

featuring our Portals, Service Menu
and our unique

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



NO YES END PREL QUIT ?

SEGA™
PINBALL, INC.

11th

ANNIVERSARY



BLACKLIGHT PINBALL

featuring

GIOPALLS

Joe Blackwell
Technical Support
Manager



Eric Winston
Technical Support
Engineer



Doug Lemons
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.

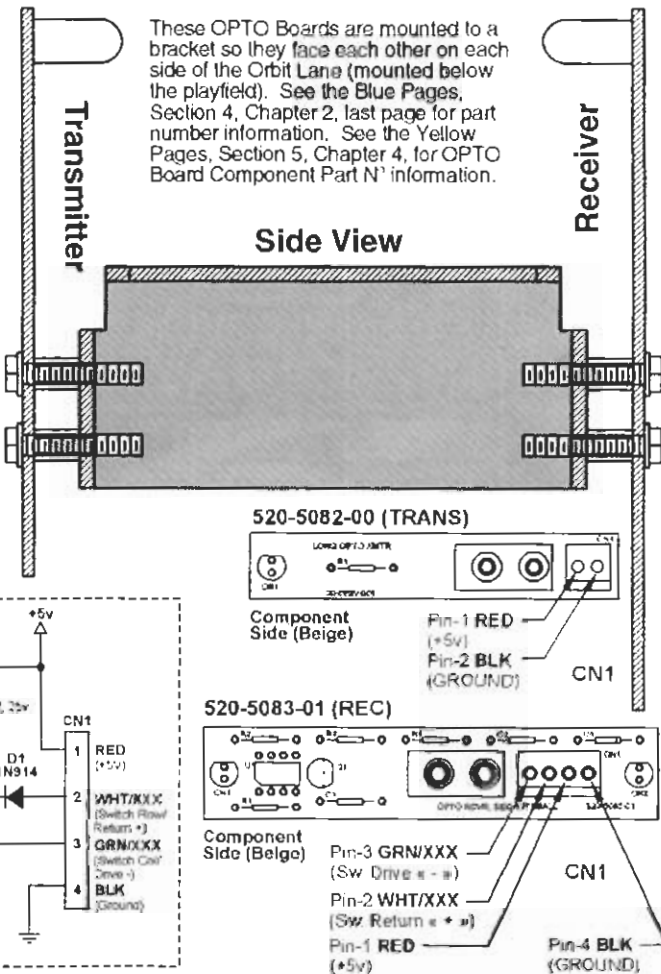
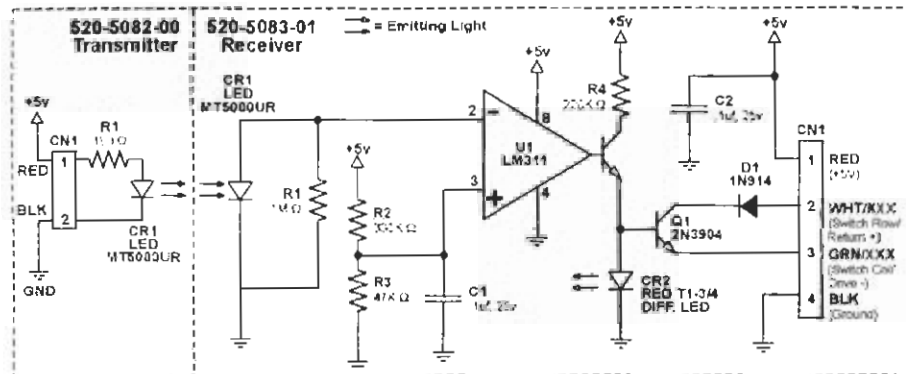
See

Playfield Switch OPTO "Long-Hop" Boards

A New OPTO Board combination (Transmitter, 520-5082-00, and Receiver, 520-5083-01) was first introduced in our pinball games with ID4: Independence Day, The X-Files and Starship Troopers. In this game, Viper, the OPTO Board combinations are being used as Ramp Switches to recognize the Small Ramp Shot (Sw. XX).

Playfield Switch OPTO Boards Theory of Operation & Schematic

The light falling on LED (CR1) generates a voltage which is applied to the input (Pin-2) of the LM311 Comparator (U1). R1 bleeds off excess charge. At about a volt input from LED (CR1) the Comparator (U1) trips & drives either Q1 (during switch line strobes) or the indicator LED (CR2) (in between strobes). If a switch line is being strobed, the emitter of Q1 drops to the saturation voltage of the Switch Line Driver, about .3v. This plus the .7 volt drop on the base give a 1v forward bias voltage to Q1, which is lower than the 1.7v drop on LED (CR2) so the current flows through the Transistor during strobes. This drives Q1 on and makes the switch. If the strobe line is high, then the 1.7v path through LED (CR2) is lower than Q1's bias voltage so current flows through LED (CR2) and the indicator lights. D1 prevents reverse bleed, R2 and R3 form the voltage divider for the trip point, R4 is a current limiter for both Q1 and CR2, C1 and C2 are general noise-filter caps.



OPTO Alignment Procedure Option

There is an easy way to align your OPTO Boards with a very cheap Tool: an ordinary, everyday drinking straw! Cut a clean, unused straw to the length that the OPTO Boards are apart (ensure the edges are cut straight). Then slip

the LEDs into each end of the straw (Note: You may have to slightly bend the straw in the middle to get both LEDs into the straw). If the straw edges are not plumb or parallel on each board, an adjustment should be made (see Fig. 1A). Adjust the OPTO Boards by loosening the screw(s) (just enough so the board(s) only move when you touch them) until the straw edges and the boards are plumb or parallel (see Fig. 1B). One or both boards may need to be adjusted. If alignment is achieved with just one board, leave the other one alone.

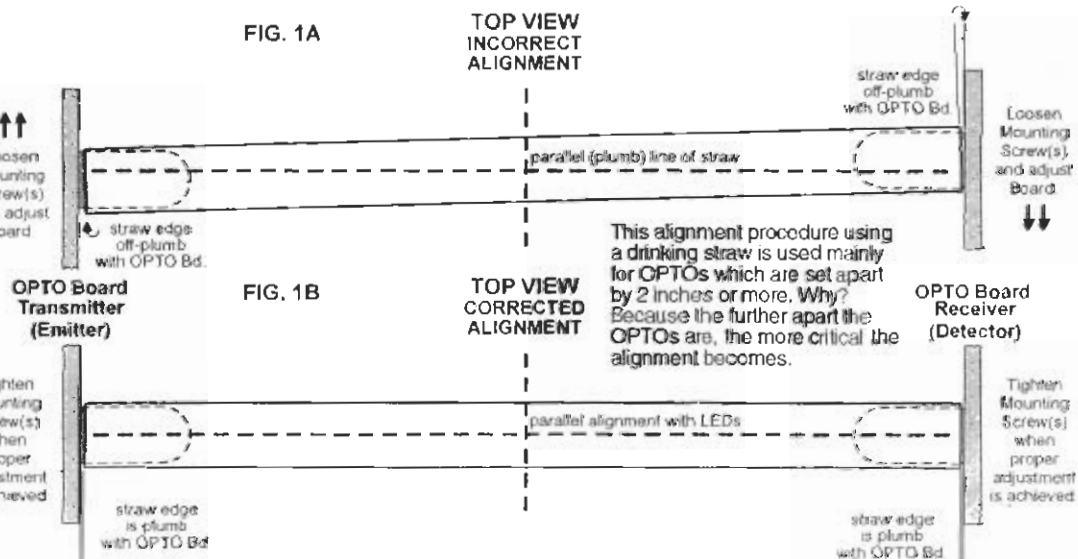
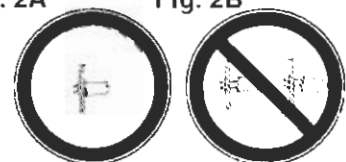


Fig. 2A

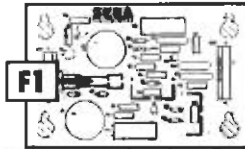
Fig. 2B

attempt this adjustment procedure, ensure the OPTO Mounting Brackets are ensuring the LEDs are sitting flush & perpendicular to the board (see Fig. 2A). If the LED is not flush and/or is bent (see Fig. 2B) take the necessary action (soldering / soldering is recommended; however, you can carefully bend the LED with a dab of silicone to help stabilize the LED.)





BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs

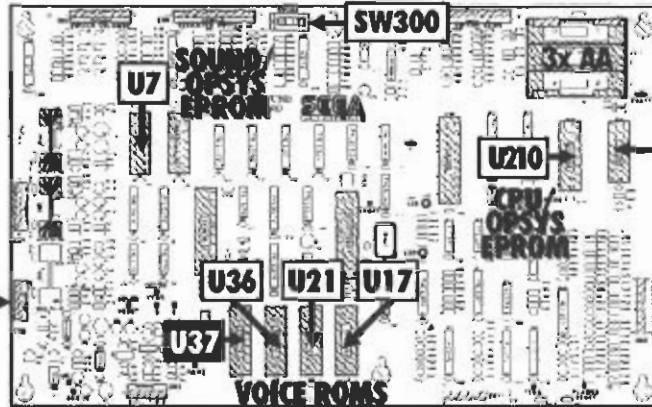


Display Power Supply Bd.

CPU / Sound Board

No Fuses

I / O Power Driver Board



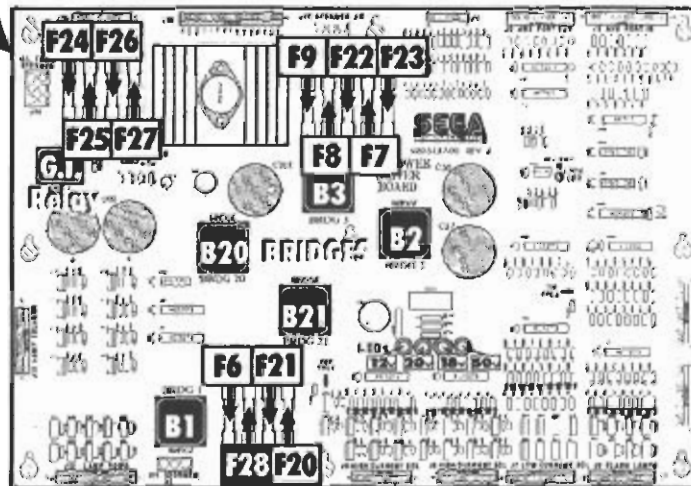
U212
CMOS
RAM

Note:

U37
is Not Used
in this game.

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

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



Note:

F28
is Not Used
in this game.

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/WHI to WHI/BRN)
F25	5A 250v S.B.	6.3v AC	G.I. Lamps (YEL to WHI/YEL)
F26	5A 250v S.B.	6.3v AC	G.I. Lamps (GRN to WHI/GRN)
F27	5A 250v S.B.	6.3v AC	G.I. Lamps (VIO to WHI/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	2A 250v S.B.	P/F	Fluorescent Black Lights (USA & Int'l)
n/a	5A 250v S.B.	220v AC	Main Fuse Line (International)

Playfield Fuses

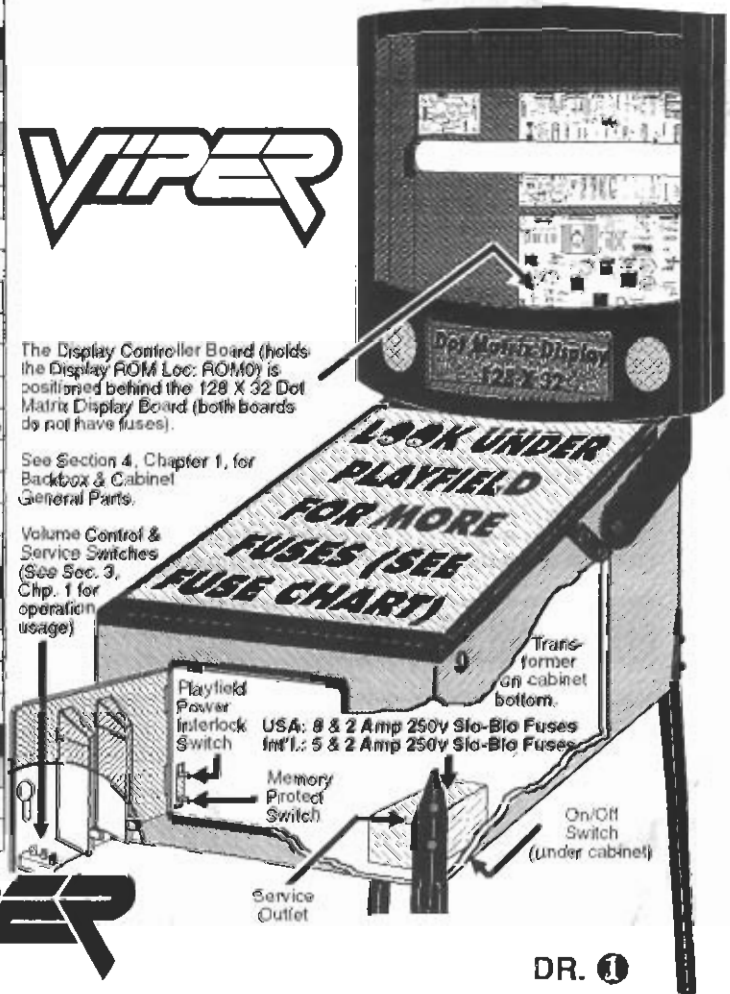
LOC: UNDER PLAYFIELD (By Assemblies Listed)			
n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU/YEL--RED/YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY/YEL--RED/YEL)

VIPER

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

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

Volume Control & Service Switches (See Sec. 3, Chp. 1 for operation usage)

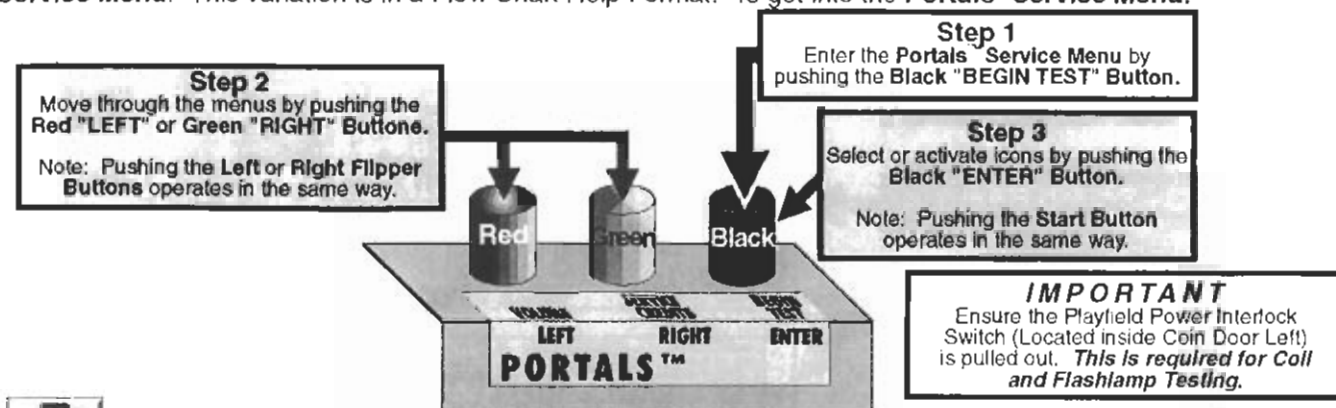


Find-It-In-Front:
Dr. Pinball

VIPER

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

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



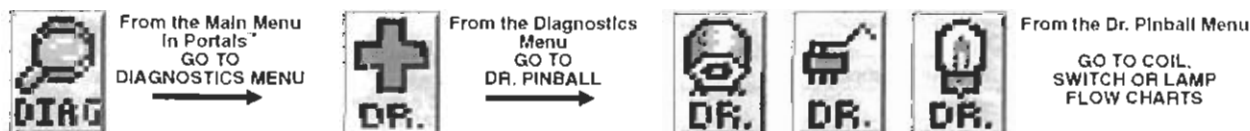
In our Portals™ Service Menu, selecting the "DR." Icon will bring the operator/technician into Dr. Pinball (Flow Chart Menus), the "on-screen" diagnostic aide. This is a feature that will allow you to utilize the power of the micro-processor assisting in troubleshooting a problem with the machine in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

★ ★ ★ ★ HOW IT WORKS ★ ★ ★ ★

First, the operator/technician must enter the Service Mode (for a complete description of the Portals™ Service Menu and ICONS see Section 3, Chapter 1). To get into the Service Menu Mode: • Power-up game (if not already) & open the Coin Door. • On the Coin Door is the Portals™ Service Switch Set (Red, Green & Black Buttons). Push down the Black "BEGIN TEST" Button. Looking at the Video Display you will momentarily see the introductory screen "Service Menu" with a satellite flying from right to left pulling a banner "Portals™ © 1997 SEGA PINBALL, INC.," followed by the MAIN MENU.

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

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



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



INSTALL OUR 4 NEW PLASTIC GLOW-BALLS!



VIPER

is a 4-Ball Game!

* DIAGNOSTIC AIDS *

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

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

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

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

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

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

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

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
NORWAY	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWEDEN	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
SWITZERLAND	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
UK	ON								
	OFF								
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
UK (New 50p, 2£ Coin Mech)	ON								
	OFF								

*All countries not noted use the "USA Setting"

ROM SUMMARY TABLE

I.C. NAME	TYPE	BOARD NAME	LOC.	PART N°
Game ROM	1MB	CPU / Sound Board	U210	965-0266-35
Voice ROM 1	4MB	CPU / Sound Board	U17	965-0267-35
Voice ROM 2	4MB	CPU / Sound Board	U21	965-0268-35
Voice ROM 3	4MB	CPU / Sound Board	U36	965-0269-35
Voice ROM 4	Not Used	CPU / Sound Board	U37	Not Used
Sound EPROM	512K	CPU / Sound Board	U7	965-0270-35
Display EPROM	4MB	Display Controller Bd.	ROM 0	965-0271-35
Display EPROM	Not Used	Display Controller Bd.	ROM 3	Not Used

FOR:



Find-It-In-Front:
Dr. Pinball

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

SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive)	1 Q1 GRN-BRN CN5-P1	2 Q2 GRN-RED CN5-P3	3 Q3 GRN-ORG CN5-P4	4 Q4 GRN-YEL CN5-P5	5 Q5 (NOT USED) CN5-P6	6 Q6 GRN-BLU CN5-P7	7 Q7 GRN-VIO CN5-P8	8 Q8 GRN-GRY CN5-P9
Row (Return)								
1 U400 WHT-BRN CN7-P9	NOT USED	NOT USED	JUMP RAMP OPTO	LEFT RAMP ENTER	NOT USED	LEFT TOP LANE	LEFT TURBO BUMPER	LEFT OUTLANE
2 U400 WHT-RED CN7-P8	4TH COIN SLOT	NOT USED	RIGHT RAMP ENTER	LEFT RAMP EXIT	NOT USED	RIGHT TOP LANE	TOP TURBO BUMPER	LEFT RETURN LANE
3 U400 WHT-ORG CN7-P7	6TH COIN SLOT	NOT USED	RIGHT RAMP EXIT	CENTER RAMP ENTER	NOT USED	NOT USED	RIGHT TURBO BUMPER	LEFT SLINGSHOT
4 U400 WHT-YEL CN7-P6	RIGHT COIN SLOT	4-BALL THROUGH #1 (LEFT)	LEFT BUTTON (UK ONLY)	CENTER RAMP EXIT	NOT USED	BILL BOARD	NOT USED	RIGHT OUTLANE
5 U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA	4-BALL THROUGH #2	RIGHT BUTTON (UK ONLY)	LT RACCOON S-U	NOT USED	LEFT VUK (LOCK)	LAUNCH BUTTON	RIGHT RETURN LANE
6 U401 WHT-BLU CN7-P3	LEFT COIN SLOT	4-BALL THROUGH #3	RIGHT RUBBER	RT RACCOON S-U	NOT USED	RIGHT VUK (LOCK)	START BUTTON	RIGHT SLINGSHOT
7 U401 WHT-VIO CN7-P2	5TH COIN SLOT	4-BALL THROUGH VUK OPTO	LEFT RUBBER	LEFT TARGET (LOWER)	NOT USED	LEFT ORBIT	SLAM TILT	NOT USED
8 U401 WHT-GRY CN7-P1	NOT USED	SHOOTER LANE	NOT USED	RIGHT TARGET (LOWER)	NOT USED	RIGHT ORBIT	PLUMB BOB TILT	NOT USED

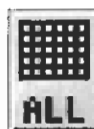
IC U206 INPUTS	Ground
1 GRN-BRN CN6-P2	#1 LEFT FLIPPER BUTTON
2 GRN-RED CN6-P3	#2 LEFT FLIPPER E.O.S. (End-of-Stroke)
3 GRN-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON
4 GRN-YEL CN6-P5	#4 RIGHT FLIPPER E.O.S. (End-of-Stroke)
5 (Not Used) GRN-GRN CN6-P7	NOT USED
6 GRN-BLU CN6-P8	#6 VOLUME (RED BUTTON) (In Test: LEFT)
7 GRN-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT)
8 GRN-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER)



From the Diagnostics
Menu
GO TO LAMP
MENU



From the Lamp
Menu
GO TO SINGLE
LAMP TEST



From the Lamp
Menu
GO TO TEST
ALL LAMPS



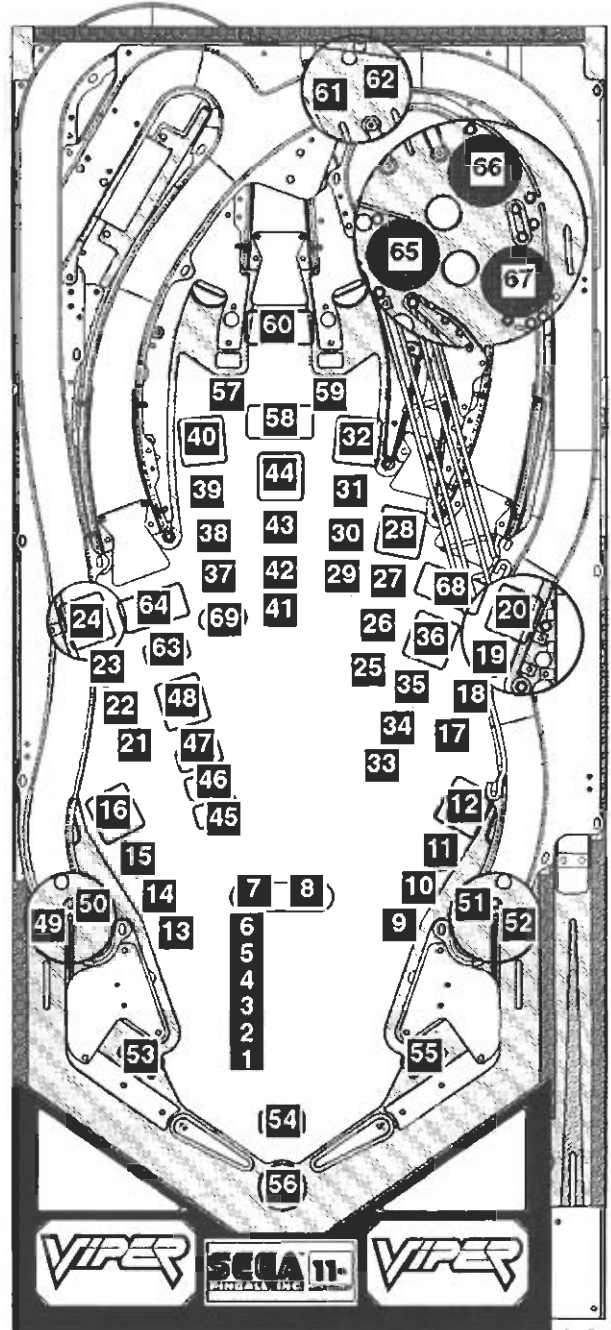
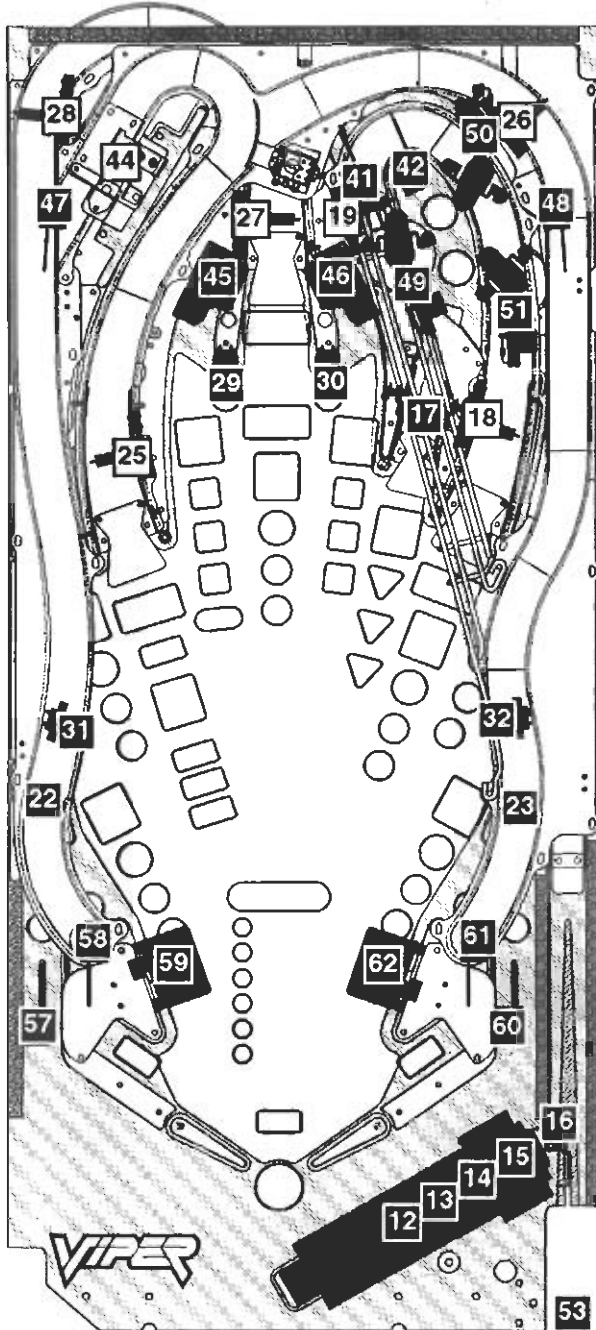
From the Lamp
Menu
GO TO ROW OR
COLUMN TEST

LAMP MATRIX GRID

Column (18V)	1: YEL-BRN J13-P9	2: YEL-RED J13-P8	3: YEL-ORG J13-P7	4: YEL-BLK J13-P6	5: YEL-GRN J13-P5	6: YEL-BLU J13-P4	7: YEL-VIO J13-P3	8: YEL-GRY J13-P1
Row (GND)								
1: Q33 RED-BRN J12-P1	DRAG RACE	INVITATIONAL	HITCH-HIKERS	LIGHTS OUT	PEDAL TO THE METAL	SLASH'S SNAKE PIT	MANCOW'S ... (LT)	MANCOW'S ... (RT)
2: Q34 RED-BLK J12-P2	2 MILES (RT TARGET)	5 MILES (RT TARGET)	LITE POST SAVE (RT)	VIPER: RIGHT TARGET	2 MILES (LT TARGET)	5 MILES (LT TARGET)	LITE POST SAVE (LT)	VIPER: LEFT TARGET
3: Q35 RED-ORG J12-P3	2 MILES (RT ORBIT)	5 MILES (RT ORBIT)	SPELL VIPER (RT)	VIPER: RIGHT ORBIT	2 MILES (LT ORBIT)	5 MILES (LT ORBIT)	SPELL VIPER (LT)	VIPER: LEFT ORBIT
4: Q36 RED-YEL J12-P4	CAUTION	WARNING	BRIDGE OUT	VIPER: JUMP RAMP	2 MORE (RT LOCK)	1 MORE (RT LOCK)	LOCK (RT)	JACKPOT (RT LOCK)
5: Q37 RED-GRN J12-P5	2 MILES (RT RAMP)	5 MILES (RT RAMP)	ONE SHOT... (RT RAMP)	VIPER: RIGHT RAMP	2 MORE (LT LOCK)	1 MORE (LT LOCK)	LOCK (LT)	JACKPOT (LT LOCK)
6: Q38 RED-BLU J12-P6	SNAKE (CTR RAMP)	RUMBLE (CTR RAMP)	ROLL (CTR RAMP)	VIPER: CENTER RAMP	DIAL (LT RAMP)	SEND (LT RAMP)	MYSTERY (LT RAMP)	VIPER: LEFT RAMP
7: Q39 RED-VIO J12-P8	SPECIAL (LT)	LEFT RETURN LANE	RIGHT RETURN LANE	SPECIAL (RT)	DOUBLE SCORING (INLANE)	SHOOT AGAIN	TRIPLE SCORING (INLANE)	UP/DOWN POST
8: Q40 RED-GRY J12-P9	LEFT RACCOON	JACKPOT (CTR RAMP)	RIGHT RACCOON	EXTRA BALL	LEFT TOP LANE (H)	RIGHT TOP LANE (P)	NOTE PAD	SUPER JACKPOT (LT RAMP)
9: Q41 RED-WHT J12-P10	LT TURBO BUMPER	TOP TURBO BUMPER	RT TURBO BUMPER	SUPER JACKPOT (RT RAMP)	ALIEN ABDUCTION	NOT USED	NOT USED	LAUNCH BUTTON
10: Q42 Not Used J12-P11	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED

SWITCH MATRIX GRID LOCATIONS

LAMP MATRIX GRID LOCATIONS

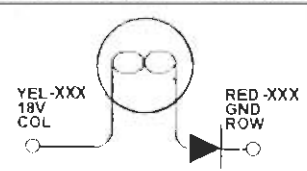


Legend Note: = Switches/Lamps mounted above playfield. = Switches/Lamps mounted below the playfield.

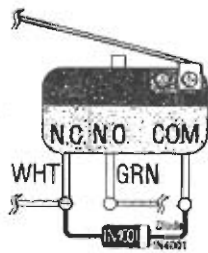
TYPICAL SWITCH SCHEMATIC

DEDICATED SWITCH SCHEMATIC

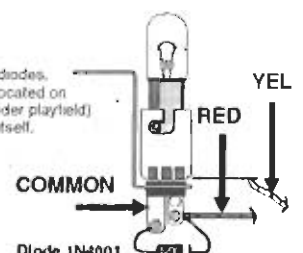
TYPICAL LAMP SCHEMATIC



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



Find-It-In-Front:
Dr. Pinball

VIPER

DR. 6



From the Main Menu
In Portals
GO TO DIAGNOSTICS
MENU



From the Diagnostics
Menu
GO TO COIL
MENU



From the Coil
Menu
GO TO COIL
TEST



From the Coil
Menu
GO TO CYCLING
COILS

COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
01	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
02	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v dc	24-940 090-5036-00B
03	LEFT VUK	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
04	RIGHT VUK	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
05	BALL RELEASE (RAMP)	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v dc	28-1050 090-5046-00
06	LT OUTLANE (UK ONLY)	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	BRN	J7-P1	20v dc	28-1050 090-5046-00
07	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	N / C	N / C	N / C	N / C
08	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v dc	N / C

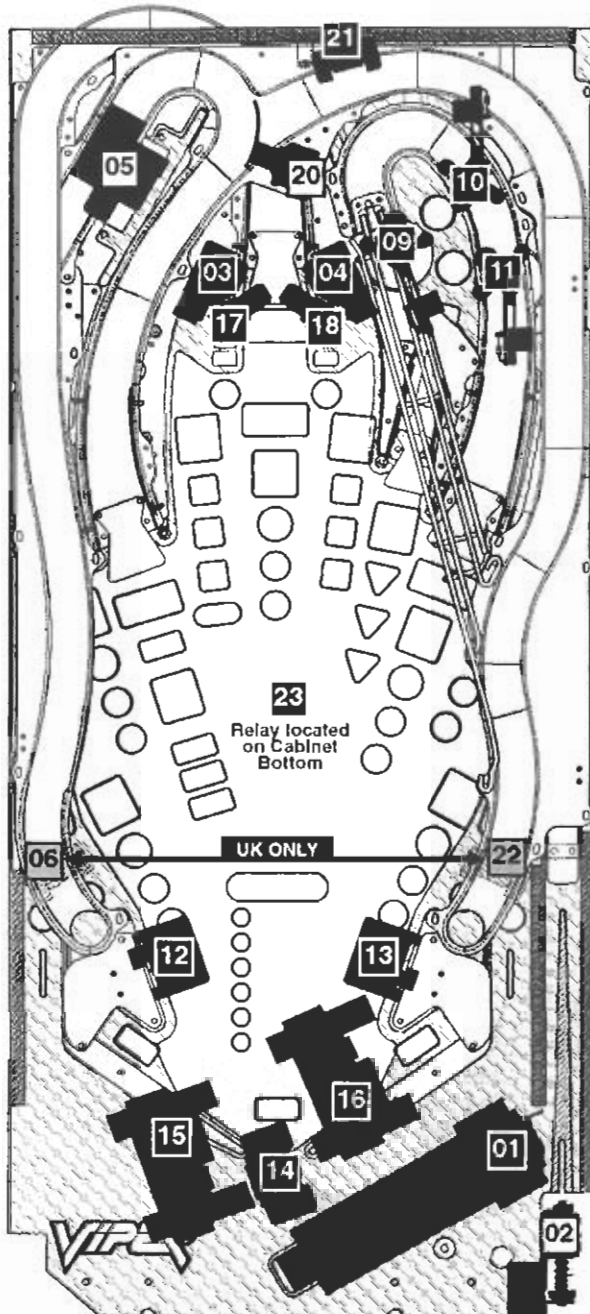
High Current Coils Group 2		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
09	LEFT TURBO BUMPER	Q9	I/O Pwr. Drvr.	BLU-BRN	J9-P1	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
10	TOP TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v dc	26-1200 090-5044-00T
14	UP/DOWN POST	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v dc	23-1100 090-5030-00T
15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v dc	23-1100 090-5030-00T
16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v dc	23-1100 090-5030-00T

Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
17	LEFT RACCOON SHAKE	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v dc	28-1050 090-5046-00
18	RIGHT RACCOON SHAKE	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v dc	28-1050 090-5046-00
19	NOT USED	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	N / C	N / C	N / C	N / C
20	LEFT RAMP DIVERTER	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v dc	32-1800 090-5031-02
21	ORBIT DIVERTER	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v dc	26-1200 090-5044-00T
22	RT OUTLANE (UK ONLY)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v dc	28-1050 090-5046-00
23	BLACK LIGHT RELAY	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v dc	Relay Bd. 520-5010-00
24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v dc	N / C

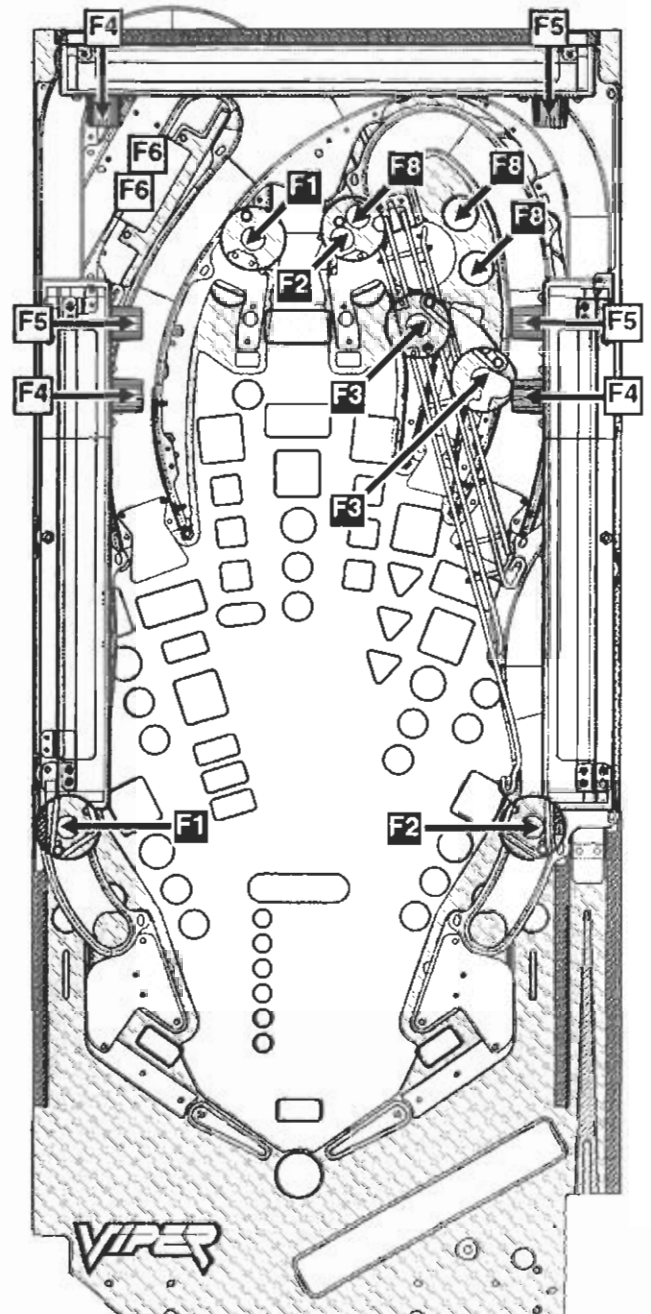
4.5v DC Meter SPI PN#: 091-5000-00

Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Bulb Type
F1	#F1 FLASH LT OUTLANE/VUK *2	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v dc	#89 Bulb 165-5000-89
F2	#F2 FLASH RT OUTLANE/VUK *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v dc	#89 Bulb 165-5000-89
F3	#F3 FLASH BRIDGE OUT *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v dc	#89 Bulb 165-5000-89
F4	#F4 FLASH RED *3	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v dc	#89 Bulb 165-5000-89
F5	#F5 FLASH BLUE *3	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v dc	#89 Bulb 165-5000-89
F6	#F6 FLASH BILLBOARD *2	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v dc	#906 Bulb 165-5004-00
F7	#F7 FLASH NOT USED *0	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	N / C	N / C	N / C	N / C
F8	#F8 FLASH POPS *3	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v dc	#89 Bulb 165-5000-89

COIL LOCATIONS

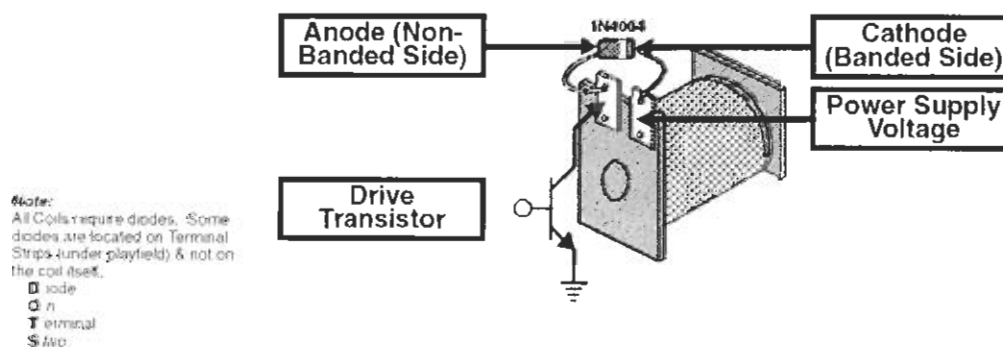


FLASH LAMP LOCATIONS



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

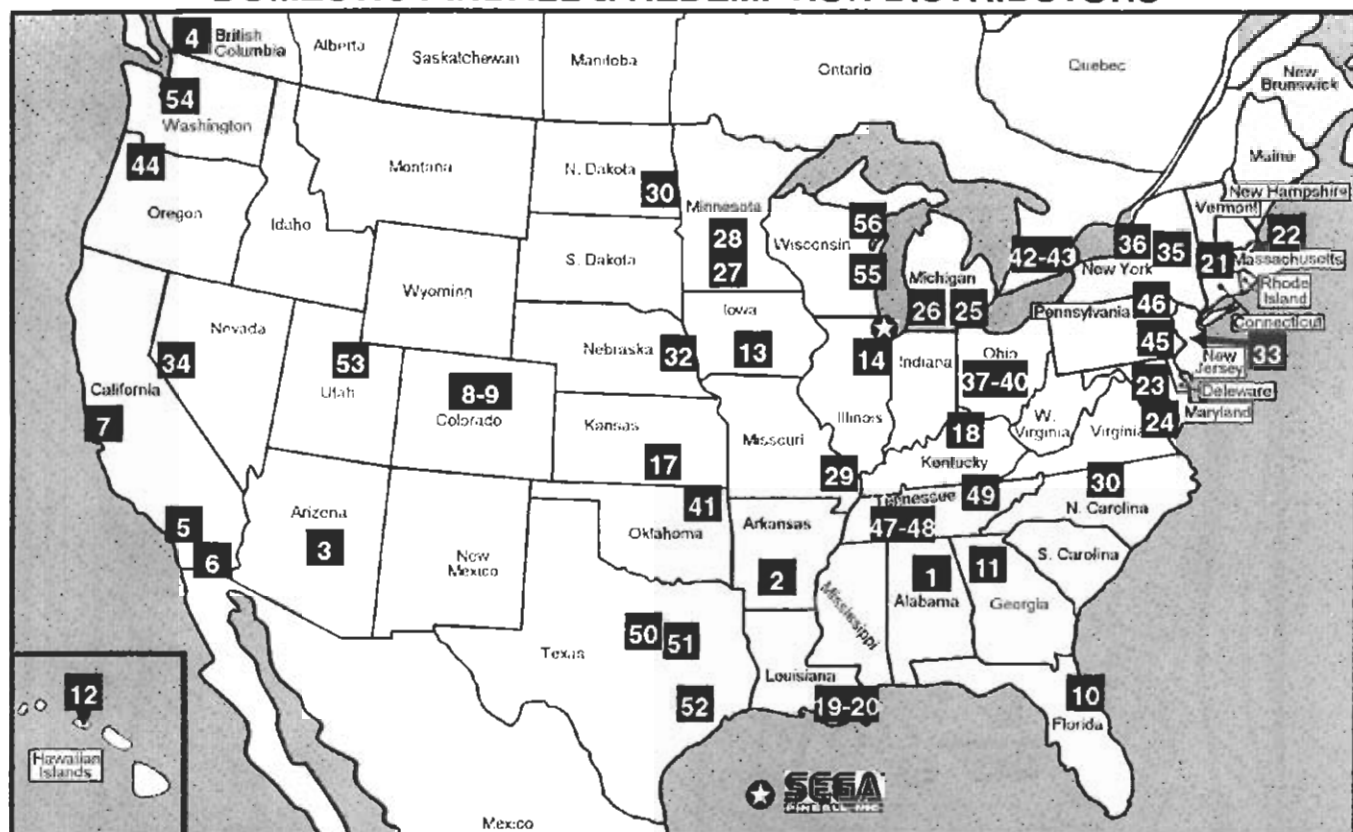
TYPICAL COIL WIRING



Find-It-In-Front:
Dr. Pinball

VIPER

DOMESTIC PINBALL & REDEMPTION DISTRIBUTORS



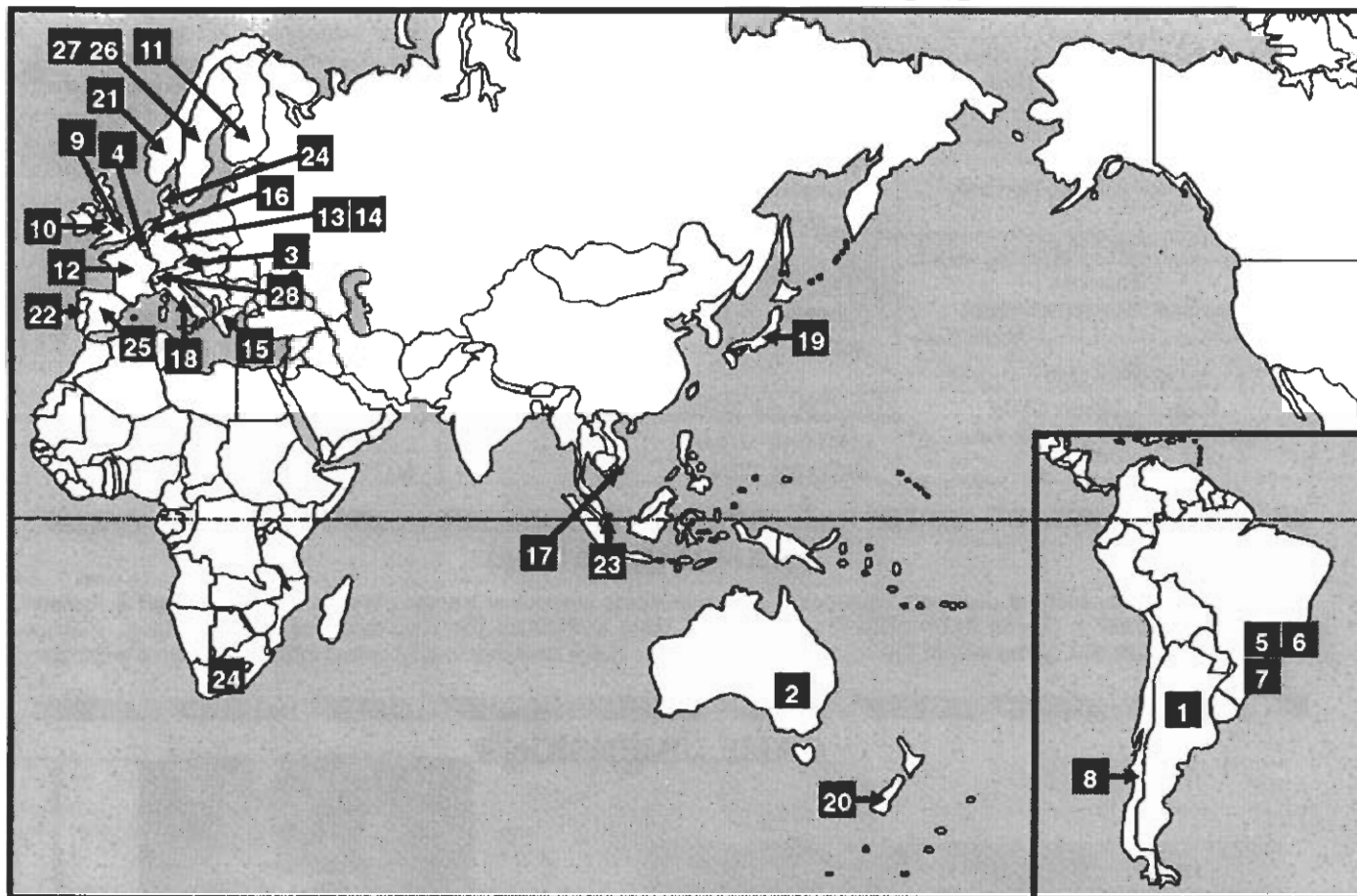
#	STATE/PROVINCE AND CITY	NAME	PHONE	#	STATE/PROVINCE AND CITY	NAME	PHONE
1	AL Birmingham	Birmingham Vending	205-324-7526	29	MO St. Louis	J. & J. Distributing	314-645-3393
2	AR N. Little Rock	Godwin Distributing	501-753-1138	30	NC Archdal	Operators Distributing	910-884-5714
3	AZ Phoenix	Betson West	602-233-0190	31	ND Fargo	M.H. Associates, Inc.	701-282-7877
4	BC Burnaby (Can.)	Can. Coin Machine	604-420-4008	32	NE Omaha	Greater American Dist.	402-553-2812
5	CA Buena Park	Betson West	714-228-7500	33	NJ Springfield	Mondial Int'l. Dist.	973-467-9700
6	CA San Diego	Betson West	619-459-0871	34	NV Reno	Reno Game Sales	702-829-2080
7	CA S. San Francisco	Betson West	415-952-4220	35	NY Garden City Park	T & M Distributing	516-747-0034
8	CO Denver	Col. Game Exchange	303-893-4300	36	NY Rochester	Mondial Dist.	716-586-1100
9	CO Denver	Mountain Coin	303-427-2133	37	OH Cincinnati	Atlas Distributing	513-771-1909
10	FL Orlando	Birmingham Vending	407-425-1505	38	OH Cleveland		800-278-8282
11	GA Marietta	Game Exchange/SE, Inc.	770-594-7215	39	OH Columbus	Shaffer Distributing, Co.	614-421-6800
12	HI Ewa Beach	50th State Coin Op.	808-682-4561	40	OH Macedonia		330-467-4850
13	IA Des Moines	Greater American Dist.	515-244-2828	41	OK Tulsa	Galaxy Distributing, Co.	918-835-1166
14	IL Chicago	Atlas Distributing	773-276-5005	42	ON Rexdale (Can.)	New Way Sales	416-674-8000
15	IN Indianapolis	Atlas Distributing	317-786-6892	43	ON Toronto (Can.)	Starburst Coin Machines	416-251-2122
16	IN Indianapolis	J. & J. Distributing	317-899-2530	44	OR Portland	American Coin	503-233-7000
17	KS Wichita	United Distributors, Inc.	316-263-6181	45	PA Bensalem	Mondial Int'l. Dist.	215-638-1122
18	KY Louisville	Atlas Distributing	502-966-5266	46	PA Wilkes-Barre	Roth Novelty	717-824-9994
19	LA Metairie	AMA Distributors, Inc.	504-835-3232	47	TN Memphis	Games Sales Co., Inc.	901-525-8351
20	LA Metairie	New Orleans Novelty	504-888-3500	48	TN Nashville	Green G.A.M.E.S.	901-353-1000
21	MA E. Long Meadow	Gekay Sales	413-525-2700	49	TN Nashville	Sammons-Pennington	615-244-3020
22	MA Norwood	Mondial Int'l. Dist.	781-769-9966	50	TX Corsicana	Master Sales	903-874-4740
23	MD Baltimore	State Sales	410-646-4100	51	TX Dallas	Commercial Music	214-741-6381
24	MD Baltimore	Weiner Distributing	410-525-2600	52	TX Houston	H.A. Franz, & Co.	713-523-7366
25	MI Redford	Atlas Distributing	313-794-4880	53	UT Salt Lake City	Struve Distributing	801-328-1636
26	MI Wyoming	Atlas Distributing	616-241-1472	54	WA Seattle	American Coin	206-764-9020
27	MN Bloomington	Hanson Distributing	612-884-6604	55	WI Green Bay	Pioneer Sales & Svc.	920-468-5200
28	MN Minneapolis	Sandler Vending	612-996-0010	56	WI Menomonee Falls	Pioneer Sales & Svc.	414-781-1420



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



INTERNATIONAL DISTRIBUTORS



#	COUNTRY AND CITY	NAME	PHONE (-011)	#	COUNTRY AND CITY	NAME	PHONE (-011)
1	Argentina, Urquiza	Florencia	54-232-5532	14	Germany, Hannover	Bally Wulff	49-511-358-5343
2	Australia, Matraville	Amusement Machine Dist.	61-29-316-6000	15	Greece, Athens	Greece Coin	30-1-554-1608
3	Austria, Grazerstrasse	Rupp Austria	43-34-528-6105	16	Holland, Sittart	Veltmeijer Automaten	31-46-452-6444
4	Belgium, Brussels	Splin S.A.	32-43-62-7677	17	Hong Kong, Kwai Fong	Bondeal Limited	85-2-487-9089
5	Brazil, Sao Paulo	Parkland	55-11-792-42864	18	Italy (RSM), Serravalle	Technoplay Sa	39-54-990-0361
6		Unimax	55-11-533-5615	19	Japan, Tokyo	Data East, Corp.	81-35-370-0708
7		Universe	55-11-575-0731	20	New Zealand, Auckland	Amco Machine Supp.	64-9-846-7606
8	Chile, Santiago	Culinsa	56-2-696-0167	21	Norway, Oslo	Vendcomatic	47-2-216-0830
9	England, London	Electrocoin	44-181-965-2055	22	Portugal, Amadora	Jacinto & Martins	35-11-495-1868
10	So. Wales, Cardiff	Electrocoin	44-22-261-5100	23	Singapore, Singapore	Valibel Technologies	65-748-8404
11	Finland, Espoo	Petika Ray Oy	35-8-943-7091	24	South Africa, Lalucia	Unimac	27-3-152-5544
12	France, Aubervilliers	PLF Sa	33-14-811-3131	25	Spain, Madrid	Sente S.A.	34-1-541-7112
13	Germany, Berlin	Bally Wulff	49-3-062-0020	26	Sweden, Bromma	Axlon	46-8-704-6580
14	Germany, Hannover	Bally Wulff	49-511-358-5343	27	Sweden, Malmo	Truemax AB	46-40-153-635
				28	Switzerland, Harkingen	Novomat Ag	41-62-398-4061



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



Dr. Pinball
Find-It-In-Front:



DR. ⑨

POWER REQUIREMENTS



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



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

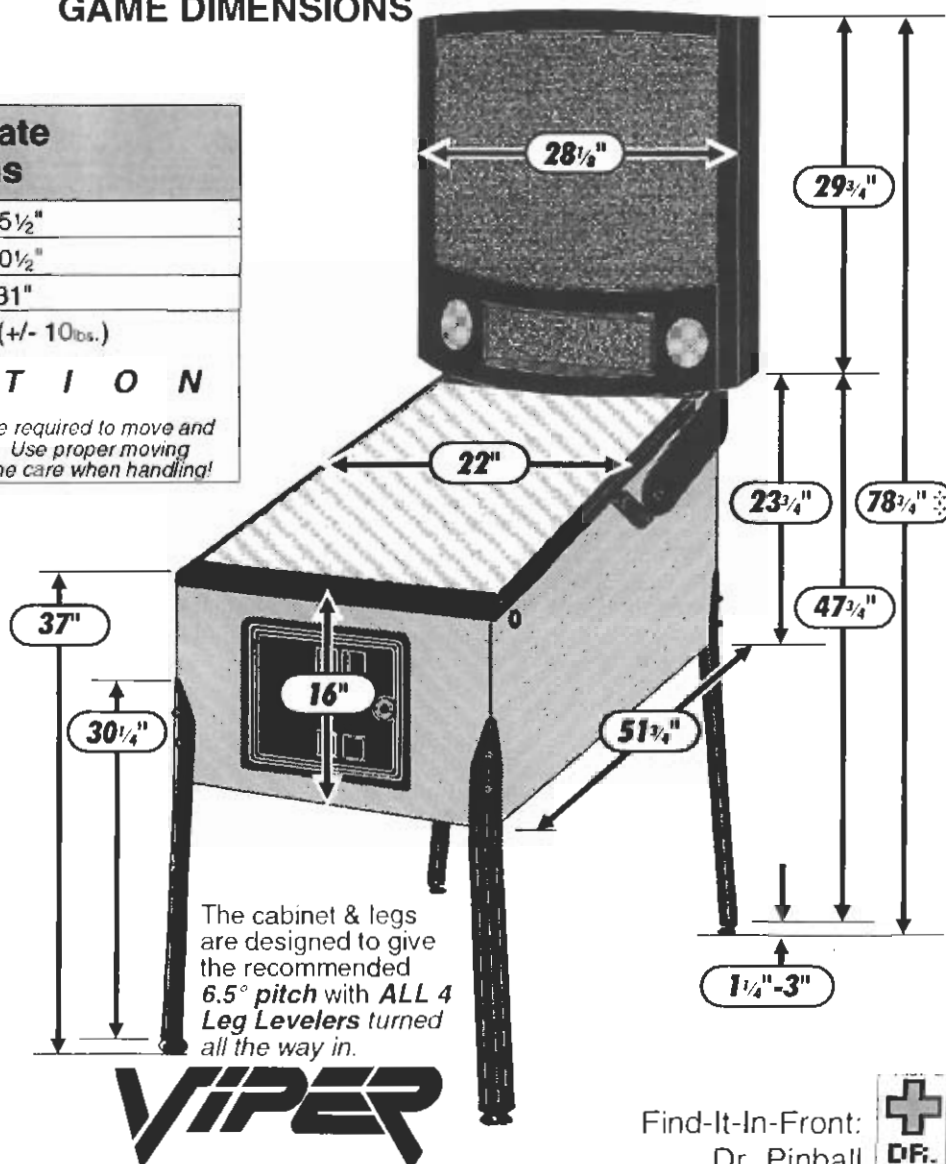
TRANSPORTATION

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

GAME DIMENSIONS

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

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



Notes:

The Leg Levelers can add up to 1½" **MORE** to the overall height.

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





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

Introducing Playfield Switch OPTO "Long-Hop" Boards Inside Front

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

Game Manual General Table of Contents i-ii

SECTION 1 1

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

SECTION 2 3

Chapter 1, Game Operation & Features.....	3
* Start of Game Features * During Game Features * End of Game Features	3-4
* Instruction Card	4
Chapter 2, Playfield Overview.....	5
Overview	5
Playfield Top Ball Shots: Layer 1, Layer 2 & Layer 3.....	7-9
Playfield Bottom Ball Shots: Layer 1	10

SECTION 3 11

Chapter 1, Portals™ Service Menu Introduction.....	11
Portals™ Service Menu Table of Contents (View for an outline of this section)	11
➤ * Portals™ Service Menu Access & Use * How to Use This Section.....	12-13
➤ Portals™ Service Menu Icon Tree.....	14-15
➤ Portals™ Service Menu Example.....	16-18
Chapter 2, Go To Diagnostics Menu	19
Chapter 3, Go To Audits Menu.....	32-33
Chapter 4, Go To Adjustments Menu	38-39
Chapter 5, Go To Reset Menu	47
Chapter 6, Go To Fuses List	49
Chapter 7, Go To Help Screen	51

General Table of Contents Continued on the Next Page

Game Set-Up

Game Assembly Procedures

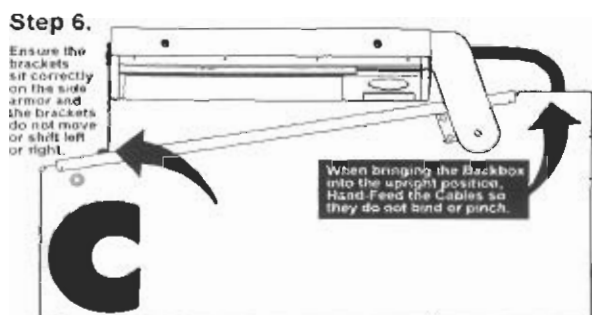
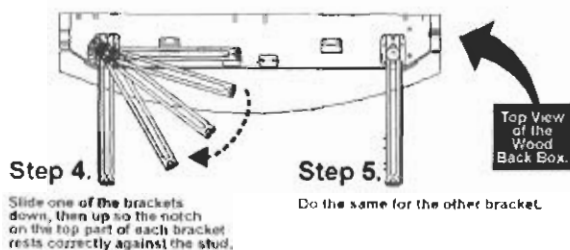
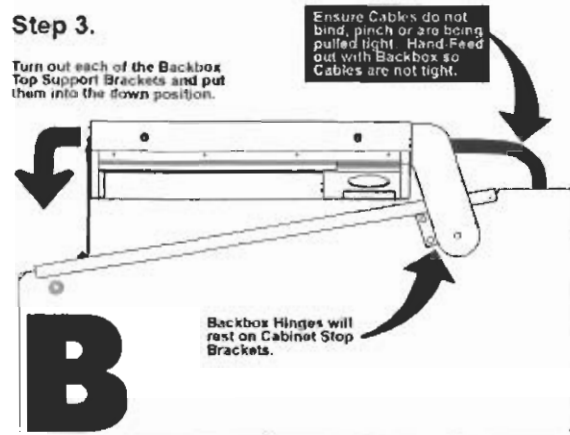
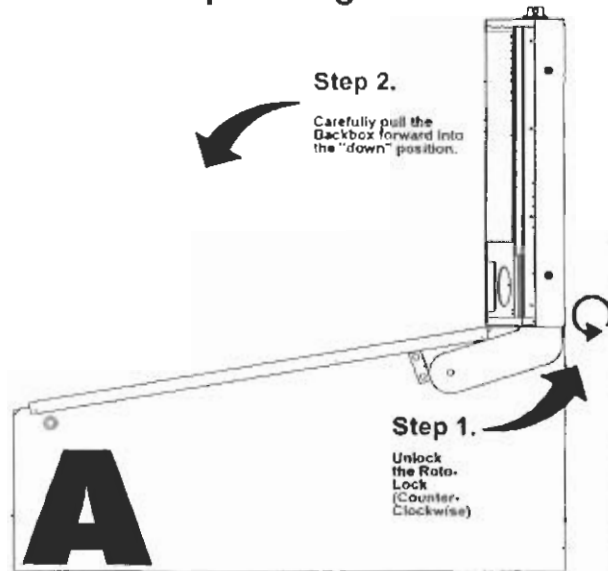
(Reference Find-It-In-Front: Dr. Pinball, taking note of pages ii, iii & 2)

1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton. **CAUTION: At least 2 people are required to move and maneuver game. Use proper moving equipment & extreme care when handling. Pinball game is 300 lbs.+.**
2. Remove all packing material. The four (4) Cabinet Leg Assemblies (Leg Levelers are attached) are in the corner packing material of the crate. A large Allen Wrench (use for securing the backbox) is inserted and taped to the rear of the cabinet. Leg Bolts, Steel Balls and any miscellaneous parts are in the cash box.
3. Support rear of cabinet and attach rear legs using two leg bolts for each leg. Support front of cabinet and attach front legs using two leg bolts for each leg. ➡Per CE: "The appliance has to be placed in a horizontal position."
4. While assuring that no cables are being pinched, carefully raise the backbox and secure it in its upright position with the Allen Wrench in the hole in the back of the cabinet and rotating the wrench 270° (¾ turn).
5. Remove the Coin Door Keys from the playfield glass, and open the Coin Door. Remove the Backbox Keys hanging inside the Coin Door, unlock the Backbox and open.
6. Check all connectors in the backbox for loose wire terminations. Reseat any loose wire by pushing in on the terminal. Push on all connectors plugged into the CPU/Sound Board, I/O Power Driver Board, and the Display Power to check that they are properly seated. Ensure Fluorescent Light Tube is seated correctly. Check that all fuses are seated properly. Close and lock the Backbox and secure the keys back inside the Coin Door.
7. Remove the Front Molding & carefully remove the playfield glass and set it aside.
8. Remove all shipping tie downs, shipping blocks, packing foam, shipping instruction pages, etc. (if any) inside the cabinet. **READ ALL PRINTED INFORMATION!** Shipping instructions, labels and/or decals describe warnings, cautions, and/or important information specific to the game. **This Game: Before** you move to **Step 9** - There is a **Playfield Shipping Bracket** attached to the playfield and secured to the cabinet by three (3) #8 x 5/8" Green screws. *Access through the Coin Door.* These **screws must be removed. Do not remove** the Shipping Bracket from the playfield (use for future shipping). Save these screws by taping to the side of the cabinet (by holes) or putting the screws into the cash box (save them with the shipping notice regarding this procedure).
9. Raise the playfield and support it, by lifting the Prop Rod (located either on the left or right side, inside the cabinet) and placing the notched end into the hole on the under playfield. See the illustration "Easy Access Service System" opposite this page.
10. Visually inspect all cabinet cables and connector terminations; ensure no wires or cables are pinched and that cable harnesses are not pulled tight.
11. Remove the Plumb Bob tilt from the parts package and install on the pendulum wire on the inside left of the cabinet. Check the plumb tilt and adjust as required. See Section 4, Chapter 1, Parts Identification & Location.
12. Lower the playfield and ensure game is level side-to-side by adjusting Leg Levelers, if required. See the illustration "Leg Leveler Adjustment" opposite this page.
13. With the Leg Levelers turned all the way in (1.25" from floor to bottom of leg), the game pitch is 6.5°; depending on the condition of the floor, adjust the Leg Levelers as required.

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

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

How to Secure the Backbox for Transporting



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

Leg Leveler Adjustment

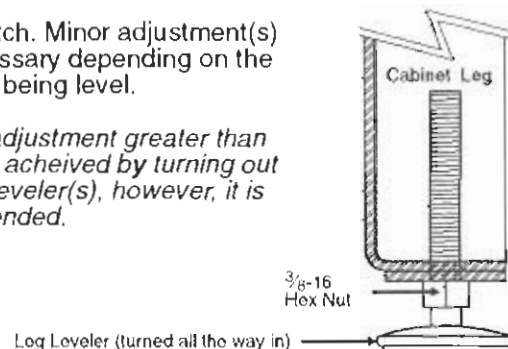
This cabinet is designed to automatically have a 6.5° pitch without any Leg Leveler adjustment!

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

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

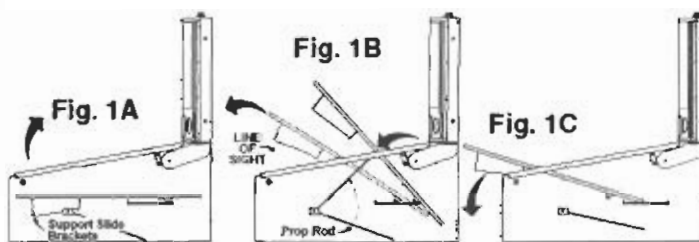
Verify 6.5° pitch. Minor adjustment(s) may be necessary depending on the location floor being level.

For custom adjustment greater than >6.5° can be 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).

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.

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!

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



MULTIBALL AND JACKPOTS Shoot the **Center Holes** until "**LOCK**" lights. Locking two balls begins **Multiball**. During **Multiball**, shoot the **Center Ramp** for **Jackpot**. Then re-lock two balls for **Double Jackpot**. Completing the **Double Jackpot** lights the **Left & Right Ramps** for **Super Jackpot**.

NOTEPAD The **Left Ramp** begins flashing event on **Notepad**. Complete all events for *Mancow's Morning Madhouse*. Completing indicated miles qualifies **Left Ramp** for "**Notepad**".

POST-SAVE The **Lower Targets** qualify **Post-Save** when lit. When **Post-Save** is qualified, the **Center Post** will be lit. Press "**Launch**" **Button** to activate.

MYSTERY CALLER Completing **Cell Phone** qualifies the **Left Ramp** for **Mystery Call**. Shooting **Mystery Call** when lit awards a **Mystery Feature**.

RABID RACCOONS Shoot a **Jumping Raccoon**. Complete the **RACCOONS** to begin "**Rabid Raccoons**".

SNAKE RUMBLE ROLL Complete to light **Combo**. Shoot the **Right Ramp Combo** to light **Double Scoring**. The **Left Return Lane** begins **Double Scoring** when lit.

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 Product Inc. (TM) & (C) 1995 Viper Night Drivin'. (TM) & (C) 1995. Chrysler Dodge Inc. All Rights Reserved.

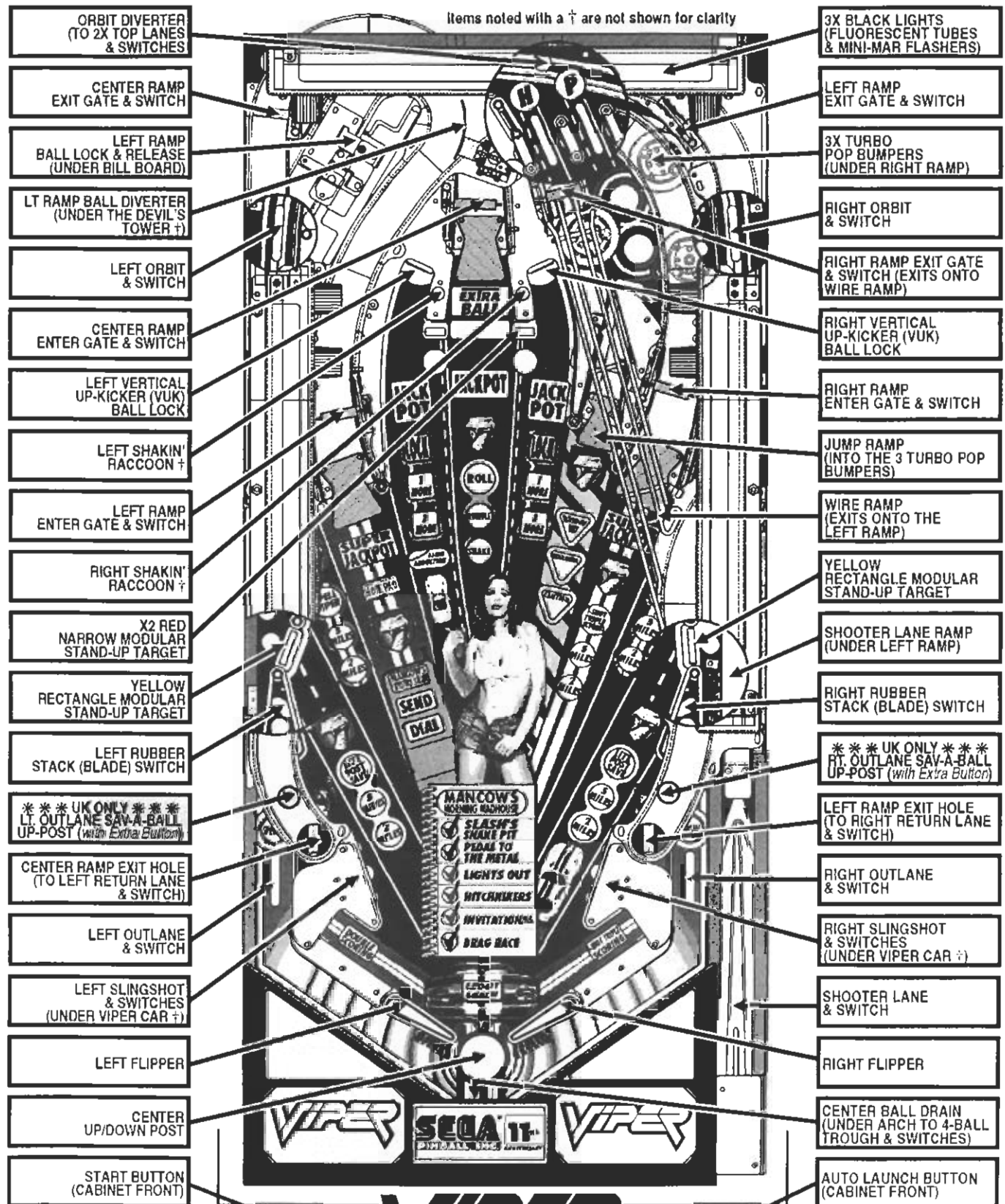
Sega Part N° 755-5135-00 USA



Playfield Overview

Overview

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



Playfield Top Ball Shots: Layer 1

Below is the top of the playfield showing the Playfield Wood Rails, Ball Guides, Flat Metal Rails, Flat Rail Shooter Lane Ramp, Posts, Rubber Rings, Target Tops, Ball Snubbers (over VUK), Enter/Exit Scoop (over Super VUK), Flipper Bats, Playfield Hanging Brackets, and Pop Bumpers.



Playfield Top Ball Shots: Layer 2

Below is the top of the playfield showing the addition of Screened & Clear Plastic (Butyrate) Pieces.

Playfield Top Ball Shots: Layer 3

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



Playfield Top Ball Shots: Layer 3

Below is the top of the playfield (no additional parts shown).



Playfield Bottom Ball Shots: Layer 1

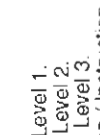
Below is the bottom of the playfield (as shown as if the playfield is up leaning against the Backbox) showing all bulbs & sockets, fuses, terminal strips, all brackets, and all bottom mounted assemblies...



Portals™ Service Menu Introduction

PORTALS™

Section 3
Table of Contents

	Chapter 1, • INTRODUCTION.....11
	<i>Service Switch Set Access & Use / How to Use This Section</i> 12-13
	<i>Portals™ Service Menu Icon Tree</i> 14-15
	<i>Portals™ Service Menu Example</i> 16-18
	Chapter 2, • GO TO DIAGNOSTICS MENU.....19
	•• <i>Go To Switch Menu</i>20
	••• <i>Switch Test / Active Switch Test / Dedicated Switch Test</i>20
	✧ Switch Matrix Grid & Dedicated Switches20
	✧ Switch Matrix Grid Descriptions with Part Numbers and Locations21
	•• <i>Go To Coil Menu</i>22
	••• <i>Single Coil Test / Cycling Coil Test</i>22
	✧ Coil & Flash Lamp Descriptions22
	✧ Coil & Flash Lamp Locations23
	✧ Coils Detailed Chart Table.....24
	✧ Backbox I/O Power Driver Board Detailed Wiring Diagram25
	•• <i>Go To Lamp Menu</i>26
	••• <i>Single Lamp Test / Test All Lamps / Row & Column Lamp Tests</i>26
	✧ Lamp Matrix Grid26
	✧ Lamp Matrix Grid Locations27
	•• <i>Test Flash Lamps</i>28
	•• <i>Clear Ball Trough</i>28
	•• <i>Technician Alert</i>28
	•• <i>Service Phone #</i>28
	•• <i>Begin Play Test</i>28
	•• <i>Fire Knocker</i>28
	•• <i>Sound / Speaker Test</i>28
	✧ Speaker Phase Testing29
	•• <i>Begin Burn In</i>29
	•• <i>Dot Matrix Test & Dot Matrix Display Explained</i>29
	•• <i>Viper Specific (...)</i>30
	•• <i>Dr. Pinball (Flow Chart Menus: Coil, Switch & Lamp)</i>31
	Chapter 3, • GO TO AUDITS MENU.....33
	✧ Game Audit Table32
	•• <i>Earnings Audits (Audits 1-12)</i>33
	•• <i>Sega Audits (Audits 13-55)</i> 34-35
	•• <i>Viper Audits (Audits 56-99)</i> 35-37
	•• <i>Go To Printer Menu</i>37
	••• <i>Printer Interface, Alison Interface, N° of Copies Printed (Adj. 53-55)</i>37
	Chapter 4, • GO TO ADJUSTMENTS MENU39
	✧ Game Adjustment Table38
	•• <i>Sega Adjustments (Adjustments 1-43)</i> 39-43
	•• <i>Viper Adjustments (Adjustments 44+)</i>44
	•• <i>Custom Message (Direct Access to Adjustment 29)</i>46
	•• <i>Film Star Reset (Special Factory Reset Settings for the Home Environment)</i>46
	Chapter 5, • GO TO RESET MENU47
	•• <i>Reset Coin Audits / Reset Game Audits / Factory Reset</i>47
	✧ Example48
	Chapter 6, • GO TO FUSES LIST49
	•• <i>Go To Fuses List</i>49
	✧ Example and Backbox Layout Locations: Fuses, Bridges, Relays & ROMs 49-50
	Chapter 7, • Go To Help Screen51

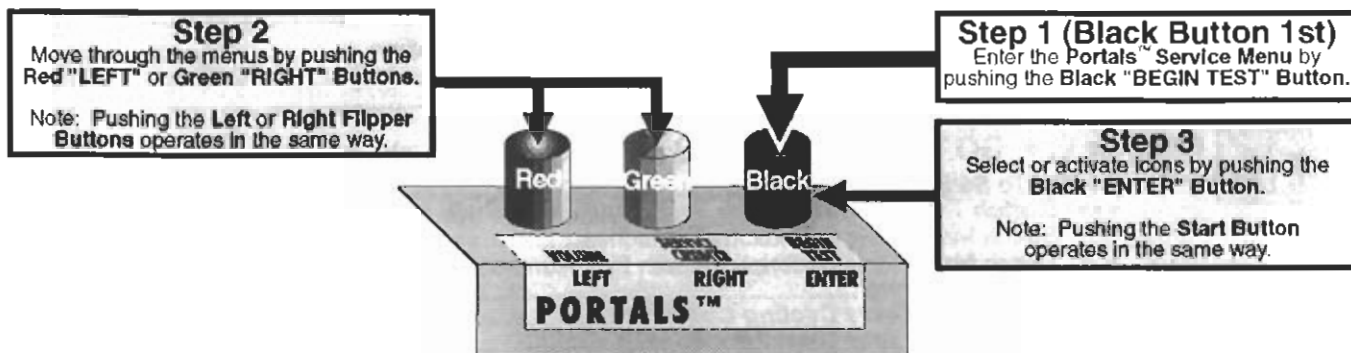
Bullet Legend:

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

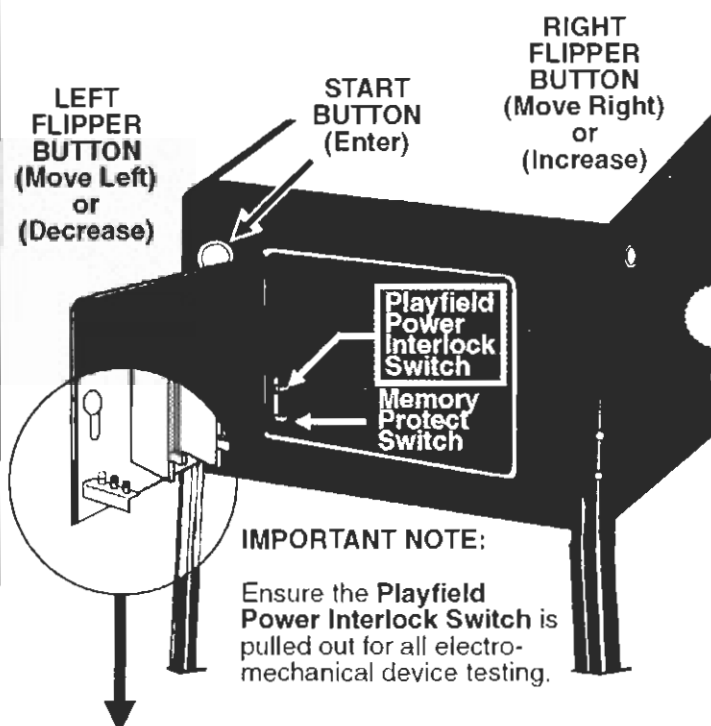
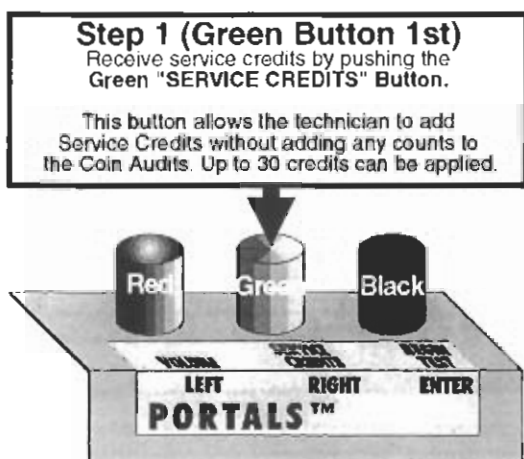
Service Switch Set (Red, Green & Black Buttons) Access & Use

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

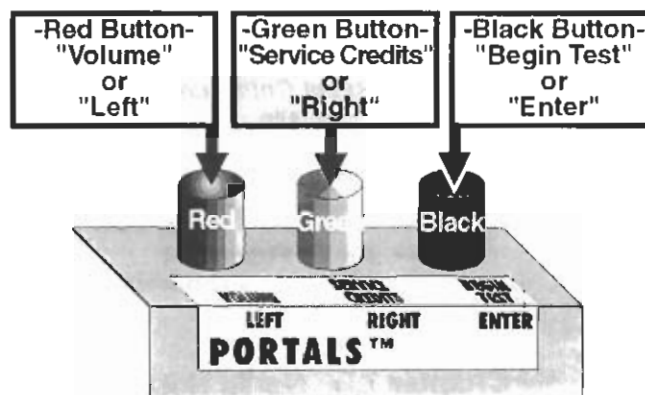
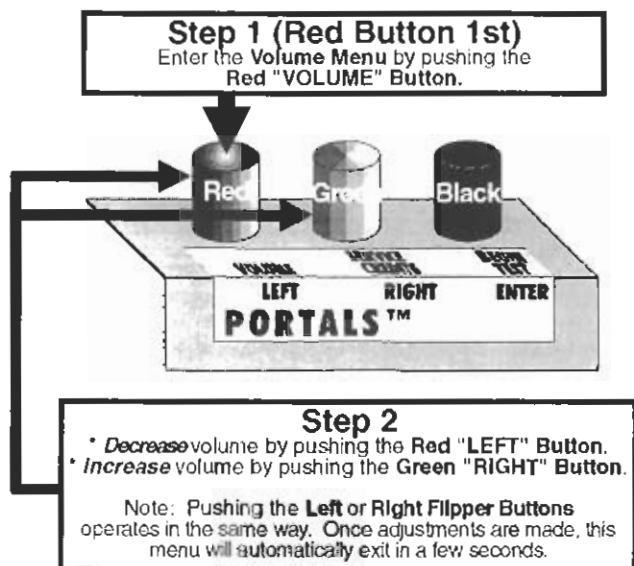
① Entering Portals™ Service Menu (will not operate in Volume Mode):



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



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

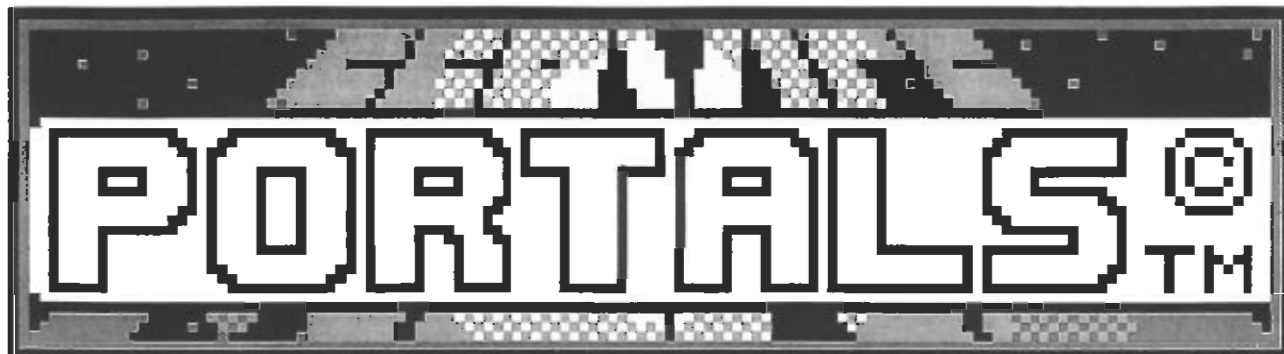


How to Use This Section

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

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

Looking at the Video Display you will momentarily see the introductory screen "Service Menu" with a satellite flying from right to left pulling a banner "**Portals™ © 1998 SEGA PINBALL, INC.,**" followed by the **MAIN MENU**:

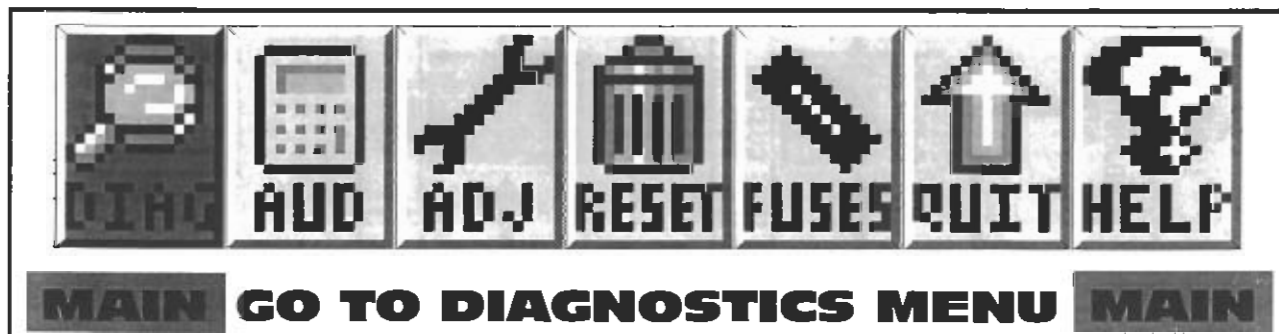


The Coin Door may be closed for security, however, please note with the Coin Door closed, the game's **MEMORY PROTECT** is enabled; *meaning any changes that are made will be not be written to memory*. If changing adjustments is required, ensure the Coin Door is open.

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

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

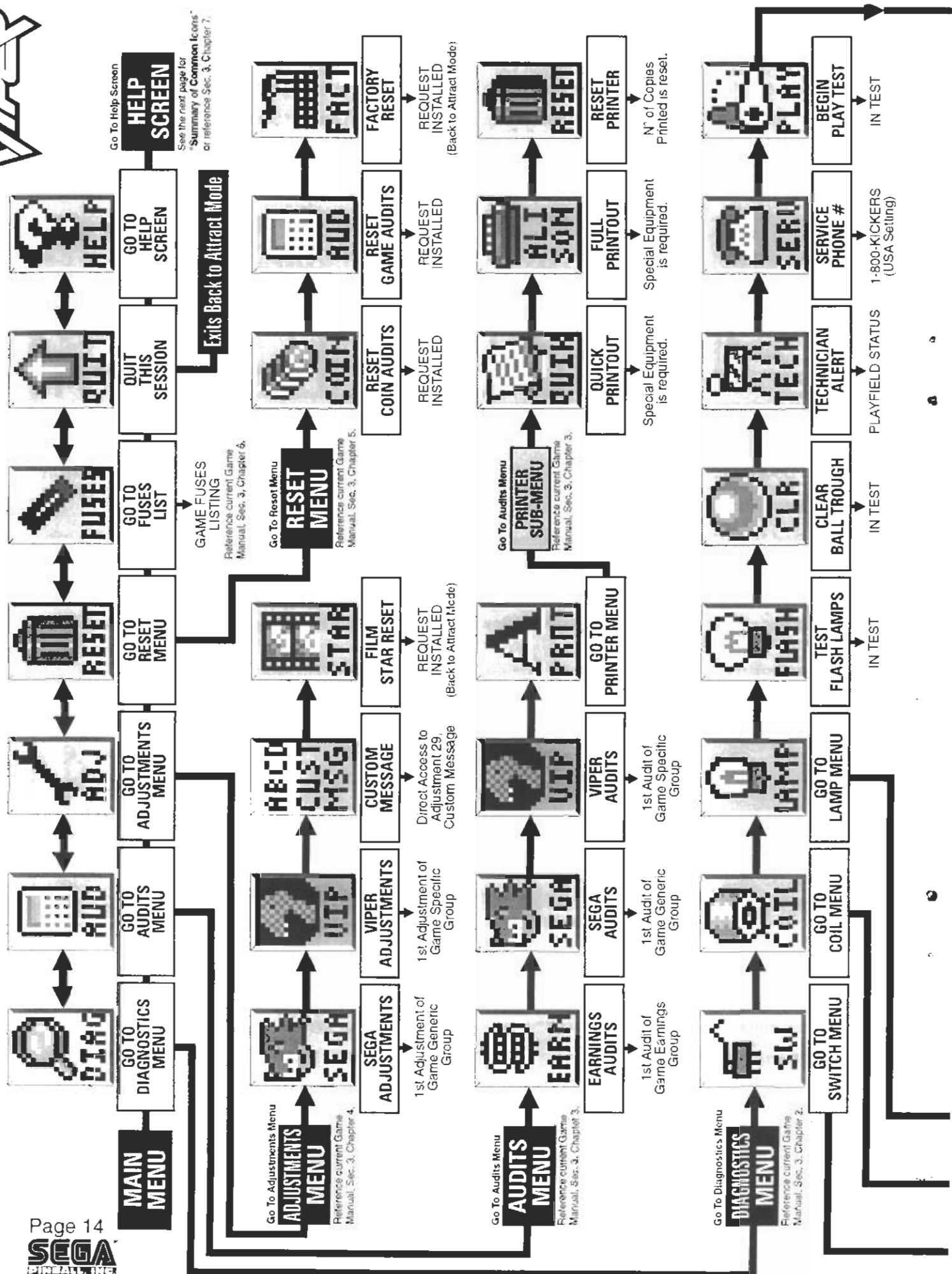
The **MAIN MENU** now appears with the "DIAG" *Icon* (**DIAGNOSTICS MENU**) flashing:



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

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

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



Portals™ Service Menu Example

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

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

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



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



Important Note:



PREV

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



QUIT

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

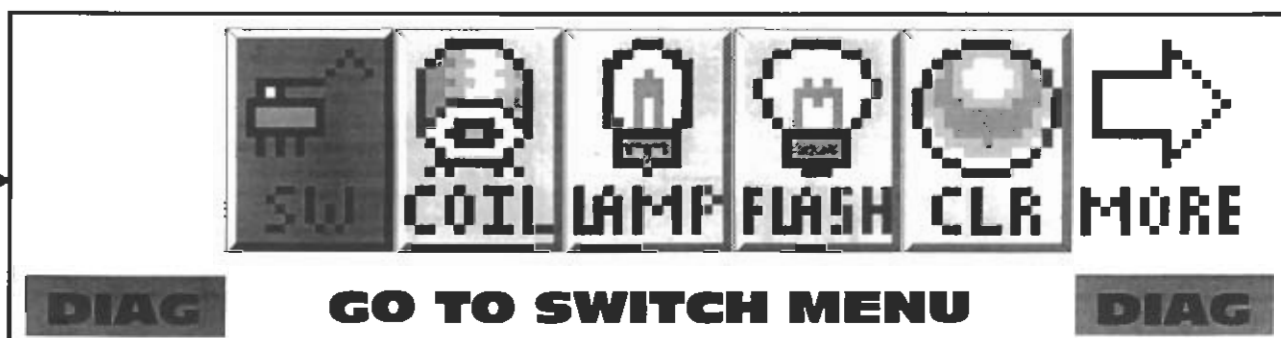


Selecting & activating the "HELP" *Icon* will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)

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

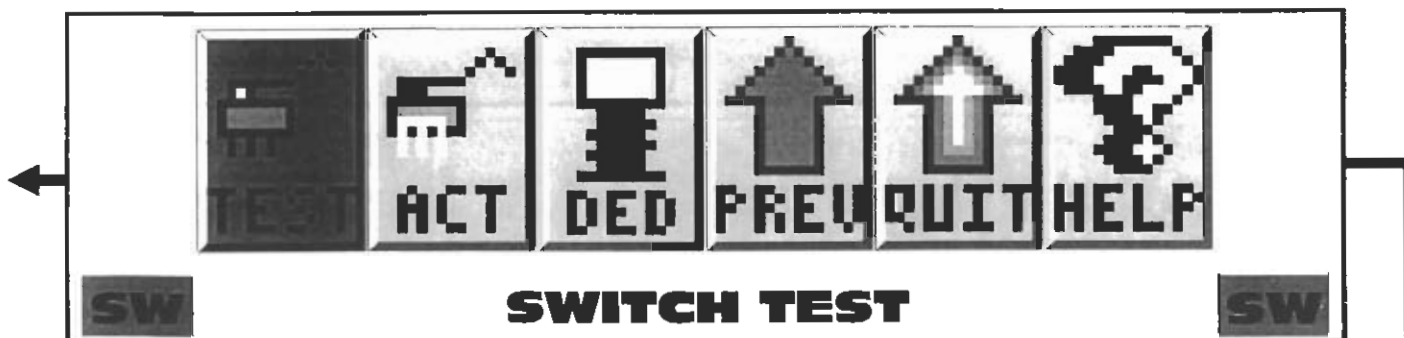


Press the Black "ENTER" Button to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

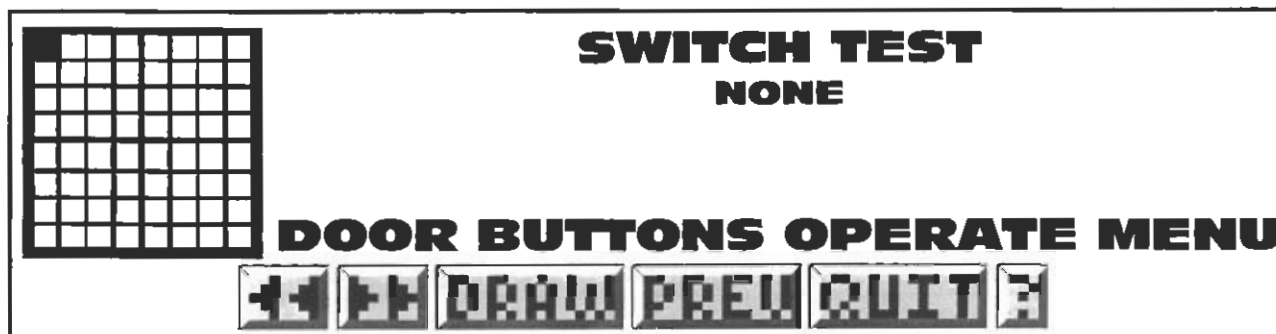


The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (GO TO SWITCH MENU) flashing. Press the Black Button to activate this icon. This will bring up the **SWITCH TEST MENU**.

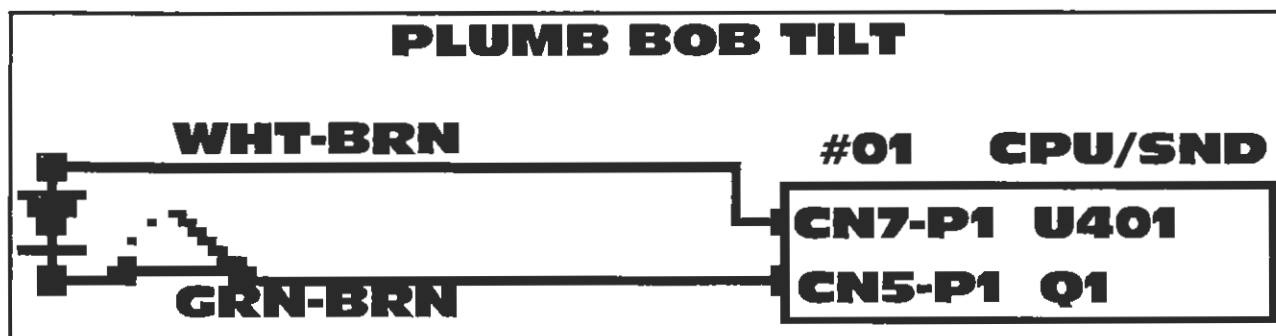
The **SWITCH TEST MENU** now appears with the "TEST" *Icon* (SWITCH TEST) flashing:
Press the **Black "ENTER" Button** to *activate* this icon. This will bring up the **Switch Test Display**.



The **Switch Test Display** now appears.



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



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

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

Note:

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

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

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

1. **Introduction**
 2. **Background**
 3. **Methodology**
 4. **Results**
 5. **Conclusion**
 6. **References**
 7. **Appendix**
 8. **Figure 1**
 9. **Figure 2**
 10. **Figure 3**
 11. **Figure 4**
 12. **Figure 5**
 13. **Figure 6**
 14. **Figure 7**
 15. **Figure 8**
 16. **Figure 9**
 17. **Figure 10**
 18. **Figure 11**
 19. **Figure 12**
 20. **Figure 13**
 21. **Figure 14**
 22. **Figure 15**
 23. **Figure 16**
 24. **Figure 17**
 25. **Figure 18**
 26. **Figure 19**
 27. **Figure 20**
 28. **Figure 21**
 29. **Figure 22**
 30. **Figure 23**
 31. **Figure 24**
 32. **Figure 25**
 33. **Figure 26**
 34. **Figure 27**
 35. **Figure 28**
 36. **Figure 29**
 37. **Figure 30**
 38. **Figure 31**
 39. **Figure 32**
 40. **Figure 33**
 41. **Figure 34**
 42. **Figure 35**
 43. **Figure 36**
 44. **Figure 37**
 45. **Figure 38**
 46. **Figure 39**
 47. **Figure 40**
 48. **Figure 41**
 49. **Figure 42**
 50. **Figure 43**
 51. **Figure 44**
 52. **Figure 45**
 53. **Figure 46**
 54. **Figure 47**
 55. **Figure 48**
 56. **Figure 49**
 57. **Figure 50**
 58. **Figure 51**
 59. **Figure 52**
 60. **Figure 53**
 61. **Figure 54**
 62. **Figure 55**
 63. **Figure 56**
 64. **Figure 57**
 65. **Figure 58**
 66. **Figure 59**
 67. **Figure 60**
 68. **Figure 61**
 69. **Figure 62**
 70. **Figure 63**
 71. **Figure 64**
 72. **Figure 65**
 73. **Figure 66**
 74. **Figure 67**
 75. **Figure 68**
 76. **Figure 69**
 77. **Figure 70**
 78. **Figure 71**
 79. **Figure 72**
 80. **Figure 73**
 81. **Figure 74**
 82. **Figure 75**
 83. **Figure 76**
 84. **Figure 77**
 85. **Figure 78**
 86. **Figure 79**
 87. **Figure 80**
 88. **Figure 81**
 89. **Figure 82**
 90. **Figure 83**
 91. **Figure 84**
 92. **Figure 85**
 93. **Figure 86**
 94. **Figure 87**
 95. **Figure 88**
 96. **Figure 89**
 97. **Figure 90**
 98. **Figure 91**
 99. **Figure 92**
 100. **Figure 93**
 101. **Figure 94**
 102. **Figure 95**
 103. **Figure 96**
 104. **Figure 97**
 105. **Figure 98**
 106. **Figure 99**
 107. **Figure 100**
 108. **Figure 101**
 109. **Figure 102**
 110. **Figure 103**
 111. **Figure 104**
 112. **Figure 105**
 113. **Figure 106**
 114. **Figure 107**
 115. **Figure 108**
 116. **Figure 109**
 117. **Figure 110**
 118. **Figure 111**
 119. **Figure 112**
 120. **Figure 113**
 121. **Figure 114**
 122. **Figure 115**
 123. **Figure 116**
 124. **Figure 117**
 125. **Figure 118**
 126. **Figure 119**
 127. **Figure 120**
 128. **Figure 121**
 129. **Figure 122**
 130. **Figure 123**
 131. **Figure 124**
 132. **Figure 125**
 133. **Figure 126**
 134. **Figure 127**
 135. **Figure 128**
 136. **Figure 129**
 137. **Figure 130**
 138. **Figure 131**
 139. **Figure 132**
 140. **Figure 133**
 141. **Figure 134**
 142. **Figure 135**
 143. **Figure 136**
 144. **Figure 137**
 145. **Figure 138**
 146. **Figure 139**
 147. **Figure 140**
 148. **Figure 141**
 149. **Figure 142**
 150. **Figure 143**
 151. **Figure 144**
 152. **Figure 145**
 153. **Figure 146**
 154. **Figure 147**
 155. **Figure 148**
 156. **Figure 149**
 157. **Figure 150**
 158. **Figure 151**
 159. **Figure 152**
 160. **Figure 153**
 161. **Figure 154**
 162. **Figure 155**
 163. **Figure 156**
 164. **Figure 157**
 165. **Figure 158**
 166. **Figure 159**
 167. **Figure 160**
 168. **Figure 161**
 169. **Figure 162**
 170. **Figure 163**
 171. **Figure 164**
 172. **Figure 165**
 173. **Figure 166**
 174. **Figure 167**
 175. **Figure 168**
 176. **Figure 169**
 177. **Figure 170**
 178. **Figure 171**
 179. **Figure 172**
 180. **Figure 173**
 181. **Figure 174**
 182. **Figure 175**
 183. **Figure 176**
 184. **Figure 177**
 185. **Figure 178**
 186. **Figure 179**
 187. **Figure 180**
 188. **Figure 181**
 189. **Figure 182**
 190. **Figure 183**
 191. **Figure 184**
 192. **Figure 185**
 193. **Figure 186**
 194. **Figure 187**
 195. **Figure 188**
 196. **Figure 189**
 197. **Figure 190**
 198. **Figure 191**
 199. **Figure 192**
 200. **Figure 193**
 201. **Figure 194**
 202. **Figure 195**
 203. **Figure 196**
 204. **Figure 197**
 205. **Figure 198**
 206. **Figure 199**
 207. **Figure 200**
 208. **Figure 201**
 209. **Figure 202**
 210. **Figure 203**
 211. **Figure 204**
 212. **Figure 205**
 213. **Figure 206**
 214. **Figure 207**
 215. **Figure 208**
 216. **Figure 209**
 217. **Figure 210</**

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 there usages are explained throughout this chapter.

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

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



GO TO DIAGNOSTICS MENU

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



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



Important Notes:



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 & Viper Specific Menu's**, the **Power Interlock Switch** (inside Coin Door) must be pulled out. (See **Access & Use** in Chapter 1 of this section for the location.)

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





Go To Switch Menu

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

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



Switch Test

To initiate, from the **SWITCH MENU**, select the "TEST" Icon with the **Red or Green Button** & press the **Black Button**. In Switch Test, close each switch and observe the display. The display will describe the switch in the Switch Matrix, which includes the switch name, Return (Row) Wire, Drive (Column) Wire, Part N°, 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°, and the "Pin-Outs" from the CPU/SOUND Board. This cycle continues until all switches are cleared or until the test is exited.



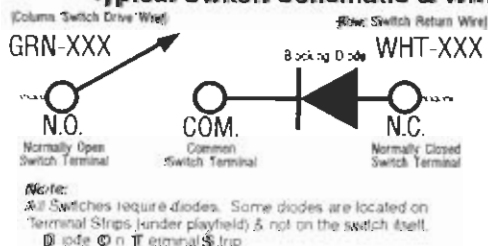
Dedicated Switch Test

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°, and the "Pin-Outs" from the CPU/SOUND Board.

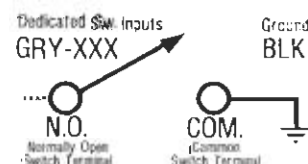
SWITCH MATRIX GRID & DEDICATED SWITCHES

Column (Drive)	1 Q1 GRN-BRN CN6-P1	2 Q2 GRN-RED CN6-P3	3 Q3 GRN-ORG CN5-P4	4 Q4 GRN-YEL CN5-P5	5 Q5 (NOT USED) CN5-P6	6 Q6 GRN-BLU CN5-P7	7 Q7 GRN-VIO CN5-P8	8 Q8 GRN-GRY CN5-P9	GND IC U206 INPUTS	Ground BLK CN6-P11
Row (Return)										
1 U400 WHT-BRN CN7-P9	NOT USED	NOT USED	JUMP RAMP OPTO	LEFT RAMP ENTER	NOT USED	LEFT TOP LANE	LEFT TURBO BUMPER	LEFT OUTLANE	1 GRN-BRN CN6-P2	#1 LEFT FLIPPER BUTTON (In Cabinet side) DS-1
2 U400 WHT-RED CN7-P8	4TH COIN SLOT (In Coin Door)	NOT USED	RIGHT RAMP ENTER	LEFT RAMP EXIT	NOT USED	RIGHT TOP LANE	TOP TURBO BUMPER	LEFT RETURN LANE	2 GRN-RED CN6-P3	#2 LEFT FLIPPER E.O.S (End-of-Stroke) (In Cabinet side) DS-2
3 U400 WHT-ORG CN7-P7	6TH COIN SLOT (In Coin Door)	NOT USED	RIGHT RAMP EXIT	CENTER RAMP ENTER	NOT USED	RIGHT TURBO BUMPER	RIGHT TURBO BUMPER	LEFT SLINGSHOT	3 GRN-ORG CN6-P4	#3 RIGHT FLIPPER BUTTON (In Cabinet side) DS-3
4 U400 WHT-YEL CN7-P6	RIGHT COIN SLOT (In Coin Door)	4-BALL TROUGH #1 (LEFT)	LEFT BUTTON (W/ONLY)	CENTER RAMP EXIT	NOT USED	BILL BOARD	NOT USED	RIGHT OUTLANE	4 GRN-YEL CN6-P5	#4 RIGHT FLIPPER E.O.S (End-of-Stroke) (In Cabinet side) DS-4
5 U401 WHT-GRN CN7-P5	CENTER COIN SLOT / DBA (In Coin Door)	4-BALL TROUGH #2	RIGHT BUTTON (W/ONLY)	LT RACCOON S-U	NOT USED	LEFT VUK (LOCK)	LAUNCH BUTTON	RIGHT RETURN LANE	5 (Not Used) GRN-GRN CN6-P7	NOT USED DS-5
6 U401 WHT-BLU CN7-P3	LEFT COIN SLOT (In Coin Door)	4-BALL TROUGH #3	RIGHT RUBBER	RT RACCOON S-U	NOT USED	RIGHT VUK (LOCK)	START BUTTON	RIGHT SLINGSHOT	6 GRN-BLU CN6-P8	#6 VOLUME (RED BUTTON) (In Test: LEFT) (In Coin Door) DS-6
7 U401 WHT-VIO CN7-P2	5TH COIN SLOT (In Coin Door)	4-BALL TROUGH VUK OPTO	LEFT RUBBER	LEFT TARGET (LOWER)	NOT USED	LEFT ORBIT	SLAM TILT	NOT USED	7 GRN-VIO CN6-P9	#7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) (In Coin Door) DS-7
8 U401 WHT-GRY CN7-P1	NOT USED	SHOOTER LANE	NOT USED	RIGHT TARGET (LOWER)	NOT USED	RIGHT ORBIT	PLUMB BOB TILT	NOT USED	8 GRN-BLK CN6-P10	#8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) (In Coin Door) DS-8

Typical Switch Schematic & Wiring

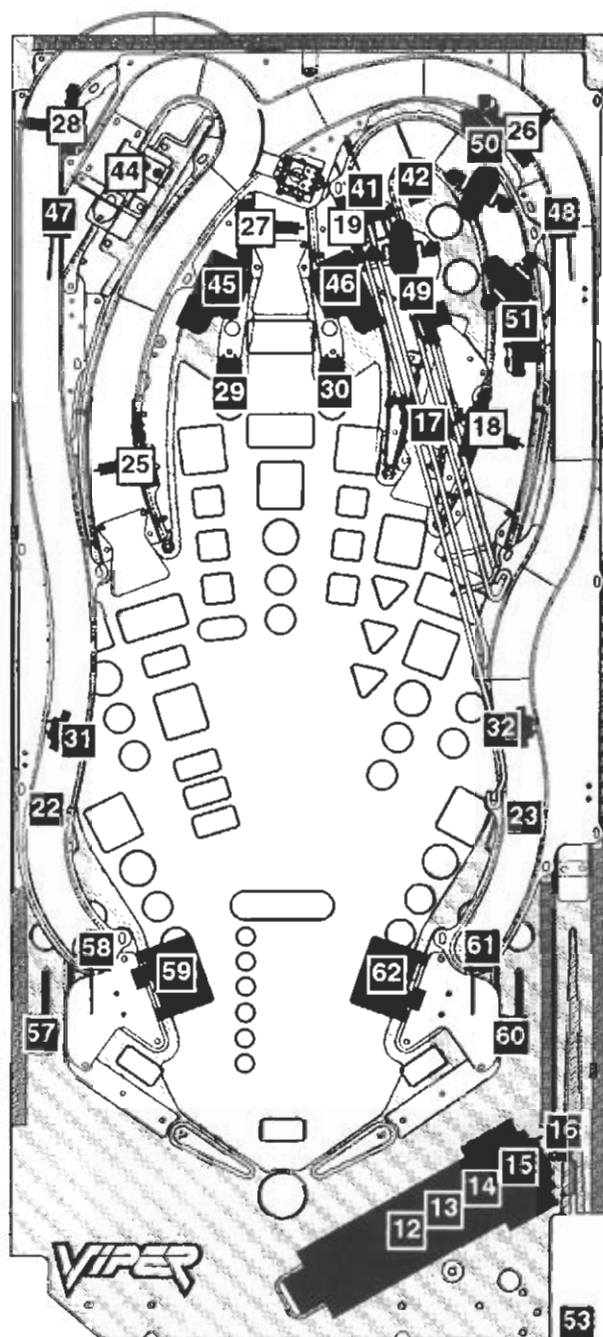


Dedicated Switch Schem.



Switch Matrix Grid Descriptions with Part Numbers and Locations

† The sw. locations correspond with the Sw. N° in the table below and the Switch Matrix Grid. Note: Diode On Terminal Strip (DOTS), 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 55 56

The following switches are not used:

1 8 - 11 24 33 - 40 43 52

63 64 These switches for UK only: **20 - 21**

Sw. N°	Col. N°	Row N°	Switch Matrix Description	Part N°
Note: The ¥ Coin Switch (for Japan) is 180-5091-00				
1	1	1	NOT USED	
2*	1	2	4TH COIN SLOT	180-5024-00
3*	1	3	5TH 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		
9	2	1	NOT USED	
10	2	2		
11	2	3		
12	2	4	4-BALL TROUGH #1 (LEFT)	
13	2	5	4-BALL TROUGH #2	180-5119-02
14	2	6	4-BALL TROUGH #3	
15	2	7	4-BALL TROUGH VUK OPTO	TRANS 520-5124-00 REC 520-5125-00
16	2	8	SHOOTER LANE	180-5100-02
17	3	1	JUMP RAMP OPTO	TRANS 520-5082-00 REC 520-5083-01
18	3	2	RIGHT RAMP ENTER	
19	3	3	RIGHT RAMP EXIT	180-5087-00
20	3	4	LEFT BUTTON (UK ONLY)	
21	3	5	RIGHT BUTTON (UK ONLY)	180-5160-00
22	3	6	RIGHT RUBBER	
23	3	7	LEFT RUBBER	180-5054-00
24	3	8	NOT USED	
25	4	1	LEFT RAMP ENTER	
26	4	2	LEFT RAMP EXIT	180-5087-00
27	4	3	CENTER RAMP ENTER	
28	4	4	CENTER RAMP EXIT	
29	4	5	LT RACCOON S-U	(Red) 500-6138-02
30	4	6	RT RACCOON S-U	(Red)
31	4	7	LEFT TARGET (LOWER)	(Yel.) 500-6228-06
32	4	8	RIGHT TARGET (LOWER)	(Yel.)
33	5	1		
34	5	2		
35	5	3		
36	5	4	NOT USED	
37	5	5		
38	5	6		
39	5	7		
40	5	8		
41	6	1	LEFT TOP LANE	
42	6	2	RIGHT TOP LANE	500-6227-04
43	6	3	NOT USED	
44	6	4	BILL BOARD	180-5093-01
45	6	5	LEFT VUK (LOCK)	
46	6	6	RIGHT VUK (LOCK)	180-5116-01
47	6	7	LEFT ORBIT	500-6227-04
48	6	8	RIGHT ORBIT	500-6227-03
49	7	4	LEFT TURBO BUMPER	
50	7	2	TOP TURBO BUMPER	180-5015-03
51	7	3	RIGHT TURBO BUMPER	
52	7	4	NOT USED	
53	7	5	LAUNCH BUTTON	(Yel.) 500-6121-06
54*	7	6	START BUTTON	(Red) 500-6090-02
55*	7	7	SLAM TILT (On Coin Door)	180-5022-00
56*	7	8	PLUMB BOB TILT	HANGER 535-5319-00 CONTACT 535-7563-01
57	8	1	LEFT OUTLANE	
58	8	2	LEFT RETURN LANE	500-6227-04
59	8	3	LEFT SLINGSHOT	180-5054-00
60	8	4	RIGHT OUTLANE	
61	8	5	RIGHT RETURN LANE	500-6227-04
62	8	6	RIGHT SLINGSHOT	180-5054-00
63	8	7		
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 17-24 are typically Low Current Coils. The remaining positions (F1-F8) are typically for Flash Lamps (although Flash Lamps may be used in positions 01-24). **Important:** The **Power Interlock Switch** must be pulled out.



Single Coil Test

To initiate, from the **COIL MENU**, select the "TEST" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Ensure the **Power Interlock Switch** is pulled out. Select either the "-" or "+" *Icons*. Start with the "+" *Icon* to start the manual Coil Test from #1 (The test runs through Coils 1-24 and Flash Lamps F1-F8). Press the **Black Button** on the "+" *Icon*, as each coil is selected, the display will describe the Coil or Flash Lamp Name with the corresponding number, the wire with colors, the "Pin-Outs" from the I/O Power Driver Board, the Coil Voltage & Gauge-Turns (e.g. 23-800). Press the **Black Button** again to move forward in the test. To test and view a particular Coil Or Flash Lamp, select the "RUN" *Icon* and press the **Black Button**. Each time the **Black Button** is pushed, the Coil Or Flash Lamp will fire on the Playfield and/or Backbox, with the display indicating the Coil or Flash Lamp information. Continue with the same procedure to run through the entire test. **Important:** The **Power Interlock Switch** must be pulled out.



Cycling Coil Test

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

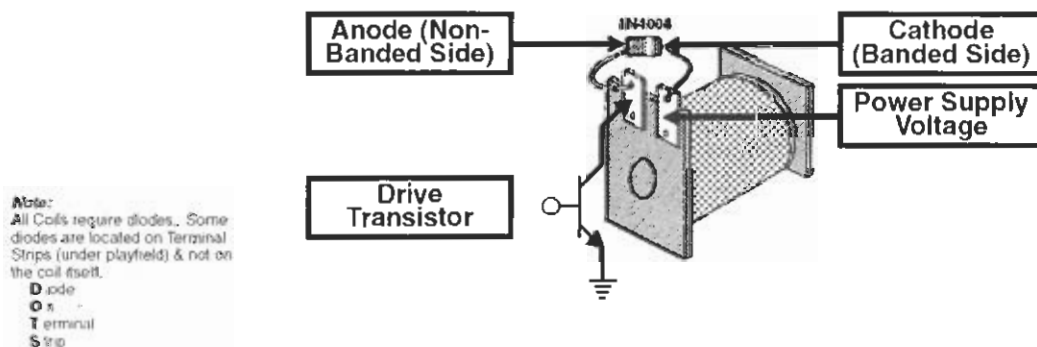
Coil & Flash Lamp Descriptions

Type	Coil / Flash Lamp Descriptions
COIL 1	TROUGH UP-KICKER (VUK) (26-1200)
COIL 2	AUTO LAUNCH (50V) (24-940)
COIL 3	LEFT VUK (26-1200)
COIL 4	RIGHT VUK (26-1200)
COIL 5	BALL RELEASE (RAMP) (28-1050)
COIL 6	LT OUTLANE (UK ONLY) (28-1050)
COIL 7	NOT USED
COIL 8	(EUROPEAN TOKEN DISPENSER)
COIL 9	LEFT TURBO BUMPER (26-1200)
COIL 10	TOP TURBO BUMPER (26-1200)
COIL 11	RIGHT TURBO BUMPER (26-1200)
COIL 12	LEFT SLINGSHOT (26-1200)
COIL 13	RIGHT SLINGSHOT (26-1200)
COIL 14	UP/DOWN POST (23-1100)
COIL 15	LEFT FLIPPER (50v RED/YEL) (23-1100)
COIL 16	RIGHT FLIPPER (50v RED/YEL) (23-1100)

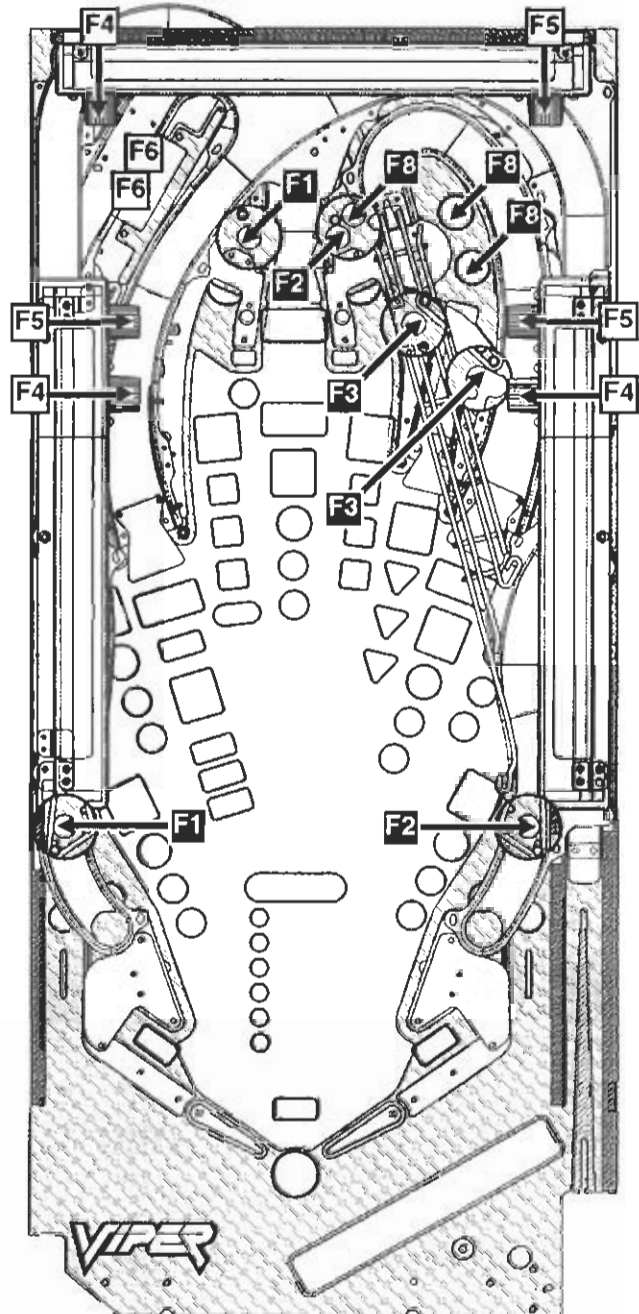
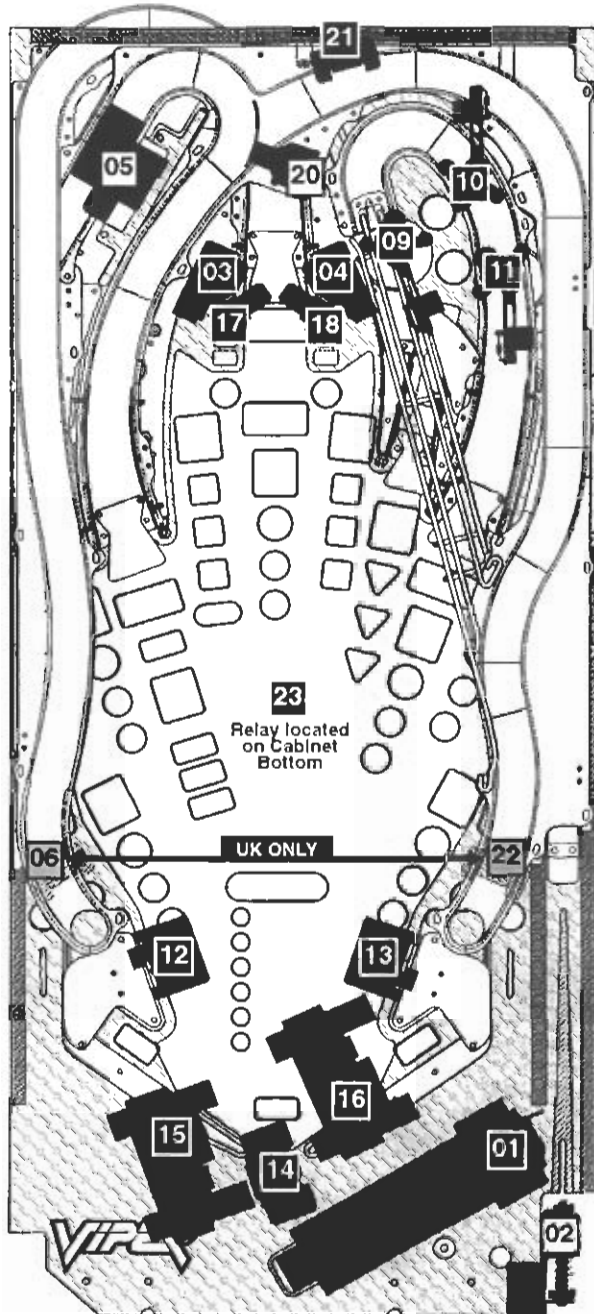
Type	Coil / Flash Lamp Descriptions
COIL 17	LEFT RACCOON SHAKE (28-1050)
COIL 18	RIGHT RACCOON SHAKE (28-1050)
COIL 19	NOT USED
COIL 20	LEFT RAMP DIVERTER (32-1800)
COIL 21	ORBIT DIVERTER (26-1200)
COIL 22	RT OUTLANE (UK ONLY) (28-1050)
COIL 23	BLACK LIGHT RELAY
COIL 24	(OPTIONAL COIN METER)
#F1	FLASH LT OUTLANE/UK *2 (#89 Bulb)
#F2	FLASH RT OUTLANE/VUK *2 (#89 Bulb)
#F3	FLASH BRIDGE OUT *2 (#89 Bulb)
#F4	FLASH RED *3 (#89 Bulb)
#F5	FLASH BLUE *3 (#89 Bulb)
#F6	FLASH BILLBOARD *2 (#906 Bulb)
#F7	NOT USED *0
#F8	FLASH POPS *3 (#89 Bulb)

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

Typical Coil Wiring



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 Coils are used for **UK Only**:

06 22

The following Coils are Optional:

08 24

The following Bulb Types are used for Flash Lamps:



#89 Bulb
(Bayonet)
165-5000-89



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

The following Coils are Not Used:

07 19

The following Flash Lamp is Not Used:

F7



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
01	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
02	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00B
03	LEFT VUK	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
04	RIGHT VUK	Q4	I/O Pwr. Drvr.	BRY-YEL	J8-P5	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
05	BALL RELEASE (RAMP)	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	28-1050 090-5046-00
06	LT OUTLANE (UK ONLY)	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	BRN	J7-P1	20v DC	28-1050 090-5046-00
07	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	N / C	N / C	N / C	N / C
08	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	N / C

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 or Bulb Type
09	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	TOP TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
14	UP/DOWN POST	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T

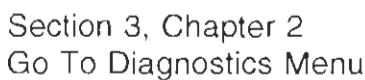
Low Current Coils Group 1		Drive Trans- istor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
17	LEFT RACCOON SHAKE	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	28-1050 090-5046-00
18	RIGHT RACCOON SHAKE	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v DC	28-1050 090-5046-00
19	NOT USED	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	N / C	N / C	N / C	N / C
20	LEFT RAMP DIVERter	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v DC	32-1800 090-5031-02
21	ORBIT DIVERter	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	26-1200 090-5044-00T
22	RT OUTLANE (UK ONLY)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	28-1050 090-5046-00
23	BLACK LIGHT RELAY	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	Relay Bd. 520-5010-00
24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	N / C

4.5v DC Meter SPI PN: 091-5000-00

Flash Lamps (FLASH)		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	Bulb Type
F1	#F1 FLASH LT OUTLANE/VUK *2	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F2	#F2 FLASH RT OUTLANE/VUK *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F3	#F3 FLASH BRIDGE OUT *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F4	#F4 FLASH RED *3	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F5	#F5 FLASH BLUE *3	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F6	#F6 FLASH BILLBOARD *2	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#806 Bulb 165-5004-00
F7	#F7 FLASH NOT USED *0	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	N / C	N / C	N / C	N / C
F8	#F8 FLASH POPS *3	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89



Section 3 | Diags.





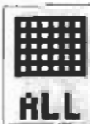
Go To Lamp Menu

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



Single Lamp Test

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



Test All Lamps

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

D o s e T e r m i n a l S t r i p									
Column (18v)	1: U17 YEL-BRN J13-P9	2: U16 YEL-RED J13-P8	3: U15 YEL-ORG J13-P7	4: U14 YEL-BLK J13-P6	5: U13 YEL-GRN J13-P5	6: U12 YEL-BLU J13-P4	7: U11 YEL-VIO J13-P3	8: U10 YEL-GRY J13-P1	
Row (GND)									
1: Q33 RED-BRN J12-P1	DRAG RACE #555 Bulb 1	INVITA- TIONAL #555 Bulb 2	HITCH- HIKERS #555 Bulb 3	LIGHTS OUT #555 Bulb 4	PEDAL TO THE METAL #555 Bulb 5	SLASH'S SNAKE PIT #555 Bulb 6	MANCOW'S ... (LT) #555 Bulb 7	MANCOW'S ... (RT) #555 Bulb 8	
2: Q34 RED-BLK J12-P2	2 MILES (RT TARGET) #555 Bulb 9	5 MILES (RT TARGET) #555 Bulb 10	LITE POST SAVE (RT) #555 Bulb 11	VIPER: RIGHT TARGET #555 Bulb 12	2 MILES (LT TARGET) #555 Bulb 13	5 MILES (LT TARGET) #555 Bulb 14	LITE POST SAVE (LT) #555 Bulb 15	VIPER: LEFT TARGET #555 Bulb 16	
3: Q35 RED-ORG J12-P3	2 MILES (RT ORBIT) #555 Bulb 17	5 MILES (RT ORBIT) #555 Bulb 18	SPELL VIPER (RT) #555 Bulb 19	VIPER: RIGHT ORBIT #555 Bulb 20	2 MILES (LT ORBIT) #555 Bulb 21	5 MILES (LT ORBIT) #555 Bulb 22	SPELL VIPER (LT) #555 Bulb 23	VIPER: LEFT ORBIT #555 Bulb 24	
4: Q36 RED-YEL J12-P4	CAUTION #555 Bulb 25	WARNING #555 Bulb 26	BRIDGE OUT #555 Bulb 27	VIPER: JUMP RAMP #555 Bulb 28	2 MORE (RT LOCK) #555 Bulb 29	1 MORE (RT LOCK) #555 Bulb 30	LOCK (RT) #555 Bulb 31	JACKPOT (RT LOCK) #555 Bulb 32	
5: Q37 RED-GRN J12-P5	2 MILES (RT RAMP) #555 Bulb 33	5 MILES (RT RAMP) #555 Bulb 34	ONE SHOT (RT RAMP) #555 Bulb 35	VIPER: RIGHT RAMP #555 Bulb 36	2 MORE (LT LOCK) #555 Bulb 37	1 MORE (LT LOCK) #555 Bulb 38	LOCK (LT) #555 Bulb 39	JACKPOT (LT LOCK) #555 Bulb 40	
6: Q38 RED-BLU J12-P6	SNAKE (CTR RAMP) #555 Bulb 41	RUMBLE (CTR RAMP) #555 Bulb 42	ROLL (CTR RAMP) #555 Bulb 43	VIPER: CEN- TER RAMP #555 Bulb 44	DIAL (LT RAMP) #555 Bulb 45	SEND (LT RAMP) #555 Bulb 46	...MYSTERY (LT RAMP) #555 Bulb 47	VIPER: LEFT RAMP #555 Bulb 48	
7: Q39 RED-VIO J12-P8	SPECIAL (LT) #555 Bulb 49	LEFT RE- TURN LANE #555 Bulb 50	RIGHT RE- TURN LANE #555 Bulb 51	SPECIAL (RT) #555 Bulb 52	DOUBLE SCOR- ING (INLANE) #555 Bulb 53	SHOOT AGAIN #555 Bulb 54	...TRIPLE SCOR- ING (INLANE) #555 Bulb 55	UP/DOWN POST #555 Bulb 56	
8: Q40 RED-GRY J12-P9	LEFT RACCOON #555 Bulb 57	JACKPOT (CTR RAMP) #555 Bulb 58	RIGHT RACCOON #555 Bulb 59	EXTRA BALL #555 Bulb 60	LEFT TOP LANE (H) #555 Bulb 61	RIGHT TOP LANE (P) #555 Bulb 62	NOTE PAD #555 Bulb 63	SUPER JACK- POT (LT RAMP) #555 Bulb 64	
9: Q41 RED-WHT J12-P10	LT TURBO BUMPER #555 Bulb 65	TOP TURBO BUMPER #555 Bulb 66	RT TURBO BUMPER #555 Bulb 67	SUPER JACK- POT (RT RAMP) #555 Bulb 68	ALIEN ABDUCTION #555 Bulb 69	NOT USED 70	NOT USED 71	LAUNCH BUTTON #555 Bulb 72	
10: Q42 Not Used J12-P11	NOT USED 73	NOT USED 74	NOT USED 75	NOT USED 76	NOT USED 77	NOT USED 78	NOT USED 79	NOT USED 80	



Lamp Matrix Grid Locations

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

Legend Note:

□ = Lamps mounted above playfield.

■ = Lamps mounted below playfield.

The following Lamps are not used:

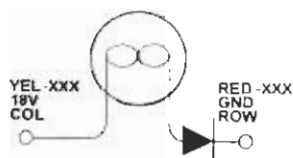
70 71 73 - 80

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

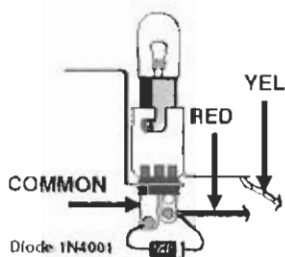


#555 Bulb
(Wedge)
165-5002-00

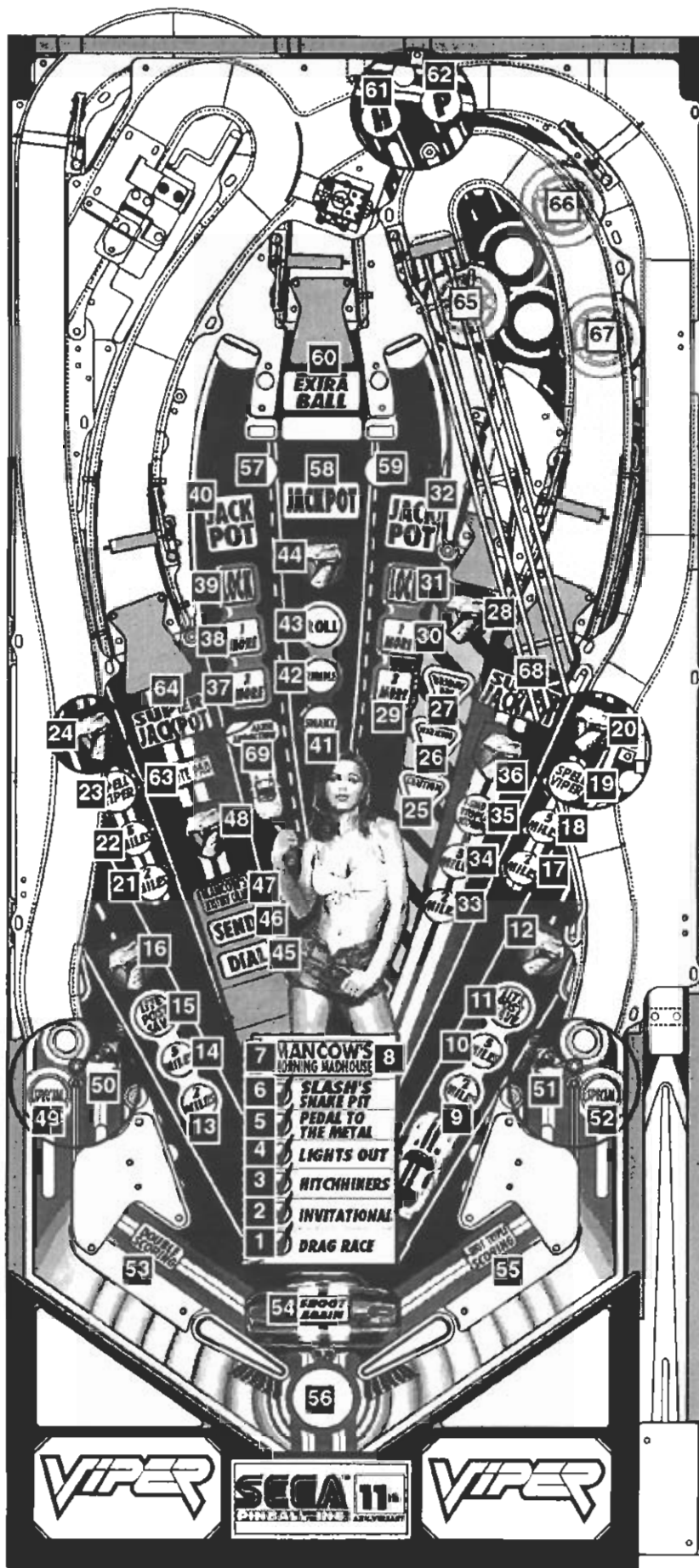
Typical Lamp Schematic



Typical Lamp Wiring



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





Test Flash Lamps

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



Clear Ball Trough

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



Technician Alert

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



Service Phone

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



Begin Play Test

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



Fire 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.

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

Speaker Phase Testing

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





Speaker Phase Testing Continued

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

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

Auto / Manual Tests	Sounds Produced
Speaker Test	Tone
Sound/OPSYS EPROM (Loc. U7)	Level 1-3 (Music Test)
Voice ROM 1 (Loc. U17)	Speech Pattern 1
Voice ROM 2 (Loc. U21)	Speech Pattern 2
Voice ROM 3 (Loc. U36)	Speech Pattern 3
Voice ROM 4 (Loc. U37)	Not Used



Begin Burn In

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



Dot Matrix Test

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

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

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

Dot Matrix Display Explained

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

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



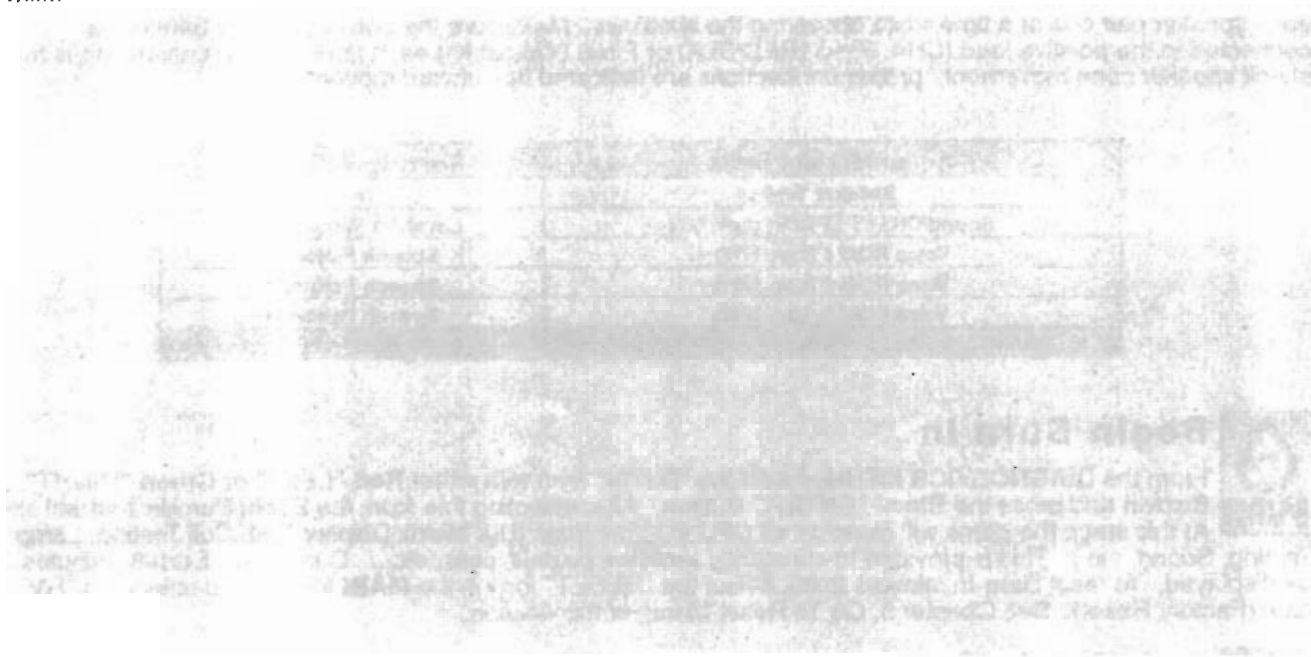


Viper Specific (Black Light Test)

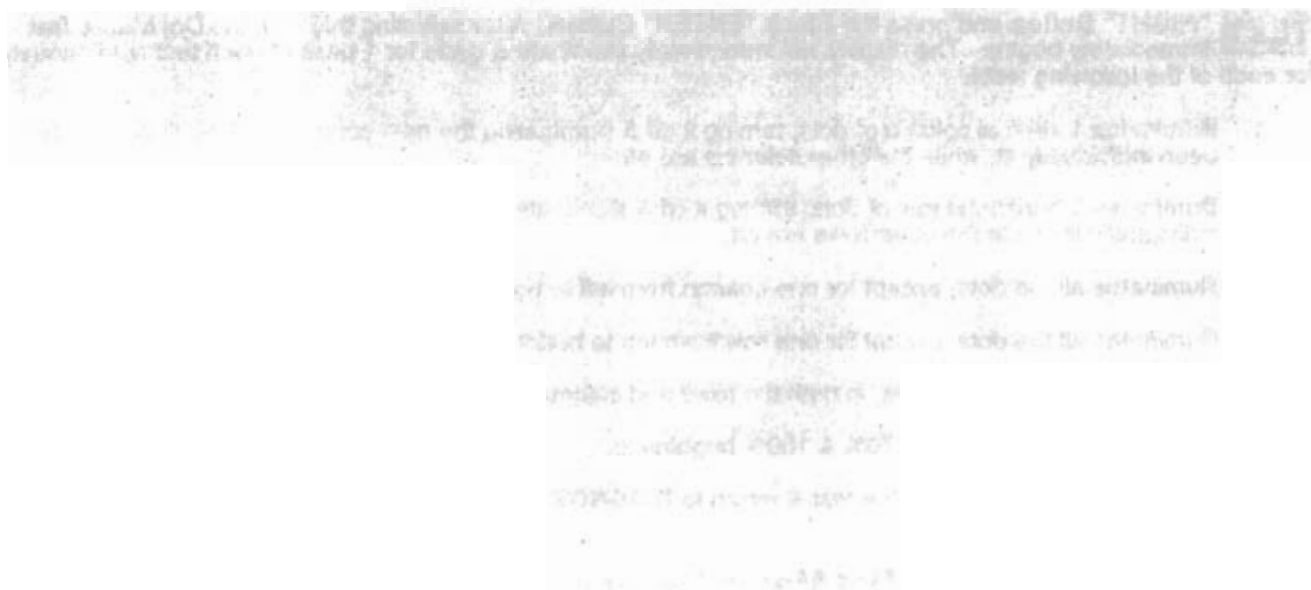
From the **DIAGNOSTICS MENU**, select the "VIP" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** & press the **Black "ENTÉR" Button**. This will bring up the **VIPER SPECIFIC MENU**. Similar to "BEGIN PLAY TEST," this menu is used to test and adjust any game specific feature(s). The game specific feature to test in this game is: **BLACK LIGHT TEST**. The display will indicate...

Run Test

Select the "RUN" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Start Button**. The test will...



Note: To exit this Menu, select & activate the "PREV" *Icon* to go to the **DIAGNOSTICS MENU** or activate the "QUIT" *Icon* to exit **Portals Service Menu**.





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.



GAME AUDIT TABLE

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



Earnings Audits 1-12

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



Sega Audits 13-55

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
13 TOTAL BALLS PLAYED		28 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			



Viper Audits 56-99 (All Audits Subject to Change)

Audit Name	Fill-In	Audit Name	Fill-In	Audit Name	Fill-In
56 Left Orbit		72 Multiball Restart Lit		88	
57 Right Orbit		73 MBall Restarted		89	
58 Left Ramp		74 MBall Jackpots		90	
59 Right Ramp		75 Double Jackpots		91	
60 Middle Ramp		76 Super Jackpot Lit		92	
61 Jump Ramp		77 Super Jackpots		93	
62 Raccoon Targets		78 Super Jackpots Completed		94	
63 Left Eject		79 Notepad Started		95	
64 Right Eject		80 Madhouse Started		96	
65 Pop Bumper Hits		81 Mystery Caller Lit		97	
66 Pop Bumper Visits		82 Mystery Caller Scored		98	
67 Left Target (Lower)		83 Rabid Raccoons Started		99	
68 Right Target (Lower)		84 Rabid Raccoons Completed			
69 MBall Ready		85			
70 Multiball Start		86			
71 2+ MBall Start		87			

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

Location:



Go To Audits Menu

Overview

The **Portals™ Service Menu System** provides 99 Audit Functions for accounting purposes and for evaluation of *Game Difficulty Adjustments*. The Audit Functions are divided into 3 groups: 1st— **Earnings (Coin) Audits**, are the first 12 most-used Audits; 2nd— **Sega Audits**, are the Game Play Generic Audits 13-55; 3rd— **Viper Audits**, are the Game Play Specific Audits 56-99; Audits left open (blank space in gray, e.g. Audits 43-51, 54 & 55, 83-99) are currently **Not Used**, allowing for *Future Expansion*, if any, or are **Proprietary**. If the code version is upgraded, view Audits in the display & write the audit(s) in the blank(s) if any audit(s) were added. Each group may be viewed in the **Portals™ Service Menu** (see Chapter 1, Portals Service Menu Introduction, of this Section). View all audits with the **Game Audit Table** provided on the previous page. Copy page to fill-in important audit information as required.



GO TO AUDITS MENU

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

Important Notes:



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



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



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



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



Earnings Audits (1-12)

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

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



Sega Audits (13-55)

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

Au. 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.





Sega Audits Continued.

Audit Name		Audit Definition
Au. 37	Lost Ball Game Starts	Provides the total number of times the game started with a ball missing from the ball trough at the start of a game.
Au. 38	Left Drains	Provides the total number of times Rollover Switch 57 was closed.
Au. 39	Center Drains	Provides the total number of times the game ball had drained with the last switch closed was not Sw. 57 or Sw. 60.
Au. 40	Right Drains	Provides the total number of times Rollover Switch 60 was closed.
Au. 41	Slam Tilts	Provides the total number of times Contact Switch 55 was closed.
Au. 42	Total Balls Saved	Provides the total number of times this feature was used. This feature is enabled at the start of each ball and is disabled as soon as the ball makes contact with 5 game switches or allocated time expired.
Au. 43- 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).



Viper Audits (56-99) (All Audits Subject to Change)

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

Au. N°	Audit Name	Audit Definition
Au. 56	Left Orbit	Provides the total number of times this feature was completed. †
Au. 57	Right Orbit	Provides the total number of times this feature was completed. †
Au. 58	Left Ramp	Provides the total number of times this feature was completed. †
Au. 59	Right Ramp	Provides the total number of times this feature was completed. †
Au. 60	Middle Ramp	Provides the total number of times this feature was completed. †
Au. 61	Jump Ramp	Provides the total number of times this feature was completed. †
Au. 62	Raccoon Targets	Provides the total number of times this feature was completed. †
Au. 63	Left Eject	Provides the total number of times this feature was completed. †
Au. 64	Right Eject	Provides the total number of times this feature was completed. †
Au. 65	Pop Bumper Hits	Provides the total number of times this feature was completed. †
Au. 66	Pop Bumper Visits	Provides the total number of times this feature was completed. †
Au. 67	Left Target (Lower)	Provides the total number of times this feature was completed. †
Au. 68	Right Target (Lower)	Provides the total number of times this feature was completed. †
Au. 69	MBall Ready	Provides the total number of times feature was ready awaiting Multiball. †
Au. 70	Multiball Start	Provides the total number of times Multiball was played. †
Au. 71	2+ MBall Start	Provides the total number of times Multiball was played more than once by a single player in one game. †
Au. 72	Multiball Restart Lit	Provides the total number of times Multiball was played and no Jackpots were collected. †
Au. 73	Multiball Restarted	Provides the total number of times Multiball was restarted after Multiball Restart was lit. †
Au. 74	MBall Jackpots	Provides the total number of times this feature was awarded. †
Au. 75	Double Jackpots	Provides the total number of times this feature was awarded. †

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





Viper Audits Continued (All Audits Subject to Change)

Audit Name		Audit Definition
Au. 76	Super Jackpot Lit	Provides the total number of times this feature was lit. ‡
Au. 77	Super Jackpots	Provides the total number of times this feature was awarded. †
Au. 78	Super Jackpots Completed	Provides the total number of times both Super Jackpots were completed. †
Au. 79	Notepad Started	Provides the total number of times this feature was played. †
Au. 80	Madhouse Started	Provides the total number of times Multiball was played. †
Au. 81	Mystery Caller Lit	Provides the total number of times this feature was lit. ‡
Au. 82	Mystery Caller Scored	Provides the total number of times this feature was awarded. †
Au. 83	Rabid Raccoons Started	Provides the total number of times this feature was played. †
Au. 84	Rabid Raccoons Completed	Provides the total number of times this feature was completed. †
Au. 85- Au. 99		At time of printing, these audits are Not Used , allowing for Future Expansion , if any.

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

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

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

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.

Au.





Go To Printer Menu

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



Special equipment is required for this Sub-Menu

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



Adjustment 54, Printer Interface (Quick Printout)

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



Adjustment 55, Alison Interface (Full Printout)

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



Adjustment 56, N° of Copies Printed (Reset Printer)

From the **PRINTER MENU**, select the "RESET" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the clear the "N° of copies printed" count total.

RESETTING AUDIT NOTES:



Audit Note: 1st Way to Reset Audits

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



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

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



Audit Note: 2nd Way to Reset Audits

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



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



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



GAME ADJUSTMENT TABLE

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



Sega Adjustments 1-43

Adjustment Name	USA Default	Your Setting	Adjustment Name	USA Default	Your Setting
1 REPLAYS: FIXED/MANUAL $\frac{1}{2}$	...10%...		23 DEFAULT HIGH SCORE #3	200,000,000	
2 REPLAY LEVELS $\frac{1}{2}$	1 ...		24 DEFAULT HIGH SCORE #4	175,000,000	
3 REPLAY AWARD	CREDIT		25 DEFAULT HIGH SCORE #5	150,000,000	
4 FREE GAME LIMIT	05		26 DEFAULT HIGH SCORE #6	125,000,000	
5 EXTRA BALL LIMIT	03		27 HSTD RESET COUNT	2,000	
6 GAME DIFFICULTY $\frac{1}{2}$	MODERATE		28 FREE PLAY	NO	
7 GAME PRICING $\frac{1}{2}$	USA8		29 CUSTOM MESSAGE	ON	
8 RESET COIN AUDITS	NO		30 ATTRACT MODE MUSIC	ON	
9 RESET GAME AUDITS	NO		31 FLASH LAMP POWER	NORMAL	
10 RESET HIGH SCORES	NO		32 COIL PULSE POWER	NORMAL	
11 MATCH PERCENTAGE	9%		33 KNOCKER VOLUME	NORMAL	
12 BALLS PER GAME	03		34 MINIMUM GAME TIME	OFF	
13 TILT WARNINGS	01		35 MUSIC VOLUME	15/15	
14 REPLAY BOOST	YES		36 GAME RESTART	YES	
15 CREDIT LIMIT	30		37 EXTRA BALL PERCENTAGE	25%	
16 ALLOW HIGH SCORES	YES		38 BILL VALIDATOR	NO	
17 HIGH SCORE #1 AWARDS	01		39 TOURNAMENT MODE	NONE	
18 HIGH SCORE #2 AWARDS	00		40 EURO. TOKEN DISP.	OFF	
19 HIGH SCORE #3 AWARDS	00		41 SPECIAL MEMORY	YES	
20 HIGH SCORE #4 AWARDS	00		42 LOCATION ID	00	00
21 DEFAULT HIGH SCORE #1	250,000,000		43 GAME ID	00	00
22 DEFAULT HIGH SCORE #2	225,000,000				

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



Viper Adjustments 44-53

Adjustment Name	USA Default	Your Setting	Adjustment Name	USA Default	Your Setting
44 MBALL RESTART	MODERATE		49 MILES CRITERION	MODERATE	
45 EXTRA BALL MEMORY	ON		50 MODE START CRITERION	MODERATE	
46 MULTIBALL CRITERION	MODERATE		51 POST SAVE CRITERION	NORMAL	
47 BALL LOCK ENABLED	YES		52 STEEL BALLS INSTALLED	NO	
48 BLACKLIGHT STYLE	NORMAL		53 MODESTY FEATURE	NO	



Go To Adjustments Menu

Overview

The **Portals™ Service Menu System** provides 53 Adjustment Functions to vary game difficulty or to customize (e.g. Adjusting: High Score Levels; Balls per game; Game Pricing; Default High Scores; etc.). The Adjustment Functions are divided into 2 groups: 1st—**Sega Adjustments**, are the Game Play Generic Adjustments (1-43); 2nd—**Viper Adjustments**, are the Game Play Specific Adjustments (44-53); There are no Adjustment(s) left open or are currently Not Used, allowing for Future Expansion, if any, or are Proprietary. If the code version is upgraded, view Adjustments in the display & write the adjustment(s) in the blank(s) if any adjustment(s) were added. Each group may be viewed manually after entering the **Portals™ Service Menu** (see Chapter 1, Portals™ Service Menu Introduction, of this Section). All adjustments can be viewed at a glance with the **Game Adjustment Table** provided on the previous page. If a value is changed, the display will indicate **REQUEST INSTALLED**.



GO TO ADJUSTMENTS MENU

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

Important Notes:



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



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



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



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



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



Sega Adjustments (1-43)

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

Adj. №	Adjustment Name	Adjustment Definition
Adj. 1	Replays: Fixed / Manual	Adjust for percentage of awards for Replay Levels (1% through 50%). Lower the automatic value to 0% and the display will indicated Fixed. Replays may be adjusted either for fixed levels or for a system-adjusted manual percentage of replay awards. Four levels may be selected. Adjustments allow awarding of a credit or an extra ball as each level is exceeded. With the manual percentage feature, if the actual replay percentage is higher or lower than that desired, the game computes new recommended manual percentage score(s). When the coin door is subsequently opened the player displays indicate the recommended level and a sound is made to alert the operator of a potential change. This new level is entered into adjustments simply by pressing the Black "ENTER" Button . (If the Coin Door is closed or the operator enters the Portals™ Service Menu, the replay level is not changed.)
Adj. 2	Replay Levels	Adjust the number of replay levels to be active (1 to 4). Once the number of Replay Levels has been selected, a "Drop-Down" Table appears showing Replay Level 1. Adjust Replay Level 1 between 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.)





Sega Adjustments Continued.

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

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

Play Rules: Novelty & 4-Ball, plus Add-A-Ball Settings

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

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

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

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

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

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

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

Adj. 7 Game Pricing

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

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

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





Sega Adjustment 7 Continued.

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

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

Custom Pricing Table

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

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

The Standard Pricing Select Table Explained:

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

Standard Pricing Select Table

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

Pos.
ON
OFF

1

2

3

4

5

6

7

8



Standard Pricing Select Table - (Continued)

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

Same as above (UK1-3); however, with this new Dip Switch Setting (2, 3, & 4 = ON), the New Style Coin Mech: 50p & 2£ Coins can be accommodated in the 5th & 6th Coin Slots. (This is "software controlled" by noting presence/non-presence of pulses via 1-4.)

Notes: ‡ indicates Factory Default for that setting.

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





Sega Adjustments Continued.

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



Sega Adjustments Continued.

Adjustment Name	Adjustment Definition
Adj. 31 Flash Lamp Power	Set to NORMAL , DIM or OFF . When set to NORMAL the flash lamps are active, when DIM the flash lamps impulse power is reduced by 25% and when OFF the flash lamps will not flash.
Adj. 32 Coil Pulse Power	Set to NORMAL , HARD or SOFT . When HARD the coil pulse power is <i>increased</i> by 12.5% of the normal pulse rate. When set to SOFT the coil pulse power is <i>decreased</i> by 12.5% of the normal pulse rate. These adjustments are provided to compensate for Low Line or High Line voltage conditions where the solenoids appear to kicking too weak or too hard. Adjust as required.
Adj. 33 Knocker Volume	Set to NORMAL , LOW or OFF . Default is NORMAL . When set to LOW , the volume is decreased 50%. When set to OFF , no sound is heard when the "knocker" is sounded.
Adj. 34 Minimum Game Time	Set between 0:01 - 8:59 for minimum game time. Default is OFF . If the last ball in play drains prior to what the game time is set for, another ball will be served into the shooter lane and normal play will continue. Subsequent balls will continue to do be served into the shooter lane if the last ball still drains prior to and up until minimum game time is satisfied.
Adj. 35 Music Volume	Set between 1 - 15 . Default is 15 . After volume is set via Portals Service Buttons (See Sec. 3, Chp. 1, ...Intro) this adjustment can be utilized to adjust the music softer while keeing the sound effects at the volume set via Portals Buttons.
Adj. 36 Game Restart	Set to YES or NO . When set to YES , a new game may be started during any ball after the first ball is completed (if credits are available). (Note-Pressing start during the first ball will add additional players.) When set to NO , the game disables the Start Button after the first ball until the final ball is in play. Review Section 2, Chapter 1, Game Operations & Features for details.
Adj. 37 Extra Ball Percentage	Set from 0 to 50 . Allows the operator to adjust how frequently the Extra Ball feature is made available to the player.
Adj. 38 Bill Validator	Set to YES or NO . When set to YES , the display, in game attract mode, will show an "Insert Bill Animation." When set to NO , the display, in game attract mode will show "Insert Coin Animation."
Adj. 39 Tournament Mode	Set to NONE , PINBALL EXPO , IFPA-PAPA or HOME . Tournament Mode determines the default conditions to quickly prepare a game for tournament play. When this setting is changed <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. 40 Euro. Token Disp.	Set to ON or OFF . When set to ON , the operator can enable the "knocker" cable in the cabinet to drive an external device (e.g. European Token Dispenser) without the game giving a replay.
Adj. 41 Special Memory	Set to YES or NO . When set to YES , the lit 'Special' light will be retained in memory from ball to ball for the same player. When set to NO , the lit 'Special' light will go out at the end of each ball.
Adj. 42 Location ID	00 to 9999 . Allows the operator to assign a location identification number to the audit print-out sheet. (Will not be affected by Factory Reset.) See the end of this Section 3, Chapter 3, Go To Audits Menu, and Chapter 5, Go to Reset Menu, for more details on Factory Reset & Printing.
Adj. 43 Game ID	00 to 9999 . Allows the operator to assign a game identification number to the audit print-out sheet. (Will not be affected by Factory Reset.) See the end of this Section 3, Chapter 3, Go To Audits Menu, and Chapter 5, Go to Reset Menu, for more details on Factory Reset & Printing.





Viper Adjustments (44-53)

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

Adj. Nº	Adjustment Name	Adjustment Definition
Adj. 44	MBall Restart	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how Multiball can restart.
Adj. 45	Extra Ball Memory	Set to ON or OFF . Default is ON . When set to ON , the lit 'Extra Ball' light will be retained in memory from ball-to-ball for the same player. When set to OFF , the lit 'Extra Ball' light will go out at the end of each ball.
Adj. 46	Multiball Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the Multiball Feature is started and played.
Adj. 47	Ball Lock Enabled	Set to YES or NO . Default is YES . When set to YES , balls will be locked (when feature is available) in the 2 center Ball Ejects. Set to NO for "virtual lock".
Adj. 48	Blacklight Style	Set to OFF, NORMAL, ATTRACT or ALWAYS ON . Default is NORMAL . When set to NORMAL , the Blacklights are only on during Multiball and selected features only. When set to ATTRACT , the Blacklights are on during Attract Mode in addition to Multiball and selected features. When set to OFF , no Blacklights. When set to ALWAYS ON , Blacklights on all the time.
Adj. 49	Miles Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the Mystery Features are started and played.
Adj. 50	Mode Start Criterion	Set to EXEASY, EASY, MODERATE, HARD or EXHARD . Default is MODERATE . Determines how the Mode Start Features are started and played.
Adj. 51	Post Save Criterion	Set to OFF, NORMAL , or ENGLISH . Default is NORMAL . When set to NORMAL this feature is available when lit. Set to OFF to disable this feature. Set to ENGLISH to have always have available. (UK Games have Outlane Post Save Devices which are accessed in a different way. Domestic games should not use the ENGLISH setting.)
Adj. 52	Steel Balls Installed	Set to YES or NO . Default is NO . When set to NO , the plastic Glow Balls are being used. When set to YES , steel balls are being used in lieu of the plastic glow balls. The program needs to know to accomodate the different weight between the two types of balls as coil pulse functions may differ.
Adj. 53	Modesty Feature	Set to YES or NO . Default is NO . When set to NO , video graphics, sounds and language are more appropriate for adults. When set to YES , video graphics, sounds and language are more appropriate for children or for people who embarrass easy.

ABCD Custom Message



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



Film Star Reset

To reset the game with *Special Home Settings (not the normal Factory Setting)*, from the **ADJUSTMENT MENU**, select the "STAR" *Icon* either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. This *Special Setting* automatically changes **Adjustment 6, Game Difficulty**, to **EASY** and **Adjustment 28, Free Play**, to **YES**. This setting is determined to be ideal for the home environment. See Chapter 5, Go to Reset Menu, of this section, to change to factory defaults if changes made are not desired.

RESETTING & PRINTING ADJUSTMENTS NOTES:



Adjustment Note: Resetting Adjustments

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



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



Adjustment Note: Printing Audit Information

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



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



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



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



Go To Reset Menu

Overview

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



GO TO RESET MENU

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

Important Notes:



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



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



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



Reset Coin Audits

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



Reset Game Audits

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

Fig. 1

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

Fig. 2

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

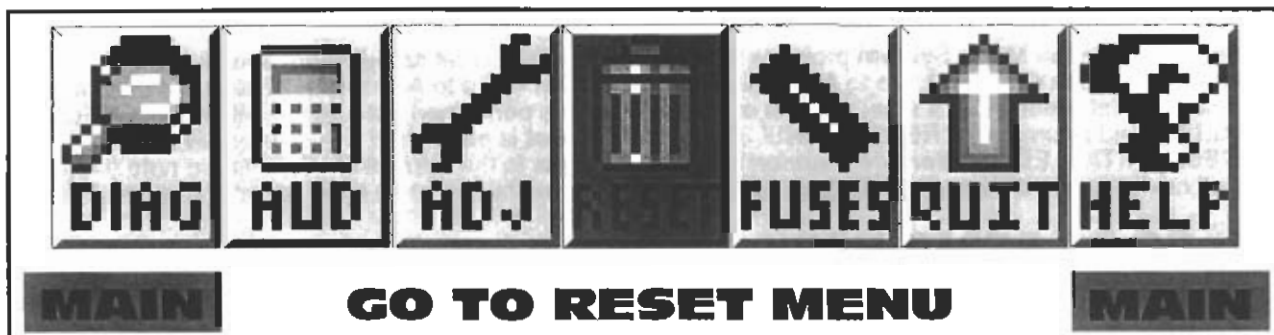


Factory Reset

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

Example:

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



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



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



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.)



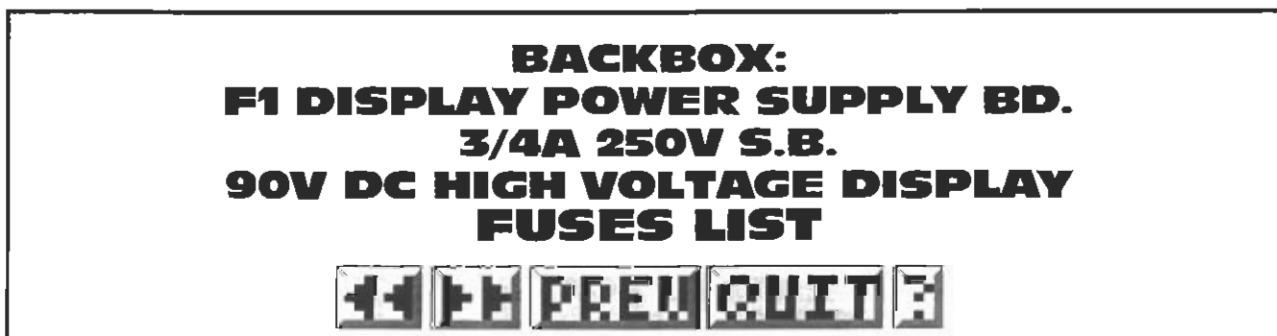
Selecting & activating the "ARROW" *Icons* selects the next or previous fuse in this group.

Example:

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

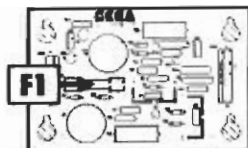


Press the **Black Button** to activate this **ICON**. This will bring up the **FUSES LIST**.





BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs

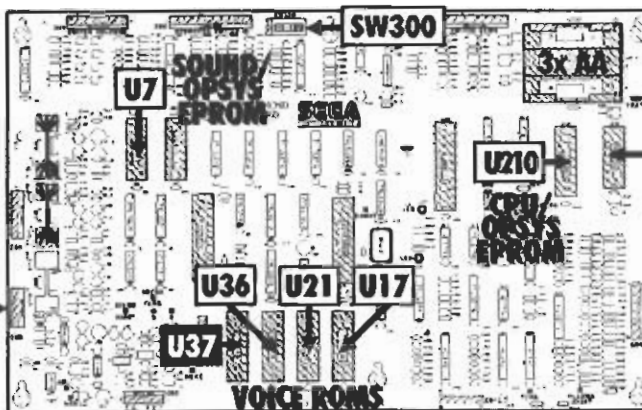


Display Power Supply Bd.

CPU / Sound Board

No Fuses

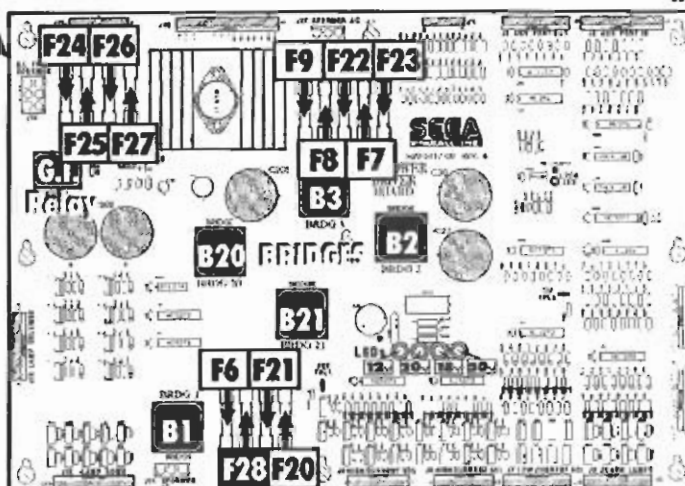
I/O Power Driver Board



U212
CMOS
RAM

Note:

U37
is Not Used
in this game.



Note:

F28
is Not Used
in this game.

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

QUICK REFERENCE FUSE CHART

Backbox Fuses

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

F1 1/4A 250v S.B. 90v DC High Voltage Display

LOC: I/O POWER DRIVER BOARD

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

Cabinet Fuses

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

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

Playfield Fuses

LOC: UNDER PLAYFIELD (By Assemblies Listed)

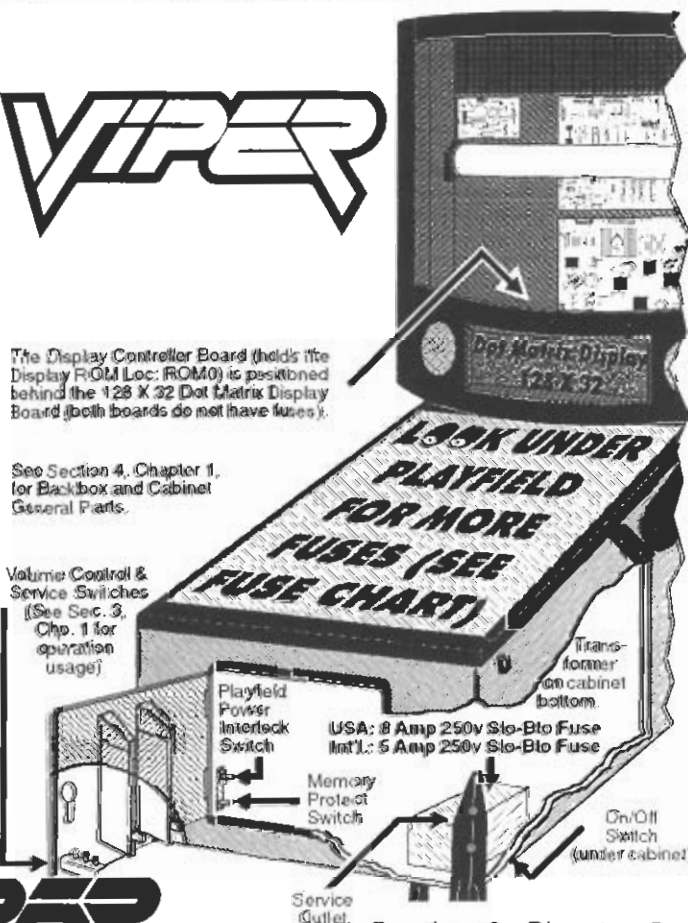
n/a	3A 250v S.B.	50v DC	Rt. Flipper (BLU/YEL--RED/YEL)
n/a	3A 250v S.B.	50v DC	Lt. Flipper (GRY/YEL--RED/YEL)



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

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

Volume Control & Service Switches (See Sec. 3, Chp. 1 for operation usage)



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 "clicks" and locks into an up/down position, the Green Button has this lock switch. Remove it. (Ref. to Service Bulletin #74.)
The Start and Flipper Buttons do not select or activate <i>Icons</i> in the SWITCH TEST MENU .	• This is normal. These switches are deactivated, as they are a part of the Switch Test. Use the Red "LEFT" or Green "RIGHT" & Black "ENTER" Buttons in this Sub-Menu (See Chapter 1).
Can't move selection of <i>Icon</i> with the Left and/or Right Flipper Buttons .	• Check the Flipper Buttons for loose connections or bad Ground and refer to the Game Manual Flipper Troubleshooting Flowchart. • This is normal only in Diagnostic's Switch & Active Switch Tests (see previous Problem).
Some <i>Icons</i> appear non-functional in the PRINTER MENU(S) .	• If no printing equipment is connected, the "-", "+" <i>Icon</i>, 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 do not fire after activating the "RUN" <i>Icon</i> .	• Ensure the POWER INTERLOCK SWITCH (See figure on front inside cover) is pulled out.
In Portals™ Service Menu , the volume cannot be adjusted with the Red or Green Buttons .	• The Volume adjustment can only be made when the Service Menu is exited. The Volume Mode is entered by pressing the Red "VOLUME" Button. Then use the Red or Green Button to increase/decrease volume. (Red "LEFT" decrements; Green "RIGHT" increments.)
In Portals™ Service Menu , the display seems to lock up, or the Help Display appears to be non-functional.	• If you cannot clear the situation by exiting back one Menu, exit completely out of the Portals™ Service Menu, and re-enter. If the problem persists, call Tech. Support for additional help.

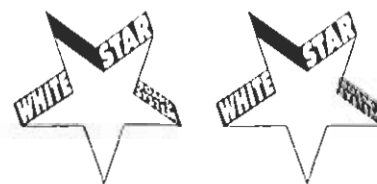
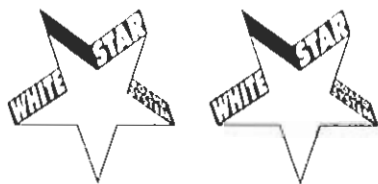


Table of Contents

☐ Coils Detailed Chart Table	86
• Chapter 1, Backbox Wiring	87
☒ Backbox Board Layout Wiring Diagram.....	87
☐ Backbox I/O Power Driver Board Detailed Wiring Diagram	88
• Chapter 2, Playfield Wiring.....	89
☒ General Illumination Circuit Detailed Wiring Diagram.....	89
☐ Playfield Switch Wiring Diagram & Playfield Lamp Wiring Diagram.....	90
☒ Playfield Diode Terminal Strip Descriptions & Locations	91
☐ 2-Flipper Circuit Wiring Diagram	92
• Chapter 3, Cabinet Wiring	93
☒ Transformer Power Wiring Diagram	93
☐ Cabinet / Coin Door Wiring Diagram	94
• Chapter 4, Printed Circuit Boards (PCBs)	95
☒ Trough Up-Kicker OPTO Boards Theory of Operation & Schematic	95
☒ Trough Up-Kicker OPTO Boards Component Layout & Parts	95
☐ OPTO Troubleshooting	95-96
☐ Single Trough OPTO Boards Alignment / Test	96
☒ Playfield Sw. OPTO "Long-Hop" Bds. Theory of Operation & Schematic	97
☒ Playfield Switch OPTO "Long-Hop" Boards Component Layout & Parts	97
☐ Dot Matrix Display/Display Controller Bd. Combined Display Connections.....	98
☒ Display Power Supply Board Schematic	99
☒ Display Power Supply Board Component Layout & Parts.....	99
☐ Display Controller Board Schematic	100
☐ Display Controller Board Component Layout & Parts	101
☒ I/O Power Driver Board Theory of Operation.....	102
☒ I/O Power Driver Board Schematic (Sheet 1 of 5)	103
☒ I/O Power Driver Board Schematic (Sheet 2 of 5)	104
☒ I/O Power Driver Board Schematic (Sheet 3 of 5)	105
☒ I/O Power Driver Board Schematic (Sheet 4 of 5)	106
☒ I/O Power Driver Board Schematic (Sheet 5 of 5)	107
☒ I/O Power Driver Board Component Layout	108
☒ I/O Power Driver Board Parts	109
☐ CPU/Sound Board Theory of Operation.....	110
☐ CPU/Sound Board Schematic (Sheet 1 of 3).....	111
☐ CPU/Sound Board Schematic (Sheet 2 of 3).....	112
☐ CPU/Sound Board Schematic (Sheet 3 of 3).....	113
☐ CPU/Sound Board Component Layout	114
☐ CPU/Sound Board Parts	115
☒ Relay Board & Playfield Black Light Schematic.....	116

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

COILS DETAILED CHART TABLE

High Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
01	TROUGH UP-KICKER	Q1	I/O Pwr. Drvr.	BRN-BLK	J8-P1	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
02	AUTO LAUNCH	Q2	I/O Pwr. Drvr.	BRN-RED	J8-P3	YEL-VIO	J10-P4/5	50v DC	24-940 090-5036-00B
03	LEFT VUK	Q3	I/O Pwr. Drvr.	BRN-ORG	J8-P4	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
04	RIGHT VUK	Q4	I/O Pwr. Drvr.	BRN-YEL	J8-P5	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
05	BALL RELEASE (RAMP)	Q5	I/O Pwr. Drvr.	BRN-GRN	J8-P6	BRN	J7-P1	20v DC	28-1050 090-5046-00
06	LT OUTLANE (UK ONLY)	Q6	I/O Pwr. Drvr.	BRN-BLU	J8-P7	BRN	J7-P1	20v DC	28-1050 090-5046-00
07	NOT USED	Q7	I/O Pwr. Drvr.	BRN-VIO	J8-P8	N / C	N / C	N / C	N / C
08	EUROPEAN TOKEN DISPENSER	Q8	I/O Pwr. Drvr.	BRN-GRY	J8-P9	YEL-VIO	J10-P4/5	50v DC	N / C

High Current Coils Group 2		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
09	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	TOP TURBO BUMPER	Q10	I/O Pwr. Drvr.	BLU-RED	J9-P2	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
11	RIGHT TURBO BUMPER	Q11	I/O Pwr. Drvr.	BLU-ORG	J9-P4	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
12	LEFT SLINGSHOT	Q12	I/O Pwr. Drvr.	BLU-YEL	J9-P5	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
13	RIGHT SLINGSHOT	Q13	I/O Pwr. Drvr.	BLU-GRN	J9-P6	YEL-VIO	J10-P4/5	50v DC	26-1200 090-5044-00T
14	UP/DOWN POST	Q14	I/O Pwr. Drvr.	BLU-BLK	J9-P7	YEL-VIO	J10-P4/5	50v DC	23-1100 090-5030-00T
15	LEFT FLIPPER (50v RED/YEL)	Q15	I/O Pwr. Drvr.	ORG-GRY	J9-P8	RED-YEL GRY-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T
16	RIGHT FLIPPER (50v RED/YEL)	Q16	I/O Pwr. Drvr.	ORG-VIO	J9-P9	RED-YEL BLU-YEL	J10-P1/2	50v DC	23-1100 090-5030-00T

Low Current Coils Group 1		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Coil GA/Turn or Bulb Type
17	LEFT RACCOON SHAKE	Q17	I/O Pwr. Drvr.	VIO-BRN	J7-P2	BRN	J7-P1	20v DC	28-1050 090-5046-00
18	RIGHT RACCOON SHAKE	Q18	I/O Pwr. Drvr.	VIO-RED	J7-P3	BRN	J7-P1	20v DC	28-1050 090-5046-00
19	NOT USED	Q19	I/O Pwr. Drvr.	VIO-ORG	J7-P4	N / C	N / C	N / C	N / C
20	LEFT RAMP DIVERter	Q20	I/O Pwr. Drvr.	VIO-YEL	J7-P6	BRN	J7-P1	20v DC	32-1800 090-5031-02
21	ORBIT DIVERter	Q21	I/O Pwr. Drvr.	VIO-GRN	J7-P7	BRN	J7-P1	20v DC	26-1200 090-5044-00T
22	RT OUTLANE (UK ONLY)	Q22	I/O Pwr. Drvr.	VIO-BLU	J7-P8	BRN	J7-P1	20v DC	28-1050 090-5046-00
23	BLACK LIGHT RELAY	Q23	I/O Pwr. Drvr.	VIO-BLK	J7-P9	BRN	J7-P1	20v DC	Relay Bd. 520-5010-00
24	OPTIONAL COIN METER	Q24	I/O Pwr. Drvr.	VIO-GRY	J7-P10	RED	J16-P7	5v DC	N / C

4.5v DC Meter SPI PN: 091-5000-00

Flash Lamps (FLASH)		Drive Transistor (D.T.)	Driver Output Board	D.T. Control Line Color	D.T. Control Line Connect	Power Line Color	Power Line Connection	Power Voltage	Bulb Type
F1	#F1 FLASH LT OUTLANE/VUK *2	Q25	I/O Pwr. Drvr.	BLK-BRN	J6-P1	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F2	#F2 FLASH RT OUTLANE/VUK *2	Q26	I/O Pwr. Drvr.	BLK-RED	J6-P2	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F3	#F3 FLASH BRIDGE OUT *2	Q27	I/O Pwr. Drvr.	BLK-ORG	J6-P3	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F4	#F4 FLASH RED *3	Q28	I/O Pwr. Drvr.	BLK-YEL	J6-P4	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F5	#F5 FLASH BLUE *3	Q29	I/O Pwr. Drvr.	BLK-GRN	J6-P5	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89
F6	#F6 FLASH BILLBOARD *2	Q30	I/O Pwr. Drvr.	BLK-BLU	J6-P6	ORG	J6-P10	20v DC	#908 Bulb 165-5004-00
F7	#F7 FLASH NOT USED *0	Q31	I/O Pwr. Drvr.	BLK-VIO	J6-P7	N / C	N / C	N / C	N / C
F8	#F8 FLASH POPS *3	Q32	I/O Pwr. Drvr.	BLK-GRY	J6-P8	ORG	J6-P10	20v DC	#89 Bulb 165-5000-89

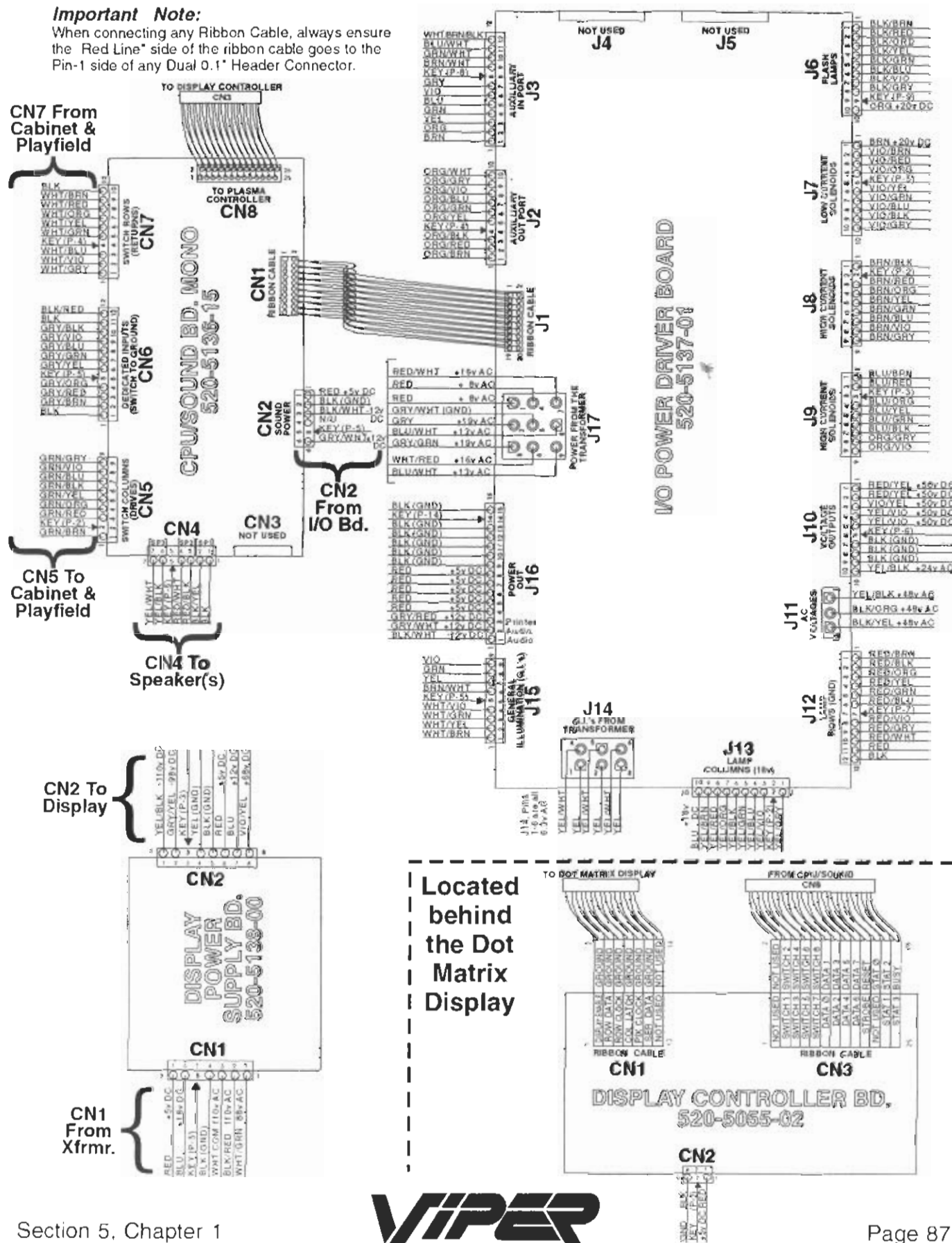


Backbox Wiring

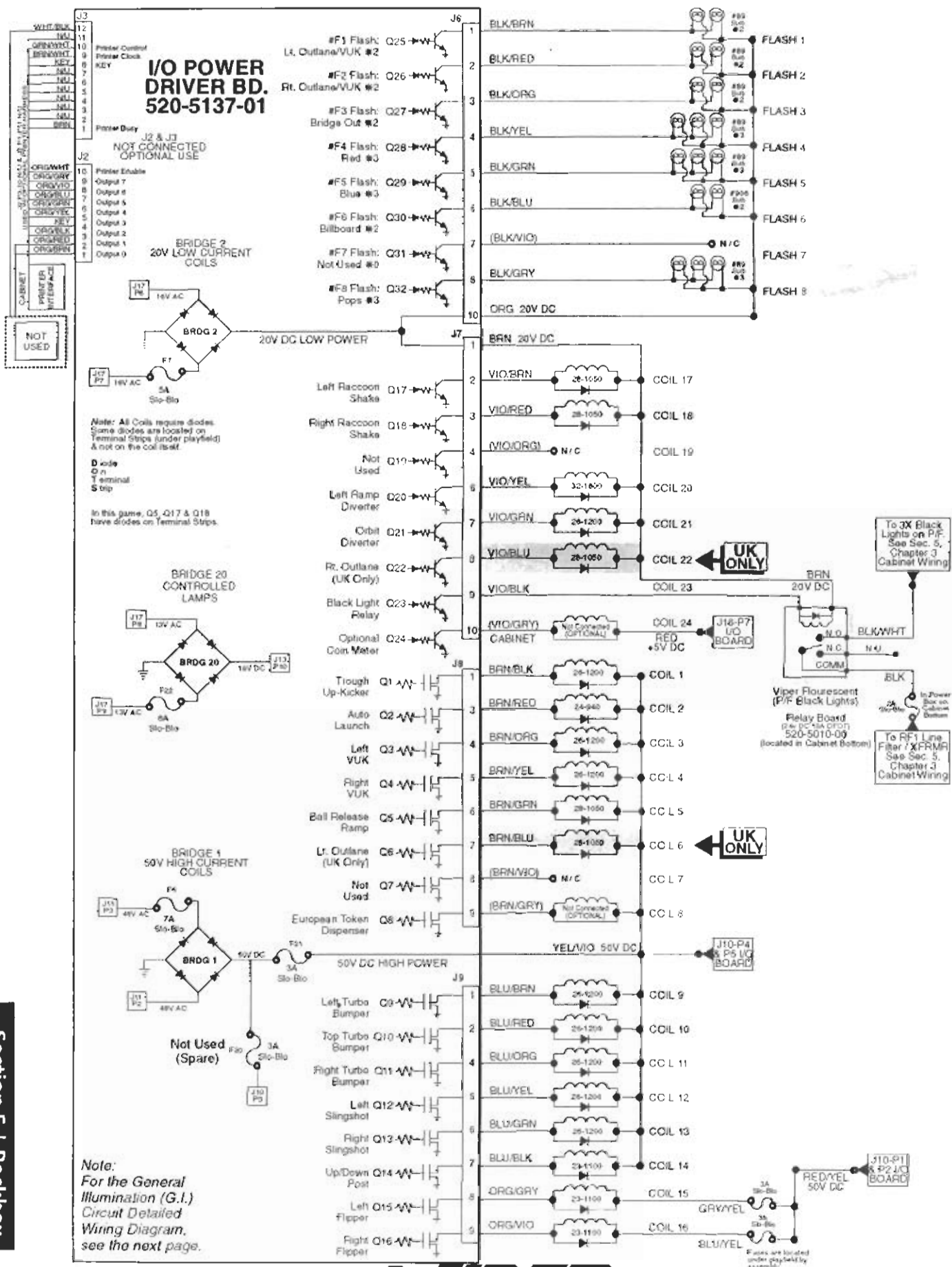
Backbox Board Layout Wiring Diagram

Important Note:

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

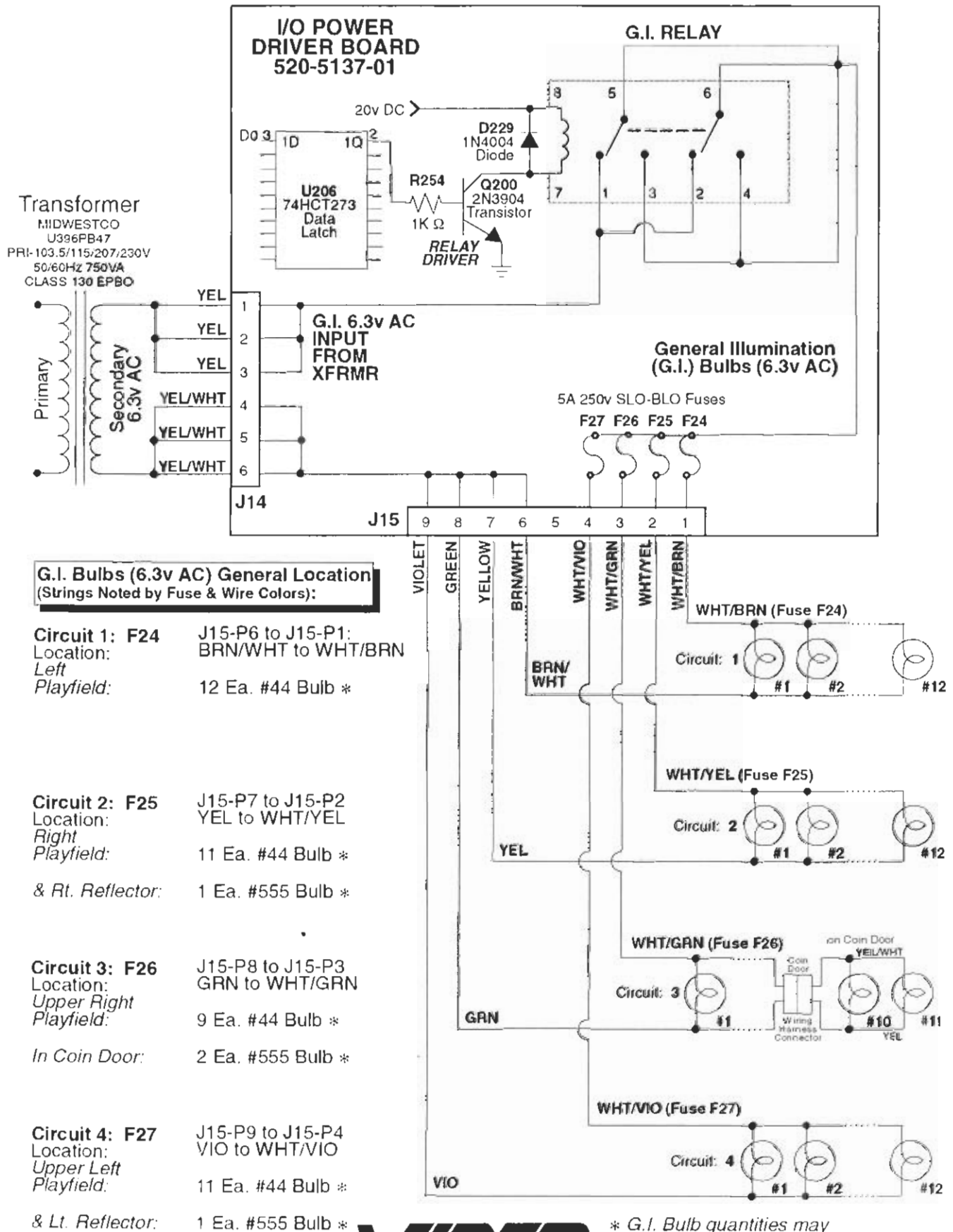


Backbox I/O Power Driver Board Detailed Wiring Diagram

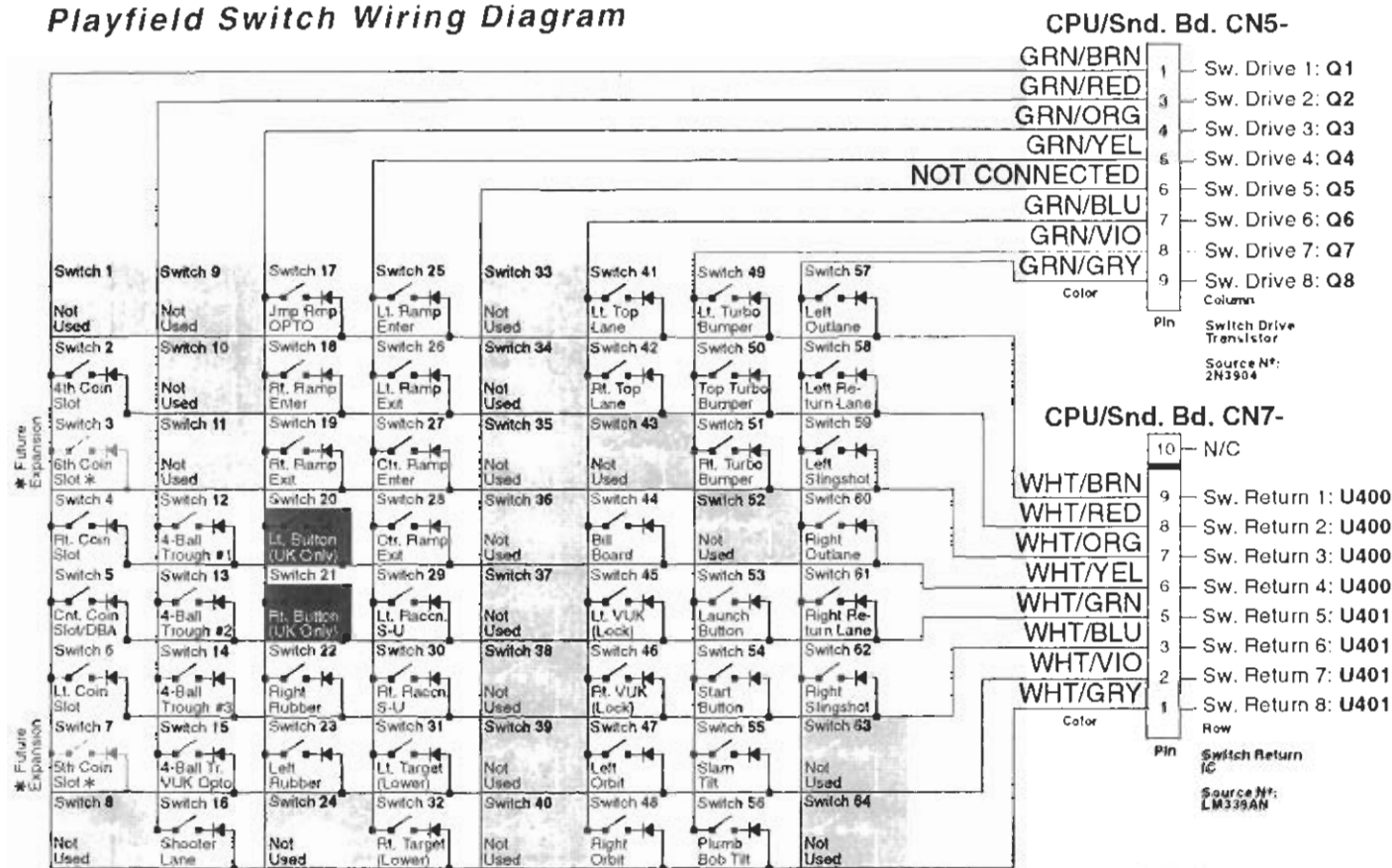


Playfield Wiring

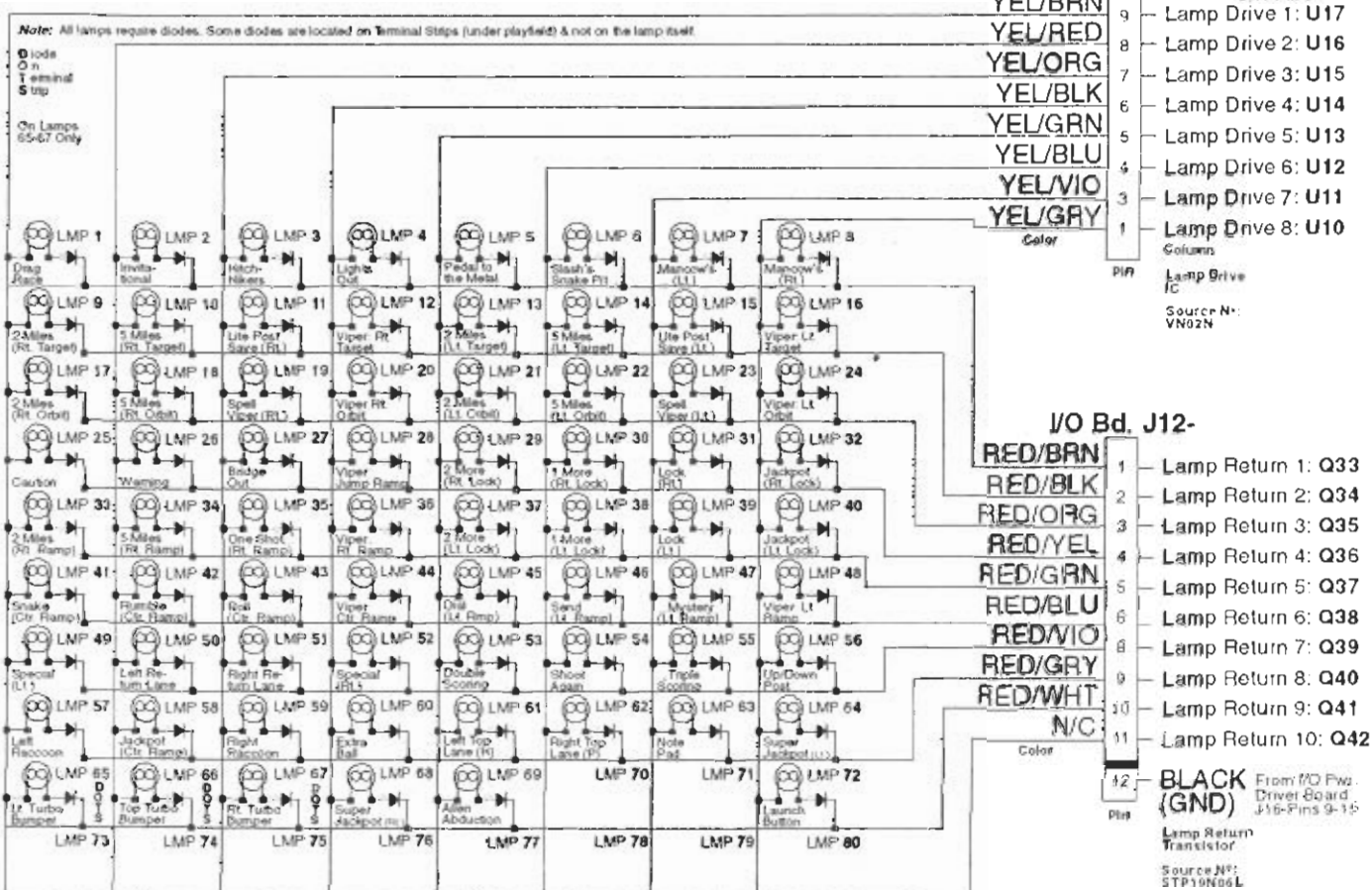
General Illumination Circuit Detailed Wiring Diagram



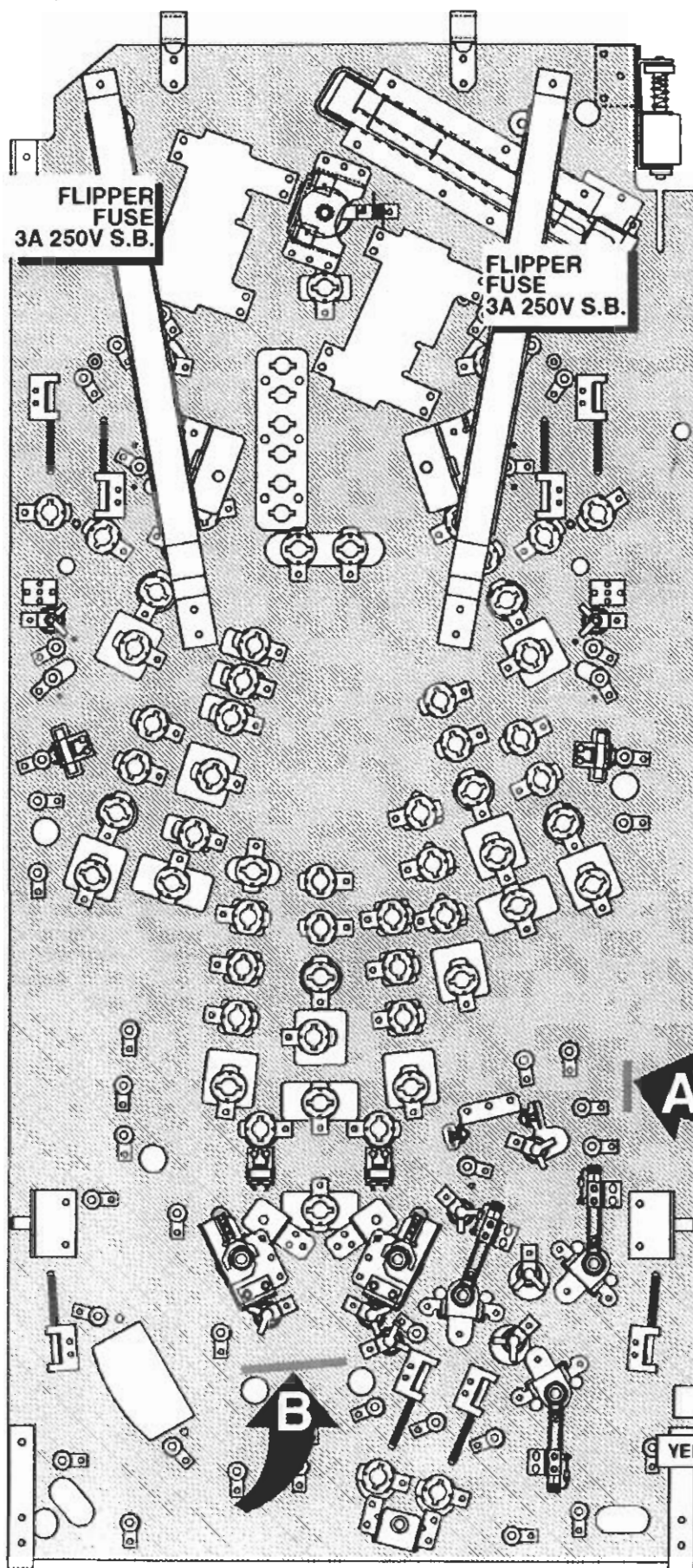
Playfield Switch Wiring Diagram



Playfield Lamp Wiring Diagram



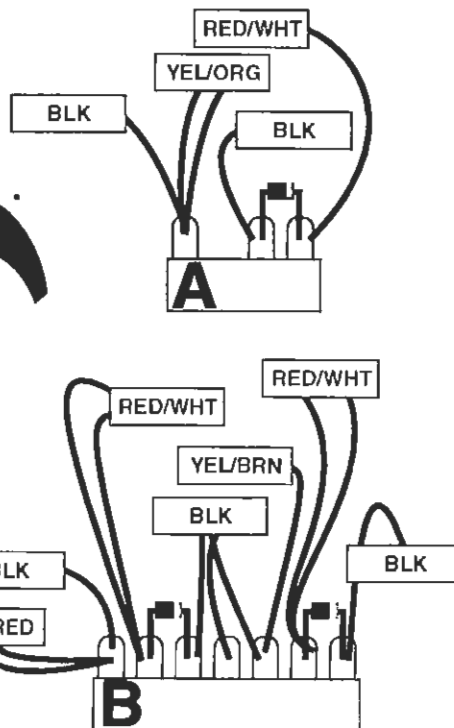
Playfield Diode Terminal Strip Descriptions & Locations



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").

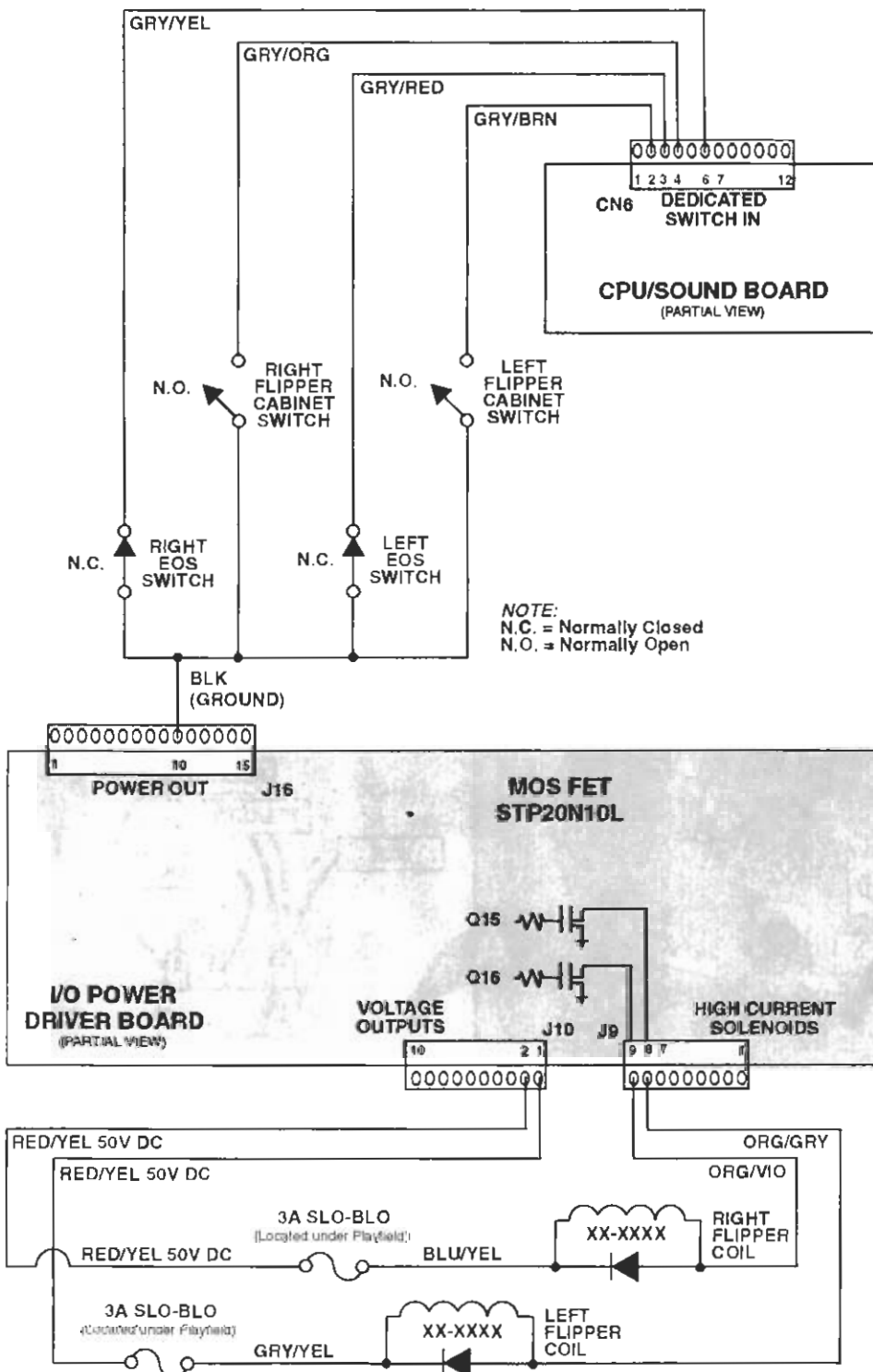
See the Pink Pages, Playfield - General Parts (Below) (Page 58) for Terminal Strips, Diodes, Fuses & Holders Part Numbers.

Nº	Diode Type / PNº	DIODE for	WIRE COLORS
A	1N4001	Lamp 67	YEL/ORG
	112-5001-00	Rt. Turbo B.	RED/WHT
B	1N4001	Lamp 66	YEL/RED
	112-5001-00	Top Turbo B.	RED/WHT
	1N4001	Lamp 65	YEL/BRN
	112-5001-00	Left Turbo B.	RED/WHT



2-Flipper Circuit Wiring Diagram

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



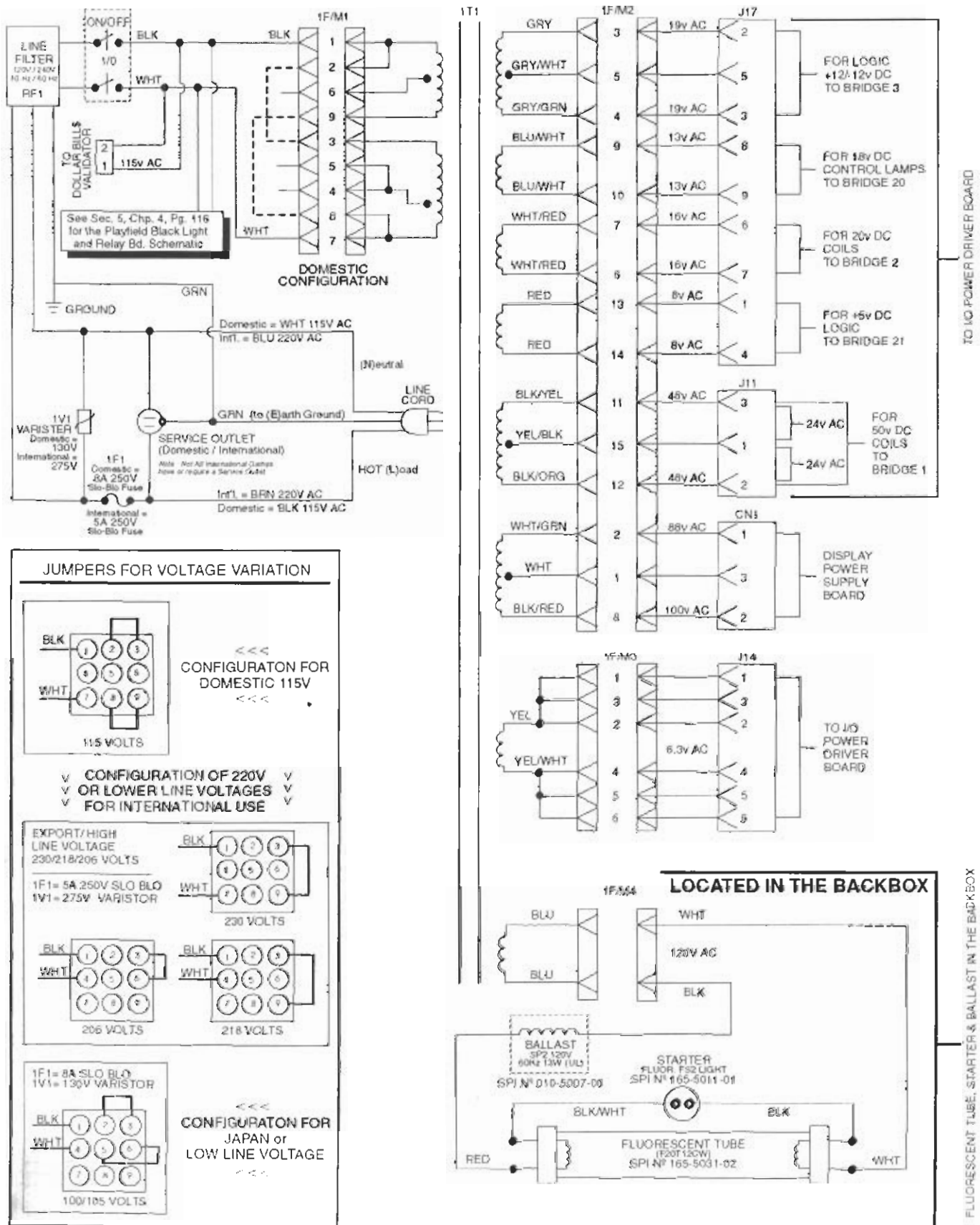
Technical Overview

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

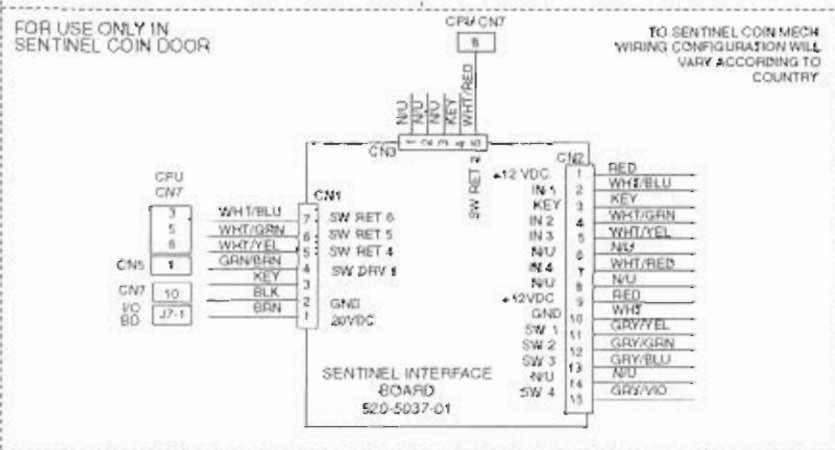
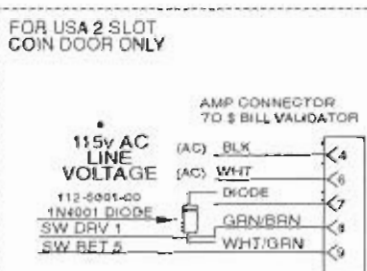
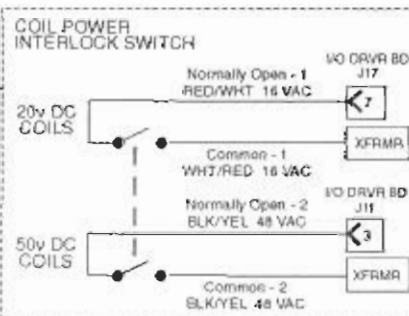
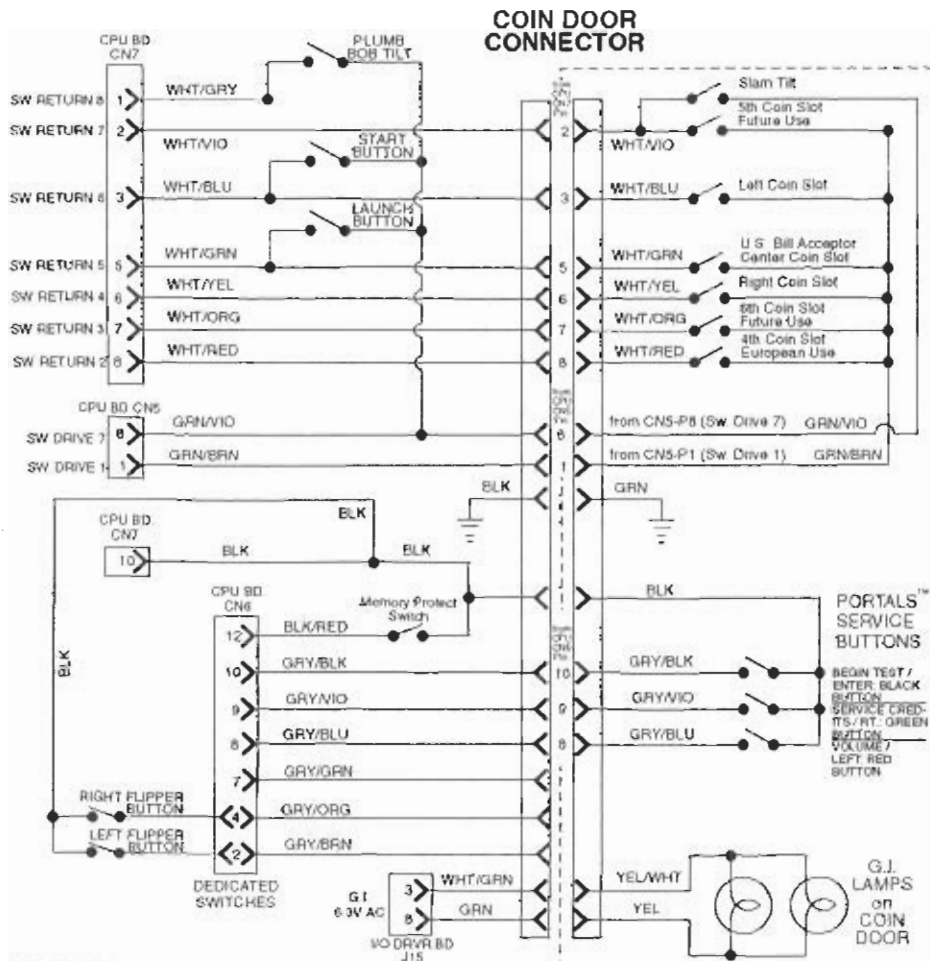
The **E.O.S. (End-Of-Stroke) Switch** serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The **E.O.S. Switch** is a normally closed switch which opens approximately a 1/16" when the flipper is energized. The **Game CPU** will detect 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

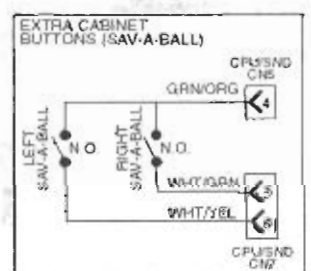
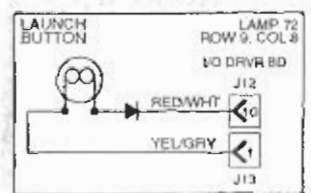
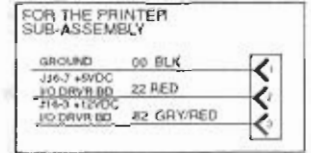
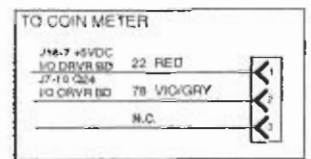
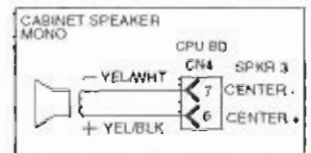
Transformer Power Wiring Diagram



Cabinet / Coin Door Wiring Diagram



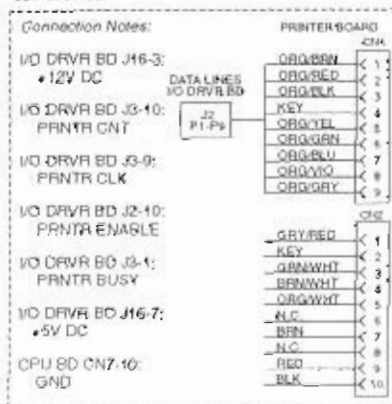
CABINET HARNESSES:



*** UK ONLY ***

PRINTER INTERFACE OPTIONAL

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



COIN DOOR

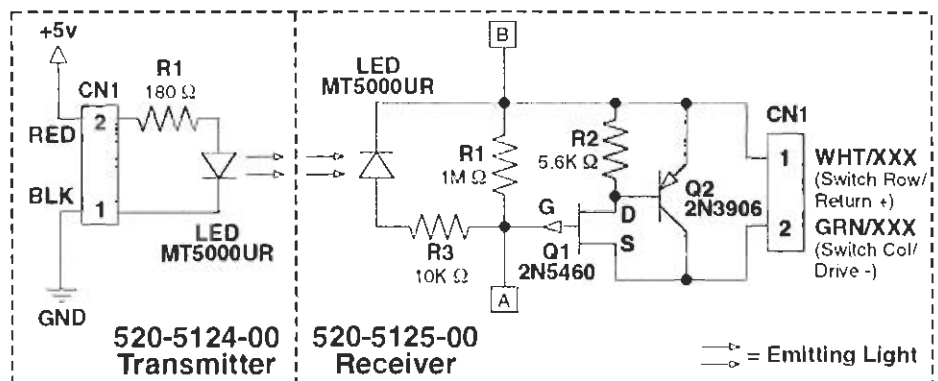


Printed Circuit Boards (PCBs)

Trough Up-Kicker OPTO Boards Theory of Operation & Schematic

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

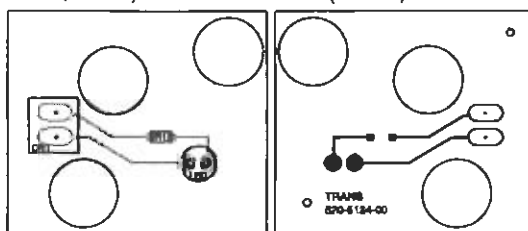
When the light is interrupted (**BLOCKED**) **R1** bleeds the gate voltage off of **Q1** allowing it to conduct, switching **Q2** on, which acts as a **CLOSED SWITCH**.



Trough Up-Kicker OPTO Boards Component Layout & Parts

Component Side (Green)

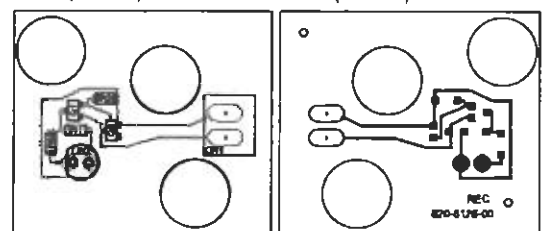
Solder / Component Side (Green)



520-5124-00 (TRANS)

Component Side (Green)

Solder / Component Side (Green)



520-5125-00 (REC)

ITEM	QTY	PART NUMBER	REF-DESIGNATOR
A	1	520-5124-00	OPTO Transmitter Board
1	1	165-5100-00	LED
2	1	121-5067-00	R1
3	1	045-5111-02	CN1
B	1	520-5125-00	OPTO Receiver Board
1	1	165-5100-00	LED
2	1	121-5068-00	R1
3	1	121-5069-00	R2
4	1	121-5011-00	R3
5	1	110-5006-00	Q1
6	1	110-5004-00	Q2
7	1	045-5111-02	CN1



LED MT5000UR
(T1-3/4 GaAlAs)
(Ultra Bright Red)
Sega Pinball Part N°
165-5100-00

DESCRIPTION

Complete PCB Assembly
LED MT5000UR (Ultra Bright Red)
180 Ω 1/8W Chip Res. (CRCW)
2X, .156" Rt. Angle (26-60-5020) Conn.
Complete PCB Assembly
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 (PNP SOT-23)
2X, .156" Rt. Angle (26-60-5020) Conn.

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** (Refer to Schematic Drawing above, 520-5125-00 Receiver Side). It should read approximately 0.8 - 1.2v DC.

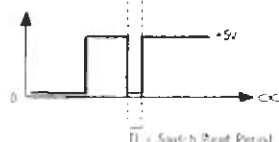
B. **CLOSED OPTO** (Light Blocked) = **SWITCH CLOSED**. Place meter leads across points **A** and **B** (Refer to Schematic Drawing above, 520-5125-00 Receiver Side). It should read approximately 0.0 - 0.1v DC.

2. Oscilloscope Test (indicates normal operating condition):

Fig. A



Fig. B



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.



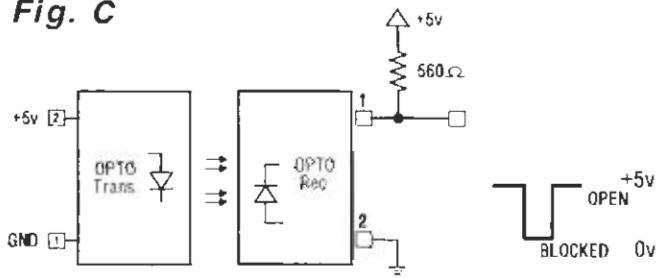
OPTO Troubleshooting cont. next page.

OPTO Troubleshooting Continued

3. Bench Test (See Fig. C):

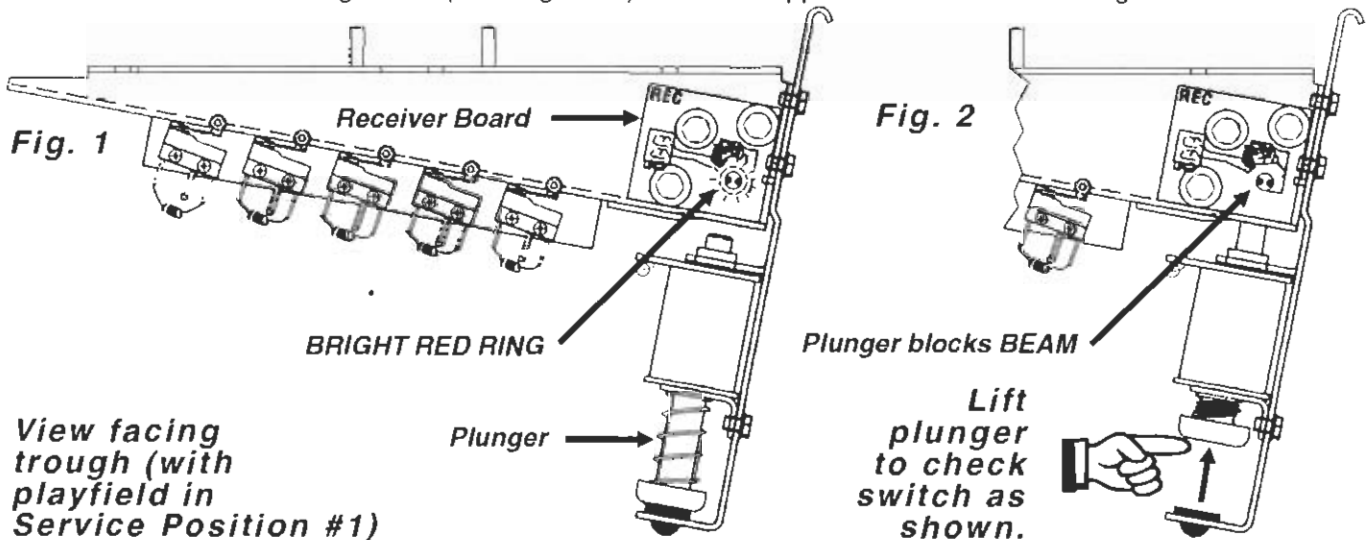
Disconnect the OPTO Transmitter / Receiver Board from the circuit. Connect one side of a 560Ω Pull-up Resistor to **Pin-1** of the OPTO Receiver Bd. and the other side of the resistor to a 5v DC source. Connect **Pin-2** to GND. Connect a +5v DC source to **Pin-1** of the Transmitter & GND to **Pin-2**. 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



Single Trough OPTO Boards Alignment / Test

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



Sectional view from right (Fig. 3a & 3b)

IMPORTANT

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

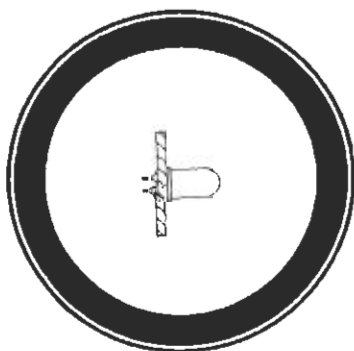


Fig. 4a
Correct Position

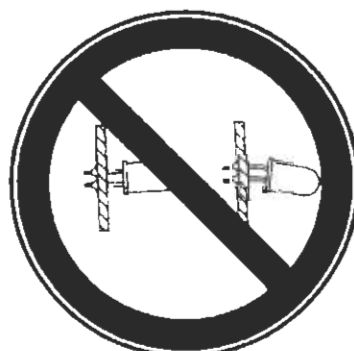
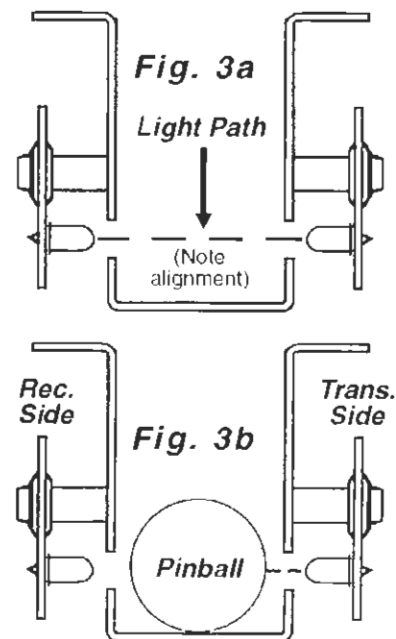
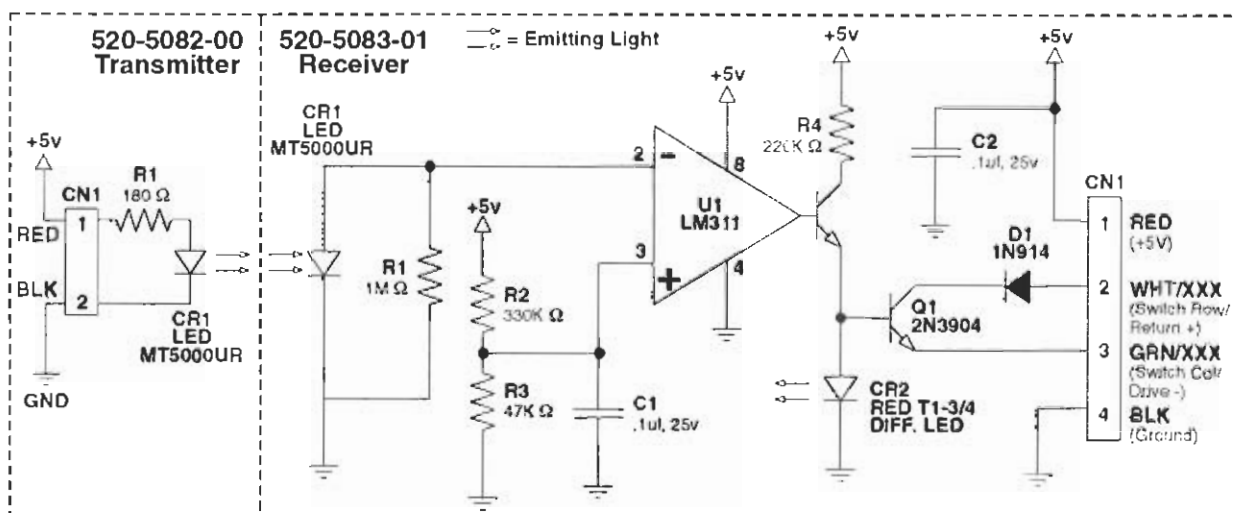


Fig. 4b
Incorrect Position



Playfield Sw. OPTO "Long-Hop" Boards Theory of Operation & Schematic

The light falling on LED (CR1) generates a voltage which is applied to the input (Pin-2) of the LM311 Comparator (U1). R1 bleeds off excess charge. At about a volt input from LED (CR1) the Com-



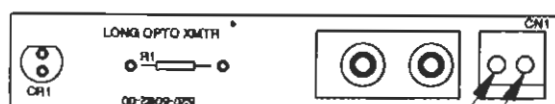
(U1) trips & drives either Q1 (during switch line strobes) or the indicator LED (CR2) (in between strobes). If a switch line is being strobed, the emitter of Q1 drops to the saturation voltage of the Switch Line Driver, about .3 volts. This plus the .7 volt drop on the base give a 1v forward bias voltage to Q1, which is lower than the 1.7v drop on LED (CR2) so the current flows through the Transistor during strobes. This drives Q1 on and makes the switch. If the strobe line is high, then the 1.7v path through LED (CR2) is lower than Q1's bias voltage so current flows through LED (CR2) and the indicator lights. D1 prevents reverse bleed, R2 and R3 form the voltage divider for the trip point, R4 is a current limiter for both Q1 and CR2, C1 and C2 are general noise-filter caps.

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



520-5082-00 (TRANS)

Solder Side (Green)

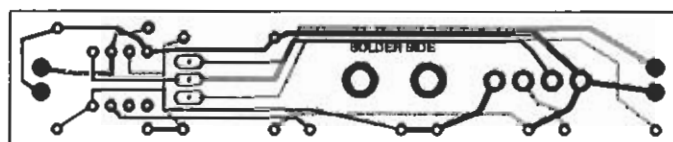


Component Side (Beige)

Pin-1 RED (+5v)
Pin-2 BLK (GROUND)

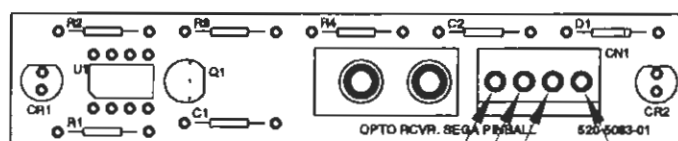
CN1

Note: In this game, this OPTO Board combo is used as the Jump Ramp Enter Switch. See the Switch Matrix Grid (Pg. 90) Switch XX, Jump Ramp (GRN-XXX, WHT-XXX).



Solder Side (Green)

520-5083-01 (REC)



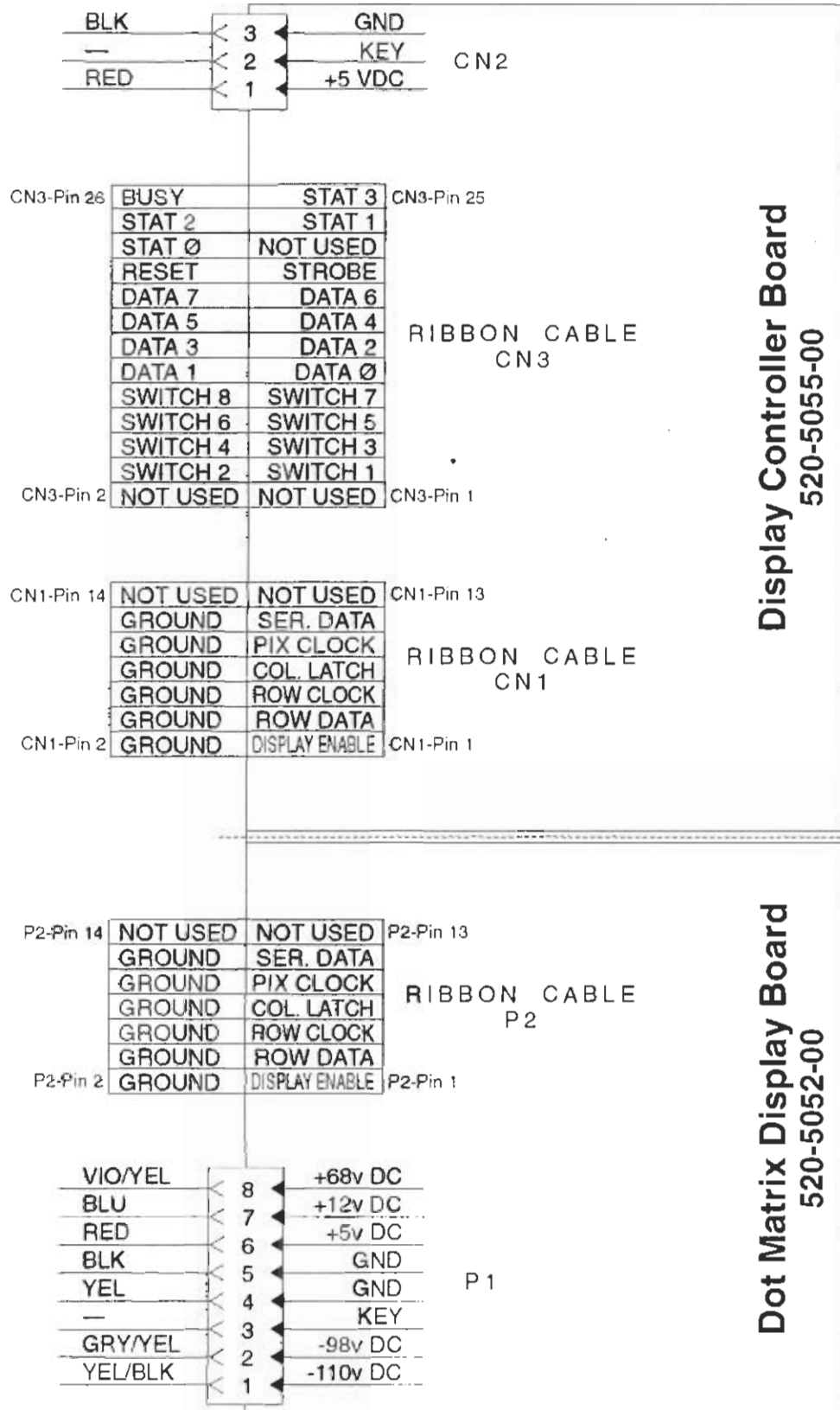
Component Side (Beige)

Pin-3 GRN/XXX (Sw. Drive « - »)
Pin-2 WHT/XXX (Sw. Return « + »)
Pin-1 RED (+5v)

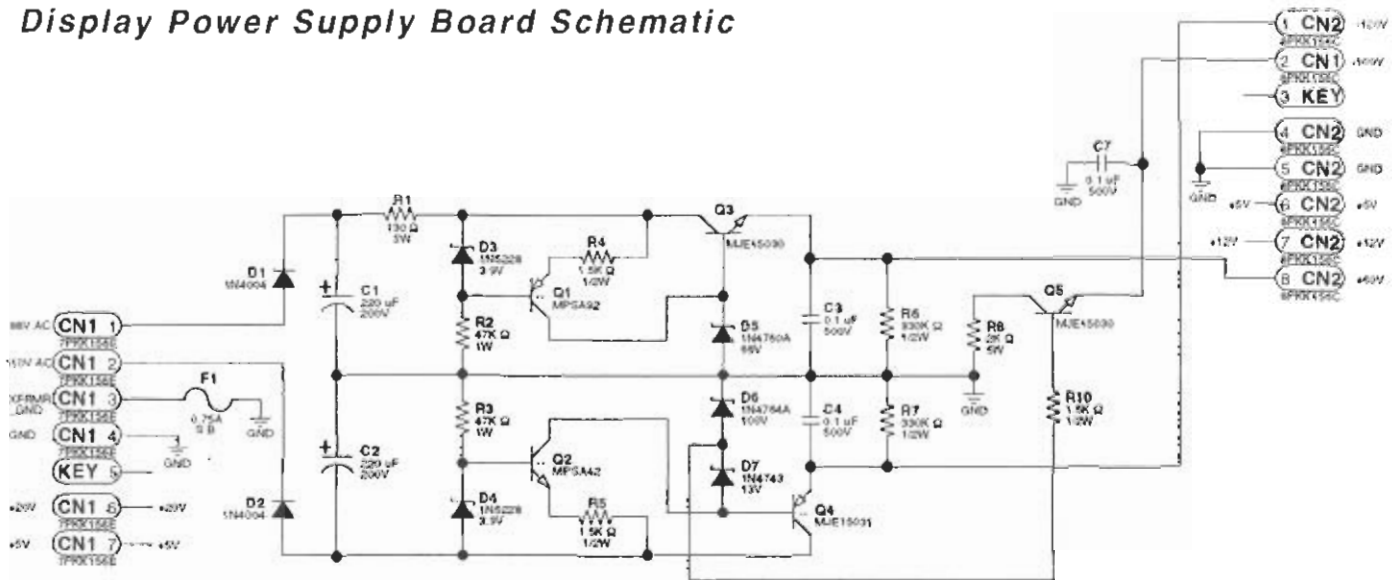
CN1

Pin-4 BLK (GROUND)

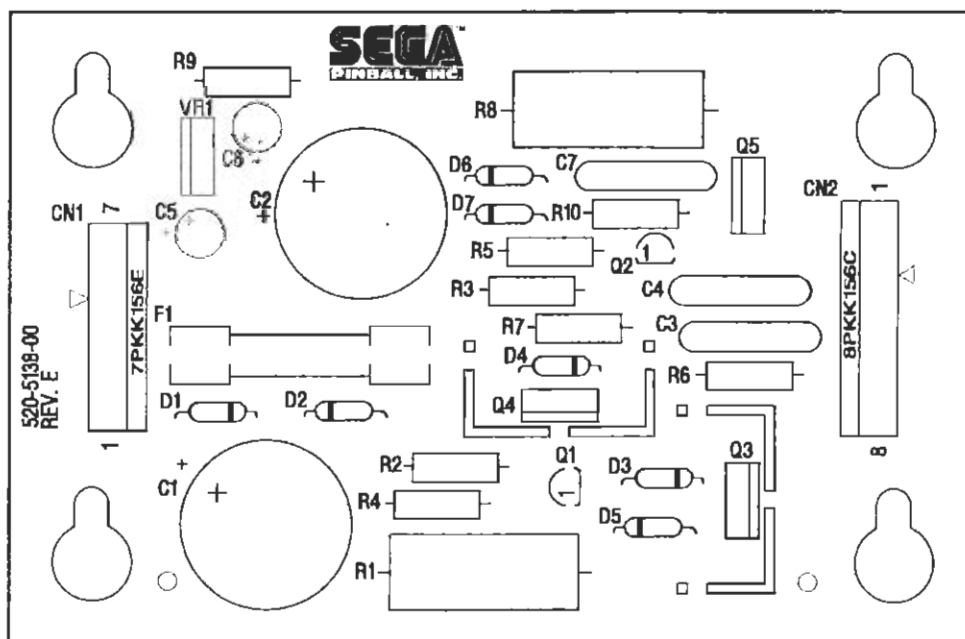
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
A	1	520-5083-01	OPTO Receiver Board	Complete PCB Assembly
1	1	165-5103-00	CR1	LED MT5000UR (Ultra Bright Red)
2	1	165-5099-00	CR2	LED T1-3/4 RED DIFFUSER
3	1	112-5014-00	D1	1N914, Diode
4	1	121-5013-00	R1	1M Ω 1/4W Res., 5%
5	1	121-5037-00	R2	330K Ω 1/4W Res., 5%
6	1	121-5032-00	R3	47K Ω 1/4W Res., 5%
7	1	121-5014-00	R4	220 Ω 1/4W Res., 5%
8	2	125-5023-00	C1, C2	.1uF, 25v, Axial Ceramic Cap.
6	1	100-5025-00	U1	LM311
7	1	110-0069-00	Q1	2N3904, Transistor
8	1	045-5203-04	CN1	4X1, .156" Locking Straight Hdr. Conn. (Molex 50-84-1040)
B	1	520-5082-00	OPTO Transmitter Board	Complete PCB Assembly
1	1	165-5103-00	CR1	LED MT5000UR (Ultra Bright Red)
2	1	121-5065-00	R1	180 Ω 1/4W Res.
3	1	045-5206-02	CN1	2X1, .156" Locking Straight Hdr. Conn. (Molex 50-84-1020)



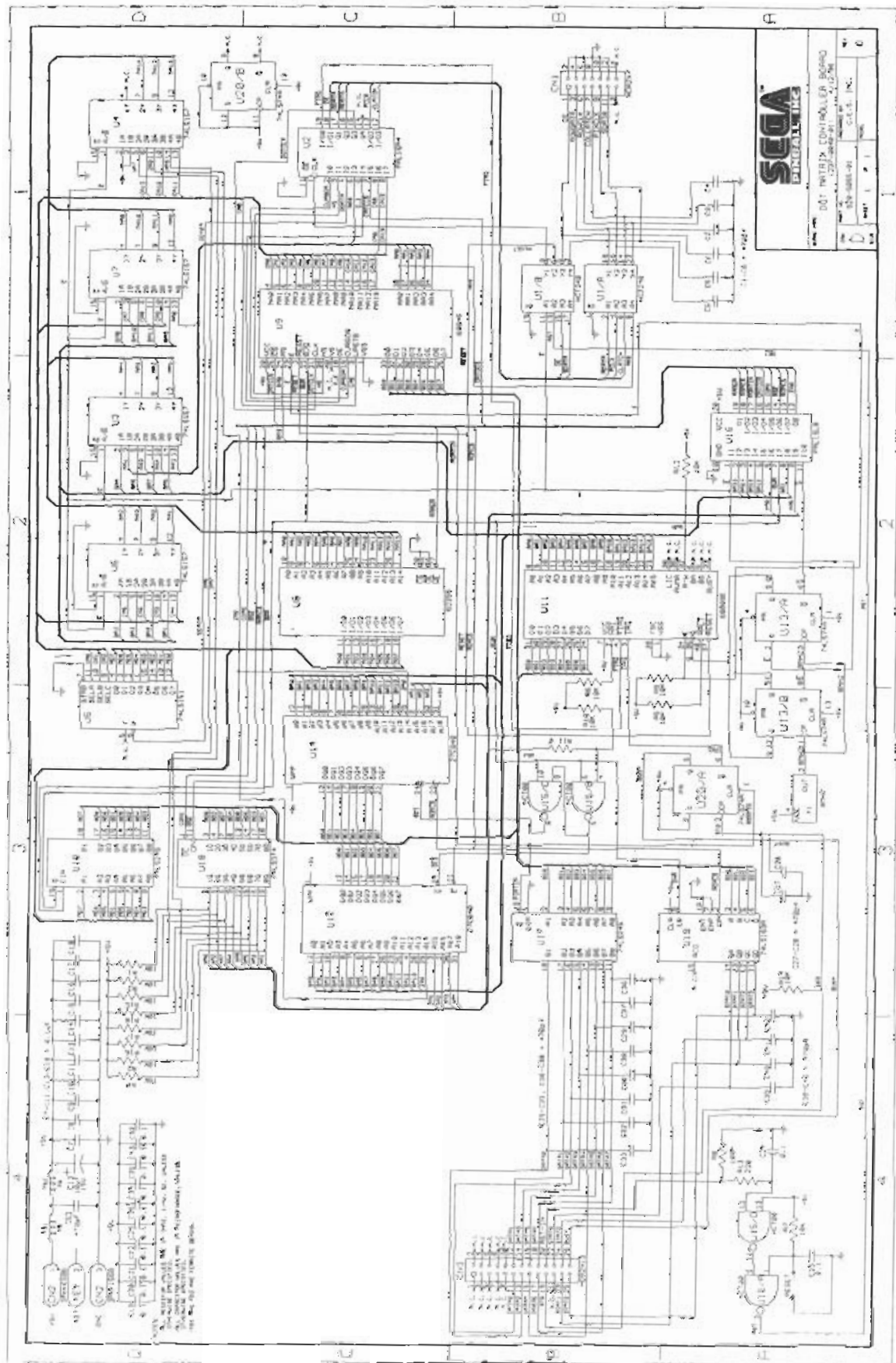
Display Power Supply Board Schematic



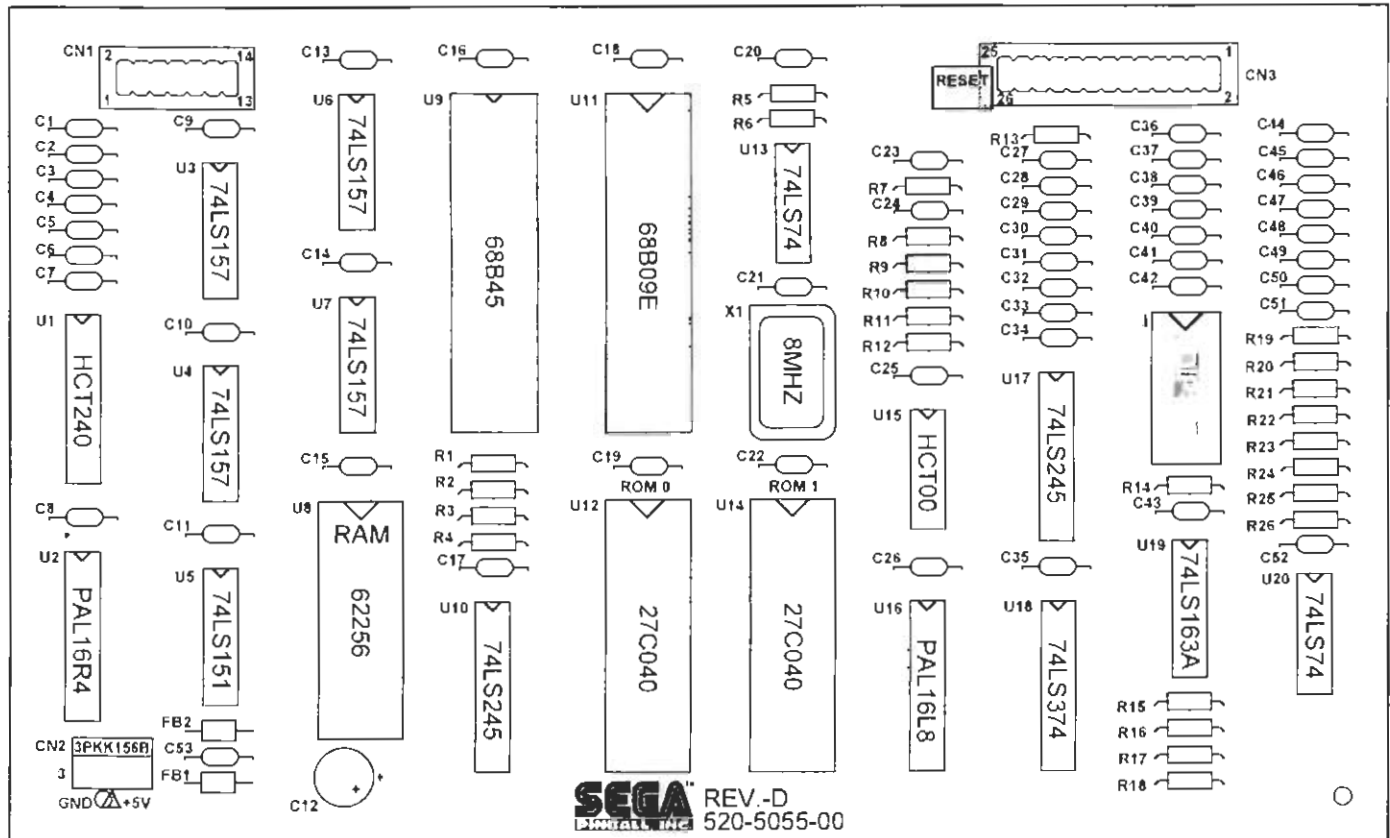
Display Power Supply Board Component Layout & Parts



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	4	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	2	121-5060-00	R2, R3	47K Ω 1W Res.
8	1	121-5061-00	R1	130 Ω 5W Res.
9	1	121-5062-00	R8	2K Ω 5W Res.
10	2	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	1	125-5003-00	C5, C6	220uF, 200v, Radial Lytic Cap.
20	1	121-5003-00	VR1	7B12CT 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	5/32 KEPS Nut
25	2	237-5501-08	Q3, Q4	5/32 X 3/8" PPH Screw
26	1	205-0004-00	F1	Fuse Clips



Display Controller Board Component Layout & Parts



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
1	1	520-5055-00	Display Controller Board	Complete PCB Assembly
2	2	077-5217-00	U12, U14	32-Pin, IC Dip Socket
3	1	100-0397-00	U8	32K X 8 Static RAM (62256L-10PC)
4	1	100-0189-01	U11	68B09E
5	1	100-0233-00	U9	68B45
6	1	100-0351-00	U15	74HCT00
7	1	100-5001-00	U1	74HCT240
8	1	100-5009-00	U5	74LS151
9	4	100-0046-00	U3, U4, U6, U7	74LS157
10	1	100-0049-00	U19	74LS163A
11	2	100-0058-00	U7, U10	74LS245
12	1	100-0064-00	U18	74LS374
13	2	100-0037-00	U13, U20	74LS74
14	1	965-0107-00	U16 - ORANGE DOT	PAL16L8 (15CN), (Programmed)
15	1	965-0108-00	U2 - ORANGE DOT	- ORANGE DOT
16	23	125-5031-00	C7>C11, C13>C26, C34, C35, C43, C52	PAL16R4 (25CN), (Programmed)
17	1	121-5051-00	R8	- ORANGE DOT
18	15	121-5011-00	R1>R7, R9, R10, R12, R14>R18	.1 uF, (104), Axial Cer. Cap
19	1	121-5014-00	R13	100K Ω 1/4W C.F. Res. 5%
20	0	n/a	R19>R26	10K Ω 1/4W Res. 5%
21	21	125-5028-00	C1>C6, C27>C33, C36>C42, C44>C51, C53	220 Ω 1/4W C.F. Res. 5%
22	2	n/a	FB1, FB2	(R19>R26: NS)
23	1	125-5015-00	C12	470pF, (471), Axial Cap (C44>C51: NS)
24	1	045-5015-26	CN3	Ferrite Bead (2743001182)
25	1	045-5015-03	CN2	100uF, 25v, Cap. (Radial Elec.)
26	1	045-5015-02	CN1	13-Pin, Dual Row .1" HDR Conn.
27	1	140-0033-00	X1	3-Pin, KK-156 Conn. (540445-3)
28	0	Not Used	SW1	7-Pin, Dual Row .1" Hdr. Conn.
	1 (See Pg. DR. Table)		U12 U14 (ROM 0)	8Mhz Clock Oscillator (SW1: NS)
				4MB ROM (U14: NS)



I/O Power Driver Board Theory of Operation

5V Supply:

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

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

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

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

Reset Circuitry:

The I/O will reset in three cases:

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

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

Address Decoding:

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

Solenoid Drivers & Flash Lamps:

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

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

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

Auxiliary In & Out:

J2 8 CMOS Outputs sometimes used for a printer interface.

J3 8 CMOS Inputs general purpose inputs.

Lamp Matrix:

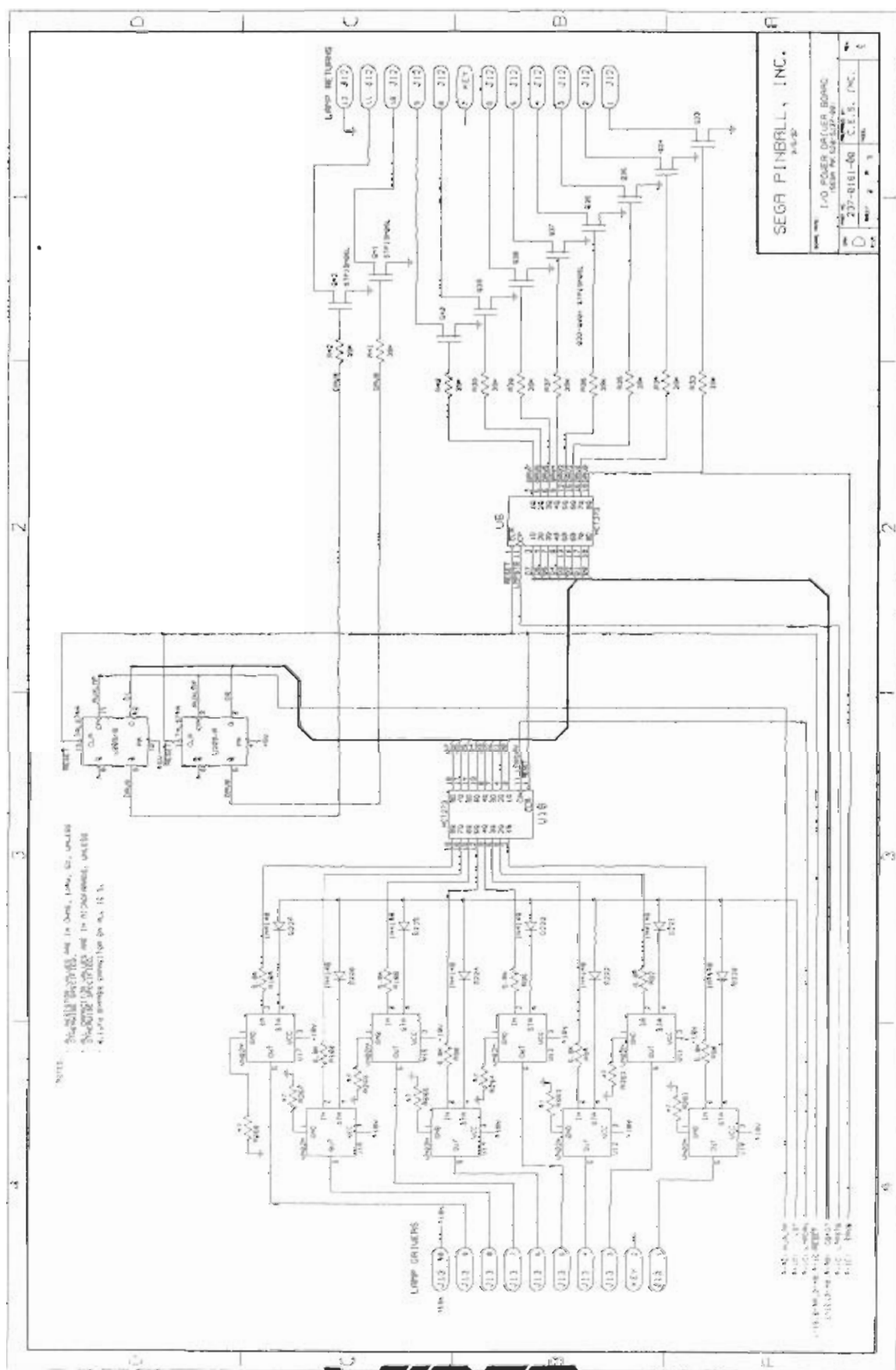
J12 has 10 low side drivers for the lamp strobes which consist of 19N06L MOSFETS. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the I/O from resetting. J13 has 8 high side drivers with each having a status indicator. All the status indicators are logically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

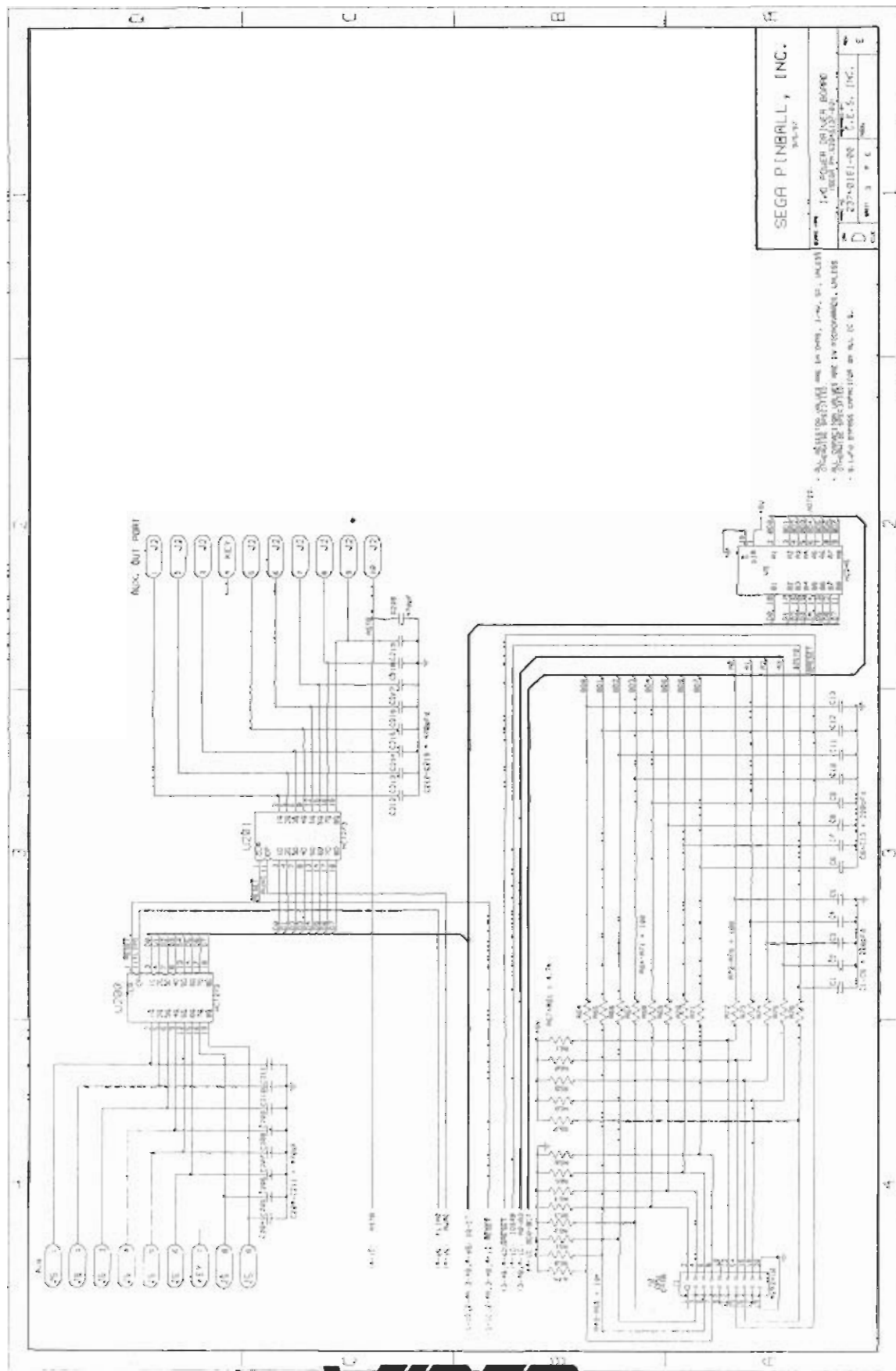
General Illumination (G.I.) Lights:

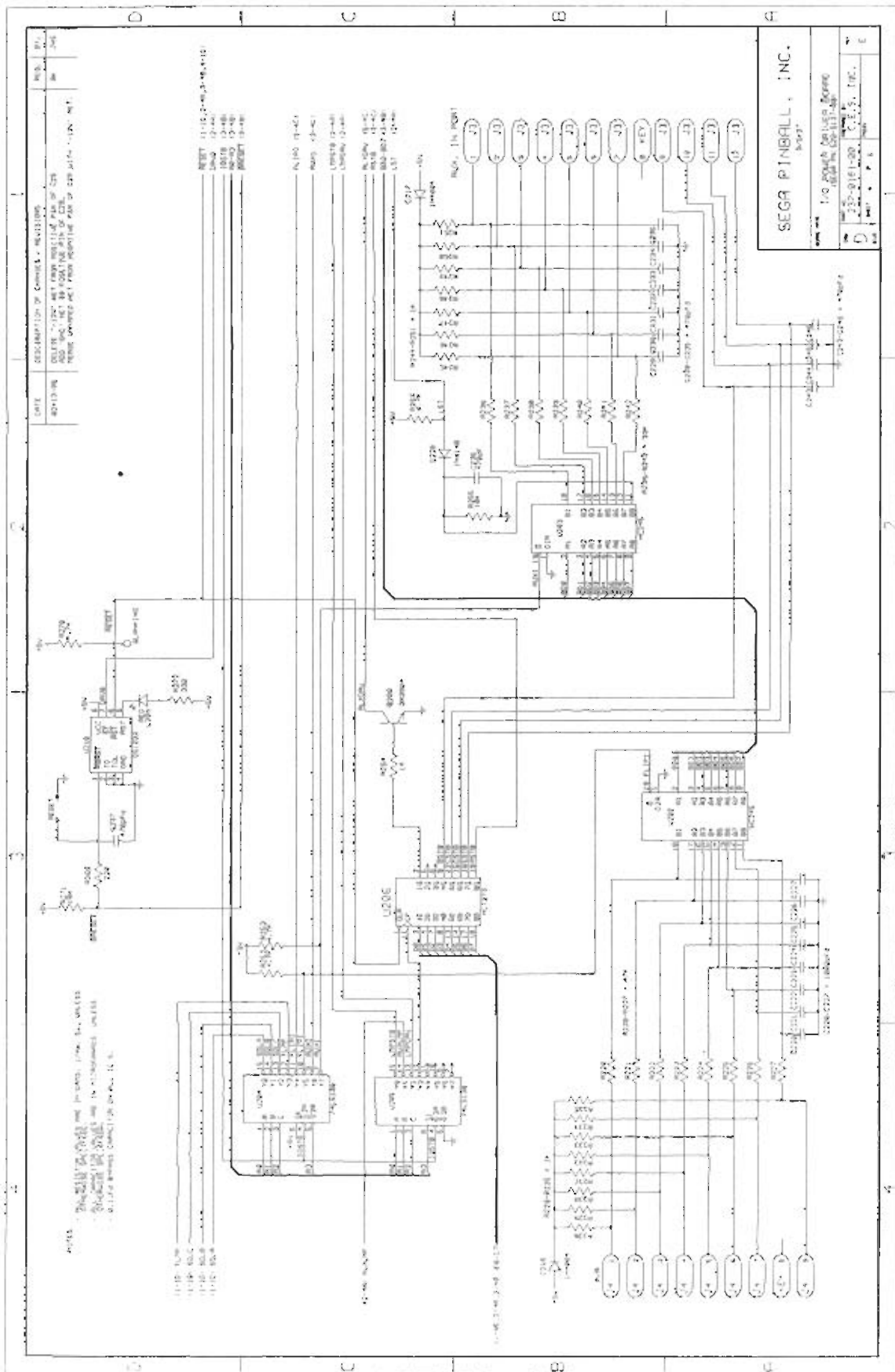
J15 has 6VAC switched on and off by a relay on the I/O Board. The relay is controlled by Q200 which supplies power to the 24V coil winding to activate the relay. There are 4 taps on J15 each fused at 5A for this 6VAC source.



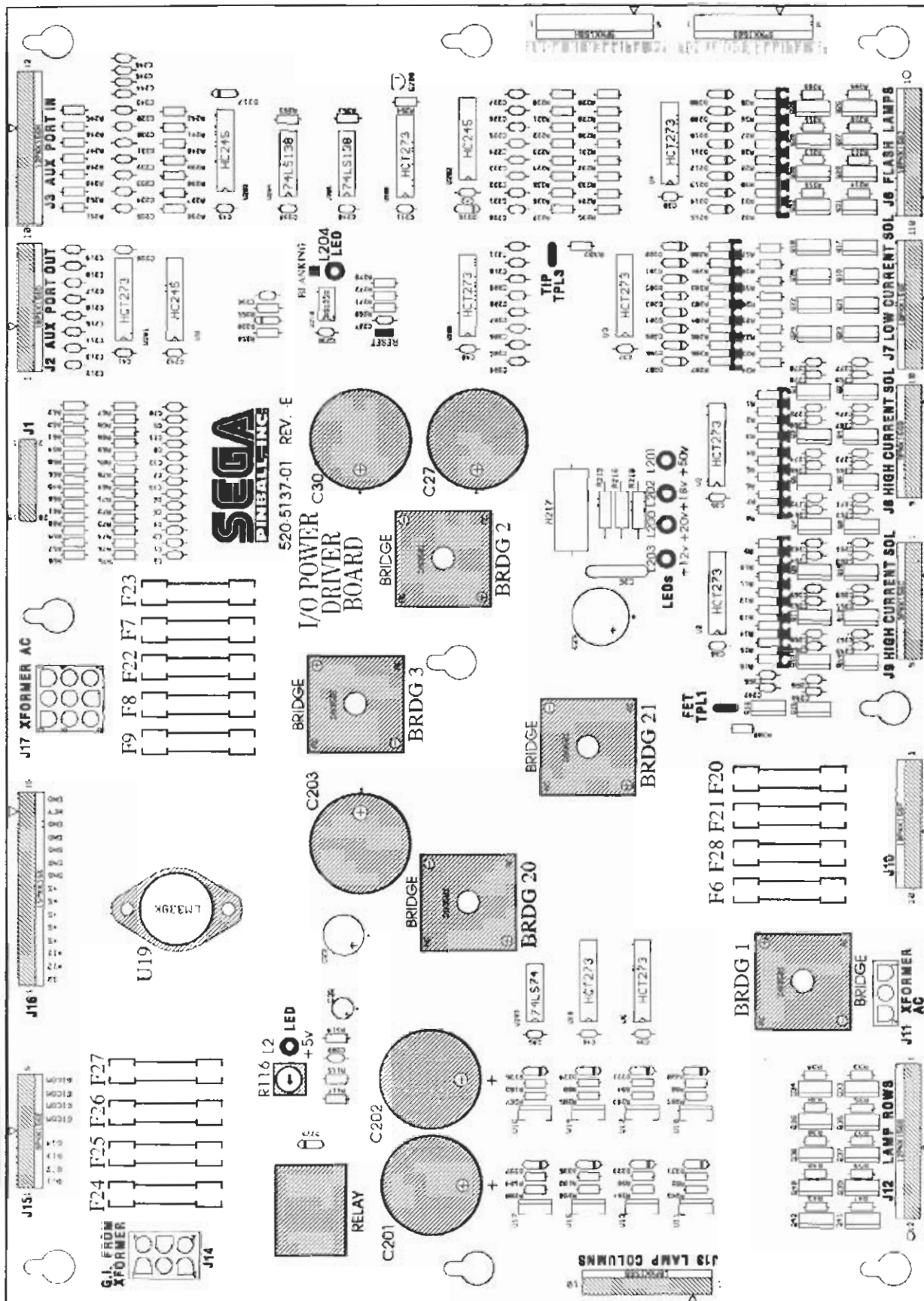












TEST POINTS:

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

I/O Power Driver Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (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>Q18	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	100-5019-00	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.)



CPU Section:

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

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

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

Switches:

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

Plasma Interface:

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

Sound Section:

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

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

Other Test Points:

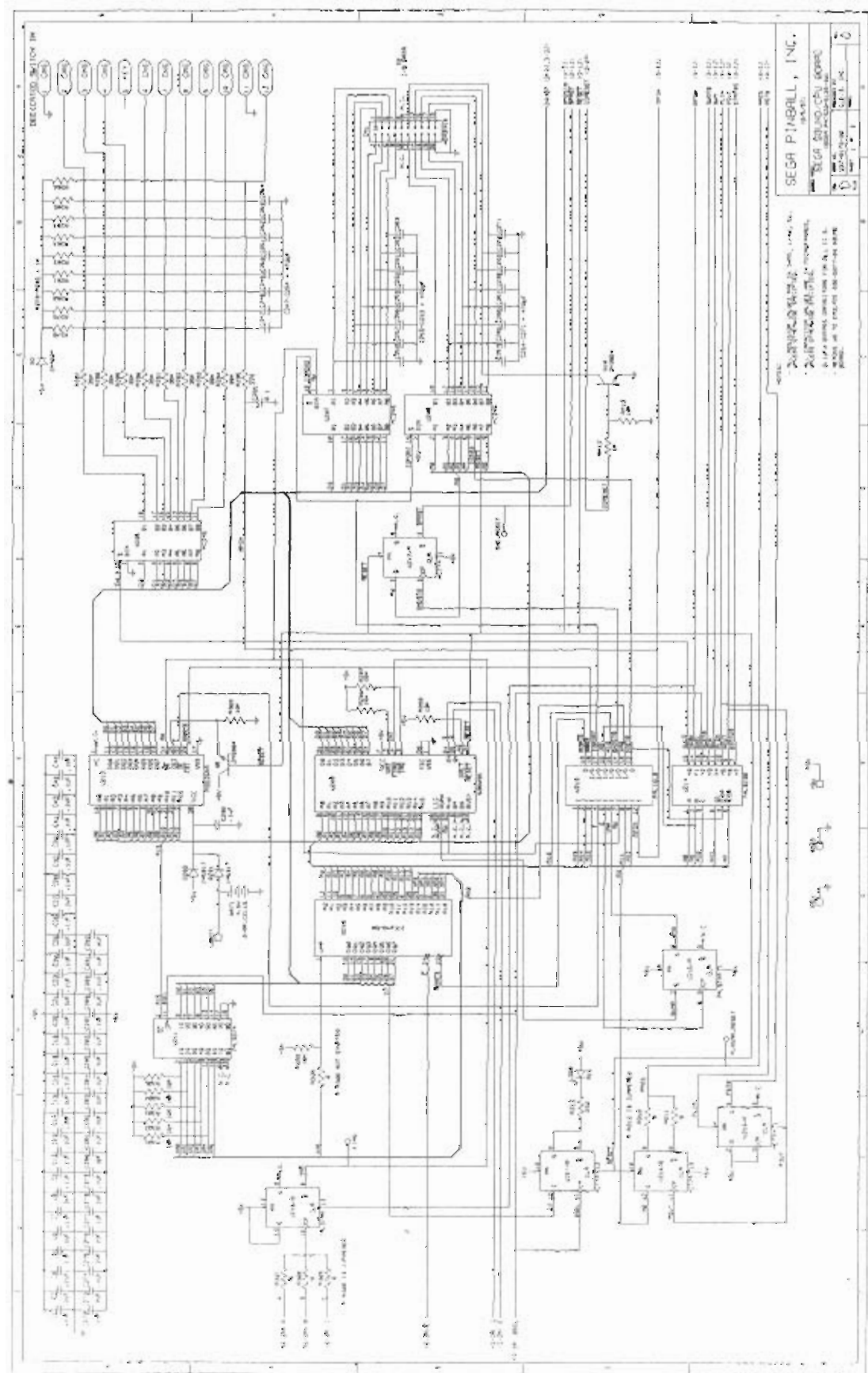
E & Q - The CPU signals for both 68B09E processors. Should be at 2Mhz with Q leading E by 500 nsec.

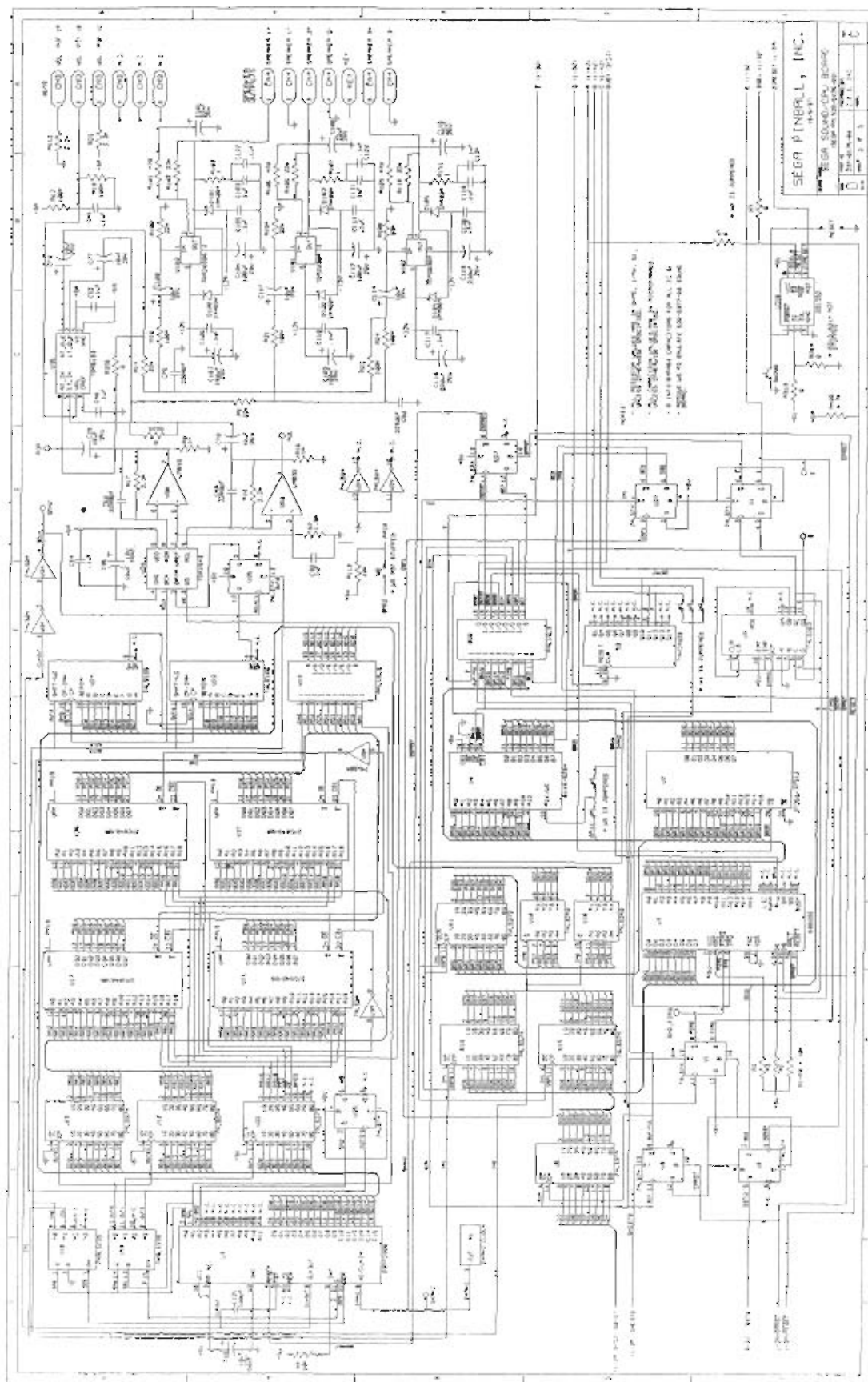
24Mhz - The oscillator used for the BSMT & derivation of E & Q.

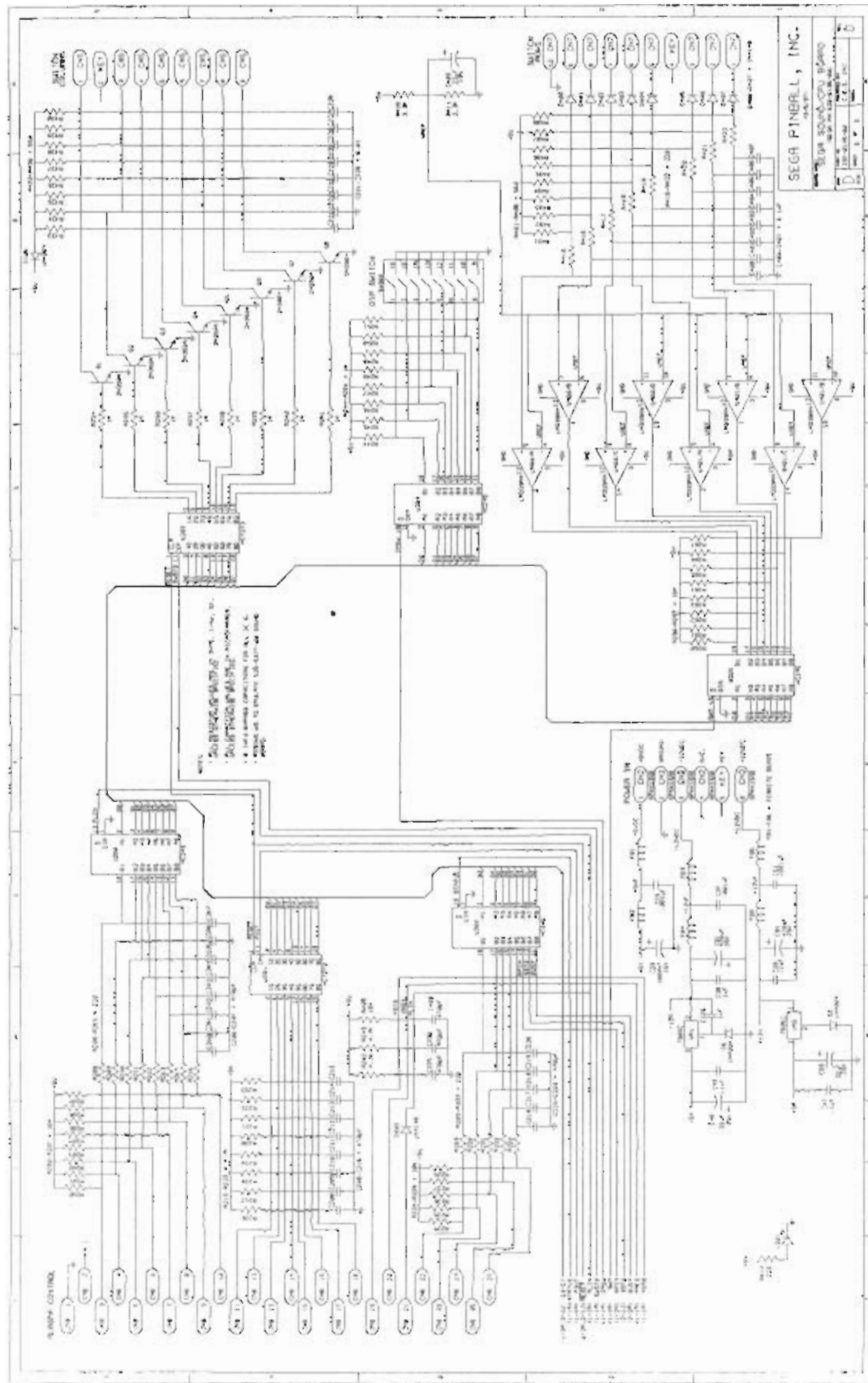
SND-FIRQ - The sound sections CPU interrupt.

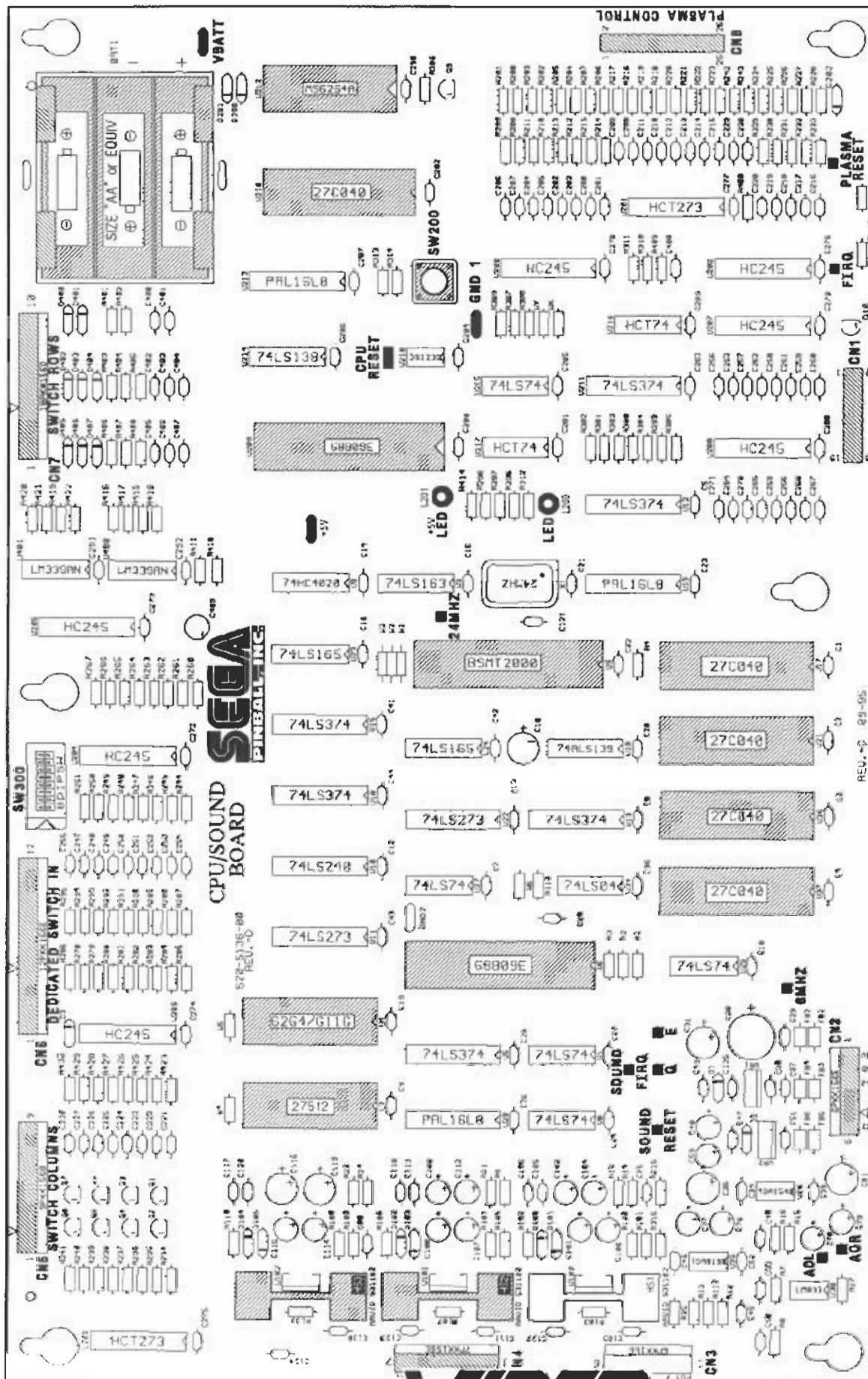
6Mhz - This clock is generated internally on the BSMT and is used for shifting the data samples into th DAC.











- TEST POINTS:
- << VBATT
 - << PLASMA RESET
 - << FIRQ
 - << SW200
 - << GROUND 1
 - << CPU RESET
 - << L201 LED+5v
 - << L200 LED
 - << +5v
 - << 24 Mhz
 - << 6 Mhz
 - << E
 - << SOUND FIRQ
 - << Q
 - << SOUND RESET
 - << AOR
 - << AOL



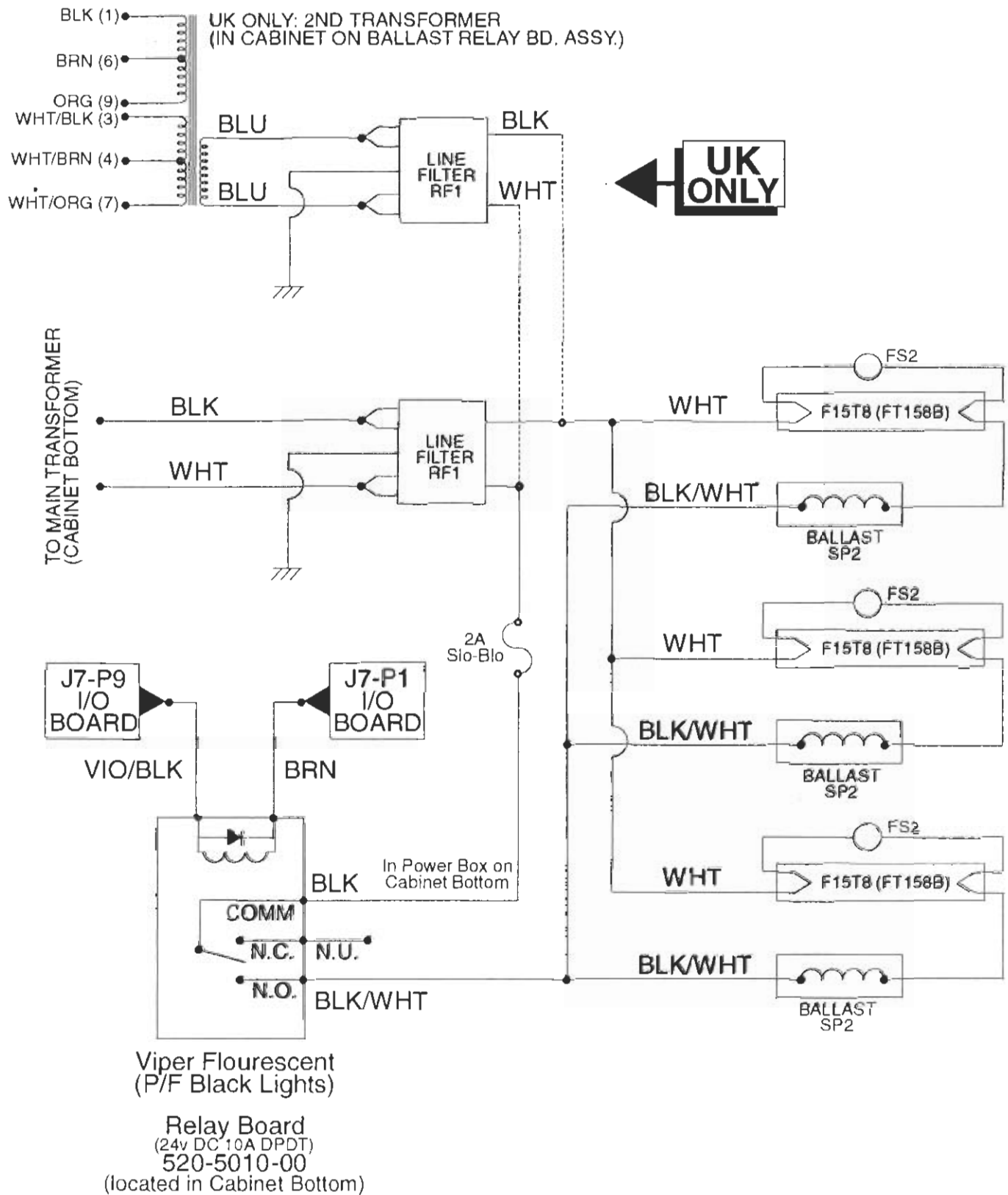
CPU/Sound Board Parts

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
—	1	520-5136-00	CPU/Sound Board	Complete PCB Assembly
1	1	124-5001-00	VR2	LM7805CT +5v Regulator
2	5	121-5051-00	R12, R13, R19, R21, R22, R24	100K Ω 1/4W Res. (R19: NS)
3	2	121-5009-00	R103, R107, R111	1K Ω 1/4W Res. (R103: NS)
4	38	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)
5	5	121-5023-00	R9, R14, R100, R102, R104, R106, R110	22K Ω 1/4W Res. (R100, R102: NS)
6	20	121-5009-00	R15, R8, R234>R241, R278>R286, R412	1K Ω 1/4W Res.
7	4	121-5043-00	R16, R17, R25, R112	2.2K Ω 1/4W Res.
8	1	121-5018-00	R7	1.5K Ω 1/4W Res.
9	2	121-5046-00	R101, R105, R109	470K Ω 1/4W Res. (R101: NS)
10	9	121-5045-00	R108, R287>R294	39K Ω Res.
11	1	121-5036-00	R312	330 Ω 1/4W Res.
12	12	n/a	R300, R308>R311, R313>R316, WX, WY	0 Ω Jumper Wire (24ga.)
13	15	121-5033-00	R208>R215, R229>R233, R414>R422	220 Ω 1/4W Res. (R208>R215: NS)
14	11	121-5021-00	R216>R223, R242, R243, R400	4.7K Ω 1/4W Res.
15	16	121-5047-00	R401>R408, R423>R430	560 Ω 1/4W Res.
16	2	121-5048-00	R410, R411	3.3K Ω 1/4W Res.
17	1	100-0049-00	U3	74LS163
18	1 (See Pg. DR. 9 Table)	U7	27512 EPROM	7PKK156 (PIN5=KEY)
19	1	045-5015-07	CN4	Do Not Stuff
20	1	Not Used	RESET	27C040 EPROM
21	5 (See Pg. DR. 9 Table)	U17, U21, U36, U37, U210	U17, U21, U36, U37, U210	74LS165
22	2	100-5008-00	U23, U24	10uF, 25v, Radial Lytic Cap.
23	4	125-5017-00	C76>C79	22uF, 25v, Radial Lytic Cap. (C101: NS)
24	4	125-5020-00	C40, C59, C101, C108, C115	10uF, 35v, Radial Lytic Cap. (C100: NS)
25	2	125-5017-00	C100, C107, C114	100uF, 25v, Rad. Lfc. Cap. (C102, C104: NS)
26	2	125-5015-00	C102, C104, C109, C112	22uF, 16v, Radial Lytic Cap.
27	1	125-5014-00	C409	TDA1899
28	1	100-5016-00	U35	1000uF, 16v, Radial Lytic Cap.
29	1	125-5037-00	C30	74LS04
30	1	100-0027-00	U34	74ALS139
31	1	100-0043-00	U18	74LS374
32	6	100-0064-00	U5, U12, U13, U15, U16, U211	74HC4020
33	1	100-0249-00	U2	74LS240
34	1	100-0149-00	U10	0 Ω Jumper Wire (24ga.)
35	6	n/a	W1>W6	470uF, 25v, Radial Lytic Cap.
36	2	125-5012-00	C31, C81	10uF, 16v, Radial Tant. Cap.
37	2	125-5017-00	C10, C35	220uF, 25v, Radial Lytic Cap.
38	2	125-5019-00	C116, C119	6PKK156 (PIN 5=KEY)
39	1	045-5015-06	CN2	24Mhz
40	1	140-0011-00	X1	BSMT2000
41	1	105-0116-00	U9	PAL16L8 (Programmed) - YELLOW DOT
42a	1	965-0136-00	U19 - YELLOW DOT	PAL16L8 (Programmed) - WHITE DOT
42b	1	965-0137-00	U20 - WHITE DOT	PAL16L8 (Programmed) - BLUE DOT
42c	1	965-6504-00	U213- BLUE DOT	74LS74
43	5	100-0037-00	U1, U8, U25, U27, U215	0.001uF, (102), Cap.
44	3	125-5043-00	C29, C37, C51	0.1uF, (104), Axial Cer. Cap.
45	79	125-5031-00	C1>C5, C7>C9, C12>C16, C18>C21, C23>C26, C28, C32>C34, C36, C38, C39, C41>C47, C49, C52, C102, C103, C105, C106, C110, C111, C113, C117, C118, C120, C122>C125, C255, C272>C292, C400>C407	(C102, C103, C105, C106: NS)
46	1	125-5038-00	C121	100pF, (101), Cap.
47	4	125-5039-00	C48, C50, C75, C80	0.0022uF, (222), Cap.
48	39	125-5028-00	C200>C220, C229, C230, C247>C254, C256>C271	470pF, (471), Cer. Cap. (C200>C207: NS)
49	8	125-5029-00	C221>C228, C408	0.01uF, (103), 100v Cap. (C408: NS)
50	1	045-5015-06	CN3	6PKK156
51	1	100-0375-00	U30	LM833
52	2	100-0022-00	U22 U11	74LS273
53	7	112-5003-00	D1>D3, D100>D105	1N4004, Diode (D100, D101: NS)
54	2	112-5008-00	D200, D201	1N5817, Diode
55	8	112-0054-00	D202, D400>D407	1N4148, Diode (D202: NS)
56	1	124-5002-00	VR1	LM7905CT -5v Regulator
57	2	100-5016-20	U100>U102	TDA2030V (U100: NS)
58	1	100-5018-00	U26	TDA1543
59	1	n/a	SW200	B3F4000
60	1	165-5099-00	L200	LED T1-3/4 DIFFUSER LED
61	1	165-5099-00	L201	LED T1-3/4 DIFFUSER LED
62	2	100-5015-00	U216, U217	HCT74
63	1	100-0148-00	U214	74LS138
64	1	105-0046-00	U212	MS6264A
65	1	100-0189-01	U6, U209	68B09E
66	1	545-5685-00	BAT1 BATTERY HOLDER	3-AA CELLS 4.5v
67	1	045-5015-01	CN1	20-Pin, 0.1 HEADER
68	10	n/a	6MHZ AOR Q AOL 24MHZ	Test Points - NS
69	10	110-0069-00	Q1>Q10	2N3904, Transistor
70	1	045-5013-00	CN5	9PKK156 (PIN 2=KEY)
71	2	100-5019-00	U201, U203	74HCT273
72	6	100-0338-00	U200, U202, U204>U208	74HC245 (U200: NS)
73	11	100-5023-00	U218	DS1232
74	11	045-5015-26	CN8	26-Pin, 0.1 HEADER
75	11	045-5014-01	CN7	10PKK156 (PIN 4=KEY)
76	4	n/a	VBATT +5V GND1, GND2	Test Point Wire (24ga.) Loops
77	11	045-5015-00	CN6	12PKK156 (PIN 5=KEY)
78	11	181-5002-00	SW3C0	8-Pin, Dip Switch
79	2	100-0377-00	U400, U401	LM339AN
80	1	105-0052-05	U4	6116 RAM
81	3	535-5000-10	U100>U102	AAVIO 531102
82	3	077-5209-00	U6, U9, U209	40-Pin, IC Socket
83	5	077-5217-00	U17, U21, U36, U37, U210	32-Pin, IC Socket
84	3	077-5208-00	U4, U7, U212	28-Pin, IC Dip Socket



Relay Board & Playfield Black Light Schematic

TO MAIN TRANSFORMER
(CABINET BOTTOM)



SEGA PINBALL, INC. LIMITED WARRANTY

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

PRINTED CIRCUIT BOARDS (GAME LOGIC): 2 MONTHS
DOT MATRIX DISPLAY BOARDS: 9 MONTHS

NO OTHER PARTS OF SELLER'S PRODUCT ARE WARRANTED.

WARRANTY PERIODS ARE EFFECTIVE FROM THE INITIAL DATE OF SHIPMENT FROM SELLER TO ITS AUTHORIZED DISTRIBUTORS.

SELLER'S SOLE LIABILITY SHALL BE, AT ITS OPTION, TO REPAIR OR REPLACE PRODUCTS WHICH ARE RETURNED TO SELLER DURING THE WARRANTY PERIODS SPECIFIED, PROVIDED:

1. SELLER IS NOTIFIED PROMPTLY UPON DISCOVERY BY PURCHASER THAT STATED PRODUCTS ARE DEFECTIVE.
2. SUCH PRODUCTS ARE PROPERLY PACKAGED AND THEN RETURNED FREIGHT PREPAID, TO SELLER'S PLANT.

THIS WARRANTY DOES NOT APPLY TO ANY PARTS DAMAGED DURING SHIPMENT AND/OR DUE TO IMPROPER HANDLING, OR DUE TO IMPROPER INSTALLATION OR USAGE, OR ALTERATION. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY ANTICIPATED PROFITS, LOSS OF PROFITS, LOSS OF USE, ACCIDENTAL OR CONSEQUENTIAL DAMAGES OR ANY OTHER LOSSES INCURRED BY THE CUSTOMER IN CONNECTION WITH THE PURCHASE OF A SEGA PINBALL, INC. PRODUCT.

WARRANTY DISCLAIMER

EXCEPT AS SPECIFICALLY PROVIDED IN A WRITTEN CONTRACT BETWEEN SELLER AND PURCHASER, THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

CAUTIONS, WARNINGS & NOTICES

Caution

⚠ FOR SAFETY AND RELIABILITY, SUBSTITUTE PARTS AND EQUIPMENT MODIFICATIONS ARE NOT RECOMMENDED (AND MAY VOID ANY WARRANTIES). USE OF NON-SEGA PINBALL INC. PARTS OR MODIFICATIONS OF GAME CIRCUITRY, MAY ADVERSELY AFFECT GAME PLAY, OR MAY CAUSE INJURIES. TRANSPORT PINBALL GAMES WITH HINGED BACKBOX DOWN ONLY! ALWAYS TAKE GREAT CARE WHEN SERVICING ANY GAME. ALWAYS DISCONNECT THE LINE VOLTAGE BEFORE SERVICING. SOME PARTS MAY STILL HOLD CURRENT WHEN UNPLUGGED. ALWAYS READ THE SERVICE MANUAL BEFORE REPLACING OR SERVICING COMPONENTS.

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

Warning

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

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

Notices

THIS DOCUMENT AND THE DATA DISCLOSED HEREIN OR HERewith IS NOT TO BE REPRODUCED (EXCEPT WHERE NOTED), USED OR OTHERWISE DISCLOSED IN WHOLE OR IN PART TO ANYONE WITHOUT WRITTEN CONSENT OF SEGA PINBALL, INC.. **WARNING:** PRODUCTS IN THIS MANUAL, THE COMPANY NAME AND DEVICES AND THE DESIGN OF THE MANUAL ITSELF, ARE PROTECTED BY FEDERAL PATENTS (AND PATENTS PENDING), DESIGN REGISTRATIONS, TRADEMARKS AND COPYRIGHTS. ACTION WILL BE TAKEN IN THE EVENT OF INFRINGEMENT OR IMITATION. THE RIGHT IS RESERVED TO CHANGE SPECIFICATIONS WITHOUT PRIOR NOTICE.



Sonic The Hedgehog™ is a TM of SEGA © 1998. GlowBall, Portals, Icon Designs, logos, characters, names, & all related indicia are trademarks of Sega Pinball, Inc. © 1998. All Rights Reserved. "Multiball" is a registered trademark of Williams Electronics Games, Inc. Used by permission. PCB Schematics (Section 5, Chapter 4) by Creative Electronics and Software (CES), Inc. © 1995. Dodge, Viper, Viper Logo & all related indicia are trademarks of Chrysler Dodge Corp. © 1997, © 1998. All Rights Reserved.

DODGE





ALTHOUGH EVERY EFFORT IS PUT INTO MAKING THIS MANUAL (AND ALL OTHER DOCUMENTS RELATING TO THIS PRODUCT) ACCURATE AND COMPLETE, PLAYFIELD COMPONENTS, FEATURES, RULES, PROGRAMMING AND OPERATION ARE SUBJECT TO CHANGE WITH OR WITHOUT NOTICE

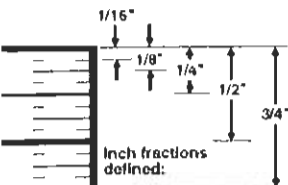
HELP US HELP YOU
IF YOU HAVE ANY SUGGESTIONS, QUESTIONS,
NEED TECHNICAL ADVICE, FIND ERRORS OR HAVE
COMMENTS, CALL US TOLL-FREE (USA or CANADA)
AT

1-800-KICKERS
(1-800-542-5377)

or
1-708-345-7700
Fax
1-708-345-7889



1990 Janice Avenue
Melrose Park, IL 60160



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



CE Games shipped factory direct to Europe from Sega Pinball, Inc. are CE approved and will have an "E" prefix attached to the Serial Number