*featuring our Portals' Service Menu and our unique*

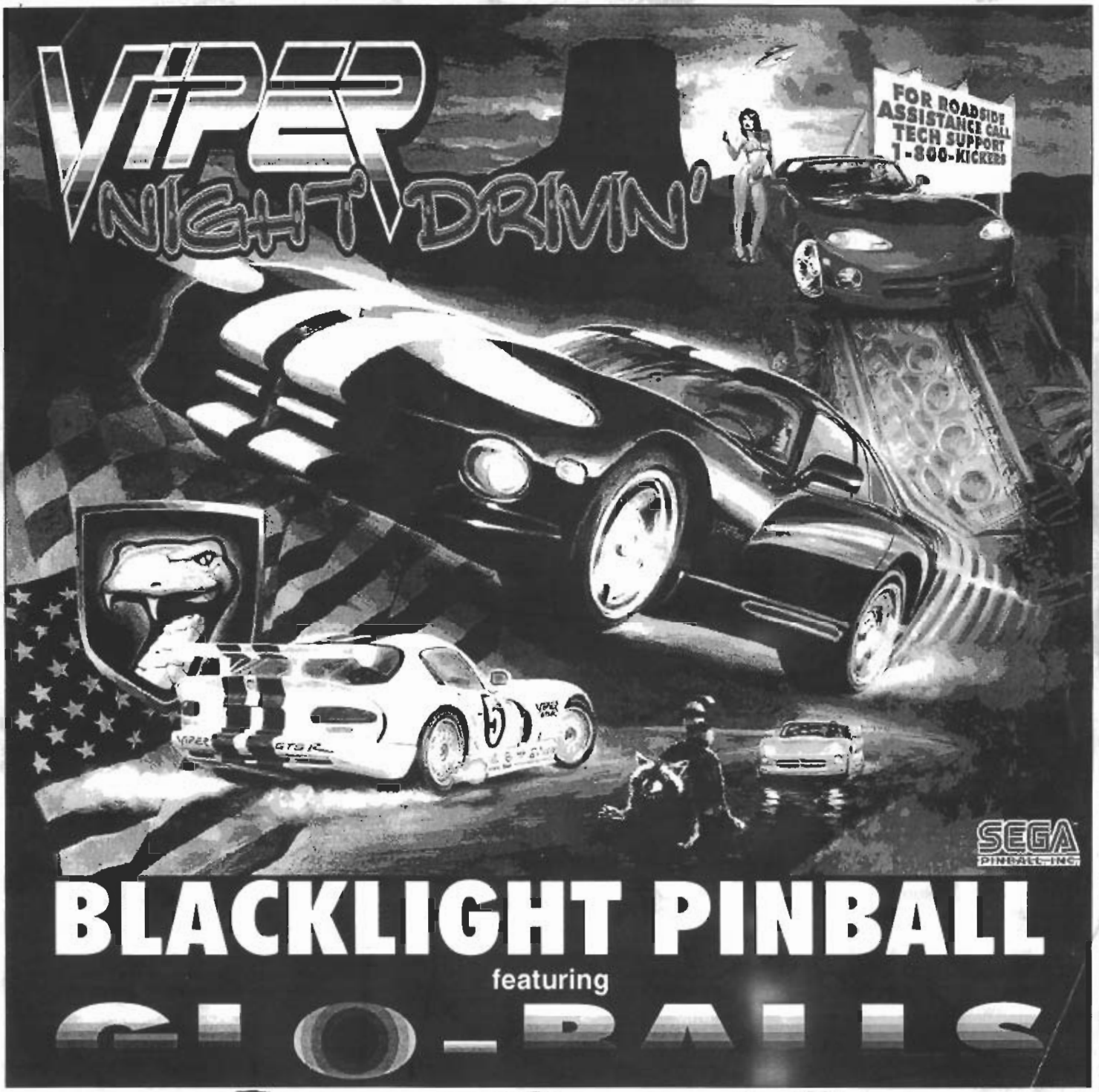
**Find-It-In-Front: Dr. Pinball Section**

DR. DR. DR. DR.

NO YES ENT PREV QUIT

SEGA™ PINBALL, INC.

11th ANNIVERSARY




# BLACKLIGHT PINBALL

featuring

**GI-BALLS**

**Joe Blackwell**
Technical Support Manager

**Eric Winston**
Technical Support Engineer

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Technical Support Engineer

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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.

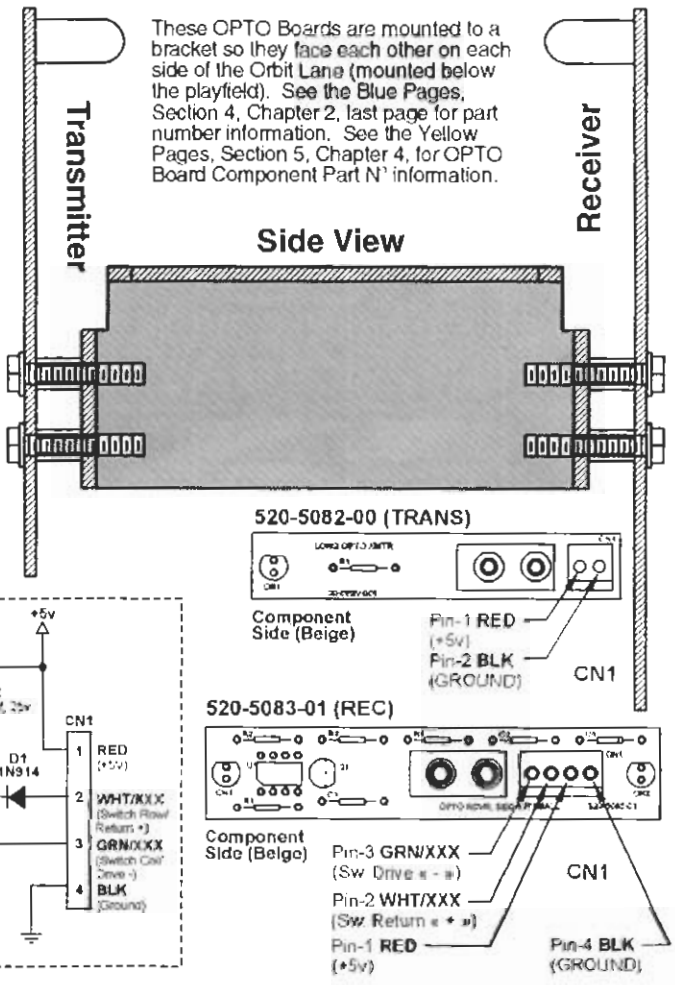
Sep

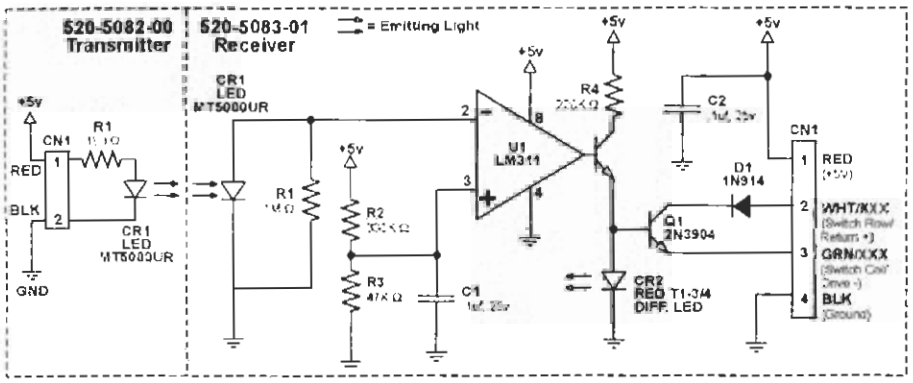
# Playfield Switch OPTO "Long-Hop" Boards

A *New* **OPTO Board combination** (**Trans**mitter, 520-5082-00, and **Rec**eiver, 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*

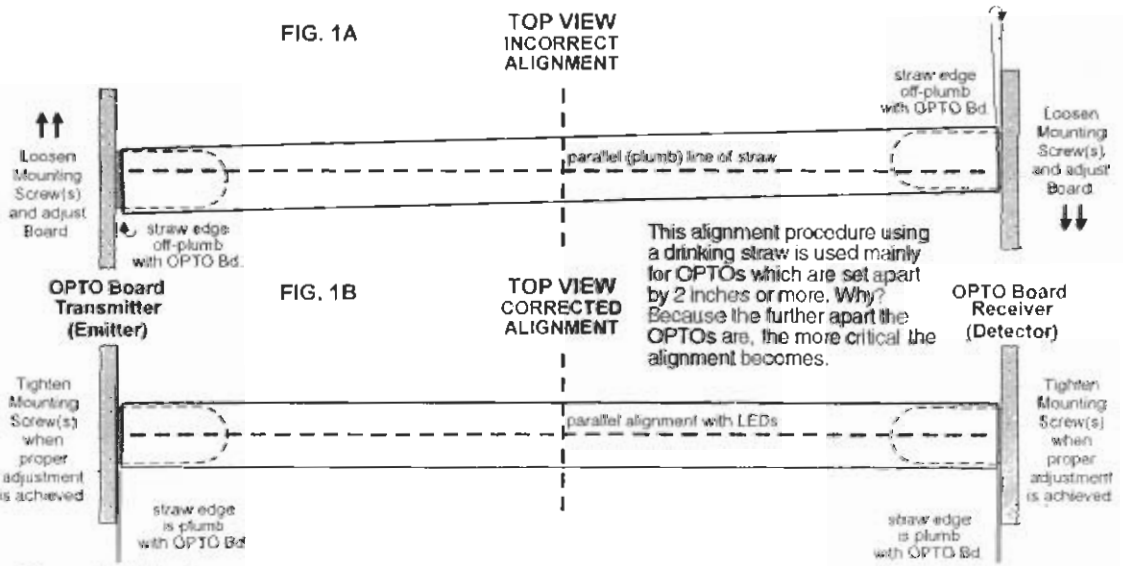
The light falling on **LED** (**CR1**) generates a voltage which is applied to the input (Pin-2) of the **LM311 Comparator** (**U1**). **R1** bleeds off excess charge. At about a volt input from **LED** (**CR1**) the **Comparator** (**U1**) trips & drives either **Q1** (during switch line strobes) or 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.



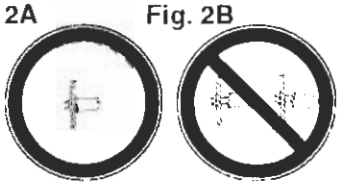

## *OPTO Alignment Procedure Option*

***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 **LED**s into each 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 ›ards may need to be ›ed. If alignment is achieved with just one board, leave the other one alone.

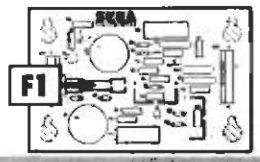



attempt this adjustment procedure, ensure the OPTO Mounting Brackets are ›nsure the **LED**s are sitting flush & perpendicular to the board (see **Fig. 2A**). ›rs not to be flush and/or is bent (see **Fig. 2B**) take the necessary action ›ering / soldering is recommended; however, you can carefully bend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

**Fig. 2A** **Fig. 2B**



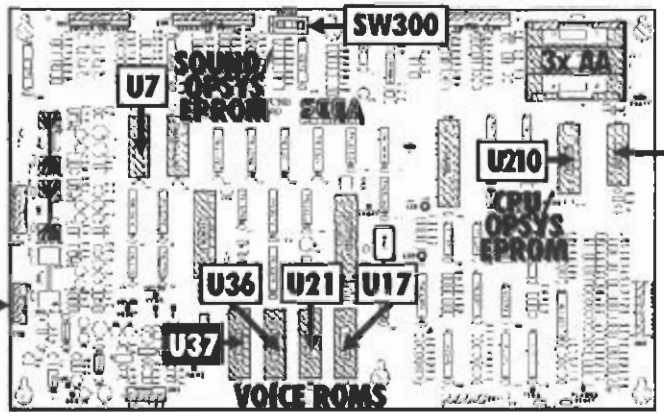
# BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs




**Display Power Supply Bd.**

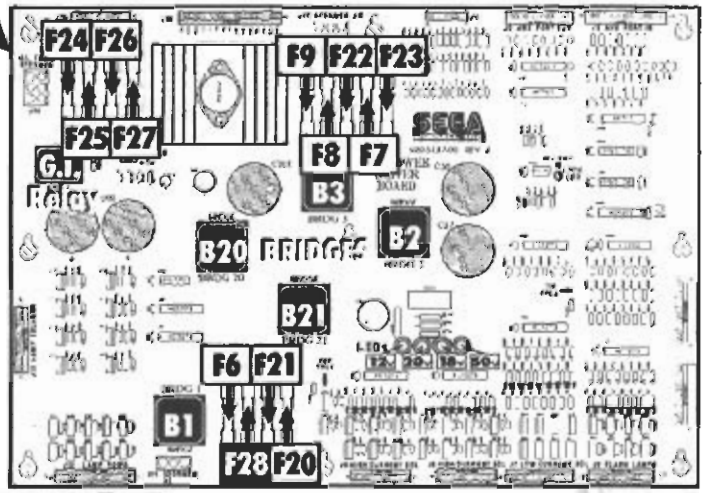
**CPU / Sound Board**
***No Fuses***

**I / O Power Driver Board**




*Note:*

**U37** *is Not Used in this game.*



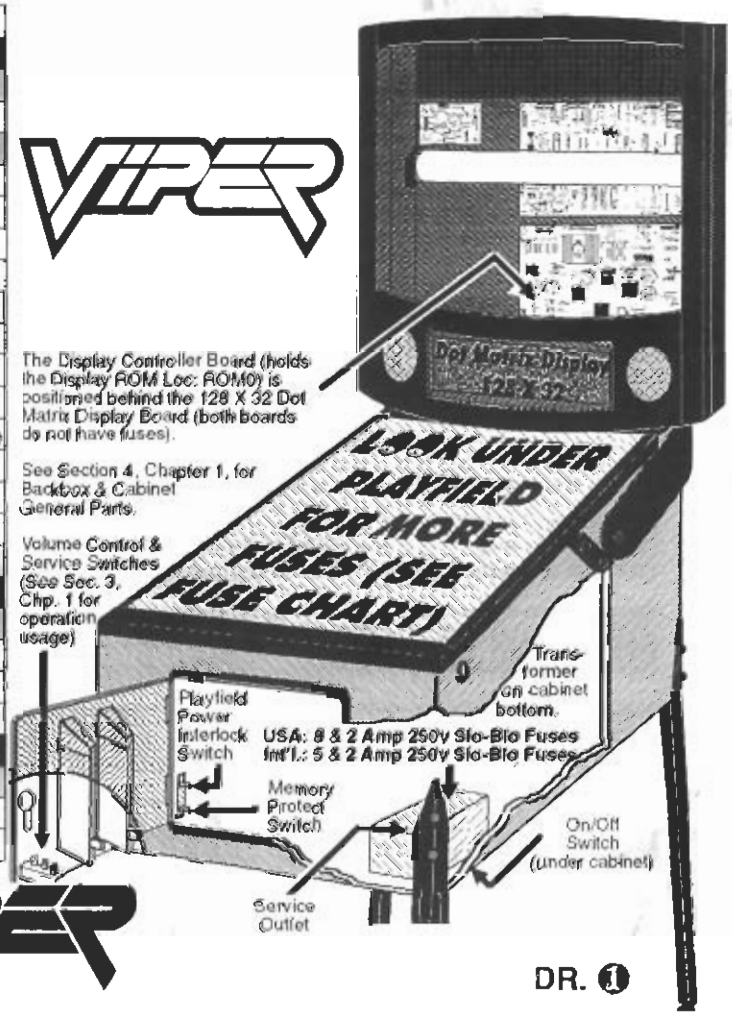

*Note:*

**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 |

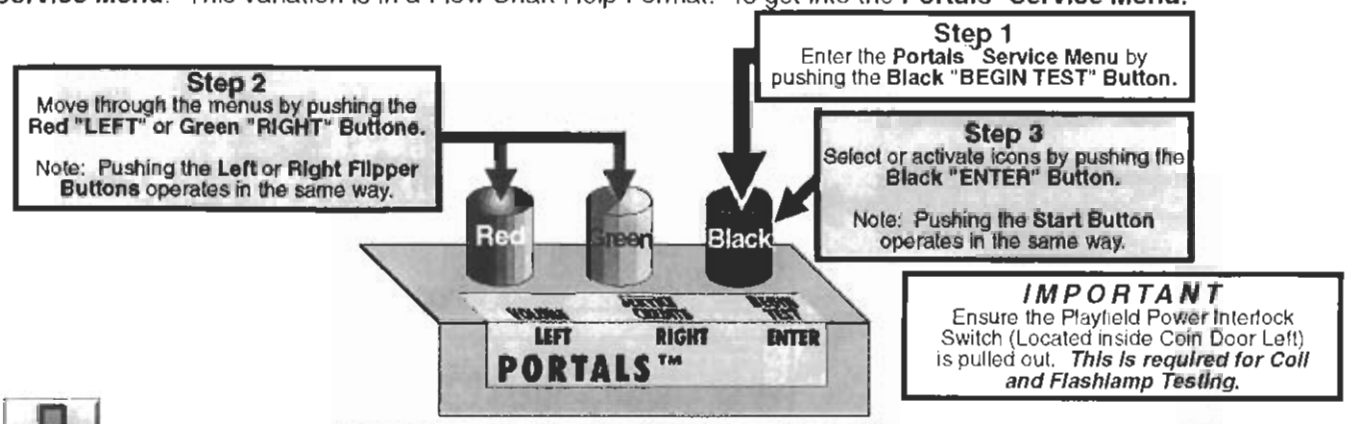
## QUICK REFERENCE FUSE CHART

| Backbox Fuses | | | |
|---|---|---|---|
| **LOC:** | **DISPLAY POWER SUPPLY (P.S.) BOARD** | | |
| F1 | ¾A 250v S.B. | 90v DC | High Voltage Display |
| **LOC:** | **I / O POWER DRIVER BOARD** | | |
| F6 | 7A 250v S.B. | 50v DC | Primary High Power Coils/Flippers |
| F7 | 5A 250v S.B. | 20v DC | Low Power Coils |
| F8 | 5A 250v S.B. | 12v DC | Logic Power |
| F9 | 5A 250v S.B. | 12v DC | Logic Power |
| F20 | 3A 250v S.B. | 50v DC | **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 | 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) |



# ✻ FIND-IT-IN-FRONT: DR. PINBALL SECTION EXPLAINED ✻

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





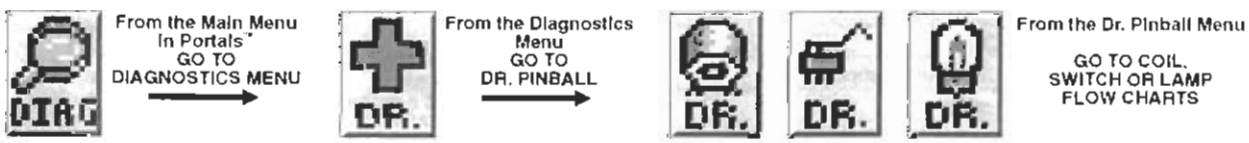
In our **Portals™ Service Menu**, selecting the "DR" *Icon* will bring the operator/technician into Dr. Pinball (Flow Chart Menus), the "on-screen" diagnostic aide. This is a feature that will allow you to utilize the power of the micro-processor assisting in troubleshooting a problem with the machine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

## ☆ ☆ ☆ ☆ HOW IT WORKS ☆ ☆ ☆ ☆

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

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

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




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


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


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


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


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

# 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 Nº |
|---|---|---|---|---|
| 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 Ø | 965-0271-35 |
| Display EPROM | Not Used | Display Controller Bd. | ROM 3 | Not Used |

**FOR:**

**VIPER**


From the Main Menu In Portals* GO TO DIAGNOSTICS MENU →


From the Diagnostics Menu GO TO SWITCH MENU →


From the Switch Menu GO TO SWITCH OR ACTIVE SWITCH TEST →


From the Switch Menu GO TO DEDICATED SWITCH TEST

## SWITCH MATRIX GRID & DEDICATED SWITCHES

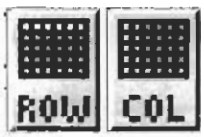
| Column (Drive) / Row (Return) | 1 Q1 GRN-BRN CN5-P1 | 2 Q2 GRN-RED CN5-P3 | 3 Q3 GRN-ORG CN5-P4 | 4 Q4 GRN-YEL CN5-P5 | 5 Q5 (NOT USED) CN5-P6 | 6 Q6 GRN-BLU CN5-P7 | 7 Q7 GRN-VIO CN5-P8 | 8 Q8 GRN-GRY CN5-P9 |
|---|---|---|---|---|---|---|---|---|
| 1 U400 WHT-BRN CN7-P9 | NOT USED 1 | NOT USED 9 | JUMP RAMP OPTO under Playfield 17 | LEFT RAMP ENTER above Playfield 25 | NOT USED 33 | LEFT TOP LANE under Playfield 41 | LEFT TURBO BUMPER under Playfield 49 | LEFT OUTLANE under Playfield 57 |
| 2 U400 WHT-RED CN7-P8 | 4TH COIN SLOT on Coin Door 2 | NOT USED 10 | RIGHT RAMP ENTER above Playfield 18 | LEFT RAMP EXIT above Playfield 26 | NOT USED 34 | RIGHT TOP LANE under Playfield 42 | TOP TURBO BUMPER under Playfield 50 | LEFT RETURN LANE under Playfield 58 |
| 3 U400 WHT-ORG CN7-P7 | 6TH COIN SLOT on Coin Door 3 | NOT USED 11 | RIGHT RAMP EXIT above Playfield 19 | CENTER RAMP ENTER above Playfield 27 | NOT USED 35 | NOT USED 43 | RIGHT TURBO BUMPER under Playfield 51 | LEFT SLINGSHOT under Playfield 59 |
| 4 U400 WHT-YEL CN7-P6 | RIGHT COIN SLOT on Coin Door 4 | 4-BALL TROUGH #1 (LEFT) under Playfield 12 | LEFT BUTTON (UK ONLY) on Cabinet side 20 | CENTER RAMP EXIT above Playfield 28 | NOT USED 36 | BILL BOARD above Playfield 44 | NOT USED 52 | RIGHT OUTLANE under Playfield 60 |
| 5 U401 WHT-GRN CN7-P5 | CENTER COIN SLOT / DBA on Coin Door 5 | 4-BALL TROUGH #2 under Playfield 13 | RIGHT BUTTON (UK ONLY) on Cabinet side 21 | LT RACCOON S-U under Playfield 29 | NOT USED 37 | LEFT VUK (LOCK) under Playfield 45 | LAUNCH BUTTON Cabinet front 53 | RIGHT RETURN LANE under Playfield 61 |
| 6 U401 WHT-BLU CN7-P3 | LEFT COIN SLOT on Coin Door 6 | 4-BALL TROUGH #3 under Playfield 14 | RIGHT RUBBER under Playfield 22 | RT RACCOON S-U under Playfield 30 | NOT USED 38 | RIGHT VUK (LOCK) under Playfield 46 | START BUTTON Cabinet front 54 | RIGHT SLINGSHOT under Playfield 62 |
| 7 U401 WHT-VIO CN7-P2 | 5TH COIN SLOT on Coin Door 7 | 4-BALL TROUGH VUK OPTO under Playfield 15 | LEFT RUBBER under Playfield 23 | LEFT TARGET (LOWER) under Playfield 31 | NOT USED 39 | LEFT ORBIT under Playfield 47 | SLAM TILT on Cabinet side 55 | NOT USED 63 |
| 8 U401 WHT-GRY CN7-P1 | NOT USED 8 | SHOOTER LANE under Playfield 16 | NOT USED 24 | RIGHT TARGET (LOWER) under Playfield 32 | NOT USED 40 | RIGHT ORBIT under Playfield 48 | PLUMB BOB TILT on Cabinet side 56 | NOT USED 64 |

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


From the Diagnostics Menu GO TO LAMP MENU →


From the Lamp Menu GO TO SINGLE LAMP TEST →


From the Lamp Menu GO TO TEST ALL LAMPS →




From the Lamp Menu GO TO ROW OR COLUMN TEST

Diode On Terminal Strip

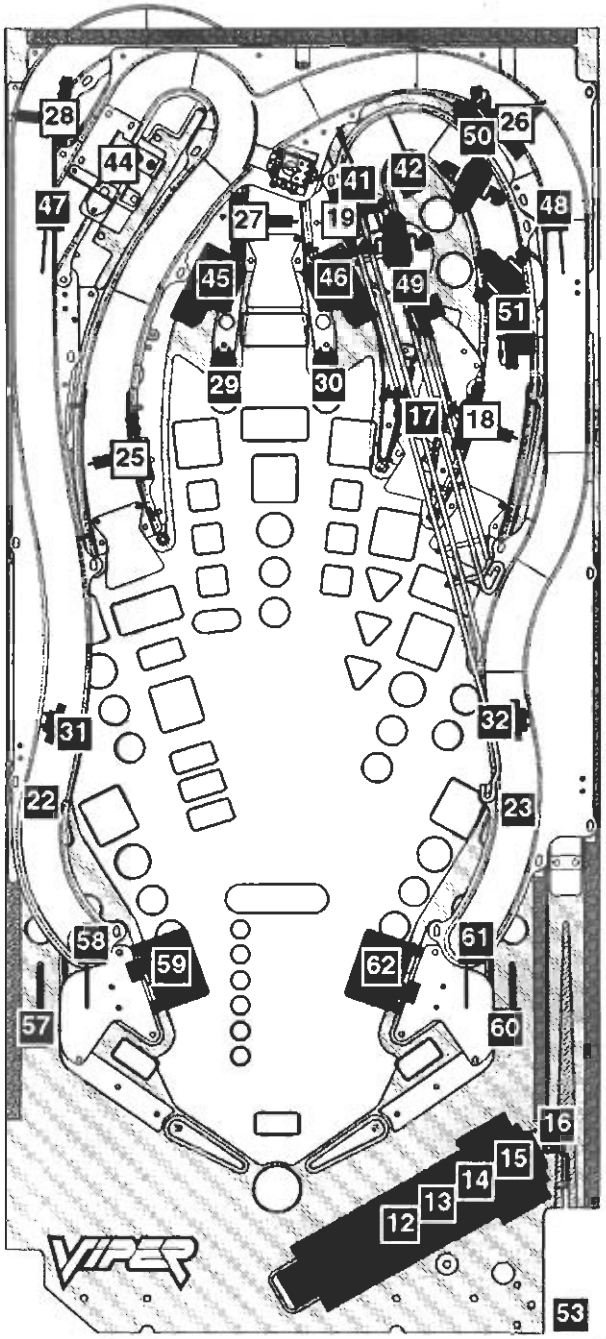
## LAMP MATRIX GRID

| Column (18v) / Row (GND) | 1: U17 YEL-BRN J13-P9 | 2: U16 YEL-RED J13-P8 | 3: U15 YEL-ORG J13-P7 | 4: U14 YEL-BLK J13-P6 | 5: U13 YEL-GRN J13-P5 | 6: U12 YEL-BLU J13-P4 | 7: U11 YEL-VIO J13-P3 | 8: U10 YEL-GRY J13-P1 |
|---|---|---|---|---|---|---|---|---|
| 1: Q33 RED-BRN J12-P1 | 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 (& 15) | TOP TURBO BUMPER #555 Bulb 66 (& 15) | RT TURBO BUMPER #555 Bulb 67 (& 15) | 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 |

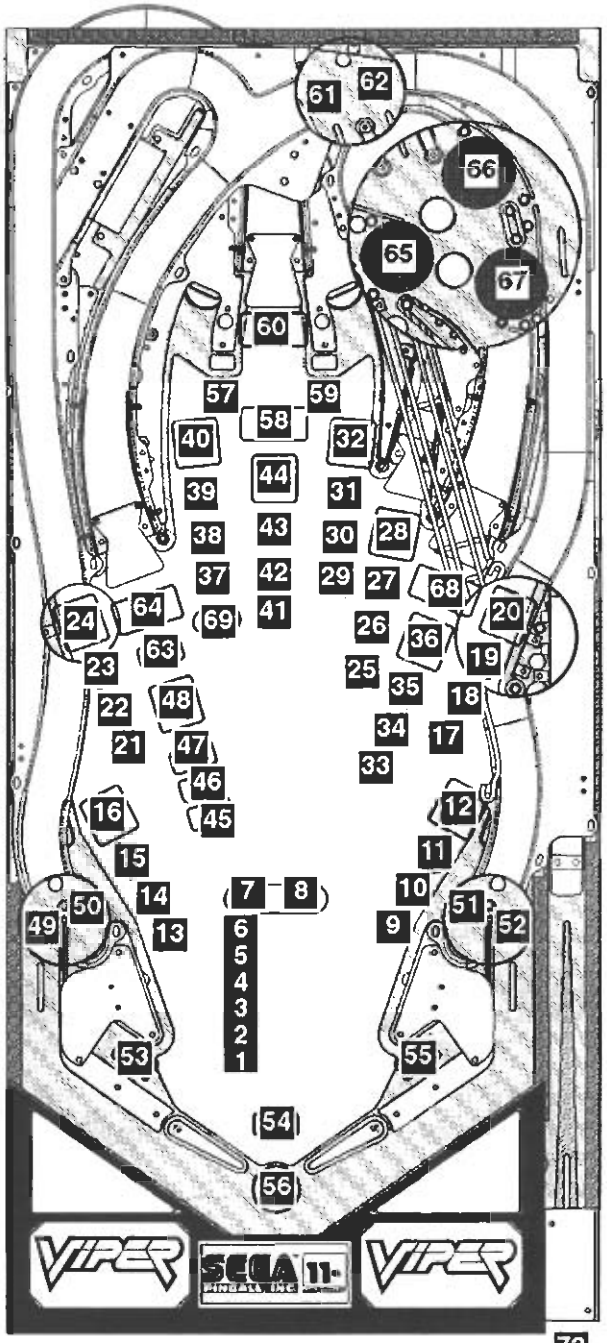


VIPER

## SWITCH MATRIX GRID LOCATIONS

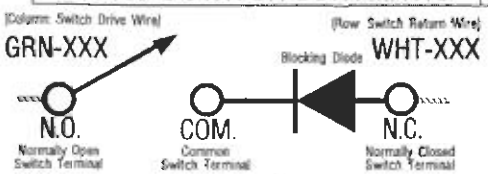



## LAMP MATRIX GRID LOCATIONS

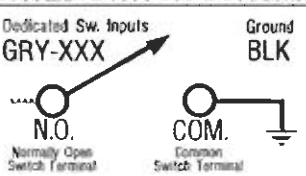



Legend Note: ☐ = Switches/Lamps mounted above playfield. ■ = Switches/Lamps mounted below the playfield.

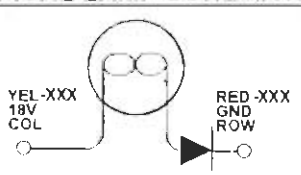
## TYPICAL SWITCH SCHEMATIC




## DEDICATED SWITCH SCHEMATIC

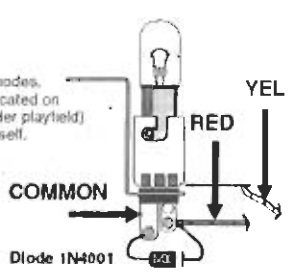



## TYPICAL LAMP SCHEMATIC




***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



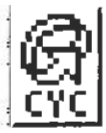

DR. Find-It-In-Front: Dr. Pinball

VIPER


From the Main Menu in Portals GO TO DIAGNOSTICS MENU →


From the Diagnostics Menu GO TO COIL MENU →


From the Coil Menu GO TO COIL TEST →




From the Coil Menu GO TO CYCLING COILS

# COILS DETAILED CHART TABLE

| High Current Coils Group 1 | | Drive Transistor (D.T.) | Driver Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 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 |

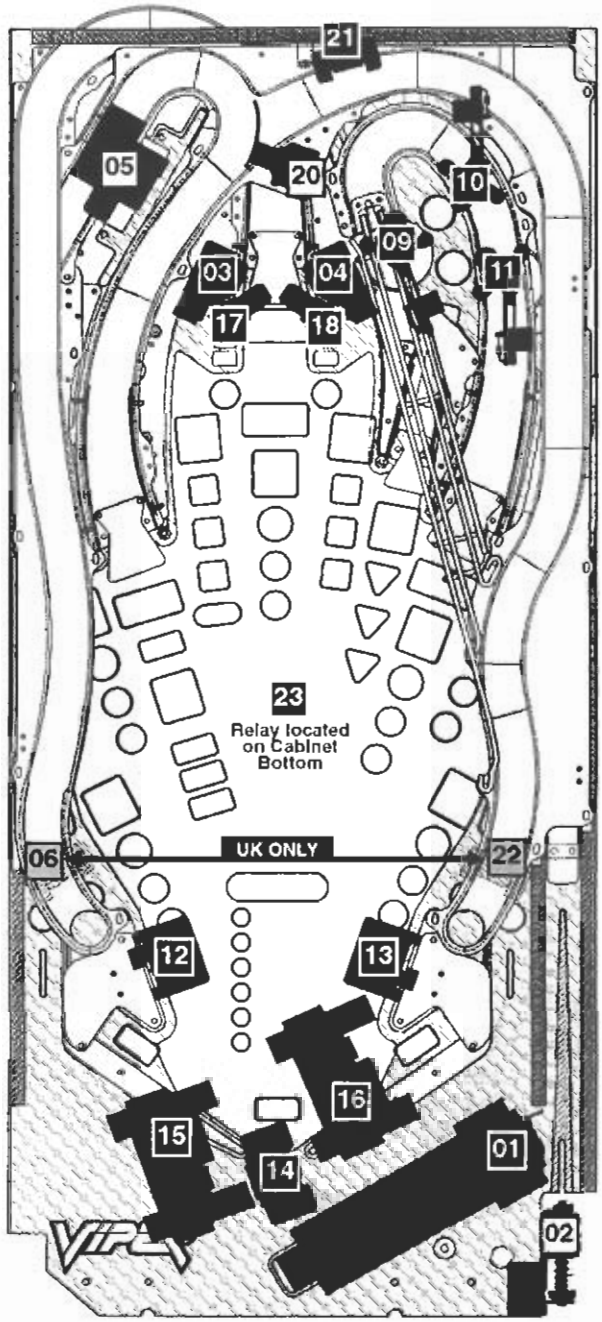
| High Current Coils Group 2 | | Drive Transistor (D.T.) | Driver Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 09 | LEFT TURBO BUMPER | Q9 | I/O Pwr. 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 Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 17 | 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 |

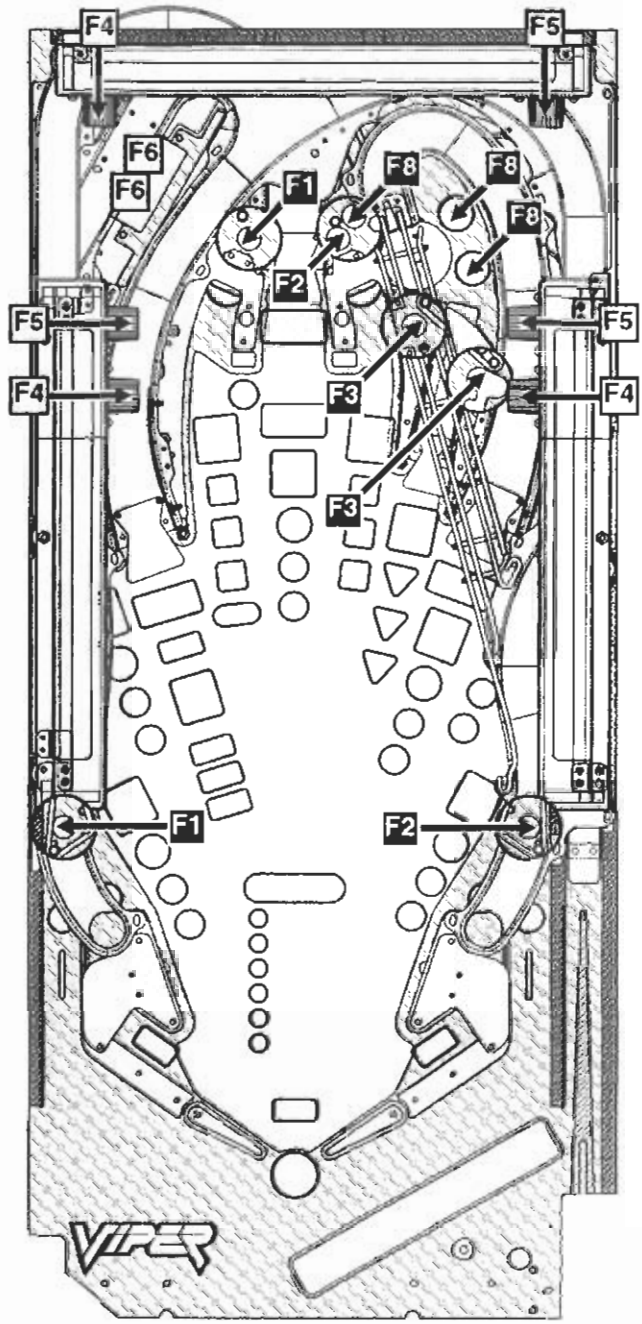
**4.5v DC Meter SPI PN#: 091-5000-00**

| Flash Lamps (FLASH) | | Drive Transistor (D.T.) | Driver Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | 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

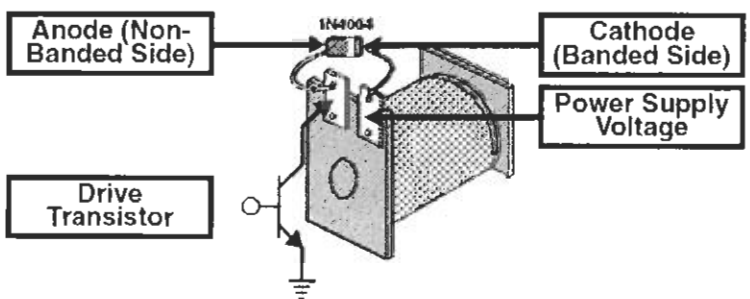



## FLASH LAMP LOCATIONS



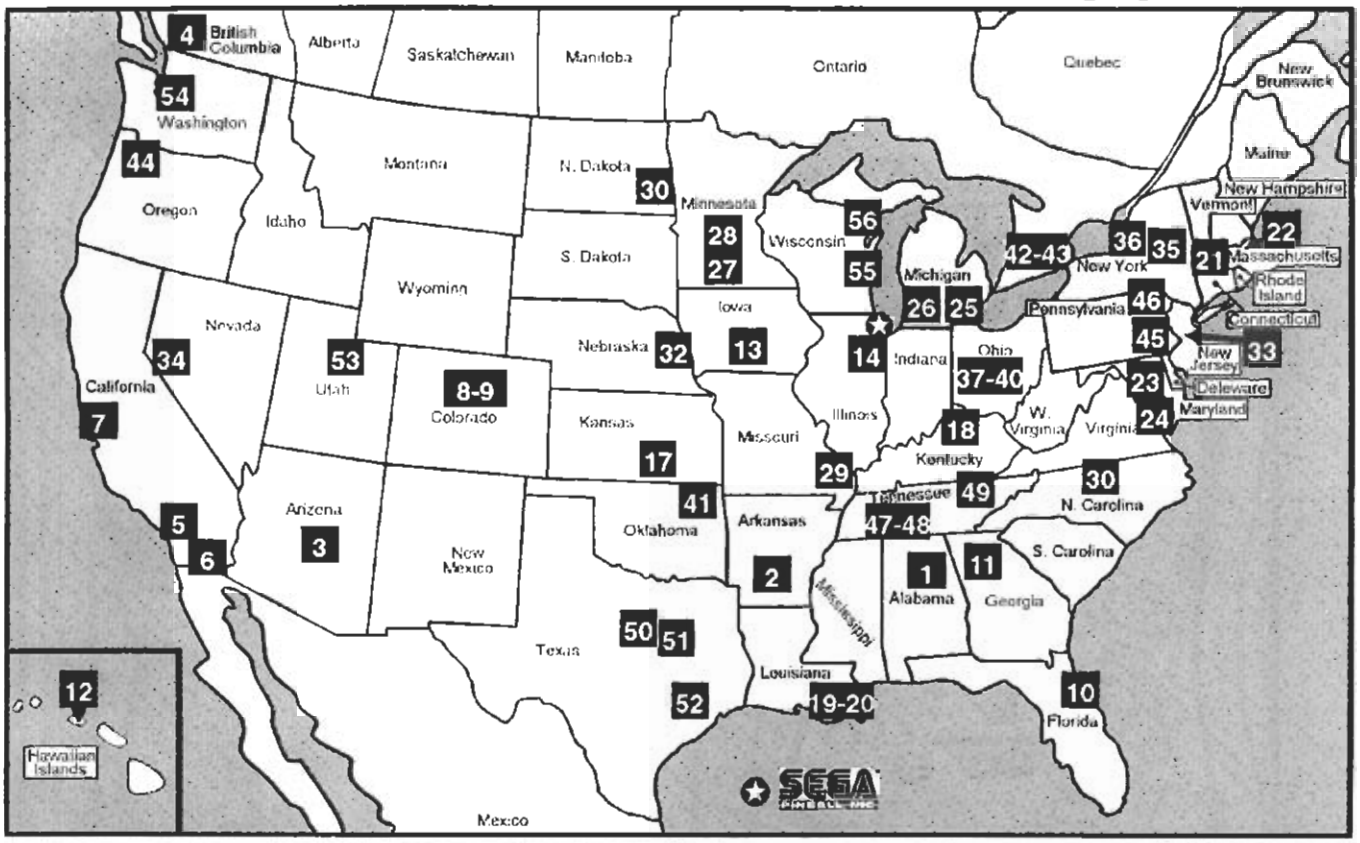

Legend Note: ☐ = Coils/Flashes mounted above playfield. ■ = Coils/Flashes mounted below the playfield.

## TYPICAL COIL WIRING




*Note:*
All Coils require diodes. Some diodes are located on Terminal Strips (under playfield) & not on the coil itself.
**D** iode
**C** oil
**T** erminal
**S**trip

# DOMESTIC PINBALL & REDEMPTION DISTRIBUTORS




| # | STATE/PROVINCE AND CITY | | NAME | PHONE |
|---|---|---|---|---|
| 1 | AL | Birmingham | Birmingham Vending | 205-324-7526 |
| 2 | AR | N. Little Rock | Godwin Distributing | 501-753-1138 |
| 3 | AZ | Phoenix | Betson West | 602-233-0190 |
| 4 | BC | Burnaby (Can.) | Can. Coin Machine | 604-420-4008 |
| 5 | CA | Buena Park | Betson West | 714-228-7500 |
| 6 | | San Diego | Betson West | 619-459-0871 |
| 7 | | S. San Francisco | Betson West | 415-952-4220 |
| 8 | CO | Denver | Col. Game Exchange | 303-893-4300 |
| 9 | | | Mountain Coin | 303-427-2133 |
| 10 | FL | Orlando | Birmingham Vending | 407-425-1505 |
| 11 | GA | Marietta | Game Exchange/SE, Inc. | 770-594-7215 |
| 12 | HI | Ewa Beach | 50th State Coin Op. | 808-682-4561 |
| 13 | IA | Des Moines | Greater American Dist. | 515-244-2828 |
| 14 | IL | Chicago | Atlas Distributing | 773-276-5005 |
| 15 | IN | Indianapolis | Atlas Distributing | 317-786-6892 |
| 16 | | Indianapolis | J. & J. Distributing | 317-899-2530 |
| 17 | KS | Wichita | United Distributors, Inc. | 316-263-6181 |
| 18 | KY | Louisville | Atlas Distributing | 502-966-5266 |
| 19 | LA | Metairie | AMA Distributors, Inc. | 504-835-3232 |
| 20 | | | New Orleans Novelty | 504-888-3500 |
| 21 | MA | E. Long Meadow | Gekay Sales | 413-525-2700 |
| 22 | | Norwood | Mondial Int'l. Dist. | 781-769-9966 |
| 23 | MD | Baltimore | State Sales | 410-646-4100 |
| 24 | | | Weiner Distributing | 410-525-2600 |
| 25 | MI | Redford | Atlas Distributing | 313-794-4880 |
| 26 | | Wyoming | Atlas Distributing | 616-241-1472 |
| 27 | MN | Bloomington | Hanson Distributing | 612-884-6604 |
| 28 | MN | Minneapolis | Sandler Vending | 612-996-0010 |

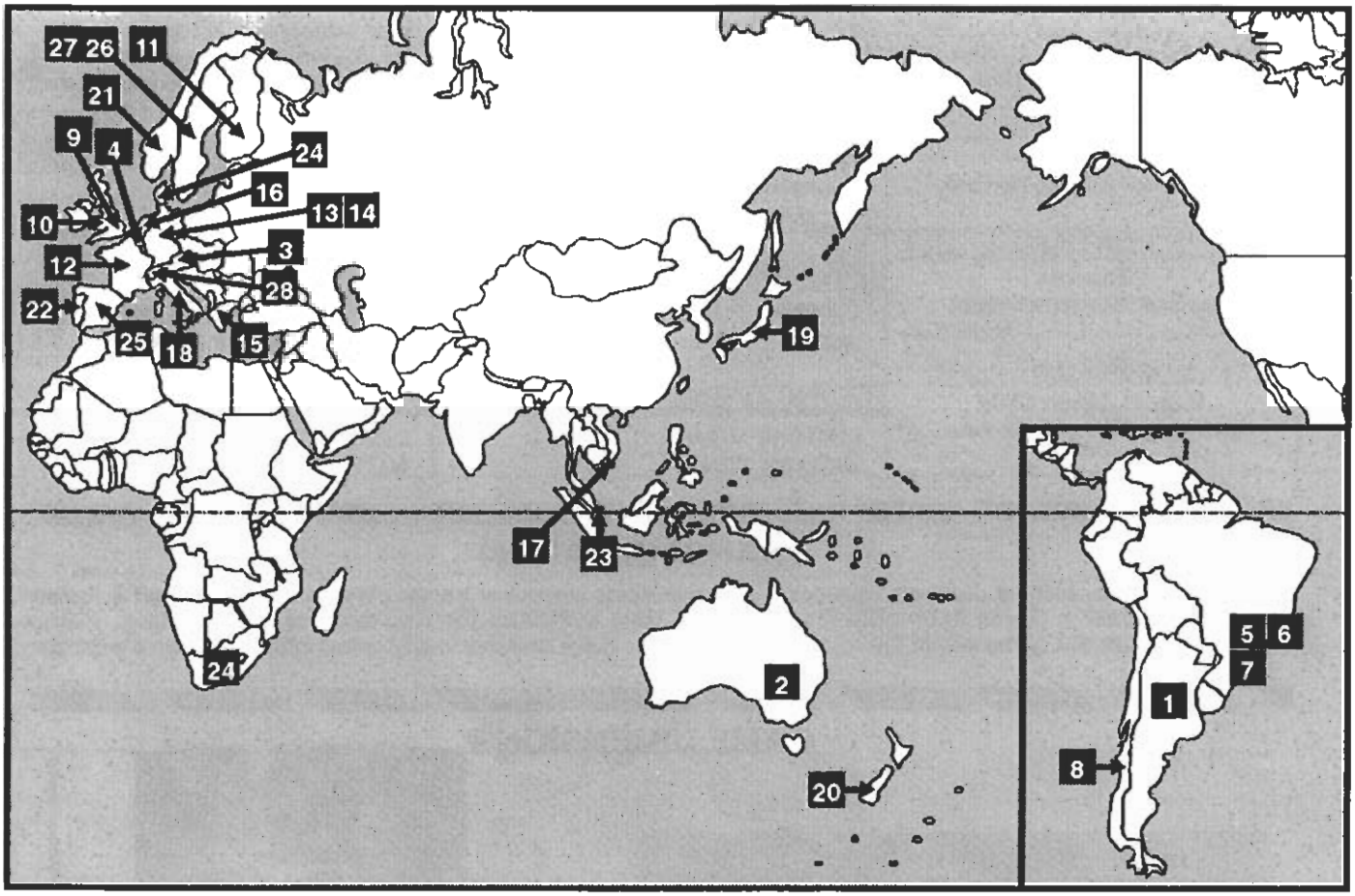
| # | STATE/PROVINCE AND CITY | | NAME | PHONE |
|---|---|---|---|---|
| 29 | MO | St. Louis | J. & J. Distributing | 314-645-3393 |
| 30 | NC | Archdal | Operators Distributing | 910-884-5714 |
| 31 | ND | Fargo | M.H. Associates, Inc. | 701-282-7877 |
| 32 | NE | Omaha | Greater American Dist. | 402-553-2812 |
| 33 | NJ | Springfield | Mondial Int'l. Dist. | 973-467-9700 |
| 34 | NV | Reno | Reno Game Sales | 702-829-2080 |
| 35 | NY | Garden City Park | T & M Distributing | 516-747-0034 |
| 36 | | Rochester | Mondial Dist. | 716-586-1100 |
| 37 | OH | Cincinnati | Atlas Distributing | 513-771-1909 |
| 39 | | Cleveland | | 800-278-8282 |
| 38 | | Columbus | Shaffer Distributing, Co. | 614-421-6800 |
| 40 | | Macedonia | | 330-467-4850 |
| 41 | OK | Tulsa | Galaxy Distributing, Co. | 918-835-1166 |
| 42 | ON | Rexdale (Can.) | New Way Sales | 416-674-8000 |
| 43 | | Toronto (Can.) | Starburst Coin Machines | 416-251-2122 |
| 44 | OR | Portland | American Coin | 503-233-7000 |
| 45 | PA | Bensalem | Mondial Int'l. Dist. | 215-638-1122 |
| 46 | | Wilkes-Barre | Roth Novelty | 717-824-9994 |
| 47 | TN | Memphis | Games Sales Co., Inc. | 901-525-8351 |
| 48 | | | Green G.A.M.E.S. | 901-353-1000 |
| 49 | | Nashville | Sammons-Pennington | 615-244-3020 |
| 50 | TX | Corsicana | Master Sales | 903-874-4740 |
| 51 | | Dallas | Commercial Music | 214-741-6381 |
| 52 | | Houston | H.A. Franz, & Co. | 713-523-7366 |
| 53 | UT | Salt Lake City | Struve Distributing | 801-328-1636 |
| 54 | WA | Seattle | American Coin | 206-764-9020 |
| 55 | WI | Green Bay | Pioneer Sales & Svc. | 920-468-5200 |
| 56 | | Menomonee Falls | Pioneer Sales & Svc. | 414-781-1420 |

TECHNICAL SUPPORT SEGA PINBALL, INC.

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

VIPER

# INTERNATIONAL DISTRIBUTORS




| # | COUNTRY AND CITY | NAME | PHONE (-011) |
|---|---|---|---|
| 1 | Argentia, Urquiza | Florencia | 54-232-5532 |
| 2 | Australia, Matraville | Amusement Machine Dist. | 61-29-316-6000 |
| 3 | Austria, Grazerstrasse | Rupp Austria | 43-34-528-6105 |
| 4 | Belgium, Brussels | Splin S.A. | 32-43-62-7677 |
| 5 | Brazil, Sao Paulo | Parkland | 55-11-792-42864 |
| 6 | | Unimax | 55-11-533-5615 |
| 7 | | Universe | 55-11-575-0731 |
| 8 | Chile, Santiago | Cuinsa | 56-2-696-0167 |
| 9 | England, London | Electrocoin | 44-181-965-2055 |
| 10 | So. Wales, Cardiff | Electrocoin | 44-22-261-5100 |
| 11 | Finland, Espoo | Petika Ray Oy | 35-8-943-7091 |
| 12 | France, Aubervilliers | PLF Sa | 33-14-811-3131 |
| 13 | Germany, Berlin | Bally Wulff | 49-3-062-0020 |
| 14 | Germany, Hannover | Bally Wulff | 49-511-358-5343 |

| # | COUNTRY AND CITY | NAME | PHONE (-011) |
|---|---|---|---|
| 14 | Germany, Hannover | Bally Wulff | 49-511-358-5343 |
| 15 | Greece, Athens | Greece Coin | 30-1-554-1608 |
| 16 | Holland, Sittart | Veltmeijer Automaten | 31-46-452-6444 |
| 17 | Hong Kong, Kwai Fong | Bondeal Limited | 85-2-487-9089 |
| 18 | Italy (RSM), Serravalle | Technoplay Sa | 39-54-990-0361 |
| 19 | Japan, Tokyo | Data East, Corp. | 81-35-370-0708 |
| 20 | New Zealand, Auckland | Amco Machine Supp. | 64-9-846-7606 |
| 21 | Norway, Oslo | Vendcomatic | 47-2-216-0830 |
| 22 | Portugal, Amadora | Jacinto & Martins | 35-11-495-1868 |
| 23 | Singapore, Singapore | Valibel Technologies | 65-748-8404 |
| 24 | South Africa, Lalucia | Unimac | 27-3-152-5544 |
| 25 | Spain, Madrid | Sente S.A. | 34-1-541-7112 |
| 26 | Sweden, Bromma | Axlon | 46-8-704-6580 |
| 27 | Sweden, Malmo | Truemax AB | 46-40-153-635 |
| 28 | Switzerland, Harkingen | Novomat Ag | 41-62-398-4061 |

TECHNICAL SUPPORT SEGA PINBALL, INC.

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# POWER REQUIREMENTS

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

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

# TRANSPORTATION

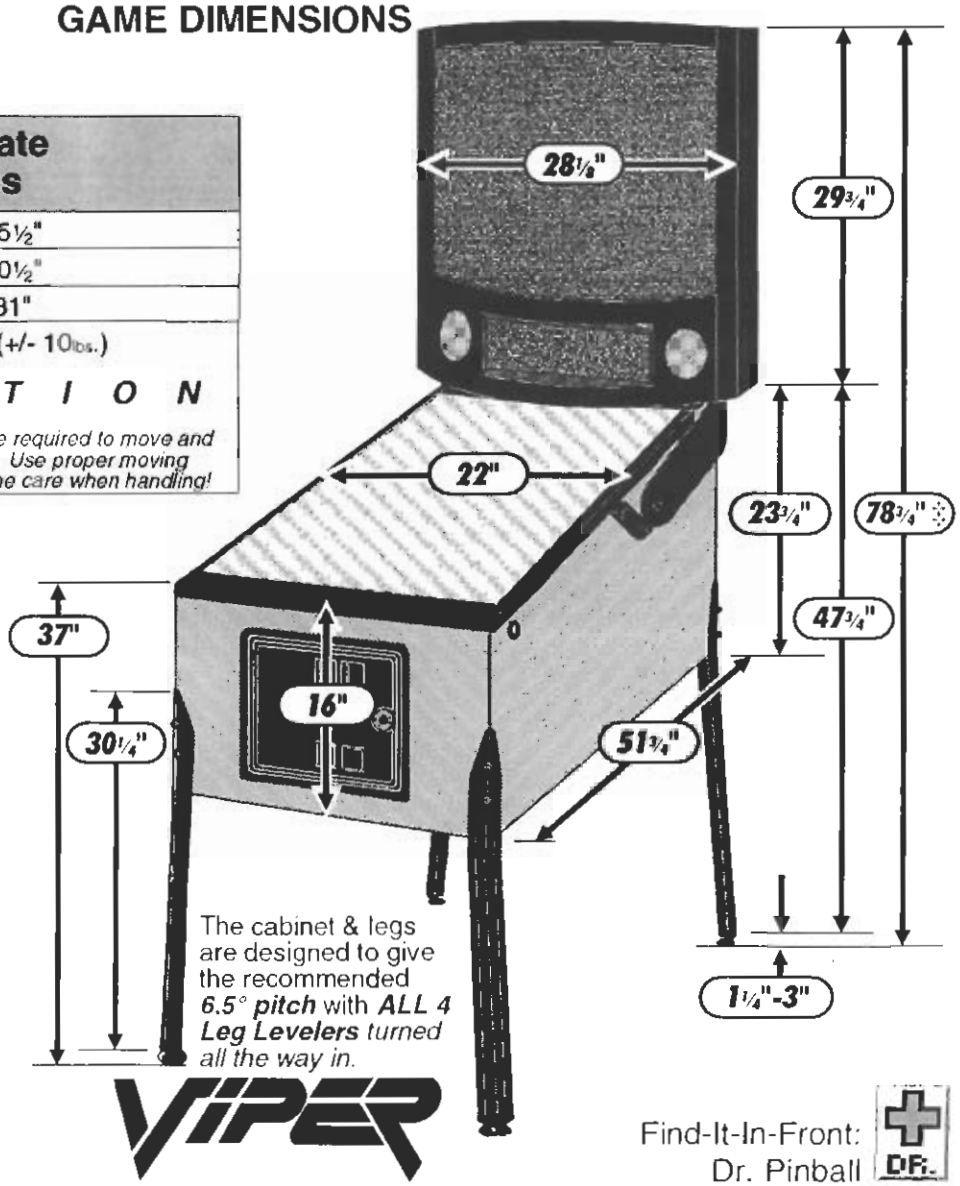
To reduce the possibility of damage, observe **ALL** precautions whenever transporting the game. ***Read & follow*** *Section 1, Chapter 1,* **Game Assembly Procedures**, & **How to Secure the Backbox for Transporting**. Remove the legs & secure the game within the transporting vehicle. *Save and retain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

# GAME DIMENSIONS

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

**C A U T I O N**

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




*N o t e s :*

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

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

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

VIPER


## General Table of Contents

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



*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.

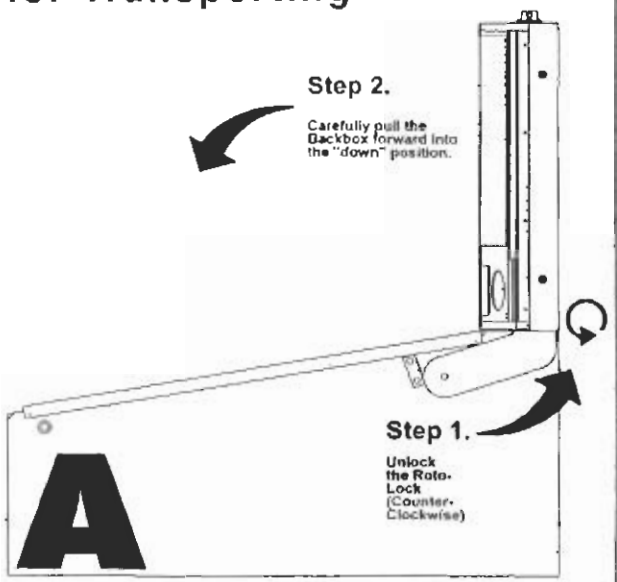
***The playfield incline affects difficulty of play. Use the recommended incline; Game difficulty is best varied using game adjustments.***

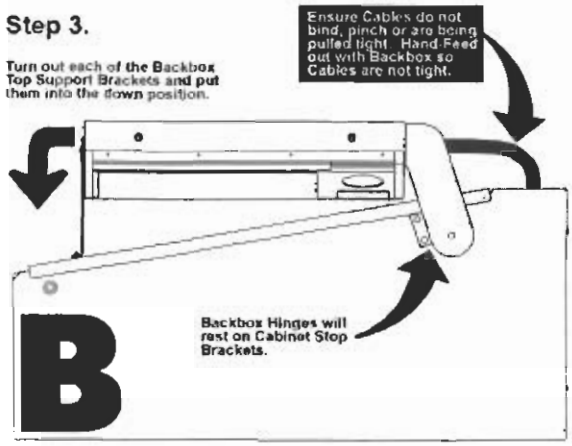
14. If desired, perform any self tests at this time. See Section 3, Chapter 1, Portals™ Service Menu Introduction, and Chapter 2, Go To Diagnostics Menu, for instructions on how to enter "Begin Play Test" and "Game Specific" to test components on the game.

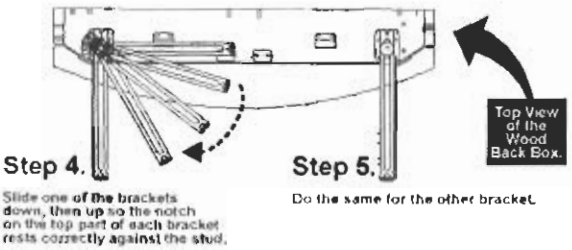
15. **INSTALL 4 PLASTIC BALLS** on the playfield near the outhole and carefully reinstall the playfield glass. (Amount of balls are always specified on decal attached to the lock down assembly.)

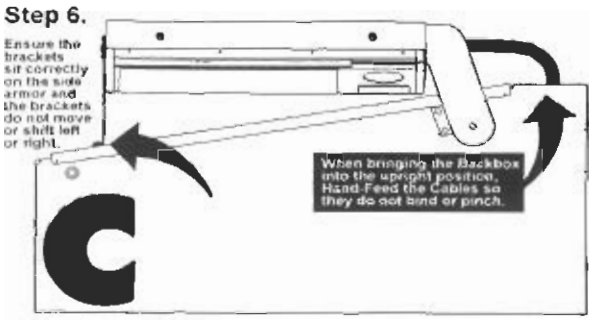
16. If desired, make Game Pricing (Standard and/or Custom) and Add-A-Ball, Novelty, or X-Ball Play adjustments at this time. See Section 3, Chapter 4, Go To Adjustments Menu, for instructions on how to enter adjustments. Follow instructions in the tables provided in the manual for suggestions of customizing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

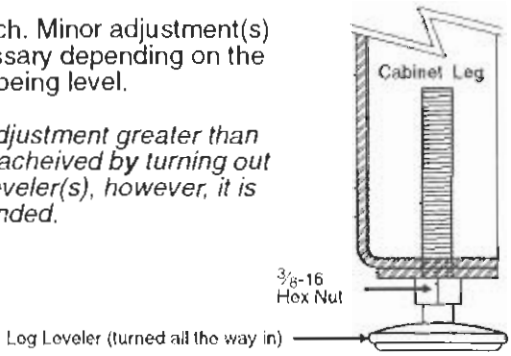
***This cabinet is designed to automatically have a 6.5° pitch without any Leg Leveler adjustment!***

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!***

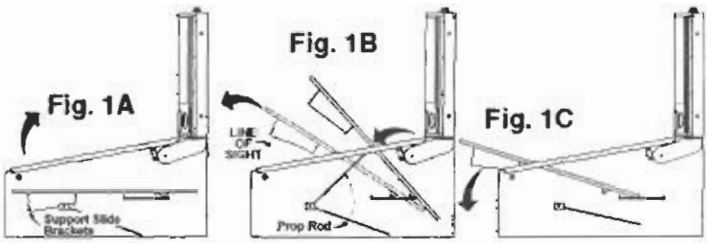
Verify 6.5° pitch. Minor adjustment(s) may be necessary depending on the location floor being level.

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




## Easy Access Service System - 3 Positions

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




***Positions 1 & 2***

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


***Position 3***

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

# Game Operation & Features

## Start of Game Features

### *Starting a Normal Game*

Insert coin(s). The game generates a sound for the first coin & for each subsequent coin with the display indicating the number of credits posted. Press the **START BUTTON** and a start-up sound is produced, and the posted credits are reduced by one. 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 ooooooh! so much gosh darn harder!

## During Game Features

### *Feature Mode & Combination Shots*

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

### *Multiball*

Multiball is started after completion of certain Feature Modes or may be a mode itself depending on game rules/play. Multiball may vary with the amount of balls used in Multiball depending on game style. Typically, if Multiball play was short, a "restart" option is given. Watch the Display for instructions on the restart.

### *Replay Feature*

Replay awards are given as the player exceeds a High Score Level during game play. This can be adjusted with Adjustment 3, Replay Awards (Default=**CREDIT**, adjustable). Players exceeding the High Score Levels can receive: **CREDIT**, **EXTRA BALL**, or **SPECIAL**. Adjust to **NONE** if a replay award is not desired.

### *Video Mode*

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

## End of Game Features

### *Game Endings*

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

### *Match Feature*

At the end of each ball, earned bonuses are collected. At the end of the last ball of a game (including any extra balls, if applicable), earned bonuses are collected, then the system produces a random 2-digit number (a multiple of 10; 00 to 90). Matching the last 2 digits of the player's score with this number awards a credit. In Adj. 11, Match Percentage (Default=**7%**, adjustable) can be changed from 0-10%. Changing the percentage to **0%** displays the "Match Animation" at the end of the game, however, will never match (to award a credit). Changing this adjustment to **OFF** will not display the "Match Animation" nor award a credit.

*Continued Next Page.*

# End of Game Features Continued

## Entering Initials

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

## Manual Percentaging

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

# Instruction Card

Below is a **COPY** of the game instruction card which is included with every game. If your card is lost or damaged, simply **COPY** this page and *cut out* the Instruction Card as a *temporary replacement* until a *new card is ordered.* (***Suggestion:*** **COPY & CUT** along the dotted line and fold in the center to keep the "COPY" sturdy.)

COPY & CUT


FOLD HERE

VIPER NIGHT DRIVIN'

**MULTIBALL AND JACKPOTS** Shoot the ***Center Holes*** until **"LOCK"** *lights*. Locking two ❷ balls begins **Multiball**. During **Multiball**, shoot the ***Center Ramp*** for Jackpot. Then *re-lock* two ❷ 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.

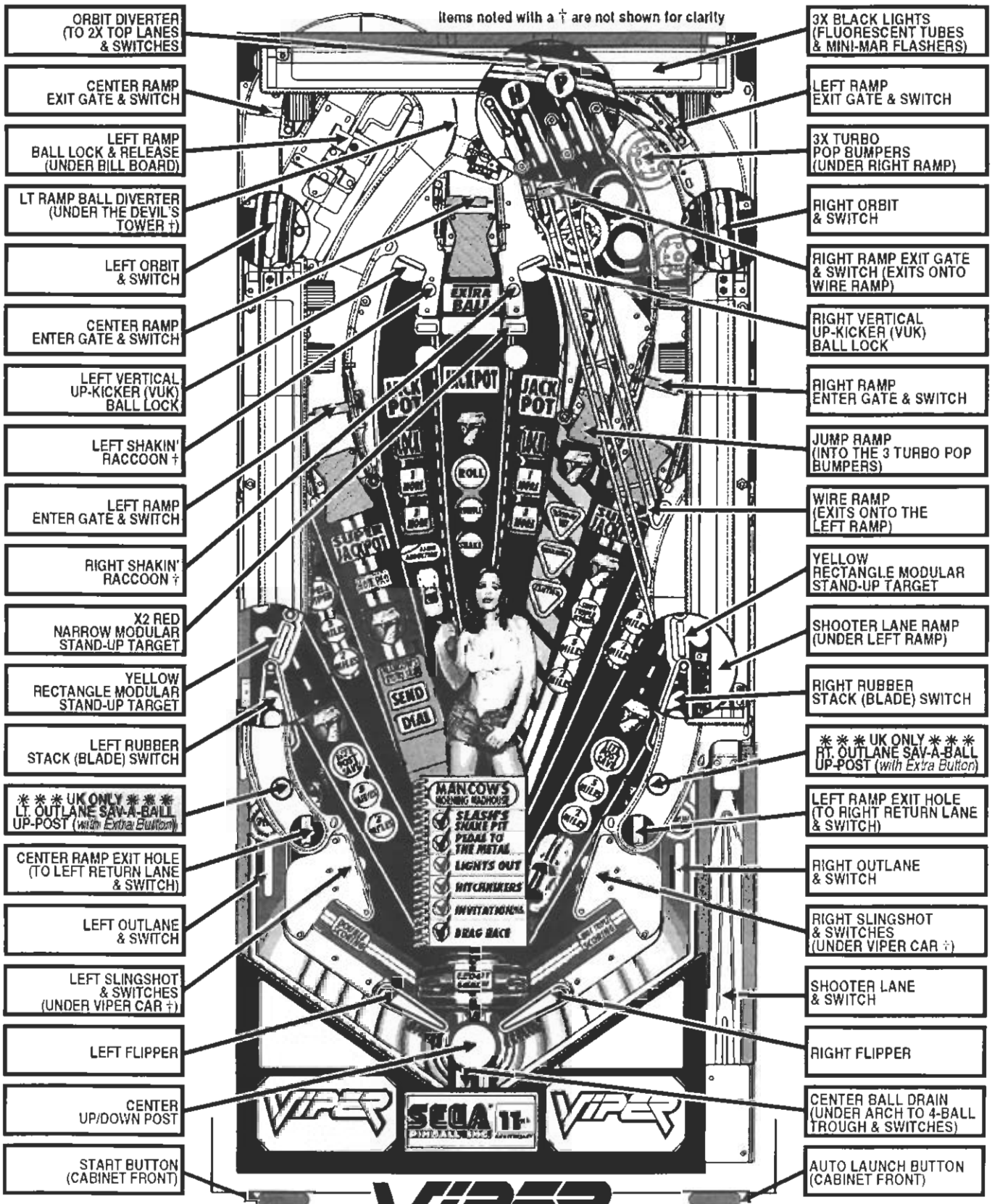


Sega Part N° 755-5135-00 USA

# 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

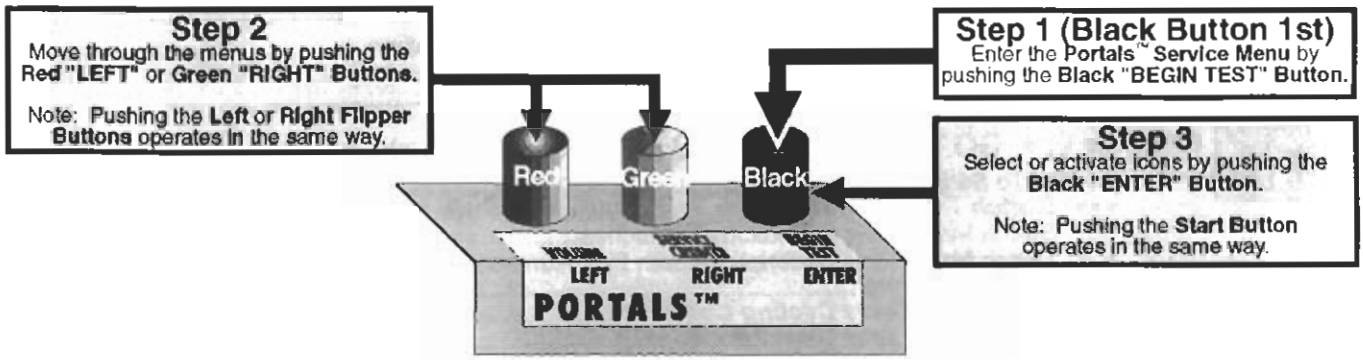
PORTALS™

## Section 3
## Table of Contents

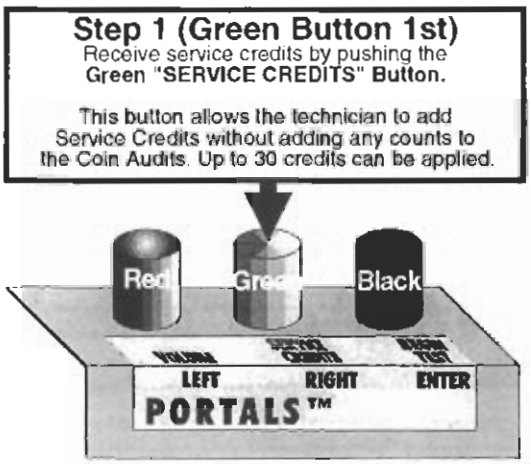
# Service Switch Set (Red, Green & Black Buttons) Access & Use

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

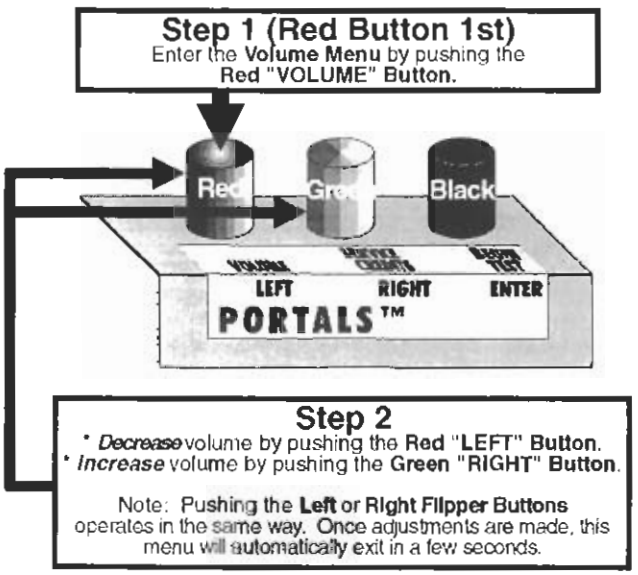
## ❶ *Entering* **Portals™ Service Menu** *(will not operate in Volume Mode):*

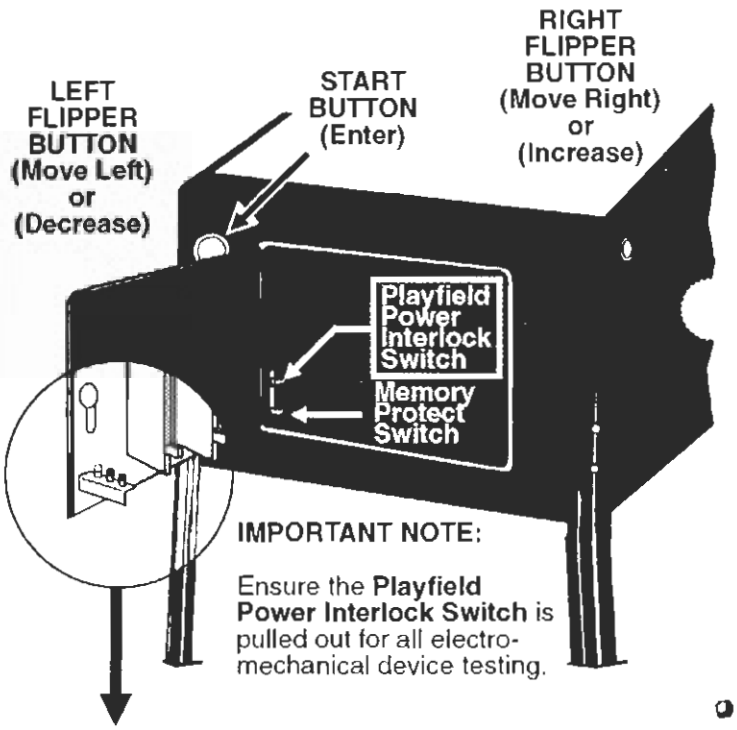


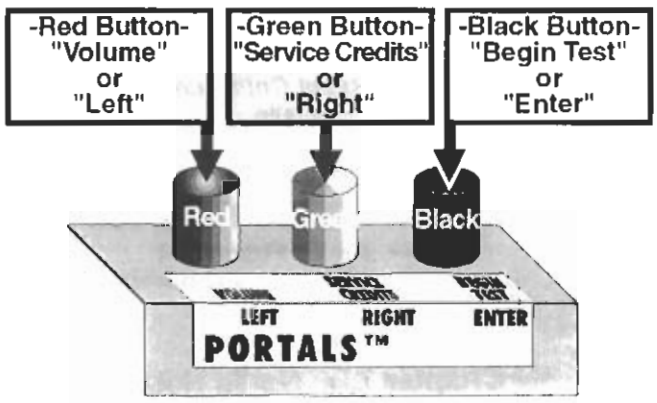

## ❷ *Adding* **Service Credits** *(will not operate in Service or Volume Modes):*




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



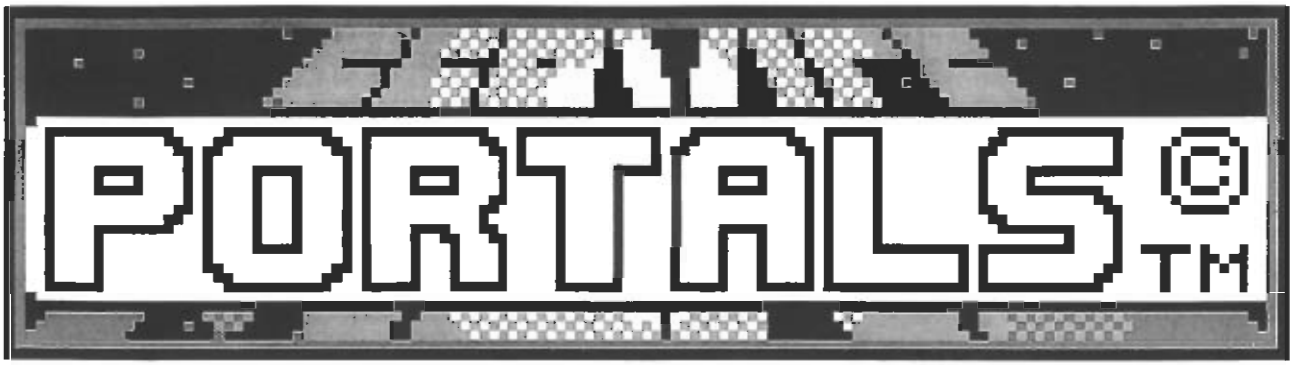



## *How to Use This Section*

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**:

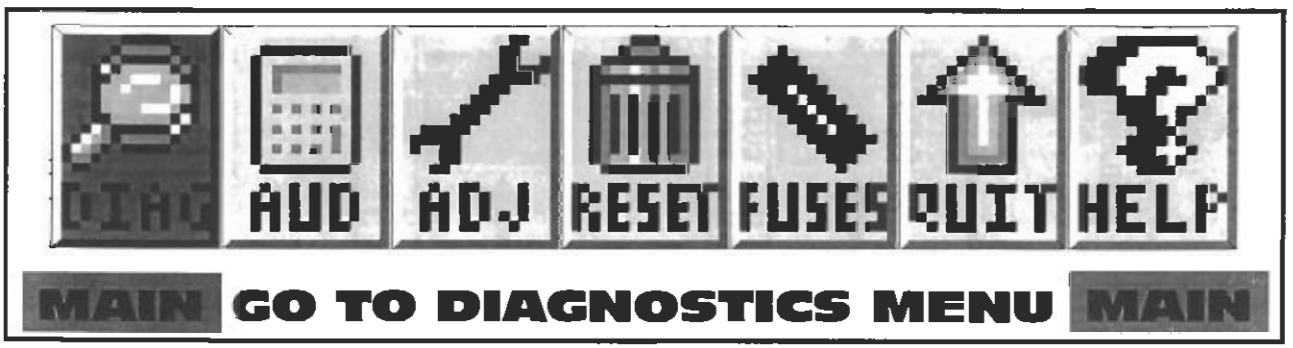



The Coin Door may be closed for security, however, please note with the Coin Door closed, the game's ***MEMORY PROTECT*** is enabled; ***meaning any changes that are made will be not be written to memory.*** If changing adjustments is required, ensure the Coin Door is open.

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:

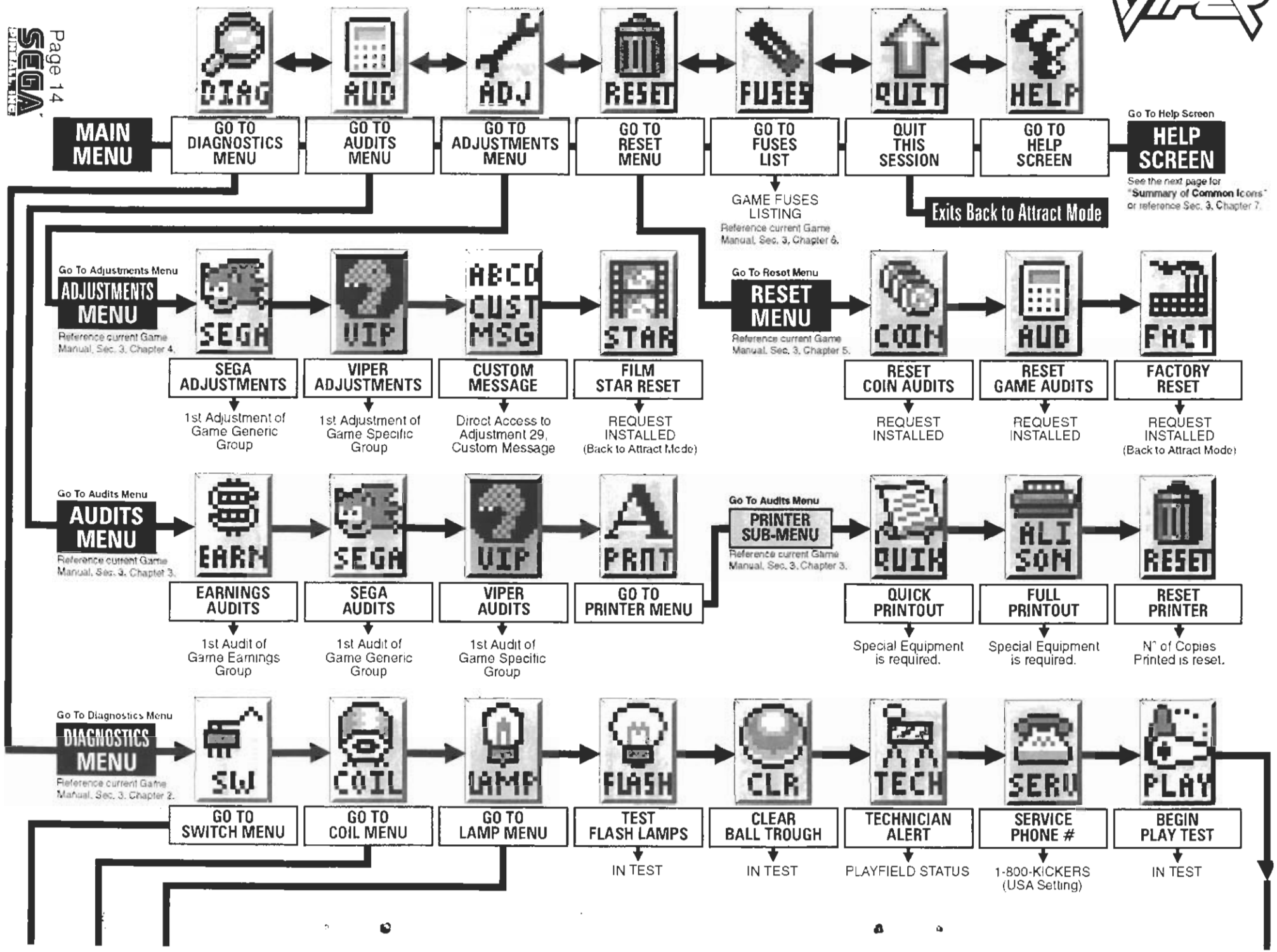


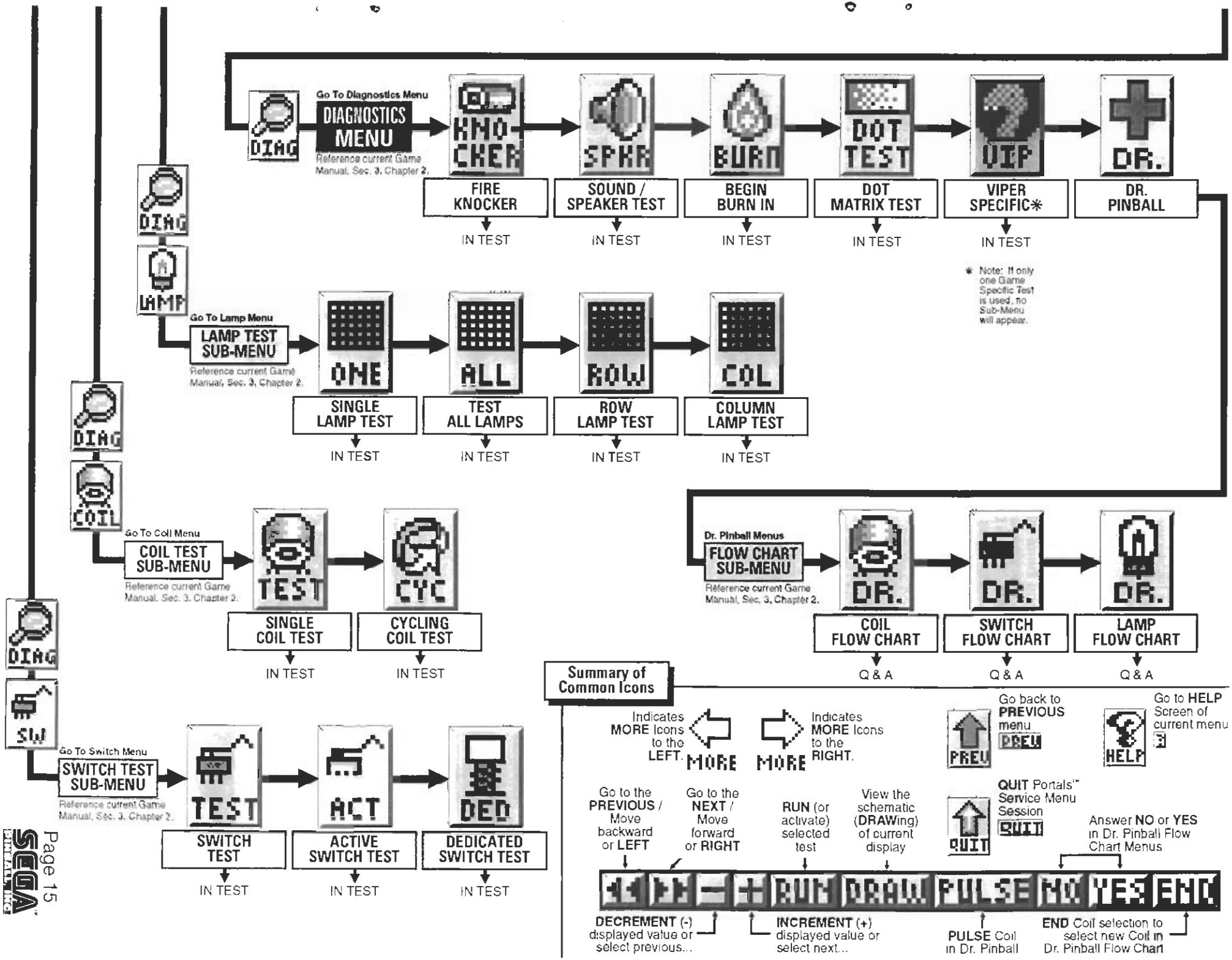

As the operator views the Menu Screen(s), the ⇦ MORE ⇨ MORE symbols indicates that there are more *Icons* to select in each direction. The *Icon* selected will blink. Pushing the **Black "ENTER" Button** (or **Start Button**) will select the *Icon* and the Menu Screen will change to the menu selected.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

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

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

# Portals™ Service Menu Icon Tree for *Viper Night Drivin'*




DIAG
Go To Diagnostics Menu
DIAGNOSTICS MENU
Reference current Game Manual, Sec. 3, Chapter 2.
KNOCKER
SPKR
BURN
DOT TEST
VIP
DR.
FIRE KNOCKER
SOUND / SPEAKER TEST
BEGIN BURN IN
DOT MATRIX TEST
VIPER SPECIFIC*
DR. PINBALL
IN TEST
* Note: If only one Game Specific Test is used, no Sub-Menu will appear.
LAMP
Go To Lamp Menu
LAMP TEST SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
ONE
ALL
ROW
COL
SINGLE LAMP TEST
TEST ALL LAMPS
ROW LAMP TEST
COLUMN LAMP TEST
COIL
Go To Coil Menu
COIL TEST SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
TEST
CYC
SINGLE COIL TEST
CYCLING COIL TEST
Dr. Pinball Menus
FLOW CHART SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
COIL FLOW CHART
SWITCH FLOW CHART
LAMP FLOW CHART
Q & A
SW
Go To Switch Menu
SWITCH TEST SUB-MENU
Reference current Game Manual, Sec. 3, Chapter 2.
TEST
ACT
DED
SWITCH TEST
ACTIVE SWITCH TEST
DEDICATED SWITCH TEST
Summary of Common Icons
Indicates MORE Icons to the LEFT.
MORE
Indicates MORE Icons to the RIGHT.
Go back to PREVIOUS menu
PREV
Go to HELP Screen of current menu
HELP
Go to the PREVIOUS / Move backward or LEFT
Go to the NEXT / Move forward or RIGHT
RUN (or activate) selected test
View the schematic (DRAWing) of current display
QUIT Portals™ Service Menu Session
QUIT
Answer NO or YES in Dr. Pinball Flow Chart Menus
RUN
DRAW
PULSE
NO
YES
END
DECREMENT (-) displayed value or select previous...
INCREMENT (+) displayed value or select next...
PULSE Coil in Dr. Pinball
END Coil selection to select new Coil in Dr. Pinball Flow Chart

## *Portals™ Service Menu Example*

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

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

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


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

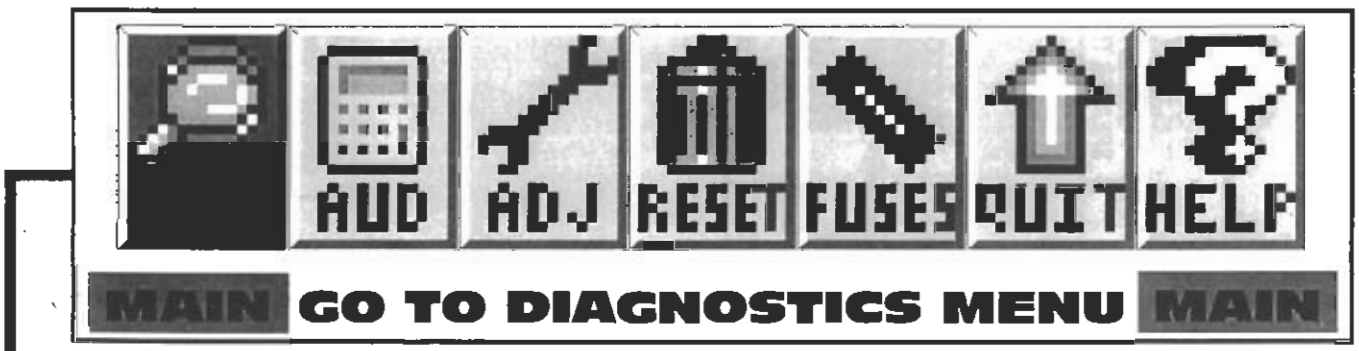

### *Important Note:*


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

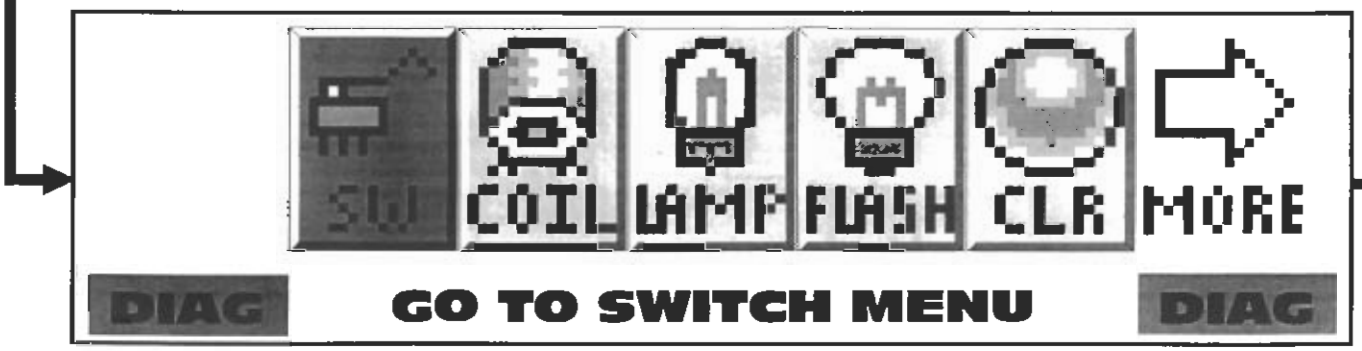

Selecting & activating the "QUIT" *Icon* from any display will exit the *Service Session*.


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

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

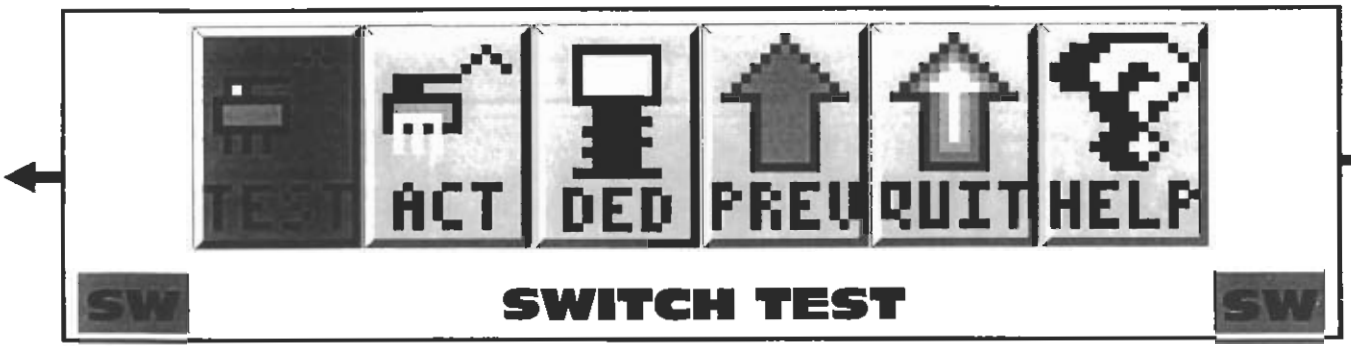



Press the **Black "ENTER" Button** to activate this **ICON**. This will bring up the **DIAGNOSTICS MENU**.

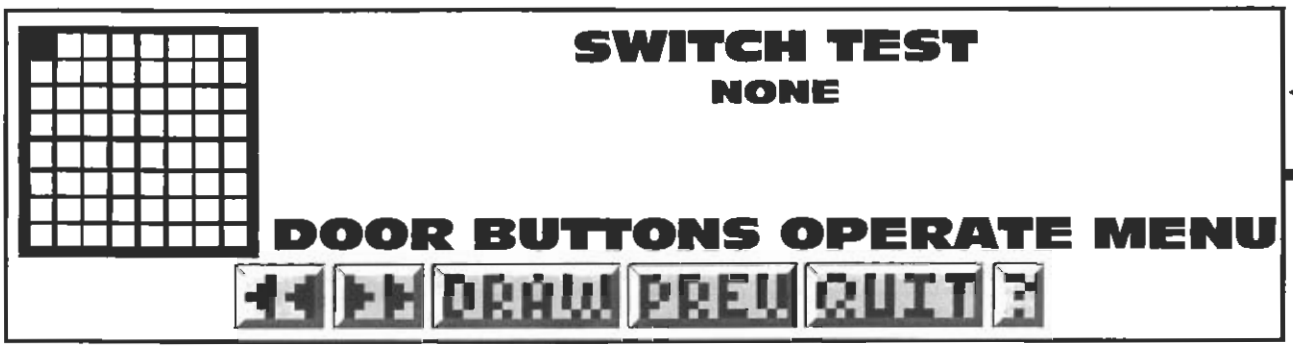



The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing. Press the **Black Button** to *activate* this icon. This will bring up the **SWITCH TEST MENU**.

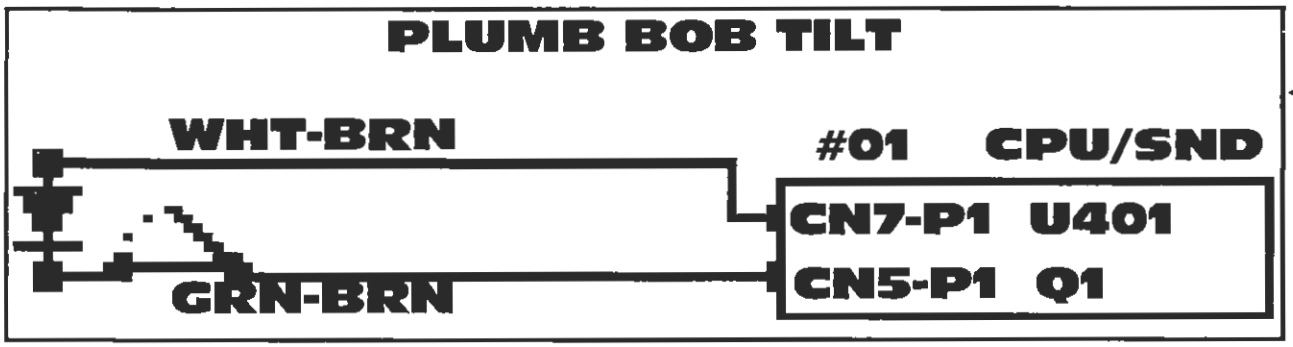
The **SWITCH TEST MENU** now appears with the "TEST" *Icon* (**SWITCH TEST**) flashing:
Press the **Black "ENTER" Button** to *activate* this icon. This will bring up the **Switch Test Display**.




The **Switch Test Display** now appears.




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




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

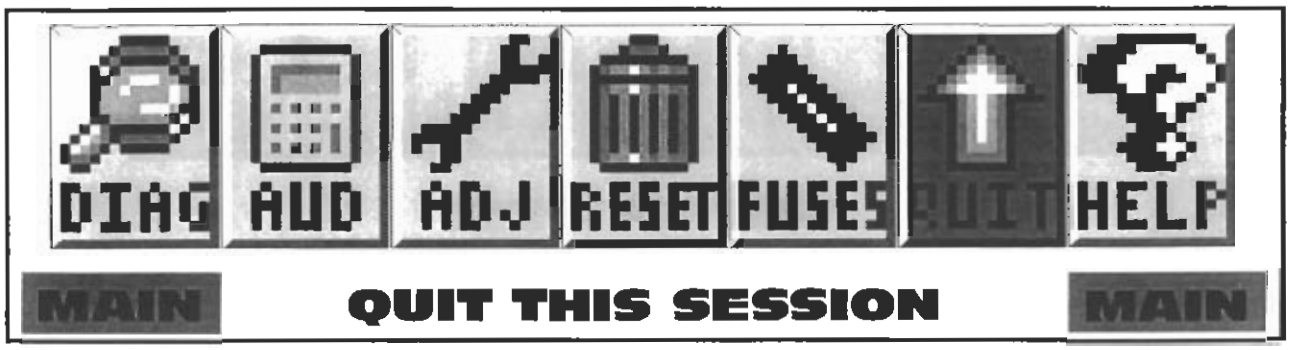
While in Switch or Active Switch Tests, the **Flipper & Start Buttons** are deactivated. Use the **Red** "**LEFT**," **Green** "**RIGHT**" and/or **Black "ENTER" Buttons** to select and activate the "**MINI-ICONS**" at the bottom of the display. In Switch Test, if the "Left Arrow" or "Right Arrow" *Icon*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

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

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

## *Exiting the Portals™ Service Menu*

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




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

### *Your Notes*

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

## Overview

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

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

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


## GO TO DIAGNOSTICS MENU

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


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


### *Important Notes:*


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


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


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


In Diagnostics, selecting & activating the "-" or "+" *Icons* moves test forwards/backwards. Selecting & activating the "RUN" *Icon* repeats the test on the coil or flash lamp left off at. Selecting & activating the "ARROW" *Icons* moves between tests in the sub-menu. Selecting & activating the "DRAW" *Icon* will show the schematic for that switch or coil.

Some tests require navigation through the menu(s) and selection of the *Icons* with **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 Nº, and the "Pin-Outs" from the CPU/SOUND Board. When the switch is released, the information of the last switch closed will remain in the display until another switch is closed or the test is exited. To view the switch schematic, select the "DRAW" *Mini-Icon* with the **Red** or **Green Button** & press the **Black Button**.

## *Active Switch Test*

To initiate, from the **SWITCH MENU**, select the "ACT" *Icon* with either **Red** or **Green Button** & press the **Black Button**. If still in a previous test, select the "PREV" *Icon* to return to Switch Menu or selecting either of the "ARROW" *Icons* will move through the tests. If any switches are stuck closed (or made from the presence of a pinball), the display sequences through the Switch Names, Return (Row) Wire, Drive (Column) Wire, Drive Transistor, Part Nº, and the "Pin-Outs" from the CPU/SOUND Board. This cycle continues until all switches are cleared or until the test is exited.

## *Dedicated Switch Test*

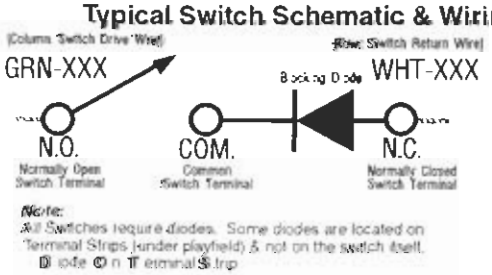
To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either **Flipper Button** & press the **Start Button** (The service switches are deactivated during this test.). The display will describe the switch which includes the Switch Name, Return (Row) Wire, Drive (Column) Wire, Part Nº, and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

## SWITCH MATRIX GRID & DEDICATED SWITCHES

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

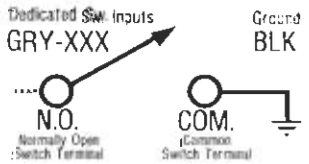
| IC U206 INPUTS \ GND | Ground BLK CN6-P1, -P11 |
|---|---|
| 1 GRY-BRN CN6-P2 | #1 LEFT FLIPPER BUTTON DS-1 |
| 2 GRY-RED CN6-P3 | #2 LEFT FLIPPER E.O.S. (End-of-Stroke) DS-2 |
| 3 GRY-ORG CN6-P4 | #3 RIGHT FLIPPER BUTTON DS-3 |
| 4 GRY-YEL CN6-P6 | #4 RIGHT FLIPPER E.O.S. (End-of-Stroke) DS-4 |
|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

### Typical Switch Schematic & Wiring



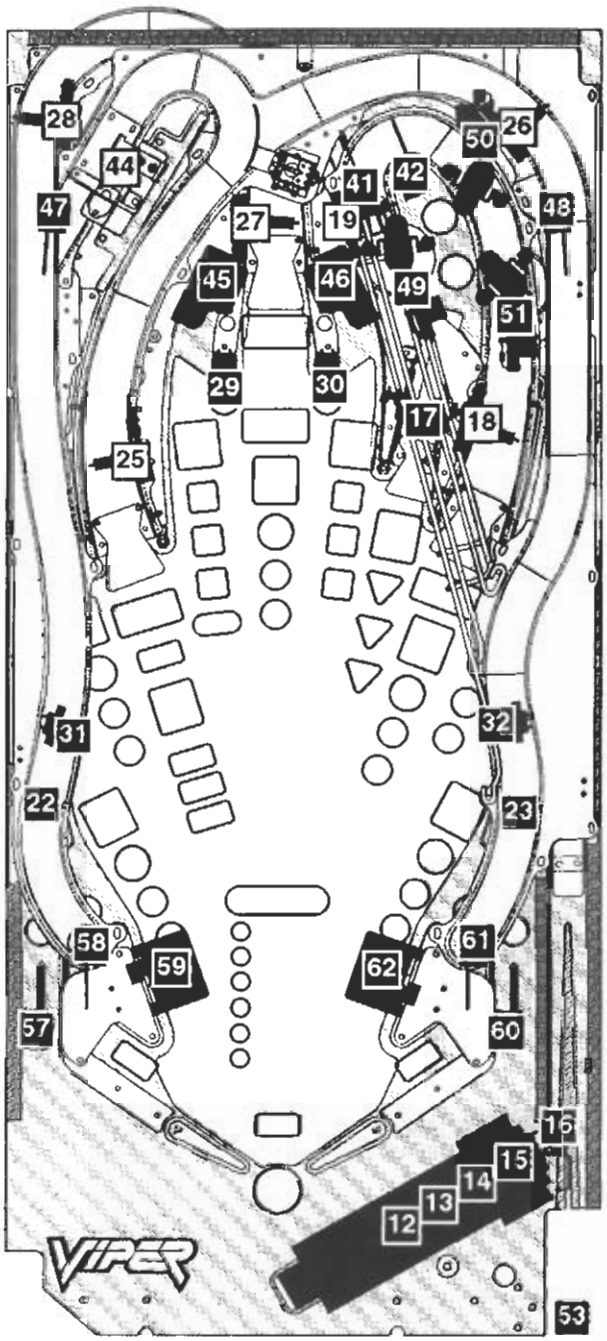


### Dedicated Switch Schem.



# 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. Nº | Col. Nº | Row Nº | See Note | Switch Matrix Description | | Part Nº |
|---|---|---|---|---|---|---|
| | | | | Note: The ¥ Coin Switch (for Japan) is | | 180-5091-00 |
| 1 | 1 | 1 | | NOT USED | | — - — - — |
| 2* | 1 | 2 | | 4TH COIN SLOT | | 180-5024-00 |
| 3* | 1 | 3 | | *6TH COIN SLOT* | | *(Future Use)* |
| 4* | 1 | 4 | | RIGHT COIN SLOT | | 180-5024-00 |
| 5* | 1 | 5 | | CENTER COIN SLOT / DBA | | |
| 6* | 1 | 6 | | LEFT COIN SLOT | | |
| 7* | 1 | 7 | | *5TH COIN SLOT* | | *(Future Use)* |
| 8 | 1 | 8 | | NOT USED | | — - — - — |
| 9 | 2 | 1 | | | | |
| 10 | 2 | 2 | | | | |
| 11 | 2 | 3 | | | | |
| 12 | 2 | 4 | | 4-BALL TROUGH #1 (LEFT) | | 180-5119-02 |
| 13 | 2 | 5 | | 4-BALL TROUGH #2 | | |
| 14 | 2 | 6 | | 4-BALL TROUGH #3 | | |
| 15 | 2 | 7 | | 4-BALL TROUGH VUK OPTO | TRANS<br>REC | 520-5124-00<br>520-5125-00 |
| 16 | 2 | 8 | | SHOOTER LANE | | 180-5100-02 |
| 17 | 3 | 1 | | JUMP RAMP OPTO | TRANS<br>REC | 520-5082-00<br>520-5083-01 |
| 18 | 3 | 2 | | RIGHT RAMP ENTER | | 180-5087-00 |
| 19 | 3 | 3 | | RIGHT RAMP EXIT | | |
| 20 | 3 | 4 | | LEFT BUTTON (UK ONLY) | | 180-5160-00 |
| 21 | 3 | 5 | | RIGHT BUTTON (UK ONLY) | | |
| 22 | 3 | 6 | | RIGHT RUBBER | | 180-5054-00 |
| 23 | 3 | 7 | | LEFT RUBBER | | |
| 24 | 3 | 8 | | NOT USED | | — - — - — |
| 25 | 4 | 1 | | LEFT RAMP ENTER | | 180-5087-00 |
| 26 | 4 | 2 | | LEFT RAMP EXIT | | |
| 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 | | NOT USED | | — - — - — |
| 34 | 5 | 2 | | | | |
| 35 | 5 | 3 | | | | |
| 36 | 5 | 4 | | | | |
| 37 | 5 | 5 | | | | |
| 38 | 5 | 6 | | | | |
| 39 | 5 | 7 | | | | |
| 40 | 5 | 8 | | | | |
| 41 | 6 | 1 | | LEFT TOP LANE | | 500-6227-04 |
| 42 | 6 | 2 | | RIGHT TOP LANE | | |
| 43 | 6 | 3 | | NOT USED | | — - — - — |
| 44 | 6 | 4 | | BILL BOARD | | 180-5093-01 |
| 45 | 6 | 5 | | LEFT VUK (LOCK) | | 180-5116-01 |
| 46 | 6 | 6 | | RIGHT VUK (LOCK) | | |
| 47 | 6 | 7 | | LEFT ORBIT | | 500-6227-04 |
| 48 | 6 | 8 | | RIGHT ORBIT | | 500-6227-03 |
| 49 | 7 | 4 | | LEFT TURBO BUMPER | | 180-5015-03 |
| 50 | 7 | 2 | | TOP TURBO BUMPER | | |
| 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<br>CONTACT | 535-5319-00<br>535-7563-01 |
| 57 | 8 | 1 | | LEFT OUTLANE | | 500-6227-04 |
| 58 | 8 | 2 | | LEFT RETURN LANE | | |
| 59 | 8 | 3 | | LEFT SLINGSHOT | | 180-5054-00 |
| 60 | 8 | 4 | | RIGHT OUTLANE | | 500-6227-04 |
| 61 | 8 | 5 | | RIGHT RETURN LANE | | |
| 62 | 8 | 6 | | RIGHT SLINGSHOT | | 180-5054-00 |
| 63 | 8 | 7 | | NOT USED | | — - — - — |
| 64 | 8 | 8 | | | | |

## Go To Coil Menu

From the **DIAGNOSTICS MENU**, select the "COIL" *Icon* with either **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The coils are listed in groups. 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 agaln will return to Coil Test). The test pulses each regular Coil or Flash Lamp sequentially (cycling) on the Playfield and Backbox. The display indicates "CYCLING COILS." ***Important:*** The **Power Interlock Switch** must be pulled out.

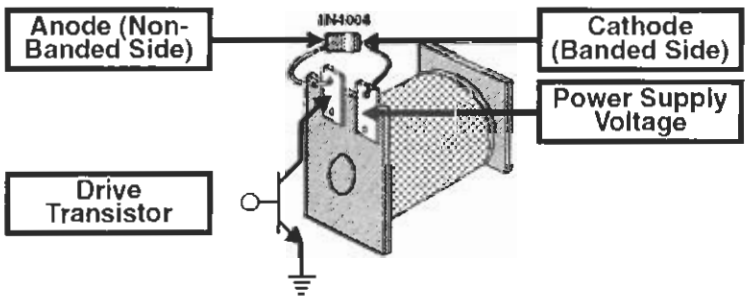
## Coil & Flash Lamp Descriptions

| 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/UK ✻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) |

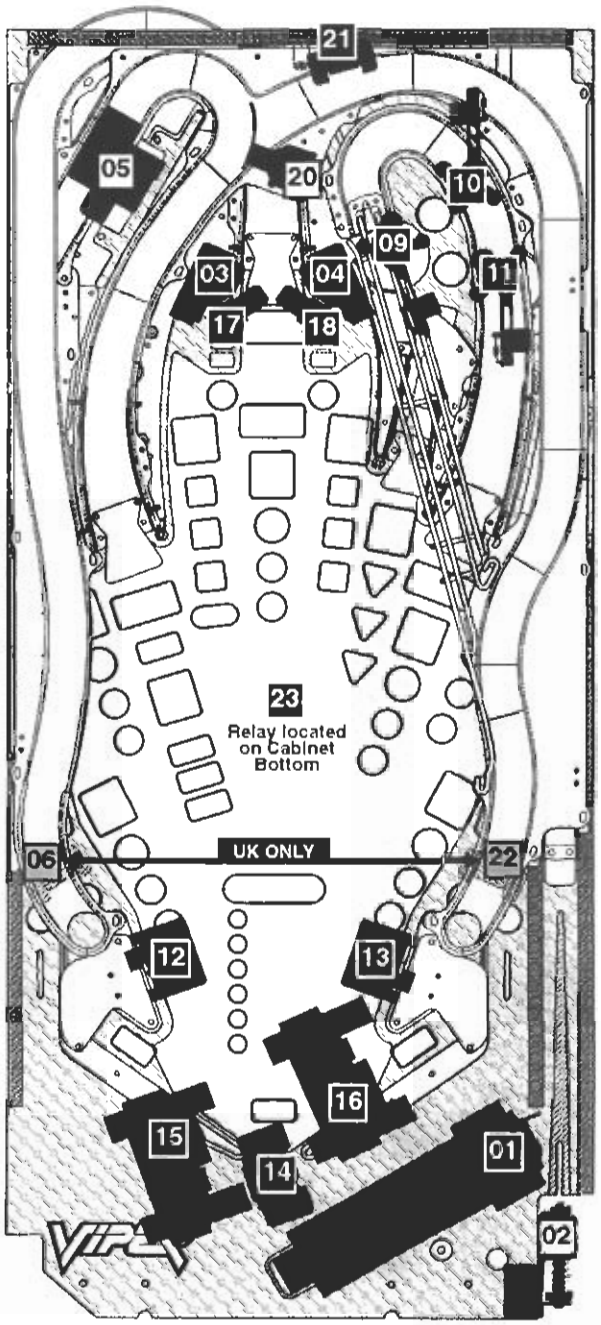
See the next three (3) pages for the **Coil & Flash Lamp Location Maps** (corresponds to above tables), **Coils Detailed Chart Table** & the **Backbox I/O Power Driver Board Detailed Wiring Diagram**.

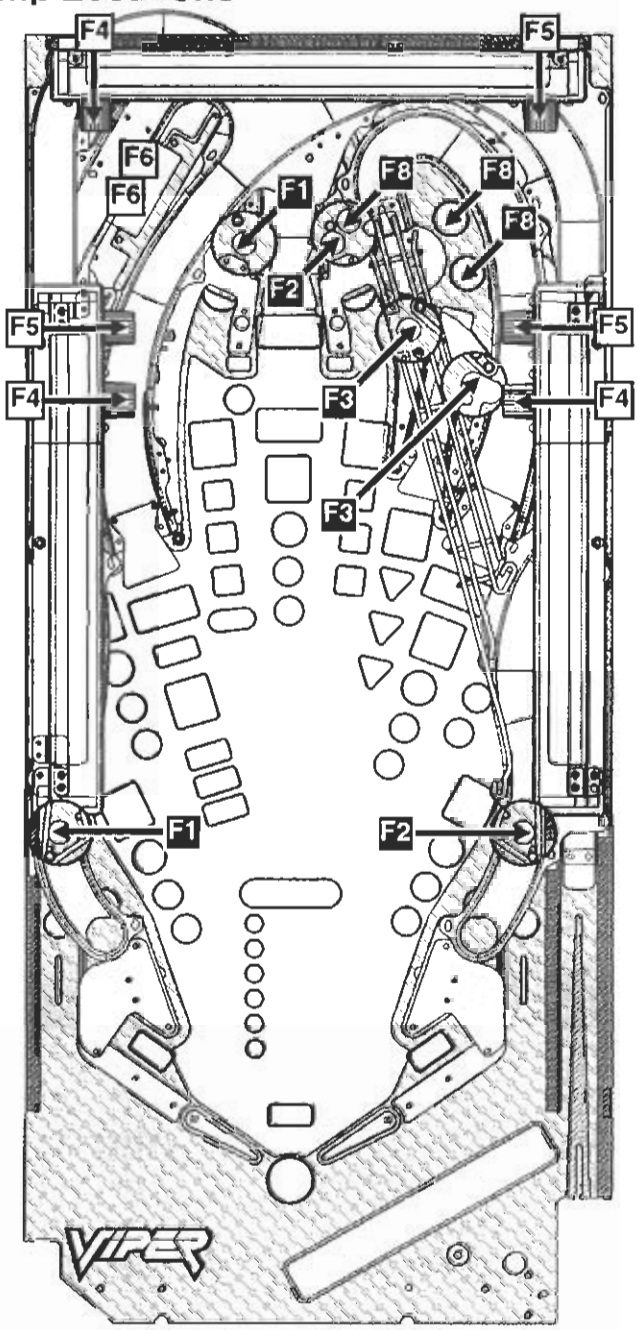
Typical Coil Wiring




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

# 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

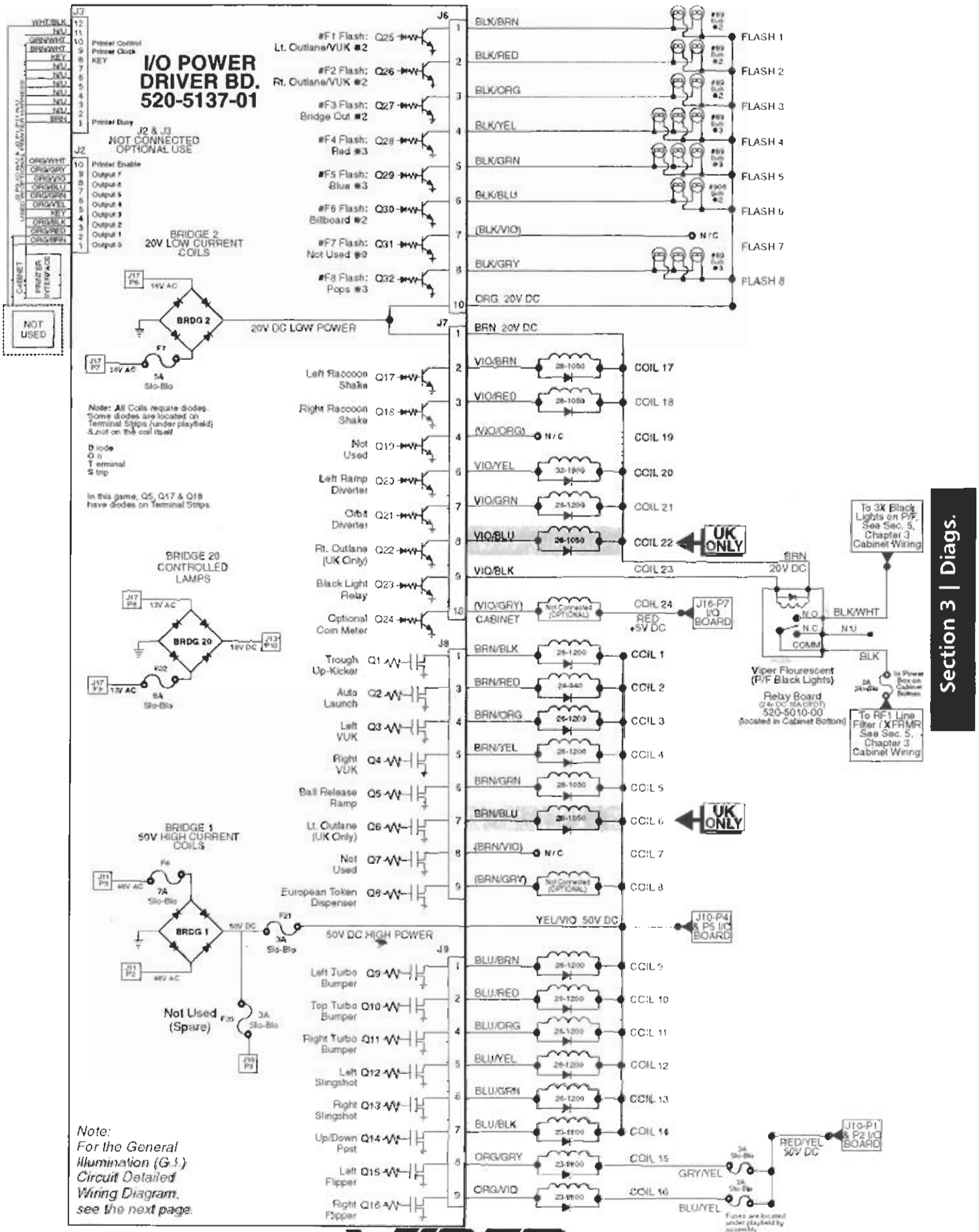
| | High Current Coils Group 1 | Drive Transistor (D.T.) | Driver Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 01 | TROUGH UP-KICKER | Q1 | I/O Pwr. 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 | 24-940 090-5036-00E |
| 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 Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 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 Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 17 | 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 Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | 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 |

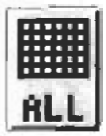

I/O POWER DRIVER BD. 520-5137-01
J2 & J3 NOT CONNECTED OPTIONAL USE
BRIDGE 2 20V LOW CURRENT COILS
BRDG 2
20V DC LOW POWER
BRIDGE 20 CONTROLLED LAMPS
BRDG 20
BRIDGE 1 50V HIGH CURRENT COILS
BRDG 1
50V DC HIGH POWER
NOT USED
Not Used (Spare)
#F1 Flash: Lt. Outlane/VUK #2
#F2 Flash: Rt. Outlane/VUK #2
#F3 Flash: Bridge Out #2
#F4 Flash: Red #3
#F5 Flash: Blue #3
#F6 Flash: Billboard #2
#F7 Flash: Not Used #9
#F8 Flash: Pops #3
Left Raccoon Shake
Right Raccoon Shake
Left Ramp Diverter
Orbit Diverter
Rt. Outlane (UK Only)
Black Light Relay
Optional Coin Meter
Trough Up-Kicker
Auto Launch
Left VUK
Right VUK
Ball Release Ramp
Lt. Outlane (UK Only)
European Token Dispenser
Left Turbo Bumper
Top Turbo Bumper
Right Turbo Bumper
Left Slingshot
Right Slingshot
Up/Down Post
Left Flipper
Right Flipper
FLASH 1
FLASH 2
FLASH 3
FLASH 4
FLASH 5
FLASH 6
FLASH 7
FLASH 8
COIL 17
COIL 18
COIL 19
COIL 20
COIL 21
COIL 22
COIL 23
COIL 24
COIL 1
COIL 2
COIL 3
COIL 4
COIL 5
COIL 6
COIL 7
COIL 8
COIL 9
COIL 10
COIL 11
COIL 12
COIL 13
COIL 14
COIL 15
COIL 16
UK ONLY
To 3K Black Lights on P/F, See Sec. 5, Chapter 3 Cabinet Wiring
Viper Flourescent (P/F Black Lights)
Relay Board 520-5010-00
To RF1 Line Filter / XFRMR See Sec. 5, Chapter 3 Cabinet Wiring
Note: For the General Illumination (G.I.) Circuit Detailed Wiring Diagram, see the next page.


## Go To Lamp Menu

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


### *Single Lamp Test*

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




### *Test All Lamps*

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



### *Row & Column Lamp Tests*

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

## LAMP MATRIX GRID

Diode On Terminal Strip

| Row (GND) \ Column (18V) | 1: U17 YEL-BRN J13-P9 | 2: U16 YEL-RED J13-P8 | 3: U15 YEL-ORG J13-P7 | 4: U14 YEL-BLK J13-P6 | 5: U13 YEL-GRN J13-P5 | 6: U12 YEL-BLU J13-P4 | 7: U11 YEL-VIO J13-P3 | 8: U10 YEL-GRY J13-P1 |
|---|---|---|---|---|---|---|---|---|
| 1: Q33 RED-BRN J12-P1 | 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 (2 rs) | TOP TURBO BUMPER #555 Bulb 66 (2 rs) | RT TURBO BUMPER #555 Bulb 67 (2 rs) | 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.

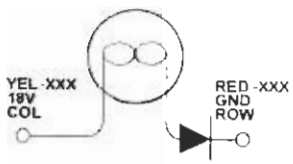
The following Lamps are not used:

**70** **71** **73 - 80**

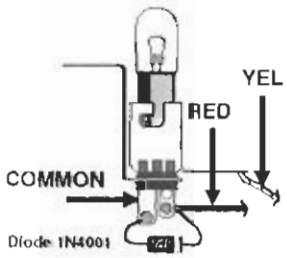
The following Bulb is used in the Lamp Matrix Grid (See Table Grid on previous page for details):

#555 Bulb (Wedge)
165-5002-00

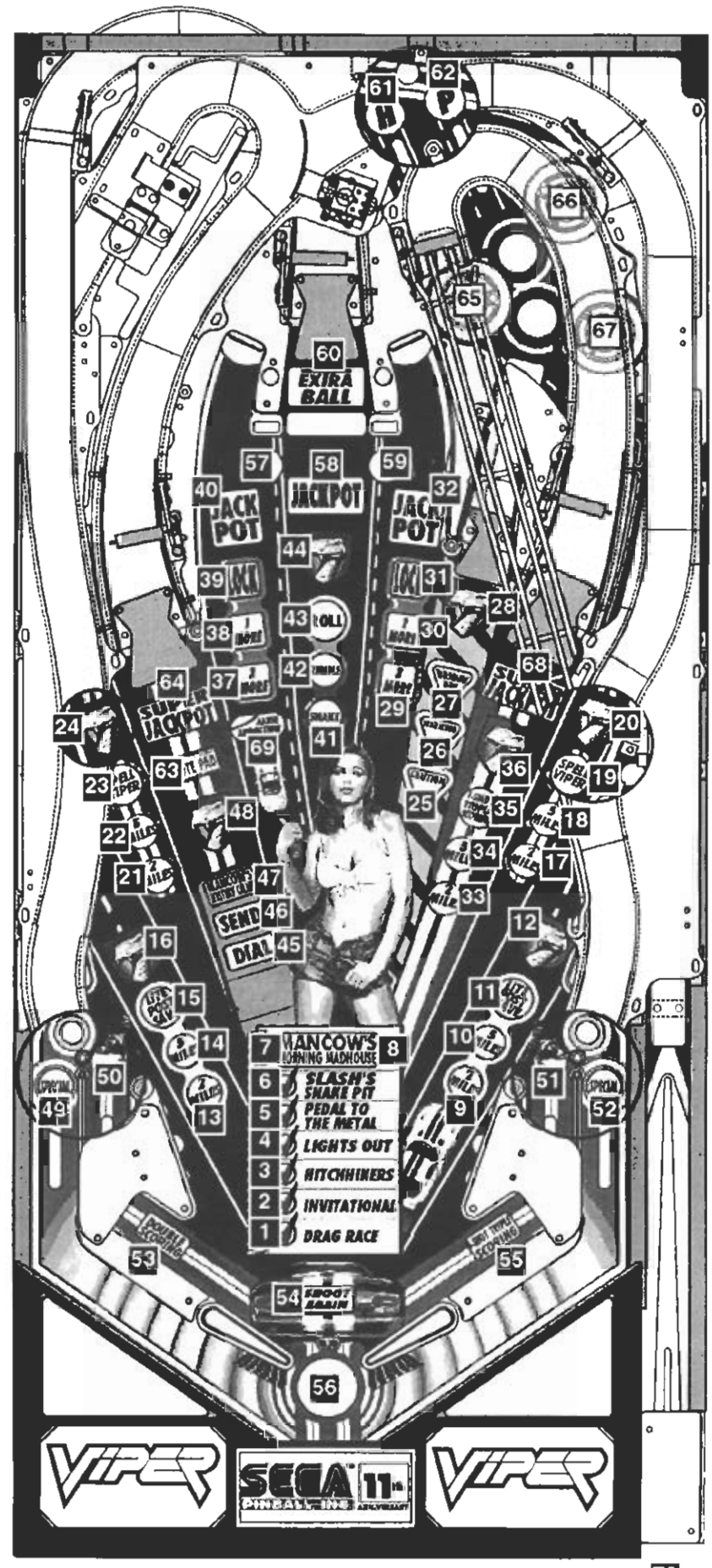
### Typical Lamp Schematic




### Typical Lamp Wiring




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

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## Test Flash Lamps

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


## Clear Ball Trough

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


## Technician Alert

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


## Service Phone #

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


## Begin Play Test

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


## Fire Knocker

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


## Sound / Speaker Test

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

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

### *Speaker Phase Testing*

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

Continued

## *Speaker Phase Testing Continued*

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

1. Check each speaker for polarity markings. If the speakers have polarity markings, verify that the Backbox Speaker RED/WHT Wire and the Cabinet Speaker YEL/WHT Wire is connected to the negative (-) terminal.

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

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

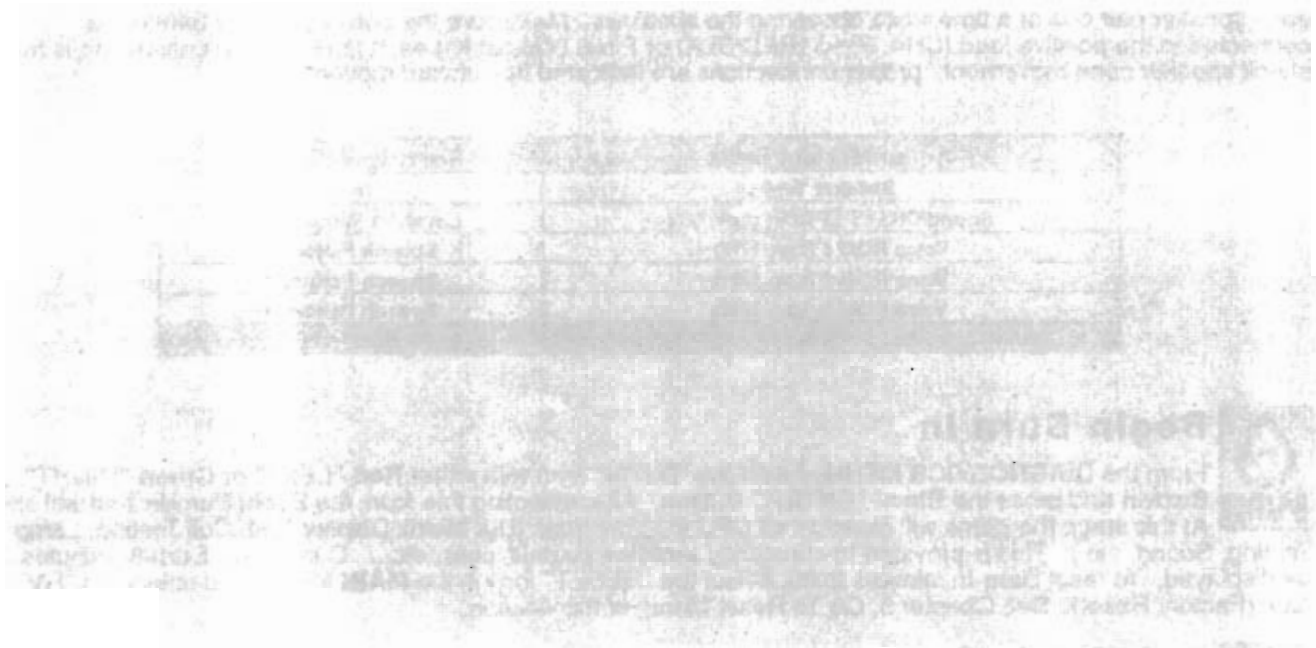
The board is controlled by a 6809E Microprocessor and its personality ROM (Unique to the Game). It receives Data, Reset & Clock Information from the CPU/Sound Board via the ribbon cable and sends back multiple Status and Busy Signals to the CPU. This is to insure synchronized communication between the 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 "ENTER" 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 | | | ***CPU Version:*** | |
| 69 | MBall Ready | | 85 | | | | ***Display Version:*** | |
| 70 | Multiball Start | | 86 | | | | ***Date Audited:*** | |
| 71 | 2+ MBall Start | | 87 | | | | ***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. Nº | Audit Name | Audit Definition |
|---|---|---|
| Au. 1 | **Total Paid Credits** | Provides the total number of paid credits. |
| Au. 2 | **Free Game Percentage** | This percentage is derived from dividing Audit 25, Total Free Plays, by Audit 26, Total Plays. |
| Au. 3 | **Average Ball Time** | In seconds, the average ball time is derived from the total play time divided by Audit 13, Total Balls Played. |
| Au. 4 | **Average Game Time** | The average game time is expressed in minutes and seconds. |
| Au. 5 | **Coins Thru Left Slot** | Provides the total number of times Coin Switch (Sw. 6) was closed. |
| Au. 6 | **Coins Thru Right Slot** | Provides the total number of times Coin Switch (Sw. 4) was closed. |
| Au. 7 | **Coins Thru Center Slot** | Provides the total number of times Coin Switch (Sw. 5) was closed. |
| Au. 8 | **Coins Thru 4th Slot** | Provides the total number of times Coin Switch (Sw. 2) was closed. |
| Au. 9 | **Total Coins** | Provides the total amount of coins registered through all the slots. |
| Au. 10 | **Total Earnings** | The total cash value accumulated since the last *Factory Restore* occurred (see Chapter 5, Go to Reset Menu, of this section). |
| Au. 11 | **Meter Clicks** | Provides the total number of money clicks accumulated. (Based on the country's lowest coin denomination used for the game credit.) |
| Au. 12 | **Software Meter** | Provides the continuing total of Meter Clicks. This audit cannot be reset; the display shows the constant addition of Meter Clicks. |

## *Sega Audits (13-55)*

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

| Au. Nº | Audit Name | Audit Definition |
|---|---|---|
| Au. 13 | Total Balls Played | Provides the total number of regular and extra balls. |
| Au. 14 | Total Extra Balls | Provides the total number of extra balls awarded. |
| Au. 15 | Extra Balls Percent | Provides the percentage total from dividing Audit 14, Total Extra Balls, by Audit 26, Total Plays. |
| Au. 16 | Replay 1 Awards | Provides the total awards (Credit, Extra Ball, Or Audit) for level 1. |
| Au. 17 | Replay 2+ Awards | Provides the total awards (Credit, Extra Ball, Or Audit) for level(s) 2 or higher. |
| Au. 18 | Total Replays | Provides the total awards (Credits, Extra Balls, Or Audit Only) for exceeding replay score levels. |
| Au. 19 | Replay Percent | Provides the percentage total from dividing Audit 18, Total Replays, by Audit 26, Total Plays. The percentage reflects replay total awards for exceeding replay score levels. |
| Au. 20 | Total Specials | Provides the total awards (Credits, Extra Balls, Or Scores) for making specials. |
| Au. 21 | Special Percent | This percentage is derived from dividing Audit 20, Total Specials, by Audit 26, Total Plays. |
| Au. 22 | Total Matches | Provides the total credits awarded for matching the last two digits of the score with the system-generated Match Number at the end of the game. Percentage of match credits is adjustable from 0% to 10% by Adjustment 11, Match Percentage, if enabled. (See Chapter 4, Go to Adjustments Menu, of this section.) |
| Au. 23 | High Score Awards | Provides the total credits awarded for exceeding the High-Score-To-Date scores. |
| Au. 24 | High Score Percent | This percentage is derived from dividing Audit 23, High Score Awards, by Audit 26, Total Plays. |
| Au. 25 | Total Free Plays | Provides the total free credits for replays, High-Score-To-Date, Specials, and Match. |
| Au. 26 | Total Plays | This total is derived by adding the sum of Audit 1, Total Paid Credits, and Audit 25, Total Free Plays. Note that free credits are not recorded in the Audit until they are actually used. |
| Au. 27 | 0—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. Nº | 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.

| | 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.

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### *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, Nº of Copies Printed (Reset Printer)*

From the **PRINTER MENU**, select the "RESET" *Icon* with either **Red** or **Green Button** and press the **Black Button**. Select the "+" *Icon* and press the **Black Button** to start the clear the "Nº of copies printed" count total.



## *RESETTING AUDIT NOTES:*


### *Audit Note: 1st Way to Reset Audits*

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


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

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


### *Audit Note: 2nd Way to Reset Audits*

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


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


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

# GAME ADJUSTMENT TABLE

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

## Sega Adjustments 1-43

| | Adjustment Name | USA Default | Your Setting | | Adjustment Name | USA Default | Your Setting |
|---|---|---|---|---|---|---|---|
| 1 | REPLAYS: FIXED/MANUAL ‡ | ...10%... | | 23 | DEFAULT HIGH SCORE #3 | 200,000,000 | |
| 2 | REPLAY LEVELS ‡ | 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 ‡ | MODERATE | | 28 | FREE PLAY | NO | |
| 7 | GAME PRICING ‡ | 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. Nº | 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.) |

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

| Adjustments which change when set to: | Extra Easy | Easy | Moderate | Hard | Extra Hard |
|---|---|---|---|---|---|
| (44) MBall Restart | EXTRA EASY | EASY | MODERATE | HARD | EXTRA HARD |
| (45) Extra Ball Memory | ON | ON | ON | ON | OFF |
| (46) Multiball Criterion | EXTRA EASY | EASY | MODERATE | HARD | EXTRA HARD |
| (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¢<br>1/25¢ 5/$1.00<br>1/25¢ 6/$1.00 | 01<br>01<br>05 | 04<br>04<br>20 | 01<br>01<br>05 | 00<br>00<br>00 | 01<br>01<br>04 | 02<br>04<br>20 | 00<br>00<br>00 | 01<br>01<br>01 |
| 5SCH | 10SCH | 10SCH | N/U | 1/10 S<br>1/10 S 4/30 S | 01<br>04 | 02<br>08 | 02<br>08 | 00<br>00 | 02<br>06 | 00<br>00 | 00<br>00 | 00<br>00 |
| 10p | 50p | £1 | 20p | 1/30p 2/50p 5/£1<br>1/50p 3/£1<br>1/30p 4/£1 | 01<br>01<br>01 | 06<br>05<br>05 | 15<br>15<br>12 | 02<br>02<br>02 | 03<br>05<br>03 | 00<br>00<br>00 | 00<br>00<br>00 | 00<br>00<br>00 |
| 20¢ | N/U | $1.00 | N/U | 1/60¢ 2/$1.00 | 01 | 00 | 05 | 00 | 03 | 05 | 00 | 01 |

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

**The Standard Pricing Select Table Explained:**

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

## Standard Pricing Select Table

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

# Standard Pricing Select Table - *(Continued)*



| CPU/SOUND BOARD DIP SWITCH 300 SETTINGS | COUNTRY SETTING OPTION † ‡ | Coin Mechanisms — COINS THRU ... SLOT: LEFT | CENTER | RIGHT | 4TH | Pricing Scheme Explained — *Number of "Plays" for Price Amount Shown* | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ***Please Note: for all USA Settings, see previous page (bottom).*** | | | | | | | | |
| | Austria † | 5S | 10S | 10S | | 1 /10S | 2 /15S | 3 /20S | |
| | Australia 1 ‡ | 20¢ | $A 1 | $A 2 | | 1 /$A 1 | 2 /$A 2 | | |
| | Australia 2 ‡ | 20¢ | $A 1 | $A 2 | | 1 /$A 1 | 2 /$A 2 | | |
| | Belgium † | 5 BF | 20 BF | 50 BF | | 1 /20 BF | 3 /50 BF | | |
| | This country uses unique Tokens and/or Debit Cards *only* (pricing varies). | | | | | | | | |
| | Brazil † | 1 'coin' | 4 'coins' | 1 'coin' | | 1 /'2 coins' | | | |
| | Canada † | 25¢ | 25¢ | Can$ 1 | | 1 /50¢ | 2 /75¢ | 3/ Can$ 1 | |
| | Denmark 1 ‡ | 1 DKr | 5 DKr | 10 DKr | 20 DKr | 1 /3 DKr | 2 /5 DKr | | |
| | Denmark 2 ‡ | 1 DKr | 5 DKr | 10 DKr | 20 DKr | 1 /2 DKr | 3 /5 DKr | 7 /10DKr | |
| | Finland ‡ | 1 Fmk | 5 Fmk | | | 1 /5 Fmk | 4 /10 Fmk | | |
| | France 1 † | 1 Fr | 5Fr | 10 Fr | 20 Fr | 1 /3 Fr | 2 /5 Fr | 5 /10 Fr | 11 /20 Fr |
| | France 2 | 1 Fr | 5 Fr | 10 Fr | 20 Fr | 1 /5 Fr | 3 /10 Fr | 7 /20 Fr | |
| | France 3 | 1 Fr | 5 Fr | 10 Fr | 20 Fr | 1 /3 Fr | 2 /5 Fr | 4 /10 Fr | 9 /20 Fr |
| | Germany 1 | 1 DM | 2 DM | 5 DM | | 1 /1 DM | 6/'1 X 5 DM' | | |
| | Germany 2 | 1 DM | 2 DM | 5 DM | | 1 /2 DM | 2 /3 DM | 3 /4 DM | 4 /5 DM |
| | Germany 3 † | 1 DM | 2 DM | 5 DM | | 1 /2 DM | 2 /3 DM | 3 /4 DM | 5 /5 DM |
| | Germany 4 | 1 DM | 2 DM | 5 DM | | 1 /1 DM | 6 /5 DM | | |
| | Greece ‡ | 50 Dr | | 100 Dr | | 1 /50 Dr | 3 /100 Dr | | |
| | Hong Kong ‡ | 1 HK$ | 2 HK$ | 5 HK$ | | 1 /5 HK$ | | | |
| | Hungary ‡ | 10 Ft | 10 Ft | 20 Ft | | 1 /20 Ft | 3 /40 Ft | | |
| | Italy 1 † | 500 Lit | | 500 Lit | | 1 /500 Lit | | | |
| | Italy 2 | 500 Lit | | 500 Lit | | 1 /1000 Lit | 3 /2000 Lit | | |
| | Japan 1 † | | | 100¥ | | 1 /100¥ | | | |
| | Japan 2 | | | 100¥ | | 1 /100¥ | 3 /200¥ | | |
| | Korea ‡ | 100 Won | | 100 Won | | 1 /100 Won | | | |
| | Netherlands 1 | 1 Fls. | 1 Fls. | 2.5 Fls. | | 1 /1 Fls. | 3 /2.5 Fls. | | |
| | Netherlands 2 † | 1 Fls. | 2.5 Fls. | 5 Fls. | | 1 /1 Fls. | 3 /2.5 Fls. | 6 /5 Fls. | |
| | New Zealand 1 ‡ | $NZ 1 | | $NZ 2 | | 1 /$NZ 1 | 2 /$NZ 2 | | |
| | New Zealand 2 ‡ | $NZ 1 | | $NZ 2 | | 1 /$NZ 1 | 3 /$NZ 2 | | |
| | Norway 1 † | 10 NKr | 5 NKr | 20 NKr | | 2 /10 NKr | 1 /5 NKr | 4 /20 NKr | |
| | Norway 2 | 10 NKr | 5 NKr | 20 NKr | | 1 /10 NKr | 3 /20 NKr | | |
| | Spain ‡ | 100 Pts | | 500 Pts | | 1 /100 Pts | 6 /500 Pts | | |
| | Sweden 1 † | 1 SKr | 5 SKr | 10 SKr | | 1 /10 SKr | 2 /15 SKr | 3 /20 SKr | |
| | Sweden 2 | † SKr | 5 SKr | 10 SKr | | 1 /5 SKr | | | |
| | Switzerland 1 † | 1 SwF | 2 SwF | 5 SwF | | 1 /1 SwF | 6 /5 SwF | | |
| | Switzerland 2 | 1 SwF | 2 SwF | 5 SwF | | 1 /1 SwF | 3 /2 SwF | 9 /5 SwF | |
| | UK 1 | 10p | 50p | 1£ | 20p | 1 /50p | 3 /1£ | | |
| | UK 2 | 10p | 50p | 1£ | 20p | 1 /40p | 3 /1£ | | |
| | UK 3 † | 10p | 50p | 1£ | 20p | 1 /50p | | | |
| | UK 1 | 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 accomodated in the 5th & 6th Coin Slots. (This is *"software controlled"* by noting presence/non-presense of pulses via 1-4.) | | | | | | | |
| *1st New Style Coin Mech: 50p / 2£* | UK 2 | | | | | | | | |
| | UK 3 † | | | | | | | | |

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

| Adjustment Name | | Adjustment Definition |
|---|---|---|
| Adj. 8 | **Reset Coin Audits** | Default is **NO**. Select the "+" *Icon* to change to **YES**. ⚠ When enabled, all *Coin Audits* (Audits 5-11), will be reset to zero. |
| Adj. 9 | **Reset Game Audits** | Default is **NO**. Select the "+" *Icon* to change to **YES**. ⚠ When enabled, all audits will be reset to zero, except for the *Coin Audits* (Audits 5-11) and Audit 12, Software Meter (the only audit which cannot be reset to zero). |
| Adj. 10 | **Reset High Scores** | When enabled (set to **YES**) the High Score Levels and associated initials will be restored to the backup settings when the "+" *Icon* is selected and activated. |
| Adj. 11 | **Match Percentage** | Set Match percent from **00%** to **10%** or **OFF**. At **00%** the match display occurs at the end of the game but never awards a credit. |
| Adj. 12 | **Balls Per Game** | Adjust the number of balls per game; **2** to **5**. Default is **3**. |
| Adj. 13 | **Tilt Warnings** | Adjust the number of plumb bob tilt switch closures before the ball in play is tilted; **1**, **2**, **3** or **OFF**. |
| Adj. 14 | **Replay Boost** | Set to **YES** or **NO**. When set to **YES**, exceeding a replay will set a temporary replay level for each time a replay level is surpassed. This new level will equal the previous replay level (when the replay was awarded) plus 50 Million for each following game, until the replays have all been played. At this time the previous level is resumed. |
| Adj. 15 | **Credit Limit** | Adjust the maximum number of credits that may be posted; **4** to **50**. Default is **30**. |

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

| | | |
|---|---|---|
| Adj. 16 | **Allow High Scores** | Set to enable (set to **YES**) or disable the four high score levels by setting to zero. |
| Adj. 17 | **High Score #1 Awards** | Adjust the number of awards (**0** to **4**) awarded for exceeding level 1 (the highest of the four levels). |
| Adj. 18 | **High Score #2 Awards** | Adjust the number of awards (**0** to **3**) awarded for exceeding level 2. |
| Adj. 19 | **High Score #3 Awards** | Adjust the number of awards (**0** to **2**) awarded for exceeding level 3. |
| Adj. 20 | **High Score #4 Awards** | Adjust the number of awards (**0** to **1**) awarded for exceeding level 4. |
| Adj. 21-26 | **Default High Score #1 - #6** | Adjust the score level to which the world record, (level 1) (the highest of the four levels) may be altered. This adjustment is not affected by Adj. 27, HSTD Reset Count. Adjust the backup score to which levels **2 - 6** may be reset, respectively. |
| Adj. 27 | **HSTD Reset Count** | **HSTD** (**H**igh **S**core **T**o **D**ate). Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments; **100** to **9,900** or **OFF** (no reset or adjustment). Default is **2,000**. |
| Adj. 28 | **Free Play** | When set to **YES**, no coins are required for games. |
| Adj. 29 | **Custom Message** | Set to **ON** or **OFF**. When set to **ON**, this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to **CHANGE** selecting the "+" *Icon*. Using either of the Flipper Buttons or the "**RED**" and/or "**GREEN**" **Buttons**, select either of the "**ARROW**" *Icons*. Press the "**BLACK**" **Button** (*Request Installed* blinks at the top of the display and the letter **A** is indicated in the first position in the display. Vary the letter(s) by operating the Left and Right Flipper Buttons (or "**RED**" or "**GREEN**" **Buttons**). With the desired letter indicated, depress the **Start Button** to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Select the "<" or ">" characters to back-space (erase) and/or to move forward in an already typed message. After completion, press the "**BLACK**" **Button**. |
| Adj. 30 | **Attract Mode Music** | Set to **ON** or **OFF**. When set to **ON**, attraction music / sounds are played between games. |

| | Adjustment Name | Adjustment Definition |
|---|---|---|
| Adj. 31 | Flash Lamp Power | Set to **NORMAL**, **DIM** or **OFF**. When set to **NORMAL** the flash lamps are active, when **DIM** the flash lamps impulse power is reduced by **25%** and when **OFF** the flash lamps will not flash. |
| Adj. 32 | Coil Pulse Power | Set to **NORMAL, HARD** or **SOFT**. When **HARD** the coil pulse power is ***increased*** by **12.5%** of the normal pulse rate. When set to **SOFT** the coil pulse power is ***decreased*** by **12.5%** of the normal pulse rate. These adjustments are provided to compensate for Low Line or High Line voltage conditions where the solenoids appear to kicking too weak or too hard. Adjust as required. |
| Adj. 33 | Knocker Volume | Set to **NORMAL, LOW** or **OFF**. Default is **NORMAL**. When set to **LOW**, the volume is decreased 50%. When set to **OFF**, no sound is heard when the "knocker" is sounded. |
| Adj. 34 | Minimum Game Time | Set between **0:01 - 8:59** for minimum game time. Default is **OFF**. If the last ball in play drains prior to what the game time is set for, another ball will be served into the shooter lane and normal play will continue. Subsequent balls will continue to do be served into the shooter lane if the last ball still drains prior to and up until minimum game time is satisfied. |
| Adj. 35 | 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 ***all audits will be reset*** and ***all adjustments will be initiated*** to the particular style selected. The game will then return to *Game Over Attract Mode*, as if a *Factory Reset* had been performed. **NONE** - Same as a Factory Reset conditions. **IFPA -** Straight 50¢ play, No Replay, No Extra Ball, No High Scores, 2 Tilt Warnings and No Match. **PINBALL EXPO-PAPA -** Same as **IFPA** settings except *Free Play is enabled.* **HOME** - Sets game for Free Play, Extra Ball Play, No Replay, **10%** Match & **30%** Extra Ball. |
| Adj. 40 | Euro. Token Disp. | Set to **ON** or **OFF**. When set to **ON**, the operator can enable the "knocker" cable in the cabinet to drive an external device (e.g. European Token Dispenser) without the game giving a replay. |
| Adj. 41 | Special Memory | Set to **YES** or **NO**. When set to **YES**, the lit 'Special' light will be retained in memory from ball to ball for the same player. When set to **NO**, the lit 'Special' light will go out at the end of each ball. |
| Adj. 42 | Location ID | **00** to **9999**. Allows the operator to assign a location identification number to the audit print-out sheet. (Will not be affected by Factory Reset.) See the end of 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 langauge are more appropriate for adults. When set to **YES**, video graphics, sounds and langauge are more appropriae for children or for people who embarass easy. |


## *Custom Message*

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


## *Film Star Reset*

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



***RESETTING & PRINTING ADJUSTMENTS NOTES:***


## *Adjustment Note: Resetting Adjustments*

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


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


## *Adjustment Note: Printing Audit Information*

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


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


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


Selection of the "RESET" *Icon*, from the **PRINTER MENU**, will reset the total 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**

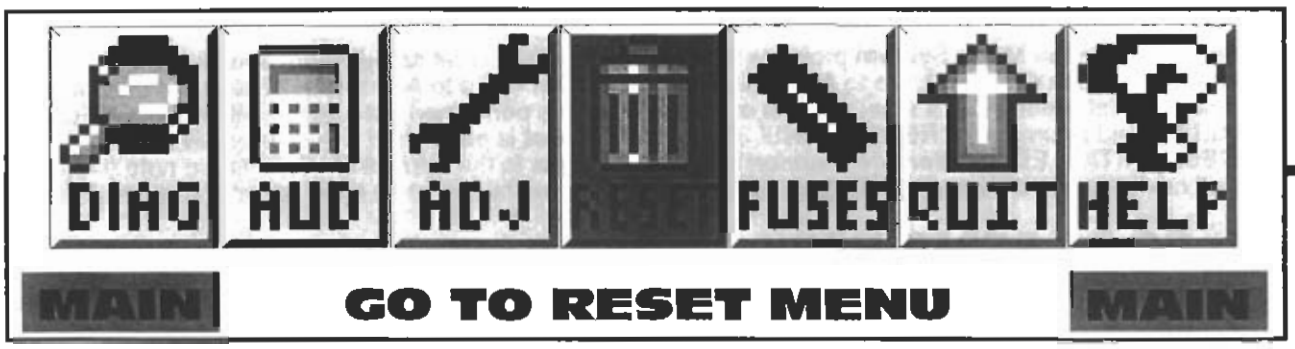
| • Reset Game Audits | |
|---|---|
| Earnings (1-4), Generic/Specific Audits (13+) | |
| Au. N° | Description |
| 1-4 | The first 4 Audits in the game. |
| 5 | Coins Thru Left Slot |
| 6 | Coins Thru Right Slot |
| 7 | Coins Thru Center Slot |
| 8 | Coins Thru 4th Slot |
| 9 | Total Coins |
| 10 | Total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

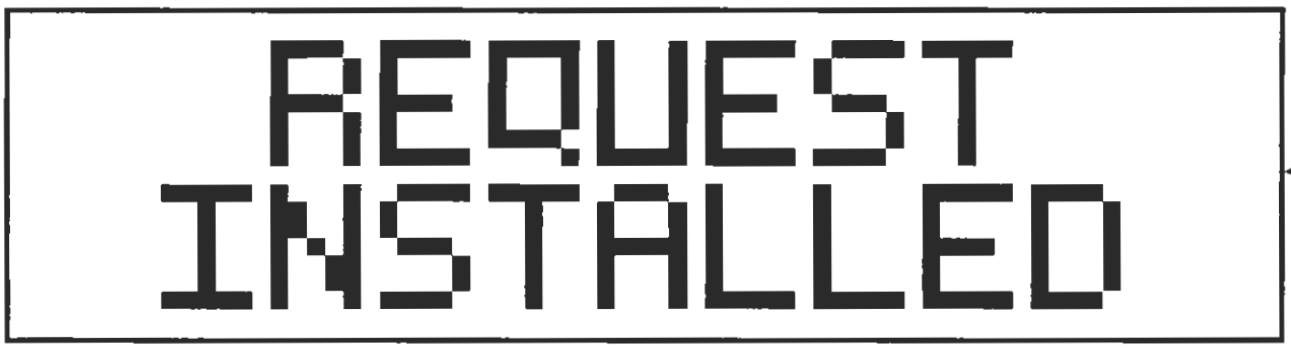



Press the **Black Button** to activate this **ICON**. This will bring up the **RESET MENU**.


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. ❶**) for the complete Fuse List in the *Quick Reference Fuse Chart* and note the drawings.


## GO TO FUSES LIST

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

### *Important Notes:*


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


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

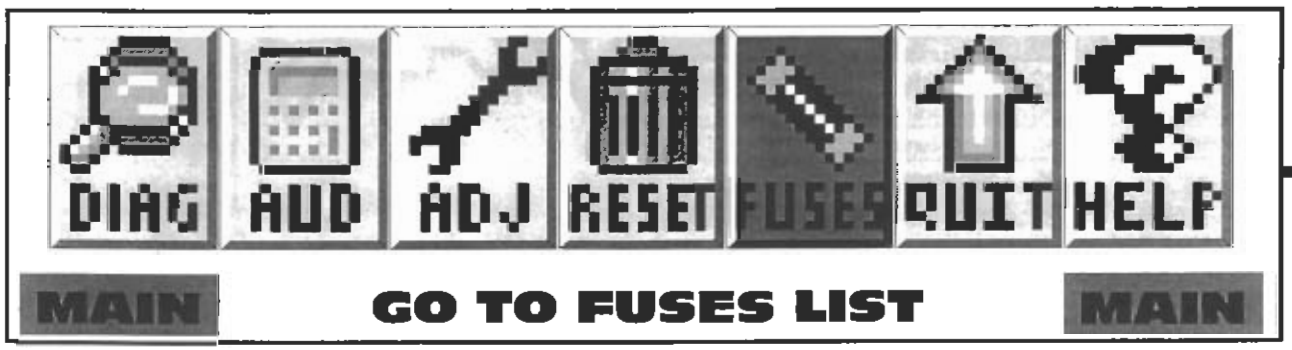

Selecting & activating the "HELP" *Icon* from any display will show a help screen. (An explanation of each *Mini-Icon* at that level will cycle continuously until any active button is pressed.)



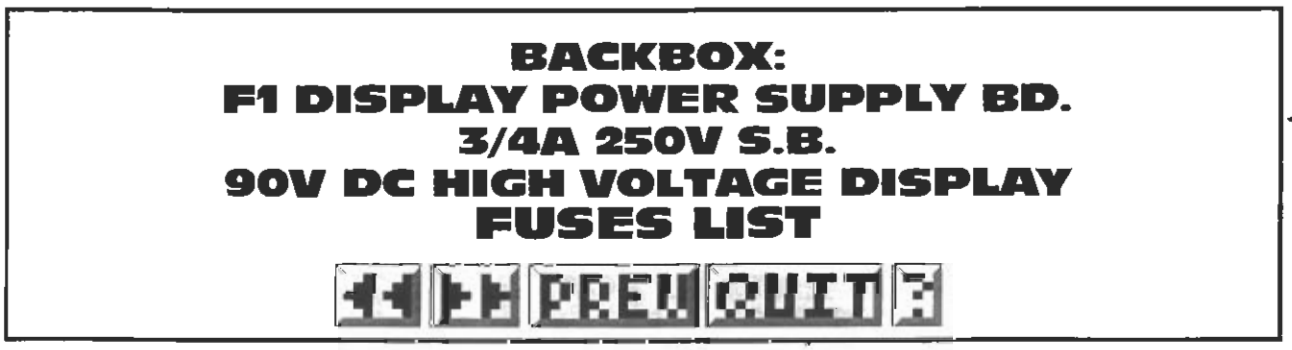
Selecting & activating the 'ARROW" *Icons* selects the next or previous fuse in this group.

### *Example:*

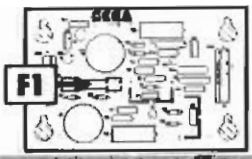
From the **MAIN MENU**, use the **Red** or **Green Buttons** to select the "FUSES" *Icon* (GO TO FUSES LIST).




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



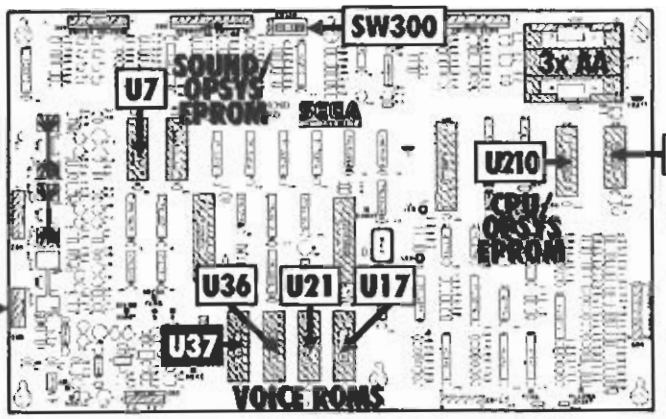
# BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs



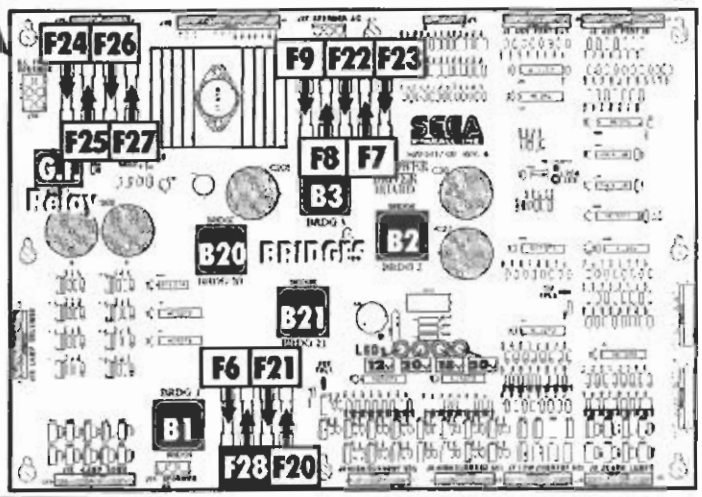

Display Power Supply Bd.

CPU / Sound Board
*No Fuses*

I / O Power Driver Board




*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 | ¾A 250v S.B. | 90v DC | High Voltage Display |
| **LOC:** | **I / O POWER DRIVER BOARD** | | |
| F6 | 7A 250v S.B. | 50v DC | Primary High Power Coils/Flippers |
| F7 | 5A 250v S.B. | 20v DC | Low Power Coils |
| F8 | 5A 250v S.B. | 12v DC | Logic Power |
| F9 | 5A 250v S.B. | 12v DC | Logic Power |
| F20 | 3A 250v S.B. | 50v DC | **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 (GRN/YEL→RED/YEL) |

# Go To Help Screen

## Overview

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


## GO TO HELP SCREEN

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

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

### *Important Notes:*


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


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


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


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

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

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

# PROBLEM/SOLUTION TABLE

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

| PROBLEM | SOLUTION |
|---|---|
| Will not enter the Service Mode after depressing the **Black "BEGIN TEST" Button**. | • Check the Service Switch(es) (**Red, Green & Black Buttons**) for loose connections or bad Ground.<br>• Check the associated wiring harness to/from the CPU Board Connector CN14.<br>• 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.<br>• Check Bridge Rectifier 3 & 8 Amp Slo Blo Fuse. Refer to Section 5, Chapter 4, Schematics & Troubleshooting. |
| Icons "*scroll*" along continuously in the **MAIN MENU**. | • If the Service Switch Set and/or the Coin Door was replaced, ensure the Locking Mechanism on the **Green Button** is removed. If the Green Button "clicks" and locks into an up/down position, the Green Button has this lock switch. Remove it. (Ref. to Service Bulletin #74.) |
| The **Start** and **Flipper Buttons** do not select or activate *Icons* in the **SWITCH TEST MENU**. | • This is normal. These switches are deactivated, as they are a part of the Switch Test. Use the **Red "LEFT" or Green "RIGHT" & Black "ENTER" Buttons** in this Sub-Menu (See Chapter 1). |
| Can't move selection of *Icon* with the **Left** and/or **Right Flipper Buttons**. | • Check the **Flipper Buttons** for loose connections or bad Ground and refer to the Game Manual Flipper Troubleshooting Flowchart.<br>• This is normal ***only*** in Diagnostic's Switch & Active Switch Tests (see previous Problem). |
| Some *Icons* appear non-functional in the **PRINTER MENU(S)**. | • If no printing equipment is connected, the "-" *Icon*, "+" *Icon* and "RUN" *Icon* will appear not to function (See Chapter 5). |
| Some *Icons* appear non-functional in the **GAME SPECIFIC MENU** under the **DIAGNOSTICS MENU**. | • If there is no other test under this Menu, the "Left Arrow" & "Right Arrow" *Icons* will appear not to function. The remaining *Icons* should function as normal. Note: If there is no Game Specific Special Test, the "**GAME SPECIFIC**" *Icon* will not invoke another display. |
| The display returns to the **ATTRACT MODE** exiting the Service Session from the **FACTORY RESET MENU**. | • This is normal. After a **FACTORY RESET**, the Service Session is automatically exited (See Chapter 4 (end) or Chapter 6). |
| In **COIL TEST MENU**, the coils and flashlamps ***do not*** fire after activating the "RUN" *Icon*. | • Ensure the **POWER INTERLOCK SWITCH** (See figure on front inside cover) ***is pulled out***. |
| In **Portals™ Service Menu**, the volume cannot be adjusted with the **Red** or **Green Buttons**. | • The Volume adjustment can only be made when the Service Menu is exited. The **Volume Mode** is entered by pressing the **Red "VOLUME" Button**. Then use the **Red** or **Green Button** to increase/decrease volume. (Red "LEFT" decrements; Green "RIGHT" increments.) |
| In **Portals™ Service Menu**, the display seems to lock up, or the Help Display appears to be non-functional. | • If you cannot clear the situation by exiting back one Menu, exit completely out of the **Portals™ Service Menu**, and re-enter. If the problem persists, call Tech. Support for additional help. |

## Table of Contents

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 Trans-Istor (D.T.) | Driver Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 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 | 24-940 090-5036-00E |
| 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 Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 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 Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Coil GA/Turn or Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| 17 | 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 |

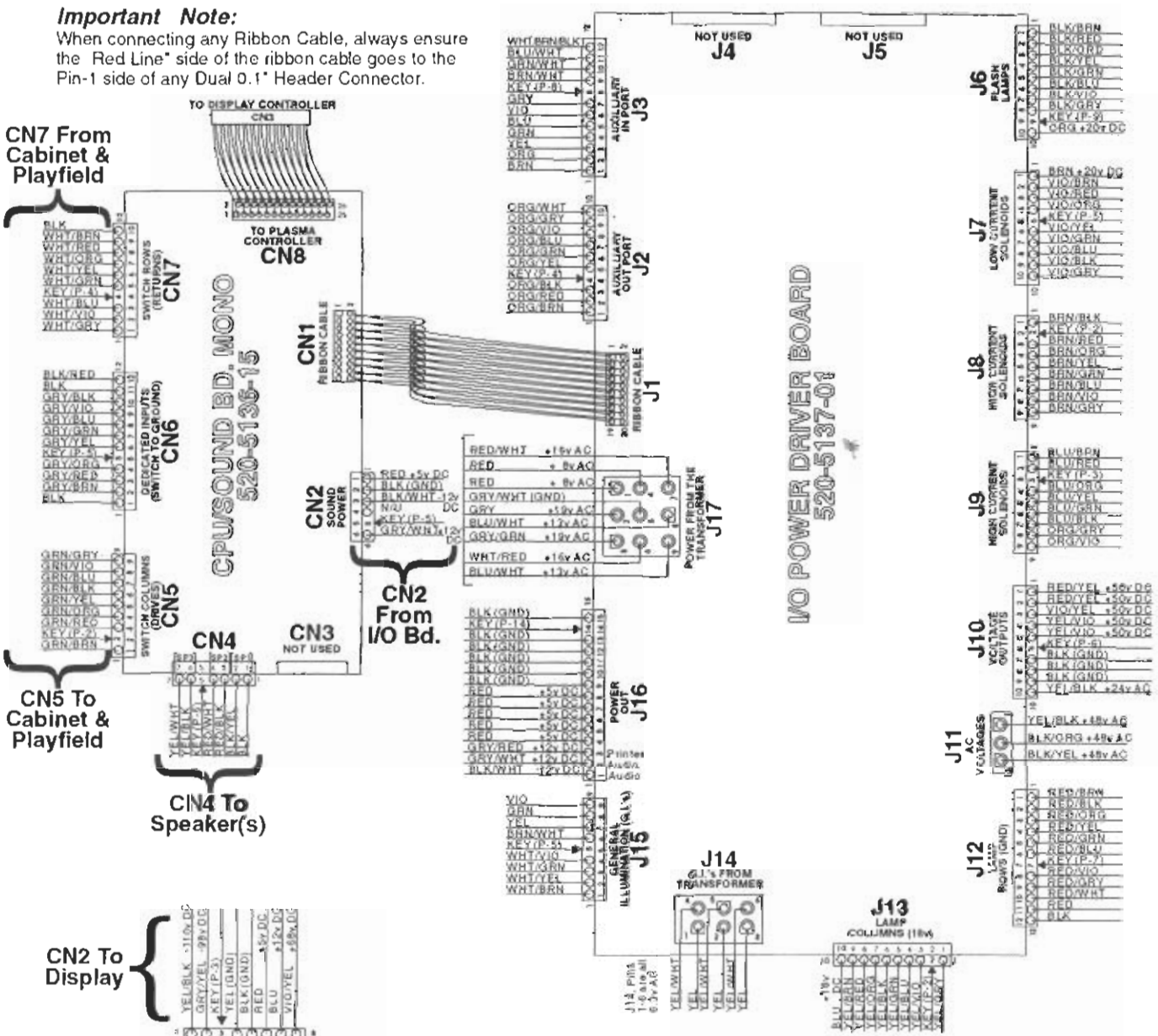
**4.5v DC Meter SPI PN#: 091-5000-00**

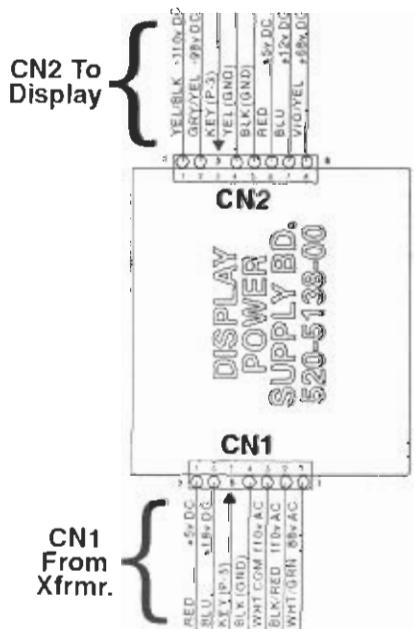
| | Flash Lamps (FLASH) | Drive Trans-Istor (D.T.) | Driver Ouput Board | D.T. Control Line Color | D.T. Control Line Connect | Power Line Color | Power Line Connnection | Power Voltage | Bulb Type |
|---|---|---|---|---|---|---|---|---|---|
| F1 | #F1 FLASH LT OUTLANE/VUK *2 | Q25 | I/O Pwr. Drvr. | 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 165-5064-00 |
| 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 |

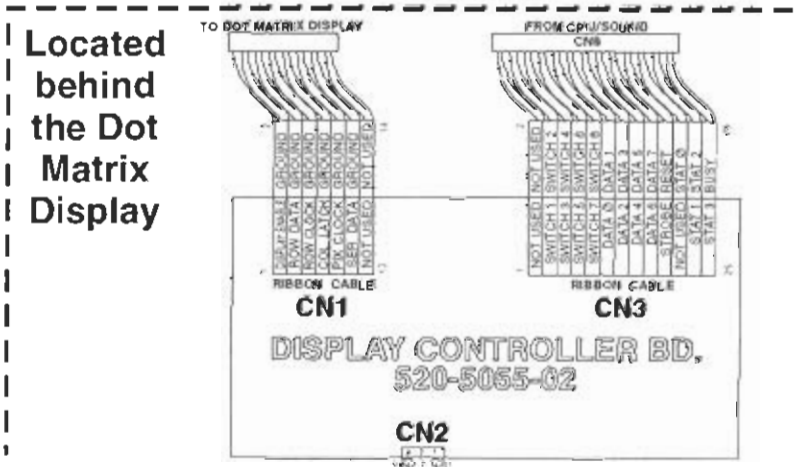
# Backbox Wiring

## *Backbox Board Layout Wiring Diagram*

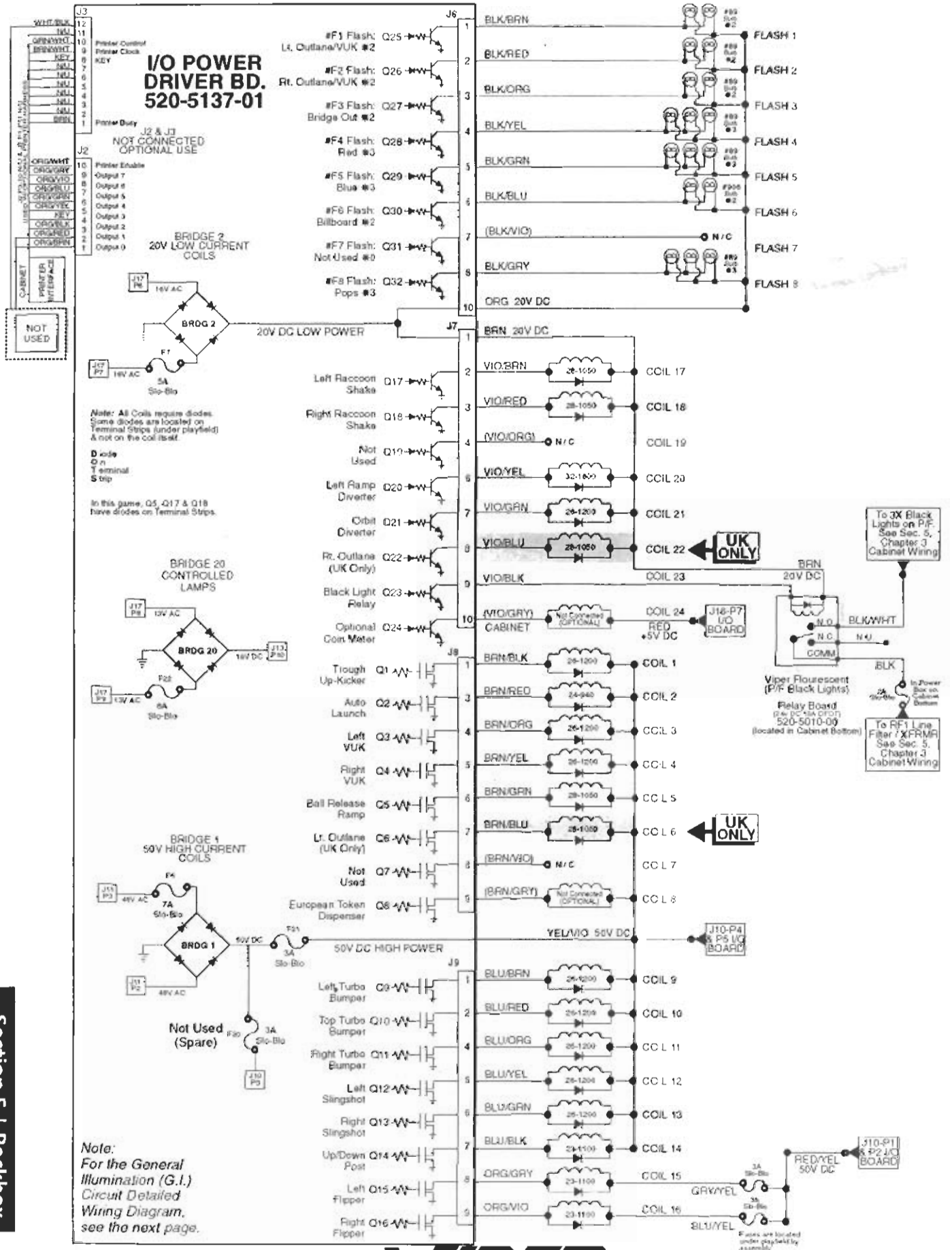
***Important Note:***
When connecting any Ribbon Cable, always ensure the "Red Line" side of the ribbon cable goes to the Pin-1 side of any Dual 0.1" Header Connector.



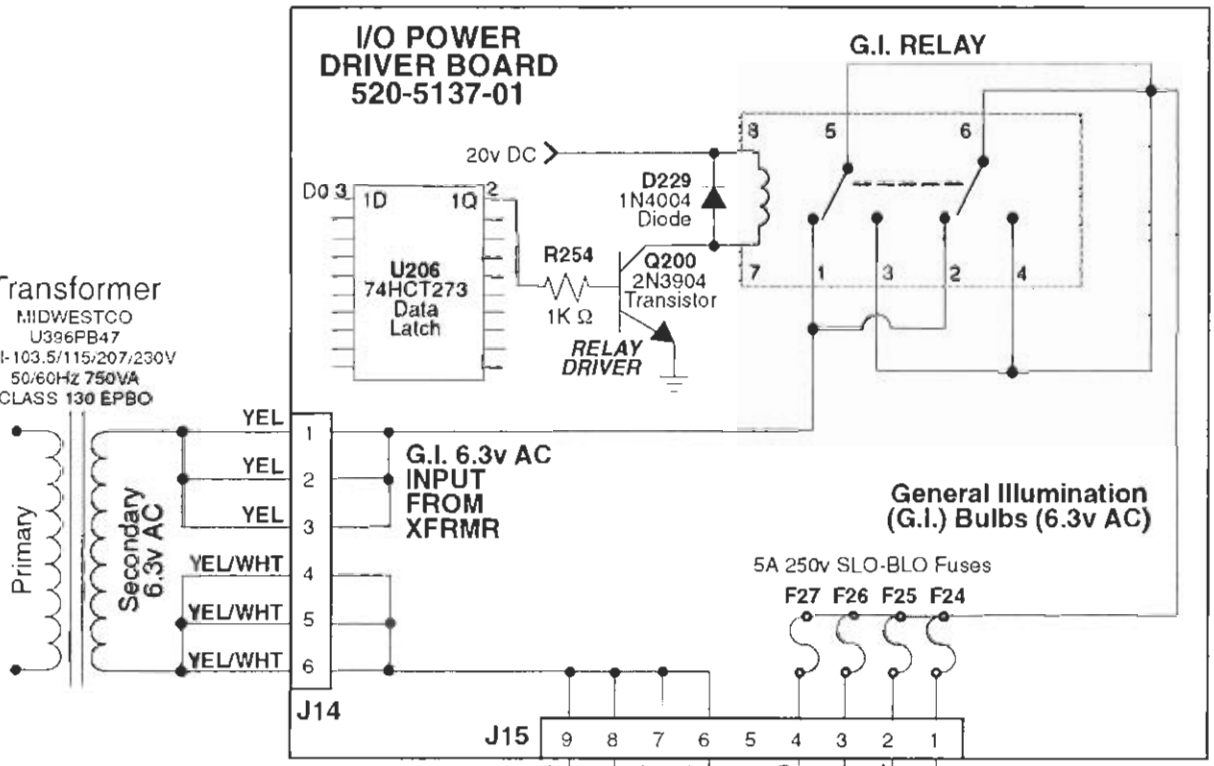



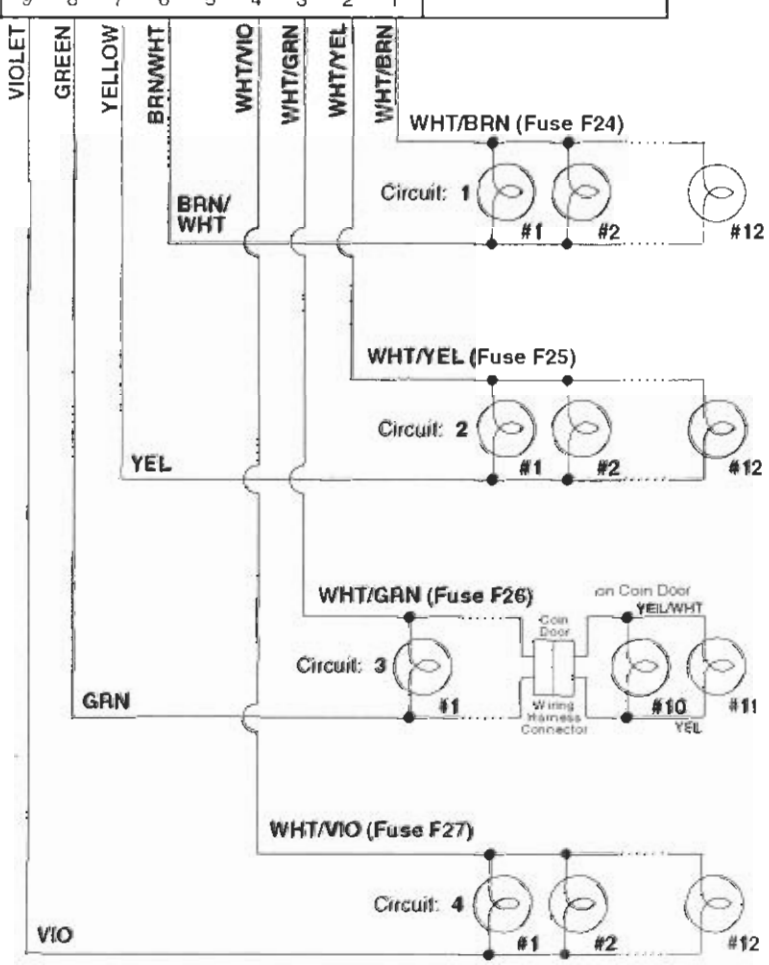
# Backbox I/O Power Driver Board Detailed Wiring Diagram



# Playfield Wiring

## *General Illumination Circuit Detailed Wiring Diagram*



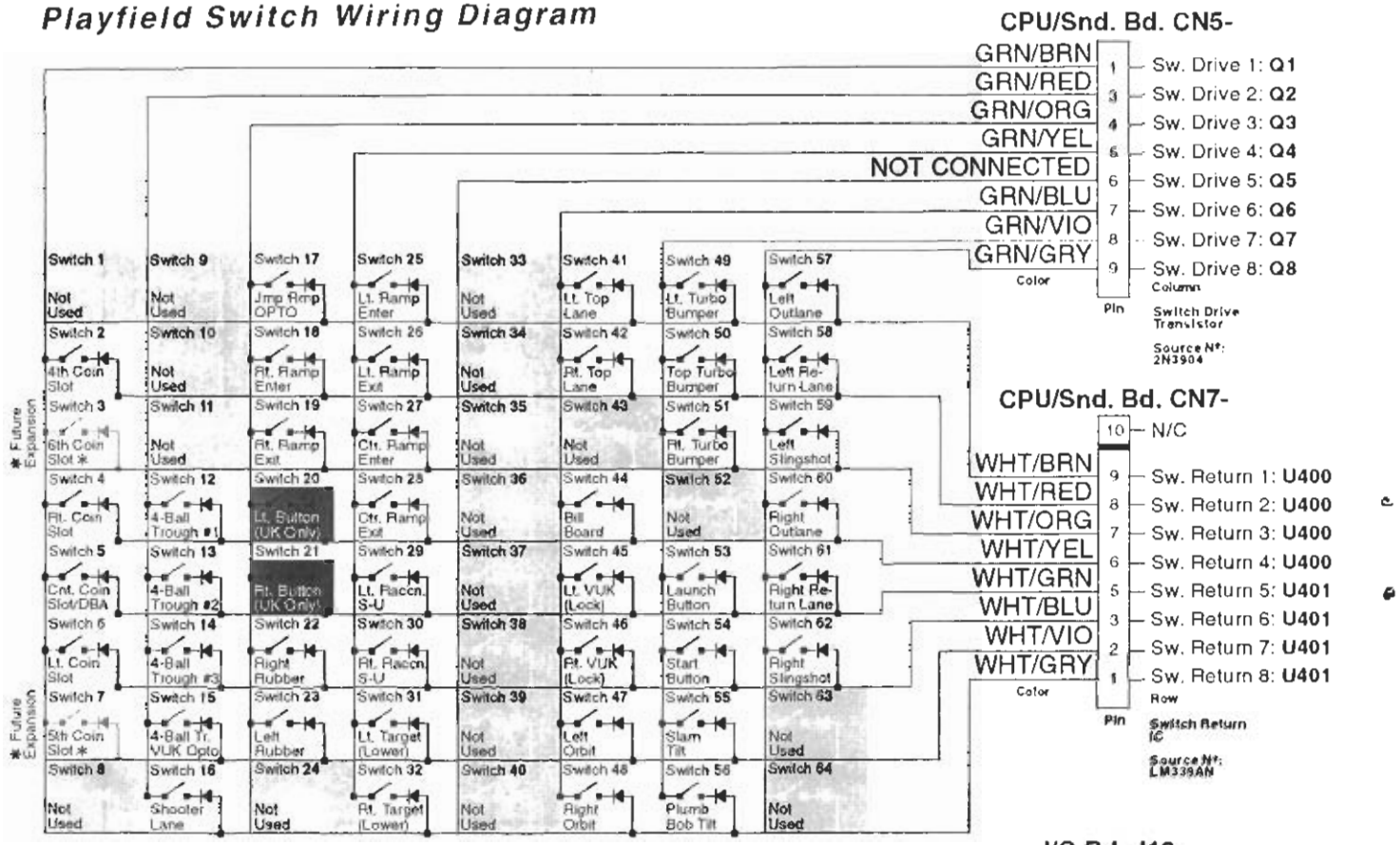




**G.I. Bulbs (6.3v AC) General Location**
**(Strings Noted by Fuse & Wire Colors):**

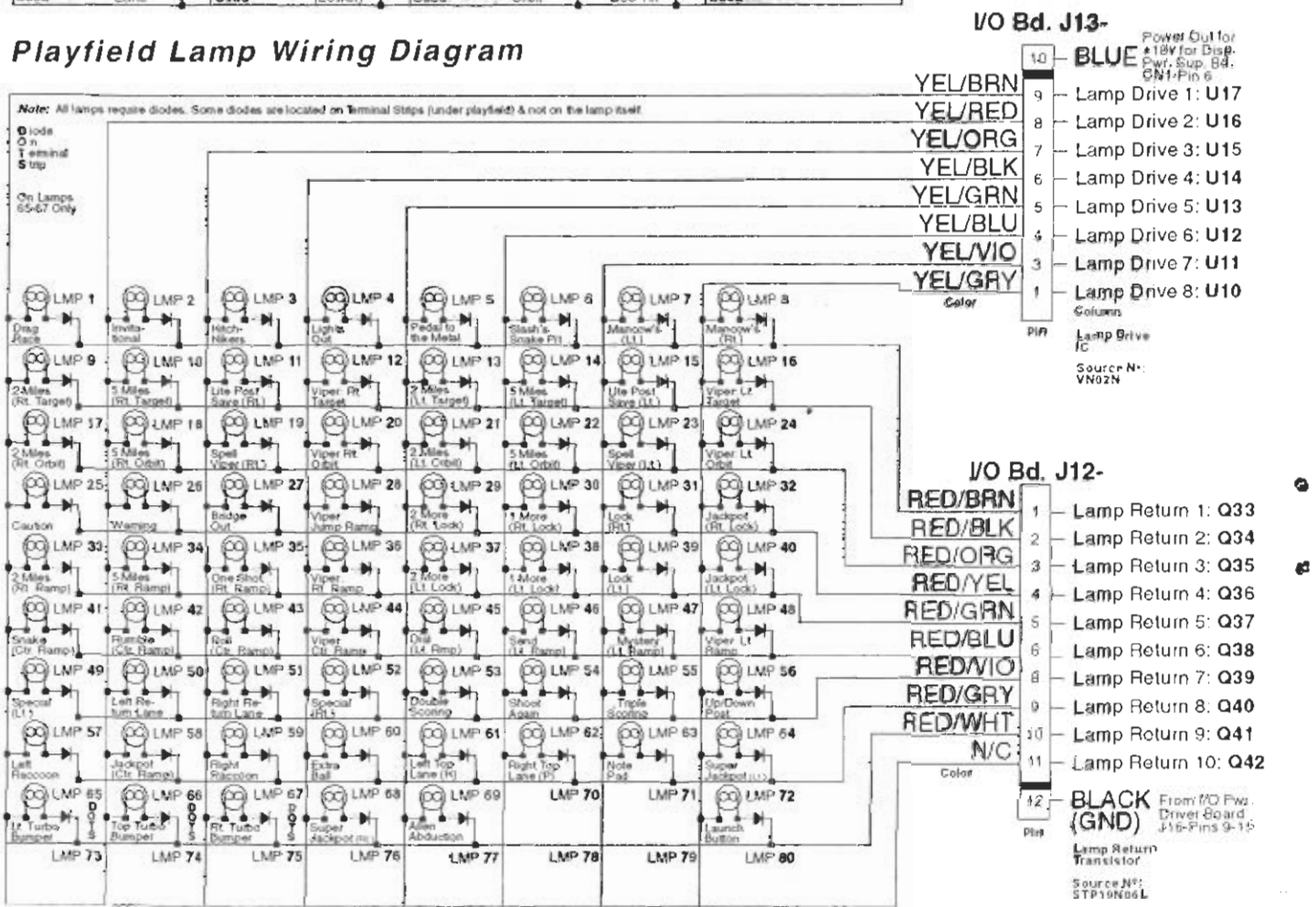
| | | |
|---|---|---|
| **Circuit 1: F24** | J15-P6 to J15-P1: | |
| Location: | BRN/WHT to WHT/BRN | |
| *Left Playfield:* | 12 Ea. #44 Bulb * | |
| **Circuit 2: F25** | J15-P7 to J15-P2 | |
| Location: | YEL to WHT/YEL | |
| *Right Playfield:* | 11 Ea. #44 Bulb * | |
| *& Rt. Reflector:* | 1 Ea. #555 Bulb * | |
| **Circuit 3: F26** | J15-P8 to J15-P3 | |
| Location: | GRN to WHT/GRN | |
| *Upper Right Playfield:* | 9 Ea. #44 Bulb * | |
| *In Coin Door:* | 2 Ea. #555 Bulb * | |
| **Circuit 4: F27** | J15-P9 to J15-P4 | |
| Location: | VIO to WHT/VIO | |
| *Upper Left Playfield:* | 11 Ea. #44 Bulb * | |
| *& Lt. Reflector:* | 1 Ea. #555 Bulb * | |

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

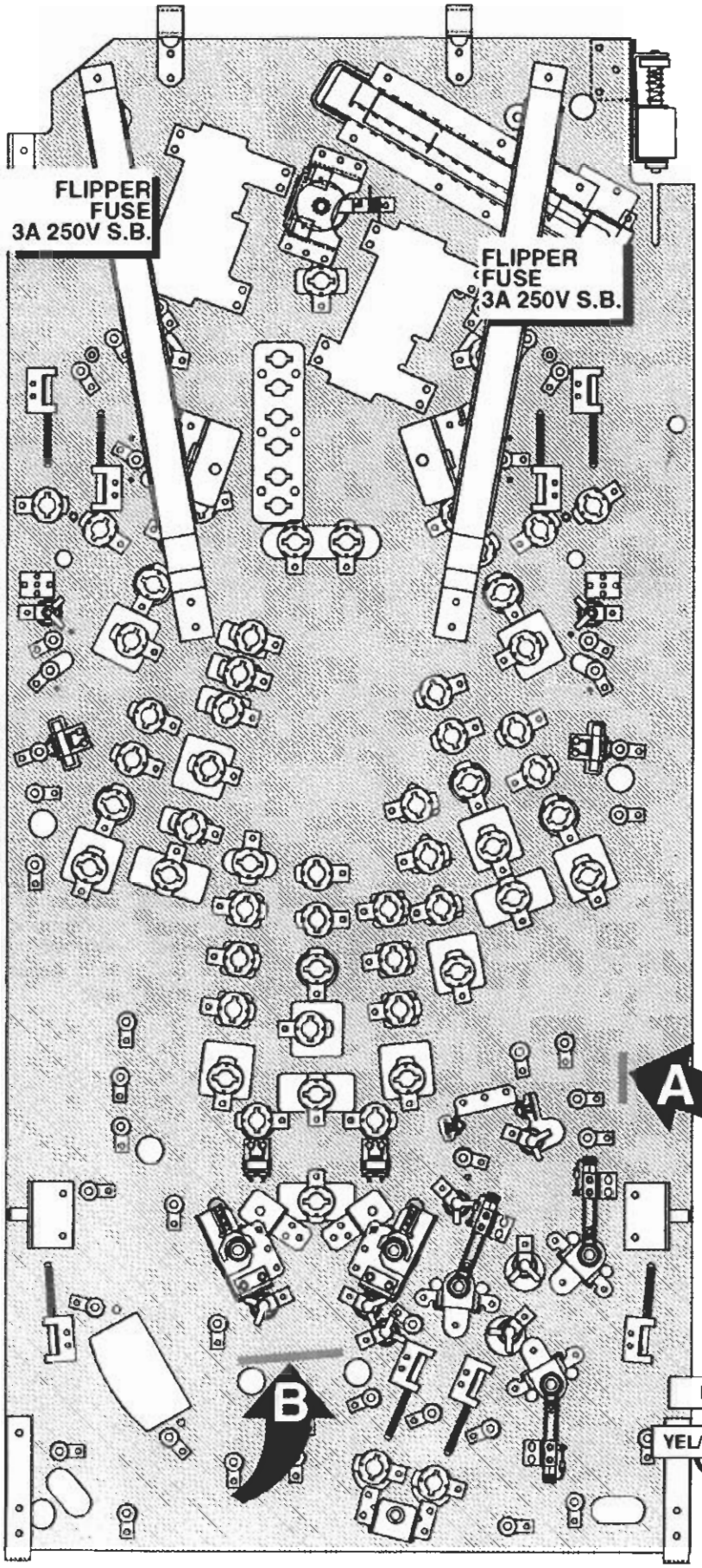
## Playfield Switch Wiring Diagram




## Playfield Lamp Wiring Diagram



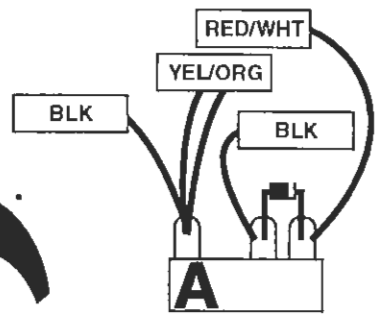
## *Playfield Diode Terminal Strip Descriptions & Locations*

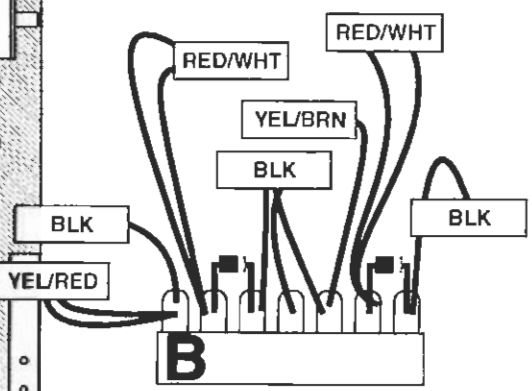



All switches, lamps, coils require diodes. The diodes not physically located on the switch, lamp or coil are located on Terminal Strips under the playfield. The Switch & Lamp Matrix Grids also note which switch or lamp has a diode on a Terminal Strip (noted by "DOTS" meaning "Diode on Terminal Strip").

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

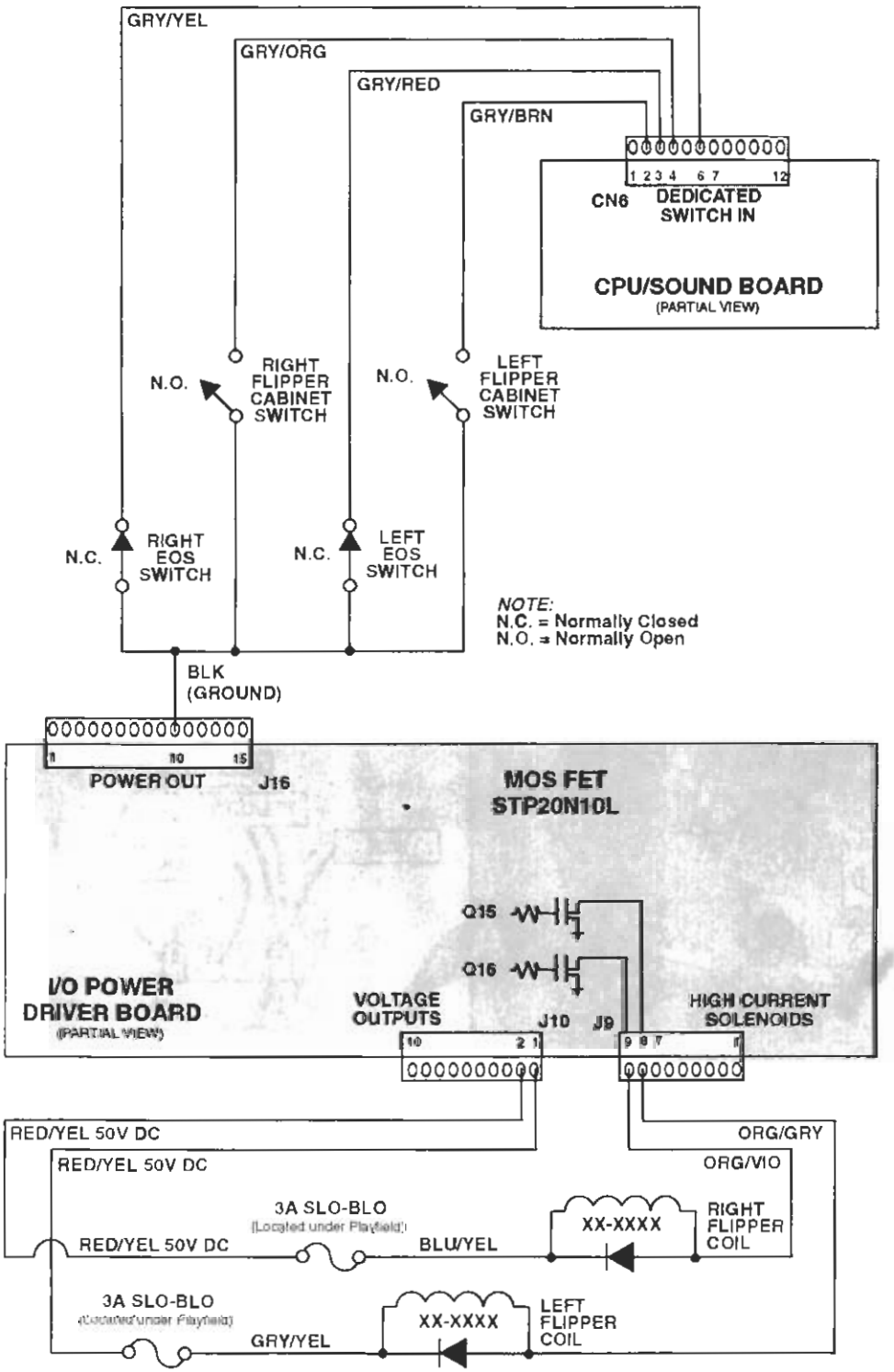
| Nº | Diode Type / PNº | DIODE for | WIRE COLORS |
|---|---|---|---|
| A | 1N4001 112-5001-00 | Lamp 67 Rt. Turbo B. | YEL/ORG |
| | | | RED/WHT |
| B | 1N4001 112-5001-00 | Lamp 66 Top Turbo B. | YEL/RED |
| | | | RED/WHT |
| | 1N4001 112-5001-00 | Lamp 65 Left Turbo B. | YEL/BRN |
| | | | RED/WHT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



## 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.



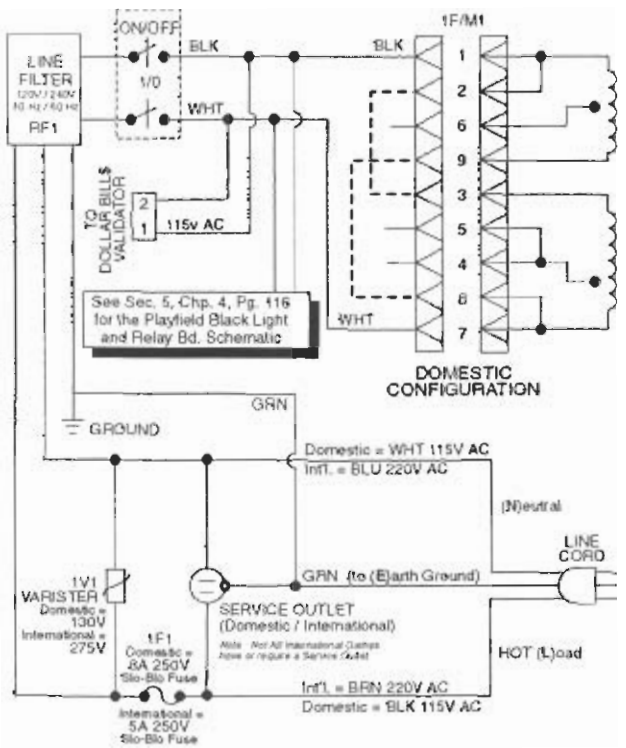

### *Technical Overview*

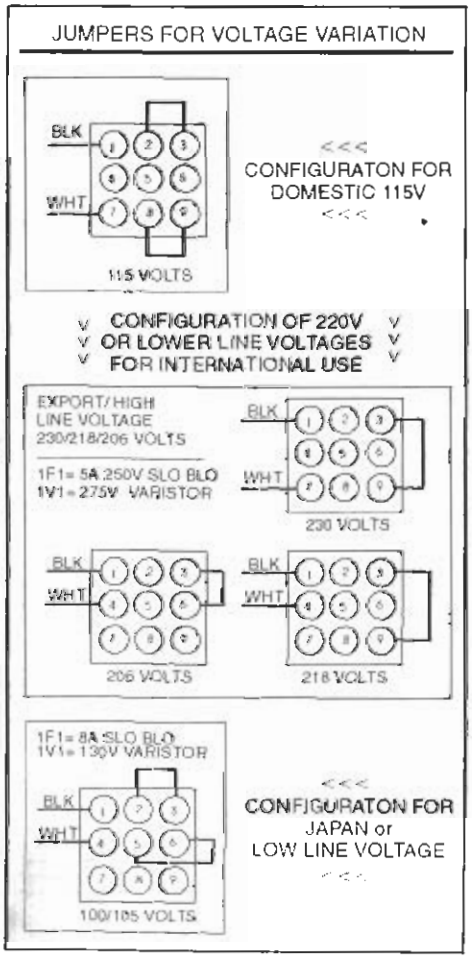
Our ***New Flipper System*** uses one supply voltage (50v DC) for both kick and hold. Once the **Game CPU** detects a flipper cabinet switch closure (during game play) it applies a 40 msec pulse to the gate of the flipper drive transistor (STP20N10L). If it continues to detect a flipper cabinet switch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

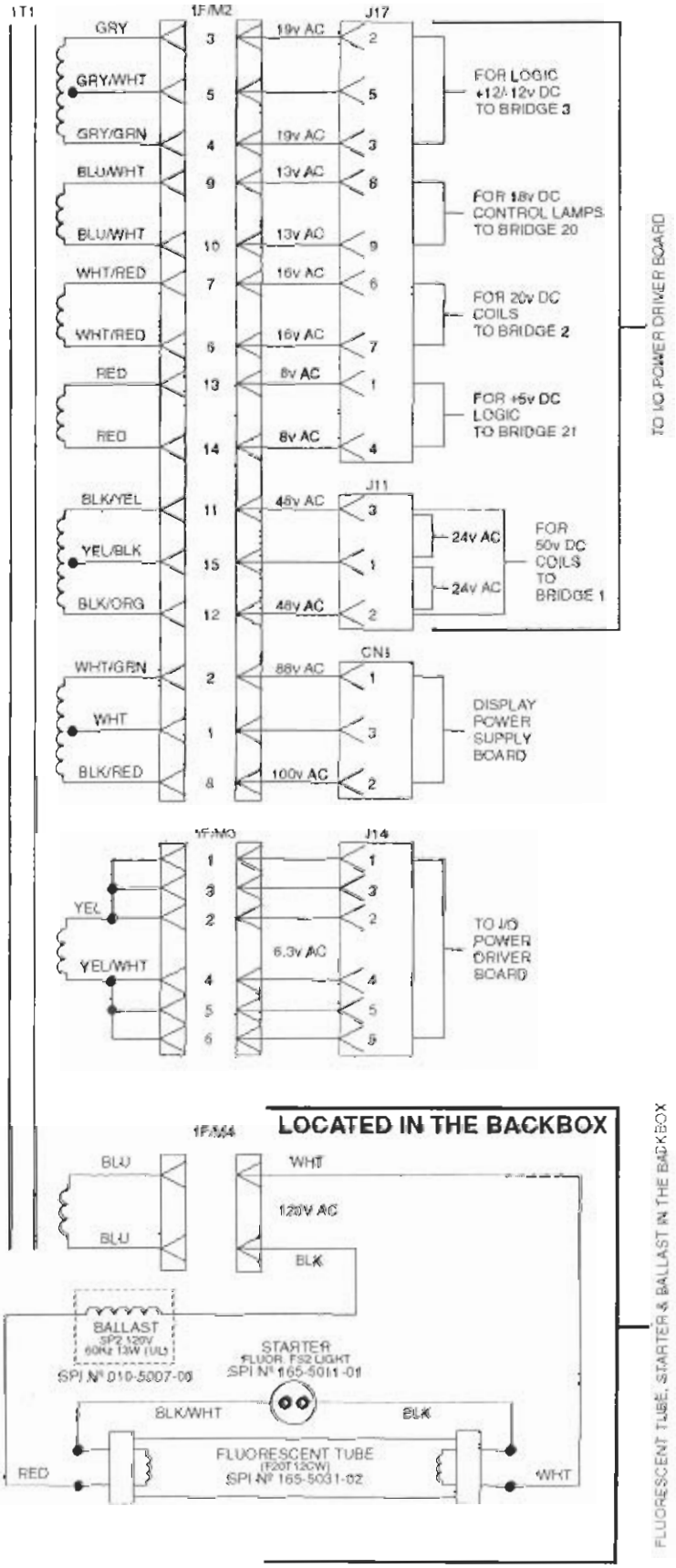
The **E.O.S.** (End-Of-Stroke) **Switch** serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The **E.O.S. Switch** is a normally closed switch which opens approximately a 1/16" when the flipper is energized. The **Game CPU** will detect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

# Cabinet Wiring

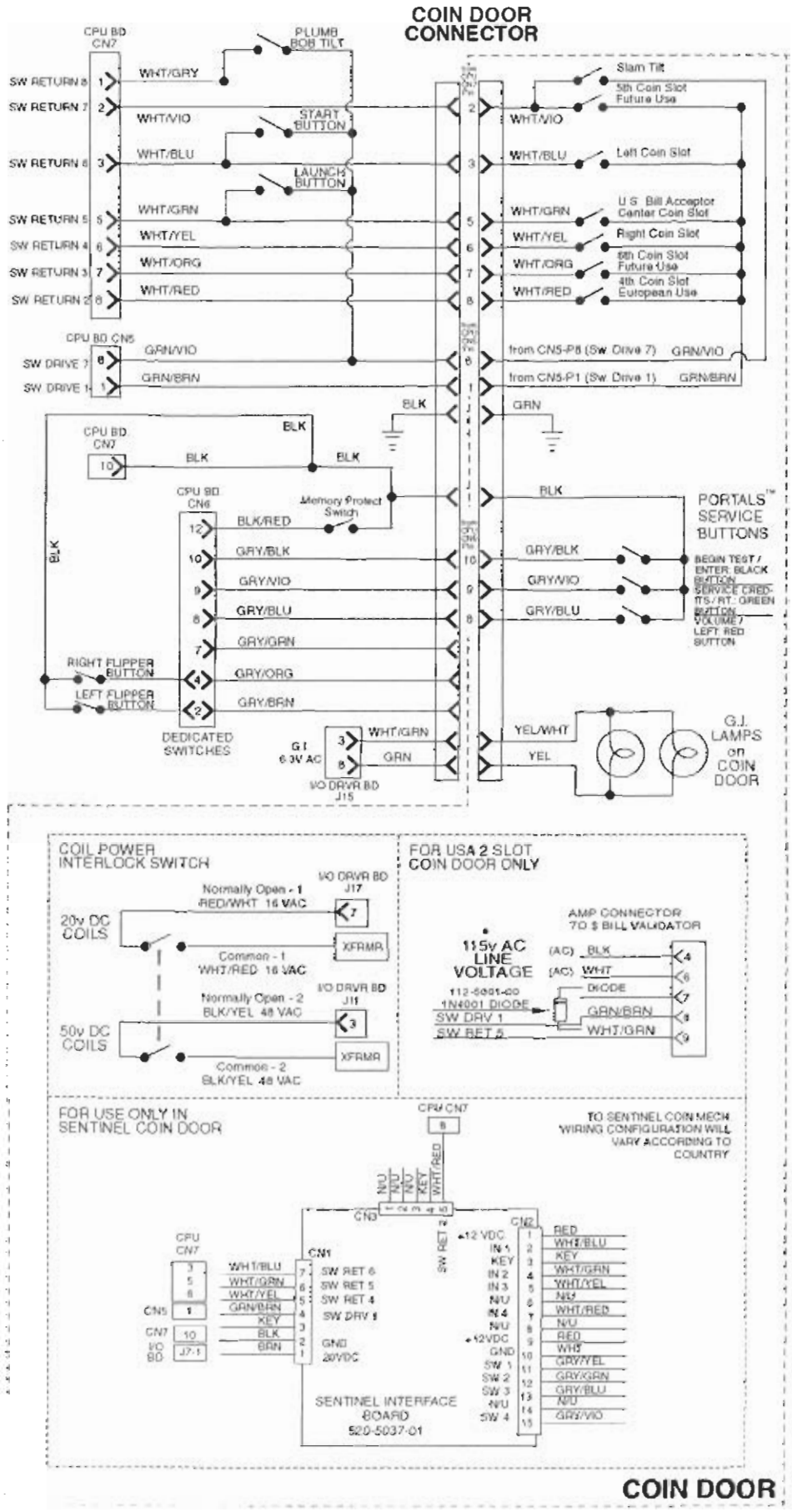
## *Transformer Power Wiring Diagram*



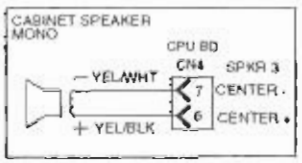



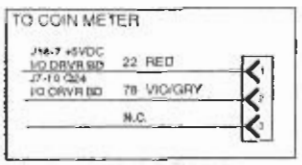



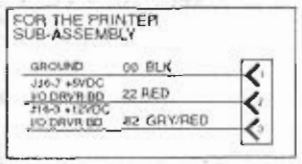
# Cabinet / Coin Door Wiring Diagram

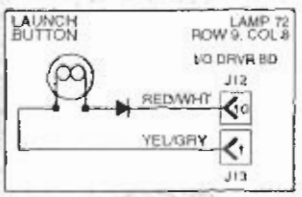


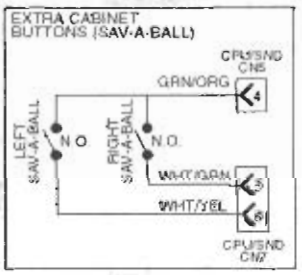

## CABINET HARNESSES:



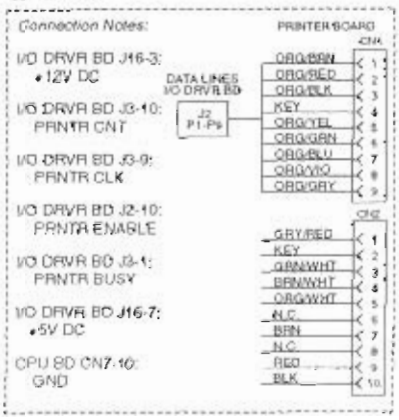




* * * UK ONLY * * *

*PRINTER INTERFACE OPTIONAL*

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

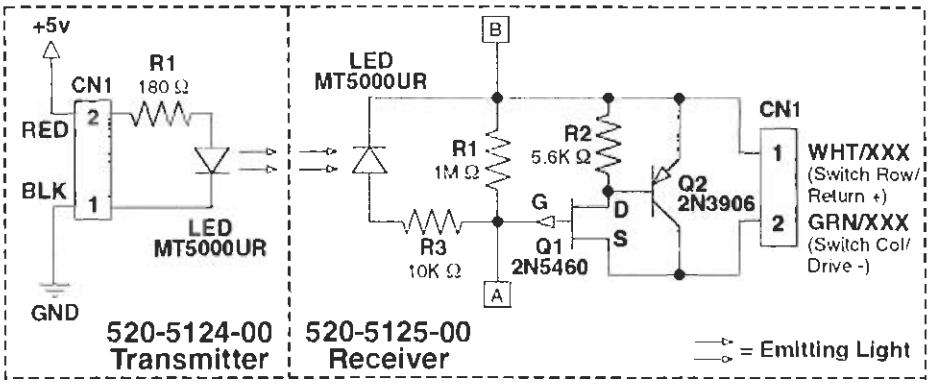


# Printed Circuit Boards (PCBs)

## *Trough Up-Kicker OPTO Boards Theory of Operation & Schematic*

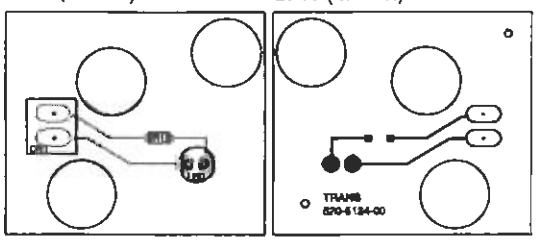
As light from the Transmitter falls on the **Receiver LED**, it generates a Positive Bias Voltage (0.7v to 1.5v) which is applied to the gate of **Q1**, turning **Q1** off. When **Q1** is held off, no current flows through **Q2**'s Base, the transistor is off acting as an *OPEN SWITCH*.

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*.



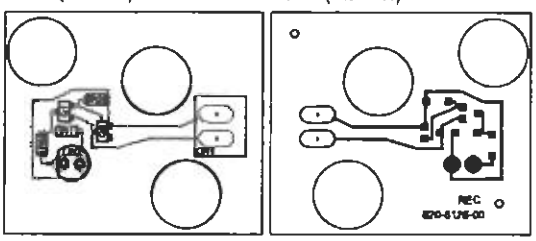

## *Trough Up-Kicker OPTO Boards Component Layout & Parts*

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):*

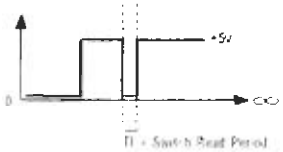
A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place meter leads across points **A** and **B** (Refer to Schematic Drawing above, 520-5125-00 Receiver Side). It should read approximately 0.8 - 1.2v DC.

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.

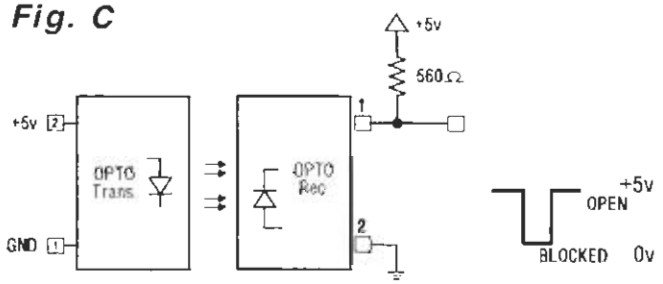
B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (see Schematic). The Scope should display a **PULSE STREAM** indicating **Q2** has switched "On" as shown in **Fig. B**, Wave Form Diagram. This is your Switch Drive Pulse.

*OPTO Troubleshooting cont. next page.*

### 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.

***Fig. 1***

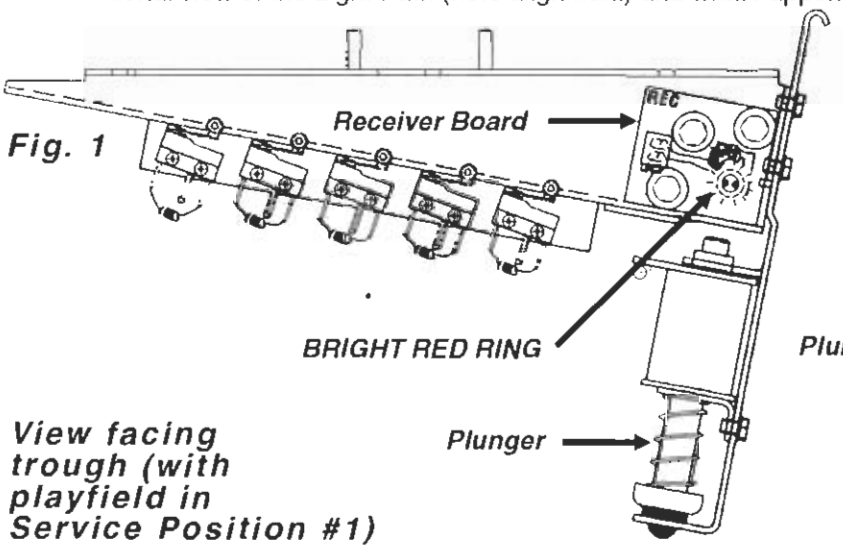
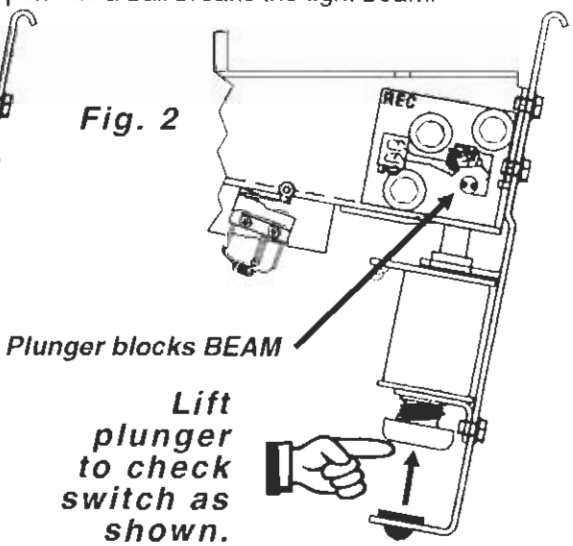



***Fig. 2***




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

*I M P O R T A N T*
*If replacement of* ***LED*** *is required, insure that is* ***mounted correctly*** *before and after soldering (See* ***Fig. 4a / 4b****).*

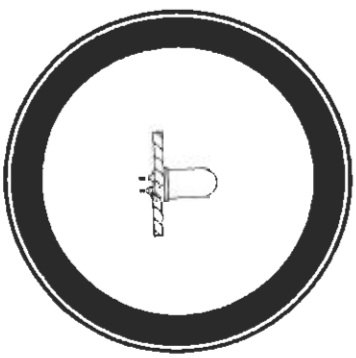


***Fig. 4a***
**Correct Position**

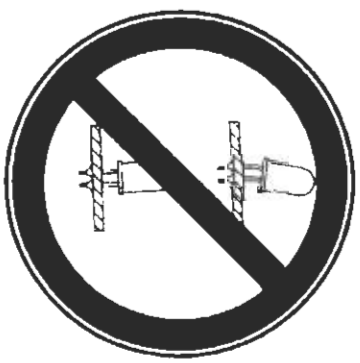


***Fig. 4b***
**Incorrect Position**

***Fig. 3a***

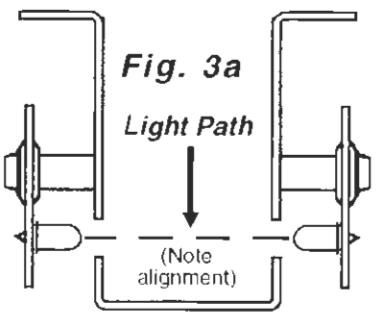
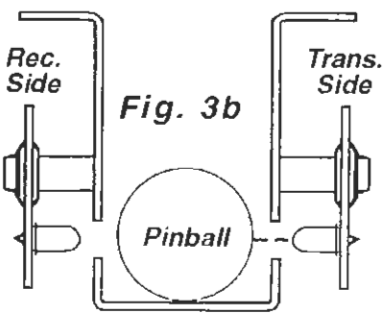
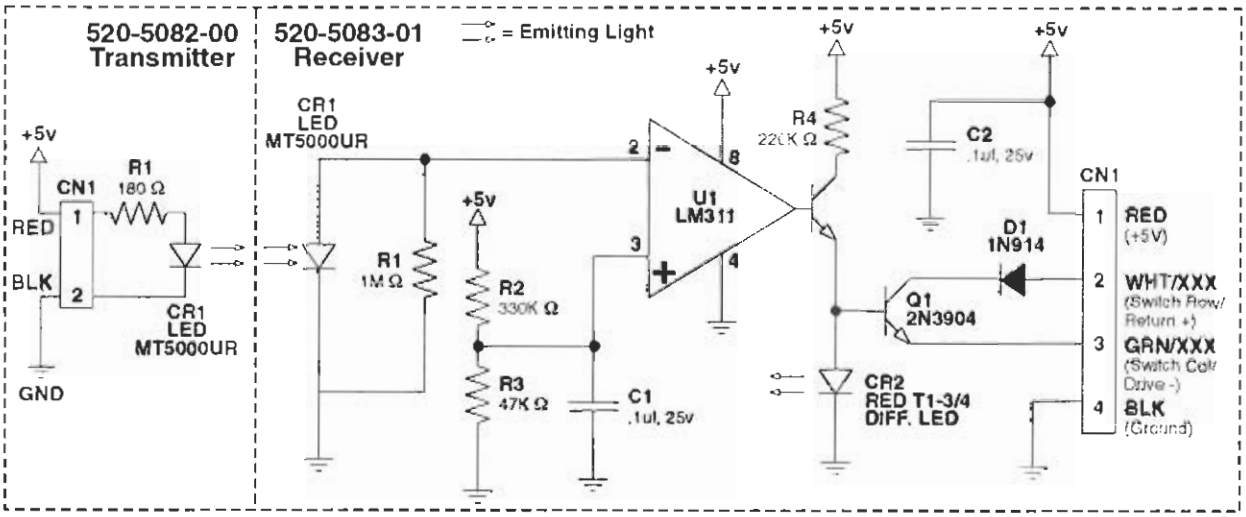



***Fig. 3b***

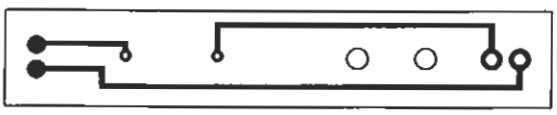


## *Playfield Sw. OPTO "Long-Hop" Boards Theory of Operation & Schematic*



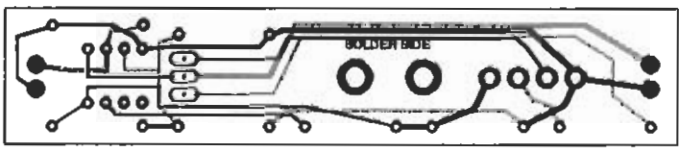

The light falling on **LED (CR1)** generates a voltage which is applied to the input (Pin-2) of the **LM311 Comparator (U1)**. **R1** bleeds off excess charge. At about a volt input from **LED (CR1)** the **Comparator (U1)** trips & drives either **Q1** (during switch line strobes) or the indicator **LED (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 .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*



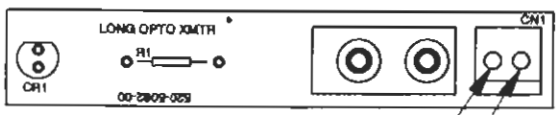
Solder Side (Green)

**520-5082-00 (TRANS)**




Solder Side (Green)

**520-5083-01 (REC)**




Component Side (Beige)

Pin-1 **RED** (+5v)

Pin-2 **BLK** (GROUND)

**CN1**


Component Side (Beige)

Pin-3 **GRN/XXX** (Sw. Drive « - »)

Pin-2 **WHT/XXX** (Sw. Return « + »)

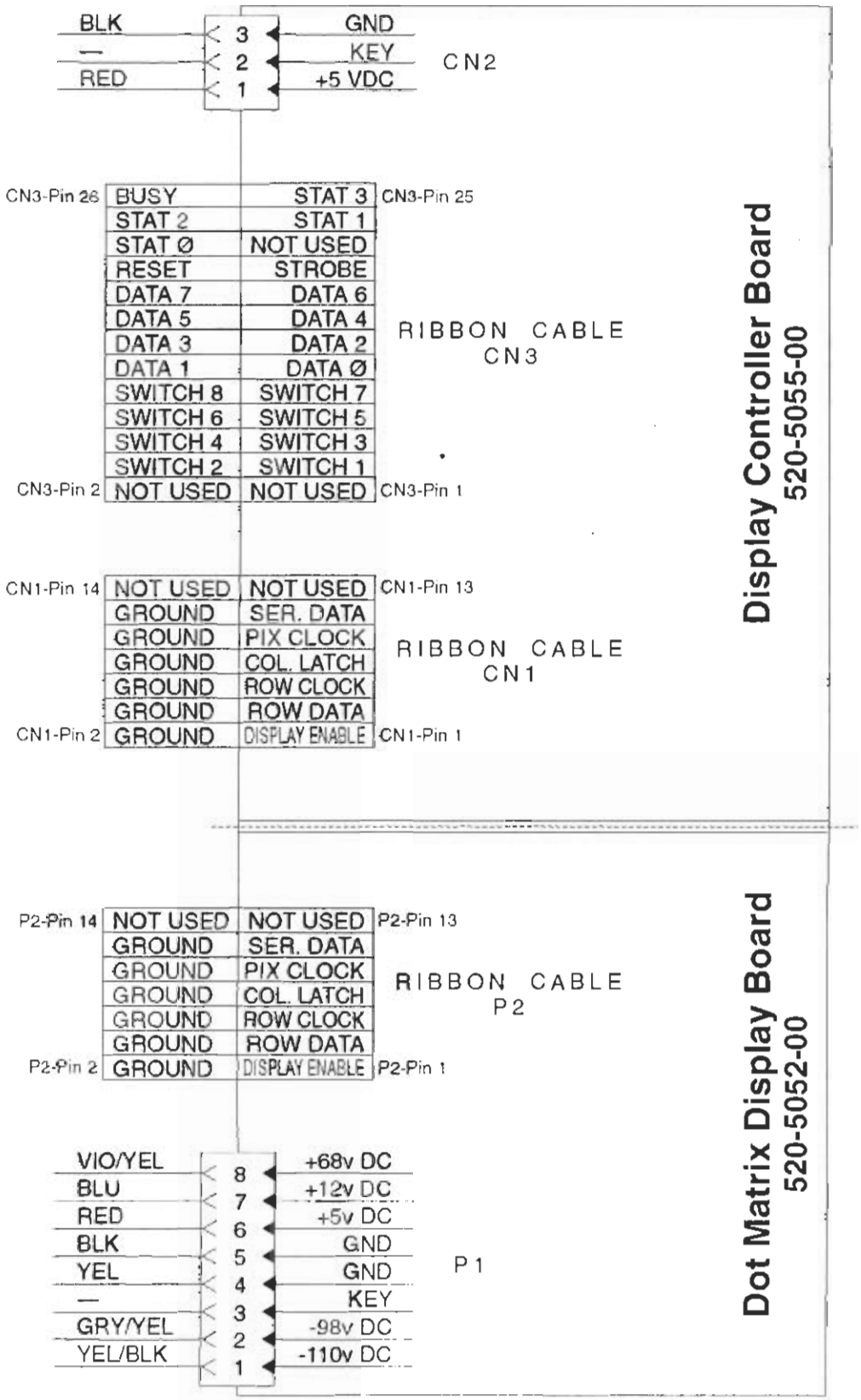
Pin-1 **RED** (+5v)

Pin-4 **BLK** (GROUND)

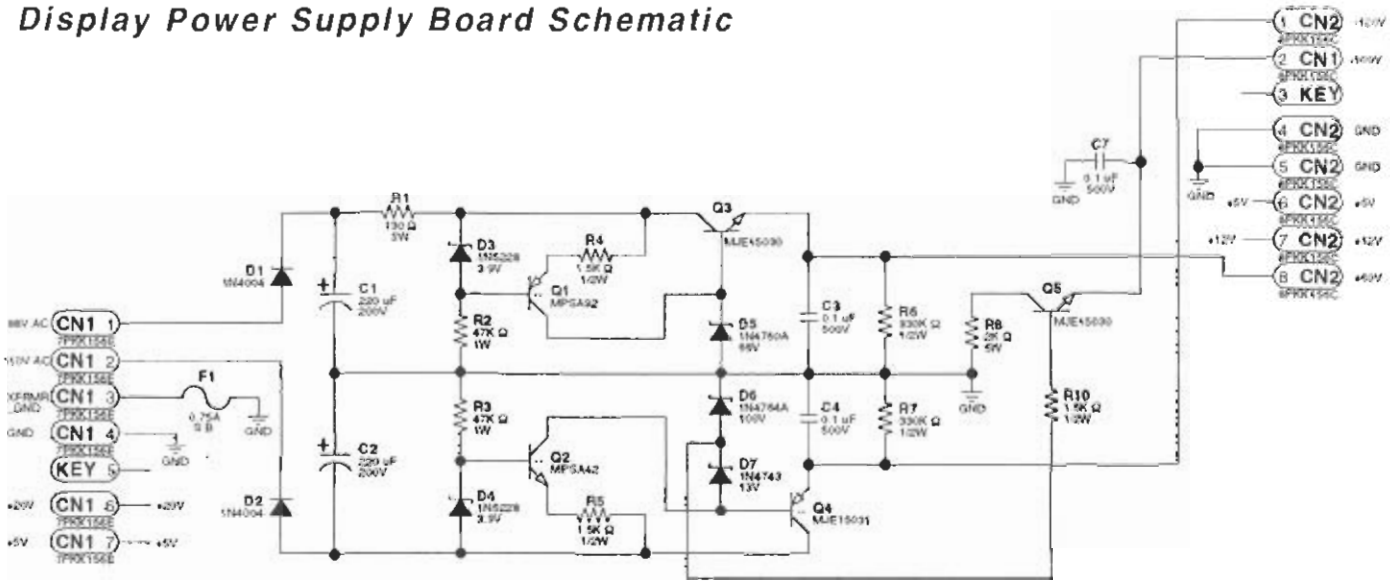
**CN1**

***Note:*** *In this game, this 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).*

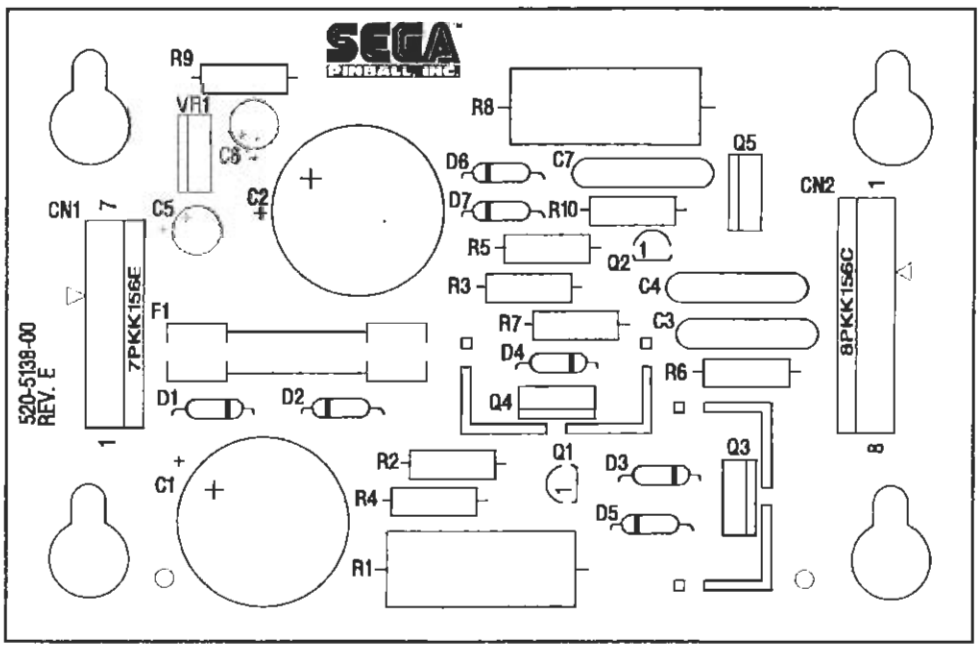
| ITEM | QTY | PART NUMBER | REF-DESIGNATOR | DESCRIPTION |
|---|---|---|---|---|
| **A** | 1 | **520-5083-01** | OPTO Receiver Board | **Complete PCB Assembly** |
| 1 | 1 | 165-5100-00 | **CR1** | **LED MT5000UR** (Ultra Bright Red) |
| 2 | 1 | 165-5099-00 | **CR2** | **LED T1-3/4 RED DIFFUSER** |
|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


BLK
—
RED
3
2
1
GND
KEY
+5 VDC
CN2
CN3-Pin 26
BUSY
STAT 3
CN3-Pin 25
STAT 2
STAT 1
STAT Ø
NOT USED
RESET
STROBE
DATA 7
DATA 6
DATA 5
DATA 4
DATA 3
DATA 2
DATA 1
DATA Ø
SWITCH 8
SWITCH 7
SWITCH 6
SWITCH 5
SWITCH 4
SWITCH 3
SWITCH 2
SWITCH 1
CN3-Pin 2
NOT USED
NOT USED
CN3-Pin 1
RIBBON CABLE
CN3
Display Controller Board
520-5055-00
CN1-Pin 14
NOT USED
NOT USED
CN1-Pin 13
GROUND
SER. DATA
GROUND
PIX CLOCK
GROUND
COL. LATCH
GROUND
ROW CLOCK
GROUND
ROW DATA
CN1-Pin 2
GROUND
DISPLAY ENABLE
CN1-Pin 1
RIBBON CABLE
CN1
P2-Pin 14
NOT USED
NOT USED
P2-Pin 13
GROUND
SER. DATA
GROUND
PIX CLOCK
GROUND
COL. LATCH
GROUND
ROW CLOCK
GROUND
ROW DATA
P2-Pin 2
GROUND
DISPLAY ENABLE
P2-Pin 1
RIBBON CABLE
P2
Dot Matrix Display Board
520-5052-00
VIO/YEL
BLU
RED
BLK
YEL
—
GRY/YEL
YEL/BLK
8
7
6
5
4
3
2
1
+68v DC
+12v DC
+5v DC
GND
GND
KEY
-98v DC
-110v DC
P1

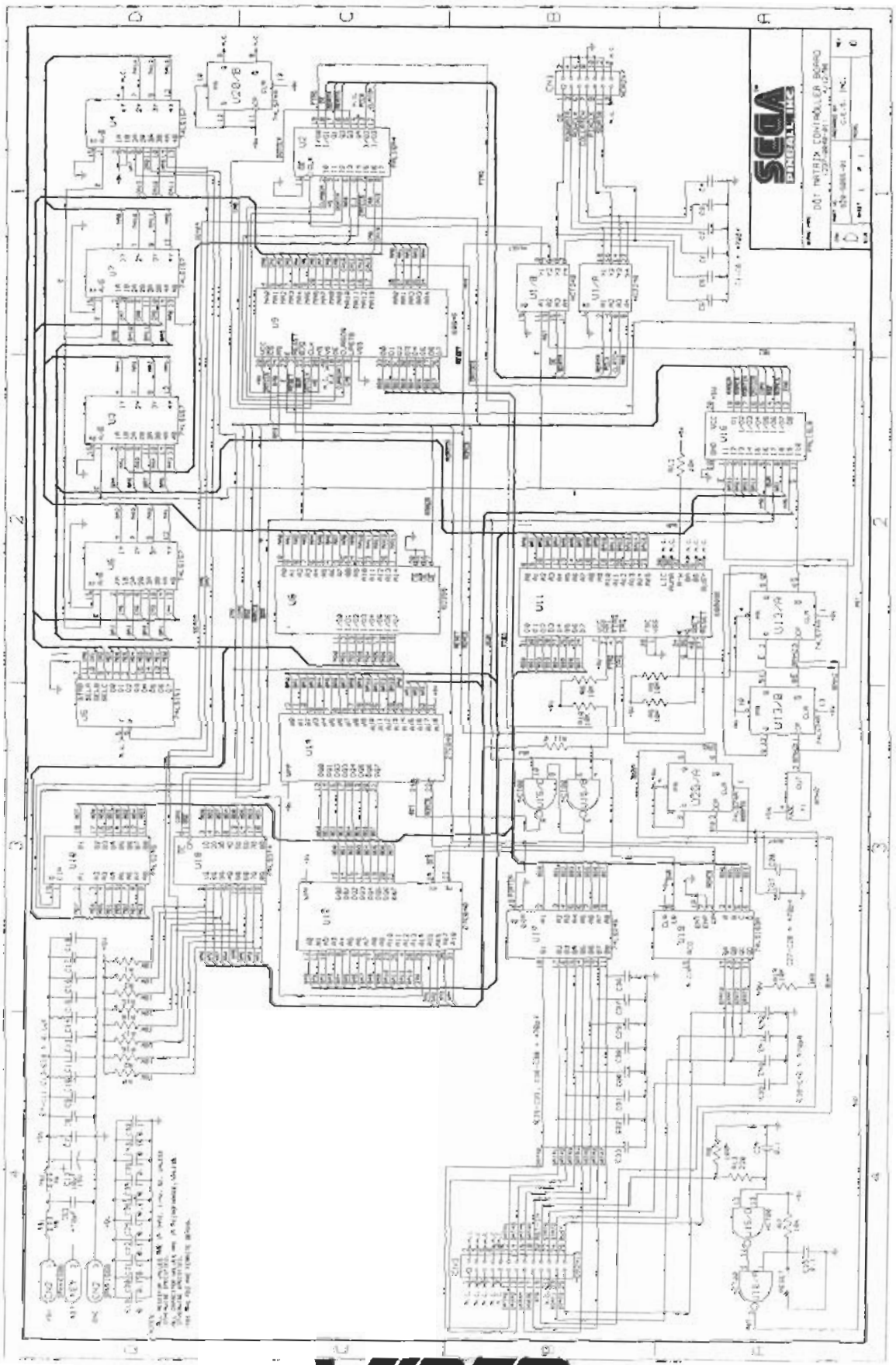
## Display Power Supply Board Schematic

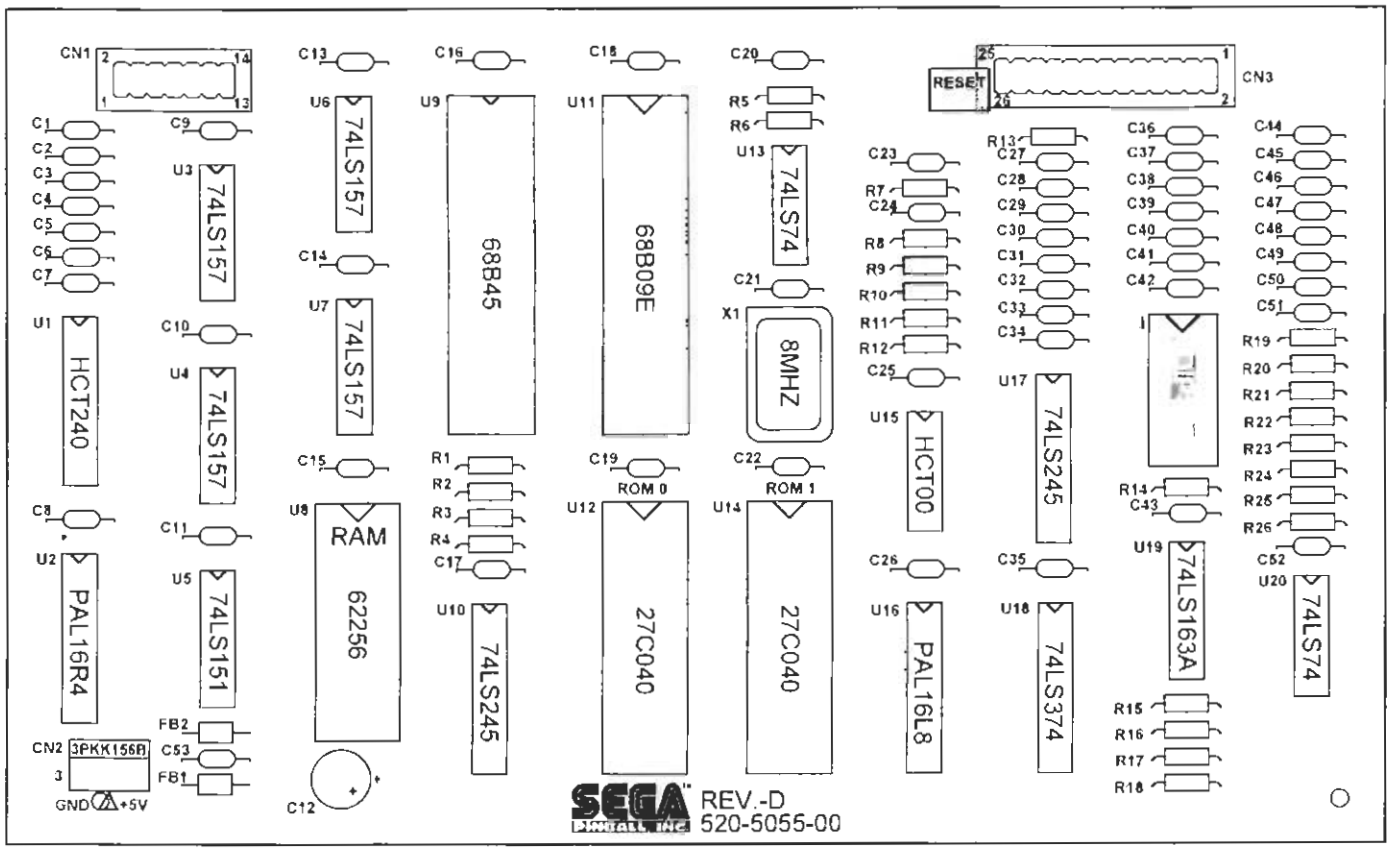



## Display Power Supply Board Component Layout & Parts




| ITEM | QTY | PART NUMBER | REF-DESIGNATOR | DESCRIPTION (NS = Not Stuffed) |
|---|---|---|---|---|
| — | 1 | 520-5138-00 | Display Power Supply Board | Complete PCB Assembly |
| 1 | 1 | 200-5000-17 | F1 | 3/4A (0.75A) S.B. Fuse |
| 2 | 2 | 535-5000-11 | Q3, Q4 | Heatsinks - AAVID #563002 |
| 3 | 2 | 125-5044-00 | C1, C2 | 220uF, 200v, Radial Lytic Cap. |
| 4 | 4 | 121-5038-00 | R4, R5, R9, R10 | 1.5K Ω 1/2W Res. (R9: NS) |
| 5 | 2 | 121-5059-00 | R6, R7 | 330K Ω 1/2W Res. |
| 6 | 2 | 121-5060-00 | R2, R3 | 47K Ω 1W Res. |
| 7 | 1 | 121-5061-00 | R1 | 130 Ω 5W Res. |
| 8 | 1 | 121-5062-00 | R8 | 2K Ω 5W Res. |
| 9 | 2 | 112-0053-00 | D3, D4 | 1N5228, 3.9v, Diode |
| 10 | 1 | 112-0062-00 | D5 | 1N4760A, 68v, Diode |
| 11 | 1 | 112-0049-00A | D6 | 1N4764A, 100v, Diode |
| 12 | 1 | 112-0061-00 | D7 | 1N4743, 13v, Diode |
| 13 | 1 | 110-0100-00 | Q1 | MPSA92, Transistor |
| 14 | 1 | 110-0082-00 | Q2 | MPSA42, Transistor |
| 15 | 3 | 125-5035-00 | C3, C4, C7 | 0.1uF, 500v, Ceramic Disk Cap. |
| 16 | 1 | 110-0103-00 | Q4 | MJE15031, Transistor |
| 17 | 2 | 110-0101-00 | Q3, Q5 | MJE15030, Transistor |
| 18 | | 125-5003-00 | C5, C6 | 220uF, 25v, Radial Lytic Cap. |
| 19 | | 121-5003-00 | VR1 | 5KB12CT (VR1: NS) |
| 20 | 1 | 045-5015-08 | CN2 | 8PKK156 (PIN3=KEY) |
| 21 | 2 | 112-5003-00 | D1, D2 | 1N4004, Diode |
| 22 | 1 | 045-5015-07 | CN1 | 7PKK156E (PIN5=KEY) |
| 23 | 2 | 240-5008-00 | Q3, Q4 | 6/32 KEPS Nut |
| 24 | 2 | 237-5501-00 | Q3, Q4 | 6/32 X 3/8" PPH Screw |
| 25 | 2 | 205-0004-00 | F1 | Fuse Clips |






| ITEM | QTY | PART NUMBER | REF-DESIGNATOR | DESCRIPTION (NS = Not Stuffed) |
|---|---|---|---|---|
| — | 1 | 520-5055-00 | Display Controller Board | Complete PCB Assembly |
| 1 | 2 | 077-5217-00 | U12, U14 | 32-Pin, IC Dip Socket |
| 2 | 1 | 100-0397-00 | U8 | 32K X 8 Static RAM (62256L-10PC) |
| 3 | 1 | 100-0189-01 | U11 | 68B09E |
| 4 | 1 | 100-0233-00 | U9 | 68B45 |
| 5 | 1 | 100-0351-00 | U15 | 74HCT00 |
| 6 | 1 | 100-5001-00 | U1 | 74HCT240 |
| 7 | 1 | 100-5000-00 | U5 | 74LS151 |
| 8 | 4 | 100-0046-00 | U3, U4, U6, U7 | 74LS157 |
| 9 | 1 | 100-0049-00 | U19 | 74LS163A |
| 10 | 2 | 100-0058-00 | U7, U10 | 74LS245 |
| 11 | 1 | 100-0064-00 | U18 | 74LS374 |
| 12 | 2 | 100-0037-00 | U13, U20 | 74LS74 |
| 13 | 1 | 965-0107-00 | **U16 - ORANGE DOT** (Note the type of PAL) | PAL16L8 (15CN), (Programmed) **- ORANGE DOT** |
| 14 | 1 | 965-0108-00 | **U2 - ORANGE DOT** (Note the type of PAL) | PAL16R4 (25CN), (Programmed) **- ORANGE DOT** |
| 15 | 23 | 125-5031-00 | C7>C11, C13>C26, C34, C35, C43, C52 | .1 uF, (104), Axial Cer. Cap |
| 16 | 1 | 121-5051-00 | R8 | 100K Ω 1/4W C.F. Res. 5% |
| 17 | 15 | 121-5011-00 | R1>R7, R9, R10, R12, R14>R18 | 10K Ω 1/4W Res. 5% |
| 18 | 1 | 121-5014-00 | R13 | 220 Ω 1/4W C.F. Res. 5% |
| 19 | 0 | n/a | R19>R26 | (R19>R26: NS) |
| 20 | 21 | 125-5028-00 | C1>C6, C27>C33, C36>C42, C44>C51, C53 | 470pF, (471), Axial Cap (C44>C51: NS) |
| 21 | 2 | n/a | FB1, FB2 | Ferrite Bead (2743001182) |
| 22 | 1 | 125-5015-00 | C12 | 100uF, 25v, Cap. (Radial Elec.) |
| 23 | 1 | 045-5015-26 | CN3 | 13-Pin, Dual Row .1" HDR Conn. |
| 24 | 1 | 045-5015-03 | CN2 | 3-Pin, KK-156 Conn. (540445-3) |
| 25 | 1 | 045-5015-02 | CN1 | 7-Pin, Dual Row .1" Hdr. Conn. |
| 26 | 1 | 140-0033-00 | X1 | 8Mhz Clock Oscillator |
| 27 | 0 | Not Used | SW1 | (SW1: NS) |
| 28 | 1 (See Pg. DR. ❸ Table) | | U12 U14 (ROM 0) | 4MB ROM (U14: NS) |

**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.

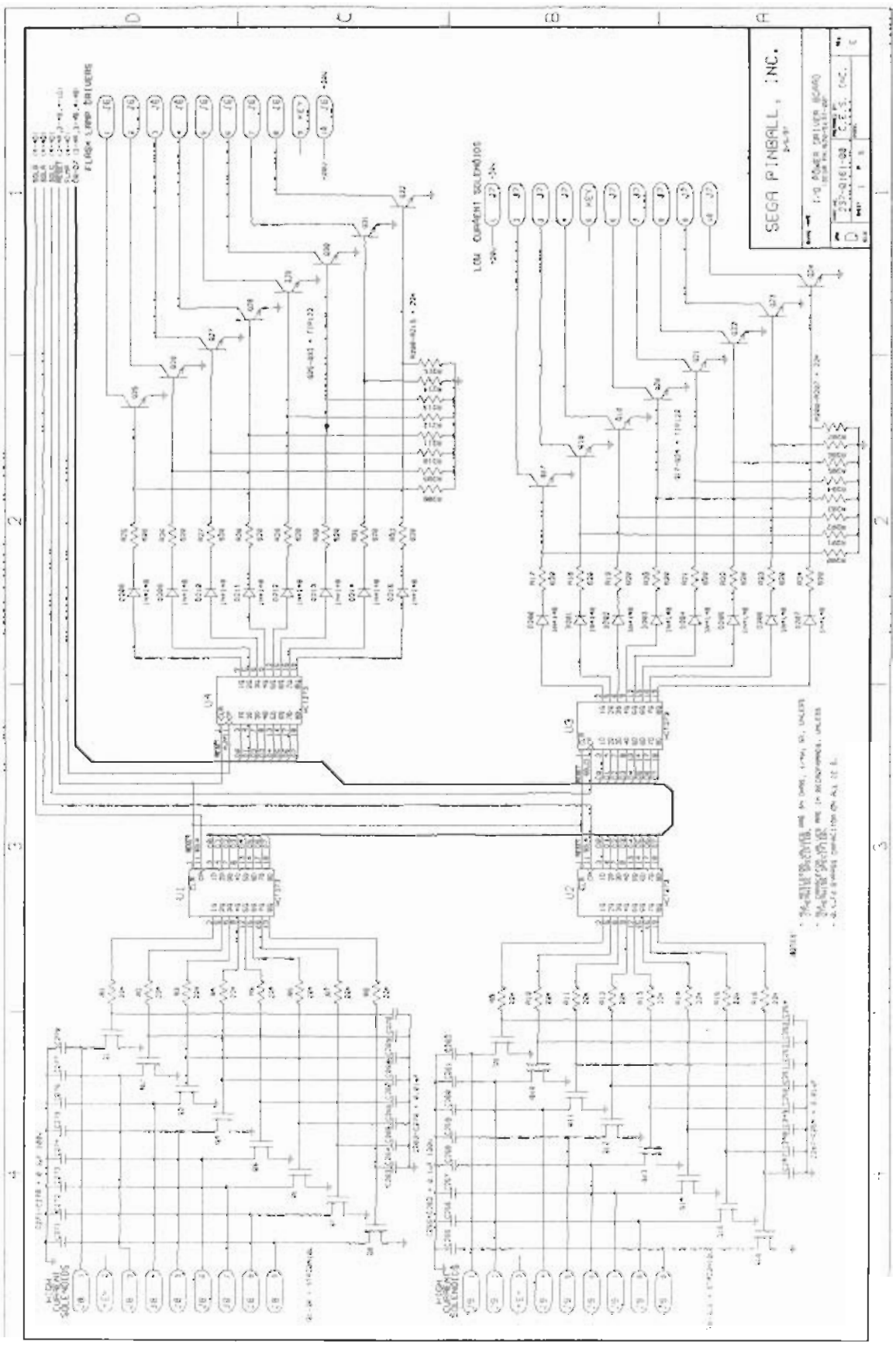
**Solenoid Drivers & Flash Lamps:**
J8 & J9 are high side drivers for driving solenoids and other heavy loads. Each connector has its own buffer driving 8 drivers. J8 & J9 consist of MOSFET drivers 20N10L which can easily & safely be tested by clipping one end of a clip-lead to test point FET TPL1 and 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).

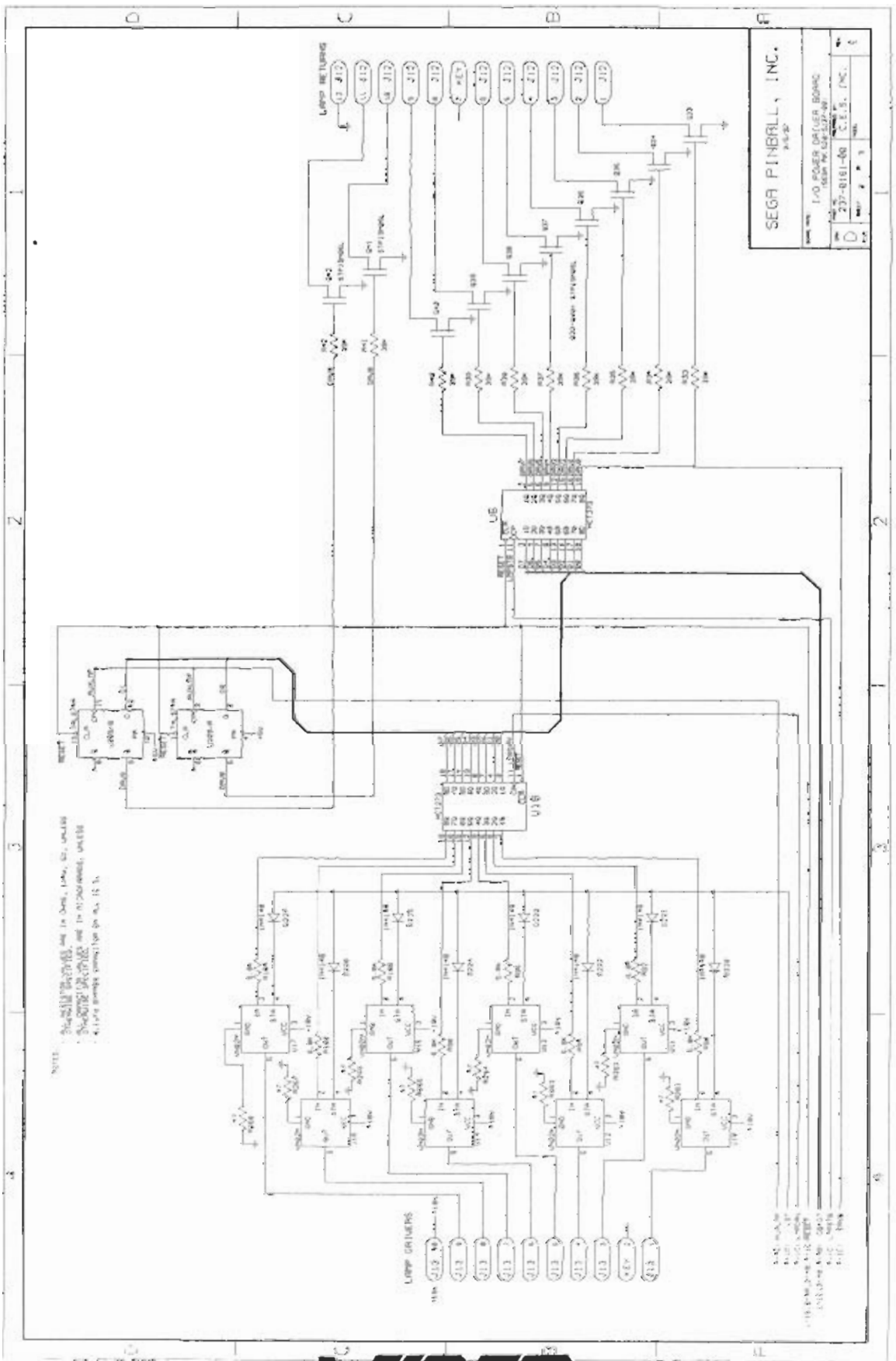
Note 1 * Clip on the resistor side with the white stripe.
** R1 controls Q1 and R2 controls Q etc...

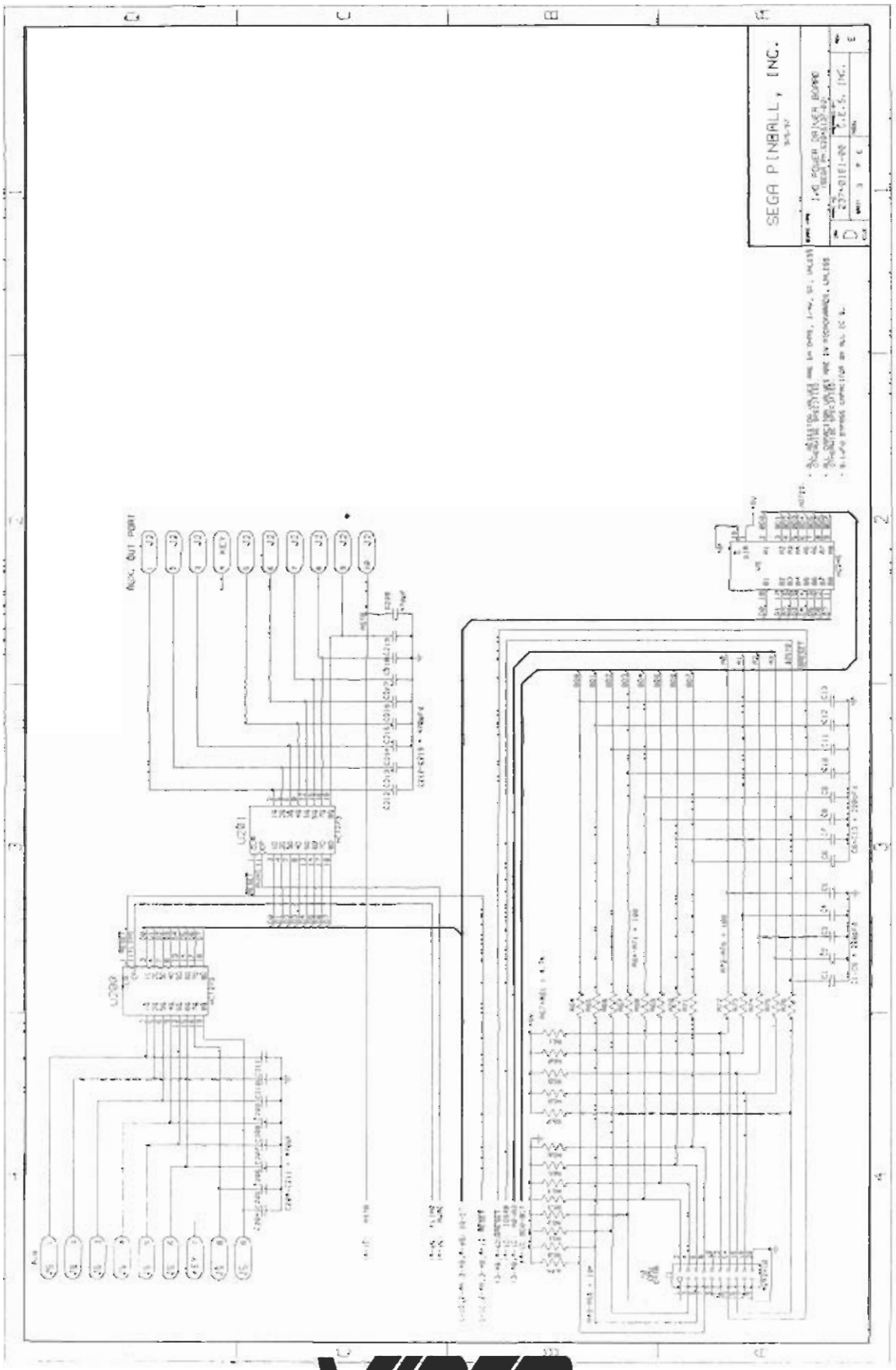
**Auxiliary In & Out:**
J2 8 CMOS Outputs sometimes used for a printer interface.
J3 8 CMOS Inputs general purpose inputs.

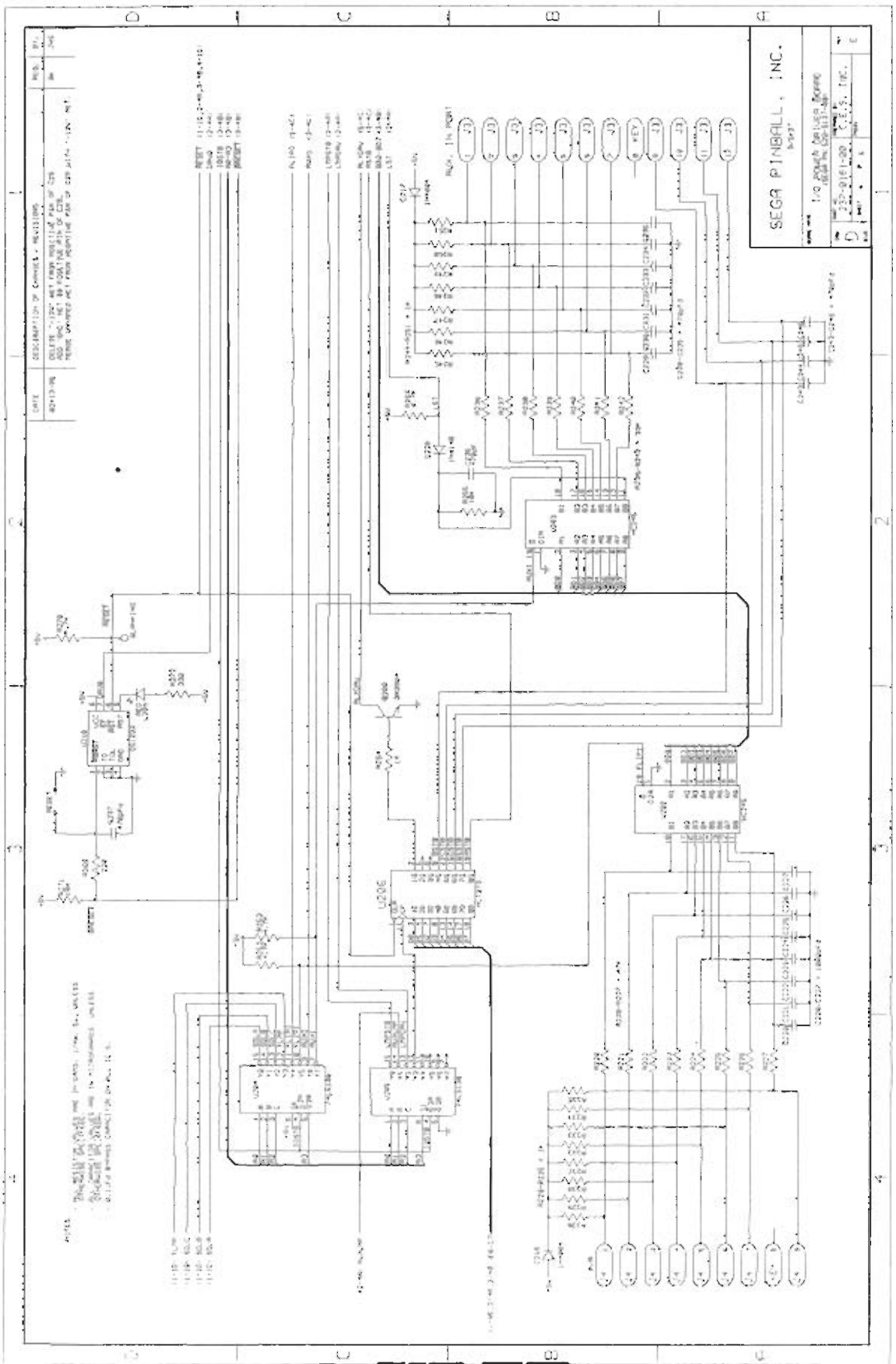
**Lamp Matrix:**
J12 has 10 low side drivers for the lamp strobes which consist of 19N06L MOSFETS. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the I/O from resetting. J13 has 8 high side drivers with each having a status indicator. All the status indicators 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.

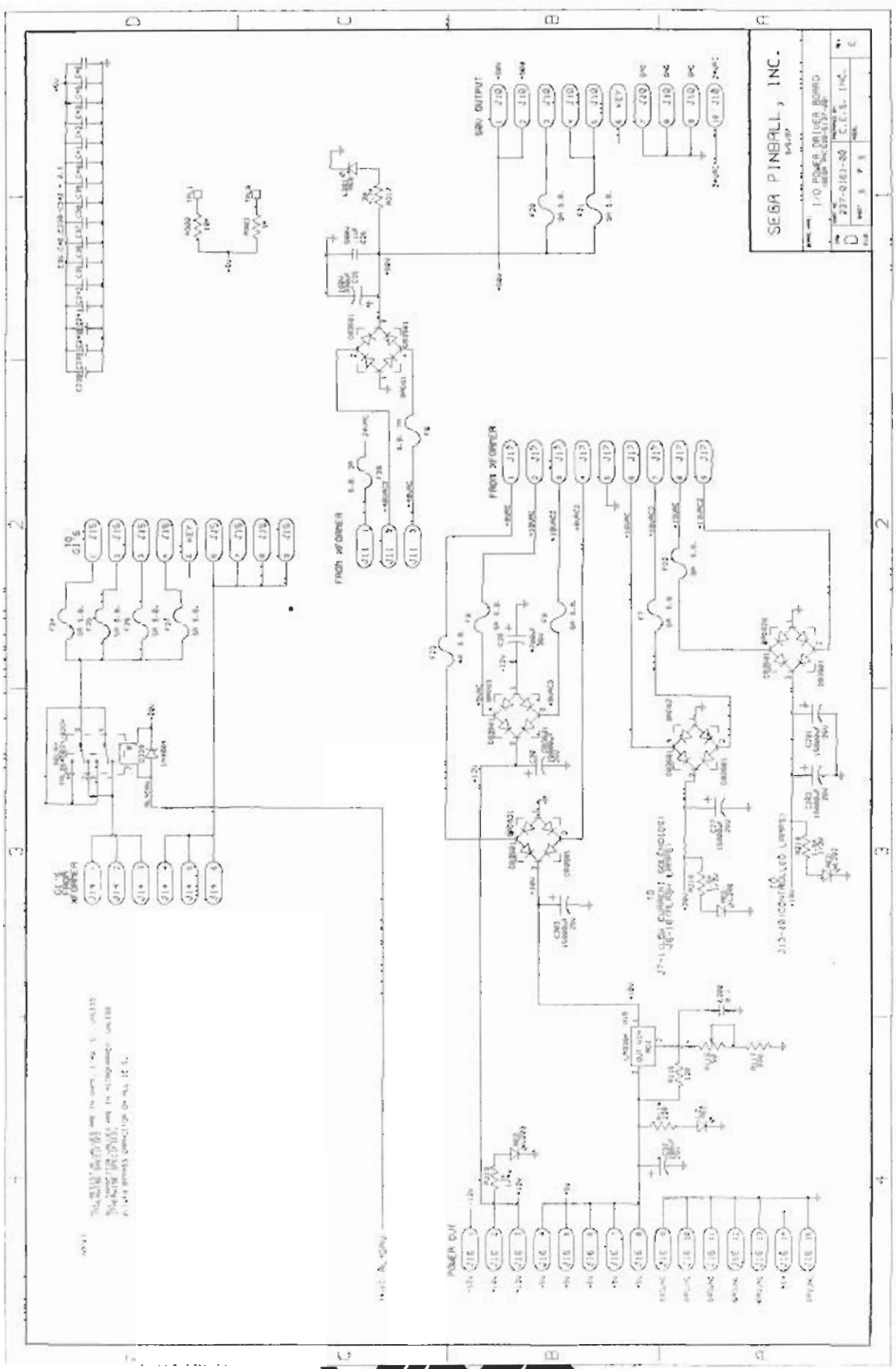
**General Illumination (G.I.) Lights:**
J15 has 6VAC switched on and off by a relay on the I/O Board. The relay is controlled by Q200 which supplies power to the 24V coil winding to activate the relay. There are 4 taps on J15 each fused at 5A for this 6VAC source.

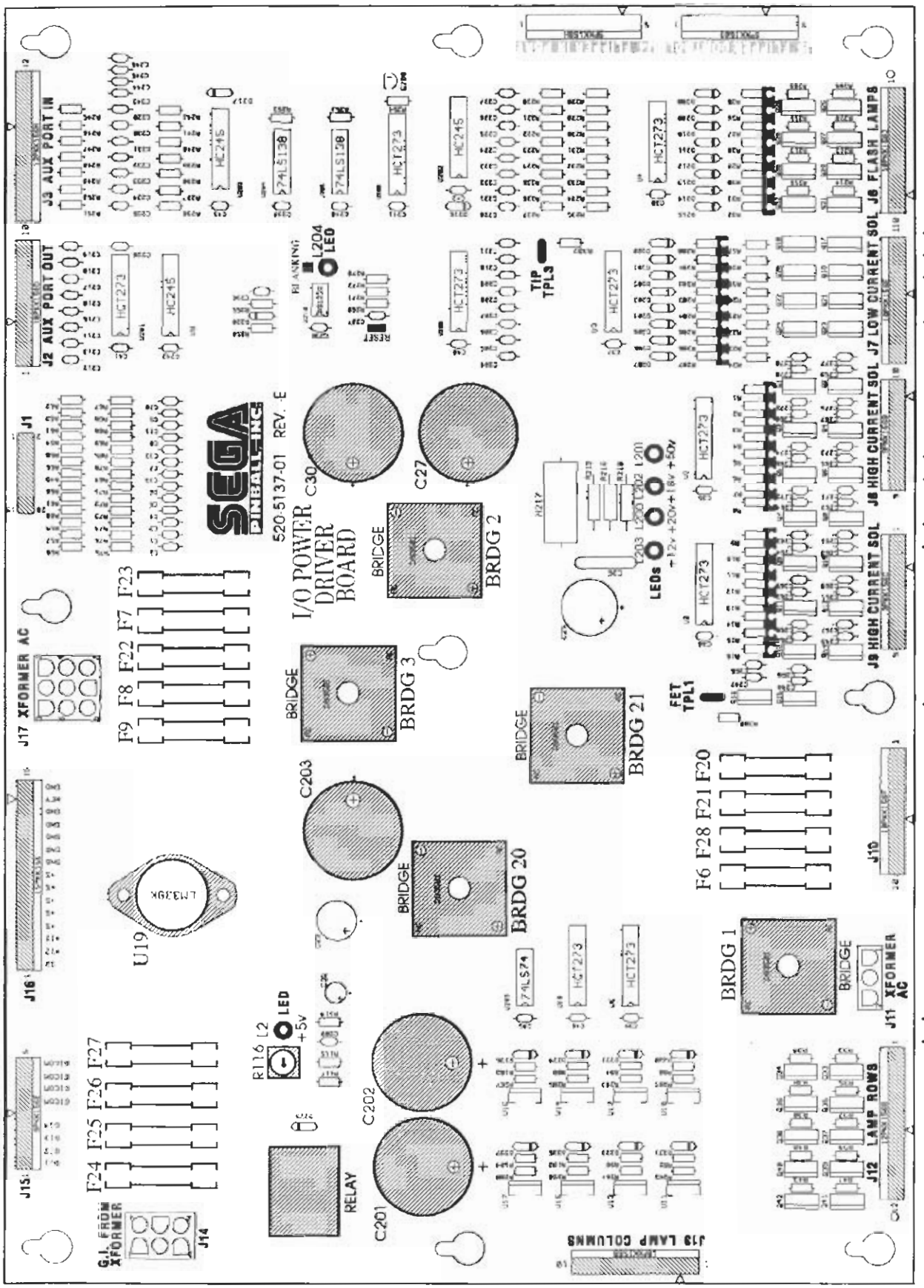

SEGA PINBALL, INC.


SEGA PINBALL, INC.
LAMP RETURNS
LAMP DRIVERS


SEGA PINBALL, INC.


SEGA PINBALL, INC.


SEGA PINBALL, INC.
I/O POWER DRIVER BOARD
FROM XFORMER
POWER OUT


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
J3 AUX PORT IN
J2 AUX PORT OUT
J8 FLASH LAMPS
J7 LOW CURRENT SOL
J6 HIGH CURRENT SOL
J9 HIGH CURRENT SOL
J17 XFORMER AC
J16
J15
J14 G.I. FROM XFORMER
J19 LAMP COLUMNS
J12 LAMP ROWS
J11 XFORMER AC
J10
J1
SEGA PINBALL, INC.
520-5137-01 REV. E
I/O POWER DRIVER BOARD
BRDG 1
BRDG 2
BRDG 3
BRDG 20
BRDG 21
BRIDGE
RELAY
U19
LM339K
C201
C202
C203
C27
C30
L204 LED
RESET
TIP TPL3
FET TPL1
L2 LED +5v
R116 L2
LEDs
F6 F7 F8 F9 F20 F21 F22 F23 F24 F25 F26 F27 F28

## *I/O Power Driver Board Parts*

| ITEM | QTY | PART NUMBER | REF-DESIGNATOR | DESCRIPTION (NS = Not Stuffed) |
|---|---|---|---|---|
| — | 1 | 520-5137-01 | I/O Power Driver Board | Complete PCB Assembly |
| 1 | 16 | 125-5027-00 | C255>C262, C271>C278 | 0.1uF, (104), 100v, Cap. |
| 2 | 22 | 125-5028-00 | C204>C219, C228>C237, C243>C246 | 470pF, (471), Axial Cap. (C204>C211: NS) |
| 3 | 16 | 125-5029-00 | C247>C254, C263>C270 | 0.01uF, (103), 100v Cap. |
| 4 | 13 | 125-5030-00 | C7 C8 C9 C10 C11 C12 C13 C1 C2 C3 C4 C5 C6 | 220pF, (221), Cap. |
| 5 | 0 | n/a | C220>C227 | (C220>C227: NS) |
| 6 | 17 | 125-5031-00 | C35>C43, C45, C46, C200, C238>C242 | 0.1uF, (104), Cap. |
| 7 | 16 | 110-0106-00 | Q1>Q16 | 20N10L STP, Transistor |
| 8 | 32 | 121-5042-00 | R1>R16, R200>R215 | 22K Ω 1/4W Res. |
| 9 | 16 | 121-5003-00 | R17>R32 | 620 Ω 1/4W Res. |
| 10 | 17 | 121-5045-00 | R33>R42, R236>R242 | 39K Ω 1/4W Res. |
| 11 | 13 | 121-5007-00 | R64>R76 | 100 Ω 1/4W Res. |
| 12 | 8 | 121-5029-00 | R90, R92, R94, R96, R98, R100, R102, R104 | 6.8K Ω 1/4W Res. |
| 13 | 1 | 121-5030-00 | R115 | 120 Ω 1/4W Res. |
| 14 | 0 | n/a | R220>R227 | (R220>R227: NS) |
| 15 | 9 | 121-5009-00 | R228>R235, R245>R251, R254, R302 | 1K Ω 1/4W Res. (R228>R235: NS) |
| 16 | 8 | 121-5032-00 | R261>R268 | 47K Ω 1/4W Res. |
| 17 | 2 | 121-5033-00 | R114, R269 | 220 Ω 1/4W Res. |
| 18 | 8 | 121-5021-00 | R49, R57>R61, R252, R253, R256, R270 | 4.7K Ω 1/4W Res. (R252: NS) |
| 19 | 11 | 121-5011-00 | R50>R56, R255, R271, R300 | 10K Ω 1/4W Res. |
| 20 | 2 | 121-5036-00 | R117, R272 | 330 Ω 1/4W Res. |
| 21 | 8 | 100-5019-00 | 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 U211and each bank consists of 16Kbytes. 8Kbytes of RAM (U212) is available to the CPU. The RAM is battery backed and has a write protected area. Battery back up is accomplished by 3-AA Cells which have a test point VB to check the battery voltage status. The write protected area consists of 512 Bytes used for storing game settings. This section of RAM can only be written to when the coin door is open. The coin door switch comes into the CPU on CN6-12 and is fed into the address decoding PAL U213. When this memory protect signal is low writes to the protected RAM area are prohibited. Address decoding for the system is accomplished by one PAL U213 and one 1-of-8 decoder U214.

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

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

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

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

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

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

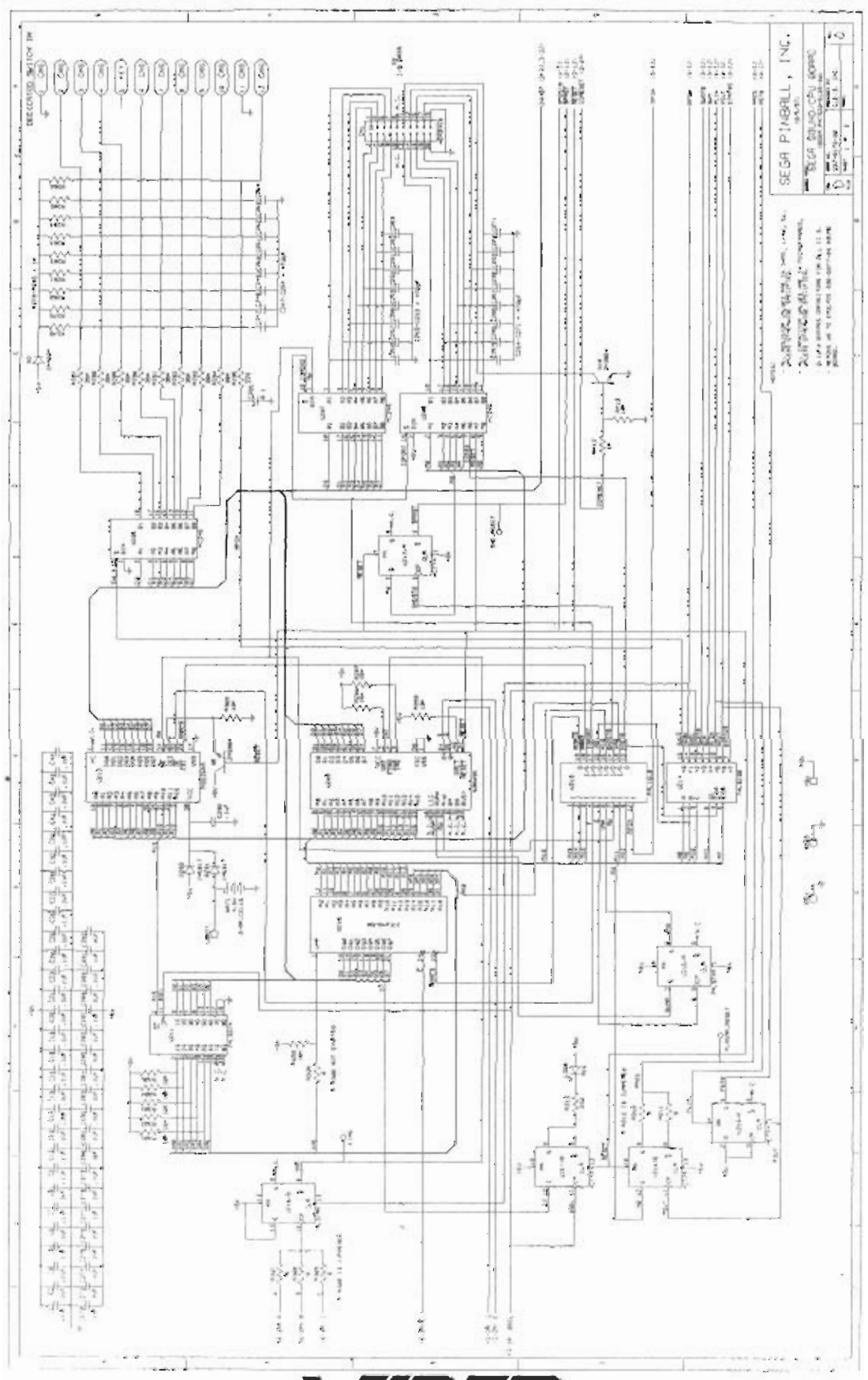
**Other Test Points:**
E & Q - The CPU signals for both 68B09E processors. Should be at 2Mhz with Q leading E by 500 nsec.

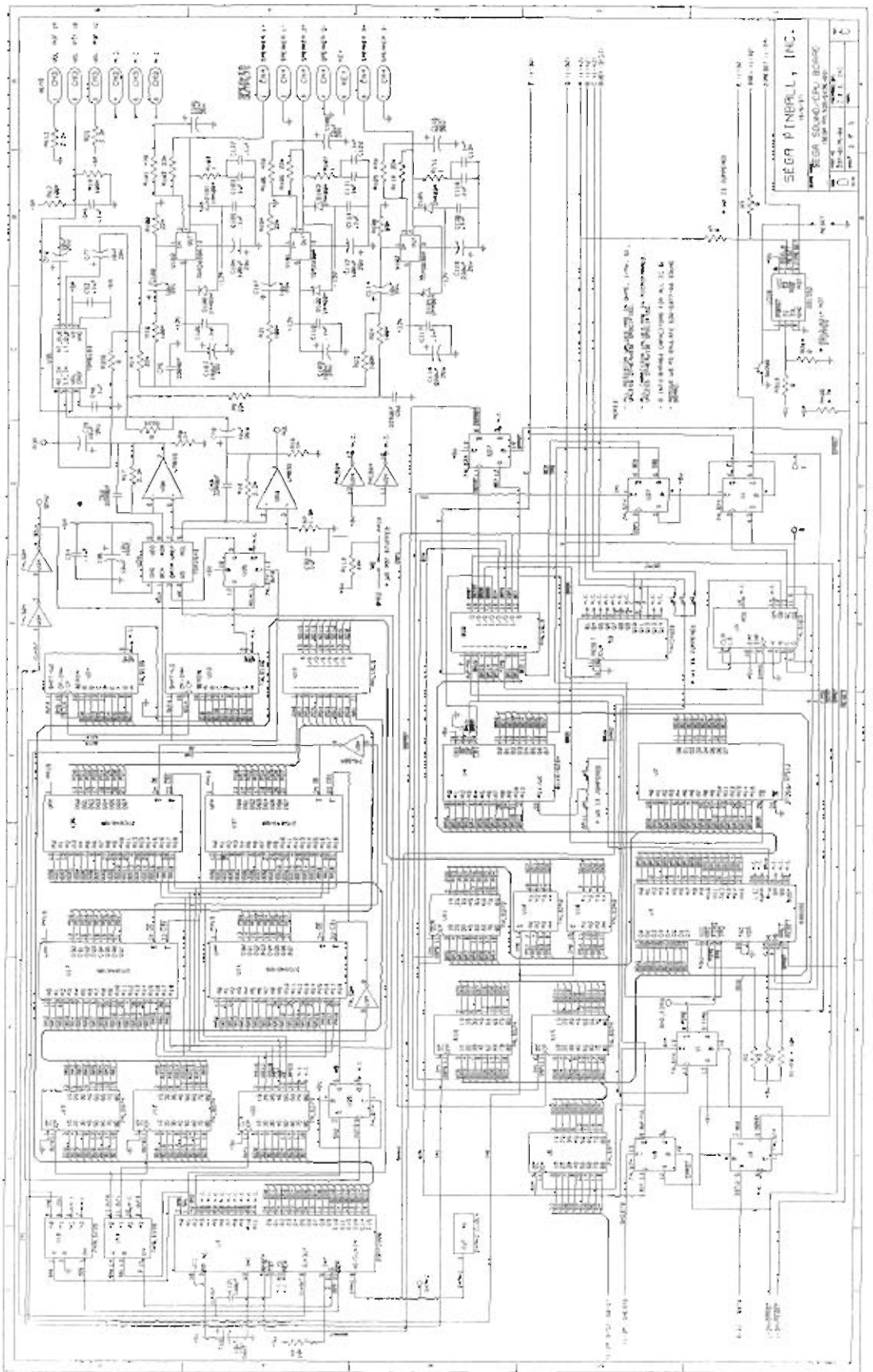
24Mhz - The oscillator used for the BSMT & derivation of E & Q.

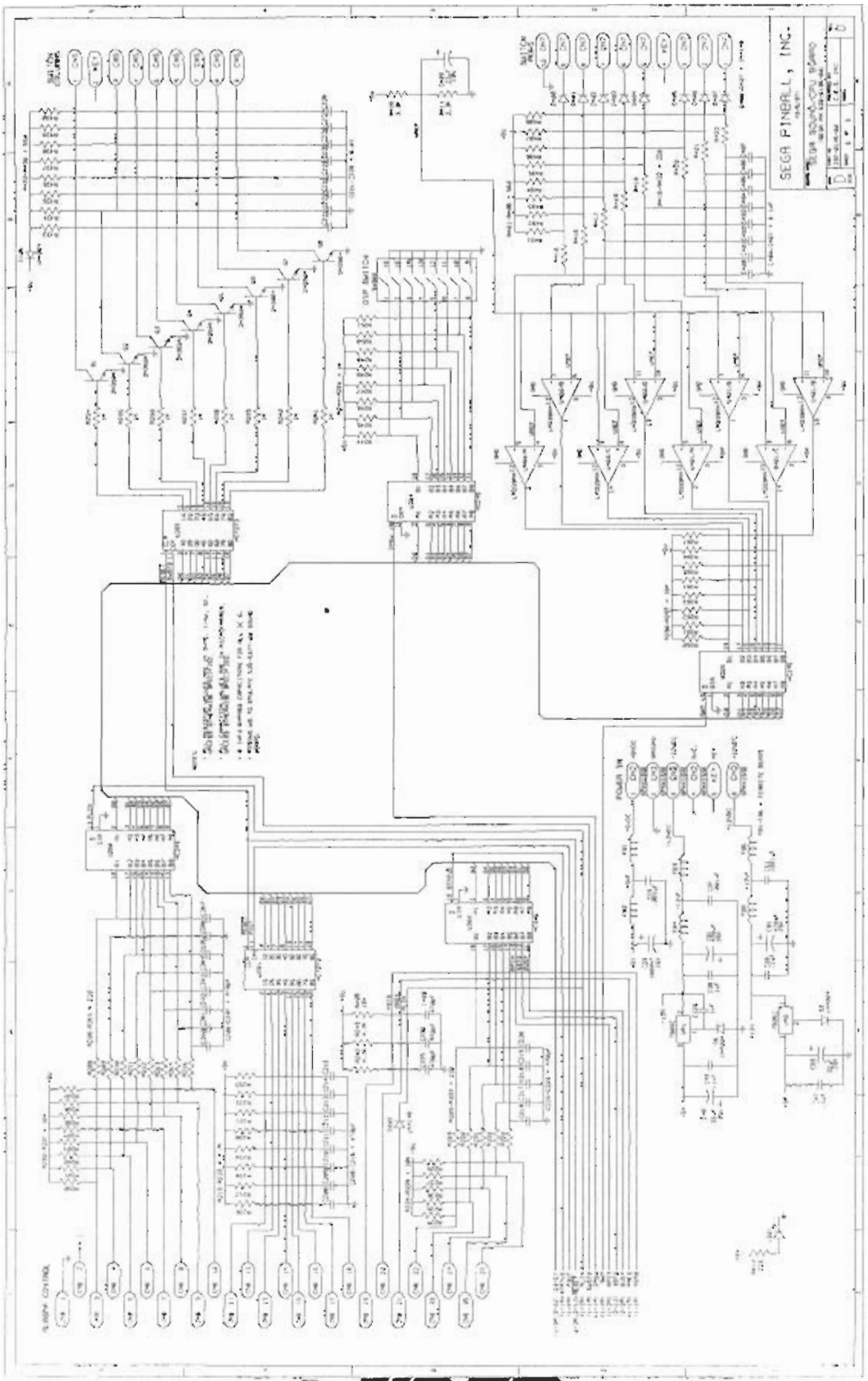
SND-FIRQ - The sound sections CPU interupt.

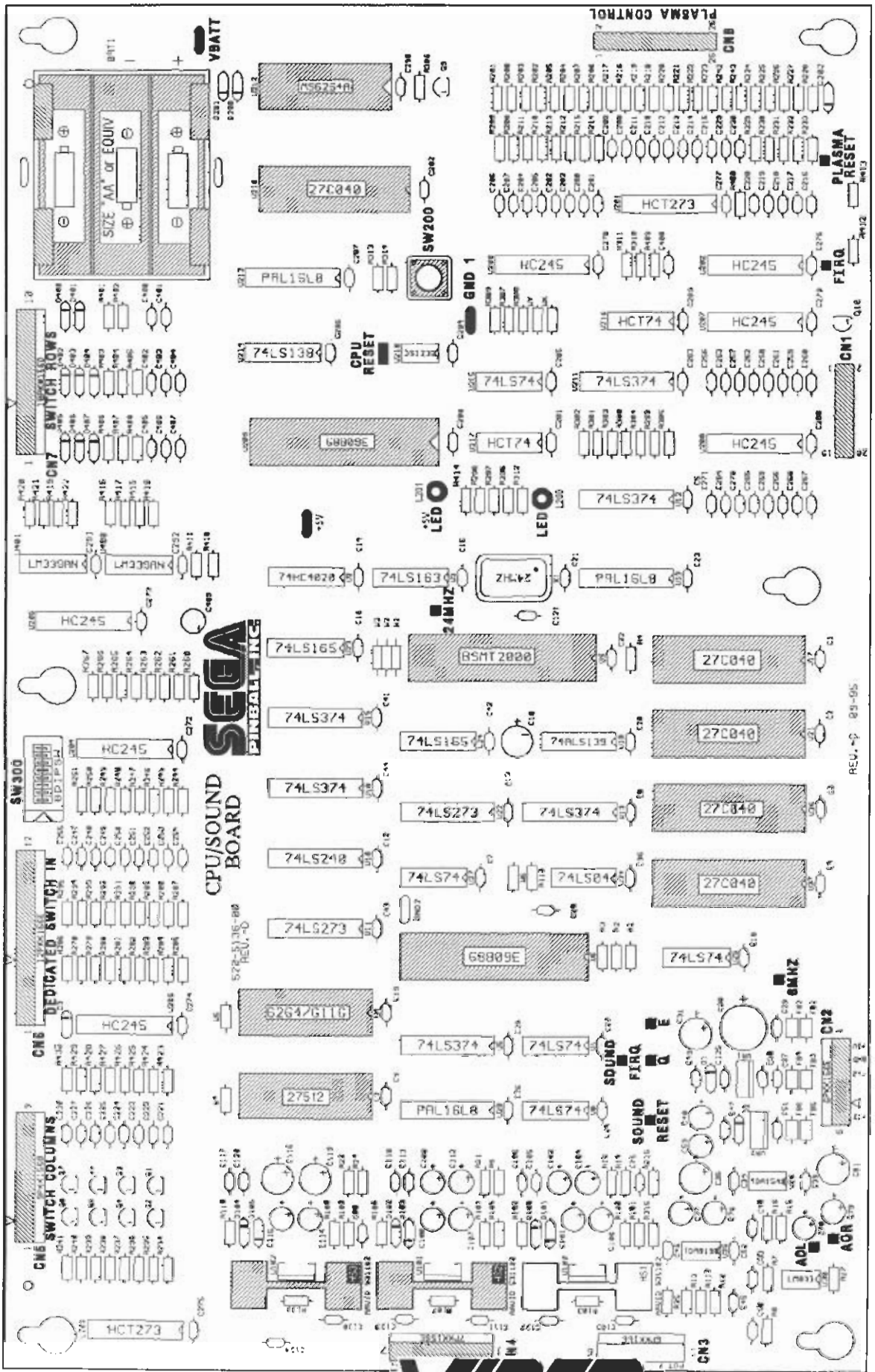
6Mhz - This clock is generated internally on the BSMT and is used for shifting the data samples into th DAC.

## *CPU/Sound Board Schematic (Sheet 1 of 3)*




SEGA PINBALL, INC.

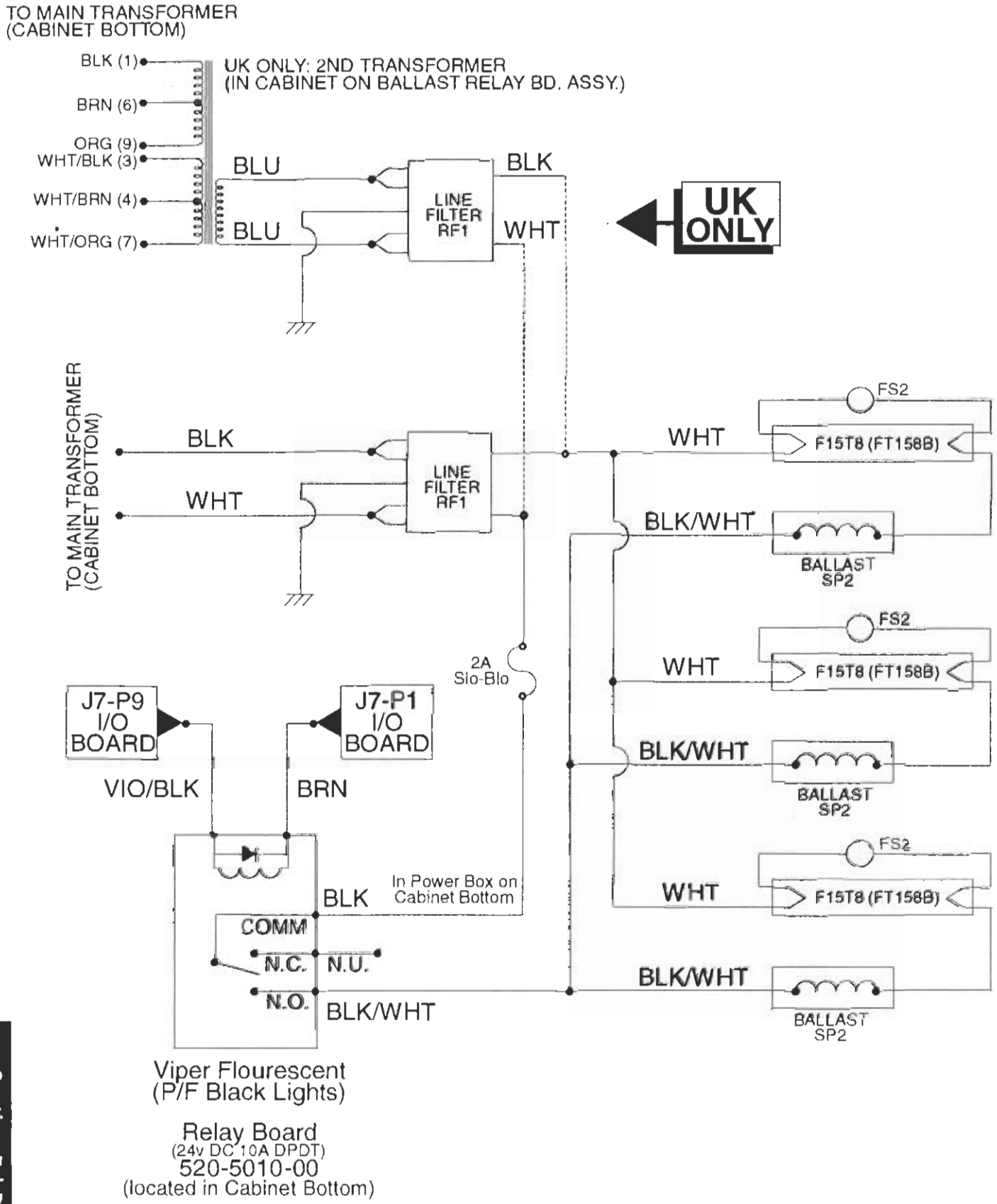

SEGA PINBALL, INC.


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
SEGA
PINBALL INC
VBATT
PLASMA CONTROL
SW200
GND 1
CPU RESET
FIRQ
PLASMA RESET
SWITCH ROWS
DEDICATED SWITCH IN
SWITCH COLUMNS
24MHZ
6MHZ
SOUND FIRQ
SOUND RESET
AOR
AOL
CN1
CN2
CN3
CN4
CN5
CN6
CN7
CN8
SW300

## 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 | 0Ω *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. ⑧** Table) | U7 | 27512 EPROM |
| 19 | 1 | 045-5015-07 | CN4 | 7PKK156 (PIN5=KEY) |
| 20 | 1 | Not Used | RESET | *Do Not Stuff* |
| 21 | 5 | (See Pg. **DR. ⑧** Table) | U17, U21, U36, U37, U210 | 27C040 EPROM |
| 22 | 2 | 100-5008-00 | U23, U24 | 74LS165 |
| 23 | 4 | 125-5017-00 | C76>C79 | 10uF, 25v, Radial Lytic Cap. |
| 24 | 4 | 125-5020-00 | C40, C59, C101, C108, C115 | 22uF, 25v, Radial Lytic Cap. (C101: NS) |
| 25 | 2 | 125-5017-00 | C100, C10,7 C114 | 10uF, 35v, Radial Lytic Cap. (C100: NS) |
| 26 | 2 | 125-5015-00 | C102, C104, C109, C112 | 100uF, 25v, Rad. Lfc. Cap. (C102, C104: NS) |
| 27 | 1 | 125-5014-00 | C409 | 22uF, 16v, Radial Lytic Cap. |
| 28 | 1 | 100-5016-00 | U35 | TDA1899 |
| 29 | 1 | 125-5037-00 | C30 | 1000uF, 16v, Radial Lytic Cap. |
| 30 | 1 | 100-0027-00 | U34 | 74LS04 |
| 31 | 1 | 100-0043-00 | U18 | 74ALS139 |
| 32 | 6 | 100-0064-00 | U5, U12, U13, U15, U16, U211 | 74LS374 |
| 33 | 1 | 100-0249-00 | U2 | 74HC4020 |
| 34 | 1 | 100-0149-00 | U10 | 74LS240 |
| 35 | 6 | n/a | W1>W6 | 0Ω *Jumper Wire (24ga.)* |
| 36 | 2 | 125-5012-00 | C31, C81 | 470uF, 25v, Radial Lytic Cap. |
| 37 | 2 | 125-5017-00 | C10, C35 | 10uF, 16v, Radial Tant. Cap. |
| 38 | 2 | 125-5019-00 | C116, C119 | 220uF, 25v, Radial Lytic Cap. |
| 39 | 1 | 045-5015-06 | CN2 | 6PKK156 (PIN 5=KEY) |
| 40 | 1 | 140-0011-00 | X1 | 24Mhz |
| 41 | 1 | 105-0116-00 | U9 | BSMT2000 |
| 42a | 1 | 965-0136-00 | **U19 - YELLOW DOT** | PAL16L8 (Programmed) - **YELLOW DOT** |
| 42b | 1 | 965-0137-00 | **U20 - WHITE DOT** | PAL16L8 (Programmed) - **WHITE DOT** |
| 42c | 1 | 965-6504-00 | **U213- BLUE DOT** | PAL16L8 (Programmed) - **BLUE DOT** |
| 43 | 5 | 100-0037-00 | U1, U8, U25, U27, U215 | 74LS74 |
| 44 | 3 | 125-5043-00 | C29, C37, C51 | 0.001uF, (102), Cap. |
| 45 | 79 | 125-5031-00 | C1>C5, C7>C9, C12>C16, C18>C21, C23>C26, C28, C32>C34, C36, C38, C39, C41>C47, C49, C52, C102 C103, C105, C106, C110, C111, C113, C117, C118, C120, C122>C125, C255, C272>C292, C400>C407 | 0.1uF, (104), Axial Cer. Cap. (C102, C103, C105, C106: NS) |
| 46 | 1 | 125-5038-00 | C121 | 100pF, (101), Cap. |
| 47 | 4 | 125-5039-00 | C48, C50, C75, C80 | 0.0022uF, (222), Cap. |
| 48 | 39 | 125-5028-00 | C200>C220, C229, C230, C247>C254, C256>C271 | 470pF, (471), Cer. Cap. (C200>C207: NS) |
| 49 | 8 | 125-5029-00 | C221>C228, C408 | 0.01uF, (103), 100v Cap. (C408: NS) |
| 50 | 1 | 045-5015-06 | CN3 | 6PKK156 |
| 51 | 1 | 100-0375-00 | U30 | LM833 |
| 52 | 2 | 100-0022-00 | U22 U11 | 74LS273 |
| 53 | 7 | 112-5003-00 | D1>D3, D100>D105 | 1N4004, Diode (D100, D101: NS) |
| 54 | 2 | 112-5008-00 | D200, D201 | 1N5817, Diode |
| 55 | 8 | 112-0054-00 | D202, D400>D407 | 1N4148, Diode (D202: NS) |
| 56 | 1 | 124-5002-00 | VR1 | LM7905CT -5v Regulator |
| 57 | 2 | 100-5016-20 | U100>U102 | TDA2030V (U100: NS) |
| 58 | 1 | 100-5018-00 | U26 | TDA1543 |
| 59 | 1 | n/a | SW200 | B3F4000 |
| 60 | 1 | 165-5099-00 | **L200** | **LED T1-3/4 DIFFUSER LED** |
| 61 | 1 | 165-5099-00 | **L201** | **LED T1-3/4 DIFFUSER LED** |
| 62 | 2 | 100-5015-00 | U216, U217 | HCT74 |
| 63 | 1 | 100-0148-00 | U214 | 74LS138 |
| 64 | 1 | 105-0046-00 | 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 | 1 | 100-5023-00 | U218 | DS1232 |
| 74 | 1 | 045-5015-26 | CN8 | 26-Pin, 0.1 HEADER |
| 75 | 1 | 045-5014-01 | CN7 | 10PKK156 (PIN 4=KEY) |
| 76 | 4 | n/a | VBATT +5V GND1, GND2 | *Test Point Wire (24ga.) Loops* |
| 77 | 1 | 045-5015-00 | CN6 | 12PKK156 (PIN 5=KEY) |
| 78 | 1 | 181-5002-00 | SW300 | 8-Pin, Dip Switch |
| 79 | 2 | 100-0377-00 | U400, U401 | LM339AN |
| 80 | 1 | 105-0052-05 | U4 | 6116 RAM |
| 81 | 3 | 535-5000-10 | U100>U102 | AAVID 531102 |
| 82 | 3 | 077-5209-00 | U6, U9, U209 | 40-Pin, IC Socket |
| 83 | 5 | 077-5217-00 | U17, U21, U36, U37, U210 | 32-Pin, IC Socket |
| 84 | 3 | 077-5208-00 | U4, U7, U212 | 28-Pin, IC Dip Socket |

## *Relay Board & Playfield Black Light Schematic*



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**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.

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2. SUCH PRODUCTS ARE PROPERLY PACKAGED AND THEN RETURNED FREIGHT PREPAID, TO SELLER'S PLANT.

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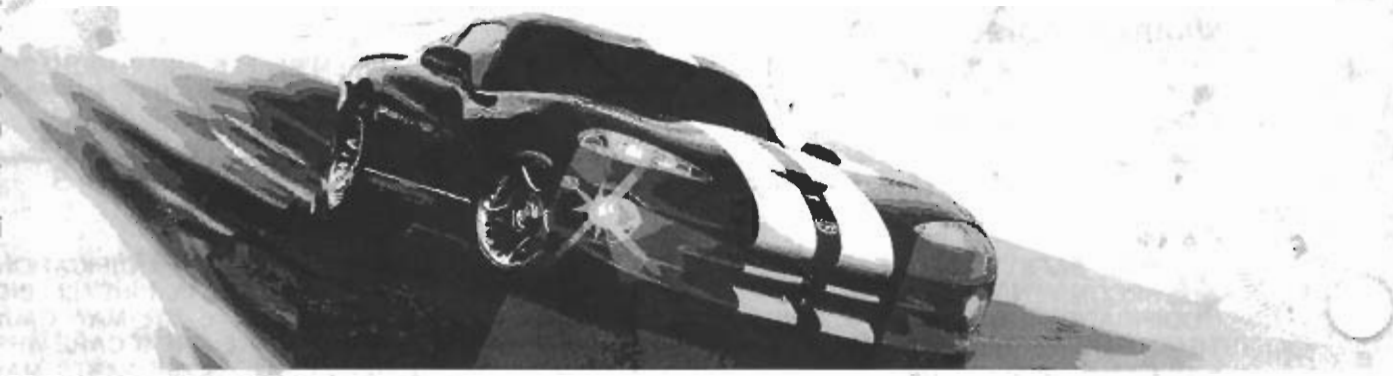


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