

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

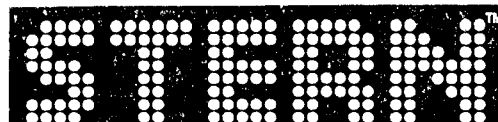
The inside cover & the front pages
DR. ① thru DR. ⑩ covers the basics

Alot of questions get answered here...



NO YES END PREU QUIT?

The Portals™ Service Menu,
Section 3, is your Technical Friend...



PINBALL, INC.

Our New Name (formerly Sega)...



Your Parts Sales & Technical Support Team

Joe Blackwell
DIRECTOR,
Parts Sales &
Technical Support



Susan Molitor
Parts
Sales
MANAGER



Patty Schraps
Parts
Stockroom
MANAGER



Jim Thornton
Technical
Support
ENGINEER



Jay Alfer
Technical Support
Documentation
ADMINISTRATOR



This is a Sample Game Manual. At time of printing, some technical information, schematics and/or drawings may not have been included. Call 1-800-542-5377 (USA & Canada) or 1-708-345-7700 for Technical Support and/or information.

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December 1999 Print Cop

SPI PN: 780-5064-SP ①

▼ BACKBOX LAYOUT LOCATIONS: FUSES, BRIDGES, RELAYS & ROMs ▼



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



QUICK REFERENCE FUSE CHART

Backbox Fuses

LOC: DISPLAY POWER SUPPLY (P.S.) BOARD

F1	¾A 250v S.B.	90v DC	High Voltage Display
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LOC: I/O POWER DRIVER BOARD

F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	3A 250v S.B.	50v DC	Not Used / Spare
F21	3A 250v S.B.	50v DC	Coils
F22	8A 250v S.B.	18v DC	Controlled Lamps
F23	4A 250v S.B.	5v DC	Logic
F24	5A 250v S.B.	6.3v AC	G.I. Lamps (BRN-WHT to WHT-BRN)
F25	5A 250v S.B.	6.3v AC	G.I. Lamps (YEL to WHT-YEL)
F26	5A 250v S.B.	6.3v AC	G.I. Lamps (GRN to WHT-GRN)
F27	5A 250v S.B.	6.3v AC	G.I. Lamps (VIO to WHT-VIO)
F28	3A 250v S.B.	24v AC	Not Used / Spare

Cabinet Fuses

LOC: SERVICE (AC) OUTLET BOX (Cabinet Bottom)

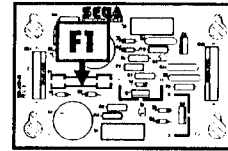
n/a	8A 250v S.B.	115v AC	Main Fuse Line (Domestic or USA)
n/a	5A 250v S.B.	220v AC	Main Fuse Line (International)

Golden Cue Playfield Fuses

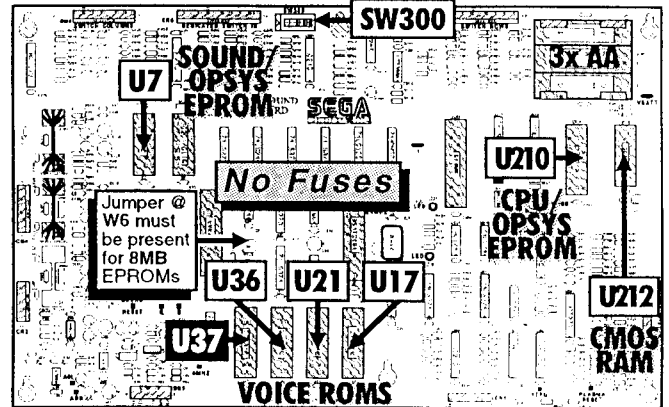
LOC: UNDER PLAYFIELD (By Assemblies Listed)

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

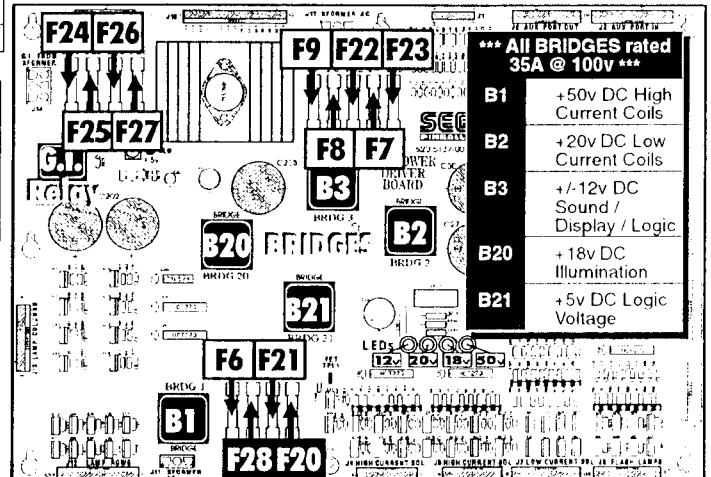
Display Power Supply Bd.



CPU / Sound Board



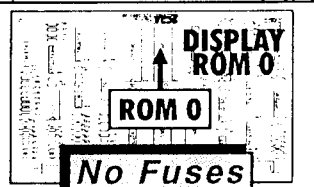
I/O Power Driver Board



For Backbox & Cabinet Gen. Parts, see Sec. 4, Chp. 1, Parts ID & Location (The Pink Pages)

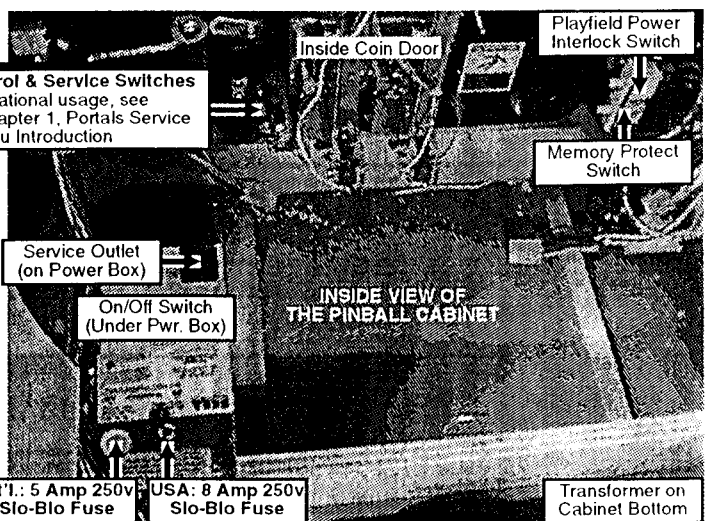
For Schematics and/or Component Parts on above Boards, see Sec. 5, Chp. 4, Printed Circuit Boards (PCBs) (The Yellow Pages)

Display Controller Board (Mounted behind the Dot Matrix Display)



The Display Controller Board (holds the Display ROM Loc: ROM0) is positioned behind the 128 X 32 Dot Matrix Display Board (Neither board contain Fuses.)

Volume Control & Service Switches
For operational usage, see Section 3, Chapter 1, Portals Service Menu Introduction



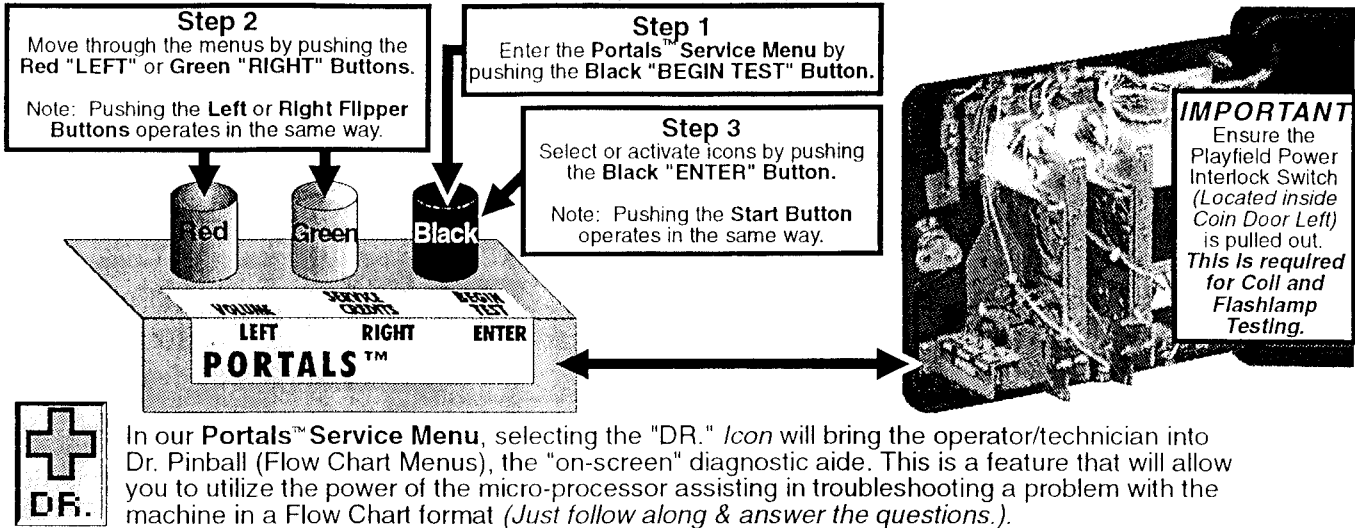
Find-It-In-Front:
Dr. Pinball

Golden Cue
TOURNAMENT EDITION

DR. ①

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

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



▼ HOW IT WORKS ▼

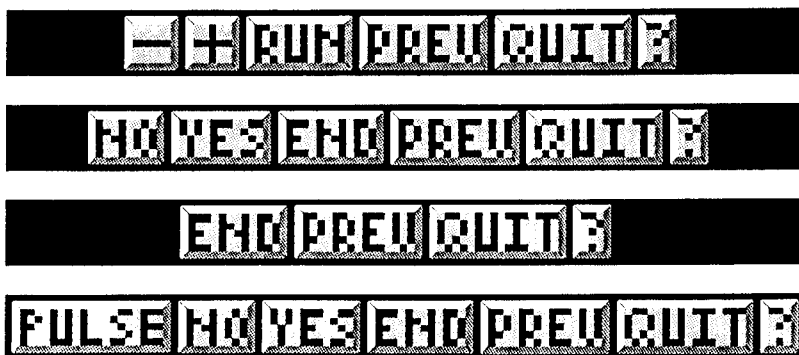
First, the operator/technician must enter the Service Mode (for a complete description of the **Portals™ Service Menu** and **ICONS** see Section 3, Chapter 1). To get into the Service Menu Mode: • Power-up game (if not already) & open the Coin Door. • On the Coin Door is the **Portals™ Service Switch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

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

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



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



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

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

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

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



▼ DIAGNOSTIC AIDS ▼

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

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

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

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

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

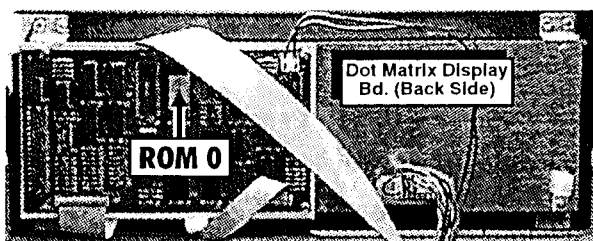
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
USA *	ON								
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
AUSTRIA	ON	▲							
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BELGIUM	ON		▲						
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
BRAZIL	ON	▲	▲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

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

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
NORWAY	ON	▲		▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWEDEN	ON	▲	▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWITZERLAND	ON		▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
UK	ON	▲	▲						
	OFF	▼	▼	▼	▼	▼	▼	▼	▼
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
UK FOR NEW 50p 2E COIN MECH	ON	▲	▲	▲					
	OFF	▼	▼	▼	▼	▼	▼	▼	▼

*All countries not noted use the "USA Setting"

▼ ROM SUMMARY TABLE ▼



The Display Controller Board (holds the Display ROM Loc. ROM0) is positioned behind the 128 X 32 Dot Matrix Display Board.

I.C. NAME	TYPE	BD. NAME	LOC.	PART N°
Game ROM	1MB	CPU / Sound Bd.	U210	965-0308-64
Voice ROM 1	4MB	CPU / Sound Bd.	U17	965-0309-64
Voice ROM 2	4MB	CPU / Sound Bd.	U21	965-0310-64
Voice ROM 3	4MB	CPU / Sound Bd.	U36	965-0311-64
Voice ROM 4	N/C	CPU / Sound Bd.	U37	N/A
Sound EPROM	512K	CPU / Sound Bd.	U7	965-0312-64
Display EPROM	4MB	Display Cntrl. Bd.	ROM 0	965-0313-64
Display EPROM	N/C	Display Cntrl. Bd.	ROM 1	N/A

For Game, Voice & Sound ROM Locations see **DR. ①**.



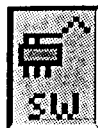
Find-It-In-Front:
Dr. Pinball

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TOURNAMENT EDITION

DR. ③



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

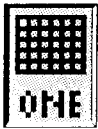
Diode On Terminal Strip: See Page 83.

SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8	GND	Ground
Row (Return)	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9	IC U206 INPUTS	BLK CN6-P1, -P11
1: U400 WHT-BRN CN7-P9	LEFT BUTTON (SKILL) On Cabinet side	PLAYFIELD GLASS SWITCH On Cabinet side	7-BANK DROF TRGT (1)(9) Under FIF	STAND-UP TARGET (G) OLDEN Under FIF	LEFT TOP LANE V (O) DKA Under FIF	TOP LEFT ORBIT Under FIF	LEFT TURBO BUMPER Under FIF	LEFT OUTLANE (SPECIAL) Under FIF	1: U206 GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON On Cabinet side
2: U400 WHT-RED CN7-P8	4TH COIN SLOT On Coin Door	LOCKDOWN SWITCH On Cabinet front	7-BANK DROF TRGT (2)(10) Under FIF	STAND-UP TARGET G (O) LDEN Under FIF	MID TOP LANE VO (D) KA Under FIF	TOP LEFT RAMP ENTER Above FIF	BOTTOM TURBO BUMPER Under FIF	LEFT RETURN (V) ODKA Under FIF	2: U206 GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S. (End-of-Stroke) On Cabinet side
3: U400 WHT-ORG CN7-P7	6TH COIN SLOT On Coin Door	4-BALL TROUGH #1 (LEFT) Under FIF	7-BANK DROF TRGT (3)(11) Under FIF	STAND-UP TARGET GO (L) DEN Under FIF	RIGHT TOP LANE VOD (K) A Under FIF	NOT USED	RIGHT TURBO BUMPER Under FIF	LEFT SLINGSHOT Under FIF	3: U206 GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON On Cabinet side
4: U400 WHT-YEL CN7-P6	RIGHT COIN SLOT On Coin Door	4-BALL TROUGH #2 Under FIF	7-BANK DROF TRGT (4)(12) Under FIF	STAND-UP TARGET GOL (D) EN Under FIF	LEFT RAMP ENTER Above FIF	NOT USED	SINGLE DROP TRG (8) BALL Under FIF	RIGHT OUTLANE (SPECIAL) Under FIF	4: U206 GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S. (End-of-Stroke) On Cabinet side
5: U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA On Coin Door	4-BALL TROUGH #3 Under FIF	7-BANK DROF TRGT (5)(13) Under FIF	STAND-UP TARGET GOLD (E) N Under FIF	NOT USED	NOT USED	TOURNA- MENT BUTTON Cabinet Front	RIGHT RETURN VODK (A) Under FIF	5: U206 GRY-GRN CN6-P7	#5 UPPER LEFT FLIPPER BUTTON On Cabinet side
6: U401 WHT-BLU CN7-P3	LEFT COIN SLOT On Coin Door	4-BALL TROUGH VUK OPTO Under FIF	7-BANK DROF TRGT (6)(14) Under FIF	STAND-UP TARGET GOLDE (N) Under FIF	NOT USED	NOT USED	START BUTTON Cabinet Front	RIGHT SLINGSHOT Under FIF	6: U206 GRY-BLU CN6-P8	#6 VOLUME (RED BUTTON) (In Test: LEFT) On Coin Door
7: U401 WHT-VIO CN7-P2	5TH COIN SLOT On Coin Door	4-BALL STACKING OPTO Under FIF	7-BANK DROF TRGT (7)(15) Under FIF	LEFT ORBIT Under FIF	STAND-UP TARGET TOP LEFT Under FIF	NOT USED	SLAM TILT On Coin Door	NOT USED	7: U206 GRY-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) On Coin Door
									8: U206 GRY-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) On Coin Door



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



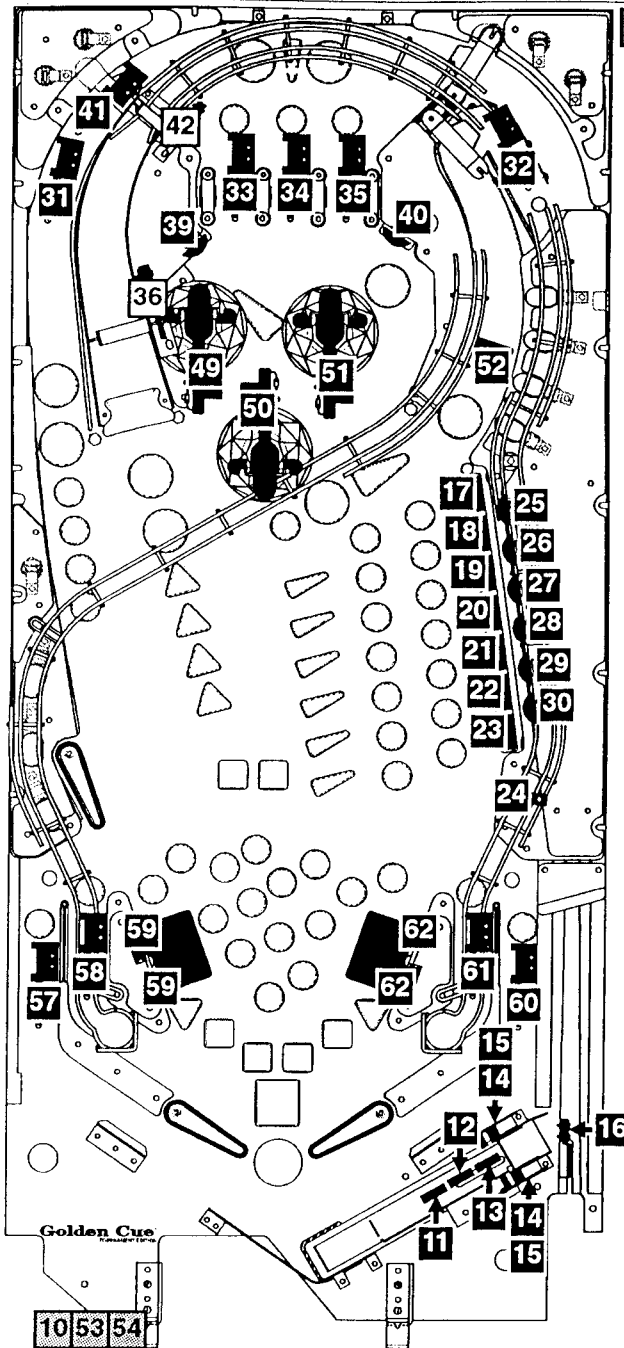
From the Lamp
Menu
GO TO ROW OR
COLUMN TEST

Diode On Terminal Strip: None

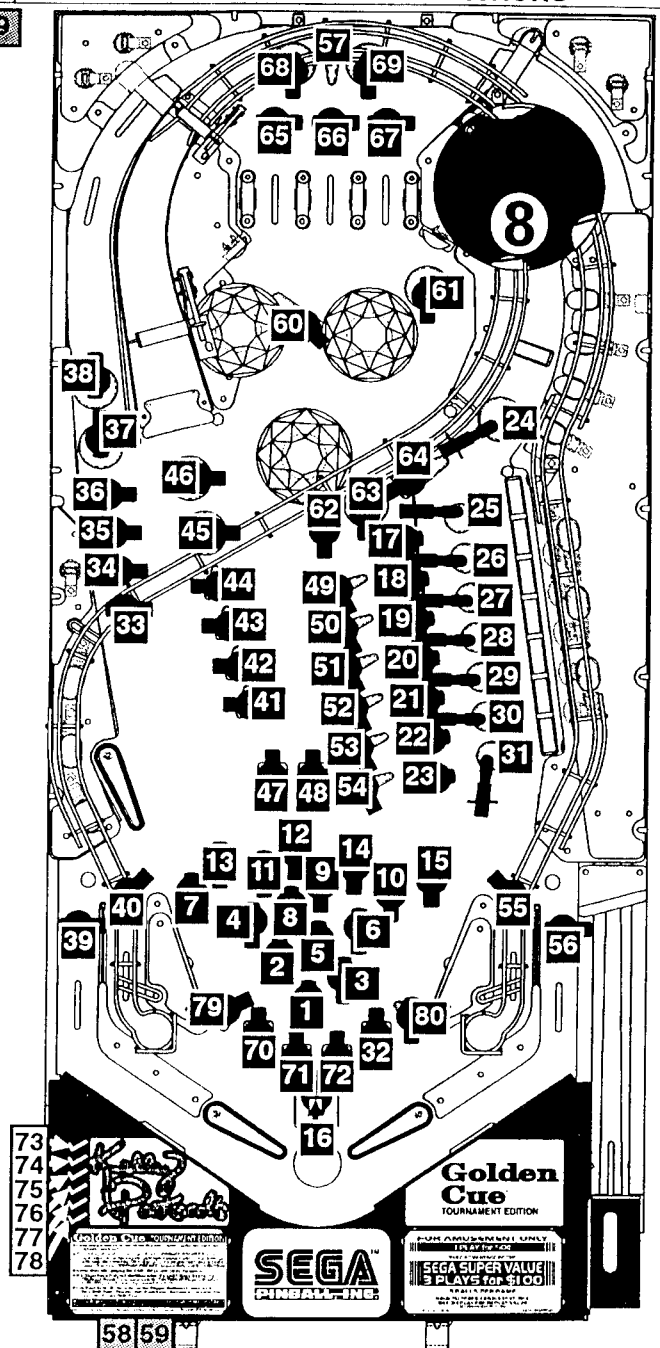
LAMP MATRIX GRID

Column (18V)	1: U17	2: U16	3: U15	4: U14	5: U13	6: U12	7: U11	8: U10
Row (GND)	YEL-BRN J13-P9	YEL-RED J13-P8	YEL-ORG J13-P7	YEL-BLK J13-P6	YEL-GRN J13-P5	YEL-BLU J13-P4	YEL-VIO J13-P3	YEL-GRY J13-P1
1: Q33 RED-BRN J12-P1	BONUS (1) BALL #555 Bulb	BONUS (2) BALL #555 Bulb	BONUS (3) BALL #555 Bulb	BONUS (4) BALL #555 Bulb	BONUS (5) BALL #555 Bulb	BONUS (6) BALL #555 Bulb	BONUS (7) BALL #555 Bulb	BONUS (8) BALL #555 Bulb
2: Q34 RED-BLK J12-P2	BONUS (9) BALL #555 Bulb	BONUS (10) BALL #555 Bulb	BONUS (11) BALL #555 Bulb	BONUS (12) BALL #555 Bulb	BONUS (13) BALL #555 Bulb	BONUS (14) BALL #555 Bulb	BONUS (15) BALL #555 Bulb	SHOOT AGAIN #555 Bulb
3: Q35 RED-ORG J12-P3	7-BANK (1) BALL #44 Bulb	7-BANK (2) BALL #44 Bulb	7-BANK (3) BALL #44 Bulb	7-BANK (4) BALL #44 Bulb	7-BANK (5) BALL #44 Bulb	7-BANK (6) BALL #44 Bulb	7-BANK (7) BALL #44 Bulb	SINGLE D/T (8) BALL #44 Bulb
4: Q36 RED-YEL J12-P4	7-BANK (9) BALL #555 Bulb	7-BANK (10) BALL #555 Bulb	7-BANK (11) BALL #555 Bulb	7-BANK (12) BALL #555 Bulb	7-BANK (13) BALL #555 Bulb	7-BANK (14) BALL #555 Bulb	7-BANK (15) BALL #555 Bulb	BONUS (5X) #555 Bulb
5: Q37 RED-GRN J12-P5	LEFT ORBIT (1M) #555 Bulb	LEFT ORBIT (2M) #555 Bulb	LEFT ORBIT (3M) #555 Bulb	LEFT ORBIT (5M) #555 Bulb	LEFT ORBIT (EXTRA BALL) #555 Bulb	LEFT ORBIT (SPECIAL) #555 Bulb	LT OUTLANE (SPECIAL) #555 Bulb	LT RETURN (V) ODKA #555 Bulb
6: Q38 RED-BLU J12-P6	LEFT RAMP (2X) #555 Bulb	LEFT RAMP (3X) #555 Bulb	LEFT RAMP (4X) #555 Bulb	LEFT RAMP (5X) #555 Bulb	LEFT RAMP (5M) #555 Bulb	LEFT RAMP (JACKPOT) #555 Bulb	GOLDEN (5M) #555 Bulb	GOLDEN (SPECIAL) #555 Bulb
7: Q39 RED-VIO J12-P8	(G) OLDEN #555 Bulb	G (O) LDEN #555 Bulb	GO (L) DEN #555 Bulb	GOL (D) EN #555 Bulb	GOLD (E) N #555 Bulb	GOLDE (N) #555 Bulb	RT RETURN VODK (A) #555 Bulb	RT OUTLANE (SPECIAL) #555 Bulb
8: Q40 RED-GRY J12-P9	SKILL SHOT #555 Bulb	TOURNAMENT BUTTON #555 Bulb	START BUTTON #555 Bulb	S-U TOP LT (BANK SHOT) #555 Bulb	S-U TOP RT (TROPHY) #555 Bulb	SINGLE D/T (LOCK) #555 Bulb	SINGLE D/T (MULTIBALL) #555 Bulb	SINGLE D/T (COLLECT...) #555 Bulb
9: Q41 RED-WHT J12-P10	TOP LANE V (O) DKA #555 Bulb	TOP LANE VO (D) KA #555 Bulb	TOP LANE VOD (K) A #555 Bulb	TOP ORBIT (2M) #555 Bulb	TOP ORBIT (5M) #555 Bulb	BONUS (2X) #555 Bulb	BONUS (3X) #555 Bulb	BONUS (4X) #555 Bulb
10: Q42 RED J12-P11	ARCH LED CHECK 1 Green LEDs	ARCH LED CHECK 2 Green LEDs	ARCH LED CHECK 3 Green LEDs	ARCH LED CHECK 4 Green LEDs	ARCH LED CHECK 5 Green LEDs	ARCH LED CHECK 6 Green LEDs	BONUS (8M) #555 Bulb	BONUS (16M) #555 Bulb

SWITCH MATRIX GRID LOCATIONS

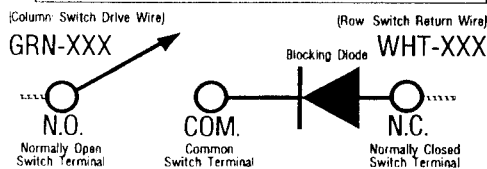


LAMP MATRIX GRID LOCATIONS

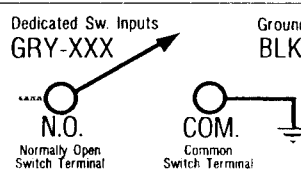


Legend Note: = Switches/Lamps mounted above P/F. = Switches/Lamps mounted below the P/F. = ...mounted on Cabinet.

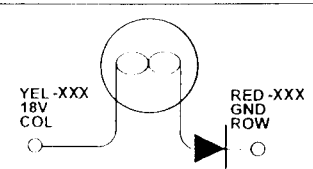
TYPICAL SWITCH SCHEMATIC



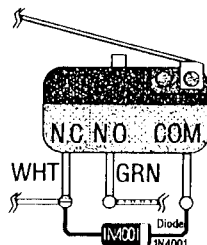
DEDICATED SWITCH SCHEMATIC



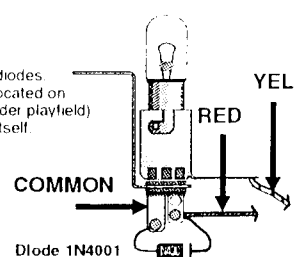
TYPICAL LAMP SCHEMATIC



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



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



Find-It-In-Front:
Dr. Pinball

Golden Cue
TOURNAMENT EDITION

DR. 6



COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	23-800 090-5001-00T
#3	FLASH LOWER LEFT X4	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-03
#4	8-BALL DIVERter	Q4	I/O Pwr. Drvr.	BRN-YEL	J8-P5	BRN	J7-P1	20v DC	32-1800 090-5031-02
#5	LOCK BALL UP-POST	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	28-1050 090-5046-00
#6	SINGLE DROP TARGET (RESET)	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#7	7-BANK DROP TARGET (RESET)	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	DL4SS 515-6076-01

High Current Coils Group 2		Drive Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn
#9	LEFT TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#10	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	BRN	J7-P1	20v DC	23-800 090-5001-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	BRN	J7-P1	20v DC	23-800 090-5001-00T
#14	UPPER FLIPPER (50v RED/YEL)	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-900 090-5020-30T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-900 090-5020-30T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-900 090-5020-30T

Low Current Coils Group 1		Drive Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn Flash/Meter #
#17	FLASH UPPER LEFT X2	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-05
#18	FLASH UPPER RIGHT X3	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	ORG	J6-P10	20v DC	165-5000-89 † 165-5004-05 †
#19	FLASH MID RIGHT X4	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-06
#20	FLASH LOWER RIGHT X3	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-02
#21	LT OUTLANE (SKILL)	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	26-1200 090-5044-00T
#22	RT OUTLANE (SKILL)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	26-1200 090-5044-00T
#23	UP/DOWN POST (SKILL)	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	Meter 5v 091-5000-00

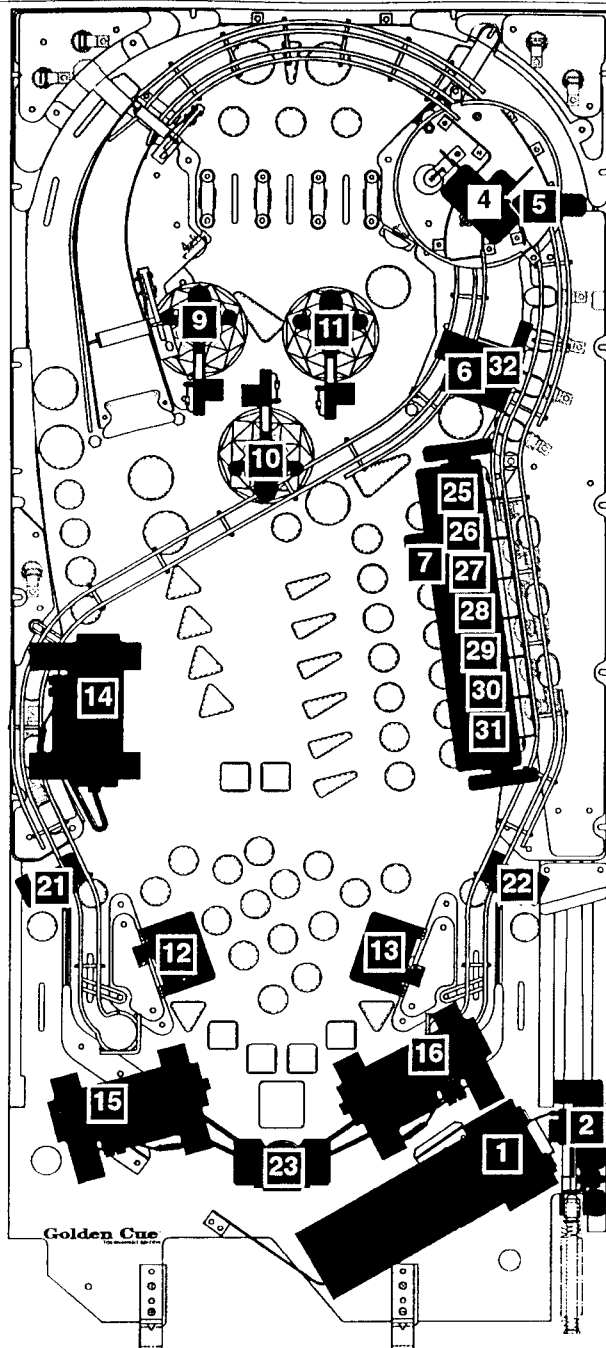
Diode On Terminal Strip (if noted)

† Flasher Note: Flash Q18 = 1X #89 Bulb, 2X Blue (-05) #906 Bulb (Yellow (-06), Red (-02), Amber (-03))

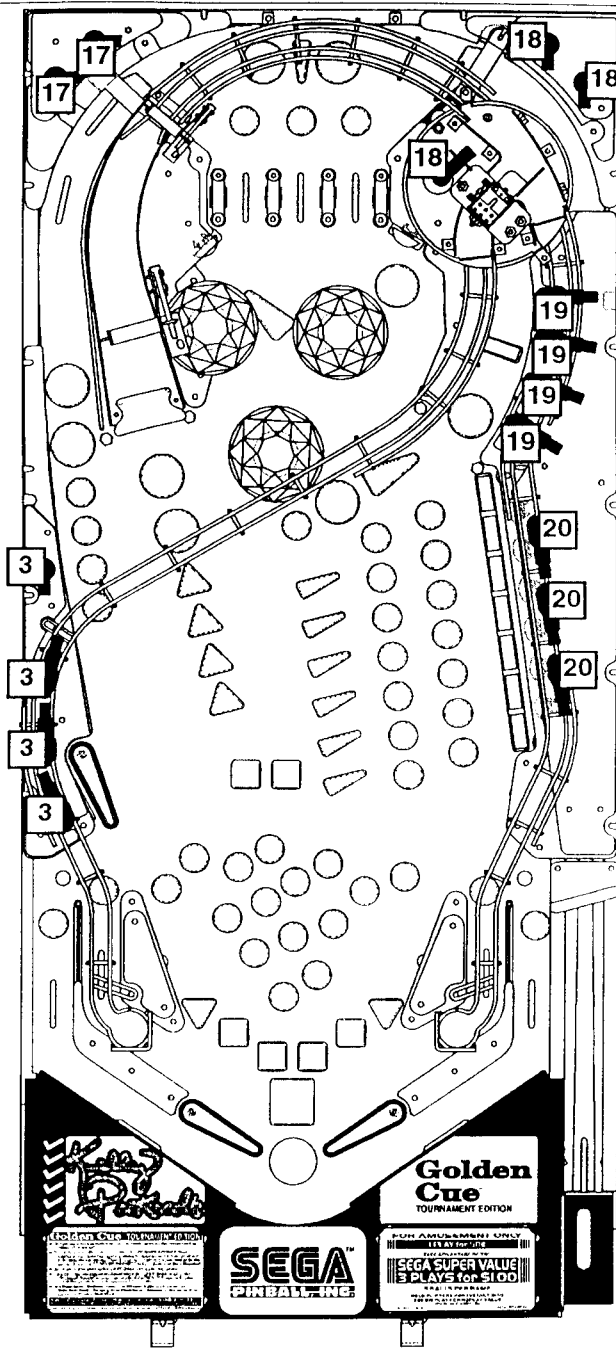
Low Current Coils Group 2		Drive Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn
#25	7-BANK DROP TRGT (1) (TRIP)	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	BRN	J7-P1	20v DC	33-1590 090-5060-00
#25	7-BANK DROP TRGT (2) (TRIP)	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	BRN	J7-P1	20v DC	33-1590 090-5060-00
#27	7-BANK DROP TRGT (3) (TRIP)	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	BRN	J7-P1	20v DC	33-1590 090-5060-00
#28	7-BANK DROP TRGT (4) (TRIP)	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	BRN	J7-P1	20v DC	33-1590 090-5060-00
#29	7-BANK DROP TRGT (5) (TRIP)	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	BRN	J7-P1	20v DC	33-1590 090-5060-00
#30	7-BANK DROP TRGT (6) (TRIP)	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	BRN	J7-P1	20v DC	33-1590 090-5060-00
#31	7-BANK DROP TRGT (7) (TRIP)	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	BRN	J7-P1	20v DC	33-1590 090-5060-00
#32	SINGLE DROP TRGT (8) (TRIP)	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	BRN	J7-P1	20v DC	33-1590 090-5060-00

Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q3 and Q17-Q20)

COIL LOCATIONS

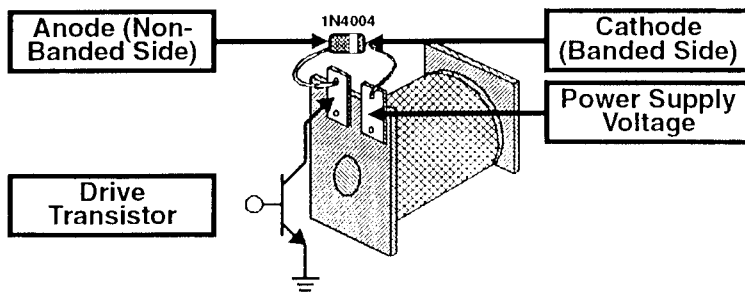


FLASH LAMP LOCATIONS



Legend Note:  = Coils/Flashers mounted above P/F.  = Coils/Flashers mounted below the P/F.  = ...mounted in/on Cabinet

TYPICAL COIL WIRING



Note:
All Coils require diodes. Some
diodes are located on Terminal
Strips (under playfield) & not on
the coil itself.
D = Diode
O = On
T = Terminal
S = Strip

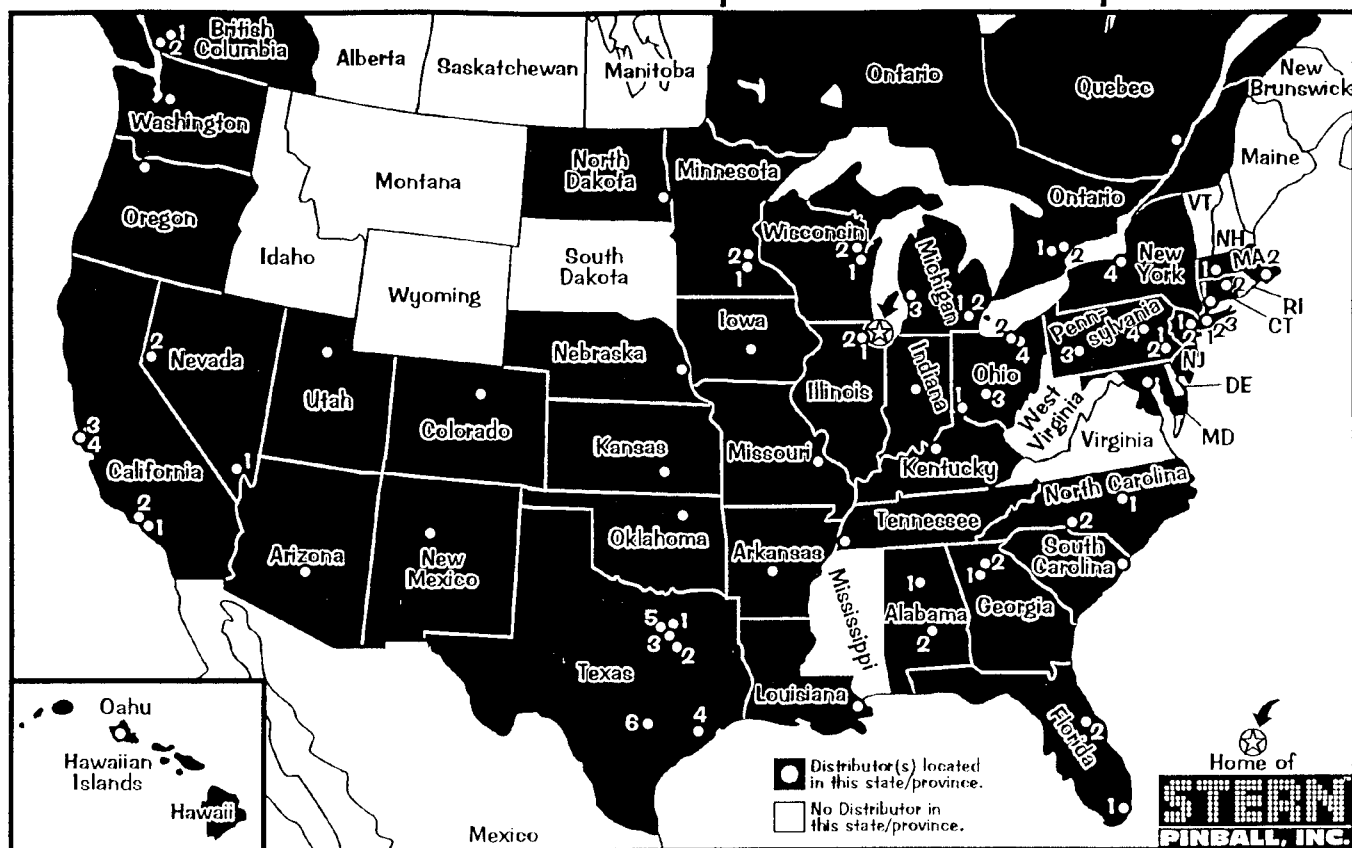


Find-It-In-Front:
Dr. Pinball

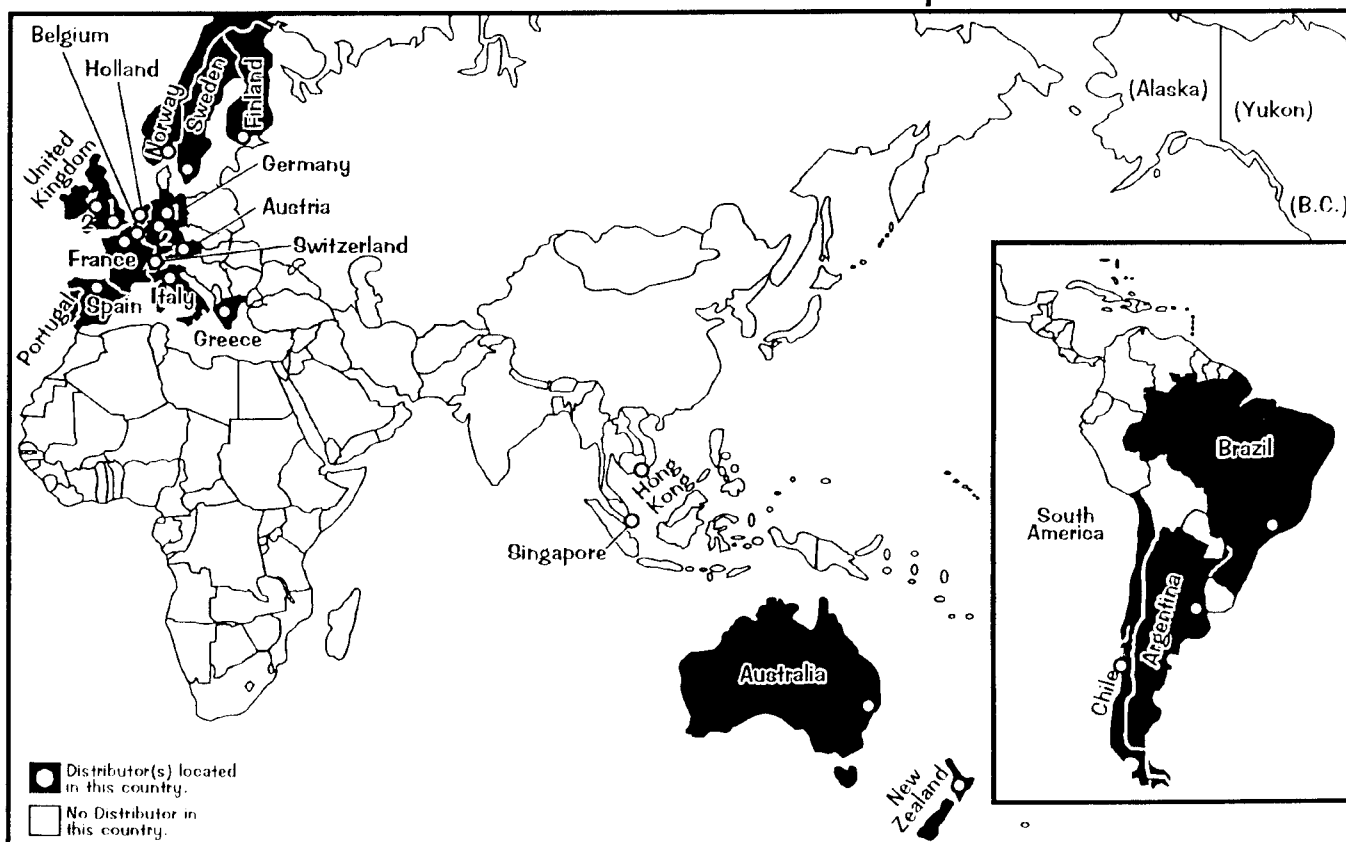
Golden Cue
TOURNAMENT EDITION

DR. 7

Domestic Pinball & Redemption Distributors Map



International Distributors Map



For Parts & Service, call your nearest Distributor. View the above maps & the directories on the next page to locate your closest Distributor in your state, province, or country. Distributors and phone numbers are subject to change. Call Stern Pinball, Inc. (Parts Sales & Technical Support) with any questions or if your Distributor cannot help you: 1-800-542-5377 (in USA or Canada) or 1-708-345-7700.

DR. 8

Kelly Perkowski

Find-It-In-Front:
Dr. Pinball



Domestic Pinball & Redemption Distributors Directory

ALABAMA Birmingham 1 Birmingham Vending 205-324-7526 Montgomery 2 Franco Distributing 334-834-3455	Florida (cont.) Orlando 2 Birmingham Vending 407-425-1505 Brady Distributing 407-872-1666 GEORGIA Atlanta 1 Greater Southern 770-352-3040 Roswell 2 Game Exchange Inc. 770-594-7215 HAWAIIAN ISLANDS Kapolei, Oahu 50th State Coin Op. 808-682-4561	Maryland (cont.) Baltimore (cont.) Weiner Distributing 410-525-2600 MASSACHUSETTS E. Longmeadow 1 Gekay Sales 413-525-2700 Norwood 2 Betson Ent. (NECO) 781-769-9760 MICHIGAN Livonia 1 Cleveland Coin 313-432-1040 Redford 2 Atlas Distributing 313-794-4880 Wyoming 3 Atlas Distributing 616-241-1472 MINNESOTA Bloomington 1 Hanson Distributing 612-884-6604 Minneapolis 2 Lieberman Music 612-887-5299 MISSOURI St. Louis Shaffer Distributing, Co. 314-645-3393 NEBRASKA Omaha Greater America Dist. 402-553-2812 Mid-City Dist. 402-341-5300 NEVADA Las Vegas 1 Mountain Coin 702-798-0900 Reno 2 Reno Game Sales 775-829-2080 NEW JERSEY Carlstadt 1 Betson Enterprises 201-438-1300 Carteret 2 State Sales & Service 732-750-2700	NEW MEXICO Albuquerque Mountain Coin 505-345-7706 NEW YORK Garden City Pk. 1 T & M Distributing 516-747-0034 New Hyde Park 2 Betson Enterprises 516-354-4647 Roslyn Heights 3 Deith Distributing 516-621-1234 Syracuse 4 Betson Enterprises 315-455-5400 T & M Distributing 315-432-1932 NORTH CAROLINA Archdale 1 Operators Distributing 336-884-5714 Charlotte 2 Brady Distributing 704-357-6284 NORTH DAKOTA Fargo M.H. Associates, Inc. 701-282-7877 OHIO Cincinnati 1 Atlas Distributing 513-851-4100 Cleveland 2 Cleveland Coin 216-692-0960 Columbus 3 Shaffer Distributing, Co. 614-421-6800 Macedonia 4 Shaffer Distributing, Co. 330-467-4850 OKLAHOMA Tulsa Galaxy Distributing, Co. 918-835-1166 ONTARIO Rexdale 1 New Way Sales 416-674-8000 Toronto 2 Starburst Coin Machines 416-251-2122	OREGON Portland American Coin 503-233-7000 Dunis Distributing 503-234-5491 PENNSYLVANIA Bensalem 1 State Sales & Service 215-638-1122 King Of Prussia 2 Betson Enterprises 610-265-1155 Pittsburgh 3 Betson Enterprises 412-331-8703 Green Coin 412-881-8804 Wilkes-Barre 4 Superior (Roth Novelty) 570-824-9994 QUEBEC Montreal Laniel Automatic Mach 514-731-8571 SOUTH CAROLINA Mrytle Beach Green Coin 843-626-1900 TENNESSEE Memphis Brady Distributing 901-345-7811 Green G.A.M.E.S. 901-353-1000 TEXAS Carrollton 1 Nickels & Dimes 972-492-3262 Corsicana 2 Master Sales 903-874-4740 Dallas 3 Commercial Music 214-741-6381 Houston 4 H.A. Franz, & Co. 713-523-7366 Southgate Amusement 713-691-7335 Irving 5 Sunbelt Amusement 972-721-4600	Texas (continued) San Antonio 6 H.A. Franz, & Co. 210-226-6322 Southgate Amusement 210-225-3844 UTAH Salt Lake City Mountain Coin 801-262-5493 Struve Distributing 801-328-1636 WASHINGTON Seattle American Coin 206-764-9020 WISCONSIN Green Bay 1 Pioneer Sales & Svc. 920-336-5800 Menomonee Falls 2 Pioneer Sales & Svc. 414-781-1420
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International Distributors Directory

ARGENTINA Mar Del Plata Electroport / Florencia 011-54-2-395-4923 AUSTRALIA Matraville Amusement Mach. Dist. 011-61-29-316-6000 AUSTRIA Kaindorf R. Rupp Gesellschaft 011-43-34-528-6105 BELOIUM Brussels Spin S.A. 011-32-4-362-7677 Namusco 011-32-2-414-4596	BRAZIL São Paulo Playcenter 011-55-113-824-1774 Setto Games / Universe 011-55-11-575-0731 Unimax 011-55-11-533-5615 CHILE Santiago Cuinsa 011-56-2-641-8520 FINLAND Espoo Pelika Ray Oy 011-35-8-943-2925 FRANCE Aubervilliers Kunick Paris 011-33-14-811-3131	GERMANY Berlin 1 Bally Wulff 011-49-3-062-0020 Hannover 2 Bally Wulff 011-49-511-358-5368 ORECE Athens Greece Coin 011-30-1-577-7012 HOLLAND Amsterdam AWA 011-31-20-694-2600 HONG KONG Kowloon Bondeal Limited 011-85-22-487-9089	ITALY (RSM) San Marino Technoplay SA 011-37-890-0361 NEW ZEALAND Auckland Amco Machine Supp. 011-64-9-846-7606 NORWAY Oslo Vendomatic 011-47-2-291-8383 PORTUGAL Amadora Jacinto & Martins 011-35-11-495-1868 SINGAPORE Singapore Valibel Technologies 011-65-748-8404	SPAIN Madrid Sente SA 011-34-91-541-7112 SWEDEN Malmo Truemax AB 011-46-4-015-3635 SWITZERLAND Harkingen Novomat AG 011-41-62-388-8961 UNITED KINGDOM London (England) 1 Electrocoin 011-44-181-965-2055 Cardiff (S. Wales) 2 Electrocoin Altersales 011-44-122-234-3888
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Find-It-In-Front:
Dr. Pinball

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

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

BEFORE TRANSPORTING



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.

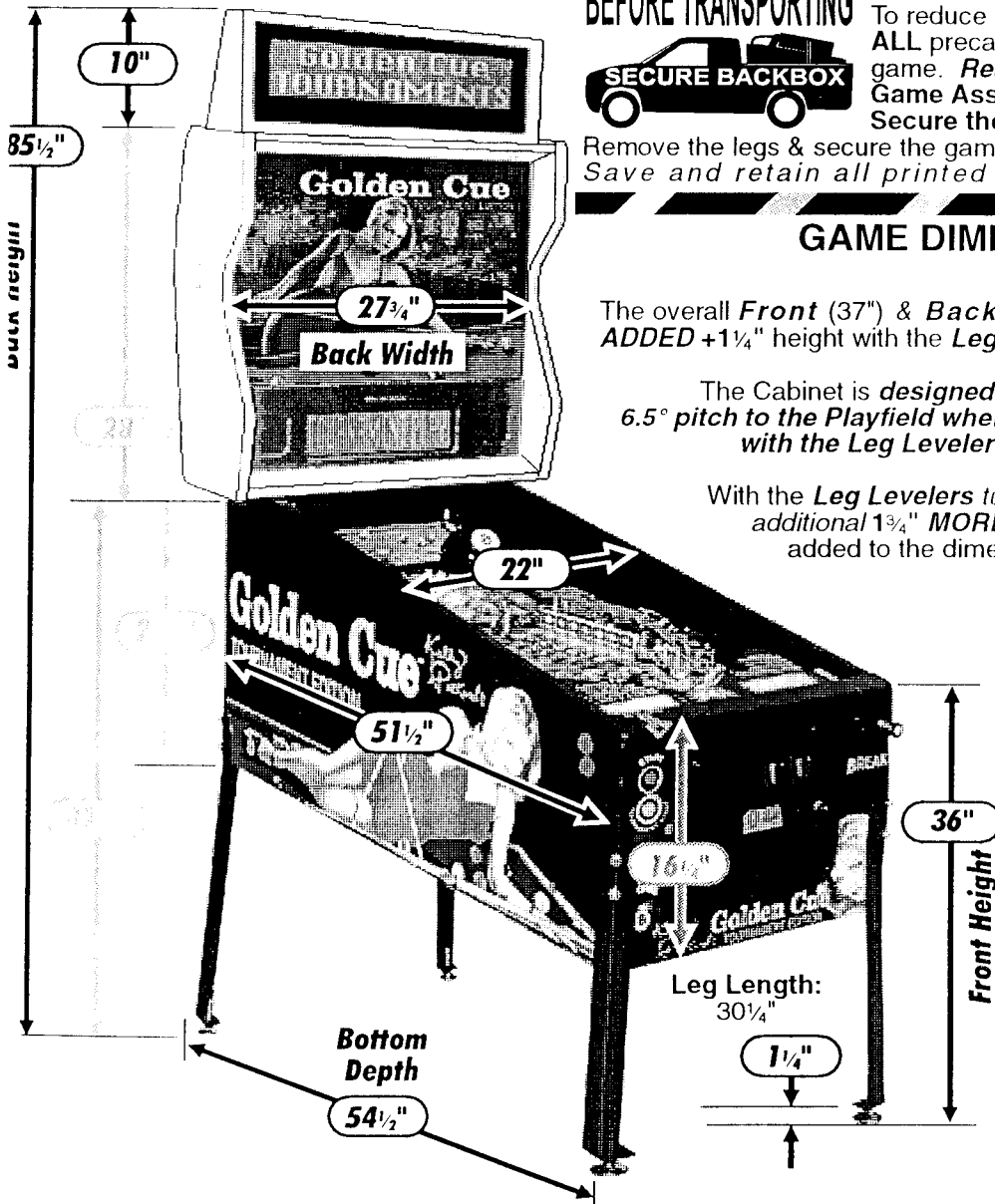
TRANSPORTATION

GAME DIMENSIONS

The overall **Front** (37") & **Back** (75⁵/₈") dimensions reflect the **ADDED +1¼"** height with the **Leg Levelers** turned all the way in;

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

With the **Leg Levelers** turned all the way **out**, an additional **1¾" MORE** to the overall height should be added to the dimensions.



Shipping Box Dimensions

Height: 55½"

Width: 30 $\frac{1}{2}$ "

Depth: 31"

Weight: 260lbs. (+/- 3)

CAUTION



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

Golden Cue™ TOURNAMENT EDITION

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

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IT MODEM & INTERFACING MANUALBack (Green) Section

Limited Warranty, Cautions, Warnings & Notices Inside Back



Game Set-Up

Game Assembly Procedures

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

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

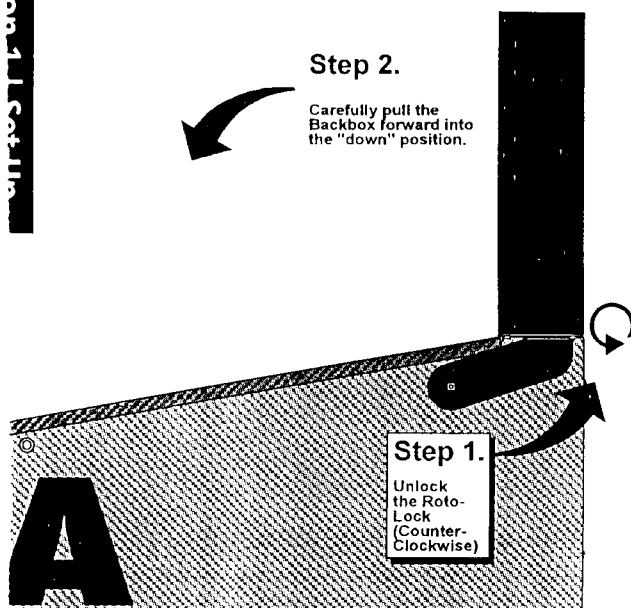
The playfield incline affects difficulty of play. Use the recommended incline; Game difficulty is best varied using game adjustments.

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

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

How to Secure the Backbox for Transporting

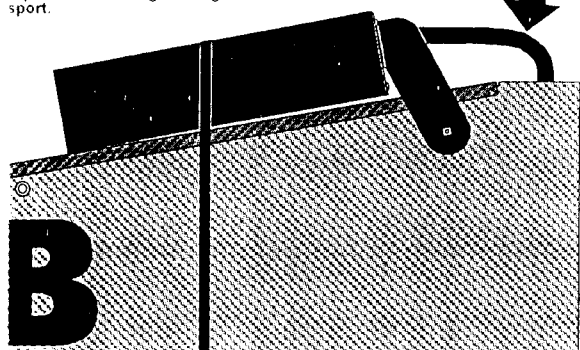
Section 1, Chapter 1



Step 3.

top of the Backbox will on the Pinball Side Armor. p or tie down the Backbox rep from "bouncing" during sport.

Ensure Cables do not bind, pinch or are being pulled tight. Hand-Feed out with Backbox so Cables are not tight.



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

Leg Leveler Adjustment

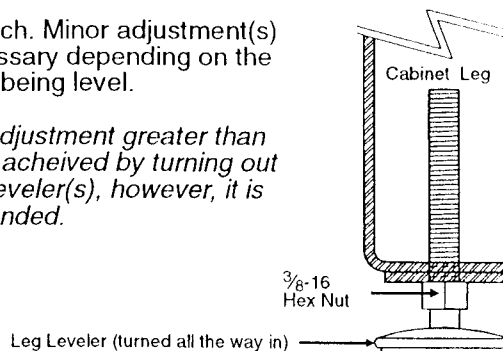
This cabinet is designed to automatically have a 6.5° pitch without any Leg Leveler adjustment!

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

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

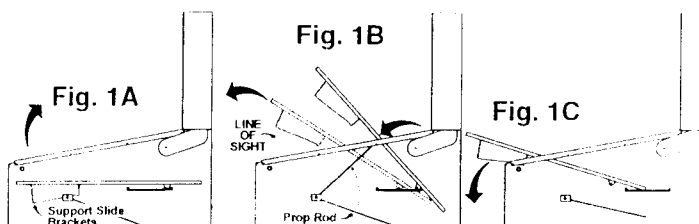
Verify 6.5° pitch. Minor adjustment(s) may be necessary depending on the location floor being level.

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



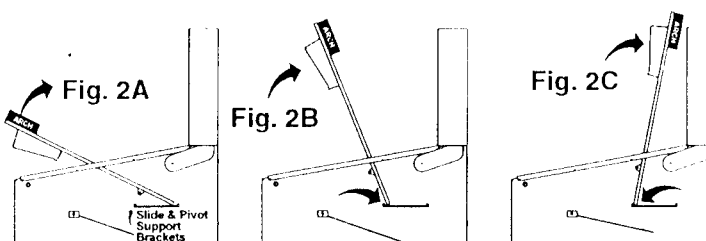
Easy Access Service System - 3 Positions

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



Positions 1 & 2

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



Position 3

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

Kelly Packard

Section 1, Chapter 1
Game Set-Up

Game Operation & Features

Start of Game Features

Starting a Normal Game

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

The display now indicates the player or # of players selected from the total depressions of the **START BUTTON**. The display indicates the ball in play, and a ball is served to the *Shooter Lane*. An introduction is shown followed by Skill Shot Graphics and/or instructions. Pressing the **START BUTTON** after ball 1 of any player will start a new game (if credits are available), **but only** if the **START BUTTON** is depressed for 2-3 seconds. This delay is to avoid accidental "re-starts" of a game. (Note: Any 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. **NOTE: THIS GAME ONLY:** For *Special IT Tournament Play*, press the **TOURNAMENT BUTTON** under the **START BUTTON**.

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 oooooooh! so much gosh darn harder!

Ball Saving: Left, Right & Center

As a "**Skill**" Feature, you can save the ball from draining into the Left or Right Outlanes by pressing either of the **EXTRA BUTTONS** under the **FLIPPER BUTTONS** (left & right respectively). To save the ball from draining down the Center, you have to press in **both EXTRA BUTTONS** simultaneously.

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



FOLD
HERE

Golden Cue™ TOURNAMENT EDITION

- Completing a feature (listed above this card), lights up the corresponding "Check" Mark. ✓
- Completing all six (6) features qualifies the **CORNER POCKET Shot** to Collect Bonus. Completing the **CORNER POCKET** when "Collect Bonus" is lit, adds the remaining "Time Bonus" to the players score and ends the game. Shoot the "CORNER POCKET" to Lock Balls and Start **Multiball**.
- Game ends after playing the **LAST BALL -OR-** collecting Bonus.
- If a player has not played **Multiball** when the **LAST BALL** begins, the "Multiball Ready" is automatically lit. **CAUTION !!!** Player will forfeit 1,000,000 points for each by-passed "Lock" Shot.
- Use **Post-Save™ Buttons** (under the Flipper Buttons) to raise each Side Skill Post. Pressing both **Post-Save™ Buttons** at the same time raises the Center Skill Post.

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

Sega Pinball, Inc. & Post-Save TM & © 1999 Golden Cue TM & © 1999 All Rights Reserved. SPI Part N°: 755-5164-GC AMERICAN

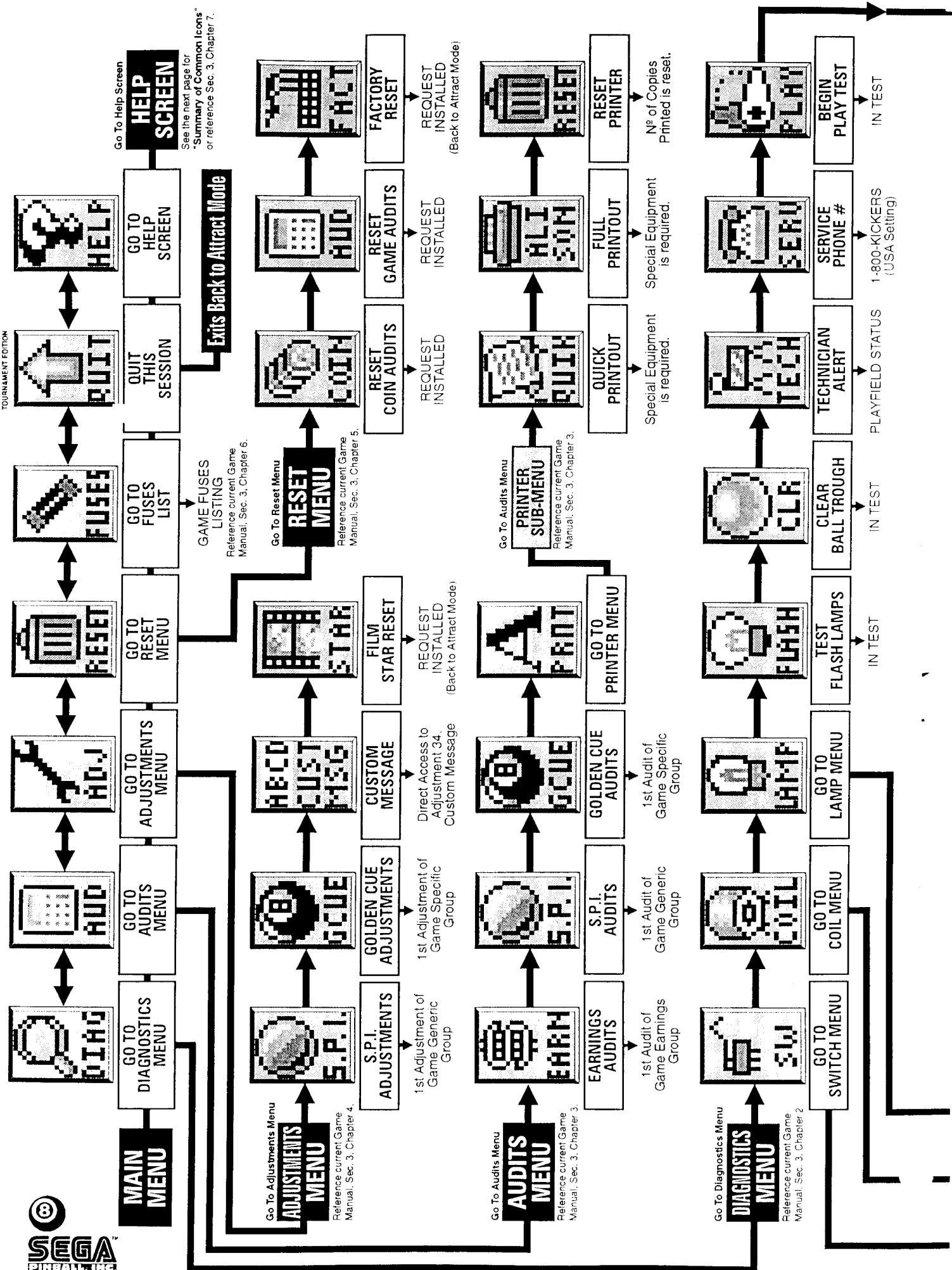
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Section 2, Chapter 1
Game Operation & Features

Portals™ Service Menu Introduction

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See the next page for
"Summary of Common Icons"
or reference Sec. 3, Chapter 7.

Portals™ Service Menu Example

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

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

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



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



Important Note:



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

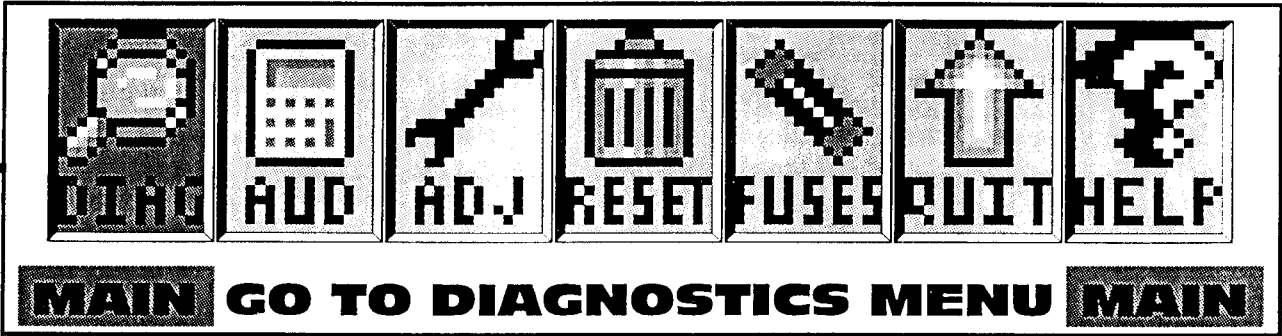


Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.

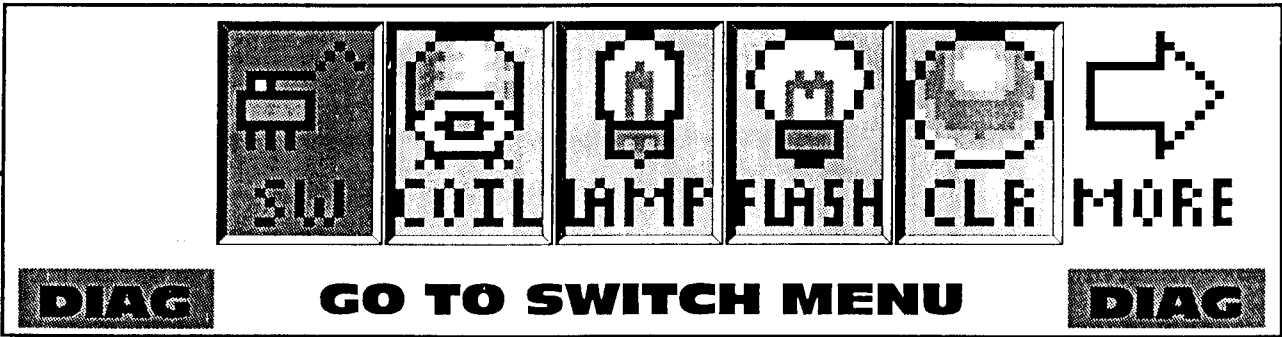


Selecting & activating the "HELP" *Icon* will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

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

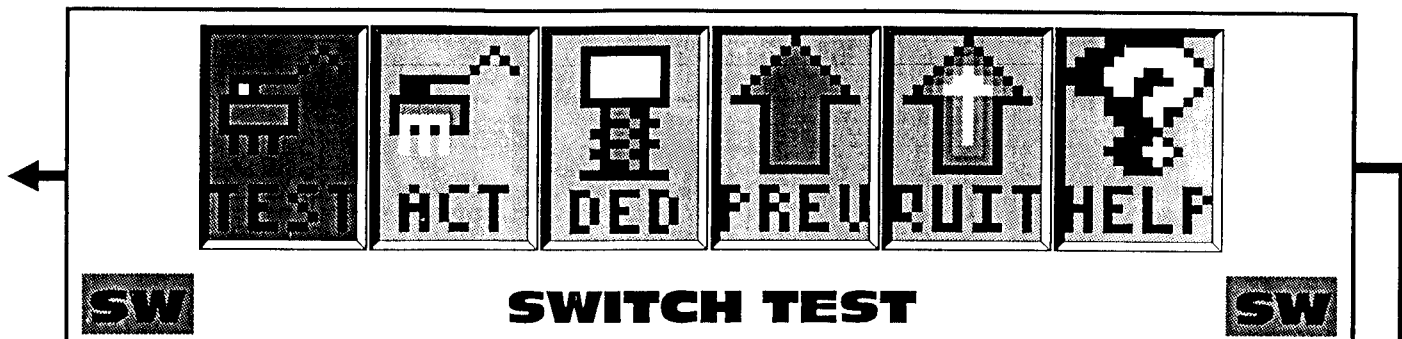


Press the **Black "ENTER" Button** to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

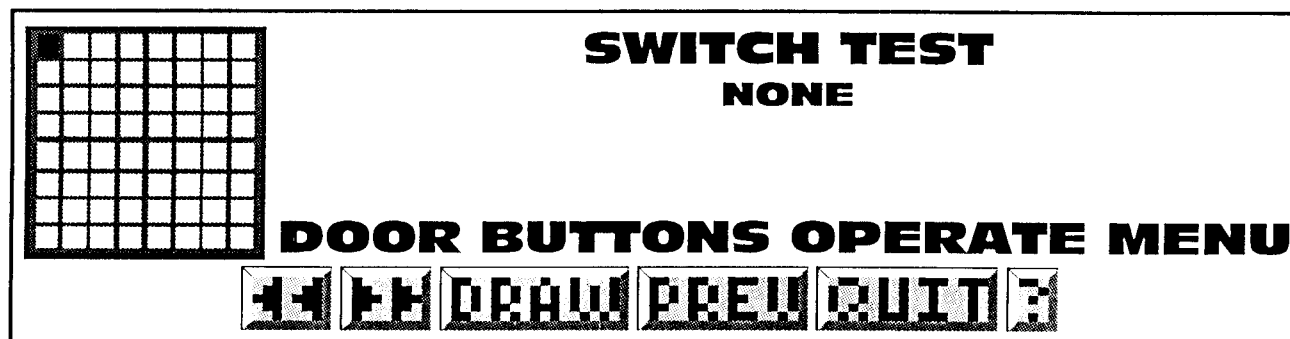


The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (GO TO SWITCH MENU) flashing. Press the **Black Button** to activate this icon. This will bring up the **SWITCH TEST MENU**.

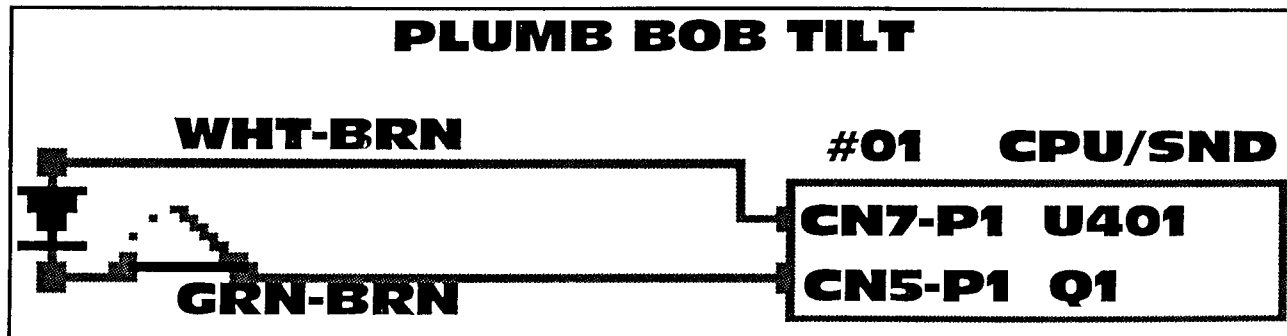
The **SWITCH TEST MENU** now appears with the "TEST" *Icon* (SWITCH TEST) flashing:
Press the **Black "ENTER" Button** to *activate* this icon. This will bring up the **Switch Test Display**.



The **Switch Test Display** now appears.



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



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

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

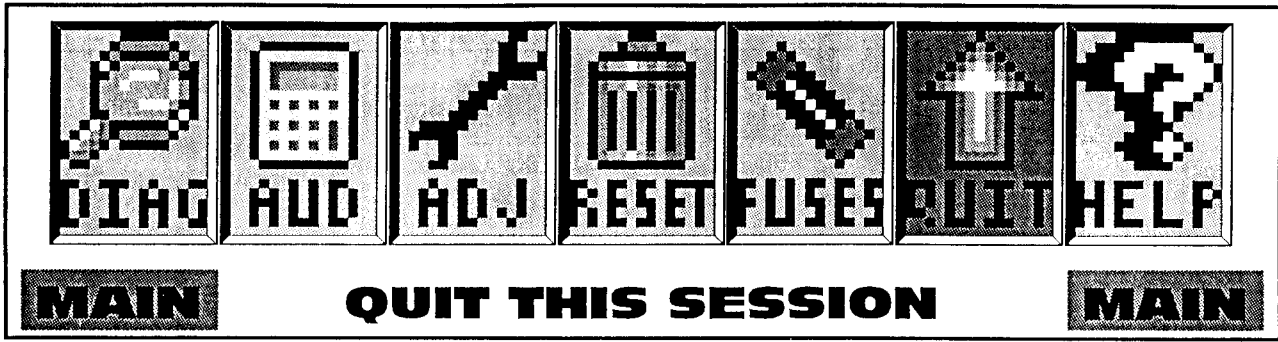
Note:

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

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

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

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no text or other markings on the paper.

Go To Diagnostics Menu

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

Overview

The Portals™ Service Menu System provides tests for sounds, display, lamps, switches and coils. Each feature may be tested manually or automatically after entering the Portals™ Service Menu (see Chapter 1 of this section). Select the "DIAG" Icon from the MAIN MENU to go to the DIAGNOSTICS MENU. The automatic tests (e.g. *Cycling Coils, 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 their 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:



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



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



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



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



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



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



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

Some tests require navigation through the menu(s) and selection of the Icons with 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* & *Golden Cue 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 (3) parts: Switch Test, Active Switches, and Dedicated Switch Test.

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



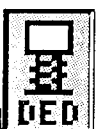
Switch Test

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



Active Switch Test

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



Dedicated Switch Test

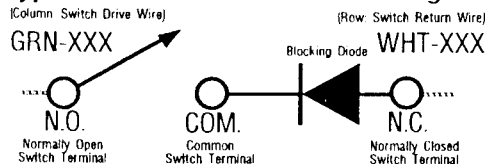
To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either **Flipper Button** & press the **Start Button** (The service switches are deactivated during this test.). The display will describe the switch which includes the Switch Name, Return (Row) Wire, Drive (Column) Wire, Part N^o, and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

Diode On Terminal Strip: See Page 83.

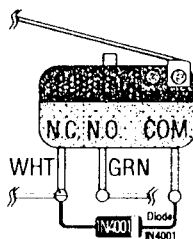
SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8	GND	Ground
Row (Return)	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9	IC U206 INPUTS	BLK CN6-P1, -P11
1: U400	LEFT BUTTON (SKILL) on Cabinet side	PLAYFIELD GLASS SWITCH on Cabinet side	7-BANK (1)(9) on Cabinet side	STAND-UP TARGET (G) OLDEN Under FIF	LEFT TOP LANE V (O) DKA Under FIF	TOP LEFT ORBIT Under FIF	LEFT TURBO BUMPER Under FIF	LEFT OUTLANE (SPECIAL) Under FIF	1: U206 GRY-BRN CN6-P2	#1 LEFT FLIPPER BUTTON on Cabinet side DS-1
2: U400	4TH COIN SLOT on Coin Door	LOCKDOWN SWITCH on Cabinet side	7-BANK (2)(10) on Cabinet side	STAND-UP TARGET G (O) LDEN Under FIF	MID TOP LANE VO (D) KA Under FIF	TOP LEFT RAMP ENTER Under FIF	BOTTOM TURBO BUMPER Under FIF	LEFT RETURN (V) ODKA Under FIF	2: U206 GRY-RED CN6-P3	#2 LEFT FLIPPER E.O.S (End-of-Stroke) on Cabinet side DS-2
3: U400	6TH COIN SLOT on Coin Door	4-BALL TROUGH #1 (LEFT) on Coin Door	7-BANK (3)(11) on Cabinet side	STAND-UP TARGET GO (L) DEN Under FIF	RIGHT TOP LANE VOD (K) A Under FIF	NOT USED	RIGHT TURBO BUMPER Under FIF	LEFT SLINGSHOT Under FIF	3: U206 GRY-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON on Cabinet side DS-3
4: U400	RIGHT COIN SLOT on Coin Door	4-BALL TROUGH #2 Under FIF	7-BANK (4)(12) on Cabinet side	STAND-UP TARGET GOL (D) EN Under FIF	LEFT RAMP ENTER Above FIF	NOT USED	SINGLE DROP TRGT (8) BALL Under FIF	RIGHT OUTLANE (SPECIAL) Under FIF	4: U206 GRY-YEL CN6-P6	#4 RIGHT FLIPPER E.O.S (End-of-Stroke) on Cabinet side DS-4
5: U401	CENTER COIN SLOT / DBA on Coin Door	4-BALL TROUGH #3 Under FIF	7-BANK (5)(13) on Cabinet side	STAND-UP TARGET GOLD (E) N Under FIF	NOT USED	NOT USED	TOURNAMENT BUTTON on Cabinet Front	RIGHT RETURN VODK (A) Under FIF	5: U206 GRY-GRN CN6-P7	#5 UPPER LEFT FLIPPER BUTTON on Cabinet side DS-5
6: U401	LEFT COIN SLOT on Coin Door	4-BALL TROUGH VUK OPTO Under FIF	7-BANK (6)(14) on Cabinet side	STAND-UP TARGET GOLDE (N) Under FIF	NOT USED	NOT USED	START BUTTON on Cabinet Front	RIGHT SLINGSHOT Under FIF	6: U206 GRY-BLU CN6-P8	#6 VOLUME (RED BUTTON) (In Test: LEFT) on Coin Door DS-6
7: U401	5TH COIN SLOT on Coin Door	4-BALL STACKING OPTO Under FIF	7-BANK (7)(15) on Cabinet side	LEFT ORBIT Under FIF	STAND-UP TARGET TOP LEFT Under FIF	NOT USED	SLAM TILT on Coin Door	NOT USED	7: U206 GRY-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) on Coin Door DS-7
8: U401	RIGHT BUTTON (SKILL) on Cabinet side	SHOOTER LANE Under FIF	10 POINT SWITCH Under FIF	LOCK BALL LANE Under FIF	STAND-UP TARGET TOP RIGHT Under FIF	NOT USED	PLUMB BOB TILT on Cabinet side	NOT USED	8: U206 GRY-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) on Coin Door DS-8

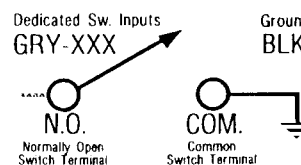
Typical Switch Schematic & Wiring



Note:
All Switches require diodes. Some diodes are located on Terminal Strips (under playfield) & not on the switch itself.
Diode On Terminal Strip



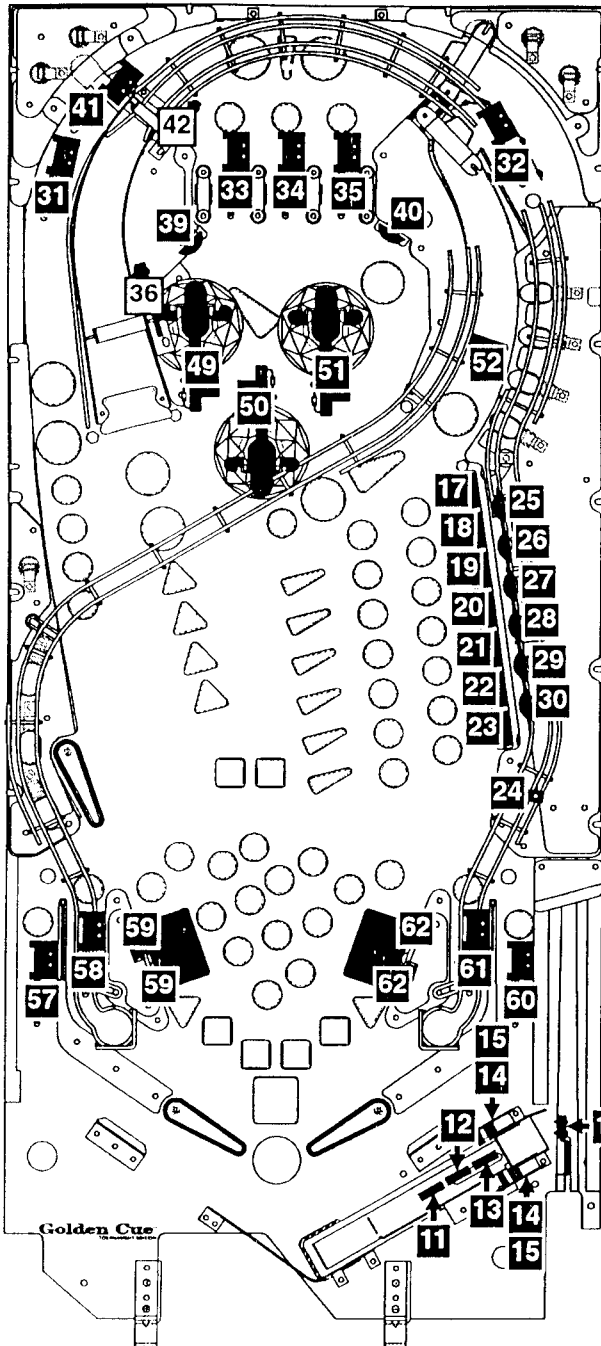
Dedicated Switch Schem.



Kelly Packard's

Switch Matrix Grid Descriptions with Part Numbers and Locations

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



‡ Sw. 14 / Sw. 15 have both REC/TRANS on 1 board respectively.

DOTS: Diode On Terminal Strip, see Page 83 (if noted).

Legend Note:

□ = Switches mounted above playfield.

■ = Switches mounted below playfield.

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

2 4 5 6 9-10 53-56

The following switches are not used:

37 38 43-48 63 64

Switches for Up/Down Post: **1+8**

Sw. N°	Col. N°	Row N°	See Note:	Switch Matrix Description	Part N°
Note: The ¥ Coin Switch (for Japan) is 180-5091-00					
1	1	1		LEFT BUTTON (SKILL)	180-5160-00
2*	1	2		4TH COIN SLOT	180-5024-00
3*	1	3		6TH COIN SLOT	(Future Use)
4*	1	4		RIGHT COIN SLOT	
5*	1	5		CENTER COIN SLOT / DBA	180-5024-00
6*	1	6		LEFT COIN SLOT	
7*	1	7		5TH COIN SLOT	(Future Use)
8	1	8		RIGHT BUTTON (SKILL)	180-5160-00
9*	2	1		PLAYFIELD GLASS SWITCH	180-5123-00
10*	2	2		LOCKDOWN SWITCH	
11	2	3		4-BALL TROUGH #1 (LEFT)	
12	2	4		4-BALL TROUGH #2	180-5119-00
13	2	5		4-BALL TROUGH #3	
14‡	2	6		4-BALL TROUGH BOT TRANS: VUK OPTO BOT REC:	520-5173-00 520-5174-00
15‡	2	7		4-BALL STACKING OPTO TOP TRANS: TOP REC:	520-5173-00 520-5174-00
16	2	8	DOTS	SHOOTER LANE	180-5157-00
17	3	1	DOTS	7-BANK DROP TARGET (1)(9)	180-5158-00
18	3	2	DOTS	7-BANK DROP TARGET (2)(10)	
19	3	3	DOTS	7-BANK DROP TARGET (3)(11)	
20	3	4	DOTS	7-BANK DROP TARGET (4)(12)	
21	3	5	DOTS	7-BANK DROP TARGET (5)(13)	
22	3	6	DOTS	7-BANK DROP TARGET (6)(14)	
23	3	7	DOTS	7-BANK DROP TARGET (7)(15)	
24	3	8		10 POINT SWITCH	180-5054-00
25	4	1		STAND-UP TARGET (G) OLDEN	500-6189-16
26	4	2		STAND-UP TARGET G (O) LDEN	
27	4	3		STAND-UP TARGET GO (L) DEN	
28	4	4		STAND-UP TARGET GOL (D) EN	
29	4	5		STAND-UP TARGET GOLD (E) N	
30	4	6		STAND-UP TARGET GOLDE (N)	500-6227-02
31	4	7		LEFT ORBIT	
32	4	8		LOCK BALL LANE	
33	5	1		LEFT TOP LANE V (O) DKA	
34	5	2		MID TOP LANE VO (D) KA	
35	5	3		RIGHT TOP LANE VOD (K) A	180-5087-00
36	5	4		LEFT RAMP ENTER	
37	5	5		NOT USED	500-6189-16
38	5	6		NOT USED	
39	5	7		STAND-UP TARGET TOP LEFT	500-6227-02
40	5	8		STAND-UP TARGET TOP RIGHT	
41	6	1		TOP LEFT ORBIT	180-5087-00
42	6	2		TOP LEFT RAMP ENTER	
43	6	3		NOT USED	180-5015-03
44	6	4		NOT USED	
45	6	5		NOT USED	
46	6	6		NOT USED	
47	6	7		NOT USED	
48	6	8		NOT USED	
49	7	4		LEFT TURBO BUMPER	180-5158-00
50	7	2		BOTTOM TURBO BUMPER	
51	7	3		RIGHT TURBO BUMPER	
52	7	4	DOTS	SINGLE DROP TARGET (8) BALL	180-5158-00
53*	7	5		TOURNAMENT BUTTON (Red)	500-6388-02
54*	7	6		START BUTTON (Yel.)	500-6388-06
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 (Rt. Mount R/O)	500-6227-02
58	8	2		LEFT RETURN LANE (Rt. Mnt. R/O)	
59	8	3		LEFT SLINGSHOT (Double-Switch)	
60	8	4		RIGHT OUTLANE (Rt. Mount R/O)	500-6227-02
61	8	5		RIGHT RETURN LANE	
62	8	6		RIGHT SLINGSHOT (Double-Switch)	
63	8	7		NOT USED	180-5054-00
64	8	8		NOT USED	



Go To Coil Menu

From the **DIAGNOSTICS MENU**, select the "COIL" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. The coils are listed in groups. Coils 01-16 are typically High Current Coils (although Low Current Coils may be used in positions 01-07). Coils 17-32 are for Low Current Coils. Flash Lamps are located in positions 03, 17-20, read **Single Coil Test**. **Important:** The **Power Interlock Switch** must be pulled out.



Single Coil Test

To initiate, from the **COIL MENU**, select the "TEST" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Ensure the **Power Interlock Switch** is pulled out. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Coil Test from #1 (The test runs through Coils 1-32 and Flash Lamps Q3, Q17-Q20). Press the **Black Button** on the "+" *Icon*, as each coil is selected, the display will describe the Coil or Flash Lamp Name with the corresponding number, the wire with colors, the "Pin-Outs" from the I/O Power Driver Board, the Coil Voltage & Gauge-Turns (e.g. 23-800). Press the **Black Button** again to move forward in the test. To test and view a particular Coil or Flash Lamp, select the "RUN" *Icon* and press the **Black Button**. Each time the **Black Button** is pushed, the Coil or Flash Lamp will fire on the Playfield and/or Backbox, with the display indicating the Coil or Flash Lamp information. Continue with the same procedure to run through the entire test.

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



Cycling Coil Test

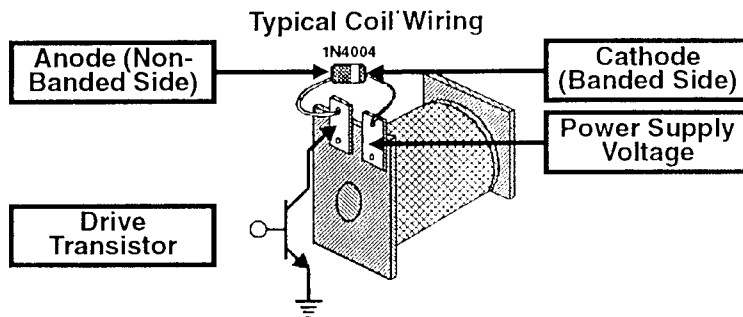
To initiate, from the **COIL MENU**, select the "CYC" *Icon* with either **Red** or **Green Button** and press the **Black Button**. If still in a previous test, select the "PREV" *Icon* to return to Coil Menu or selecting either of the "ARROW" *Icons* will move to Cycling Coil Test (selecting again will return to Coil Test). The test pulses each regular Coil or Flash Lamp sequentially (cycling) on the Playfield and Backbox. The display indicates "CYCLING COILS." **Important:** The **Power Interlock Switch** must be pulled out.

Coil & Flash Lamp Descriptions

Type	Coil / Flash Lamp Descriptions
COIL 1	TROUGH UP-KICKER (VUK) (26-1200)
COIL 2	AUTO LAUNCH (50V) (23-800)
COIL 3	FLASH: LOWER LEFT X4 (AMBER #906)
COIL 4	8-BALL RAMP DIVERTER (32-1800)
COIL 5	LOCK BALL UP-POST (28-1050)
COIL 6	SINGLE DROP TARGET (RESET) (23-1100)
COIL 7	7-BANK DROP TARGET (RESET) (23-1100)
COIL 8	(EUROPEAN TOKEN DISPENSER)
COIL 9	LEFT TURBO BUMPER (26-1200)
COIL 10	BOTTOM TURBO BUMPER (26-1200)
COIL 11	RIGHT TURBO BUMPER (26-1200)
COIL 12	LEFT SLINGSHOT (23-800)
COIL 13	RIGHT SLINGSHOT (23-800)
COIL 14	UPPER FLIPPER [50V RED/YEL] (23-900)
COIL 15	LEFT FLIPPER [50V RED/YEL] (23-900)
COIL 16	RIGHT FLIPPER [50V RED/YEL] (23-900)

Type	Coil / Flash Lamp Descriptions
COIL 17	FLASH: UPPER LEFT X2 (BLUE #906)
COIL 18	FLASH: UPPER RIGHT X3 (BLUE #906 + #89)
COIL 19	FLASH: MID RIGHT X4 (YELLOW #906)
COIL 20	FLASH: LOWER RIGHT X3 (RED #906)
COIL 21	LT OUTLANE (SKILL) (26-1200)
COIL 22	RT OUTLANE (SKILL) (26-1200)
COIL 23	UP/DOWN POST (SKILL) (23-1100)
COIL 24	(OPTIONAL COIN METER)
COIL 25	7-BANK DROP TARGET (1) TRIP (33-1590)
COIL 26	7-BANK DROP TARGET (2) TRIP (33-1590)
COIL 27	7-BANK DROP TARGET (3) TRIP (33-1590)
COIL 28	7-BANK DROP TARGET (4) TRIP (33-1590)
COIL 29	7-BANK DROP TARGET (5) TRIP (33-1590)
COIL 30	7-BANK DROP TARGET (6) TRIP (33-1590)
COIL 31	7-BANK DROP TARGET (7) TRIP (33-1590)
COIL 32	SINGLE DROP TARGET (8) TRIP (33-1590)

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

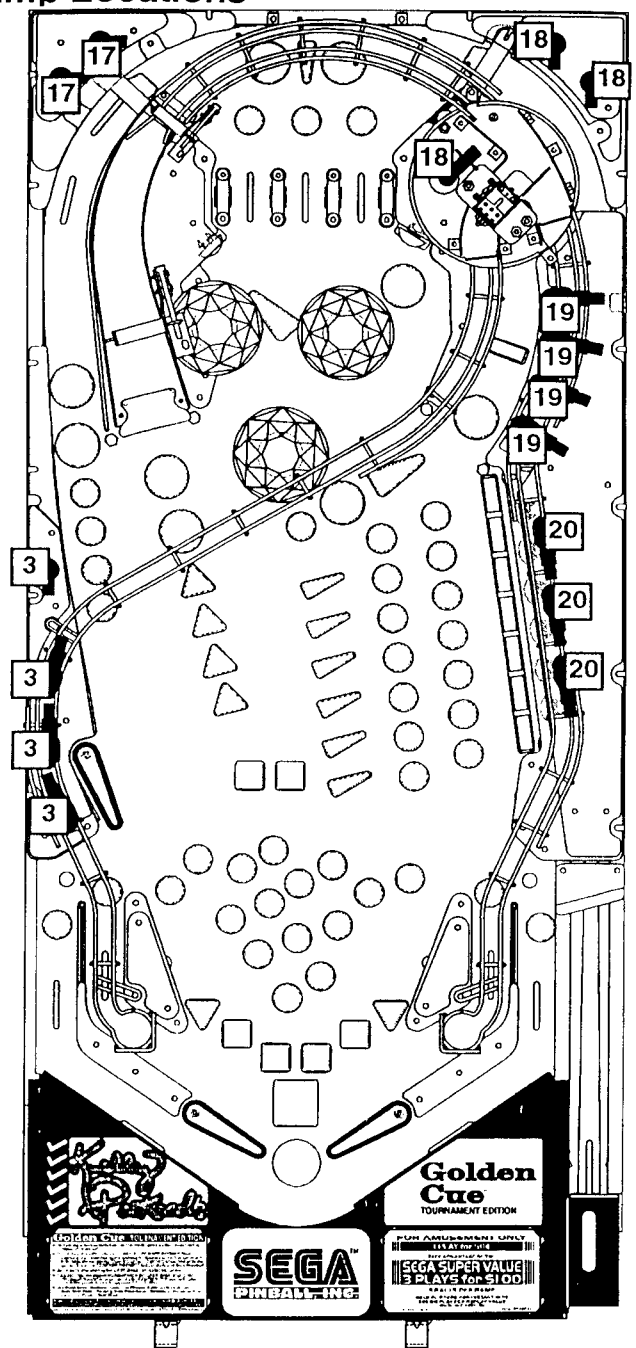
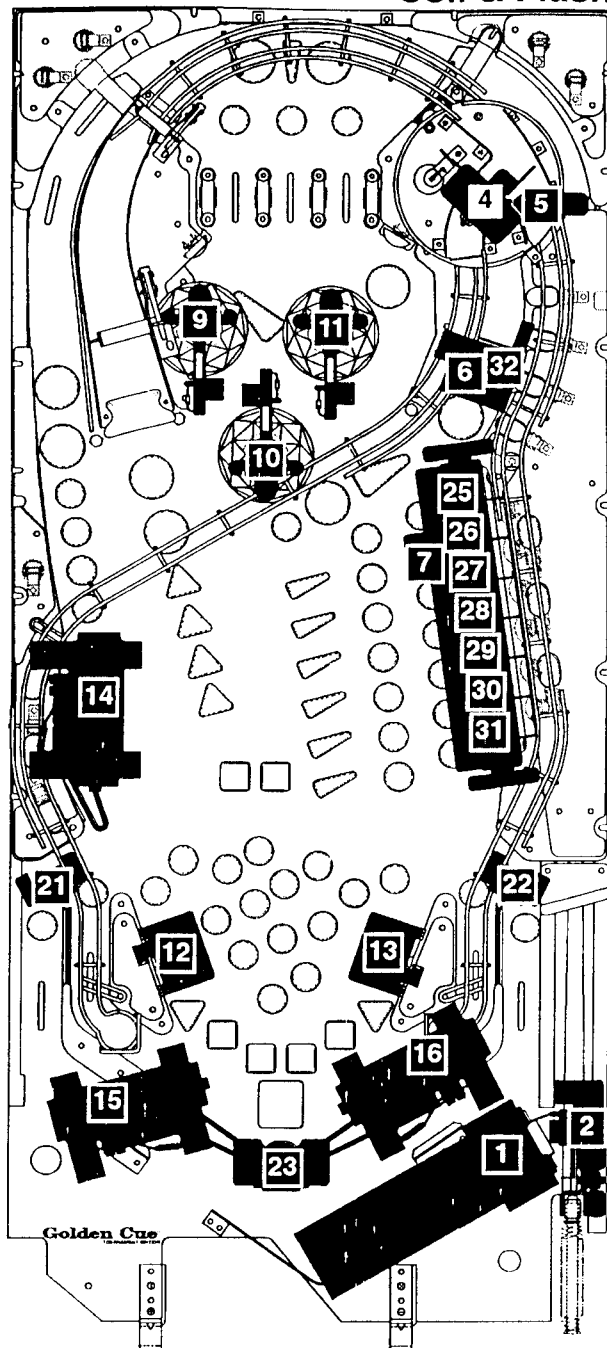


Note:
All Coils require diodes. Some diodes are located on Terminal Strips (under playfield) & not on the coil itself.

D iode
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T ermin
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Packard's

Coil & Flash Lamp Locations



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

Legend Note:

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

The following Bulb Type is used for Flash Lamps:



#89 Bulb
(Bayonet)
165-5000-89



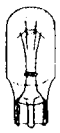
#906 Red Bulb
(Wedge Base)
165-5004-02



#906 Amber Bulb
(Wedge Base)
165-5004-03



#906 Blue Bulb
(Wedge Base)
165-5004-05



#906 Yellow Bulb
(Wedge Base)
165-5004-06

The following Coils are Optional:

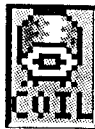
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Section 3, Chapter 2
Go To Diagnostics Menu

Golden Cue
TOURNAMENT EDITION



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 Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	23-800 090-5001-00T
#3	FLASH LOWER LEFT X4	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-03
#4	8-BALL DIVERter	Q4	I/O Pwr. Drvr.	BRN-YEL	J8-P5	BRN	J7-P1	20v DC	32-1800 090-5031-02
#5	LOCK BALL UP-POST	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	28-1050 090-5046-00
#6	SINGLE DROP TARGET (RESET)	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#7	7-BANK DROP TARGET (RESET)	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	DL4SS 515-6076-01

High Current Coils Group 2		Drive Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn
#9	LEFT TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#10	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	BRN	J7-P1	20v DC	23-800 090-5001-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	BRN	J7-P1	20v DC	23-800 090-5001-00T
#14	UPPER FLIPPER (50v RED/YEL)	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-900 090-5020-30T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-900 090-5020-30T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-900 090-5020-30T

Low Current Coils Group 1		Drive Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn Flash/Meter #
#17	FLASH UPPER LEFT X2	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-05
#18	FLASH UPPER RIGHT X3	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	ORG	J6-P10	20v DC	165-5000-89 † 165-5004-05 †
#19	FLASH MID RIGHT X4	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-06
#20	FLASH LOWER RIGHT X3	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-02
#21	LT OUTLANE (SKILL)	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	26-1200 090-5044-00T
#22	RT OUTLANE (SKILL)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	26-1200 090-5044-00T
#23	UP/DOWN POST (SKILL)	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	Meter 5v 091-5000-00

Diode On Terminal Strip (if noted)

† Flasher Note: Flash Q18 = 1X #89 Bulb, 2X Blue (-05) #906 Bulb (Yellow (-06), Red (-02), Amber (-03))

Low Current Coils Group 2		Drive Trans-istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn
#25	7-BANK DROP TRGT (1) (TRIP)	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	BRN	J7-P1	20v DC	33-1590 090-5060-00
#25	7-BANK DROP TRGT (2) (TRIP)	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	BRN	J7-P1	20v DC	33-1590 090-5060-00
#27	7-BANK DROP TRGT (3) (TRIP)	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	BRN	J7-P1	20v DC	33-1590 090-5060-00
#28	7-BANK DROP TRGT (4) (TRIP)	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	BRN	J7-P1	20v DC	33-1590 090-5060-00
#29	7-BANK DROP TRGT (5) (TRIP)	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	BRN	J7-P1	20v DC	33-1590 090-5060-00
#30	7-BANK DROP TRGT (6) (TRIP)	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	BRN	J7-P1	20v DC	33-1590 090-5060-00
#31	7-BANK DROP TRGT (7) (TRIP)	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	BRN	J7-P1	20v DC	33-1590 090-5060-00
#32	SINGLE DROP TRGT (8) (TRIP)	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	BRN	J7-P1	20v DC	33-1590 090-5060-00

Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q3 and Q17-Q20)

[illegible]



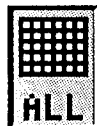
Go To Lamp Menu

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



Single Lamp Test

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



Test All Lamps

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



Row & Column Lamp Tests

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



LAMP MATRIX GRID

Diode On Terminal Strip

Column (18v)	1: U17	2: U16	3: U15	4: U14	5: U13	6: U12	7: U11	8: U10
Row (GND)	YEL-BRN J13-P9	YEL-RED J13-P8	YEL-ORG J13-P7	YEL-BLK J13-P6	YEL-GRN J13-P5	YEL-BLU J13-P4	YEL-VIO J13-P3	YEL-GRY J13-P1
1: Q33 RED-BRN J12-P1	BONUS (1) BALL #555 Bulb 1	BONUS (2) BALL #555 Bulb 2	BONUS (3) BALL #555 Bulb 3	BONUS (4) BALL #555 Bulb 4	BONUS (5) BALL #555 Bulb 5	BONUS (6) BALL #555 Bulb 6	BONUS (7) BALL #555 Bulb 7	BONUS (8) BALL #555 Bulb 8
2: Q34 RED-BLK J12-P2	BONUS (9) BALL #555 Bulb 9	BONUS (10) BALL #555 Bulb 10	BONUS (11) BALL #555 Bulb 11	BONUS (12) BALL #555 Bulb 12	BONUS (13) BALL #555 Bulb 13	BONUS (14) BALL #555 Bulb 14	BONUS (15) BALL #555 Bulb 15	SHOOT AGAIN #555 Bulb 16
3: Q35 RED-ORG J12-P3	7-BANK (1) BALL #44 Bulb 17	7-BANK (2) BALL #44 Bulb 18	7-BANK (3) BALL #44 Bulb 19	7-BANK (4) BALL #44 Bulb 20	7-BANK (5) BALL #44 Bulb 21	7-BANK (6) BALL #44 Bulb 22	7-BANK (7) BALL #44 Bulb 23	SINGLE D/T (8) BALL #44 Bulb 24
4: Q36 RED-YEL J12-P4	7-BANK (9) BALL #555 Bulb 25	7-BANK (10) BALL #555 Bulb 26	7-BANK (11) BALL #555 Bulb 27	7-BANK (12) BALL #555 Bulb 28	7-BANK (13) BALL #555 Bulb 29	7-BANK (14) BALL #555 Bulb 30	7-BANK (15) BALL #555 Bulb 31	BONUS (5X) #555 Bulb 32
5: Q37 RED-GRN J12-P5	LEFT ORBIT (1M) #555 Bulb 33	LEFT ORBIT (2M) #555 Bulb 34	LEFT ORBIT (3M) #555 Bulb 35	LEFT ORBIT (5M) #555 Bulb 36	LEFT ORBIT (EXTRA BALL) #555 Bulb 37	LEFT ORBIT (SPECIAL) #555 Bulb 38	LT OUTLANE (SPECIAL) #555 Bulb 39	LT RETURN (V) ODKA #555 Bulb 40
6: Q38 RED-BLU J12-P6	LEFT RAMP (2X) #555 Bulb 41	LEFT RAMP (3X) #555 Bulb 42	LEFT RAMP (4X) #555 Bulb 43	LEFT RAMP (5X) #555 Bulb 44	LEFT RAMP (5M) #555 Bulb 45	LEFT RAMP (JACKPOT) #555 Bulb 46	GOLDEN (5M) #555 Bulb 47	GOLDEN (SPECIAL) #555 Bulb 48
7: Q39 RED-VIO J12-P8	(G) OLDEN #555 Bulb 49	G (O) LDEN #555 Bulb 50	GO (L) DEN #555 Bulb 51	GOL (D) EN #555 Bulb 52	GOLD (E) N #555 Bulb 53	GOLDE (N) #555 Bulb 54	RT RETURN VODK (A) #555 Bulb 55	RT OUTLANE (SPECIAL) #555 Bulb 56
8: Q40 RED-GRY J12-P9	SKILL SHOT #555 Bulb 57	TOURNAMENT BUTTON #555 Bulb 58	START BUTTON #555 Bulb 59	S-U TOP LT (BANK SHOT) #555 Bulb 60	S-U TOP RT (TROPHY) #555 Bulb 61	SINGLE D/T (LOCK) #555 Bulb 62	SINGLE D/T (MULTIBALL) #555 Bulb 63	SINGLE D/T (COLLECT...) #555 Bulb 64
9: Q41 RED-WHT J12-P10	TOP LANE V (O) DKA #555 Bulb 65	TOP LANE VO (D) KA #555 Bulb 66	TOP LANE VOD (K) A #555 Bulb 67	TOP ORBIT (2M) #555 Bulb 68	TOP ORBIT (5M) #555 Bulb 69	BONUS (2X) #555 Bulb 70	BONUS (3X) #555 Bulb 71	BONUS (4X) #555 Bulb 72
10: Q42 RED J12-P11	ARCH LED CHECK 1 Green LEDs 73	ARCH LED CHECK 2 Green LEDs 74	ARCH LED CHECK 3 Green LEDs 75	ARCH LED CHECK 4 Green LEDs 76	ARCH LED CHECK 5 Green LEDs 77	ARCH LED CHECK 6 Green LEDs 78	BONUS (8M) #555 Bulb 79	BONUS (16M) #555 Bulb 80

Kelly
Packard's

Lamp Matrix Grid Locations

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

Legend Note:

□ = Lamps mounted above playfield.

■ = Lamps mounted below playfield.

The following Lamps are mounted on the Cabinet:

9 + 10

58 + 59

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

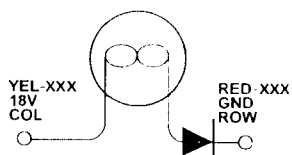


#555 Bulb
(Wedge)
165-S002-00

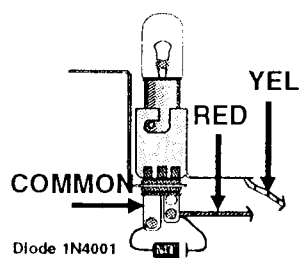


#44 Bulb
(Bayonet)
165-S000-44

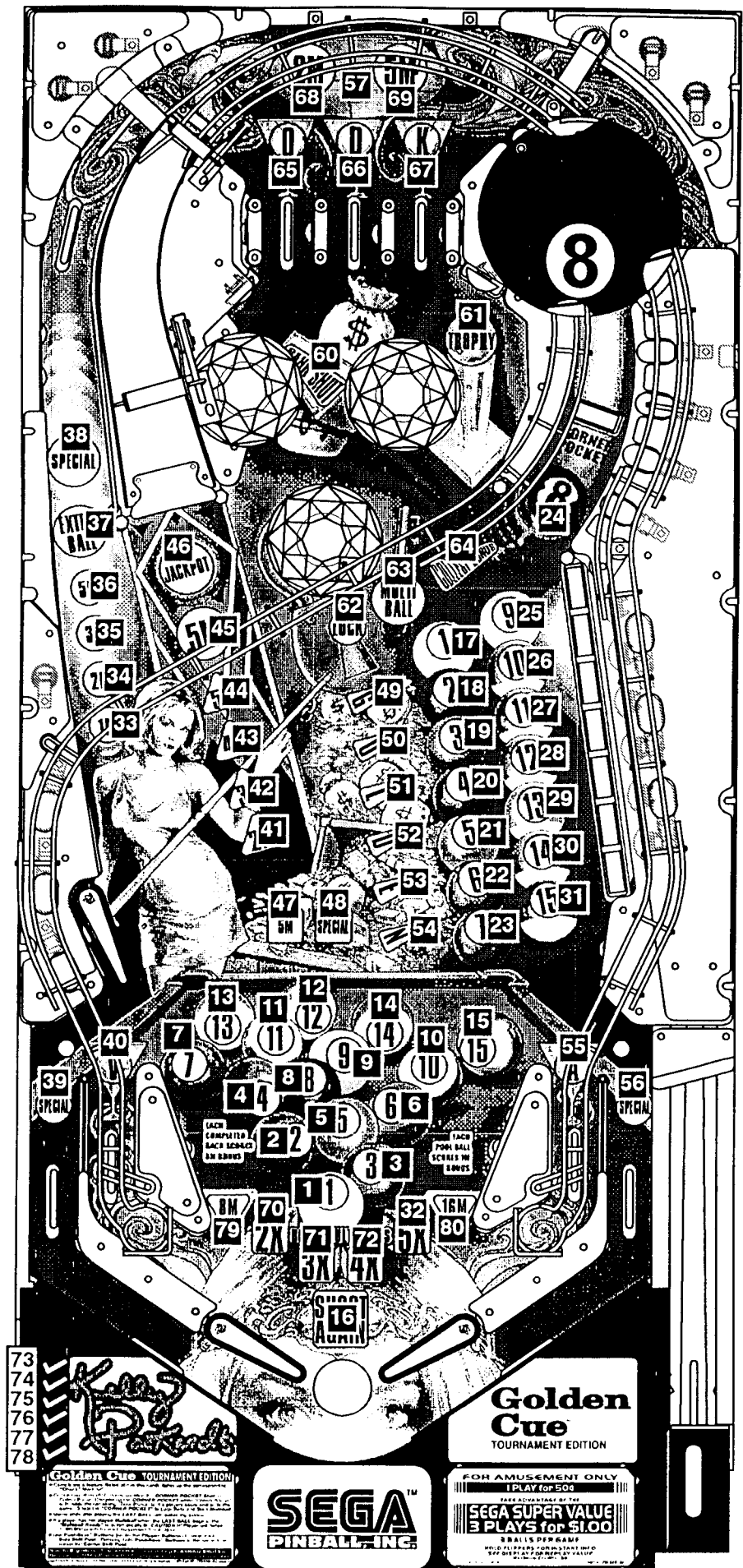
Typical Lamp Schematic



Typical Lamp Wiring



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



Section 3 | Diags.

Section 3, Chapter 2
Go To Diagnostics Menu

Golden Cue
TOURNAMENT EDITION

2 1



Test Flash Lamps

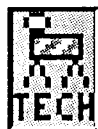
From the **DIAGNOSTICS MENU**, select the "FLASH" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** **Button** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate "CYCLING FLASHERS" and all the Flash Lamps will cycle continuously until the test is exited. This test is allows the technician to easily spot any burned-out bulbs and replace them. Flashers tested are Flash Lamps in Positions: **Q3, Q17-Q20**.

Important: The **Power Interlock Switch** must be pulled out for this Test to Function.



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 Shooter Lane switch, the Autoplunger should fire. If it kicks to early or too late, the switch actuator should be adjusted to compensate for this error. If it fails to fire, use the Switch Test or Coil Test to help determine the cause of the failure. During this function, similar tests may be performed on the "Ejects", Sling-shots, 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 Klocker

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



Sound / Speaker Test

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

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

Sound / Speaker Test Continued Next Page



Speaker Phase Testing

Continued

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

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

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

Note: For ROM Locations, see Page DR. ❶. For ROM Usage (Summary Table) see Page DR. ❸ in the "Find-It-In-Front: Dr. Pinball Section" Voice ROMs which are 8MB must have a Jumper at W6 on the CPU/Sound Bd. to function properly.



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

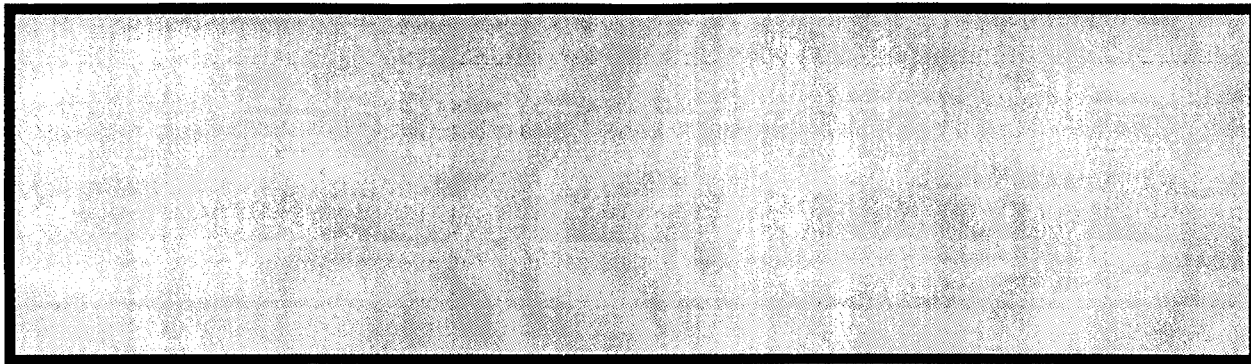
The display utilizes a Micro-Processor Control Board mounted in piggyback fashion to the Dot Matrix Display (128 X 32) Driver Board. The purpose behind this board is to provide more information to the operator as well as displaying graphics to the player.

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.



Golden Cue Specific (>...Test)

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



This test allows you to operate the <> (Coil QX) ... outside of Game Mode for the purpose of troubleshooting and adjustment.

Test Procedure:

Adjustment Procedure:



Dr. Pinball (Flow Chart Menus)

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

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



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



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



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



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



Coil Flow Chart

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



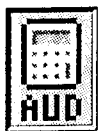
Switch Flow Chart

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



Lamp Flow Chart

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



Golden Cue

TOURNAMENT EDITION

GAME AUDIT TABLE



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



Earnings Audits 1-12

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



S.P.I. Audits 13-55

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



Golden Cue Audits 56-99 (All Audits Subject to Change)

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
56		72		88	
57		73		89	
58		74		90	
59		75		91	
60		76		92	
61		77		93	
62		78		94	
63		79		95	
64		80		96	
65		81		97	
66		82		98	
67		83		99	
68		84			
69		85			
70		86			
71		87			

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

Location:



Section 3, Chapter 3
Go To Audits Menu

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— **Golden Cue Audits**, are the Game Play Specific Audits 56-99; Audits left open (blank space in gray, e.g. Audits 43-51, 54 & 55, XX-99) are currently **Not Used**, allowing for *Future Expansion*, if any, or are **Proprietary**. If the code version is upgraded, view Audits in the display & write the audit(s) in the blank(s) if any audit(s) were added. Each group may be viewed in the **Portals™ Service Menu** (see Chapter 1, Portals Service Menu Introduction, of this Section). View all audits with the **Game Audit Table** provided on the previous page. Copy page to fill-in important audit information as required.



GO TO AUDITS MENU

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

Important Notes:



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



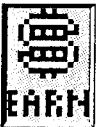
Selecting & activating the "QUIT" *Icon* from any display will exit the Service Session.



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



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



Earnings Audits (1-12)

From the **AUDITS MENU**, select the "EARN" *Icon* with either **Red "LEFT"** or **Green "RIGHT"** Button and press the **Black "ENTER" Button**. Select and activate the "RIGHT ARROW" *Icon* to view the 1st audit in this group. Continue to select either of the "ARROW" *Icons* to view each audit one at a time.

The display will describe the audit number, the audit name, and the audit total or value. The current audit will remain in the display until the next audit is chosen or when the sub-menu is exited.

Au. 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 <i>Factory Restore</i> occurred (see Chapter 5, Go to Reset Menu, of this section).
Au. 11	Meter Clicks	Provides the total number of money clicks accumulated. (Based on the country's lowest coin denomination used for the game credit.)
Au. 12	Software Meter	Provides the continuing total of Meter Clicks. This audit cannot be reset; the display shows the constant addition of Meter Clicks.



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

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

Au. 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—19.9M Scores	Provides the total number of games the Player's final score was between 0 and 19,900,000 points.
Au. 28	20M—49.9M Scores	Provides the total number of games the Player's final score was between 20,000,000 and 49,900,000 points.
Au. 29	50M—69.9M Scores	Provides the total number of games the Player's final score was between 50,000,000 and 69,900,000 points.
Au. 30	70M—99.9M Scores	Provides the total number of games the Player's final score was between 70,000,000 and 99,900,000 points.
Au. 31	100M—129.9M Scores	Provides the total number of games the Player's final score was between 100,000,000 and 129,900,000 points.
Au. 32	130M+ Scores	Provides the total number of games the Player's final score was over 130,000,000 points.
Au. 33	Average Scores	This total is derived from adding the Final Score of each game to a table and dividing this sum by Audit 26, Total Plays.
Au. 34	Service Credits	Provides the total number of times Dedicated Switch (DS-7) was closed, not in the Portals™ Service Menu. (See Chapter 1, Introduction [Access & Use] for instructions on how to receive Service Credits.)
Au. 35	Ball Search Started	Provides the total number of times the game performed a ball search.
Au. 36	Lost Ball Feeds	Provides the total number of times the game added a ball to play when it could not find a ball after ball search.





S.P.I. Audits Continued.

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



Golden Cue Audits (56-99) (All Audits Subject to Change)

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

Au. N°	Audit Name	Audit Definition
Au. 56		
Au. 57		
Au. 58		
Au. 59		
Au. 60		
Au. 61		
Au. 62		
Au. 63		
Au. 64		
Au. 65		
Au. 66		
Au. 67		
Au. 68		
Au. 69		
Au. 70		
Au. 71		
Au. 72		
Au. 73		
Au. 74		

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



Golden Cue Audits Continued (All Audits Subject to Change)

Audit Name

Audit Definition

Au. 75

Au. 76

Au. 77

Au. 78

Au. 79

Au. 80

Au. 81

Au. 82

Au. 83

Au. 84

Au. 85

Au. 86

Au. 87

Au. 88

Au. 89

Au. 90

Au. 91

Au. 92

Au. 93

Au. 94

Au. xx-

Au. 99

At time of printing, these audits are **Not Used**, allowing for **Future Expansion**, if any.

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

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

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.



Section 3, Chapter 3
Go To Audits Menu



Go To Printer Menu

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



Special equipment is required for this Sub-Menu

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



Quick Printout (Printer Interface)

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



Full Printout (Alison Interface Program)

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



Reset Printer (Nº of Copies Printed)

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

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



Audit Note: 2nd Way to Reset Audits

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



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



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



GAME ADJUSTMENT TABLE

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



S.P.I. Adjustments 1-48

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

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



Golden Cue Adjustments 49-XX

Adjustment Name	USA Default	Your Setting	Adjustment Name	USA Default	Your Setting
49 EXTRA BALL MEMORY	ON		XX UK POST SAVE ENABLED	NO	
50 MBALL RESTART	MODERATE		XX UK COIN MECH. TYPE	CURRENT:	
51 MULTIBALL CRITERION	MODERATE		ADJ. 54 CAN ONLY BE ADJUSTED IF THE GAME HAS THE UK EPROM INSTALLED (UK ONLY). ADJ. 55 CAN ONLY BE ADJUSTED IF USING UK DIP SWITCH OPTION SETTING 2		
XX ENABLED	YES		XX ADULT SPEECH ENABLED	YES	

Go To Adjustments Menu

Overview

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



GO TO ADJUSTMENTS MENU

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

Important Notes:



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



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



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



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



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



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

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

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



S.P.I. Adjustments Continued.

Adjustment Name

Adjustment Definition

Adj. 4 Free Game Limit Adjust the max. # of *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
(49) Extra Ball Memory	ON	ON	ON	ON	OFF
(50) MBall Restart	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(51) Multiball Criterion	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD

Play Rules: Novelty & 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			

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

Adj. 7 Game Pricing

With Adjustment 7 set to **CUSTOM** operating the **Black "Enter" Button** again initiates a drop down menu representing coin switch pulses for the LEFT, CENTER, RIGHT and 4TH Coin Slots. The prescribed 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.





S.P.I. Adjustment 7 Continued.

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

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

Custom Pricing Table

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

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

The Standard Pricing Select Table Explained:

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

Standard Pricing Select Table

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

Used to promote the Bill Validator

Standard Pricing Select Table - (Continued)

CPU DIP SWITCH SETTINGS Location: SW300 CPU/SOUND BOARD									COUNTRY SETTING OPTION †	Coin Mechanisms				Pricing Scheme Explained Number of "Plays" for Price Amount Shown				
										COINS THRU ... SLOT: LEFT CENTER RIGHT 4TH								
Pos. 1 2 3 4 5 6 7 8										Please Note: for all USA Settings, see previous page (bottom).								
ON ▲										5S 10S 10S				1 /10S 2 /15S 3 /20S				
OFF ▼									Austria †									
Pos. 1 2 3 4 5 6 7 8										20¢ \$A 1 \$A 2				1 /\$A 1 3 /\$A 2				
ON ▲									Australia 1 ‡									
OFF ▼									Australia 2 ‡	20¢ \$A 1 \$A 2				1 /\$A 1				
Pos. 1 2 3 4 5 6 7 8										5 BF 20 BF 50 BF				1 /20 BF 3 /50 BF				
ON ▲									Belgium †									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										1 'coin' 4 'coins' 1 'coin'				1 /'2 coins'				
ON ▲									Brazil †									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										25¢ 25¢ Can\$ 1				1 /50¢ 2 /75¢ 3 / Can\$ 1				
ON ▲									Canada †									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										1 DKr 5 DKr 10 DKr 20 DKr				1 /3 DKr 2 /5 DKr				
ON ▲									Denmark 1 ‡									
OFF ▼									Denmark 2 ‡	1 DKr 5 DKr 10 DKr 20 DKr				1 /2 DKr 3 /5 DKr 7 /10DKr				
Pos. 1 2 3 4 5 6 7 8										1 Fmk 5 Fmk				1 /5 Fmk 4 /10 Fmk				
ON ▲									Finland ‡									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										1 Fr 5Fr 10 Fr 20 Fr				1 /3 Fr 2 /5 Fr 5 /10 Fr 11 /20 Fr				
ON ▲									France 1 †									
OFF ▼									France 2	1 Fr 5 Fr 10 Fr 20 Fr				1 /5 Fr 3 /10 Fr 7 /20 Fr				
Pos. 1 2 3 4 5 6 7 8										1 Fr 5 Fr 10 Fr 20 Fr				1 /3 Fr 2 /5 Fr 4 /10 Fr 9 /20 Fr				
ON ▲									France 3									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										1 DM 2 DM 5 DM				1 /1 DM 6 /'1 X 5 DM'				
ON ▲									Germany 1	1 DM 2 DM 5 DM				1 /2 DM 2 /3 DM 3 /4 DM 4 /5 DM				
OFF ▼									Germany 2	1 DM 2 DM 5 DM				1 /2 DM 2 /3 DM 3 /4 DM 5 /5 DM				
Pos. 1 2 3 4 5 6 7 8										1 DM 2 DM 5 DM				1 /1 DM 6 /5 DM				
ON ▲									Germany 3 †									
OFF ▼									Germany 4									
Pos. 1 2 3 4 5 6 7 8										50 Dr 100 Dr				1 /50 Dr 3 /100 Dr				
ON ▲									Greece ‡									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										1 HK\$ 2 HK\$ 5 HK\$				1 /5 HK\$				
ON ▲									Hong Kong ‡									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										10 Ft 10 Ft 20 Ft				1 /20 Ft 3 /40 Ft				
ON ▲									Hungary ‡									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										500 Lit 500 Lit				1 /500 Lit				
ON ▲									Italy 1 †					1 /1000 Lit 3 /2000 Lit				
OFF ▼									Italy 2	500 Lit 500 Lit								
Pos. 1 2 3 4 5 6 7 8										100¥ 100¥				1 /100¥ 3 /200¥				
ON ▲									Japan 1 †									
OFF ▼									Japan 2									
Pos. 1 2 3 4 5 6 7 8										100 Won 100 Won				1 /100 Won				
ON ▲									Korea ‡									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										1 Fls. 1 Fls. 2.5 Fls.				1 /1 Fls. 3 /2.5 Fls.				
ON ▲									Netherlands 1					6 /5 Fls.				
OFF ▼									Netherlands 2 †	1 Fls. 2.5 Fls. 5 Fls.								
Pos. 1 2 3 4 5 6 7 8										\$NZ 1 \$NZ 2				1 /\$NZ 1				
ON ▲									New Zealand 1 ‡					3 /\$NZ 2				
OFF ▼									New Zealand 2 ‡	\$NZ 1 \$NZ 2								
Pos. 1 2 3 4 5 6 7 8										10 NKr 5 NKr 20 NKr				2 /10 NKr 1 /5 NKr 4 /20 NKr				
ON ▲									Norway 1 †					1 /10 NKr 3 /20 NKr				
OFF ▼									Norway 2	10 NKr 5 NKr 20 NKr								
Pos. 1 2 3 4 5 6 7 8										100 Pts 500 Pts				1 /100 Pts 6 /500 Pts				
ON ▲									Spain ‡									
OFF ▼																		
Pos. 1 2 3 4 5 6 7 8										1 SKr 5 SKr 10 SKr				1 /10 SKr 2 /15 SKr 3 /20 SKr				
ON ▲									Sweden 1 †					1 /5 SKr				
OFF ▼									Sweden 2	1 SKr 5 SKr 10 SKr								
Pos. 1 2 3 4 5 6 7 8										1 SwF 2 SwF 5 SwF				1 /1 SwF 6 /5 SwF				
ON ▲									Switzerland 1 †					3 /90p 2 /£1 5 /£2				
OFF ▼									Switzerland 2	1 SwF 2 SwF 5 SwF				1 /1 SwF 3 /2 SwF 9 /5 SwF				
Pos. 1 2 3 4 5 6 7 8										10p 50p £1 20p				3 /£1 7 /£2				
ON ▲									UK 1 †					4 /£1 8 /£2				
OFF ▼									UK 2	10p 50p £1 20p				1 /50p 2 /£1				
Pos. 1 2 3 4 5 6 7 8										10p 50p £1 20p				1 /30p 2 /60p 3 /90p 4 /£1				
ON ▲									UK 3					1 /£1 3 /£2				
OFF ▼									UK 4	10p 50p £1 20p				Normal Coin Slots 1-4 (Left, Center, Right & 4th). If an old style Coin Mech is used, see new adjustment to accommodate.				
Pos. 1 2 3 4 5 6 7 8										10p 50p £1 20p								
ON ▲									UK 5									
OFF ▼									UK 6	10p 50p £1 20p								

Notes: † Indicates Factory Default for that setting.

‡ Indicates a USA Dip Switch Setting (all positions in the "OFF" position).



S.P.I. Adjustments Continued.

Adjustment Name		Adjustment Definition
Adj. 8	Reset Coin Audits	Default is NO . Select the "+" <i>Icon</i> to change to YES . ▲ When enabled, all <i>Coin Audits</i> (Audits 5-11), will be reset to zero.
Adj. 9	Reset Game Audits	Default is NO . Select the "+" <i>Icon</i> to change to YES . ▲ When enabled, all audits will be reset to zero, except for the <i>Coin Audits</i> (Audits 5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero).
Adj. 10	Reset High Scores	When enabled (set to YES) the High Score Levels and associated initials will be restored to the backup settings when the "+" <i>Icon</i> is selected and activated.
Adj. 11	Match Percentage	Set Match percent from 00% to 10% or OFF . At 00% the match display occurs at the end of the game but never awards a credit.
Adj. 12	Balls Per Game	Default is 3 . Adjust the number of balls per game: 2 to 5 .
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	Default is 30 . Adjust the maximum number of credits that may be posted: 4 to 50 .
Adj. 16	Allow High Scores	Set to YES or NO . When set to YES if a player exceeds any 1 of the 4 High Scores, the player may receive an award (depending on Adj. 3, Replay Award). Set to NO to disable this feature. There are 10 High Scores that will allow the player to enter their initials (or name) (See Adj. 32, Initials), however, only the top 4 can receive an award if this adjustment is enabled.
Adj. 17	High Score #1 Awards	Adjust the number of awards (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. 21-30	Default High Score #1 - #10	Adjust the score level to which the world record, (level 1) (the highest of the four levels) may be altered. This adjustment is not affected by Adj. 31, HSTD Reset Count. Adjust the backup score to which levels 2 - 10 may be reset, respectively.
Adj. 31	HSTD Reset Count	Default is 2,000 . HSTD (High Score To Date). Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments: 100 to 9,900 or OFF (no reset or adjustment).
Adj. 32	High Score Initials	Default is 3 INITIALS . When set to 3 INITIALS , player is allowed only 3 initials to input. When set to 10 LETTER NAME , player is allowed to enter 10 initials to input.
Adj. 33	Free Play	When set to YES , no coins are required for game play.
Adj. 34	Custom Message	Set to ON or OFF . When set to ON , this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to CHANGE selecting the "+" <i>Icon</i> . Using either of the Flipper Buttons or the "RED" and/or "GREEN" Buttons, select either of the "ARROW" <i>Icons</i> . Press the "BLACK" Button (<i>Request Installed</i> blinks at the top of the display and the letter A is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or "RED" or "GREEN" Buttons). With the desired letter indicated, depress the Start Button to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the "BLACK" Button.



S.P.I. Adjustments Continued.

Adjustment Name	Adjustment Definition
Adj. 35 Attract Mode Music	Set to ON or OFF . When set to ON , attraction music / sounds are played between games.
Adj. 36 Flash Lamp Power	Set to NORMAL , DIM or OFF . When set to NORMAL the flash lamps are active, when DIM the flash lamps impulse power is reduced by 25% and when OFF the flash lamps will not flash.
Adj. 37 Coil Pulse Power	Set to NORMAL , HARD or SOFT . When HARD the coil pulse power is <i>increased</i> by 12.5% of the normal pulse rate. When set to SOFT the coil pulse power is <i>decreased</i> by 12.5% of the normal pulse rate. These adjustments are provided to compensate for Low Line or High Line voltage conditions where the solenoids appear to kicking too weak or too hard. Adjust as required.
Adj. 38 Knocker Volume	Set to NORMAL , LOW or OFF . Default is NORMAL . When set to LOW , the volume is decreased 50%. When set to OFF , no sound is heard when the "knocker" is sounded.
Adj. 39 Minimum Game Time	Set between 0:01 - 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. 40 Bkgrnd (Background) Music Volume	Set between 01 - 15. Default is 01. After volume is set via Portals Service Buttons (See Sec. 3, Chp. 1, ...Intro) this adjustment can be utilized to adjust the background music (1 all the way on, 15 all the way off) while keeping the Special Sound FX the same level.
Adj. 41 Game Restart	Set to YES or NO . When set to YES , a new game may be started during any ball after the first ball is completed (if credits are available). (Note-Pressing start during the first ball will add additional players.) When set to NO , the game disables the Start Button after the first ball until the final ball is in play. Review Section 2, Chapter 1, Game Operations & Features for details.
Adj. 42 Extra Ball Percentage	Set from 0 to 50. Allows the operator to adjust how frequently the Extra Ball feature is made available to the player.
Adj. 43 Bill Validator	Set to YES or NO . When set to YES , the display, in game attract mode, will show an "Insert Bill Animation." When set to NO , the display, in game attract mode will show "Insert Coin Animation."
Adj. 44 Tournament Mode	Set to NONE , 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 <i>all audits will be reset</i> and <i>all adjustments will be initiated</i> to the particular style selected. The game will then return to <i>Game Over Attract Mode</i> , as if a <i>Factory Reset</i> had been performed. NONE - Same as a Factory Reset conditions. IFPA - Straight 50¢ play, No Replay, No Extra Ball, No High Scores, 2 Tilt Warnings and No Match. PINBALL EXPO- PAPA - Same as IFPA settings except <i>Free Play is enabled</i> . HOME - Sets game for Free Play, Extra Ball Play, No Replay, 10% Match & 30% Extra Ball.
Adj. 45 Euro. Token Disp.	Set to ON or OFF . When set to ON , the operator can enable the BRN/BRN-GRY Wires (out of the Main Cabinet Cable Harness, by bottom speaker) to drive an external device (e.g. European Token Dispenser) without the game giving a replay. (Ref. Coil #8 or Q8)
Adj. 46 Special Memory	Set to YES or NO . When set to YES , the lit 'Special' light will be retained in memory from ball to ball for the same player. When set to NO , the lit 'Special' light will go out at the end of each ball.
Adj. 47 Location ID	00 to 9999. Allows the operator to assign a location identification number to the audit print-out sheet. (<i>Will not be affected by Factory Reset.</i>)
See the end of this Sec. 3, Chp. 3, Go To Audits Menu, & Chp. 5, Go to Reset Menu, for more details on Factory Reset & Printing.	
Adj. 48 Game ID	00 to 9999. Allows the operator to assign a game identification number to the audit print-out sheet. (<i>Will not be affected by Factory Reset.</i>)
See the end of this Sec. 3, Chp. 3, Go To Audits Menu, & Chp. 5, Go to Reset Menu, for more details on Factory Reset & Printing.	



Golden Cue Adjustments (49-XX)

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

Adj. Nº	Adjustment Name	Adjustment Definition
Adj. 49	Extra Ball Memory	Set to ON or OFF . Default is ON . When set to ON , the lit 'Extra Ball' light will be retained in memory from ball-to-ball for the same player. When set to OFF , the lit 'Extra Ball' light will go out at the end of each ball.
Adj. 50	MBall Restart	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how Multiball can restart.
Adj. 51	Multiball Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the Multiball Feature is started and played.
Adj. xx		
Adj. xx		
Adj. xx	UK Post Save Enabled	//////// THIS ADJUSTMENT CAN ONLY BE ADJUSTED IF THE GAME HAS THE UK EPROM INSTALLED FOR UK SETTINGS ////////// Set to YES or NO. Default is NO. (UK Default is YES). When set to YES this feature is available when lit. Set to NO to disable this feature. (UK Games have Outlane & Center Post Save Devices which are accessed in a different way. Domestic games should cannot adjust this setting.)
Adj. xx	UK Coin Mech. Type	//////// THIS ADJUSTMENT CAN ONLY BE ADJUSTED IF THE GAME HAS THE UK EPROM INSTALLED FOR UK SETTINGS and HAS THE DIP SWITCH SETTING OPTION 2 SET (2, 3 & 4 ON) ////////// Set to CURRENT: 2 POUND AT #5 if using a Coin Control Mech 74-1129-104U (latest version). Set to OLD: 2 POUND AT #6 if using older version Coin Control Mech 74-1129-104.
Adj. xx	Adult Speech Enabled	Set to YES or NO . Default is YES . When set to YES , the original game program Adult Graphic Sound & Speech is used. When set to NO , the Sound & Speech is suitable for the Family Style Environment.



Custom Message

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



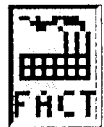
Film Star Reset

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



Take Note:

To **Restore** or **Reset** any of the adjustments to the *Factory Settings (Default)*, review Sec. 3, Chp. 5, Go To Reset Menu. Follow the **"RESET"** *Icon* or **"FACT"** *Icon* and their explanations.



Go To Reset Menu

Overview

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



GO TO RESET MENU

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

Important Notes:



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



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



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



Reset Coin Audits

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



Reset Game Audits

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

Fig. 1

• Reset Coin Audits	
Earnings Audits (Coin Audits Only 5-11)	
Au. 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.

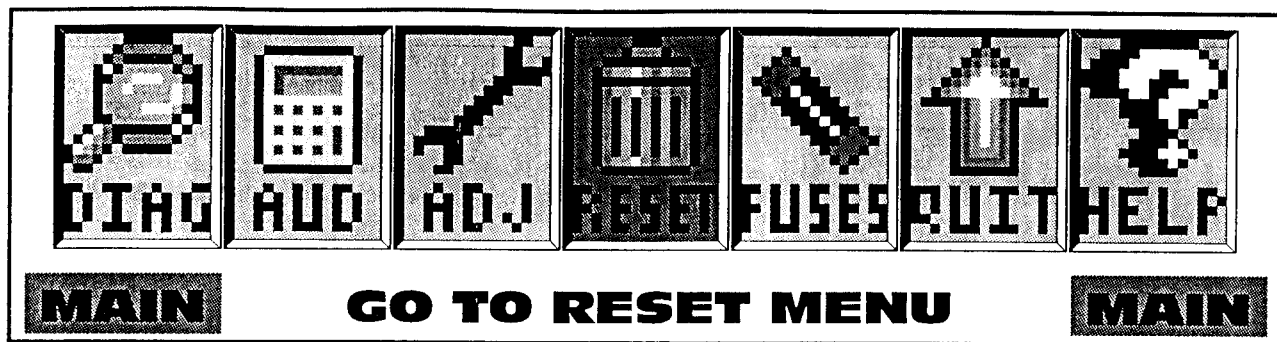


Factory Reset

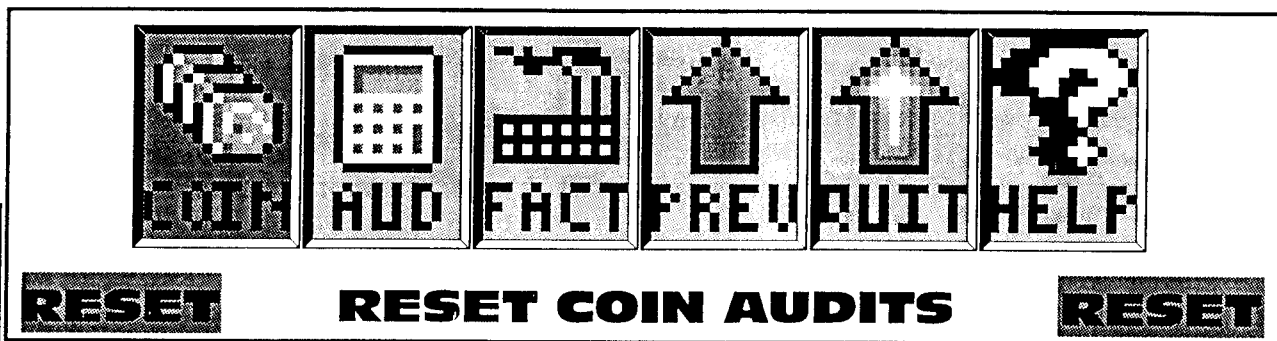
From the **RESET MENU**, select the "FACT" *Icon* with either **Red** or **Green Button** and press the **Black Button**. ⚠ All adjustments will be reset to *Factory Settings* (except for *Proprietary Adjustments*). The display will indicate **REQUEST INSTALLED** and exit the *Service Session*. See Chapter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

Example:

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



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



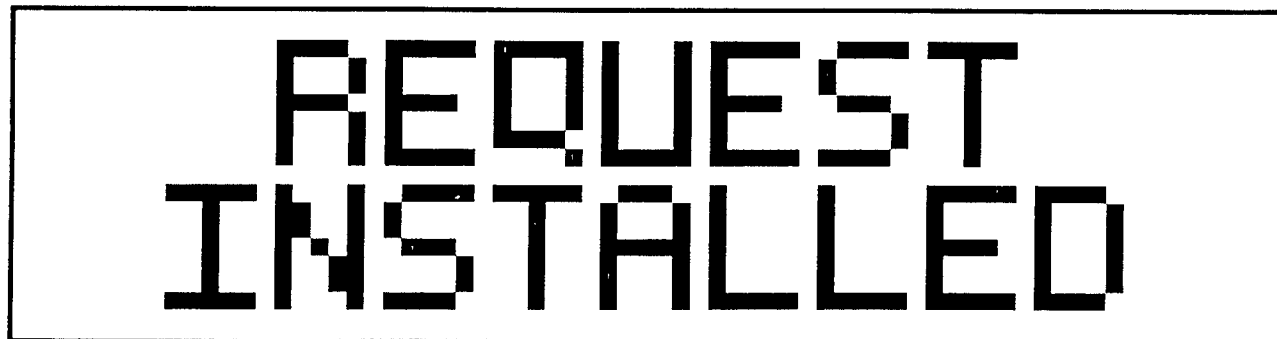
The **RESET MENU** now appears with the "COIN" *Icon* (RESET COIN AUDITS) flashing:



DO NOT PRESS THE START BUTTON AFTER SELECTING ANY THREE OF THESE ICONS UNLESS THIS IS WHAT IS DESIRED (SETTINGS WILL BE LOST)! PLEASE READ THE PREVIOUS PAGE FOR EXACTLY WHAT WILL HAPPEN IF ANY OF THESE THREE ICONS ARE ACTIVATED.



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



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

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

Go To Fuses List

Overview

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



GO TO FUSES LIST

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

Important Notes:



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



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



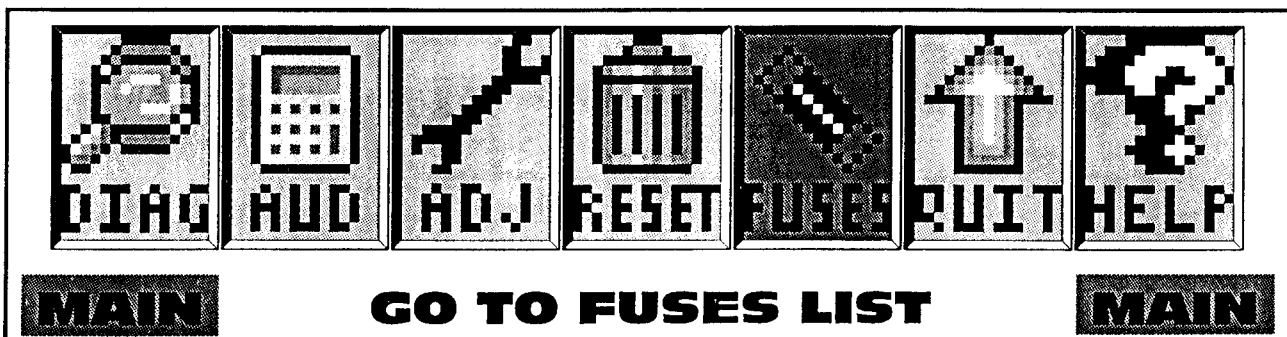
Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



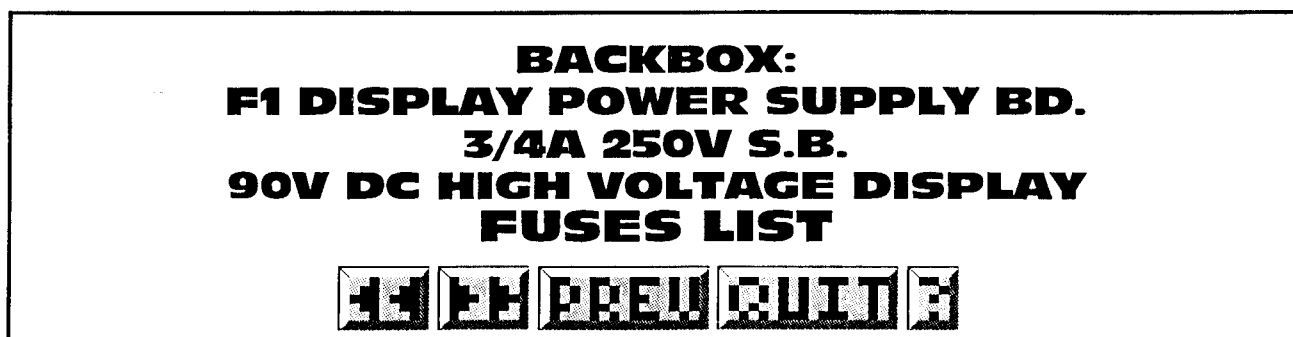
Selecting & activating the "ARROW" *Icons* selects the next or previous fuse in this group.

Example:

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



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



▼ BACKBOX LAYOUT LOCATIONS: FUSES, BRIDGES, RELAYS & ROMs ▼

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

QUICK REFERENCE FUSE CHART

Backbox Fuses

LOC:	DISPLAY POWER SUPPLY (P.S.) BOARD
F1	¼A 250v S.B. 90v DC High Voltage Display
LOC:	I/O POWER DRIVER BOARD
F6	7A 250v S.B. 50v DC Primary High Power Coils/Flippers
F7	5A 250v S.B. 20v DC Low Power Coils
F8	5A 250v S.B. 12v DC Logic Power
F9	5A 250v S.B. 12v DC Logic Power
F20	3A 250v S.B. 50v DC Not Used / Spare
F21	3A 250v S.B. 50v DC Coils
F22	8A 250v S.B. 18v DC Controlled Lamps
F23	4A 250v S.B. 5v DC Logic
F24	5A 250v S.B. 6.3v AC G.I. Lamps (BRN-WHT to WHT-BRN)
F25	5A 250v S.B. 6.3v AC G.I. Lamps (YEL to WHT-YEL)
F26	5A 250v S.B. 6.3v AC G.I. Lamps (GRN to WHT-GRN)
F27	5A 250v S.B. 6.3v AC G.I. Lamps (VIO to WHT-VIO)
F28	3A 250v S.B. 24v AC Not Used / Spare

Cabinet Fuses

LOC:	SERVICE (AC) OUTLET BOX (Cabinet Bottom)
n/a	8A 250v S.B. 115v AC Main Fuse Line (Domestic or USA)
n/a	5A 250v S.B. 220v AC Main Fuse Line (International)

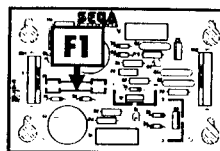
Golden Cue Playfield Fuses

LOC:	UNDER PLAYFIELD (By Assemblies Listed)
n/a	3A 250v S.B. 50v DC Rt. Flipper (BLU-YEL ↔ RED-YEL)
n/a	3A 250v S.B. 50v DC Lt. Flipper (GRY-YEL ↔ RED-YEL)
n/a	3A 250v S.B. 50v DC Lt. Flipper (GRY-YEL ↔ RED-YEL)

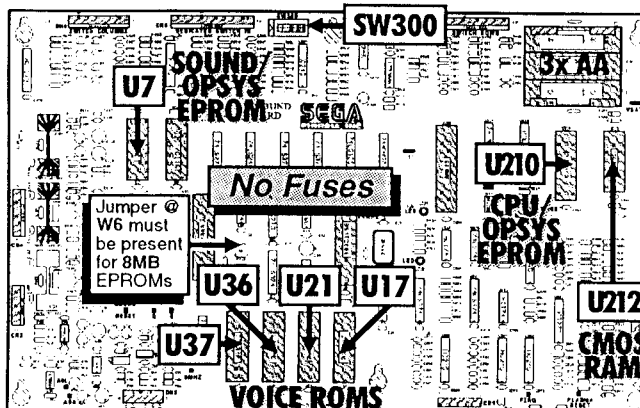
For Backbox & Cabinet Gen. Parts, see Sec. 4, Chp. 1, Parts ID & Location (The Pink Pages)

For Schematics and/or Component Parts on above Boards, see Sec. 5, Chp. 4, Printed Circuit Boards (PCBs) (The Yellow Pages)

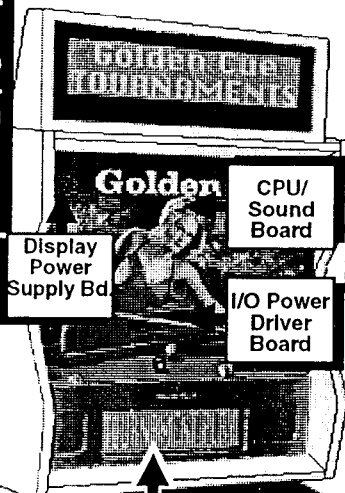
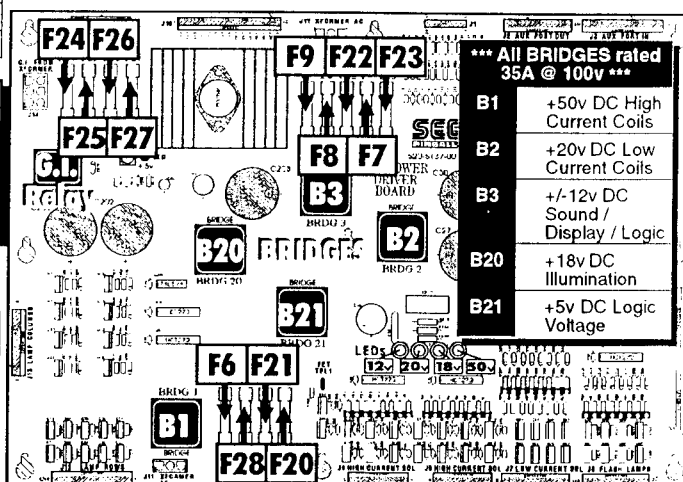
Display Power Supply Bd.



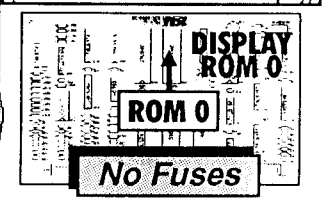
CPU / Sound Board



I/O Power Driver Board

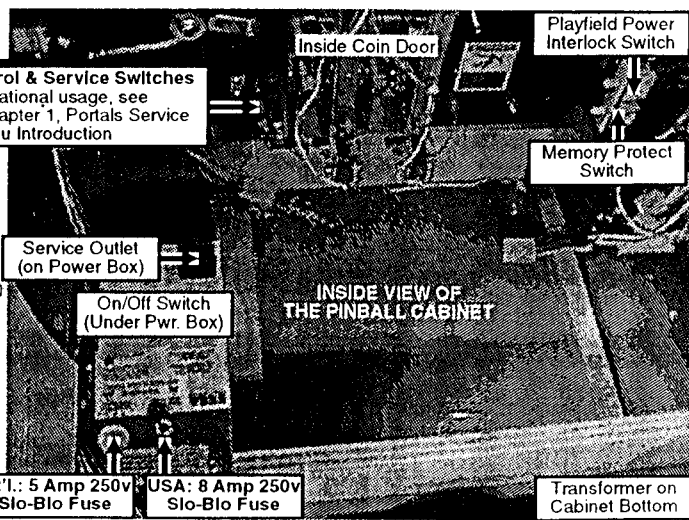
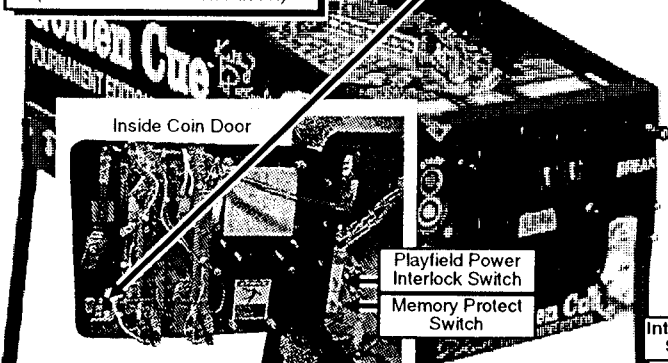


Display Controller Board (Mounted behind the Dot Matrix Display)



The Display Controller Board (holds the Display ROM Loc: ROM0) is positioned behind the 128 X 32 Dot Matrix Display Board (Neither board contain Fuses.)

Volume Control & Service Switches
For operational usage, see Section 3, Chapter 1, Portals Service Menu Introduction



Kelly's Pinball

Section 3, Chapter 6
Go To Fuses List

Go To Help Screen

Overview

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



GO TO HELP SCREEN

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

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

Important Notes:



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



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



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



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

Review Chapter 1, Introduction:

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

Review Chapter 2, Go to Diagnostics Menu:

Find all the tests needed to troubleshooting the game.

Review Chapter 3, Go to Audits Menu:

Gather play information and printing functions (downloading).

Review Chapter 4, Go to Adjustments Menu:

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

Review Chapter 5, Go to Reset Menu:

Reset audits and adjustments to Factory Settings.

Review Chapter 6, Go to Fuses Menu:

View the location & descriptions of the game fuses (the same information is referenced in the Fuse Chart Table on DR. ①).

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



PORTALS™ SERVICE MENU PROBLEM/SOLUTION TABLE

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



PROBLEM	SOLUTION
Will not enter the Service Mode after depressing the Black "BEGIN TEST" Button .	• Check the Service Switch(es) (Red, Green & Black Buttons) for loose connections or bad Ground. • Check the associated wiring harness to/from the CPU Board Connector CN14. • Check CPU Board, possibly failed.
Service Buttons (Red, Green and Black) are nonfunctional.	• Check the Service Switches for poor connections or broken wires.
The display blanks out.	• Check the Dot Matrix Display for loose wiring harness connections. • Check Bridge Rectifier 3 & 8 Amp Slo Blo Fuse. Refer to Section 5, Chapter 4, Schematics & Troubleshooting.
Icons " <i>scroll</i> " along continuously in the MAIN MENU .	• If the Service Switch Set and/or the Coin Door was replaced, ensure the Locking Mechanism on the Green Button is removed. If the Green Button "<i>clicks</i>" and locks into an up/down position, the Green Button has this lock switch. Remove it. (Ref. to Service Bulletin #74.)
The Start and Flipper Buttons do not select or activate <i>Icons</i> in the SWITCH TEST MENU .	• This is normal. These switches are deactivated, as they are a part of the Switch Test. Use the Red "LEFT" or Green "RIGHT" & Black "ENTER" Buttons in this Sub-Menu (See Chapter 1).
Can't move selection of <i>Icon</i> with the Left and/or Right Flipper Buttons .	• Check the Flipper Buttons for loose connections or bad Ground and refer to the Game Manual Flipper Troubleshooting Flowchart. • This is normal <i>only</i> in Diagnostic's Switch & Active Switch Tests (see previous Problem).
Some <i>Icons</i> appear non-functional in the PRINTER MENU(S) .	• If no printing equipment is connected, the "-" <i>Icon</i>, "+" <i>Icon</i> and "RUN" <i>Icon</i> will appear not to function (See Chapter 5).
Some <i>Icons</i> appear non-functional in the GAME SPECIFIC MENU under the DIAGNOSTICS MENU .	• If there is no other test under this Menu, the "Left Arrow" & "Right Arrow" <i>Icons</i> will appear not to function. The remaining <i>Icons</i> should function as normal. Note: If there is no Game Specific Special Test, the "GAME SPECIFIC" <i>Icon</i> will not invoke another display.
The display returns to the ATTRACT MODE exiting the Service Session from the FACTORY RESET MENU .	• This is normal. After a FACTORY RESET, the Service Session is automatically exited (See Chapter 4 (end) or Chapter 6).
In COIL TEST MENU , the coils and flashlamps <i>do not</i> fire after activating the "RUN" <i>Icon</i> .	• Ensure the POWER INTERLOCK SWITCH (See figure on front inside cover) <i>is pulled out</i>.
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. **Important:** Read all "Take Note:" items.

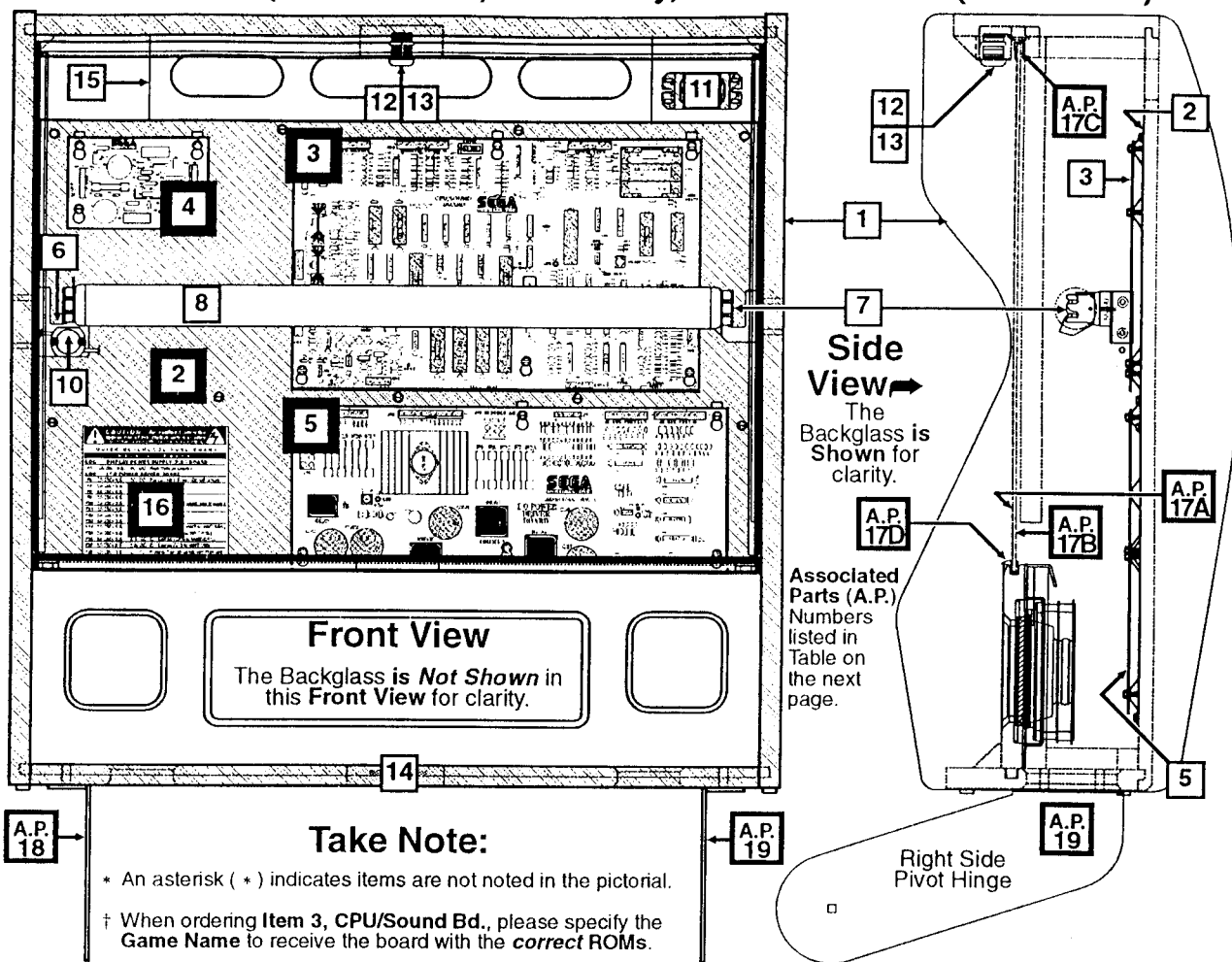


Section 4

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Backbox (Golden Cue) Assembly, 505-6002-64-64 (Items 1-27)



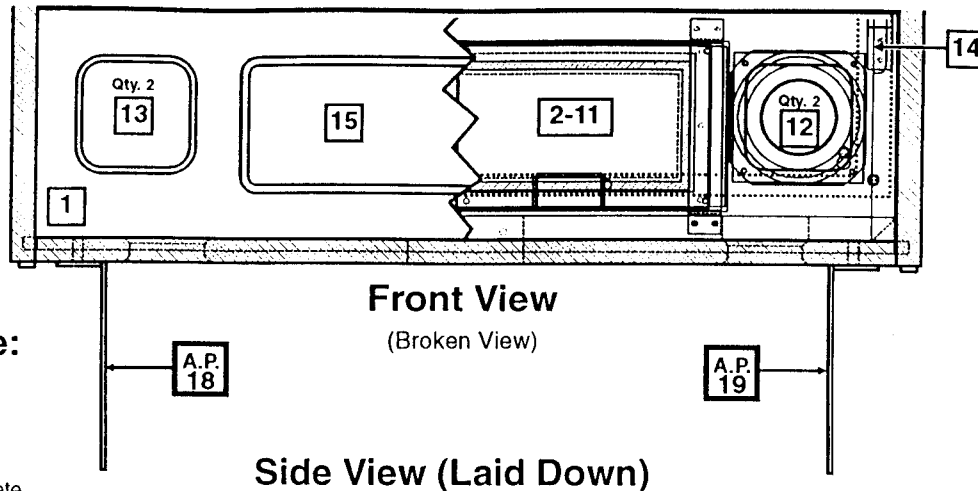
® "R" indicates item has a riveted-on part(s), if removing/adding rivets is not an option, order the entire
 ® Sub-Assembly. **Please Note:** If the ® Sub-Assembly **is not** available, call Technical Support.

Nº	Individual Part Name (Back)	QTY	SPI Part Nº	Nº	Individual Part Name (Back)	QTY	SPI Part Nº
1	Backbox Showcase Golden Cue	1	525-5505-02	14	#1 Roto Lock Female (R2-0002-02)	1	355-5006-02
Item 1 is the White Special IT Tournee Style; Item 1 comes with T-Molding.				Item 14 is secured by: #10-24 X 1-3/4" CBSN (Qty. 1) (231-5022-00), #10-24 X 2" CB (Blk) (Qty. 1) (231-5045-00), #10-24 Keps Nut (Qty. 2) (240-5207-00) and #10 Washer 7/32" ID X .5" OD X 1/16" (Qty. 2) (242-5003-00)			
2	PCB Metal Mounting Plate	1	535-5809-04	Note: #1 Roto Lock Male (on Cabinet)			
Item 2 is secured to Item 1 by: #8 X 1/2" SHWH AB (Zinc) (Qty. 8) (234-5101-00)				15	Back Vent Grill 2-1/2" X 18"	1	545-5072-02
3†	CPU/Sound Board (Mono) FCC-FEB98	1	520-5136-16	Item 15 is secured by: Staple 5/16" (Qty. 24) (631-5000-00)			
4	Display Power Supply Board	1	520-5138-00	16	Fuse Description Decal (Generic)	1	820-6152-00
5	I/O Power Driver Board	1	520-5137-01	17*	Fuse Description Decal Game Nº 64	1	820-6152-64
Items 3, 4 & 5 are secured to Item 2 by: #8-32 X 3/8" HWH MS (Qty. 19) (237-5903-00)				18*	Fuse Label (UL)	1	820-6143-00
6	Fluorescent Light Bracket Assy. Left	1	515-6545-00	19*	Backbox Date Label	1	820-5091-00
ORDERING ABOVE (ITEM 6) SUB-ASSY. PART Nº WILL INCLUDE:				20*	Ribbon Cable, 20-Pin	1	036-5000-04
6A	Fluorescent Light Bracket Left	1	535-7739-01	21*	Ribbon Cable, 26-Pin	1	036-5001-80
6B	Lamp Holder (Self-Locking)	1	077-5214-00	Item 20 (20-Pin) connects the CPU/Sound Board to the I/O Power Driver Board. Item 21 (26-Pin) connects the CPU/Sound Board to the Display Controller Board.			
6C	#6-32 X 5/8" PPH MS (Sems) Zinc	1	232-5203-00	22*	1/4" Clamp (Double)	3	040-5000-23
6D	Starter Base (with Leads)	1	077-5213-00	23*	1/2" Clamp (Single)	1	040-5000-06
6E	#4-40 X 1/2" PPH MS (Sems) Zinc	2	237-5813-00	24*	3/4" Clamp (Single)	3	040-5000-08
7	Fluorescent Light Bracket Assy. Right	1	515-6545-01	25*	1" Clamp (Single)	5	040-5000-09
ORDERING ABOVE (ITEM 7) SUB-ASSY. PART Nº WILL INCLUDE:				Items 22-25 secured by: #8 X 1/2" SHWH AB (Zinc) (Qty. 12) (234-5101-00)			
7A	Fluorescent Light Bracket Right	1	535-7739-00				
7B-7C	Identical to Items 6B-6C above		See 6B-6C				
Items 6 & 7 are secured by: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 2/per) (231-5012-00) and #10-24 Keps Nut (Qty. 2/per) (240-5207-00)							
8	Fluorescent Tube (F20T12CW)	1	165-5031-02				
9*	3/4" X 3" Reinforced Strapping Tape	1	626-5040-00				
Above Item 9 is self-adhesive. It is located on Items 6 & 7. Sold in 12" Lengths only.							
10	Starter - Fluorescent (FS2 Light)	1	165-5011-01				
11	Ballast SP2/A 120v 60Hz 13W UL	1	010-5007-00				
Item 11 is secured to Item 1 by: #6 X 3/8" HWH AB (Zinc) (Qty. 2) (234-5000-00)							
12	Lock Mounting Plate	1	535-5828-01				
13	Lock & Key Set	1	355-5018-02				
Items 12-13 are secured by: #8 X 5/8" TP Torx T20 (Qty. 2) (237-5947-00)							

BACKBOX HEADER:

See the end of this manual for a separate Tournament Edition Section containing unique parts and schematics.

**Speaker Panel Assy. for the Backbox, 515-6888-00 (Items 1-16)
and Assoc. Parts: Backglass Assembly & Pivot Hinges (Left & Right) (Items 17-19)**

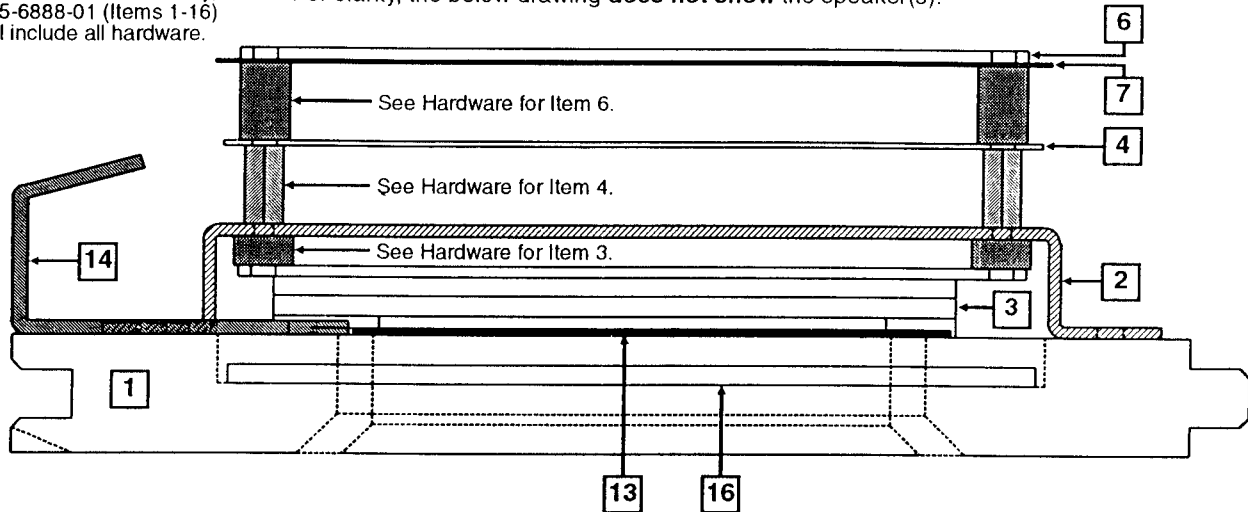


Take Note:

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

1. Ordering the complete Speaker Panel Assembly, 515-6888-01 (Items 1-16) will include all hardware.

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



Nº	Individual Part Name (Front)	QTY.	SPI Part Nº	Nº	Individual Part Name (Front)	QTY.	SPI Part Nº
1	Speaker Panel (same as Shwcs. II)	1	525-5515-00	14	Speaker Panel Hook Bracket	2	535-7009-02
2	Dot Matrix Disp. Bd. Mounting Bracket	2	535-8368-01	Items 12, 13 & 14 are secured by: #8 X 3/4" HWH AB (Zinc) (Qty. 12/13: Qty. 4/per; Item 14: Qty. 2/per) (234-5103-00)			
Item 2 is secured to Item 1 by: #8 X 3/4" HWH AB (Zinc) (Qty. 4/per) (234-5103-00)				15	Plastic Shield (Display Cover)	1	545-5884-00
3	Dot Matrix Display Board 128 X 32	1	520-5052-00	Item 15 is secured to Item 2 by: #6 X 3/8" HWH AB (Zinc) (Qty. 8) (234-5000-00)			
Item 3 is secured to Item 2 by (at corners): 3/16" X 3/8" Spacer Gray (Qty. 4) (254-5000-18) and #6-32 X 1/2" HWH Swage (Serr) Zinc (Qty. 4) (237-5976-03) Item 3 is secured to Item 4 (at the top center) by: 3/4" X 1/4" Hex Spacer #6-32 Tap (Qty. 1) (254-5008-04) and #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 1) (232-5200-00)				16*	Ground Strap (41")	2	600-5006-41
4	Static Shield (Steel Plate)	1	535-6437-00	The Associated Parts A.P. 17-19 are also noted in the Backbox (Golden Cue) Assy. drawings on the previous page. ASSOC. PARTS ARE NOT INCLUDED WITH BACKBOX/SPKR. PANEL ASSY'S.			
Item 4 is secured to Item 2 by: 1/2" X 1/4" Hex Spacer #6-32 Tap (Qty. 4) (254-5008-03) and #6-32 X 1/2" PPH MS (Sems) Zinc (Qty. 2, on Left Side only) (232-5202-00)				Nº	Assoc. Backbox Part Name	QTY.	SPI Part Nº
5*	Edge Protector (on Item 4)	2	545-5592-01	17	Backglass Assembly (Game Nº 64)	1	515-5450-0064
6	Display Controller Board FCC-FEB98	1	520-5055-03	ORDERING ABOVE (ITEM 17) SUB-ASSY. PART Nº WILL INCLUDE:			
Item 6 is secured to Item 4 by: 1/2" X 5/16" X .144 ID Spacer Tap (Qty. 3) (254-5014-00), #6-32 X 3/4" PPH MS (Sems) Zinc (Qty. 3) (237-5504-00), 1/2" X 1/4" Hex Spacer #6-32 Tap. (Qty. 1) (254-5008-03) and #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5200-00)				17A	Clear Backglass 25.906" X 19.187"	1	660-5038-02
7	RF Shield	1	820-5092-00	17B	Screened Film (Game Nº 64)	1	830-5264-00
Item 7 is secured Inbetween: "Item 6" and its' mounting hardware described.				17C	Top Plastic Channel - 26"	1	545-5018-15
8*	Ground Strap (25") (on Items 4,6, 12)	2	600-5006-25	17D	Bottom Plastic Lift Channel - 26-1/16"	1	545-5021-01
9*	1/2" Clamp (Single) (on Item 4)	1	040-5000-06	17E*	Plastic Edging (Left/Right) - 18-1/8"	2	545-5018-14
10*	Ribbon Cable, 14-Pin	1	036-5260-00	17F*	Tape (double-sided) (12" Length)	1/2	626-6005-00
Item 10 (14-Pin) connects the Dot Matrix Disp. Board to the Disp. Controller Board.				Note: 17F secures 17E to 17A			
11*	Foam 3/16" Thk. X 1/4" X 36"	3	626-5026-00	18	Pivot Hinge Left	1	535-7999-00
Above Item 11 is self-adhesive. Located between Items 3 & 17. Sold in 12" Lengths only.				19	Pivot Hinge Right	1	535-7999-01
12	Speaker (Shld.) 4" 8Ω MG Elec #4060SH	2	031-5004-01	Items 18 & 19 are secured to Backbox by: 1/4"-20 X 1-1/4" C.B. Sq. Neck (Qty. 4) (231-5003-00), Washer 1/4" ID X 1" OD X .49" Thk (Qty. 4) (242-5009-00) and 1/4"-20 Flange Nut (Qty. 4) (240-5300-00)			
13	Speaker Grill (Black w/no Artwork)	2	535-8081-00	Items 18 & 19 are secured to Cabinet by: 1/4"-20 X 7/8" Carriage Bolt Sq. Neck (Qty. 2) (231-5014-00), Hinge Spacer (Qty. 2) (530-5099-00), Washer 1/4" I.D. X 7/8" O.D. X 1/8" Yellow (Qty. 2) (242-5016-01), Washer 1/4" I.D. X 1" O.D. (Qty. 2) (242-5009-00) and 1/4"-20 Flange Nut (Qty. 2) (240-5300-00)			

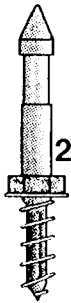
Playfield - Metal Posts (Screws) and Nuts (Actual Size) †



Item 1 Post can use
3/16" I.D. Rubber Ring,
545-5348-01;
or If Item 1 Post Is
used in pairs, can use
3/4" — 3" Rubber Rings.

1

Items 2 & 4 Posts can use
7/16" O.D. Rubber Ring,
545-5348-17.



2



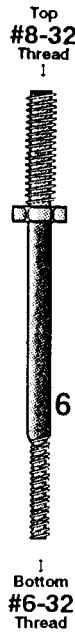
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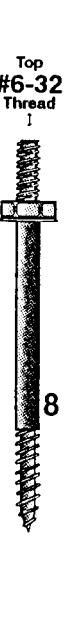
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6



7



8



9



10



11



12



13



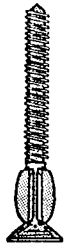
14



15



16



17



18

Item 16 is typically used to hold Hex
Spacers onto the Playfield Top.

Item 17 is typically used to hold the
bottom Cabinet Speaker (used with
#6-32 Nylon Stop Nut, 240-5005-00).

Item 18 is typically used to hold
Item 15 (515-5339-00) in Turbo
Bumper Assy., 515-6459-04.

Note: The "Fins" keep the screw
from turning inside the wood hole.

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

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



Top & Side Views
Nylon Stop Nuts
Not Shown:

• #6-32
(w/ 1/4" Hex Body):
240-5010-00
• #8-32:
240-5102-00 ✓
• #10-32:
240-5203-00 ✓
• #10-24:
240-5206-00 ✓
• #4-40:
240-5303-00
• #4-40
(18/8 Stainless):
240-5303-01
• 5/16"-18:
240-5316-00

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



Bottom & Side Views
KEPS Nuts
Not Shown:

• #6-32
(w/ 1/4" Hex Body):
240-5011-00
• #8-32:
240-5104-00 ✓
• #10-32:
240-5208-00 ✓
• #10-24:
240-5207-00 ✓
• #4-40:
240-5318-00

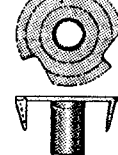
Shown Below-
• #6-32
Hex Nut
(No Star Washer):
240-5004-00 ✓



Top View
Hex Nuts
Not Shown:

• #8-32:
240-5103-00
• #10-32:
240-5201-00
• #10-24:
240-5202-00 ✓
• #10-32 X 3/8":
240-5209-00
• 3/4-16:
240-5315-00
• #2-56:
240-5301-00 ✓
• 7/8"-14:
240-5317-00

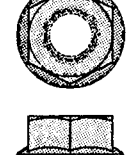
Shown Below-
• #6-32
T-Nut:
240-5002-00 ✓



Bottom & Side Views
T-Nuts
Not Shown:

• #6-32
(w/Side Cut Off):
240-5002-01
• #8-32:
240-5101-00 ✓
• #10-32
(Black Oxide):
240-5007-00
• #10-32
(w/Side Cut Off):
240-5205-00
• #10-24:
240-5200-00

Shown Below-
• 1/4" X 20
Flange Nut:
240-5300-00 ✓



Top & Side Views
Miscellaneous Nuts
Not Shown:

• Plastic Pal Nut
(on Flipper Buttons):
240-5003-00
• Metal Pal Nut
(on Flipper Buttons):
240-5003-01 ✓
• #6-32 Wing Nut:
240-5001-00
• #8-32 Wing Nut:
240-5100-00
• 1/4"-20 Wing Nut:
240-5302-00
• 1/4"-20 Toggle Wing:
240-5324-00

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

Section 4, Chapter 1
Parts Identification & Location

Golden Cue
TOURNAMENT EDITION

5 7

Section 4 | Parts

Hex Spacers:

#6-32

Tap

Playfield - Metal Spacers (Actual Size) †

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

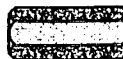
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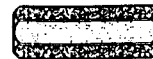
3/8"



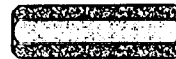
1/2"



5/8"



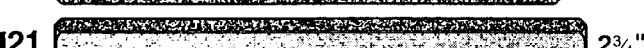
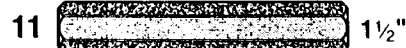
3/4"



7/8"



1"

* Item 31 (Not
Shown) is 5 1/4".

27 3 5/8" 26 3 1/2"

22 2 7/8"

Take Note:

Items 1-31 are 1/4" wide. Items 39-44 are 5/16" wide. With Items 1-6, the tap goes through the length of the spacer. With Items 7-31 & Items 39-44, the tap is up to 5/8" deep on each end (exception: Item 8B has 1 Male End #6-32 Thread).

28 4" 29 4 1/4" 30 4 3/8"

23 3" 24 3 1/8" 25 3 1/4"

33 1/4"

34 1/2"

35 9/16"

36 3/4"

37 1 1/8"

38 1"

Note the Part N° & Material Difference

‡ Hex Spacers Not
Used in current
games may no
longer be available.
Choose one size
up or down (+/-).

39 1 3/4"

40 2"

41 4"

42 4 5/16"

43 4.92"

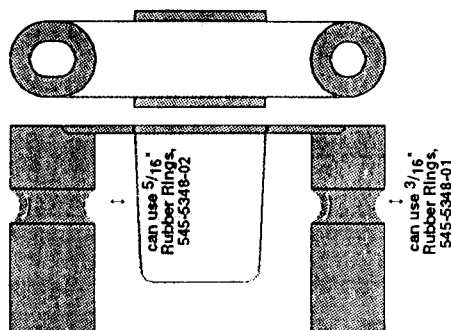
* Item 44 (Not
Shown) is 6".

N°	Metal Spacer Name	QTY.	SPI Part N°	N°	Metal Spacer Name	QTY.	SPI Part N°
1	1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-00	22	2 7/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-31
2	3/8" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-12	23	3" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-14
3	1/2" X 1/4" Hex Spacer #6-32 Tap	5	254-5008-03	24	3 1/8" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-19
4	5/8" X 1/4" Hex Spacer #6-32 Tap	17	254-5008-02	25	3 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-26
5	3/4" X 1/4" Hex Spacer #6-32 Tap	3	254-5008-04	26	3 1/2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-27
6	7/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-05	27	3 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-25
7	1" X 1/4" Hex Spacer #6-32 Tap	4	254-5008-06	28	4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-21
8A	1 1/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-17	29	4 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-30
8B	Same as 8A with Male End #6-32	0	254-5024-17	30	4 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-29
9A	1 1/4" X 1/4" Hex Spacer #6-32 Tap	2	254-5008-11	31	5 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-35
9B	1 5/16" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-34	32	3/4" X 1/2" Spacer (Used with Backbox)	2	530-5099-00
10	1 1/2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-33	33	1/2" X 5/16" X .144" I.D. Spacer Tap	0	254-5014-03
11	1 1/2" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-09	34	1/2" X 5/16" X .144" I.D. Spacer Tap	3	254-5014-00
12	1 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-13	35	9/16" X 5/16" X .144" I.D. Spacer Tap	0	254-5014-04
13	1 3/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-10	36	3/4" X 5/16" X .144" I.D. Spacer Tap	0	254-5014-01
14	1 7/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-20	37	1 1/8" X 5/16" X .144" I.D. Spacer Tap	0	254-5014-02
15	2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-07	38	1" X 5/16" X .144" I.D. Spacer Tap	0	254-5001-00
16	2 1/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-32	39	1 1/4" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-06
17	2 1/4" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-18	40	2" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-07
18	2 3/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-28	41	4" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-03
19	2 1/2" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-16	42	4 5/16" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-00
20	2 5/8" X 1/4" Hex Spacer #6-32 Tap	0	254-5008-08	43	4.92" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-04
21	2 3/4" X 1/4" Hex Spacer #6-32 Tap	4	254-5008-15	44	6" X 5/16" Hex Spacer #6-32 Tap	0	254-5018-02

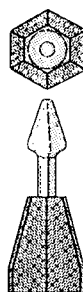
† Items with Ø Qty. are not used in this game.
Size and/or quantities may change during production.

Playfield - Plastic Posts and Spacers (Actual Size) †

1** Various Colors



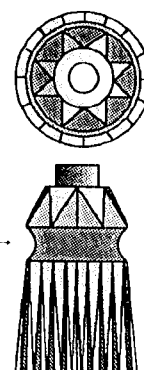
2** Various Colors



3** Limited Colors



4** Various Colors



Take Note:

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

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

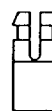
Items 3-4 Posts used in pairs can use 3/4" through 3" Rubber Rings, (See Rubber Parts for Part Nºs).

5 †



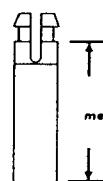
1/4"

6 †



3/8"

7 †



3/4"

8



1/2"

† Items 5, 6 & 7 (Board Spacers) dimensions are measured from bottom to just under cut-away (see pictorial with Item 7 above).

9

10

11

12

13

14

15

16

17

18

Take Note:

If any one of Items 9-18 Spacers is not available in the size required, order the smaller sized spacers required to stack sizes together until appropriate size is achieved. (e.g. If 1 1/8" is needed but unavailable, order a 1/2" + 3/8" and stack to = 1 1/8")



3/16"



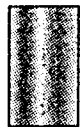
1/4"



3/8"



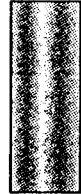
1/2"



5/8"



3/4"



1"



1 1/8"



1 1/4"



1 1/2"

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

Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº	Nº	Plastic Post/Spacer Name	QTY.	SPI Part Nº
1**	Top Lane Mini-Light Hood (Clear)	4	550-5061-01	9	3/16" X 3/8" Spacer Gray (4 for Dot Display)	4	254-5000-18
Item 1 typically secured by: #6-32 X 1-3/4" PPH MS (Zinc) (Qty. 2/per) (237-5511-00) and Washer 9/64" X 5/16" OD X 1/32" (Qty. 2/per) (242-5017-00)				10	1/4" X 3/8" Spacer Gray	4	254-5000-02
2**	Mini-Jewel Post	0	550-5052-XX	11	3/8" X 3/8" Spacer Gray	0	254-5000-12
Item 2 typically secured by: #6 X 3/8" HWH AB (Zinc) (Qty. 1/per) (234-5000-00)				12	1/2" X 3/8" Spacer Gray	0	254-5000-01
3**	1 1/16" Single Groove Post (Black)	15	550-5059-00	13	3/4" X 3/8" Spacer Gray	0	254-5000-14
4**	Single Groove Jewel Post (Clear)	25	550-5034-01	14	1" X 3/8" Spacer Gray	7	254-5000-07
Items 3 & 4 typically secured by: Post Fastening Screw #6-32 Top / #6-32 Bottom (Qty. 1/per) (530-5012-02, Item 7 Page 57) and may use Washer 9/64" X 5/16" OD X 1/32" (Qty. 1/per) (242-5017-00) with a #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00).				15	1 1/8" X 3/8" Spacer Gray	0	254-5000-04
5 †	1/4" Slf. Rtn. Spacer White	0	254-5007-02	16	1 1/4" X 3/8" Spacer Gray	0	254-5000-06
6 †	3/8" Slf. Rtn. Spacer White	0	254-5007-01	17	1 1/2" X 3/8" Spacer Gray	0	254-5000-05
7 †	1/2" Slf. Rtn. Spacer White	0	254-5007-03	18	1 1/2" X 3/8" Spacer Gray	1	254-5000-08
8	1/2" X 1/4" Spacer White (Narrow)	0	254-5000-03	Items 10-18 typically secured by: See Items 6, 7 & 8 Page 57 &/or #6-32 1 1/4" PPH MS Zinc Screw (Qty. 1/per) (237-5511-00) and #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00).			

Section 4, Chapter 1 Parts Identification & Location

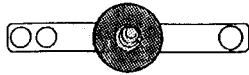
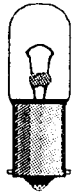
Golden Cue
TOURNAMENT EDITION

5 9

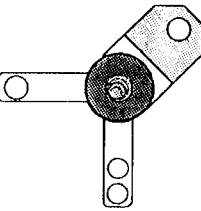
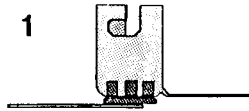
Playfield - Small Bayonet Type Bulbs and Sockets (Actual Size) †

#44 Bulb

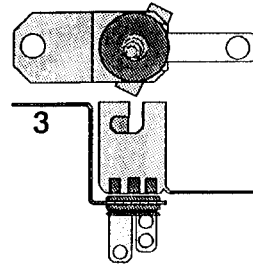
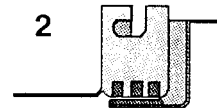
A



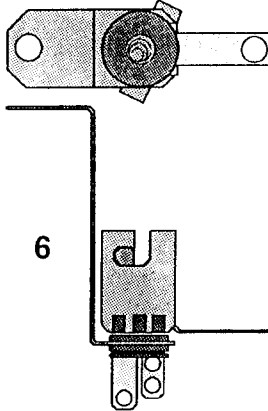
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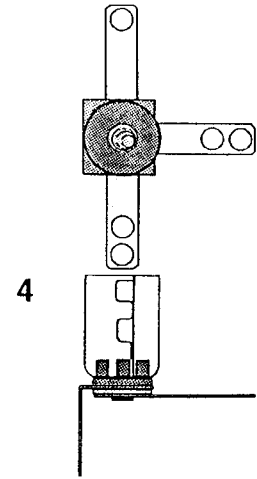
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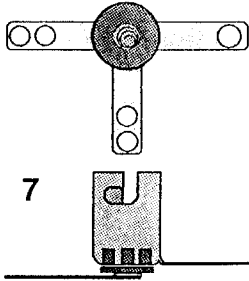
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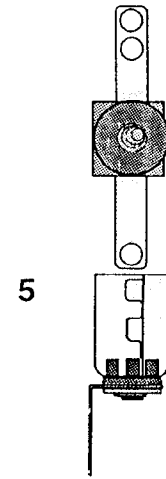
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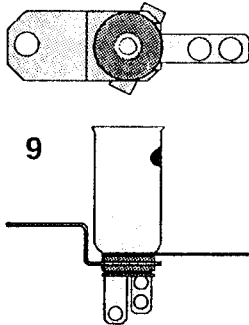
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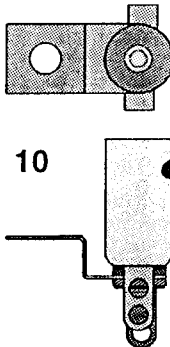
7



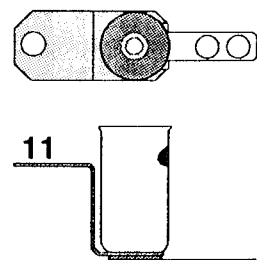
5



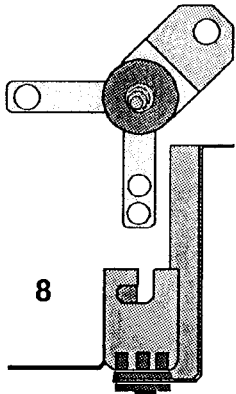
9



10



11



8

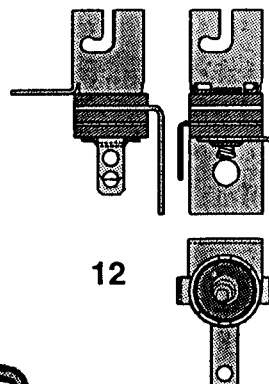
Nº	#44 Bulb & Socket Name	QTY	SPI Part Nº
A	#44 Bulb	47	165-5000-44
1	2-Lug Staple Down Socket	4	077-5000-00
2	2-Lug Stand-Up Short Socket	6	077-5002-00
3	3-Lug Stand-Up Short Socket	0	077-5008-00
4	3-Lug Laydown Socket (3 Lugs Flat)	8	077-5006-00
5	2-Lug Laydown Socket	0	077-5003-00
6	3-Lug Stand-Up 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
10	2-Lug Stand-Up Lg. Shell Socket (G1s)	29	077-5031-00
11	1-Lug Stand-Up Long Shell Socket	0	077-5012-00
12	3-Lug Laydown Socket (2 Lugs Bent)	0	077-5032-00

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

Take Note:

Item B Bulb (#455) is normally used in conjunction with Item 11 Socket, but *can* be used with Items 1-12 Sockets on this page.

Note: Always replace with same type bulb in original application.



12

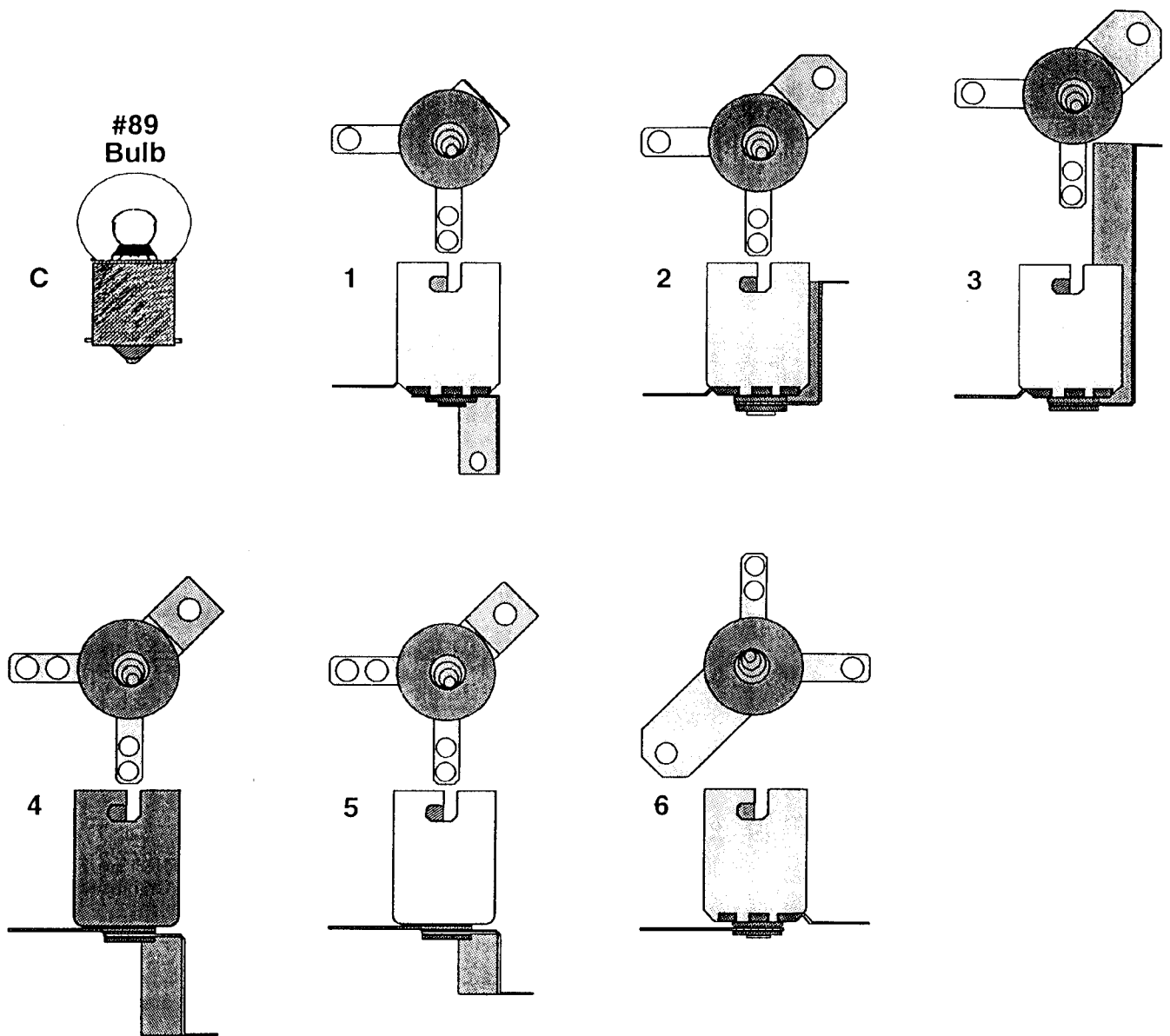
#455 Bulb

B

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

Kelly's Pinheads

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.

Section 4 | Parts

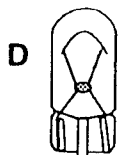
Nº	#89 Bulb & Socket Name	Qty.	SPI Part Nº
C	#89 Bulb	1	165-5000-89
1	Laydown Standard Socket	1	077-5100-00
2	2-Lug Stand-Up Short Socket	0	077-5101-00
3	2-Lug Stand-Up Long Socket	0	077-5102-00
4	Stand-Up Socket Rev. Short	0	077-5103-00
5	2-Lug Stand-Up Small Socket	0	077-5106-00
6	Straight Leg Socket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

Section 4, Chapter 1
Parts Identification & Location

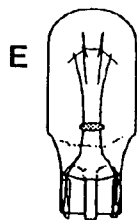
Golden Cue
TOURNAMENT EDITION

6 1

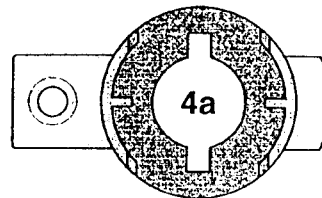
Playfield - Wedge Base Bulbs and Sockets (Actual Size) †



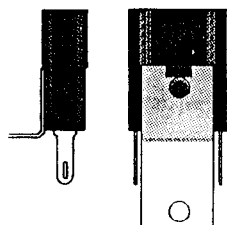
#555 Bulb



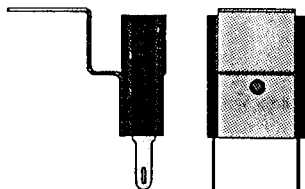
#906 Bulb



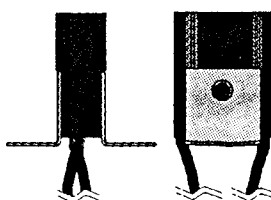
1



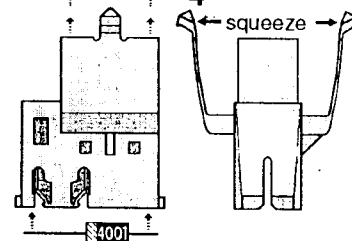
2



3



4

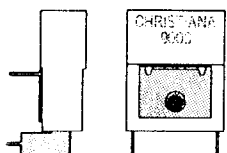


This Socket is equipped with a *built-in* Diode, 1N4003, (112-5013-00). However, replacement can be made with Diode, 1N4001, (112-5003-00).

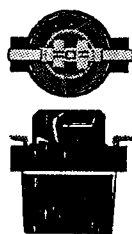
↑ Take Special Note ↓

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

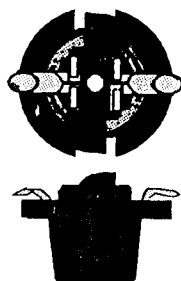
5



6



7



Take Note:

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

- Item 2 Socket has 2 Wires attached are approximately 12" ea.
- Item 5 Socket **was** used on PC Light Boards to position bulbs horizontally; Item 5 Socket is secured by soldering into place.
- Item 6 Socket **was** used on PC Light Boards to position bulbs vertically; Item 6 Socket is secured by "twisting" into place.
- Item E Bulb (#906) is normally used in conjunction with Item 7 Socket, but **can** be used with Items 1, 2, 4 or 5.

Note: Always replace with same type bulb in original application.

5. See the start of this chapter for Fluor. Bulb & Associated Parts.

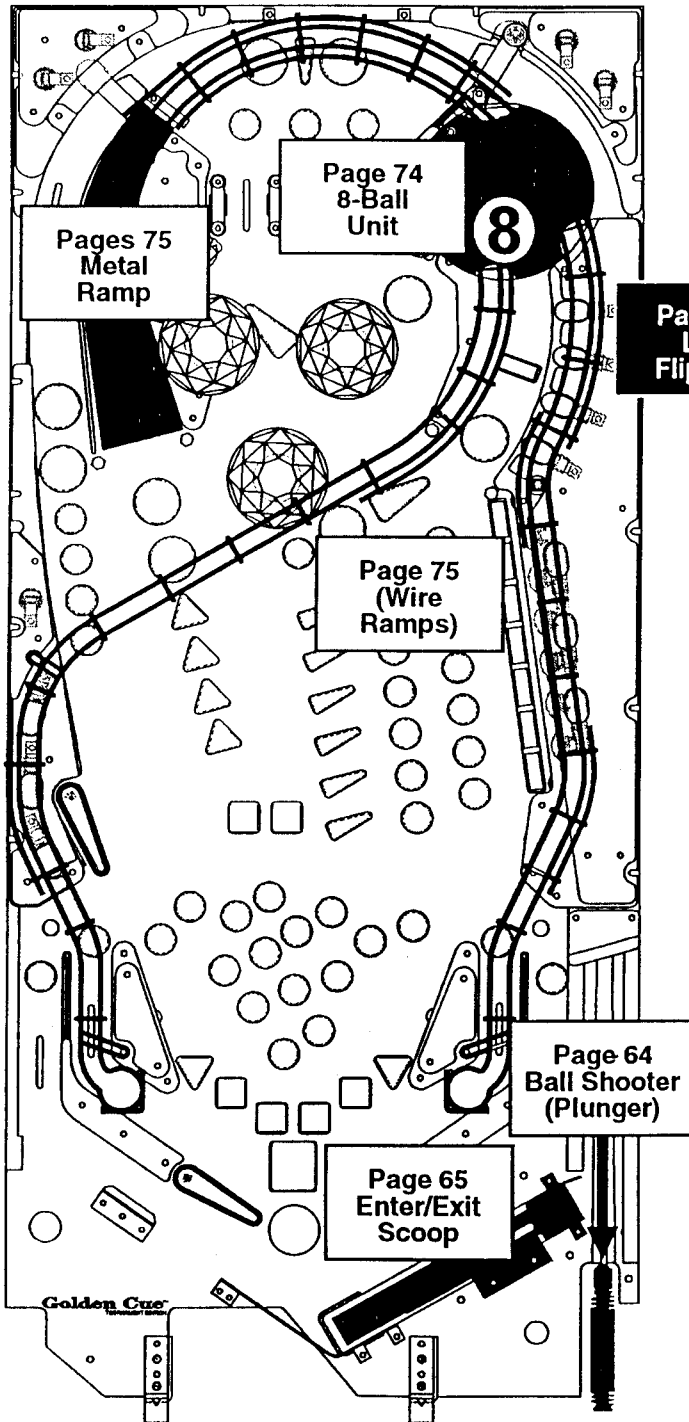
N ^o	#555 Bulb & Socket Name	QTY.	SPI Part N ^o	N ^o	#906 Bulb & Socket Name	QTY.	SPI Part N ^o
D	#555 Wedge Base Bulb (Clear)	66	165-5002-00	E	#906 Wedge Base Bulb (Clear)	0	165-5004-00
1	Laydown #555 Wedge Base Socket	10	077-5026-01		#906 Wedge Base Bulb (Red)	3	165-5004-02
2	#555 Wedge Base Offset Socket	5	077-5029-00		#906 Wedge Base Bulb (Amber)	4	165-5004-03
3	#555 W.B. Socket (for Pop Bumper)	3	077-5206-00		#906 Wedge Base Bulb (Blue)	4	165-5004-05
4	#555 IDC Snap-On Socket	63	077-5216-00		#906 Wedge Base Bulb (Yellow)	4	165-5004-06
4a	5/16" Ht. Snap-On Socket Bracket	63	545-5760-18		#906 Wedge Base Socket (Twist)	0	077-5016-00
4b *	19/32" Ht. Snap-On Socket Bracket	0	545-5760-19				
4c *	Clear Plastic (Butyl) Socket Mtg. Bd.	0	Not Used				
5	#555 W.B. Socket (Solder Type)	0	077-5207-00				
6	#555 Wedge Base Socket (Twist)	0	077-5007-00				

Drawings for Major Assemblies & Ramps (The Blue Pages)

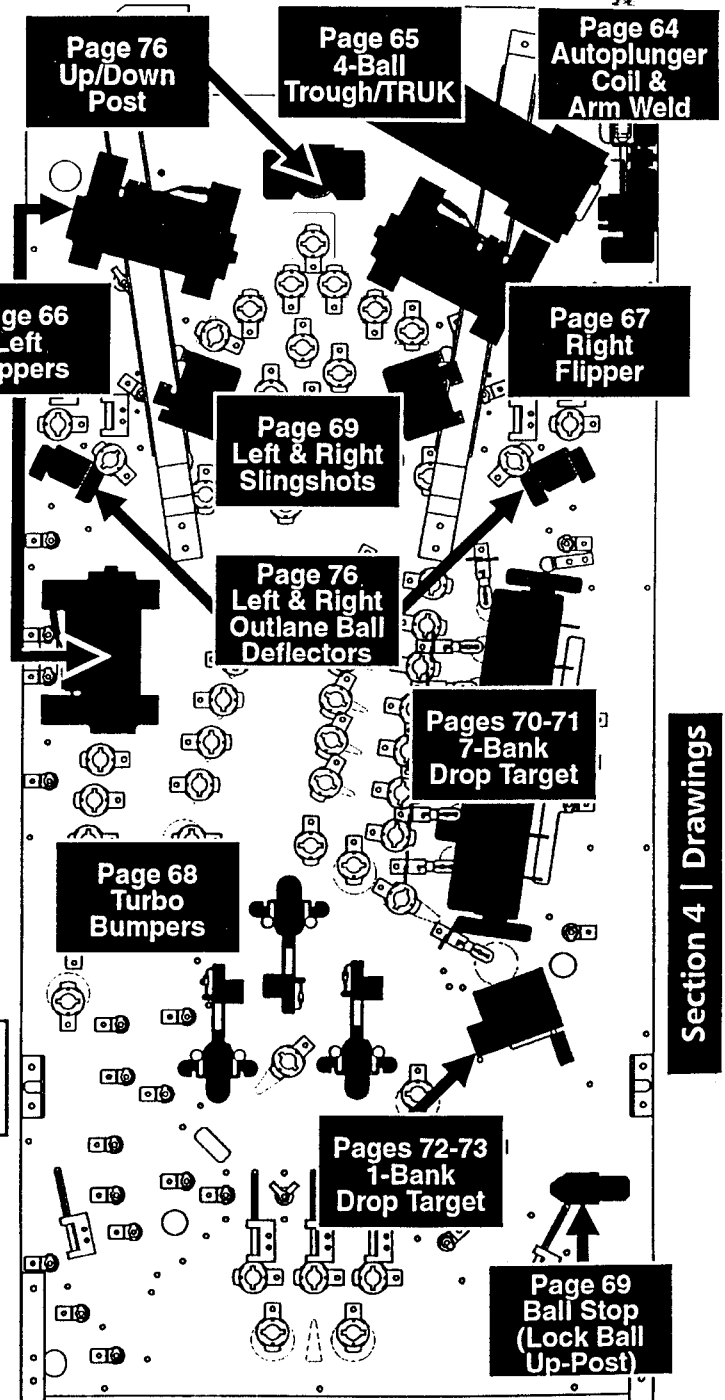
Overview

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

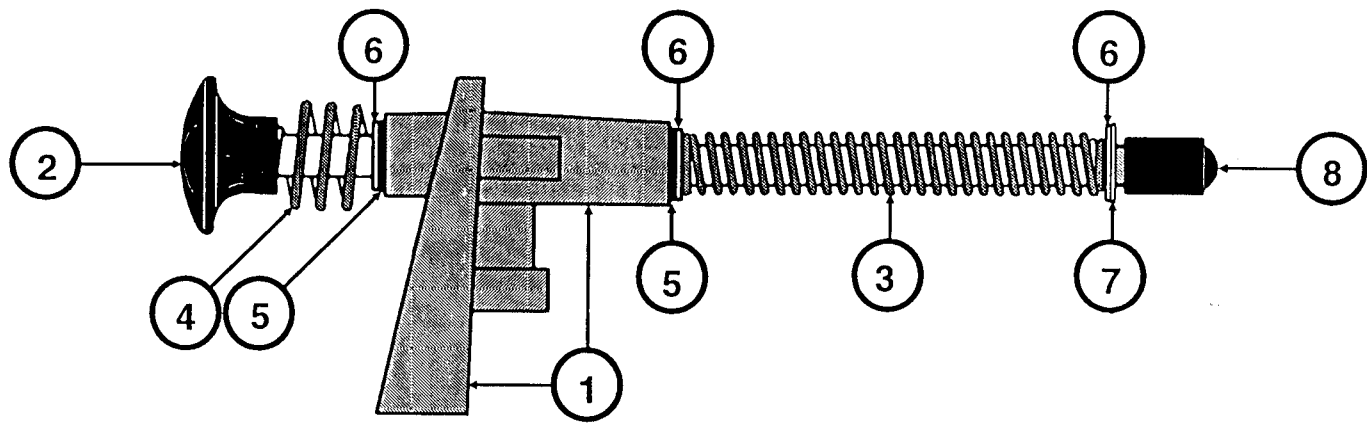
ASSEMBLIES MOUNTED ABOVE THE PLAYFIELD



ASSEMBLIES MOUNTED BELOW THE PLAYFIELD



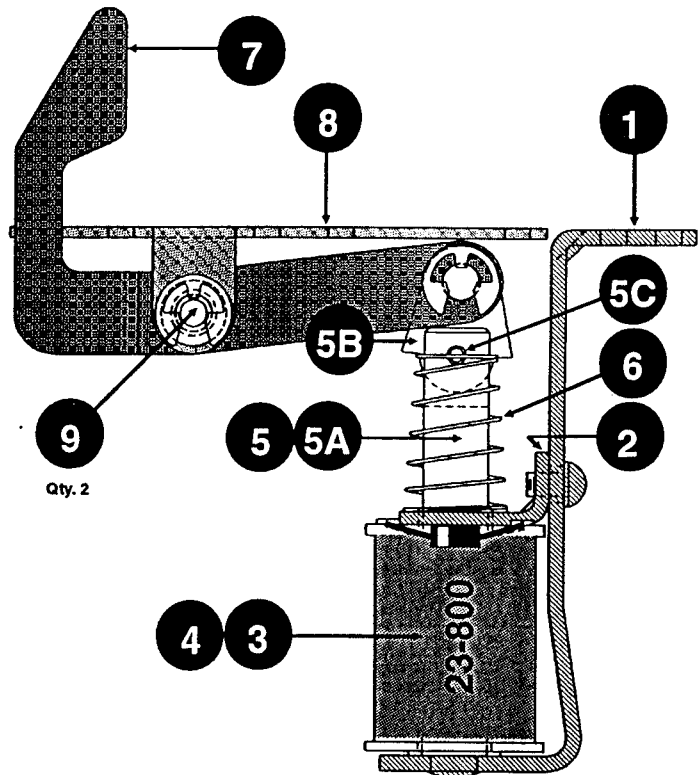
Ball Shooter (Plunger) Assembly, 500-6146-50-04 (Items 1-8)



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

Autoplunger Coil Assembly, 500-6092-03 (Items 1-6) with Autoplunger Arm Weld Assembly, 500-6091-00 (Items 7-9)

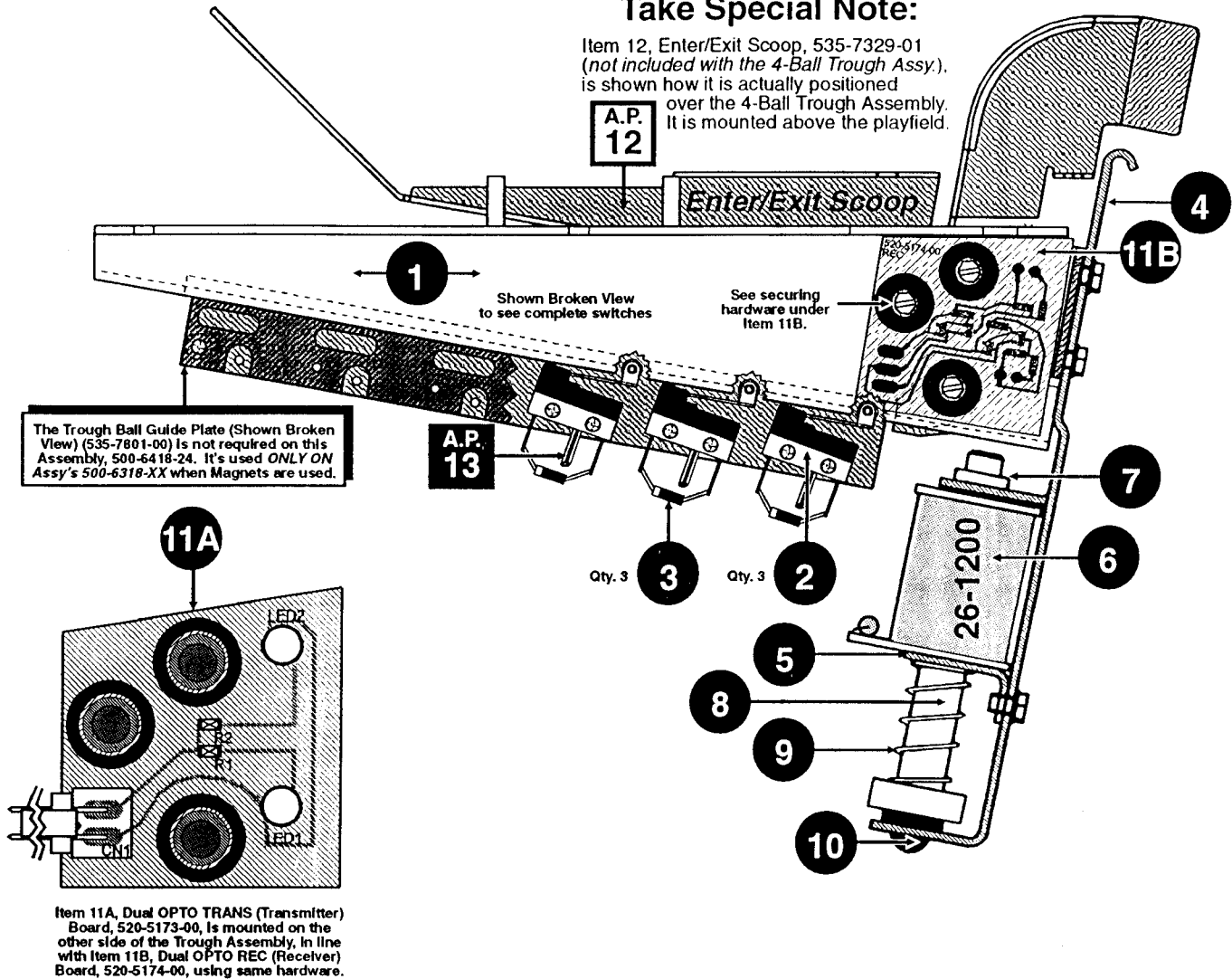
Nº	Individual Part Name	QTY.	SPI Part Nº
Autoplunger Coil Assembly, 500-6092-02 (Items 1-6)			
1	Autoplunger Coil Bracket Assembly	1	515-6527-00
2	Coil Retainer Bracket	1	535-5203-03
Item 2 is secured to Item 1 by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)			
3	Coil, 23-800	1	090-5001-00T
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:			
	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5031-00
5	Plunger & Link Assembly	1	515-5338-00
ORDERING ABOVE (ITEM 5) SUB-ASSY. PART Nº WILL INCLUDE:			
5A	Plunger 2"	1	530-5025-01
5B	Plunger Link	1	545-5293-00
5C	Roll Pin, 1/8" ø X 5/8" Lg.	1	251-5008-00
Item 5B is secured to Item 7 by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)			
6	Compression Return Spring	1	266-5020-00
Autoplunger Arm Weld Assy., 500-6091-00 (Items 7-9)			
7	Arm Weld Assembly	1	515-6526-00
Item 7 is secured to Item 8 by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)			
8	Autoplunger Fulcrum	1	535-7697-00
9	Nyliner, 1/4" (Thomson #411-FF)	2	545-5423-00
Autoplunger Arm Weld Assy., 500-6091-00 and Autoplunger Coil Assy., 500-6092-01 are secured under the playfield by: #8 X 1/2 HWW AB (Zinc) Blue (Qty. 9) (234-5101-05)			



4-Ball Trough Assembly, 500-6418-24 (Items 1-11B) and Associated Part: Ball Trough Enter/Exit Scoop, 535-7329-01 (Item 12)

Take Special Note:

Item 12, Enter/Exit Scoop, 535-7329-01 (not included with the 4-Ball Trough Assy.), is shown how it is actually positioned over the 4-Ball Trough Assembly. It is mounted above the playfield.

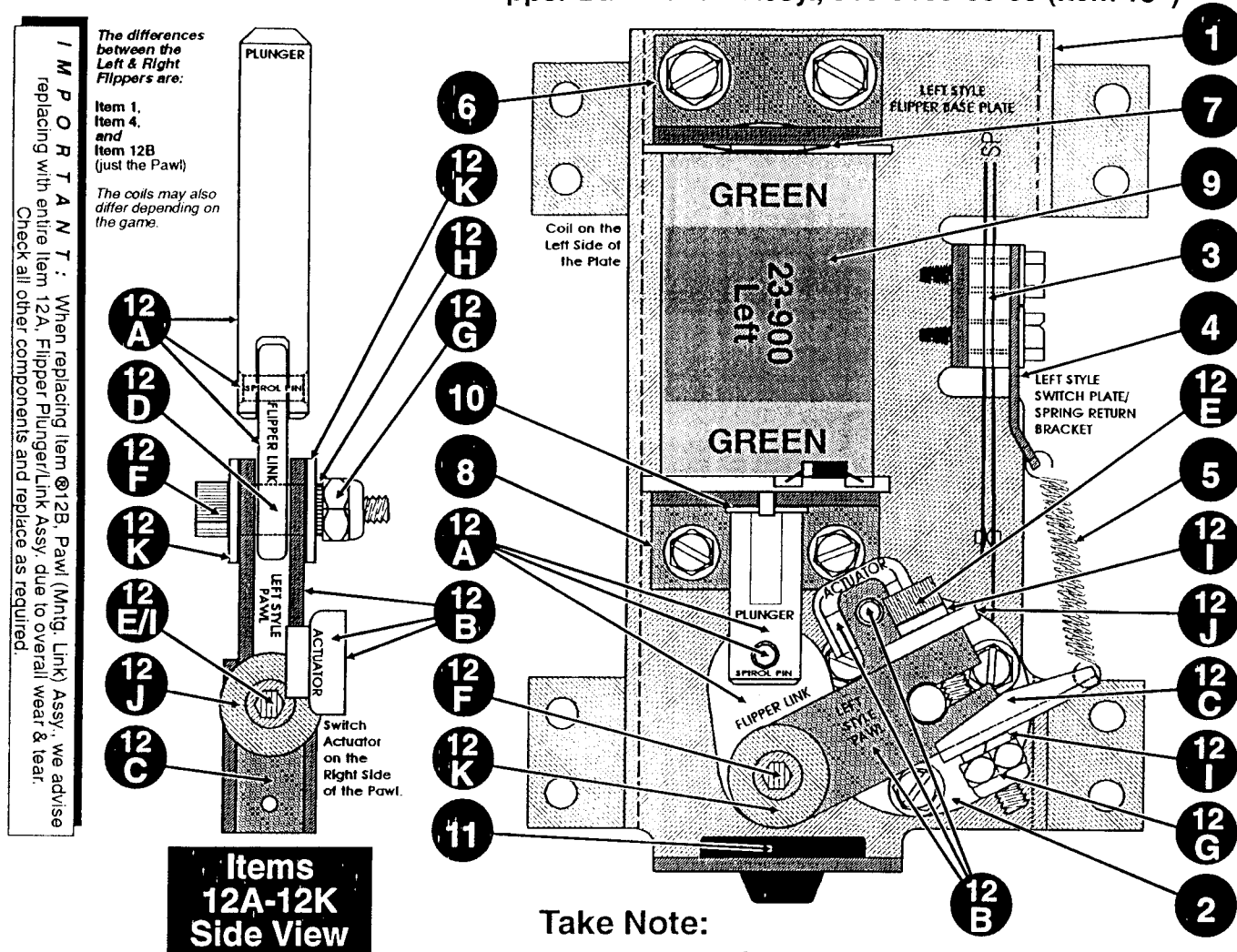


Take Note:

* 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	Ball Trough Outhole Mounting Bracket	1	515-6580-01	9	Compression Spring	1	266-5020-00
2	Micro-Switch (Roller Actuator, Life-Force)	3	180-5119-02	10	Rubber Bumper (Grommet)	1	545-5105-00
Item 2 is secured to Item 1 by: #2-56 X 1/2" HWH (Ser) UNS #4HD TR3 BO (Qty. 2/per) (237-5937-02)				11A	Dual OPTO Transmitter (TRANS) Bd.	1	520-5173-00
3	Switch Diode, 1N4001	3	112-5001-00	11B	Dual OPTO Receiver (REC) Board	1	520-5174-00
4	Coil Mounting Bracket	1	535-7330-01	Items 11A & 11B are secured to Item 1 by: OPTO PCB Tube Spacer (Brass) (Qty. 3/per) (530-5308-02), OPTO PCB Rubber Grommet (Qty. 3/per) (545-5518-00) and #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 3/per) (237-5976-04)			
Item 4 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Serr) Zinc (Qty. 4) (237-5975-00)				4-Ball Trough Assy., 500-6418-24 is secured below the playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 6) (234-5101-00)			
5	Coil Retaining Bracket	1	535-5203-03	ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.			
Item 5 is secured to Item 4 by: #8-32 X 1/4" HWH MS (Serr) Zinc (Qty. 2) (237-5964-01)				Nº	Associated Part Name	QTY.	SPI Part Nº
6	Coil, 26-1200	1	090-5044-00T	12	Ball Trough Enter / Exit Scoop	1	535-7329-01
ORDERING ABOVE (ITEM 6) COIL PART NAME WILL INCLUDE				Item 12 secured to the playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 4) (234-5101-00).			
7	Coil Sleeve	1	545-5076-00	13	Heat Shrink Tubing 1/8" ø PUI-24	3"	605-5006-00
8	Plunger Assembly	1	515-5941-01	n/a*	Steel Balls (1-1/16" ø)	4	260-5000-00

Flipper (Left) Assembly, 500-5944-13 (Qty. 2) (Items 1-12) and Associated Part: White Flipper Bat & Shaft Assy., 515-5133-08-05 (Item 13*)



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

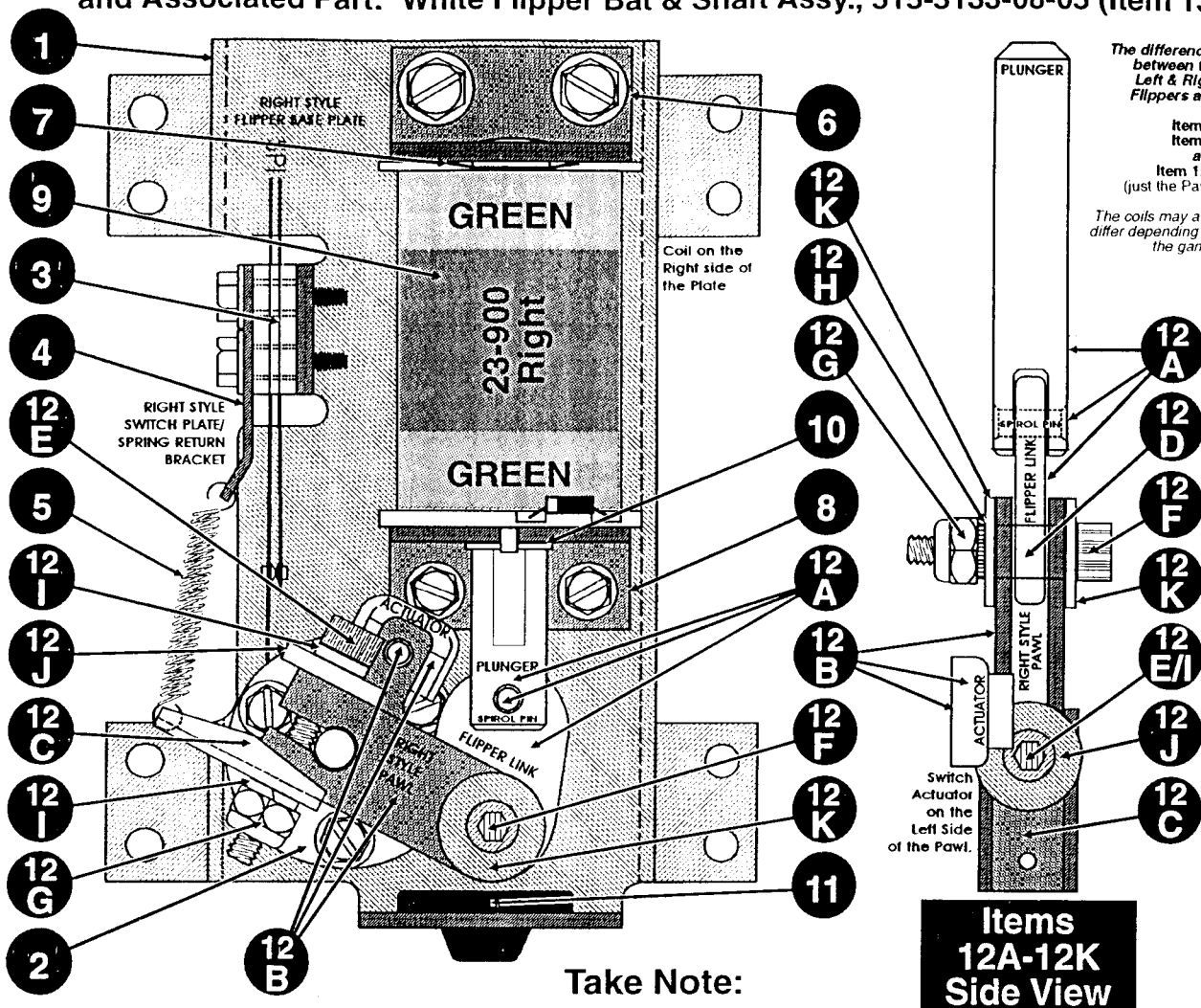
@ "R" indicates item has a riveted-on part, if removing/adding rivets is not an option, order the entire @ Sub-Assembly.

Nº	Individual Part Name	QTY.	SPI Part Nº	Nº	Individual Part Name	QTY.	SPI Part Nº
1	Flipper Base Plate Kit (Left)	1	515-6617-01	12	Plunger, Link & Pawl (Left) Sub-Assy.	1	515-6518-01
ORDERING ABOVE (ITEM 1) KIT (LEFT) PART Nº WILL INCLUDE:				ORDERING ABOVE (ITEM 12) SUB-ASSY. PART Nº WILL INCLUDE:			
Note: Flipper Base Plate (Left) comes threaded with all securing hardware (Thread Forming Screws) as listed under each of the Items which will get secured to it (Items 2, 3, 6 & 8).				12A	Flipper Plunger/Link Sub-Assy.	1	515-6304-01
2	Flipper Bat Bushing	1	545-5594-00	includes:	Plunger, Flipper Link	1	545-5611-00
Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)				includes:	Spirol Pin ø 5/32" X 3/4" Lg.	1	251-5015-02
3	Power (End of Stroke) Switch	1	180-5149-00	includes:	Flipper Plunger with "Flat"	1	530-5349-01
Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-04)				@12B	Pawl (Mntg. Link) (Left) Sub-Assy.	1	515-6305-01
4	Switch Plate/Spring Return Lt. Brkt.	1	535-7354-01	includes:	Pawl (Mounting Link) (Left) Plain	1	535-7271-01
5	Flipper Return Spring	1	265-5035-00	includes:	Switch Actuator	1	545-5612-00
6	Coil Stop Bracket Sub-Assembly	1	515-6308-01	includes:	Rivet 1/8" ø X 1/4" Lg.	1	249-5003-00
Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Ser.) Zinc (Qty. 2) (237-5985-00) and #10 Split Lock Washer (Qty. 2) (244-5003-00)				12C	Return Bracket	1	535-7353-00
7	Spring Washer	1	269-5002-00	12D	Flipper Link Bushing (Metal, Ext.) (385" Lg. X .192" ID X .312" OD)	1	530-5139-01
8	Coil Support Bracket	1	535-7356-00	12E	#10-32 X 1-1/4" Lg. Socket Head	1	237-5950-01
Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)				12F	#10-32 X 7/8" Lg. Socket Head	1	237-5966-00
9	Coil, 23-900 (GRN) (Left)	1	090-5020-30T	12G	#10-32 Nylon Stop Nut	2	240-5203-00
ORDERING ABOVE (ITEM 9) COIL PART Nº WILL INCLUDE:				12H	#10 Star Washer	1	246-5002-00
10	Coil Sleeve	1	545-5388-00	12I	#10 Split Lock Washer	2	244-5003-00
11	Deflector Pad (Bumper)	1	545-5428-00	12J	Washer 203" ID X .63" OD X .105" Thk w/cut	1	242-5039-01
				12K	Washer 203" ID X .63" OD X .062" Thk	2	242-5038-00
				Flipper (Left) Assembly, 500-5944-13 is secured below the playfield by: #10 X 1/2" HWH MS (Ser.) Zinc ST (Qty. 8) (237-5949-00)			
				ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.			
Nº	Associated Part Name	QTY.	SPI Part Nº	Nº	Associated Part Name	QTY.	SPI Part Nº
13*	White Flipper Bat (Sega Saturn® Logo) & Shaft (Non-Knurled End) Assembly	1	515-5133-08-05	n/a*	Large Flipper BLACK Rubber Ring	1	545-5277-00

Kelly's Parkends

Section 4, Chapter 2
...Major Assemblies & Ramps

Flipper (Right) Assembly, 500-5944-03 (Items 1-12) and Associated Part: White Flipper Bat & Shaft Assy., 515-5133-08-05 (Item 13*)



The differences between the Left & Right Flippers are:

Item 1,
Item 4,
and
Item 12B
(just the Pawl)

The coils may also differ depending on the game.

IMPORTANT: When replacing item 12B, Pawl (Mntg. Link) Assy., we advise replacing with entire item 12A, Flipper Plunger/Link Assy. due to overall wear & tear. Check all other components and replace as required.

Take Note:

Items
12A-12K
Side View

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

* 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	Flipper Base Plate Kit (Right)	1	515-6617-00	12	Plunger, Link & Pawl (Rt.) Sub-Assy.	1	515-6518-00
ORDERING ABOVE (ITEM 1) KIT (RIGHT) PART Nº WILL INCLUDE:				ORDERING ABOVE (ITEM 12) SUB-ASSY. PART Nº WILL INCLUDE:			
Note: Flipper Base Plate (Right) comes threaded with all securing hardware (Thread Forming Screws) as listed under each of the Items which will get secured to it (Items 2, 3, 6 & 8).				12A	Flipper Plunger/Link Sub-Assy.	1	515-6304-01
				Includes:	Plunger "Flipper" Link	1	545-5611-00
				Includes:	Spirol Pin 5/32" X 3/4" Lg.	1	251-5015-02
				Includes:	Flipper Plunger with "Flat"	1	530-5349-01
2	Flipper Bat Bushing	1	545-5594-00	12B	Pawl (Mntg. Link) (Rt.) Sub-Assy.	1	515-6305-00
Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)				Includes:	Pawl (Mounting Link) (Rt.) Plain	1	535-7271-00
3	Power (End of Stroke) Switch	1	180-5149-00	Includes:	Switch Actuator	1	545-5612-00
Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-04)				Includes:	Rivet, 1/8" 6 X 1/4" Lg.	1	249-5003-00
4	Switch Plate/Spring Return Rt. Brkt.	1	535-7354-00	12C	Return Bracket	1	535-7353-00
5	Flipper Return Spring	1	265-5035-00	12D	Flipper Link Bushing (Metal, Ext.) (.385" Lg. X .192" ID X .312" OD)	1	530-5139-01
6	Coil Stop Bracket Sub-Assembly	1	515-6308-01	12E	#10-32 X 1-1/4" Lg. Socket Head	1	237-5950-01
Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) and #10 Split Lock Washer (Qty. 2) (244-5003-00)				12F	#10-32 X 7/8" Lg. Socket Head	1	237-5966-00
7	Spring Washer	1	269-5002-00	12G	#10-32 Nylon Stop Nut	2	240-5203-00
8	Coil Support Bracket	1	535-7356-00	12H	#10 Star Washer	1	246-5002-00
Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)				12I	#10 Split Lock Washer	2	244-5003-00
9	Coil, 23-900 (GRN) (Right)	1	090-5020-30T	12J	Washer .203" ID X .63" OD X .105" Thk W/out	1	242-5039-01
ORDERING ABOVE (ITEM 9) COIL PART Nº WILL INCLUDE:				12K	Washer .203" ID X .63" OD X .062" Thk	2	242-5038-00
10	Coil Sleeve	1	545-5388-00	Flipper (Right) Assembly, 500-5944-03 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00)			
11	Deflector Pad (Bumper)	1	545-5428-00	ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.			
				Nº	Associated Part Name	QTY.	SPI Part Nº
				13*	White Flipper Bat (Sega Saturn® Logo) & Shaft (Non-Knurled End) Assembly	1	515-5133-08-05
				n/a*	Large Flipper BLACK Rubber Ring	1	545-5277-00

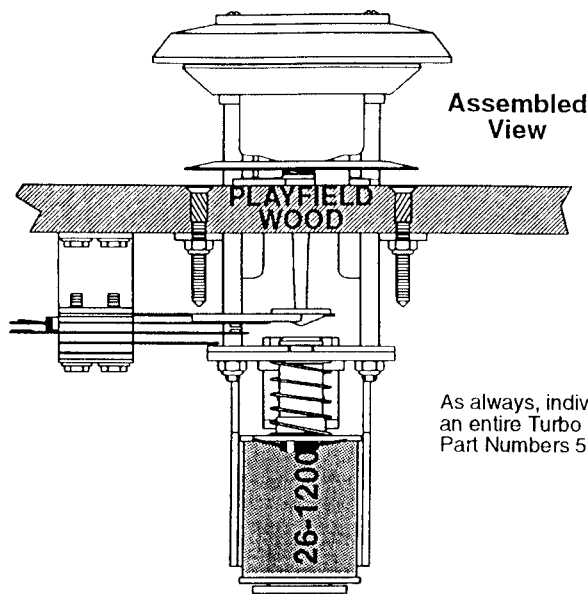
Section 4, Chapter 2
...Major Assemblies & Ramps

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TOURNAMENT EDITION

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Section 4 | Drawings

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



Assembled View

Take Note:

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

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

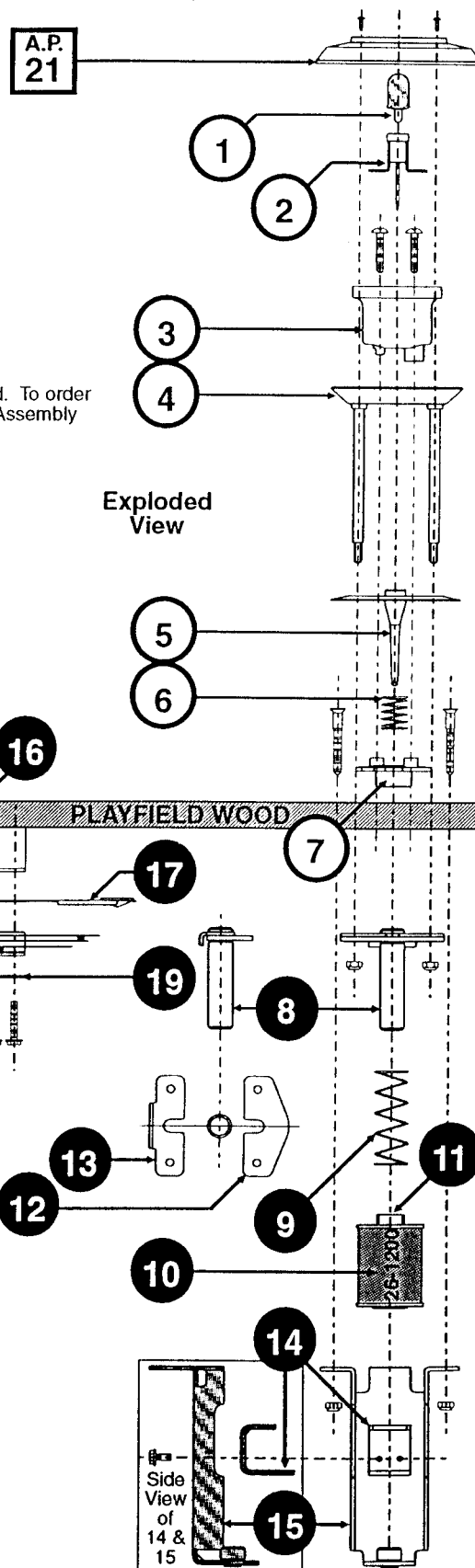
Turbo Bumper Bottom Assy., 515-6459-04 (Items 8-15)			
8	Plunger	1	530-5348-00
9	Coil Compression Spring	1	266-5047-00
10	Coil, 26-1200	1	090-5044-00T
ORDERING ABOVE (ITEM 10) COIL PART Nº WILL INCLUDE:			
Diode, 1N4004 (positioned at top)	1	112-5003-00	
11	Coil Sleeve	1	545-5031-00
12	Fiber Yoke	1	545-5609-00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

Turbo Bumper Switch Assy., 515-6459-03 (Items 16-20)			
16	Switch Bracket	1	535-7342-00
Item 16 is secured by: #8 X 1/2" SHWH AB (Zinc) (Qty. 2) (234-5101-00)			
17	Spoon Switch Actuator	1	545-5610-01
18	Turbo Bumper Stack (Blade) Switch	1	180-5015-03
19	Switch Body Protect Plate	1	535-7344-00
Items 18 & 19 are secured by: #6-32 X 3/4" HWH Swage (Serr.) Zc. (Qty. 2) (237-5976-05)			
20	Switch Diode, 1N4001	1	112-5001-00

The Top & Bottom Assemblies are secured together by hardware included in assemblies.

ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

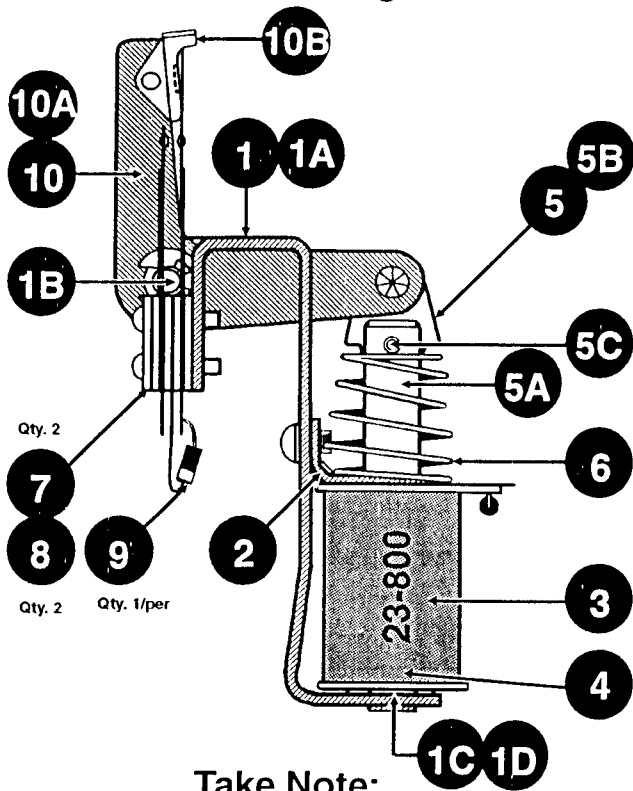
Nº	Associated Part Name	QTY.	SPI Part Nº
21	Yellow Pop Cap (Plastic)	3	550-5057-06
Item 21 is secured to Item 4 by: #4 X 3/4" PRH (Zinc) (Qty. 2/per) (237-5873-00)			



Exploded View

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Packards*

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



Take Note:

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

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Slingshot Bracket Assembly	1	515-5339-01
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:			
1A	Slingshot Bracket	1	535-5919-01
1B	Hinge Stud	1	530-5034-01
1C	Armature Stop	1	530-5017-01
1D	Shading Ring	1	530-5307-00
2	Coil Retaining Bracket	1	535-5203-03

Item 2 is secured to Item 1A by: #8-32 X 1/4" PPH MS (Sems) (Qty. 2) (232-5300-00)

3	Coil, 23-800	1	090-5001-00T
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5031-00
5	Plunger & Link Assembly	1	515-5338-00
ORDERING ABOVE (ITEM 5) SUB-ASSY. PART Nº WILL INCLUDE:			
5A	Plunger 2" Lg.	1	530-5025-01
5B	Plunger Link	1	545-5293-00
5C	Roll Pin 1/8" ø x 5/8" Lg.	1	251-5008-00

Item 5B is secured to Item 10A by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)

6	Compression Spring	1	266-5020-00
7	Slingshot Stack (Blade) Switch	2	180-5054-00
8	Switch Body Protect Plate	2	535-5045-00

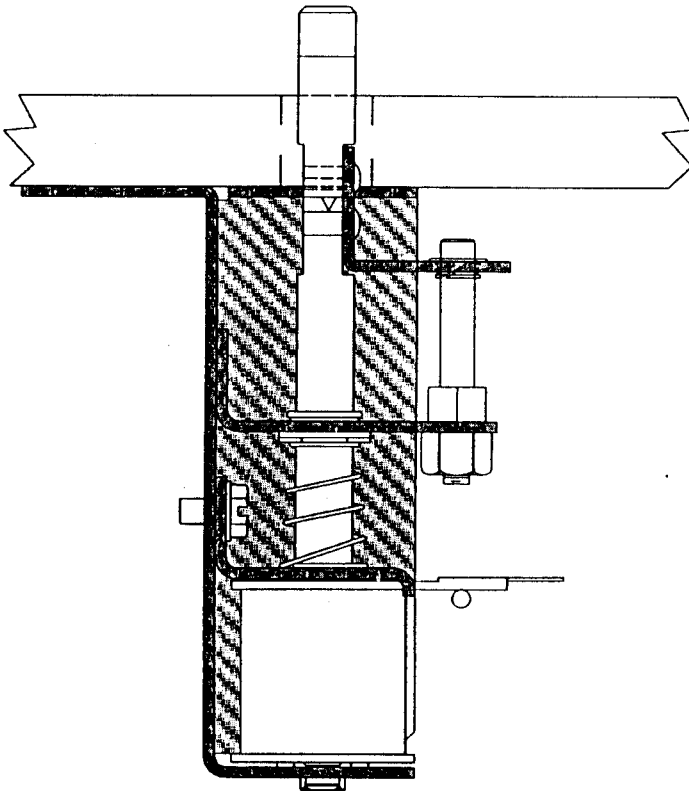
Items 7 & 8 are secured to Item 1A by: #6-32 X 5/8" HWH Swage (Qty. 4) (237-5976-04)

9	Switch Diode, 1N4001	2	112-5001-00
10®	Riveted Arm & Tip Assembly	1	515-5340-01
ORDERING ABOVE ® RIVETED ASSY. PART Nº WILL INCLUDE:			
10A	Arm	1	515-5341-01
10B	Kicker Tip	1	545-5216-01
10C	Rivet, 1/8" ø x 1/4" Lg.	1	249-5003-00

Item 10A is secured to Item 1A by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)

Slingshot Assemblies (Qty. 2), 500-5849-01 are secured below the playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 3/per) (234-5101-00)

Ball Stop (Lock Ball Up-Post) Assembly, 500-6356-00-64 (Items 1-8)



Nº	Individual Part Name	QTY.	SPI Part Nº
1	Mounting Weldment Bracket	1	515-6834-01
2	Coil Retaining Bracket (Mini)	1	535-7321-01
Item 2 secured to Item 1 by: #6-32 X 1/4" HWH Swage (Ser.) Zinc (Qty. 2) (237-5976-01)			
3	Coil, 28-1050	1	090-5046-00
ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE:			
—	Diode, 1N4004	1	112-5003-00
4	Coil Sleeve, Mini	1	545-5442-00
5	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
6	Plunger Assembly	1	515-6925-00

Item 6 secured to Item 1 by: Nyliner (5L1-FF Thomson) (Qty. 1) (545-5485-00) and Retaining Ring, 5/16" ø (Zinc) (Qty. 1) (270-5003-00)

7	Mini-Compression (Relay) Spring	1	266-5043-00
8	Shoulder Pin	1	530-5808-00

Item 8 secured to Item 1 by: #6-32 Nylon Stop Nut (Qty. 1) (240-5005-00)

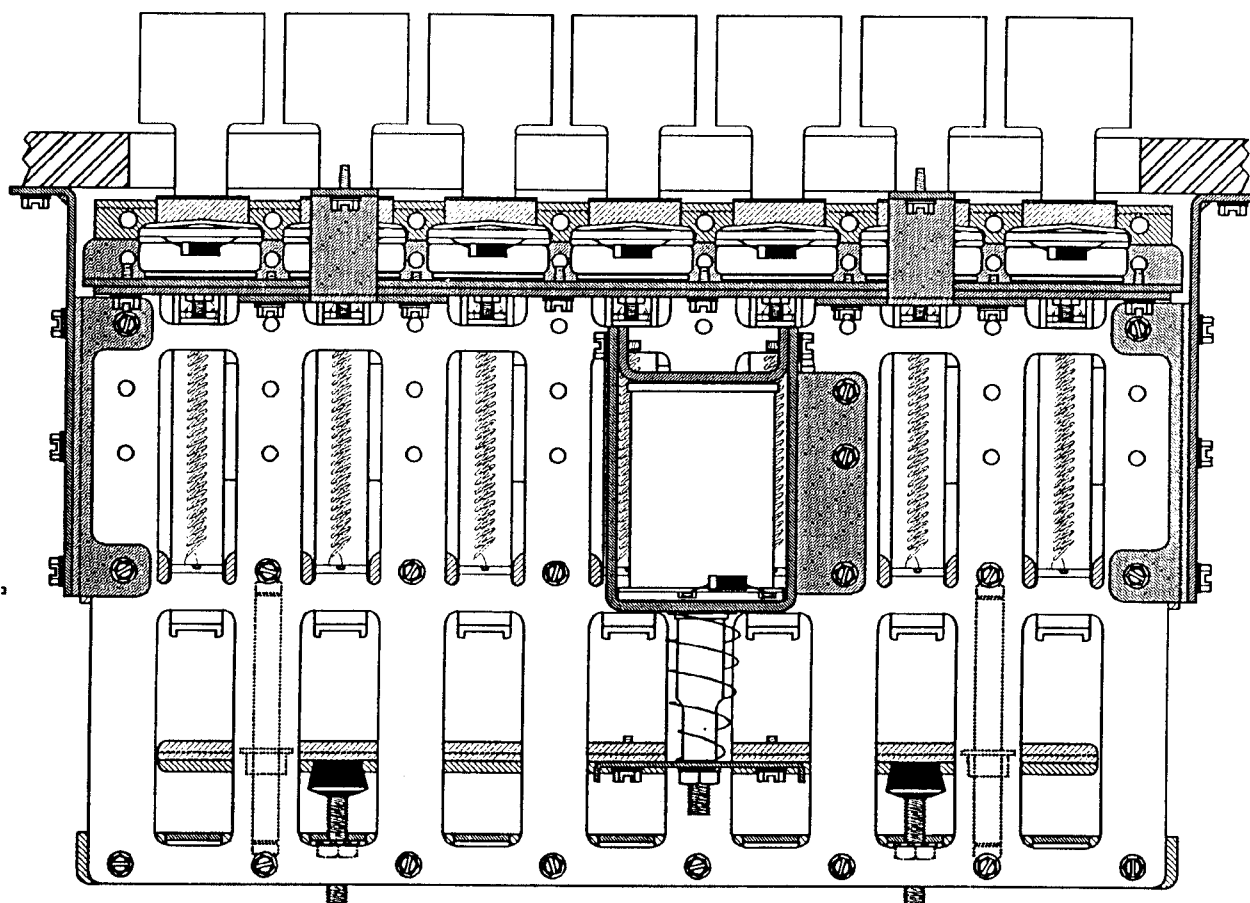
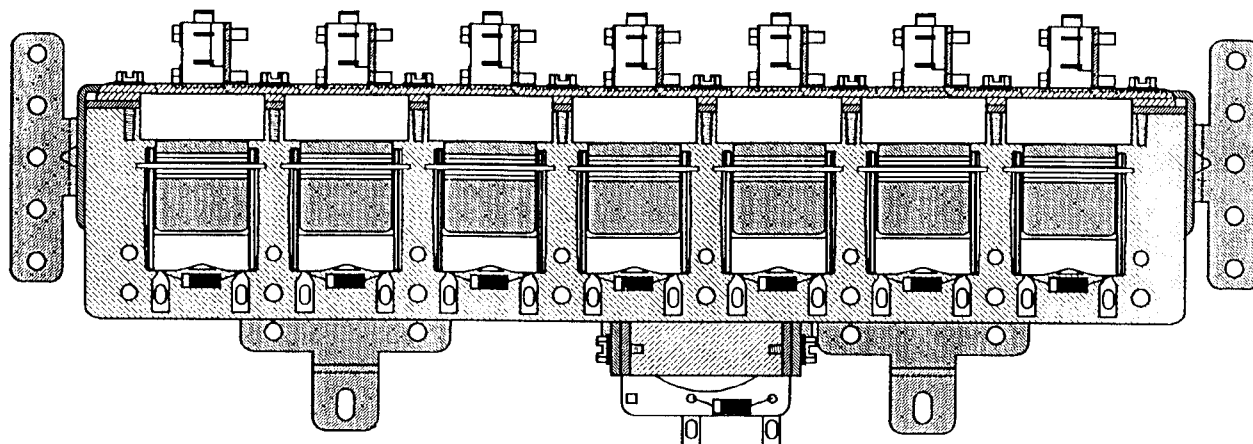
Ball Stop (Lock Ball Up-Post) Assy., 500-6356-00-64, is secured under the playfield by: #8 X 1/2" SHWH AB (Zinc) (Qty. 3) (234-5101-00)

Section 4 | Drawings

7-Bank Drop Target Assembly, 500-6345-07-64 (Items 1-22)

The Parts Table for this assembly is on the next page.

**Assembled
Top View**

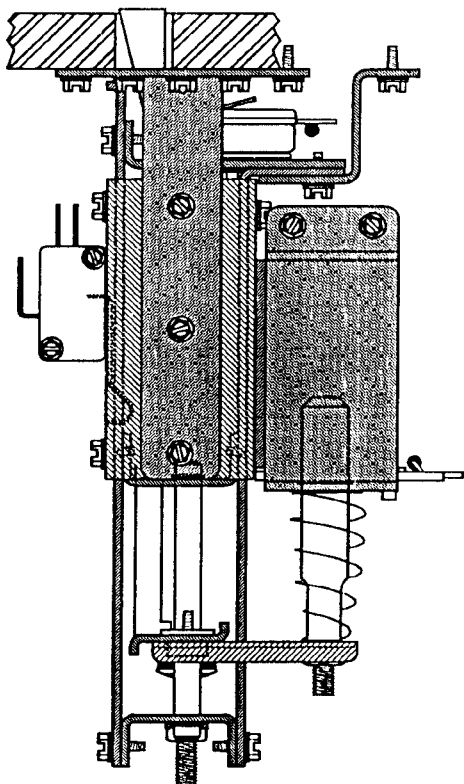


**Assembled
Front View**

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7-Bank Drop Target Assembly, 500-6345-07-64 (Items 1-22) Continued
 The Parts Table for the views on this and the previous page is below.

**Assembled
Side View**



Nº	Individual Part Name	QTY.	SPI Part Nº
1	Guide Bracket Assy. (7-Bank)	1	515-6904-07
2	Mounting Plate Housing Side	2	535-8415-00
2A	Mntg. Plate Housing Right Side Mod.	0	Not Required
2B	Mntg. Plate Housing Left Side Mod.	0	Not Required

Items 2A & 2B are modified for the 1-Bank Only.

3	Mounting Bracket Side	2	535-8416-00
4	Mounting Bracket Front	2	535-8419-00
5	Guide Bracket (7-Bank)	1	535-8408-07
6	Coil Housing Stop Bracket Assembly	1	515-6905-00
7	Coil Housing Bracket	1	535-8411-00
8	Coil, 23-1100	1	090-5030-00T

ORDERING ABOVE (ITEM 8) COIL PART Nº WILL INCLUDE:

—	Diode, 1N4004 (positioned at top)	1	112-5003-00
9	Coil Sleeve	1	545-5709-00
10	Plunger Lift Bracket	1	535-8413-00
11	Drive Coil Plunger	2	530-5522-00
12	Reset/Stop Bracket Assy. (7-Bank)	1	515-6903-07
13	Trip Coil Mounting Brkt. (7-Bank)	1	535-8410-07
14	Coil, 33-1590 (Miniature) Assembly	7	515-6916-00

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

—	Diode, 1N4004 (positioned at top) Coil riveted onto Weldment Bracket	1	112-5003-00
15	Drop Target White (Rollover)	7	545-5533-01
16	Drop Target Guide Shaft	2	530-5521-00

Item 16 is secured to Item X by: Retaining Ring, 1/4" ø (Qty. 2) (270-5002-00)

17	Switch Support Bracket (7-Bank)	1	535-8407-07
18	Switch Bracket	7	535-8414-00
19	Switch (D/T)	7	180-5158-00
20	Spring Support Bracket (7-Bank)	1	535-8420-07
21	Spring (D/T Reset)	7	265-5003-00
22	#10-32 Adj. Spindle Stop w/Rubber Tip	2	280-5014-00

Item 22 is secured by: #10-32 Keps Nut (Qty. 1/per) (240-5208-00)

7-Bank Drop Target Assembly, 500-6345-07-64 is secured under the playfield by:
 #8-32 X 1/2" SHWH AB (Zinc) (Qty. 9) (234-5101-00)

Items X-X are secured to Item X by: #8-32 X 3/8" HWH MS Type C (Qty. 77)
 (237-5903-00)

Items X-X are secured to Item X by: #10-32 Nylon Stop Nut (Qty. 1) (240-5203-00)

Items X-X are secured to Item X by: #4-40 X 5/8" HWH MS (Serr) Zinc (Qty. 14)
 (237-5945-00)

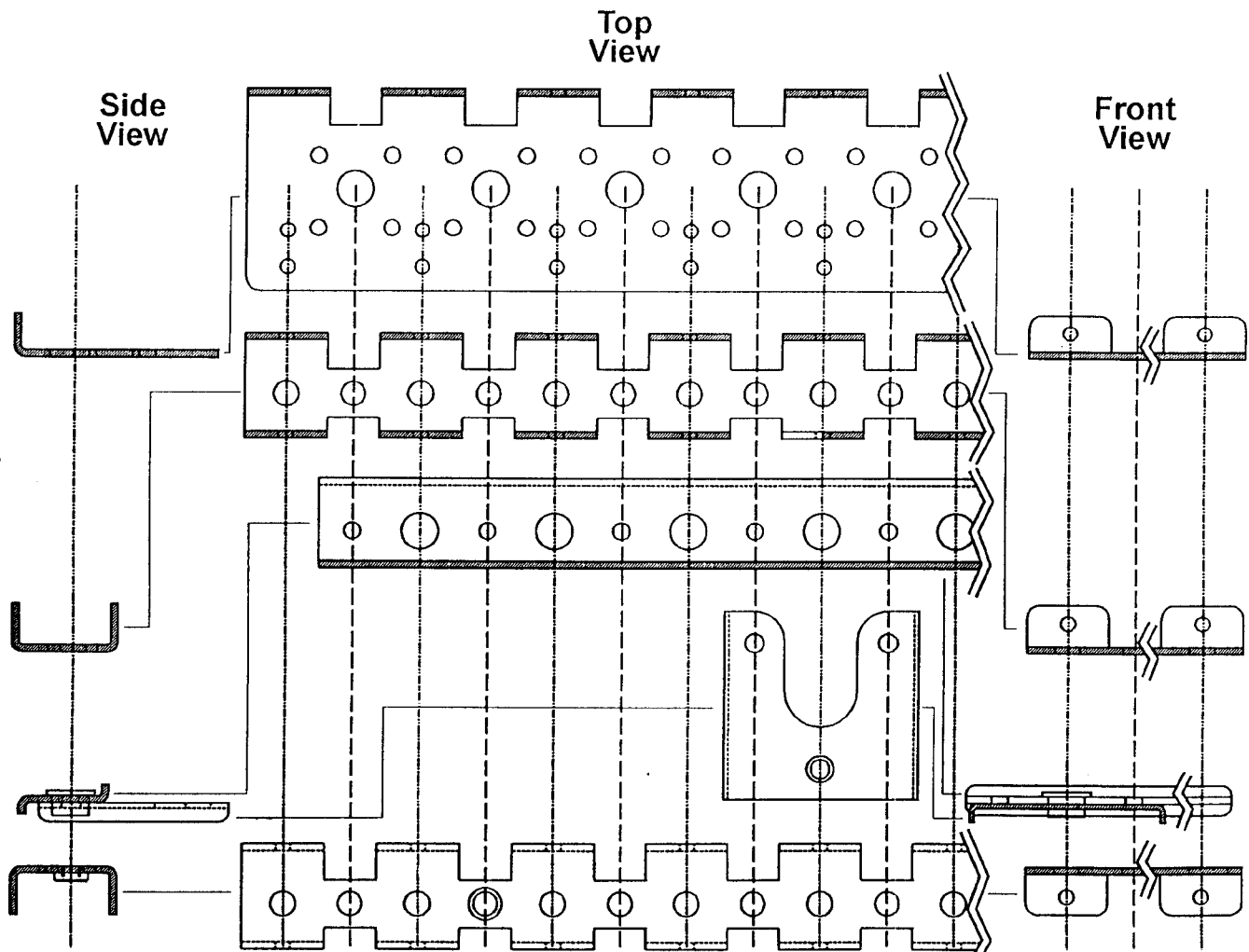
Items X-X are secured to Item X by: #8-32 Keps Nut (Qty. 13) (240-5104-00)

Items X-X are secured to Item X by: #10-32 X 3/8" SHWH (Serr) Swage (Qty. 2)
 (237-5985-00)

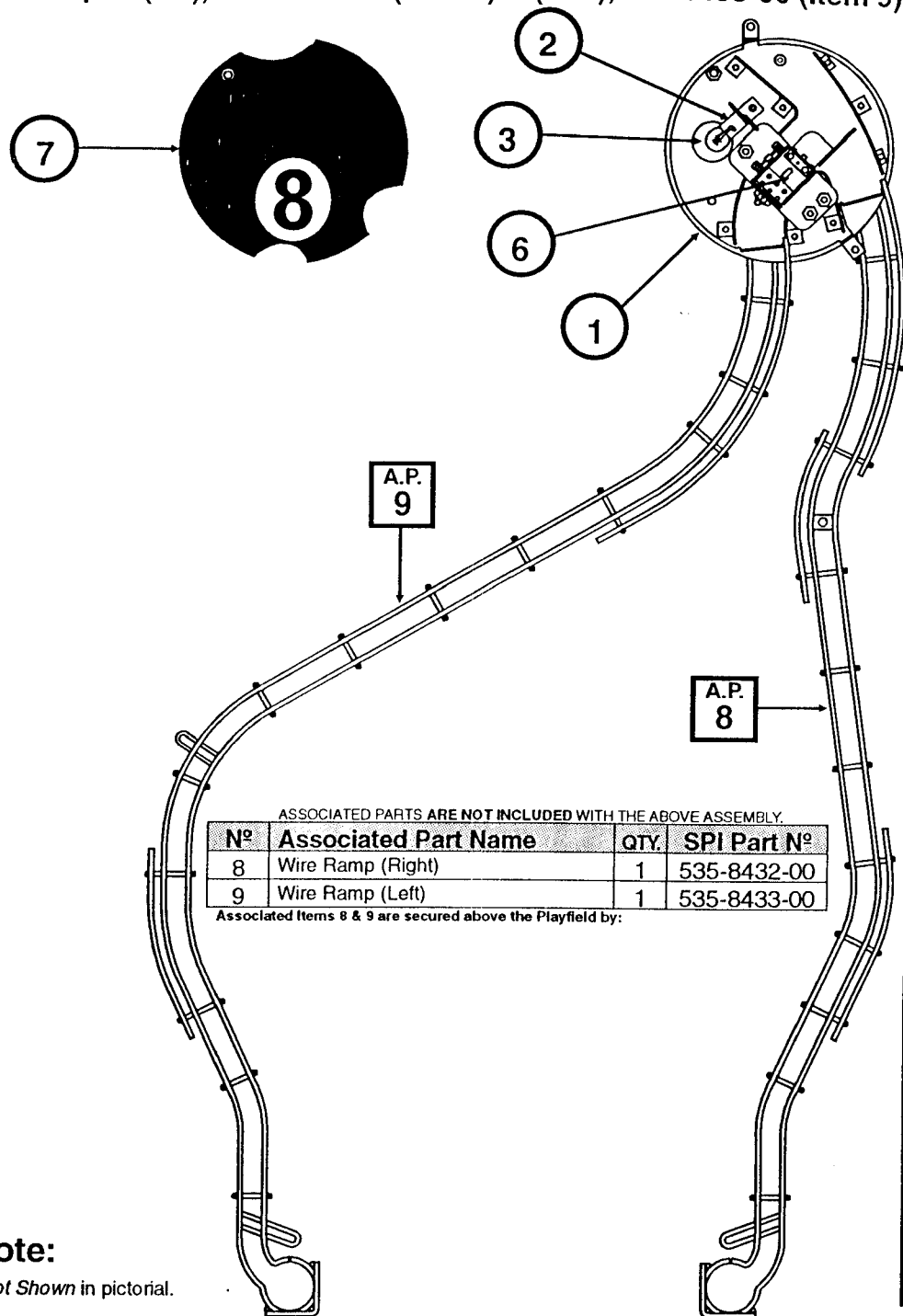
Items X-X are secured to Item X by: #10 Washer 7/32" ID X 1/2" OD X 1/16" (Qty. 1)
 (242-5003-00)

Section 4 | Drawings

7-Bank Drop Target Assembly, 500-6345-07-64 (Items 1-22) Continued
The Parts Table for the views on this page is on the previous page.



8-Ball Unit Assembly, 500-6375-00-64 (Items 1-7)
 and Assoc. Parts: Wire Ramps~ (Rt.), 535-8432-00 (Item 8) & (Left), 535-8433-00 (Item 9)



ASSOCIATED PARTS ARE NOT INCLUDED WITH THE ABOVE ASSEMBLY.

Nº	Associated Part Name	QTY.	SPI Part Nº
8	Wire Ramp (Right)	1	535-8432-00
9	Wire Ramp (Left)	1	535-8433-00

Associated Items 8 & 9 are secured above the Playfield by:

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	Platform Assembly (8-Ball Unit)	1	515-6927-00	6	Diverter Assembly	1	515-6930-00-64
ORDERING ABOVE (ITEM 1) SUB-ASSY. PART Nº WILL INCLUDE:				ORDERING ABOVE (ITEM 6) SUB-ASSY. PART Nº WILL INCLUDE:			
1A	Platform Wall #1	1	535-8452-00	6A	Diverter Mounting Plate	1	535-8457-00
1B	Platform Wall #2	1	535-8453-00	6B	Coil Assembly	1	515-6929-00
1C	Platform Wall #3	1	535-8454-00	6B Includes:			
1D	Platform Base	1	535-8455-00	6B1	Coil Arm/Diverter Assy.	1	515-6928-00
2	Socket, Laydown Standard	1	077-5100-00	6B2	Frame (Ramp Lock Up)	1	535-6198-00
3	#89 Bulb	1	165-5000-89	6B3	Coil, 32-1800	1	090-5031-02
4*	1-1/4" X 1/4" Hex Spacer #6-32 Tap.	2	254-5008-11	6B4	Spring (Ramp Lock Up)	1	265-5024-00
5*	3-1/8" X 1/4" Hex Spacer #6-32 Tap.	1	254-5008-19	Item 6 is secured by: #8-32 X 3/8" PPH MS (Sems) Zinc (Qty. 5) (232-5301-00)			
Items 4 & 5 use: #6-32 X 3/8" PPH MS (Sems) Zinc (Qty. 5) (232-5201-00)				7	8-Ball Cover	1	545-5897-00

Item 7 is secured by: #6-32 X 1/2" PPH MS (Sems) Zinc (Qty. 5) (232-5301-00)

8-Ball Unit Assembly, 500-6375-00-64 is secured under the playfield by:
 #8-32 X 1/2" SHWH AB (Zinc) (Qty. 6) (234-5101-00)

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

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Up/Down Post Coil Mounting Bracket	1	515-6840-00
2	Adjustment Spindle Stop Bracket	1	535-8303-00
3	Coil Retaining Bracket	2	535-7356-00

Items 2 & 3 are secured by: #8-32 X 3/8" Swage (Serr) Zinc (Qty. 2/per) (237-5975-00)

4	Coil, 23-1100 (ORG)	1	090-5030-00T
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ORDERING ABOVE (ITEM 4) COIL PART Nº WILL INCLUDE

—	Diode, 1N4004 (positioned at top)	1	112-5003-00
5	Coil Sleeve (with extension)	1	545-5847-00
6	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00
7	Plunger & Shaft Assembly	1	515-6844-00

ORDERING ABOVE (ITEM 7) SUB-ASSY PART Nº WILL INCLUDE

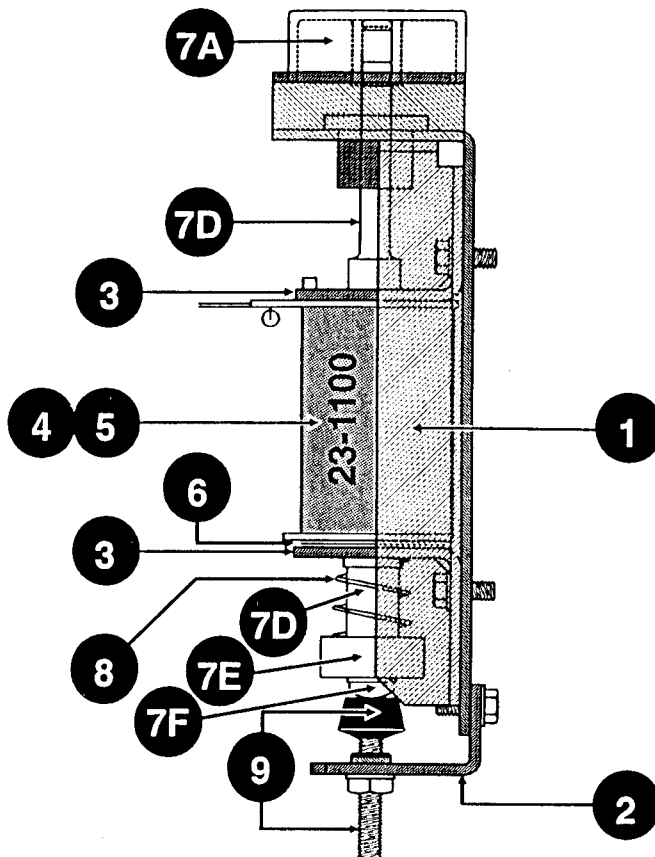
7A	Ball Bumper Plastic (Top) Red	1	550-5029-02
7B*	Roll Pin, 3/32" ø X 1/2" Long	1	251-5002-00
7C*	Retaining Ring, 1/4" ø Shaft	1	270-5002-00
7D	Plunger & Shaft Sub-Assembly	1	515-6841-00
7E	Plunger Head	1	530-5511-00
7F	#10-32 X 3/8" PPH MS (Sems) Zinc	1	232-5401-00
8	Compression (Relay) Spring	1	266-5022-01
9	#10-32 Adj. Spindle Stop w/Rubber Tip	1	280-5014-00

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

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

Take Note:

Item 7D, part of Item 7, Plunger & Shaft Sub-Assembly, is 1 piece and cannot be ordered separated.



Lt. & Rt. Outlane Ball Deflector Assemblies, 500-5788-02 (Qty. 2) (Items 1-8)

Nº	Individual Part Name	QTY.	SPI Part Nº
1	Ball Deflector Coil Mounting Bracket	1	535-6857-02
2	Coil Retaining Bracket	1	535-5203-03

Item 2 is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)

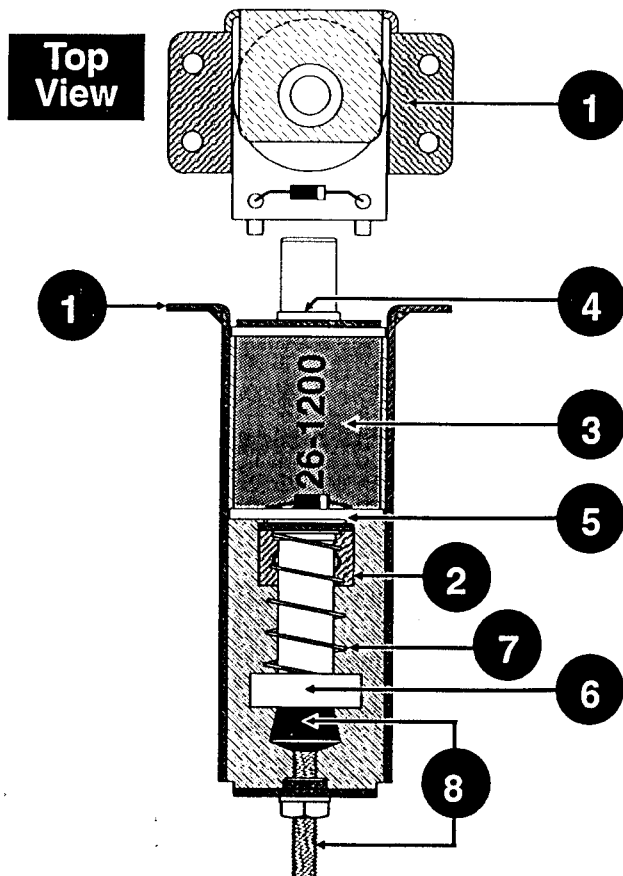
3	Coil, 26-1200	1	090-5044-00T
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ORDERING ABOVE (ITEM 3) COIL PART Nº WILL INCLUDE

—	Diode, 1N4004 (positioned at top)	1	112-5003-00
4	Coil Sleeve	1	545-5076-00
5	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
6	Solid Plunger Assembly	1	515-6858-00
7	Compression (Relay) Spring	1	266-5022-01
8	#10-32 Adj. Spindle Stop w/Rubber Tip	1	280-5014-00

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

Left & Right Ball Deflector Assemblies, 500-5788-03 is secured under the playfield by:
#8-32 X 1/2" SHWH AB (Zinc) (Qty. 4/per) (234-5101-00)



7 6

Kelly
Packards

Section 4, Chapter 2
...Major Assemblies & Ramps

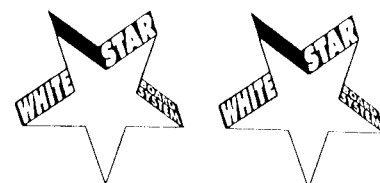
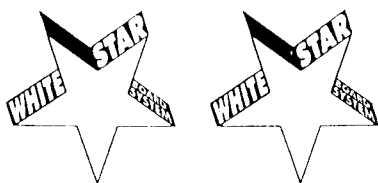


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Use the below **Coils Detailed Chart Table** in conjunction with Sec. 5, Chp. 1, Backbox I/O Power Driver Board Detailed Wiring Diagram (I/O Board Connectors J6, J7, J8 & J9) and Backbox Board Layout Wiring Diagram:

COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	23-800 090-5001-00T
#3	FLASH LOWER LEFT X4	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-03
#4	8-BALL DIVERter	Q4	I/O Pwr. Drvr.	BRN-YEL	J8-P5	BRN	J7-P1	20v DC	32-1800 090-5031-02
#5	LOCK BALL UP-POST	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	28-1050 090-5046-00
#6	SINGLE DROP TARGET (RESET)	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#7	7-BANK DROP TARGET (RESET)	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
#8	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	DL4SS 515-6076-01

High Current Coils Group 2		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn
#9	LEFT TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
#10	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	BRN	J7-P1	20v DC	23-800 090-5001-00T
#13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	BRN	J7-P1	20v DC	23-800 090-5001-00T
#14	UPPER FLIPPER (50v RED/YEL)	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-900 090-5020-30T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-900 090-5020-30T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-900 090-5020-30T

Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn Flash/Meter #
#17	FLASH UPPER LEFT X2	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-05
#18	FLASH UPPER RIGHT X3	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	ORG	J6-P10	20v DC	165-5000-89 † 165-5004-05 †
#19	FLASH MID RIGHT X4	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-06
#20	FLASH LOWER RIGHT X3	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	ORG	J6-P10	20v DC	#906 Bulb † 165-5004-02
#21	LT OUTLANE (SKILL)	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	26-1200 090-5044-00T
#22	RT OUTLANE (SKILL)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	26-1200 090-5044-00T
#23	UP/DOWN POST (SKILL)	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	23-1100 090-5030-00T
#24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	Meter 5v 081-5000-00

Diode On Terminal Strip (if noted)

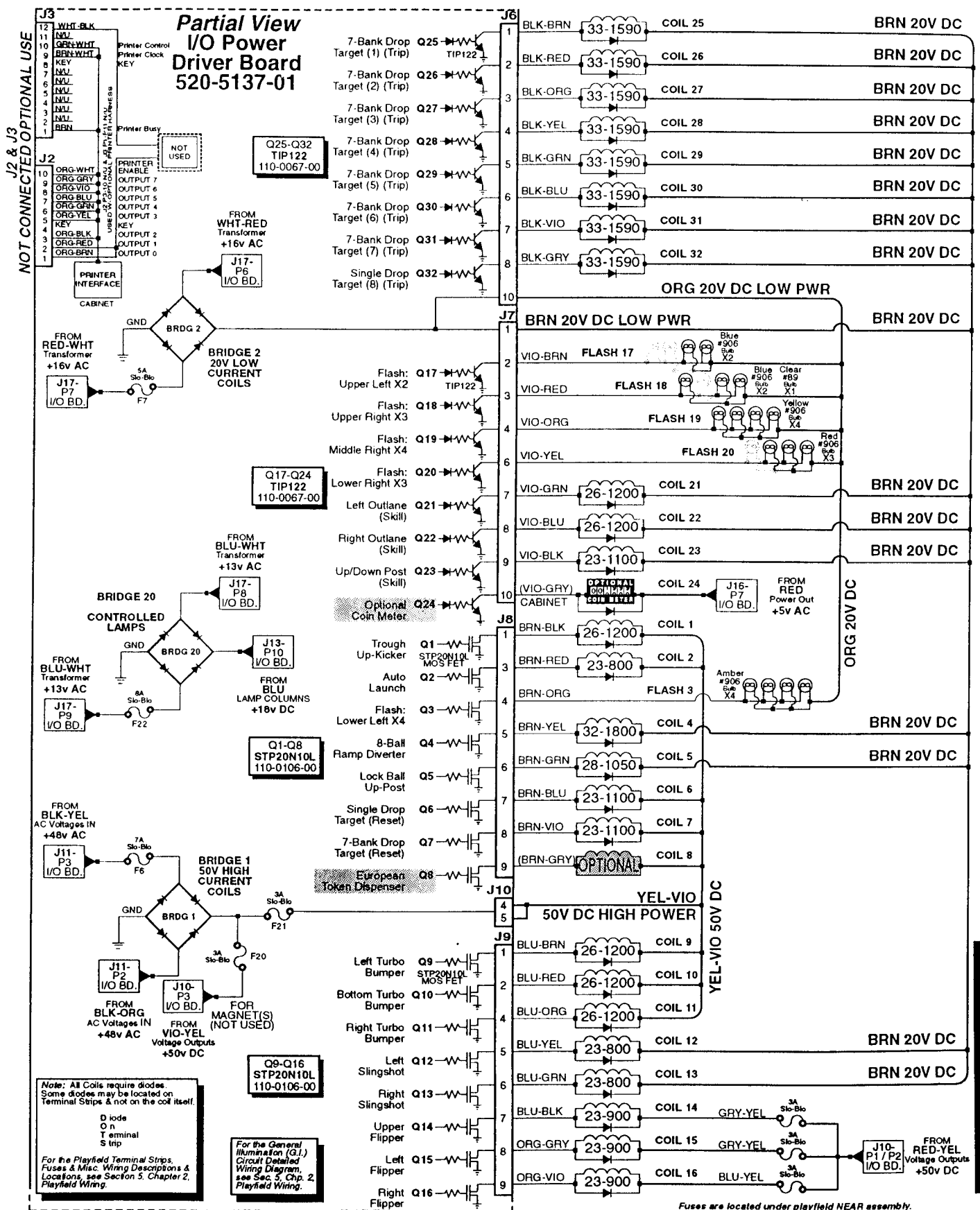
† Flasher Note: Flash Q18 = 1X #89 Bulb, 2X Blue (-05) #906 Bulb (Yellow (-06), Red (-02), Amber (-03))

Low Current Coils Group 2		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn
#25	7-BANK DROP TRGT (1) (TRIP)	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	BRN	J7-P1	20v DC	33-1590 090-5060-00
#25	7-BANK DROP TRGT (2) (TRIP)	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	BRN	J7-P1	20v DC	33-1590 090-5060-00
#27	7-BANK DROP TRGT (3) (TRIP)	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	BRN	J7-P1	20v DC	33-1590 090-5060-00
#28	7-BANK DROP TRGT (4) (TRIP)	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	BRN	J7-P1	20v DC	33-1590 090-5060-00
#29	7-BANK DROP TRGT (5) (TRIP)	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	BRN	J7-P1	20v DC	33-1590 090-5060-00
#30	7-BANK DROP TRGT (6) (TRIP)	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	BRN	J7-P1	20v DC	33-1590 090-5060-00
#31	7-BANK DROP TRGT (7) (TRIP)	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	BRN	J7-P1	20v DC	33-1590 090-5060-00
#32	SINGLE DROP TRGT (8) (TRIP)	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	BRN	J7-P1	20v DC	33-1590 090-5060-00

Note: In Test Flash Lamps Menu ("Flash" icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q3 and Q17-Q20)

Backbox Wiring

Backbox I/O Power Driver Board Detailed Wiring Diagram



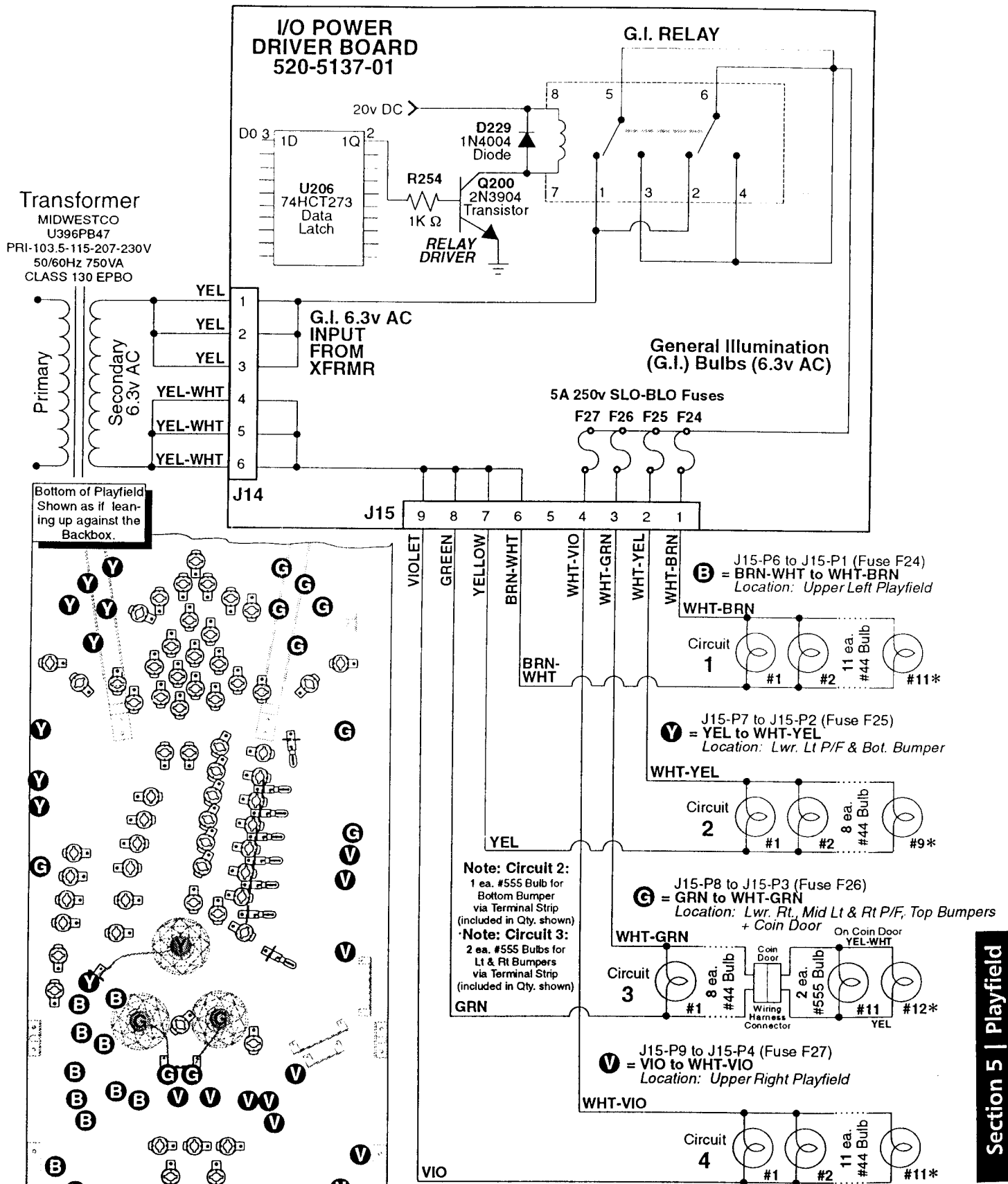
Important Note:

CN7.From Cabinet & Playfield



Playfield Wiring

General Illumination Circuit Detailed Wiring Diagram



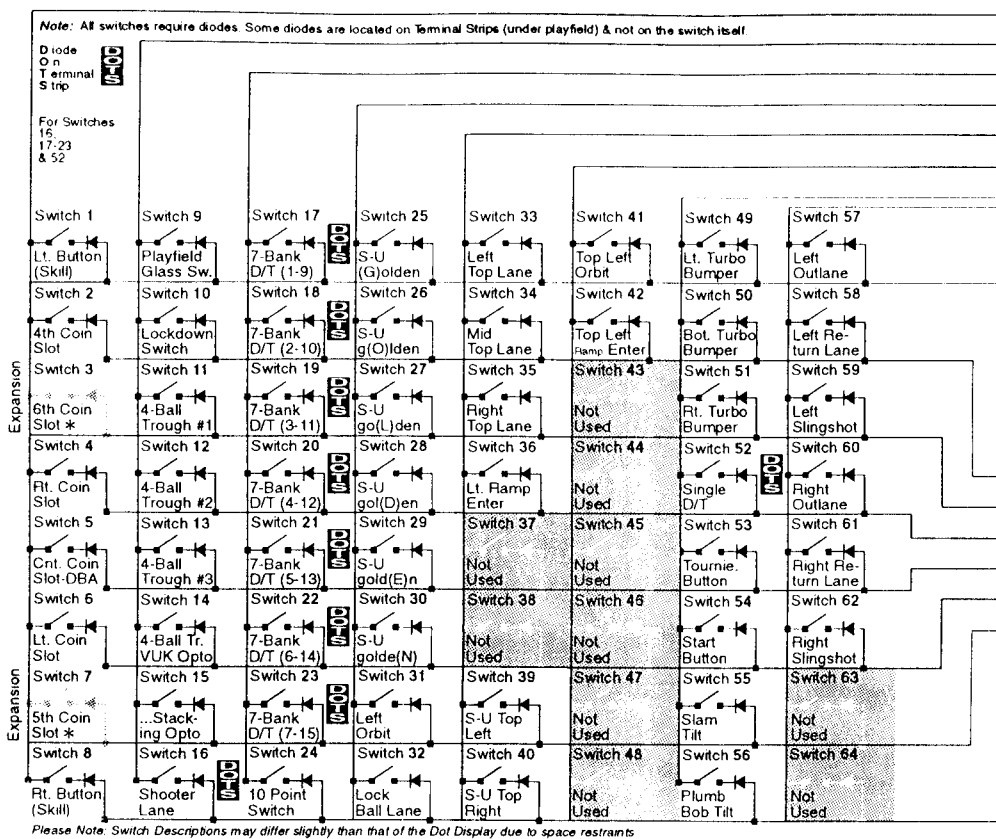
Section 5, Chapter 2
Playfield Wiring

Golden Cue
TOURNAMENT EDITION

* G.I. Bulb quantities may
change during production.

8 1

Playfield Switch Wiring Diagram



CPU-Snd. Bd. CN5-

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

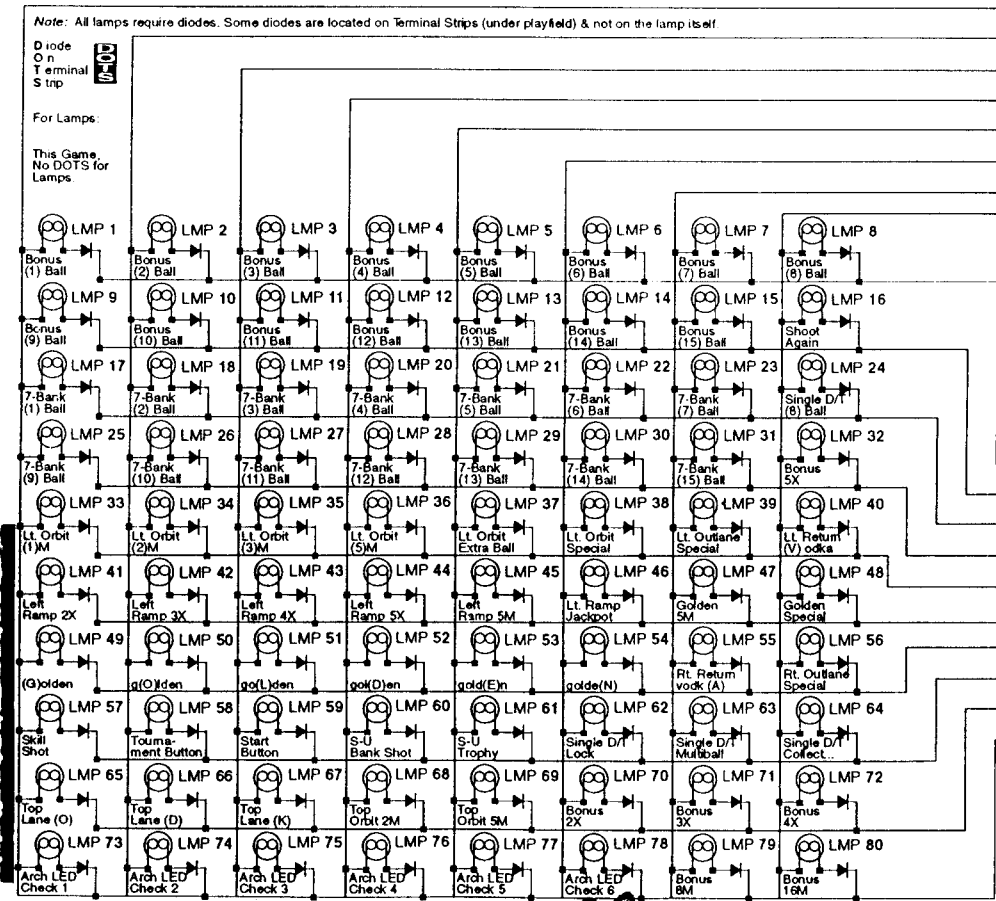
Source N°:
2N3904

CPU-Snd. Bd. CN7-

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

Source N°:
LM339AN

Playfield Lamp Wiring Diagram



I/O Bd. J13-

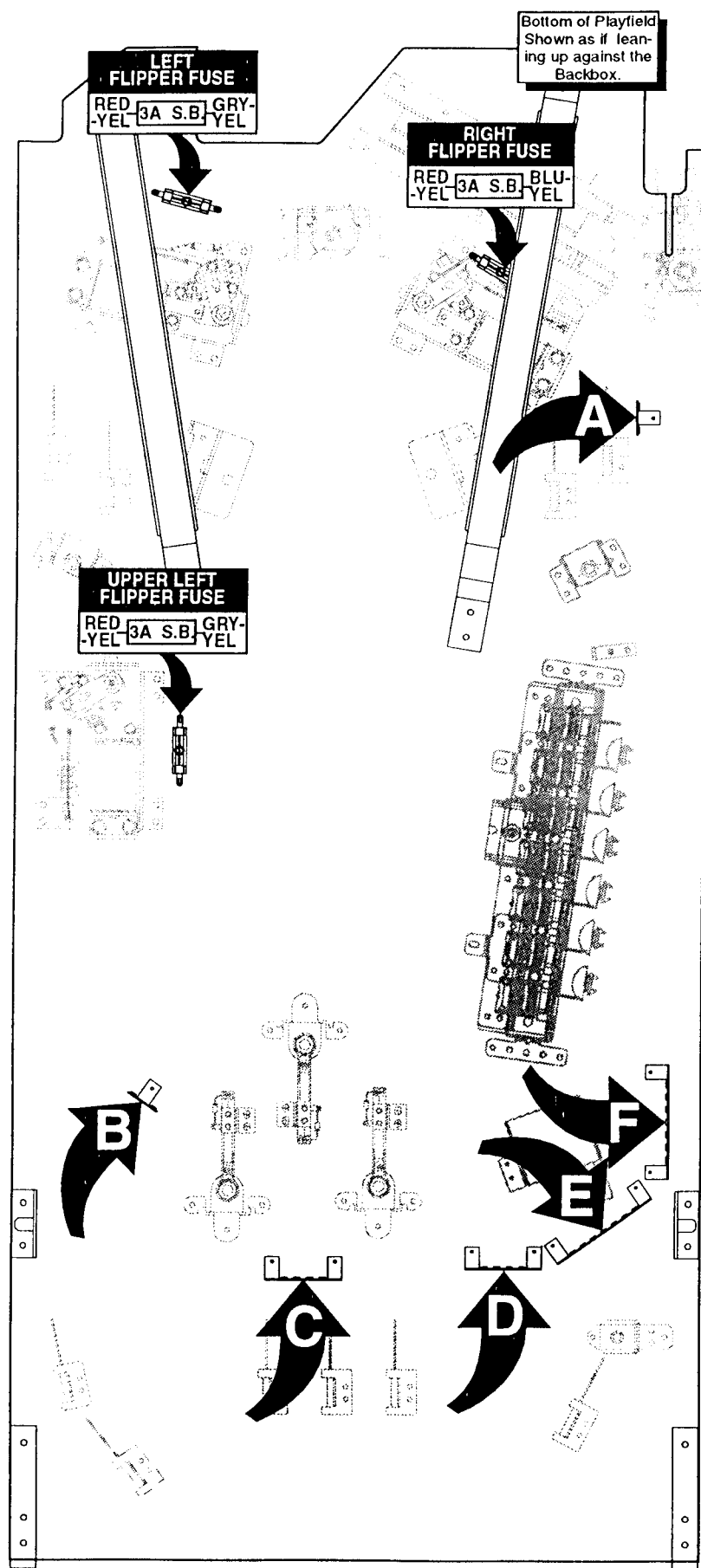
YEL-BRN	10	BLUE
YEL-RED	9	Lamp Drive 1: U17
YEL-ORG	8	Lamp Drive 2: U16
YEL-BLK	7	Lamp Drive 3: U15
YEL-GRN	6	Lamp Drive 4: U14
YEL-BLU	5	Lamp Drive 5: U13
YEL-VIO	4	Lamp Drive 6: U12
YEL-GRY	3	Lamp Drive 7: U11
Color	Pin	Lamp Drive 8: U10
Color	Pin	Lamp Drive IC

Source N°:
VN02N

I/O Bd. J12-

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

From I/O Pwr. Driver Board J16-Pins 9-15
Source N°:
STP19N06L



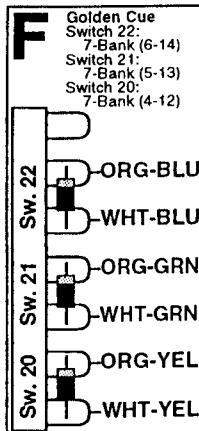
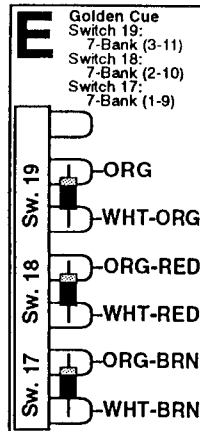
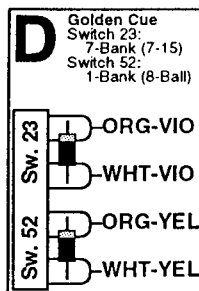
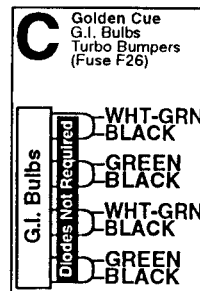
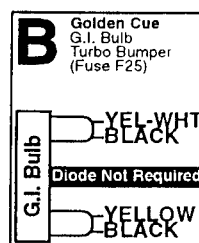
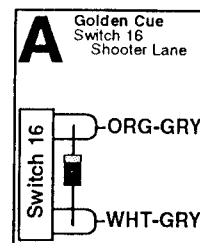
See the Pink Pages, Playfield - General Parts (Below) (Page 52) for Terminal Strips, Diodes, Fuses and Fuse Holders Part N^os.

Also Note:

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

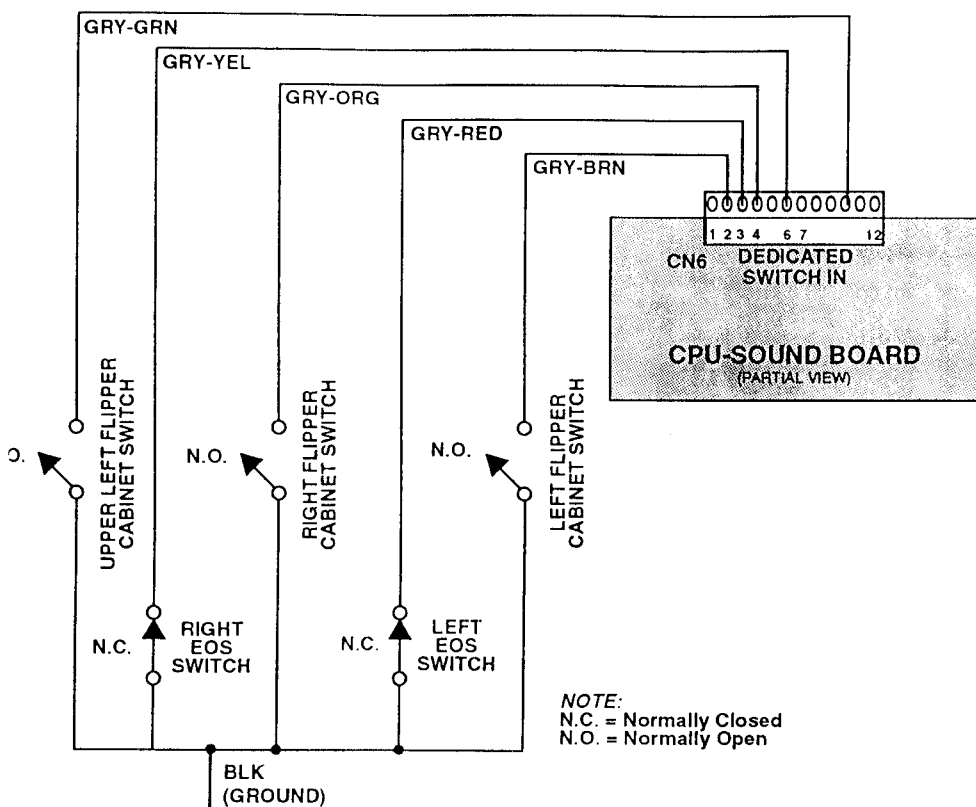
Explanation:

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



3-Flipper Circuit Wiring Diagram

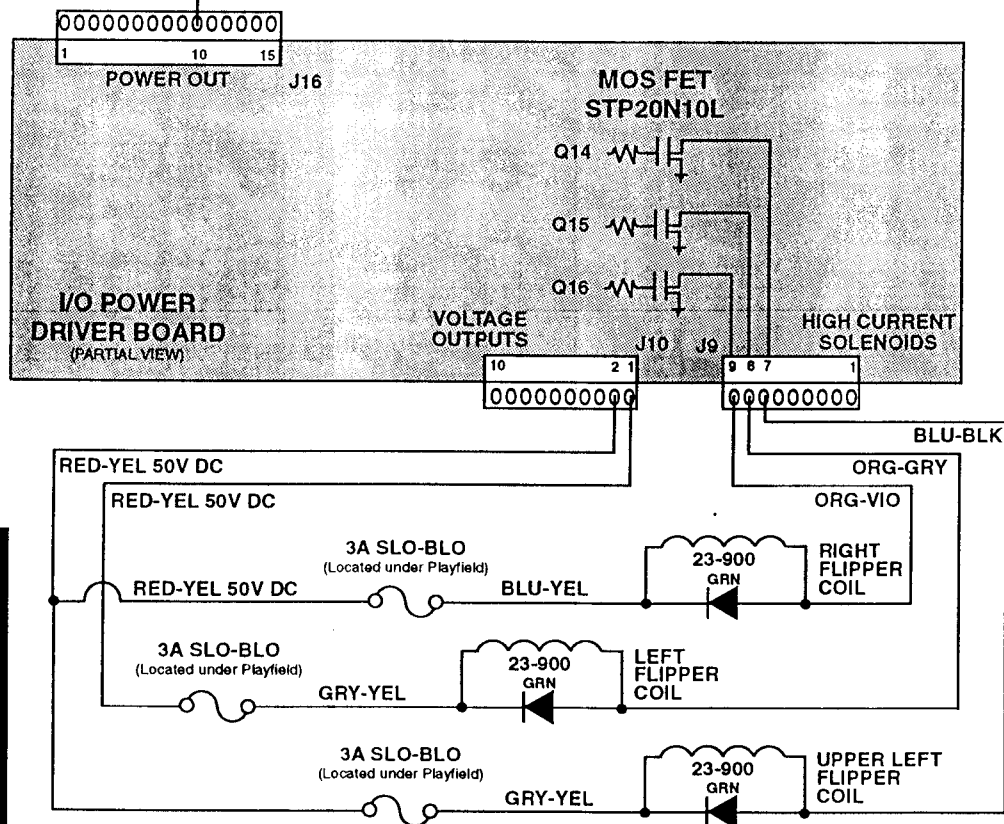
The **White Star Board System™** has allowed us to *simplify* the flipper circuit to the point where we have *eliminated* the flipper board all together. The flipper circuit is now configured the same as any other solenoid drive circuit.



Technical Overview

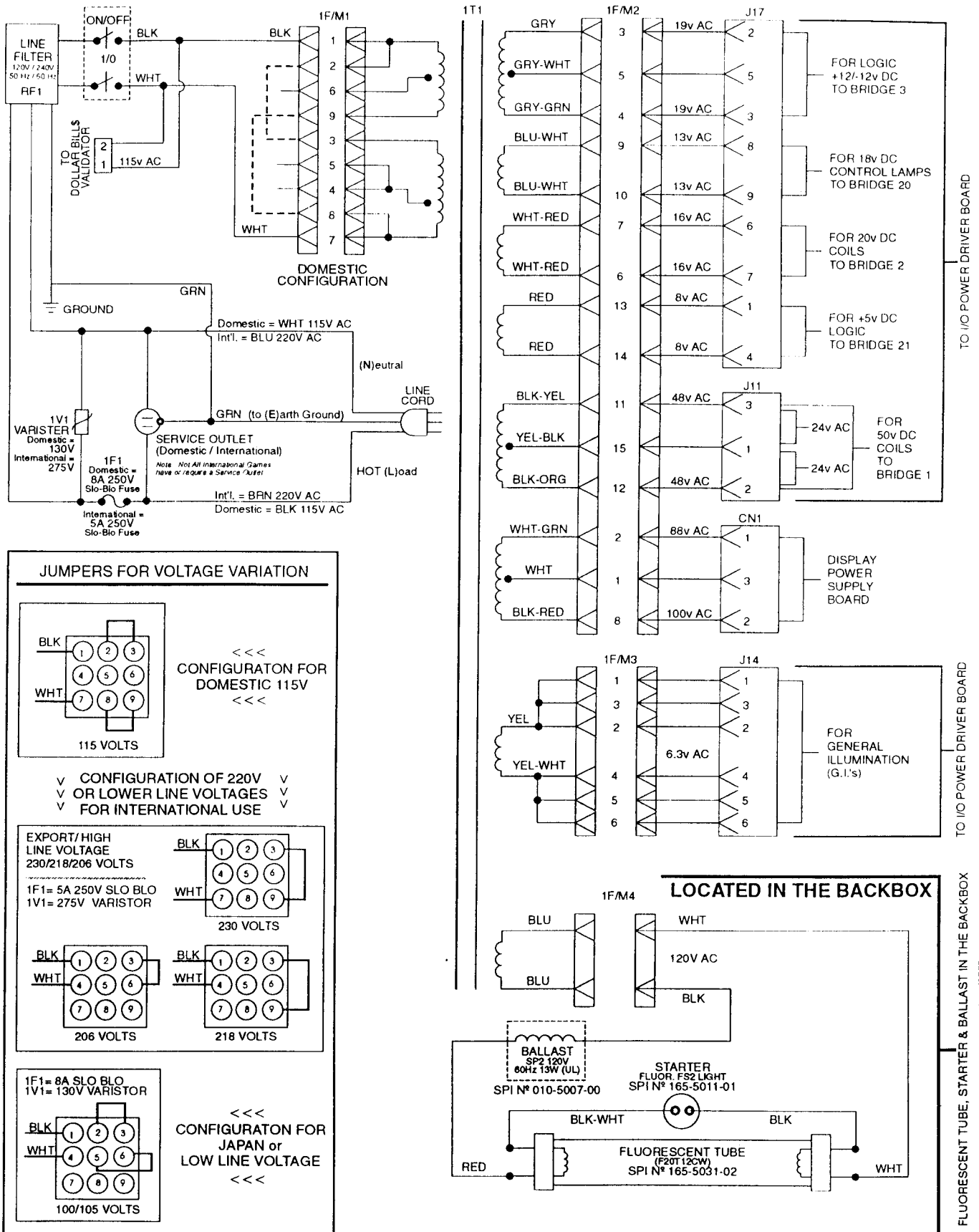
Our **New Flipper System** uses one supply voltage (50v DC) for both kick and hold. Once the **Game CPU** detects a flipper cabinet switch closure (during game play) it applies a 40 msec pulse to the gate of the flipper drive transistor (STP20N10L). If it continues to detect a flipper cabinet switch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

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

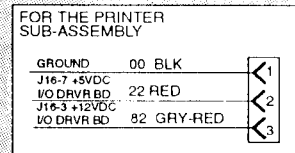
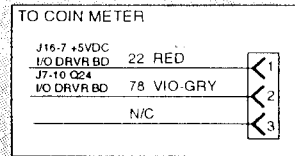
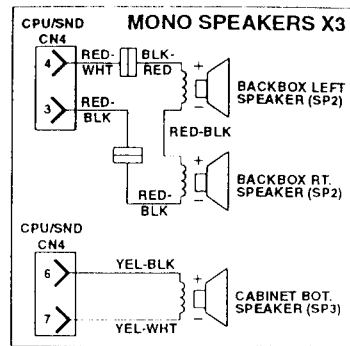
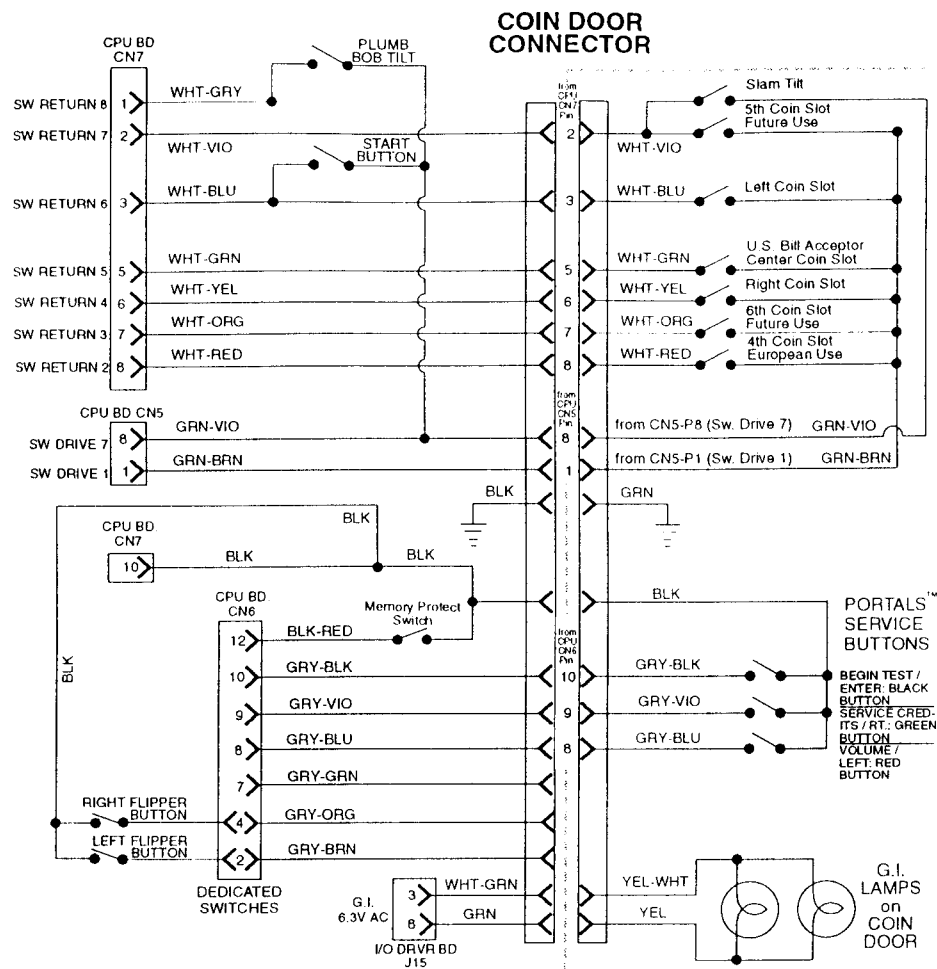


Cabinet Wiring

Transformer Power Wiring Diagram



Cabinet / Coin Door Wiring Diagram

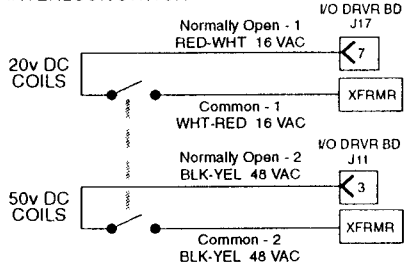


Use both Extra Buttons to operate the Up/Down Center Post.

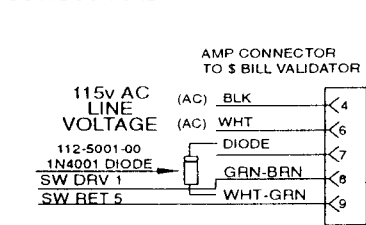
Use the Extra Left Button to operate the Left Outlane Ball Deflector.

Use the Extra Right Button to operate the Right Outlane Ball Deflector.

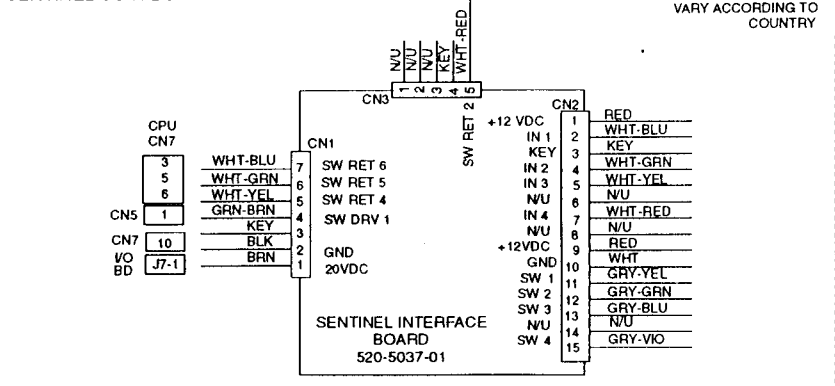
COIL POWER INTERLOCK SWITCH



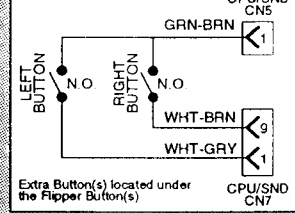
FOR USA 2 SLOT COIN DOOR ONLY



FOR USE ONLY IN SENTINEL COIN DOOR

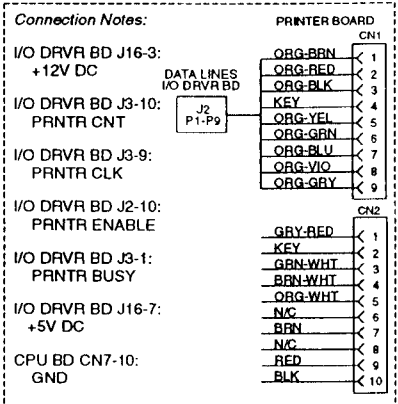


EXTRA CABINET BUTTON(S) For the "SAV-A-BALL" Feature(s).



PRINTER INTERFACE OPTIONAL

Cable Wiring Harness Part N°:
 036-5408-00
 RS-232 Printer Interface Board Part N°:
 520-5069-00



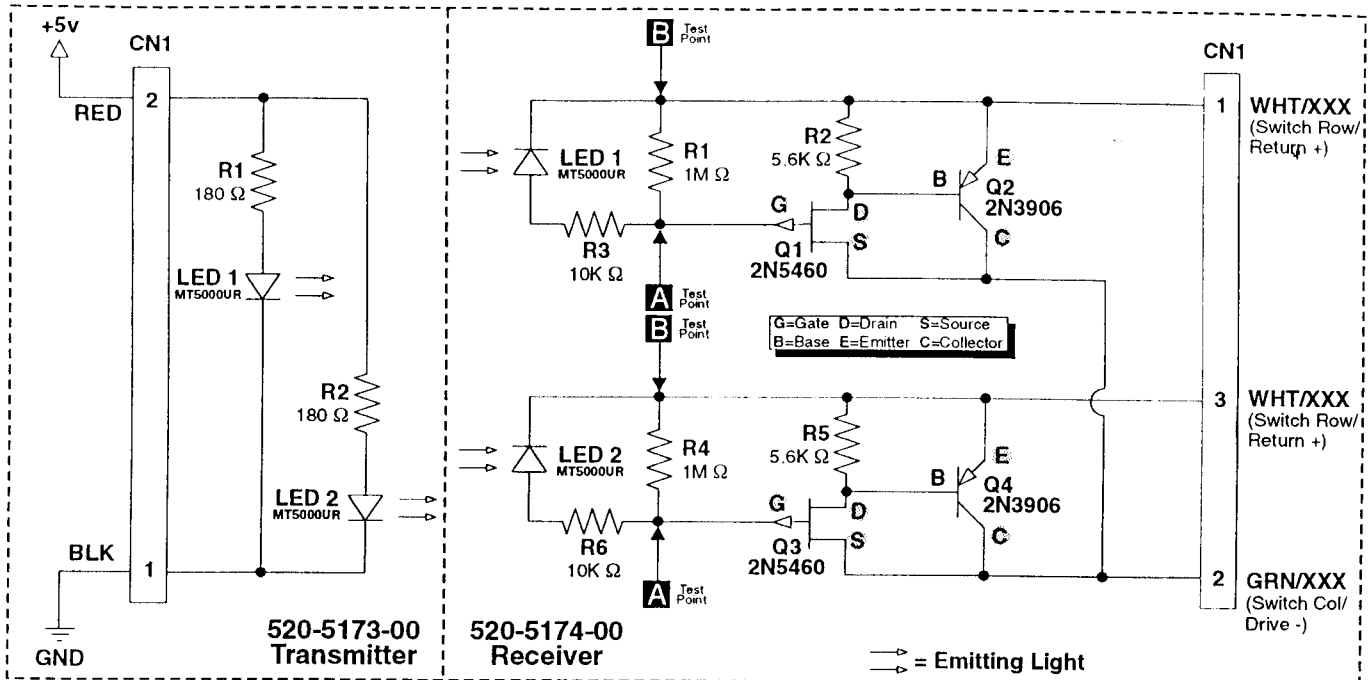
COIN DOOR



Printed Circuit Boards (PCBs)

Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic

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



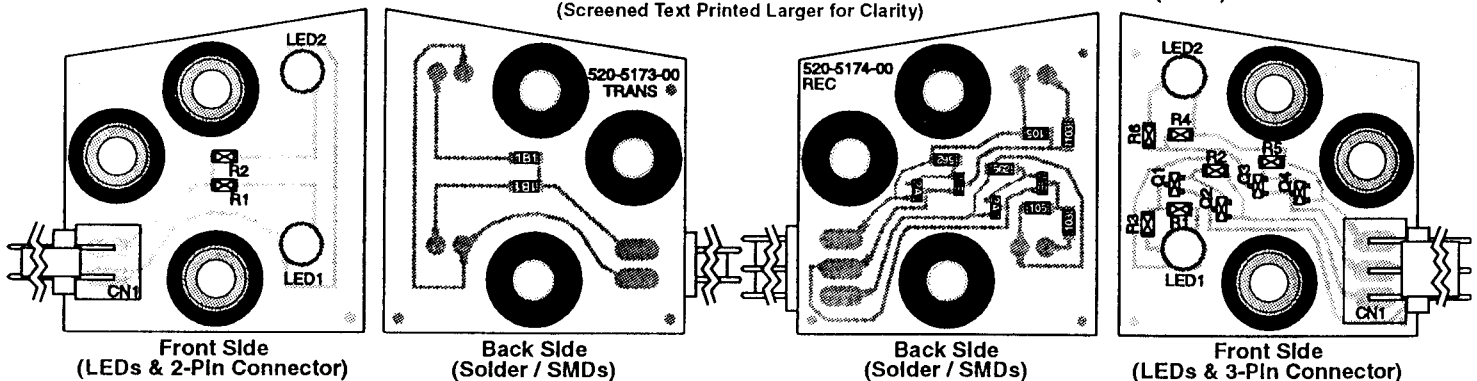
Trough Up-Kicker Dual OPTO Boards Component Layout & Parts

520-5173-00 (TRANS)

Boards Actual Size

(Screened Text Printed Larger for Clarity)

520-5174-00 (REC)



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



LED MT5000UR
(T1-3/4 GaAlAs)
(Ultra Bright Red)
Sega Pinball Part №
165-5100-00

DESCRIPTION

PCB Assy. (with all Items 1-5)
PCB Assy. (with Items 1-3 only)
LED MT5000UR (Ultra Bright Red)
180 Ω 1/8W Chip Res. (CRCW)
2X .156" Rt. Angle (26-60-5020) Conn.
OPTO PCB Rubber Gromment
OPTO PCB Brass Tube Spacer
PCB Assy. (with all Items 1-9)
PCB Assy. (with Items 1-7 only)
LED MT5000UR (Ultra Bright Red)
1M Ω 1/8W Chip Res. (CRCW)
5.6K Ω 1/8W Chip Res. (CRCW)
10K Ω 1/8W Chip Res. (CRCW)
2N5460, Transistor (P-FET SOT-23)
2N3906, Transistor
3X .156" Rt. Angle (26-60-5030) Conn.
OPTO PCB Rubber Gromment
OPTO PCB Brass Tube Spacer

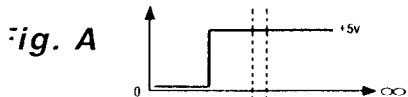
OPTO Troubleshooting

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

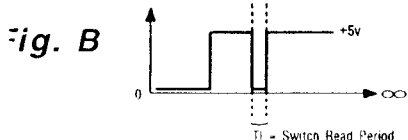
A. **OPEN OPTO** (Light Falling on LED) = **SWITCH OPEN**. Place meter leads across points **A** and **B** on the **LED1 Circuit** (Refer to Schematic Drawing on previous page, 520-5174-00 Receiver Side). It should read approximately 0.8 - 1.2v DC. The **LED2 Circuit** operates the same.

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

2. Oscilloscope Test (indicates normal operating condition):



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



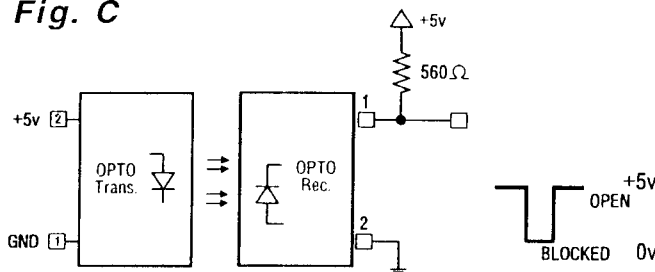
B. **CLOSED OPTO** (Light Blocked) = **SWITCH CLOSED**. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (see Schematic). The Scope should display a **PULSE STREAM** indicating **Q2** has switched "On" as shown in Fig. B, Wave Form Diagram. This is your Switch Drive Pulse.

3. Bench Test (See Fig. C):

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

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

Fig. C



Trough Dual OPTO Boards Alignment / Test for LED1

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

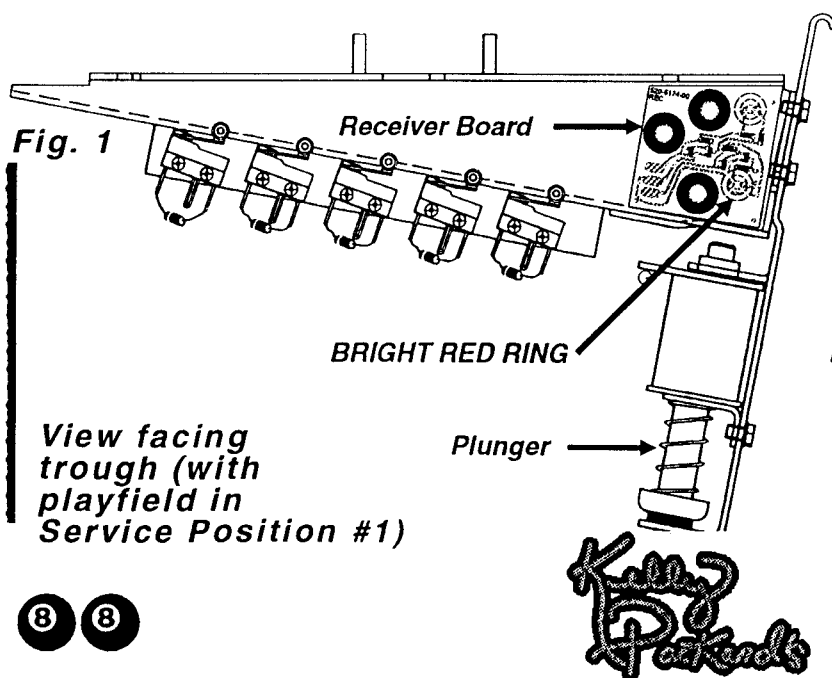
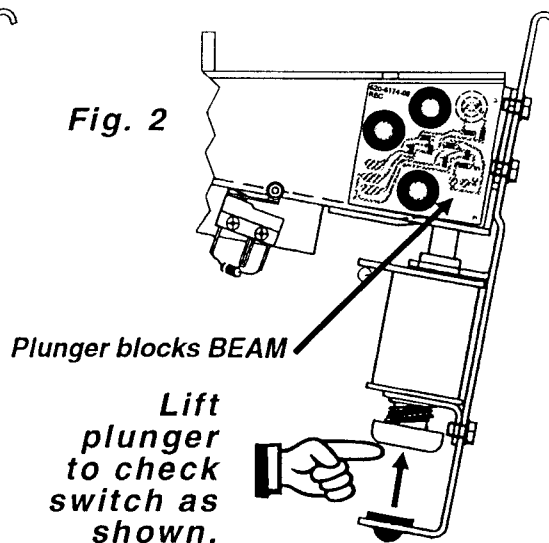
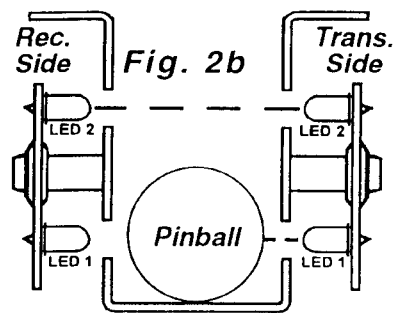
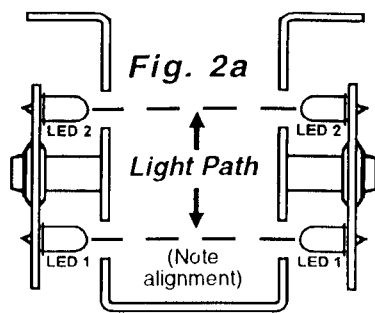


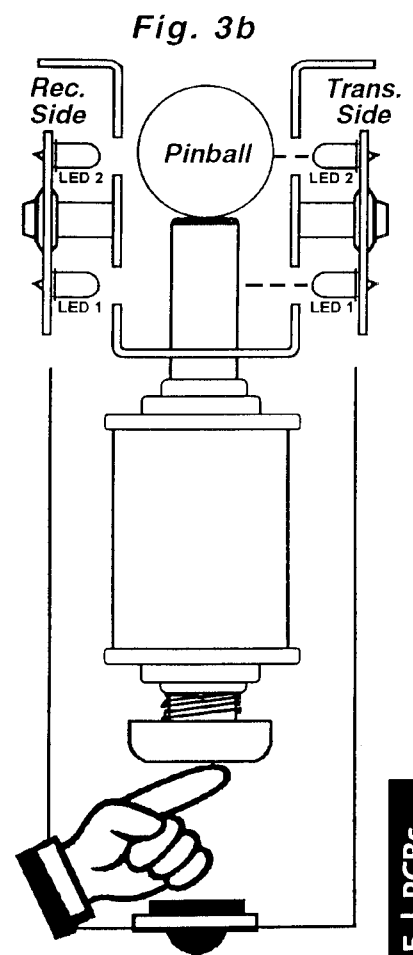
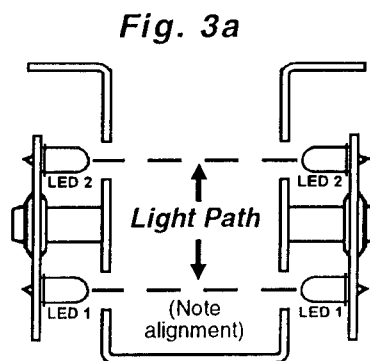
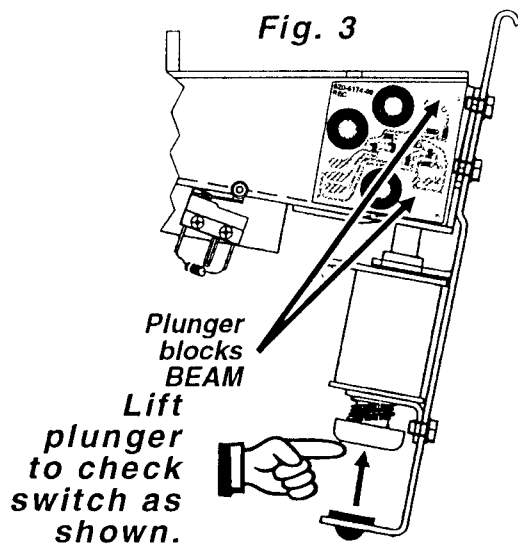
Fig. 2





Trough Dual OPTO Boards Alignment / Test for LED2

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



IMPORTANT

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

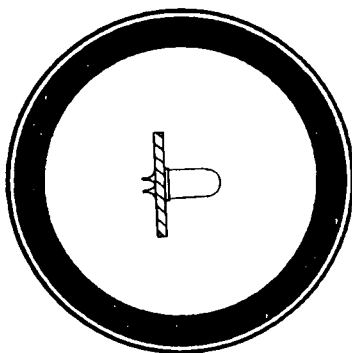


Fig. 4a
Correct Position

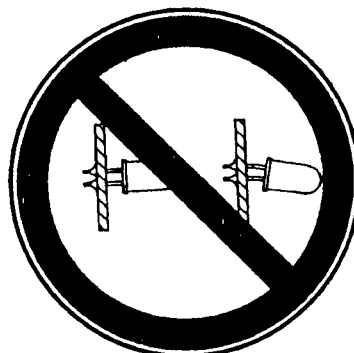
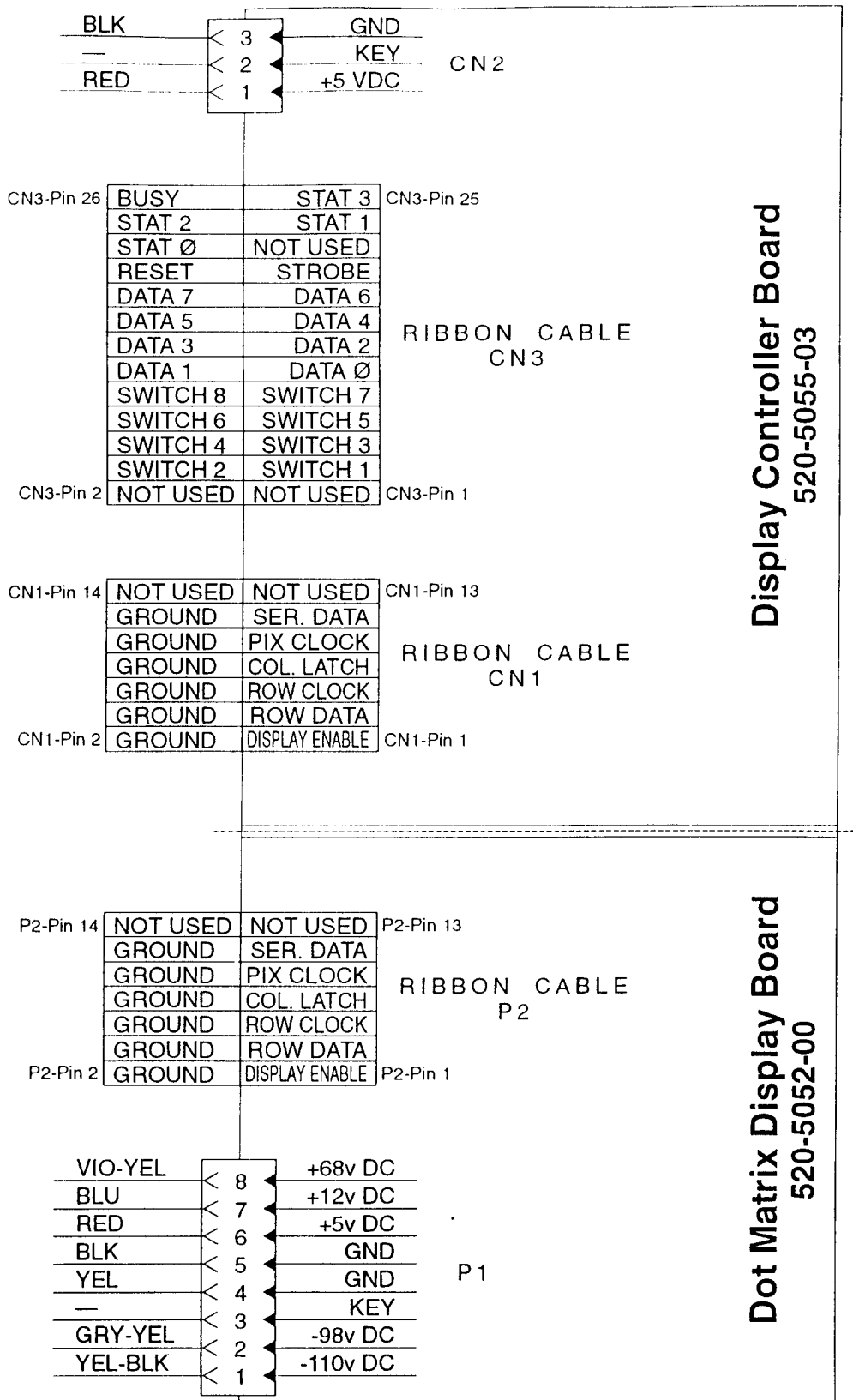


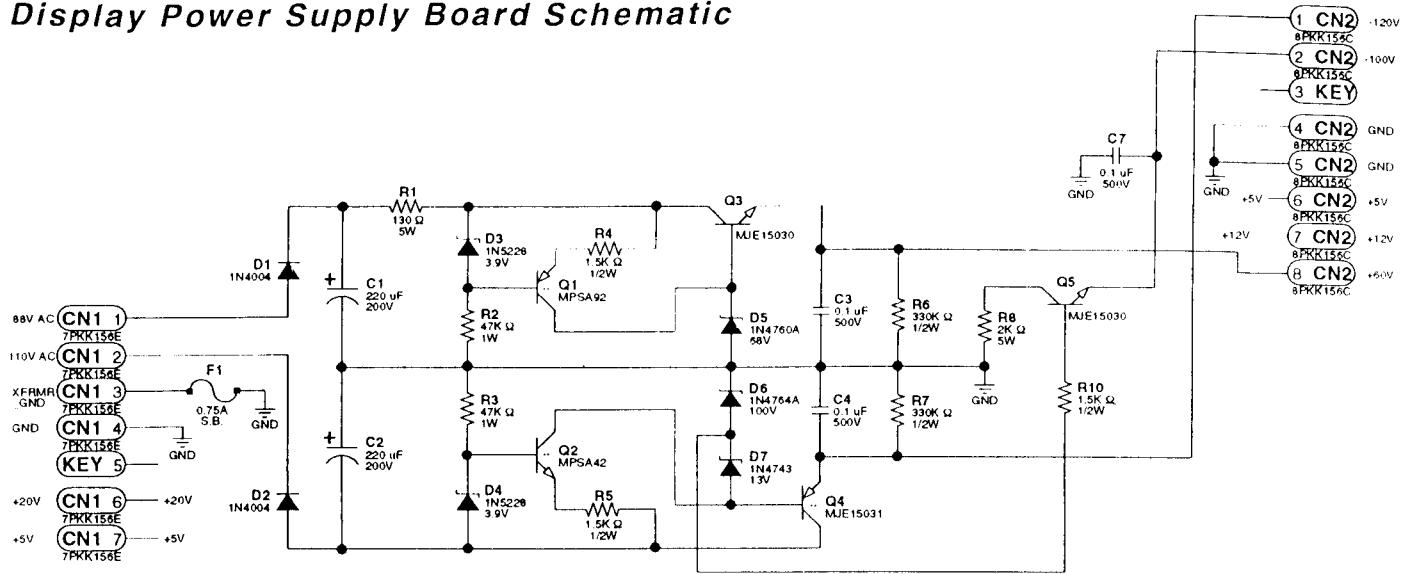
Fig. 4b
Incorrect Position

Dot Matrix Display/Display Controller Bd. Combined Display Connections

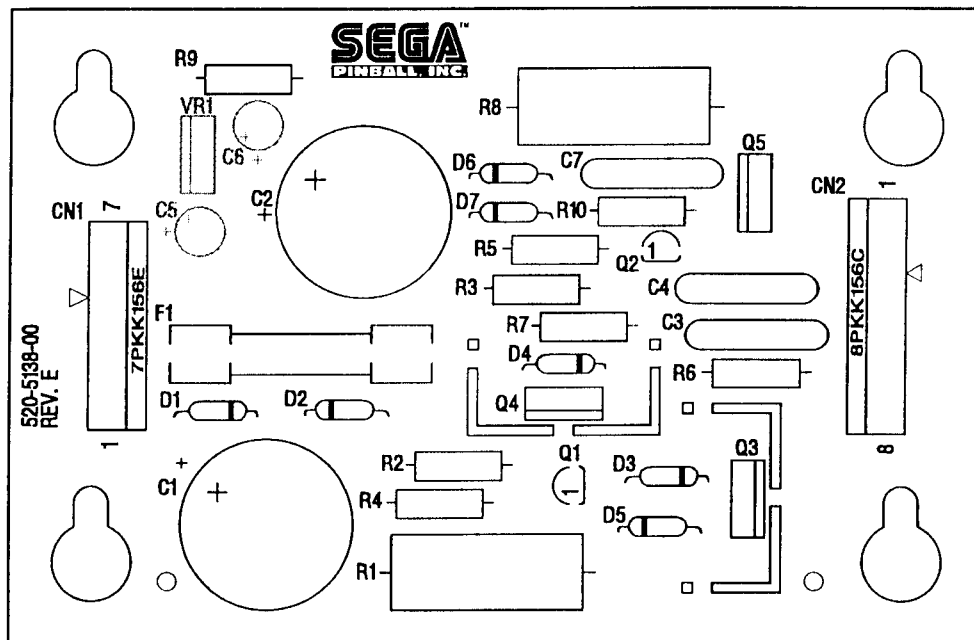


*Kelly
Packard*

Display Power Supply Board Schematic

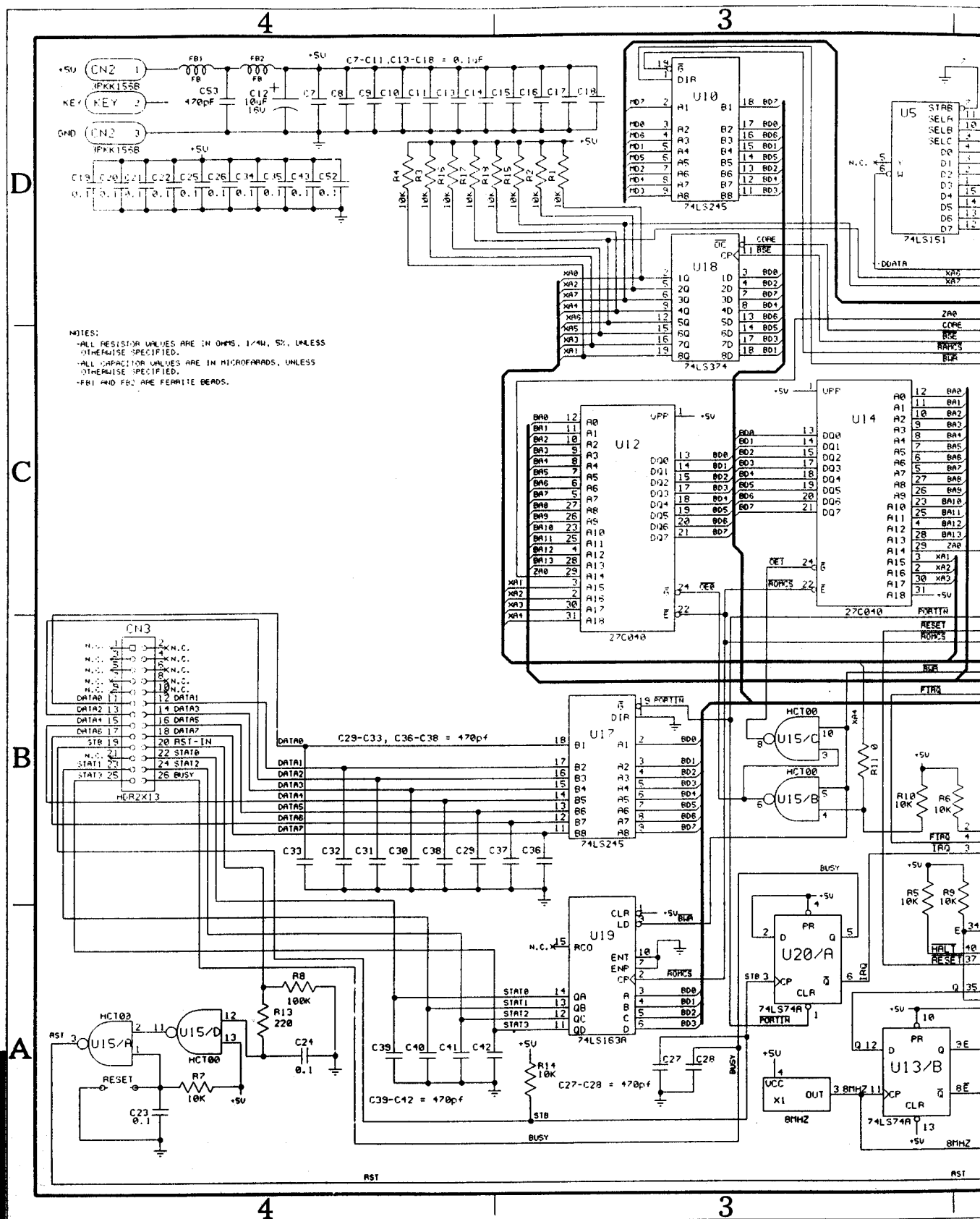


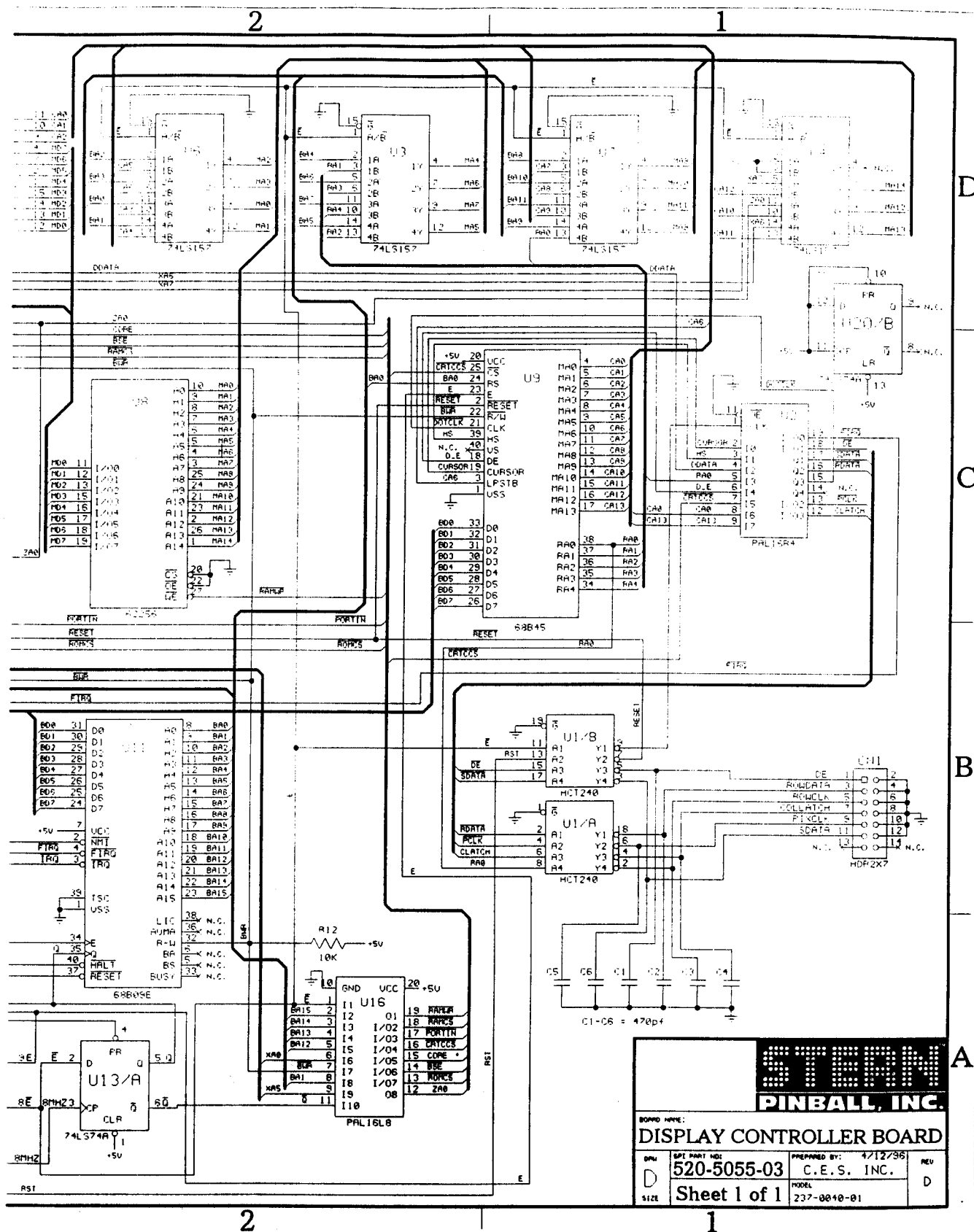
Display Power Supply Board Component Layout & Parts



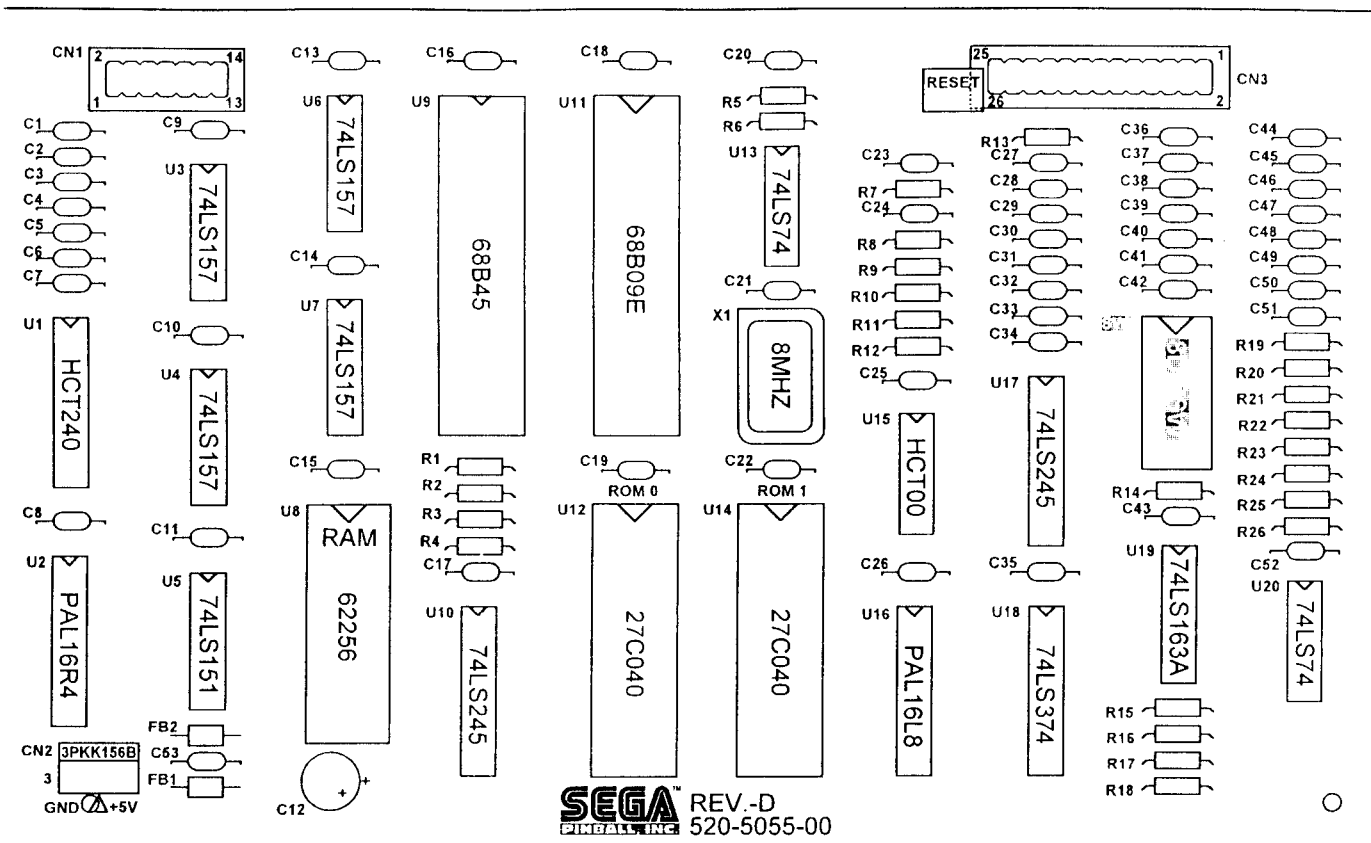
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
1	1	520-5138-00	Display Power Supply Board	Complete PCB Assembly
2	1	200-5000-17	F1	3/4A (0.75A) S.B. Fuse
3	2	535-5000-11	Q3, Q4	Heatsinks - AAVID #563002
4	2	125-5044-00	C1, C2	220uF, 200v, Radial Lytic Cap.
5	2	121-5038-00	R4, R5, R9, R10	1.5K Ω 1/2W Res. (R9: NS)
6	2	121-5059-00	R6, R7	330K Ω 1/2W Res.
7	1	121-5060-00	R2, R3	47K Ω 1W Res.
8	1	121-5061-00	R1	130 Ω 5W Res.
9	2	121-5062-00	R8	2K Ω 5W Res.
10	1	112-0053-00	D3, D4	1N5228, 3.9v, Diode
11	1	112-0062-00	D5	1N4760A, 68v, Diode
12	1	112-0049-00A	D6	1N4764A, 100v, Diode
13	1	112-0061-00	D7	1N4743, 13v, Diode
14	1	110-0100-00	Q1	MPSA92, Transistor
15	1	110-0082-00	Q2	MPSA42, Transistor
16	3	125-5035-00	C3, C4, C7	0.1uF, 500v, Ceramic Disk Cap.
17	1	110-0103-00	Q4	MJE15031, Transistor
18	2	110-0101-00	Q3, Q5	MJE15030, Transistor
19	0	125-5003-00	C5, C6	22uF, 25v, Rad Lytic Cap (C5, C6: NS)
20	0	124-5003-00	VR1	7812CT (VR1: NS)
21	1	045-5015-08	CN2	8PKK156 (PIN3=KEY)
22	2	112-5003-00	D1, D2	1N4004, Diode
23	1	045-5015-07	CN1	7PKK156E (PIN5=KEY)
24	2	240-5008-00	Q3, Q4	6/32 KEPS Nut
25	2	237-5501-00	Q3, Q4	6/32 X 3/8" PPH Screw
26	2	205-0004-00	F1	Fuse Clips

Display Controller Board Schematic





Display Controller Board Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
1	1	520-5055-03	Display Controller Board (FCC FEB98)	Complete PCB Assembly
2	2	077-5217-00	U12, U14	32-Pin, IC Dip Socket
3	1	100-0397-00	U8	32K X 8 Static RAM (62256L-10PC)
4	1	100-0189-01	U11	68B09E
5	1	100-0233-00	U9	68B45
6	1	100-0351-00	U15	74HCT00
7	1	100-5001-00	U1	74HCT240
8	4	100-5000-00	U5	74LS151
9	1	100-0046-00	U3, U4, U6, U7	74LS157
10	2	100-0049-00	U19	74LS163A
11	1	100-0058-00	U7, U10	74LS245
12	2	100-0064-00	U18	74LS374
13	1	100-0037-00	U13, U20	74LS74
14	1	965-0107-00	U16 - ORANGE DOT	PAL16L8 (15CN), (Programmed)
			(Note the type of PAL)	- ORANGE DOT
15	23	125-5031-00	U2 - ORANGE DOT	PAL16R4 (25CN), (Programmed)
16	1	121-5051-00	(Note the type of PAL)	- ORANGE DOT
17	15	121-5011-00	C7>C11, C13>C26, C34, C35, C43, C52	.1 uF, (104), Axial Cer. Cap
18	1	121-5014-00	R8	100K Ω 1/4W C.F. Res. 5%
19	0	n/a	R1>R7, R9, R10, R12, R14>R18	10K Ω 1/4W Res. 5%
20	21	125-5028-00	R13	220 Ω 1/4W C.F. Res. 5%
21	2	n/a	R19>R26	(R19>R26: NS)
22	1	125-5015-00	C1>C6, C27>C33, C36>C42, C44>C51, C53	470pF, (471), Axl. Cap (C44>C51: NS)
23	1	045-5015-26	FB1, FB2	Ferrite Bead (2743001182)
24	1	045-5015-03	C12	100uF, 25v, Cap. (Radial Elec.)
25	1	045-5015-02	CN3	13-Pin, Dual Row .1" HDR Conn.
26	1	140-0013-00	CN2	3-Pin, KK-156 Conn. (540445-3)
27	0	Not Used	CN1	7-Pin, Dual Row .1" Hdr. Conn.
28	1 (See Pg. DR. 6 Table)	n/a	X1	8Mhz Clock Oscillator
29	1	n/a	SW1	(SW1: NS)
			U12 U14 (ROM 0)	4MB ROM (U14: NS)
			U1 (@ Pins 9 & 10)	100pF, Cap.

5V Supply:

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

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

These DC voltages are derived on the I/O Board by rectification and filtering. Each has a **LED** indicating that power is being supplied to each of these voltage sources. The -12V supply comes from the same transformer winding as the +12V thus it does not have a **LED** indicator.

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

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

Reset Circuitry:

The I/O will reset in three (3) cases:

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

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

Address Decoding:

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

Solenoid (Coil) Drivers & Flash Lamps:

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

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

Auxiliary In & Out:

J2-8 CMOS Outputs sometimes used for a printer interface.

J3-8 CMOS Inputs general purpose inputs.

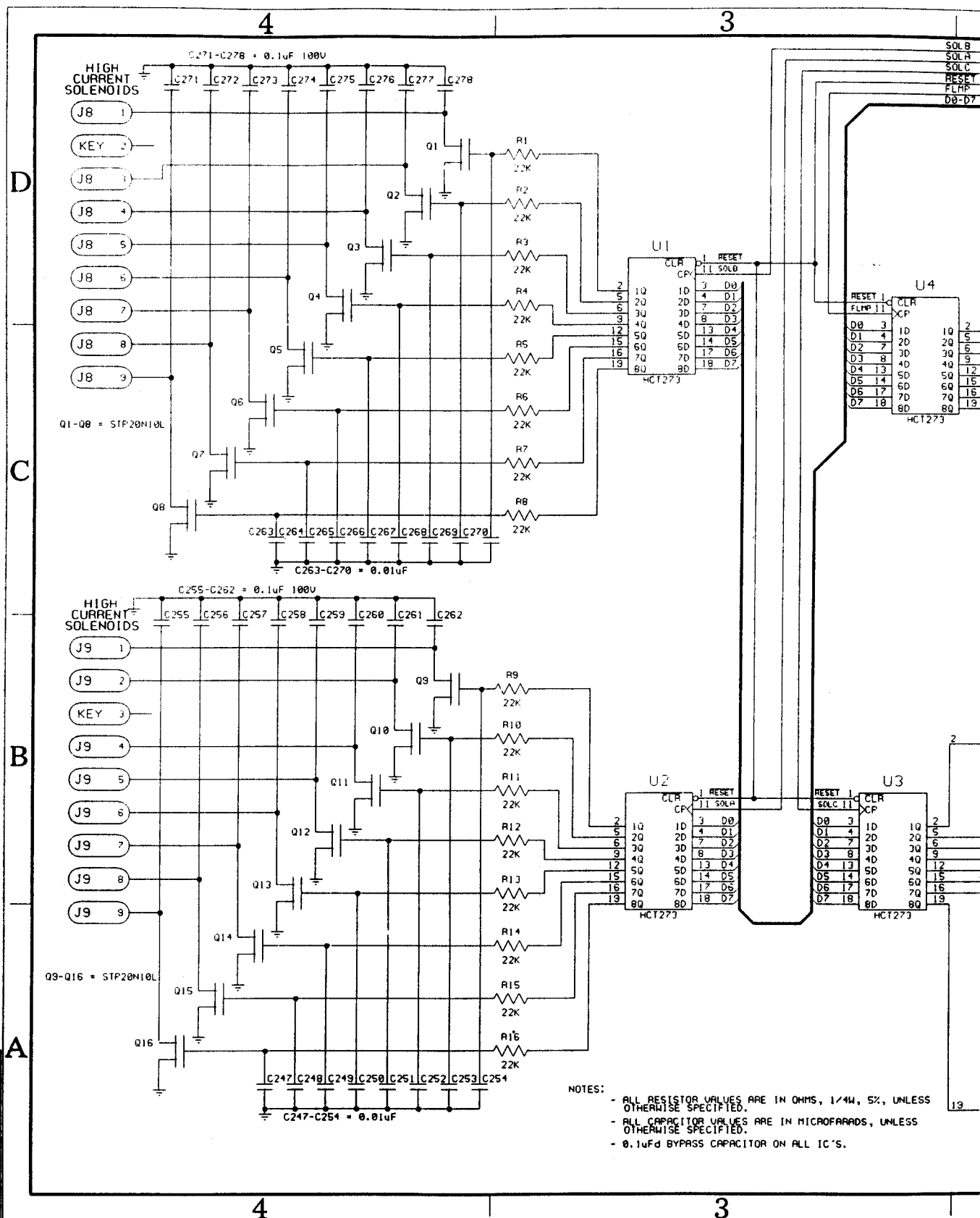
Lamp Matrix:

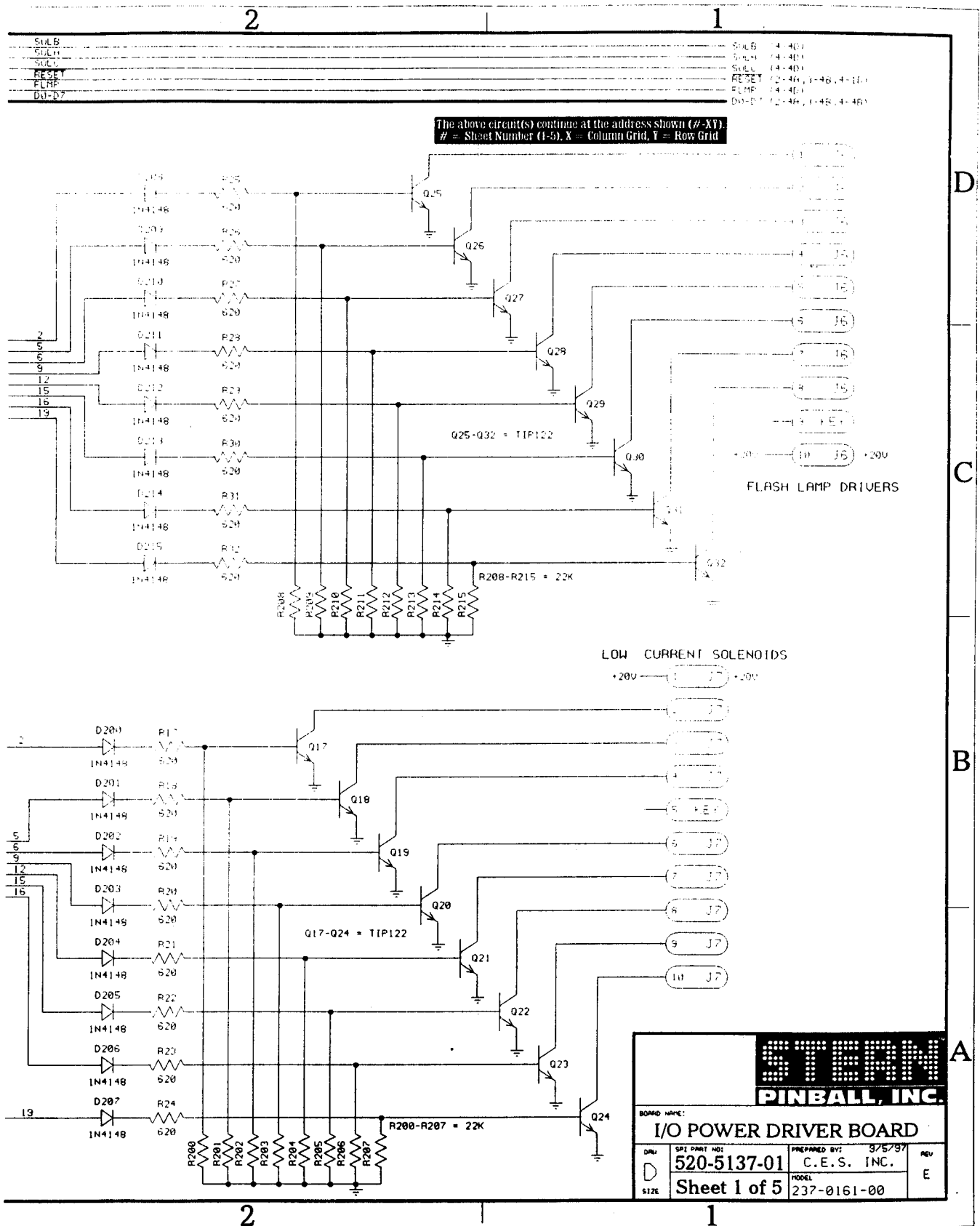
J12 has 10 low side drivers for the lamp strobes which consist of **19N06L MOSFETS**. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the I/O from resetting. **J13** has 8 high side drivers with each having a status indicator. All the status indicators are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

General Illumination (G.I.) Lights:

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

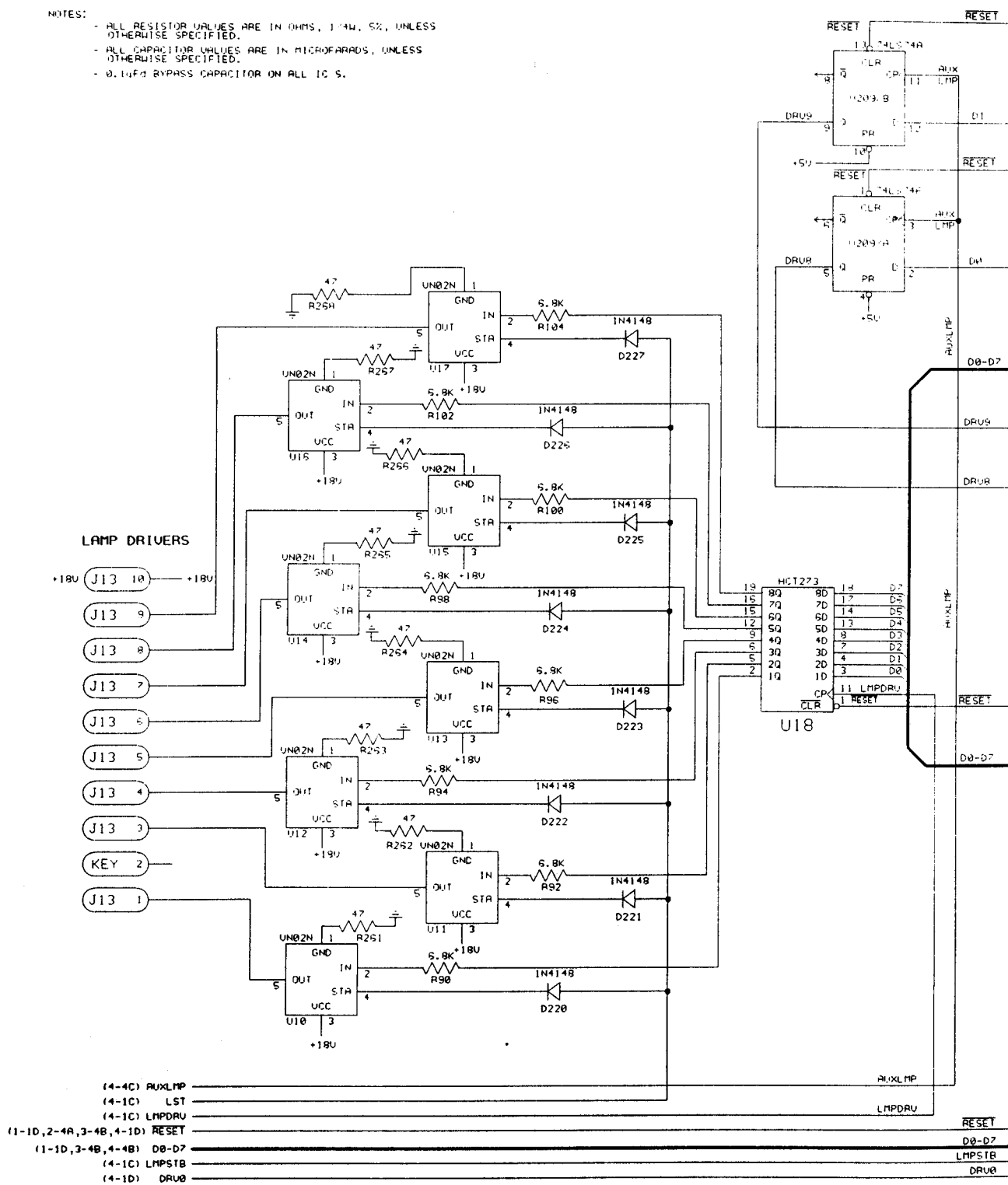
I/O Power Driver Board Schematic (Sheet 1 of 5)



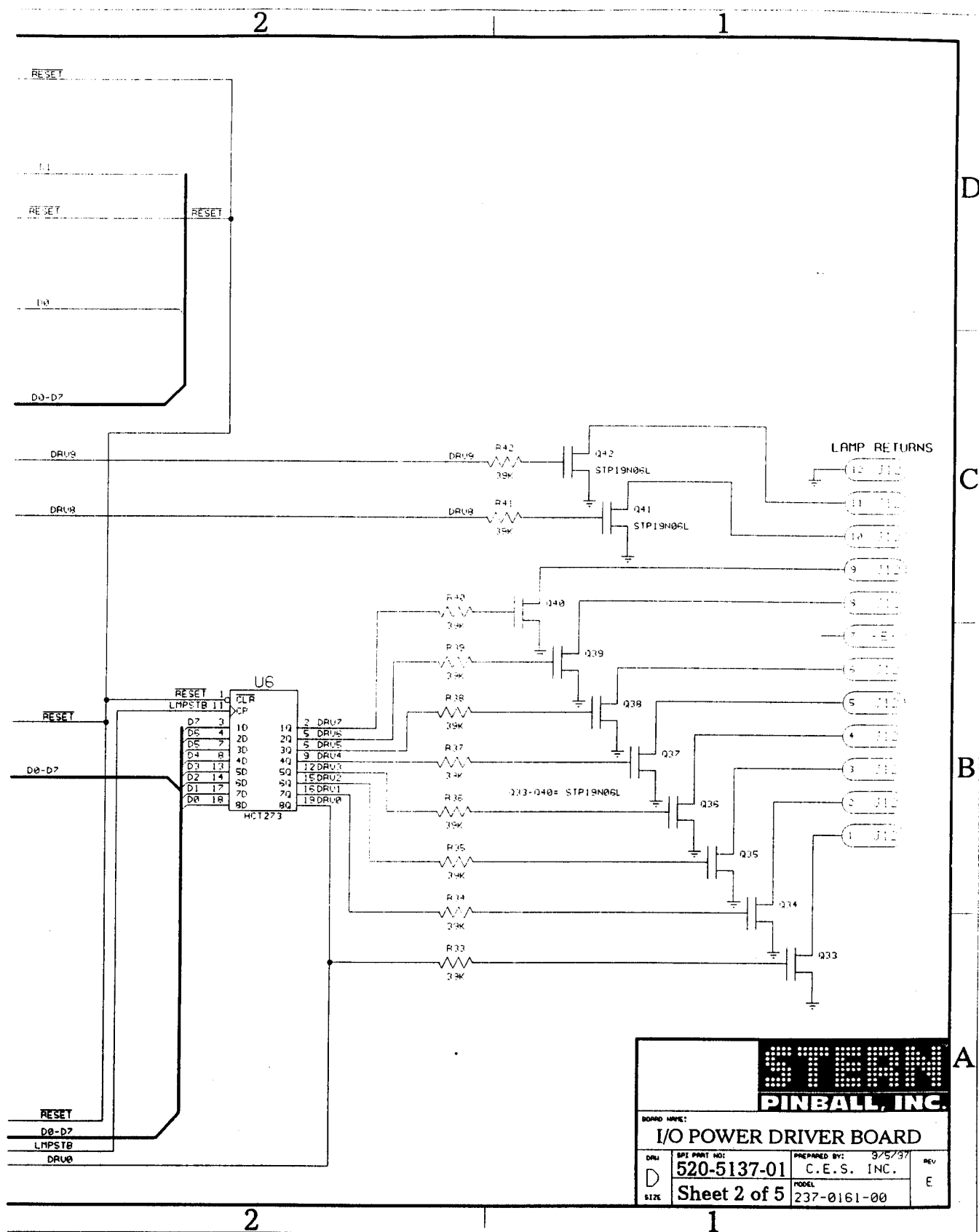


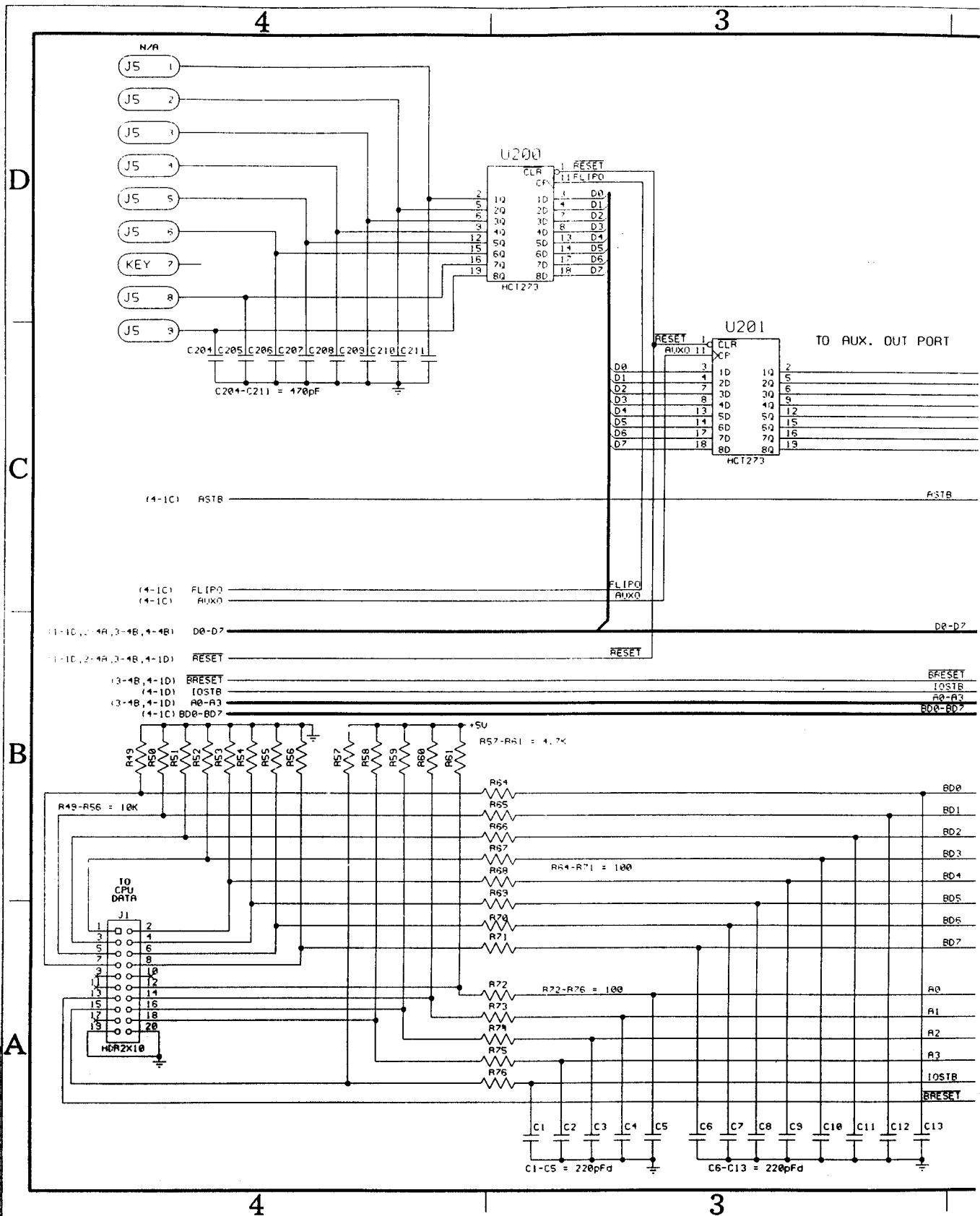
NOTES:

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



Key
of
Parts





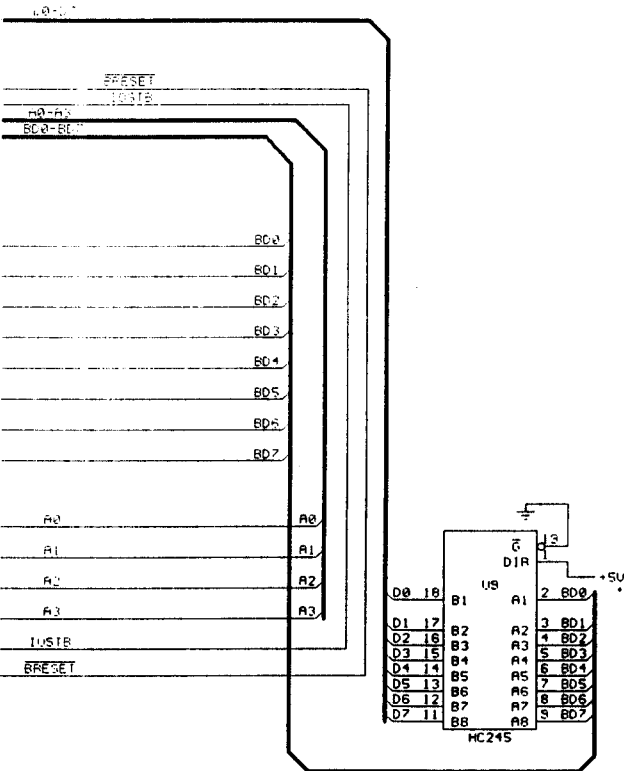
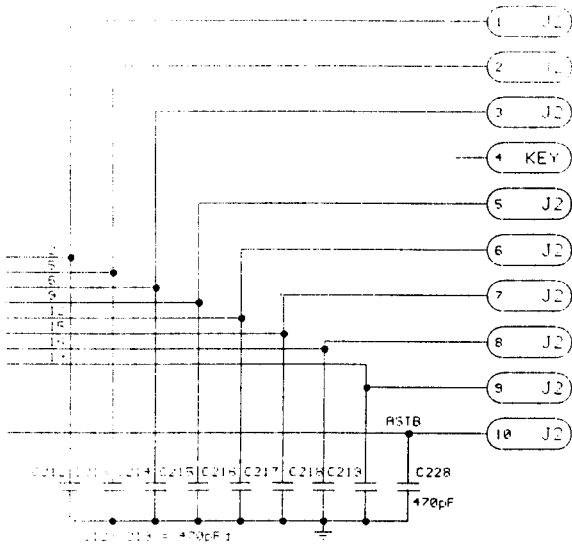
2

1

NOTES:

- ALL RESISTOR VALUES ARE IN OHMS, UNLESS OTHERWISE SPECIFIED.
- ALL CAPACITOR VALUES ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
- 0.1UF BYPASS CAPACITOR ON HLT 17.5.

AUX. OUT PORT

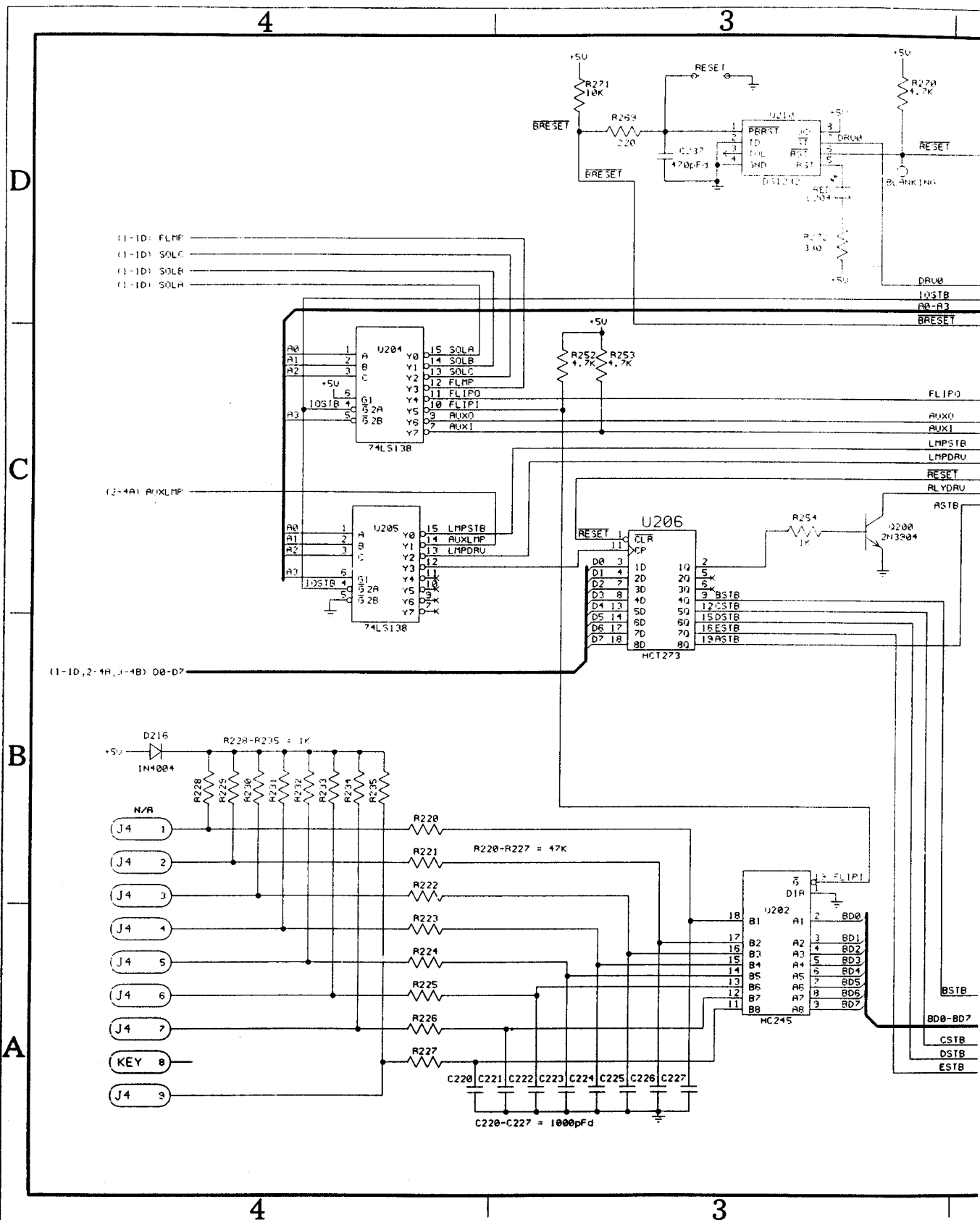


STERN
PINBALL, INC.

BOARD NAME:
I/O POWER DRIVER BOARD

DATE	SPT PART NO:	PREPARED BY:	REV
D	520-5137-01	C.E.S. INC.	E
SIZE	Sheet 3 of 5	MODEL	
		237-0161-00	

Section 5 | PCBs



1

05-25-99 CUT PIN-3 TO GND ON U210 (4-3D)

- ALL RESISTOR VALUES ARE IN OHMS, UNLESS OTHERWISE SPECIFIED.
- ALL CAPACITOR VALUES ARE IN PICO FARADS, UNLESS OTHERWISE SPECIFIED.
- 0.1UF BYPASS CAPACITOR ON ALL IC'S.

RE-SET

D

C



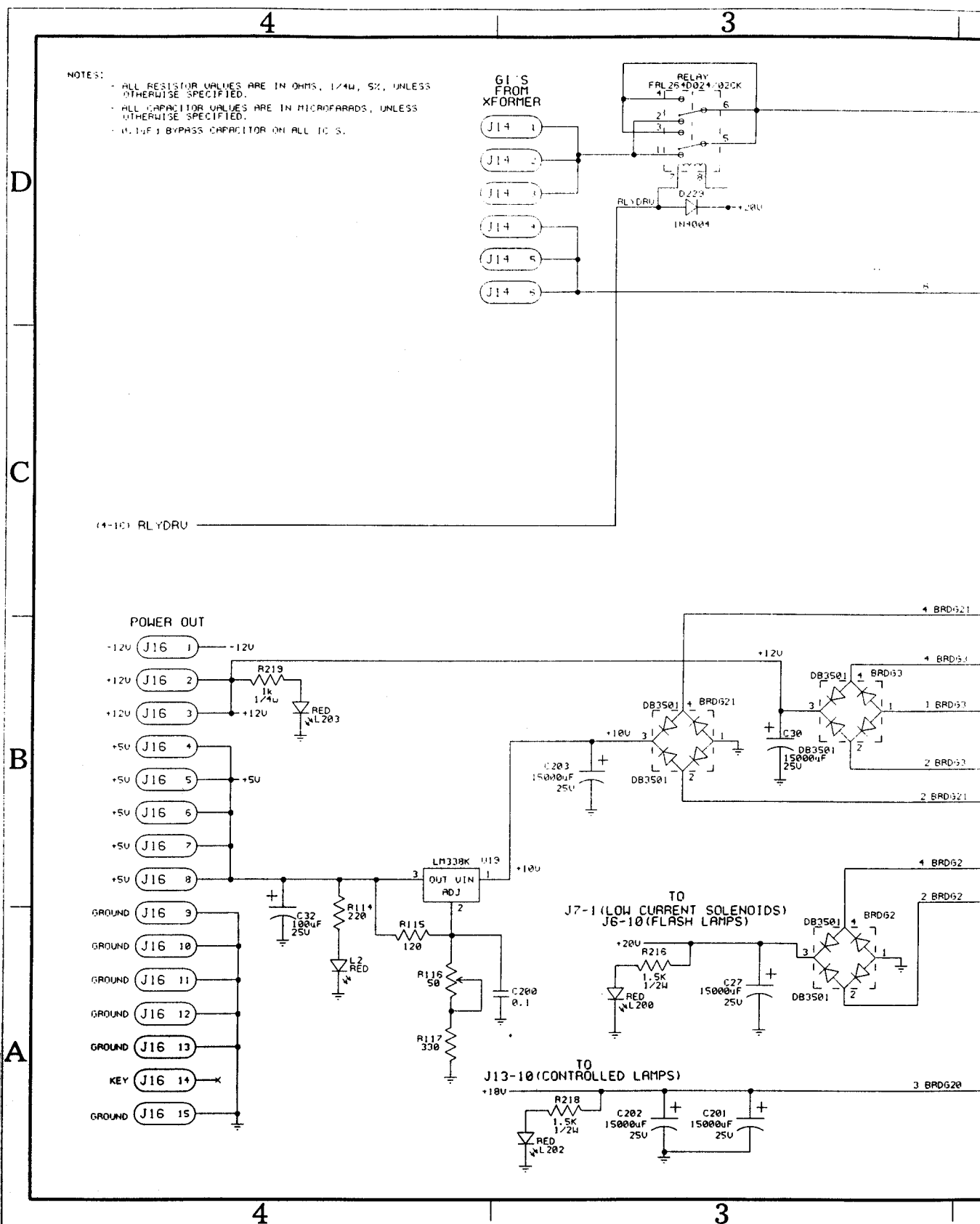
A

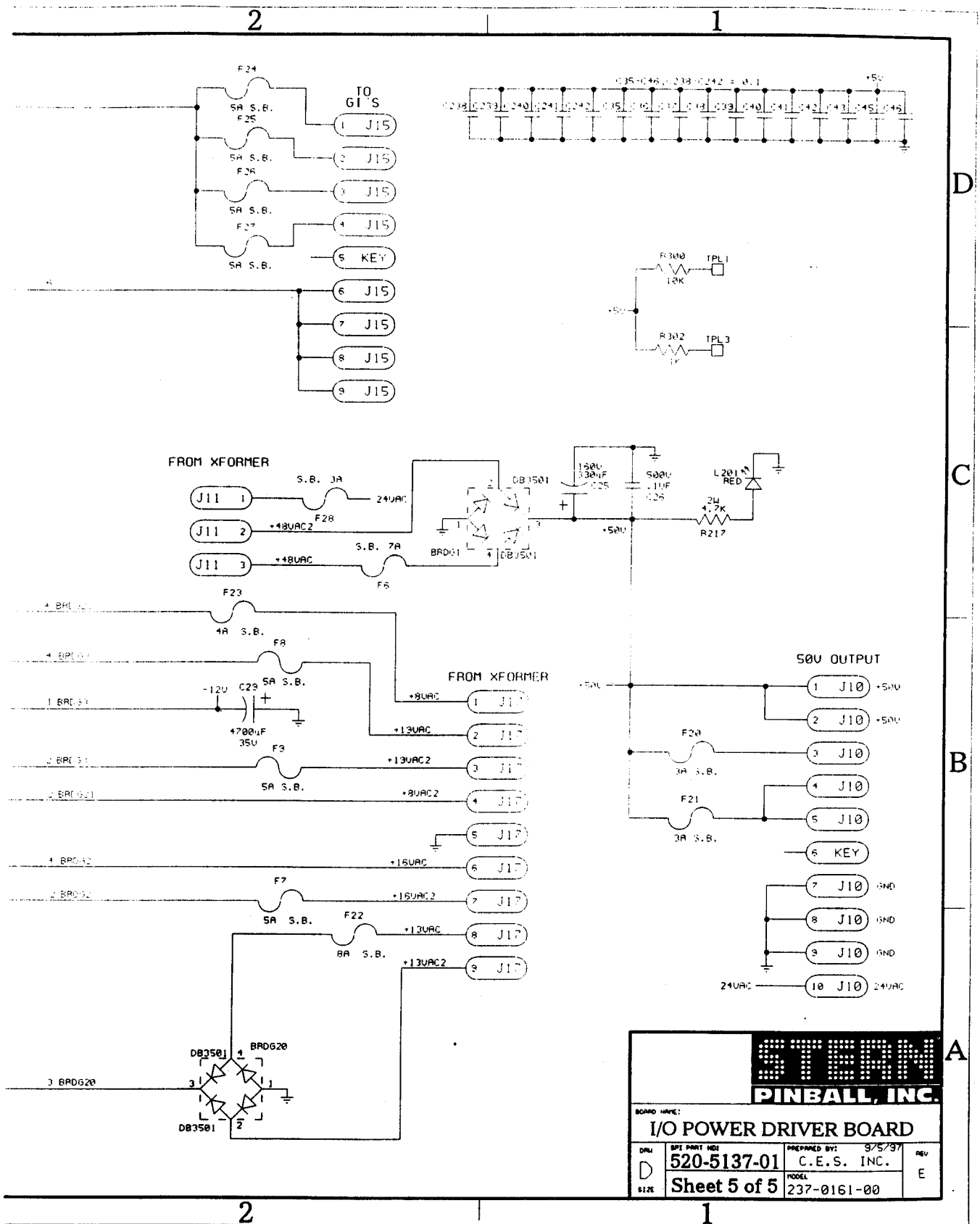
I/O POWER DRIVER BOARD

DRAWING D SIZE	SPI PART NO:	PREPARED BY:
	520-5137-01	C.E.S. INC.
	Sheet 4 of 5	MODEL 237-0161-00

REV
E

103





106



Section 5, Chapter 4 Printed Circuit Boards (PCBs)

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

I/O Power Driver Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
—	1	520-5137-01	I/O Power Driver Board	Complete PCB Assembly
1	16	125-5027-00	C255>C262, C271>C278	0.1uF, (104), 100v, Cap.
2	22	125-5028-00	C204>C219, C228>C237, C243>C246	470pF, (471), Axial Cap. (C204>C211: NS)
3	16	125-5029-00	C247>C254, C263>C270	0.01uF, (103), 100v Cap.
4	13	125-5030-00	C7 C8 C9 C10 C11 C12 C13 C1 C2 C3 C4 C5 C6	220pF, (221), Cap.
5	0	n/a	C220>C227	(C220>C227: NS)
6	17	125-5031-00	C35>C43, C45, C46, C200, C238>C242	0.1uF, (104), Cap.
7	16	110-0106-00	Q1>Q16	20N10L STP Transistor
8	32	121-5042-00	R1>R16, R200>R215	22K Ω 1/4W Res.
9	16	121-5003-00	R17>R32	620 Ω 1/4W Res.
10	17	121-5045-00	R33>R42, R236>R242	39K Ω 1/4W Res.
11	13	121-5007-00	R64>R76	100 Ω 1/4W Res.
12	8	121-5029-00	R90, R92, R94, R96, R98, R100, R102, R104	6.8K Ω 1/4W Res.
13	1	121-5030-00	R115	120 Ω 1/4W Res.
14	0	n/a	R220>R227	(R220>R227: NS)
15	9	121-5009-00	R228>R235, R245>R251, R254, R302	1K Ω 1/4W Res. (R228>R235: NS)
16	8	121-5032-00	R261>R268	47K Ω 1/4W Res.
17	2	121-5033-00	R114, R269	220 Ω 1/4W Res.
18	8	121-5021-00	R49, R57>R61, R252, R253, R256, R270	4.7K Ω 1/4W Res. (R252: NS)
19	11	121-5011-00	R50>R56, R255, R271, R300	10K Ω 1/4W Res.
20	2	121-5036-00	R117, R272	330 Ω 1/4W Res.
21	8	100-5012-00	U1>U4, U6, U18, U200, U201, U206	74HCT273 (U200: NS)
22	1	n/a	RESET	(RESET: NS)
23	1	121-5009-00	R219	1K Ω 1/4W Res.
24	2	121-5038-00	R216, R218	1.5K Ω 1/2W Res.
25	7	200-5000-01	F7>F9, F24>F27	5A 250v S.B. Fuse
26	1	200-5000-03	F6	7A 250v S.B. Fuse
27	1	200-5000-06	F23	4A 250v S.B. Fuse
28	1	200-5000-05	F22	8A 250v S.B. Fuse
29	3	200-5000-08	F20, F21, F28	3A 250v S.B. Fuse
30	1	045-5013-00	J15	9PKK156 (PIN 5=KEY)
31	1	045-5016-00	J16	15PKK156
32	1	100-5023-00	U210	DS1232
33	1	110-0069-00	Q200	2N3904 Transistor
34	1	125-5032-00	C32	100uF, 25v, Radial Lytic Cap.
35	1	045-5015-01	J1	20-Pin, 0.1 Dual Row Header
36	1	100-0338-00	U202, U203	74HC245 (U202: NS)
37	10	110-0088-00	Q33>Q42	19N06L STP Transistor
38	6	165-5099-00	L2, L200>L204	LED T1-3/4 DIFFUSER LED
39	1	045-5014-01	J2	10PKK156 (PIN 4=KEY)
40	1	121-5039-00	R116	50 Ω Pot
41	16	110-0067-00	Q17>Q32	TIP122
42	1	125-5033-00	C25	100uF, 150v, Radial Lytic Cap.
43	1	110-0058-00	U9	74LS245
44	1	125-5034-00	C29	4700uF, 35v, Radial Lytic Cap.
45	1	190-5002-00	RELAY	FRL264D024/02CK Relay
46	0	n/a	J5	(J5: NS)
47	1	100-0037-00	U209	74LS74
48	0	n/a	J4	(J4: NS)
49	2	100-0148-00	U204, U205	74LS138
50	1	125-5035-00	C26	.1uF, 500v, Ceramic Disk Cap.
51	1	100-0356-00	U19	LM338K
52	5	124-5000-00	BRDG1, BRDG2, BRDG3, BRDG20, BRDG21	DB3501
53	5	125-5036-00	C27, C30, C201>C203	15000uF, 25v, Radial Lytic Cap.
54	25	112-0054-00	D200>D215, D220>D227	1N4148, Diode
55	2	112-5003-00	D216, D217, D229	1N4004, Diode (D216: NS)
56	2	n/a	TPL1, TPL3	Test Point Wire (24ga.) Loops
57	1	045-5014-01	J7	10PKK156 (PIN 5=KEY)
58	1	045-5014-01	J6	10PKK156 (PIN 9=KEY)
59	8	110-0089-00	U10>U17	VN02N
60	1	045-0014-03	J11	10-84-4030 (3 PIN MOLEX)
61	1	045-5015-00	J12	12PKK156 (PIN 7=KEY)
62	1	045-0014-09	J17	10-84-4090 (9 PIN MOLEX)
63	1	n/a	BLANKING	Test Point - Do Not Stuff
64	1	121-5050-00	R217	4.7K Ω 2W Res. (SANDBAR)
65	1	045-5014-01	J13	10PKK156 (PIN 2=KEY)
66	1	045-0014-06	J14	10-84-4060 (6 PIN MOLEX)
67	1	045-5014-01	J10	10PKK156 (PIN 6=KEY)
68	1	045-5015-00	J3	12PKK156 (PIN 8=KEY)
69	1	045-5013-00	J9	9PKK156 (PIN 3=KEY)
70	1	045-5013-00	J8	9PKK156 (PIN 2=KEY)
71	26	205-0004-00	F6>F9, F20>F28	Fuse Clips
72	1	n/a	U19	Heatsink (5v Reg.)

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CPU Section:

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

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

The I/O Interface **CN1** is buffered by two (2) **HC245** Chips. The CPU's reset line is buffered by **Q10** and fed over to the I/O through **CN1**. An I/O strobe signal is 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 eight (8) **2N3904** Transistors which pull one of 8 strobes 'low' to activate a Single Column of switches. The *Switch Return Signals* are fed into **CN7** [SWITCH ROWS] and are highly filtered and compared to a 2.5v reference voltage. The *Switch Return Voltage* must be below 2.5v to make a *Valid Switch Closure*. If false switches are appearing, check that none of the **2N3904** Transistors are permanently pulling the *strobe line low*. Only one strobe from **CN5** [SWITCH COLUMNS] should be *low at any time*. **CN6** [DEDICATED SWITCH IN] is a *Dedicated Bank of Input Switches*. Switches connected to **CN6** are connected to ground instead of a strobe and may be read at any time.

Plasma Interface:

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

Sound Section:

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

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

Other Test Points:

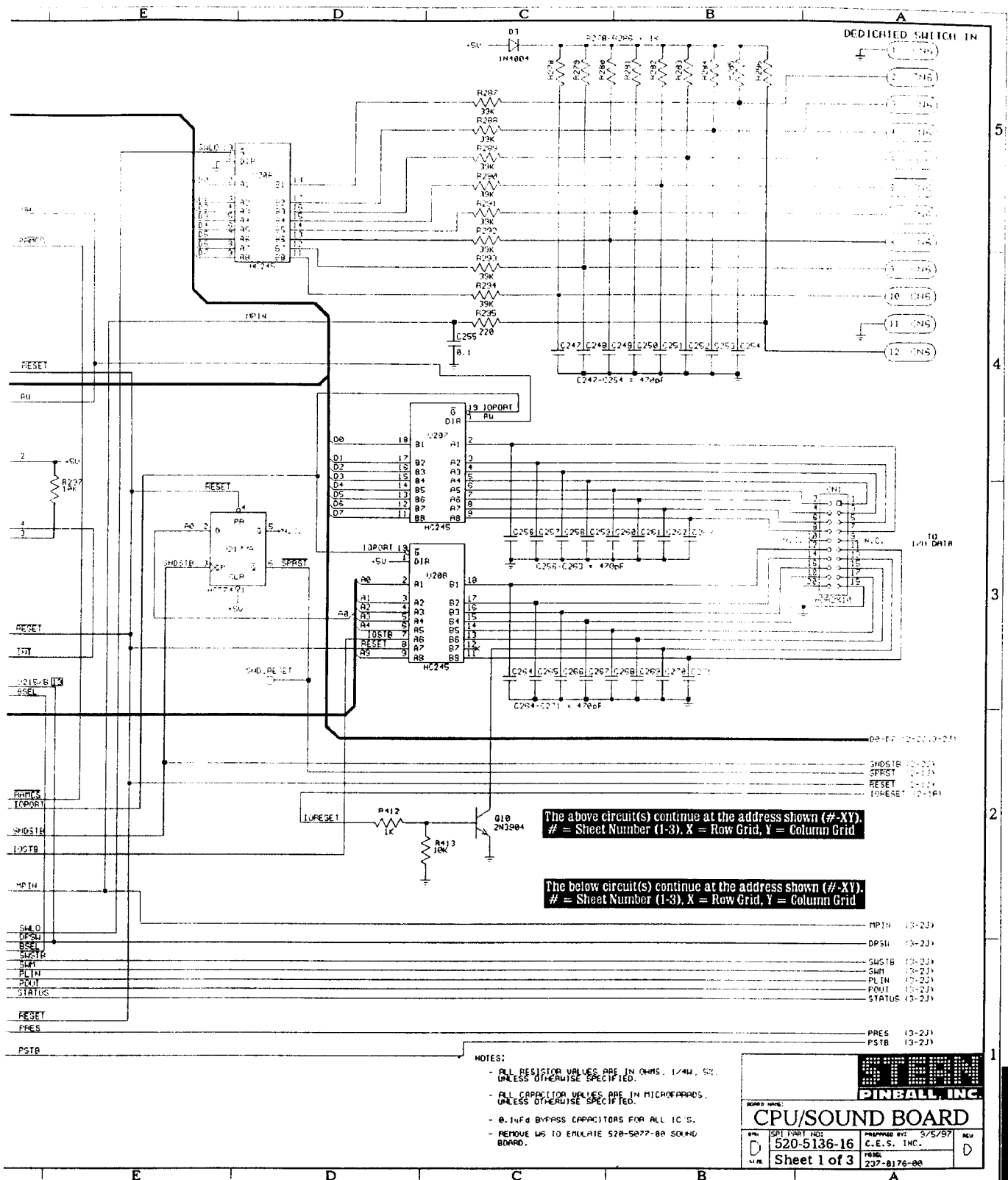
E & Q - The CPU signals for both **68B09E** processors. Should be at 2Mhz with Q leading E by 500 nsec.

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

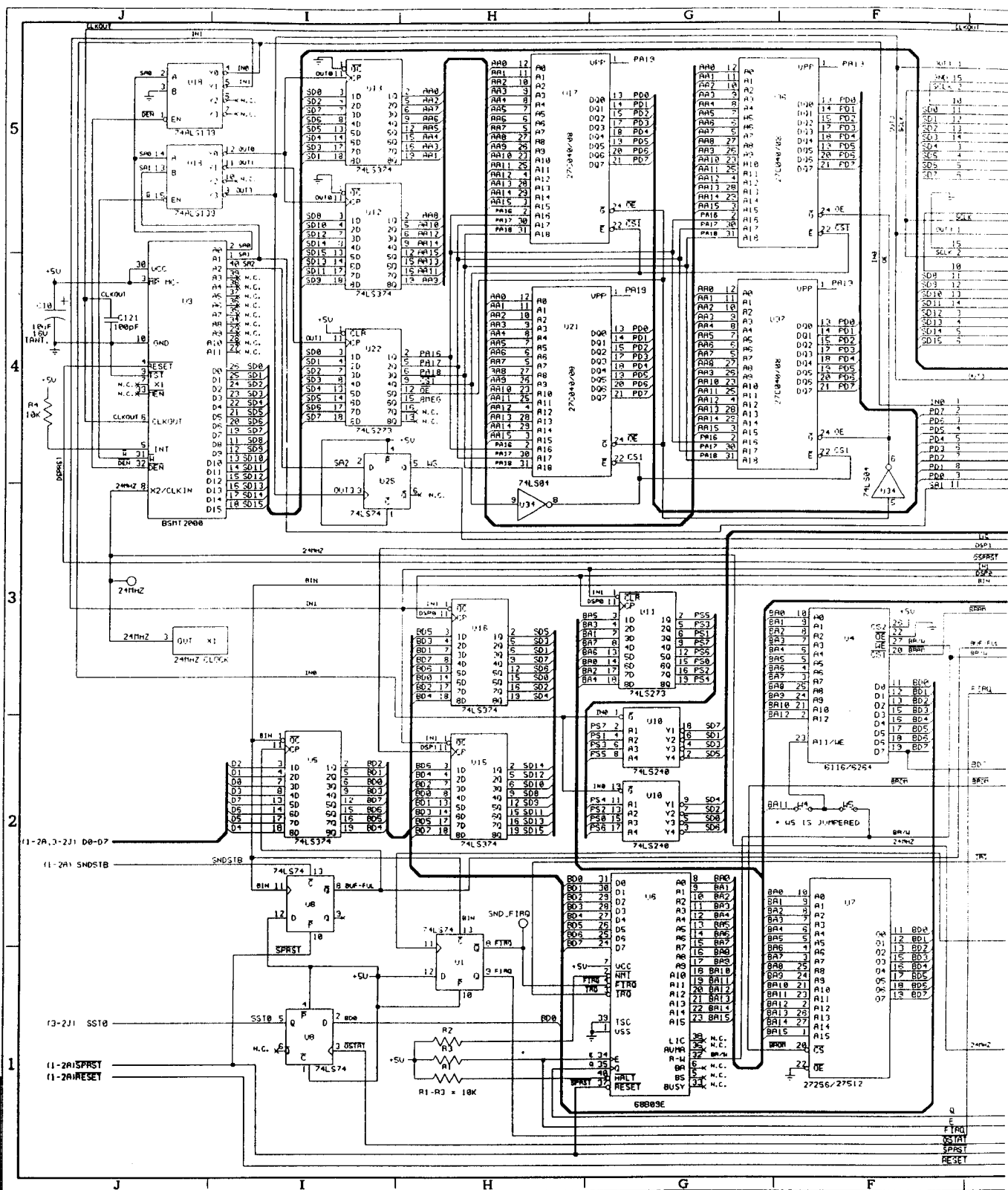
SND-FIRQ - The sound sections CPU interrupt.

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

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

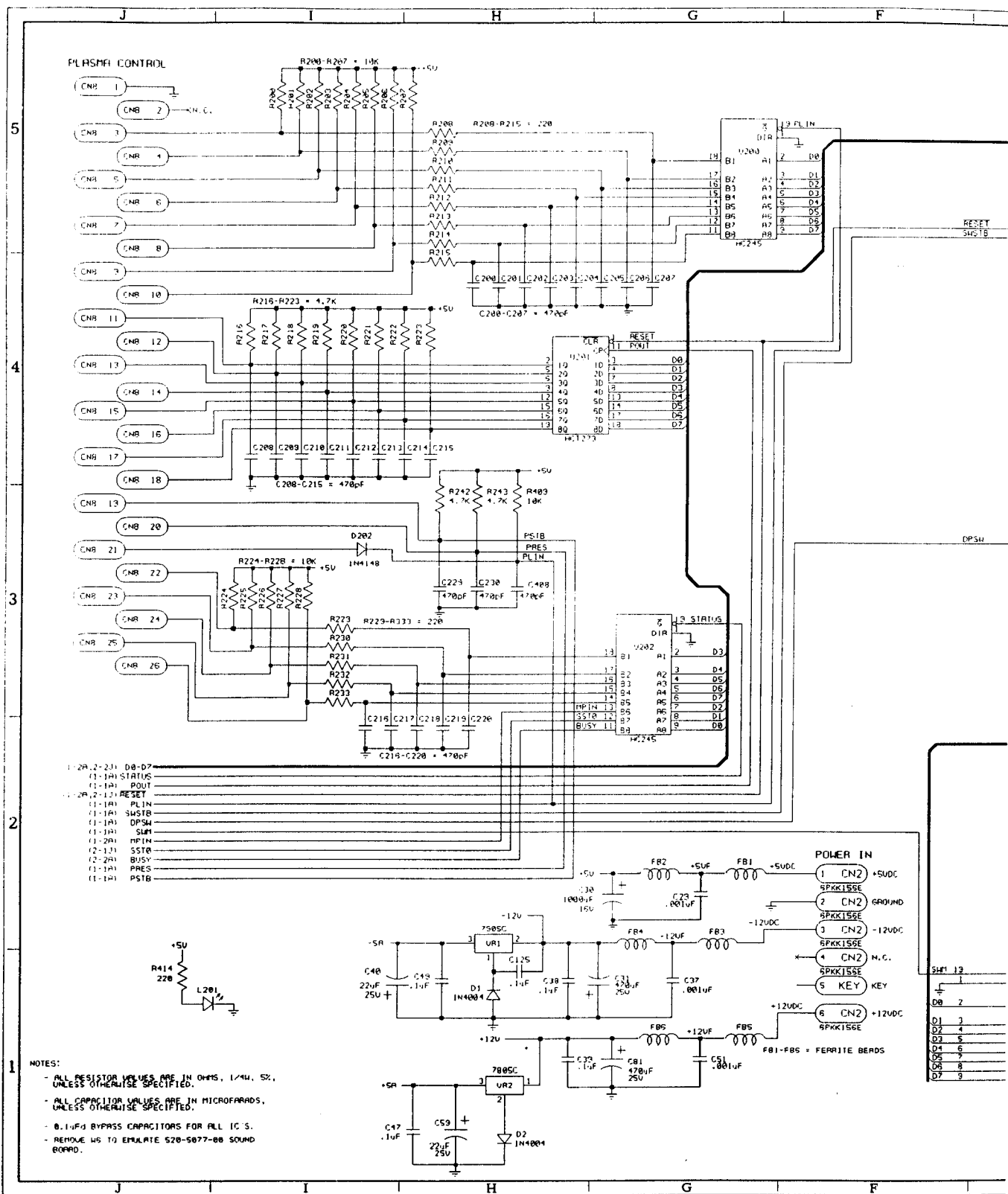


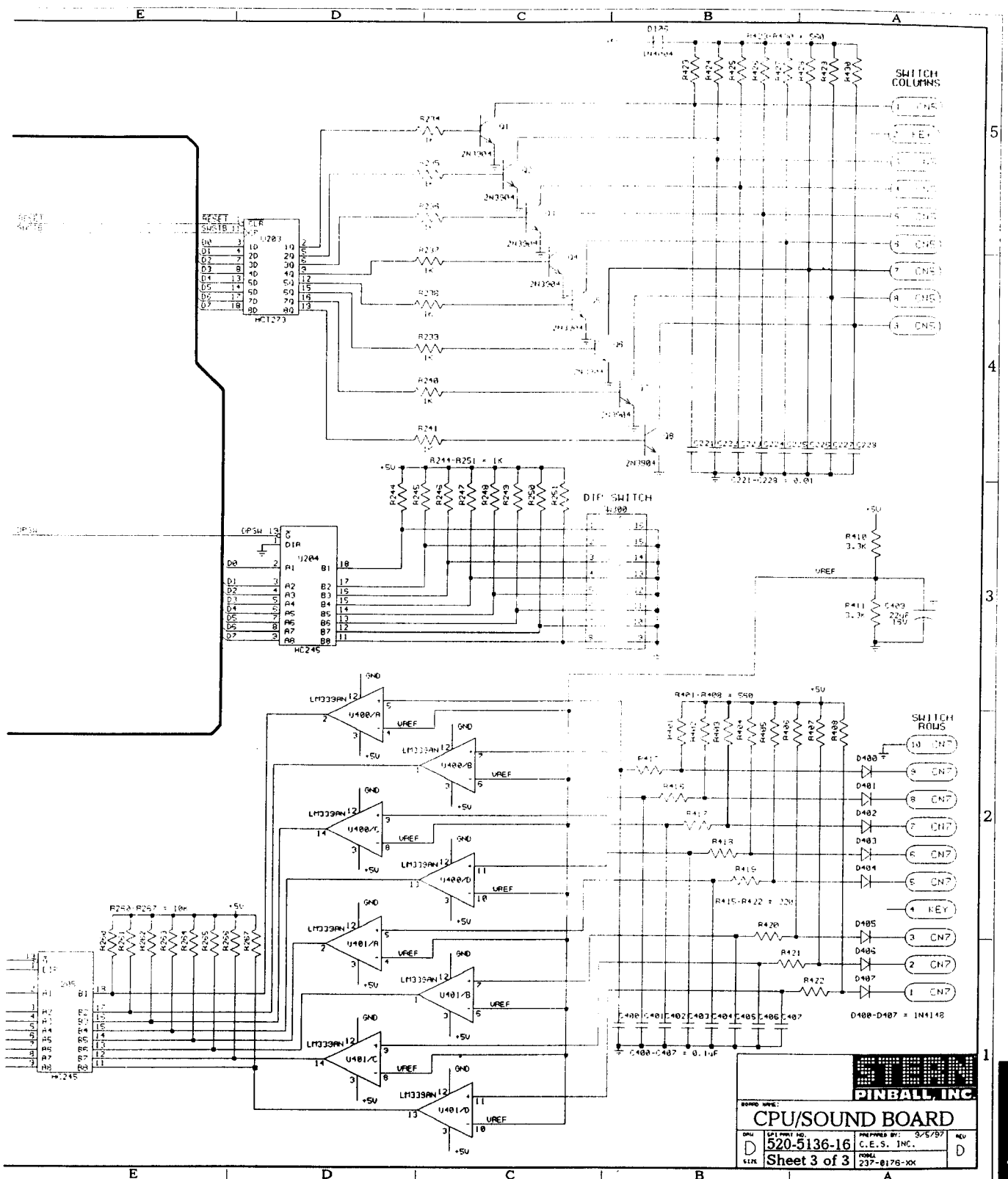
CPU/Sound Board Schematic (Sheet 2 of 3)



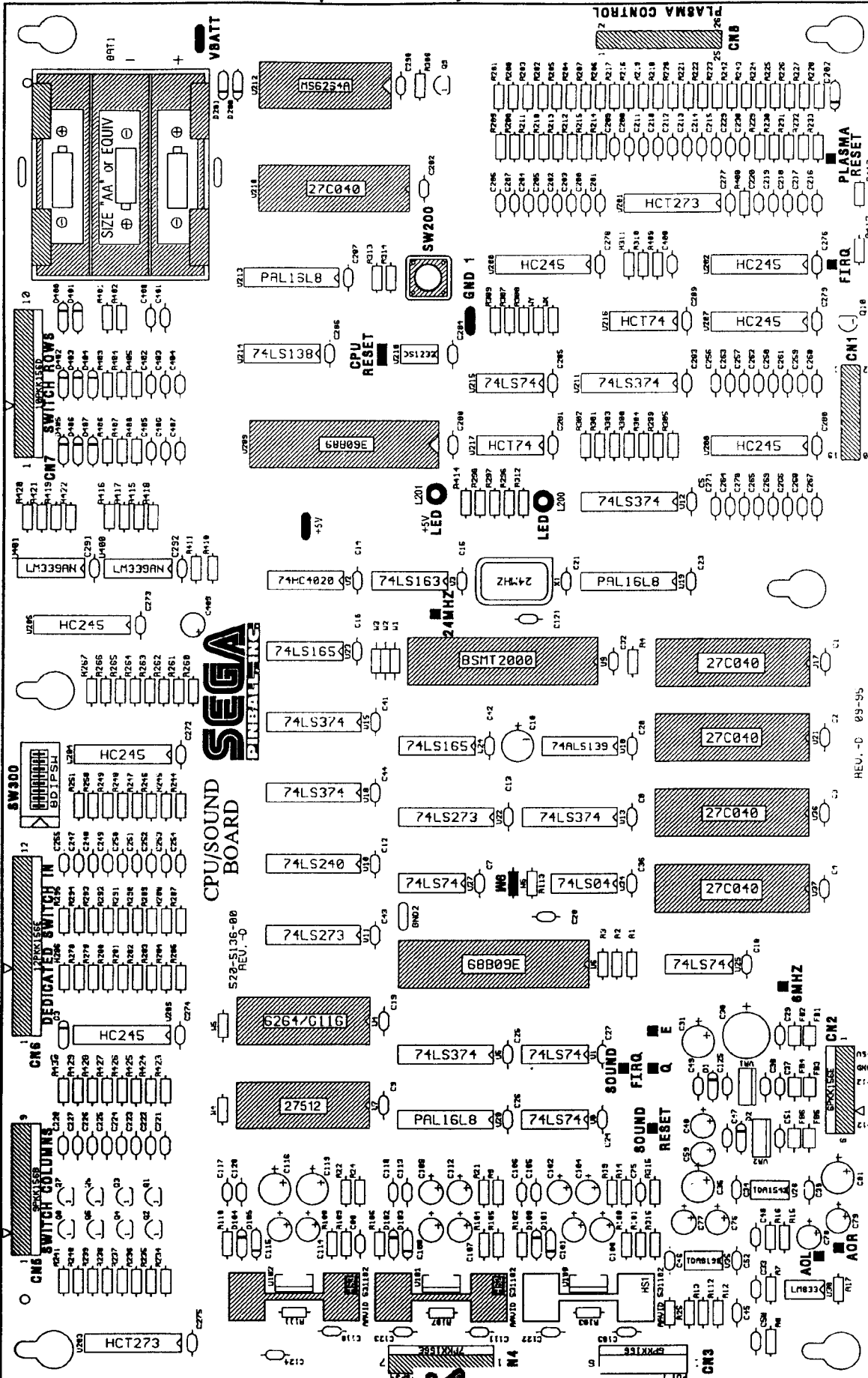
Kenny
Pakende

Section 5, Chapter 4
Printed Circuit Boards (PCBs)





CPU/Sound Board Component Layout



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

1 1 6

Key

Section 5, Chapter 4
Printed Circuit Boards (PCBs)

CPU/Sound Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
1	1	520-5136-16	CPU/Sound Board Mono (FCC FEB98)	Complete PCB Assembly
2	5	124-5001-00	VR2	LM7805CT +5v Regulator
3	2	121-5051-00	R12, R13, R19, R21, R22, R24	100K Ω 1/4W Res. (R19: NS)
4	38	121-5009-00	R103, R107, R111	1K Ω 1/4W Res. (R103: NS)
5	5	121-5011-00	R1>R4, R113, R200>R207, R224>R228, R244>R251, R260>R267, R296>R299, R301>R306, R409, R413	10K Ω 1/4W Res. (R200>R207, R409, R413: NS)
6	20	121-5023-00	R9, R14, R100, R102, R104, R106, R110	22K Ω 1/4W Res. (R100, R102: NS)
7	4	121-5009-00	R15, R8, R234>R241, R278>R286, R412	1K Ω 1/4W Res.
8	1	121-5043-00	R16, R17, R25, R112	2.2K Ω 1/4W Res.
9	2	121-5018-00	R7	1.5K Ω 1/4W Res.
10	9	121-5046-00	R101, R105, R109	470K Ω 1/4W Res. (R101: NS)
11	1	121-5045-00	R108, R287>R294	39K Ω Res.
12	12	121-5036-00	R312	330 Ω 1/4W Res.
13	15	n/a	R300, R308>R311, R313>R316, WX, WY	0 Ω Jumper Wire (24ga.)
14	11	121-5033-00	R208>R215, R229>R233, R414>R422	220 Ω 1/4W Res. (R208>R215: NS)
15	16	121-5021-00	R216>R223, R242, R243, R400	4.7K Ω 1/4W Res.
16	2	121-5047-00	R401>R408, R423>R430	560 Ω 1/4W Res.
17	1	121-5048-00	R410, R411	3.3K Ω 1/4W Res.
18	1	100-0049-00	U3	74LS163
19	1	(See Pg. DR. 6 Table)	U7	27512 EPROM
20	1	045-5015-07	CN4	7PKK156 (PIN5=KEY)
21	5	Not Used	RESET	Do Not Stuff
22	2	(See Pg. DR. 6 Table)	U17, U21, U36, U37, U210	27C040 EPROM
23	4	100-5008-00	U23, U24	74LS165
24	4	125-5017-00	C76>C79	10uF, 25v, Radial Lytic Cap.
25	2	125-5020-00	C40, C59, C101, C108, C115	22uF, 25v, Radial Lytic Cap. (C101: NS)
26	2	125-5017-00	C100, C107, C114	10uF, 35v, Radial Lytic Cap. (C100: NS)
27	1	125-5015-00	C102, C104, C109, C112	100uF, 25v, Rad. Ltc. Cap. (C102, C104: NS)
28	1	125-5014-00	C409	22uF, 16v, Radial Lytic Cap.
29	1	100-5016-00	U35	TDA1899
30	1	125-5037-00	C30	1000uF, 16v, Radial Lytic Cap.
31	1	100-0027-00	U34	74LS04
32	6	100-0043-00	U18	74ALS139
33	1	100-0064-00	U5, U12, U13, U15, U16, U211	74LS374
34	1	100-0249-00	U2	74HC4020
35	6	100-0149-00	U10	74LS240
36	2	n/a	W1>W6 (Jumper required @ W6 if using 8MB EPROMs)	0 Ω Jumper Wire (24ga.)
37	2	125-5019-00	C31, C81	470uF, 25v, Radial Lytic Cap.
38	2	125-5017-00	C10, C35	10uF, 16v, Radial Tant. Cap.
39	1	125-5012-00	C116, C119	220uF, 25v, Radial Lytic Cap.
40	1	045-5015-06	CN2	6PKK156 (PIN 5=KEY)
41	1	140-0011-00	X1	24Mhz
42a	1	105-0116-00	U9	BSMT2000
42b	1	965-0136-00	U19 - YELLOW DOT	PAL16L8 (Programmed) - YELLOW DOT
42c	1	965-0137-00	U20 - WHITE DOT	PAL16L8 (Programmed) - WHITE DOT
43	5	965-6504-00	U213 - BLUE DOT	PAL16L8 (Programmed) - BLUE DOT
44	3	100-0037-00	U1, U8, U25, U27, U215	74LS74
45	79	125-5043-00	C29, C37, C51	0.001uF (102), Cap.
		125-5031-00	C1>C5, C7>C9, C12>C16, C18>C21, C23>C26, C28, C32>C34, C36, C38, C39, C41>C47, C49, C52, C102, C103, C105, C106, C110, C111, C113, C117, C118, C120, C122>C125, C255, C272>C292, C400>C407, C121	0.1uF (104), Axial Cer. Cap. (C102, C103, C105, C106: NS)
46	1	125-5038-00	C48, C50, C75, C80	100pF (101), Cap.
47	4	125-5039-00	C200>C220, C229, C230, C247>C254, C256>C271	0.0022uF (222), Cap.
48	39	125-5028-00	C221>C228, C408	470pF (471), Cer. Cap. (C200>C207: NS)
49	8	125-5029-00	CN3	0.01uF (103), 100v Cap. (C408: NS)
50	1	045-5015-06	U30	6PKK156
51	1	100-0375-00	U22 U11	LM833
52	2	100-0022-00	D1>D3, D100>D105	74LS273
53	7	112-5003-00	D200, D201	1N4004, Diode (D100, D101: NS)
54	2	112-5008-00	D202, D400>D407	1N5817, Diode
55	8	112-0054-00	VR1	1N4148, Diode (D202: NS)
56	1	124-5002-00	U100>U102	LM7905CT -5v Regulator
57	2	100-5016-20	U26	TDA2030V (U100: NS)
58	1	100-5018-00	SW200	TDA1543
59	1	n/a	L200	B3F4000
60	1	165-5099-00	L201	LED T1-3/4 DIFFUSER LED
61	1	165-5099-00	U216, U217	LED T1-3/4 DIFFUSER LED
62	2	100-5015-00	U214	HCT74
63	1	100-0148-00	U212	74LS138
64	1	105-0046-00	U6, U209	MS6264A
65	1	100-0189-01	BAT1 BATTERY HOLDER	68B09E
66	1	045-5015-01	CN1	3-AA CELLS 4.5v
67	10	n/a	6MHZ AOR Q AOL 24MHZ	20-Pin, 0.1 HEADER
68	10	110-0069-00	Q1>Q10	Test Points - NS
69	1	045-5013-00	CN5	2N3904, Transistor
70	2	100-5012-00	U201, U203	9PKK156 (PIN 2=KEY)
71	6	100-0338-00	U200, U202, U204>U208	74HCT273
72	1	100-5023-00	U218	74HC245 (U200: NS)
73	1	045-5015-26	CN8	DS1232
74	1	045-5014-01	CN7	26-Pin, 0.1 HEADER
75	1	n/a	VBATT +5V GND1, GND2	10PKK156 (PIN 4=KEY)
76	4	045-5015-00	CN6	Test Point Wire (24ga.) Loops
77	1	181-5002-00	SW300	12PKK156 (PIN 5=KEY)
78	2	100-0377-00	U400, U401	8-Pin, Dip Switch
79	1	105-0052-05	U4	LM339AN
80	3	535-5000-10	U100>U102	6116 RAM
81	3	077-5209-00	U6, U9, U209	AAVID 531102
82	5	077-5217-00	U17, U21, U36, U37, U210	40-Pin, IC Socket
83	3	077-5208-00	U4, U7, U212	32-Pin, IC Socket
84	1	n/a	U1 (@ Pins 5 & 6)	28-Pin, IC Dip Socket
85				100pF, Cap.

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APPENDIX A

Pinball Game Firmware Table

EPROM	Chlp Size	Program Part N°	USA Ver.	Bd. Loc.	Raw Part N°
Laser War					
CPU	(256K)	965-0004-00		C5	960-5007-00
Sound (104)	(256K)	965-0005-00		J6	960-5007-00
Sound (104)	(256K)	965-0006-00		J6	960-5007-00
Sound (104)	(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)	965-0013-00		6F	960-7001-02
Voice 2	(512K)	965-0014-00		4F	960-7001-02
Sound	(256K)	965-0015-00		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)	965-0018-00		6F	960-7001-02
Voice 2	(512K)	965-0019-00		4F	960-7001-02
Sound	(256K)	965-0020-00		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)	965-0023-00		6F	960-7001-02
Voice 2	(512K)	965-0024-00		4F	960-7001-02
Sound	(256K)	965-0025-00		7F	960-5007-00
Playboy 35th Anniversary					
CPU	(256K)	965-0026-00	A02-3	B5	960-5007-00
CPU	(256K)	965-0027-00	A02-3	C5	960-5007-00
Voice 1	(512K)	965-0028-00		6F	960-7001-02
Voice 2	(512K)	965-0029-00		4F	960-7001-02
Sound	(256K)	965-0030-00		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)	965-0033-00		6F	960-7001-02
Voice 2	(512K)	965-0034-00		4F	960-7001-02
Sound	(256K)	965-0035-00		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)	965-0038-00		6F	960-7001-02
Voice 2	(512K)	965-0039-00		4F	960-7001-02
Sound	(256K)	965-0040-00		7F	960-5007-00
Phantom of the Opera					
CPU	(256K)	965-0041-00	A03-2	B5	960-5007-00
CPU	(256K)	965-0042-00	A03-2	C5	960-5007-00
Voice 1	(512K)	965-0043-00		6F	960-7001-02
Voice 2	(512K)	965-0044-00		4F	960-7001-02
Sound	(256K)	965-0045-00		7F	960-5007-00
Back to the Future					
CPU	(256K)	965-0046-00	A02-0	B5	960-5007-00
CPU	(256K)	965-0047-00	A02-0	C5	960-5007-00
Voice 1	(512K)	965-0048-00		6F	960-7001-02
Voice 2	(512K)	965-0049-00		4F	960-7001-02
Sound	(256K)	965-0050-00		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)	965-0053-00		6F	960-7001-02
Voice 2	(512K)	965-0054-00		4F	960-7001-02
Sound	(256K)	965-0055-00		7F	960-5007-00
Checkpoint					
CPU	(256K)	965-0056-00	A1-7	B5	960-5007-00
CPU	(256K)	965-0057-00	A1-7	C5	960-5007-00
Voice 1	(1M)	965-0058-00		F7	960-5009-00
Voice 2	(1M)	965-0059-00		F4	960-5009-00
Sound	(256K)	965-0060-00		F4	960-5007-00
Display	(512K)	965-0061-00	CP80	U8	960-7001-02
Teenage Mutant Ninja Turtles					
CPU	(256K)	965-0062-00	A1.04	B5	960-5007-00
CPU	(256K)	965-0063-00	A1.04	C5	960-5007-00
Voice 1	(1M)	965-0064-00		F5/6	960-5009-00
Voice 2	(1M)	965-0065-00		F4/5	960-5009-00
Sound	(256K)	965-0066-00		F7	960-5007-00
Display	(512K)	965-0067-00	A1.04	U8	960-7001-02
Batman					
CPU	(128K)	965-0068-00	A1.06	B5	960-5006-00
CPU	(256K)	965-0069-00	A1.06	C5	960-5007-00
Voice 1	(2M)	965-0070-00		U17	960-5010-00
Voice 2	(1M)	965-0071-00		U21	960-5009-00
Sound	(256K)	965-0072-00		U7	960-5007-00
Display	(1M)	965-0073-00	A1.06	U8	960-5009-00
Star Trek 25th Anniversary					
CPU	(512K)	965-0074-00	A2.01	C5	960-7001-02
Voice 1	(2M)	965-0075-00		U17	960-5010-00
Voice 2	(2M)	965-0076-00		U21	960-5010-00
Sound	(256K)	965-0077-00		U7	960-5007-00
Display	(1M)	965-0078-00	A1.09	U8	960-5009-00
Hook					
CPU	(512K)	965-0079-00	A4.08	C5	960-7001-02
Voice 1	(2M)	965-0080-00		U17	960-5010-00
Voice 2	(2M)	965-0081-00		U21	960-5010-00
Sound	(256K)	965-0082-00		U7	960-5007-00
Display	(1M)	965-0083-00	A4.01	U8	960-5009-00

EPROM	Chlp Size	Program Part N°	USA Ver.	Bd. Loc.	Raw Part N°
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)	965-0169-00		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
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



APPENDIX A

Pinball Game Firmware (for White Star Board System) Table



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

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

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

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

Space Jam					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0229-43	A3.00 \$E6FF	U210	960-5009-00
Voice 1	(4M)	965-0230-43		U17	960-5015-01
Voice 2	(4M)	965-0231-43		U21	960-5015-01
Voice 3	(4M)	965-0232-43		U36	960-5015-01
Sound	(512K)	965-0233-43		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0234-43	A3.00 \$0057	ROM 0	960-5015-01

The Star Wars Trilogy - Special Edition (S.E.)					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0235-56	A4.03 \$5EFF	U210	960-5009-00
Voice 1	(4M)	965-0236-56		U17	960-5015-01
Voice 2	(4M)	965-0237-56		U21	960-5015-01
Sound	(512K)	965-0238-56		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0239-56	A4.00 \$8817	ROM 0	960-5015-01

The Lost World: Jurassic Park					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0240-53	A2.01 \$C2FF	U210	960-5009-00
Voice 1	(4M)	965-0241-53		U17	960-5015-01
Voice 2	(4M)	965-0242-53		U21	960-5015-01
Sound	(512K)	965-0243-53		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0244-53	A2.01 \$7F46	ROM 0	960-5015-01

The X-Files					
CPU / Sound Board: 520-5136-10 (Mono)					
Game ROM	(1M)	965-0245-46	A3.03 \$A2FF	U210	960-5009-00
Voice 1	(4M)	965-0246-46		U17	960-5015-01
Voice 2	(4M)	965-0247-46		U21	960-5015-01
Sound	(512K)	965-0248-46		U7	960-7001-02
Display Controller Bd.: 520-5055-01					
Display	(4M)	965-0249-46	A3.00 \$66D0	ROM 0	960-5015-01

Starship Troopers					
CPU / Sound Board: 520-5136-15 (Mono FCC NOV97)					
Game ROM	(1M)	965-0250-59	A2.00 \$85FF	U210	960-5009-00
Voice 1	(4M)	965-0251-59		U17	960-5015-01
Voice 2	(4M)	965-0252-59		U21	960-5015-01
Voice 3	(4M)	965-0255-59		U36	960-5015-01
Sound	(512K)	965-0253-59		U7	960-7001-02
Display Controller Bd.: 520-5055-02 (FCC NOV97)					
Display	(4M)	965-0254-59	A2.00 \$E77B	ROM 0	960-5015-01

ROM	Chip Size	Program Part N°	USA Ver. I / Sum	Bd. Loc.	Raw Part N°
Viper Night Drivin'					
CPU / Sound Board: 520-5136-16 (Mono FCC FEB98)					
Game ROM	(1M)	965-0266-35	A2.01 \$C5FF	U210	960-5009-00
Voice 1	(4M)	965-0267-35		U17	960-5015-01
Voice 2	(4M)	965-0268-35		U21	960-5015-01
Voice 3	(4M)	965-0269-35		U36	960-5015-01
Voice 4	(4M)	965-0270-35		U37	960-5015-01
Sound	(512K)	965-0271-35		U7	960-7001-02
Display Controller Bd.: 520-5055-03 (FCC FEB98)					
Display	(4M)	965-0272-35	A2.01 \$C17D	ROM 0	960-5015-01

Lost In Space					
CPU / Sound Board: 520-5136-16 (Mono FCC FEB98)					
Game ROM	(1M)	965-0282-60	A1.01 \$B2FF	U210	960-5009-00
Voice 1	(4M)	965-0283-60		U17	960-5015-01
Voice 2	(4M)	965-0284-60		U21	960-5015-01
Voice 3	(4M)	965-0285-60		U36	960-5015-01
Voice 4	(4M)	965-0286-60		U37	960-5015-01
Sound	(512K)	965-0287-60		U7	960-7001-02
Display Controller Bd.: 520-5055-03 (FCC FEB98)					
Display	(4M)	965-0288-60	A1.02 \$32AB	ROM 0	960-5015-01

Godzilla					
CPU / Sound Board: 520-5136-16 (Mono FCC FEB98)					
Game ROM	(1M)	965-0289-40	A2.05 \$B1FF	U210	960-5009-00
Voice 1	(4M)	965-0290-40		U17	960-5015-01
Voice 2	(4M)	965-0291-40		U21	960-5015-01
Voice 3	(4M)	965-0292-40		U36	960-5015-01
Voice 4	(4M)	965-0293-40		U37	960-5015-01
Sound	(512K)	965-0294-40		U7	960-7001-02
Display Controller Bd.: 520-5055-03 (FCC FEB98)					
Display	(4M)	965-0295-40	A2.00 \$C929	ROM 0	960-5015-01

South Park					
CPU / Sound Board: 520-5136-16 (Mono FCC FEB98)					
Note: This game uses four (4) 8MB VOICE ROMS at U17, U21, U36 & U37 requiring a Jumper at Loc. W6. Refer to CPU/Snd. Bd. Schematic (2 of 3).					
Game ROM	(1M)	965-0301-71	A1.03 \$58FF	U210	960-5009-00
Voice 1	(8M)	965-0302-71		U17	960-5016-00
Voice 2	(8M)	965-0303-71		U21	960-5016-00
Voice 3	(8M)	965-0304-71		U36	960-5016-00
Voice 4	(8M)	965-0305-71		U37	960-5016-00
Sound	(512K)	965-0306-71		U7	960-7001-02
Display Controller Bd.: 520-5055-03 (FCC FEB98)					
Display	(4M)	965-0307-71	A1.01 \$166F	ROM 0	960-5015-01

Golden Cue Tournament Edition					
CPU / Sound Board: 520-5136-16 (Mono FCC FEB98)					
Game ROM	(1M)	965-0308-64	A1 \$	U210	960-5009-00
Voice 1	(4M)	965-0309-64		U17	960-5015-01
Voice 2	(4M)	965-0310-64	GAME CODE	U21	960-5015-01
Voice 3	(4M)	965-0311-64	IN	U36	960-5015-01
Sound	(512K)	965-0312-64	PRODUCTION	U7	960-7001-02
Display Controller Bd.: 520-5055-03 (FCC FEB98)					
Display	(4M)	965-0313-64	A1 \$	ROM 0	960-5015-01

Game Revisions can be updated after the Production Run. This Table is accurate as of the printing of this manual. If any changes occurred, the next game manual will include the updated information. The version stated is USA. If there is a question of as to the latest Code Revision & Check Sum call our Technical Support Department.

APPENDIX B

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

Table Nº	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	112-0062-00B	NTE5092A	ECG5092A	— — — —	SK68V
	Diode	1N4764A 100v	112-0049-00A	NTE5096A	ECG5096A	— — — —	SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A	— — — —	SK3A9
	Diode	1N5234B 6.2v	112-0047-00B	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	— — — —	SK110X
	Diode	1N6267A 6.8v	112-5011-00	— — — —	ECG4902	— — — —	— — — —
	Diode	1N4752A 33v	112-5010-00A	— — — —	— — — —	— — — —	SK33V
3	Diode	1N4736 6.8v 1w	112-5007-00	— — — —	— — — —	— — — —	— — — —
	TRANSISTORS - TYPE FET, NPN, PNP AND/OR SCR						
	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	124-5000-00	For White Star I/O Bds., BR = 35 Amp @ 100v P.I.V.			
	BR (Old)	MDA2501	124-2501-00	BR = 25 Amp @ 100v P.I.V.			
	BR (Old)	MDA3502	124-3502-00	BR = 35 Amp @ 200v P.I.V.			
RELAYS				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

Game Mfg. Date, Manual Part N° and CPU Jumper Table (1-28 only)

Game Name	Game Mfg. Date and Manual PN ²	CPU Ver.	EPROM Position	Jumpers Installed	Jumpers Removed	Game Name	Game Mfg. Date and Manual PN ²	CPU Ver.	EPROM Position	Jumpers Installed	Jumpers Removed
1. Laser War	MAY 87 780-5001-00	1	5C	J4 J6a J7a	J5 J6 J7b	29. Apollo 13	NOV 95 780-5044-00	—	U210	n / a	n / a
2. Secret Service	MAR 88 780-5002-00	2	5B, 5C	J4 J5a J6a	J5 J5b J6b	30. Golden Eye	FEB 96 780-5042-00	—	U210	n / a	n / a
3. Torpedo Alley	AUG 88 780-5003-00	2	5B, 5C	J4	J5	31. Twister	APR 96 780-5041-00	—	U210	n / a	n / a
4. Time Machine	DEC 88 780-5004-00	2	5B, 5C	J4	J5	32. ID4: Independence Day	JUL 96 780-5045-00	—	U210	n / a	n / a
5. Playboy 35th Anniversary	MAY 89 780-5005-00	2	5B, 5C	J4	J5	33. Space Jam	OCT 96 780-5043-00	—	U210	n / a	n / a
6. ABC Monday Night Football	SEP 89 780-5007-00	2	5B, 5C	J4	J5	34. The Star Wars Trilogy - S.E.	FEB 97 780-5056-00	—	U210	n / a	n / a
7. Robocop	NOV 89 780-5006-00	2	5B, 5C	J4	J5	35. The Lost World: J.P.	JUN 97 780-5053-00	—	U210	n / a	n / a
8. Phantom of the Opera	JAN 90 780-5008-00	2	5B, 5C	J4	J5	36. The X-Files	AUG 97 780-5046-00	—	U210	n / a	n / a
9. Back to the Future	JUN 90 780-5009-00	3	5B, 5C	J4	J5	37. Starship Troopers	NOV 97 780-5059-00	—	U210	n / a	n / a
10. The Simpsons	SEP 90 780-5012-00	3	5B, 5C	J4	J5	38. Viper Night Drivin'	FEB 98 780-5035-00	—	U210	n / a	n / a
11. Checkpoint	FEB 91 780-5010-00	3	5B, 5C	J4	J5	39. Lost In Space	JUN 98 780-5060-00	—	U210	n / a	n / a
12. Teenage Mutant Ninja Turtles	MAY 91 780-5017-00	3	5B, 5C	J4	J5	40. Godzilla	SEP 98 780-5040-00	—	U210	n / a	n / a
13. Batman	JUL 91 780-5011-00	3	5B, 5C	J4	J5	41. South Park	JAN 99 780-5071-00	—	U17 U21 U36 U37	W6 CPU/Snd.	n / a
14. Star Trek 25th Anniversary	OCT 91 780-5014-00	3	5C	J5	J4	42. Golden Cue Tournament Ed.	JUN 99 780-5064-00	—	U210	n / a	n / a
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						

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

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

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

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

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

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

APPENDIX D Board Type Table

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

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

*Kelly
Peckard's*

Table continued on the next page.

Appendix — D —
Board Type Table

APPENDIX D Board Type Table



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

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

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

Game Name	I/O Power Driver	CPU/Sound Mono	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO TRANS./REC.	OPTO APPLICATION
Twister	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
	Misc.: Light Bds. (520-5145-01 thru -07), Mag. Drvr. Bd. (520-5143-00) & Relay Bd. (520-5010-00)						
ID4: Independence Day	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
	Misc.: Light Bds. (520-5149-01 thru -10) & Servo Motor Bd. (520-5152-00)					520-5082-00 520-5083-00	Long Hop OPTO: Alien Head
Space Jam	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
	Misc.: 2X 7-Segment Display Bd. (520-5153-00)						
The Star Wars Trilogy - Special Edition	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
	Misc.: Relay Bd. (520-5010-00)						
The Lost World: J.P.	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
	Misc.: DC Relay Bd. (520-5066-00) & Shaker Motor Bd. (520-5065-00)					520-5162-00 (combo)	Slotted OPTO: Snagger Motor
The X-Files	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32	520-5055-01	520-5124-00 520-5125-00	Single OPTO: Ball Trough
						520-5082-00 520-5083-00	Long Hop OPTO: File Cab. Enter
						520-5155-00 (combo)	Slotted OPTO: File Cab. Motor
Starship Troopers	520-5137-01	520-5136-15	520-5138-00	520-5052-00 128 X 32	520-5055-02	520-5124-00 520-5125-00	Single OPTO: Ball Trough
	Misc.: 4X 7-Segment Display Bd. (520-5166-00)					520-5082-00 520-5083-01	Long Hop OPTO: L/R Orbit Lane
Viper Night Drivin'	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5124-00 520-5125-00	Single OPTO: Ball Trough
	Misc.: Relay Bd. (520-5010-00)					520-5082-00 520-5083-01	Long Hop OPTO: Jump Ramp
Lost In Space	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5173-00 520-5174-00	Dual OPTO: Ball Trough
	Misc.: Relay Bd. (520-5010-00)						
Godzilla	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5173-00 520-5174-00	Dual OPTO: Ball Trough
	Misc.: Shaker Motor Bd. (520-5065-00)						
South Park	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5173-00 520-5174-00	Dual OPTO: Ball Trough
						520-5082-00 520-5083-01	Long Hop OPTO: Kenny Trough
Golden Cue Tournament Edition	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32	520-5055-03	520-5173-00 520-5174-00	Dual OPTO: Ball Trough

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

APPENDIX E

Generic Coil Cross-Reference Guide † ‡

STANDARD COILS						FLIPPER COILS			
GA-TURNS	Res. (Ω)	SPI PART N°	GA-TURNS	Res. (Ω)	SPI PART N°	GAUGE-TURNS	Res. (Ω)	COLOR	SPI PART N°
20-400	1.0 Ω	090-5021-00	24-940 †	5.5 Ω	090-5036-00T	21-900 †	not available	RED	090-5020-10T
22-500	1.7 Ω	090-5017-00			090-5036-00B	22-750/30-2600 ‡	2.6 / 92.0 Ω	N/A	090-5011-00
22-600	2.2 Ω	090-5023-00	25-1240	9.3 Ω	090-5034-00	22-900 †	3.4 Ω	YEL	090-5020-20T
23-700	3.1 Ω	090-5022-00	26-1200 †	10.3 Ω	090-5044-00T	22-1080 †	4.3 Ω	YEL/GRN	090-5032-00T
23-750	3.4 Ω	090-5019-00			090-5044-00B				090-5032-00B
23-800 †	3.6 Ω	090-5001-00T	27-1300	14.2 Ω	090-5003-00	23-620/30-2600 ‡	2.4 / 75.0 Ω	N/A	090-5006-00
		090-5001-00B	27-1400	14.7 Ω	090-5015-00	23-700/30-2600 ‡	3.0 / 83.5 Ω	N/A	090-5013-00
23-840	4.0 Ω	090-5005-00	27-1500	16.3 Ω	090-5004-00T	23-800/30-2600 ‡	2.8 / 90.5 Ω	N/A	090-5012-00
23-1200	7.1 Ω	090-5008-00			090-5004-00B	23-900	3.8 Ω	GRN	090-5020-30
23½-765	3.6 Ω	090-5037-03	28-1050	11.5 Ω	090-5046-00	23-1100	5.1 Ω	ORG	090-5030-00
24-900	5.0 Ω	090-5002-00	29-2000	33.6 Ω	090-5016-00	24-1570	9.5 Ω	N/A	090-5025-00
						25-1800	13.8 Ω	BLU/GRN	090-5041-00

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

† Coil Part N°s ending with a "T" signifies the Diode is on the top of the lug; ...ending with a "B" signifies the Diode is on the bottom of the lug.

‡ These coils are dual-wound.

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

The above coil has 12" leads.

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

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

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

Flipper Coil Table ‡ ††

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

‡ These coils are dual-wound.

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

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

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



Table continued on the next page.

Appendix — E —
Generic & Flipper Coil Tables

APPENDIX E

Flipper Coil Table †

GAME NAME	Nº of Flippers	LOWER FLIPPERS		UPPER FLIPPERS	
		SPI Nº / Gauge-Turns / Color		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
Starship Troopers †	3	090-5030-00T 23-1100 -ORG-	SAME	Not Used	090-5032-00T 22-1080 -YEL-GRN-
Viper Night Drivin' †	2	090-5030-00T 23-1100 -ORG-	SAME	Not Used	Not Used
Lost In Space †	2	090-5030-00T 23-1100 -ORG-	090-5032-00T 22-1080 -YEL-GRN-	Not Used	Not Used
Godzilla †	2	090-5032-00T 22-1080 -YEL-GRN-	SAME	Not Used	Not Used
South Park †	2	090-5030-00T 23-1100 -ORG-	SAME	Not Used	Not Used
Golden Cue Tournament Edition †	3	090-5030-00T 23-1100 -ORG-	SAME	090-5030-00T 23-1100 -ORG-	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

The following table only list games that used motors.

Game Name	Function	Specifications	Part N°
ABC Monday Night Football	Goal Post Up/Down Movement	Motor 24v A.C. 60 RPM CW	515-5222-00
Phantom of the Opera	Organ Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Checkpoint	Mag Wheel (in Backbox)	Motor D.C. (KEN)	041-5005-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Teenage Mutant Ninja Turtles	Spinning Pizza Ball Deflector	Gear Motor 24v A.C. 325 RPM CW	515-5397-00
Batman	Bar Target Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Star Trek 25th Anniversary	Swinging Target	Bowman Motor 24v 22½ RPM	515-5534-00
	Transporter F/X	Gear Motor 24v A.C. 3½ RPM	500-5421-00
	Cooling Fan (for Transporter F/X)	4½" Motor 12v	041-5014-00
Lethal Weapon 3	Spinning Light	Motor 2½ v A.C. 4000 RPM CCW	041-5017-00
Star Wars	Bar Target Up/Down Movement	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
	R2D2 Robot Left/Right Movement	Bowman Motor 24v A.C. 22½ RPM CW	515-5571-00
	Death Star Rotation	Bowman "G" Motor 24v A.C. 60Hz 6 RPM CW	515-5570-00
Rocky & Bullwinkle & Friends	Nell Log "Cutting Blade" Forward/Back Movement	Autotrol Model E Motor 24v 60hz 4W 3 RPM CCW	041-5023-00
Jurassic Park	T-Rex Left/Right Movement	Multi Motor 5v D.C.	041-5025-00
	T-Rex Up/Down Movement	Bowman Motor 24v 11 RPM CW	041-5026-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Last Action Hero	Crane Left/Right Movement	Multi Products Motor 12v D.C. #3312 OSC	041-5027-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Tales from the Crypt	Tombstone Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
The Who's Tommy	Mirror Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Flipper Blinders	Servo Motor (94102)	041-5032-00
	Spinning Airplane Propellers	Motor D.C.	041-5033-00
WWF Royal Rumble	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
Batman Forever	Cannon Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00
Apollo 13	Rocket Up/Down Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00
	Moon Unit Rotational Orbit	Multi Products Motor 24v A.C. 50/60Hz 3W 6 RPM CCW	515-6487-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Golden Eye	Satellite Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CW	515-6528-00

Table continued on the next page.

APPENDIX F

Motor Specification Table

The following table only list games that used motors.

Game Name	Function	Specifications	Part N°
Twister	Spinning Disc with Magnet	Multi Products Motor 24v A.C. 50/60Hz 3W 325 RPM CCW	515-6347-00
	Backbox Fan (Tomado Wind)	Multi Products Motor 24v A.C. 50/60Hz 3W 3600 RPM CW	515-6531-00
ID4: Independence Day	Alien Head Open/Close Movement	Servo Motor (94322)	041-5045-00
The Star Wars Trilogy - S.E.	X-Wing Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 10 RPM CCW	515-6383-01
The Lost World: J.P.	Snagger & Center Link Lift Up/Down Movement	Multi Products Motor 20v D.C. 9 RPM Non-Directional	515-6715-03
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
The X-Files	X-File Cabinet Lift Up/Down Movement	Multi Products Motor 20v D.C. 9 RPM CCW	041-5057-00
Starship Troopers	Warrior Bug Forward/Reverse Movement	Haydon Switch & Instrument, Inc. Stepper Motor, Series 36000: 1.4"ø (Non-Captive Shaft) HSI #36864-12 (Unipolar) / Travel per Step = .004 Step Angle = 15° / 12v D.C. / 4.6W	515-6794-00-59
Lost In Space	Spinning Disc with Magnet	Multi Products Motor 24v A.C. 50/60Hz 3W 325 RPM CCW	515-6347-00
Godzilla	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW ±	041-5029-01

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

‡ **Please Note:** "-01" Shaker Motor is **Not Compatible** with old Shaker Motor 041-5029-00 (Shaker Motor Assy. 515-5893-00). THIS NEW MOTOR CAN ONLY BE USED IN NEW SHAKER MOTOR ASSY. 515-5893-01.

APPENDIX G

Part Number Prefix Classification Codes

I. Electrical Source, Energy & Signal Converters

- 010- Transformers
- 031- Speakers
- 090- Solenoids (Coils)

II. Conductors, Connectors & Insulators

- 034- Line Cords
- 036- Cable and Harness Assemblies
- 041- Motors
- 045- Connectors (All Types)
- 077- Lamp Sockets

III. Circuits & Circuit Elements

- 100- ICs
- 110- Transistors
- 112- Diodes
- 121- Resistors
- 123- Resistors (Variable & Adjustable)
- 124- Regulators & Bridge Rectifiers
- 125- CAPS
- 140- Crystals
- 165- Light Bulbs
- 180- Switches
- 190- Relays

IV. Bolts, Screws, Nuts & Washers

- 231- Bolts
- 232- Screws (Pan Head)
- 234- Screws (HWH)
- 237- Screws (Misc.)
- 240- Nuts (Misc.)
- 242- Washers (Flat, Round)
- 244- Washers (Split Lock)
- 246- Washers (Lockers, External Tooth)

V. Mechanical Components

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

VI. Handles, Locks, Catches & Latches, Keys & Hinges

- 355- Handles, Locks, Catches & Latches and Keys
- 390- Hinges

VII. Fabricated Parts (In-House Assemblies)

- 500- End Product (Systems and Models)
- 515- Sub-Assemblies
- 520- Printed Circuit Boards (PCBs)
- 522- Display Glass
- 525- Wood Parts
- 530- Screw Machined Parts
- 535- Fabricated Parts
- 545- Molded (Extruded) Plastic/Rubber Parts
- 550- Molded (Inserts)

VIII. Bulk Materials

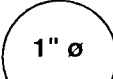
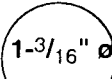
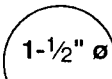
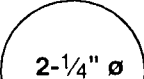
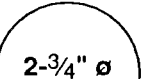
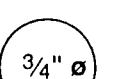
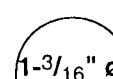
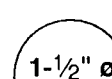
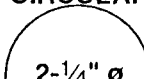
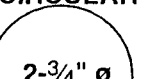
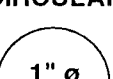
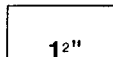
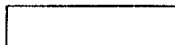
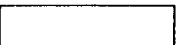
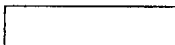
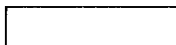
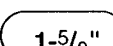
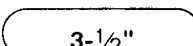
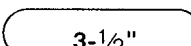
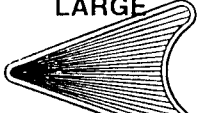
- 600- Braided Ground Wire
- 601- Stranded Wire
- 602- Ribbon Cable
- 605- Sleeving (Shrink Tubing)
- 626- Foam Rubber

IX. Miscellaneous

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

APPENDIX H

Playfield Inserts (Plastic Light Covers)

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

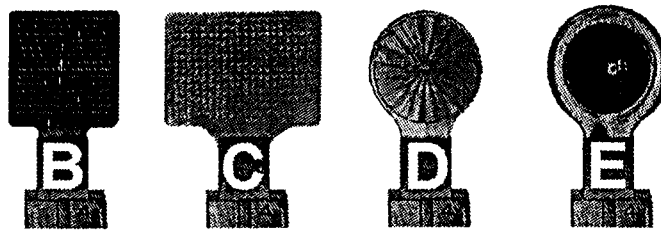
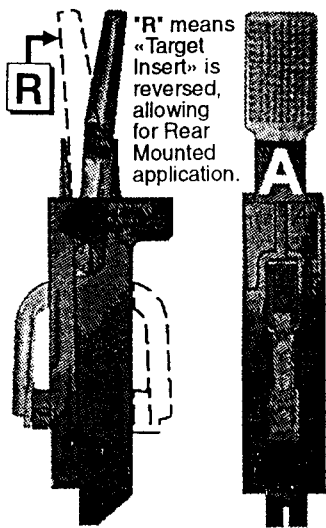
Instructions: Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit N^o which correspond to the color of that part. The "-XX" in Part N^os which may come in various colors should be replaced with the desired 2-Digit N^o, corresponding to the color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

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

APPENDIX I Stand-Up Targets

PLASTIC PART COLOR CHART

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



Take Note:

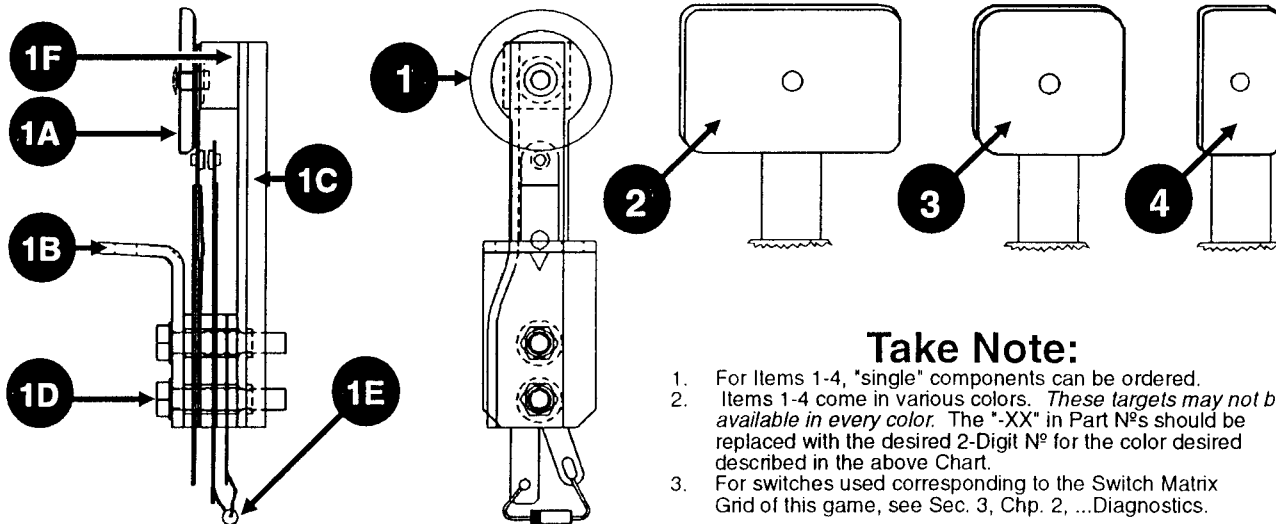
- For Items A-E, for the Target Assembly use the "500-" SPI Nº; For the Target Assy. with Rear Mount add "R" to "500-" SPI Nº; For just the «Target Insert» use the "545-" SPI Nº.
- Items A-E come in various colors. *These targets may not be available in every color.* The "-XX" in should be replaced with the desired 2-Digit Nº for the color desired described in the Chart ¶.

As of date of print, the following colors were used for Items A-E:

-01 Clear (A, D); -02 Red (A, B, C, D, E); -03 Amber (D, E); -04 Green (A, B); -05 Blue (C); -06 Yellow (A, C); -09 Purple (B, D); -11 Fluorescent Green (A, B, D).

- See Section 3, Chapter 2, Go To Diagnostics Menu, for switches used corresponding to the Switch Matrix Grid of this game.

Nº	Stand-Up Target Name	Part Nº	Nº	Stand-Up Target Name	Part Nº
A	Modular Stand-Up Target Narrow Assy.	500-6138-XX	D	Modular Stand-Up Target Round Assy.	500-6075-XX
	Stand-Up Target Narrow (Insert)	545-6138-XX		Stand-Up Target Round (Insert)	545-6075-XX
B	Modular Stand-Up Target Square Assy.	500-6139-XX	E	Mod. Stand-Up Target 1" Spherical Assy.	500-6189-XX
	Stand-Up Target Square (Insert)	545-6139-XX		Stand-Up Target 1" Spherical (Insert)	545-6189-XX
C	Modular Stand-Up Target Rectangle Assy.	500-6228-XX	NOTE: To receive the Target Assy. with the «Target Insert» «Reversed» simply add a "R" at the end of the Part Nº. See Side View picture above to compare (dashed line shows target reversed).		
	Stand-Up Target Rectangle (Insert)	545-6228-XX			



Take Note:

- For Items 1-4, "single" components can be ordered.
- Items 1-4 come in various colors. *These targets may not be available in every color.* The "-XX" in Part Nºs should be replaced with the desired 2-Digit Nº for the color desired described in the above Chart.
- For switches used corresponding to the Switch Matrix Grid of this game, see Sec. 3, Chp. 2, ...Diagnostics.

Nº	Stand-Up (Flat) Target Name	Part Nº	Nº	Stand-Up (Flat) Target Name	Part Nº
1	1" Round Stand-Up Target Assy.	500-5835-XX	† Note: Item 2A, is a riveted Sub-Assy. which includes the following items for reference: A1— Stack Switch Radius End (180-5133-00), A2— Washer 5/16" (242-5017-00), A3— Rivet 1/8" ø X 3/16" (249-5001-00) and A4— Rectangular Target (545-5145-XX).		
ORDERING ABOVE (ITEM 1) ASSY. PART Nº WILL INCLUDE:			ORDERING ABOVE (ITEM 3) ASSY. PART Nº WILL INCLUDE:		
1A†	Switch & Target Assy. 1" Round	515-5966-XX	3	1" Sq. Stand-Up Target Assy.	500-5232-XX
1B	Mounting Bracket	535-6896-00	ORDERING ABOVE (ITEM 3) ASSY. PART Nº WILL INCLUDE:		
1C	Switch Back Plate	535-6452-00	3A†	Sw. & Target Assy. 1" Square	515-5162-XX
1D	6-32 X ¾ HWH Swage (Qty. 2)	237-5976-05	Items 3B-F are identical to 1B-F		
1E	Switch Diode, 1N4001	112-5001-00	Same as 1B-F		
1F	Foam Pad	626-5029-00	† Note: Item 3A, is a riveted Sub-Assy. which includes the following items for reference: A1— Stack Switch Radius End (180-5133-00), A2— Washer 5/16" (242-5017-00), A3— Rivet 1/8" ø X 3/16" (249-5001-00) and A4— 1" Square Target (545-5470-XX).		
† Note: Item 1A, is a riveted Sub-Assy. which includes the following items for reference: A1— Stack Switch Radius End (180-5133-00), A2— Washer 5/16" (242-5017-00), A3— Rivet 1/8" ø X 3/16" (249-5001-00) and A4— 1" Round Target (545-5456-XX).			4	Narrow Stand-Up Target Assy.	500-5835-XX
2	1" X 1½" Stand-Up Rect. Target Assy.	500-5321-XX	ORDERING ABOVE (ITEM 4) ASSY. PART Nº WILL INCLUDE:		
ORDERING ABOVE (ITEM 2) ASSY. PART Nº WILL INCLUDE:			4A†	Sw. & Target Assy. Narrow	515-5967-XX
2A†	Sw. & Target Assy. 1" X 1½" Rect.	515-6027-XX	Items 4B-F are identical to 1B-F		
Items 2B-F are identical to 1B-F			Same as 1B-F		
Item 2 Table continued in the next column.			† Note: Item 4A, is a riveted Sub-Assy. which includes the following items for reference: A1— Stack Switch Square End (180-5132-00), A2— Washer 5/16" (242-5017-00), A3— Rivet 1/8" ø X 3/16" (249-5001-00) and A4— Narrow Target (545-5210-XX).		

Item 2 Table Note continued in the next column.

*Kelly
Parkend's*

GLOSSARY OF TERMS

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

AC (Acronym) Alternating Current.

Adj. (Abbreviation) Adjustment(s).

Assy. (Abbreviation) Assembly.

Au. (Abbreviation) Audit(s).

Bd. (Abbreviation) Board.

BOT (Abbreviation) Bottom.

Brkt. (Abbreviation) Bracket.

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

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

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

Conn. (Abbreviation) Connector.

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

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

CT (Abbreviation) Center.

DC (Abbreviation) Direct Current.

DT (Abbreviation) Drop Target(s).

DOTS (Acronym) Diode On Terminal Strip.

EB (Abbreviation) Extra Ball.

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

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

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

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

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

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

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

HWH (Abbreviation) Hex Washer Head.

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

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

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

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

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

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

LED (Acronym) Light Emitting Diode.

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

Lwr. (Abbreviation) Lower.

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

MB (Abbreviation) Magnet Board.

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

MID (Abbreviation) Middle

Non-Reflexive See Reflexive.

No. or N° or # (Abbreviation) Number

NPF (Acronym) No Problem Found.

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

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

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

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

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

PCB (Acronym) Printed Circuit Board

P/F (Abbreviation) Playfield.

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

Plumb Bob Tilt Weight on Tilt Assembly.

PPH (Abbreviation) Phillips Pan Head.

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

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

PREV (Abbreviation) Previous.

PSB (Abbreviation) Power Supply Board

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

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

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

Relay An automatic switch operated by current in a coil.

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

RMA (Abbreviation) Return Merchandise Authorization Number

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

RO (Abbreviation) Rollover (switches).

Saucer See Eject.

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

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

SMB (Abbreviation) Shaker Motor Board.

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

SSFB (Abbreviation) Solid State Flipper Board.

STEP Refers to the service switches on the coin door.

Sub-Assy. (Abbreviation) Sub-Assembly.

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

TM (Abbreviation) Trademark

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

Tri-Ball Three balls in play.

TTL (Abbreviation) Transistor-Transistor Logic

Upr. (Abbreviation) Upper.

V or v (Abbreviation) Volt(s).

Ver. (Abbreviation) Version.

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

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

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

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

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

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

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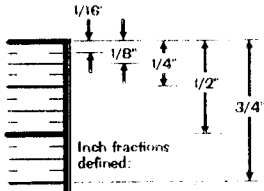
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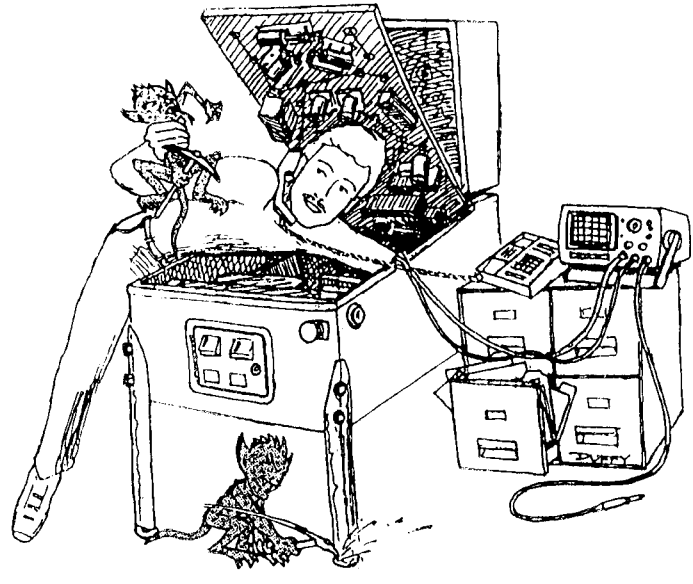
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