featuring our unique

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

DR. DR. DR. DR.

SEGA™

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File Cabinet Motor Test and OPTO PCB Theory of Operation & Schematic

File Cabinet Motor Test

From the **DIAGNOSTICS MENU**, select the "FILES" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** & press the **Black "ENTER" Button**. This will bring up the **X-FILES SPECIFIC MENU**. Similar to "BEGIN PLAY TEST," this menu is used to test and adjust the game specific features. The feature is the **FILE CABINET MOTOR TEST**. The display will indicate the switch status of the ***File Cabinet :*** "**TOP (HOME)**", "**MIDDLE**" & "**BOTTOM**". The ❒ "**TOP**" (Sw. 43) indicator will be active when the ***File Cabinet*** is in the "**HOME**" position. This is the position it should be in when it is at rest. The ❒ "**MIDDLE**" (Sw. 44) indicator will be activated when the ***File Cabinet*** is in the "**MIDDLE**" position. The ❒ "**BOTTOM**" (Sw. 45) indicator will be active when the ***File Cabinet*** is in the "**BOTTOM**" Position.

The Run Test:
Select the "RUN" *Icon* and press the **Start Button**. This test will cycle the File Cabinet Motor to the next open switch (OPTO) and stop. That is, If the File Cabinet Motor is on Switch 43 (OP1), the Top ("Home") Position, it will advance to the next Switch 44 (OP2), the Middle Position, and then Switch 45 (OP3), the Bottom Position. This test is used in conjunction with the display to ensure the OPTO's / Switch 43 (OP1), the Top ("Home") Position, Switch 44 (OP2), the Middle Position, and Switch 45 (OP3), the Bottom Position, closes when the Motor Cam Flag Bracket passes between the OPTOs.

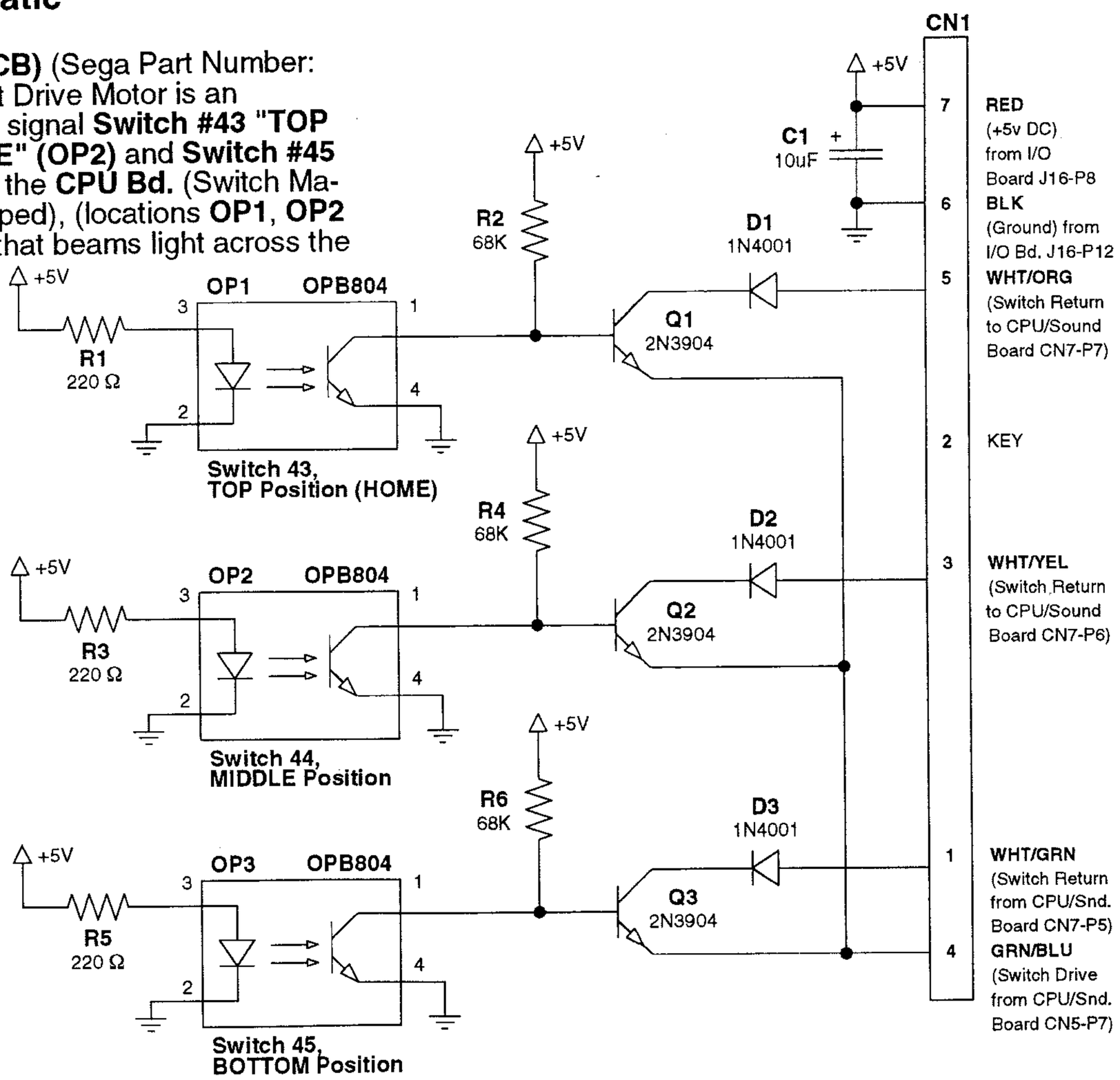
The Step Test:
Select the "STEP" *Icon* and press the **Start Button**. This test will pulse the File Cabinet Motor via pulses from the I/O Power Driver Board. This test is used to cycle the motor in incremental steps. This test is also used in conjunction with the display to ensure the OPTO switches are closing when the Motor Cam Flag Bracket passes between the OPTOs.

During both tests when the File Cabinet is down and Switch 45 (OP3, Down Position) indicates as "closed" in the display, a ball can be put into the File Cabinet to test the under trough transition and operation of the Super VUK.

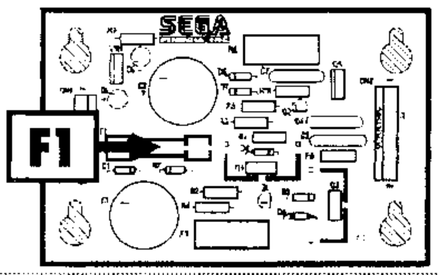
Note: To exit this Menu, select & activate the "PREV" *Icon* to go to the **DIAGNOSTICS MENU** or activate the "QUIT" *Icon* to exit **Portals Service Menu**. See Section 5, Chapter 2, Playfield Wiring, for the File Cabinet Motor OPTO PCB Theory of Operation & Schematic and the Component Layout & Parts.

Theory of Operation & Schematic

This **OPTO Printed Circuit Board (PCB)** (Sega Part Number: 520-5155-00) used on the File Cabinet Drive Motor is an ordinary Photo-Interrupter designed to signal **Switch #43 "TOP (HOME)" (OP1)**, **Switch #44 "MIDDLE" (OP2)** and **Switch #45 "BOTTOM"** Cabinet Positions back to the **CPU Bd.** (Switch Matrix Grid). The slotted OPTO's (U-Shaped), (locations **OP1**, **OP2** & **OP3**), contain a small infrared **LED** that beams light across the slot to an **NPN Phototransistor**. This causes the **Phototransistor** to *conduct* and *pulls down the voltage* at the base of **Q1**, **Q2** and **Q3** (Transistors 2N3904) to **.3v** *or less.* **Q1**, **Q2** and **Q3** require the Base-Emitter Drop Voltage (**.7v**) **plus** the Switch Drive Drop (**.1v**) to *conduct,* and since **.3v** *is less* than this **.8v**, **Q1**, **Q2** and **Q3** stays off when the *Switch Matrix Strobe* (on Pin-4 of CN1) polls them. If the Metal Flag Bracket (riveted on the CAM) of the Motor Shaft breaks the beam in the **OPTO Slot**, the **NPN Phototransistors** *stay off,* and the *base voltages* on associated 2N2904 Transistor is **pulled to .8v** during the *Switch Strobe* by the 68KΩ 1/4W Resistors (this base voltage will actually be higher when the switch is not being polled). With the **.8v** applied to the bases, **Q1**, **Q2** and **Q3** conduct through **D1**, **D2** and **D3**, respectively. These Diodes (1N4001) prevent certain kinds of *Matrix-Related leakages* which show up as a "Phantom Switch" that completes the corners of a square in the Matrix with three (3) Real Activated Switches comprising the other three (3) corners.



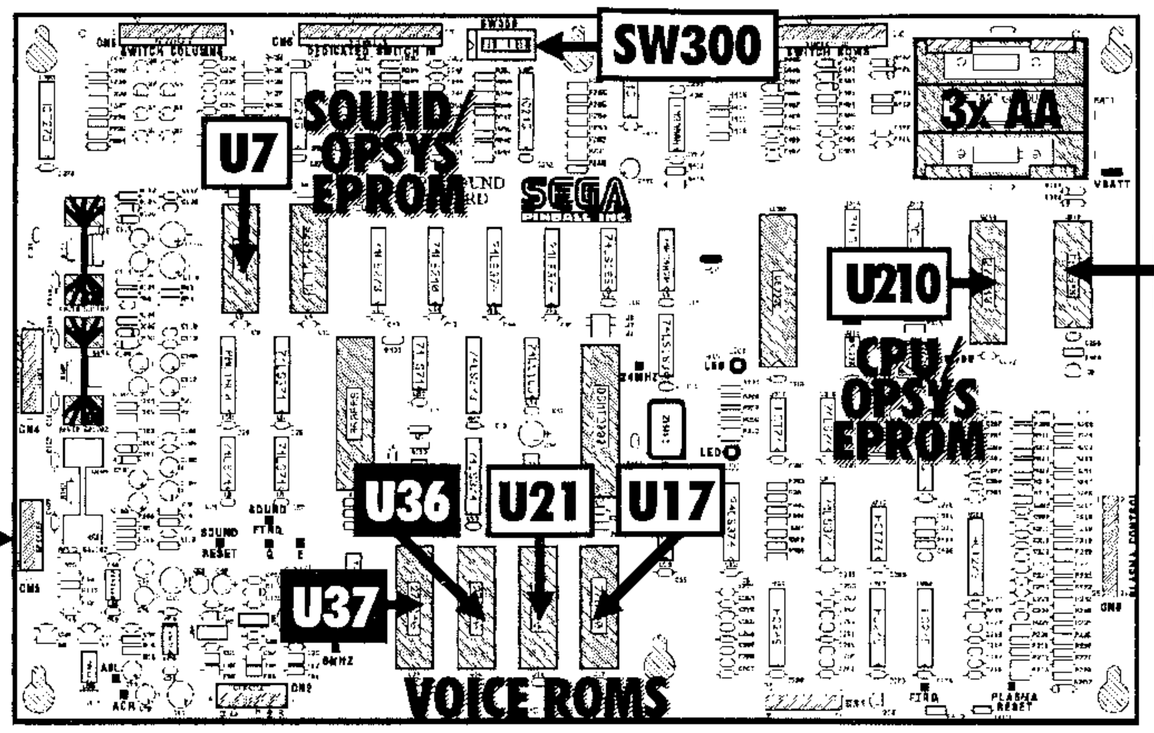
BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs



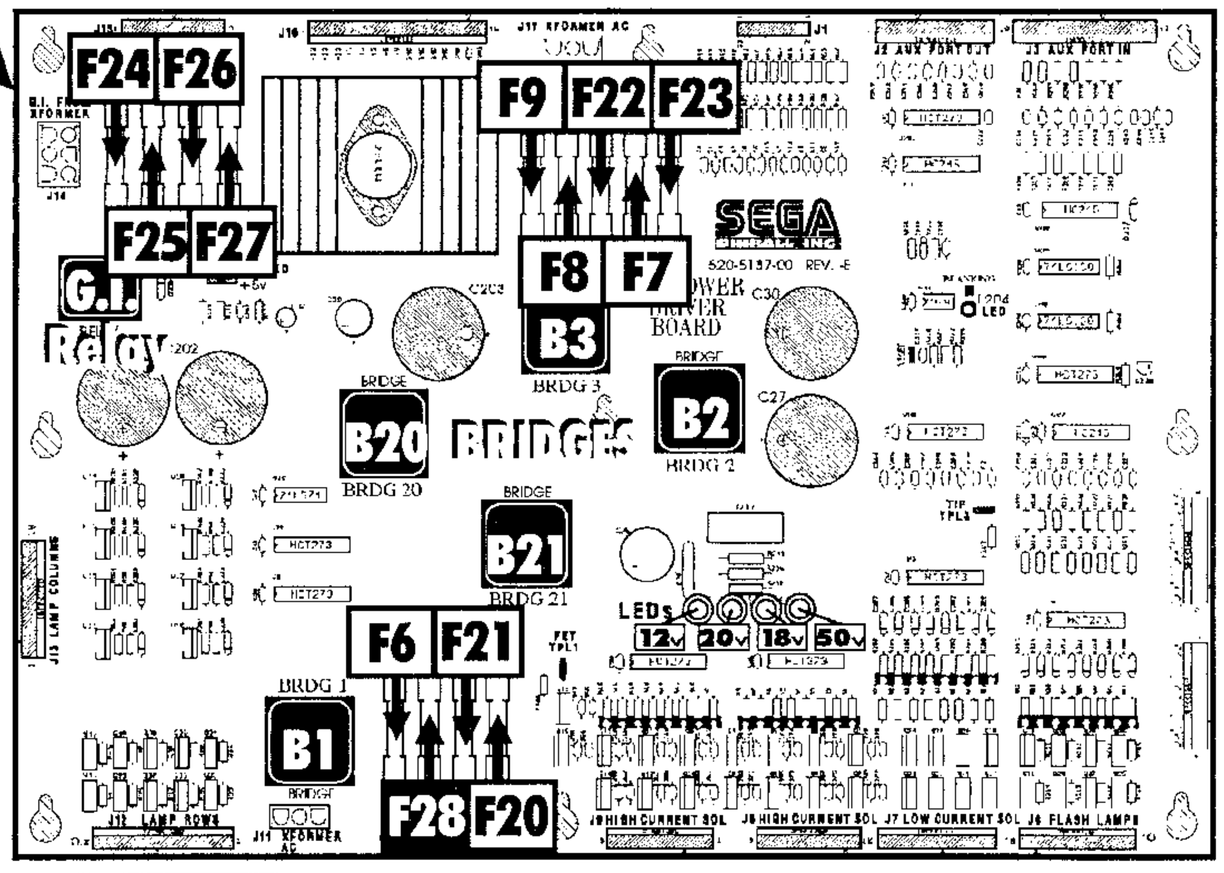
Display Power Supply Bd.

CPU / Sound Board
No Fuses

I / O Power Driver Board



Note:
U36
U37
are Not Used in this game.



Note:
F28
is Not Used in this game.

*** All BRIDGES rated 35A @ 100v ***	
B1	+50v DC High Current Coils
B2	+20v DC Low Current Coils
B3	+/-12v DC Sound/Display/Logic
B20	+18v DC Illumination
B21	+5v DC Logic Voltage

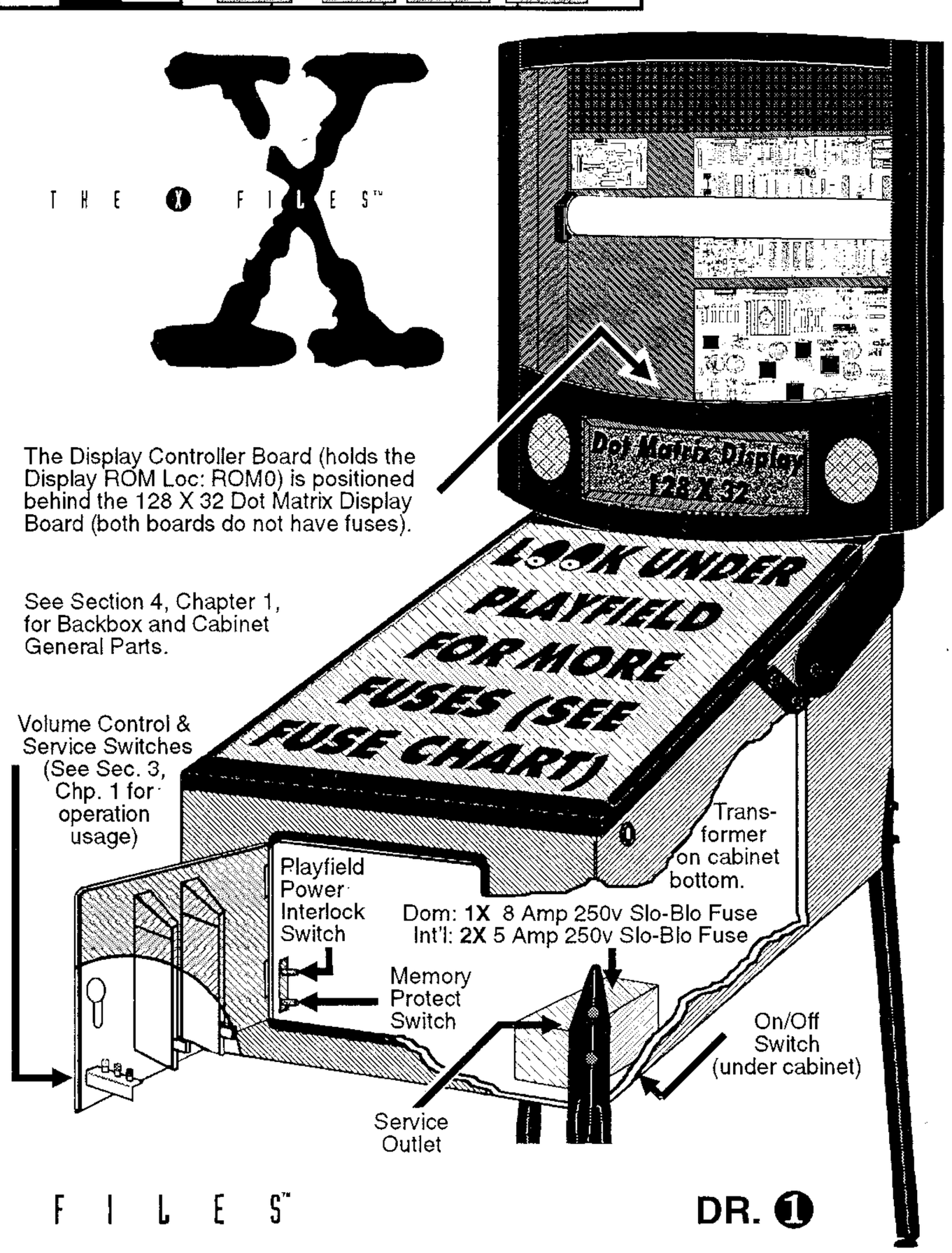
QUICK REFERENCE FUSE CHART

Backbox Fuses			
LOC: DISPLAY POWER SUPPLY (P.S.) BOARD			
F1	¾A 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	Magnet
F21	3A 250v S.B.	50v DC	Coils
F22	8A 250v S.B.	18v DC	Controlled Lamps
F23	4A 250v S.B.	5v DC	Logic
F24	5A 250v S.B.	6.3v AC	G.I. Lamp (Playfield Upper Right)
F25	5A 250v S.B.	6.3v AC	G.I. Lamp (Playfield Left)
F26	5A 250v S.B.	6.3v AC	G.I. Lamp (P/F Right & Coin Door)
F27	5A 250v S.B.	6.3v AC	G.I. Lamp (Playfield Upper Left)
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 X1)
n/a	5A 250v S.B.	220v AC	Main Fuse Line (International X2)
Playfield Fuses			
LOC: UNDER PLAYFIELD (By Flippers & Magnet)			
n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU/YEL↔RED/YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY/YEL↔RED/YEL)
n/a	3A 250v S.B.	50v DC	Magnet (VIO/YEL↔BLU/BLK)

THE X FILES™

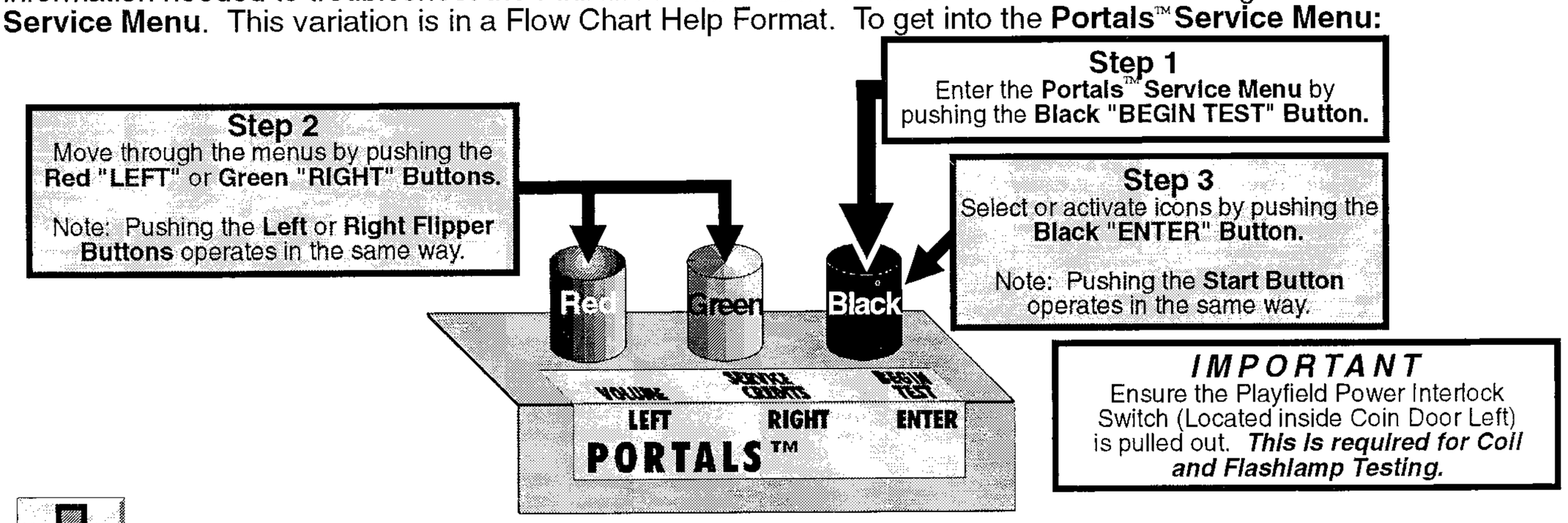
The Display Controller Board (holds the Display ROM Loc: ROM0) is positioned behind the 128 X 32 Dot Matrix Display Board (both boards do not have fuses).

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



✻ 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. ❶ - 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:**



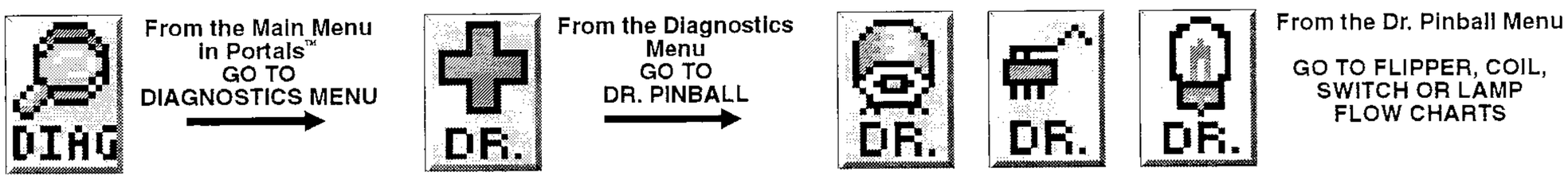
In our **Portals™ Service Menu**, selecting the "DR" *Icon* will bring the operator/technician into Dr. Pinball (Flow Chart Menus), the "on-screen" diagnostic aide. This is a feature that will allow you to utilize the power of the micro-processor assisting in troubleshooting a problem with the machine 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™ © 1997 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.



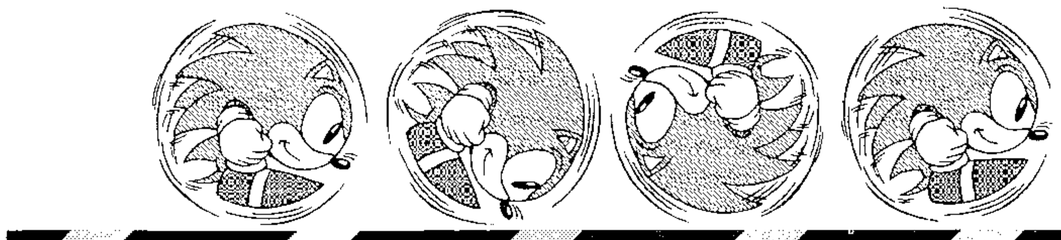
Seen when question is being asked on the Display. Select "YES" or "NO" to answer question given.
"END" lets you select a new item to test.

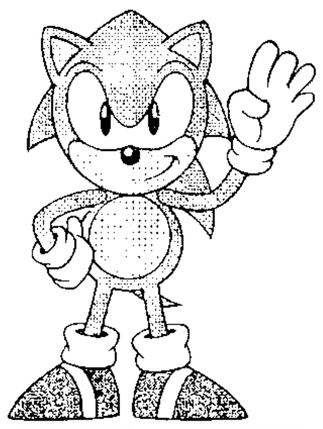


Seen when diagnosis is given.
Select any Icon for your next step.
"?" gives Help.



In Coil Flow Chart Menu, select "PULSE" to pulse the coil selected.







✻ DIAGNOSTIC AIDS ✻

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

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

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

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

CPU DIP SWITCH SETTINGS, LOC. SW300 CPU/SOUND BOARD

CUSTOM FACTORY ADJUSTMENTS BY COUNTRY*

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
USA *	ON								
	OFF	●	●	●	●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
FRANCE	ON		●	●					
	OFF	●			●	●	●	●	●

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

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
AUSTRIA	ON	●							
	OFF		●	●	●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
GERMANY	ON	●	●	●					
	OFF				●	●	●	●	●

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

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BELGIUM	ON		●						
	OFF	●		●	●	●	●	●	●

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
ITALY	ON				●				
	OFF	●	●	●		●	●	●	●

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

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BRAZIL	ON	●		●	●				
	OFF		●			●	●	●	●

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

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

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
CANADA	ON	●	●						
	OFF			●	●	●	●	●	●

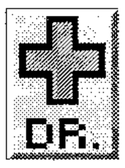
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
NETHERLANDS (Holland / Dutch)	ON			●					
	OFF	●	●		●	●	●	●	●

*All countries not noted use the "USA Setting"

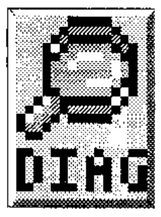
ROM SUMMARY TABLE

I.C. NAME	TYPE	BOARD NAME	LOC.	PART Nº
Game ROM	1MB	CPU / Sound Board	U210	965-0245-46
Voice ROM 1	4MB	CPU / Sound Board	U17	965-0246-46
Voice ROM 2	4MB	CPU / Sound Board	U21	965-0247-46
Voice ROM 3	Not Used	CPU / Sound Board	U36	Not Used
Voice ROM 4	Not Used	CPU / Sound Board	U37	Not Used
Sound EPROM	512K	CPU / Sound Board	U7	965-0248-46
Display EPROM	4MB	Display Controller Bd.	ROM Ø	965-0249-46
Display EPROM	Not Used	Display Controller Bd.	ROM 3	Not Used

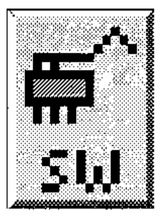
FOR:



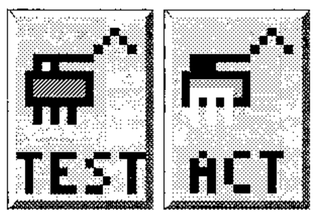
Find-It-In-Front:
Dr. Pinball



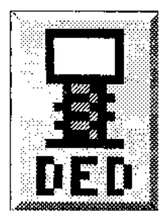
From the Main Menu in Portals™ GO TO DIAGNOSTICS MENU



From the Diagnostics Menu GO TO SWITCH MENU



From the Switch Menu GO TO SWITCH OR ACTIVE SWITCH TEST

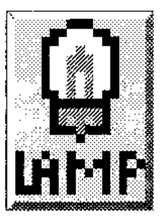


From the Switch Menu GO TO DEDICATED SWITCH TEST

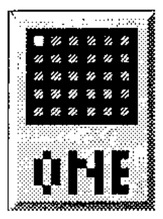
SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive) / Row (Return)	1 Q1 GRN-BRN CN5-P1	2 Q2 GRN-RED CN5-P3	3 Q3 GRN-ORG CN5-P4	4 Q4 GRN-YEL CN5-P5	5 Q5 GRN-BLK CN5-P6	6 Q6 GRN-BLU CN5-P7	7 Q7 GRN-VIO CN5-P8	8 Q8 GRN-GRY CN5-P9
1 U400 WHT-BRN CN7-P9	NOT USED 1	NOT USED 9	LEFT 3-BANK BOTTOM 17	LEFT RAMP ENTER 25	LEFT ORBIT 33	UNDER-TROUGH TOP #1 41	TOP TURBO BUMPER 49	LEFT OUTLANE 57
2 U400 WHT-RED CN7-P8	4TH COIN SLOT 2	NOT USED 10	LEFT 3-BANK MID 18	LEFT RAMP EXIT 26	NOT USED 34	UNDER-TROUGH BOT #2 42	BOTTOM TURBO BUMPER 50	LEFT RETURN LANE 58
3 U400 WHT-ORG CN7-P7	6TH COIN SLOT 3	NOT USED 11	LEFT 3-BANK TOP 19	RIGHT RAMP ENTER 27	RIGHT ORBIT 35	FILE CABINET TOP 43	RIGHT TURBO BUMPER 51	LEFT SLINGSHOT 59
4 U400 WHT-YEL CN7-P6	RIGHT COIN SLOT 4	4-BALL TROUGH #1 12	RIGHT 3-BANK BOTTOM 20	RIGHT RAMP EXIT 28	NOT USED 36	FILE CABINET MIDDLE 44	NOT USED 52	RIGHT OUTLANE 60
5 U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA 5	4-BALL TROUGH #2 13	RIGHT 3-BANK MID 21	LEFT TOP LANE 29	MINI LOOP LEFT 37	FILE CABINET BOTTOM 45	LAUNCH BUTTON 53	RIGHT RETURN LANE 61
6 U401 WHT-BLU CN7-P3	LEFT COIN SLOT 6	4-BALL TROUGH #3 14	RIGHT 3-BANK TOP 22	MIDDLE TOP LANE 30	MINI LOOP RIGHT 38	MAGNET OPTO 46	START BUTTON 54	RIGHT SLINGSHOT 62
7 U401 WHT-VIO CN7-P2	5TH COIN SLOT 7	4-BALL TROUGH VUK OPTO 15	NOT USED 23	RIGHT TOP LANE 31	SHOOTER UNDER-TROUGH 39	FILE CABINET OPTO 47	SLAM TILT 55	NOT USED 63
8 U401 WHT-GRY CN7-P1	NOT USED 8	SHOOTER LANE 16	NOT USED 24	NOT USED 32	TRAP DOOR UP 40	SUPER VUK 48	PLUMB BOB TILT 56	NOT USED 64

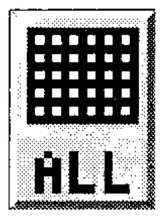
IC U206 INPUTS / GND	Ground BLK CN6-P1, -P11
1 GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON DS-1
2 GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S (End-of-Stroke) DS-2
3 GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON DS-3
4 GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S. (End-of-Stroke) DS-4
5 (Not Used) GRY-GRN CN6-P7	NOT USED DS-5
6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



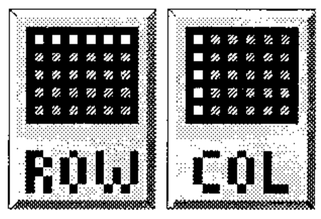
From the Diagnostics Menu GO TO LAMP MENU



From the Lamp Menu GO TO SINGLE LAMP TEST



From the Lamp Menu GO TO TEST ALL LAMPS

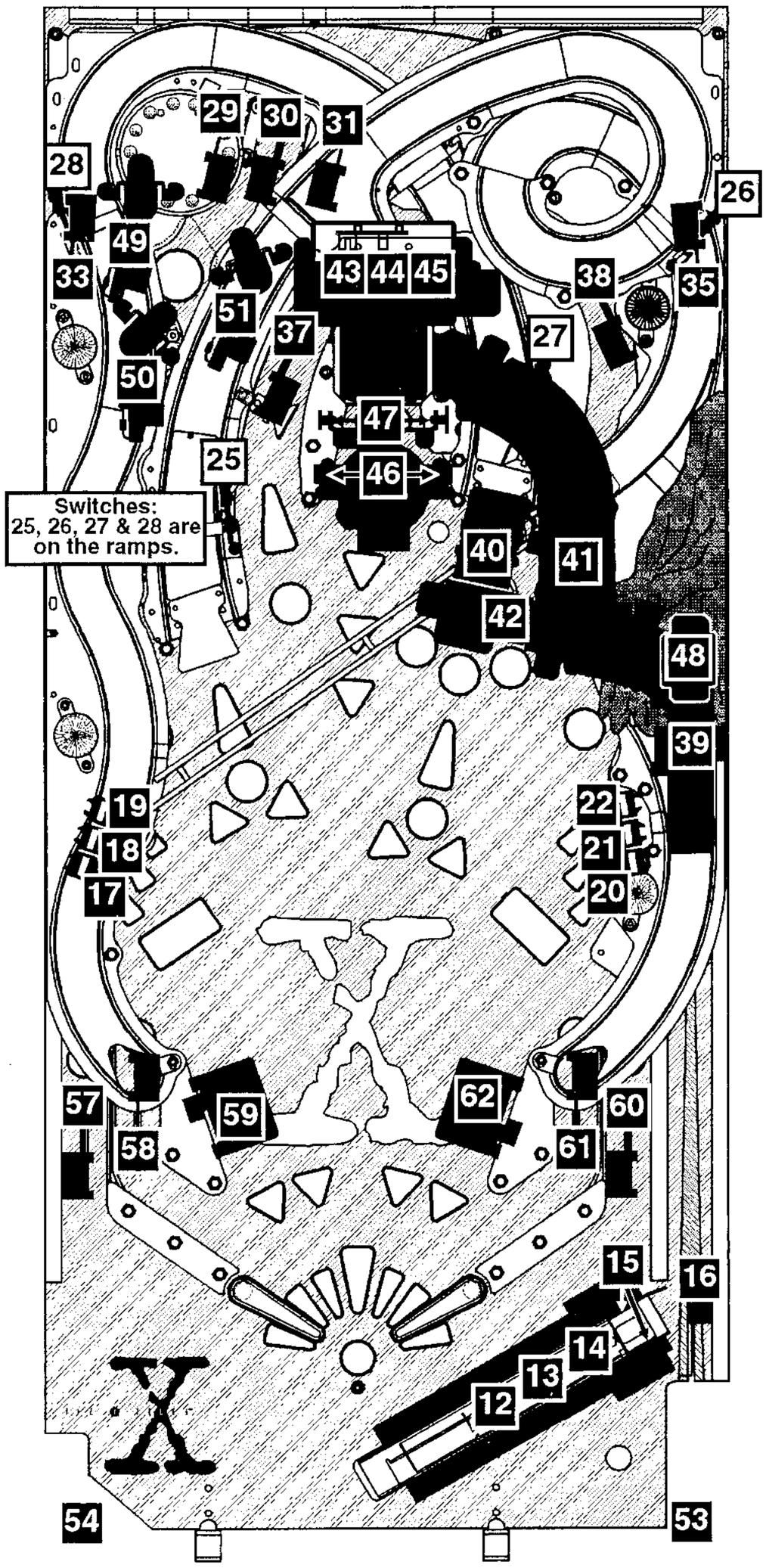


From the Lamp Menu GO TO ROW OR COLUMN TEST

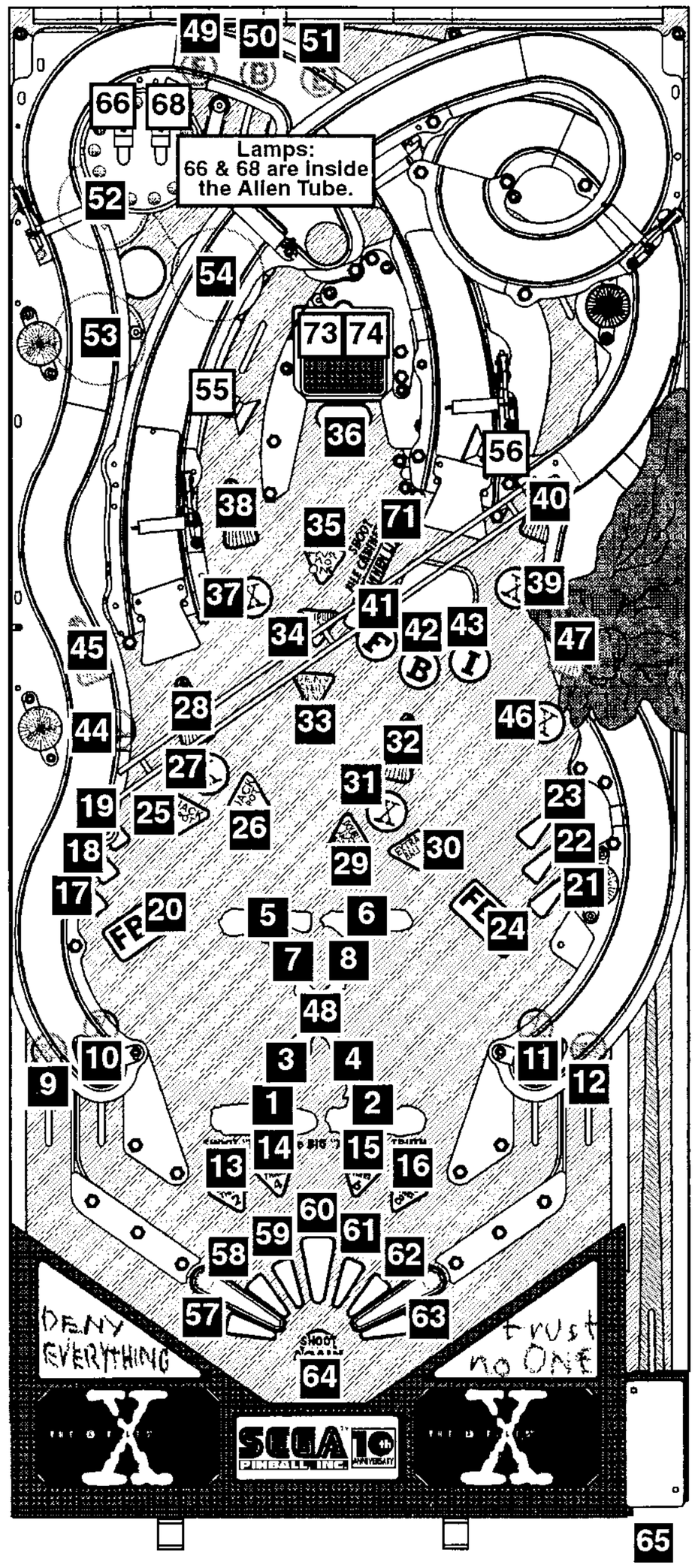
LAMP MATRIX GRID

Column (18v) / Row (GND)	1: U17 YEL-BRN J13-P9	2: U16 YEL-RED J13-P8	3: U15 YEL-ORG J13-P7	4: U14 YEL-BLK J13-P6	5: U13 YEL-GRN J13-P5	6: U12 YEL-BLU J13-P4	7: U11 YEL-VIO J13-P3	8: U10 YEL-GRY J13-P1
1: Q33 RED-BRN J12-P1	X: BOTTOM LEFT #555 Bulb 1	X: BOTTOM RIGHT #555 Bulb 2	X: LOWER MID-LEFT #555 Bulb 3	X: LOWER MID-RIGHT #555 Bulb 4	X: TOP LEFT #555 Bulb 5	X: TOP RIGHT #555 Bulb 6	X: UPPER MID-LEFT #555 Bulb 7	X: UPPER MID-RIGHT #555 Bulb 8
2: Q34 RED-BLK J12-P2	LEFT OUTLANE #555 Bulb 9	LEFT RE-TURN LANE #555 Bulb 10	RIGHT RE-TURN LANE #555 Bulb 11	RIGHT OUTLANE #555 Bulb 12	BONUS TIMES 2 #555 Bulb 13	BONUS TIMES 4 #555 Bulb 14	BONUS TIMES 6 #555 Bulb 15	BONUS TIMES 8 #555 Bulb 16
3: Q35 RED-ORG J12-P3	LEFT 3-BANK BOTTOM #555 Bulb 17	LEFT 3-BANK MID #555 Bulb 18	LEFT 3-BANK TOP #555 Bulb 19	LEFT FBI BADGE #555 Bulb 20	RIGHT 3-BANK BOTTOM #555 Bulb 21	RIGHT 3-BANK MID #555 Bulb 22	RIGHT 3-BANK TOP #555 Bulb 23	RIGHT FBI BADGE #555 Bulb 24
4: Q36 RED-YEL J12-P4	JACKPOT (LEFT) #555 Bulb 25	JACKPOT (RIGHT) #555 Bulb 26	LEFT RAMP X #555 Bulb 27	LEFT RAMP ARROW #555 Bulb 28	DOUBLE JACKPOT #555 Bulb 29	EXTRA BALL #555 Bulb 30	RIGHT RAMP X #555 Bulb 31	RIGHT RAMP ARROW #555 Bulb 32
5: Q37 RED-GRN J12-P5	DENY EVERY THING #555 Bulb 33	THE TRUTH IS OUT THERE #555 Bulb 34	TRUST NO ONE #555 Bulb 35	FILE CABI-NET CIRCLE #555 Bulb 36	MINI LOOP X LEFT #555 Bulb 37	MINI LOOP ARROW LEFT #555 Bulb 38	MINI LOOP X RIGHT #44 Bulb 39	MINI LOOP ARROW RIGHT #44 Bulb 40
6: Q38 RED-BLU J12-P6	(F) BI #555 Bulb 41	F (B) I #555 Bulb 42	FB (I) #555 Bulb 43	LEFT ORBIT X #555 Bulb 44	LEFT ORBIT ARROW #555 Bulb 45	RIGHT OR-BIT X #555 Bulb 46	RIGHT OR-BIT ARROW #44 Bulb 47	X: CENTER #555 Bulb 48
7: Q39 RED-VIO J12-P8	(E) BE #555 Bulb 49	E (B) E #555 Bulb 50	EB (E) #555 Bulb 51	TOP TUR-BO BUMPER #555 Bulb 52	BOTTOM TUR-BO BUMPER #555 Bulb 53	RIGHT TUR-BO BUMPER #555 Bulb 54	CAB. SPOT-LIGHT (LT.) #555 Bulb 55	CAB. SPOT-LIGHT (RT.) #555 Bulb 56
8: Q40 RED-GRY J12-P9	FLIPPER 1 (LEFT) #555 Bulb 57	FLIPPER 2 #555 Bulb 58	FLIPPER 3 #555 Bulb 59	FLIPPER 4 (CENTER) #555 Bulb 60	FLIPPER 5 #555 Bulb 61	FLIPPER 6 #555 Bulb 62	FLIPPER 7 (RIGHT) #555 Bulb 63	SHOOT AGAIN #555 Bulb 64
9: Q41 RED-WHT J12-P10	LAUNCH BUTTON #555 Bulb 65	ALIEN LEFT #555 Bulb 66	NOT USED 67	ALIEN RIGHT #555 Bulb 68	NOT USED 69	NOT USED 70	CIGARETTE #555 Bulb 71	NOT USED 72
10: Q42 RED J12-P11	FILE CABI-NET LEFT #555 Bulb 73	FILE CABI-NET RIGHT #555 Bulb 74	NOT USED 75	NOT USED 76	NOT USED 77	NOT USED 78	NOT USED 79	NOT USED 80

SWITCH MATRIX GRID LOCATIONS

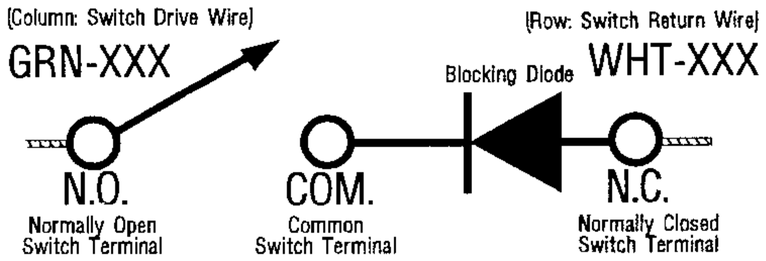


LAMP MATRIX GRID LOCATIONS

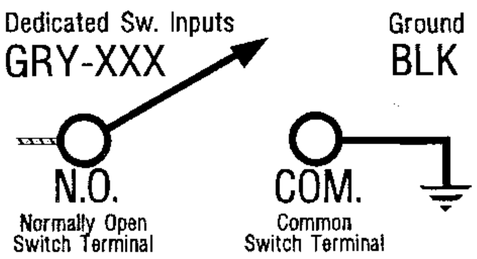


Legend Note: ☐ = Switches/Lamps mounted above playfield. ■ = Switches/Lamps mounted below the playfield.

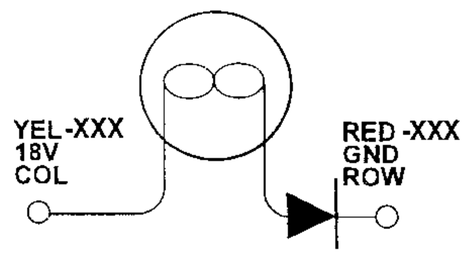
TYPICAL SWITCH SCHEMATIC

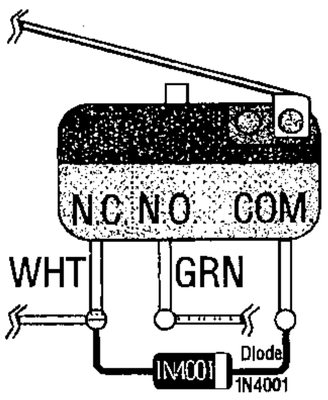


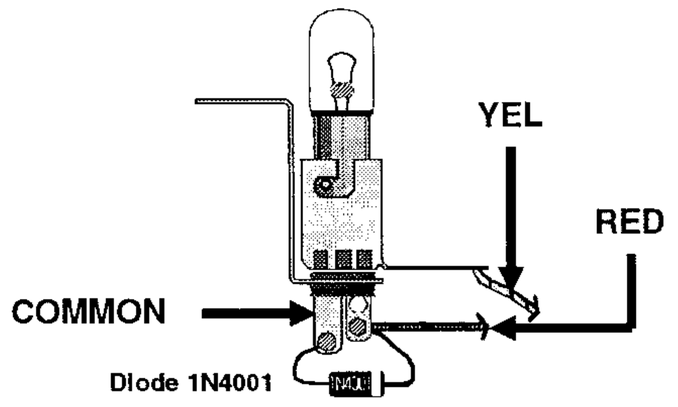
DEDICATED SWITCH SCHEMATIC

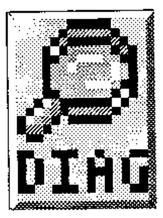


TYPICAL LAMP SCHEMATIC

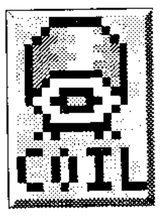




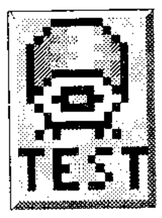




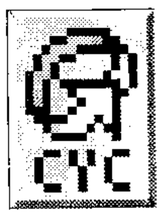
From the Main Menu in Portals™ GO TO DIAGNOSTICS MENU



From the Diagnostics Menu GO TO COIL MENU



From the Coil Menu GO TO COIL TEST



From the Coil Menu GO TO CYCLING COILS

COILS DETAILED CHART TABLE

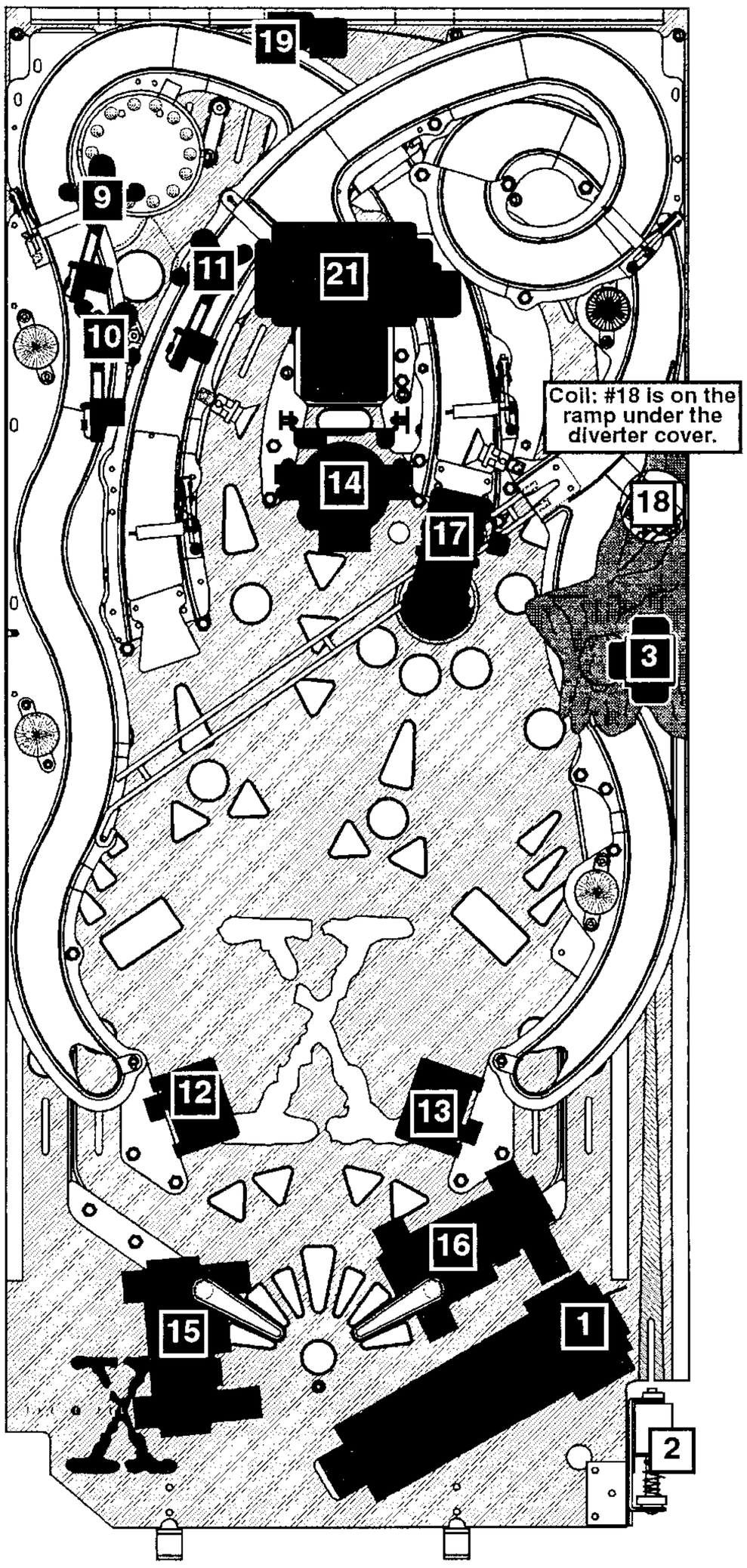
High Current Coils Group 1		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00B
#2	AUTO 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	23-800 090-5031-00B
#4	NOT USED	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	N/C	N/C	NOT USED
#5	NOT USED	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	N/C	N/C	NOT USED
#6	NOT USED	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	N/C	N/C	NOT USED
#7	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	N/C	N/C	NOT USED
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	N/A

High Current Coils Group 2		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#9	TOP TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#10	BOTTOM TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#11	RIGHT 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	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#14	MAGNET	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	VIO-YEL	J10-P3	50v DC	22-650 090-5042-01
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	22-1080 090-5032-00T

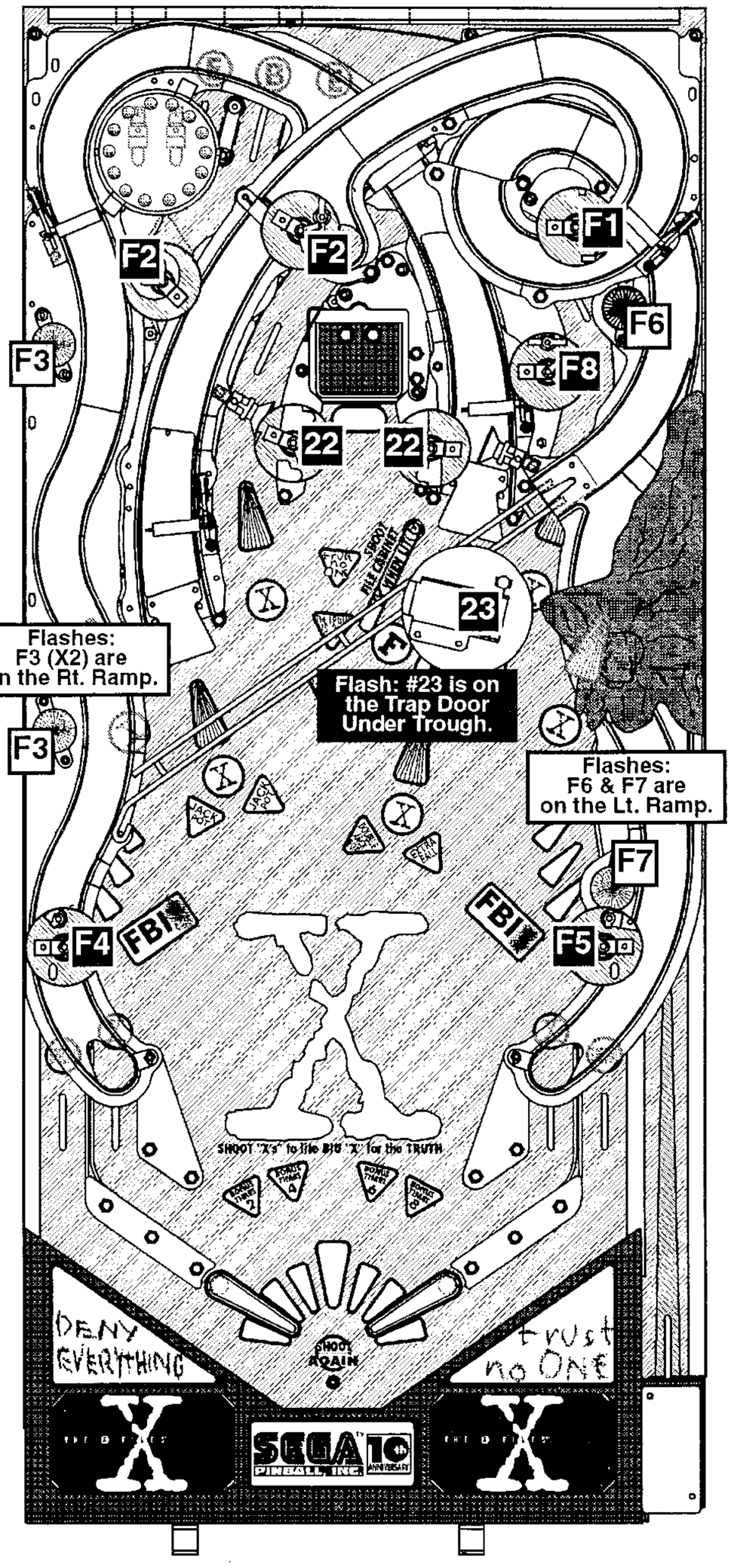
Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#17	TRAP DOOR	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	22-1080 090-5032-00T
#18	RAMP DIVERTER	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v DC	32-1800 090-5031-02
#19	ORBIT DIVERTER	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	J7-P1	20v DC	27-1500 090-5004-00B
#20	NOT USED	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	N/C	N/C	NOT USED
#21	FILE CABINET MOTOR	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	Motor 041-5057-00
#22	FLASH TOP-MID *2	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#23	FLASH TRAPDOOR *1	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	ORG	J6-P10	20v DC	#906 Bulb 165-5004-00
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	5v Meter (If Required)

Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Bulb Type
#F1	FLASH RT RAMP TOP *1	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F2	FLASH POPS *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F3	FLASH LT RAMP *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F4	FLASH BOT LT *2	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F5	FLASH BOT RT *1	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F6	FLASH RT RAMP TOP *1	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F7	FLASH RT RAMP BOT *1	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F8	FLASH MINI-LOOP *1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89

COIL LOCATIONS

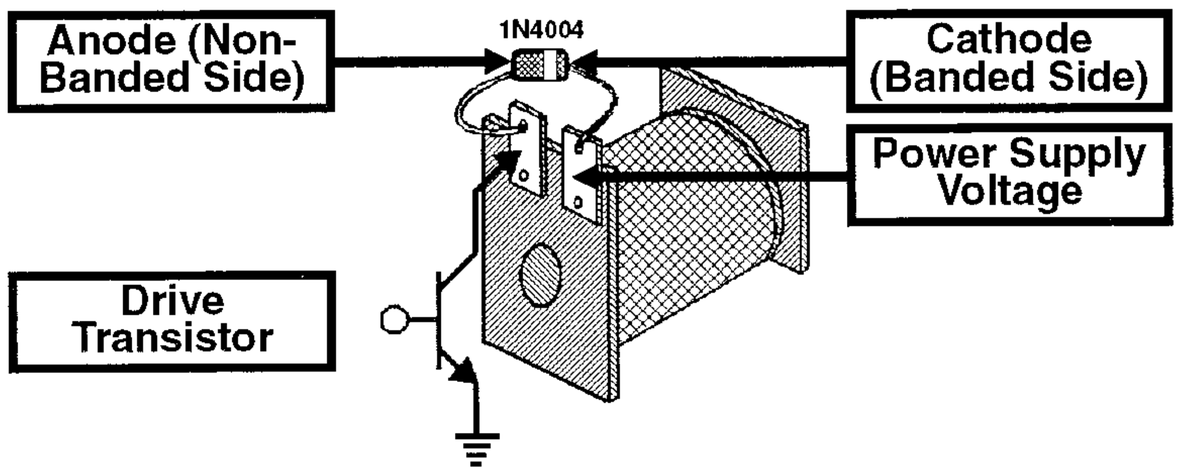


FLASH LAMP LOCATIONS

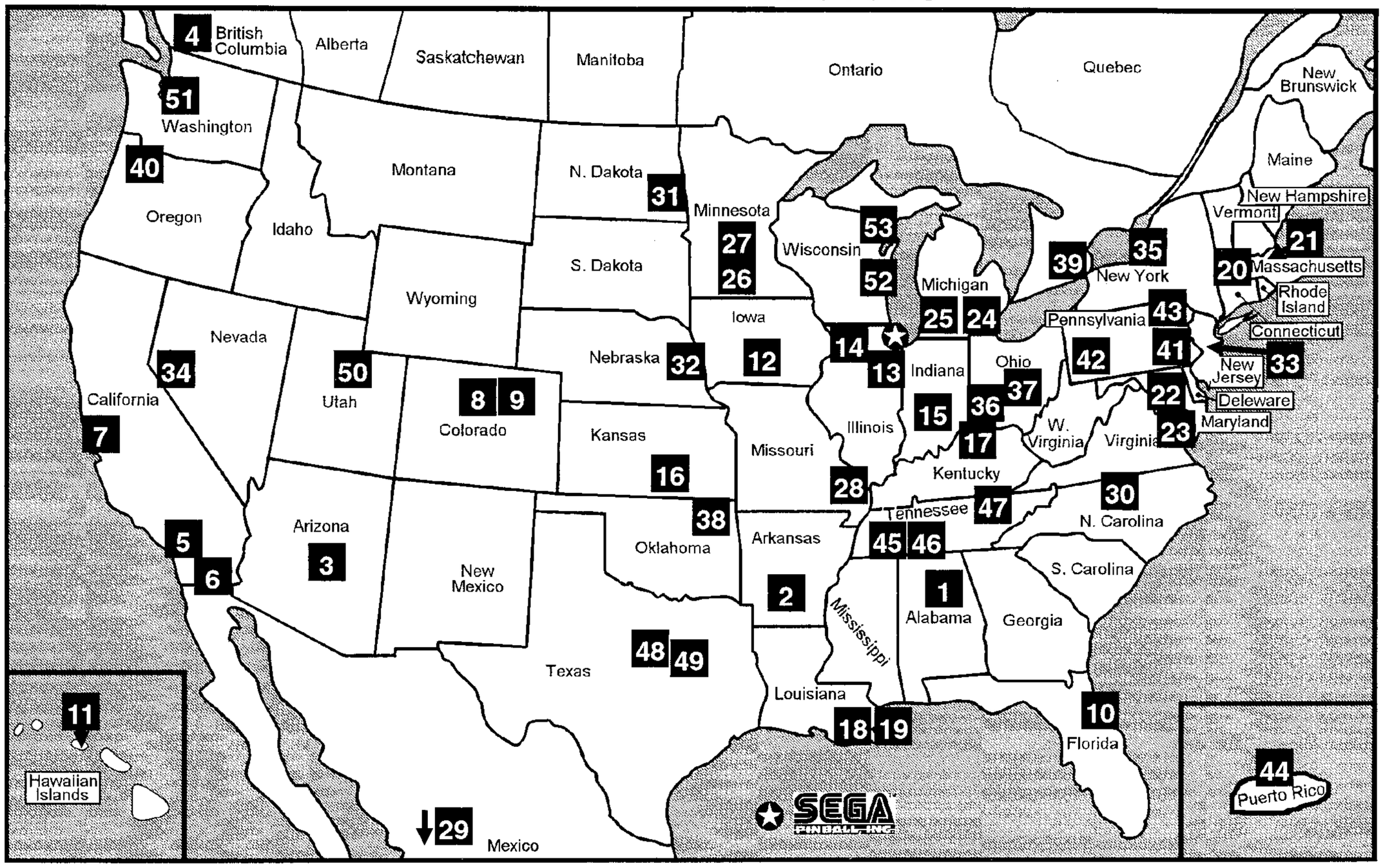


Legend Note: ☐ = Coils/Flashes mounted above playfield. ■ = Coils/Flashes mounted below the playfield.

TYPICAL COIL WIRING



DOMESTIC DISTRIBUTORS



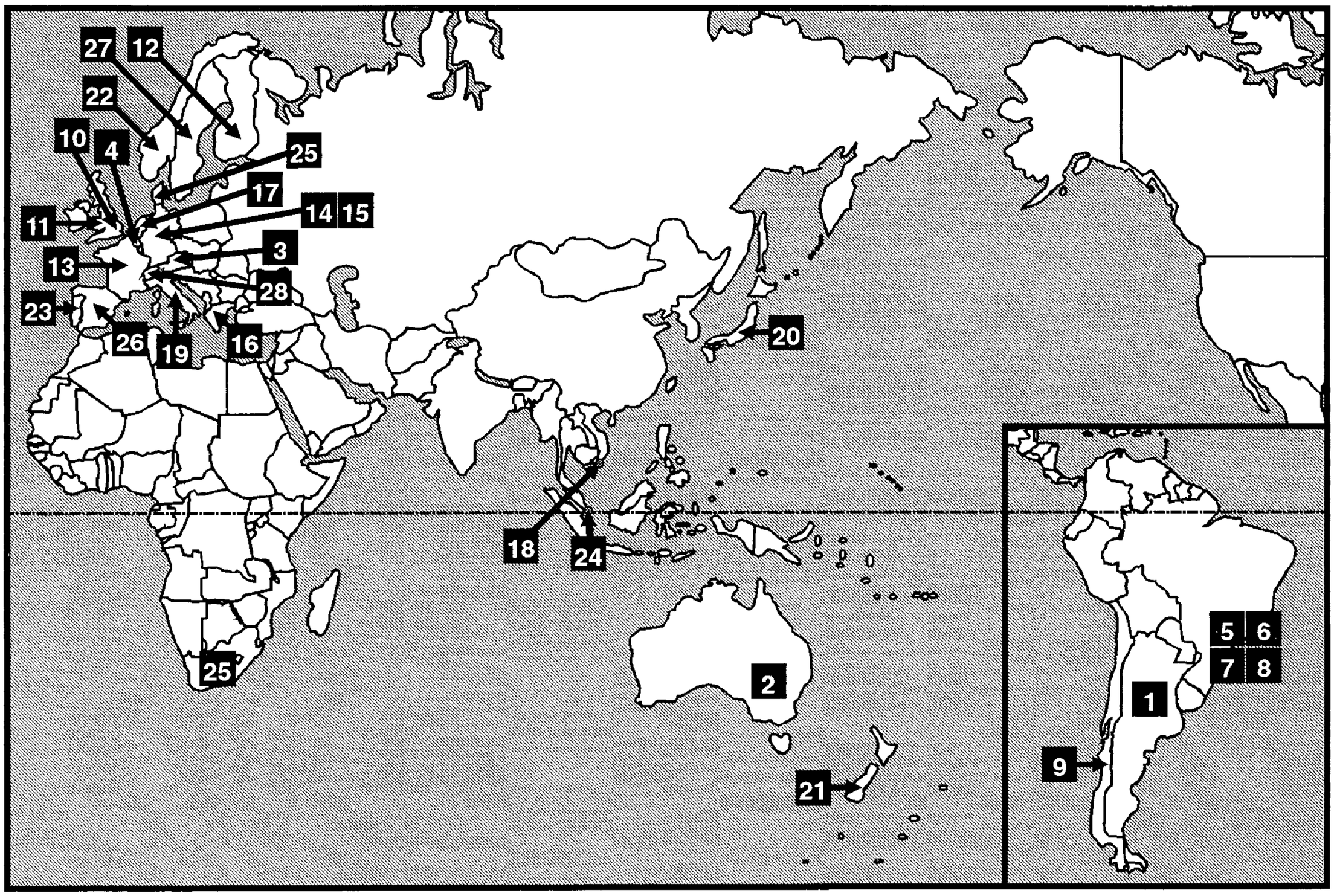
#	STATE/PROVINCE AND CITY		NAME	PHONE
1	AL	Birmingham	Birmingham Vending	205-324-7526
2	AR	N. Little Rock	Godwin Distributing	501-753-1138
3	AZ	Phoezix	Betson Pacific	602-233-0190
4	BC	Burnaby (Can.)	Can. Coin Machine	604-420-4008
5	CA	Buena Park	Betson Pacific	714-228-7500
6		San Diego	Betson Pacific	619-459-0871
7		S. San Francisco	Betson Pacific	415-952-4220
8	CO	Denver	Col. Game Exchange	303-893-4300
9			Mountain Coin	303-427-2133
10	FL	Orlando	Birmingham Vending	407-425-1505
11	HI	Ewa Beach	50th State Coin Op.	808-682-4561
12	IA	Des Moines	Greater American Dist.	515-244-2828
13	IL	Chicago	Atlas Distributing	773-276-5005
14		Inverness	James Industries	708-358-8000
15	IN	Indianapolis	J. & J. Distributing	317-899-2530
16	KS	Wichita	United Distributing	316-263-6181
17	KY	Louisville	Kentucky Coin Machine	502-966-5266
18	LA	Metairie	AMA Distributors, Inc.	504-835-3232
19			New Orleans Novelty	504-888-3500
20	MA	E. Long Meadow	Gekay Sales	413-525-2700
21		Norwood	Mondial Int'l. Dist.	617-769-9966
22	MD	Baltimore	Automated Services	410-646-4100
23			Weiner Distributing	410-525-2600
24	MI	Farmington Hills	Atlas Distributing	810-615-1703
25		Wyoming	Atlas Distributing	616-241-1472
26	MN	Bloomington	Hanson Distributing	612-884-6604

#	STATE/PROVINCE AND CITY		NAME	PHONE
27	MN	Minneapolis	Sandler Vending	612-996-0010
28	MO	St. Louis	J. & J. Distributing	314-645-3393
29	MX	Col. Napoles	James Industries	011-525-543-1174
30	NC	Archdal	Operators Distributing	910-884-5714
31	ND	Fargo	M.H. Associates, Inc.	701-282-7877
32	NE	Omaha	Greater American Dist.	402-553-2812
33	NJ	Springfield	Mondial Int'l. Dist.	201-467-9700
34	NV	Reno	Reno Game Sales	702-829-2080
35	NY	Rochester	Mondial Dist.	716-586-1100
36	OH	Cincinnati	Atlas Distributing	513-771-1909
37		Columbus	Shaffer Dist.	614-421-6800
38	OK	Tulsa	Galaxy Distributing, Co.	918-835-1166
39	ON	Rexdale (Can.)	New Way Sales	416-674-8000
40	OR	Portland	American Coin	503-233-7000
41	PA	Bensalem	Mondial Int'l. Dist.	215-638-1122
42		Pittsburgh	Mondial Int'l. Dist.	412-881-8804
43		Wilkes-Barre	Roth Novelty	717-824-9994
44	PR	Carolina	James Industries	809-253-7149
45	TN	Memphis	Games Sales Co., Inc.	901-525-8351
46			Green G.A.M.E.S.	901-353-1000
47		Nashville	Sammons-Pennington	615-244-3020
48	TX	Corsicana	Master Sales	903-874-4740
49		Dallas	Commercial Music	214-741-6381
50	UT	Salt Lake City	Struve Distributing	801-328-1636
51	WA	Seattle	American Coin	206-764-9020
52	WI	Green Bay	Pioneer Sales & Svc.	414-468-5200
53		Menomonee Falls	Pioneer Sales & Svc.	414-781-1420

TECHNICAL SUPPORT
SEGA PINBALL, INC.

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)
1	Argentia, Urquiza	Florencia	54-232-5532
2	Australia, Matraville	Amusement Machine Dist.	61-29-316-6000
3	Austria, Grazerstrasse	Rupp Austria	43-34-528-6105
4	Belgium, Brussels	Splin S.A.	32-43-62-7677
5	Brazil, Sao Paulo	Parkland	55-11-792-42864
6		Topway Commercial	55-11-278-6838
7		Unimax	55-11-533-5615
8		Universe	55-11-575-0731
9	Chile, Santiago	Cuinsa	56-2-696-0167
10	England, London	Electrocoin	44-181-965-2055
11	So. Wales, Cardiff	Electrocoin	44-22-261-5100
12	Finland, Espoo	Pelika Ray Oy	35-804-37091
13	France, Aubervilliers	PLF Sa	33-14-811-3131
14	Germany, Berlin	Bally Wulff	49-3-062-0020

#	COUNTRY AND CITY	NAME	PHONE (-011)
15	Germany, Hannover	Bally Wulff	49-511-358-5343
16	Greece, Athens	Alpha Distributing	30-1-554-1608
17	Holland, Sittart	Veltmeijer Automaten	31-46-452-6444
18	Hong Kong, Kwai Fong	Bondeal Limited	85-2-487-9089
19	Italy (RSM), Serravalle	Technoplay Sa	39-54-990-0361
20	Japan, Tokyo	Data East, Corp.	81-35-370-0708
21	New Zealand, Auckland	Amco Machine Supp.	64-9-846-7606
22	Norway, Oslo	Vendcomatic	47-2-216-0830
23	Portugal, Amadora	Jacinto & Martins	35-11-495-1868
24	Singapore, Singapore	Valibel Technologies	65-748-8404
25	South Africa, Lalucia	Unimac	27-3-152-5544
26	Spain, Madrid	Sente S.A.	34-1-541-7112
27	Sweden, Bromma	Axlon	46-8-704-6580
28	Switzerland, Harkingen	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**.

TECHNICAL SUPPORT SEGA™ PINBALL, INC.

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**, & **Low Line** conditions.

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

TRANSPORTATION

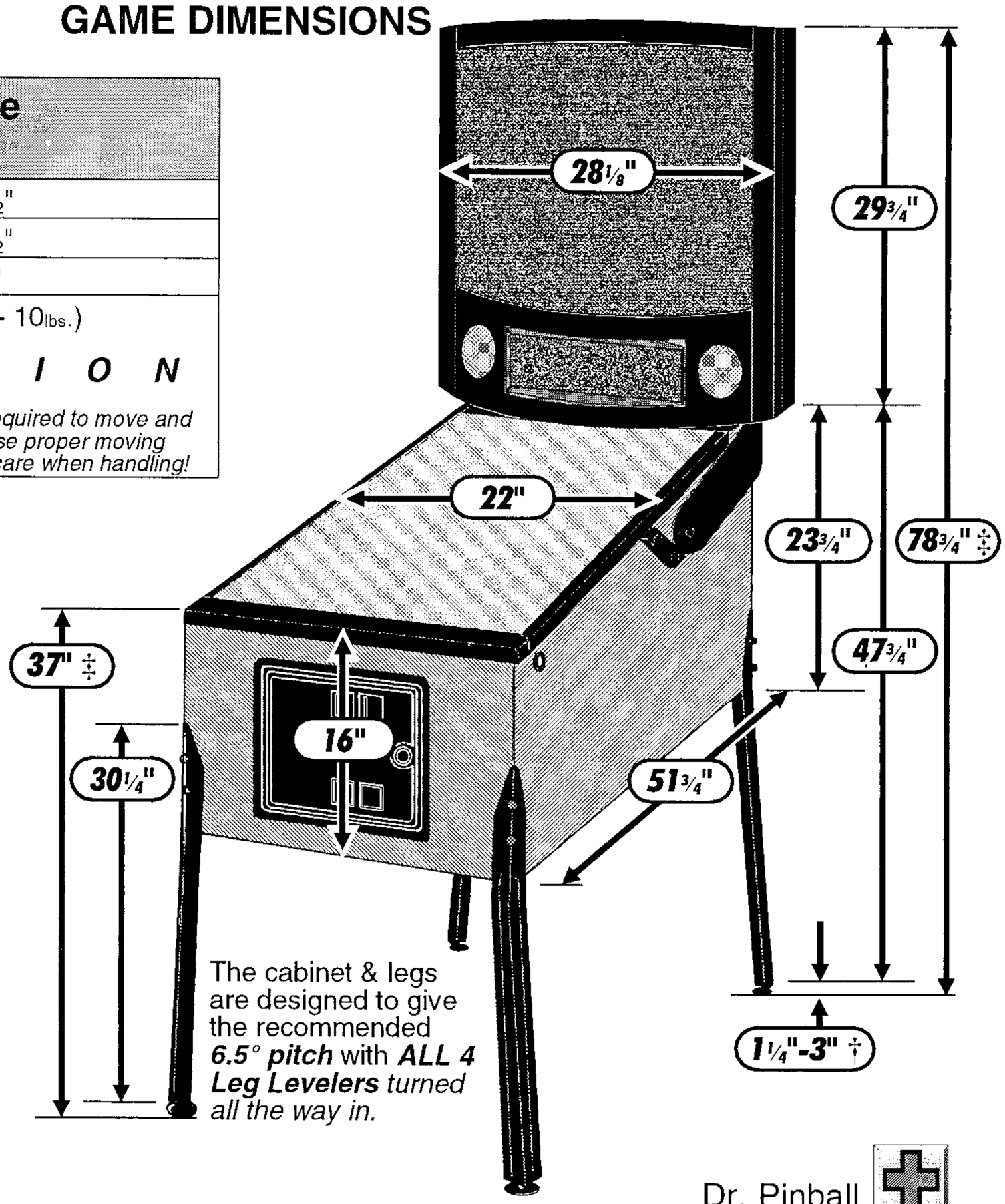
To reduce the possibility of damage, observe **ALL** precautions whenever transporting the game. ***Read & follow*** *Section 1, Chapter 1,* **Game Assembly Procedures**, & **How to Secure the Backbox for Transporting**. Remove the legs & secure the game within the transporting vehicle. *Save and retain all printed information on the game.*

GAME DIMENSIONS

Shipping Crate Dimensions	
Height:	55½"
Width:	30½"
Depth:	31"
Weight:	300lbs. (+/- 10lbs.)

C A U T I O N

At least 2 people are required to move and maneuver game. Use proper moving equipment & extreme care when handling!



N o t e s :

The Leg Levelers can add up to 1¾" ***MORE*** to the overall height.

The overall *FRONT & BACK* dimensions reflect the added +1¼" height from the Leg Levelers turned all the way in.

The cabinet & legs are designed to give the recommended ***6.5° pitch*** with ***ALL 4 Leg Levelers*** *turned all the way in.*

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Game Set-Up

Game Assembly Procedures

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

1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton. ***CAUTION:*** *At least 2 people are required to move and maneuver game. Use proper moving equipment & extreme care when handling.* **Pinball game is 300 lbs.+.**

2. Remove all packing material. 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 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 the 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. **This Game:** ***Before*** you move to **Step 9** - There is a Playfield Shipping Bracket attached to the playfield and secured to the cabinet by three (3) #8 x 3/4" screws. *Access through the Coin Door.* These ***screws must be removed***. ***Do not remove*** the Shipping Bracket from the playfield (use for future shipping). Save these screws by taping to the side of the cabinet (by holes) or putting the screws into the cash box (save them with the shipping notice regarding this procedure).

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.

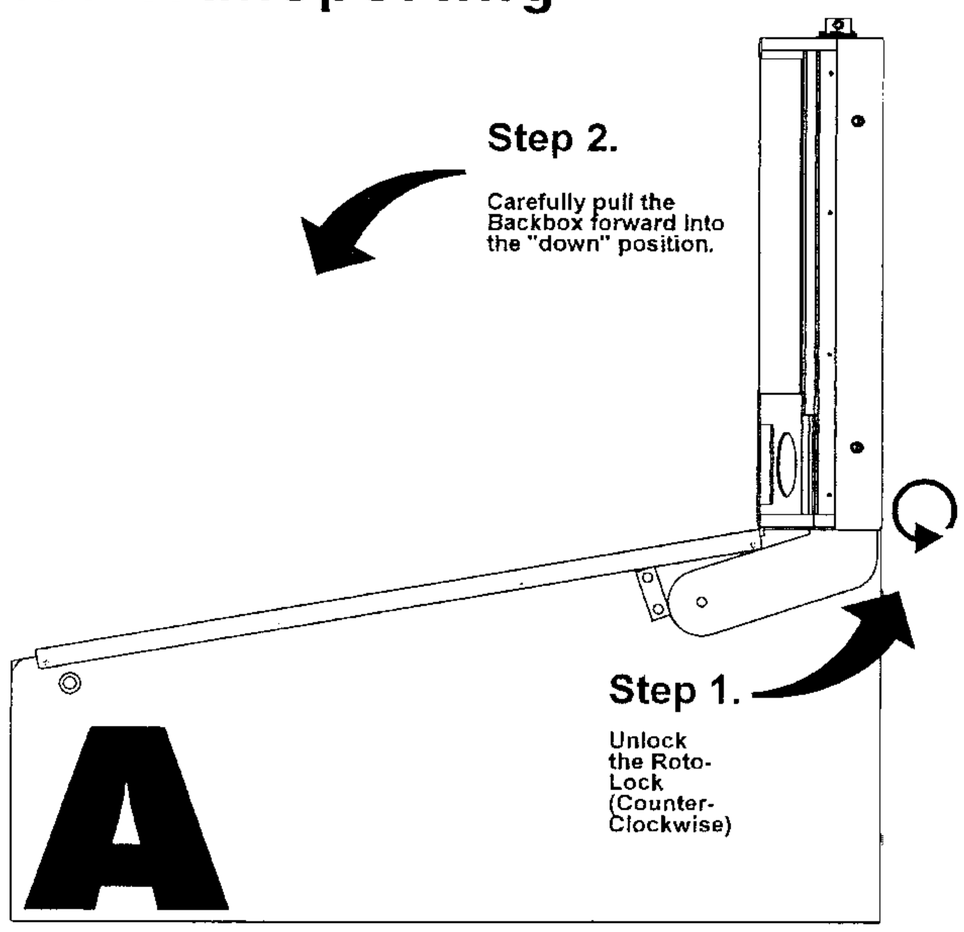
The playfield incline affects difficulty of play. Use the recommended incline; Game difficulty is best varied using game adjustments.

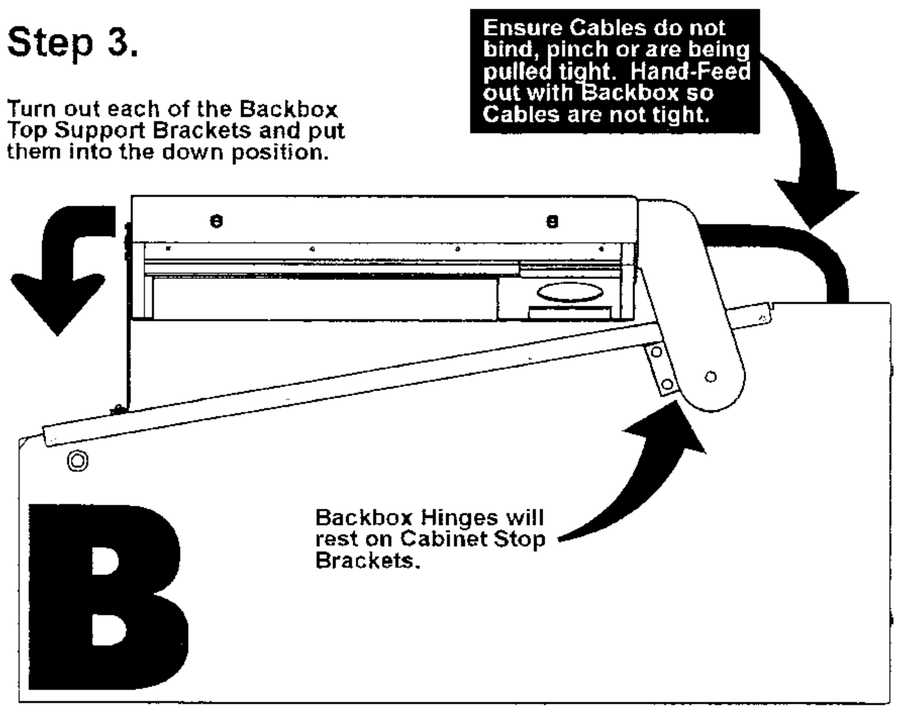
14. If desired, perform any self tests at this time. See Section 3, Chapter 1, Portals™ Service Menu Introduction, and Chapter 2, Go To Diagnostics Menu, for instructions on how to enter "Begin Play Test" and "Game Specific" to test components on the game.

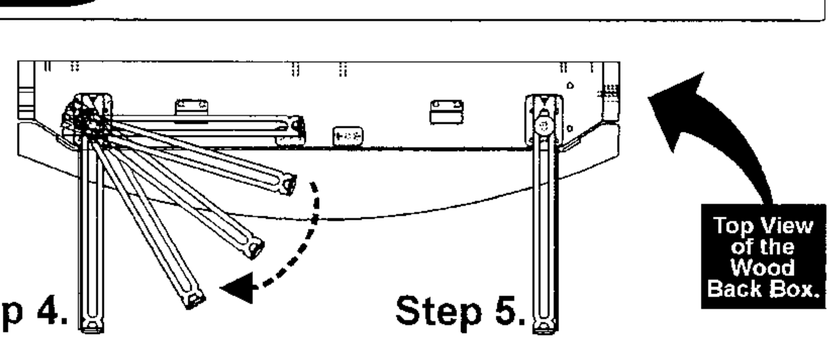
15. **INSTALL 4 BALLS** on the playfield near the outhole and carefully reinstall the playfield glass. (Amount of balls are always specified on decal attached to the lock down assembly.)

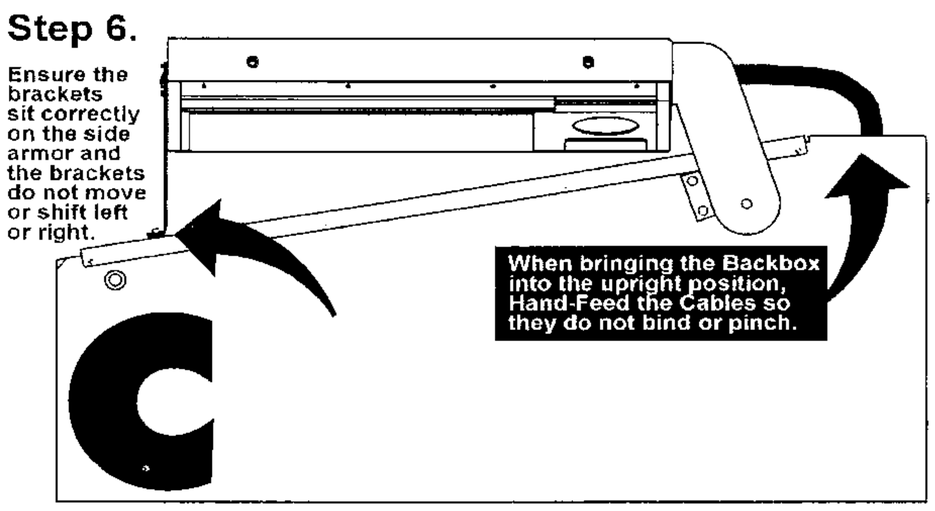
16. If desired, make Game Pricing (Standard and/or Custom) and Add-A-Ball, Novelty, or X-Ball Play adjustments at this time. See Section 3, Chapter 4, Go To Adjustments Menu, for instructions on how to enter adjustments. Follow instructions in the tables provided in the manual for suggestions of customizing changes.

How to Secure the Backbox for Transporting









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

Leg Leveler Adjustment

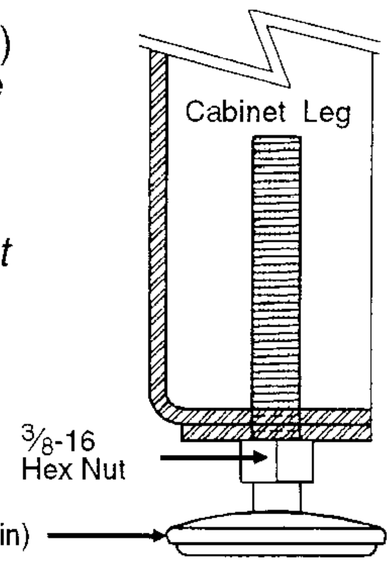
This cabinet is designed to automatically have a 6.5° pitch without any Leg Leveler adjustment!

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!

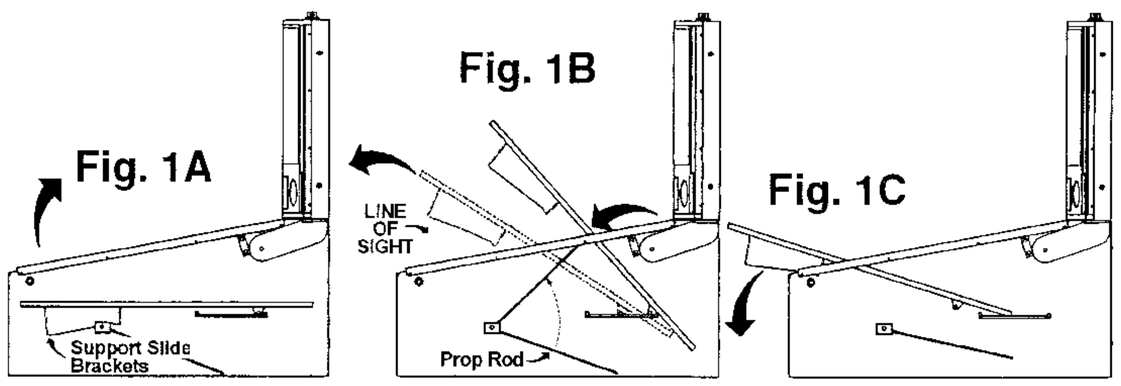
Verify 6.5° pitch. Minor adjustment(s) may be necessary depending on the location floor being level.

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



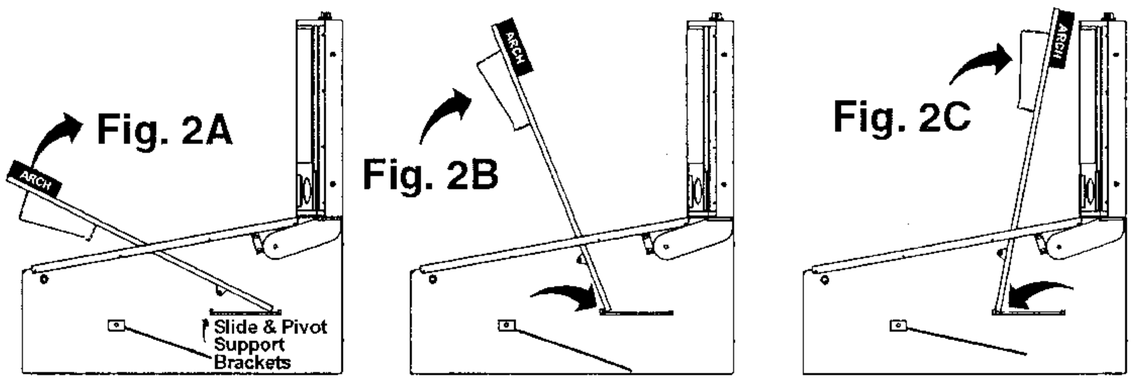
Easy Access Service System - 3 Positions

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).

Game Operation & Features

Start of Game Features

Starting a Normal Game

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

Special Note for The X-Files Game: Before you press the Launch Button to begin play, you must choose who you want to be: "Mulder" or "Scully". Either choice will give "secret power-ups."

The display now indicates the player or # of players selected from the total depressions of the **START BUTTON**. The display indicates the ball in play, and a ball is served to the *Shooter Lane*. An introduction is shown followed by Skill Shot Graphics. Pressing the **START BUTTON** after ball 1 of any player will start a new game (if credits are available), ***but only*** if the **START BUTTON** is depressed for 2-3 seconds. This delay is to avoid accidental "re-starts" of a game. (Note: Any ½ credit remaining during game play after the end of ball 1, or power down, will be eliminated.)

Starting Team Play (Doubles!)

Team Play is a four player game. The totals for players 1 & 3 (Team 1) and players 2 & 4 (Team 2) are displayed individually as well as the combined score for both teams. Team Play 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.

End of Game Features Continued

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

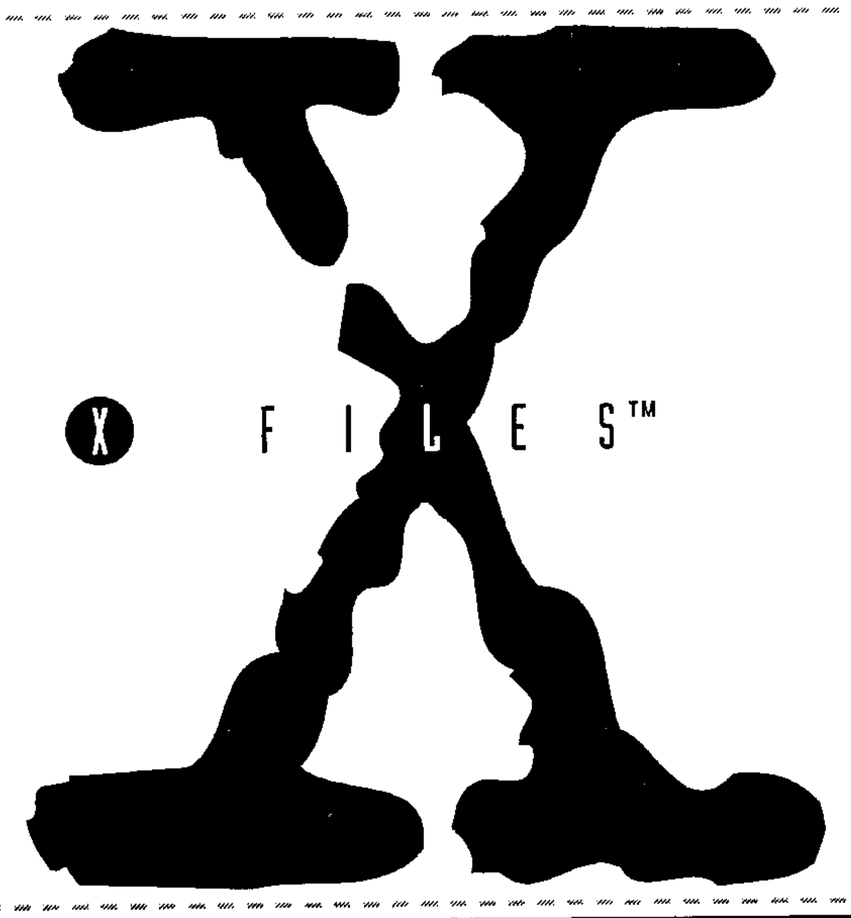
This game is equipped with a Manual Percentage Adjustment. As with our previous games, you can either set operator adjustments for a replay percent or you can set a fixed replay score. See Section 3, Chapter 4, Go To Adjustments Menu, Adjustments 1 & 2. If you set operator adjustments for a particular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

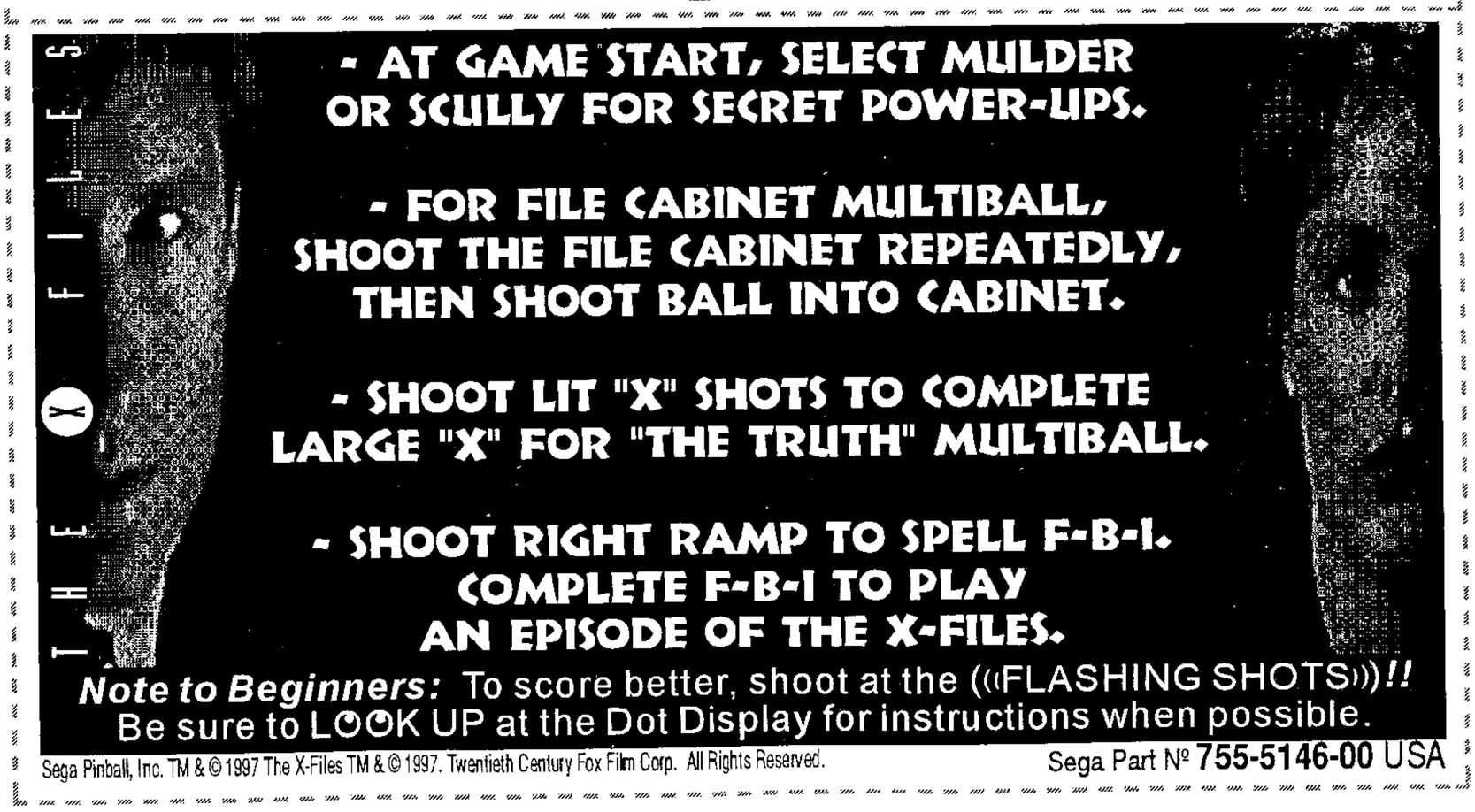
COPY & CUT

SEGA™ PINBALL, INC.



THE X FILES™

FOLD HERE



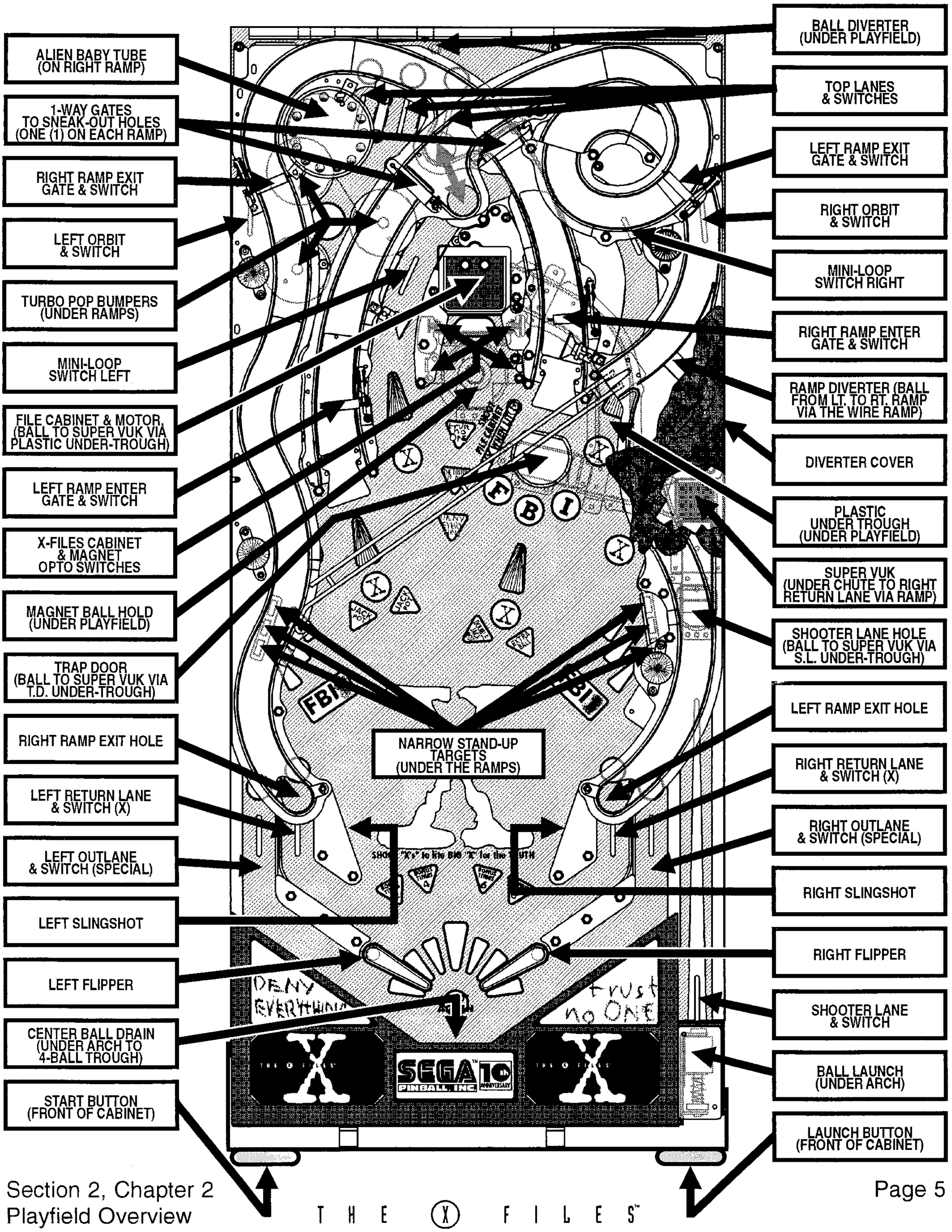
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Sega Part № **755-5146-00** USA

Playfield Overview

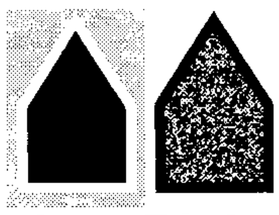
Overview

Below is ***The X-Files Playfield Map*** showing all the Major Items & where the pinball can travel in this game. The balance of this Chapter will show the playfield as it is built up (and 1 view of underneath). For component names & parts mentioned, review Section 4, Chapters 1 (Pink Section) & Chapter 2 (Blue Section).

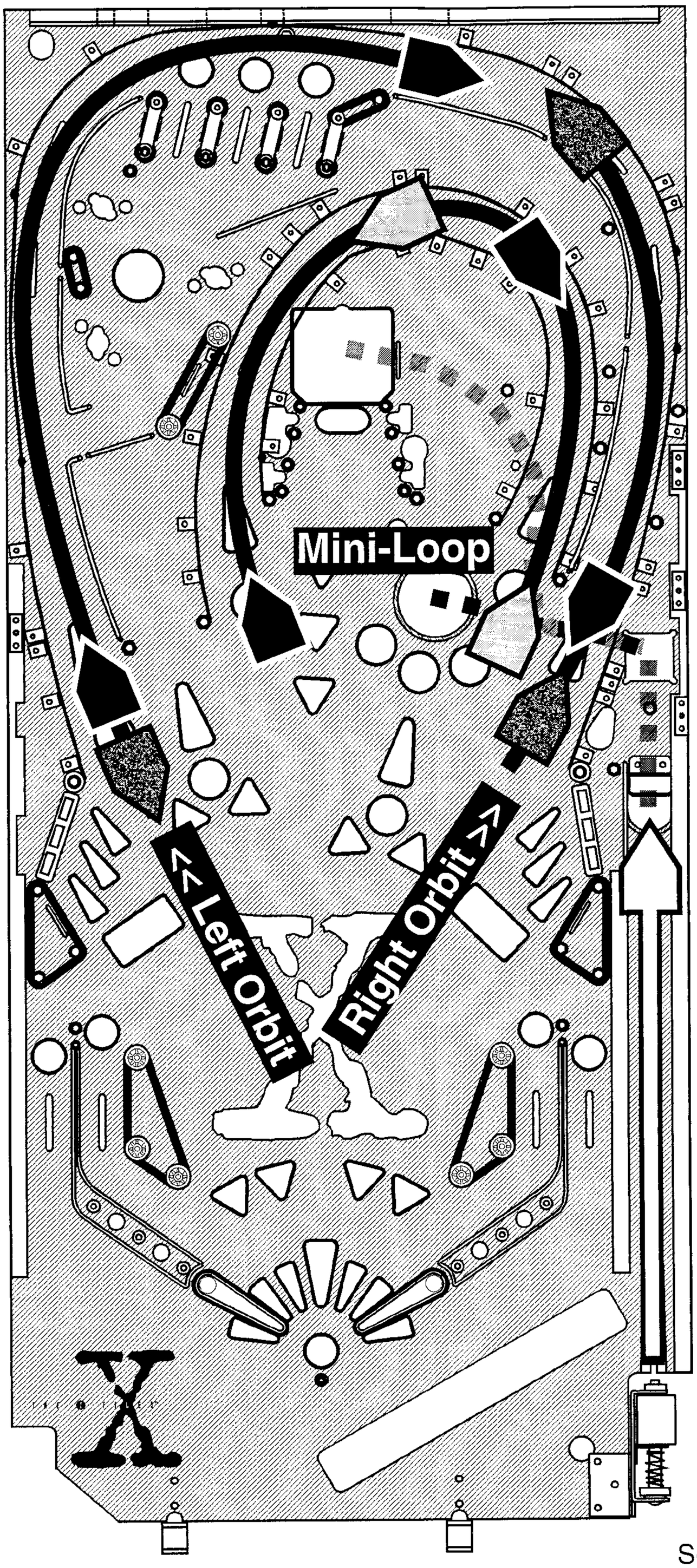


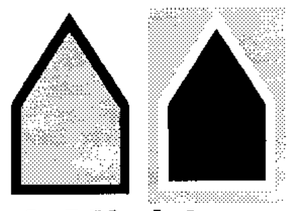
Playfield Top Ball Shots: Layer 1

Below is the top of the playfield showing the Playfield Back Panel, Wood Rails, Ball Guides, Flat Metal Rails, Posts, Rubber Rings, Target Tops, Ball Snubber, Flipper Bats, Playfield Hanging Brackets and the Auto Ball Launch.



A Left or Right Orbit Shot with the Ball Deflector down will continue around completing each Orbit Shot.





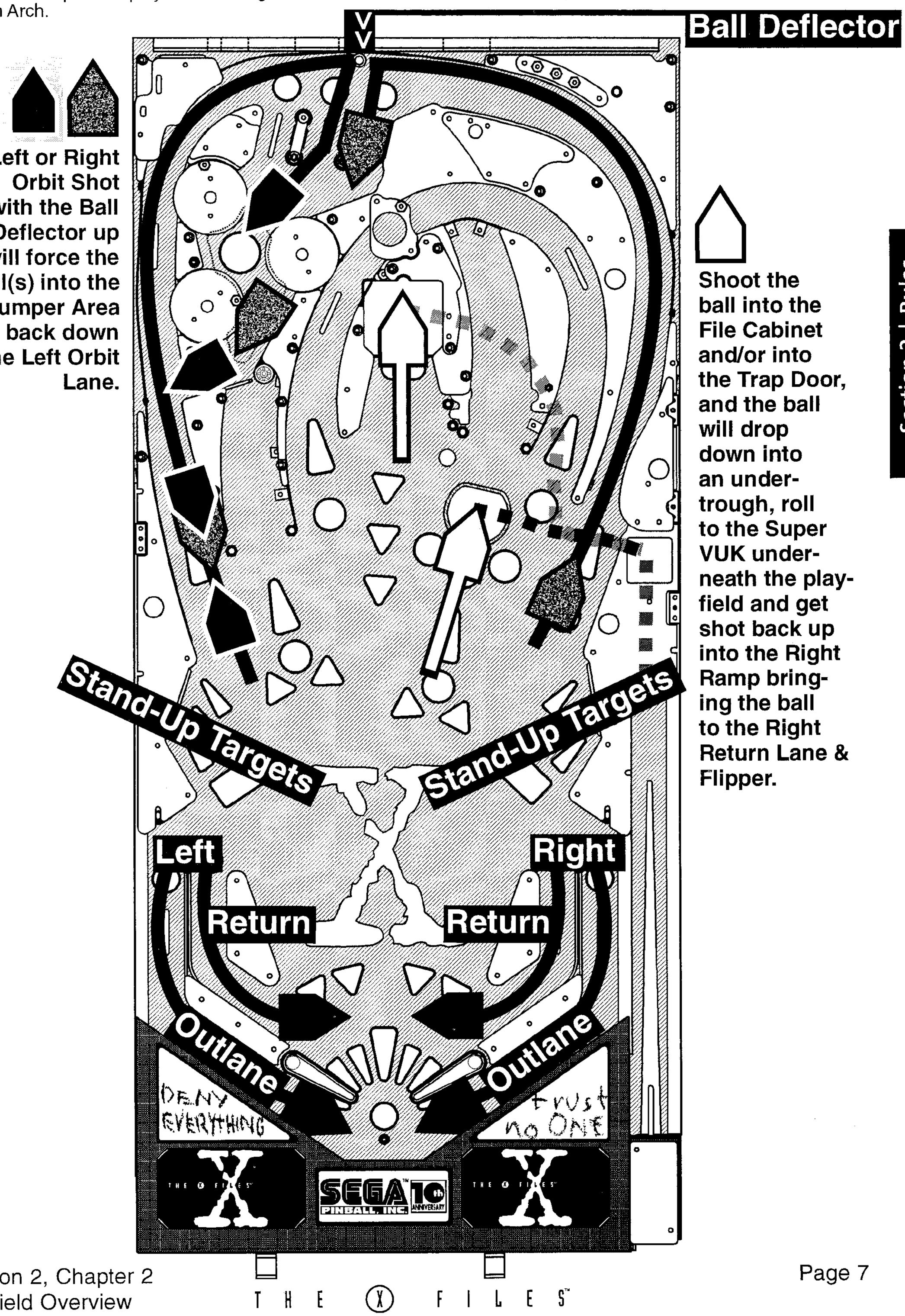
A Mini-Loop Shot either from the Left or the Right will follow through the other side.



The shot from the Shooter Lane will bring the ball underneath the playfield into an under-trough and get shot back up into the Right Ramp bringing the ball to the Right Return Lane & Flipper.

Playfield Top Ball Shots: Layer 2

Below is the top of the playfield showing the addition of Screened & Clear Butyrate (plastic) Pieces and the Bottom Arch.



A Left or Right Orbit Shot with the Ball Deflector up will force the ball(s) into the Pop Bumper Area then back down the Left Orbit Lane.

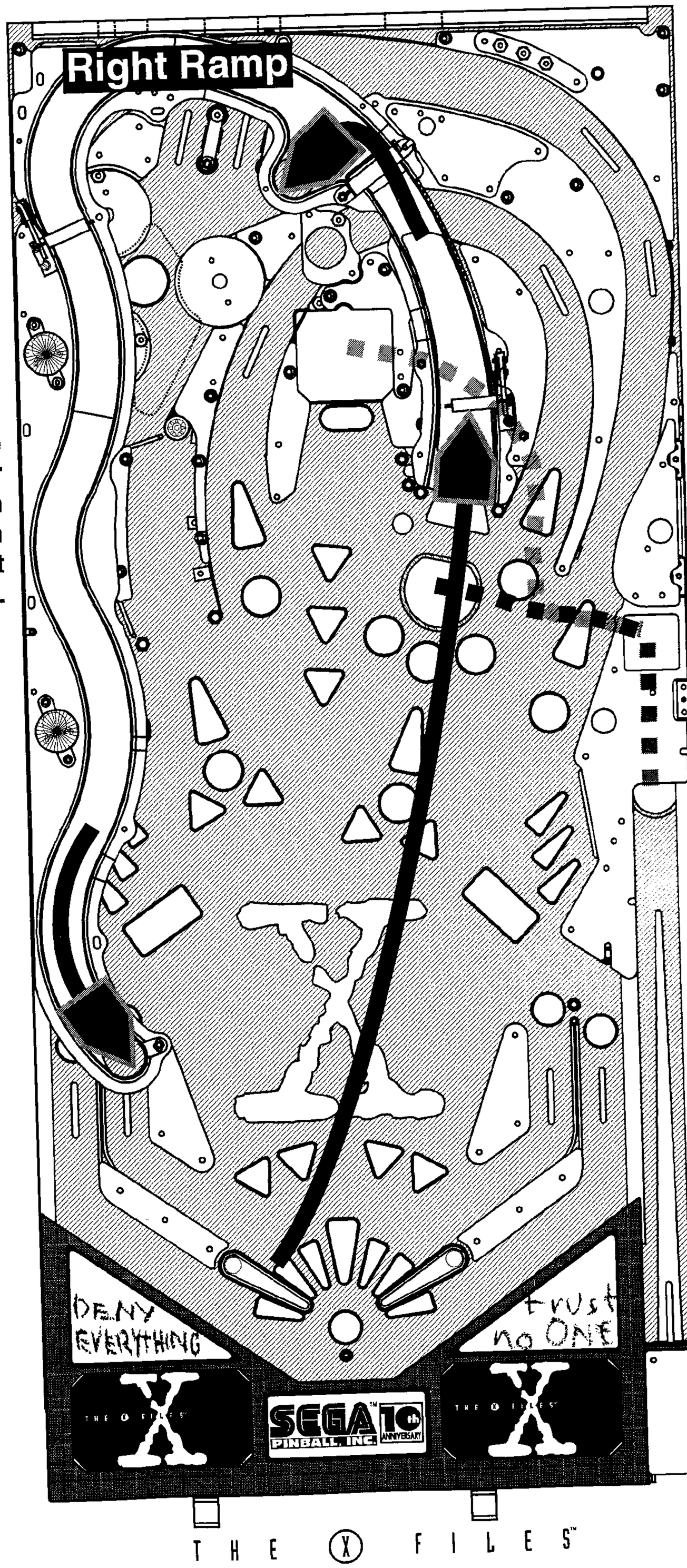
Shoot the ball into the File Cabinet and/or into the Trap Door, and the ball will drop down into an under-trough, roll to the Super VUK under-neath the play-field and get shot back up into the Right Ramp bring-ing the ball to the Right Return Lane & Flipper.

Playfield Top Ball Shots: Layer 3

Below is the top of the playfield showing the addition of the Right Plastic Ramp.

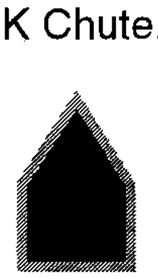


A Hard Shot to the Right Ramp will exit to the Left Return Lane. A Soft Shot may exit out the "Sneak-Out" Hole to the Pop Bumper Area then back down the Left Orbit Lane.

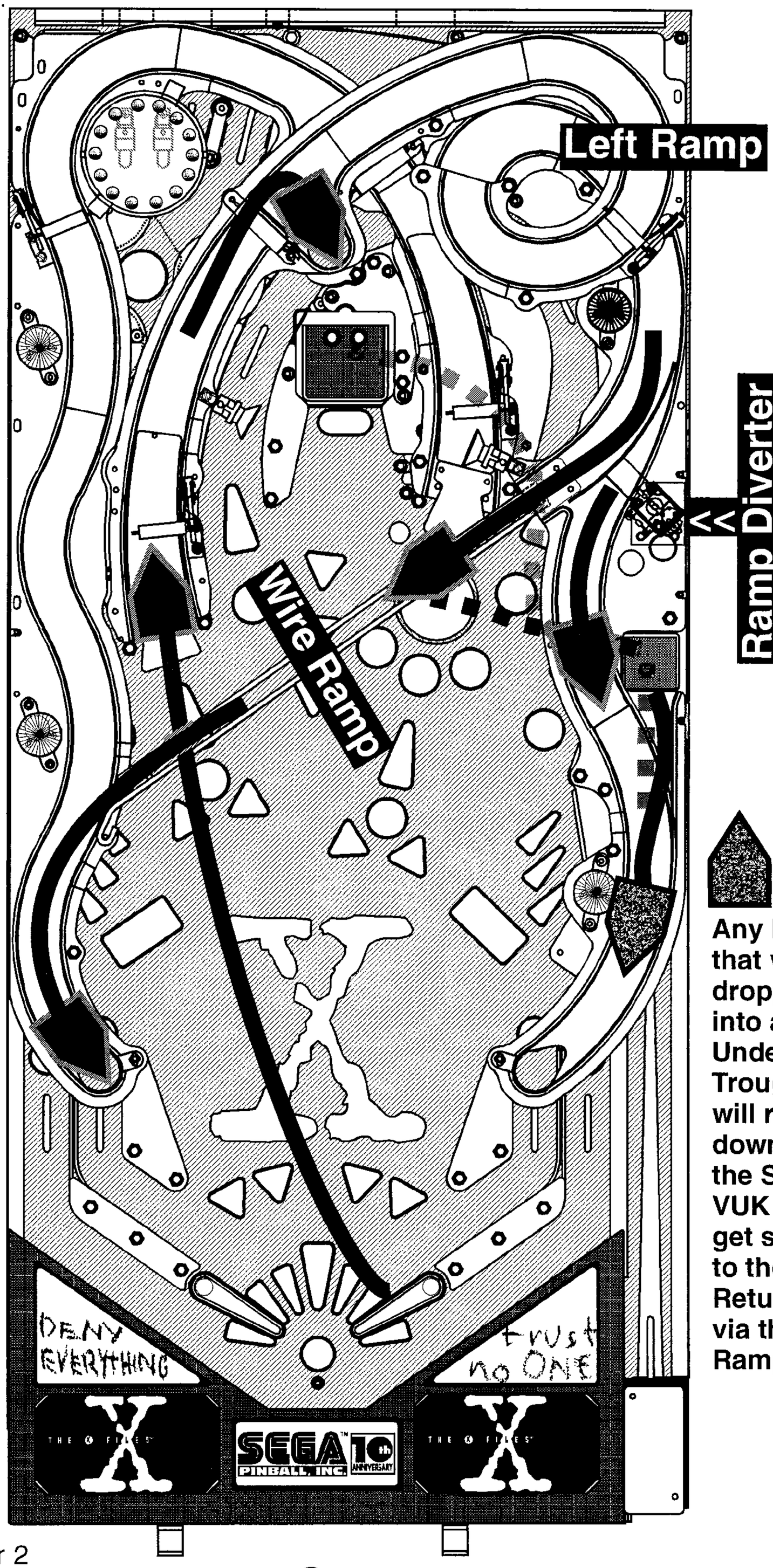


Playfield Top Ball Shots: Layer 4

Below is the top of the playfield showing the addition of both the Left Enter & Exit Plastic Ramps (with Ball Diverter, *Diverter Cover Not Shown*), Wire Ramp, the File Cabinet, Alien Baby Tube (attached to the Right Ramp) and Super VUK Chute.



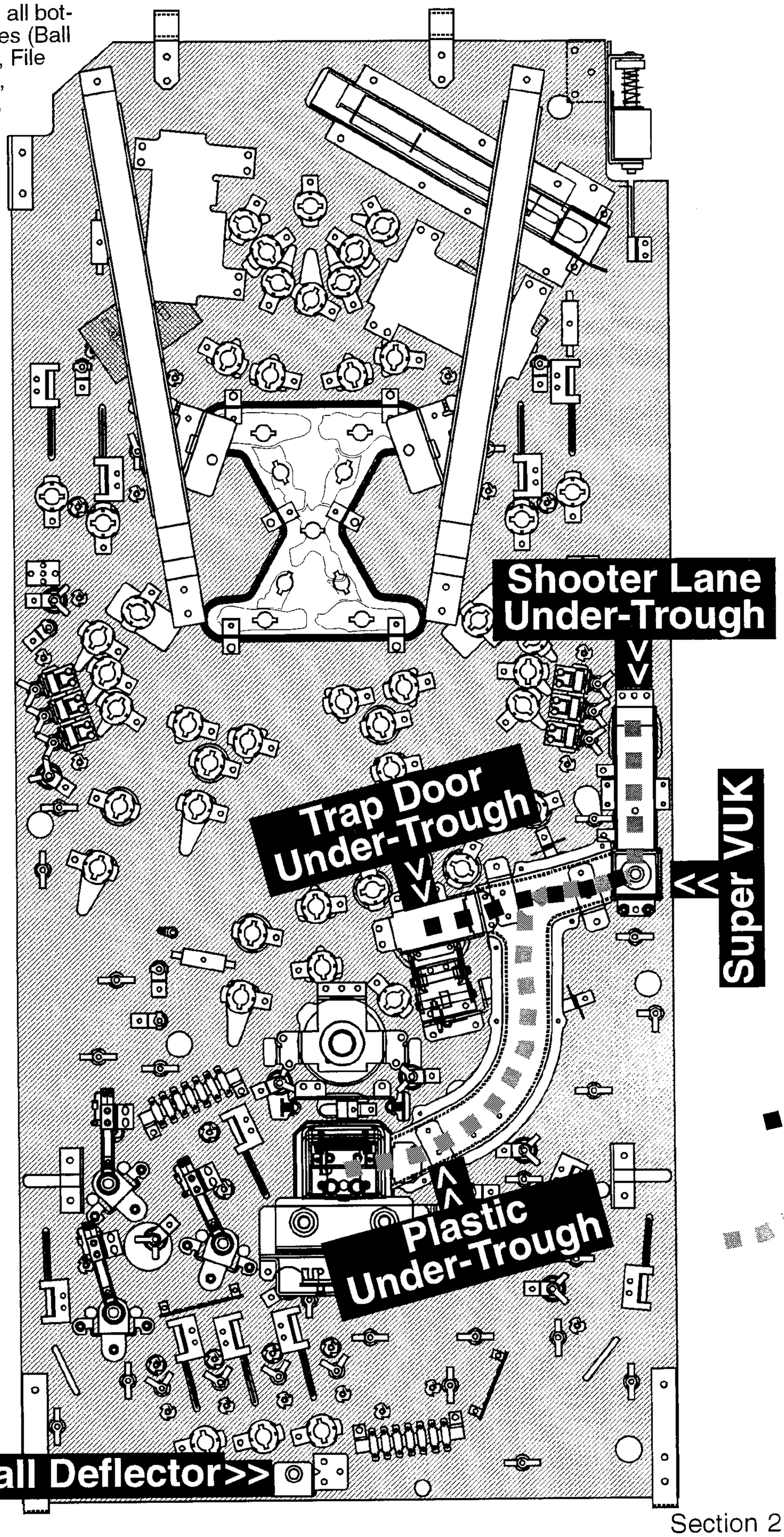
A Hard Shot to the Left Ramp will exit to the Right Return Lane. However, with the Ball Diverter down, the ball will exit down the Cross-Over Wire Ramp to the Right Ramp exiting to the Left Return Lane. A Soft Shot may exit out the "Sneak-Out" Hole to the Mini-Loop Lane.



Any ball that was dropped into any Under-Trough will roll down to the Super VUK and get shot to the Right Return Lane via the Left Ramp.

Playfield Bottom Ball Shots: Layer 1

Below is the bottom of the playfield (as shown as if the playfield is up leaning against the Backbox) showing all bulbs & sockets, fuses, terminal strips, all brackets, and all bottom mounted assemblies (Ball Diverter, Pop Bumpers, File Cabinet Motor, Magnet, Trap Door, Super VUK, Slingshots, Flippers, Ball Trough, Stand-Up Targets and the 3 Under-Troughs.



Portals™ Service Menu Introduction

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Bullet Legend:
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•• From Sub-Menu, Level 2.
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¤ Added Information / Instruction.

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

Open Coin Door and view Service Switch Set (see figures below). The Memory Protect Switch is now disabled: when changing adjustments, leave the coin door open, so changes can be made. ***Important:*** The **Playfield Power Interlock Switch** must be pulled out for electro-mechanical device testing (this is required).

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

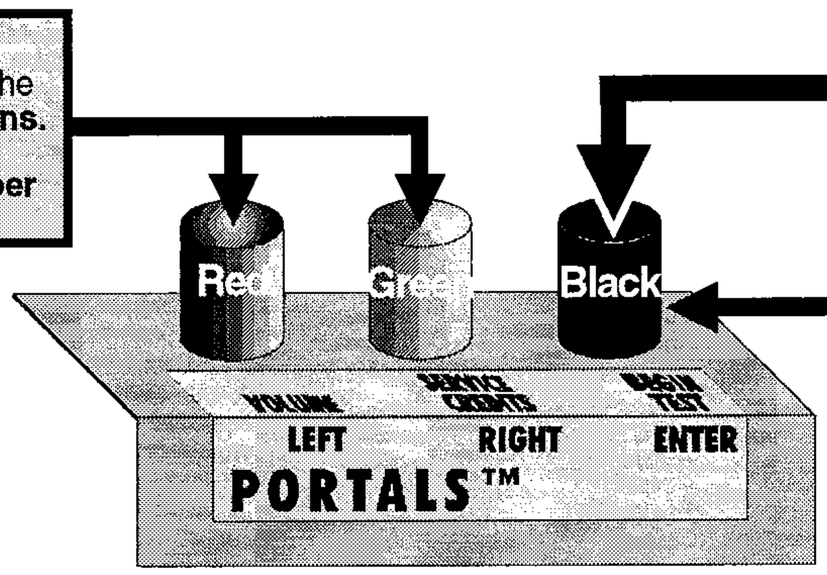
Step 2
Move through the menus by pushing the **Red "LEFT" or Green "RIGHT" Buttons.**

Note: Pushing the **Left** or **Right Flipper Buttons** operates in the same way.

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

Step 3
Select or activate icons by pushing the **Black "ENTER" Button.**

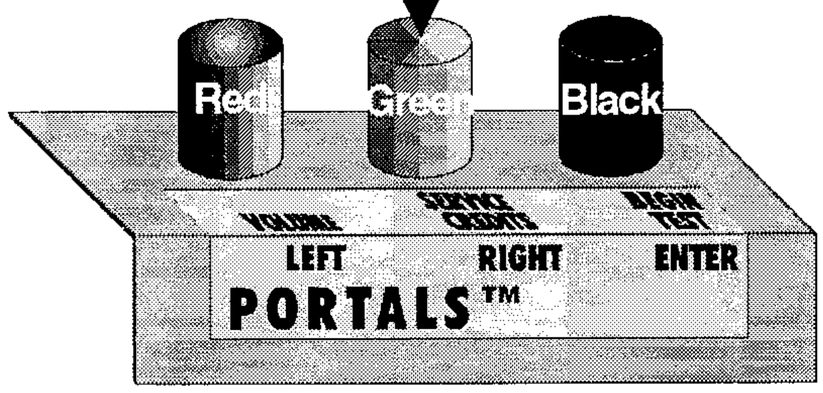
Note: Pushing the **Start Button** operates in the same way.

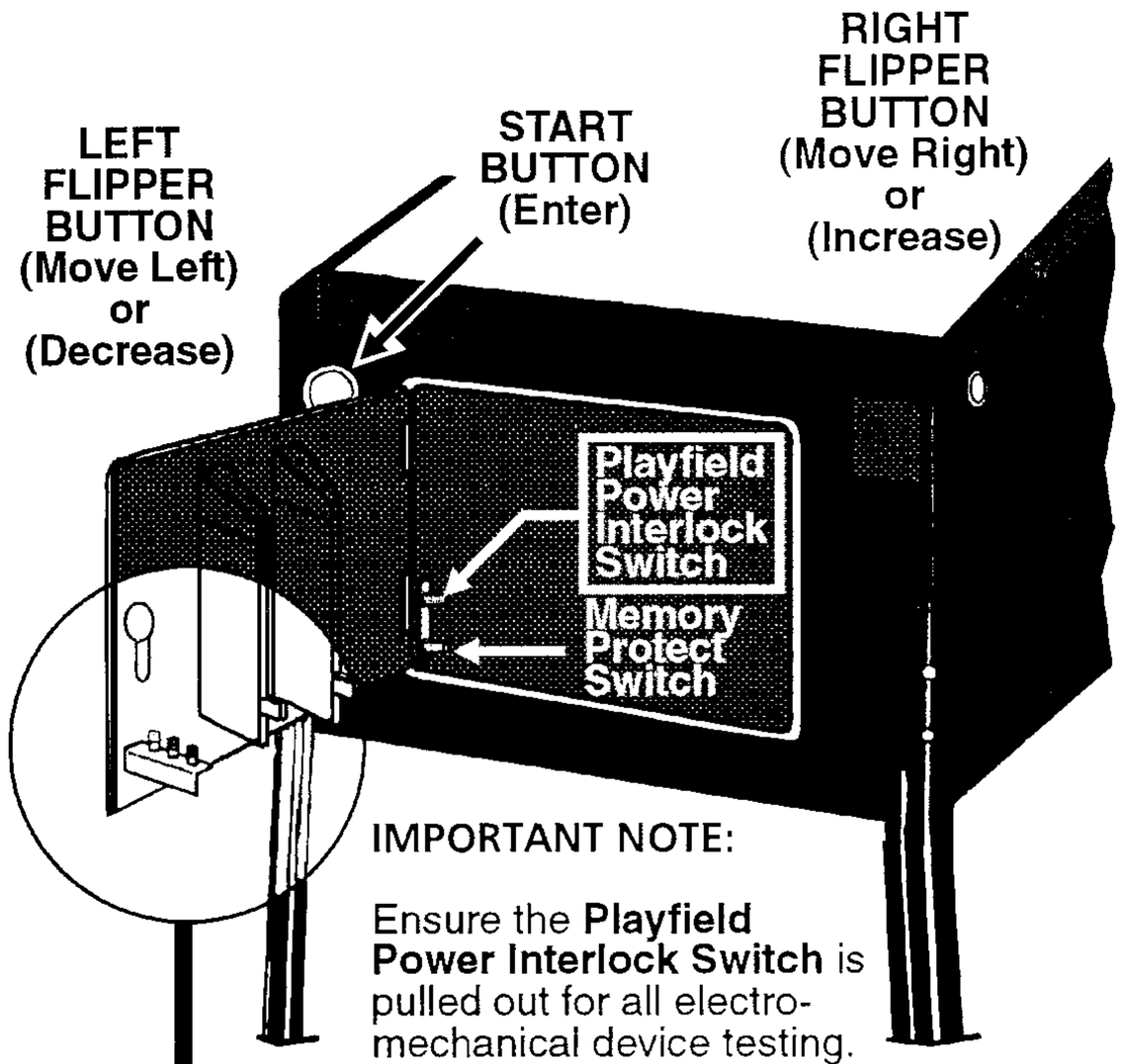


❷ *Adding* **Service Credits** *(will not operate in Service or Volume Modes):*

Step 1
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.



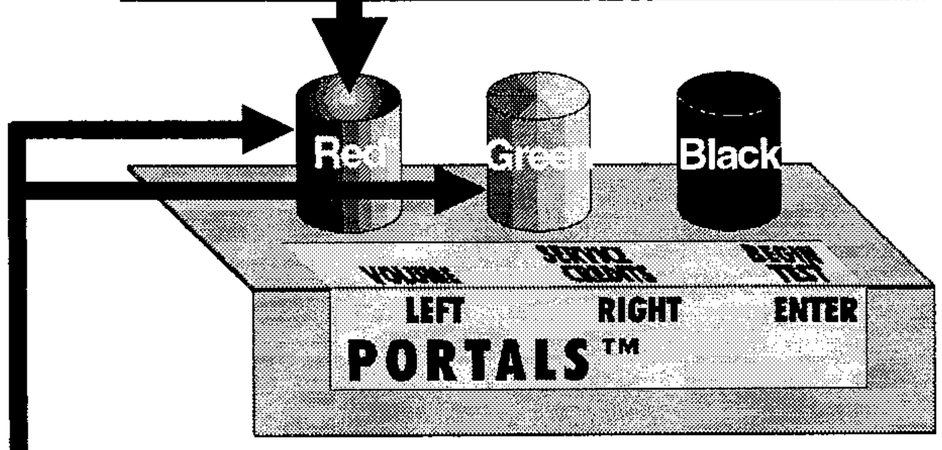


IMPORTANT NOTE:

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

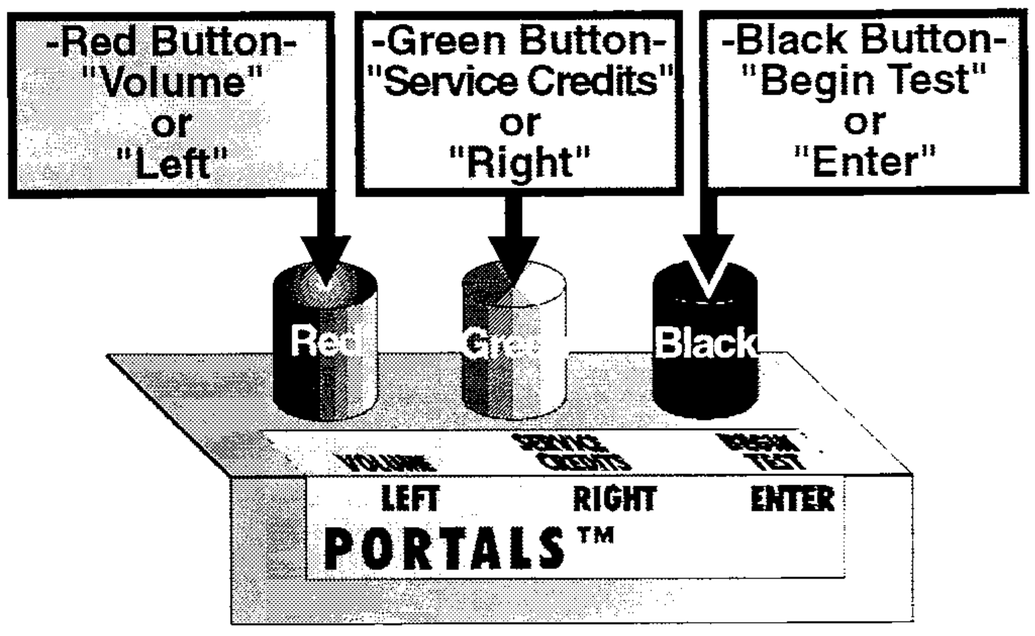
❸ *Entering the* **Volume Menu** *(will not operate in Service Mode):*

Step 1
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.

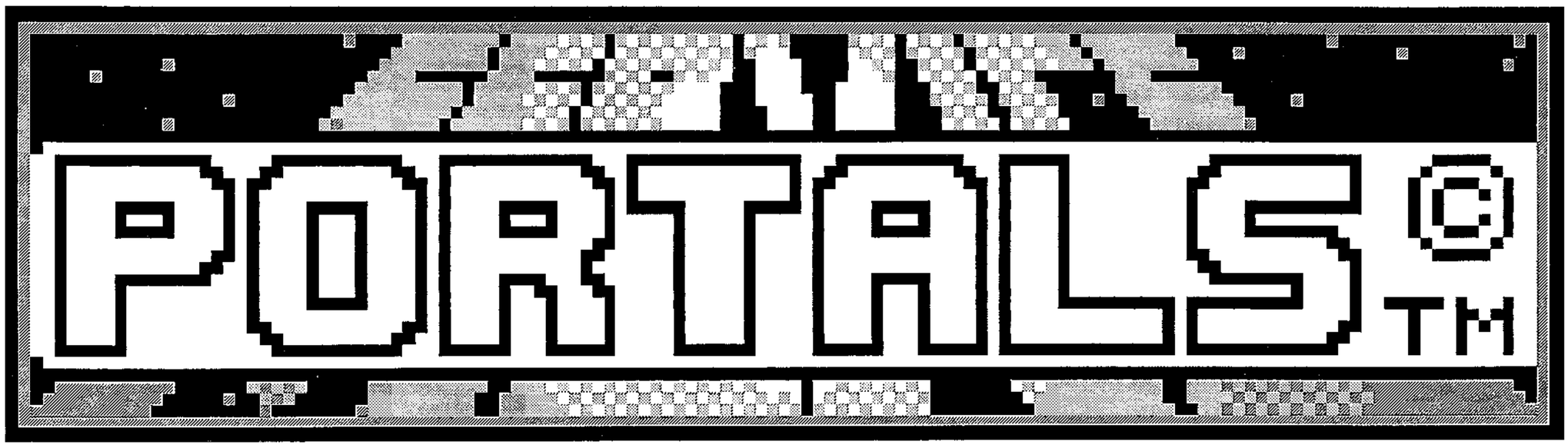


How to Use This Section

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

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

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

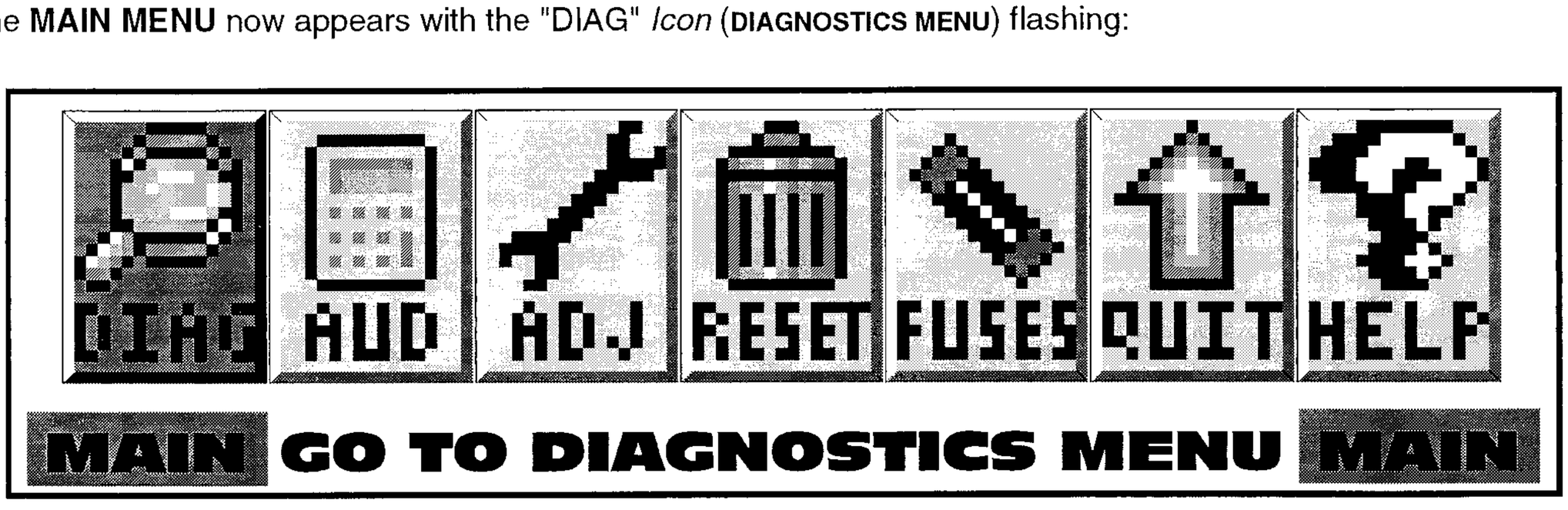


The Coin Door may be closed for security, however, please note with the Coin Door closed, the game's ***MEMORY PROTECT*** is enabled; ***meaning any changes that are made will be not be written to memory***. If changing adjustments is required, ensure the Coin Door is open.

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

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

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

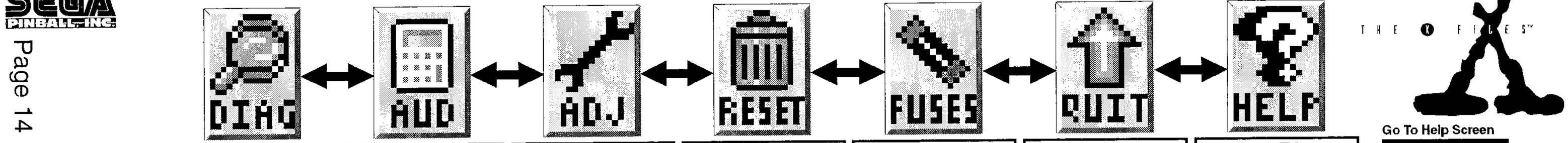


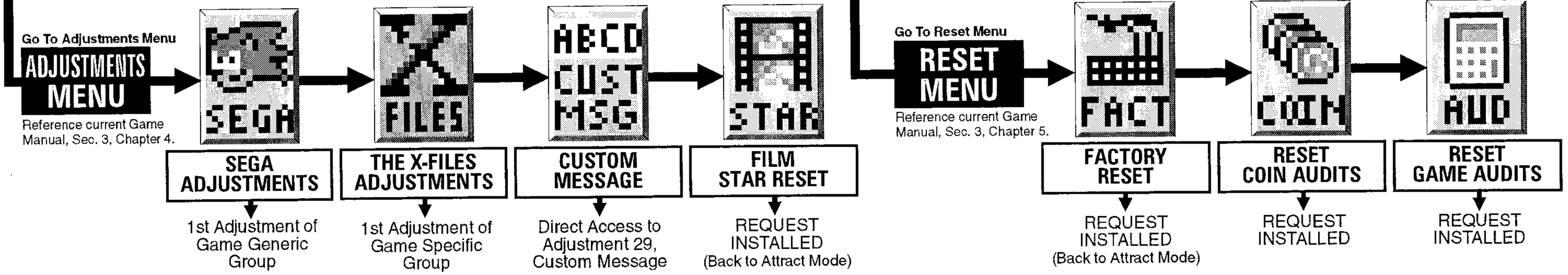
As the operator views the Menu Screen(s), the MORE MORE symbols indicates that there are more *Icons* to select in each direction. The *Icon* selected will blink. Pushing the **Black "ENTER" Button** (or **Start Button**) will select the *Icon* and the Menu Screen will change to the menu selected. Select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

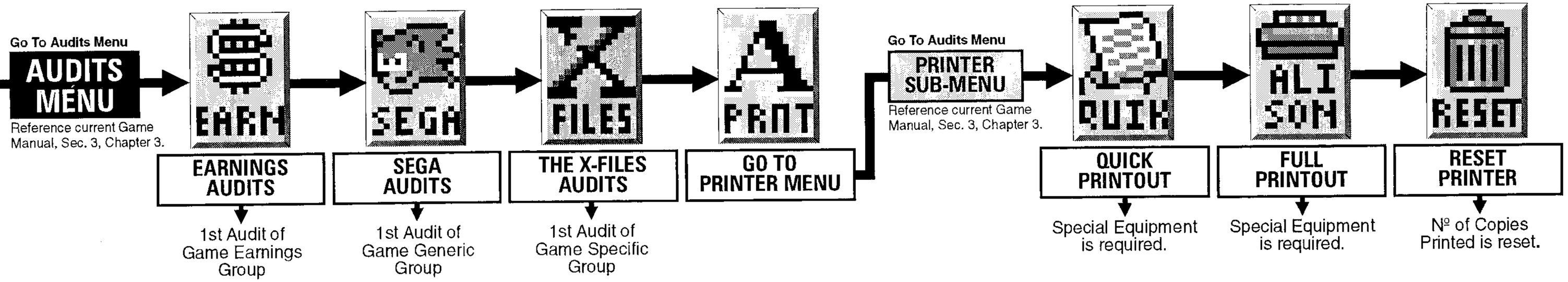
View the **Portals™ Service Menu Icon Tree** on the next pages for a complete overview of all menus used in this system. View the last chapter (HELP) if more information is required. Selecting the "QUIT" *Icon* with the **Red "LEFT"** or **Green "RIGHT" Buttons** (or either **Flipper Button**), then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

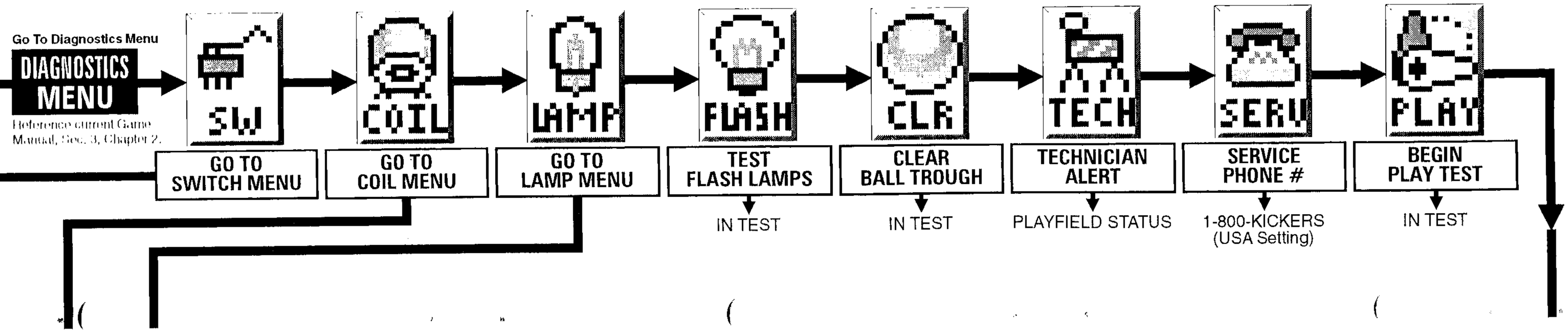
The **chapters** in this **section**, which coincide with the **MAIN MENU**, will also provide more detailed information which could not fit in the display. Use both the manual and the display to help customize, troubleshoot and/or diagnose faults, if any.

Portals™ Service Menu Icon Tree for *The X-Files*









DIAG

Go To Diagnostics Menu

DIAGNOSTICS MENU

Reference current Game Manual, Sec. 3, Chapter 2.

KNO-CKER — FIRE KNOCKER — IN TEST

SPKR — SOUND / SPEAKER TEST — IN TEST

BURN — BEGIN BURN IN — IN TEST

DOT TEST — DOT MATRIX TEST — IN TEST

FILES — THE X-FILES SPECIFIC* — IN TEST

* Note: If only one Game Specific Test is used, no Sub-Menu will appear.

DR. — DR. PINBALL

DIAG

LAMP

Go To Diagnostics Menu

LAMP TEST SUB-MENU

Reference current Game Manual, Sec. 3, Chapter 2.

ONE — SINGLE LAMP TEST — IN TEST

ALL — TEST ALL LAMPS — IN TEST

ROW — ROW LAMP TEST — IN TEST

COL — COLUMN LAMP TEST — IN TEST

DIAG

COIL

Go To Diagnostics Menu

COIL TEST SUB-MENU

Reference current Game Manual, Sec. 3, Chapter 2.

TEST — SINGLE COIL TEST — IN TEST

CYC — CYCLING COIL TEST — IN TEST

DIAG

SW

Go To Diagnostics Menu

SWITCH TEST SUB-MENU

Reference current Game Manual, Sec. 3, Chapter 2.

TEST — SWITCH TEST — IN TEST

ACT — ACTIVE SWITCH TEST — IN TEST

DED — DEDICATED SWITCH TEST — IN TEST

Go To Diagnostics Menu

FLOW CHART SUB-MENU

Reference current Game Manual, Sec. 3, Chapter 2.

DR. — COIL FLOW CHART — Q & A

DR. — SWITCH FLOW CHART — Q & A

DR. — LAMP FLOW CHART — Q & A

Summary of Common Icons

MORE — Indicates **MORE** Icons to the **LEFT**.

MORE — Indicates **MORE** Icons to the **RIGHT**.

PREV — Go back to **PREVIOUS** menu

HELP — Go to **HELP** Screen of current menu

QUIT — **QUIT** Portals™ Service Menu Session

Go to the **PREVIOUS** / Move backward or **LEFT**

Go to the **NEXT** / Move forward or **RIGHT**

RUN (or activate) selected test

View the schematic (**DRAW**ing) of current display

Answer **NO** or **YES** in Dr. Pinball Flow Chart Menus



DECREMENT (-) displayed value or select previous...

INCREMENT (+) displayed value or select next...

PULSE Coil in Dr. Pinball

END Coil selection to select new Coil in Dr. Pinball Flow Chart

SEGA™ PINBALL, INC.

Portals™ Service Menu Example

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

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

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



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



Important Note:



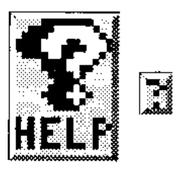
PREV

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



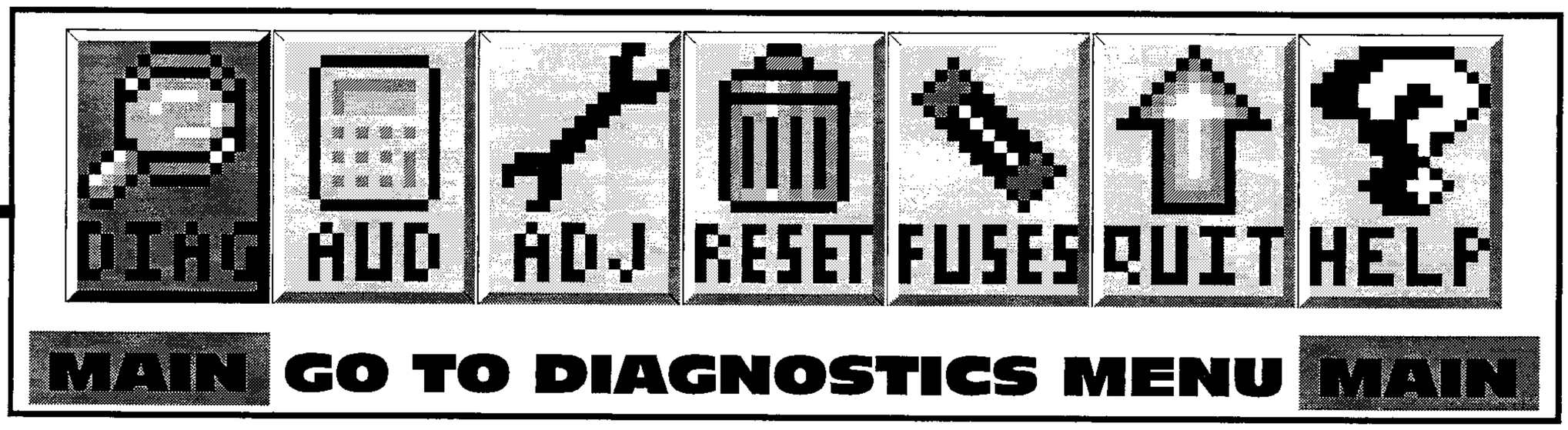
QUIT

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

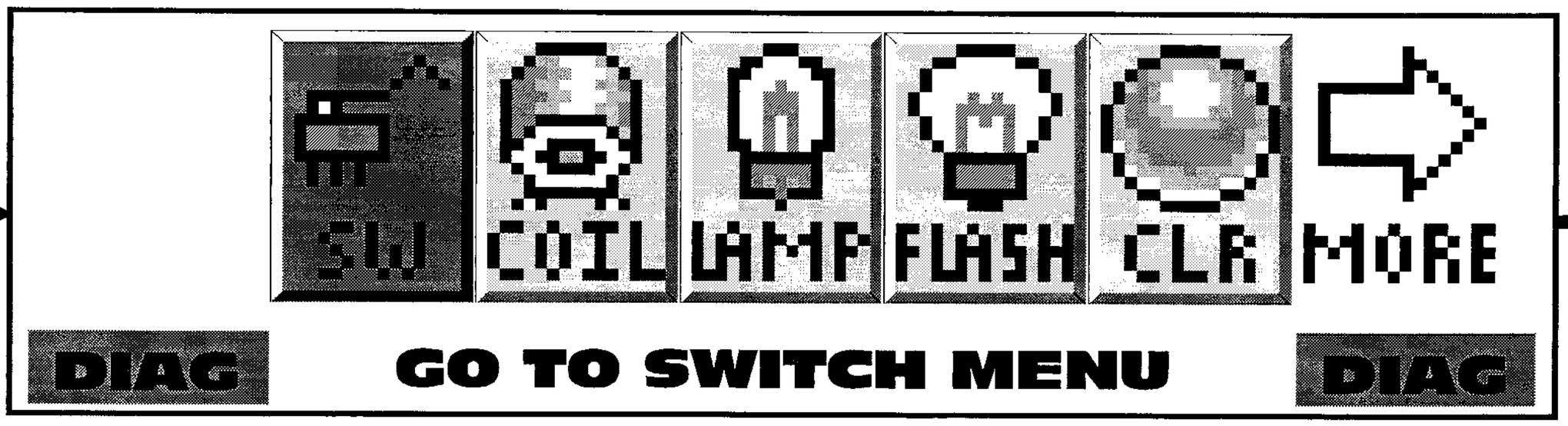


Selecting & activating the "HELP" *Icon* will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

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

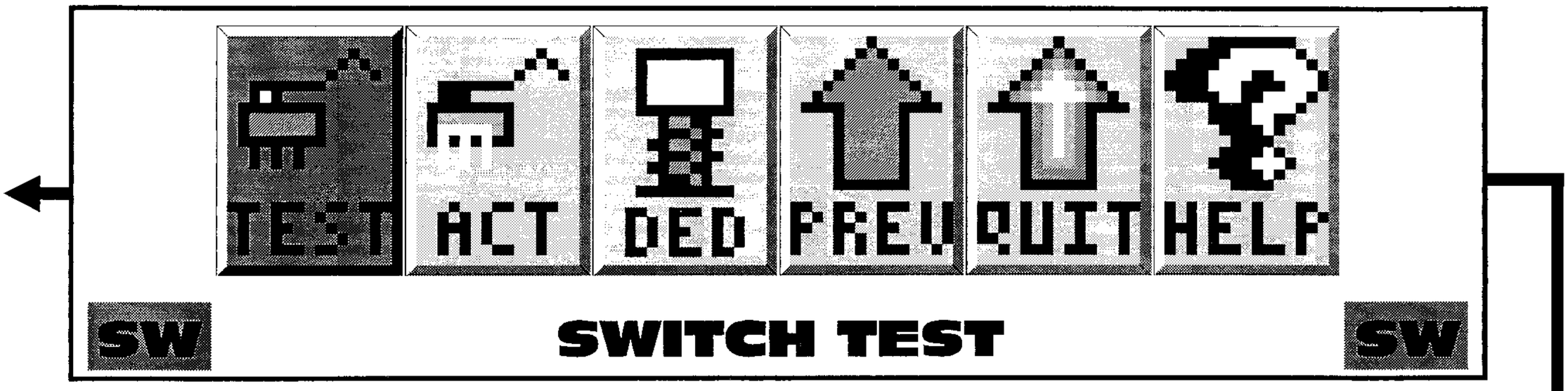


Press the **Black "ENTER" Button** to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

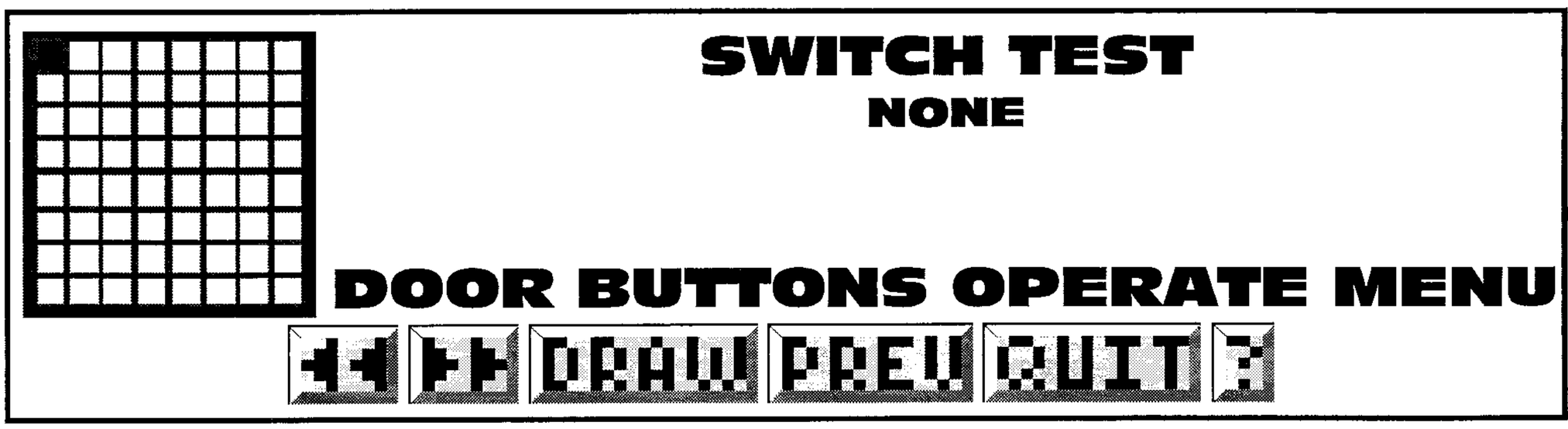


The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing. Press the **Black Button** to *activate* this icon. This will bring up the **SWITCH TEST MENU**.

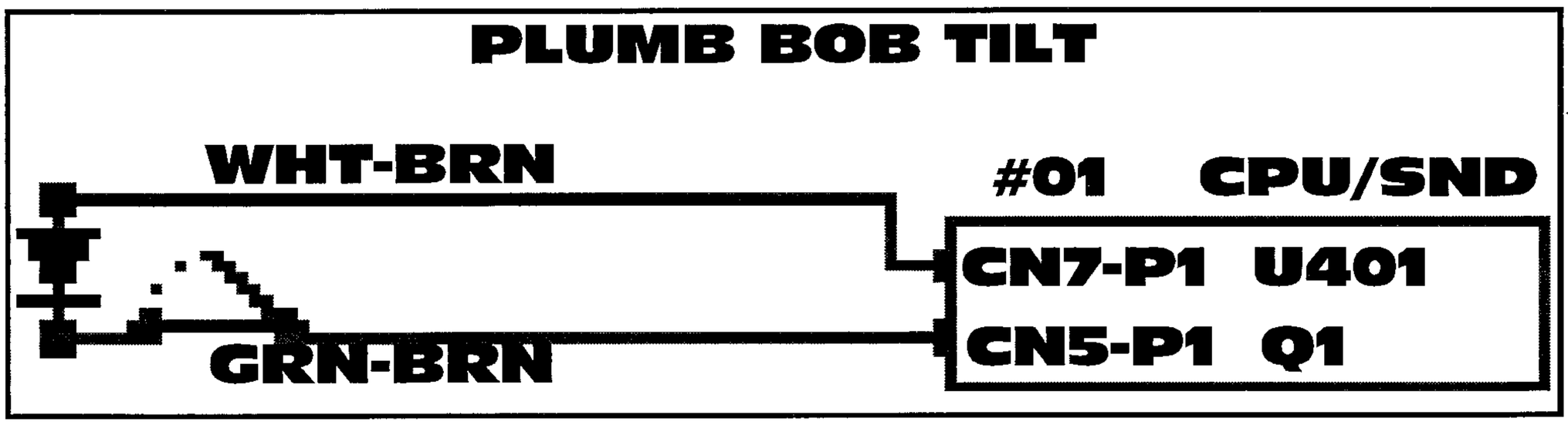
The **SWITCH TEST MENU** now appears with the "TEST" *Icon* (**SWITCH TEST**) flashing:
Press the **Black "ENTER" Button** to *activate* this icon. This will bring up the **Switch Test Display**.



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**.

Exiting the Portals™ Service Menu

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



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

Your Notes

Go To Diagnostics Menu

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

Overview

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

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

⚠ Caution: Remove pinballs from the Ball Trough prior to lifting the playfield for servicing. This can easily be done in the **Portals™ Service Menu System**. Select the "DIAG" *Icon* from the **MAIN MENU** to go to the **DIAGNOSTICS MENU**. Select the "CLR" *Icon* to enter the **CLEAR BALL TROUGH MENU**. Select the "RUN" *Icon* & press the **Start Button** to remove one ball at a time. This is also useful to retrieve one ball for game testing in ***Begin Play Test*** & ***Game Specific Test***. ***Important:*** The **Power Interlock Switch** must be pulled out.



GO TO DIAGNOSTICS MENU

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



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



Important Notes:

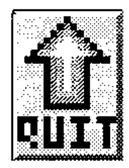


PREV

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



QUIT

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



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

RUN

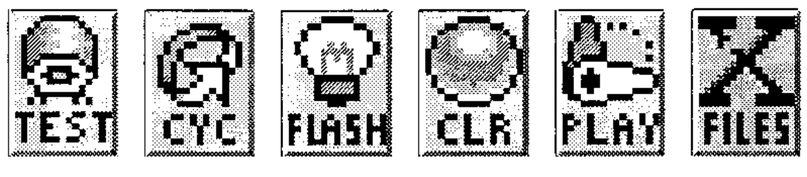
Selecting & activating the "RUN" *Icon* repeats the test on the coil or flash lamp left off at.

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

DRAW

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

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



In ***Single Coil Test***, ***Cycling Coil Test***, ***Test Flash Lamps***, ***Clear Ball Trough***, ***Begin Play Test*** and ***X-Files Specific*** Menu's, the **Power Interlock Switch** (inside Coin Door) must be pulled out. (See ***Access & Use*** in Chapter 1 of this section for the location.)

If the Power Interlock Switch is not pulled out, all electro-mechanical devices (such as Coils) cannot be tested (20v & 50v DC power is disabled). Closing the Coin Door will automatically reset this switch.

Go To Switch Menu

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

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

Switch Test

To initiate, from the **SWITCH MENU**, select the "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 Nº, 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 Nº, 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

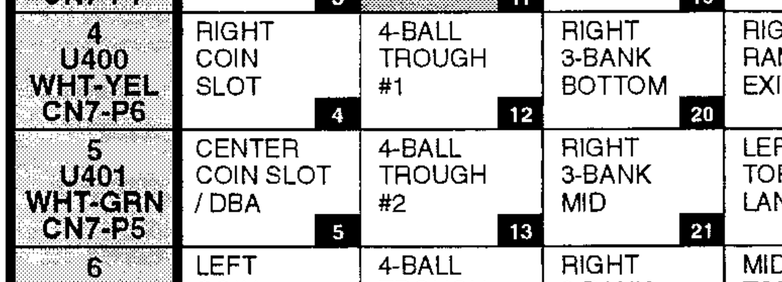
To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either **Flipper Button** & press the **Start Button** (The service switches are deactivated during this test.). The display will describe the switch which includes the Switch Name, Return (Row) Wire, Drive (Column) Wire, Part Nº, and the "Pin-Outs" from the CPU/SOUND Board.

SWITCH MATRIX GRID & DEDICATED SWITCHES

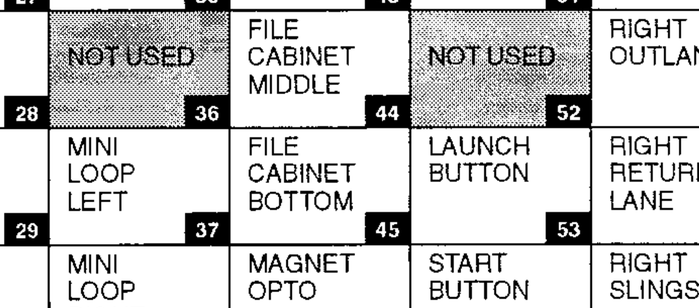
Row (Return) \ Column (Drive)	1 Q1 GRN-BRN CN5-P1	2 Q2 GRN-RED CN5-P3	3 Q3 GRN-ORG CN5-P4	4 Q4 GRN-YEL CN5-P5	5 Q5 GRN-BLK CN5-P6	6 Q6 GRN-BLU CN5-P7	7 Q7 GRN-VIO CN5-P8	8 Q8 GRN-GRY CN5-P9
1 U400 WHT-BRN CN7-P9	NOT USED 1	NOT USED 9	LEFT 3-BANK BOTTOM 17	LEFT RAMP ENTER 25	LEFT ORBIT 33	UNDER-TROUGH TOP #1 41	TOP TURBO BUMPER 49	LEFT OUTLANE 57
2 U400 WHT-RED CN7-P8	4TH COIN SLOT 2	NOT USED 10	LEFT 3-BANK MID 18	LEFT RAMP EXIT 26	NOT USED 34	UNDER-TROUGH BOT #2 42	BOTTOM TURBO BUMPER 50	LEFT RETURN LANE 58
3 U400 WHT-ORG CN7-P7	6TH COIN SLOT 3	NOT USED 11	LEFT 3-BANK TOP 19	RIGHT RAMP ENTER 27	RIGHT ORBIT 35	FILE CABINET TOP 43	RIGHT TURBO BUMPER 51	LEFT SLINGSHOT 59
4 U400 WHT-YEL CN7-P6	RIGHT COIN SLOT 4	4-BALL TROUGH #1 12	RIGHT 3-BANK BOTTOM 20	RIGHT RAMP EXIT 28	NOT USED 36	FILE CABINET MIDDLE 44	NOT USED 52	RIGHT OUTLANE 60
5 U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA 5	4-BALL TROUGH #2 13	RIGHT 3-BANK MID 21	LEFT TOP LANE 29	MINI LOOP LEFT 37	FILE CABINET BOTTOM 45	LAUNCH BUTTON 53	RIGHT RETURN LANE 61
6 U401 WHT-BLU CN7-P3	LEFT COIN SLOT 6	4-BALL TROUGH #3 14	RIGHT 3-BANK TOP 22	MIDDLE TOP LANE 30	MINI LOOP RIGHT 38	MAGNET OPTO 46	START BUTTON 54	RIGHT SLINGSHOT 62
7 U401 WHT-VIO CN7-P2	5TH COIN SLOT 7	4-BALL TROUGH VUK OPTO 15	NOT USED 23	RIGHT TOP LANE 31	SHOOTER UNDER-TROUGH 39	FILE CABINET OPTO 47	SLAM TILT 55	NOT USED 63
8 U401 WHT-GRY CN7-P1	NOT USED 8	SHOOTER LANE 16	NOT USED 24	NOT USED 32	TRAP DOOR UP 40	SUPER VUK 48	PLUMB BOB TILT 56	NOT USED 64

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

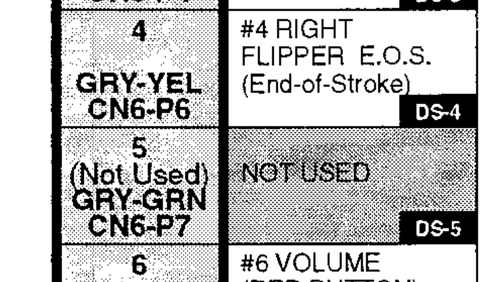
Typical Switch Schematic



Reed Switch Schematic

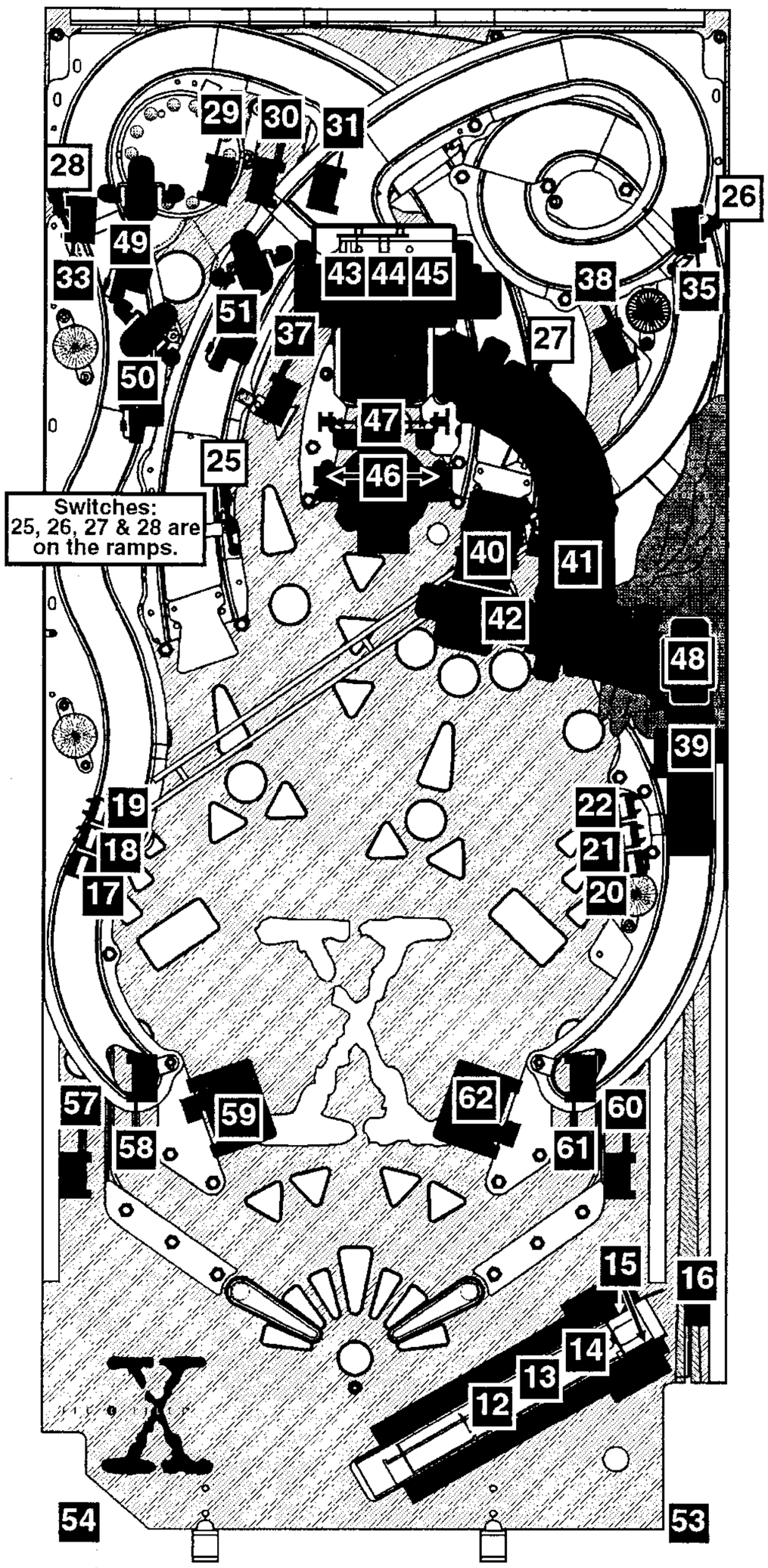


Dedicated Switch Schem.



Switch Matrix Grid Descriptions with Part Numbers and Locations †

† The switch locations correspond with the Switch Nº in the table below and the Switch Matrix Grid.



Legend Note:

☐ = Switches mounted above playfield.

■ = Switches mounted below playfield.

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

2 **4** **5** **6** **55** **56**

The following switches are not used:

1 **8** **9** **10** **11** **23** **24** **32** **34** **35** **52** **63** **64**

Sw. Nº	Col. Nº	Row Nº	Switch Matrix Description		Part Nº
			Note: The ¥ Coin Switch (for Japan) is 180-5091-00		
1	1	1	NOT USED		— - — - —
2*	1	2	4TH COIN SLOT		180-5024-00
3*	1	3	*6TH COIN SLOT*		*(Future Use)*
4*	1	4	RIGHT COIN SLOT		180-5024-00
5*	1	5	CENTER COIN SLOT / DBA		
6*	1	6	LEFT COIN SLOT		
7*	1	7	*5TH COIN SLOT*		*(Future Use)*
8	1	8	NOT USED		— - — - —
9	2	1			
10	2	2			
11	2	3			
12	2	4	4-BALL TROUGH #1 (LEFT)		180-5119-00
13	2	5	4-BALL TROUGH #2		
14	2	6	4-BALL TROUGH #3		
15	2	7	4-BALL TROUGH VUK OPTO	TRANS REC	520-5124-00 520-5125-00
16	2	8	SHOOTER LANE		500-5498-01
17	3	1	LEFT 3-BANK BOTTOM		500-6138-02
18	3	2	LEFT 3-BANK MID		
19	3	3	LEFT 3-BANK TOP		
20	3	4	RIGHT 3-BANK BOTTOM		
21	3	5	RIGHT 3-BANK MID		
22	3	6	RIGHT 3-BANK TOP		
23	3	7	NOT USED		— - — - —
24	3	8			
25	4	1	LEFT RAMP ENTER		180-5087-00
26	4	2	LEFT RAMP EXIT		
27	4	3	RIGHT RAMP ENTER		
28	4	4	RIGHT RAMP EXIT		
29	4	5	LEFT TOP LANE		500-5706-00
30	4	6	MIDDLE TOP LANE		500-5707-00
31	4	7	RIGHT TOP LANE		
32	4	8	NOT USED		— - — - —
33	5	1	LEFT ORBIT		500-5707-00
34	5	2	NOT USED		— - — - —
35	5	3	RIGHT ORBIT		500-5706-00
36	5	4	NOT USED		— - — - —
37	5	5	MINI LOOP LEFT		500-5706-00
38	5	6	MINI LOOP RIGHT		500-5707-00
39	5	7	SHOOTER UNDERTROUGH		180-5057-00
40	5	8	TRAP DOOR UP		180-5119-00
41	6	1	UNDERTROUGH TOP #1		180-5057-00
42	6	2	UNDERTROUGH BOT #2		
43	6	3	FILE CABINET TOP	OP1	520-5155-00
44	6	4	FILE CABINET MIDDLE	OP2	
45	6	5	FILE CABINET BOTTOM	OP3	
47	6	6	MAGNET OPTO	TRANS REC	520-5082-00 520-5083-00
47	6	7	FILE CABINET OPTO	TRANS REC	520-5082-00 520-5083-00
48	6	8	SUPER VUK		180-5052-00
49	7	4	TOP TURBO BUMPER		180-5015-03
50	7	2	BOTTOM TURBO BUMPER		
51	7	3	RIGHT TURBO BUMPER		
52	7	4	NOT USED		— - — - —
53	7	5	LAUNCH BUTTON		500-6121-46
54*	7	6	START BUTTON		500-6090-06
55*	7	7	SLAM TILT (On Coin Door)		180-5022-00
56*	7	8	PLUMB BOB TILT	HANGER CONTACT	535-5319-00 535-7563-01
57	8	1	LEFT OUTLANE		500-5707-00
58	8	2	LEFT RETURN LANE		
59	8	3	LEFT SLINGSHOT		180-5054-00
60	8	4	RIGHT OUTLANE		500-5707-00
61	8	5	RIGHT RETURN LANE		
62	8	6	RIGHT SLINGSHOT		180-5054-00
63	8	7	NOT USED		— - — - —
64	8	8			

Go To Coil Menu

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

Single Coil Test

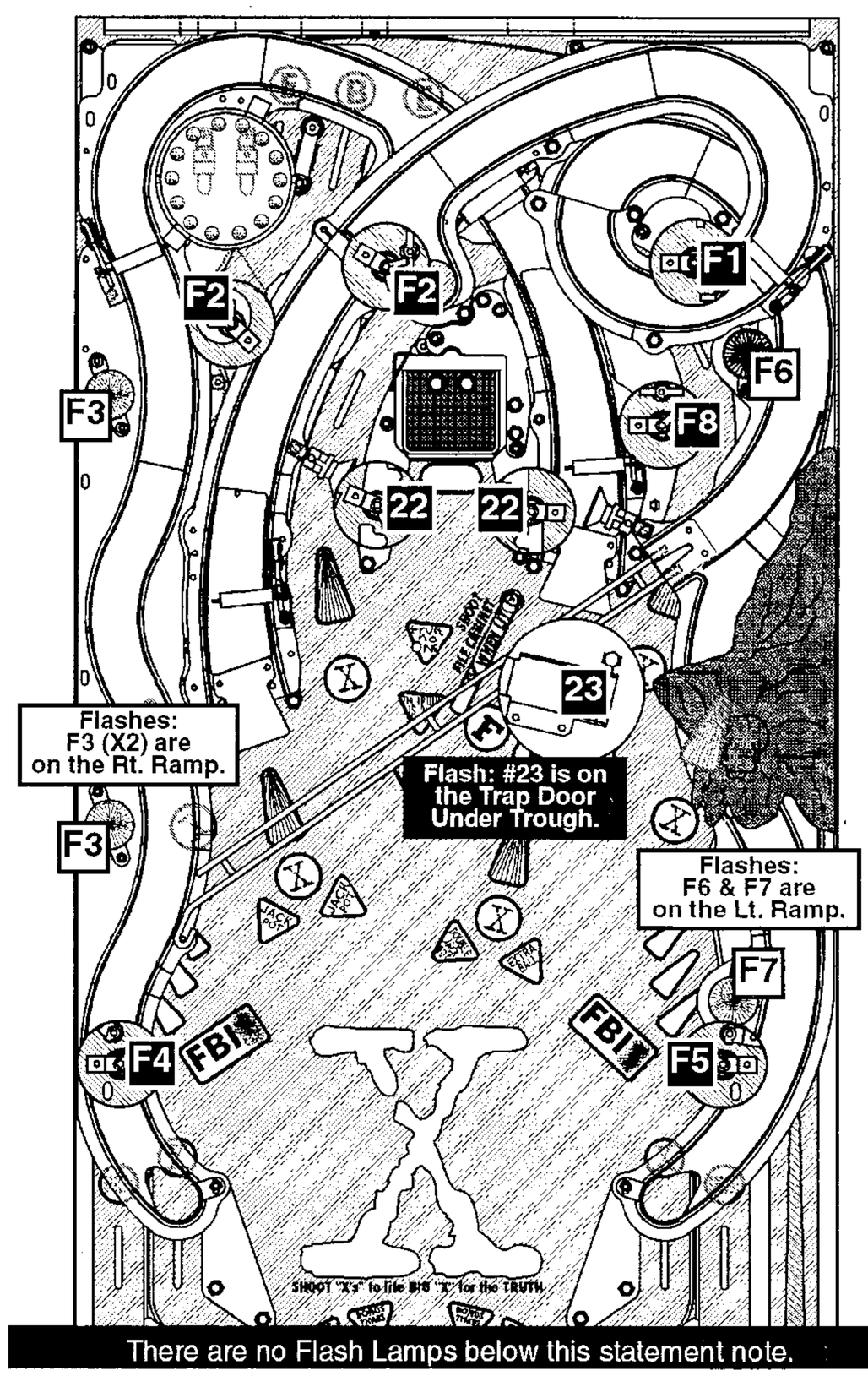
To initiate, from the **COIL MENU**, select the "TEST" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Ensure the **Power Interlock Switch** is pulled out. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Coil Test from #1 (The test runs through Coils 1-24 and Flash Lamps F1-F8; In this game, there are 2 Flash Lamps in Coil Positions 22 & 23.). 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 agaln 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.

Playfield Flash Lamp Locations

Type	Description	
#22 (FLASH)	TOP MID*2	(#89 Bulb)
#23 (FLASH)	TRAPDOOR*1	(#906 Bulb)
#F1 FLASH	RT RAMP TOP*1	(#89 Bulb)
#F2 FLASH	POPS*2	(#89 Bulb)
#F3 FLASH	LT RAMP*2	(#89 Bulb)
#F4 FLASH	BOT LT*2	(#89 Bulb)
#F5 FLASH	BOT RT*1	(#89 Bulb)
#F6 FLASH	RT RAMP TOP*1	(#89 Bulb)
#F7 FLASH	RT RAMP BOT*1	(#89 Bulb)
#F8 FLASH	MINI LOOP*1	(#89 Bulb)

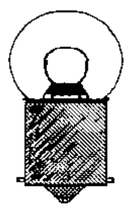


Legend Note:

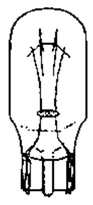
☐ = Flash Lamps mounted above playfield.

■ = Flash Lamps mounted below playfield.

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

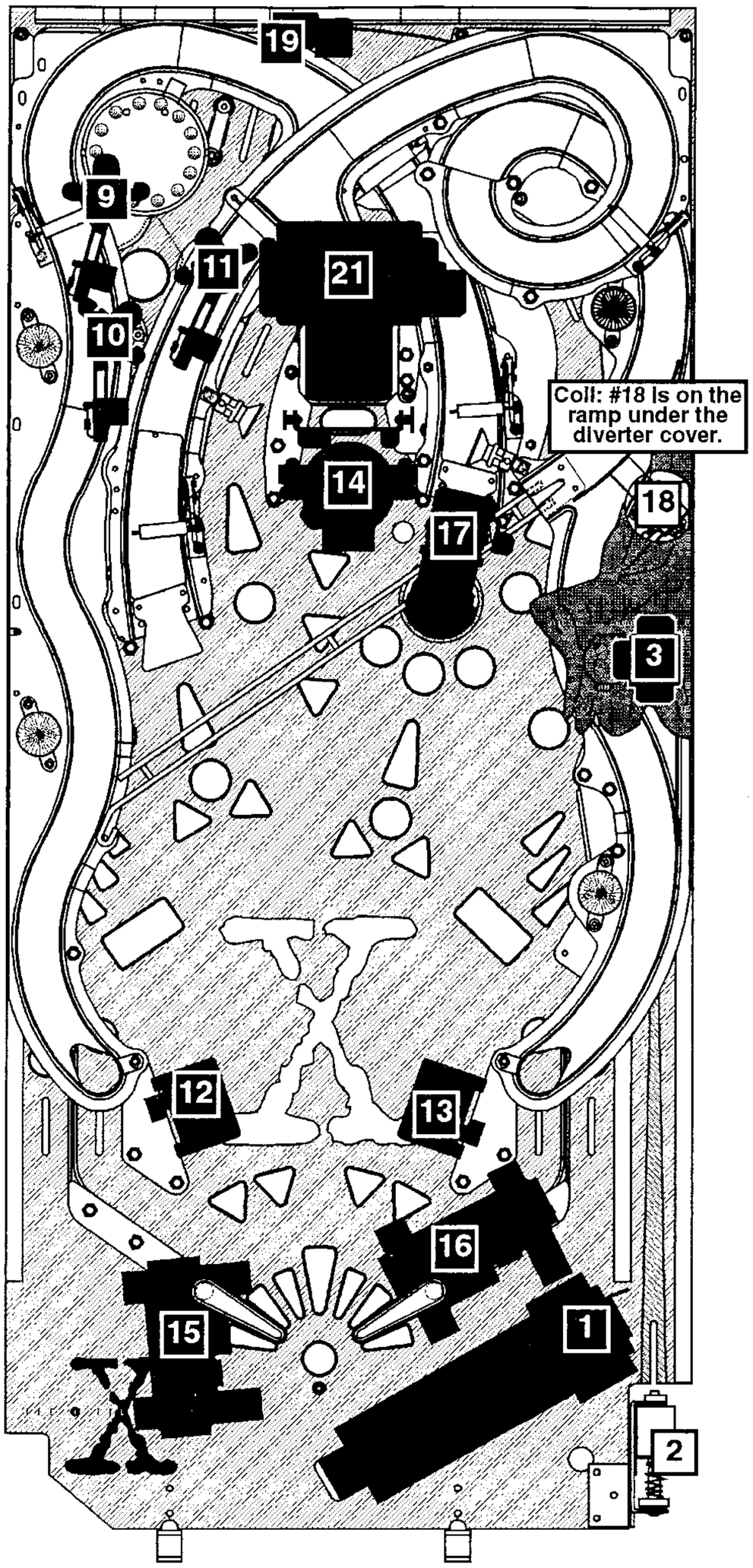


#89 Bulb
(Bayonet)
165-5000-89



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

Playfield Coil Locations



Type	Coil Description
#1 COIL	TROUGH UP-KICKER (VUK) (24-940)
#2 COIL	AUTO LAUNCH (50V) (24-940)
#3 COIL	SUPER VUK (23-800)
#4 COIL	NOT USED
#5 COIL	NOT USED
#6 COIL	NOT USED
#7 COIL	NOT USED
#8 COIL	(EUROPEAN TOKEN DISPENSER)
#9 COIL	TOP TURBO BUMPER (26-1200)
#10 COIL	BOTTOM TURBO BUMPER (26-1200)
#11 COIL	RIGHT TURBO BUMPER (26-1200)
#12 COIL	LEFT SLINGSHOT (26-1200)
#13 COIL	RIGHT SLINGSHOT (26-1200)
#14 COIL	MAGNET (22-650)
#15 COIL	LEFT FLIPPER [50v RED/YEL] (22-1080)
#16 COIL	RIGHT FLIPPER [50v RED/YEL] (22-1080)
#17 COIL	TRAP DOOR (22-1080)
#18 COIL	RAMP DIVERTER (32-1800)
#19 COIL	ORBIT DIVERTER (27-1500)
#20 COIL	NOT USED
#21 COIL	FILE CABINET MOTOR (041-5057-00)
#22 COIL	FLASH: TOP MID*2 (#89 Bulb)
#23 COIL	FLASH: TRAPDOOR*1 (#906 Bulb)
#24 COIL	(OPTIONAL COIN METER)

Legend Note:

□ = Coils mounted above playfield.

■ = Coils mounted below playfield.

The following Coil Positions are used for Flash Lamps (see previous page for locations):

22 **23**

The following coils are optional:

8 **24**

The following coils are not used:

4 **5** **6** **7** **20**

COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	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	24-940 090-5036-00B
#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	23-800 090-5001-00B
#4	NOT USED	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	N/C	N/C	NOT USED
#5	NOT USED	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	N/C	N/C	NOT USED
#6	NOT USED	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	N/C	N/C	NOT USED
#7	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	N/C	N/C	NOT USED
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	N/A

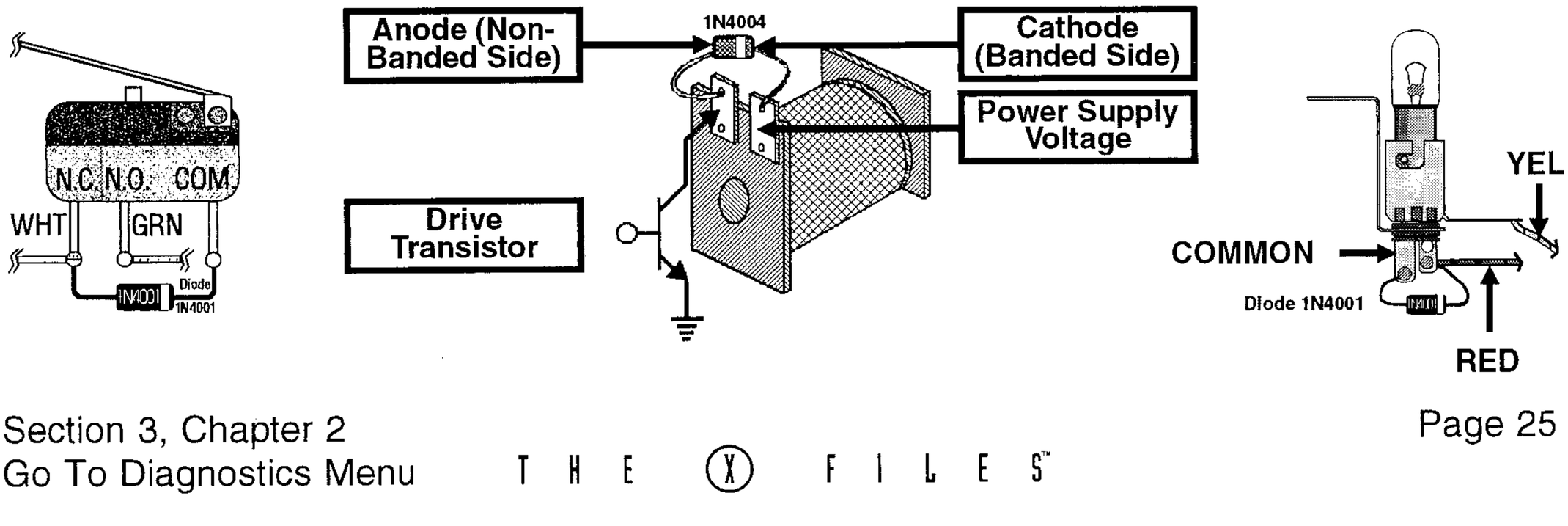
High Current Coils Group 2		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#9	TOP TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#10	BOTTOM TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#11	RIGHT 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	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#14	MAGNET	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	VIO-YEL	J10-P3	50v DC	22-650 090-5042-01
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	22-1080 090-5032-00T

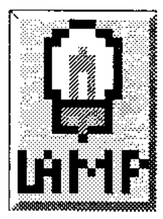
Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#17	TRAP DOOR	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	22-1080 090-5032-00T
#18	RAMP DIVERTER	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v DC	32-1800 090-5031-02
#19	ORBIT DIVERTER	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	J7-P1	20v DC	27-1500 090-5004-00B
#20	NOT USED	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	N/C	N/C	NOT USED
#21	FILE CABINET MOTOR	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	Motor 041-5057-00
#22	FLASH TOP-MID *2	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#23	FLASH TRAPDOOR *1	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	ORG	J6-P10	20v DC	#906 Bulb 165-5004-00
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	5v Meter (If Reguired)

Coils Detailed Chart Table Continued

Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Bulb Type
#F1	FLASH RT RAMP TOP ⁎1	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F2	FLASH POPS ⁎2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F3	FLASH LT RAMP ⁎2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F4	FLASH BOT LT ⁎2	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F5	FLASH BOT RT ⁎1	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F6	FLASH RT RAMP TOP ⁎1	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F7	FLASH RT RAMP BOT ⁎1	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F8	FLASH MINI LOOP ⁎1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89

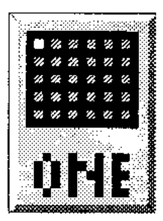
TYPICAL SWITCH, COIL & LAMP WIRING





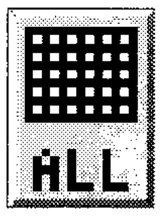
Go To Lamp Menu

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



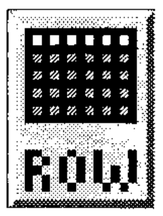
Single Lamp Test

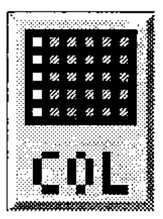
To initiate, from the **LAMP MENU**, select the "ONE" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Lamp Test from Column 1, Row 1, Switch 1. Press the **Black Button** on the "+" *Icon*, as each lamp is selected, the lamp will light at 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.





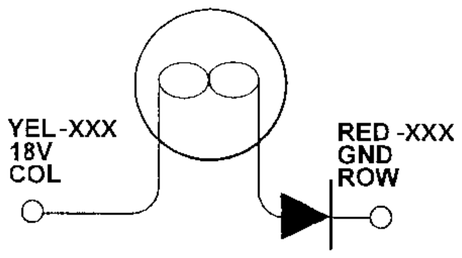
Row & Column Lamp Tests

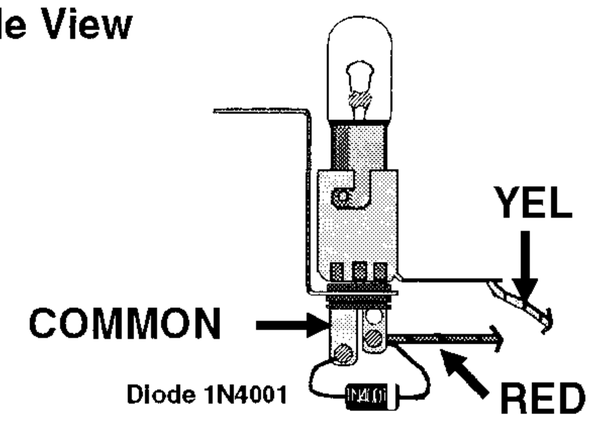
To initiate, from the **LAMP MENU**, select the "ROW" or "COL" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black Button**. If still in a previous test, select the "PREV" *Icon* to return to Lamp Menu or selecting either of the "ARROW" *Icons* will move through the tests, 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 (respective to each test) will light-up on the playfield and is indicated in the display.

LAMP MATRIX GRID

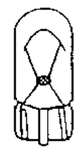
Row (GND) \ Column (18v)	1: U17 YEL-BRN J13-P9	2: U16 YEL-RED J13-P8	3: U15 YEL-ORG J13-P7	4: U14 YEL-BLK J13-P6	5: U13 YEL-GRN J13-P5	6: U12 YEL-BLU J13-P4	7: U11 YEL-VIO J13-P3	8: U10 YEL-GRY J13-P1
1: Q33 RED-BRN J12-P1	X: BOTTOM LEFT #555 Bulb 1	X: BOTTOM RIGHT #555 Bulb 2	X: LOWER MID-LEFT #555 Bulb 3	X: LOWER MID-RIGHT #555 Bulb 4	X: TOP LEFT #555 Bulb 5	X: TOP RIGHT #555 Bulb 6	X: UPPER MID-LEFT #555 Bulb 7	X: UPPER MID-RIGHT #555 Bulb 8
2: Q34 RED-BLK J12-P2	LEFT OUTLANE #555 Bulb 9	LEFT RE-TURN LANE #555 Bulb 10	RIGHT RE-TURN LANE #555 Bulb 11	RIGHT OUTLANE #555 Bulb 12	BONUS TIMES 2 #555 Bulb 13	BONUS TIMES 4 #555 Bulb 14	BONUS TIMES 6 #555 Bulb 15	BONUS TIMES 8 #555 Bulb 16
3: Q35 RED-ORG J12-P3	LEFT 3-BANK BOTTOM #555 Bulb 17	LEFT 3-BANK MID #555 Bulb 18	LEFT 3-BANK TOP #555 Bulb 19	LEFT FBI BADGE #555 Bulb 20	RIGHT 3-BANK BOTTOM #555 Bulb 21	RIGHT 3-BANK MID #555 Bulb 22	RIGHT 3-BANK TOP #555 Bulb 23	RIGHT FBI BADGE #555 Bulb 24
4: Q36 RED-YEL J12-P4	JACKPOT (LEFT) #555 Bulb 25	JACKPOT (RIGHT) #555 Bulb 26	LEFT RAMP X #555 Bulb 27	LEFT RAMP ARROW #555 Bulb 28	DOUBLE JACKPOT #555 Bulb 29	EXTRA BALL #555 Bulb 30	RIGHT RAMP X #555 Bulb 31	RIGHT RAMP ARROW #555 Bulb 32
5: Q37 RED-GRN J12-P5	DENY EVERY THING #555 Bulb 33	THE TRUTH IS OUT THERE #555 Bulb 34	TRUST NO ONE #555 Bulb 35	FILE CABI-NET CIRCLE #555 Bulb 36	MINI LOOP X LEFT #555 Bulb 37	MINI LOOP ARROW LEFT #555 Bulb 38	MINI LOOP X RIGHT #44 Bulb 39	MINI LOOP ARROW RIGHT #44 Bulb 40
6: Q38 RED-BLU J12-P6	(F) BI #555 Bulb 41	F (B) I #555 Bulb 42	FB (I) #555 Bulb 43	LEFT ORBIT X #555 Bulb 44	LEFT ORBIT ARROW #555 Bulb 45	RIGHT OR-BIT X #555 Bulb 46	RIGHT OR-BIT ARROW #44 Bulb 47	X: CENTER #555 Bulb 48
7: Q39 RED-VIO J12-P8	(E) BE #555 Bulb 49	E (B) E #555 Bulb 50	EB (E) #555 Bulb 51	TOP TUR-BO BUMPER #555 Bulb 52	BOTTOM TUR-BO BUMPER #555 Bulb 53	RIGHT TUR-BO BUMPER #555 Bulb 54	CAB. SPOT-LIGHT (LT.) #555 Bulb 55	CAB. SPOT-LIGHT (RT.) #555 Bulb 56
8: Q40 RED-GRY J12-P9	FLIPPER 1 (LEFT) #555 Bulb 57	FLIPPER 2 #555 Bulb 58	FLIPPER 3 #555 Bulb 59	FLIPPER 4 (CENTER) #555 Bulb 60	FLIPPER 5 #555 Bulb 61	FLIPPER 6 #555 Bulb 62	FLIPPER 7 (RIGHT) #555 Bulb 63	SHOOT AGAIN #555 Bulb 64
9: Q41 RED-WHT J12-P10	LAUNCH BUTTON #555 Bulb 65	ALIEN LEFT #555 Bulb 66	NOT USED 67	ALIEN RIGHT #555 Bulb 68	NOT USED 69	NOT USED 70	CIGARETTE #555 Bulb 71	NOT USED 72
10: Q42 RED J12-P11	FILE CABI-NET LEFT #555 Bulb 73	FILE CABI-NET RIGHT #555 Bulb 74	NOT USED 75	NOT USED 76	NOT USED 77	NOT USED 78	NOT USED 79	NOT USED 80

Typical Switch Schematic & Side View

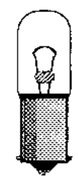




The following Bulbs are used in the Lamp Matrix Grid (See Table Grid for details):



#555 Bulb (Wedge)
165-5002-00



#44 Bulb (Bayonet)
165-5000-44

Lamp Matrix Grid Locations

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

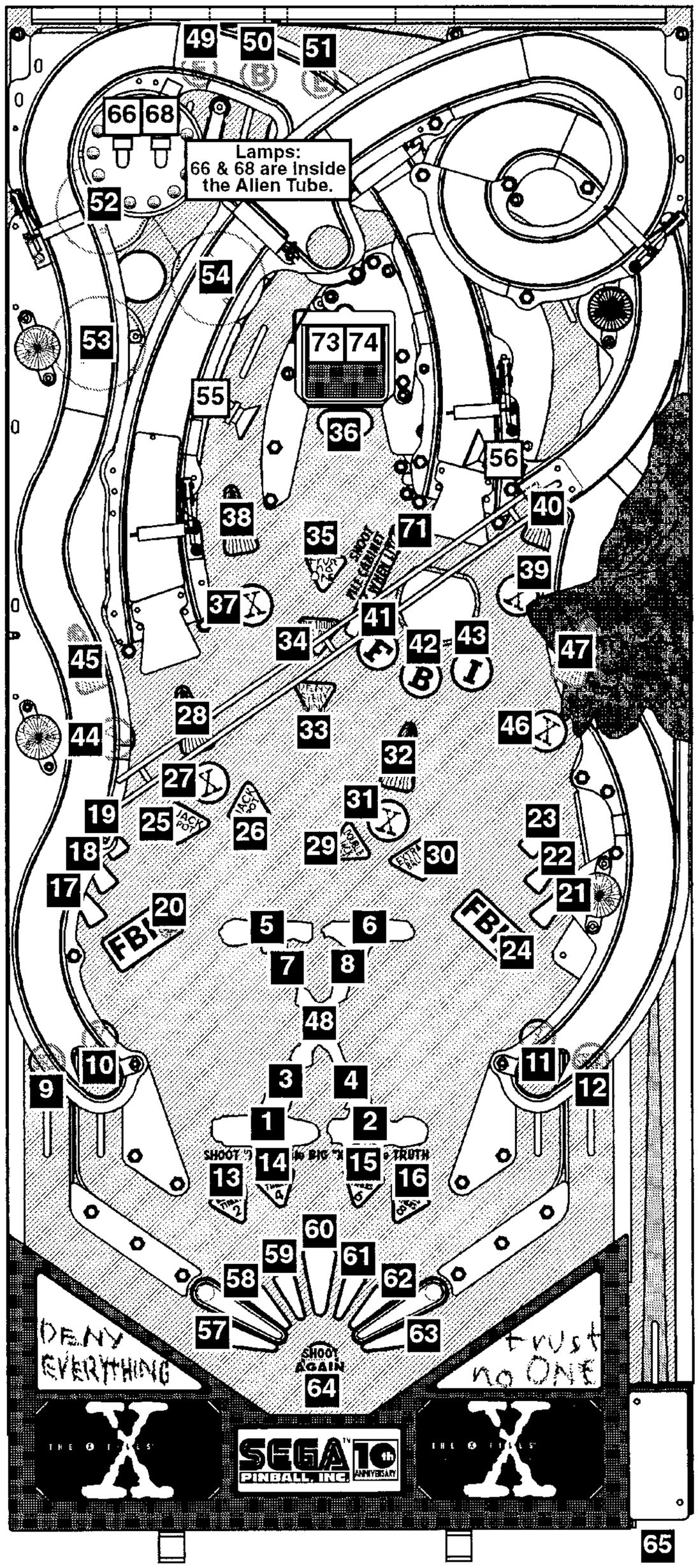
Legend Note:

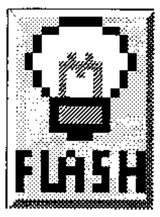
□ = Lamps mounted above playfield.

■ = Lamps mounted below playfield.

The following Lamps are not used:

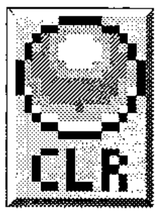
67 69 70 72
75 76 77 78
79 80





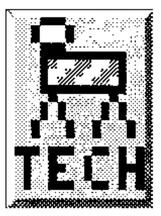
Test Flash Lamps

From the **DIAGNOSTICS MENU**, select the "FLASH" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate "CYCLING FLASHERS" and all the Flash Lamps will cycle continuously until the test is exited. This test is allows the technician to easily spot any burned-out bulbs and replace them. ***Important:*** The **Power Interlock Switch** must be pulled out.



Clear Ball Trough

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



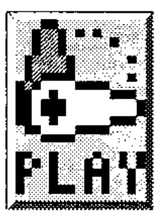
Technician Alert

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.)



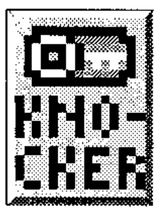
Service Phone

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 left outlane switch, the Laser Kick should fire. If it kicks to early or too late, the switch actuator should be adjusted to compensate for this error. If it fails to fire, use the Switch Test or Coil Test to help determine the cause of the failure. During this function, similar tests may be performed on the "Ejects", Slingshots, Vertical Up-Kickers, Pop Bumpers, etc. in the game. For unique Play Test functions, select the "GAME SPECIFIC" *Icon* in the **DIAGNOSTICS MENU**. ***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.

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

Speaker Phase Testing

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



Continued

Speaker Phase Testing Continued

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.

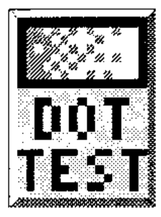
2. Disconnect the speaker output connector from the CPU / Sound Board and connect a 1.5-volt battery across each speaker pair one at a time while observing the speakers. Make sure the positive battery terminal is connected to the positive lead (CN4, Pin-3 (RED/BLK) or Pin-6 (YEL/BLK)) each time. As the 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)	Not Used
Voice ROM 4 (Loc. U37)	Not Used



Begin Burn In

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



Dot Matrix Test

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

1. Illuminates 1 vertical column of dots, turning it off & illuminating the next column, until each column has been individually lit, while the other columns are off.

2. Illuminates 1 horizontal row of dots, turning it off & illuminating the next row, until each row has been individually lit, while the other rows are off.

3. Illuminates all the dots, except for one column from left to right.

4. Illuminates all the dots, except for one row from top to bottom.

5. Illuminates every other dot lit, in both the rows and columns.

6. Illuminates all dots at 30%, 70% & 100% brightness.

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

Dot Matrix Display Explained

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

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

X-Files Specific (File Cabinet Motor Test)

From the **DIAGNOSTICS MENU**, select the "FILES" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** & press the **Black "ENTER" Button**. This will bring up the **X-FILES SPECIFIC MENU**. Similar to "BEGIN PLAY TEST," this menu is used to test and adjust the game specific features. The feature is the **FILE CABINET MOTOR TEST**. The display will indicate the switch status of the ***File Cabinet :*** "**TOP (HOME)**", "**MIDDLE**" & "**BOTTOM**". The ❒ "**TOP**" (Sw. 43) indicator will be active when the ***File Cabinet*** is in the "**HOME**" position. This is the position it should be in when it is at rest. The ❒ "**MIDDLE**" (Sw. 44) indicator will be activated when the ***File Cabinet*** is in the "**MIDDLE**" position. The ❒ "**BOTTOM**" (Sw. 45) indicator will be active when the ***File Cabinet*** is in the "**BOTTOM**" Position.

The Run Test:

Select the "RUN" *Icon* and press the **Start Button**. This test will cycle the File Cabinet Motor to the next open switch (OPTO) and stop. That is, If the File Cabinet Motor is on Switch 43 (OP1), the Top ("Home") Position, it will advance to the next Switch 44 (OP2), the Middle Position, and then Switch 45 (OP3), the Bottom Position. This test is used in conjunction with the display to ensure the OPTO's / Switch 43 (OP1), the Top ("Home") Position, Switch 44 (OP2), the Middle Position, and Switch 45 (OP3), the Bottom Position, closes when the Motor Cam Flag Bracket passes between the OPTOs.

The Step Test:

Select the "STEP" *Icon* and press the **Start Button**. This test will pulse the File Cabinet Motor via pulses from the I/O Power Driver Board. This test is used to cycle the motor in incremental steps. This test is also used in conjunction with the display to ensure the OPTO switches are closing when the Motor Cam Flag Bracket passes between the OPTOs.

During both tests when the File Cabinet is down and Switch 45 (OP3, Down Position) indicates as "closed" in the display, a ball can be put into the File Cabinet to test the under trough transition and operation of the Super VUK.

Note: To exit this Menu, select & activate the "PREV" *Icon* to go to the **DIAGNOSTICS MENU** or activate the "QUIT" *Icon* to exit **Portals Service Menu**. See Section 5, Chapter 2, Playfield Wiring, for the File Cabinet Motor OPTO PCB Theory of Operation & Schematic and the Component Layout & Parts.

Your Notes

Dr. Pinball (Flow Chart Menus)

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

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



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



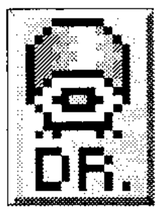
→ Seen when question is being asked on the Display. Select "YES" or "NO" to answer question given.
"END" lets you select a new item to test.
"PREV", "QUIT" and "?" (see first example above).



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

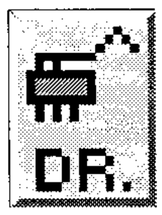


→ In Coil Flow Chart Menu, select "PULSE" to pulse the coil selected.
"END" lets you select a new item to test.
"PREV", "QUIT" and "?" (see first example above).



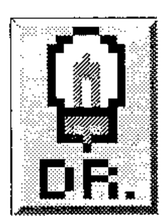
Coil Flow Chart

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



Switch Flow Chart

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



Lamp Flow Chart

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

GAME AUDIT TABLE

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

SEGA™ PINBALL, INC.

Earnings Audits 1-12

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

Sega Audits 13-55

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

The X-Files Audits 56-99 (Audits Subject to Change)

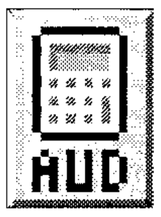
	Audit Name	Fill-In		Audit Name	Fill-In		Audit Name	Fill-In
56	LEFT ORBITS		72	MULTIBALL RESTART LIT		88	MINI ORBIT AWARDS	
57	RIGHT ORBITS		73	MBALL RESTARTED		89	POP BUMPERS	
58	LEFT RAMP		74	MBALL JACKPOTS		90		
59	RIGHT RAMP		75	2X JACKPOT LIT		91		
60	LEFT MINI-LOOP		76	2X JACKPOTS		92		
61	RIGHT MINI-LOOP		77	SUPER JACKPOT LIT		93		
62	FILE CABINET HIT		78	SUPER JACKPOTS		94		
63	RIGHT 3-BANK HITS		79	TRUTH MBALL START		95		
64	LEFT 3-BANK HITS		80	TRUTH MBALL JACKPOTS		96		
65	FBI COMPLETED		81	TRUTH MBALL SUPER JPOT		97		
66	X-FILE OPENED		82	WIZARD MODE STARTED		98		
67	MULDER SELECTED		83	VIDEO MODE STARTED		99		
68	SCULLY SELECTED		84	VIDEO MODE COMPLETE			***CPU Version:***	
69	MBALL READY		85	TRIVIA GAME STARTED			***Display Version:***	
70	MULTIBALL START		86	TRIVIA GAME WON			***Date Audited:***	
71	2+ MBALL START		87	LEFT RAMP AWARDS			***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— **The X-Files Audits**, are the Game Play Specific Audits 56-99; Audits left open (blank space in gray, e.g. Audits 54 & 55) 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.



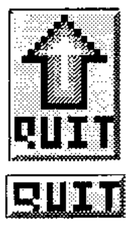
GO TO AUDITS MENU

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:



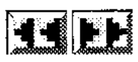
Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



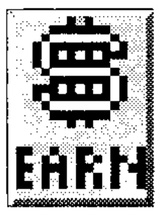
Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.



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. Nº	Audit Name	Audit Definition
Au. 1	Total Paid Credits	Provides the total number of paid credits.
Au. 2	Free Game Percentage	This percentage is derived from dividing Audit 25, Total Free Plays, by Audit 26, Total Plays.
Au. 3	Average Ball Time	In seconds, the average ball time is derived from the total play time divided by Audit 13, Total Balls Played.
Au. 4	Average Game Time	The average game time is expressed in minutes and seconds.
Au. 5	Coins Thru Left Slot	Provides the total number of times 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.

Sega Audits (13-55)

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

Au. Nº	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—999K Scores**	Provides the total number of games the Player's final score was between 0 and 999,990 points.
Au. 28	**1M—1.99M Scores**	Provides the total number of games the Player's final score was between 1,000,000 and 1,999,990 points.
Au. 29	**2M—3.99M Scores**	Provides the total number of games the Player's final score was between 2,000,000 and 3,999,990 points.
Au. 30	**4M—7.99M Scores**	Provides the total number of games the Player's final score was between 4,000,000 and 7,999,990 points.
Au. 31	**8M—11.99M Scores**	Provides the total number of games the Player's final score was between 8,000,000 and 11,999,990 points.
Au. 32	**12M+ Scores**	Provides the total number of games the Player's final score was over 12,000,000 points.
Au. 33	**Average Scores**	This total is derived from adding the Final Score of each game to a table and dividing this sum by Audit 26, Total Plays.
Au. 34	**Service Credits**	Provides the total number of times Dedicated Switch (DS-7) was closed, not in the Portals™ Service Menu. (See Chapter 1, Introduction [*Access & Use*] for instructions on how to receive Service Credits.)
Au. 35	**Ball Search Started**	Provides the total number of times the game performed a ball search.
Au. 36	**Lost Ball Feeds**	Provides the total number of times the game added a ball to play when it could not find a ball after ball search.

Sega Audits Continued.

Audit Name		Audit Definition
Au. 37	Lost Ball Game Starts	Provides the total number of times the game started with a ball missing from the ball trough at the start of a game.
Au. 38	Left Drains	Provides the total number of times 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	Total Regular Plays	Provides the total number of times Regular Games were played.
Au. 44	Avg. Regular Game Time	Provides the average game time of Regular played games.
Au. 45	Regular Game MBalls	Provides the number of times this feature was played in a Regular Game.
Au. 46	Regular Game Replays	Provides the total number of times this feature was awarded in a Regular Game.
Au. 47	Total Novice Plays	Provides the total number of times Novice Games were played.
Au. 48	Avg. Novice Game Time	Provides the average game time of Novice played games.
Au. 49	Novice Game MBalls	Provides the total number of times this feature was played in a Novice Game.
Au. 50	Novice Game Replays	Provides the total number of times this feature was awarded in a Novice Game.
Au. 51	Avg. Novice Ball Saves	Provides the average number of times this feature was used to maintain the ball time criteria for a Novice Game.
Au. 52	Left Flipper Used	Provides the total number of times 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).

The X-Files Audits (56-99) (Audits Subject to Change)

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

Au. Nº	Audit Name	Audit Definition
Au. 56	Left Orbits	Provides the total number of times this feature was completed. †
Au. 57	Right Orbits	Provides the total number of times this feature was completed. †
Au. 58	Left Ramp	Provides the total number of times this feature was completed. †
Au. 59	Right Ramp	Provides the total number of times this feature was completed. †
Au. 60	Left Mini-Loop	Provides the total number of times this feature was completed. †
Au. 61	Right Mini-Loop	Provides the total number of times this feature was completed. †
Au. 62	File Cabinet Hit	Provides the total number of times this feature was completed. †
Au. 63	Right 3-Bank Hits	Provides the total number of times this feature was completed. †
Au. 64	Left 3-Bank Hits	Provides the total number of times this feature was completed. †
Au. 65	FBI Completed	Provides the total number of times this feature was completed.
Au. 66	X-File Opened	Provides the total number of times this feature was opened.
Au. 67	Mulder Selected	Provides the total number of times this feature was selected.

† Multiple variations of switch closures are used to determine the completion of the feature stated.

The X-Files Audits Continued (Audits Subject to Change)

	Audit Name	Audit Definition
Au. 68	**Scully Selected**	Provides the total number of times this feature was selected.
Au. 69	**MBall Ready**	Provides the total number of times feature was ready awaiting Multiball. †
Au. 70	**Multiball Start**	Provides the total number of times Multiball was played. †
Au. 71	**2+ MBall Start**	Provides the total number of times Multiball was played more than once by a single player in one game. †
Au. 72	**Multiball Restart Lit**	Provides the total number of times Multiball was played and no Jackpots were collected. ‡
Au. 73	**Multiball Restarted**	Provides the total number of times Multiball was restarted after Multiball Restart was lit. ‡
Au. 74	**MBall Jackpots**	Provides the total number of times this feature was awarded. †
Au. 75	**2X Jackpot Lit**	Provides the total number of times this feature was lit. ‡
Au. 76	**2X Jackpots**	Provides the total number of times this feature was awarded.
Au. 77	**Super Jackpot Lit**	Provides the total number of times this feature was lit. ‡
Au. 78	**Super Jackpots**	Provides the total number of times this feature was awarded.
Au. 79	**Truth MBall Start**	Provides the total number of times Truth Multiball was played.
Au. 80	**Truth MBall Jackpots**	Provides the total number of times this feature was awarded.
Au. 81	**Truth MBall Super Jpot**	Provides the total number of times this feature was awarded.
Au. 82	**Wizard Mode Started**	Provides the total number of times this feature was started. †
Au. 83	**Video Mode Started**	Provides the total number of times this feature was started. †
Au. 84	**Video Mode Complete**	Provides the total number of times this feature was completed. †
Au. 85	**Trivia Game Started**	Provides the total number of times this feature was started. †
Au. 86	**Trivia Game Won**	Provides the total number of times this feature was won. †
Au. 87	**Left Ramp Awards**	Provides the total number of times this feature was awarded.
Au. 88	**Mini Orbit Awards**	Provides the total number of times this feature was awarded.
Au. 89	**Pop Bumpers**	Provides the total number of times this feature was activated.
Au. 90-Au. 99		At time of printing, these audits are ***Not Used***, allowing for ***Future Expansion***, if any.

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

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

Au.

Au.

Au.

Au.

Au.

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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 51, Printer Interface (Quick Printout)

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



Adjustment 52, 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, Sega & Game Specific) can be retrieved.



Adjustment 53, Nº 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 "Nº of copies printed" count total.

RESETTING AUDIT NOTES:



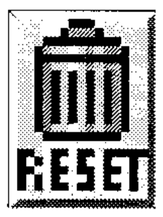
Audit Note: 1st Way to Reset Audits

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



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

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

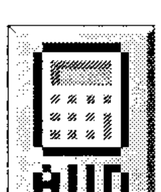


Audit Note: 2nd Way to Reset Audits

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



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



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

GAME ADJUSTMENT TABLE

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

Sega Adjustments 1-43

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

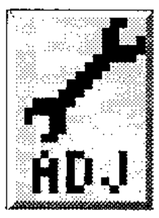
The X-Files Adjustments 44-50

	Adjustment Name	Factory Setting		Adjustment Name	Factory Setting
44	MBALL RESTART	MODERATE	49	FILE CABINET MOTOR ENABLED	YES
45	EXTRA BALL MEMORY	ON	50	NOT USED	
46	MULTIBALL CRITERION	MODERATE			
47	ORBIT CRITERION	MODERATE			
48	RAMP CRITERION	MODERATE			

Go To Adjustments Menu

Overview

The **Portals™ Service Menu System** provides 50 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— **Sega Adjustments**, are the Game Play Generic Adjustments (1-43); 2nd— **The X-Files Adjustments**, are the Game Play Specific Adjustments (44-50); Adjustment(s) left open (blank space in gray, e.g. Adj. 50) are currently Not Used, 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:



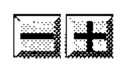
Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



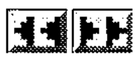
Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



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



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



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



Sega Adjustments (1-43)

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

Adj. №	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 1M - 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.)

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

Adjustments which change when set to:	Extra Easy	Easy	Moderate	Hard	Extra Hard
(44) MBall Restart	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(45) Extra Ball Memory	ON	ON	ON	ON	OFF
(46) Multiball Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(47) Orbit Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(48) Ramp Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD

Play Rules: Novelty & 4-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

4-Ball Play Rules - Set to establish recommended settings for 4-Ball Play:

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

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

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

Adj. 7 Game Pricing

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

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

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

Sega Adjustment 7 Continued.

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

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

Custom Pricing Table

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

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

The Standard Pricing Select Table Explained:

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

Standard Pricing Select Table

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

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

Standard Pricing Select Table - *(Continued)*

CPU/SOUND BOARD DIP SWITCH 300 SETTINGS	COUNTRY SETTING OPTION † ‡	Coin Mechanisms — COINS THRU ... SLOT: LEFT	CENTER	RIGHT	4TH	Pricing Scheme Explained — *Number of "Plays" for Price Amount Shown*			
		For all of USA Settings, see previous page (the USA Default Setting is repeated below):							
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**USA8 †**	25¢	$1.00	25¢		1 /50¢	3 /$1.00		
Pos. 1 2 3 4 5 6 7 8 / ON ■ / OFF ■ ■ ■ ■ ■ ■ ■	**Austria †**	5S	10S	10S		1 /10S	2 /15S	3 /20S	
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Australia 1 ‡**	20¢	$A 1	$A 2		1 /$A 1	2 /$A 2		
	Australia 2 ‡	20¢	$A 1	$A 2		1 /$A 1	2 /$A 2		
Pos. 1 2 3 4 5 6 7 8 / ON ■ / OFF ■ ■ ■ ■ ■ ■ ■	**Belgium †**	5 BF	20 BF	50 BF		1 /20 BF	3 /50 BF		
		This country uses unique Tokens and/or Debit Cards *only* (pricing varies).							
Pos. 1 2 3 4 5 6 7 8 / ON ■ ■ / OFF ■ ■ ■ ■ ■	**Brazil †**	1 'coin'	4 'coins'	1 'coin'		1 /'2 coins'			
Pos. 1 2 3 4 5 6 7 8 / ON ■ ■ / OFF ■ ■ ■ ■ ■ ■	**Canada †**	25¢	25¢	Can$ 1		1 /50¢	2 /75¢	3/ Can$ 1	
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Denmark 1 ‡**	1 DKr	5 DKr	10 DKr	20 DKr	1 /3 DKr	2 /5 DKr		
	Denmark 2 ‡	1 DKr	5 DKr	10 DKr	20 DKr	1 /2 DKr	3 /5 DKr	7 /10DKr	
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Finland ‡**	1 Fmk	5 Fmk			1 /5 Fmk	4 /10 Fmk		
	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 / ON ■ ■ / OFF ■ ■ ■ ■ ■	**France 2**	1 Fr	5 Fr	10 Fr	20 Fr	1 /5 Fr	3 /10 Fr	7 /20 Fr	
	France 3	1 Fr	5 Fr	10 Fr	20 Fr	1 /3 Fr	2 /5 Fr	4 /10 Fr	9 /20 Fr
	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 / ON ■ ■ ■ / OFF ■ ■ ■ ■ ■	**Germany 2**	1 DM	2 DM	5 DM		1 /2 DM	2 /3 DM	3 /4 DM	4 /5 DM
	Germany 3 †	1 DM	2 DM	5 DM		1 /2 DM	2 /3 DM	3 /4 DM	5 /5 DM
	Germany 4	1 DM	2 DM	5 DM		1 /1 DM	6 /5 DM		
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Greece ‡**	50 Dr		100 Dr		1 /50 Dr	3 /100 Dr		
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Hong Kong ‡**	1 HK$	2 HK$	5 HK$		1 /5 HK$			
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Hungary ‡**	10 Ft	10 Ft	20 Ft		1 /20 Ft	3 /40 Ft		
Pos. 1 2 3 4 5 6 7 8 / ON ■ / OFF ■ ■ ■ ■ ■ ■ ■	**Italy 1 †**	500 Lit		500 Lit		1 /500 Lit			
	Italy 2	500 Lit		500 Lit		1 /1000 Lit	3 /2000 Lit		
Pos. 1 2 3 4 5 6 7 8 / ON ■ / OFF ■ ■ ■ ■ ■ ■ ■	**Japan 1 †**			100¥		1 /100¥			
	Japan 2			100¥		1 /100¥	3 /200¥		
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Korea ‡**	100 Won		100 Won		1 /100 Won			
Pos. 1 2 3 4 5 6 7 8 / ON ■ / OFF ■ ■ ■ ■ ■ ■ ■	**Netherlands 1**	1 Fls.	1 Fls.	2.5 Fls.		1 /1 Fls.	3 /2.5 Fls.		
	Netherlands 2 †	1 Fls.	2.5 Fls.	5 Fls.		1 /1 Fls.	3 /2.5 Fls.	6 /5 Fls.	
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**New Zealand 1 ‡**	$NZ 1		$NZ 2		1 /$NZ 1	2 /$NZ 2		
	New Zealand 2 ‡	$NZ 1		$NZ 2		1 /$NZ 1	3 /$NZ 2		
Pos. 1 2 3 4 5 6 7 8 / ON ■ ■ / OFF ■ ■ ■ ■ ■	**Norway 1 †**	10 NKr	5 NKr	20 NKr		2 /10 NKr	1 /5 NKr	4 /20 NKr	
	Norway 2	10 NKr	5 NKr	20 NKr		1 /10 NKr	3 /20 NKr		
Pos. 1 2 3 4 5 6 7 8 / ON / OFF ■ ■ ■ ■ ■ ■ ■ ■	**Spain ‡**	100 Pts		500 Pts		1 /100 Pts	6 /500 Pts		
Pos. 1 2 3 4 5 6 7 8 / ON ■ ■ / OFF ■ ■ ■ ■ ■	**Sweden 1 †**	1 SKr	5 SKr	10 SKr		1 /10 SKr	2 /15 SKr	3 /20 SKr	
	Sweden 2	1 SKr	5 SKr	10 SKr		1 /5 SKr			
Pos. 1 2 3 4 5 6 7 8 / ON ■ ■ / OFF ■ ■ ■ ■ ■	**Switzerland 1 †**	1 SwF	2 SwF	5 SwF		1 /1 SwF	6 /5 SwF		
	Switzerland 2	1 SwF	2 SwF	5 SwF		1 /1 SwF	3 /2 SwF	9 /5 SwF	
	UK 1	10p	50p	1£	20p	1 /50p	3 /1£		
Pos. 1 2 3 4 5 6 7 8 / ON ■ ■ / OFF ■ ■ ■ ■ ■	**UK 2**	10p	50p	1£	20p	1 /40p	3 /1£		
	UK 3 †	10p	50p	1£	20p	1 /50p			

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

	Adjustment Name	Adjustment Definition
Adj. 8	**Reset Coin Audits**	Default is **NO**. Select the "+" *Icon* to change to **YES**. ⚠ When enabled, all *Coin Audits* (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 *Coin Audits* (Audits 5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero).
Adj. 10	**Reset High Scores**	When enabled (set to **YES**) the High Score Levels and associated initials will be restored to the backup settings when the "+" *Icon* is selected and activated.
Adj. 11	**Match Percentage**	Set Match percent from **00%** to **10%** or **OFF**. At **00**% the match display occurs at the end of the game but never awards a credit.
Adj. 12	**Balls Per Game**	Adjust the number of balls per game; **2** to **5**. Default is **3**.
Adj. 13	**Tilt Warnings**	Adjust the number of plumb bob tilt switch closures before the ball in play is tilted; **1**, **2**, **3** or **OFF.**
Adj. 14	**Replay Boost**	Set to **YES** or **NO**. When set to **YES**, exceeding a replay will set a temporary replay level for each time a replay level is surpassed. This new level will equal the previous replay level (when the replay was awarded) plus 50 Million for each following game, until the replays have all been played. At this time the previous level is resumed.
Adj. 15	**Credit Limit**	Adjust the maximum number of credits that may be posted; **4** to **50**. Default is **30**.

Note: There are 4 of the 6 High Score Levels with associated player initials that are displayed during the attract mode. This provides a High-Score-To-Date feature. When players exceed these levels, the player initials may be entered to replace the previous ones. These levels may be adjusted to award credits and to be reset to backup values after a selected number of games.

Adj. 16	**Allow High Scores**	Set to enable (set to **YES**) or disable the four high score levels by setting to zero.
Adj. 17	**High Score #1 Awards**	Adjust the number of awards (**0** to **4**) awarded for exceeding level 1 (the highest of the four levels).
Adj. 18	**High Score #2 Awards**	Adjust the number of awards (**0** to **3**) awarded for exceeding level 2.
Adj. 19	**High Score #3 Awards**	Adjust the number of awards (**0** to **2**) awarded for exceeding level 3.
Adj. 20	**High Score #4 Awards**	Adjust the number of awards (**0** to **1**) awarded for exceeding level 4.
Adj. 21-26	**Default High Score #1 - #6**	Adjust the score level to which the world record, (level 1) (the highest of the four levels) may be altered. This adjustment is not affected by Adj. 27, HSTD Reset Count. Adjust the backup score to which levels **2 - 6** may be reset, respectively.
Adj. 27	**HSTD Reset Count**	**HSTD** (**H**igh **S**core **T**o **D**ate). Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments; **100** to **9,900** or **OFF** (no reset or adjustment). Default is **2,000**.
Adj. 28	**Free Play**	When set to **YES**, no coins are required for games.
Adj. 29	**Custom Message**	Set to **ON** or **OFF**. When set to **ON**, this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to **CHANGE** selecting the "+" *Icon*. Using either of the Flipper Buttons or the **"RED"** and/or **"GREEN" Buttons**, select either of the **"ARROW"** *Icons*. Press the **"BLACK" Button** (*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**.
Adj. 30	**Attract Mode Music**	Set to **ON** or **OFF**. When set to **ON**, attraction music / sounds are played between games.

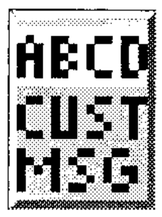
Sega Adjustments Continued.

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

The X-Files Adjustments (44-50)

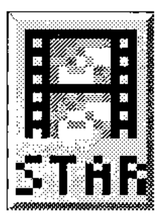
From the **ADJUSTMENTS MENU**, select the "FILES" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st adjustment in this group. Continue to select either of the "ARROW" *Icons* to view each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

Adj. Nº	Adjustment Name	Adjustment Definition
Adj. 44	**MBall Restart**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how Multiball can restart.
Adj. 45	**Extra Ball Memory**	Set to **ON** or **OFF**. Default is **ON**. When set to **ON**, the lit 'Extra Ball' light will be retained in memory from ball-to-ball for the same player. When set to **OFF**, the lit 'Extra Ball' light will go out at the end of each ball.
Adj. 46	**Multiball Criterion**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how the Multiball Feature is started and played.
Adj. 47	**Orbit Criterion**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how the Orbit Features are started and played.
Adj. 48	**Ramp Criterion**	Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how the Ramp Features are started and played.
Adj. 49	**File Cabinet Motor Enabled**	Set to **YES** or **NO**. Default is **YES**. When set to **YES**, the File Cabinet Motor is operational. When set to **NO**, the Motor & Magnet under the playfield are disabled. Use the **NO** setting, if the Motor or Playfield Magnet is malfunctioning awaiting service and/or repair.
Adj. 50	**Not Used**	This adjustment is ***Not Used***, allowing for ***Future Expansion***, if any.



Custom Message

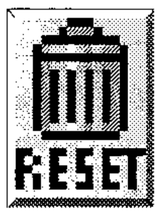
To go directly to ***Adjustment 29, Custom Message,*** from the **ADJUSTMENT MENU**, select the "CUST MSG" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. Set the feature to **CHANGE** selecting the "+" *Icon*. Using either of the Flipper Buttons or the **"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

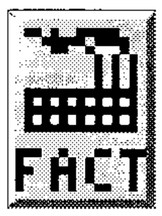
To reset the game with *Special Home Settings* (*not the normal Factory Setting*), from the **ADJUSTMENT MENU**, select the "STAR" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This *Special Setting* automatically changes ***Adjustment 6, Game Difficulty,*** to **EASY** and ***Adjustment 28, 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:

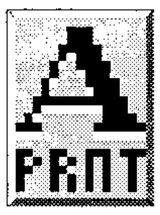


Adjustment Note: Resetting Adjustments

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

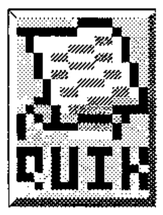


Selection of the "FACT" *Icon*, from the **RESET MENU**, will reset all adjustments to the *Factory Settings* (except for Proprietary Adjustments). The display will return to the **Attract Mode**. To perform any other functions, the system must be entered again by pressing the **Black "BEGIN TEST" Button** 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 Nº of copies value to zero.

Go To Reset Menu

Overview

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



GO TO RESET MENU

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

Important Notes:



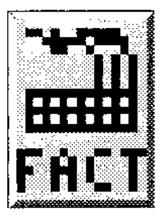
Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icon*.



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

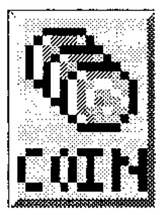


Selecting & activating the "HELP" *Icon* from the display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



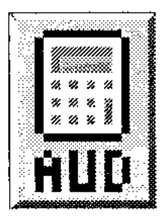
Factory Reset

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



Reset Coin Audits

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



Reset Game Audits

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

Fig. 1

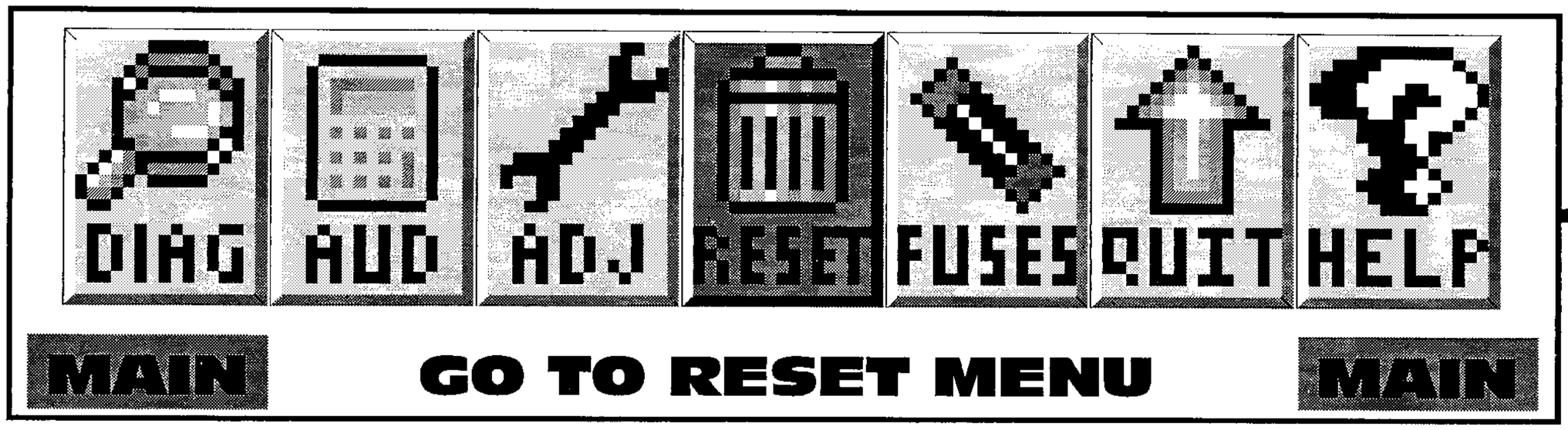
• Reset Coin Audits	
Earnings Audits (Coin Audits Only 5-11)	
Au. Nº	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder of the Audits.

Fig. 2

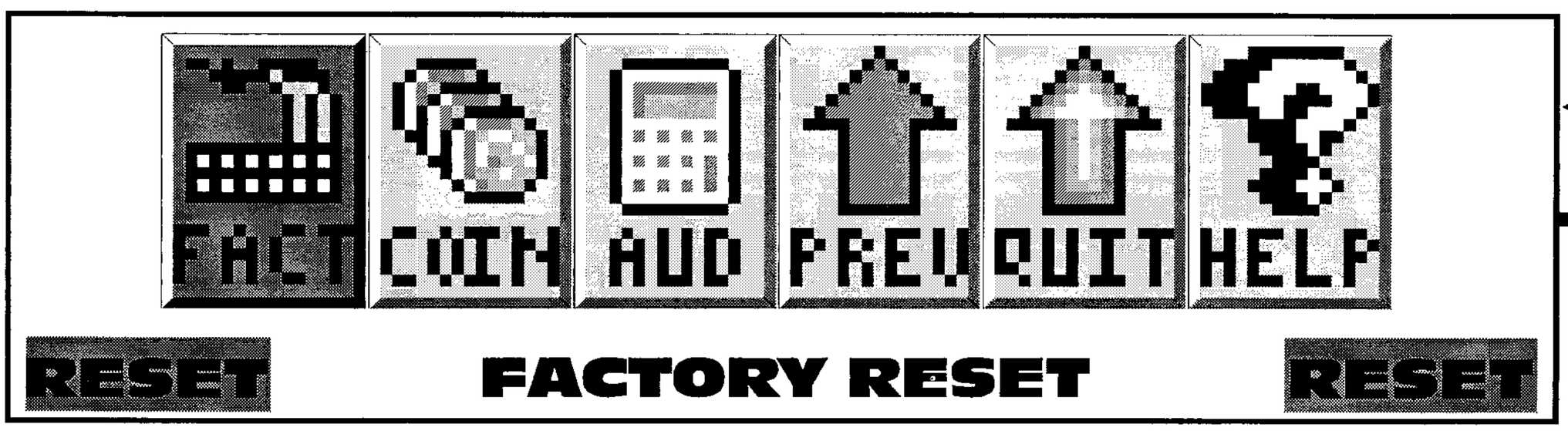
• Reset Game Audits	
Earnings (1-4), Generic/Specific Audits (13+)	
Au. Nº	Description
1-4	The first 4 Audits in the game.
5	Coins Thru Left Slot
6	Coins Thru Right Slot
7	Coins Thru Center Slot
8	Coins Thru 4th Slot
9	Total Coins
10	Total Earnings
11	Meter Clicks
12	Software Meter
13 +	The remainder of the Audits.

Example:

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



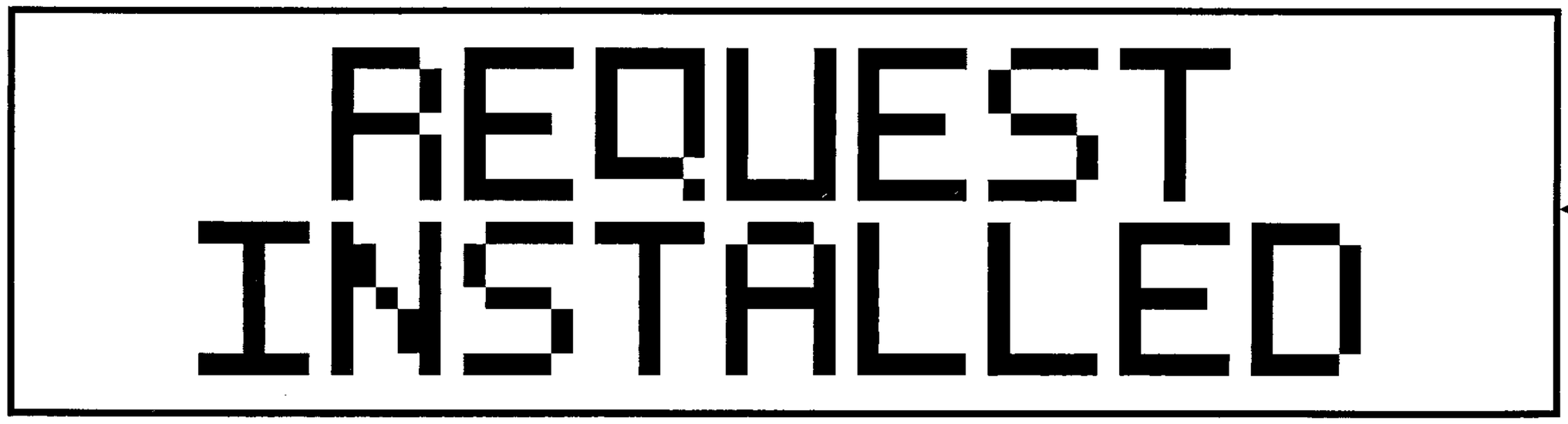
Press the **Black Button** to activate this **ICON**. This will bring up the **RESET MENU**.



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

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

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



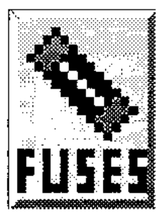
The **REQUEST INSTALLED** now appears momentarily and the *Service Session* is automatically exited with the display returning to the **ATTRACT MODE**.

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

Go To 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. ❶**) 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:



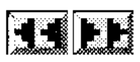
Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



Selecting & activating the "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.)



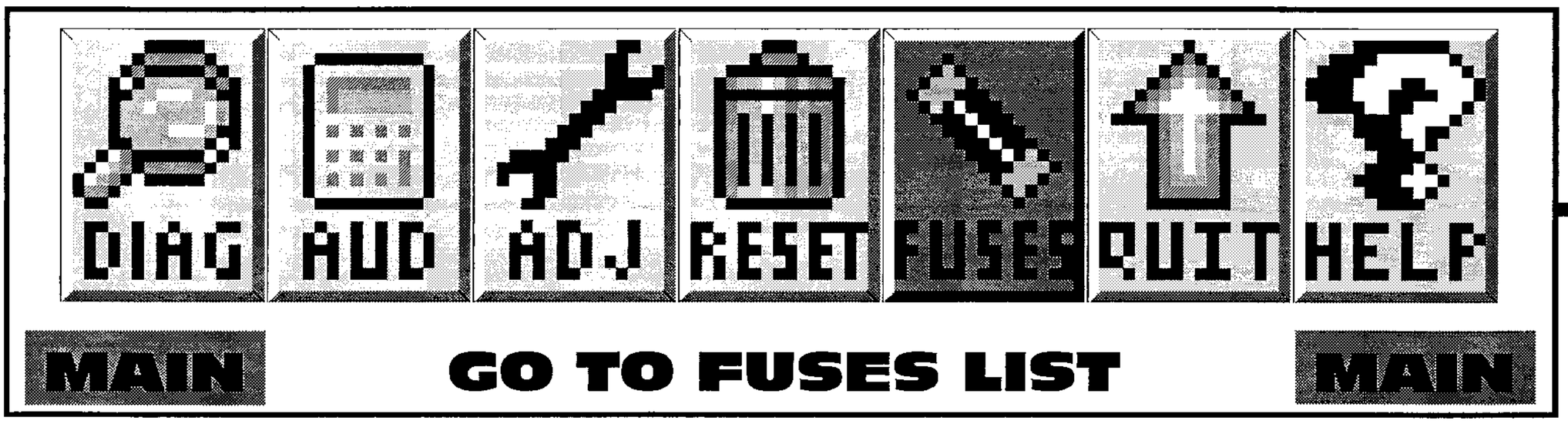
Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.



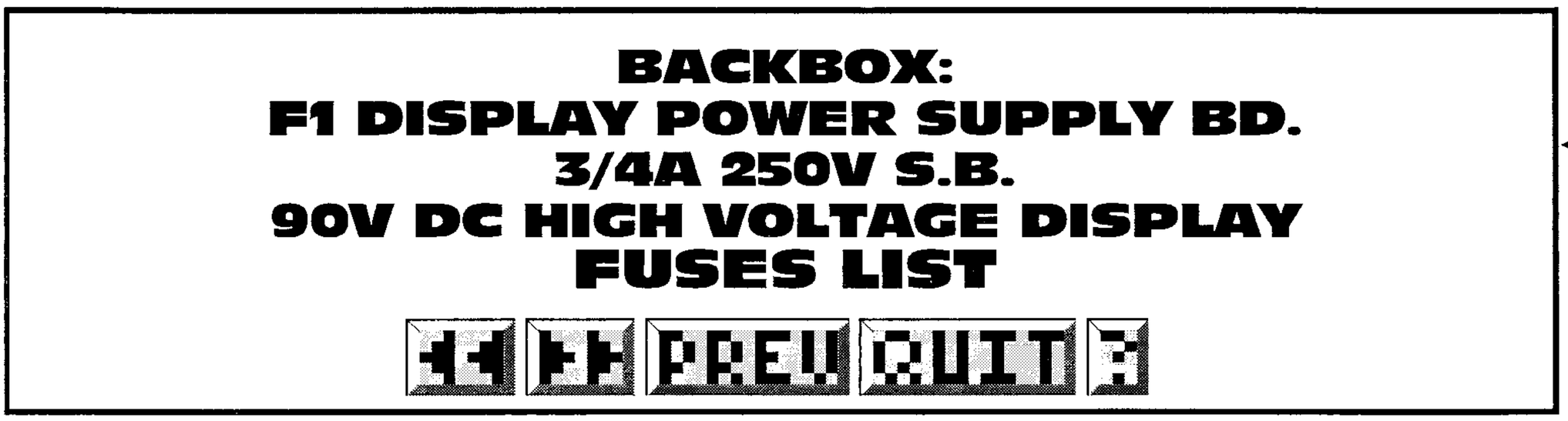
Selecting & activating the "ARROW" *Icons* selects the next or previous fuse in this group.

Example:

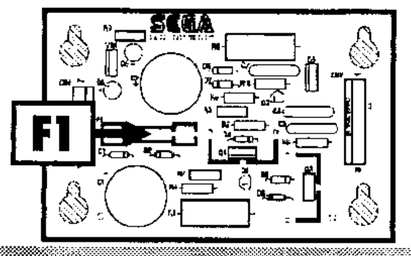
From the **MAIN MENU**, use the **Red** or **Green Buttons** to select the "FUSES" *Icon* (**GO TO FUSES LIST**).



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



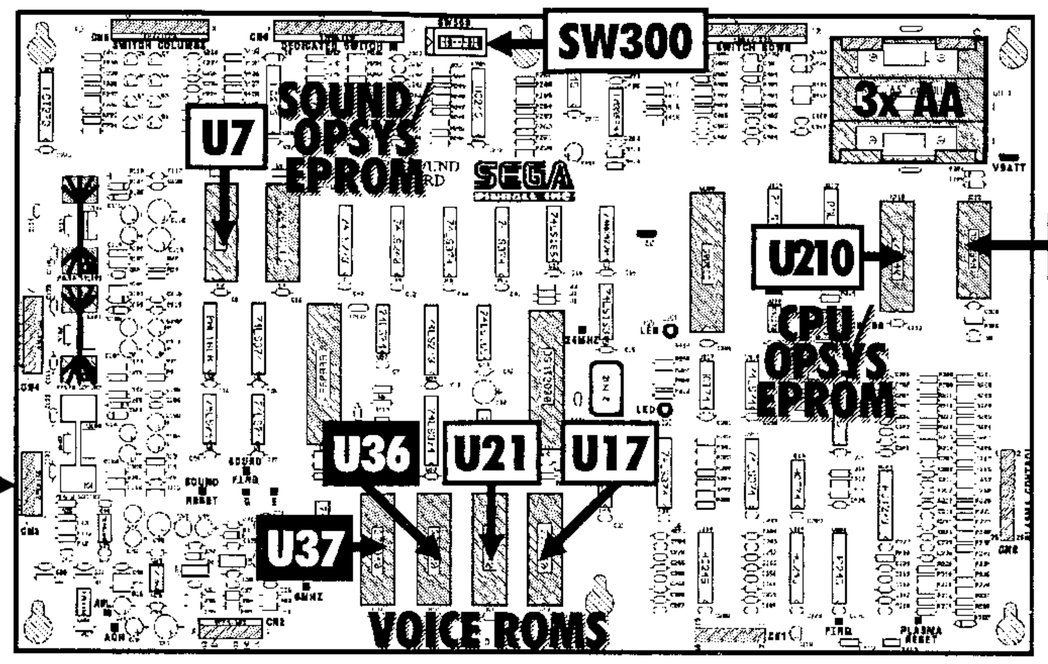
BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs



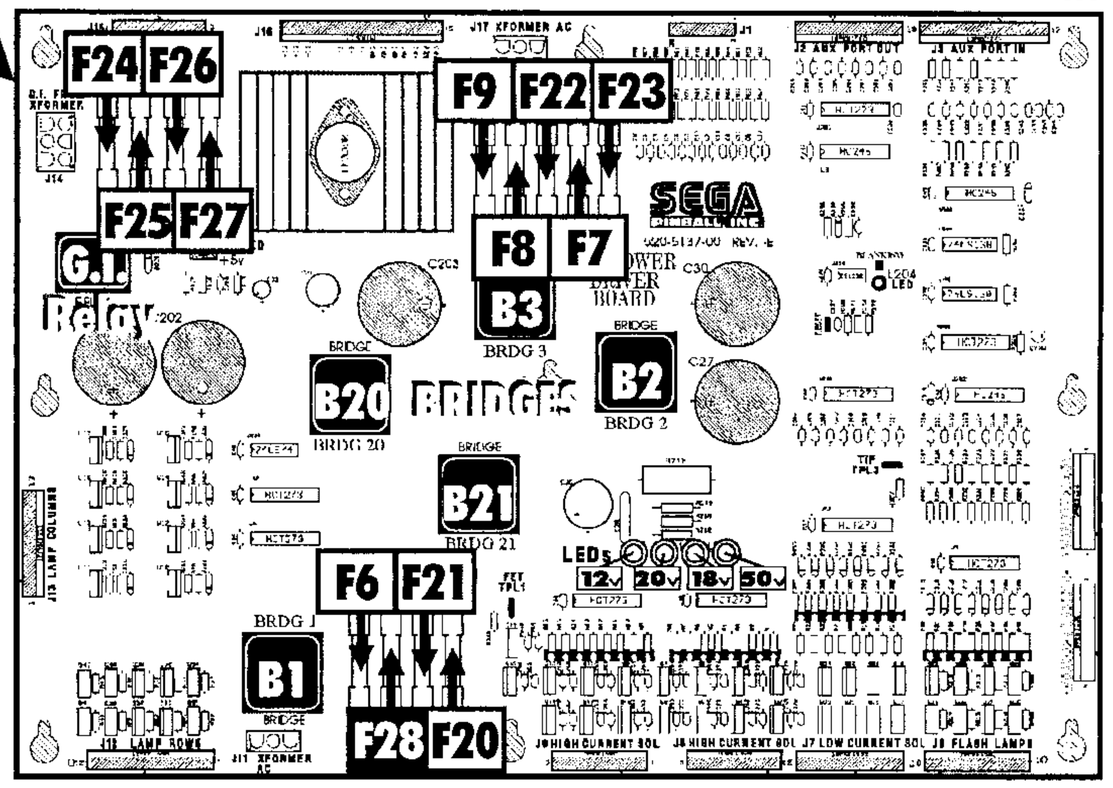
Display Power Supply Bd.

CPU / Sound Board
No Fuses

I / O Power Driver Board



Note:
U36
U37
are Not Used in this game.



Note:
F28
is Not Used in this game.

*** All BRIDGES rated 35A @ 100v ***	
B1	+50v DC High Current Coils
B2	+20v DC Low Current Coils
B3	+/-12v DC Sound/Display/Logic
B20	+18v DC Illumination
B21	+5v DC Logic Voltage

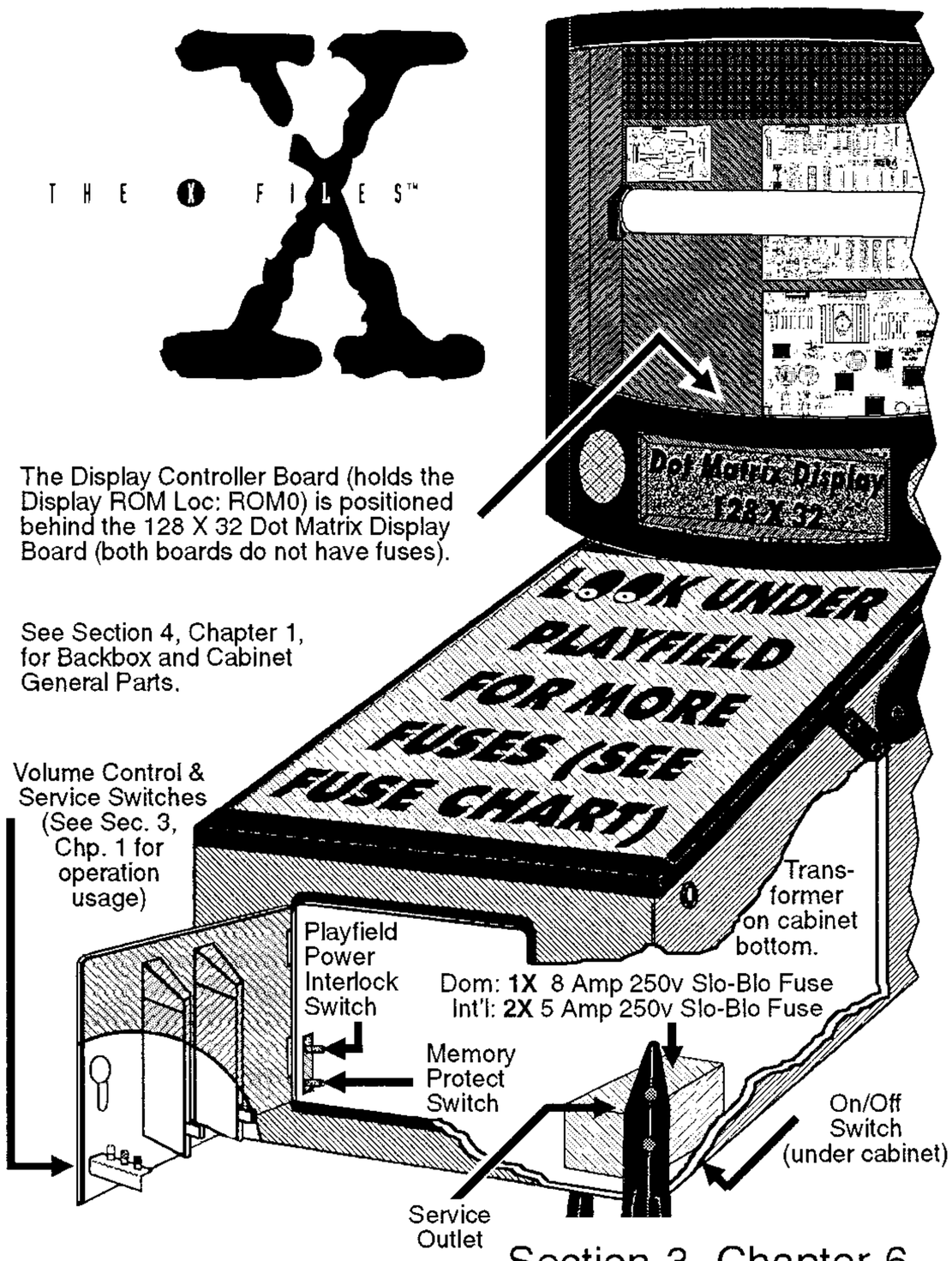
QUICK REFERENCE FUSE CHART

Backbox Fuses			
LOC: DISPLAY POWER SUPPLY (P.S.) BOARD			
F1	¾A 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	Magnet
F21	3A 250v S.B.	50v DC	Coils
F22	8A 250v S.B.	18v DC	Controlled Lamps
F23	4A 250v S.B.	5v DC	Logic
F24	5A 250v S.B.	6.3v AC	G.I. Lamp (Playfield Upper Right)
F25	5A 250v S.B.	6.3v AC	G.I. Lamp (Playfield Left)
F26	5A 250v S.B.	6.3v AC	G.I. Lamp (P/F Right & Coin Door)
F27	5A 250v S.B.	6.3v AC	G.I. Lamp (Playfield Upper Left)
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 X1)
n/a	5A 250v S.B.	220v AC	Main Fuse Line (International X2)
Playfield Fuses			
LOC: UNDER PLAYFIELD (By Flippers & Magnet)			
n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU/YEL↔RED/YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY/YEL↔RED/YEL)
n/a	3A 250v S.B.	50v DC	Magnet (VIO/YEL↔BLU/BLK)

THE X FILES™

The Display Controller Board (holds the Display ROM Loc: ROM0) is positioned behind the 128 X 32 Dot Matrix Display Board (both boards do not have fuses).

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



Go To Help Screen

Overview

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



GO TO HELP SCREEN

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

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

Important Notes:



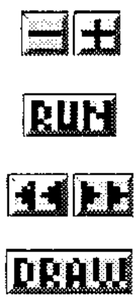
Exit any sub-menu and return to the **MAIN MENU** by selecting & activating the "PREV" *Icons*. If no *Icons* appear in the display because of a testing function or special display (e.g. "Help"), press any button to exit.



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



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



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

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

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

PROBLEM/SOLUTION TABLE

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

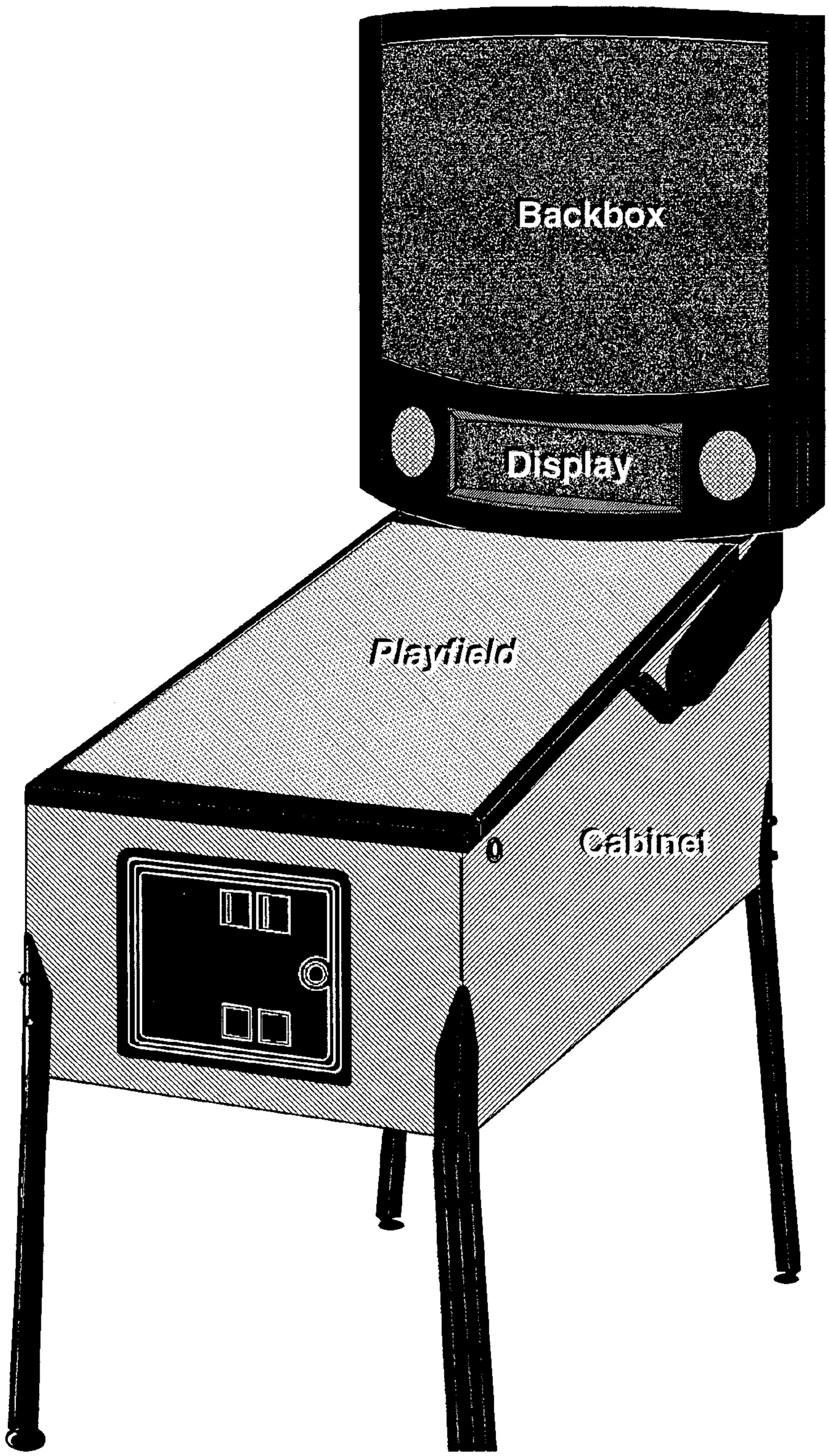
PROBLEM	SOLUTION
Will not enter the Service Mode after depressing the **Black "BEGIN TEST" Button**.	• Check the Service Switch(es) (**Red, Green & Black Buttons**) for loose connections or bad Ground. • Check the associated wiring harness to/from the CPU Board Connector CN14. • Check CPU Board, possibly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

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, Drawings for Major Assemblies & Ramps.

Important: Read all "**Take Note:**" items.



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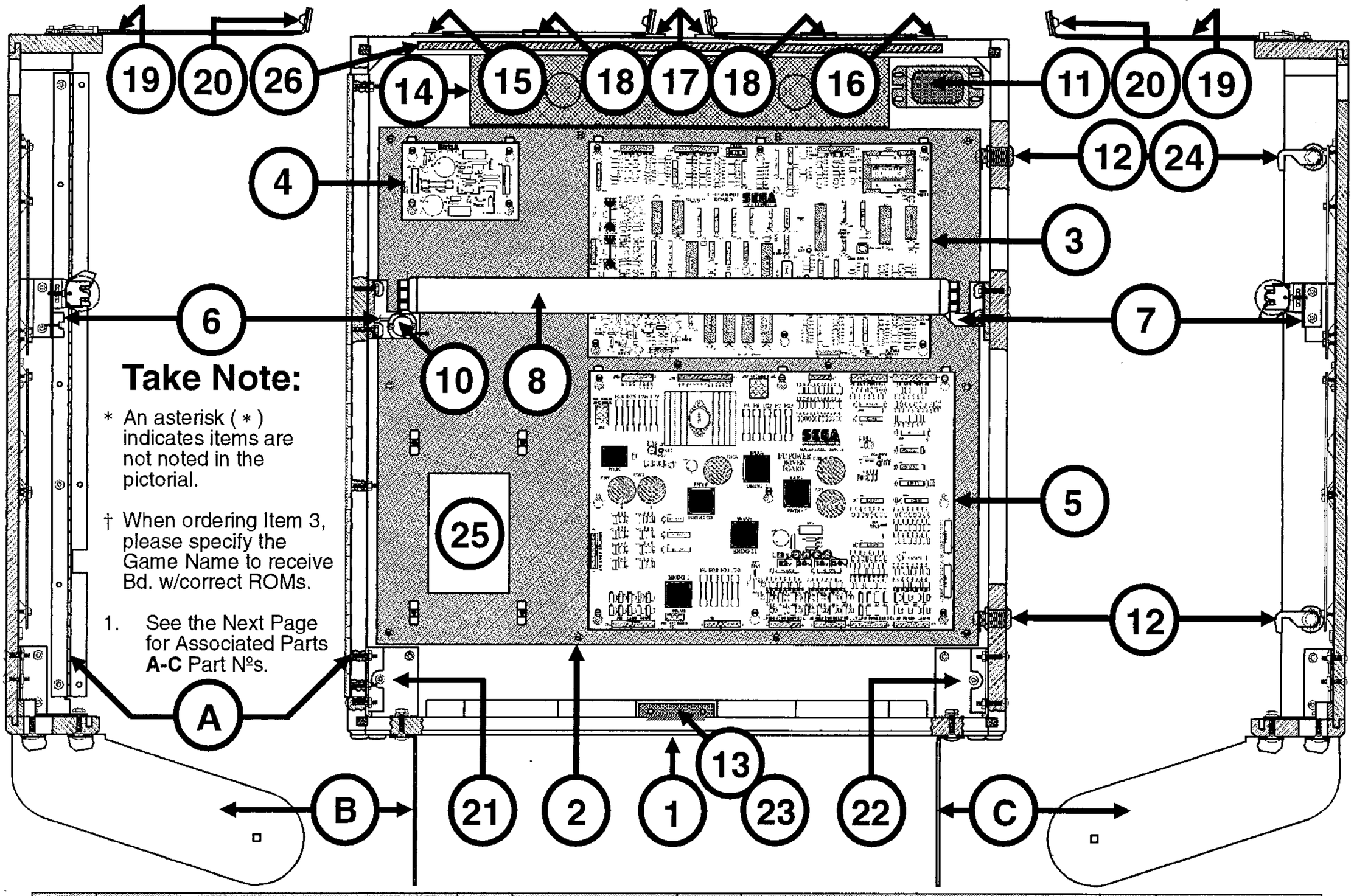
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Backbox (Back Side) Assembly, 505-6002-46-46A (Items 1-37)



Take Note:

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

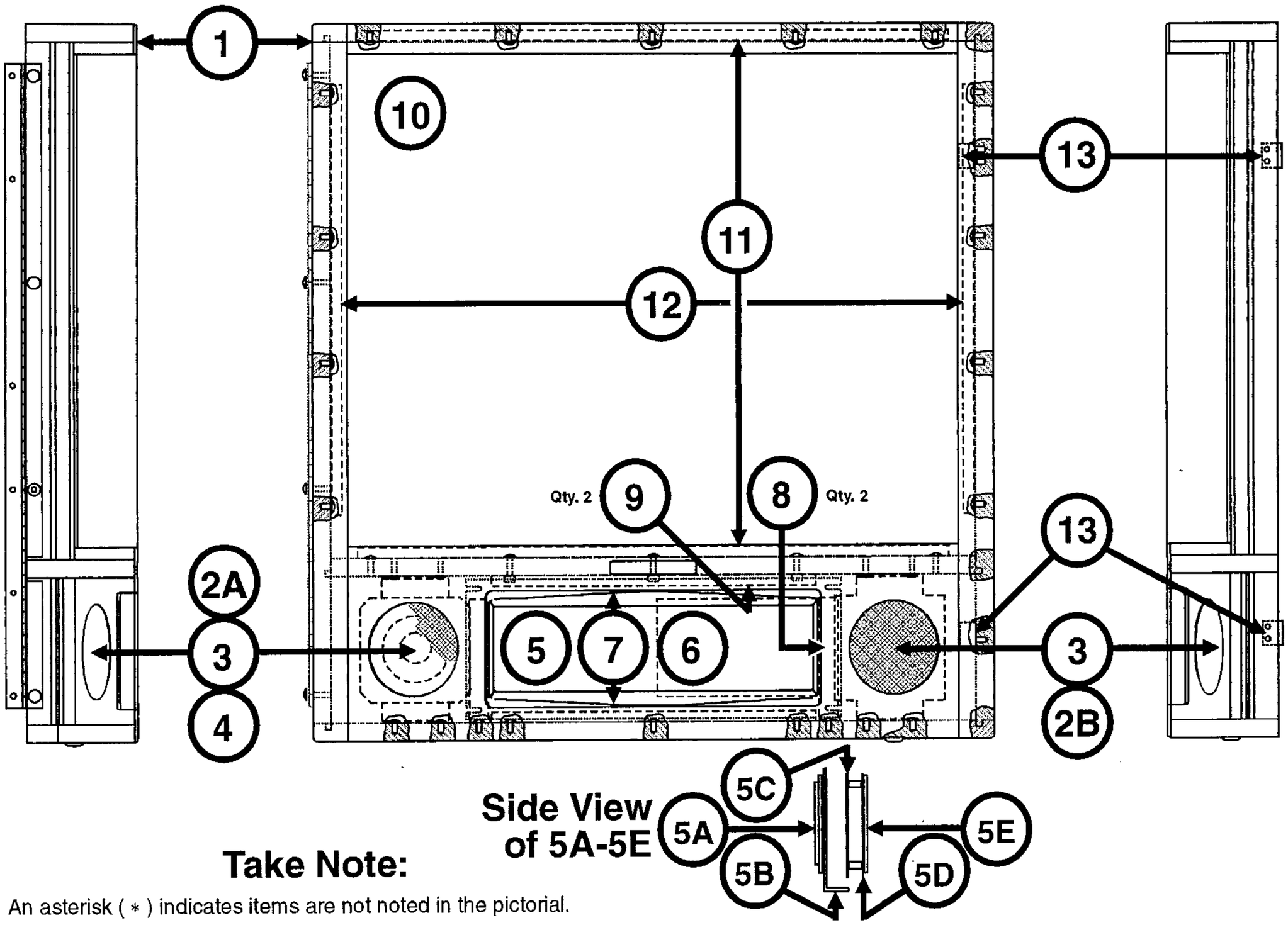
† When ordering Item 3, please specify the Game Name to receive Bd. w/correct ROMs.

1. See the Next Page for Associated Parts **A-C** Part Nºs.

Nº	Individual Part Name (Back)	QTY.	SPI Part Nº
1	Backbox Housing (Wood)	1	525-5453-01
2	PCB Metal Mounting Plate	1	535-5809-04
	Item 2 secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 13) (234-5101-05) **and** #8 Washer (Qty. 3) (242-5005-00)		
3 †	CPU/Sound Board (Mono)	1	520-5136-10
4	Display Power Supply Board	1	520-5138-00
5	I/O Power Driver Board	1	520-5137-01
	Items 3, 4 & 5 secured by: #8-32 X 3/8" HWH MS (Qty. 19) (237-5903-00)		
6	Fluorescent Light Bracket Assy. Left	1	515-6545-00
	ORDERING ABOVE (ITEM 6) SUB-ASSY. PART Nº WILL INCLUDE:		
6A	Fluorescent Light Bracket Left	1	535-7739-01
6B	Lamp Holder (Self-Locking)	1	077-5214-00
6C	#6-32 X 5/8" PPH MS (Sems) Zinc	1	232-5203-00
6D	Starter Base (with Leads)	1	077-5213-00
6E	#4-40 X 1/2" PPH MS (Sems) Zinc	2	237-5813-00
7	Fluorescent Light Bracket Assy. Right	1	515-6545-01
	ORDERING ABOVE (ITEM 7) SUB-ASSY. PART Nº WILL INCLUDE:		
7A	Fluorescent Light Bracket Right	1	535-7739-00
7B-7C	Identical to Items 6B-6C above.		See 6B-6C
	Items 6 & 7 secured by: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 4) (231-5012-00) **and** #10-24 Keps Nut (Qty. 4) (240-5207-00)		
8	Fluorescent Tube (F20T12CW)	1	165-5031-02
9*	3/4" Reinforced Strapping Tape (6")	1	626-5040-00
10	Starter - Fluorescent (FS2 Light)	1	165-5011-01
11	Ballast Assembly	1	500-6143-00
	ORDERING ABOVE (ITEM 11) SUB-ASSY. PART Nº WILL INCLUDE:		
11A	Ballast (SP2 120v 60Hz 13W UL)	1	010-5007-00
11B	Wire Lock (NYT) Clear JN418-212	3	055-5146-00
11C	Fluor. Light Cable Wiring Harness	1	036-5402-15
	Item 11 secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 2) (234-5101-05)		
12	Backbox Lock & Key	2	355-5018-01
13	#1 Roto Lock Female (R2-0002-02)	1	355-5006-02
	Item 13 secured by: #10-24 X 1-3/4" CBSN (Qty. 2) (231-5022-00), #10-32 Nylon Stop Nut (Qty. 2) (240-5203- 00) **and** #10 Washer 7/32" ID X .5" OD X 1/16" (Qty. 2) (242-5003-00)		
Note: #1 Roto Lock Male (on Cabinet)		*1*	*355-5006-01*
14	Back Vent Grill 2-1/2" X 18"	1	545-5072-02
	Item 14 secured by: Staple 5/16" (Qty. 24) (631-5000-00)		

Nº	Individual Part Name (Back)	QTY.	SPI Part Nº
15	Top Support Mounting Bracket Left	1	515-6704-00
16	Top Support Mounting Bracket Right	1	515-6704-01
17	Support Mounting Bracket (Small)	2	515-6706-00
	Items 15, 16 & 17 secured by: #8 X 3/8" PFH MS (Zinc) (Qty. 10) (237-5902-00)		
18	Support Bracket	2	535-8041-00
	Item 18 secured by: #8 X 3/8" HWH MS (Zinc) (Qty. 4) (237-5903-00)		
19	"Swing-Out Arm" Top Support Bracket	2	535-8040-00
	Items 19 secured by: Washer 1/4" ID X 1" OD X .049" Thk (Qty. 2) (242-5009-00), Washer #10 7/32" ID X .5" OD X 1/16" Thk (Qty. 2) **and** #10-32 X 3/8" PPH MS (Sems) Zinc (Qty. 2) (232-5401-00)		
20	Deflector Pad	2	545-5428-00
21	Corner Support Bracket Left	1	515-6703-00
22	Corner Support Bracket Right	1	515-6703-01
	Items 21 & 22 secured by: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 8) (231-5012-00), **and** #10-24 Keps Nut (Qty. 8) (240-5207-00)		
23	Door Restraint Bracket	1	535-8127-00
	Items 23 secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 2) (234-5101-05)		
24	Lock Mounting Plate	2	535-8128-00
	Items 24 secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 4/per) (234-5101-05)		
25	Fuse Description Decal Game Nº 46	1	820-6152-46
26	1' of 3/8" X 1/4" Poly Foam Tape	2.41	626-5038-00
27*	Fuse Label (UL)	1	820-6143-00
28*	Backbox Date Label	1	820-5091-00
29*	Ribbon Cable, 20-Pin	1	036-5000-04
30*	Ribbon Cable, 26-Pin	1	036-5001-80
	Item 29 (20-Pin) connects the CPU/Sound Board to the I/O Power Driver Board. **Item 30 (26-Pin) connects** the CPU/Sound Board to the Display Controller Board.		
31*	Display Cable Wiring Harness	1	036-5409-00
32*	Fluor. Power Cable Wiring Harness	1	036-5414-10
33*	1" Clamp (Single)	9	040-5000-09
34*	3/4" Clamp (Single)	3	040-5000-08
35*	1/2" Clamp (Single)	1	040-5000-06
36*	1/4" Clamp (Double)	3	040-5000-23
37*	Screw Down Cable Tie	2	040-5005-00
	Items 33-35 & 37 secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 15) (234-5101-05); Item 36 secured by: #6 X 1/2" HWH AB (Zinc) Red (Qty. 3) (234-5001-02)		

Backbox (Front Side) Assembly, 505-6002-46-46B (Items 1-16)



Take Note:

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

Nº	Individual Part Name (Front)	QTY.	SPI Part Nº
1	Backbox Door Pane (Wood)	1	525-5453-02

Item 1 contains #8-32 Insert Nuts (Qty. 46) (240-5320-00) inlaid in the Door Pane and Sega Logo Stick-On Plate (Qty. 1) (535-7877-00).

2A	Speaker Mounting Plate (Left - Black)	1	515-6681-00
2B	Speaker Mounting Plate (Right - Raw)	1	515-6681-01
3	Speaker Grill (Left Black w/o Artwork)	2	535-8081-00
4	Speaker 4 X 4 Quam (#89-9572)	1	031-5004-00

Items 2A/B, 3 & 4 secured by: #8-32 X 3/8" HWH MS (Sems) Zinc (Qty. 4) (237-5903-00), #10-24 X 1-1/4" CB Sq. Neck (Black) (Qty. 4) (231-5012-00), #10-24 Keps Nut (Qty. 4) (240-5207-00) **and** Rivet - 1/8" ø X 3/16" (Qty. 8) (249-5001-00)

5	Dot Matrix Display Board Assembly	1	515-6713-00
ORDERING ABOVE (ITEM 5) SUB-ASSY. PART Nº WILL INCLUDE:			
5A	**Dot Matrix Display Board 128 X 32**	**1**	**520-5052-00**
5B	**Dot Matrix Display Holder**	**2**	**535-8005-00**
5C	**Static Shield**	**1**	**535-6437-00**
5D	**RF Shield (Display PCB Control)**	**1**	**820-5092-00**
5E	**Display Controller Board**	**1**	**520-5055-01**
5F*	Edge Protector	2	545-5592-01
5G*	Ribbon Cable, 14-Pin (connects **5B** to **5C**)	1	036-5260-00
5H*	3/16" X 3/8" Spacer Gray	4	254-5000-18
5I*	#6-32 X 1/2" HWH Swage (Serr) Zn.	4	237-5976-03
5J*	1/2" X 1/4" Hex Spacer #6-32 Tap.	5	254-5008-03
5K*	3/4" X 1/4" Hex Spacer #6-32 Tap.	1	254-5008-04
5L*	1/2" X 5/16" X .144 I.D. Spacer Tap.	3	254-5014-00
5M*	#6-32 X 1/4" PPH MS (Sems) Zinc	5	232-5200-00
5N*	#6-32 X 3/4" PPH MS (Sems) Zinc	3	237-5504-00
5O*	Ground Strap - 25"	2	600-5006-25
5P*	Ground Strap - 41"	2	600-5006-41
5Q*	5-1/2" Cable Tie	3	040-5001-06
5R*	1/2" Clamp (Single)	1	040-5000-06
6	Plastic Shield (Display Cover)	1	545-5800-00
7	Showcase Bezel (Black Plastic)	1	545-5752-01
8	Display Retainer Bracket (Sides)	2	535-8036-00

Nº	Individual Part Name (Front)	QTY.	SPI Part Nº
9	Plastic Shield Bracket (Top/Bottom)	2	515-6682-00

Items 6-9 secured by: #8-32 X 1/2" PPH MS (Sems) Zinc (Qty. 3) (232-5302-00), #10-24 X 1-1/4" Carriage Bolt Sq. Neck (Black) (Qty. 3) (231-5012-00), #10-24 Keps Nut (Qty. 3) (240-5207-00) **and** #6-32 Nylon Stop Nut (Qty. 8) (240-5005-00)

10	Backglass Assembly (Game Nº 46)	1	515-5450-00-46
ORDERING ABOVE (ITEM 10) SUB-ASSY. PART Nº WILL INCLUDE:			
10A	Backglass - Lexan (Front)	1	545-5743-00
10B	Screened Film (Game Nº 46) (Middle)	1	830-5246-00
10C	Backglass - Butyrate Cover (Back)	1	545-5753-00
11	Backglass Assy. Retainer Brkt. (Top/Bot.)	2	535-8001-00
12	Backglass Assy. Retainer Brkt. (Sides)	2	535-8002-00

Items 11 & 12 secured by: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 2) (231-5012-00), #10-24 Keps Nut (Qty. 2) (240-5207-00) **and** #8-32 X 3/8" HWH MS (Qty. 13) (237-5903-00)

13	Lock Bracket	2	535-8037-00

Item 13 secured by: #8-32 X 3/8" HWH MS (Sems) Zinc (Qty. 4) (237-5903-00)

14*	1' of 3/8" X 1/4" Poly Foam Tape	3.33	626-5038-00
15*	Speaker Cable Wiring Harness	1	036-5388-01
16*	1" Clamp (Single)	3	040-5000-09

SEE THE PREVIOUS PAGE FOR LOCATIONS:

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE BACKBOX ASSEMBLIES.

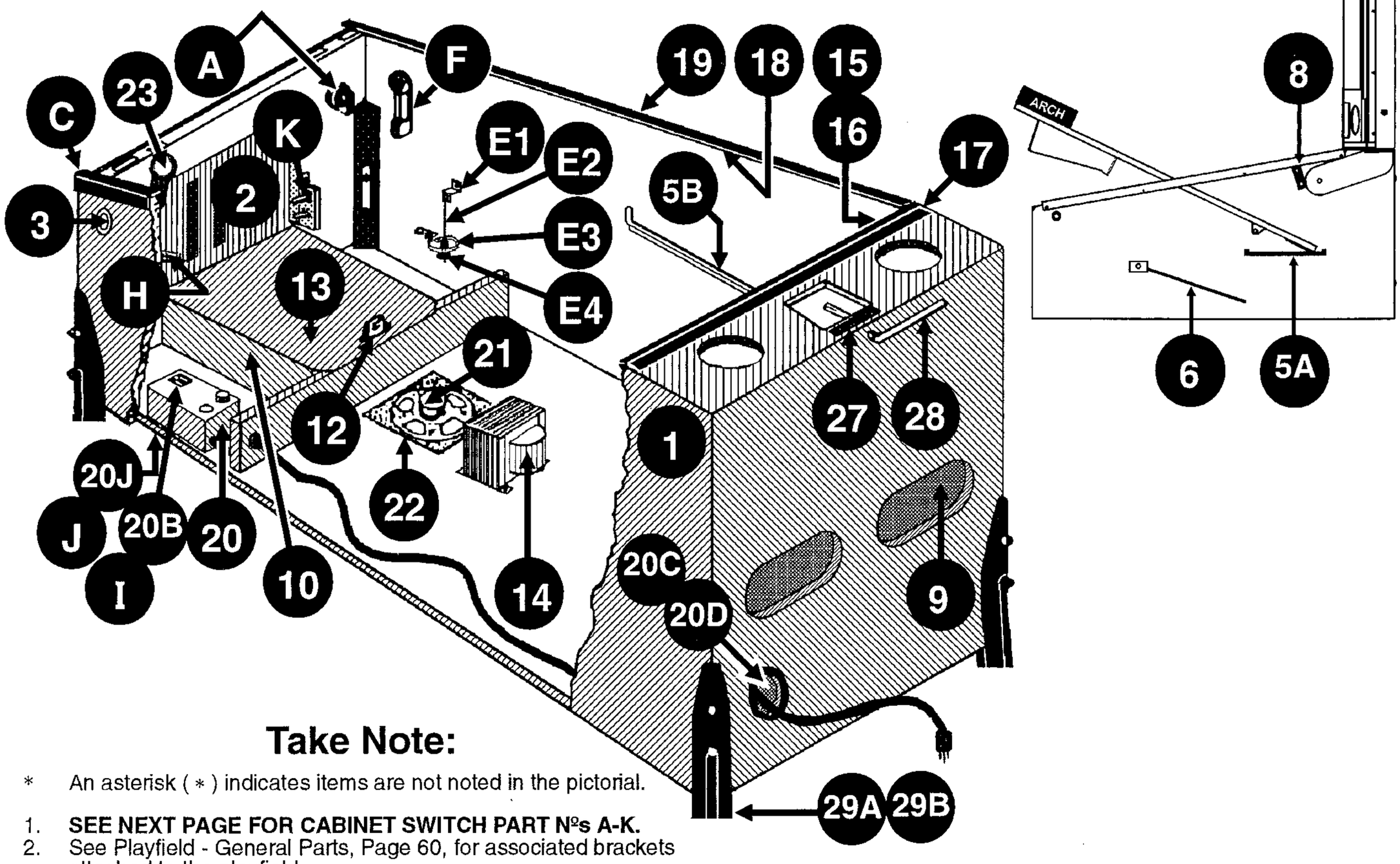
Nº	Assoc. Backbox Part Name	QTY.	SPI Part Nº
A	Backbox Hinge (Full Length Left Side)	1	390-5031-00

Item A secured to Backbox by: #10-24 X 1-1/4" CB Sq. Neck (Black) (Qty. 8) (231-5012-00) **and** #10-24 Keps Nut (Qty. 8) (240-5207-00)

B	Pivot Hinge Left	1	535-7999-00
C	Pivot Hinge Right	1	535-7999-01

Items B & C **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 B & C **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. (Qty. 2) (242-5016-00), 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



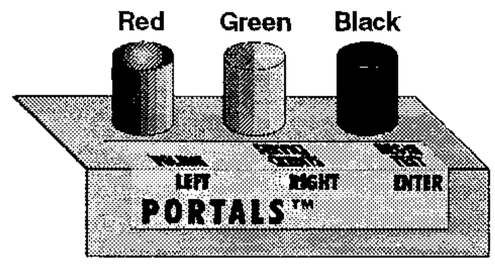
Take Note:

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

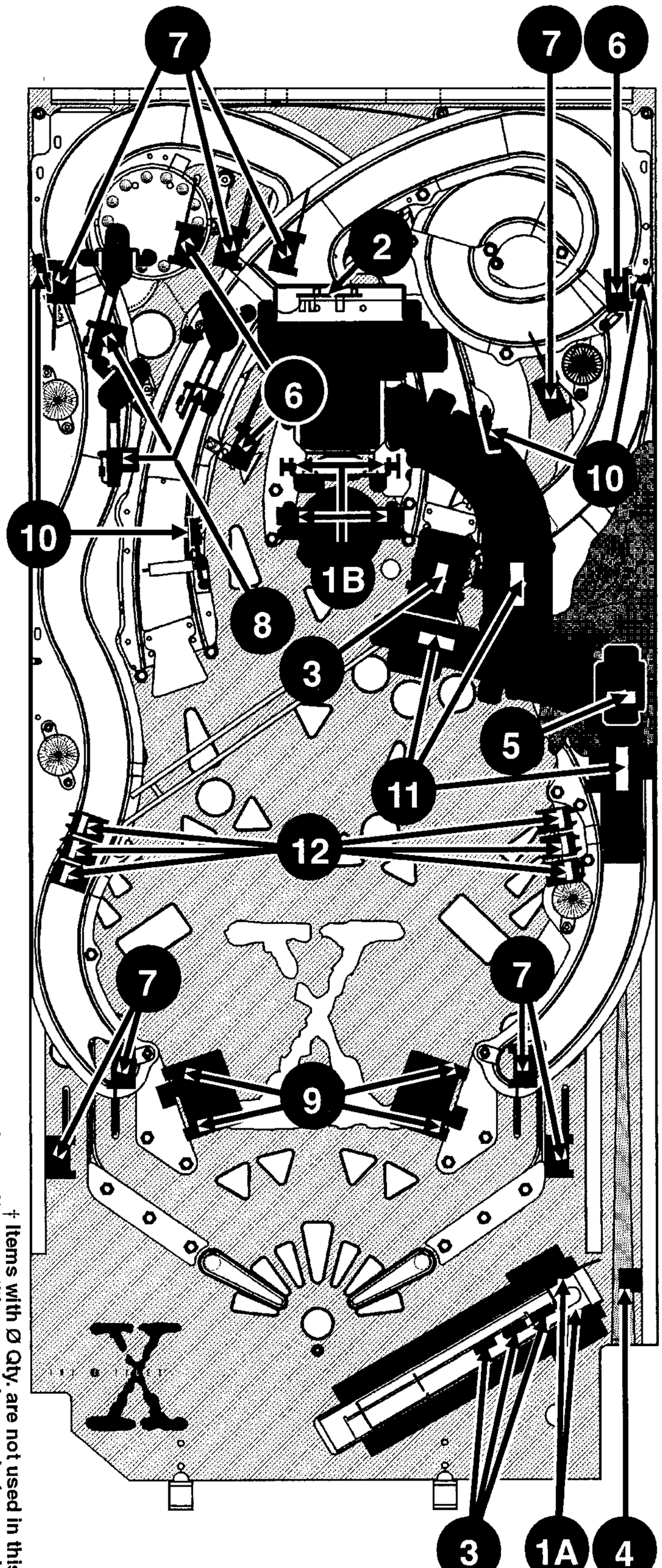
1. **SEE NEXT PAGE FOR CABINET SWITCH PART Nºs A-K.**
2. See Playfield - General Parts, Page 60, for associated brackets attached to the playfield.

Nº	Cabinet Part Name	QTY.	SPI Part Nº
1	Game 46 Screened Cabinet (Plain)	1	525-6000-46
2	Coin Door (with Validator) USA only	1	500-5018-172
	Item 2 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)		
3	Flipper Button Assembly Red	2	500-5026-32
4 *	Pal Nut for Flipper Button	2	240-5003-00
5A	Slide & Pivot Support Bracket - Right	1	535-5989-00
5B	Slide & Pivot Support Bracket - Left	1	535-5990-00
	Item 5A/B secured by: #10-24 X 1" Carriage Bolt Sq. Neck (3/per) (231-5021-00) **and** #10-24 Hex Nut (3/per) (240-5202-00)		
6	Prop Rod	1	535-7553-00
	Item 6 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)		
7 *	Mylar Carriage Bolt Cover Disc	6	820-5041-00
8	Back Box Stop Block (outside Cabinet)	2	545-5795-00
	Item 8 secured by: Hinge Spacer (1/per) (530-5099-00), Washer 1/4" I.D. X 1" O.D. (1/per) (242-5009-00), 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (2/per) (231-5003-00) **and** 1/4"-20 Flange Nut (2/per) (240-5300-00)		
9	Grills 2-1/2" X 18" (on Back & Bottom)	2	545-5072-02
10	Cash Box Plastic Bottom	1	545-5090-00
11 *	Foam Rubber 1/2" X 3/4" (behind Item 10)	1	626-5004-00
12	Cash Box Lock Bracket (wire)	1	535-7562-00
13	Cash Box Cover (Validator)	1	535-5013-03
14	Transformer with Ballast Winding	1	010-5012-00
15	Rear Glass Channel 20⅜" Length	1	545-5038-00
16	Foam Rubber 3/8" X 3/16" (In Item 19)	1	626-5004-00
17	Cabinet Pedestal Bracket	1	535-8035-00
	Item 17 secured by: #8 X 3/4" PFH (Zinc) (Qty. 3) (237-5822-00)		
18	Plastic Channel 42⅝" Lg. (Lt. & Rt.)	2	545-5017-00
19	Side Armor "with holes" (Lt. & Rt.)	2	535-7297-02
	Item 19 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" Tamper Proof (237-5947-00)		
20	Power Input Box Sub-Assy. (no Vol. pot)	1	515-5360-01
	ORDERING ABOVE (ITEM 20) SUB-ASSY. PART Nº WILL INCLUDE:		
20A*	Power Box (Plain)	1	535-5932-00
20B	Service Outlet (for USA)	1	180-5008-01
20C	Line Cord 10' ROJ 3" Max.	1	034-5000-10
20D	Recessed Cup for Line Cord	1	545-5122-00
20E*	Line Filter	1	150-5000-00
20F*	Varistor TNR159211KM	1	150-5001-00
20G*	Fuse 8 Amp (Domestic)	1	200-5000-05
20H*	Fuse Holder	1	205-5001-00
20I*	On/Off Switch Plate	1	535-5224-01
20J	On/Off Switch Toggle (Under Cabinet)	1	180-5001-00
20K*	Power Box Decal	1	820-6123-01
20L*	Fuse Label UL Decal	1	820-6143-00
21	Speaker - Round - 8" ø Quam 4Ω	1	031-5005-00
22	Speaker Grill 7" X 7"	1	545-5072-03
23	Front Molding Lockdown Assembly	1	500-5020-01
	Item 23 secured by: #10-24 X 1-1/4" Carriage Bolt (Qty. 2) (231-5012-00) **and** #10-24 Keps Nut (Qty. 2) (240-5207-00)		
24 *	Front Molding Lockdown Spring	1	265-5008-00
25 *	Front Molding - Black	1	500-5757-01-00
26 *	P/F Glass (Tmprd.) 21" X 43" X 3/16"	1	660-5001-00
27	#1 Roto Lock Male	1	355-5006-01
	Note: #1 Roto Lock Female (on Backbox)	1	*355-5006-02*
	Item 27 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)		
28	Hex Key Allen Wrench 5/16"	1	777-0001-00
29	Leg Assembly	4	500-5921-50
	ORDERING ABOVE (ITEM 29) ASSEMBLY PART Nº WILL INCLUDE:		
29A	Leg (Black)	4	535-5020-50
29B	Leg Leveler 3/8" - 16 X 3"	4	500-5017-00
	Item 29 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)		
30 *	Cabinet Back Panel Shield	1	545-5838-00
	Item 30 secured by: #6 X 1/2" PPH (Black) (Qty. 4) (237-5805-00)		

Cabinet & Playfield - Switches †



H Service Switch Set on Coin Door



Nº	Cabinet Switch Name	QTY.	Part Nº
A	Start Button Sw. Assy. (Yellow Flip. Style)	1	500-6090-06
B *	Coin Door Switch (USA)	4	180-5024-00
	Coin Door Switch (¥ Japan)	n/a	180-5091-00
C	Large Round Auto Launch Assy. "X"	1	500-6121-46
D *	Slam Tilt Switch (On Coin Door)	1	180-5022-00
E	Cabinet Plumb Bob Tilt Switch	1	n/a
ORDER ONLY INDIVIDUAL PARTS NEEDED (NO ASSY. NUMBER):			
E1	Tilt Hanger Bracket	1	535-5221-00
E2	Tilt Hanger Wire (Attached to bracket)	1	535-5319-00
E3	Tilt Contact Wire	1	535-7563-01
E4	Tilt Plumb Bob (Atch'd to hanger wire)	1	535-5029-00
F	Flipper Cabinet Sw. - Self-Cleaning	2	180-5160-00
G *	EOS Switch (on Lwr. Flippers)	2	180-5149-00
H	Service Switch Set (X3 on Coin Door)	1	180-5012-03
I	Service Outlet	1	180-5008-01
J	On/Off Switch	1	180-5001-00
K	Dual Switch Assembly	1	500-5808-00
ORDERING ABOVE (ITEM K) ASSEMBLY PART Nº WILL INCLUDE:			
K1*	Mounting Bracket	1	535-6958-00
K2*	Playfield Power Interlock Switch (Top)	1	180-5136-00
K3*	Memory Protect Switch (Bottom)	1	180-5000-00

SEE PREV. PAGE FOR CABINET SWITCHES A-K LOCATIONS.

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. ‡ Item 12, Mod. Stand-Up Target Narrow (Red), see the Plastic Part Color Chart on Plastic Posts and Spacers, further in this chapter, for other color alternatives, if desired.
4. **Legend Note:** Items noted with a white circle (①) are mounted above the playfield; items noted with a black circle (❶) are mounted below the playfield or on/in the cabinet.

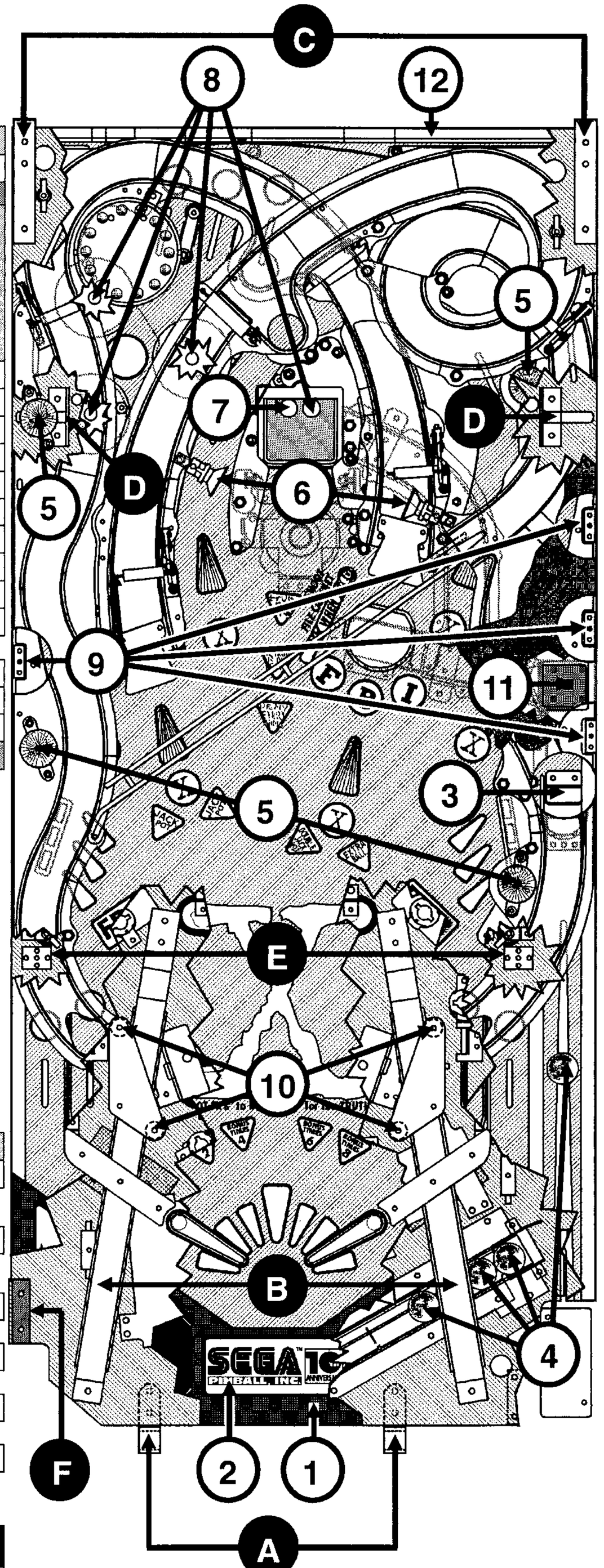
Nº	Playfield Switch Name	QTY.	Part Nº
1A	OPTO TRANS Board	1	520-5124-00
	OPTO REC Board	1	520-5125-00
1B	OPTO TRANS Board	2	520-5082-00
	OPTO REC Board	2	520-5083-00
2	Slotted OPTO (REC/TRANS) Board	1	520-5155-00
3	Micro Rollover Sw. (3/4-Ball Trgh 1/Trap Dr.)	4	180-5119-00
4	Shooter Lane Switch Assembly	1	500-5498-01
ORDERING ABOVE (ITEM 4) ASSEMBLY PART Nº WILL INCLUDE:			
4A*	Micro Switch	1	180-5100-01
4B*	Bracket	1	535-6173-00
4C*	#2-56 X 3/8" HWH Screw	2	237-5938-01
4D*	Diode, 1N4001	1	112-5001-00
5	Micro Switch (used on Super VUK)	1	180-5052-00
6	Micro Sw. Rollover Assy. (Lt. Brkt.)	3	500-5706-00
7	Micro Sw. Rollover Assy. (Rt. Brkt.)	8	500-5707-00
8	Turbo Bumper Switch	3	180-5015-03
9	Slingshot Micro Switch	4	180-5054-00
10	Micro Switch (Roll-Under Gate)	4	180-5087-00
11	Micro Switch (High Form)	3	180-5057-00
12‡	Modular S-U Target Narrow (Red)	6	500-6138-02

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

Playfield - General Parts

Nº	Above Playfield Name	QTY.	SPI Part Nº
1	Bottom Arch Assembly (Plastic)	1	500-6005-00-46
ORDERING ABOVE (ITEM 1) ASSEMBLY PART Nº WILL INCLUDE:			
1A*	Bottom Arch with "Fork" (Plain)	1	545-5302-07
1B*	#6-32 X 1-1/4" PPH MS	2	237-5508-00
1C*	Spacer 3/4" Plastic 3/8" (Gray)	2	254-5000-07
1D*	#6-32 Nylon Stop Nut	2	240-5005-00
1E*	Bottom Arch Shooter Lane Buty. -5	1	830-5486-05
1F*	Nelson Protect Strip 8-9/16"	2	545-5212-02
1G*	Bottom Arch Trim	1	545-5835-00
1H*	Bottom Arch Fence (Shooter Lane)	1	535-7901-00
2	Decal Arch Left	1	820-6138-01
	Decal Arch Right		820-6138-02
	Decal Arch Center		820-6138-03
3	Shooter Lane Ball Snubber Bracket	1	535-7280-01
4	1-1/16" Steel Balls	4	260-5000-00
5	Mini-Mars Light Cover (Flo. Grn.)	4	550-5031-11
6	Light Reflector	3	545-5409-01
7	Rubber Lite Cover GRN (1/File Cab.)	1	545-5014-04
8	Rubber Lite Cover RED (1/File Cab. 3/Pops)	4	545-5014-02
9	Ramp Mounting Bracket Type #1	4	515-6508-00
Item 9 secured by: #6 X 1/2" PTH A (Zinc) (Qty. 2/per) (237-5809-00)			
10	Slingshot Butyrate Protect Washer	4	242-5059-00
11	Chute Weldment Assy. (over SVUK)	1	515-6667-00
12	Playfield Back Panel Game Specific	1	525-5439-00
13 *	Plastic Button Plug (Black) 3/16"	0	545-5232-01

Special Note: *Order above Item 13 if a Post was added then removed at the Center Drain to "hide" hole.*



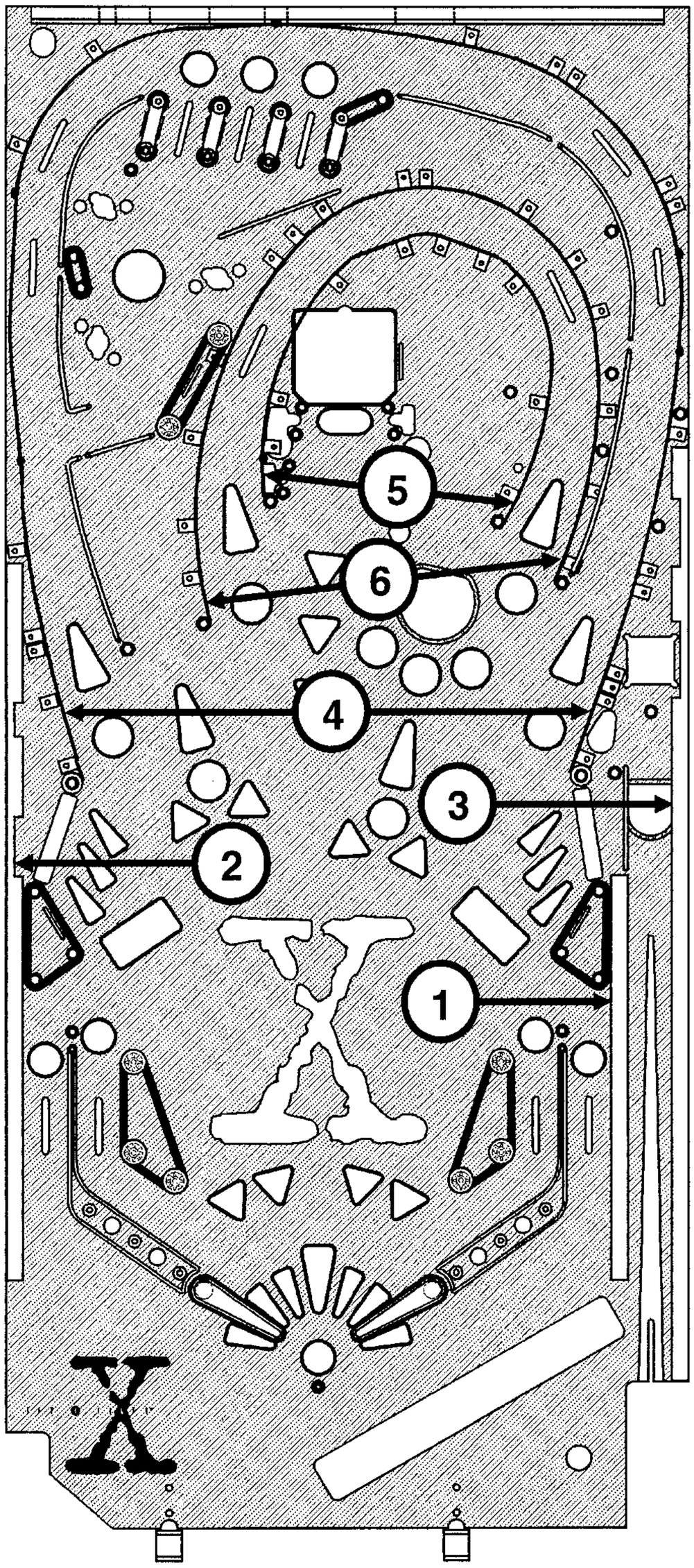
Take Note:

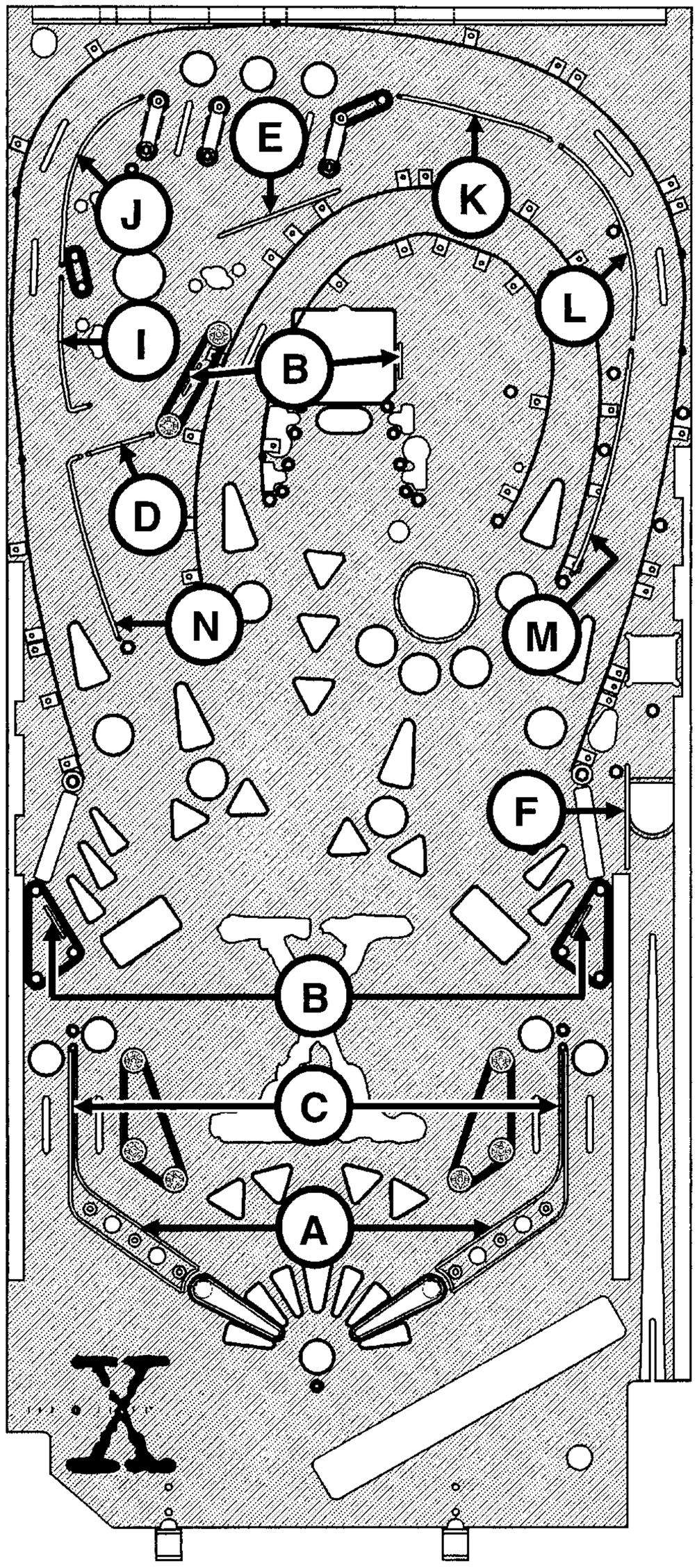
* An asterisk (*) indicates items are not noted in the pictorial.

1. See the different pages of this or the next chapter for parts 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 circle (①) are mounted above the playfield; items noted with a black circle (❶) are mounted below the playfield.

Nº	Below Playfield Name	QTY.	SPI Part Nº
A	Playfield Hanger Bracket	2	535-5216-03
Item A secured by: #8 X 1/2" HWH AB (Zinc) Blue (Qty. 1/per) (234-5101-05) **and** #8-32 X 5/8" HWH Swage (Ser) Zinc (Qty. 1/per) (237-5975-03)			
B	Playfield Support Slide Bracket	2	535-6862-02
Item B secured by: #8 X 1/2" HWH (Qty. 2/per) (234-5101-05) **and** #8-32 X 5/8" HWH (Qty. 1/per) (237-5975-03)			
C	Edge Slide Bracket	2	535-5988-00
Item C secured by: #4 X 1/2" PFH (Zinc) (Qty. 3/per) (237-5840-00)			
D	Pivot Pin Bracket Welded Assembly	2	500-5329-01
Item D secured by: #8-32 X 5/8" HWH (Qty. 2/per) (237-5975-03)			
E	Outlane Adjustable Post Plate	2	535-5091-02
Item E secured by: #6 X 1/2" HWH AB (Zinc) Red (Qty. 2/per) (234-5001-02)			
F	Playfield Shipping Bracket	1	535-7729-00
Item F **secured to the Playfield** by: #8-32 X 1" Carriage Bolt Sq. Neck (Qty. 2) (231-5031-00) **and** #8-32 Nylon Stop Nut (Qty. 2) (240-5102-00) Item F **secured to the Cabinet** by: #8 X 3/4" HWH AB (Zinc) (Qty. 3) (234-5103-00)			
Note: Please Read Section 1, Chapter 1, Game Set-Up, Item 8, regarding above Item F Bracket.			
n/a *	Playfield Screened (No Parts)	1	830-5146-00
	Playfield Complete with all Parts		505-6004-46-46

Playfield - Rails and Ball Guides





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

Nº	Rail Name	QTY.	SPI Part Nº
1	Wood Rail 12" (Shooter Lane)	1	525-5007-44
2	Wood Rail Routed (Left Side)	1	525-5449-00
3	Wood Rail Routed (Right Side)	1	525-5450-00
4	Flat Metal Rail #1 (Main Loop)	1	515-6632-00
5	Flat Metal Rail #2 (Inner Mini Loop)	1	515-6633-00
6	Flat Metal Rail #3 (Outer Mini Loop)	1	535-7894-01

Nº	Ball Guide Name	QTY.	SPI Part Nº
A	Plastic Return Lane Guide Long	2	550-5037-01
B	Metal Ball Guide Wire Form 1"	4	535-5300-05
C	Metal Ball Guide Wire Form (over A)	2	535-5642-00
D	Ball Guide Rail - 2"	1	535-5356-01
E	Ball Guide Rail - 3¾"	1	535-5356-03
F	Ball Guide Rail - 3"	1	535-5356-04
G	Ball Guide Rail - Lt. Inner Loop Ctr.	1	535-7892-01
H	Ball Guide Rail - Lt. Inner Loop Top	1	535-7892-02
I	Ball Guide Rail - Rt. Inner Loop Top	1	535-7893-01
J	Ball Guide Rail - Rt. Inner Loop Ctr.	1	535-7893-02
K	Ball Guide Rail - Rt. Inner Loop Bot.	1	535-7893-03
L	Ball Guide Rail - Lt. Inner Loop Bot.	1	535-7900-00

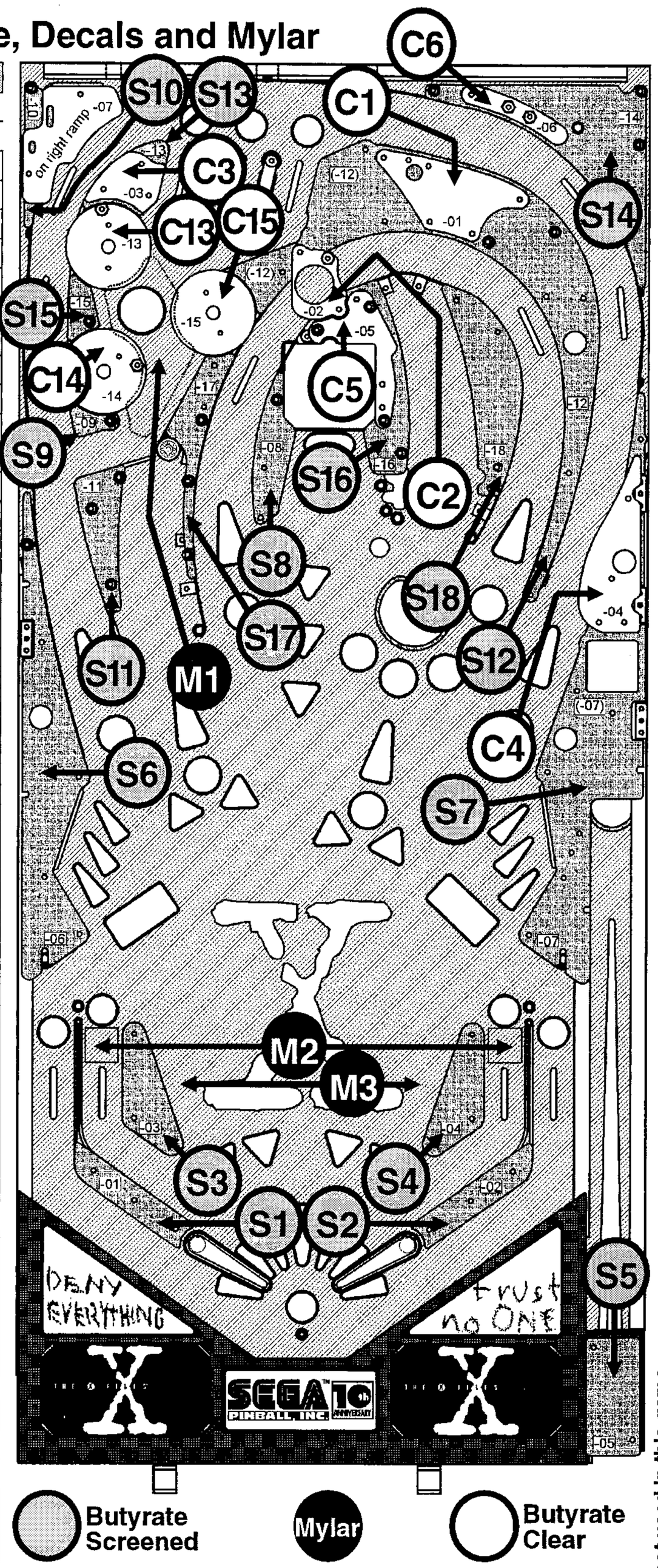
Playfield - Butyrate, Decals and Mylar

Nº	Butyrate Name	QTY.	SPI Part Nº
(S)	Complete Butyrate Sheet Screened (1-21)		830-5486-XX
(C)	Complete Butyrate Sheet Clear (A-O)		830-5908-XX
S1	Screened Butyrate - Left Return	1	830-5486-01
S2	Screened Butyrate - Right Return	1	830-5486-02
S3	Screened Butyrate - Left Slingshot	1	830-5486-03
S4	Screened Butyrate - Right Slingshot	1	830-5486-04
S5	Screened Butyrate - Bottom Arch	1	830-5486-05
S6	Screened Butyrate - Left Side	1	830-5486-06
S7	Screened Butyrate - Right Side	1	830-5486-07
S8	Screened Butyrate - File Cab. Left	1	830-5486-08
S9	Screened Butyrate - Lower Pop	1	830-5486-09
S10	Screened Butyrate - Top Left Corner	1	830-5486-10
S11	Screened Buty. - Lt. Side Lt. Ramp	1	830-5486-11
S12	Screened Butyrate - Top Rt. Center	1	830-5486-12
S13	Screened Butyrate - Top Left Pop	1	830-5486-13
S14	Screened Butyrate - Top Rt. Corner	1	830-5486-14
S15	Screened Butyrate - Top Pop Bot.	1	830-5486-15
S16	Screened Butyrate - File Cabinet Rt.	1	830-5486-16
S17	Screened Butyrate - Inner Loop Lt.	1	830-5486-17
S18	Screened Buty. - Rt. Side Rt. Ramp	1	830-5486-18
S19*	Screened Butyrate - Dana Scully	1	830-5486-19
S20*	Screened Butyrate - Fox Mulder	1	830-5486-20
S21*	Screened Butyrate - Key Chain	1	830-5486-21
C1	Clear Butyrate - over Item 12 Buty.	1	830-5908-01
C2	Clear Butyrate - over Item 12 Buty.	1	830-5908-02
C3	Clear Butyrate - over Item 13 Buty.	1	830-5908-03
C4	Clear Butyrate - over Item 07 Buty.	1	830-5908-04
C5	Clear Butyrate - over Item 16 Buty.	1	830-5908-05
C6	Clear Butyrate - over Item 14 Buty.	1	830-5908-06
C7	Clear Butyrate - on Right Ramp	1	830-5908-07
C8 ‡	Clear Butyrate - X-Logo Light Board	1	830-5908-08
C9*	Clear Butyrate - NOT USED	0	---- - ---- - ----
C10 ‡	Clear Butyrate - Metal Trough	1	830-5908-10
C11 ‡	Clear Butyrate - Plastic Trough	1	830-5908-11
C12 ‡	Clear Butyrate - on File Cabinet	1	830-5908-12
C13	Clear Butyrate - Pop Cap (Top)	1	830-5908-13
C14	Clear Butyrate - Pop Cap (Bottom)	1	830-5908-14
C15	Clear Butyrate - Pop Cap (Middle)	1	830-5908-15

Nº	Mylar Name	QTY.	SPI Part Nº
M1	Mylar Pieces - Pop Bumper Area	1	820-5861-00
M2	Mylar Square Pad - Ball Drop	2	820-5815-00
M3	Mylar Sling Shot Protector	2	820-5821-00
n/a*	Mylar Cover Discs (on Cabinet)	6	820-5041-00

Nº	The X-Files Decal Name	QTY.	SPI Part Nº
	The X-Files Decal Sheet (Complete)		820-6138-XX
	The X-Files Decal Sheet (for Ramps)		820-6205-XX
Note: See Chapter 2 of this Section for the assemblies which decals are on for the correct last 2-digit number.			
n/a*	Game Specific Backbox Fuse Loc.	1	820-6152-46

Nº	Generic Decal Name	QTY.	SPI Part Nº
n/a*	"Suitable for Indoor Use Only (UL)"	1	820-6001-01
n/a*	"High Voltage Label (UL)"	2	820-6082-01
n/a*	"Power Box Decal - USA"	1	820-6123-01
n/a*	"Danger Coin Door Label (UL)"	1	820-6140-00
n/a*	"UL Listing Label"	1	820-6141-00
n/a*	"Fuse Lable (UL)"	1	820-6143-00
n/a*	"Start" (Word & Arrow) Decal	1	820-6177-00



Take Note:

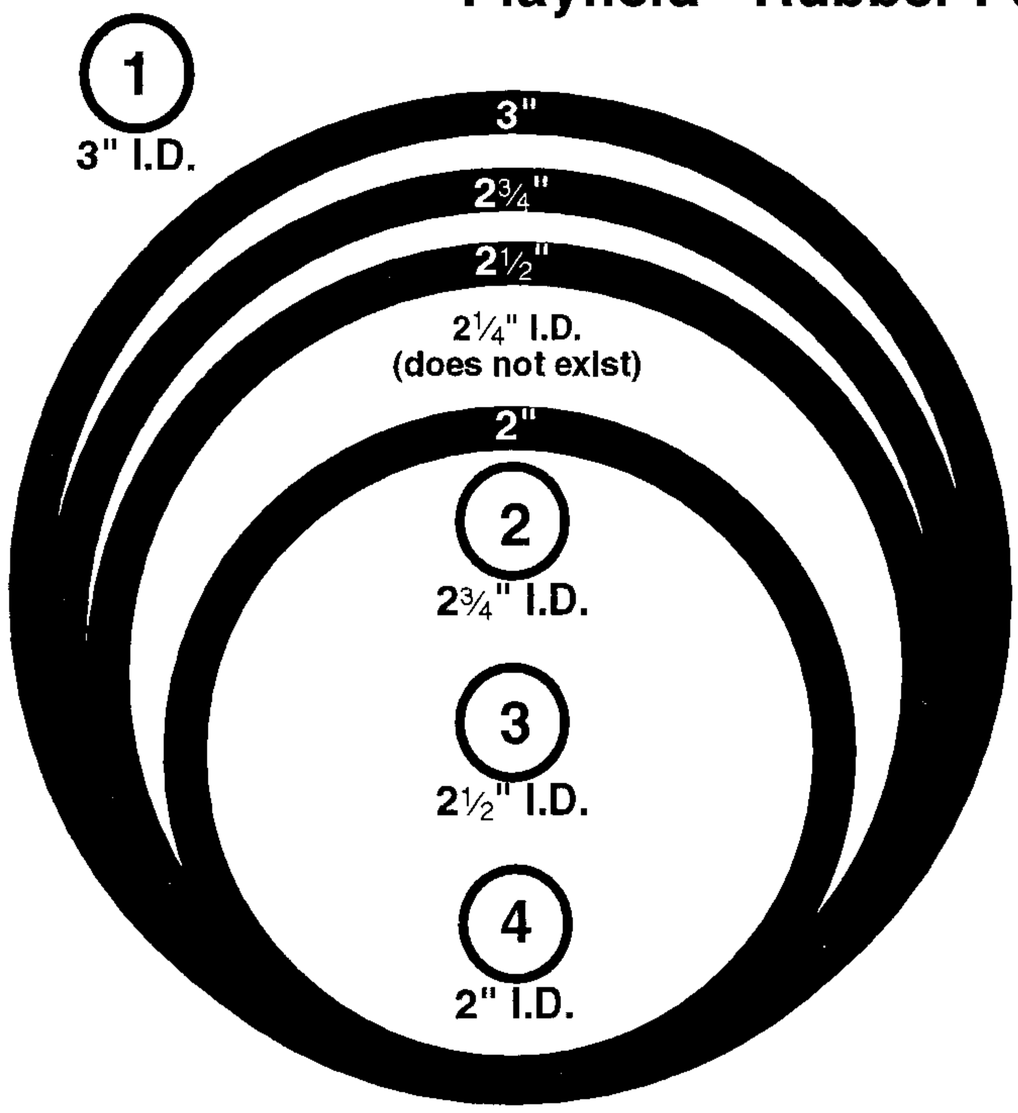
* An asterisk (*) indicates items are not noted in the pictorial.

‡ The following are under the Playfield: Item H, see Pg. 68; Item J, see Pg. 83 (top); Item K, see Pg. 82. Item L is on the File Cabinet Assy., see Pg. 77.

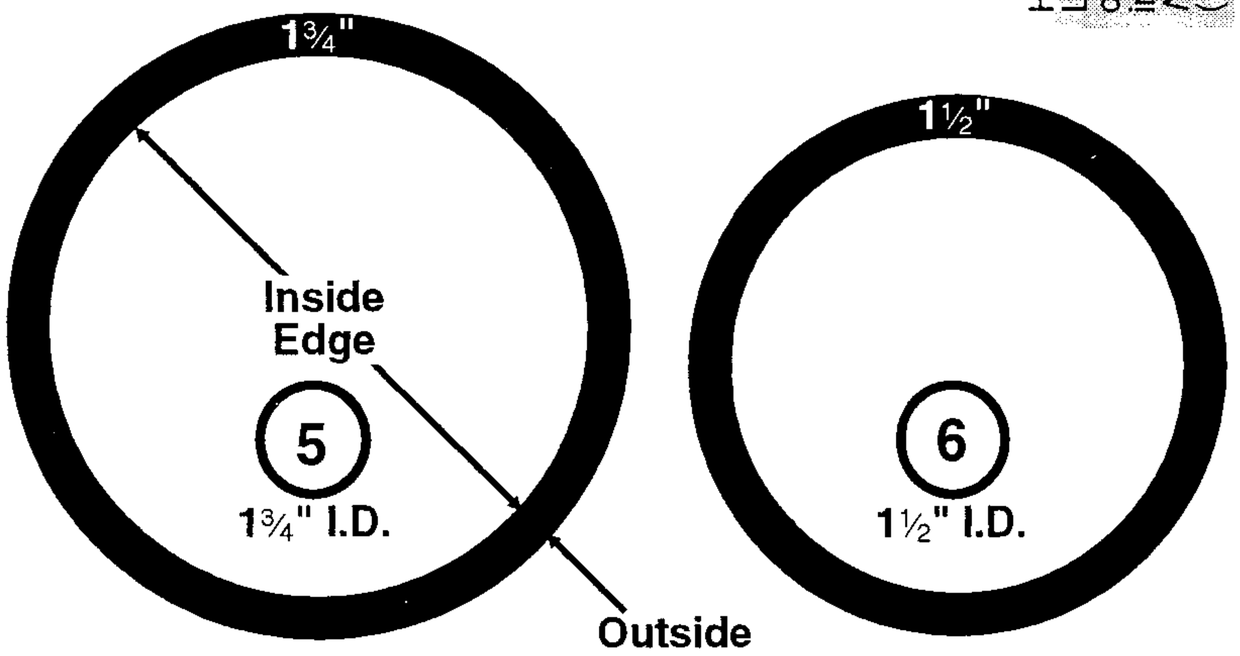
1. To order the entire decal, screened butyrate or clear butyrate sheets, use the Part Nº with the "-XX" ending. For individual pieces replace the "-XX" with appropriate last 2-digit number. *Attention: Individual pieces may not be available.*
2. **Legend Note:** Items noted with a gray circle (◍) are Screened; ...a white circle (①) are Clear; ...a black circle (❶) are Mylar.

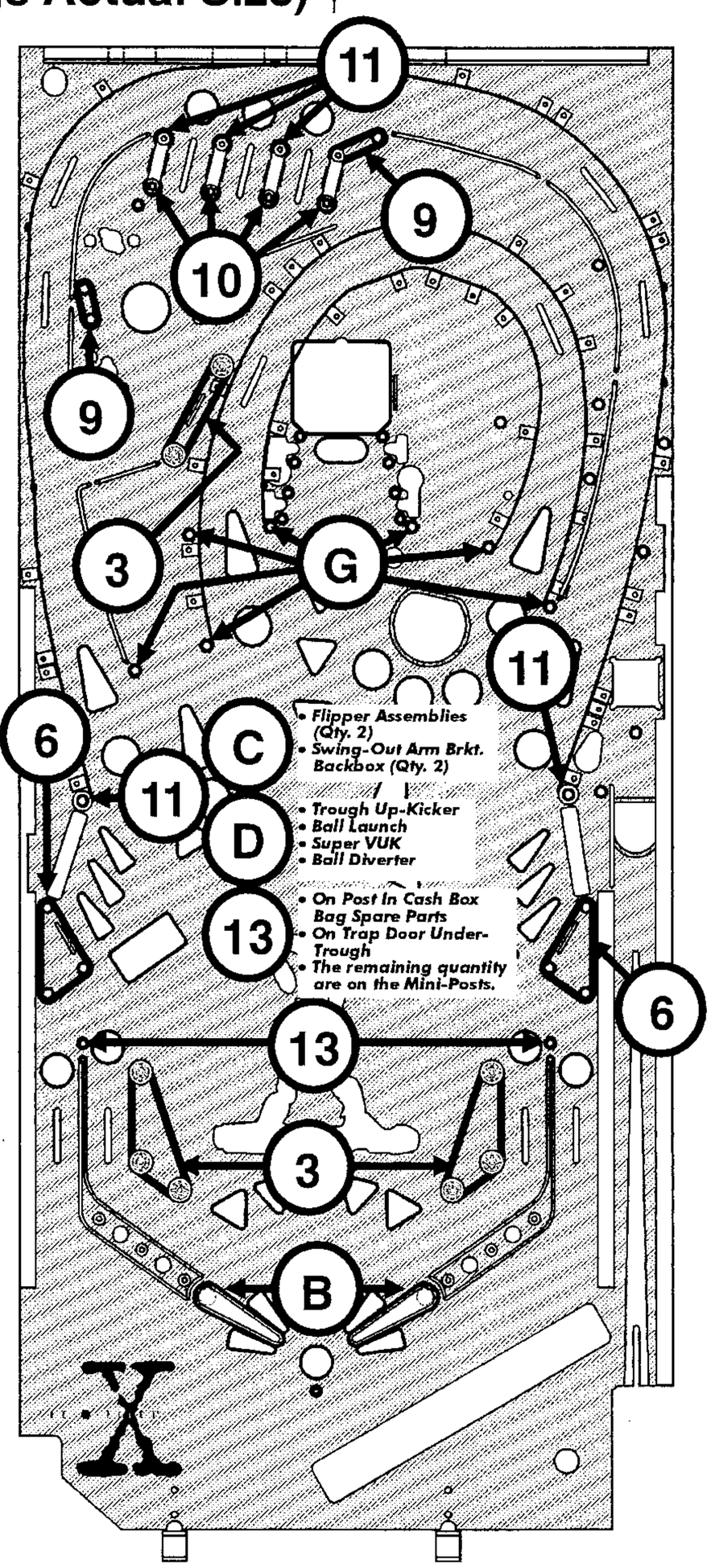
† **Items with Ø Qty. are not used in this game. Size and/or quantities may change durlng production.**

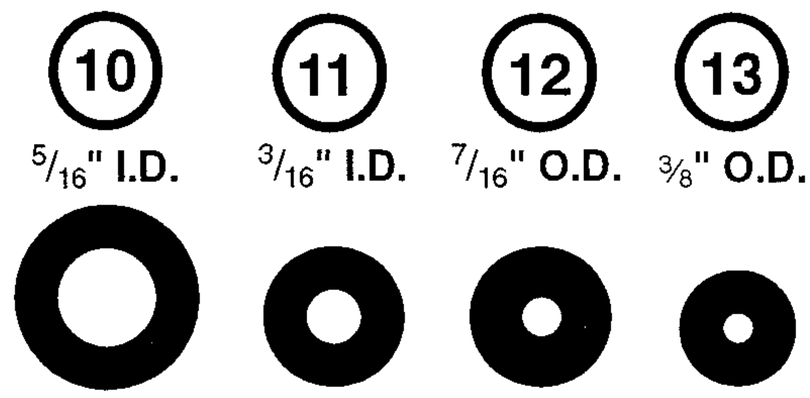
Playfield - Rubber Parts (Rings Actual Size) †



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



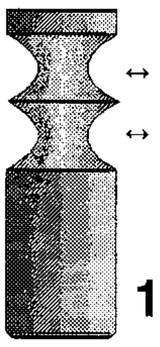




† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Nº	Rubber Part Name	QTY.	Part Nº	Nº	Rubber Part Name	QTY.	Part Nº
A	Small Flipper Rubber Ring	0	545-5207-00	4	2" I.D. Black Rubber Ring	0	545-5348-08
B	Large Flipper Rubber Ring	2	545-5277-00	5	1¾" I.D. Black Rubber Ring	0	545-5348-21
C*	Rubber Deflector Pad (Bumper)	4	545-5428-00	6	1½" I.D. Black Rubber Ring	2	545-5348-07
D*	Rubber Bumper (Grommet)	4	545-5105-00	7	1¼" I.D. Black Rubber Ring	0	545-5348-06
E	Bumper Post Rubber	0	545-5009-00	8	1" I.D. Black Rubber Ring	0	545-5348-05
F	Post Rubber (Sleeve Short)	0	545-5151-00	9	¾" I.D. Black Rubber Ring	2	545-5348-04
G	Post Rubber (Sleeve Tall)	7	545-5308-00	10	5/16" I.D. Black Rubber Ring	4	545-5348-02
1	3" I.D. BLK Rubber Ring	0	545-5348-10	11	3/16" I.D. Black Rubber Ring	5	545-5348-01
2	2¾" I.D. Black Rubber Ring	0	545-5348-20	12	7/16" O.D. Black Rubber Ring	0	545-5348-17
3	2½" I.D. Black Rubber Ring	3	545-5348-09	13	⅜" O.D. Black Rubber Ring	28	545-5348-19

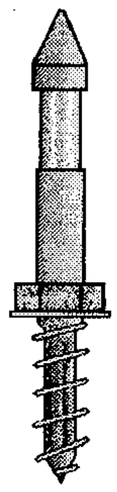
Playfield - Metal Posts and Nuts (Actual Size) †



1

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

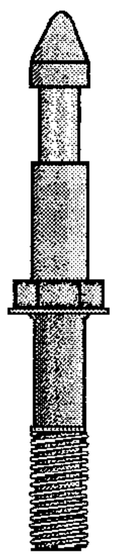
Item 1 Post used in pairs can use 3/4" through 3" Rubber Rings (See Rubber Parts for Part Nºs)



2

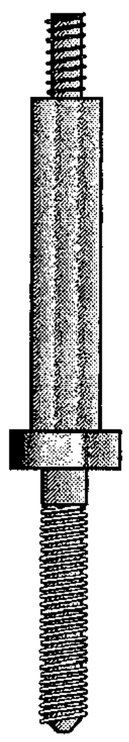


3



4

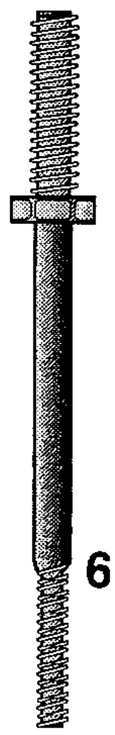
Bottom
#10-32
Thread



5

Top
#6-32
Thread

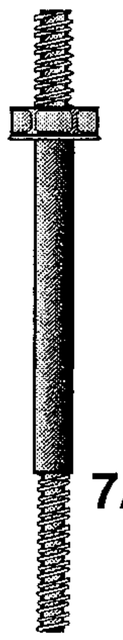
Bottom
#8-32
Thread



6

Top
#8-32
Thread

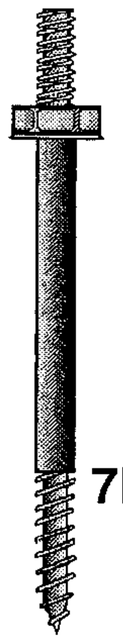
Bottom
#6-32
Thread



7A

Top
#6-32
Thread

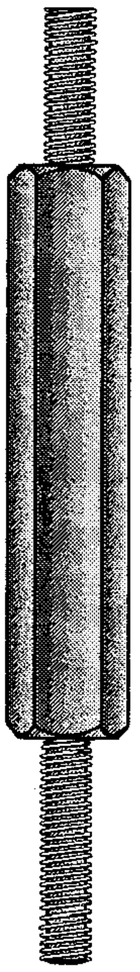
Bottom
#6-32
Thread



7B

Top
#6-32
Thread

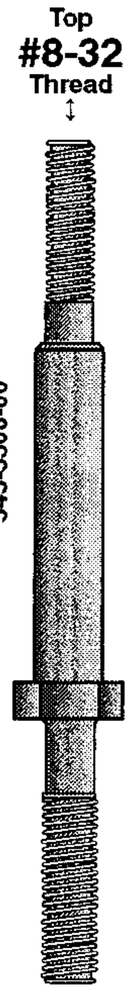
Top
#8-32
Thread



11

Top
#8-32
Thread

Bottom
#8-32
Thread



8A

#6-32
Tap

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

Bottom
#10-32
Thread



8B

No
Tap

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

Bottom
#10-32
Thread



8C

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

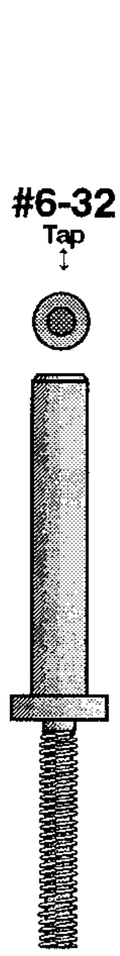
Bottom
#10-32
Thread



8D

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

Bottom
#10-32
Thread



9

#6-32
Tap

Bottom
#6-32
Thread

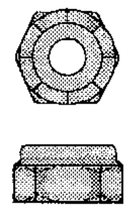


10

Top
#6-32
Thread

Bottom
#6-32
Thread

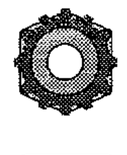
Shown Below:
• #6-32 Nylon Stop Nut: 240-5005-00



Top & Side Views

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

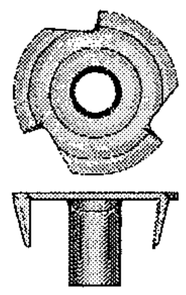
Shown Below:
• #6-32 KEPS Nut (with Star Washer): 240-5008-00



Bottom & Side Views

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

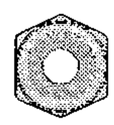
Shown Below:
• #6-32 T-Nut: 240-5002-00



Bottom & Side Views

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

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



Top View

Not Shown:
• #8-32 Hex Nut: 240-5003-00
• #10-32 Hex Nut: 240-5201-00

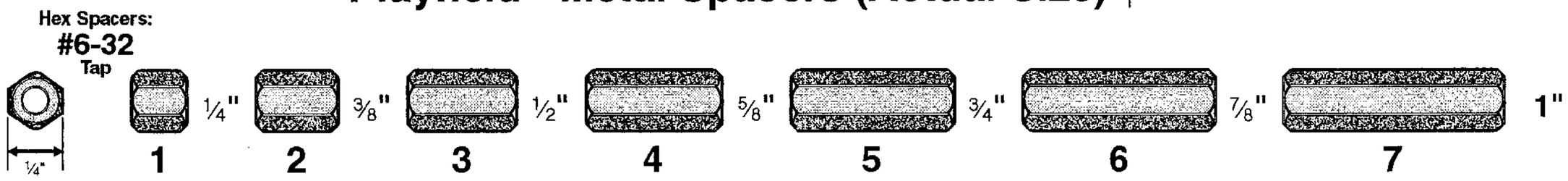
† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

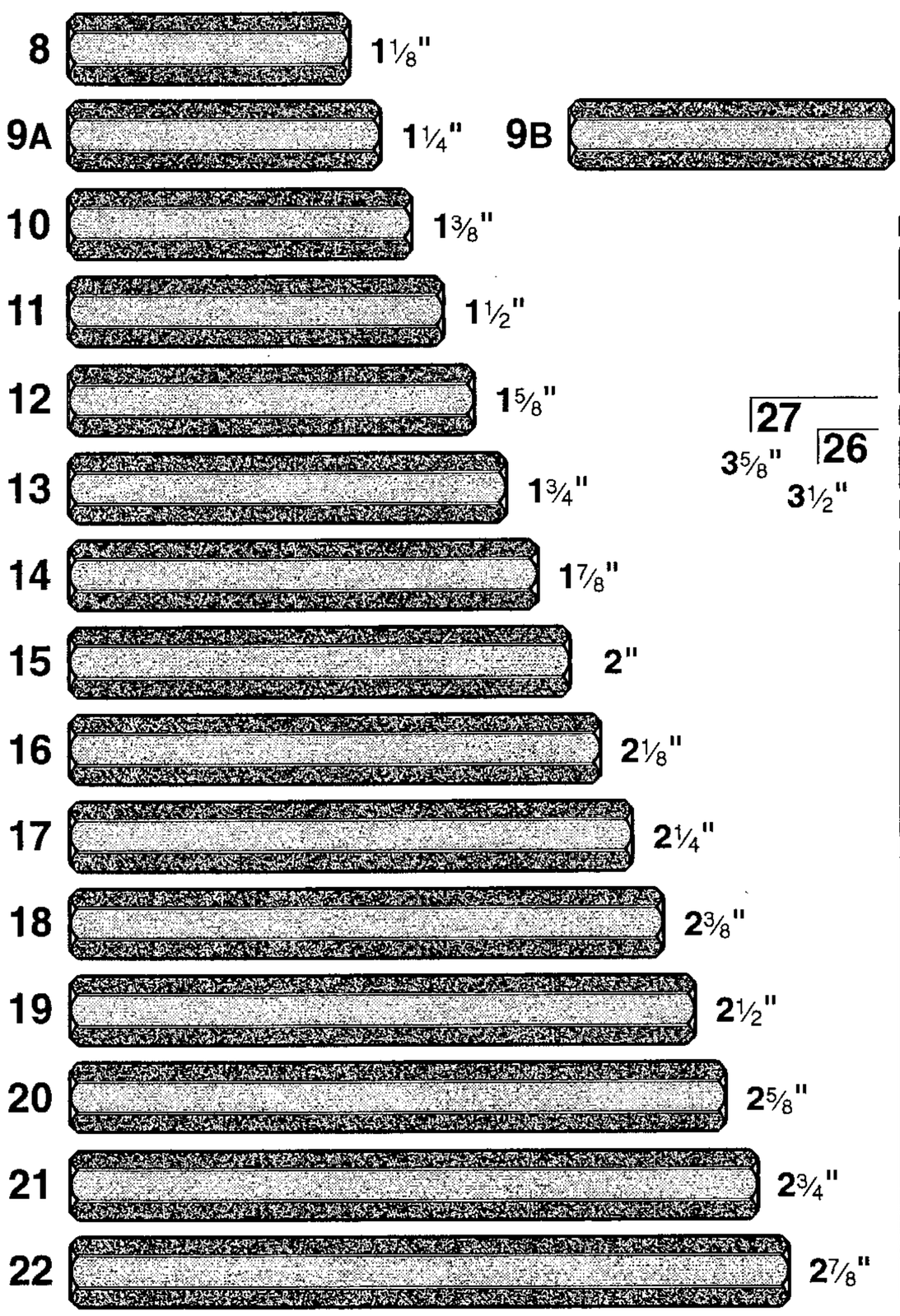
Nº	Metal Post Name	QTY.	SPI Part Nº	Nº	Metal Post Name	QTY.	SPI Part Nº
1	Stand-Off Double Groove Post $1^{1}/_{16}$"	0	530-5102-00	7B	Post #6-32 Top / Wood Screw Bottom	27	530-5010-02
2	Mini-Post Wood Screw	6	530-5004-00	8A	Post Hex Base #6-32 Tap/#10-32 Bot.	7	530-5332-01
3	Mini-Post Wood Screw (no cut-away)	0	530-5004-01	8B	Post Hex Base (No Tap)/#10-32 Bot.	0	530-5332-00
4	Mini-Post #10-32 Bottom	10	530-5005-00	8C	Post Hex Base #8-32 Top/#10-32 Bot.	0	530-5332-02
5	Post #6-32 Top / #8-32 Bottom	0	530-5007-00	8D	Post Hex Base #6-32 Top/#10-32 Bot.	0	530-5332-03
6	Post #8-32 Top / #6-32 Bottom	0	530-5008-00	9	Post #6-32 Tap / #6-32 Bottom	0	530-5127-00
7A	Post #6-32 Top / #6-32 Bottom	24	530-5012-02	10	Post #6-32 Top / Wood Screw Bottom	0	530-5263-01
				11	Playfield Support #8-32 Top/Bottom	0	530-5285-00

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

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

Playfield - Metal Spacers (Actual Size) †





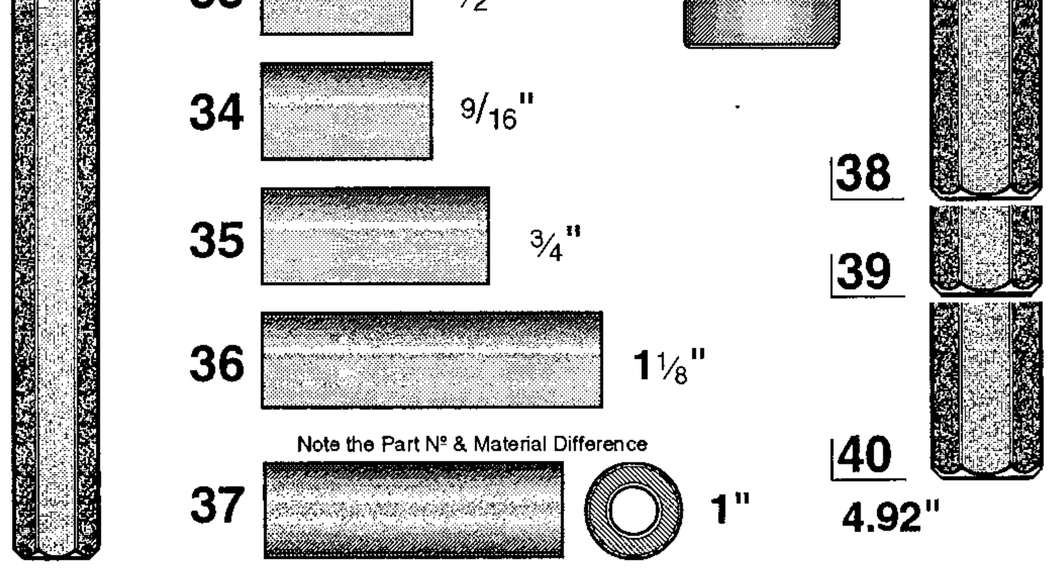
Take Note:

Items 1-30 are 1/4" wide. Items 38-41 are 5/16" wide. With Items 1-6, the tap goes through the length of the spacer. With Items 7-30 & Items 38-41, the tap is up to ⅝" deep on each end.

* Item **41** is *Not Shown*, it's identical to Items 38-40, but is 6" in length.

‡ Hex Spacer sizes not used in current games *may* no longer be available; choose ⅛" +/-.

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	¼" X ¼" Hex Spacer #6-32 Tap	0	254-5008-00	21	2¾" X ¼" Hex Spacer #6-32 Tap	0	254-5008-15
2	⅜" X ¼" Hex Spacer #6-32 Tap	35	254-5008-12	22	2⅞" X ¼" Hex Spacer #6-32 Tap	0	254-5008-31
3	½" X ¼" Hex Spacer #6-32 Tap	10	254-5008-03	23	3" X ¼" Hex Spacer #6-32 Tap	1	254-5008-14
4	⅝" X ¼" Hex Spacer #6-32 Tap	10	254-5008-02	24	3⅛" X ¼" Hex Spacer #6-32 Tap	1	254-5008-19
5	¾" X ¼" Hex Spacer #6-32 Tap	5	254-5008-04	25	3¼" X ¼" Hex Spacer #6-32 Tap	0	254-5008-26
6	⅞" X ¼" Hex Spacer #6-32 Tap	3	254-5008-05	26	3½" X ¼" Hex Spacer #6-32 Tap	0	254-5008-27
7	1" X ¼" Hex Spacer #6-32 Tap	3	254-5008-06	27	3⅝" X ¼" Hex Spacer #6-32 Tap	0	254-5008-25
8	1⅛" X ¼" Hex Spacer #6-32 Tap	1	254-5008-17	28	4" X ¼" Hex Spacer #6-32 Tap	0	254-5008-21
9A	1¼" X ¼" Hex Spacer #6-32 Tap	1	254-5008-11	29	4¼" X ¼" Hex Spacer #6-32 Tap	0	254-5008-30
9B	15/16" X ¼" Hex Spacer #6-32 Tap	0	254-5008-34	30	4⅜" X ¼" Hex Spacer #6-32 Tap	0	254-5008-29
10 ‡	1⅜" X ¼" Hex Spacer #6-32 Tap	0	254-5008-33	31	⅜" X ½" Spacer (Used with Backbox)	6	530-5099-00
11	1½" X ¼" Hex Spacer #6-32 Tap	5	254-5008-09	32	¼" X 5/16" X .144" I.D. Spacer Tap.	1	254-5014-03
12 ‡	1⅝" X ¼" Hex Spacer #6-32 Tap	0	254-5008-13	33	½" X 5/16" X .144" I.D. Spacer Tap.	3	254-5014-00
13	1¾" X ¼" Hex Spacer #6-32 Tap	2	254-5008-10	34	9/16" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-04
14 ‡	1⅞" X ¼" Hex Spacer #6-32 Tap	0	254-5008-20	35	¾" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-01
15	2" X ¼" Hex Spacer #6-32 Tap	1	254-5008-07	36	1⅛" X 5/16" X .144" I.D. Spacer Tap.	0	254-5014-02
16	2⅛" X ¼" Hex Spacer #6-32 Tap	0	254-5008-32	37	1" X 5/16" X .144" I.D. Spacer Tap.	0	254-5001-00
17	2¼" X ¼" Hex Spacer #6-32 Tap	1	254-5008-18	38	4" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-03
18	2⅜" X ¼" Hex Spacer #6-32 Tap	0	254-5008-28	39	45/16" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-00
19	2½" X ¼" Hex Spacer #6-32 Tap	0	254-5008-16	40	4.92" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-04
20	2⅝" X ¼" Hex Spacer #6-32 Tap	0	254-5008-08	41 *	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) †

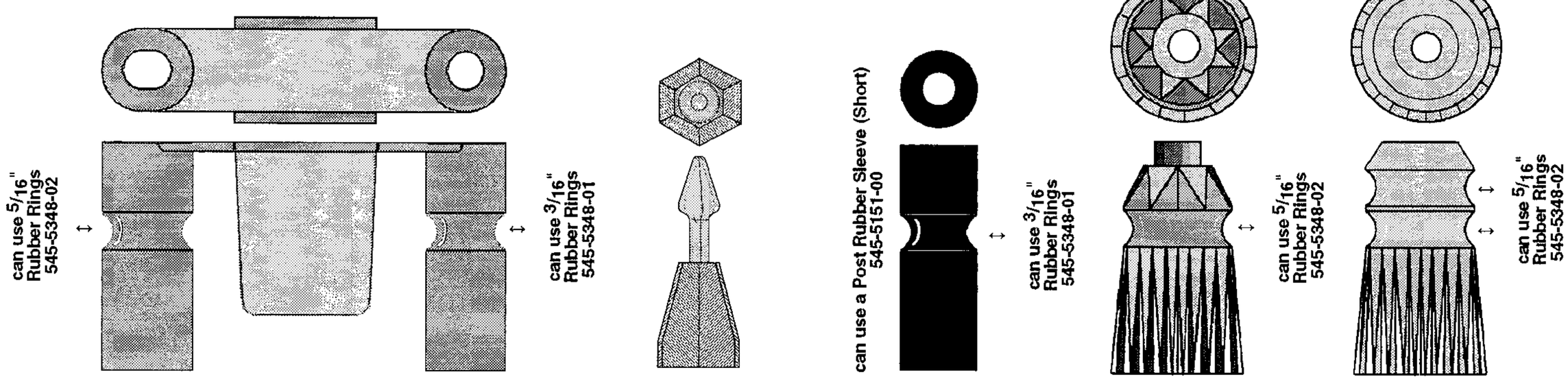
1** *Various Colors*

2** *Various Colors*

3** *Limited Colors*

4** *Various Colors*

5** *Various Colors*



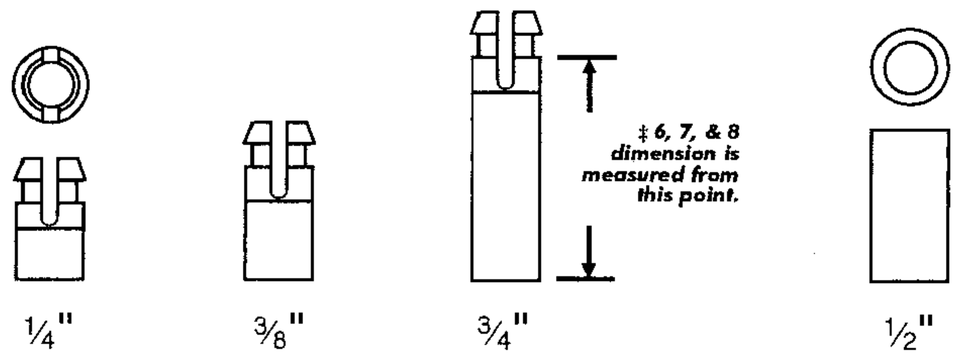
Items 3-5 Posts used in pairs can use 3/4" through 3" Rubber Rings
(See Rubber Parts for Part Nºs)

Take Note:

PLASTIC PART COLOR CHART					
Nº	Color	Nº	Color	Nº	Color
-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		
-06	Yellow	-12	Fluor. Blue		

** Items 1-2 and 4-5 come in various colors. These posts may not be available in every color; i.e. Item 3 is currently only available in Orange (-07), Teal Green (-13), Gold (-16) & Black (-00, Standard Color). The "-XX" in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº. corresponding to the color desired. *Not all colors may be available.*

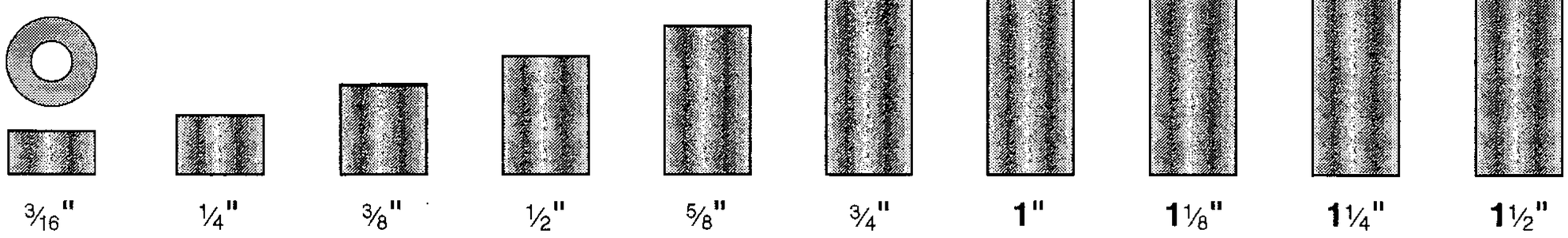
6 ‡ 7 ‡ 8 ‡ 9



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

10 11 12 13 14 15 16 17 18 19

—Items 10-19 Spacers are used in conjunction with Metal Posts (see Items 6, 7A & 7B on that page) and/or a #6-32 1 3/4" PPH Screw (237-5511-00) with a #6-32 Nylon Stop Nut (240-5005-00). These items are only available in the sizes specified / shown.



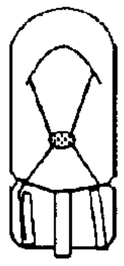
Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº	Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº
1**	Top Lane Mini-Light Hood (RED)	4	550-5061-02	10	3/16" X 3/8" Spacer Gray (4 for Dot Display)	4	254-5000-18
2**	Mini-Jewel Post (CLEAR)	19	550-5052-01	11	1/4" X 3/8" Spacer Gray	1	254-5000-02
3**	1 1/16" Single Groove Post (BLK)	48	550-5059-00	12	3/8" X 3/8" Spacer Gray	1	254-5000-12
4**	*Single* Groove Jewel Post (CLEAR)	8	550-5034-01	13	1/2" X 3/8" Spacer Gray	0	254-5000-01
5**	*Double* Groove Jewel Post	0	545-5209-XX	14	5/8" X 3/8" Spacer Gray	0	254-5000-14
6 ‡	1/4" Slf. Rtn. Spacer White	0	254-5007-02	15	3/4" X 3/8" Spacer Gray	2	254-5000-07
7 ‡	3/8" Slf. Rtn. Spacer White	0	254-5007-01	16	1" X 3/8" Spacer Gray	3	254-5000-04
8 ‡	3/4" Slf. Rtn. Spacer White	0	254-5007-03	17	1 1/8" X 3/8" Spacer Gray	1	254-5000-06
9	1/2" X 1/4" Spacer White (Narrow)	0	254-5000-03	18	1 1/4" X 3/8" Spacer Gray	0	254-5000-05
				19	1 1/2" X 3/8" Spacer Gray	0	254-5000-08

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

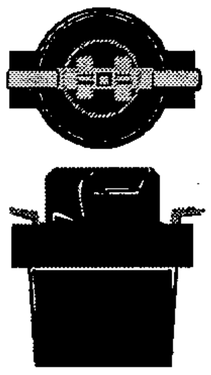
Playfield - Wedge Base Bulbs and Sockets (Actual Size) †

#555 Bulb

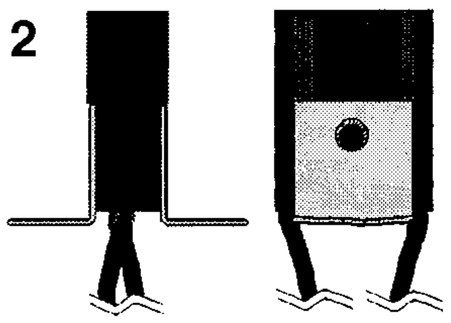
A



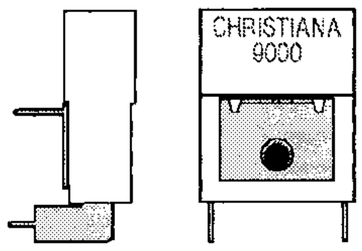
1



2

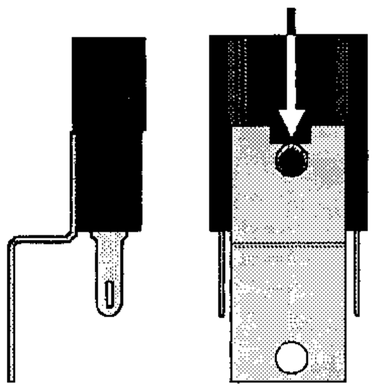


3

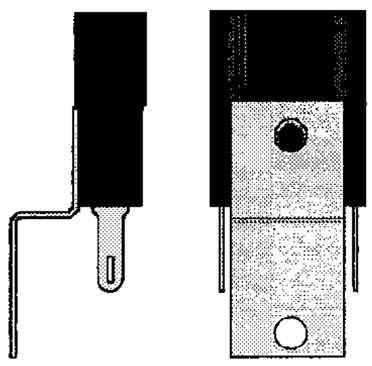


Note the notch.

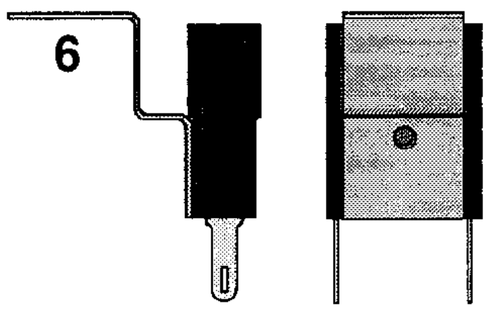
4



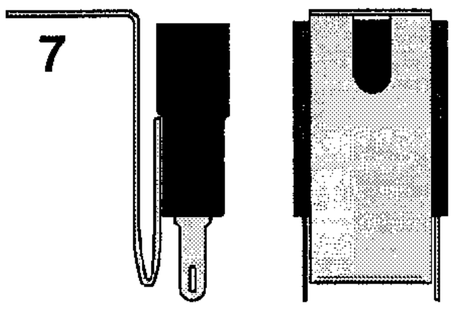
5



6

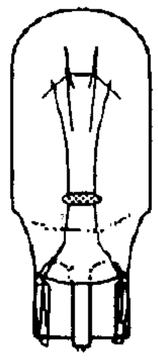


7

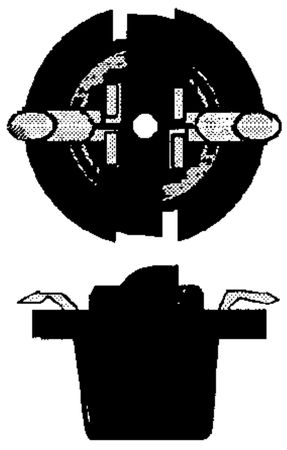


#906 Bulb

B



8



Take Note:

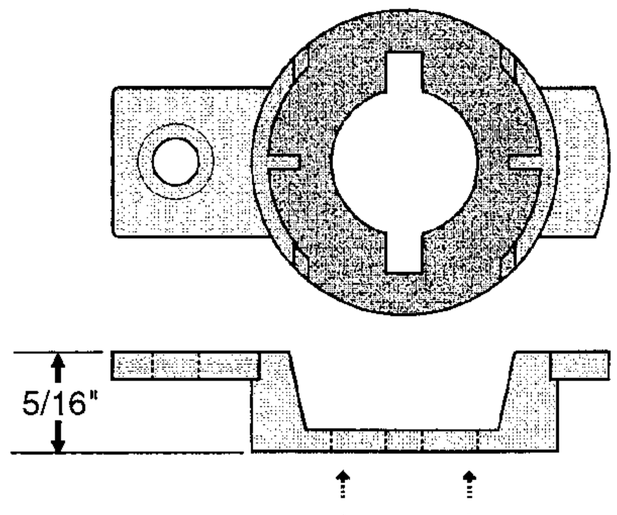
* An asterisk (*) indicates items are not shown on this page.

1. Item 1 Socket was used on PC Light Boards to position bulbs vertically.
2. Item 2 Socket has 2 Wires attached are approximately 12" ea.
3. Item 3 Socket was used on PC Light Boards to position bulbs horizontally.
4. Item 4 Socket is normally used with Reflectors.
5. If Item 7 Socket is desired, order Item 6 for replacement.
   >>>Item 7 Socket is no longer available.<<<
6. Item B Bulb (#906) is normally used in conjunction with Item 8 Socket, but ***can*** be used with Items 1-7 Sockets on this page.
   Note: Always replace with same type bulb in original application.
7. Item 8 Socket is sometimes used in conjunction with Mini-Mars or special Butyrate assemblies.
8. See the start of this chapter for Fluor. Bulb & Associated Parts. See the end of this chapter for Misc. Bulbs, Boards & Parts.

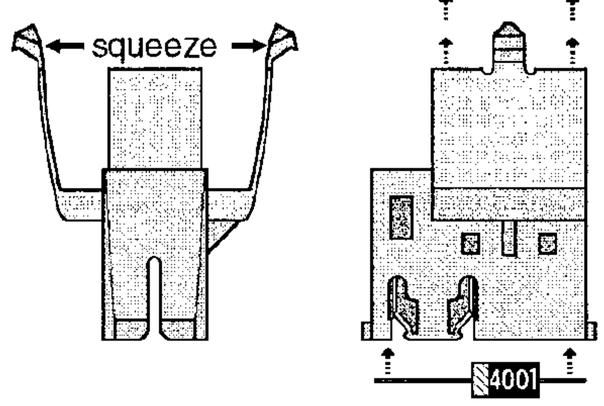
† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

The below Snap-On Socket Bracket currently is available in two height sizes (Item 9a is 5/16" High and Item 9b is 19/32" High.)

9a



9



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

Take Special Note:

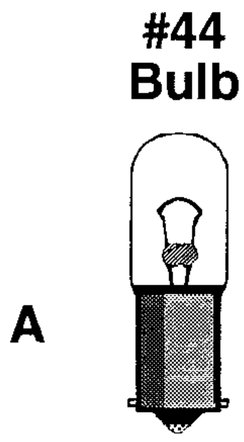
Item 9 Socket is the new Insulation Displacement Connection (IDC) Style. This new design is used in the same application as PC Light Boards, allowing for easier bulb replacement. This style is solderless, and has a built-in diode. This socket is secured to the playfield or component by Items 9a & 9b Snap-On Socket Brackets, or may also be snapped into Item 9c Socket Mounting Board (specially designed Clear Butyrate piece) where sockets are positioned too close together. Just squeeze the "side arms" of the socket together and pull away from the bracket or mounting board for easy #555 Bulb replacement.

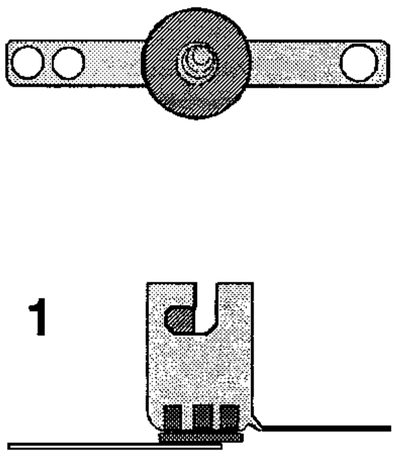
Nº	#555 Bulb & Socket Name	QTY.	SPI Part Nº
A	#555 Wedge Base Bulb	66	165-5002-00
1	#555 Wedge Base (WB) Socket	0	077-5007-00
2	Turbo Pop Bumper Socket	3	077-5206-00
3	PC Light Board Laydown WB Socket	0	077-5207-00
4	Laydown WB Socket (with notch)	7	077-5026-01
5	Laydown WB Socket (without notch)	0	077-5026-00
6	WB Offset Socket (Step-Bracket)	1	077-5029-00
7	WB Offset Socket (use Item 6)	0	077-5029-01

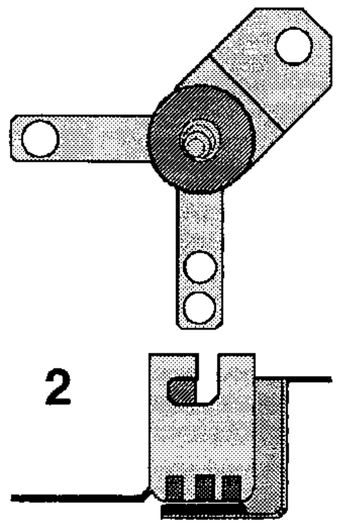
Nº	#906 Bulb & Socket Name	QTY.	SPI Part Nº
B	#906 Wedge Base Bulb	1	165-5004-00
8	#906 Wedge Base Socket	0	077-5016-00

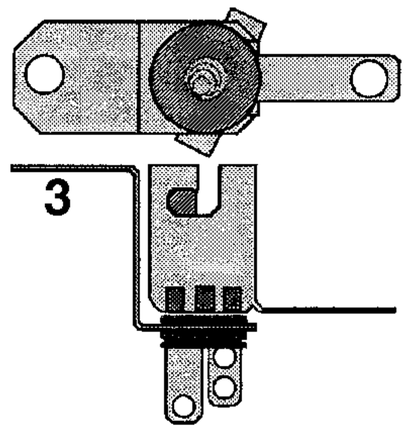
Nº	#555 IDC Socket Name	QTY.	SPI Part Nº
9	#555 *New* IDC Snap-On Socket	56	077-5216-00
9a	5/16" Ht. Snap-On Socket Bracket	47	545-5760-18
9b *	19/32" Ht. Snap-On Socket Bracket	0	545-5760-19
9c *	X-Logo Light Holder (Board) Assy.	1	500-6230-00

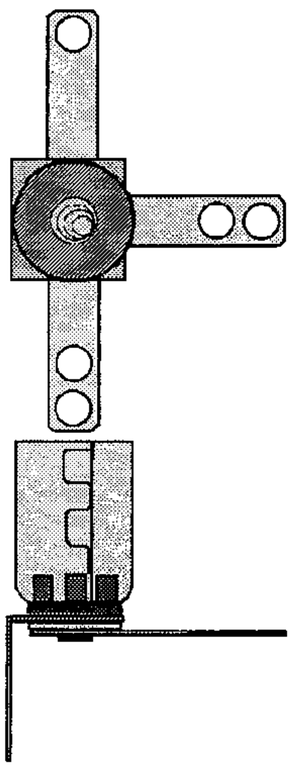
Playfield - Small Bayonet Type Bulbs and Sockets (Actual Size) †

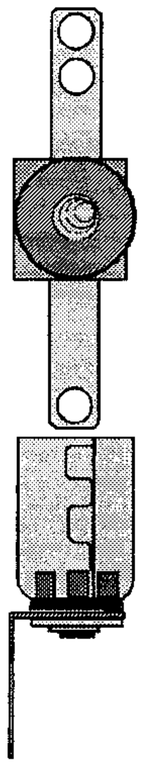


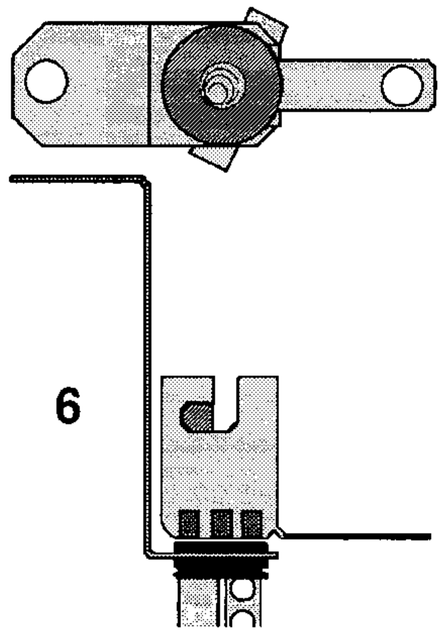


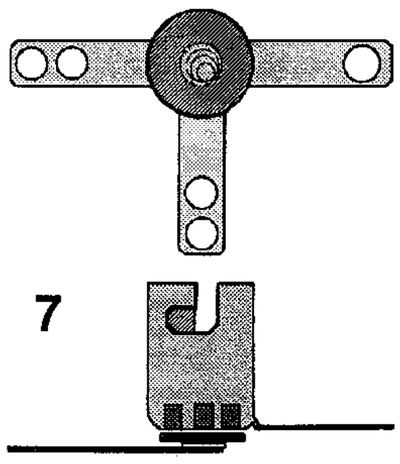


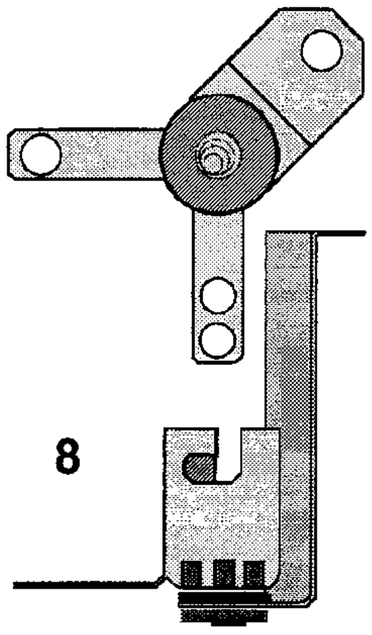


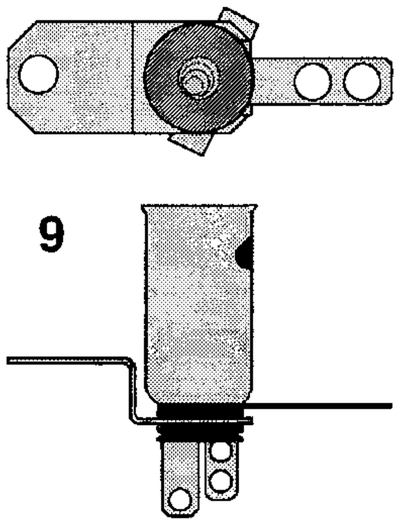










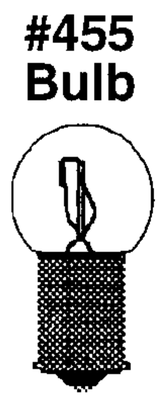


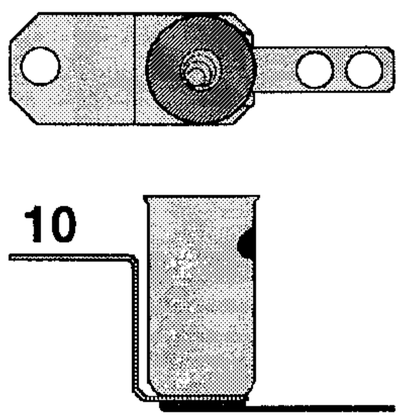
Nº	#44 Bulb & Socket Name	QTY.	SPI Part Nº
A	#44 Bulb	52	165-5000-44
1	2-Lug Staple Down Socket	41	077-5000-00
2	2-Lug Stand-Up Short Socket	8	077-5002-00
3	3-Lug Stand-Up Short Socket	0	077-5008-00
4	3-Lug Laydown Socket	3	077-5006-00
5	2-Lug Laydown Socket	0	077-5003-00
6	3-Lug Stand-Up Long Socket	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

Nº	#455 Bulb & Socket Name	QTY.	SPI Part Nº
B	#455 Twinkle Bulb	0	165-5003-00
10	1-Lug Stand-Up Long Shell Socket	0	077-5012-00

Take Note:

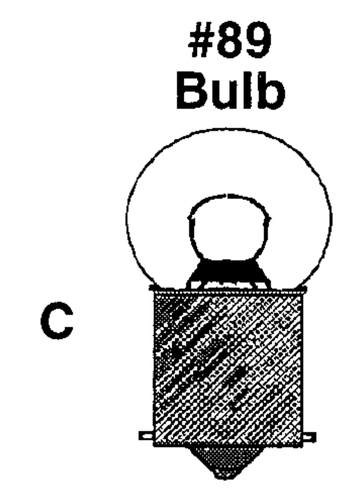
Item B Bulb (#455) is normally used in conjunction with Item 10 Socket, but ***can*** be used with Items 1-9 Sockets on this page.
Note: Always replace with same type bulb in original application.

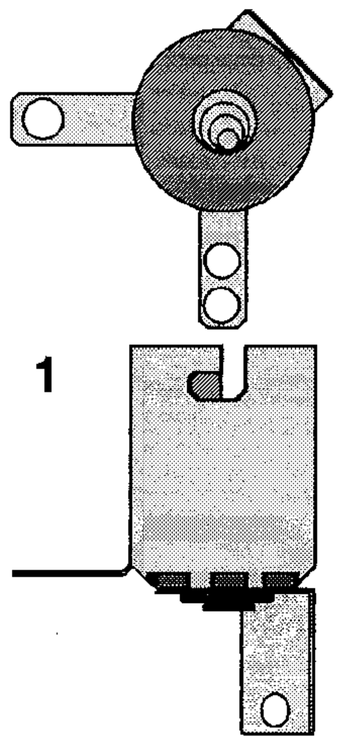


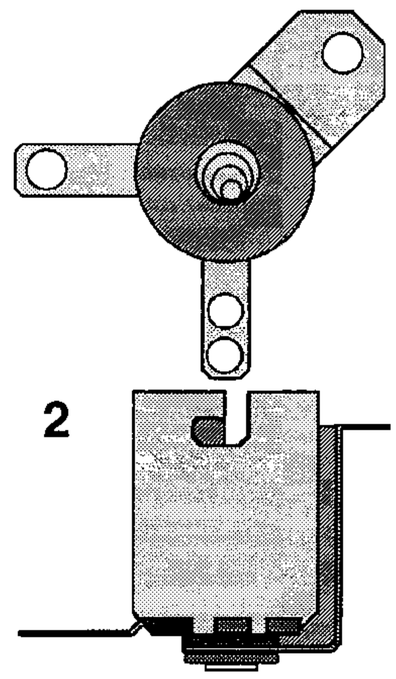


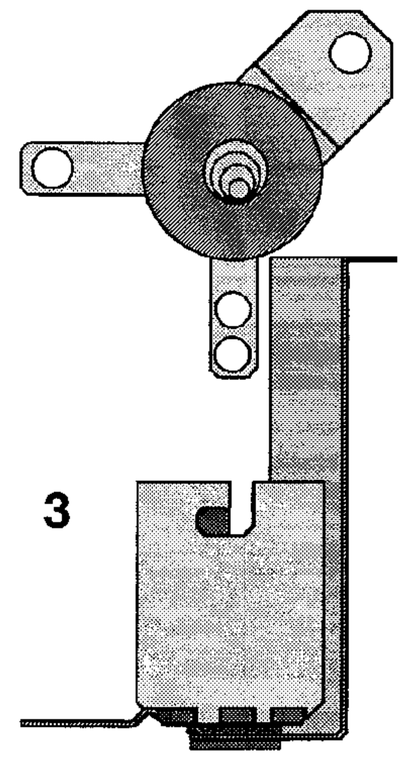
† Items with Ø Qty. are not used in this game.
Size and/or quantities may change during production.

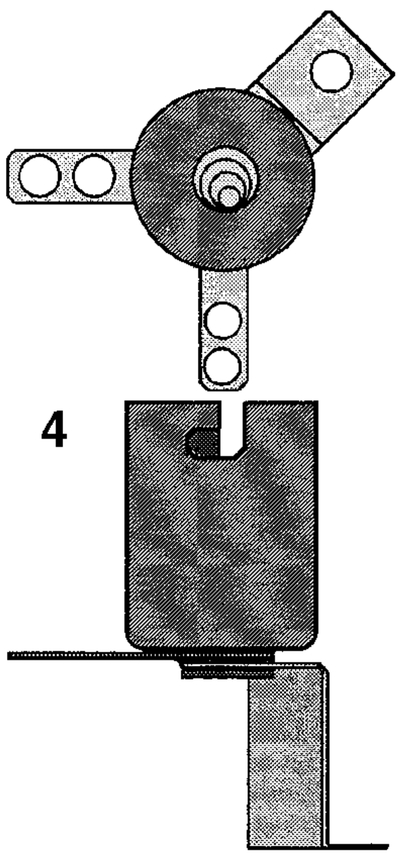
Playfield - Large Bayonet Type Bulb and Sockets (Actual Size) †

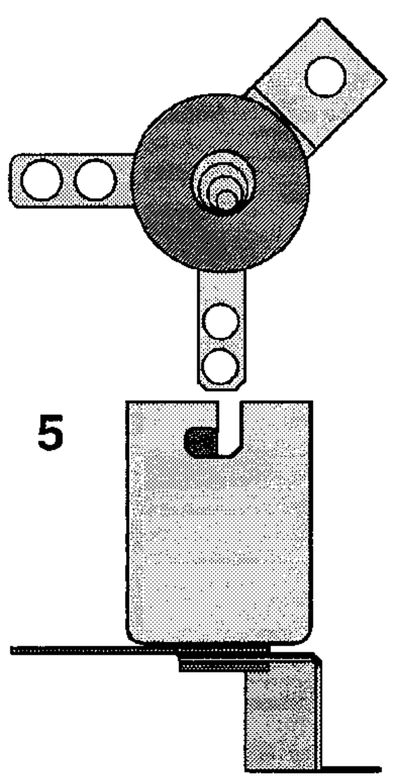


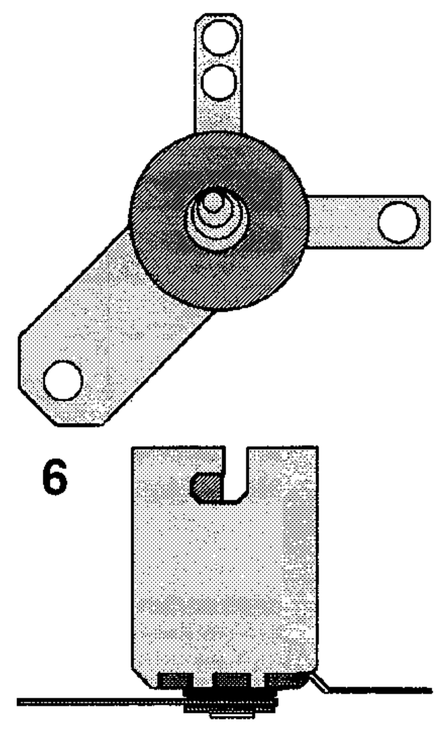












† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

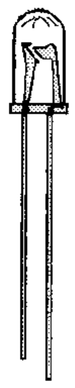
Nº	#89 Bulb & Socket Name	QTY.	SPI Part Nº
C	#89 Bulb	13	165-5000-89
1	Laydown Standard Socket	0	077-5100-00
2	2-Lug Stand-Up Short Socket	12	077-5101-00
3	2-Lug Stand-Up Long Socket	1	077-5102-00
4	Stand-Up Socket Rev. Short	0	077-5103-00
5	2-Lug Stand-Up Small Socket	0	077-5106-00
6	Straight Leg Socket	0	077-5107-00

Backbox, Cabinet & Playfield - Misc. Bulbs (Actual Size), Boards and Parts †



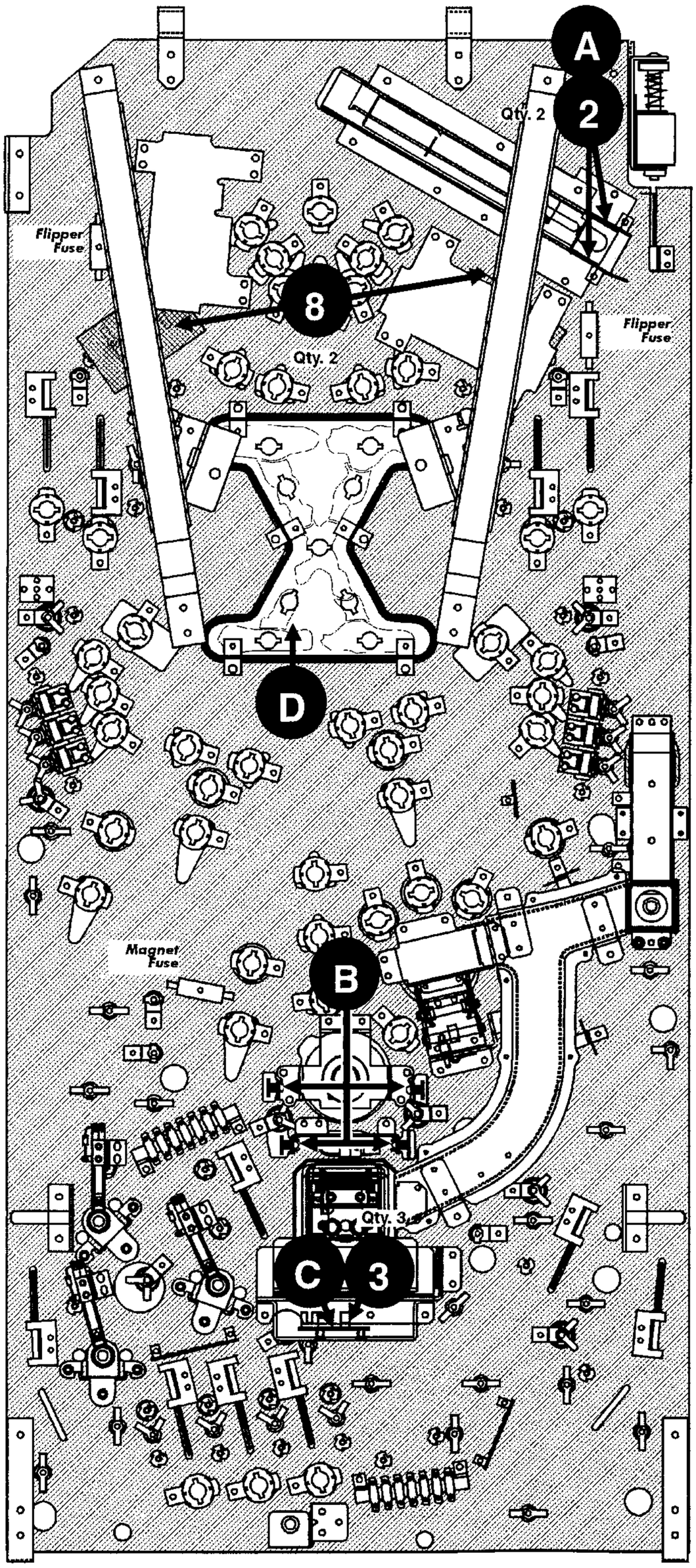
1 NEON BULB

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



2 OPTO LED

This OPTO LED (Ultra Bright Red) is normally used on the Ball Trough OPTO Boards.



Take Note:

* An asterisk (*) indicates items are not shown on this page.

1. See start of this chapter, Backbox (Back Side) Assembly, for Fluorescent Tube location and associated parts (e.g. starter, ballast & cable).
2. See Section 4, Chapter 2, Drawings for Major Assemblies & Ramps, for Assemblies referenced in the tables below.
3. *Note: 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).*

Nº	Miscellaneous Bulb Name	QTY.	SPI Part Nº
1	Neon NE-2 Bulb (may be used w/some motors)	0	165-5021-00
2	LED (MT5000UR) Ultra Bright OPTO	4	165-5100-00
Note:	The above Item 2 is used on Item A/B OPTO Bds. (1 per).		
3	LED OPB804 Slotted OPTO	3	165-5036-00
Note:	The above Item 3 is used on Item C OPTO Bd. (3 per).		
4 *	LED T1-3/4 Red Diffuser	8	165-5099-00
Note:	The above Item 4 are used on the CPU/Sound Board and I/O Power Driver Board (located in the Backbox).		
5	LED (SSB-LX02SRC) (Sm. Rect. RED)	0	165-5102-00
6	LED (SSL-LX100133GD) (Lg. Round GRN)	0	165-5101-00
7 *	Fluorescent Tube - F20T12CW	1	165-5031-02

Nº	Miscellaneous Board Name	QTY.	SPI Part Nº
A	OPTO Transmitter (TRANS) Board	1	520-5124-00
	OPTO Receiver (REC) Board	1	520-5125-00
Note:	The above Item A is found on the 4-Ball Trough Assembly, 500-6119-14, Major Assy., (see Sec. 4, Chp. 2).		
B	OPTO Transmitter (TRANS) Board	2	520-5082-00
	OPTO Receiver (REC) Board	2	520-5083-00
Note:	The above Item B is found on the OPTO Assy., 515-6583-00-46, & The Magnet & OPTO Assy., 500-6193-00-46, both Major Assemblies, (see Sec. 4, Chp. 2).		
C	Slotted OPTO TRANS/REC Board	1	520-5155-00
Note:	The above Item C is found on the File Cabinet & Motor Assy., 500-6159-00-46, Major Assy., (see Sec. 4, Chp. 2).		
D	X-Logo Light Holder Assembly	1	500-6230-00
ORDERING ABOVE (ITEM D) ASSY. PART Nº WILL INCLUDE:			
1	Clear Butyrate -08	1	830-5908-08
2	Lamp Mounting Bracket	6	535-8079-00
3	Rivet, 1/8" ø X 3/16" Long	6	249-5001-00

Note: Item D holds 9 ea. #555 IDC Snap-On Sockets.

Nº	Miscellaneous Part Name	QTY.	SPI Part Nº
8	Flipper Base Insulator (Fiche Paper)	2	545-5721-00
n/a *	3½" Plastic Post (holds cables)	9	545-5253-01
n/a *	4" Cable Tie PLT1MXMR	120	040-5001-01
n/a *	5½" Cable Tie PLT1.5I	10	040-5001-02
n/a *	5½" Cable Tie PLT1.5M-XMR	208	040-5001-06
n/a *	10" Cable Tie	1	040-5001-05
n/a *	Insulating Tubing ⅛" ø (CLR) (12" Long)	3	605-5006-00
n/a *	Insulating Tubing ⅜" ø (CLR) (12" Long)	0	605-5005-00
n/a *	Insulating Tubing #18 (Teflon) (12" Long)	1	605-5003-00
n/a *	Heat Shrink Tubing ⅛" ø (BLK) (12" Lg.)	2	605-5002-00
n/a *	Heat Shrink Tubing ¼" ø (CLR) (12" Lg.)	3	605-5004-00
n/a *	Heat Shrink Tubing ¼" ø (BLK) (12" Lg.)	9	605-5004-01
n/a *	Heat Shrink Tubing ¼" ø (WHT) (12" Lg.)	1	605-5010-00
n/a *	Split Flex Tubing 1¼" ø (12" Long)	2	605-5008-00
n/a *	Split Flex Tubing ¼" ø (12" Long)	3	605-5008-01
n/a *	Split Flex Tubing ½" ø (12" Long)	1	605-5008-02
n/a *	Braided Expandable Tubing ¼" ø (12")	1	605-5012-02

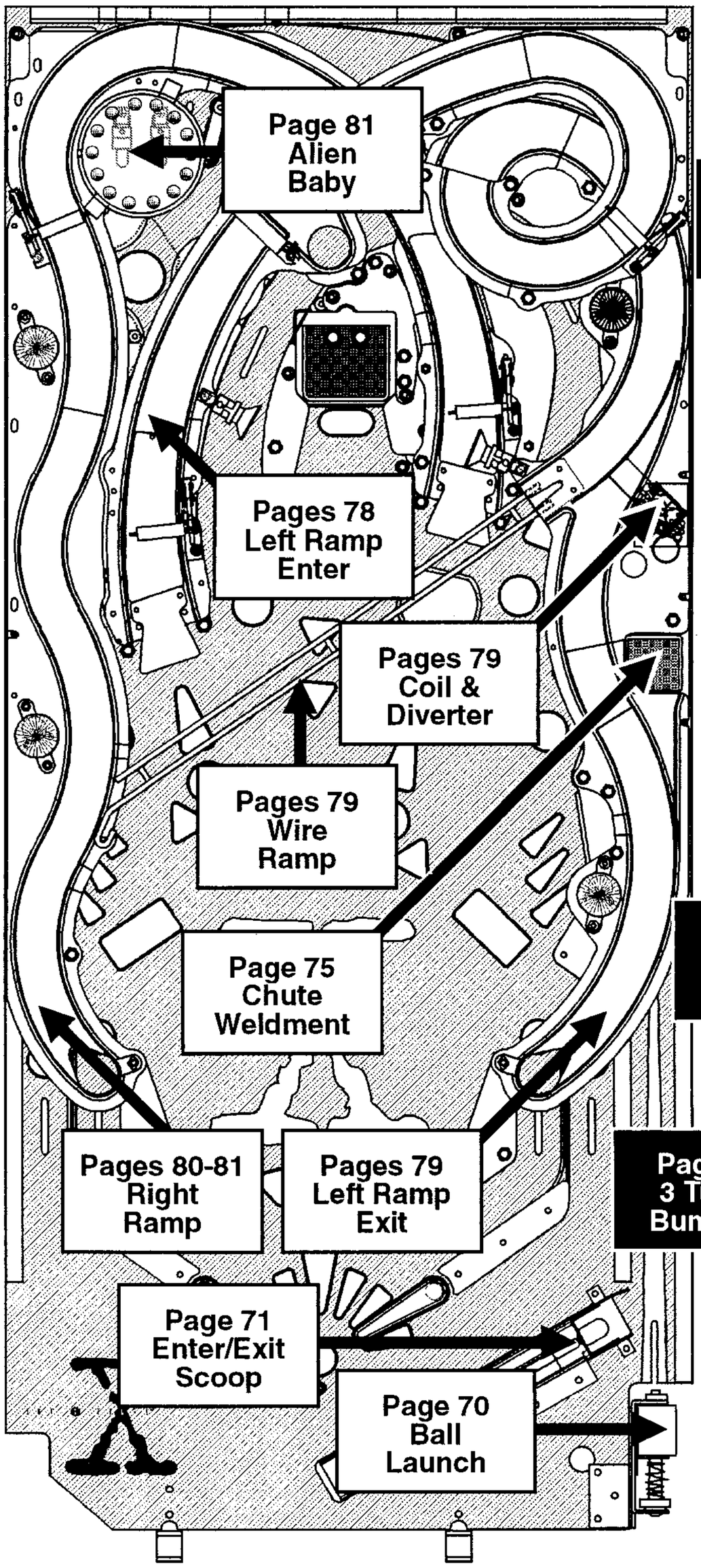
† Items with Ø Qty. are not used in this game. Size and/or quantities may change during production.

Drawings for Major Assemblies & Ramps (The Blue Pages)

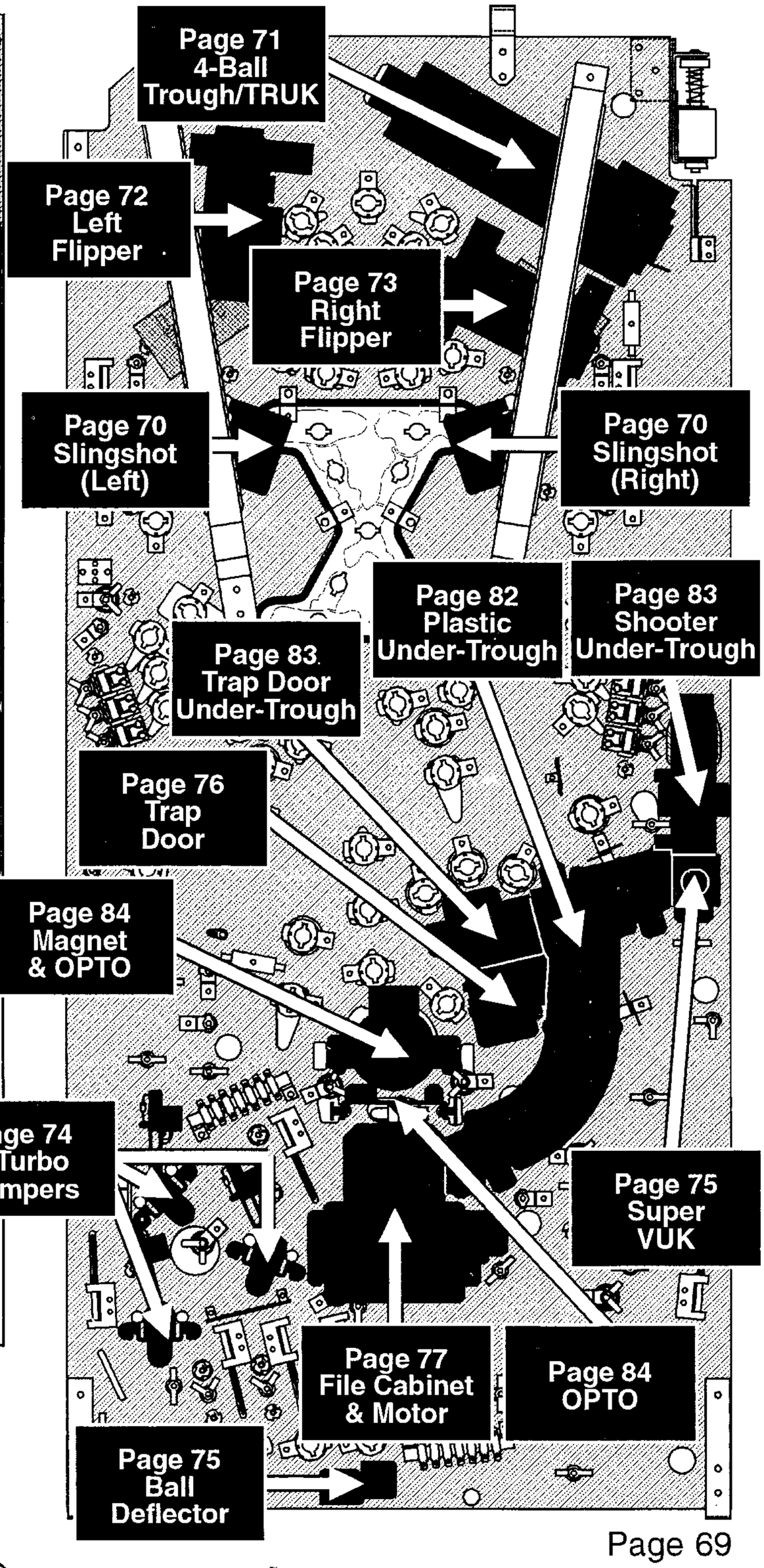
Overview

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 (❶) are mounted below. All numbered parts describe the name, quantity and Part Nº. Where multiple parts are riveted &/or assembled as sub-assemblies, the sub-assembly needs to be ordered. Minor changes may be made during production. Always verify the part to be replaced with the Part Nº and/or description as noted. Replacement parts may be substituted with revised parts which may have a different Part Nº. View any special notes on each page of this chapter. For General Part Nºs or items not described in this chapter, see the Pink Pages: Chapter 1, of this section. Call our Technical Support Office at 800-542-5377 in USA/Canada or at 708-345-7700 with any questions.

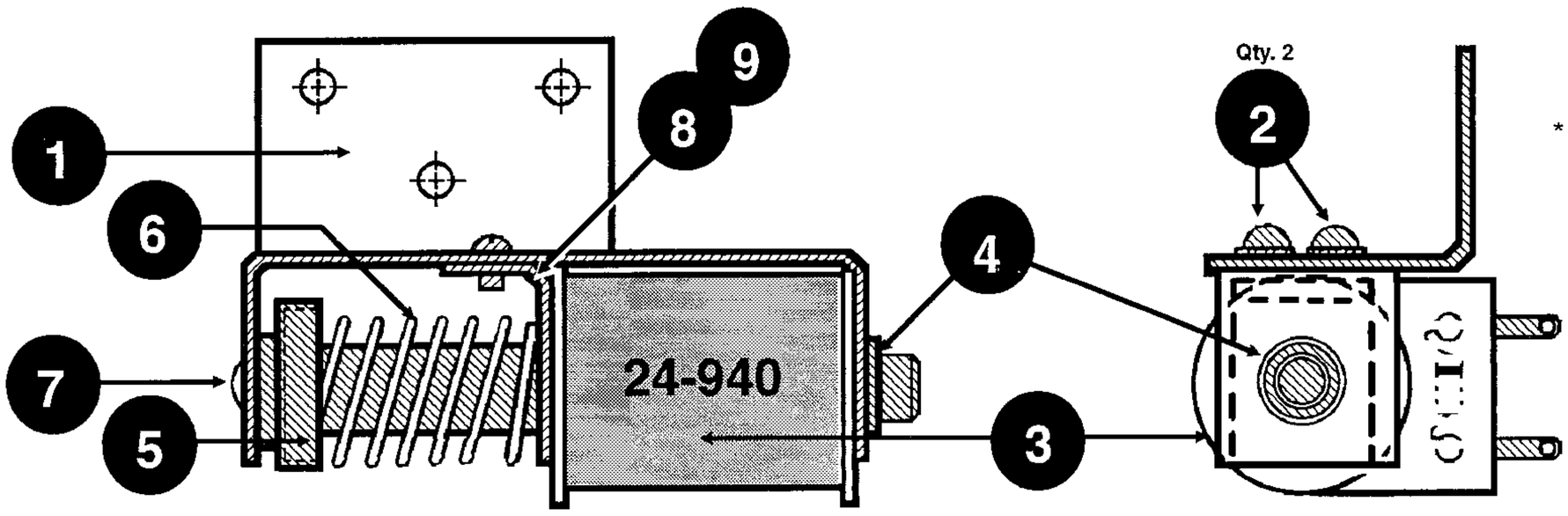
Assemblies Mounted Above



Assemblies Mounted Below



Ball Launch Assembly, 500-5477-01 (Items 1-10) and Assoc. Part: Shooter Lane Micro-Switch Assy., 500-5498-01 (Item 11*)



Take Note:

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

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Coil Mounting Bracket	1	535-6385-00
2	#8-32 X 1/4" PPH MS (SEMS)	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	545-5076-00
5	Plunger Assembly	1	515-5000-02
6	Compression (Relay) Spring	1	266-5020-00
7	Rubber Bumper (Grommet)	1	545-5015-00
8	Coil Retaining Bracket	1	535-5203-03
9	Spring Washer	1	269-5002-00
10 *	Cable Wiring Harness	1	036-5390-16

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

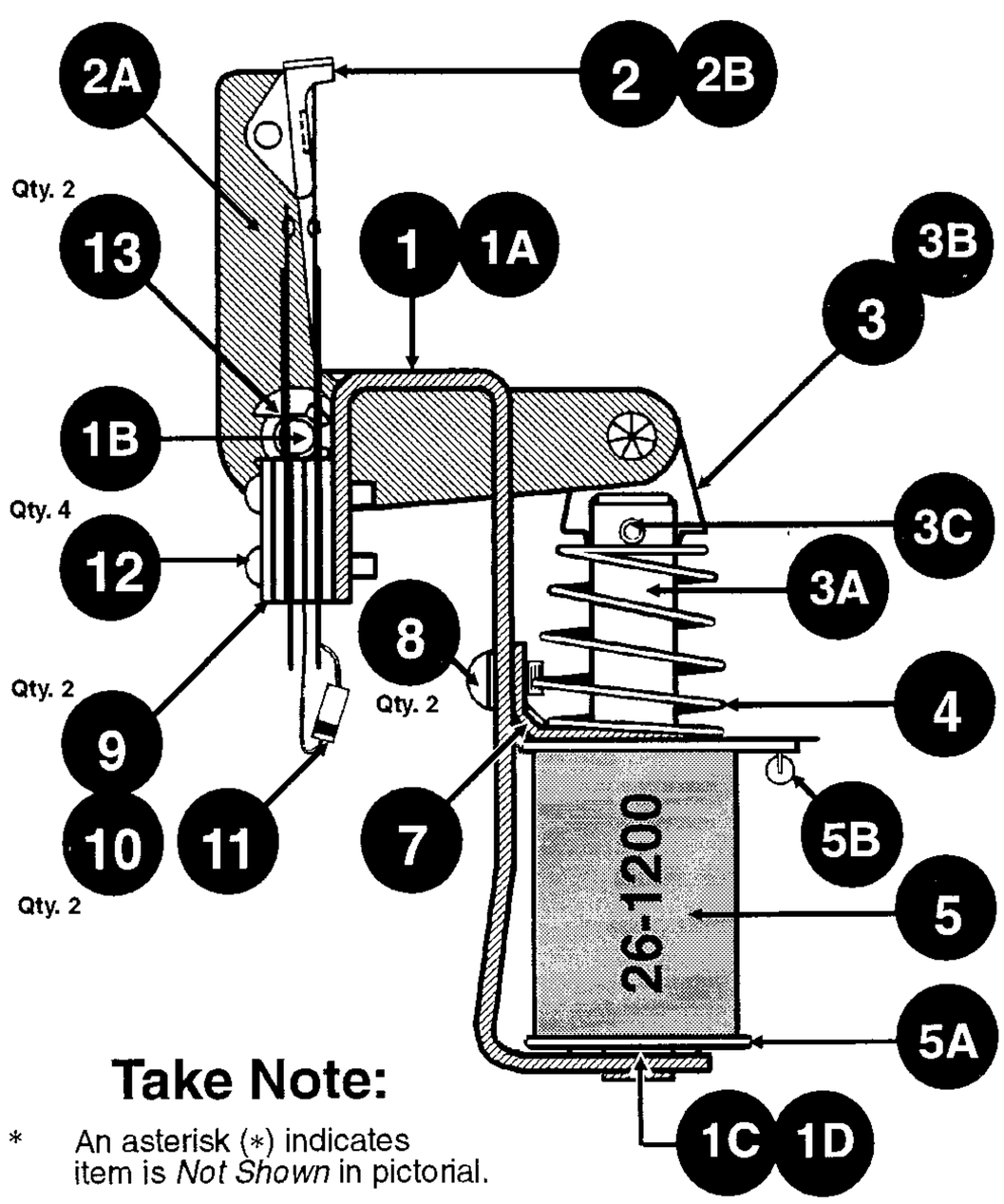
Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8-32 X 5/8" HWH AB Zinc	3	237-5975-00
Note: Above item secures this Ball Launch to the playfield.			
11 *	Shooter Lane Micro-Switch Assembly	1	500-5498-01

Slingshot Assembly, 500-5849-01 (Qty. 2) (Items 1-13)

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	Arm & Tip Assembly	1	515-5340-01
ORDERING ABOVE (ITEM 2) SUB-ASSY. PART Nº WILL INCLUDE:			
2A	Arm	1	515-5341-01
2B	Kicker Tip	1	545-5216-01
2C	Rivet 1/8" ø x 1/4" Lg.	1	249-5003-00
3	Plunger & Link Assembly	1	515-5338-00
ORDERING ABOVE (ITEM 3) SUB-ASSY. PART Nº WILL INCLUDE:			
3A	Plunger 2" Lg.	1	530-5025-01
3B	Plunger Link	1	545-5293-00
3C	Roll Pin 1/8" ø x 5/8" Lg.	1	251-5008-00
4	Compression Spring	1	266-5020-00
5	Coil, 26-1200	1	090-5044-00T
ORDERING ABOVE (ITEM 5) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
6	Coil Sleeve	1	545-5031-00
7	Coil Retaining Bracket	1	535-5203-03
8	#8-32 X 1/4" PPH MS (SEMS)	2	232-5300-00
9	Slingshot Switch	2	180-5054-00
10	Switch Body Protect Plate	2	535-5045-00
11	Switch Diode, 1N4001	2	112-5001-00
12	#6-32 X 5/8" HWH SWAGE	4	237-5976-04
13	Retaining Ring, 1/4" ø Shaft	2	270-5002-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	2-1/2" I.D. Black Rubber Ring (1 per)	2	545-5348-09
n/a *	#8 X 1/2" HWH AB (Blue) (3 per)	6	234-5101-05
Note: Above item secures both Slingshots to the playfield.			



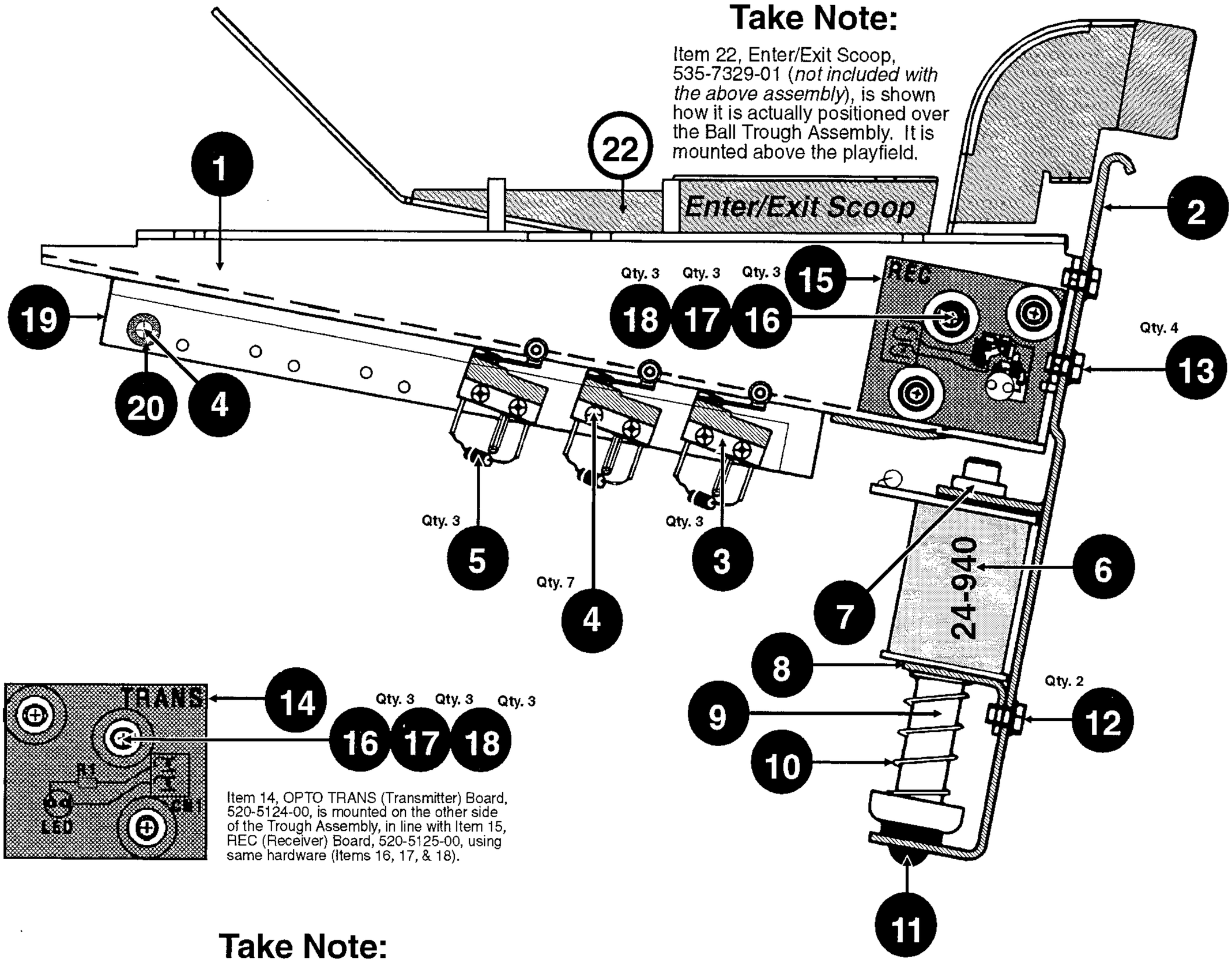
Take Note:

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

4-Ball Trough (OPTO) Assembly, 500-6119-14 (Items 1-21) and Associated Part: Ball Trough Enter/Exit Scoop, 535-7329-01 (Item 22)

Take Note:

Item 22, Enter/Exit Scoop, 535-7329-01 (*not included with the above assembly*), is shown how it is actually positioned over the Ball Trough Assembly. It is mounted above the playfield.



Item 14, OPTO TRANS (Transmitter) Board, 520-5124-00, is mounted on the other side of the Trough Assembly, in line with Item 15, REC (Receiver) Board, 520-5125-00, using same hardware (Items 16, 17, & 18).

Take Note:

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

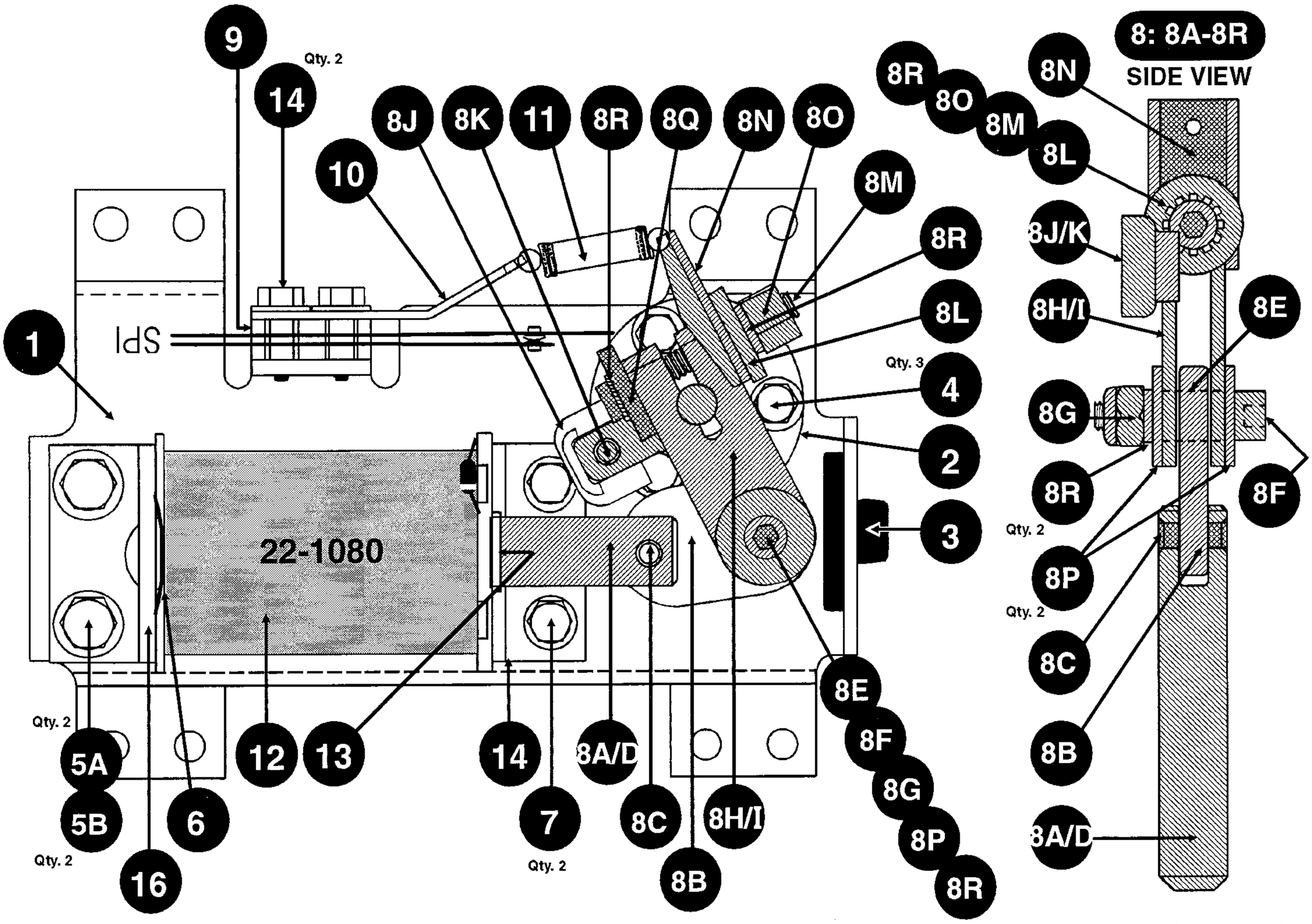
1. *The Lock Ball Assembly is no longer required.* Ball Position (1) is determined by the OPTO Switch; therefore, a 4-Ball Trough, requires only 3 Submini-Switch Roller Actuators.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Ball Trough Outhole Mounting Bracket	1	515-6580-00
2	Coil Mounting Bracket	1	535-7330-01
3	Submini-Switch Roller Actuator	3	180-5119-00
4	#2-56 X 1/2" HWH SER TF (Larger Head)	7	237-5937-01
5	Switch Diode, IN4001	3	112-5001-00
6	Coil, 24-940	1	090-5036-00B
ORDERING ABOVE (ITEM 6) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at bottom)	1	112-5003-00
7	Coil Sleeve	1	545-5076-00
8	Coil Retaining Bracket	1	535-5203-03
9	Plunger Assembly	1	515-5941-01
10	Compression Spring	1	266-5020-00
11	Rubber Bumper (Grommet)	1	545-5105-00
12	#8-32 X 1/4" HWH SER TF	2	237-5964-00
13	#8-32 X 3/8" HWH SWAGE	4	237-5975-00
14	OPTO Transmitter (TRANS) Board	1	520-5124-00
15	OPTO Receiver (REC) Board	1	520-5125-00
16	OPTO PCB Tube Spacer	6	530-5308-02
17	OPTO PCB Rubber Grommet	6	545-5518-00
18	#6-32 X 5/8" HWH SWAGE	6	237-5976-04
19	Trough Ball Guide Plate	1	535-7801-00
20	1/4" X 5/16" X .144" I.D. Spacer Tap.	1	254-5014-03
21 *	Cable Wiring Harness	1	036-5399-04

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
22	Ball Trough Enter / Exit Scoop	1	535-7329-01
n/a *	#8 X 1/2" HWH AB (Blue)	9	234-5101-05
Note: Above item secures this 4-Ball Trough & Scoop to the playfield.			
n/a *	1-1/16" Steel Balls	4	260-5000-00

Flipper (Left) Assembly, 500-5944-12 (Items 1-16) and Associated Part: Flipper Bat & Shaft Assy., 515-5133-08-05 (Item 17*)



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) already threaded with all necessary Thread Forming Screws (Items 4, 5A, 7 & 15)		
2	Flipper Bushing	1	545-5594-00
3	Deflector Pad (Bumper)	1	545-5428-00
4	#6-32 X .38" HWH TF SWAGE	3	237-5976-02
5A	#10-32 X .38" HWH SWAGE	2	237-5985-00
5B	#10 Lock Washer	2	246-5002-00
6	Spring Washer	1	269-5002-00
7	#8-32 X .38 HWH TF SWAGE	2	237-5975-00
8	Plunger, Link & Pawl (Left) Sub-Assy.	1	515-6518-01
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:			
8A	Flipper Plunger/Link Assembly (ordering 8A includes 8B-8D)	1	515-6304-01
8B	*Flipper Link*	*1*	*545-5611-00*
8C	*Spirol Pin ø 5/32" X 7/16" Lg.*	*1*	*251-5015-01*
8D	*Flipper Plunger with Flat*	*1*	*530-5349-01*
8E	Extended Flipper Bushing	1	530-5139-01
8F	#10-32 X 7/8" Lg. SOC HD	1	237-5966-00
8G	#10-32 Nylon Stop Nut	1	240-5203-00
8H	Pawl (Mounting Link) (Left) Sub-Assy.	1	515-6305-01
8I	Pawl (Mounting Link) (Left) *Plain*	1	535-7271-01
8J	Switch Actuator	1	545-5612-00
8K	Rivet 1/8" ø X 1/4" Lg.	1	249-5003-00
8L	Washer .105" THK .203" ID X .63" OD	1	242-5039-00
8M	#10-32 SOC HD X 1.25" Lg.	1	237-5950-01 *
8N	Return Bracket	1	535-7353-00
8O	#10-32 X 9/32" Long 3/8" Hex Nut	1	240-5209-00 1.
8P	Wshr, .06" THK (same ID/OD)	2	242-5038-00
8Q	Washer .105" THK .203" ID X .63" OD	1	242-5039-01
8R	#10 Star Washer	3	246-5002-00 2.

Nº	Individual Part Name	QTY.	SPI Part Nº
9	Power (End of Stroke) Switch	1	180-5149-00
10	Switch Plate/Spring Return Lt. Brkt.	1	535-7354-01
11	Flipper Return Spring	1	265-5035-00
12	Coil, 22-1080 (YEL-GRN)	1	090-5032-00T
ORDERING ABOVE (ITEM 12) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
13	Coil Sleeve	1	545-5388-00
14	Coil Support Bracket	1	535-7356-00
15	#6-32 X 5/8" HWH TF SWAGE	2	237-5976-04
16	Coil Stop Sub-Assembly	1	515-6308-01
ORDERING ABOVE (ITEM 16) SUB-ASSY. PART Nº WILL INCLUDE:			
16A	Coil Stop with with .093" ø Hole	1	530-5350-01
16B	Shading Ring	1	530-5123-00
16C	Coil Stop Bracket	1	535-7355-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

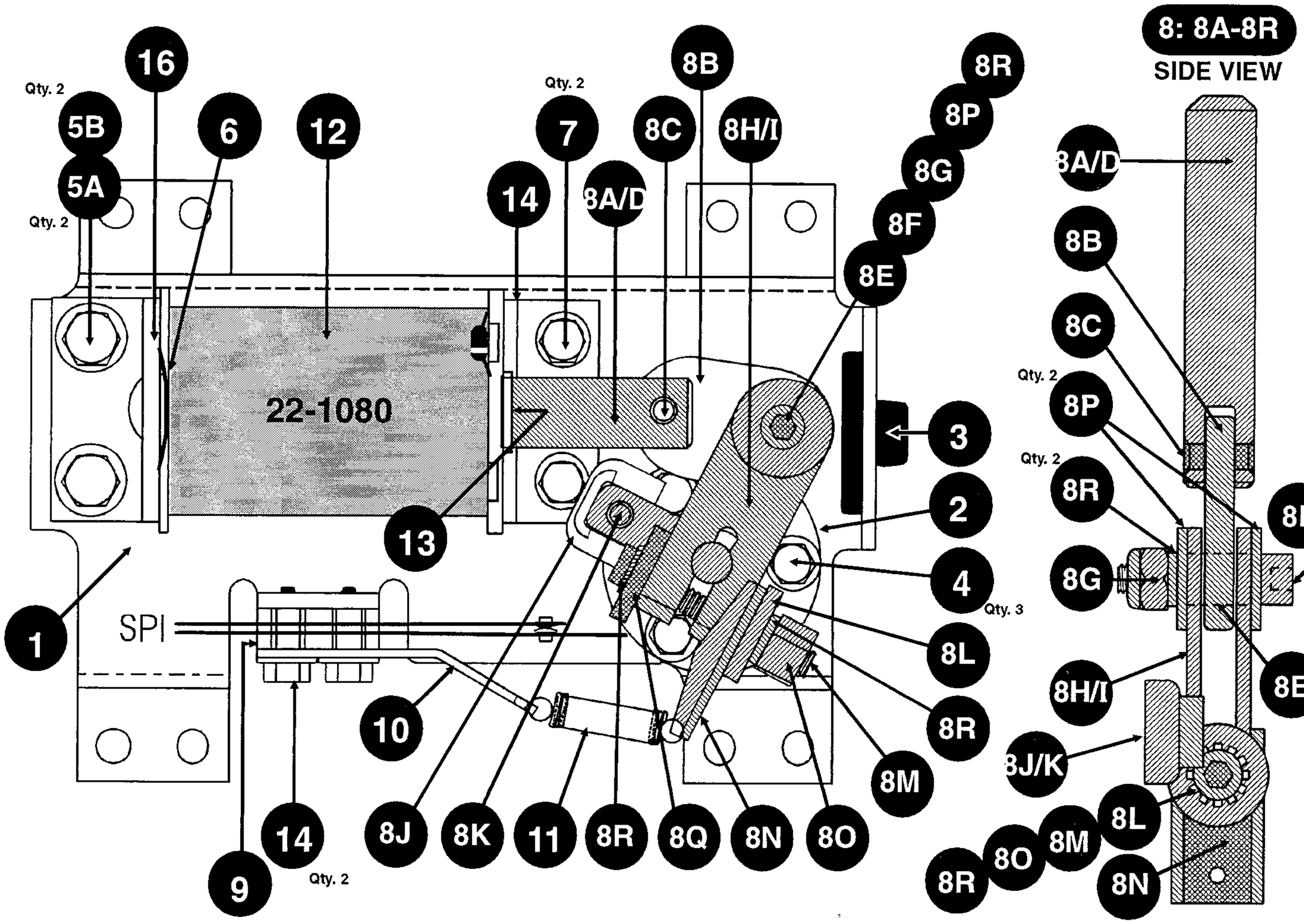
Nº	Associated Part Name	QTY.	SPI Part Nº
17 *	Flipper Bat & Shaft Assy. White with Sega Saturn™ Logo ©1997	1	515-5133-08-05
n/a *	Large Flipper Rubber Ring	1	545-5277-00
n/a *	#10 X 1/2" HWH MS (Serr) Zinc ST	8	237-5949-00
Note: Above item secures this Flipper to the playfield.			

Take Note:

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

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

Flipper (Right) Assembly, 500-5944-02 (Items 1-16) and Associated Part: Flipper Bat & Shaft Assy., 515-5133-08-05 (Item 17*)



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) already threaded with all necessary Thread Forming Screws (Items 4, 5A, 7 & 15)		
2	Flipper Bushing	1	545-5594-00
3	Deflector Pad (Bumper)	1	545-5428-00
4	#6-32 X .38" HWH TF SWAGE	3	237-5976-02
5A	#10-32 X .38" HWH TF SWAGE	2	237-5985-00
5B	#10 Lock Washer	2	246-5002-00
6	Spring Washer	1	269-5002-00
7	#8-32 X .38 HWH TF SWAGE	2	237-5975-00
8	Plunger, Link & Pawl (Rt.) Sub-Assy.	1	515-6518-00
ORDERING ABOVE (ITEM 8) SUB-ASSY. PART Nº WILL INCLUDE:			
8A	Flipper Plunger/Link Assembly (ordering 8A includes 8B-8D)	1	515-6304-01
8B	*Flipper Link*	*1*	*545-5611-00*
8C	*Spirol Pin ø 5/32" X 7/16" Lg.*	*1*	*251-5015-01*
8D	*Flipper Plunger with Flat*	*1*	*530-5349-01*
8E	Extended Flipper Bushing	1	530-5139-01
8F	#10-32 X 7/8" Lg. SOC HD	1	237-5966-00
8G	#10-32 Nylon Stop Nut	1	240-5203-00
8H	Pawl (Mounting Link) (Rt.) Sub-Assy.	1	515-6305-00
8I	Pawl (Mounting Link) (Right) *Plain*	1	535-7271-00
8J	Switch Actuator	1	545-5612-00
8K	Rivet 1/8" ø X 1/4" Lg.	1	249-5003-00
8L	Washer .105" THK .203" ID X .63" OD	1	242-5039-00
8M	#10-32 SOC HD X 1.25" Lg.	1	237-5950-01
8N	Return Bracket	1	535-7353-00
8O	#10-32 X 9/32" Long 3/8" Hex Nut	1	240-5209-00
8P	Wshr. .06" THK (same ID/OD)	2	242-5038-00
8Q	Washer .105" THK .203" ID X .63" OD	1	242-5039-01
8R	#10 Star Washer	3	246-5002-00

Nº	Individual Part Name	QTY.	SPI Part Nº
9	Power (End of Stroke) Switch	1	180-5149-00
10	Switch Plate/Spring Return Rt. Brkt.	1	535-7354-00
11	Flipper Return Spring	1	265-5035-00
12	Coil, 22-1080 (YEL-GRN)	1	090-5032-00T
ORDERING ABOVE (ITEM 12) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
13	Coil Sleeve	1	545-5388-00
14	Coil Support Bracket	1	535-7356-00
15	#6-32 X 5/8" HWH TF SWAGE	2	237-5976-04
16	Coil Stop Sub-Assembly	1	515-6308-01
ORDERING ABOVE (ITEM 16) SUB-ASSY. PART Nº WILL INCLUDE:			
—	Coil Stop with with .093" ø Hole	1	530-5350-01
—	Shading Ring	1	530-5123-00
—	Coil Stop Bracket	1	535-7355-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
17 *	Flipper Bat & Shaft Assy. White with Sega Saturn™ Logo ©1997	1	515-5133-08-05
n/a *	Large Flipper Rubber Ring	1	545-5277-00
n/a *	#10 X 1/2" HWH MS (Serr) Zinc ST	8	237-5949-00

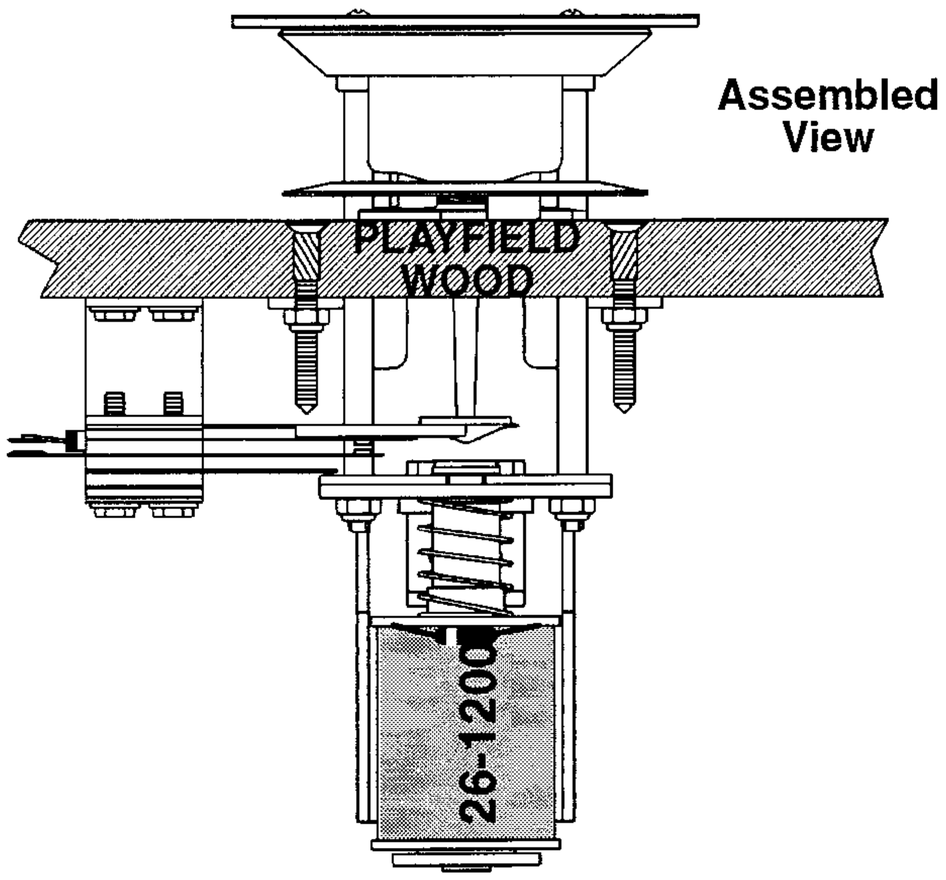
Note: Above item secures this Flipper to the playfield.

Take Note:

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

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

Turbo Bumper Individual Parts (Qty. 3) (Items 1-28)
(Not available as an assembly. Parts are grouped for easy reference.)



Assembled View

TOP GROUP

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

BOTTOM GROUP

Nº	Individual Part Name	QTY.	SPI Part Nº
10B	#6-32 Nylon Stop Nut	3	240-5005-00
11	Plunger	1	530-5348-00
12	Coil Spring	1	266-5047-00
13	Coil, 26-1200	1	090-5044-00T
ORDERING ABOVE (ITEM 13) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
14	Coil Sleeve	1	545-5031-00
15	Fiber Yoke	1	545-5609-00
16	Metal Yoke	1	535-7346-00
17	Metal Yoke Stop	1	535-7347-00
18	Coil Bracket Welded Assembly	1	515-5939-00
19	#6-32 X 1/4" HWH TF SWAGE	2	237-5976-01

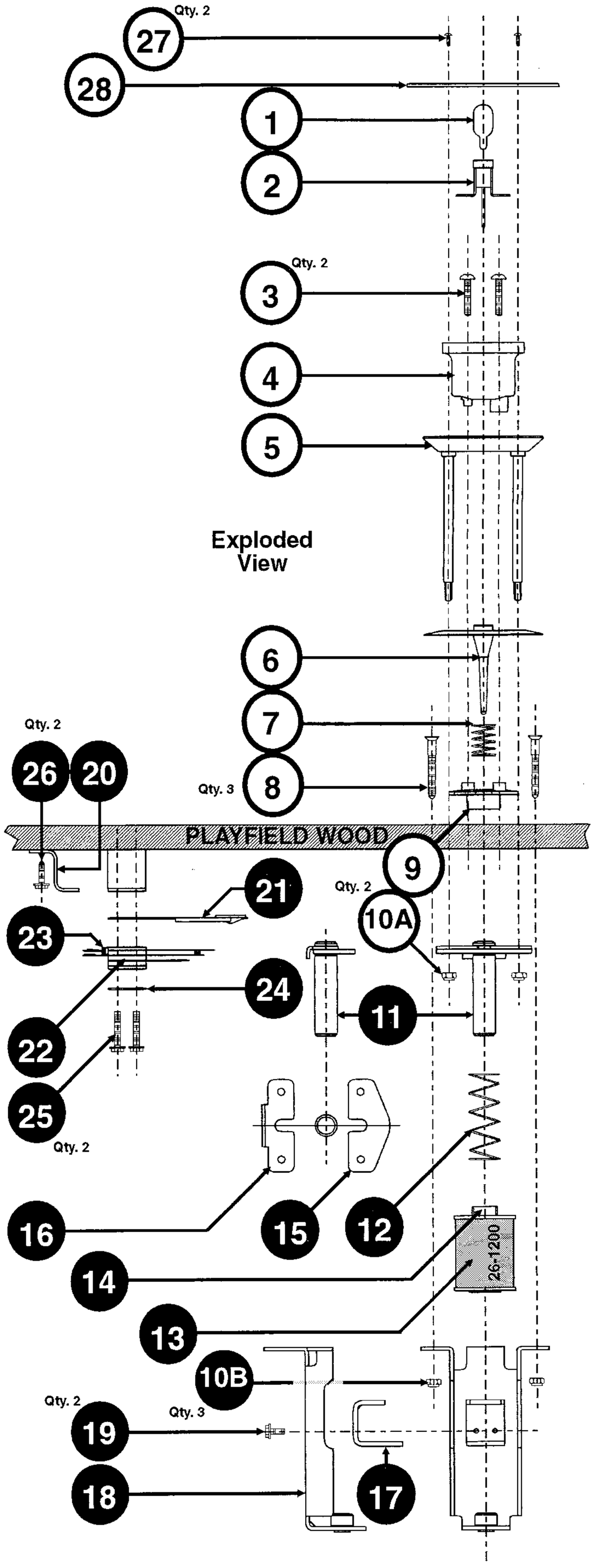
SWITCH GROUP

Nº	Individual Part Name	QTY.	SPI Part Nº
20	Switch Bracket	1	535-7342-00
21	Spoon Switch Actuator	1	545-5610-01
22	Stack Switch	1	180-5015-03
23	Switch Diode, 1N4001	1	112-5001-00
24	Switch Body Protect Plate	1	535-7344-00
25	#6-32 X 3/4" HWH MS SWAGE	2	237-5976-05

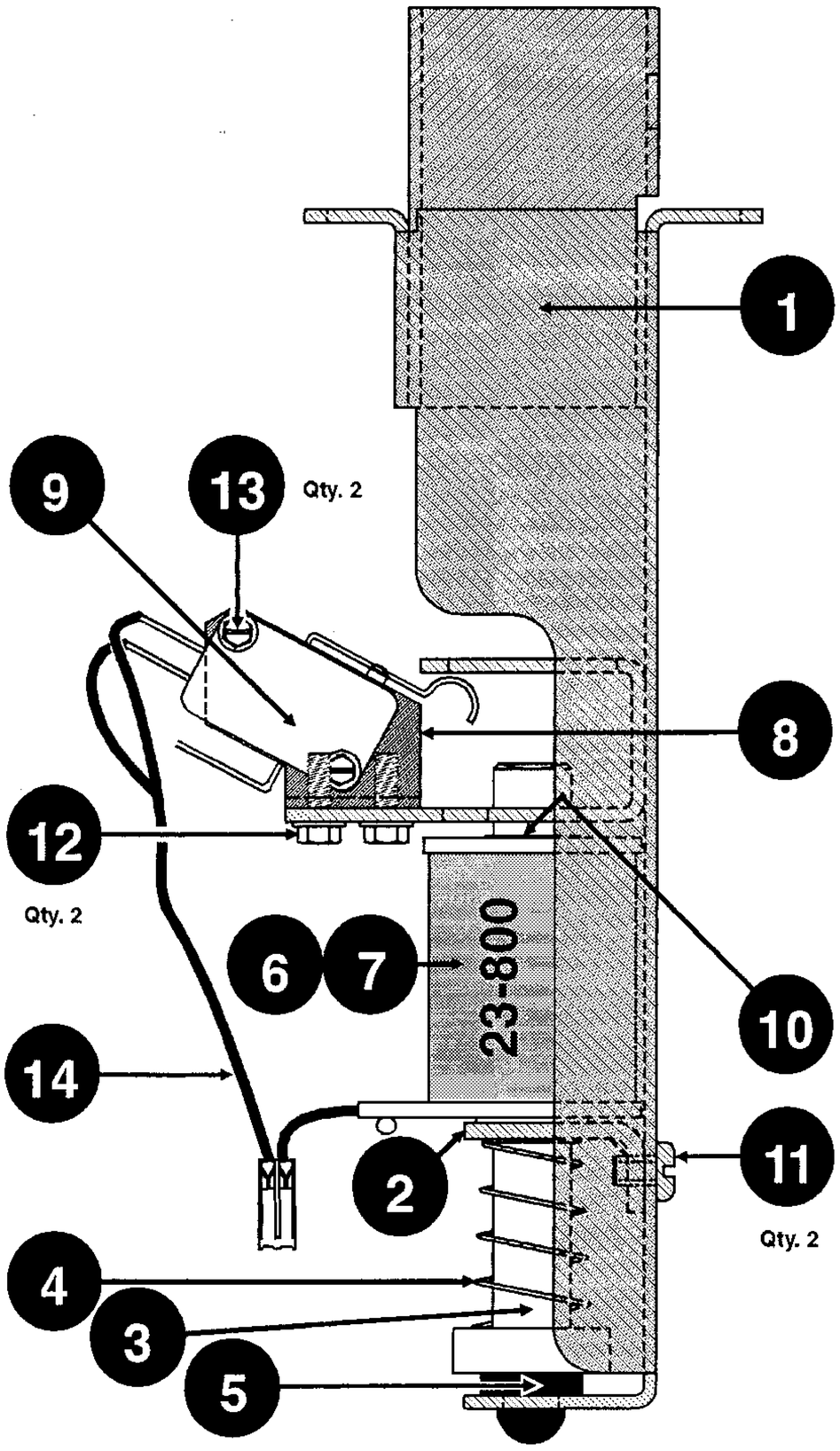
ASSOCIATED GROUP

Nº	Associated Part Name	QTY.	SPI Part Nº
26	#6 X 1/2" HWH (AB) (PER POP)	2	234-5001-02
27	#6 X 3/8" PRH AB (PER POP)	2	237-5000-00
28	Pop Bumper Cap Clear Butyrate	1	830-5908-XX

For Item 28 THIS GAME ONLY: replace the "-XX" with the following for the desired buty. piece: -13 (Top Pop); -14 (Bot Pop); -15 (Mid Pop)



Super VUK (Vertical Up-Kicker) Assembly, 500-6184-00-46 (Items 1-14) and Associated Part: Chute Weldment Assy., 515-6667-00 (Item 15*)



Take Note:

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

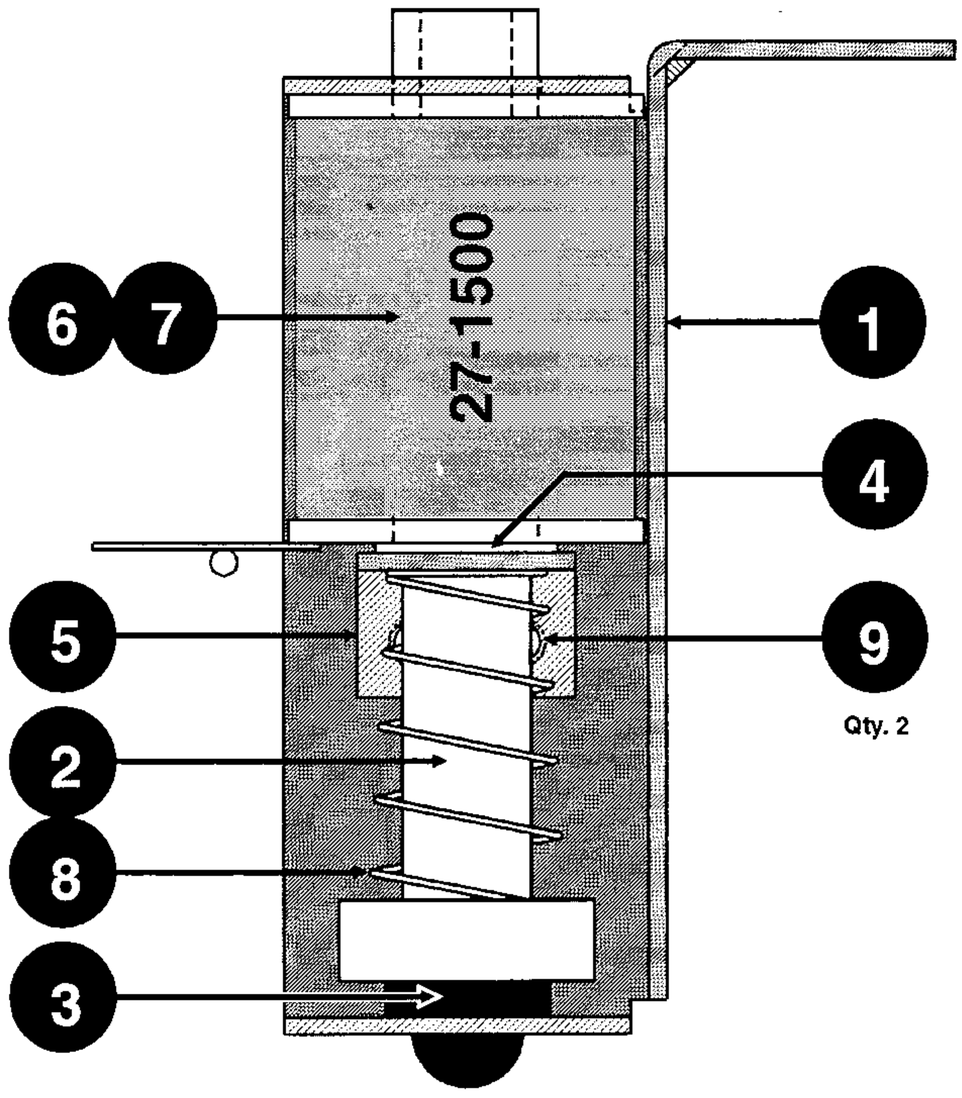
1. Note: The Switch Diode, 1N4001, is not located on this assembly (nor included); it's located on a terminal strip under the playfield.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Weldment Bracket Assy. (Mtg. Frame)	1	515-6666-00
2	Coil Retainer Bracket	1	535-5203-03
3	Plunger Assembly	1	515-5941-01
4	Compression Spring	1	266-5020-00
5	Rubber Bumper (Grommet)	1	545-5105-00
6	Coil, 23-800	1	090-5001-00B
ORDERING ABOVE (ITEM 6) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at bottom)	1	112-5003-00
7	Coil Sleeve	1	545-5076-00
8	SVUK Switch Mounting Bracket	1	535-8144-00
9	Micro Switch	1	180-5052-00
10	Spring Washer	1	269-5002-00
11	#8-32 X 1/4" PPH MS (Sems) Zinc	2	232-5300-00
12	#6-32 X 3/8" HWH Swage (Serr) Zinc	2	237-5976-02
13	#4-40 X 5/8" HWH Mach. Scr. MS (Ser) ST	2	237-5945-00
14	SVUK Coil & Sw. Cbl. Wiring Harness	1	036-5420-13-46

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Zinc) Blue	2	234-5101-05
n/a *	#8-32 X 7/8" HWH AB	3	237-5890-00
Note: Above item secures the Super VUK to the playfield.			
15 *	Chute Weldment Assembly (SVUK)	1	515-6667-00
n/a *	#4 X 5/8" PFH (Black)	2	237-5833-00
Note: Above item secures the Chute over the Super VUK.			

Ball Deflector (Orbit Diverter) Assembly, 500-5788-01-46 (Items 1-9)



Take Note:

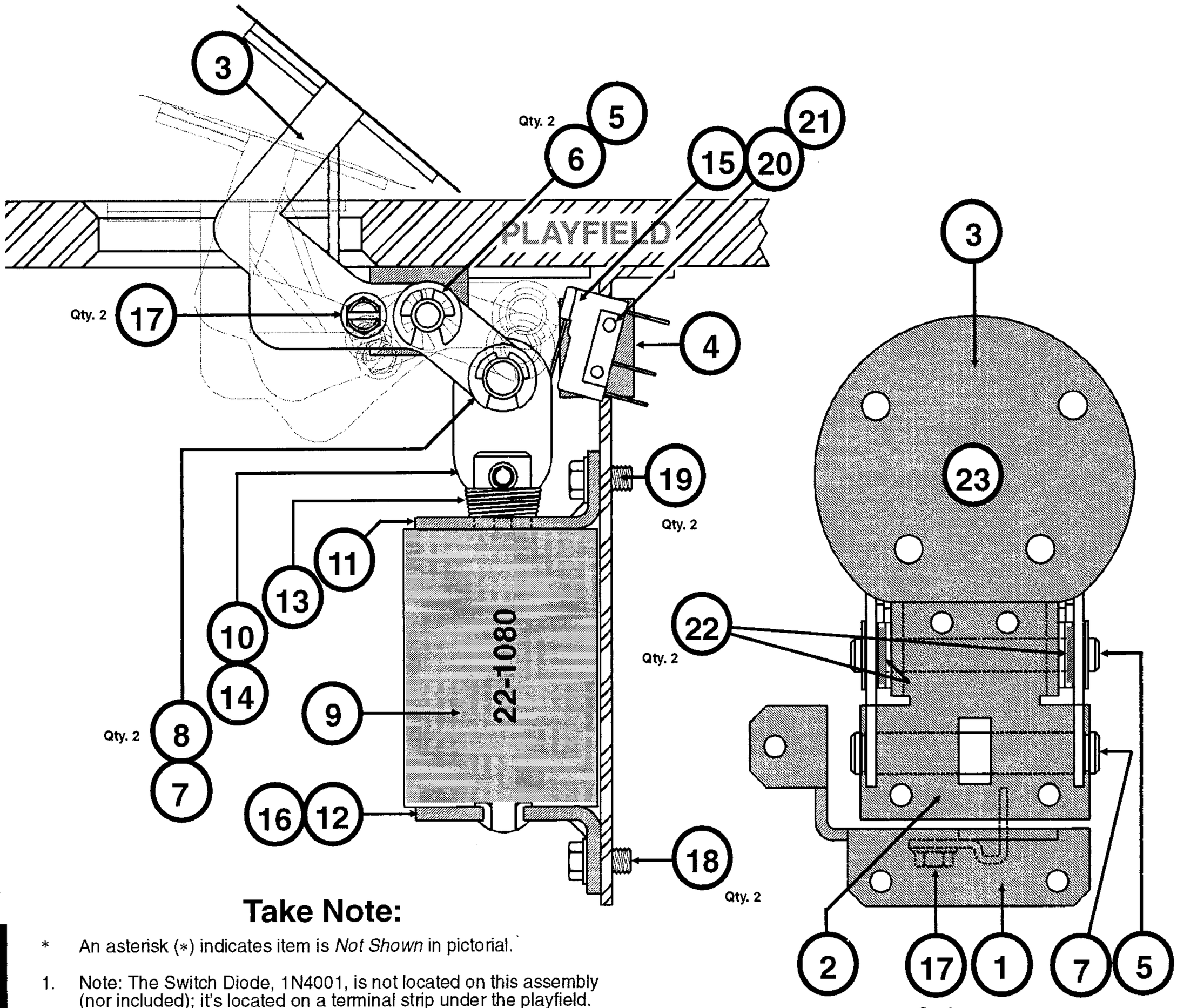
* An asterisk (*) indicates item is *Not Shown* in pictorial.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Plunger & Coil Bracket	1	535-6857-01
2	Plunger Assembly	1	515-5941-01
3	Rubber Bumper (Grommet)	1	545-5105-00
4	Spring Washer	1	269-5002-00
5	Coil Retainer Bracket	1	535-5203-03
6	Coil, 27-1500	1	090-5004-00B
ORDERING ABOVE (ITEM 6) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
7	Coil Sleeve	1	545-5076-00
8	Compression Spring	1	266-5020-00
9	#8-32 X 1/4 PPH MS (Sems) Zinc	2	232-5300-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue) Zinc	3	234-5101-05
Note: Above item secures Ball Diverter to the playfield.			

Trap Door Assembly, 500-6200-00-46 (Items 1-24)



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.

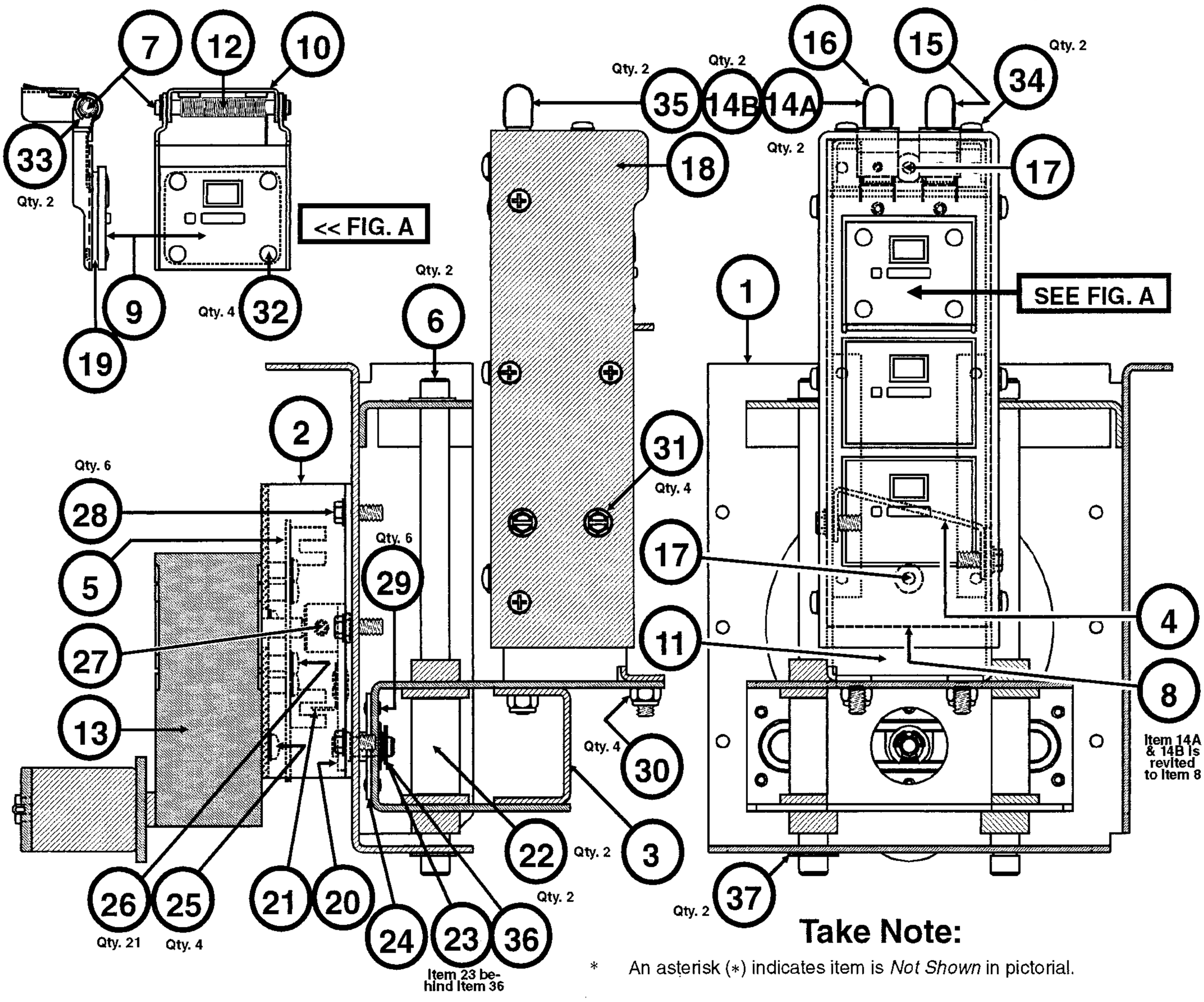
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Trap Door Bracket Weldment	1	515-6652-01
2	Trap Door Bracket Weldment Top	1	515-6754-00
3	Trap Door Up-Down Bracket Assy.	1	515-6653-00
4	Trap Door Bracket	1	535-7948-01
5	Trap Door Shaft 1/4" ø	1	530-5453-01
6	Retaining Ring, 1/4" ø Shaft	2	270-5002-00
7	Trap Door Shaft 5/16" ø	1	530-5453-00
8	Retaining Ring, 5/16" ø Shaft	2	270-5003-00
9	Coil, 22-1080	1	090-5032-00T
ORDERING ABOVE (ITEM 9) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
10	Coil Sleeve	1	545-5388-00
11	Coil Support Bracket	1	535-7356-00
12	Coil Stop Weldment	1	515-6308-01
13	Compression Spring	1	266-5054-00

Nº	Individual Part Name	QTY.	SPI Part Nº
14	Plunger & Link Assembly	1	515-6304-00
ORDERING ABOVE (ITEM 14) SUB-ASSY. PART Nº WILL INCLUDE:			
14A	Link	1	545-5611-00
14B	Spiro Spring	1	251-5015-01
14C	Plunger	1	530-5349-00
15	Submini-Switch Roller Actuator	1	180-5119-00
16	Spring Washer	1	269-5002-00
17	#6-32 X 3/8" HWH Swage (Serr) Zinc	4	237-5976-02
18	#10-32 X 3/8" SHWH (Serr) Swage	2	237-5985-00
19	#8-32 X 3/8" HWH Swage (Serr) Zinc	2	237-5975-00
20	Switch Body Protect Plate	1	535-6539-00
21	#2-56 X 1/2" HWH MS (Serr) TF 1/8" Hd.	2	237-5937-01
22	Washer 1/4" ID X 1/2" OD X 1/16" Thk.	2	242-5008-00
23	Decal (Trap Door Cover) -09	1	820-6138-09
24 *	Trap Door Cable Wiring Harness	1	036-5420-12-46

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue)	5	234-5101-05
Note: Above item secures this Trap Door to the playfield.			

File Cabinet & Motor Assembly, 500-6159-00-46 (Items 1-38)



Take Note:

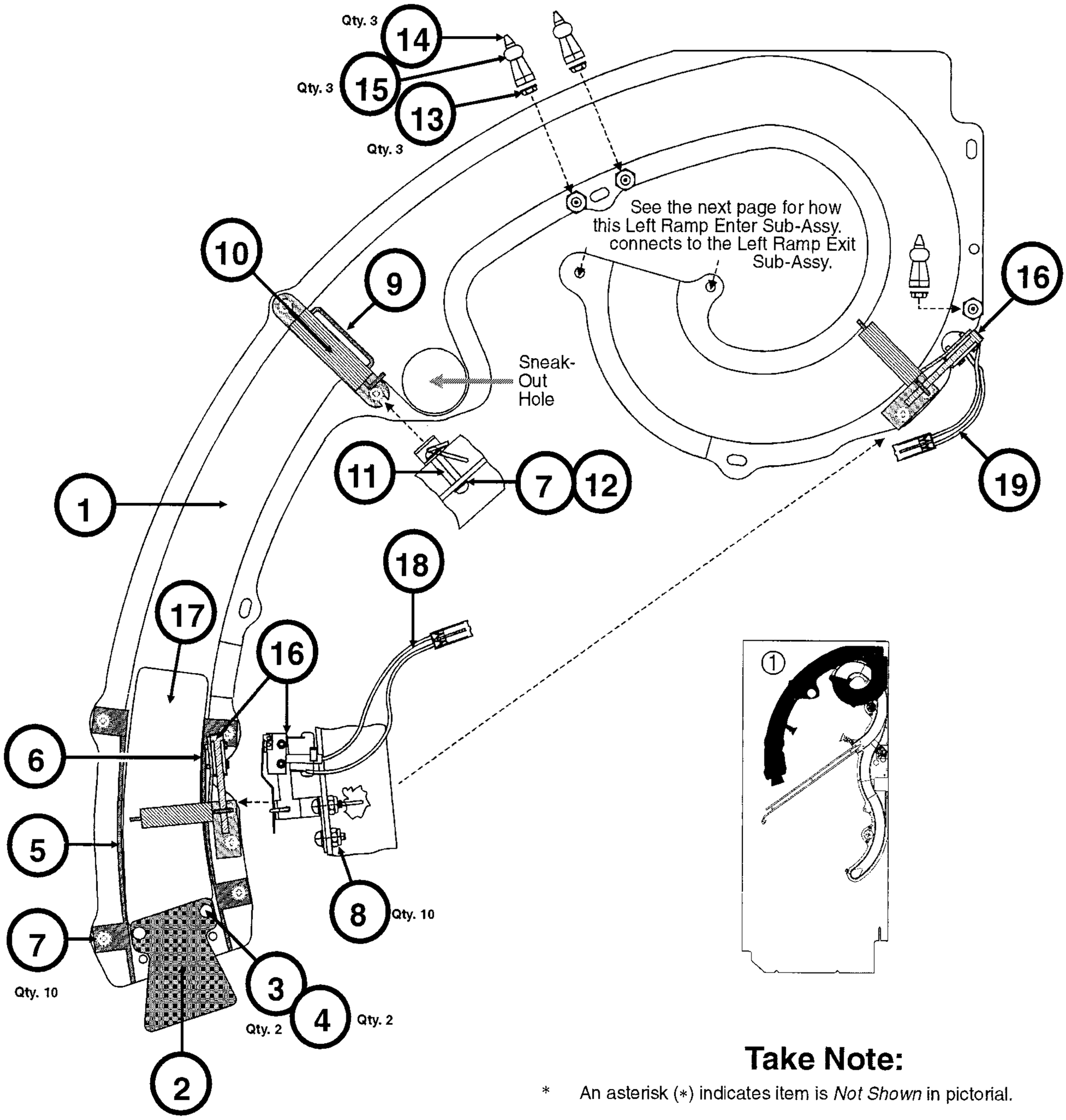
* An asterisk (*) indicates item is *Not Shown* in pictorial.

Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
1	Support Bracket Weldment	1	515-6641-00	21	OPTO Flag Bracket	1	535-7928-00
2	Motor Bracket Weldment	1	515-6639-00	22	Plain Bearing	2	530-5443-00
3	Lift Bracket Weldment	1	515-6640-00	23	Roller Bearing	1	530-5446-00
4	Bracket Support Weldment	1	515-6638-00	24	Bearing Housing	1	545-5779-00
5	Cabinet OPTO PCB	1	520-5155-00	25	#8-32 X 3/8" PPH MS (Serr) Zinc	4	232-5301-00
6	File Cabinet Shaft	2	530-5441-00	26	#6-32 X 3/8" PPH MS (Serr) Zinc	21	232-5201-00
7	Door Shaft	1	530-5447-00	27	#10-32 X 1/2" Set Scr. Cup Point	1	237-5980-01
8	File Cabinet Back Plate	1	535-7926-00	28	#8-32 X 3/8" HWH Swage (Sr.) Zinc	6	237-5975-00
9	File Cabinet Door	1	535-7927-00	29	Rivet, 1/8" ø X 3/16" Lg.	6	249-5001-00
10	Door Bracket	1	535-7929-00	30	#8-32 Nylon Stop Nut	4	240-5102-00
11	Bracket Weldment	1	515-6637-00	31	#6-32 X 3/8" HWH Swage (Sr.) Zinc	4	237-5976-02
12	Spring (Cabinet Door)	1	265-5047-01	32	Rivet, 1/8" ø X 1/4" Lg. (Black)	4	249-5003-01
13	Motor 20v DC 9 RPM CCW	1	041-5057-00	33	Retaining Ring, 3/16" ø Shaft	2	270-5001-00
14A	Laydown WB Socket (with notch)	2	077-5026-01	34	#6-32 X 1/4" PPH MS (Sems) Zinc	2	232-5200-00
14B	#555 Wedge Base Bulb	2	165-5002-00	35	Rivet, 1/8" ø X 5/32" Lg.	2	249-5009-00
15	Rubber Lite Cover - Red	1	545-5014-02	36	Retaining Ring, 1/4" ø Shaft	2	270-5002-00
16	Rubber Lite Cover - Green	1	545-5014-04	37	Retaining Ring, 3/8" ø Shaft	2	270-5012-00
17	Rubber Bumper (Grommet)	2	545-5810-00	38*	Lamps 73/74 Cable Wiring Harness	1	036-5420-10-46
18	File Cabinet Molded Cover	1	545-5778-00				
19	Clear Butyrate - File Cabinet (-12)	1	830-5908-12				
20	Crank Arm Assembly	1	515-6643-00				

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8-32 X 5/8" LG HWH Swage (Serr)	5	237-5975-03
Note: Above item secures this File Cabinet to the playfield.			

Left Plastic Ramp Enter Sub-Assembly, 515-6628-00-46 (Item 1-19)



Take Note:

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

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Left Plastic Ramp Enter (Plain)	1	545-5756-01
2	Ramp Flap	1	535-7922-00
3	Rivet, 1/8" ø X 3/16" Long	2	249-5001-00
4	#6 Lock Washer (Riveting)	2	246-5000-00
5	Left Ramp Protector (Left Side)	1	535-7930-00
6	Left Ramp Protector (Right Side)	1	535-7931-00
7	#6-32 X 3/8" PPH MS (Sems) Zinc	10	232-5201-00
8	#6-32 Nylon Stop Nut	10	240-5005-00
9	Wire Gate	1	535-5307-09
10	Mounting Bracket (for Wire Gate)	1	535-5269-06
11	3/4" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-04
12	Washer 9/64" ID X 5/16" OD X 1/32"	1	242-5017-00
13	#6 X 3/8" HWH AB (Zinc)	3	234-5000-00
14	Mini-Jewel Post (CLEAR)	3	550-5052-01
15	3/8" O.D. Black Rubber Ring	3	545-5348-19

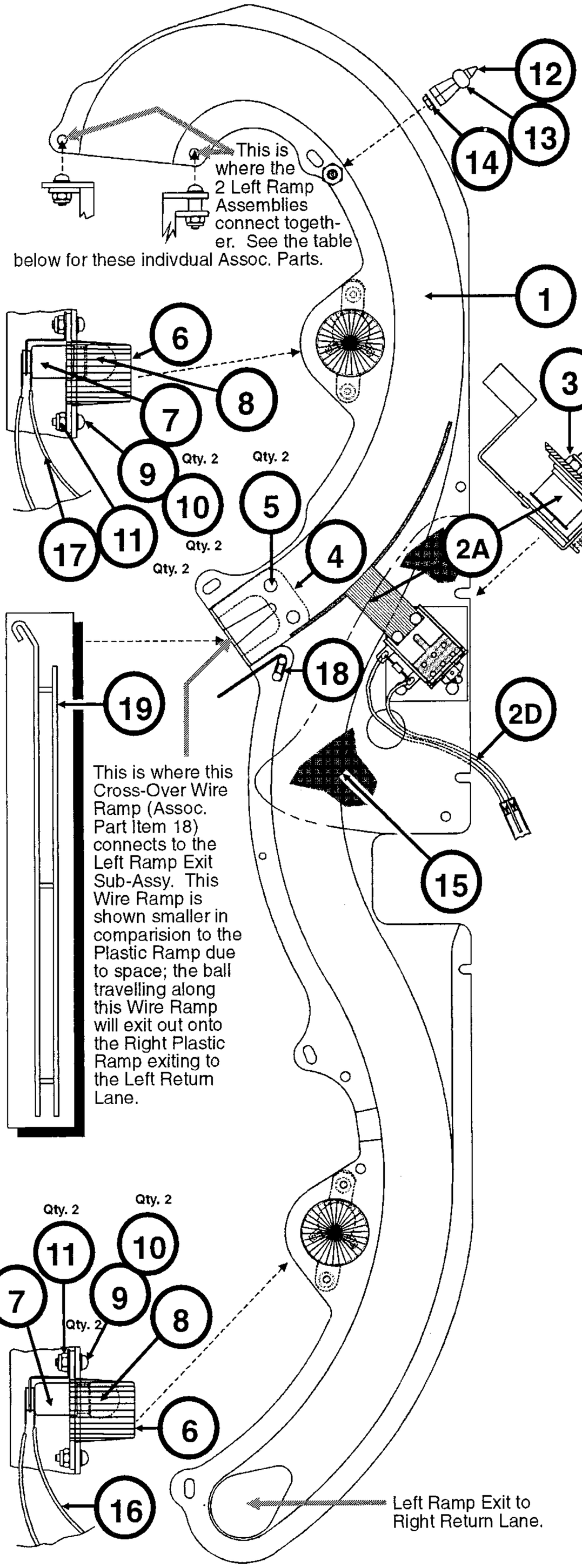
Nº	Individual Part Name	QTY.	SPI Part Nº
16	Gate Assembly	2	515-6490-01
ORDERING ABOVE (ITEM 16) SUB-ASSY. PART Nº WILL INCLUDE:			
16A	Gate Bracket	1	535-7613-02
16B	Wire Form	1	535-6304-03
16C	Micro Switch (Wire Gate)	1	180-5087-00
16D	Switch Diode, 1N4001	1	112-5001-00
16E	#2-56 X 3/8" HWH MS(Ser) TF 3/16" Hd.	2	237-5938-01
17	Ramp Decal "-01"	1	820-6205-01
18	Sw. 25 (Enter) Cable Wiring Harness	1	036-5420-14-46
19	Sw. 26 (Exit) Cable Wiring Harness	1	036-5420-15-46

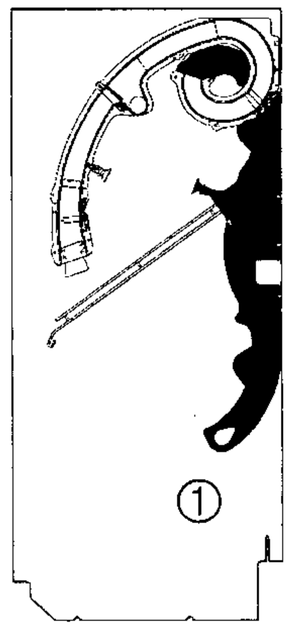
ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#4 X 5/8" PFH (Black)	2	237-5833-00
Note: Above item secures this Lt. Rmp. Entr. (@ flap) to the playfield.			

Note: See the next page for the Associated Parts which connect both these Left Ramp assemblies together.

Left Plastic Ramp Exit Sub-Assembly, 515-6629-00-46 (Item 1-18) and Associated Part: Cross-Over Wire Ramp, 515-6630-00 (Item 19)





Take Note:

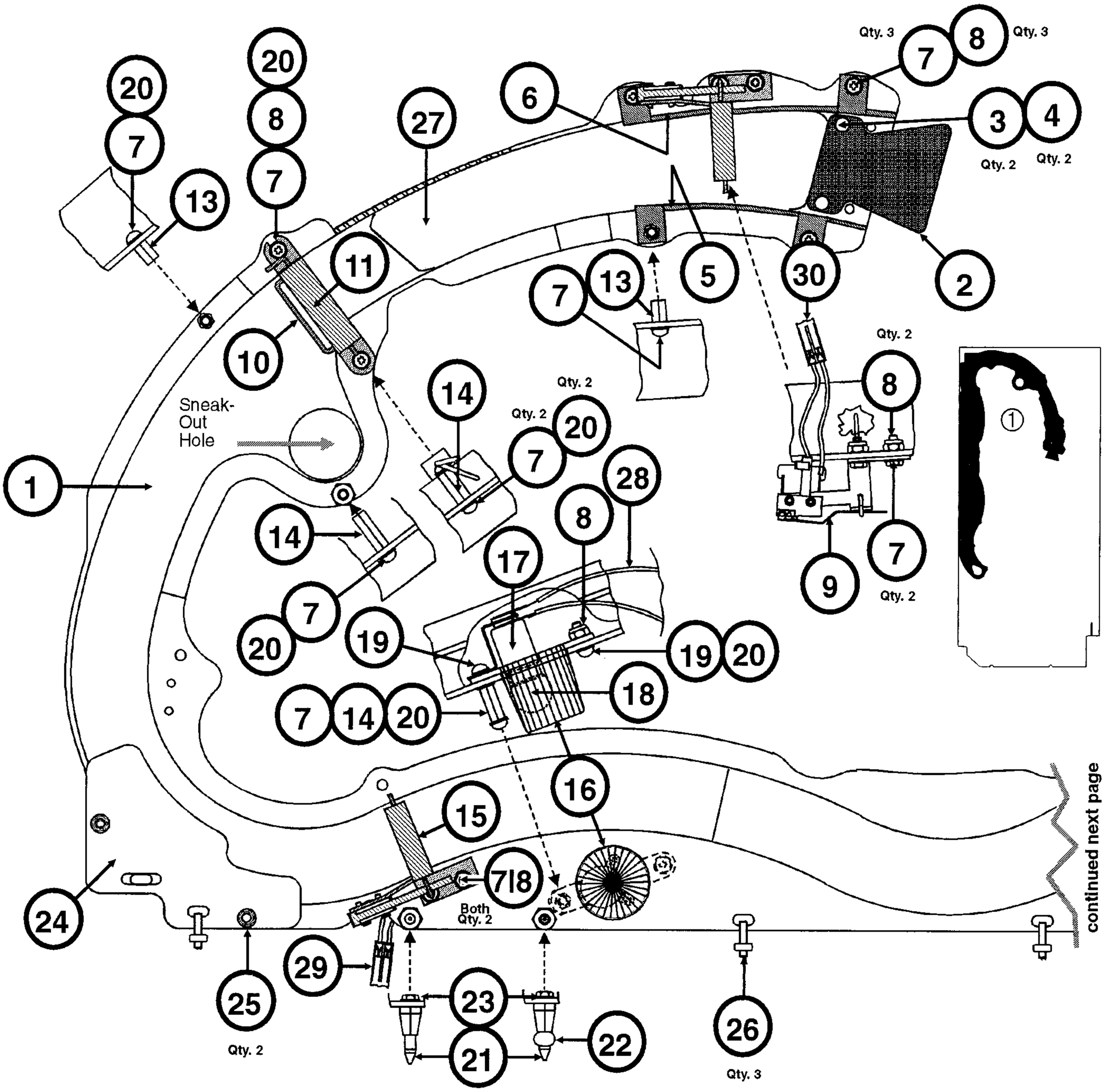
An asterisk (*) indicates item is *Not Shown* in pictorial.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Left Plastic Ramp Exit (Plain)	1	545-5757-00
2	Coil & Diverter Sub-Assembly	1	515-6725-00-46
ORDERING ABOVE (ITEM 2) SUB-ASSY. PART Nº WILL INCLUDE:			
2A	Coil Assy.	1	515-6724-00
	Items 2A Incls: *Coil, 32-1800*	*1*	*090-5031-00*
	Return Spring	*1*	*265-5024-00*
2B	Diverter Mounting Plate	1	515-6722-00
2C	#8-32 X 3/8" PPH MS (Serr) Zinc	1	232-5301-00
2D*	Coil #18 Cable Wiring Harness		036-5420-08-46
3	#8-32 Nylon Stop Nut	3	240-5102-00
4	Ramp Mounting Bracket	1	535-7925-00
5	Rivet, 1/8" ø X 3/16" Lg.	2	249-5001-00
6	Mini-Mars Light Cover (Flo. Green)	2	550-5031-11
7	2-Lug Stand-Up Short Socket	2	077-5101-00
8	#89 Bulb	2	165-5000-89
9	#6-32 X 1/2" PPH MS (Sems) Zinc	4	232-5202-00
10	Washer 9/64" X 5/16" OD X 1/32"	4	242-5017-00
11	#6-32 Nylon Stop Nut	4	240-5005-00
12	Mini-Jewel Post (Clear)	1	550-5052-01
13	3/8" O.D. Black Rubber Ring	1	545-5348-19
14	#6 X 3/8" HWH AB (Zinc)	1	234-5000-00
15	Diverter Cover	1	545-5811-00
16	Flash #F6 Cable Wiring Harness	1	036-5420-19-46
17	Flash #F7 Cable Wiring Harness	1	036-5420-07-46
18	Diverter Guide Rail	1	535-8151-00
	#6-32 X 5/8" PPH	2	232-5203-00
	#6 Washer	2	242-5001-00
	#6-32 Stop Nut	2	240-5005-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
19	Cross-Over Wire Ramp	1	515-6630-00
Note: Above item, Cross-Over Wire Ramp, is secured into the Left Plastic Ramp Exit Sub-Assembly and is also attached to the Right Plastic Ramp Assembly.			
n/a *	#6-32 X 3/4" PPH MS (Sems) Zinc	1	232-5204-00
n/a *	#6-32 X 5/8" PPH MS (Sems) Zinc	1	232-5203-00
n/a *	#8 Washer .17 ID X .5" OD X 1/32"	1	242-5015-00
n/a *	1/4" X 3/8" Spacer Gray	1	254-5000-02
n/a *	#6-32 Nylon Stop Nut	2	240-5005-00
Note: Above items secures both Left Ramp Sub-Assemblies together.			

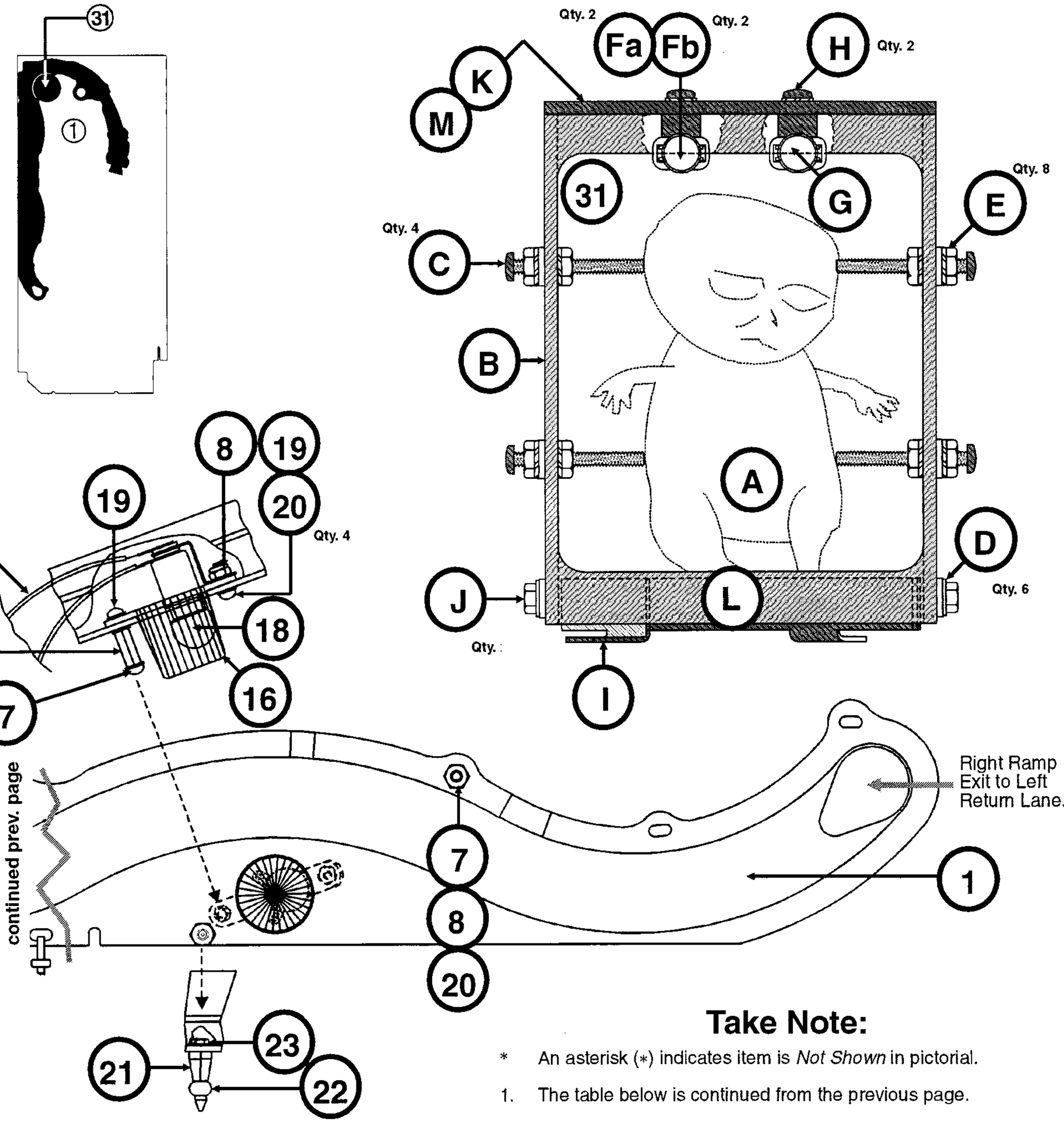
Right Plastic Ramp Assembly, 500-6158-00-46 (Items 1-30)



Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
1	Right Plastic Ramp (Plain)	1	545-5758-01	10	Wire Gate	1	535-5307-09
2	Ramp Flap	1	535-7921-00	11	Mounting Bracket (for Wire Gate)	1	535-5269-06
3	Rivet, 1/8" ø X 3/16" Long	2	249-5001-00	12	3/4" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-04
4	#6 Lock Washer (Riveting)	2	246-5000-00	13	3/8" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-12
5	Right Ramp Protector (Left Side)	1	535-7932-00	14	5/8" X 1/4" Hex Spacer #6-32 Tap	3	254-5008-02
6	Right Ramp Protector (Right Side)	1	535-7939-00	15	Gate Assembly	1	515-6490-00
7	#6-32 X 3/8" PPH MS (Sems) Zinc	16	232-5201-00	ORDERING ABOVE (ITEM 15) SUB-ASSY. PART Nº WILL INCLUDE:			
8	#6-32 Nylon Stop Nut	11	240-5005-00	15A	Gate Bracket	1	535-7613-01
9	Gate Assembly	1	515-6490-01	15B	Wire Form	1	535-6304-03
ORDERING ABOVE (ITEM 9) SUB-ASSY. PART Nº WILL INCLUDE:				15C	Micro Switch (Wire Gate)	1	180-5087-00
9A	Gate Bracket	1	535-7613-02	15D	Switch Diode, 1N4001	1	112-5001-00
9B	Wire Form	1	535-6304-03	15E	#2-56 X 3/8" HWH MS(Ser) TF 3/16" Hd.	2	237-5938-01
9C	Micro Switch (Wire Gate)	1	180-5087-00	16	Mini-Mars Light Cover (Flo. Green)	2	550-5031-11
9D	Switch Diode, 1N4001	1	112-5001-00	17	2-Lug Stand-Up Short Socket	2	077-5101-00
9E	#2-56 X 3/8" HWH MS(Ser) TF 3/16" Hd.	2	237-5938-01	18	#89 Bulb	2	165-5000-89

Items 19--30 and Associated Parts are continued on the next page.

Right Plastic Ramp Assembly, 500-6158-00-46 (Items 1-30) *Continued* and Associated Part: Alien Baby Assy., 515-6751-00-46 (Item 31)



Take Note:

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

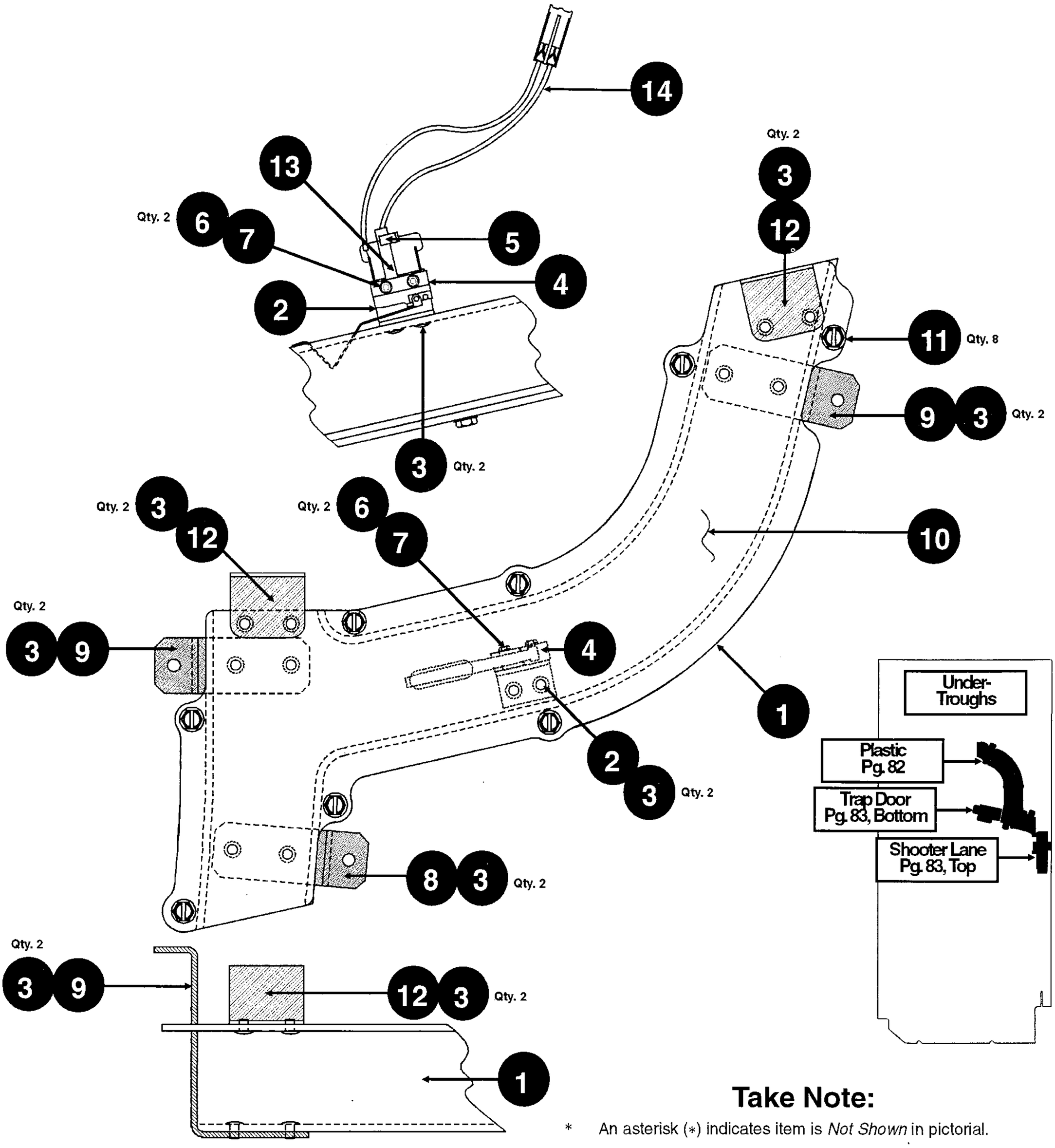
1. The table below is continued from the previous page.

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Individual Part Name	QTY.	SPI Part Nº
19	#6-32 X 1/2" PPH MS (Sems) Zinc	4	232-5202-00
20	Washer 9/64" X 5/16" OD X 1/32"	11	242-5017-00
21	Mini-Jewel Post (Clear)	3	550-5052-01
22	3/8" O.D. Black Rubber Ring	2	545-5348-19
23	#6 X 3/8" HWH AB (Zinc)	3	234-5000-00
24	Clear Butyrate - Right Ramp (-07)	1	830-5908-07
25	#6 X 1/2" PPH (Zinc)	2	237-5809-00
26	5-1/2" Cable Tie	3	040-5001-06
27	Right Ramp Decal -03	1	820-6205-03
28	Flash #F7 Cable Wiring Harness	1	036-5420-06-46
29	Switch 27 Cable Wiring Harness	1	036-5420-16-46
30	Switch 28 Cable Wiring Harness	1	036-5420-17-46

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#4 X 5/8" PFH (Black)	2	237-5833-00
Note: Above item secures this Right Ramp (@ flap) to the playfield.			
n/a *	Rt. Ramp Bottom Exit Hole Protector	1	535-8143-00
31	Alien Baby Assembly	1	515-6751-00-46
ORDERING ABOVE (ITEM 31) SUB-ASSY. PART Nº WILL INCLUDE:			
A	Alien Baby	1	545-5812-00
B	Alien Baby Cylinder	1	545-5812-01
C	#6-32 X 1-1/4" PPH MS	4	237-5508-00
D	#6 Washer	6	242-5001-00
E	#6-32 Keps Nut	8	240-5008-00
F-a	Laydown WB Socket (with notch)	2	077-5026-01
F-b	#555 Wedge Base Bulb	2	165-5002-00
G	Rubber Lite Cover - Red	2	545-5014-02
H	#6-32 X 1/2" PPH MS (Sems) Zinc	2	232-5202-00
I	Alien Tube Mounting Bracket	1	535-8131-00
J	#6-32 X 3/8" HWH Swage	2	237-5967-02
K	Alien Tube Lid	1	545-5837-00
L	Decal (Around Alien Tube) -07	1	820-6138-07
M	Decal (Alien Lid Cover) -10	1	820-6138-10
N*	Lamps 66/68 Cable Wiring Harness	1	036-5420-01-46

Plastic Under-Trough Assembly, 500-6160-00-46 (Items 1-14)



Take Note:

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

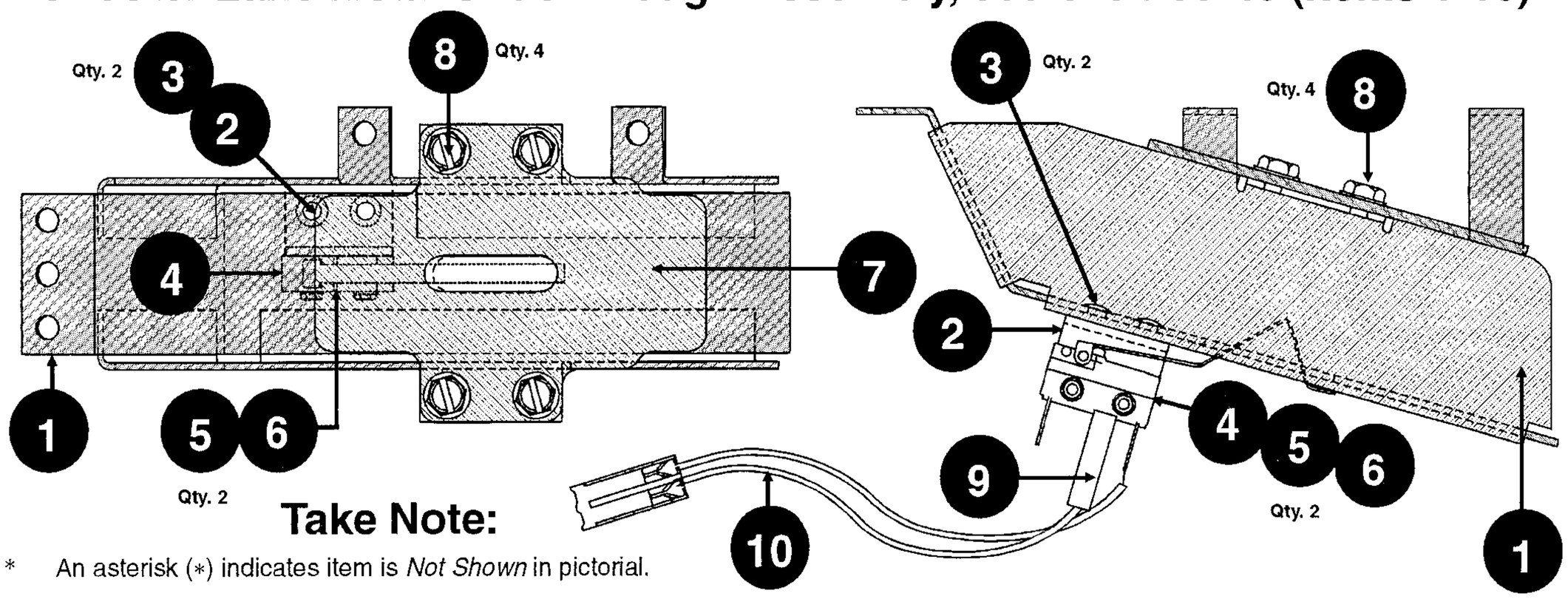
Nº	Individual Part Name	QTY.	SPI Part Nº
1	Plastic Under-Trough (Plain)	1	545-5793-00
2	Micro Switch Bracket	1	535-7319-05
3	Rivet, 1/8" ø X 3/16" Long	12	249-5001-00
4	Micro Switch (High Form)	1	180-5057-00
5	Switch Diode, 1N4001	1	112-5001-00
6	#2-56 X 1/2" HWH MS (Ser) TF 3/16" Hd.	2	237-5937-01
7	Switch Body Protect Plate	1	535-6539-00
8	Mounting Bracket 2-1/2" Ht.	1	535-7764-00
9	Mounting Bracket 2-3/8" Ht.	2	535-7764-01

Nº	Individual Part Name	QTY.	SPI Part Nº
10	Clear Butyrate - Plastic Trough (-11)	1	830-5908-11
11	#6 X 3/8" HWH AB (Zinc)	8	234-5000-00
12	Trough Plate	2	535-7966-01
13	Shrink Tubing 1/8" ø X 12"	1/10	605-5002-00
14	Switch 42 Cable Wiring Harness	1	036-5420-11-46

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue)	3	234-5101-05

Shooter Lane Metal Under-Trough Assembly, 500-6194-00-46 (Items 1-10)



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	Metal Under-Trough Weldment (Plain)	1	515-6672-00
2	Micro Switch Bracket	1	535-7319-05
3	Rivet, 1/8" ø X 5/32" Long	2	249-5009-00
4	Micro Switch (High Form)	1	180-5057-00
5	#2-56 X 1/2" HWH MS (Ser) TF 3/16" Hd.	2	237-5937-01
6	Switch Body Protect Plate	1	535-6539-00
7	Clear Butyrate - Metal Trough (-10)	1	830-5908-10

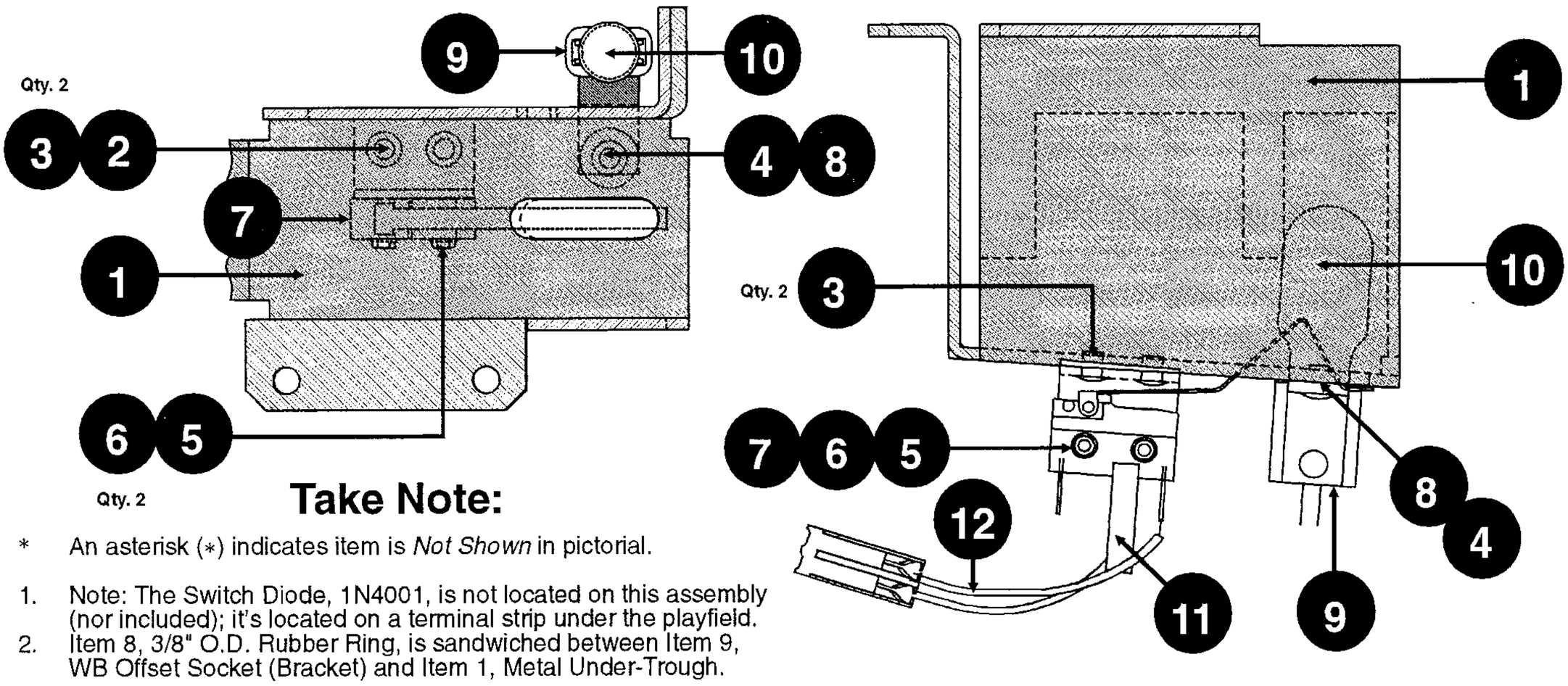
Nº	Individual Part Name	QTY.	SPI Part Nº
8	#6 X 3/8" HWH Swage (Serr) Zinc	4	237-5976-02
9	Shrink Tubing 1/8" ø X 12"	1/10	605-5002-00
10	Ball Shooter Cable Wiring Harness	1	036-5420-21-46

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue)	5	234-5101-05

Note: Above item secures this Under-Trough to the playfield.

Trap Door Metal Under-Trough Assembly, 500-6195-00-46 (Items 1-12)



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.
2. Item 8, 3/8" O.D. Rubber Ring, is sandwiched between Item 9, WB Offset Socket (Bracket) and Item 1, Metal Under-Trough.

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Metal Under-Trough Weldment (Plain)	1	515-6658-00
2	Micro Switch Bracket	1	535-7319-05
3	Rivet, 1/8" ø X 5/32" Long	2	249-5009-00
4	Rivet, 1/8" ø X 1/4" Long	1	249-5003-00
5	Micro Switch (High Form)	1	180-5057-00
6	#2-56 X 1/2" HWH MS (Ser) TF 3/16" Hd.	2	237-5937-01
7	Switch Body Protect Plate	1	535-6539-00
8	3/8" O.D. Black Rubber Ring	1	545-5348-19

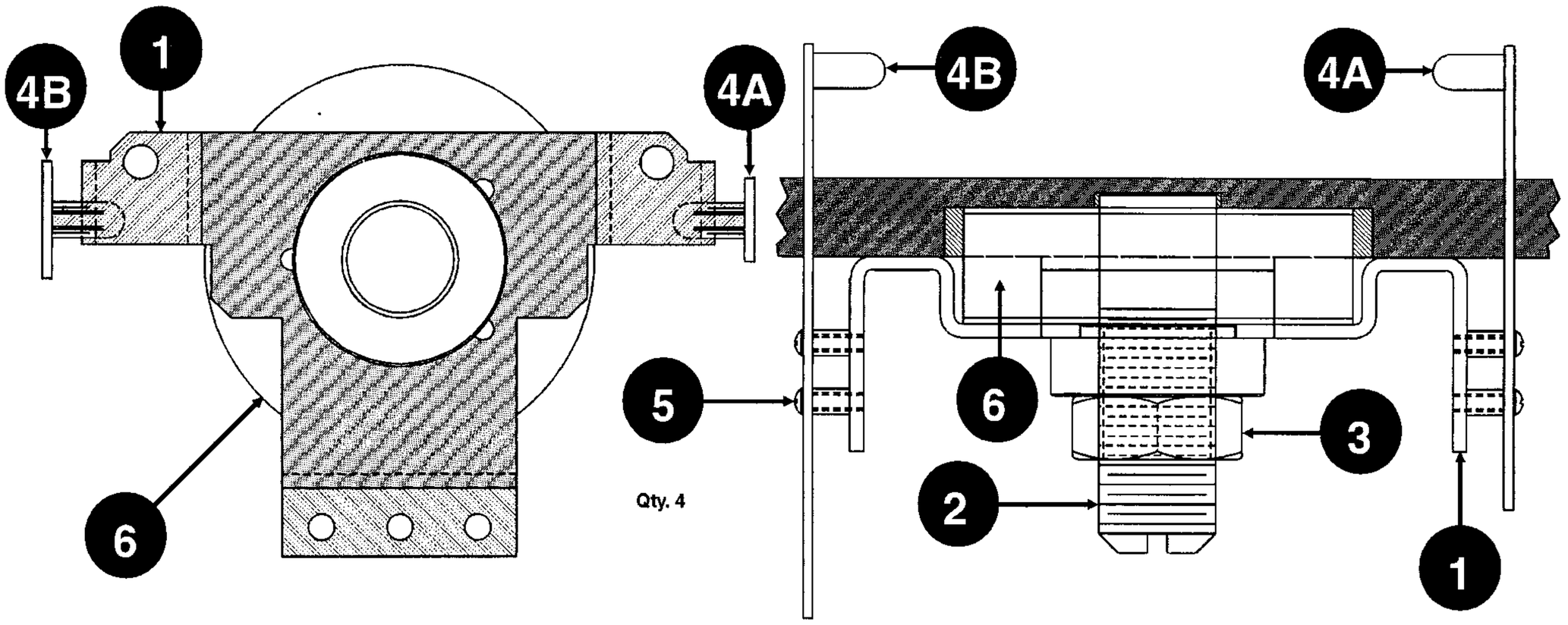
Nº	Individual Part Name	QTY.	SPI Part Nº
9	WB Offset Socket (Step-Bracket)	1	077-5029-00
10	#906 Wedge Base Bulb	1	165-5004-00
11	Shrink Tubing 1/8" ø X 12"	1/10	605-5002-00
12	Switch 41 Cable Wiring Harness	1	036-5420-18-46

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2" HWH AB (Blue)	5	234-5101-05

Note: Above item secures this Under-Trough to the playfield.

Magnet & OPTO Assembly, 500-6193-00-46 (Items 1-5) and Associated Part: Magnet (22-650), 090-5042-01 (Item 6)



Nº	Individual Part Name	QTY.	SPI Part Nº
1	Magnet Mounting Bracket	1	515-6645-01
2	Threaded Core Plug	1	530-5320-00
3	3/4"-16 Hex Nut	1	240-5315-00
4A	OPTO Transmitter (TRANS) Board	1	520-5082-00
4B	OPTO Receiver (REC) Board	1	520-5083-00
5	#4-40 X 5/8" PPH MS (Sems) Zinc	4	237-5832-00

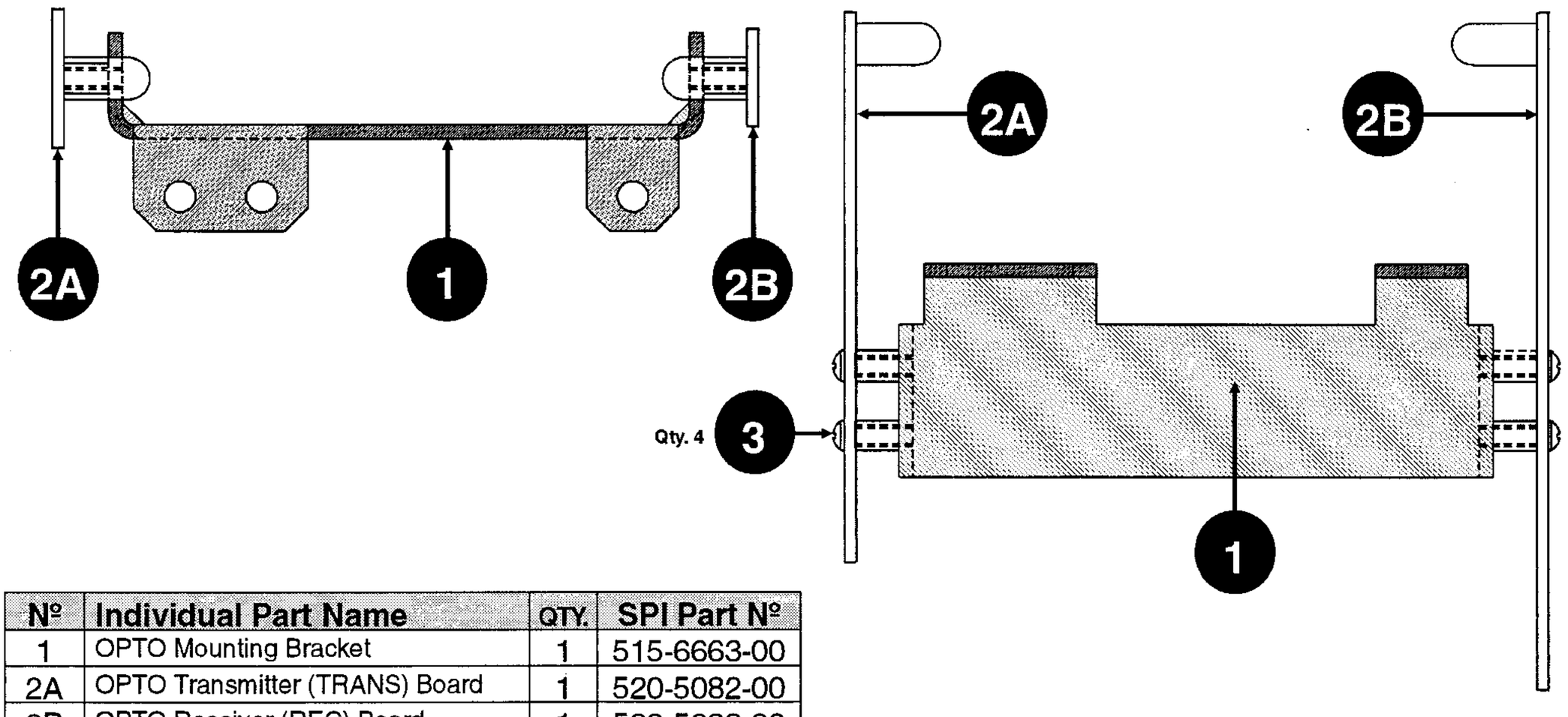
Take Note:

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

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
6	Magnet Coil, 22-650 (12" Leads)	1	090-5042-01
n/a *	#8 X 1/2 HWH MS (Sems) Zinc	5	234-5101-05
Note: Above item secures this Magnet Assy. to the playfield.			

OPTO Assembly, 515-6583-00-46 (Items 1-3)



Nº	Individual Part Name	QTY.	SPI Part Nº
1	OPTO Mounting Bracket	1	515-6663-00
2A	OPTO Transmitter (TRANS) Board	1	520-5082-00
2B	OPTO Receiver (REC) Board	1	520-5083-00
3	#4-40 X 5/8" PPH MS (Sems) Zinc	4	237-5832-00

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
n/a *	#8 X 1/2 HWH MS (Sems) Zinc	5	234-5101-05
Note: Above item secures OPTO Assy. to the playfield.			

Take Note:

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

Section 5
Schematics & Troubleshooting

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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 Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	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	24-940 090-5036-00B
#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	23-800 090-5001-00B
#4	NOT USED	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	N/C	N/C	NOT USED
#5	NOT USED	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	YEL-VIO	N/C	N/C	NOT USED
#6	NOT USED	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	N/C	N/C	NOT USED
#7	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	N/C	N/C	NOT USED
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	N/A

High Current Coils Group 2		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#9	TOP TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#10	BOTTOM TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#11	RIGHT 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	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#14	MAGNET	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	VIO-YEL	J10-P3	50v DC	22-650 090-5042-01
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	22-1080 090-5032-00T

Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Coil GA/Turn or Bulb Type
#17	TRAP DOOR	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	22-1080 090-5032-00T
#18	RAMP DIVERTER	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v DC	32-1800 090-5031-02
#19	ORBIT DIVERTER	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	BRN	J7-P1	20v DC	27-1500 090-5004-00B
#20	NOT USED	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	N/C	N/C	NOT USED
#21	FILE CABINET MOTOR	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	Motor 041-5057-00
#22	FLASH TOP-MID *2	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#23	FLASH TRAPDOOR *1	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	ORG	J6-P10	20v DC	#906 Bulb 165-5004-00
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	5v Meter (If Required)

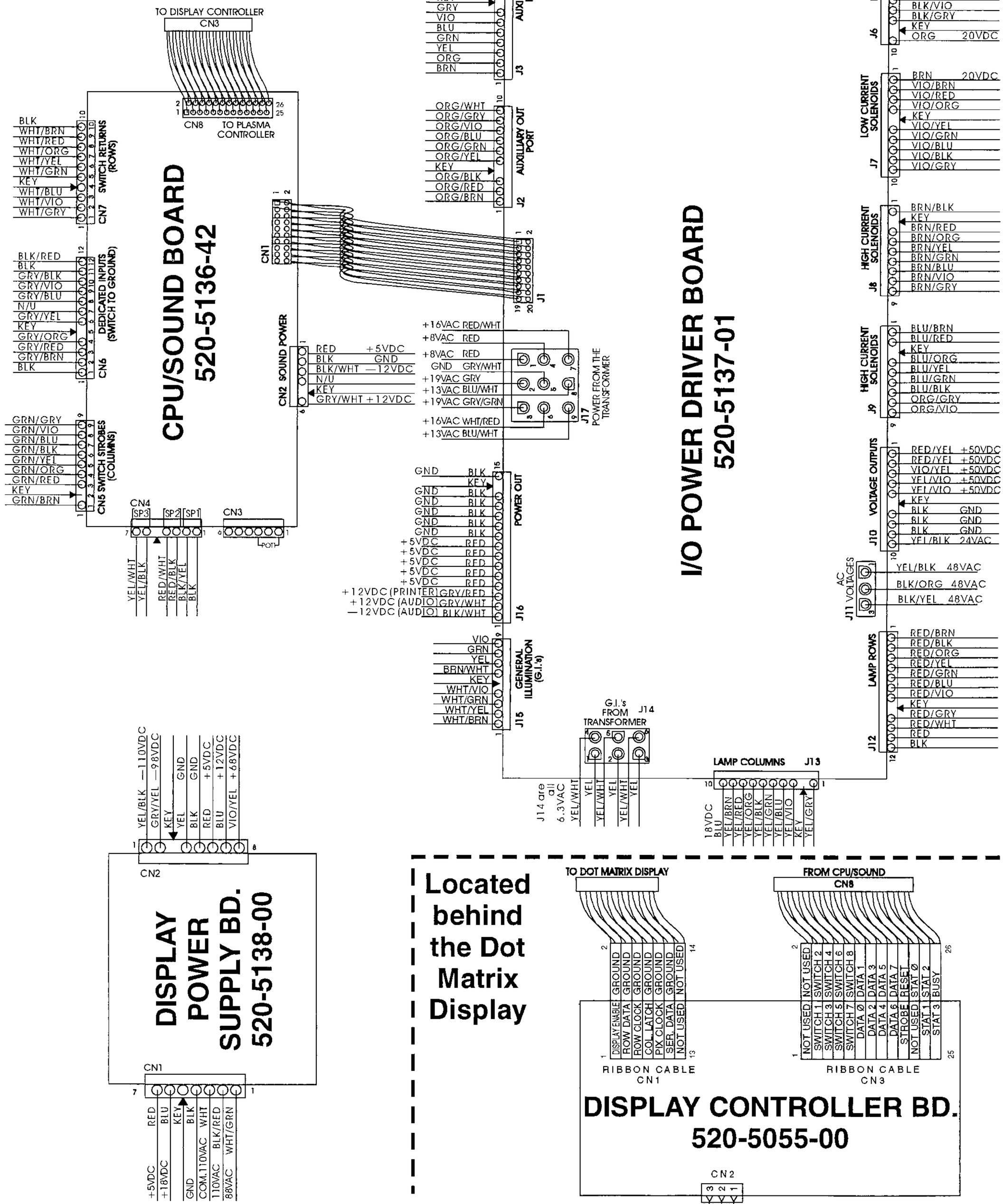
Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Ouput Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connnection	Power Voltage	Bulb Type
#F1	FLASH RT RAMP TOP *1	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F2	FLASH POPS *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F3	FLASH LT RAMP *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F4	FLASH BOT LT *2	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F5	FLASH BOT RT *1	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F6	FLASH RT RAMP TOP *1	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F7	FLASH RT RAMP BOT *1	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
#F8	FLASH MINI-LOOP *1	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89

Backbox Wiring

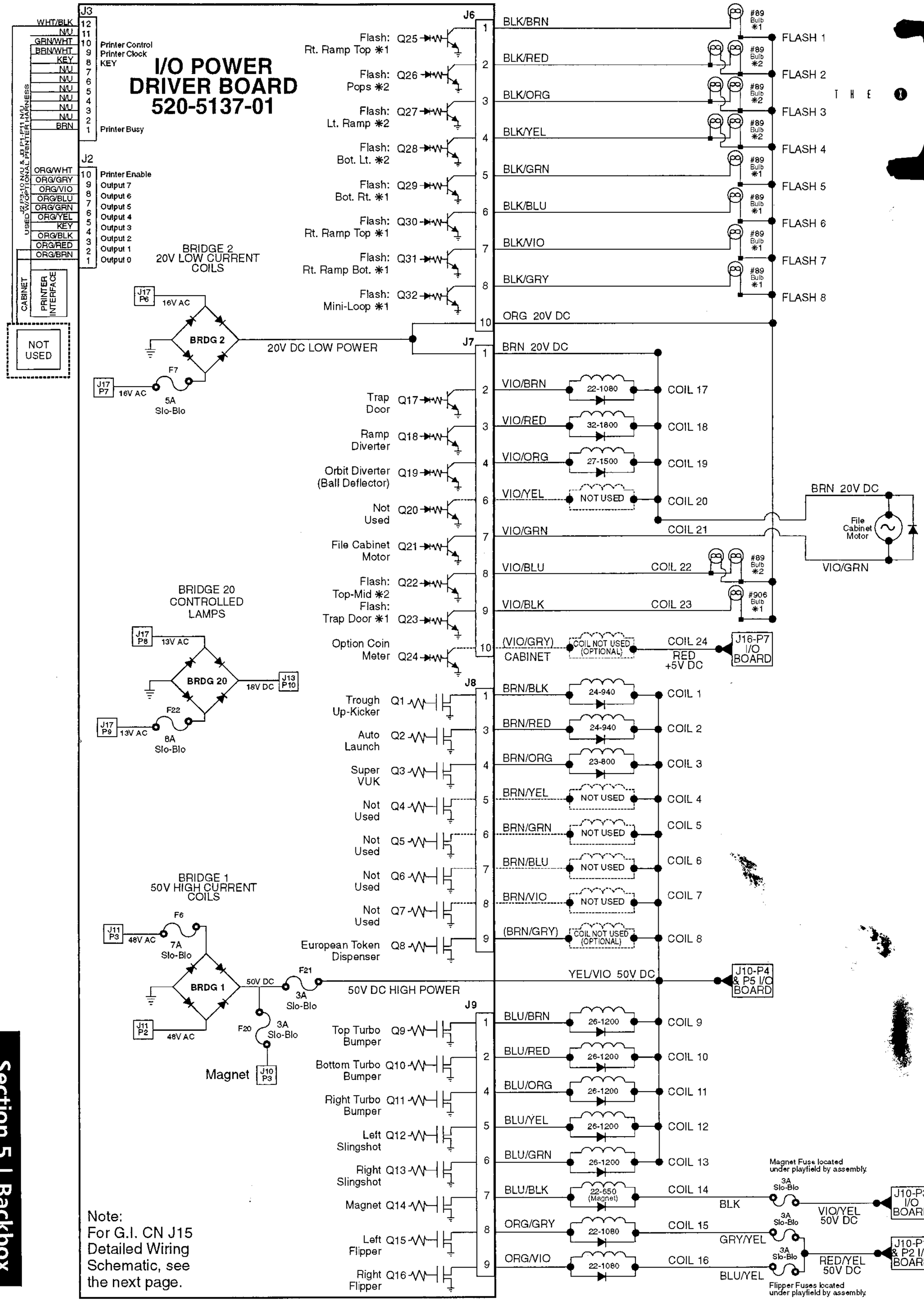
Backbox Board Layout Wiring Diagram

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.

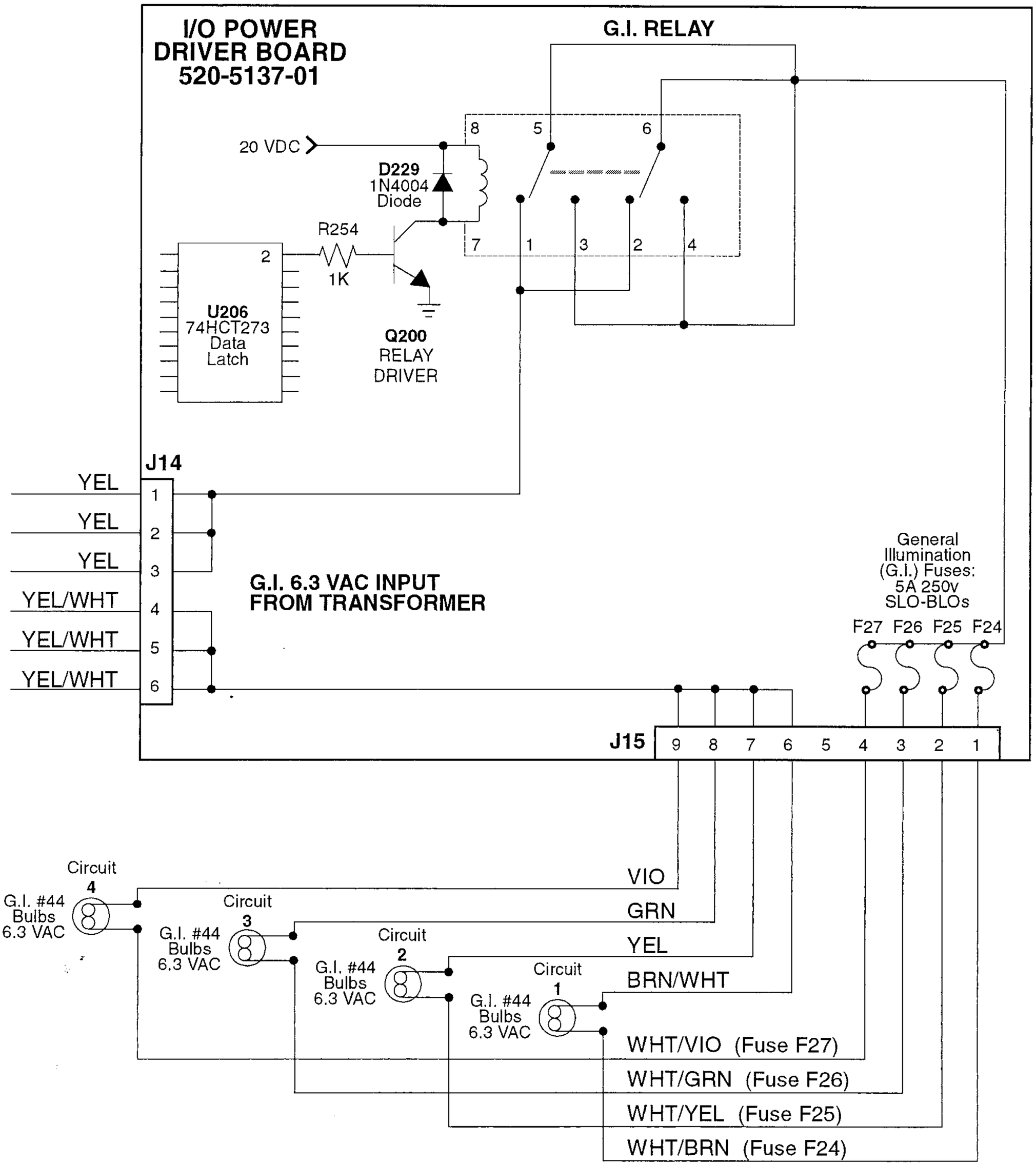


Backbox I/O Power Driver Board Detailed Wiring Diagram



Playfield Wiring

General Illumination Detailed Wiring Diagram



G.I. Bulb General Location
(Strings Noted by Fuse & Wire Colors):

Circuit 1: F24
J15-P6 to J15-P1:
BRN/WHT to WHT/BRN
Loc.: Playfield Upr. Rt.

Qty.: 13 Ea. #44 Bulbs

Circuit 2: F25
J15-P7 to J15-P2
YEL to WHT/YEL
Loc.: Playfield Left

Qty.: 16 Ea. #44 Bulbs

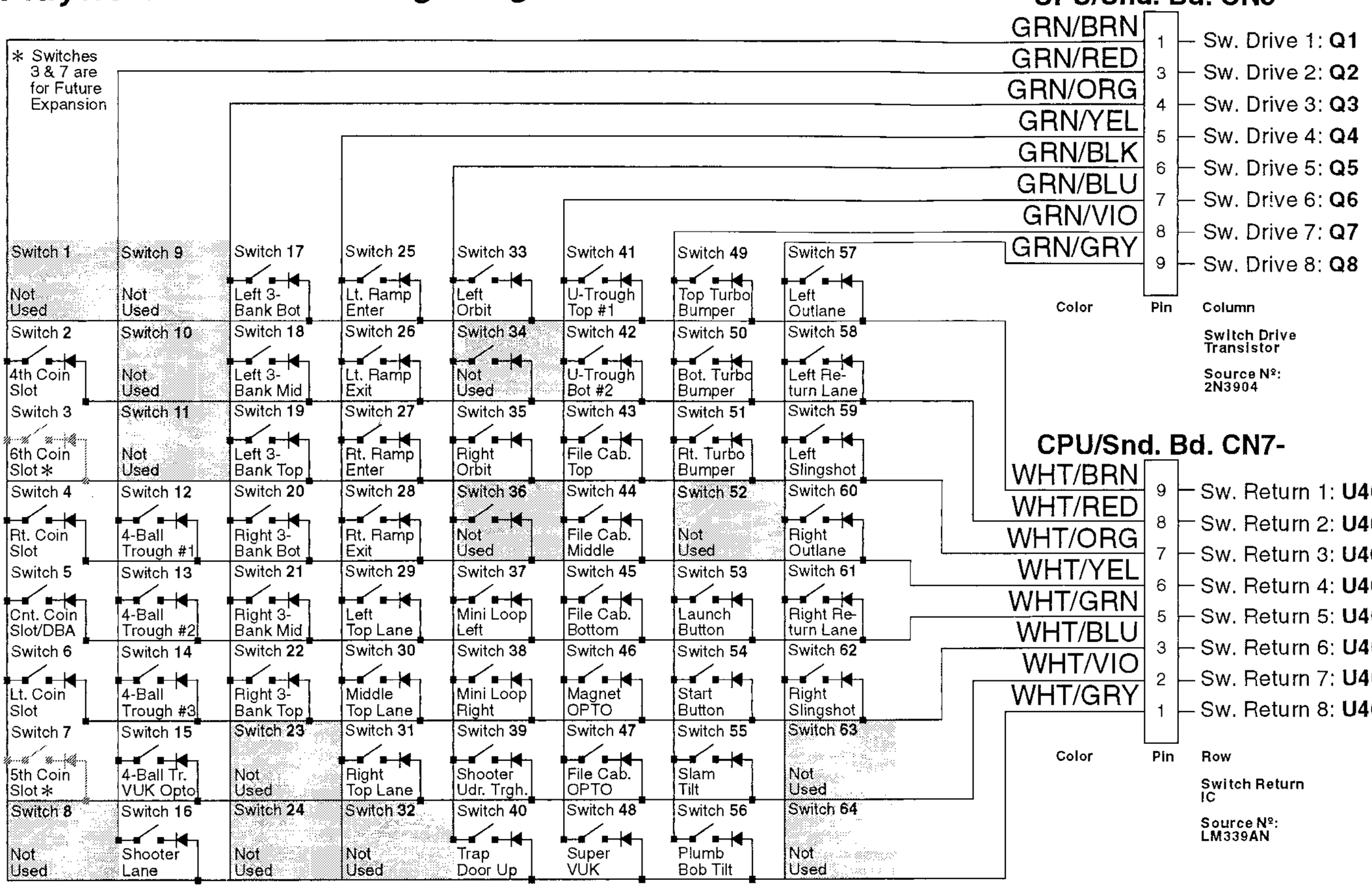
Circuit 3: F26
J15-P8 to J15-P3
GRN to WHT/GRN
Loc.: Playfield Rt.
and Coin Door

Qty.: 11 Ea. #44 Bulbs

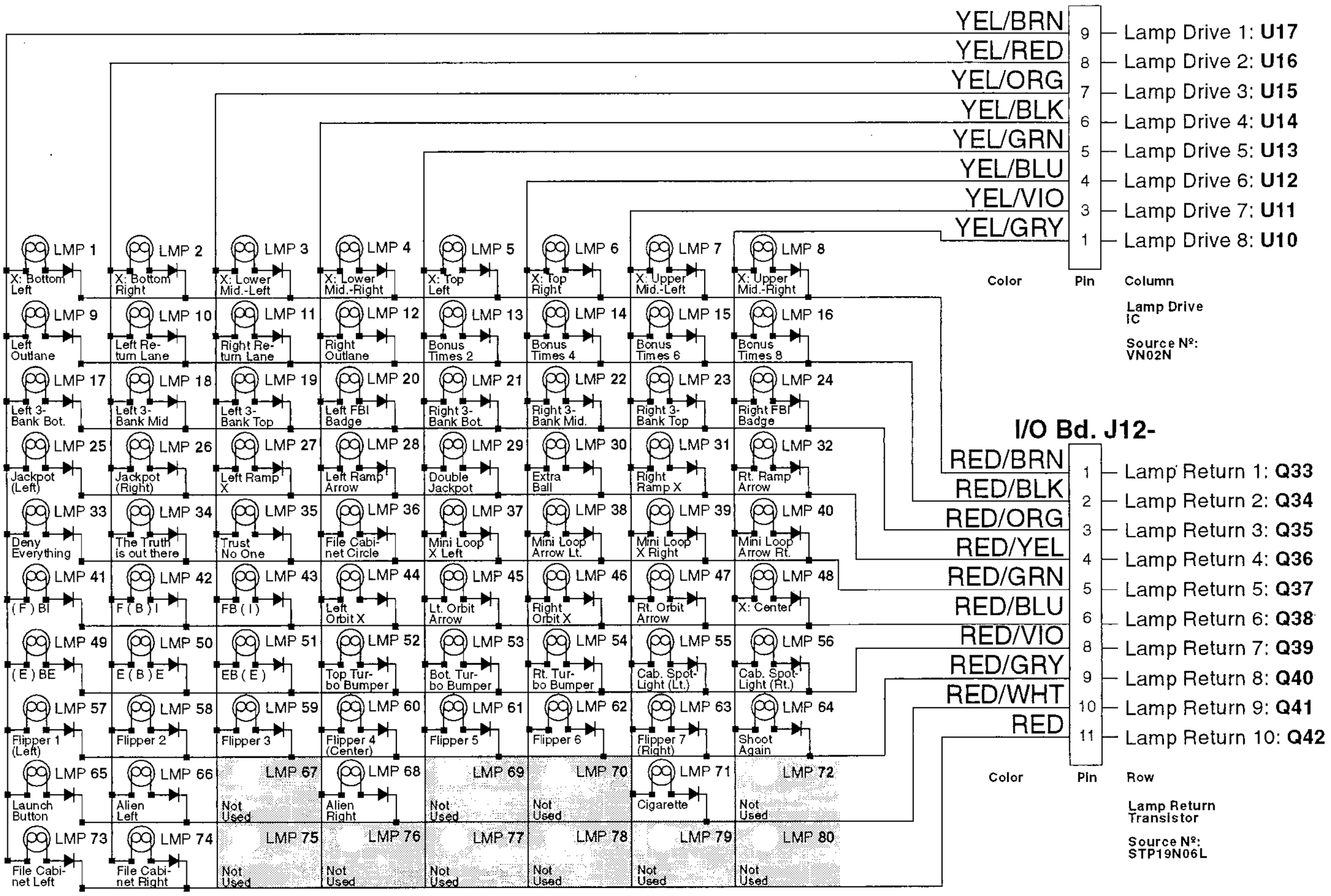
Circuit 4: F27
J15-P9 to J15-P4
VIO to WHT/VIO
Loc.: Playfield Upr. Lt.

Qty.: 9 Ea. #44 Bulbs

Playfield Switch Wiring Diagram

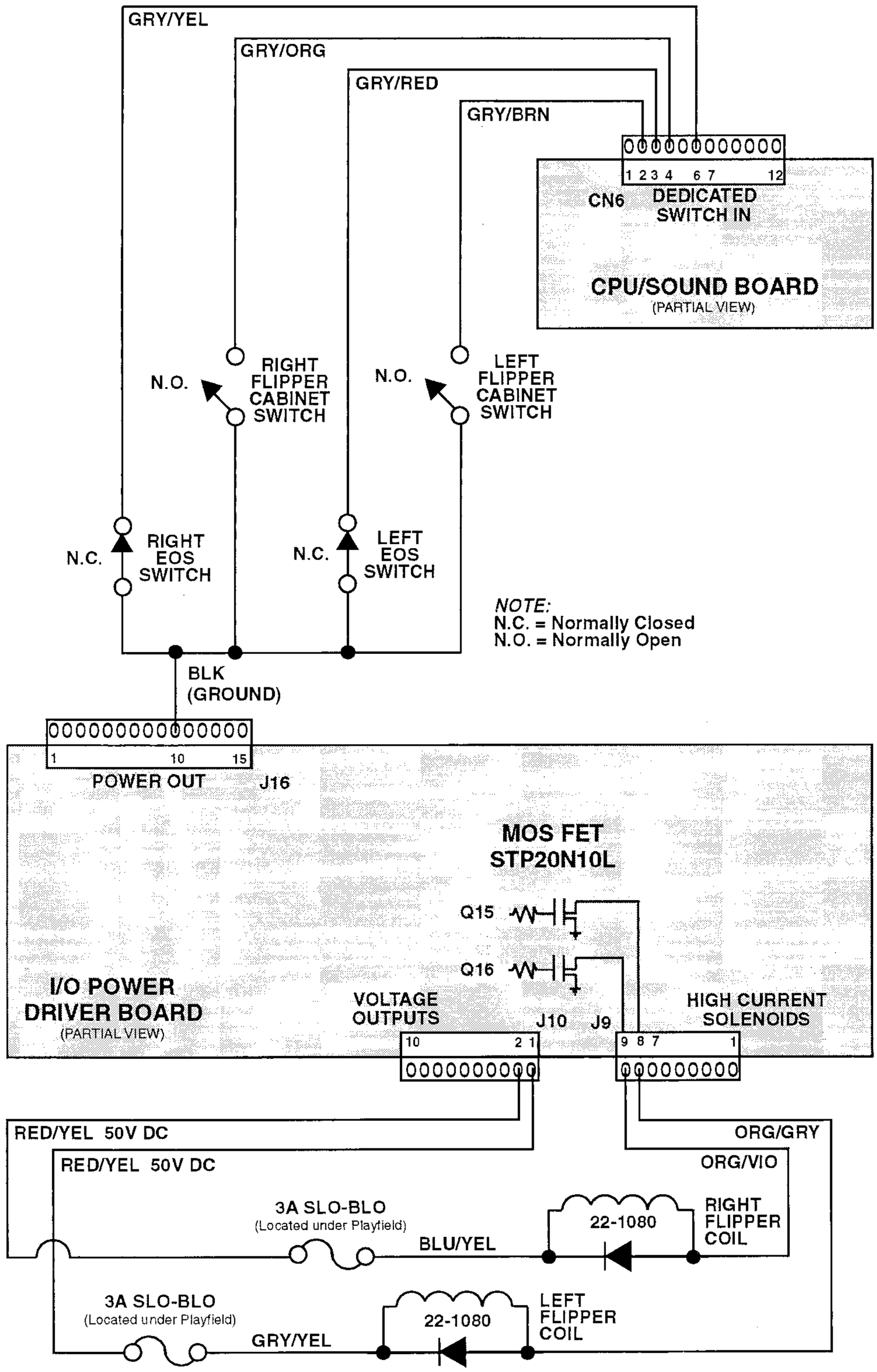


Playfield Lamp Wiring Diagram



2-Flipper Circuit Wiring Diagram

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



Technical Overview

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

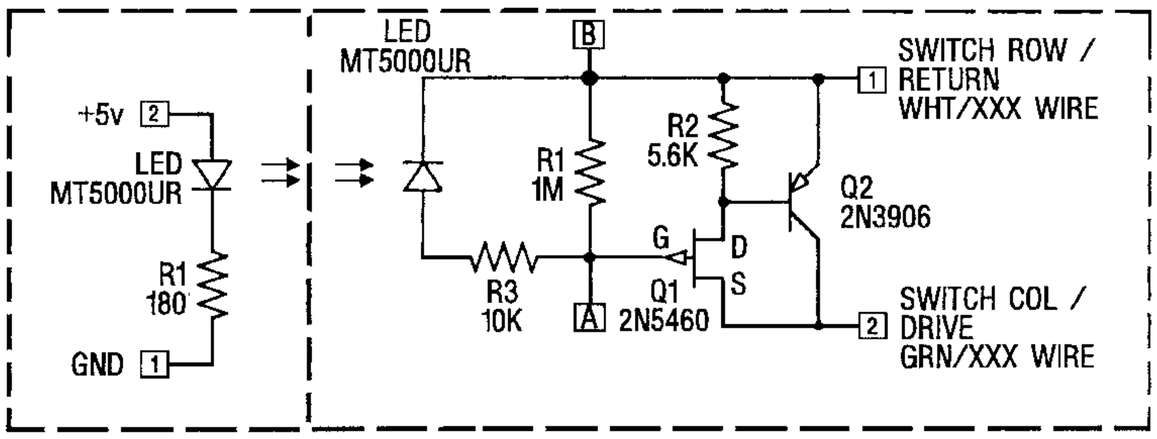
The **E.O.S.** (End-Of-Stroke) **Switch** serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The **E.O.S. Switch** is a normally closed switch which opens approximately a 1/16" when the flipper is energized. The **Game CPU** will detect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

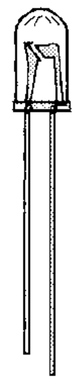
Trough Up-Kicker OPTO
Theory of Operation & Schematic

Theory of Operation

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

Fig. 1





TAKE NOTE:
LED MT5000UR
(Ultra Bright Red)
Sega Pinball Part №
165-5100-00

Troubleshooting

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

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

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

2. Oscilloscope Test (indicates normal operating condition):

Fig. 2A

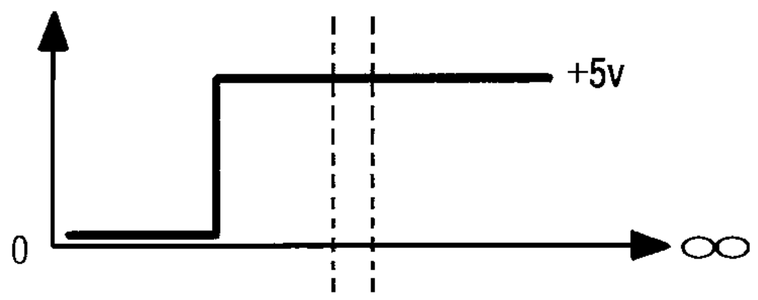
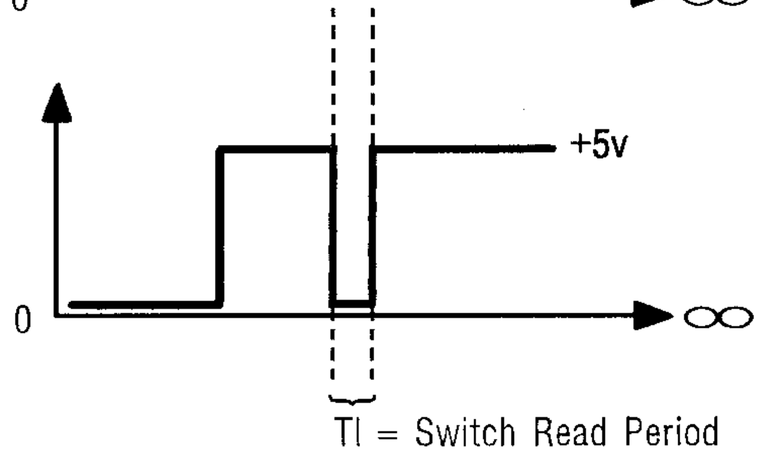


Fig. 2B



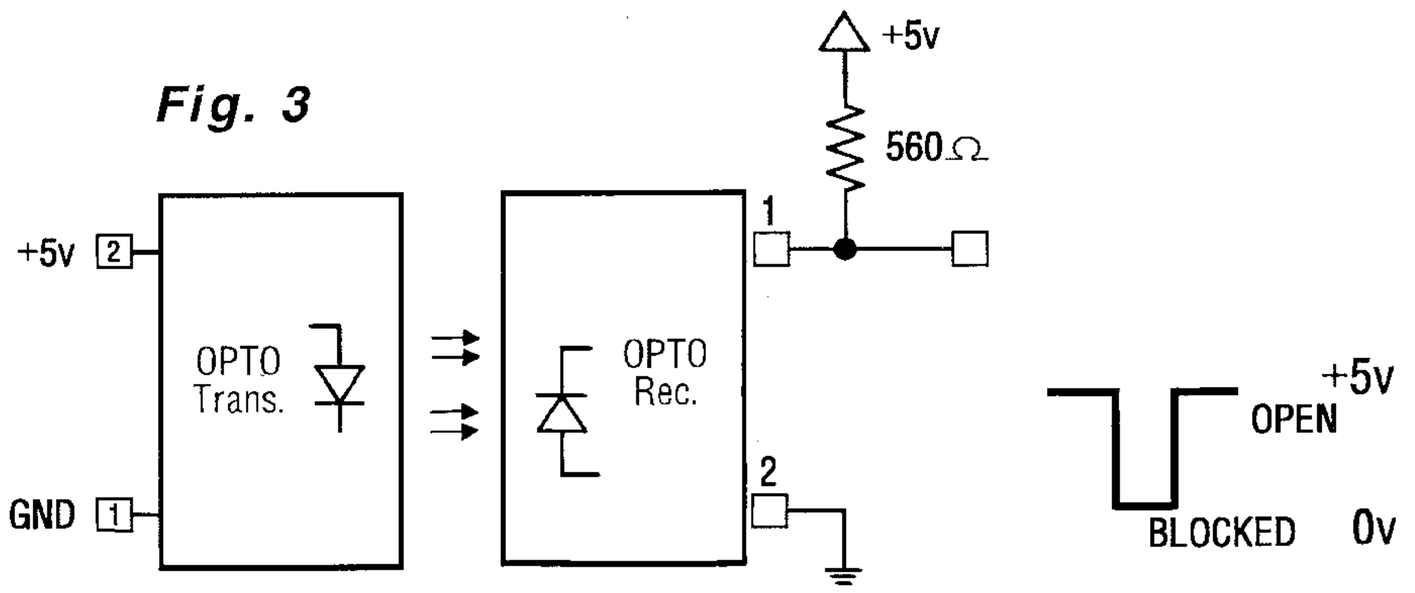
A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (See Fig. 1). The Scope should display a **STEADY +5v** as shown in Fig. 2A, Wave Form Diagram.

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

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

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

Fig. 3

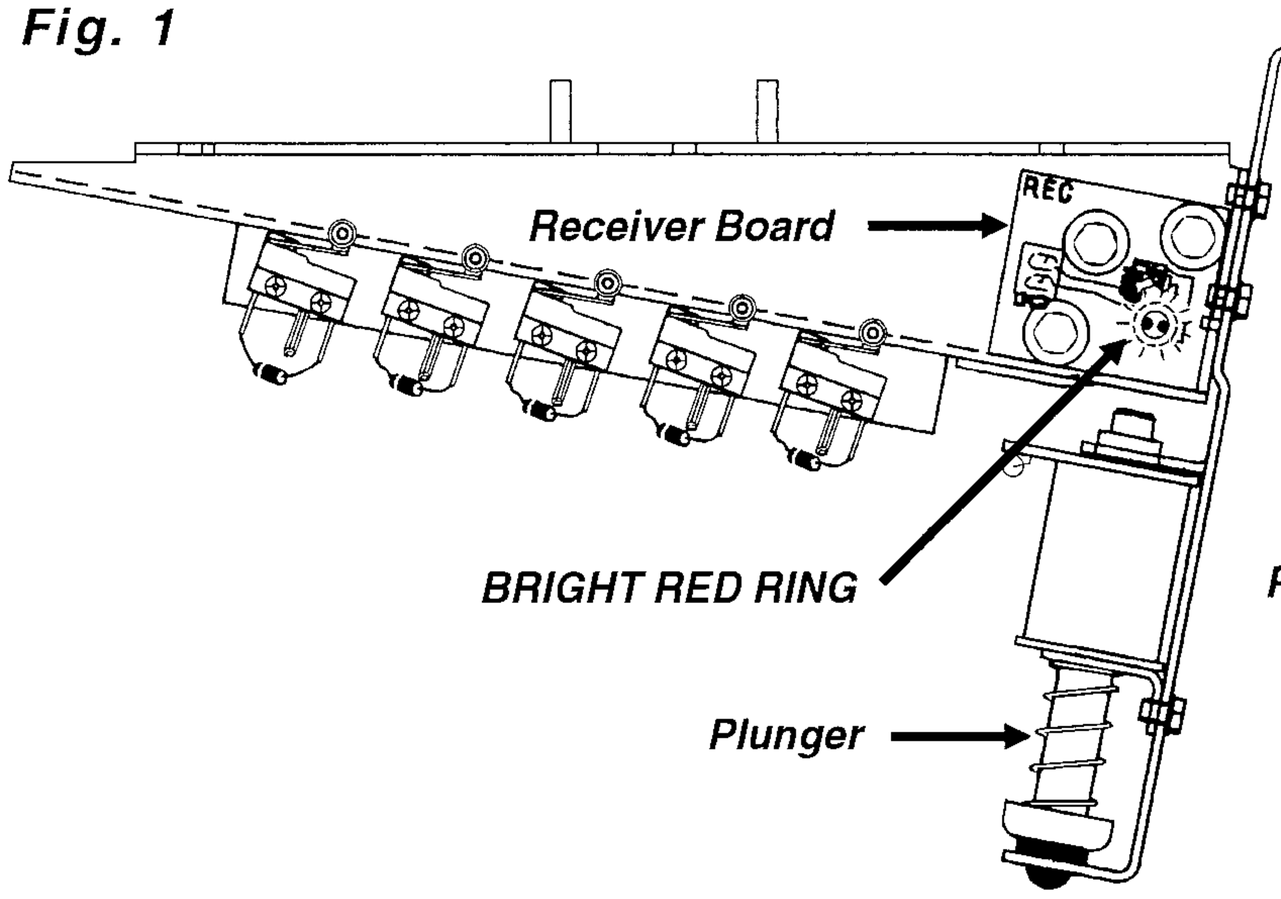


Single Trough OPTO Alignment / Test

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

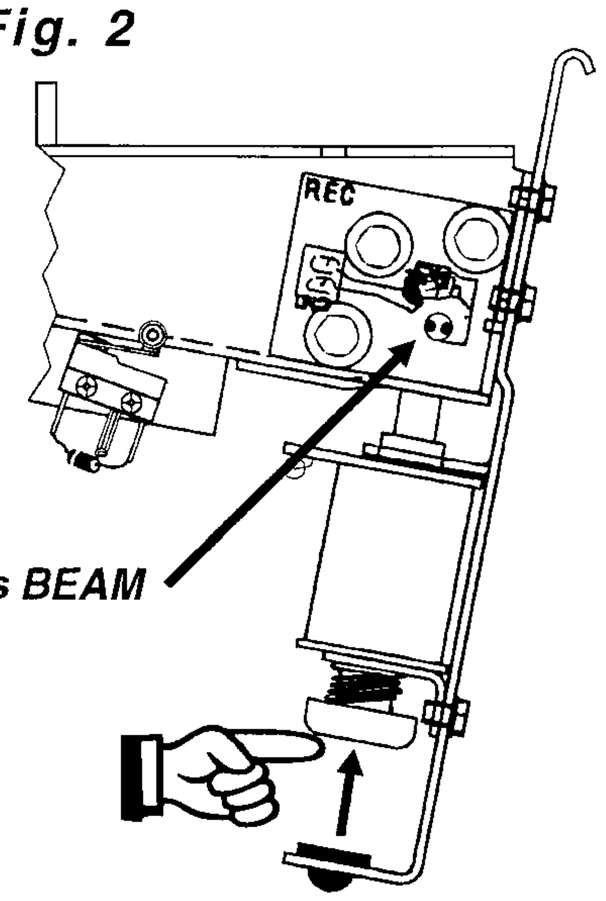
View facing trough (with playfield in Service Position #1)

Fig. 1



Lift plunger to check switch as shown.

Fig. 2



Sectional view from right

Fig. 3a

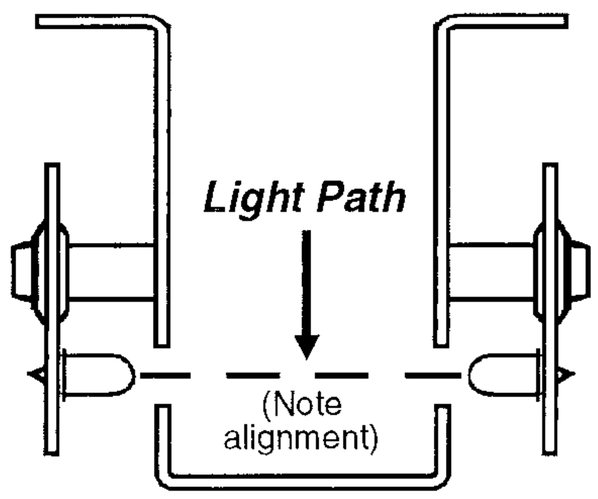
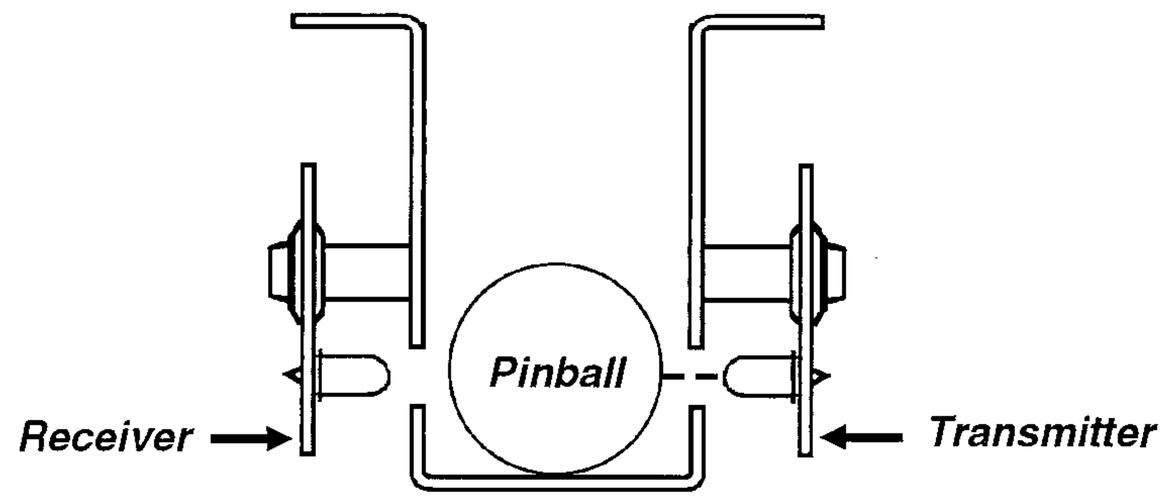


Fig. 3b



I M P O R T A N T

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

Fig. 4a

Correct Position

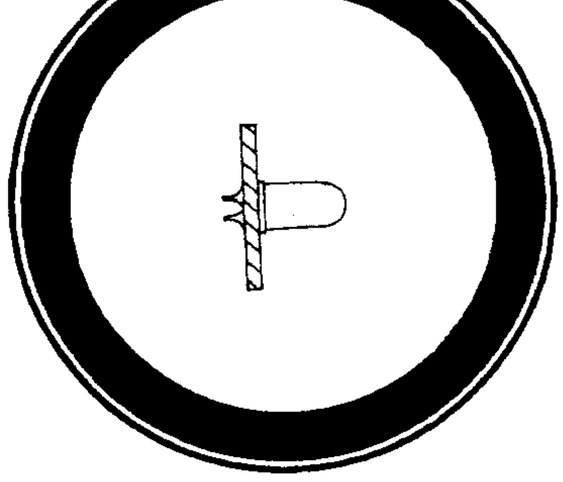
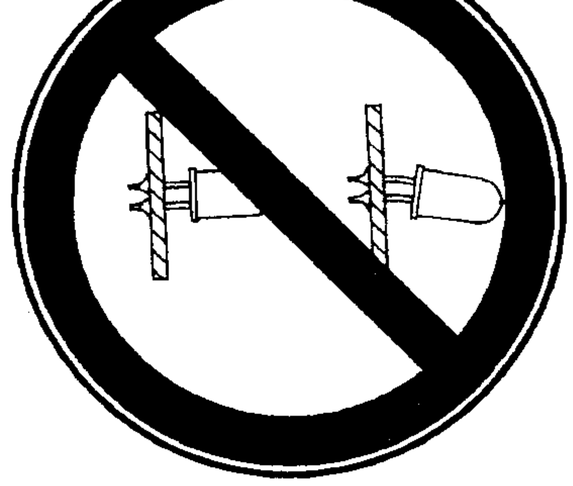


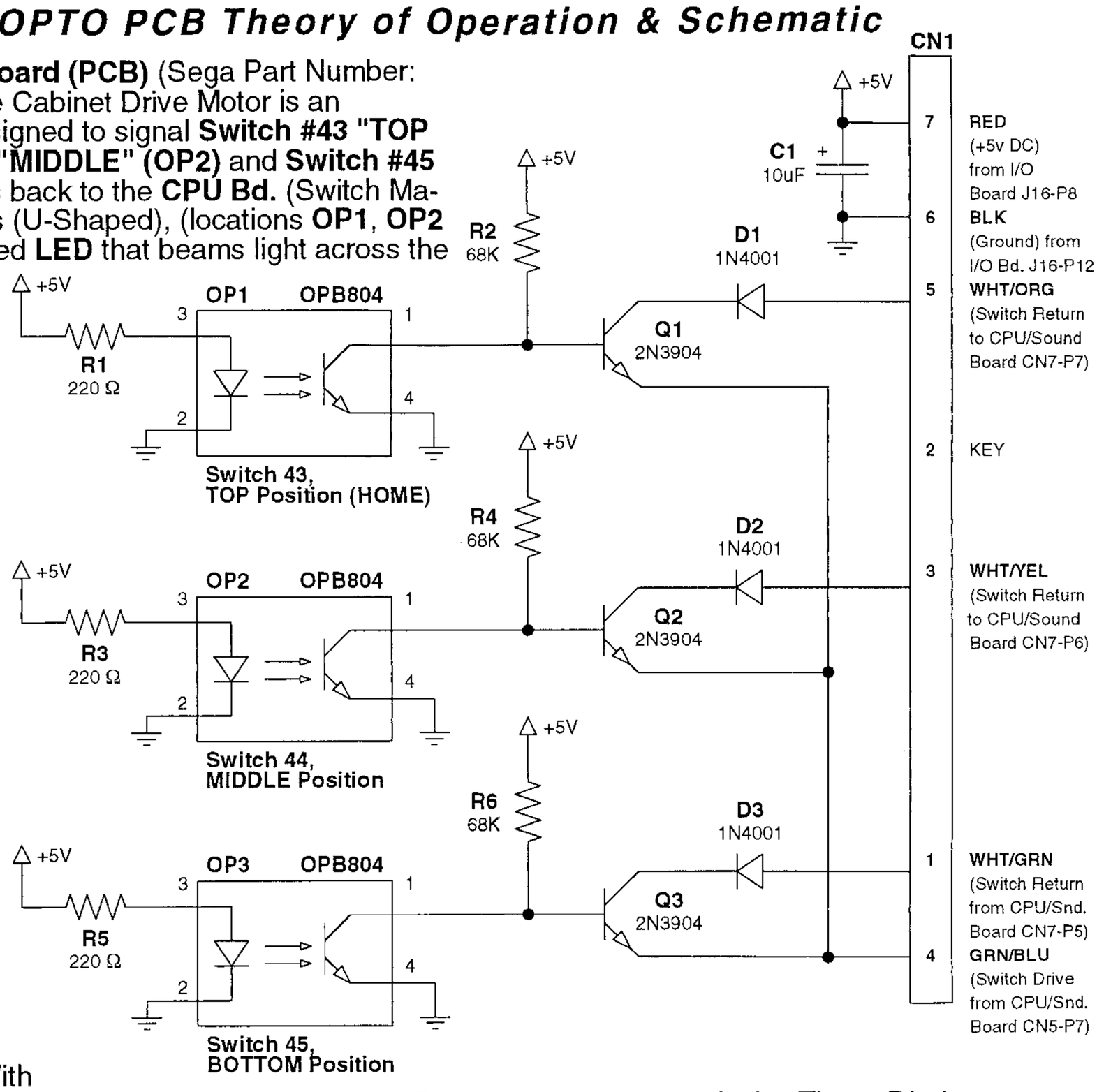
Fig. 4b

Incorrect Position



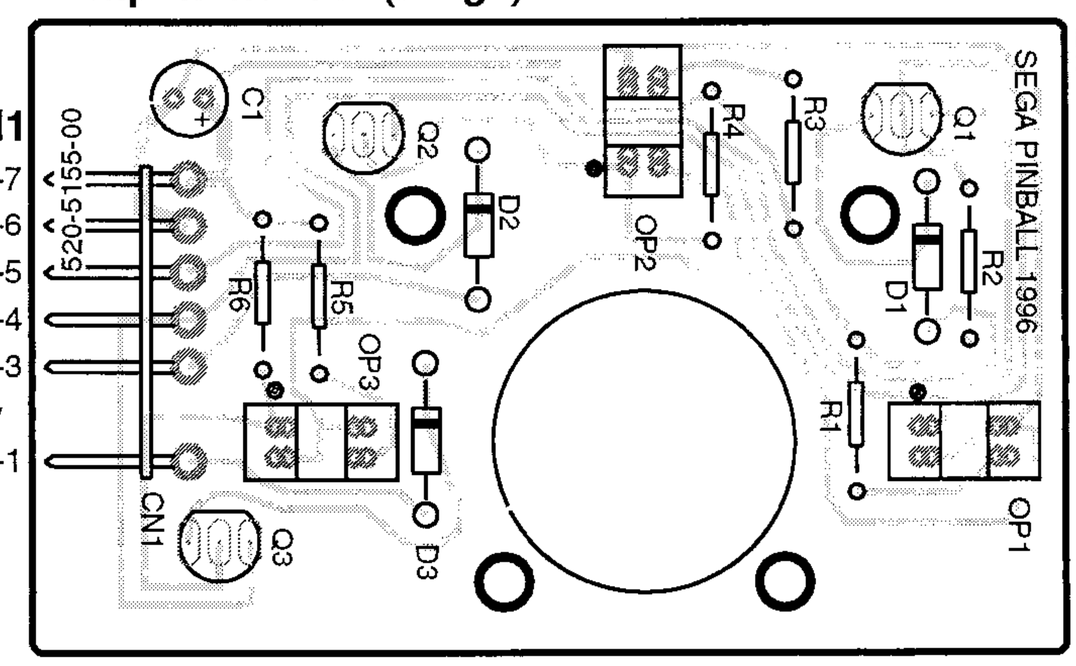
File Cabinet Motor OPTO PCB Theory of Operation & Schematic

This **OPTO Printed Circuit Board (PCB)** (Sega Part Number: 520-5155-00) used on the File Cabinet Drive Motor is an ordinary Photo-Interrupter designed to signal **Switch #43 "TOP (HOME)" (OP1)**, **Switch #44 "MIDDLE" (OP2)** and **Switch #45 "BOTTOM"** Cabinet Positions back to the **CPU Bd.** (Switch Matrix Grid). The slotted OPTO's (U-Shaped), (locations **OP1**, **OP2** & **OP3**), contain a small infrared **LED** that beams light across the slot to an **NPN Phototransistor**. This causes the **Phototransistor** to *conduct* and *pulls down the voltage* at the base of **Q1**, **Q2** and **Q3** (Transistors 2N3904) to **.3v** *or less.* **Q1**, **Q2** and **Q3** require the Base-Emitter Drop Voltage (**.7v**) **plus** the Switch Drive Drop (**.1v**) to *conduct,* and since **.3v** *is less* than this **.8v**, **Q1**, **Q2** and **Q3** stays off when the *Switch Matrix Strobe* (on Pin-4 of CN1) polls them. If the Metal Flag Bracket (riveted on the CAM) of the Motor Shaft breaks the beam in the **OPTO Slot**, the **NPN Phototransistors** *stay off,* and the *base voltages* on associated 2N2904 Transistor is **pulled to .8v** during the *Switch Strobe* by the 68KΩ 1/4W Resistors (this base voltage will actually be higher when the switch is not being polled). With the **.8v** applied to the bases, **Q1**, **Q2** and **Q3** conduct through **D1**, **D2** and **D3**, respectively. These Diodes (1N4001) prevent certain kinds of *Matrix-Related leakages* which show up as a "Phantom Switch" that completes the corners of a square in the Matrix with three (3) Real Activated Switches comprising the other three (3) corners.

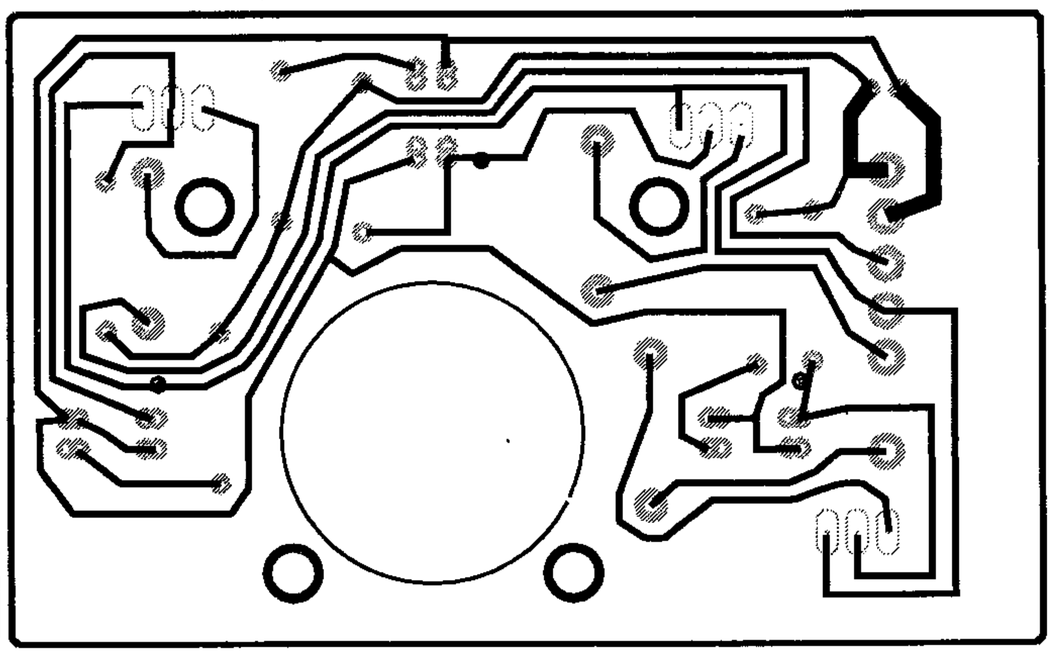


File Cabinet Drive Motor OPTO PCB Component Layout & Parts

Component Side (Beige)



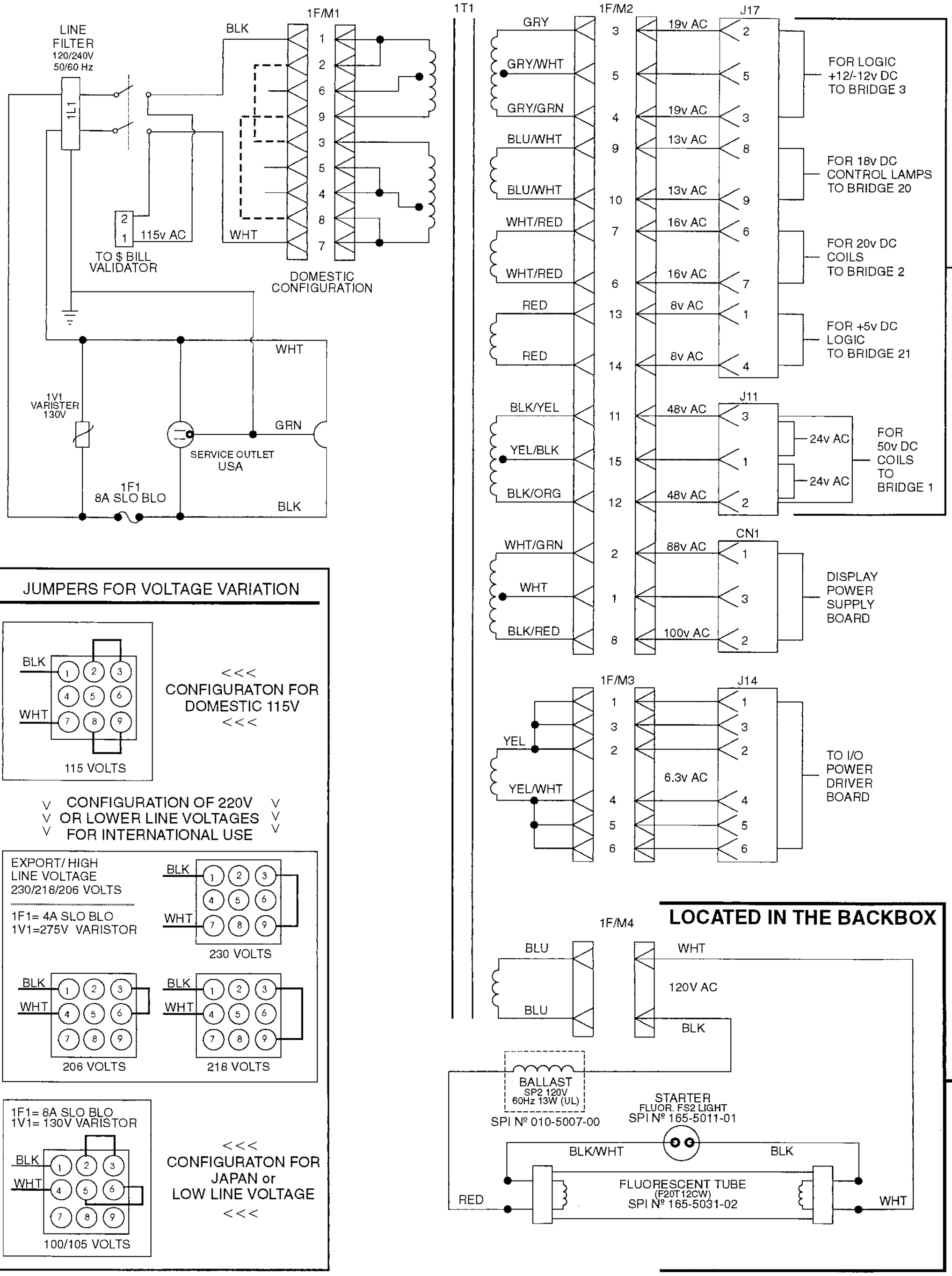
Solder Side (Green)



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5155-00	—	Complete PCB Assembly
1	2	165-5036-00	OP1, OP2, OP3	SLOTTED OPTO OPB804 REC/TRANS
2	2	112-5001-00	D1, D2, D3	DIODE 1N4001
3	2	121-5014-00	R1, R3, R5	220Ω 1/4W RESISTOR 5%
4	2	121-5035-00	R2, R4, R6	68KΩ 1/4W RESISTOR 5%
5	1	125-5017-00	C1	10uf, 16V RADIAL ELECTROLYTIC CAP. (Panasonic ECE-A1VU100 (35v) or eqv.)
6	2	110-0069-00	Q1, Q2, Q3	TRANSISTOR 2N3904
7	1	045-5009-07	CN1	CONN: 7X1 .156" HEADER

Cabinet Wiring

Transformer Power Wiring Diagram



JUMPERS FOR VOLTAGE VARIATION

<<< CONFIGURATON FOR DOMESTIC 115V <<<

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

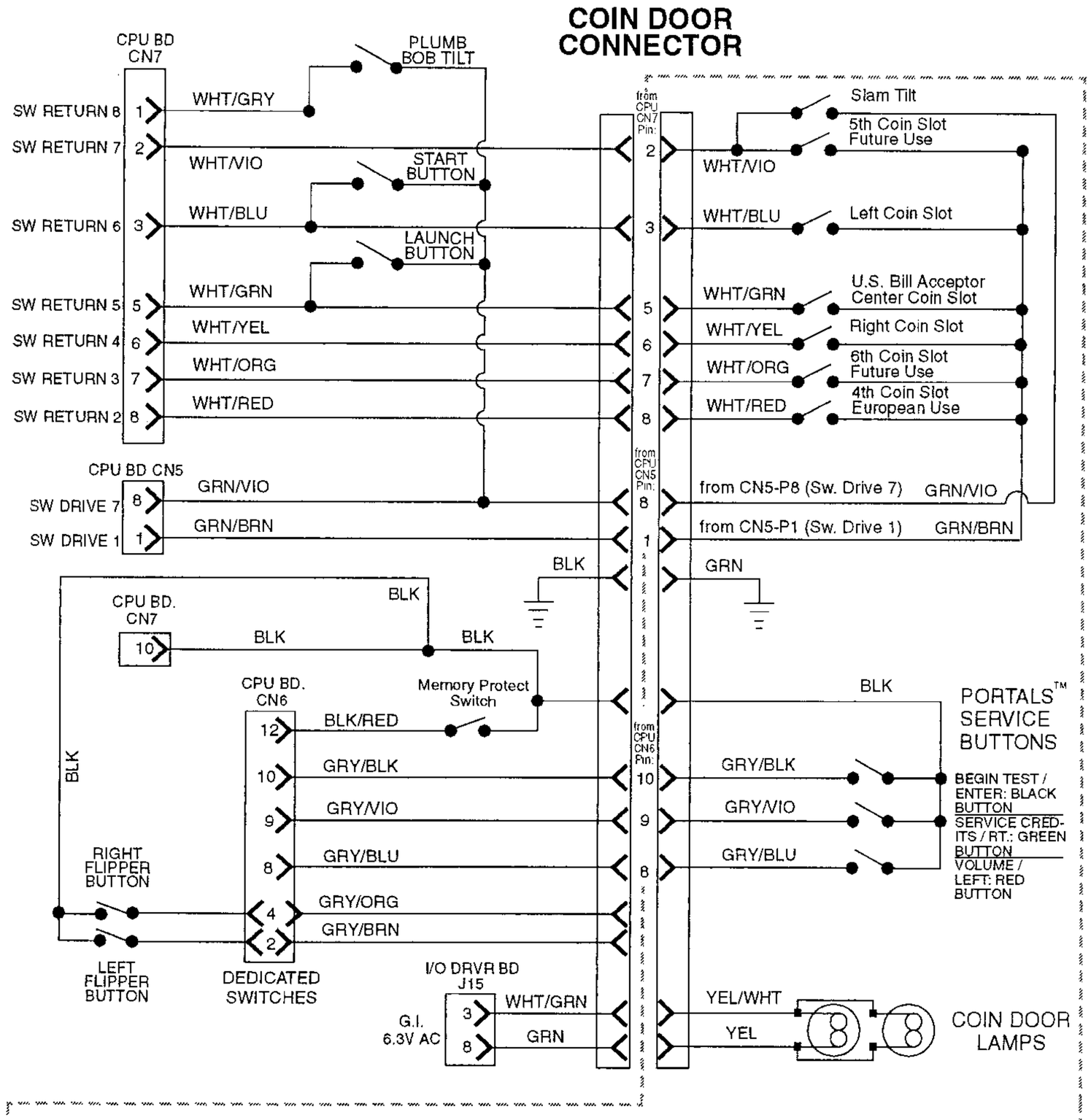
EXPORT/ HIGH LINE VOLTAGE
230/218/206 VOLTS

1F1= 4A SLO BLO
1V1=275V VARISTOR

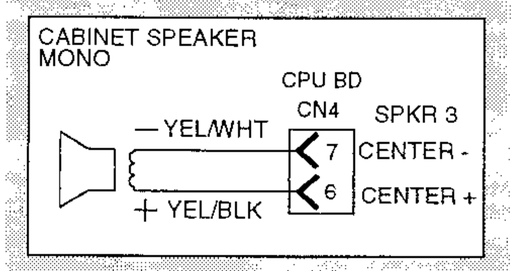
1F1= 8A SLO BLO
1V1= 130V VARISTOR

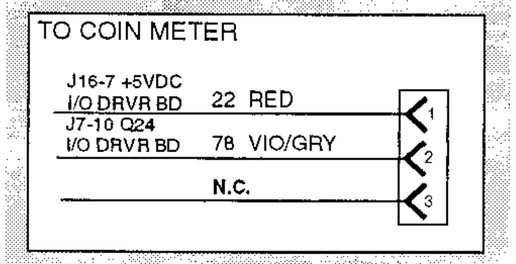
<<< CONFIGURATON FOR JAPAN or LOW LINE VOLTAGE <<<

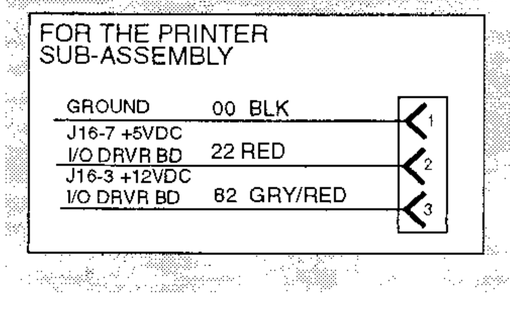
Cabinet/Coin Door Wiring Diagram

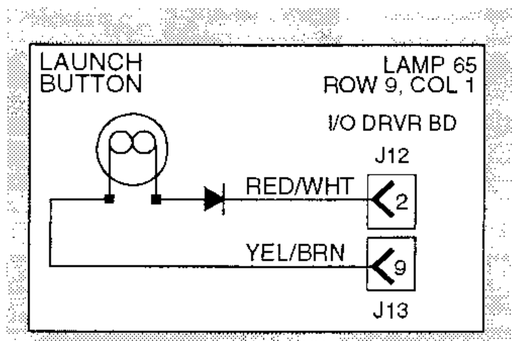


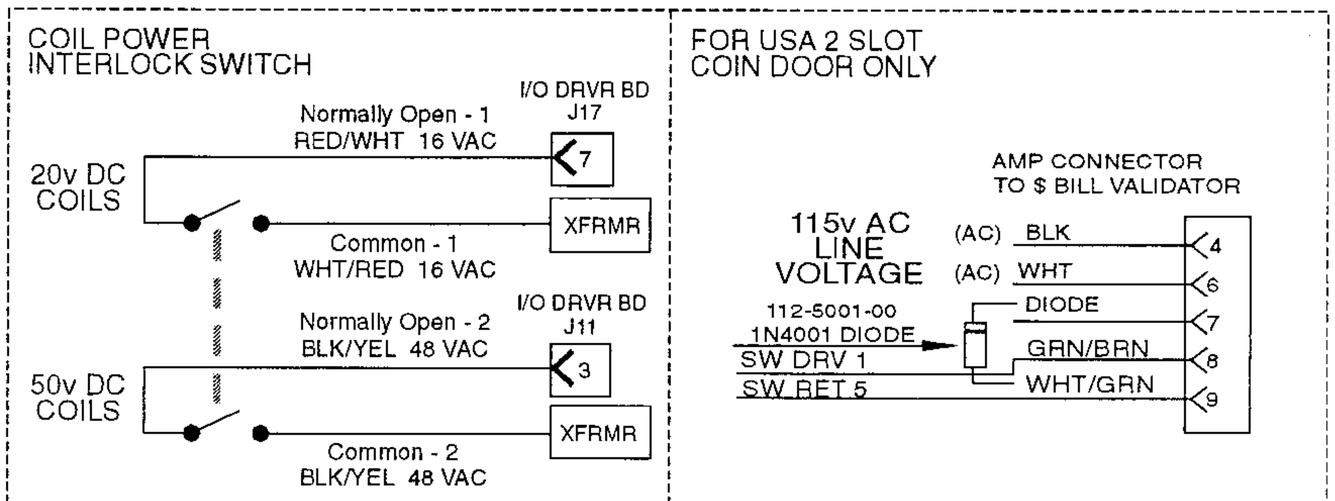
CABINET HARNESSES:

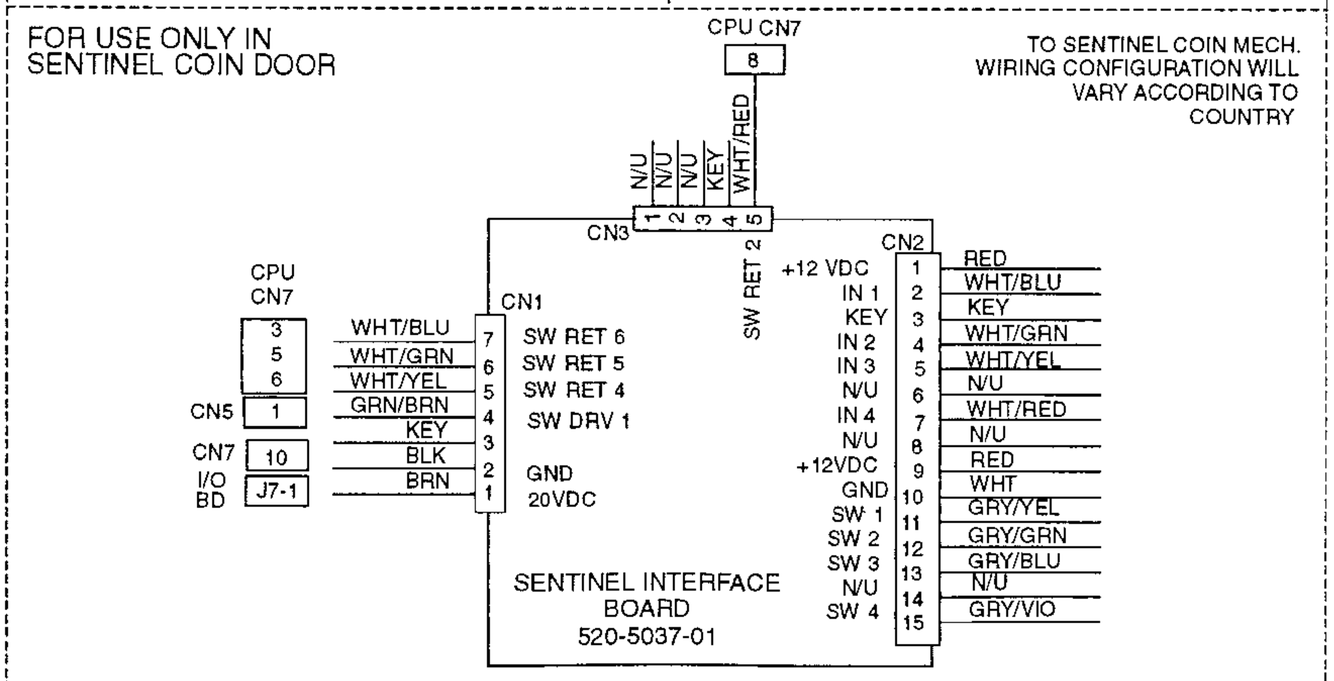








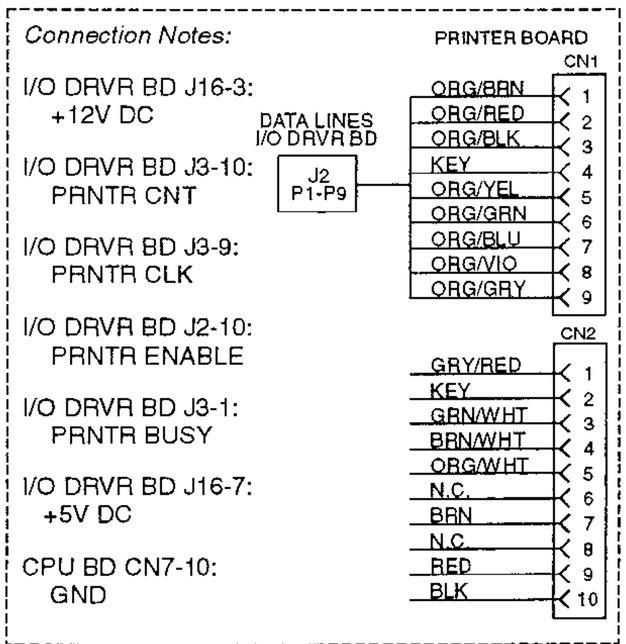




COIN DOOR

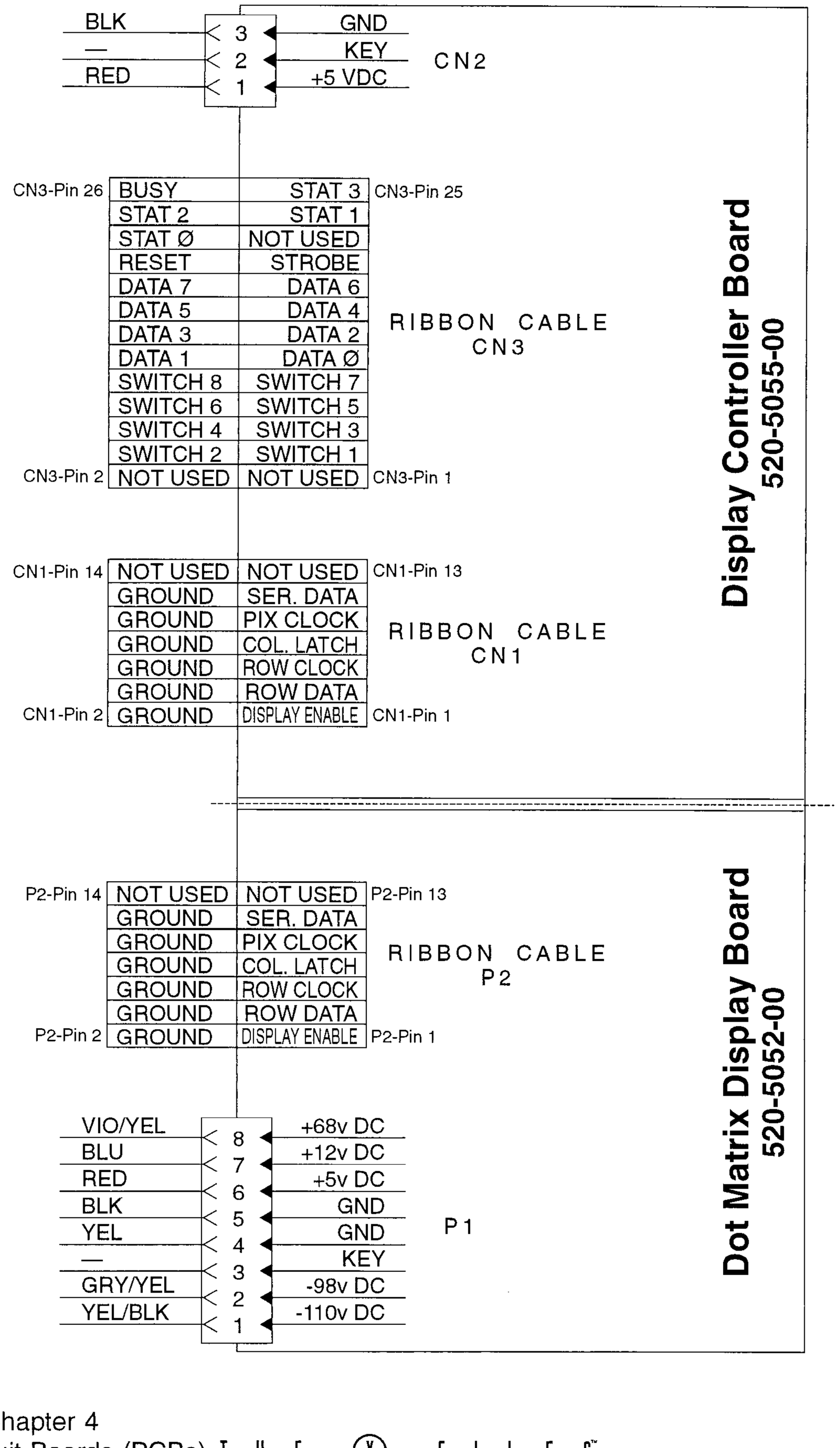
PRINTER INTERFACE OPTIONAL

Cable Wiring Harness Part Nº:
036-5408-00
RS-232 Printer Interface Board Part Nº:
520-5069-00

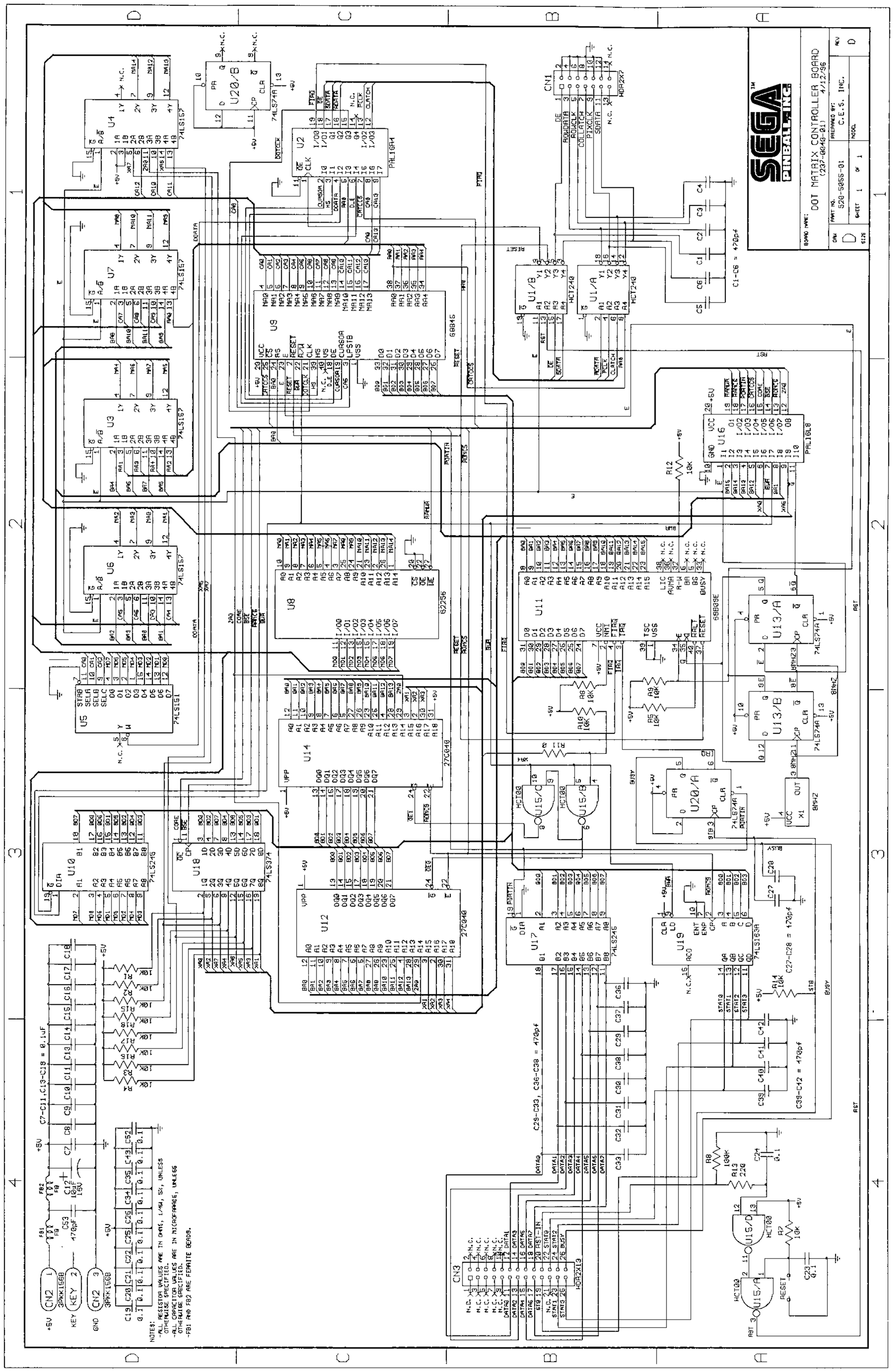


Printed Circuit Boards (PCBs)

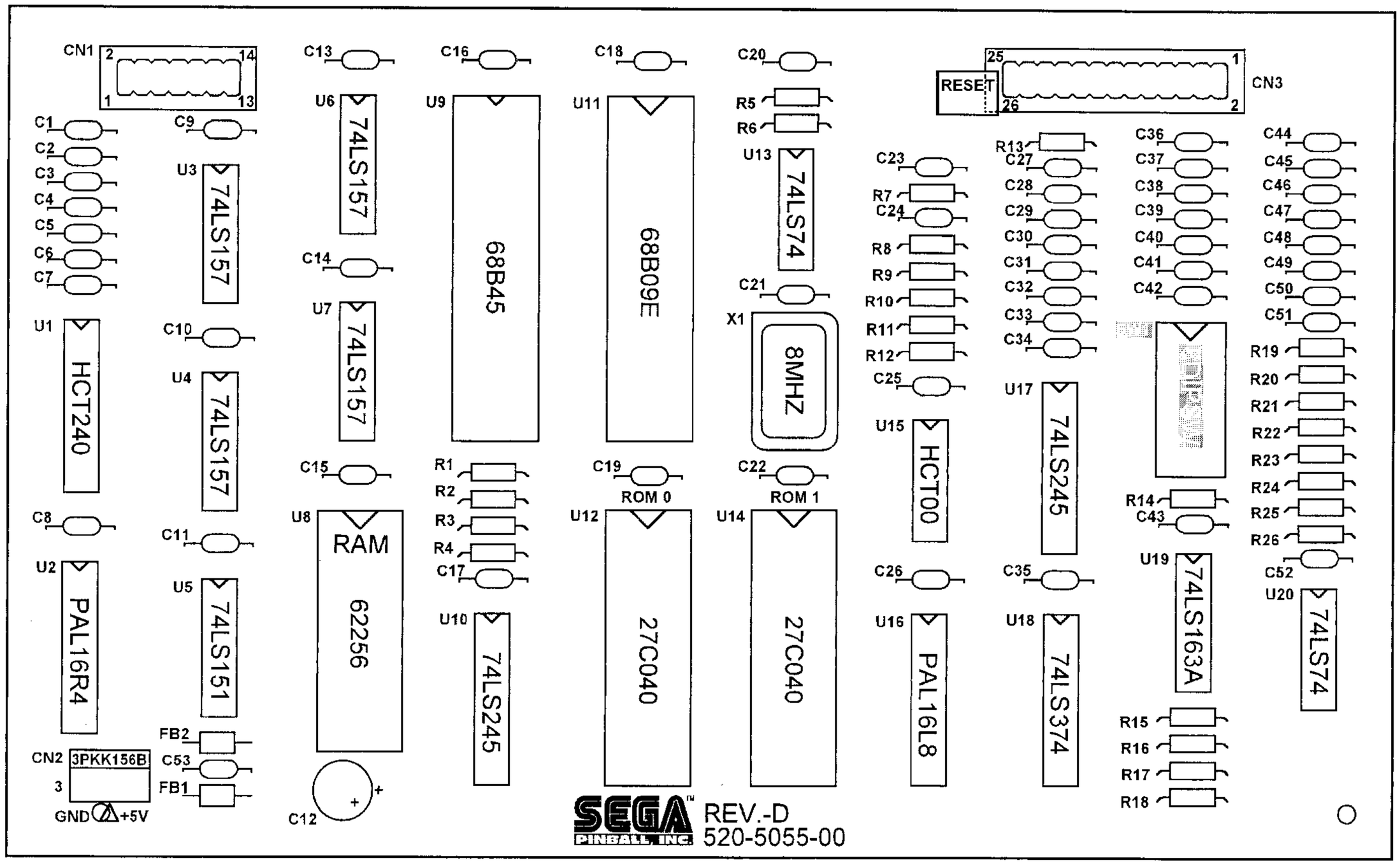
Dot Matrix Display/Display Controller Bd. Combined Display Connections



Display Controller Board Schematic

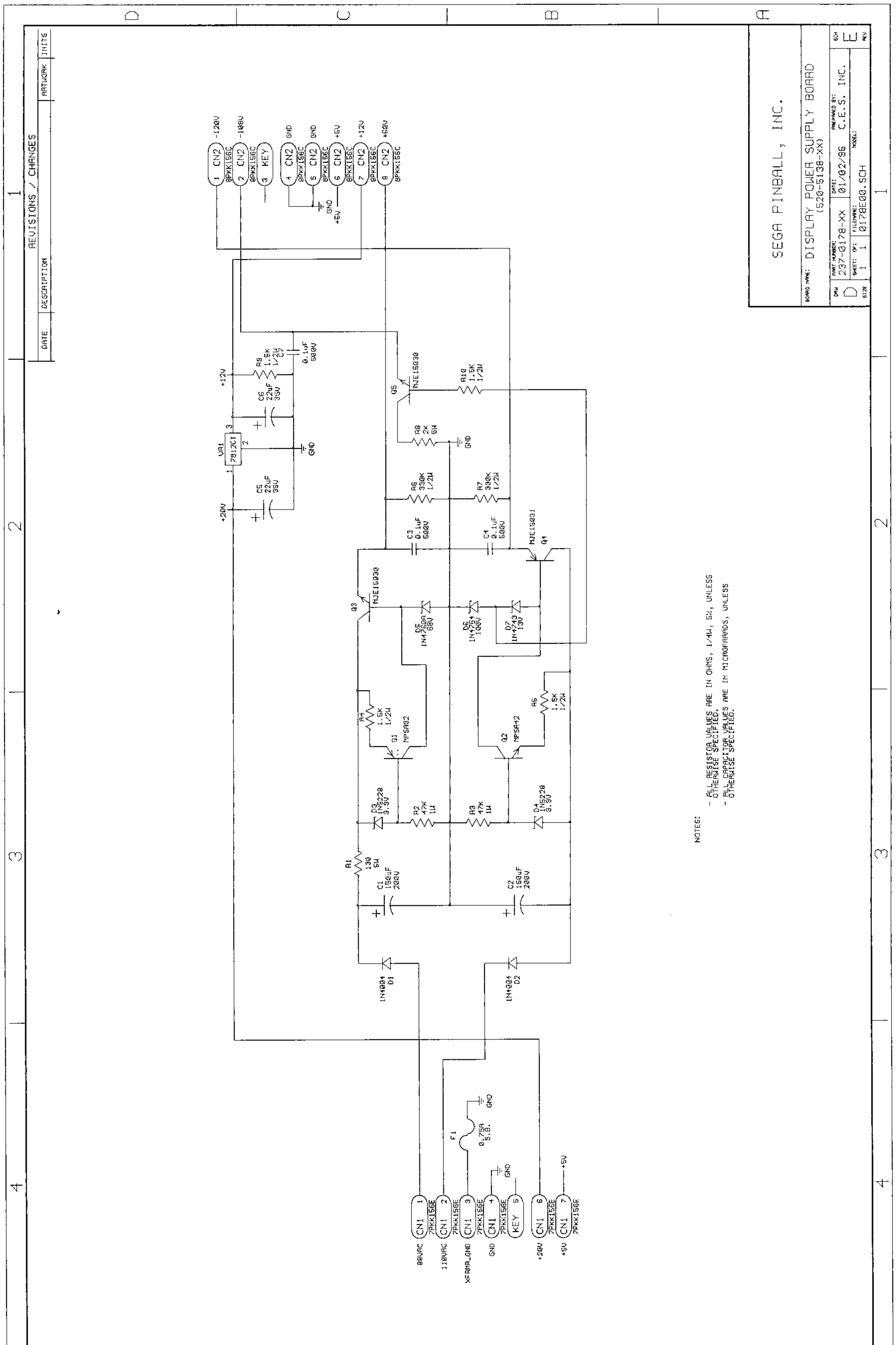


Display Controller Board Component Layout & Parts

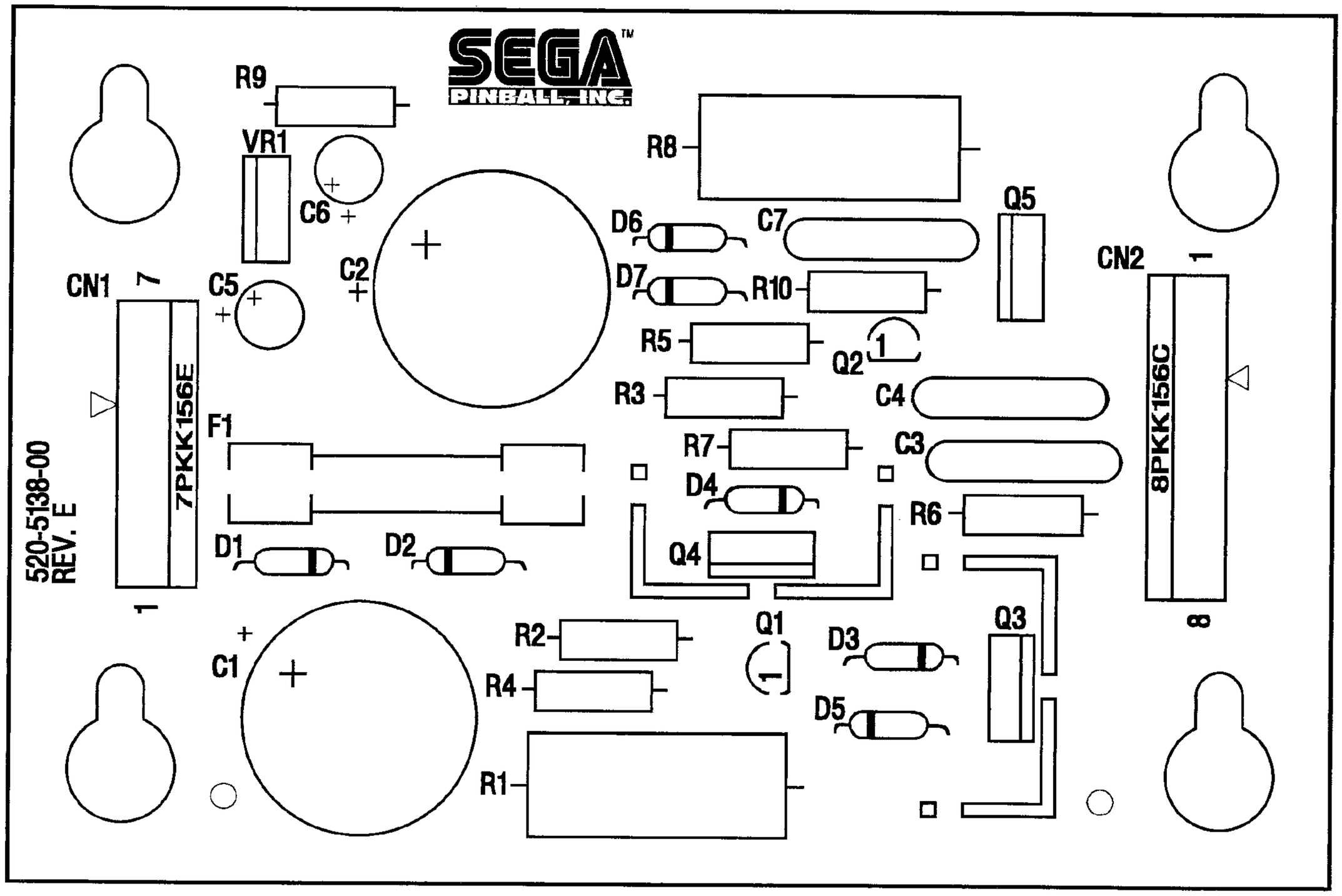


ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5055-00	—	Complete PCB Assembly
1	2	077-5217-00	U12 U14	32-PIN IC DIP SOCKET
2	1	100-0397-00	U8	32K X 8 STATIC RAM (62256L-10PC)
3	1	100-0189-01	U11	68B09E
4	1	100-0233-00	U9	68B45
5	1	100-0351-00	U15	74HCT00
6	1	100-5001-00	U1	74HCT240
7	1	100-5000-00	U5	74LS151
8	4	100-0046-00	U3 U4 U6 U7	74LS157
9	1	100-0049-00	U19	74LS163A
10	2	100-0058-00	U7, U10	74LS245
11	1	100-0064-00	U18	74LS374
12	2	100-0037-00	U13 U20	74LS74
13	1	965-0107-00	**U16 - ORANGE DOT** (Note the type of PAL)	PAL16L8 (15CN) (Programmed) **- ORANGE DOT**
14	1	965-0108-00	**U2 - ORANGE DOT** (Note the type of PAL)	PAL16R4 (25CN) (Programmed) **- ORANGE DOT**
15	23	125-5031-00	C7 C8 C9 C10 C11 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C34 C35 C43 C52	.1 mF (104) AXIAL CER. CAP
16	1	121-5051-00	R8	100K OHM 1/4 W C.F. RES. 5%
17	15	121-5011-00	R1 R2 R3 R4 R5 R6 R7 R9 R10 R12 R14 R15 R16 R17 R18	10K 1/4 W RES. 5%
18	1	121-5014-00	R13	220 OHM 1/4 W C.F. RES. 5%
19	0	Not Used	R19 R20 R21 R22 R23 R24 R25 R26	NOT STUFFED
20	21	125-5028-00	C1 C2 C3 C4 C5 C6 C27 C28 C29 C30 C31 C32 C33 C36 C37 C38 C39 C40 C41 C42 C44 C45 C46 C47 C48 C49 C50 C51 C53	470 pF (471) AXIAL CER. CAP (C44—C51 NOT STUFFED)
21	2	n/a	FB1 FB2	FERRITE BEAD (2743001182)
22	1	125-5015-00	C12	100uF 25V CAP (RADIAL ELEC)
23	1	045-5015-26	CN3	13-PIN DUAL ROW .1" HDR CONN.
24	1	045-5015-03	CN2	3-PIN KK-156 CONN. (540445-3)
25	1	045-5015-02	CN1	7-PIN DUAL ROW .1" HDR. CONN.
26	1	140-0013-00	X1	8Mhz CLOCK OSCILLATOR
27	0	Not Used	SW1	NOT STUFFED
28	1	See Page iii Table	U12 U14 (ROM 0)	4MB ROM (U14 NOT STUFFED)

Display Power Supply Board Schematic



Display Power Supply Board Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5138-00	—	Complete PCB Assembly
1	1	200-5000-10	F1	S.B. 0.75A
2	2	535-5000-11	Q3 Q4	HEATSINKS - AAVID #563002
3	2	125-5041-00	C2 C1	200V 150uF RADIAL LYTIC
4	4	121-5038-00	R10 R9 R5 R4	1/2W 1.5K
5	2	121-5059-00	R7 R6	1/2W 330K
6	2	121-5060-00	R2 R3	1W 47K
7	1	121-5061-00	R1	5W 130
8	1	121-5062-00	R8	5W 2K
9	2	112-0053-00	D3 D4	3.9V 5228
10	1	112-0062-00	D5	68V 4760A
11	1	112-0049-00	D6	100V 4764
12	1	112-0061-00	D7	13V 4743
13	1	110-0100-00	Q1	MPSA92
14	1	110-0082-00	Q2	MPSA42
15	3	125-5035-00	C3 C4 C7	500V 0.1uF CERAMIC DISK
16	1	110-0103-00	Q4	MJE15031
17	2	110-0101-00	Q3 Q5	MJE15030
18	2	125-5003-00	C5 C6	25V 22uF RADIAL LYTIC
19	1	124-5003-00	VR1	7812CT
20	1	045-5015-08	CN2	8pkk156 (PIN3=KEY)
21	2	112-5003-00	D1 D2	1N4004
22	1	045-5015-07	CN1	7PKK156E (PIN5=KEY)
23	2	n/a	Q3 Q4	6/32 KEY NUT
24	2	n/a	Q3 Q4	6/32 X 3/8 SCREW
25	2	205-0004-00	F1	FUSECLIPS

I/O Power Driver Board Theory of Operation

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

+5 +12 +50V +18V +20V LED Indicators:
These DC voltages are derived on the I/O board by rectification and filtering. Each has a LED indicating that power is being supplied to each of these voltage sources. The -12V supply comes from the same transformer winding as the +12V thus it does not have a led indicator. ** Note that the +50V &+20V power sources are turned off by the interlock switches when the coin door is open.

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

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

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

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

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

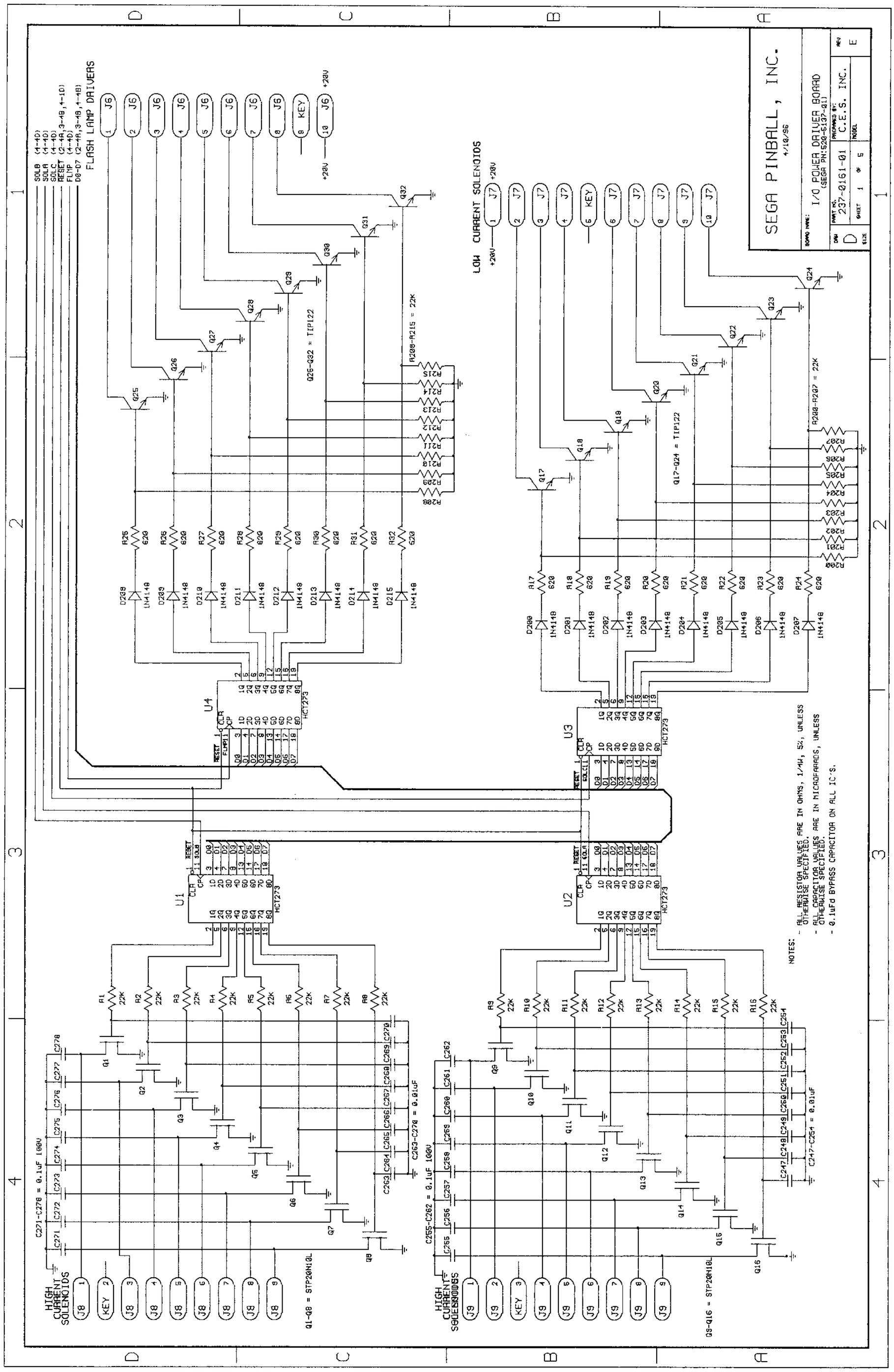
Note 1 * Clip on the resistor side with the white stripe.
** R1 controls Q1 and R2 controls Q etc...

Auxiliary In & Out:
J2 8 CMOS Outputs sometimes used for a printer interface.
J3 8 CMOS Inputs general purpose inputs.

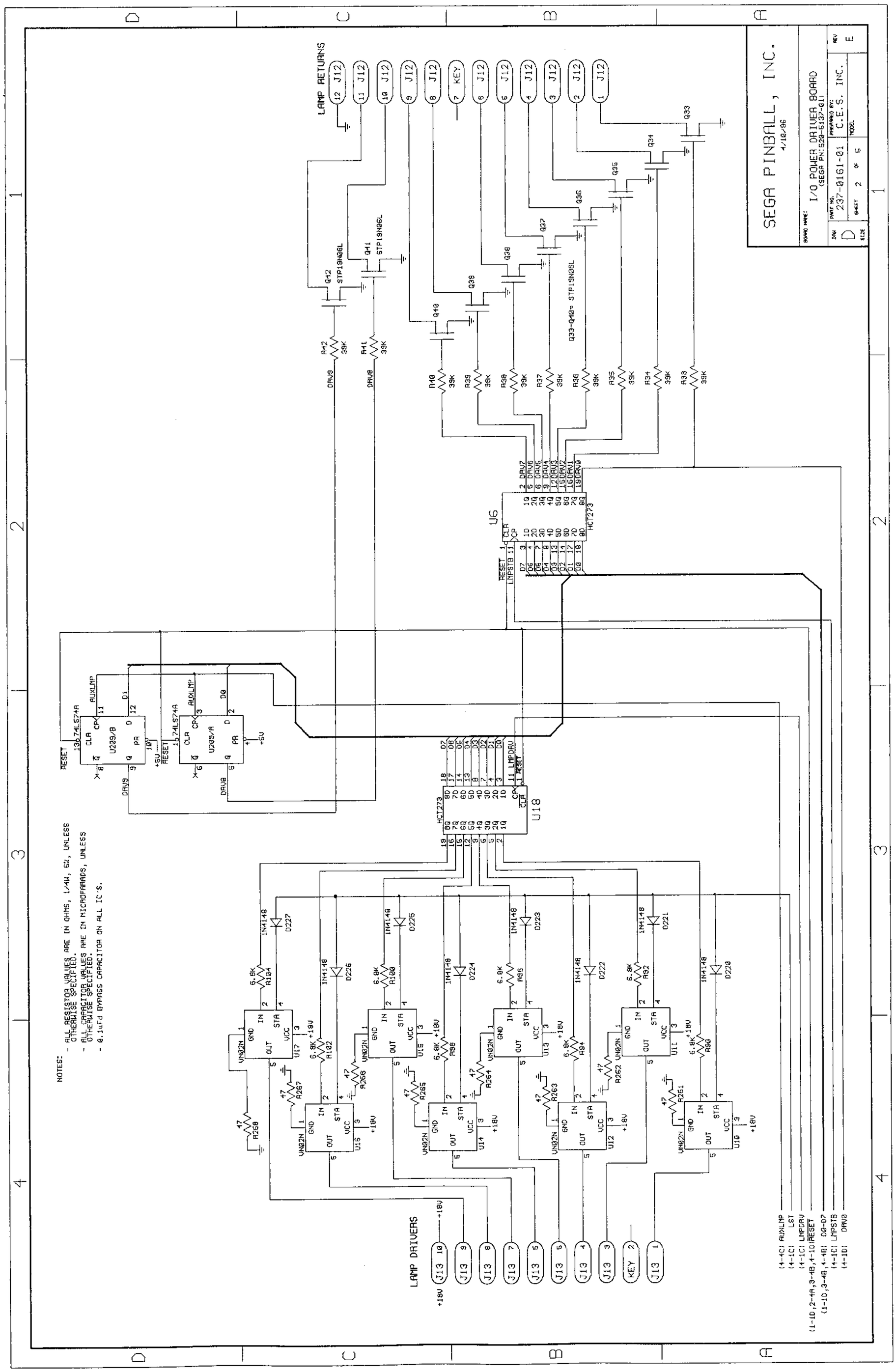
Lamp Matrix:
J12 has 10 low side drivers for the lamp strobes which consist of 19N06L MOSFETS. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the I/O from resetting. J13 has 8 high side drivers with each having a status indicator. All the status indicators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

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

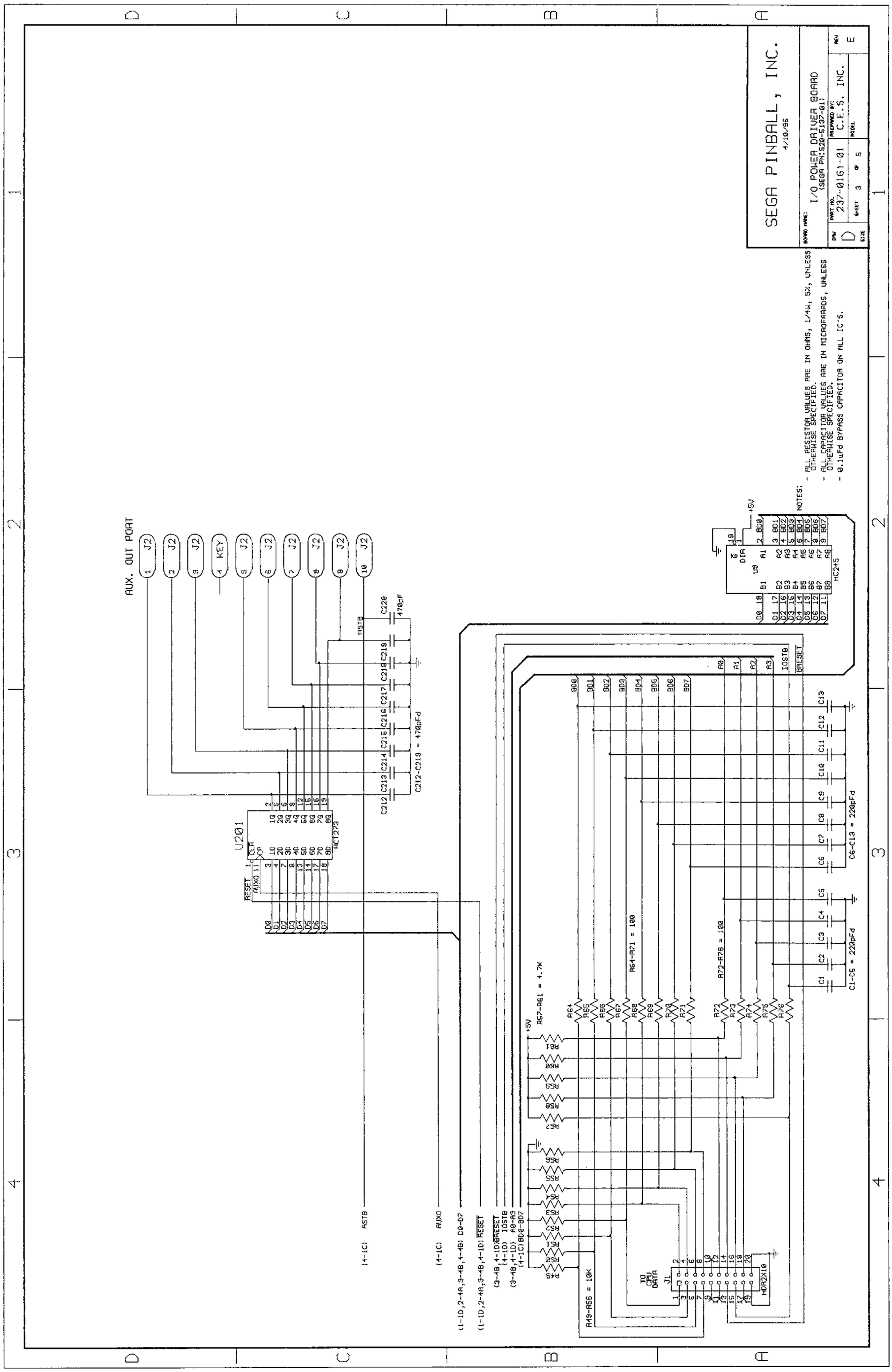
I/O Power Driver Board Schematic (Sheet 1 of 5)



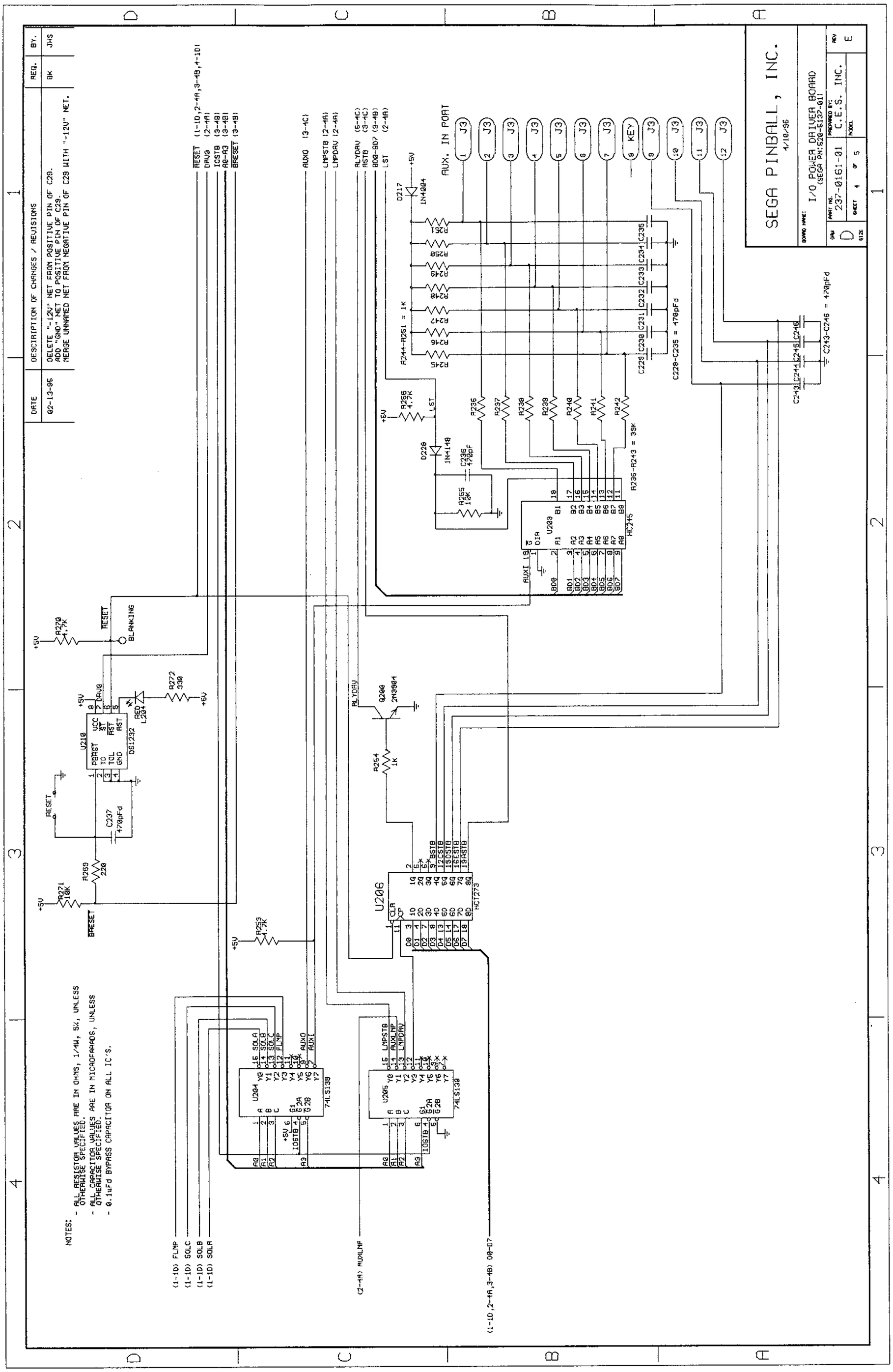
I/O Power Driver Board Schematic (Sheet 2 of 5)



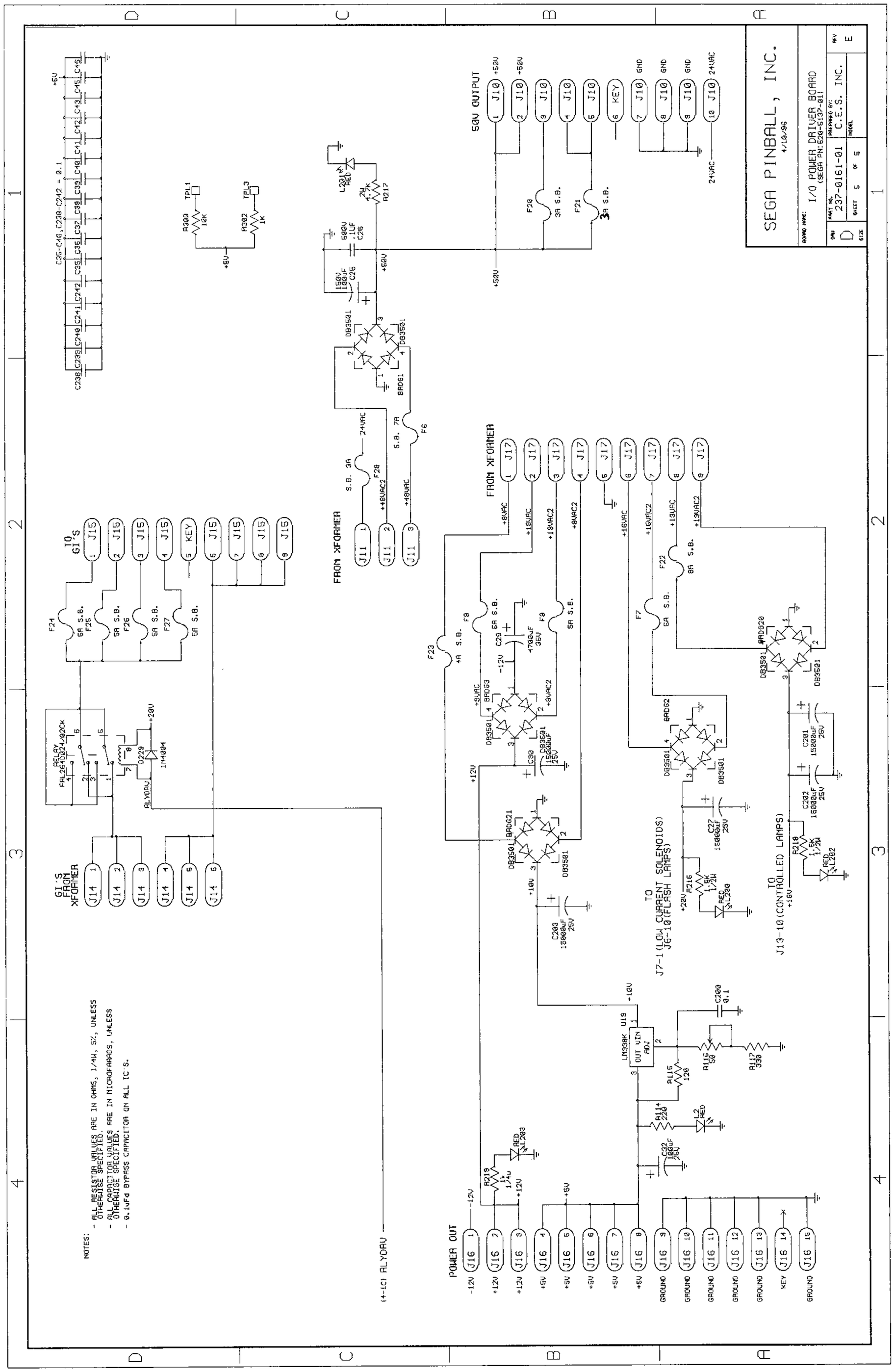
I/O Power Driver Board Schematic (Sheet 3 of 5)



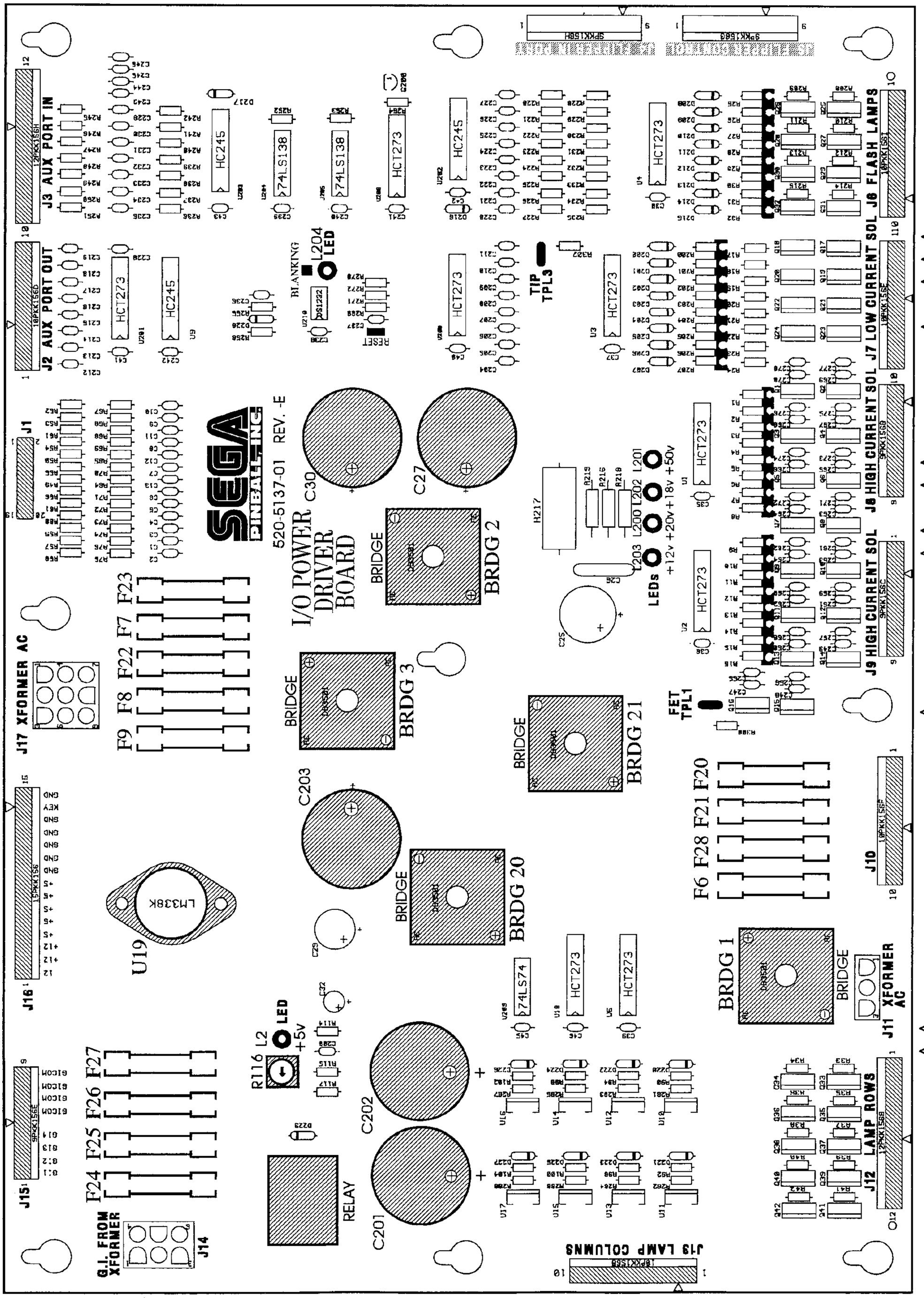
I/O Power Driver Board Schematic (Sheet 4 of 5)



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



I/O Power Driver Board Component Layout



TEST POINTS:

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

I/O Power Driver Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5137-01	—	Complete PCB Assembly
1	16	125-5027-00	C260 C259 C258 C257 C256 C278 C271 C255 C261 C262 C277 C276 C275 C274 C273 C272	100V 104 (0.1uF)
2	22	125-5028-00	C204 C206 C207 C208 C209 C210 C211 C235 C234 C228 C229 C230 C231 C232 C233 C219 C217 C216 C215 C214 C212 C213 C237 C218 C236 C205 C243 C245 C246 C244	471 (470pF) AXIAL CAP (C204—C11 Not Stuffed)
3	16	125-5029-00	C263 C264 C265 C270 C269 C268 C267 C266 C247 C254 C253 C252 C251 C250 C249 C248	103 (0.01uF)
4	13	125-5030-00	C7 C8 C9 C10 C11 C12 C13 C1 C2 C3 C4 C5 C6	221 (220pF)
5	0	Not Used	C227 C226 C220 C221 C222 C223 C224 C225	Not Stuffed
6	17	125-5031-00	C35 C36 C37 C38 C39 C40 C41 C42 C43 C45 C46 C200 C239 C238 C240 C241 C242	104 (0.1uF)
7	16	110-0106-00	Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q16 Q15 Q14 Q13 Q12 Q11 Q10 Q9	20N10L STP
8	32	121-5042-00	R2 R3 R4 R5 R6 R7 R8 R16 R15 R14 R13 R12 R11 R10 R9 R200 R201R202 R203 R204 R205 R206 R207 R215 R214 R213 R212 R211 R210 R209 R208 R1	22K 1/4W Res.
9	16	121-5003-00	R17 R32 R18 R19 R20 R21 R22 R23 R24 R31 R30 R29 R28 R27 R26 R25	620Ω 1/4W Res.
10	17	121-5045-00	R236 R237 R40 R39 R38 R37 R36 R35 R34 R33 R238 R239 R240 R241 R242 R42 R41	39K 1/4W Res.
11	13	121-5007-00	R64 through R76	100 1/4W Res.
12	8	121-5029-00	R90 R92 R94 R96 R98 R100 R102 R104	6.8K 1/4W Res.
13	1	121-5030-00	R115	120Ω 1/4W Res.
14	0	Not Used	R221 R220 R222 R223 R224 R225 R226 R227	Not Stuffed
15	9	121-5009-00	R254 R248 R249 R250 R251 R232 R246 R247 R245 R233 R234 R235 R230 R231 R228 R229 R302	1K 1/4 W REST. (R228—R235 Not Stuffed)
16	8	121-5032-00	R262 R261 R263 R264 R265 R266 R267 R268	47K 1/4W RESISTOR
17	2	121-5033-00	R269 R114	220K 1/4W RESISTOR
18	8	121-5021-00	R57 R58 R59 R60 R61R252 R253 R256 R270 R49	4.7K 1/4W RES. (R252 Not Stuffed)
19	11	121-5011-00	R271 R56 R55 R54 R53 R52 R51 R50 R255 R300	10K 1/4W Res.
20	2	121-5036-00	R117 R272	330Ω 1/4W Res.
21	8	100-5019-00	U6 U4 U18 U2 U1 U200 U3 U201 U206	74HCT273 (U200 Not Stuffed)
22	1	Not Used	RESET	Not Stuffed
23	1	121-5009-00	R219	1/4W 1K Res.
24	2	121-5038-00	R218 R216	1/2W 1.5K Res.
25	7	200-5000-01	F24 F25 F26 F27 F8 F9 F7	S.B. 5A
26	1	200-5000-03	F6	S.B. 7A
27	1	200-5000-06	F23	S.B. 4A
28	1	200-5000-07	F22	S.B. 8A
29	3	200-5000-08	F20 F21 F28	S.B. 3A
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
34	1	125-5032-00	C32	25V 100uF RADIAL LYTIC
35	1	045-5015-01	J1	20 PIN 0.1 DUAL ROW HEADER
36	1	100-0338-00	U202 U203	74HC245 (U202 Not Stuffed)
37	10	110-0088-00	Q41 Q33 Q34 Q35 Q36 Q37 Q38 Q39 Q40 Q42	19N06L STP
38	6	165-5099-00	**L203 L202 L204 L200 L2 L201**	**LED T1-3/4 DIFFUSER LED**
39	1	045-5014-01	J2	10PKK156 (PIN 4=KEY)
40	1	121-5039-00	R116	50 OHM POT
41	16	110-0067-00	Q23 Q22 Q21 Q20 Q19 Q18 Q26 Q27 Q28 Q29 Q30 Q31 Q32 Q17 Q25 Q24	TIP122
42	1	125-5033-00	C25	150V 100uF RADIAL LYTIC
43	1	110-0058-00	U9	74LS245
44	1	125-5034-00	C29	35V 4700uF RADIAL LYTIC
45	1	190-5002-00	RELAY	FRL264D024/02CK RELAY
46	0	Not Used	J5	Not Stuffed
47	1	100-0037-00	U209	74LS74
48	0	Not Used	J4	Not Stuffed
49	2	100-0148-00	U204 U205	74LS138
50	1	125-5035-00	C26	500V .1UF CERAMIC DISK
51	1	100-0356-00	U19	LM338K
52	5	124-5000-00	BRDG20 BRDG3 BRDG1 BRDG2 BRDG21	DB3501
53	5	125-5036-00	C202 C203 C201 C30 C27	25V 15000uF RADIAL LYTIC
54	25	112-0054-00	D208 D225 D226 D221D220 D223 D227 D224 D222 D200 D201 D202 D203 D204 D205 D206 D207 D209 D210 D211 D212 D213 D214 D215 D228	1N4148
55	2	112-5003-00	D217 D216 D229	1N4004 (D216 Not Stuffed)
56	2	n/a	TPL3 TPL1	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	U17 U16 U15 U14 U13 U12 U11 U10	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	Not Used	BLANKING	TEST POINT - DO NOT STUFF
64	1	121-5050-00	R217	2W 4.7K 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	-->	FUSECLIPS
72	1	n/a	U19	HEATSINK (5v Reg.)

CPU/Sound Board Theory of Operation

CPU Section:

The CPU is a 68B09E (U209) with up to 8Mbytes of CPU code space (U210). The CPU code is bank selected by the use of U211and each bank consists of 16Kbytes. 8Kbytes of RAM (U212) is available to the CPU. The RAM is battery backed and has a write protected area. Battery back up is accomplished by 3-AA Cells which have a test point VB to check the battery voltage status. The write protected area consists of 512 Bytes used for storing game settings. This section of RAM can only be written to when the coin door is open. The coin door switch comes into the CPU on CN6-12 and is fed into the address decoding PAL U213. When this memory protect signal is low writes to the protected RAM area are prohibited. Address decoding for the system is accomplished by one PAL U213 and one 1-of-8 decoder U214.

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

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

Switches:

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

Plasma Interface:

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

Sound Section:

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

Sound calls are made from the CPU's 68B09E U200 to the sound section by latching data into U5. The sound section's CPU 68BO9E (U6) reads in this data and handles the interfacing to the BSMT.

Other Test Points:

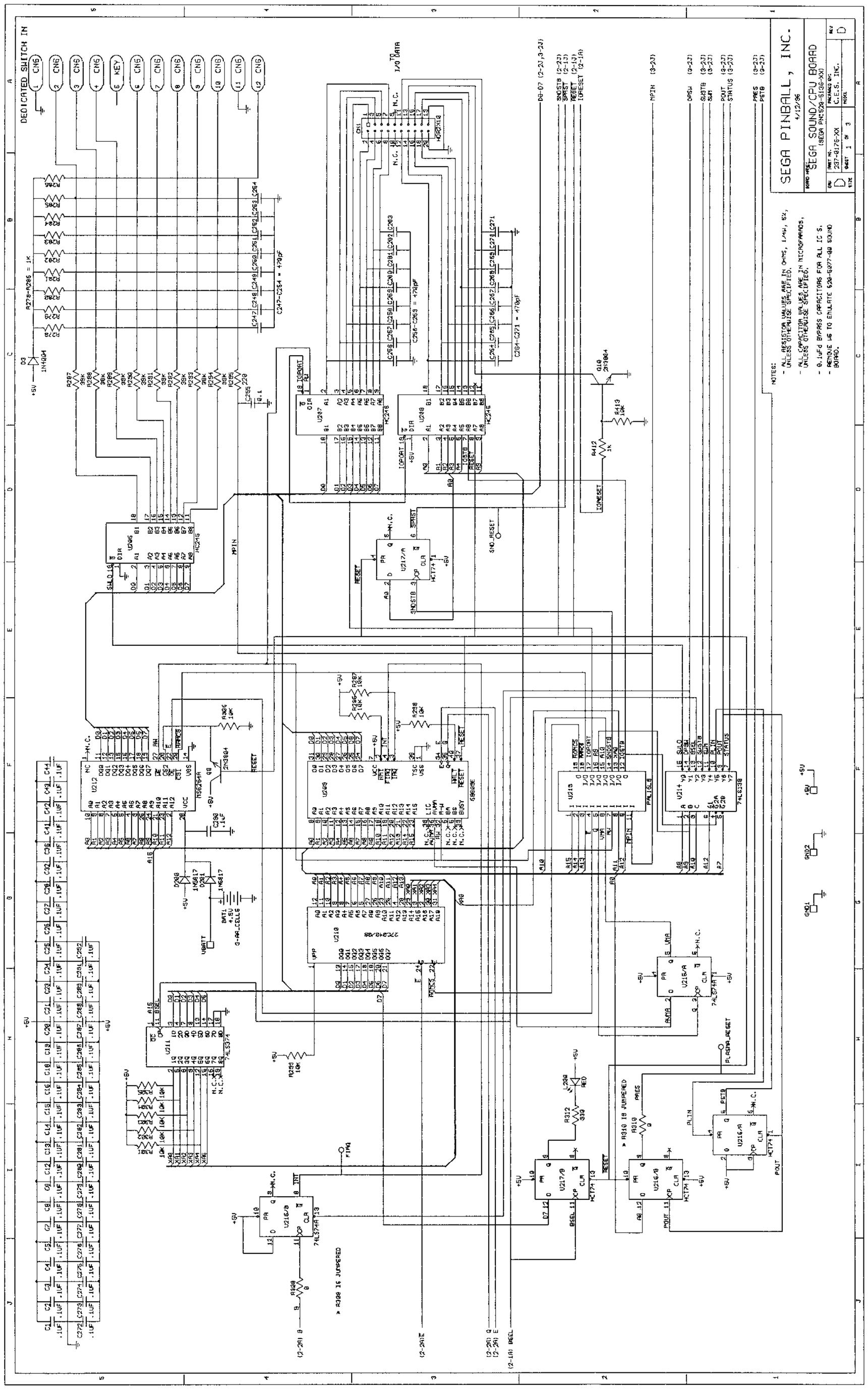
E & Q - The CPU signals for both 68B09E processors. Should be at 2Mhz with Q leading E by 500 nsec.

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

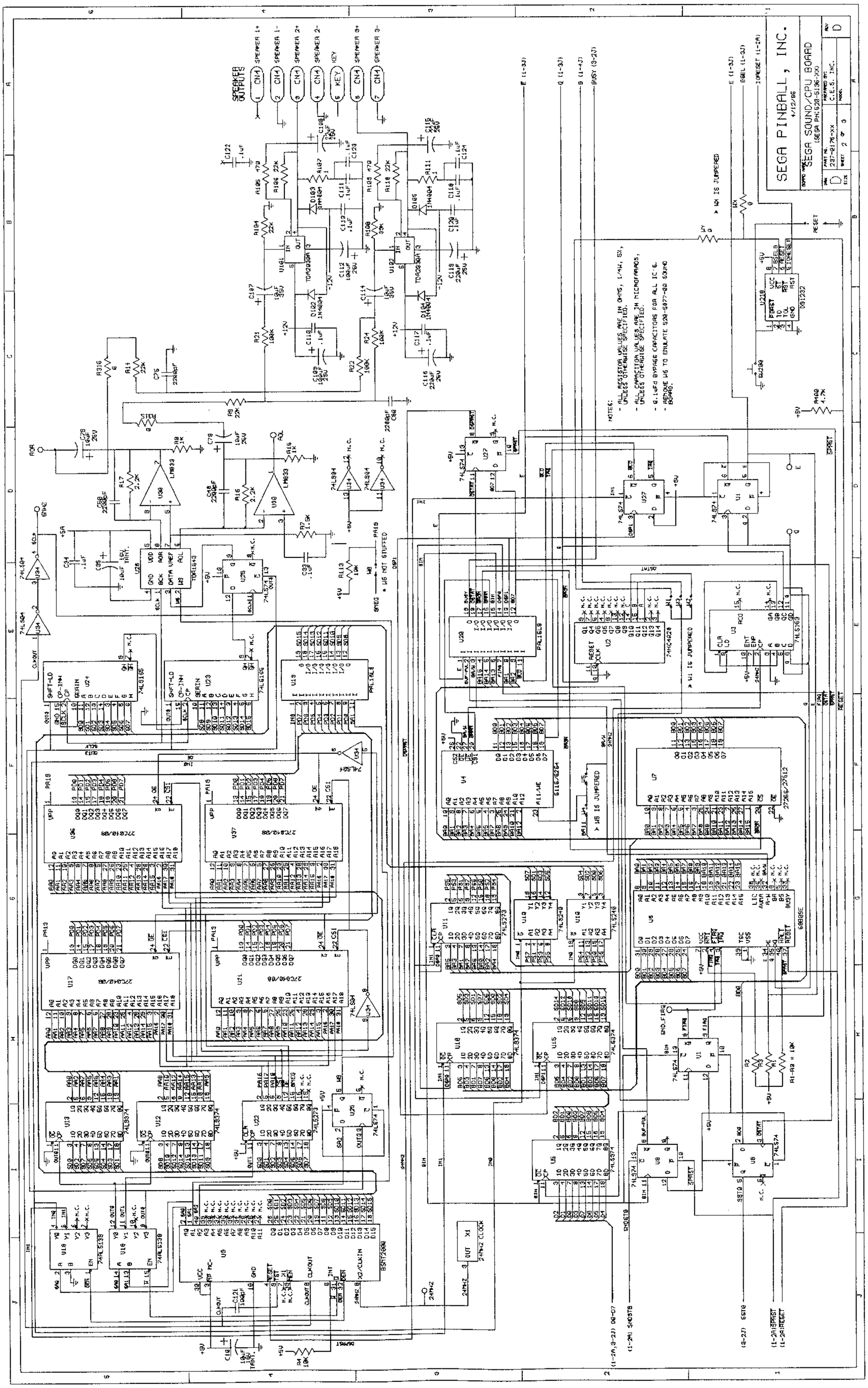
SND-FIRQ - The sound sections CPU interupt.

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

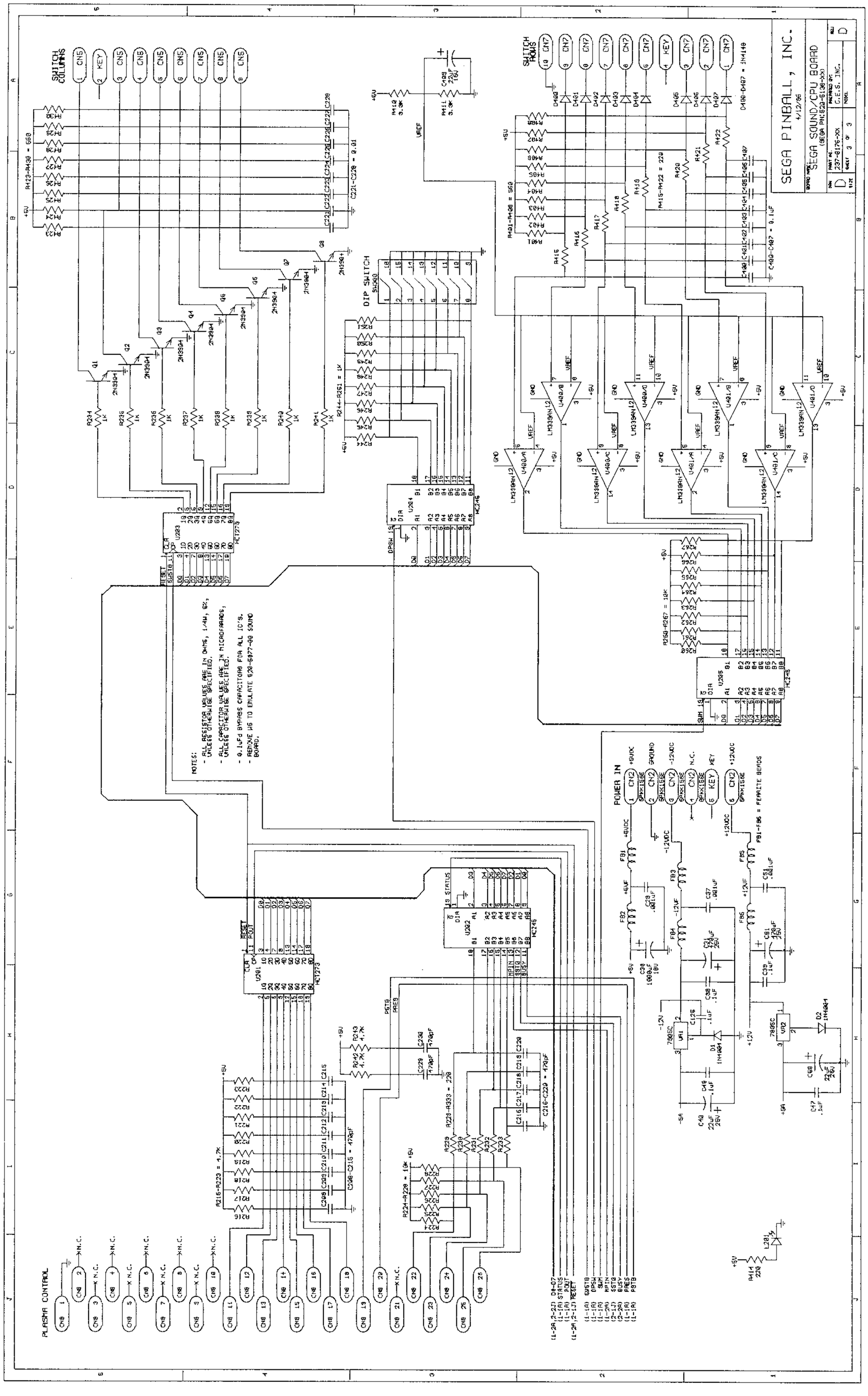
CPU/Sound Board Schematic (Sheet 1 of 3)



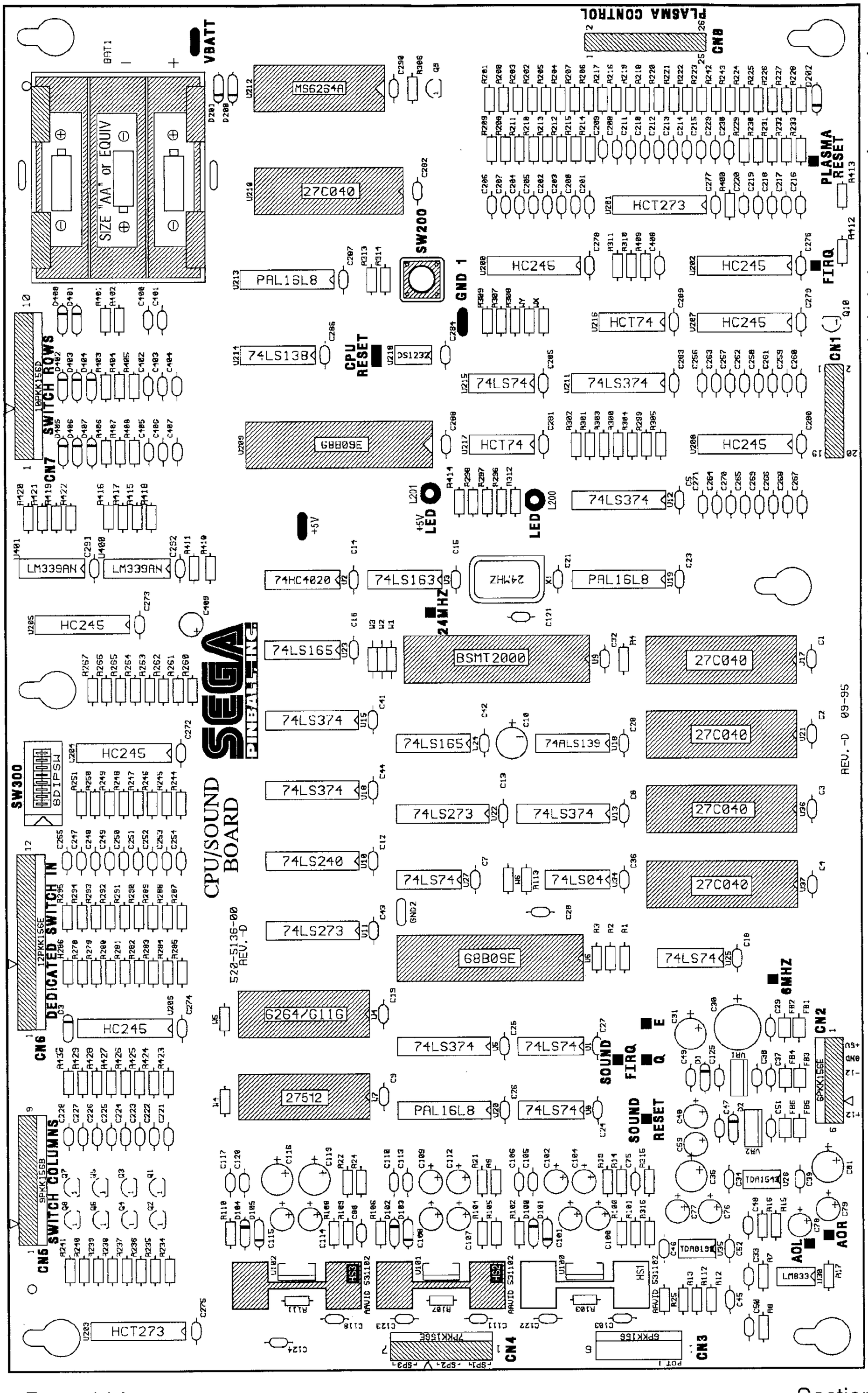
CPU/Sound Board Schematic (Sheet 2 of 3)



CPU/Sound Board Schematic (Sheet 3 of 3)



CPU/Sound Board Component Layout



CPU/Sound Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5136-00	—	Complete PCB Assembly
1	1	124-5001-00	VR2	7805
2	5	121-5051-00	R13 R24 R21 R12 R19 R22	100K 1/4W RES. (R19 Not Stuffed)
3	2	121-5009-00	R111 R103 R107	1K 1/4W RES. (R103 Not Stuffed)
4	38	121-5011-00	R4 R3 R2 R1 R113 R306 R301 R302 R303 R305 R304 R299 R296 R298 R297 R247 R248 R249 R251 R250 R246 R245 R244 R266 R267 R265 R264 R263 R228 R227 R226 R225 R224 R200 R201 R202 R203 R204 R205 R206 R207 R262 R261 R260 R409 R413	10K1/4W RES. (R200-R207 R409 R413 Not Stuffed)
5	5	121-5023-00	R14 R104 R110 R102 R100 R106 R9	22K1/4W RES. (R100 R102 Not Stuffed)
6	20	121-5009-00	R15 R8 R241 R240 R239 R238 R237 R236 R235 R234 R278 R279 R280 R281 R282 R283 R285 R286 R284 R412	1K 1/4W RES.
7	4	121-5043-00	R25 R17 R16 R112	2.2K 1/4W Res.
8	1	121-5018-00	R7	1.5K 1/4W Res.
9	2	121-5046-00	R105 R101 R109	470K 1/4W RES. (R101 Not Stuffed)
10	9	121-5045-00	R108 R294 R293 R292 R291 R290 R289 R288 R287	39K
11	1	121-5036-00	R312	330Ω 1/4W Res.
12	12	n/a	R311 R310 R307 R309 R308 R300 R313 R316 R315 R314 WX WY	0Ω (Jumper Wire 24ga.)
13	15	121-5033-00	R295 R229 R230 R231 R232 R233 R215 R214 R213 R212 R211 R210 R209 R208 R414 R422 R421 R420 R419 R418 R417 R416 R415	220K 1/4W RES. (R208—R215 Not Stuffed)
14	11	121-5021-00	R223 R222 R221 R220 R219 R218 R217 R216 R243 R242 R400	4.7K 1/4W RES.
15	16	121-5047-00	R408 R407 R406 R405 R404 R403 R402 R401 R430 R429 R428 R427 R426 R425 R424 R423	560Ω 1/4W Res.
16	2	121-5048-00	R411 R410	3.3K 1/4W RES.
17	1	100-0049-00	U3	74LS163
18	1	See Page iii Table	U7	27512 EPROM
19	1	045-5015-07	CN4	7PKK156 (PIN5=KEY)
20	1	Not Used	RESET	DO NOT STUFF
21	5	See Page iii Table	U37 U36 U21 U17 U210	27C040 EPROM
22	2	100-5008-00	U24 U23	74LS165
23	4	125-5017-00	C76 C78 C79 C77	25V 10uF RADIAL LYTIC
24	4	125-5020-00	C59 C101 C108 C115 C40	25V 22uF RADIAL LYTIC (C101 Not Stuffed)
25	2	125-5017-00	C100 C107 C114	35V 10uF RADIAL LYTIC (C100 Not Stuffed)
26	2	125-5015-00	C102 C104 C109 C112	25V 100uF RADIAL LYTIC (C102/104 N.Stffd)
27	1	125-5014-00	C409	16V 22uF RADILA LYTIC
28	1	100-5016-00	U35	TDA1899
29	1	125-5037-00	C30	16V 1000uF RADIAL LYTIC
30	1	100-0027-00	U34	74LS04
31	1	100-0043-00	U18	74ALS139
32	6	100-0064-00	U16 U12 U13 U15 U211U5	74LS374
33	1	100-0249-00	U2	74HC4020
34	1	100-0149-00	U10	74LS240
35	6	n/a	W2 W3 W1 W4 W5 W6	0Ω (Jumper Wire 24ga.)
36	2	125-5012-00	C81 C31	25V 470uF RADIAL LYTIC
37	2	125-5017-00	C10 C35	16V 10uF RADIAL TANT.
38	2	125-5019-00	C116 C119	25V 220uF RADIAL LYTIC
39	1	045-5015-06	CN2	6PKK156 (PIN 5=KEY)
40	1	140-0011-00	X1	24MHZ
41	1	105-0116-00	U9	BSMT2000
42a	1	965-0136-00	**U19 - 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	U27 U1 U25 U8 U215	74LS74
44	3	125-5043-00	C29 C37 C51	102 (0.001uF)
45	79	125-5031-00	C2 C12 C13 C14 C15 C20 C1 C42 C24 C32 C28 C43 C16 C103 C23 C27 C52 C36 C21 C26 C39 C47 C105 C120 C44 C46 C34 C25 C4 C19 C8 C41 C49 C3 C33 C9 C38 C18 C106 C45 C7 C118 C110 C122 C124 C113 C123 C5 C117 C111 C125 C290 C289 C288 C287 C286 C285 C284 C283 C282 C281 C280 C279 C278 C277 C276 C275 C273 C272 C255 C274 C292 C291 C407 C406 C405 C404 C400 C403 C401 C402 C102 C103	104 (0.1uF) AXIAL CER. CAP. (C102 C103 C105 C106 Not Stuffed)
46	1	125-5038-00	C121	101 (100pF)
47	4	125-5039-00	C48 C50 C75 C80	222 (0.0022uF)
48	41	125-5028-00	C270 C269 C268 C267 C271 C265 C266 C262 C261 C260 C259 C263 C256 C257 C258 C249 C248 C247 C254 C250 C251 C252 C220 C219 C218 C217 C216 C215 C213 C212 C211 C210 C209 C208 C200 C201 C202 C203 C205 C206 C207 C230 C229 C253 C214 C204 C264 C408	471 (470pF) CER. CAP (C200—C107, C408 Not Stuffed)
49	8	125-5029-00	C221 C222 C223 C225 C226 C227 C228 C224 C408	103 (0.01uF)
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 D100 D2 D103 D104 D101 D105 D102 D3	1N4004 (D100 D101 Not Stuffed)
54	2	112-5008-00	D201 D200	1N5817
55	8	112-0054-00	D407 D406 D405 D404 D403 D402 D401 D400 D202	1N4148 (D202 Not Stuffed)
56	6	n/a	FB6 FB4 FB5 FB2 FB1 FB3	FB
57	1	124-5002-00	VR1	7905

THIS PARTS LIST IS CONTINUED ON THE NEXT PAGE.

CPU/Sound Board Parts Continued

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
58	2	100-5016-20	U102 U100 U101	TDA2030V (U100 Not Stuffed)
59	1	100-5018-00	U26	TDA1543
60	1	n/a	SW200	B3F4000
61	1	165-5099-00	**L200**	**LED T1-3/4 DIFFUSER LED**
62	1	165-5099-00	**L201**	**LED T1-3/4 DIFFUSER LED**
63	2	100-5015-00	U217 U216	HCT74
64	1	100-0148-00	U214	74LS138
65	1	105-0046-00	U212	MS6264A
66	1	100-0189-01	U209 U6	68B09E
67	1	545-5685-00	BAT1 BATTERY HOLDER	3-AA CELLS 4.5V
68	1	045-5015-01	CN1	20 PIN 0.1 HEADER
69	10	n/a	6MHZ AOR Q AOL 24MHZ	TEST POINTS - Not Stuffed
70	10	110-0069-00	Q9 Q3 Q4 Q5 Q6 Q7 Q8 Q1 Q2 Q10	2N3904
71	1	045-5013-00	CN5	9PKK156 (PIN 2=KEY)
72	2	100-5019-00	U201 U203	74HCT273
73	6	100-0338-00	U207 U206 U202 U200 U205 U208 U204	74HC245 (U200 Not Stuffed)
74	1	100-5023-00	U218	DS1232
75	1	045-5015-26	CN8	26 PIN 0.1 HEADER
76	1	045-5014-01	CN7	10PKK156 (PIN 4=KEY)
77	4	n/a	VBATT +5V GND2 GND1	TEST POINT WIRE (24ga.) LOOPS
78	1	045-5015-00	CN6	12PKK156 (PIN 5=KEY)
79	1	181-5002-00	SW300	8 PIN DIPSWITCH
80	2	100-0377-00	U401 U400	LM339AN
81	1	105-0052-05	U4	6116 RAM
82	3	535-5000-10	U100 U101 U102	AAVID 531102
83	3	077-5209-00	U6, U9, U209	40-Pin IC Socket
84	5	077-5217-00	U17, U21, U36, U37, U210	32-Pin IC Socket
85	3	077-5208-00	U4, U7, U212	28-Pin IC Dip Socket

Your Notes

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- **Appendix C, CPU Jumper Table 121**
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- **Appendix D, Board Type Table..... 122-123**
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- **Appendix E, Generic Coil Cross-Reference Guide and Flipper Coil Table 124-125**
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- **Appendix F, Motor Specification Table 126-127**
  ...provides all the Motor information used on the games (Motor Type, Function and Part Nº).

- **Appendix G, Part Number Prefix Classification Codes..... 128**
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- **Appendix H, Playfield Inserts (Plastic Light Covers) 129**
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- **Appendix I, Stand-Up Targets (Happ Modular & Regular) 130**
  ...gives a pictoral view with the name and part number of all the Single Stand-Up Targets used (also gives the Color Code Chart).

- **Glossary of Terms 131**
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- **Parts Order Checklist Notes 132**
  ...keep track of your parts ordered through your distributor for this game.

APPENDIX A
Pinball Game Firmware Table

EPROM	Chip Size	Part Nº	Ver.	Loc.	Raw Part Nº
Laser War					
CPU	(256K)	965-0004-00		C5	960-5007-00
Sound (Old)	(256K)	965-0005-00		J5	960-5007-00
Sound (Old)	(256K)	965-0006-00		J6	960-5007-00
Sound (Old)	(256K)	965-0007-00		J7	960-5007-00
		- OR -			
Sound	(256K)	965-0008-00		7F	960-5007-00
Sound 1	(512K)	965-0009-00		6F	960-7001-02
Sound 2	(512K)	965-0010-00		4F	960-7001-02
Secret Service					
CPU	(256K)	965-0011-00	A-6	B5	960-5007-00
CPU	(256K)	965-0012-00	A-6	C5	960-5007-00
Voice 1	(512K)	965-0014-00		6F	960-7001-02
Voice 2	(512K)	965-0015-00		4F	960-7001-02
Sound	(256K)	965-0013-00		7F	960-5007-00
Torpedo Alley					
CPU	(256K)	965-0016-00	A02-1	B5	960-5007-00
CPU	(256K)	965-0017-00	A02-1	C5	960-5007-00
Voice 1	(512K)	965-0019-00		6F	960-7001-02
Voice 2	(512K)	965-0020-00		4F	960-7001-02
Sound	(256K)	965-0018-00		7F	960-5007-00
Time Machine					
CPU	(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
Lethal Weapon 3					
CPU	(512K)	965-0082-00	A2.07	C5	960-7001-02
Voice 1	(2M)	965-0083-00		U17	960-5010-00
Voice 2	(2M)	965-0084-00		U21	960-5010-00
Sound	(256K)	965-0085-00		U7	960-5007-00
Display	(2M)	965-0086-00	A2.06	ROM 0	960-5010-00
Display	(2M)	965-0087-00	A2.06	ROM 1	960-5010-00
	(Used on Display PCB 520-5055-00)				
		-OR-			
Display	(4M)	965-0087-04	A2.06	ROM 0	960-5015-00
	(Used on Display PCB 520-5055-01)				
Star Wars					
CPU	(512K)	965-0119-00	A1.03	C5	960-7001-02
Voice 0	(4M)	965-0132-00		U17	960-5015-00
Voice 1	(2M)	965-0133-00		U21	960-5010-00
Sound	(256K)	965-0131-00		U7	960-5007-00
Display	(2M)	965-0120-00	A1.04	ROM 0	960-5010-00
Display	(2M)	965-0121-00	A1.04	ROM 1	960-5010-00
	(Used on Display PCB 520-5055-00)				
		-OR-			
Display	(4M)	965-0122-00	A1.05	ROM 0	960-5015-00
	(Used on Display PCB 520-5055-01)				
Rocky & Bullwinkle & Friends					
CPU	(512K)	965-0138-00	A1.30	C5	960-7001-02
Voice 0	(4M)	965-0139-00		U17	960-5015-00
Voice 1	(2M)	965-0140-00		U21	960-5010-00
Sound	(256K)	965-0141-00		U7	960-5007-00
Display	(4M)	965-0142-00	A1.30	ROM 0	960-5015-00
Jurassic Park					
CPU	(512K)	965-0143-00	A5.13	C5	960-7001-02
Voice 0	(4M)	965-0144-00		U17	960-5015-00
Voice 1	(2M)	965-0145-00		U21	960-5010-00
Sound	(256K)	965-0146-00		U7	960-5007-00
Display	(4M)	965-0147-00	A5.10	ROM 0	960-5015-00
Last Action Hero					
CPU	(512K)	965-0148-00	A1.12	C5	960-7001-02
Voice 0	(4M)	965-0149-00		U17	960-5015-00
Voice 1	(2M)	965-0150-00		U21	960-5010-00
Sound	(256K)	965-0151-00		U7	960-5007-00
Display	(4M)	965-0152-00	A1.06	ROM 0	960-5015-00
Tales from the Crypt					
CPU	(512K)	965-0157-00	A3.03	C5	960-7001-02
Voice 0	(4M)	965-0158-00		U17	960-5015-00
Voice 1	(2M)	965-0159-00		U21	960-5010-00
Sound	(256K)	965-0160-00		U7	960-5007-00
Display	(4M)	965-0161-00	A3.01	ROM 0	960-5015-00
The Who's Tommy					
CPU	(512K)	965-0162-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0165-00		U17	960-5015-00
Voice 2	(4M)	965-0166-00		U21	960-5015-00
Voice 3	(4M)	965-0167-00		U36	960-5015-00
Voice 4	(4M)	965-0168-00		U37	960-5015-00
Sound	(512K)	965-0164-00		U7	960-7001-02
Display	(4M)	965-0163-00	A4.00	ROM 0	960-5015-00
WWF Royal Rumble					
CPU	(512K)	965-0169-00	A1.06	C5	960-7001-02
Voice 1	(4M)	965-0172-00		U17	960-5015-00
Voice 2	(4M)	965-0173-00		U21	960-5015-00
Voice 3	(4M)	965-0174-00		U36	960-5015-00
Sound	(512K)	965-0171-00		U7	960-7001-02
Display	(4M)	965-0170-00	A1.02	ROM 0	960-5015-00
Guns N' Roses					
CPU	(512K)	965-0175-00	A3.00	C5	960-7001-02
Voice 1	(4M)	965-0178-00		U17	960-5015-00
Voice 2	(4M)	965-0179-00		U21	960-5015-00
Voice 3	(4M)	965-0180-00		U36	960-5015-00
Voice 4	(4M)	965-0181-00		U37	960-5015-00
Sound	(512K)	965-0177-00		U7	960-7001-02
Display	(4M)	965-0176-00	A3.00	ROM 0	960-5015-00

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

Table continued on the next page.

APPENDIX A
Pinball Game Firmware Table

EPROM	Chip Size	Part Nº	Ver.	Loc.	Raw Part Nº
Maverick					
CPU	(512K)	965-0182-00	A4.04	C5	960-7001-02
Voice 1	(4M)	965-0186-00		U17	960-5015-00
Voice 2	(4M)	965-0187-00		U21	960-5015-00
Voice 3	(4M)	965-0187-01		U36	960-5015-00
Sound	(512K)	965-0185-00		U7	960-7001-02
Display*	(4M)	965-0183-00	A4.01	ROM 0	960-5015-00
Display*	(4M)	965-0184-00	A4.01	ROM 3	960-5015-00
Mary Shelley's Frankenstein					
CPU	(512K)	965-0188-00	A1.03	C5	960-7001-02
Voice 1	(4M)	965-0192-00		U17	960-5015-00
Voice 2	(4M)	965-0193-00		U21	960-5015-00
Voice 3	(4M)	965-0194-00		U36	960-5015-00
Sound	(512K)	965-0191-00		U7	960-7001-02
Display*	(4M)	965-0189-00	A1.03	ROM 0	960-5015-00
Display*	(4M)	965-0190-00	A1.03	ROM 3	960-5015-00
Baywatch		(CPU Board 520-5003-04)			
CPU	(512K)	965-0195-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0196-00		U17	960-5015-00
Voice 2	(4M)	965-0197-00		U21	960-5015-00
Sound	(512K)	965-0199-00		U7	960-7001-02
Display*	(4M)	965-0200-00	A4.00	ROM 0	960-5015-00
Display*	(4M)	965-0201-00	A4.00	ROM 3	960-5015-00
Batman Forever		(CPU Board 520-5003-04)			
CPU	(512K)	965-0202-00	A3.02	C5	960-7001-02
Voice 1	(4M)	965-0203-00		U17	960-5015-00
Voice 2	(4M)	965-0204-00		U21	960-5015-00
Sound	(512K)	965-0205-00		U7	960-7001-02
Display*	(4M)	965-0206-00	A3.00	ROM 0	960-5015-00
Display*	(4M)	965-0207-00	A3.00	ROM 3	960-5015-00

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

Games hereon use the White Star Board System™ :

ROM	Chip Size	Part Nº	Ver. ✓Sum	Loc.	Raw Part Nº
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	960-5015-00
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	960-5015-00
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	960-5015-00
Voice 2	(4M)	965-0223-41		U21	960-5015-00
Sound	(512K)	965-0221-41		U7	960-7001-02
Display Controller Bd:		**520-5055-01**			
Display	(4M)	965-0222-41	A4.01 $FD01	ROM 0	960-5015-00
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	960-5015-00
Voice 2	(4M)	965-0226-45		U21	960-5015-00
Sound	(512K)	965-0227-45		U7	960-7001-02
Display Controller Bd:		**520-5055-01**			
Display	(4M)	965-0228-45	A2.00 $ABF7	ROM 0	960-5015-00

ROM	Chip Size	Part Nº	Ver. ✓Sum	Loc.	Raw Part Nº
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	960-5015-00
Voice 2	(4M)	965-0231-43		U21	960-5015-00
Voice 3	(4M)	965-0232-43		U36	960-5015-00
Sound	(512K)	965-0233-43		U7	960-7001-02
Display Controller Bd:		**520-5055-01**			
Display	(4M)	965-0234-43	A3.00 $ØØ57	ROM 0	960-5015-00
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	960-5015-00
Voice 2	(4M)	965-0237-56		U21	960-5015-00
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	960-5015-00
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	960-5015-00
Voice 2	(4M)	965-0242-53		U21	960-5015-00
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	960-5015-00
The X-Files					
CPU / Sound Board:		**520-5136-10 (Mono)**			
Game ROM	(1M)	965-0245-46	GAME CODE IN PRODUCTION	U210	960-5009-00
Voice 1	(4M)	965-0246-46		U17	960-5015-00
Voice 2	(4M)	965-0247-46		U21	960-5015-00
Sound	(512K)	965-0248-46		U7	960-7001-02
Display Controller Bd:		**520-5055-01**			
Display	(4M)	965-0249-46		ROM 0	960-5015-00

Table Notes:

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

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

Table №	Type	Source Number	SEGA PINBALL™	N T E®	E C G®	Radio Shack®	R C A®
	RECTIFICATION, BLOCKING AND/OR DAMPENING DIODES						
1	Diode	1N4001	112-5001-00	NTE552	ECG552	- — - — -	SK9000
	Diode	1N4004	112-5003-00	NTE116	ECG116	276-1103	SK3312
	Diode	1N5401	112-0056-00	NTE5801	ECG5801	276-1143	SK9004
	Diode	1N5404	112-5004-00	NTE5804	ECG5804	276-1144	SK9007
	Diode	T6A10L	112-5006-01	- — - — -	- — - — -	- — - — -	- — - — -
	Diode	FR302	112-5009-00	- — - — -	ECG588	- — - — -	SK5014
	ZENER DIODES						
2	Diode	1N4742A 12v	112-0061-00	NTE142A	ECG142A	276-563	SK12V
	Diode	1N4760B 68v	112-0062-00	NTE5092A	ECG5092A	- — - — -	SK68V
	Diode	1N4764 100v	112-0049-00	NTE5096A	ECG5096A	- — - — -	SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A	- — - — -	SK3A9
	Diode	1N5234B 6.2v	112-0047-00	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	- — - — -	SK110X
	Diode	1N6267A 6.8v	112-5011-00	- — - — -	ECG4902	- — - — -	- — - — -
	Diode	1N4752A 33v	112-5010-00	- — - — -	- — - — -	- — - — -	SK33V
	Diode	1N4736 6.8v 1w	112-5007-00	- — - — -	- — - — -	- — - — -	- — - — -
	TRANSISTORS - TYPE FET, NPN, PNP AND/OR SCR						
3	FET Trans.	STP20N10L	110-0106-00	- — - — -	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)			**Comments:**			
4	BR (Present)	DB or CM3501	112-0052-00	For WhiteStar I/O Bds., BR = 35 Amp @ 100v P.I.V.			
	BR (Old)	MDA2501	112-0054-00	BR = 25 Amp @ 100v P.I.V.			
	BR (Old)	MDA3502	112-0057-00	BR = 35 Amp @ 200v P.I.V.			
	RELAYS			**Comments:**			
5	Relay	FRL-264 D024/02CK	190-5002-00	For PPB, Power Supply, & White Star I/O Boards, Relay = 24v DC 10 Amp DPDT			
	Relay	FRL-264 D006/04CV	190-5001-00	For CPU Boards, Relay = 6v DC 5 Amp 4 Pole DT			

APPENDIX C
CPU Jumper Table

Game Name	Game Mfg. Date and Manual PN	CPU Ver.	EPROM Position	Jumpers Installed	Jumpers Removed
1. Laser War	MAY 87 780-5001-00	1	5C	J4 J6a J7a	J5 J6 J7b
		2	5B, 5C	J4 J5a J6a	J5 J5b J6b
2. Secret Service	MAR 88 780-5002-00	2	5B, 5C	J4	J5
3. Torpedo Alley	AUG 88 780-5003-00	2	5B, 5C	J4	J5
4. Time Machine	DEC 88 780-5004-00	2	5B, 5C	J4	J5
5. Playboy 35th Anniversary	MAY 89 780-5005-00	2	5B, 5C	J4	J5
6. ABC Monday Night Football	SEP 89 780-5007-00	2	5B, 5C	J4	J5
7. Robocop	NOV 89 780-5006-00	2	5B, 5C	J4	J5
8. Phantom of the Opera	JAN 90 780-5008-00	2	5B, 5C	J4	J5
9. Back to the Future	JUN 90 780-5009-00	3	5B, 5C	J4	J5
10. The Simpsons	SEP 90 780-5012-00	3	5B, 5C	J4	J5
11. Checkpoint	FEB 91 780-5010-00	3	5B, 5C	J4	J5
12. Teenage Mutant Ninja Turtles	MAY 91 780-5017-00	3	5B, 5C	J4	J5
13. Batman	JUL 91 780-5011-00	3	5B, 5C	J4	J5
14. Star Trek 25th Anniversary	OCT 91 780-5014-00	3	5C	J5	J4
15. Hook	JAN 92 780-5019-00	3	5C	J5	J4
16. Lethal Weapon 3	JUN 92 780-5026-00	3	5C	J5	J4
17. Star Wars	OCT 92 780-5024-00	3	5C	J5	J4
18. Rocky & Bullwinkle & Friends	FEB 93 780-5022-00	3	5C	J5	J4
19. Jurassic Park	APR 93 780-5020-00	3	5C	J5	J4
20. Last Action Hero	AUG 93 780-5027-00	3	5C	J5	J4
21. Tales from the Crypt	NOV 93 780-5018-00	3	5C	J5	J4
22. The Who's Tommy	FEB 94 780-5028-00	3	5C	J5	J4
23. WWF Royal Rumble	MAY 94 780-5023-00	3	5C	J5	J4
24. Guns N' Roses	JUL 94 780-5029-00	3	5C	J5	J4
25. Maverick	SEP 94 780-5031-00	3	5C	J5	J4
26. Mary Shelley's Frankenstein	DEC 94 780-5036-00	3	5C	J5	J4
27. Baywatch	MAR 95 780-5033-00	3	5C	J5	J4
28. Batman Forever	JUL 95 780-5038-00	3	5C	J5	J4
29. Apollo 13	NOV 95 780-5044-00	—	U210	n / a	n / a
30. Golden Eye	FEB 96 780-5042-00	—	U210	n / a	n / a
31. Twister	APR 96 780-5041-00	—	U210	n / a	n / a
32. ID4: Independence Day	JUL 96 780-5045-00	—	U210	n / a	n / a
33. Space Jam	OCT 96 780-5043-00	—	U210	n / a	n / a
34. The Star Wars Trilogy - S.E.	FEB 97 780-5056-00	—	U210	n / a	n / a
35. The Lost World: J.P.	JUN 97 780-5053-00	—	U210	n / a	n / a
36. The X-Files	AUG 97 780-5046-00	—	U210	n / a	n / a

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

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

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

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

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

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

APPENDIX D
Board Type Table

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

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller
Checkpoint	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Teenage Mutant Ninja Turtles	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Batman	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Star Trek 25th Anniversary	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Hook	520-5033-00 2-Flipper	520-5050-01	520-5047-00	520-5042-00 128 X 16	Not Required with 128 X 16
Lethal Weapon 3	520-5033-00 2-Flipper	520-5050-01	520-5047-01	520-5052-00 128 X 32	520-5055-00
Star Wars	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00
Rocky & Bullwinkle & Friends	520-5033-00 2-Flipper	520-5050-02	520-5047-01	520-5052-00 128 X 32	520-5055-00
Jurassic Park	520-5076-00 3-Flipper	520-5050-02	520-5047-02	520-5052-00 128 X 32	520-5055-00
Last Action Hero	520-5070-00 2-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-00
Tales from the Crypt	520-5076-00 3-Flipper	520-5050-03	520-5047-02	520-5052-00 128 X 32	520-5055-01
The Who's Tommy	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01
WWF Royal Rumble	520-5070 or 5080/-00 (Qty. 2) 4-Flip. (2X2)	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01

Table continued on the next page.

APPENDIX D
Board Type Table

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller
Guns N' Roses	520-5076-00 3-Flipper	520-5077-00	520-5047-02	520-5052-00 128 X 32	520-5055-01
Maverick	520-5076-00 3-Flipper	520-5050-03	520-5047-03	520-5075-00 192 X 64	520-5092-01
Mary Shelley's Frankenstein	520-5076-00 3-Flipper	520-5077-00	520-5047-03	520-5075-00 192 X 64	520-5092-01
Baywatch	520-5070 or 5080/-00 (Qty. 2) 4-Flip. (2X2)	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01
Batman Forever	520-5076-00 3-Flipper	520-5126-02	520-5047-03	520-5075-00 192 X 64	520-5092-01

Games hereon use the White Star Board System™ :

Game Name	Flipper	I/O Power Driver	CPU / Sound †	Display Power Supply	Dot Matrix Display	Display Controller
Apollo 13	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32	520-5055-01
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
Twister	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
ID4: Indepen-dence Day	3-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
Space Jam	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
The Star Wars Trilolgy - S.E.	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
The Lost World: J.P.	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01
The X-Files	2-Flipper Bd. Not Required	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01

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

APPENDIX E
Generic Coil Cross-Reference Guide † ‡

STANDARD COILS						FLIPPER COILS			
GA-TURNS	Res. (Ω)	SPI PART Nº	GA-TURNS	Res. (Ω)	SPI PART Nº	GAUGE-TURNS	Res. (Ω)	COLOR	SPI PART Nº
20-400	**1.0** Ω	090-5021-00	**24-940** †	**5.5** Ω	090-5036-00T	**22-750**/30-2600 ‡	**2.6** / 92.0 Ω	N/A	090-5011-00
22-500	**1.7** Ω	090-5017-00			090-5036-00B	**22-900** †	**3.4** Ω	YEL	090-5020-20T
22-600	**2.2** Ω	090-5023-00	**25-1240**	**9.3** Ω	090-5034-00	**22-1080** †	**4.3** Ω	YEL/GRN	090-5032-00T
23-700	**3.1** Ω	090-5022-00	**26-1200** †	**10.3** Ω	090-5044-00T				090-5032-00B
23-750	**3.4** Ω	090-5019-00			090-5044-00B	**23-620**/30-2600 ‡	**2.4** / 75.0 Ω	N/A	090-5006-00
23-800 †	**3.6** Ω	090-5001-00T	**27-1300**	**14.2** Ω	090-5003-00	**23-700**/30-2600 ‡	**3.0** / 83.5 Ω	N/A	090-5013-00
		090-5001-00B	**27-1400**	**14.7** Ω	090-5015-00	**23-800**/30-2600 ‡	**2.8** / 90.5 Ω	N/A	090-5012-00
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			090-5004-00B	**23-1100**	**5.1** Ω	ORG	090-5030-00
23½-765	**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	**29-2000**	**33.6** Ω	090-5016-00	**25-1800**	**13.8** Ω	BLU/GRN	090-5041-00

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

† Coil Part Nºs 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 Nº
22-650	**4.3** Ω	090-5042-00

MINI-COILS		
GA-TURNS	Res. (Ω)	SPI PART Nº
31-1500	**52.0** Ω	090-5054-00
32-1800	**50.2** Ω	090-5031-00

LUGLESS COILS		
GA-TURNS	Res. (Ω)	SPI PART Nº
23-800	**3.6** Ω	090-5053-00

NOTE: All Coil Part Nºs listed ***Do Not Include*** Coil Sleeves (must be ordered separately).

Flipper Coil Table ‡ ††

GAME NAME	Nº of Flip-pers	LOWER FLIPPERS SPI Nº / Gauge-Turns / Color		UPPER FLIPPERS SPI Nº / 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	Nº of Flip-pers	LOWER FLIPPERS SPI Nº / Gauge-Turns / Color		UPPER FLIPPERS SPI Nº / 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

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

APPENDIX F
Motor Specification Table

Game Name	Function	Specifications	Part Nº
Laser War Secret Service Torpedo Alley Time Machine Playboy 35th Anniversary	No motors were used on the games listed on the shaded lines.		
ABC Monday Night Football	Goal Post Up/Down Movement	Motor 24v A.C. 60 RPM CW	515-5222-00
Robocop			
Phantom of the Opera	Organ Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Back to the Future The Simpsons			
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
Hook			
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

Table continued on the next page.

APPENDIX F
Motor Specification Table

Game Name	Function	Specifications	Part Nº
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
Guns N' Roses			
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
Baywatch			
Batman Forever	Cannon Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00
Apollo 13	Rocket Up/Down Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00
	Moon Unit 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
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
Space Jam			
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

APPENDIX G
Part Number Prefix Classification Codes

I. **ELECTRICAL SOURCE AND ENERGY AND SIGNAL CONVERTERS**
- 010- Transformers
- 031- Speakers
- 090- Solenoids

II. **CONDUCTORS, CONNECTORS AND INSULATORS**
- 034- Line Cords
- 036- Cable and Harness Assemblies
- 041- Motors
- 045- Connectors (All Types)
- 077- Lamp Sockets

III. **CIRCUITS AND CIRCUIT ELEMENTS**
- 100- ICs
- 110- Transistors
- 112- Diodes
- 121- Resistors
- 123- Resistors (Variable & Adjustable)
- 125- CAPS
- 140- Crystals
- 165- Light Bulbs
- 180- Switches
- 190- Relays

IV. **BOLTS, SCREWS, NUTS, AND WASHERS**
- 231- Bolts
- 232- Screws (Pan Head)
- 234- Screws (HXW)
- 237- Screws (Misc.)
- 240- Nuts (Misc.)
- 242- Washers (Flat, Round)
- 244- Washers (Split Lock)
- 246- Washers (Lockers, External Tooth)

V. **MECHANICAL COMPONENTS**
- 249- Rivets
- 251- Pins (Dowel)
- 254- Stand-Offs, Spacers and Shims
- 260- Steel Ball
- 265- Springs (Extension)
- 266- Springs (Compression)
- 269- Springs (Washers - Belleville, Wave)
- 280- Grommets and Bushing

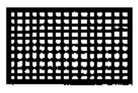
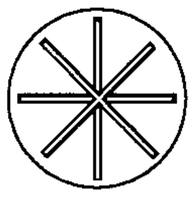
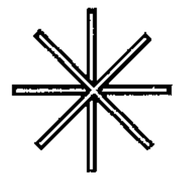
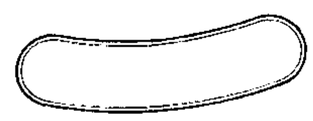
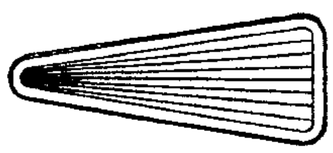
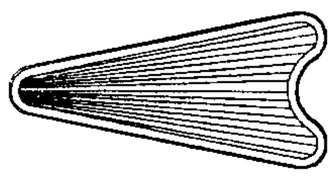
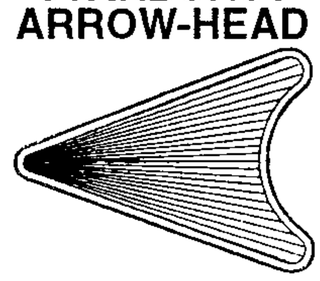
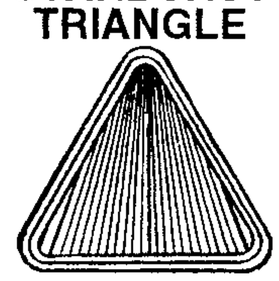
VI. **HANDLES, LOCKS, CATCHES & LATCHES, KEYS & HINGES**
- 355- Handles, Locks, Catches & Latches and Keys
- 390- Hinges

VII. **FABRICATED PARTS (IN-HOUSE ASSEMBLIES)**
- 500- End Product (Systems and Models)
- 515- Sub-Assemblies
- 520- P.C. Boards
- 522- Display Glass
- 525- Wood Parts
- 530- Screw Machined Parts
- 535- Fabricated Parts
- 545- Molded (Extruded) Parts (Rubber Rings, Molded Plastic)
- 550- Molded (Inserts)

VIII. **BULK MATERIALS**
- 600- Braided Ground Wire
- 601- Stranded Wire
- 602- Ribbon Cable
- 605- Sleeving (Shrink Tubing)
- 626- Foam Rubber

IX. **MISCELLANEOUS**
- 705- Packing & Shipping Items
- 820- Decals and Labels (Sets & Misc.)
- 820- Butyrate
- 900- Game Posters
- 960- EPROM (Raw Part)
- 965- EPROM (Programmed Part)

APPENDIX H
Playfield Inserts (Plastic Light Covers)

Patterns: STARBURST  STIPPLE 	STARBURST CIRCULAR 5/8" ø 550-5000-XX	STARBURST CIRCULAR 3/4" ø 550-5001-XX	STARBURST CIRCULAR 1" ø 550-5002-XX	STARBURST CIRCULAR 1-3/16" ø 550-5003-XX	STARBURST CIRCULAR 1-1/2" ø 550-5004-XX
STARBURST CIRCULAR 2-1/4" ø 550-5005-XX	STARBURST CIRCULAR 2-3/4" ø 550-5006-XX	PLAIN CIRCULAR 3/4" ø 550-5007-XX	PLAIN CIRCULAR 1" ø 550-5008-XX	PLAIN CIRCULAR 1-3/16" ø 550-5009-XX	PLAIN CIRCULAR 1-1/2" ø 550-5010-XX
PLAIN CIRCULAR 2-1/4" ø 550-5011-XX	PLAIN CIRCULAR 2-3/4" ø 550-5012-XX	STIPPLE CIRCULAR 1" ø 550-5048-XX	STIPPLE 1" SQUARE 1" 550-5019-XX	ROLLOVER BUTTON BASE  550-5026-XX	WHITE STAR *(only in white)*  545-5015-00
STIPPLE RECTANGULAR 1-1/2" X 3/4" 550-5018-XX	STIPPLE RECTANGULAR 1-1/4" X 1-1/2" 550-5051-XX	STARBURST RECTANGULAR 2-1/4" X 1-1/8" 550-5044-XX	PLAIN RECTANGULAR 2-1/4" X 1-1/8" 550-5049-XX	PLAIN RECTANGULAR 1-1/4" X 1-1/2" 550-5050-XX	PLAIN RECTANGULAR 2" X 2-1/2" 550-5063-XX
STARBURST MINI SHIELD 1" X 1" 550-5024-XX	STARBURST LARGE SHIELD 2-1/5" X 2" 550-5025-XX	MINI HOT DOG 1-5/8" 550-5020-XX	BEVEL HOT DOG 3-1/2" 550-5021-XX	PLAIN HOT DOG 3-1/2" 550-5022-XX	BANANA  550-5023-XX
STARBURST ARROW-SHORT  550-5013-XX	STARBURST ARROW-LARGE  550-5014-XX	STARBURST ARROW-HEAD  550-5015-XX	STARBURST BULLET  550-5016-XX	STARBURST TRIANGLE  550-5017-XX	

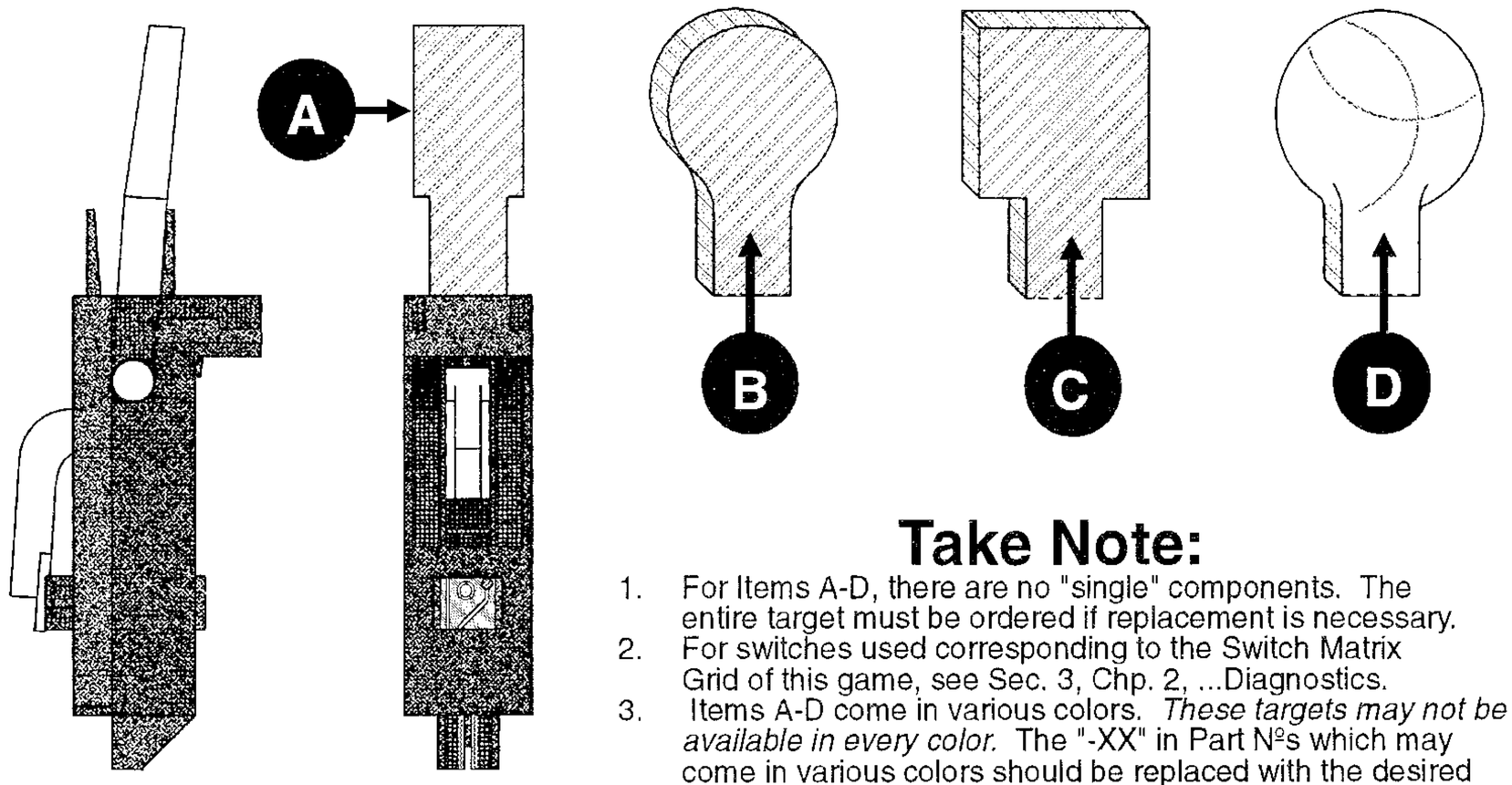
Note: The shapes and sizes shown above are not to scale. Some shapes may no longer be available in every color.

Plastic Part Color Chart

Nº	Color Name	Nº	Color Name	Nº	Color Name	Nº	Color Name
-01	Clear	-09	Purple	-05	Blue	-13	Teal Green
-02	Red	-10	Fluorescent Orange	-06	Yellow	-14	Gray
-03	Amber	-11	Fluorescent Green	-07	Orange	-15	Luminescent
-04	Green	-12	Fluorescent Blue	-08	White	-16	Gold

Instructions: Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit Nº which correspond to the color of that part. The "-XX" in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº. corresponding to the color desired.
Not all colors may be available.

APPENDIX I
Stand-Up Targets

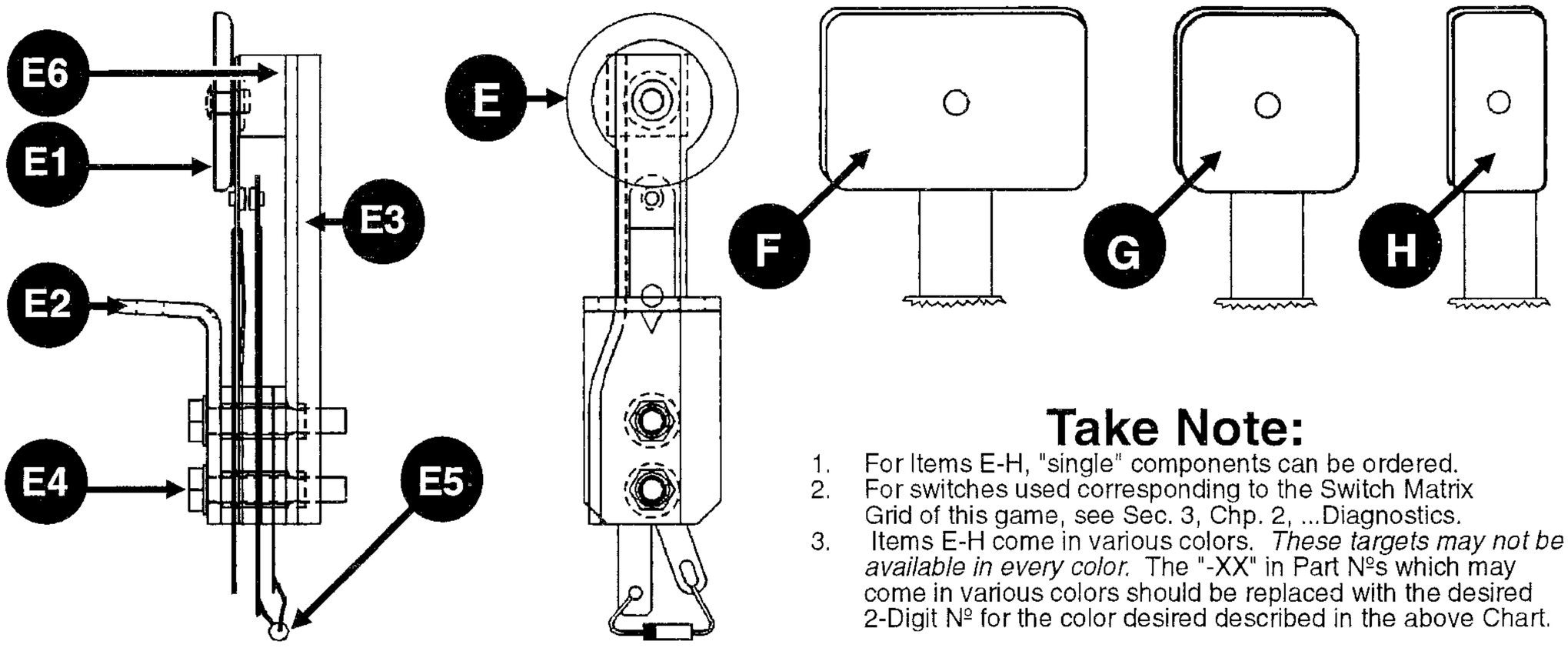


PLASTIC PART COLOR CHART	
Nº	Color
-01	Clear
-02	Red
-03	Amber
-04	Green
-05	Blue
-06	Yellow
-07	Orange
-08	White
-09	Purple
-10	Fluor. Orange
-11	Fluor. Green
-12	Fluor. Blue
-13	Teal Green
-14	Gray
-15	Luminescent
-16	Gold

Take Note:

1. For Items A-D, there are no "single" components. The entire target must be ordered if replacement is necessary.
2. For switches used corresponding to the Switch Matrix Grid of this game, see Sec. 3, Chp. 2, ...Diagnostics.
3. Items A-D come in various colors. *These targets may not be available in every color.* The "-XX" in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº for the color desired described in the Chart.

Nº	Stand-Up Target Name	Part Nº	Nº	Stand-Up Target Name	Part Nº
A	Modular Stand-Up Target Narrow	500-6138-XX	C	Modular Stand-Up Target Square	500-6139-XX
B	Modular Stand-Up Target Round	500-6075-XX	D	Modular Stand-Up Target 1" Spherical	500-6189-XX



Take Note:

1. For Items E-H, "single" components can be ordered.
2. For switches used corresponding to the Switch Matrix Grid of this game, see Sec. 3, Chp. 2, ...Diagnostics.
3. Items E-H come in various colors. *These targets may not be available in every color.* The "-XX" in Part Nºs which may come in various colors should be replaced with the desired 2-Digit Nº for the color desired described in the above Chart.

Nº	Stand-Up (Flat) Target Name	Part Nº
E	1" Round Stand-Up Target Assy.	500-5835-XX
ORDERING ABOVE (ITEM E) ASSY. PART Nº WILL INCLUDE:		
E1‡	Switch & Target Assy. 1" Round	515-5966-XX
E2	Mounting Bracket	535-6896-00
E3	Switch Back Plate	535-6452-00
E4	6-32 X ¾ HWH Swage (Qty. 2)	237-5976-05
E5	Switch Diode, 1N4001	112-5001-00
E6	Foam Pad	626-5029-00

‡ Note: Item E1, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— 1" Round Target (545-5456-XX).

Nº	Stand-Up (Flat) Target Name	Part Nº
F	1" X 1½" Stand-Up Rect. Target Assy.	500-5321-XX
ORDERING ABOVE (ITEM F) ASSY. PART Nº WILL INCLUDE:		
F1‡	Sw. & Target Assy. 1" X 1½" Rect. Items F2-6 are identical to E2-6	515-6027-XX Same as E2-6

Item F Table Note continued in the next column.

Nº	Stand-Up (Flat) Target Name	Part Nº

‡ Note: Item F1, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— Rectangular Target (545-5145-XX).

G	1" Sq. Stand-Up Target Assy.	500-5232-XX
ORDERING ABOVE (ITEM G) ASSY. PART Nº WILL INCLUDE:		
G1‡	Sw. & Target Assy. 1" Square Items G2-6 are identical to E2-6	515-5162-XX Same as E2-6

‡ Note: Item G1, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Radius End (180-5133-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— 1" Square Target (545-5470-XX).

H	Narrow Stand-Up Target Assy.	500-5835-XX
ORDERING ABOVE (ITEM H) ASSY. PART Nº WILL INCLUDE:		
H1‡	Sw. & Target Assy. Narrow Items H2-6 are identical to E2-6	515-5967-XX Same as E2-6

‡ Note: Item H1, is a riveted Sub-Assy. which includes the following items for reference:
1— Stack Switch Square End (180-5132-00), 2— Washer 5/16" (242-5017-00),
3— Rivet 1/8" ø X 3/16" (249-5001-00) and 4— Narrow Target (545-5210-XX).

GLOSSARY OF TERMS

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

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, Color Chart (Bottom) or Section 4, Chapter 1, Playfield & Cabinet - General Switches.

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. **CN**5-P3).

CT (Abbreviation) Center.

DC (Abbreviation) Direct Current.

DT (Abbreviation) Drop Target(s).

EB (Acronym) Extra Ball.

Eject Playfield surface device to kick ball back into play; 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 (Acronym) 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 Light emitting diode.

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

Lwr. (Abbreviation) Lower.

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

MB (Acronym) Magnet Board.

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

MID (Abbreviation) Middle

Non-Reflexive See Reflexive.

No. or Nº or # (Abbreviation) Number

NPF (Acronym) No Problem Found.

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

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

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

P (Abbreviation) Pin (e.g. CN5-**P**3).

PCB (Acronym) Printed Circuit Board

P/F (Abbreviation) Playfield.

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

Plumb Bob Tilt Weight on Tilt Assembly.

PPH (Abbreviation) Phillips Pan Head.

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

PPB Playfield Power Board ("Popcorn Popping Board").

PREV (Abbreviation) Previous.

PSB (Acronym) 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 (Acronym) Return Merchandise Authorization Number

RT, Rt. or R. (Abbreviation) Right.

RO (Abbreviation) Rollover (switches).

Saucer See Eject.

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

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

SMB (Acronym) Shaker Motor Board.

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

SSFB (Acronym) Solid State Flipper Board.

STEP Refers to the service switches on the coin door.

Sub-Assy. (Abbreviation) Sub-Assembly.

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

TM (Acronym) Trademark

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

Tri-Ball Three balls in play.

TTL (Acronym) Transistor-Transistor Logic

Upr. (Abbreviation) Upper.

V or v (Abbreviation) Volt(s).

Ver. (Abbreviation) Version.

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

X (Acronym) "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 Nº	Qty.	Description	Date Received

SEGA PINBALL, INC. LIMITED WARRANTY

SEGA PINBALL, INC., ("SELLER") WARRANTS ONLY TO THE INITIAL PURCHASER OF ITS PRODUCTS THAT THE ITEMS LISTED BELOW ARE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND SERVICE FOR THE ***WARRANTY PERIOD SPECIFIED:***

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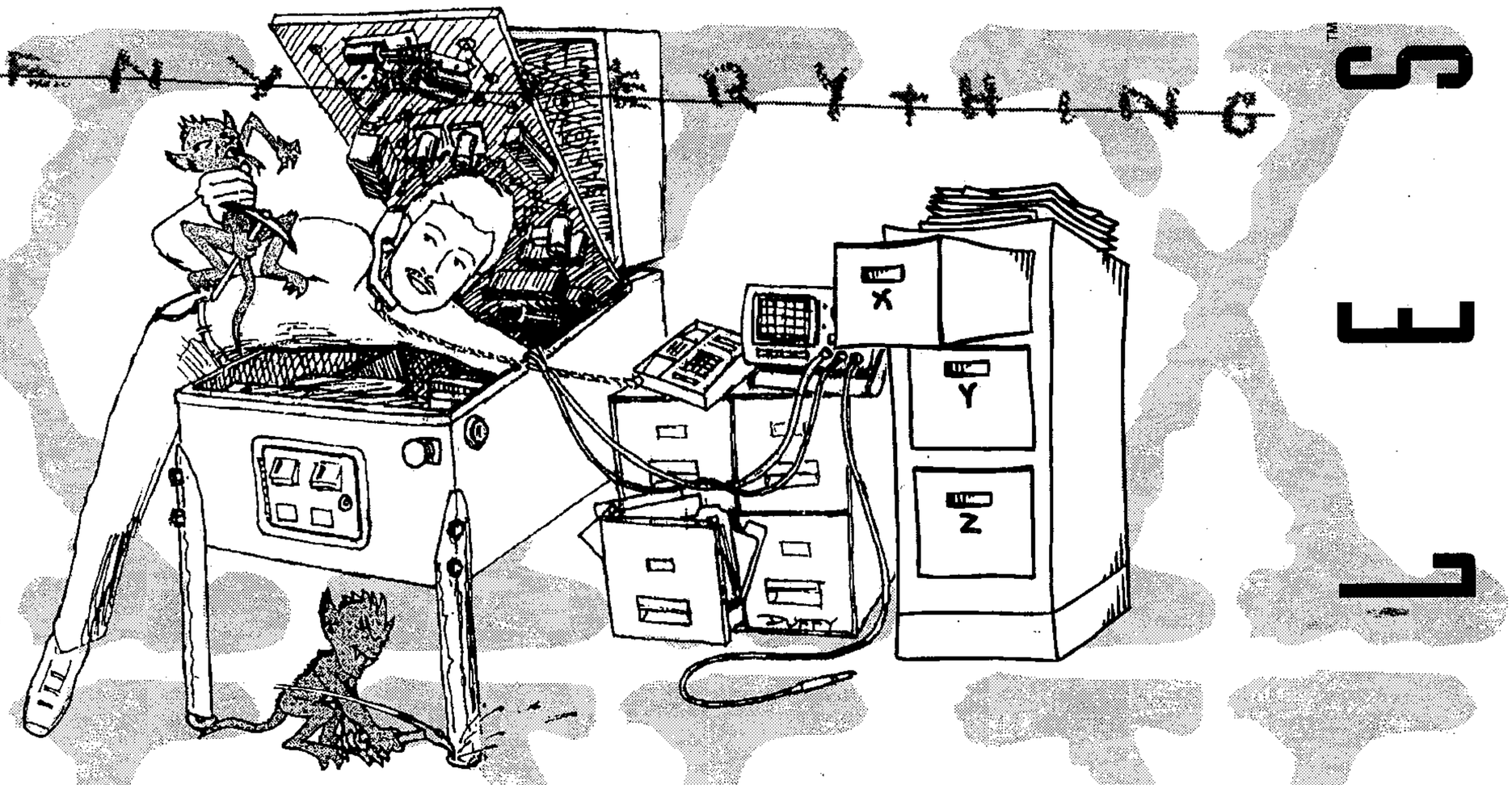
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Inch fractions defined:

1/16"
1/8"
1/4"
1/2"
3/4"

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

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