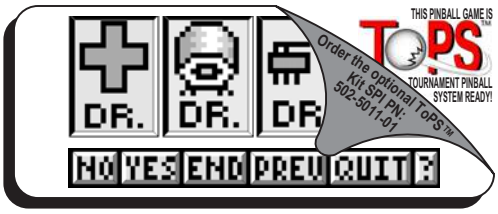
Find-It-In-Front: Dr. Pinball Section

The inside cover & the front pages DR. ❶ thru DR. ❿ covers the basics...

Find the answers to your questions here...
If you still need help, give us a call!

STERN® PINBALL, INC.



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

Joe Blackwell
DIRECTOR,
Parts Sales &
Technical Support

Susan White
Parts
Sales
MANAGER

Patty Schraps
Parts
Stockroom
MANAGER

Your Parts Sales & Technical Support Team

Chas Siddiqi
Technical
Support
ENGINEER

Patrick Powers
Technical
Support
ENGINEER

J. Alfer
Technical Support
Documentation
ADMINISTRATOR

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

1-800-KICKERS

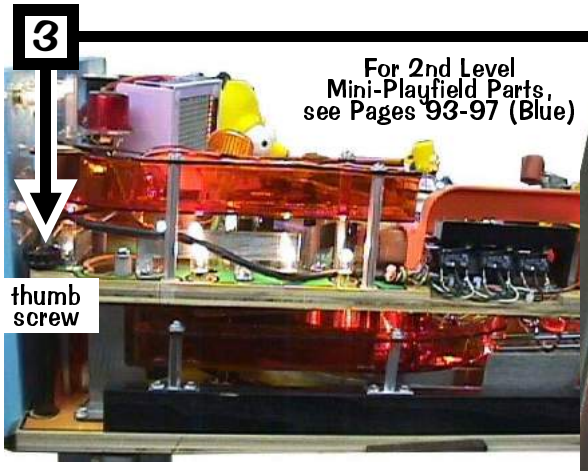
Visit us at our Web Site www.SternPinball.com.

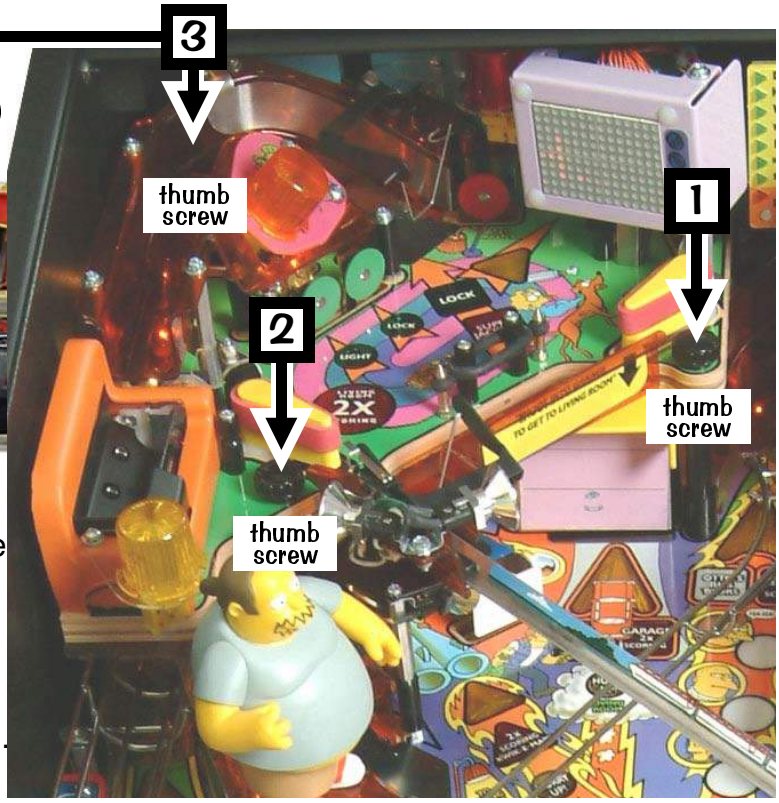
Stern® Pinball, Inc.
All Rights Reserved. Printed in the U.S.A.
July 2004

SPI Part Number
780-5077-01

For Proper Operation of The Simpsons™ Pinball Party, five (5) Pinballs must be installed!

Removal of the 2nd Level (Upper) Mini-Playfield for Service or Access Underneath





Removal: There are three (**3**) Thumb Screws *(Black Knobs)* which secures the 2nd Level Mini-Playfield to the Support Posts. Two (**2**) are located just below the Mini-Flipper Bats, and the **3rd** one is *behind* the Plastic Ramp.

You can now *carefully* move the playfield. **TAKE CARE!** when lifting so as not to damage the bulbs on the Back Panel.

If the playfield needs servicing outside or away from the game cabinet, note the wiring and connector harness from the TV Set (via the Back Panel Access Hole) and the remaining harnesses via the Main Playfield Access Hole (all of which need to be disconnected).

Reinstallation: After the Mini-Playfield is positioned back into place, hold down firmly while tightening the Thumb Screws. After all three knobs are secured, press down firmly with one hand on the playfield and ***ensure there is no movement*** *(or play).* If harnesses were disconnected, ensure they were all properly fed through the same access holes and the connectors are seated correctly.

It is always a good idea to enter Diagnostics (Begin Play Test) or play a game with the glass removed to ensure all switches, coils and lamps are still working properly.

Look over the TOURNAMENT MENU in Portals™!
*Read over Section **3**, Chapter **7**, Pages **53-57**.*

An Optional Tournament Kit is required for this ToPS™ Ready Pinball Game.
You can now easily set-up, start and end Tournaments for cash, tokens, tickets or points!

New to our Pinball Games?
Don't forget to go over **Section 3, Chapter 1, Portals™ Service Menu Introduction**. *If using Diagnostics...very useful!* Got confused? Comments? Questions? Call Technical Support at 800-542-5377 or 708-345-7700 (Option 1).

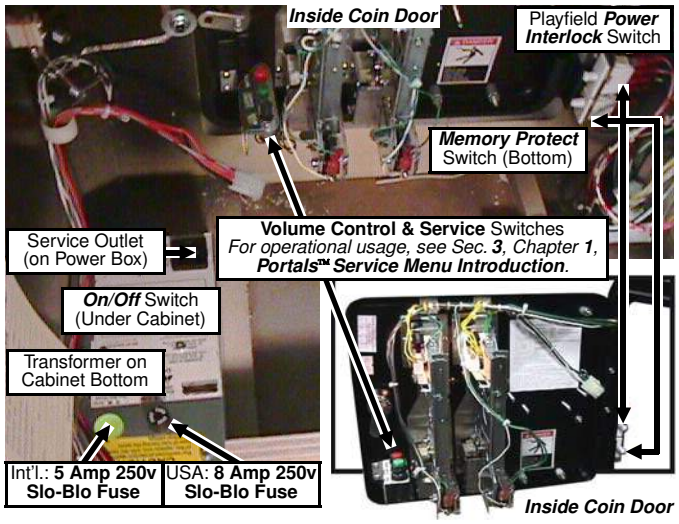
Backbox PCB Fuses, ROMs, Bridges, Relays, P/F & Cabinet Fuses, Cab. Switches

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

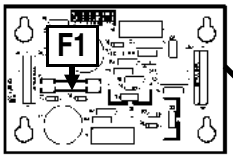
QUICK REFERENCE FUSE CHART

Backbox Fuses			
LOC:	**DISPLAY POWER SUPPLY (P.S.) BOARD**		
F1	¾A 250v S.B.	90v DC	High Voltage Display
LOC:	**I / O POWER DRIVER BOARD**		
F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	3A 250v S.B.	50v DC	Magnet(s)/Auxilliary **NOT USED**
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 (P/F) Fuses			
LOC:	**UNDER PLAYFIELD (near Flippers)**		
n/a	3A 250v S.B.	50v DC	Rt. & Upr. Rt. Flips **(BLU-YEL⇆RED-YEL)**
n/a	3A 250v S.B.	50v DC	Left Flipper (GRY-YEL⇆RED-YEL)
n/a	3A 250v S.B.	50v DC	Upr. P/F Rt. Flip. **(BLU-YEL⇆RED-YEL)**
n/a	3A 250v S.B.	50v DC	Upr. P/F Lt. Flip. (GRY⇆RED-YEL)

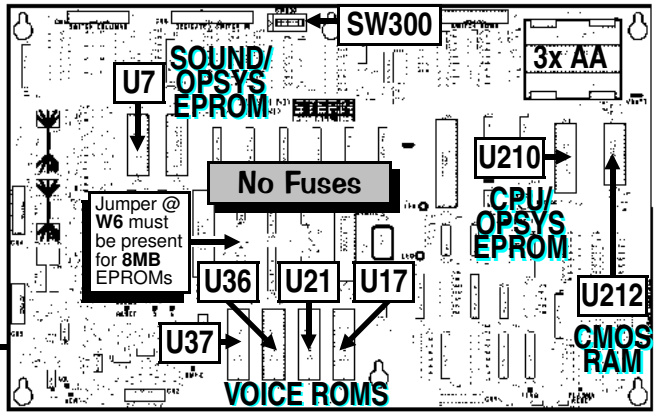
*For locations & more information on fuses, see Sec. **5**, Chapter **2**.*



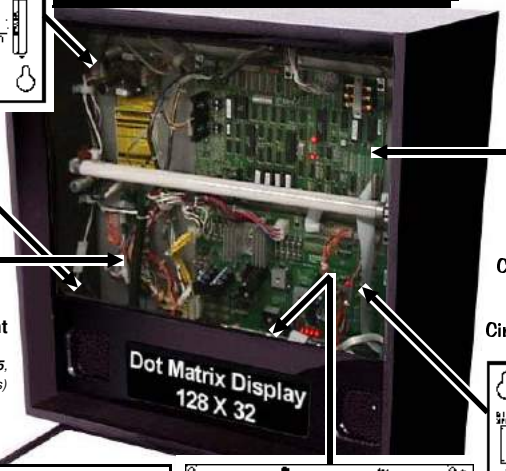
ROM TYPE on BD	LOCATION	SIZE	PART NUMBER
CPU Sound	U7	512K	965-0381-77
CPU Game	U210	1 MB	965-0382-77
CPU Voice ROM 1	U17	8 MB	965-0383-77
CPU Voice ROM 2	U21	8 MB	965-0384-77
CPU Voice ROM 3	U36	8 MB	965-0385-77
CPU Voice ROM 4	U37	8 MB	965-0386-77
DISPLAY Controller	U5	4 MB	965-0387-77



◀ Display Power Supply Bd.



CPU / Sound Board ▲



Solenoid Expander Board ‡

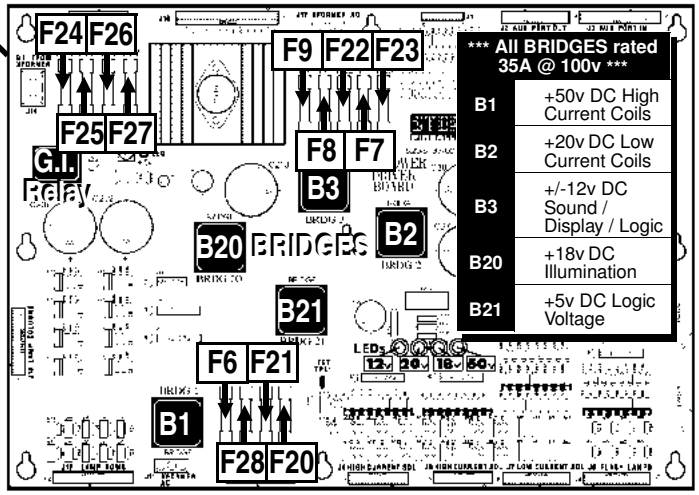
Tournament Interface Board ‡

‡ UK or Tournament GAMES ONLY

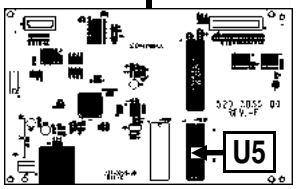
*For more info., see Section **5**, Chp. **4**, **PCBs** (Yellow Pages)*

For Schematics and/or Component Parts on PC Boards shown on this page, review Section 5, Chapter 4, Printed Circuit Boards (The Yellow Pages).

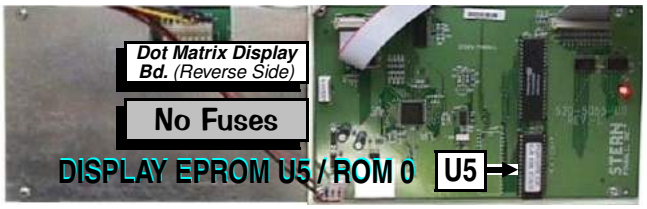
I/O Power Driver Board ▼



Display Controller Bd. ▶



The Display Controller has the Display EPROM (Location: U5 / ROM 0). This board is located behind the 128 X 32 Dot Matrix Display Board.

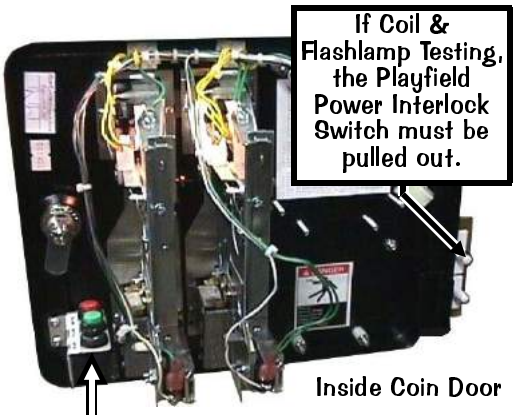


FIND-IT-IN-FRONT: Dr. Pinball Section Explained

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 - ❿) will assist the technician in locating important technical information needed to troubleshoot the Pinball Machine. **Dr. Pinball** is also available in a Flow Chart Help Format in the Game Display. To access, enter the **Portals™ Service Menu**.

How It Works

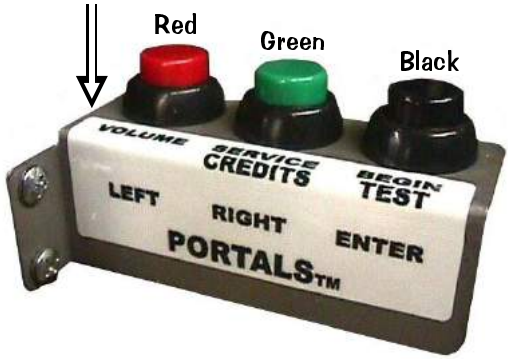
First, the operator / technician must enter the ***Service Menu Mode*** *(for a complete description of the* ***Portals™ Service Menu*** *and* ***ICONS Read!*** *Section* ***3****, Chapter* ***1****).* To get into the ***Service Menu Mode***, power-up the game *(if not already)* and open the **Coin Door**. On the **Coin Door** is the **Portals™ Service Switch Set** (**Red**, **Green** & **Black Buttons**).



Step 1: Push down the **Black "BEGIN TEST" Button**. Looking at the Video Display you will momentarily see the introductory screen followed by the **MAIN MENU**.

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

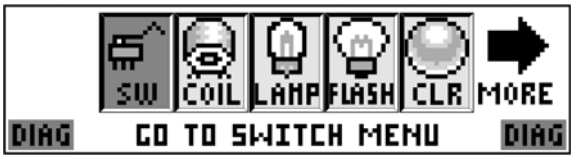
Step 3: Select or activate the *Icons* by pushing the **Black "ENTER" Button**.



While in the **Portals™ Service Menu**, the **Start Button** can be used in lieu of the **Black Button**; the **Left** & **Right Flipper Buttons** can be used in lieu of the **Red** & **Green Buttons**. However, in *Switch* or *Active Switch Tests* ***only*** the **Red** & **Green Buttons** can be used.

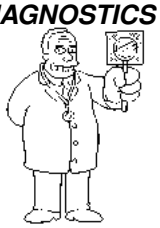
In our **Portals™ Service Menu**, selecting the "DR." *Icon* will bring the operator/technician into **DR. PINBALL** (**Flow Chart Menus**), the "on-screen" diagnostic aide. This is a feature that will allow you to utilize the power of the micro-processor assisting in troubleshooting a problem with the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

After entering **Portals™**, the **MAIN MENU** now appears with the "DIAG" *Icon* (**GO TO DIAGNOSTICS MENU**) flashing; press the **Black "ENTER" Button** to *activate* this **ICON**. The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing; use the **Red "LEFT"** or **Green "RIGHT" Buttons**, until the "DR." *Icon* (**DR. PINBALL**) is flashing:



Press the **Black "ENTER" Button** to *activate* this **ICON**. The **DR. PINBALL MENU** (**Flow Chart Menus**) now appears with the COIL "DR." *Icon* flashing. Three (3) *Icons,* Coil "DR.", Switch "DR." and Lamp "DR." are available for selection. Selecting a particular *Icon* 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. After selection, *Dr. Pinball* will now display a question or a procedure to follow such as "Does the lamp turn on?" or "Check bridge rectifier BR-20, if short replace." When *Dr. Pinball* displays a question or requests a procedure, *Dr. Pinball* will expect a response such as "NO" or "YES". You the operator/technician must respond by using the **Red** or **Green Buttons** to "SELECT" a *Mini-Icon* and the **Black Button** to "ACTIVATE or ENTER" your selection.

For Mini-Icons explanations & details, see the end of Section ***3****, Chapter* ***2****,* ***GO TO DIAGNOSTICS MENU****,* ***Dr. Pinball****.*



DIAGNOSTIC AIDS

OPEN THE DOOR

If this ***display flashes***, the game is indicating that **CMOS RAM** memory *(CPU Loc. **U212**)* 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 (Reset)*, by opening the ***Memory Protect Switch***. Check battery voltage at **VBATT Test Point** on the **CPU/Sound Bd.** *(more details in Section **5**, Chapter **4**, **PCBs**).*

OPERATOR ALERT!
#2 AUTO LAUNCH
COIL MALFUNCTION

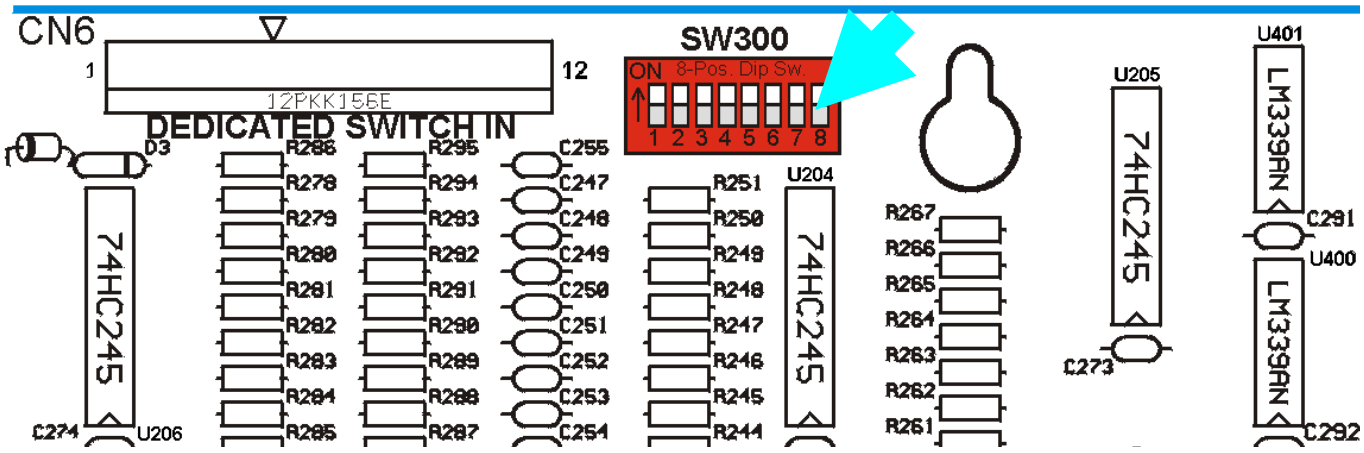
This ***display*** is shown momentarily during **Game Mode** or **Power-Up** to alert the operator of a coil malfunction *(coil doesn't energize or coil fires a multiple number of times)*. **OPERATOR ALERT!** works by monitoring any *switch activated coil* that has the potential to trap a ball when disabled *(e.g. in the Auto Launch, Scoop, Eject, etc.)*. This alert can also appear if a switch associated with a coil *(e.g. #16 Shooter Lane & #2 Auto Launch)* is stuck closed *(caused by a switch jam or stuck ball)*; the **CPU/Sound Board** will activate the coil approximately ten times and if the switch remains closed, the game will report this switch in **Technician Alerts** & will indicate the *following display warning:*

PLEASE CHECK
TECH REPORT
PORTALS->DIAG->TECH

If this ***display flashes*** *(along with an audible sound)*, the game has detected faulty switches and/or missing pinballs. To check, enter the **Portals™Service Menu System**, select the **"DIAG"** *Icon (**GO TO DIAGNOSTICS MENU**)* from the **MAIN MENU** and select the **"TECH"** *Icon (more details in Section **3**, Chapter **2**, **GO TO DIAGNOSTICS MENU**).*

CPU DIP SWITCH SETTINGS

Location of Dip Switch [SW300] is on the CPU/Sound Board (Right of CN6, Top Middle)



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
France	ON		▲	▲					
	OFF	▼			▼	▼	▼	▼	▼

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
Norway	ON		▲		▲				
	OFF	▼		▼		▼	▼	▼	▼

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
Australia	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
Portugal	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
Greece	ON	▲	▲	▲	▲				
	OFF					▼	▼	▼	▼

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
Spain	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
Italy	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
Denmark	ON	▲			▲				
	OFF		▼	▼		▼	▼	▼	▼

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
Netherlands	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
Finland	ON	▲		▲					
	OFF		▼		▼	▼	▼	▼	▼

CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
New Zealand	ON					▲			
	OFF	▼	▼	▼	▼		▼	▼	▼

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

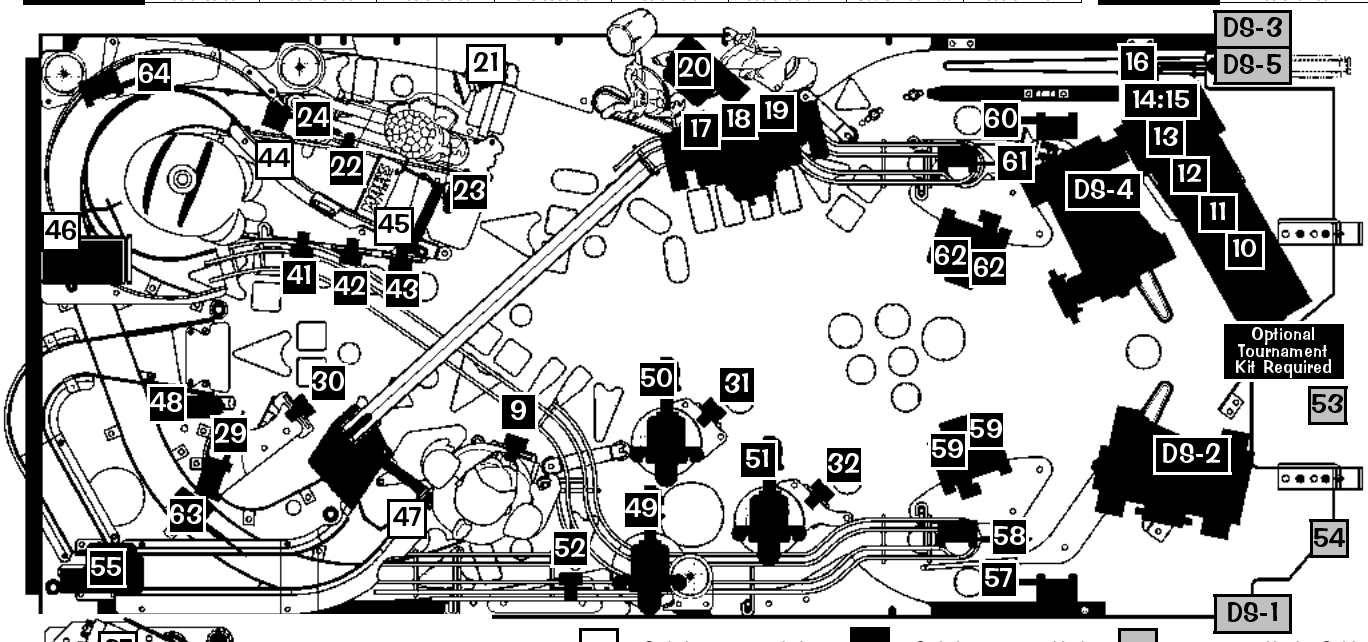
In SWITCH MENU also select:

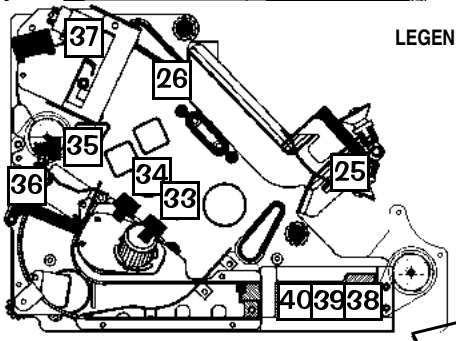
ACTIVE and DEDICATED SWITCH TESTS

SWITCH MATRIX GRID, DEDICATED SWITCHES & LOCATIONS

Row (Return) \ Column (Drive)	1: Q1 GRN-BRN CN5-P1	2: Q2 GRN-RED CN5-P3	3: Q3 GRN-ORG CN5-P4	4: Q4 GRN-YEL CN5-P5	5: Q5 GRN-BLK CN5-P6	6: Q6 GRN-BLU CN5-P7	7: Q7 GRN-VIO CN5-P8	8: Q8 GRN-GRY CN5-P9
1: U400 WHT-BRN CN7-P9	1 Cabinet Side LEFT BUTTON (UK ONLY) 180-5160-00	9 Below P/F COMIC BOOK GUY STANDUP 515-6027-08	17 Below P/F DROP TARGET #1 (TOP) DOTS 180-5158-00	25 Abv. Upr. P/F UPPER PLAYFIELD EXIT 180-5190-28	33 Blw. Upr. P/F UPF LIGHT STANDUP 515-5966-04	41 Below P/F BULLY 3-BANK (TOP) 515-6027-08	49 Below P/F LEFT BUMPER 180-5015-03	57 Below P/F LEFT OUTLANE 500-6227-02
2: U400 WHT-RED CN7-P8	2 Coin Door 4TH COIN SLOT 180-5204-00	10 Below P/F 5-BALL TROUGH #1 (LEFT) 180-5119-02	18 Below P/F DROP TARGET #2 (MID) DOTS 180-5158-00	26 Blw. Upr. P/F GARAGE RAMP ENTER 180-5190-28	34 Blw. Upr. P/F UPF LOCK STANDUP 515-5966-04	42 Below P/F BULLY 3-BANK (MID) 515-6027-08	50 Below P/F RIGHT BUMPER 180-5015-03	58 Below P/F LEFT RETURN LANE 500-6227-02
3: U400 WHT-ORG CN7-P7	3 Coin Door 6TH COIN SLOT *Future Use*	11 Below P/F 5-BALL TROUGH #2 180-5119-02	19 Below P/F DROP TARGET #3 (BOT) DOTS 180-5158-00	27 NOT USED	35 Blw. Upr. P/F UPF TOP STANDUP 515-5966-02	43 Below P/F BULLY 3-BANK (BOT) 515-6027-08	51 Below P/F BOTTOM BUMPER 180-5015-03	59 Below P/F LEFT SLINGSHOT 180-5054-00 (x2)
4: U400 WHT-YEL CN7-P6	4 Coin Door RIGHT COIN SLOT 180-5204-00	12 Below P/F 5-BALL TROUGH #3 180-5119-02	20 Below P/F ITCHY & SCRATCHY SAUCER DOTS 180-5116-01	28 NOT USED	36 Abv. Upr. P/F COUCH ENTER 180-5190-28	44 Above P/F UP RIGHT SAUCER BACKUP 180-5119-02	52 Below P/F POP SIDE STANDUP 515-6027-08	60 Below P/F RIGHT OUTLANE 500-6227-02
5: U401 WHT-GRN CN7-P5	5 Coin Door CENTER COIN SLOT / DBA 180-5204-00	13 Below P/F 5-BALL TROUGH #4 180-5119-02	21 Above P/F SPINNER 180-5010-04	29 Below P/F KWIK-E-MART LOOP 500-6227-02	37 Blw. Upr. P/F TV LOCKUP 500-6227-02	45 Above P/F RIGHT RAMP ENTER 180-5190-28	53 In Cabinet TOURNAMENT BUTTON 180-5174-00	61 Below P/F RIGHT RETURN LANE 500-6227-02
6: U401 WHT-BLU CN7-P3	6 Coin Door LEFT COIN SLOT 180-5204-00	14 Below P/F 5-BALL TROUGH VUK OPTO *See Sw. 14 Note*	22 Below P/F BART SKATEBOARD TOP 180-5190-48	30 Below P/F KWIK-E-MART STANDUP 515-6027-08	38 Abv. Upr P/F COUCH LOCK (BOT) 180-5119-02	46 Above P/F RIGHT RAMP MADE 180-5190-28	54 In Cabinet START BUTTON 180-5174-00	62 Below P/F RIGHT SLINGSHOT 180-5054-00 (x2)
7: U401 WHT-VIO CN7-P2	7 Coin Door 5TH COIN SLOT *Future Use*	15 Below P/F 5-BALL STACKING OPTO *See Sw. 15 Note*	23 Below P/F BART SKATEBOARD 180-5190-48	31 Below P/F ADV. POPS STANDUP 515-5966-07	39 Abv. Upr. P/F COUCH LOCK (MID) 180-5119-02	47 Above P/F LEFT RAMP ENTER 180-5190-28	55 Below P/F UPPER LEFT VUK 180-5116-01	63 Below P/F LEFT ORBIT 500-6227-02
8: U401 WHT-GRY CN7-P1	8 Cabinet Side RIGHT BUTTON (UK ONLY) 180-5160-00	16 Below P/F SHOOTER LANE 180-5157-00	24 Below P/F UPPER RIGHT SAUCER 180-5186-00	32 Below P/F LIGHT OTTO STANDUP 515-5966-08	40 Abv. Upr. P/F COUCH LOCK (TOP) 180-5119-02	48 Below P/F GARAGE DOOR 500-6138-01R	56 In Cabinet PLUMB BOB TILT *See Sw. 56 Note*	64 Below P/F RIGHT ORBIT 500-6227-02

IC U206 INPUTS \ GROUND	GROUND BLK CN6-P1, -P11
1: U206 GRY-BRN CN6-P2	DS-1 on Cabinet Side #1 LEFT FLIPPER BUTTON 180-5160-00
2: U206 GRY-RED CN6-P3	DS-2 Below Playfield #2 LEFT FLIPPER E.O.S (End-of-Stroke) 180-5149-00 *on Flipper*
3: U206 GRY-ORG CN6-P4	DS-3 on Cabinet Side #3 RIGHT FLIPPER BUTTON 180-5164-00 *Doubled*
4: U206 GRY-YEL CN6-P6	DS-4 Below Playfield #4 RIGHT FLIPPER E.O.S. (End-of-Stroke) 180-5149-00 *on Flipper*
5: U206 GRY-GRN CN6-P7	DS-5 on Cabinet Side #5 UPPER RT. FLIPPER BUTTON 180-5164-00 *Doubled*
6: U206 GRY-BLU CN6-P8	DS-6 on Coin Door #6 VOLUME (RED BUTTON) (In Test: LEFT) 180-5192-02
7: U206 GRY-VIO CN6-P9	DS-7 on Coin Door #7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) 180-5192-04
8: U206 GRY-BLK CN6-P10	DS-8 on Coin Door #8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) 180-5192-00





LEGEND NOTE: ☐ = Switches mounted above. ■ = Switches mounted below. ▒ = ... mounted in the Cabinet.

Switch Part Note: *¥ Yen Coin Switch is 180-5091-00. Part numbers which start with 515- or 500- include the bracket, target, and/or housing. Targets: See Appendix I, Stand-Up Targets, for pictorial views. Switches are listed again in the Pink and Blue Pages and list the securing hardware they're used on.*

Sw. 14 & 15 Part Note: *Transmitter & Receiver OPTO PC Boards are used for both Switches 14 & 15. Transmitter: 515-0173-00; Receiver: 515-0174-00.*

Switch 56 Part Note: *The Switch is comprised of a Hanger Bracket (535-5319-00) and Contact Wire (535-7563-01) located in the Cabinet.*

Some Switch Diodes are located under the playfield *on Terminal Strips* ***or*** *Diode Boards and not on the assemblies.* **DOTS:** Diode On Terminal Strip ***or*** **DODB:** Diode On Diode Board

The Simpsons Pinball Party

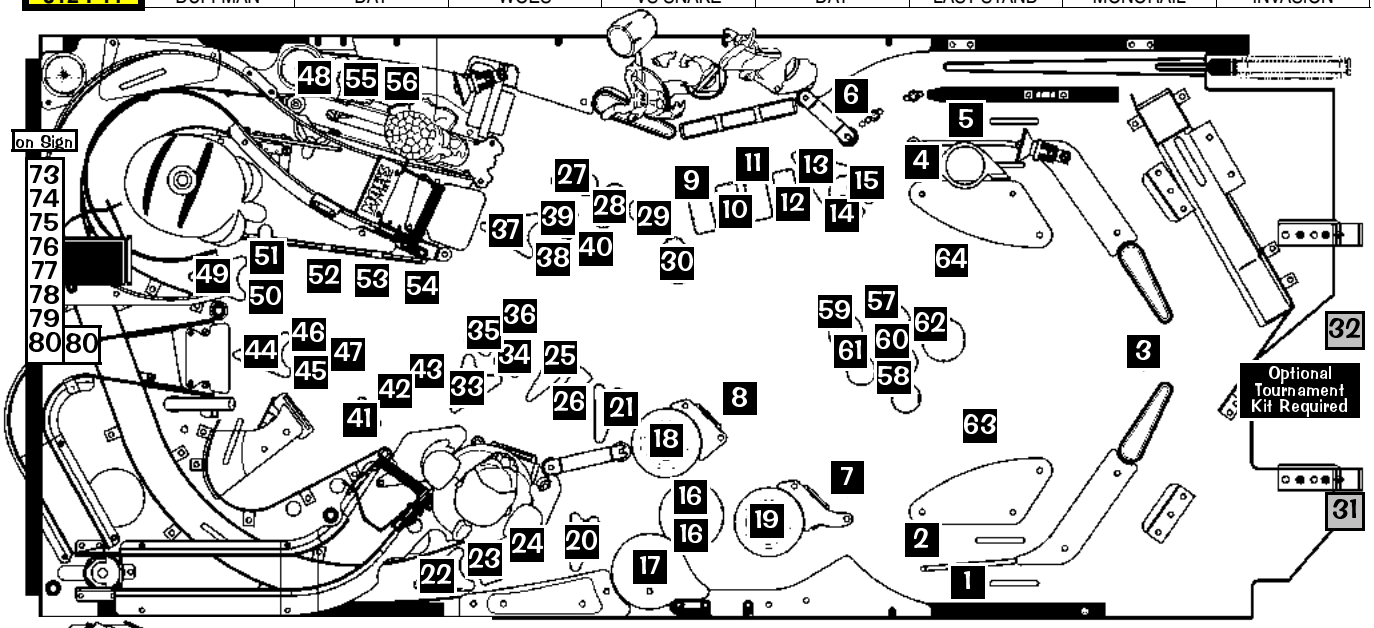
Find-It-In-Front: Dr. Pinball

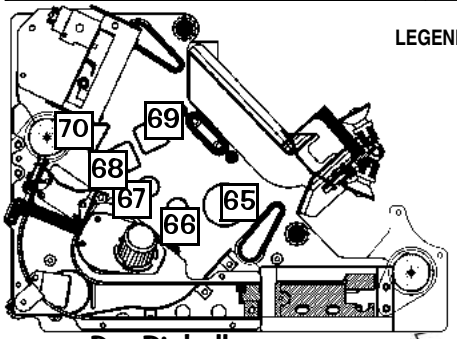
In LAMP MENU also select:

TEST ALL LAMPS, ROW & COLUMN LAMP TESTS

LAMP MATRIX GRID & LOCATIONS

Row (Ground) \ 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	1 #555 Bulb LEFT OUT EXTRA BALL	2 #555 Bulb LEFT RETURN EXTRA BALL	3 #555 Bulb SHOOT AGAIN	4 #555 Bulb RIGHT RETURN EXTRA BALL	5 #555 Bulb SPECIAL	6 #555 Bulb SHOOTER LANE SKILL SHOT	7 #555 Bulb LIGHT OTTO	8 #555 Bulb ADV. POPS
2: Q34 RED-BLK J12-P2	9 #555 Bulb SPAY ANYTHING	10 #555 Bulb KITTY KITTY BANG BANG	11 #555 Bulb FIELD OF SCREAMS	12 #555 Bulb ESOPHAGUS NOW	13 #555 Bulb I&S ARROW	14 #555 Bulb START I&S MULTIBALL	15 #555 Bulb I&S 2X SCORING	16 #44 Bulb (x2) POPS 2X SCORING
3: Q35 RED-ORG J12-P3	17 #555 Bulb LEFT POP BUMPER DOTS	18 #555 Bulb RIGHT POP BUMPER DOTS	19 #555 Bulb BOTTOM POP BUMPER DOTS	20 #555 Bulb MORE TIME	21 #555 Bulb COLLECT NUC-LEAR PLANT	22 #555 Bulb LEFT ORBIT ARROW	23 #555 Bulb CLETUS 2X SCORING	24 #555 Bulb LEFT ORBIT HURRY UP
4: Q36 RED-YEL J12-P4	25 #555 Bulb CBG SKILL SHOT	26 #555 Bulb CGB START HURRY UP	27 #555 Bulb DAREDEVIL RAMPS	28 #555 Bulb DAREDEVIL BUMPERS	29 #555 Bulb DAREDEVIL LOOPS	30 #555 Bulb DAREDEVIL TARGETS	31 #555 Bulb START BUTTON DOTS	32 #555 Bulb TOURNAMENT BUTTON * * *
5: Q37 RED-GRN J12-P5	33 #555 Bulb LEFT RAMP ARROW	34 #555 Bulb TREEHOUSE OF HORROR	35 #555 Bulb TREEHOUSE 2X SCORING	36 #555 Bulb LEFT RAMP HURRY UP	37 #555 Bulb RIGHT RAMP ARROW	38 #555 Bulb GET DUFFED!	39 #555 Bulb MOE'S 2X SCORING	40 #555 Bulb RIGHT RAMP HURRY UP
6: Q38 RED-BLU J12-P6	41 #555 Bulb MINI LOOP ARROW	42 #555 Bulb 2X SCORING KWIK-E-MART	43 #555 Bulb KWIK-E-MART HURRY UP	44 #555 Bulb GARAGE ARROW	45 #555 Bulb CLEAN THE GARAGE	46 #555 Bulb GARAGE 2X SCORING	47 #555 Bulb GARAGE HURRY UP	48 #555 Bulb RIGHT ORBIT ARROW
7: Q39 RED-VIO J12-P8	49 #555 Bulb RIGHT LOOP ARROW	50 #555 Bulb OTTO'S BUS TOURS	51 #555 Bulb ELEMENTARY 2X SCORING	52 #555 Bulb BULLY 3-BANK (TOP)	53 #555 Bulb BULLY 3-BANK (MID)	54 #555 Bulb BULLY 3-BANK (BOT)	55 #555 Bulb KRUSTY 2X SCORING	56 #555 Bulb RIGHT ORBIT HURRY UP
8: Q40 RED-GRY J12-P9	57 #555 Bulb HOMER	58 #555 Bulb MARGE	59 #555 Bulb BART	60 #555 Bulb LISA	61 #555 Bulb MAGGIE	62 #555 Bulb GRANDPA	63 #44 Bulb LEFT HEADLIGHT	64 #44 Bulb RIGHT HEADLIGHT
9: Q41 RED-WHT J12-P10	65 #555 Bulb LIVING ROOM 2X SCORING DOTS	66 #555 Bulb (LIGHT) LOCK DOTS	67 #555 Bulb LIGHT (LOCK) DOTS	68 #555 Bulb LOCK (SQUARE) DOTS	69 #555 Bulb SUPER JACKPOT DOTS	70 #555 Bulb TV ARROW DOTS	71 NOT USED	72 NOT USED
10: Q42 RED J12-P11	73 Green LED (LED) DUFFMAN	74 Green LED (LED) HOMER'S DAY	75 Green LED (LED) WILLIE'S WOES	76 Green LED (LED) WIGGUM VS SNAKE	77 Green LED (LED) BART'S DAY	78 Green LED (LED) KRUSTY'S LAST STAND	79 Green LED (LED) STOP THE MONORAIL	80 Red LED (x2) (LED) ALIEN INVASION





LEGEND NOTE: ☐ = Lamps mounted above. ■ = Lamps mounted below. ▒ = Lamps mounted in the Cabinet.

Lamp Part Note: *#555 Bulb Clear = 165-5002-00. #44 Bulb Clear = 165-5000-44. See Section **4**, Chapter **1**, **Parts Id. & Location**, Pages **72-74** for more details on bulbs and corresponding sockets.*

Lamp Part Note: *For Green or Red LEDs are attached to LED PC Bd., 520-5219-00. See Section **5**, Chapter **4**, **Printed Circuit Boards (PCBs)**, Page **143**.*

Some Lamp Diodes are located under the playfield* *on Terminal Strips **or** Diode Boards and not on the assemblies.* **DOTS: D**iode **O**n **T**erminal **S**trip ***or*** **DODB: D**iode **O**n **D**iode **B**oard

Lamp 31, Start Button: DOTS (2-Lug) in Cabinet under Button (RED-YEL / ORG-YEL to YEL-VIO).

Lamp 32, Tournament Button (Optional with Tournament Kit, Diode in Connector).

Dr. Pinball Find-It-In-Front:

In COIL MENU also select:

CYCLING COIL TEST

COILS DETAILED CHART TABLE

	High Current Coils Group 1	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	▲ I/O Power Driver ▼	YEL-VIO	J10-P4/5	50v DC	BRN-BLK	J8-P1	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2		YEL-VIO	J10-P4/5	50v DC	BRN-RED	J8-P3	26-1200 090-5044-00T
#3	COUCH RELEASE	Q3		YEL-VIO	J10-P4/5	50v DC	BRN-ORG	J8-P4	28-1050 090-5046-00
#4	DROPS RESET UP	Q4		YEL-VIO	J10-P4/5	50v DC	BRN-YEL	J8-P5	26-1200 090-5044-00T
#5	ITCHY & SCRATCHY EJECT (VUK)	Q5		YEL-VIO	J10-P4/5	50v DC	BRN-GRN	J8-P6	27-1500 090-5004-00T
#6	UPPER LEFT VUK	Q6		YEL-VIO	J10-P4/5	50v DC	BRN-BLU	J8-P7	26-1200 090-5044-00B
#7	TV RELEASE	Q7		YEL-VIO	J10-P4/5	50v DC	BRN-VIO	J8-P8	28-1050 090-5046-00
#8	HOMER HEAD	Q8		GRY~3A Fuse~BRN	J7-P1	20v DC	BRN-GRY	J8-P9	22-900 090-5020-20T

	High Current Coils Group 2	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#9	LEFT BUMPER	Q9	▲ I/O Power Driver ▼	YEL-VIO	J10-P4/5	50v DC	BLU-BRN	J9-P1	26-1200 090-5044-00T
#10	RIGHT BUMPER	Q10		YEL-VIO	J10-P4/5	50v DC	BLU-RED	J9-P2	26-1200 090-5044-00T
#11	BOTTOM BUMPER	Q11		YEL-VIO	J10-P4/5	50v DC	BLU-ORG	J9-P4	26-1200 090-5044-00T
#12	UPF LEFT FLIPPER	Q12		GRY~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-YEL	J9-P5	25-1800 090-5041-00T
#13	UPF RIGHT FLIPPER	Q13		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-GRN	J9-P6	24-1570 090-5025-00T
#14	TOP RIGHT FLIPPER	Q14		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-BLK	J9-P7	23-1100 090-5030-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15		GRY-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-GRY	J9-P8	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-VIO	J9-P9	22-1080 090-5032-00T

	Low Current Coils Group 1	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#17	LEFT SLINGSHOT	Q17	▲ I/O Power Driver ▼	BRN	J7-P1	20v DC	VIO-BRN	J7-P2	23-800 090-5001-00T
#18	RIGHT SLINGSHOT	Q18		BRN	J7-P1	20v DC	VIO-RED	J7-P3	23-800 090-5001-00T
#19	UPPER RIGHT EJECT	Q19		BRN	J7-P1	20v DC	VIO-ORG	J7-P4	26-1200 090-5044-00T
#20	GARAGE DOOR (EJECT)	Q20		BRN	J7-P1	20v DC	VIO-YEL	J7-P6	26-1200 090-5044-00T
#21	FLASH: POPS CLEAR	Q21		ORG	J6-P10	20v DC	VIO-GRN	J7-P7	#906 Bulb 165-5004-00
#22	FLASH: R.RAMP RED	Q22		ORG	J6-P10	20v DC	VIO-BLU	J7-P8	#906 Bulb 165-5004-00
#23	FLASH: R.RAMP ORANGE	Q23		ORG	J6-P10	20v DC	VIO-BLK	J7-P9	#906 Bulb 165-5004-00
#24	OPTIONAL COIL	Q24		RED	J16-P7	5v DC	VIO-GRY	J7-P10	Opt. 5v

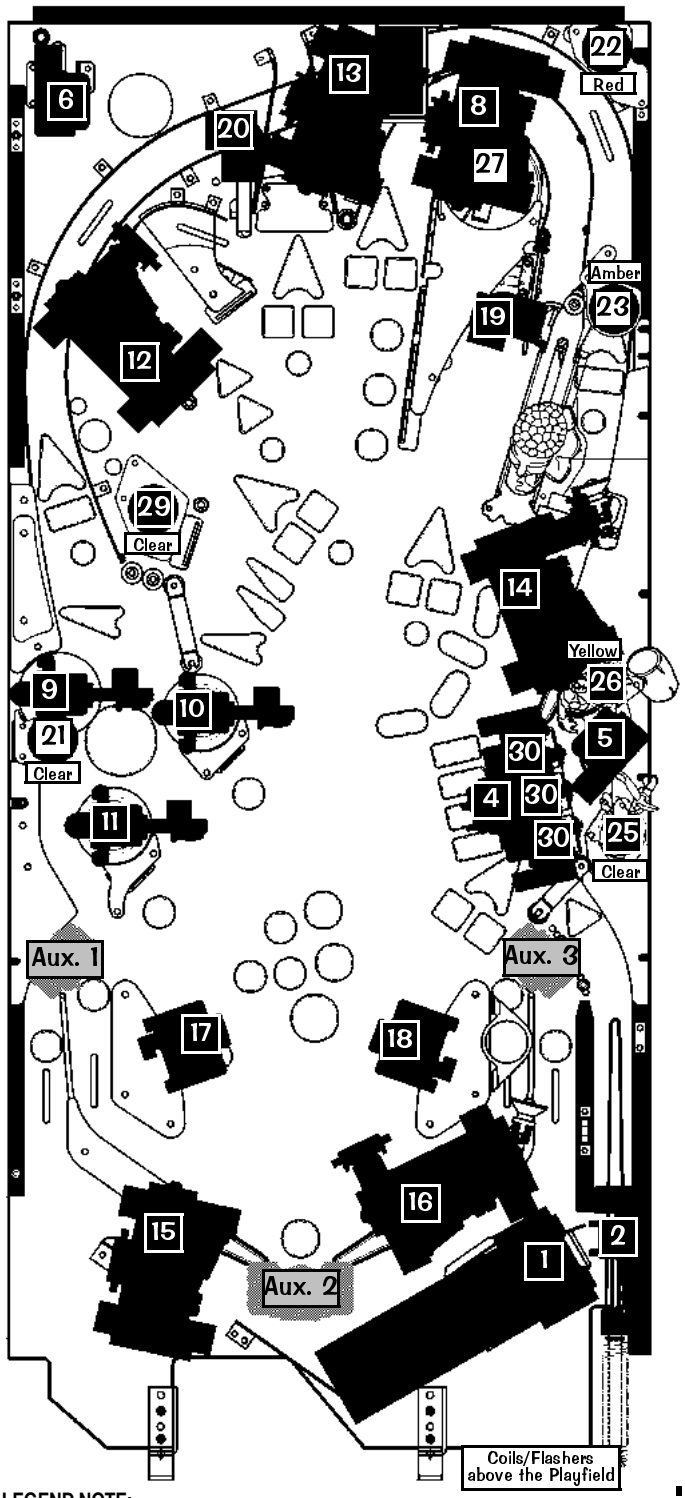
Diode On Terminal Strip (if noted)

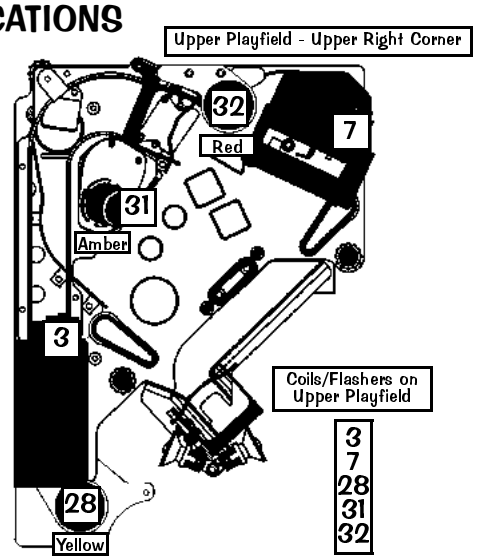
	Low Current Coils Group 2	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#25	FLASH: ITCHY	Q25	▲ I/O Power Driver ▼	ORG	J6-P10	20v DC	BLK-BRN	J6-P1	#906 Bulb 165-5004-00
#26	FLASH: SCRATCHY	Q26		ORG	J6-P10	20v DC	BLK-RED	J6-P2	#906 Bulb 165-5004-00
#27	FLASH: HOMER HEAD	Q27		ORG	J6-P10	20v DC	BLK-ORG	J6-P3	#906 Bulb 165-5004-00
#28	FLASH: COUCH	Q28		ORG	J6-P10	20v DC	BLK-YEL	J6-P4	#906 Bulb 165-5004-00
#29	FLASH: COMIC BOOK GUY	Q29		ORG	J6-P10	20v DC	BLK-GRN	J6-P5	#906 Bulb 165-5004-00
#30	DROP BANK TRIPS	Q30		BRN	J7-P1	20v DC	BLK-BLU	J6-P6	32-1250 515-6916-01
#31	FLASH: UPF ORANGE	Q31		ORG	J6-P10	20v DC	BLK-VIO	J6-P7	#906 Bulb 165-5004-00
#32	FLASH: UPF RED	Q32		ORG	J6-P10	20v DC	BLK-GRY	J6-P8	#906 Bulb 165-5004-00

Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q21-Q23, Q25-Q29, Q31-Q32)

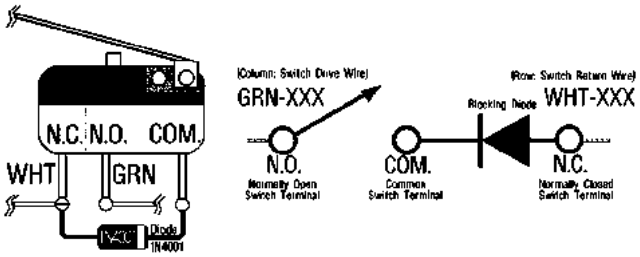
	Auxiliary (UK ONLY)	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	Solenoid Expander Auxiliary	BRN	J7-P1	20v DC	WHT	CN2-P5	26-1200 090-5044-00T
	AUX 2: CENTER UP/DOWN POST	Q2		BRN	J7-P1	20v DC	RED	CN2-P4	23-1100 090-5030-00T
	AUX 3: RIGHT UP/DOWN POST	Q3		BRN	J7-P1	20v DC	ORG	CN2-P3	26-1200 090-5044-00T

COIL & FLASH LAMP LOCATIONS

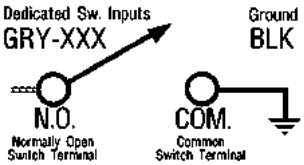




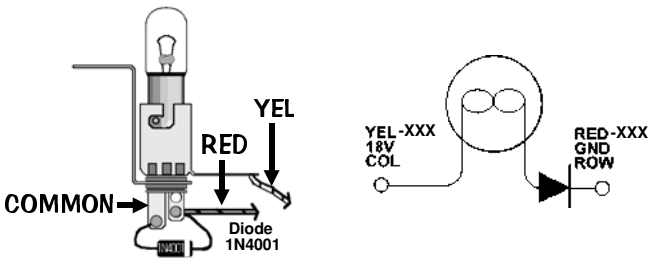
Typical Switch Wiring & Schematic



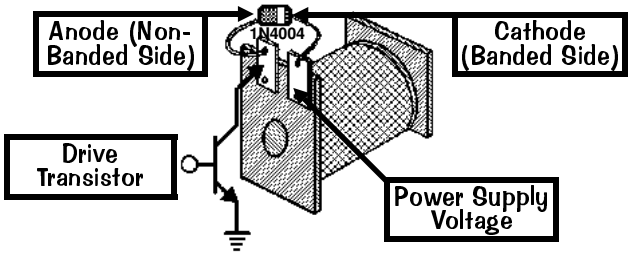
Dedicated Switch Schematic



Typical Lamp Wiring & Schematic



Typical Coil Wiring



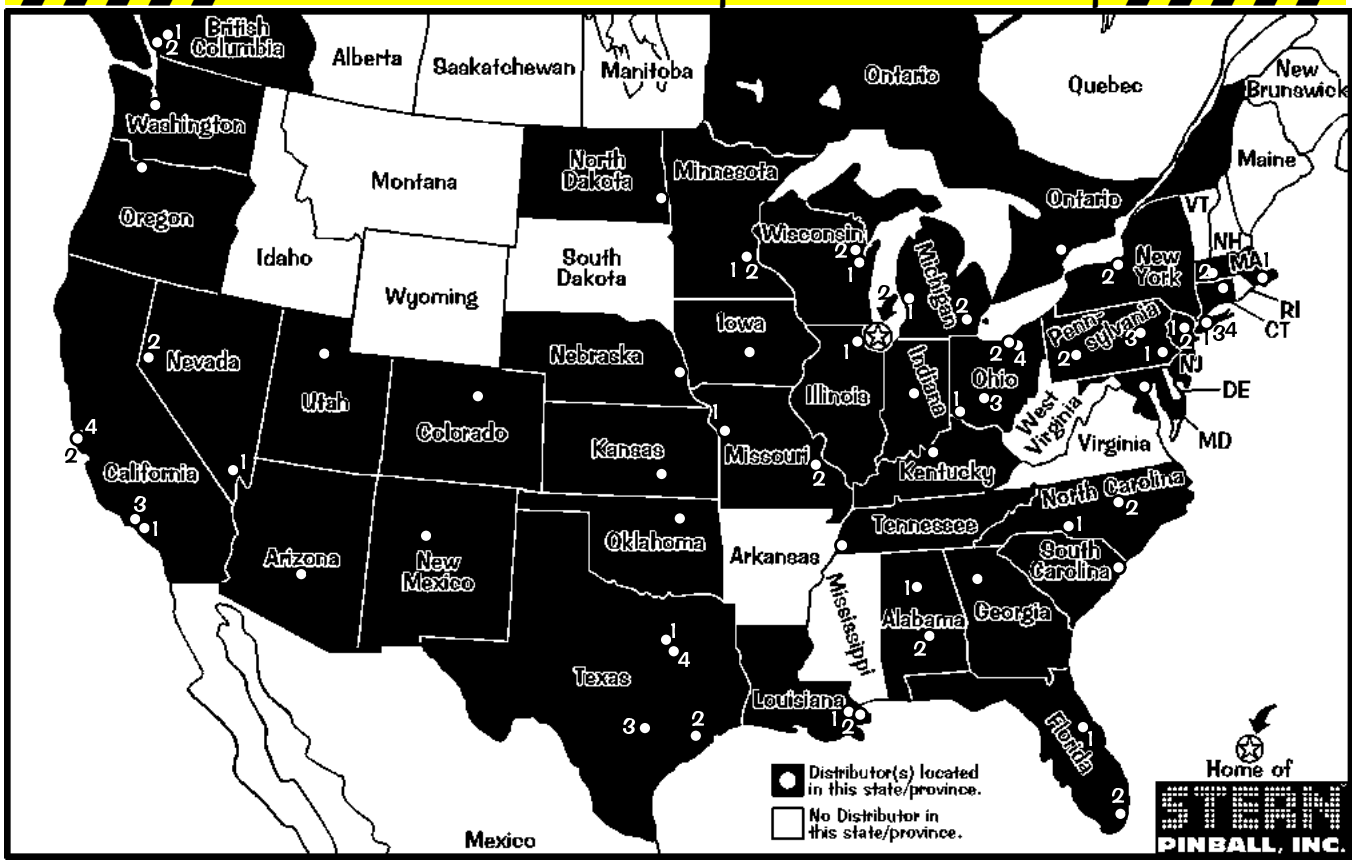
LEGEND NOTE:

- ☐ = Coils / Flash Lamps mounted above the Playfield.
- ■ = Coils / Flash Lamps mounted below the Playfield.
- ▒ = Coils / Flash Lamps mounted in the Cabinet.

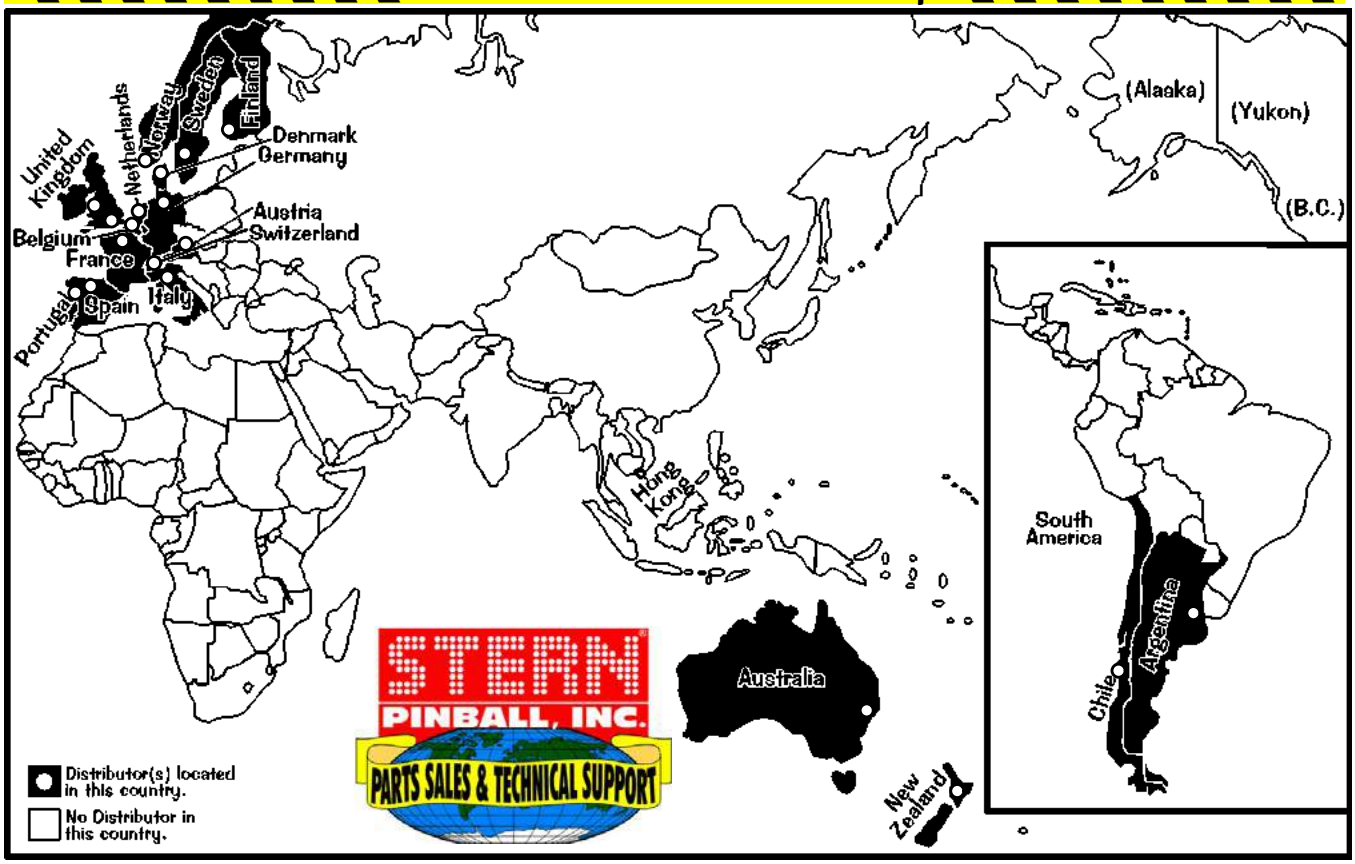
Flash Lamp Part Note: Color = Color of Mini-Mars over bulb.

Some Coil / Flash Lamp Diodes are located under the playfield *on Terminal Strips* ***or*** *Diode Boards and not on the assemblies.*
DOTS: Diode On Terminal Strip ***or***
DODB: Diode On Diode Board *(only if noted in the Chart Table).*

Domestic Pinball & Redemption Distributors Map



International Distributors Map



For *Parts & Service*, call your nearest Distributor. View the above maps & the directories on the next page to locate your closest Distributor in your state, province, or country. Distributors and phone numbers are subject to change. Call **Stern™ Pinball, Inc.** *(Parts Sales & Technical Support)* with any questions or if your Distributor cannot help you: **1-800-542-5377** (in **USA** or **Canada**) or **1-708-786-5466**. Visit us at www.SternPinball.com for current Distributor Information & other pinball needs.

The Simpsons Pinball Party

Domestic Pinball & Redemption Distributors Directory

ALABAMA
Birmingham Vending
Birmingham (1)
1-205-324-7526

Franco Distributing
Montgomery (2)
1-334-834-3455

ARIZONA
Betson West
Phoenix
1-480-380-8857

Mountain Coin
Phoenix
1-602-269-7596

CALIFORNIA
Betson West
Buena Park (1)
1-714-228-7500
So. San Francisco (2)
1-650-952-4220

C.A. Robinson
Los Angeles (3)
1-323-735-3001
San Francisco (4)
1-650-871-4280

COLORADO
Mountain Coin
Denver
1-303-427-2133

CONNECTICUT
TDM Distributing
Williamantic
1-860-423-1403

FLORIDA
Birmingham Vending
Orlando (1)
1-407-425-1505

Brady Distributing
Miami [Miramar] (2)
1-954-874-1100
Orlando (1)
1-407-872-1666

GEORGIA
Greater Southern Dist.
Smyrna
1-770-803-3040

ILLINOIS
American Vending
Elk Grove Village (1)
1-847-439-9400

Atlas Distributing
Elk Grove Village (1)
1-847-952-7500

World Wide Distributing
Chicago (2)
773-384-2300

IOWA
Greater America Dist.
Johnston
1-515-278-4455

Moss Distributing
Des Moines
1-515-266-6422

INDIANA
Atlas Distributing
Indianapolis
1-317-786-6892

Shaffer Distributing
Indianapolis
1-317-899-2530

KANSAS
United Dist., Inc.
Wichita
1-316-263-6181

KENTUCKY
Atlas Distributing
Louisville
1-502-966-5266

LOUISIANA
AMA Distributors, Inc.
Metairie (1)
1-504-835-3232

Parts & Service Only:

New Orleans Novelty
New Orleans (2)
1-504-888-3500

MARYLAND
Betson Enterprises
Baltimore
1-410-646-4100

Parts & Service Only:

Weiner Distributing
Baltimore
1-410-525-2600

MASSACHUSETTS
Betson Ent. (NECO)
Norwood (1)
1-781-769-9760

Gekay Sales
E. Longmeadow (2)
1-413-525-2700

MICHIGAN
Atlas Distributing
Wyoming (1)
1-616-241-1472

Cleveland Coin Machine
Livonia (2)
1-734-432-1040

MINNESOTA
Lieberman Music
Minneapolis (1)
1-952-887-5299

Moss Distributing
Richfield (2)
1-612-798-8030

MISSOURI
Greater America Dist.
Kansas City (1)
1-816-531-4300

Shaffer Distributing
St. Louis (2)
1-314-645-3393

NEBRASKA
Central Dist.
Omaha
1-402-493-5600

Greater America Dist.
Omaha
1-402-553-2812

NEVADA
Mountain Coin
Las Vegas (1)
1-702-798-0900

Reno Game Sales
Reno (2)
1-775-829-2080

NEW JERSEY
Betson Enterprises
Carlstadt (1)
1-201-438-1300

Jack Guarnieri Service Co., Inc. (Pinballsales.com)
Lakewood (2)
1-732-364-9900

NEW MEXICO
Mountain Coin
Albuquerque
1-505-345-7706

NEW YORK
Betson Enterprises
New Hyde Park (2)
1-516-354-4647
Syracuse (3)
1-315-437-2400

Parts & Service Only:

Bay Coin
Richmond Hill (1)
1-718-291-5757

NORTH CAROLINA
Brady Distributing
Charlotte (1)
1-704-357-6284

Operators Distributing
Archdale (2)
1-336-884-5714

NORTH DAKOTA
M.H. Associates, Inc.
Fargo
1-701-282-7877

OHIO
Atlas Distributing
Cincinnati (1)
1-513-851-4100

Cleveland Coin
Cleveland (2)
1-216-692-0960

Shaffer Distributing
Columbus (3)
1-614-421-6800
Macedonia (4)
1-330-467-4850

OKLAHOMA
Galaxy Distributing
Tulsa
1-918-835-1166

OREGON
Betson West
Portland
1-503-772-4567

Mountain Coin
Portland
1-503-234-5491

Specialty Coin Products
Portland
1-503-786-9200
Toll-Free
1-800-987-4946

PENNSYLVANIA
Betson Enterprises
King Of Prussia (1)
1-610-265-1155
Pittsburgh (2)
1-412-331-8703

Cleveland Coin Machine
Pittsburgh (2)
1-412-920-1300

Roth Novelty (Superior)
Wilkes-Barre (3)
1-570-824-9994

SOUTH CAROLINA
Parts & Service Only:

Green Coin
Mrytle Beach
1-843-626-1900

TENNESSEE
Brady Distributing
Memphis
1-901-345-7811

Parts & Service Only:

Green G.A.M.E.S.
Memphis
1-901-353-1000

TEXAS
Amusement Distributors
San Antonio (3)
1-210-225-3844

Commercial Music
Dallas (1)
1-214-741-6381

H.A. Franz, & Co.
Houston (2)
1-713-523-7366
San Antonio (3)
1-210-226-6322

Master Sales
Corsicana (4)
1-903-874-4740

Spirit Consulting
Dallas (1)
1-214-638-4900

UTAH
Mountain Coin
Salt Lake City
1-801-262-5494

Struve Distributing
Salt Lake City
1-801-328-1636

WASHINGTON
Mountain Coin
Seattle
1-206-682-5700

WISCONSIN
Pioneer Sales & Svc.
Green Bay (1)
1-920-336-5800
Menomonee Falls (2)
1-262-781-1420

Lieberman/Viking Vend.
Menomonee Falls (2)
1-262-703-4168

CANADA

ONTARIO
Starburst Coin Mach.
Toronto
1-416-251-2122

BRITISH COLUMBIA
Parts & Service Only:

Can. Coin Machine
Burnaby (1)
1-604-420-4008

Parts & Service Only:

Pacific Vending
Vancouver (2)
1-604-324-2164

Note: *For states and Canadian Provinces which do not have Distributors, call the neighboring state or province with the city closest to you (indicated with a white dot). States or Provinces with more than 1 city containing a distributor are numbered. View the map on the previous page.*

Note: *Distributors are subject to change. Visit us at* **www.SternPinball.com** *for current Distributor Information.*

International Distributors Directory

ARGENTINA
Electroport (Florencia)
Mar Del Plata
[54] 22-3495-5532

AUSTRALIA
Amusement Mach. Dist.
Matraville
[61] 2931-66000

AUSTRIA
TAB
Ansfelden
[43] 72-297-8660

Parts & Service Only:

R. Rupp
Kaindorf, Austria
[43] 3452-86105

BELGIUM
Namusco
Brussels
[32] 2414-4596

CHILE
Cuinsa
Santiago
[56] 2641-8520

DENMARK
Vendcomatic
(Oslo, Norway)
[47] 2291-8383

FINLAND
Pelika Ray-Oy
Espoo
[35] (0) 5892-90452-99

FRANCE
Avranches Automatic
Ducey
[33] 2338-96162

SFA
Paris
[33] 1532-68082

GERMANY
Bergmann Automaten
Hamburg
[49] 4101/30 24-0

HONG KONG
Topfull Amusement Mach.
Kowloon
[85] 2278-10456

ITALY (RSM)
Tecnoplay S.A.
San Marino
[39] 5499-00361

NETHERLANDS
JVH Gaming Products
Tilburg
[31] 13-595-3200

NEW ZEALAND
Coin Cascade Ltd.
Christchuch
[64] 3338-1411

Parts & Service Only:

Amco Machine Supplies
Auckland, New Zealand
[64] 9846-7606

NORWAY
Vendcomatic
Oslo
[47] 2291-8383

PORTUGAL
Jacinto & Martins, S.A.
Belas
[35] 1214-325624/38

SPAIN
Comercial Cocomatic
Madrid
[34] 9167-16980

SWEDEN
Bjuvia Fritid AB
Bjuv
[46] 4238-6900

SWITZERLAND
Novomat, A.G.
Harkingen
[41] 6238-88961

UNITED KINGDOM
Electrocoin
London, England
[44] 2089-652055

Parts & Service Only:

Electrocoin Aftersales
Cardiff, S. Wales
[44] (0) 2920 343888

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

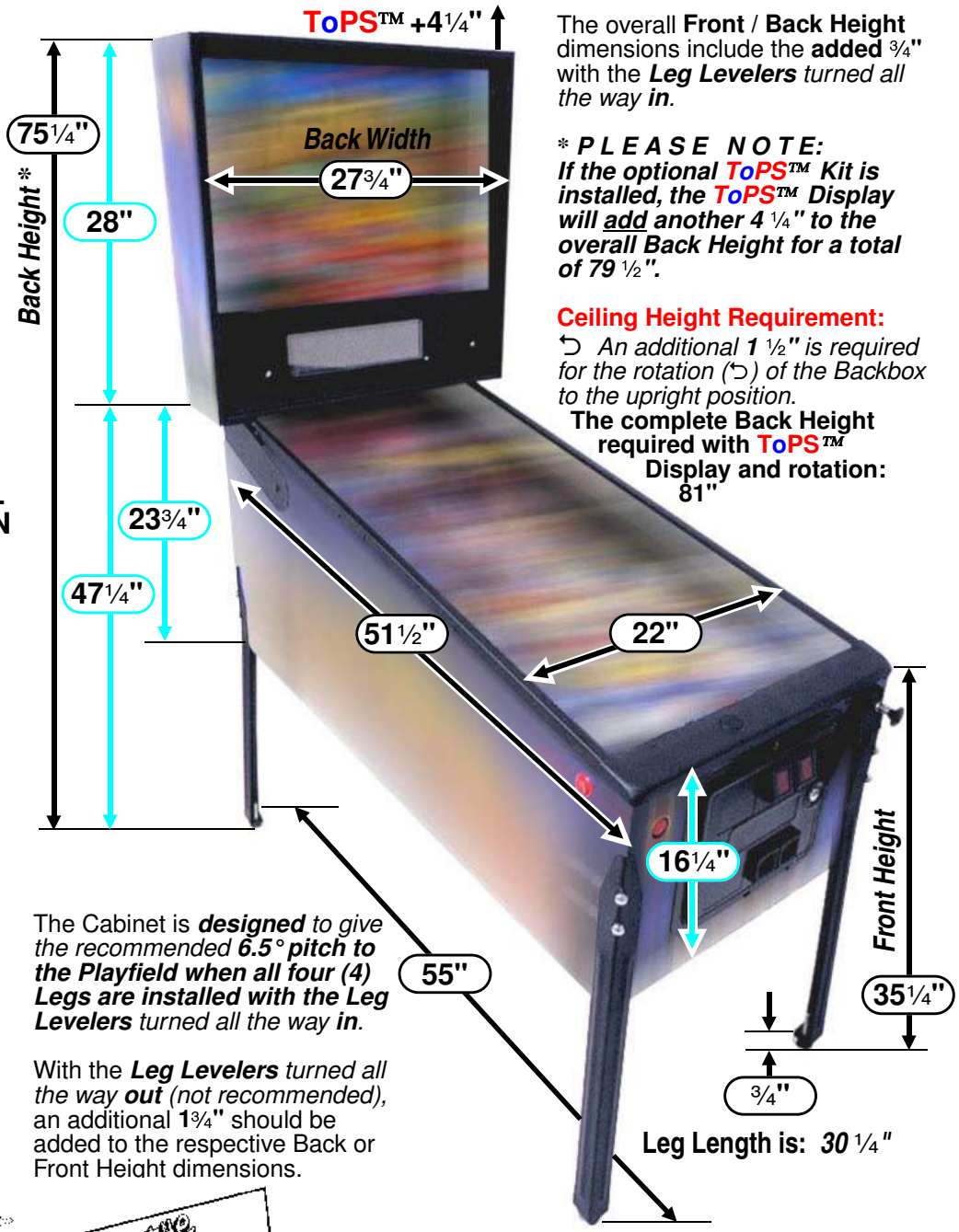
TRANSPORTATION

To reduce the possibility of damage, observe **ALL** precautions whenever transporting the game.

Read & follow *Section* ***1****, Chapter* ***1****,* ***Pinball Game Set-Up Procedures****, and* ***How to Secure the Backbox for Transporting****.* Remove the legs and secure the game within the transporting vehicle.

SAVE AND RETAIN ALL PRINTED INFORMATION INSIDE THE CABINET !

GAME DIMENSIONS



The overall **Front / Back Height** dimensions include the **added** ¾" with the ***Leg Levelers*** *turned all the way* ***in****.*

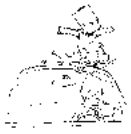
**** PLEASE NOTE:***
If the optional ToPS™ Kit is installed, the ToPS™ Display will add another 4 ¼" to the overall Back Height for a total of 79 ½".

Ceiling Height Requirement:
↺ *An additional* ***1 ½"*** *is required for the rotation (↺) of the Backbox to the upright position.*

The complete Back Height required with ToPS™ Display and rotation: 81"

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

With the ***Leg Levelers*** *turned all the way* ***out*** *(not recommended),* an additional **1¾"** should be added to the respective Back or Front Height dimensions.



STERN PINBALL, INC.

The Simpsons™ Pinball Party Pinball Game Service Manual General Table of Contents

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

For Proper Operation of ... five (5) Pinballs must be installed!.....Inside Front

▶ Backbox PCB Fuses, ROMs, Bridges, Relays Playfield/Cabinet Fuses, Cab. Switches . DR. ❶
▶ Find-It-In-Front: Dr. Pinball Section Explained ▶ How It Works ..... DR. ❷
▶ Diagnostic Aids ▶ CPU DIP Switch Setting ..... DR. ❸
▶ Switch Matrix Grid, Dedicated Switches & Locations ..... DR. ❹
▶ Lamp Matrix Grid & Locations ..... DR. ❺
▶ Coils Detailed Chart Table ..... DR. ❻
▶ Coil & Flash Lamp Locations ..... DR. ❼
▶ Domestic Pinball & Redemption and International Distributors Maps..... DR. ❽
▶ Domestic Pinball & Redemption and International Distributors Directories ..... DR. ❾
▶ Power Requirements ▶ Transportation ▶ Game Dimensions ..... DR. ❿

Game Manual General Table of Contents .....i-ii

SECTION 1 1-4

Chapter 1, After Set-Up..... 1
▷ Pinball Game Set-Up Procedures.....1
▷ Pinball Game Set-Up Future Reference.....2-3
▷ How to Secure the Backbox... ▷ Leg Leveler Adjustment ▷ Easy Access... - 3 Positions.....4

SECTION 2 5-6

Chapter 1, Game Operation & Features..... 5
▷ Start of Game Features (Starting a Normal Game, ... Team Play, ... Tournament Play with ToPS™)
▷ During Game Features (Feature Mode & Combination Shots, Multiball, Replay Feature)
▷ End of Game Features (Game Endings, Match Features, Entering Initials/Name) 5
▷ Auto Percentaging ▷ Instruction Card 6

SECTION 3 7-54

▷ Portals™ Service Menu System Table of Contents (detailed outline of this section).....7
▷ Portals™ Service Switch Set Access & Use (Function 1, ...; Function 2, ...; Function 3, ...) 8
Chapter 1, Portals™ Service Menu Introduction..... 9
▷ How to Use This Section.....9
▷ Portals™ Service Menu Icon Tree 10-11
▷ Portals™ Service Menu Example ▶ Exiting the Portals™ Service Menu 12-14
Chapter 2, Go To Diagnostics Menu 15-31
Chapter 3, Go To Audits Menu 32-37
Chapter 4, Go To Adjustments Menu..... 38-46
Chapter 5, Go To Installs Menu 47-50
Chapter 6, Go To Reset Menu..... 51-52
Chapter 7, Go To Tournament Menu 53-57

SECTION 4 58-74

Chapter 1, Parts Identification & Location (The Pink Pages) 59
Overview.....59
The Simpsons™ Pinball Party Backbox Assembly.....60
Speaker Panel Assy. for the Backbox & Associated Parts:.....61
Cabinet - General Parts & Switches.....62-63
Main Playfield - General Parts, Metal Rails/Ball Guides & Switches (Above).....64-65
Main Playfield - General Parts & Switches (Below) 66
Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals 67
Main Playfield - Rubber Parts Red & Black (Rings Actual Size) 68

Section 4, Chapter 1, Parts Identification & Location (The Pink Pages) Continued on the Next Page

Main Playfield & Mini-Playfield - Metal Posts (Screws) and Nuts (Actual Size) 69
Main Playfield & Mini-Playfield - Hex Spacers (Actual Size) 70
Main Playfield & Mini-Playfield - Posts & Spacers (Actual Size) 71
Main Playfield & Mini-Playfield - Small Bayonet Type Bulbs & Sockets (Actual Size) 72
Main Playfield & Mini-Playfield - Large Bayonet Type Bulb and Sockets (Actual Size) 73
Main Playfield & Mini-Playfield - Wedge Base Bulbs and Sockets (Actual Size) 74
Chapter 2, Drawings for Major Assemblies & Ramps (The Blue Pages) 75-98
▷ Overview 75
Ball Shooter (Plunger) Assembly, 500-6146-00-04 ..... (Top) 76
Autoplunger Arm Weld Assembly, 500-6091-0 with ...Coil Assembly, 500-6092-06 ..... (Bot) 76
5-Ball Trough Assembly, 500-6318-15 and Associated Parts: 77
Flipper (Left) Assembly, 500-6543-12 and Associated Parts: 78
Flipper (Right) Assembly, 500-6543-02 and Associated Parts: 79
Flipper (Mini-Playfield, Left) Assembly, 500-6543-79 and Associated Parts: 80
Flipper (Mini-Playfield, Right) Assembly, 500-6543-66 and Associated Parts: 81
Flipper (Mid. Playfield, Upr. Right) Assembly, 500-6543-24 and Associated Parts: 82
Turbo (Pop) Bumper Top Assy., 515-6459-01 (Qty. 3) ..... (Top) 83
Turbo (Pop) Bumper Bottom Assy., 515-6459-04 (Qty. 3) ..... (Mid) 83
Turbo (Pop) Bumper Switch Assy., 515-6459-03 (Qty. 3) and Associated Parts: ..... (Bot) 83
Homer Head Actuator (Upr. Rt. Flipper Style) Assembly, 500-6543-21 84
Homer Head Assembly Individual Parts Only 85
Slingshot Assemblies, 500-5849-00 (Qty. 2) ..... (Top) 86
30° Eject Assembly, 500-6511-11 and Associated Parts: ..... (Bot) 86
VUK (Vertical Up-Kicker, Right Style) Assembly, 500-6659-00 ..... (Top) 87
VUK (Vertical Up-Kicker, Right Style) Assembly, 500-6660-00 ..... (Bot) 87
3-Bank Drop Target Assembly, 500-6577-33 88-89
Bart & Skateboard on Rail Individual Parts Only 90
Main Playfield - Left & Right Plastic Ramps Individual Parts Only 91
Main Playfield & Mini-Playfield - Ramps Overview 92
30° Eject Assembly, 500-6661-00 ..... (Top) 93
2nd LEVEL MINI-PLAYFIELD (BELOW)
Garage Door Individual Parts Only ..... (Bot) 93
General Individual Parts Below Only ..... (Top) 94
2nd LEVEL MINI-PLAYFIELD (ABOVE)
General Individual Parts Above Only ..... (Bot) 94
Couch Ball-Lock Individual Parts Only 95
TV (Color Dot Display) & LED (Mode Signifier) Individual Parts Only 96
Left Plastic Ramp & Plastic Trough Ramp Individual Parts Only 97
▷ UK ONLY OPTIONAL: Ball Deflector Asssemblies, 500-5788-02 (Qty. 2) ..... (Top) 98
▷ UK ONLY OPTIONAL: Up/Down Post Assembly, 500-6293-00 ..... (Bot) 98
SECTION 5 99-148
▷ Schematics & Troubleshooting Table of Contents (detailed outline of this section) 99
▷ Coils Detailed Chart Table 100
Chapter 1, Backbox Wiring (The Yellow Pages) 101-102
Chapter 2, Playfield Wiring (The Yellow Pages) 103-106
Chapter 3, Cabinet Wiring (The Yellow Pages) 107-108
Chapter 4, Printed Circuit Boards (PCBs) (The Yellow Pages) 109-144
APPENDIXES A-J A1-J1
▷ Appendixes A-J Table of Contents (outline of this section) ..... after 144
▷ Appendixes A-J A1-J1
Plastic Part Color Chart ..... (Bottom) H1 + (Top) I1
Glossary of Terms ..... Last Page
Limited Warranty, Cautions, Warnings & Notices ..... Last Page
▶ Switch Matrix Grid & Dedicated Switches ▶ Lamp Matrix Grid ..... Inside Back

After Set-Up

Pinball Game Set-Up Procedures

...after reading the Pinball Game Set-Up Instruction Sheet (SPI Part Nº 755-5310-00) included with your New Pinball Game, continue with the below procedures:

With the Back Glass Removed:

1. Check all connectors in the Backbox for loose wire terminations. Reseat any loose wire by pushing in on the terminal. **Push on all** connectors plugged into the CPU/Sound Board, I/O Power Driver Board, and the Display Power Bd. to check that they are properly seated. Ensure Fluorescent Light Tube is seated correctly. Check that all fuses are seated properly. *Close and lock the Backbox and secure its' keys back inside the Coin Door.*

With the Playfield Glass Removed:

2. Make sure the proper amount of pinballs were installed *(Amount of balls are always specified on decal attached to the lock down assembly and at the top of the inside cover).*

3. Remove all shipping tie downs, shipping blocks, packing foam, shipping instruction pages, etc. (if any) from the game. ***READ ALL PRINTED INFORMATION!*** Shipping instructions, labels and/or decals describe warnings, cautions, and/or important information specific to the game. **SAVE ALL PRINTED INFORMATION.**

4. Raise the playfield and support it, by lifting the **Prop Rod** *(located on the left, inside the cabinet).* The end of the Prop Rod should be placed into the hole under playfield. See the illustration **"Easy Access Service System - 3 Positions"** *on Page 4.*

5. Visually inspect all cabinet cables and connector terminations; ensure no wires or cables are pinched and that cable harnesses are not pulled tight.

6. Lower the playfield and ensure game is **level side-to-side** by adjusting Leg Levelers, if required. See the illustration **"Leg Leveler Adjustment"** *on Page 4.* Start with the Leg Levelers turned all the way in (1.25" from floor to bottom of leg), depending on the condition of the floor, adjust the Leg Levelers as required until the **game pitch is 6.5**°, determined by the Bubble Level.

USE THE BUBBLE LEVEL ON THE WOOD RAIL (LOWER RIGHT) TO DETERMINE IF LEVEL IS ACHIEVED. BUBBLE SHOULD APPEAR BETWEEN THE 2 BLACK LINES. SEE PAGE 4 FOR AN ILLUSTRATION.

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

With the Coin Door Open:

7. 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 Name Test**" Menus to test components on the game).*

8. If desired, adjust **Game Pricing, Standard and/or Custom** *(see Section **3**, Chapter **4**, **GO TO ADJUSTMENTS MENU** and Section **3**, Chapter **5**, **GO TO INSTALS MENU** to adjust **Game Difficulty**, **3-** or **5-Ball Play**, **Home** or **Tournament Settings**, **Novelty**, **Add-A-Ball**, etc.).*

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

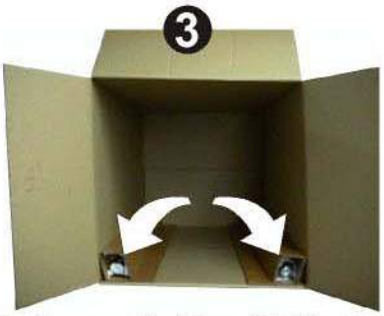
Open up the Printable Version in both 8-1/2 X 11 & 11 X 17.

Pinball Game Set-Up Future Reference

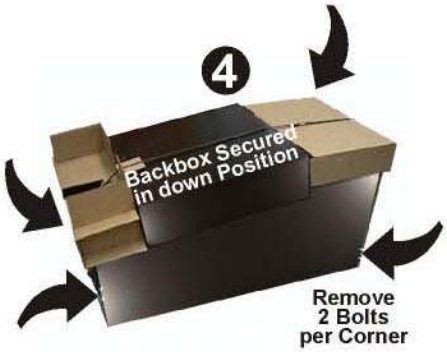
CAUTION: At least 2 people are required to move and maneuver game.
Use proper moving equipment & extreme care while handling. Pinball game is 260lbs (+/- 10).
Refer to Game Manual for further Game Set-Up Procedures (Sec. 1, Chp. 1) and other important information!
TOOLS REQUIRED: 5/8" Socket Wrench & Utility Knife

1. Before opening box, lay the box flat on its side with **"TRUCK THIS SIDE ONLY"** facing the floor.

2. Slide game out using the **Black Nylon Strapping** as a handle.



3. Remove the **Four (4) Identical Legs with Levelers** from the carton and set aside. (***SAVE!*** *all packing materials and information sheets related to this pinball until Set-Up is complete.)*



4. At this point **DO NOT CUT STRAPPING** *(You want to keep the Backbox secured in the down position)*. Loosen and remove the 8 Leg Bolts (use 5/8" Socket Wrench) and set aside.

5. Lift game into an **UPRIGHT POSITION** *(Coin Door Facing Up).*

6. Install **FRONT LEGS** using the bolts removed from ***Step 4***. *Secure tightly.* ***Take care not to scratch the Black Finish on any of the Legs.***

7. Carefully set the game down on the **FRONT LEGS**. *Care should be taken...Game is heavy, two (2) people are recommended for this and the following step.*

8. Using supports or two (2) people, prop the rear of the cabinet up and install **REAR LEGS**. *Secure tightly.*

9. Cut **BLACK NYLON STRAPPING**. ***CAUTION:*** *Strapping will* ***SNAP, protect your eyes! Use extreme care*** *when using a utility knife or scissors.*

The Simpsons Pinball Party

10

10. Lift the Backbox into the **UPRIGHT POSITION** *(Ensure the cables do not get pinched).*

11

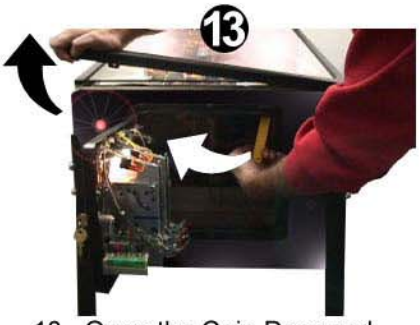
11. After the **BACKBOX** is in the **UPRIGHT POSITION**, locate the **5/16" HEX KEY**. While inserted, rotate **KEY** with a **3/4** turn until latched & locked.

12

12. The next step you will remove the **PLAYFIELD GLASS** & **BACK GLASS** to access the inside of the cabinet & Backbox.

NOTE: KEYS are tied to the **Shooter Rod*** *(if equipped)* or taped to the **Playfield Glass** *(if equipped with Auto Plunger Button). Remove keys. One (1) set of keys opens the Coin Door, the other set is used to unlock the* ***Back Glass*** *to gain access to the White Star Board System.*

13



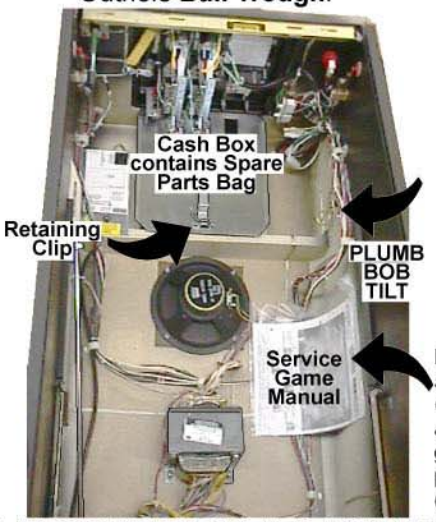
13. Open the Coin Door and pull the **YELLOW HANDLE** to the **LEFT** and at the same time pull up on the **FRONT TOP MOLDING** and remove. The **GLASS** can now be pulled out towards you and removed. ***TAKE CARE*** *while moving; set glass on a safe surface.*

14

14. Through the open **Coin Door**, remove the **RETAINING RING** at the rear of the **CASH BOX** and open. Remove the **PINBALLS** & the **PLUMB BOB** *from the* **SPARE PARTS BAG.**
(Save the other spare parts in cabinet).
Install the **PINBALLS** by placing them on the playfield so they can roll into the Outhole **Ball Trough**.

15

15. Install the **PLUMB BOB** on the **Hanger Wire** & tighten the **Thumb Screw**. Loosening the **Thumb Screw** & lowering or raising the **PLUMB BOB** makes the ***Games Tilt Function*** more or less sensitive.



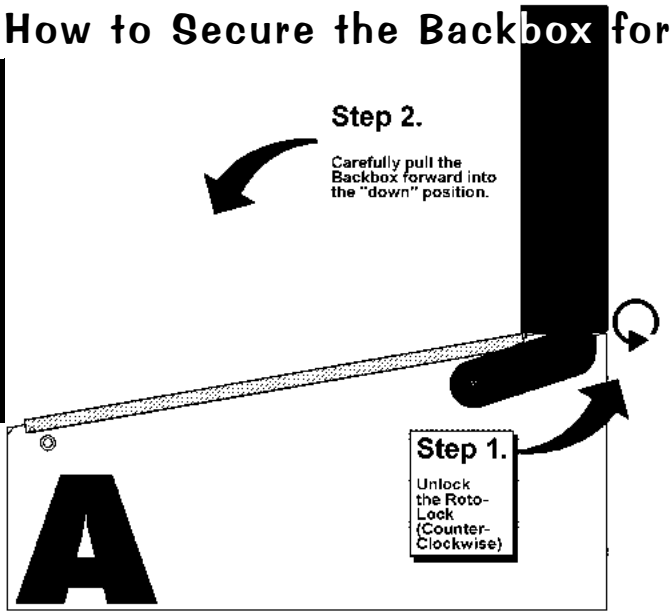
Remove the **PINBALL GAME MANUAL** *(stapled to side of the left wall of the cabinet). Review Section 1, Chapter 1, which describes how to lift the playfield to access the Plumb Bob Tilt Assembly.* The manual gives you all the important information you need to prepare for final set-up and other important information (such as Parts, Diagnostics, Schematics and more...).

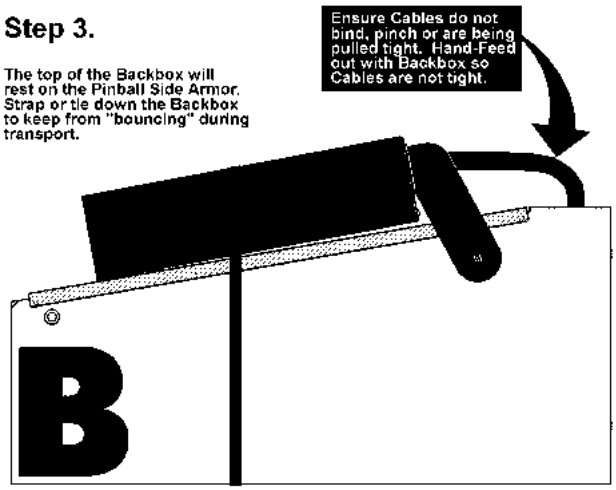
STERN PINBALL, INC.
1-800-542-5377

ALWAYS STORE THE MANUAL & INFORMATION SHEETS INSIDE THE CABINET WHEN NOT USING.

How to Secure the Backbox for Transporting

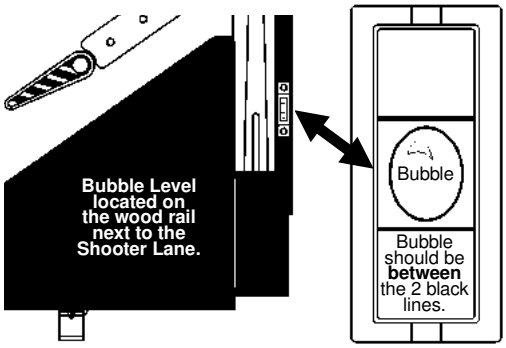
*For more Backbox details & part numbers, see Section **4**, Chapter **1**, **Backbox Assembly**, Pages 60-61.*





Leg Leveler Adjustment

Attach the four (4) Leg Assemblies to cabinet corners with the eight (8) leg bolts provided .

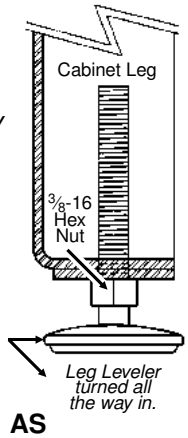


Start adjustment with the leg levelers *turned all the way in.*

View the *bubble* in the level provided on the right side wood rail.

Adjust the front or rear levelers as necessary to cause the bubble to float between the two (2) black lines.

Use a pinball to roll down the center of the playfield for side-to-side leveling.



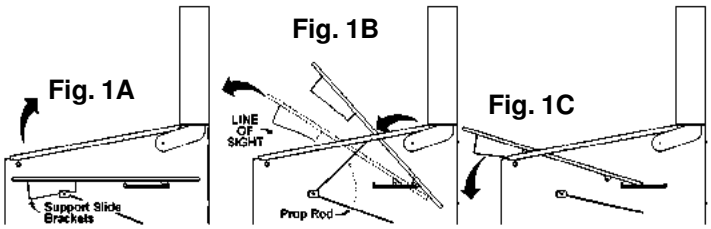
YOUR PLAYFIELD PITCH IS NOW AT 6.5° AS REQUIRED FOR PROPER GAME PLAY!

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

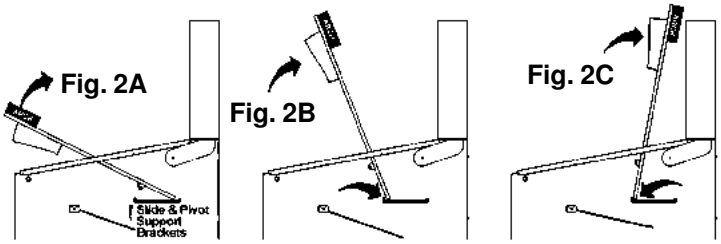
Easy Access Service System - 3 Positions

With the front molding & glass removed, carefully lift the playfield *(take care when using the Bottom Arch to hoist).*

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 4 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 partial 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 (4) player game. The totals for Players 1/3 (Team 1) & 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 Tournament Play with ToPS

This Pinball Game is **ToPS™ (Tournament Pinball System) Ready**. ***Optional Tournament equipment & hardware (sold separately) is required.*** *Review Section **3**, Chp. **7**, **GO TO TOURNAMENT MENU**, for more info!*

Unlike a *"Normal Game"*, the Tournament Game is started by depressing the **Tournament Start Button** *(located on the Front Molding, if installed).* If adequate credit(s) are posted **and** a ***Tournament is started*** via **Portals™** *(select the "TOUR" Icon in the Main Menu)*, the **Tournament Start Button** will flash. *Any adjustments or installs changed will not be in affect. Starting a Tournament Game defaults to preprogrammed Tournament Rules (e.g. No Extra Balls, Specials or Bonus Credits are awarded); however, starting a Normal Game after a Tournament Game will then revert back to any unique adjustments or installs performed previously.* **During** and **End of Game Features** operate in the same manner *(differences in adjustment defaults are present).*

During Game Features

Feature Mode & Combination Shots

Features are lit on the playfield and started by completing *certain shots (e.g. completion of Target Banks, Orbit(s), Ramp(s) and/or any combination of the shots).*

Multiball

Multiball is started after completion of certain features *(amount of balls used depends on game rules).*

Replay Feature

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

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, **Standard Adj. 15, Tilt Warnings** (Default = **01**) or 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 **Std. Adj. 13, Match Percentage** (Default = **8%**) 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 nor award anything. Changing this adjustment to **OFF** will **not display** the *"Match Animation"* nor award anything.

Entering Initials/Name

If player achieved a new *High Score* in a game or achieved a *Special Feature (if given)* the player may enter 3 Initials. In **Std. Adj. 29, High Score Initials** (Default = **3 Initials**) can also be changed to **10-Letter Name**. Use the **Flipper Buttons** to choose a 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: **Standard Adj. 31**, ***Custom Message*** *(Default = **ON**) can be displayed during the Attract Mode; enter letters in the same fashion.*

*For more details on Adjustments, see Sec. **3**, Chp. **4**.*

Continued Next Page.

Auto Percentaging

This game is equipped with Auto Percentaging, **Standard Adj. 01, Replay Type** (Default = **AUTO**, *adjustable*). The *Replay Percent* is automatically adjusted, **Standard Adj. 02, Replay Percentage**, or you can set a *Fixed Replay Score*. Four levels may be selected. Adjustments allow awarding of a "CREDIT" (or your setting) as each level is exceeded. This can be adjusted with, **Standard Adj. 03, Replay Award** (Default = **CREDIT**). With the ***Autopercentage Feature***, if the actual replay percent- age is higher or lower than that desired, the game will automatically adjust for the new recommended percentage score(s). You may choose to make a different "score-to-beat" adjustment; this is done by utilizing **Standard Adj. 04, Replay Levels**. *For more details with* ***Adjustments****, see Section* ***3****, Chapter* ***4****,* ***GO TO ADJUSTMENTS MENU****; also, see see Section* ***3****, Chapter* ***5****,* ***GO TO INSTALLS MENU*** *for further customization of your Pinball Game.*

Instruction Card

Below is a **COPY** of the Game Instruction Card (SPI Nº: 755-5177-00 USA) 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.*

(***Hint:*** **COPY & CUT** along the dotted line and fold in the center to keep the "COPY" sturdy.)

COPY & CUT

THE SIMPSONS™ PINBALL PARTY

For more detailed game rules, visit our website @ www.SternPinball.com and click on the "The Simpsons™ Pinball Party" or "Game Archive" Pop Bumper Link.

FOLD HERE

OBJECT: Help the citizens of Springfield party like there's no tomorrow!
GET DUFFED!: Shoot **Moe's** *(Right Ramp)* to light **Extra Ball** and the **Treehouse of Horror.**
LIVING ROOM: Shoot into the **Garage** or the **Treehouse** *(Left Ramp)* to enter the *Upper Playfield.*
ITCHY & SCRATCHY: Shoot past *Drop Targets* for **Itchy & Scratchy Multiball**.
OTTO'S BUS TOURS: Shoot **Otto** to enable shots for ***double scoring***.
COMIC BOOK GUY: Hit **CBG** to light **Hurry-Ups.** *Collect them before they go away!*
DAREDEVIL BART: Hit **Captive Ball** to light playfield shots for big points!
TV: Shoot under the **TV** to start modes.
MULTIBALL: Lock balls in the **couch** to start **Multiball**. *In Multiball, shoot couch for Super Jackpot.*
TIMER: All timed features use the same timer.
Starting any feature resets timer for all features!

THE SIMPSONS PINBALL PARTY

The Simpsons TM & © Twentieth Century Fox Film Corporation. All Rights Reserved.

SPI PART Nº: 755-5177-00 USA

Click on card to open the Instruction Card for printing.

Section 3
Service Menu System
Table of Contents

Service Switch Set (Red, Green & Black Buttons) Access & Use 8
- Function 1, Volume Menu / Function 2, Service Credits Menu / Function 3, Portals™ Service Menu 8

Chapter 1, Portals™ Service Menu Introduction 9

How to Use This Section 9
Portals™ Service Menu Icon Tree for The Simpsons™ Pinball Party Pinball 10-11
- Example 12-13

QUIT THIS SESSION (Exiting the Portals™ Service Menu) & Problem / Solution Table 14

Chapter 2, Go To Diagnostics Menu (Overview) 15

GO TO DIAGNOSTICS MENU 15
- **Go To Switch Menu ■■ Switch Test ■■ Active Switch Test ■■ Dedicated Switch Test** 16
  - Switch Matrix Grid & Dedicated Switches
  - Switch Matrix Grid Locations, Typical Switch Wiring & Schematic, Dedicated Switch Schematic 17
- **Go To Coil Menu ■■ Single Coil Test ■■ Cycling Coil Test** 18
  - Partial Coils Detailed Chart ...
  - Coil & Flash Lamp Locations, Typical Coil WIring, Bulb Types used for Flash Lamps 19
  - Coils Detailed Chart Table 20
  - Backbox I/O Power Driver Board Detailed Wiring Diagram 21
- **Go To Lamp Menu ■■ Single Lamp Test ■■ Test All Lamps ■■ Row & Column Lamp Tests** 22
  - Lamp Matrix Grid
  - Lamp Matrix Grid Locations, Typical Lamp Wiring & Schematic, Bulb Types used for Lamps 23
- **Test Flash Lamps ■ Clear Ball Trough** 24
- **Technician Alerts (Switch Detection and Pinball Detection)** 24-25
- **Service Phone # ■ Begin Play Test ■ Fire Knocker** 25
- **Sound / Speaker Test (Speaker Phase Testing)** 25-26
- **Begin Burn In ■ Dot Matrix Test (Dot Matrix Display Explained)** 26
- **LED Test** 27-28
- **Go To Fuse Table (with Example)** 29

BACKBOX LAYOUT LOCATIONS: Fuses, Bridges, Relays & ROMs 30
- **Dr. Pinball ■■ Coil Flow Chart ■■ Switch Flow Chart ■■ Lamp Flow Chart** 31

Chapter 3, Go To Audits Menu (Overview) 33

- EARNINGS & STANDARD AUDIT TABLES 32

GO TO AUDITS MENU 33
- **Earnings Audits (01-14)** 33
- **Standard Audits (01-67)** 34-35
- **Feature Audits (01-165)** 36
- **Go To Printer Menu ■■ Quick Printout ■■ Full Printout ■■ Reset Printer** 37

Chapter 4, Go To Adjustments Menu (Overview) 39

- STANDARD & FEATURE ADJUSTMENT TABLES 38

GO TO ADJUSTMENTS MENU 39
- **Standard Adjustments (01-48)** 39-43
- **Feature Adjustments (01-35)** 44-45
- **Custom Message (Direct Access to Adjustment 31)** 46

Chapter 5, Go To Installs Menu (Overview) 47

GO TO INSTALLS MENU 47
- **Install Extra Easy ■ Install Easy** 47
- **Install Normal ■ Install Hard ■ Install Extra Hard ■ Install 3-Ball ■ Install 5-Ball**
- **$.50 Tournament ■ Free Play Tournament ■ Install Home Play** 48
- **Film Star Reset ■ Install Novelty ■ Install Add-A-Ball ■ Install Factory** 49
  - Overview of Standard Adjustment Changes and ... Feature Adjustment Changes with selection of these Installs 49-50

Chapter 6, Go To Reset Menu (Overview) 51

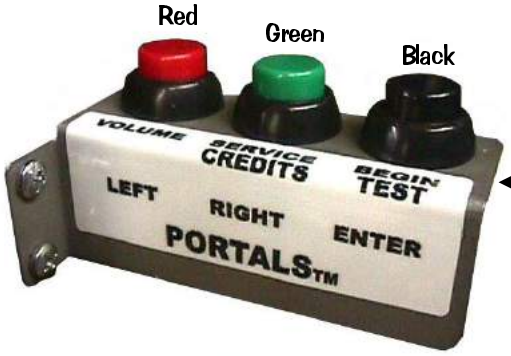
GO TO RESET MENU 51
- **Reset Coin Audits ■ Reset Game Audits ■ Reset High Scores ■ Reset Credits ■ Factory Reset** 51
  - Example 52

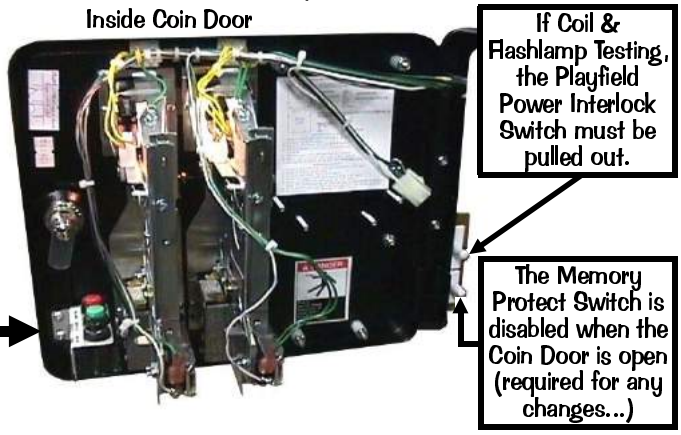
Chapter 7, Go To Tournmament Menu 53

GO TO TOURNAMENT MENU (OPTIONAL USE ONLY) 53
- TOURNAMENT ADJUSTMENT TABLES & TOURNAMENT AUDIT TABLE 54
- **Tournament Adjustments (01-10)** 55
- **Start Tournament ■ Stop Tournament ■ Tournament Prizes ■ Tournament Audits (01-12)** 56
- **Tournament Audits Continued ■ Sign Messages A-B (Tournie Adj. 11-12)** 57

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

The ***Service Switch Set*** provides access for ***three (3) functions*** available for your use. They are **Volume Menu**, **Service Credits Menu** and **Portals™ Service Menu**. All are accessed separately depending on which colored button (**Red**, **Green** or **Black**) is ***pushed first***.





To access any of these ***three (3) functions*** you must first open the **Coin Door** (see pictorial above) with the Game in the ***Attract Mode*** *(not already in any Function or Menu stated below).*

Function 1, Volume Menu

Pushing the ***Red Button*** ***(VOLUME / LEFT)*** first, enters the ***Volume Menu***. While in this Mode, to **DECREASE** the volume, hold down or depress the **Red "LEFT" Button** until desired the volume is achieved; to **INCREASE** the volume, hold down or depress the **Green "RIGHT" Button** until the desired volume is achieved.

Note: *Pushing the **Left** or **Right Flipper Buttons** operates the same as the **Red** or **Green Buttons** of the Service Switch Set, while in this Volume Mode.*

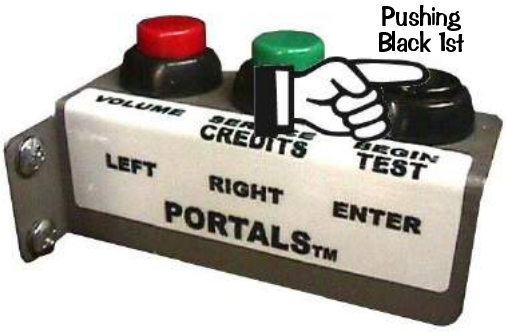
Set between **0** and **31**; **15** is the *Factory Default*. Once your adjustments are made, this menu will ***automatically exit*** a few seconds after the last button depression.

Function 2, Service Credits Menu

Pushing the ***Green Button*** ***(SERVICE CREDITS / RIGHT)*** first, adds ***Service Credits*** *(will not affect your audits as "paid" credits).* This is useful for the technician to test games in regular play without affecting the game audits. Each depression adds **1 credit**; up to **50 credits** can be applied. **Adj. 16**, **Credit Limit**, determines this, however, it can be changed from 04-50; *for details see Chapter **4** of this Section **3**.* Once your credits are added, this menu will ***automatically exit*** a few seconds after the last button depression.

Note: *This function is disabled if **Adjustment 30**, **Free Play**, is set to **YES**. The Service Credits are limited to the Credit Limit in addition to any paid credits present in the game (e.g. If the Credit Limit is 30, and there are 8 paid credits present, only 22 Service Credits can be applied.).*

open Adjustments



Function 3, Portals™ Service Menu

Pushing the ***Black Button*** ***(BEGIN TEST / ENTER)*** first, enters the ***Portals™ Service Menu***. Once in, navigate through all menus depressing the **Red "LEFT"** or **Green "RIGHT" Buttons**.

Note: *Pushing the **Left** or **Right Flipper Buttons** operates the same as the **Red** or **Green Buttons** of the Service Switch Set, while in this Service Mode.*

Select or *activate* the *Icon* chosen *(the Icon will be "flashing")* by pushing down or depressing the **Black "ENTER" Button**.

*Note: Pushing the **Start Button** operates the same as the **Black Button** of the Service Switch Set, while in this Service Mode.*

Please read *the remainder of this Chapter for more information on the **Portals™ Service Menu**. The remaining six (6) Chapters of this Section explains all **Icons & Menus** in detail. **Read! Read! Read!***

back to Page 8

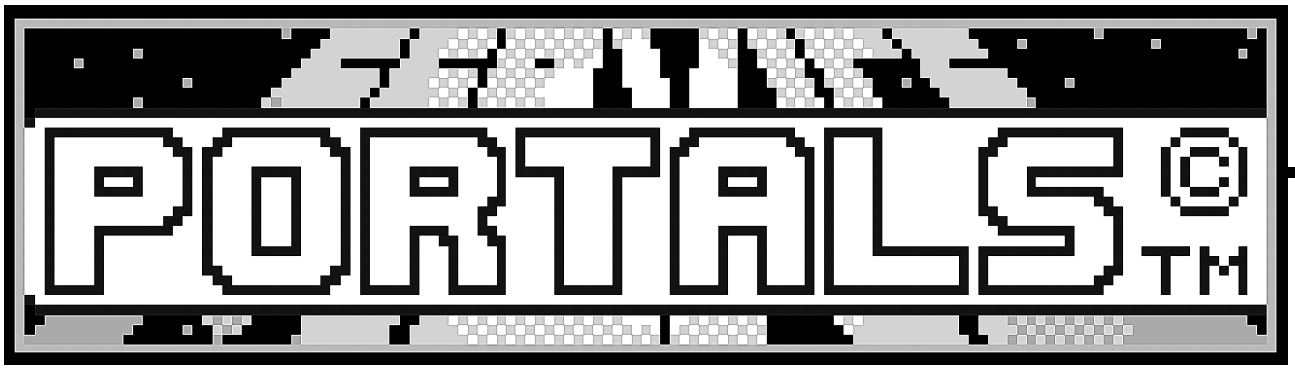
Portals™ Service Menu Introduction

Important: The ***Dual Switch Bracket*** holds the ***Playfield Power Interlock*** & ***Memory Protect Switches***. It is located just inside the Coin Door frame *(see pictorial of the **Coin Door** on the previous page)*. The Button Switch at the top is the ***Playfield Power Interlock Switch***. It must be pulled out for electro-mechanical device testing or diagnostic purposes (this is required). If this button is pushed in, the ***Playfield Power*** is disabled while the **Coin Door** is **OPEN**. The Button Switch at the bottom is the ***Memory Protect Switch***. It is enabled while the **Coin Door** is **CLOSED**; *meaning any adjustment changes that are made **will not be written to memory**.* If changing adjustments is required, ensure the **Coin Door** is **OPEN** to disable this switch, thus allowing for desired changes.

How to Use This Section

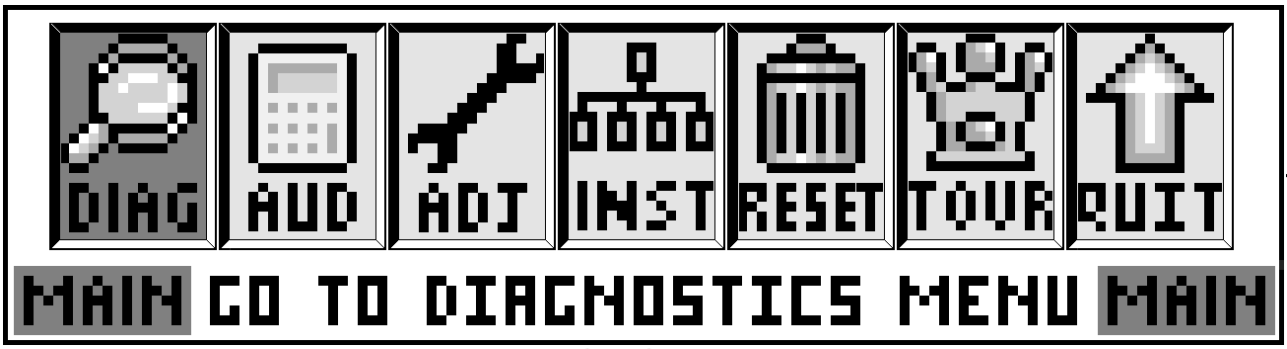
This section will cover all functions available in the **Portals™ Service Menu** in a *Step-By-Step* process. This section is divided into chapters which coincide with the **MAIN MENU**. The previous and following pages in this Chapter will instruct the operator on how to move through the Menus. It's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

To get into the **Service Menu Mode** review **"Function 3, Portals™ Service Menu"** on the previous page. After Power-Up, push down the **Black "BEGIN TEST" Button** to begin. Looking at the display you will momentarily see "**Service Menu**" with a *satellite flying from right to left pulling a banner* "**Portals©™**" followed by the **MAIN MENU**:



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.

The **MAIN MENU** now appears with the "DIAG" *Icon* (**GO TO 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. The "HELP" *Icon* & "?" *Mini-Icon* provide explanation of **ICON** usage in the Menu where the "HELP" *Icon* or "?" *Mini-Icon* was selected. View **QUIT THIS SESSION** (**Exiting the Portals™ Service Menu**) at the end of this chapter *(reference Section **3**, Chapter **1**, **Portals™ Service Menu Introduction**).*

The **chapters** in this **section**, which coincide with the **MAIN MENU**, will also provide more detailed information. ***Use both the manual and the display to help customize, troubleshoot and/or diagnose faults, if any.***

COIN DOOR IS OPEN
PLAYFIELD HIGH POWER
DISABLED BY
COIN DOOR INTERLOCK

* WHEN ENTERING THESE NOTED MENUS, YOU MUST PULL OUT the Power Interlock Switch for operation with the Coin Door open.

MAIN MENU

GO TO DIAGNOSTICS MENU	GO TO AUDITS MENU	GO TO ADJUSTMENTS MENU	GO TO INSTALLS MENU	GO TO RESET MENU	GO TO TOURNAMENT MENU	QUIT THIS SESSION
DIAG	AUD	ADJ	INST	RESET	TOUR	QUIT

MORE

These ***non-selectable Icons*** appear in the *selected Menu* only when there are **MORE** *Icons* to the **LEFT** or to the **RIGHT** available for selection.

MORE

CONTINUED NEXT PAGE.

SELECTING THIS ICON IN ANY MENU WILL EXIT PORTALS™ AND WILL RETURN TO THE ATTRACT MODE.

DIAGNOSTICS MENU

GO TO SWITCH MENU	GO TO COIL MENU *	GO TO LAMP MENU	TEST FLASH LAMPS *	CLEAR BALL TROUGH *	TECH-NICIAN ALERTS	SERVICE PHONE #	BEGIN PLAY TEST *	FIRE KNOCKER	SOUND/ SPEAKER TEST	BEGIN BURN IN	DOT MATRIX TEST	LED TEST	GO TO FUSE TABLE	DR. PINBALL
SW	COIL	LAMP	FLASH	CLR	TECH	SERV	PLAY	KNO-CKER	SPKR	BURN	DOT TEST	TV	FUSES	DR.

SWITCH MENU

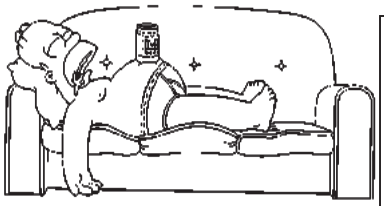
SWITCH TEST	ACTIVE SWITCH TEST	DEDICATED SWITCH TEST
TEST	ACT	DED

COIL MENU

SINGLE COIL TEST	CYCLING COIL TEST
TEST	CYC

LAMP MENU

SINGLE LAMP TEST	TEST ALL LAMPS	ROW LAMP TEST	COLUMN LAMP TEST
ONE	ALL	ROW	COL



DR. PINBALL MENU

COIL FLOW CHART	SWITCH FLOW CHART	LAMP FLOW CHART
DR.	DR.	DR.

AUDITS MENU

EARNINGS AUDITS	STANDARD AUDITS	FEATURE AUDITS	GO TO PRINTER MENU
EARN	S.P.I.	SPF	PRNT

ADJUSTMENTS MENU

STANDARD ADJUST-MENTS	FEATURE ADJUST-MENTS	CUSTOM MESSAGE
S.P.I.	SPF	ABCD CUST MSG

PRINTER MENU

QUICK PRINTOUT	FULL PRINTOUT	RESET PRINTER
QUIK	ALL-SOM	RESET

OPTIONAL ***PRINTING KIT (sold separately)*** *IS REQUIRED FOR OPERATION OF THIS MENU.*

Explanation & usage of common Large & Mini-Icons used in various Menus & Sub-Menus:

Note: *In Sub-Menu Tests or Displays, further action is required: select & activate the appropriate Mini-Icon(s).*

PREV — *Return to the* **PREVIOUS** Menu.

QUIT — **QUIT**, *exits & returns to the* ***Attract Mode***.

HELP — *View* **HELP** *Screens of the current Menu.*

Note: *If a new* ***MINI-ICON*** *is used for a specific function, select the* **"?"** *Icon for more information.*

◀◀ ▶▶ — *Move* **LEFT** *or* **RIGHT**, *select previous/next or move backwards/ forwards.*

− + — **DECREMENT (-)** *or* **INCREMENT (+)** *displayed value or select previous/next.*

RUN — **RUN** *(or activate) selected test or coil.*

PULSE — **PULSE** *coil.*

DRAW — *View the schematic (***DRAW***ing) of current display. Select while current switch, lamp or coil is viewed.*

NO YES — *Answer* **NO** *or* **YES** *for Flow Chart Menu questions in Dr. Pinball Menus.*

END — **END** *current coil selection to select a new coil for diagnosing in Dr. Pinball Menus.*

The Simpsons Pinball Party Portals™ Service Menu Icon Tree

Portals™ Service Menu Icon Tree Continued

Note: *After selection of any of the 1st* ***13 Install Icons****, the request is installed and returns to the* ***Install Menu****. The last icon activated before exiting this menu will supercede any previous Icon selected in the group.*

SEE PREVIOUS PAGE.

MAIN MENU

GO TO DIAGNOSTICS MENU	GO TO AUDITS MENU	GO TO ADJUSTMENTS MENU	GO TO INSTALLS MENU	GO TO RESET MENU	GO TO TOURNAMENT MENU	QUIT THIS SESSION
DIAG	AUD	ADJ	INST	RESET	TOUR	QUIT

Note: *After selection of any of the 1st* ***4 Reset Icons****, the request is installed and returns to the* ***Reset Menu****. Selecting a "FACT" Icon, the request is installed and* ***exits the Portals™ Service Menu System****.*

INSTALLS MENU

X.EZ	EASY	FACT	HARD	X.HD	3BAL	5BAL	PAY	FREE	HOME	STAR	NOV	A.A.B	FACT
INSTALL EXTRA EASY	INSTALL EASY	INSTALL NORMAL	INSTALL HARD	INSTALL EXTRA HARD	INSTALL 3-BALL	INSTALL 5-BALL	$ .50 COMPETI-TION	FREE PLAY COMPETI-TION	INSTALL HOME PLAY	FILM STAR RESET	INSTALL NOVELTY	INSTALL ADD-A-BALL	INSTALL FACTORY

SELECTING THIS ICON IN ANY MENU WILL EXIT PORTALS™ AND WILL RETURN TO THE ATTRACT MODE.

RESET MENU

COIN	AUD	HSTD	CRED	FACT
RESET COIN AUDITS	RESET GAME AUDITS	RESET HIGH SCORES	RESET CREDITS	FACTORY RESET

AFTER FACTORY RESET IS INSTALLED, YOU WILL THEN EXIT PORTALS™ AND WILL RETURN TO THE ATTRACT MODE.

REQUEST INSTALLED

TOURNAMENT MENU

SET UP	STRT	END	PRIZ	AUD	A-B TEXT
TOURNAMENT ADJUST-MENTS	START TOURNA-MENT	STOP TOURNA-MENT	TOURNA-MENT PRIZES	TOURNA-MENT AUDITS	SIGN MESSAGES A-B

OPTIONAL ***TOURNAMENT KIT (sold separately)*** *IS REQUIRED FOR OPERATION OF THIS MENU.*

Chapter 2	Chapter 3	Chapter 4	Chapter 5	Chapter 6	Chapter 7
DIAG	AUD	ADJ	INST	RESET	TOUR

For more detailed information on these Menus, review Chapters 1-7 in this Section 3.

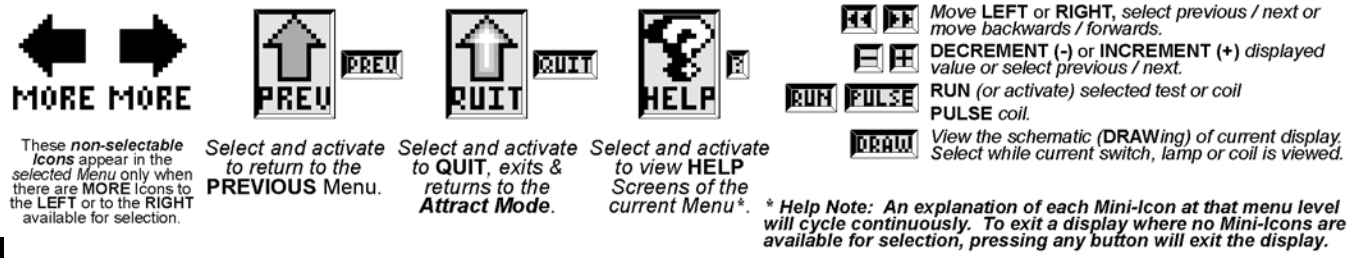
Portals™ Service Menu Example

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.

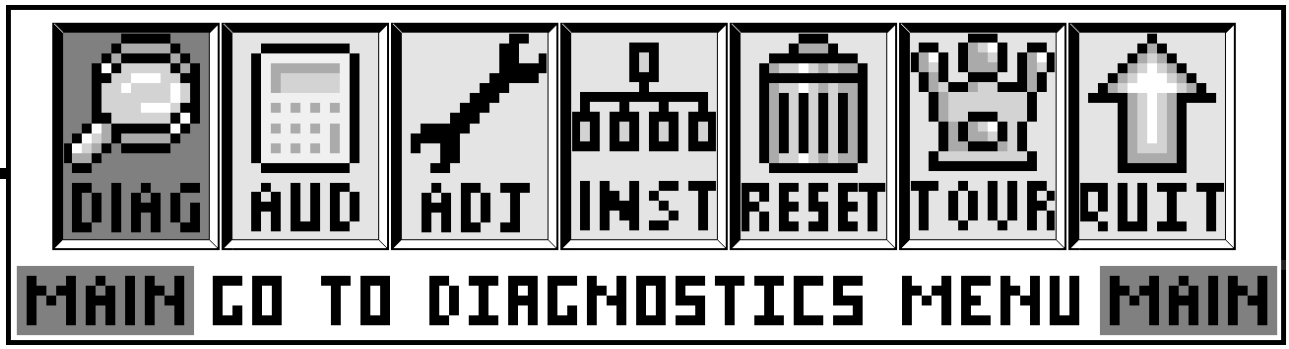
Chapters **2** through **7** will cover all menu items within the **Portals™ Service Menu**. The *Icon* is shown preceding the text. Find the *Icon* in the **Portals™ Service Menu** by navigating with the **Red** or **Green Buttons**. Each chapter started is from the **MAIN MENU**. Within the chapter, and Sub-Menu 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 on Button Usage, select & *activate* the "HELP" *Icon* or "?" *Mini-Icons.*

EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

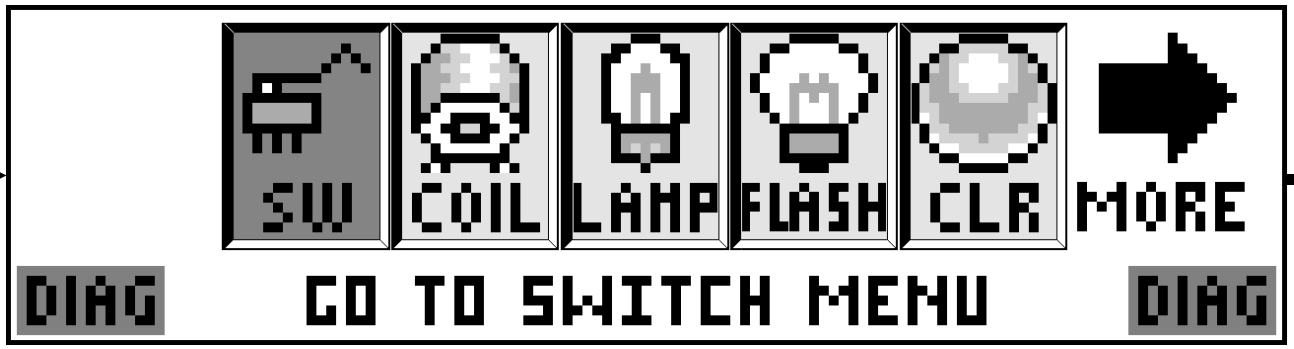


Example:

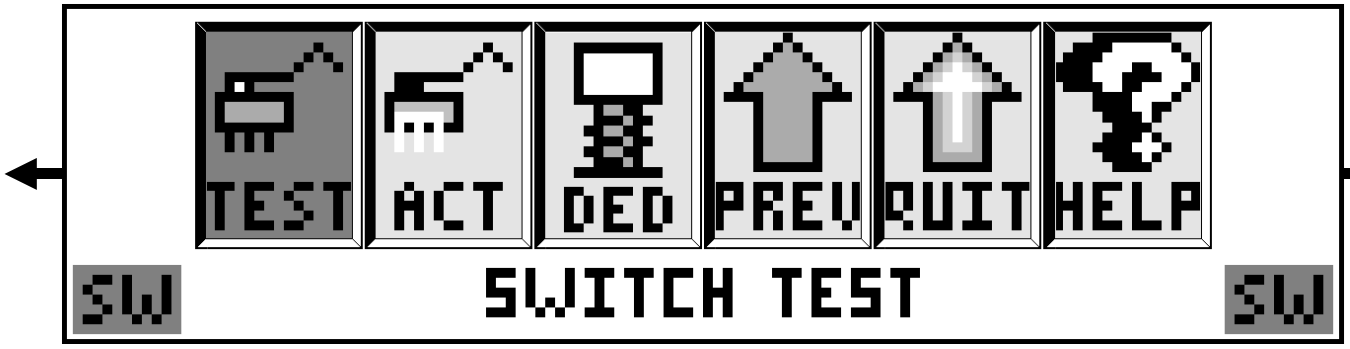
After entering **Portals™**, the **MAIN MENU** now appears with the **"DIAG"** *Icon* (**GO TO DIAGNOSTICS MENU**) flashing:



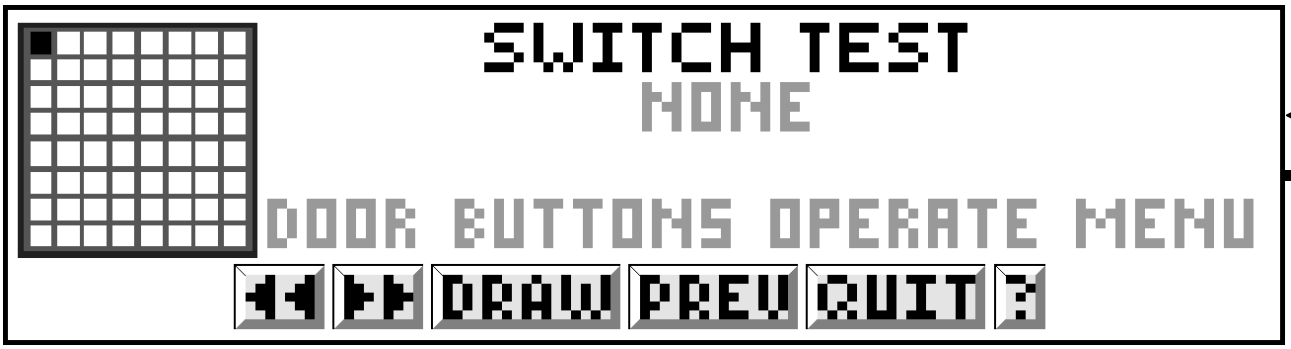
Press the **Black "ENTER" Button** to *activate* this **ICON**. The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing:



Press the **Black Button** to *activate* this **ICON**. The **SWITCH TEST MENU** now appears with the "TEST" *Icon* (**SWITCH TEST**) flashing:

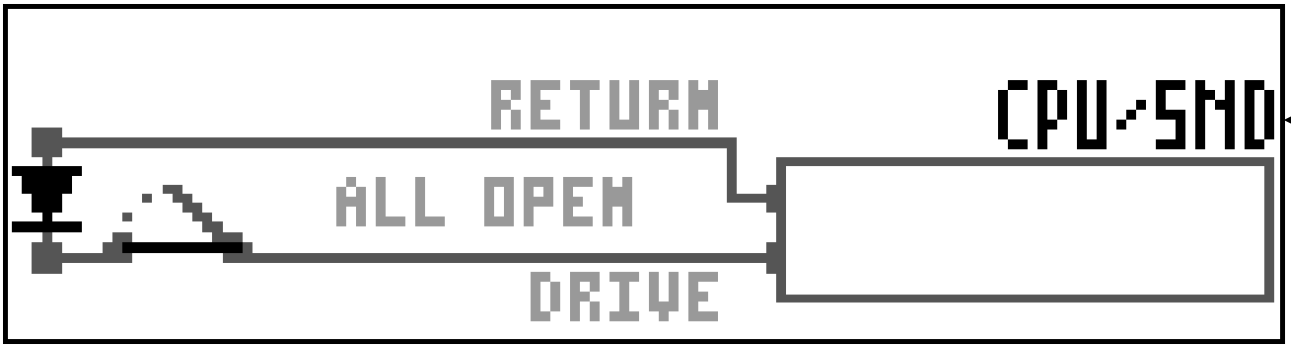


Press the **Black "ENTER" Button** to *activate* this icon. The **Switch Test Display** now appears.



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 either the **Red** or **Green Button** to select the "DRAW" *Mini-Icon*. Press the **Black Button** to *activate* this *Mini-Icon*; do so while the switch is momentarily closed. This will bring up the **Switch Schematic Display**. 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, and the "Pin-Outs" from the CPU/Sound Board. *Activating* the "DRAW" *Icon* when a switch is not closed, will give the generic switch schematic as shown below.



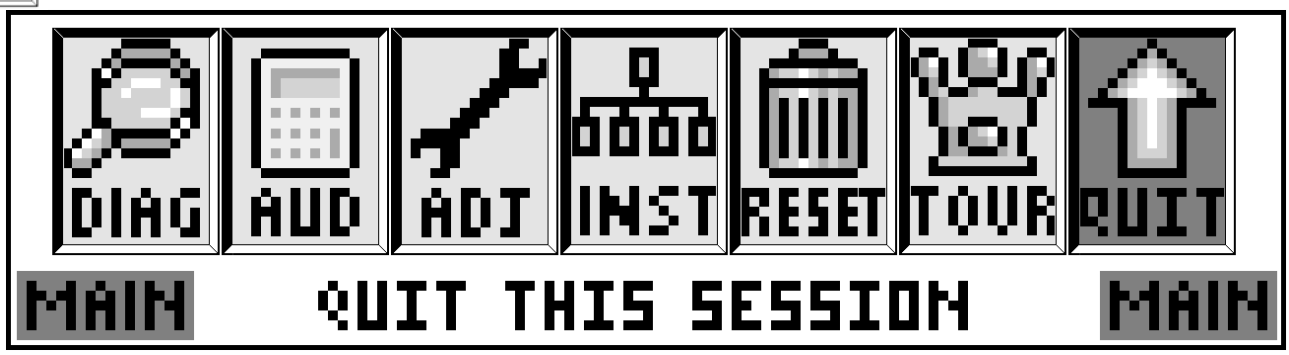
To ***exit any display where there are no Mini-Icons*** *(Schematics or Help Displays)*, ***press any button*** to return to the previous Menu.

While in **Switch Test** or **Active Switch Test**, the **Flipper & Start Buttons** are deactivated (because they can be part of these tests). 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 "<<" or ">>" *Mini-Icon* is *activated*, the display will go to (slip between) the previous tests *(Active & Dedicated Switch Tests).* Use either the **Red** or **Green Button** to select the "PREV" *Mini-Icon.* Press the **Black "ENTER" Button** to return to **Switch Test Menu**. To exit out of this Sub-Menu, select and *activate* the "PREV" *Icon* in the Menu. The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing. Go through other ***Diagnostics*** selections or exit.

To exit the **Portals™Service Menu**, select & *activate* the "QUIT" *Icon (see the next page).*

QUIT THIS SESSION (Exiting the Portals™ Service Menu)

In the **MAIN MENU** and in all **SUB-MENUS**, if the "QUIT" *Icon* or "QUIT" *Mini-Icon* is selected and *activated*, the **Portals™ Service Menu Session** will be exited and returned to the ***Attract Mode***.



The game will go into the same *Power-Up Routine* as if turning on the game. Upon **Power-Up**, the CPU Game Code & Display Code versions with Check-Sums are shown, followed by the Location ID & Game ID Numbers and Alerts, if any *(see Section **3**, Chapter **2**, **GO TO DIAGNOSTICS MENU**, **Technician Alerts**).*

The below **Problem** / **Solution Table** was designed to answer some common problems frequently asked.

Problem / Solution Table

PROBLEM	SOLUTION
Will not enter the **Service Mode** after depressing the **Black "BEGIN TEST" Button**.	• Check the Service Switch(es) (**Red, Green & Black Buttons**) for loose connections or bad Ground. • Check the associated wiring harness to/from the CPU/Sound Board, Connector **CN6**. • Check CPU/Sound Board for possible failure.
All Service Buttons (**Red, Green** and **Black**) appear nonfunctional.	• Check the Service Switches wiring harness for poor or no connection and/or broken wires.
The **Green Service Button** in the Attract Mode will not enter the **SERVICE CREDITS MENU** to add Service Credits.	• Check to make sure the Game is not in "**Free Play**." *If the game is set to Free Play, adding Service Credits is not required.* • Check the Service Switches wiring harness for poor or no connection and/or broken wires.
The **Display** "blanks out."	• Check the Dot Matrix Display for loose wiring harness for poor or no connection and/or broken wires. • Check **F1** (3/4A Fuse) on the Display Power Supply Board. Refer to Sec. **5**, Chp. **4**, **SCHEMATICS & TROUBLESHOOTING**.
Icons *"scroll"* along continuously in the **MAIN MENU**.	• Check for a stuck switch on the **Green Button**. • If the Service Switch Set and/or the Coin Door was replaced, ensure the Locking Mechanism on the **Green Button** was removed. If the Green Button "clicks" and locks into an up/down position, the **Green Button** has this lock switch. Remove it. (Ref. to Svc. 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. Refer to Section **3**, Chapter **2**, **GO TO DIAGNOSTICS MENU**, **Switch Test**.
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 Section **5**, Chapter **2**, Playfield Wiring, #-Flipper Circuit Wiring Diagram. • 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. Refer Section **3**, Chapter **3**, **GO TO PRINTER MENU**.
Some *Icons* appear non-functional in the **GAME SPECIFIC MENU** under the **DIAGNOSTICS MENU**.	• If there is no other test under this Menu, the "<<" & ">>" *Mini-Icons* will appear not to function. The remaining *Icons* should function as normal. ***Note:*** *If there is no "Go To (Game Name) Test(s), the "GAME NAME" Icon will not invoke another display.*
The display returns to the **ATTRACT MODE** exiting the Service Session after a **FACTORY RESET**.	• This is normal. After a **FACTORY RESET**, the Service Session is automatically exited. Refer to Sec. **3**, Chp. **6**, **GO TO RESET MENU**, **Factory Reset**.
In **COIL TEST MENU**, the coils and flashlamps ***do not*** fire after activating the "RUN" *Icon*.	• Ensure the **POWER INTERLOCK SWITCH** ***is pulled out*** *(see the start of this Chapter).*
In **ADJUSTMENTS MENU**, with the Coin Door **CLOSED**, adjustments are not getting changed as desired (using the **Flipper** & **Start Buttons**).	• This is normal. The ***Memory Protect Switch*** is enabled when the Coin Door is **CLOSED**. Changes can be made with the Coin Door **OPEN** only.
In **Portals™ Service Menu**, the volume cannot be adjusted with the **Red** or **Green Buttons**.	• The Volume adjustment can only be made when in the **Attract Mode**. The **Volume Mode** is entered by pressing the **Red "VOLUME" Button**. Then use the **Red "LEFT"** to decrease / decrement (-) or **Green "RIGHT" Button** to increase / increment (+) the volume.
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 Technical Support for additional help.

Go To Diagnostics Menu

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)*. 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 Name' Tests**) may be used for troubleshooting. All *Icons* and there usages are explained throughout this chapter in order.

Important: *Upon* ***Power-up****, opening the* ***Coin Door*** *or exiting* ***Portals™****, watch the* ***Display*** *for any* ***Alerts.***

OPEN THE DOOR

If this ***display flashes***, the game is indicating that **CMOS RAM** memory (CPU Loc. U212) 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 (Reset)*, by opening the ***Memory Protect Switch***. Check battery voltage at **VBATT Test Point** on the **CPU/Sound Bd.** *(more details in Sec.* ***5****, Chp.* ***4****,* ***PCBs****).*

COIN DOOR IS OPEN
PLAYFIELD HIGH POWER
DISABLED BY
COIN DOOR INTERLOCK

This ***flashing display*** is shown immediately upon opening the **Coin Door** as a reminder that **20v/50v DC** power to the playfield is **disabled**. All electro-mechanical devices *(such as Coils)* ***cannot be tested*** with the switch pushed in. **PULL OUT** the **Power Interlock Switch** ***ONLY*** if you're in a ***Testing Menu*** requiring power. See ***Access & Use*** in Chapter **1** of this Section for the location of this switch. *Closing the* ***Coin Door*** *will automatically reset this switch.*

OPERATOR ALERT!
#2 AUTO LAUNCH
COIL MALFUNCTION

This ***display*** is shown momentarily during **Game Mode** or **Power-Up** to alert the operator of a coil malfunction *(coil doesn't energize or coil fires a multiple number of times)*. **OPERATOR ALERT!** works by monitoring any *switch activated coil* that has the potential to trap a ball when disabled *(more details in this Chapter,* ***Technician Alerts****,* ***Pages 24-25****).*

PLEASE CHECK
TECH REPORT
PORTALS->DIAG->TECH

If this ***display flashes*** *(along with an audible sound),* the game has detected faulty switches and/or missing pinballs. To check, enter the **Portals™ Service Menu System**, select the **"DIAG"** *Icon* (**GO TO DIAGNOSTICS MENU**) from the **MAIN MENU** and select the **"TECH"** *Icon (more details in this Chapter,* ***Technician Alerts****,* ***Pages 24-25****).*

⚠ **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**, then select the "CLR" *Icon* to enter the **CLEAR BALL TROUGH MENU**. Select the "RUN" *Mini-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 Name' Tests***. **PULL OUT** the **Power Interlock Switch** for operation.

EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

These ***non-selectable Icons*** appear in the *selected Menu* only when there are **MORE** Icons to the **LEFT** or to the **RIGHT** available for selection.

Select and activate to return to the **PREVIOUS** Menu.

Select and activate to **QUIT**, *exits & returns to the* ***Attract Mode***.

Select and activate to view **HELP** *Screens of the current Menu*.*

Select and activate to:

Move **LEFT** or **RIGHT,** *select previous / next or move backwards / forwards.*

DECREMENT (-) or **INCREMENT (+)** *displayed value or select previous / next.*

RUN *(or activate) selected test or coil*

PULSE *coil.*

*View the schematic (***DRAW***ing) of current display. Select while current switch, lamp or coil is viewed.*

**** Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.***

GO TO DIAGNOSTICS MENU

After entering **Portals™**, the **MAIN MENU** now appears. To initiate, from the **MAIN MENU**, select the "DIAG" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** (the **Flipper Buttons** operates in the same manner) and press the **Black "ENTER" Button** (the **Start Button** operates in the same manner). The **DIAGNOSTICS MENU** appears. Continue through this chapter for the explanation & usage of the *Icons* in the **DIAGNOSTICS MENU**. ***Usage Note:*** *Only in Switch & Active Switch Tests, the* ***Flipper & Start Buttons cannot be used*** *as the alternate navigation buttons as they are a part of these tests.* After exiting these tests, the **Left** & **Right Flipper** and **Start Buttons** can once again be used. Continue through this chapter for the explanation & usage of the *Icons* in the **DIAGNOSTICS MENU**.

Go To Switch Menu

To initiate, from the **DIAGNOSTICS MENU**, select the "SW" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** 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** possible switches. The **SWITCH TEST MENU** consists of three (3) parts: **Switch Test**, **Active Switches** & **Dedicated Switch Test**. ***Reminder:*** *The **Flipper & Start Buttons** (part of Switch Tests) cannot be used as **navigation buttons** during these test(s)*

Switch Test

To initiate, from the **SWITCH MENU**, select the "TEST" *Icon* with either the **Red** or **Green Buttons** & press the **Black Button**. In **Switch Test**, close each switch and observe the display. The display will describe the switch in the Switch Matrix Grid *(below),* which includes the switch name, Return (Row) Wire, Drive (Column) Wire and the "Pin-Outs" from the **CPU/Sound Board**. When the switch is closed, the information if displayed momentarily. To view the schematic for the switch selected, press either the **Red** or **Green Button** to select the "DRAW" *Mini-Icon*. Press the **Black Button** to *activate* this *Mini-Icon*; do so while the switch is momentarily closed. To return to **Switch Test**, press the **Black Button** again.

Active Switch Test

To initiate, from the **SWITCH MENU**, select the "ACT" *Icon* with either the **Red** or **Green Buttons** & press the **Black Button**. If still in a previous test, select the "PREV" *Mini-Icon* to return to **SWITCH MENU** or select either of the "<<" or ">>" *Mini-Icons* to move through the tests. In **Active Switch Test**, 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 Number 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

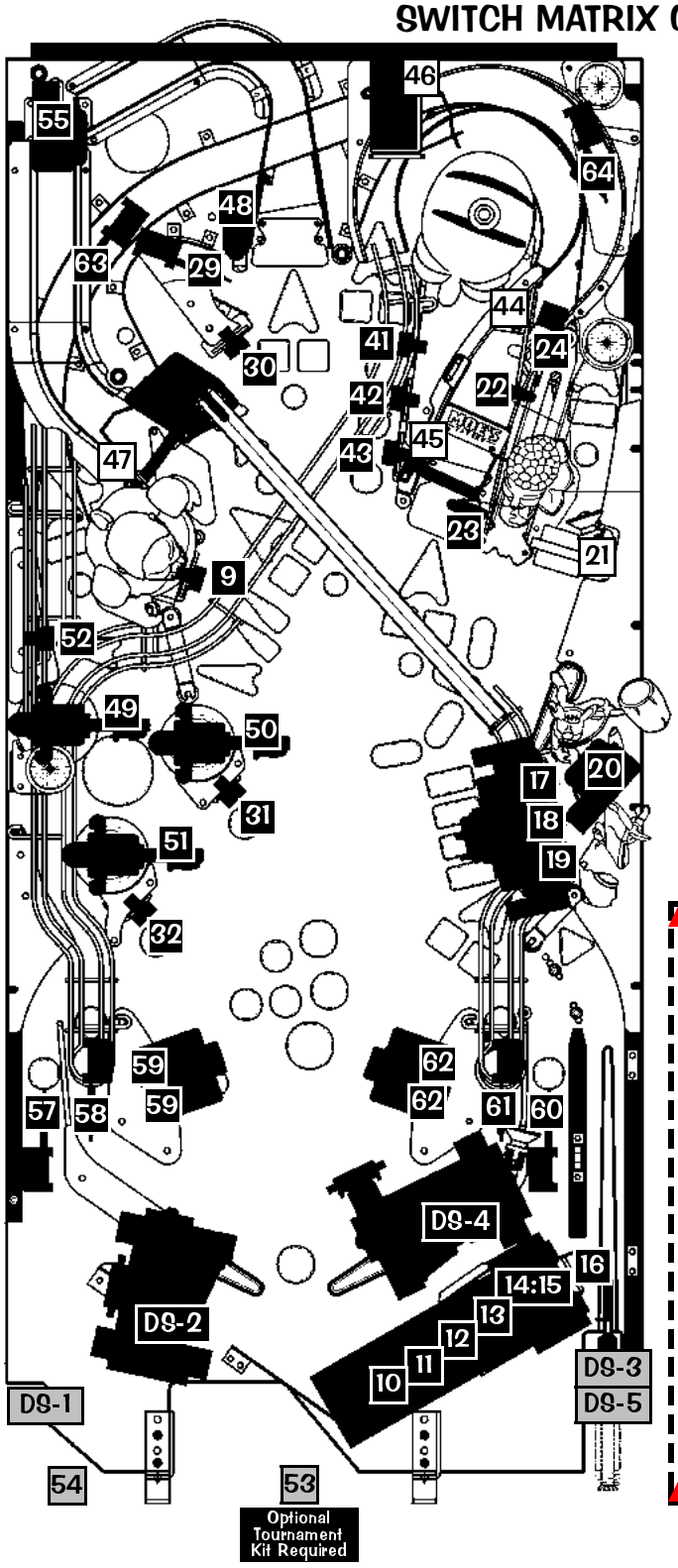
To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either **Flipper Button** & press the **Start Button** *(the Service Switches are deactivated during this test.).* In **Dedicated Switch Test**, the display will describe the switch which includes the Switch Name, Return (Row) Wire, Drive (Column) Wire, Part Number and the "Pin-Outs" from the **CPU/Sound Board**.

SWITCH MATRIX GRID & DEDICATED SWITCHES

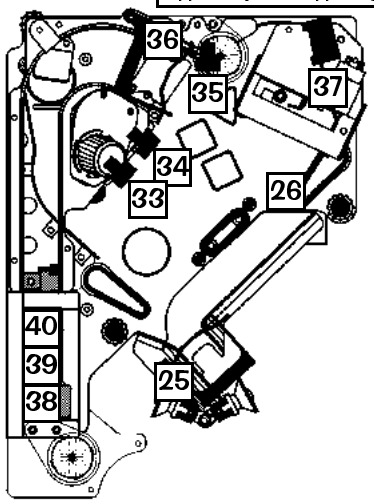
Row (Return) \ Column (Drive)	1: Q1 GRN-BRN CN5-P1	2: Q2 GRN-RED CN5-P3	3: Q3 GRN-ORG CN5-P4	4: Q4 GRN-YEL CN5-P5	5: Q5 GRN-BLK CN5-P6	6: Q6 GRN-BLU CN5-P7	7: Q7 GRN-VIO CN5-P8	8: Q8 GRN-GRY CN5-P9
1: U400 WHT-BRN CN7-P9	1 Cabinet Side LEFT BUTTON (UK ONLY) 180-5160-00	9 Below P/F COMIC BOOK GUY STANDUP 515-6027-08	17 Below P/F DROP TARGET #1 (TOP) DOTS 180-5158-00	25 Abv. Upr. P/F UPPER PLAYFIELD EXIT 180-5190-28	33 Blw. Upr. P/F UPF LIGHT STANDUP 515-5966-04	41 Below P/F BULLY 3-BANK (TOP) 515-6027-08	49 Below P/F LEFT BUMPER 180-5015-03	57 Below P/F LEFT OUTLANE 500-6227-02
2: U400 WHT-RED CN7-P8	2 Coin Door 4TH COIN SLOT 180-5204-00	10 Below P/F 5-BALL TROUGH #1 (LEFT) 180-5119-02	18 Below P/F DROP TARGET #2 (MID) DOTS 180-5158-00	26 Blw. Upr. P/F GARAGE RAMP ENTER 180-5190-28	34 Blw. Upr. P/F UPF LOCK STANDUP 515-5966-04	42 Below P/F BULLY 3-BANK (MID) 515-6027-08	50 Below P/F RIGHT BUMPER 180-5015-03	58 Below P/F LEFT RETURN LANE 500-6227-02
3: U400 WHT-ORG CN7-P7	3 Coin Door 6TH COIN SLOT *Future Use*	11 Below P/F 5-BALL TROUGH #2 180-5119-02	19 Below P/F DROP TARGET #3 (BOT) DOTS 180-5158-00	27 NOT USED	35 Blw. Upr. P/F UPF TOP STANDUP 515-5966-02	43 Below P/F BULLY 3-BANK (BOT) 515-6027-08	51 Below P/F BOTTOM BUMPER 180-5015-03	59 Below P/F LEFT SLINGSHOT 180-5054-00 (x2)
4: U400 WHT-YEL CN7-P6	4 Coin Door RIGHT COIN SLOT 180-5204-00	12 Below P/F 5-BALL TROUGH #3 180-5119-02	20 Below P/F ITCHY & SCRATCHY SAUCER DOTS 180-5116-01	28 NOT USED	36 Abv. Upr. P/F COUCH ENTER 180-5190-28	44 Above P/F UP RIGHT SAUCER BACKUP 180-5119-02	52 Below P/F POP SIDE STANDUP 515-6027-08	60 Below P/F RIGHT OUTLANE 500-6227-02
5: U401 WHT-GRN CN7-P5	5 Coin Door CENTER COIN SLOT / DBA 180-5204-00	13 Below P/F 5-BALL TROUGH #4 180-5119-02	21 Above P/F SPINNER 180-5010-04	29 Below P/F KWIK-E-MART LOOP 500-6227-02	37 Blw. Upr. P/F TV LOCKUP 500-6227-02	45 Above P/F RIGHT RAMP ENTER 180-5190-28	53 In Cabinet TOURNAMENT BUTTON 180-5174-00	61 Below P/F RIGHT RETURN LANE 500-6227-02
6: U401 WHT-BLU CN7-P3	6 Coin Door LEFT COIN SLOT 180-5204-00	14 Below P/F 5-BALL TROUGH VUK OPTO *See Sw. 14 Note*	22 Below P/F BART SKATEBOARD TOP 180-5190-48	30 Below P/F KWIK-E-MART STANDUP 515-6027-08	38 Abv. Upr P/F COUCH LOCK (BOT) 180-5119-02	46 Above P/F RIGHT RAMP MADE 180-5190-28	54 In Cabinet START BUTTON 180-5174-00	62 Below P/F RIGHT SLINGSHOT 180-5054-00 (x2)
7: U401 WHT-VIO CN7-P2	7 Coin Door 5TH COIN SLOT *Future Use*	15 Below P/F 5-BALL STACKING OPTO *See Sw. 15 Note*	23 Below P/F BART SKATEBOARD 180-5190-48	31 Below P/F ADV. POPS STANDUP 515-5966-07	39 Abv. Upr. P/F COUCH LOCK (MID) 180-5119-02	47 Above P/F LEFT RAMP ENTER 180-5190-28	55 Below P/F UPPER LEFT VUK 180-5116-01	63 Below P/F LEFT ORBIT 500-6227-02
8: U401 WHT-GRY CN7-P1	8 Cabinet Side RIGHT BUTTON (UK ONLY) 180-5160-00	16 Below P/F SHOOTER LANE 180-5157-00	24 Below P/F UPPER RIGHT SAUCER 180-5186-00	32 Below P/F LIGHT OTTO STANDUP 515-5966-08	40 Abv. Upr. P/F COUCH LOCK (TOP) 180-5119-02	48 Below P/F GARAGE DOOR 500-6138-01R	56 In Cabinet PLUMB BOB TILT *See Sw. 56 Note*	64 Below P/F RIGHT ORBIT 500-6227-02

IC U206 INPUTS \ GROUND	GROUND BLK CN6-P1, -P11
1: U206 GRY-BRN CN6-P2	DS-1 on Cabinet Side #1 LEFT FLIPPER BUTTON 180-5160-00
2: U206 GRY-RED CN6-P3	DS-2 Below Playfield #2 LEFT FLIPPER E.O.S (End-of-Stroke) 180-5149-00 *on Flipper*
3: U206 GRY-ORG CN6-P4	DS-3 on Cabinet Side #3 RIGHT FLIPPER BUTTON 180-5164-00 *Doubled*
4: U206 GRY-YEL CN6-P6	DS-4 Below Playfield #4 RIGHT FLIPPER E.O.S. (End-of-Stroke) 180-5149-00 *on Flipper*
5: U206 GRY-GRN CN6-P7	DS-5 on Cabinet Side #5 UPPER RT. FLIPPER BUTTON 180-5164-00 *Doubled*
6: U206 GRY-BLU CN6-P8	DS-6 on Coin Door #6 VOLUME (RED BUTTON) (In Test: LEFT) 180-5192-02
7: U206 GRY-VIO CN6-P9	DS-7 on Coin Door #7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) 180-5192-04
8: U206 GRY-BLK CN6-P10	DS-8 on Coin Door #8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) 180-5192-00

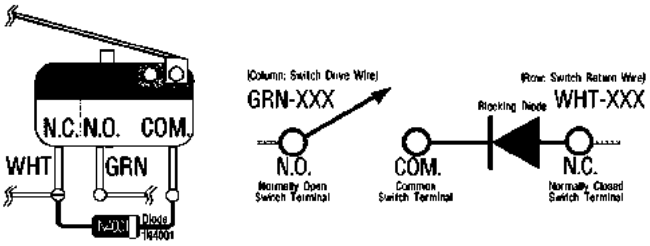
SWITCH MATRIX GRID LOCATIONS



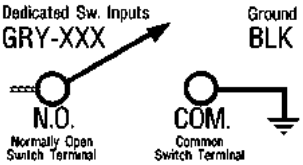
Upper Playfield - Upper Right Corner



Typical Switch Wiring & Schematic



Dedicated Switch Schematic



LEGEND NOTE:

☐ = Switches mounted above the Playfield. ■ = Switches mounted below the Playfield. ▒ = Switches mounted in the Cabinet.

Switch Part Note: *¥ Yen Coin Switch is 180-5091-00. Part numbers which start with 515- or 500- include the bracket, target, and/or housing. Targets: See Appendix I, Stand-Up Targets, for pictorial views. Switches are listed again in the Pink and Blue Pages and list the assembly and securing hardware they're used on.*
Sw. 14 & 15 Part Note: *Transmitter & Receiver OPTO PC Boards are used for both Switches 14 & 15. Transmitter: 515-0173-00; Receiver: 515-0174-00.*
Switch 56 Part Note: *The Switch is comprised of a Hanger Bracket (535-5319-00) and Contact Wire (535-7563-01) located in the Cabinet.*
Some Switch Diodes are located under the playfield *on Terminal Strips* ***or*** *Diode Boards and not on the assemblies.*
DOTS: **D**iode **O**n **T**erminal **S**trip ***or*** **DODB:** **D**iode **O**n **D**iode **B**oard *(only if noted in the Matrix Grid).*

Go To Coil Menu

To initiate, from the **DIAGNOSTICS MENU**, select the "COIL" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** 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 these positions & will be noted).* Coils **17-32** are typically Low Current Coils. Flash Lamps are typically used in positions **26-32** *(although may be used in any position & will be noted).*

```
COIN DOOR IS OPEN
PLAYFIELD HIGH POWER
DISABLED BY
COIN DOOR INTERLOCK
```

PULL OUT the Power Interlock Switch for operation with the Coin Door open.

Important: *The Partial Coils Detailed Chart Table is used as a reference against the Coil & Flash Lamp Locations on the next page. For the* ***complete*** *Coils Detailed Chart Table, see the reverse of the following page. The Chart is shown to compare against the Backbox I/O Power Driver Board Detailed Wiring Diagram (shown again in Sec.* ***5****, Chapter* ***1****,* ***Playfield Wiring****. For more on troubleshooting and diagnosing, see Sec.* ***5****, Chapter* ***4****,* ***Printed Circuit Boards****.*

Single Coil Test

To initiate, from the **COIL MENU**, select the "TEST" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. Ensure the **Power Interlock Switch** is pulled out. Select either the "-" or "+" *Mini-Icons*. Start with the "+" *Mini-Icon* to start the manual **Single Coil Test** from #1 *(the test runs through all Coils and Flash Lamps #1-#32 & Optional UK Only Auxiliary Positions AUX 1-3).* Press the **Black Button** on the "+" *Mini-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 and 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" *Mini-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.

Cycling Coil Test

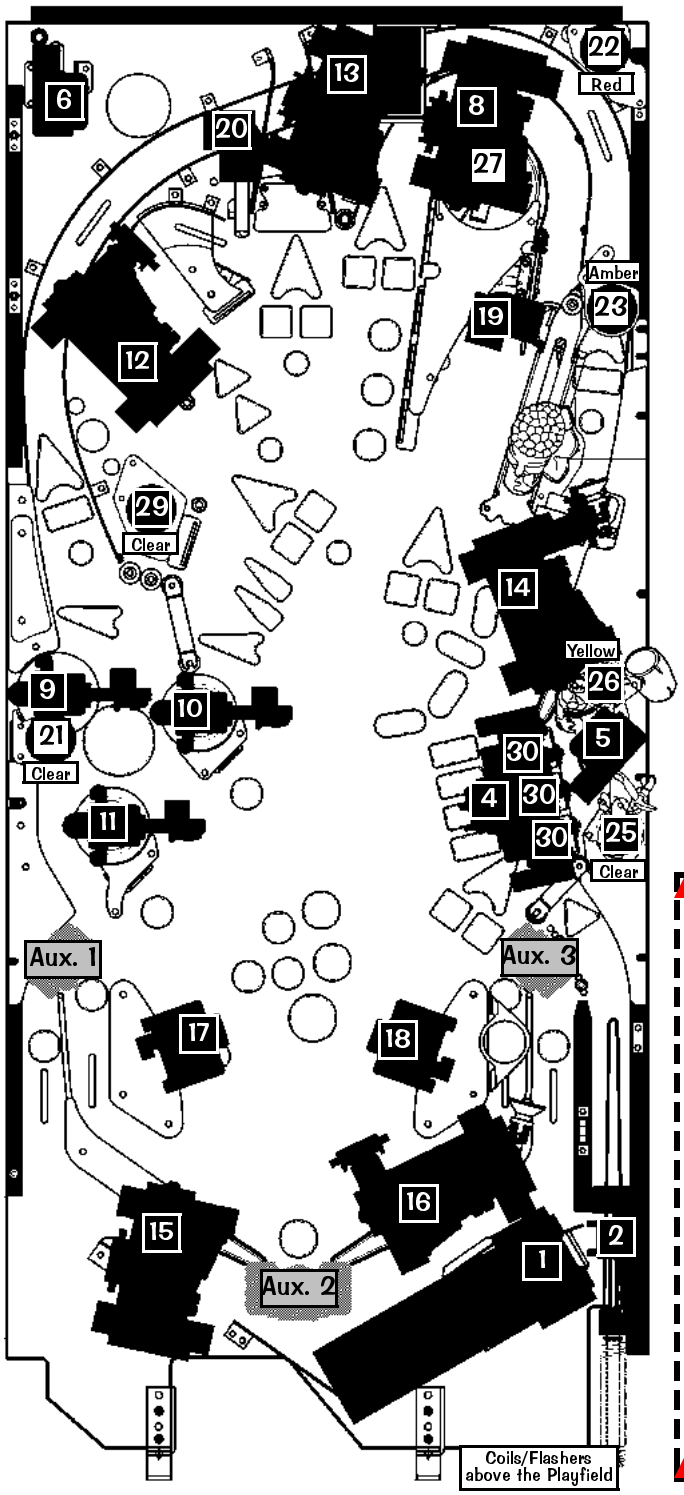
To initiate, from the **COIL MENU**, select the "CYC" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. If still in a previous test, select the "PREV" *Mini-Icon* to return to **COIL MENU** or select either of the "<<" or ">>" *Mini-Icons* to move to **Cycling Coil Test** *(selecting again will return to* ***Coil Test****).* The test pulses each regular Coil or Flash Lamp sequentially *(cycling)* on the Playfield and in the Backbox *(if Coils are used).* The display indicates **CYCLING COILS**.

PARTIAL COILS DETAILED CHART...

	High Current Coils Group 1	Drive Transistor	Coil GA-Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2	26-1200 090-5044-00T
#3	COUCH RELEASE	Q3	28-1050 090-5046-00
#4	DROPS RESET UP	Q4	26-1200 090-5044-00T
#5	ITCHY & SCRATCHY EJECT (VUK)	Q5	27-1500 090-5004-00T
#6	UPPER LEFT VUK	Q6	26-1200 090-5044-00B
#7	TV RELEASE	Q7	28-1050 090-5046-00
#8	HOMER HEAD	Q8	22-900 090-5020-20T
	High Current Coils Group 2	**Drive Transistor**	**Coil GA-Turn or Bulb Type**
#9	LEFT BUMPER	Q9	26-1200 090-5044-00T
#10	RIGHT BUMPER	Q10	26-1200 090-5044-00T
#11	BOTTOM BUMPER	Q11	26-1200 090-5044-00T
#12	UPF LEFT FLIPPER	Q12	25-1800 090-5041-00T
#13	UPF RIGHT FLIPPER	Q13	24-1570 090-5025-00T
#14	TOP RIGHT FLIPPER	Q14	23-1100 090-5030-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	22-1080 090-5032-00T
	Low Current Coils Group 1	**Drive Transistor**	**Coil GA-Turn or Bulb Type**
#17	LEFT SLINGSHOT	Q17	23-800 090-5001-00T
#18	RIGHT SLINGSHOT	Q18	23-800 090-5001-00T
#19	UPPER RIGHT EJECT	Q19	26-1200 090-5044-00T
#20	GARAGE DOOR (EJECT)	Q20	26-1200 090-5044-00T
#21	FLASH: POPS CLEAR	Q21	#906 Bulb 165-5004-00
#22	FLASH: R.RAMP RED	Q22	#906 Bulb 165-5004-00
#23	FLASH: R.RAMP ORANGE	Q23	#906 Bulb 165-5004-00
#24	OPTIONAL COIL	Q24	Opt. 5v
	Diode **O**n **T**erminal **S**trip (if noted)		
	Low Current Coils Group 2	**Drive Transistor**	**Coil GA-Turn or Bulb Type**
#25	FLASH: ITCHY	Q25	#906 Bulb 165-5004-00
#26	FLASH: SCRATCHY	Q26	#906 Bulb 165-5004-00
#27	FLASH: HOMER HEAD	Q27	#906 Bulb 165-5004-00
#28	FLASH: COUCH	Q28	#906 Bulb 165-5004-00
#29	FLASH: COMIC BOOK GUY	Q29	#906 Bulb 165-5004-00
#30	DROP BANK TRIPS	Q30	32-1250 515-6916-01
#31	FLASH: UPF ORANGE	Q31	#906 Bulb 165-5004-00
#32	FLASH: UPF RED	Q32	#906 Bulb 165-5004-00
	Auxiliary (UK ONLY)	**Drive Transistor**	**Coil GA-Turn**
	AUX 1: LEFT UP/DOWN POST	Q1	26-1200 090-5044-00T
	AUX 2: CENTER UP/DOWN POST	Q2	23-1100 090-5030-00T
	AUX 3: RIGHT UP/DOWN POST	Q3	26-1200 090-5044-00T

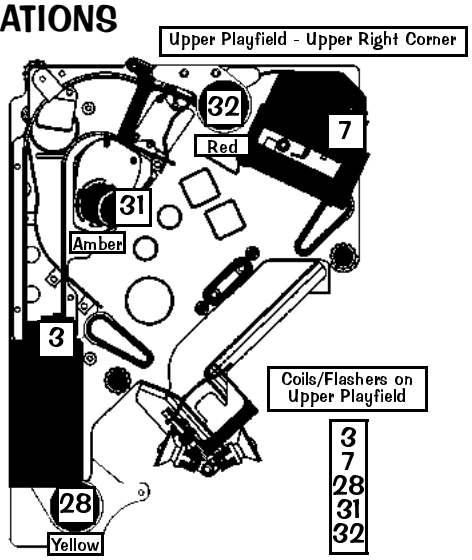
Go To Diagnostics Menu

COIL & FLASH LAMP LOCATIONS

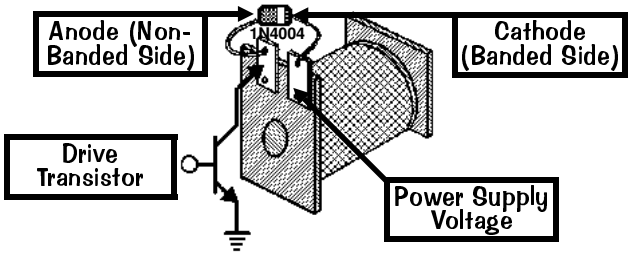


21
22
23
27

Remaining Coils/ Flashers are below

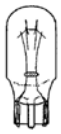


Typical Coil Wiring



Bulb Types used for Flash Lamps

#89 Bulb
(Bayonet)
165-5000-89



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

LEGEND NOTE:

☐ = Coils / Flash Lamps mounted above the Playfield. ■ = Coils / Flash Lamps mounted below the Playfield. ▒ = Coils / Flash Lamps mounted in the Cabinet.

***Coil Q24 is Optional**. If a Coin Meter, Token Dispenser or Knocker is required (both optional) call Technical Support for more information, 1-800-542-5377 or 1-708-345-7700.*
Auxiliary Coils AUX 1 - AUX 3 are typically for UK Only.

Flash Lamp Part Note: Color = Color of Mini-Mars over bulb.

***Some Coil / Flash Lamp Diodes are located under the playfield** on Terminal Strips **or** Diode Boards and not on the assemblies.*
DOTS: **D** iode **O** n **T** erminal **S** trip ***or*** **DODB:** **D** iode **O** n **D** iode **B** oard *(only if noted in the Chart Table).*

In COIL MENU also select:

CYCLING COIL TEST

COILS DETAILED CHART TABLE

	High Current Coils Group 1	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	▲ I/O Power Driver ▼	YEL-VIO	J10-P4/5	50v DC	BRN-BLK	J8-P1	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2		YEL-VIO	J10-P4/5	50v DC	BRN-RED	J8-P3	26-1200 090-5044-00T
#3	COUCH RELEASE	Q3		YEL-VIO	J10-P4/5	50v DC	BRN-ORG	J8-P4	28-1050 090-5046-00
#4	DROPS RESET UP	Q4		YEL-VIO	J10-P4/5	50v DC	BRN-YEL	J8-P5	26-1200 090-5044-00T
#5	ITCHY & SCRATCHY EJECT (VUK)	Q5		YEL-VIO	J10-P4/5	50v DC	BRN-GRN	J8-P6	27-1500 090-5004-00T
#6	UPPER LEFT VUK	Q6		YEL-VIO	J10-P4/5	50v DC	BRN-BLU	J8-P7	26-1200 090-5044-00B
#7	TV RELEASE	Q7		YEL-VIO	J10-P4/5	50v DC	BRN-VIO	J8-P8	28-1050 090-5046-00
#8	HOMER HEAD	Q8		GRY~3A Fuse~BRN	J7-P1	20v DC	BRN-GRY	J8-P9	22-900 090-5020-20T

	High Current Coils Group 2	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#9	LEFT BUMPER	Q9	▲ I/O Power Driver ▼	YEL-VIO	J10-P4/5	50v DC	BLU-BRN	J9-P1	26-1200 090-5044-00T
#10	RIGHT BUMPER	Q10		YEL-VIO	J10-P4/5	50v DC	BLU-RED	J9-P2	26-1200 090-5044-00T
#11	BOTTOM BUMPER	Q11		YEL-VIO	J10-P4/5	50v DC	BLU-ORG	J9-P4	26-1200 090-5044-00T
#12	UPF LEFT FLIPPER	Q12		GRY~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-YEL	J9-P5	25-1800 090-5041-00T
#13	UPF RIGHT FLIPPER	Q13		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-GRN	J9-P6	24-1570 090-5025-00T
#14	TOP RIGHT FLIPPER	Q14		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-BLK	J9-P7	23-1100 090-5030-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15		GRY-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-GRY	J9-P8	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-VIO	J9-P9	22-1080 090-5032-00T

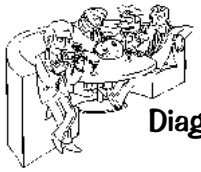
	Low Current Coils Group 1	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#17	LEFT SLINGSHOT	Q17	▲ I/O Power Driver ▼	BRN	J7-P1	20v DC	VIO-BRN	J7-P2	23-800 090-5001-00T
#18	RIGHT SLINGSHOT	Q18		BRN	J7-P1	20v DC	VIO-RED	J7-P3	23-800 090-5001-00T
#19	UPPER RIGHT EJECT	Q19		BRN	J7-P1	20v DC	VIO-ORG	J7-P4	26-1200 090-5044-00T
#20	GARAGE DOOR (EJECT)	Q20		BRN	J7-P1	20v DC	VIO-YEL	J7-P6	26-1200 090-5044-00T
#21	FLASH: POPS CLEAR	Q21		ORG	J6-P10	20v DC	VIO-GRN	J7-P7	#906 Bulb 165-5004-00
#22	FLASH: R.RAMP RED	Q22		ORG	J6-P10	20v DC	VIO-BLU	J7-P8	#906 Bulb 165-5004-00
#23	FLASH: R.RAMP ORANGE	Q23		ORG	J6-P10	20v DC	VIO-BLK	J7-P9	#906 Bulb 165-5004-00
#24	OPTIONAL COIL	Q24		RED	J16-P7	5v DC	VIO-GRY	J7-P10	Opt. 5v

Diode On Terminal Strip (if noted)

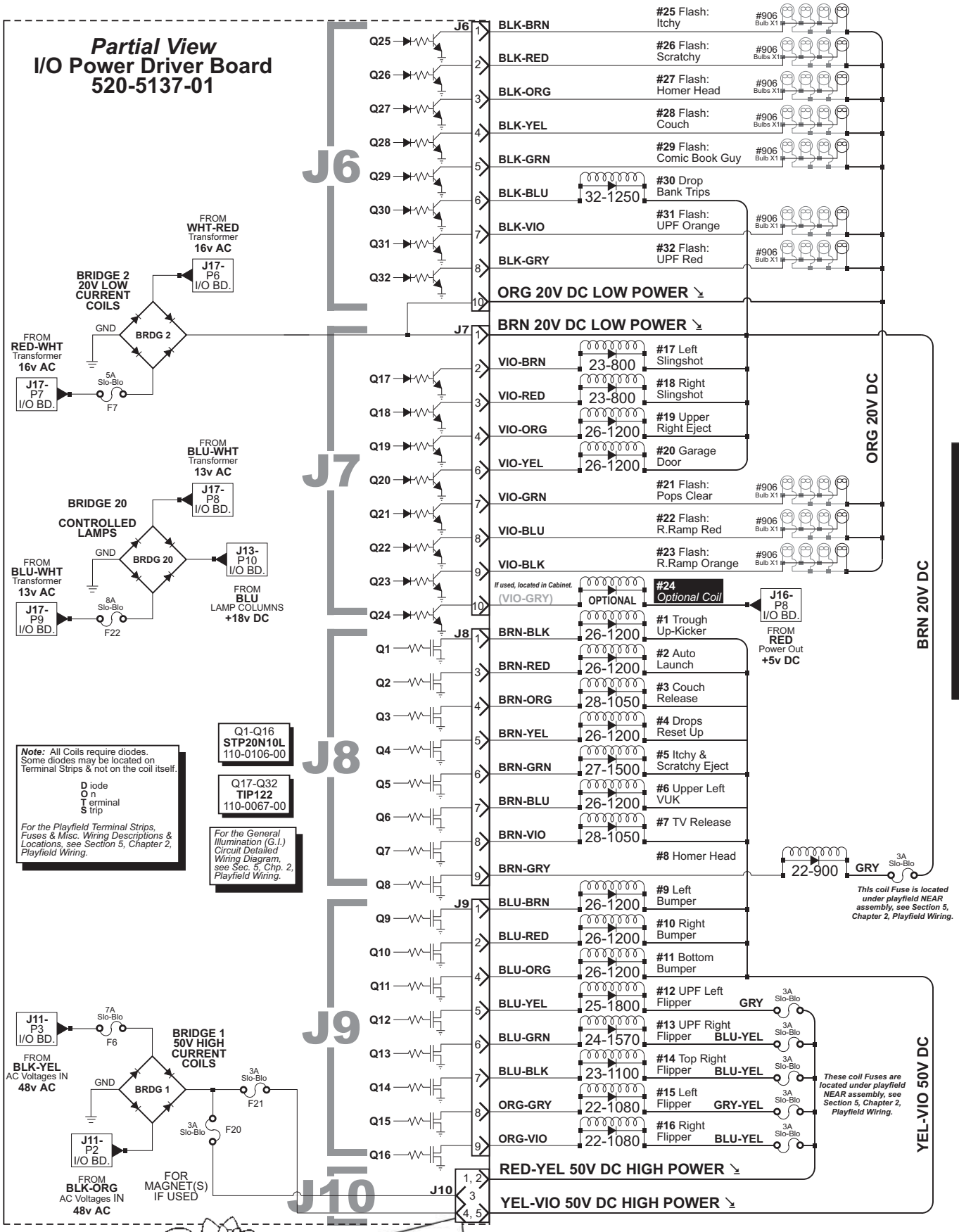
	Low Current Coils Group 2	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#25	FLASH: ITCHY	Q25	▲ I/O Power Driver ▼	ORG	J6-P10	20v DC	BLK-BRN	J6-P1	#906 Bulb 165-5004-00
#26	FLASH: SCRATCHY	Q26		ORG	J6-P10	20v DC	BLK-RED	J6-P2	#906 Bulb 165-5004-00
#27	FLASH: HOMER HEAD	Q27		ORG	J6-P10	20v DC	BLK-ORG	J6-P3	#906 Bulb 165-5004-00
#28	FLASH: COUCH	Q28		ORG	J6-P10	20v DC	BLK-YEL	J6-P4	#906 Bulb 165-5004-00
#29	FLASH: COMIC BOOK GUY	Q29		ORG	J6-P10	20v DC	BLK-GRN	J6-P5	#906 Bulb 165-5004-00
#30	DROP BANK TRIPS	Q30		BRN	J7-P1	20v DC	BLK-BLU	J6-P6	32-1250 515-6916-01
#31	FLASH: UPF ORANGE	Q31		ORG	J6-P10	20v DC	BLK-VIO	J6-P7	#906 Bulb 165-5004-00
#32	FLASH: UPF RED	Q32		ORG	J6-P10	20v DC	BLK-GRY	J6-P8	#906 Bulb 165-5004-00

Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q21-Q23, Q25-Q29, Q31-Q32)

	Auxiliary (UK ONLY)	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	Solenoid Expander Auxiliary	BRN	J7-P1	20v DC	WHT	CN2-P5	26-1200 090-5044-00T
	AUX 2: CENTER UP/DOWN POST	Q2		BRN	J7-P1	20v DC	RED	CN2-P4	23-1100 090-5030-00T
	AUX 3: RIGHT UP/DOWN POST	Q3		BRN	J7-P1	20v DC	ORG	CN2-P3	26-1200 090-5044-00T



Go To Diagnostics Menu


Partial View
I/O Power Driver Board
520-5137-01
J6
J7
J8
J9
J10
Q25
Q26
Q27
Q28
Q29
Q30
Q31
Q32
BLK-BRN
BLK-RED
BLK-ORG
BLK-YEL
BLK-GRN
BLK-BLU
BLK-VIO
BLK-GRY
#25 Flash: Itchy
#26 Flash: Scratchy
#27 Flash: Homer Head
#28 Flash: Couch
#29 Flash: Comic Book Guy
#30 Drop Bank Trips
#31 Flash: UPF Orange
#32 Flash: UPF Red
#906 Bulb X1
32-1250
ORG 20V DC LOW POWER
BRN 20V DC LOW POWER
FROM WHT-RED Transformer 16v AC
J17-P6 I/O BD.
BRIDGE 2 20V LOW CURRENT COILS
BRDG 2
GND
FROM RED-WHT Transformer 16v AC
J17-P7 I/O BD.
5A Slo-Blo
F7
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
VIO-BRN
VIO-RED
VIO-ORG
VIO-YEL
VIO-GRN
VIO-BLU
VIO-BLK
(VIO-GRY)
23-800
26-1200
#17 Left Slingshot
#18 Right Slingshot
#19 Upper Right Eject
#20 Garage Door
#21 Flash: Pops Clear
#22 Flash: R.Ramp Red
#23 Flash: R.Ramp Orange
ORG 20V DC
FROM BLU-WHT Transformer 13v AC
J17-P8 I/O BD.
BRIDGE 20 CONTROLLED LAMPS
BRDG 20
J13-P10 I/O BD.
FROM BLU-WHT Transformer 13v AC
J17-P9 I/O BD.
8A Slo-Blo
F22
FROM BLU LAMP COLUMNS +18v DC
If used, located in Cabinet.
OPTIONAL
#24 Optional Coil
J16-P8 I/O BD.
FROM RED Power Out +5v DC
BRN 20V DC
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
BRN-BLK
BRN-RED
BRN-ORG
BRN-YEL
BRN-GRN
BRN-BLU
BRN-VIO
BRN-GRY
26-1200
28-1050
27-1500
22-900
#1 Trough Up-Kicker
#2 Auto Launch
#3 Couch Release
#4 Drops Reset Up
#5 Itchy & Scratchy Eject
#6 Upper Left VUK
#7 TV Release
#8 Homer Head
GRY
3A Slo-Blo
This coil Fuse is located under playfield NEAR assembly, see Section 5, Chapter 2, Playfield Wiring.
Note: All Coils require diodes. Some diodes may be located on Terminal Strips & not on the coil itself.
Diode On Terminal Strip
For the Playfield Terminal Strips, Fuses & Misc. Wiring Descriptions & Locations, see Section 5, Chapter 2, Playfield Wiring.
Q1-Q16 STP20N10L 110-0106-00
Q17-Q32 TIP122 110-0067-00
For the General Illumination (G.I.) Circuit Detailed Wiring Diagram, see Sec. 5, Chp. 2, Playfield Wiring.
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
BLU-BRN
BLU-RED
BLU-ORG
BLU-YEL
BLU-GRN
BLU-BLK
ORG-GRY
ORG-VIO
26-1200
25-1800
24-1570
23-1100
22-1080
#9 Left Bumper
#10 Right Bumper
#11 Bottom Bumper
#12 UPF Left Flipper
#13 UPF Right Flipper
#14 Top Right Flipper
#15 Left Flipper
#16 Right Flipper
BLU-YEL
BLU-YEL
BLU-YEL
GRY-YEL
BLU-YEL
These coil Fuses are located under playfield NEAR assembly, see Section 5, Chapter 2, Playfield Wiring.
YEL-VIO 50V DC
J11-P3 I/O BD.
7A Slo-Blo
F6
FROM BLK-YEL AC Voltages IN 48v AC
BRIDGE 1 50V HIGH CURRENT COILS
BRDG 1
3A Slo-Blo
F21
F20
J11-P2 I/O BD.
FROM BLK-ORG AC Voltages IN 48v AC
FOR MAGNET(S) IF USED
RED-YEL 50V DC HIGH POWER
YEL-VIO 50V DC HIGH POWER

Go To Lamp Menu

To initiate, from the **DIAGNOSTICS MENU**, select the "LAMP" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** 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 (4) parts: **Single Lamp Test**, **Test All Lamps**, **Row Lamp Test** & **Column Lamp Test**.

Single Lamp Test

To initiate, from the **LAMP MENU**, select the "ONE" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. Select either the "-" or "+" *Mini-Icons*. Start with the "+" *Mini-Icon* to start the manual **Single Lamp Test** from Column 1, Row 1, Switch 1. Press the **Black Button** on the "+" *Mini-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 *(below)*, 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" *Mini-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 the **Red** or **Green Buttons** and press the **Black Button**. If still in **Single Lamp Test** (or any 1 of the 4 tests), select the "PREV" *Mini-Icon* to return to **LAMP MENU** or select either of the "<<" or ">>" *Mini-Icons* to 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.

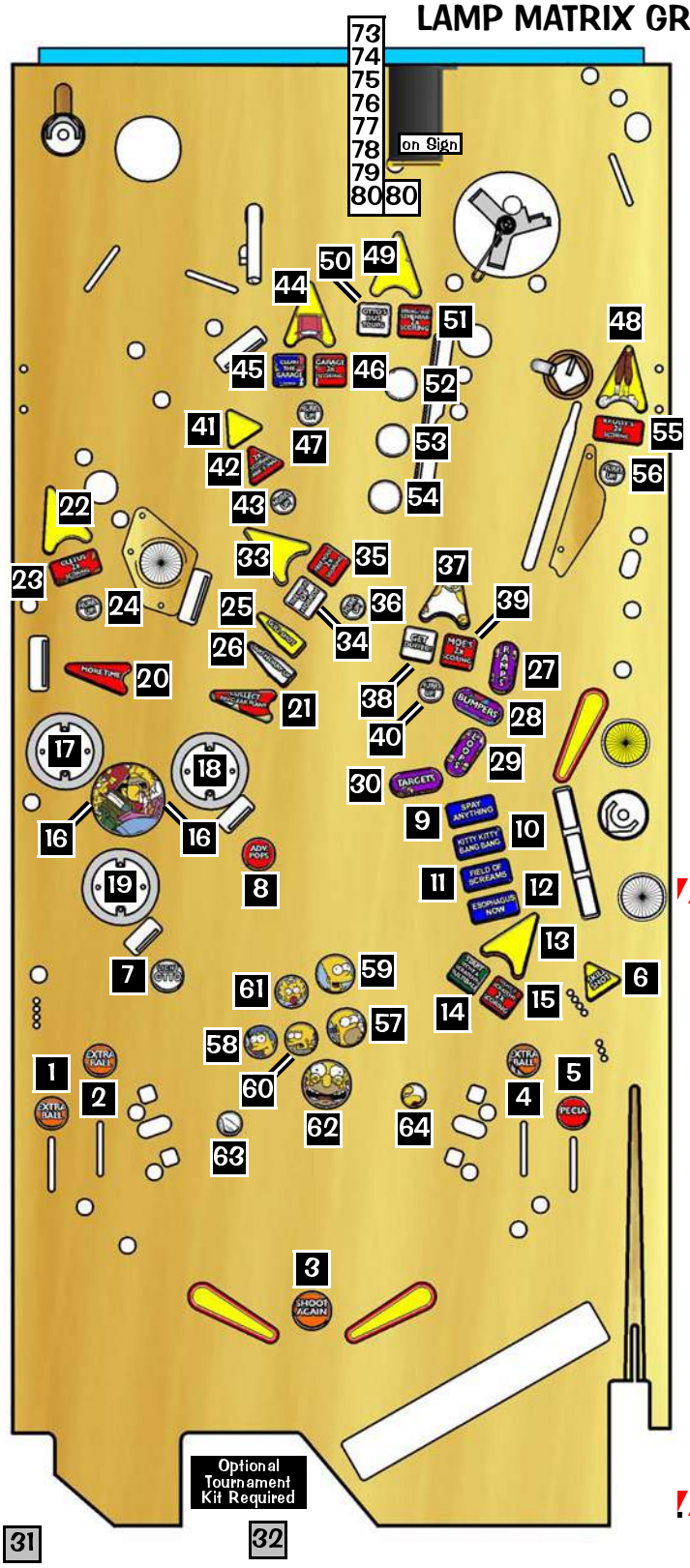
Row & Column Lamp Tests

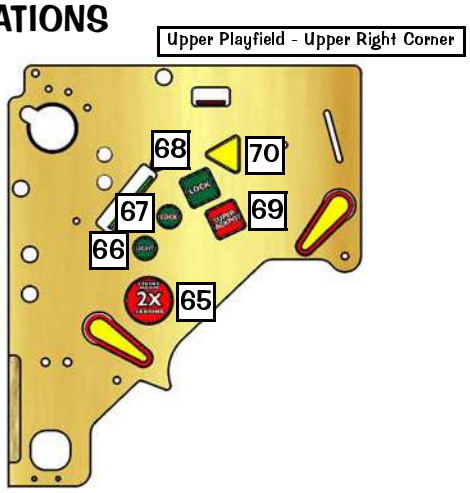
To initiate, from the **LAMP MENU**, select the "ROW" or "COL" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. If still in a previous test, select the "PREV" *Mini-Icon* to return to **LAMP MENU** or select either of the "<<" or ">>" *Mini-Icons* to move through the 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

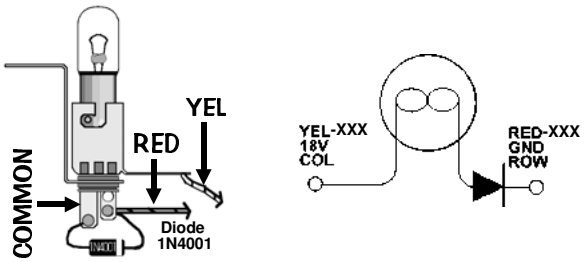
Column (18v) / Row (Ground)	1: U17 YEL-BRN J13-P9	2: U16 YEL-RED J13-P8	3: U15 YEL-ORG J13-P7	4: U14 YEL-BLK J13-P6	5: U13 YEL-GRN J13-P5	6: U12 YEL-BLU J13-P4	7: U11 YEL-VIO J13-P3	8: U10 YEL-GRY J13-P1
1: Q33 RED-BRN J12-P1	1 #555 Bulb LEFT OUT EXTRA BALL	2 #555 Bulb LEFT RETURN EXTRA BALL	3 #555 Bulb SHOOT AGAIN	4 #555 Bulb RIGHT RETURN EXTRA BALL	5 #555 Bulb SPECIAL	6 #555 Bulb SHOOTER LANE SKILL SHOT	7 #555 Bulb LIGHT OTTO	8 #555 Bulb ADV. POPS
2: Q34 RED-BLK J12-P2	9 #555 Bulb SPAY ANYTHING	10 #555 Bulb KITTY KITTY BANG BANG	11 #555 Bulb FIELD OF SCREAMS	12 #555 Bulb ESOPHAGUS NOW	13 #555 Bulb I&S ARROW	14 #555 Bulb START I&S MULTIBALL	15 #555 Bulb I&S 2X SCORING	16 #44 Bulb (x2) POPS 2X SCORING
3: Q35 RED-ORG J12-P3	17 #555 Bulb LEFT POP BUMPER [Dots]	18 #555 Bulb RIGHT POP BUMPER [Dots]	19 #555 Bulb BOTTOM POP BUMPER [Dots]	20 #555 Bulb MORE TIME	21 #555 Bulb COLLECT NUC-LEAR PLANT	22 #555 Bulb LEFT ORBIT ARROW	23 #555 Bulb CLETUS 2X SCORING	24 #555 Bulb LEFT ORBIT HURRY UP
4: Q36 RED-YEL J12-P4	25 #555 Bulb CBG SKILL SHOT	26 #555 Bulb CGB START HURRY UP	27 #555 Bulb DAREDEVIL RAMPS	28 #555 Bulb DAREDEVIL BUMPERS	29 #555 Bulb DAREDEVIL LOOPS	30 #555 Bulb DAREDEVIL TARGETS	31 #555 Bulb START BUTTON [Dots]	32 #555 Bulb TOURNAMENT BUTTON [***]
5: Q37 RED-GRN J12-P5	33 #555 Bulb LEFT RAMP ARROW	34 #555 Bulb TREEHOUSE OF HORROR	35 #555 Bulb TREEHOUSE 2X SCORING	36 #555 Bulb LEFT RAMP HURRY UP	37 #555 Bulb RIGHT RAMP ARROW	38 #555 Bulb GET DUFFED!	39 #555 Bulb MOE'S 2X SCORING	40 #555 Bulb RIGHT RAMP HURRY UP
6: Q38 RED-BLU J12-P6	41 #555 Bulb MINI LOOP ARROW	42 #555 Bulb 2X SCORING KWIK-E-MART	43 #555 Bulb KWIK-E-MART HURRY UP	44 #555 Bulb GARAGE ARROW	45 #555 Bulb CLEAN THE GARAGE	46 #555 Bulb GARAGE 2X SCORING	47 #555 Bulb GARAGE HURRY UP	48 #555 Bulb RIGHT ORBIT ARROW
7: Q39 RED-VIO J12-P8	49 #555 Bulb RIGHT LOOP ARROW	50 #555 Bulb OTTO'S BUS TOURS	51 #555 Bulb ELEMENTARY 2X SCORING	52 #555 Bulb BULLY 3-BANK (TOP)	53 #555 Bulb BULLY 3-BANK (MID)	54 #555 Bulb BULLY 3-BANK (BOT)	55 #555 Bulb KRUSTY 2X SCORING	56 #555 Bulb RIGHT ORBIT HURRY UP
8: Q40 RED-GRY J12-P9	57 #555 Bulb HOMER	58 #555 Bulb MARGE	59 #555 Bulb BART	60 #555 Bulb LISA	61 #555 Bulb MAGGIE	62 #555 Bulb GRANDPA	63 #44 Bulb LEFT HEADLIGHT	64 #44 Bulb RIGHT HEADLIGHT
9: Q41 RED-WHT J12-P10	65 #555 Bulb LIVING ROOM 2X SCORING [Dots]	66 #555 Bulb (LIGHT) LOCK [Dots]	67 #555 Bulb LIGHT (LOCK) [Dots]	68 #555 Bulb LOCK (SQUARE) [Dots]	69 #555 Bulb SUPER JACKPOT [Dots]	70 #555 Bulb TV ARROW [Dots]	71 NOT USED	72 NOT USED
10: Q42 RED J12-P11	73 Green LED (LED) DUFFMAN	74 Green LED (LED) HOMER'S DAY	75 Green LED (LED) WILLIE'S WOES	76 Green LED (LED) WIGGUM VS SNAKE	77 Green LED (LED) BART'S DAY	78 Green LED (LED) KRUSTY'S LAST STAND	79 Green LED (LED) STOP THE MONORAIL	80 Red LED (x2) (LED) ALIEN INVASION

LAMP MATRIX GRID LOCATIONS



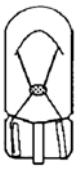


Typical Lamp Wiring & Schematic

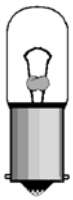


Bulb Types used for Lamps

For LEDs, read Lamp Part Note below.



#555 Bulb (Wedge)
165-5002-00



#44 Bulb (Bayonet)
165-5000-44

LEGEND NOTE:

☐ = Lamps mounted above the Playfield. ■ = Lamps mounted below the Playfield. ▒ = Lamps mounted in the Cabinet.

Lamp Part Note: *#555 Bulb Clear = 165-5002-00. #44 Bulb Clear = 165-5000-44. See Section **4**, Chapter **1**, **Parts Id. & Location**, Pages **72-74** for more details on bulbs and corresponding sockets.*

Lamp Part Note: *For Green or Red LEDs are attached to LED PC Bd., 520-5219-00. See Section **5**, Chapter **4**, **Printed Circuit Boards (PCBs)**, Page **143**.*

Some Lamp Diodes are located under the playfield *on Terminal Strips **or** Diode Boards and not on the assemblies.*

DOTS: Diode **O**n **T**erminal **S**trip ***or*** **DODB: D**iode **O**n **D**iode **B**oard *(only if noted in the Matrix Grid).*

Lamp 31, Start Button: DOTS (2-Lug) in Cabinet under Button (RED-YEL / ORG-YEL to YEL-VIO).

Lamp 32, Tournament Button (Optional with Tournament Kit, Diode in Connector).

Test Flash Lamps

```
COIN DOOR IS OPEN
PLAYFIELD HIGH POWER
DISABLED BY
COIN DOOR INTERLOCK
```

PULL OUT the Power Interlock Switch for operation with the Coin Door open.

To initiate, from the **DIAGNOSTICS MENU**, select the "FLASH" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate **CYCLING FLASHERS**. The Flash Lamps will cycle continuously until the test is exited. This test allows the technician to easily spot any burned-out bulbs and replace them. Flashers tested are Flash Lamps in Positions: **Q1-Q32** and in this game Flash Lamp(s) are in Position(s): **Q21-Q23, Q25-Q29, Q31-Q32**.

Clear Ball Trough

```
COIN DOOR IS OPEN
PLAYFIELD HIGH POWER
DISABLED BY
COIN DOOR INTERLOCK
```

PULL OUT the Power Interlock Switch for operation with the Coin Door open.

To initiate, from the **DIAGNOSTICS MENU**, select the "CLR" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. This Menu 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" *Mini-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**.

⚠ **CAUTION:** *Continuous use of above test may overheat the Trough Up-Kicker Coil.* ⚠

Technician Alerts

```
PLAYFIED STATUS
POSSIBLY BROKEN SWITCH
#02 SHOOTER LANE
PREV QUIT ?
```

```
PLAYFIED STATUS
CHECK SWITCHES
#02 SHOOTER LANE
PREV QUIT ?
```

```
PLAYFIED STATUS
HYPERSENSITIVE SWITCH
#02 SHOOTER LANE
PREV QUIT ?
```

To initiate, from the **DIAGNOSTICS MENU**, select the "TECH" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. This Menu is provided to show any switch problems and/or missing pinballs. After selecting this *Icon*, the display will indicate *any or all* of the following categories: **POSSIBLY BROKEN SWITCH**, **CHECK SWITCHES** or **HYPER-SENSITIVE SWITCH** (Sw. #16, Shooter Lane, is used as an example). If more than one switch is reported, the Switch Number and Name will cycle within the category, and then will cycle the categories. To return to the **DIAGNOSTICS MENU**, select & *activate* the "PREV" *Mini-Icon.*

Switch Detection

During game play, activation of switches and operation of coils with associated switches are monitored. In programming, every switch is given a minimum & maximum value based on the game. The switches are monitored every 5 minutes of game play with a "sliding window" of 15 minutes. If a switch is determined to be faulty, game play is compensated. Switches noted as **POSSIBLY BROKEN SWITCH** should be checked, then adjusted or replaced. ***Important:*** *A switch reported as "possibly broken" may actually be an unused switch due to* ***lack of usage*** *and* ***not because they're broken.*** *This can happen, if a switch is located in a "hard" shot position, and the players are not making the shot. Game programming will still compensate for this unplayed switch.* Switches noted as **CHECK SWITCHES** are determined to be stuck closed or open depending on switch usage. Free up the switch actuator; adjust or replace if necessary. Switches noted as **HYPERSENSTIVE SWITCH** means just that, the switch should be readjusted or replace if necessary.

Determination of switch usage can be check in **Audits** *(review Section* ***3****, Chapter* ***3****,* ***GO TO AUDITS MENU****).* Find the associated Audit with the switch in question and check usage; compare it to commonly used switches for comparison. After any switch is checked and repaired or replaced, it's suggested to test the switch in the **PLAY TEST MENU** *(see the* ***next page****)* or **Single Coil Test** *(reviewed earlier in this chapter,* ***Page 18****)* where the associated coil to the switch can be tested as well. After correcting the problem, the switch will still be reported until the game is played and the switch is again monitored as specified above. *Only you can determine if a switch getting reported is bad or if the switch is currently not getting actuated during game play.*

```
OPERATOR ALERT!
#2 AUTO LAUNCH
COIL MALFUNCTION
```

Coils ***are not reported*** in **Technician Alerts**, however, if a faulty switch is the culprit, the switch will then be reported. This ***display*** is shown momentarily during **Game Mode** or **Power-Up** to alert the operator of a coil malfunction (coil doesn't energize or coil fires a multiple number of times). **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.). This alert can also appear if a switch associated with a coil (e.g. #16 Shooter Lane & #2 Auto Launch) is stuck closed (caused by a switch jam or stuck ball); the **CPU/Sound Board** will *activate* the coil approximately ten times and if the switch remains closed, the game will report this switch in **Technician Alerts** as **CHECK SWITCHES**. The display alert **PLEASE CHECK TECH REPORT** will be shown.

```
PLEASE CHECK
TECH REPORT
PORTALS->DIAG->TECH
```

Technicians Alerts continued on the next page.

Go To Diagnostics Menu

Technician Alerts Continued

While in **Technician Alerts** Menu, if the following is displayed, the game has detected 1 or more pinball(s) missing and has compensated for the lost pinball(s) to provide normal game play

```
PLAYFIED STATUS
PINBALL MISSING

PREV QUIT ?
```

Important: *Determine where the pinball is!* ***Do not add pinball(s)*** *until it is determined the pinball(s) are indeed missing and not just stuck. If pinball(s) are added, and if the original stuck pinball has freed itself, the pinball game will not operate properly with the extra pinball(s). When the pinball is recovered, the above display will not appear the next time* ***Technician Alerts*** *is visited (a game must be played for the pinball to be determined as found).*

Pinball Detection

During game play, a ball can get trapped or stuck. If after approximately 15 seconds of inactivity or "no scoring," **Ball Search** is started. ***Note:*** *If the pinball is in the Plunger Lane or "held" on the flipper, no* ***Ball Search*** *will be performed.* The game will perform one **Ball Search** in an attempt to "find" or free-up the pinball. If the game does not see a switch closure (indicating the pinball has not been found), the following display will appear with a count-down timer of 20 seconds, during which **Ball Search** will continue until the timer runs out *(this feature will not happen if the game is in Competition Mode; Ball Search will continue until the pinball is found, unstuck and/or replaced manually).* The display will momentarily acknowledge the missing pinball(s). The game will provide another pinball into play and will compensate for the lost pinball. Game play will appear normal. ***Note:*** *This detection and compensation will happen with every pinball, if each suffers the same fate of a ball trap. If* ***all*** *balls get trapped, the game cannot be played or started until the situation is rectified.*

```
LOOKING FOR
PINBALLS      20
PLEASE WAIT
```

Until any missing pinball is returned to play, the game upon ***Power-up***, *opening the* ***Coin Door*** *or exiting* ***Portals™***, *will continue to momentarily display the following (along with an audible sound):*

```
PLEASE CHECK
TECH REPORT
PORTALS->DIAG->TECH
```

Service Phone

To initiate, from the **DIAGNOSTICS MENU**, select the "SERV" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. After selecting this *Icon* the display will indicate a phone number to call if technical assistance is required *(In USA Code: 1-800-KICKERS).*

Begin Play Test

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

```
COIN DOOR IS OPEN
PLAYFIELD HIGH POWER
DISABLED BY
COIN DOOR INTERLOCK
```

PULL OUT the Power Interlock Switch for operation with the Coin Door open.

Fire Knocker

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

Sound / Speaker Test

To initiate, from the **DIAGNOSTICS MENU**, select the "SPKR" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** 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 "+" *Mini-Icons* and press the **Black "ENTER" Button** to *activate* the first test. Repeat to visually see & hear all tests. Select the "RUN" *Mini-Icon* to *activate* the test chosen without moving to the next test.

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

Sound / Speaker Test continued on the next page.

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

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

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

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

Note: *For ROM Usage (Summary Table) & Locations, see Page* DR. ❶ *in the* ***"Find-It-In-Front: Dr. Pinball Section"****. Voice ROMs (****U17****,* ***U21****,* ***U36*** *and/or* ***U37****) which are* ***8MB must have a Jumper at W6*** *on the* ***CPU/Sound Board*** *to function properly.*

Begin Burn In

To initiate, from the **DIAGNOSTICS MENU**, select the "BURN" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** 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. ***Note:*** *To reset Burn-In minutes to* ***00*** *see Section* ***3****, Chapter* ***6****,* ***GO TO RESET MENU****,* ***Factory Reset****.* ***Caution:*** *Performing a Factory Reset will reset all other information as well.*

Dot Matrix Test

To initiate, from the **DIAGNOSTICS MENU**, select the "DOT TEST" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** 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.

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

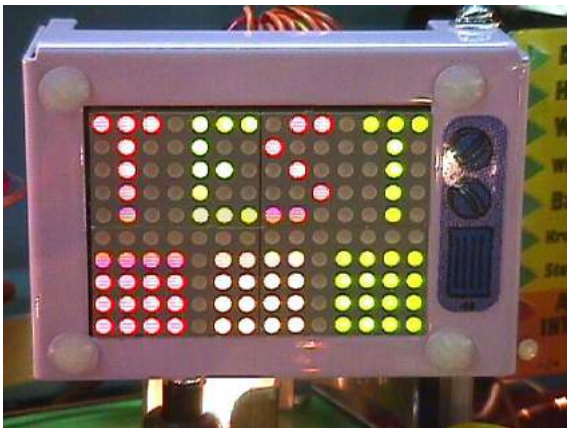
Dot Matrix Display Explained

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**.

LED Test

NOTE: *Upon Power-Up, entering the* ***Portals™ Service Menu****, or exiting this test, the "TV" will display the word* ***TEST*** *and 3 '4x4' Squares (Red, Yellow and Green).*



To initiate, from the **DIAGNOSTICS MENU**, select the "TV" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** & press the **Black "ENTER" Button**. The **LED TEST MENU** appears with the "+" *Mini-Icon* flashing. This test is provided to allow a method of testing the combined 4 "5X7 Color Dot Displays" in the **"TV Set"** on the *Upper Playfield*. Upon entering the **LED TEST MENU**, the first *Test Menu* "**ALL OFF**"appears and the TV Set LEDs are shut off.

Select and *activate* either of the "-" or "+" *Mini-Icons* to change any of the **eight (8) LED Tests** *(as shown below).* As each *Test Menu* appears, the name of the test will appear in the Main Dot Matrix Display (128 X 32) with the corresponding test demonstrated in the **"TV Set."** *The* ***LED Test*** *selected will cycle continuously until the next or previous test is chosen, or if the Test Menu is exited.*

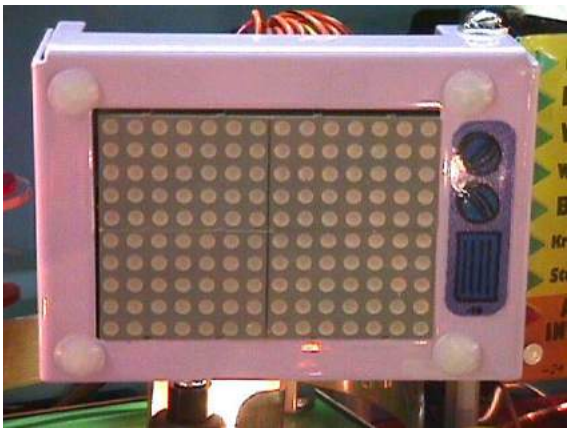
The first four (4) of the eight (8) LED Test Menus are:

1:

LED TEST

ALL OFF

− + PREV QUIT ?

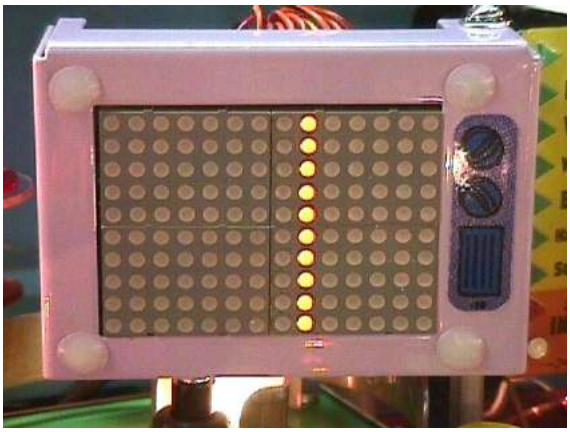


2:

LED TEST

VERTICAL LINE

− + PREV QUIT ?

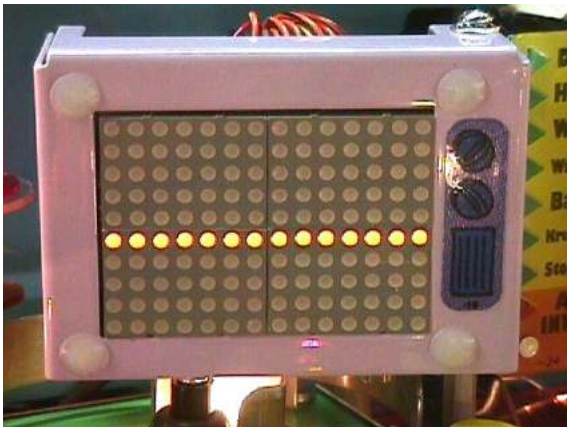


3:

LED TEST

HORIZONTAL LINE

− + PREV QUIT ?

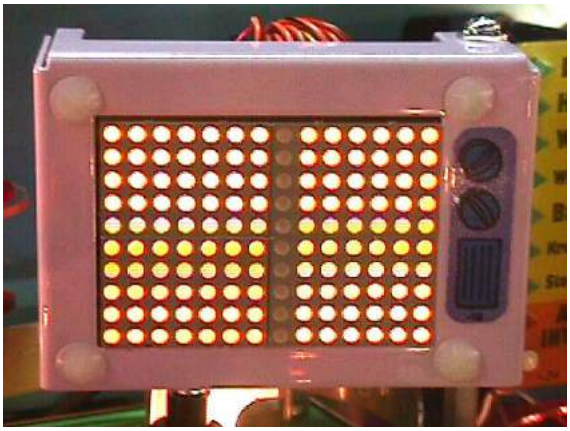


4:

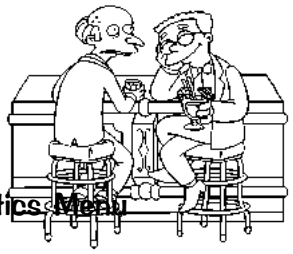
LED TEST

REVERSE VERTICAL LINE

− + PREV QUIT ?



LED Test Menus 5-8 continued on the next page.



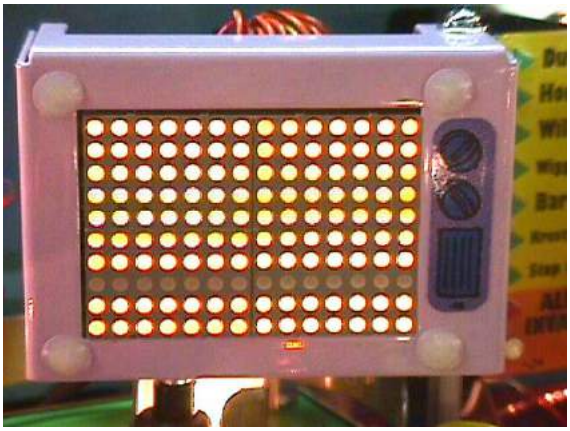
The next four (4) of the eight (8) LED Test Menus are:

5:

LED TEST

REV. HORIZONTAL LINE

– + PREV QUIT ?



6:

LED TEST

ALL YEL

– + PREV QUIT ?

7:

LED TEST

ALL RED

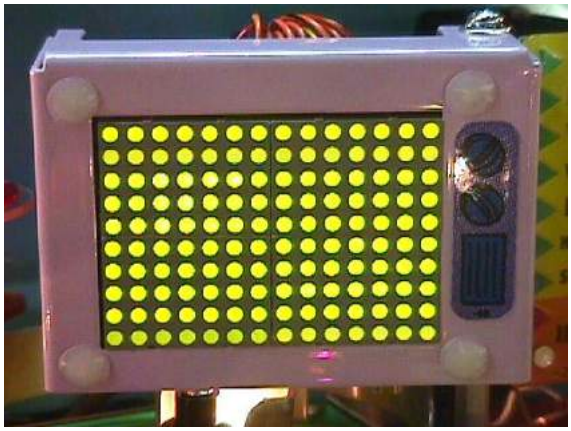
– + PREV QUIT ?

8:

LED TEST

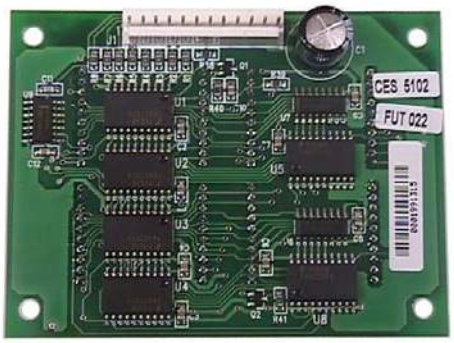
ALL GRN

– + PREV QUIT ?



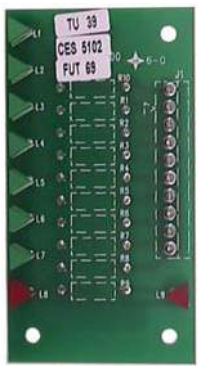
Select the "PREV" *Mini-Icon* to return to the **DIAGNOSTICS MENU** or select "QUIT" *Mini-Icon* to exit **Portals™**.
If any of the tests do not perform correctly, call Technical Support for diagnosing or troubleshooting.

Note: *For more details on the Color Dot Display (5X7) x4 PC Board or the LED PC Bd., see Sec.* ***5****, Chapter* ***4****,* ***Printed Circuit Boards (PCBs)****, Pages* ***140-143****.*



*To test the LEDs on the Mode Sign, enter the "**Go To Lamp Menu**" and select "**Single Lamp Test**."*

*These LEDs are **Lamps 73-80** in the Lamp Matrix, Page **22**.*

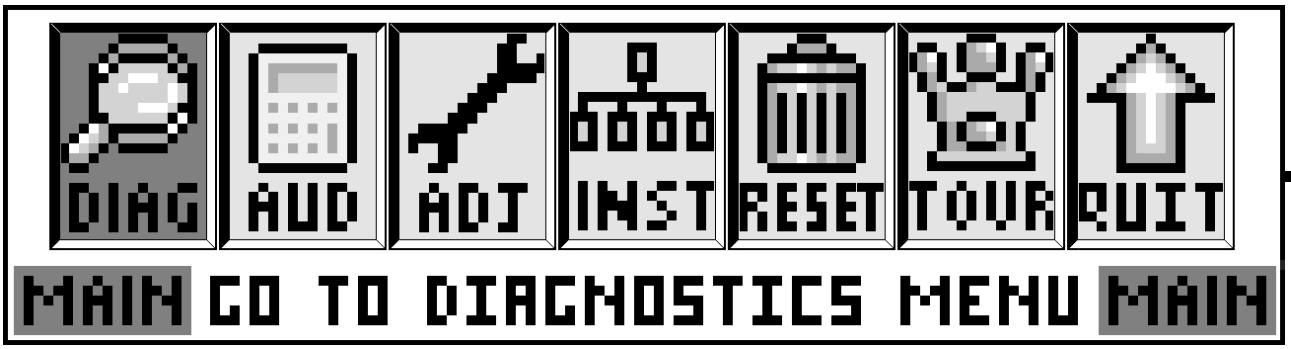


Go To Fuse Table

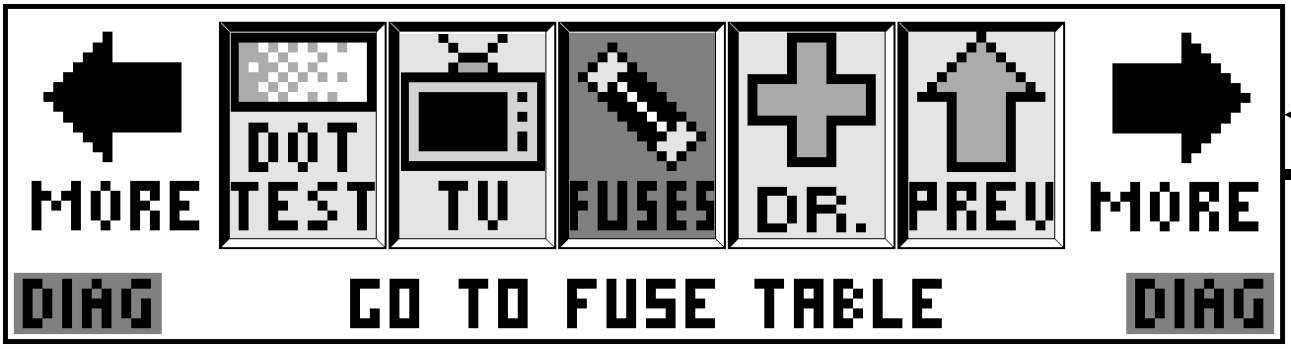
To initiate, from the **DIAGNOSTICS MENU**, select the "FUSES" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. The **FUSE TABLE MENU** now appears. This provides the technician with the current **Fuse Table** for this game *(also noted on decal in the Backbox)*.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 requiring an additional fuse, such as magnets)*. For the complete **Fuse List** in the *Quick Reference Fuse Chart & Pictorials*, *see the next page or Page* DR. ❶ *(front of this manual).*

Example:

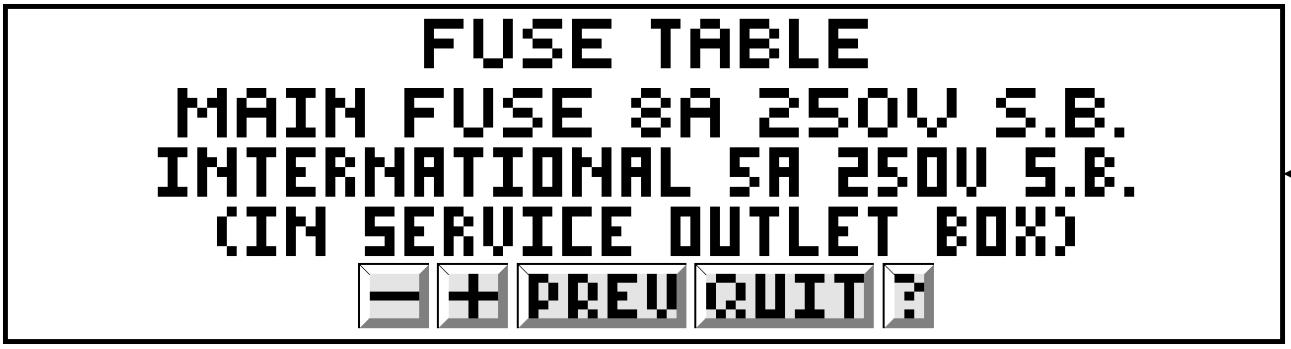
After entering **Portals™**, the **MAIN MENU** now appears with the "DIAG" *Icon* (**GO TO DIAGNOSTICS MENU**) flashing:



Press the **Black "ENTER" Button** to *activate* this **ICON**. The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing; use the **Red "LEFT"** or **Green "RIGHT" Buttons**, until the "FUSES" *Icon* (**GO TO FUSE TABLE**) is flashing:



Press the **Black Button** to *activate* this **ICON**. The **FUSE TABLE** now appears.



Select and *activate* the "+" *Mini-Icon* to view the next fuse in the group. Continue to select either the "+" or "-" *Mini-Icons* to view each fuse one at a time. The display will describe the fuse identification number (e.g. Main, F1, F6, F7, etc.), rating of fuse (e.g. 5A 250v S.B. - i.e. 5 Amp, 250 volt, Slo-Blo), location of fuse (i.e. Backbox: Board Name located on; or Cabinet: Under the playfield or in Service Outlet), 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 by selecting & *activating* the "PREV" or "QUIT" *Mini-Icons*.

Go To Fuse Table continued on the next page.

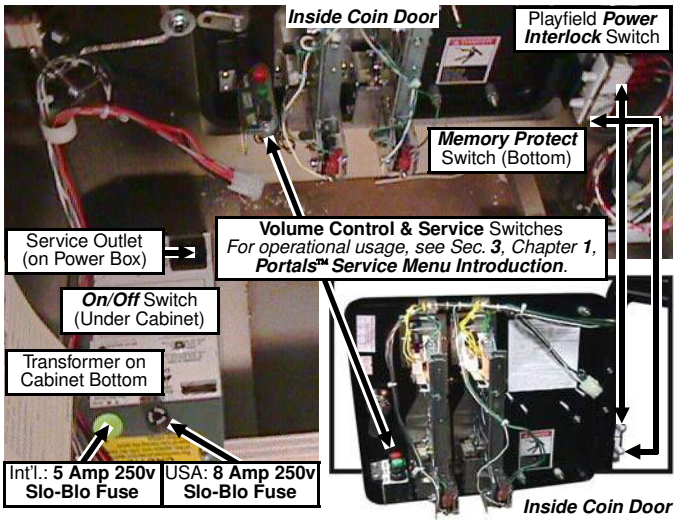
Backbox PCB Fuses, ROMs, Bridges, Relays, P/F & Cabinet Fuses, Cab. Switches

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

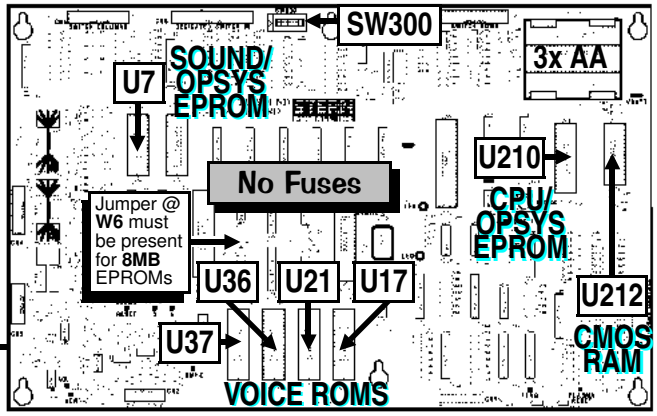
QUICK REFERENCE FUSE CHART

Backbox Fuses			
LOC: DISPLAY POWER SUPPLY (P.S.) BOARD			
F1	¾A 250v S.B.	90v DC	High Voltage Display
LOC: I / O POWER DRIVER BOARD			
F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	3A 250v S.B.	50v DC	Magnet(s)/Auxilliary **NOT USED**
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 (P/F) Fuses			
LOC: UNDER PLAYFIELD (near Flippers)			
n/a	3A 250v S.B.	50v DC	Rt. & Upr. Rt. Flips **(BLU-YEL⇆RED-YEL)**
n/a	3A 250v S.B.	50v DC	Left Flipper (GRY-YEL⇆RED-YEL)
n/a	3A 250v S.B.	50v DC	Upr. P/F Rt. Flip. **(BLU-YEL⇆RED-YEL)**
n/a	3A 250v S.B.	50v DC	Upr. P/F Lt. Flip. (GRY⇆RED-YEL)

*For locations & more information on fuses, see Sec. **5**, Chapter **2**.*

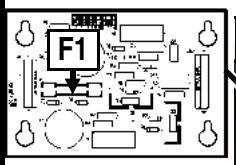


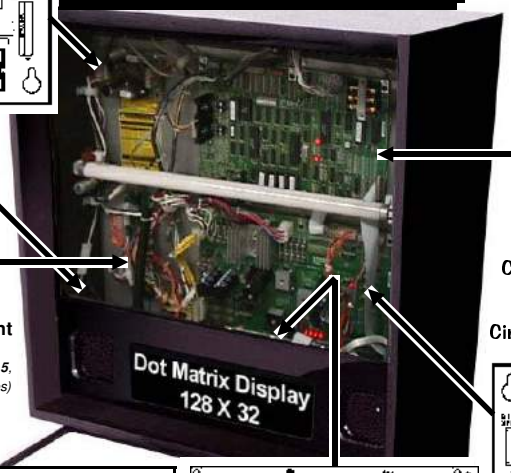
ROM TYPE on BD	LOCATION	SIZE	PART NUMBER
CPU Sound	U7	512K	965-0381-77
CPU Game	U210	1 MB	965-0382-77
CPU Voice ROM 1	U17	8 MB	965-0383-77
CPU Voice ROM 2	U21	8 MB	965-0384-77
CPU Voice ROM 3	U36	8 MB	965-0385-77
CPU Voice ROM 4	U37	8 MB	965-0386-77
DISPLAY Controller	U5	4 MB	965-0387-77



CPU / Sound Board ▶

◀ Display Power Supply Bd.





Solenoid Expander Board ‡

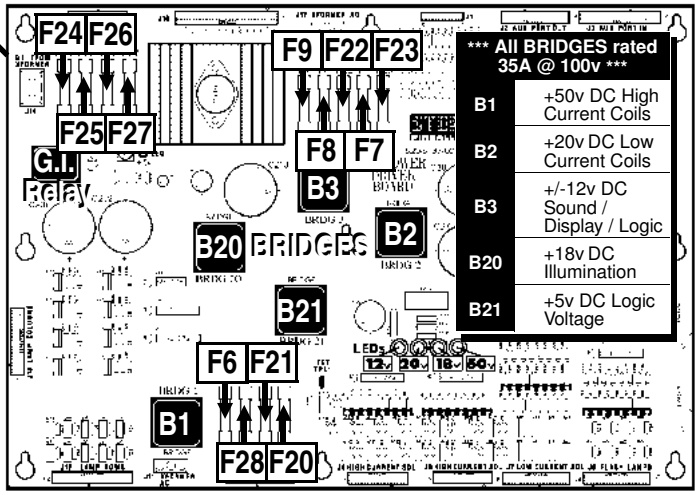
Tournament Interface Board ‡

‡ UK or Tournament GAMES ONLY

*For more info., see Section **5**, Chp. **4**, **PCBs** (Yellow Pages)*

For Schematics and/or Component Parts on PC Boards shown on this page, review Section 5, Chapter 4, Printed Circuit Boards (The Yellow Pages).

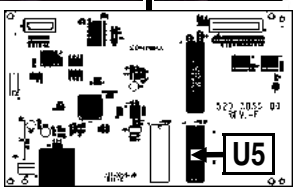
I/O Power Driver Board ▼

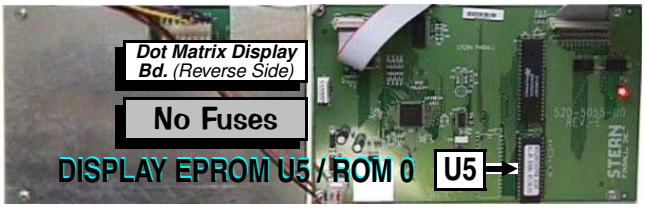


*** All BRIDGES rated 35A @ 100v ***	
B1	+50v DC High Current Coils
B2	+20v DC Low Current Coils
B3	+/-12v DC Sound / Display / Logic
B20	+18v DC Illumination
B21	+5v DC Logic Voltage

Display Controller Bd. ▶

The Display Controller has the Display EPROM (Location: U5 / ROM 0). This board is located behind the 128 X 32 Dot Matrix Display Board.





Dr. Pinball

To initiate, from the **DIAGNOSTICS MENU**, select the Cross "DR." *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** 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 (3) *Icons:* Coil "DR.", Switch "DR." and Lamp "DR." *Icons.* Selecting a particular *Icon* 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. *Dr. Pinball* will now display 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* displays a question or requests a procedure, *Dr. Pinball* 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 the **Red** or **Green Buttons** to "SELECT" a *Mini-Icon* and the **Black Button** to "ACTIVATE or ENTER" your selection.

Coil Flow Chart

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

The following are the *Mini-Icons* with explanations for the **DR. PINBALL** Sub-Menus:

Select and *activate* either the "-" or "+" *Mini-Icons* to diagnose a Coil, Lamp or Switch. Select and *activate* the "RUN" *Mini-Icon* to test selected item. The "PREV" *Mini-Icon* allows you to go back to previous question. Select the "QUIT" *Mini-Icon* to exit **Portals™** completely. Select the "?" *Mini-Icon* (Help) to see directions on button usage.

Select and *activate* either the "NO or "YES" *Mini-Icons* to answer a question given. Select and *activate* the "END" *Mini-Icon* to change to a new item to test. The "PREV" *Mini-Icon* allows you to go back to previous question. Select the "QUIT" *Mini-Icon* to exit **Portals™** completely. Select the "?" *Mini-Icon* (Help) to see directions on button usage.

After a diagnosis is given, select and *activate* the "END" *Mini-Icon* to change to a new item to test. The "PREV" *Mini-Icon* allows you to go back to previous display. Select the "QUIT" *Mini-Icon* to exit **Portals™** completely. Select the "?" *Mini-Icon* (Help) to see directions on button usage.

In **COIL FLOW CHART MENU**, select and *activate* the "PULSE" *Mini-Icon* to pulse the coil selected. Select and *activate* the "END" *Mini-Icon* to change to a new item to test. The "PREV" *Mini-Icon* allows you to go back to previous question. Select the "QUIT" *Mini-Icon* to exit **Portals™** completely. Select the "?" *Mini-Icon* (Help) to see directions on button usage.

STARTING METER Reading : ☐☐☐☐☐☐

STARTING METER Date (MM/DD/YR) : ☐☐☐☐0☐

AUDITOR'S NAME :

CURRENT VOLUME SETTING: ▶ ▶ ▶ ☐☐

CURRENT METER Reading : ☐☐☐☐☐☐

AUDIT Date (MM/DD/YR) : ☐☐☐☐0☐

CPU Version : ☐☐.☐

DISPLAY Version : ☐☐.☐

GAME LOCATION NAME :

EARNINGS & STANDARD AUDIT TABLES

EARNINGS AUDITS

01-14 ✍ = ✎

Audit definitions follow in this Chapter.

01	TOTAL PAID CREDITS
02	FREE GAME PERCENTAGE
03	AVERAGE BALL TIME
04	AVERAGE GAME TIME
05	COINS THRU LEFT SLOT
06	COINS THRU RIGHT SLOT
07	COINS THRU CENTER SLOT
08	COINS THRU 4TH SLOT
09	COINS THRU 5TH SLOT
10	COINS THRU 6TH SLOT
11	TOTAL COINS
12	TOTAL EARNINGS
13	METER CLICKS
14	SOFTWARE METER

STANDARD AUDITS

01-67 ✍ = ✎

Audit definitions follow in this Chapter.

To track Feature & Tournament Audits, see Pages 36 or 54.

01	TOTAL BALLS PLAYED
02	TOTAL EXTRA BALLS
03	EXTRA BALL PERCENT
04	REPLAY 1 AWARDS
05	REPLAY 2+ AWARDS
06	TOTAL REPLAYS
07	REPLAY PERCENT
08	TOTAL SPECIALS
09	SPECIAL PERCENT
10	TOTAL MATCHES
11	HIGH SCORE AWARDS
12	HIGH SCORE PERCENT
13	TOTAL FREE PLAYS
14	TOTAL PLAYS
15	0 - 2M SCORES
16	2M - 3M SCORES
17	3M - 4M SCORES
18	4M - 5M SCORES
19	5M - 6M SCORES
20	6M - 7M SCORES
21	7M - 8M SCORES
22	8M - 9M SCORES
23	9M - 10M SCORES
24	10M - 12.5M SCORES
25	12.5M - 15M SCORES
26	15M - 20M SCORES
27	20M - 30M SCORES
28	30M - 50M SCORES
29	50M - 75M SCORES
30	75M - 100M SCORES
31	100M+ SCORES
32	AVERAGE SCORES
33	SERVICE CREDITS
34	BALL SEARCH STARTED
35	LOST BALL FEEDS
36	LOST BALL GAME STARTS
37	LEFT DRAINS
38	CENTER DRAINS
39	RIGHT DRAINS
40	TILTS
41	TOTAL BALLS SAVED
42	PROPRIETARY
43	PROPRIETARY
44	PROPRIETARY
45	PROPRIETARY
46	PROPRIETARY
47	PROPRIETARY
48	PROPRIETARY
49	PROPRIETARY
50	BASE REPLAY
51	LEFT FLIPPER USED
52	RIGHT FLIPPER USED
53	PROPRIETARY
54	PROPRIETARY
55	0 - 1 MINUTE GAMES
56	1 - 1.5 MINUTE GAMES
57	1.5 - 2 MINUTE GAMES
58	2 - 2.5 MINUTE GAMES
59	2.5 - 3 MINUTE GAMES
60	3 - 3.5 MINUTE GAMES
61	3.5 - 4 MINUTE GAMES
62	4 - 5 MINUTE GAMES
63	5 - 6 MINUTE GAMES
64	6 - 8 MINUTE GAMES
65	8 - 10 MINUTE GAMES
66	10 -15 MINUTE GAMES
67	15+ MINUTE GAMES

back to Page 32

Go To Audits Menu

Overview

The **Portals™ Service Menu System** provides **246** Audits for accounting purposes and for evaluation of *Game Programming*. The Audits are divided into 3 groups: • **Earnings Audits** (Audits **01-14**), • **Standard Audits** (Audits **01-67**) and • **Feature Audits (Programming Use Only)** (Audits **01-165**). *For details on **Tournament Audits**, see Section **3**, Chapter **7**, **GO TO TOURNAMENT MENU**.* Audits which are named **Proprietary** are also for ***Future Expansion*** or ***Programming***. Game code may get upgraded during production; compare all Audits in the display with the manual and make any corrections to the Audit Table *(previous page)*, as necessary. Audits are subject to change (with or without notice). To view Audits in the display, enter the **Portals™ Service Menu System**. *For how to **RESET** Audits, see Section **3**, Chapter **6**, **GO TO RESET MENU**.*

EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

These ***non-selectable Icons*** appear in the *selected Menu* only when there are **MORE** Icons to the **LEFT** or to the **RIGHT** available for selection.

Select and activate to return to the **PREVIOUS** Menu.

Select and activate to **QUIT**, *exits & returns to the* ***Attract Mode***.

Select and activate to view **HELP** *Screens of the current Menu*.*

Select and activate to:

Move **LEFT** *or* **RIGHT**, *select previous / next or move backwards / forwards.*

**** Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.***

GO TO AUDITS MENU

After entering **Portals™**, the **MAIN MENU** now appears. Select the "AUD" *Icon* in the **MAIN MENU** with either the **Red "LEFT"** or **Green "RIGHT" Buttons** (the **Flipper Buttons** operates in the same manner) and press the **Black "ENTER" Button** (the **Start Button** operates in the same manner). The **AUDITS MENU** appears. Continue through this chapter for the explanation & usage of the *Icons* in the **AUDITS MENU**.

Earnings Audits (01-14)

To initiate, from the **AUDITS MENU**, select the "EARN" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Audit in this group. The display will describe the **Audit Number**, **Audit Name** and the **Current Audit Total** (Value). The current Audit will remain in the display until the next Audit is viewed or when this Menu is exited.

Nr.	EARNINGS AUDIT NAME: Definition
01	**TOTAL PAID CREDITS:** Provides the total number of *Paid Credits.*
02	**FREE GAME PERCENTAGE:** Provides the percentage total by dividing Standard Audit **13**, **TOTAL FREE PLAYS**, by Standard Audit **14**, **TOTAL PLAYS**.
03	**AVERAGE BALL TIME:** In seconds, the average ball time is derived from the total play time divided by Standard Audit **01**, **TOTAL BALLS PLAYED**.
04	**AVERAGE GAME TIME:** The average game time is expressed in minutes and seconds (0:00).
05	**COINS THRU LEFT SLOT:** Provides the total number of times Coin Mechanism Switch 06 was closed.
06	**COINS THRU RIGHT SLOT:** Provides the total number of times Coin Mechanism Switch 04 was closed.
07	**COINS THRU CENTER SLOT:** Provides the total number of times Coin Mechanism Switch 05 was closed.
08	**COINS THRU 4TH SLOT:** Provides the total number of times Coin Mechanism Switch 02 was closed.
09	**COINS THRU 5TH SLOT:** Provides the total number of times Coin Mechanism Switch 07 was closed.
10	**COINS THRU 6TH SLOT:** Provides the total number of times Coin Mechanism Switch 03 was closed.
11	**TOTAL COINS:** Provides the total amount of coins registered through all the *Coin Slots.*
12	**TOTAL EARNINGS:** The total cash value accumulated since the last Factory Reset occurred. *See Section **3**, Chapter **6**, **GO TO RESET MENU**, **Reset Coin Audits**.*
13	**METER CLICKS:** Provides the total number of money clicks accumulated. *Based on the country's lowest coin denomination used for the game credit.*
14	**SOFTWARE METER:** Provides the continuing total of Meter Clicks. *This audit cannot be reset; the display shows the constant addition of Meter Clicks.*

Standard Audits (01-67)

To initiate, from the **AUDITS MENU**, select the "S.P.I." *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Audit in this group. The display will describe the **Audit Number**, **Audit Name** and the **Current Audit Total** (Value). The current Audit will remain in the display until the next Audit is viewed or when this Menu is exited.

Nr.	STANDARD AUDIT NAME: Definition
01	**TOTAL BALLS PLAYED:** Provides the total number of *Regular* and *Extra Balls.*
02	**TOTAL EXTRA BALLS:** Provides the total number of *Extra Balls* awarded.
03	**EXTRA BALLS PERCENT:** Provides the percentage total by dividing Standard Audit **02**, **TOTAL EXTRA BALLS**, by Standard Audit **14**, **TOTAL PLAYS**.
04	**REPLAY 1 AWARDS:** Provides the total *Awards (Credits, Extra Balls or Scores)* for Level 1.
05	**REPLAY 2+ AWARDS:** Provides the total *Awards (Credits, Extra Balls or Scores)* for Level 2 or higher.
06	**TOTAL REPLAYS:** Provides the total *Awards (Credits, Extra Balls or Scores)* for exceeding *Replay Score Levels.*
07	**REPLAY PERCENT:** Provides the percentage total from dividing Standard Audit **06**, **TOTAL REPLAYS**, by Standard Audit **14**, **TOTAL PLAYS**. The percentage reflects replay total awards for exceeding replay score levels.
08	**TOTAL SPECIALS:** Provides the total *Awards (Credits, Extra Balls, or Scores)* for making *Specials.*
09	**SPECIAL PERCENT:** Provides the percentage total by dividing Standard Audit **08**, **TOTAL SPECIALS**, by Standard Audit **14**, **TOTAL PLAYS**.
10	**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 Standard Adjustment **13**, **MATCH PERCENTAGE**, if enabled. *See Section **3**, Chapter **4**, **GO TO ADJUSTMENTS MENU**, **Standard Adjustments**.*
11	**HIGH SCORE AWARDS:** Provides the total *Awards (Credits, Extra Balls, or Scores)* for exceeding the High-Score-To-Date scores.
12	**HIGH SCORE PERCENT:** Provides the percentage total by dividing Standard Audit **11**, **HIGH SCORE AWARDS**, by Standard Audit **14**, **TOTAL PLAYS**.
13	**TOTAL FREE PLAYS:** Provides the total *Free Credits* for *Replays, High-Score-To-Date, Specials and Match.*
14	**TOTAL PLAYS:** This total is derived by adding the sum of Earnings Audit **01**, **TOTAL PAID CREDITS**, and Standard Audit **13**, **TOTAL FREE PLAYS**. ***Note:*** *Free Credits are not recorded in the Audit until they are actually used.*
15	**0 - 2M SCORES:** Provides the total number of games the Player's final score was **0** and **1,999,990** points.
16	**2M - 3M SCORES:** ... and the Player's final score was between **2,000,000** and **2,999,990** points.
17	**3M - 4M SCORES:** ... and the Player's final score was between **3,000,000** and **3,999,990** points.
18	**4M - 5M SCORES:** ... and the Player's final score was between **4,000,000** and **4,999,990** points.
19	**5M - 6M SCORES:** ... and the Player's final score was between **5,500,000** and **5,999,990** points.
20	**6M - 7M SCORES:** ... and the Player's final score was between **6,000,000** and **6,999,990** points.
21	**7M - 8M SCORES:** ... and the Player's final score was between **7,000,000** and **7,999,990** points.
22	**8M - 9M SCORES:** ... and the Player's final score was between **8,000,000** and **8,999,990** points.
23	**9M - 10M SCORES:** ... and the Player's final score was between **9,000,000** and **9,999,990** points.
24	**10M - 12.5M SCORES:** ... and the Player's final score was between **10,000,000** and **12,499,990** points.
25	**12.5M - 15M SCORES:** ... and the Player's final score was between **12,500,000** and **14,999,990** points.
26	**15M - 20M SCORES:** ... and the Player's final score was between **15,000,000** and **19,999,990** points.
27	**20M - 30M SCORES:** ... and the Player's final score was between **20,000,000** and **29,999,990** points.
28	**30M - 50M SCORES:** ... and the Player's final score was between **30,000,000** and **49,999,990** points.
29	**50M - 75M SCORES:** ... and the Player's final score was between **50,000,000** and **74,999,990** points.
30	**75M - 100M SCORES:** ... and the Player's final score was between **75,000,000** and **99,999,990** points.
31	**100M+ SCORES:** Provides the total number of games the Player's final score was **100,000,000** points and over.
32	**AVERAGE SCORES:** This total is derived from adding the *Final Score* of each game to a table and dividing this sum by Standard Audit **14**, **TOTAL PLAYS**.

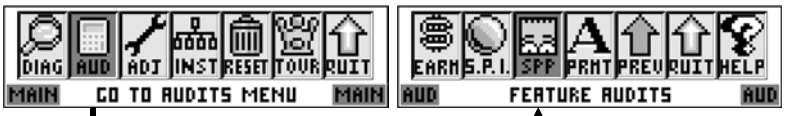
Standard Audits 33-67 continued on the next page.

	STANDARD AUDIT NAME: Definition
33	**SERVICE CREDITS:** Provides the total number of times the **Portals™ Green Button** (Dedicated Switch 7) was pushed in **Attract Mode**. *See Section **3**, Chapter **1**, **Service Switch Set Access & Use**, for how to receive Service Credits. See Sec. **3**, Chp. **6**, **GO TO RESET MENU**, **Reset Credits**, for how to delete Service (and Paid Credits).*
34	**BALL SEARCH STARTED:** Provides the total number of times the game performed a *Ball Search*.
35	**LOST BALL FEEDS:** Provides the total number of times the game added a pinball to play when it could not find a pinball after *Ball Search*. *See Section **3**, Chapter **2**, **GO TO DIAGNOSTICS MENU**, **Technicians Alert** [Pinball Detection].*
36	**LOST BALL GAME STARTS:** Provides the total number of times the game started with a pinball missing from the ball trough at the start of a game. *See Section **3**, Chapter **2**, **GO TO DIAGNOSTICS MENU**, **Technicians Alert** [Pinball Detection].*
37	**LEFT DRAINS:** Provides the total number of times Rollover Switch 57 was closed.
38	**CENTER DRAINS:** Provides the total number of times the pinball had drained when the last switch closed was not Switch 57 or Switch 60.
39	**RIGHT DRAINS:** Provides the total number of times Rollover Switch 60 was closed.
40	**TILTS:** Provides the total number of times Contact Switch 56 was closed.
41	**TOTAL BALLS SAVED:** Provides the total number of times this feature was used *(this feature can be turned ON or OFF, see Standard Adj. **38**, **FREEZE TIME** in Section **3**, Chapter **4**, **GO TO ADJUSTMENTS MENU, Standard Adjustments**).* This feature is enabled at the start of each pinball and is disabled as soon as a predetermined number of switches are "closed" ***or*** the allocated time has expired.
>>	**42 - 49 PROPRIETARY:** Proprietary Audits are used for ***Future Expansion*** or ***Programming***.
50	**BASE REPLAY:** Provides the current base *Replay Level Score*.
51	**LEFT FLIPPER USED:** Provides the total number of times the **Left Flipper Button** (Dedicated Switch 1) was pushed in **Game Mode**.
52	**RIGHT FLIPPER USED:** Provides the total number of times the **Right Flipper Button** (Dedicated Switch 3) was pushed in **Game Mode**.
>>	**53 - 54 PROPRIETARY:** Proprietary Audits are used for ***Future Expansion*** or ***Programming***.
55	**0 - 1 MINUTE GAMES:** Provides the total number of games the total game time was between **0:00** and **1:00** minute.
56	**1 - 1.5 MINUTE GAMES:** Provides the total number of games the total game time was between **1:00** and **1:30** minutes.
57	**1.5 - 2 MINUTE GAMES:** Provides the total number of games the total game time was between **1:30** and **2:00** minutes.
58	**2 - 2.5 MINUTE GAMES:** Provides the total number of games the total game time was between **2:00** and **2:30** minutes.
59	**2.5 - 3 MINUTE GAMES:** Provides the total number of games the total game time was between **2:30** and **3:00** minutes.
60	**3 - 3.5 MINUTE GAMES:** Provides the total number of games the total game time was between **3:00** and **3:30** minutes.
61	**3.5 - 4 MINUTE GAMES:** Provides the total number of games the total game time was between **3:30** and **4:00** minutes.
62	**4 - 5 MINUTE GAMES:** Provides the total number of games the total game time was between **4:00** and **5:00** minutes.
63	**5 - 6 MINUTE GAMES:** Provides the total number of games the total game time was between **5:00** and **6:00** minutes.
64	**6 - 8 MINUTE GAMES:** Provides the total number of games the total game time was between **6:00** and **8:00** minutes.
65	**8 - 10 MINUTE GAMES:** Provides the total number of games the total game time was between **8:00** and **10:00** minutes.
66	**10 - 15 MINUTE GAMES:** Provides the total number of games the total game time was between **10:00** and **15:00** minutes.
67	**15+ MINUTE GAMES:** Provides the total number of games the total game time was **15:00** and over.

Feature Audits (01-165)

To initiate, from the **AUDITS MENU**, select the "SPP" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Audit in this group. The display will describe the **Audit Number**, **Audit Name** and the **Current Audit Total** (Value). The current Audit will remain in the display until the next Audit is viewed or when this Menu is exited. **Audits Definition: Programming Use Only.** *The proprietary information provides the total number of times a feature was started, awarded, lit, played and/or completed (awarded); also, the total number of Switch Closures during certain modes or features are tracked (a predetermined single/multiple variations of switch closures are used to determine the lighting and/or completion of the feature stated).*

FEATURE AUDIT TABLE



FEATURE AUDITS
01-165 ✍ = ✎
***** PROGRAMMING USE ONLY *****
UNLABELED BOXES ARE FOR FUTURE EXPANSION.

01	LEFT ORBITS
02	LEFT RAMP
03	KWIK-E-MARTS
04	KWIK-E-MART INCREASED
05	BULLY 3-BANK HITS
06	GARAGE DOOR
07	GARAGE RAMP
08	GARAGE SECRET PASSAGE
09	OTTO SHOTS
10	RIGHT RAMPS
11	CAPTIVE BALL
12	RIGHT ORBIT
13	SPINNER SPINS
14	POP BUMPER HITS
15	DROP TARGET HITS
16	DROP BANKS COMPETE
17	I&S SAUCER ARRIVALS
18	TV ARRIVALS
19	COUCH ARRIVALS
20	MONORAIL EXITS
21	LEFT OUTLANE
22	LEFT INLANE
23	RIGHT INLANE
24	RIGHT OUTLANE
25	SKILL SHOT STARTS
26	CBG SKILL SHOT
27	KWIK-E-MART SKILL SHOT
28	BULLY SKILL SHOT
29	POPS ADVANCE
30	POPS MAXED AWARDS
31	NUCLEAR VALUE LIT
32	1X NUCLEAR VALUE
33	3X NUCLEAR VALUE
34	5X NUCLEAR VALUE
35	TIMER STARTS
36	TIMER RESTARTS
37	TIMER SECRET BONUS
38	MORE TIME SMALL
39	MORE TIME MEDIUM
40	MORE TIME LARGE
41	HUS STARTED
42	HUS COLLECTED
43	CBG EXTRA BALL AWARD
44	CBG SPECIAL AWARD
45	CBG STASH LIT
46	CBG STASH STARTED
47	CBG STASH COLLECTS
48	CBG STASH SECRET BONUS
49	CBG STASH FINISHED
50	BULLY 3-BANK COMPLETED
51	DD MODE LIT
52	DD RAMPS START
53	DD RAMPS FINISHED
54	DD BUMPERS START
55	DD BUMPERS FINISHED
56	DD LOOPS START
57	DD LOOPS FINISHED
58	DD TARGETS START
59	DD TARGETS FINISHED
60	DD MANIA LIT
61	DD MANIA STARTED
62	DD MANIA FINISHED
63	I&S ARRIVE LIGHT MBALL
64	I&S 1 START
65	I&S 1 JACKPOT INC
66	I&S 2 START
67	I&S 2 JACKPOT INC
68	I&S 3 START
69	I&S 3 JACKPOT INC
70	I&S 4 START
71	I&S 4 JACKPOT INC
72	I&S MB JACKPOT
73	I&S MB SUPER JACKPOT
74	REVENGE LIT
75	REVENGE STARTED
76	REVENGE JACKPOTS
77	REVENGE SUPER JACKPOTS
78	REVENGE FINISHED
79	OTTO LIT
80	OTTO STARTED
81	SMS LIT
82	SMS STARTED
83	SMS JACKPOTS
84	SMS SUPER JACKPOTS
85	SMS FINISHED
86	CHALKBOARD COMPLETED
87	BONUS X AWARDS
88	BONUS X COMBO AWARDS
89	BONUS X MAXED AWARDS
90	SPINNER BONUS
91	MYSTERY LIT
92	MYSTERY AWARDS
93	MYSTERY EBS
94	MYSTERY SPECIALS
95	TV LIT
96	DUFFMAN STARTED
97	DUFFMAN WON
98	HOMER STARTED
99	HOMER WON
100	WILLIE STARTED
101	WILLIE WON
102	WIGGUM STARTED
103	WIGGUM WON
104	BART STARTED
105	BART WON
106	KRUSTY STARTED
107	KRUSTY WON
108	MONORAIL STARTED
109	MONORAIL WON
110	VICTORY LAPS
111	INVASION LIT
112	INVASION STARTED
113	INVASION 2 LOCKS
114	INVASION 3 LOCKS
115	INVASION 4 LOCKS
116	INVASION 5 LOCKS
117	COUCH LOCK LIT
118	COUCH LOCK
119	COUCH MULTIBALL
120	COUCH 2+ MULTIBALLS
121	COUCH JACKPOT
122	COUCH SUPER JACKPOT
123	COUCH JP VALUE HELD
124	COUCH SECRET BONUS
125	COUCH FINISHED
126	THOH LIT
127	THOH 10X NUCLEAR PLANT
128	THOH DISASTER STARTED
129	THOH DISASTER POP HITS
130	THOH DISASTER WON
131	THOH DISASTER BONUS HITS
132	THOH GIVEAWAY STARTED
133	THOH GIVEAWAY SHOTS
134	THOH NIGHTMARE STARTED
135	THOH NIGHTMARE SPINS
136	THOH NIGHTMARE BIG SPINS
137	THOH MAX EVERYTHING
138	THOH BOUNTY STARTED
139	THOH BOUNTY LEFT RAMPS
140	THOH BOUNTY MIDLE RAMPS
141	THOH BOUNTY RIGHT RAMPS
142	THOH CRAZY EB STARTED
143	THOH CRAZY EB GOT E.B.
144	THOH CRAZY EB GOT POINTS
145	THOH BIG POINTS
146	3-WAY COMBOS
147	4-WAY COMBOS
148	5-WAY COMBOS
149	PRETZEL MB START
150	PRETZELS
151	PRETZEL JACKPOT
152	PRETZEL SJ LIT
153	PRETZEL SJ
154	SDMEWM 2 TASK
155	SDMEWM 4 TASK
156	SDMEWM LIT
157	SDMEWM STARTED
158	SDMEWM JACKPOT
159	SDMEWM 2X COMP
160	SDMEWM BALLS ADDED
161	SDMEWM I&S SJP LIT
162	SDMEWM BULLY SJP LIT
163	SDMEWM SUPER JACKPOT
164	NUCLEAR VALUE EB LIT
165	COUCH MB EB LIT

Go To
Audits Menu

Go To Printer Menu (OPTIONAL USE ONLY)

Operational Usage Note: *The use of the following Sub-Menus are* ***OPTIONAL*** and provided as a *convenience only.* ***No special equipment was included with your Pinball Game.*** To initiate, from the **AUDITS MENU**, select the "PRNT" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Button** and press the **Black "ENTER" Button**. The **PRINTER MENU** appears. A **Tournament Serial Interface (TSI) Board** and a **RS-232 Communication Device** *(which can download serial information)* are required for proper operation of these Sub-Menus. *Entering the menus & selecting/activating the Icons without the equipment mentioned, will not affect the Pinball Game nor the operation of the* ***Portals™ Service Menu System*** *in any way.* An optional Printer Kit is available for purchase *(contact your local distributor).*

Quick Printout

To initiate, from the **PRINTER MENU**, select the "QUIK" *Icon* with either the **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Mini-Icon* and press the **Black Button** to start the printout. Per the display instruction, the **Start Button** can also be pressed to start the printout. Only the **Earnings Audits** can be retrieved and/or printed for further processing.

Full Printout

To initiate, from the **PRINTER MENU**, select the "ALISON" *Icon* with either the **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Mini-Icon* and press the **Black Button** to start the download. Per the display instruction, the **Start Button** can also be pressed to start the download. All **Earnings**, **Standard** & **Feature Audits** can be retrieved and/or printed for further processing.

Reset Printer

To initiate, from the **PRINTER MENU**, select the "RESET" *Icon* with either the **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Mini-Icon* and press the **Black Button** to clear the "Nº of copies printed" count total appearing in the display. ***Operational Usage Note:*** *Activating the "QUIK" Icon (in the previous Quick Printout)* ***without*** *the special equipment and unique software, will still provide a "count total" in this Reset Printer Menu, which does not affect the operation of the* ***Portals™ Service Menu System*** *in any way.* Activating this "RESET" *Icon* will reset the "count total" in the display to **00**.

AUDIT ABBREVIATIONS USED IN THIS CHAPTER:

CBG: Comic Book Guy	**COMP:** Completed	**DD:** Daredevil	**EB: / EBs:** Extra Ball / s	**HUS:** Hurry-Ups	**I&S:** Itchy & Scratchy
INC: Increment	**JP:** Jackpot	**MAX:** Maximum	**M:** Million	**MB** *or* **MBALL:** Multiball	**NV: / NVs:** Nuclear Values / s
SMS: Springfield Mystery Spot	**SDMEWM:** Super Duper Mega Extreme Wizard Mode	**SJP:** Super Jackpot	**THOH:** Tree House of Horrors	**X:** Multiplier (Bonus)	

For how to RESET Audits, see Section 3, Chapter 6, GO TO RESET MENU.

STARTING METER Reading : _____

STARTING METER Date (MM/DD/YR) : _____ 0

AUDITOR'S NAME :

CURRENT VOLUME SETTING: ▶ ▶ ▶ __

CURRENT METER Reading : _____

AUDIT Date (MM/DD/YR) : _____ 0

CPU Version : __ . __

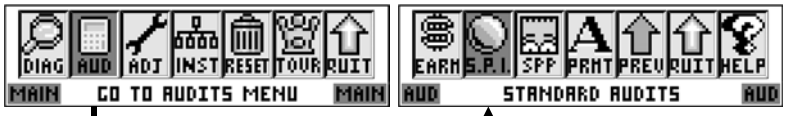
DISPLAY Version : __ . __

GAME LOCATION NAME :

EARNINGS & STANDARD AUDIT TABLES

EARNINGS AUDITS 01-14 ✍ = ✎

01	TOTAL PAID CREDITS
02	FREE GAME PERCENTAGE
03	AVERAGE BALL TIME
04	AVERAGE GAME TIME
05	COINS THRU LEFT SLOT
06	COINS THRU RIGHT SLOT
07	COINS THRU CENTER SLOT
08	COINS THRU 4TH SLOT
09	COINS THRU 5TH SLOT
10	COINS THRU 6TH SLOT
11	TOTAL COINS
12	TOTAL EARNINGS
13	METER CLICKS
14	SOFTWARE METER



STANDARD AUDITS 01-67 ✍ = ✎

01	TOTAL BALLS PLAYED
02	TOTAL EXTRA BALLS
03	EXTRA BALL PERCENT
04	REPLAY 1 AWARDS
05	REPLAY 2+ AWARDS
06	TOTAL REPLAYS
07	REPLAY PERCENT
08	TOTAL SPECIALS
09	SPECIAL PERCENT
10	TOTAL MATCHES
11	HIGH SCORE AWARDS
12	HIGH SCORE PERCENT
13	TOTAL FREE PLAYS
14	TOTAL PLAYS
15	0 - 2M SCORES
16	2M - 3M SCORES
17	3M - 4M SCORES
18	4M - 5M SCORES
19	5M - 6M SCORES
20	6M - 7M SCORES
21	7M - 8M SCORES
22	8M - 9M SCORES
23	9M - 10M SCORES
24	10M - 12.5M SCORES
25	12.5M - 15M SCORES
26	15M - 20M SCORES
27	20M - 30M SCORES
28	30M - 50M SCORES
29	50M - 75M SCORES
30	75M - 100M SCORES
31	100M+ SCORES
32	AVERAGE SCORES
33	SERVICE CREDITS
34	BALL SEARCH STARTED
35	LOST BALL FEEDS
36	LOST BALL GAME STARTS
37	LEFT DRAINS
38	CENTER DRAINS
39	RIGHT DRAINS
40	TILTS
41	TOTAL BALLS SAVED
42	PROPRIETARY
43	PROPRIETARY
44	PROPRIETARY
45	PROPRIETARY
46	PROPRIETARY
47	PROPRIETARY
48	PROPRIETARY
49	PROPRIETARY
50	BASE REPLAY
51	LEFT FLIPPER USED
52	RIGHT FLIPPER USED
53	PROPRIETARY
54	PROPRIETARY
55	0 - 1 MINUTE GAMES
56	1 - 1.5 MINUTE GAMES
57	1.5 - 2 MINUTE GAMES
58	2 - 2.5 MINUTE GAMES
59	2.5 - 3 MINUTE GAMES
60	3 - 3.5 MINUTE GAMES
61	3.5 - 4 MINUTE GAMES
62	4 - 5 MINUTE GAMES
63	5 - 6 MINUTE GAMES
64	6 - 8 MINUTE GAMES
65	8 - 10 MINUTE GAMES
66	10 -15 MINUTE GAMES
67	15+ MINUTE GAMES

Comments:

FEATURE AUDIT TABLE

FEATURE AUDITS
01-165 ✍ = ✎
***** PROGRAMMING USE ONLY *****

UNLABELED BOXES ARE FOR FUTURE EXPANSION.

01	LEFT ORBITS
02	LEFT RAMP
03	KWIK-E-MARTS
04	KWIK-E-MART INCREASED
05	BULLY 3-BANK HITS
06	GARAGE DOOR
07	GARAGE RAMP
08	GARAGE SECRET PASSAGE
09	OTTO SHOTS
10	RIGHT RAMPS
11	CAPTIVE BALL
12	RIGHT ORBIT
13	SPINNER SPINS
14	POP BUMPER HITS
15	DROP TARGET HITS
16	DROP BANKS COMPETE
17	I&S SAUCER ARRIVALS
18	TV ARRIVALS
19	COUCH ARRIVALS
20	MONORAIL EXITS
21	LEFT OUTLANE
22	LEFT INLANE
23	RIGHT INLANE
24	RIGHT OUTLANE
25	SKILL SHOT STARTS
26	CBG SKILL SHOT
27	KWIK-E-MART SKILL SHOT
28	BULLY SKILL SHOT
29	POPS ADVANCE
30	POPS MAXED AWARDS
31	NUCLEAR VALUE LIT
32	1X NUCLEAR VALUE
33	3X NUCLEAR VALUE
34	5X NUCLEAR VALUE
35	TIMER STARTS
36	TIMER RESTARTS
37	TIMER SECRET BONUS
38	MORE TIME SMALL
39	MORE TIME MEDIUM
40	MORE TIME LARGE
41	HUS STARTED
42	HUS COLLECTED
43	CBG EXTRA BALL AWARD
44	CBG SPECIAL AWARD
45	CBG STASH LIT
46	CBG STASH STARTED
47	CBG STASH COLLECTS
48	CBG STASH SECRET BONUS
49	CBG STASH FINISHED
50	BULLY 3-BANK COMPLETED
51	DD MODE LIT
52	DD RAMPS START
53	DD RAMPS FINISHED
54	DD BUMPERS START
55	DD BUMPERS FINISHED

56	DD LOOPS START
57	DD LOOPS FINISHED
58	DD TARGETS START
59	DD TARGETS FINISHED
60	DD MANIA LIT
61	DD MANIA STARTED
62	DD MANIA FINISHED
63	I&S ARRIVE LIGHT MBALL
64	I&S 1 START
65	I&S 1 JACKPOT INC
66	I&S 2 START
67	I&S 2 JACKPOT INC
68	I&S 3 START
69	I&S 3 JACKPOT INC
70	I&S 4 START
71	I&S 4 JACKPOT INC
72	I&S MB JACKPOT
73	I&S MB SUPER JACKPOT
74	REVENGE LIT
75	REVENGE STARTED
76	REVENGE JACKPOTS
77	REVENGE SUPER JACKPOTS
78	REVENGE FINISHED
79	OTTO LIT
80	OTTO STARTED
81	SMS LIT
82	SMS STARTED
83	SMS JACKPOTS
84	SMS SUPER JACKPOTS
85	SMS FINISHED
86	CHALKBOARD COMPLETED
87	BONUS X AWARDS
88	BONUS X COMBO AWARDS
89	BONUS X MAXED AWARDS
90	SPINNER BONUS
91	MYSTERY LIT
92	MYSTERY AWARDS
93	MYSTERY EBS
94	MYSTERY SPECIALS
95	TV LIT
96	DUFFMAN STARTED
97	DUFFMAN WON
98	HOMER STARTED
99	HOMER WON
100	WILLIE STARTED
101	WILLIE WON
102	WIGGUM STARTED
103	WIGGUM WON
104	BART STARTED
105	BART WON
106	KRUSTY STARTED
107	KRUSTY WON
108	MONORAIL STARTED
109	MONORAIL WON
110	VICTORY LAPS

111	INVASION LIT
112	INVASION STARTED
113	INVASION 2 LOCKS
114	INVASION 3 LOCKS
115	INVASION 4 LOCKS
116	INVASION 5 LOCKS
117	COUCH LOCK LIT
118	COUCH LOCK
119	COUCH MULTIBALL
120	COUCH 2+ MULTIBALLS
121	COUCH JACKPOT
122	COUCH SUPER JACKPOT
123	COUCH JP VALUE HELD
124	COUCH SECRET BONUS
125	COUCH FINISHED
126	THOH LIT
127	THOH 10X NUCLEAR PLANT
128	THOH DISASTER STARTED
129	THOH DISASTER POP HITS
130	THOH DISASTER WON
131	THOH DISASTER BONUS HITS
132	THOH GIVEAWAY STARTED
133	THOH GIVEAWAY SHOTS
134	THOH NIGHTMARE STARTED
135	THOH NIGHTMARE SPINS
136	THOH NIGHTMARE BIG SPINS
137	THOH MAX EVERYTHING
138	THOH BOUNTY STARTED
139	THOH BOUNTY LEFT RAMPS
140	THOH BOUNTY MIDLE RAMPS
141	THOH BOUNTY RIGHT RAMPS
142	THOH CRAZY EB STARTED
143	THOH CRAZY EB GOT E.B.
144	THOH CRAZY EB GOT POINTS
145	THOH BIG POINTS
146	3-WAY COMBOS
147	4-WAY COMBOS
148	5-WAY COMBOS
149	PRETZEL MB START
150	PRETZELS
151	PRETZEL JACKPOT
152	PRETZEL SJ LIT
153	PRETZEL SJ
154	SDMEWM 2 TASK
155	SDMEWM 4 TASK
156	SDMEWM LIT
157	SDMEWM STARTED
158	SDMEWM JACKPOT
159	SDMEWM 2X COMP
160	SDMEWM BALLS ADDED
161	SDMEWM I&S SJP LIT
162	SDMEWM BULLY SJP LIT
163	SDMEWM SUPER JACKPOT
164	NUCLEAR VALUE EB LIT
165	COUCH MB EB LIT

MULTI-WEEK TOURNAMENT AUDIT TABLES

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) :

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) :

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) :

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) :

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) :

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) :

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) :

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) :

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

MULTI-WEEK TOURNAMENT AUDIT TABLES

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) : 0

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) : 0

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) : 0

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) : 0

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) : 0

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) : 0

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) : 0

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

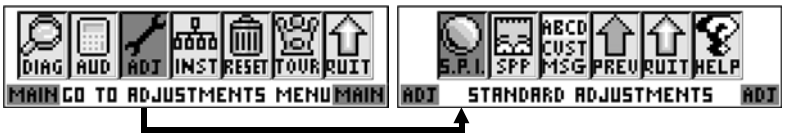
AUDIT Date (MM/DD/YR) : 0

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

01	TOTAL PLAYS	06	NET EARNINGS	11	ACCUM. JACKPOT
02	TOURNAMENT PLAYS	07	ACCUM. TOTAL PLAYS	12	# TOURNAMENTS
03	TOTAL GAME EARNINGS	08	ACCUM. TOUR. PLAYS		
04	TOTAL TOUR. EARNINGS	09	ACCUM. EARNINGS		
05	JACKPOT	10	ACCUM. TOUR EARNINGS		

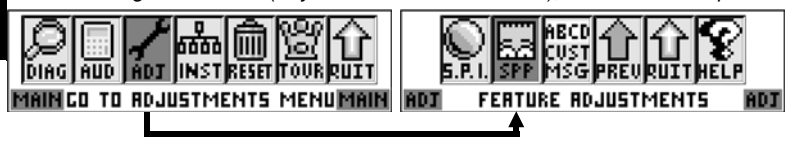


STANDARD & FEATURE ADJUSTMENT TABLES

STANDARD ADJUSTMENTS 01-51 ✍ = ✎

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
01	REPLAY TYPE	AUTO	
02	REPLAY PERCENTAGE	10%	
03	REPLAY AWARD	CREDIT	
04	REPLAY LEVELS	1: 10,000,000	
05	REPLAY BOOST	YES	
06	SPECIAL AWARD	CREDIT	
07	SPECIAL PERCENTAGE	2%	
08	FREE GAME LIMIT	05	
09	EXTRA BALL LIMIT	09	
10	EXTRA BALL PERCENTAGE	25%	
11	GAME PRICING	USA 5	
12	MATCH AWARD	CREDIT	
13	MATCH PERCENTAGE	9%	
14	BALLS PER GAME	03	
15	TILT WARNINGS	01	
16	CREDIT LIMIT	30	
17	ALLOW HIGH SCORES	YES	
18	GRAND CHAMPION AWARDS	01	
19	HIGH SCORE #1 AWARDS	01	
20	HIGH SCORE #2 AWARDS	00	
21	HIGH SCORE #3 AWARDS	00	
22	HIGH SCORE #4 AWARDS	00	
23	GRAND CHAMPION SCORE	50,000,000	
24	DEFAULT HIGH SCORE #1	40,000,000	
25	DEFAULT HIGH SCORE #2	35,000,000	
26	DEFAULT HIGH SCORE #3	30,000,000	
27	DEFAULT HIGH SCORE #4	25,000,000	
28	HSTD RESET COUNT	2,000	
29	HIGH SCORE INITIALS	3 INITIALS	
30	FREE PLAY	NO	
31	CUSTOM MESSAGE	ON	
32	FLASH LAMP POWER	NORMAL	
33	COIL PULSE POWER	NORMAL	
34	KNOCKER VOLUME	NORMAL	
35	GAME RESTART	YES	
36	BILL VALIDATOR	NO	
37	BKGRND MUSIC VOLUME	01	
38	FREEZE TIME	OFF	
39	UK POST SAVE ENABLED	NO	
40	TIMED PLUNGER	OFF	
41	FLIPPER BALL LAUNCH	DISABLED	
42	COINDOOR BALL SAVER	NO	
43	COMPETITION MODE	NO	
44	CONSOLATION BALL	YES	
45	FAST BOOT	NO	
46	Q24 OPTION	COIN METER	
47	TICKET DISP. INSTALLED	NO	
48	ALLOW PLAYER COMP. MODE	YES	
49	TECH ALERT WARNING	NEVER	
50	LOCATION ID	00	
51	GAME ID	00	
##	*Note: Shaded box around Standard & Feature Adjustment Number, indicates new Adjustments added and / or USA Default changers after Version 3.00.* This Table reflects v4.00+ (CPU/Display) as of 08-14-03 printing.		

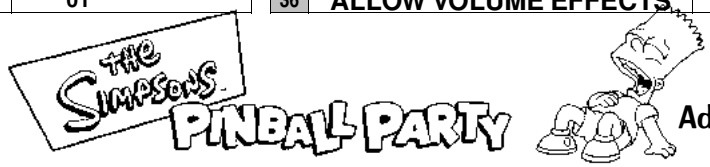
Note: *If **Game & Display ROMs** other than USA are installed, along with the proper Dip Switch Settings, different Defaults will appear. If changes are made (or your Defaults are not USA), enter them with pencil in the **YOUR SETTING** spaces provided for reference.*



Shortcut to Standard Adjustment 31.

FEATURE ADJUSTMENTS 01-36 ✍ = ✎

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
01	3 BANK DIFFICULTY	HARD	
02	DAREDEVIL DIFFICULTY	MODERATE	
03	# OF RAMPS FOR 1ST EB	10	
04	# OF RAMPS NEXT EBS	50	
05	MAX EBS FROM RAMP	04	
06	RAMP EB MEMORY	YES	
07	1ST RAMP TREEHOUSE	05	
08	NEXT TREEHOUSE	10	
09	1ST COUCH LOCKS UNLIT	02	
10	COUCH MB DIFFICULTY	EXEASY	
11	TV LIGHTING DIFFICULTY	EASY	
12	MYSTERY LIGHTING DIFF.	MODERATE	
13	MYSTERY EB MEMORY	NO	
14	MYSTERY SPECIAL MEMORY	NO	
15	MAIN TIMER DIFFICULTY	MODERATE	
16	1ST I&S WITH DROPS	02	
17	1ST I&S DROPS RESET	03	
18	1ST I&S SHOT TWICE	01	
19	ENABLE REVERSED FLIPPERS	YES	
20	GARAGE DOOR DIFF	EASY	
21	OTTO LIGHTING DIFF	EASY	
22	SHOW UPPER FLIPPERS	YES	
23	CBG HURRY UP DIFFICULTY	MODERATE	
24	# OF NVS FOR 1ST EB	10	
25	# OF NVS NEXT EBS	50	
26	MAX EBS FROM NUCLEAR	04	
27	NUCLEAR EB MEMORY	YES	
28	COUCH EB DIFFICULTY	EASY	
29	COUCH EB MEMORY	NO	
30	CBG EB MEMORY	NO	
31	CBG SPECIAL MEMORY	NO	
32	SDMEWM SPECIAL MEMORY	NO	
33	MONORAIL INTERVAL	05	
34	ADULT CONTENT ENABLED	YES	
35	HOLD COUCH LOCKS	1-PLAYER GAMES	
36	ALLOW VOLUME EFFECTS	YES	



Go To Adjustments Menu

back to Page 38

Go To Adjustments Menu

Overview

The **Portals™ Service Menu System** provides **87** Adjustments to vary Game Functions to customize for your particular needs. The Adjustments are divided into 2 groups: • **Standard Adjustments** (**01-51**) and • **Feature Adjustments** (**01-36**). Game code may get upgraded during production; compare all Adjustments in the display with the manual and make any corrections to the Adjustment Table *(previous page)*, as necessary. Adjustments are subject to change *(with or without notice)*. To view Adjustments in the display, enter the **Portals™ Service Menu System**. When a change is made and then the next / previous Adjustment is selected *(or the Sub-Menu is exited)*, the display will momentarily flash **REQUEST INSTALLED**. *For **further customization** of **Game Play Difficulty** or **Game Play Type** or how to **RESET ONLY** the **Adjustments**, see Section **3**, Chapter **5**, **GO TO INSTALLS MENU**.*

***Important:** The **Coin Door** must be **OPEN** allowing the **Memory Protect Switch** to be disabled, so any Adjustment changes can be made.*

EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

Select and activate to:

Move **LEFT** or **RIGHT**, *select previous / next or move backwards / forwards.*

DECREMENT (-) or **INCREMENT (+)** *displayed value or select previous / next.*

These ***non-selectable Icons*** appear in the *selected Menu* only when there are **MORE** Icons to the **LEFT** or to the **RIGHT** available for selection.

Select and activate to return to the **PREVIOUS** Menu.

Select and activate to **QUIT**, *exits & returns to the* ***Attract Mode***.

Select and activate to view **HELP** *Screens of the current Menu*.*

**** Help Note:** An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.*

GO TO ADJUSTMENTS MENU

After entering **Portals™**, the **MAIN MENU** now appears. Select the "ADJ" *Icon* in the **MAIN MENU** with either the **Red "LEFT"** or **Green "RIGHT" Buttons** (the **Flipper Buttons** operates in the same manner) and press the **Black "ENTER" Button** (the **Start Button** operates in the same manner). The **ADJUSTMENTS MENU** appears. Continue through this chapter for the explanation & usage of the *Icons* in the **ADJUSTMENTS MENU**.

Standard Adjustments (01-51)

To initiate, from the **ADJUSTMENTS MENU**, select the "S.P.I." *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Adjustment in this group. Select and *activate* either of the "-" or "+" *Mini-Icons* to change the setting, if desired *(the Default Setting is noted in the definitions below)*. The display will describe the **Adjustment Number**, **Adjustment Name** and the **Current Adjustment Setting**. The current Adjustment will remain in the display until the next Adjustment is view or when this Menu is exited.

WARNING: Changes made in any Adjustments will be lost after a FACTORY RESET or removal of the CPU/Sound Board Batteries.

Nr.	STANDARD ADJUSTMENT NAME: Definition
	REPLAY TYPE: Set to **AUTO**, **DYNAMIC**, **FIXED** or **NONE**. Default is **AUTO**. Selecting **NONE** will make Standard Adjustments **2-5** ***NOT AVAILABLE***. Selecting **FIXED** will make Standard Adjustment **2** ***NOT AVAILABLE***. If selected **AUTO**, **DYNAMIC** or **FIXED**, you will need to then select the number of Replay Levels and Score Threshold *(in Standard Adj. **4**)* desired for the player to receive a Replay Award *(select type in Standard Adj. **3**)*. The Default Score appears as a starting point after the Level amount is selected. **AUTO** & **DYNAMIC** will then get based on the Replay Percentage *(in Standard Adjustment **2**)*.
01	• Select **FIXED** to give the player a Replay Award as the Score Threshold is reached. This Score Threshold ***will not*** adjust up or down. • Select **AUTO** to give the player a Replay Award as the Score Threshold is reached. This Score Threshold ***will automatically*** adjust up or down based on the Replay Percentage chosen *(in Std. Adj. **2**)*. The game periodically adjusts based upon the Player Base Skill Level. • Select **DYNAMIC** to give the player a Replay Award as the Score Threshold is reached. This Score Threshold will go down every game based on the Replay Percentage selected. *For (Dynamic) example, if the Score Threshold is 50,000,00 and the Replay Percentage selected is 10%, every game a player does not reach the Score Threshold, the score to reach will drop by 5,000,000 (10% of 50M). This will continue every game until the Threshold Score is reached. Thus, if the score then drops to 15,000,000 after 7 games and is then achieved, the Replay Award is given. The original Score Threshold is added to 15,000,000 and is now 65,000,000. It will then take the same player 10 games to reach 15,000,000.*
02	**REPLAY PERCENTAGE:** Set between **01% - 50**. Default is **10%**. This Adjustment is required if Standard Adjustment **1** is set to **AUTO** or **DYNAMIC**.

Standard Adjustments 03-11 continued on the next page.

STANDARD ADJUSTMENT NAME: Definition

03 **REPLAY AWARD:** Set to **EXTRA BALL**, **CREDIT**, **TICKET*** or **TOKEN***. Default is **CREDIT**. Select **EXTRA BALL** if awarding a ***CREDIT***, ***TICKET/TOKEN*** is prohibited in your area.

***TICKET or TOKEN is selected, the game will require an optional Ticket or Token Dispenser**
If selected Token, then Standard Ajustment 46, Q24 Option, must be changed accordingly.

04 **REPLAY LEVELS:** Set between **1 - 4** for the number of Replay Levels to be active. Default is **1**. A "Drop-Down" Table appears showing Replay Level 1. Adjust the Replay Level between 10M - 9.99B *(Default Score appears as a starting point)* using the "-" or "+" *Mini-Icons*, then use the *">>" Mini-Icon* to go to next Level *(if selected more than 1)* and select the next highest Threshold Score(s) desired.

05 **REPLAY BOOST:** Set to **YES** or **NO**. Default is **YES**. *This Adjustment works only when Standard Adjustment **1**, **Replay Type**, is set to **FIXED** or **AUTO**.*
When set to **YES**, while **FIXED** or **AUTO** maintains the Replay Levels, Replay Boost works as follows: If the Replay Level is 7,000,000 *(regardless of the Replay Percentage)*, and the Player scores 20M, and receives the Replay Award, the next game the Current Replay Level is added to this base. Thus the next game, the Replay Level is 14,000,000. The Player agains scores 20M. The next game the Player will need to achieve 21,000,00 to earn the Replay Award. If the Player does not achieve 21,000,000, the next game reverts back to the original 7,000,000 or the new adjusted level maintained by the Fixed or Autopercentaging Feature.

06 **SPECIAL AWARD:** Set to **EXTRA BALL**, **CREDIT**, **TICKET***, **TOKEN*** or **POINTS**. Default is **CREDIT**. Select **EXTRA BALL** or **POINTS** if awarding a ***CREDIT*** or ***TICKET/TOKEN*** is prohibited in your area.

07 **SPECIAL PERCENTAGE:** Set between **1% - 5%**. Default is **2%**. This adjustment allows the operator to adjust how frequently the ***Special Feature*** is made available to the player.

08 **FREE GAME LIMIT:** Set between **01 - 09**, **NO FREE GAMES** or **UNLIMITED**. Default is **05**. Set the maximum number of *Free Games* that may be accumulated per game.

09 **EXTRA BALL LIMIT:** Set between **01 - 09**, **NO EXTRA BALLS** or **UNLIMITED**. Default is **09**. Set the number of *Extra Balls* that may be accumulated per game.

10 **EXTRA BALL PERCENTAGE:** Set between **01% - 50%**. Default is **25%**. This adjustment allows the operator to adjust how frequently the ***Extra Ball Feature*** is made available to the player.

11 **GAME PRICING:** There are two (2) methods available for *Coin Switch Programming*: **Standard** & **Custom**. Set between **USA 1** thru **EURO 12** or **CUSTOM**. *USA Factory Default Setting* is **USA 5**.

The **Dip Switch Settings (Sw. 300)** on the **CPU/Sound Board** for each Country ***must match*** *with what is shown in the **USA & Int'l. Standard Pricing Select Tables** for your country to have correct operation (see the next page).* For a **Standard** Selection *(**USA** or **International**):* Select & *activate* either of the "-" or "+" *Mini-Icons* to move backward or forward in the Display; With your choice appearing in the display, select & *activate* the ">>" *Mini-Icon* to advance and "lock-in" the change *(display will momentarily flash **REQUEST INSTALLED**).*

If **CUSTOM** is selected *(appears in display)*, after selecting & *activating* any *Mini-Icon (except for "-" or "+")*, the display will momentarily flash **REQUEST INSTALLED** with the display "**LEFT COIN: 0 PULSE**" appearing. Use the "<<" or ">>" *Mini-Icons* to ***select*** the next choice *(see Table Examples below)* and the "-" or "+" *Mini-Icons* to ***customize*** the PULSES, CREDITS & CLICKS from **0** to **99**.

The prescribed number of **PULSES** required for **1 CREDIT** must be set according to the ***Pricing Scheme*** *desired*. Some simple calculations are required to get the proper set-up. After customizing, ***test*** *the set-up* with appropriate Coins or Bills and adjust, if necessary. ***Note:*** *Clicks can be changed if an optional Coin Meter is installed.*

LEFT	CENTER	RIGHT	4TH	Example 1			LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:	BONUS 2:	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
25¢	$1.00	25¢	Not Used	1 /50¢	2 /75¢	3/ $1.00	3	12	3	1	4	0	0	0	0	1	4	1	1
Coin Mechanisms Used				Pricing Scheme Desired			PULSES	PULSES	PULSES	PULSE	PULSES	PULSES	PULSES	CREDITS	CREDITS	CLICK	CLICKS	CLICK	CLICK

In **Example 1**, note the **LEFT** (and **RIGHT**) **COIN: 3 PULSES** and **ONE CREDIT: 4 PULSES**. Since every Coin inserted produces 3 Pulses & every Credit requires 4 Pulses, 2 Coins (50¢) will produce 6 Pulses (*4 Pulses for the 1st Credit + 2 Pulses remains in escrow).* The 3rd Coin (75¢) provides another 3 Pulses for a total of 5 Pulses *(4 Pulses for the 2nd Credit + 1 Pulse remains in es crow).* The 4th Coin ($1.00) provides another 3 Pulses for a total of 4 Pulses (*4 Pulses for the 3rd Credit + 0 Pulses remain).* The **CENTER COIN: 12 PULSES** is set this way *(with a Bill Validator attached);* every $1-Bill inserted produces 12 Pulses or 3 Credits.

LEFT	CENTER	RIGHT	4TH	Example 2			LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:	BONUS 2:	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
25¢	$1.00	25¢	Not Used	1 /50¢	2 /75¢	7/ $2.00	3	12	3	1	4	24	0	1	0	1	4	1	1
Coin Mechanisms Used				Pricing Scheme Desired			PULSES	PULSES	PULSES	PULSE	PULSES	PULSES	PULSES	CREDIT	CREDITS	CLICK	CLICKS	CLICK	CLICK

In **Example 2**, *similar to Example 1*, however, **BONUS CREDITS** are implemented. In addition to receiving 3 plays for every $1.00, the player is awarded an extra Credit for every 2nd dollar inserted before game start.

LEFT	CENTER	RIGHT	4TH	Example 3			LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:	BONUS 2:	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
25¢	$1.00	25¢	Not Used	1 /25¢	6/ $1.00	13/ $2.00	5	20	5	0	4	20	40	1	0	1	4	1	1
Coin Mechanisms Used				Pricing Scheme Desired			PULSES	PULSES	PULSES	PULSES	PULSES	PULSES	PULSES	CREDIT	CREDITS	CLICK	CLICKS	CLICK	CLICK

In **Example 3**, a ***Pricing Scheme*** for a cheaper game is shown. An extra Pulse is put in escrow for every 25¢, thus at 4X 25¢ inserted, another Credit is given, and the **BONUS 1: 20 PULSES** threshold is also met, so 6/ $1.00 is achieved. **BONUS 2: 40 PULSES** is set, so when this threshold is met with $2.00, 13 Credits are produced.

LEFT	CENTER	RIGHT	4TH	Example 4			LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:	ONE CREDIT:	BONUS 1:	BONUS 2:	BONUS 1:	BONUS 2:	LEFT COIN:	CENTER COIN:	RIGHT COIN:	FOURTH COIN:
10p	50p	£1	20p	1 /30p	2 /50p	5 /£1	1	6	15	2	3	0	0	0	0	1	4	1	1
Coin Mechanisms Used				Pricing Scheme Desired			PULSE	PULSES	PULSES	PULSES	PULSES	PULSES	PULSES	CREDITS	CREDITS	CLICK	CLICKS	CLICK	CLICK

In **Example 4**, a ***Pricing Scheme*** using a different currency *(i.e. British Sterling)* is shown to provide another way coins *(or tokens)* can be utilized to custom tailor to your own needs.

Standard Adjustment 11, Custom Pricing, continued on the next page.

STANDARD ADJUSTMENT NAME: Definition

USA & International Standard Pricing Select Tables

CPU/SOUND BOARD DIP SWITCH 300 SETTING	COUNTRY SETTING OPTION(S)	COIN MECHANISMS (SWITCHES) COINS THRU ... SLOT: LEFT	CENTER	RIGHT	4TH	PRICING SCHEME Number of Plays (Credits) for Price Amount Shown See "Appendix J" for Coin Cards Examples & Info!			Requires SPI Coin Card(s) Part Number
Pos. 1 2 3 4 5 6 7 8									
ON / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼	USA 1	$.25	$1.00	$.25		1 /$.25			755-5400-01
	USA 2					1 /$.50	2 /$.75	3 /$1.00	755-5400-02
	USA 3					1 /$.50			755-5400-02
	USA 4					1 /$.50	*For USA Defaults 6 & 7 use:*		755-5400-02
	USA 5 »					1 /$.50	5 /$2.00	**755-5400-02**	755-5400-00
	USA 6					1 /$.50	2 /'4 X 25¢'	3 /$1.00 Bill	◀ Used to promote the Bill Validator.
	USA 7					1 /$.50	4 /$1.50	6 /$2.00	
	USA 8					1 /$.50	3 /$1.00		755-5400-00
Pos. 1 2 3 4 5 6 7 8	For different Euro Pricing Scheme (other than below default), go to Adjustment 06 and scroll through Euro 1-12 for new setting (see end of table Euro 1-12).								
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	Austria **Euro 9**	€.50	€1.00	€2.00		1 /€1.00	2 /€1.50	3 /€2.00	755-5401-09
Pos. 1 2 3 4 5 6 7 8									
ON: ▲ ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼	**Australia 1** «	20¢	$A1	$A2		1 /$A1	3 /$A2		755-5406-00
	Australia 2					1 /$A1			(Side 1)
Pos. 1 2 3 4 5 6 7 8	For different Euro Pricing Scheme (other than below default), go to Adjustment 06 and scroll through Euro 1-12 for new setting (see end of table Euro 1-12).								
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	Belgium **Euro 1**	€.50	€1.00	€2.00		1 /€.50			755-5401-01
Pos. 1 2 3 4 5 6 7 8									
ON: ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼	**Canada**	Can$.25	Can$.25	Can$1	Can$2	1 /50¢	2 /75¢	3/ Can$1	755-5400-00 *or -01 or -02*
Pos. 1 2 3 4 5 6 7 8									
ON: ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼	**Denmark 1** «	1 DKr	5 DKr	10 DKr	20 DKr	1 /3 DKr	2 /5 DKr		755-5402-00
	Denmark 2					1 /2 DKr	3 /5 DKr	7 /10 DKr	(2-Sided)
Pos. 1 2 3 4 5 6 7 8	For different Euro Pricing Scheme (other than below default), go to Adjustment 06 and scroll through Euro 1-12 for new setting (see end of table Euro 1-12).								
ON: ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼	Finland **Euro 8**	€.50	€1.00	€2.00		1 /€1.00	3 /€2.00		755-5401-08
Pos. 1 2 3 4 5 6 7 8	For different Euro Pricing Scheme (other than below default), go to Adjustment 06 and scroll through Euro 1-12 for new setting (see end of table Euro 1-12).								
ON: ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼	France **Euro 10**	0,50 €	1,00 €	2,00 €		1 /1,00 €	3 /2,00 €	7 /3,00 €	755-5401-10
Pos. 1 2 3 4 5 6 7 8	*Germany: For different Euro Pricing Scheme (other than below settings), go to Adjustment 06 and scroll to Custom for this Unique Coin Door & Mech.*								
ON: ▲ ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼	Germany 1					1 /0,50¢			755-5401-01
	Germany 2 «	€0,50	€1,00	€2,00		1 /0,50¢	5 /€2,00		755-5401-02
	Germany 3					1 /0,50¢	6 /€2,00		755-5401-04
Pos. 1 2 3 4 5 6 7 8	For different Euro Pricing Scheme (other than below default), go to Adjustment 06 and scroll through Euro 1-12 for new setting (see end of table Euro 1-12).								
ON: ▲ ▲ ▲ ▲ / OFF: ▼ ▼ ▼ ▼	Greece **Euro 6**	€.50	€1.00	€2.00		2 /€.50			755-5401-06
Pos. 1 2 3 4 5 6 7 8	*Italy: For different Euro Pricing Scheme (other than below settings), go to Adjustment 06 and scroll to Custom for this Unique Coin Door & Mech.*								
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	**Italy 1** «	€.50		€.50		1 /.50¢			755-5401-01 &
	Italy 2					1 /.50¢	3 /€2.00		755-5401-08
Pos. 1 2 3 4 5 6 7 8	For different Euro Pricing Scheme (other than below default), go to Adjustment 06 and scroll through Euro 1-12 for new setting (see end of table Euro 1-12).								
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	Netherlands **Euro 3**	€.50	€1.00	€2.00		1 /€.50	3 /€1.00		755-5401-03
Pos. 1 2 3 4 5 6 7 8									
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	**New Zealand 1** «	$NZ1		$NZ2		1 /$NZ1			755-5406-00
	New Zealand 2					1 /$NZ1	3 /$NZ2		(Side 2)
Pos. 1 2 3 4 5 6 7 8									
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	**Norway 1** «	10 NKr	5 NKr	20 NKr		1 /5 NKr			755-5403-00
	Norway 2					1 /10 NKr	3 /20 NKr		(2-Sided)
Pos. 1 2 3 4 5 6 7 8	*Portugal: For different Euro Pricing Scheme (other than below settings), go to Adjustment 06 and scroll to Custom for this Unique Coin Door & Mech.*								
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	**Portugal**	€.50		€.50		1 /€.50			755-5401-01
Pos. 1 2 3 4 5 6 7 8	For different Euro Pricing Scheme (other than below default), go to Adjustment 06 and scroll through Euro 1-12 for new setting (see end of table Euro 1-12).								
ON: ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼ ▼	Spain **Euro 3**	€.50	€1.00	€2.00		1 /€.50	3 /€1.00		755-5401-03
Pos. 1 2 3 4 5 6 7 8									
ON: ▲ ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼	**Sweden 1** «	1 SKr	5 SKr	10 SKr		1 /10 SKr	2 /15 SKr	3 /20 SKr	755-5404-00
	Sweden 2					1 /5 SKr			(2-Sided)
Pos. 1 2 3 4 5 6 7 8									
ON: ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼ ▼	**Switzerland 1** «	1 SwF	2 SwF	5 SwF		1 /1 SwF	6 /5 SwF		755-5405-00
	Switzerland 2					1 /1 SwF	3 /2 SwF	9 /5 SwF	(2-Sided)

Pos. 1 2 3 4 5 6 7 8		LEFT	CENTER	RIGHT	4TH	5TH				
							UK also utilizes the 5th Coin Slot Switch (not available with Custom Pricing).			
ON: ▲ ▲ ▲ / OFF: ▼ ▼ ▼ ▼ ▼	UK 1	10p	50p	£1	20p	£2	3 /£1	7 /£2		755-5407-00
	UK 2						4 /£1			755-5407-01*
	UK 3						1 /50p	5 /£2		755-5407-01
	UK 4						1 /30p	4 /£1		755-5407-01*
	UK 5 «						1 /£1	3 /£2		755-5407-00
	UK 6						3 /£2		*use blank side	755-5407-01*

Note: *The Country Setting Option above noted with "«" & "»" denotes the Factory Default Setting (subject to change).*

Standard Adj. 11, Custom Pricing, and Std. Adj. 12-32 continued on the next page.

STANDARD ADJUSTMENT NAME: Definition

Euro Summary Pricing Select Table

Pos.	1	2	3	4	5	6	7	8
ON	S	E	E	A	B	O	V	E
OFF	S	E	T	T	I	N	G	S

Euro 1-12 are alternate settings for countries using the Euro:

If choosing an alternate Euro Setting other than your Country's Default, please remember to use your Country Dip Switch Setting.

Alternate Settings	LEFT	CENTER	RIGHT	4TH				
Euro 1	€.50	€1.00	€2.00	optional €.20 optional	1 /€.50			755-5401-01
Euro 2					1 /€.50	5 /€2.00		755-5401-02
Euro 3					1 /€.50	3 /€1.00		755-5401-03
Euro 4					1 /€.50	6 /€2.00		755-5401-04
Euro 5					1 /€.50	3 /€1.00	7 /€2.00	755-5401-05
Euro 6					2 /€.50			755-5401-06
Euro 7					1 /€1.00	5 /€4.00		755-5401-07
Euro 8					1 /€1.00	3 /€2.00		755-5401-08
Euro 9					1 /€1.00	2 /€1.50	3 /€2.00	755-5401-09
Euro 10					1 /€1.00	3 /€2.00	7 /€3.00	755-5401-10
Euro 11					1 /€1.00	4 /€2.00		755-5401-11
Euro 12					2 /€1.00	9 /€4.00		755-5401-12

12 **MATCH AWARD:** Set to **CREDIT**, **TICKET*** or **TOKEN***. Default is **CREDIT**. **read note under Std. Adjustment 3.*

13 **MATCH PERCENTAGE:** Set between **0% - 10%** or **OFF**. Default is **9%**. At **0**% the match display occurs at the end of the game but never awards a Credit. Set to **OFF**, no ***Match Animation Feature*** is shown.

14 **BALLS PER GAME:** Set between **02 - 05**. Default is **03**. Set the number of balls per game.

15 **TILT WARNINGS:** Set to **00**, **01** or **03**. Default is **01**. Set the number of Plumb Bob Tilt Switch closures before the ball in play is tilted.

16 **CREDIT LIMIT:** Set between **04 - 50**. Default is **30**. Set the maximum credits allowed.

17 **ALLOW HIGH SCORES:** Set to **YES** or **NO**. Default is **YES**. When set to **YES** if a player exceeds any 1 of the 4 High Scores, the player may receive an award *(depending on Standard Adjustment **03, Replay Award**)*. Set to **NO** to disable this feature. There are 5 High Scores that will allow the player to enter their initials *(or name) (see Standard Adjustment **29, High Score Initials**)*.

18 **GRAND CHAMPION AWARDS:** Set between **00 - 05**. Default is **01**. Set the number of awards, awarded for exceeding Level 1 *(the highest of the five (5) Levels)*.

19 **HIGH SCORE #1 AWARDS:** Set between **00 - 03**. Default is **01**. Set the number of awards, awarded for exceeding Level 2.

20 **HIGH SCORE #2 AWARDS:** Set between **00 - 02**. Default is **00**. Set the number of awards, awarded for exceeding Level 3.

21 **HIGH SCORE #3 AWARDS:** Set between **00 - 01**. Default is **00**. Set the number of awards, awarded for exceeding Level 4.

22 **HIGH SCORE #4 AWARDS:** Set between **00 - 01**. Default is **00**. Set the number of awards, awarded for exceeding Level 5.

23 **GRAND CHAMPION SCORE:** Set between **1,000,000 - 9,999,000,000** or **00** *(increments of 1M)*. Default is **50,000,000**. Set the desired ***High Score Level*** to which Level 1 may be achieved. A score higher than the default, cannot be reset by Standard Adjustment **28**, **HSTD Reset Count**. *The High Score will revert to the Default Score **ONLY** if a **Factory Reset** is done or the batteries are removed from the CPU/Snd. Bd.*

24 **DEFAULT HIGH SCORE #1:** Set between **1,000,000 - 9,999,000,000** or **00** *(increments of 1M)*. Default is **40,000,000**. Set the desired ***High Score Level*** to which Level 2 may be achieved. *Read Std. Adj. **28**.*

25 **DEFAULT HIGH SCORE #2:** Set between **1,000,000 - 9,999,000,000** or **00** *(increments of 1M)*. Default is **35,000,000**. Set the desired ***High Score Level*** to which Level 3 may be achieved. *Read Std. Adj. **28**.*

26 **DEFAULT HIGH SCORE #3:** Set between **1,000,000 - 9,999,000,000** or **00** *(increments of 1M)*. Default is **30,000,000**. Set the desired ***High Score Level*** to which Level 4 may be achieved. *Read Std. Adj. **28**.*

27 **DEFAULT HIGH SCORE #4:** Set between **1,000,000 - 9,999,000,000** or **00** *(increments of 1M)*. Default is **25,000,000**. Set the desired ***High Score Level*** to which Level 5 may be achieved. *Read Std. Adj. **28**.*

28 **HSTD RESET COUNT:** Set between **100 - 9,900** or **OFF** *(increments of 100)*. Default is **2,000**. **HSTD** *(**H**igh **S**core **T**o **D**ate)*. Set the number of games between "automatic resets of High Score Levels" to "Default Scores" for ***ONLY*** Standard Adj. **24-27, Default High Score #1-#4**.

29 **HIGH SCORE INITIALS:** Set to **3 INITIALS** or **10 LETTER**. Default is **3 INITIALS**. When set to **3 INITIALS**, the player is allowed only 3 initials to input. When set to **10 LETTER NAME**, the player is allowed to enter 10 initials to input.

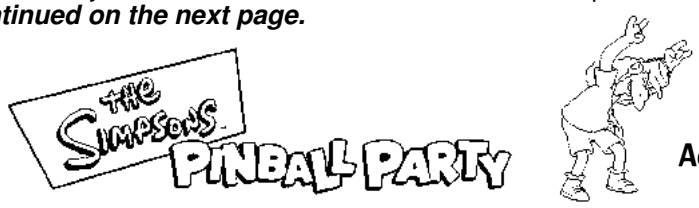
30 **FREE PLAY:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, no coins are required for *Game Play.*

31 **CUSTOM MESSAGE:** Set to **ON, CHANGE** or **OFF**. Default is **ON**. When set to **CHANGE**, a new message can be set or the old one can be edited *(select the "+" Mini-Icon to change settings until "CHANGE" appears in the display, then select the ">>" Mini-Icon to access.)*. This adjustment can be accessed in two (2) ways by either selecting the "S.P.I." *Icon* and advancing to this Adjustment, **or** can be directly accessed by selecting the "ABCD CUST MSG" *Icon* in the **ADJUSTMENTS MENU**.

View the Custom Message Shortcut summary (end of this chapter) for how to enter text or symbols.

32 **FLASH LAMP POWER:** Set to **NORMAL**, **DIM** or **OFF**. Default is **NORMAL**. When set to **DIM**, the Flash Lamps impulse power is reduced by **25**% and when set to **OFF** the Flash Lamps will not flash.

Standard Adjustments 33-51 continued on the next page.



	STANDARD ADJUSTMENT NAME: Definition
33	**COIL PULSE POWER:** Set to **NORMAL, HARD** or **SOFT**. Default is **NORMAL**. When set to **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. This adj. is provided to compensate for *Low Line* or *High Line voltage* conditions where the solenoids (coils) appear to *kicking too weak or too hard*. Adjust as required.
34	**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.
35	**GAME RESTART:** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, a new game may be started during any ball after the first ball is completed *(if credits are available).* Pressing the **Start Button** 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 Sec. **2**, Chp. **1**, **GAME OPERATIONS & FEATURES**, for details.*
36	**BILL VALIDATOR:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, in *Game Attract Mode* the Display will show an "*Insert Bill Animation*." When set to **NO,** the Display will show an "*Insert Coin Animation*."
37	**BKGRND (BACKGROUND) MUSIC VOLUME:** Set between **01 - 15**. Default is **01**. After volume is set via Portals Service Buttons *(see Section **3**, Chapter **1**, **PORTALS™SERVICE MENU INTRODUCTION**)* this adjustment can be utilized to adjust the background music *(1 all the way on, 15 all the way off)* while keeping the Special Sound FX the same level.
38	**FREEZE TIME (BALL SAVE):** Set to **OFF**, **0:01-0:15** or **AUTO**. Default is **OFF**. When set to **OFF** this feature is unavailable. Set between **0:01** through **0:15** *(single increments)* for the ball to be sent back into play if the time set is not met *(per ball).* Set to **AUTO** to automatically adjust the Freeze Timer based on the average ball time.
39	***UK ONLY*** ***Dip Switch Must Be Set*** **UK POST SAVE ENABLED:** Set to **YES** or **NO**. Default is **NO**, *(UK Default is **YES**).* When set to **YES** this feature is available when lit. Set to **NO** to disable this feature. *(UK Games have Outlane/Center Post Save Devices which are accessed in differently; Non-UK Games cannot adjust this setting.)*
40	**TIMED PLUNGER:** Set to **OFF** or **0:15 - 1:00**. Default is **OFF**. When set to **0:15** to **1:00**, the plunger will "Autoplunge" the ball *(at the time set)* when the ball is at the beginning of play, awaiting the skill shot by the player.
41	**FLIPPER BALL LAUNCH:** Set to **DISABLED**, **LEFT FLIPPER**, **RIGHT FLIPPER**, **EITHER FLIPPER** or **BOTH FLIPPERS**. Default is **DISABLED**. This feature allows the player to operate the *Auto Ball Launch* with the **FLIPPER BUTTON(S)** depending on which setting is chosen.
42	**COINDOOR BALL SAVER:** Set to **YES** or **NO**. Default is **NO**. When set to **NO**, this feature is not available. When set to **YES**, this feature allows the Coin Door to be opened during game play; the ball will drain but the game will be placed "on hold". When the Coin Door is closed, the pinball will return to the Shooter Lane, and the game will resume.
43	**COMPETITION MODE:** Set to **YES** or **NO**. Default is **NO**. When set to **NO**, this feature is not available. If an Install of either $.50 or Free Play Competition was made *(changing the default to YES)*, and was changed back to **NO**, the **COMPETITION MODE** will be turned **OFF** *(see Section **3**, Chapter **5**, **GO TO INSTALLS MENU**, **$. 50** or **Free Play Competition**).* Set to **YES**, this feature is available *(required for Competition Modes)*; this feature will equalize random game features and global score values during multi-player games.
44	**CONSOLATION BALL:** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, the ***EXTRA BALL*** *(Playfield Light Insert, location varies)* will be lit on the last ball in play, if certain programming criteria is met.
45	**FAST BOOT:** Set to **YES** or **NO**. Default is **NO**. When set to **NO**, this feature is not available and will display all normal Power-Up screens. When set to **YES**, the game will not display the normal informative Power-Up screens, specifically the CPU Version screen and the Location/Game ID screen. Regardless of the setting, normal Power-Up safety checks are still performed.
46	**Q24 OPTION:** Set to **COIN METER**, **TOKEN DISPENSER** or **KNOCKER**. Default is **COIN METER**. This Coil (Solenoid) Location is left "open" at the Factory to allow for these optional Mechanisms to be added to the game. If selecting **TOKEN DISPENSER**, Standard Adjustments 03, 06 & 12 should be changed to **TOKEN**. *Call Technical Support at 1-800-542-5377 if more information is required on this option.*
47	**TICKET DISP. INSTALLED:** Set to **YES** or **NO**. Default is **NO**. *This adjustment is required only for games which have an optional Deltronics (DL-1275 PCB Style) Ticket Dispenser Installed. Unique CPU Sound Board Dip Switch (Sw. 300) Setting required, which also changes the Default to YES.*
48	**ALLOW PLAYER COMP. MODE:** Set to **YES** or **NO**. Default is **YES**. ***Competition Mode*** unrandomizes feature events, and standardizes game play and rule sets *(varies from game to game)* for fair compe- titions. With adequate credit, to enter ***Competition Mode***, hold the **Flipper Button** in while pressing the **Start Button**. ***Watch the Dot Display for more details*** *(rules and operation are subject to change).* General rules are covered in the Instruction Card. Other *Hints and/or Rules* can be made known on this game either visually *(the Dot Display or Flashing Light Inserts)* or can be audible.
49	**TECH ALERT WARNING:** A Portals™ Function. *Review Sec. **3**, Chp. **2**, **GO TO DIAGNOSTICS MENU**, Page **25**, regarding **Technician Alerts** and its' functions.* Set to **NEVER**, **POWERUP**, **COIN DOOR** or **POWERUP AND COIN DOOR**. Default is **NEVER**. When set to **NEVER**, *the Tech Report Alert display **will not appear** upon Power-Up or opening the Coin Door, if the game detects any problems.* When set to **POWERUP**, *the display will appear only upon Power-Up (if problems detected).* When set to **COIN DOOR**, *the display will appear only when the Coin Door is opened (if problems detected).* When set to **POWERUP AND COIN DOOR**, *the display will appear upon Power-Up and if the Coin Door is opened (if problems detected).*
50	**LOCATION ID:** Set between **00** to **9999**. Default is **00**. This adjustment allows the operator to assign a location identification number to the audit print-out sheet. *(Will not be affected by Factory Reset.)*
51	**GAME ID:** Set between **00** to **9999**. Default is **00**. This adjustment allows the operator to assign a game identification number to the audit print-out sheet. *(Will not be affected by Factory Reset.)*

Feature Adjustments (01-36)

To initiate, from the **ADJUSTMENTS MENU**, select the "SPP" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icon*s to view the next or previous Adjustment in this group. Select and *activate* either of the "-" or "+" *Mini-Icons* to change the setting, if desired *(the Default Setting is noted in the definitions below)*. The display will describe the **Adjustment Number**, **Adjustment Name** and the **Current Adjustment Setting**. The current Adjustment will remain in the display until the next Adjustment is view or when this Menu is exited.

Nr.	FEATURE ADJUSTMENT NAME: Definition
01	**3 BANK DIFFICULTY:** Set to **EASY, MODERATE** or **HARD**. Default is **HARD**. Determines how this Feature is started and played. Adjusts the difficulty of the Captive Ball spotting 3-Bank Targets. **EASY** will cause the Captive Ball to always spot a target. **HARD** will cause the Captive Ball to spot a target only when it can not advance the *Daredevil Feature.* **MODERATE** will cause **EASY** behavior the first time through Captive Ball Awards, then **HARD** behavior after that.
02	**DAREDEVIL DIFFICULTY:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how this Feature is started and played. Adjusts how *Daredevil Modes* are lit. **EXTRA EASY** will light all *Modes* with each ball. **EASY** will light all *Modes* once, then light additional *Modes* at Ball Start if none are already lit. **MODERATE** will light one *Mode* at Ball Start if none are already lit. **HARD** will light one *Mode* one time. **EXTRA HARD** will never light a *Mode* for free.
03	**# OF RAMPS FOR 1ST EB:** Set between **06** to **14**. Default is **10**. Sets the maximum number of *Right Ramp Shots* required to light the Extra Ball (EB) for the first time.
04	**# OF RAMPS NEXT EBS:** Set between **20** to **90**. Default is **50**. Sets the maximum number of ***additional*** *Ramp Shots* required to light the Extra Ball (EB) for ***subsequent*** EBs *(e.g. Setting of **50** cause EBs to be lit at the **initial 10** Ramps, then **60** , **110** , **etc**.).*
05	**MAX EBS FROM RAMP:** Set between **00** to **10**. Default is **04**. Sets the maximum number of Extra Balls (EBs) that may be earned from the Right Ramp.
06	**RAMP EB MEMORY:** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, this feature bonus *(Extra Ball (EB) lit from the Right Ramp)* will be retained in memory from *ball-to-ball* for the same player. When set to **NO**, this feature will go out at the end of each ball.
07	**1ST RAMP TREEHOUSE:** Set between **02** to **10**. Default is **05**. Sets the number of *Right Ramp Shots* required to light the *Treehouse of Horror Mode* for the first time.
08	**NEXT TREEHOUSE:** Set between **05** to **20**. Default is **10**. Sets the number of *Right Ramp Shots* required to light the *Treehouse of Horror Mode* ***subsequent*** times *(e.g. Default settings cause Treehouse of Horror Mode to be lit at **5** Ramps, then **15** Ramps, then **25** ..., **etc.**)*
09	**1ST COUCH LOCKS UNLIT:** Set between **01** to **05**. Default is **02**. Sets the first *Couch Multiball* where *Locks* start off unlit *(i.e. the player must earn locks; setting of **2** means the "2nd" Multiball).*
10	**COUCH MB DIFFICULTY:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **EXTRA EASY**. Determines how this Feature is started and played. Sets the difficulty of lighting *Locks* for *Couch Multiball (MB).* **EXTRA EASY** means targets can be hit in any order, and the *Locks* are stackable. **EASY** means targets can be hit in any order, but balls must be *Locked* before the next *Lock* can be lit (unstackable). **MODERATE** means the targets must be hit in order *(LIGHT then LOCK),* unstackable. **HARD** means targets must be hit 2 times each, any order, unstackable. **EXTRA HARD** means targets must be hit *LIGHT* twice, then *LOCK* twice, unstackable.
11	**TV LIGHTING DIFFICULTY:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **EASY**. Determines how this Feature is started and played. Sets how hard it is to start *TV Modes*. **EXTRA EASY** means the *TV Mode* is *ALWAYS* lit. **EASY** means the *TV Mode* is always lit at Ball Start. **MODERATE** means the *TV Mode* starts off lit, but *does not automatically relight* at Ball Start. **HARD** means the *TV Mode* starts off unlit. **EXTRA HARD** means the *TV Mode* will start off at Ball Start *regardless if it was lit before or not.*
12	**MYSTERY LIGHTING DIFF.:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how this Feature is started and played. Sets how hard the *Mystery Feature (clean the garage)* is. The settings are the identical to Feature Adjustment **11**, **TV Light Difficulty**.
13	**MYSTERY EB MEMORY:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Extra Ball (EB) Lit from the Mystery Award)* will be retained in memory from *ball-to-ball* for the same player. When set to **NO**, this feature will go out at the end of each ball.
14	**MYSTERY SPECIAL MEMORY:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Special Lit from the Mystery Award)* will be retained in memory from *ball-to-ball* for the same player. When set to **NO**, this feature will go out at the end of each ball.
15	**MAIN TIMER DIFFICULTY:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how this Feature is started and played. Sets how much time the player gets for every *Scoring Mode* as well as how much time is added when ***MORE TIME*** is hit. *Range: **EXEASY** provides more time... **EXHARD** provides less time. Time allotment may vary.*
16	**1ST I&S WITH DROPS:** Set between **01** to **05**. Default is **02**. Sets the first *Itchy & Scratchy (I&S) Multiball* where all Drop Targets must be knocked down before the *I&S Saucer Shots* count *(setting of **2** means the "2nd" Multiball).*
17	**1ST I&S DROPS RESET:** Set between **01** to **05**. Default is **03**. Sets the first **Itchy & Scratchy Multiball** where the Drop Targets will reset after a period of time, if they are not all knocked down *(setting of **3** means the "3rd" Multiball).*
18	**1ST I&S SHOT TWICE:** Set between **01** to **05**. Default is **01**. Sets the first *Itchy & Scratchy Multiball* where the Saucer must be *shot first* in order to light *I&S Multiball (setting of **1** means the "1st" Multiball).*

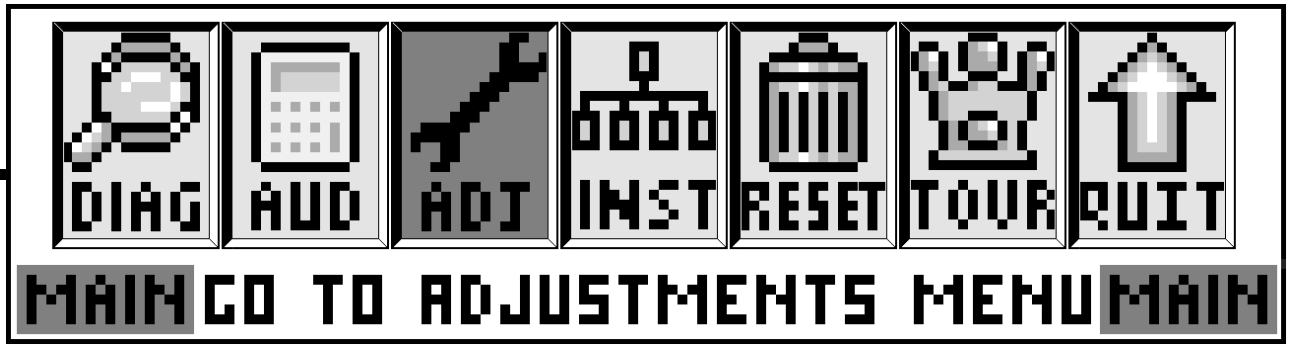
Feature Adjustments 19-36 continued on the next page.

	FEATURE ADJUSTMENT NAME: Definition
19	**ENABLE REVERSED FLIPPERS:** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, the game is allowed to reverse flipper control during Springfield Mystery Spot.
20	**GARAGE DOOR DIFF:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **EASY**. Determines when the garage door will automatically reopen when the player is leaving the *Upper Mini-Playfield,* either by locking a ball in the *couch* or by exiting onto the *Monorail Ramp*. **EXTRA EASY** means the door will continue to open until Couch Multiball is achieved. **EASY** means the door will continue to open until a ball has been locked in the couch. **MODERATE** means the door will continue to open until a ball has been locked in the couch or a TV Award has been given. **HARD** means the door will continue to open until a ball has been locked in the couch or a TV Award has been given or the Mystery has been relit. **EXTRA HARD** means the door will never automatically reopen.
21	**OTTO LIGHTING DIFF:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **EASY**. Determines how this Feature is started and played. Sets how hard it is to start *Otto 2X Scoring Modes. The settings are the identical to Feature Adjustment **11**, **TV Light Difficulty**.*
22	**SHOW UPPER FLIPPERS:** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, the game will ***flip*** *(actuate the coils)* the Upper Flippers in an attempt to get players to notice them when they are being fed for the first time. If the player is about to have a ball kicked out of the Upper Right Saucer, the game will ***flip*** the Lower Playfield Mid Right Flipper 5 times. If the player is about to have a ball kicked up to the living room, the game will ***flip*** the Upper Playfield Left Flipper 5 times. *This will not occur if the first feed to a Flipper is during any Multiball Mode.*
23	**CBG HURRY UP DIFFICULTY:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. Determines how this Feature is started and played. Controls the speed at which the *Comic Book Guy (CBG) Hurry-Up Feature* counts down. *Difficulty will vary*.
24	**# OF NVS FOR 1ST EB:** Set between **05** to **20**. Default is **10**. Sets the number of *Nuclear Values (NVs)* required to light the Extra Ball (EB) for the first time.
25	**# OF NVS NEXT EBS:** Set between **20** to **90**. Default is **50**. Sets the number of ***additional*** *Nuclear Values (NVS)* required to light the Extra Ball (EB) for **subsequent** EBs *(e.g. Setting of **50** cause Extra Balls to be lit at the initial **10** NVs, then **60 , 110** ..., **etc.**).*
26	**MAX EBS FROM NUCLEAR:** Set between **00** to **10**. Default is **04**. Sets the maximum number of Extra Balls (EBs) that may be earned from the *Nuclear Value.*
27	**NUCLEAR EB MEMORY:** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, this feature bonus *(Extra Ball (EB) lit from Nuclear Value)* will be retained in mem. from *ball-to-ball* for the same player. ... **NO**, this feature will go out at the end of each ball.
28	**COUCH EB DIFFICULTY:** Set to **EASY, MODERATE** or **HARD**. Default is **EASY**. Determines how this Feature is started and played. Sets how hard it is to earn an Extra Ball (EB) from *Couch Multiball.* **EASY** means only a *Couch Super Jackpot* is required. **MODERATE** means all *Jackpots* must be completed before the *Super Jackpot* to light the Extra Ball. **HARD** means all *Jackpots* must be shot perfectly *(singles then doubles then triple)* before the Super Jackpot to light the Extra Ball (EB).
29	**COUCH EB MEMORY:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Extra Ball (EB) lit from Couch Multiball)* will be retained in memory from *ball-to-ball* for the same player. ... **NO**, this feature will go out at the end of each ball.
30	**CBG EB MEMORY:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Extra Ball (EB) lit from Comic Book Guy (CBG) Hurry-Up Feature)* will be retained in memory from *ball-to-ball* for the same player. When set to **NO**, this feature will go out at the end of each ball.
31	**CBG SPECIAL MEMORY:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Special lit from Comic Book Guy (CBG) Hurry-Up Feature)* will be retained in memory from *ball-to-ball* for the same player. When set to **NO**, this feature will go out at the end of each ball.
32	**SDMEWM SPECIAL MEMORY:** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Special lit from Super Duper Mega Extreme Wizard Mode (SDMEWM))* will be retained in memory from *ball-to-ball* for the same player. When set to **NO**, this feature will go out at the end of each ball.
33	**MONORAIL INTERVAL:** Set between **03** to **07**. Default is **05**. Sets the max. number of *Monorail Rides* required to earn awards.
34	**ADULT CONTENT ENABLED:** Set to **YES** or **NO**. Default is **YES**. Set to **NO** to disable "adult content" in both audible (sounds and/or words). Visual (dot display graphics) may be included, if present.
35	**HOLD COUCH LOCKS:** Set to **NEVER**, **1-PLAYER GAMES** or **ALWAYS**. Default is **1-PLAYER GAMES**. *Set to* **NEVER** means the couch will never hold locks between games and will kick balls out at the Game End. **1-PLAYER GAMES** means the couch will hold locks between games and allow players to "steal" locks from previous games, but only in a *1-Player Game (so there isn't an advantage in Multiplayer Games)*. **ALWAYS** means the couch will always hold locks between games ***AND*** players, *and* allow players to "steal" locks even in *Multiplayer Games. (This adjustment is ignored when Competition Mode is on (treated as **NEVER**)).* In ***Tournament Games***, players must always earn Couch Multiball by making 3 locks. In the case that a *Tournament Game Player* is starting a game with 1 or more balls already in the lock, balls will be passed-through as in a *Multiplayer Game* when the couch is full *(or the Installed number of balls is maxed out).*
36	**ALLOW VOLUME EFFECTS:** Set to **YES** or **NO**. Default is **YES**. Set to **NO** to disable this feature. Set to **YES**, the volume will automatically adjust louder and softer, depending on which feature (or certain events) is being played and/or how well the player is performing (or awards received). *Note: If the game volume is set to 0, this adjustment will be treated as if set to NO.*

For further customization of Game Play Difficulty or Game Play Type or how to RESET ONLY the Adjustments, see Section 3, Chapter 5, GO TO INSTALLS MENU.

Custom Message

To go directly to ***Standard Adjustment 31, Custom Message,*** from the **ADJUSTMENT MENU**, select the "CUST MSG" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. At the top left corner of the Display, the letter **A** is indicated *(blinking)* in the first available position *(Thirty-Six (36) characters including spaces are available).* 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**, **"REQUEST INSTALLED"** is indicated and then exits this sub-menu.



For further customization of Game Play Difficulty or Game Play Type or how to RESET ONLY the Adjustments, see Section 3, Chapter 5, GO TO INSTALLS MENU.

Go To Installs Menu

Overview

The **Portals™ Service Menu System** provides **14 Installs** to vary **Game Play Difficulty** or **Game Play Type** and **Install Factory**.

Important: *The **Coin Door** must be **OPEN** allowing the **Memory Protect Switch** to be disabled, so any Install changes can be made.*

For **detailed customization** or to check current **Adjustments Defaults** *(either changed by YOU in the Adjustments Menu or by this* **Installs** *Menu or for Factory Default Settings), see Section **3**, Chapter **4**, **GO TO ADJUSTMENTS MENU**. **Important: Before preceding***, write down any *previously changed Adjustment Defaults.* After completing one or more of the **Installs** in this Chapter, go back to the **ADJUSTMENTS MENU** to see which **Standard and/or Feature Adjustments** have changed *(Feature Adjustments and/or settings are subject to change during production, and may differ than what is described in the tables at the end of this chapter). If the settings are not to your liking, perform **one** of the following:*

1.: Manually change the **Standard & Feature Adjustments** Settings *(perform task in the **ADJUSTMENTS MENU**, see Section **3**, Chapter **4**, **GO TO ADJUSTMENTS MENU**).*

2.: Install Factory *(see Page 49, end of this chapter)* to reset all of the **Standard & Feature Adjustments** back to the *Factory Default Settings*.

Multiple **Installs can be set** to vary game play; however, for **Installs** that have *one or more* Adjustments in common, the ***last*** "Install" selected & *activated*, will **supersede** any previously changed Adjustment(s) from any prior **Installs**. Any adjustments which you changed and are not affected by the Install will remain as set.

For example, if you want a **5-BALL Game** *set to* **EXTRA EASY**: Select and *activate* the "5BAL" *Icon* first (which will typically change any ***Feature*** Difficulty Adjustments to **HARD**), then select & *activate* the "X.EZ" *Icon* to **change back** the Difficulty Adjustments to **EXTRA EASY**. However, if the "X.EZ" *Icon* was selected & *activated* first, then the "5BAL" *Icon* was selected & *activated*, the game will be set to a **5-BALL Game** *set to* **HARD**.

EXPLANATION & USAGE OF COMMON LARGE ICONS USED IN THIS MENU:

These ***non-selectable Icons*** appear in the *selected Menu* only when there are **MORE** Icons to the **LEFT** or to the **RIGHT** available for selection.

Select and activate to return to the **PREVIOUS** Menu.

Select and activate to **QUIT**, *exits & returns to the* ***Attract Mode***.

Select and activate to view **HELP** *Screens of the current Menu*.*

⚠ WARNING: ⚠
Selection & activation of the "Install Factory" Icon, will change all Adjustments & Installs to the Factory Default!

**** Help Note: An explanation of each Icon at that menu level will cycle continuously. To exit a display where no Icons are available for selection, pressing any button will exit the display.***

GO TO INSTALLS MENU

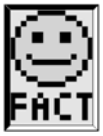
After entering **Portals™**, the **MAIN MENU** now appears. Select the "INST" *Icon* in the **MAIN MENU** with either the **Red "LEFT"** or **Green "RIGHT" Buttons** (the **Flipper Buttons** operates in the same manner) and press the **Black "ENTER" Button** (the **Start Button** operates in the same manner). The **INSTALLS MENU** appears. Continue through this chapter for the explanation & usage of the *Icons* in the **INSTALLS MENU**.

Install Extra Easy

To initiate, from the **INSTALLS MENU**, select the "X.EZ" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Difficulty** is set to **EXTRA EASY. "REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "X.EZ" *Icon* flashing. *Only the Feature Adjustments which changed, are listed in the Overview of Feature Adjustment Changes (Pg. 50).*

Install Easy

To initiate, from the **INSTALLS MENU**, select the "EASY" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Difficulty** is set to **EASY**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "EASY" *Icon* flashing. *Only the Feature Adjustments which changed, are listed in the Overview of Feature Adjustment Changes (Page 50).*



Install Normal (Factory Default Settings)

To initiate, from the **INSTALLS MENU**, select the "FACT" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Difficulty** is set to **MODERATE**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "FACT" *Icon* flashing. *Only the Feature Adjustments which changed, are listed in the Overview of Feature Adjustment Changes (Page 50).*

Install Hard

To initiate, from the **INSTALLS MENU**, select the "HARD" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Difficulty** is set to **HARD**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "HARD" *Icon* flashing. *Only the Feature Adjustments which changed, are listed in the Overview of Feature Adjustment Changes (Page 50).*

Install Extra Hard

To initiate, from the **INSTALLS MENU**, select the "X.HD" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Difficulty** is set to **EXTRA HARD**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "X.HD" *Icon* flashing. *Only the Feature Adjustments which changed, are listed in the Overview of Feature Adjustment Changes (Page 50).*

Install 3-Ball

To initiate, from the **INSTALLS MENU**, select the "3BAL" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **3-BALL PLAY**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "3BAL" *Icon* flashing. *Only the Standard & Feature Adjustments which changed, are listed in the Overview of Standard & Feature Adjustment Changes (Pages 49 & 50).*

Install 5-Ball

To initiate, from the **INSTALLS MENU**, select the "5BAL" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **5-BALL PLAY**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "5BAL" *Icon* flashing. *Only the Standard & Feature Adjustments which changed, are listed in the Overview of Standard & Feature Adjustment Changes (Pages 49 & 50).*

$ .50 Competition (a.k.a. IFPA)

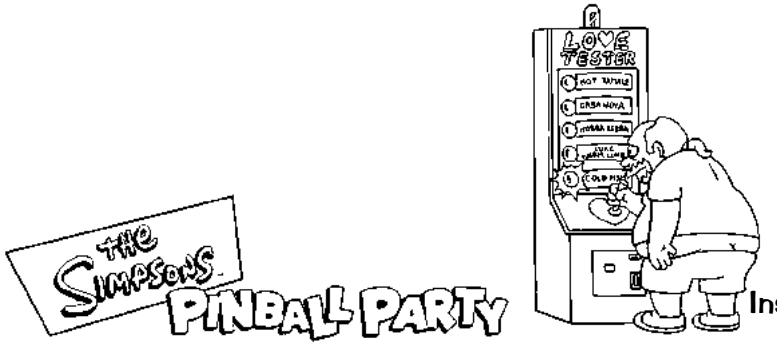
To initiate, from the **INSTALLS MENU**, select the "PAY" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **TOURNAMENT PAY MODE**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "PAY" *Icon* flashing. *Only the Standard Adjustments which changed, are listed in the Standard Adjustment Changes (Page 49).*

Free Play Competition (a.k.a. EXPO or PAPA)

To initiate, from the **INSTALLS MENU**, select the "FREE" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **TOURNAMENT FREE MODE**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "FREE" *Icon* flashing. *Only the Standard Adjustments which changed, are listed in the Overview of Standard Adjustment Changes (Page 49).*

Install Home Play

To initiate, from the **INSTALLS MENU**, select the "HOME" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **NORMAL HOME PLAY**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "HOME" *Icon* flashing. *Only the Standard Adjustments which changed, are listed in the Overview of Standard Adjustment Changes (Page 49).*



Film Star Reset

To initiate, from the **INSTALLS MENU**, select the "STAR" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **EASY HOME PLAY**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "STAR" *Icon* flashing. *Only the Standard & Feature Adjustments which changed, are listed in the Overview of Standard Adjustment Changes (below) and in the Overview of Feature Changes (next page).*

Install Novelty

This setting is recommended where ***local laws restrict certain game features***.

To initiate, from the **INSTALLS MENU**, select the "NOV" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **RESTRICTED PLAY**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "NOV" *Icon* flashing. *Only the Standard Adjustments which changed, are listed in the Overview of Standard Adjustment Changes (below).*

Install Add-A-Ball

This setting is recommended where ***local laws restrict certain game features***.

To initiate, from the **INSTALLS MENU**, select the "A.A.B" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. **Game Play Type** is set to **RESTRICTED PLAY**. **"REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "A.A.B" *Icon* flashing. *Only the Standard Adjustments which changed, are listed in the Overview of Standard Adjustment Changes (below).*

Install Factory (ONLY affects all Adjustments/Installs)

To initiate, from the **INSTALLS MENU**, select the "FACT" *Icon* with either the **Red "LT"** or **Green "RT" Buttons** and press the **Black "ENT" Button**. ⚠ All **Installs** will be reset to the *Factory Default Settings*. **"REQUEST INSTALLED"** is indicated and the **Service Menu** is exited, returning to the ***Attract Mode***. All Standard & Feature Adjustments which were changed in the **INSTALLS** or **ADJUSTMENTS MENU** are returned to the ***Factory Defaults*** *(see the Adjustment Tables in Sec.* ***3****, Chp.* ***4****,* ***GO TO ADJUSTMENTS MENU****).*

Overview of Standard Adjustment Changes with selection of these Installs:

Nr.	STANDARD ADJUSTMENT NAME	INSTALL 3-BALL	INSTALL 5-BALL	$ .50 COMPE-TITION *	FREE PLAY COMP. *	INSTALL HOME PLAY	FILM STAR RESET	INSTALL NOVELTY	INSTALL ADD-A-BALL
01	REPLAY TYPE							NONE	
03	REPLAY AWARD								EX. BALL
08	FREE GAME LIMIT							NO FREE...	NO FREE...
09	EXTRA BALL LIMIT					UNLIMITED	UNLIMITED	NO EXTRA...	UNLIMITED
10	EXTRA BALL PERCENTAGE					30%			
11	GAME PRICING			USA 5					
13	MATCH PERCENTAGE					10%		OFF	OFF
14	BALLS PER GAME	03	05						
15	TILT WARNINGS			02	02				
18	GRAND CHAMPION AWARDS							00	00
19	HIGH SCORE #1 AWARDS							00	00
20	HIGH SCORE #2 AWARDS							00	00
21	HIGH SCORE #3 AWARDS							00	00
22	HIGH SCORE #4 AWARDS							00	00
30	FREE PLAY			NO	YES	YES	YES		
35	GAME RESTART			NO	NO				
42	COINDOOR BALL SAVER**			YES	YES	YES	YES		
43	COMPETITION MODE***			YES	YES				

* If Competition Mode was set, it is suggested to "Install Factory" to restore all Adjustments *(Factory Default);* then to recustomize, if desired.
** *Note 1: Adjustment 42 Default* ***will not change****; Installing $ .50 Competition will override this Adjustment regardless of the setting.*
*** *Note 2: If Adjustment 43 is changed back to* ***NO*** *after this Install, the Competition Mode Install will be canceled (turned off).*

Overview of Feature Adjustment Changes ... on the next page.

Overview of Feature Adjustment Changes with selection of these Installs:

Nr.	FEATURE ADJUSTMENT NAME *	INSTALL EXTRA EASY	INSTALL EASY	INSTALL NORMAL (FACTORY)	INSTALL HARD	INSTALL EXTRA HARD	INSTALL 3-BALL **	INSTALL 5-BALL **	FILM STAR RESET **
01	3 BANK DIFFICULTY	EASY	MODERATE	HARD	HARD	HARD	HARD	HARD	EASY
02	DAREDEVIL DIFFICULTY	EX. EASY	EASY	MODERATE	HARD	EX. HARD	MODERATE	HARD	EX. EASY
03	# OF RAMPS FOR 1ST EB	06	08	10	12	14	10	12	06
04	# OF RAMPS NEXT EBS	30	40	50	60	70	50	60	30
05	MAX EBS FROM RAMP	10	06	04	03	02	04	03	10
06	RAMP EB MEMORY	YES	YES	YES	YES	NO	YES	YES	YES
07	1ST RAMP TREEHOUSE	03	04	05	06	07	05	06	03
08	NEXT TREEHOUSE	06	08	10	12	14	10	12	06
09	1ST COUCH LOCKS UNLIT	03	02	02	01	01	02	01	03
10	COUCH MB DIFFICULTY	EX. EASY	EX EASY	EX EASY	EX EASY	EASY	EX EASY	EX EASY	EX. EASY
11	TV LIGHTING DIFFICULTY	EX. EASY	EASY	EASY	MODERATE	MODERATE	EASY	MODERATE	EX. EASY
12	MYSTERY LIGHTING DIFF.	EASY	MODERATE	MODERATE	MODERATE	HARD	MODERATE	MODERATE	EASY
13	MYSTERY EB MEMORY	YES	YES	NO	NO	NO	NO	NO	YES
14	MYSTERY SPECIAL MEMORY	YES	NO	NO	NO	NO	NO	NO	YES
15	MAIN TIMER DIFFICULTY	EX. EASY	EASY	MODERATE	HARD	EX. HARD	MODERATE	HARD	EX. EASY
16	1ST I&S WITH DROPS	04	03	02	01	01	02	01	04
17	1ST I&S DROPS RESET	06	04	03	02	01	03	02	06
18	1ST I&S SHOT TWICE	02	02	01	01	01	01	01	02
20	GARAGE DOOR DIFF	EX. EASY	EX. EASY	EASY	MODERATE	HARD	EASY	MODERATE	EX. EASY
21	OTTO LIGHTING DIFF	EX. EASY	EASY	EASY	MODERATE	MODERATE	EASY	MODERATE	EX. EASY
23	CBG HURRY UP DIFFICULTY	EX. EASY	EASY	MODERATE	HARD	EX. HARD	MODERATE	HARD	EX. EASY
24	# OF NVS FOR 1ST EB	05	08	10	12	15	10	12	05
25	# OF NVS NEXT EBS	25	40	50	60	75	50	60	25
26	MAX EBS FROM NUCLEAR	10	06	04	03	02	04	03	10
27	NUCLEAR EB MEMORY	YES	YES	YES	YES	NO	YES	YES	YES
28	COUCH EB DIFFICULTY	EASY	EASY	EASY	MODERATE	MODERATE	EASY	MODERATE	EASY
29	COUCH EB MEMORY	YES	YES	NO	NO	NO	NO	NO	YES
30	CBG EB MEMORY	YES	YES	NO	NO	NO	NO	NO	YES
31	CBG SPECIAL MEMORY	YES	NO	NO	NO	NO	NO	NO	YES
32	SDMEWM SPECIAL MEMORY	YES	NO	NO	NO	NO	NO	NO	YES
33	MONORAIL INTERVAL	03	04	05	06	07	05	06	03
35	HOLD COUCH LOCKS	1-PLAYER...	1-PLAYER...	1-PLAYER...	NEVER	NEVER	1-PLAYER...	NEVER	1-PLAYER...

** Feature Adjustments and/or settings are subject to change.* ***Feature Adjustments which are not affected by any Installs are: 19 & 22.***
*** Install 3-Ball, Install 5-Ball & Film Star Reset have Standard Adjustment(s) which change (see table on previous page).*

For how to RESET Audits (also can RESET High Scores, Credits or Reset All Adjustments), see Section 3, Chapter 6, GO TO RESET MENU.

(Select any Reset...) (Reset all Audits, Adjustments & Installs)

Go To Reset Menu

Overview

The **Portals™ Service Menu System** provides five (5) functions to reset **Coin & Game Audits**, **High Scores**, **Credits** *or to reset* **ALL AUDITS, ADJUSTMENTS & INSTALLS** back to the ***Factory Default Settings***.

Important: *The **Coin Door** must be **OPEN** allowing the **Memory Protect Switch** to be disabled, so any Reset changes can be made.*

EXPLANATION & USAGE OF COMMON LARGE ICONS USED IN THIS MENU:

These ***non-selectable Icons*** appear in the *selected Menu* only when there are **MORE** Icons to the **LEFT** or to the **RIGHT** available for selection.

Select and activate to return to the **PREVIOUS** Menu.

Select and activate to **QUIT**, *exits & returns to the* ***Attract Mode***.

Select and activate to view **HELP** *Screens of the current Menu*.*

⚠ WARNING: ⚠
As soon as any Reset Icon is selected & activated, the information associated with the Reset Icon, is lost!

**** Help Note: An explanation of each Icon at that menu level will cycle continuously. To exit a display where no Icons are available for selection, pressing any button will exit the display.***

GO TO RESET MENU

After entering **Portals™**, the **MAIN MENU** now appears. Select the "RESET" *Icon* in the **MAIN MENU** with either the **Red "LEFT"** or **Green "RIGHT" Buttons** (the **Flipper Buttons** operates in the same manner) and press the **Black "ENTER" Button** (the **Start Button** operates in the same manner). The **RESET MENU** appears. Continue below for the explanation & usage of the *Icons* in the **RESET MENU**.

Reset Coin Audits

To initiate, from the **RESET MENU**, select the "COIN" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. ⚠ **ONLY** the **Coin Audits (05-13)** will be reset to zero (0), *Factory Default Settings.* **"REQUEST INSTALLED"** is indicated and returns to the **RESET MENU** with the "COIN" *Icon* flashing.

Reset Game Audits

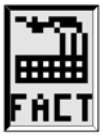
To initiate, from the **RESET MENU**, select the "AUD" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. ⚠ **ONLY** the **Game Audits *(01-04)*** & ***Standard Audits (01-67)*** will be reset to zero (0), *Factory Default Settings.* ***Note: Coin Audits (05-13)*** & ***Software Meter Audit (14)*** *will not be reset.* **"REQUEST INSTALLED"** is indicated and returns to the **RESET MENU** with the "AUD" *Icon* flashing.

Reset High Scores

To initiate, from the **RESET MENU**, select the "HSTD" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. ⚠ **ONLY** the **High Scores** will be reset to the current values. ***Note:*** *If these five (5) adjustments were not personally changed by you, the Factory Default Settings will be used (see Section **3**, Chapter **4**, **GO TO ADJUSTMENTS MENU**, **Standard Adjustments** 18-22).* **"REQUEST INSTALLED"** is indicated and returns to the **RESET MENU** with the "HSTD" *Icon* flashing.

Reset Credits

To initiate, from the **RESET MENU**, select the "CRED" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. ⚠ All **Credits** will be reset to zero (0), *Factory Default Settings.* **"REQUEST INSTALLED"** is indicated and returns to the **RESET MENU** with the "CRED" *Icon* flashing.

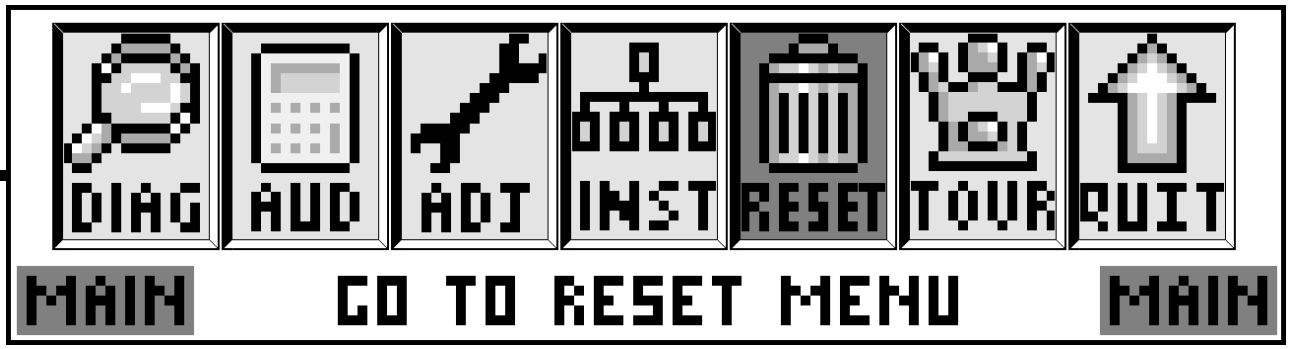


Factory Reset

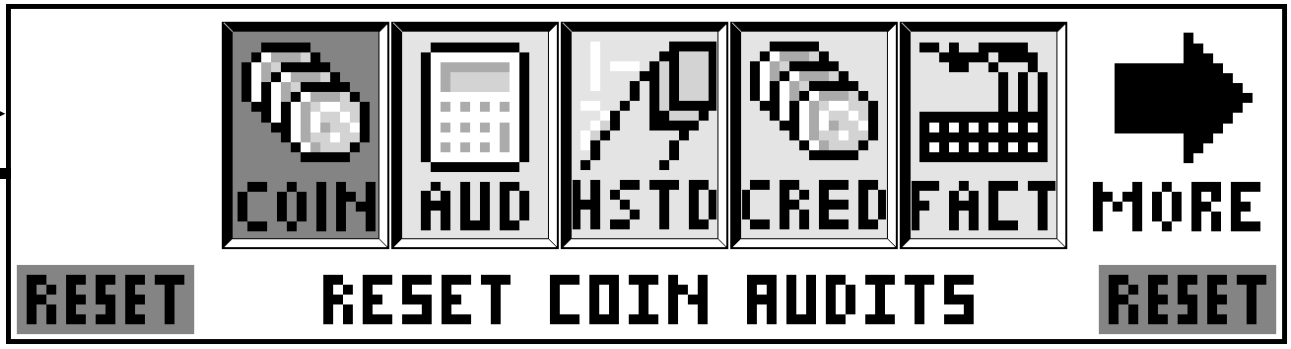
To initiate, from the **RESET MENU**, select the "FACT" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button**. ⚠ All **Audits** *(except for Audit **14**, **Software Meter**)*, all **Adjustments** and **Installs** will be reset to the *Factory Default Settings.* ***Note:*** *To **RESET ONLY** the ADJUSTMENTS & INSTALLS (leaving all the Audits alone), see Section **3**, Chapter **5**, **GO TO INSTALLS MENU**, **Install Factory**.* **"REQUEST INSTALLED"** is indicated and the **Service Menu** is exited, returning to the ***Attract Mode***.

Example:

After entering **Portals**™, the **MAIN MENU** now appears. Use the **Red "LEFT"** or **Green "RIGHT" Buttons** to select the "RESET" *Icon* (**GO TO RESET MENU**).



Press the **Black "ENTER" Button** to *activate* this **ICON**. The **RESET MENU** now appears with the "COIN" *Icon* (**RESET COIN AUDITS**) flashing:

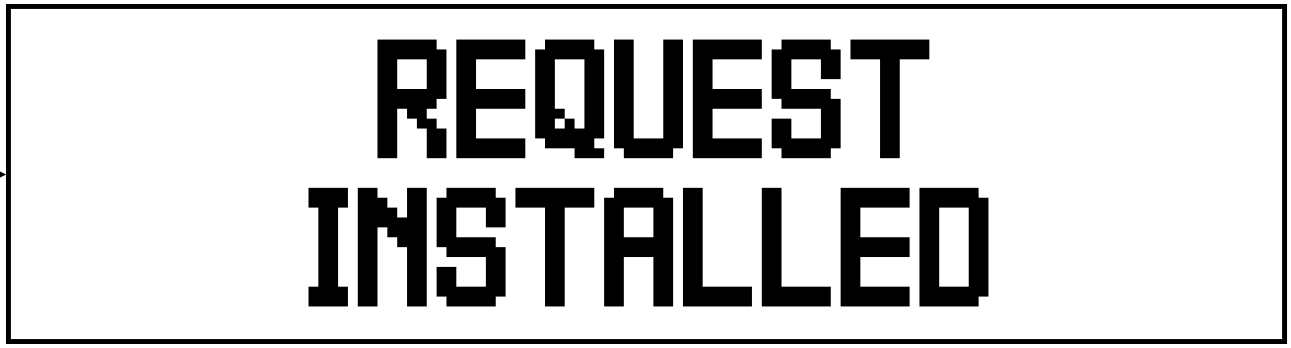


From the **RESET MENU**, select any of the *Icons* ("COIN", "AUD", "HSTD", "CRED") with either the **Red** or **Green Buttons** and press the **Black Button** to *activate* the **ICON** chosen. After the **ICON** is selected & *activated*, **"REQUEST INSTALLED"** is indicated and is returned to the **RESET MENU** with the previously selected *Icon* flashing.

Important:

AT THIS TIME, ***DO NOT*** PRESS THE **START BUTTON** OR **BLACK BUTTON** AFTER SELECTING ANY OF THE FIVE (5) ICONS UNLESS THIS IS WHAT IS DESIRED. ***THE INFORMATION ASSOCIATED WITH THE RESET ICON WILL BE LOST!*** *PLEASE READ THE PREVIOUS PAGE* FOR EXACTLY WHAT WILL HAPPEN IF ANY OF THESE FIVE (5) ICONS ARE *SELECTED & ACTIVATED.*

*Before performing any **RESET**, write down your **last Audit Totals** (see Section **3**, Chapter **3**, **GO TO AUDITS MENU**) and any **personalized Adjustment changes** you may have made (see Section **3**, Chapter **4**, **GO TO ADJUSTMENTS MENU**).*



If the "FACT" *Icon* is select and *activated*, "**REQUEST INSTALLED"** is indicated and the **Service Menu** is exited, returning to the ***Attract Mode***. *See the previous page for explanation & usage of the Icons in the **RESET MENU**.*

Go To Tournament Menu

Overview

The **Portals™ Service Menu System** provides **6** Steps necessary to **SET-UP**, **START**, **MONITOR** and **END** Pinball Tournaments on your *Tournament Pinball System Ready Pinball Game.* ***OPTIONAL EQUIPMENT & HARDWARE (SOLD SEPARATELY) ARE REQUIRED FOR PROPER OPERATION AND USE OF THIS MENU.***

Game code may get upgraded during production; compare all Tournament Adjustments & Audits in the display with the manual and make any corrections to the Tournament Adjustments and/or Audits Tables *(next page),* as necessary. Tournament Adjustments & Audits are subject to change *(with or without notice)*. To view Tournament Adjustments & Audits in the display, enter the **Portals™ Service Menu System**. When any change is made and then the next / previous item is selected *(or the Sub-Menu is exited)*, the display will momentarily flash **REQUEST INSTALLED**. *For details on* ***Earnings, Standard & Feature Audits****, see Section* ***3****, Chapter* ***3****,* ***GO TO AUDITS MENU****. For details on* ***Standard & Feature Adjustments****, see Section* ***3****, Chapter* ***4****,* ***GO TO ADJUSTMENTS MENU****.*

Tournament Operation Note:

The use of the *Tournament Equipment* and/or running a Tournament is **OPTIONAL** and to be used solely in the discretion of the owner.

It is the sole responsibility of the operator to ensure that this product is used in conformity with all applicable laws. Stern Pinball, Inc.® disclaims any such responsibility.

Due to continuing product innovation, information in this chapter is subject to change without notice.

For more details on the equipment & hardware required, Installation and Set-up, read the **ToPS™ Tournament Pinball System Kit Installation Manual** *(SPI Part Number: 780-6011-00)* provided in the ***Optional Tournament Kit*** *(SPI Part Number: 502-5011-00),* not included with this *ToPS™ Ready Pinball Game.*

The equipment & hardware consists of: BETAbrite **Electronic 7 X 80 Multi-Color Dot Display** (*secured above the Backbox*), **Tournament Serial Interface (TSI) Board** *(secured in the Backbox)*, **Tournament Button + Lamp** (*secured onto the Front Molding)* and all necessary wiring, hardware and documentation *(which also provides suggestions and Tips for ToPS™).*

To order, contact your local Distributor *(view Pages* ***DR.*** ❽ *&* ❾ *in the* ***Find-It-In-Front: Dr. Pinball****).* You can also call Technical Support or visit our website *(details on the back cover of this manual).*

Important: *The* ***Coin Door*** *must be* ***OPEN*** *allowing the* ***Memory Protect Switch*** *to be disabled, so any Tournament changes can be made.*

EXPLANATION & USAGE OF COMMON LARGE & MINI-ICONS USED IN VARIOUS MENUS & SUB-MENUS:

These ***non-selectable Icons*** appear in the *selected Menu* only when there are **MORE** Icons to the **LEFT** or to the **RIGHT** available for selection.

Select and activate to return to the **PREVIOUS** Menu.

Select and activate to **QUIT**, *exits & returns to the* ***Attract Mode****.*

Select and activate to view **HELP** *Screens of the current Menu*.*

Select and activate to:

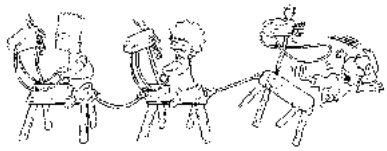
Move **LEFT** or **RIGHT,** *select previous / next or move backwards / forwards.*

DECREMENT (-) or **INCREMENT (+)** *displayed value or select previous / next.*

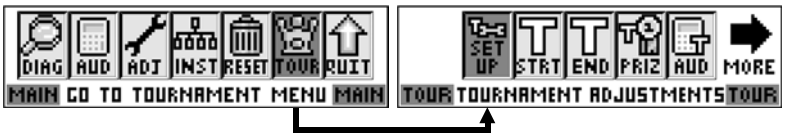
**** Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.***

GO TO TOURNAMENT MENU (OPTIONAL USE ONLY)

After entering **Portals™**, the **MAIN MENU** now appears. Select the "TOUR" *Icon* in the **MAIN MENU** with either the **Red "LEFT"** or **Green "RIGHT" Buttons** (the **Flipper Buttons** operates in the same manner) and press the **Black "ENTER" Button** (the **Start Button** operates in the same manner). The **TOURNAMENT MENU** appears. Continue through this chapter for the explanation & usage of the *Icons* in the **TOURNAMENT MENU**.



Tournament Adjustment & Audit Tables on the next page.



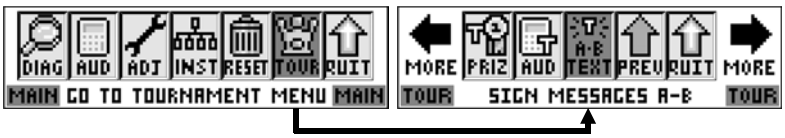
TOURNAMENT ADJUSTMENT TABLES

TOURNAMENT ADJUSTMENTS 01-10 ✍ = ✎

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
01	CREDITS PER PLAY	02	
02	JACKPOT BASE	$20.00	
03	JACKPOT INCREMENT	$00.50	
04	JACKPOT MAX.	$2,500.00	
05	CURRENT DATE/TIME	JANUARY...	

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
06	START DATE	JANUARY 1	
07	END DATE	FEBRUARY 1	
08	# OF PRIZES	03	
09	AWARD TYPE	CASH	
10	SHOW PLAYER'S CASH	YES	

Note: *The above adjustments must be set just before selecting and activating the "STRT" Icon (**START TOURNAMENT**). See the following pages for explanation and more details.*



SIGN MESSAGES A-B (ADJUSTMENTS 11-12) ✍ = ✎

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
11	LOCATION MESSAGE	ON	

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
12	PRIZE MESSAGE	ON	

Sec. 3: Tournament ...

STARTING METER Reading :

STARTING METER Date (MM/DD/YR) : 0

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) : 0

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

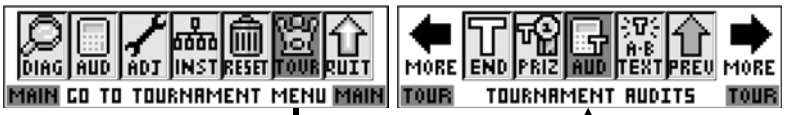
Copy this page for Field Audit Tracking Performance

See Adj. 06 & 07 above >>

TOURNAMENT START DATE : 0

TOURNAMENT END DATE : 0

TOURNAMENT AUDIT TABLE



TOURNAMENT AUDITS 01-12 ✍ = ✎

Audit definitions follow in this Chapter.

01	TOTAL PLAYS
02	TOURNAMENT PLAYS
03	TOTAL GAME EARNINGS
04	TOTAL TOUR. EARNINGS
05	JACKPOT

06	NET EARNINGS
07	ACCUM. TOTAL PLAYS
08	ACCUM. TOUR. PLAYS
09	ACCUM. EARNINGS
10	ACCUM. TOUR EARNINGS

11	ACCUM. JACKPOT
12	# TOURNAMENTS

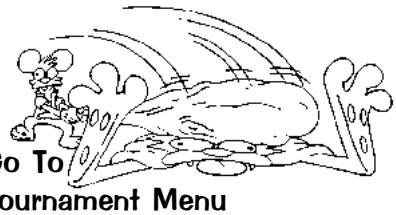
Tournament Adjustments (01-10)

To initiate, from the **TOURNAMENT MENU**, select the "SET UP" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icon*s to view the next or previous Tournament Adjustment in this group. Select and *activate* either of the "-" or "+" *Mini-Icons* to change the setting, if desired *(the Default Setting is noted in the definitions below)*. The display will describe the **Tournament Adjustment Number**, **Tournament Adjustment Name** and the **Current Tournament Adjustment Setting**. The current Tournament Adjustment will remain in the display until the next Tournament Adjustment is viewed or when this Menu is exited.

IMPORTANT FOR TOURNAMENT USERS: *Select the settings carefully.* For **Tips for ToPS™** *(different Tournament Sample Set-Ups, etc.),* view the **ToPS™ Tournament Pinball System Kit Installation Manual** *(SPI Part Number: 780-6011-00)* provided in the ***Optional Tournament Kit*** *(SPI Part Number: 502-5011-00).* Before allowing players to begin after you've started a Tournament, double-check the **Normal Mono-Color Dot Display** and **Top Multi-Color Dot (Beta Brite®) Display** to ensure everything you want is displayed correctly. Once a Tournament is started, no adjustments can be made until you end the Tournament *(by selecting the "END" Icon).* Allowing players to qualify, then ending a Tournament prematurely to make corrections will affect the outcome of the Tournament. *View the **ToPS™** Manual for more details.*

WARNING: Changes made in any Adjustments will be lost after a FACTORY RESET or removal of the CPU/Sound Board Batteries.

Nr.	TOURNAMENT ADJUSTMENT NAME: Definition
01	**CREDITS PER PLAY:** Set between **01 - 10**. Default is **02**. Set the maximum number of *Credits* that may be accumulated per game.
02	**JACKPOT BASE:** Set between **$00.00 - $999,999.00** *(increments of $1).* Default is **$20.00**. Set the initial *Prize Pool Amount* to be offered for the Tournament. ***Note:*** *The displays will present the words "**PRIZE POOL**" in lieu of the word "JACKPOT".*
03	**JACKPOT INCREMENT:** Set between **$00.00 - $999,999.99** *(increments of 1¢).* Default is **$00.50**. Set the *Prize Pool Increment* which will increase the *Prize Pool Amount* with each Tournament Game played.
04	**JACKPOT MAX.:** Set between **$00.00 - $999,999.00** *(increments of $1).* Default is **$2,500.00**. Set the maximum cap to be placed on the *Prize Pool* during a Tournament. ***Note:*** *The displays will present the words "**PRIZE POOL**" in lieu of "JACKPOT".*
05	**CURRENT DATE/TIME:** Set the current date and time. After setting the Start and End Dates in Tournament Adjustments 6 & 7, the Tournament will then start automatically*. **Requires the TIMEKEEPER™ IC (included in the kit) installed in Location U212 on the CPU/Sound Board.*
06	**START DATE:** Set between **JANUARY** through **DECEMBER**. Default is **JANUARY**. After the month desired is set, a **valid day** must be set. To **Start a Tournament**, go back to the **TOURNAMENT MENU** and select the "STRT" *Icon (see the next page).*
07	**END DATE:** Set between **JANUARY** through **DECEMBER**. Default is **FEBRUARY**. After the month desired is set, a **valid day** must be set. To **End a Tournament**, go back to the **TOURNAMENT MENU** and select the "END" *Icon (see the next page).*
08	**# OF PRIZES:** Set between **01 - 05**. Default is **03**. Set the maximum number of *Prize Positions* to be awarded during a Tournament. Selections *(cannot be changed)* are as follows: Set to **01**, the Tournament Winner is awarded **100%** of the Prize Pool. Set to **02**, the 1st & 2nd place winners are awarded **70%** / **30%**, respectively. Set to **03**, the 1st, 2nd & 3rd place winners are awarded **50%** / **30%** / **20%**, respectively. Set to **04**, the 1st, 2nd, 3rd & 4th place winners are awarded **50%** / **25%** / **15%** / **10%**, respectively. Set to **05**, the 1st, 2nd, 3rd, 4th & 5th place winners are awarded **50%** / **20%** / **15%** / **10%** / **5%**, respectively.
09	**AWARD TYPE:** Set to **CASH**, **POINTS**, **TICKET**, **NONE** or **PRIZE**. Default is **CASH**. ***This adjustment determines how the Prize Pool is to be represented in the Attract Mode on both the Normal and top Beta-Brite® Displays.*** Select **CASH** for the displays to represent the Prize Pool amount *(based on Jackpot Base and Max.)* in ***$Dollars***. Select **POINTS** for the displays to represent the Prize Pool amount in ***Points***. Select **TICKET** for the display to represent the Prize Pool amount in ***Tickets***. Select **NONE** ***NOT TO*** represent the Prize Pool amount *(if prize(s) to be awarded are not Cash, Points or Tickets).* Select **PRIZE**, if applicable.
10	**SHOW PLAYER'S CASH:** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, both the **Beta-Brite® Multi-Color Dot Display** and the **Normal Mono-Color Display** exhibit the Cash amount in the ***Attract Mode***.



Start Tournament (select only after Set-Up is completed)

To initiate, from the **TOURNAMENT MENU**, select the "STRT" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. The **"START TOURNAMENT?" MENU** appears with the "NO" *Mini-Icon* flashing.

START TOURNAMENT?

NO YES QUIT ?

If ***Set-Up (Tournament Adjustments)*** *was not completed* ***OR*** the ***Tournament Audits were not recorded from the prior Tournament***, exit this Menu by activating the "NO" *Mini-Icon*. If ***Set-Up*** *was completed and the* ***Tournament Audits*** *were recorded,* select and activate the "YES" *Mini-Icon.* The Pinball Game is set to **Tournament Ready Mode** *(the* ***Flashing Tournament Button*** *must be depressed for a Tournament Game after the proper credit is inserted).* **"REQUEST INSTALLED"** is indicated and returns to the **TOURNAMENT MENU** with the "STRT" *Icon* flashing. ***Note:*** *If the "STRT" Icon appears to be non-functioning, it is because a Tournament is in progress. The Tournament must first be stopped (select and activate the "END" Icon in the* ***TOURNAMENT MENU****).*

Stop Tournament (select only after a Tournament is started)

To initiate, from the **TOURNAMENT MENU**, select the "END" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. The **"END TOURNAMENT?" MENU** appears with the "NO" *Mini-Icon* flashing. If the ***Tournament*** *was not completed*, exit this Menu by activating the "NO" *Mini-Icon*. If the ***Tournament*** *was completed (the End Date set has passed)*, select and activate the "YES" *Mini-Icon. The Pinball Game is taken out of* **Tournament Ready Mode** *(to readjust any Tournament Adjustments, the Tournament must be "stopped").* **"REQUEST INSTALLED"** is indicated and returns to the **TOURNAMENT MENU** with the "END" *Icon* flashing. ***Record your Tournament Audits at this time as they will be reset (except for the "Accumulative Audits) if another Tournament is started!***

END TOURNAMENT?

NO YES QUIT ?

Tournament Prizes

To initiate, from the **TOURNAMENT MENU**, select the "PRIZ" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Leader in this group. The display will describe the **Leader Placement (1st, 2nd, 3rd, 4th & 5th)**, **Leader Name**, **4-Digit Pin-Code**, and **Prize Pool** portion for the *Current and Previous Tournaments.* The current Leader *(and related information)* will remain in the display until the next Leader is chosen or when the Sub-Menu is exited.

Tournament Audits (01-12)

To initiate, from the **TOURNAMENT MENU**, select the "AUD" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Tournament Audit in this group. The display will describe the **Tournament Audit Number**, **Tournament Audit Name** and the **Current Tournament Audit Total** (Value). The current Tournament Audit will remain in the display until the next Tournament Audit is viewed or when this Menu is exited.

IMPORTANT FOR TOURNAMENT USERS: ***>>>> A L L*** *of the Tournament Audits* ***01-12 are RESET O N L Y if a Factory Reset is done*** *(see Section* ***3****, Chapter* ***6****,* ***GO TO RESET MENU****).* ***>>>> Tournament Audits 01-06 are RESET ONLY if a new Tournament is started****.* ***>>>> Tournament Audits 07-12*** *are* ***NOT RESET****, they're accumulative (totals accumulate since the first Tournament was played).* **if no Factory Reset is done.*

Nr.	TOURNAMENT AUDIT NAME: Definition
01	**TOTAL PLAYS:** Provides the total number of *Regular* and *Tournament Games* played while a *Tournament is active (in progress).* This total is derived by adding Tournament Audit **02**, **TOURNAMENT PLAYS,** with ***Regular Plays.***
02	**TOURNAMENT PLAYS:** Provides the total number of *Tournament Games* played while a *Tournament is active (in progress).*
03	**TOTAL GAME EARNINGS:** Provides the total Gross Earnings *accepted,* while a *Tournament is active (in progress).*
04	**TOTAL TOUR. EARNINGS:** Provides the total Tournament Earnings *(Audit* ***03*** *less Regular Game Earnings)* while a *Tournament is active (in progress).*
05	**JACKPOT (PRIZE POOL TOTAL):** Provides the total Prize Pool *(Jackpot)* Amount to be paid out while a *Tournament is active (in progress).*
06	**NET EARNINGS:** Provides the total Net Earnings *(Gross Earnings less Prize Pool)* while a *Tournament is active (in progress).*

Tournament Audits 07-12 continued on the next page.

Go To
Tournament Menu

	TOURNAMENT AUDIT NAME: Definition
07	**ACCUM. TOTAL PLAYS:** Provides the accumulative total amount of *Regular & Tournament Games* played since the first Tournament was played.
08	**ACCUM. TOUR. PLAYS:** Provides the accumulative total amount of *Tournament Games* played since the first Tournament was played.
09	**ACCUM. EARNINGS:** Provides the total Gross Earnings *accepted,* since the first Tournament was played.
10	**ACCUM. TOUR EARNINGS:** Provides the accumulative total Tournament Game Earnings since the first Tournament was played.
11	**ACCUM. JACKPOT:** Provides the accumulative total of Prize Pool *(Jackpot)* Amounts paid out since the first Tournament was played.
12	**# TOURNAMENTS:** Provides the number of Tournaments *(not individual Tournament Games)* since the first Tournament was played.

The following Tournament Audits WILL NOT BE RESET if a new Tournament is started. ALL AUDITS can be reset if a Factory Reset is done!

Sign Messages A-B (Tournie Adj. 11-12)

To initiate, from the **TOURNAMENT MENU**, select the "A-B TEXT" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. Select and *activate* either of the ">>" *Mini-Icon*s to view the next or previous Tournament Adjustment in this group. Select and *activate* either of the "-" or "+" *Mini-Icons* to change the setting, if desired *(the Default Setting is noted in the definitions below)*. The display will describe the **Tournament Adjustment Number**, **Tournament Adjustment Name** and the **Current Tournament Adjustment Setting**. The current Tournament Adjustment will remain in the display until the next Tournament Adjustment is viewed or when this Menu is exited.

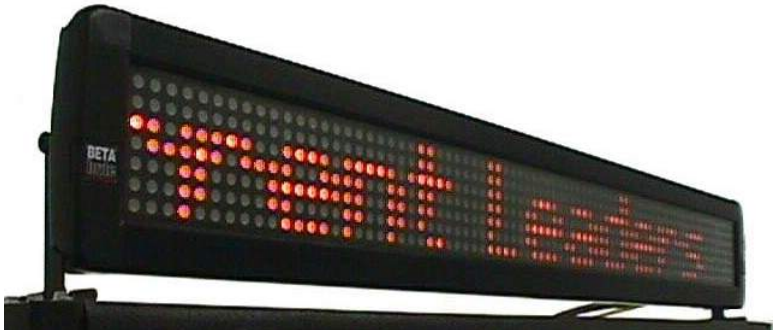
Nr.	TOURNAMENT ADJUSTMENT NAME: Definition
11	**LOCATION MESSAGE:** Set to **ON, CHANGE** or **OFF**. Default is **ON**. When set to **CHANGE**, a new message can be set or the old one can be edited *(select the "+" Mini-Icon to change settings until "CHANGE" appears in the display, then select the ">>" Mini-Icon to access.)*. At the top left corner of the Display, the letter **A** is indicated *(blinking)* in the first available position. 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**, **"REQUEST INSTALLED"** is indicated and then exits this sub-menu.
12	**PRIZE MESSAGE:** Set to **ON, CHANGE** or **OFF**. Default is **ON**. *Procedure identical to Tournament Adjustment* ***11, Location Message****.*

The ***DEFAULT LOCATION MESSAGE*** is:

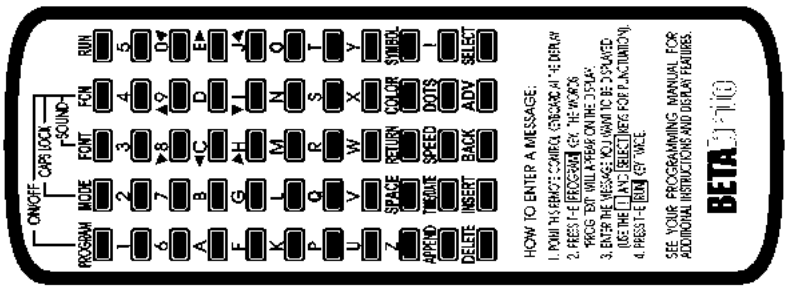
STERN PINBALL PROUDLY PRESENTS...

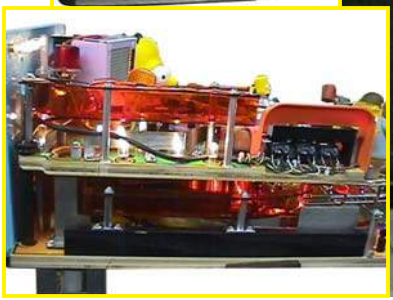
The ***DEFAULT PRIZE MESSAGE*** is:

YOU CAN BE THE NEXT BIG WINNER!



IMPORTANT FOR TOURNAMENT USERS:
2 additional messages can be added by using the **Beta Brite® Remote**. More details in the **ToPS™ Tournament Pinball System Kit Installation Manual** *(SPI Part Number: 780-6011-00)* provided in the ***Optional Tournament Kit*** *(SPI Part Number: 502-5011-00)*.





For Upper Mini-Playfield Parts, see the Pages 93-97 (Blue).

back to Page 58

Parts Identification & Location (The Pink Pages)

Overview

This section provides the Part Nºs and locations of all the components in this Pinball Machine. The parts are arranged in three groups: **BACKBOX**, **CABINET** and **MAIN PLAYFIELD**. Generic parts which may change as production continues (quantity and/or size) are listed together. Quantities greater than 0 indicates that the part is used in this game. Since quantity changes *may occur*, an item indicating "0" *may be used*. Compare the item which needs to be replaced with the drawings provided *(the Posts, Sockets, Bulbs & Rubber Rings are drawn actual size). Major Assemblies (including the 2nd Level Playfield) & Ramps are detailed in the **Blue Pages**, Pages **75-98**.*

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

For 2nd Level (Upper) Playfield, see the Blue Pages (94-97)

Pinball Rejuvenation Kit Available
502-5013-77
This kit consists of 8 oz. Novus Wax #2 Fine (Red) (675-0003-01), cloth and all Rubber Rings & Bulbs used in this Pinball Machine.

Section 4, Table of Contents

Chapter 1: The Pink Pages

Overview..... 59

BACKBOX:

The Simpsons™ Pinball Party Backbox Assy. 60
Speaker Panel Assy. for the Backbox & Assoc. Parts: ... 61

CABINET:

Cabinet -General Parts & Switches 62-63

PLAYFIELD:

Main Playfield - General Parts, Metal Rails/Ball Guides & Switches (Above) 64-65
Main Playfield - General Parts & Switches (Below) 66
Main Playfield & Mini-Playfield Plastics (Screened & Clear) & Decals..... 67
Main Playfield - Rubber Parts Red and Black 68
Main Playfield & Mini-Playfield - Metal Posts (Screws) and Nuts 69
Main Playfield & Mini-Playfield - Hex Spacers..... 70
Main Playfield & Mini-Playfield - Posts and Spacers 71
Main Playfield & Mini-Playfield - Small Bayonet Type Bulbs & Sockets 72
Main Playfield & Mini-Playfield - Large Bayonet Type Bulb and Sockets 73
Main Playfield & Mini-Playfield - Wedge Base Bulbs and Sockets 74

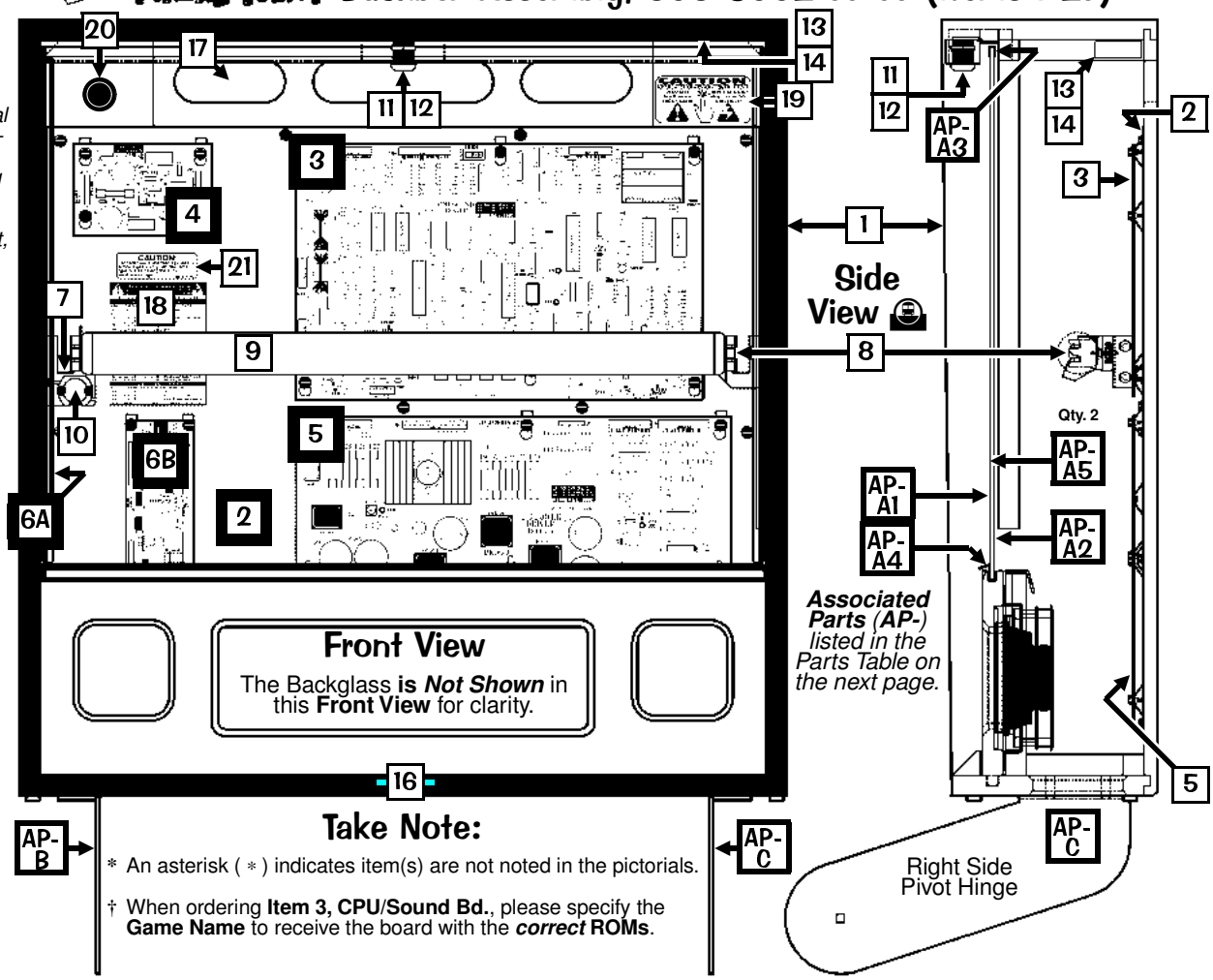
Chapter 2: The Blue Pages

Overview..... 75
Drawings for Major Assemblies & Ramps (includes the 2nd Level Mini-Playfield) 76-98

Not sold as an assembly, order the individual part(s) actually required.

The Simpsons Pinball Party Backbox Assembly, 505-6002-77-77 (Items 1-27)

‡ **Item 20, Button Hole Plug (Black)** *is the optional ToPS™ Access Hole; if removing for the Optional ToPS™ Kit, save with the game.*



Take Note:

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

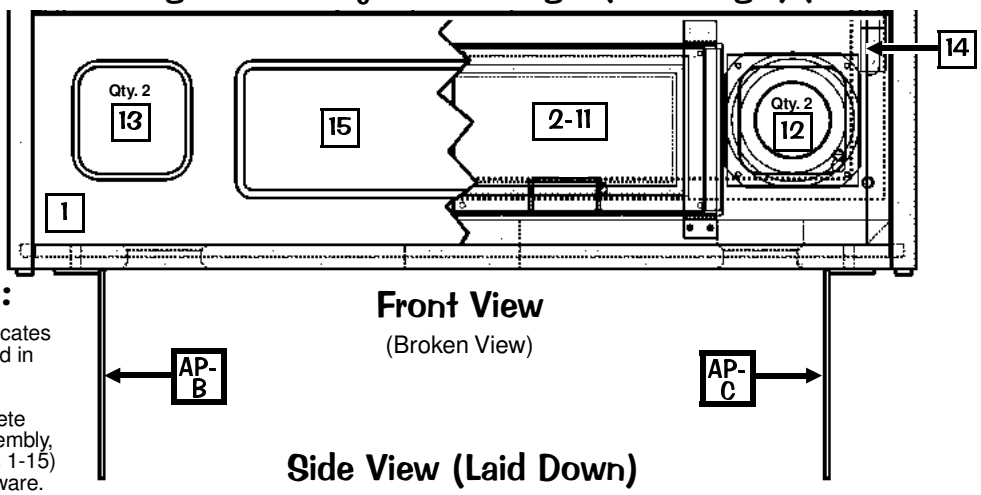
† When ordering **Item 3, CPU/Sound Bd.**, please specify the **Game Name** to receive the board with the ***correct*** **ROMs**.

№	BACKBOX PART NAME	QTY.	SPI PART №
1	Backbox **SPP Screened No Parts**	1	**525-5631-00-77**
	Item 1 Note: *Black Texured T-Molding is installed and cannot be ordered separately.*		
2	PCB Metal Mounting Plate	1	535-5809-14
	Item 2 is secured to Item 1 by: #8 X 1/2" HWH AB (Zinc) (Qty. 13) (234-5101-00) **and** #10 Washer 7/32" I.D. X .5" O.D. X 1/16" Thick (Qty. 4) (242-5003-00)		
3 †	CPU/Snd. Bd. **w/ATMEL Sound Processor**	1	**520-5300-00**
4	Display Power Supply Board	1	520-5138-00
5	I/O Power Driver Board	1	520-5137-01
	Items 3, 4 & 5 are secured to Item 2 by: #8-32 X 3/8" HWH MS (Qty. 19) (237-5903-00)		
6A	3X Trans. Drvr. Bd. **(UK/Special Apps.Only)**		520-5068-01
6B	Tournament Serial Interface (TSI) Bd. **ToPS™**		520-5220-00
	Item 6A is required for UK Games *to support Auxiliary assemblies listed under the Coil Matrix of Q1-Q32; also used for* ***Special Applications*** *such as Ticket / Coin Dispensers used in conjunction with* ***Item 6B ToPS™ Tournament Serial Board.***		
7	Fluorescent Light Bracket Assy. Left	1	515-6545-00
	For Individual Items use : Fluorescent Light Bracket Left (**535-7739-00**), Lamp Holder** (Self-Locking) (**077-5214-00**) **and** Starter Base *(with Leads)**** (**077-5213-00**).		
8	Fluorescent Light Bracket Assy. Right	1	515-6545-01
	For Individual Items use : Fluorescent Light Bracket Right (**535-7739-01**), Lamp Holder** (Self-Locking) (**077-5214-00**) **and** Starter Base *(with Leads)**** (**077-5213-00**). ** **secured by:** #6-32 X 5/8" PPH MS (Sems) Zinc (Qty. 1) (232-5203-00) *** **secured by:** #4-40 X 1/2" PPH MS (Sems) Zinc (Qty. 2) (237-5813-00) **Items 7 & 8 are secured to Item 1 by:** #10-24 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 2/per) (231-5012-00), #10-24 Keps Nut (Qty. 2/per) (240-5207-00) **and** 3/4" X 3" Reinforced Strapping Tape (Qty. 1, Sold in 12" Lengths only) (626-5040-00)		
9	Fluorescent Tube 24" (F18T8CW)	1	165-5061-00
10	Starter - Fluorescent (FS2 Light)	1	165-5011-01
11	Lock Mounting Plate	1	535-8128-01
12	Lock 5/8" Barrel, 3/4"ø, 1.5" Flat Cam	1	355-5055-00
	Items 11-12 are secured by: #8 X 5/8" TP Torx T20 (Qty. 4) (237-5947-00)		

№	BACKBOX PART NAME	QTY.	SPI PART №
13	Ballast Mounting Plate	1	535-8657-00
14	Ballast *CU45Z-W 1/2" Core 120v 60 Hz 13W*	1	010-5015-00
	Ballast, EU / UK Only 5/8" Core 50/60 Hz		010-5015-01
	Items 13 & 14 are secured to Item 1 by: #6 X 5/8" HWH AB (Zinc) (Qty. 2) (234-5102-04)		
15*	*#1 Roto Lock Male (on Cabinet)*	*1*	*355-5006-01*
16	#1 Roto Lock Female (R2-0002-02)	1	355-5006-02
	Item 16 is secured by: #10-24 X 1-3/4" CBSN (Qty. 2) (231-5022-00), #10-24 Keps Nut (Qty. 2) (240-5207-00) **and** #10 Washer 7/32" ID X .5" OD X 1/16" (Qty. 2) (242-5003-00)		
17	Back Vent Grill 2-1/2" X 18"	1	545-5072-02
	Item 17 is secured by: Staple 5/16" (Qty. 24) (631-5000-00)		
18	Fuse Description Decal (Generic)	1	820-6152-01
19	"CAUTION - VERY HOT" Decal	1	820-6266-00
20‡	Button Hole Plug (Blk) **(Happ #52-6214-00)**	1	500-6566-00
21	Fuse Label (UL)	1	820-6143-00
22*	Backbox Date Label	1	820-5091-00
23*	Ribbon Cable, 20-Pin (4")	1	036-5000-04
	Item 23 (20-Pin) connects the *CPU/Sound Board to the I/O Power Driver Board.*		
24*	Ribbon Cable, 26-Pin (40")	1	036-5001-40
	Item 24 (26-Pin) connects *the CPU/Sound Board to the Display Controller Board.*		
25*	1/4" Clamp (Double)	2	040-5000-23
26*	1/2", 3/4" & 1" Clamp (Single)	9	040-5000-XX
	Items 25-26 are secured to Item 1 by: #8 X 1/2" HWH AB (Zinc) (Qty. 13) (234-5101-00) ***-XX Note:*** for **1/2"** use **-06** (Qty. 1); for **3/4"** use **-08** (Qty. 2); for **1"** use **-09** (Qty. 6)		
27*	Ground Strap (5") *(by Item 12)*	1	600-5006-05

Not sold as an assembly, order the individual part(s) actually required.

The Simpsons Pinball Party Speaker Panel Assy. for the Backbox, 515-6888-03 (Items 1-15) and Assoc. Parts: Backglass Assembly & Pivot Hinges (Left & Right) (Items AP-A - AP-C)



Take Note:

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

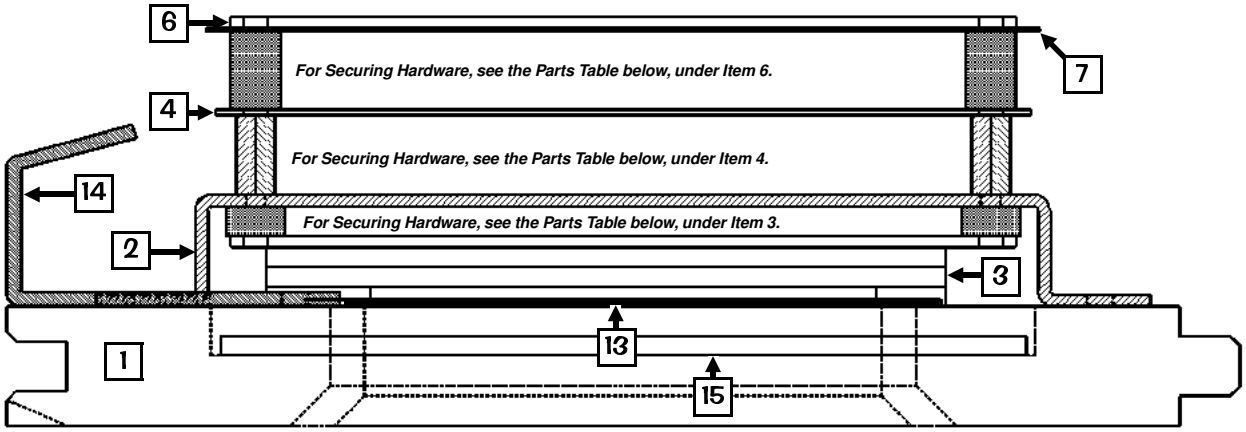
1. Ordering the complete Speaker Panel Assembly, 515-6888-03 (Items 1-15) will include all hardware.

Front View

(Broken View)

Side View (Laid Down)

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



№	SPEAKER PANEL PART NAME	QTY.	SPI PART №
1	Speaker Panel (Black Wood)	1	525-5515-00
2	Dot Matrix Disp. Bd. Mounting Bracket	2	535-8368-01
	Item 2 is secured to Item 1 by: #8 X 3/4" HWH AB (Zinc) (Qty. 4/per) (234-5103-00)		
3	Dot Matrix Display Board 128 X 32	1	520-5052-00
	Item 3 is secured to Item 2 by (at corners): 3/16" X 3/8" Spacer Gray (Qty. 4) (254-5000-18) **and** #6-32 X 1/2" HWH Swage (Serr) Zinc (Qty. 4) (237-5976-03) **Item 3 is secured to Item 4 (at the top center) by:** 3/4" X 1/4" Hex Spacer #6-32 Tap (Qty. 1) (254-5008-04) **and** #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 1) (232-5200-00)		
4	Static Shield (Steel Plate)	1	535-6437-00
	Item 4 is secured to Item 2 by: 1/2" X 1/4" Hex Spacer #6-32 Tap (Qty. 4) (254-5008-03) **and** #6-32 X 1/2" PPH MS (Sems) Zinc (Qty. 2, on Left Side only) (232-5202-00)		
5*	Edge Protector (on Item 4)	2	545-5592-01
6	Display Controller Board FCC-FEB98	1	520-5055-03
	Item 6 is secured to Item 4 by: 1/2" X 5/16" X .144 ID Spacer Tap (Qty. 3) (254-5014-00), #6-32 X 3/4" PPH MS (Sems) Zinc (Qty. 3) (237-5504-00), 1/2" X 1/4" Hex Spacer #6-32 Tap. (Qty. 1) (254-5008-03) **and** #6-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5200-00)		
7	RF Shield	1	820-5092-00
	Item 7 is secured inbetween: "Item 6" and its' mounting hardware described.		
8*	Ground Strap (25") (on Items 4, 6, 12)	4	600-5006-25
9*	1/2" Clamp (Single) (on Item 4)	1	040-5000-06
10*	Ribbon Cable, 14-Pin	1	036-5260-00
	Item 10 Note: *The 14-Pin cable connects the Dot Matrix Disp. Bd. to the Disp. Controller Bd.*		
11*	Foam 3/16" Thk. X 1/4" X 36"	6	626-5026-00
	Above Item 11 is self-adhesive. *Located between Items 3 & 17. Sold in 12" Lengths only.*		
12	Speaker (Shld.) 4" 8Ω MG Elec #4060SH	2	031-5004-01
13	Speaker Grill (Black w/no Artwork)	2	535-8081-01
14	Speaker Panel Hook Bracket	2	535-7009-02
	Items 12, 13 & 14 are secured by: #8 X 3/4" HWH AB (Zinc) (**Items 12/13:** Qty. 4/per; **Item 14:** Qty. 2/per) (234-5103-00)		

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
15	Plastic Shield (Display Cover)	1	545-5884-00
	Item 15 is secured to Item 2 by: #6 X 3/8" HWH AB (Zinc) (Qty. 8) (234-5000-00)		

The Associated Parts AP-A thru AP-C are also noted in the Backbox Assembly drawings on the previous page.

ASSOC. PARTS **ARE NOT INCLUDED** WITH BACKBOX/SPKR. PANEL ASSY'S.

№	ASSOC. BACKBOX PART NAME	QTY.	SPI PART №
AP-A	Backglass Assembly (Game № XX)	1	*See Parts Below*
	ORDER ONLY INDIVIDUAL PART(S) NEEDED:		
AP-A1	Clear Backglass 25.906" X 19.187"	1	660-5038-02
AP-A2	**The Simpsons™ P.P. Film Art (#77)**	1	**830-5277-00**
AP-A3	Top Plastic Channel - 26"	1	545-5018-15
AP-A4	Bottom Plastic Lift Channel - 26-1/16"	1	545-5021-01
AP-A5	Plastic Edging (Left/Right) - 18-1/8"	2	545-5018-14
AP-A6*	Tape (double-sided) (12" Length)	1	626-5005-00 *(only 6" required)*
Note:	*AP-A6 secures AP-A3--A5 to AP-A1*		
AP-B	Pivot Hinge Left	1	535-7999-00
AP-C	Pivot Hinge Right	1	535-7999-01
	Items AP-B & AP-C are secured to Backbox by: 1/4"-20 X 1-1/4" C.B. Sq. Neck (Qty. 4) (231-5003-00), 1/4"-20 Flange Nut (Qty. 4) (240-5300-00) **and** Fend Washer 1/4" I.D. X 1" O.D. (Qty. 1) (242-5009-00) **Items AP-B & AP-C are secured to Cabinet by:** 1/4"-20 X 7/8" Carriage Bolt Sq. Neck (Qty. 2) (231-5014-00), Hinge Spacer (Qty. 2) (530-5099-00), Washer 1/4" I.D. X 7/8" O.D. X 1/8" Yellow (Qty. 1/per) (242-5016-01), Fend Washer 1/4" I.D. X 1" O.D. (Qty. 1/per) (242-5009-00) **and** 1/4"-20 Flange Nut (Qty. 1/per) (240-5300-00)		

Note: *Inside cabinet holes are covered by* ***BLACK MYLAR COVER DISCS (QTY. 2) (820-5041-00)*** *to hide securing hardware (AP-B & AP-C above) from player view.*

Cabinet - General Parts ■ & Switches □

For Backbox Parts see the previous two pages.

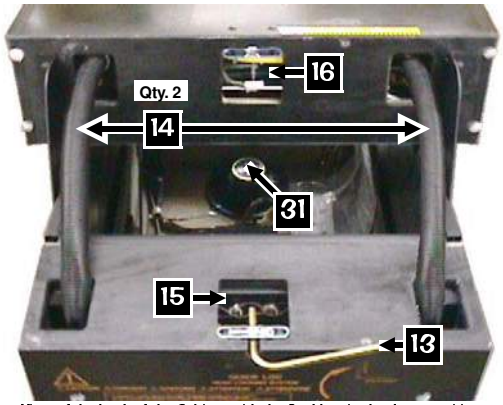
Enlarged View of Item 19 inside the Coin Door, Item 17. Buttons, Bracket & Decal sold separately. For usage, see Section 3, Chapter 1, Portals Service Menu Introduction, Page 8.

Item 33J (On/Off Switch) is located under the Cabinet (Front Right) directly below the Power Box.

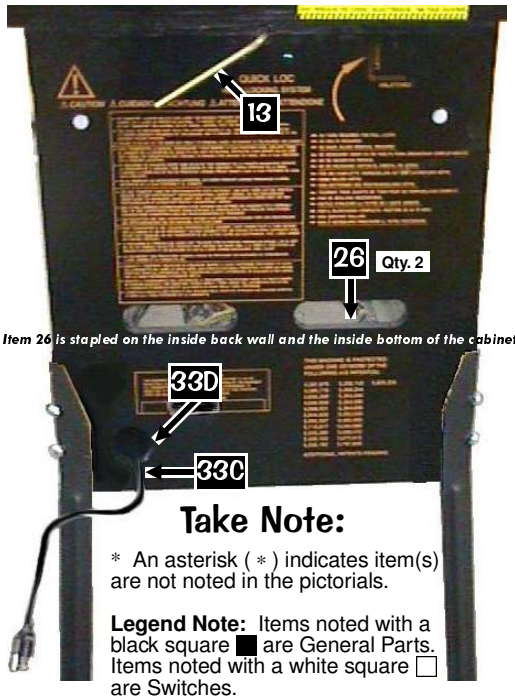
View of the Coin Door Open, Item 17.

Take Note:

‡ **Item 11, Button Hole Plug (Blk)** is the Optional Tournie Button Access Hole. *If removing for the Optional Tournament Button, save with the game.*



View of the back of the Cabinet with the Backbox in the down position.



Item 26 is stapled on the inside back wall and the inside bottom of the cabinet.

Take Note:

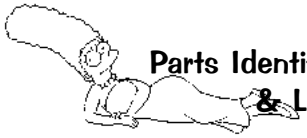
* An asterisk (*) indicates item(s) are not noted in the pictorials.

Legend Note: Items noted with a black square ■ are General Parts. Items noted with a white square □ are Switches.

Nº	CABINET PART NAME	QTY.	SPI PART Nº
1	T.S.P.P. Screened Cabinet (No Parts)	1	525-6000-77
2	Black Leg & Leveler Assembly	4	500-5921-50
	Item 2 is secured by: Leg Bolt Back Plate (535-5703-00) **and** Leg Bolt 3/8" X 16 X 2-1/2" Hex 5/8" Hd. (2/per) (231-5001-01) *To order just a Leg Leveler (3/8" - 16 X 3") use SPI Nº: 500-5017-00. A Leg "without" a Leg Leveler is not available.*		
3	Start Button (Red) + Lamp Assembly	1	500-6388-02
	Item 3 includes the Switch.* FOR SWITCH ONLY *see Item 25 on the Next Page.		
4*	#555 Wedge Base Bulb (Clear)	1	165-5002-00
	Item 4 is included with Item 3, for just a replacement Bulb use the above number.		
5	Ball Shooter (Plunger) Assembly	1	500-6146-00-04
	Item 5 is secured by: Support Plate (Qty. 1) (535-5027-00), #10-32 X 3/8" SHWH (Serr) Swage (Qty. 3) (237-5985-00) **and** #6 X 5/8" HWH AB (Zinc) (Qty. 2) (234-5002-00). **FOR A BREAKDOWN OF PARTS SEE:** ***Sec. 4, Chp. 2, Drawings for ... Assemblies...***		
6	Flipper Button (Red) Assembly	2	500-5026-32
	Item 6 is secured by: Pal Nut for Flipper Button (Metal) (Qty. 2) (240-5003-01) **and is fitted with:** O-Ring 11/32" X 7/32" X 1/16" (Qty. 1/per) (545-5850-00) **Item 6 *DOES NOT* include the Switch. FOR SWITCHES ONLY *see Items 23A/B on the Next Page.***		
7	Rear Glass Channel 20-3/8" Length	1	545-5038-00
8	Plastic Channel 42-5/8" Lg. (Left/Rt.)	2	545-5017-00
9	Side Armor "with holes" (Left & Right)	2	535-7297-02
	Item 9 is secured by: Pem Stud 1/4 X 1" FH (Qty. 2/per) (237-6116-01), 1/4-20 Flange Nut (Qty. 2/per) (240-5300-00) **and** #8 X 5/8" T20 Tamper Proof (Qty. 2/per) (237-5947-00)		
10	Front Molding - Black	1	500-5757-02-00
	Item 10 requires: Self-Adhesive Foam Rubber 3/8" X 3/16" X 20-3/8" (626-5001-00).		
11‡	Button Hole Plug (Blk) **(Happ #52-6214-00)**	1	500-6566-00
12	P/F Glass (Tmprd.) 21" X 43" X 3/16"	1	660-5001-00

Nº	CABINET PART NAME	QTY.	SPI PART Nº
13	Hex Key Allen Wrench 5/16"	1	777-0001-00
14	Corrugated Tubing Black **1¼"ø X 2.6' Lg.**	2	605-5008-00
	*Above Item **14** covers the Cables Wiring Harnesses going into the Backbox from the Cab.*		
15	#1 Roto Lock Male (R2-0055-02)	1	355-5006-01
	Item 15 is secured by: #10-24 X 1-3/4" Carr. Bolt Sq. Neck (Qty. 2) (231-5022-00), #10-24 Nylon Stop Nut (Qty. 2) (240-5206-00) **and** #10 Washer 7/32" X .5" X 1/16" (Qty. 2) (242-5003-00)		
16	*#1 Roto Lock Female (on Backbox)*	*1*	*355-5006-02*
17	Coin Door (with Validator) USA only	1	500-5018-172
	Item 17 is secured by: 1/4"-20 X 1-1/4" Carriage Bolt Sq. Neck (Qty. 4) (231-5003-00) 1/4"-20 Flange Nut (Qty. 4) (240-5300-00) **and** Fend Washer 1/4" I.D. X 1" O.D. (Qty. 3) (242-5009-00) ***Note:*** *For Coin Door other than USA call Technical Support for SPI Part Nº.*		
18	Coin Door Switch (USA)	2	180-5024-00
	FYI: Coin Door Switch (¥ Japan)	0	180-5091-00
19	Bracket for below Portals™ Switches	1	535-6860-03
19B	Push-Button Portals™ Switch (Black)	1	180-5192-00
19R	Push-Button Portals™ Switch (Red)	1	180-5192-02
19G	Push-Button Portals™ Switch (Green)	1	180-5192-04
	Ordering Note: *Securing hardware for switches included. For Decal Kit, see Page **63**.*		
20	Dual Switch Assembly	1	500-5808-00
	ORDERING ABOVE (ITEM 20) ASSEMBLY PART Nº WILL INCLUDE:		
20A	Mounting Bracket	1	535-6958-00
20B	Playfield Power Interlock Sw. (Top)	1	180-5136-00
20C	Memory Protect Switch (Bottom)	1	180-5000-01
	Item 20 is secured to Cabinet by: #8 X 1/2" HWH AB (Zinc) (Qty. 2) (234-5101-00)		

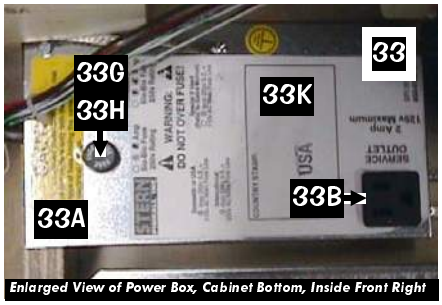
Parts Table & Views continue on the next page.



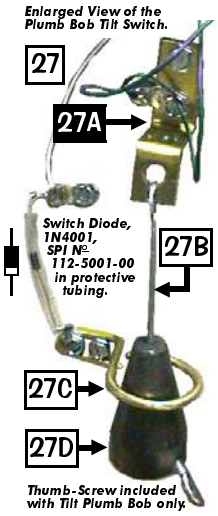
Cabinet Back Lights are on the Playfield Back Panel.

Wood Back Panel:
See Main Playfield - General Parts ■ Metal Rails/Ball Guides ■ & Switches □ (Above), Pages 64-65.

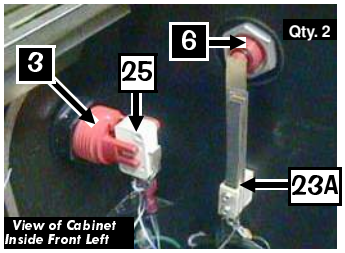
Bulbs & Sockets:
Playfield - Small Bayonet Type Bulbs and Sockets, Page 72 for Sockets & Bulbs.



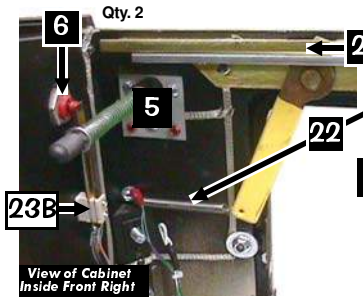
Enlarged View of Power Box, Cabinet Bottom, Inside Front Right



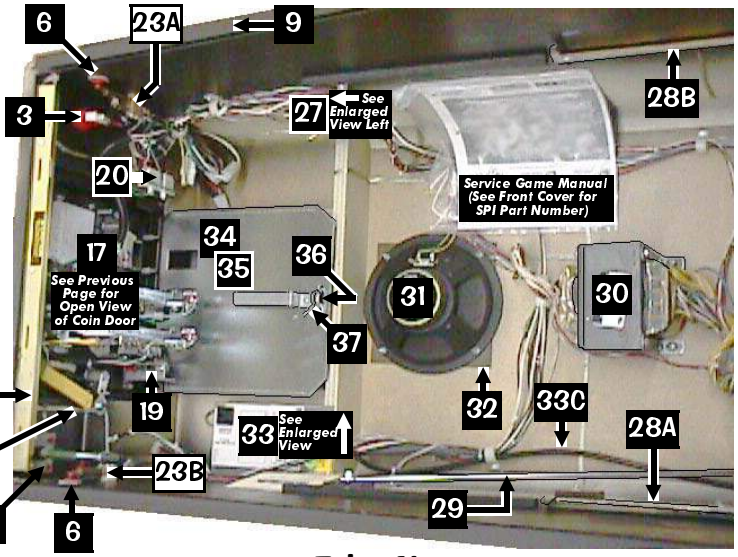
Enlarged View of the Plumb Bob Tilt Switch.



View of Cabinet Inside Front Left



View of Cabinet Inside Front Right



Take Note:

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

Legend Note: Items noted with a black square ■ are General Parts. Items noted with a white square □ are Switches.

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
Parts Table & Views continue on the previous page.			
21	Front Molding Lockdown Assembly	1	500-6509-00
Item 21 is secured by: #10-24 X 1-1/4" Carr. Bolt (Qty. 2) (231-5012-00), #10-24 Keps Nut (Qty. 2) (240-5207-00), #8 X 5/8" HWH AB Zinc (Qty. 4) (234-5102-04) **and** #10 Washer 7/32" ID X 1/2" OD X 1/16" (Qty. 2) (242-5003-00)			
22	Lockdown Spring (connected to handle)	1	265-5008-00
23A	Flipper Switch - **Self-Cleaning**	1	180-5160-00
23B	Flipper Sw. - **X2 Stack for Lwr./Upr. Flipper(s)**	1	180-5164-00
24*	Foam Strip (2 on 23A; 1 on 23B)	3	626-5042-00
25	Start Button Switch **(ONLY)**	1	180-5174-00
26	Grills 2-1/2" X 18" (on Back & Bottom)	2	545-5072-02
27	Cabinet Plumb Bob Tilt Switch	1	*See Parts Below*
ORDER ONLY INDIVIDUAL PART(S) NEEDED:			
27A	Bracket for Hanger Wire	1	535-5221-00
27B	Hanger Wire	1	535-5319-00
27C	Contact Wire Form	1	535-7563-01
27D	Plumb Bob Weight (includes Thumb-Screw)	1	535-5029-00
Items 27A & 27C are secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 4) (234-5101-00)			
28A	Slide & Pivot Support Bracket - Right	1	535-5990-00
28B	Slide & Pivot Support Bracket - Left	1	535-5989-00
Items 28A & 28B are secured by: #10-24 X 1-1/4" Carriage Bolt Sq. Neck (3/per) (231-5012-00) **and** #10-24 KEPS Nut (3/per) (240-5207-00)			

Pinball Rejuvenation Kit Available: 502-5013-77
This kit consists of 8 oz. Novus Wax #2 Fine (Red) (675-0003-01), cloth and all Rubber Rings & Bulbs used in this Pinball Machine.

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
29	Prop Rod	1	535-7553-00
Item 29 is secured by: #10-24 X 1-3/4" Carriage Bolt Sq. Neck (Qty. 1) (231-5022-00), Washer #10 7/32" ID X .5" OD X 1/16" Thk (Qty. 1) (242-5003-00) **and** #10-24 Nylon Stop Nut (Qty. 1) (240-5206-00)			
30	Transformer 5.7v AC (with Ballast Winding)	1	010-5012-01
Item 30 is secured by: 1/4"-20 X 5/8" PPH MS (Zinc) (Qty. 4) (237-5854-00) **and** 1/4" Split Lock Washer (Qty. 4) (244-5000-00)			
31	Speaker 8" ø Rd. 8010 4Ω	1	031-5007-00
32	Speaker Grill 7" X 7"	1	545-5072-03
Items 31 & 32 are secured by: #6-32 X 1-1/4" Fin Shank Screw (Qty. 4) (237-5883-00) **and** #6-32 Keps Nut (Qty. 4) (240-5008-00)			
33	Power Input Box Sub-Assy.	1	515-5360-07
ORDERING ABOVE (ITEM 33) SUB-ASSY. PART № WILL INCLUDE:			
33A	Power Box (Plain)	1	535-5932-00
33B	Service Outlet (for USA)	1	180-5008-01
33C	Line Cord 10' ROJ 3" Max.	1	034-5000-10
33D	Recessed Cup for Line Cord	1	545-5122-00
33E*	Line Filter	1	150-5000-00
33F*	Varistor TNR159211KM	1	150-5001-00
33G	Fuse 8 Amp 250v Slo-Blo (Domestic)	1	200-5000-05
33H	Fuse Holder	1	205-5001-00
33I*	On/Off Switch Bracket	1	535-8318-00
33J	On/Off Rocker Sw. (APEM R2101C5NBB)	1	180-5001-03
33K	Power Box Decal	1	820-6123-03
34	Cash Box Plastic Bottom	1	545-5090-00
35	Cash Box Cover (Validator)	1	535-5013-03
36	Cash Box Lock Bracket (wire)	1	535-7562-00
37	Large Hair-Pin Clip	1	535-7772-00
	Optional Meter **(+12v DC w/Diode & Bracket)**		G-0053-013-102
	Optional Meter **(+12v DC w/Diode, No Bracket)**		G-0053-013-102A

Nº	ABOVE PLAYFIELD PART NAME	QTY.	SPI PART Nº
PF	P/F Screened w/ Inserts & **NO** Parts	1	830-5177-00
	P/F Complete w/ Inserts & **ALL** Parts	1	505-6004-**77-77**

General Items

Nº	ABOVE PLAYFIELD PART NAME	QTY.	SPI PART Nº
1	Arch (Black Metal) **no Forks**	1	535-8392-01

Item 1 is secured to the playfield by Item 16 and : #10-32 X 5/16" PH FL U/C MS STL Zinc (Qty. 2) (237-6013-00). ***Usage Note:*** *When replacing the Arch,* order new replacement **Nelson Protect Strips** *(not included)* (Qty. 2) (545-5212-02).

2	Instruction Card (USA) ...Simpsons™...	1	755-5177-00

Note: *Visit* ***www.sternpinball.com*** *for a PDF copy of the Game Instruction Card which will also have any translated Instruction Cards made for this game. Find Game Link or Archives.* ***Spanish*** *755-5177-**02**;* ***German*** *755-5177-**03**;* ***Italian*** *755-5177-**04**;* ***French*** *755-5177-**05**.*

3	Coin Card (2-Sided)	1	755-5400-00

Usage Notes: *Use* ***Item 3*** *(**Back: 1 Play 50¢ - 5 Plays $2**) for Adj. 6, Game Pricing,* ***USA 5*** *Setting, or (**Front: 1 Play 50¢ - 3 Plays $1**) for Adj. 6, Game Pricing,* ***USA 8*** *Setting.*

4	Coin Card (2-Sided)	1	755-5400-02

Usage Notes: *Use* ***Item 4*** *(**Front: 1 Play 50¢**) for Adj. 6, Game Pricing,* ***USA 2-7*** *Setting, (**Back: is Blank**) for Custom Settings.* ***Availability:*** *See* ***Appendix J*** *(back of manual) for all current Coin Cards (**USA**, **Canada**, **Euro** & other **International**). If this is a non-US Game, Coin Card(s) provided will differ.*

5	Light Reflector (Silver Color Plastic)	5	545-5409-01
6	Mini-Mars Lite Cover **(Snap-In)** ***(see Note)***	6	550-5030-**XX**

*Item **6** come in various colors, replace **XX** with the following **2-Digit Numbers**:*
-01 Clear (Qty. 3), -02 Red (Qty. 1), -03 Amber (Qty. 1) *&* ***-06 Yellow (Qty. 1)****.*
*(**Note:** Additional 1 of each on 2nd Level Playfield: -02 Red, -03 Amber & -06 Yellow)*

7	Itchy with Axe Figurine	1	880-5059-00
8	Scratchy with Hammer Figurine	1	880-5059-01

Items 7-8 are secured by: #8-32 X 3/8" HWH AB (Zinc-Yellow) (Qty. 2/per) (234-5100-00)

9	Level Assembly	1	515-7214-00

For Individual Items use : .882" 8MM **Vial Mtg. Flange** (545-6027-00), **Level** .8mm Empire #0224 (545-6001-01) or **Level Bracket** (535-9010-00). **Flange secured by:** #6-32 X 1/4" PPH MS (no Sems) Zinc (237-5500-00) **and** #6-32 Keps Nut (240-5008-00)
Item 9 is secured to the wood rail by: #6 X 1/2" HWH AB Zinc Red (Qty. 2) (234-5001-02)

10	Pinball (Steel) 1 1/16" ø *(1 is captive)*	6	260-5000-00
11*	Plug-Cap (3/16") Black Plastic	0	545-5232-01

Note: *Item **11** should plug hole if a Center Post (@ Drain) is used, then removed.*

Brackets with Spinner or Wire Gates

12	Spinner Bracket (Narrow)	1	535-8684-00
	Spinner Target Narrow	1	515-7088-00

Item 12 is secured by: #6 X 1/2" HWH AB Zinc (Red) (Qty. 2) (234-5001-02)

13	1-Way Gate Mounting Bracket (Large)	1	535-5269-02
	Wire Gate (for above)		535-5307-02
14	1-Way Gate Mounting Bracket (Small)		535-5269-03
	Wire Gate (for above)		535-5307-03

Brackets for Mounting

15	Playfield Hanger Bracket	2	535-8385-00

Item 15 is secured to the P/F by: #8-32 X 7/8" HWH MS Zinc (Qty. 2/per) (237-5890-00)

16*	*Bracket, Back Panel Support*	2	535-8964-00

Item 16 is shown in the General Parts (Below) on the opposite of the next Page (66).

17	Arch Retaining (Hold-Down) Brackets	2	535-8394-00

Item 17 is secured to the P/F by: #8 X 1/2" HWH AB (Zinc) (Qty. 3/per) (234-5101-00)

18	Switch Base Plate (Black)	1	535-5195-00

Item 18 is secured by: #8-32 X 1/2" HWH AB (Zinc) (Qty. 2) (234-5101-00)

19	Bracket, Back Panel Front Guide	1	535-6896-00
20	Bracket (Black), LED Mode Sign	1	535-6896-00

Items 19 & 20 are secured by: #8-32 X 3/4" HWH Swage (Ser) Zinc (Qty. 5) (237-5975-02)

21	Platform (Black), Monorail Support	1	535-9112-01

Item 21 is secured by: #6-32 X 3/8" PPH MS Sems (Zc) (Qty. 1) (232-5201-00), #6 Washer (Qty. 1) (242-5001-00) **and** 1-3/4" X 1/4" Hex Spacer #6-32 Tap (Qty. 1) (254-5008-10)

22	Ramp Mounting Bracket	3	515-6508-00

Item 22 is secured by: #6 X 1/2" PTH AB (Zinc) (Qty. 2/per) (237-5809-00)

Brackets for Ball Stops, Traps or Protect

23	Snubber Bracket	1	535-8250-01

Item 23 is secured by: #8-32 X 1-1/4" HWH MS (Qty. 2) (237-6137-00), #8 Washer .170" ID X 1/2" OD X .042" (Qty. 2) (242-5015-00) **and** #8-32 Nylon Stop Nut (Qty. 2) (240-5102-00)

24	Bracket, Plastic Piece -16 Protect	1	535-9219-00
25	Bracket, Plastic Piece -18 Protect	1	535-9220-00

Items 24 & 25 are secured by: Washer 1/4" ID X 1/2" OD X 1/16" (Qty. 2/per) (242-5008-00) **and** #6-32 Nylon Stop Nut (Qty. 2/per) 240-5005-00

26	Bracket, Ball Drop Guide **(Rt. Return)**	1	535-9259-00
27	Bracket, VUK Channel **(Top Left)**	1	535-9263-00

Item 27 is secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 7) (234-5101-00)

Wood Back Panel & Wood Rails

28	Back Panel (Blue Wood)	1	525-5618-00

Item 28 is secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 4) (234-5101-00)

29	Wood Rail 8" **(Bottom Left Side P/F Edge)**	1	525-5007-07
30	Wood Rail 12" **(Top Left Side P/F Edge)**		525-5007-44
31	Wood Rail 15" **(Bot. Right Side P/F Edge)**	1	525-5007-12
32	Wood Rail 21-**3/16" (Top Rt. Side P/F Edge)**	1	525-5007-50
33	Wood Rail **(Shooter Lane, Chamfered)**	1	525-5619-01

Items 29-33 are secured by: #6 X 1-1/4" PFH A (Zinc) (Qty. 13 total) (237-5804-00)

Metal Flat Rails, Wire Forms & Ball Guides

34	Metal Rail **(Center Drain under Arch)**	1	535-8393-00
35	Metal Rail **(Entrance)**	1	535-9080-00
36	Metal Rail **(Main Loop)**	1	535-9082-00
37	Metal Rail **(Main Loop Inside)**	1	535-9083-00
38	Metal Rail **(Mini Loop)**	1	535-9084-00
39	Metal Rail **(Mini Loop Inside)**	1	535-9085-00
40	Metal Rail **(Top Middle)**	1	535-9086-00
41	Metal Rail **(Mini Inner Loop)**	1	535-9206-00

Items 34-37, 39-40 are secured at Tabs by: #8 X 1/2" HWH AB (Zinc) (Qty. 1/per tab) (234-5101-00) **Item 35 is also secured at Tabs by:** #6 X 3/8" HWH AB (Zinc) (Qty. 4) (234-5000-00) **Items 37 & 39 are also secured at Tabs by:** #8 Washer (Qty. 1/per) (242-5005-00) **and** #8-32 Nylon Stop Nut (Qty. 1/per) (240-5102-00) **Items 38 & 41 are secured at Tabs by:** #8 X 1/2" HWH AB (Zinc) Black (Qty. 1/per tab) (234-5101-01)

42	Metal Wire Form 2.25" (ø .092")	1	535-5300-12
43	Metal Ball Guide 2-5/16" (ø .162")	1	535-6492-10
44	Metal Ball Guide 3-3/4" (ø .12")	1	535-5356-03
45	Metal Ball Guide **(Return - Left)**	1	535-7560-00 or -9278-00
46	Metal Ball Guide **(Return - Right)**	1	535-7560-01
47	Metal Ball Guide **(Left Drain)**	1	535-9092-00
48	Metal Ball Guide **(Right Drain)**	1	535-9092-01

Items 42-48 are secured by the ends tapped into the playfield. Take care if removing.

49	Metal Ball Guide Wire **(back of Homer)**	1	535-9264-00

Miscellaneous Metal & Plastic Ramps

50	Steel Ramp (Monorail)	1	535-9111-00
51	Wire Ramp (Monorail to Rt. Return)	1	515-7235-00
52	Wire Ramp (... to Left Return)	1	515-7234-00

Items 51 & 52 are secured by: #8 Washer .170" ID X 1/2" OD X .042" (Qty. 12) (242-5015-00) **and** #6-32 X 3/8" PPH MS Sems (Qty. 7) (232-5201-00) **onto various Hex Spacers: Item 51** 2-1/4" X 1/4" H.S. (254-5008-18) **+** 1" X 1/4" H.S. (254-5008-06) **and Item 52** 1-3/4" X 1/4" H.S. (Qty. 2) (254-5008-10) **+** 1/2" X 1/4" H.S. (254-5008-03) **+** 5/8" X 1/4" H.S. (254-5008-02)

53	Steel Ramp with Ramp Flap	1	515-7271-00

Item 53 is secured by: #4 X 5/8" PFH (Black) (Qty. 2) (237-5833-00) ***For Individual Items use :*** Ramp (Steel, No Parts) (**535-9201-00**), Ramp Flap (**535-9095-00**), Rivet, 1/8" ø X 3/16" Lg. (Qty. 2) (**249-5001-00**) **and** #6 Lock Washer (Qty. 2) (**246-5000-00**)

54	Plastic Ramp, Middle	1	545-6045-00

Item 54 is secured by: #6-32 X 3/8" PPH MS Sems (Zinc) (Qty. 5) (232-5201-00), #6 Washer (Qty. 5) (242-5001-00) **and** 2-5/8" X 1/4" Hex Spacer #6-32 (Qty. 5) (254-5008-08)

Switches & Misc. PC Board

A	Micro Switch **(X1 Left Ramp; X2 Right Ramp)**	3	180-5190-28
B	Micro Switch, Spinner **(1 -1/4")**	1	180-5010-04

Items A/B require a Switch Body Protect Plate (Qty. 1/ea.) (535-6539-00) & is secured by: #2-56 X 1/2" HWH Sr (Qty. 2) (237-5937-02) **and** #2-56 Hex Nut (Qty. 2) (240-5301-00).

C	Micro Switch **(Roller Actuator, Lite Force)**	1	180-5119-02

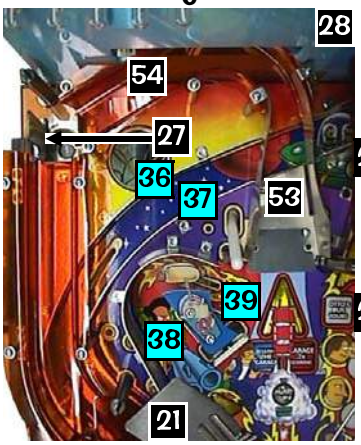
Item C is sandwiched between 2 Switch Mounting Plates (535-9194-00) which is secured thru Item 17 by: #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 2) (237-5976-04)

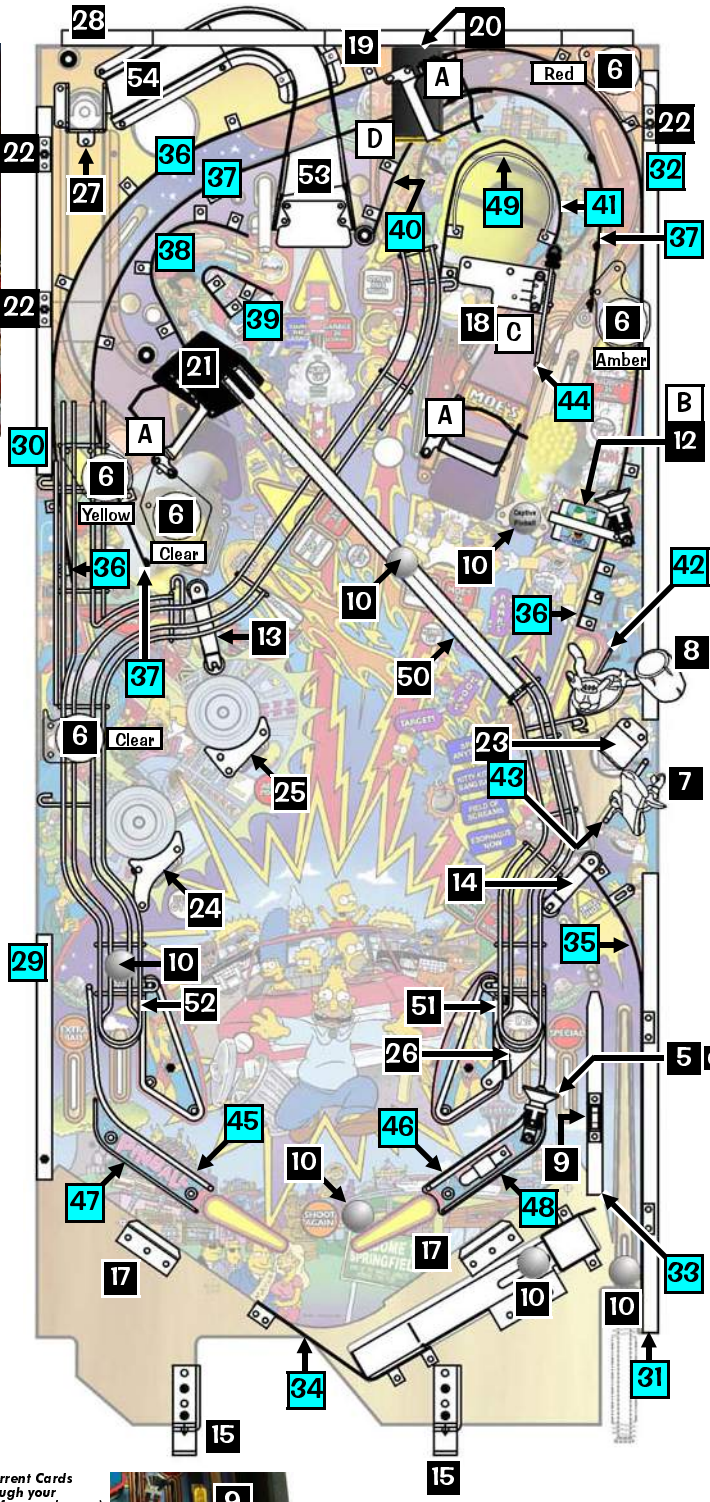
D	LED PCB (Mode Signifier)	1	520-5225-00

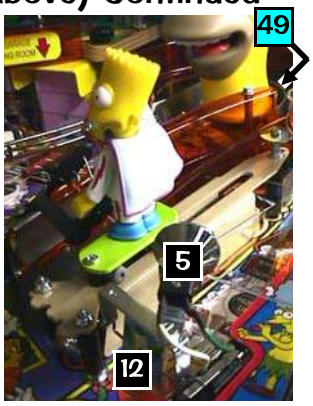
Item D is secured to Item 20 by: #6-32 X 5/8" PEM Stud-FH-632-10 Zinc (Qty. 3) (237-6131-10), #6-32 Keps Nut (Qty. 3) (240-5008-00) **and** #6-32 Nylon Stop Nut (Qty. 3) (240-5005-00). *More information and views in Sec.* ***5****, Chp.* ***4****, on Pages* ***142-143****.*

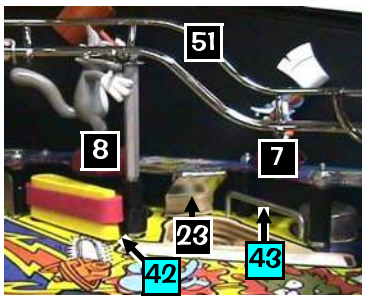
Pinball Rejuvenation Kit Available: 502-5013-77
This kit consists of 8 oz. Novus Wax #2 Fine (Red) (675-0003-01), cloth and all Rubber Rings & Bulbs used in this Pinball Machine.

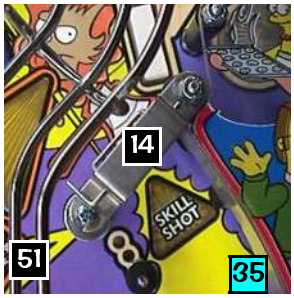
For Assemblies, Ramps, Individual Parts, Figurines and 2nd Level Playfield General Parts not listed on this page, view the Blue Pages (75-98).

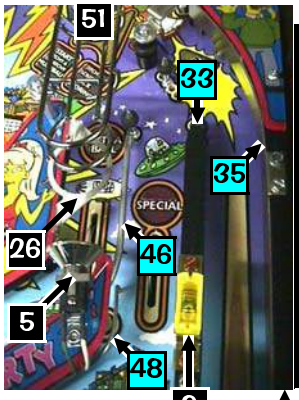












See Appendix J at the back of this manual for all current Cards (USA, Canada, Euro & International) available through your distributor or download via our website (see back of manual cover).

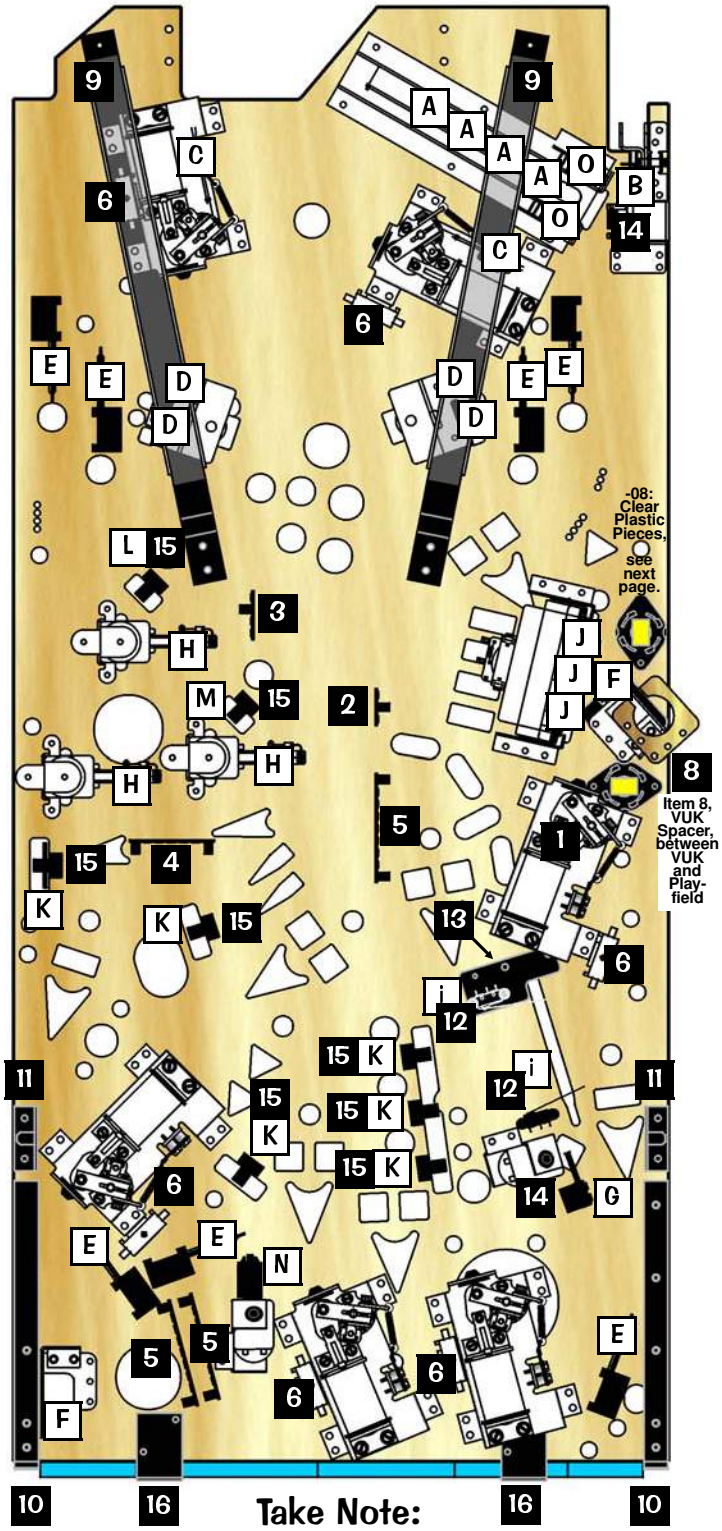
Take Note:

1. Some items or parts *may be included with* **or** *associated with* a Major Assembly or Ramp Assembly; **see the Blue Pages, Sec. 4, Chp. 2**. for parts required not appearing on this page. If you still cannot find the part required, Call Stern Pinball, Inc. ® Technical Support, 1-800-542-5377 or 1-708-345-7700 (Opt. 1).
2. Items 1, 12, 24, 25, 27 & D have associated ***Individual Plastics and/or Decals.*** *These pieces are not available individually. For the Plastic and/or Decal Kits (or views), see the page after next,* ***Main Playfield & Mini-Playfield - Plastics & Decals****, Page 67.*
3. **Legend Note:** Items noted with a black square ■ are General Parts. Items noted with a cyan square ■ are Rails. Items noted with a white square □ are Switches and Misc. PC Board(s).

Main Playfield - General Parts ■ & Switches □ (Below)

№	BELOW PLAYFIELD PART NAME	QTY.	SPI PART №
	General Items		
1	Insulation Fiche Paper **(under Top Rt. Flip)**	1	545-5721-00
2	Diode Terminal Strip 2-Lug (810) Isolated	2	055-5203-00
	Note: Item 2 (Qty. 1) is located in the Cabinet on the Coin Door.		
3	Diode Terminal Strip 3-Lug (813) Isolated	1	055-5204-03
4	Diode Terminal Strip 5-Lug (824) Isolated	1	055-5204-05
5	Diode Terminal Strip 7-Lug Isolated	3	055-5204-07
	Items 2-5 are secured by: #6 X 3/8 HWH AB Zinc (Qty. 1-2/per) (234-5000-00). ***Note:*** *1N4004 Diodes (112-5003-00) are used in all Diode applications. 1N4001 Diodes can be used for Switches and/or Lamps. See Sec.* ***5****, Chp.* ***2****,* ***P/F Diode Terminal Strip****...*		
6	3A 250v Slo-Blo Fuse	6	200-5000-08
	Fuse Clip Holder (Socket)	6	205-5000-01
	Item 6 is secured by: #6 X 1/2" PPH AB (Qty. 1/per) (237-5805-00) ***Note:*** *Item* ***6****, Fuse Clip Holder (Socket) 205-5000-01 is part of a set of 12 (205-5000-12). You can order them as individuals (...-01) or a set of 12 (...-12).*		
7*	Diode Terminal Strip/Fuse Decals A-F		820-6221-77
	Note: *For Decal Descriptions & Locations, see Sec.* ***5****, Chp.* ***2****,* ***Playfield Wiring****, Page 105.*		
8	Wood Spacer (VUK)	1	525-5548-00
	Brackets for Mounting		
9	Playfield Support Slide Bracket	2	535-6862-02
	Item 9 is secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 2/per) (234-5101-00) **and** #8-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 1/per) (237-5975-03)		
10	Edge Slide Bracket (Extended)	2	535-5988-01
	Item 10 is secured by: #4 X 1/2" PFH (Zinc) (Qty. 5/per) (237-5840-00)		
11	Pivot Pin Bracket Welded Assembly	2	500-5329-03
12	Switch Mounting Plate (Black)	2	535-9194-00
13	Switch Base Plate (Black)	1	535-9195-00
	Items 12 & 13 are secured by: #6-32 X 5/8" HWH Swage (Ser) Zinc (Qty. 2) (237-5976-04) **and** #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00)		
14	Switch Bracket **(Shooter Lane & Eject Hole)**	2	535-6173-00
	Item 14 is secured by: #6 X 3/8" HWH AB (Zinc) (Qty. 2/per) (234-5000-00)		
15	Switch Back Plate **(Stand-Up Target)**	8	535-6452-00
	Target (Stand-Up) Bracket	8	535-6896-00
	Item 15 requires: Foam Pad (Qty. 1/per) (626-5029-00) on Target Bracket.		
16	Bracket, Back Panel Support	2	535-8964-00
	Item 16 secures Item 28 *(prev. page)* by: #8 X 1/2" HWH AB (Zinc) (Qty. 3) (234-5101-00)		
	Switches & Misc. PC Boards		
A	Micro Sw. **(Roller Actuator, Lite Force)**	4	180-5119-02
B	Micro Switch **(at Shooter Lane)**	1	180-5157-00
C	EOS Switch Flipper **(on Flippers)**	2	180-5149-00
D	Stack (Blade) Switch **(on Slingshots)**	4	180-5054-00
E	Micro Sw. Roll-Over Right Brkt. Assy.	7	500-6227-02
	Item E is secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 2/per) (234-5101-00)		
F	Micro Sw. **(Heavy Duty "Y" Flat Actuator)**	2	180-5116-01
G	Micro Switch **(Long Flat+Bent End Actuator)**	1	180-5186-00
	Items A-B / G-F require a Switch Body Protect Plate (535-6539-00) which is secured by: #2-56 X 1/2" HWH Serr (Qty. 2) (237-5937-02) **and** #2-56 Hex Nut (Qty. 2) (240-5301-00).		
H	Micro Switch **(on Pop Bumpers)**	3	180-5015-03
i	Micro Switch **(for Bart Skateboard)**	2	180-5190-48
	Item i is secured with Items 12 & 13 above.		
J	Micro Switch **(on Drop Target)**	3	180-5158-00
K	Switch & Target Assy. Rect. (White)	6	515-6027-08
L	Switch & Target Assy. 1" **Round** (Wht.)	1	515-5966-08
M	Switch & Target Assy. 1" **Round** (Org.)	1	515-5966-07
	Items K-M are secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 2) (234-5101-00)		
N	Modular S-U Target Narrow (Clear)	1	500-6138-01**R**
	Item N is secured by: #6 X 3/4" PPH (Zinc) (Qty. 2) (232-5003-00) ***Note Items K-N:*** *For better view(s) or entire assembly, see* ***Appdx. I****,* ***Pg. I1*** *(end of manual).*		
O	Dual OPTO TRANS Bd. **(on Ball Trough)**	1	520-5173-00
	Dual OPTO REC Board **(on Ball Trough)**	1	520-5174-00
	Note: *For how Items* ***A, C, D, F, H-J, O*** *are secured or for a better view, see Section* ***4****, Chapter* ***2****,* ***Drawings for Major Assemblies & Ramps****, on the individual assemblies noted.*		
	Note: *For more details on Item* ***O*** *and a break-down of parts, see Section* ***5****, Chapter* ***4****,* ***Printed Circuit Boards****, Page 109.*		

Pinball Rejuvenation Kit Available: 502-5013-77
This kit consists of 8 oz. Novus Wax #2 Fine (Red) (675-0003-01), cloth and all Rubber Rings & Bulbs used in this Pinball Machine.

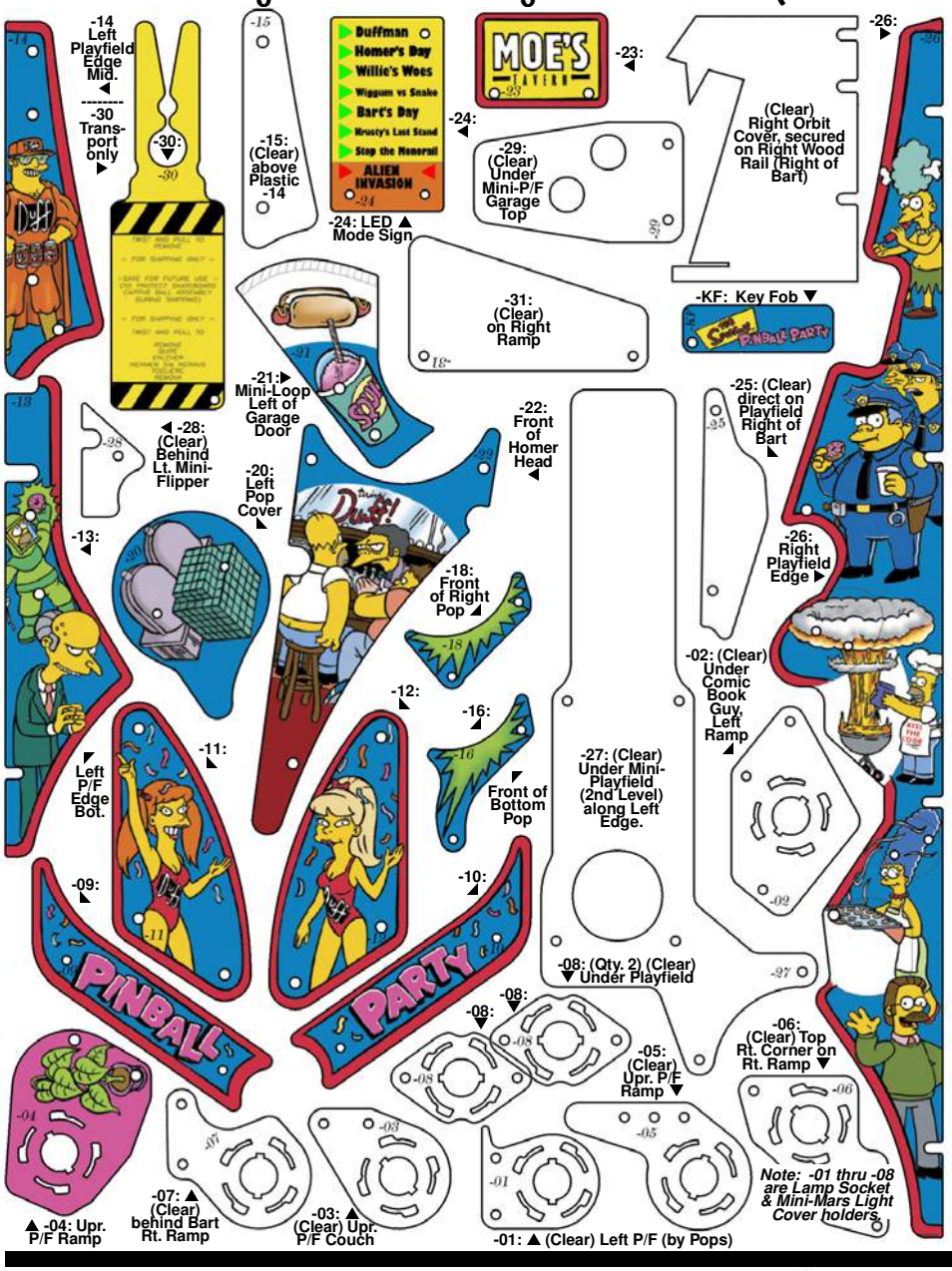


Take Note:

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

1. For Sockets & Bulbs (drawings & part numbers) see Pgs. **72-74**.
2. Some items or parts *may be included with* **or** *associated with* a Major Assembly or Ramp Assembly; **see the Blue Pages, Sec. 4, Chp. 2**. for parts required not appearing on this page. If you still cannot find the part required, Call Stern Pinball, Inc.® Technical Support, 1-800-542-5377 or 1-708-345-7700 (Opt. 1).
3. **Legend Note:** Items noted with a black square ■ are General Parts. Items noted with a white square □ are Switches and Miscellaneous PC Board(s).

Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals



PLASTICS KIT	SPI PART №
Kit: Plastics (Screened & Clear) *(Shown Above the Black Line)*	803-5000-77
DECALS KIT	**SPI PART №**
Kit: Game Specific Decals *(Shown Below the Black Line)*	802-5000-77

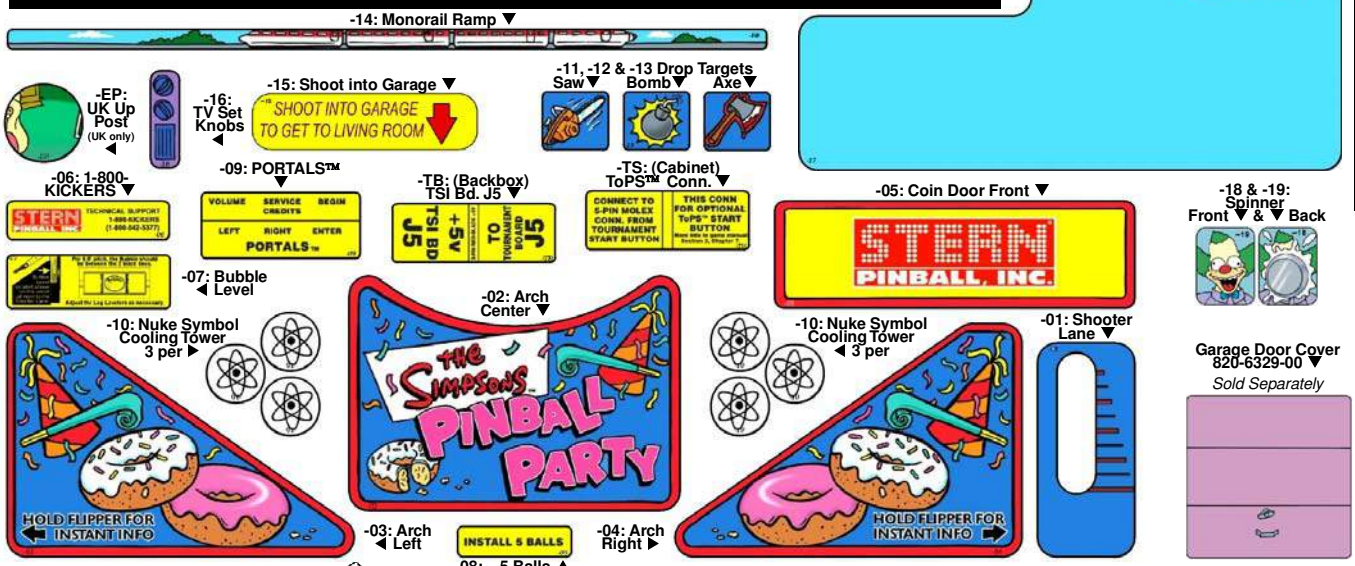
Attention: ***No individual Plastic or Decal can be ordered separately, unless noted otherwise*.*** *The individual decals listed on this page which* ***are not included*** *in either Kit are described below.*

Some duplicate plastics or decals pieces can be found in the Spare Parts Bag included with this Pinball Machine.

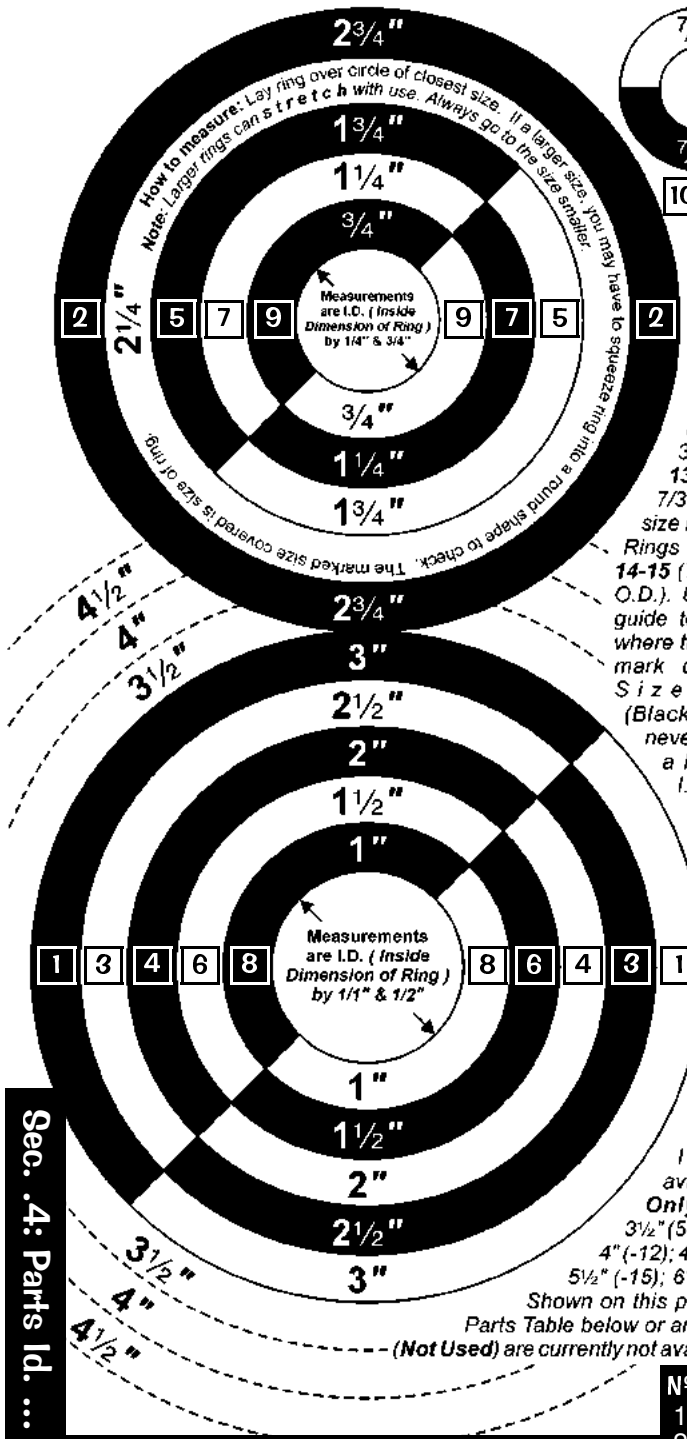
For location purposes, most pieces are identified by a sequential 2-digit number or letter (some numbers may be skipped or not apparent).

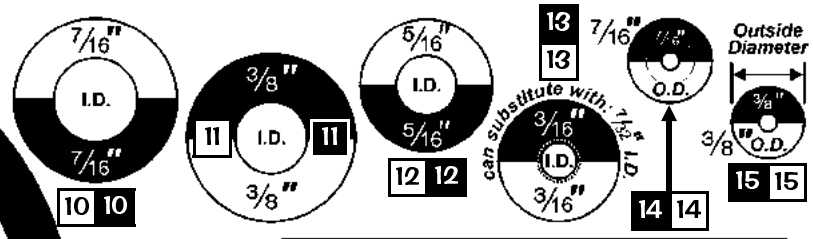
Other miscellaneous plastics and/or decals can be found on the Backbox & Speaker Panel Assemblies (Pages ***60-61****), Cabinet - General Parts (Pages* ***62-63****) and Main Playfield - General Parts & Switches (Below) (Page* ***66****).*

* ***Not included*** *in the Decals Kit (must be ordered separately):*
* **Garage Door Cover** *(Material : Suede Lexan)* * **820-6329-00**
* **Full Playfield Clear Mylar Sheet (Click to View)** * **820-5887-00**



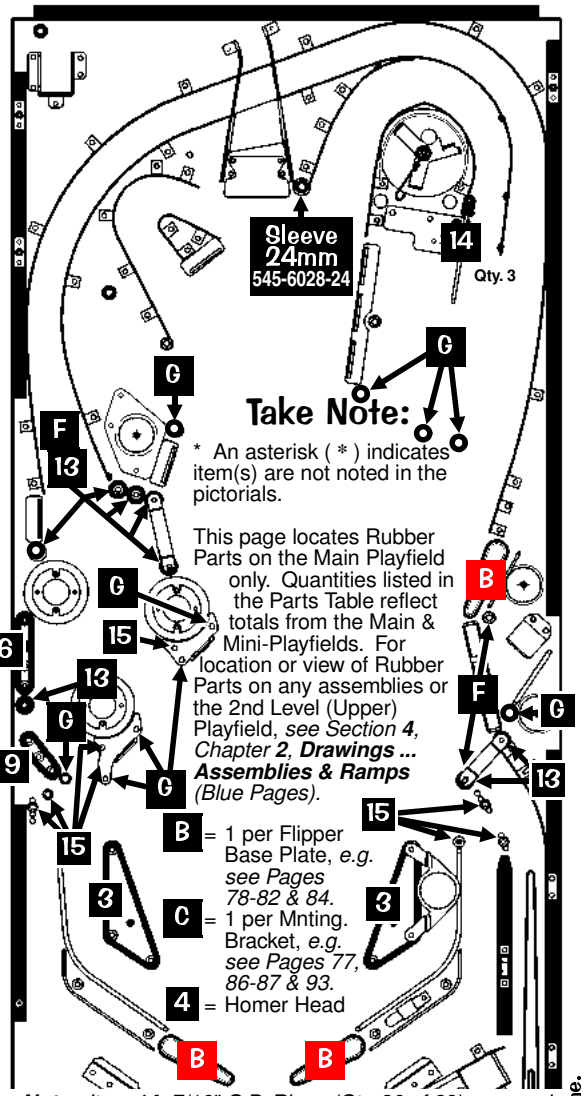
Main Playfield - Rubber Parts Red ■ & Black ■ (Rings Actual Size) †





*Items **1-13** are measured by the Inside Diameter (I.D.). Items **1-9** and **11** are approximately 1/4" thick. Items **10, 12-15** are approximately 3/16" thick. Item **13** can also be a 7/32" I.D Ring. The size is imprinted on all Rings except for Items **14-15** (7/16" O.D. & 3/8" O.D.). Use this page as a guide to measure rings where the size imprint or mark does not exist. Size 2¼" I.D. (Black or White) was never used. Choose a Ring Size +/- ¼" I.D. if required.*

***Note:** Sizes larger than 3" I.D. currently available in **Black Only (Not Used)**: 3½" (545-5348-11); 4" (-12); 4½" (-13); 5" (-14); 5½" (-15); 6" (-16). Sizes Not Shown on this page, listed in the Parts Table below or are noted with **N/U (Not Used)** are currently not available.*



Take Note:

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

This page locates Rubber Parts on the Main Playfield only. Quantities listed in the Parts Table reflect totals from the Main & Mini-Playfields. For location or view of Rubber Parts on any assemblies or the 2nd Level (Upper) Playfield, *see Section **4**, Chapter **2**, **Drawings ... Assemblies & Ramps** (Blue Pages).*

B = 1 per Flipper Base Plate, *e.g. see Pages 78-82 & 84.*

C = 1 per Mnting. Bracket, *e.g. see Pages 77, 86-87 & 93.*

4 = Homer Head

***Note:** Item **14**, 7/16" O.D. Rings (Qty. 26 of 29) are used to cusion the Bayonet (Metal) Sockets under the playfield.*

№	RUBBER PART NAME	QTY.	SPI PART №
A*	Small Flipper **BLACK** Ring		545-5207-00
	Sm. Flipper **RED** (Soft Duro) Ring	2	545-5207-**22**
B	Large Flipper **BLK** (50 Duro) Ring		545-5277-00
	Lg. Flipper **RED** (Soft Duro) Ring	3	545-5277-**22**
	Optional Item B Replacements: Lg. **YELLOW (50 Duro)** Ring (**545-5277-04**) or Large **YELLOW (40 Duro)** Ring (**545-5277-06**)		
C*	Bumper (Deflector Pad)	6	545-5428-00
D*	Bumper (Grommet) 1138 (A60)	5	545-5105-00
E*	Bumper (Post)		545-5009-00
F*	Bumper (Post Sleeve, Short)	7	545-5151-00
G	Bumper **BLACK** (Post Sleeve, Tall)	10	545-5308-00
	Bumper **WHITE** (Post Sleeve, Tall)		545-5308-08
H*	O-Ring 11/32" x 07/32" x 1/16" (Flipper Buttons)	2	545-5850-00

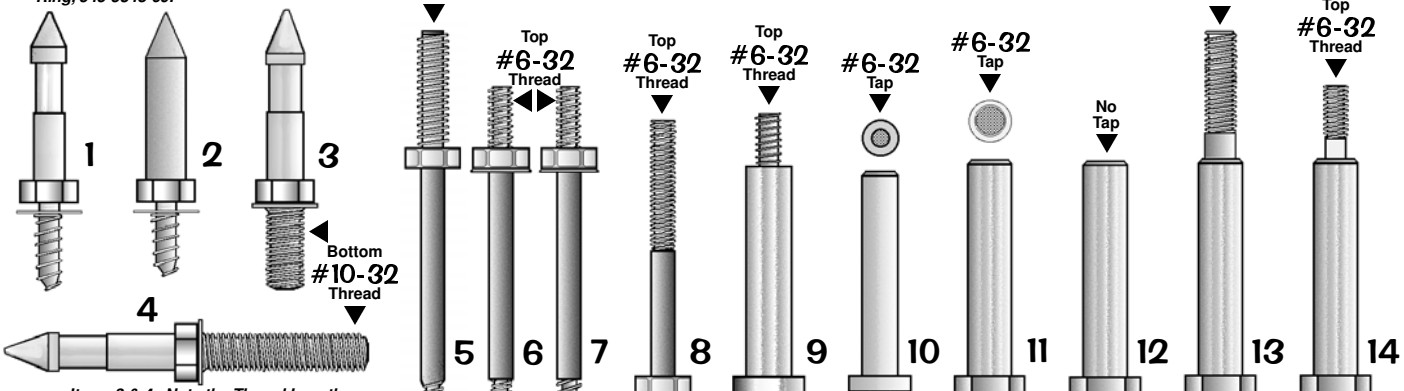
№	SPI PART №	QTY.	RUBBER PART NAME	QTY.	SPI PART №	№
1	545-5348-10		Black 3" I.D. Ring White		-60 N/U	1
2	545-5348-20		Black 2¾" I.D. Ring White		-70 N/U	2
3	545-5348-09	2	Black 2½" I.D. Ring White		545-5348-59	3
4	545-5348-08	1	Black 2" I.D. Ring White		545-5348-58	4
5	545-5348-21		Black 1¾" I.D. Ring White		-71 N/U	5
6	545-5348-07	1	Black 1½" I.D. Ring White		545-5348-57	6
7	545-5348-06		Black 1¼" I.D. Ring White		545-5348-56	7
8	545-5348-05		Black 1" I.D. Ring White		-55 N/U	8
9	545-5348-04	1	Black ¾" I.D. Ring White		545-5348-54	9
10	545-5348-18		Black 7/16" I.D. Ring White		-68 N/U	10
11	545-5348-03	1	Black ⅜" I.D. Ring White		-53 N/U	11
12	545-5348-02		Black 5/16" I.D. Ring White		545-5348-52	12
13	545-5348-01	13	Black 3/16" I.D. Ring White		545-5348-51	13
14	545-5348-17	29	Black 7/16" O.D. Ring White		-67 N/U	14
15	545-5348-19	12	Black ⅜" O.D. Ring White		545-5348-69	15

† Items with no Qty. (quantity) are not used in this game. Size and/or quantities may change during production.

Sec. .4: Parts Id. ...

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

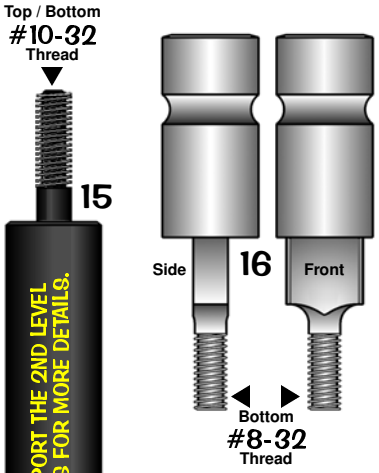
Items 1, 3 & 4 Posts can use 3/8" O.D. Black Ring, 545-5348-19 or White Ring, 545-5348-69.



Items 3 & 4: Note the Thread Lengths.

Item 16 Adjustable Sliding Post can use 5/16" I.D. Black Ring, 545-5348-02 or White Ring 545-5348-52.

Items 11-14 Posts can use a Black Post Rubber Sleeve (Tall), 545-5308-00 or White Post Rubber Sleeve (Tall), 545-5308-08.



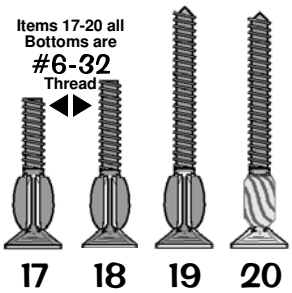
THIS GAME ONLY: 3 REQUIRED TO SUPPORT THE 2ND LEVEL UPPER PLAYFIELD. SEE THE BLUE PAGES FOR MORE DETAILS.

Items 17 & 18 are typically used with Hex Spacers above the Playfield.

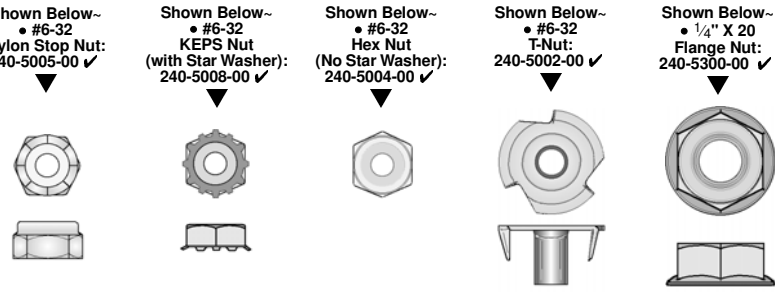
Item 19 is typically used with the bottom Cabinet Speaker (used with #6-32 Nylon Stop Nut, 240-5005-00).

Item 20 is typically used to secure "Item 15 (515-5939-00) in Bumper Bottom Assembly, 515-6459-04".

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



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



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

Top & Side Views

Nylon Stop Nuts *Not Shown:*

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

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

Bottom & Side Views

KEPS Nuts *Not Shown:*

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

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

Top View

Hex Nuts *Not Shown:*

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

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

Bottom & Side Views

T-Nuts *Not Shown:*

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

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

Top & Side Views

Miscellaneous Nuts *Not Shown:*

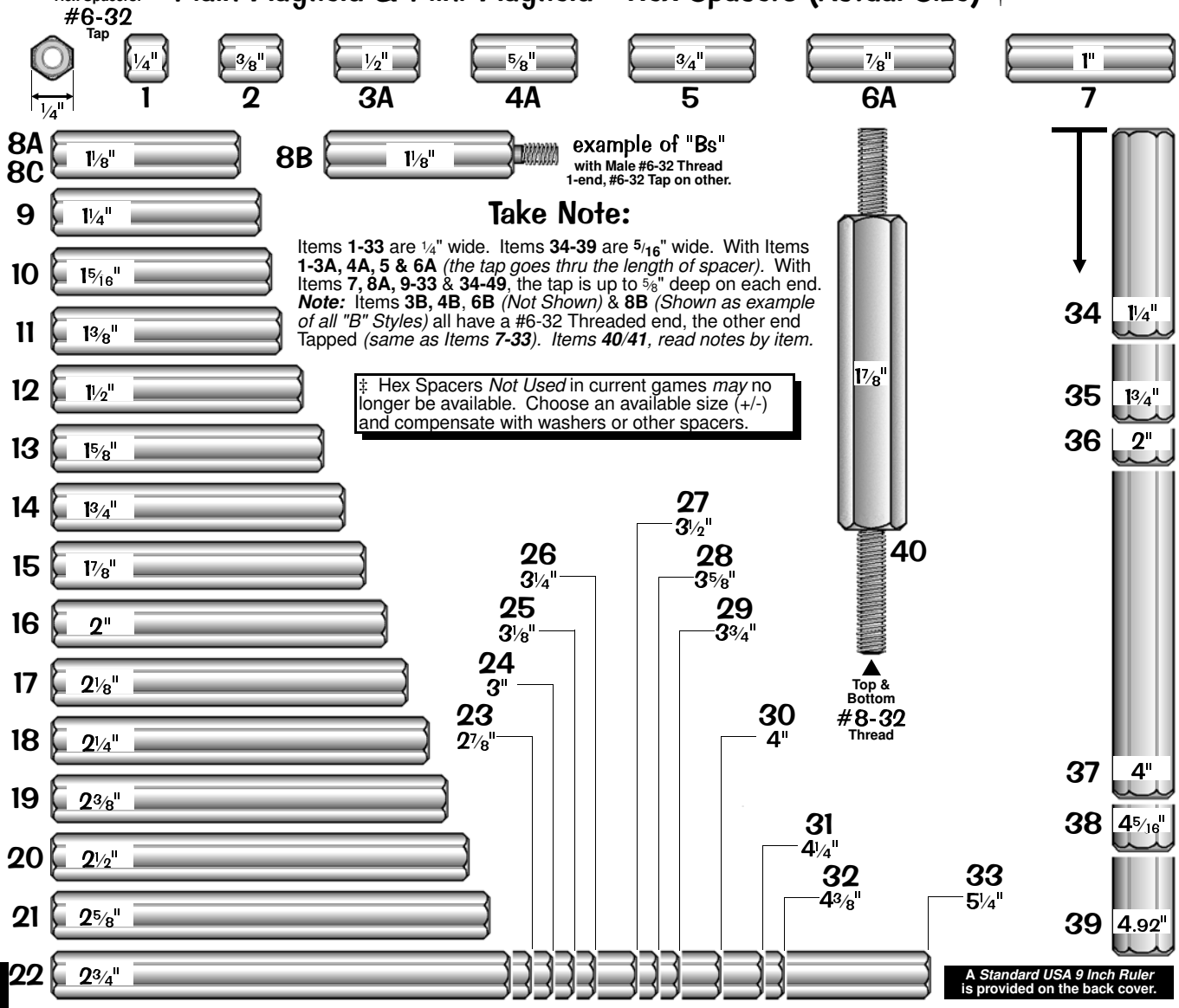
- Plastic Pal Nut (on Flipper Buttons): 240-5003-00
- Metal Pal Nut (on Flipper Buttons): 240-5003-01 ✔
- #6-32 Wing Nut: 240-5001-00
- #8-32 Wing Nut: 240-5100-00
- 1/4"-20 Wing Nut: 240-5302-00
- 1/4"-20 Toggle Wing: 240-5324-00

№	METAL POST NAME	QTY.	SPI PART №
1	Mini-Post Wood Screw	2	530-5004-00
2	Mini-Post Wood Screw (no cut-away)	4	530-5004-01
3	Mini-Post MS / #10-32 Bot. .4" Thread	2	530-5005-01
4	Mini-Post MS / #10-32 Bot. .875" Thread	10	530-5005-00
5	Post Fasten #8-32 Top / #6-32 Bot.	1	530-5008-00
6	Post Fasten #6-32 Top / #6-32 Bot.	10	530-5012-02
7	Post Fstn. #6-32 Top / Wood Scr. Bot.	12	530-5010-02
8	Post #6-32 Top / Wood Screw Bottom		530-5263-01
9	Post Fasten #6-32 Top / #8-32 Bot.		530-5007-00
10	Post #6-32 Tap / #6-32 Bottom		530-5127-00

№	METAL POST NAME	QTY.	SPI PART №
11	Post Hex Base #6-32 Tap/#10-32 Bot.		530-5332-01
12	Post Hex Base (No Tap)/#10-32 Bot.	3	530-5332-00
13	Post Hex Base #8-32 Top/#10-32 Bot.		530-5332-02
14	Post Hex Base #6-32 Top/#10-32 Bot.	10	530-5332-03
15	#10-32 Top/Bot. X 3½" P/F Post (Black)	3	530-5612-00
16	*Adjustable* Sliding Post (Brass) #8-32 Bot.		530-5621-00
17	#6-32 X 3/4" Fin Shank Screw	10	237-5921-02
18	#6-32 X 7/8" Fin Shank Screw	4	237-5921-04
19	#6-32 X 1¼" Fin Shank Screw	6	237-5883-00
20	#6-32 X 1 3/16" Spirol Fin Shank Screw	9	237-5957-00

† Items with no Qty. (quantity) are not used in this game. Size and/or quantities may change during production.

Main Playfield & Mini-Playfield - Hex Spacers (Actual Size) †



Take Note:

Items **1-33** are 1/4" wide. Items **34-39** are 5/16" wide. With Items **1-3A, 4A, 5 & 6A** *(the tap goes thru the length of spacer)*. With Items **7, 8A, 9-33** & **34-49**, the tap is up to 5/8" deep on each end. ***Note:*** Items **3B, 4B, 6B** *(Not Shown)* & **8B** *(Shown as example of all "B" Styles)* all have a #6-32 Threaded end, the other end Tapped *(same as Items **7-33**). Items **40/41**, read notes by item.*

‡ Hex Spacers *Not Used* in current games *may* no longer be available. Choose an available size (+/-) and compensate with washers or other spacers.

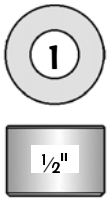
A *Standard USA 9 Inch Ruler* is provided on the back cover.

Nº	HEX SPACER NAME	QTY.	SPI PART Nº
1	1/4" X 1/4" : #6-32 Tap *(both ends)*		254-5008-00
2	3/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-12
3A	1/2" X 1/4" : #6-32 Tap *(both ends)*	8	254-5008-03
3B*	Identical to **3A** *with #6-32 Thread end*		254-5024-03
4A	5/8" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-02
4B*	Identical to **4A** *with #6-32 Thread end*		254-5024-02
5	3/4" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-04
6A	7/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-05
6B*	Identical to **6A** *with #6-32 Thread end*		254-5024-05
7	1" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-06
8A	1 1/8" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-17
8B	Identical to **8A** *with #6-32 Thread end*		254-5024-17
8C	... to 8A *with **#8-32** Tap (both ends)*		254-5031-06
9	1 1/4" X 1/4" : #6-32 Tap *(both ends)*	2	254-5008-11
10	1 5/16" X 1/4" : #6-32 Tap *(both ends)*		254-5008-34
11 ‡	1 3/8" X 1/4" : #6-32 Tap *(both ends)*	4	254-5008-33
12	1 1/2" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-09
13 ‡	1 5/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-13
14	1 3/4" X 1/4" : #6-32 Tap *(both ends)*	2	254-5008-10
15 ‡	1 7/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-20
16	2" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-07
17	2 1/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-32
18	2 1/4" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-18
19	2 3/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-28
20	2 1/2" X 1/4" : #6-32 Tap *(both ends)*	2	254-5008-16
21	2 5/8" X 1/4" : #6-32 Tap *(both ends)*	7	254-5008-08
22	2 3/4" X 1/4" : #6-32 Tap *(both ends)*	5	254-5008-15
23	2 7/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-31
24	3" X 1/4" : #6-32 Tap *(both ends)*	3	254-5008-14
25	3 1/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-19
26	3 1/4" X 1/4" : #6-32 Tap *(both ends)*		254-5008-26
27	3 1/2" X 1/4" : #6-32 Tap *(both ends)*		254-5008-27
28	3 5/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-25
29	3 3/4" X 1/4" : #6-32 Tap *(both ends)*		254-5008-36
30	4" X 1/4" : #6-32 Tap *(both ends)*	1	254-5008-21
31	4 1/4" X 1/4" : #6-32 Tap *(both ends)*		254-5008-30
32	4 3/8" X 1/4" : #6-32 Tap *(both ends)*		254-5008-29
33	5 1/4" X 1/4" : #6-32 Tap *(both ends)*		254-5008-35
34	1 1/4" X 5/16" : #6-32 Tap *(both ends)*		254-5018-09
35	1 3/4" X 5/16" : #6-32 Tap *(both ends)*		254-5018-06
36	2" X 5/16" : #6-32 Tap *(both ends)*		254-5018-07
37	4" X 5/16" : #6-32 Tap *(both ends)*		254-5018-03
38	4 5/16" X 5/16" : #6-32 Tap *(both ends)*		254-5018-00
39	4.92" X 5/16" : #6-32 Tap *(both ends)*		254-5018-04
40	1 7/8" X 3/8" : #8-32 *Thread (both ends)*		***530***-5285-00

† Items with no Qty. (quantity) are not used in this game. Size and/or quantities may change during production.

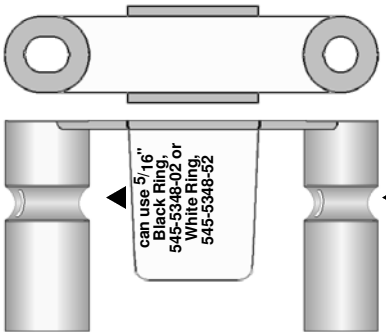
Main Playfield & Mini-Playfield - Posts & Spacers (Actual Size) †

Item 1, Metal Spacer, used in the Backbox *(see securing hardware*

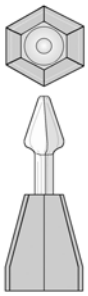


under Items AP-B/-C on Page 61).

2** Various Colors

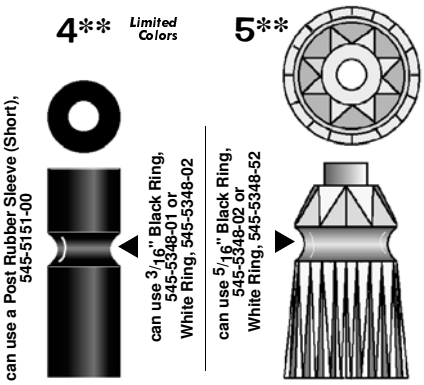


3** Various Colors



4** Limited Colors

5**



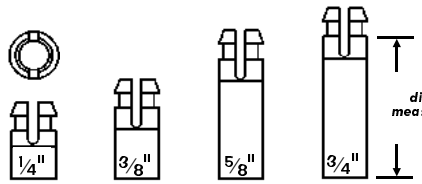
Items 4-5 Posts used in pairs can use ¾" through 3" Rubber Rings, *(See Rubber Parts for Part Nºs).*

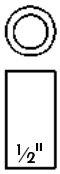
Take Note:

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

** Items **2, 4 & 5** come in various colors *(may not be available in every color).* Item **4** is currently only available in the color(s) stated in this game manual *(other colors used in prior games may no longer be available).* The "**-XX**" or last 2-Digits in Part Nºs which come in various colors, should be replaced with the desired 2-Digit Nº. from the above Color Chart. *Some colors may no longer be available for desired item.*

6 ‡ 7 ‡ 8 ‡ 9 ‡



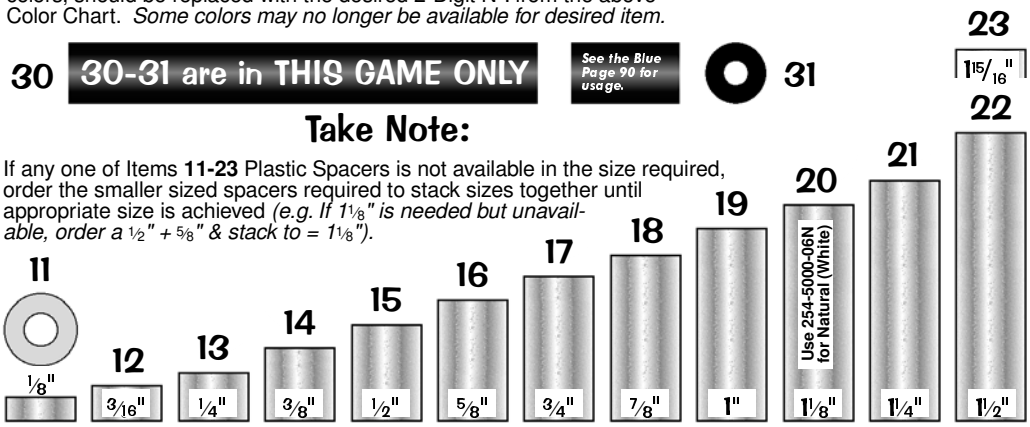


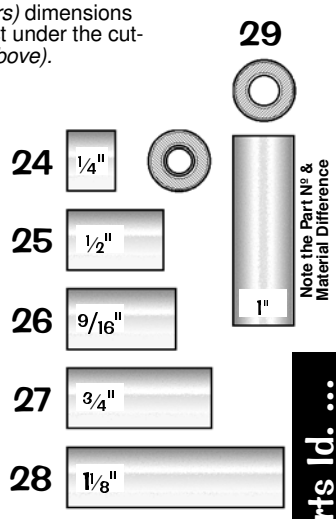
‡ Items **6** through **9** *(Board Spacers)* dimensions are measured from bottom to just under the cut-away *(see pictorial with Item **9** above).*

30 **30-31 are in THIS GAME ONLY** See the Blue Page 90 for usage. 31

Take Note:

If any one of Items **11-23** Plastic Spacers is not available in the size required, order the smaller sized spacers required to stack sizes together until appropriate size is achieved *(e.g. If 1⅛" is needed but unavailable, order a ½" + ⅝" & stack to = 1⅛").*





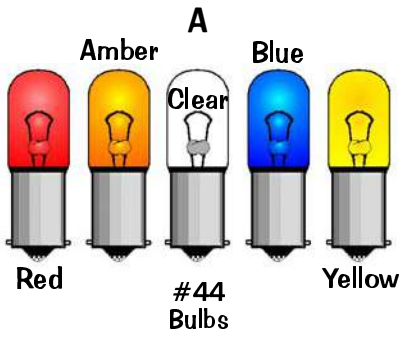
Nº	POST & SPACER NAME	QTY.	SPI PART Nº
1	⅜" X ½" Metal Spacer (Backbox)	2	530-5099-00
2**	Top Lane Plastic Mini-Light Hood		550-5061-XX
	Item 2 typically secured by: #6-32 X 1-3/4" PPH MS (Zinc) (Qty. 2/per) (237-5511-00) **and** Washer 9/64" X 5/16" OD X 1/32" (Qty. 2/per) (242-5017-00)		
3**	Mini-Jewel Plastic Post		550-5052-XX
	Item 3 typically secured by: #6 X 3/8" HWH AB (Zinc) (Qty. 1/per) (234-5000-00)		
4**	1 1/16" 1-Groove Plastic Post (Black)	39	550-5059-00
	1 1/16" 1-Groove Plastic Post (Clear)	1	550-5059-01
5**	1-Groove Jewel Plastic Post		550-5034-XX
	Items 4 & 5 typically secured by: Post Fastening Screw #6-32 Top / #6-32 Bottom (Qty. 1/per) (530-5012-02, Item 7 Page 69).		
6 ‡	¼" Slf. Rtn. Plastic Spacer White		254-5007-02
7 ‡	⅜" Slf. Rtn. Plastic Spacer White		254-5007-01
8 ‡	⅝" Slf. Rtn. Plastic Spacer White		254-5007-00
9 ‡	¾" Slf. Rtn. Plastic Spacer White		254-5007-03
10	½" X ¼" Plastic Spacer White **(Narrow)**		254-5000-03
11	⅛" X ⅜" Plastic Spacer Gray		254-5000-19
12	3/16" X ⅜" Plastic Spacer Gray	7	254-5000-18
13	¼" X ⅜" Plastic Spacer Gray	14	254-5000-02

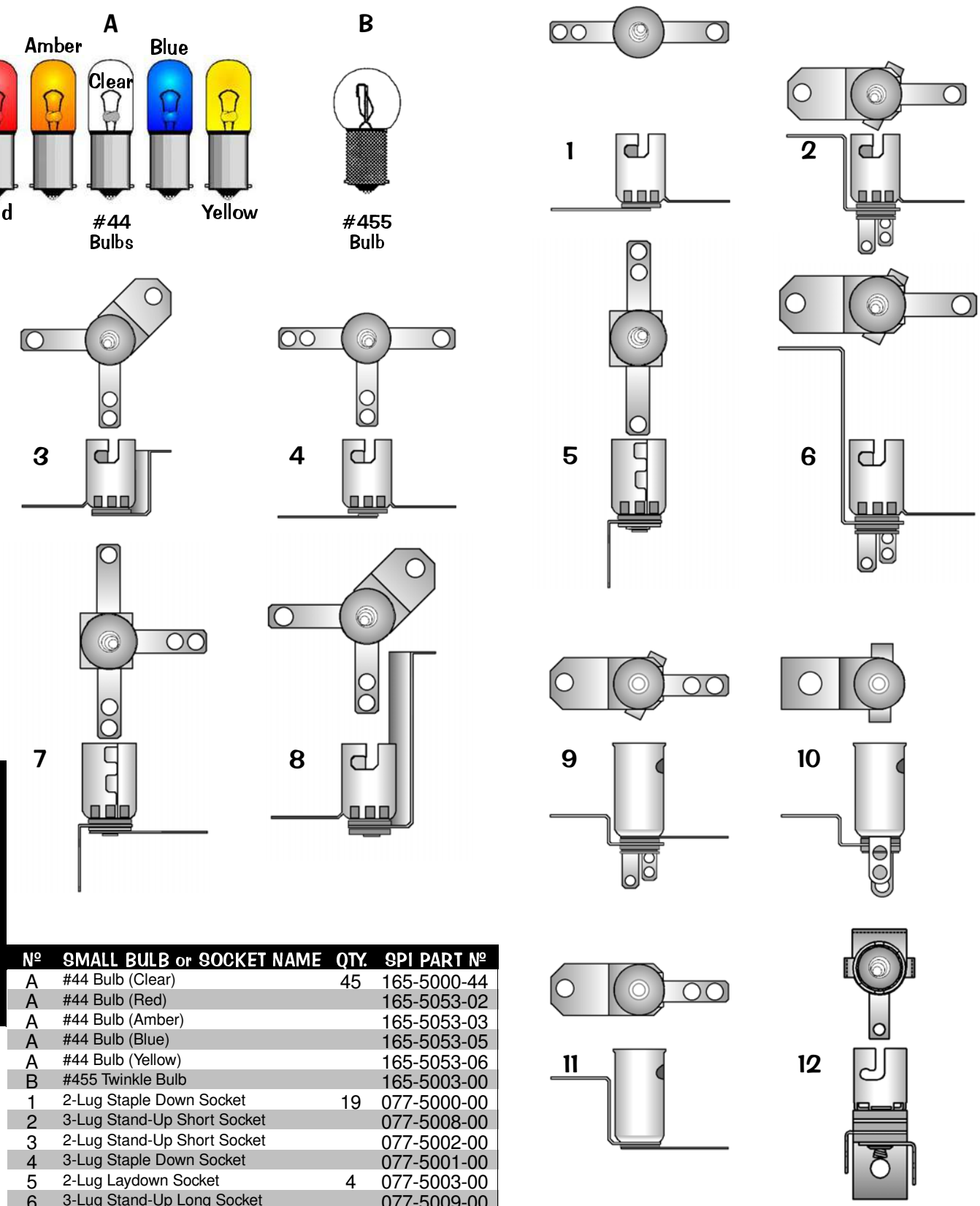
Nº	POST & SPACER NAME	QTY.	SPI PART Nº
14	⅜" X ⅜" Plastic Spacer Gray	2	254-5000-12
15	½" X ⅜" Plastic Spacer Gray	4	254-5000-01
16	⅝" X ⅜" Plastic Spacer Gray	2	254-5000-14
17	¾" X ⅜" Plastic Spacer Gray	1	254-5000-07
18	⅞" X ⅜" Plastic Spacer Gray		254-5000-11
19	1" X ⅜" Plastic Spacer Gray *or* Black	2	254-5000-04
20	1⅛" X ⅜" Plastic Spacer Gray		254-5000-06
	1⅛" X ⅜" Plastic Spacer Natural		254-5000-06N
21	1¼" X ⅜" Plastic Spacer Gray		254-5000-05
22	1½" X ⅜" Plastic Spacer Gray	1	254-5000-08
23	1 15/16" X ⅜" Plastic Spacer Gray	1	254-5000-15
24	¼" X 5/16" X .144" I.D. Metal Spacer		254-5014-03
25	½" X 5/16" X .144" I.D. Metal Spacer	3	254-5014-00
26	9/16" X 5/16" X .144" I.D. Metal Spacer		254-5014-04
27	¾" X 5/16" X .144" I.D. Metal Spacer		254-5014-01
28	1⅛" X 5/16" X .144" I.D. Metal Spacer		254-5014-02
29	1" X 5/16" X .144" I.D. Metal Spacer		254-5001-00
30	2-7/16" X 5/16" X ⅛" O.D. Pl. Spcr. Blk.	1	254-5035-00
31	9/16" X 5/16" X ⅛" O.D. Plstc. Spcr. Blk.	2	254-5034-00

† Items with no Qty. (quantity) are not used in this game. Size and/or quantities may change during production.

Sec. 4: Parts Id. ...

Main Playfield & Mini-Playfield - Small Bayonet Type Bulbs & Sockets (Actual Size) †





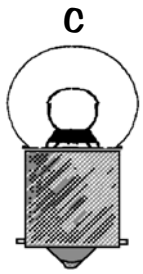
№	SMALL BULB or SOCKET NAME	QTY.	SPI PART №
A	#44 Bulb (Clear)	45	165-5000-44
A	#44 Bulb (Red)		165-5053-02
A	#44 Bulb (Amber)		165-5053-03
A	#44 Bulb (Blue)		165-5053-05
A	#44 Bulb (Yellow)		165-5053-06
B	#455 Twinkle Bulb		165-5003-00
1	2-Lug Staple Down Socket	19	077-5000-00
2	3-Lug Stand-Up Short Socket		077-5008-00
3	2-Lug Stand-Up Short Socket		077-5002-00
4	3-Lug Staple Down Socket		077-5001-00
5	2-Lug Laydown Socket	4	077-5003-00
6	3-Lug Stand-Up Long Socket		077-5009-00
7	3-Lug Laydown Socket (3 Lugs Flat)		077-5006-00
8	2-Lug Stand-Up Long Socket		077-5005-00
9	3-Lug Stand-Up Long Shell Socket		077-5013-00
10	2-Lug Stand-Up Lg. Shell Socket (Gls)	22	077-5031-00

№	SOCKET NAME	QTY.	SPI PART №
11	1-Lug Stand-Up Long Shell Socket		077-5012-00
12	3-Lug Laydown Socket (2 Lugs Bent)		077-5032-00

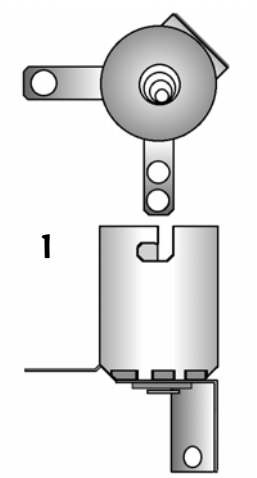
† Items with no Qty. (quantity) are not used in this game. Size and/or quantities may change during production.

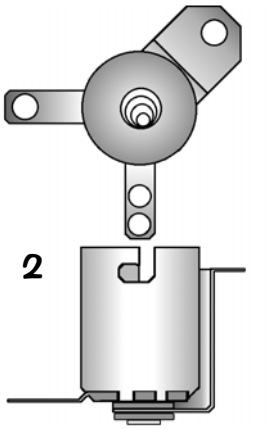
Main Playfield - Large Bayonet Type Bulb and Sockets (Actual Size) †

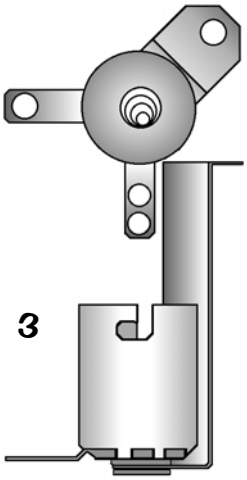
(None Used in this Game)

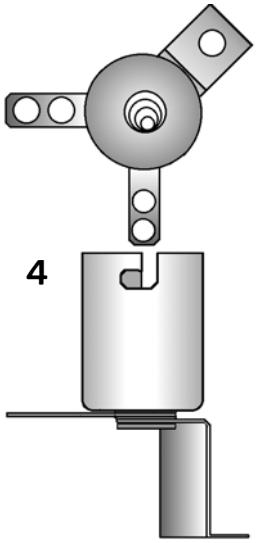


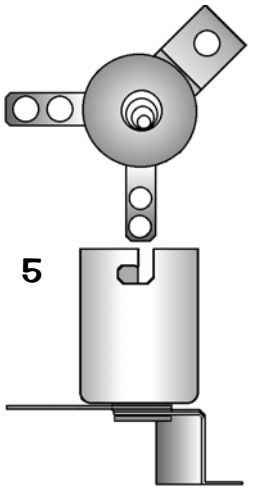
#89
Bulb

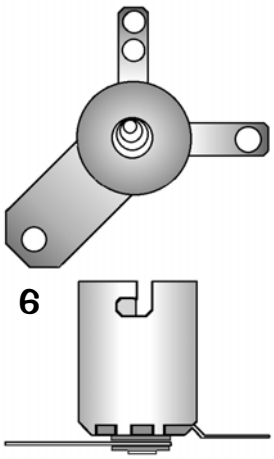










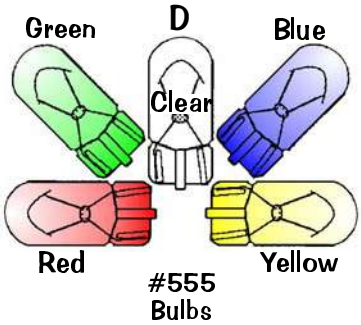


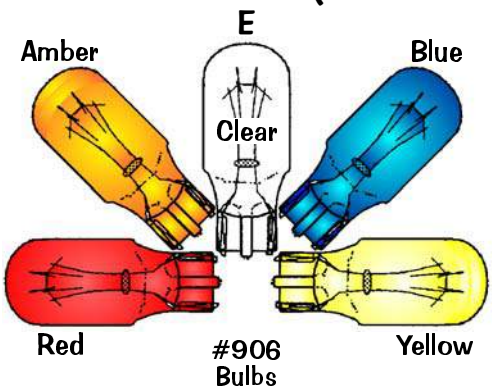
† Items with no Qty. (quantity) are not used in this game.
Size and/or quantities may change during production.

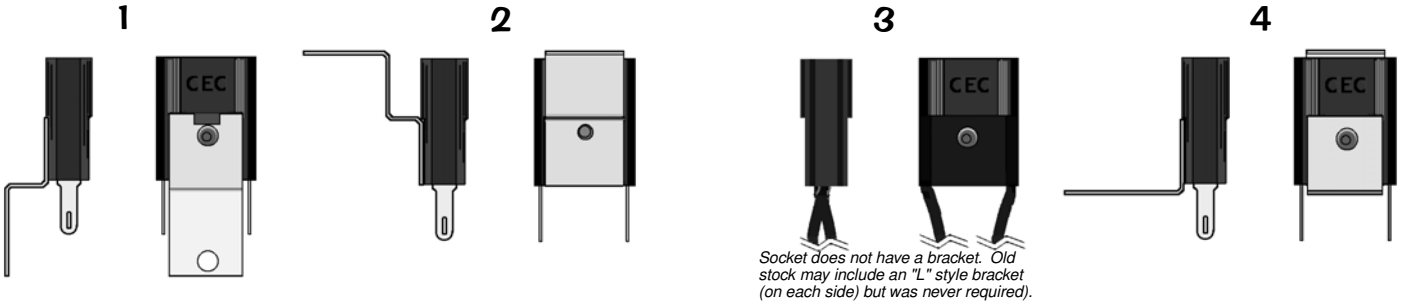
№	LARGE BULB & SOCKET NAME	QTY.	SPI PART №
C	#89 Bulb		165-5000-89
1	Laydown Standard Socket		077-5100-00
2	2-Lug Stand-Up Short Socket		077-5101-00

№	LARGE BULB & SOCKET NAME	QTY.	SPI PART №
3	2-Lug Stand-Up Long Socket		077-5102-00
4	Stand-Up Socket Rev. Short		077-5103-00
5	2-Lug Stand-Up Small Socket		077-5106-00
6	Straight Leg Socket		077-5107-00

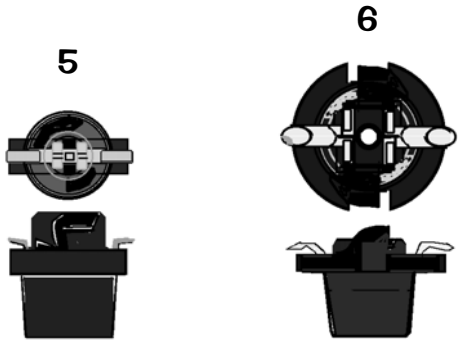
Main Playfield & Mini-Playfield - Wedge Base Bulbs and Sockets (Actual Size) †



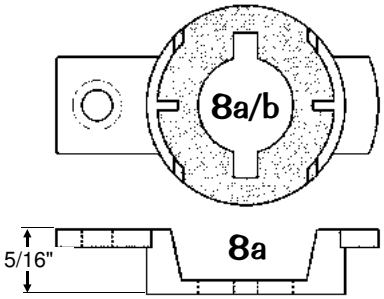




Socket does not have a bracket. Old stock may include an "L" style bracket (on each side) but was never required).



8a/b Top View (8b Side View is Not Shown)



Take Special Note

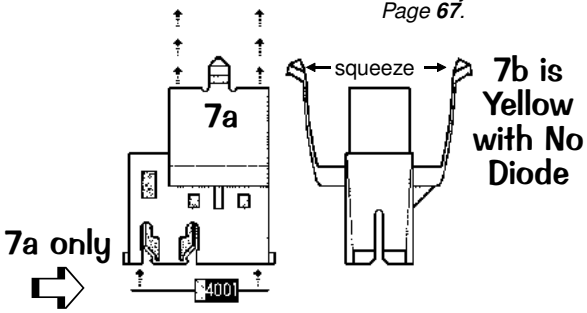
Item 7a is an **IDC** (Insulation Displacement Connection) Style Socket (this style is solderless). This socket is secured to the playfield or component by Items **8a** or **8b** Snap-On Socket Brackets, or *may* also be snapped into specially cut **Clear and/or Screened Plastic Pieces** *(used only when sockets are positioned closely together and/or in a special applications, e.g. on Ramps). If Plastic Pieces are used to mount some **7a** or **7b** Sockets, it will be noted on the Main Playfield & Mini-Playfield - Plastics & Decals, Page **67**.*

Take Note:

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

1. Item **3** Socket has 2 Wires attached are approximately 12" ea.
2. Item **5** Socket **was** used on PC Light Boards to position bulbs vertically; Item **5** Socket is secured by "twisting" into place.
3. Item **D** Bulb (#555) can be used in all sockets, *except Item **6***. Item **E** Bulb (#906) can be used in all sockets, *except Item **5***.
4. Item **7a** Socket is equipped with a *built-in* Diode, 1N4003 (112-5003-00), however, replacement can be made with a 1N4001 Diode (112-5001-00). Item **7b** Socket is ***NOT*** equipped with a diode *(Not Required)*.

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



№	WEDGE BULB & SOCKET NAME	QTY.	SPI PART №	№	WEDGE BULB & SOCKET NAME	QTY.	SPI PART №
D	#555 Wedge Base Bulb (Clear)	72	165-5002-00	1	Wedge Base Socket (Laydown)	12	077-5026-01
D	#555 Wedge Base Bulb (Red)		165-5054-02	2	Wedge Base Socket (Offset)		077-5029-00
D	#555 Wedge Base Bulb (Green)		165-5054-04	3	W.B. Socket (Bumpers/Special App.)	4	077-5206-00
D	#555 Wedge Base Bulb (Blue)		165-5054-05	4	Wedge Base Socket (Laydown GI)	1	077-5030-00
D	#555 Wedge Base Bulb (Yellow)		165-5054-06	5	#555 *only* Wedge Base Socket (Twist)		077-5007-00
E	#906 Wedge Base Bulb (Clear)	13	165-5004-00	6	#906 *only* Wedge Base Socket (Twist)		077-5016-00
E	#906 Wedge Base Bulb (Red)		165-5004-02	7a	IDC Snap-On Socket	56	077-5216-00
E	#906 Wedge Base Bulb (Amber)		165-5004-03	7b	IDC Snap-On Socket ***No Diode***	12	077-5216-**01**
E	#906 Wedge Base Bulb (Blue)		165-5004-05	8a	5/16" Ht. Snap-On Socket Bracket	55	545-5760-18
E	#906 Wedge Base Bulb (Yellow)		165-5004-06	8b*	19/32" Ht. Snap-On Socket Bracket		545-5760-19

† Items with no Qty. (quantity) are not used in this game. Size and/or quantities may change during production.

Drawings for Major Assemblies & Ramps (The Blue Pages)

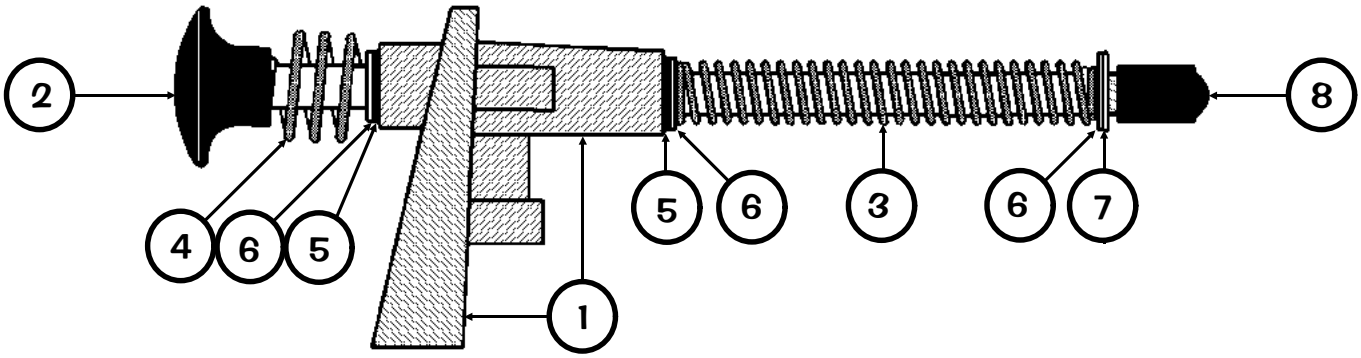
Overview

Drawings are provided for the Major Assemblies in this game with individual parts of each assembly numbered. Items noted with a white circle ○ are mounted above the playfield; items noted with a black circle ● are mounted below. All numbered parts describe the **NAME**, **QUANTITY** & **PART Nº**. **ASSOCIATED PARTS** (**AP-**) are noted and/or viewed with the associated Major Assembly. ***Important:*** Read all "**Take Note:**" items.

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

Manually launch the ball into play.

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	Housing (Shooter Assembly)	1	535-5067-02
	Item 1 is secured to the Cabinet by: Support Plate (Qty. 1) (535-5027-00), #10-32 X 1/2" PPH (Sems) Zinc TF (Qty. 3) (237-6033-00), #10 Split Lock Washer (Qty. 3) (234-5003-00) **and** #6 X 5/8" HWH AB (Zinc) (Qty. 2) (234-5002-00)		
2	Rod Assembly (w/Black Knob)	1	515-6557-00
3	Comp. (Return) Spring (GRN, .035" ø)	1	266-5001-04
4	Compression Spring (Short Plunger)	1	266-5010-00
5	Bushing, 3/8" I.D. (Oilite)	2	280-5010-00
6	Washer, 3/8" I.D. X 5/8" O.D. X 1/16"	3	242-5014-00
7	Retaining Ring, 3/8" ø Shaft	1	270-5012-00
8	Plunger Tip (Black 50 Duro)	1	545-5276-00

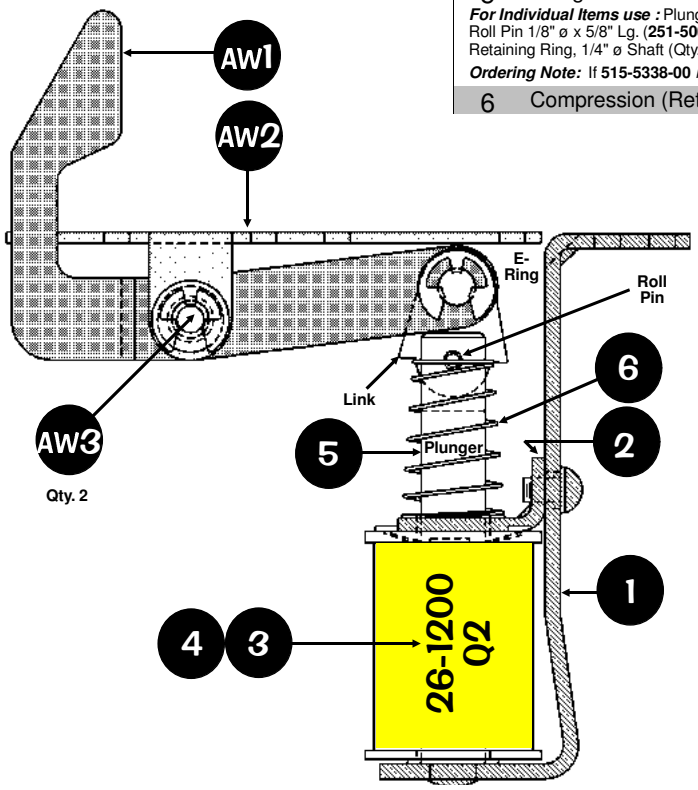


Autoplunger Arm Weld Assembly, 500-6091-00 (Items AW1-AW3) with Autoplunger Coil Assembly, 500-6092-06 (Items 1-6)

Automatically launches the ball into play.

№	... ARM WELD PART NAME	QTY.	SPI PART №
AW1	Arm Weld Assembly	1	515-6526-00
	Item AW1 is secured to Item AW2 by: Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)		
AW2	Autoplunger Fulcrum	1	535-7697-00
AW3	Nyliner, 1/4" (Thomson #4I1-FF)	2	545-5423-00

№	'PLUNGER COIL PART NAME	QTY.	SPI PART №
1	Autoplunger Coil Bracket Assembly	1	515-6527-00
	Item 1 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 9) (234-5101-00)		
2	Coil Retainer Bracket	1	535-5203-03
	Item 2 is secured to Item 1 by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)		
3	Coil, 26-1200	1	090-5044-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
4	Coil Sleeve	1	545-5031-00
5	Plunger & Link Assembly	1	515-5338-00
	For Individual Items use : Plunger 2" Lg. (**530-5025-01**), Plunger Link (**545-5293-00**) **and** Roll Pin 1/8" ø x 5/8" Lg. (**251-5008-00**) **The Plunger Link is secured to the Arm Weld by:** Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)		
	Ordering Note: If **515-5338-00** *is unavailable*, order the individual part(s) actually required.		
6	Compression (Return) Spring	1	266-5020-00



5-Ball Trough Assembly, 500-6318-15 (Items 1-12)

and Associated Parts: See Parts Table below.

Ordering Note: Identical to 500-6318-25 except it does not require Item 10, Trough Ball Guide Plate (used only when magnets are present in the game).

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Ball Trough Outhole Mounting Bracket	1	515-6580-01
	Item 1 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 6) (234-5101-00)		
2	Micro Switch **(Roller Actuator, Lite-Force)**	4	180-5119-02
	Item 2 is secured to Item 1 by: #2-56 X 1/2" HWH (Sr) UNS #4HD TR3 BO (Qty. 6) (237-5937-02) ***Item 2 requires:*** Heat Shrink Tubing 1/8" ø PUI-24 (Qty. 1"/per) (605-5006-00)		
	Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).*		
3	Coil Mounting Bracket	1	535-7330-01
	Item 3 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Sr.) Zinc (Qty. 4) (237-5975-00)		
4	Coil Retaining Bracket	1	535-5203-03
	Item 4 is secured to Item 4 by: #8-32 X 1/4" HWH MS (Serr) Zinc (Qty. 2) (237-5964-01)		
5	Coil, 26-1200	1	090-5044-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
6	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
7	Plunger Assembly	1	515-5941-01
8	Compression (Return) Spring	1	266-5020-00
9	Rubber Bumper (Grommet)	1	545-5105-00

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
10	Trough Ball Guide Plate *Not Required*	0	535-7801-00
	Item 10 is secured to Item 1 by: 1/4" X 5/16" X .144" I.D. Spacer Tap. (Qty. 1) (254-5014-03) **and** #2-56 X 1/2" HWH (Ser) UNS #4HD TR3 BO (Qty. 4) (237-5937-02)		
11	Dual OPTO TRANS Board Assembly	1	515-0173-00
12	Dual OPTO REC Board Assembly	1	515-0174-00
	Items 11 & 12 are by: #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 3/per) (237-5976-04) *For Individual Items use :* Dual OPTO TRANS Bd. (Qty. 1) (**520-5173-00**), Dual OPTO REC Bd. (Qty. 1) (**520-5174-00**), OPTO PCB Tube Spacer (Brass) (Qty. 3/per) (**530-5308-02**) or OPTO PCB Rubber Grommet (Qty. 3/per) (**545-5518-00**)		

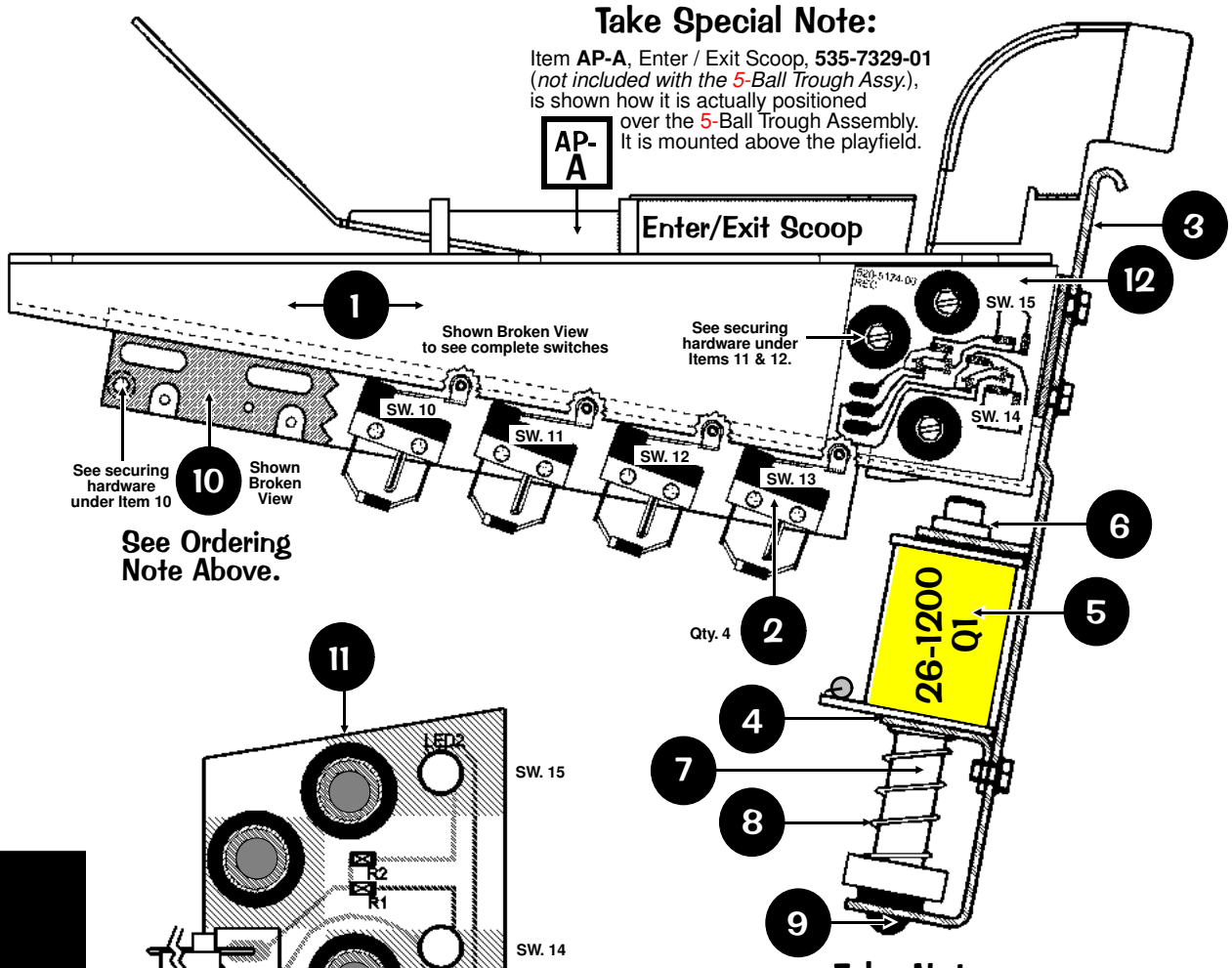
Ordering Note: If **500-6318-15** *is unavailable*, order the individual part(s) actually required. ***This assembly is identical*** to 500-6318-14 except for the quantity of **Item 2** *(an additional switch & diode is required to accomodate this 5-Ball Game).*

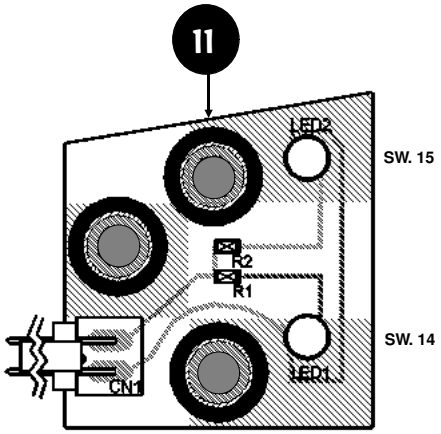
ASSOCIATED PARTS **ARE NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

Nº	ASSOCIATED PART NAME	QTY.	SPI PART Nº
AP-A	Ball Trough Enter / Exit Scoop	1	535-7329-01
	Item AP-A secured to the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 4) (234-5101-00).		
AP-B*	Steel Balls (1-1/16" ø)	5	260-5000-00

Take Special Note:

Item **AP-A**, Enter / Exit Scoop, **535-7329-01** (*not included with the 5-Ball Trough Assy.*), is shown how it is actually positioned over the 5-Ball Trough Assembly. It is mounted above the playfield.





Item 11, Dual OPTO TRANS (Transmitter) Board, 515-0173-00, is mounted on the other side of the Trough Assembly, in line with Item 12, Dual OPTO REC (Receiver) Board, 515-0174-00, using same hardware.

Take Note:

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

For a break-down of parts of Items **11** & **12**, **OPTO Boards** (**515-0173-00** & **515-0174-00**), *see Section **5**, Chapter **4**, **Trough Up-Kicker Dual OPTO Boards Theory of Operation & Schematic**, **Component Layout & Parts**.*

Flipper (Left) Assembly, 500-6543-12 (Items 1-15)
and Assoc. Parts: Yellow Flipper Bat & Shaft Assy., 515-5133-06-06 (Item AP-A/-B)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Flipper Base Plate (**LEFT**)	1	**See FRP1**
	Item 1 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00) ***Ordering Note:*** *Use Item **FRP1**, see the end of this Parts Table.*		
2	Flipper Bat Bushing (White Plastic)	1	545-5070-00
	Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)		
3	Power (End of Stroke) Switch	1	180-5149-00
	Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-04)		
4	Sw. Plate/Spring Return Brkt. (**LEFT**)	1	535-7354-**01**
5	Flipper Return Spring	1	265-5035-**00**
6*	Coil Stop Bracket Sub-Assembly	1	515-6308-01
	Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) **and** #10 Split Lock Washer (Qty. 2) (244-5003-00)		
7	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
	Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)		
9	Coil, 22-1080 (YEL-GRN) (Left)	1	090-5032-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
10*	Coil Sleeve	1	545-5388-00
11	Deflector Pad (Bumper)	1	545-5428-00
12*	Flipper Plunger & Link Sub-Assy.	1	515-6304-03
	ORDERING ABOVE (ITEM 12) SUB-ASSY. PART Nº WILL INCLUDE:		
12A	Flipper Plunger with "Flat"	1	530-5349-01
12B	Plunger "Flipper" Link	1	545-5611-01
	Item 12B is secured to 12A by: Bushing, .16" ø ID X .281" ø OD X .187" (Qty. 1) (530-5532-00) **and** Spirol Pin ø 5/32" X 3/4" Lg. (Qty. 1) (251-5015-02)		

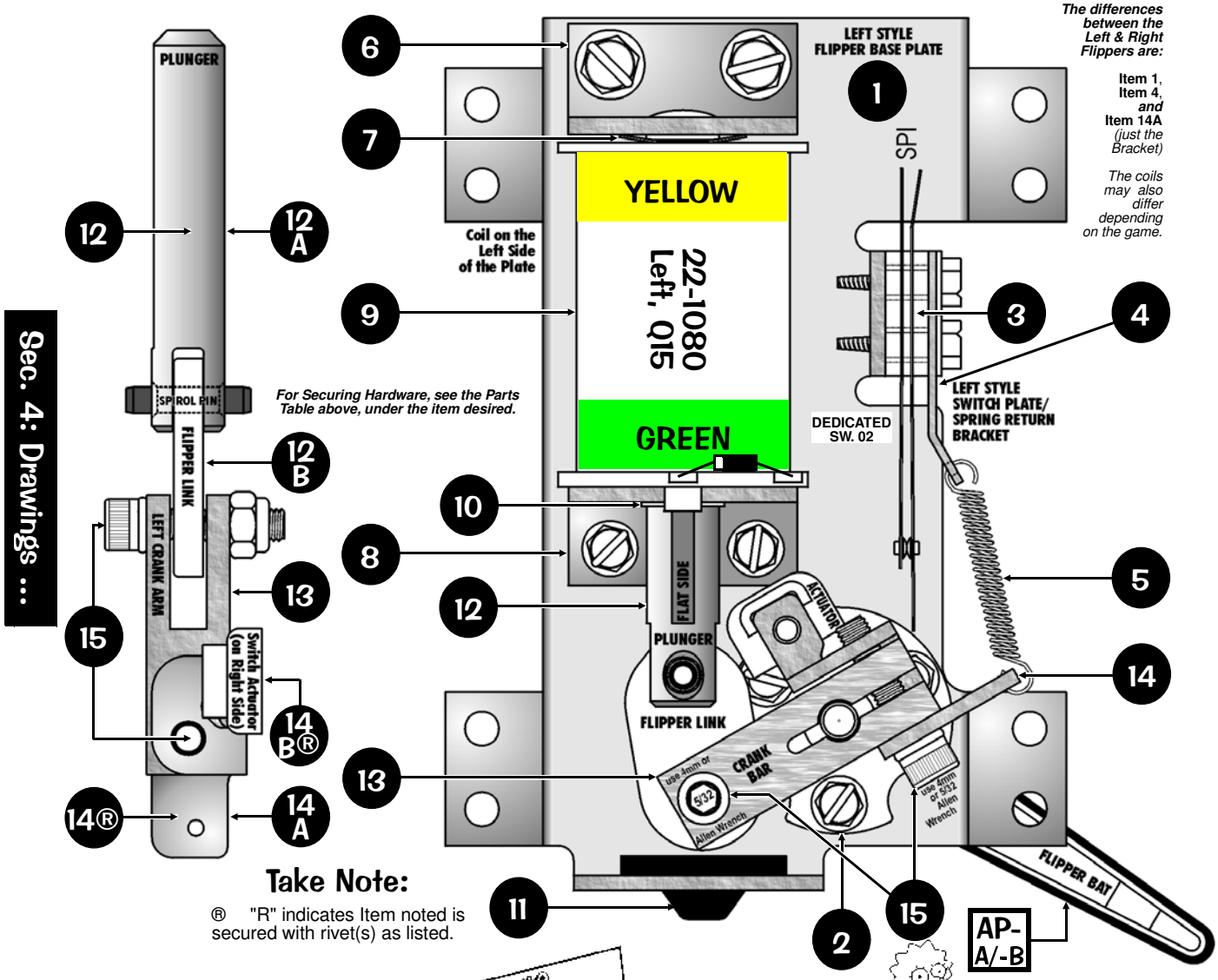
Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
13*	Crank Bar	1	530-5070-02
	Item 13 requires: Bushing, .192" ø ID X .312" ø OD X .195" (Qty. 1) (530-5139-00)		
14*	® Switch Actuator (**LEFT**) Sub-Assy.	1	515-7257-**01**
	ORDERING ABOVE (ITEM 14) SUB-ASSY. PART Nº WILL INCLUDE:		
14A	Actuator & Spring Bracket (**LEFT**)	1	535-9038-**01**
14B	® Switch Actuator (White Plastic)	1	545-5612-00
	Item 14B is secured to 14A by: Rivet, 1/8" ø X 1/4" Lg. (Qty. 1) (249-5003-00)		
15*	Set Screw: #10-32 X 3/4" Socket Hd.	2	237-6144-00
	Item 15 requires: #10-32 Nylon Stop Nut (Qty. 1 *Flipper Link Side Only*) (240-5203-00)		
	Tool Required for Item 15: 5/32" or 4mm Allen Wrench		

Flipper Rebuild Parts for Easier Installation, $ave $:

FRP1	**Flipper Base Plate Kit (LEFT)** *Includes Item 1 pre-threaded, with the Securing Hardware for Items 2, 3, 6 & 8.*	515-6617-**01**
FRP2	**Plunger, Link & Crank (LEFT) Assy.** *Includes above Items 12, 13, 14 and 15 and is pre-assembled.*	515-7203-**01**
FRP3	**Flipper (LEFT) Rebuild Kit** *Same as **FRP2**, but also includes above Items 6 & 10.*	500-6307-**10**

ASSOCIATED PARTS **ARE NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

Nº	ASSOCIATED PART NAME	QTY.	SPI PART Nº
AP-A	**YELLOW** Flipper Bat & Shaft (Plain) (Non-Knurled End) Assembly	1	515-5133-06-06
AP-B	Large Flipper **RED** Rubber Ring	1	545-5277-22



Take Note:

® "R" indicates Item noted is secured with rivet(s) as listed.

* To Order the Flipper (Left) Rebuild Kit ask for Part Nr.: 500-6307-10 (includes Items 6, 10, 12, 13, 14 & 15)

Flipper (Right) Assembly, 500-6543-02 (Items 1-15)
and Assoc. Parts: Yellow Flipper Bat & Shaft Assy., 515-5133-06-06 (Item AP-A/-B)

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	Flipper Base Plate (**RIGHT**)	1	**See FRP1**
	Item 1 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00) ***Ordering Note:*** *Use Item **FRP1**, see the end of this Parts Table.*		
2	Flipper Bat Bushing (White Plastic)	1	545-5070-00
	Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)		
3	Power (End of Stroke) Switch	1	180-5149-00
	Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5976-04)		
4	Sw. Plate/Spring Return Brkt. (**RIGHT**)	1	535-7354-**00**
5	Flipper Return Spring	1	265-5035-**00**
6*	Coil Stop Bracket Sub-Assembly	1	515-6308-01
	Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) **and** #10 Split Lock Washer (Qty. 2) (244-5003-00)		
7	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
	Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)		
9	Coil, 22-1080 (YEL-GRN) (Right)	1	090-5032-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
10*	Coil Sleeve	1	545-5388-00
11	Deflector Pad (Bumper)	1	545-5428-00
12*	Flipper Plunger & Link Sub-Assy.	1	515-6304-03
	ORDERING ABOVE (ITEM 12) SUB-ASSY. PART № WILL INCLUDE:		
12A	Flipper Plunger with "Flat"	1	530-5349-01
12B	Plunger "Flipper" Link	1	545-5611-01
	Item 12B is secured to 12A by: Bushing, .16" ø ID X .281" ø OD X .187" (Qty. 1) (530-5532-00) **and** Spirol Pin ø 5/32" X 3/4" Lg. (Qty. 1) (251-5015-02)		

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
13*	Crank Bar	1	530-5070-02
	Item 13 requires: Bushing, .192" ø ID X .312" ø OD X .195" (Qty. 1) (530-5139-00)		
14*	® Switch Actuator (**RIGHT**) Sub-Assy.	1	515-7257-**00**
	ORDERING ABOVE (ITEM 14) SUB-ASSY. PART № WILL INCLUDE:		
14A	Actuator & Spring Bracket (**RIGHT**)	1	535-9038-**00**
14B	® Switch Actuator (White Plastic)	1	545-5612-00
	Item 14B is secured to 14A by: Rivet, 1/8" ø X 1/4" Lg. (Qty. 1) (249-5003-00)		
15*	Set Screw: #10-32 X 3/4" Socket Hd.	2	237-6144-00
	Item 15 requires: #10-32 Nylon Stop Nut (Qty. 1 *Flipper Link Side Only*) (240-5203-00) **Tool Required for Item 15: 5/32" or 4mm Allen Wrench**		

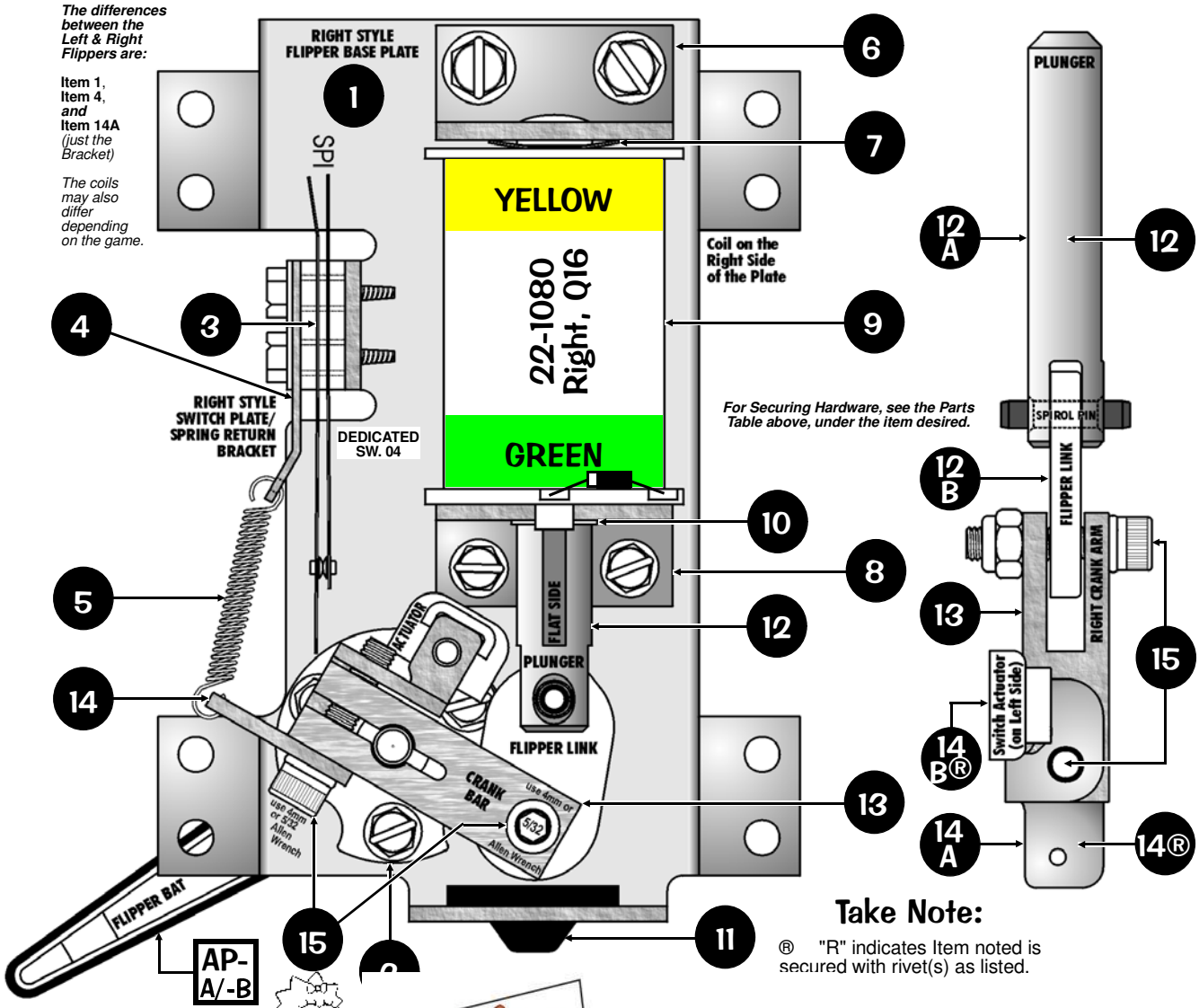
Flipper Rebuild Parts for Easier Installation, $ave $:

FRP1	**Flipper Base Plate Kit (RIGHT)** *Includes Item 1 pre-threaded, with the Securing Hardware for Items 2, 3, 6 & 8.*	515-6617-**00**
FRP2	**Plunger, Link & Crank (RIGHT) Assy.** *Includes above Items 12, 13, 14 and 15 and is pre-assembled.*	515-7203-**00**
FRP3	**Flipper (RIGHT) Rebuild Kit** *Same as **FRP2**, but also includes above Items 6 & 10.*	500-6307-**00**

***ASSOCIATED PARTS* ARE NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

№	ASSOCIATED PART NAME	QTY.	SPI PART №
AP-A	**YELLOW** Flipper Bat & Shaft (Plain) (Non-Knurled End) Assembly	1	515-5133-06-06
AP-B	Large Flipper **RED** Rubber Ring	1	545-5277-22

* To Order the Flipper (Right) Rebuild Kit ask for Part Nr.: 500-6307-00 (includes Items 6, 10, 12, 13, 14 & 15)



Take Note:

® "R" indicates Item noted is secured with rivet(s) as listed.

Sec. 4: Drawings ...

Flipper (Mini-Playfield, Left) Assembly, 500-6543-79 (Items 1-15)
and Associated Parts: See Parts Table Below (Items AP-A, AP-B, AP-C & AP-D)

(Identical to 500-6543-39 except for Item 2, 545-5070-00. 500-6543-79 requires a modified Item 2, 545-5070-01)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Flipper Base Plate (**LEFT**)	1	**See FRP1**
	Item 1 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00) ***Ordering Note:*** *Use Item **FRP1**, see the end of this Parts Table.*		
2	Flipper Bat Bushing (Modified)	1	545-5070-**01**
	Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)		
3	¼" X ⅜" Spacer Gray	2	254-5000-02
	Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Sw. (Ser.) Zc. (Qty. 1/per) (237-5976-04)		
4	Sw. Plate/Spring Return Brkt. (**LEFT**)	1	535-7354-**01**
5	Flipper Return Spring	1	265-5035-**00**
6*	Coil Stop Bracket Sub-Assembly	1	515-6308-01
	Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) **and** #10 Split Lock Washer (Qty. 2) (244-5003-00)		
7	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
	Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)		
9	Coil, 25-1800 (BLU-GRN) (**2nd P/F Upper Left**)	1	090-5041-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
10*	Coil Sleeve	1	545-5388-00
11	Deflector Pad (Bumper)	1	545-5428-00
12*	Flipper Plunger & Link Sub-Assy.	1	515-6304-03
	ORDERING ABOVE (ITEM 12) SUB-ASSY. PART Nº WILL INCLUDE:		
12A	Flipper Plunger with "Flat"	1	530-5349-01
12B	Plunger "Flipper" Link	1	545-5611-01
	Item 12B is secured to 12A by: Bushing, .16" ø ID X .281" ø OD X .187" (Qty. 1) (530-5532-00) **and** Spirol Pin ø 5/32" X 3/4" Lg. (Qty. 1) (251-5015-02)		

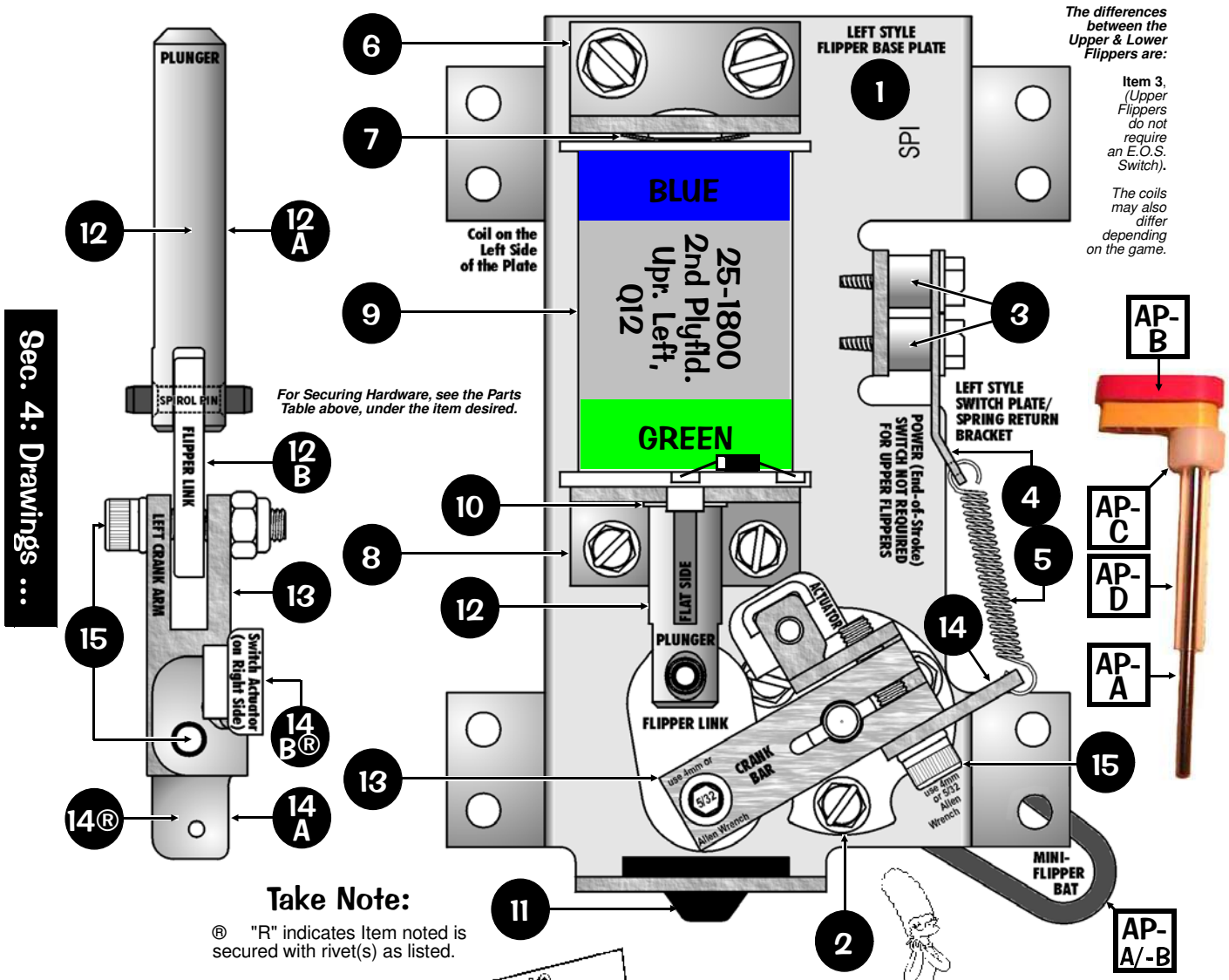
Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
13*	Crank Bar	1	530-5070-02
	Item 13 requires: Bushing, .192" ø ID X .312" ø OD X .195" (Qty. 1) (530-5139-00)		
14*	® Switch Actuator (**LEFT**) Sub-Assy.	1	515-7257-**01**
	ORDERING ABOVE (ITEM 14) SUB-ASSY. PART Nº WILL INCLUDE:		
14A	Actuator & Spring Bracket (**LEFT**)	1	535-9038-**01**
14B	® Switch Actuator (White Plastic)	1	545-5612-00
	Item 14B is secured to 14A by: Rivet, 1/8" ø X 1/4" Lg. (Qty. 1) (249-5003-00)		
15*	Set Screw: #10-32 X 3/4" Socket Hd.	2	237-6144-00
	Item 15 requires: #10-32 Nylon Stop Nut (Qty. 1 *Flipper Link Side Only*) (240-5203-00)		
	Tool Required for Item 15: 5/32" or 4mm Allen Wrench		

Flipper Rebuild Parts for Easier Installation, $ave $:

FRP1	**Flipper Base Plate Kit (LEFT)** *Includes Item 1 pre-threaded, with the Securing Hardware for Items 2, 3, 6 & 8.*	515-6617-**01**
FRP2	**Plunger, Link & Crank (LEFT) Assy.** *Includes above Items 12, 13, 14 and 15 and is pre-assembled.*	515-7203-**01**
FRP3	**Flipper (LEFT) Rebuild Kit** *Same as **FRP2**, but also includes above Items 6 & 10.*	500-6307-**10**

ASSOCIATED PARTS **ARE NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

Nº	ASSOCIATED PART NAME	QTY.	SPI PART Nº
AP-A	**YELLOW** Mini-Flipper Bat & 6" Shaft	1	515-7265-06
AP-B	Small Flipper **RED** Rubber Ring	1	545-5207-22
AP-C	Spacer, WHT 1/4" **ID X** 1" **W X** 16mm **H**	1	530-5633-00



The differences between the Upper & Lower Flippers are:

Item 3, *(Upper Flippers do not require an E.O.S. Switch).*

The coils may also differ depending on the game.

*** To Order the Flipper (Left) Rebuild Kit ask for Part Nr.: 500-6307-10 (includes Items 6, 10, 12, 13, 14 & 15)**

Take Note:

® "R" indicates Item noted is secured with rivet(s) as listed.

Flipper (Mini-Playfield, Right) Assembly, 500-6543-66 (Items 1-15)
and Associated Parts: See Parts Table Below (Items AP-A, AP-B, AP-C & AP-D)

(Identical to 500-6543-26 except for Item 2, 545-5070-00. 500-6543-66 requires a modified Item 2, 545-5070-01)

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	Flipper Base Plate (**RIGHT**)	1	**See FRP1**
	Item 1 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00) ***Ordering Note:*** *Use Item **FRP1**, see the end of this Parts Table.*		
2	Flipper Bat Bushing (Modified)	1	545-5070-**01**
	Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)		
3	¼" X ⅜" Spacer Gray	2	254-5000-02
	Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Sw. (Ser.) Zc. (Qty. 1/per) (237-5976-04)		
4	Sw. Plate/Spring Return Brkt. (**RIGHT**)	1	535-7354-**00**
5	Flipper Return Spring	1	265-5035-**00**
6*	Coil Stop Bracket Sub-Assembly	1	515-6308-01
	Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) **and** #10 Split Lock Washer (Qty. 2) (244-5003-00)		
7	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
	Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)		
9	Coil, 24-1570 (BLU-BLU) (**2nd P/F Upr. Rt.**)	1	090-5025-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
10*	Coil Sleeve	1	545-5388-00
11	Deflector Pad (Bumper)	1	545-5428-00
12*	Flipper Plunger & Link Sub-Assy.	1	515-6304-03
	ORDERING ABOVE (ITEM 12) SUB-ASSY. PART № WILL INCLUDE:		
12A	Flipper Plunger with "Flat"	1	530-5349-01
12B	Plunger "Flipper" Link	1	545-5611-01
	Item 12B is secured to 12A by: Bushing, .16" ø ID X .281" ø OD X .187" (Qty. 1) (530-5532-00) **and** Spirol Pin ø 5/32" X 3/4" Lg. (Qty. 1) (251-5015-02)		

№	INDIVIDUAL PART NAME	QTY.	SPI PART №
13*	Crank Bar	1	530-5070-02
	Item 13 requires: Bushing, .192" ø ID X .312" ø OD X .195" (Qty. 1) (530-5139-00)		
14*	® Switch Actuator (**RIGHT**) Sub-Assy.	1	515-7257-**00**
	ORDERING ABOVE (ITEM 14) SUB-ASSY. PART № WILL INCLUDE:		
14A	Actuator & Spring Bracket (**RIGHT**)	1	535-9038-**00**
14B	® Switch Actuator (White Plastic)	1	545-5612-00
	Item 14B is secured to 14A by: Rivet, 1/8" ø X 1/4" Lg. (Qty. 1) (249-5003-00)		
15*	Set Screw: #10-32 X 3/4" Socket Hd.	2	237-6144-00
	Item 15 requires: #10-32 Nylon Stop Nut (Qty. 1 *Flipper Link Side Only*) (240-5203-00) **Tool Required for Item 15: 5/32" or 4mm Allen Wrench**		

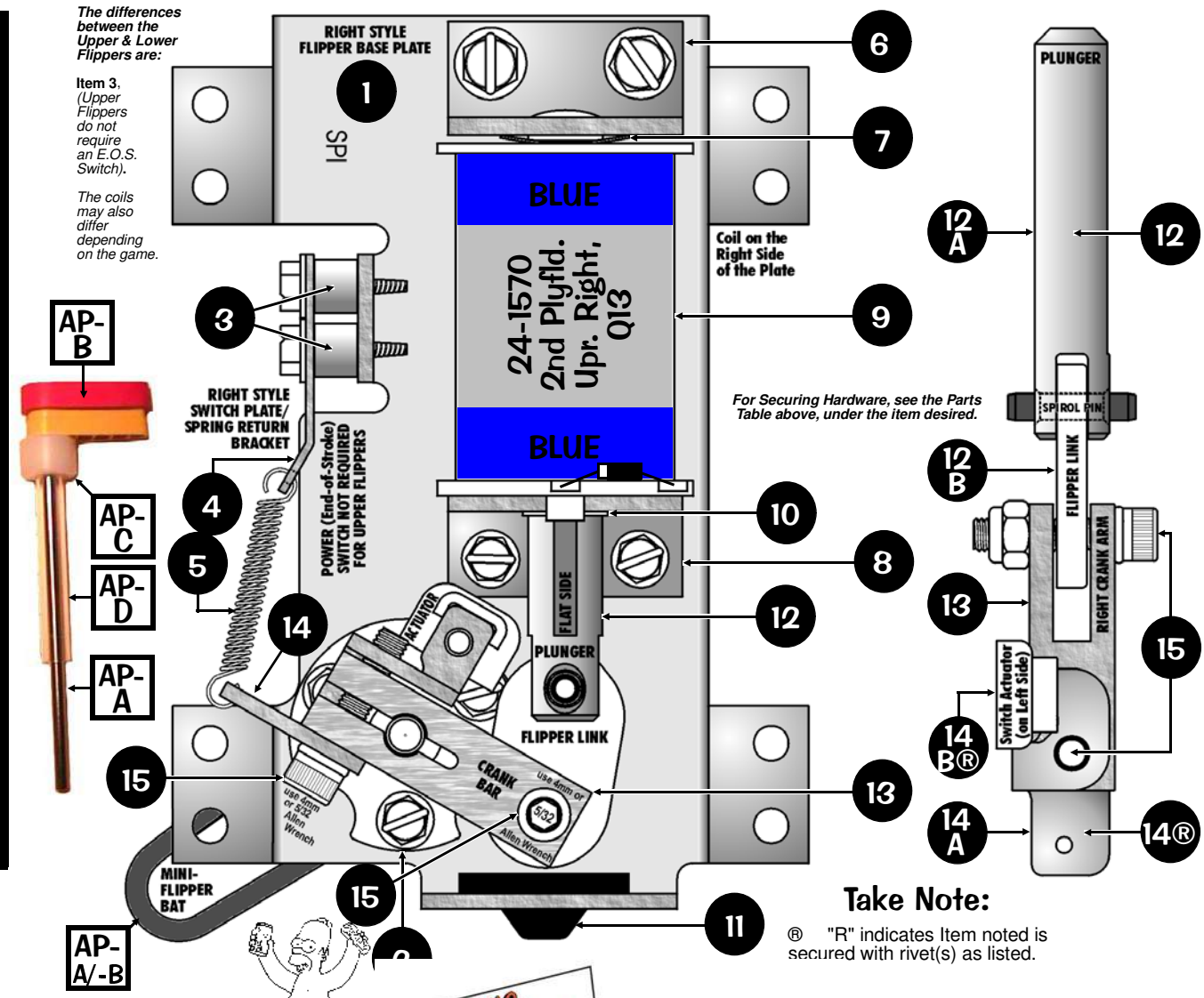
Flipper Rebuild Parts for Easier Installation, $ave $:

FRP1	**Flipper Base Plate Kit (RIGHT)** *Includes Item 1 pre-threaded, with the Securing Hardware for Items 2, 3, 6 & 8.*	515-6617-**00**
FRP2	**Plunger, Link & Crank (RIGHT) Assy.** *Includes above Items 12, 13, 14 and 15 and is pre-assembled.*	515-7203-**00**
FRP3	**Flipper (RIGHT) Rebuild Kit** *Same as **FRP2**, but also includes above Items 6 & 10.*	500-6307-**00**

***ASSOCIATED PARTS* ARE NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

№	ASSOCIATED PART NAME	QTY.	SPI PART №
AP-A	**YELLOW** Mini-Flipper Bat & 6" Shaft	1	515-7265-06
AP-B	Small Flipper **RED** Rubber Ring	1	545-5207-22
AP-C	Spacer, WHT 1/4" **ID X** 1" **W X** 16mm **H**	1	530-5633-00

* To Order the Flipper (Right) Rebuild Kit ask for Part Nr.: 500-6307-00 (includes Items 6, 10, 12, 13, 14 & 15)



Take Note:

® "R" indicates Item noted is secured with rivet(s) as listed.

Flipper (Mid. Playfield, Upr. Right) Assembly, 500-6543-24 (Items 1-15)
and Assoc. Part: Yellow Flipper Bat & Shaft Assy., 515-5133-06-06 (Items AP-A/-B)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Flipper Base Plate (**RIGHT**)	1	**See FRP1**
	Item 1 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. 8) (237-5949-00) ***Ordering Note:*** *Use Item **FRP1**, see the end of this Parts Table.*		
2	Flipper Bat Bushing (White Plastic)	1	545-5070-00
	Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)		
3	¼" X ⅜" Spacer Gray	2	254-5000-02
	Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Sw. (Ser.) Zc. (Qty. 1/per) (237-5976-04)		
4	Sw. Plate/Spring Return Brkt. (**RIGHT**)	1	535-7354-**00**
5	Flipper Return Spring	1	265-5035-**00**
6*	Coil Stop Bracket Sub-Assembly	1	515-6308-01
	Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) **and** #10 Split Lock Washer (Qty. 2) (244-5003-00)		
7	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
	Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)		
9	Coil, 23-1100 (ORG-ORG) (**Mid. Upr. Rt.**)	1	090-5030-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
10*	Coil Sleeve	1	545-5388-00
11	Deflector Pad (Bumper)	1	545-5428-00
12*	Flipper Plunger & Link Sub-Assy.	1	515-6304-03
	ORDERING ABOVE (ITEM 12) SUB-ASSY. PART Nº WILL INCLUDE:		
12A	Flipper Plunger with "Flat"	1	530-5349-01
12B	Plunger "Flipper" Link	1	545-5611-01
	Item 12B is secured to 12A by: Bushing, .16" ø ID X .281" ø OD X .187" (Qty. 1) (530-5532-00) **and** Spirol Pin ø 5/32" X 3/4" Lg. (Qty. 1) (251-5015-02)		

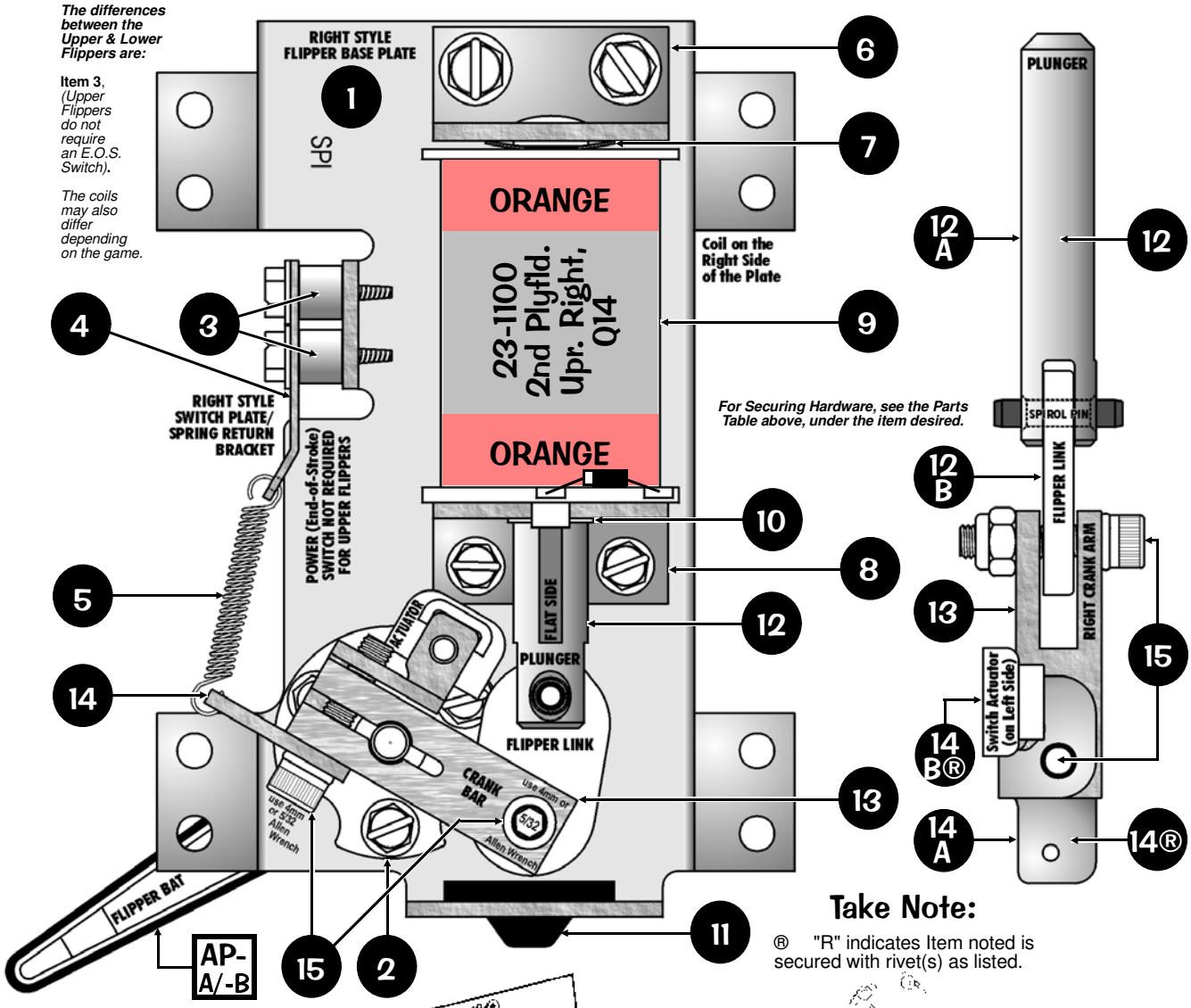
Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
13*	Crank Bar	1	530-5070-02
	Item 13 requires: Bushing, .192" ø ID X .312" ø OD X .195" (Qty. 1) (530-5139-00)		
14*	® Switch Actuator (**RIGHT**) Sub-Assy.	1	515-7257-**00**
	ORDERING ABOVE (ITEM 14) SUB-ASSY. PART Nº WILL INCLUDE:		
14A	Actuator & Spring Bracket (**RIGHT**)	1	535-9038-**00**
14B	® Switch Actuator (White Plastic)	1	545-5612-00
	Item 14B is secured to 14A by: Rivet, 1/8" ø X 1/4" Lg. (Qty. 1) (249-5003-00)		
15*	Set Screw: #10-32 X 3/4" Socket Hd.	2	237-6144-00
	Item 15 requires: #10-32 Nylon Stop Nut (Qty. 1 *Flipper Link Side Only*) (240-5203-00) **Tool Required for Item 15: 5/32" or 4mm Allen Wrench**		

Flipper Rebuild Parts for Easier Installation, $ave $:

FRP1	**Flipper Base Plate Kit (RIGHT)** *Includes Item 1 pre-threaded, with the Securing Hardware for Items 2, 3, 6 & 8.*	515-6617-**00**
FRP2	**Plunger, Link & Crank (RIGHT) Assy.** *Includes above Items 12, 13, 14 and 15 and is pre-assembled.*	515-7203-**00**
FRP3	**Flipper (RIGHT) Rebuild Kit** *Same as **FRP2**, but also includes above Items 6 & 10.*	500-6307-**00**

ASSOCIATED PARTS **ARE NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

Nº	ASSOCIATED PART NAME	QTY.	SPI PART Nº
AP-A	**YELLOW** Flipper Bat & Shaft (Plain) (Non-Knurled End) Assembly	1	515-5133-06-06
AP-B	Large Flipper **RED** Rubber Ring	1	545-5277-22



Take Note:

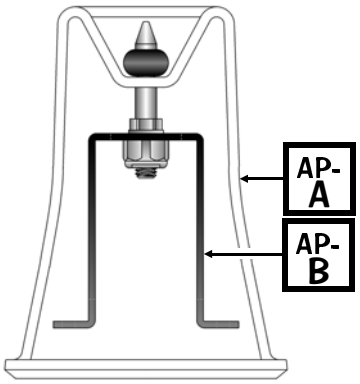
® "R" indicates Item noted is secured with rivet(s) as listed.

* To Order the Flipper (Right) Rebuild Kit ask for Part Nr.: 500-6307-00 (includes Items 6, 10, 12, 13, 14 & 15)

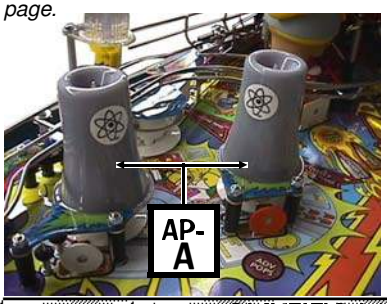
The Simpsons Pinball Party

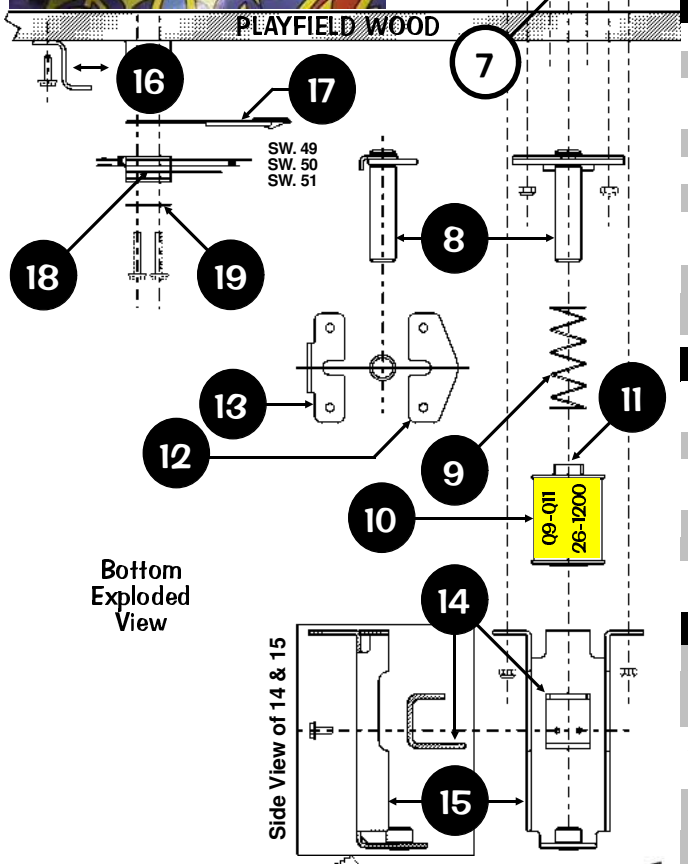
Bumper Top Assemblies, 515-6459-01 (Qty. 3) (Items 1-7), Bumper Bottom Assy., 515-6459-04 (Qty. 3) (Items 8-15), Bumper Switch Assy., 515-6459-03 (Qty. 3) (Items 16-19) and Associated Part(s): See Parts Table below.

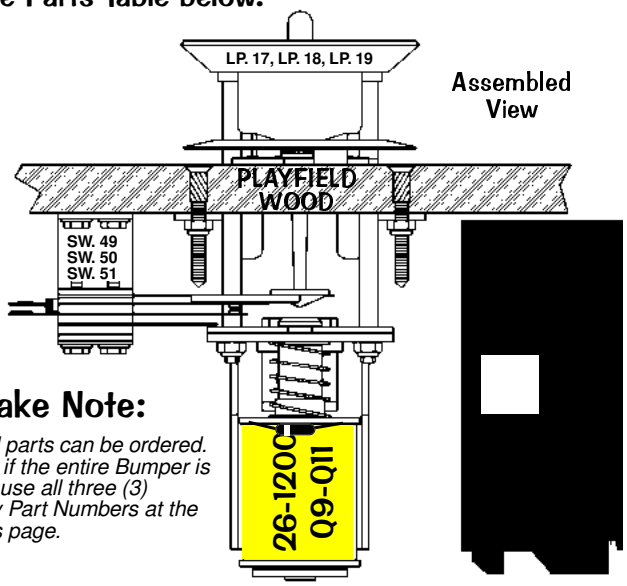
For Securing Hardware, see the Parts Table below, under the item desired.



Note in this Pinball Machine only: *In lieu of Bumper Caps, the* ***Right*** *&* ***Bottom*** *Bumper Top Assemblies have plastic "Nuclear Cooling Towers" affixed to them. The* ***Left*** *Bumper is under a Screened Plastic Piece (-20)*. See the* ***Associated Parts*** *at the bottom of this page.*







Take Note:

Individual parts can be ordered. However, if the entire Bumper is required, use all three (3) Assembly Part Numbers at the top of this page.

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

№	BUMPER BOTTOM PART NAME	QTY.	SPI PART №
8	Plunger	1	530-5348-00
9	Compression (Return) Spring	1	266-5047-00
10	Coil, 26-1200	1	090-5044-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
11	Coil Sleeve	1	545-5031-00
12	Fiber Yoke	1	545-5609-00
13	Metal Yoke	1	535-7346-00
14	Metal Yoke Stop	1	535-7347-00
	Item 14 is secured by: #6-32 X 1/4" HWH Swage (Serr.) Zinc (Qty. 2) (237-5976-01)		
15	Coil Bracket Welded Assembly	1	515-5939-00
	Item 15 is secured by: #6-32 X 1-3/16" Spiral Fin Shank (Qty. 3) (237-5957-00) **and** #6-32 Nylon Stop Nut (Qty. 3) (240-5005-00)		

№	BUMPER SWITCH PART NAME	QTY.	SPI PART №
16	Switch Bracket	1	535-7342-00
	Item 16 is secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 2) (234-5101-00)		
17	Spoon Switch Actuator	1	545-5610-01
18	Bumper Stack (Blade) Switch	1	180-5015-03
	Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).*		
19	Switch Body Protect Plate	1	535-7344-00
	Items 18 & 19 are secured by: #6-32 X 3/4" HWH Swage (Serr) Zc. (Qty. 2) (237-5976-05)		

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

ASSOCIATED PART **IS NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

№	ASSOCIATED PART NAME	QTY.	SPI PART №
AP-A	Nuclear Cooling Tower (Plastic)	2	545-6065-25
	Item AP-A is secured to Item AP-B by: Mini-Post MS/#10-32 Post (Qty. 1/per) (530-5005-01), #10-32 Nylon Stop Nut (Qty. 1/per) (240-5203-00) **and** 7/16" O.D. Rubber Ring, Black (Qty. 1/per) (545-5348-17) *Push down on Tower to place Rubber on Post.*		
AP-B	Mounting Bracket (Black)	2	535-9200-00
	Item AP-B is secured to Item 3 by: #4-40 X 3/8" HWH MS (Zinc) TF (Qty. 2/per) (237-5933-00)		
	Kit: Plastics (Screened & Clear)	1	803-5000-77
	Kit: Game Specific Decals		802-5000-77

Note: *For associated Plastics (-16, -18 & -20) or Decals (-10 Qty. 3/per), see* ***Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals****, Page* ***67****.*
Plastic Pieces & Game Decals are not available individually, ordering of either kit is required.

Homer Head Actuator (Upr. Rt. Flipper Style) Assembly, 500-6543-21 (Items 1-15)

Works in conjunction with the Homer Head Assembly on the next page.

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Flipper Base Plate (**RIGHT**)	1	**See FRP1**
	Item 1 is secured below the playfield by: #10 X 1/2" HWH MS (Serr) Zinc ST (Qty. **6**) (237-5949-00) ***Ordering Note:*** *Use Item **FRP1**, see the end of this Parts Table.*		
2	Flipper Bat Bushing (White Plastic)	1	545-5070-00
	Item 2 is secured to Item 1 by: #6-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 3) (237-5976-02)		
3	¼" X ⅜" Spacer Gray	2	254-5000-02
	Item 3 is secured to Item 1 by: #6-32 X 5/8" HWH Sw. (Ser.) Zc. (Qty. 1/per) (237-5976-04)		
4	Sw. Plate/Spring Return Brkt. (**RIGHT**)	1	535-7354-**00**
5	Flipper Return Spring	1	265-5035-**00**
6*	Coil Stop Bracket Sub-Assembly	1	515-6308-01
	Item 6 is secured to Item 1 by: #10-32 X 3/8" SHWH Swage (Serr) Zinc (Qty. 2) (237-5985-00) **and** #10 Split Lock Washer (Qty. 2) (244-5003-00)		
7	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
8	Coil Support Bracket	1	535-7356-00
	Item 8 is secured to Item 1 by: #8-32 X 3/8" HWH Swage (Ser.) Zc. (Qty. 2) (237-5975-00)		
9	Coil, 22-900 (YEL-YEL)	1	090-5020-20T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
10*	Coil Sleeve	1	545-5388-00
11	Deflector Pad (Bumper)	1	545-5428-00
12*	Flipper Plunger & Link Sub-Assy.	1	515-6304-03
	ORDERING ABOVE (ITEM 12) SUB-ASSY. PART Nº WILL INCLUDE:		
12A	Flipper Plunger with "Flat"	1	530-5349-01
12B	Plunger "Flipper" Link	1	545-5611-01
	Item 12B is secured to 12A by: Bushing, .16" ø ID X .281" ø OD X .187" (Qty. 1) (530-5532-00) **and** Spirol Pin ø 5/32" X 3/4" Lg. (Qty. 1) (251-5015-02)		

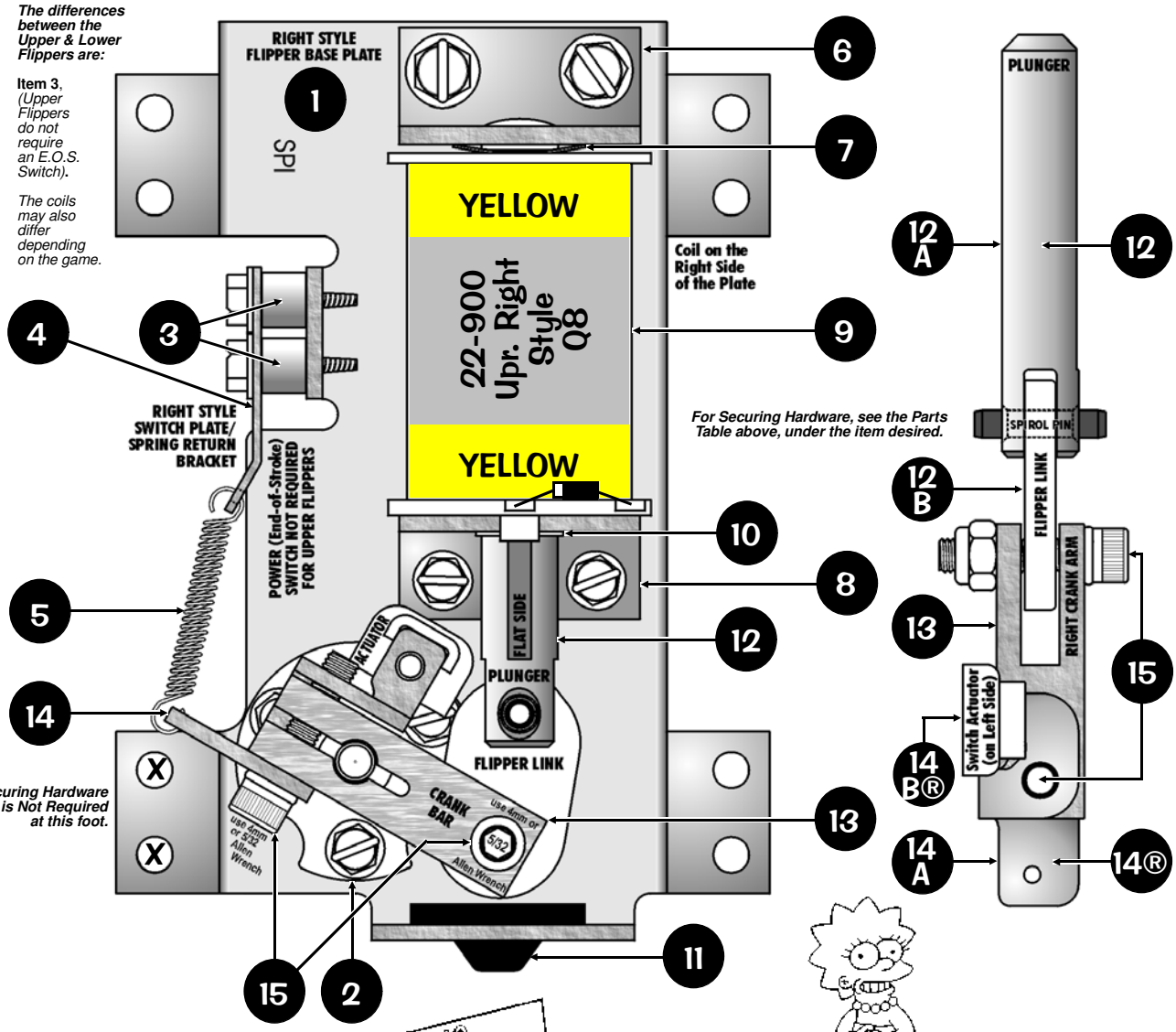
Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
13*	Crank Bar	1	530-5070-02
	Item 13 requires: Bushing, .192" ø ID X .312" ø OD X .195" (Qty. 1) (530-5139-00)		
14*	® Switch Actuator (**RIGHT**) Sub-Assy.	1	515-7257-**00**
	ORDERING ABOVE (ITEM 14) SUB-ASSY. PART Nº WILL INCLUDE:		
14A	Actuator & Spring Bracket (**RIGHT**)	1	535-9038-**00**
14B	® Switch Actuator (White Plastic)	1	545-5612-00
	Item 14B is secured to 14A by: Rivet, 1/8" ø X 1/4" Lg. (Qty. 1) (249-5003-00)		
15*	Set Screw: #10-32 X 3/4" Socket Hd.	2	237-6144-00
	Item 15 requires: #10-32 Nylon Stop Nut (Qty. 1 *Flipper Link Side Only*) (240-5203-00) **Tool Required for Item 15: 5/32" or 4mm Allen Wrench**		

Flipper Rebuild Parts for Easier Installation, $ave $:

FRP1	**Flipper Base Plate Kit (RIGHT)** *Includes Item 1 pre-threaded, with the Securing Hardware for Items 2, 3, 6 & 8.*	515-6617-**00**
FRP2	**Plunger, Link & Crank (RIGHT) Assy.** *Includes above Items 12, 13, 14 and 15 and is pre-assembled.*	515-7203-**00**
FRP3	**Flipper (RIGHT) Rebuild Kit** *Same as **FRP2**, but also includes above Items 6 & 10.*	500-6307-**00**

Take Note:

® "R" indicates Item noted is secured with rivet(s) as listed.

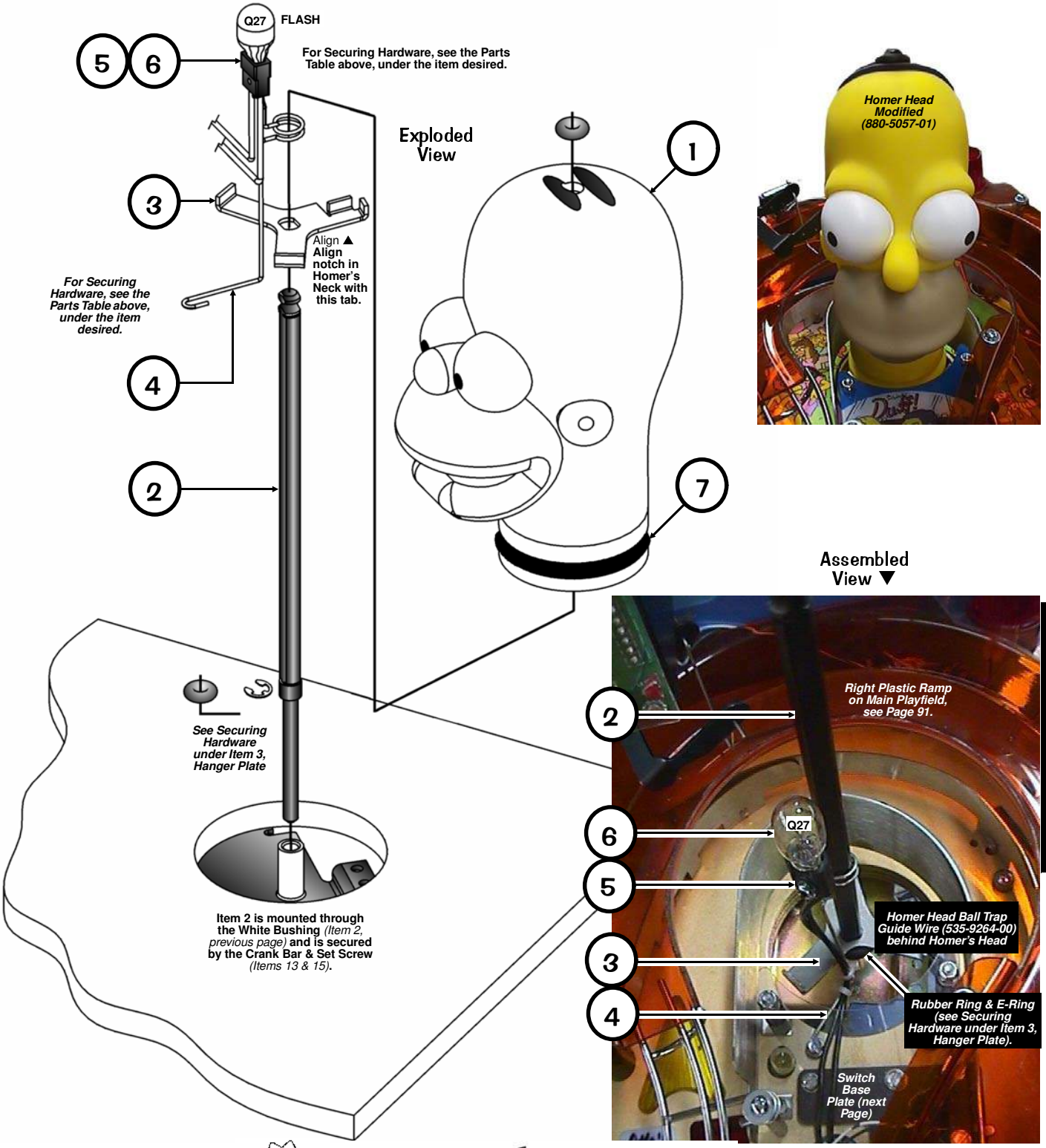


* To Order the Flipper (Right) Rebuild Kit ask for Part Nr.: 500-6307-00 (includes Items 6, 10, 12, 13, 14 & 15)

Homer Head Assembly Individual Parts Only (Items 1-7)

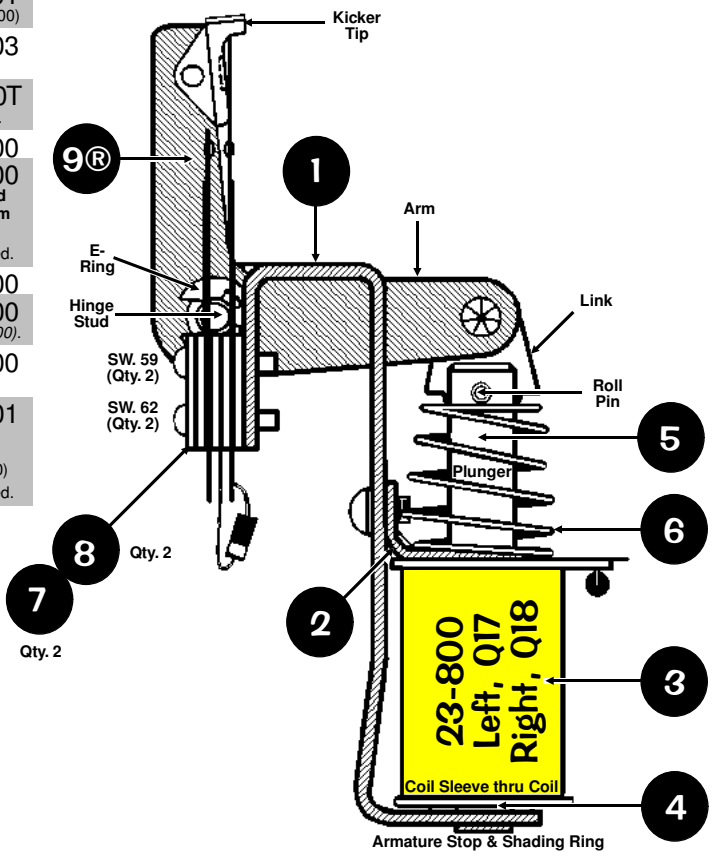
Works in conjunction with the "Upper Right Style" Flipper Assembly on the previous page.

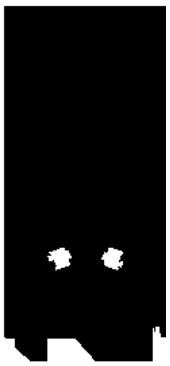
№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	Homer Head (Modified)	1	880-5057-01
	Item 1 is secured onto Item 2 by: Rubber Ring, 3/16" I.D. (Black) (Qty. 1) (545-5348-01). *Note the notch in Homer's neck should be positioned correctly onto Item 3.* ***Take Care when removing the Homer Head so damage to Item 6 (Bulb) does not occur.***		
2	Pivot Shaft (Black)	1	530-5632-00
3	Hanger Plate	1	535-9198-00
	Item 3 is secured onto Item 2 (@ bottom) by: Retaining Ring (E-Ring), 3/8" ø (Qty. 1) (270-5012-00) **and** Rubber Ring, 3/8" I.D. (Black) (Qty. 1) (545-5348-03)		
4	Wire Bracket ***(Socket to Shaft Mount)***	1	535-9199-00
	Item 4 is secured to Item 4 (@ top) by: #2-56 X 1/2" HWH Ser Uns #4HD TR3 Black (Qty. 1) (237-5937-02) **and** #2-56 Nylon Stop Nut (Qty. 1) (240-5321-00) **Item 4 is secured above the Playfield by:** #6 X 3/8" HWH AB (Zinc) (Qty. 1) (234-5000-00)		
5	Wedge Base Socket	1	077-5206-00
	If replacing Item 5, redress wires along Item 4 with 4" Cable Ties (040-5001-01).		
6	#906 Wedge Base Bulb (Clear)	1	165-5004-00
7	Rubber Ring, Black 2" I.D.	1	545-5348-08



Slingshot Assemblies, 500-5849-00 (Qty. 2) (Items 1-9)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Slingshot Bracket Assembly	1	515-5339-01
	Item 1 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 3) (234-5101-00)		
2	Coil Retaining Bracket	1	535-5203-03
	Item 2 is secured to Item 1 by: #8-32 X 3/8" PPH MS (Sems) (Qty. 2) (232-5301-00)		
3	Coil, 23-800	1	090-5001-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
4	Coil Sleeve	1	545-5031-00
5	Plunger & Link Assembly	1	515-5338-00
	For Individual Items use : Plunger 2" Lg. (**530-5025-01**), Plunger Link (**545-5293-00**) **and** Roll Pin 1/8" ø x 5/8" Lg. (**251-5008-00**) **The Plunger Link is secured to the Riveted Arm by:** Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)		
	Ordering Note: If **515-5338-00** *is unavailable*, order the individual part(s) actually required.		
6	Compression (Return) Spring	1	266-5020-00
7	Slingshot Stack (Blade) Switch	2	180-5054-00
	Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).*		
8	Switch Body Protect Plate	2	535-5045-00
	Items 7 & 8 are secured to Item 1 by: #6-32 X 5/8" HWH Swage (Qty. 4) (237-5976-04)		
9®	Riveted Arm & Tip Assembly	1	515-5340-01
	For Individual Parts use (requires drilling out rivet & rereviting) : Arm (**515-5341-01**), Kicker Tip (**545-5216-01**) **and** Rivet, 1/8" ø x 1/4" Lg. (**249-5003-00**) **The Riv. Arm is secured to Item 1 by:** Retaining Ring, 1/4" ø Shaft (Qty. 1) (270-5002-00)		
	Ordering Note: If **515-5340-01** *is unavailable*, order the individual part(s) actually required.		





Take Note:

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

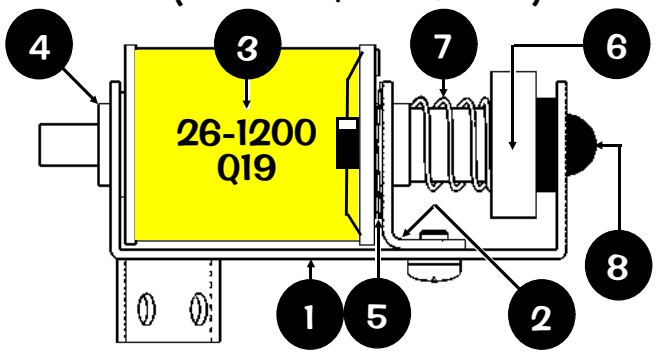
® "R" indicates Item noted is secured with rivet(s) as listed.

30° Eject Assembly, 500-6511-11 (Items 1-8)

and Associated Parts: Switch & Bracket Individual Parts (Items AP-A, AP-B & AP-C)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Mounting Bracket 30° Bend (Frame)	1	535-8932-00
	Item 1 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 2) (234-5101-00)		
2	Coil Retaining Bracket	1	535-5203-03
	Item 2 is secured to Item 1 by: #8-32 X 1/4" PPH MS (Sems) (Qty. 2) (232-5300-00)		
3	Coil, 26-1200	1	090-5044-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
4	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
5	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
6	Plunger Assembly	1	515-7197-00
7	Compression (Return) Spring	1	**266-5022-01**
8	Rubber Bumper (Grommet)	1	545-5105-00

Ordering Note: If **500-6511-11** *is unavailable*, order the individual part(s) actually required. ***This assembly is identical*** to **500-6511-00** except for **Item 3** *(replace with above referenced part number for the different Coil)* and Item **7** *(replace with above referenced part number for the different Compression Spring).*

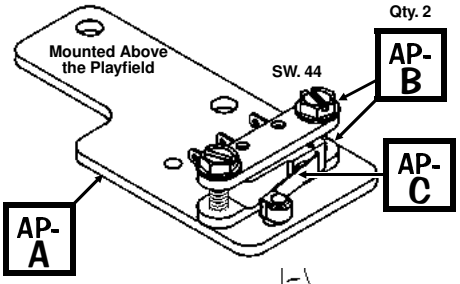


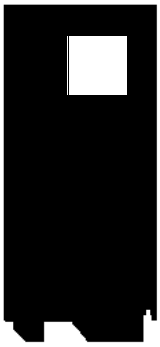
ASSOCIATED PART **IS NOT INCLUDED** WITH THE ABOVE ASSEMBLY.

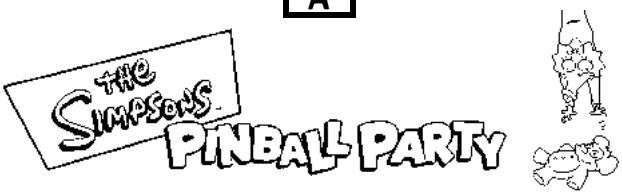
Nº	ASSOCIATED PART NAME	QTY.	SPI PART Nº
AP-A	Switch Base Plate (Black)	1	535-9195-00
AP-B	Switch Mounting Bracket	2	535-9194-00
AP-C	Micro Switch **(Roller Actuator, Lite-Force)**	1	180-5119-02

Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).*

Item AP-A is secured >above< the Playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 2) (234-5101-00)
Item AP-C is secured to Items AP-A & AP-B by: #6-32 X 5/8" HWH Swage (Serr) Zinc (Qty. 2) (237-5976-04)

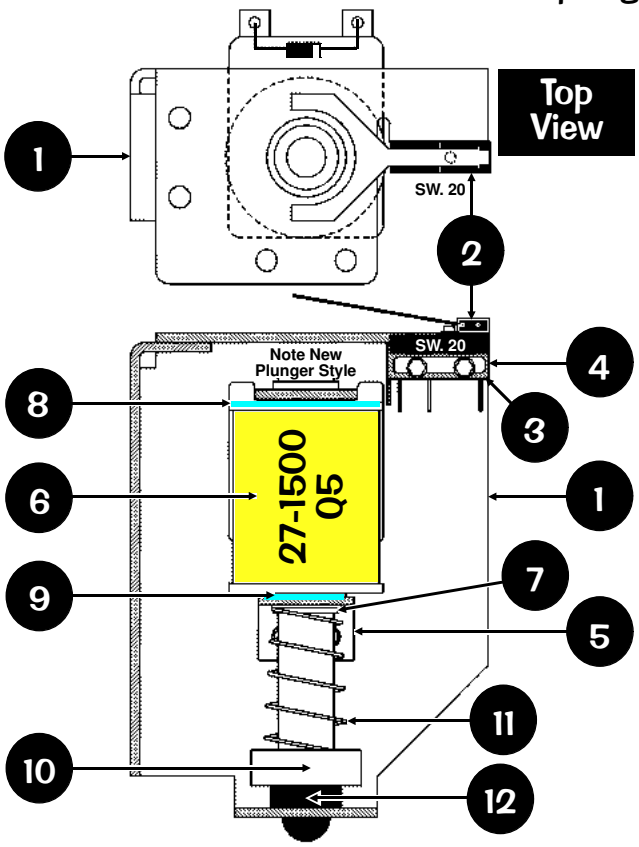






VUK (Vertical Up-Kicker, Right Style) Assembly, 500-6659-00 (Items 1-12)

Located behind the 3-Bank Drop Target, launches ball back into play after entry.



№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	VUK Coil Mounting Bracket (Right Style)	1	535-8296-01
	Item 1 is secured under the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 3) (234-5101-00)		
2	Micro Sw. **(Heavy Duty "Y" Flat Actuator)**	1	180-5116-01
	Switch has a Diode (1N4004) (112-5003-00) on a Terminal Strip below the Playfield.		
3	Switch Lug Insulator (Fiche Paper)	1	545-5759-00
4	Switch Body Protect Plate	1	535-6539-00
	Items 2-4 are secured by: #2-56 X 1/2" HWH MS (Serr) Zc TF 3/16" (Qty. 2) (237-5937-02)		
5	Coil Retaining Bracket	1	535-5203-03
	Item 5 is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)		
6	Coil, **27-1500**	1	090-5004-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
7	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
8	Coil Lug Insulator (Fiche Paper)	1	545-5431-00
9	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00
10	Plunger Assembly	1	515-5000-02
11	Compression (Relay) Spring	1	266-5020-00
12	Rubber Bumper (Grommet)	1	545-5105-00

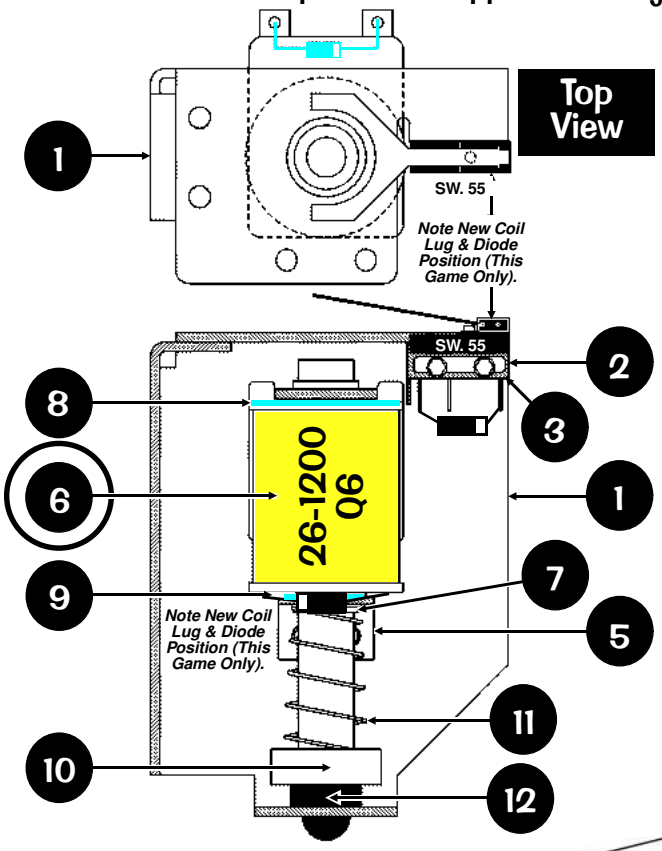
Ordering Note: If **500-6659-00** *is unavailable*, order the individual part(s) actually required. ***This assembly is identical*** to 500-6290-01, or 500-6290-11, except for **Items 6 & 10** *(replace with above referenced part numbers for the different Coil & Plunger).*
If replacing the entire assembly, do not forget to reattach the Wood VUK Spacer (525-5548-00); *see Section **4**, Chapter **1**, **Playfield - General Parts & Switches (Below)**, **Page 64** for location.*

Take Note:

DOTS: *The Switch Diode, 1N4001, is not located on either VUK Assembly (nor included); it's located on a Terminal Strip under the playfield near this assembly. See Section **5**, Chapter **2**, **Playfield Terminal Strips**.., **Page 105**, for more details.*

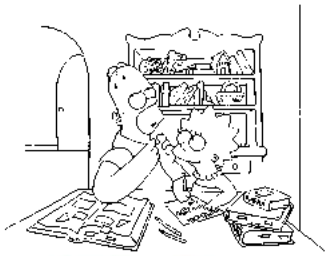
VUK (Vertical Up-Kicker, Right Style) Assembly, 500-6660-00 (Items 1-12)

Launches ball up onto the Upper Mini-Playfield after entry from either Left Plastic Ramps.



№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	VUK Coil Mounting Bracket (Right Style)	1	535-8296-01
	Item 1 is secured under the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 3) (234-5101-00)		
2	Micro Sw. **(Heavy Duty "Y" Flat Actuator)**	1	180-5116-01
	Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).*		
3	Switch Lug Insulator (Fiche Paper)	1	545-5759-00
4	Switch Body Protect Plate	1	535-6539-00
	Items 2-4 are secured by: #2-56 X 1/2" HWH MS (Serr) Zc TF 3/16" (Qty. 2) (237-5937-02)		
5	Coil Retaining Bracket	1	535-5203-03
	Item 5 is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)		
6	Coil, **26-1200** ***(Note Lug Position)***	1	090-5044-00**B**
	Coil has a Diode (1N4004) (112-5003-00) positioned @ bottom (below lugs).		
7	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
8	Coil Lug Insulator (Fiche Paper)	1	545-5431-00
9	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00
10	Plunger Assembly	1	515-5941-01
11	Compression (Relay) Spring	1	266-5020-00
12	Rubber Bumper (Grommet)	1	545-5105-00

Ordering Note: If **500-6660-00** *is unavailable*, order the individual part(s) actually required. ***This assembly is identical*** to 500-6290-01, except for the Coil Lug & Diode Position of **Item 6** *(replace Coil with the same orientation as shown in drawing).*



3-Bank Drop Target Assembly, 500-6577-33 (Items 1-19)

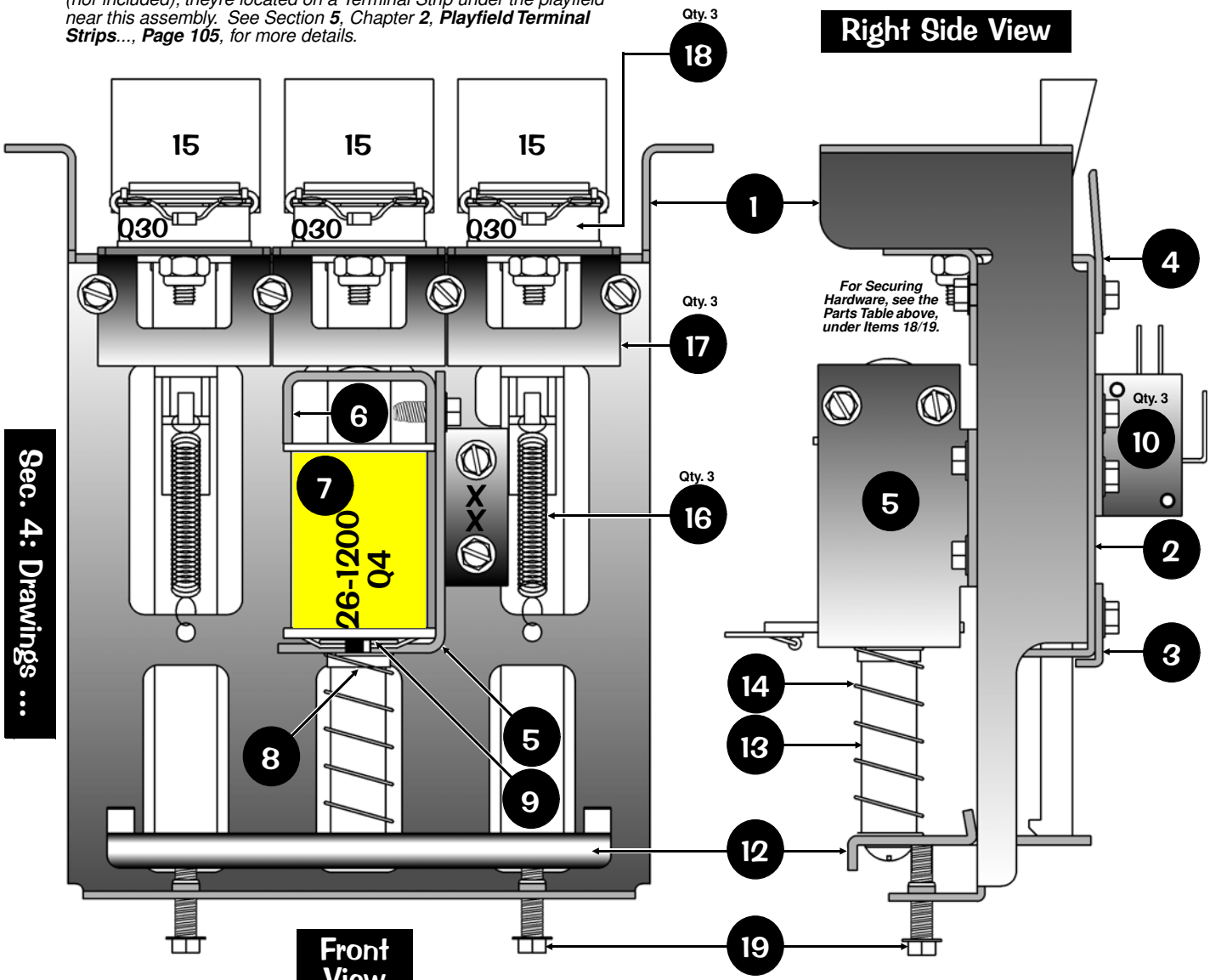
Different Views, Target Height Adjustment & Drop Target Removal Procedures on the next page.

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Bracket, Main Housing	1	535-9126-03
Item 1 is secured below the P/F by: #8 X 1/2" HWH AB (Zinc) (Qty. 6) (234-5101-00)			
2	Back Plate (3-Bank Drop Target)	1	535-9127-03
3	Bracket, Target Retainer (3-Bank D/T)	1	535-9129-03
4	Bracket, Target Back Stop	1	535-9131-03
5	Bracket, Coil Housing	1	535-7707-00
6	Bracket Cap, Coil Housing	1	515-6533-00
7	Coil, 26-1200	1	090-5044-00B
Coil has a Diode (1N4004) (112-5003-00) positioned @ bottom (below lugs).			
8	Coil Sleeve	1	545-5709-00
9	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
To order ***Items 5-9*** *assembled with securing hardware, use SPI Nº:* ***515-6535-03****.*			
10	Bracket, Switch **(Universal X-Bank D/T)**	3	535-7710-00
11	Switch (Drop Target)	3	180-5158-00
Each Switch has a Diode (1N4004) (112-5003-00) on a Terminal Strip below the Playfield.			
Item 11 is secured to Item 10 by: #4-40 X 5/8" HWH TF (Qty. 2) (237-5945-00)			

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
12	Bracket, Target Lift (3-Bank D/T)	1	535-9128-03
13	Plunger (Drive Coil)	1	530-5410-00
Item 13 is secured to Item 12 by: #10-32 X 3/8" PPH (Sems) (Qty. 1) (232-5401-00)			
To order ***Items 12-13*** *assembled with securing hardware, use SPI Nº:* ***515-7246-00****.*			
14	Compression (Return) Spring	1	266-5020-00
15	Drop Target White (Rollover)	3	545-5533-01
Note: *For associated Decals (-11, -12 & -13), see* ***Main Playfield & Mini-Playfield - ... & Decals****, Page* ***67****. Decals not available individually, ordering of Decal Kit is required.*			
16	Spring, Target Reset	3	265-5003-00
17	Bracket, Trip Coil Mounting	3	535-9130-00
18	Coil, 32-1250 (Mini-Bobin) Assembly	3	515-6916-01
For Individual Items use : *Diode, 1N4004 (****112-5003-00****), Actuator Flap Plate (****535-8597-00****) and Retainer Clip (****530-5550-00****).*			
Item 19 is secured to Item 17 by: #8-32 Nylon Stop Nut (Qty. 1/per) (240-5102-00)			
19	Height Adj. Screw (#8-32 X 3/4" HWH)	2	237-6010-00
Items 3, 4, 5, 6, 10 & 17 are secured by: #8-32 X 3/8" HWH Swg. (Qty. 2) (237-5975-00)			
Ordering Note: *If* ***500-6577-XX*** *is unavailable*, order the individual part(s) actually required.			

Take Note:

DOTS: *The Switch Diodes, 1N4001, are not located on this assembly (nor included); theyre located on a Terminal Strip under the playfield near this assembly. See Section* ***5****, Chapter* ***2****,* ***Playfield Terminal Strips****...,* ***Page 105****, for more details.*



3-Bank Drop Target Assembly, 500-6577-33 (Items 1-19) Continued

Different Views & Parts Table on the previous page.

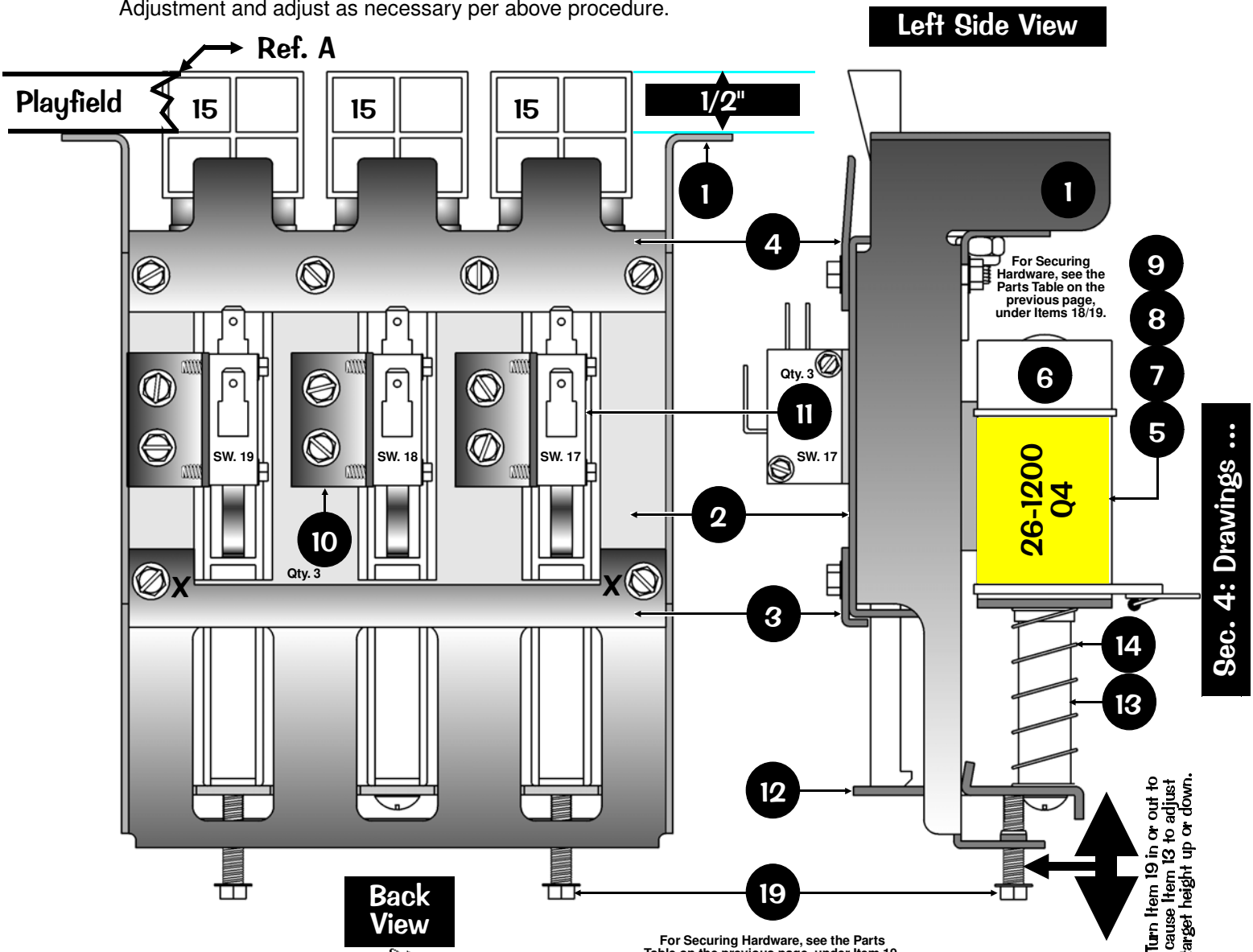
Target Height Adjustment Procedure:

With the Drop Targets (Rollover) (**Item 15**) in the ***D O W N P O S I T I O N***, adjust the height of the Target so the top is *just slightly* over 1/2" above the feet of the Main Housing Bracket (**Item 1**) as shown below *(see **Ref. A**). **Keep in Mind:*** This adjustment procedure should have the **TOP SIDE** of the Drop Targets "flush to slightly above" the *playfield surface* after reinstalling the assembly to the underside of the Playfield *(see **Ref. A** below).* This will ensure a **BALL TRAP** is ***n o t c r e a t e d*** where the ball can rest in the target hole above the playfield.

Step 1. Using a 1/4" Nut Driver, loosen or tighten *(turn in or out)* the Height Adjustment Screws (**Item 19**) through the Target Lift Bracket (**Item 12**) to raise or lower the Drop Targets to reach desired height as stated above *(using 1/4 turns between each screw to keep Targets even).* **Step 2.** *Apply **Blue** Loc-Tite.*

Drop Target Removal Procedure:

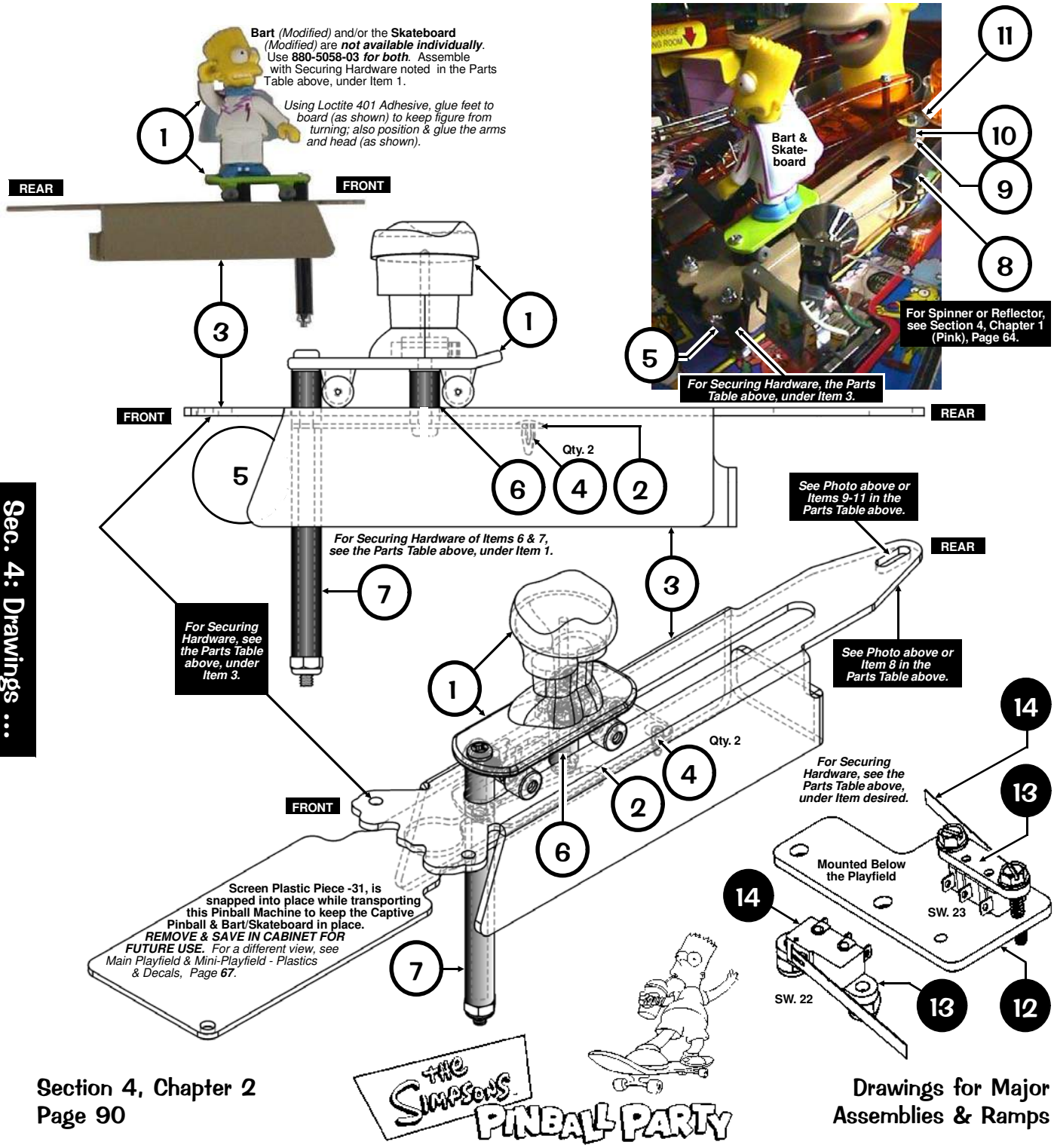
Although it is possible to remove the Drop Targets with the Assembly secured to the playfield, it would be easier to remove the assembly. The #8-32 X 3/8" Screws to be removed are marked by an "**X**" in the **Front** and **Back Views**. **Step 1.** Remove the Target Retainer Bracket (**Item 3**, *see* **Back View** *below*). **Step 2.** Turn assembly around and remove the Target Reset Spring (**Item 16**) with pointed-nose pliers. ***Note:*** *If replacing the middle Target, it may be necessary to remove the Coil Housing Bracket (**Item 5**) to access the Spring.* **Step 3.** Replace Target & Decal *(see note in Parts Table under **Item 15**, previous page)* and reassemble. **Step 4.** Recheck the Target Height Adjustment and adjust as necessary per above procedure.



Sec. 4: Drawings ...

Bart & Skateboard on Rail Individual Parts Only (Items 1-14)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Bart & Skateboard (Modified)	1	880-5058-**03**
	Item 1 is secured at the rear with Items 2 & 6 by: #6 X 1-3/4" PPH (Zinc) (Qty. 1) (232-5009-00) **and** #6 Riveting Lock Washer (Qty. 1) (246-5000-00) *[between Post and skateboard]*. **Item 1 is secured at the front with Item 7 by:** #6-32 X 3-1/2" PPH MS (Zinc) (Qty. 1) (237-5517-02), #6 Riveting Lock Washer (Qty. 1) (246-5000-00) **and** #6-32 Nylon Stop Nut (Qty. 1) (240-5005-00)		
2	Mounting Plate	1	535-9191-00
3	Mounting Frame	1	535-9192-00
	Item 3 is secured above the Playfield at the Front by: #6-32 Nylon Stop Nut (Qty. 2) (240-5005-00) **onto** Post Hex Base #6-32 Top/#10-32 Bot (Qty. 2) (530-5332-03). **Item 3 is secured below the Playfield at the Front by:** #10-32 Nylon Stop Nut (Qty. 2) (240-5203-00) **Item 3 is secured above the Playfield at the Rear by:** *See Items **8-11**, next column.*		
4	Buttonhead Rivet (Nylon) .125"ø	2	545-6062-00
5	Pinball (Captive Ball)	1	260-5000-00
6	**9/16" X 5/16" X 1/8" O.D. Plastic Spacer Gray**	1	254-5034-00
7	**2-7/16" X 5/16" X 1/8" O.D. Plastic Spacer Gray**	1	254-5035-00
8	1 X 15/16" X 3/8" Plastic Spacer Gray	1	254-5000-15
	Item 8 is secured under the Playfield by: #6-32 X 2-3/4" PPH Zinc (Qty. 1) (237-5906-00) **with a** #6-32 T-Nut (Qty. 1) (240-5002-00)		
9	#6 Washer	1	242-5001-00
10	5/8" X 1/4" Hex Spacer #6-32 Tap	1	254-5008-02
11	**Fender Washer .187" I.D. X .875"O.D. X .048" Zc.**	1	254-5059-00
	Item 11 is secured to Item 10 by: #6-32 X 3/8" PPH Sems (Qty. 1) (232-5201-00)		
12	Switch Base Plate (Black)	1	535-9195-00
	Item 12 is secured below the P/F using the same hardware as Item 3 (Front Posts).		
13	Switch Mounting Bracket	2	535-9194-00
14	Micro Switch **(Flat Actuator)**	2	180-5190-48
	Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).* **Item 14 (Qty. 1) is secured to Item 12 with Item 13 by:** #6-32 X 5/8" HWH Slotted (Zinc) (Qty. 2) (237-5976-04) **and Item 14 (Qty. 1) is secured below the playfield with Item 13 by:** #6-32 X 3/4" Fin Shank Screw (thru top of playfield) (Qty. 2) (237-5921-02) **and** #6-32 Nylon Stop Nut (Qty. 1/per) (240-5005-00)		

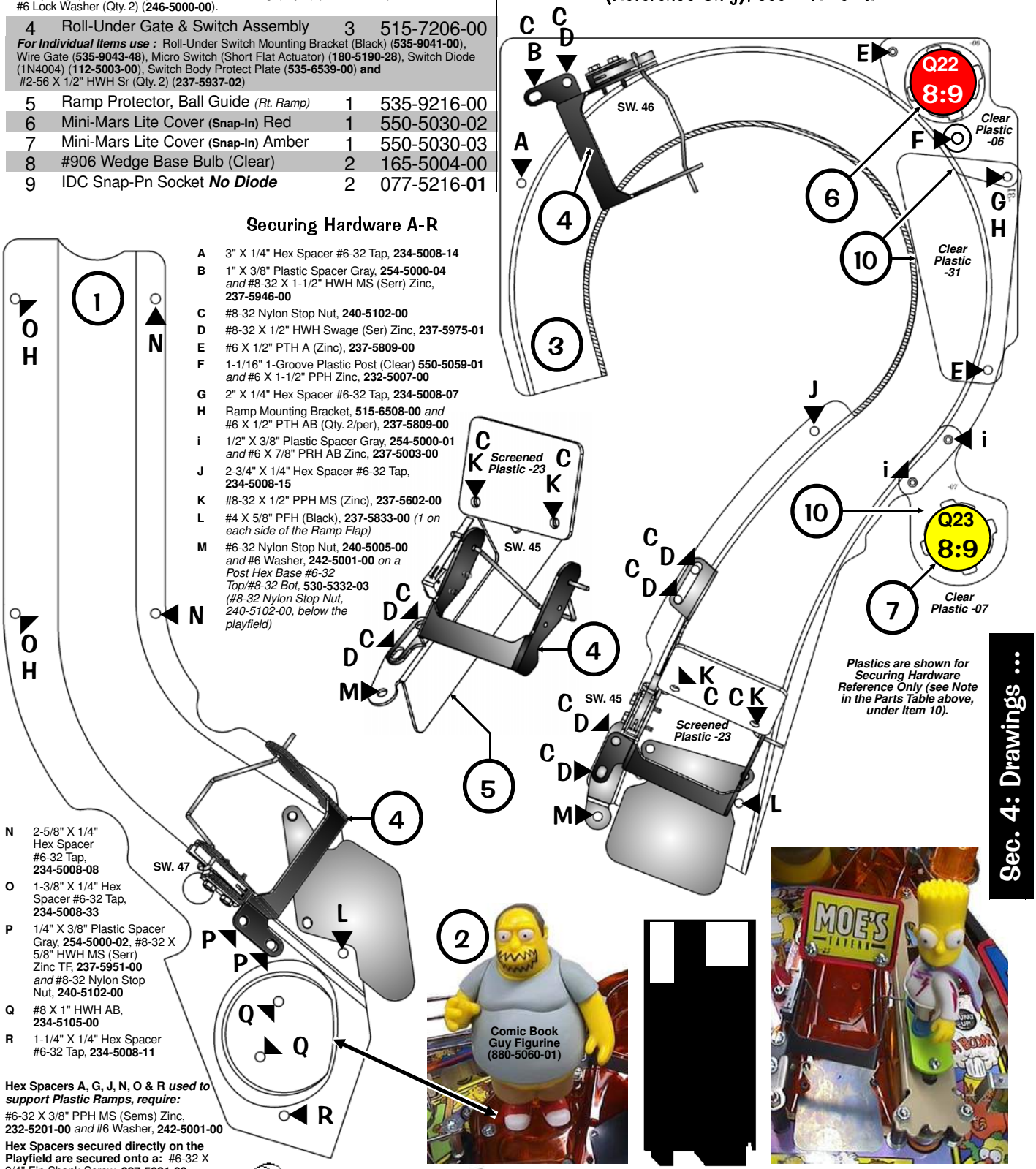


Main Playfield - Left & Right Plastic Ramps Individual Parts Only (Items 1-10)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Left Plastic Ramp ***with Ramp Flap only***	1	515-7270-00
	For Individual Items use : Plastic Ramp (Left, No Parts) (**545-6046-00**), Ramp Flap (**535-9096-00**), Rivet, 1/8"ø X 3/16" Lg. (Qty. 2) (**249-5001-00**) **and** #6 Lock Washer (Qty. 2) (**246-5000-00**).		
2	Comic Book Guy (Modified)	1	880-5060-01
3	Right Plastic Ramp ***with Ramp Flap only***	1	515-7272-00
	For Individual Items use : Plastic Ramp (Right, No Parts) (**545-6044-00**), Ramp Flap (**535-9094-00**), Rivet, 1/8"ø X 3/16" Lg. (Qty. 2) (**249-5001-00**) **and** #6 Lock Washer (Qty. 2) (**246-5000-00**).		
4	Roll-Under Gate & Switch Assembly	3	515-7206-00
	For Individual Items use : Roll-Under Switch Mounting Bracket (Black) (**535-9041-00**), Wire Gate (**535-9043-48**), Micro Switch (Short Flat Actuator) (**180-5190-28**), Switch Diode (1N4004) (**112-5003-00**), Switch Body Protect Plate (**535-6539-00**) **and** #2-56 X 1/2" HWH Sr (Qty. 2) (**237-5937-02**)		
5	Ramp Protector, Ball Guide *(Rt. Ramp)*	1	535-9216-00
6	Mini-Mars Lite Cover **(Snap-In)** Red	1	550-5030-02
7	Mini-Mars Lite Cover **(Snap-In)** Amber	1	550-5030-03
8	#906 Wedge Base Bulb (Clear)	2	165-5004-00
9	IDC Snap-Pn Socket ***No Diode***	2	077-5216-**01**

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
10	***Kit:*** Plastics (Screened & Clear)	1	803-5000-77
	Note: *For associated Plastics (-06 -07, -23 & -31), see* ***Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals****, Page* ***67****. Plastics are not available individually, ordering of Plastic Kit is required.* ***Plastics shown in the position used, so Securing Hardware can be determined.***		

For Securing Hardware of Items 1-5 & 10 (Reference Only), see A-R below.



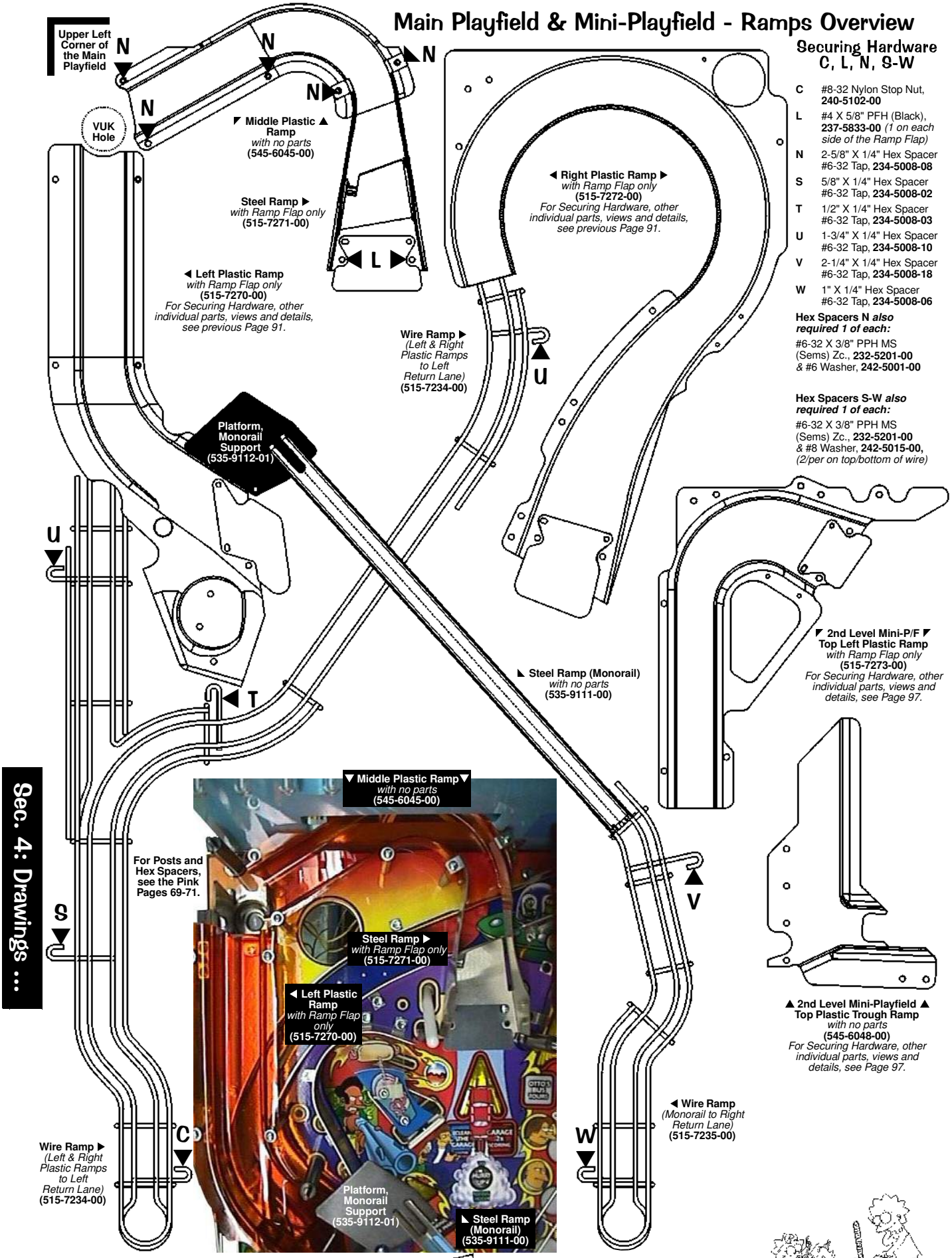
Securing Hardware A-R

- **A** 3" X 1/4" Hex Spacer #6-32 Tap, **234-5008-14**
- **B** 1" X 3/8" Plastic Spacer Gray, **254-5000-04** *and* #8-32 X 1-1/2" HWH MS (Serr) Zinc, **237-5946-00**
- **C** #8-32 Nylon Stop Nut, **240-5102-00**
- **D** #8-32 X 1/2" HWH Swage (Ser) Zinc, **237-5975-01**
- **E** #6 X 1/2" PTH A (Zinc), **237-5809-00**
- **F** 1-1/16" 1-Groove Plastic Post (Clear) **550-5059-01** *and* #6 X 1-1/2" PPH Zinc, **232-5007-00**
- **G** 2" X 1/4" Hex Spacer #6-32 Tap, **234-5008-07**
- **H** Ramp Mounting Bracket, **515-6508-00** *and* #6 X 1/2" PTH AB (Qty. 2/per), **237-5809-00**
- **i** 1/2" X 3/8" Plastic Spacer Gray, **254-5000-01** *and* #6 X 7/8" PRH AB Zinc, **237-5003-00**
- **J** 2-3/4" X 1/4" Hex Spacer #6-32 Tap, **234-5008-15**
- **K** #8-32 X 1/2" PPH MS (Zinc), **237-5602-00**
- **L** #4 X 5/8" PFH (Black), **237-5833-00** *(1 on each side of the Ramp Flap)*
- **M** #6-32 Nylon Stop Nut, **240-5005-00** *and* #6 Washer, **242-5001-00** *on a Post Hex Base #6-32 Top/#8-32 Bot,* **530-5332-03** *(#8-32 Nylon Stop Nut, 240-5102-00, below the playfield)*
- **N** 2-5/8" X 1/4" Hex Spacer #6-32 Tap, **234-5008-08**
- **O** 1-3/8" X 1/4" Hex Spacer #6-32 Tap, **234-5008-33**
- **P** 1/4" X 3/8" Plastic Spacer Gray, **254-5000-02**, #8-32 X 5/8" HWH MS (Serr) Zinc TF, **237-5951-00** *and* #8-32 Nylon Stop Nut, **240-5102-00**
- **Q** #8 X 1" HWH AB, **234-5105-00**
- **R** 1-1/4" X 1/4" Hex Spacer #6-32 Tap, **234-5008-11**

Hex Spacers A, G, J, N, O & R ***used to support Plastic Ramps, require:***
#6-32 X 3/8" PPH MS (Sems) Zinc, **232-5201-00** *and* #6 Washer, **242-5001-00**

Hex Spacers secured directly on the Playfield are secured onto a: #6-32 X 3/4" Fin Shank Screw, **237-5921-02**

Main Playfield & Mini-Playfield - Ramps Overview



Securing Hardware C, L, N, S-W

C	#8-32 Nylon Stop Nut, **240-5102-00**
L	#4 X 5/8" PFH (Black), **237-5833-00** *(1 on each side of the Ramp Flap)*
N	2-5/8" X 1/4" Hex Spacer #6-32 Tap, **234-5008-08**
S	5/8" X 1/4" Hex Spacer #6-32 Tap, **234-5008-02**
T	1/2" X 1/4" Hex Spacer #6-32 Tap, **234-5008-03**
U	1-3/4" X 1/4" Hex Spacer #6-32 Tap, **234-5008-10**
V	2-1/4" X 1/4" Hex Spacer #6-32 Tap, **234-5008-18**
W	1" X 1/4" Hex Spacer #6-32 Tap, **234-5008-06**

Hex Spacers N *also required 1 of each:*

#6-32 X 3/8" PPH MS (Sems) Zc., **232-5201-00** & #6 Washer, **242-5001-00**

Hex Spacers S-W *also required 1 of each:*

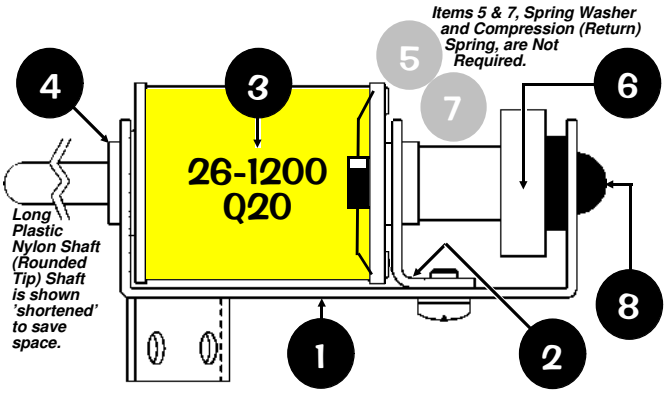
#6-32 X 3/8" PPH MS (Sems) Zc., **232-5201-00** & #8 Washer, **242-5015-00,** *(2/per on top/bottom of wire)*

30° Eject Assembly, 500-6661-00 (Items 1-8)

When energized, opens the Garage Door (entrance to the 2nd Level Mini-Playfield)

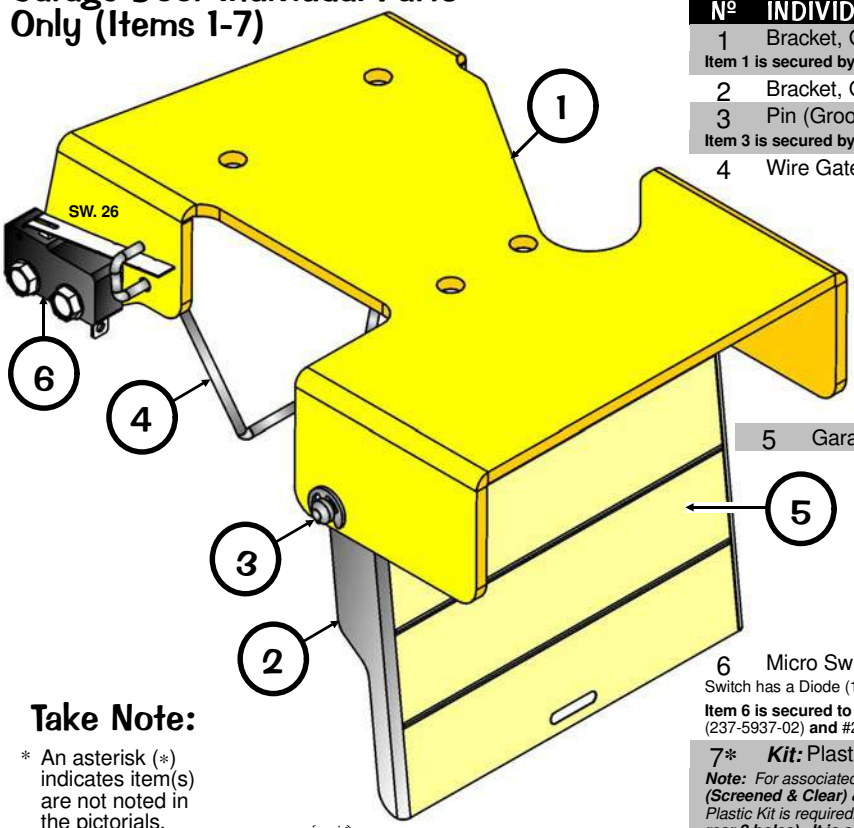
№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	Mounting Bracket 30° Bend (Frame)	1	535-8932-00
	Item 1 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 2) (234-5101-00)		
2	Coil Retaining Bracket	1	535-5203-03
	Item 2 is secured to Item 1 by: #8-32 X 1/4" PPH MS (Sems) (Qty. 2) (232-5300-00)		
3	Coil, 26-1200	1	090-5044-00T
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
4	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
5	*Spring Washer (17/32" ID X 3/4" X 1")*	**0**	*Not Required*
6	Long Plunger Assembly	1	515-7223-00
7	*Compression (Return) Spring*	**0**	*Not Required*
8	Rubber Bumper (Grommet)	1	545-5105-00

Ordering Note: If **500-6661-00** *is unavailable*, order the individual part(s) actually required. ***This assembly is identical*** to 500-6511-01, except for **Items 3 & 7** *(replace with above referenced part number for the different Plunger; the Compression Spring is Not Required).*



2ND LEVEL MINI-PLAYFIELD (BELOW)

Garage Door Individual Parts Only (Items 1-7)



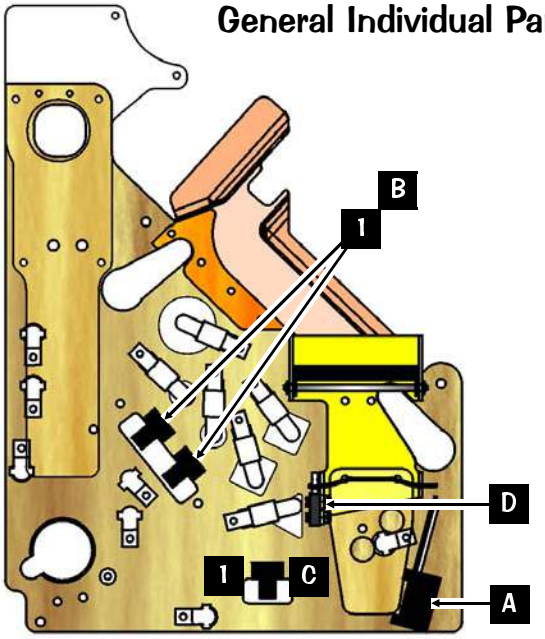
№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1	Bracket, Garage Frame (Yellow)	1	535-9190-00
	Item 1 is secured by: #8 X 1/2" HWH AB (Zinc) (Qty. 6) (234-5101-00)		
2	Bracket, Garage Door	1	535-9189-00
3	Pin (Grooved), Door Hinge (Mount)	1	530-5630-00
	Item 3 is secured by: Retaining Ring (E-Ring) 5/32" ø (Qty. 2) (270-5021-15)		
4	Wire Gate	1	535-9043-56
5	Garage Door Cover Decal	1	820-6329-00
6	Micro Switch **(Short Flat Actuator)**	1	180-5190-28
	Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).* **Item 6 is secured to Item 1 by:** #2-56 X 1/2" HWH (Sr) Uns #4HD TR3 BO (Qty. 2) (237-5937-02) **and** #2-56 Nylon Stop Nut (Qty. 2) (240-5321-00)		
7*	***Kit:*** Plastics (Screened & Clear)	1	803-5000-77
	Note: *For associated Plastics (-29), see* ***Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals****, Page* ***67****. Plastics are not available individually, ordering of Plastic Kit is required.* ***Clear Plastic -29 is not shown in this pictorial (positioned at the rear 2 holes). It is secured by the same hardware (Qty. 2) as noted under Item 1 above.***		

Take Note:

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

2ND LEVEL MINI-PLAYFIELD (BELOW)

General Individual Parts Below Only (1 & A-D)



Nº	BELOW MINI-P/F PART NAME	QTY.	SPI PART Nº
	Brackets for Mounting		
1	Switch Back Plate **(Stand-Up Target)**	3	535-6452-00
	Target (Stand-Up) Bracket	3	535-6896-00
	Item 1 requires: Foam Pad (Qty. 1/per) (626-5029-00) on Target Bracket.		
	Switches		
A	Micro Sw. Roll-Over Right Brkt. Assy.	1	500-6227-02
	Item A is secured by: #6 X 1/2" HWH AB (Zinc) (Qty. 2/per) (234-5001-02)		
B	Switch & Target Assy. 1" **Round** (Grn.)	2	515-5966-04
C	Switch & Target Assy. 1" **Round** (Red)	1	515-5966-02
	Items B-C are secured by: #6 X 1/2" HWH AB Zinc (Qty. 2/per) (234-5001-02)		
D	Micro Switch	1	180-5190-28

For Plastic Pieces or Decals:
*See Main Playfield & Mini-Playfield - ..., Page **67** (**The Pink Pages**).*

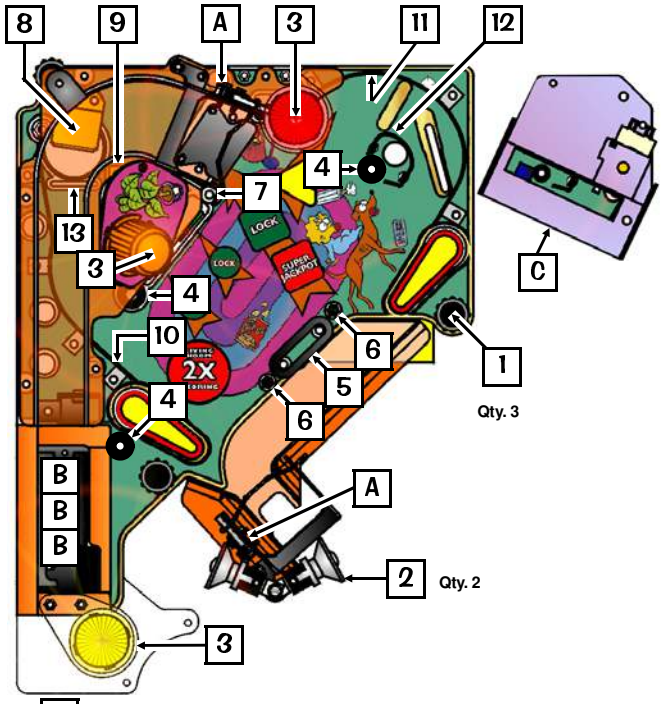
For Metal Posts (Screws), Hex Spacers and Posts & Spacers:
*See Main Playfield & Mini-Playfield - ..., Pages **69-71** (**The Pink Pages**).*

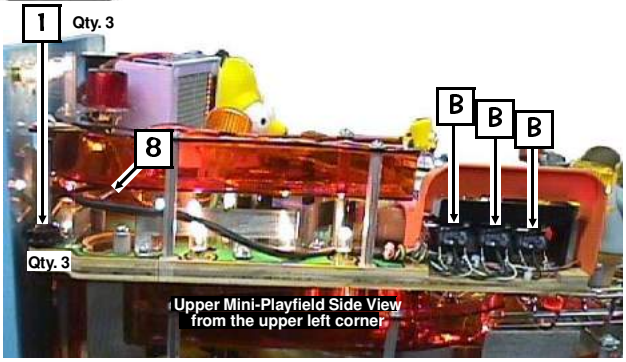
For Small Bayonet Type Bulbs & Sockets and Wedge Base Bulbs & Sockets:
*See Main Playfield & Mini-Playfield - ..., Pages **72** & **74** (**The Pink Pages**).*

For complete Switch Target Assemblies:
*See Appendix **I** at the end of this manual.*

2ND LEVEL MINI-PLAYFIELD (ABOVE)

General Individual Parts Above Only (1-13 & A-C)



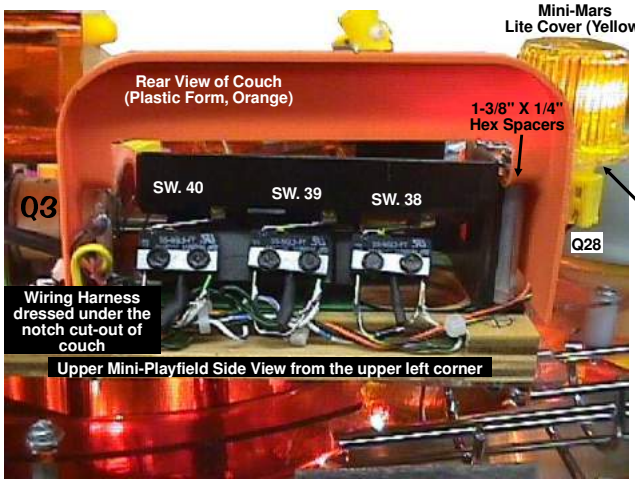


Upper Mini-Playfield Side View from the upper left corner

Nº	ABOVE MINI-P/F PART NAME	QTY.	SPI PART Nº
PF	Mini-P/F Screened **w/ Inserts & NO Parts**	1	830-5177-01
	Mini-P/F **Complete w/ Inserts & ALL Parts**	1	**505-6004-77-77B**
	General Items		
1	Thumb Screw (Black Knob)	3	355-5050-00
	*Item **1** secures down the 2nd Level Mini-Playfield onto #10-32 X 3-1/2" P/F Post (Black)*		
	*For actual size view of Post, see Main P/F & Mini-P/F - Metal Posts & Nuts, Pink Page **69**.*		
2	Light Reflector (Silver Color Plastic)	2	545-5409-01
3	Mini-Mars Lite Cover **(Snap-In)** ***(see Note)***	3	550-5030-**XX**
	*Item **3** come in various colors, replace **XX** with the following **2-Digit Numbers**:*		
	-02 Red (Qty. 1), -03 Amber (Qty. 1) & -06 Yellow (Qty. 1)		
	Rubber Parts		
4	Rubber Ring, Black 3/16" I.D.	3	545-5348-01
5	Rubber Ring, Black 3/4" I.D.	1	545-5348-04
6	Rubber Ring, Black 3/8" O.D.	2	545-5348-19
7	Bumper **BLACK** **(Post Sleeve, Tall)**	2	545-5308-00
	Bracket with Wire Gate		
8	Snubber Bracket	1	535-8250-04
	Brackets for Ball Stops, Traps or Protect		
9	Bracket ***(identical to Coil Mounting)***	1	535-7356-00
	Item 9 is secured by: #8 X 1/2" HWH AB (Zinc) (Qty, 2) (234-5101-00)		
	Metal Flat Rails, Wire Forms & Ball Guides		
10	Metal Rail **(Mini-P/F, Left)**	1	535-9087-00
11	Metal Rail **(Mini-P/F, Loop)**	1	535-9089-00
12	Metal Rail **(Mini-P/F, Loop Inside)**	1	535-9090-00
	Items 10-12 are secured at Tabs by: #8 X 1/2" HWH AB (Z.) (Qty. 1/per tab) (234-5101-00)		
13	Snubber Wire 1"	1	535-5373-00
	Switches & Misc. PC Board		
A	Micro Switch **(X2 Ramps)**	2	180-5190-28
	Item A requires a Switch Body Protect Plate (Qty. 1/ea.) (535-6539-00) & is secured by: #2-56 X 1/2" HWH Sr Uns #4HD TR3 Black (Qty. 2) (237-5937-02)		
B	Micro Switch **(Roller Actuator, Lite Force)**	3	180-5119-02
	Item B is secured by: #2-56 X 1/2" HWH (Qty. 2/per) (237-5937-02)		
C	Color Dot Display (5X7) x4 PC Bd.	1	520-5219-00
	*More information and views in Sec. **5**, Chp. **4**, on Pages **140-141**.*		

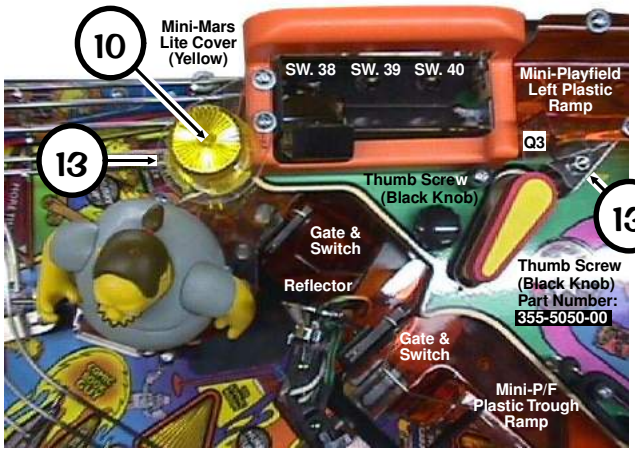
2ND LEVEL MINI-PLAYFIELD (ABOVE)

Couch Ball-Lock Individual Parts Only (Items 1-13)

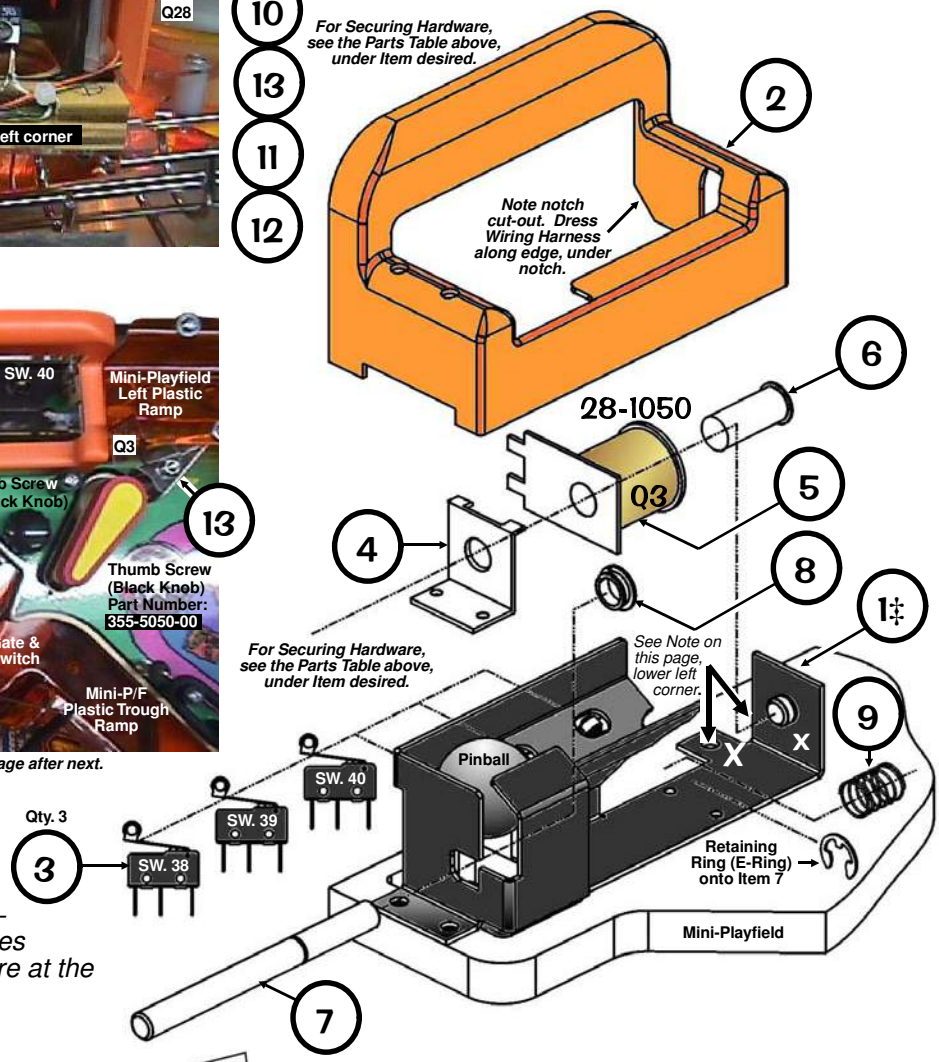


№	INDIVIDUAL PART NAME	QTY.	SPI PART №
1‡	Couch Weldment Frame (Black)	1	535-9193-00
	‡ *If Required:* Bracket, Reinforcement	1	535-9307-00
	Item 1 is secured at the back tab by: #8 X 1/2" HWH AB Zinc (Qty. 1) (234-5101-00) **Item 1 is secured at the front tab by:** #6-32 X 3/4" Fin Shank Screw (Qty. 2) (237-5921-02) **and** 1-3/8" X 1/4" Hex Spacer #6-32 Tap (Qty. 2) (254-5008-33)		
2	Couch (Plastic Form, Orange)	1	545-6063-00
	Item 2 is secured onto the Hex Spacers by: #6-32 X 3/8" PPH MS (Sems) Zinc (Qty. 2) (232-5201-00 **and** #6 Washer (Qty. 2) (242-5001-00) *under Plastic Piece -03*.*		
3	Micro Switch **(Roller Actuator, Lite-Force)**	3	180-5119-02
	Item 3 is secured to Item 1 by: #2-56 X 1/2" HWH (Sr) UNS #4HD TR3 BO (Qty. 6) (237-5937-02) Switch has a Diode (1N4004) (112-5003-00). *Can be replaced with (1N4001) (112-5001-00).*		
4	(Mini) Coil Retainer	1	535-7321-01
	Item 4 is secured to Item 1 by: #6-32 X 1/4" HWH Swage (Serr) Zc. (Qty. 2) (237-5976-01)		
5	Coil, 28-1050 (Mini-Bobin)	1	090-5046-00
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
6	Coil Sleeve	1	545-5442-00
7	Plunger (Shaft)	1	530-5631-00
	Item 7 is secured in Item 4 with: Retaining Ring (E-Ring) 5/16" ø (Qty. 1) (270-5003-00)		
8	Nyliner - 5L1-FF Thomson	1	545-5485-00
9	Compression (Return) Spring	1	266-5043-00
10	Mini-Mars Lite Cover **(Snap-In)** Amber	1	550-5030-03
11	#906 Wedge Base Bulb (Clear)	2	165-5004-00
12	IDC Snap-Pn Socket ***No Diode***	2	077-5216-**01**
13*	***Kit:*** Plastics (Screened & Clear)	1	803-5000-77

Note: *For associated Plastics (-03 & -28), see* ***Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals****, Page* ***67****. Plastics are not available individually, ordering of Plastic Kit is required.* ***For position of Clear Plastic -03 & -28 see photo.***
**** Not shown in drawing below for clarity.***



Plastic Ramps on Mini-Playfield: See page after next.



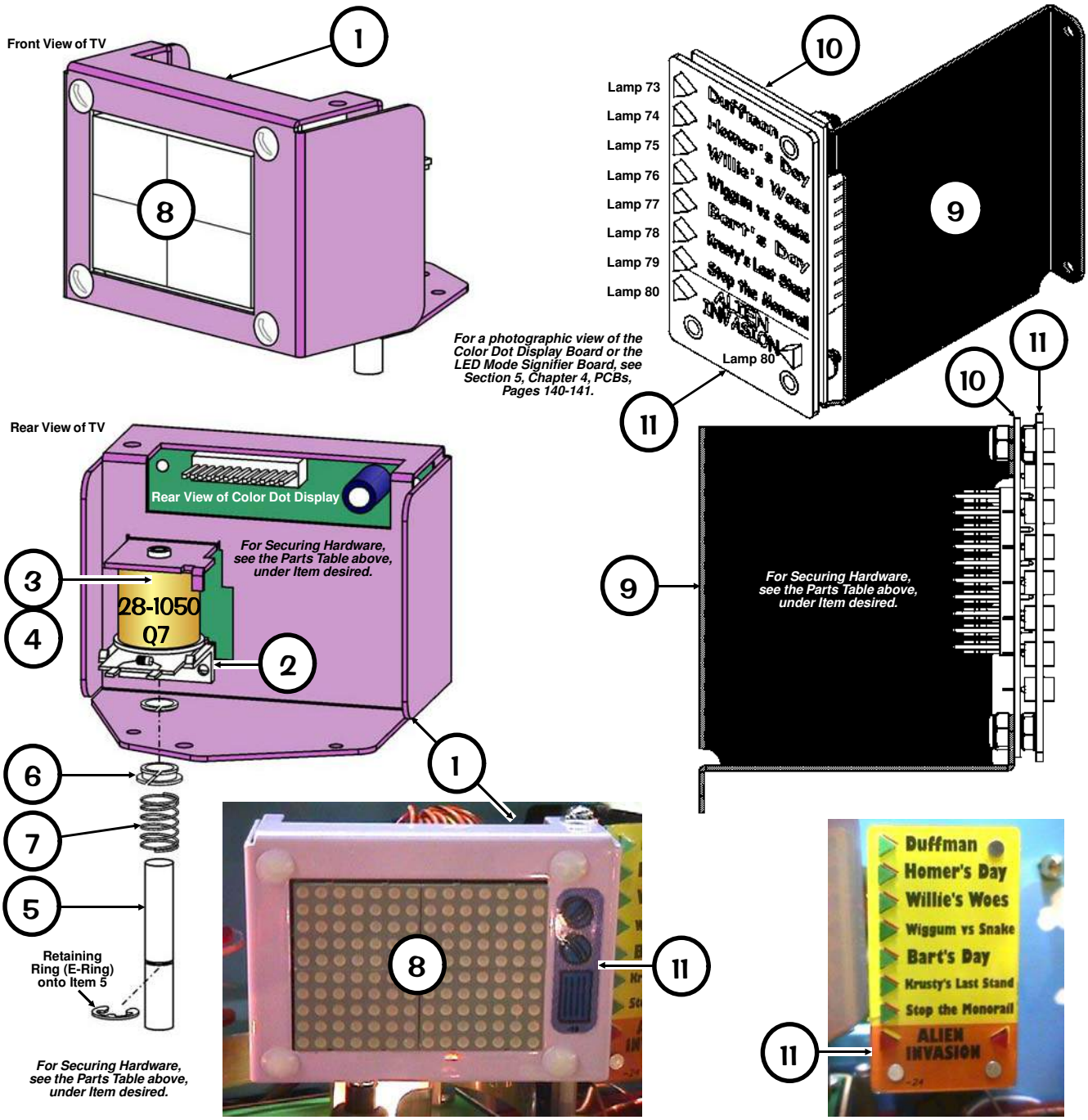
Note: *If you find Item* ***1****,* ***Couch Weldment Frame (Black)****, bending in the rear (marked with an "x"), order the Couch Reinforcement Bracket, 535-9307-00. It slides into place, using the same hardware at the location marked with capital "X".*

2ND LEVEL MINI-PLAYFIELD (ABOVE)

TV (Color Dot Display) & LED (Mode Signifier) Individual Parts Only (Items 1-11)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	TV Weldment Frame (Violet)	1	515-7263-00
	Item 1 is secured by: #6-32 X 3/4" Fin Shank Screw (Qty. 2) (237-5921-02), Washer ("fat") 13/64" I.D. X 5/8" O.D. X .105 (Qty. 2) (242-5039-00), 4" X 1/4" Hex Spacer #6-32 Tap (Qty. 2) (254-5008-21) [Front], 1-1/4" Hex Spacer #6-32 Tap (Qty. 2) (254-5008-11) [Rear], #6-32 X 3/8" PPH MS (Sems) Zinc (Qty. 2) (232-5201-00) **and** #6 Washer (Qty. 2) (242-5001-00)		
2	(Mini) Coil Retainer	1	535-7321-01
	Item 2 is secured to Item 1 by: #6-32 X 1/4" HWH Swage (Serr) Zc. (Qty. 2) (237-5976-01)		
3	Coil, 28-1050 (Mini-Bobin)	1	090-5046-00
	Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).		
4	Coil Sleeve	1	545-5442-00
5	Plunger (Shaft)	1	530-5629-00
	Item 5 is secured in Item 2 with: Retaining Ring (E-Ring) 5/16" ø (Qty. 1) (270-5003-00)		
6	Nyliner - 5L1-FF Thomson	1	545-5485-00

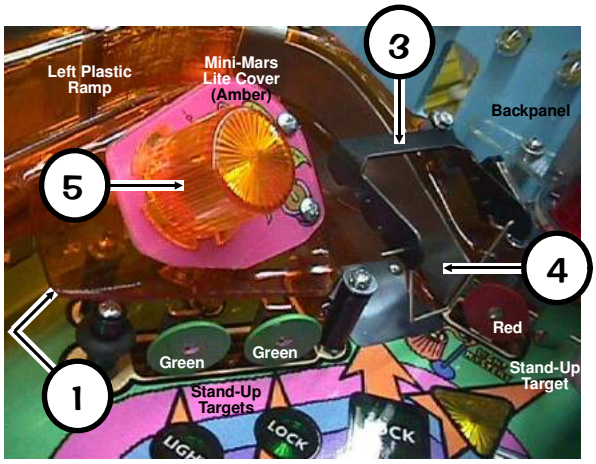
Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
7	Compression (Return) Spring	1	266-5043-00
8	Color Dot Display (5X7) x4 PCB	1	520-5219-00
	Item 8 is secured to Item 1 by: PCB Fastener (6mm) White Nylon (Qty. 4) (237-5008-00)		
9	Bracket, Mode LED PCB Mount (Blk)	1	535-9232-00
	Item 9 is secured to the BACKPANEL by: #8-32 X 3/4" HWH Swage (Serr) Zinc (Qty. 3) (237-5975-02)		
10	LED PCB (Mode Signifier)	1	520-5225-00
	Item 10 is secured to Item 9 by: #6-32 X 5/8" PEM (Self-Clinching) Stud (Zinc) (Qty. 3) (237-6131-10), #6-32 Keps Nut (Qty. 3) (240-5008-00) [between Plastic -24 & PCB] **and** #6-32 Nylon Stop Nut (Qty. 3) (240-5005-00)		
11	***Kit:*** Plastics (Screened & Clear) ***Kit:*** Game Specific Decals	1	803-5000-77 802-5000-77
	Note: *For associated Plastic (-24) and Decal (-16), see* ***Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals****, Page* ***67****. Plastics & Decals are not available individually, ordering of Plastic and/or Decal Kit is required.*		



Left Plastic Ramp & Plastic Trough Ramp Individual Parts Only (Items 1-11)

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Left Plastic Ramp ***with Ramp Flap only***	1	515-7273-00
	For Individual Items use : Plastic Ramp (Left, No Parts) (**545-6047-00**), Ramp Flap (**535-9093-00**), Rivet, 1/8"ø X 3/16" Lg. (Qty. 2) (**249-5001-00**) **and** #6 Lock Washer (Qty. 2) (**246-5000-00**).		
2	Plastic Trough Ramp ***(Plain, No Parts)***	1	545-6048-00
3	Roll-Under Gate & Switch Assembly	2	515-7206-00
	For Individual Items use : Roll-Under Switch Mounting Bracket (Black) (**535-9041-00**), Wire Gate (**535-9043-48**), Micro Switch (Short Flat Actuator) (**180-5190-28**), Switch Diode (1N4004) (**112-5003-00**), Switch Body Protect Plate (**535-6539-00**) **and** #2-56 X 1/2" HWH Sr (Qty. 2) (**237-5937-02**)		
4	Ramp Protector, Ball Guide *(Left Ramp)*	1	535-9217-00
5	Mini-Mars Lite Cover **(Snap-In)** Amber	1	550-5030-03
6	#906 Wedge Base Bulb (Clear)	2	165-5004-00
7	IDC Snap-Pn Socket ***No Diode***	2	077-5216-**01**
8	Light Reflector (Silver Color Plastic)	2	545-5409-01
9	#555 Wedge Base Bulb (Clear)	2	165-5002-00
10	Wedge Base Socket (Laydown)	2	077-5026-01
11	***Kit:*** Plastics (Screened & Clear) ***Kit:*** Game Specific Decals	1	803-5000-77 802-5000-77

Note: *For associated Plastic (-04) and Decal (-15), see* ***Main Playfield & Mini-Playfield - Plastics (Screened & Clear) & Decals****, Page* ***67****. Plastics & Decals are not available individually, ordering of Plastic and/or Decal Kit is required.*
Plastics shown in the position used, so Securing Hardware can be determined.



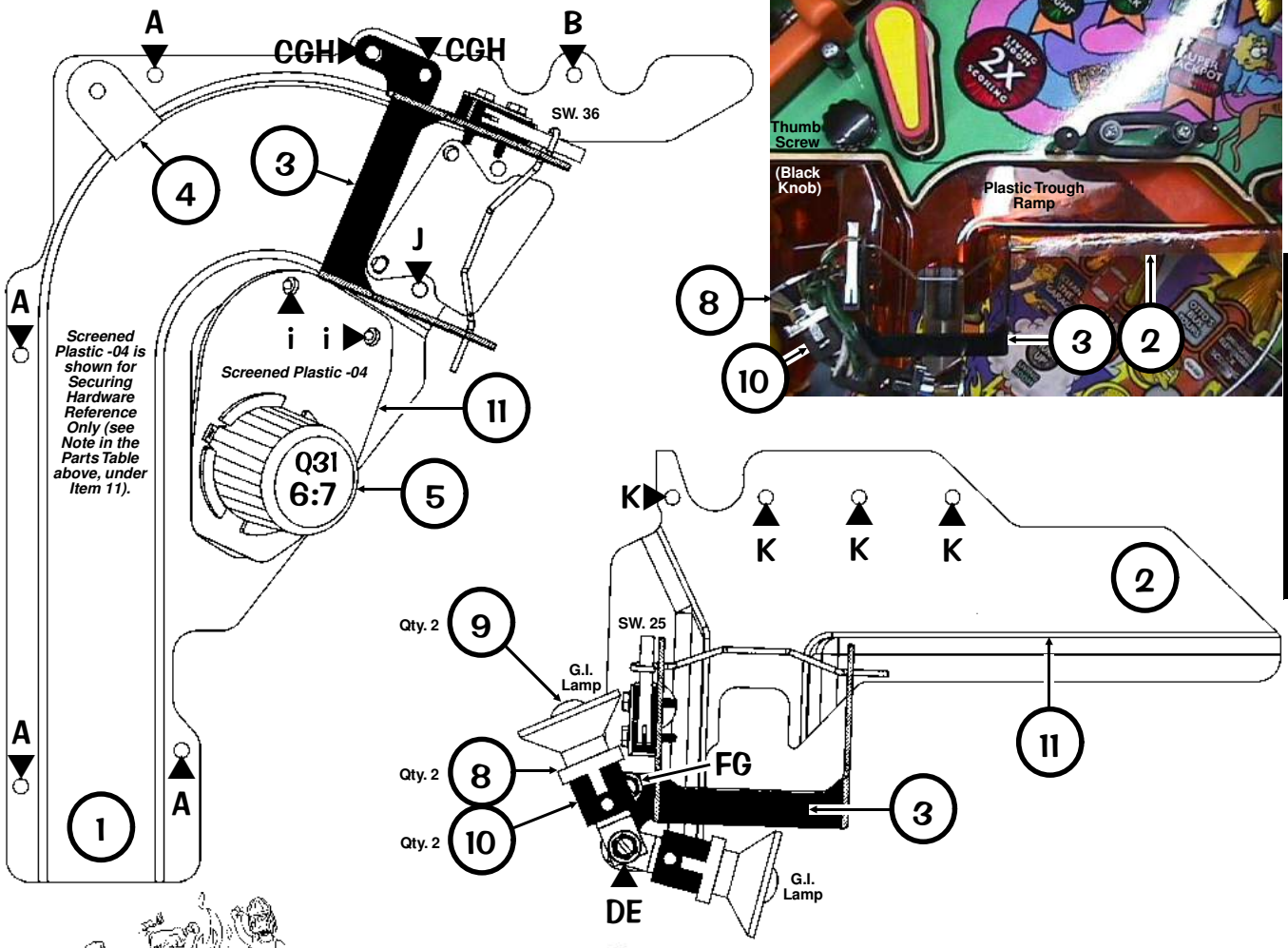
For Securing Hardware of Items 1-4, 10 & 11 (Reference Only), see A-K below.

Securing Hardware A-K

A	2-3/4" X 1/4" Hex Spacer #6-32 Tap, **234-5008-15**
B	1-1/8" X 1/4" Hex Spacer #6-32 Tap, **234-5008-17**
C	1/4" X 3/8" Plastic Spacer Gray, **254-5000-02**
D	#6-32 X 1/2" HWH Swage (Ser) Zinc, **237-5976-03**
E	#6-32 Nylon Stop Nut, **240-5005-00**
F	#8-32 X 1/2" HWH Swage (Ser) Zinc, **237-5975-01**
G	#8-32 Nylon Stop Nut, **240-5102-00**
H	#8-32 X 5/8" HWH MS (Ser) Zinc TF, **237-5951-00**
i	#6 X 1/2" PTH A (Zinc), **237-5809-00**
J	#4 X 5/8" PFH (Black), **237-5833-00** *(1 on each side of the Ramp Flap)*
K	#6 X 3/8' HWH AB (Zinc), **234-5000-00**

Hex Spacers A and B *used to support Plastic Ramps, require:*
#6-32 X 3/8" PPH MS (Sems) Zinc, **232-5201-00** *and* #6 Washer, **242-5001-00**

Hex Spacers secured directly on the Mini-Playfield are secured onto a:
#6-32 X 3/4" Fin Shank Screw, **237-5921-02**

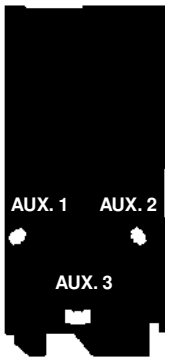


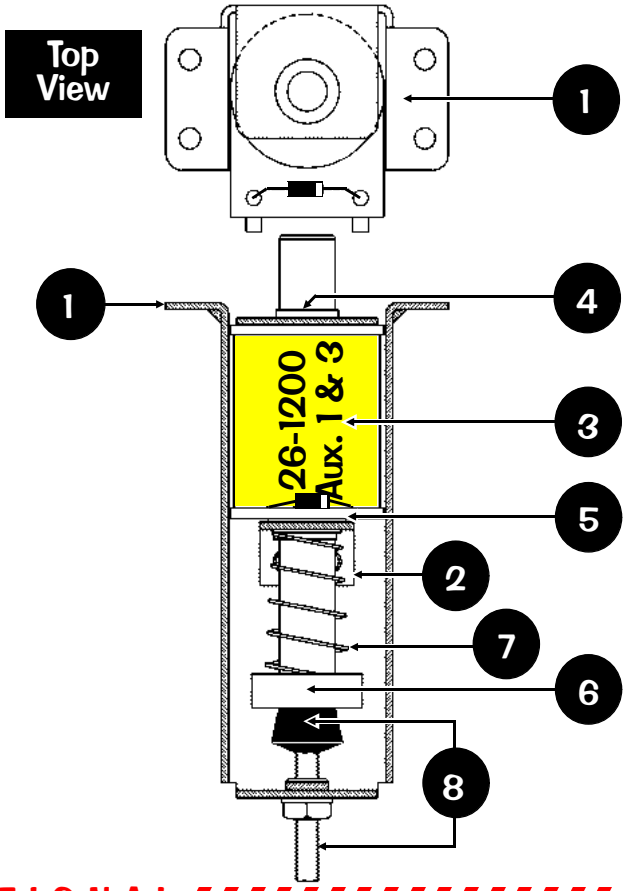
UK ONLY OPTIONAL

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

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Ball Deflector Coil Mounting Bracket	1	535-6857-02
Item 1 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 4) (234-5101-00)			
2	Coil Retaining Bracket	1	535-5203-03
Item 2 is secured by: #8-32 X 1/4" PPH MS (Sems) Zinc (Qty. 2) (232-5300-00)			
3	Coil, 26-1200	1	090-5044-00T
Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).			
4	Coil Sleeve (Short) (Formost #10-7077)	1	545-5076-01
5	Spring Washer (17/32" ID X 3/4" X 1")	1	269-5002-00
6	Solid Plunger Assembly	1	515-6858-00
7	Compression (Relay) Spring	1	266-5022-01
8	#10-32 Adj. Spindle Stop w/Rubber Tip	1	280-5014-00
Item 8 is secured by: #10-32 Keps Nut (Qty. 1) (240-5208-00)			

Ordering Note: If **500-5788-02** *is unavailable*, order the individual part(s) actually required.





UK ONLY OPTIONAL

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

Nº	INDIVIDUAL PART NAME	QTY.	SPI PART Nº
1	Up/Down Post Coil Mounting Bracket	1	515-6840-00
Item 1 is secured below the playfield by: #8 X 1/2" HWH AB (Zinc) (Qty. 6) (234-5101-00)			
2	Adjustment Spindle Stop Bracket	1	535-8303-00
3	Coil Retaining Bracket	2	535-7356-00
Items 2 & 3 are secured by: #8-32 X 3/8" Swage (Serr) Zinc (Qty. 2/per) (237-5975-00)			
4	Coil, 23-1100 (ORG)	1	090-5030-00T
Coil has a Diode (1N4004) (112-5003-00) positioned @ top (above lugs next to windings).			
5	Coil Sleeve (with extension)	1	545-5847-00
6	Spring Washer, 17/32" ID X 3/4" X 1"	1	269-5002-00
7	Plunger & Shaft Assembly	1	515-6844-00
ORDERING ABOVE (ITEM 7) SUB-ASSY. PART Nº WILL INCLUDE:			
7A	Ball Bumper Plastic (Top) Red	1	550-5029-02
7B*	Roll Pin, 3/32" ø X 1/2" Long	1	251-5002-00
7C*	Retaining Ring, 1/4" ø Shaft	1	270-5002-00
7D	Plunger & Shaft Sub-Assembly	1	515-6841-00
7E	Plunger Head	1	530-5511-00
7F	#10-32 X 3/8" PPH MS (Sems) Zinc	1	232-5401-00
Ordering Note: If **515-6844-00** *is unavailable*, order the individual part(s) actually required. Item **7D**, part of Item **7**, Plunger & Shaft Sub-Assembly, is 1 piece and cannot be ordered separated.			
8	Compression (Relay) Spring	1	266-5022-01
9	#10-32 Adj. Spindle Stop w/Rubber Tip	1	280-5014-00
Item 9 is secured by: #10-32 Keps Nut (Qty. 1) (240-5208-00)			

Ordering Note: If **500-6293-00** *is unavailable*, order the individual part(s) actually required.

Take Note:

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

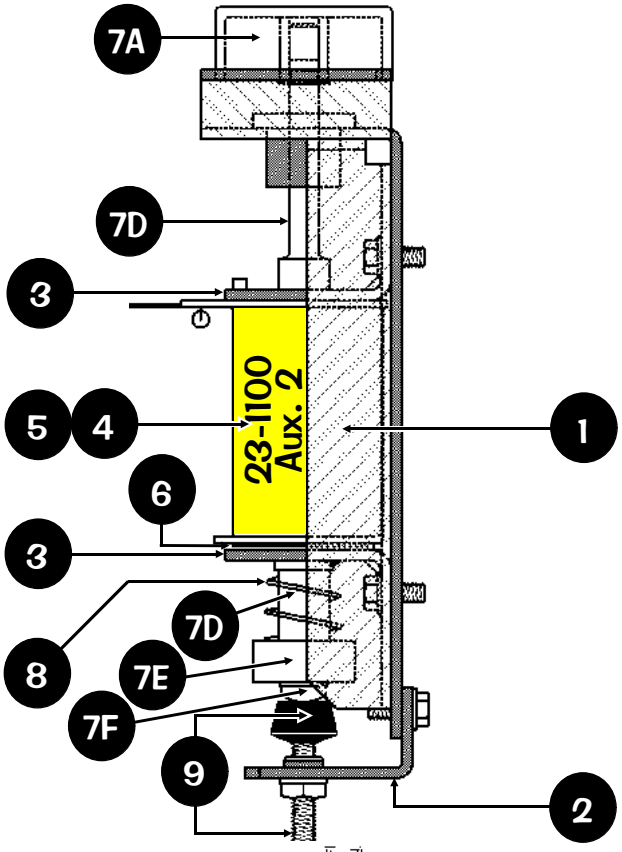


Table of Contents

☐ COILS DETAILED CHART TABLE 100

• Chapter 1, Backbox Wiring 101
- ■ Backbox I/O Power Driver Board Detailed Wiring Diagram 101
- ■ Backbox Board Layout Wiring Diagram 102

• Chapter 2, Playfield Wiring 103
- ■ General Illumination Circuit Detailed Wiring Diagram 103
- ☐ Playfield Switch Wiring Diagram & Playfield Lamp Wiring Diagram 104
- ■ Playfield Terminal Strips, Fuses & Misc. Wiring Descriptions & Locations 105
- ☐ 5-Flipper Circuit Wiring Diagram 106

• Chapter 3, Cabinet Wiring 107
- ■ Transformer Power Wiring Diagram 107
- ☐ Cabinet / Coin Door Wiring Diagram 108

• Chapter 4, Printed Circuit Boards (PCBs) 109
- ■ Trough Up-Kicker Dual OPTO Boards
  Theory of Operation & Schematic, Component Layout & Parts 109
- ☐ OPTO Troubleshooting ..... (Top) 110
- ☐ Trough Dual OPTO Boards Alignment / Tests for LED1 & LED2 110-111
- ■ Dot Matrix Display/Display Controller Bd. Combined Display Connections 112
- ☐ Display Power Supply Board Schematic, Component Layout & Parts 113
- ■ Display Controller Board Schematic 114-115
- ■ Display Controller Board Component Layout & Parts 116
- ☐ I/O Power Driver Board Theory of Operation 117
- ☐ I/O Power Driver Board Schematic
  (Sheet 1 of 5), (Sheet 2 of 5), (Sheet 3 of 5), (Sheet 4 of 5), (Sheet 5 of 5) 118-127
- ☐ I/O Power Driver Board Component Layout 128
- ☐ I/O Power Driver Board Parts 129
- ■ CPU/Sound Board Theory of Operation 131
- ■ CPU/Sound Board Schematic
  (Sheet 1 of 3), (Sheet 2 of 3), (Sheet 3 of 3) 132-137
- ■ CPU/Sound Board Component Layout 138
- ■ CPU/Sound Board Parts 139
- ■ CPU/Sound Board II (with ATMEL Processor) Theory of Operation I
- ■ CPU/Sound Board II (with ATMEL Processor) Schematic
  (Sheet 1 of 4), (Sheet 2 of 4), (Sheet 3 of 4), (Sheet 4 of 4) ..... II-IX
- ■ CPU/Sound Board II (with ATMEL Processor) Component Layout X
- ■ CPU/Sound Board II (with ATMEL Processor) Parts XI
- ☐ Color Dot Display (5X7) x4 PC Board (TV Set) Component Layou 140
- ■ LED PC Board (Mode Signifier) Component Layout 141
- ☐ Tournament Serial Interface Board Schematic 142-143
- ☐ Tournament Serial Interface Board Component Layout & Parts 144

Visit **www.SternPinball.com/schematics.htm** for the latest 11" X 17" Schematics (or "Split 8-1/2" X 11") for the **Display Power Supply, Display Controller, I/O Power Driver & CPU/Sound Boards** (White Star™ System Only). Along with the schematics you'll find the component layout and theory of operation. Keep visiting as these files are continuously improved with more search links in the documents. The files are in PDF format (Adobe® Reader required). They may be slow to open in the website only, but once on your hardrive they load fast! Inside the schematics you can use email links where address may direct you a another sheet in the schematic set (further instructions within documents). To "download" once open, in your browser click "File" "Send" "Page by eMail". It will be sent to your eMail Address, where there you can save the file to your hardrive.

All 11 X 17 Schematics and other PDF files are also available on CD-ROM.

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

COILS DETAILED CHART TABLE

	High Current Coils Group 1	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	▲ I/O Power Driver ▼	YEL-VIO	J10-P4/5	50v DC	BRN-BLK	J8-P1	26-1200 090-5044-00T
#2	AUTO LAUNCH	Q2		YEL-VIO	J10-P4/5	50v DC	BRN-RED	J8-P3	26-1200 090-5044-00T
#3	COUCH RELEASE	Q3		YEL-VIO	J10-P4/5	50v DC	BRN-ORG	J8-P4	28-1050 090-5046-00
#4	DROPS RESET UP	Q4		YEL-VIO	J10-P4/5	50v DC	BRN-YEL	J8-P5	26-1200 090-5044-00T
#5	ITCHY & SCRATCHY EJECT (VUK)	Q5		YEL-VIO	J10-P4/5	50v DC	BRN-GRN	J8-P6	27-1500 090-5004-00T
#6	UPPER LEFT VUK	Q6		YEL-VIO	J10-P4/5	50v DC	BRN-BLU	J8-P7	26-1200 090-5044-00B
#7	TV RELEASE	Q7		YEL-VIO	J10-P4/5	50v DC	BRN-VIO	J8-P8	28-1050 090-5046-00
#8	HOMER HEAD	Q8		GRY~3A Fuse~BRN	J7-P1	20v DC	BRN-GRY	J8-P9	22-900 090-5020-20T

	High Current Coils Group 2	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#9	LEFT BUMPER	Q9	▲ I/O Power Driver ▼	YEL-VIO	J10-P4/5	50v DC	BLU-BRN	J9-P1	26-1200 090-5044-00T
#10	RIGHT BUMPER	Q10		YEL-VIO	J10-P4/5	50v DC	BLU-RED	J9-P2	26-1200 090-5044-00T
#11	BOTTOM BUMPER	Q11		YEL-VIO	J10-P4/5	50v DC	BLU-ORG	J9-P4	26-1200 090-5044-00T
#12	UPF LEFT FLIPPER	Q12		GRY~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-YEL	J9-P5	25-1800 090-5041-00T
#13	UPF RIGHT FLIPPER	Q13		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-GRN	J9-P6	24-1570 090-5025-00T
#14	TOP RIGHT FLIPPER	Q14		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	BLU-BLK	J9-P7	23-1100 090-5030-00T
#15	LEFT FLIPPER (50v RED/YEL)	Q15		GRY-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-GRY	J9-P8	22-1080 090-5032-00T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-VIO	J9-P9	22-1080 090-5032-00T

	Low Current Coils Group 1	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#17	LEFT SLINGSHOT	Q17	▲ I/O Power Driver ▼	BRN	J7-P1	20v DC	VIO-BRN	J7-P2	23-800 090-5001-00T
#18	RIGHT SLINGSHOT	Q18		BRN	J7-P1	20v DC	VIO-RED	J7-P3	23-800 090-5001-00T
#19	UPPER RIGHT EJECT	Q19		BRN	J7-P1	20v DC	VIO-ORG	J7-P4	26-1200 090-5044-00T
#20	GARAGE DOOR (EJECT)	Q20		BRN	J7-P1	20v DC	VIO-YEL	J7-P6	26-1200 090-5044-00T
#21	FLASH: POPS CLEAR	Q21		ORG	J6-P10	20v DC	VIO-GRN	J7-P7	#906 Bulb 165-5004-00
#22	FLASH: R.RAMP RED	Q22		ORG	J6-P10	20v DC	VIO-BLU	J7-P8	#906 Bulb 165-5004-00
#23	FLASH: R.RAMP ORANGE	Q23		ORG	J6-P10	20v DC	VIO-BLK	J7-P9	#906 Bulb 165-5004-00
#24	OPTIONAL COIL	Q24		RED	J16-P7	5v DC	VIO-GRY	J7-P10	Opt. 5v

Diode On Terminal Strip (if noted)

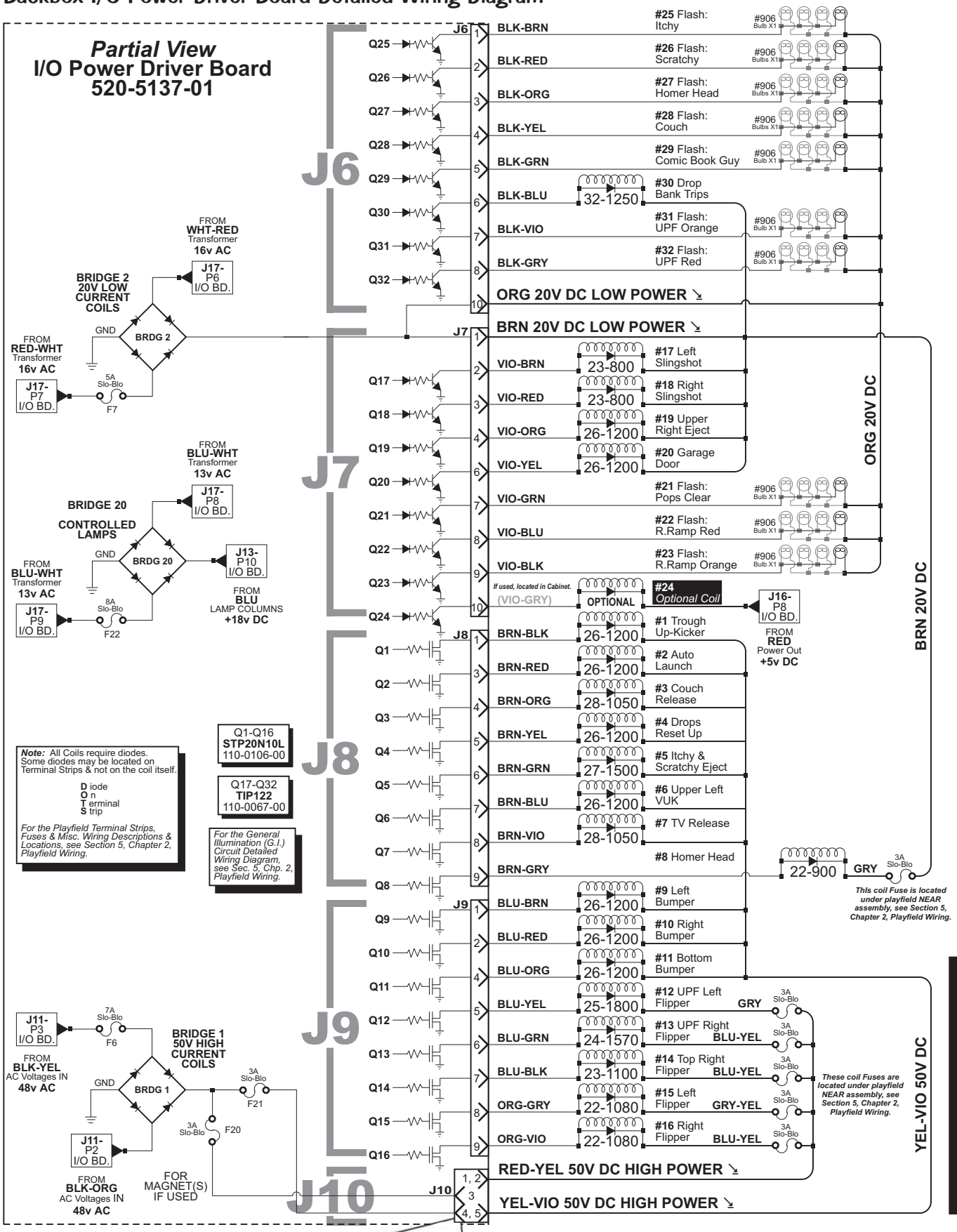
	Low Current Coils Group 2	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn or Bulb Type
#25	FLASH: ITCHY	Q25	▲ I/O Power Driver ▼	ORG	J6-P10	20v DC	BLK-BRN	J6-P1	#906 Bulb 165-5004-00
#26	FLASH: SCRATCHY	Q26		ORG	J6-P10	20v DC	BLK-RED	J6-P2	#906 Bulb 165-5004-00
#27	FLASH: HOMER HEAD	Q27		ORG	J6-P10	20v DC	BLK-ORG	J6-P3	#906 Bulb 165-5004-00
#28	FLASH: COUCH	Q28		ORG	J6-P10	20v DC	BLK-YEL	J6-P4	#906 Bulb 165-5004-00
#29	FLASH: COMIC BOOK GUY	Q29		ORG	J6-P10	20v DC	BLK-GRN	J6-P5	#906 Bulb 165-5004-00
#30	DROP BANK TRIPS	Q30		BRN	J7-P1	20v DC	BLK-BLU	J6-P6	32-1250 515-6916-01
#31	FLASH: UPF ORANGE	Q31		ORG	J6-P10	20v DC	BLK-VIO	J6-P7	#906 Bulb 165-5004-00
#32	FLASH: UPF RED	Q32		ORG	J6-P10	20v DC	BLK-GRY	J6-P8	#906 Bulb 165-5004-00

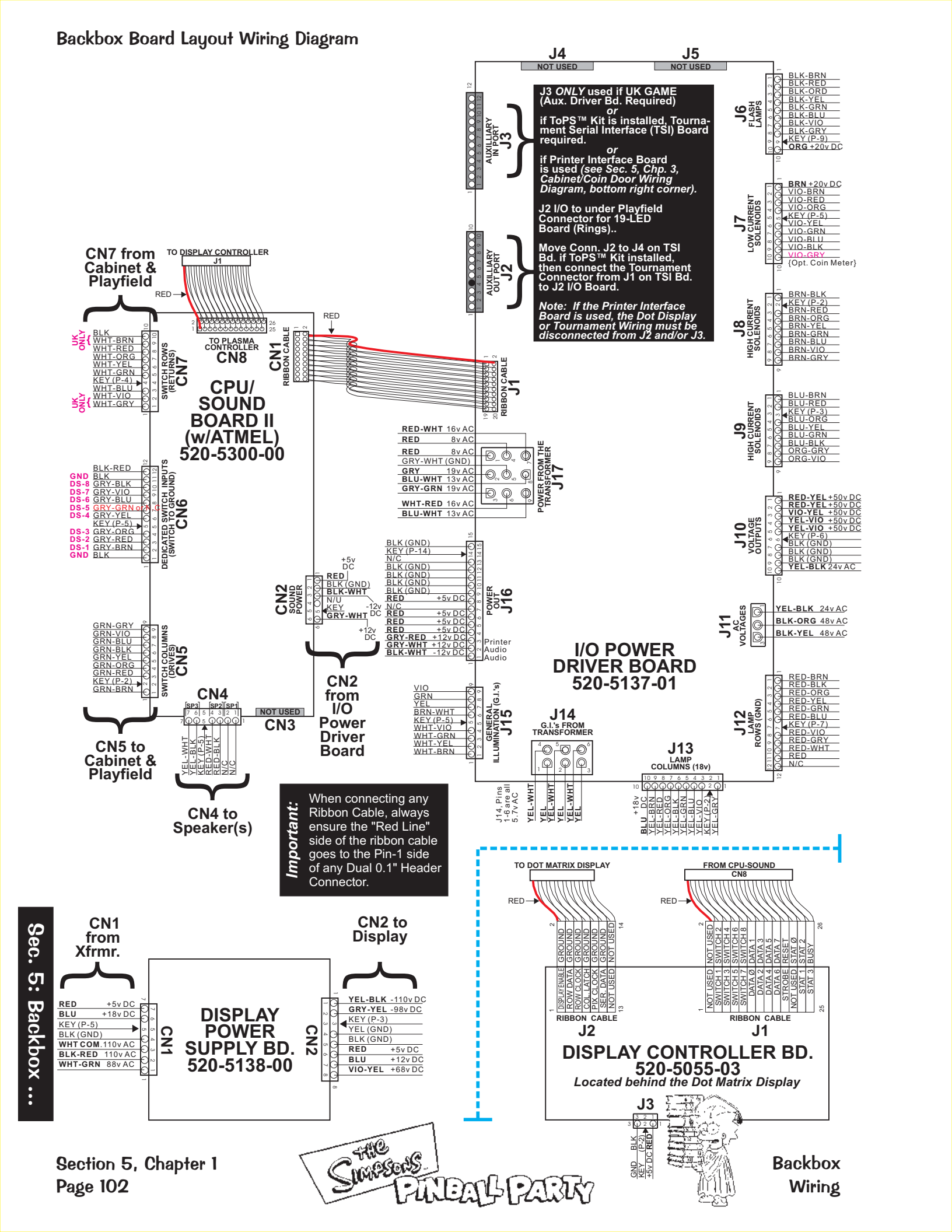
Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q21-Q23, Q25-Q29, Q31-Q32)

	Auxiliary (UK ONLY)	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	Solenoid Expander Auxiliary	BRN	J7-P1	20v DC	WHT	CN2-P5	26-1200 090-5044-00T
	AUX 2: CENTER UP/DOWN POST	Q2		BRN	J7-P1	20v DC	RED	CN2-P4	23-1100 090-5030-00T
	AUX 3: RIGHT UP/DOWN POST	Q3		BRN	J7-P1	20v DC	ORG	CN2-P3	26-1200 090-5044-00T

Backbox Wiring

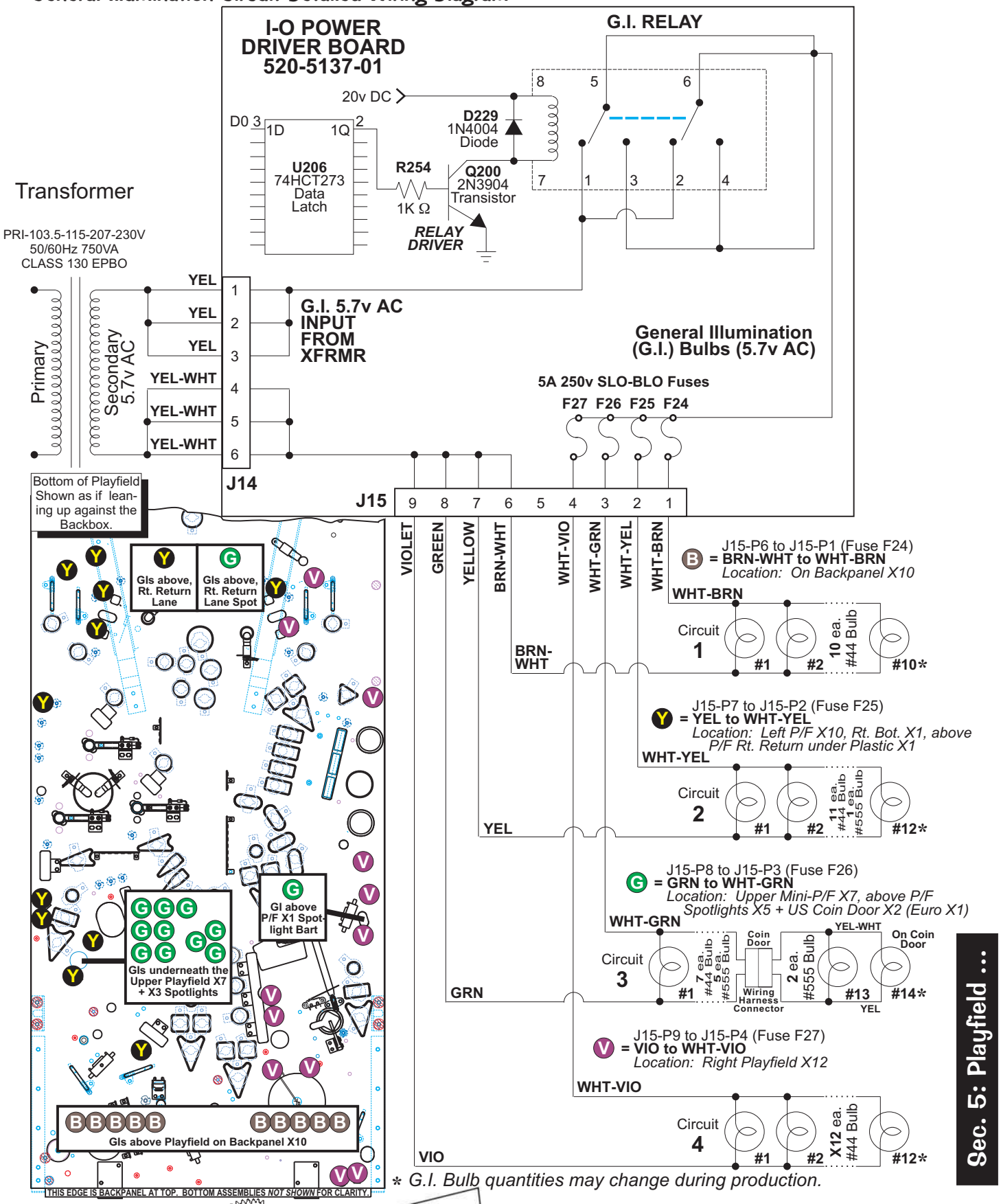
Backbox I/O Power Driver Board Detailed Wiring Diagram




J4
NOT USED
J5
NOT USED
J3 ONLY used if UK GAME (Aux. Driver Bd. Required)
or
if ToPS™ Kit is installed, Tournament Serial Interface (TSI) Board required.
or
if Printer Interface Board is used (see Sec. 5, Chp. 3, Cabinet/Coin Door Wiring Diagram, bottom right corner).
J2 I/O to under Playfield Connector for 19-LED Board (Rings)..
Move Conn. J2 to J4 on TSI Bd. if ToPS™ Kit installed, then connect the Tournament Connector from J1 on TSI Bd. to J2 I/O Board.
Note: If the Printer Interface Board is used, the Dot Display or Tournament Wiring must be disconnected from J2 and/or J3.
AUXILIARY IN PORT J3
AUXILIARY OUT PORT J2
J6 FLASH LAMPS
BLK-BRN
BLK-RED
BLK-ORD
BLK-YEL
BLK-GRN
BLK-BLU
BLK-VIO
BLK-GRY
KEY (P-9)
ORG +20v DC
J7 LOW CURRENT SOLENOIDS
BRN +20v DC
VIO-BRN
VIO-RED
VIO-ORG
KEY (P-5)
VIO-YEL
VIO-GRN
VIO-BLU
VIO-BLK
VIO-GRY
{Opt. Coin Meter}
J8 HIGH CURRENT SOLENOIDS
BRN-BLK
KEY (P-2)
BRN-RED
BRN-ORG
BRN-YEL
BRN-GRN
BRN-BLU
BRN-VIO
BRN-GRY
J9 HIGH CURRENT SOLENOIDS
BLU-BRN
BLU-RED
KEY (P-3)
BLU-ORG
BLU-YEL
BLU-GRN
BLU-BLK
ORG-GRY
ORG-VIO
J10 VOLTAGE OUTPUTS
RED-YEL +50v DC
RED-YEL +50v DC
VIO-YEL +50v DC
YEL-VIO +50v DC
YEL-VIO +50v DC
KEY (P-6)
BLK (GND)
BLK (GND)
BLK (GND)
YEL-BLK 24v AC
J11 AC VOLTAGES
YEL-BLK 24v AC
BLK-ORG 48v AC
BLK-YEL 48v AC
J12 LAMP ROWS (GND)
RED-BRN
RED-BLK
RED-ORG
RED-YEL
RED-GRN
RED-BLU
KEY (P-7)
RED-VIO
RED-GRY
RED-WHT
RED
N/C
CN7 from Cabinet & Playfield
TO DISPLAY CONTROLLER J1
RED
TO PLASMA CONTROLLER CN8
CN1 RIBBON CABLE
RED
RIBBON CABLE J1
UK ONLY
BLK
WHT-BRN
WHT-RED
WHT-ORG
WHT-YEL
WHT-GRN
KEY (P-4)
WHT-BLU
WHT-VIO
WHT-GRY
UK ONLY
SWITCH ROWS (RETURNS) CN7
CPU/ SOUND BOARD II (w/ATMEL) 520-5300-00
BLK-RED
GND BLK
DS-8 GRY-BLK
DS-7 GRY-VIO
DS-6 GRY-BLU
DS-5 GRY-GRN or N/C
DS-4 GRY-YEL
KEY (P-5)
DS-3 GRY-ORG
DS-2 GRY-RED
DS-1 GRY-BRN
GND BLK
DEDICATED SWITCH INPUTS (SWITCH TO GROUND) CN6
RED-WHT 16v AC
RED 8v AC
RED 8v AC
GRY-WHT (GND)
GRY 19v AC
BLU-WHT 13v AC
GRY-GRN 19v AC
WHT-RED 16v AC
BLU-WHT 13v AC
POWER FROM THE TRANSFORMER J17
BLK (GND)
KEY (P-14)
N/C
BLK (GND)
BLK (GND)
BLK (GND)
BLK (GND)
RED +5v DC
N/C
RED +5v DC
RED +5v DC
RED +5v DC
GRY-RED +12v DC
GRY-WHT +12v DC
BLK-WHT -12v DC
POWER OUT J16
Printer
Audio
Audio
+5v DC
RED
BLK (GND)
BLK-WHT
N/U
KEY
GRY-WHT
-12v DC
+12v DC
CN2 SOUND POWER
GRN-GRY
GRN-VIO
GRN-BLU
GRN-BLK
GRN-YEL
GRN-ORG
GRN-RED
KEY (P-2)
GRN-BRN
SWITCH COLUMNS (DRIVES) CN5
CN4
SP3
SP2
SP1
NOT USED
CN3
YEL-WHT
YEL-BLK
KEY (P-5)
RED-WHT
RED-BLK
N/C
N/C
CN5 to Cabinet & Playfield
CN4 to Speaker(s)
CN2 from I/O Power Driver Board
VIO
GRN
YEL
BRN-WHT
KEY (P-5)
WHT-VIO
WHT-GRN
WHT-YEL
WHT-BRN
GENERAL ILLUMINATION (G.I.'s) J15
I/O POWER DRIVER BOARD 520-5137-01
J14 G.I.'s FROM TRANSFORMER
J13 LAMP COLUMNS (18v)
J14, Pins 1-6 are all 5.7v AC
YEL-WHT
YEL
YEL-WHT
YEL
YEL-WHT
YEL
+18v DC
BLU
YEL-BRN
YEL-RED
YEL-ORG
YEL-BLK
YEL-GRN
YEL-BLU
YEL-VIO
KEY (P-2)
YEL-GRY
Important: 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.
Sec. 5: Backbox ...
CN1 from Xfrmr.
RED +5v DC
BLU +18v DC
KEY (P-5)
BLK (GND)
WHT COM. 110v AC
BLK-RED 110v AC
WHT-GRN 88v AC
CN1
DISPLAY POWER SUPPLY BD. 520-5138-00
CN2
CN2 to Display
YEL-BLK -110v DC
GRY-YEL -98v DC
KEY (P-3)
YEL (GND)
BLK (GND)
RED +5v DC
BLU +12v DC
VIO-YEL +68v DC
TO DOT MATRIX DISPLAY
RED
GROUND
GROUND
GROUND
ROW CLOCK
COL LATCH
GROUND
PIX CLOCK
SER DATA
GROUND
NOT USED
DISPLAY ENABLE
ROW DATA
RIBBON CABLE J2
FROM CPU-SOUND CN8
RED
NOT USED
SWITCH 1
SWITCH 2
SWITCH 3
SWITCH 4
SWITCH 5
SWITCH 6
SWITCH 7
SWITCH 8
DATA 0
DATA 1
DATA 2
DATA 3
DATA 4
DATA 5
DATA 6
DATA 7
STROBE
RESET
NOT USED
STAT 0
STAT 1
STAT 2
STAT 3
BUSY
RIBBON CABLE J1
DISPLAY CONTROLLER BD. 520-5055-03
Located behind the Dot Matrix Display
J3
GND BLK
KEY (P-2)
+5v DC RED
THE SIMPSONS PINBALL PARTY

Playfield Wiring

General Illumination Circuit Detailed Wiring Diagram



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

Playfield Switch Wiring Diagram

Note: All Switch, Lamp & Coil assemblies require diodes. Some diodes are ***located under the playfield*** on Terminal Strips ***or*** Diode Boards and not on the assemblies.

For Switch(es): *17-20*

Diode **O**n **T**erminal **S**trip -or- **D**iode **O**n **D**iode **B**oard

Switch **Drive Transistor** Source №: **2N3904**

COLUMN DRIVE	SWITCH DRIVE Wire & Transistor	CN5 PIN
1	GRN-BRN Q1	1
2	GRN-RED Q2	3
3	GRN-ORG Q3	4
4	GRN-YEL Q4	5
5	GRN-BLK Q5	6
6	GRN-BLU Q6	7
7	GRN-VIO Q7	8
8	GRN-GRY Q8	9

Switch							
Switch 1	Switch 9	Switch 17	Switch 25	Switch 33	Switch 41	Switch 49	Switch 57
Left Button (UK ONLY)	Comic Book Guy Standup	Drop Target #1 (Top)	Upper Play-field Exit	UPF Light Standup	Bully 3-Bank (Top)	Left Bumper	Left Outlane
Switch 2	Switch 10	Switch 18	Switch 26	Switch 34	Switch 42	Switch 50	Switch 58
4th Coin Slot	5-Ball Trough #1 (Left)	Drop Target #2 (Mid)	Garage Ramp Enter	UPF Lock Standup	Bully 3-Bank (Mid)	Right Bumper	Left Return Lane
Switch 3	Switch 11	Switch 19	Switch 27	Switch 35	Switch 43	Switch 51	Switch 59
✻ Future Expansion 6th ✻ Coin Slot	5-Ball Trough #2	Drop Target #3 (Bot)	Not Used	UPF Top Standup	Bully 3-Bank (Bot)	Bottom Bumper	Left Slingshot
Switch 4	Switch 12	Switch 20	Switch 28	Switch 36	Switch 44	Switch 52	Switch 60
Right Coin Slot	5-Ball Trough #3	Itchy/Scratchy Saucer VUK	Not Used	Couch Enter	Upper Right Saucer Backup	Pop Side Standup	Right Outlane
Switch 5	Switch 13	Switch 21	Switch 29	Switch 37	Switch 45	Switch 53	Switch 61
Center Coin Slot / DBA	5-Ball Trough #4	Spinner	Kwik-E-Mart Mini Loop	TV Lockup	Right Ramp Enter	Tournament Button	Right Return Lane
Switch 6	Switch 14	Switch 22	Switch 30	Switch 38	Switch 46	Switch 54	Switch 62
Left Coin Slot	5-Ball Trough VUK Opto	Bart Skate-board Top	Kwik-E-Mart Standup	Couch Lock (Bot)	Right Ramp Made	Start Button	Right Slingshot
Switch 7	Switch 15	Switch 23	Switch 31	Switch 39	Switch 47	Switch 55	Switch 63
✻ Future Expansion 5th ✻ Coin Slot	5-Ball Stack-ing Opto	Bart Skateboard	Adv. Pops Standup	Couch Lock (Mid)	Left Ramp Enter	Upper Left VUK	Left Orbit
Switch 8	Switch 16	Switch 24	Switch 32	Switch 40	Switch 48	Switch 56	Switch 64
Right Button (UK ONLY)	Shooter Lane	Upper Right Saucer	Light Otto Standup	Couch Lock (Top)	Garage Door	Plumb Bob Tilt	Right Orbit

CPU/Sound Board

N/C ◀ 10

ROW RETURN	Wire & IC SWITCH RETURN	CN7 PIN
1	WHT-BRN U400	9
2	WHT-RED U400	8
3	WHT-ORG U400	7
4	WHT-YEL U400	6
5	WHT-GRN U401	5
6	WHT-BLU U401	3
7	WHT-VIO U401	2
8	WHT-GRY U401	1

Switch **Return IC** Source №: **LM339AN**

Playfield Lamp Wiring Diagram

Note: All Switch, Lamp & Coil assemblies require diodes. Some diodes are ***located under the playfield*** on Terminal Strips ***or*** Diode Boards and not on the assemblies.

For Lamp(s): *17-19, 31 & 65-70*

Diode **O**n **T**erminal **S**trip -or- **D**iode **O**n **D**iode **B**oard

Please Note: *Switch & Lamp Descriptions may differ slightly than that of the Dot Display due to space restraints.*

J13-Pin 10 is Power Out for +18v DC to the Display Power Supply Bd at **CN1-Pin 6** ◀ BLUE 10

COLUMN DRIVE	Wire & IC LAMP DRIVE	PIN J13
1	YEL-BRN U17	9
2	YEL-RED U16	8
3	YEL-ORG U15	7
4	YEL-BLK U14	6
5	YEL-GRN U13	5
6	YEL-BLU U12	4
7	YEL-VIO U11	3
8	YEL-GRY U10	1

Lamp **Drive IC** Source №: **VN02N**

Lamp **Return Transistor** Source №: **STP19N06L**

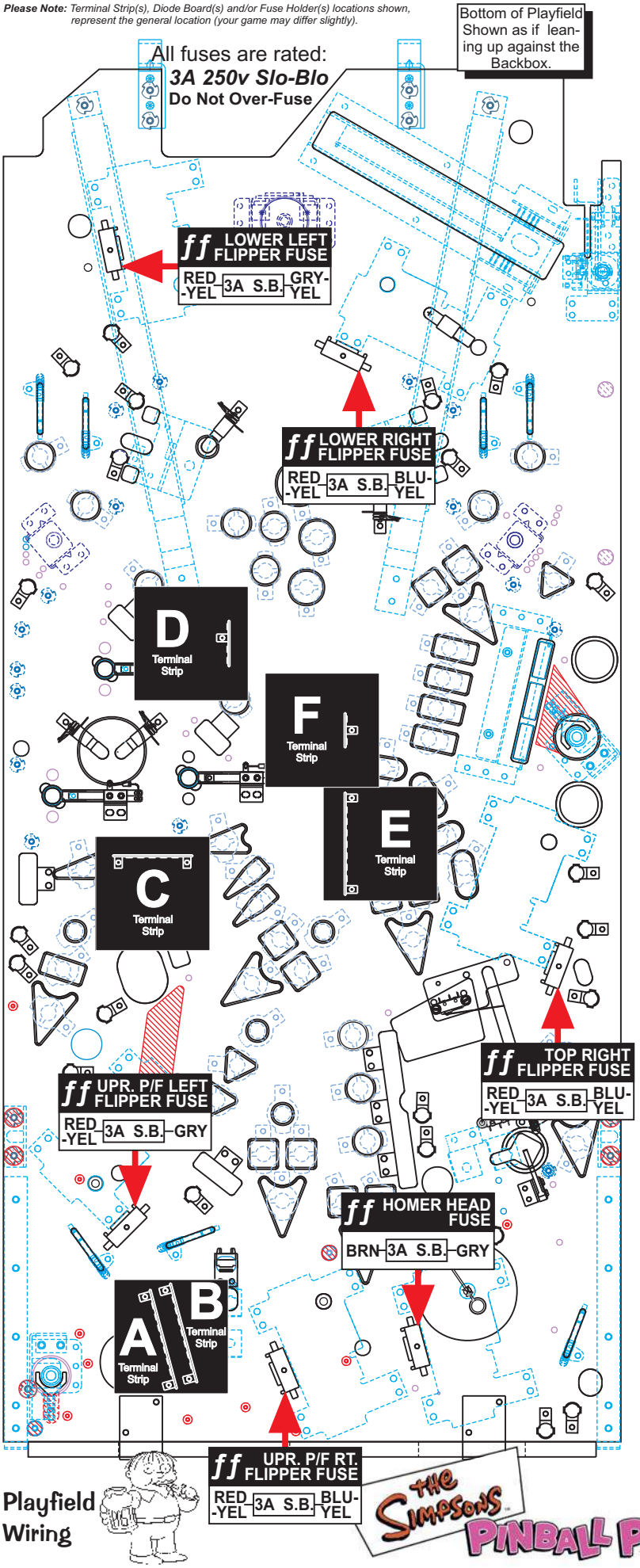
I/O Power Driver Board

ROW RETURN	LAMP RETURN Wire & Transistor	J12 PIN
1	RED-BRN Q33	1
2	RED-BLK Q34	2
3	RED-ORG Q35	3
4	RED-YEL Q36	4
5	RED-GRN Q37	5
6	RED-BLU Q38	6
7	RED-VIO Q39	8
8	RED-GRY Q40	9
9	RED-WHT Q41	10
10	RED Q42	11

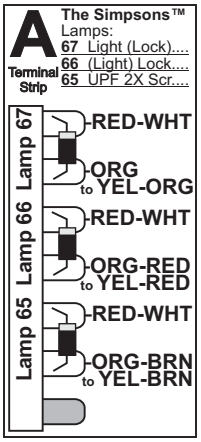
From I/O Pwr. Driver Board **J16-Pins 9-15** ◀ N/C 12

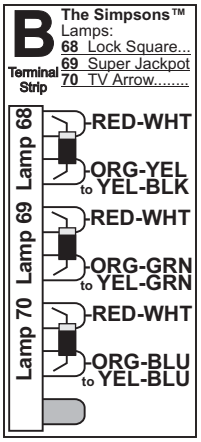
Lamp 1	Lamp 2	Lamp 3	Lamp 4	Lamp 5	Lamp 6	Lamp 7	Lamp 8
Left Out Extra Ball	Left Re-turn Extra Ball	Shoot Again	Right Return Extra Ball	Special	Shooter Lane Skill Shot	Light Otto	Adv. Pops
Lamp 9	Lamp 10	Lamp 11	Lamp 12	Lamp 13	Lamp 14	Lamp 15	Lamp 16
Spay Anything	Kitty Kitty Bang Bang	Field of Screams	Esophagus Now	I&S Arrow	Start I&S Multiball	I&S 2X Scoring	Pops 2X Scoring
Lamp 17	Lamp 18	Lamp 19	Lamp 20	Lamp 21	Lamp 22	Lamp 23	Lamp 24
Left Pop Bumper	Right Pop Bumper	Bottom Pop Bumper	More Time	Collect Nuclear Plant	Left Orbit Arrow	Cletus 2X Scoring	Left Orbit Hurry Up
Lamp 25	Lamp 26	Lamp 27	Lamp 28	Lamp 29	Lamp 30	Lamp 31	Lamp 32
CBG Skill Shot	CBG Start Hurry Up	Dare-Devil Ramps	Dare-Devil Bumpers	Dare-Devil Loops	Dare-Devil Targets	Start Button	Tourna-ment Button
Lamp 33	Lamp 34	Lamp 35	Lamp 36	Lamp 37	Lamp 38	Lamp 39	Lamp 40
Left Ramp Arrow	Treehouse of Horror	Treehouse 2X Scoring	Left Ramp Hurry Up	Right Ramp Arrow	Get Duffed!	Moe's 2X Scoring	Right Ramp Hurry Up
Lamp 41	Lamp 42	Lamp 43	Lamp 44	Lamp 45	Lamp 46	Lamp 47	Lamp 48
Mini Loop Arrow	Kwik-E-Mart 2X Scoring	Kwik-E-Mart Hurry Up	Garage Arrow	Clean the Garage	Garage 2X Scoring	Garage Hurry Up	Right Orbit Arrow
Lamp 49	Lamp 50	Lamp 51	Lamp 52	Lamp 53	Lamp 54	Lamp 55	Lamp 56
Right Loop Arrow	Otto's Bus Tours	Elementary 2X Scoring	Bully 3-Bank (Top)	Bully 3-Bank (Mid)	Bully 3-Bank (Bot)	Krusty 2X Scoring	Right Orbit Hurry Up
Lamp 57	Lamp 58	Lamp 59	Lamp 60	Lamp 61	Lamp 62	Lamp 63	Lamp 64
Homer	Marge	Bart	Lisa	Maggie	Grandpa	Left Headlight	Right Headlight
Lamp 65	Lamp 66	Lamp 67	Lamp 68	Lamp 69	Lamp 70	Lamp 71	Lamp 72
Living Room 2X Scoring	(Light) Lock	Light (Lock)	Lock Square	Super Jackpot	TV Arrow	Not Used	Not Used
Lamp 73	Lamp 74	Lamp 75	Lamp 76	Lamp 77	Lamp 78	Lamp 79	Lamp 80
(LED) Duffman	(LED) Homer's Day	(LED) Willie's Woes	(LED) Wiggum vs. Snake	(LED) Bart's Day	(LED) Krusty's Last Stand	(LED) Stop the Monorail	(LED) Alien Invasion

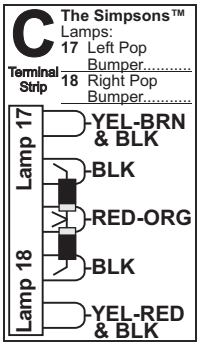
Please Note: *Terminal Strip(s), Diode Board(s) and/or Fuse Holder(s) locations shown, represent the general location (your game may differ slightly).*

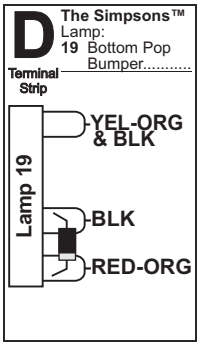


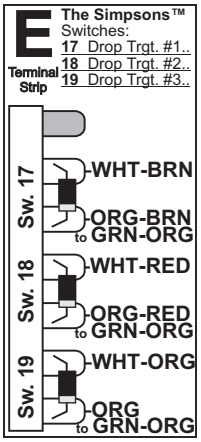
Explanation:
All Switch, Lamp & Coil assemblies require diodes. Some diodes are ***located under the playfield*** on Terminal Strips ***or*** Diode Boards and not on the assemblies. The Switch and Lamp Matrix Grids also note which Switch or Lamp has a diode on a Terminal Strip *(noted by **"DOTS"** meaning: "**D**iode **O**n **T**erminal **S**trip") or on a Diode Board (noted by **"DODB"** meaning: "**D**iode **O**n **D**iode **B**oard").*

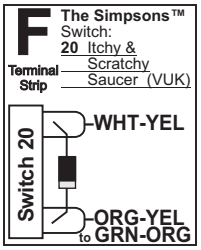


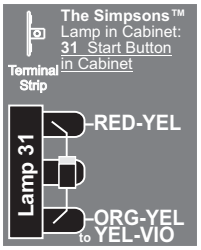








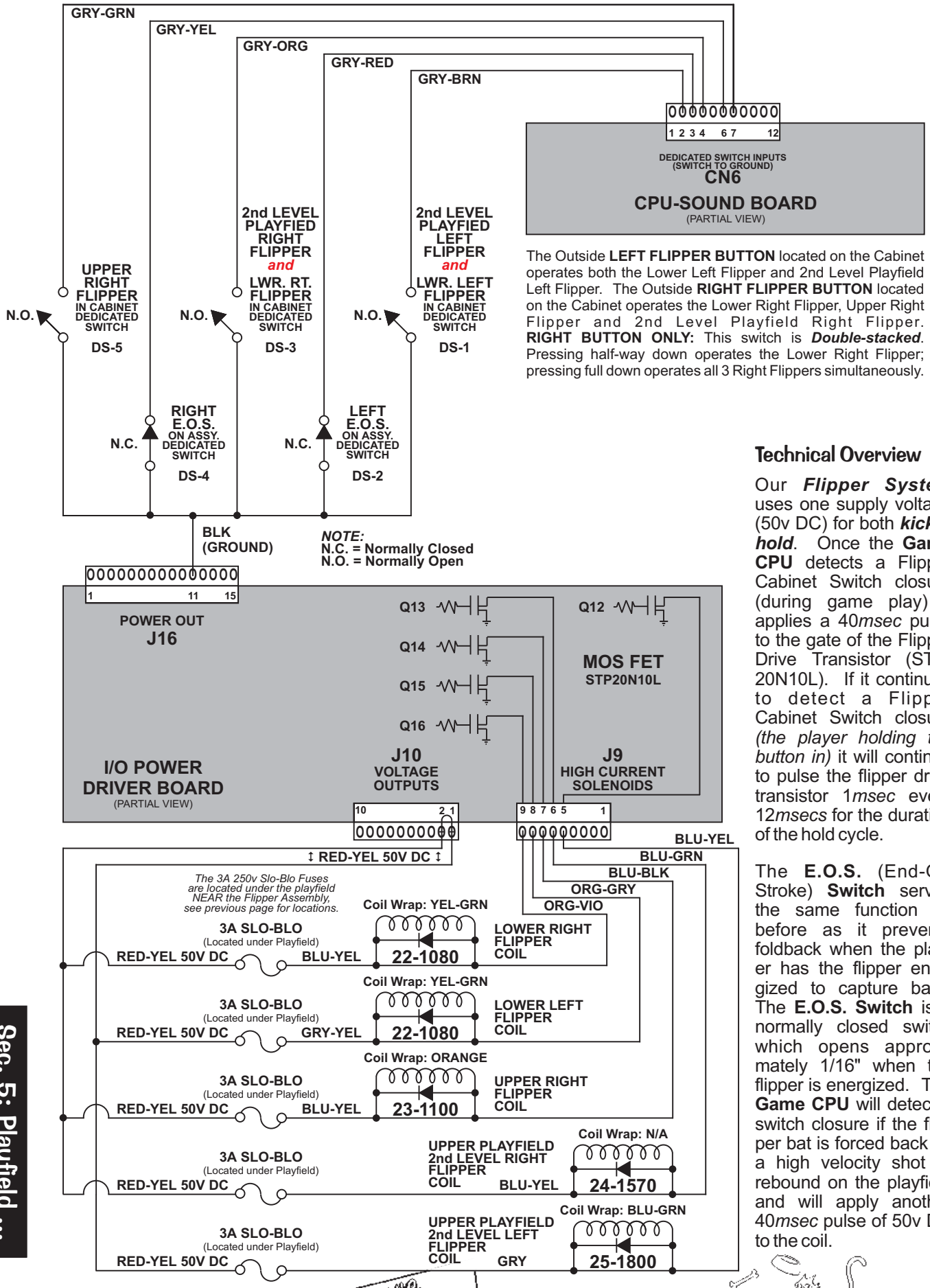




The Simpsons™ Optional Lamp in Cabinet:
32 Tournament Button (Diode in Connector)

See the Pink Pages, Playfield - General Parts (Below) (Pg. 64) **for Terminal Strips, Diodes, Fuses and Fuse Holders Part Nºs.**

5- Flipper Circuit Wiring Diagram



The Outside **LEFT FLIPPER BUTTON** located on the Cabinet operates both the Lower Left Flipper and 2nd Level Playfield Left Flipper. The Outside **RIGHT FLIPPER BUTTON** located on the Cabinet operates the Lower Right Flipper, Upper Right Flipper and 2nd Level Playfield Right Flipper. **RIGHT BUTTON ONLY:** This switch is ***Double-stacked***. Pressing half-way down operates the Lower Right Flipper; pressing full down operates all 3 Right Flippers simultaneously.

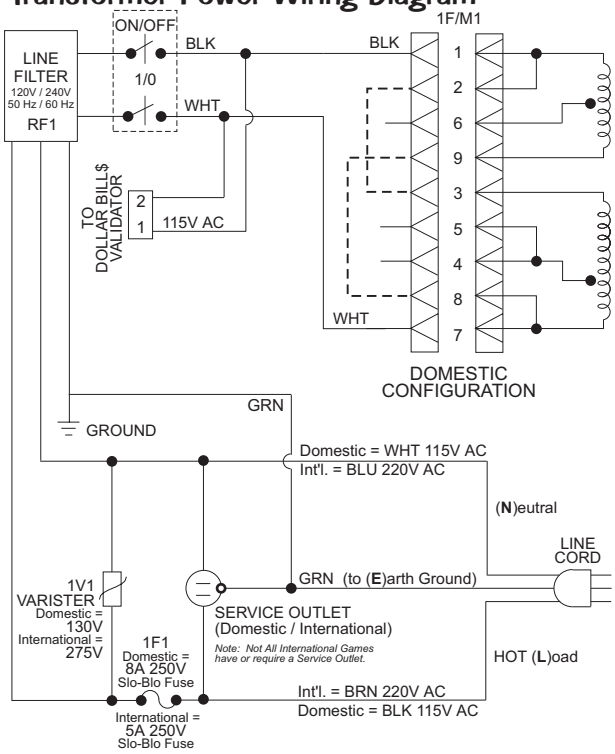
Technical Overview

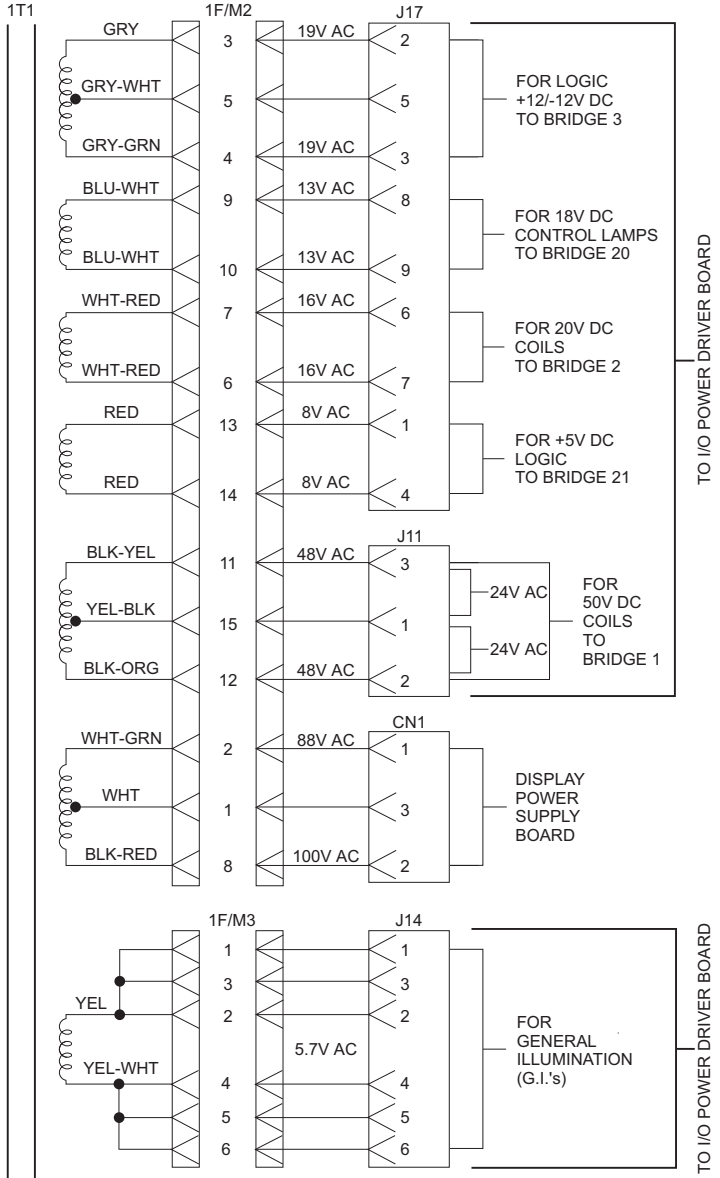
Our ***Flipper System*** uses one supply voltage (50v DC) for both ***kick*** & ***hold***. Once the **Game CPU** detects a Flipper Cabinet Switch closure (during game play) it applies a 40*msec* pulse to the gate of the Flipper Drive Transistor (STP-20N10L). If it continues to detect a Flipper Cabinet 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.

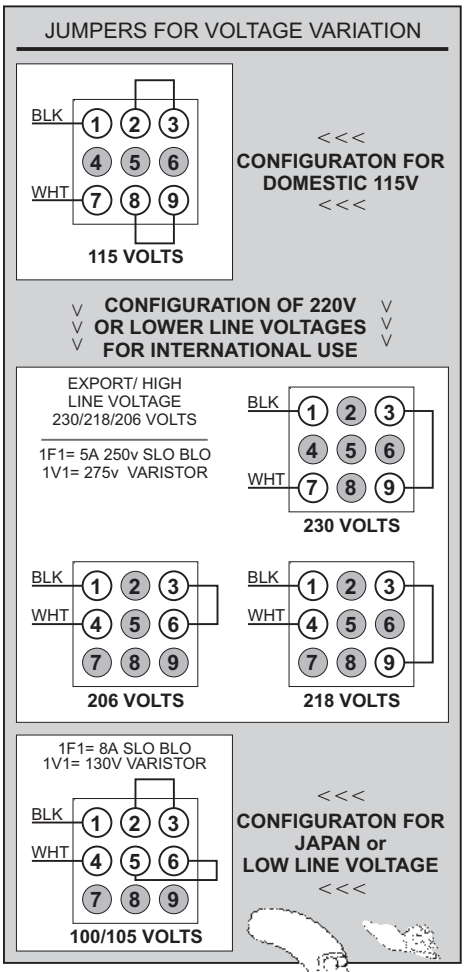
The **E.O.S.** (End-Of-Stroke) **Switch** serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The **E.O.S. Switch** is a normally closed switch which opens approximately 1/16" when the flipper is energized. The **Game CPU** will detect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

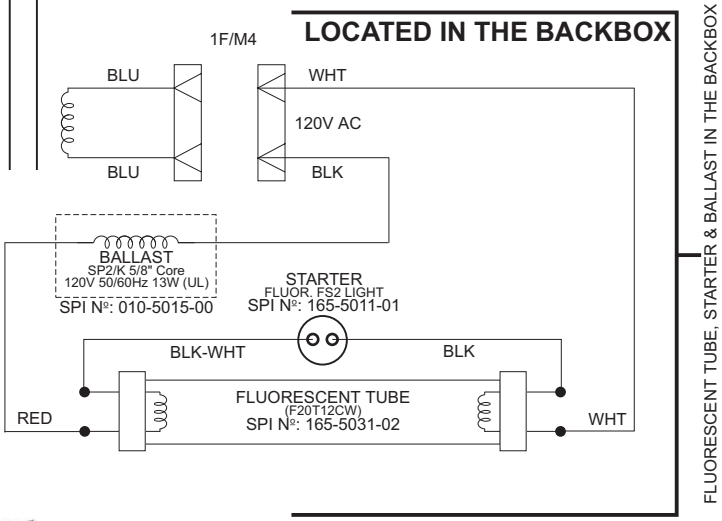
Cabinet Wiring

Transformer Power Wiring Diagram

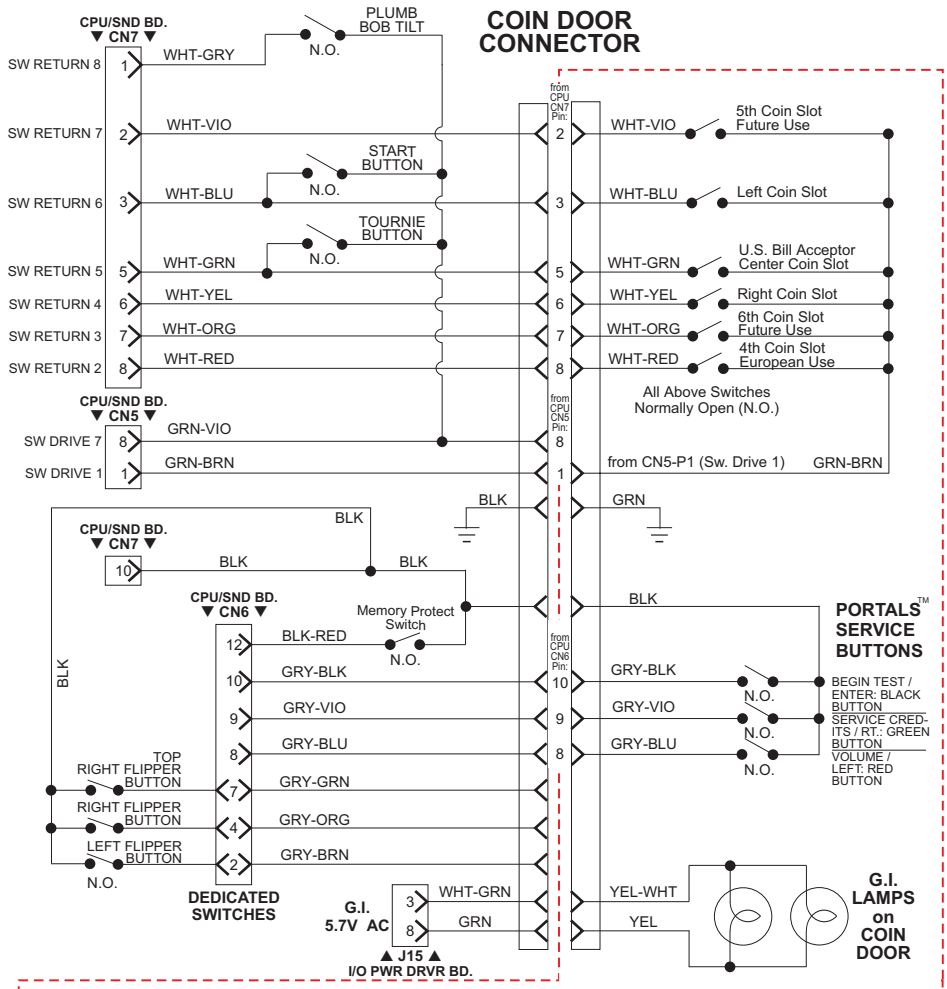


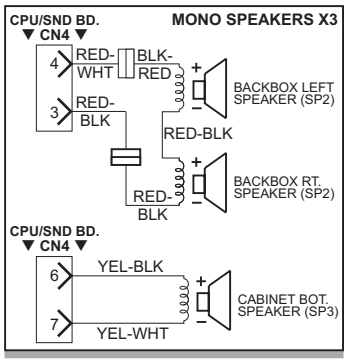






Cabinet / Coin Door Wiring Diagram



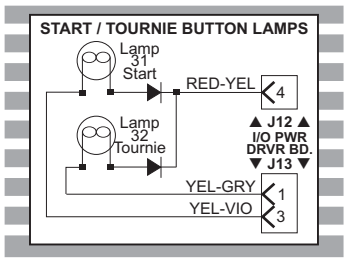


TO COIN METER

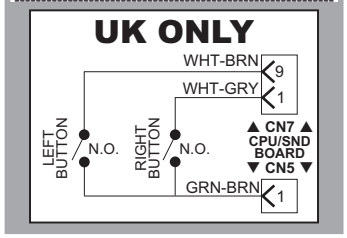
J16-7 +5V DC I/O DRVR BD	22	RED
J7-10 Q24 I/O DRVR BD	78	VIO-GRY
N/C		

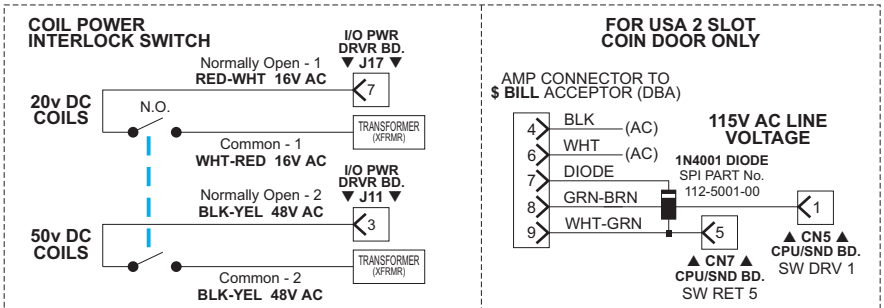
FOR THE PRINTER SUB-ASSEMBLY

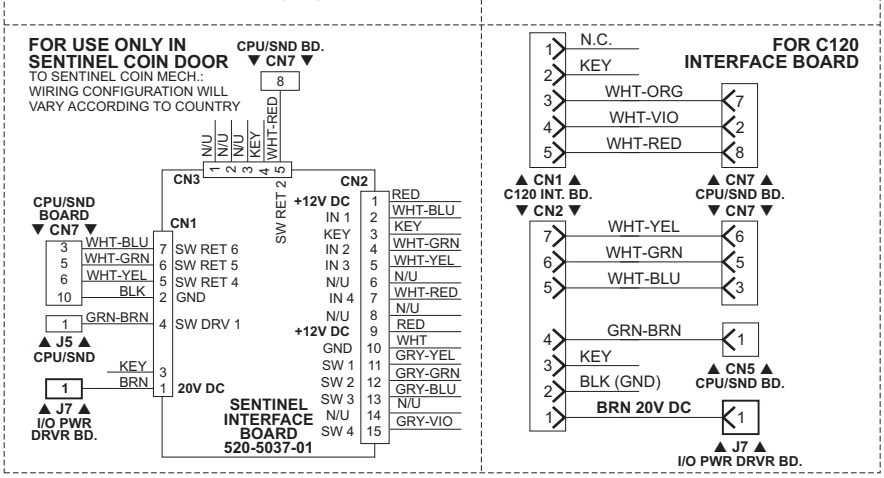
GROUND	00	BLK
J16-7 +5V DC I/O DRVR BD	22	RED
J16-3 +12V DC I/O DRVR BD	82	GRY-RED



UK ONLY: 2 Extra Cabinet Buttons for the Post Save™ Feature are used. The Left Button operates the Left Outlane Ball Deflector. The Right Button operates the Right Outlane Ball Deflector. Both buttons pushed together operate the Center Up/Down Post. Both buttons are located under the Flipper Buttons.







COIN DOOR

PRINTER INTERFACE OPTIONAL

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

Connection Notes:

PRINTER BOARD

I/O DRVR BD **J16-3**: **+12V DC**

I/O DRVR BD **J3-10**: **PRNTR CNT**

I/O DRVR BD **J3-9**: **PRNTR CLK**

DATA LINES P1-P9 ▲ J2 ▲ I/O PWR DRVR BD.

I/O DRVR BD **J2-10**: **PRNTR ENABLE**

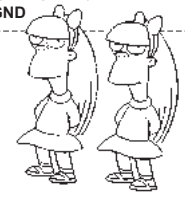
I/O DRVR BD **J3-1**: **PRNTR BUSY**

I/O DRVR BD **J16-7**: **+5V DC**

CPU BD **CN7-10**: **GND**

CN1: ORG-BRN, ORG-RED, ORG-BLK, KEY, ORG-YEL, ORG-GRN, ORG-BLU, ORG-VIO, ORG-GRY

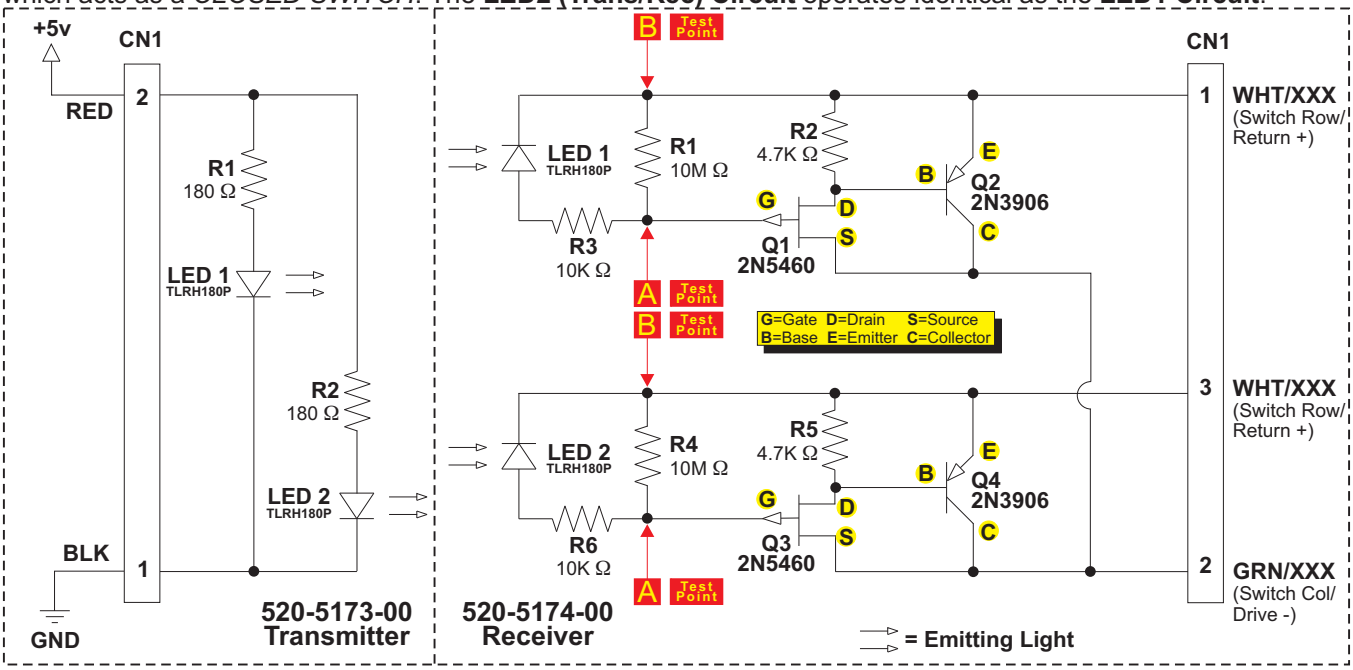
CN2: GRY-RED, KEY, GRN-WHT, BRN-WHT, ORG-WHT, N/C, BRN, N/C, RED, BLK



Printed Circuit Boards (PCBs)

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

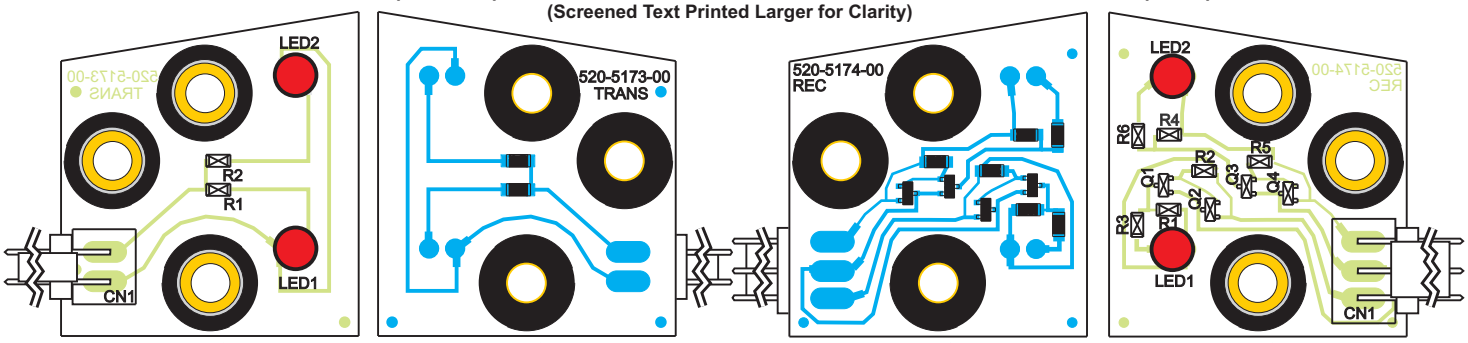
As light from the **Transmitter LED1** falls on the **Receiver LED1**, it generates a Positive Bias Voltage (0.7v to 1.5v) which is applied to the **Gate** (**G**) of **Q1 (Fet 2N5460)** turning **Q1** off. When **Q1** is held off, no current flows through **Q2**'s **(2N3906) Base** (**B**). With no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



Trough Up-Kicker Dual OPTO Boards Component Layout & Parts

520-5173-00 (TRANS) **Boards Actual Size** **520-5174-00 (REC)**

(Screened Text Printed Larger for Clarity)



Front Side (LEDs & 2-Pin Connector) | Back Side (Solder / Surface Mounts) | Back Side (Solder / Surface Mounts) | Front Side (LEDs & 3-Pin Connector)

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
A	**1**	**515-0173-00**	**Dual-OPTO Trans. Bd. Assy.**	**PCB Assy.** (with all **Items 1-5**)
—	**1**	**520-5173-00**	**Dual-OPTO Trans. Board**	**PCB Assy.** (with Items **1-3** only)
01	1	045-5111-02	CN1	2X, .156" Rt. Angle (26-60-5020) Conn.
02	**2**	**165-5052-00**	**LED1, LED2**	**LED TLRH180P** (**Ultra Bright Red**)
03	2	121-5067-00	R1, R2	180 Ω 1/8W Chip Res. (CRCW)
04	3	530-5308-02	n/a	OPTO PCB Brass Tube Spacer
05	3	545-5518-00	n/a	OPTO PCB Rubber Grommet
B	**1**	**515-0174-00**	**Dual-OPTO Rec. Bd. Assy.**	**PCB Assy.** (with all **Items 1-9**)
—	**1**	**520-5174-00**	**Dual-OPTO Rec. Board**	**PCB Assy.** (with **Items 1-7** only)
01	1	045-5111-03	CN1	3X, .156" Rt. Angle (26-60-5030) Conn.
02	**2**	**165-5052-00**	**LED 1, LED 2**	**LED TLRH180P** (**Ultra Bright Red**)
03	2	110-5006-00	Q1, Q3	2N5460, Transistor (P-FET SOT-23)
04	2	110-0086-00	Q2, Q4	**2N3906**, Transistor
05	2	121-5082-00	R1, R4	10M Ω 1/8W Chip Res. (CRCW)
06	2	121-5083-00	R2, R5	4.7K Ω 1/8W Chip Res. (CRCW)
07	2	121-5011-00	R3, R6	10K Ω 1/8W Chip Res. (CRCW)
08	3	530-5308-02	n/a	OPTO PCB Brass Tube Spacer
09	3	545-5518-00	n/a	OPTO PCB Rubber Grommet

Replacement Part:
LED TLRH180P
(T1-3/4 GaAlAs)
SPI Part №:
165-5052-00

OPTO Troubleshooting

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

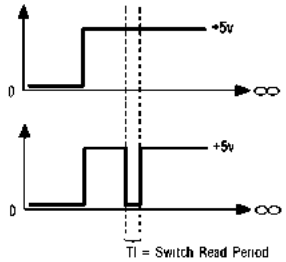
A. **OPEN OPTO** (Light Falling on LED) = *SWITCH OPEN*. Place meter leads across points **A** and **B** on the **LED1 Circuit** *(Refer to Schematic Drawing on previous page, 520-5174-00 Receiver Side).* It should read approximately 0.8 - 1.2v DC. The **LED2 Circuit** operates the same.

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

2. Oscilloscope Test (indicates normal operating condition):

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.

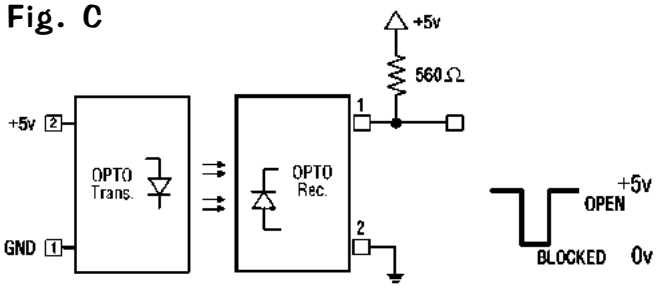
B. **CLOSED OPTO** (Light Blocked) = *SWITCH CLOSED*. Place Scope lead at **Pin-1** of OPTO Rec. Board with Scope Grounded (see Schematic). The Scope should display a **PULSE STREAM** indicating **Q2** has switched "On" as shown in **Fig. B**, Wave Form Diagram. This is your Switch Drive Pulse.

3. Bench Test (See Fig. C):

Please Note: To perform this test you must use a spare 560Ω Pull-Up Resistor, SPI Nº: 121-5047-00

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

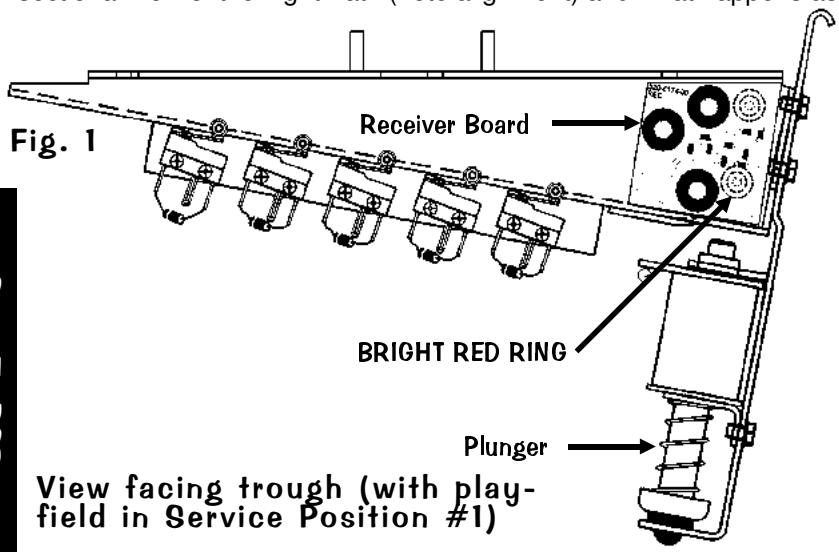
Fig. C



Trough Dual OPTO Boards Alignment / Test for LED1

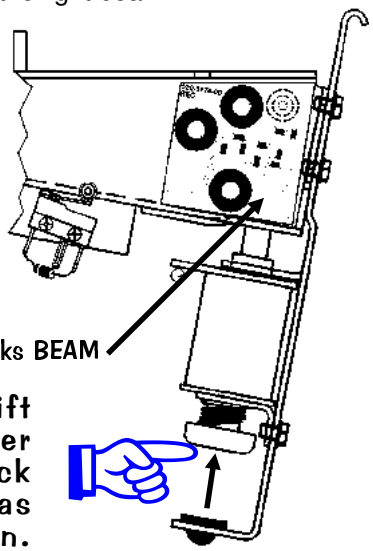
When a working **OPTO** is installed and connected in a game, the transmitter should light (LED1 lower & LED2 upper) when the power is switched on. With the playfield in **Service Position #1** *(playfield lifted up in the half-way position resting on the Prop Rod or edge slide support brackets)* and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

Fig. 1



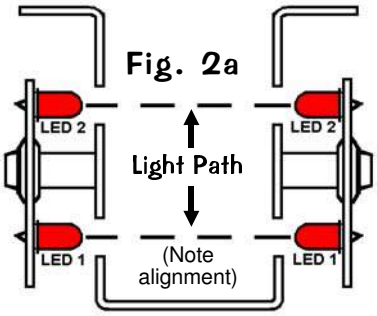
View facing trough (with playfield in Service Position #1)

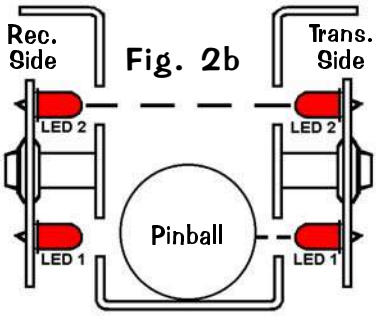
Fig. 2



Lift plunger to check switch as shown.

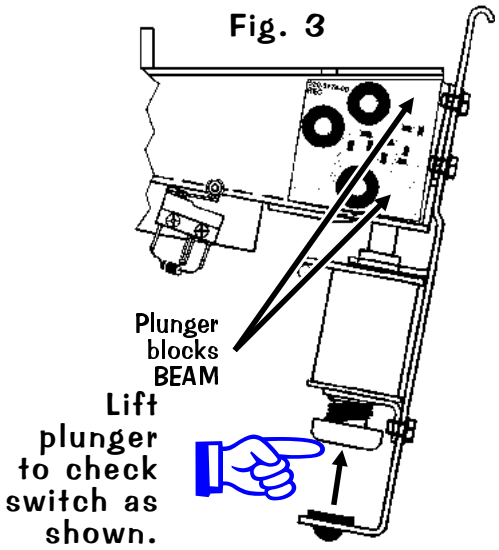
Sectional view from right (Fig. 2a & 2b)

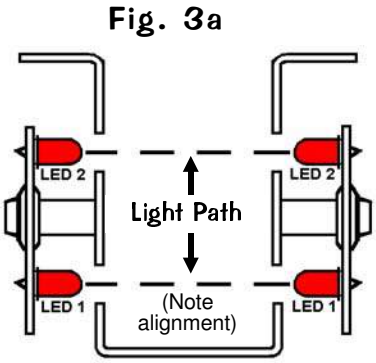


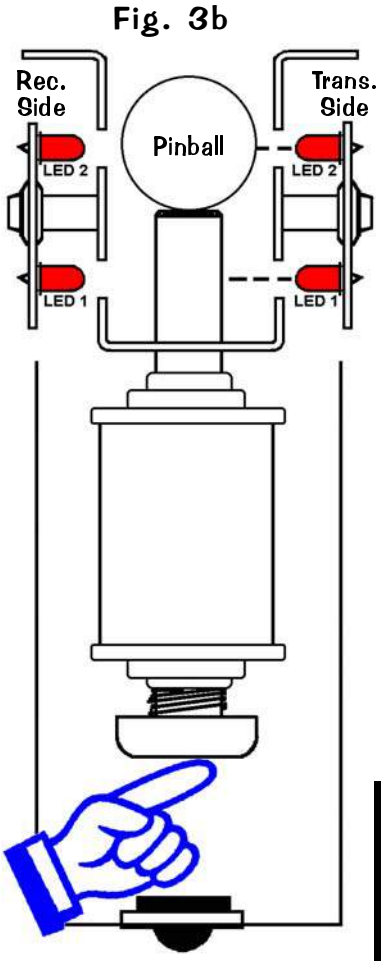


Trough Dual OPTO Boards Alignment / Test for LED2

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







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****).*

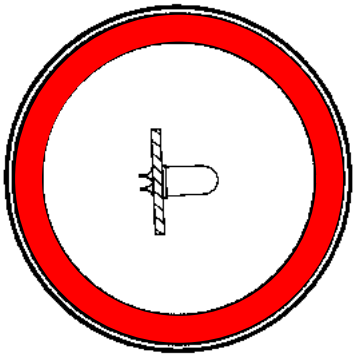


Fig. 4a
Correct Position

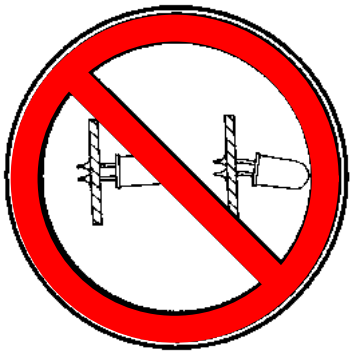
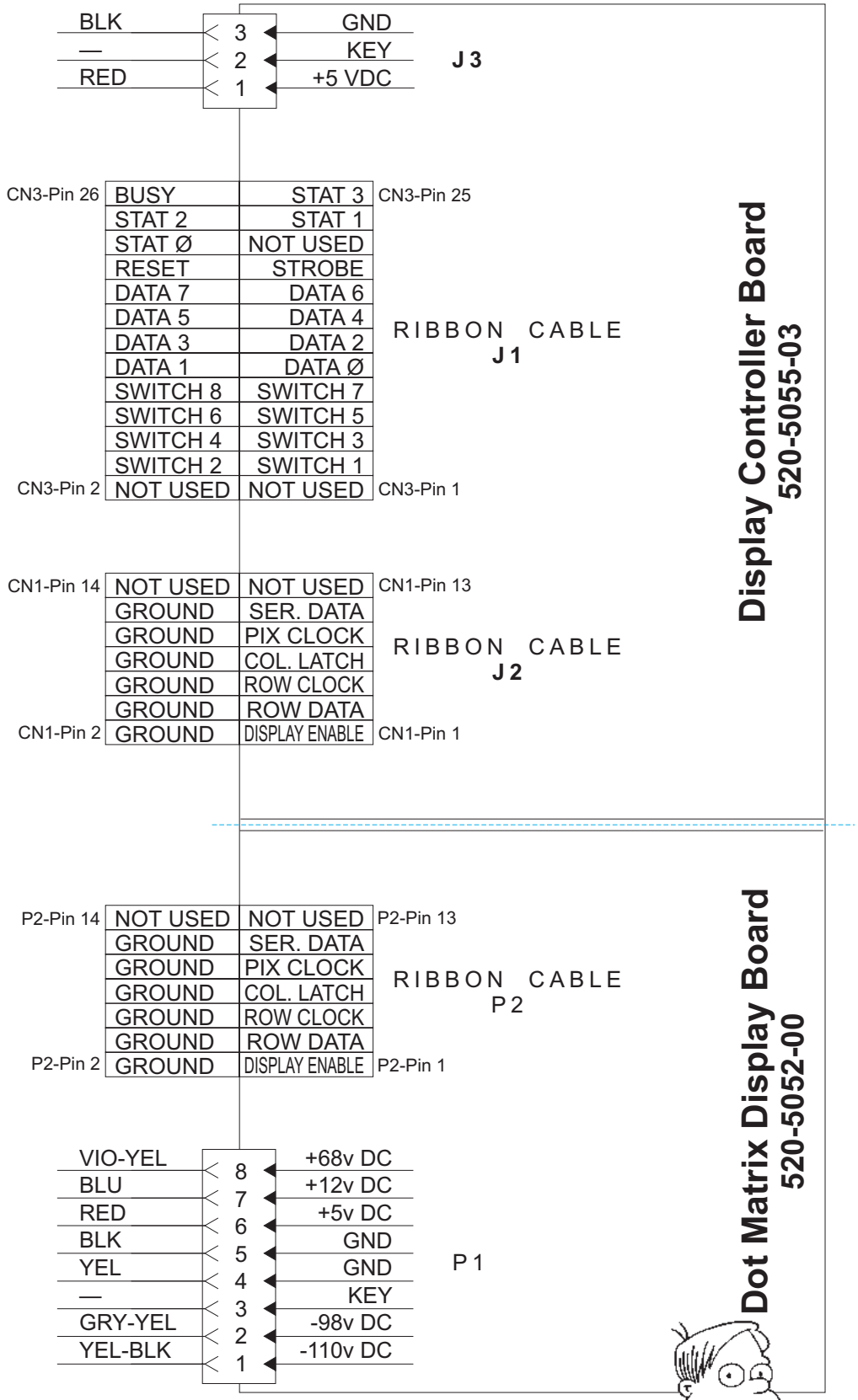
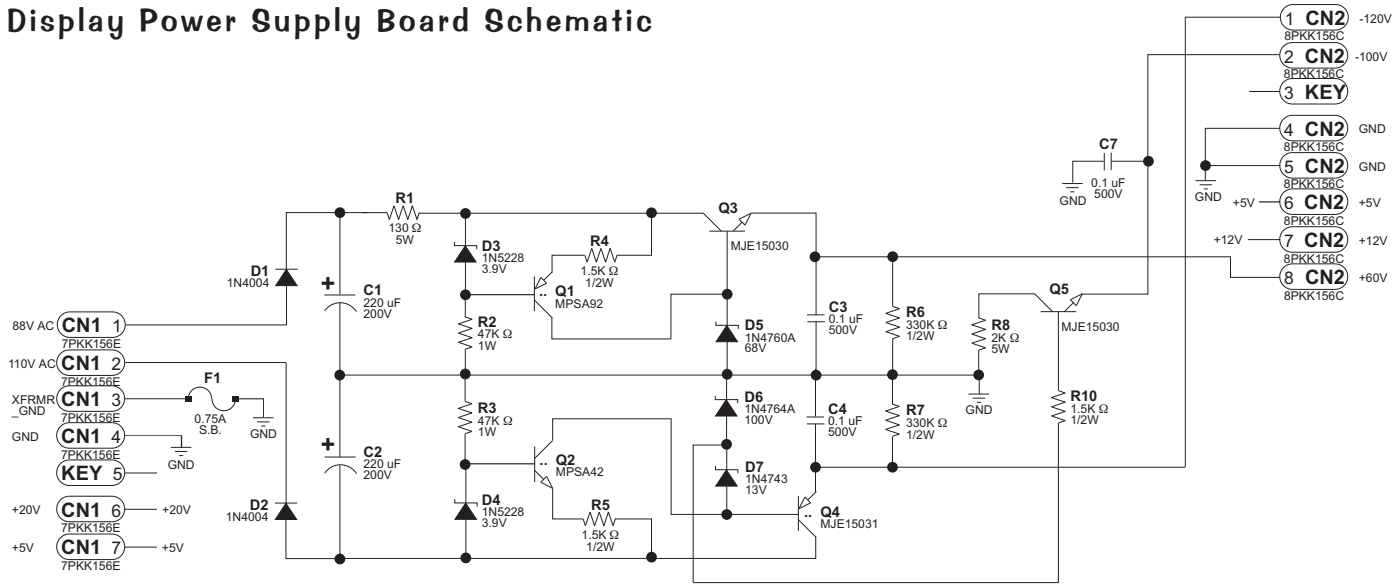


Fig. 4b
Incorrect Position

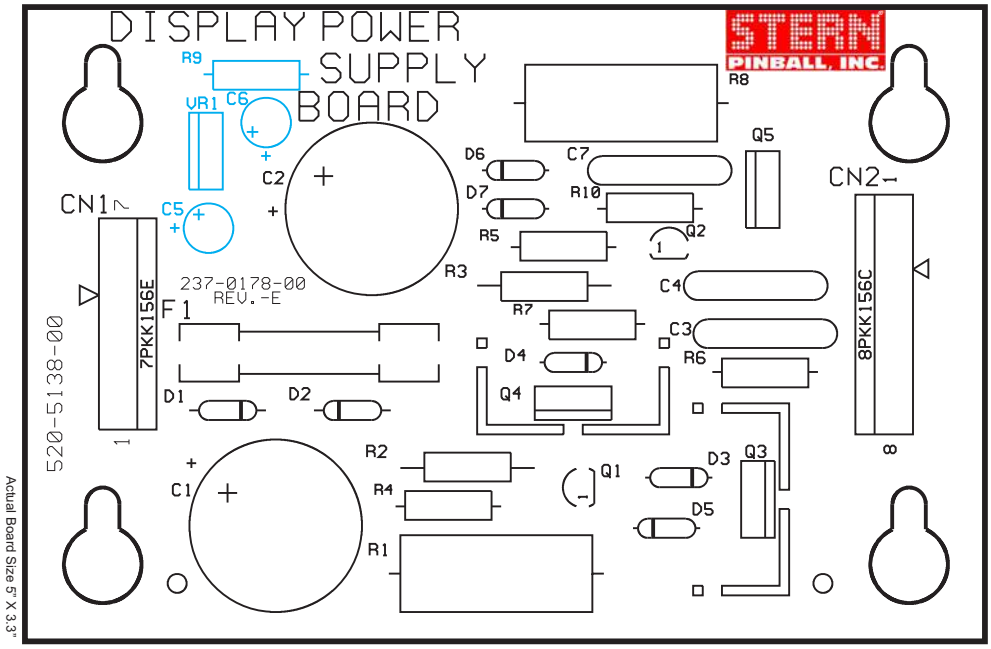

BLK
—
RED
3
2
1
GND
KEY
+5 VDC
J 3
CN3-Pin 26
BUSY
STAT 3
CN3-Pin 25
STAT 2
STAT 1
STAT Ø
NOT USED
RESET
STROBE
DATA 7
DATA 6
DATA 5
DATA 4
DATA 3
DATA 2
DATA 1
DATA Ø
SWITCH 8
SWITCH 7
SWITCH 6
SWITCH 5
SWITCH 4
SWITCH 3
SWITCH 2
SWITCH 1
CN3-Pin 2
NOT USED
NOT USED
CN3-Pin 1
RIBBON CABLE
J 1
CN1-Pin 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
J 2
Display Controller Board
520-5055-03
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
P 2
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
P 1
Dot Matrix Display Board
520-5052-00

THE SIMPSONS
PINBALL PARTY

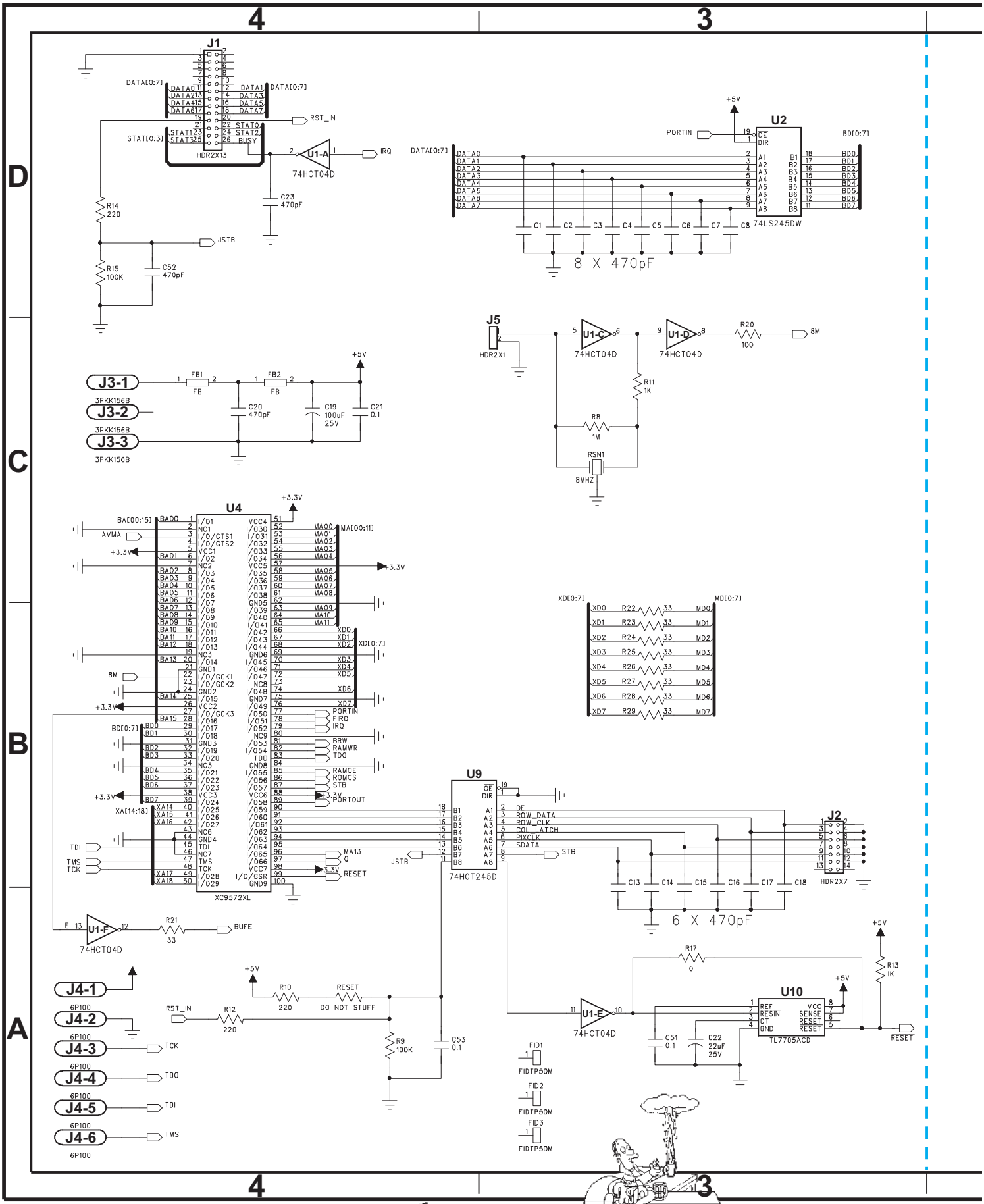
Display Power Supply Board Schematic



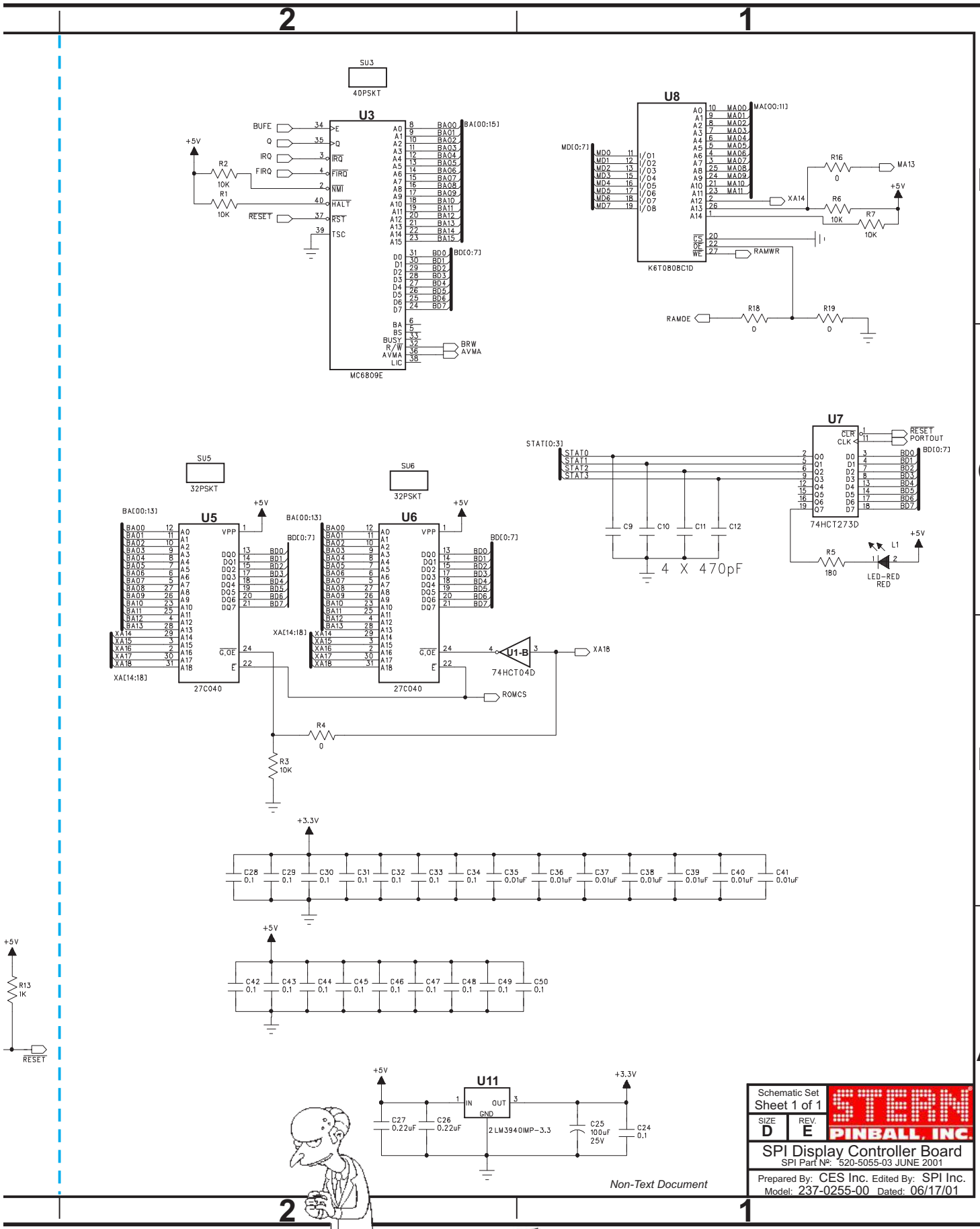
Display Power Supply Board Component Layout & Parts



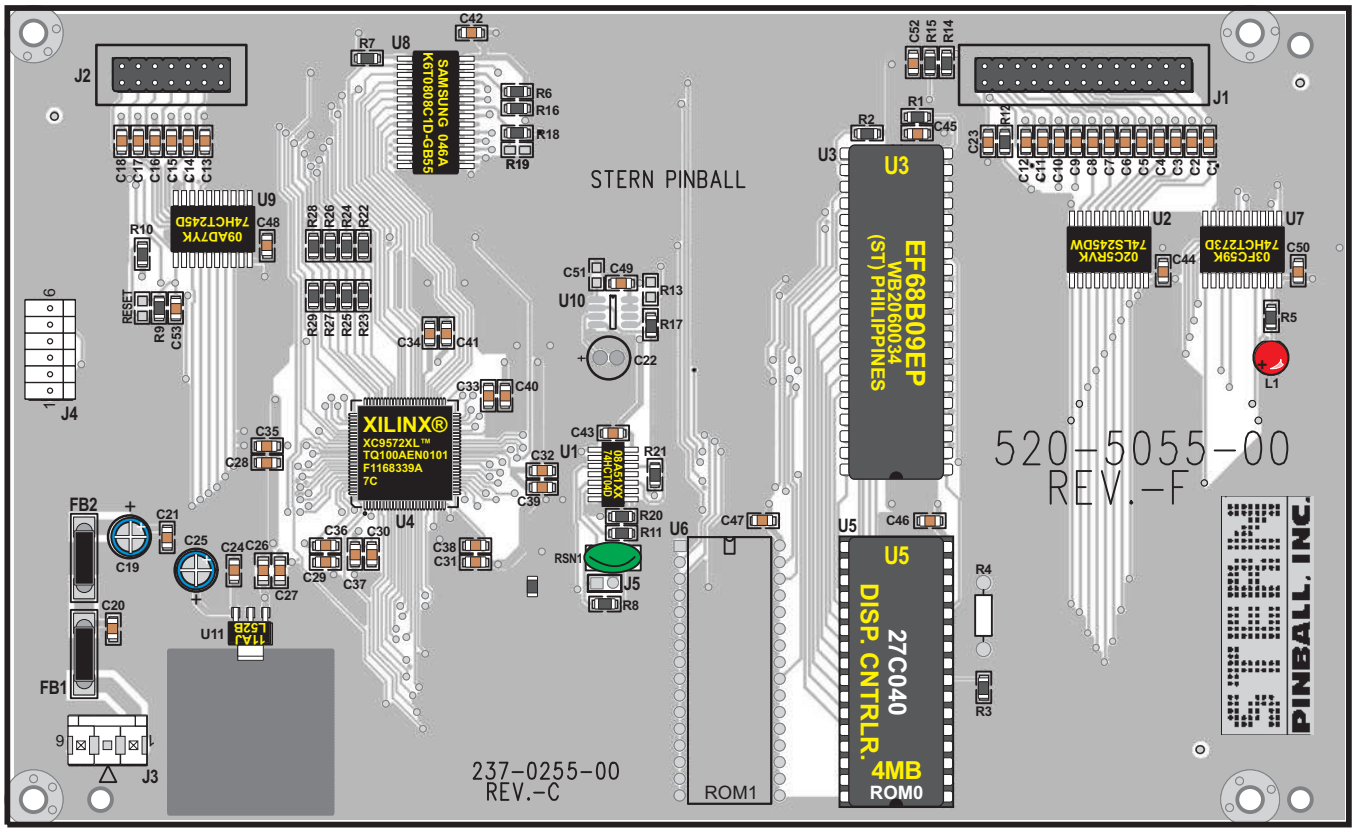
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
—	1	**520-5138-00**	**Display Power Supply Board**	**Complete PCB Assembly**
01	2	125-5044-00	C1, C2	220uF, 200v, Radial Lytic Cap.
02	3	125-5035-00	C3, C4, C7	0.1uF, 500v, Ceramic Disk Cap.
03	0	125-5003-00	(C5, C6: NS)	22uF, 35v, Rad Lytic Cap
04	1	045-5015-07	CN1	7PKK156E (PIN5=KEY)
05	1	045-5015-08	CN2	8PKK156 (PIN3=KEY)
06	2	112-5003-00	D1, D2	1N4004, Diode
07	2	112-0053-00	D3, D4	1N5228, 3.9v, Diode
08	1	112-0062-00	D5	1N4760A, 68v, Diode
09	1	112-0049-00A	D6	1N4764A, 100v, Diode
10	1	112-0061-00	D7	1N4743, 13v, Diode
11	1	200-5000-17	F1	3/4A (0.75A) S.B. Fuse
12	2	205-0004-00	F1	Fuse Clip
13	1	110-0100-00	Q1	MPSA92, Transistor
14	1	110-0082-00	Q2	MPSA42, Transistor
15	2	110-0101-00	Q3, Q5	MJE15030, Transistor
16	2	535-5000-11	Q3, Q4	Heatsinks - AAVID #563002
17	2	240-5008-00	Q3, Q4	#6-32 KEPS Nut
18	2	237-5501-00	Q3, Q4	#6-32 X 3/8" PPH Screw
19	1	110-0103-00	Q4	MJE15031, Transistor
20	1	121-5061-00	R1	130 Ω 5W Res.
21	2	121-5060-00	R2, R3	47K Ω 1W Res.
22	3	121-5038-00	R4, R5, R10	1.5K Ω 1/2W Res. (R9: NS)
23	2	121-5059-00	R6, R7	330K Ω 1/2W Res.
24	1	121-5062-00	R8	2K Ω 5W Res.
25	0	124-5003-00	(VR1: NS)	7812CT


4
3
D
C
B
A
J1
HDR2X13
DATA[0:7]
STAT[0:3]
RST_IN
IRQ
U1-A
74HCT04D
C23
470pF
R14
220
R15
100K
C52
470pF
JSTB
U2
74LS245DW
PORTIN
BD[0:7]
8 X 470pF
J5
HDR2X1
U1-C
U1-D
R20
100
8M
R11
1K
R8
1M
RSN1
8MHZ
J3-1
J3-2
J3-3
3PKK156B
FB1
FB2
FB
C20
470pF
C19
100uF
25V
C21
0.1
+5V
U4
XC9572XL
BA[00:15]
AVMA
MA[00:11]
XD[0:7]
BD[0:7]
XA[14:18]
TDI
TMS
TCK
PORTIN
FIRQ
IRQ
BRW
RAMWR
TDO
RAMOE
ROMCS
STB
PORTOUT
MA13
Q
RESET
+3.3V
XD0 R22 33 MD0
XD1 R23 33 MD1
XD2 R24 33 MD2
XD3 R25 33 MD3
XD4 R26 33 MD4
XD5 R27 33 MD5
XD6 R28 33 MD6
XD7 R29 33 MD7
U9
74HCT245D
DE
ROW_DATA
ROW_CLK
COL_LATCH
PIXCLK
SDATA
STB
J2
HDR2X7
6 X 470pF
U1-F
R21
33
BUFE
J4-1
J4-2
J4-3
J4-4
J4-5
J4-6
6P100
TCK
TDO
TDI
TMS
R10
220
RESET
DO NOT STUFF
R12
220
R9
100K
C53
0.1
FID1
FID2
FID3
FIDTP50M
R17
0
U1-E
U10
TL7705ACD
C51
0.1
C22
22uF
25V
R13
1K

The Simpsons
Pinball Party


SU3
40PSKT
U3
MC6809E
BUFE
Q
IRQ
FIRQ
RESET
R1 10K
R2 10K
+5V
BA[00:15]
BD[0:7]
BRW
AVMA
U8
K6T0808C1D
MD[0:7]
MA[00:11]
XA14
RAMWR
RAMOE
R16 0
R6 10K
R7 10K
R18 0
R19 0
MA13
U7
74HCT273D
STAT[0:3]
RESET
PORTOUT
C9
C10
C11
C12
4 X 470pF
R5 180
L1
LED-RED
SU5
32PSKT
U5
27C040
SU6
32PSKT
U6
27C040
U1-B
74HCT04D
XA18
ROMCS
R4 0
R3 10K
+3.3V
C28 0.1
C29 0.1
C30 0.1
C31 0.1
C32 0.1
C33 0.1
C34 0.1
C35 0.01uF
C36 0.01uF
C37 0.01uF
C38 0.01uF
C39 0.01uF
C40 0.01uF
C41 0.01uF
C42 0.1
C43 0.1
C44 0.1
C45 0.1
C46 0.1
C47 0.1
C48 0.1
C49 0.1
C50 0.1
R13 1K
U11
LM3940IMP-3.3
C27 0.22uF
C26 0.22uF
C25 100uF 25V
C24 0.1
Non-Text Document
Schematic Set
Sheet 1 of 1
SIZE D
REV. E
STERN PINBALL, INC.
SPI Display Controller Board
SPI Part Nº: 520-5055-03 JUNE 2001
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0255-00 Dated: 06/17/01

Display Controller Board Component Layout & Parts



Actual Board Size 20.5cm X 12.5cm

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
—	**1**	**520-5055-03**	**Display Controller Bd. (FCC FEB98) Rev. E June 2001**	**Complete PCB Assembly**
01	1	045-5015-26	J1	13-Pin, Dual row .1" Hdr. Conn HDR2X13
02	1	045-5015-02	J2	7-Pin, Dual Row .1" Hdr. Conn HDR2X7
03	1	045-5015-03	J3	3-Pin, PKK156B Connector
04	1		J4	6-Pin (6P100)
05	7		C35-C39, C40, C41	SMT 0.01uF, 50v Cap. 103-0805-X7R
06	20		C21, C24, C28-C32, C33, C34, C42, C43, C44, C45, C46 C47, C48, C49, C50, C53 (C51: NS)	SMT 0.1uF, 50v Cap. 104-0805
07	2		C26, C27	SMT 0.22uF, 50v Cap. 224-1206-Z5U
08	21		C1-C12, C13-C18, C20, C23, C52	SMT 470pF, 50v Cap. 471-0805
09	2		C19, C25	100uF, 25v TCap.
10	**1**	**165-5099-00**	**L1**	**LED T1-3/4 DIFFUSER RED**
11	4		R16-R18 (R19: NS)	0 Ω 1/10W Resistor 0805
12	1	n/a	RESET	*DO NOT STUFF*
13	2		R11, R13	SMT 1K Ω 1/10W Resistor 0805
14	1		R8	SMT 1M Ω 1/10W Resistor 0805
15	5		R1, R2, R3, R7 (R6: NS)	SMT 10K Ω 1/10W Resistor 0805
16	9		R21, R22-R29	SMT 33 Ω 1/10W Resistor 0805
17	1		R20	SMT 100 Ω 1/10W Resistor 0805
18	2		R9, R15	SMT 100K Ω 1/10W Resistor 0805
19	1		R5	SMT 180 Ω 1/10W Resistor 0805
20	3		R10, R12, R14	SMT 220 Ω 1/10W Resistor 0805
21	1		U1	74HCT04D (74LS04)
22	1		U2	74LS245DW
23	1	100-0189-01	U3 *(40-Pin Socket, 077-X)*	MC6809E
24	1	100-5044-00	U4	XC9572XL, Int. Xilinx®
25	2 (See Pg. **DR.** ❶ Table)		U5 (ROM0) (U6: NS) *(32-Pin, IC Dip Socket, 077-5217-00)*	4MB ROM 27C040 (M27C401-100)
26	1		U7	74HCT273D
27	1	100-5045-00	U8	K6T0808C1D-GB55, Int. Samsung 046A
28	1		U9	74HCT245D
29	1		U11	LM3940IMP-3.3
30	1		RSN1	8MHZRSN (8Mhz) Crystal
31	2	n/a	FB1, FB2	Ferrite Bead, FB0370
32	0		FID1-3	FIDTP50M

If a part is required where a part number is not provided, call Technical Support (see back of cover).

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 11v DC which is inserted into a linear voltage regulator for the output of 5v DC. This 5v regulated voltage can be adjusted by potentiometer **R116** the voltage should be set to 5.00v. Besides powering the **I/O Board** the regulated 5 volts supplies power to the **CPU** / **Sound Board**, **Gas Plasma (Dot Matrix) Display** and **Plasma (Display) Controller Board**. Power for these devices comes off the **I/O Board** on [**J16**-(4-8)].

+5v, +20v, +50v, +18v, & +12v LED Indicators:
These DC voltages are derived on the **I/O Board** by rectification and filtering. Each has a **LED** indicating that power is being supplied to each of these voltage sources. The **-12v** supply comes from the same transformer winding as the **+12v** thus it does not have a **LED** indicator.

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

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

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

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

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

Address Decoding:
All Address decoding is done by two **74LS138's (U204 & U205)** (3 of 8 decoder). Both of these must be in operation for the **I/O Board** to function properly.

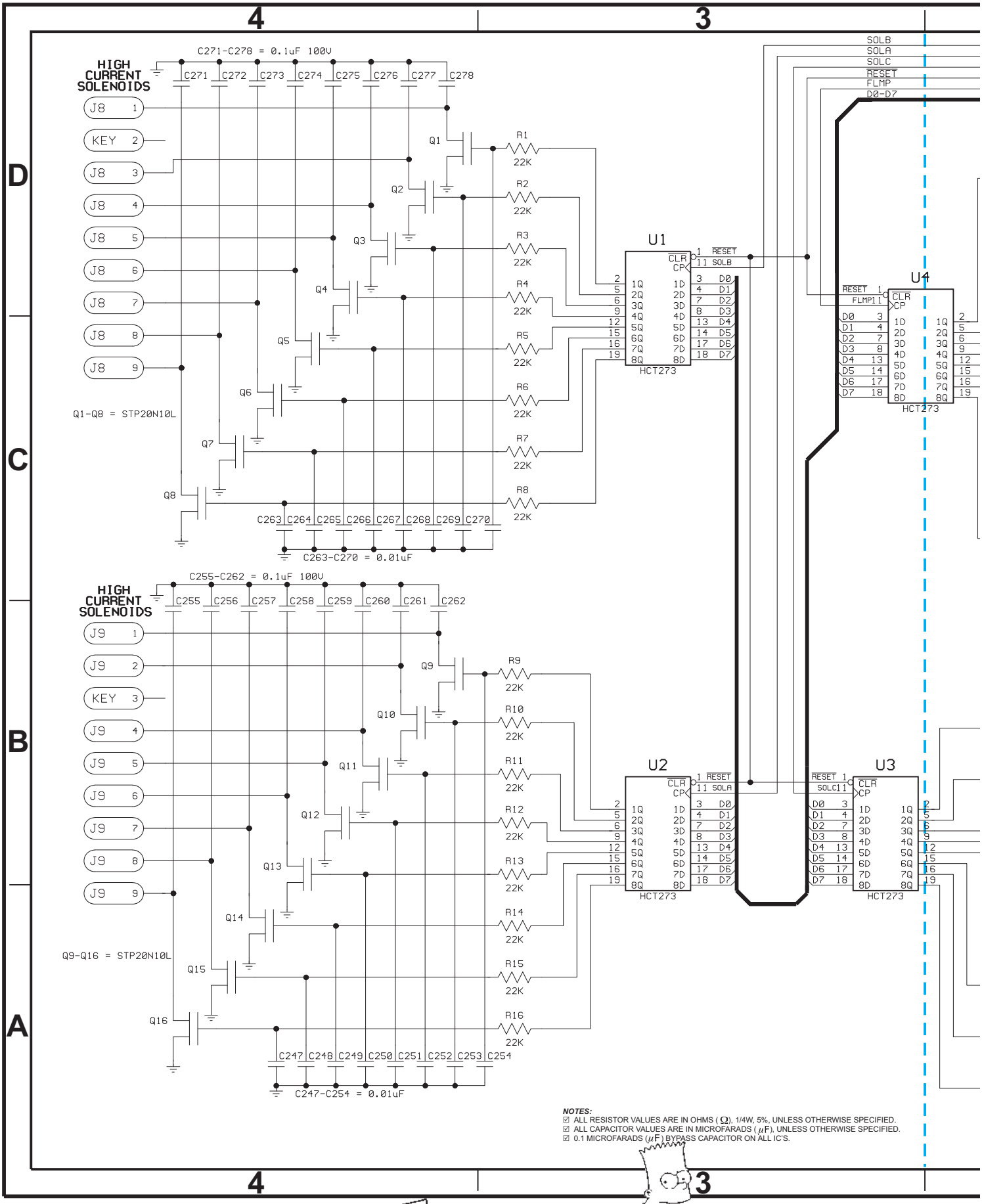
Solenoid (Coil) Drivers & Flash Lamps:
J8 & **J9** are high side drivers for driving solenoids and other heavy loads. Each connector has its own buffer driving 8 drivers. **J8** & **J9** consist of **MOSFET Drivers 20N10L** which can easily & safely be tested by clipping one end of a clip-lead to test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

Note 1 • *Clip on the resistor side with the white stripe.* •• *R1 controls Q1, R2 controls Q2, et cetera...*

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

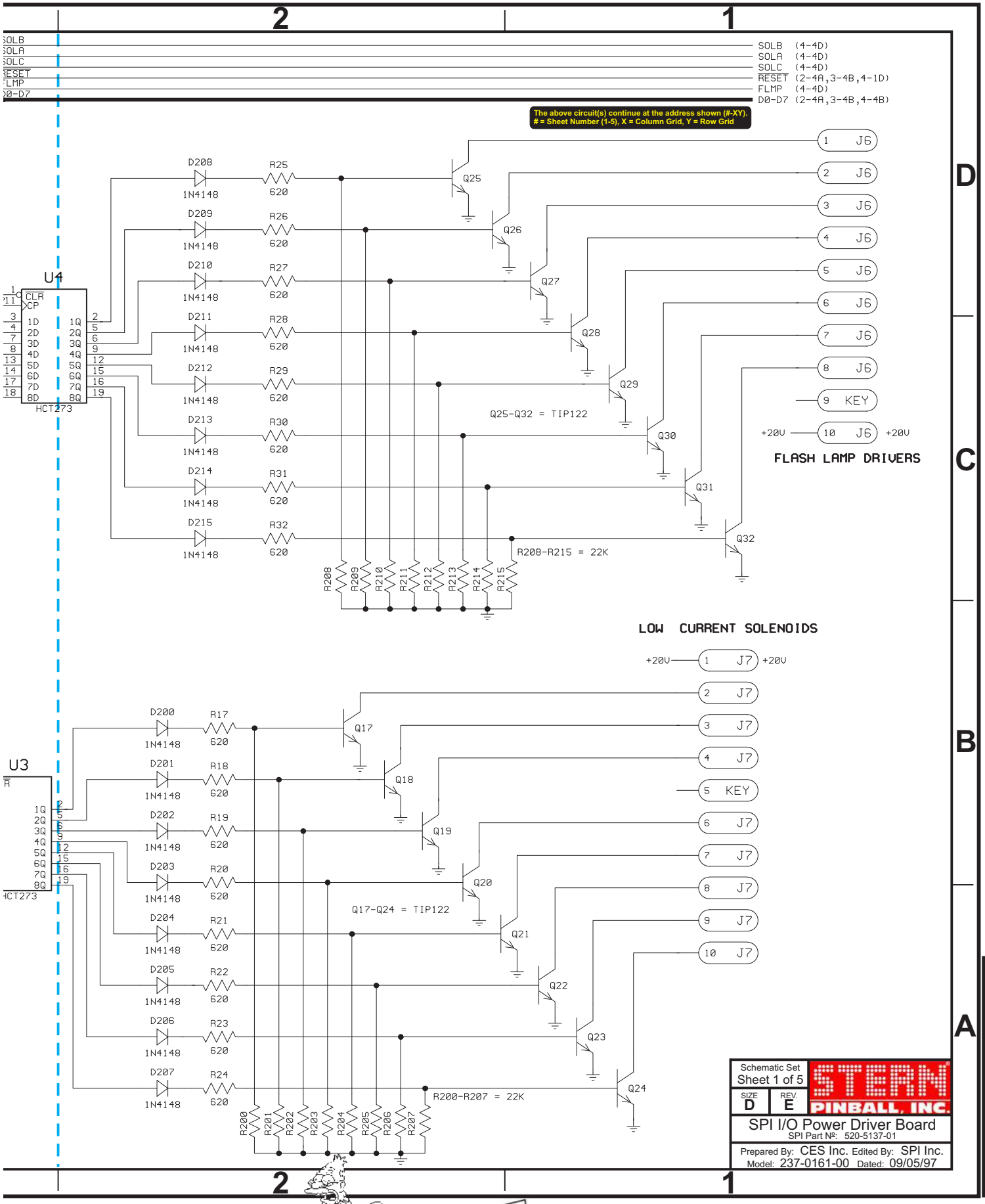
Lamp Matrix:
J12 has 10 low side drivers for the lamp strobes which consist of **19N06L MOSFETS**. Only one lamp strobe should be low at any time. Again the scanning of the lamp strobes keeps the **I/O** from resetting. **J13** has 8 high side drivers with each having a status indicator. All the status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

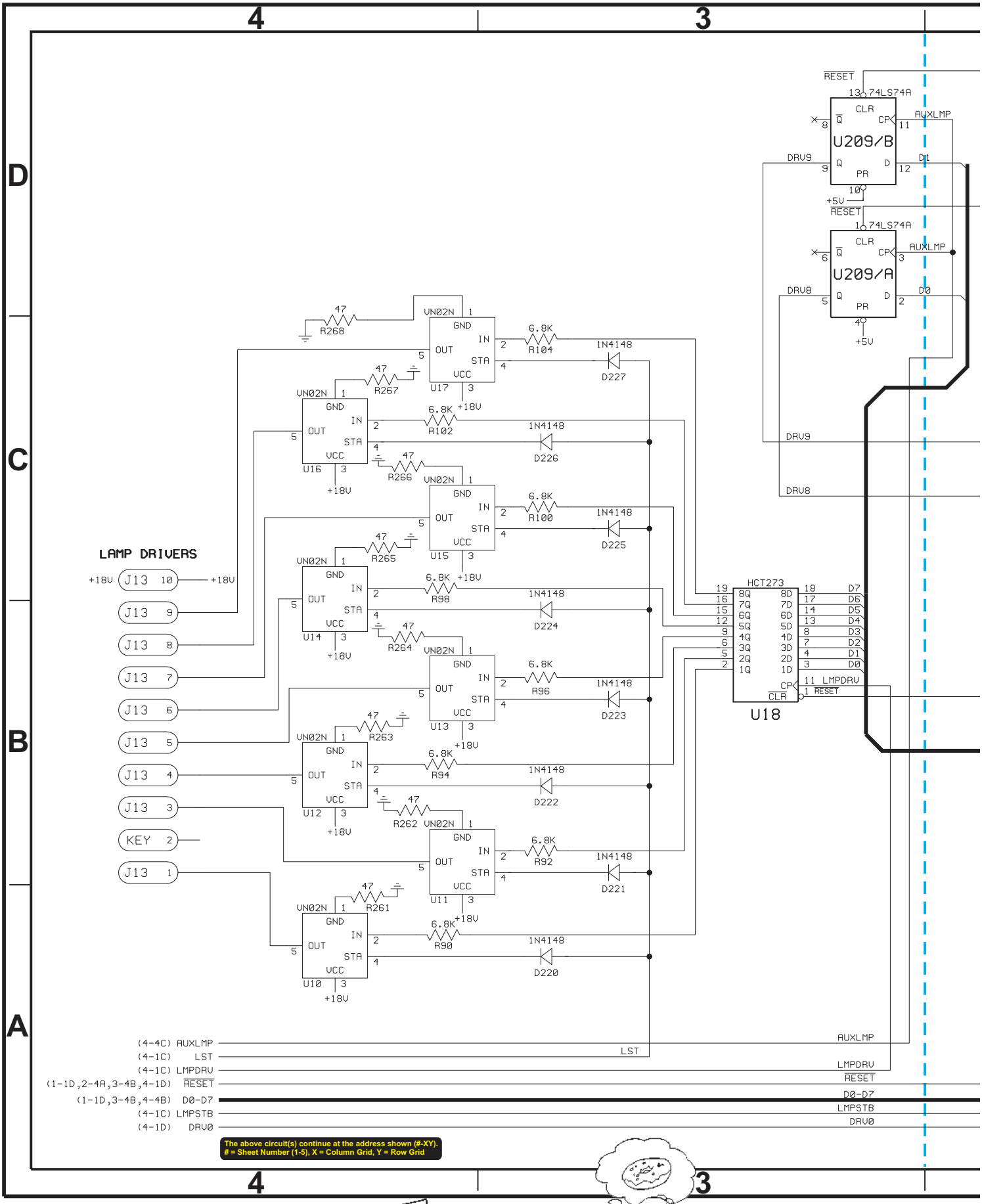
General Illumination (G.I.) Lights:
J15 has 6v AC switched on & off by a relay on the **I/O Board**. The relay is controlled by **Q200** which supplies power to the 24v coil winding to activate the relay. There are 4 taps on **J15** each fused at 5A for this 6v AC source.



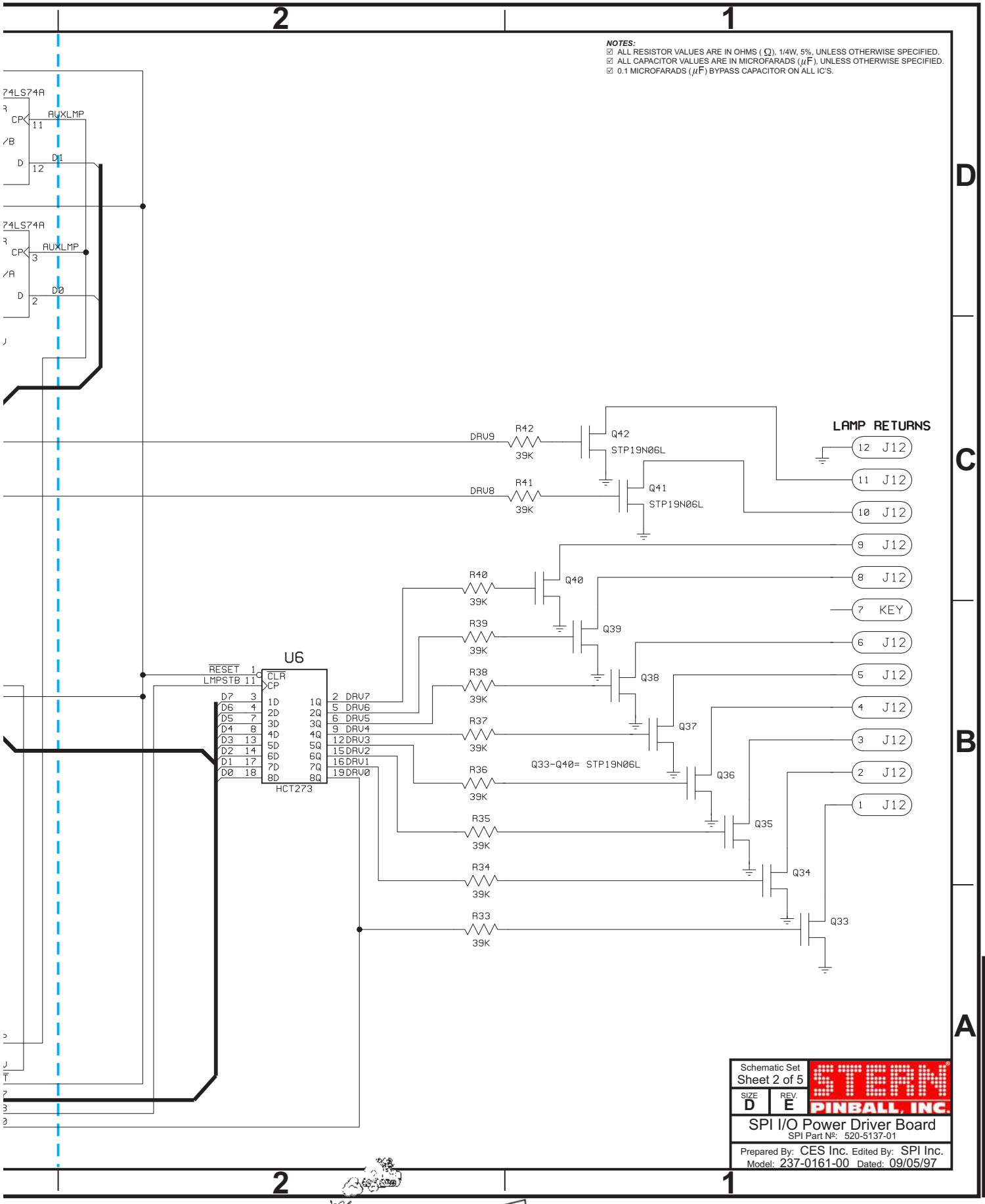
NOTES:

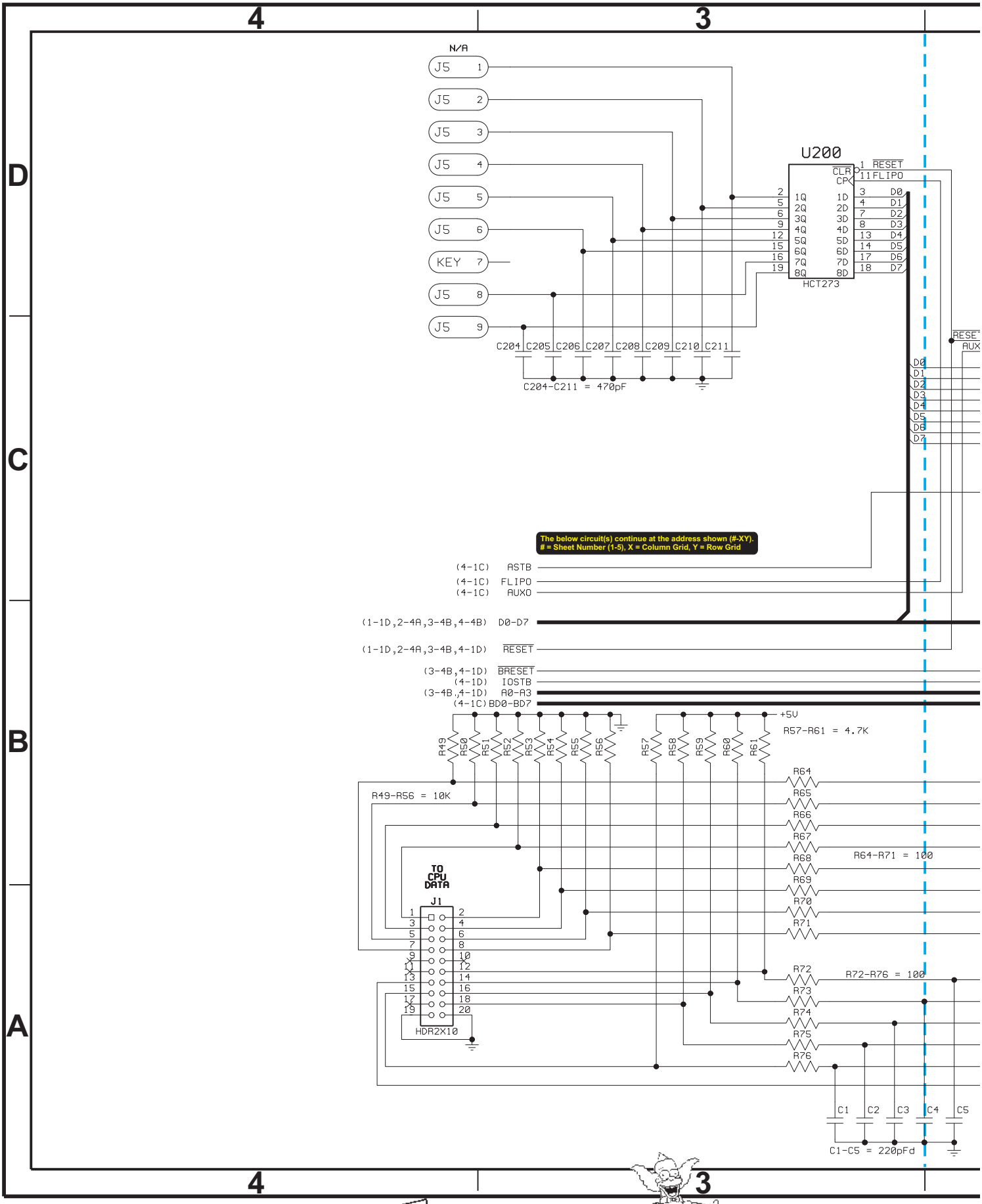
- ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
- ☑ 0.1 MICROFARADS (μF) BYPASS CAPACITOR ON ALL IC'S.


SOLB (4-4D)
SOLA (4-4D)
SOLC (4-4D)
RESET (2-4A,3-4B,4-1D)
FLMP (4-4D)
D0-D7 (2-4A,3-4B,4-4B)
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
U4
HCT273
Q25-Q32 = TIP122
R208-R215 = 22K
FLASH LAMP DRIVERS
+20V
LOW CURRENT SOLENOIDS
U3
Q17-Q24 = TIP122
R200-R207 = 22K
Schematic Set
Sheet 1 of 5
SIZE D
REV. E
STERN PINBALL, INC.
SPI I/O Power Driver Board
SPI Part №: 520-5137-01
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0161-00 Dated: 09/05/97


4
3
D
C
B
A
RESET
74LS74A
CLR
Q
CP
PR
D
U209/B
U209/A
AUXLMP
DRV9
DRV8
D1
D0
+5V
UN02N
GND
IN
OUT
STA
VCC
U17
U16
U15
U14
U13
U12
U11
U10
+18V
6.8K
R104
R102
R100
R98
R96
R94
R92
R90
47
R268
R267
R266
R265
R264
R263
R262
R261
1N4148
D227
D226
D225
D224
D223
D222
D221
D220
LAMP DRIVERS
J13 10
J13 9
J13 8
J13 7
J13 6
J13 5
J13 4
J13 3
KEY 2
J13 1
HCT273
U18
D7
D6
D5
D4
D3
D2
D1
D0
LMPDRV
(4-4C) AUXLMP
(4-1C) LST
(4-1C) LMPDRV
(1-1D,2-4A,3-4B,4-1D) RESET
(1-1D,3-4B,4-4B) D0-D7
(4-1C) LMPSTB
(4-1D) DRV0
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid

The Simpsons
Pinball Party

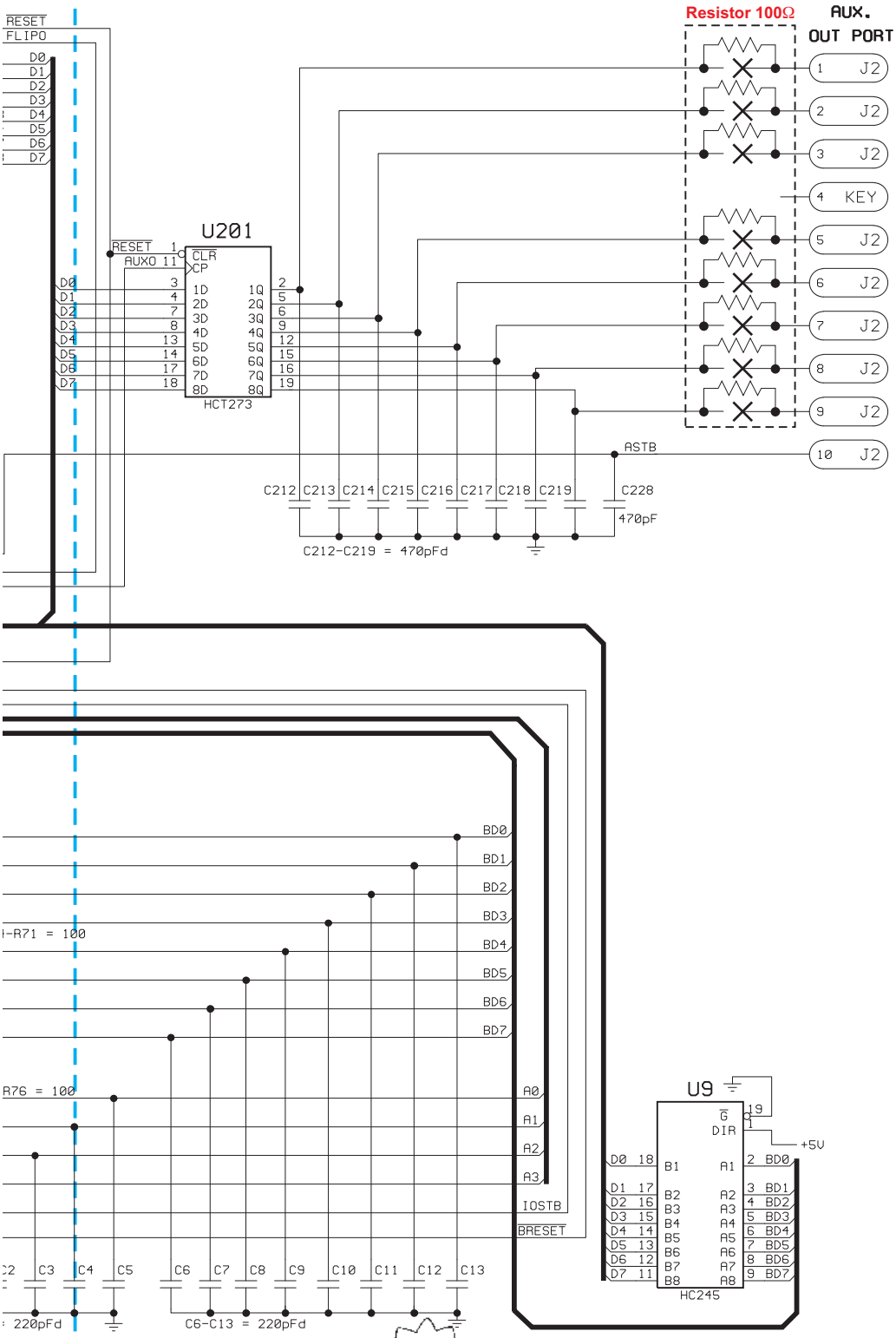

NOTES:
☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
☑ 0.1 MICROFARADS (μF) BYPASS CAPACITOR ON ALL IC'S.
74LS74A
AUXLMP
D1
D0
LAMP RETURNS
DRV9
DRV8
R42
R41
R40
R39
R38
R37
R36
R35
R34
R33
39K
Q42
Q41
Q40
Q39
Q38
Q37
Q36
Q35
Q34
Q33
STP19N06L
Q33-Q40= STP19N06L
U6
HCT273
RESET
LMPSTB
CLR
CP
DRV7
DRV6
DRV5
DRV4
DRV3
DRV2
DRV1
DRV0
J12
KEY
Schematic Set
Sheet 2 of 5
SIZE D
REV. E
STERN PINBALL, INC.
SPI I/O Power Driver Board
SPI Part №: 520-5137-01
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0161-00 Dated: 09/05/97


4
3
D
C
B
A
N/A
J5 1
J5 2
J5 3
J5 4
J5 5
J5 6
KEY 7
J5 8
J5 9
U200
HCT273
CLR
CP
1Q 2Q 3Q 4Q 5Q 6Q 7Q 8Q
1D 2D 3D 4D 5D 6D 7D 8D
RESET
FLIPO
D0 D1 D2 D3 D4 D5 D6 D7
C204 C205 C206 C207 C208 C209 C210 C211
C204-C211 = 470pF
RESET
AUX
The below circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
(4-1C) ASTB
(4-1C) FLIPO
(4-1C) AUXO
(1-1D,2-4A,3-4B,4-4B) D0-D7
(1-1D,2-4A,3-4B,4-1D) RESET
(3-4B,4-1D) BRESET
(4-1D) IOSTB
(3-4B,4-1D) A0-A3
(4-1C) BD0-BD7
+5V
R49 R50 R51 R52 R53 R54 R55 R56
R57 R58 R59 R60 R61
R57-R61 = 4.7K
R49-R56 = 10K
R64 R65 R66 R67 R68 R69 R70 R71
R64-R71 = 100
TO CPU DATA
J1
HDR2X10
R72 R73 R74 R75 R76
R72-R76 = 100
C1 C2 C3 C4 C5
C1-C5 = 220pFd

The Simpsons
Pinball Party

NOTES:
- ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
- ☑ 0.1 MICROFARADS (μF) BYPASS CAPACITOR ON ALL IC'S.

DATE	DESCIRIPTION OF CHANGES / REVISIONS	REQ.	BY.
JAN 2001	Cut trace on solder side at Aux. Out Port J2-PIN1 thru J2-PIN3 & J2-PIN5 thru J2-PIN9; Soldered **Resistor 100Ω** 1/4W 5% (SPI Nº: 121-5007-00). This Modification (highlighted below at J2 with a dotted-line box) was accomplished on boards produced after Jan. 1, 2001. This board is backwards compatible for the White Star™ Board System.	TS	JET

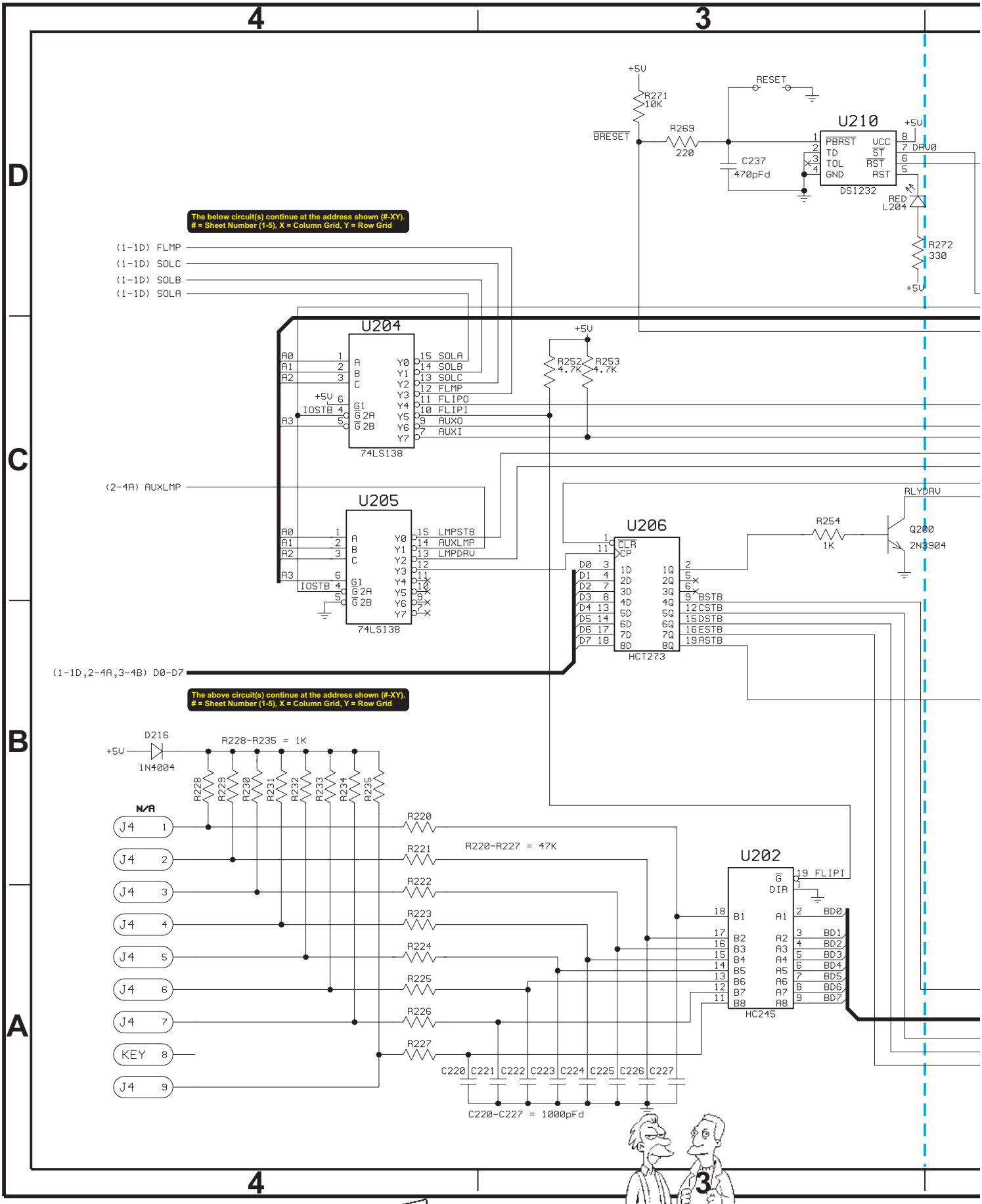


Schematic Set	
Sheet 3 of 5	
SIZE D	REV. E

STERN PINBALL, INC.

SPI I/O Power Driver Board
SPI Part Nº: 520-5137-01

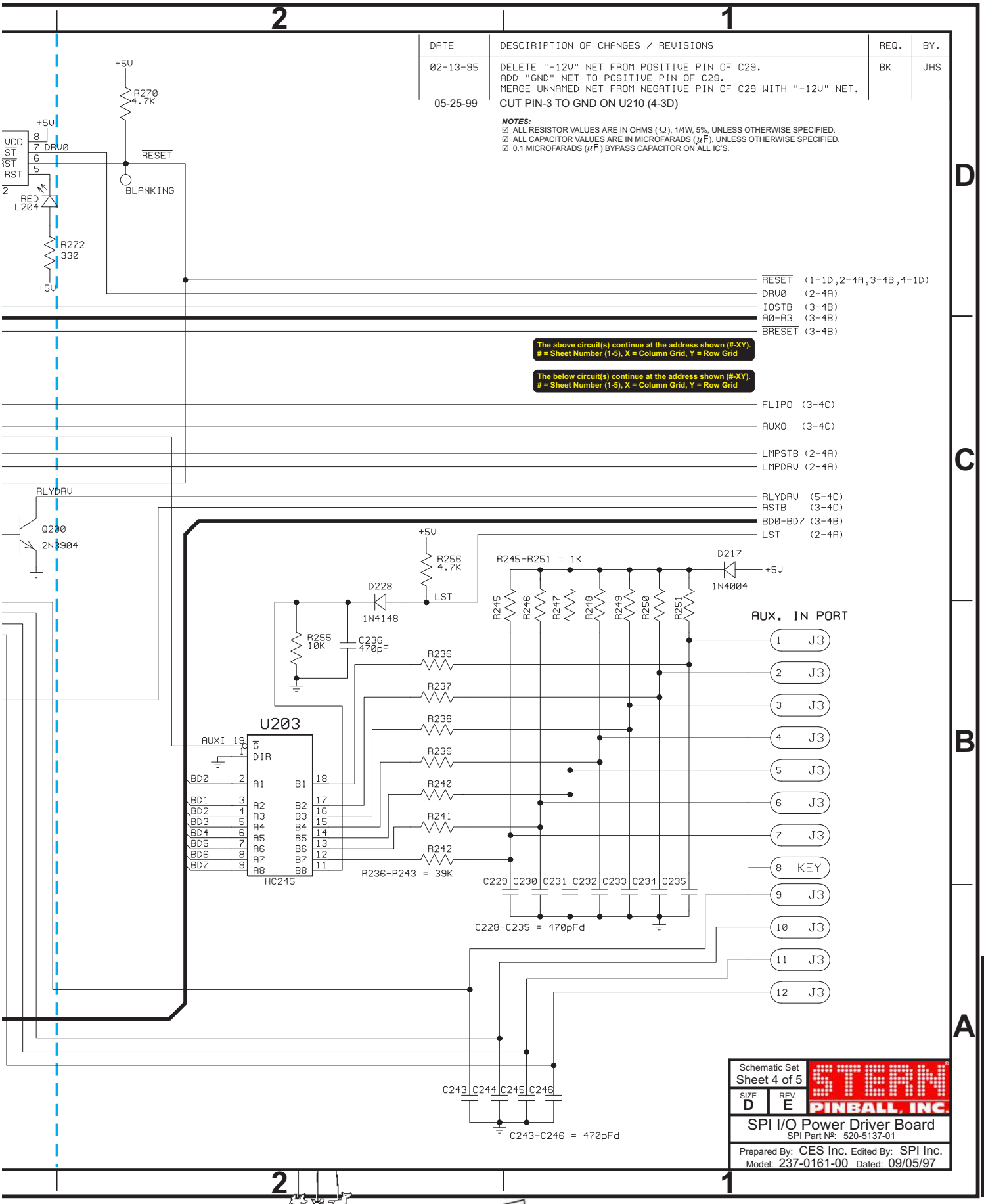
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0161-00 Dated: 09/05/97

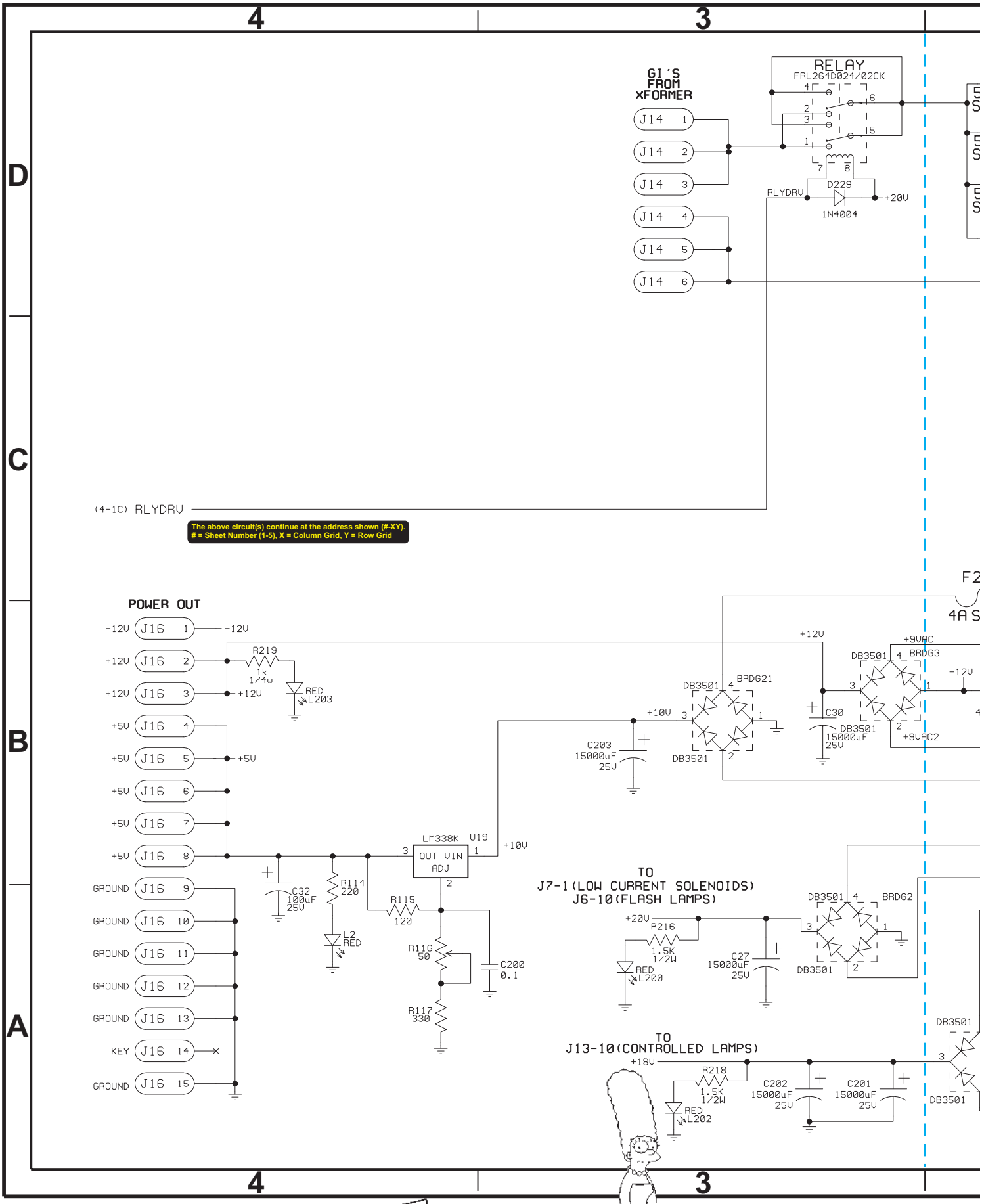

4
3
D
C
B
A
+5V
R271
10K
RESET
BRESET
R269
220
C237
470pFd
U210
PBRST
TD
TOL
GND
VCC
ST
RST
RST
DS1232
DRV0
RED
L204
R272
330
The below circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
(1-1D) FLMP
(1-1D) SOLC
(1-1D) SOLB
(1-1D) SOLA
U204
A0
A1
A2
A3
IOSTB
G1
G 2A
G 2B
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
SOLA
SOLB
SOLC
FLMP
FLIPO
FLIPI
AUXO
AUXI
74LS138
R252
4.7K
R253
4.7K
(2-4A) AUXLMP
U205
LMPSTB
AUXLMP
LMPDRV
74LS138
U206
CLR
CP
D0
D1
D2
D3
D4
D5
D6
D7
1D
2D
3D
4D
5D
6D
7D
8D
1Q
2Q
3Q
4Q
5Q
6Q
7Q
8Q
BSTB
CSTB
DSTB
ESTB
ASTB
HCT273
R254
1K
RLYDRV
Q200
2N3904
(1-1D,2-4A,3-4B) D0-D7
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
D216
1N4004
R228-R235 = 1K
R228
R229
R230
R231
R232
R233
R234
R235
N/A
J4 1
J4 2
J4 3
J4 4
J4 5
J4 6
J4 7
KEY 8
J4 9
R220
R221
R222
R223
R224
R225
R226
R227
R220-R227 = 47K
U202
G
DIR
FLIPI
B1
B2
B3
B4
B5
B6
B7
B8
A1
A2
A3
A4
A5
A6
A7
A8
BD0
BD1
BD2
BD3
BD4
BD5
BD6
BD7
HC245
C220
C221
C222
C223
C224
C225
C226
C227
C220-C227 = 1000pFd

The Simpsons
Pinball Party

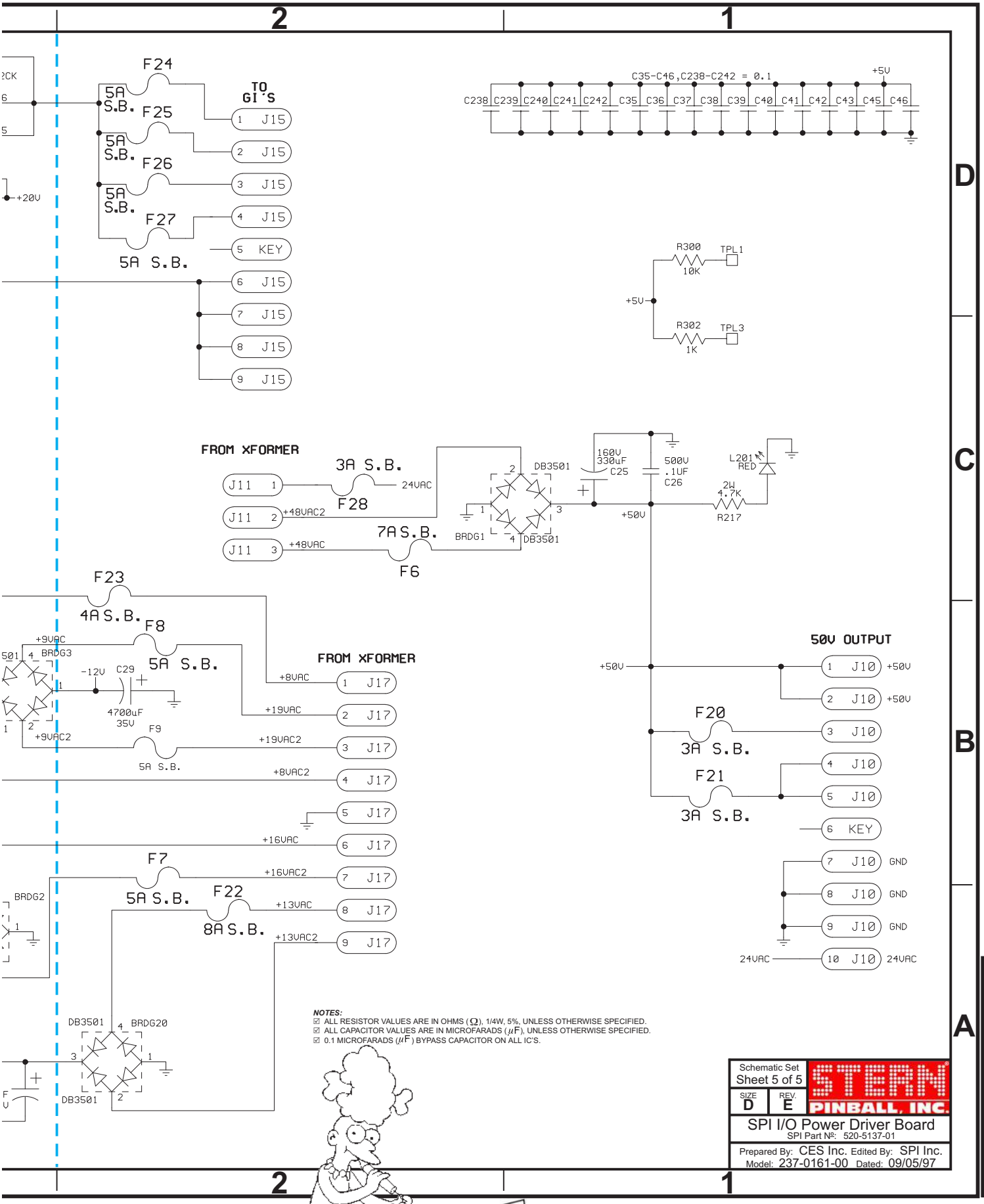
DATE	DESCIRIPTION OF CHANGES / REVISIONS	REQ.	BY.
02-13-95	DELETE "-12V" NET FROM POSITIVE PIN OF C29. ADD "GND" NET TO POSITIVE PIN OF C29. MERGE UNNAMED NET FROM NEGATIVE PIN OF C29 WITH "-12V" NET.	BK	JHS
05-25-99	CUT PIN-3 TO GND ON U210 (4-3D)		

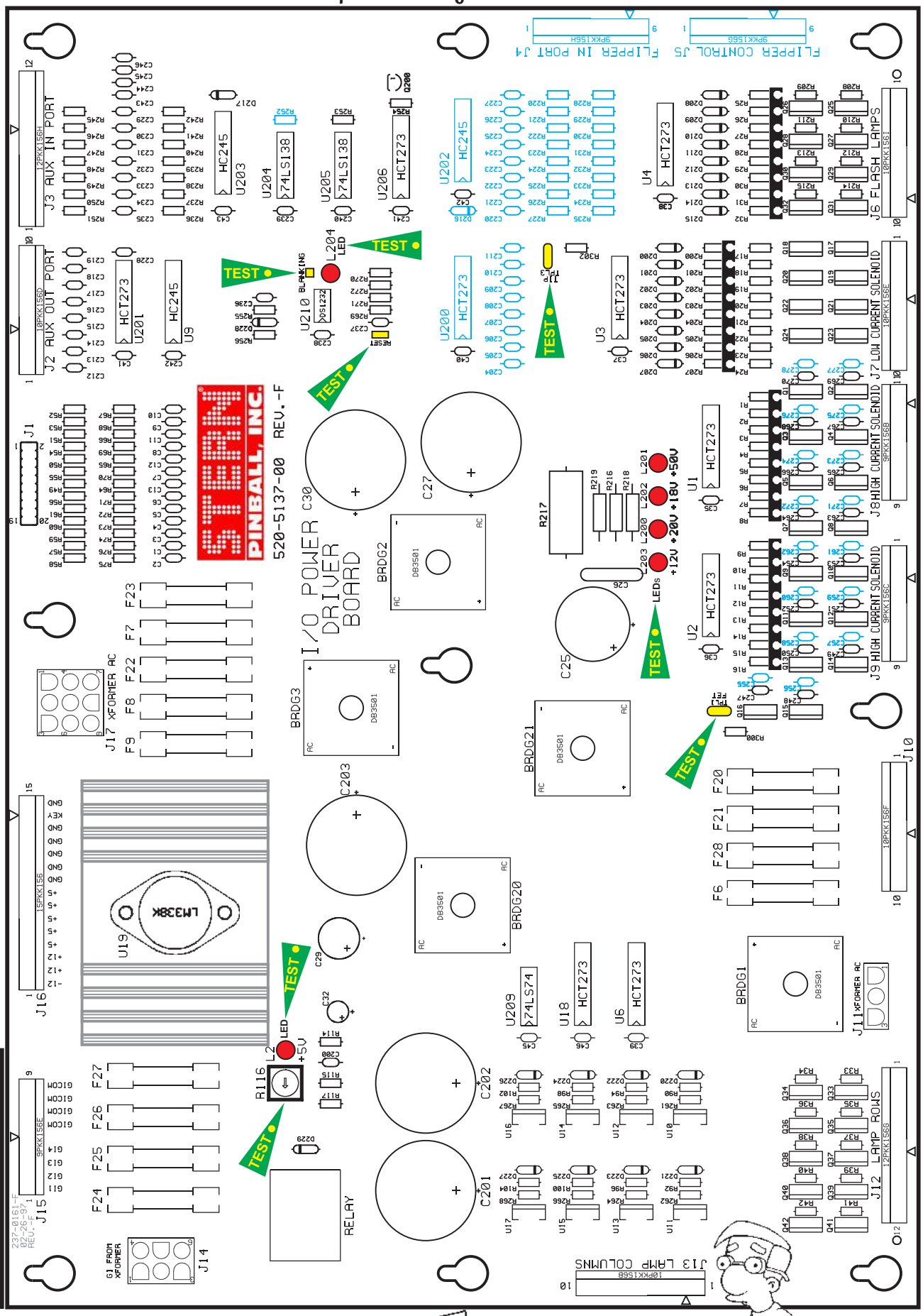
NOTES:
- ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
- ☑ 0.1 MICROFARADS (μF) BYPASS CAPACITOR ON ALL IC'S.




4
3
D
C
B
A
GI'S FROM XFORMER
J14 1
J14 2
J14 3
J14 4
J14 5
J14 6
RELAY
FRL264D024/02CK
RLYDRV
D229
1N4004
+20V
(4-1C) RLYDRV
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
POWER OUT
-12V J16 1
+12V J16 2
+12V J16 3
+5V J16 4
+5V J16 5
+5V J16 6
+5V J16 7
+5V J16 8
GROUND J16 9
GROUND J16 10
GROUND J16 11
GROUND J16 12
GROUND J16 13
KEY J16 14
GROUND J16 15
R219
1k
1/4w
RED
L203
C32
100uF
25V
R114
220
L2
RED
LM338K U19
OUT VIN
ADJ
R115
120
R116
50
R117
330
C200
0.1
+10V
C203
15000uF
25V
DB3501
BRDG21
+12V
C30
15000uF
25V
+9VAC
BRDG3
+9VAC2
TO
J7-1(LOW CURRENT SOLENOIDS)
J6-10(FLASH LAMPS)
+20V
R216
1.5K
1/2W
RED
L200
C27
15000uF
25V
BRDG2
TO
J13-10(CONTROLLED LAMPS)
+18V
R218
1.5K
1/2W
RED
L202
C202
15000uF
25V
C201
15000uF
25V
F2
4A S

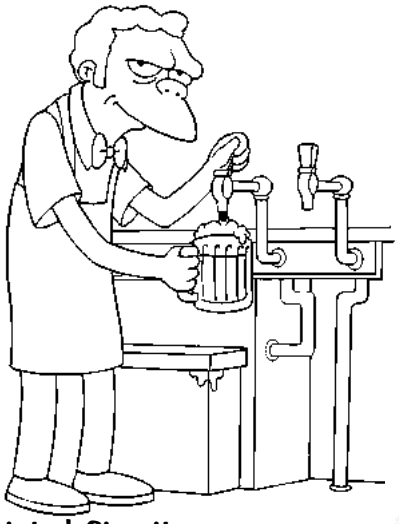
The Simpsons
Pinball Party


2
1
D
C
B
A
F24
5A S.B.
F25
5A S.B.
F26
5A S.B.
F27
5A S.B.
TO GI'S
J15
KEY
+20V
C35-C46,C238-C242 = 0.1
+5V
C238 C239 C240 C241 C242 C35 C36 C37 C38 C39 C40 C41 C42 C43 C45 C46
R300
10K
TPL1
R302
1K
TPL3
FROM XFORMER
J11
3A S.B.
F28
24VAC
+48VAC2
7A S.B.
F6
+48VAC
DB3501
BRDG1
160V
330uF
C25
500V
.1UF
C26
+50V
L201
RED
2W
4.7K
R217
F23
4A S.B.
F8
5A S.B.
+9VAC
BRDG3
-12V
C29
4700uF
35V
+9VAC2
F9
5A S.B.
FROM XFORMER
J17
+8VAC
+19VAC
+19VAC2
+8VAC2
+16VAC
+16VAC2
+13VAC
+13VAC2
F7
5A S.B.
F22
8A S.B.
BRDG2
DB3501
BRDG20
50V OUTPUT
J10
+50V
F20
3A S.B.
F21
3A S.B.
GND
24VAC
NOTES:
ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
0.1 MICROFARADS (μF) BYPASS CAPACITOR ON ALL IC'S.
Schematic Set
Sheet 5 of 5
SIZE D
REV. E
STERN PINBALL, INC.
SPI I/O Power Driver Board
SPI Part №: 520-5137-01
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0161-00 Dated: 09/05/97

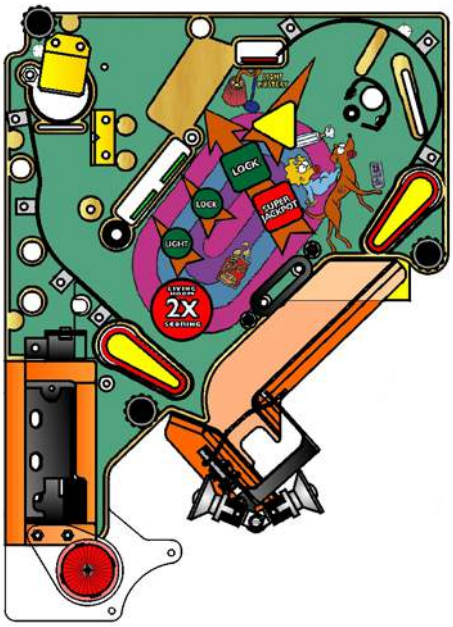

Test Points:
TEST
←TIP TPL3
←BLANKING
←L204 LED
←RESET
LEDs :
←L201+50v
←L202+18v
←L200+20v
←L203+12v
←FET TPL1
LED :
←L2+5V
←R116 POT
J3 AUX IN PORT
J2 AUX OUT PORT
J6 FLASH LAMPS
J7 LOW CURRENT SOLENOID
J8 HIGH CURRENT SOLENOID
J9 HIGH CURRENT SOLENOID
J12 LAMP ROWS
J13 LAMP COLUMNS
FLIPPER CONTROL J5
FLIPPER IN PORT J4
PINBALL, INC.
520-5137-00 REV.-F
I/O POWER DRIVER BOARD
J17 XFORMER AC
J11 XFORMER AC
J14 GI FROM XFORMER
J15
J16
J10
J1
U19 LM338K
RELAY
Actual Board Size 15.698" X 11"

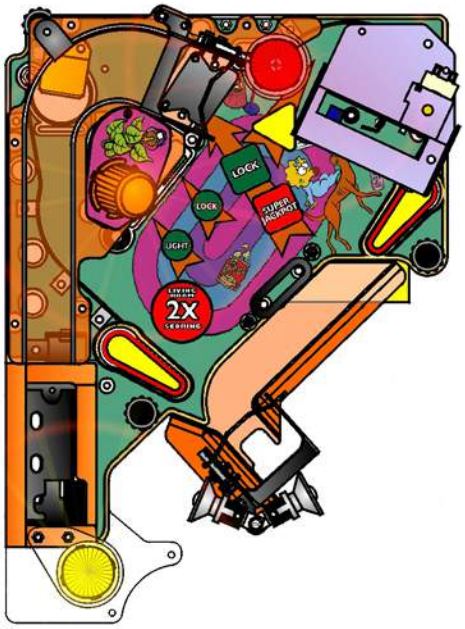
I/O Power Driver Board Parts

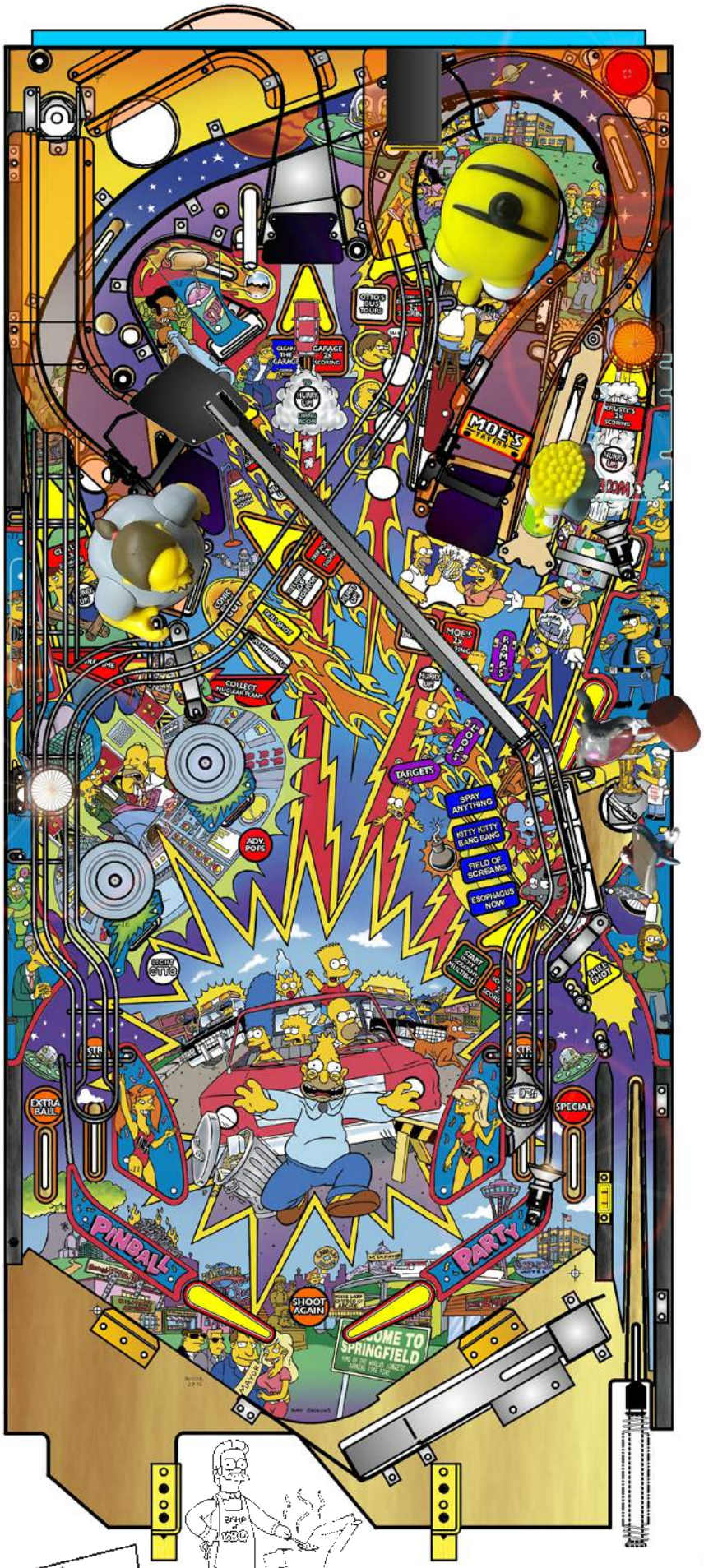
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
—	**1**	**520-5137-01**	**I/O Power Driver Board**	**Complete PCB Assembly**
01	5	112-5000-00	BRDG1, BRDG2, BRDG3, BRDG20, BRDG21	DB3501
02	13	125-5030-00	C1, C2, C3>C6, C7, C8, C9>C10, C11, C12	220pF, (221), Cap.
03	1	125-5033-00	C25	100uF, 150v, Radial Lytic Cap.
04	1	125-5035-00	C26	.1UF, 500v, Ceramic Disk Cap.
05	5	125-5036-00	C27, C30, C201, C202, C203	15000uF, 25v, Radial Lytic Cap.
06	1	125-5034-00	C29	4700uF, 35v, Radial Lytic Cap.
07	1	125-5032-00	C32	100uF, 25v, Radial Lytic Cap.
08	17	125-5031-00	C35, C36, C37, C38, C39, C40, C41, C42, C43, C45, C46, C200, C238, C239, C240, C241, C242	0.1uF, (104), Cap.
09	22	125-5028-00	C212>C219, C228>C237, C243>C246 (C204-C211: NS)	470pF, (471), Axial Cap.
10	0	n/a	(C220>C227: NS)	
11	16	125-5029-00	C247>C254, C263>C270	0.01uF, (103), 100v Cap.
12	0	125-5027-00	(C255>C262, C271>C278: NS)	0.1uF, (104), 100v, Cap.
13	25	112-0054-00	D200>D207, D208>D215, D220, D221, D222, D223, D224, D225, D226, D227	1N4148, Diode
14	2	112-5003-00	D217, D229 (D216: NS)	1N4004, Diode
15	26	205-0004-00	F6, F7, F8, F9, F20, F21, F22, F23, F24> F27, F28	Fuse Clips
16	1	200-5000-03	F6	7A 250v S.B. Fuse
17	7	200-5000-01	F7, F8, F9, F24>F27	5A 250v S.B. Fuse
18	3	200-5000-08	F21, F20, F28	3A 250v S.B. Fuse
19	1	200-5000-05	F22	8A 250v S.B. Fuse
20	1	200-5000-06	F23	4A 250v S.B. Fuse
21	1	045-5015-01	J1	20-Pin, 0.1 Dual Row Header
22	1	045-5014-01	J2 (Key Pin-4), J6 (Key Pin-9), J7 (Key Pin-5) J10 (Key Pin-6), J13 (Key Pin-2)	10PKK156
23	1	045-5015-00	J3 (Key Pin-8)	12PKK156
	0	n/a	(J4, J5: NS)	
24	1	045-5013-00	J8 (Key Pin-2), J9 (Key Pin-3), J15 (Key Pin-5)	9PKK156
25	1	045-0014-03	J11	10-84-4030 (3-Pin MOLEX)
26	1	045-5015-00	J12 (Key Pin-7)	12PKK156
27	1	045-0014-06	J14	10-84-4060 (6-Pin MOLEX)
28	1	045-5016-00	J16 (Key Pin-14)	15PKK156
29	1	045-0014-09	J17	10-84-4090 (9-Pin MOLEX)
30	**6**	**165-5099-00**	**L2, L200, L201, L202, L203, L204**	**LED T1-3/4 DIFFUSER LED**
31	16	110-0106-00	Q1>Q16	22NE10L STP, Transistor
32	16	110-0067-00	Q17>Q24, Q25>Q32	TIP122
33	10	110-0088-00	Q33>Q42	19N06L STP, Transistor
34	1	110-0069-00	Q200	2N3904, Transistor.
35	32	121-5042-00	R1>R8, R9>R16, R200>R207, R208>R215	22K Ω 1/4W Res.
36	16	121-5003-00	R17>R24, R25>R32	620 Ω 1/4W Res.
37	17	121-5045-00	R33>R42, R236>R242	39K Ω 1/4W Res.
38	8	121-5021-00	R49, R57>R61, R253, R256, R270 (R252: NS)	4.7K Ω 1/4W Res.
39	11	121-5011-00	R50>R56, R255, R271, R300	10K Ω 1/4W Res.
40	13	121-5007-00	R64>R76 Resistors on Solder Side @ J2-Pins: 1-3 & 5-9	100 Ω 1/4W Res.
41	8	121-5029-00	R90, R92, R94, R96, R98, R100, R102, R104	6.8K Ω 1/4W Res.
42	2	121-5033-00	R114, R269	220 Ω 1/4W Res.
43	1	121-5030-00	R115	120 Ω 1/4W Res.
44	1	121-5039-00	R116	50 Ω Pot
45	2	121-5036-00	R117, R272	330 Ω 1/4W Res.
46	2	121-5038-00	R216, R218	1.5K Ω 1/2W Res.
47	1	121-5050-00	R217	4.7K Ω 2W Res. (SANDBAR)
48	1	121-5009-00	R219, R245>R251, R254, R302 (R228>R235: NS)	1K Ω 1/4W Res.
49	8	121-5016-00	R261, R262, R263, R264, R265, R266, R267, R268	47 Ω 1/4W Res.
50	1	190-5002-00	RELAY	FRL264D024/02CK Relay
51	2	n/a	TPL1, TPL3	*Test Point Wire (24ga.) Loops*
52	8	100-5012-00	U1, U2, U3, U4, U6, U18, U201, U206 (U200: NS)	74HCT273
53	1	110-0058-00	U9	74LS245
54	1	100-5023-00	U210	DS1232
55	8	110-0089-00	U10, U11, U12, U13, U14, U15, U16, U17	VN02N
56	1	100-0356-00	U19	LM338K
57	1	n/a	U19	Heatsink (5v Reg.)
58	1	100-0338-00	U203 (U202: NS)	74HC245
59	2	100-0148-00	U204, U205	74LS138
60	1	100-0037-00	U209	74LS74
61	1	n/a	BLANKING, RESET	*Test Points*

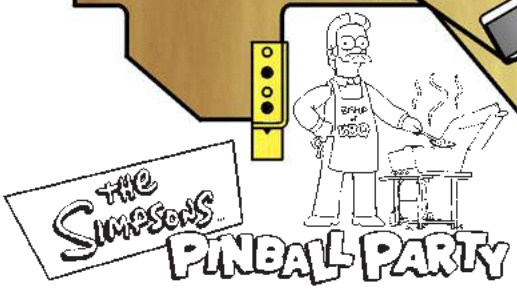


Your Notes


LOCK
LOCK
SUPER JACKPOT
LIGHT
2X


LOCK
LOCK
SUPER JACKPOT
LIGHT
2X


OTTO'S BUS TOURS
CLEAN THE GARAGE
GARAGE 2X SCORING
MOE'S TAVERN
COLLECT NUCLEAR PARTS
TARGETS
SPAY ANYTHING
KITTY KITTY BANG BANG
FIELD OF SCREAMS
ESOPHAGUS NOW
ADV. POPS
EXTRA BALL
SPECIAL
PINBALL
PARTY
SHOOT AGAIN
WELCOME TO SPRINGFIELD


The Simpsons
PINBALL PARTY

Please Note:
This file is for the CPU/Sound II Board (with ATMEL Processor)

CPU Section:

The **CPU** is a **68B09E** (**U209**) with up to 8 MBytes of **CPU** *Code Space* (**U210**). The **CPU** code is bank selected by the use of **U211** and each bank consists of 16 KBytes. 8 KBytes of **RAM** (**U212**) is available to the **CPU**. The RAM is battery backed and has a write protected area. Battery back up is accomplished by **3-AA Cells** (**BAT1**) Battery Pack which has a **TEST POINT (TP): VBATT** to check the battery voltage status. The write protected area consists of 512 Bytes used for storing game settings. This section of **RAM** can only be written to when the coin door is open. The Coin Door switch comes into the **CPU** on **CN6-12** and is fed into the address decoding **PAL U213**. When this memory protect signal is low writes to the protected **RAM** area are prohibited. Address decoding for the system is accomplished by one **PAL U213** and one 1-of-8 decoder **U214**.

A watchdog is used to monitor the **CPU** and the 5v supply. If the 5v supply is below 4.75 the watchdog will hold the **CPU**/**Sound Board** & **I**/**O Board** in *reset*. The watchdog must be fed at a rate of ***250ms*** or faster. The signal used to feed the watchdog comes from the EPROM Bank select signal used to load **U211**.

The **I**/**O** Interface **CN1** is buffered by two (2) **HC245** Chips (**U207 & U208**). The **CPU**'s reset line is buffered by **Q10** and fed over to the **I**/**O** through **CN1**. An I/*O Strobe Signal* is fed through **CN1-15** and is used to notify the **I**/**O** that a valid address is being sent.

Switches:

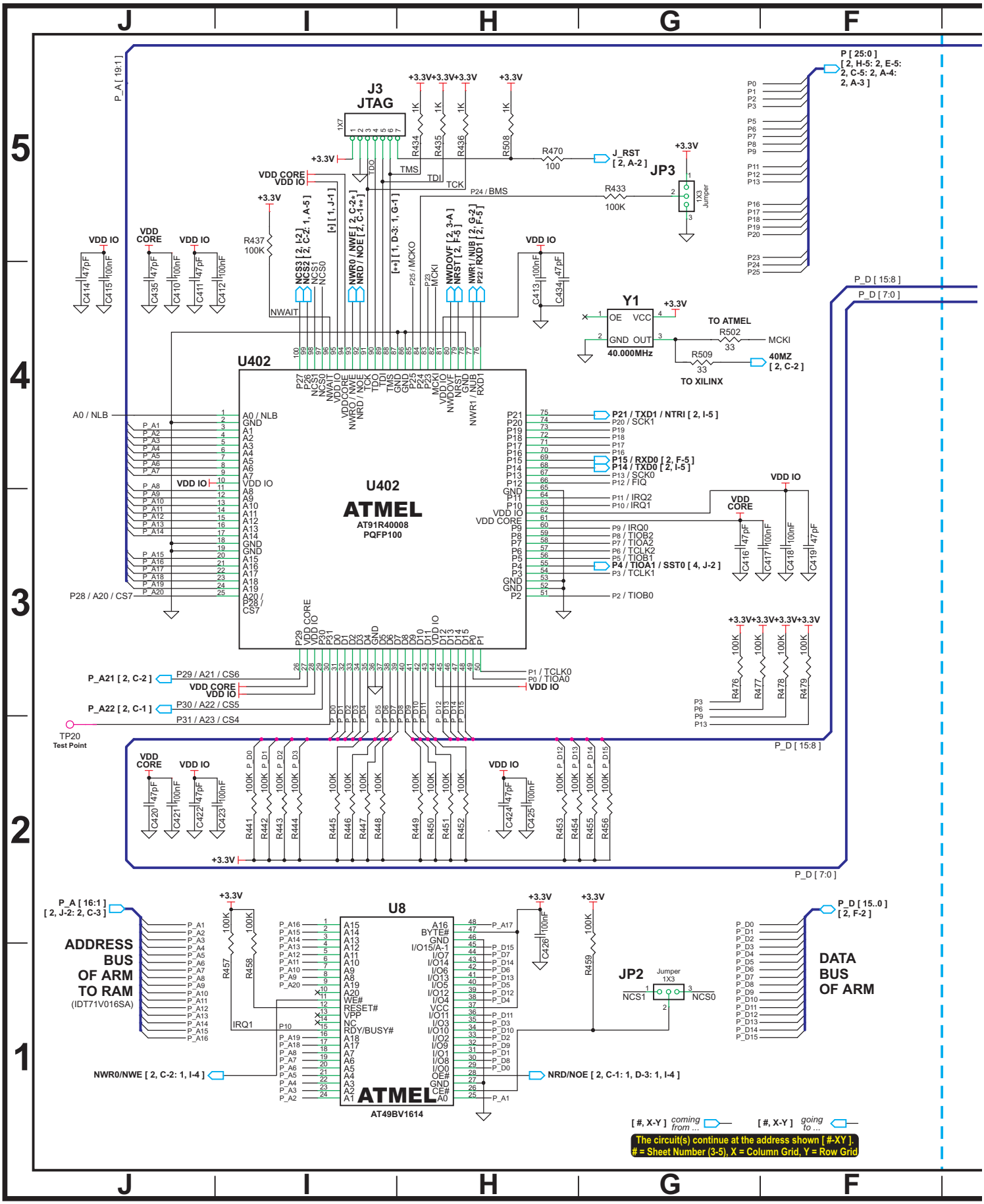
The Switch Matrix consists of eight (8) **2N3904** Transistors(**Q1-Q8**) which pull one of 8 strobes 'low' to *activate* a Single Column of switches. The *Switch Return Signals* are fed into **CN7** [SWITCH ROWS] and are highly filtered and compared to a 2.5v *reference voltage*. The *Switch Return 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.

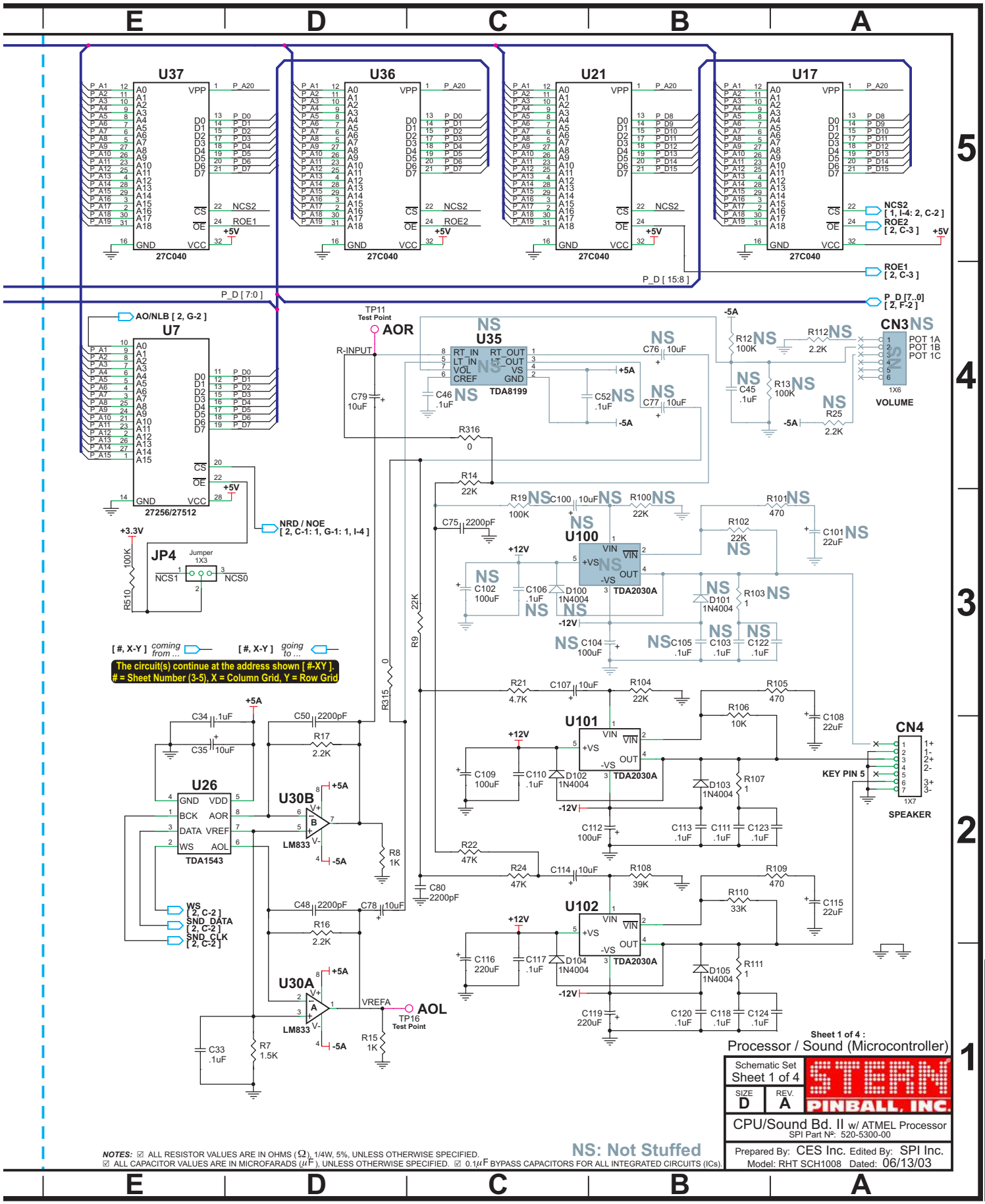
Plasma Interface:

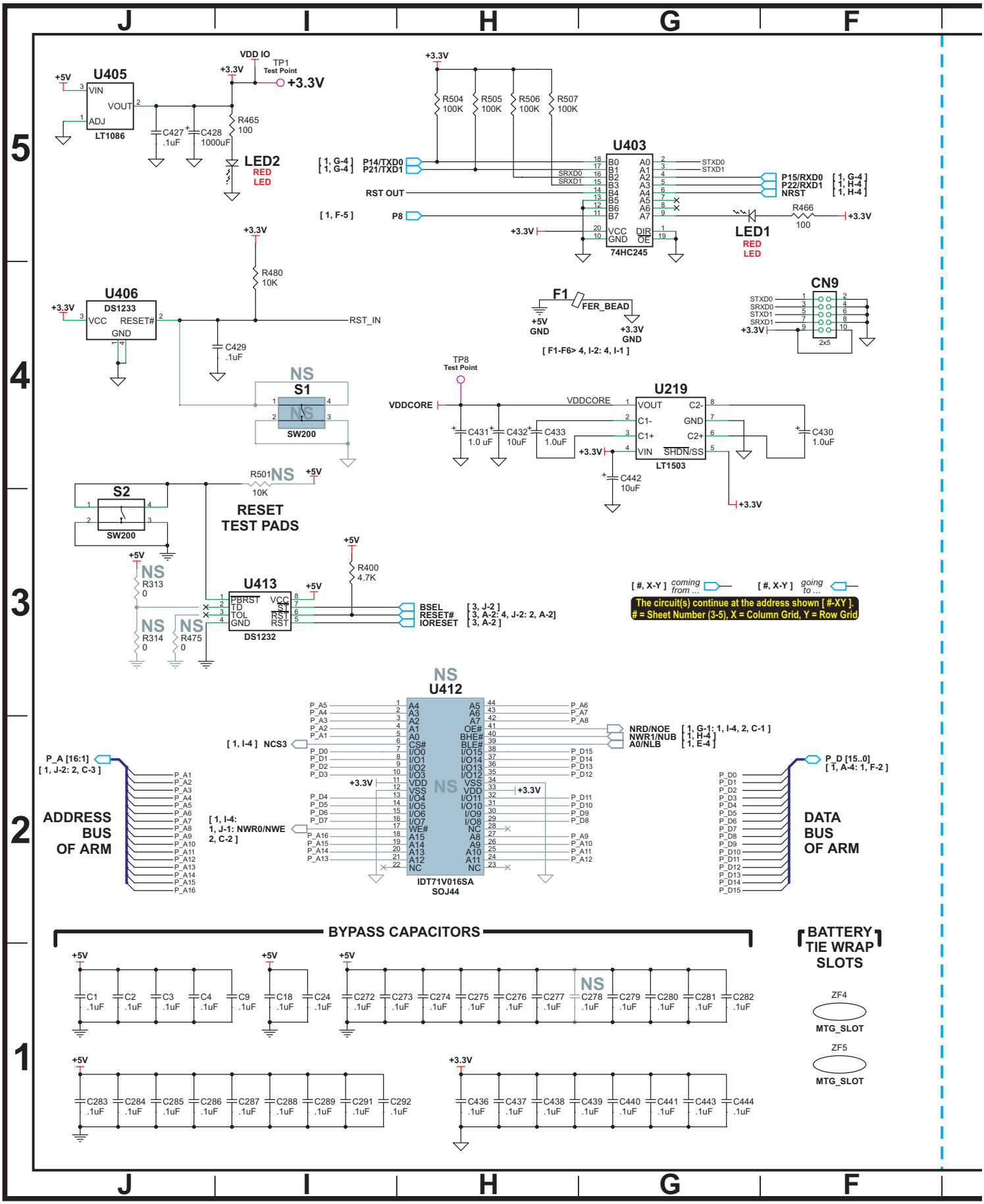
The data path for communication to and from the **Plasma Controller Board** is 8 bits wide. There are separate *Input* and *Output Busses*. Data going out to the controller comes from the **CPU**'s *Data Bus* through **U201** and onto **CN8-Pins 11-18**. Status back from the Plasma Controller comes in 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** [TP17: 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.

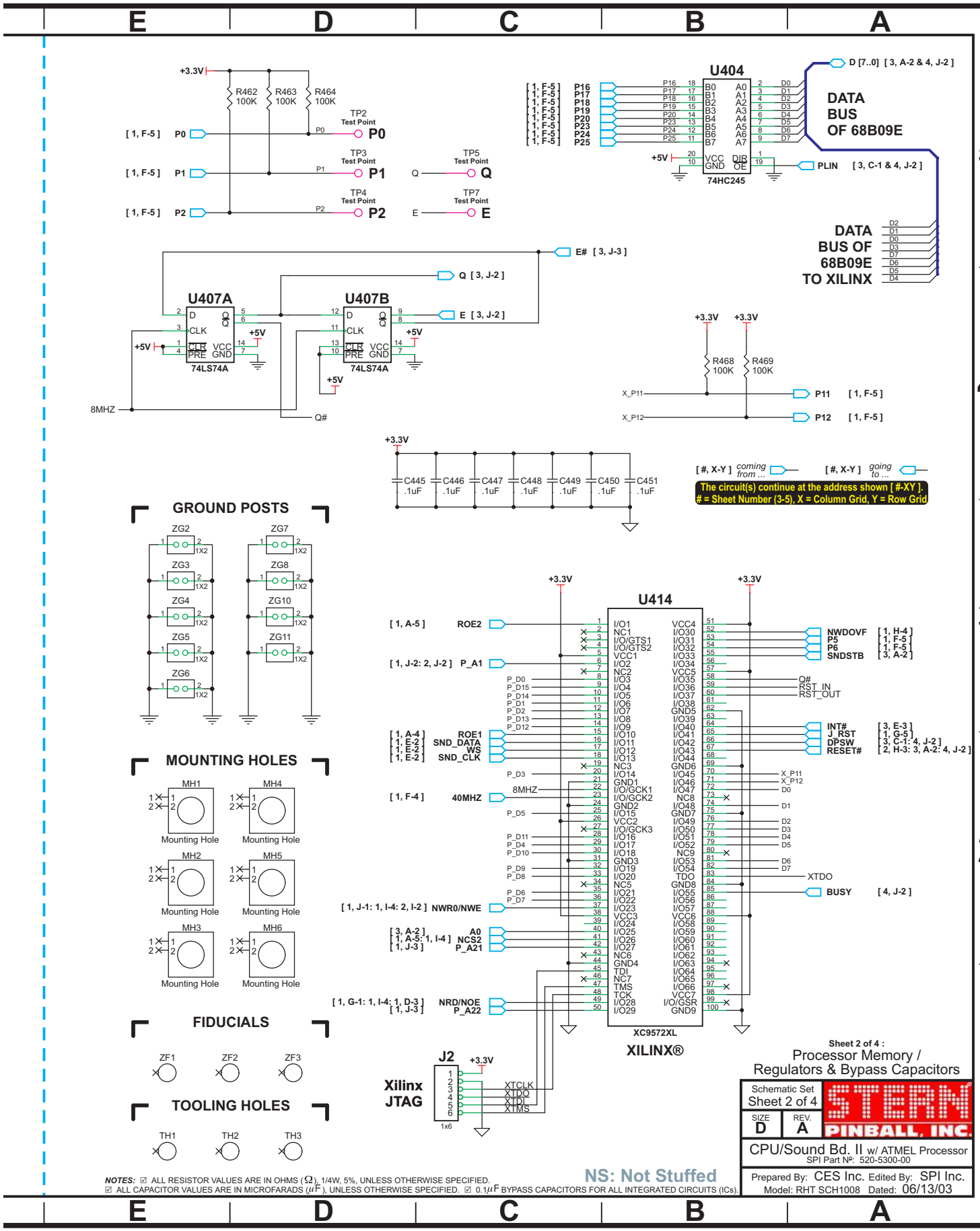
Other Test Points (TP):

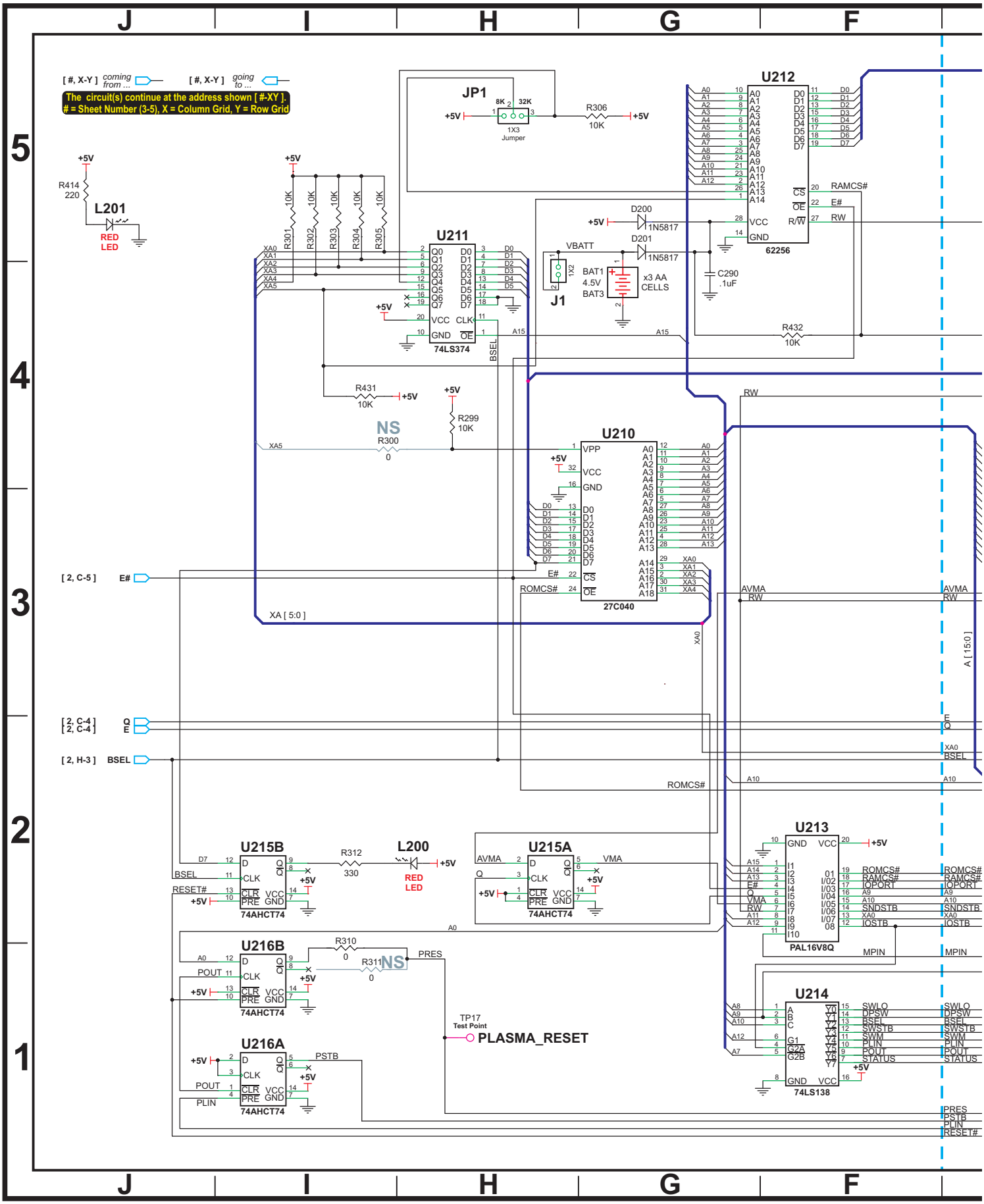
TP 7: E & **TP5: Q** - The **CPU** signals for both **68B09E** processors. Should be at 2Mhz with **Q** leading **E** by ***500 nsec***. **TP2: P0. TP3: P1. TP4: P2. TP20:** *(near U402)***. TP8:** *(near U219)***. TP1: +3.3V.**

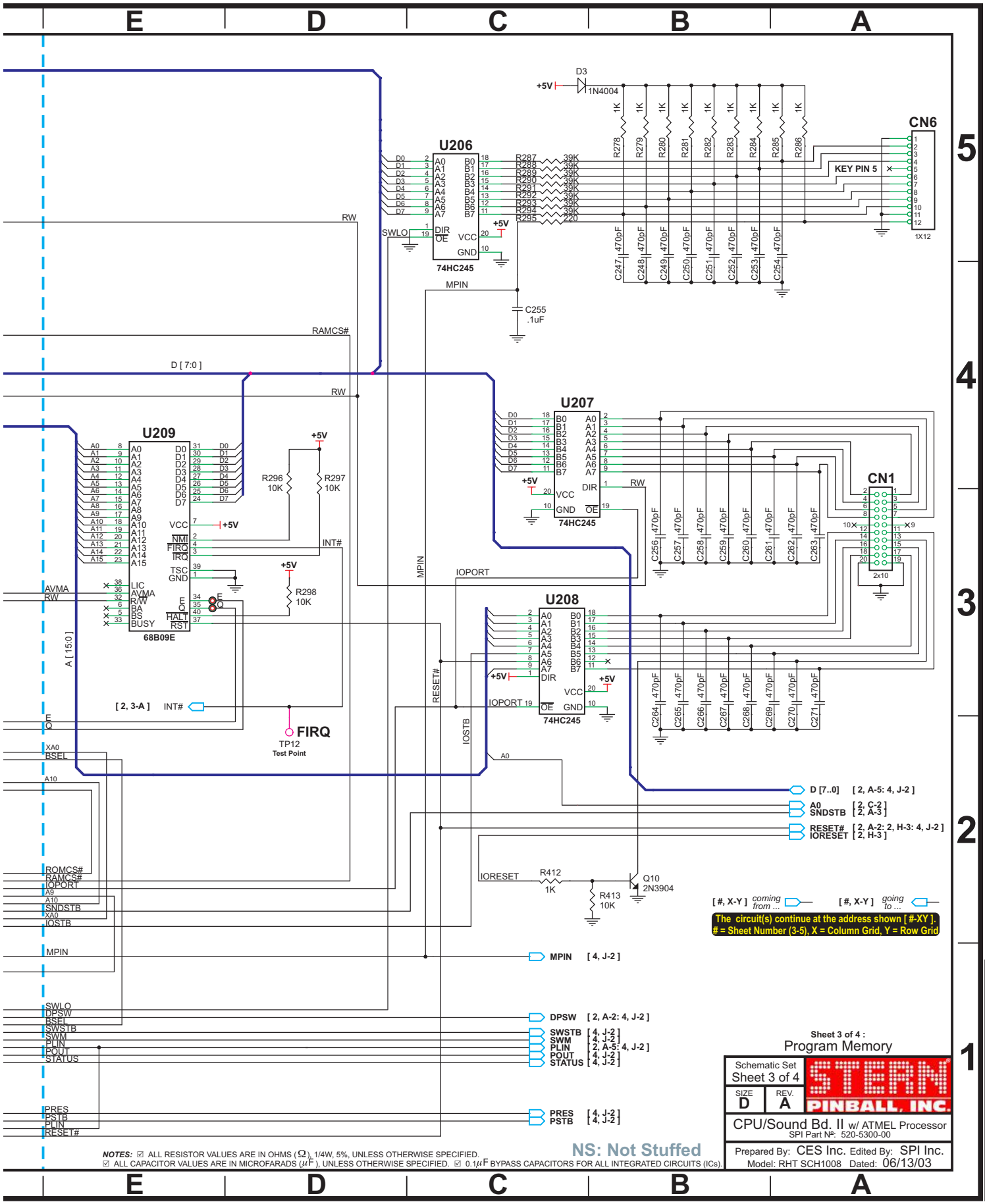

J3
JTAG
U402
ATMEL
AT91R40008
PQFP100
Y1
40.000MHz
TO ATMEL
TO XILINX
JP3
JP2
U8
ATMEL
AT49BV1614
ADDRESS BUS OF ARM TO RAM
(IDT71V016SA)
DATA BUS OF ARM
TP20
Test Point
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid

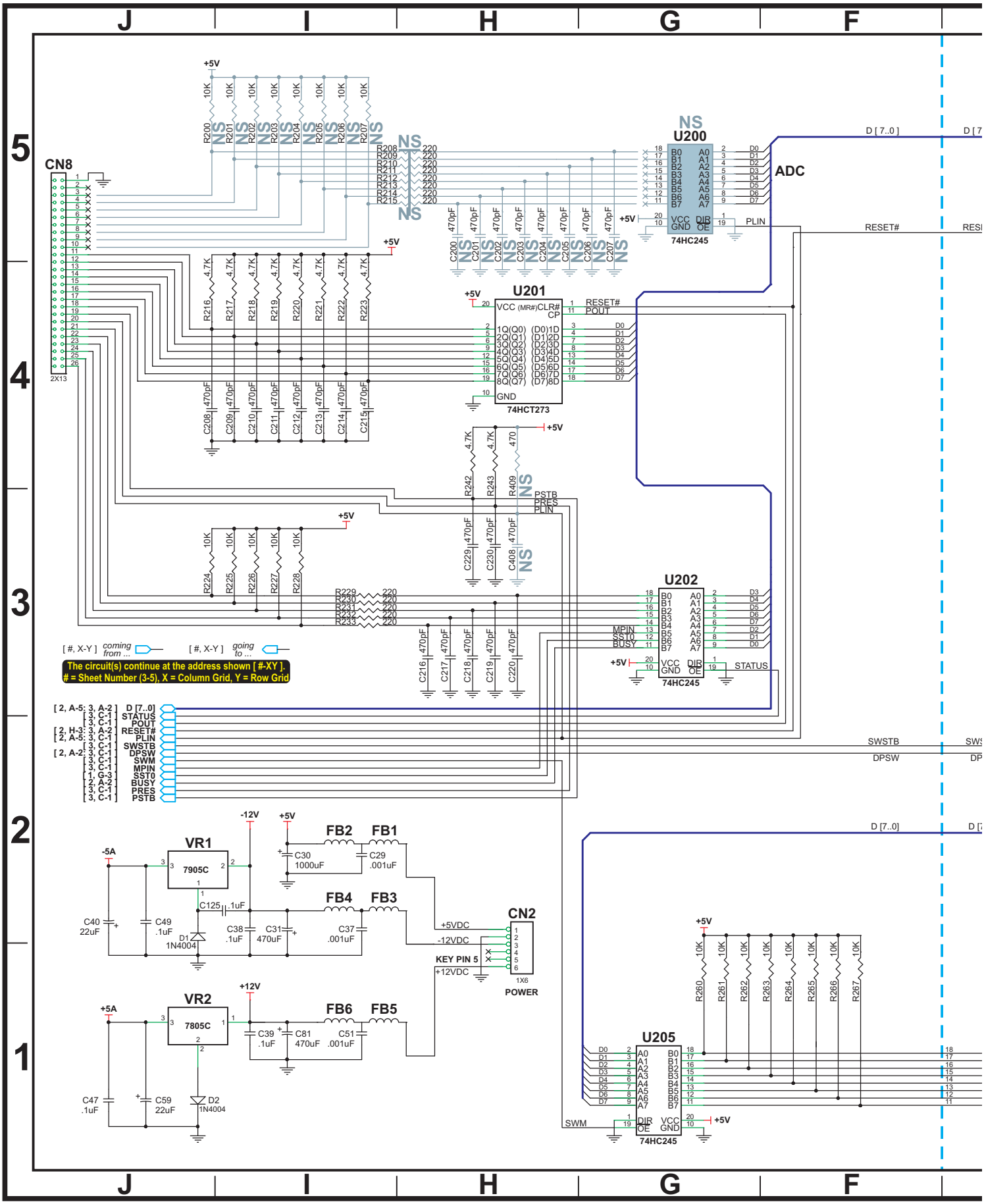

U37
U36
U21
U17
27C040
P_D [15:8]
P_D [7:0]
P_D [7..0] [2, F-2]
ROE1 [2, C-3]
NCS2 [1, I-4: 2, C-2]
ROE2 [2, C-3]
AO/NLB [2, G-2]
U7
27256/27512
NRD / NOE [2, C-1: 1, G-1: 1, I-4]
JP4
Jumper 1X3
NCS1
NCS0
TP11 Test Point
AOR
R-INPUT
U35
TDA8199
CN3
POT 1A
POT 1B
POT 1C
1X6
VOLUME
U100
TDA2030A
U101
U102
CN4
KEY PIN 5
SPEAKER
1X7
U26
TDA1543
U30B
U30A
LM833
WS [2, C-2]
SND_DATA [2, C-2]
SND_CLK [2, C-2]
AOL
TP16 Test Point
[#, X-Y] coming from ...
[#, X-Y] going to ...
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid
NS: Not Stuffed
Sheet 1 of 4 :
Processor / Sound (Microcontroller)
Schematic Set Sheet 1 of 4
SIZE D
REV. A
STERN PINBALL, INC.
CPU/Sound Bd. II w/ ATMEL Processor
SPI Part №: 520-5300-00
Prepared By: CES Inc. Edited By: SPI Inc.
Model: RHT SCH1008 Dated: 06/13/03
NOTES: ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED. ☑ 0.1μF BYPASS CAPACITORS FOR ALL INTEGRATED CIRCUITS (ICs).

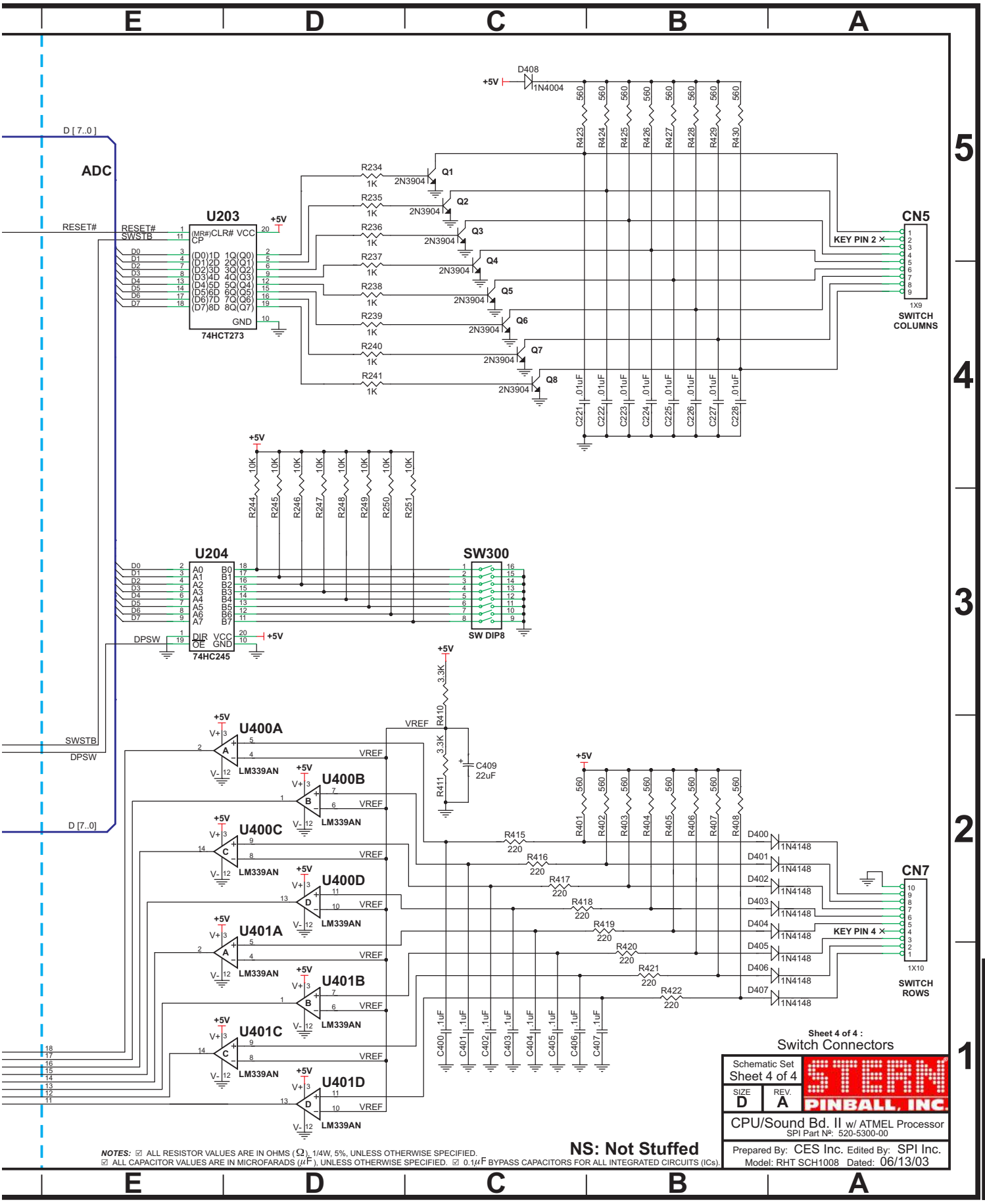

U405
LT1086
VIN
VOUT
ADJ
+5V
VDD IO
+3.3V
TP1
Test Point
C427 .1uF
C428 1000uF
R465 100
LED2
RED LED
R504 100K
R505 100K
R506 100K
R507 100K
U403
74HC245
P14/TXD0
P21/TXD1
RST OUT
P8
P15/RXD0
P22/RXD1
NRST
R466 100
LED1
RED LED
U406
DS1233
RESET#
GND
R480 10K
RST_IN
C429 .1uF
F1
FER_BEAD
CN9
2x5
S1
SW200
NS
TP8
Test Point
VDDCORE
U219
LT1503
VOUT
C1-
C1+
VIN
SHDN/SS
C2-
GND
C2+
C431 1.0 uF
C432 10uF
C433 1.0uF
C430 1.0uF
C442 10uF
S2
R501 10K
RESET TEST PADS
R313 0
R314 0
R475 0
R400 4.7K
U413
DS1232
PBRST
TD
TOL
GND
VCC
RST
BSEL
RESET#
IORESET
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid
U412
IDT71V016SA
SOJ44
NCS3
NRD/NOE
NWR1/NUB
A0/NLB
P_A [16:1]
ADDRESS BUS OF ARM
P_D [15..0]
DATA BUS OF ARM
BYPASS CAPACITORS
BATTERY TIE WRAP SLOTS
ZF4
ZF5
MTG_SLOT


E D C B A
5 4 3 2 1
+3.3V
R462 100K
R463 100K
R464 100K
[1, F-5] P0
[1, F-5] P1
[1, F-5] P2
TP2 Test Point P0
TP3 Test Point P1
TP4 Test Point P2
TP5 Test Point Q
TP7 Test Point E
U404
74HC245
D [7..0] [3, A-2 & 4, J-2]
DATA BUS OF 68B09E
PLIN [3, C-1 & 4, J-2]
DATA BUS OF 68B09E TO XILINX
E# [3, J-3]
Q [3, J-2]
E [3, J-2]
U407A
U407B
74LS74A
8MHZ
Q#
R468 100K
R469 100K
X_P11
X_P12
P11 [1, F-5]
P12 [1, F-5]
C445 .1uF
C446 .1uF
C447 .1uF
C448 .1uF
C449 .1uF
C450 .1uF
C451 .1uF
[#, X-Y] coming from ...
[#, X-Y] going to ...
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid
GROUND POSTS
ZG2
ZG3
ZG4
ZG5
ZG6
ZG7
ZG8
ZG10
ZG11
1X2
MOUNTING HOLES
MH1
MH2
MH3
MH4
MH5
MH6
Mounting Hole
FIDUCIALS
ZF1
ZF2
ZF3
TOOLING HOLES
TH1
TH2
TH3
U414
XC9572XL
XILINX®
[1, A-5] ROE2
[1, J-2: 2, J-2] P_A1
[1, A-4] ROE1
[1, E-2] SND_DATA
[1, E-2] WS
[1, E-2] SND_CLK
[1, F-4] 40MHZ
[1, J-1: 1, I-4: 2, I-2] NWR0/NWE
[3, A-2] A0
[1, A-5: 1, I-4] NCS2
[1, J-3] P_A21
[1, G-1: 1, I-4: 1, D-3] NRD/NOE
[1, J-3] P_A22
NWDOVF [1, H-4]
P5 [1, F-5]
P6 [1, F-5]
SNDSTB [3, A-2]
Q#
RST_IN
RST_OUT
INT# [3, E-3]
J_RST [1, G-5]
DPSW [3, C-1: 4, J-2]
RESET# [2, H-3: 3, A-2: 4, J-2]
XTDO
BUSY [4, J-2]
J2
Xilinx JTAG
XTCLK
XTDO
XTDI
XTMS
1x6
Sheet 2 of 4 :
Processor Memory / Regulators & Bypass Capacitors
Schematic Set Sheet 2 of 4
SIZE D
REV. A
STERN PINBALL, INC.
CPU/Sound Bd. II w/ ATMEL Processor
SPI Part №: 520-5300-00
Prepared By: CES Inc. Edited By: SPI Inc.
Model: RHT SCH1008 Dated: 06/13/03
NS: Not Stuffed
NOTES: ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED. ☑ 0.1μF BYPASS CAPACITORS FOR ALL INTEGRATED CIRCUITS (ICs).

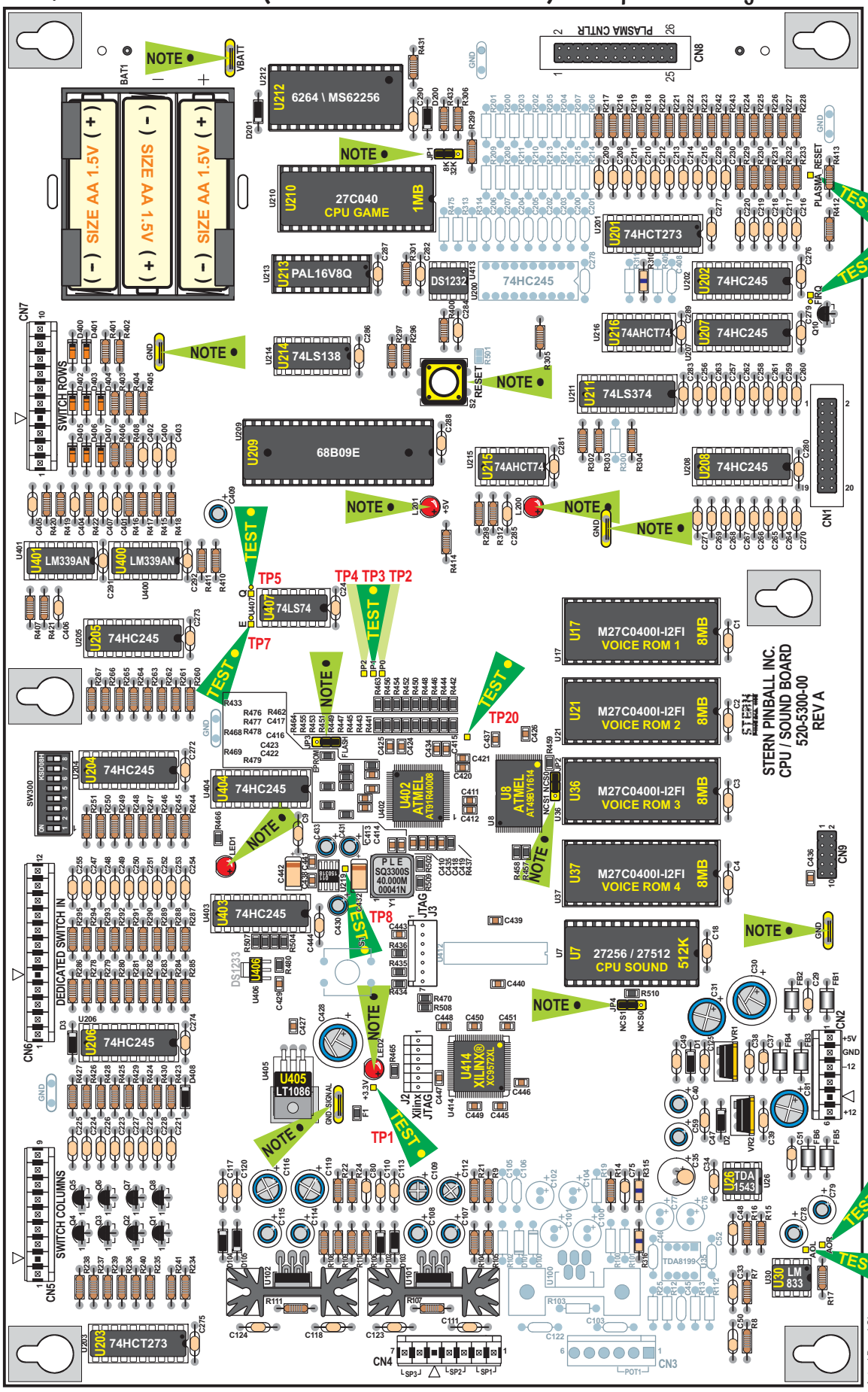

[#, X-Y] coming from ...
[#, X-Y] going to ...
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid
JP1
8K
32K
1X3
Jumper
R306
10K
+5V
U212
62256
RAMCS#
E#
RW
D200
1N5817
D201
1N5817
VBATT
J1
1X2
BAT1
4.5V
BAT3
x3 AA
CELLS
C290
.1uF
R432
10K
R414
220
L201
RED
LED
R301
R302
R303
R304
R305
10K
U211
74LS374
XA0
XA1
XA2
XA3
XA4
XA5
BSEL
A15
R431
10K
R299
10K
NS
R300
0
U210
27C040
VPP
VCC
GND
E#
ROMCS#
XA [5:0]
XA0
AVMA
RW
A [15:0]
[2, C-5]
[2, C-4]
[2, H-3]
Q
E
BSEL
ROMCS#
A10
U213
PAL16V8Q
ROMCS#
RAMCS#
IOPORT
A9
A10
SNDSTB
XA0
IOSTB
MPIN
U215B
74AHCT74
D7
BSEL
RESET#
R312
330
L200
RED
LED
U215A
74AHCT74
AVMA
VMA
U216B
74AHCT74
A0
POUT
R310
0
R311
0
NS
PRES
U216A
74AHCT74
PSTB
PLIN
TP17
Test Point
PLASMA_RESET
U214
74LS138
SWLQ
DPSW
BSEL
SWSTB
SWM
PLIN
POUT
STATUS
PRES
PSTB
PLIN
RESET#


U206
74HC245
U207
74HC245
U208
74HC245
U209
68B09E
CN6
1X12
CN1
2x10
D3
1N4004
+5V
KEY PIN 5
RW
RAMCS#
D [7:0]
SWLO
MPIN
C255
.1uF
R296
10K
R297
10K
R298
10K
INT#
AVMA
A [15:0]
IOPORT
RESET#
IOSTB
FIRQ
TP12
Test Point
[2, 3-A]
ROMCS#
SNDSTB
XA0
BSEL
A10
A9
IORESET
R412
1K
R413
10K
Q10
2N3904
D [7..0] [2, A-5: 4, J-2]
A0 [2, C-2]
SNDSTB [2, A-3]
RESET# [2, A-2: 2, H-3: 4, J-2]
IORESET [2, H-3]
MPIN [4, J-2]
DPSW [2, A-2: 4, J-2]
SWSTB [4, J-2]
SWM [4, J-2]
PLIN [2, A-5: 4, J-2]
POUT [4, J-2]
STATUS [4, J-2]
PRES [4, J-2]
PSTB [4, J-2]
[#, X-Y] coming from ...
[#, X-Y] going to ...
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid
NS: Not Stuffed
NOTES: ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED. ☑ 0.1μF BYPASS CAPACITORS FOR ALL INTEGRATED CIRCUITS (ICs).
Sheet 3 of 4 :
Program Memory
Schematic Set
Sheet 3 of 4
SIZE D
REV. A
STERN PINBALL, INC.
CPU/Sound Bd. II w/ ATMEL Processor
SPI Part №: 520-5300-00
Prepared By: CES Inc. Edited By: SPI Inc.
Model: RHT SCH1008 Dated: 06/13/03


CN8
2X13
U200
74HC245
ADC
U201
74HCT273
U202
74HC245
U205
74HC245
VR1
7905C
VR2
7805C
CN2
KEY PIN 5
POWER
D [7..0]
RESET#
SWSTB
DPSW
PSTB
PRES
PLIN
STATUS
MPIN
SST0
BUSY
SWM
POUT
[#, X-Y] coming from ...
[#, X-Y] going to ...
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid


D408
1N4004
+5V
D [7..0]
ADC
RESET#
SWSTB
U203
74HCT273
(MR#)CLR# VCC
CP
(D0)1D 1Q(Q0)
(D1)2D 2Q(Q1)
(D2)3D 3Q(Q2)
(D3)4D 4Q(Q3)
(D4)5D 5Q(Q4)
(D5)6D 6Q(Q5)
(D6)7D 7Q(Q6)
(D7)8D 8Q(Q7)
GND
R234 1K
R235 1K
R236 1K
R237 1K
R238 1K
R239 1K
R240 1K
R241 1K
Q1 2N3904
Q2 2N3904
Q3 2N3904
Q4 2N3904
Q5 2N3904
Q6 2N3904
Q7 2N3904
Q8 2N3904
R423 560
R424 560
R425 560
R426 560
R427 560
R428 560
R429 560
R430 560
C221 .01uF
C222 .01uF
C223 .01uF
C224 .01uF
C225 .01uF
C226 .01uF
C227 .01uF
C228 .01uF
CN5
KEY PIN 2
1X9
SWITCH COLUMNS
R244 10K
R245 10K
R246 10K
R247 10K
R248 10K
R249 10K
R250 10K
R251 10K
U204
74HC245
A0 B0
A1 B1
A2 B2
A3 B3
A4 B4
A5 B5
A6 B6
A7 B7
DIR VCC
OE GND
DPSW
SW300
SW DIP8
3.3K R410
3.3K R411
VREF
C409 22uF
U400A
U400B
U400C
U400D
U401A
U401B
U401C
U401D
LM339AN
V+
V-
SWSTB
DPSW
D [7..0]
R401 560
R402 560
R403 560
R404 560
R405 560
R406 560
R407 560
R408 560
R415 220
R416 220
R417 220
R418 220
R419 220
R420 220
R421 220
R422 220
D400 1N4148
D401 1N4148
D402 1N4148
D403 1N4148
D404 1N4148
D405 1N4148
D406 1N4148
D407 1N4148
CN7
KEY PIN 4
1X10
SWITCH ROWS
C400 .1uF
C401 .1uF
C402 .1uF
C403 .1uF
C404 .1uF
C405 .1uF
C406 .1uF
C407 .1uF
Sheet 4 of 4 :
Switch Connectors
Schematic Set
Sheet 4 of 4
SIZE D
REV. A
STERN PINBALL, INC.
CPU/Sound Bd. II w/ ATMEL Processor
SPI Part №: 520-5300-00
Prepared By: CES Inc. Edited By: SPI Inc.
Model: RHT SCH1008 Dated: 06/13/03
NS: Not Stuffed
NOTES: ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED. ☑ 0.1μF BYPASS CAPACITORS FOR ALL INTEGRATED CIRCUITS (ICs).

CPU/Sound Board II (with ATMEL Processor) Component Layout



Actual Board Size
14.67" X 9.125"

Test Points (TP):

TEST NOTE

←VBATT [3, G-4]

8K/32K
←JP1 [3, H-5]
←PLASMA_RESET
TP17: [3, H-1]
TP17

TP12
←FIRQ TP12: [3, D-2]

←GND

←S2 RESET [2, J-3]
SW200

LEDs
←L201 / L200
[3, J-5] & [3, H-2]
←GND

←Q TP5: [2, C-5]

←E TP7: [2, C-5]

←P2, P1, P0
TP4, TP3, TP2: [2, D-5]

←U402 TP20: [1, J-2]
JP3 [1, G-5]

←JP2 [1, G-1]

←U219 TP8: [2, H-4]

←LED1 [2, G-5]

←JTAG J3 [1, I-5]
←GND

←JP4 [1, E-3]
←JTAG J2 [2, C-1]
XILINX

←LED2 [2, I-5]
←+3.3V TP1: [2, I-5]
←GND_SIGNAL

TP11
←AOL & AOR
TP16: [1, C-1],
TP16 TP11: [1, D-4]

CPU/Sound II Board (with Atmel Processor) Parts

	ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
	—	1	520-5300-00	**CPU/Sound II Board (with Atmel Processor)**	**Complete PCB Assembly**
Connectors	01	4		JP1, JP2, JP3, JP4	3-Pin Jumper & 2-Pin Cover
	02	1	045-5015-06	CN2 (Key Pin-5)	6-Pin, 6PKK156
	03	1		J2 JTAG Xilinx®	6-Pin, ## Header
	04	1	045-5015-07	CN4 (Key Pin-5)	7-Pin, 7PKK156
	05	1		J3 JTAG	7-Pin, ## Header
	06	1	045-5013-00	CN5 (Key Pin-2)	9-Pin, 9PKK156
	07	1		CN9	10-Pin, 0.1 Header
	08	1	045-5014-01	CN7 (Key Pin-4)	10-Pin, 10PKK156
	09	1	045-5015-00	CN6 (Key Pin-5)	12-Pin, 12PKK156
	10	1	045-5015-01	CN1	20-Pin, 0.1 Header
	11	1	045-5015-26	CN8	26-Pin, 0.1 Header
Capacitors*	12	3	125-5043-00	C29, C37, C51	0.001uF (102), Cap.
	13	4	125-5039-00	C48, C50, C75, C80	0.0022uF *or* 2200pF, (222), Cap.
	14	8	125-5029-00	C221>C228	0.01uF (103), 100v Cap.
	15	52	125-5031-00	C1>C4, C9, C18, C24, C33, C34, C38, C39, C47, C49, C110, C111, C113, C117, C118, C120, C123, C124, C125, C255, C272>C277, C279>C292, C400>C407, C444 (C45, C46, C52, C103, C105, C106, C122, C278: NS)	0.1uF (104), Axial Cer. Cap.
	16	3		C430, C431, C433 *(near U403, U404)*	1.0uF, ##v, Radial Lytic Cap.
	17	1	125-5017-00	C35	10uF, 16v, Radial Tant. Cap.
	18	4	125-5017-00	C78, C79, C107, C114 (C76, C77, C100: NS)	10uF, 25v-35v, Radial Lytic Cap.
	19	2	125-5015-00	C109, C112 (C102, C104: NS)	100uF, 25v, Radial Lytic Cap.
	20	1	125-5014-00	C409	22uF, 16v, Radial Lytic Cap.
	21	4	125-5020-00	C40, C59, C108, C115 (C101: NS)	22uF, 25v, Radial Lytic Cap.
	22	2	125-5012-00	C116, C119	220uF, 25v, Radial Lytic Cap.
	23	2	125-5019-00	C31, C81	470uF, 25v, Radial Lytic Cap.
	24	39	125-5028-00	C208>C215, C216>C220, C229, C230, C247>C254, C256>C263, C264>C271 (C200>C207, C408: NS)	470pF (471), Cer. Cap.
	25	2	125-5037-00	C30, C428	1000uF, 16v, Radial Lytic Cap.
	26	17		C427, C429, C436>C441, C443, C445>C451	SMT .1uF Cap.
	27	2		C432, C442 *(near U403 & U404)*	SMT 10uF Cap.
	28	9		C411, C414, C416, C419, C420, C422, C424, C434, C435	SMT 47pF Cap.
	29	10		C410, C412, C413, C415, C417, C418, C421, C423, C425, C426	SMT 100nF Cap.
Diodes & LEDs*	30	7	112-5003-00	D1>D3, D102>D105, D408 (D100, D101: NS)	1N4004, Diode
	31	2	112-5008-00	D200, D201	1N5817, Diode
	32	8	112-0054-00	D400-D407	1N4148, Diode
	33	4	165-5099-00	**LED1, LED2, L200, L201**	**LED T1-3/4 DIFFUSER LED**
Resistors / Transistors*	34	3	124-5064-00	R310, R315, R316 (R300, R311, R313, R314, R475: NS)	0Ω Jumper Res. (1-Stripe)
	35	2	121-5041-00	R107, R111 (R103: NS)	1 Ω 1/4W Res.
	35	20	121-5009-00	R8, R15, R234>R241, R278>R286, R412	1K Ω 1/4W Res.
	36	1	121-5018-00	R7	1.5K Ω 1/4W Res.
	37	2	121-5043-00	R16, R17 (R25, R112: NS)	2.2K Ω 1/4W Res.
	38	2	121-5048-00	R410, R411	3.3K Ω 1/4W Res.
	39	12	121-5021-00	R21, R216>R223, R242, R243, R400	4.7K Ω 1/4W Res.
	40	36	121-5011-00	R106, R224>R228, R244>R251,R260>R267, R296>R299, R301>R306, R413, R431, R432 (R200>R207, R501: NS)	10K Ω 1/4W Res.
	41	3	121-5023-00	R9, R14, R104 (R100, R102: NS)	22K W 1/4W Res.
	42	1	121-5022-04	R110	33K Ω 1/4W Res.
	43	9	121-5045-00	R108, R287>R294	39K Ω Res.
	44	2	121-5032-00	R22, R24	47K Ω 1/4W Res.
	45	15	121-5014-00	R229>R233, R295, R414>R422 (R208>R215: NS)	220 Ω 1/4W Res.
	46	1	121-5036-00	R312	330 Ω 1/4W Res.
	47	2	121-5046-01	R105, R109 (R101, R409: NS)	470 Ω 1/4W Res.
	48	16	121-5047-00	R401>R408, R423>R430	560 Ω 1/4W Res.
	49	1		F1	SMT xx Res.
	50	4		R434, R435, R436, R508	SMT 1K Ω Res.
	51	1		R480	SMT 10K Ω Res.
	52	2		R502, R509	SMT 33 Ω Res.
	53	3		R465, R466, R470	SMT 100 Ω Res.
	54	35		R433, R437, R441>R459, R462>R464, R468, R469, R476>R479, R504>R507, R510	SMT 100K Ω Res.
	55	9	110-0069-00	Q1-Q8, Q10	2N3904, Transistor
ICs / RAMs / ROMs / EPROMs	56	1		U402	**ATMEL**, AT91R40008
	57	1		U8	**ATMEL**, AT49BV1614
	58	1		U414	**XILINX®**, XC9572XL
	59	1	(See Pg. DR. ❶ Table)	U7	**512K EPROM** Sound (27512)
	60	1	(See Pg. DR. ❶ Table)	U210 *(32-Pin, IC Socket, 077-5217-00)*	**1MB EPROM** CPU Game (27C040)
	61	4	(See Pg. DR. ❶ Table)	U17, U21, U36, U37 *(32-Pin, IC Socket, 077-5217-00)*	**8MB EPROM** Voice 1-4 (M27C0400I-12FI)
	62	1	965-6504-00	U213 (**BLUE DOT**)	**PAL16V8Q (Programmed) BLUE DOT**
	63	1	105-5046-00	U212 *(28-Pin, IC Dip Socket, 077-5208-00)*	6264/MS62256 (MS6264A) (28-Pin)
	64	1	100-0189-01	U209 *(40-Pin, IC Socket, 077-5209-00)*	68B09E (40-Pin)
	65	2	100-5015-00	U215, U216	74AHCT74 (14-Pin)
	66	8	100-0338-00	U202, U204, U205, U206, U207, U208, U403, U404 (U200: NS)	74HC245 (20-Pin)
	67	2	100-5012-00	U201, U203	74HCT273 (20-Pin)
	68	1	100-0037-00	U407	74LS74 (14-Pin)
	69	1	100-0148-00	U214	74LS138 (16-Pin)
	70	1	100-0064-00	U211	74LS374 (20-Pin)
	71	1		U406	3.3v Watchdog, DS1233 (3-Pin)
	72	1	100-5023-00	U413	5.0v Watchdog, DS1232 (8-Pin)
	73	1		U219	1.8v Volt. Regulator LT1503 (8-Pin)
	74	1		U405	3.3v Volt. Regulator LT1086 (3-Pin)
	75	1	124-5002-00	VR1	-5v Regulator, LM7905CT
	76	1	124-5001-00	VR2	+5v Regulator, LM7805CT
	77	2	100-0377-00	U400, U401	LM339AN (14-Pin)
	78	1	100-0375-00	U30	LM833 (8-Pin)
	79	1	100-5018-00	U26	TDA1543 (8-Pin)
Miscellaneous	80	2	100-5016-20	U101, U102 (U100: NS)	TDA2030A (5-Pin)
	81	1		Y1	40MHz Clock PLE SQ3300S
	82	1	181-5002-00	SW300	Dip Switch 8-Pos., (KSD08H Black)
	83		n/a	FB1>FB6	Ferrite Bead
	84		535-5000-10	HS2, HS3, (HS1: NS) *(over U101, U102)*	Heat Sink (AAVID 531102)
	85	1		S2 (Reset)	Push-Button Switch (B3F4000)
	86	1	545-5685-00	BAT1 HOLDER ***(Always replace all 3, Size AA 1.5v Cells, with new ones, when required)***	

Test Point Wire (24ga.) Loops:
VBATT, GND *(near CN7)*, GND *(near CN9)*, GND *(near L200)*, GND_SIGNAL *(near U405)*

Test Point Pads:
TP1>TP5, TP7, TP8, TP11, TP12, TP16, TP17, TP20

* Surface Mounts (SMT) are not listed.

* Surface Mounts (SMT) are not listed.

If a part is required where a part number is not provided, call Tech. Support (see back of cover).

Please Note:
This file is for the CPU/Sound Board 520-5136-XX family only.

CPU Section:

The **CPU** is a **68B09E** (**U209**) with up to 8 MBytes of **CPU** *Code Space* (**U210**). The **CPU** code is bank selected by the use of **U211** and each bank consists of 16 KBytes. 8 KBytes of **RAM** (**U212**) is available to the **CPU**. The RAM is battery backed and has a write protected area. Battery back up is accomplished by **3-AA Cells** (**BAT1**) which have a **TEST POINT VBATT** to check the battery voltage status. The write protected area consists of 512 Bytes used for storing game settings. This section of **RAM** can only be written to when the coin door is open. The Coin Door switch comes into the **CPU** on **CN6-12** and is fed into the address decoding **PAL U213**. When this memory protect signal is low writes to the protected **RAM** area are prohibited. Address decoding for the system is accomplished by one **PAL U213** and one 1-of-8 decoder **U214**.

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

The **I/O** Interface **CN1** is buffered by two (2) **HC245** Chips (**U207 & U208**). The **CPU**'s reset line is buffered by **Q10** and fed over to the **I/O** through **CN1**. An I*/O Strobe Signal* is fed through **CN1-15** and is used to notify the **I/O** that a valid address is being sent.

Switches:

The Switch Matrix consists of eight (8) **2N3904** Transistors(**Q1-Q8**) which pull one of 8 strobes 'low' to *activate* a Single Column of switches. The *Switch Return Signals* are fed into **CN7** [SWITCH ROWS] and are highly filtered and compared to a 2.5v *reference voltage*. The *Switch Return Voltage* must be below 2.5v to make a *Valid Switch Closure*. If *false switches* are appearing, check that none of the **2N3904** Transistors are permanently pulling the *strobe line low*. Only one strobe from **CN5** [SWITCH COLUMNS] should be *low at any time*. **CN6** [DEDICATED SWITCH IN] is a *Dedicated Bank of Input Switches*. Switches connected to **CN6** are connected to ground instead of a strobe and may be read at any time.

Plasma Interface:

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

Sound Section:

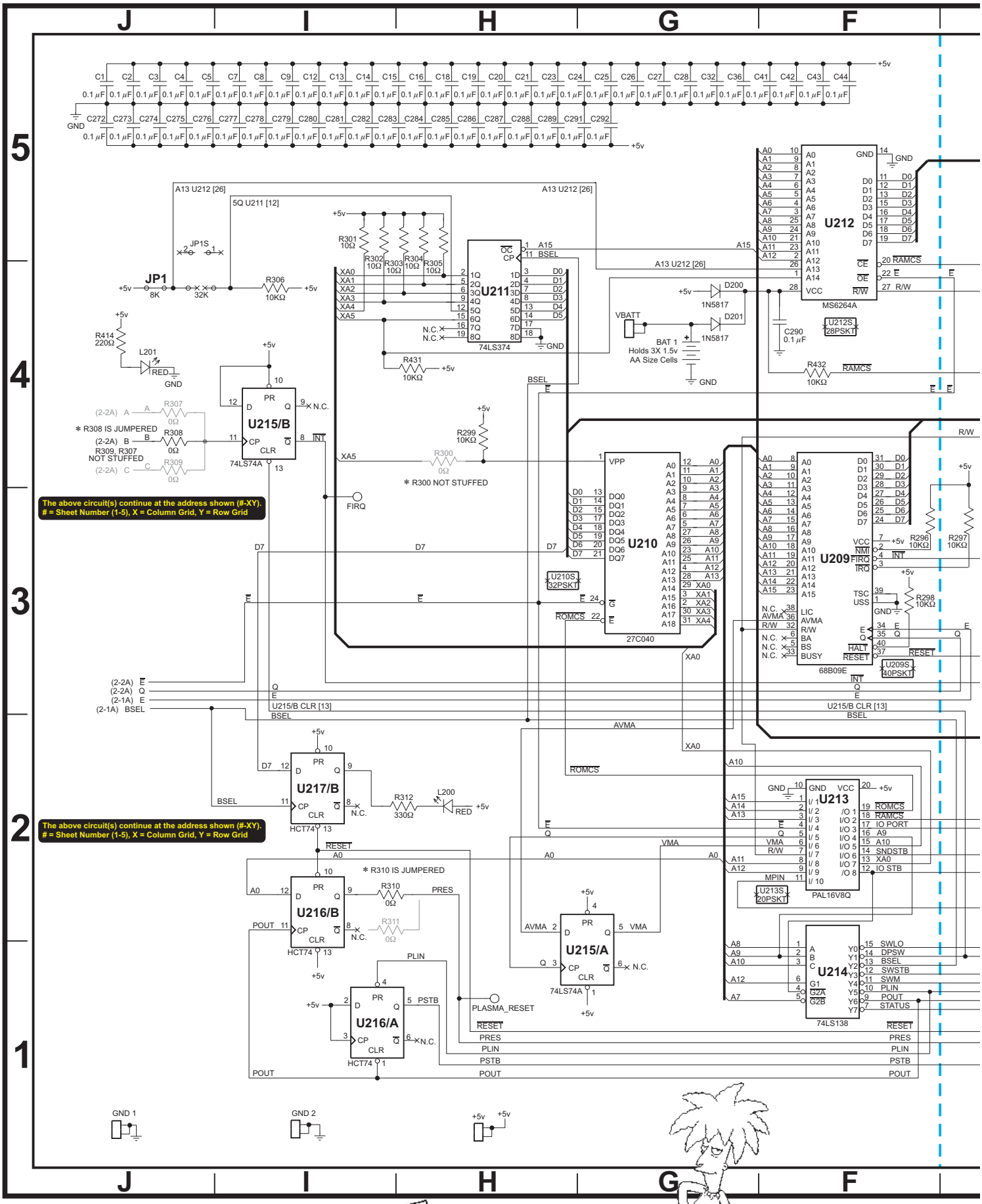
The audio section consists of a **BSMT SOUND CHIP U9** Sound (Voice) EPROMs (**U17 U21 U36 U37**) **68B09E U6** and Sound Code **EPROM U7**. The **BSMT** latches sound EPROM addresses in **U13** & **U12** for output to the Sound EPROMs. Sound Data from the EPROMs is read through **U19** to the **BSMT**. The EPROMs are bank selected by **U22**. When the **BSMT** has sound data to be played out to the speakers it loads 16 bits into a 16 bit shift register made up of **U24** & **U23**. The data stream from the shift register is serially shifted into a stereo 16 bit *Digital to Analog Converter* (**DAC, U26**). 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 the 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 U209** to the sound section by latching data into **U5**. The sound section's **CPU 68BO9E (U6)** reads in this data and handles the interfacing to the **BSMT**.

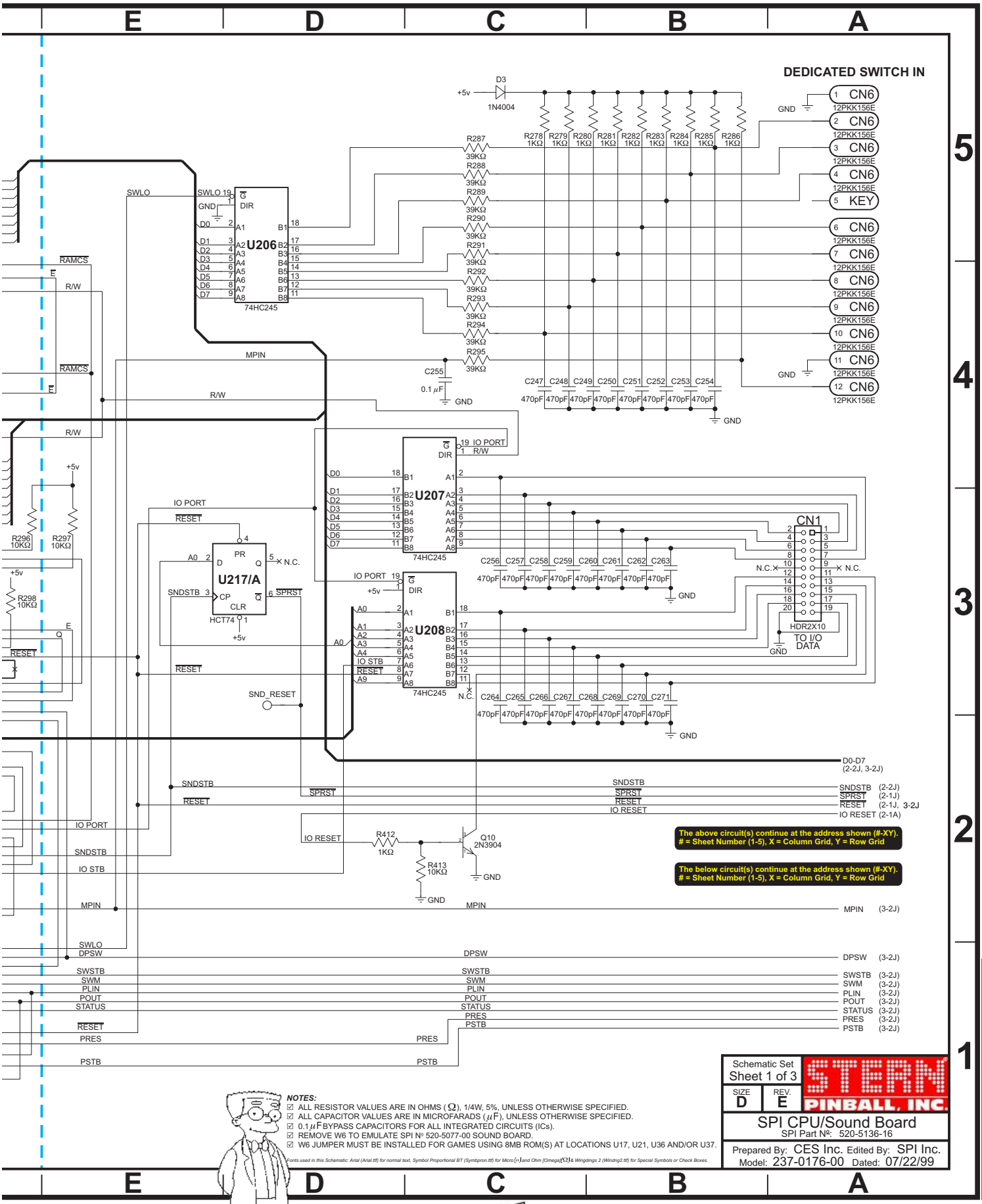
Other Test Points:

E & **Q** - The **CPU** signals for both **68B09E** processors. Should be at 2Mhz with **Q** leading **E** by ***500 nsec***.
24Mhz - The oscillator used for the **BSMT** & derivation of **E** & **Q**.
SND-FIRQ - The sound sections **CPU Interupt**.
6Mhz - This clock is generated internally on the **BSMT** and is used for shifting the data samples into th **DAC**.

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


U211
74LS374
U212
MS6264A
U215/B
74LS74A
U210
27C040
U209
68B09E
U217/B
HCT74
U216/B
HCT74
U216/A
HCT74
U215/A
74LS74A
U213
PAL16V8Q
U214
74LS138
JP1
JP1S
R306
10KΩ
R414
220Ω
L201
RED
R431
10KΩ
R432
10KΩ
R299
10KΩ
R300
0Ω
R307
0Ω
R308
0Ω
R309
0Ω
R312
330Ω
L200
RED
R310
0Ω
R311
0Ω
R296
10KΩ
R297
10KΩ
R298
10KΩ
D200
1N5817
D201
1N5817
VBATT
BAT 1
Holds 3X 1.5v
AA Size Cells
C290
0.1 µF
U212S
28PSKT
U210S
32PSKT
U209S
40PSKT
U213S
20PSKT
* R308 IS JUMPERED
R309, R307
NOT STUFFED
* R300 NOT STUFFED
* R310 IS JUMPERED
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
FIRQ
PLASMA_RESET
GND 1
GND 2
+5v
GND
RAMCS
R/W
ROMCS
RESET
PRES
PLIN
PSTB
POUT
AVMA
VMA
BSEL
U215/B CLR [13]
A13 U212 [26]
5Q U211 [12]

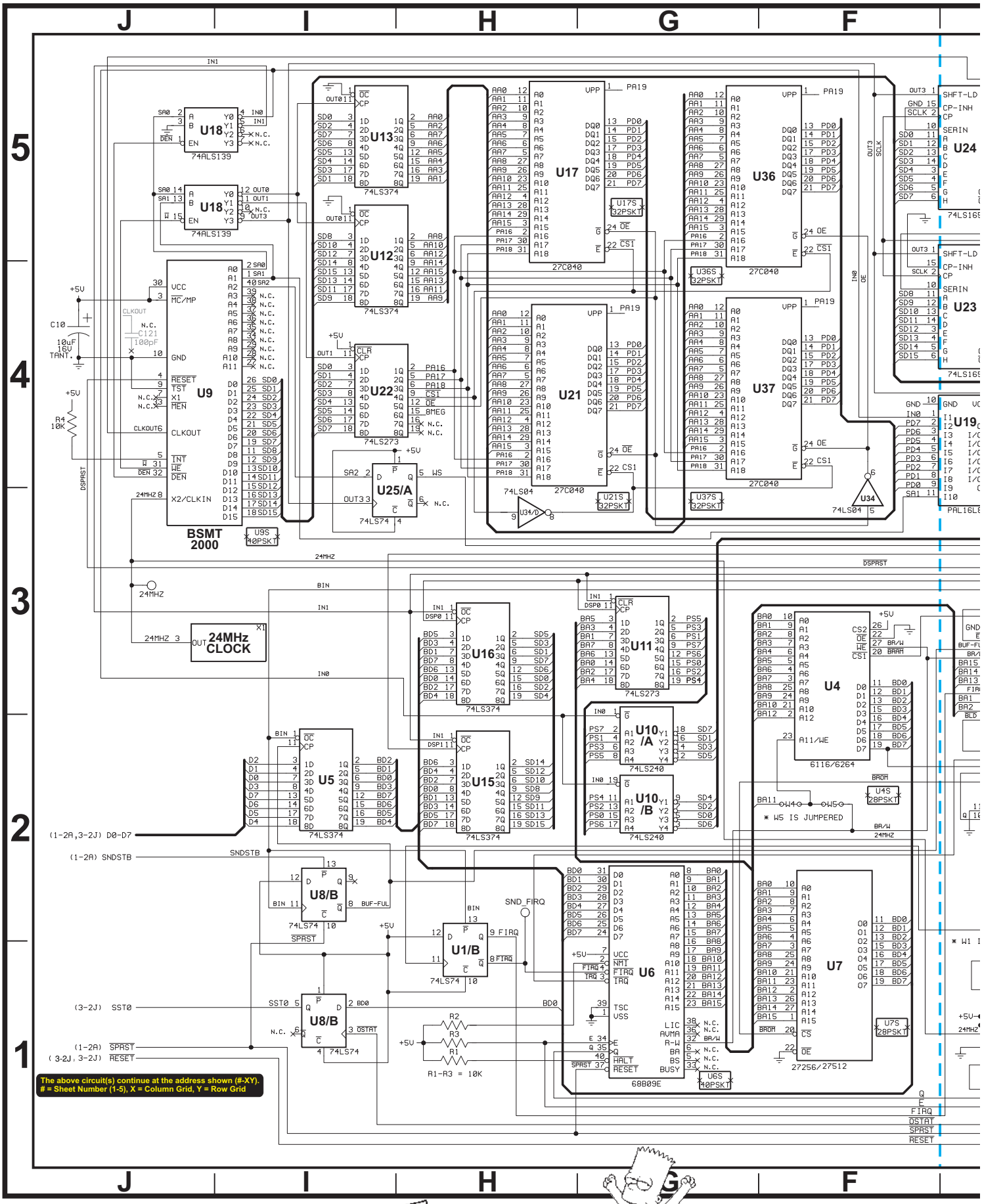
The Simpsons
Pinball Party

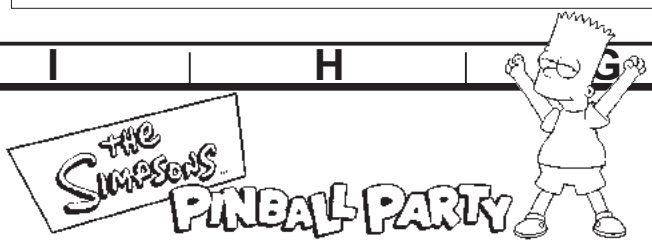


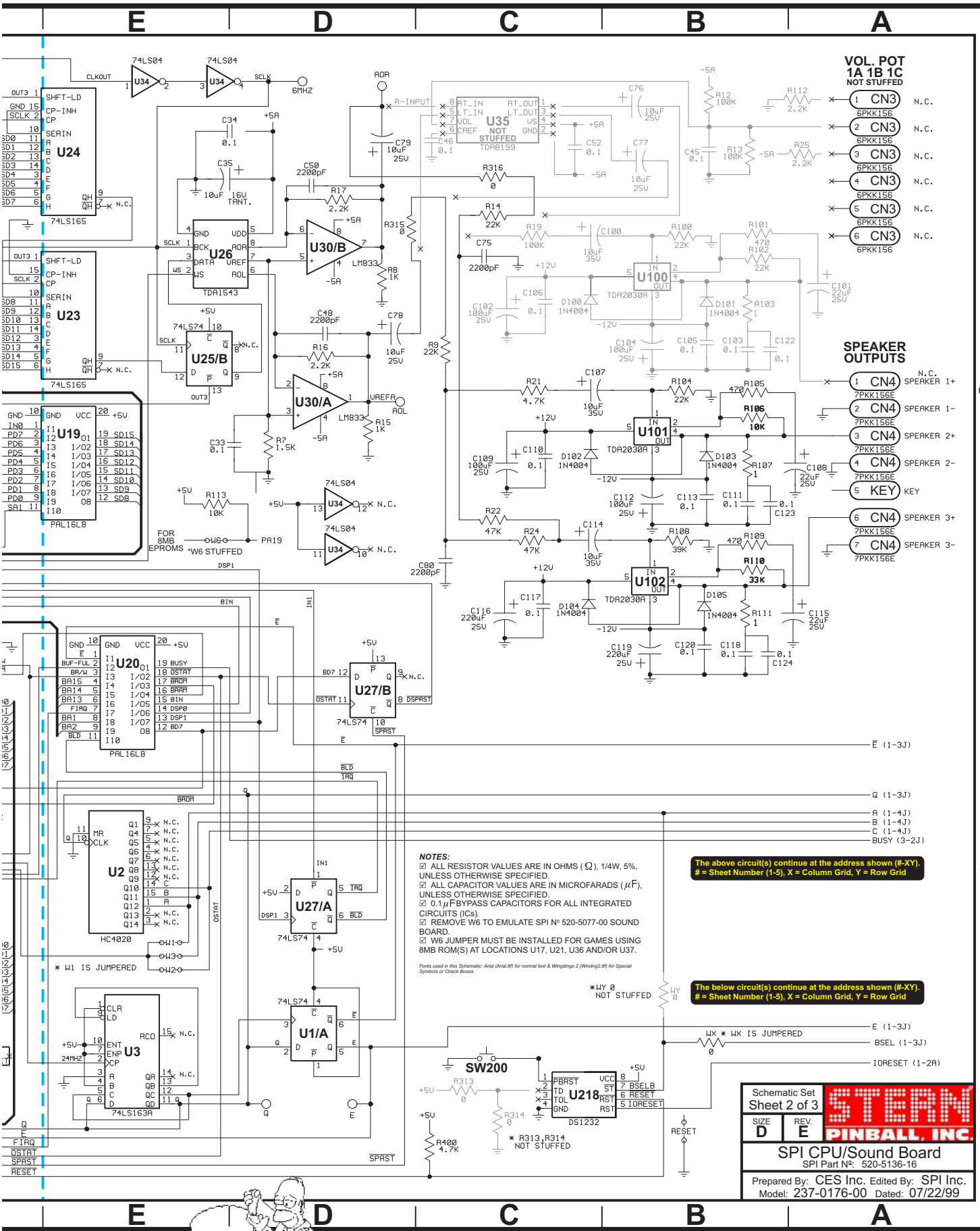
NOTES:

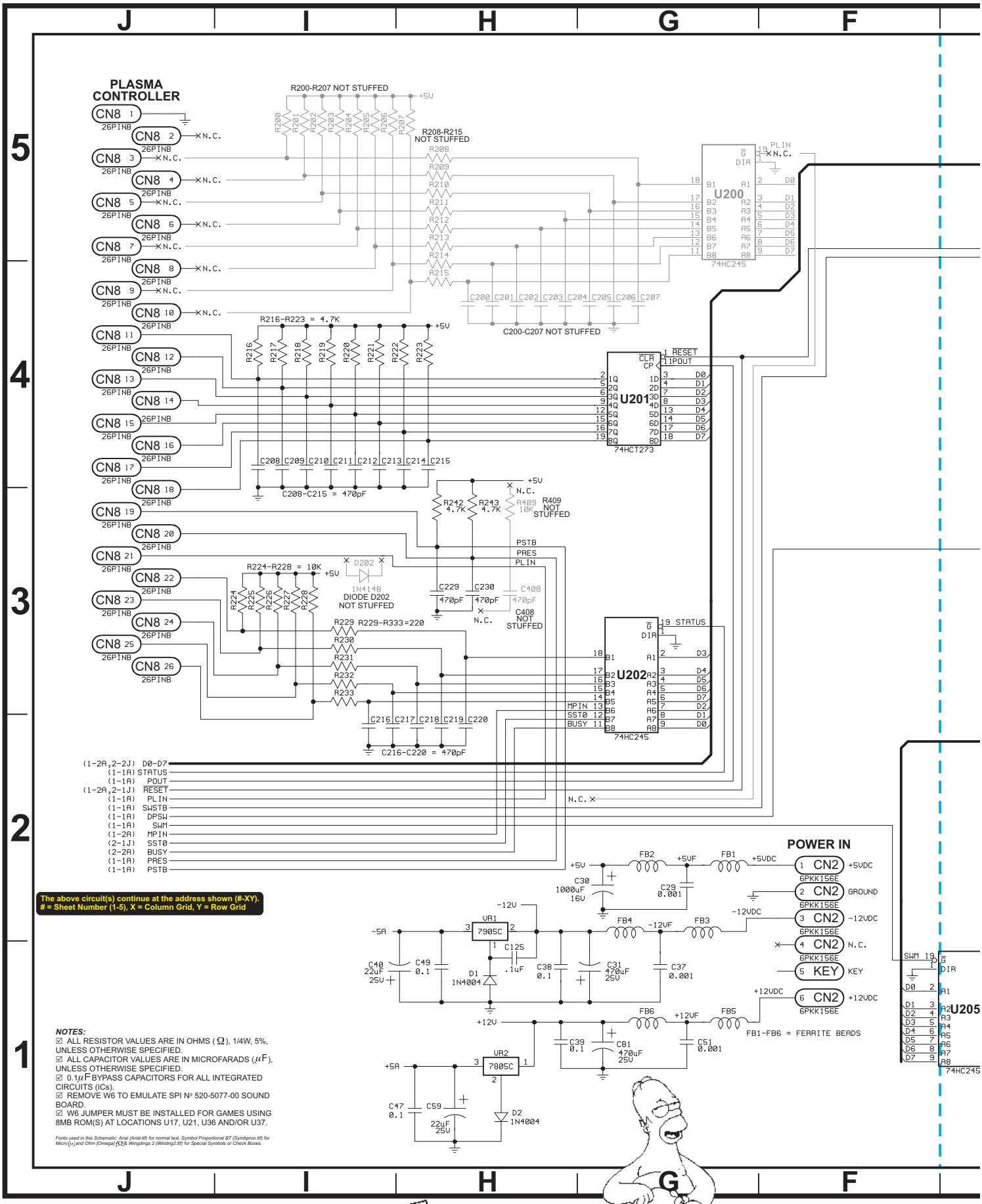
- ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
- ☑ 0.1μF BYPASS CAPACITORS FOR ALL INTEGRATED CIRCUITS (ICs).
- ☑ REMOVE W6 TO EMULATE SPI № 520-5077-00 SOUND BOARD.
- ☑ W6 JUMPER MUST BE INSTALLED FOR GAMES USING 8MB ROM(S) AT LOCATIONS U17, U21, U36 AND/OR U37.

Fonts used in this Schematic: Arial (Arial.ttf) for normal text, Symbol Proportional BT (Symbpron.ttf) for Micro (μ) and Ohm (Omega) (Ω) & Wingdings 2 (Winding2.ttf) for Special Symbols or Check Boxes.


J
I
H
G
F
5
4
3
2
1
U18
74ALS139
U13
74LS374
U12
74LS374
U22
74LS273
U9
BSMT 2000
U17
27C040
U36
27C040
U21
27C040
U37
27C040
U24
74LS165
U23
74LS165
U19
PAL16L8
U25/A
74LS74
U34
74LS04
24MHZ CLOCK
U16
74LS374
U11
74LS273
U10 /A
74LS240
U10 /B
74LS240
U4
6116/6264
U5
74LS374
U15
74LS374
U8/B
74LS74
U1/B
74LS74
U6
68B09E
U7
27256/27512
* W5 IS JUMPERED
R1-R3 = 10K
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid


The Simpsons
Pinball Party

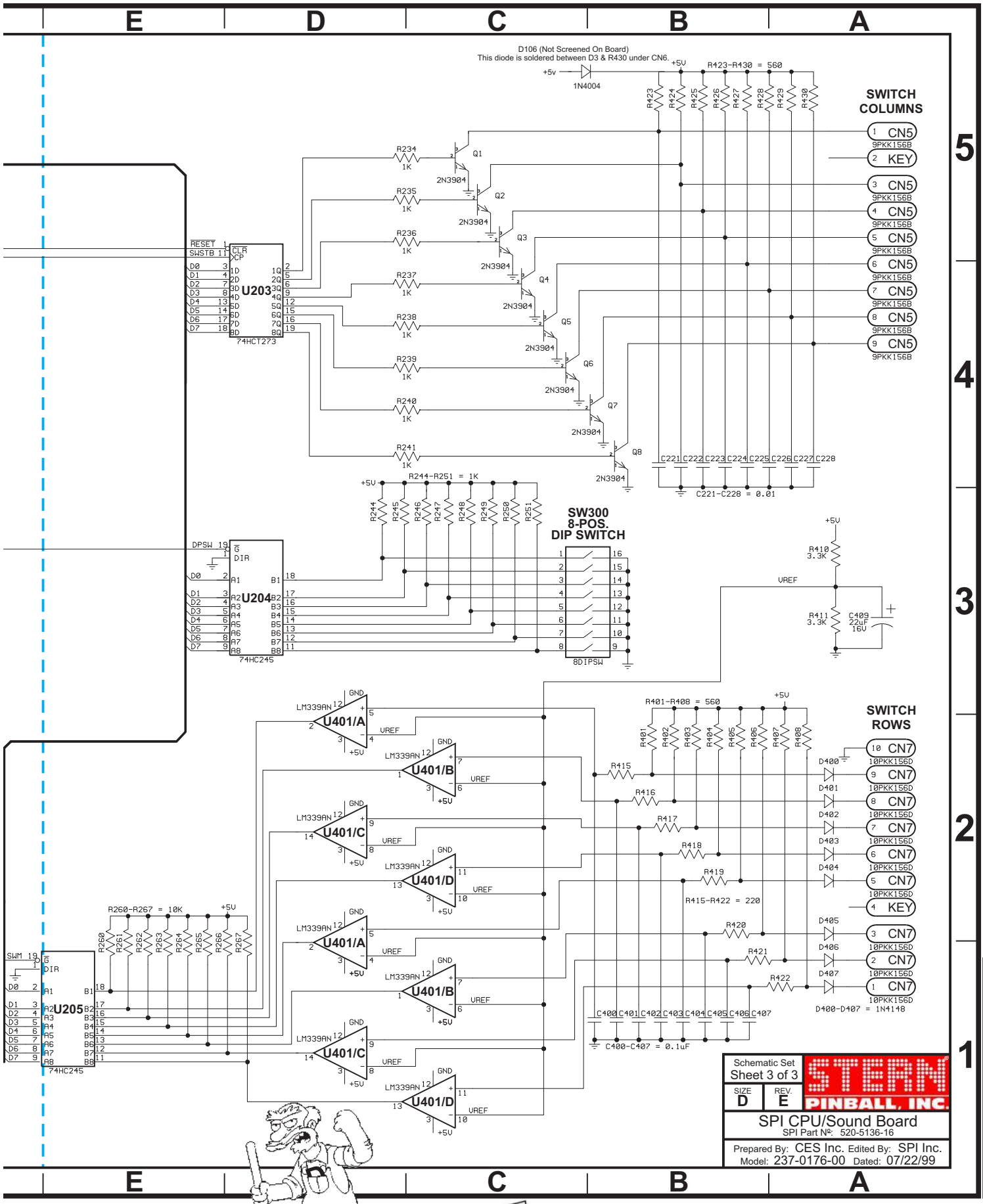

VOL. POT
1A 1B 1C
NOT STUFFED
SPEAKER OUTPUTS
U24
74LS165
U23
74LS165
U19
PAL16L8
U20
PAL16L8
U2
HC4020
U3
74LS163A
U1/A
U27/A
U27/B
U25/B
U30/A
U30/B
U26
TDA1543
U35
NOT STUFFED
TDA8199
U100
U101
U102
TDA2030A
U218
DS1232
SW200
FOR 8MB EPROMS
*W6 STUFFED
* W1 IS JUMPERED
* WY 0 NOT STUFFED
WX * WX IS JUMPERED
* R313,R314 NOT STUFFED
NOTES:
☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
☑ 0.1μF BYPASS CAPACITORS FOR ALL INTEGRATED CIRCUITS (ICs).
☑ REMOVE W6 TO EMULATE SPI № 520-5077-00 SOUND BOARD.
☑ W6 JUMPER MUST BE INSTALLED FOR GAMES USING 8MB ROM(S) AT LOCATIONS U17, U21, U36 AND/OR U37.
Fonts used in this Schematic: Arial (Arial.ttf) for normal text & Wingdings 2 (Winding2.ttf) for Special Symbols or Check Boxes.
The above circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
The below circuit(s) continue at the address shown (#-XY).
= Sheet Number (1-5), X = Column Grid, Y = Row Grid
Schematic Set
Sheet 2 of 3
SIZE D
REV. E
STERN PINBALL, INC.
SPI CPU/Sound Board
SPI Part №: 520-5136-16
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0176-00 Dated: 07/22/99

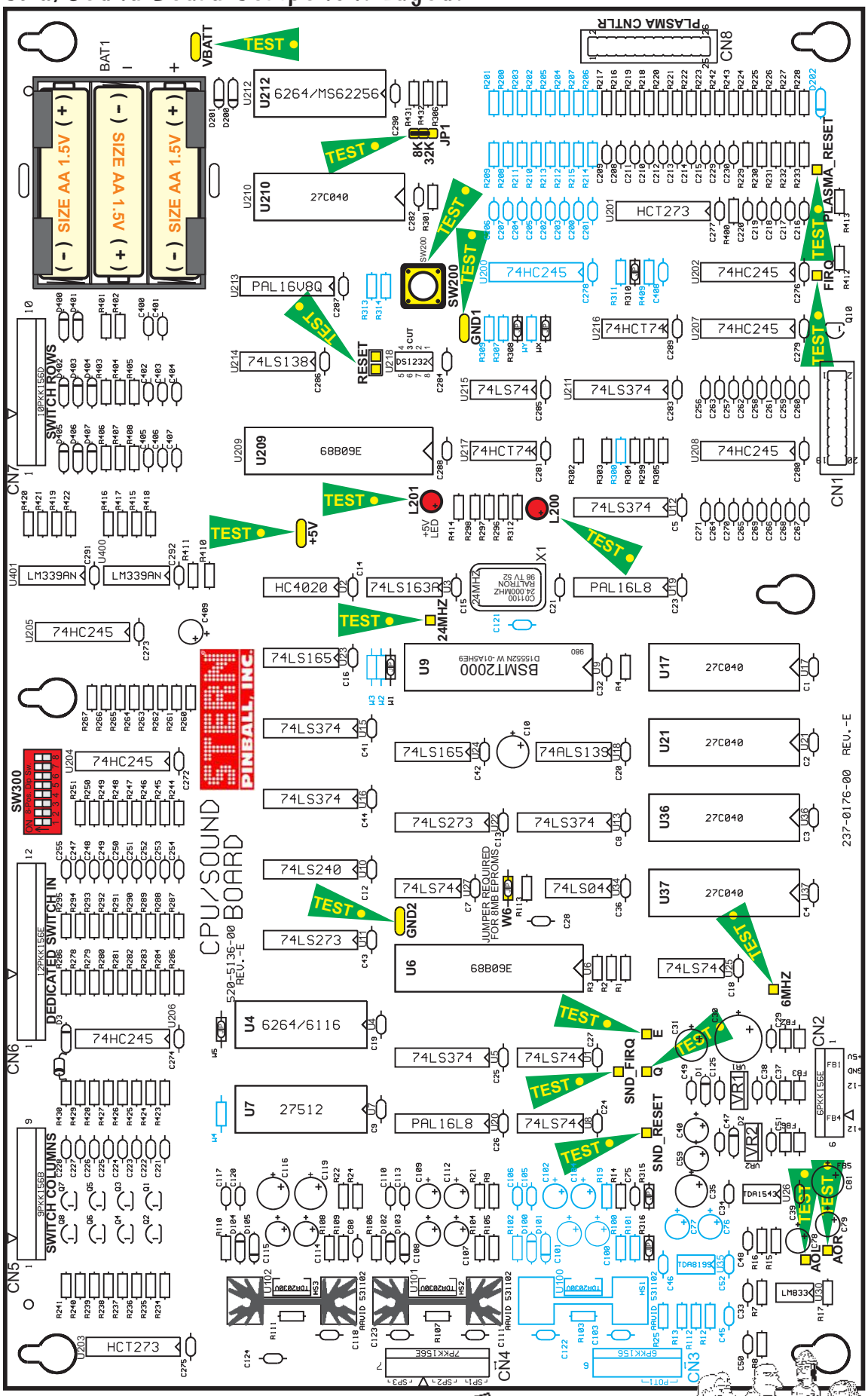


NOTES:

- ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
- ☑ 0.1μF BYPASS CAPACITORS FOR ALL INTEGRATED CIRCUITS (ICs).
- ☑ REMOVE W6 TO EMULATE SPI Nº 520-5077-00 SOUND BOARD.
- ☑ W6 JUMPER MUST BE INSTALLED FOR GAMES USING 8MB ROM(S) AT LOCATIONS U17, U21, U36 AND/OR U37.

Fonts used in this Schematic: Arial (Arial.ttf) for normal text, Symbol Proportional BT (Symbpron.ttf) for Micro(μ) and Ohm (Omega) (Ω) & Wingdings 2 (Windng2.ttf) for Special Symbols or Check Boxes.


D106 (Not Screened On Board)
This diode is soldered between D3 & R430 under CN6.
1N4004
R423-R430 = 560
SWITCH COLUMNS
CN5
KEY
9PKK156B
U203
74HCT273
RESET
SWSTB
CLR
CP
2N3904
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
R234
R235
R236
R237
R238
R239
R240
R241
1K
C221-C228 = 0.01
R244-R251 = 1K
SW300
8-POS.
DIP SWITCH
8DIPSW
DPSW
U204
74HC245
DIR
R410
3.3K
R411
3.3K
C409
22uF
16V
VREF
LM339AN
U401/A
U401/B
U401/C
U401/D
GND
R401-R408 = 560
SWITCH ROWS
CN7
10PKK156D
D400-D407 = 1N4148
R415-R422 = 220
C400-C407 = 0.1uF
R260-R267 = 10K
SWM
U205
74HC245
Schematic Set
Sheet 3 of 3
SIZE
D
REV.
E
STERN PINBALL, INC.
SPI CPU/Sound Board
SPI Part №: 520-5136-16
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0176-00 Dated: 07/22/99

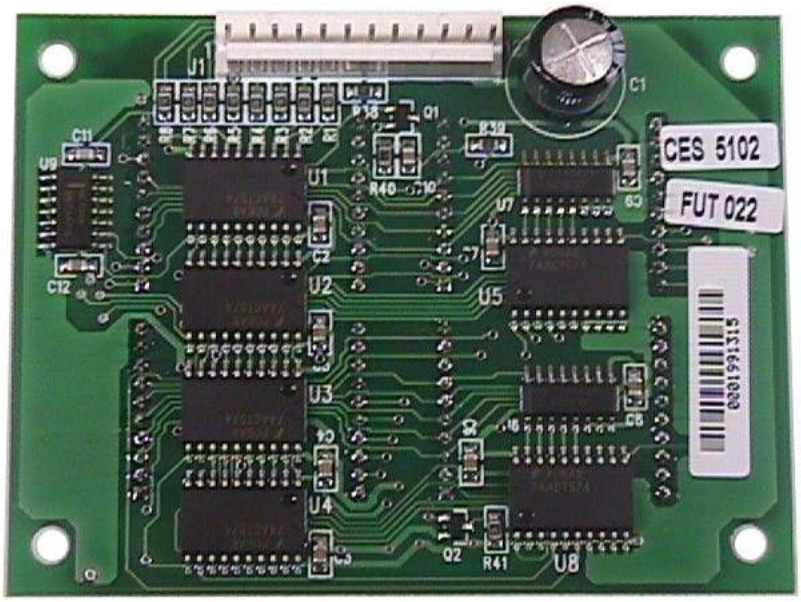


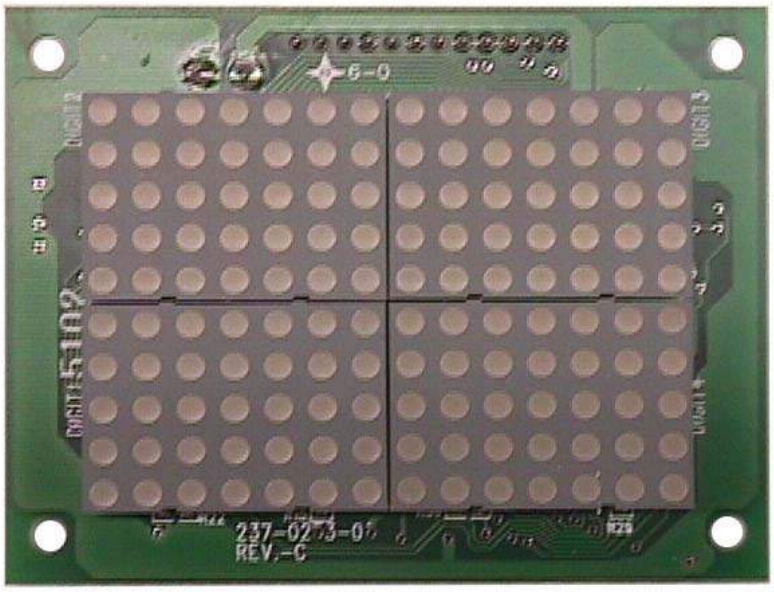
Test Points:

- ←VBATT
- ←8K/32K JUMPER JP1
- ←PLASMA_RESET
- ←FIRQ
- ←SW200
- ←GND1
- ←RESET
- LEDs :
- ←L201+5v & L200
- ←+5V
- ←24MHZ
- REQUIRED FOR 8MB EPROM USE
- ←W6 JUMPER
- ←GND2
- ←6MHZ
- ←E
- ←SND_FIRQ & Q
- ←SND_RESET
- ←AOL & AOR

CPU/Sound Board Parts

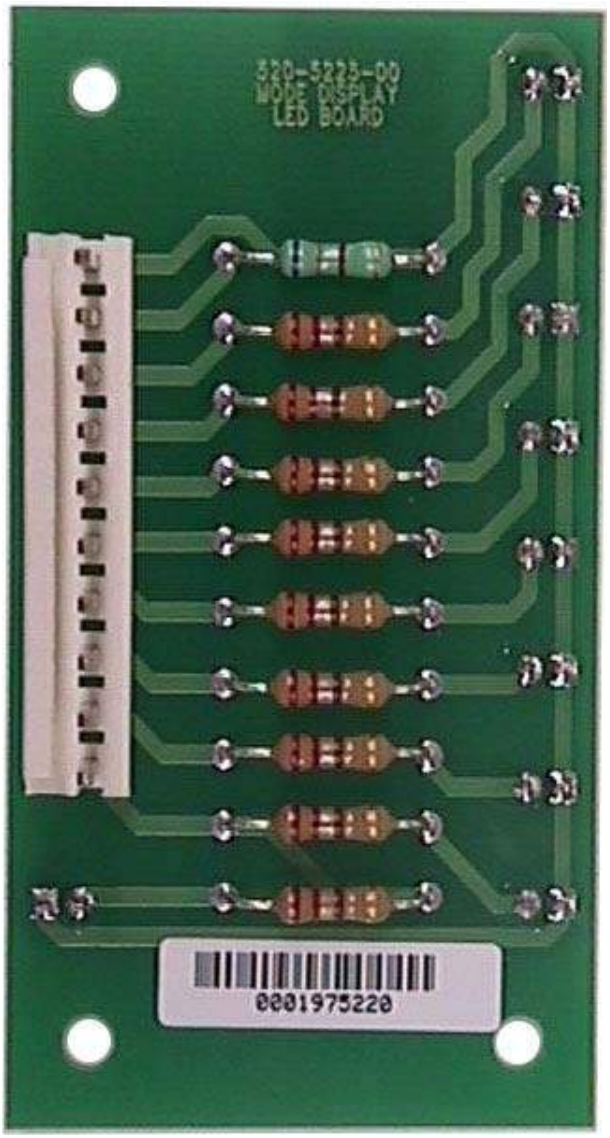
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION (NS = Not Stuffed)
—	**1**	**520-5136-16**	**CPU/Sound Board Mono (FCC FEB98)**	**Complete PCB Assembly**
01	1	545-5685-00	BAT1 HOLDER ***(Always replace all 3, Size AA 1.5v Cells, with new ones, when required)***	
02	79	125-5031-00	C1, C2, C3, C4, C5, C7, C8, C9, C12, C13, C14, C15, C16, C18, C19, C20, C21, C23, C24, C25, C26, C28, C32, C33, C34, C36, C38, C39, C41, C42, C43, C44, C47, C49, C110, C111, C113, C117, C118, C120, C123, C124, C125, C255, C272, C273, C274, C275, C276, C277, C279, C280, C281, C282, C283, C284, C285, C286, C287, C288, C289, C290, C291, C292, C400>C401, C402>C404, C405>C407 (C45, C46, C52, C103, C105, C106, C122: NS)	0.1uF, (104), Axial Cer. Cap.
03	2	125-5017-00	C10, C35	10uF, 16v, Radial Tant. Cap.
04	3	125-5043-00	C29, C37, C51	0.001uF, (102), Cap.
05	1	125-5037-00	C30	1000uF, 16v, Radial Lytic Cap.
06	2	125-5019-00	C31, C81	470uF, 25v, Radial Lytic Cap.
07	4	125-5020-00	C40, C59, C108, C115 (C76, C77, C101: NS)	22uF, 25v, Radial Lytic Cap.
08	4	125-5039-00	C48, C50, C75, C80	0.0022uF, (222), Cap.
09	6	125-5017-00	C78, C79, C107, C114 (C100: NS)	10uF, 25v-35v, Radial Lytic Cap.
10	2	125-5015-00	C109, C112 (C102, C104: NS)	100uF, 25v, Rad. Ltc. Cap.
11	2	125-5012-00	C116, C119	220uF, 25v, Radial Lytic Cap.
12	0	125-5038-00	(C121: NS)	100pF, (101), Cap.
13	44	125-5028-00	C208>C215, C216>C220, C229, C230, C247>C254, C256>C263, C264>C271 (C200>C207: NS)	470pF, (471), Cer. Cap.
14	8	125-5029-00	C221>C228 (C408: NS)	0.01uF, (103), 100v Cap.
15	1	125-5014-00	C409	22uF, 16v, Radial Lytic Cap.
16	1	045-5015-01	CN1	20-Pin, 0.1 HEADER
17	1	045-5015-06	CN2 (Key Pin-5) (CN3: NS)	6PKK156
18	1	045-5015-07	CN4 (Key Pin-5)	7PKK156
19	1	045-5013-00	CN5 (Key Pin-2)	9PKK156
20	1	045-5015-00	CN6 (Key Pin-5)	12PKK156
21	1	045-5014-01	CN7 (Key Pin-4)	10PKK156
22	1	045-5015-26	CN8 x2	26-Pin, 0.1 HEADER
23	7	112-5003-00	D1, D2, D3, D102, D103, D104, D105 (D100, D101: NS)	1N4004, Diode
24	2	112-5008-00	D200, D201	1N5817, Diode
25	8	112-0054-00	D400, D401, D402>D404, D405>D407 (D202: NS)	1N4148, Diode
26	6	n/a	(FB1)-FB2, FB3-(FB4), (FB5)-FB6	Ferrite Bead *(if required, call Tech Support)*
27	**1**	**165-5099-00**	**L200, L201**	**LED T1-3/4 DIFFUSER LED**
28	10	110-0069-00	Q1>Q8, Q10 (Q9 Not Used)	2N3904, Transistor
29	36	121-5011-00	R1>R3, R4, R106, R113, R224>R228, R244>R251, R260>R267, R296>R298, R299, R301, R302>R305, R306, R413, R431>R432 (R200>R207, R409: NS)	10K Ω 1/4W Res.
30	1	121-5018-00	R7	1.5K Ω 1/4W Res.
31	5	121-5023-00	R9, R14, R104, (R100, R102: NS)	22K Ω 1/4W Res.
32	20	121-5009-00	R15, R8, R234>R241, R278>R286, R412	1K Ω 1/4W Res.
33	2	121-5043-00	R16, R17 (R25, R112: NS)	2.2K Ω 1/4W Res.
34	2	121-5032-00	R22, R24	47K Ω 1/4W Res.
35	2	121-5046-01	R105, R109 (R101: NS)	470 Ω 1/4W Res.
36	2	121-5041-00	R107, R111 (R103: NS)	1 Ω 1/4W Res.
37	9	121-5045-00	R108, R287>R294	39K Ω Res.
38	12	121-5021-00	R21, R216>R223, R242, R243, R400	4.7K Ω 1/4W Res.
39	15	121-5014-00	R229>R233, R295, R414, R415>R422 (R208>R215: NS)	220 Ω 1/4W Res.
40	5	n/a	R308, R310, R315>R316, WX (R300,R307,R309,R311,R313>R314,WY:NS)	0Ω *Jumper Wire (24ga.)*
41	1	121-5036-00	R312	330 Ω 1/4W Res.
42	16	121-5047-00	R401>R402, R403>R405, R406>R408, R423>R430	560 Ω 1/4W Res.
43	2	121-5048-00	R410, R411	3.3K Ω 1/4W Res.
44	1	n/a	SW200	B3F4000
45	1	181-5002-00	SW300	8-Pin, Dip Switch
46	5	100-0037-00	U1, U8, U25, U27, U215	74LS74
47	1	100-0249-00	U2	74HC4020
48	1	100-0049-00	U3	74LS163
49	1	105-0052-05	U4	6116 RAM
50	3	077-5208-00	U4, U7, U212	28-Pin, IC Dip Socket
51	6	100-0064-00	U5, U12, U13, U15, U16, U211	74LS374
52	1	100-0189-01	U6, U209	68B09E
53	3	077-5209-00	U6, U9, U209	40-Pin, IC Socket
54	1	(See Pg. DR. ❶ Table)	U7	27512 EPROM
55	**1**	**105-0116-00**	**U9**	**BSMT2000**
56	1	100-0149-00	U10	74LS240
57	5	(See Pg. DR. ❶ Table)	U17, U21, U36, U37, U210	27C040 EPROM
58	5	077-5217-00	U17, U21, U36, U37, U210	32-Pin, IC Socket
59	1	100-0043-00	U18	74ALS139
60	**1**	**965-0136-00**	**U19 - YELLOW DOT**	**PAL16L8 (Programmed) YELLOW DOT**
61	**1**	**965-0137-00**	**U20 - WHITE DOT**	**PAL16L8 (Programmed) WHITE DOT**
62	2	100-0022-00	U22, U11	74LS273
63	2	100-5008-00	U23, U24	74LS165
64	1	100-5018-00	U26	TDA1543
65	1	100-0375-00	U30	LM833
66	1	100-0027-00	U34	74LS04
67	0	100-5016-00	(U35: NS)	TDA1899
68	2	100-5016-20	U101, U102 (U100 : NS)	TDA2030A
69	3	535-5000-10	U101 (HS2), U102 (HS3) (U100 (HS1): NS)	AAVID 531102 (Heat Sink)
70	2	100-5012-00	U201, U203	74HCT273
71	6	100-0338-00	U202, U204, U205, U206, U207, U208 (U200: NS)	74HC245
72	**1**	**105-5046-00**	**U212**	**MS6264A**
73	**1**	**965-6504-00**	**U213- BLUE DOT**	**PAL16L8 (Programmed) BLUE DOT**
74	1	100-0148-00	U214	74LS138
75	2	100-5015-00	U216, U217	HCT74
76	1	100-5023-00	U218	DS1232
77	2	100-0377-00	U400, U401	LM339AN
78	4	n/a	VBATT, +5v, GND1, GND2	*Test Point Wire (24ga.) Loops*
79	1	124-5002-00	VR1	LM7905CT **-5v** Regulator
80	1	124-5001-00	VR2	LM7805CT **+5v** Regulator
81	6	124-5064-00	W1, W5, **W6* (*for 8MB EPROMs)** (W2-W3, W4: NS)	0Ω *Jumper Wire (24ga.)*
82	1	140-0011-00	X1	24Mhz
83	12	n/a	AOR, AOL, SND_RESET, SND_FIRQ, Q, E, 6Mhz, 24Mhz, FIRQ, PLASMA_RESET, RESET (X2)	*Test Points*
84	1	**(call Tech. Support)**	R110 *(New Rev. Change Feb 02)*	33K Ω 1/4W Res.

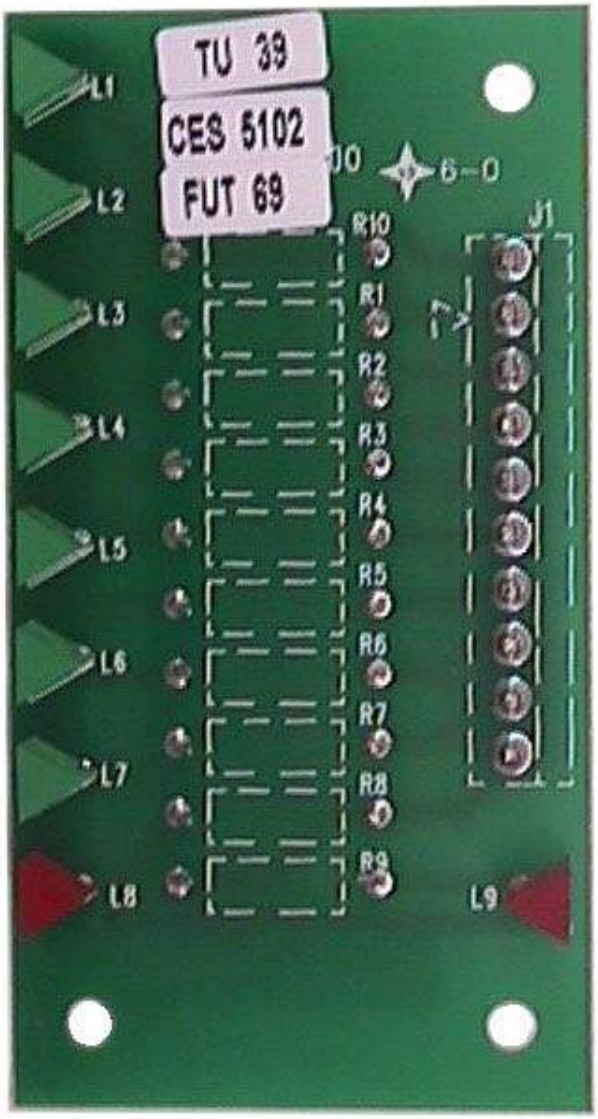




This PCB is used in the TV Set on the 2nd Level Mini-Playfield.
See Section 4, Chapter 2, Page 96, for associated parts or better view.
If Schematic is required, call Technical Support at 1-800-542-5377 to ask for availability.

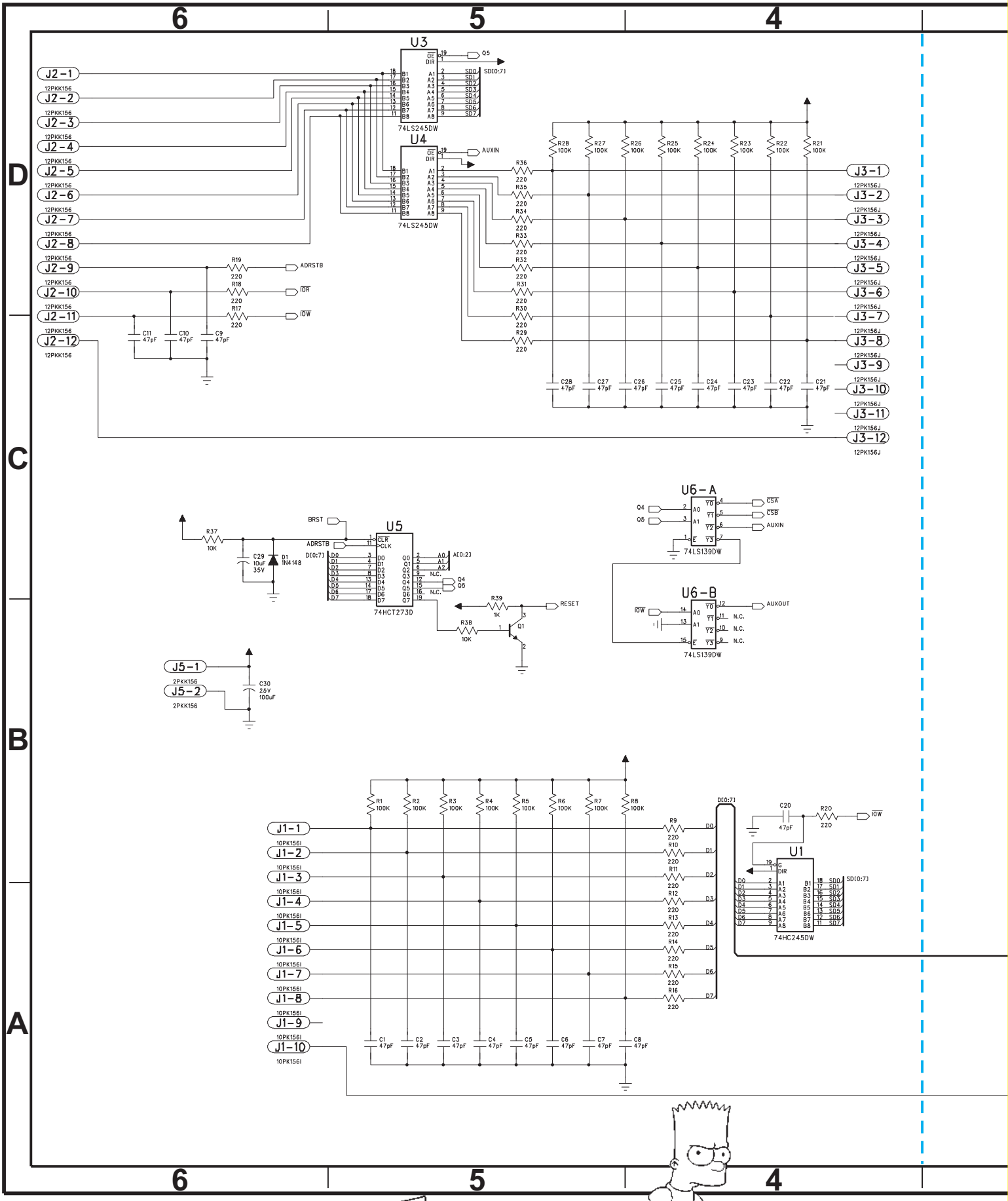
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
--	1	520-5219-00	Color Dot Display (5X7) x4 PC Board	PCB Assembly



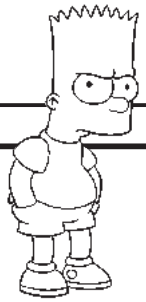


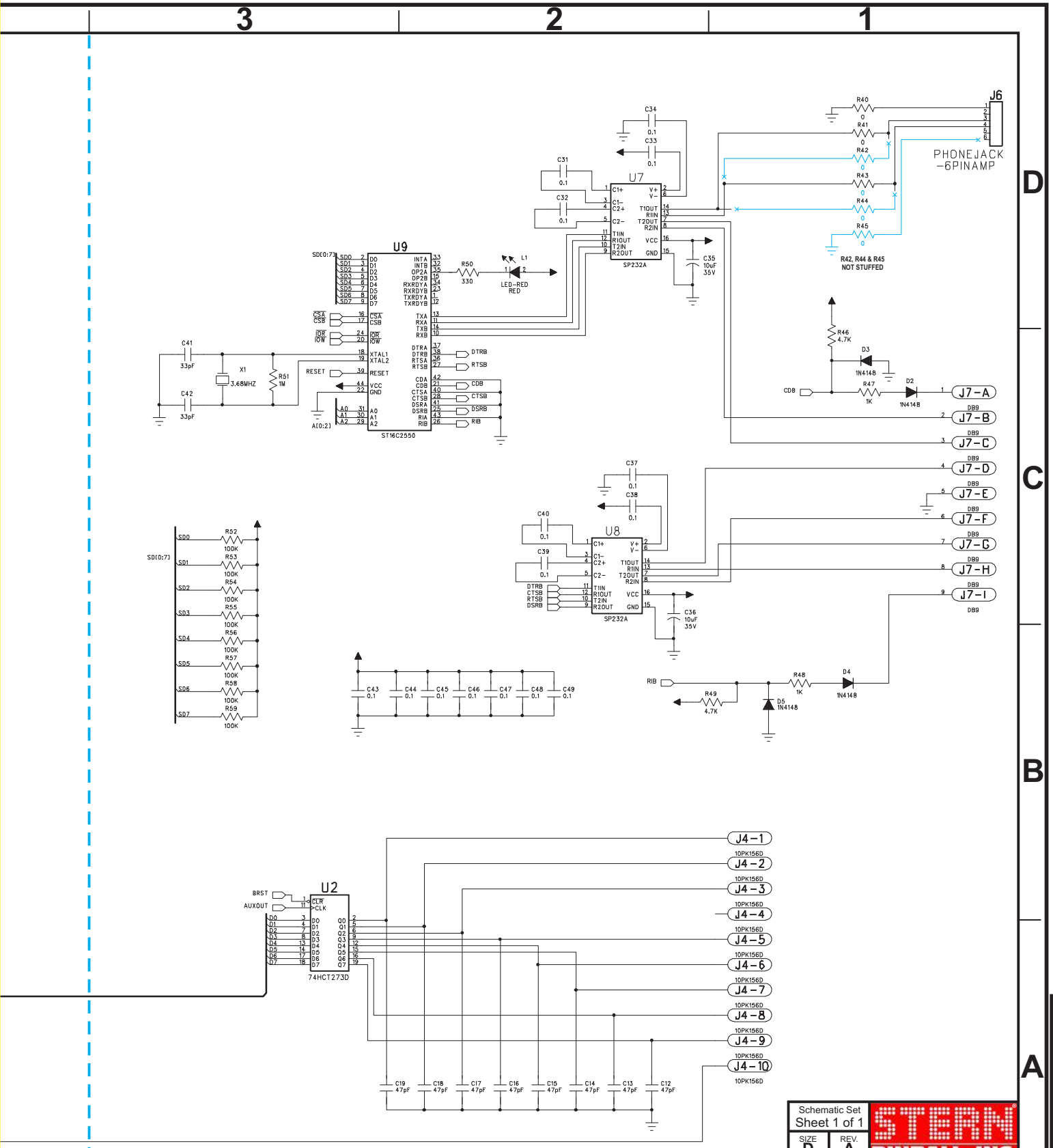
This PCB is used on the Back Panel next to the TV Set.
See Section 4, Chapter 2, Page 96, for associated parts or better view.
If Schematic is required, call Technical Support at 1-800-542-5377 to ask for availability.

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
--	1	520-5225-00	LED PC Board	PCB Assembly


6
5
4
D
C
B
A
U3
74LS245DW
U4
74LS245DW
SD[0:7]
AUXIN
ADRSTB
IOR
IOW
J2-1
J2-2
J2-3
J2-4
J2-5
J2-6
J2-7
J2-8
J2-9
J2-10
J2-11
J2-12
12PKK156
J3-1
J3-2
J3-3
J3-4
J3-5
J3-6
J3-7
J3-8
J3-9
J3-10
J3-11
J3-12
12PK156J
U5
74HCT273D
BRST
ADRSTB
D[0:7]
A[0:2]
RESET
U6-A
U6-B
74LS139DW
CSA
CSB
AUXIN
AUXOUT
J5-1
J5-2
2PKK156
J1-1
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9
J1-10
10PK156I
U1
74HC245DW
SD[0:7]
IOW

The Simpsons
Pinball Party



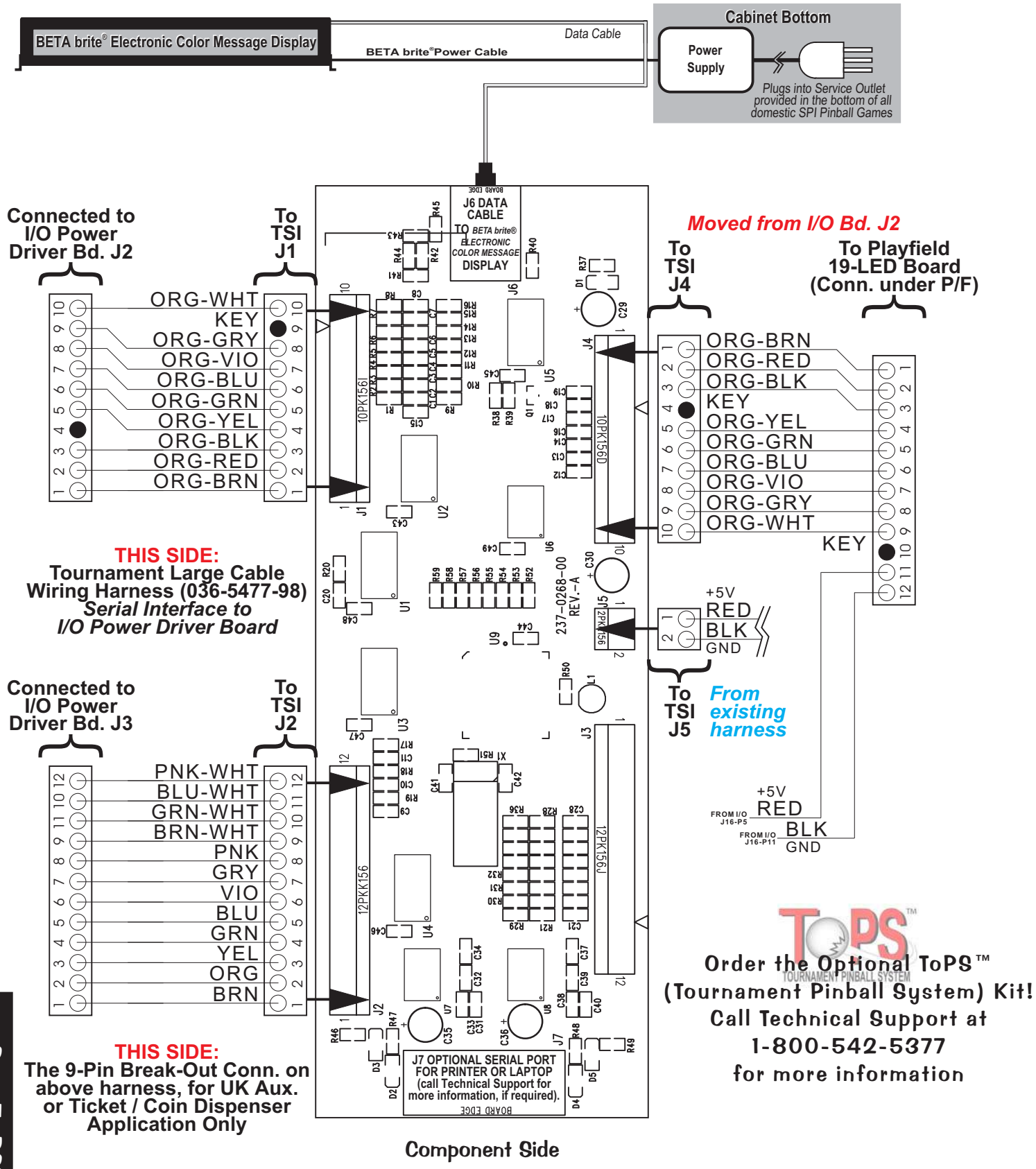


NOTES:

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

Non-Text Document

Schematic Set Sheet 1 of 1	STERN PINBALL, INC.
SIZE D / REV. A	
SPI Tournament Serial Interface Bd. SPI Part №: 520-5220-00	
Prepared By: CES Inc. Edited By: SPI Inc. Model: 237-0268-00 Dated: 08/2002	



Component Side

ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
--	1	520-5220-00	Tournament Serial Interface (TSI) Board	PCB Assembly

Appendixes A through J

Table of Contents for Appendixes

- **Appendix A : Pinball Game Firmware Table A1-A2**
  - ▶ **[White Star Board System and S.A.M. System Only*]**
    - ▷ ... describes the ROM / Chip Size / Program & Raw Part Number / USA Version / Check Sum and CPU/Sound PCB I & II ROM locations for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games).
- **Appendix B : Semi-Conductors / I.C.'s / Relays Cross-Reference Table B1**
  - ▷ ...describes diodes and transistors with Source Number, SPI Part Number, NTE Number, ECG Number, Radio Shack Number & RCA Part Number *(If applicable).*
- **Appendix C : Production Start Date, Manual Part N°, ROM Size & Positions and Jumper W6 .. C1**
  - ▶ **[White Star Board System and S.A.M. System Only*]**
    - ▷ ...provides the Production Start Date, Manual Part Number, ROM Position(s), and Jumpers Installed for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games).
- **Appendix D : Board Type Table D1-D2**
  - ▶ **[White Star Board System and S.A.M. System Only*]**
    - ▷ ...provides the Flipper**, I/O Power Driver, CPU/Sound, Display Power Supply, Dot Matrix Display, Display Controller, OPTOs and Misc. Board Part Numbers for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games). ***Flipper Bd. with White Star Bd. System for A13 & Golden Eye only.)*
- **Appendix E : Generic Coil Cross-Reference Guide & Flipper Coil Table E1-E2**
  - ▶ **[White Star Board System and S.A.M. System Only*]**
    - ▷ ...provides the Coils used with Part Number and Gauge-Turns *(of the coil)* for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games).
- **Appendix F : Motor Specification Table F1-F2**
  - ▶ **[White Star Board System and S.A.M. System Only*]**
    - ▷ ...provides all the Motor Function, Specifications and Part Number for Games Apollo 13 — Grand Prix (White Star Games); World Poker Tour – current (S.A.M. Games)..
- **Appendix G : Part Number Prefix Classification Codes G1**
  - ▷ ...explains how our Part Numbers are developed to help sort parts easier.
- **Appendix H : Playfield Inserts (Plastic Light Covers) H1**
  - ▷ ...gives a pictoral view with the name and Part Nr. of all the inserts used *(with Color Code Chart).*
- **Appendix I : Stand-Up Targets & Modular Stand-Up Targets I1-I2**
  - ▷ ...gives a pictoral view with the name and Part Number of all the Single Stand-Up Targets used *(with Color Code Chart).*
- **Appendix J : Coin Cards (USA & International) J1**
  - ▷ ...gives a pictoral view with the name and Part Number of all the current Coin Cards for USA, Canada, Euro and other International Countries. *For all Coin Cards and/or free Coin Card files for download, visit our website : www.sternpinball.com*

APPENDIX A

Pinball Game Firmware (White Star Board System* Only) Table

See website for the latest International Code or Updated USA version / checksums

ROM	Chip Size	Program Part Nº	USA Ver. & Check Sum	Bd. Loc.	Raw Part Nº
Apollo 13 (Note 1)					
Game ROM	(1M)	965-0208-00	**A5.01 | $09FF**	**U210**	960-5009-00
Sound	(512K)	965-0212-00	1.00 | $5244	U7	960-7001-02
Display	(4M)	965-0213-00	**A5.00 | $B92B**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0209-00	1.00 | $7FC7	U17	n/a (masked)
Voice 2	(4M)	965-0210-00	1.00 | $8E55	U21	n/a (masked)
Voice 3	(4M)	965-0211-00	1.00 | $08EE	U36	n/a (masked)
Golden Eye (Note 1)					
Game ROM	(1M)	965-0214-42	**A4.04 | $3FFF**	**U210**	960-5009-00
Sound	(512K)	965-0217-42	1.00 | $D615	U7	960-7001-02
Display	(4M)	965-0218-42	**A4.00 | $E6ED**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0215-42	1.00 | $3E32	U17	n/a (masked)
Voice 2	(4M)	965-0216-42	1.00 | $71F0	U21	n/a (masked)
Twister (Note 2)					
Game ROM	(1M)	965-0219-41	**A4.05 | $E9FF**	**U210**	960-5009-00
Sound	(512K)	965-0221-41	1.00 | $1FFF	U7	960-7001-02
Display	(4M)	965-0222-41	**A4.00 | $FD01**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0220-41	1.00 | $3650	U17	960-5015-01
Voice 2	(4M)	965-0223-41	1.00 | $9300	U21	960-5015-01
ID4: Independence Day (Note 2)					
Game ROM	(1M)	965-0224-45	**A2.02 | $9CFF**	**U210**	960-5009-00
Sound	(512K)	965-0227-45	1.00 | $222B	U7	960-7001-02
Display	(4M)	965-0228-45	**A2.00 | $ABF7**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0225-45	1.00 | $3AE1	U17	960-5015-01
Voice 2	(4M)	965-0226-45	1.00 | $206E	U21	960-5015-01
Space Jam (Note 2)					
Game ROM	(1M)	965-0229-43	**A3.00 | $E6FF**	**U210**	960-5009-00
Sound	(512K)	965-0233-43	1.00 | $F1E7	U7	960-7001-02
Display	(4M)	965-0234-43	**A3.00 | $0057**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0230-43	1.00 | $DBA8	U17	960-5015-01
Voice 2	(4M)	965-0231-43	1.00 | $DDF1	U21	960-5015-01
Voice 3	(4M)	965-0232-43	1.00 | $F32A	U36	960-5015-01
The Star Wars Trilogy - Special Edition (S.E.) (Note 2)					
Game ROM	(1M)	965-0235-56	**A4.03 | $5EFF**	**U210**	960-5009-00
Sound	(512K)	965-0238-56	1.00 | $4A7D	U7	960-7001-02
Display	(4M)	965-0239-56	**A4.00 | $8817**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0236-56	1.00 | $E66B	U17	960-5015-01
Voice 2	(4M)	965-0237-56	1.00 | $8F54	U21	960-5015-01
The Lost World: Jurassic Park (Note 2)					
Game ROM	(1M)	965-0240-53	**A2.02 | $C8FF**	**U210**	960-5009-00
Sound	(512K)	965-0243-53	1.00 | $A35B	U7	960-7001-02
Display	(4M)	965-0244-53	**A2.01 | $7F46**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0241-53	1.00 | $1D27	U17	960-5015-01
Voice 2	(4M)	965-0242-53	1.00 | $8DA4	U21	960-5015-01
The X-Files (Note 2)					
Game ROM	(1M)	965-0245-46	**A3.03 | $A2FF**	**U210**	960-5009-00
Sound	(512K)	965-0248-46	1.00 | $6648	U7	960-7001-02
Display	(4M)	965-0249-46	**A3.00 | $66D0**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0246-46	1.00 | $349D	U17	960-5015-01
Voice 2	(4M)	965-0247-46	1.00 | $629C	U21	960-5015-01
Starship Troopers (Note 3)					
Game ROM	(1M)	965-0250-59	**A2.00 | $85FF**	**U210**	960-5009-00
Sound	(512K)	965-0253-59	1.00 | $64B2	U7	960-7001-02
Display	(4M)	965-0254-59	**A2.00 | $E77B**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0251-59	1.00 | $152A	U17	960-5015-01
Voice 2	(4M)	965-0252-59	1.00 | $0291	U21	960-5015-01
Voice 3	(4M)	965-0255-59	1.00 | $95A7	U36	960-5015-01
Viper Night Drivin' (Note 4)					
Game ROM	(1M)	965-0266-35	**A2.01 | $C5FF**	**U210**	960-5009-00
Sound	(512K)	965-0271-35	1.00 | $4DF8	U7	960-7001-02
Display	(4M)	965-0272-35	**A2.01 | $C17D**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0267-35	1.00 | $8018	U17	960-5015-01
Voice 2	(4M)	965-0268-35	1.00 | $2157	U21	960-5015-01
Voice 3	(4M)	965-0269-35	1.00 | $B5A6	U36	960-5015-01
Voice 4	(4M)	965-0270-35	1.00 | $D01E	U37	960-5015-01
Lost In Space (Note 4)					
Game ROM	(1M)	965-0282-60	**A1.01 | $B2FF**	**U210**	960-5009-00
Sound	(512K)	965-0287-60	1.00 | $A6AF	U7	960-7001-02
Display	(4M)	965-0288-60	**A1.02 | $32AB**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0283-60	1.00 | $4391	U17	960-5015-01
Voice 2	(4M)	965-0284-60	1.00 | $8215	U21	960-5015-01
Voice 3	(4M)	965-0285-60	1.00 | $5B32	U36	960-5015-01
Voice 4	(4M)	965-0286-60	1.00 | $8971	U37	960-5015-01
Godzilla (Note 4)					
Game ROM	(1M)	965-0289-40	**A2.05| $B1FF**	**U210**	960-5009-00
Sound	(512K)	965-0294-40	1.00 | $0CC8	U7	960-7001-02
Display	(4M)	965-0295-40	**A2.00 | $C929**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0290-40	1.00 | $0D75	U17	960-5015-01
Voice 2	(4M)	965-0291-40	1.00 | $CCCF	U21	960-5015-01
Voice 3	(4M)	965-0292-40	1.00 | $227F	U36	960-5015-01
Voice 4	(4M)	965-0293-40	1.00 | $DB69	U37	960-5015-01
South Park (Notes 4, 5)					
Game ROM	(1M)	965-0301-71	**A1.03 | $58FF**	**U210**	960-5009-00
Sound	(512K)	965-0306-71	1.00 | $1286	U7	960-7001-02
Display	(4M)	965-0307-71	**A1.01 | $166F**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0302-71	1.00 | $7BF8	U17	960-5016-00
Voice 2	(8M)	965-0303-71	1.00 | $9CCC	U21	960-5016-00
Voice 3	(8M)	965-0304-71	1.00 | $ADD9	U36	960-5016-00
Voice 4	(8M)	965-0305-71	1.00 | $6659	U37	960-5016-00
Harley-Davidson® (Notes 4, 5, 6) *Original (1999-2001)*					
Game ROM	(1M)	965-0319-67	**A1.03 | $3EFF**	**U210**	960-5009-00
Sound	(512K)	965-0320-67	1.00 | $F4FF	U7	960-7001-02
Display	(4M)	965-0321-67	**A1.04 | $FC7C**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0322-67	1.00 | $CD26	U17	960-5016-00
Voice 2	(8M)	965-0323-67	1.00 | $9396	U21	960-5016-00
Voice 3	(8M)	965-0324-67	1.00 | $FB72	U36	960-5016-00
Voice 4	(4M)	965-0325-67	1.00 | $6100	U37	960-5015-01
▶ **Harley-Davidson® (Notes 4, 5, 6, 8) *2nd Edition (2002-2003)***					
Game ROM	(1M)	965-0319-67A	**A1.08 | $23FF**	**U210**	960-5009-00
Display	(4M)	965-0321-67A	**A1.05 | $B594**	**ROM 0**	960-5015-01
▶ **Harley-Davidson® (Notes 4, 5, 6, 8) *3rd Edition (2004)***					
Game ROM	(1M)	965-0319-87	**A4.00 | $1CFF**	**U210**	960-5009-00
Display	(4M)	965-0321-87	**A4.00 | $F4FF**	**U5**	960-5015-01
Striker Xtreme (Notes 4, 5)					
Game ROM	(1M)	965-0326-68	**A1.03 | $E4FF**	**U210**	960-5009-00
Sound	(512K)	965-0327-68	1.00 | $3BCA	U7	960-7001-02
Display	(4M)	965-0328-68	**A1.03 | $1957**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0329-68	1.00 | $482A	U17	960-5016-00
Voice 2	(8M)	965-0330-68	1.00 | $7312	U21	960-5016-00
Voice 3	(8M)	965-0331-68	1.00 | $DE2F	U36	960-5016-00
Voice 4	(8M)	965-0332-68	1.00 | $C508	U37	960-5016-00
NFL (Notes 4, 5) *Not on CD-R or Website: Code through Distributor Only.*					
Game ROM	(1M)	965-0339-73	**A1.00 | $D2FF**	**U210**	960-5009-00
Sound	(512K)	965-0340-73	1.00 | $	U7	960-7001-02
Display	(4M)	965-0341-73	**A1.01 | $845A**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0342-73	1.00 | $	U17	960-5016-00
Voice 2	(8M)	965-0343-73	1.00 | $	U21	960-5016-00
Voice 3	(8M)	965-0344-73	1.00 | $	U36	960-5016-00
Voice 4	(8M)	965-0345-73	1.00 | $	U37	960-5016-00
Sharkey's Shootout (Notes 4, 5)					
Game ROM	(1M)	965-0333-72	**A2.11 | $49FF**	**U210**	960-5009-00
Sound	(512K)	965-0334-72	1.01 | $9796	U7	960-7001-02
Display	(4M)	965-0335-72	**A2.01 | $6C33**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0336-72	1.00 | $58EA	U17	960-5016-00
Voice 2	(8M)	965-0337-72	1.00 | $272B	U21	960-5016-00
Voice 3	(8M)	965-0338-72	1.00 | $41AE	U36	960-5016-00
High Roller Casino (Notes 4, 5)					
Game ROM	(1M)	965-0346-65	**A3.00 | $90FF**	**U210**	960-5009-00
Sound	(512K)	965-0347-65	1.00 | $581C	U7	960-7001-02
Display	(4M)	965-0348-65	**A3.00 | $74B3**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0349-65	1.00 | $E12D	U17	960-5016-00
Voice 2	(8M)	965-0350-65	1.00 | $38F4	U21	960-5016-00
Voice 3	(8M)	965-0351-65	1.00 | $1B54	U36	960-5016-00
Voice 4	(8M)	965-0352-65	1.00 | $D720	U37	960-5016-00
Austin Powers™ (Notes 4, 5)					
Game ROM	(1M)	965-0353-74	**A3.02 | $5DFF**	**U210**	960-5009-00
Sound	(512K)	965-0354-74	1.00 | $DA7B	U7	960-7001-02
Display	(4M)	965-0035-74	**A3.00 | $6A34**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0356-74	1.00 | $D2B9	U17	960-5016-00
Voice 2	(8M)	965-0357-74	1.00 | $9E75	U21	960-5016-00
Voice 3	(8M)	965-0358-74	1.00 | $51F3	U36	960-5016-00
Voice 4	(8M)	965-0359-74	1.00 | $0AE5	U37	960-5016-00
MONOPOLY® (Notes 4, 5)					
Game ROM	(1M)	965-0360-75	**A3.20 | $07FF**	**U210**	960-5009-00
Sound	(512K)	965-0361-75	1.00 | $8C18	U7	960-7001-02
Display	(4M)	965-0362-75	**A3.01 | $A381**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0363-75	1.00 | $35E6	U17	960-5016-00
Voice 2	(8M)	965-0364-75	1.00 | $B35A	U21	960-5016-00
Voice 3	(8M)	965-0365-75	1.00 | $8A9F	U36	960-5016-00
Playboy (Notes 4, 5, 7)					
Game ROM	(1M)	965-0367-76	**A5.00 | $7DFF**	**U210**	960-5009-00
Sound	(512K)	965-0368-76	1.02 | $E7C2	U7	960-7001-02
Display	(4M)	965-0369-76	**A5.00 | $A5FF**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0370-76	1.00 | $9ABE	U17	960-5016-00
Voice 2	(8M)	965-0371-76	1.00 | $9F34	U21	960-5016-00
Voice 3	(8M)	965-0372-76	1.00 | $374B	U36	960-5016-00
Voice 4	(8M)	965-0373-76	1.00 | $237A	U37	960-5016-00
RollerCoaster Tycoon™ (Notes 4, 5, 7)					
Sound	(512K)	965-0374-78	1.00 | $F663	U7	960-7001-02
Game ROM	(1M)	965-0375-78	**A7.02| $E5FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0377-78	1.00 | $3C4A	U17	960-5016-00
Voice 2	(8M)	965-0378-78	1.00 | $057A	U21	960-5016-00
Voice 3	(8M)	965-0379-78	1.00 | $04D7	U36	960-5016-00
Display	(4M)	965-0376-78	**A7.01 | $8DDB**	**U5** Disp. Cntrlr.	
The Simpsons™ Pinball Party (Notes 4, 5, 7)					
Sound	(512K)	965-0381-77	1.01 | $A7EE	U7	960-7001-02
Game ROM	(1M)	965-0382-77	**A4.00 | $4FFF**	**U210**	960-5009-00
Voice 1	(8M)	965-0383-77	1.00 | $9719	U17	960-5016-00
Voice 2	(8M)	965-0384-77	1.00 | $16ED	U21	960-5016-00
Voice 3	(8M)	965-0385-77	1.00 | $ADCE	U36	960-5016-00
Voice 4	(8M)	965-0386-77	1.00 | $E7E5	U37	960-5016-00
Display	(4M)	965-0387-77	**A4.00 | $8A03**	**U5** DC PCB	960-5015-01
Terminator® 3: Rise of the Machines™ (Notes 4, 5, 7)					
Sound	(512K)	965-0388-79	1.00 | $D2FD	U7	960-7001-02
Game ROM	(1M)	965-0389-79	**A4.00 | $F8FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0390-79	1.00 | $1838	U17	960-5016-00
Voice 2	(8M)	965-0391-79	1.00 | $F0D5	U21	960-5016-00
Voice 3	(8M)	965-0392-79	1.00 | $89DA	U36	960-5016-00
Voice 4	(8M)	965-0393-79	1.00 | $1200	U37	960-5016-00
Display	(4M)	965-0394-79	**A4.00 | $6E49**	**U5** DC PCB	960-5015-01
The Lord of the Rings™ (Notes 7, 8)					
Sound	(512K)	965-0401-80	1.01 | $36BC	U7	960-7001-02
Game ROM	(1M)	965-0402-80	**A10.00 | $84FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0403-80	1.00 | $1792	U17	960-5016-00
Voice 2	(8M)	965-0404-80	1.00 | $67F1	U21	960-5016-00
Voice 3	(8M)	965-0405-80	1.00 | $89B6	U36	960-5016-00
Voice 4	(8M)	965-0406-80	1.00 | $EA49	U37	960-5016-00
Display	(4M)	965-0407-80	**A10.00 | $1669**	**U5** DC PCB	960-5015-01

Sound & Voice 1-4 identical to above H-D® Original.

footnotes : 1 — 8 *see the bottom of the next page (**A2**).*

APPENDIX A

Pinball Game Firmware (White Star Board System* & S.A.M. System** Only) Table

See website for the latest International Code or Updated USA version / checksums

Ripley's Believe It or Not!® (Notes 7, 8)

ROM	Chip Size	Program Part Nº	USA Ver. & Check Sum	Bd. Loc.	Raw Part Nº
Sound	(512K)	965-0408-81	1.00 | $D93D	U7	960-7001-02
Game ROM	(1M)	965-0409-81	**A3.20 | $43FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0410-81	1.00 | $067B	U17	960-5016-00
Voice 2	(8M)	965-0411-81	1.00 | $C8B8	U21	960-5016-00
Voice 3	(8M)	965-0412-81	1.00 | $64C2	U36	960-5016-00
Voice 4	(8M)	965-0413-81	1.00 | $5341	U37	960-5016-00
Display	(4M)	965-0414-81	**A3.00 | $DE4B**	**U5** DC PCB	960-5015-01

Elvis® (Notes 7, 8)

Sound	(512K)	965-0415-84	1.00 | $8CD2	U7	960-7001-02
Game ROM	(1M)	965-0416-84	**A5.00 | $50FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0417-84	1.00 | $538D	U17	960-5016-00
Voice 2	(8M)	965-0418-84	1.00 | $8BCD	U21	960-5016-00
Voice 3	(8M)	965-0419-84	1.00 | $60F8	U36	960-5016-00
Voice 4	(8M)	965-0420-84	1.00 | $14D8	U37	960-5016-00
Display	(4M)	965-0421-84	**A5.00 | $A1F6**	**U5** DC PCB	960-5015-01

The Sopranos℠ (Notes 7, 8)

Sound	(512K)	965-0422-85	4.00 | $9B5A	U7	960-7001-02
Game ROM	(1M)	965-0423-85	**A5.00 | $5BFF**	**U210**	960-5009-00
Voice 1	(8M)	965-0424-85	3.00 | $F01E	U17	960-5016-00
Voice 2	(8M)	965-0425-85	1.04 | $C14C	U21	960-5016-00
Voice 3	(8M)	965-0426-85	1.04 | $47A3	U36	960-5016-00
Voice 4	(8M)	965-0427-85	1.04 | $ADCD	U37	960-5016-00
Display	(4M)	965-0428-85	**A5.00 | $B4BB**	**U5** DC PCB	960-5015-01

NASCAR® (Notes 7, 8)

Sound	(512K)	965-0429-86	2.00 | $32B3	U7	960-7001-02
Game ROM	(1M)	965-0430-86	**A4.50 | $39FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0431-86	2.00 | $CFFB	U17	960-5016-00
Voice 2	(8M)	965-0432-86	2.00 | $22C0	U21	960-5016-00
Voice 3	(8M)	965-0433-86	2.00 | $5FC8	U36	960-5016-00
Voice 4	(8M)	965-0434-86	2.00 | $2902	U37	960-5016-00
Display	(4M)	965-0435-86	**A4.00 | $92BD**	**U5** DC PCB	960-5015-01

Grand Prix (Notes 7, 8)

Sound	(512K)	965-0429-91	V1.00 | $6F89	U7	960-7001-02
Game ROM	(1M)	965-0430-91	**A4.50 | $5EFF**	**U210**	960-5009-00
Voice 1	(8M)	965-0431-91	1.00 | $CE0E	U17	960-5016-00
Voice 2	(8M)	965-0432-91	1.00 | $F4C6	U21	960-5016-00
Voice 3	(8M)	965-0433-91	1.00 | $057D	U36	960-5016-00
Voice 4	(8M)	965-0434-91	1.00 | $2646	U37	960-5016-00
Display	(4M)	965-0435-91	**A4.00 | $DA8E**	**U5** DC PCB	960-5015-01

[NDSE] (Notes 7, 8) *Call for more info if code update required.*

Sound	(512K)	965-0436-97	U7	960-7001-02
Game ROM	(1M)	965-0437-97	**U210**	960-5009-00
Voice 1	(8M)	965-0438-97	U17	960-5016-00
Voice 2	(8M)	965-0439-97	U21	960-5016-00
Voice 3	(8M)	965-0440-97	U36	960-5016-00
Voice 4	(8M)	965-0441-97	U37	960-5016-00
Display	(4M)	965-0442-97	**U5** DC PCB	960-5015-01

**** GAMES BELOW THIS LINE / NEXT COLUMN ARE S.A.M. SYSTEM GAMES**

TO ORDER MEMORY STICK WITH GAME FILES FROM YOUR DISTRIBUTOR, USE SPI PART NUMBER 970-0128-00 & INCLUDE THE GAME NAME / LANGUAGE FILE(S) DESIRED.

World Poker Tour™ Pinball (WPT) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**1.04** | $7E62	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	1.12AL	1.17+	WPT0112AL.bin
English Only	1.12A	1.17+	WPT0112A.bin
English + French	1.12AF	1.17+	WPT0112AF.bin
French Only	1.12F	1.17+	WPT0112F.bin
German + French	1.12GF	1.17+	WPT0112GF.bin
German Only	1.12G	1.17+	WPT0112G.bin
English + Italian	1.12AI	1.17+	WPT0112AI.bin
Italian Only	1.12I	1.17+	WPT0112I.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

The Simpsons™ Kooky Carnival Redemption (Note 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**1.04** | $7E62	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**Bin Files:**
English Only	1.05	SKC0105.bin
English New Jersey Only	0.09NJ	SKC0090NJ.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 5.5MB +/–

©Disney's Pirates of the Caribbean Pinball (POTC) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**1.06** | $2014	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	1.15AS	1.17+	POTC115AS.bin
English + French	1.15AF	1.17+	POTC115AF.bin
German + French	1.15GF	1.17+	POTC115GF.bin
English + Italian	1.15AI	1.17+	POTC115AI.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

Family Guy™ Pinball (FG) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**2.09** | $10A3	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	10.00AL	1.23+	FG1000AL.bin
English + French	10.00AF	1.23+	FG1000AF.bin
English + German	10.00AG	1.23+	FG1000GF.bin
English + Italian	10.00AI	1.23+	FG1000AI.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

Spider-Man™ Pinball (S-M) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**2.10** | $F625	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	1.3ES	1.27+	spd_1_30_es.bin
English + French	1.3EF	1.27+	spd_1_30_ef.bin
German+French	1.3GF	1.27+	spd_1_30_gf.bin
English + Italian	1.3EI	1.27+	spd_1_30_ei.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

footnotes:

1 ROMs on CPU/Sound Bd.: 520-5136-**00** (Stereo) & Display Cont. Bd.: 520-5055-01
2 ROMs on CPU/Sound Bd.: 520-5136-**10** (Mono) & Display Cont. Bd.: 520-5055-01
3 ROMs on CPU/Sound Board: 520-5136-**15*** (Mono) (*FCC 11-97) &
Display Controller Board: 520-5055-**02*** (*FCC 11-97)

APPENDIX A

Pinball Game Firmware Table

EPROM	Chip Size	Program Part Nº	USA Ver.	Bd. Loc.	Raw Part Nº
Laser War					
CPU	(256K)	965-0004-00	LWAR.C5	C5	960-5007-00
Sound (Old)	(256K)	965-0005-00		J5	960-5007-00
Sound (Old)	(256K)	965-0006-00		J6	960-5007-00
Sound (Old)	(256K)	965-0007-00		J7	960-5007-00
			- OR -		
Sound	(256K)	965-0008-00		7F	960-5007-00
Sound 1	(512K)	965-0009-00		6F	960-7001-02
Sound 2	(512K)	965-0010-00		4F	960-7001-02
Secret Service					
CPU	(256K)	965-0011-00	A4-6	B5	960-5007-00
CPU	(256K)	965-0012-00	A4-6	C5	960-5007-00
Voice 1	(512K)	965-0014-00		6F	960-7001-02
Voice 2	(512K)	965-0015-00		4F	960-7001-02
Sound	(256K)	965-0013-00		7F	960-5007-00
Torpedo Alley					
CPU	(256K)	965-0016-00	A2-1	B5	960-5007-00
CPU	(256K)	965-0017-00	A2-1	C5	960-5007-00
Voice 1	(512K)	965-0019-00		6F	960-7001-02
Voice 2	(512K)	965-0020-00		4F	960-7001-02
Sound	(256K)	965-0018-00		7F	960-5007-00
Time Machine					
CPU	(128K)	965-0021-00	A2-4	B5	960-5006-00
CPU	(256K)	965-0022-00	A2-4	C5	960-5007-00
Voice 1	(512K)	965-0024-00		6F	960-7001-02
Voice 2	(512K)	965-0025-00		4F	960-7001-02
Sound	(256K)	965-0023-00		7F	960-5007-00
Playboy 35th Anniversary					
CPU	(256K)	965-0046-00	A2-4	B5	960-5007-00
CPU	(256K)	965-0047-00	A2-4	C5	960-5007-00
Voice 1	(512K)	965-0049-00		6F	960-7001-02
Voice 2	(512K)	965-0050-00		4F	960-7001-02
Sound	(256K)	965-0048-00		7F	960-5007-00
ABC Monday Night Football					
CPU	(128K)	965-0031-00	A2-7	B5	960-5006-00
CPU	(256K)	965-0032-00	A2-7	C5	960-5007-00
Voice 1	(512K)	965-0034-00		6F	960-7001-02
Voice 2	(512K)	965-0035-00		4F	960-7001-02
Sound	(256K)	965-0033-00		7F	960-5007-00
Robocop					
CPU	(256K)	965-0036-00	A3-4	B5	960-5007-00
CPU	(256K)	965-0037-00	A3-4	C5	960-5007-00
Voice 1	(512K)	965-0039-00		6F	960-7001-02
Voice 2	(512K)	965-0040-00		4F	960-7001-02
Sound	(256K)	965-0038-00		7F	960-5007-00
Phantom of the Opera					
CPU	(128K)	965-0026-00	A3-2	B5	960-5006-00
CPU	(256K)	965-0027-00	A3-2	C5	960-5007-00
Voice 1	(512K)	965-0029-00		6F	960-7001-02
Voice 2	(512K)	965-0030-00		4F	960-7001-02
Sound	(256K)	965-0028-00		7F	960-5007-00
Back to the Future					
CPU	(256K)	965-0041-00	A2-0	B5	960-5007-00
CPU	(256K)	965-0042-00	A2-0	C5	960-5007-00
Voice 1	(512K)	965-0044-00		6F	960-7001-02
Voice 2	(512K)	965-0045-00		4F	960-7001-02
Sound	(256K)	965-0043-00		7F	960-5007-00
The Simpsons					
CPU	(128K)	965-0051-00	A2-7	B5	960-5006-00
CPU	(256K)	965-0052-00	A2-7	C5	960-5007-00
Voice 1	(512K)	965-0054-00		6F	960-7001-02
Voice 2	(512K)	965-0055-00		4F	960-7001-02
Sound	(256K)	965-0053-00		7F	960-5007-00
Checkpoint					
CPU	(128K)	965-0056-00	A1-7	B5	960-5006-00
CPU	(256K)	965-0134-00	A1-7	C5	960-5007-00
Voice 1	(1M)	965-0057-00		F7	960-5009-00
Voice 2	(1M)	965-0058-00		F5	960-5009-00
Sound	(256K)	965-0059-00		F4	960-5007-00
Display	(512K)	965-0060-00	CP80	U8	960-7001-02
Teenage Mutant Ninja Turtles					
CPU	(128K)	965-0061-00	A1.04	B5	960-5006-00
CPU	(256K)	965-0062-00	A1.04	C5	960-5007-00
Voice 1	(1M)	965-0063-00		F5/6	960-5009-00
Voice 2	(1M)	965-0064-00		F4/5	960-5009-00
Sound	(256K)	965-0065-00		F7	960-5007-00
Display	(512K)	965-0066-00	A1.04	U8	960-7001-02
Batman					
CPU	(128K)	965-0067-00	A1.06	B5	960-5006-00
CPU	(256K)	965-0135-00	A1.06	C5	960-5007-00
Voice 1	(2M)	965-0068-00		U17	960-5010-00
Voice 2	(1M)	965-0069-00		U21	960-5009-00
Sound	(256K)	965-0070-00		U7	960-5007-00
Display	(1M)	965-0071-00	A1.06	U8	960-5009-00
Star Trek 25th Anniversary					
CPU	(512K)	965-0072-00	A2.01	C5	960-7001-02
Voice 1	(2M)	965-0073-00		U17	960-5010-00
Voice 2	(2M)	965-0074-00		U21	960-5010-00
Sound	(256K)	965-0075-00		U7	960-5007-00
Display	(1M)	965-0076-00	A1.09	U8	960-5009-00
Hook					
CPU	(512K)	965-0077-00	A4.08	C5	960-7001-02
Voice 1	(2M)	965-0078-00		U17	960-5010-00
Voice 2	(2M)	965-0079-00		U21	960-5010-00
Sound	(256K)	965-0080-00		U7	960-5007-00
Display	(1M)	965-0081-00	A4.01	U8	960-5009-00
Lethal Weapon 3					
CPU	(512K)	965-0082-00	A2.08	C5	960-7001-02
Voice 1	(2M)	965-0083-00		U17	960-5010-00
Voice 2	(2M)	965-0084-00		U21	960-5010-00
Sound	(256K)	965-0085-00		U7	960-5007-00
Display	(2M)	965-0086-00	A2.06	ROM 0	960-5010-00
Display	(2M)	965-0087-00	A2.06	ROM 1	960-5010-00
	(Used on Display PCB 520-5055-00)				
			-OR-		
Display	(4M)	965-0087-04	A2.06	ROM 0	960-5015-00
	(Used on Display PCB 520-5055-01)				
Star Wars					
CPU	(512K)	965-0119-00	A1.03	C5	960-7001-02
Voice 0	(4M)	965-0132-00		U17	960-5015-00
Voice 1	(2M)	965-0133-00		U21	960-5010-00
Sound	(256K)	965-0131-00		U7	960-5007-00
Display	(2M)	965-0120-00	A1.04	ROM 0	960-5010-00
Display	(2M)	965-0121-00	A1.04	ROM 1	960-5010-00
	(Used on Display PCB 520-5055-00)				
			-OR-		
Display	(4M)	965-0122-00	A1.05	ROM 0	960-5015-00
	(Used on Display PCB 520-5055-01)				
Rocky & Bullwinkle & Friends					
CPU	(512K)	965-0138-00	A1.30	C5	960-7001-02
Voice 0	(4M)	965-0139-00		U17	960-5015-00
Voice 1	(2M)	965-0140-00		U21	960-5010-00
Sound	(256K)	965-0141-00		U7	960-5007-00
Display	(4M)	965-0142-00	A1.30	ROM 0	960-5015-00
Jurassic Park					
CPU	(512K)	965-0143-00	A5.13	C5	960-7001-02
Voice 0	(4M)	965-0144-00		U17	960-5015-00
Voice 1	(2M)	965-0145-00		U21	960-5010-00
Sound	(256K)	965-0146-00		U7	960-5007-00
Display	(4M)	965-0147-00	A5.10	ROM 0	960-5015-00
Last Action Hero					
CPU	(512K)	965-0148-00	A1.12	C5	960-7001-02
Voice 0	(4M)	965-0149-00		U17	960-5015-00
Voice 1	(2M)	965-0150-00		U21	960-5010-00
Sound	(256K)	965-0151-00		U7	960-5007-00
Display	(4M)	965-0152-00	A1.06	ROM 0	960-5015-00
Tales from the Crypt					
CPU	(512K)	965-0157-00	A3.03	C5	960-7001-02
Voice 0	(4M)	965-0158-00		U17	960-5015-00
Voice 1	(2M)	965-0159-00		U21	960-5010-00
Sound	(256K)	965-0160-00		U7	960-5007-00
Display	(4M)	965-0161-00	A3.01	ROM 0	960-5015-00
The Who's Tommy					
CPU	(512K)	965-0162-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0165-00		U17	960-5015-00
Voice 2	(4M)	965-0166-00		U21	960-5015-00
Voice 3	(4M)	965-0167-00		U36	960-5015-00
Voice 4	(4M)	965-0168-00		U37	960-5015-00
Sound	(512K)	965-0164-00		U7	960-7001-02
Display	(4M)	965-0163-00	A4.00	ROM 0	960-5015-00
WWF Royal Rumble					
CPU	(512K)	965-0169-00	A1.06	C5	960-7001-02
Voice 1	(4M)	965-0172-00		U17	960-5015-00
Voice 2	(4M)	965-0173-00		U21	960-5015-00
Voice 3	(4M)	965-0174-00		U36	960-5015-00
Sound	(512K)	965-0171-00		U7	960-7001-02
Display	(4M)	965-0170-00	A1.02	ROM 0	960-5015-00
Guns N' Roses					
CPU	(512K)	965-0175-00	A3.00	C5	960-7001-02
Voice 1	(4M)	965-0178-00		U17	960-5015-00
Voice 2	(4M)	965-0179-00		U21	960-5015-00
Voice 3	(4M)	965-0180-00		U36	960-5015-00
Voice 4	(4M)	965-0181-00		U37	960-5015-00
Sound	(512K)	965-0177-00		U7	960-7001-02
Display	(4M)	965-0176-00	A3.00	ROM 0	960-5015-00
Maverick *					
CPU	(512K)	965-0182-00	A4.04	C5	960-7001-02
Voice 1	(4M)	965-0186-00		U17	960-5015-00
Voice 2	(4M)	965-0187-00		U21	960-5015-00
Voice 3	(4M)	965-0187-01		U36	960-5015-00
Sound	(512K)	965-0185-00		U7	960-7001-02
Display*	(4M)	965-0183-00	A4.01	ROM 0	960-5015-00
Display*	(4M)	965-0184-00	A4.01	ROM 3	960-5015-00
Mary Shelley's Frankenstein *					
CPU	(512K)	965-0188-00	A1.03	C5	960-7001-02
Voice 1	(4M)	965-0192-00		U17	960-5015-00
Voice 2	(4M)	965-0193-00		U21	960-5015-00
Voice 3	(4M)	965-0194-00		U36	960-5015-00
Sound	(512K)	965-0191-00		U7	960-7001-02
Display*	(4M)	965-0189-00	A1.03	ROM 0	960-5015-00
Display*	(4M)	965-0190-00	A1.03	ROM 3	960-5015-00
Baywatch *		(CPU Board 520-5003-04)			
CPU	(512K)	965-0195-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0196-00		U17	960-5015-00
Voice 2	(4M)	965-0197-00		U21	960-5015-00
Sound	(512K)	965-0199-00		U7	960-7001-02
Display*	(4M)	965-0200-00	A4.00	ROM 0	960-5015-00
Display*	(4M)	965-0201-00	A4.00	ROM 3	960-5015-00
Batman Forever *		(CPU Board 520-5003-04)			
CPU	(512K)	965-0202-00	A3.02	C5	960-7001-02
Voice 1	(4M)	965-0203-00		U17	960-5015-00
Voice 2	(4M)	965-0204-00		U21	960-5015-00
Sound	(512K)	965-0205-00		U7	960-7001-02
Display*	(4M)	965-0206-00	A3.00	ROM 0	960-5015-00
Display*	(4M)	965-0207-00	A3.00	ROM 3	960-5015-00

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

APPENDIX B

Semi-Conductors / Integrated Circuits (I.C.) / Relays Cross-Reference Table

Table №	Type	Source Number	STERN® PINBALL	N T E®	E C G®	Radio Shack®	R C A®
	RECTIFICATION, BLOCKING, DAMPENING DIODES AND/OR LIGHT EMITTING DIODES (LEDs)						
1	Diode	1N4001	112-5001-00	NTE552	ECG552	- — - — -	SK9000
	Diode	1N4004	112-5003-00	NTE116	ECG116	276-1103	SK3312
	Diode	1N5401	112-0056-00	NTE5801	ECG5801	276-1143	SK9004
	Diode	1N5404	112-5004-00	NTE5804	ECG5804	276-1144	SK9007
	Diode	T6A10L	112-5006-01	NTE5812	ECG5812	- — - — -	- — - — -
	Diode	FR302	112-5009-00	NTE588	ECG588	- — - — -	SK5014
	Diode, Signal	1N914	112-5014-00	- — - — -	- — - — -	- — - — -	- — - — -
	LED	**MT5000UR** or **TLRH180P** (T1-3/4 GaAlAs)	165-5052-00 *(old SPI Part №: 165-5100-00)*	- — - — -	- — - — -	276-066B	- — - — -
	ZENER DIODES						
2	Diode	1N4742A 12v	112-0061-00	NTE142A	ECG142A	276-563	SK12V
	Diode	1N4760B 68v	112-0062-00B	NTE5092A	ECG5092A	- — - — -	SK68V
	Diode	1N4764A 100v	112-0049-00A	NTE5096A	ECG5096A	- — - — -	SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A	- — - — -	SK3A9
	Diode	1N5234B 6.2v	112-0047-00B	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	- — - — -	SK110X
	Diode	1N6267A 6.8v	112-5011-00	NTE4902	ECG4902	- — - — -	- — - — -
	Diode	1N4752A 33v	112-5010-00A	NTE147A	ECG147A	- — - — -	SK33V
	Diode	1N4736 6.8v 1w	112-5007-00	NTE5071A	ECG5071A	- — - — -	- — - — -
	TRANSISTORS - TYPE FET, NPN, PNP AND/OR SCR						
3	FET Trans.	STP20N10L	110-0106-00	NTE2987	ECG2987	- — - — -	- — - — -
	FET Trans.	STP19N06L	110-0088-00	NTE2985	ECG2985	- — - — -	- — - — -
	FET Trans.	VN02N	110-0089-00	- — - — -	- — - — -	- — - — -	- — - — -
	NPN Trans.	2N4401	110-0073-00	NTE85	ECG85	276-2009	SK3124A
	NPN Trans.	2N6427	110-0070-00	NTE48	ECG48	- — - — -	SK4906
	NPN Trans.	MJE340	110-0071-00	NTE157	ECG157	- — - — -	SK3747
	NPN Trans.	MPSA42	110-0082-00	NTE287	ECG287	- — - — -	SK3232
	NPN Trans.	2N3904	110-0069-00	NTE123AP	ECG123AP	276-2009	- — - — -
	NPN Trans.	TIP122	110-0067-00	NTE261	ECG261	276-2068	SK3896
	NPN Trans.	MJE15030	110-0101-00	NTE375	ECG375	- — - — -	SK9118
	PNP Trans.	2N5401	110-0078-00	NTE288	ECG288	- — - — -	SK3434
	PNP Trans.	MJE15031	110-0103-00	NTE292	ECG292	- — - — -	SK3441
	PNP Trans.	MJE350	110-0072-00	NTE374	ECG374	- — - — -	SK9042
	PNP Trans.	MPSA92	110-0100-00	NTE288	ECG278	- — - — -	SK3434
	PNP Trans.	TIP42	110-0068-00	NTE332	ECG332	- — - — -	SK9236
	PNP Trans.	TIP32C	110-0081-00	NTE292	ECG292	- — - — -	SK3441
	PNP Trans.	TIP36C	110-0077-00	NTE393	ECG393	- — - — -	SK3961
	SCR Trans.	2N5060	110-0074-00	NTE5400	ECG5400	276-1067	SK3950
	SCR Trans.	SCR2800B	110-0083-00	NTE5461-8	ECG5461-8	- — - — -	- — - — -
	BRIDGE RECTIFIERS (BR)			**Comments:**			
4	BR (Present)	DB3501 or CM3501	112-5000-00	For White Star I/O Bds., BR = 35 Amp @ 100v P.I.V.			
	RELAYS			**Comments:**			
5	Relay	FRL-264 D024/02CK	190-5002-00	For PPB, Power Supply, & White Star I/O Boards, Relay = 24v DC 10 Amp DPDT			
	Relay	FRL-264 D006/04CV	190-5001-00	For CPU Boards, Relay = 6v DC 5 Amp 4 Pole DT			

APPENDIX C

Production Start Date, Manual Part Nº, ROM Size & Positions and Jumper W6 Installed Note‡ (White Star Board System & S.A.M. System Only*)

	Game Name White Star Bd. System™	Production Start Date and Manual Part Nr.	CPU/Sound Board **Sound U7 512K** CPU/Sound Board **Game U210 1MB** CPU/Sound Board **Voice ROMS:**				Jumper Installed (‡ see Note)
			U17	U21	U36	U37	
29	Apollo 13 (A13)	NOV 95 780-5044-00	4MB	4MB	4MB	Not Used	n / a
30	Golden Eye	FEB 96 780-5042-00	4MB	4MB	Not Used	Not Used	n / a
31	Twister	APR 96 780-5041-00	4MB	4MB	Not Used	Not Used	n / a
32	ID4: Independence Day	JUL 96 780-5045-00	4MB	4MB	Not Used	Not Used	n / a
33	Space Jam	OCT 96 780-5043-00	4MB	4MB	4MB	Not Used	n / a
34	The Star Wars Trilogy - Sp. Ed.	FEB 97 780-5056-00	4MB	4MB	Not Used	Not Used	n / a
35	The Lost World: Jurassic Park	JUN 97 780-5053-00	4MB	4MB	Not Used	Not Used	n / a
36	The X-Files	AUG 97 780-5046-00	4MB	4MB	Not Used	Not Used	n / a
37	Starship Troopers	NOV 97 780-5059-00	4MB	4MB	4MB	Not Used	n / a
38	Viper Night Drivin'	FEB 98 780-5035-00	4MB	4MB	4MB	4MB	n / a
39	Lost In Space	JUN 98 780-5060-00	4MB	4MB	4MB	4MB	n / a
40	Godzilla	SEP 98 780-5040-00	4MB	4MB	4MB	4MB	n / a
41	South Park	JAN 99 780-5071-00	8MB	8MB	8MB	8MB	W6
42 a	Harley-Davidson®	AUG 99 780-5067-01	8MB	8MB	8MB	8MB	W6
42 b	Harley-Davidson®2nd Ed.	SEP 02 780-5067-10	8MB	8MB	8MB	8MB	W6
42 c	Harley-Davidson® 3rd Ed.	OCT 04 780-5087-00	8MB	8MB	8MB	8MB	W6
43 a	Striker Xtreme	MAR 00 780-5068-01	8MB	8MB	8MB	8MB	W6
43 b	NFL	OCT 00 780-50**73**-00	8MB	8MB	8MB	8MB	W6
44	Sharkey's Shootout	JUL/OCT 00 780-5072-01	8MB	8MB	8MB	Not Used	W6
45	High Roller Casino	JAN 01 780-5065-00	8MB	8MB	8MB	8MB	W6
46	Austin Powers™	MAY 01 780-5074-00	8MB	8MB	8MB	8MB	W6
47	MONOPOLY®	SEP 01 780-5075-00	8MB	8MB	8MB	Not Used	W6
48	Playboy	FEB 02 780-5076-00	8MB	8MB	8MB	8MB	W6
49	RollerCoaster Tycoon™	AUG 02 780-5078-00	8MB	8MB	8MB	Not Used	W6
50	The Simpsons™ Pinball Party	JAN 03 780-5077-00	8MB	8MB	8MB	8MB	W6
51	T3®: Rise of the Machines™	MAY 03 780-5079-00	8MB	8MB	8MB	8MB	W6
52	The Lord of the Rings™	NOV 03 780-5080-00	8MB	8MB	8MB	8MB	
53	Ripley's Believe It or Not!®	APR 04 780-5081-00	8MB	8MB	8MB	8MB	

**** Note:*** *For complete Appendix Information for Games **Laser War** through **Batman Forever**, see any Service Game Manual between **Apollo 13** through **Ripley's Believe It or Not!** or on-line at our website www.sternpinball.com/parts.htm; also available on CD-R, 970-2003-00 (**The Simpsons™ Pinball Party**, **T3®** and **The Lord of the Rings™**).*

‡ *Additional Information for **Installed** Jumper (above games 41-51):*

- *Installed **W6** so 8MB ROMS can be utilized. See the **CPU/Sound Board Schematic** (Sheet 2 of 3, Address Location 3E) in the games' Service Game Manual. Games 52 - 57 CPU/Sound Board differ than <51 (See Appendix D).*

See **Apdx. A** for more detailed information on **Pinball Game Firmware** *(ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).*

	Game Name White Star Board System™	Production Start Date and Manual Part Nr.	CPU/Sound Board **Sound U7 512K** CPU/Sound Board **Game U210 1MB** CPU/Sound Board **Voice ROMS:**			
			U17	U21	U36	U37
54	Elvis®	AUG 04 780-5084-00	8MB	8MB	8MB	8MB
55	The Sopranos℠	FEB 05 780-5085-00	8MB	8MB	8MB	8MB
56	NASCAR®	JUL 05 780-5086-00	8MB	8MB	8MB	8MB
57	Grand Prix	SEP 05 780-5091-00	8MB	8MB	8MB	8MB

See **Apdx. A** for more detailed information on **Pinball Game Firmware** *(ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).*

	Game Name S.A.M. System	Production Start Date and Manual Part Nr.	S.A.M. System CPU/Sound Board Boot EPROM **U9** 965-BOOT-SAM *(Programmed)*			
58	World Poker Tour™ (WPT)	JUN 06 780-5088-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
59	The Simpsons™ Kooky Carnival	APR 06 780-5090-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
60	©Disney's Pirates of the Caribbean	AUG 06 780-5092-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
61	Famil Guy™	DEC 06 780-5093-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
62	Spider-Man™	MAY 07 780-5094-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9

Games 58 – current, S.A.M. System : CPU/Sound & I/O Power Driver PCBs differ than White Star *(previous Games 29 – 57)*; Disp. Controller Not Required.

APPENDIX D

Board Type (White Star Board System* Only) Table

Game Name	Flipper	I/O Power Driver	CPU/Sound Stereo	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application
Apollo 13	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
	Miscellaneous PC Boards:	Light Boards 520-5130-01, -04 & -05 Magnet Interface, 7-Segment Display & Light Bd. 520-5130-06 Magnet Driver Board 520-5130-02 Switch Membrane Board 520-5130-03				Relay Board 520-5010-00			
Golden Eye	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
	Miscellaneous PC Boards:	Light Boards 520-5128-05 through -08		Mag. Processor X2 Driver Bd. 520-5143-00		Relay Board 520-5010-00			

GAMES HEREON NO LONGER REQUIRE THE FLIPPER BOARD WITH THE WHITE STAR BOARD SYSTEM™

Game Name	I/O Power Driver	CPU/Sound Mono	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application	Misc OPTO & App.
Twister	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Light Boards 520-5145-01 through -07		Mag. Drv. Bd. 520-5143-00	Relay Board 520-5010-00				
Independence Day (ID4)	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Light Boards 520-5149-01 through -10		Servo Mtr. Bd. 520-5152-00		520-5082-00 Long Hop OPTO	520-5083-00 Long Hop OPTO	Alien Head Enter	
Space Jam	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	2X 7-Segment Display Board 520-5153-00							
The Star Wars Trilolgy - Special Ed.	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00							
The Lost World: J.P.	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	520-5162-00 2-Pos. Motor Sensor on Snagger Motor
	MiscellaneousPC Boards:	DC Relay Bd. 520-5066-00	Shaker Mtr. Bd. 520-5065-00						
The X-Files	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor Sensor on File Cab. Motor
	Miscellaneous PC Boards:					520-5082-00 Long Hop OPTO	520-5083-00 Long Hop OPTO	File Cabinet Enter	
Starship Troopers	520-5137-01	520-5136-15	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-02	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	4X 7-Segment Display Board 520-5166-00				520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	L/R Orbit Lane Enter	
Viper Night Drivin'	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00				520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Jump Ramp	
Lost In Space	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00							
Godzilla	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Shaker Mtr. Bd. 520-5065-00							
South Park	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	5-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:					520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Kenny Under Trough Enter	
Harley-Davidson® 1st-3rd* Editions	520-5137-01	520-5136-16 *520-5300-00*	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00	Shaker Mtr. Bd. 520-5065-00	Diode Board 520-5146-00		520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Motorcycle Enter	
Striker Xtreme (NFL)	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor Sensor on Goalie Motor
	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Relay Board 520-5010-00	Diode Board 520-5146-00	for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Goalie Under-Trough Enter	
Sharkey's Shootout	520-5137-64	520-5136-64	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor Sensor on ?-Ball Motor
	MiscellaneousPC Boards:	Relay Board 520-5010-00	Sol. Exp. Bd. 520-5192-00						
High Roller Casino	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor Sensor on Roulette Wheel Motor
						520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Ball Lock under Roulette	
	Miscellaneous PC Boards:	Dot Display (5X7) in Slot Mach. 520-5197-00			for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5196-00 3-Pos. OPTO	520-5195-00 3-Pos. OPTO	Up/Dn Ramp in Slot Mach.	
Austin Powers™	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5212-00 Pulse-Stretcher OPTO on Spini-Me
	MiscellaneousPC Boards:	Relay Bd. (X3) 520-5010-00			for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Time Machine Ramp	
MONOPOLY®	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	MiscellaneousPC Boards:	DC Relay Bd. 520-5066-00	Mini-Dot Display (3 by 5X7) 520-5197-00 (Electric C° Sign)		for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5218-00 4-Pos. OPTO	520-5210-00 4-Pos. OPTO	Bank Door	

Table continued on the next page.

APPENDIX D

Board Type (White Star Board System* & S.A.M. System** Only) Table

Game Name	I/O Power Driver	CPU/Sound (old & new)	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application	Misc OPTO & App.
Playboy	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Relay Bd. 520-5010-00		for UK ONLY> Solenoid Expander Bd. 520-5192-00				
RollerCoaster Tycoon™	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5222-00 1-Position Switch Detect on Wheel Spin
	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Mini-Dot Display (3 by 5X7) 520-5221-00 (Ramp Enter Sign)		for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Behind 1-Bank Drop Target	
The Simpsons™ Pinball Party	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	LED Bd. 520-5219-00	Color Dot Display (4 by 5X7) 520-5225-00 (TV Set)		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
Terminator® 3: Rise of the Machines™	520-5137-01	**520-5136-16**	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	515-7307-00 Single OPTO	515-7308-00 Single OPTO	TXCannon Trough	
The Lord of the Rings™	520-5137-01	***New* 520-5300-00**	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6746-00 (White Trans.) 500-6747-00 (Black Rec.)
	Miscellaneous PC Boards:	19-LED PCB 520-5242-00	OPTO Transmitter / Receiver Amplifier PCB 520-5239-00		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	515-7307-00 Single OPTO	515-7308-00 Single OPTO	Orthanc Tower Trough	
Ripley's Believe It or Not!®	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trnscvr
	Miscellaneous PC Boards:	520-5236-00 X3 Dot Display	OPTO Transmitter / Receiver Amplifier PCB 520-5239-01		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	520-5234-00 3-Pos. OPTO	520-5234-00 3-Pos. OPTO	Vari-Target	520-5235-03 X3 Aux. Drvr
Elvis®	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
The Sopranos℠	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
NASCAR® and [NDSE]	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trans. (Qty. 16) Switch Detect.
	Miscellaneous PC Boards:	520-5235-03 X3 Aux. Drvr	OPTO Transmitter / Receiver Amplifier PCB 520-5239-01		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
Grand Prix	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trans. (Qty. 16) Switch Detect.
	Miscellaneous PC Boards:	520-5235-03 X3 Aux. Drvr	OPTO Transmitter / Receiver Amplifier PCB 520-5239-01		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				

Game Name	I/O Power Driver**	CPU / Sound**	Disp. Power Supply	Dot Matrix Display	Dual OPTO Transmitter	Dual OPTO Receiver	Dual OPTO Transceiver	OPTO Transceiver Miscellaneous
World Poker Tour™ (WPT)	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 4 Switch Pairs (Qty. 8)	520-5251-00 'U' 1/per PCB Jail Bars Up Ace/Hole Mech
	Miscellaneous **PCBs :**	520-5254-00 50V Step-Up Drv	520-5250-14 14LED 5X7 Disp.	520-5239-01 OPTO Amplifier	520-5247-00 Ace/Hole Mech	520-5248-00 Ace/Hole Mech		520-5252-04 'U' 4/per PCB Drop Targets 4- & 8- Banks
The Simpsons™ Kooky Carnival	**520-5249-00** Back Door	**520-5246-00** Back Door	520-5138-00 Cabinet Rear	520-5052-00 128 X 32 Dots			**520-5253-00-ASY** Coin Drop (Qty. 11)	
	Miscellaneous **PCBs :**	515-5742-00 Shaker PCB	500-6700-00 Relay *(incl. Wiring + Conn.)*					
©Disney's Pirates of the Caribbean	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 5 Switch Pairs (Qty. 10)	
	Miscellaneous **PCBs :**	520-5239-01 OPTO Amp. (X3)	511-5024-03 Relay *(incl. Wiring + Conn.)*					
		520-5238-00 : H-E-A-R-T LED PCB						
Family Guy™	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 3 Switch Pairs (Qty. 6)	520-5252-01 'U' 1/per PCB Drop Target 1-Bank
	Miscellaneous **PCBs :**	520-5239-01 OPTO Amp. (X2)	520-5261-00 Stepper Motor	511-5042-01 Trgt. Sensor (X2)			500-6775-01 1 Switch Pair (Qty. 2)	520-5252-04 'U' 4/per PCB Drop Target 4-Bank
		511-5046-00 : Mini Playfield Lamp PCB						
Spider-Man™	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 3 Switch Pairs (Qty. 6)	
	Miscellaneous **PCBs :**	520-5239-01 OPTO Amp. (X2)						

APPENDIX D

Board Type Table

Game Name	Flipper	Sound	Power Supply	Display X-Digit
• Laser War	2-Flipper **Board Not Required**	***initial:*** 520-5002-00 ***replaced with:*** 520-5002-02 *520-5002-01 was not used.*	520-5000-00	Master: 520-5004-00 plus: 520-5005-00 (Qty. 2): 7 Digit Alpha/Numeric 520-5006-00 (Qty. 2): 7 Digit Numeric 520-5007-00 (Qty. 1): 4 Digit Numeric
• Secret Service • Torpedo Alley	3-Flipper **Board Not Required**	520-5002-02		520-5014-01 7 Digit Alpha/Numeric Combined
• Time Machine	2-Flipper **Board Not Required**			
• Playboy 35th Anniversary *	520-5033-00 2-Flipper *(*only for 100 games of Playboy 35th Anniv. & ABC Mon. Night Football)*			520-5030-00 16 Digit Alpha/Numeric Combined
• ABC Monday Night Football * • *Robocop* • *Phantom of the Opera* • *Back to the Future*				
• The Simpsons		520-5002-**03**		

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Apllication
• Checkpoint • Teenage Mutant Ninja Turtles	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16				
• Batman • Star Trek 25th Anniv. • Hook		520-5050-01						
• Lethal Weapon 3			520-5047-01	520-5052-00 128 X 32	520-5055-00			
• Star Wars • Rocky & Bull-winkle & Friends		520-5050-02						
• Jurassic Park	520-5076-00 3-Flipper		520-5047-02					
• Last Action Hero	520-5070-00 2-Flipper	520-5050-03						
• Tales from the Crypt	520-5076-00 3-Flipper				520-5055-01			
• The Who's Tommy		520-5077-00						
• WWF Royal Rumble	**520-5070 / 5080 -00** 4-Flipper (2X2)							
• Guns N' Roses	520-5076-00 3-Flipper							
• Maverick		520-5050-03	520-5047-03	520-5075-00 192 X 64	520-5092-01	520-5102-00 Single OPTO	520-5103-00 Single OPTO	Paddle Boat Wheel Enter
• Mary Shelley's Frankenstein	520-5076-00 3-Flipper	520-5077-00						
• Baywatch	**520-5070 / 5080 -00** 4-Flipper (2X2)	520-5126-02				520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
• Batman Forever	520-5076-00 3-Flipper					520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker

Miscellaneous Boards (Lamp Boards & Relay Boards) not listed above can be found in each individual game manual.

APPENDIX E

Flipper Coil (White Star Board System* & S.A.M. System** Only) Table

Typical Coil Diode 1N4004 unless noted otherwise (Diode Top = above lugs next to windings; Diode Below (Bottom) = under lugs opposite of windings).

STANDARD COILS (TYPICAL APPLICATIONS)		
Ga.-Turn	**Res (Ω)**	**SPI Part Number and Comments**
20-400	1.0 Ω	090-5021-*use* : **-00** Diode Top
22-500	1.7 Ω	090-5017-*use* : -00 Diode Top
22-600	2.2 Ω	090-5017-*use* : -0B Diode Below // **-0T** Diode Top
23-700	3.1 Ω	090-5022-*use* : -0B Diode Below // **-0T** Diode Top
23-750	3.4 Ω	090-5019-*use* : -00 Diode Top
23-800	3.6 Ω	090-5001-*use* : -0B Diode Below // **-0T** Diode Top // **-NL** No Lugs 11" Leads // **-ND** No Diode
23-840	4.0 Ω	090-5005-*use* : -00 Diode Top
23.5-765	3.6 Ω	090-5037-*use* : -03 Diode Top
24-900	5.0 Ω	090-5002-*use* : -02 Diode Top // **-10** No Lugs 14" Leads
24-940	5.5 Ω	090-5036-*use* : -0B Diode Below // **-0T** Diode Top *use* **090-5051-01** No Lugs 11" Leads
25-1240	9.3 Ω	090-5034-*use* : -00 Diode Below
26-1200	10.3 Ω	090-5044-*use* : -0B Diode Below // **-0T** Diode Top // **-NL** No Lugs 11" Leads // **-ND** No Diode
27-1300	14.2 Ω	090-5003-*use* : -0T Diode Top
27-1400	14.7 Ω	090-5015-*use* : -00 Diode Below
27-1400		**511-5031-00** *Special App.: No Diode / Lugs + Conn.*
27-1500	16.3 Ω	090-5004-*use* : -0B Diode Below // **-0T** Diode Top
29-2000	33.6 Ω	090-5016-*use* : -00 Diode Top
LARGE, MEDIUM & MINI COILS (MAGNET APPLICATIONS)		
20.5-480	2.9 Ω	090-5064-*use* : -02 No Lugs *or* Core; 14" Leads // Large
22-650	4.3 Ω	090-5042-*use* : -00 No Lugs *or* Core; 6" Leads // Large **-01** No Lugs *or* Core; 12" Leads // Large
24-780	8.0 Ω	090-5061-*use* : -00 No Lugs *or* Core; 6" Lds. // Medium
29-1000	15.2 Ω	090-5059-*use* : -00 Lugs + Diode + Magnet Core // Mini
31-1500	52.0 Ω	090-5054-00 : Straight Lugs + Diode + Mag Core // Mini 090-5055-00 : 90° Lugs + Diode + Magnet Core // Mini

Please Note: *Ohm values may vary **+ / – .03** depending on meter calibration.*

Ordering Note: *Coils typically should not come with Coil Sleeves.* ***IF A SLEEVE EXISTS****, ensure it is the correct sleeve for the application usage. For the correct Coil Sleeve, refer to the Game Assembly Drawing the coil exists on and order separately.*

LARGE COILS (FLIPPERS & SPECIAL APPLICATIONS)		
Ga.-Turn	**Res (Ω)**	**SPI Part Number and Comments**
21-900	*call* Ω	090-5020-*use* : **-01** 3-Lugs + 1N4004 & 1N5404 Diodes **-10** Diode Top <BROWN><RED>
22-750 / 30-2600	2.6 Ω / 92.0 Ω	090-5011-*use* : **-00 DUAL WND COIL** // 3-Lugs Diode x2
22-900	3.45 Ω	090-5020-*use* : -20T Diode Top <YELLOW> // **-20-ND** No Diode
22-1080	4.2 Ω	090-5032-*use* : -0B D. Below // **-0T** D. Top <YEL-GRN> **-NL** No Diode
23-620 / 30-2600	2.4 Ω / 75.0 Ω	090-5006-*use* : -00 **DUAL WND COIL** // 3-Lugs Diode x2
23-700 / 30-2600	3.0 Ω / 83.5 Ω	090-5013-*use* : -00 **DUAL WOUND COIL** // Diode Top
23-800 / 30-2600	2.4 Ω / 90.5 Ω	090-5012-*use* : -00 **DUAL WOUND COIL** // Diode Top
23-900	4.05 Ω	090-5020-*use* : -30 Diode Top <GREEN>
23-1100	5.1 Ω	090-5030-*use* : -0T Diode Top <ORANGE> **-ND** No Diode
23-1200	7.1 Ω	090-5008-*use* : -00 Diode Top <BLACK>
23-1500	4.4 Ω	090-5062-*use* : -00 Diode Top <BLUE>
24-1570	9.5 Ω	090-5025-*use* : -00 Diode Top <BLUE>
25-1400	*call* Ω	090-5067-*use* : -0T Diode Top <RED>
25-1600	*call* Ω	090-5068-*use* : -0T Diode Top <WHITE>
25-1800	13.8 Ω	090-5041-*use* : -0T Diode Top <BLUE-GREEN>
MINI COILS (RESET / TRIP APPLICATIONS)		
27-950	*call* Ω	090-5046-*use* : -01 Diode Top
28-1050	11.5 Ω	090-5046-*use* : -00 Diode Top
27-880	*call* Ω	500-6976-01 No Lugs *or* Diode + 6" Leads & Conn.
31-590	*call* Ω	090-5010-*use* : -00 Diode Top
32-1250	35.0 Ω	**515-6916-01 :** *includes Flap & Screw* <YELLOW>
32-1800	50.2 Ω	090-5031-*use* (515-6110-00) : -0B Diode Below // **-0T** Diode Top *use 515-# to include mounting & armature brackets*
33-1590	59.0 Ω	**515-6916-00 :** *includes brackets* <WHITE>

Flipper Coil (White Star Board System* Only) Table

GAME NAME	Nº of Flippers	FLIPPERS SPI Nº / GAUGE-TURNS / Color LOWER LEFT	FLIPPERS SPI Nº / GAUGE-TURNS / Color LOWER RIGHT	FLIPPERS no E.O.S. Switch SPI Nº / GAUGE-TURNS / Color UPPER LEFT	FLIPPERS no E.O.S. Switch SPI Nº / GAUGE-TURNS / Color UPPER RIGHT
**** Note:*** *For complete Appendix Information for Games **Laser War** through **Batman Forever**, see any Service Game Manual between **Apollo 13** through **Ripley's Believe It or Not!**; or order CD-R, 970-2003-00 (**The Simpsons™ Pinball Party, Terminator® 3** and **The Lord of the Rings™**).*					
Apollo 13	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Golden Eye	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Twister	2	090-5020-20T **22-900 -YELLOW-**	090-5032-0T **22-1080 -YEL-GRN-**	Not Used	Not Used
ID4: Independence Day	3	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5020-30 **23-900 -GREEN-**
Space Jam †	2	090-5032-0T **22-1080 -YEL-GRN-**	090-5020-20T **22-900 -YELLOW-**	Not Used	Not Used
The Star Wars Trilogy - Special Edition †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lost World: Jurassic Park †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The X-Files †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Starship Troopers †	3	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	090-5032-0T **22-1080 -YEL-GRN-**
Viper Night Drivin' †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used
Lost In Space †	2	090-5030-0T **23-1100 -ORANGE-**	090-5032-0T **22-1080 -YEL-GRN-**	Not Used	Not Used
Godzilla †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
South Park †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used

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

Table continued on the next page.

APPENDIX E

Flipper Coil (White Star Board System* & S.A.M. System** Only) Table

GAME NAME	№ of Flippers	FLIPPERS w/E.O.S. Switch		FLIPPERS no E.O.S. Switch	
		SPI № / GAUGE-TURNS / Color		SPI № / GAUGE-TURNS / Color	
		LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Harley-Davidson® † *and 1st through 3rd Editions*	2	090-5032-0T **22-1080 -YEL-GRN-**	090-5030-0T **23-1100 -ORANGE-**	Not Used	Not Used
Striker Xtreme (NFL) †	3	090-5032-0T **22-1080 -YEL-GRN-**	090-5030-0T **23-1100 -ORANGE-**	090-5030-0T **23-1100 -ORANGE-**	Not Used
Sharkey's Shootout †	3	090-5030-0T **23-1100 -ORANGE-**	SAME	090-5030-0T **23-1100 -ORANGE-**	Not Used
High Roller Casino †	2	090-5020-20T **22-900 -YELLOW-**	090-5032-0T **22-1080 -YEL-GRN-**	Not Used	Not Used
Austin Powers™ †	2	090-5020-30 **23-900 -GREEN-**	090-5030-0T **23-1100 -ORANGE-**	Not Used	Not Used
MONOPOLY® †	3	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5062-0T **23-1500 -BLUE-**
Playboy †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used
RollerCoaster Tycoon™ †	4	090-5032-0T **22-1080 -YEL-GRN-**	SAME	090-5067-0T **25-1400 -RED-**	090-5068-0T **25-1600 -WHITE-**
The Simpsons™ Pinball Party †	6** (5 with Flipper Bats)	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5030-0T **23-1100 -ORANGE-**
		** *The Homer Head Assembly is affixed to an Upr. Rt. Style Flipper (no E.O.S. Switch):*		Flippers (Mini-Bats) on 2nd Level Playfield:	
			** 090-5020-20T **22-900 -YELLOW-**	090-5041-00T **25-1800 -BLU-GRN-**	090-5025-00 **24-1570 -BLUE-**
Terminator® 3: Rise of the Machines™ †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lord of the Rings™ †	2	090-5020-20T **22-900 -YELLOW-**	SAME	Not Used	Not Used
Ripley's Believe It or Not!® †	3	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5067-00T **25-1400 -RED-**
Elvis® †	4	090-5020-20T **22-900 -YELLOW-**	SAME	090-5020-30 **23-900 -GREEN-**	SAME
The Sopranos℠ †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
NASCAR® and [NDSE] †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used
Grand Prix †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used

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

** S.A.M. System Games **DO NOT REQUIRE DIODES**. If you use a coil from your stock which has a diode, remove it **ONLY FOR** S.A.M. System Games.

World Poker Tour™ (WPT)**	4	090-5032-ND **22-1080 [NO DIODE]**	SAME	090-5030-ND **23-1100 [NO DIODE]**	SAME
©Disney's Pirates of the Caribbean**	2	090-5030-ND **23-1100 [NO DIODE]**	SAME	Not Used	Not Used
Family Guy™ **	3 Norm.	090-5030-ND **23-1100 [NO DIODE]**	SAME	090-5062-ND **23-1500 [NO DIODE]**	Not Used
	2 Mini	090-5046-01-ND **27-950 [NO DIODE]**	SAME		
Spider-Man™ **	3	090-5032-ND **22-1080 [NO DIODE]**	SAME	Not Used	090-5032-ND **22-1080 [NO DIODE]**

APPENDIX E

Generic Coil Cross-Reference Guide † ‡

Flipper Coil Table ‡ ††

GAME NAME	Nº of Flippers	FLIPPERS w/E.O.S. Switch SPI Nº / GAUGE-TURNS / Color		FLIPPERS no E.O.S. Switch SPI Nº / GAUGE-TURNS / Color	
		LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Laser War ‡	2	090-5011-00 **22-750 / 30-2600**	SAME	Not Used	Not Used
Secret Service ‡	3	090-5006-00 **23-620 / 30-2600**	SAME	Not Used	090-5006-00 **23-620 / 30-2600**
Torpedo Alley ‡	3	090-5011-00 **22-750 / 30-2600**	090-5013-00 **23-700 / 30-2600**	Not Used	090-5012-00 **23-800 / 30-2600**
Time Machine ‡	2	090-5011-00 **22-750 / 30-2600**	SAME	Not Used	Not Used
‡ These coils are dual-wound.					
Playboy 35th Anniversary ††	2	090-5020-02 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
ABC Monday Night Football ††	2	090-5020-02 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
†† A very small % of these games used a 090-5020-20 coil which used a proto-type Solid State Flipper System. The two types of coils both are 22-900 coils; the only difference is the addition of the 1N5404 Diode on the (-02) coils which was used in the Deger Design.					
Robocop	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Phantom of the Opera	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Back to the Future	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
The Simpsons	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Checkpoint	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Teenage Mutant Ninja Turtles	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Batman	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Star Trek 25th Anniversary	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Hook	2	090-5030-00 **23-1100 -ORG-ORG-**	090-5020-30 **23-900 -GRN-GRN-**	Not Used	Not Used
Lethal Weapon 3	2	090-5030-00 **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
Star Wars	2	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Rocky & Bullwinkle & Friends	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Jurassic Park	3	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	090-5030-00 **23-1100 -ORG-ORG-**

Table continued on the next page.

APPENDIX E

Flipper Coil Table †

GAME NAME	Nº of Flippers	FLIPPERS w/E.O.S. Switch		FLIPPERS no E.O.S. Switch	
		SPI Nº / GAUGE-TURNS / Color		SPI Nº / GAUGE-TURNS / Color	
		LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Last Action Hero	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Tales from the Crypt	3	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	090-5041-00 **25-1800 -BLU-GRN-**
The Who's Tommy	3	090-5020-30 **23-900 -GRN-GRN-**	SAME	090-5041-00 **25-1800 -BLU-GRN-**	Not Used
WWF Royal Rumble	4	090-5032-00 **22-1080 -YEL-GRN-**	SAME	090-5041-00 **25-1800 -BLU-GRN-**	SAME
Guns N' Roses	3	090-5032-00 **22-1080 -YEL-GRN-**	SAME	090-5030-00 **23-1100 -ORG-ORG-**	Not Used
Maverick	3	090-5032-00 **22-1080 -YEL-GRN**	SAME	Not Used	090-5032-00 **22-1080 -YEL-GRN-**
Mary Shelley's Frankenstein	3	090-5030-00 **23-1100 -ORG-ORG-**	SAME	Not Used	090-5030-00 **23-1100 -ORG-ORG-**
Baywatch	4	090-5030-00 **23-1100 -ORG-ORG-**	090-5020-30 **23-900 -GRN-GRN-**	090-5025-00 **24-1570 -See Note-**	090-5030-00 **23-1100 -ORG-ORG-**
Batman Forever	3	090-5032-00 **22-1080 -YEL-GRN-**	090-5020-20 **22-900 -YEL-YEL-**	Not Used	090-5020-30 **23-900 -GRN-GRN-**
Apollo 13	2	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Golden Eye	2	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Twister	2	090-5020-20 **22-900 -YEL-YEL-**	090-5032-00 **22-1080 -YEL-GRN-**	Not Used	Not Used
ID4: Independence Day	3	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	090-5020-30 **23-900 -GRN-GRN-**
Space Jam †	2	090-5032-00T **22-1080 -YEL-GRN-**	090-5020-20T **22-900 -YEL-YEL-**	Not Used	Not Used
The Star Wars Trilogy - Special Edition †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lost World: Jurassic Park †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The X-Files †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Starship Troopers †	3	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	090-5032-00T **22-1080 -YEL-GRN-**
Viper Night Drivin' †	2	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
Lost In Space †	2	090-5030-00T **23-1100 -ORG-ORG-**	090-5032-00T **22-1080 -YEL-GRN-**	Not Used	Not Used
Godzilla †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
South Park †	2	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
Harley-Davidson® † *and* Harley-Davidson® 2nd Ed. †	2	090-5032-00T **22-1080 -YEL-GRN-**	090-5030-00T **23-1100 -ORG-ORG-**	Not Used	Not Used
Striker Xtreme (NFL) †	3	090-5032-00T **22-1080 -YEL-GRN-**	090-5030-00T **23-1100 -ORG-ORG-**	090-5030-00T **23-1100 -ORG-ORG-**	Not Used
Sharkey's Shootout †	3	090-5030-00T **23-1100 -ORG-ORG-**	SAME	090-5030-00T **23-1100 -ORG-ORG-**	Not Used
High Roller Casino †	2	090-5020-20T **22-900 -YEL-YEL-**	090-5032-00T **23-1080 -YEL-GRN-**	Not Used	Not Used
Austin Powers™ †	2	090-5020-30 **23-900 -GRN-GRN-**	090-5030-00T **23-1100 -ORG-ORG-**	Not Used	Not Used
MONOPOLY® †	3	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5062-00T **23-1500 -BLU-BLU-**
Playboy †	2	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
RollerCoaster Tycoon™ †	4	090-5032-00T **22-1080 -YEL-GRN-**	SAME	090-5067-00T **25-1400 -RED-RED-**	090-5068-00T **25-1600 -WHT-WHT**
The Simpsons™ Pinball Party †	6* (5 with Flipper Bats)	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5030-00T **23-1100 -ORG-ORG-**
		** The Homer Head Assembly is affixed to an Upr. Rt. Style Flipper (no E.O.S. Switch):*		**Flippers (Mini-Bats) on 2nd Level Playfield:**	
			* 090-5020-20T **22-900 -YEL-YEL-**	090-5041-00T **25-1800 -BLU-GRN-**	090-5025-00T **24-1570 -See Note-**
Terminator® 3: Rise of the Machines™ †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lord of the Rings™ †	2	090-5020-20T **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Ripley's Believe It or Not!® †	3	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5067-00T **25-1400 -RED-RED-**

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

APPENDIX F

Motor Specification (White Star Board System* Only) Table

Game Name	Function	Specifications	Part Numer
Apollo 13	Rocket Up/Down Movement	Bowman Motor 24VAC 60Hz 3W 6 RPM CCW	515-6383-00 *incl. Connector*
	Moon Unit Rotational Orbit	Multi Products Motor 24VAC 50/60Hz 3W 6 RPM CCW	515-6487-00 *incl. Connector*
	Shaker	Johnson Motor *(Vibrator)* 10.5VDC 10 AMP 2950 RPM CW	041-5029-**00** *MOTOR ONLY*
Golden Eye	Satellite Left/Right Movement	Bowman Motor 24VAC 60Hz 3W 6 RPM CW	515-6528-00 *incl. Connector*
Twister	Spinning Disc with Magnet	Multi Products Motor 24VAC *(041-5026-00)* 50/60Hz 3W 325 RPM CCW	515-6347-00 *incl. Connector*
	Backbox Fan (Tornado Wind)	Multi Products Motor 24VAC *(041-5052-00)* 50/60Hz 3W 3600 RPM CW	515-6531-00 *incl. Connector*
ID4: Independence Day	Alien Head Open/Close Movement	Servo Motor *(94322)*	041-5045-00 *MOTOR ONLY*
SPACE JAM (NO MOTOR USED)			
The Star Wars Trilogy - S.E.	X-Wing Left/Right Movement	Bowman Motor 24VAC *(041-5058-00)* 60Hz 3W 10 RPM CCW	515-6383-01 *incl. Connector*
The Lost World: Jurassic Park	Snagger & Center Link Lift Up/Down Movement	Multi Products Motor 20VDC *(041-5059-03)* 9 RPM Non-Directional	515-6715-03 *incl. Connector*
	Shaker	Johnson Motor *(Vibrator)* 10.5VDC 10 AMP 2950 RPM CW	041-5029-**00** *MOTOR ONLY*
The X-Files	X-File Cabinet Lift Up/Down Movement	Multi Products Motor 20VDC 9 RPM CCW	041-5057-00 *MOTOR ONLY*
Starship Troopers	Warrior Bug Forward/Reverse Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W *(041-5062-00)*, Series 36000: 1.4"ø *(Non-Captive Shaft **not included**)* HSI #36864-12 *(Unipolar)* Travel per Step: .004 Step Angle: 15°	515-6794-00 *incl. Connector* **Requires 7" Shaft:** 530-5503-00
VIPER NIGHT DRIVIN' (NO MOTOR USED)			
Lost In Space	Spinning Disc with Magnet	Multi Products Motor 24VAC *(041-5046-00)* 50/60Hz 3W 325 RPM CCW	515-6347-00 *incl. Connector*
Godzilla	Shaker ‡	Multi #3811 0630 Motor (Vibrator) 12VDC 3100 RPM CW *(w/DRL PTS)* ‡	041-5029-**01** *MOTOR ONLY*
SOUTH PARK (NO MOTOR USED)			
Harley-Davidson® *1st through 3rd Editions*	Shaker ‡	Multi #3811 0630 Motor (Vibrator) 12VDC 3100 RPM CW *(w/DRL PTS)* ‡	041-5029-**01** *MOTOR ONLY*
	Motorcycle Lift Up/Down Movement	Autotrol 24VAC *(041-5072-02)* 20 RPM CCW	515-7025-00 *incl. Connector*
Striker Xtreme (NFL)	Goalie (Linebacker) Left to Right Movement	Multi #3590 12VDC *(041-5075-00)* 60 RPM	515-7071-00 *incl. Connector*
Sharkey's Shootout	Mystery Ball Rotating Movement	Hankscraft Motor Model-E 24VAC *(041-5076-00)* 50/60Hz 3W 20 RPM CW	515-7095-00 *incl. Connector*
High Roller Casino	Roulette Wheel Rotating Movement	Multi Products Motor 20VDC *(041-5078-00)* 17 RPM CCW	515-7153-00 *incl. Connector*
	Up/Dn. Ramp in Slot Mach. Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W *(041-5062-00)*, Series 36000: 1.4"ø *(Non-Captive Shaft **not included**)* HSI #36864-12 *(Unipolar)* Travel per Step: .004 Step Angle: 15°	515-6794-00 *incl. Connector* **Requires Shaft 4¼":** 530-5503-01
Austin Powers™	Time Machine Rotating Movement	Multi Products Motor 24VAC *(041-5079-00)* 50/60Hz 20RPM CCW	515-7141-00 *incl. Connector*
	Laser Beam Left to Right Directional	Autotrol Motor 24VAC *(041-5081-00)* 50/60Hz 4W 10RPM Bi-Directional	515-7171-00 *incl. Connector*
	Dr. Evil Target Lift Up/Down Movement	Hankscraft Motor Model-E 24VAC *(041-5030-00)* 50/60Hz 6RPM CCW	515-5900-00 *incl. Connector*
Monopoly®	Mini-Flipper (Waterworks) Rotating Movement	Multi Prod. Motor & Gear Box #7000 EX00159A 20VDC 50/60Hz 85RPM CC/CCW	041-5083-00 *MOTOR ONLY*
Playboy	Triangular Billboard Rotating Movement	Autotrol Motor *(BD511 150-1387)* 24VAC 50/60Hz 12RPM Bi-Directional	041-5086-02 *MOTOR ONLY*
	Centerfold Mechanism Open/Close Movement	Multi Products *(3680)* Motor 12v DC 10/12 RPM CC/CCW	041-5075-04 *MOTOR ONLY*
	Tease Drop Screen Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W *(041-5062-00)*, Series 36000: 1.4"ø *(Non-Captive Shaft **not included**)* HSI #36864-12 *(Unipolar)* Travel per Step: .004 Step Angle: 15°	515-6794-00 *incl. Connector* **Requires 7" Shaft:** 530-5503-00

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

Table continued on the next page.

Game Name	Function	Specifications	Part Number
ROLLERCOASTER TYCOON™ (NO MOTOR USED)			
THE SIMPSONS™ PINBALL PARTY (NO MOTOR USED)			
Terminator® 3: Rise of the Machines™	Backbox Ball Shooter Up/Down Movement	Multi Products Motor 24VAC *(041-5079-01)* 21 RPM CW	515-7317-00 *incl. Connector*
The Lord of the Rings™	Balrog *(Motor & Gate)* Open/Close Movement	Multi Prod. Motor 20VDC Series 600B *(or equiv.)* 50/60Hz 10 RPM Bi-Directional	041-5088-01 *MOTOR ONLY*
RIPLEY'S BELIEVE IT OR NOT!® (NO MOTOR USED)			
Elvis®	Elvis™ Front/Back Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 10W *(041-5089-00)*, *(Non-Captive Shaft **not included**)* *HSI #46868-12-002*	500-6809-00 *incl. Connector* **Requires 7.25" Shaft:** 530-5658-00
	▶▶▶ **OPTIONAL** ◀◀◀ Shaker	Multi #3811 0630 Motor *(Vibrator)* 12VDC *(041-5029-**01**) 3100 RPM (w/DRL PTS)*	515-5893-01 *incl. Connector*
The Sopranos℠	Bada Bing! Girls x2 Rotating Posts Movement	Autotrol Synchronous Motor 24VAC 4W 50/60Hz 45.7/54.9 RPM Bi-Directional	041-5092-00 **w/1" Shaft + 12" Leads**
NASCAR® and [NDSE]	Back Panel Rotating *(Car)* Windmill *(Skill Ball Enter)*	Multi Products Motor & Gear Box 20VDC Model #8000 *(EX-04-073)* 10 RPM	041-5093-00 *MOTOR ONLY*
Grand Prix	Back Panel Rotating *(Car)* Windmill *(Skill Ball Enter)*	Multi Products Motor & Gear Box 20VDC Model #8000 *(EX-04-073)* 10 RPM	041-5093-00 *MOTOR ONLY*
World Poker Tour™ (WPT) (NO MOTOR USED)			
The Simpons™ Kooky Carnival	Bart on Skateboard Left/Right Movement	Multi Products Motor with Crank 24VAC *(041-5095-01)* 50/60Hz 3W 14 RPM	500-6947-01 *incl. Connector*
	Left & Right Ramps Up/Down Movement	Multi Products Motor 24VAC *(041-5048-01)* 50/60Hz 3W 15 RPM CCW *(Qty. 2 in game)*	515-7558-00 *incl. Connector*
	Shaker *(details in SKC Manual, Page **24**)*	Multi #3811 0630 Motor *(Vibrator)* 12VDC 3100 RPM *(w/DRL PTS)*	041-5029-**01** *MOTOR ONLY*
©Disney's Pirates of the Caribbean	Spinning Disk	Multi #3811**R** 0630 Motor *(Vibrator)* 12VDC *(041-5029-**04**)* 3100 RPM *(w/DRL PTS)* *-04 is RoHS compliant; can substitute with -01 domestic*	511-5024-04 *incl. Connector*
	Pirate Ship Sinking/Raising Movement	Multi Products Motor & Gear Box 24VDC Model #7000-DCM 12 RPM	041-5101-00 *MOTOR ONLY*
Family Guy™	Stewie Figurine Left & Right Movement	Stepper Motor NPM PF35T-48D4STD 5V RVB *(041-5102-00 Reference Only)*	511-5043-00 *incl. Connector*
Spider-Man™	Doc Ock, Sandman & 3-Bank Up/Down Movement	Sync. Motor 24VAC 50/60Hz 3W 12 RPM CW *(041-5103-00 Reference Only)*	511-5063-00 *incl. Connector*
	▶▶▶ **OPTIONAL** ◀◀◀ **Shaker Motor Kit** 502-5027-00	Multi #3811**R** 0630 Motor *(Vibrator)* 12VDC *(041-5029-**04**) 3100 RPM (w/DRL PTS)* *-04 is RoHS compliant; can substitute with -01 domestic*	515-5893-01 *incl. Connector*

APPENDIX F

Motor Specification Table

The following table only list games that used motors. *Part Numbers starting with "515-" will include the Wiring Harness & Connector.*

Game Name	Function	Specifications	Part №
ABC Monday Night Football	Goal Post Up/Down Movement	Motor 24v A.C. 60 RPM CW	515-5222-00
Phantom of the Opera	Organ Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Checkpoint	Mag Wheel (in Backbox)	Motor D.C. (KEN)	041-5005-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Teenage Mutant Ninja Turtles	Spinning Pizza Ball Deflector	Gear Motor 24v A.C. 325 RPM CW	515-5397-00
Batman	Bar Target Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Star Trek 25th Anniversary	Swinging Target	Bowman Motor 24v 22½ RPM	515-5534-00
	Transporter F/X	Gear Motor 24v A.C. 3½ RPM	500-5421-00
	Cooling Fan (for Transporter F/X)	4½" Motor 12v	041-5014-00
Lethal Weapon 3	Spinning Light	Motor 2½ v A.C. 4000 RPM CCW	041-5017-00
Star Wars	Bar Target Up/Down Movement	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
	R2D2 Robot Left/Right Movement	Bowman Motor 24v A.C. 22½ RPM CW	515-5571-00
	Death Star Rotation	Bowman "G" Motor 24v A.C. 60Hz 6 RPM CW	515-5570-00
Rocky & Bullwinkle & Friends	Nell Log "Cutting Blade" Forward/Back Movement	Autotrol Model E Motor 24v 60hz 4W 3 RPM CCW	041-5023-00
Jurassic Park	T-Rex Left/Right Movement	Multi Motor 5v D.C.	041-5025-00
	T-Rex Up/Down Movement	Bowman Motor 24v 11 RPM CW	041-5026-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Last Action Hero	Crane Left/Right Movement	Multi Products Motor 12v D.C. #3312 OSC	041-5027-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Tales from the Crypt	Tombstone Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
The Who's Tommy	Mirror Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Flipper Blinders	Servo Motor (94102)	041-5032-00
	Spinning Airplane Propellers	Motor D.C.	041-5033-00
WWF Royal Rumble	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
Batman Forever	Cannon Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00

APPENDIX G

Part Number Prefix Classification Codes

I. Electrical Source, Energy & Signal Converters
- 010- Transformers
- 031- Speakers
- 090- Solenoids (Coils)
- 150- Filters, Outlets, Varistors, Thermistors
- 200- Fuses

II. Conductors, Connectors & Insulators
- 034- Line Cords
- 036- Cable Assemblies & Wiring Harnesses
- 041- Motors
- 045- Connectors (All Types)
- 055- Lugs (M/F), Pins (M/F), Discs, Ring Terminals, Terminal Strips, etc.
- 060- Polarizing Keys and Conn. Covers
- 077- Lamp Sockets

III. Circuits & Circuit Elements
- 100- ICs
- 110- Transistors
- 112- Diodes (All Types including LEDs & Modules)
- 121- Resistors
- 123- Resistors (Variable & Adjustable)
- 124- Regulators & Bridge Rectifiers
- 125- Capacitors (Radial Lytics & Ferrites)
- 126- Piezo Crystal
- 127- Heatsinks
- 130- Capacitors (Tecates & Ceramics)
- 140- Oscillators (Clocks/Crystals)
- 165- Light Bulbs
- 180- Switches
- 181- Switch Membranes (Pads) & Piezo Sensors
- 190- Relays
- 960- EPROM *(Raw Part)*
- 965- EPROM *(Programmed Part)*

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

V. Mechanical Components
- 249- Rivets
- 251- Pins (Dowel), Finishing Nails, Hairpins, Spring Pins and Clevis Pins
- 254- Stand-Offs, Spacers and Shims
- 260- Steel Ball (All Types Steel, Glowing, Delrin, etc.)
- 265- Springs (Extension)
- 266- Springs (Compression)
- 267- Springs (Torsion)
- 269- Springs (Washers - Belleville, Wave)
- 270- Retaining Rings
- 280- Grommets, Bushings and Nyliners
- 283- Bearings

VI. Handles, Locks, Catches, Latches, Keys
- 355- Handles, Locks, Catches, Latches and Keys

VII. Fabricated Parts
- 390- Hinges
- 501- Coin Doors
- 515- Sub-Assemblies
- 520- Printed Circuit Boards (PCBs)
- 522- Display Glass
- 525- Wood Parts
- 530- Screw Machined Parts
- 535- Fabricated Parts
- 545- Molded (Extruded) Plastic and Rubber Parts (Rings, Sleeves, etc.)
- 550- Molded (Inserts)

VIII. In-House Assemblies
- 500- End Product (Systems and Models)
- 502- Kits (Created In-House)
- 505- Cabinets (complete)
- 510- Riveted Sub-Assemblies (In-House)
- 511- Sub-Assemblies (In-House)
- 515- Sub-Assemblies*

  **2 or more 515-'s but still a sub-assembly.*

IX. Bulk Materials
- 600- Braided Wire & Ground Straps
- 601- Stranded Wire
- 602- Ribbon Cable
- 604- Telephone Line Cord
- 605- Sleeving (Shrink Tubing)
- 625- Velcro (non-adhesive)
- 626- Foam Rubber, Foam Pads, Rubber Bumpers (Blue Pads), Tape (All Types) Velcro (adhesive) and String / Rope

X. Miscellaneous
- 000- Tools *(see also 777-)* and Supplies
- 040- Clamps, Ties & Clips
- 042- Pulleys
- 091- Coin Mechs
- 205- Fuse Holders
- 631- Staples
- 660- Glass (Playfield, Backglass, etc.)
- 675- Cleaners
- 705- Packing & Shipping Items
- 755- Instruction, Coin Cards, Ins. Sheets
- 756- Information Sheets, Service Bulletins, Instruction Sheets in Kits and Templates
- 777- Tools (Wrenches and Drivers)
- 780- Manuals
- 802- Decal Kits (comprised of 820's)
- 820- Decals, Mylar and Labels (Sheets/Sets)
- 803- Plastic Kits (comprised of 830's)
- 830- Plastic Pieces (Butyrate Sheets/Sets)
- 880- Toys, Models, Figurines, etc.
- 900- Game Posters

APPENDIX H

Playfield Inserts (Plastic Light Covers)

Patterns: STARBURST **STIPPLE**	**STARBURST CIRCULAR** 5/8" ø **550-5000-XX**	**STARBURST CIRCULAR** 3/4" ø **550-5001-XX**	**STARBURST CIRCULAR** 1" ø **550-5002-XX**	**STARBURST CIRCULAR** 1-3/16" ø **550-5003-XX**	**STARBURST CIRCULAR** 1-1/2" ø **550-5004-XX**
STARBURST CIRCULAR 2-1/4" ø **550-5005-XX**	**STARBURST CIRCULAR** 2-3/4" ø **550-5006-XX**	**PLAIN CIRCULAR** 3/4" ø **550-5007-XX**	**PLAIN CIRCULAR** 1" ø **550-5008-XX**	**PLAIN CIRCULAR** 1-3/16" ø **550-5009-XX**	**PLAIN CIRCULAR** 1-1/2" ø **550-5010-XX**
PLAIN CIRCULAR 2-1/4" ø **550-5011-XX**	**PLAIN CIRCULAR** 2-3/4" ø **550-5012-XX**	**STIPPLE CIRCULAR** 1" ø **550-5048-XX**	**STIPPLE 1" SQUARE** 1" **550-5019-XX**	**ROLLOVER BUTTON BASE** **550-5026-XX**	**WHITE STAR** *(only in white)* **545-5015-00**
STIPPLE RECTANGULAR 1-1/2" X 3/4" **550-5018-XX**	**STIPPLE RECTANGULAR** 1-5/8" X 1-1/2" **550-5051-XX**	**STARBURST RECTANGULAR** 2-1/4" X 1-1/8" **550-5044-XX**	**PLAIN RECTANGULAR** 2-1/4" X 1-1/8" **550-5049-XX**	**PLAIN RECTANGULAR** 1-1/4" X 1-1/2" **550-5050-XX**	**PLAIN RECTANGULAR** 2" X 2-1/2" **550-5063-XX**
STARBURST MINI SHIELD 1" X 1" **550-5024-XX**	**STARBURST LARGE SHIELD** **550-5025-XX**	**MINI HOT DOG** 1-5/8" **550-5020-XX**	**BEVEL HOT DOG** 3-1/2" **550-5021-XX**	**PLAIN HOT DOG** 3-1/2" **550-5022-XX**	**BANANA** **550-5023-XX**
STARBURST ARROW-SMALL **550-5013-XX**	**STARBURST ARROW-LARGE** **550-5070-XX**	**STARBURST ARROW-HEAD SMALL** **550-5014-XX**	**STARBURST ARROW-HEAD LARGE** **550-5015-XX**	**STARBURST BULLET** **550-5016-XX**	**STARBURST TRIANGLE** **550-5017-XX**

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

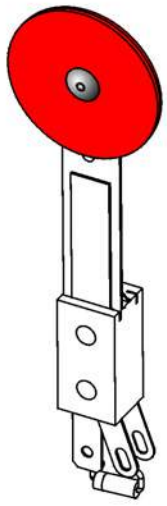
Instructions: Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit number which correspond to the color of that part. The "**-XX**" in part number which may come in various colors should be replaced with the desired 2-Digit number corresponding to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

PLASTIC PART COLOR CHART

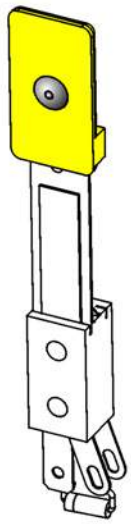
Nº	Color	Nº	Color	Nº	Color	Nº	Color	Nº	Color	Nº	Color
-00	**Black** or Solid Clear	-03	Amber	-06	Yellow	-09	Purple	-12	Fluor. Blue	-15	Luminescent
-01	Clear	-04	Green	-07	Orange	-10	Fluor. Orange	-13	Teal Green	-16	Gold
-02	Red	-05	Blue	-08	White	-11	Fluor. Green	-14	Gray	-17	Trans. Brown

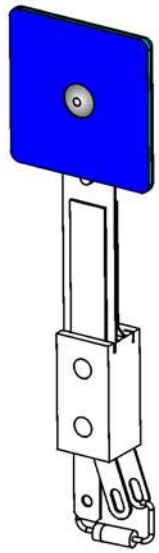
APPENDIX I

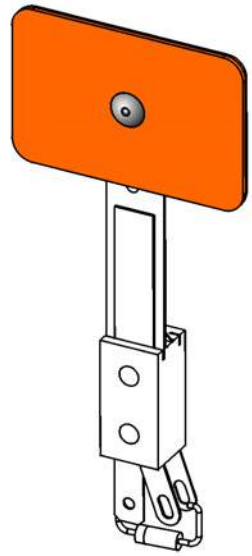
Stand-Up Targets



112-5003-00
Switch Diode, 1N4004
(all Stand-Up Targets)







515-5966-XX
1" ROUND STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

STANDARD / ANTI-LOFT
515-5967-XX *or* **515-7581-XX**
1" X 1/2" NARROW STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

515-5162-XX
1" X 1" SQUARE STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

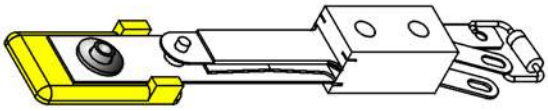
515-6027-XX
1" X 1-1/2" RECTANGLE STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

**Note: Does not include the Switch Back Plate, Mounting Bracket or screws.*

To include the Switch Back Plate, Foam Pad, and Switch Mounting Bracket assembled, use the follow assembly part numbers (replace the -XX with 2-digit number from chart):

500-5835-XX : 1" ROUND TARGET
500-5857-XX : 1" X 1/2" NARROW TARGET
500-6985-XX : 1" X 1/2" ANTI-LOFT TARGET
500-5232-XX : 1" X 1" SQUARE TARGET
500-5321-XX : 1" X 1-1/2" RECT. TARGET

REAR VIEW 515-5967-06 SHOWN



SHOWN BELOW : 500-5857-06
1" X 1/2" NARROW STAND-UP
TARGET ASSEMBLY COMPLETE

626-50**29**-00
Foam Pad, Square
.44" X .44" X .125" Thick (Self-Adhesive)**

*** Note:*
Use with all Switch & Targets THIS page except for 515-7581-XX.

535-6896-00
Bracket, Switch Mounting
(all targets THIS page)

237-5976-05
#6-32 X 3/4" SHWH Sc.
(all targets THIS page)

535-**6452-00**
Switch Back Plate**

515-5967-XX
1" X 1/2" NARROW
STAND-UP (STANDARD)
SWITCH & TARGET
RIVETED ASSEMBLY*

-XX REPLACE WITH 2-DIGIT FOR COLOR:
-00 Black
-01 Clear
-02 Red
-03 Amber
-04 Green
-05 Blue
-06 Yellow
-07 Orange
-08 White
-09 Purple
-10 Fluor. Orange
-11 Fluor. Green
-12 Fluor. Blue
-13 Teal Green
-14 Gray
-15 Luminescent
-16 Gold

Note: Not all colors available.

SHOWN BELOW : 500-6985-04
1" X 1/2" NARROW ANTI-LOFT
STAND-UP TARGET
ASSEMBLY COMPLETE

626-**5069**-00
Foam Pad, Rectangle
.6" X .4" X .25" Thick (Self-Adhesive) ‡

535-**9823-01**
Switch Back Plate ‡

‡ Note: *Use only with 515-7581-XX Switch & Target Assembly unless otherwise noted.*

535-6896-00
Bracket, Switch Mounting
(all targets THIS page)

237-5976-05
#6-32 X 3/4" SHWH Sc.
(all targets THIS page)

515-7581-XX
1" X 1/2" NARROW
STAND-UP TALL
SWITCH & TARGET
RIVETED ASSEMBLY*

ORDERING NOTE: 515-7581-XX *(500-6985-XX) differences from* ***515-5967-XX*** *(500-5857-XX) are:*

1. Switch & Target Taller *(Target sits higher over P/F)*
2. Switch Back Plate differs *(bend, shape & tab)*
3. Foam Pad differs *(thicker, taller, different type foam)*

**Note: Does not include the Switch Back Plate, Mounting Bracket or screws.*

"**R**" means «Target Insert» is reversed, allowing for Rear Mounted application.

Take Note:

1. **Items A-E** come in various colors. *These targets may not be available in every color.* The "**-XX**" in should be replaced with the desired 2-Digit number for the color desired as described in the Color Chart below. *As of print date, the following colors were used :*
-01 Clear (A, D); **-02** Red (A, B, C, D, E); **-03** Amber (D, E); **-04** Green (A, B); **-05** Blue (C); **-06** Yellow (A, C), **-09** Purple (B, D); **-11** Fluorescent Green (A, B, D)
2. *For location(s) and type of Stand-Up Targets used, if any, see Section **4**, Chapter **1**, Parts Identification & Location.*

-XX REPLACE WITH 2-DIGIT FOR COLOR:
-00 Black
-01 Clear
-02 Red
-03 Amber
-04 Green
-05 Blue
-06 Yellow
-07 Orange
-08 White
-09 Purple
-10 Fluor. Orange
-11 Fluor. Green
-12 Fluor. Blue
-13 Teal Green
-14 Gray
-15 Luminescent
-16 Gold
Note: Not all colors available.

Nr.	STAND-UP TARGET PARTS	SPI PART Nr.
A	Modular Stand-Up Target Narrow Assy.	500-6138-XX
	Stand-Up Target Narrow (Insert)	**545-6138-XX**
B	Modular Stand-Up Target Square Assy.	500-6139-XX
	Stand-Up Target Square (Insert)	**545-6139-XX**
C	Modular Stand-Up Target Rectangle Assy.	500-6228-XX
	Stand-Up Target Rectangle (Insert)	**545-6228-XX**
D	Modular Stand-Up Target Round Assy.	500-6075-XX
	Stand-Up Target Round (Insert)	**545-6075-XX**
E	Mod. Stand-Up Target 1" Spherical Assy.	500-6189-XX
	Stand-Up Target 1" Spherical (Insert)	**545-6189-XX**

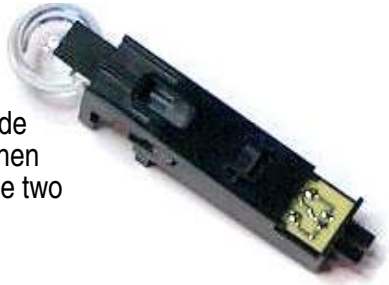
To Replace the « Target Insert » or change Target Orientation :

Items A-E Note: For the Target Assembly use the "**500-**" SPI Part Number(s) shown in the Parts Table below. To receive the Target Assembly with the « Target Insert » « ***Reversed*** » *simply add a* ***"R"*** *at the end of the Part Number. See Side View picture left to compare (dashed line shows target reversed).* For just the «Target Insert» use the "**545-**" SPI Part Number.

To reverse it yourself or to just change the insert:

1. With a small flat head screwdriver, push into the small tab at the bottom of the target front and give a slight twist motion to "pop" the two halves.

2. Push the Target Insert bottom in at the same time while you slide the top (front) part up, then let go of the insert as the two halves come apart.



3. Replace target or reinsert it into the other size while sliding the two halves back together.

Note: *If you were reversing the orientation, don't forget to also turn the Switch Actuator PCB **180°**. Test Switch.*

APPENDIX J

Coin Cards (USA & International Pricing Defaults) ▶ For Yellow Stock add -Y to the Part Number

*If more than one Pricing Scheme is available for countries listed, the **F.** listed beside the option, denotes the Factory Default Setting.*

FOR VIEWS OF THE LATEST or OPTIONAL USA, INTERNATIONAL / EURO AND CUSTOM COIN CARDS, VISIT OUR WEBSITE.

Not Shown USA 755-5400-10 Tournament Option $2 = X1; 755-5400-11 Tournament Option $1.50 = X1

USA 10 *F.*	USA 10	USA 2-7 *or* CANADA	*FOR CUSTOM PRICING †*	USA 3 *with* ToPS™	USA 5 *with* ToPS™
NON-TOURNAMENT PLAY $ .75=x1 $2.00=x3 TOURNAMENT PLAY! $1.50=x1	75¢=x1 SUPER VALUE $2.00=x3	50¢=x1	Backside is Blank (Border Only) *Typeset your Custom Pricing*	NON-TOURNAMENT PLAY $ .50=x1 $1.00=x2 TOURNAMENT PLAY! $1.00=x1	NON-TOURNAMENT PLAY $ .50=x1 $2.00=x5 TOURNAMENT PLAY! $1.00=x1
755-5400-11 *Front*	755-5400-11 *Back*	755-5400-02 *Front*	755-5400-01, -02 *or* -04 *Back*	755-5400-03 *or* -09 *Front*	755-5400-03 *Back / -08 Front*
AUSTRALIA 1 *F.*	**AUSTRALIA 2**	**CROATIA**	*FOR CUSTOM PRICING †*	**DENMARK 1** *F.*	**DENMARK 2**
$1.00=x1 SUPER VALUE $2.00=x3	$1.00=x1	3 KUNA=x1 5 KUNA=x2	Backside is Blank (Border Only) *Typeset your Custom Pricing*	Kr.3,00=x1 Kr.5,00=x2	Kr.2,00=x1 Kr.5,00=x3 Kr.10,00=x7
755-5406-00 *Front*	755-5406-00 *Back*	755-5410-00 *Front*	755-5410-00 *Back*	755-5402-00 *Front*	755-5402-00 *Back*
JAPAN 1	**JAPAN 2** *F.*	**MIDDLE EAST**	*ANY COUNTRY CAN USE*	**NEW ZEALAND 1** *F.*	**NEW ZEALAND 2**
¥100=x1	¥100=x1 ¥200=x3	TOKEN=x1	COIN=x1	$1.00=x1	$1.00=x1 SUPER VALUE $2.00=x3
755-5408-01 *Front*	755-5408-01 *Back*	755-5400-06 *Front*	*755-5400-06 Back*	*755-5406-00 Back*	755-5406-00 *Front*
NORWAY 1 *F.*	**NORWAY 2**	**RUSSIA** *F.*	**RUSSIA (ALTERNATE)**	**SOUTH AFRICA**	*FOR CUSTOM PRICING †*
Kr. 10,00=x1	Kr. 10,00=x1 Kr.20,00=x3	5 Рублей=x1	Жетон=x1	R2=x1	Backside is Blank (Border Only) *Typeset your Custom Pricing*
755-5403-01 *Front*	755-5403-01 *Back*	755-5411-00 *Front*	755-5411-00 *Back*	755-5409-01 *Front*	755-5409-01 *Back*
SWEDEN 1 *F.*	**SWEDEN 2**	**SWITZERLAND 1** *F.*	**SWITZERLAND 2**	**TAIWAN**	*FOR CUSTOM PRICING †*
10,00 kr.=x1 15,00 kr.=x2 20,00 kr.=x3	5,00 kr.=x1	sf 1,00=x1 sf 5,00=x6	sf 1,00=x1 sf 2,00=x3 sf 5,00=x9	TWD10=x1	Backside is Blank (Border Only) *Typeset your Custom Pricing*
755-5404-00 *Front*	755-5404-00 *Back*	755-5405-00 *Front*	755-5405-00 *Back*	755-5412-00 *Front*	755-5412-00 *Back*
UK 1	**UK 3**	**UK 5** *F.*	*FOR CUSTOM PRICING †*		
£1.00=x3 £2.00=x7	£ .50=x1 £1.00=x2 £2.00=x5	£1.00=x1 £2.00=x3	Backside is Blank (Border Only) *Typeset your Custom Pricing*		
755-5407-00 *Front*	755-5407-00 *Back*	755-5407-01 *Front*	755-5407-01 *Back*		

Not Shown EURO 755-5401-20 Tournament Custom (can fill in your own pricing).

Appendix J Notes:

1. Coin Card on Game is determined by original shipping country destination.
2. Optional Coin Card(s), are available via your distributor or via free download @ www.sternpinball.com/**coinagecards.shtml**.

Older style Coin Cards (foreign or domestic) not available on our website or no longer available through your distributor, are obsolete.

3. Coin Cards which have a Blank Backside *can be used for* †***Custom Pricing***.

EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EURO 6
€ .50=x1	€ .50=x1 €1.00=x2 €2.00=x5	€ .50=x1 €1.00=x3	€ .50=x1 €1.00=x2 €2.00=x6	€ .50=x1 €1.00=x3 €2.00=x7	€ .50=x2
755-5401-01 *1-Side Only*	755-5401-02 *1-Side Only*	755-5401-03 *1-Side Only*	755-5401-04 *1-Side Only*	755-5401-05 *1-Side Only*	755-5401-06 *1-Side Only*
EURO 7	**EURO 8**	**EURO 9**	**EURO 10**	**EURO 11**	**EURO 12**
€1.00=x1 €4.00=x5	€1.00=x1 €2.00=x3	€1.00=x1 €1.50=x2 €2.00=x3	€1.00=x1 €2.00=x3 €3.00=x7	€1.00=x1 €2.00=x4	€1.00=x2 €4.00=x9
755-5401-07 *1-Side Only*	755-5401-08 *1-Side Only*	755-5401-09 *1-Side Only*	755-5401-10 *1-Side Only*	755-5401-11 *1-Side Only*	755-5401-12 *1-Side Only*

◣ EURO FACTORY DEFAULT SUMMARY TABLE ◢

EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EURO 6	EURO 7	EURO 8	EURO 9	EURO 10	EURO 11	EURO 12
BELGIUM ITALY 1 PORTUGAL	*GERMANY 2*	*NETHERLANDS SPAIN*			*GREECE*		*FINLAND*	*AUSTRIA*	*FRANCE*		

Section ***3***, *Chapter* ***4***, ***GO TO ADJUSTMENTS MENU***, *Adj.* ***18***, ***Game Pricing***, ***USA & International (non-Euro) and Euro 1-12 Summary & International (Euro) Standard Pricing Select Tables***, *summarizes Standard or Custom Pricing Schemes & the Dip Switch Setting required.*

APPENDIX A

Pinball Game Firmware (White Star Board System* Only) Table

See website for the latest International Code or Updated USA version / checksums

ROM	Chip Size	Program Part Nº	USA Ver. & Check Sum	Bd. Loc.	Raw Part Nº
Apollo 13 (Note 1)					
Game ROM	(1M)	965-0208-00	**A5.01 | $09FF**	**U210**	960-5009-00
Sound	(512K)	965-0212-00	1.00 | $5244	U7	960-7001-02
Display	(4M)	965-0213-00	**A5.00 | $B92B**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0209-00	1.00 | $7FC7	U17	n/a (masked)
Voice 2	(4M)	965-0210-00	1.00 | $8E55	U21	n/a (masked)
Voice 3	(4M)	965-0211-00	1.00 | $08EE	U36	n/a (masked)
Golden Eye (Note 1)					
Game ROM	(1M)	965-0214-42	**A4.04 | $3FFF**	**U210**	960-5009-00
Sound	(512K)	965-0217-42	1.00 | $D615	U7	960-7001-02
Display	(4M)	965-0218-42	**A4.00 | $E6ED**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0215-42	1.00 | $3E32	U17	n/a (masked)
Voice 2	(4M)	965-0216-42	1.00 | $71F0	U21	n/a (masked)
Twister (Note 2)					
Game ROM	(1M)	965-0219-41	**A4.05 | $E9FF**	**U210**	960-5009-00
Sound	(512K)	965-0221-41	1.00 | $1FFF	U7	960-7001-02
Display	(4M)	965-0222-41	**A4.00 | $FD01**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0220-41	1.00 | $3650	U17	960-5015-01
Voice 2	(4M)	965-0223-41	1.00 | $9300	U21	960-5015-01
ID4: Independence Day (Note 2)					
Game ROM	(1M)	965-0224-45	**A2.02 | $9CFF**	**U210**	960-5009-00
Sound	(512K)	965-0227-45	1.00 | $222B	U7	960-7001-02
Display	(4M)	965-0228-45	**A2.00 | $ABF7**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0225-45	1.00 | $3AE1	U17	960-5015-01
Voice 2	(4M)	965-0226-45	1.00 | $206E	U21	960-5015-01
Space Jam (Note 2)					
Game ROM	(1M)	965-0229-43	**A3.00 | $E6FF**	**U210**	960-5009-00
Sound	(512K)	965-0233-43	1.00 | $F1E7	U7	960-7001-02
Display	(4M)	965-0234-43	**A3.00 | $0057**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0230-43	1.00 | $DBA8	U17	960-5015-01
Voice 2	(4M)	965-0231-43	1.00 | $DDF1	U21	960-5015-01
Voice 3	(4M)	965-0232-43	1.00 | $F32A	U36	960-5015-01
The Star Wars Trilogy - Special Edition (S.E.) (Note 2)					
Game ROM	(1M)	965-0235-56	**A4.03 | $5EFF**	**U210**	960-5009-00
Sound	(512K)	965-0238-56	1.00 | $4A7D	U7	960-7001-02
Display	(4M)	965-0239-56	**A4.00 | $8817**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0236-56	1.00 | $E66B	U17	960-5015-01
Voice 2	(4M)	965-0237-56	1.00 | $8F54	U21	960-5015-01
The Lost World: Jurassic Park (Note 2)					
Game ROM	(1M)	965-0240-53	**A2.02 | $C8FF**	**U210**	960-5009-00
Sound	(512K)	965-0243-53	1.00 | $A35B	U7	960-7001-02
Display	(4M)	965-0244-53	**A2.01 | $7F46**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0241-53	1.00 | $1D27	U17	960-5015-01
Voice 2	(4M)	965-0242-53	1.00 | $8DA4	U21	960-5015-01
The X-Files (Note 2)					
Game ROM	(1M)	965-0245-46	**A3.03 | $A2FF**	**U210**	960-5009-00
Sound	(512K)	965-0248-46	1.00 | $6648	U7	960-7001-02
Display	(4M)	965-0249-46	**A3.00 | $66D0**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0246-46	1.00 | $349D	U17	960-5015-01
Voice 2	(4M)	965-0247-46	1.00 | $629C	U21	960-5015-01
Starship Troopers (Note 3)					
Game ROM	(1M)	965-0250-59	**A2.00 | $85FF**	**U210**	960-5009-00
Sound	(512K)	965-0253-59	1.00 | $64B2	U7	960-7001-02
Display	(4M)	965-0254-59	**A2.00 | $E77B**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0251-59	1.00 | $152A	U17	960-5015-01
Voice 2	(4M)	965-0252-59	1.00 | $0291	U21	960-5015-01
Voice 3	(4M)	965-0255-59	1.00 | $95A7	U36	960-5015-01
Viper Night Drivin' (Note 4)					
Game ROM	(1M)	965-0266-35	**A2.01 | $C5FF**	**U210**	960-5009-00
Sound	(512K)	965-0271-35	1.00 | $4DF8	U7	960-7001-02
Display	(4M)	965-0272-35	**A2.01 | $C17D**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0267-35	1.00 | $8018	U17	960-5015-01
Voice 2	(4M)	965-0268-35	1.00 | $2157	U21	960-5015-01
Voice 3	(4M)	965-0269-35	1.00 | $B5A6	U36	960-5015-01
Voice 4	(4M)	965-0270-35	1.00 | $D01E	U37	960-5015-01
Lost In Space (Note 4)					
Game ROM	(1M)	965-0282-60	**A1.01 | $B2FF**	**U210**	960-5009-00
Sound	(512K)	965-0287-60	1.00 | $A6AF	U7	960-7001-02
Display	(4M)	965-0288-60	**A1.02 | $32AB**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0283-60	1.00 | $4391	U17	960-5015-01
Voice 2	(4M)	965-0284-60	1.00 | $8215	U21	960-5015-01
Voice 3	(4M)	965-0285-60	1.00 | $5B32	U36	960-5015-01
Voice 4	(4M)	965-0286-60	1.00 | $8971	U37	960-5015-01
Godzilla (Note 4)					
Game ROM	(1M)	965-0289-40	**A2.05| $B1FF**	**U210**	960-5009-00
Sound	(512K)	965-0294-40	1.00 | $0CC8	U7	960-7001-02
Display	(4M)	965-0295-40	**A2.00 | $C929**	**ROM 0**	960-5015-01
Voice 1	(4M)	965-0290-40	1.00 | $0D75	U17	960-5015-01
Voice 2	(4M)	965-0291-40	1.00 | $CCCF	U21	960-5015-01
Voice 3	(4M)	965-0292-40	1.00 | $227F	U36	960-5015-01
Voice 4	(4M)	965-0293-40	1.00 | $DB69	U37	960-5015-01
South Park (Notes 4, 5)					
Game ROM	(1M)	965-0301-71	**A1.03 | $58FF**	**U210**	960-5009-00
Sound	(512K)	965-0306-71	1.00 | $1286	U7	960-7001-02
Display	(4M)	965-0307-71	**A1.01 | $166F**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0302-71	1.00 | $7BF8	U17	960-5016-00
Voice 2	(8M)	965-0303-71	1.00 | $9CCC	U21	960-5016-00
Voice 3	(8M)	965-0304-71	1.00 | $ADD9	U36	960-5016-00
Voice 4	(8M)	965-0305-71	1.00 | $6659	U37	960-5016-00
Harley-Davidson® (Notes 4, 5, 6) *Original (1999-2001)*					
Game ROM	(1M)	965-0319-67	**A1.03 | $3EFF**	**U210**	960-5009-00
Sound	(512K)	965-0320-67	1.00 | $F4FF	U7	960-7001-02
Display	(4M)	965-0321-67	**A1.04 | $FC7C**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0322-67	1.00 | $CD26	U17	960-5016-00
Voice 2	(8M)	965-0323-67	1.00 | $9396	U21	960-5016-00
Voice 3	(8M)	965-0324-67	1.00 | $FB72	U36	960-5016-00
Voice 4	(4M)	965-0325-67	1.00 | $6100	U37	960-5015-01
▶ **Harley-Davidson® (Notes 4, 5, 6, 8) *2nd Edition (2002-2003)***					
Game ROM	(1M)	965-0319-67A	**A1.08 | $23FF**	**U210**	960-5009-00
Display	(4M)	965-0321-67A	**A1.05 | $B594**	**ROM 0**	960-5015-01
▶ **Harley-Davidson® (Notes 4, 5, 6, 8) *3rd Edition (2004)***					
Game ROM	(1M)	965-0319-87	**A4.00 | $1CFF**	**U210**	960-5009-00
Display	(4M)	965-0321-87	**A4.00 | $F4FF**	**U5**	960-5015-01
Striker Xtreme (Notes 4, 5)					
Game ROM	(1M)	965-0326-68	**A1.03 | $E4FF**	**U210**	960-5009-00
Sound	(512K)	965-0327-68	1.00 | $3BCA	U7	960-7001-02
Display	(4M)	965-0328-68	**A1.03 | $1957**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0329-68	1.00 | $482A	U17	960-5016-00
Voice 2	(8M)	965-0330-68	1.00 | $7312	U21	960-5016-00
Voice 3	(8M)	965-0331-68	1.00 | $DE2F	U36	960-5016-00
Voice 4	(8M)	965-0332-68	1.00 | $C508	U37	960-5016-00
NFL (Notes 4, 5) *Not on CD-R or Website: Code through Distributor Only.*					
Game ROM	(1M)	965-0339-73	**A1.00 | $D2FF**	**U210**	960-5009-00
Sound	(512K)	965-0340-73	1.00 | $	U7	960-7001-02
Display	(4M)	965-0341-73	**A1.01 | $845A**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0342-73	1.00 | $	U17	960-5016-00
Voice 2	(8M)	965-0343-73	1.00 | $	U21	960-5016-00
Voice 3	(8M)	965-0344-73	1.00 | $	U36	960-5016-00
Voice 4	(8M)	965-0345-73	1.00 | $	U37	960-5016-00
Sharkey's Shootout (Notes 4, 5)					
Game ROM	(1M)	965-0333-72	**A2.11 | $49FF**	**U210**	960-5009-00
Sound	(512K)	965-0334-72	1.01 | $9796	U7	960-7001-02
Display	(4M)	965-0335-72	**A2.01 | $6C33**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0336-72	1.00 | $58EA	U17	960-5016-00
Voice 2	(8M)	965-0337-72	1.00 | $272B	U21	960-5016-00
Voice 3	(8M)	965-0338-72	1.00 | $41AE	U36	960-5016-00
High Roller Casino (Notes 4, 5)					
Game ROM	(1M)	965-0346-65	**A3.00 | $90FF**	**U210**	960-5009-00
Sound	(512K)	965-0347-65	1.00 | $581C	U7	960-7001-02
Display	(4M)	965-0348-65	**A3.00 | $74B3**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0349-65	1.00 | $E12D	U17	960-5016-00
Voice 2	(8M)	965-0350-65	1.00 | $38F4	U21	960-5016-00
Voice 3	(8M)	965-0351-65	1.00 | $1B54	U36	960-5016-00
Voice 4	(8M)	965-0352-65	1.00 | $D720	U37	960-5016-00
Austin Powers™ (Notes 4, 5)					
Game ROM	(1M)	965-0353-74	**A3.02 | $5DFF**	**U210**	960-5009-00
Sound	(512K)	965-0354-74	1.00 | $DA7B	U7	960-7001-02
Display	(4M)	965-0035-74	**A3.00 | $6A34**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0356-74	1.00 | $D2B9	U17	960-5016-00
Voice 2	(8M)	965-0357-74	1.00 | $9E75	U21	960-5016-00
Voice 3	(8M)	965-0358-74	1.00 | $51F3	U36	960-5016-00
Voice 4	(8M)	965-0359-74	1.00 | $0AE5	U37	960-5016-00
MONOPOLY® (Notes 4, 5)					
Game ROM	(1M)	965-0360-75	**A3.20 | $07FF**	**U210**	960-5009-00
Sound	(512K)	965-0361-75	1.00 | $8C18	U7	960-7001-02
Display	(4M)	965-0362-75	**A3.01 | $A381**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0363-75	1.00 | $35E6	U17	960-5016-00
Voice 2	(8M)	965-0364-75	1.00 | $B35A	U21	960-5016-00
Voice 3	(8M)	965-0365-75	1.00 | $8A9F	U36	960-5016-00
Playboy (Notes 4, 5, 7)					
Game ROM	(1M)	965-0367-76	**A5.00 | $7DFF**	**U210**	960-5009-00
Sound	(512K)	965-0368-76	1.02 | $E7C2	U7	960-7001-02
Display	(4M)	965-0369-76	**A5.00 | $A5FF**	**ROM 0**	960-5015-01
Voice 1	(8M)	965-0370-76	1.00 | $9ABE	U17	960-5016-00
Voice 2	(8M)	965-0371-76	1.00 | $9F34	U21	960-5016-00
Voice 3	(8M)	965-0372-76	1.00 | $374B	U36	960-5016-00
Voice 4	(8M)	965-0373-76	1.00 | $237A	U37	960-5016-00
RollerCoaster Tycoon™ (Notes 4, 5, 7)					
Sound	(512K)	965-0374-78	1.00 | $F663	U7	960-7001-02
Game ROM	(1M)	965-0375-78	**A7.02| $E5FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0377-78	1.00 | $3C4A	U17	960-5016-00
Voice 2	(8M)	965-0378-78	1.00 | $057A	U21	960-5016-00
Voice 3	(8M)	965-0379-78	1.00 | $04D7	U36	960-5016-00
Display	(4M)	965-0376-78	**A7.01 | $8DDB**	**U5** Disp. Cntrlr.	
The Simpsons™ Pinball Party (Notes 4, 5, 7)					
Sound	(512K)	965-0381-77	1.01 | $A7EE	U7	960-7001-02
Game ROM	(1M)	965-0382-77	**A4.00 | $4FFF**	**U210**	960-5009-00
Voice 1	(8M)	965-0383-77	1.00 | $9719	U17	960-5016-00
Voice 2	(8M)	965-0384-77	1.00 | $16ED	U21	960-5016-00
Voice 3	(8M)	965-0385-77	1.00 | $ADCE	U36	960-5016-00
Voice 4	(8M)	965-0386-77	1.00 | $E7E5	U37	960-5016-00
Display	(4M)	965-0387-77	**A4.00 | $8A03**	**U5** DC PCB	960-5015-01
Terminator® 3: Rise of the Machines™ (Notes 4, 5, 7)					
Sound	(512K)	965-0388-79	1.00 | $D2FD	U7	960-7001-02
Game ROM	(1M)	965-0389-79	**A4.00 | $F8FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0390-79	1.00 | $1838	U17	960-5016-00
Voice 2	(8M)	965-0391-79	1.00 | $F0D5	U21	960-5016-00
Voice 3	(8M)	965-0392-79	1.00 | $89DA	U36	960-5016-00
Voice 4	(8M)	965-0393-79	1.00 | $1200	U37	960-5016-00
Display	(4M)	965-0394-79	**A4.00 | $6E49**	**U5** DC PCB	960-5015-01
The Lord of the Rings™ (Notes 7, 8)					
Sound	(512K)	965-0401-80	1.01 | $36BC	U7	960-7001-02
Game ROM	(1M)	965-0402-80	**A10.00 | $84FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0403-80	1.00 | $1792	U17	960-5016-00
Voice 2	(8M)	965-0404-80	1.00 | $67F1	U21	960-5016-00
Voice 3	(8M)	965-0405-80	1.00 | $89B6	U36	960-5016-00
Voice 4	(8M)	965-0406-80	1.00 | $EA49	U37	960-5016-00
Display	(4M)	965-0407-80	**A10.00 | $1669**	**U5** DC PCB	960-5015-01

Sound & Voice 1-4 identical to above H-D® Original.

footnotes : 1 — 8 *see the bottom of the next page (**A2**).*

APPENDIX A

Pinball Game Firmware (White Star Board System* & S.A.M. System** Only) Table

See website for the latest International Code or Updated USA version / checksums

Ripley's Believe It or Not!® (Notes 7, 8)

ROM	Chip Size	Program Part Nº	USA Ver. & Check Sum	Bd. Loc.	Raw Part Nº
Sound	(512K)	965-0408-81	1.00 | $D93D	U7	960-7001-02
Game ROM	(1M)	965-0409-81	**A3.20 | $43FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0410-81	1.00 | $067B	U17	960-5016-00
Voice 2	(8M)	965-0411-81	1.00 | $C8B8	U21	960-5016-00
Voice 3	(8M)	965-0412-81	1.00 | $64C2	U36	960-5016-00
Voice 4	(8M)	965-0413-81	1.00 | $5341	U37	960-5016-00
Display	(4M)	965-0414-81	**A3.00 | $DE4B**	**U5** DC PCB	960-5015-01

Elvis® (Notes 7, 8)

Sound	(512K)	965-0415-84	1.00 | $8CD2	U7	960-7001-02
Game ROM	(1M)	965-0416-84	**A5.00 | $50FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0417-84	1.00 | $538D	U17	960-5016-00
Voice 2	(8M)	965-0418-84	1.00 | $8BCD	U21	960-5016-00
Voice 3	(8M)	965-0419-84	1.00 | $60F8	U36	960-5016-00
Voice 4	(8M)	965-0420-84	1.00 | $14D8	U37	960-5016-00
Display	(4M)	965-0421-84	**A5.00 | $A1F6**	**U5** DC PCB	960-5015-01

The Sopranos℠ (Notes 7, 8)

Sound	(512K)	965-0422-85	4.00 | $9B5A	U7	960-7001-02
Game ROM	(1M)	965-0423-85	**A5.00 | $5BFF**	**U210**	960-5009-00
Voice 1	(8M)	965-0424-85	3.00 | $F01E	U17	960-5016-00
Voice 2	(8M)	965-0425-85	1.04 | $C14C	U21	960-5016-00
Voice 3	(8M)	965-0426-85	1.04 | $47A3	U36	960-5016-00
Voice 4	(8M)	965-0427-85	1.04 | $ADCD	U37	960-5016-00
Display	(4M)	965-0428-85	**A5.00 | $B4BB**	**U5** DC PCB	960-5015-01

NASCAR® (Notes 7, 8)

Sound	(512K)	965-0429-86	2.00 | $32B3	U7	960-7001-02
Game ROM	(1M)	965-0430-86	**A4.50 | $39FF**	**U210**	960-5009-00
Voice 1	(8M)	965-0431-86	2.00 | $CFFB	U17	960-5016-00
Voice 2	(8M)	965-0432-86	2.00 | $22C0	U21	960-5016-00
Voice 3	(8M)	965-0433-86	2.00 | $5FC8	U36	960-5016-00
Voice 4	(8M)	965-0434-86	2.00 | $2902	U37	960-5016-00
Display	(4M)	965-0435-86	**A4.00 | $92BD**	**U5** DC PCB	960-5015-01

Grand Prix (Notes 7, 8)

Sound	(512K)	965-0429-91	V1.00 | $6F89	U7	960-7001-02
Game ROM	(1M)	965-0430-91	**A4.50 | $5EFF**	**U210**	960-5009-00
Voice 1	(8M)	965-0431-91	1.00 | $CE0E	U17	960-5016-00
Voice 2	(8M)	965-0432-91	1.00 | $F4C6	U21	960-5016-00
Voice 3	(8M)	965-0433-91	1.00 | $057D	U36	960-5016-00
Voice 4	(8M)	965-0434-91	1.00 | $2646	U37	960-5016-00
Display	(4M)	965-0435-91	**A4.00 | $DA8E**	**U5** DC PCB	960-5015-01

[NDSE] (Notes 7, 8) *Call for more info if code update required.*

Sound	(512K)	965-0436-97	U7	960-7001-02
Game ROM	(1M)	965-0437-97	**U210**	960-5009-00
Voice 1	(8M)	965-0438-97	U17	960-5016-00
Voice 2	(8M)	965-0439-97	U21	960-5016-00
Voice 3	(8M)	965-0440-97	U36	960-5016-00
Voice 4	(8M)	965-0441-97	U37	960-5016-00
Display	(4M)	965-0442-97	**U5** DC PCB	960-5015-01

**** GAMES BELOW THIS LINE / NEXT COLUMN ARE S.A.M. SYSTEM GAMES**

TO ORDER MEMORY STICK WITH GAME FILES FROM YOUR DISTRIBUTOR, USE SPI PART NUMBER 970-0128-00 & INCLUDE THE GAME NAME / LANGUAGE FILE(S) DESIRED.

World Poker Tour™ Pinball (WPT) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**1.04** | $7E62	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	1.12AL	1.17+	WPT0112AL.bin
English Only	1.12A	1.17+	WPT0112A.bin
English + French	1.12AF	1.17+	WPT0112AF.bin
French Only	1.12F	1.17+	WPT0112F.bin
German + French	1.12GF	1.17+	WPT0112GF.bin
German Only	1.12G	1.17+	WPT0112G.bin
English + Italian	1.12AI	1.17+	WPT0112AI.bin
Italian Only	1.12I	1.17+	WPT0112I.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

The Simpsons™ Kooky Carnival Redemption (Note 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**1.04** | $7E62	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**Bin Files:**
English Only	1.05	SKC0105.bin
English New Jersey Only	0.09NJ	SKC0090NJ.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 5.5MB +/–

©Disney's Pirates of the Caribbean Pinball (POTC) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**1.06** | $2014	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	1.15AS	1.17+	POTC115AS.bin
English + French	1.15AF	1.17+	POTC115AF.bin
German + French	1.15GF	1.17+	POTC115GF.bin
English + Italian	1.15AI	1.17+	POTC115AI.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

Family Guy™ Pinball (FG) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**2.09** | $10A3	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	10.00AL	1.23+	FG1000AL.bin
English + French	10.00AF	1.23+	FG1000AF.bin
English + German	10.00AG	1.23+	FG1000GF.bin
English + Italian	10.00AI	1.23+	FG1000AI.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

Spider-Man™ Pinball (S-M) (Notes 7, 9)

Boot B-02	(8M)	**965-BOOT-SAM**	**2.10** | $F625	**U9**	*960-5016-00 unprogrammed*

Memory Stick 128MB (970-0128-00)	**Version**	**System**	**Bin Files:**
English + Spanish	1.3ES	1.27+	spd_1_30_es.bin
English + French	1.3EF	1.27+	spd_1_30_ef.bin
German+French	1.3GF	1.27+	spd_1_30_gf.bin
English + Italian	1.3EI	1.27+	spd_1_30_ei.bin

NOTE: THE TYPICAL SIZE PER UNZIPPED BIN FILE IS 25MB – 30MB+/–

footnotes:

1 ROMs on CPU/Sound Bd.: 520-5136-**00** (Stereo) & Display Cont. Bd.: 520-5055-01
2 ROMs on CPU/Sound Bd.: 520-5136-**10** (Mono) & Display Cont. Bd.: 520-5055-01
3 ROMs on CPU/Sound Board: 520-5136-**15*** (Mono) (*FCC 11-97) &
Display Controller Board: 520-5055-**02*** (*FCC 11-97)

APPENDIX A

Pinball Game Firmware Table

EPROM	Chip Size	Program Part Nº	USA Ver.	Bd. Loc.	Raw Part Nº
Laser War					
CPU	(256K)	965-0004-00	LWAR.C5	C5	960-5007-00
Sound (Old)	(256K)	965-0005-00		J5	960-5007-00
Sound (Old)	(256K)	965-0006-00		J6	960-5007-00
Sound (Old)	(256K)	965-0007-00		J7	960-5007-00
			- OR -		
Sound	(256K)	965-0008-00		7F	960-5007-00
Sound 1	(512K)	965-0009-00		6F	960-7001-02
Sound 2	(512K)	965-0010-00		4F	960-7001-02
Secret Service					
CPU	(256K)	965-0011-00	A4-6	B5	960-5007-00
CPU	(256K)	965-0012-00	A4-6	C5	960-5007-00
Voice 1	(512K)	965-0014-00		6F	960-7001-02
Voice 2	(512K)	965-0015-00		4F	960-7001-02
Sound	(256K)	965-0013-00		7F	960-5007-00
Torpedo Alley					
CPU	(256K)	965-0016-00	A2-1	B5	960-5007-00
CPU	(256K)	965-0017-00	A2-1	C5	960-5007-00
Voice 1	(512K)	965-0019-00		6F	960-7001-02
Voice 2	(512K)	965-0020-00		4F	960-7001-02
Sound	(256K)	965-0018-00		7F	960-5007-00
Time Machine					
CPU	(128K)	965-0021-00	A2-4	B5	960-5006-00
CPU	(256K)	965-0022-00	A2-4	C5	960-5007-00
Voice 1	(512K)	965-0024-00		6F	960-7001-02
Voice 2	(512K)	965-0025-00		4F	960-7001-02
Sound	(256K)	965-0023-00		7F	960-5007-00
Playboy 35th Anniversary					
CPU	(256K)	965-0046-00	A2-4	B5	960-5007-00
CPU	(256K)	965-0047-00	A2-4	C5	960-5007-00
Voice 1	(512K)	965-0049-00		6F	960-7001-02
Voice 2	(512K)	965-0050-00		4F	960-7001-02
Sound	(256K)	965-0048-00		7F	960-5007-00
ABC Monday Night Football					
CPU	(128K)	965-0031-00	A2-7	B5	960-5006-00
CPU	(256K)	965-0032-00	A2-7	C5	960-5007-00
Voice 1	(512K)	965-0034-00		6F	960-7001-02
Voice 2	(512K)	965-0035-00		4F	960-7001-02
Sound	(256K)	965-0033-00		7F	960-5007-00
Robocop					
CPU	(256K)	965-0036-00	A3-4	B5	960-5007-00
CPU	(256K)	965-0037-00	A3-4	C5	960-5007-00
Voice 1	(512K)	965-0039-00		6F	960-7001-02
Voice 2	(512K)	965-0040-00		4F	960-7001-02
Sound	(256K)	965-0038-00		7F	960-5007-00
Phantom of the Opera					
CPU	(128K)	965-0026-00	A3-2	B5	960-5006-00
CPU	(256K)	965-0027-00	A3-2	C5	960-5007-00
Voice 1	(512K)	965-0029-00		6F	960-7001-02
Voice 2	(512K)	965-0030-00		4F	960-7001-02
Sound	(256K)	965-0028-00		7F	960-5007-00
Back to the Future					
CPU	(256K)	965-0041-00	A2-0	B5	960-5007-00
CPU	(256K)	965-0042-00	A2-0	C5	960-5007-00
Voice 1	(512K)	965-0044-00		6F	960-7001-02
Voice 2	(512K)	965-0045-00		4F	960-7001-02
Sound	(256K)	965-0043-00		7F	960-5007-00
The Simpsons					
CPU	(128K)	965-0051-00	A2-7	B5	960-5006-00
CPU	(256K)	965-0052-00	A2-7	C5	960-5007-00
Voice 1	(512K)	965-0054-00		6F	960-7001-02
Voice 2	(512K)	965-0055-00		4F	960-7001-02
Sound	(256K)	965-0053-00		7F	960-5007-00
Checkpoint					
CPU	(128K)	965-0056-00	A1-7	B5	960-5006-00
CPU	(256K)	965-0134-00	A1-7	C5	960-5007-00
Voice 1	(1M)	965-0057-00		F7	960-5009-00
Voice 2	(1M)	965-0058-00		F5	960-5009-00
Sound	(256K)	965-0059-00		F4	960-5007-00
Display	(512K)	965-0060-00	CP80	U8	960-7001-02
Teenage Mutant Ninja Turtles					
CPU	(128K)	965-0061-00	A1.04	B5	960-5006-00
CPU	(256K)	965-0062-00	A1.04	C5	960-5007-00
Voice 1	(1M)	965-0063-00		F5/6	960-5009-00
Voice 2	(1M)	965-0064-00		F4/5	960-5009-00
Sound	(256K)	965-0065-00		F7	960-5007-00
Display	(512K)	965-0066-00	A1.04	U8	960-7001-02
Batman					
CPU	(128K)	965-0067-00	A1.06	B5	960-5006-00
CPU	(256K)	965-0135-00	A1.06	C5	960-5007-00
Voice 1	(2M)	965-0068-00		U17	960-5010-00
Voice 2	(1M)	965-0069-00		U21	960-5009-00
Sound	(256K)	965-0070-00		U7	960-5007-00
Display	(1M)	965-0071-00	A1.06	U8	960-5009-00
Star Trek 25th Anniversary					
CPU	(512K)	965-0072-00	A2.01	C5	960-7001-02
Voice 1	(2M)	965-0073-00		U17	960-5010-00
Voice 2	(2M)	965-0074-00		U21	960-5010-00
Sound	(256K)	965-0075-00		U7	960-5007-00
Display	(1M)	965-0076-00	A1.09	U8	960-5009-00
Hook					
CPU	(512K)	965-0077-00	A4.08	C5	960-7001-02
Voice 1	(2M)	965-0078-00		U17	960-5010-00
Voice 2	(2M)	965-0079-00		U21	960-5010-00
Sound	(256K)	965-0080-00		U7	960-5007-00
Display	(1M)	965-0081-00	A4.01	U8	960-5009-00
Lethal Weapon 3					
CPU	(512K)	965-0082-00	A2.08	C5	960-7001-02
Voice 1	(2M)	965-0083-00		U17	960-5010-00
Voice 2	(2M)	965-0084-00		U21	960-5010-00
Sound	(256K)	965-0085-00		U7	960-5007-00
Display	(2M)	965-0086-00	A2.06	ROM 0	960-5010-00
Display	(2M)	965-0087-00	A2.06	ROM 1	960-5010-00
	(Used on Display PCB 520-5055-00)				
			-OR-		
Display	(4M)	965-0087-04	A2.06	ROM 0	960-5015-00
	(Used on Display PCB 520-5055-01)				
Star Wars					
CPU	(512K)	965-0119-00	A1.03	C5	960-7001-02
Voice 0	(4M)	965-0132-00		U17	960-5015-00
Voice 1	(2M)	965-0133-00		U21	960-5010-00
Sound	(256K)	965-0131-00		U7	960-5007-00
Display	(2M)	965-0120-00	A1.04	ROM 0	960-5010-00
Display	(2M)	965-0121-00	A1.04	ROM 1	960-5010-00
	(Used on Display PCB 520-5055-00)				
			-OR-		
Display	(4M)	965-0122-00	A1.05	ROM 0	960-5015-00
	(Used on Display PCB 520-5055-01)				
Rocky & Bullwinkle & Friends					
CPU	(512K)	965-0138-00	A1.30	C5	960-7001-02
Voice 0	(4M)	965-0139-00		U17	960-5015-00
Voice 1	(2M)	965-0140-00		U21	960-5010-00
Sound	(256K)	965-0141-00		U7	960-5007-00
Display	(4M)	965-0142-00	A1.30	ROM 0	960-5015-00
Jurassic Park					
CPU	(512K)	965-0143-00	A5.13	C5	960-7001-02
Voice 0	(4M)	965-0144-00		U17	960-5015-00
Voice 1	(2M)	965-0145-00		U21	960-5010-00
Sound	(256K)	965-0146-00		U7	960-5007-00
Display	(4M)	965-0147-00	A5.10	ROM 0	960-5015-00
Last Action Hero					
CPU	(512K)	965-0148-00	A1.12	C5	960-7001-02
Voice 0	(4M)	965-0149-00		U17	960-5015-00
Voice 1	(2M)	965-0150-00		U21	960-5010-00
Sound	(256K)	965-0151-00		U7	960-5007-00
Display	(4M)	965-0152-00	A1.06	ROM 0	960-5015-00
Tales from the Crypt					
CPU	(512K)	965-0157-00	A3.03	C5	960-7001-02
Voice 0	(4M)	965-0158-00		U17	960-5015-00
Voice 1	(2M)	965-0159-00		U21	960-5010-00
Sound	(256K)	965-0160-00		U7	960-5007-00
Display	(4M)	965-0161-00	A3.01	ROM 0	960-5015-00
The Who's Tommy					
CPU	(512K)	965-0162-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0165-00		U17	960-5015-00
Voice 2	(4M)	965-0166-00		U21	960-5015-00
Voice 3	(4M)	965-0167-00		U36	960-5015-00
Voice 4	(4M)	965-0168-00		U37	960-5015-00
Sound	(512K)	965-0164-00		U7	960-7001-02
Display	(4M)	965-0163-00	A4.00	ROM 0	960-5015-00
WWF Royal Rumble					
CPU	(512K)	965-0169-00	A1.06	C5	960-7001-02
Voice 1	(4M)	965-0172-00		U17	960-5015-00
Voice 2	(4M)	965-0173-00		U21	960-5015-00
Voice 3	(4M)	965-0174-00		U36	960-5015-00
Sound	(512K)	965-0171-00		U7	960-7001-02
Display	(4M)	965-0170-00	A1.02	ROM 0	960-5015-00
Guns N' Roses					
CPU	(512K)	965-0175-00	A3.00	C5	960-7001-02
Voice 1	(4M)	965-0178-00		U17	960-5015-00
Voice 2	(4M)	965-0179-00		U21	960-5015-00
Voice 3	(4M)	965-0180-00		U36	960-5015-00
Voice 4	(4M)	965-0181-00		U37	960-5015-00
Sound	(512K)	965-0177-00		U7	960-7001-02
Display	(4M)	965-0176-00	A3.00	ROM 0	960-5015-00
Maverick *					
CPU	(512K)	965-0182-00	A4.04	C5	960-7001-02
Voice 1	(4M)	965-0186-00		U17	960-5015-00
Voice 2	(4M)	965-0187-00		U21	960-5015-00
Voice 3	(4M)	965-0187-01		U36	960-5015-00
Sound	(512K)	965-0185-00		U7	960-7001-02
Display*	(4M)	965-0183-00	A4.01	ROM 0	960-5015-00
Display*	(4M)	965-0184-00	A4.01	ROM 3	960-5015-00
Mary Shelley's Frankenstein *					
CPU	(512K)	965-0188-00	A1.03	C5	960-7001-02
Voice 1	(4M)	965-0192-00		U17	960-5015-00
Voice 2	(4M)	965-0193-00		U21	960-5015-00
Voice 3	(4M)	965-0194-00		U36	960-5015-00
Sound	(512K)	965-0191-00		U7	960-7001-02
Display*	(4M)	965-0189-00	A1.03	ROM 0	960-5015-00
Display*	(4M)	965-0190-00	A1.03	ROM 3	960-5015-00
Baywatch *		(CPU Board 520-5003-04)			
CPU	(512K)	965-0195-00	A4.00	C5	960-7001-02
Voice 1	(4M)	965-0196-00		U17	960-5015-00
Voice 2	(4M)	965-0197-00		U21	960-5015-00
Sound	(512K)	965-0199-00		U7	960-7001-02
Display*	(4M)	965-0200-00	A4.00	ROM 0	960-5015-00
Display*	(4M)	965-0201-00	A4.00	ROM 3	960-5015-00
Batman Forever *		(CPU Board 520-5003-04)			
CPU	(512K)	965-0202-00	A3.02	C5	960-7001-02
Voice 1	(4M)	965-0203-00		U17	960-5015-00
Voice 2	(4M)	965-0204-00		U21	960-5015-00
Sound	(512K)	965-0205-00		U7	960-7001-02
Display*	(4M)	965-0206-00	A3.00	ROM 0	960-5015-00
Display*	(4M)	965-0207-00	A3.00	ROM 3	960-5015-00

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

APPENDIX B

Semi-Conductors / Integrated Circuits (I.C.) / Relays Cross-Reference Table

Table №	Type	Source Number	STERN® PINBALL	N T E®	E C G®	Radio Shack®	R C A®
	RECTIFICATION, BLOCKING, DAMPENING DIODES AND/OR LIGHT EMITTING DIODES (LEDs)						
1	Diode	1N4001	112-5001-00	NTE552	ECG552	- — - — -	SK9000
	Diode	1N4004	112-5003-00	NTE116	ECG116	276-1103	SK3312
	Diode	1N5401	112-0056-00	NTE5801	ECG5801	276-1143	SK9004
	Diode	1N5404	112-5004-00	NTE5804	ECG5804	276-1144	SK9007
	Diode	T6A10L	112-5006-01	NTE5812	ECG5812	- — - — -	- — - — -
	Diode	FR302	112-5009-00	NTE588	ECG588	- — - — -	SK5014
	Diode, Signal	1N914	112-5014-00	- — - — -	- — - — -	- — - — -	- — - — -
	LED	**MT5000UR** or **TLRH180P** (T1-3/4 GaAlAs)	165-5052-00 *(old SPI Part №: 165-5100-00)*	- — - — -	- — - — -	276-066B	- — - — -
	ZENER DIODES						
2	Diode	1N4742A 12v	112-0061-00	NTE142A	ECG142A	276-563	SK12V
	Diode	1N4760B 68v	112-0062-00B	NTE5092A	ECG5092A	- — - — -	SK68V
	Diode	1N4764A 100v	112-0049-00A	NTE5096A	ECG5096A	- — - — -	SK100V
	Diode	1N5228 3.9v	112-0053-00	NTE5007A	ECG5007A	- — - — -	SK3A9
	Diode	1N5234B 6.2v	112-0047-00B	NTE5013A	ECG5013A	276-561	SK6A2
	Diode	1N5379 110v	112-0072-00	NTE5157	ECG5157	- — - — -	SK110X
	Diode	1N6267A 6.8v	112-5011-00	NTE4902	ECG4902	- — - — -	- — - — -
	Diode	1N4752A 33v	112-5010-00A	NTE147A	ECG147A	- — - — -	SK33V
	Diode	1N4736 6.8v 1w	112-5007-00	NTE5071A	ECG5071A	- — - — -	- — - — -
	TRANSISTORS - TYPE FET, NPN, PNP AND/OR SCR						
3	FET Trans.	STP20N10L	110-0106-00	NTE2987	ECG2987	- — - — -	- — - — -
	FET Trans.	STP19N06L	110-0088-00	NTE2985	ECG2985	- — - — -	- — - — -
	FET Trans.	VN02N	110-0089-00	- — - — -	- — - — -	- — - — -	- — - — -
	NPN Trans.	2N4401	110-0073-00	NTE85	ECG85	276-2009	SK3124A
	NPN Trans.	2N6427	110-0070-00	NTE48	ECG48	- — - — -	SK4906
	NPN Trans.	MJE340	110-0071-00	NTE157	ECG157	- — - — -	SK3747
	NPN Trans.	MPSA42	110-0082-00	NTE287	ECG287	- — - — -	SK3232
	NPN Trans.	2N3904	110-0069-00	NTE123AP	ECG123AP	276-2009	- — - — -
	NPN Trans.	TIP122	110-0067-00	NTE261	ECG261	276-2068	SK3896
	NPN Trans.	MJE15030	110-0101-00	NTE375	ECG375	- — - — -	SK9118
	PNP Trans.	2N5401	110-0078-00	NTE288	ECG288	- — - — -	SK3434
	PNP Trans.	MJE15031	110-0103-00	NTE292	ECG292	- — - — -	SK3441
	PNP Trans.	MJE350	110-0072-00	NTE374	ECG374	- — - — -	SK9042
	PNP Trans.	MPSA92	110-0100-00	NTE288	ECG278	- — - — -	SK3434
	PNP Trans.	TIP42	110-0068-00	NTE332	ECG332	- — - — -	SK9236
	PNP Trans.	TIP32C	110-0081-00	NTE292	ECG292	- — - — -	SK3441
	PNP Trans.	TIP36C	110-0077-00	NTE393	ECG393	- — - — -	SK3961
	SCR Trans.	2N5060	110-0074-00	NTE5400	ECG5400	276-1067	SK3950
	SCR Trans.	SCR2800B	110-0083-00	NTE5461-8	ECG5461-8	- — - — -	- — - — -
	BRIDGE RECTIFIERS (BR)			**Comments:**			
4	BR (Present)	DB3501 or CM3501	112-5000-00	For White Star I/O Bds., BR = 35 Amp @ 100v P.I.V.			
	RELAYS			**Comments:**			
5	Relay	FRL-264 D024/02CK	190-5002-00	For PPB, Power Supply, & White Star I/O Boards, Relay = 24v DC 10 Amp DPDT			
	Relay	FRL-264 D006/04CV	190-5001-00	For CPU Boards, Relay = 6v DC 5 Amp 4 Pole DT			

APPENDIX C

Production Start Date, Manual Part Nº, ROM Size & Positions and Jumper W6 Installed Note‡ (White Star Board System & S.A.M. System Only*)

	Game Name White Star Bd. System™	Production Start Date and Manual Part Nr.	CPU/Sound Board **Sound U7 512K** CPU/Sound Board **Game U210 1MB** CPU/Sound Board **Voice ROMS:**				Jumper Installed (‡ see Note)
			U17	U21	U36	U37	
29	Apollo 13 (A13)	NOV 95 780-5044-00	4MB	4MB	4MB	Not Used	n / a
30	Golden Eye	FEB 96 780-5042-00	4MB	4MB	Not Used	Not Used	n / a
31	Twister	APR 96 780-5041-00	4MB	4MB	Not Used	Not Used	n / a
32	ID4: Independence Day	JUL 96 780-5045-00	4MB	4MB	Not Used	Not Used	n / a
33	Space Jam	OCT 96 780-5043-00	4MB	4MB	4MB	Not Used	n / a
34	The Star Wars Trilogy - Sp. Ed.	FEB 97 780-5056-00	4MB	4MB	Not Used	Not Used	n / a
35	The Lost World: Jurassic Park	JUN 97 780-5053-00	4MB	4MB	Not Used	Not Used	n / a
36	The X-Files	AUG 97 780-5046-00	4MB	4MB	Not Used	Not Used	n / a
37	Starship Troopers	NOV 97 780-5059-00	4MB	4MB	4MB	Not Used	n / a
38	Viper Night Drivin'	FEB 98 780-5035-00	4MB	4MB	4MB	4MB	n / a
39	Lost In Space	JUN 98 780-5060-00	4MB	4MB	4MB	4MB	n / a
40	Godzilla	SEP 98 780-5040-00	4MB	4MB	4MB	4MB	n / a
41	South Park	JAN 99 780-5071-00	8MB	8MB	8MB	8MB	W6
42 a	Harley-Davidson®	AUG 99 780-5067-01	8MB	8MB	8MB	8MB	W6
42 b	Harley-Davidson®2nd Ed.	SEP 02 780-5067-10	8MB	8MB	8MB	8MB	W6
42 c	Harley-Davidson® 3rd Ed.	OCT 04 780-5087-00	8MB	8MB	8MB	8MB	W6
43 a	Striker Xtreme	MAR 00 780-5068-01	8MB	8MB	8MB	8MB	W6
43 b	NFL	OCT 00 780-50**73**-00	8MB	8MB	8MB	8MB	W6
44	Sharkey's Shootout	JUL/OCT 00 780-5072-01	8MB	8MB	8MB	Not Used	W6
45	High Roller Casino	JAN 01 780-5065-00	8MB	8MB	8MB	8MB	W6
46	Austin Powers™	MAY 01 780-5074-00	8MB	8MB	8MB	8MB	W6
47	MONOPOLY®	SEP 01 780-5075-00	8MB	8MB	8MB	Not Used	W6
48	Playboy	FEB 02 780-5076-00	8MB	8MB	8MB	8MB	W6
49	RollerCoaster Tycoon™	AUG 02 780-5078-00	8MB	8MB	8MB	Not Used	W6
50	The Simpsons™ Pinball Party	JAN 03 780-5077-00	8MB	8MB	8MB	8MB	W6
51	T3®: Rise of the Machines™	MAY 03 780-5079-00	8MB	8MB	8MB	8MB	W6
52	The Lord of the Rings™	NOV 03 780-5080-00	8MB	8MB	8MB	8MB	
53	Ripley's Believe It or Not!®	APR 04 780-5081-00	8MB	8MB	8MB	8MB	

**** Note:*** *For complete Appendix Information for Games **Laser War** through **Batman Forever**, see any Service Game Manual between **Apollo 13** through **Ripley's Believe It or Not!** or on-line at our website www.sternpinball.com/parts.htm; also available on CD-R, 970-2003-00 (**The Simpsons™ Pinball Party**, **T3®** and **The Lord of the Rings™**).*

‡ *Additional Information for **Installed** Jumper (above games 41-51):*

- *Installed **W6** so 8MB ROMS can be utilized. See the **CPU/Sound Board Schematic** (Sheet 2 of 3, Address Location 3E) in the games' Service Game Manual. Games 52 - 57 CPU/Sound Board differ than <51 (See Appendix D).*

See **Apdx. A** for more detailed information on **Pinball Game Firmware** *(ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).*

	Game Name White Star Board System™	Production Start Date and Manual Part Nr.	CPU/Sound Board **Sound U7 512K** CPU/Sound Board **Game U210 1MB** CPU/Sound Board **Voice ROMS:**			
			U17	U21	U36	U37
54	Elvis®	AUG 04 780-5084-00	8MB	8MB	8MB	8MB
55	The Sopranos℠	FEB 05 780-5085-00	8MB	8MB	8MB	8MB
56	NASCAR®	JUL 05 780-5086-00	8MB	8MB	8MB	8MB
57	Grand Prix	SEP 05 780-5091-00	8MB	8MB	8MB	8MB

See **Apdx. A** for more detailed information on **Pinball Game Firmware** *(ROM Name, Size, Part Numbers, USA Version & Checksum and Board Locations).*

	Game Name S.A.M. System	Production Start Date and Manual Part Nr.	S.A.M. System CPU/Sound Board Boot EPROM **U9** 965-BOOT-SAM *(Programmed)*			
58	World Poker Tour™ (WPT)	JUN 06 780-5088-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
59	The Simpsons™ Kooky Carnival	APR 06 780-5090-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
60	©Disney's Pirates of the Caribbean	AUG 06 780-5092-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
61	Famil Guy™	DEC 06 780-5093-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9
62	Spider-Man™	MAY 07 780-5094-00	8MB	B-02 V2.1+	chksum $F625	LOC: U9

Games 58 – current, S.A.M. System : CPU/Sound & I/O Power Driver PCBs differ than White Star *(previous Games 29 – 57)*; Disp. Controller Not Required.

APPENDIX D

Board Type (White Star Board System* Only) Table

Game Name	Flipper	I/O Power Driver	CPU/Sound Stereo	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application
Apollo 13	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
	Miscellaneous PC Boards:	Light Boards 520-5130-01, -04 & -05 Magnet Interface, 7-Segment Display & Light Bd. 520-5130-06 Magnet Driver Board 520-5130-02 Switch Membrane Board 520-5130-03				Relay Board 520-5010-00			
Golden Eye	520-5080-00 2-Flipper	520-5137-00	520-5136-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
	Miscellaneous PC Boards:	Light Boards 520-5128-05 through -08		Mag. Processor X2 Driver Bd. 520-5143-00		Relay Board 520-5010-00			

GAMES HEREON NO LONGER REQUIRE THE FLIPPER BOARD WITH THE WHITE STAR BOARD SYSTEM™

Game Name	I/O Power Driver	CPU/Sound Mono	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application	Misc OPTO & App.
Twister	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Light Boards 520-5145-01 through -07		Mag. Drv. Bd. 520-5143-00	Relay Board 520-5010-00				
Independence Day (ID4)	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Light Boards 520-5149-01 through -10		Servo Mtr. Bd. 520-5152-00		520-5082-00 Long Hop OPTO	520-5083-00 Long Hop OPTO	Alien Head Enter	
Space Jam	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	2X 7-Segment Display Board 520-5153-00							
The Star Wars Trilolgy - Special Ed.	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00							
The Lost World: J.P.	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	520-5162-00 2-Pos. Motor Sensor on Snagger Motor
	MiscellaneousPC Boards:	DC Relay Bd. 520-5066-00	Shaker Mtr. Bd. 520-5065-00						
The X-Files	520-5137-01	520-5136-10	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-01	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor Sensor on File Cab. Motor
	Miscellaneous PC Boards:					520-5082-00 Long Hop OPTO	520-5083-00 Long Hop OPTO	File Cabinet Enter	
Starship Troopers	520-5137-01	520-5136-15	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-02	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	4X 7-Segment Display Board 520-5166-00				520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	L/R Orbit Lane Enter	
Viper Night Drivin'	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00				520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Jump Ramp	
Lost In Space	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00							
Godzilla	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Shaker Mtr. Bd. 520-5065-00							
South Park	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	5-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:					520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Kenny Under Trough Enter	
Harley-Davidson® 1st-3rd* Editions	520-5137-01	520-5136-16 *520-5300-00*	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	Relay Board 520-5010-00	Shaker Mtr. Bd. 520-5065-00	Diode Board 520-5146-00		520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Motorcycle Enter	
Striker Xtreme (NFL)	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5155-00 3-Pos. Motor Sensor on Goalie Motor
	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Relay Board 520-5010-00	Diode Board 520-5146-00	for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Goalie Under-Trough Enter	
Sharkey's Shootout	520-5137-64	520-5136-64	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor Sensor on ?-Ball Motor
	MiscellaneousPC Boards:	Relay Board 520-5010-00	Sol. Exp. Bd. 520-5192-00						
High Roller Casino	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5194-00 4-Pos. Motor Sensor on Roulette Wheel Motor
						520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Ball Lock under Roulette	
	Miscellaneous PC Boards:	Dot Display (5X7) in Slot Mach. 520-5197-00			for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5196-00 3-Pos. OPTO	520-5195-00 3-Pos. OPTO	Up/Dn Ramp in Slot Mach.	
Austin Powers™	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5212-00 Pulse-Stretcher OPTO on Spini-Me
	MiscellaneousPC Boards:	Relay Bd. (X3) 520-5010-00			for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Time Machine Ramp	
MONOPOLY®	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	MiscellaneousPC Boards:	DC Relay Bd. 520-5066-00	Mini-Dot Display (3 by 5X7) 520-5197-00 (Electric C° Sign)		for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5218-00 4-Pos. OPTO	520-5210-00 4-Pos. OPTO	Bank Door	

Table continued on the next page.

APPENDIX D

Board Type (White Star Board System* & S.A.M. System** Only) Table

Game Name	I/O Power Driver	CPU/Sound (old & new)	Disp. Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Application	Misc OPTO & App.
Playboy	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Relay Bd. 520-5010-00		for UK ONLY> Solenoid Expander Bd. 520-5192-00				
RollerCoaster Tycoon™	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	520-5222-00 1-Position Switch Detect on Wheel Spin
	Miscellaneous PC Boards:	DC Relay Bd. 520-5066-00	Mini-Dot Display (3 by 5X7) 520-5221-00 (Ramp Enter Sign)		for UK ONLY> Solenoid Expander Bd. 520-5192-00	520-5082-00 Long Hop OPTO	520-5083-01 Long Hop OPTO	Behind 1-Bank Drop Target	
The Simpsons™ Pinball Party	520-5137-01	520-5136-16	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:	LED Bd. 520-5219-00	Color Dot Display (4 by 5X7) 520-5225-00 (TV Set)		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
Terminator® 3: Rise of the Machines™	520-5137-01	**520-5136-16**	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	515-7307-00 Single OPTO	515-7308-00 Single OPTO	TXCannon Trough	
The Lord of the Rings™	520-5137-01	***New* 520-5300-00**	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6746-00 (White Trans.) 500-6747-00 (Black Rec.)
	Miscellaneous PC Boards:	19-LED PCB 520-5242-00	OPTO Transmitter / Receiver Amplifier PCB 520-5239-00		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	515-7307-00 Single OPTO	515-7308-00 Single OPTO	Orthanc Tower Trough	
Ripley's Believe It or Not!®	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trnscvr
	Miscellaneous PC Boards:	520-5236-00 X3 Dot Display	OPTO Transmitter / Receiver Amplifier PCB 520-5239-01		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01	520-5234-00 3-Pos. OPTO	520-5234-00 3-Pos. OPTO	Vari-Target	520-5235-03 X3 Aux. Drvr
Elvis®	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
The Sopranos℠	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	
	Miscellaneous PC Boards:				for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
NASCAR® and [NDSE]	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trans. (Qty. 16) Switch Detect.
	Miscellaneous PC Boards:	520-5235-03 X3 Aux. Drvr	OPTO Transmitter / Receiver Amplifier PCB 520-5239-01		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				
Grand Prix	520-5137-01	520-5300-00	520-5138-00	520-5052-00 128 X 32 Dots	520-5055-03	515-0173-00 Dual OPTO	515-0174-00 Dual OPTO	4-Ball Trough over Up-Kicker	500-6775-00 OPTO Trans. (Qty. 16) Switch Detect.
	Miscellaneous PC Boards:	520-5235-03 X3 Aux. Drvr	OPTO Transmitter / Receiver Amplifier PCB 520-5239-01		for UK ONLY ◀◀◀ Aux. Driver Bd. 520-5068-01				

Game Name	I/O Power Driver**	CPU / Sound**	Disp. Power Supply	Dot Matrix Display	Dual OPTO Transmitter	Dual OPTO Receiver	Dual OPTO Transceiver	OPTO Transceiver Miscellaneous
World Poker Tour™ (WPT)	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 4 Switch Pairs (Qty. 8)	520-5251-00 'U' 1/per PCB Jail Bars Up Ace/Hole Mech
	Miscellaneous **PCBs :**	520-5254-00 50V Step-Up Drv	520-5250-14 14LED 5X7 Disp.	520-5239-01 OPTO Amplifier	520-5247-00 Ace/Hole Mech	520-5248-00 Ace/Hole Mech		520-5252-04 'U' 4/per PCB Drop Targets 4- & 8- Banks
The Simpsons™ Kooky Carnival	**520-5249-00** Back Door	**520-5246-00** Back Door	520-5138-00 Cabinet Rear	520-5052-00 128 X 32 Dots			**520-5253-00-ASY** Coin Drop (Qty. 11)	
	Miscellaneous **PCBs :**	515-5742-00 Shaker PCB	500-6700-00 Relay *(incl. Wiring + Conn.)*					
©Disney's Pirates of the Caribbean	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 5 Switch Pairs (Qty. 10)	
	Miscellaneous **PCBs :**	520-5239-01 OPTO Amp. (X3)	511-5024-03 Relay *(incl. Wiring + Conn.)*					
		520-5238-00 : H-E-A-R-T LED PCB						
Family Guy™	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 3 Switch Pairs (Qty. 6)	520-5252-01 'U' 1/per PCB Drop Target 1-Bank
	Miscellaneous **PCBs :**	520-5239-01 OPTO Amp. (X2)	520-5261-00 Stepper Motor	511-5042-01 Trgt. Sensor (X2)			500-6775-01 1 Switch Pair (Qty. 2)	520-5252-04 'U' 4/per PCB Drop Target 4-Bank
		511-5046-00 : Mini Playfield Lamp PCB						
Spider-Man™	**520-5249-00** Backbox	**520-5246-00** Backbox	520-5138-00 Backbox	520-5052-00 128 X 32 Dots	515-0173-00 4-Ball Trough	515-0174-00 4-Ball Trough	500-6775-00 3 Switch Pairs (Qty. 6)	
	Miscellaneous **PCBs :**	520-5239-01 OPTO Amp. (X2)						

APPENDIX D

Board Type Table

Game Name	Flipper	Sound	Power Supply	Display X-Digit
• Laser War	2-Flipper **Board Not Required**	***initial:*** 520-5002-00 ***replaced with:*** 520-5002-02 *520-5002-01 was not used.*	520-5000-00	Master: 520-5004-00 plus: 520-5005-00 (Qty. 2): 7 Digit Alpha/Numeric 520-5006-00 (Qty. 2): 7 Digit Numeric 520-5007-00 (Qty. 1): 4 Digit Numeric
• Secret Service • Torpedo Alley	3-Flipper **Board Not Required**	520-5002-02		520-5014-01 7 Digit Alpha/Numeric Combined
• Time Machine	2-Flipper **Board Not Required**			
• Playboy 35th Anniversary *	520-5033-00 2-Flipper *(*only for 100 games of Playboy 35th Anniv. & ABC Mon. Night Football)*			520-5030-00 16 Digit Alpha/Numeric Combined
• ABC Monday Night Football * • *Robocop* • *Phantom of the Opera* • *Back to the Future*				
• The Simpsons		520-5002-**03**		

Game Name	Flipper	Sound	Power Supply	Dot Matrix Display	Display Controller	OPTO Transmitter	OPTO Receiver	OPTO Apllication
• Checkpoint • Teenage Mutant Ninja Turtles	520-5033-00 2-Flipper	520-5002-03	520-5047-00	520-5042-00 128 X 16				
• Batman • Star Trek 25th Anniv. • Hook		520-5050-01						
• Lethal Weapon 3			520-5047-01	520-5052-00 128 X 32	520-5055-00			
• Star Wars • Rocky & Bull-winkle & Friends		520-5050-02						
• Jurassic Park	520-5076-00 3-Flipper		520-5047-02					
• Last Action Hero	520-5070-00 2-Flipper	520-5050-03						
• Tales from the Crypt	520-5076-00 3-Flipper				520-5055-01			
• The Who's Tommy		520-5077-00						
• WWF Royal Rumble	**520-5070 / 5080 -00** 4-Flipper (2X2)							
• Guns N' Roses	520-5076-00 3-Flipper							
• Maverick		520-5050-03	520-5047-03	520-5075-00 192 X 64	520-5092-01	520-5102-00 Single OPTO	520-5103-00 Single OPTO	Paddle Boat Wheel Enter
• Mary Shelley's Frankenstein	520-5076-00 3-Flipper	520-5077-00						
• Baywatch	**520-5070 / 5080 -00** 4-Flipper (2X2)	520-5126-02				520-5124-00 Single OPTO	520-5125-00 Single OPTO	5-Ball Trough over Up-Kicker
• Batman Forever	520-5076-00 3-Flipper					520-5124-00 Single OPTO	520-5125-00 Single OPTO	4-Ball Trough over Up-Kicker

Miscellaneous Boards (Lamp Boards & Relay Boards) not listed above can be found in each individual game manual.

APPENDIX E

Flipper Coil (White Star Board System* & S.A.M. System** Only) Table

Typical Coil Diode 1N4004 unless noted otherwise (Diode Top = above lugs next to windings; Diode Below (Bottom) = under lugs opposite of windings).

STANDARD COILS (TYPICAL APPLICATIONS)		
Ga.-Turn	**Res (Ω)**	**SPI Part Number and Comments**
20-400	1.0 Ω	090-5021-*use* : **-00** Diode Top
22-500	1.7 Ω	090-5017-*use* : -00 Diode Top
22-600	2.2 Ω	090-5017-*use* : -0B Diode Below // **-0T** Diode Top
23-700	3.1 Ω	090-5022-*use* : -0B Diode Below // **-0T** Diode Top
23-750	3.4 Ω	090-5019-*use* : -00 Diode Top
23-800	3.6 Ω	090-5001-*use* : -0B Diode Below // **-0T** Diode Top // **-NL** No Lugs 11" Leads // **-ND** No Diode
23-840	4.0 Ω	090-5005-*use* : -00 Diode Top
23.5-765	3.6 Ω	090-5037-*use* : -03 Diode Top
24-900	5.0 Ω	090-5002-*use* : -02 Diode Top // **-10** No Lugs 14" Leads
24-940	5.5 Ω	090-5036-*use* : -0B Diode Below // **-0T** Diode Top *use* **090-5051-01** No Lugs 11" Leads
25-1240	9.3 Ω	090-5034-*use* : -00 Diode Below
26-1200	10.3 Ω	090-5044-*use* : -0B Diode Below // **-0T** Diode Top // **-NL** No Lugs 11" Leads // **-ND** No Diode
27-1300	14.2 Ω	090-5003-*use* : -0T Diode Top
27-1400	14.7 Ω	090-5015-*use* : -00 Diode Below
27-1400		**511-5031-00** *Special App.: No Diode / Lugs + Conn.*
27-1500	16.3 Ω	090-5004-*use* : -0B Diode Below // **-0T** Diode Top
29-2000	33.6 Ω	090-5016-*use* : -00 Diode Top
LARGE, MEDIUM & MINI COILS (MAGNET APPLICATIONS)		
20.5-480	2.9 Ω	090-5064-*use* : -02 No Lugs *or* Core; 14" Leads // Large
22-650	4.3 Ω	090-5042-*use* : -00 No Lugs *or* Core; 6" Leads // Large **-01** No Lugs *or* Core; 12" Leads // Large
24-780	8.0 Ω	090-5061-*use* : -00 No Lugs *or* Core; 6" Lds. // Medium
29-1000	15.2 Ω	090-5059-*use* : -00 Lugs + Diode + Magnet Core // Mini
31-1500	52.0 Ω	090-5054-00 : Straight Lugs + Diode + Mag Core // Mini 090-5055-00 : 90° Lugs + Diode + Magnet Core // Mini

Please Note: *Ohm values may vary **+ / – .03** depending on meter calibration.*

Ordering Note: *Coils typically should not come with Coil Sleeves.* ***IF A SLEEVE EXISTS****, ensure it is the correct sleeve for the application usage. For the correct Coil Sleeve, refer to the Game Assembly Drawing the coil exists on and order separately.*

LARGE COILS (FLIPPERS & SPECIAL APPLICATIONS)		
Ga.-Turn	**Res (Ω)**	**SPI Part Number and Comments**
21-900	*call* Ω	090-5020-*use* : **-01** 3-Lugs + 1N4004 & 1N5404 Diodes **-10** Diode Top <BROWN><RED>
22-750 / 30-2600	2.6 Ω / 92.0 Ω	090-5011-*use* : **-00 DUAL WND COIL** // 3-Lugs Diode x2
22-900	3.45 Ω	090-5020-*use* : -20T Diode Top <YELLOW> // **-20-ND** No Diode
22-1080	4.2 Ω	090-5032-*use* : -0B D. Below // **-0T** D. Top <YEL-GRN> **-NL** No Diode
23-620 / 30-2600	2.4 Ω / 75.0 Ω	090-5006-*use* : -00 **DUAL WND COIL** // 3-Lugs Diode x2
23-700 / 30-2600	3.0 Ω / 83.5 Ω	090-5013-*use* : -00 **DUAL WOUND COIL** // Diode Top
23-800 / 30-2600	2.4 Ω / 90.5 Ω	090-5012-*use* : -00 **DUAL WOUND COIL** // Diode Top
23-900	4.05 Ω	090-5020-*use* : -30 Diode Top <GREEN>
23-1100	5.1 Ω	090-5030-*use* : -0T Diode Top <ORANGE> **-ND** No Diode
23-1200	7.1 Ω	090-5008-*use* : -00 Diode Top <BLACK>
23-1500	4.4 Ω	090-5062-*use* : -00 Diode Top <BLUE>
24-1570	9.5 Ω	090-5025-*use* : -00 Diode Top <BLUE>
25-1400	*call* Ω	090-5067-*use* : -0T Diode Top <RED>
25-1600	*call* Ω	090-5068-*use* : -0T Diode Top <WHITE>
25-1800	13.8 Ω	090-5041-*use* : -0T Diode Top <BLUE-GREEN>
MINI COILS (RESET / TRIP APPLICATIONS)		
27-950	*call* Ω	090-5046-*use* : -01 Diode Top
28-1050	11.5 Ω	090-5046-*use* : -00 Diode Top
27-880	*call* Ω	500-6976-01 No Lugs *or* Diode + 6" Leads & Conn.
31-590	*call* Ω	090-5010-*use* : -00 Diode Top
32-1250	35.0 Ω	**515-6916-01 :** *includes Flap & Screw* <YELLOW>
32-1800	50.2 Ω	090-5031-*use* (515-6110-00) : -0B Diode Below // **-0T** Diode Top *use 515-# to include mounting & armature brackets*
33-1590	59.0 Ω	**515-6916-00 :** *includes brackets* <WHITE>

Flipper Coil (White Star Board System* Only) Table

GAME NAME	Nº of Flippers	FLIPPERS SPI Nº / GAUGE-TURNS / Color LOWER LEFT	FLIPPERS SPI Nº / GAUGE-TURNS / Color LOWER RIGHT	FLIPPERS no E.O.S. Switch SPI Nº / GAUGE-TURNS / Color UPPER LEFT	FLIPPERS no E.O.S. Switch SPI Nº / GAUGE-TURNS / Color UPPER RIGHT
**** Note:*** *For complete Appendix Information for Games **Laser War** through **Batman Forever**, see any Service Game Manual between **Apollo 13** through **Ripley's Believe It or Not!**; or order CD-R, 970-2003-00 (**The Simpsons™ Pinball Party, Terminator® 3** and **The Lord of the Rings™**).*					
Apollo 13	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Golden Eye	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Twister	2	090-5020-20T **22-900 -YELLOW-**	090-5032-0T **22-1080 -YEL-GRN-**	Not Used	Not Used
ID4: Independence Day	3	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5020-30 **23-900 -GREEN-**
Space Jam †	2	090-5032-0T **22-1080 -YEL-GRN-**	090-5020-20T **22-900 -YELLOW-**	Not Used	Not Used
The Star Wars Trilogy - Special Edition †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lost World: Jurassic Park †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The X-Files †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Starship Troopers †	3	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	090-5032-0T **22-1080 -YEL-GRN-**
Viper Night Drivin' †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used
Lost In Space †	2	090-5030-0T **23-1100 -ORANGE-**	090-5032-0T **22-1080 -YEL-GRN-**	Not Used	Not Used
Godzilla †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
South Park †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used

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

Table continued on the next page.

APPENDIX E

Flipper Coil (White Star Board System* & S.A.M. System** Only) Table

GAME NAME	№ of Flippers	FLIPPERS w/E.O.S. Switch		FLIPPERS no E.O.S. Switch	
		SPI № / GAUGE-TURNS / Color		SPI № / GAUGE-TURNS / Color	
		LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Harley-Davidson® † *and 1st through 3rd Editions*	2	090-5032-0T **22-1080 -YEL-GRN-**	090-5030-0T **23-1100 -ORANGE-**	Not Used	Not Used
Striker Xtreme (NFL) †	3	090-5032-0T **22-1080 -YEL-GRN-**	090-5030-0T **23-1100 -ORANGE-**	090-5030-0T **23-1100 -ORANGE-**	Not Used
Sharkey's Shootout †	3	090-5030-0T **23-1100 -ORANGE-**	SAME	090-5030-0T **23-1100 -ORANGE-**	Not Used
High Roller Casino †	2	090-5020-20T **22-900 -YELLOW-**	090-5032-0T **22-1080 -YEL-GRN-**	Not Used	Not Used
Austin Powers™ †	2	090-5020-30 **23-900 -GREEN-**	090-5030-0T **23-1100 -ORANGE-**	Not Used	Not Used
MONOPOLY® †	3	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5062-0T **23-1500 -BLUE-**
Playboy †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used
RollerCoaster Tycoon™ †	4	090-5032-0T **22-1080 -YEL-GRN-**	SAME	090-5067-0T **25-1400 -RED-**	090-5068-0T **25-1600 -WHITE-**
The Simpsons™ Pinball Party †	6** (5 with Flipper Bats)	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5030-0T **23-1100 -ORANGE-**
		** *The Homer Head Assembly is affixed to an Upr. Rt. Style Flipper (no E.O.S. Switch):*		Flippers (Mini-Bats) on 2nd Level Playfield:	
			** 090-5020-20T **22-900 -YELLOW-**	090-5041-00T **25-1800 -BLU-GRN-**	090-5025-00 **24-1570 -BLUE-**
Terminator® 3: Rise of the Machines™ †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lord of the Rings™ †	2	090-5020-20T **22-900 -YELLOW-**	SAME	Not Used	Not Used
Ripley's Believe It or Not!® †	3	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5067-00T **25-1400 -RED-**
Elvis® †	4	090-5020-20T **22-900 -YELLOW-**	SAME	090-5020-30 **23-900 -GREEN-**	SAME
The Sopranos℠ †	2	090-5032-0T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
NASCAR® and [NDSE] †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used
Grand Prix †	2	090-5030-0T **23-1100 -ORANGE-**	SAME	Not Used	Not Used

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

** S.A.M. System Games **DO NOT REQUIRE DIODES**. If you use a coil from your stock which has a diode, remove it **ONLY FOR** S.A.M. System Games.

World Poker Tour™ (WPT)**	4	090-5032-ND **22-1080 [NO DIODE]**	SAME	090-5030-ND **23-1100 [NO DIODE]**	SAME
©Disney's Pirates of the Caribbean**	2	090-5030-ND **23-1100 [NO DIODE]**	SAME	Not Used	Not Used
Family Guy™ **	3 Norm.	090-5030-ND **23-1100 [NO DIODE]**	SAME	090-5062-ND **23-1500 [NO DIODE]**	Not Used
	2 Mini	090-5046-01-ND **27-950 [NO DIODE]**	SAME		
Spider-Man™ **	3	090-5032-ND **22-1080 [NO DIODE]**	SAME	Not Used	090-5032-ND **22-1080 [NO DIODE]**

APPENDIX E

Generic Coil Cross-Reference Guide † ‡

Flipper Coil Table ‡ ††

GAME NAME	Nº of Flippers	FLIPPERS w/E.O.S. Switch SPI Nº / GAUGE-TURNS / Color		FLIPPERS no E.O.S. Switch SPI Nº / GAUGE-TURNS / Color	
		LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Laser War ‡	2	090-5011-00 **22-750 / 30-2600**	SAME	Not Used	Not Used
Secret Service ‡	3	090-5006-00 **23-620 / 30-2600**	SAME	Not Used	090-5006-00 **23-620 / 30-2600**
Torpedo Alley ‡	3	090-5011-00 **22-750 / 30-2600**	090-5013-00 **23-700 / 30-2600**	Not Used	090-5012-00 **23-800 / 30-2600**
Time Machine ‡	2	090-5011-00 **22-750 / 30-2600**	SAME	Not Used	Not Used
‡ These coils are dual-wound.					
Playboy 35th Anniversary ††	2	090-5020-02 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
ABC Monday Night Football ††	2	090-5020-02 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
†† A very small % of these games used a 090-5020-20 coil which used a proto-type Solid State Flipper System. The two types of coils both are 22-900 coils; the only difference is the addition of the 1N5404 Diode on the (-02) coils which was used in the Deger Design.					
Robocop	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Phantom of the Opera	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Back to the Future	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
The Simpsons	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Checkpoint	2	090-5020-20 **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Teenage Mutant Ninja Turtles	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Batman	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Star Trek 25th Anniversary	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Hook	2	090-5030-00 **23-1100 -ORG-ORG-**	090-5020-30 **23-900 -GRN-GRN-**	Not Used	Not Used
Lethal Weapon 3	2	090-5030-00 **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
Star Wars	2	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Rocky & Bullwinkle & Friends	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Jurassic Park	3	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	090-5030-00 **23-1100 -ORG-ORG-**

Table continued on the next page.

APPENDIX E

Flipper Coil Table †

GAME NAME	Nº of Flippers	FLIPPERS w/E.O.S. Switch		FLIPPERS no E.O.S. Switch	
		SPI Nº / GAUGE-TURNS / Color		SPI Nº / GAUGE-TURNS / Color	
		LOWER LEFT	LOWER RIGHT	UPPER LEFT	UPPER RIGHT
Last Action Hero	2	090-5020-30 **23-900 -GRN-GRN-**	SAME	Not Used	Not Used
Tales from the Crypt	3	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	090-5041-00 **25-1800 -BLU-GRN-**
The Who's Tommy	3	090-5020-30 **23-900 -GRN-GRN-**	SAME	090-5041-00 **25-1800 -BLU-GRN-**	Not Used
WWF Royal Rumble	4	090-5032-00 **22-1080 -YEL-GRN-**	SAME	090-5041-00 **25-1800 -BLU-GRN-**	SAME
Guns N' Roses	3	090-5032-00 **22-1080 -YEL-GRN-**	SAME	090-5030-00 **23-1100 -ORG-ORG-**	Not Used
Maverick	3	090-5032-00 **22-1080 -YEL-GRN**	SAME	Not Used	090-5032-00 **22-1080 -YEL-GRN-**
Mary Shelley's Frankenstein	3	090-5030-00 **23-1100 -ORG-ORG-**	SAME	Not Used	090-5030-00 **23-1100 -ORG-ORG-**
Baywatch	4	090-5030-00 **23-1100 -ORG-ORG-**	090-5020-30 **23-900 -GRN-GRN-**	090-5025-00 **24-1570 -See Note-**	090-5030-00 **23-1100 -ORG-ORG-**
Batman Forever	3	090-5032-00 **22-1080 -YEL-GRN-**	090-5020-20 **22-900 -YEL-YEL-**	Not Used	090-5020-30 **23-900 -GRN-GRN-**
Apollo 13	2	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Golden Eye	2	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Twister	2	090-5020-20 **22-900 -YEL-YEL-**	090-5032-00 **22-1080 -YEL-GRN-**	Not Used	Not Used
ID4: Independence Day	3	090-5032-00 **22-1080 -YEL-GRN-**	SAME	Not Used	090-5020-30 **23-900 -GRN-GRN-**
Space Jam †	2	090-5032-00T **22-1080 -YEL-GRN-**	090-5020-20T **22-900 -YEL-YEL-**	Not Used	Not Used
The Star Wars Trilogy - Special Edition †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lost World: Jurassic Park †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The X-Files †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
Starship Troopers †	3	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	090-5032-00T **22-1080 -YEL-GRN-**
Viper Night Drivin' †	2	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
Lost In Space †	2	090-5030-00T **23-1100 -ORG-ORG-**	090-5032-00T **22-1080 -YEL-GRN-**	Not Used	Not Used
Godzilla †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
South Park †	2	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
Harley-Davidson® † *and* Harley-Davidson® 2nd Ed. †	2	090-5032-00T **22-1080 -YEL-GRN-**	090-5030-00T **23-1100 -ORG-ORG-**	Not Used	Not Used
Striker Xtreme (NFL) †	3	090-5032-00T **22-1080 -YEL-GRN-**	090-5030-00T **23-1100 -ORG-ORG-**	090-5030-00T **23-1100 -ORG-ORG-**	Not Used
Sharkey's Shootout †	3	090-5030-00T **23-1100 -ORG-ORG-**	SAME	090-5030-00T **23-1100 -ORG-ORG-**	Not Used
High Roller Casino †	2	090-5020-20T **22-900 -YEL-YEL-**	090-5032-00T **23-1080 -YEL-GRN-**	Not Used	Not Used
Austin Powers™ †	2	090-5020-30 **23-900 -GRN-GRN-**	090-5030-00T **23-1100 -ORG-ORG-**	Not Used	Not Used
MONOPOLY® †	3	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5062-00T **23-1500 -BLU-BLU-**
Playboy †	2	090-5030-00T **23-1100 -ORG-ORG-**	SAME	Not Used	Not Used
RollerCoaster Tycoon™ †	4	090-5032-00T **22-1080 -YEL-GRN-**	SAME	090-5067-00T **25-1400 -RED-RED-**	090-5068-00T **25-1600 -WHT-WHT**
The Simpsons™ Pinball Party †	6* (5 with Flipper Bats)	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5030-00T **23-1100 -ORG-ORG-**
		** The Homer Head Assembly is affixed to an Upr. Rt. Style Flipper (no E.O.S. Switch):*		**Flippers (Mini-Bats) on 2nd Level Playfield:**	
			* 090-5020-20T **22-900 -YEL-YEL-**	090-5041-00T **25-1800 -BLU-GRN-**	090-5025-00T **24-1570 -See Note-**
Terminator® 3: Rise of the Machines™ †	2	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	Not Used
The Lord of the Rings™ †	2	090-5020-20T **22-900 -YEL-YEL-**	SAME	Not Used	Not Used
Ripley's Believe It or Not!® †	3	090-5032-00T **22-1080 -YEL-GRN-**	SAME	Not Used	090-5067-00T **25-1400 -RED-RED-**

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

APPENDIX F

Motor Specification (White Star Board System* Only) Table

Game Name	Function	Specifications	Part Numer
Apollo 13	Rocket Up/Down Movement	Bowman Motor 24VAC 60Hz 3W 6 RPM CCW	515-6383-00 *incl. Connector*
	Moon Unit Rotational Orbit	Multi Products Motor 24VAC 50/60Hz 3W 6 RPM CCW	515-6487-00 *incl. Connector*
	Shaker	Johnson Motor *(Vibrator)* 10.5VDC 10 AMP 2950 RPM CW	041-5029-**00** *MOTOR ONLY*
Golden Eye	Satellite Left/Right Movement	Bowman Motor 24VAC 60Hz 3W 6 RPM CW	515-6528-00 *incl. Connector*
Twister	Spinning Disc with Magnet	Multi Products Motor 24VAC *(041-5026-00)* 50/60Hz 3W 325 RPM CCW	515-6347-00 *incl. Connector*
	Backbox Fan (Tornado Wind)	Multi Products Motor 24VAC *(041-5052-00)* 50/60Hz 3W 3600 RPM CW	515-6531-00 *incl. Connector*
ID4: Independence Day	Alien Head Open/Close Movement	Servo Motor *(94322)*	041-5045-00 *MOTOR ONLY*
SPACE JAM (NO MOTOR USED)			
The Star Wars Trilogy - S.E.	X-Wing Left/Right Movement	Bowman Motor 24VAC *(041-5058-00)* 60Hz 3W 10 RPM CCW	515-6383-01 *incl. Connector*
The Lost World: Jurassic Park	Snagger & Center Link Lift Up/Down Movement	Multi Products Motor 20VDC *(041-5059-03)* 9 RPM Non-Directional	515-6715-03 *incl. Connector*
	Shaker	Johnson Motor *(Vibrator)* 10.5VDC 10 AMP 2950 RPM CW	041-5029-**00** *MOTOR ONLY*
The X-Files	X-File Cabinet Lift Up/Down Movement	Multi Products Motor 20VDC 9 RPM CCW	041-5057-00 *MOTOR ONLY*
Starship Troopers	Warrior Bug Forward/Reverse Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W *(041-5062-00)*, Series 36000: 1.4"ø *(Non-Captive Shaft **not included**)* HSI #36864-12 *(Unipolar)* Travel per Step: .004 Step Angle: 15°	515-6794-00 *incl. Connector* **Requires 7" Shaft:** 530-5503-00
VIPER NIGHT DRIVIN' (NO MOTOR USED)			
Lost In Space	Spinning Disc with Magnet	Multi Products Motor 24VAC *(041-5046-00)* 50/60Hz 3W 325 RPM CCW	515-6347-00 *incl. Connector*
Godzilla	Shaker ‡	Multi #3811 0630 Motor (Vibrator) 12VDC 3100 RPM CW *(w/DRL PTS)* ‡	041-5029-**01** *MOTOR ONLY*
SOUTH PARK (NO MOTOR USED)			
Harley-Davidson® *1st through 3rd Editions*	Shaker ‡	Multi #3811 0630 Motor (Vibrator) 12VDC 3100 RPM CW *(w/DRL PTS)* ‡	041-5029-**01** *MOTOR ONLY*
	Motorcycle Lift Up/Down Movement	Autotrol 24VAC *(041-5072-02)* 20 RPM CCW	515-7025-00 *incl. Connector*
Striker Xtreme (NFL)	Goalie (Linebacker) Left to Right Movement	Multi #3590 12VDC *(041-5075-00)* 60 RPM	515-7071-00 *incl. Connector*
Sharkey's Shootout	Mystery Ball Rotating Movement	Hankscraft Motor Model-E 24VAC *(041-5076-00)* 50/60Hz 3W 20 RPM CW	515-7095-00 *incl. Connector*
High Roller Casino	Roulette Wheel Rotating Movement	Multi Products Motor 20VDC *(041-5078-00)* 17 RPM CCW	515-7153-00 *incl. Connector*
	Up/Dn. Ramp in Slot Mach. Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W *(041-5062-00)*, Series 36000: 1.4"ø *(Non-Captive Shaft **not included**)* HSI #36864-12 *(Unipolar)* Travel per Step: .004 Step Angle: 15°	515-6794-00 *incl. Connector* **Requires Shaft 4¼":** 530-5503-01
Austin Powers™	Time Machine Rotating Movement	Multi Products Motor 24VAC *(041-5079-00)* 50/60Hz 20RPM CCW	515-7141-00 *incl. Connector*
	Laser Beam Left to Right Directional	Autotrol Motor 24VAC *(041-5081-00)* 50/60Hz 4W 10RPM Bi-Directional	515-7171-00 *incl. Connector*
	Dr. Evil Target Lift Up/Down Movement	Hankscraft Motor Model-E 24VAC *(041-5030-00)* 50/60Hz 6RPM CCW	515-5900-00 *incl. Connector*
Monopoly®	Mini-Flipper (Waterworks) Rotating Movement	Multi Prod. Motor & Gear Box #7000 EX00159A 20VDC 50/60Hz 85RPM CC/CCW	041-5083-00 *MOTOR ONLY*
Playboy	Triangular Billboard Rotating Movement	Autotrol Motor *(BD511 150-1387)* 24VAC 50/60Hz 12RPM Bi-Directional	041-5086-02 *MOTOR ONLY*
	Centerfold Mechanism Open/Close Movement	Multi Products *(3680)* Motor 12v DC 10/12 RPM CC/CCW	041-5075-04 *MOTOR ONLY*
	Tease Drop Screen Lift Up/Down Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 4.6W *(041-5062-00)*, Series 36000: 1.4"ø *(Non-Captive Shaft **not included**)* HSI #36864-12 *(Unipolar)* Travel per Step: .004 Step Angle: 15°	515-6794-00 *incl. Connector* **Requires 7" Shaft:** 530-5503-00

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

Table continued on the next page.

Game Name	Function	Specifications	Part Number
ROLLERCOASTER TYCOON™ (NO MOTOR USED)			
THE SIMPSONS™ PINBALL PARTY (NO MOTOR USED)			
Terminator® 3: Rise of the Machines™	Backbox Ball Shooter Up/Down Movement	Multi Products Motor 24VAC *(041-5079-01)* 21 RPM CW	515-7317-00 *incl. Connector*
The Lord of the Rings™	Balrog *(Motor & Gate)* Open/Close Movement	Multi Prod. Motor 20VDC Series 600B *(or equiv.)* 50/60Hz 10 RPM Bi-Directional	041-5088-01 *MOTOR ONLY*
RIPLEY'S BELIEVE IT OR NOT!® (NO MOTOR USED)			
Elvis®	Elvis™ Front/Back Movement	Haydon Switch & Instrument, Inc. Stepper Motor 12VDC 10W *(041-5089-00)*, *(Non-Captive Shaft **not included**)* *HSI #46868-12-002*	500-6809-00 *incl. Connector* **Requires 7.25" Shaft:** 530-5658-00
	▶▶▶ **OPTIONAL** ◀◀◀ Shaker	Multi #3811 0630 Motor *(Vibrator)* 12VDC *(041-5029-**01**) 3100 RPM (w/DRL PTS)*	515-5893-01 *incl. Connector*
The Sopranos℠	Bada Bing! Girls x2 Rotating Posts Movement	Autotrol Synchronous Motor 24VAC 4W 50/60Hz 45.7/54.9 RPM Bi-Directional	041-5092-00 **w/1" Shaft + 12" Leads**
NASCAR® and [NDSE]	Back Panel Rotating *(Car)* Windmill *(Skill Ball Enter)*	Multi Products Motor & Gear Box 20VDC Model #8000 *(EX-04-073)* 10 RPM	041-5093-00 *MOTOR ONLY*
Grand Prix	Back Panel Rotating *(Car)* Windmill *(Skill Ball Enter)*	Multi Products Motor & Gear Box 20VDC Model #8000 *(EX-04-073)* 10 RPM	041-5093-00 *MOTOR ONLY*
World Poker Tour™ (WPT) (NO MOTOR USED)			
The Simpons™ Kooky Carnival	Bart on Skateboard Left/Right Movement	Multi Products Motor with Crank 24VAC *(041-5095-01)* 50/60Hz 3W 14 RPM	500-6947-01 *incl. Connector*
	Left & Right Ramps Up/Down Movement	Multi Products Motor 24VAC *(041-5048-01)* 50/60Hz 3W 15 RPM CCW *(Qty. 2 in game)*	515-7558-00 *incl. Connector*
	Shaker *(details in SKC Manual, Page **24**)*	Multi #3811 0630 Motor *(Vibrator)* 12VDC 3100 RPM *(w/DRL PTS)*	041-5029-**01** *MOTOR ONLY*
©Disney's Pirates of the Caribbean	Spinning Disk	Multi #3811**R** 0630 Motor *(Vibrator)* 12VDC *(041-5029-**04**)* 3100 RPM *(w/DRL PTS)* *-04 is RoHS compliant; can substitute with -01 domestic*	511-5024-04 *incl. Connector*
	Pirate Ship Sinking/Raising Movement	Multi Products Motor & Gear Box 24VDC Model #7000-DCM 12 RPM	041-5101-00 *MOTOR ONLY*
Family Guy™	Stewie Figurine Left & Right Movement	Stepper Motor NPM PF35T-48D4STD 5V RVB *(041-5102-00 Reference Only)*	511-5043-00 *incl. Connector*
Spider-Man™	Doc Ock, Sandman & 3-Bank Up/Down Movement	Sync. Motor 24VAC 50/60Hz 3W 12 RPM CW *(041-5103-00 Reference Only)*	511-5063-00 *incl. Connector*
	▶▶▶ **OPTIONAL** ◀◀◀ **Shaker Motor Kit** 502-5027-00	Multi #3811**R** 0630 Motor *(Vibrator)* 12VDC *(041-5029-**04**) 3100 RPM (w/DRL PTS)* *-04 is RoHS compliant; can substitute with -01 domestic*	515-5893-01 *incl. Connector*

APPENDIX F

Motor Specification Table

The following table only list games that used motors. *Part Numbers starting with "515-" will include the Wiring Harness & Connector.*

Game Name	Function	Specifications	Part №
ABC Monday Night Football	Goal Post Up/Down Movement	Motor 24v A.C. 60 RPM CW	515-5222-00
Phantom of the Opera	Organ Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Checkpoint	Mag Wheel (in Backbox)	Motor D.C. (KEN)	041-5005-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Teenage Mutant Ninja Turtles	Spinning Pizza Ball Deflector	Gear Motor 24v A.C. 325 RPM CW	515-5397-00
Batman	Bar Target Up/Down Movement	Bowman Motor 24v 60Hz 3W 11 RPM CCW	515-5256-00
Star Trek 25th Anniversary	Swinging Target	Bowman Motor 24v 22½ RPM	515-5534-00
	Transporter F/X	Gear Motor 24v A.C. 3½ RPM	500-5421-00
	Cooling Fan (for Transporter F/X)	4½" Motor 12v	041-5014-00
Lethal Weapon 3	Spinning Light	Motor 2½ v A.C. 4000 RPM CCW	041-5017-00
Star Wars	Bar Target Up/Down Movement	Bowman Motor 24v 60hz 3W 11 RPM CCW	515-5256-00
	R2D2 Robot Left/Right Movement	Bowman Motor 24v A.C. 22½ RPM CW	515-5571-00
	Death Star Rotation	Bowman "G" Motor 24v A.C. 60Hz 6 RPM CW	515-5570-00
Rocky & Bullwinkle & Friends	Nell Log "Cutting Blade" Forward/Back Movement	Autotrol Model E Motor 24v 60hz 4W 3 RPM CCW	041-5023-00
Jurassic Park	T-Rex Left/Right Movement	Multi Motor 5v D.C.	041-5025-00
	T-Rex Up/Down Movement	Bowman Motor 24v 11 RPM CW	041-5026-00
	Shaker	Johnson Motor (Vibrator)	041-5002-00
Last Action Hero	Crane Left/Right Movement	Multi Products Motor 12v D.C. #3312 OSC	041-5027-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Tales from the Crypt	Tombstone Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
The Who's Tommy	Mirror Up/Down Movement	Bowman Motor 24v A.C. 6 RPM CCW	515-5900-00
	Flipper Blinders	Servo Motor (94102)	041-5032-00
	Spinning Airplane Propellers	Motor D.C.	041-5033-00
WWF Royal Rumble	Shaker	Johnson Motor (Vibrator) 10.5v D.C. 10 AMP 2950 RPM CW	041-5029-00
Maverick, The Movie	Turning Paddle Wheel	Motor 24v A.C. 10 RPM	041-5036-00
Mary Shelley's Frankenstein	Creature Head Left/Right Movement	Servo Motor (94102)	041-5032-00
Batman Forever	Cannon Left/Right Movement	Bowman Motor 24v A.C. 60Hz 3W 6 RPM CCW	515-6383-00

APPENDIX G

Part Number Prefix Classification Codes

I. Electrical Source, Energy & Signal Converters
- 010- Transformers
- 031- Speakers
- 090- Solenoids (Coils)
- 150- Filters, Outlets, Varistors, Thermistors
- 200- Fuses

II. Conductors, Connectors & Insulators
- 034- Line Cords
- 036- Cable Assemblies & Wiring Harnesses
- 041- Motors
- 045- Connectors (All Types)
- 055- Lugs (M/F), Pins (M/F), Discs, Ring Terminals, Terminal Strips, etc.
- 060- Polarizing Keys and Conn. Covers
- 077- Lamp Sockets

III. Circuits & Circuit Elements
- 100- ICs
- 110- Transistors
- 112- Diodes (All Types including LEDs & Modules)
- 121- Resistors
- 123- Resistors (Variable & Adjustable)
- 124- Regulators & Bridge Rectifiers
- 125- Capacitors (Radial Lytics & Ferrites)
- 126- Piezo Crystal
- 127- Heatsinks
- 130- Capacitors (Tecates & Ceramics)
- 140- Oscillators (Clocks/Crystals)
- 165- Light Bulbs
- 180- Switches
- 181- Switch Membranes (Pads) & Piezo Sensors
- 190- Relays
- 960- EPROM *(Raw Part)*
- 965- EPROM *(Programmed Part)*

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

V. Mechanical Components
- 249- Rivets
- 251- Pins (Dowel), Finishing Nails, Hairpins, Spring Pins and Clevis Pins
- 254- Stand-Offs, Spacers and Shims
- 260- Steel Ball (All Types Steel, Glowing, Delrin, etc.)
- 265- Springs (Extension)
- 266- Springs (Compression)
- 267- Springs (Torsion)
- 269- Springs (Washers - Belleville, Wave)
- 270- Retaining Rings
- 280- Grommets, Bushings and Nyliners
- 283- Bearings

VI. Handles, Locks, Catches, Latches, Keys
- 355- Handles, Locks, Catches, Latches and Keys

VII. Fabricated Parts
- 390- Hinges
- 501- Coin Doors
- 515- Sub-Assemblies
- 520- Printed Circuit Boards (PCBs)
- 522- Display Glass
- 525- Wood Parts
- 530- Screw Machined Parts
- 535- Fabricated Parts
- 545- Molded (Extruded) Plastic and Rubber Parts (Rings, Sleeves, etc.)
- 550- Molded (Inserts)

VIII. In-House Assemblies
- 500- End Product (Systems and Models)
- 502- Kits (Created In-House)
- 505- Cabinets (complete)
- 510- Riveted Sub-Assemblies (In-House)
- 511- Sub-Assemblies (In-House)
- 515- Sub-Assemblies*

  **2 or more 515-'s but still a sub-assembly.*

IX. Bulk Materials
- 600- Braided Wire & Ground Straps
- 601- Stranded Wire
- 602- Ribbon Cable
- 604- Telephone Line Cord
- 605- Sleeving (Shrink Tubing)
- 625- Velcro (non-adhesive)
- 626- Foam Rubber, Foam Pads, Rubber Bumpers (Blue Pads), Tape (All Types) Velcro (adhesive) and String / Rope

X. Miscellaneous
- 000- Tools *(see also 777-)* and Supplies
- 040- Clamps, Ties & Clips
- 042- Pulleys
- 091- Coin Mechs
- 205- Fuse Holders
- 631- Staples
- 660- Glass (Playfield, Backglass, etc.)
- 675- Cleaners
- 705- Packing & Shipping Items
- 755- Instruction, Coin Cards, Ins. Sheets
- 756- Information Sheets, Service Bulletins, Instruction Sheets in Kits and Templates
- 777- Tools (Wrenches and Drivers)
- 780- Manuals
- 802- Decal Kits (comprised of 820's)
- 820- Decals, Mylar and Labels (Sheets/Sets)
- 803- Plastic Kits (comprised of 830's)
- 830- Plastic Pieces (Butyrate Sheets/Sets)
- 880- Toys, Models, Figurines, etc.
- 900- Game Posters

APPENDIX H

Playfield Inserts (Plastic Light Covers)

Patterns: STARBURST **STIPPLE**	**STARBURST CIRCULAR** 5/8" ø **550-5000-XX**	**STARBURST CIRCULAR** 3/4" ø **550-5001-XX**	**STARBURST CIRCULAR** 1" ø **550-5002-XX**	**STARBURST CIRCULAR** 1-3/16" ø **550-5003-XX**	**STARBURST CIRCULAR** 1-1/2" ø **550-5004-XX**
STARBURST CIRCULAR 2-1/4" ø **550-5005-XX**	**STARBURST CIRCULAR** 2-3/4" ø **550-5006-XX**	**PLAIN CIRCULAR** 3/4" ø **550-5007-XX**	**PLAIN CIRCULAR** 1" ø **550-5008-XX**	**PLAIN CIRCULAR** 1-3/16" ø **550-5009-XX**	**PLAIN CIRCULAR** 1-1/2" ø **550-5010-XX**
PLAIN CIRCULAR 2-1/4" ø **550-5011-XX**	**PLAIN CIRCULAR** 2-3/4" ø **550-5012-XX**	**STIPPLE CIRCULAR** 1" ø **550-5048-XX**	**STIPPLE 1" SQUARE** 1" **550-5019-XX**	**ROLLOVER BUTTON BASE** **550-5026-XX**	**WHITE STAR** *(only in white)* **545-5015-00**
STIPPLE RECTANGULAR 1-1/2" X 3/4" **550-5018-XX**	**STIPPLE RECTANGULAR** 1-5/8" X 1-1/2" **550-5051-XX**	**STARBURST RECTANGULAR** 2-1/4" X 1-1/8" **550-5044-XX**	**PLAIN RECTANGULAR** 2-1/4" X 1-1/8" **550-5049-XX**	**PLAIN RECTANGULAR** 1-1/4" X 1-1/2" **550-5050-XX**	**PLAIN RECTANGULAR** 2" X 2-1/2" **550-5063-XX**
STARBURST MINI SHIELD 1" X 1" **550-5024-XX**	**STARBURST LARGE SHIELD** **550-5025-XX**	**MINI HOT DOG** 1-5/8" **550-5020-XX**	**BEVEL HOT DOG** 3-1/2" **550-5021-XX**	**PLAIN HOT DOG** 3-1/2" **550-5022-XX**	**BANANA** **550-5023-XX**
STARBURST ARROW-SMALL **550-5013-XX**	**STARBURST ARROW-LARGE** **550-5070-XX**	**STARBURST ARROW-HEAD SMALL** **550-5014-XX**	**STARBURST ARROW-HEAD LARGE** **550-5015-XX**	**STARBURST BULLET** **550-5016-XX**	**STARBURST TRIANGLE** **550-5017-XX**

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

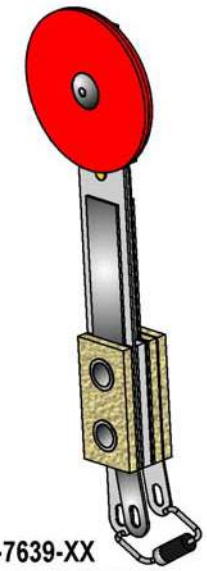
Instructions: Parts which may come in various colors (i.e. targets, some posts, playfield inserts, etc.) end in a 2-digit number which correspond to the color of that part. The "**-XX**" in part number which may come in various colors should be replaced with the desired 2-Digit number corresponding to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

PLASTIC PART COLOR CHART

Nº	Color	Nº	Color	Nº	Color	Nº	Color	Nº	Color	Nº	Color
-00	**Black** or Solid Clear	-03	Amber	-06	Yellow	-09	Purple	-12	Fluor. Blue	-15	Luminescent
-01	Clear	-04	Green	-07	Orange	-10	Fluor. Orange	-13	Teal Green	-16	Gold
-02	Red	-05	Blue	-08	White	-11	Fluor. Green	-14	Gray	-17	Trans. Brown

APPENDIX I

Anti-Loft Stand-Up Targets



515-7639-XX
1" ø ROUND
ANTI-LOFT STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

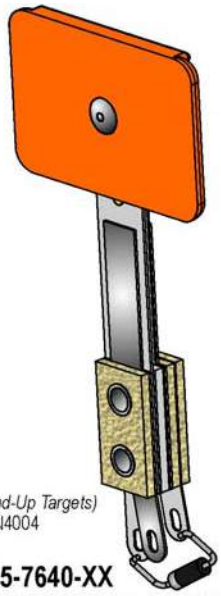
515-7581-XX
1" X 1/2" NARROW RECTANGLE
ANTI-LOFT STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

Ordering Note:
-XX REPLACE WITH 2-DIGIT FOR COLOR:
Not all colors available
(colors shown not exact)

-02	Red
-03	Amber
-04	Green
-05	Blue
-06	Yellow
-07	Orange
-08	White

515-7568-XX
1" X 1" SQUARE
ANTI-LOFT STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

(Required on all Stand-Up Targets)
▼ Switch Diode, 1N4004
112-5003-00



515-7640-XX
1" X 1-1/2" WIDE RECTANGLE
ANTI-LOFT STAND-UP
SWITCH & TARGET
RIVETED ASSEMBLY*

*Some targets may require the lugs position be changed to the left *or* to the right, depending on the application; these targets will have a different part number and are called out in the game manual they are used in *(see Section 4, Chapter 1, Parts Identification & Location, Playfield ... - Switches.)* Review the game manual for the game desired for the original target used or application.

For Anti-Loft Application use
Large Foam Pad,
5/8" X 7/16" X 3/16" Thick
626-5078-00

For > Light < Anti-Loft Application use
Small Foam Pad,
7/16" X 7/16" X 1/8" Thick
626-5029-00

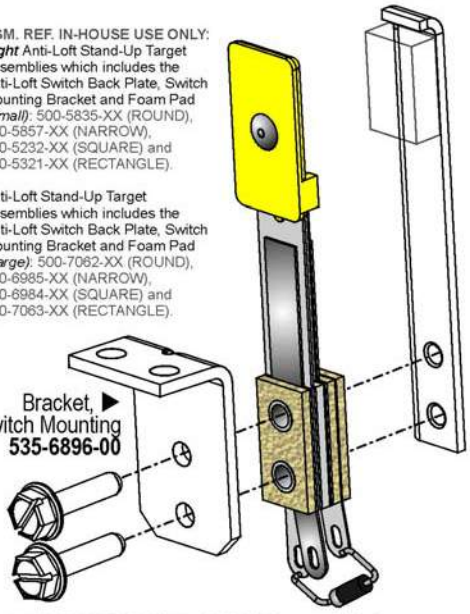
Foam Pads have self-adhesive backing

or

Anti-Loft Switch Back Plate ▼
535-9823-01

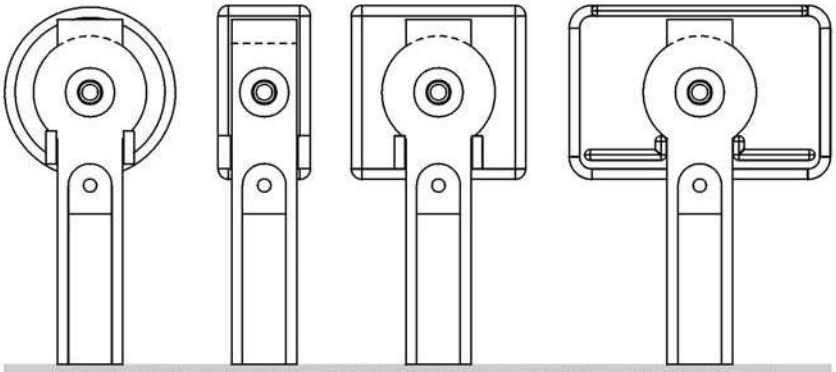
ASM. REF. IN-HOUSE USE ONLY:
Light Anti-Loft Stand-Up Target Assemblies which includes the Anti-Loft Switch Back Plate, Switch Mounting Bracket and Foam Pad *(Small)*: 500-5835-XX (ROUND), 500-5857-XX (NARROW), 500-5232-XX (SQUARE) and 500-5321-XX (RECTANGLE).

Anti-Loft Stand-Up Target Assemblies which includes the Anti-Loft Switch Back Plate, Switch Mounting Bracket and Foam Pad *(Large)*: 500-7062-XX (ROUND), 500-6985-XX (NARROW), 500-6984-XX (SQUARE) and 500-7063-XX (RECTANGLE).



Bracket, ▶
Switch Mounting
535-6896-00

▲ #6-32 X 5/8" Slotted HWH Swage (Zinc) Screws (Qty. 2/per) **237-5976-04**

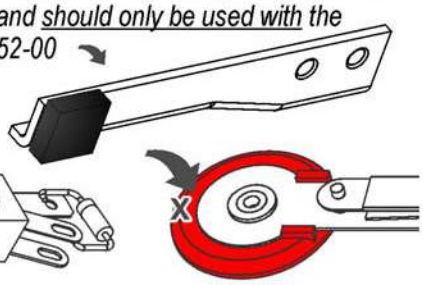


REAR VIEWS OF ANTI-LOFT TARGET & SWITCH ASSEMBLIES

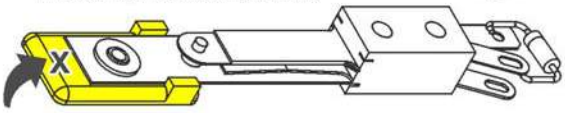
The material of the Anti-Loft Switch has been extended higher to be used with the Anti-Loft Switch Back Plate. ***IMPORTANT:*** *Switch & Target Assemblies (**X**) **without** the extension (the predecessors) **SHOULD NOT** be used with an **Anti-Loft** Switch Back Plate (shown left).*

APPENDIX REFERENCE FOR PINBALL GAMES WHICH USED THE BELOW SWITCH & TARGET ASSEMBLIES NOTE:

*The Switch & Target Assemblies (**X**) **without** the extension have the following part numbers*: 515-5966-XX (Round), 515-5967-XX (Narrow), 515-5162-XX (Square) and 515-6027-XX (Rectangle) and should only be used with the Switch Back Plate (shown right), 535-6452-00 and Small Foam Pad, 626-5029-00.*



** If the above referenced part numbers are no longer available from the factory or your distributor, it will be substituted with the appropriate Anti-Loft counterpart. Not all colors may be available.*



"**R**" means «Target Insert» is reversed, allowing for Rear Mounted application.

Take Note:

1. **Items A-E** come in various colors. *These targets may not be available in every color.* The "**-XX**" in should be replaced with the desired 2-Digit number for the color desired as described in the Color Chart below. *As of print date, the following colors were used :*
-01 Clear (A, D); **-02** Red (A, B, C, D, E); **-03** Amber (D, E); **-04** Green (A, B); **-05** Blue (C); **-06** Yellow (A, C), **-09** Purple (B, D); **-11** Fluorescent Green (A, B, D)
2. *For location(s) and type of Stand-Up Targets used, if any, see Section **4**, Chapter **1**, Parts Identification & Location.*

-XX REPLACE WITH 2-DIGIT FOR COLOR:
-00 Black
-01 Clear
-02 Red
-03 Amber
-04 Green
-05 Blue
-06 Yellow
-07 Orange
-08 White
-09 Purple
-10 Fluor. Orange
-11 Fluor. Green
-12 Fluor. Blue
-13 Teal Green
-14 Gray
-15 Luminescent
-16 Gold
Note: Not all colors available.

Nr.	STAND-UP TARGET PARTS	SPI PART Nr.
A	Modular Stand-Up Target Narrow Assy.	500-6138-XX
	Stand-Up Target Narrow (Insert)	**545-6138-XX**
B	Modular Stand-Up Target Square Assy.	500-6139-XX
	Stand-Up Target Square (Insert)	**545-6139-XX**
C	Modular Stand-Up Target Rectangle Assy.	500-6228-XX
	Stand-Up Target Rectangle (Insert)	**545-6228-XX**
D	Modular Stand-Up Target Round Assy.	500-6075-XX
	Stand-Up Target Round (Insert)	**545-6075-XX**
E	Mod. Stand-Up Target 1" Spherical Assy.	500-6189-XX
	Stand-Up Target 1" Spherical (Insert)	**545-6189-XX**

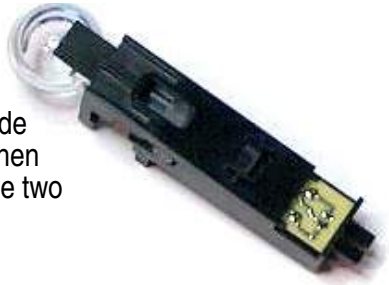
To Replace the « Target Insert » or change Target Orientation :

Items A-E Note: For the Target Assembly use the "**500-**" SPI Part Number(s) shown in the Parts Table below. To receive the Target Assembly with the « Target Insert » « ***Reversed*** » *simply add a* ***"R"*** *at the end of the Part Number. See Side View picture left to compare (dashed line shows target reversed).* For just the «Target Insert» use the "**545-**" SPI Part Number.

To reverse it yourself or to just change the insert:

1. With a small flat head screwdriver, push into the small tab at the bottom of the target front and give a slight twist motion to "pop" the two halves.

2. Push the Target Insert bottom in at the same time while you slide the top (front) part up, then let go of the insert as the two halves come apart.



3. Replace target or reinsert it into the other size while sliding the two halves back together.

Note: *If you were reversing the orientation, don't forget to also turn the Switch Actuator PCB **180°**. Test Switch.*

APPENDIX J

Coin Cards (USA & International Pricing Defaults) ▶ For Yellow Stock add -Y to the Part Number

*If more than one Pricing Scheme is available for countries listed, the **F.** listed beside the option, denotes the Factory Default Setting.*

FOR VIEWS OF THE LATEST or OPTIONAL USA, INTERNATIONAL / EURO AND CUSTOM COIN CARDS, VISIT OUR WEBSITE.

Not Shown USA 755-5400-10 Tournament Option $2 = X1; 755-5400-11 Tournament Option $1.50 = X1

USA 10 *F.*	USA 10	USA 2-7 *or* CANADA	*FOR CUSTOM PRICING †*	USA 3 *with* ToPS™	USA 5 *with* ToPS™
NON-TOURNAMENT PLAY $ .75=x1 $2.00=x3 TOURNAMENT PLAY! $1.50=x1	75¢=x1 SUPER VALUE $2.00=x3	50¢=x1	Backside is Blank (Border Only) *Typeset your Custom Pricing*	NON-TOURNAMENT PLAY $ .50=x1 $1.00=x2 TOURNAMENT PLAY! $1.00=x1	NON-TOURNAMENT PLAY $ .50=x1 $2.00=x5 TOURNAMENT PLAY! $1.00=x1
755-5400-11 *Front*	755-5400-11 *Back*	755-5400-02 *Front*	755-5400-01, -02 *or* -04 *Back*	755-5400-03 *or* -09 *Front*	755-5400-03 *Back / -08 Front*
AUSTRALIA 1 *F.*	**AUSTRALIA 2**	**CROATIA**	*FOR CUSTOM PRICING †*	**DENMARK 1** *F.*	**DENMARK 2**
$1.00=x1 SUPER VALUE $2.00=x3	$1.00=x1	3 KUNA=x1 5 KUNA=x2	Backside is Blank (Border Only) *Typeset your Custom Pricing*	Kr.3,00=x1 Kr.5,00=x2	Kr.2,00=x1 Kr.5,00=x3 Kr.10,00=x7
755-5406-00 *Front*	755-5406-00 *Back*	755-5410-00 *Front*	755-5410-00 *Back*	755-5402-00 *Front*	755-5402-00 *Back*
JAPAN 1	**JAPAN 2** *F.*	**MIDDLE EAST**	*ANY COUNTRY CAN USE*	**NEW ZEALAND 1** *F.*	**NEW ZEALAND 2**
¥100=x1	¥100=x1 ¥200=x3	TOKEN=x1	COIN=x1	$1.00=x1	$1.00=x1 SUPER VALUE $2.00=x3
755-5408-01 *Front*	755-5408-01 *Back*	755-5400-06 *Front*	*755-5400-06 Back*	*755-5406-00 Back*	755-5406-00 *Front*
NORWAY 1 *F.*	**NORWAY 2**	**RUSSIA** *F.*	**RUSSIA (ALTERNATE)**	**SOUTH AFRICA**	*FOR CUSTOM PRICING †*
Kr. 10,00=x1	Kr. 10,00=x1 Kr.20,00=x3	5 Рублей=x1	Жетон=x1	R2=x1	Backside is Blank (Border Only) *Typeset your Custom Pricing*
755-5403-01 *Front*	755-5403-01 *Back*	755-5411-00 *Front*	755-5411-00 *Back*	755-5409-01 *Front*	755-5409-01 *Back*
SWEDEN 1 *F.*	**SWEDEN 2**	**SWITZERLAND 1** *F.*	**SWITZERLAND 2**	**TAIWAN**	*FOR CUSTOM PRICING †*
10,00 kr.=x1 15,00 kr.=x2 20,00 kr.=x3	5,00 kr.=x1	sf 1,00=x1 sf 5,00=x6	sf 1,00=x1 sf 2,00=x3 sf 5,00=x9	TWD10=x1	Backside is Blank (Border Only) *Typeset your Custom Pricing*
755-5404-00 *Front*	755-5404-00 *Back*	755-5405-00 *Front*	755-5405-00 *Back*	755-5412-00 *Front*	755-5412-00 *Back*
UK 1	**UK 3**	**UK 5** *F.*	*FOR CUSTOM PRICING †*		
£1.00=x3 £2.00=x7	£ .50=x1 £1.00=x2 £2.00=x5	£1.00=x1 £2.00=x3	Backside is Blank (Border Only) *Typeset your Custom Pricing*		
755-5407-00 *Front*	755-5407-00 *Back*	755-5407-01 *Front*	755-5407-01 *Back*		

Not Shown EURO 755-5401-20 Tournament Custom (can fill in your own pricing).

Appendix J Notes:

1. Coin Card on Game is determined by original shipping country destination.
2. Optional Coin Card(s), are available via your distributor or via free download @ www.sternpinball.com/**coinagecards.shtml**.

Older style Coin Cards (foreign or domestic) not available on our website or no longer available through your distributor, are obsolete.

3. Coin Cards which have a Blank Backside *can be used for* †***Custom Pricing***.

EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EURO 6
€ .50=x1	€ .50=x1 €1.00=x2 €2.00=x5	€ .50=x1 €1.00=x3	€ .50=x1 €1.00=x2 €2.00=x6	€ .50=x1 €1.00=x3 €2.00=x7	€ .50=x2
755-5401-01 *1-Side Only*	755-5401-02 *1-Side Only*	755-5401-03 *1-Side Only*	755-5401-04 *1-Side Only*	755-5401-05 *1-Side Only*	755-5401-06 *1-Side Only*
EURO 7	**EURO 8**	**EURO 9**	**EURO 10**	**EURO 11**	**EURO 12**
€1.00=x1 €4.00=x5	€1.00=x1 €2.00=x3	€1.00=x1 €1.50=x2 €2.00=x3	€1.00=x1 €2.00=x3 €3.00=x7	€1.00=x1 €2.00=x4	€1.00=x2 €4.00=x9
755-5401-07 *1-Side Only*	755-5401-08 *1-Side Only*	755-5401-09 *1-Side Only*	755-5401-10 *1-Side Only*	755-5401-11 *1-Side Only*	755-5401-12 *1-Side Only*

◣ EURO FACTORY DEFAULT SUMMARY TABLE ◢

EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EURO 6	EURO 7	EURO 8	EURO 9	EURO 10	EURO 11	EURO 12
BELGIUM ITALY 1 PORTUGAL	*GERMANY 2*	*NETHERLANDS SPAIN*			*GREECE*		*FINLAND*	*AUSTRIA*	*FRANCE*		

Section ***3***, *Chapter* ***4***, ***GO TO ADJUSTMENTS MENU***, *Adj.* ***18***, ***Game Pricing***, ***USA & International (non-Euro) and Euro 1-12 Summary & International (Euro) Standard Pricing Select Tables***, *summarizes Standard or Custom Pricing Schemes & the Dip Switch Setting required.*

In SWITCH MENU also select:

ACTIVE and DEDICATED SWITCH TESTS

SWITCH MATRIX GRID & DEDICATED SWITCHES (for notes & locations, see Page DR. 4 or 17)

Row (Return) \ Column (Drive)	1: Q1 GRN-BRN CN5-P1	2: Q2 GRN-RED CN5-P3	3: Q3 GRN-ORG CN5-P4	4: Q4 GRN-YEL CN5-P5	5: Q5 GRN-BLK CN5-P6	6: Q6 GRN-BLU CN5-P7	7: Q7 GRN-VIO CN5-P8	8: Q8 GRN-GRY CN5-P9
1: U400 WHT-BRN CN7-P9	1 Cabinet Side LEFT BUTTON (UK ONLY) 180-5160-00	9 Below P/F COMIC BOOK GUY STANDUP 515-6027-08	17 Below P/F DROP TARGET #1 (TOP) DOTS 180-5158-00	25 Abv. Upr. P/F UPPER PLAYFIELD EXIT 180-5190-28	33 Blw. Upr. P/F UPF LIGHT STANDUP 515-5966-04	41 Below P/F BULLY 3-BANK (TOP) 515-6027-08	49 Below P/F LEFT BUMPER 180-5015-03	57 Below P/F LEFT OUTLANE 500-6227-02
2: U400 WHT-RED CN7-P8	2 Coin Door 4TH COIN SLOT 180-5204-00	10 Below P/F 5-BALL TROUGH #1 (LEFT) 180-5119-02	18 Below P/F DROP TARGET #2 (MID) DOTS 180-5158-00	26 Blw. Upr. P/F GARAGE RAMP ENTER 180-5190-28	34 Blw. Upr. P/F UPF LOCK STANDUP 515-5966-04	42 Below P/F BULLY 3-BANK (MID) 515-6027-08	50 Below P/F RIGHT BUMPER 180-5015-03	58 Below P/F LEFT RETURN LANE 500-6227-02
3: U400 WHT-ORG CN7-P7	3 Coin Door 6TH COIN SLOT *Future Use*	11 Below P/F 5-BALL TROUGH #2 180-5119-02	19 Below P/F DROP TARGET #3 (BOT) DOTS 180-5158-00	27 NOT USED	35 Blw. Upr. P/F UPF TOP STANDUP 515-5966-02	43 Below P/F BULLY 3-BANK (BOT) 515-6027-08	51 Below P/F BOTTOM BUMPER 180-5015-03	59 Below P/F LEFT SLINGSHOT 180-5054-00 (x2)
4: U400 WHT-YEL CN7-P6	4 Coin Door RIGHT COIN SLOT 180-5204-00	12 Below P/F 5-BALL TROUGH #3 180-5119-02	20 Below P/F ITCHY & SCRATCHY SAUCER DOTS 180-5116-01	28 NOT USED	36 Abv. Upr. P/F COUCH ENTER 180-5190-28	44 Above P/F UP RIGHT SAUCER BACKUP 180-5119-02	52 Below P/F POP SIDE STANDUP 515-6027-08	60 Below P/F RIGHT OUTLANE 500-6227-02
5: U401 WHT-GRN CN7-P5	5 Coin Door CENTER COIN SLOT / DBA 180-5204-00	13 Below P/F 5-BALL TROUGH #4 180-5119-02	21 Above P/F SPINNER 180-5010-04	29 Below P/F KWIK-E-MART LOOP 500-6227-02	37 Blw. Upr. P/F TV LOCKUP 500-6227-02	45 Above P/F RIGHT RAMP ENTER 180-5190-28	53 In Cabinet TOURNAMENT BUTTON 180-5174-00	61 Below P/F RIGHT RETURN LANE 500-6227-02
6: U401 WHT-BLU CN7-P3	6 Coin Door LEFT COIN SLOT 180-5204-00	14 Below P/F 5-BALL TROUGH VUK OPTO *See Sw. 14 Note*	22 Below P/F BART SKATEBOARD TOP 180-5190-48	30 Below P/F KWIK-E-MART STANDUP 515-6027-08	38 Abv. Upr P/F COUCH LOCK (BOT) 180-5119-02	46 Above P/F RIGHT RAMP MADE 180-5190-28	54 In Cabinet START BUTTON 180-5174-00	62 Below P/F RIGHT SLINGSHOT 180-5054-00 (x2)
7: U401 WHT-VIO CN7-P2	7 Coin Door 5TH COIN SLOT *Future Use*	15 Below P/F 5-BALL STACKING OPTO *See Sw. 15 Note*	23 Below P/F BART SKATEBOARD 180-5190-48	31 Below P/F ADV. POPS STANDUP 515-5966-07	39 Abv. Upr. P/F COUCH LOCK (MID) 180-5119-02	47 Above P/F LEFT RAMP ENTER 180-5190-28	55 Below P/F UPPER LEFT VUK 180-5116-01	63 Below P/F LEFT ORBIT 500-6227-02
8: U401 WHT-GRY CN7-P1	8 Cabinet Side RIGHT BUTTON (UK ONLY) 180-5160-00	16 Below P/F SHOOTER LANE 180-5157-00	24 Below P/F UPPER RIGHT SAUCER 180-5186-00	32 Below P/F LIGHT OTTO STANDUP 515-5966-08	40 Abv. Upr. P/F COUCH LOCK (TOP) 180-5119-02	48 Below P/F GARAGE DOOR 500-6138-01R	56 In Cabinet PLUMB BOB TILT *See Sw. 56 Note*	64 Below P/F RIGHT ORBIT 500-6227-02

IC U206 INPUTS \ GROUND	GROUND BLK CN6-P1, -P11
1: U206 GRY-BRN CN6-P2	DS-1 on Cabinet Side #1 LEFT FLIPPER BUTTON 180-5160-00
2: U206 GRY-RED CN6-P3	DS-2 Below Playfield #2 LEFT FLIPPER E.O.S (End-of-Stroke) 180-5149-00 *on Flipper*
3: U206 GRY-ORG CN6-P4	DS-3 on Cabinet Side #3 RIGHT FLIPPER BUTTON 180-5164-00 *Doubled*
4: U206 GRY-YEL CN6-P6	DS-4 Below Playfield #4 RIGHT FLIPPER E.O.S. (End-of-Stroke) 180-5149-00 *on Flipper*
5: U206 GRY-GRN CN6-P7	DS-5 on Cabinet Side #5 UPPER RT. FLIPPER BUTTON 180-5164-00 *Doubled*
6: U206 GRY-BLU CN6-P8	DS-6 on Coin Door #6 VOLUME (RED BUTTON) (In Test: LEFT) 180-5192-02
7: U206 GRY-VIO CN6-P9	DS-7 on Coin Door #7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) 180-5192-04
8: U206 GRY-BLK CN6-P10	DS-8 on Coin Door #8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) 180-5192-00

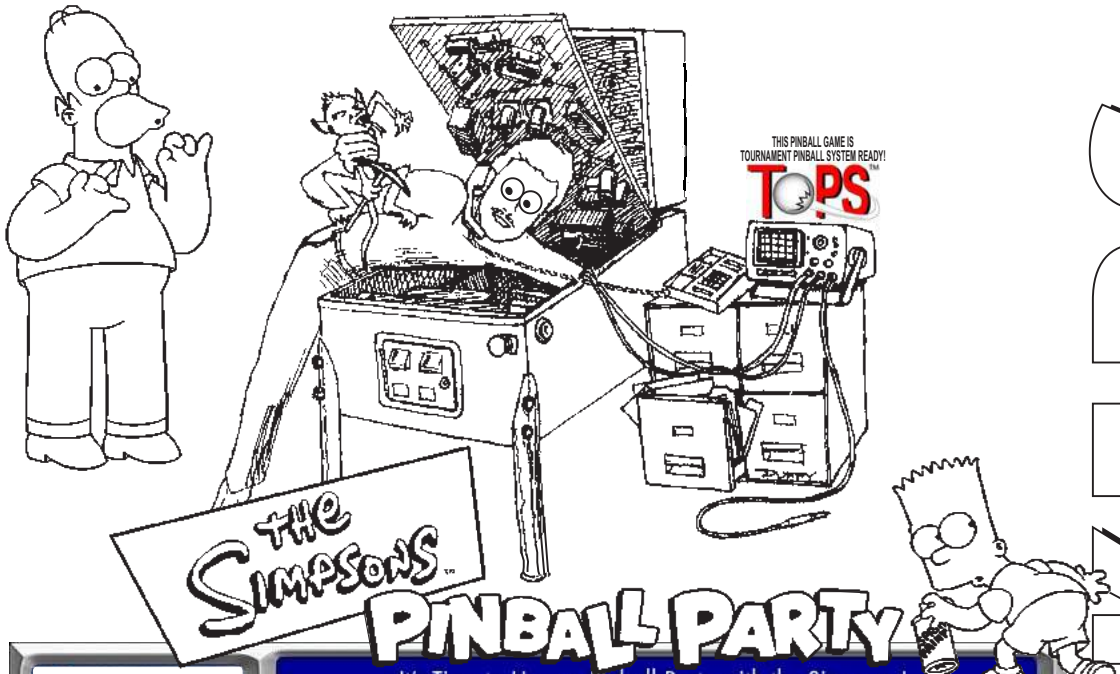
In LAMP MENU also select:

TEST ALL LAMPS, ROW & COLUMN LAMP TESTS

LAMP MATRIX GRID (for notes & locations, see Page DR. 5 or 23)

Row (Ground) \ 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	1 #555 Bulb LEFT OUT EXTRA BALL	2 #555 Bulb LEFT RETURN EXTRA BALL	3 #555 Bulb SHOOT AGAIN	4 #555 Bulb RIGHT RETURN EXTRA BALL	5 #555 Bulb SPECIAL	6 #555 Bulb SHOOTER LANE SKILL SHOT	7 #555 Bulb LIGHT OTTO	8 #555 Bulb ADV. POPS
2: Q34 RED-BLK J12-P2	9 #555 Bulb SPAY ANYTHING	10 #555 Bulb KITTY KITTY BANG BANG	11 #555 Bulb FIELD OF SCREAMS	12 #555 Bulb ESOPHAGUS NOW	13 #555 Bulb I&S ARROW	14 #555 Bulb START I&S MULTIBALL	15 #555 Bulb I&S 2X SCORING	16 #44 Bulb (x2) POPS 2X SCORING
3: Q35 RED-ORG J12-P3	17 #555 Bulb LEFT POP BUMPER DOTS	18 #555 Bulb RIGHT POP BUMPER DOTS	19 #555 Bulb BOTTOM POP BUMPER DOTS	20 #555 Bulb MORE TIME	21 #555 Bulb COLLECT NUC-LEAR PLANT	22 #555 Bulb LEFT ORBIT ARROW	23 #555 Bulb CLETUS 2X SCORING	24 #555 Bulb LEFT ORBIT HURRY UP
4: Q36 RED-YEL J12-P4	25 #555 Bulb CBG SKILL SHOT	26 #555 Bulb CGB START HURRY UP	27 #555 Bulb DAREDEVIL RAMPS	28 #555 Bulb DAREDEVIL BUMPERS	29 #555 Bulb DAREDEVIL LOOPS	30 #555 Bulb DAREDEVIL TARGETS	31 #555 Bulb START BUTTON DOTS	32 #555 Bulb TOURNAMENT BUTTON **
5: Q37 RED-GRN J12-P5	33 #555 Bulb LEFT RAMP ARROW	34 #555 Bulb TREEHOUSE OF HORROR	35 #555 Bulb TREEHOUSE 2X SCORING	36 #555 Bulb LEFT RAMP HURRY UP	37 #555 Bulb RIGHT RAMP ARROW	38 #555 Bulb GET DUFFED!	39 #555 Bulb MOE'S 2X SCORING	40 #555 Bulb RIGHT RAMP HURRY UP
6: Q38 RED-BLU J12-P6	41 #555 Bulb MINI LOOP ARROW	42 #555 Bulb 2X SCORING KWIK-E-MART	43 #555 Bulb KWIK-E-MART HURRY UP	44 #555 Bulb GARAGE ARROW	45 #555 Bulb CLEAN THE GARAGE	46 #555 Bulb GARAGE 2X SCORING	47 #555 Bulb GARAGE HURRY UP	48 #555 Bulb RIGHT ORBIT ARROW
7: Q39 RED-VIO J12-P8	49 #555 Bulb RIGHT LOOP ARROW	50 #555 Bulb OTTO'S BUS TOURS	51 #555 Bulb ELEMENTARY 2X SCORING	52 #555 Bulb BULLY 3-BANK (TOP)	53 #555 Bulb BULLY 3-BANK (MID)	54 #555 Bulb BULLY 3-BANK (BOT)	55 #555 Bulb KRUSTY 2X SCORING	56 #555 Bulb RIGHT ORBIT HURRY UP
8: Q40 RED-GRY J12-P9	57 #555 Bulb HOMER	58 #555 Bulb MARGE	59 #555 Bulb BART	60 #555 Bulb LISA	61 #555 Bulb MAGGIE	62 #555 Bulb GRANDPA	63 #44 Bulb LEFT HEADLIGHT	64 #44 Bulb RIGHT HEADLIGHT
9: Q41 RED-WHT J12-P10	65 #555 Bulb LIVING ROOM 2X SCORING DOTS	66 #555 Bulb (LIGHT) LOCK DOTS	67 #555 Bulb LIGHT (LOCK) DOTS	68 #555 Bulb LOCK (SQUARE) DOTS	69 #555 Bulb SUPER JACKPOT DOTS	70 #555 Bulb TV ARROW DOTS	71 NOT USED	72 NOT USED
10: Q42 RED J12-P11	73 Green LED (LED) DUFFMAN	74 Green LED (LED) HOMER'S DAY	75 Green LED (LED) WILLIE'S WOES	76 Green LED (LED) WIGGUM VS SNAKE	77 Green LED (LED) BART'S DAY	78 Green LED (LED) KRUSTY'S LAST STAND	79 Green LED (LED) STOP THE MONORAIL	80 Red LED (x2) (LED) ALIEN INVASION

▼ U.S. ▼
Customary
Inch Ruler



Metric Conversion

1/16" 1/8" 1/4" 1/2" 3/4"
.0625" .125" .25" .5" .75"
1/32" (.03125")

1" = 2.54cm /25.4mm
1cm = .3937"
1mm = .03937"

- For metric, multiply inch value by metric value, e.g. 5" X 2.54cm = 12.7cm or 127mm.
- For US, multiply metric value by inch value, e.g. 13cm X .3937" = 5.1181"

http://www.SternPinball.com

Visit our website for Pinball game information, Technical Support & Part Sales (for Service Bulletins and a whole lot more!), Stern News, Pinball Links and Distributor Listings. HELP US, HELP YOU! If you have any suggestions, questions, need technical advice, find errors or have comments, contact us through our website or call!

This Game Service Manual and all other documents relating to this product, playfield components, features, rules, programming and operation are subject to change without notice (Service Bulletins, if applicable, available through our website).

2020 Janice Avenue, Melrose Park, IL 60160

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

1-800-KICKERS
Tel 708-345-7700 (Option 1) Fax 708-345-7889 eMail parts.service@SternPinball.com

780-5077-01