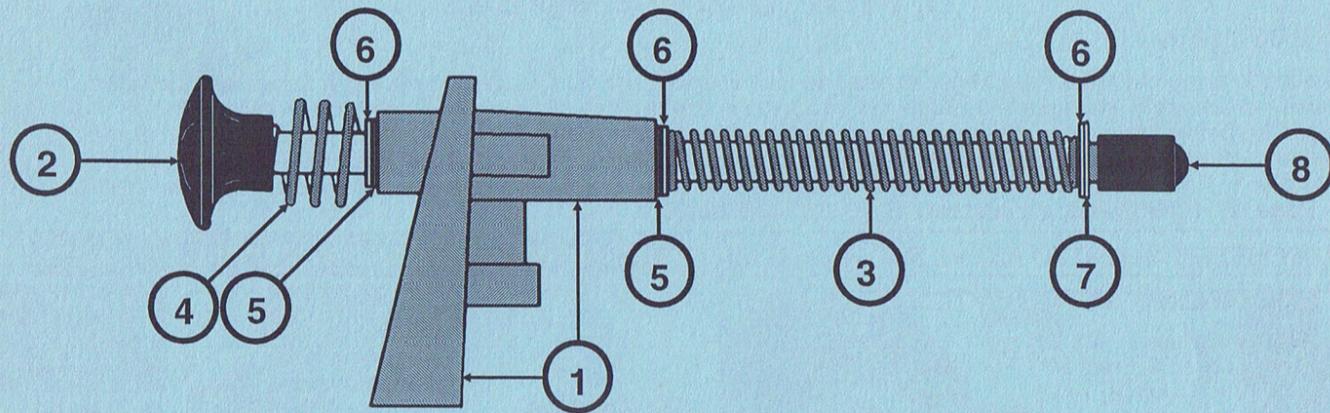
- Pages 70-71 Toilet & Frame (Above)
- Pages 72-73 Kenny (Above)
- Page 76 Left Plastic Ramp
- Page 77 Right Plastic Ramp
- Page 65 Enter/Exit Scoop

ASSEMBLIES MOUNTED BELOW THE PLAYFIELD

- Page 65 5-Ball Trough/TRUK
- Page 64 Autoplunger Coil & Arm Weld
- Page 66 Left Flipper
- Page 67 Right Flipper
- Page 69 Left & Right Slingshots
- Page 74 Super VUK
- Page 68 Turbo Bumpers
- Page 75 Plastic Under-Trough
- Page 75 OPTO (Kenny)
- Page 64 Ball Shooter (Plunger)
- Page 69 Vertical Up-Kicker (VUK)
- Pages 72-73 Kenny (Below)
- Page 63



Ball Shooter (Plunger) Assembly, 500-6146-00-04 (Items 1-8)

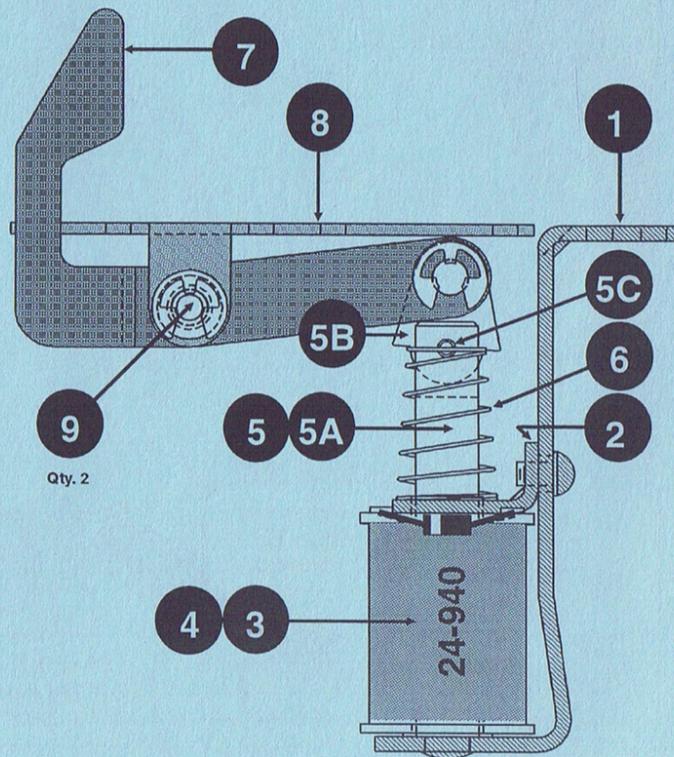


Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
1	Housing (Shooter Assembly)	1	535-5067-02	6	Washer, 3/8" I.D. X 5/8" O.D. X 1/16"	3	242-5014-00
2	Rod Assembly (w/ Black Knob)	1	515-6557-00	7	Retaining Ring, 3/8" ø Shaft	1	270-5012-00
3	Comp. Spring (Green, .035" ø)	1	266-5001-04	8	Plunger Tip (Black 50 Duro)	1	545-5276-00
4	Compression Spring (Short Plunger)	1	266-5010-00	Ball Shooter (Plunger) Assembly, 500-6146-00-04, is secured to the Cabinet by:			
5	Bushing, 3/8" I.D. (Oilite)	2	280-5010-00	Support Plate (Qty. 1) (535-5027-00), #10-32 X 3/8 SHWH (Serr) Swage (Qty. 3) (237-5985-00) and #6 X 5/8" HWW AB (Zinc) (Qty. 2) (234-5002-00)			

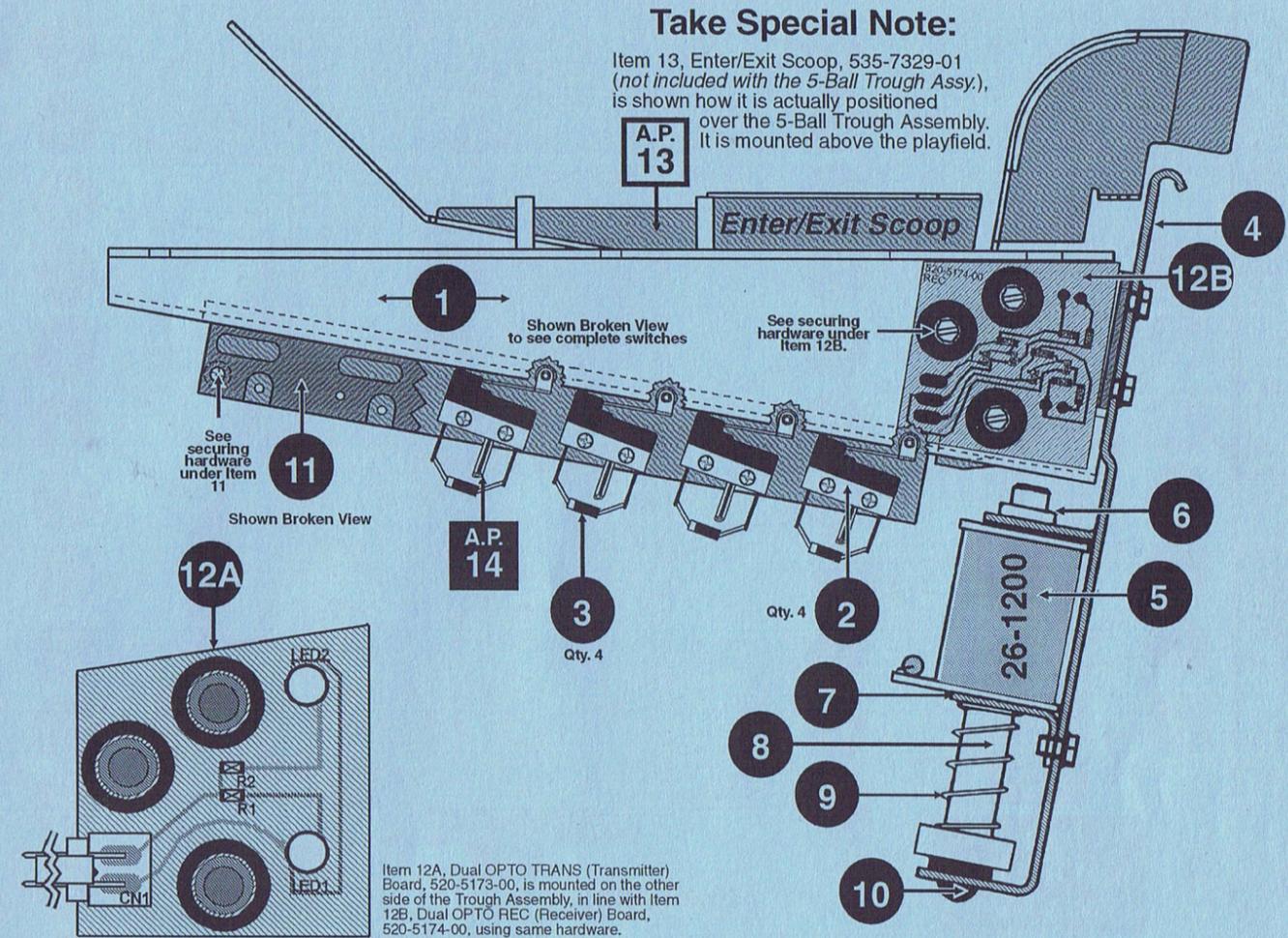
Autoplunger Coil Assembly, 500-6092-02 (Items 1-6) with Autoplunger Arm Weld Assembly, 500-6091-00 (Items 7-9)

Nº	Individual Part Name	QTY.	SPI Part Nº
Autoplunger Coil Assembly, 500-6092-02 (Items 1-6)			
1	Autoplunger Coil Bracket Assembly	1	515-6527-00
2	Coil Retainer Bracket	1	535-5203-03
Item 2 is secured to Item 1 by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)			
3	Coil, 24-940	1	090-5036-00T
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5031-00
5	Plunger & Link Assembly	1	515-5338-00
ORDERING ABOVE (ITEM 5) SUB-ASSY PART Nº WILL INCLUDE:			
5A	Plunger 2"	1	530-5025-01
5B	Plunger Link	1	545-5293-00
5C	Roll Pin, 1/8" ø X 5/8" Lg.	1	251-5008-00
Item 5B is secured to Item 7 by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)			

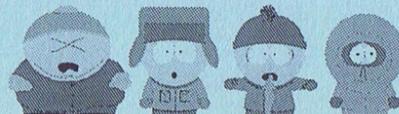
6	Compression Return Spring	1	266-5020-00
Autoplunger Arm Weld Assy., 500-6091-00 (Items 7-9)			
7	Arm Weld Assembly	1	515-6526-00
Item 7 is secured to Item 8 by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)			
8	Autoplunger Fulcrum	1	535-7697-00
9	Nyliner, 1/4" (Thomson #411-FF)	2	545-5423-00
Autoplunger Arm Weld Assy., 500-6091-00 and Autoplunger Coil Assy., 500-6092-01 are secured under the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 9) (234-5101-05)			



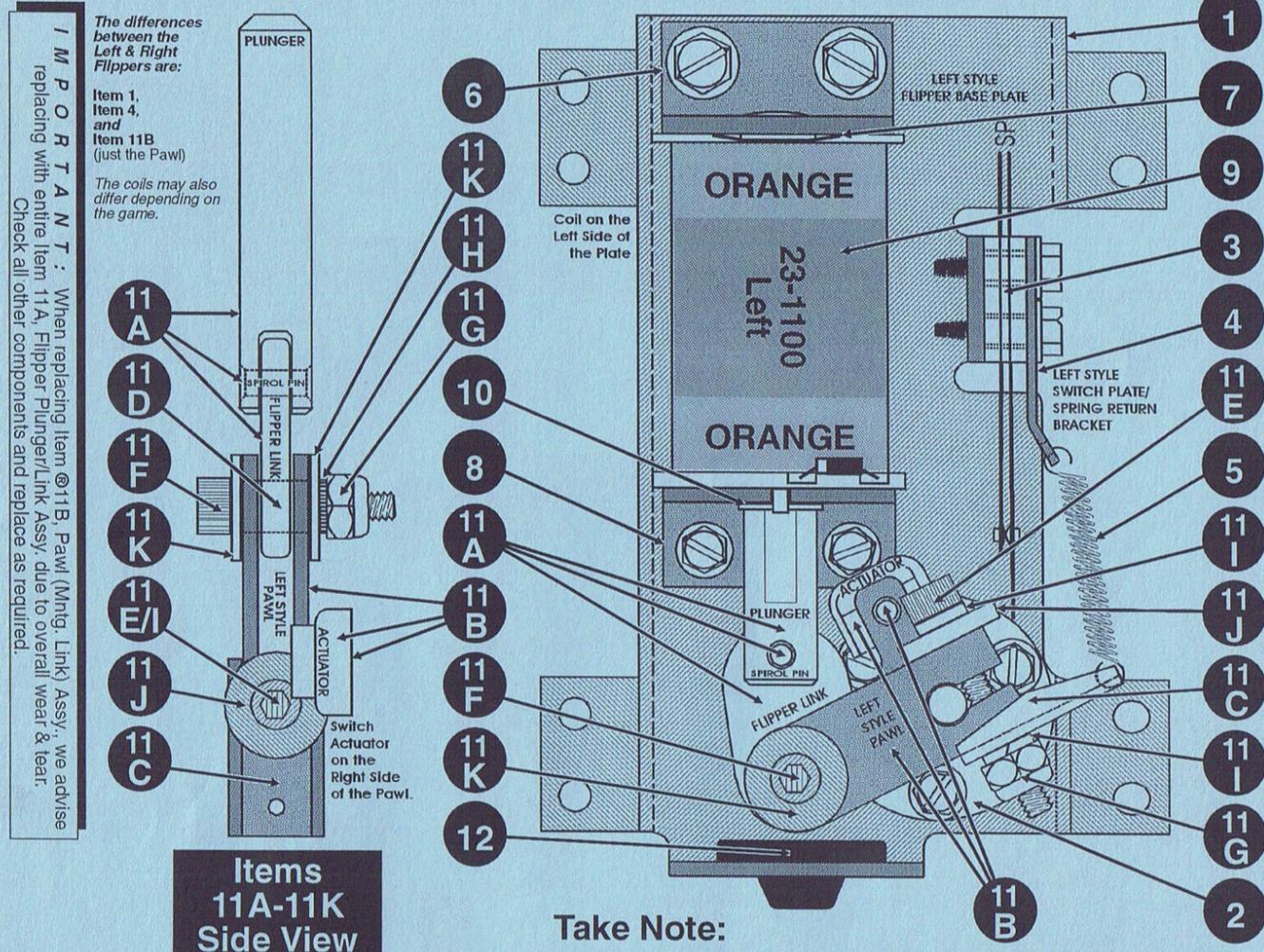
5-Ball Trough Assembly, 500-6318-25 (Items 1-12B) and Associated Part: Ball Trough Enter/Exit Scoop, 535-7329-01 (Item 13)



Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
1	Ball Trough Outhole Mounting Bracket	1	515-6580-01	11	Trough Ball Guide Plate	1	535-7801-00
2	Micro-Switch (Roller Actuator, Lite-Force)	4	180-5119-02	Item 11 is secured to Item 1 by: 1/4" X 5/16" X .144" I.D. Spacer Tap. (Qty. 1) (254-5014-03) and #2-56 X 1/2" HWH (Ser) TF 3/16" Hd. (Qty. 1) (237-5937-01)			
3	Switch Diode, 1N4001	4	112-5001-00	12A	Dual OPTO Transmitter (TRANS) Bd.	1	520-5173-00
4	Coil Mounting Bracket	1	535-7330-01	12B	Dual OPTO Receiver (REC) Board	1	520-5174-00
5	Coil, 26-1200	1	090-5044-00T	Items 12A & 12B are secured to Item 1 by: OPTO PCB Tube Spacer (Brass) (Qty. 3/per) (530-5308-02), OPTO PCB Rubber Grommet (Qty. 3/per) (545-5518-00) and #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 3/per) (237-5976-04)			
ORDERING ABOVE (ITEM 5) COIL PART Nº WILL INCLUDE:				5-Ball Trough Assy., 500-6318-25 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 6) (234-5101-05)			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00	ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.			
6	Coil Sleeve	1	545-5076-00	Nº	Associated Part Name	QTY.	SPI Part Nº
7	Coil Retaining Bracket	1	535-5203-03	13	Ball Trough Enter / Exit Scoop	1	535-7329-01
Item 7 is secured to Item 2 by: #8-32 X 1/4" HWH (Serr) Zinc TF (Qty. 2) (237-5964-00)				Item 13 secured to the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 4) (234-5101-05).			
8	Plunger Assembly	1	515-5941-01	14	Heat Shrink Tubing 1/8" ø PUI-24	3"	605-5006-00
9	Compression Spring	1	266-5020-00	n/a*	Steel Balls (1-1/16" ø)	5	260-5000-00
10	Rubber Bumper (Grommet)	1	545-5105-00				



Flipper (Left) Assembly, 500-5944-14 (Items 1-12)
 and Associated Part: Yellow Flipper Bat & Shaft Assy., 515-5133-06-05 (Item 13*)



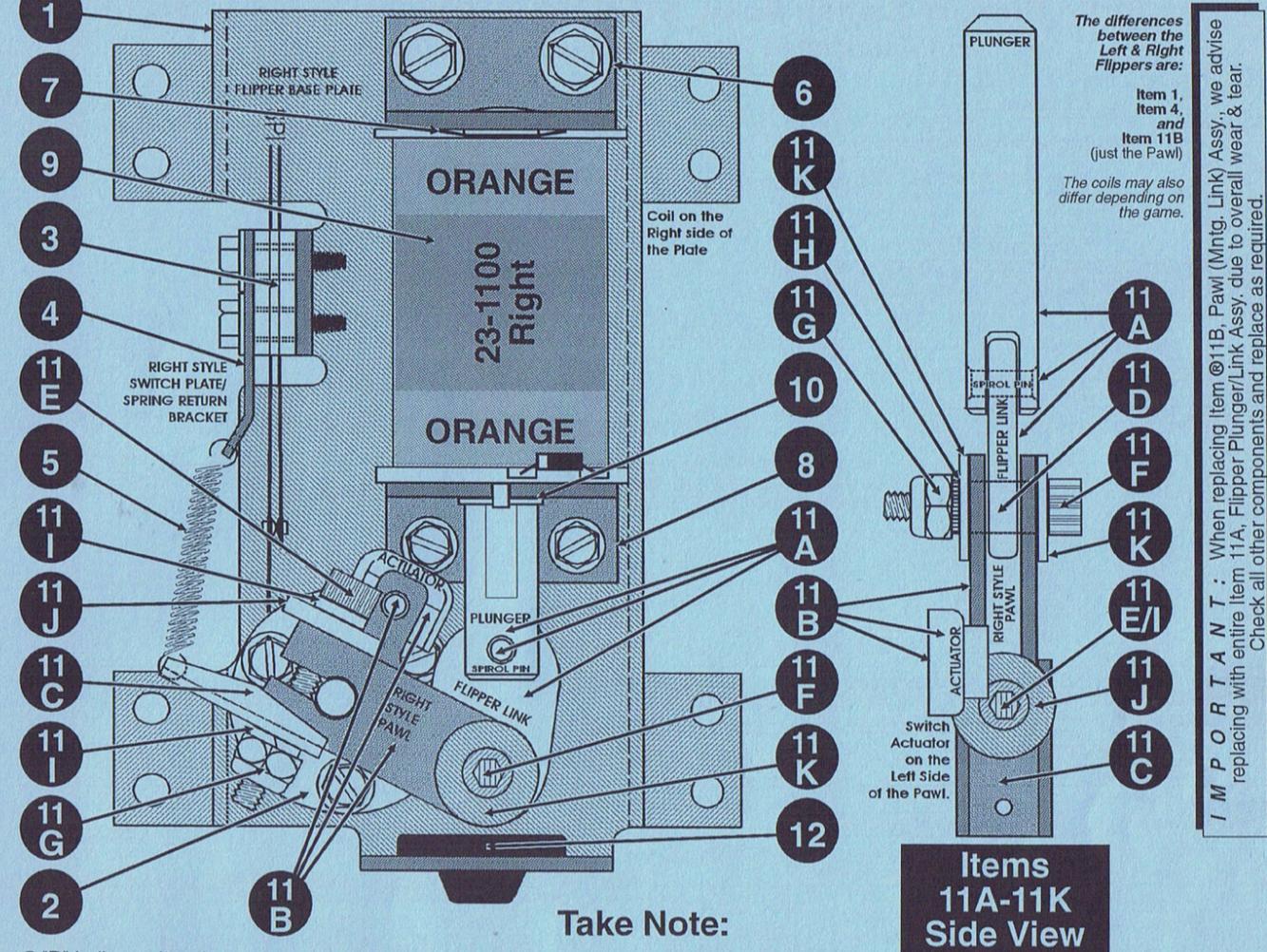
IMPORTANT: When replacing Item 11B, Pawl (Mntg. Link) Assy., we advise replacing with entire Item 11A, Flipper Plunger/Link Assy., due to overall wear & tear. Check all other components and replace as required.

The differences between the Left & Right Flippers are:
 Item 1, Item 4, and Item 11B (just the Pawl)
 The coils may also differ depending on the game.

Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.
 © "R" indicates item has a riveted-on part, if removing/adding rivets is not an option, order the entire © Sub-Assembly.

Flipper (Right) Assembly, 500-5944-04 (Items 1-12)
 and Associated Part: Yellow Flipper Bat & Shaft Assy., 515-5133-06-05 (Item 13*)



IMPORTANT: When replacing Item 11B, Pawl (Mntg. Link) Assy., we advise replacing with entire Item 11A, Flipper Plunger/Link Assy., due to overall wear & tear. Check all other components and replace as required.

The differences between the Left & Right Flippers are:
 Item 1, Item 4, and Item 11B (just the Pawl)
 The coils may also differ depending on the game.

Take Note:

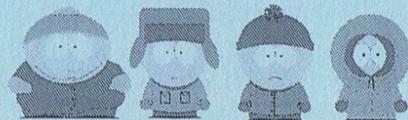
* An asterisk (*) indicates item is *Not Shown* in pictorial.
 © "R" indicates item has a riveted-on part, if removing/adding rivets is not an option, order the entire © Sub-Assembly.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Flipper Base Plate Kit (Left)	1	515-6617-01
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:			
— Flipper Base Plate (Left) comes threaded with all securing hardware (Thread Forming Screws) for Items 2, 3, 6 & 8.			
2	Flipper Bat Bushing	1	545-5594-00
Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)			
3	Power (End of Stroke) Switch	1	180-5149-00
Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-04)			
4	Switch Plate/Spring Return Lt. Brkt.	1	535-7354-01
5	Flipper Return Spring	1	265-5035-00
6	Coil Stop Sub-Assembly	1	515-6308-01
ORDERING ABOVE (ITEM 6) SUB-ASSY. PART Nº WILL INCLUDE:			
6A	Coil Stop with with .093" ø Hole	1	530-5350-01
6B	Shading Ring	1	530-5123-00
6C	Coil Stop Bracket	1	535-7355-00
Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) and #10 Split Lock Washer (Qty. 2) (244-5003-00)			
7	Spring Washer	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)			
9	Coil, 23-1100 (ORG) (Left)	1	090-5030-00T
ORDERING ABOVE (ITEM 9) COIL PART Nº WILL INCLUDE:			
— Diode, 1N4004 (positioned at top)			
10	Coil Sleeve	1	545-5388-00

Nº	Individual Part Name	QTY.	SPI Part Nº
11	Plunger, Link & Pawl (Left) Sub-Assy.	1	515-6518-01
ORDERING ABOVE (ITEM 11) SUB-ASSY. PART Nº WILL INCLUDE:			
11A Flipper Plunger/Link Sub-Assy.			
includes: Plunger "Flipper" Link 1 545-5611-00			
includes: Spirol Pin ø 5/32" X 7/16" Lg. 1 251-5015-01			
includes: Flipper Plunger with "Flat" 1 530-5349-01			
11B Pawl (Mntg. Link) (Left) Sub-Assy.			
includes: Pawl (Mounting Link) (Left) Plain 1 535-7271-01			
includes: Switch Actuator 1 545-5612-00			
includes: Rivet, 1/8" ø X 1/4" Lg. 1 249-5003-00			
11C	Return Bracket	1	535-7353-00
11D	Flipper Link Bushing (Metal, Ext.) (.385" Lg. X .192" ID X .312" OD)	1	530-5139-01
11E	#10-32 X 1-1/4" Lg. Socket Head	1	237-5950-01
11F	#10-32 X 7/8" Lg. Socket Head	1	237-5966-00
11G	#10-32 Nylon Stop Nut	2	240-5203-00
11H	#10 Star Washer	1	246-5002-00
11I	#10 Split Lock Washer	2	244-5003-00
11J	Washer .203" ID X .63" OD X .105" Thk W/cut	1	242-5039-01
11K	Washer .203" ID X .63" OD X .062" Thk	2	242-5038-00
12	Deflector Pad (Bumper)	1	545-5428-00
Flipper (Left) Assembly, 500-5944-14 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00)			
ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.			
Nº	Associated Part Name	QTY.	SPI Part Nº
13*	Yellow Flipper Bat (Sega Saturn® Logo) & Shaft (Non-Knurled End) Assembly	1	515-5133-06-05
n/a*	Large Flipper BLACK Rubber Ring	1	545-5277-00

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Flipper Base Plate Kit (Right)	1	515-6617-00
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:			
— Flipper Base Plate (Right) comes threaded with all securing hardware (Thread Forming Screws) for Items 2, 3, 6 & 8.			
2	Flipper Bat Bushing	1	545-5594-00
Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)			
3	Power (End of Stroke) Switch	1	180-5149-00
Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-04)			
4	Switch Plate/Spring Return Rt. Brkt.	1	535-7354-00
5	Flipper Return Spring	1	265-5035-00
6	Coil Stop Sub-Assembly	1	515-6308-01
ORDERING ABOVE (ITEM 6) SUB-ASSY. PART Nº WILL INCLUDE:			
6A	Coil Stop with with .093" ø Hole	1	530-5350-01
6B	Shading Ring	1	530-5123-00
6C	Coil Stop Bracket	1	535-7355-00
Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) and #10 Split Lock Washer (Qty. 2) (244-5003-00)			
7	Spring Washer	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)			
9	Coil, 23-1100 (ORG) (Right)	1	090-5030-00T
ORDERING ABOVE (ITEM 9) COIL PART Nº WILL INCLUDE:			
— Diode, 1N4004 (positioned at top)			
10	Coil Sleeve	1	545-5388-00

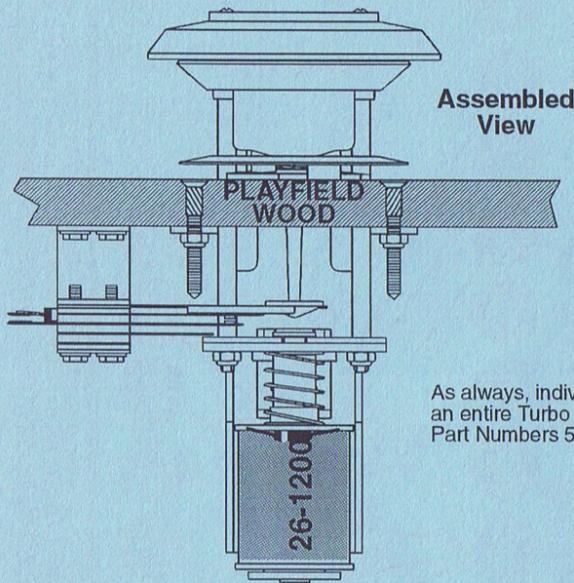
Nº	Individual Part Name	QTY.	SPI Part Nº
11	Plunger, Link & Pawl (Rt.) Sub-Assy.	1	515-6518-00
ORDERING ABOVE (ITEM 11) SUB-ASSY. PART Nº WILL INCLUDE:			
11A Flipper Plunger/Link Sub-Assy.			
includes: Plunger "Flipper" Link 1 545-5611-00			
includes: Spirol Pin ø 5/32" X 7/16" Lg. 1 251-5015-01			
includes: Flipper Plunger with "Flat" 1 530-5349-01			
11B Pawl (Mntg. Link) (Rt.) Sub-Assy.			
includes: Pawl (Mounting Link) (Rt.) Plain 1 535-7271-00			
includes: Switch Actuator 1 545-5612-00			
includes: Rivet, 1/8" ø X 1/4" Lg. 1 249-5003-00			
11C	Return Bracket	1	535-7353-00
11D	Flipper Link Bushing (Metal, Ext.) (.385" Lg. X .192" ID X .312" OD)	1	530-5139-01
11E	#10-32 X 1-1/4" Lg. Socket Head	1	237-5950-01
11F	#10-32 X 7/8" Lg. Socket Head	1	237-5966-00
11G	#10-32 Nylon Stop Nut	2	240-5203-00
11H	#10 Star Washer	1	246-5002-00
11I	#10 Split Lock Washer	2	244-5003-00
11J	Washer .203" ID X .63" OD X .105" Thk W/cut	1	242-5039-01
11K	Washer .203" ID X .63" OD X .062" Thk	2	242-5038-00
12	Deflector Pad (Bumper)	1	545-5428-00
Flipper (Right) Assembly, 500-5944-04 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00)			
ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.			
Nº	Associated Part Name	QTY.	SPI Part Nº
13*	Yellow Flipper Bat (Sega Saturn® Logo) & Shaft (Non-Knurled End) Assembly	1	515-5133-06-05
n/a*	Large Flipper BLACK Rubber Ring	1	545-5277-00



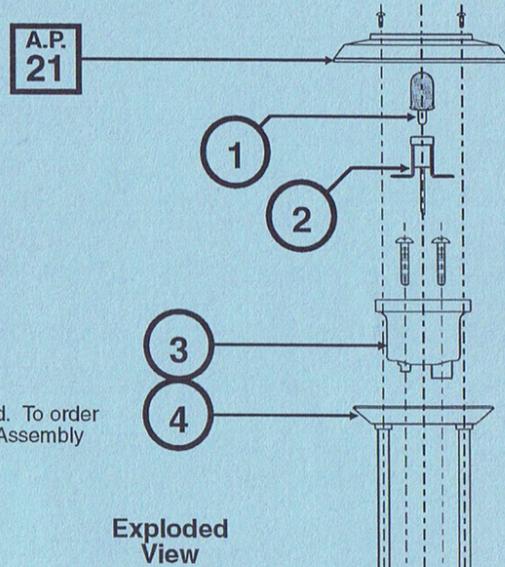
Section 4 | Drawings

Section 4 | Drawings

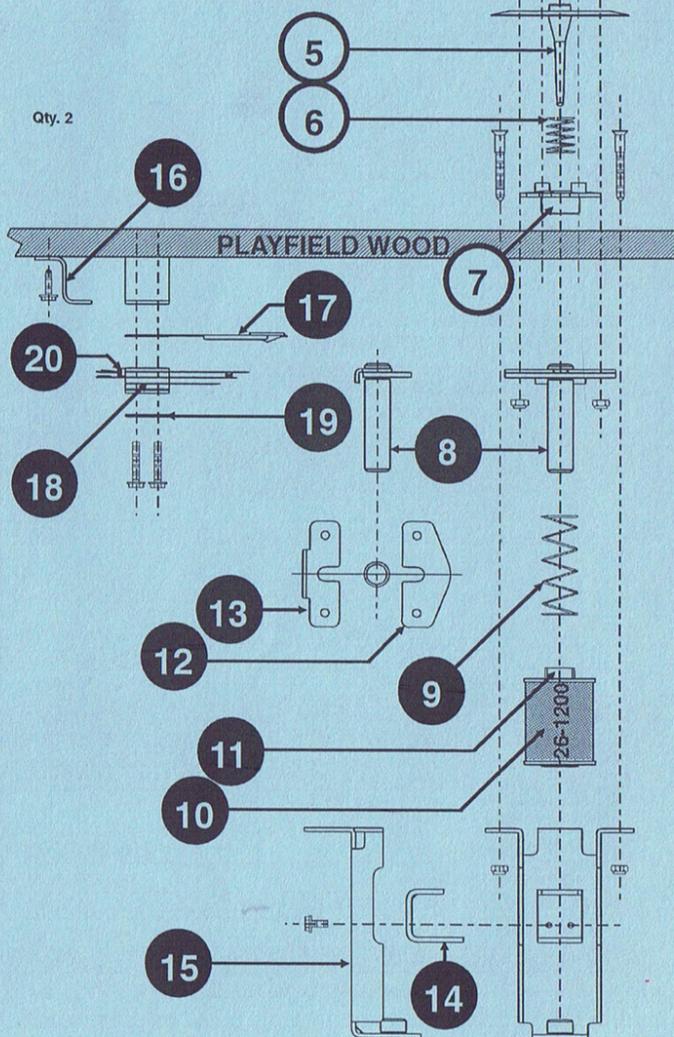
**Turbo Bumper Top Assy., 515-6459-01 (Qty. 3) (Items 1-7),
Turbo Bumper Bottom Assy., 515-6459-04 (Qty. 3) (Items 8-15),
Turbo Bumper Switch Assy., 515-6459-03 (Qty. 3) (Items 16-20)
and Associated Part: See Table Below (Item 21)**



Assembled View



Exploded View



Nº	Individual Part Name	QTY.	SPI Part Nº
Turbo Bumper Top Assy., 515-6459-01 (Items 1-7)			
1	#555 Wedge Base Bulb	1	165-5002-00
2	#555 Wedge Base Socket	1	077-5206-00
3	Bumper Body	1	545-5197-00
Item 3 is secured by: #5 X 7/8" PRH AB (Zinc) (Qty. 2) (237-5826-00)			
4	Ring Assembly	1	515-5085-00
Item 4 is secured by: #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00)			
5	Bumper Skirt	1	545-5607-00
6	Bumper Skirt Spring	1	266-5048-00
7	Bumper Base	1	545-5195-00

Nº	Individual Part Name	QTY.	SPI Part Nº
Turbo Bumper Bottom Assy., 515-6459-04 (Items 8-15)			
8	Plunger	1	530-5348-00
9	Coil Spring	1	266-5047-00
10	Coil, 26-1200	1	090-5044-00T
ORDERING ABOVE (ITEM 10) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
11	Coil Sleeve	1	545-5031-00
12	Fiber Yoke	1	545-5609-00
13	Metal Yoke	1	535-7346-00
14	Metal Yoke Stop	1	535-7347-00
Item 14 is secured by: #6-32 X 1/4" HWH Swage (Serr.) Zinc (Qty. 2) (237-5976-01)			
15	Coil Bracket Welded Assembly	1	515-5939-00
Item 15 is secured by: #6-32 X 1-3/16" Spiral Fin Shank (Qty. 3) (237-5957-00) and #6-32 Nylon Stop Nut (Qty. 3) (240-5005-00)			

Nº	Individual Part Name	QTY.	SPI Part Nº
Turbo Bumper Switch Assy., 515-6459-03 (Items 16-20)			
16	Switch Bracket	1	535-7342-00
Item 16 is secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 2) (234-5101-05)			
17	Spoon Switch Actuator	1	545-5610-01
18	Turbo Bumper Stack (Blade) Switch	1	180-5015-03
19	Switch Body Protect Plate	1	535-7344-00
Items 18 & 19 are secured by: #6-32 X 3/4" HWH Swage (Serr.) Zc. (Qty. 2) (237-5976-05)			
20	Switch Diode, 1N4001	1	112-5001-00

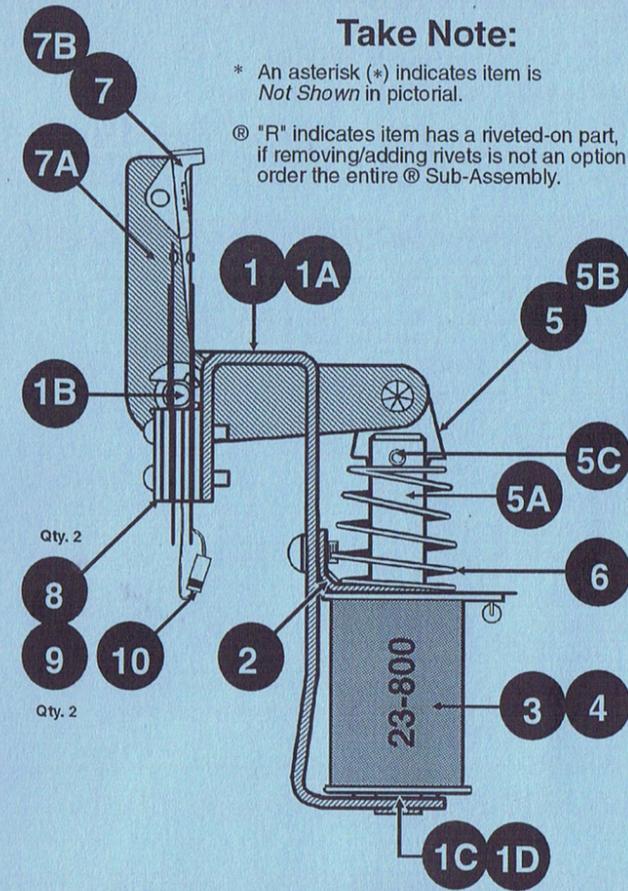
Nº	Associated Part Name	QTY.	SPI Part Nº
21	Red Pop Cap (Plastic)	3	550-5057-02
Item 21 is secured to Item 4 by: #4 X 3/4" PRH (Zinc) (Qty. 2/per) (237-5873-00)			

Take Note:
As always, individual parts can be ordered. To order an entire Turbo Bumper, use all three (3) Assembly Part Numbers 515-6459-01, -04 & -03.

Left & Right Slingshot Assemblies, 500-5849-00 (Qty. 2) (Items 1-10)

Take Note:

* An asterisk (*) indicates item is *Not Shown* in pictorial.
® "R" indicates item has a riveted-on part, if removing/adding rivets is not an option, order the entire ® Sub-Assembly.



Nº	Individual Part Name	QTY.	SPI Part Nº
1	Slingshot Bracket Assembly	1	515-5339-01
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:			
1A	Slingshot Bracket	1	535-5919-01
1B	Hinge Stud	1	530-5034-01
1C	Armature Stop	1	530-5017-01
1D	Shading Ring	1	530-5307-00
2	Coil Retaining Bracket	1	535-5203-03
Item 2 is secured to Item 1 by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)			

Nº	Individual Part Name	QTY.	SPI Part Nº
3	Coil, 23-800	1	090-5001-00T
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5031-00
5	Plunger & Link Assembly	1	515-5338-00
ORDERING ABOVE (ITEM 5) SUB-ASSY. PART Nº WILL INCLUDE:			
5A	Plunger 2" Lg.	1	530-5025-01
5B	Plunger Link	1	545-5293-00
5C	Roll Pin 1/8" ø x 5/8" Lg.	1	251-5008-00
Item 5B is secured to Item 1 by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)			

Nº	Individual Part Name	QTY.	SPI Part Nº
6	Compression Return Spring	1	266-5020-00
7®	Riveted Arm & Tip Assembly	1	515-5340-01
ORDERING ABOVE ® RIVETED ASSY. PART Nº WILL INCLUDE:			
7A	Arm	1	515-5341-01
7B	Kicker Tip	1	545-5216-01
7C	Rivet, 1/8" ø x 1/4" Lg.	1	249-5003-00
Item 7A is secured to Item 1B by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)			

Nº	Individual Part Name	QTY.	SPI Part Nº
8	Slingshot Stack (Blade) Switch	2	180-5054-00
9	Switch Body Protect Plate	2	535-5045-00
Items 8 & 9 are secured to Item 1 by: #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 2/per) (237-5976-04)			
10	Switch Diode, 1N4001	2	112-5001-00

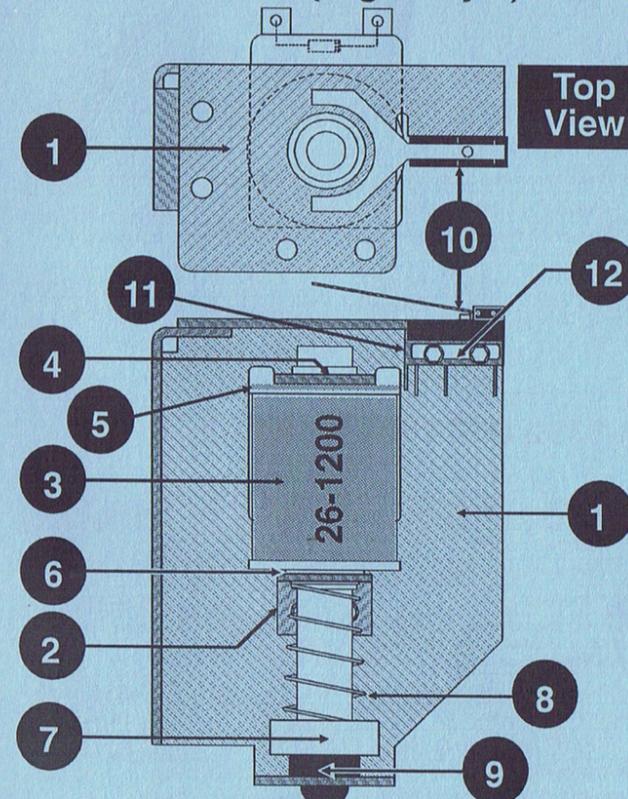
Slingshot Assemblies (Qty. 2), 500-5849-01 are secured below the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 3/per) (234-5101-05)

VUK (Right Style) Assembly, 500-6290-01 (Items 1-13)

Take Note:

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

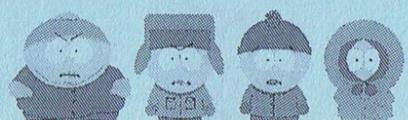
1. Note: The Switch Diode, 1N4001, is not located on this assembly (nor included); it's located on a *Terminal Strip* under the playfield.



Nº	Individual Part Name	QTY.	SPI Part Nº
1	VUK Coil Mounting Bracket (Right Style)	1	535-8296-01
2	Coil Retaining Bracket	1	535-5203-03
Item 2 is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)			

Nº	Individual Part Name	QTY.	SPI Part Nº
3	Coil, 26-1200	1	090-5044-00T
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5076-00
5	Coil Lug Insulator (Fiche Paper)	1	545-5431-00
6	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00
7	Plunger Assembly	1	515-5941-01
8	Compression (Relay) Spring	1	266-5020-00
9	Rubber Bumper (Grommet)	1	545-5105-00
10	Micro Switch ("Y" Actuator)	1	180-5116-01
11	Switch Lug Insulator (Fiche Paper)	1	545-5759-00
12	Switch Body Protect Plate	1	535-6539-00
Items 10, 11 & 12 are secured by: #2-56 X 1/2" HWH MS (Serr) Zinc Thread-Forming 3/16" (Qty. 2) (237-5937-01)			

Nº	Individual Part Name	QTY.	SPI Part Nº
13*	Diode, 1N4001 (On Terminal Strip)	1	112-5001-00
VUK (Right Style) Assembly, 500-6290-01 is secured under the playfield by: Wood VUK Spacer (Qty. 1) (525-5548-00) and #8 X 3/4" HWH AB (Zinc) (Qty. 3) (234-5103-00)			



Toilet & Frame Assembly, 500-6360-00-71 (Items 1-16)

Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.
 ® "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire ® Sub-Assembly. **Please Note:** If the ® Sub-Assembly is **not** available, call Technical Support.

Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
1®	Riveted Toilet Frame Weldment	1	515-7007-00-71	8	Plastic Edge Protector 2"	1	545-5930-02
ORDERING ABOVE @ RIVETED ASSY. PART Nº WILL INCLUDE:							
1A	Toilet Frame Weldment	1	515-6991-00	9	Laydown Wedge Base Socket	2	077-5026-01
1B	Toilet Lid Hinge Weldment (Black)	1	390-5043-00	Item 9 is secured to Item 1A by: #6-32 X 3/8" PPH MS (Sems) Zinc (Qty. 1/per) (232-5201-00) and #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00)			
1C*	Rivet, 1/8" ø X 5/32" Lg.	2	249-5009-00	10	#906 Wedge Base Bulb (Red)	2	165-5004-02
2	Toilet (White Molded Plastic, Altered)	1	880-5033-00	11	Wedge Base Offset Socket	2	077-5029-00
Item 2 is secured to Item 1A by: #6-32 X 3/8" HWH Swage (Ser) Zinc (Qty. 4) (237-5976-02) and #6 Washer (Qty. 4) (242-5001-00)							
3	Toilet Hinge Welded Assembly	1	515-7000-00	Item 11 is secured to Item 1A by: #6-32 X 3/8" PPH MS (Sems) Zinc (Qty. 1/per) (232-5201-00) and #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00)			
4	Toilet Lid Stop Bracket	1	535-8546-00	12	#555 Wedge Base Bulb	2	165-5002-00
Item 3 (bottom half) & Item 4 are secured to Item 1A by: #6-32 X 1/2" PPH MS (Sems) Zinc (Qty. 2) (232-5202-00) and #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00).							
5	Tank Lid Mounting Plate	1	515-6997-00	13*	Rubber Lite Cover GREEN	2	545-5014-04
Item 5 is secured to Item 3 (top half) by: #6-32 X 3/8" PPH MS (Sems) (Qty. 2) (232-5201-00) and #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00)							
6	Tank Lid (White Molded Plastic, Altrd.)	1	880-5033-01	14	Toilet Lid Seat (Black)	1	830-5968-00
Item 6 is secured to Item 5 by: #6-32 X 3/8" PPH MS (Sems) (Qty. 2) (232-5201-00) and #6 Washer (Qty. 2) (242-5001-00)							
7	Spring (used in Drop Targets)	1	265-5003-00	Item 14 is secured to Item 1B by: #6-32 X 1/2" PFH MS (Zinc) (Qty. 2) (237-5918-00) and #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00)			
Item 15 is secured to Item 14 by: #6-32 X 3/8" PFH MS (Zinc) (Qty. 2) (237-5850-00)							
Item 16 is secured onto Item 14 as a Ball Guide. The Dimensions: 1/8" X 1/4" X 2-1/2"							

Toilet & Frame Assembly, 500-6360-00-71 is secured above the playfield by: #6-32 X 7/8" PFH (Zinc) (Qty. 7) (237-6021-00)

Mr. Hankey & Tank Lid Lift Coil Assembly, 500-6391-00-71 (Items 17-30)

Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
17	Coil & Trip Coil Mntg. Brkt. Weldment	1	515-6983-00	27	Trip Coil Assembly	1	515-6985-00
18	Coil Support (Retainer) Bracket (Lrg.)	2	535-7356-00	ORDERING ABOVE (ITEM 27) SUB-ASSY. PART Nº WILL INCLUDE:			
Item 18 is secured to Item 17 by: #8-32 X 3/8" HWH Swage (Serr.) Zinc (Qty. 2/per) (237-5975-00)							
19	Coil, 23-1100	1	090-5030-00T	27A	Trip Coil Frame Top	1	535-6198-00
ORDERING ABOVE (ITEM 19) COIL PART Nº WILL INCLUDE:							
Diode, 1N4004 (positioned at top) 1 112-5003-00							
20	Coil Sleeve (with Extension)	1	545-5847-00	27B	Trip Coil Frame (Weldment) Bottom	1	535-6198-01
21	Spring Washer	1	269-5002-00	27C®	Trip Coil Arm Riveted Assembly	1	515-6984-01
22	Drive Plunger (Main)	1	530-5539-01	27D	Return Spring	1	265-5024-00
23	Plunger Spring	1	266-5063-01	27E	Coil, 29-1000	1	090-5059-00
24	Metal Yoke Weldment	1	515-6986-00	27F*	Coil Lug Insulator (Fiche Paper)	1	545-5431-00
25	Fiber Yoke	1	545-5609-00	Item 27 is secured to Item 17 by: #8-32 X 3/8" PPH MS (Sems) Zc. (Qty. 1) (232-5301-00)			
Item 25 is secured to Item 24 by: #6-32 X 3/8" HWH Swg. (Ser.) Zc. (Qty. 2) (237-5976-02)							
26	Shaft (Drive Plunger Guide)	1	530-5540-00	28	Mr. Hankey Mntg. Brkt. Weldment	1	515-6996-00
Item 26 is secured to Item 17 by: Retaining Ring, 1/4" ø Shaft (Qty. 2) (270-5002-00)							
Item 28 is secured to Item 22 by: #8-32 X 1/2" PPH MS (Sems) Zc. (Qty. 2) (232-5302-00)							
Item 29 is secured to Item 28 by: #6-32 X 7/8" PFH Zinc (Qty. 2) (237-6021-00) and 1/4" X 3/8" Spacer Gray (Qty. 1, Bottom) (254-5000-02)							
Item 30 is secured to Item 28 by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 7) (234-5101-05)							

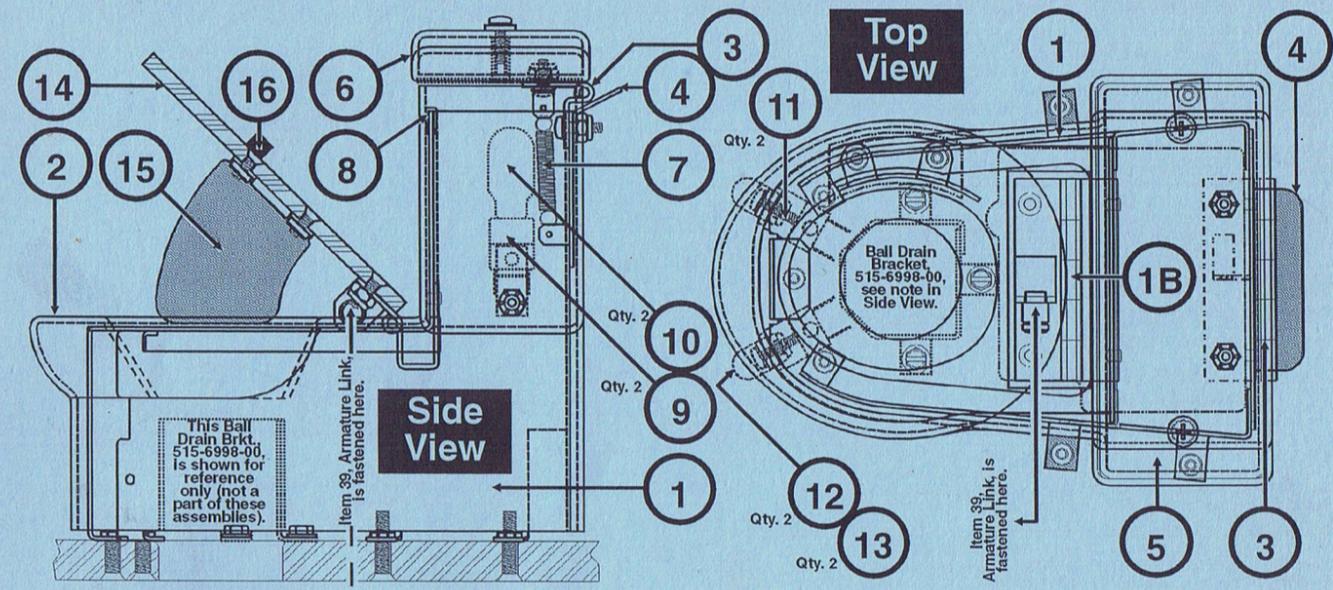
Mr. Hankey & Tank ... Coil Assy., 500-6391-00-71 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 7) (234-5101-05)

Toilet Lid Lift Coil Assembly, 500-6392-00-71 (Items 31-40)

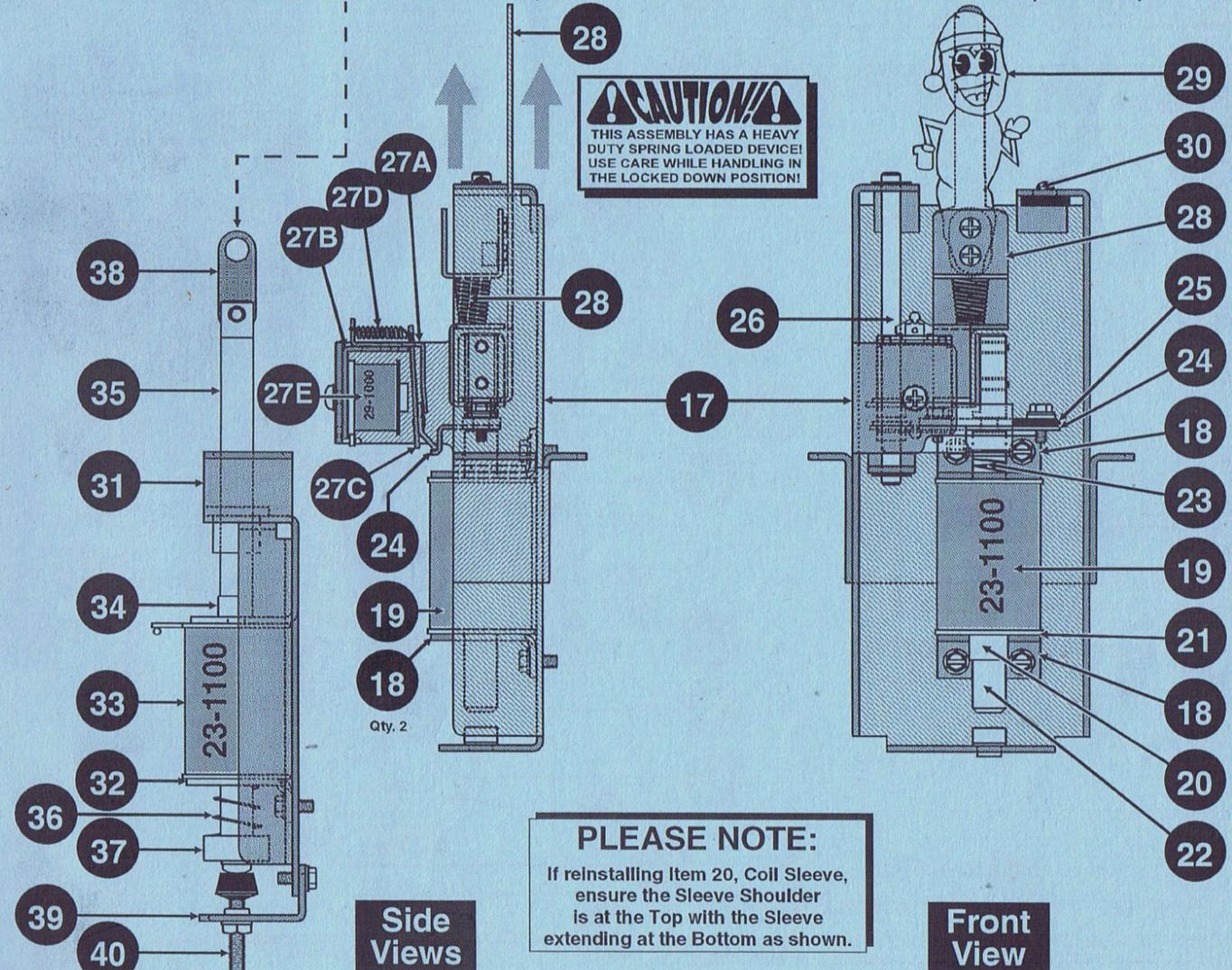
Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
31	Coil Mounting Bracket Weldment	1	515-6993-00	37	Plunger Head	1	530-5511-00
32	Coil Support (Retainer) Bracket (Lrg.)	1	535-7356-00	Item 37 is secured to Item 35 by: #10-32 X 3/8" PPH MS (Sms) Zc. (Qty. 1) (232-5401-00)			
Item 32 is secured to Item 31 by: #8-32 X 3/8" HWH Swage (Sr.) Zc. (Qty. 2) (237-5975-00)							
33	Coil, 23-1100	1	090-5030-00T	38	Armature Link	1	535-8535-00
ORDERING ABOVE (ITEM 33) COIL PART Nº WILL INCLUDE:							
Diode, 1N4004 (positioned at top) 1 112-5003-00							
34	Coil Sleeve (with Extension)	1	545-5847-00	Item 38 is secured to Item 35 by: Spirol Spring Pin 5/32" X 7/16" (Qty. 1) (251-5015-01) and Item 38 is secured to Item 1B (Toilet & Frame Assy.) by: Retaining Ring, 5/16" ø Shaft (Zinc) (Qty. 1) (270-5003-00)			
35	Toilet Lid Plunger Assembly	1	515-6994-00	39	Adjustment Spindle Stop Bracket	1	535-8303-00
36	Compression Spring	1	266-5022-01	Item 39 is secured to Item 31 by: #8-32 X 3/8" HWH Swage (Sr.) Zc. (Qty. 2) (237-5975-00)			
Item 40 is secured to Item 39 by: #10-32 Keps Nut (Qty. 1) (240-5208-00)							

Toilet Lid Lift Coil Assy., 500-6392-00-71 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 4) (234-5101-05)

Toilet & Frame Assembly, 500-6360-00-71 (Items 1-16), Mr. Hankey & Tank Lid Lift Coil Assy., 500-6391-00-71 (Items 17-30) and Toilet Lid Lift Coil Assembly, 500-6392-00-71 (Items 31-41) Continued



Items 11, 12, 13, 26 & 29 are Not Shown in the Side Views for clarity.
 Items 9 & 10 are Not Shown in the above Top View for clarity.



PLEASE NOTE:
 If reinstalling Item 20, Coil Sleeve, ensure the Sleeve Shoulder is at the Top with the Sleeve extending at the Bottom as shown.



Nº	Individual Part Name	QTY.	SPI Part Nº
1	South Park Kenny (6" Figurine) Altrd.	1	880-5024-00
2	Platform Bracket Weldment	1	515-6978-00
3	Nyliner - 1/4" ø (Thomson #4L1-FF)	4	545-5423-00

Item 3 has a Qty. 2 in Item 2 & Qty. 2 in Item 15.

4	Pem Stud Plate (Inside Kenny)	1	535-8528-00
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Item 4 is secured to Item 2 by: #8-32 Nylon Stop Nut (Qty. 3) (240-5102-00)

5®	Riveted Lamp Bracket Assembly	1	515-7006-00-71
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ORDERING ABOVE ® RIVETED ASSY. PART Nº WILL INCLUDE:

5A	Lamp Assembly Bracket	1	535-8527-00
5B	Laydown Wedge Base Socket	2	077-5026-01
5C*	Rivet, 1/8" ø X 3/16" Lg.	1	249-5001-00
5E*	#6 Riveting Lock Washer	1	246-5000-00

Item 5 is secured to Item 2 by: #6-32 X 3/8" PPH MS (Sems) Zinc (Qty. 1) (232-5201-00)

6	#555 Wedge Base Bulb	1	165-5002-00
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7	#906 Wedge Base Bulb	1	165-5004-00
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8	Main Mntg. (Double-Coil) Brkt. Assy.	1	515-6976-00
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Item 8 is secured to Item 15 (at the Top) by: Nylon Washer 25/64" ID X 3/4" OD X 1/16" (Qty. 2, 1 between Item 8 & 15, 1 with Steel Washer) (242-5049-00), Steel Washer 13/32" ID X 13/16" OD X 1/16" (Qty. 1) (242-5050-00) and Retaining Ring, 3/8" ø Shaft (Qty. 1) (270-5012-00)

Item 8 is secured to Item 15 (at the Bottom) by: Teflon Washer 1/4" ID X 1/2" OD X .062" (Qty. 2, 1 between Item 8 & 15, 1 with Steel Washer) (242-5040-01), Steel Washer 9/32" ID X 5/8" OD X 1/16" (Qty. 1) (242-5051-00) and Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)

9	Coil Retainer Bracket	2	535-5203-03
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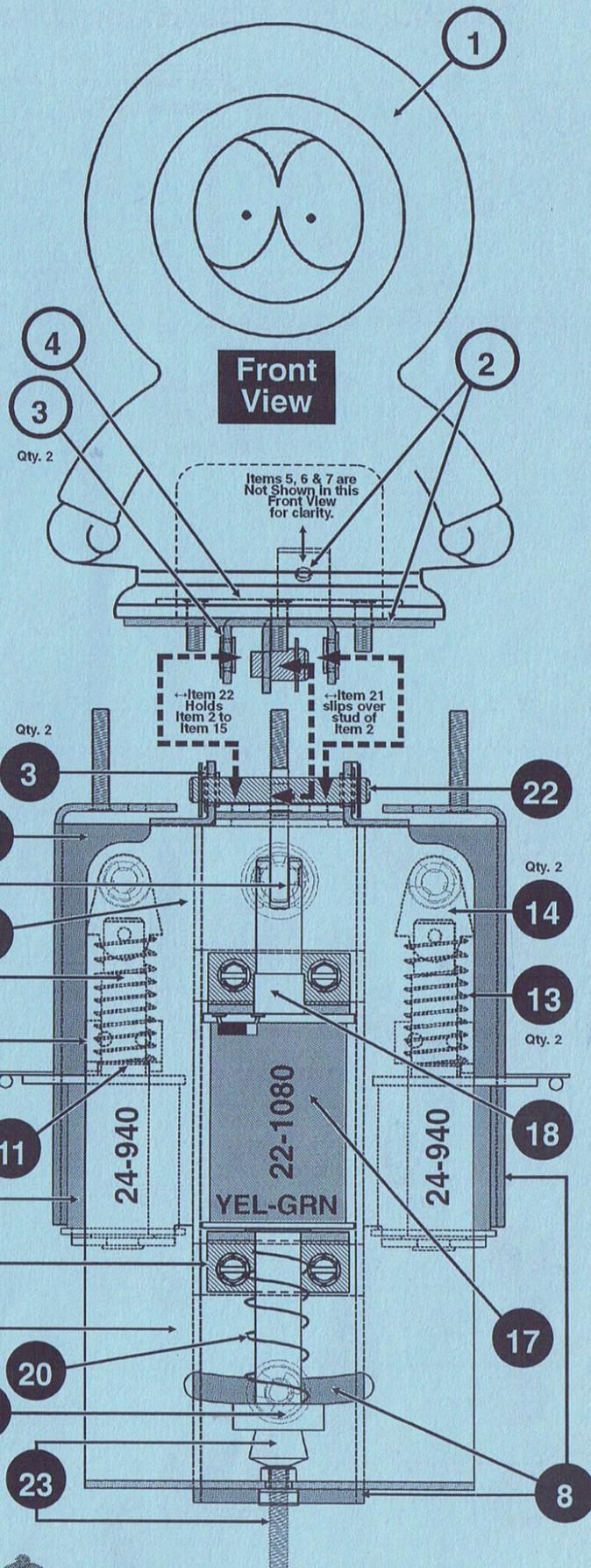
Item 9 is secured to Item 8 by: #8-32 X 1/4" PPH MS (Sems) Zc (Qty. 2/per) (237-5975-00)

10	Coil, 24-940	2	090-5036-00T
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ORDERING ABOVE (ITEM 10) COIL PART Nº WILL INCLUDE:

Diode, 1N4004 (positioned at top)	1	112-5003-00
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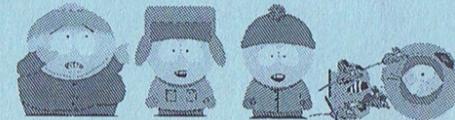
Parts Table continued on next page...



PLEASE NOTE:
If reinstalling Item 18, Coil Sleeve, ensure the Sleeve Shoulder is at the Bottom with the Sleeve extending at the Top as shown.

Take Note:

* An asterisk (*) indicates items are not noted in the pictorial.
® "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire ® Sub-Assembly. **Please Note:** If the ® Sub-Assembly is not available, call Technical Support.



Nº	Individual Part Name	QTY.	SPI Part Nº
11	Coil Sleeve	2	545-5031-00
12	Plunger (2-1/2")	2	530-5025-02
13	Compression Spring (.045) (On Item 12)	2	266-5034-06
14	Plunger Link (Standard, Blue)	2	545-5293-00

Item 14 is secured to Item 12 by: Roll Pin, 1/8" ø X 5/8" Lg. (Qty. 1/per) (251-5008-00)

Item 14 is secured to Item 15 by: Retaining Ring, 1/4" ø Shaft (Qty. 1/per) (270-5002-00)

15	Carriage (Swinging) Mntg. Brkt. Assy.	1	515-6977-00
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16	Coil Support (Retainer) Bracket (Lrg.)	2	535-7356-00
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Item 16 is secured to Item 15 by: #8-32 X 3/8" HWH Swage (Serr.) Zinc (Qty. 2/per) (237-5975-00)

17	Coil, 22-1080 (Yel-Grn)	1	090-5032-00T
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ORDERING ABOVE (ITEM 17) COIL PART Nº WILL INCLUDE:

Diode, 1N4004 (positioned at top)	1	112-5003-00
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18	Coil Sleeve (with Extension)	1	545-5847-00
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19	Plunger Assembly (Long)	1	515-6792-01
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20	Compression Spring (on Item 19)	1	266-5020-00
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21	Plunger "Flipper" Link (White, Sonic Logo)	1	545-5611-00
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Item 21 is secured to Item 19 by: Spirol Spring Pin 5/32" X 1/2" (Qty. 1) (251-5015-00)

Item 21 is secured to Item 2 by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)

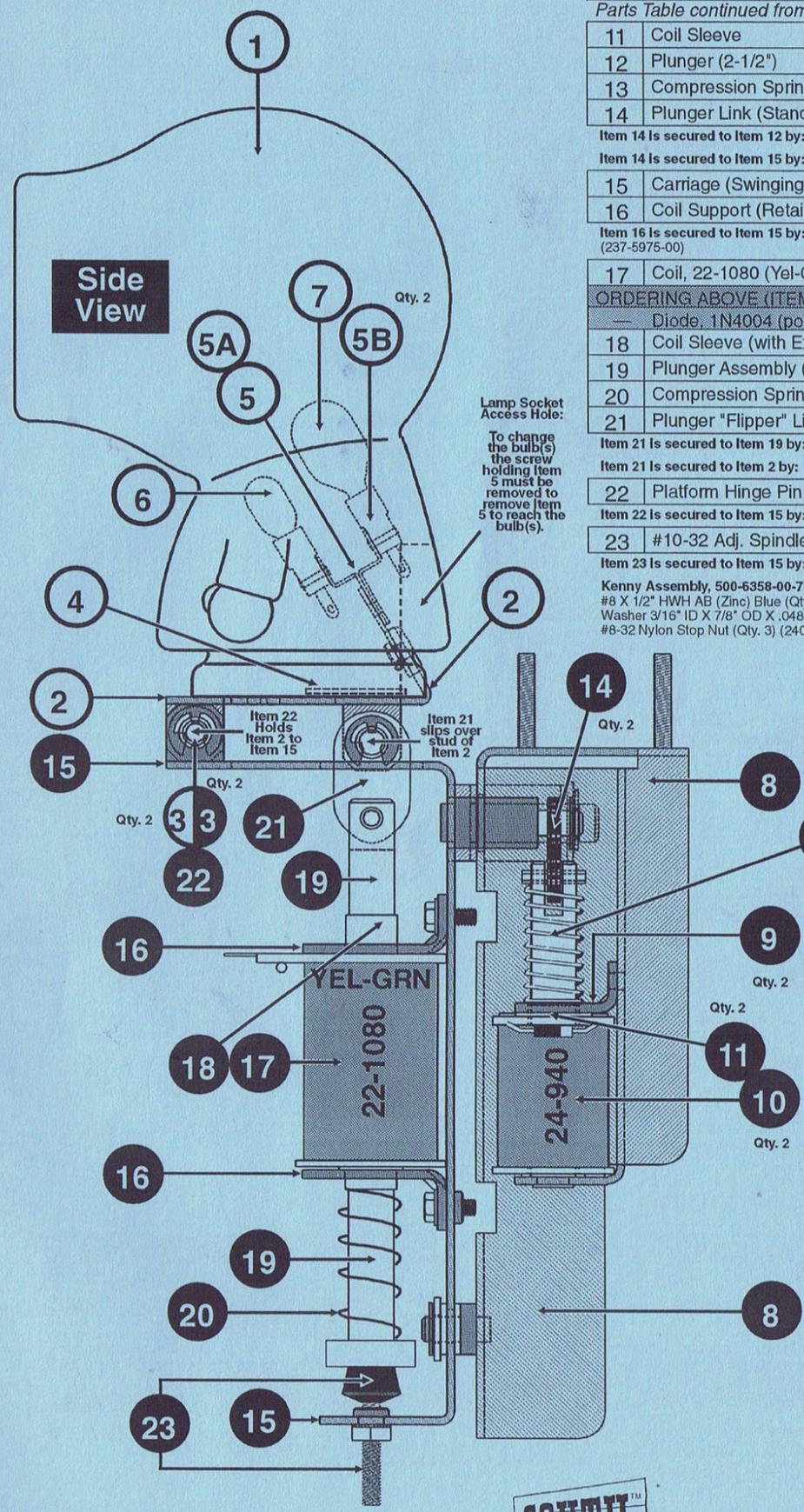
22	Platform Hinge Pin	1	530-5537-00
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Item 22 is secured to Item 15 by: Retaining Ring, 1/4" ø Shaft (Qty. 2) (270-5002-00)

23	#10-32 Adj. Spindle Stop w/Rubber Tip	1	280-5014-00
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Item 23 is secured to Item 15 by: #10-32 Keps Nut (Qty. 1) (240-5208-00)

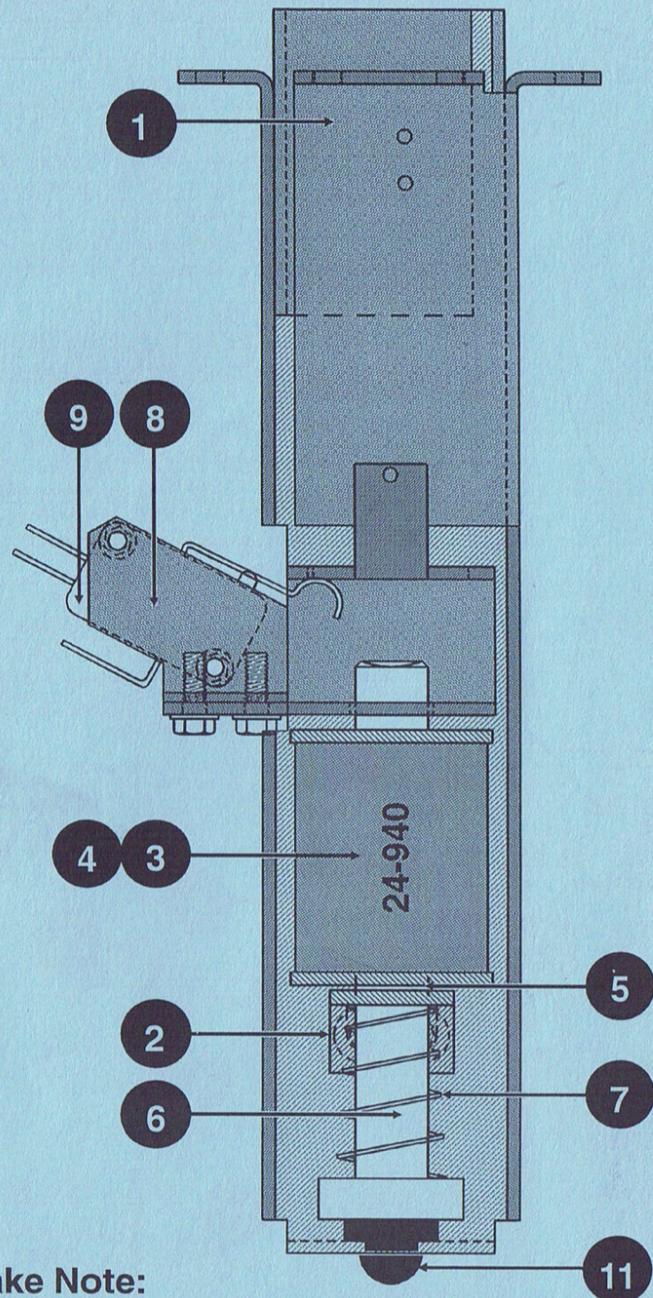
Kenny Assembly, 500-6358-00-71 (via Item 8) is secured under the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 5) (234-5101-05) and above the playfield by: Washer 3/16" ID X 7/8" OD X .048" (Qty. 3) (242-5059-00) and #8-32 Nylon Stop Nut (Qty. 3) (240-5102-00)



PLEASE NOTE:
If reinstalling Item 18, Coil Sleeve, ensure the Sleeve Shoulder is at the Bottom with the Sleeve extending at the Top as shown.



Super VUK Assembly, 500-6184-04-71 (Items 1-11)



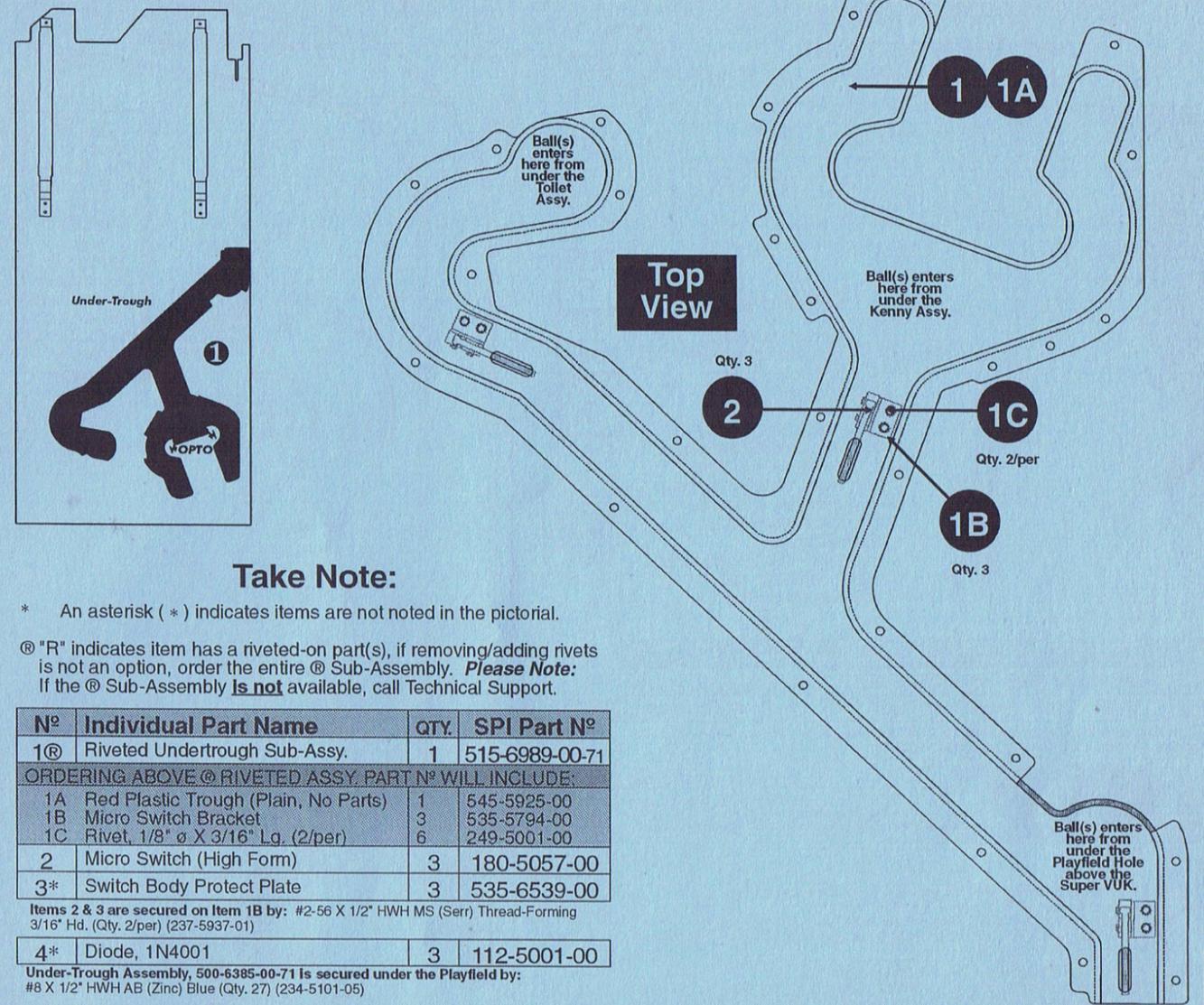
Take Note:

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

1. Note: The Switch Diode, 1N4001, is not located on this assembly (nor included); it's located on a *Terminal Strip* under the playfield.

Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
1	SVUK Mounting Weldment Bracket	1	515-6744-04	7	Compression (Relay) Spring	1	266-5020-00
2	Coil Retaining Bracket	1	535-5203-03	8	Super VUK Switch Bracket	1	535-8144-01
Item 2 is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)				Item 8 is secured by: #4-40 X 5/8" MS (Serr) Zinc (Qty. 2) (237-5945-00)			
3	Coil, 24-940	1	090-5036-00T	9	Micro Switch	1	180-5052-00
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:				Item 9 is secured to Item 8 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-02)			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00	10*	Diode, 1N4001 (On Terminal Strip)	1	112-5001-00
4	Coil Sleeve	1	545-5076-00	11	Rubber Bumper (Grommet)	1	545-5105-00
5	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00	Super VUK Assembly, 500-6184-04-71, is secured under the playfield by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 3) (234-5101-05)			
6	Plunger Assembly	1	515-5941-01				

Under-Trough Assembly, 500-6385-00-71 (Items 1-4)



Take Note:

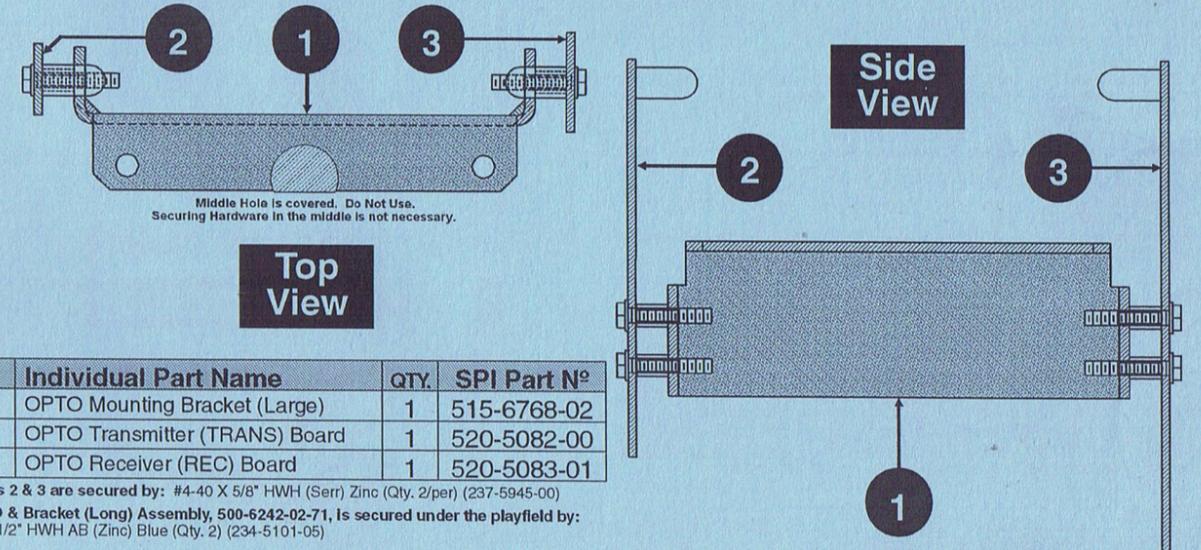
* An asterisk (*) indicates items are not noted in the pictorial.

® "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire ® Sub-Assembly. **Please Note:** If the ® Sub-Assembly **is not** available, call Technical Support.

Nº	Individual Part Name	QTY.	SPI Part Nº
1®	Riveted Undertrough Sub-Assy.	1	515-6989-00-71
ORDERING ABOVE ® RIVETED ASSY. PART Nº WILL INCLUDE:			
1A	Red Plastic Trough (Plain, No Parts)	1	545-5925-00
1B	Micro Switch Bracket	3	535-5794-00
1C	Rivet, 1/8" ø X 3/16" Lg. (2/per)	6	249-5001-00
2	Micro Switch (High Form)	3	180-5057-00
3*	Switch Body Protect Plate	3	535-6539-00
Items 2 & 3 are secured on Item 1B by: #2-56 X 1/2" HWH MS (Serr) Thread-Forming 3/16" Hd. (Qty. 2/per) (237-5937-01)			
4*	Diode, 1N4001	3	112-5001-00

Under-Trough Assembly, 500-6385-00-71 is secured under the Playfield by:
#8 X 1/2" HWH AB (Zinc) Blue (Qty. 27) (234-5101-05)

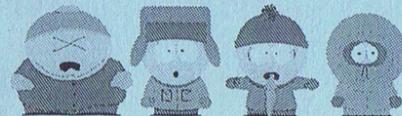
OPTO & Bracket (Long) Assembly, 500-6242-02-71 (Items 1-3)



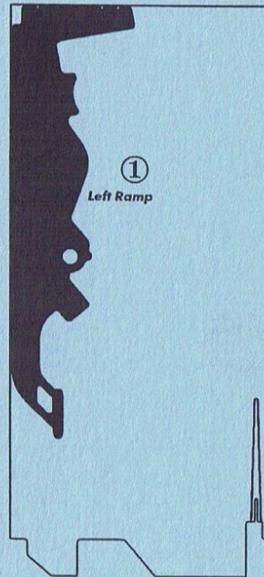
Nº	Individual Part Name	QTY.	SPI Part Nº
1	OPTO Mounting Bracket (Large)	1	515-6768-02
2	OPTO Transmitter (TRANS) Board	1	520-5082-00
3	OPTO Receiver (REC) Board	1	520-5083-01

Items 2 & 3 are secured by: #4-40 X 5/8" HWH (Serr) Zinc (Qty. 2/per) (237-5945-00)

OPTO & Bracket (Long) Assembly, 500-6242-02-71, is secured under the playfield by:
#8 X 1/2" HWH AB (Zinc) Blue (Qty. 2) (234-5101-05)



**Left Ramp Assembly,
500-6389-00-71 (Items 1-4)
and Associated Part:
(See Below Parts Table, Items 5-7)**



Take Note:

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

Ⓜ "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire Ⓜ Sub-Assembly.

Please Note:
If the Ⓜ Sub-Assembly is **not** available, call Technical Support.

N ^o	Individual Part Name	QTY.	SPI Part N ^o
1	Left Plastic Ramp (Plain, No Parts)	1	545-5923-01
2	Single Groove Jewel Post (Clear)	9	550-5034-01

Item 2 secured onto Item 1 by: #6-32 X 1-1/2" PPH MS (Zinc) (Qty. 1/per) (237-5510-00) and #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00)

3	5/16" I.D. Black Rubber Ring	9	545-5348-02
4	Ramp Exit Protector	1	535-8167-01

Item 4 secured onto Item 1 by: #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5200-00) and #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00)

Left Ramp Assembly, 500-6389-00-71 is secured above the Playfield by:

A▲ 4" X 1/4" Hex Spacer #6-32 Top (Qty. 5) (254-5008-21)
at playfield with #6-32 X 3/4" Fin Shank Screw (Qty. 1/per) (237-5921-02)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1/per) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00)

B▲ 2-3/4" X 1/4" Hex Spacer #6-32 Top (Qty. 3) (254-5008-15)
at the Wood Rail with Ramp Mntg. Bracket (Qty. 1/per) (515-6508-00)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1/per) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00); with A.P. Item 5 see securing hardware under Item 5.

C▲ 2-5/8" X 1/4" Hex Spacer #6-32 Top (Qty. 1) (254-5008-08)
at the playfield above the 1-Way Gate (Right Side) with #6-32 T-Nut (Qty. 1/per) (240-5002-00), Post Fasten #6-32 Top / #6-32 Bottom (Metal Post) (Qty. 1/per) (530-5012-02) thru 1-1/16" Single Groove Post (Black Plastic) (Qty. 1/per) (550-5059-00); Slingshot Plastic Protect Washer (.187" ID X .875" OD X .048" Thk.) (Qty. 1) (242-5059-00)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1/per) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00)

D▲ 2-1/2" X 1/4" Hex Spacer #6-32 Top (Qty. 1) (254-5008-16)
at the Wood Rail with Ramp Mntg. Bracket (Qty. 1) (515-6508-00)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00)

E▼ 2-1/4" X 1/4" Hex Spacer #6-32 Top (Qty. 2) (254-5008-18)
at the playfield through the Left Slingshot Plastic (Butyrate) Piece with #6-32 T-Nut (Qty. 1/per) (240-5002-00), Post Fasten #6-32 Top / #6-32 Bottom (Metal Post) (Qty. 1/per) (530-5012-02) thru 1-1/16" Single Groove Post (Black Plastic) (Qty. 1/per) (550-5059-00); Slingshot Plastic Protect Washer (.187" ID X .875" OD X .048" Thk.) (Qty. 1) (242-5059-00)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1/per) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00)

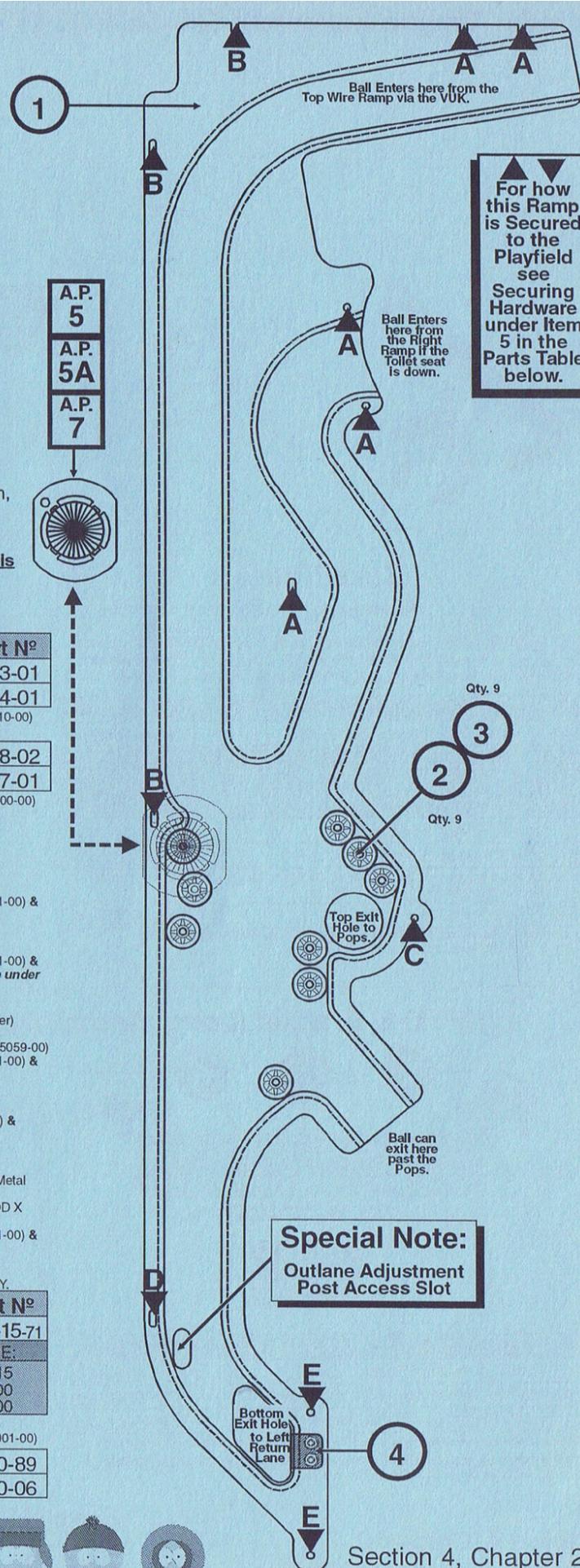
ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

N ^o	Associated Part Name	QTY.	SPI Part N ^o
5Ⓜ	Riveted Plastic Piece (Buty.) Assy.	1	515-7009-15-71

ORDERING ABOVE Ⓜ RIVETED ASSY. PART N ^o WILL INCLUDE:			
5A	Screened (Yellow) Plastic Piece -15	1	830-5967-15
5B*	2-Lug Stand-Up Short Socket	1	077-5101-00
5C*	Rivet, 1/8" ⌀ X 3/16" Long	1	249-5001-00

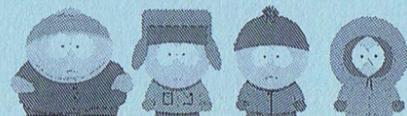
A.P. Item 5 secured on Item 1 by: 1" X 3/8" Spacer Gray (Qty. 1) (254-5000-04), #6-32 X 1-1/2" PPH MS (Zinc) (Qty. 1) (237-5510-00) and #6 Washer (Qty. 1) (242-5001-00)

6*	#89 Bulb	1	165-5000-89
7	Mini-Mars Light Cover Snap-In Yellow	1	550-5030-06

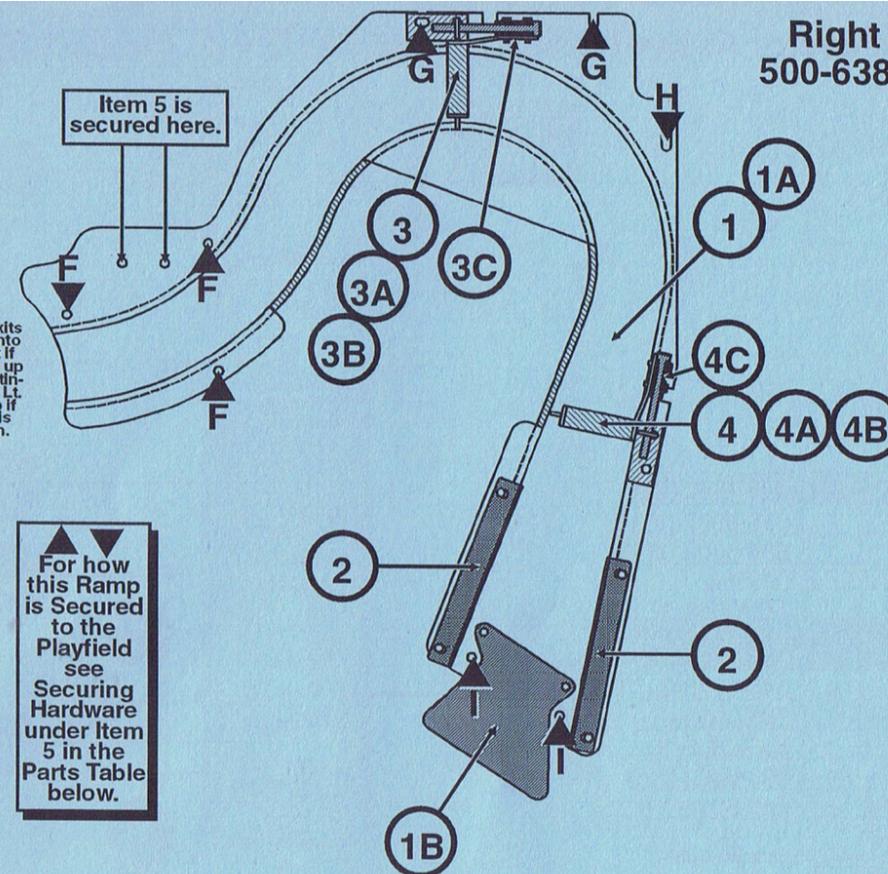
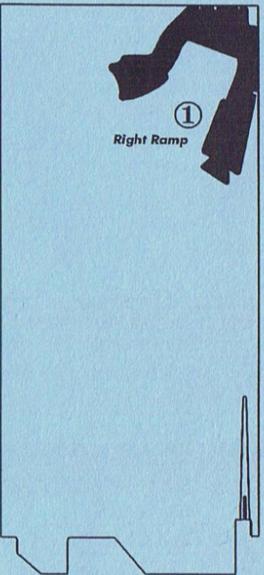


For how this Ramp is Secured to the Playfield see Securing Hardware under Item 5 in the Parts Table below.

Special Note:
Outline Adjustment Post Access Slot



**Right Ramp Assembly,
500-6383-00-71 (Items 1-5)**



For how this Ramp is Secured to the Playfield see Securing Hardware under Item 5 in the Parts Table below.

Take Note:

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

Ⓜ "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire Ⓜ Sub-Assembly. **Please Note:** If the Ⓜ Sub-Assembly is **not** available, call Technical Support.

N ^o	Individual Part Name	QTY.	SPI Part N ^o
1Ⓜ	Riveted Right Ramp Sub-Assy.	1	515-6988-00-71
ORDERING ABOVE Ⓜ RIVETED ASSY. PART N ^o WILL INCLUDE:			
1A	Right Plastic Ramp (Plain, No Parts)	1	545-5923-00
1B	Ramp Flap	1	535-8373-00
1C*	Rivet, 1/8" ⌀ X 3/16" Lg.	2	249-5001-00
1D*	Washer, 9/64" ID X 5/16" OD X 1/32"	2	242-5017-00
2	Ramp Entrance Protector	2	535-6707-01

Item 2 secured onto Item 1 by: #6-32 X 3/8" PPH MS (Sems) Zinc (Qty. 2/per) (232-5201-00) and #6-32 Nylon Stop Nut (Qty. 2/per) (240-5005-00)

3	Gate Assembly (Exit)	1	515-6490-00
ORDERING ABOVE (ITEM 3) SUB-ASSY. PART N ^o WILL INCLUDE:			
3A	Gate Mounting Bracket	1	535-7613-01
3B	Wire Form	1	535-6304-03
3C	Micro Switch for Wire Gate	1	180-5087-00
3D*	Diode, 1N4001	1	112-5001-00
3E*	#2-56 X 3/8" HWH MS (Serr.) TF 3/16" Hd.	2	237-5938-01

Item 3E secures Item 3C onto 3A.
Item 3 (closest to switch) secured onto Item 1 by: #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 1) (232-5200-00), #6-32 Nylon Stop Nut (Qty. 1) (240-5005-00) and (farthest from switch) secured by (see ▲F following Item 5)

4	Gate & Sign Assembly (Enter)	1	515-6774-04-71
ORDERING ABOVE (ITEM 4) SUB-ASSY. PART N ^o WILL INCLUDE:			
4A	Gate & Sign Mounting Bracket	1	535-6303-03
4B	Wire Form	1	535-6304-03
4C	Micro Switch for Wire Gate	1	180-5087-00
4D	Diode, 1N4001	1	112-5001-00
4E*	Wdg. Base Offset Socket (Step-Brkt.)	2	077-5029-00
4F*	#555 Wedge Base Bulb	2	165-5002-00
4G*	Rubber Lite Cover Yellow	1	545-5014-06

Item 4 continued in the next column...

N ^o	Individual Part Name	QTY.	SPI Part N ^o
Item 4 continued from previous column...			
4H*	Rubber Lite Cover Orange	1	545-5014-07
4I*	Plastic (Butyrate) Mr. Hankey Sign -16	1	830-5967-16
4J*	Plastic (Butyrate) Alternate Sign -17	1	830-5967-17
4K*	#2-56 X 3/8" HWH MS (Serr.) TF 3/16" Hd.	2	237-5938-01
4L*	#4-40 X 3/8" PPH TF	1	237-5979-00
4M*	#4-40 Nylon Stop Nut	1	240-5303-00
4N*	#6 X 3/8" HWH AB Zinc	2	234-5000-00

Item 4 secured onto Item 1 by: #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5200-00) and #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00)
Item 4K secures Item 4C onto Item 4A.
Items 4L & 4M secures Item 4E to Item 4I or 4J.
Item 4N secures Item 4I or 4J to Item 4A.
* Item 4J only for use if Item 4I is offensive to owner (See Parts Bag in your Game).
Item 5 secured onto Item 1 by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 2) (234-5101-05)

Right Ramp Assembly, 500-6383-00-71 is secured above the playfield by:

F▲ 4-1/4" X 1/4" Hex Spacer #6-32 Top (Qty. 3) (254-5008-30)
at playfield with #6-32 X 3/4" Fin Shank Screw (Qty. 1/per) (237-5921-02)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1/per) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00)

G▲ 3" X 1/4" Hex Spacer #6-32 Top (Qty. 2) (254-5008-14)
at the Wood Rail with Ramp Mntg. Bracket (Qty. 1/per) (515-6508-00)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1/per) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00)

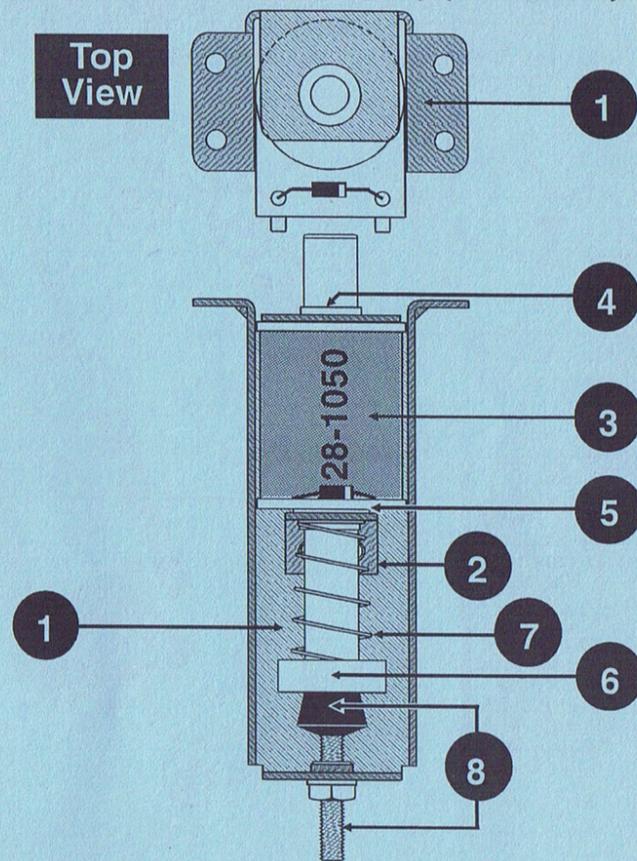
H▼ 2-5/8" X 1/4" Hex Spacer #6-32 Top (Qty. 2) (254-5008-08)
at the Wood Rail with Ramp Mntg. Bracket (Qty. 1/per) (515-6508-00)
and at the Ramp with #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 1/per) (232-5201-00) & #6 Washer (Qty. 1/per) (242-5001-00)

I▲ #4 X 5/8" PFH (Black) Screw (Qty. 2/per) (237-5833-00) by the Ramp Flap.



**UK ONLY
OPTIONAL**

**Top
View**



Nº	Individual Part Name	QTY.	SPI Part Nº
1	Ball Deflector Coil Mounting Bracket	1	535-6857-02
2	Coil Retaining Bracket	1	535-5203-03
Item 2 is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)			
3	Coil, 28-1050	1	090-5046-00
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5076-00
5	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
6	Solid Plunger Assembly	1	515-6858-00
7	Compression (Relay) Spring	1	266-5022-01
8	#10-32 Adj. Spindle Stop w/Rubber Tip	1	280-5014-00

Item 8 is secured by: #10-32 Keps Nut (Qty. 1) (240-5208-00)

Left & Right Ball Deflector Assemblies, 500-5788-03 is secured under the playfield by:
#8-32 X 1/2" HWH AB (Zinc) Blue (Qty. 4/per) (234-5101-05)

Up / Down Post Assembly, 500-6293-00 (Items 1-9)

**UK ONLY
OPTIONAL**

Take Note:

Item 5D, part of Item 5, Plunger & Shaft Sub-Assembly, is 1 piece and cannot be ordered separated.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Up/Down Post Coil Mounting Bracket	1	515-6840-00
2	Adjustment Spindle Stop Bracket	1	535-8303-00
3	Coil Retaining Bracket	2	535-7356-00
Items 2 & 3 are secured by: #8-32 X 3/8" Swage (Serr) Zinc (Qty. 2/per) (237-5975-00)			
4	Coil, 23-1100 (ORG)	1	090-5030-00T
ORDERING ABOVE (ITEM 4) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
5	Coil Sleeve (with extension)	1	545-5847-00
6	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00
7	Plunger & Shaft Assembly	1	515-6844-00-35
ORDERING ABOVE (ITEM 7) SUB-ASSY. PART Nº WILL INCLUDE:			
7A	Ball Bumper Plastic (Top) Red	1	550-5029-02
7B*	Roll Pin, 3/32" ø X 1/2" Long	1	251-5002-00
7C*	Retaining Ring, 1/4" ø Shaft	1	270-5002-00
7D	Plunger & Shaft Sub-Assembly	1	515-6841-00
7E	Plunger Head	1	590-5511-00
7F	#10-32 X 3/8" PPH MS (Sems) Zinc	1	232-5401-00
8	Compression (Relay) Spring	1	266-5022-01
9	#10-32 Adj. Spindle Stop w/Rubber Tip	1	280-5014-00

Item 9 is secured by: #10-32 Keps Nut (Qty. 1) (240-5208-00)

Up/Down Post Assembly, 500-6293-00 is secured under the playfield by:
#8-32 X 1/2" HWH AB (Zinc) Blue (Qty. 6) (234-5101-05)

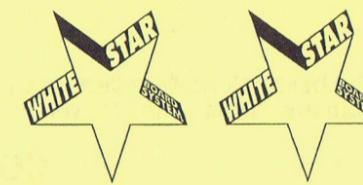
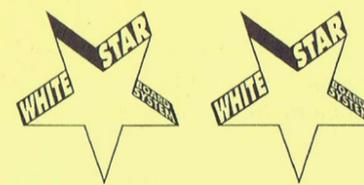
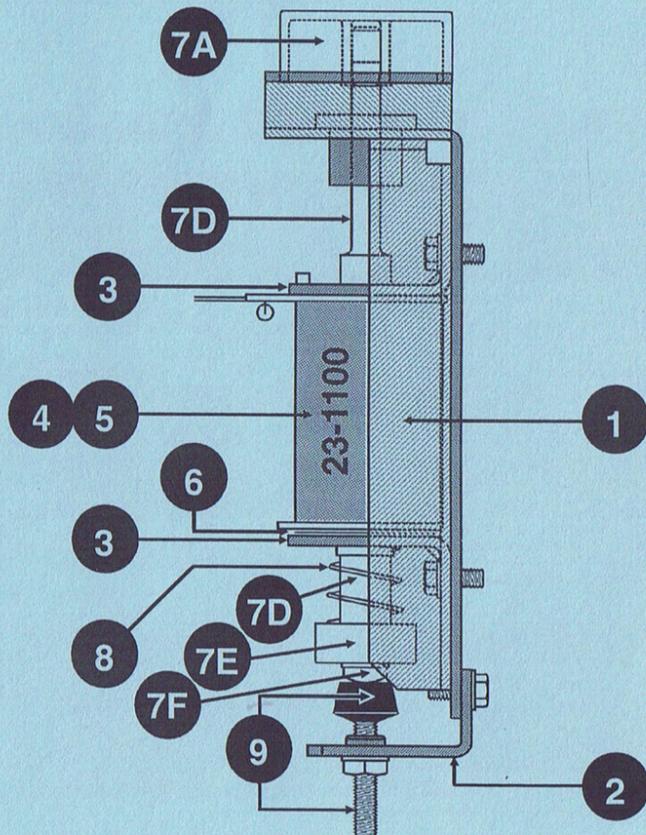
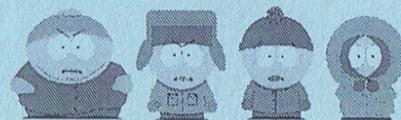


Table of Contents

- Coils Detailed Chart Table..... 80
- Chapter 1, Backbox Wiring..... 81
 - Backbox Board Layout Wiring Diagram 81
 - Backbox I/O Power Driver Board Detailed Wiring Diagram..... 82
- Chapter 2, Playfield Wiring..... 83
 - General Illumination Circuit Detailed Wiring Diagram 83
 - Playfield Switch Wiring Diagram & Playfield Lamp Wiring Diagram 84
 - Playfield Terminal Strips, Fuses & Misc. Wiring Descriptions & Locations 85
 - 2-Flipper Circuit Wiring Diagram..... 86
- Chapter 3, Cabinet Wiring 87
 - Transformer Power Wiring Diagram..... 87
 - Cabinet / Coin Door Wiring Diagram..... 88
- Chapter 4, Printed Circuit Boards (PCBs) 89
 - Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic 89
 - Trough Up-Kicker Dual OPTO Boards Component Layout & Parts..... 89
 - OPTO Troubleshooting..... 89-90
 - Trough Dual OPTO Boards Alignment / Tests for LED1 & LED2..... 90-91
 - Dot Matrix Display/Display Controller Bd. Combined Display Connections 92
 - Display Power Supply Board Schematic..... 93
 - Display Power Supply Board Component Layout & Parts 93
 - Display Controller Board Schematic..... 94
 - Display Controller Board Component Layout & Parts 95
 - I/O Power Driver Board Theory of Operation 96
 - I/O Power Driver Board Schematic (Sheet 1 of 5)..... 97
 - I/O Power Driver Board Schematic (Sheet 2 of 5)..... 98
 - I/O Power Driver Board Schematic (Sheet 3 of 5)..... 99
 - I/O Power Driver Board Schematic (Sheet 4 of 5)..... 100
 - I/O Power Driver Board Schematic (Sheet 5 of 5)..... 101
 - I/O Power Driver Board Component Layout..... 102
 - I/O Power Driver Board Parts..... 103
 - CPU/Sound Board Theory of Operation 104
 - CPU/Sound Board Schematic (Sheet 1 of 3) 105
 - CPU/Sound Board Schematic (Sheet 2 of 3) 106
 - CPU/Sound Board Schematic (Sheet 3 of 3) 107
 - CPU/Sound Board Component Layout..... 108
 - CPU/Sound Board Parts..... 109
 - P/F Sw. OPTO "Long-Hop" Boards Theory of Operation & Schematic 110
 - P/F Sw. OPTO "Long-Hop" Boards Component Layout & Parts..... 110

Section 5 | S & T



Use the below *Coils Detailed Chart Table* in conjunction with Sec. 5, Chp. 1, Backbox Board Layout Wiring Diagram and Backbox I/O Power Driver Board Detailed Wiring Diagram (I/O Board Connectors J6, J7, J8 & J9):

COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00T
#3	SUPER VUK	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00T
#4	TOP VUK	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#5	TOILET SEAT LID	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#6	MR. HANKEY LATCH	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v DC	29-1000 090-5059-00
#7	FLASH POPS *4	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	DL4SS 515-6076-01
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-P4/5	50v DC	26-1200 090-5044-00T
#10	RIGHT TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#11	BOTTOM TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	BRN	J7-P1	20v DC	23-800 090-5001-00T
#13	MR. HANKEY (DOWN)	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#14	KENNY PIVOT (DEAD)	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v DC	22-1080 090-5032-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
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 Bulb or Meter
#17	RIGHT SLINGSHOT	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	23-800 090-5001-00T
#18	FLASH TOP VUK *1	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#19	KENNY LT	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	J7-P1	20v DC	24-940 090-5036-00T
#20	KENNY RT	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v DC	24-940 090-5036-00T
#21	LT OUTLANE (UK ONLY)	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	23-1050 090-5046-00
#22	RT OUTLANE (UK ONLY)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	23-1050 090-5046-00
#23	UP/DOWN POST (UK ONLY)	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	Meter 5v 091-5000-00
Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Bulb Type
#F1	FLASH STAN *2	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F2	FLASH CHEF *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F3	FLASH KENNY *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F4	FLASH KYLE *2	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F5	FLASH CARTMAN *2	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F6	FLASH KENNY *1 BACK *2	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#906 Bulb 165-5004-00 #89 Bulb 165-5000-89
#F7	FLASH MR HANKEY/TOILET *2	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F8	FLASH SUPER VUK *1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89

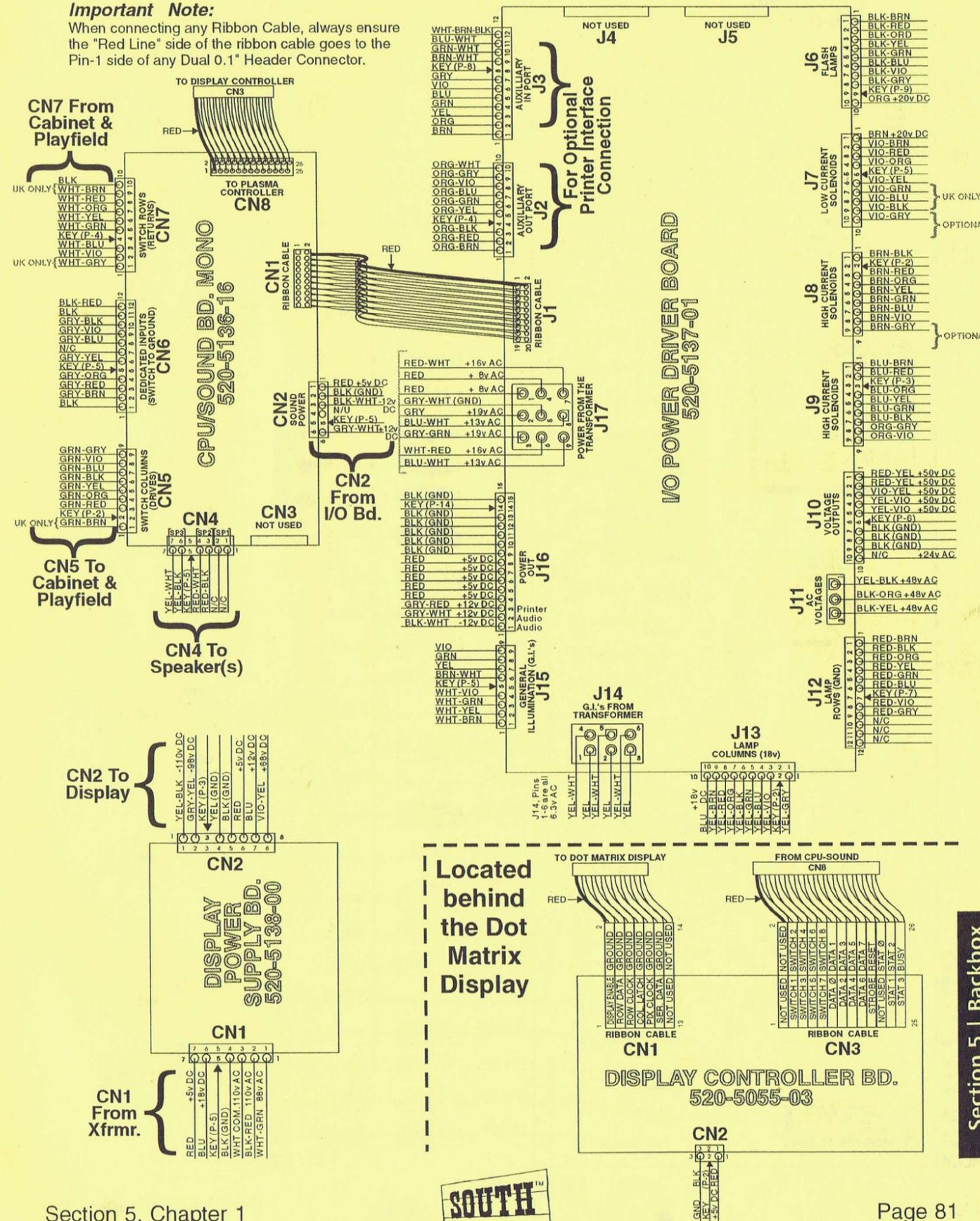
Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are Flash Lamps F1-F8 ONLY. Test all others in Single or Cycling Coil Tests.



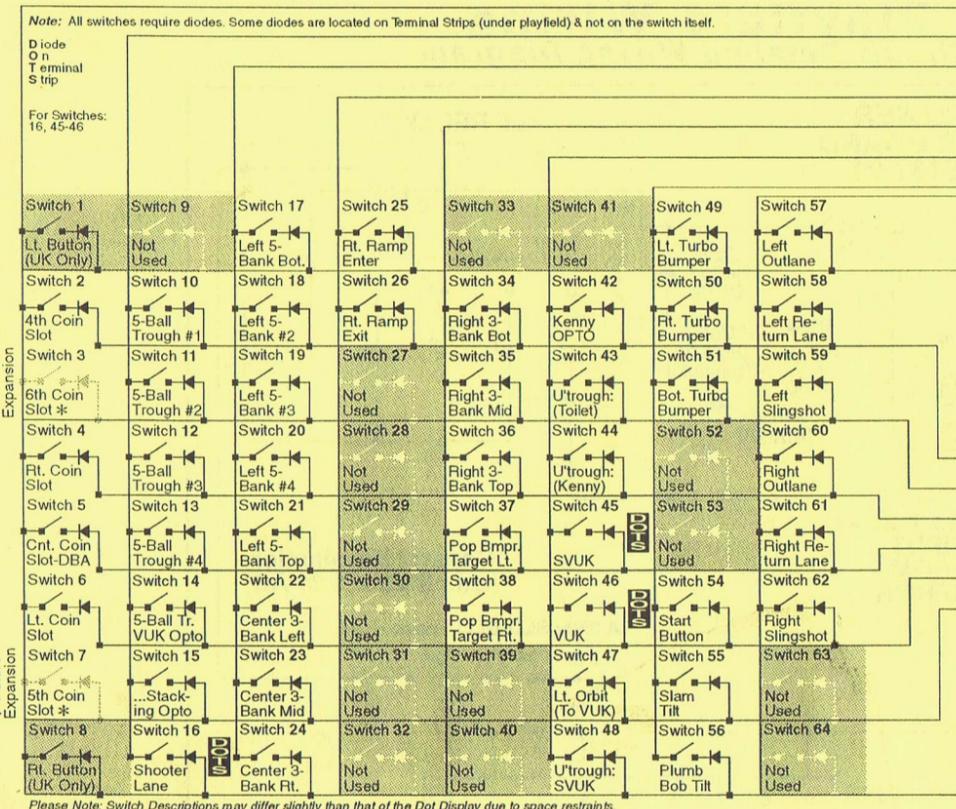
Backbox Wiring Backbox Board Layout Wiring Diagram

Important Note:

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



Playfield Switch Wiring Diagram



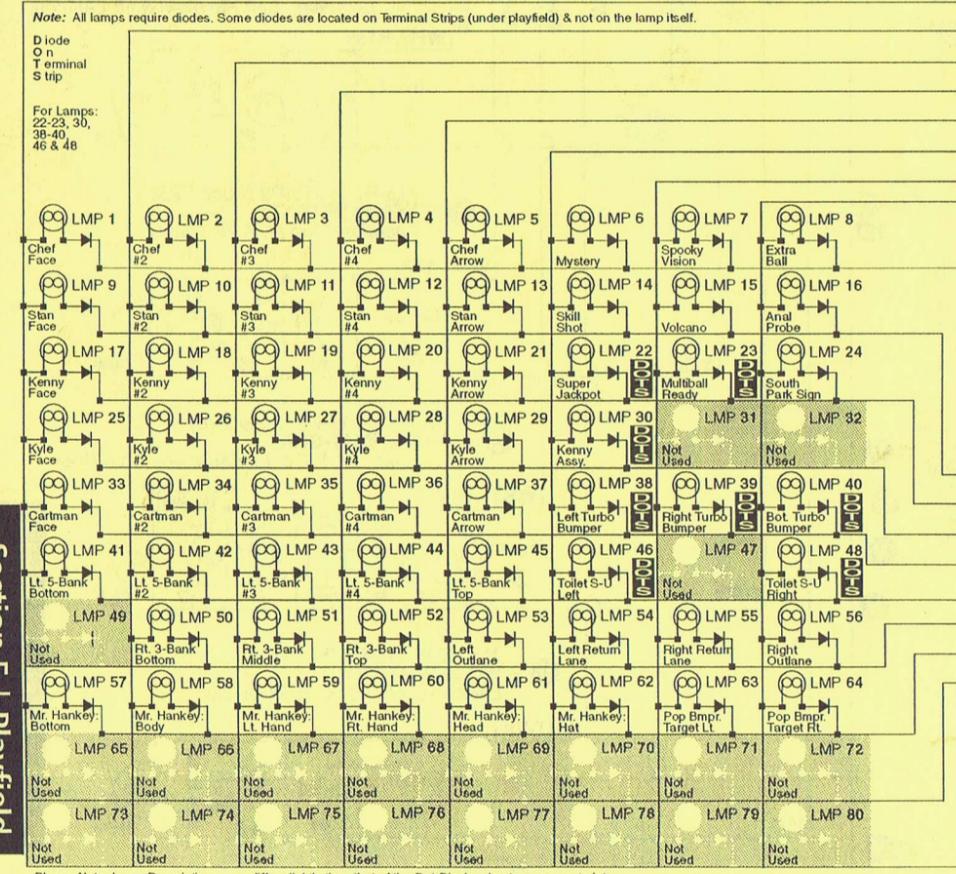
CPU-Snd. Bd. CN5-

GRN-BRN	1	Sw. Drive 1: Q1
GRN-RED	3	Sw. Drive 2: Q2
GRN-ORG	4	Sw. Drive 3: Q3
GRN-YEL	5	Sw. Drive 4: Q4
GRN-BLK	6	Sw. Drive 5: Q5
GRN-BLU	7	Sw. Drive 6: Q6
GRN-VIO	8	Sw. Drive 7: Q7
GRN-GRY	9	Sw. Drive 8: Q8
Color		Column
		Switch Drive Transistor
		Source N°: 2N3904

CPU-Snd. Bd. CN7-

WHT-BRN	10	N/C
WHT-RED	9	Sw. Return 1: U400
WHT-ORG	8	Sw. Return 2: U400
WHT-YEL	7	Sw. Return 3: U400
WHT-GRN	6	Sw. Return 4: U400
WHT-BLU	5	Sw. Return 5: U401
WHT-VIO	3	Sw. Return 6: U401
WHT-GRY	2	Sw. Return 7: U401
Color		Sw. Return 8: U401
		Row
		Switch Return IC
		Source N°: LM339AN

Playfield Lamp Wiring Diagram

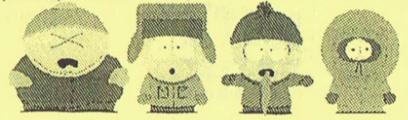


I-O Bd. J13-

BLUE	10	Power Out for +18v for Disp. Pwr. Sup. Bd. CN1-Pin 6
YEL-BRN	9	Lamp Drive 1: U17
YEL-RED	8	Lamp Drive 2: U16
YEL-ORG	7	Lamp Drive 3: U15
YEL-BLK	6	Lamp Drive 4: U14
YEL-GRN	5	Lamp Drive 5: U13
YEL-BLU	4	Lamp Drive 6: U12
YEL-VIO	3	Lamp Drive 7: U11
YEL-GRY	1	Lamp Drive 8: U10
Color		Column
		Lamp Drive IC
		Source N°: VN02N

I-O Bd. J12-

RED-BRN	1	Lamp Return 1: Q33
RED-BLK	2	Lamp Return 2: Q34
RED-ORG	3	Lamp Return 3: Q35
RED-YEL	4	Lamp Return 4: Q36
RED-GRN	5	Lamp Return 5: Q37
RED-BLU	6	Lamp Return 6: Q38
RED-VIO	8	Lamp Return 7: Q39
RED-GRY	9	Lamp Return 8: Q40
N/C	10	Lamp Return 9: Q41
N/C	11	Lamp Return 10: Q42
Color		Column
		Lamp Return Transistor
		Source N°: STP19N06L

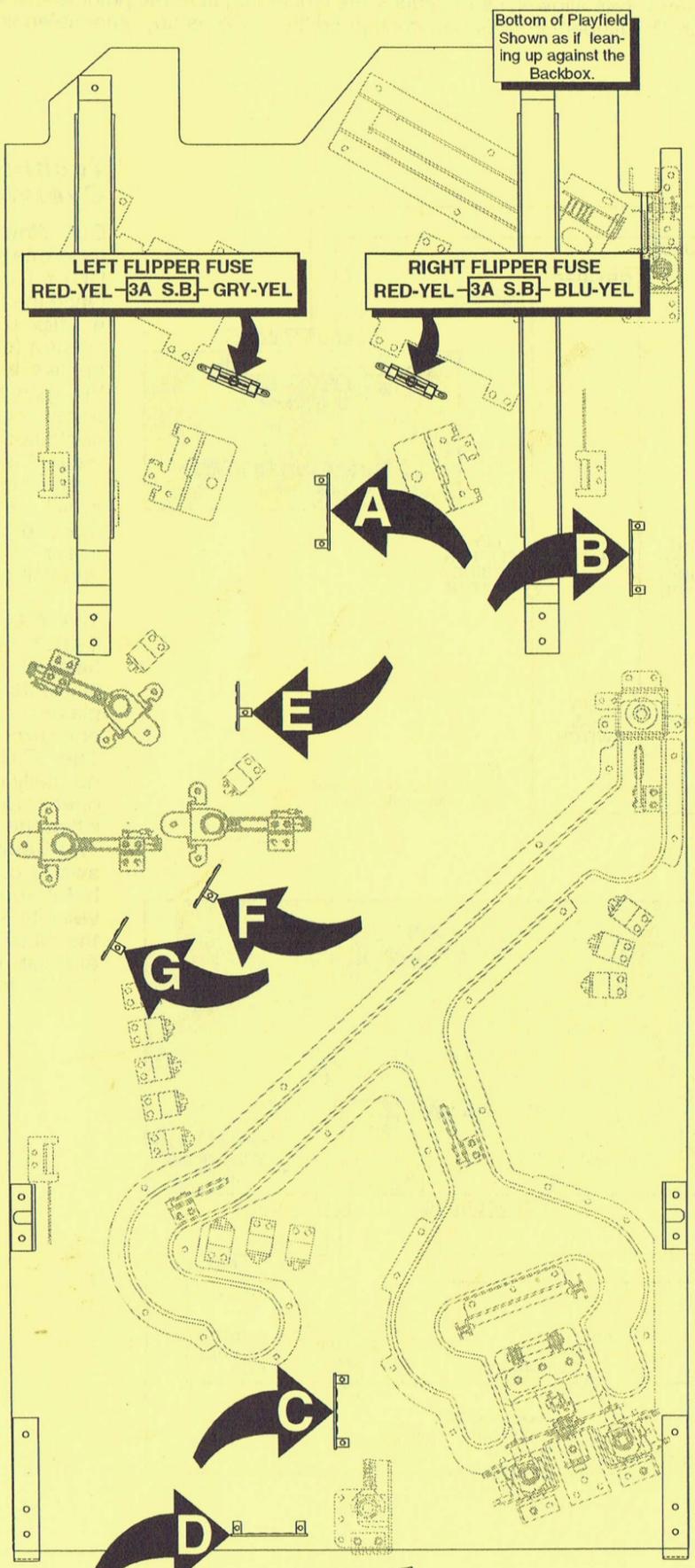


Playfield Terminal Strips, Fuses & Misc. Wiring Descriptions & Locations

See the Pink Pages, Playfield - General Parts (Below) (Page 52) for Terminal Strips, Diodes, Fuses & Holders Part N°s.

Also Note: Terminal Strip & Fuse Holder locations shown represent the general location (your game may differ slightly).

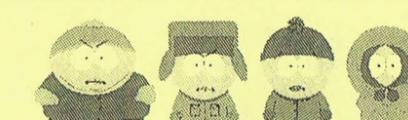
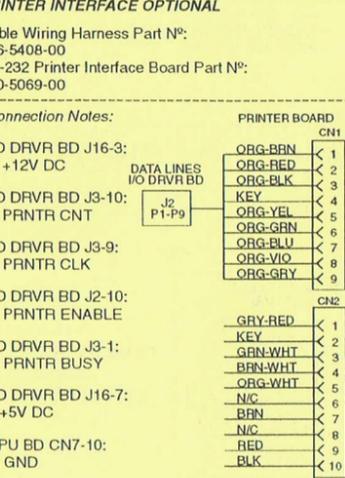
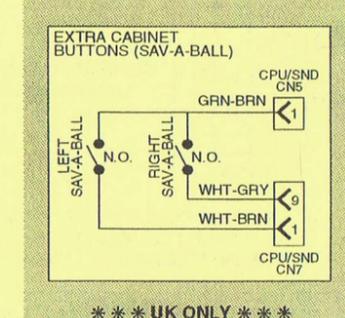
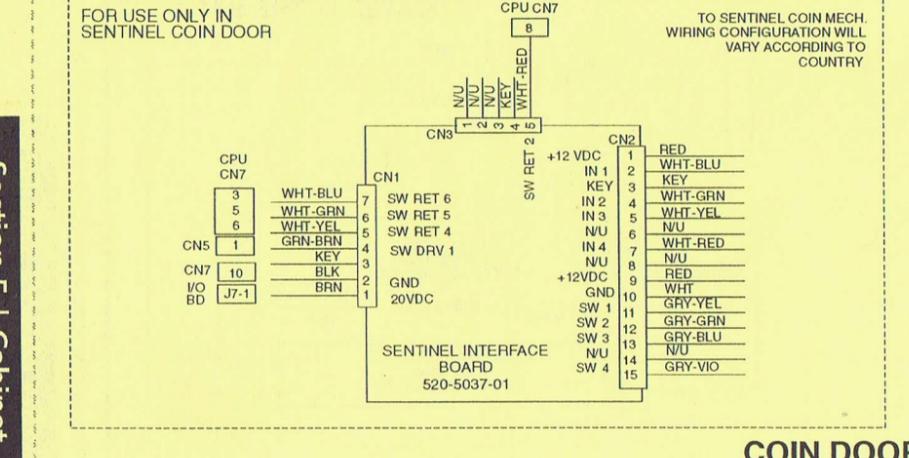
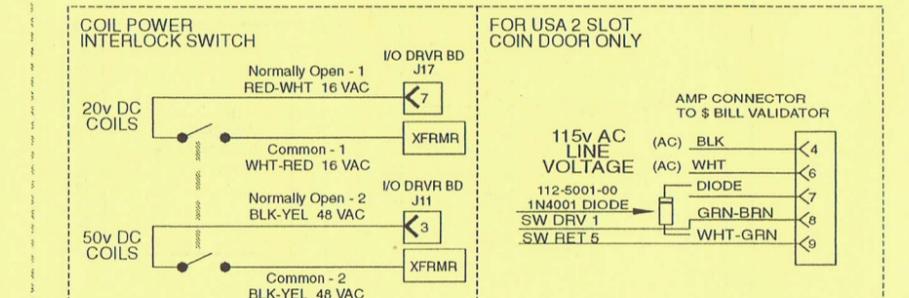
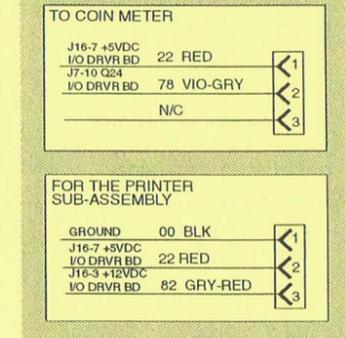
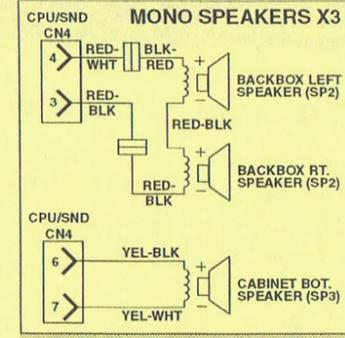
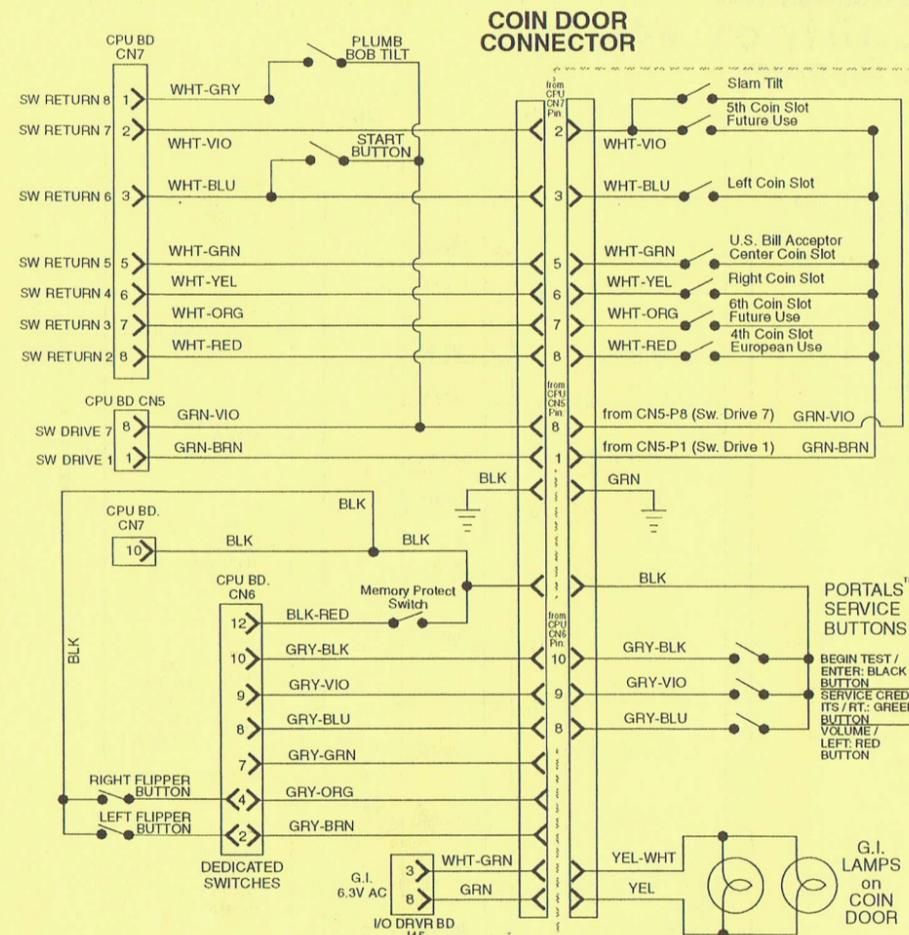
- A** South Park Lamp 22: Super Jackpot Lamp 23: Multiball Ready (Mr. Hankey Sign over Right Ramp)
- B** South Park Lamp 16: Shooter Lane Switch 45: Super VUK
- C** South Park Switch 46: VUK Lamp 30: Kenny Assy. #555 Bulb inside
- D** South Park Lamp 48: Toilet Ft. (S.U.) Lamp 46: Toilet Lt. (S.U.) #555 Bulbs outside



All switches, lamps, coils require diodes. The diodes not physically located on the switch, lamp or coil are located on Terminal Strips under the playfield. The Switch & Lamp Matrix Grids also note which switch or lamp has a diode on a Terminal Strip (noted by "DOTS" meaning "Diode on Terminal Strip"). There are diodes located on solder lugs for the Magnet Fuses. All fuses are 3A 250v Slo-Blow, do not over-fuse.

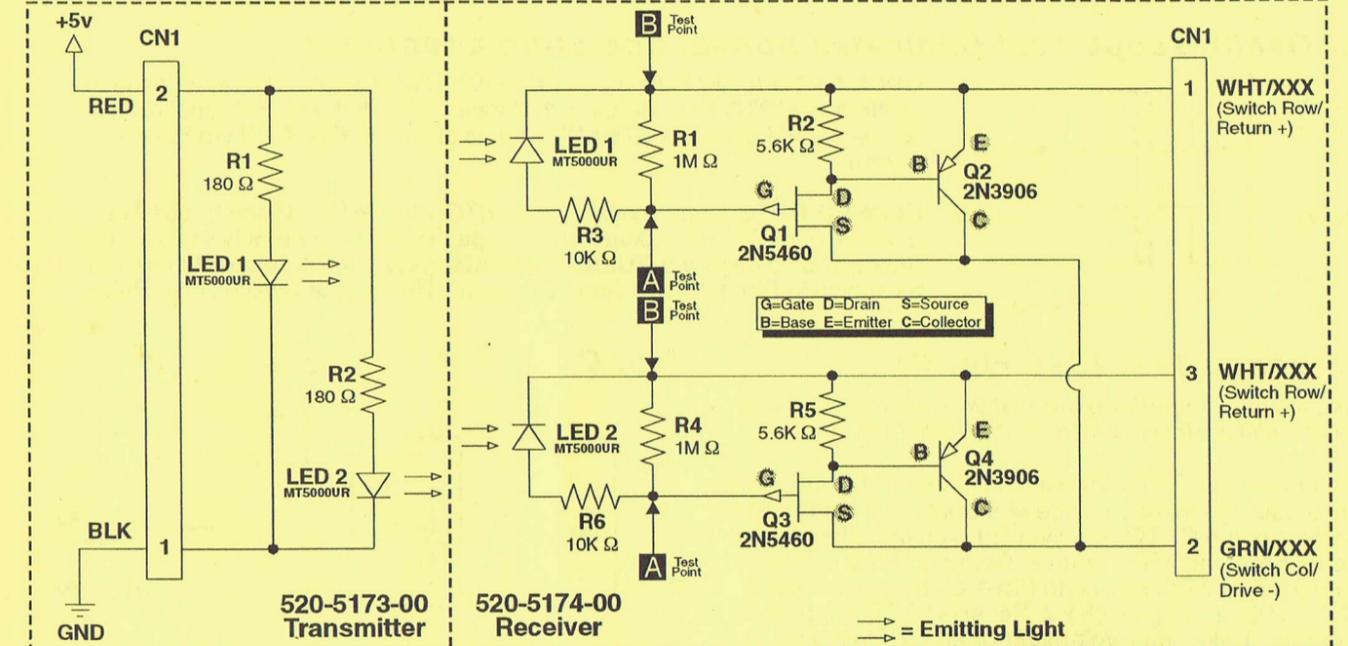
- E** South Park Lamp 40: Bottom Turbo Bumper (Pop)
- F** South Park Lamp 39: Right Turbo Bumper (Pop)
- G** South Park Lamp 38: Left Turbo Bumper (Pop)



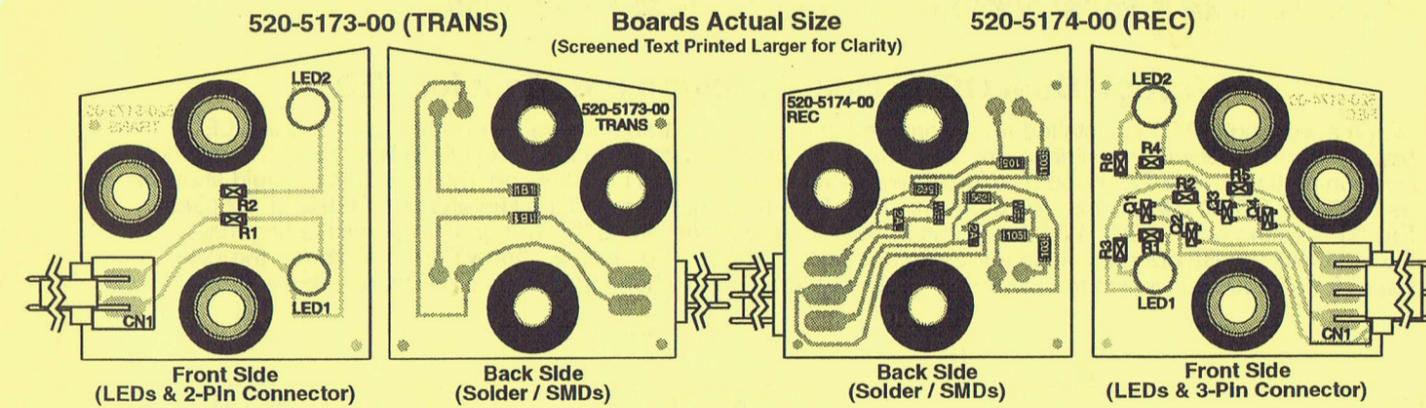


Printed Circuit Boards (PCBs) Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic

As light from the Transmitter LED1 falls on the Receiver LED1, it generates a Positive Bias Voltage (0.7v to 1.5v) which is applied to the Gate (G) of Q1 (Fet 2N5460), turning Q1 off. When Q1 is held off, no current flows through Q2's (2N3906) Base (B). With no base current, Q2 is off and acts as an OPEN SWITCH. When the light is interrupted (BLOCKED) R1 (Rec. Bd.) bleeds the gate voltage off of Q1 allowing it to conduct, switching Q2 on, which acts as a CLOSED SWITCH. The LED2 (Trans/Rec) Circuit operates identical as the LED1 Circuit.



Trough Up-Kicker Dual OPTO Boards Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
A	1	515-0173-00		Dual-OPTO Trans. Bd. Assy.
1	1	520-5173-00		Dual-OPTO Trans. Bd.
2	2	165-5100-00		LED1, LED2
3	1	121-5067-00		R1, R2
4	1	045-5111-02		CN1
5	3	545-5518-00		n/a
6	1	530-5308-02		n/a
B	1	515-0174-00		Dual-OPTO Rec. Bd. Assy.
1	1	520-5174-00		Dual-OPTO Rec. Bd.
2	2	165-5100-00		LED 1, LED 2
3	2	121-5068-00		R1, R4
4	2	121-5069-00		R2, R5
5	2	121-5011-00		R3, R6
6	2	110-5006-00		Q1, Q3
7	2	110-0086-00		Q2, Q4
8	1	045-5111-03		CN1
9	3	545-5518-00		n/a
10	3	530-5308-02		n/a



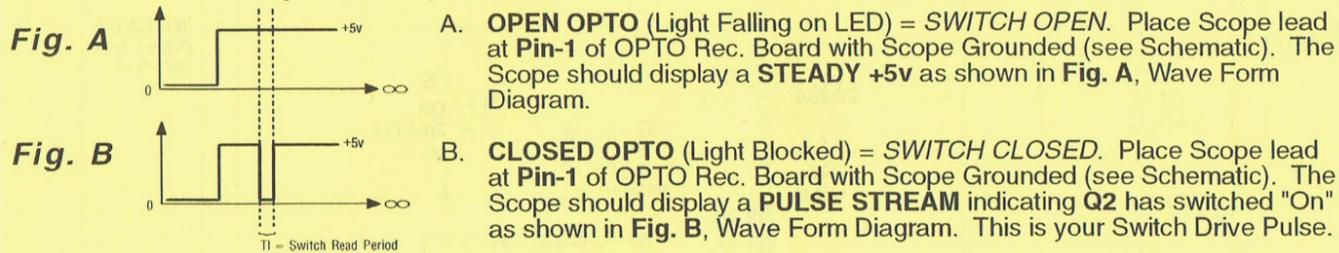
OPTO Troubleshooting

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

A. **OPEN OPTO** (Light Falling on LED) = **SWITCH OPEN**. Place meter leads across points **A** and **B** on the **LED1 Circuit** (Refer to Schematic Drawing on previous page, 520-5174-00 Receiver Side). It should read approximately 0.8 - 1.2v DC. The **LED2 Circuit** operates the same.

B. **CLOSED OPTO** (Light Blocked) = **SWITCH CLOSED**. Place meter leads across points **A** and **B** on the **LED1 Circuit** (Refer to Schematic Drawing on previous page, 520-5174-00 Receiver Side). It should read approximately 0.0 - 0.1v DC. The **LED2 Circuit** operates the same.

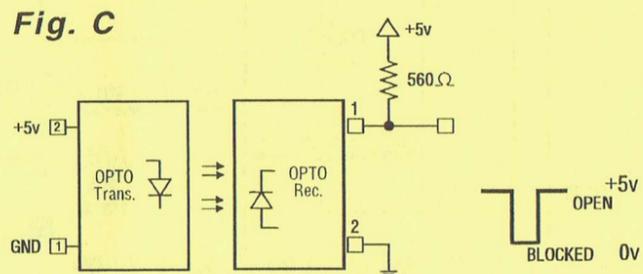
2. Oscilloscope Test (indicates normal operating condition):



3. Bench Test (See Fig. C):

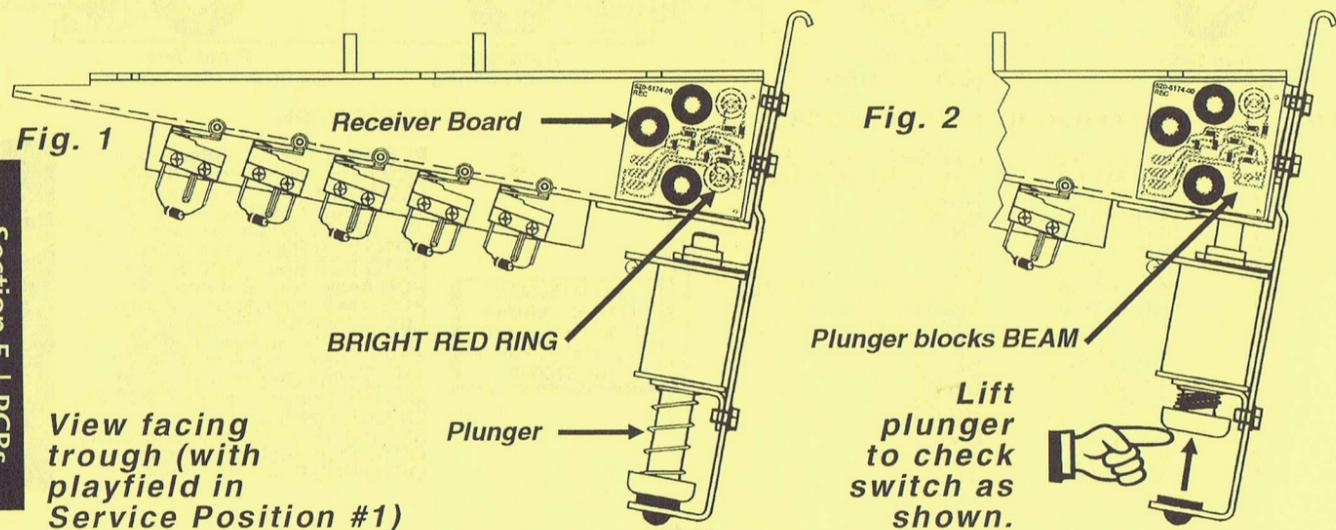
Please Note: To perform this test you must use a spare 560Ω Pull-Up Resistor, SPI N#: 121-5047-00

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

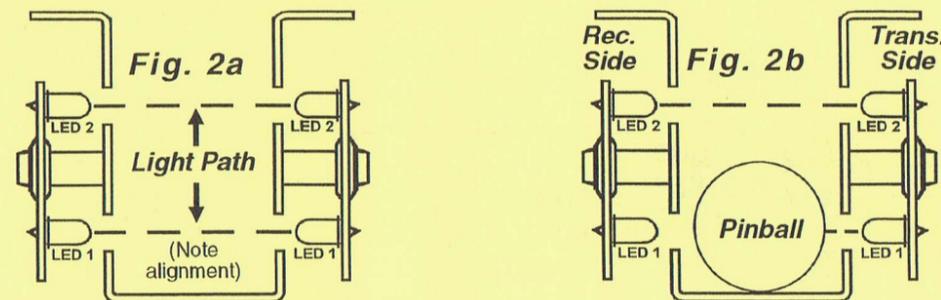


Trough Dual OPTO Boards Alignment / Test for LED1

When a working **OPTO** is installed and connected in a game, the transmitter should light (LED1 lower & LED2 upper) when the power is switched on. With the playfield in Service Position #1 (playfield lifted up in the half-way position resting on the Prop Rod or edge slide support brackets) and the game on, the LED lights should show up as a **BRIGHT RED RINGS** through the back of the Receiver Board around the **Receivers LED1 & LED2** (See **Fig. 1**). Testing only **LED1**: 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. 2a & 2b** (on the next page) for a sectional view of the Light Path (note alignment) and what happens as a ball breaks the light beam.

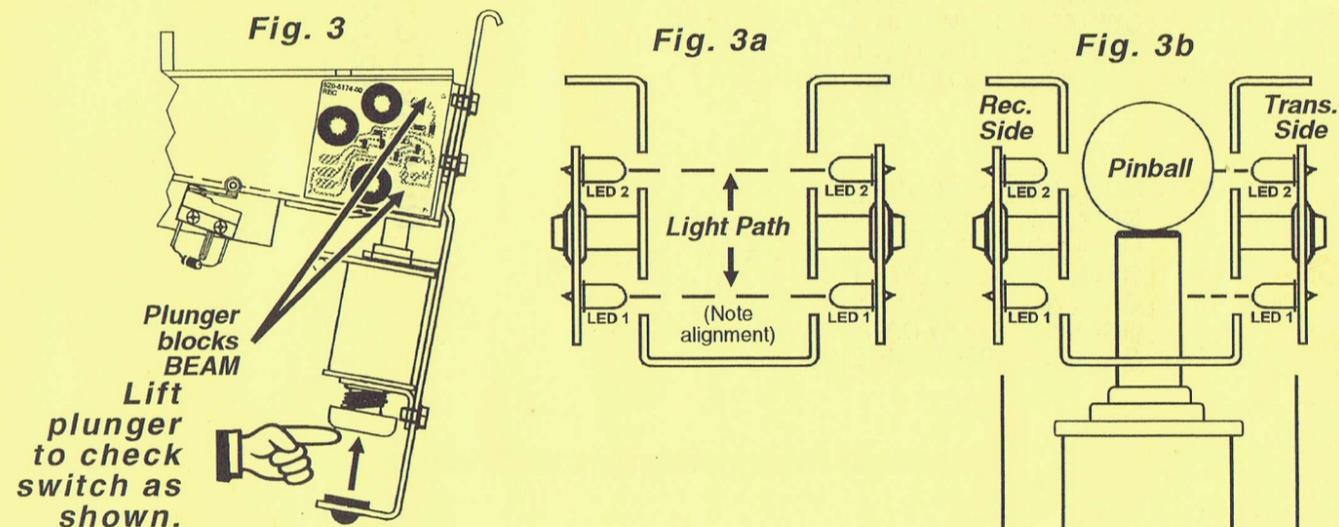


Sectional view from right (Fig. 2a & 2b)



Trough Dual OPTO Boards Alignment / Test for LED2

When a working **OPTO** is installed and connected in a game, the transmitter should light (LED1 lower & LED2 upper) when the power is switched on. With the playfield in Service Position #1 (playfield lifted up in the half-way position resting on the Prop Rod or edge slide support brackets) and the game on, the LED lights should show up as a **BRIGHT RED RINGS** through the back of the Receiver Board around the **Receivers LED1 & LED2** (See **Fig. 1, previous page**). Testing only **LED2**: **TO PERFORM THIS TEST, A PINBALL MUST BE IN THE BALL TROUGH**. With the game in **Switch Test Mode**, lifting the Trough Plunger with a finger tip should block the **BEAM** on LED2 and cause the Switch Position to trigger (See **Fig. 3**). View **Fig. 3a & 3b** for a sectional view of the Light Path (note alignment) and what happens as a "double-stacked" ball scenario breaks the light beam.



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

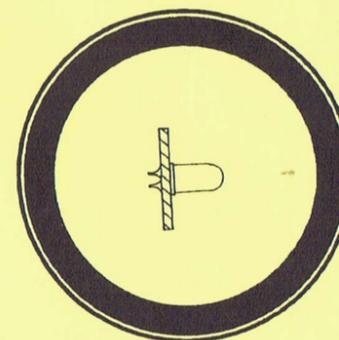


Fig. 4a
Correct Position

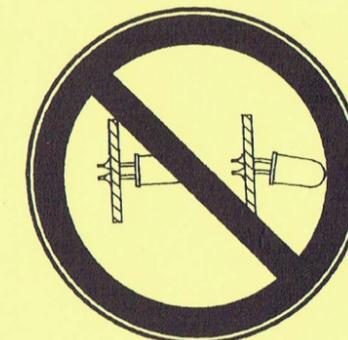
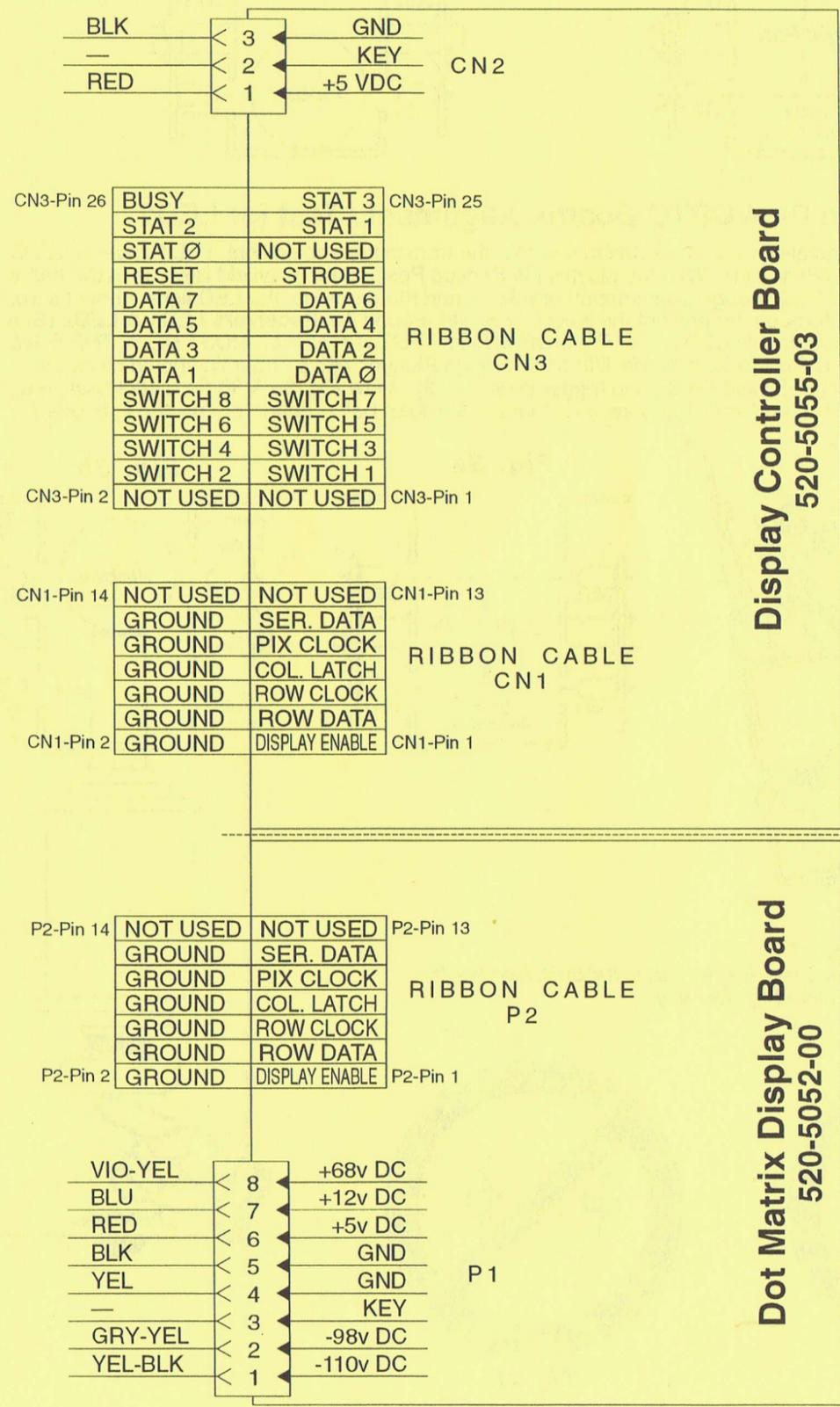


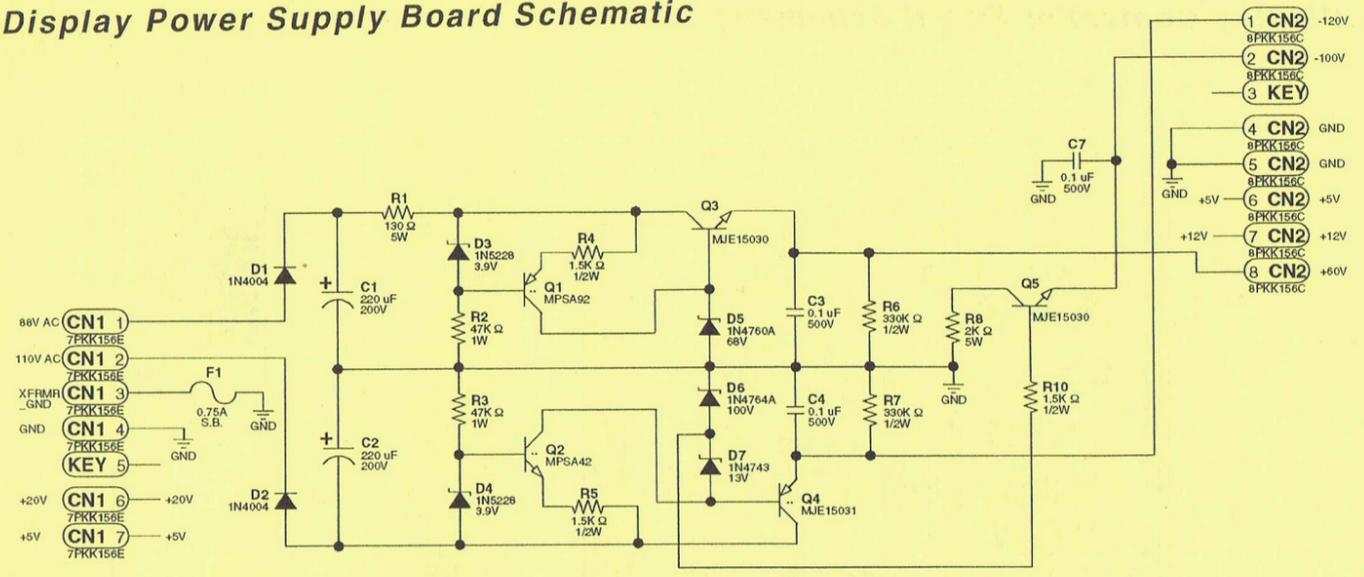
Fig. 4b
Incorrect Position



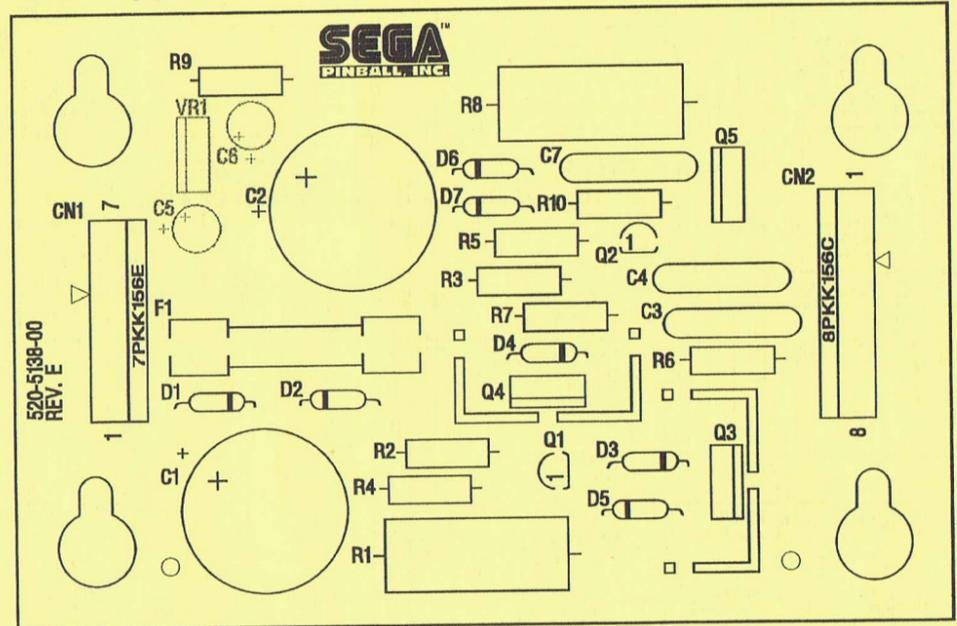


Display Controller Board
520-5055-03

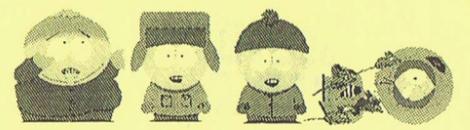
Dot Matrix Display Board
520-5052-00

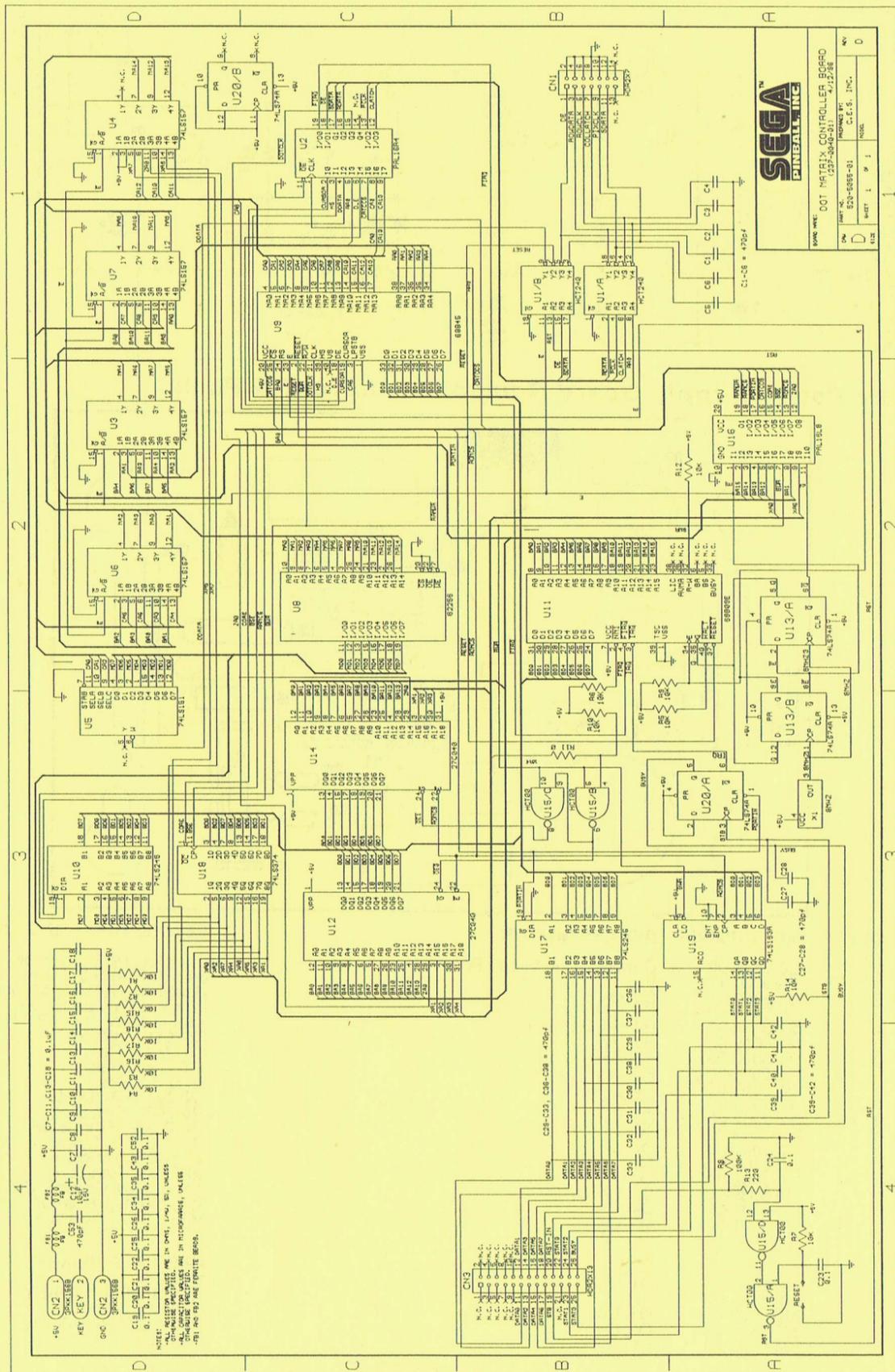


Display Power Supply Board Component Layout & Parts

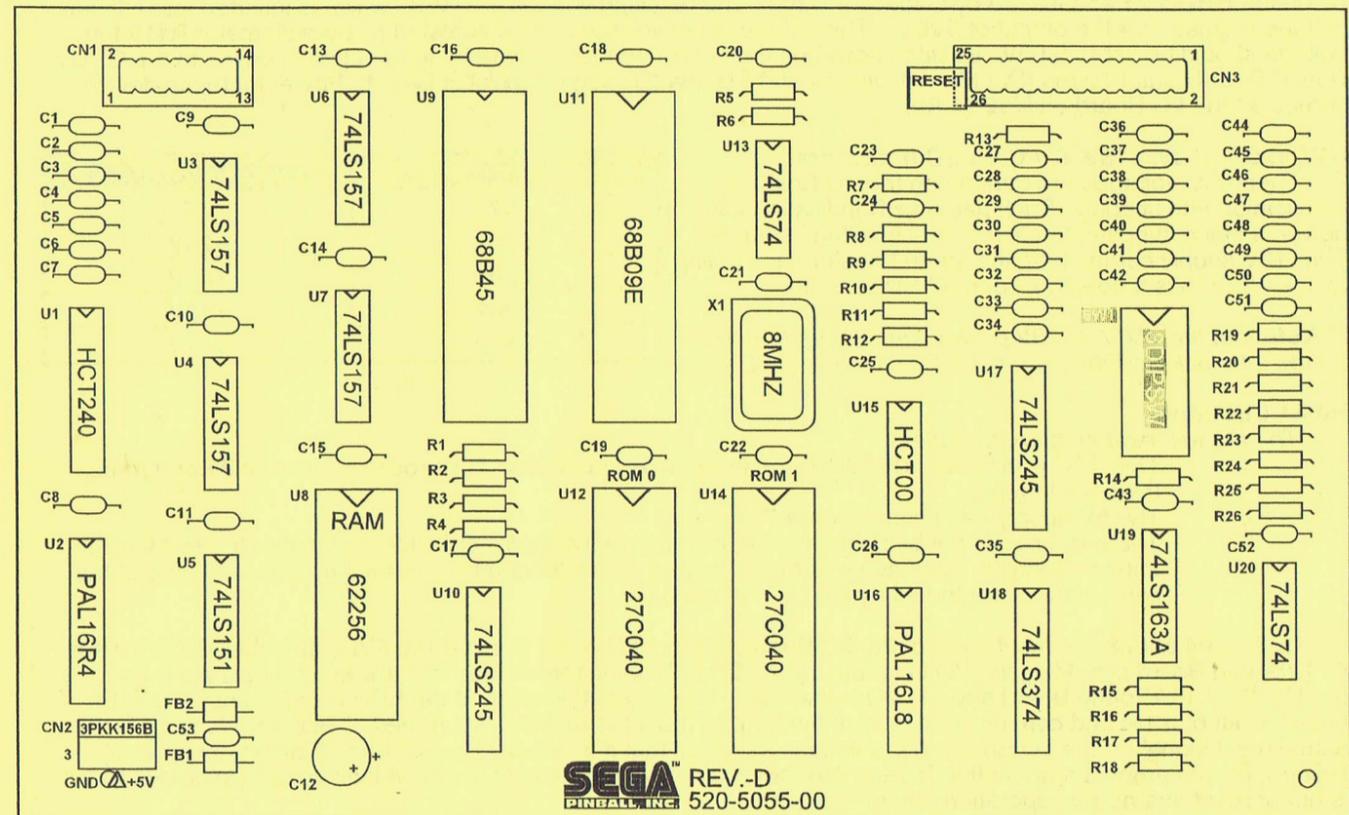


ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
—	1	520-5138-00	Display Power Supply Board	Complete PCB Assembly
1	1	200-5000-17	F1	3/4A (0.75A) S.B. Fuse
2	2	535-5000-11	Q3, Q4	Heatsinks - AAVID #563002
3	2	125-5044-00	C1, C2	220uF, 200v, Radial Lytic Cap.
4	4	121-5038-00	R4, R5, R9, R10	1.5K Ohm 1/2W Res. (R9: NS)
5	2	121-5059-00	R6, R7	330K Ohm 1/2W Res.
6	2	121-5060-00	R2, R3	47K Ohm 1W Res.
7	1	121-5061-00	R1	130 Ohm 5W Res.
8	1	121-5062-00	R8	2K Ohm 5W Res.
9	2	112-0053-00	D3, D4	1N5228, 3.9v, Diode
10	1	112-0062-00	D5	1N4760A, 68v, Diode
11	1	112-0049-00A	D6	1N4764A, 100v, Diode
12	1	112-0061-00	D7	1N4743, 13v, Diode
13	1	110-0100-00	Q1	MPSA92, Transistor
14	1	110-0082-00	Q2	MPSA42, Transistor
15	3	125-5035-00	C3, C4, C7	0.1uF, 500v, Ceramic Disk Cap.
16	1	110-0103-00	Q4	MJE15031, Transistor
17	2	110-0101-00	Q3, Q5	MJE15030, Transistor
18	0	125-5003-00	C5, C6	22uF, 25v, Rad Lytic Cap (C5, C6: NS)
19	0	124-5003-00	VR1	7812CT (VR1: NS)
20	1	045-5015-08	CN2	8PKK156 (PIN3=KEY)
21	2	112-5003-00	D1, D2	1N4004, Diode
22	1	045-5015-07	CN1	7PKK156E (PIN5=KEY)
23	2	240-5008-00	Q3, Q4	6/32 KEPS Nut
24	2	237-5501-00	Q3, Q4	6/32 X 3/8" PPH Screw
25	2	205-0004-00	F1	Fuse Clips



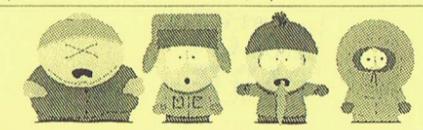


NAME: DOT MATRIX CONTROLLER BOARD
 DATE: 05/20/88
 DRAWN BY: C.E.S. INC.
 NO. 47264



SEGA REV.-D
 520-5055-00

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
1	1	520-5055-03	Display Controller Board (FCC FEB98)	Complete PCB Assembly
2	2	077-5217-00	U12, U14	32-Pin, IC Dip Socket
3	1	100-0397-00	U8	32K X 8 Static RAM (62256L-10PC)
4	1	100-0189-01	U11	68B09E
5	1	100-0233-00	U9	68B45
6	1	100-0351-00	U15	74HCT00
7	1	100-5001-00	U1	74HCT240
8	1	100-5000-00	U5	74LS151
9	4	100-0046-00	U3, U4, U6, U7	74LS157
10	1	100-0049-00	U19	74LS163A
11	2	100-0058-00	U7, U10	74LS245
12	2	100-0064-00	U18	74LS374
13	1	100-0037-00	U13, U20	74LS74
14	1	965-0107-00	U16 - ORANGE DOT	PAL16L8 (15CN), (Programmed) - ORANGE DOT
15	23	125-5031-00	C7>C11, C13>C26, C34, C35, C43, C52	PAL16R4 (25CN), (Programmed) - ORANGE DOT
16	1	121-5051-00	R8	.1 uF, (104), Axial Cer. Cap
17	15	121-5011-00	R1>R7, R9, R10, R12, R14>R18	100K Ω 1/4W C.F. Res. 5%
18	1	121-5014-00	R13	10K Ω 1/4W Res. 5%
19	0	n/a	R19>R26	220 Ω 1/4W C.F. Res. 5%
20	21	125-5028-00	C1>C6, C27>C33, C36>C42, C44>C51, C53	(R19>R26: NS)
21	2	n/a	FB1, FB2	470pF, (471), Axl. Cap (C44>C51: NS)
22	1	125-5015-00	C12	Ferrite Bead (2743001182)
23	1	045-5015-26	CN3	100uF, 25v, Cap. (Radial Elec.)
24	1	045-5015-03	CN2	13-Pin, Dual Row .1" HDR Conn.
25	1	045-5015-02	CN1	3-Pin, KK-156 Conn. (540445-3)
26	1	140-0013-00	X1	7-Pin, Dual Row .1" Hdr. Conn.
27	0	Not Used	SW1	8Mhz Clock Oscillator (SW1: NS)
28	1	(See Pg. DR. 6 Table)	U12 U14 (ROM 0)	4MB ROM (U14: NS)
29	1	n/a	U1 (@ Pins 9 & 10)	100pF, Cap.



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 (Dot Matrix) Display and Plasma (Display) Controller Board. Power for these devices comes off the I/O Board on [J16-(4-8)].

+5V, +20V, +50V, +18V, & +12V 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.

LED	SUPPLY VOLTAGE
L2	+5
L200	+20V
L201	+50V
L202	+18V
L203	+12V

**** Note that the +50V & +20V power sources are turned off by the Interlock Switches when the Coin Door is OPEN.**

Reset Circuitry:

The I/O will reset in three (3) 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/Sound Board is holding the I/O in reset. If the **LED** is flashing this means that the watchdog is not being feed by the CPU/Sound 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 (Coil) Drivers, Flash Lamps, Lamp Matrix Drivers, Auxiliary Outputs and Flipper Outputs. A high voltage indicates that it is out of reset and normal operation can take place.

Address Decoding:

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

Solenoid (Coil) Drivers & Flash Lamps:

J8 & J9 are high side drivers for driving solenoids and other heavy loads. Each connector has its own buffer driving 8 drivers. **J8 & J9** consist of **MOSFET Drivers 20N10L** which can easily & safely be tested by clipping one end of a clip-lead to test point **FET TPL1** and then the other to the corresponding gate resistor **R1-R16** (see *Note 1*). This will apply 3.4V to the gate of the **MOSFET Transistor** thus switching it on. **J7 & J6** each are a bank of 8 low side driver for driving lamps or other lower current solenoids (coils). 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:

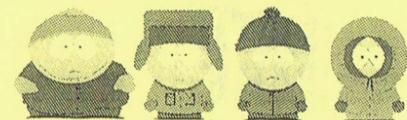
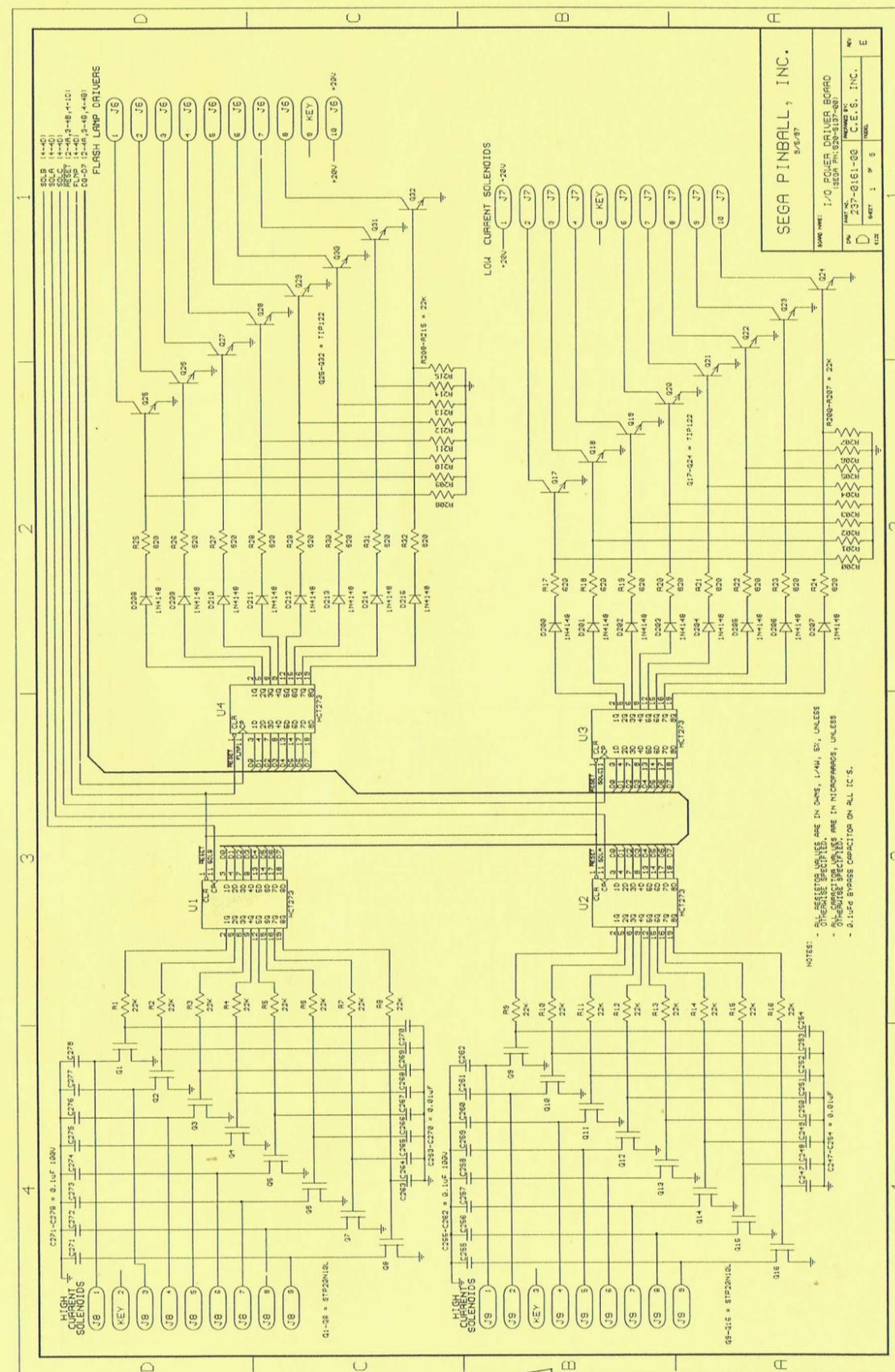
- J2-8 CMOS** Outputs sometimes used for a printer interface.
- J3-8 CMOS** Inputs general purpose inputs.

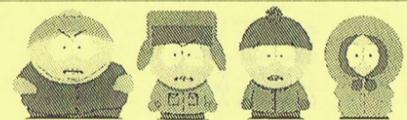
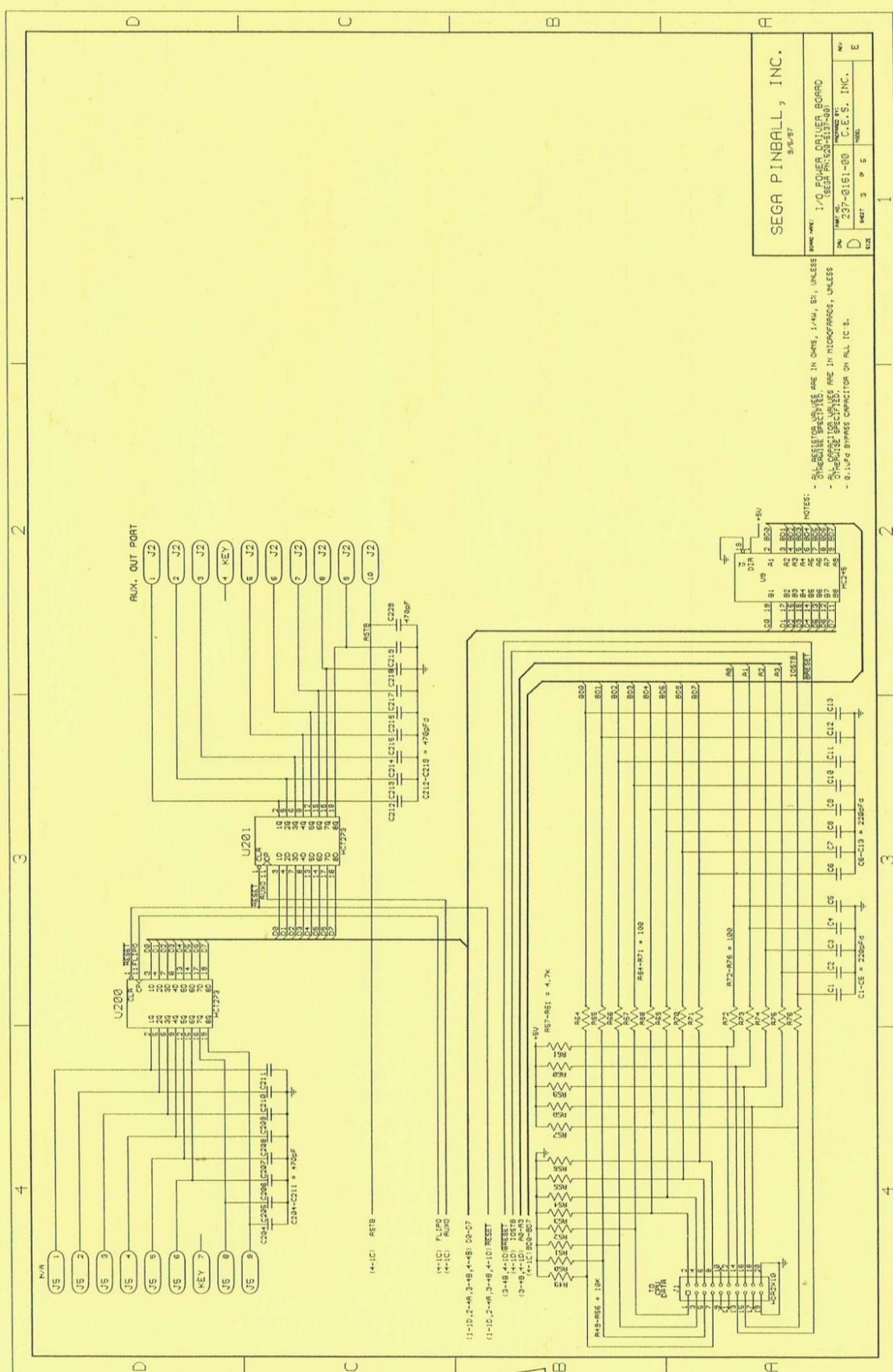
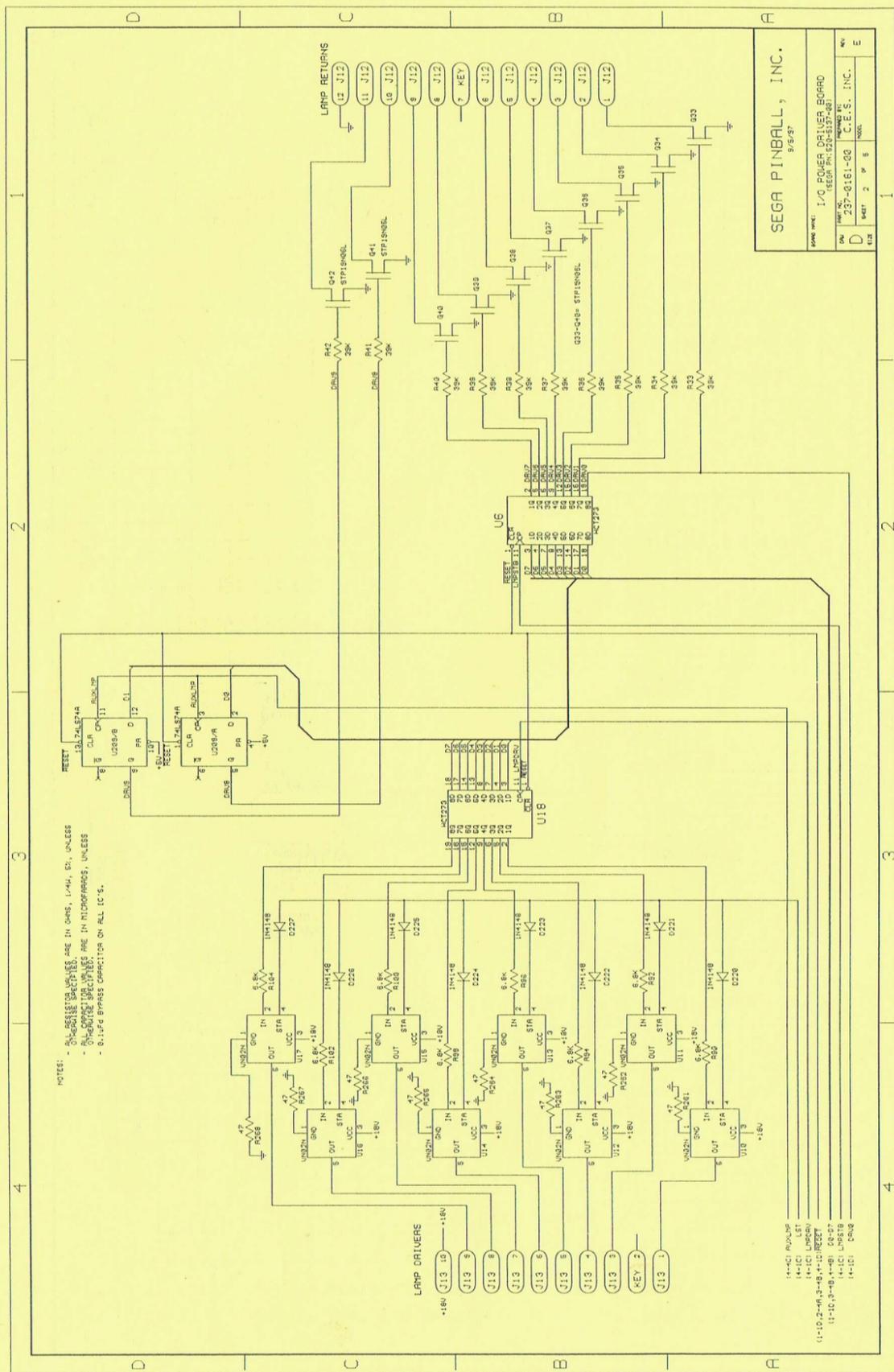
Lamp Matrix:

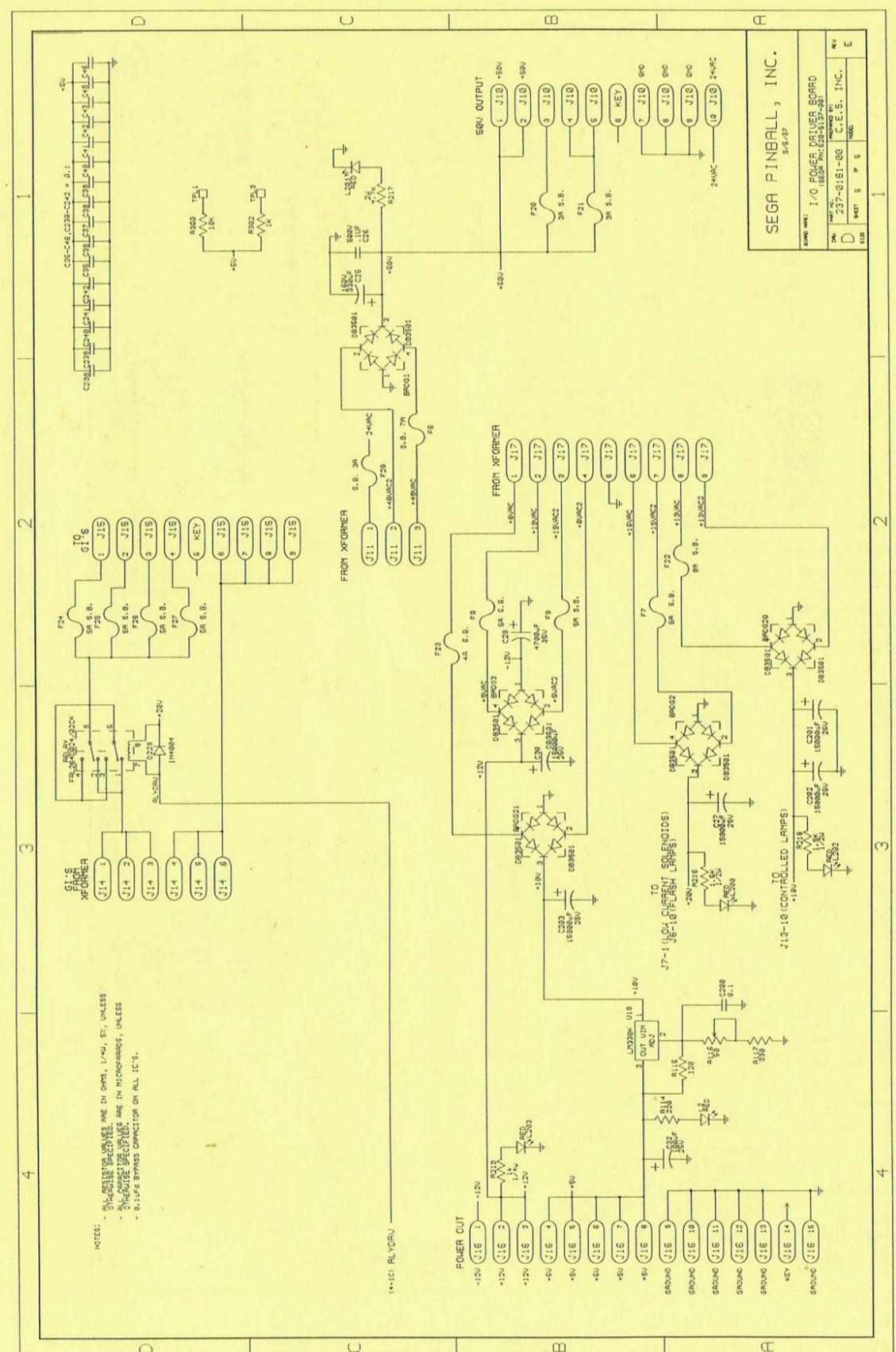
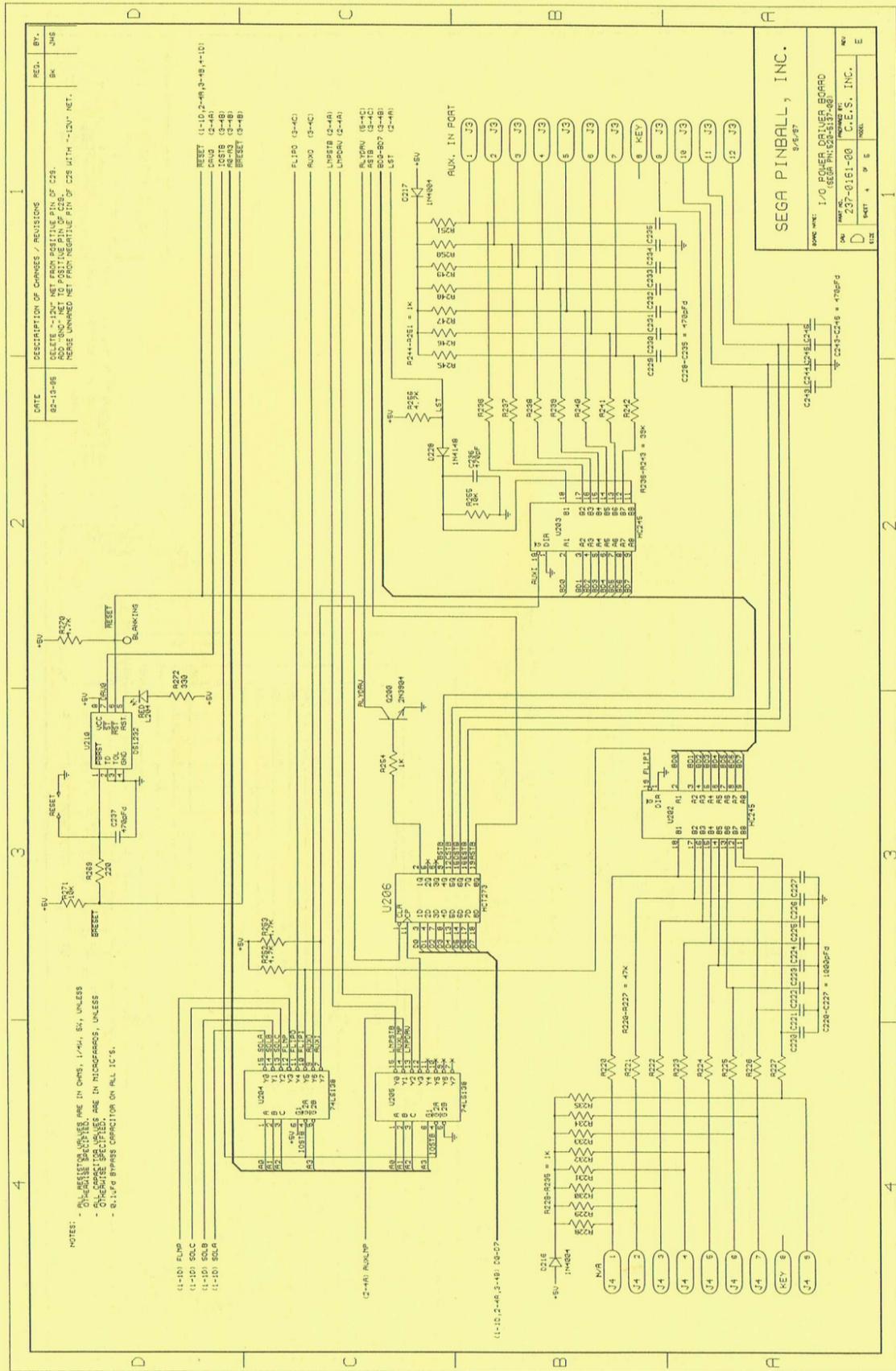
J12 has 10 low side drivers for the lamp strobes which consist of **19N06L MOSFETS**. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the I/O from resetting. **J13** has 8 high side drivers with each having a status indicator. All the status indicators are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

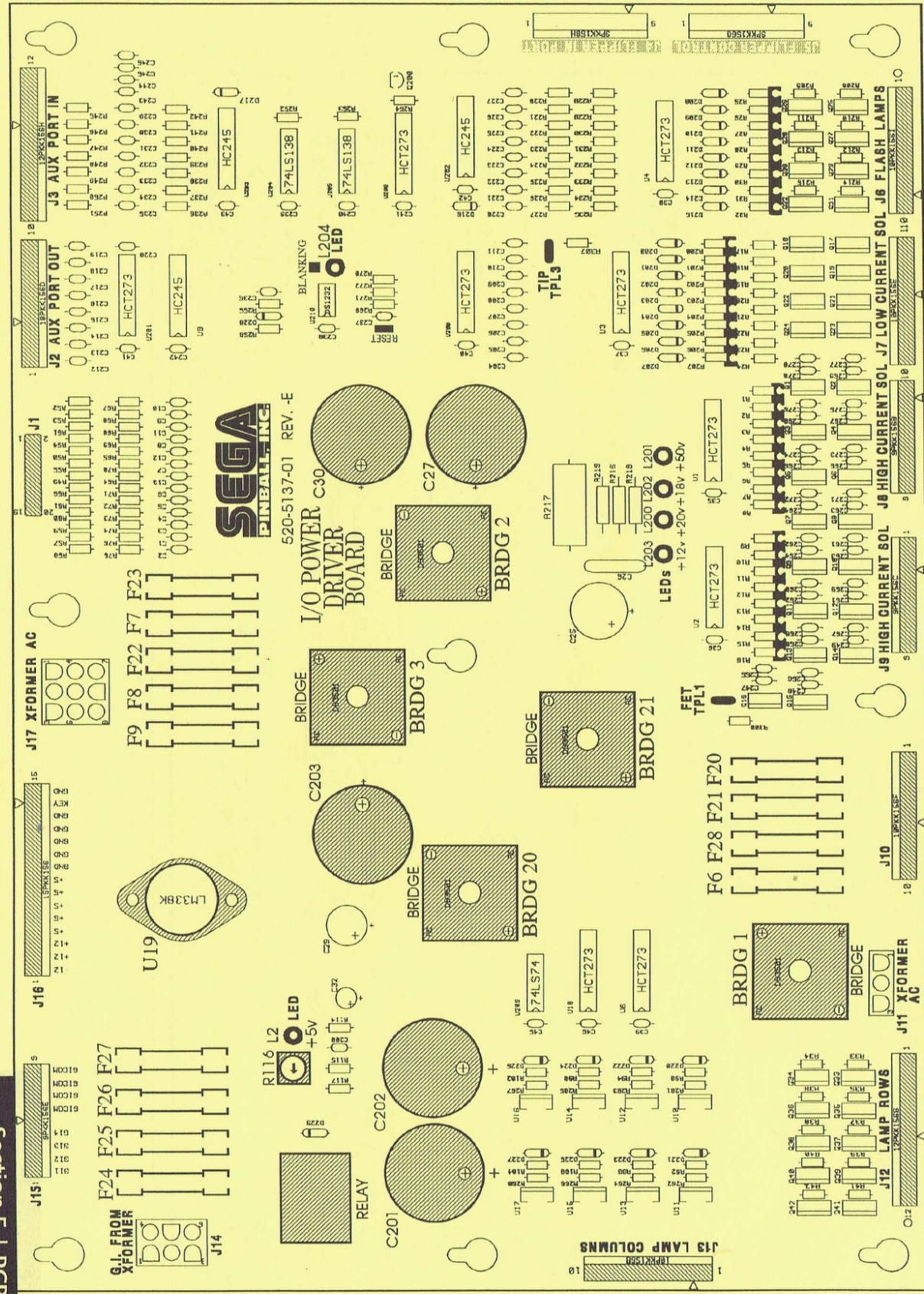
General Illumination (G.I.) Lights:

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.





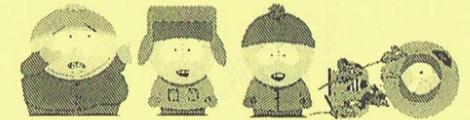




TEST POINTS:

- ← TIP TPL3
- ← BLANKING
- ← L204 LED
- ← RESET
- ← L201 LED+50v
- ← L202 LED+18v
- ← L200 LED+20v
- ← L203 LED+12v
- ← FET TPL1
- ← L2 LED +5v
- ← R116 POT

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
1	1	520-5137-01	I/O Power Driver Board	Complete PCB Assembly
1	16	125-5027-00	C255>C262, C271>C278	0.1uF, (104), 100v, Cap.
2	22	125-5028-00	C204>C219, C228>C237, C243>C246	470pF, (471), Axial Cap. (C204>C211: NS)
3	16	125-5029-00	C247>C254, C263>C270	0.01uF, (103), 100v Cap.
4	13	125-5030-00	C7 C8 C9 C10 C11 C12 C13 C1 C2 C3 C4 C5 C6	220pF, (221), Cap. (C220>C227: NS)
5	0	n/a	C220>C227	(C220>C227: NS)
6	17	125-5031-00	C35>C43, C45, C46, C200, C238>C242	0.1uF, (104), Cap.
7	16	110-0106-00	Q1>Q16	20N10L STP Transistor
8	32	121-5042-00	R1>R16, R200>R215	22K Ω 1/4W Res.
9	16	121-5003-00	R17>R32	620 Ω 1/4W Res.
10	17	121-5045-00	R33>R42, R236>R242	39K Ω 1/4W Res.
11	13	121-5007-00	R64>R76	100 Ω 1/4W Res.
12	8	121-5029-00	R90, R92, R94, R96, R98, R100, R102, R104	6.8K Ω 1/4W Res.
13	1	121-5030-00	R115	120 Ω 1/4W Res.
14	0	n/a	R220>R227	(R220>R227: NS)
15	9	121-5009-00	R228>R235, R245>R251, R254, R302	1K Ω 1/4W Res. (R228>R235: NS)
16	8	121-5032-00	R261>R268	47K Ω 1/4W Res.
17	2	121-5033-00	R114, R269	220 Ω 1/4W Res.
18	8	121-5021-00	R49, R57>R61, R252, R253, R256, R270	4.7K Ω 1/4W Res. (R252: NS)
19	11	121-5011-00	R50>R56, R255, R271, R300	10K Ω 1/4W Res.
20	2	121-5036-00	R117, R272	330 Ω 1/4W Res.
21	8	100-5012-00	U1>U4, U6, U18, U200, U201, U206	74HCT273 (U200: NS)
22	1	n/a	RESET	(RESET: NS)
23	1	121-5009-00	R219	1K Ω 1/4W Res.
24	2	121-5038-00	R216, R218	1.5K Ω 1/2W Res.
25	7	200-5000-01	F7>F9, F24>F27	5A 250v S.B. Fuse
26	1	200-5000-03	F6	7A 250v S.B. Fuse
27	1	200-5000-06	F23	4A 250v S.B. Fuse
28	1	200-5000-05	F22	8A 250v S.B. Fuse
29	3	200-5000-08	F20, F21, F28	3A 250v S.B. Fuse
30	1	045-5013-00	J15	9PKK156 (PIN 5=KEY)
31	1	045-5016-00	J16	15PKK156
32	1	100-5023-00	U210	DS1232
33	1	110-0069-00	Q200	2N3904 Transistor
34	1	125-5032-00	C32	100uF, 25v, Radial Lytic Cap.
35	1	045-5015-01	J1	20-Pin, 0.1 Dual Row Header
36	1	100-0338-00	U202, U203	74HC245 (U202: NS)
37	10	110-0088-00	Q33>Q42	19N06L STP Transistor
38	6	165-5099-00	L2, L200>L204	LED T1-3/4 DIFFUSER LED
39	1	045-5014-01	J2	10PKK156 (PIN 4=KEY)
40	1	121-5039-00	R116	50 Ω Pot
41	16	110-0067-00	Q17>Q32	TIP-122
42	1	125-5033-00	C25	100uF, 150v, Radial Lytic Cap.
43	1	110-0058-00	U9	74LS245
44	1	125-5034-00	C29	4700uF, 35v, Radial Lytic Cap.
45	1	190-5002-00	RELAY	FRL264D024/02CK Relay
46	0	n/a	J5	(J5: NS)
47	1	100-0037-00	U209	74LS74
48	0	n/a	J4	(J4: NS)
49	2	100-0148-00	U204, U205	74LS138
50	1	125-5035-00	C26	1uF, 500v, Ceramic Disk Cap.
51	1	100-0356-00	U19	LM338K
52	5	124-5000-00	BRDG1, BRDG2, BRDG3, BRDG20, BRDG21	DB3501
53	5	125-5036-00	C27, C30, C201>C203	15000uF, 25v, Radial Lytic Cap.
54	25	112-0054-00	D200>D215, D220>D227	1N4148, Diode
55	2	112-5003-00	D216, D217, D229	1N4004, Diode (D216: NS)
56	2	n/a	TPL1, TPL3	Test Point Wire (24ga.) Loops
57	1	045-5014-01	J7	10PKK156 (PIN 5=KEY)
58	1	045-5014-01	J6	10PKK156 (PIN 9=KEY)
59	8	110-0089-00	U10>U17	VN02N
60	1	045-0014-03	J11	10-84-4030 (3 PIN MOLEX)
61	1	045-5015-00	J12	12PKK156 (PIN 7=KEY)
62	1	045-0014-09	J17	10-84-4090 (9 PIN MOLEX)
63	1	n/a	BLANKING	Test Point - Do Not Stuff
64	1	121-5050-00	R217	4.7K Ω 2W Res. (SANDBAR)
65	1	045-5014-01	J13	10PKK156 (PIN 2=KEY)
66	1	045-0014-06	J14	10-84-4060 (6 PIN MOLEX)
67	1	045-5014-01	J10	10PKK156 (PIN 6=KEY)
68	1	045-5015-00	J3	12PKK156 (PIN 8=KEY)
69	1	045-5013-00	J9	9PKK156 (PIN 3=KEY)
70	1	045-5013-00	J8	9PKK156 (PIN 2=KEY)
71	26	205-0004-00	F6>F9, F20>F28	Fuse Clips
72	1	n/a	U19	Heatsink (5v Reg.)



CPU Section:

The CPU is a **68B09E (U209)** with up to 8 MBytes of CPU Code Space (**U210**). The CPU code is bank selected by the use of **U211** and each bank consists of 16 KBytes. 8 KBytes 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/Sound 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 two (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 fed through **CN1-15** and is used to notify the I/O that a valid address is being sent.

Switches:

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

Plasma Interface:

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

Sound Section:

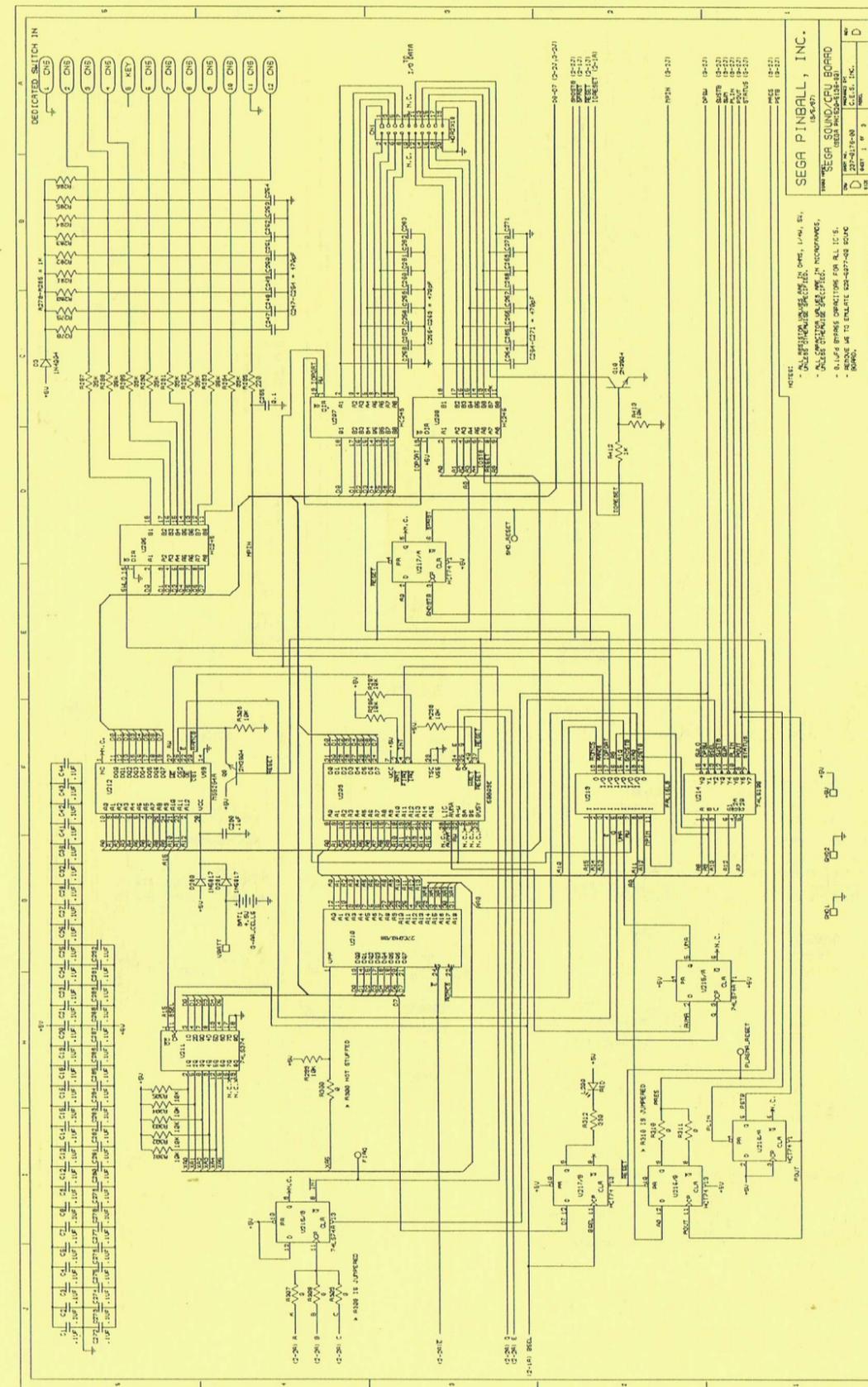
The audio section consists of a **BSMT SOUND CHIP U9** Sound (Voice) EPROMs (**U17 U21 U36 U37**) **68B09E U6** and Sound Code EPROM **U7**. The **BSMT** latches sound EPROM addresses in **U13 & U12** for output to the Sound EPROMs. Sound Data from the EPROMs is read through **U19** to the **BSMT**. 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**.

W6 Jumper - This jumper must be installed for games that use **8MBSound** EPROMs (**U17 U21 U36 U37**). For games which use **4MB** Sound EPROMs this jumper is not installed but will operate on boards with **W6** installed.

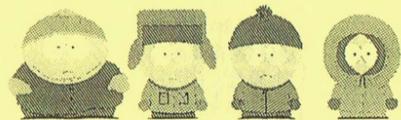
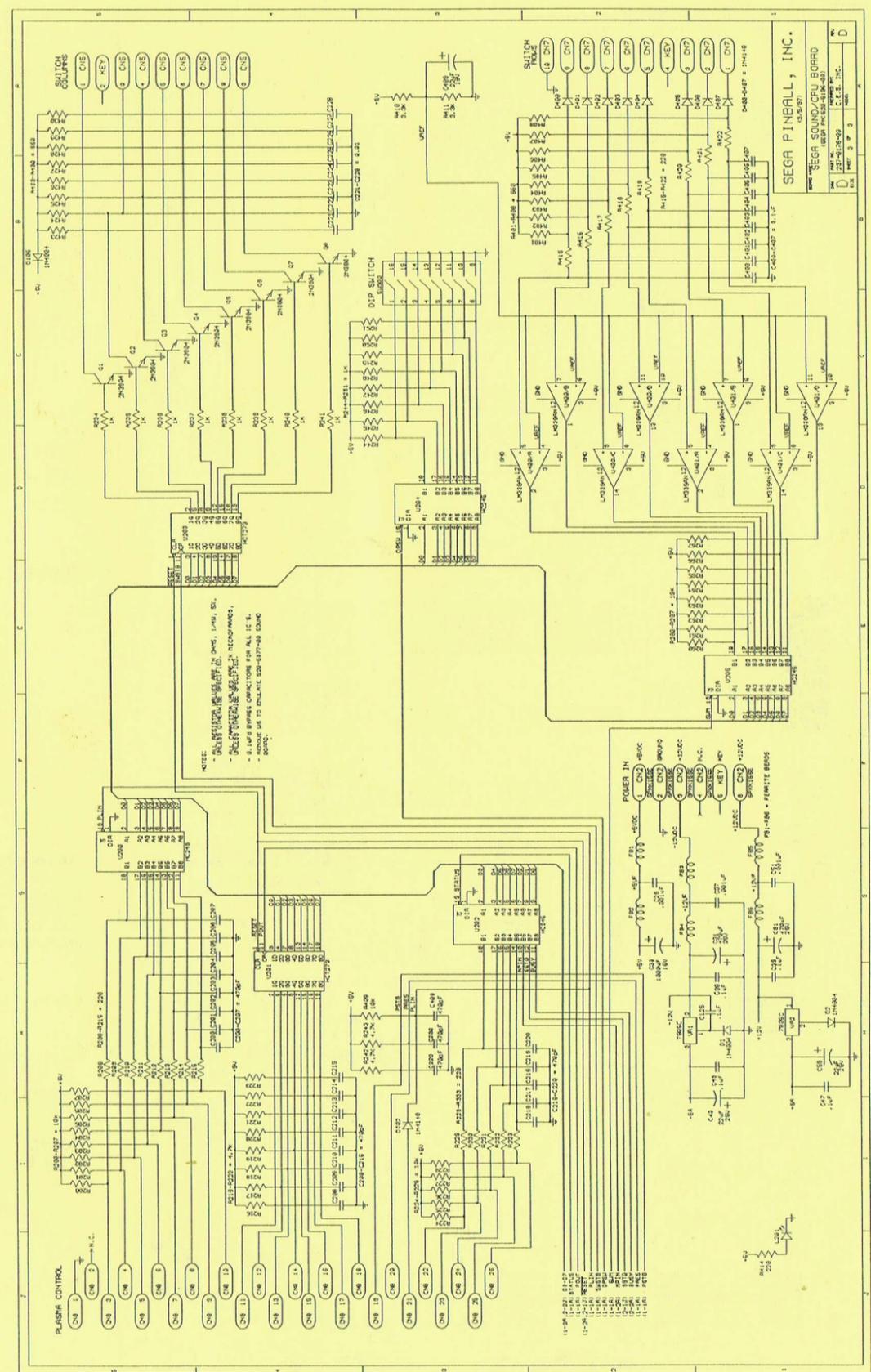
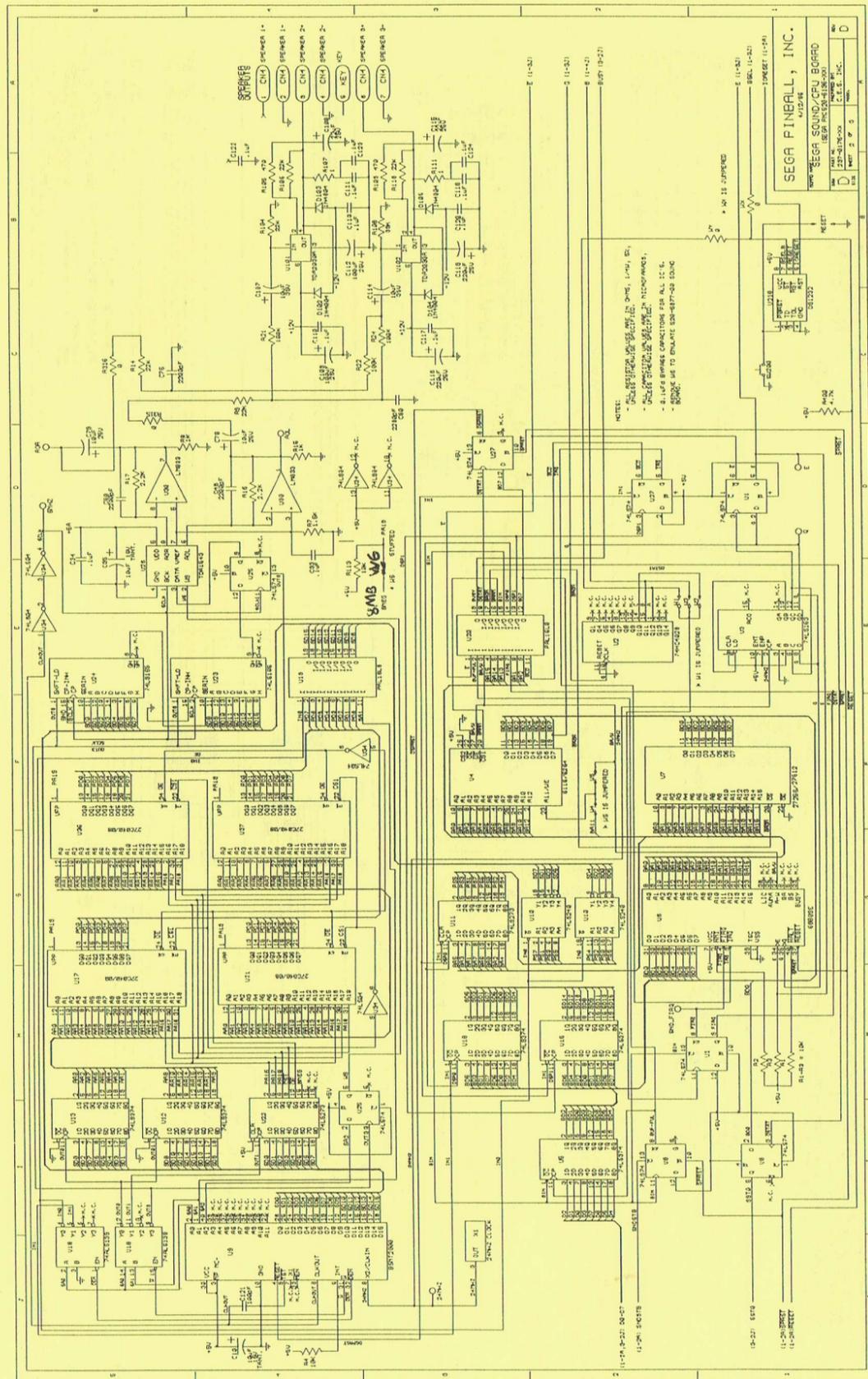


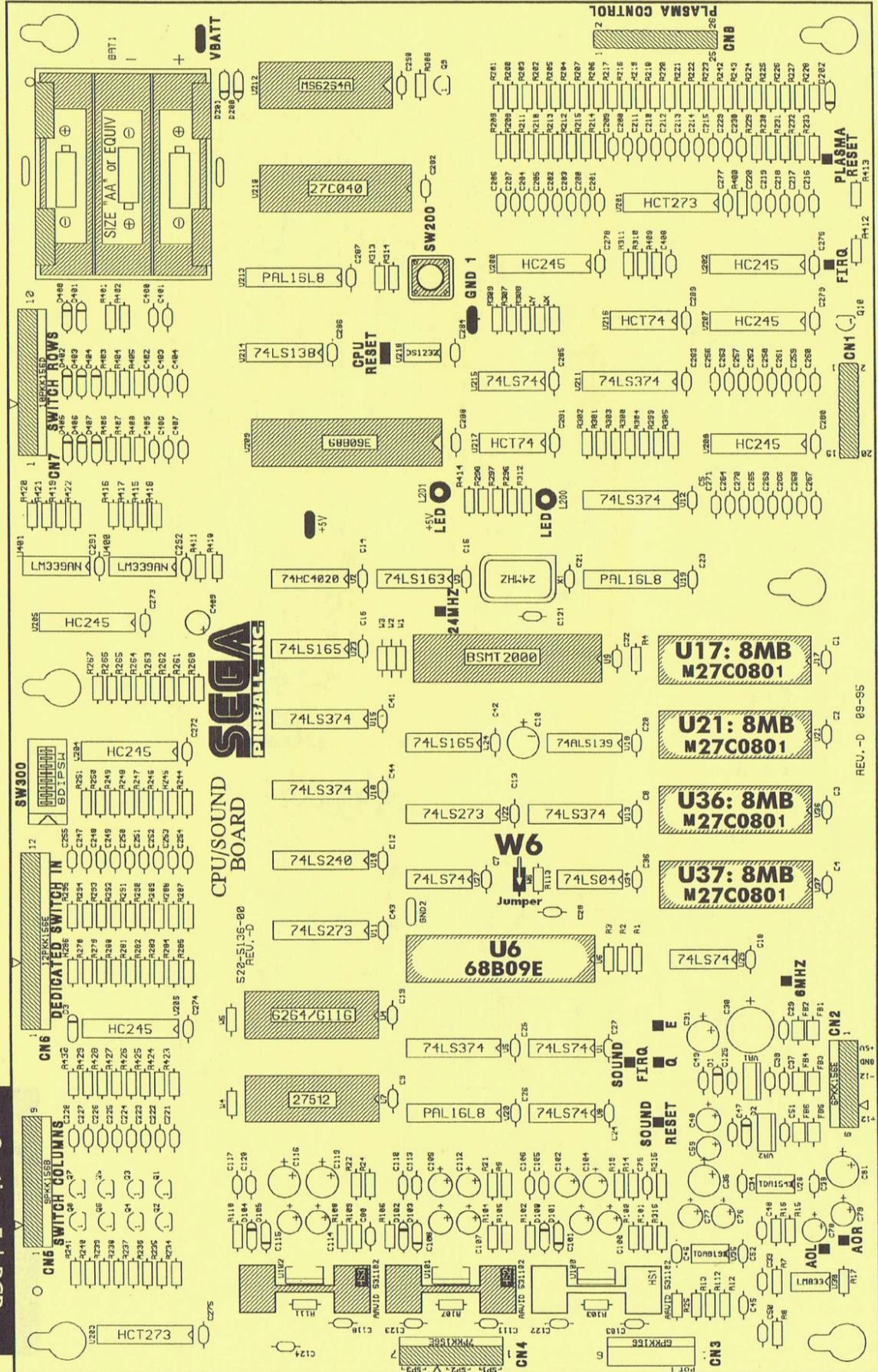
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Section 5 | PCBs

Section 5 | PCBs

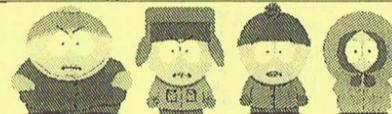




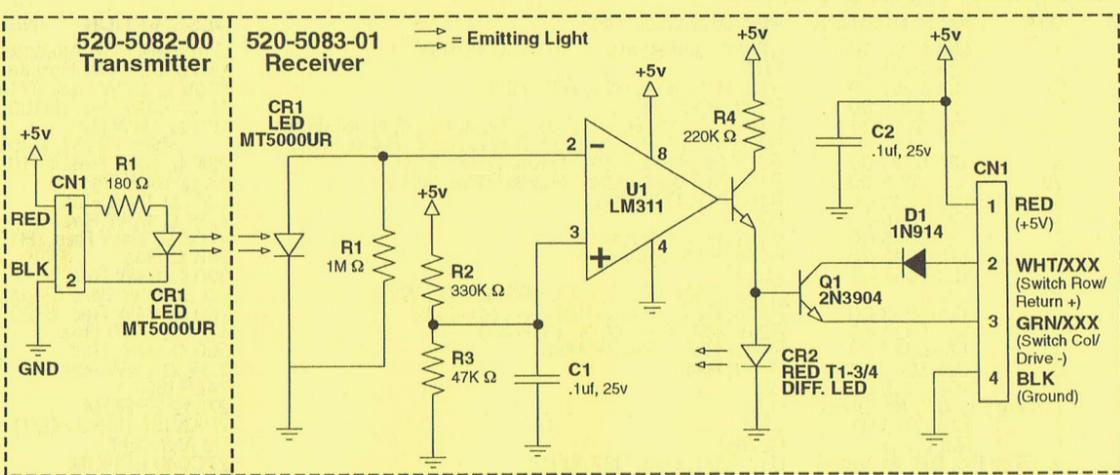


- TEST POINTS:
- VBATT
 - PLASMA RESET
 - FIRQ
 - SW200
 - GROUND 1
 - CPU RESET
 - L201 LED+5v
 - L200 LED
 - +5v
 - 24 Mhz
 - W6 requires a Jumper If using 8MB EPROMs in U17, U21, U36 and/or U37
 - 6 Mhz
 - E
 - SOUND FIRQ
 - Q
 - SOUND RESET
 - AOR
 - AOL

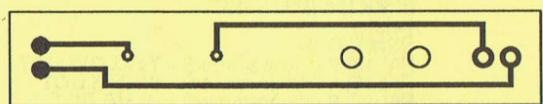
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
1	1	520-5136-16	CPU/Sound Board Mono (FCC FEB98)	Complete PCB Assembly
2	1	124-5001-00	VR2	LM7805CT +5v Regulator
3	5	121-5051-00	R12, R13, R19, R21, R22, R24	100K Ω 1/4W Res. (R19: NS)
4	38	121-5009-00	R103, R107, R111	1K Ω 1/4W Res. (R103: NS)
5	5	121-5023-00	R1>R4, R113, R200>R207, R224>R228, R244>R251, R260>R267, R296>R299, R301>R306, R409, R413	10K Ω 1/4W Res. (R200>R207, R409, R413: NS)
6	20	121-5009-00	R9, R14, R100, R102, R104, R106, R110	22K Ω 1/4W Res. (R100, R102: NS)
7	4	121-5043-00	R15, R8, R234>R241, R278>R286, R412	1K Ω 1/4W Res.
8	1	121-5018-00	R7	2.2K Ω 1/4W Res.
9	2	121-5046-00	R101, R105, R109	1.5K Ω 1/4W Res.
10	9	121-5045-00	R108, R287>R294	470K Ω 1/4W Res. (R101: NS)
11	1	121-5036-00	R312	39K Ω Res.
12	12	n/a	R300, R308>R311, R313>R316, WX, WY	330 Ω 1/4W Res.
13	15	121-5033-00	R208>R215, R229>R233, R414>R422	0 Ω Jumper Wire (24ga.)
14	11	121-5021-00	R216>R223, R242, R243, R400	220 Ω 1/4W Res. (R208>R215: NS)
15	16	121-5047-00	R401>R408, R423>R430	4.7K Ω 1/4W Res.
16	2	121-5048-00	R410, R411	560 Ω 1/4W Res.
17	1	100-0049-00	U3	3.3K Ω 1/4W Res.
18	1	(See Pg. DR. Table)	U7	74LS163
19	1	045-5015-07	CN4	27512 EPROM
20	1	Not Used	RESET	7PKK156 (PIN5=KEY)
21	5	(See Pg. DR. Table)	U17, U21, U36, U37, U210	Do Not Stuff
22	2	100-5008-00	U23, U24	27C040 EPROM
23	4	125-5017-00	C76>C79	74LS165
24	4	125-5020-00	C40, C59, C101, C108, C115	10uF, 25v, Radial Lytic Cap.
25	2	125-5017-00	C100, C107, C114	22uF, 25v, Radial Lytic Cap. (C101: NS)
26	2	125-5015-00	C102, C104, C109, C112	10uF, 35v, Radial Lytic Cap. (C100: NS)
27	1	125-5014-00	C409	100uF, 25v, Rad. Ltc. Cap. (C102, C104: NS)
28	1	100-5016-00	U35	TDA1899
29	1	125-5037-00	C30	1000uF, 16v, Radial Lytic Cap.
30	1	100-0027-00	U34	74LS04
31	1	100-0043-00	U18	74ALS139
32	6	100-0064-00	U5, U12, U13, U15, U16, U211	74LS374
33	1	100-0249-00	U2	74HC4020
34	1	100-0149-00	U10	74LS240
35	6	n/a	W1>W6 (Jumper required @ W6 if using 8MB EPROMs)	0 Ω Jumper Wire (24ga.)
36	2	125-5019-00	C31, C81	470uF, 25v, Radial Lytic Cap.
37	2	125-5017-00	C10, C35	10uF, 16v, Radial Tant. Cap.
38	2	125-5012-00	C116, C119	220uF, 25v, Radial Lytic Cap.
39	1	045-5015-06	CN2	6PKK156 (PIN 5=KEY)
40	1	140-0011-00	X1	24Mhz
41	1	105-0116-00	U9	BSMT2000
42a	1	965-0136-00	U19 - YELLOW DOT	PAL16L8 (Programmed) - YELLOW DOT
42b	1	965-0137-00	U20 - WHITE DOT	PAL16L8 (Programmed) - WHITE DOT
42c	1	965-6504-00	U213 - BLUE DOT	PAL16L8 (Programmed) - BLUE DOT
43	5	100-0037-00	U1, U8, U25, U27, U215	74LS74
44	3	125-5043-00	C29, C37, C51	0.001uF, (102), Cap.
45	79	125-5031-00	C1>C5, C7>C9, C12>C16, C18>C21, C23>C26, C28, C32>C34, C36, C38, C39, C41>C47, C49, C52, C102, C103, C105, C106, C110, C111, C113, C117, C118, C120, C122>C125, C255, C272>C292, C400>C407, C121	0.1uF, (104), Axial Cer. Cap. (C102, C103, C105, C106: NS)
46	1	125-5038-00	C121	100pF, (101), Cap.
47	4	125-5039-00	C48, C50, C75, C80	0.0022uF, (222), Cap.
48	39	125-5028-00	C200>C220, C229, C230, C247>C254, C256>C271	470pF, (471), Cer. Cap. (C200>C207: NS)
49	8	125-5029-00	C221>C228, C408	0.01uF, (103), 100v Cap. (C408: NS)
50	1	045-5015-06	CN3	6PKK156
51	1	100-0375-00	U30	LM833
52	2	100-0022-00	U22, U11	74LS273
53	7	112-5003-00	D1>D3, D100>D105	1N4004, Diode (D100, D101: NS)
54	2	112-5008-00	D200, D201	1N5817, Diode
55	8	112-0054-00	D202, D400>D407	1N4148, Diode (D202: NS)
56	1	124-5002-00	VR1	LM7905CT -5v Regulator
57	2	100-5016-20	U100>U102	TDA2030V (U100: NS)
58	1	100-5018-00	U26	TDA1543
59	1	n/a	SW200	B3F4000
60	1	165-5099-00	L200	LED T1-3/4 DIFFUSER LED
61	1	165-5099-00	L201	LED T1-3/4 DIFFUSER LED
62	2	100-5015-00	U216, U217	HCT74
63	1	100-0148-00	U214	74LS138
64	1	105-0046-00	U12	MS6264A
65	1	100-0189-01	U6, U209	68B09E
66	1	545-5685-00	BAT1 BATTERY HOLDER	3-AA CELLS 4.5v
67	1	045-5015-01	CN1	20-Pin, 0.1 HEADER
68	10	n/a	6MHZ AOR Q AOL 24MHZ	Test Points - NS
69	10	110-0069-00	Q1>Q10	2N3904, Transistor
70	1	045-5013-00	CN5	9PKK156 (PIN 2=KEY)
71	2	100-5012-00	U201, U203	74HCT273
72	6	100-0338-00	U200, U202, U204>U208	74HCT245 (U200: NS)
73	1	100-5023-00	U218	DS1232
74	1	045-5015-26	CN8	26-Pin, 0.1 HEADER
75	1	045-5014-01	CN7	10PKK156 (PIN 4=KEY)
76	4	n/a	VBATT +5V GND1, GND2	Test Point Wire (24ga.) Loops
77	1	045-5015-00	CN6	12PKK156 (PIN 5=KEY)
78	1	181-5002-00	SW300	8-Pin, Dip Switch
79	2	100-0377-00	U400, U401	LM339AN
80	1	105-0052-05	U4	6116 RAM
81	3	535-5000-10	U100>U102	AAVID 531102
82	3	077-5209-00	U6, U9, U209	40-Pin, IC Socket
83	5	077-5217-00	U17, U21, U36, U37, U210	32-Pin, IC Socket
84	3	077-5208-00	U4, U7, U12	28-Pin, IC Dip Socket
85	1	n/a	U1 (@ Pins 5 & 6)	100pF, Cap.



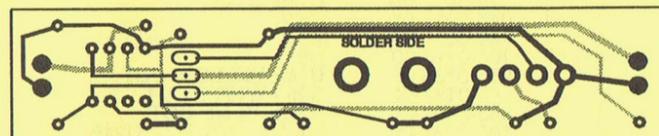
The light falling on LED (CR1) generates a voltage which is applied to the input (Pin-2) of the LM311 Comparator (U1). R1 bleeds off excess charge. At about a volt input from LED (CR1) the Comparator (U1) trips & drives either Q1 (during switch line strobcs) or the indicator LED (CR2) (in between strobcs). If a switch line is being strobed, the emitter of Q1 drops to the saturation voltage of the Switch Line Driver, about .7 volts. This plus the .7 volt drop on the base give a 1v forward bias voltage to Q1, which is lower than the 1.7v drop on LED (CR2) so the current flows through the Transistor during strobcs. This drives Q1 on and makes the switch. If the strobe line is high, then the 1.7v path through LED (CR2) is lower than Q1's bias voltage so current flows through LED (CR2) and the indicator lights. D1 prevents reverse bleed, R2 and R3 form the voltage divider for the trip point, R4 is a current limiter for both Q1 and CR2, C1 and C2 are general noise-filter caps.



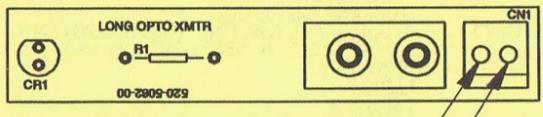
Playfield Switch OPTO "Long-Hop" Boards Component Layout & Parts



520-5082-00 (TRANS) Solder Side (Green)



520-5083-01 (REC) Solder Side (Green)



Component Side (Beige) Pin-1 RED (+5v) Pin-2 BLK (GROUND) CN1



Component Side (Beige) Pin-3 GRN/XXX (Sw. Drive « - ») Pin-2 WHT/XXX (Sw. Return « + ») Pin-1 RED (+5v) Pin-4 BLK (GROUND) CN1

Note: In this game, this Combo OPTO Board is used as a Playfield Detection Switch for Kenny & the below trough. See the Switch Matrix Grid (Pg. 84). 1 Pair is used for Switch 42, Kenny OPTO (GRN-BLU, WHT-RED).

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
A	1	520-5083-01	OPTO Receiver Board	Complete PCB Assembly
1	1	165-5100-00	CR1	LED MT5000UR (Ultra Bright Red)
2	1	165-5099-00	CR2	LED T1-3/4 RED DIFFUSER
3	1	112-5014-00	D1	1N914, Diode
4	1	121-5013-00	R1	1M Ω 1/4W Res., 5%
5	1	121-5037-00	R2	330K Ω 1/4W Res., 5%
6	1	121-5032-00	R3	47K Ω 1/4W Res., 5%
7	1	121-5014-00	R4	220 Ω 1/4W Res., 5%
8	2	125-5023-00	C1, C2	.1uF, 25v, Axial Ceramic Cap.
9	1	100-5025-00	U1	LM311
10	1	110-0069-00	Q1	2N3904, Transistor
11	1	045-5200-04	CN1	4X1, .156" Locking Straight Hdr. Conn. (Molex 50-84-1040)
12	1	520-5082-00	OPTO Transmitter Board	Complete PCB Assembly
13	1	165-5100-00	CR1	LED MT5000UR (Ultra Bright Red)
14	1	121-5066-00	R1	180 Ω 1/4W Res.
15	1	045-5206-02	CN1	2X1, .156" Locking Straight Hdr. Conn. (Molex 50-84-1020)

Appendix

Appendixes A through I

Appendix Table of Contents

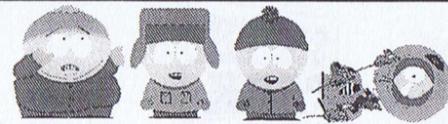
- Appendix A, Pinball Game Firmware Table112-113
...describes the EPROM with its chip size, the Sega Pinball Inc. (SPI) Part N^o, version (if applicable), and CPU Board & CPU/Sound Board Pin location(s).
- Appendix B, Semi-Conductors / Integrated Circuits / Relay Cross-Reference Table.....114
...describes diodes and transistors with Source N^o, SPI Part N^o, NTE N^o, ECG N^o, Radio Shack N^o and RCA Part N^o (If applicable).
- Appendix C, Game Mfg. Date, Manual Part N^o and CPU Jumper Table115
...provides the Game Manufactured Date and Manual Part N^o, the CPU version, the EPROM Position (Jumpers Installed and Removed for Games Laser War through Batman Forever (1-28) only)
- Appendix D, Board Type Table116-117
...provides Board Part N^os for Games Laser War through Batman Forever (Flipper, Sound, Power Supply, Dot Matrix Display, Display Controller & OPTOs) and the White Star Board System, Games Apollo 13 through current (Flipper, I/O Power Driver, CPU/Sound, Display Power Supply, Dot Matrix Display, Display Controller & OPTOs)
- Appendix E, Generic Coil Cross-Reference Guide and Flipper Coil Table.....118-119
...provides the Coils used with Part N^o and Gauge-Turns (of the coil).
- Appendix F, Motor Specification Table 120-121
...provides all the Motor Function, Specifications and Part N^o for Games Laser War through current.
- Appendix G, Part Number Prefix Classification Codes 122
...explains how our Part Numbers are developed to help sort parts easier.
- Appendix H, Playfield Inserts (Plastic Light Covers)..... 123
...gives a pictorial view with the name and Part N^o of all the inserts used (also gives the Color Code Chart).
- Appendix I, Stand-Up Targets (Happ Modular & Regular)..... 124
...gives a pictorial view with the name and Part N^o of all the Single Stand-Up Targets used (also gives the Color Code Chart).
- Glossary of Terms 125
...gives definitions or explanations of some pinball terms and acronyms.
- Parts Order Checklist Notes..... 126
...keep track of your parts ordered through your distributor for this game.



APPENDIX A Pinball Game Firmware Table

EPROM	Chip Size	Program Part N°	USA Ver.	Bd. Loc.	Raw Part N°
Laser War					
CPU	(256K)	965-0004-00		C5	960-5007-00
Sound (01)	(256K)	965-0005-00		J6	960-5007-00
Sound (04)	(256K)	965-0006-00		J7	960-5007-00
		-OR-			
Sound	(256K)	965-0008-00		7F	960-5007-00
Sound 1	(512K)	965-0009-00		6F	960-7001-02
Sound 2	(512K)	965-0010-00		4F	960-7001-02
Secret Service					
CPU	(256K)	965-0011-00	A-6	B5	960-5007-00
CPU	(256K)	965-0012-00	A-6	C5	960-5007-00
Voice 1	(512K)	965-0014-00		6F	960-7001-02
Voice 2	(512K)	965-0015-00		4F	960-7001-02
Sound	(256K)	965-0013-00		7F	960-5007-00
Torpedo Alley					
CPU	(256K)	965-0016-00	A02-1	B5	960-5007-00
CPU	(256K)	965-0017-00	A02-1	C5	960-5007-00
Voice 1	(512K)	965-0019-00		6F	960-7001-02
Voice 2	(512K)	965-0020-00		4F	960-7001-02
Sound	(256K)	965-0018-00		7F	960-5007-00
Time Machine					
CPU	(128K)	965-0021-00	A02-3	B5	960-5007-00
CPU	(256K)	965-0022-00	A02-3	C5	960-5007-00
Voice 1	(512K)	965-0024-00		6F	960-7001-02
Voice 2	(512K)	965-0025-00		4F	960-7001-02
Sound	(256K)	965-0023-00		7F	960-5007-00
Playboy 35th Anniversary					
CPU	(256K)	965-0046-00	A02-3	B5	960-5007-00
CPU	(256K)	965-0047-00	A02-3	C5	960-5007-00
Voice 1	(512K)	965-0049-00		6F	960-7001-02
Voice 2	(512K)	965-0050-00		4F	960-7001-02
Sound	(256K)	965-0048-00		7F	960-5007-00
ABC Monday Night Football					
CPU	(256K)	965-0031-00	A02-7	B5	960-5007-00
CPU	(256K)	965-0032-00	A02-7	C5	960-5007-00
Voice 1	(512K)	965-0034-00		6F	960-7001-02
Voice 2	(512K)	965-0035-00		4F	960-7001-02
Sound	(256K)	965-0033-00		7F	960-5007-00
Robocop					
CPU	(256K)	965-0036-00	A03-4	B5	960-5007-00
CPU	(256K)	965-0037-00	A03-4	C5	960-5007-00
Voice 1	(512K)	965-0039-00		6F	960-7001-02
Voice 2	(512K)	965-0040-00		4F	960-7001-02
Sound	(256K)	965-0038-00		7F	960-5007-00
Phantom of the Opera					
CPU	(256K)	965-0026-00	A03-2	B5	960-5007-00
CPU	(256K)	965-0027-00	A03-2	C5	960-5007-00
Voice 1	(512K)	965-0029-00		6F	960-7001-02
Voice 2	(512K)	965-0030-00		4F	960-7001-02
Sound	(256K)	965-0028-00		7F	960-5007-00
Back to the Future					
CPU	(256K)	965-0041-00	A02-0	B5	960-5007-00
CPU	(256K)	965-0042-00	A02-0	C5	960-5007-00
Voice 1	(512K)	965-0044-00		6F	960-7001-02
Voice 2	(512K)	965-0045-00		4F	960-7001-02
Sound	(256K)	965-0043-00		7F	960-5007-00
The Simpsons					
CPU	(256K)	965-0051-00	A02-7	B5	960-5007-00
CPU	(256K)	965-0052-00	A02-7	C5	960-5007-00
Voice 1	(512K)	965-0054-00		6F	960-7001-02
Voice 2	(512K)	965-0055-00		4F	960-7001-02
Sound	(256K)	965-0053-00		7F	960-5007-00
Checkpoint					
CPU	(256K)	965-0056-00	A1-7	B5	960-5007-00
CPU	(256K)	965-0134-00	A1-7	C5	960-5007-00
Voice 1	(1M)	965-0057-00		F7	960-5009-00
Voice 2	(1M)	965-0058-00		F5	960-5009-00
Sound	(256K)	965-0059-00		F4	960-5007-00
Display	(512K)	965-0060-00	CP80	U8	960-7001-02
Teenage Mutant Ninja Turtles					
CPU	(256K)	965-0061-00	A1.04	B5	960-5007-00
CPU	(256K)	965-0062-00	A1.04	C5	960-5007-00
Voice 1	(1M)	965-0063-00		F5/6	960-5009-00
Voice 2	(1M)	965-0064-00		F4/5	960-5009-00
Sound	(256K)	965-0065-00		F7	960-5007-00
Display	(512K)	965-0066-00	A1.04	U8	960-7001-02
Batman					
CPU	(128K)	965-0067-00	A1.06	B5	960-5006-00
CPU	(256K)	965-0135-00	A1.06	C5	960-5007-00
Voice 1	(2M)	965-0068-00		U17	960-5010-00
Voice 2	(1M)	965-0069-00		U21	960-5009-00
Sound	(256K)	965-0070-00		U7	960-5007-00
Display	(1M)	965-0071-00	A1.06	U8	960-5009-00
Star Trek 25th Anniversary					
CPU	(512K)	965-0072-00	A2.01	C5	960-7001-02
Voice 1	(2M)	965-0073-00		U17	960-5010-00
Voice 2	(2M)	965-0074-00		U21	960-5010-00
Sound	(256K)	965-0075-00		U7	960-5007-00
Display	(1M)	965-0076-00	A1.09	U8	960-5009-00
Hook					
CPU	(512K)	965-0077-00	A4.08	C5	960-7001-02
Voice 1	(2M)	965-0078-00		U17	960-5010-00
Voice 2	(2M)	965-0079-00		U21	960-5010-00
Sound	(256K)	965-0080-00		U7	960-5007-00
Display	(1M)	965-0081-00	A4.01	U8	960-5009-00

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



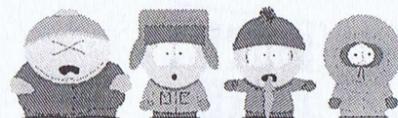
APPENDIX A Pinball Game Firmware (for White Star Board System) Table

ROM	Chip Size	Program Part N°	USA Ver. I / Sum	Bd. Loc.	Raw Part N°
Apollo 13					
CPU / Sound Board: 520-5136-00 (Stereo)					
Game ROM	(1M)	965-0208-00	A5.01 \$09FF	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 Bd.: 520-5055-01					
Display	(4M)	965-0213-00	A5.00 \$B92B	ROM 0	960-5015-01
Golden Eye					
CPU / Sound Board: 520-5136-00 (Stereo)					
Game ROM	(1M)	965-0214-42	A4.04 \$3FFF	U210	960-5009-00
Voice 1	(4M)	965-0215-42		U17	n/a (masked)
Voice 2	(4M)	965-0216-42		U21	n/a (masked)
Sound	(512K)	965-0217-42		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0218-42	A4.00 \$E6ED	ROM 0	960-5015-01
Twister					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0219-41	A4.05 \$E9FF	U210	960-5009-00
Voice 1	(4M)	965-0220-41		U17	960-5015-01
Voice 2	(4M)	965-0223-41		U21	960-5015-01
Sound	(512K)	965-0221-41		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0222-41	A4.01 \$FD01	ROM 0	960-5015-01
ID4: Independence Day					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0224-45	A2.02 \$9CFF	U210	960-5009-00
Voice 1	(4M)	965-0225-45		U17	960-5015-01
Voice 2	(4M)	965-0226-45		U21	960-5015-01
Sound	(512K)	965-0227-45		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0228-45	A2.00 \$ABF7	ROM 0	960-5015-01
Space Jam					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0229-43	A3.00 \$E6FF	U210	960-5009-00
Voice 1	(4M)	965-0230-43		U17	960-5015-01
Voice 2	(4M)	965-0231-43		U21	960-5015-01
Voice 3	(4M)	965-0232-43		U36	960-5015-01
Sound	(512K)	965-0233-43		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0234-43	A3.00 \$0057	ROM 0	960-5015-01
The Star Wars Trilogy - Special Edition (S.E.)					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0235-56	A4.03 \$5EFF	U210	960-5009-00
Voice 1	(4M)	965-0236-56		U17	960-5015-01
Voice 2	(4M)	965-0237-56		U21	960-5015-01
Sound	(512K)	965-0238-56		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0239-56	A4.00 \$8817	ROM 0	960-5015-01
The Lost World: Jurassic Park					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0240-53	A2.01 \$C2FF	U210	960-5009-00
Voice 1	(4M)	965-0241-53		U17	960-5015-01
Voice 2	(4M)	965-0242-53		U21	960-5015-01
Sound	(512K)	965-0243-53		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0244-53	A2.01 \$7F46	ROM 0	960-5015-01
The X-Files					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0245-46	A3.03 \$A2FF	U210	960-5009-00
Voice 1	(4M)	965-0246-46		U17	960-5015-01
Voice 2	(4M)	965-0247-46		U21	960-5015-01
Sound	(512K)	965-0248-46		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0249-46	A3.00 \$66D0	ROM 0	960-5015-01
Starship Troopers					
CPU / Sound Board: 520-5136-15 (Mono FCC NOV97)					
Game ROM	(1M)	965-0250-59	A2.00 \$85FF	U210	960-5009-00
Voice 1	(4M)	965-0251-59		U17	960-5015-01
Voice 2	(4M)	965-0252-59		U21	960-5015-01
Voice 3	(4M)	965-0255-59		U36	960-5015-01
Sound	(512K)	965-0253-59		U7	960-7001-02
Display Controller Bd.: 520-5055-02 (FCC NOV97)					
Display	(4M)	965-0254-59	A2.00 \$E77B	ROM 0	960-5015-01
Viper Night Drivin'					
CPU / Sound Board: 520-5136-16 (Mono FCC FEB98)					
Game ROM	(1M)	965-0266-35	A2.01 \$C5FF	U210	960-5009-00
Voice 1	(4M)	965-0267-35		U17	960-5015-01
Voice 2	(4M)	965-0268-35		U21	960-5015-01
Voice 3	(4M)	965-0269-35		U36	960-5015-01
Voice 4	(4M)	965-0270-35		U37	960-5015-01
Sound	(512K)	965-0271-35		U7	960-7001-02
Display Controller Bd.: 520-5055-03 (FCC FEB98)					
Display	(4M)	965-0272-35	A2.01 \$C17D	ROM 0	960-5015-01
Lost In Space					
CPU / Sound Board: 520-5136-16 (Mono FCC FEB98)					
Game ROM	(1M)	965-0282-60	A1.01 \$B2FF	U210	960-5009-00
Voice 1	(4M)	965-0283-60		U17	960-5015-01
Voice 2	(4M)	965-0284-60		U21	960-5015-01
Voice 3	(4M)	965-0285-60		U36	960-5015-01
Voice 4	(4M)	965-0286-60		U37	960-5015-01
Sound	(512K)	965-0287-60		U7	960-7001-02
Display Controller Bd.: 520-5055-03 (FCC FEB98)					
Display	(4M)	965-0288-60	A1.02 \$32AB	ROM 0	960-5015-01
Godzilla					
CPU / Sound Board:					

APPENDIX B

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

Table No	Type	Source Number	SEGA PINBALL™	NTE®	ECG®	Radio Shack®	RCA®
RECTIFICATION, BLOCKING AND/OR DAMPENING DIODES							
1	Diode	1N4001	112-5001-00	NTE552	ECG552	-----	SK9000
	Diode	1N4004	112-5003-00	NTE116	ECG116	276-1103	SK3312
	Diode	1N5401	112-0056-00	NTE5801	ECG5801	276-1143	SK9004
	Diode	1N5404	112-5004-00	NTE5804	ECG5804	276-1144	SK9007
	Diode	T6A10L	112-5006-01	-----	-----	-----	-----
	Diode	FR302	112-5009-00	-----	ECG588	-----	SK5014
ZENER DIODES							
2	Diode	1N4742A 12v	112-0061-00	NTE142A	ECG142A	276-563	SK12V
	Diode	1N4760B 68v	112-0062-00B	NTE5092A	ECG5092A	-----	SK68V
	Diode	1N4764A 100v	112-0049-00A	NTE5096A	ECG5096A	-----	SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A	-----	SK3A9
	Diode	1N5234B 6.2v	112-0047-00B	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	-----	SK110X
	Diode	1N6267A 6.8v	112-5011-00	-----	ECG4902	-----	-----
	Diode	1N4752A 33v	112-5010-00A	-----	-----	-----	SK33V
Diode	1N4736 6.8v 1w	112-5007-00	-----	-----	-----	-----	
TRANSISTORS - TYPE FET, NPN, PNP AND/OR SCR							
3	FET Trans.	STP20N10L	110-0106-00	-----	ECG2943	-----	-----
	FET Trans.	STP19N06L	110-0088-00	-----	-----	-----	-----
	FET Trans.	VN02	110-0089-00	-----	-----	-----	-----
	NPN Trans.	2N4401	-----	NTE85	ECG85	276-2009	SK3124A
	NPN Trans.	2N6427	110-0070-00	NTE48	ECG48	-----	SK4906
	NPN Trans.	MJE340	110-0071-00	NTE157	ECG157	-----	SK3747
	NPN Trans.	MPSA42	110-0082-00	NTE287	ECG287	-----	SK3232
	NPN Trans.	2N3904	110-0069-00	NTE123AP	ECG123AP	276-2009	-----
	NPN Trans.	TIP122	110-0067-00	NTE261	ECG261	276-2068	SK3896
	NPN Trans.	MJE15030	110-0101-00	NTE375	ECG375	-----	SK9118
	PNP Trans.	2N5401	110-0078-00	NTE288	ECG288	-----	SK3434
	PNP Trans.	MJE15031	110-0103-00	NTE292	ECG292	-----	SK3441
	PNP Trans.	MJE350	110-0072-00	NTE374	ECG374	-----	SK9042
	PNP Trans.	MPSA92	110-0100-00	NTE288	ECG278	-----	SK3434
	PNP Trans.	TIP42	110-0068-00	NTE332	ECG332	-----	SK9236
	PNP Trans.	TIP32C	110-0081-00	NTE292	ECG292	-----	SK3441
	PNP Trans.	TIP36C	110-0077-00	NTE393	ECG393	-----	SK3961
	SCR Trans.	2N5060	110-0074-00	NTE5400	ECG5400	276-1067	SK3950
	SCR Trans.	SCR2800B	110-0083-00	-----	ECG5463 / 65 / 66 / 68	-----	-----
	BRIDGE RECTIFIERS (BR)						
4			Comments:				
	BR (Present)	DB or CM3501	124-5000-00	For White Star I/O Bds., BR = 35 Amp @ 100v P.I.V.			
	BR (Old)	MDA2501	124-2501-00	BR = 25 Amp @ 100v P.I.V.			
	BR (Old)	MDA3502	124-3502-00	BR = 35 Amp @ 200v P.I.V.			
RELAYS							
5			Comments:				
	Relay	FRL-264 D024/02CK	190-5002-00	For PPB, Power Supply, & White Star I/O Boards, Relay = 24v DC 10 Amp DPDT			
	Relay	FRL-264 D006/04CV	190-5001-00	For CPU Boards, Relay = 6v DC 5 Amp 4 Pole DT			



APPENDIX C

Game Mfg. Date, Manual Part No and CPU Jumper Table (1-28 only)

Game Name	Game Mfg. Date and Manual PN ²	CPU Ver.	EPROM Position	Jumpers Installed	Jumpers Removed	Game Name	Game Mfg. Date and Manual PN ²	CPU Ver.	EPROM Position	Jumpers Installed	Jumpers Removed
1. Laser War	MAY 87 780-5001-00	1	5C	J4 J6a J7a	J5 J6 J7b	29. Apollo 13	NOV 95 780-5044-00	—	U210	n/a	n/a
		2	5B, 5C	J4 J5a J6a	J5 J5b J6b						
2. Secret Service	MAR 88 780-5002-00	2	5B, 5C	J4	J5	30. Golden Eye	FEB 96 780-5042-00	—	U210	n/a	n/a
4. Time Machine	DEC 88 780-5004-00	2	5B, 5C	J4	J5	32. ID4: Independence Day	JUL 96 780-5045-00	—	U210	n/a	n/a
6. ABC Monday Night Football	SEP 89 780-5007-00	2	5B, 5C	J4	J5	34. The Star Wars Trilogy - S.E.	FEB 97 780-5056-00	—	U210	n/a	n/a
8. Phantom of the Opera	JAN 90 780-5008-00	2	5B, 5C	J4	J5	36. The X-Files	AUG 97 780-5046-00	—	U210	n/a	n/a
10. The Simpsons	SEP 90 780-5012-00	3	5B, 5C	J4	J5	38. Viper Night Drivin'	FEB 98 780-5035-00	—	U210	n/a	n/a
12. Teenage Mutant Ninja Turtles	MAY 91 780-5017-00	3	5B, 5C	J4	J5	40. Godzilla	SEP 98 780-5040-00	—	U210	n/a	n/a
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
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
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
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
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

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

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

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

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

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

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

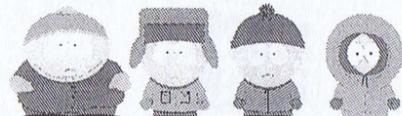


APPENDIX D Board Type Table

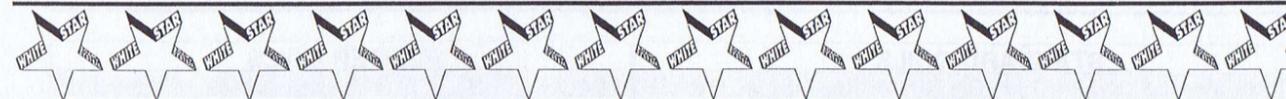
Game Name	Flipper	Sound	Power Supply	Display X-Digit
Laser War	2-Flipper Board Not Required	<i>Initial:</i> 520-5002-00 <i>replaced with:</i> 520-5002-02 520-5002-01 was not used.	520-5000-00	Master: 520-5004-00 plus: 7 Digit Alpha/Numeric 520-5005-00 (Qty. 2) 7 Digit Numeric 520-5006-00 (Qty. 2) 4 Digit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

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller	OPTO TRANS./REC.	OPTO APPLICATION
Checkpoint	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Used w/ 128 X 16	None Used	None Used
Teenage Mutant Ninja Turtles	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Used w/ 128 X 16	None Used	None Used
Batman	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Used w/ 128 X 16	None Used	None Used
Star Trek 25th Anniversary	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Used w/ 128 X 16	None Used	None Used
Hook	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Used w/ 128 X 16	None Used	None Used
Lethal Weapon 3	520-5033-00 2-Flipper	520-5050-01	520-5047-01	520-5052-00 128 X 32	520-5055-00	None Used	None Used
Star Wars	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00	None Used	None Used
Rocky & Bullwinkle & Friends	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00	None Used	None Used
Jurassic Park	520-5076-00 3-Flipper	520-5050-02	520-5047-02	520-5052-00 128 X 32	520-5055-00	None Used	None Used
Last Action Hero	520-5070-00 2-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-00	None Used	None Used
Tales from the Crypt	520-5076-00 3-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-01	None Used	None Used
The Who's Tommy	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01	None Used	None Used
WWF Royal Rumble	520-5070 / 5080 -00 4-Flipper (2X2)	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01	None Used	None Used
Guns N' Roses	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01	None Used	None Used
Maverick	520-5076-00 3-Flipper	520-5050-03	520-5047-03	520-5075-00 192 X 64	520-5092-01	520-5102-00 520-5103-00	Single OPTO: Paddle Boat
Mary Shelley's Frankenstein	520-5076-00 3-Flipper	520-5077-00	520-5047-03	520-5075-00 192 X 64	520-5092-01	None Used	None Used
Baywatch	520-5070 / 5080 -00 4-Flipper (2X2)	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
Batman Forever	520-5076-00 3-Flipper	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough

Table continued on the next page.



APPENDIX D Board Type Table



GAMES HEREON USE THE WHITE STAR BOARD SYSTEM™ (WITH THE ADDITION OF THE I/O POWER DRIVER BOARD):

Game Name	Flipper	I/O Power Driver	CPU/Sound Stereo	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO TRANS./REC.	OPTO APPLICATION
Apollo 13	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
Golden Eye	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough

GAMES HEREON USE THE WHITE STAR BOARD SYSTEM™ (WITH THE DELETION OF THE FLIPPER BOARD):

Game Name	I/O Power Driver	CPU/Sound Mono	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO TRANS./REC.	OPTO APPLICATION
Twister	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
ID4: Independence Day	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
						520-5082-00 520-5083-00	Long Hop OPTO: Alien Head
Space Jam	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
The Star Wars Trilogy - S.E.	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
The Lost World: J.P.	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
						520-5162-00 (combo)	Slotted OPTO: Snagger Motor
The X-Files	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
						520-5082-00 520-5083-00	Long Hop OPTO: File Cab. Enter
Starship Troopers	520-5137-01	520-5136-15	520-5138-00	520-5052-00 128 X 32	520-5055-02	520-5124-00 520-5125-00	Single OPTO: Ball Trough
						520-5082-00 520-5083-01	Long Hop OPTO: L/R Orbit Lane
Viper Night Drivin'	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5124-00 520-5125-00	Single OPTO: Ball Trough
						520-5082-00 520-5083-01	Long Hop OPTO: Jump Ramp
Lost In Space	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5173-00 520-5174-00	Dual OPTO: Ball Trough
Godzilla	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5173-00 520-5174-00	Dual OPTO: Ball Trough
South Park	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5173-00 520-5174-00	Dual OPTO: Ball Trough
						520-5082-00 520-5083-01	Long Hop OPTO: Kenny Trough

† Note: To order Game Specific CPU/Sound Board please specify Game Name.



APPENDIX E

Generic Coil Cross-Reference Guide † ‡

STANDARD COILS					FLIPPER COILS				
GA-TURNS	Res. (Ω)	SPI PART N°	GA-TURNS	Res. (Ω)	SPI PART N°	GAUGE-TURNS	Res. (Ω)	COLOR	SPI PART N°
20-400	1.0 Ω	090-5021-00	24-940 †	5.5 Ω	090-5036-00T	21-900 †	not available	RED	090-5020-10T
22-500	1.7 Ω	090-5017-00				22-750/30-2600 ‡	2.6 / 92.0 Ω	N/A	090-5011-00
22-600	2.2 Ω	090-5023-00	25-1240	9.3 Ω	090-5034-00	22-900 †	3.4 Ω	YEL	090-5020-20T
23-700	3.1 Ω	090-5022-00				22-1080 †	4.3 Ω	YEL/GRN	090-5032-00T
23-750	3.4 Ω	090-5019-00	26-1200 †	10.3 Ω	090-5044-00B	23-620/30-2600 ‡	2.4 / 75.0 Ω	N/A	090-5032-00B
23-800 †	3.6 Ω	090-5001-00T				23-700/30-2600 ‡	3.0 / 83.5 Ω	N/A	090-5006-00
		090-5001-00B	23-800/30-2600 ‡	2.8 / 90.5 Ω	N/A	090-5013-00			
23-840	4.0 Ω	090-5005-00	27-1500	16.3 Ω	090-5004-00T	23-900	3.8 Ω	GRN	090-5020-30
23-1200	7.1 Ω	090-5008-00				23-1100	5.1 Ω	ORG	090-5030-00
23 1/2-765	3.6 Ω	090-5037-03	28-1050	11.5 Ω	090-5046-00	24-1570	9.5 Ω	N/A	090-5025-00
24-900	5.0 Ω	090-5002-00				25-1800	13.8 Ω	BLU/GRN	090-5041-00

NOTE: Ohm values may vary +/- .03Ω depending on meter calibration.

† Coil Part N°s ending with a "T" signifies the Diode is on the top of the lug; ...ending with a "B" signifies the Diode is on the bottom of the lug.
‡ These coils are dual-wound.

MAGNET COILS		
GA-TURNS	Res. (Ω)	SPI PART N°
22-650	4.3 Ω	090-5042-01

The above coil has 12" leads.

NOTE: All Coil Part N°s listed **Do Not Include** Coil Sleeves (must be ordered separately)

LUGLESS COILS		
GA-TURNS	Res. (Ω)	SPI PART N°
23-800	3.6 Ω	090-5053-00

MINI-COILS		
GA-TURNS	Res. (Ω)	SPI PART N°
29-1000	15.2 Ω	090-5059-00
31-1500	52.0 Ω	090-5054-00
32-1800	50.2 Ω	090-5031-00

Flipper Coil Table † ‡ ††

GAME NAME	N° of Flippers	LOWER FLIPPERS		UPPER FLIPPERS	
		SPI N° / Gauge-Turns / Color		SPI N° / Gauge-Turns / Color	
		LEFT	RIGHT	LEFT	RIGHT
Laser War ‡	2	090-5011-00 22-750 / 30-2600	SAME	Not Used	Not Used
Secret Service †	3	090-5006-00 23-620 / 30-2600	SAME	Not Used	090-5006-00 23-620 / 30-2600
Torpedo Alley ‡	3	090-5011-00 22-750 / 30-2600	090-5013-00 23-700 / 30-2600	Not Used	090-5012-00 23-800 / 30-2600
Time Machine ‡	2	090-5011-00 22-750 / 30-2600	SAME	Not Used	Not Used

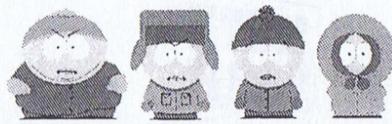
‡ These coils are dual-wound.

Playboy 35th Anniversary ††	2	090-5020-02 22-900 -YEL-	SAME	Not Used	Not Used
ABC Monday Night Football ††	2	090-5020-02 22-900 -YEL-	SAME	Not Used	Not Used

†† 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.

Robocop	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Phantom of the Opera	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Back to the Future	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
The Simpsons	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Checkpoint	2	090-5020-20 22-900 -YEL-	SAME	Not Used	Not Used
Teenage Mutant Ninja Turtles	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Batman	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Star Trek 25th Anniversary	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Hook	2	090-5030-00 23-1100 -ORG-	090-5020-30 23-900 -GRN-	Not Used	Not Used
Lethal Weapon 3	2	090-5030-00 23-1100 -ORG-	SAME	Not Used	Not Used

Table continued on the next page.



APPENDIX E

Flipper Coil Table †

GAME NAME	N° of Flippers	LOWER FLIPPERS		UPPER FLIPPERS	
		SPI N° / Gauge-Turns / Color		SPI N° / Gauge-Turns / Color	
		LEFT	RIGHT	LEFT	RIGHT
Star Wars	2	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
Rocky & Bullwinkle & Friends	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Jurassic Park	3	090-5020-30 23-900 -GRN-	SAME	Not Used	090-5030-00 23-1100 -ORG-
Last Action Hero	2	090-5020-30 23-900 -GRN-	SAME	Not Used	Not Used
Tales from the Crypt	3	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	090-5041-00 25-1800 -BLU-GRN-
The Who's Tommy	3	090-5020-30 23-900 -GRN-	SAME	090-5041-00 25-1800 -BLU-GRN-	Not Used
WWF Royal Rumble	4	090-5032-00 22-1080 -YEL-GRN-	SAME	090-5041-00 25-1800 -BLU-GRN-	SAME
Guns N' Roses	3	090-5032-00 22-1080 -YEL-GRN-	SAME	090-5030-00 23-1100 -ORG-	Not Used
Maverick	3	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	090-5032-00 22-1080 -YEL-GRN-
Mary Shelley's Frankenstein	3	090-5030-00 23-1100 -ORG-	SAME	Not Used	090-5030-00 23-1100 -ORG-
Baywatch	4	090-5030-00 23-1100 -ORG-	090-5020-30 23-900 -GRN-	090-5025-00 24-1570 -N/A-	090-5030-00 23-1100 -ORG-
Batman Forever	3	090-5032-00 22-1080 -YEL-GRN-	090-5020-20 22-900 -YEL-	Not Used	090-5020-30 23-900 -GRN-
Apollo 13	2	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
Golden Eye	2	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
Twister	2	090-5020-20 22-900 -YEL-	090-5032-00 22-1080 -YEL-GRN-	Not Used	Not Used
ID4: Independence Day	3	090-5032-00 22-1080 -YEL-GRN-	SAME	Not Used	090-5020-30 23-900 -GRN-
Space Jam †	2	090-5032-00T 22-1080 -YEL-GRN-	090-5020-20T 22-900 -YEL-	Not Used	Not Used
The Star Wars Trilogy - Special Edition †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
The Lost World: Jurassic Park †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
The X-Files †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
Starship Troopers †	3	090-5030-00T 23-1100 -ORG-	SAME	Not Used	090-5032-00T 22-1080 -YEL-GRN-
Viper Night Drivin' †	2	090-5030-00T 23-1100 -ORG-	SAME	Not Used	Not Used
Lost In Space †	2	090-5030-00T 23-1100 -ORG-	090-5032-00T 22-1080 -YEL-GRN-	Not Used	Not Used
Godzilla †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
South Park †	2	090-5030-00T 23-1100 -ORG-	SAME	Not Used	Not Used

† Coil Part N°s ending with a "T" signifies the Diode is on the top of the lug (on the coil-winding side);
Coil Part N°s ending with a "B" signifies the Diode is on the bottom of the lugs.



APPENDIX F Motor Specification Table

The following table only list games that used motors.

Game Name	Function	Specifications	Part N°
ABC Monday Night Football	Goal Post Up/Down Movement	Motor 24v A.C. 60 RPM CW	515-5222-00
Phantom of the Opera	Organ Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Checkpoint	Mag Wheel (in Backbox)	Motor D.C. (KEN)	041-5005-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Teenage Mutant Ninja Turtles	Spinning Pizza Ball Deflector	Gear Motor 24v A.C. 325 RPM CW	515-5397-00
Batman	Bar Target Up/Down Movement	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. 3½ RPM	500-5421-00
	Cooling Fan (for Transporter F/X)	4½" Motor 12v	041-5014-00
Lethal Weapon 3	Spinning Light	Motor 2½ v A.C. 4000 RPM CCW	041-5017-00
Star Wars	Bar Target Up/Down Movement	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
	R2D2 Robot Left/Right 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" Forward/Back Movement	Autotrol Model E Motor 24v 60hz 4W 3 RPM CCW	041-5023-00
Jurassic Park	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
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Last Action Hero	Crane Left/Right Movement	Multi Products Motor 12v D.C. #3312 OSC	041-5027-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Tales from the Crypt	Tombstone Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
The Who's Tommy	Mirror Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Flipper Blinders	Servo Motor (94102)	041-5032-00
	Spinning Airplane Propellers	Motor D.C.	041-5033-00
WWF Royal Rumble	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
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 Rotational Orbit	Multi Products Motor 24v A.C. 50/60Hz 3W 6 RPM CCW	515-6487-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Golden Eye	Satellite Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CW	515-6528-00

Table continued on the next page.



APPENDIX F Motor Specification Table

The following table only list games that used motors.

Game Name	Function	Specifications	Part N°
Twister	Spinning Disc with Magnet	Multi Products Motor 24v A.C. 50/60Hz 3W 325 RPM CCW	515-6347-00
	Backbox Fan (Tornado Wind)	Multi Products Motor 24v A.C. 50/60Hz 3W 3600 RPM CW	515-6531-00
ID4: Independence Day	Alien Head Open/Close Movement	Servo Motor (94322)	041-5045-00
The Star Wars Trilogy - S.E.	X-Wing Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 10 RPM CCW	515-6383-01
The Lost World: J.P.	Snagger & Center Link Lift Up/Down Movement	Multi Products Motor 20v D.C. 9 RPM Non-Directional	515-6715-03
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
The X-Files	X-File Cabinet Lift Up/Down Movement	Multi Products Motor 20v D.C. 9 RPM CCW	041-5057-00
Starship Troopers	Warrior Bug Forward/Reverse Movement	Haydon Switch & Instrument, Inc. Stepper Motor, Series 36000: 1.4"ø (Non-Captive Shaft) HSI #36864-12 (Unipolar) / Travel per Step = .004 Step Angle = 15° / 12v D.C. / 4.6W	515-6794-00-59
Lost In Space	Spinning Disc with Magnet	Multi Products Motor 24v A.C. 50/60Hz 3W 325 RPM CCW	515-6347-00
Godzilla	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW ‡	041-5029-01
	‡ Please Note: Not Compatible with old Motor 041-5029-00 (Shaker Motor Assy. 515-5893-00). THIS NEW MOTOR CAN ONLY BE USED IN NEW SHAKER MOTOR ASSY. 515-5893-01.		

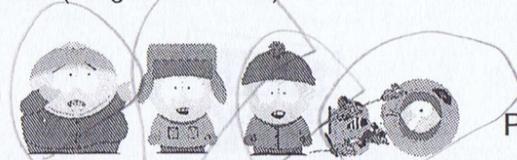
No motors were used on the following games: Laser War, Secret Service, Torpedo Alley, Time Machine, Playboy 35th Anniversary, Robocop, Back to the Future, The Simpsons, Hook, Guns N' Roses, Baywatch, Space Jam, Viper Night Drivin', South Park.



APPENDIX G

Part Number Prefix Classification Codes

I.	ELECTRICAL SOURCE, ENERGY & SIGNAL CONVERTERS 010- Transformers 031- Speakers 090- Solenoids (Coils)
II.	CONDUCTORS, CONNECTORS & INSULATORS 034- Line Cords 036- Cable and Harness Assemblies 041- Motors 045- Connectors (All Types) 077- Lamp Sockets
III.	CIRCUITS & CIRCUIT ELEMENTS 100- ICs 110- Transistors 112- Diodes 121- Resistors 123- Resistors (Variable & Adjustable) 124- Regulators & Bridge Rectifiers 125- CAPS 140- Crystals 165- Light Bulbs 180- Switches 190- Relays
IV.	BOLTS, SCREWS, NUTS & WASHERS 231- Bolts 232- Screws (Pan Head) 234- Screws (HWH) 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- Printed Circuit Boards (PCBs) 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.) 830- Butyrate (Plastic Pieces) 900- Game Posters 960- EPROM (Raw Part) 965- EPROM (Programmed Part)



APPENDIX H

Playfield Inserts (Plastic Light Covers)

Patterns: STARBURST STIPPLE 	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR	STARBURST CIRCULAR
	550-5000-XX	550-5001-XX	550-5002-XX	550-5003-XX	550-5004-XX
STARBURST CIRCULAR	STARBURST CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR	PLAIN CIRCULAR
550-5005-XX	550-5006-XX	550-5007-XX	550-5008-XX	550-5009-XX	550-5010-XX
PLAIN CIRCULAR	PLAIN CIRCULAR	STIPPLE CIRCULAR	STIPPLE 1" SQUARE	ROLLOVER BUTTON BASE	WHITE STAR (only in white)
550-5011-XX	550-5012-XX	550-5048-XX	550-5019-XX	550-5026-XX	545-5015-00
STIPPLE RECTANGULAR	STIPPLE RECTANGULAR	STARBURST RECTANGULAR	PLAIN RECTANGULAR	PLAIN RECTANGULAR	PLAIN RECTANGULAR
550-5018-XX	550-5051-XX	550-5044-XX	550-5049-XX	550-5050-XX	550-5063-XX
STARBURST MINI SHIELD	STARBURST LARGE SHIELD	MINI HOT DOG	BEVEL HOT DOG	PLAIN HOT DOG	BANANA
550-5024-XX	550-5025-XX	550-5020-XX	550-5021-XX	550-5022-XX	550-5023-XX
STARBURST ARROW-SMALL	STARBURST ARROW-LARGE	STARBURST ARROW-HEAD SMALL	STARBURST ARROW-HEAD	STARBURST BULLET	STARBURST TRIANGLE
550-5013-XX	550-5070-XX	550-5014-XX	550-5015-XX	550-5016-XX	550-5017-XX

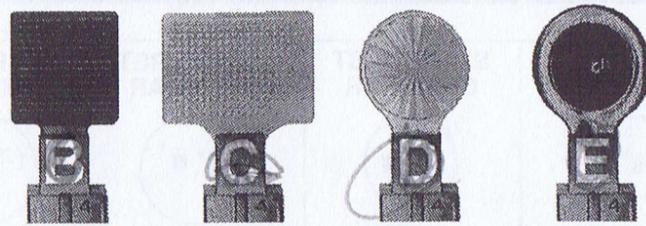
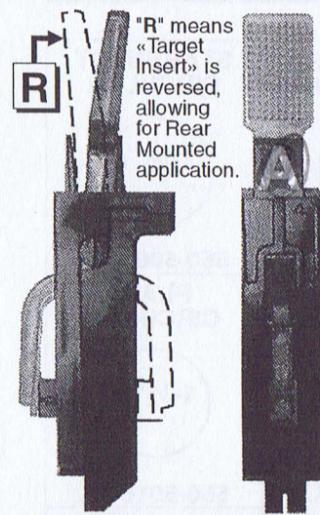
Note: The shapes and sizes shown above are not to scale. Some shapes may no longer be available in every color.

Instructions: Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit N^o which correspond to the color of that part. The "-XX" in Part N^os which may come in various colors should be replaced with the desired 2-Digit N^o. corresponding to the color desired. *Not all colors may be available.*

P L A S T I C P A R T C O L O R C H A R T											
N ^o	Color	N ^o	Color	N ^o	Color	N ^o	Color	N ^o	Color	N ^o	Color
-00	Black or Solid Clear	-03	Amber	-06	Yellow	-09	Purple	-12	Fluor. Blue	-15	Luminescent
-01	Clear	-04	Green	-07	Orange	-10	Fluor. Orange	-13	Teal Green	-16	Gold
-02	Red	-05	Blue	-08	White	-11	Fluor. Green	-14	Gray	-17	Trans. Brown



APPENDIX I Stand-Up Targets



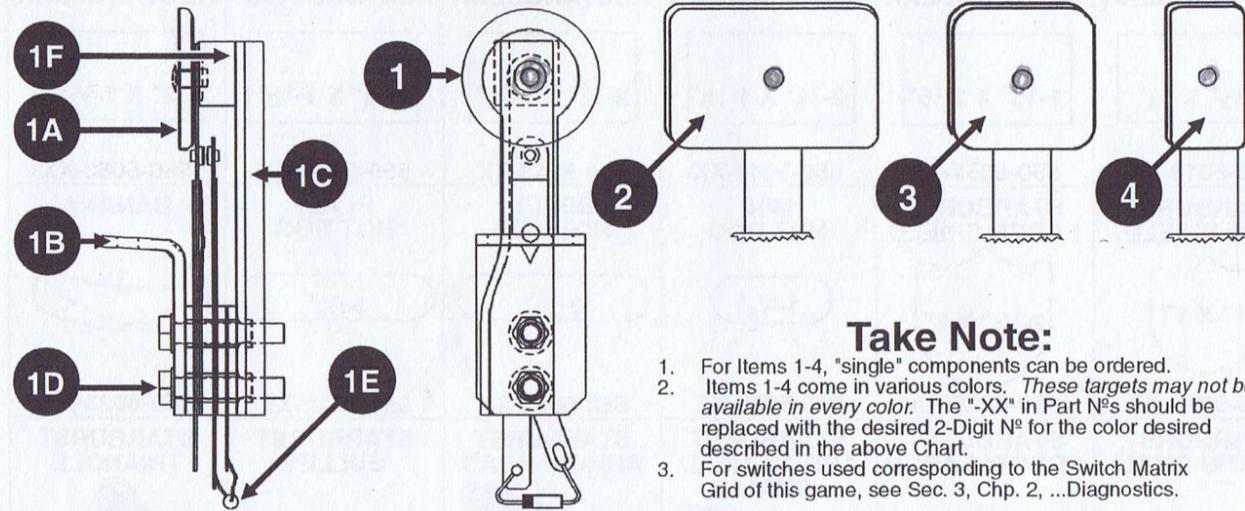
Take Note:

- For Items A-E, for the Target Assembly use the "500-" SPI N^o. For the Target Assy. with Rear Mount add "R" to "500-" SPI N^o. For just the «Target Insert» use the "545-" SPI N^o.
- Items A-E come in various colors. *These targets may not be available in every color.* The "-XX" in should be replaced with the desired 2-Digit N^o for the color desired described in the Chart *7.
As of date of print, the following colors were used for Items A-E:
-01 Clear (A, D); -02 Red (A, B, C, D, E); -03 Amber (D, E); -04 Green (A, B); -05 Blue (C); -06 Yellow (A, C); -09 Purple (B, D); -11 Fluorescent Green (A, B, D).
- See Section 3, Chapter 2, Go To Diagnostics Menu, for switches used corresponding to the Switch Matrix Grid of this game.

PLASTIC PART COLOR CHART

N ^o	Color
-00	Black
-01	Clear
-02	Red
-03	Amber
-04	Green
-05	Blue
-06	Yellow
-07	Orange
-08	White
-09	Purple
-10	Fluor. Orange
-11	Fluor. Green
-12	Fluor. Blue
-13	Teal Green
-14	Gray
-15	Luminescent
-16	Gold

N ^o	Stand-Up Target Name	Part N ^o	N ^o	Stand-Up Target Name	Part N ^o
A	Modular Stand-Up Target Narrow Assy.	500-6138-XX	D	Modular Stand-Up Target Round Assy.	500-6075-XX
	Stand-Up Target Narrow (Insert)	545-6138-XX		Stand-Up Target Round (Insert)	545-6075-XX
B	Modular Stand-Up Target Square Assy.	500-6139-XX	E	Mod. Stand-Up Target 1" Spherical Assy.	500-6189-XX
	Stand-Up Target Square (Insert)	545-6139-XX		Stand-Up Target 1" Spherical (Insert)	545-6189-XX
C	Modular Stand-Up Target Rectangle Assy.	500-6228-XX	NOTE: To receive the Target Assy. with the «Target Insert» «Reversed» simply add a "R" at the end of the Part N ^o . See Side View picture above to compare (dashed line shows target reversed).		
	Stand-Up Target Rectangle (Insert)	545-6228-XX			

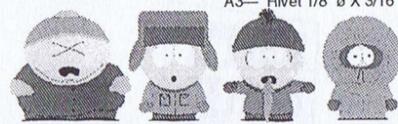


Take Note:

- For Items 1-4, "single" components can be ordered.
- Items 1-4 come in various colors. *These targets may not be available in every color.* The "-XX" in Part N^os should be replaced with the desired 2-Digit N^o for the color desired described in the above Chart.
- For switches used corresponding to the Switch Matrix Grid of this game, see Sec. 3, Chp. 2, ...Diagnostics.

N ^o	Stand-Up (Flat) Target Name	Part N ^o	N ^o	Stand-Up (Flat) Target Name	Part N ^o
1	1" Round Stand-Up Target Assy.	500-5835-XX	3	1" Sq. Stand-Up Target Assy.	500-5232-XX
<small>‡ Note: Item 2A, is a riveted Sub-Assy. which includes the following items for reference: A1— Stack Switch Radius End (180-5133-00), A2— Washer 5/16" (242-5017-00), A3— Rivet 1/8" ø X 3/16" (249-5001-00) and A4— Rectangular Target (545-5145-XX).</small>					
ORDERING ABOVE (ITEM 1) ASSY. PART N ^o WILL INCLUDE:					
1A‡	Switch & Target Assy. 1" Round	515-5966-XX	ORDERING ABOVE (ITEM 3) ASSY. PART N ^o WILL INCLUDE:		
1B	Mounting Bracket	535-6896-00	3A‡	Sw. & Target Assy. 1" Square	515-5162-XX
1C	Switch Back Plate	535-6452-00	Items 3B-F are identical to 1B-F		
1D	6-32 X 3/4 HWH Swage (Qty. 2)	237-5976-05	Same as 1B-F		
1E	Switch Diode, 1N4001	112-5001-00	<small>‡ Note: Item 3A, is a riveted Sub-Assy. which includes the following items for reference: A1— Stack Switch Radius End (180-5133-00), A2— Washer 5/16" (242-5017-00), A3— Rivet 1/8" ø X 3/16" (249-5001-00) and A4— 1" Square Target (545-5470-XX).</small>		
1F	Foam Pad	626-5029-00	4	Narrow Stand-Up Target Assy.	500-5835-XX
ORDERING ABOVE (ITEM 4) ASSY. PART N ^o WILL INCLUDE:					
<small>‡ Note: Item 4A, is a riveted Sub-Assy. which includes the following items for reference: A1— Stack Switch Square End (180-5132-00), A2— Washer 5/16" (242-5017-00), A3— Rivet 1/8" ø X 3/16" (249-5001-00) and A4— Narrow Target (545-5210-XX).</small>					
2	1" X 1 1/2" Stand-Up Rect. Target Assy.	500-5321-XX	4A‡	Sw. & Target Assy. Narrow	515-5967-XX
Items 4B-F are identical to 1B-F					
Same as 1B-F					

Item 2 Table Note continued in the next column.



GLOSSARY OF TERMS

A Followed after a number means "Amp." or Ampage in an expression relating to an electrical object. (e.g. 8A).

AC (Acronym) Alternating Current.

Adj. (Abbreviation) Adjustment(s).

Assy. (Abbreviation) Assembly.

Au. (Abbreviation) Audit(s).

Bd. (Abbreviation) Board.

BOT (Abbreviation) Bottom.

Brkt. (Abbreviation) Bracket.

Bridge Rectifier A configuration of a diode that allows current to flow in one direction producing both positive and negative pulsating DC Voltages.

Color Coding See Appendix H or I, Plastic Part Color Chart or Section 4, Chapter 1, Playfield - Plastic Posts & Spacers.

Combination (Combo) [Shot] Any variable pinball shot(s) made successively.

Conn. (Abbreviation) Connector.

CMOS Short for COSMOS (Complementary Symmetry M.O.S.); Complementary Metal-Oxide Semi-Conductor.

CN (Abbreviation) Connector (e.g. CN5-P3).

CT (Abbreviation) Center.

DC (Abbreviation) Direct Current.

DT (Abbreviation) Drop Target(s).

DOTS (Acronym) Diode On Terminal Strip.

EB (Abbreviation) Extra Ball.

Eject Playfield surface device to kick ball back into play; Saucer.

EPROM (Acronym) Erasable Programmable Read Only Memory. Can be erased using UV Light and re-programmed.

e.g. (Abbreviation) Latin- Exempli gratia. For Example.

EOS (Acronym) End-Of-Stroke (i.e. Switch for flipper).

F (Abbreviation) Fuse (i.e. F23).

GA-Turn Gauge & Turn describing the windings on a coil (e.g. 23-800, 23 is the gauge of wire and 800 is the amount of windings).

G.I. (Abbreviation) General Illumination (Lamps).

HWH (Abbreviation) Hex Washer Head.

IC (Acronym) Integrated Circuit (As in after 24-Pin IC).

ID or I.D. (Acronym) Inside Dimension.

I.e. (Abbreviation) Latin- Id est. That is.

IO or I/O (Abbreviation) Input / Output (e.g. I/O Power Driver Bd.).

LT, Lt. or L. (Abbreviation) Left.

Laser Kick A coil/plunger used above the playfield to kick pinball back into play.

LED (Acronym) Light Emitting Diode.

Loop [Shot] Continuously up a ramp and back to the flipper.

Lwr. (Abbreviation) Lower.

Orbit [Shot] From the left or right flipper around the back rail of the playfield back to the flipper.

MB (Abbreviation) Magnet Board.

M-BALL or MBALL (Abbreviation) Multiball™ More than 1 ball in game play.

MID (Abbreviation) Middle.

Non-Reflexive See Reflexive.

No. or N^o or # (Abbreviation) Number.

NPF (Acronym) No Problem Found.

N.C. or NC (Abbreviation) Normally Closed.

N.O. or NO (Abbreviation) Normally Open.

NS (Abbreviation) Not Stuffed. (Use in Part Listings, Sec. 5)

OD or O.D. (Abbreviation) Outside Dimension.

P (Abbreviation) Pin (e.g. CN5-P3).

PCB (Acronym) Printed Circuit Board.

P/F (Abbreviation) Playfield.

PIA LED (Acronym) Peripheral Interface Adapter Light Emitting Diode.. This is a diagnostic LED on the CPU; it should not be lit during normal operation of a pinball game.

Plumb Bob Tilt Weight on Tilt Assembly.

PPH (Abbreviation) Phillips Pan Head.

Pop(s) Another term for Turbo Bumper(s).

PPB (Acronym) Playfield Power Board ("Popcorn-Popping Bd.").

PREV (Abbreviation) Previous.

PSB (Abbreviation) Power Supply Board

RAM (Acronym) Random Access Memory. RAM can store input instructions and supply output information.

Reflexive/Non-Reflexive Reflexive—Solenoid Drive Transistor is enabled directly by a switch closure on the (Relating to CPU Boards) solenoid assembly (Ver. 1/2).

Non-Reflexive—Solenoid Drive Transistor is enabled by the CPU after reading a switch closure in the Switch Matrix (Ver. 3). Also note: All CPU Boards are backwards compatible (e.g. Jurassic Park/Ver. 3 to Time Machine/ Ver. 2). Swapping a Ver. 2 Board to a Ver. 3 is not possible due to the special solenoids section (i.e. Slingshots, Turbo Bumpers, etc.) changing from **REFLEXIVE** to **NON-REFLEXIVE** on Ver. 3 Boards.

Relay An automatic switch operated by current in a coil.

ROM (Acronym) Read Only Memory. ROM cannot store input instructions but can supply output information. ROM can be programmed only once.

RMA (Abbreviation) Return Merchandise Authorization Number

RT, Rt. or R. (Abbreviation) Right; ("R" at the end of Target Assy. Part N^o signifies Target Insert is Reversed.)

RO (Abbreviation) Rollover (switches).

Saucer See Eject.

Scoop A hole into the playfield. A metal scoop is in place to guide the ball into the kick-back under the playfield.

Slam Tilt A switch which closes when the game is slammed into or the Coin Door is slammed shut. Depending on adjustable settings, will cancel game in play when the number of closures required is achieved.

SMB (Abbreviation) Shaker Motor Board.

Solenoid A coil used for Electro Magnetic devices such as relays, flippers, slingshots, etc.

SSFB (Abbreviation) Solid State Flipper Board.

STEP Refers to the service switches on the coin door.

Sub-Assy. (Abbreviation) Sub-Assembly.

S-U or S/U (Abbreviation) Stand-Up (targets).

TM (Abbreviation) Trademark

Transfer [Shot] Maneuvering the ball in play from one flipper to the other. With flipper in the up position and the ball cradled by that flipper one would activate the flipper button in a quick repetitive manner to bounce the ball to the other side. Skilled players can rebound the ball off the slingshot.

Tri-Ball Three balls in play.

TTL (Abbreviation) Transistor-Transistor Logic

Upr. (Abbreviation) Upper.

V or v (Abbreviation) Volt(s).

Ver. (Abbreviation) Version.

VUK (Acronym) Vertical Up-Kicker (Super or Standard).

X (Abbreviation) "Times" A multiplier; also used in dimensions.

X-Ball An undetermined number of ball(s) during game play.

Zener Diode A semi-conductor diode used for voltage regulation. Application depends on reverse break-down voltage.

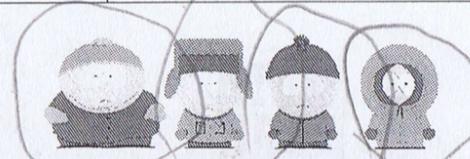
"-00B" "B" at the end of Coil Part Numbers signifies that the diode is attached to the bottom of the lug.

"-00T" "T" at the end of Coil Part Numbers signifies that the diode is attached to the top of the lug (the side nearest the coil-winding).



Parts Order Checklist Notes

Date Ordered	Part N°	Qty.	Description	Date Received
0	SEGA		BATMAN FOREVER	0
0			GOLDENEYE 007	0
0			STARSHIP TROOPERS VIPER	0
0			SPACE AM INDEPENDENCE DAY	0
0			THE LOST WORLD NAVERICK	0
0			BAYWATCH APOLLO 13	0
0			TWISTER A13	0
0			GODZILLA MARY SHELLEY'S	0
0			FRANKENSTEIN	0
0	SEGA		BATMAN FOREVER	0
0			GOLDENEYE 007	0
0			STARSHIP TROOPERS VIPER	0
0			SPACE AM INDEPENDENCE DAY	0
0			THE LOST WORLD NAVERICK	0
0			BAYWATCH APOLLO 13	0
0			TWISTER A13	0
0			GODZILLA MARY SHELLEY'S	0
0			FRANKENSTEIN	0



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DOT MATRIX DISPLAY BOARDS: 9 MONTHS

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SUBSTITUTIONS OF PARTS OR EQUIPMENT MODIFICATIONS MAY VOID FCC TYPE ACCEPTANCE.

Warning

THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY, AND IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTIONS MANUAL, MAY CAUSE INTERFERENCE TO RADIO COMMUNICATIONS. IT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A COMPUTING DEVICE PURSUANT TO SUBPART J OF PART 15 OF FCC RULES, WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFERENCE WHEN OPERATED IN A COMMERCIAL ENVIRONMENT. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE INTERFERENCE IN WHICH CASE THE USER AT HIS OWN EXPENSE WILL BE REQUIRED TO TAKE WHATEVER MEASURES MAY BE REQUIRED TO CORRECT THE INTERFERENCE.

RF INTERFERENCE NOTICE, CABLE HARNESS PLACEMENTS AND GROUND STRAP ROUTING ON THIS GAME HAVE BEEN DESIGNED TO KEEP RF RADIATION AND CONDUCTION WITHIN LEVELS ACCEPTED BY THE FCC RULES. TO MAINTAIN THESE LEVELS, REPOSITION HARNESSES AND RECONNECT GROUND STRAPS TO THEIR ORIGINAL PLACEMENTS, IF THEY BECOME DISCONNECTED DURING MAINTENANCE.

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