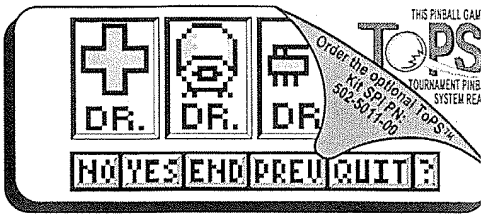
Find-It-In-Front: Dr. Pinball Section

The inside cover & the front pages DR. ❶ thru DR. ⑩ 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...

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This is a Sample Game Manual. At time of printing, some technical information, schematics and drawings were excluded. Call us at 1-800-542-5377 (USA & Canada) or 1-708-345-7700 for Technical Support and/or information. Visit us at our Web Site www.SternPinball.com.

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November 2003

SPI Part Number
780-5080-SP

For Proper Operation of Pinball Game, four (4) Pinballs must be installed!

THE LORD OF THE RINGS™

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!

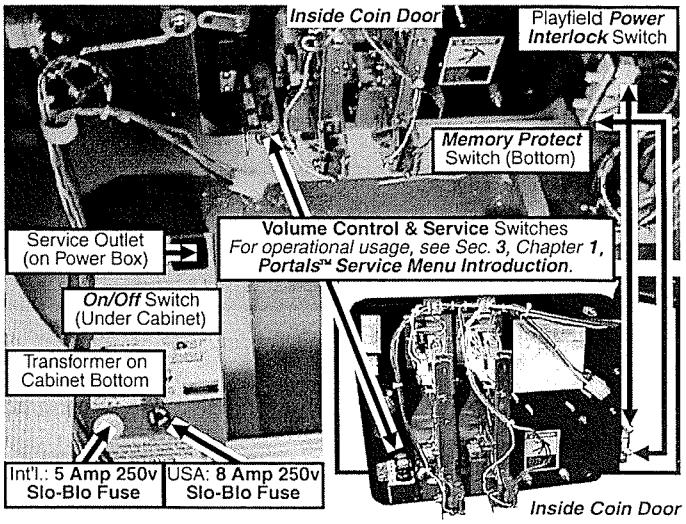
New to our Pinball Games?
Don't forget to go over **Section 3, Chapter 1, Portals™ Service Menu Introduction**. *If using Diagnostics...very useful!* Got confused? Comments? Questions? Call Technical Support at 800-542-5377 or 708-345-7700 (Option 1).

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

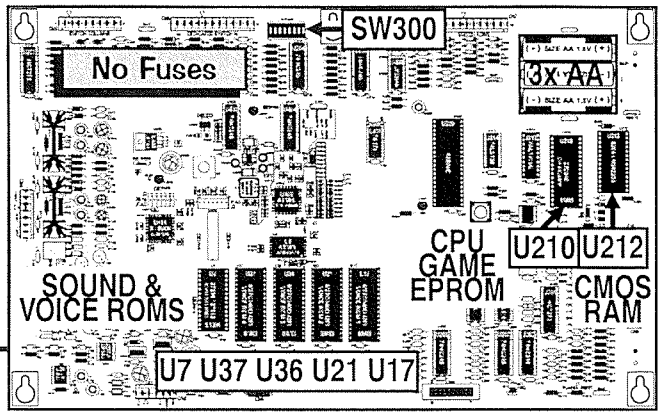
CAUTION: For continued protection against risk of fire, replace only with same type of fuse having the same electrical rating!

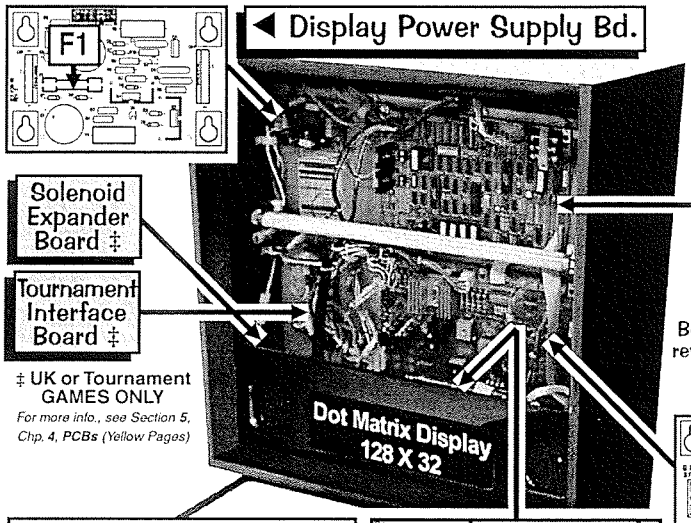
QUICK REFERENCE FUSE CHART			
Backbox Fuses			
LOC:	DISPLAY POWER SUPPLY (P.S.) BOARD		
F1	¾A 250v S.B.	90v DC	High Voltage Display
LOC:	I / O POWER DRIVER BOARD		
F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	**4A 250v S.B.**	50v DC	Magnet ◀◀◀ **THIS GAME ONLY**
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	Right Flipper (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	Loop Diverter (GRY-YEL⇆YEL-VIO)

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



ROM TYPE on BD	LOCATION	SIZE	PART NUMBER
CPU Sound	U7	512K	965-0401-80
CPU Game	U210	1 MB	965-0402-80
CPU Voice ROM 1	U17	8 MB	965-0403-80
CPU Voice ROM 2	U21	8 MB	965-0404-80
CPU Voice ROM 3	U36	8 MB	965-0405-80
CPU Voice ROM 4	U37	8 MB	965-0406-80
DISPLAY Controller	U5	4 MB	965-0407-80





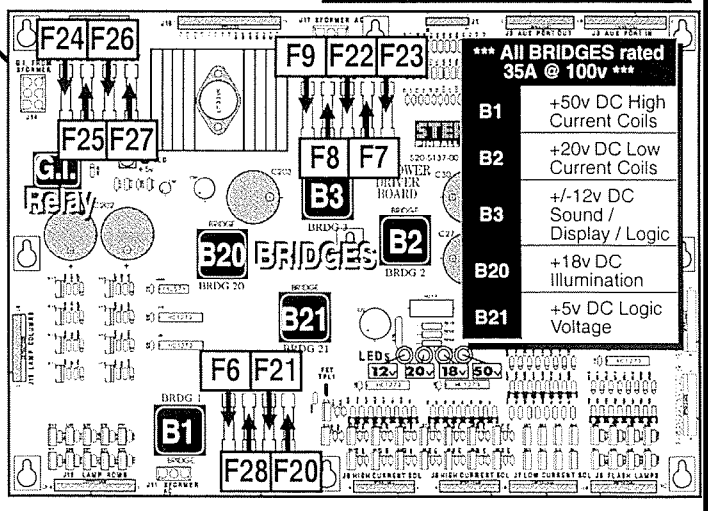
‡ UK or Tournament GAMES ONLY

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).

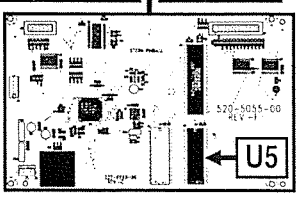
CPU/Sound Bd. II w/ATMEL ▲

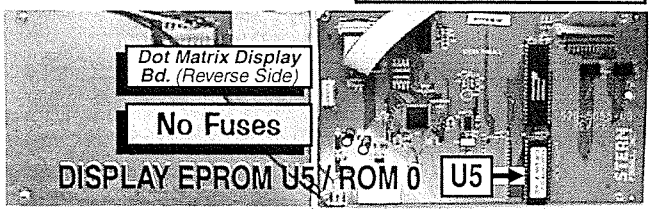
I/O Power Driver Board ▼



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 - ⑩) 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**.

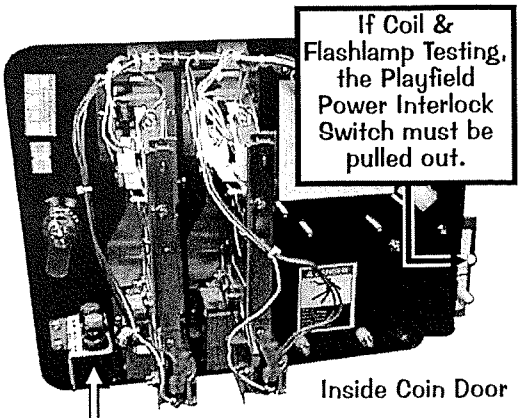
How It Works

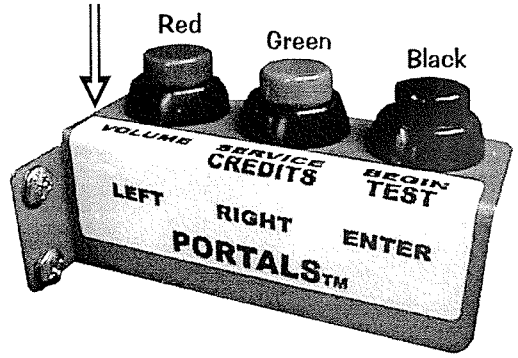
First, the operator / technician must enter the ***Service Menu Mode*** *(for a complete description of the* ***Portals™ Service Menu*** *and* ***ICONS Read!*** *Section 3, Chapter 1).* To get into the ***Service Menu Mode***, power-up the game *(if not already)* and open the **Coin Door**. On the **Coin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

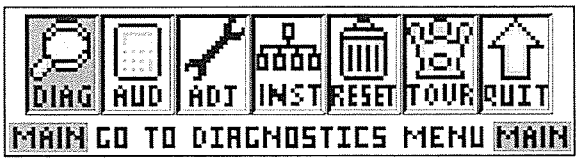
Step 3: Select or activate the *Icons* by pushing the **Black "ENTER" Button**.



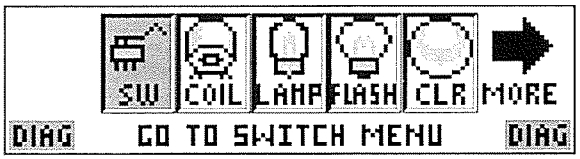


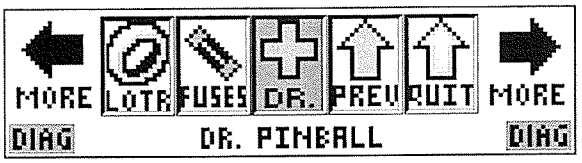
While in the **Portals™ Service Menu**, the **Start Button** can be used in lieu of the **Black Button**; the **Left** & **Right Flipper Buttons** can be used in lieu of the **Red** & **Green Buttons**. However, in *Switch* or *Active Switch Tests* ***only*** the **Red** & **Green Buttons** can be used.

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).*



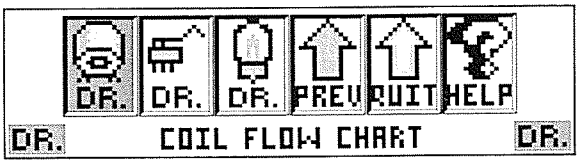
After entering **Portals™**, the **MAIN MENU** now appears with the "DIAG" *Icon* (**GO TO DIAGNOSTICS MENU**) flashing; press the **Black "ENTER" Button** to *activate* this **ICON**. The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing; use the **Red "LEFT"** or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

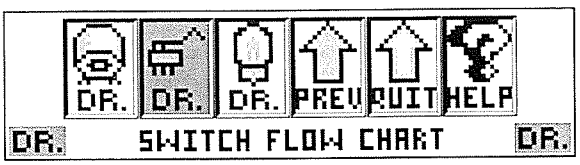


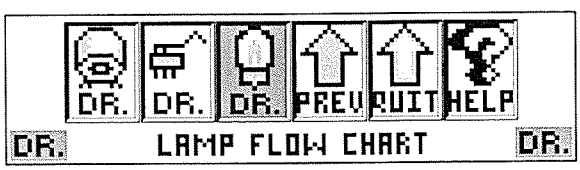


Press the **Black "ENTER" Button** to *activate* this **ICON**. The **DR. PINBALL MENU** (**Flow Chart Menus**) now appears with the COIL "DR." *Icon* flashing. Three (3) *Icons,* Coil "DR.", Switch "DR." and Lamp "DR." are available for selection. Selecting a particular *Icon* will give you a choice 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

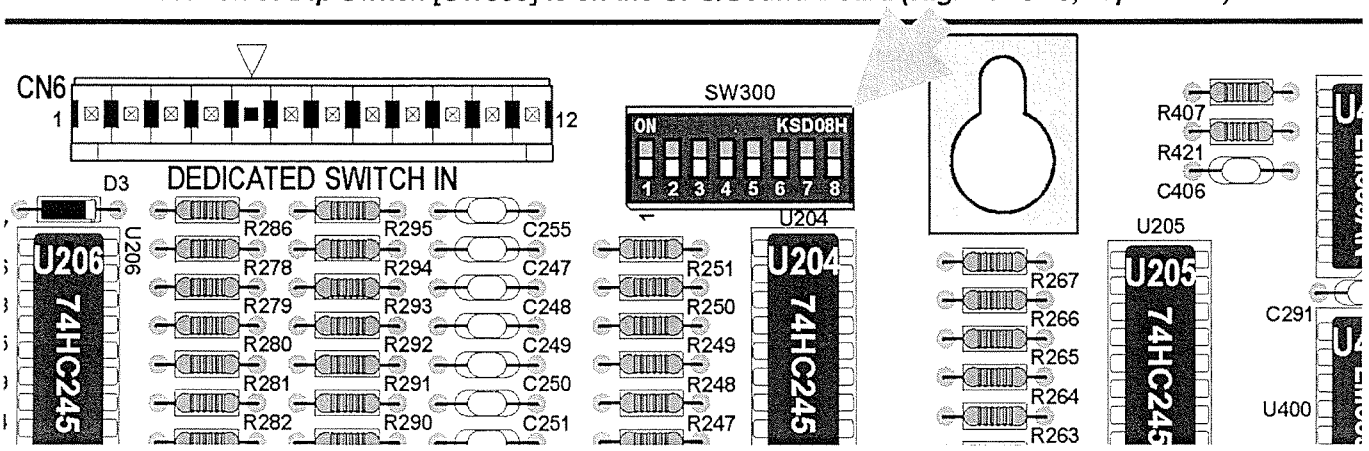
This ***display*** is shown momentarily during **Game Mode** or **Power-Up** to alert the operator of a coil malfunction *(coil doesn't energize or coil fires a multiple number of times)*. **OPERATOR ALERT!** works by monitoring any *switch activated coil* that has the potential to trap a ball when disabled *(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 ***Tech Report Alert flashes*** *(along with an audible sound)*, the game has detected faulty switches and/or missing pinballs. Select the "TECH" *Icon* for information *(review **Technician Alerts, Pages 24-25**)*. *For this **Alert display** to appear, Standard Adj. **49, must be changed** to **POWERUP, COIN DOOR** or **POWERUP AND COIN DOOR**, the default is **NEVER** (review Section **3**, Chp. **4**, **GO TO ADJUSTMENTS MENU**, Standard Adjustments, Page **44**).*

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
Australia	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
Canada	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
Finland	ON	▲		▲					
	OFF		▼		▼	▼	▼	▼	▼

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

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

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

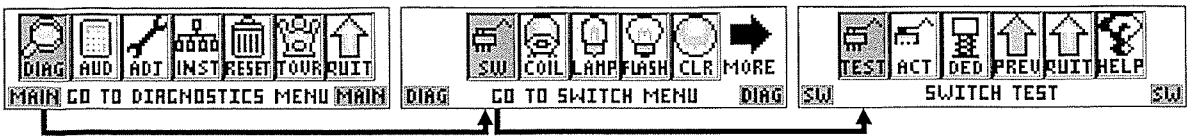
CPU COUNTRY SETTING:	Pos.	1	2	3	4	5	6	7	8
Portugal	ON	▲				▲			
	OFF		▼	▼	▼		▼	▼	▼

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

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

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

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



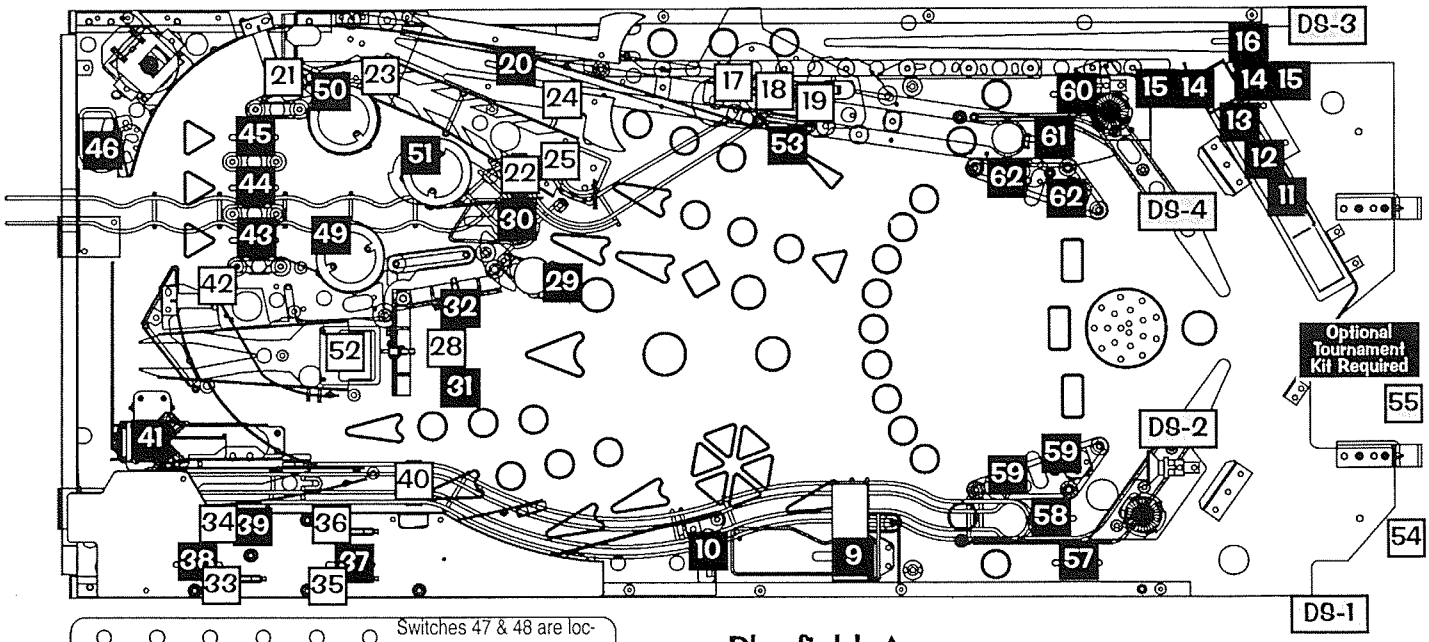
In SWITCH MENU also select:

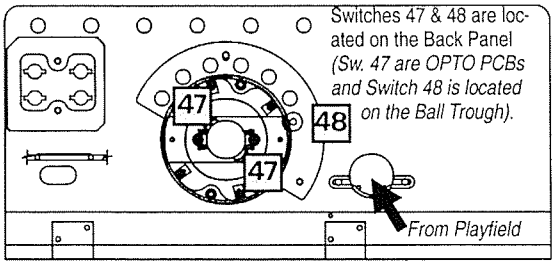
ACTIVE and DEDICATED SWITCH TESTS

SWITCH MATRIX GRID, DEDICATED SWITCHES & LOCATIONS

Column (Drive) / Row (Return)	1: Q1 GRN-BRN CN5-P1	2: Q2 GRN-RED CN5-P3	3: Q3 GRN-ORG CN5-P4	4: Q4 GRN-YEL CN5-P5	5: Q5 GRN-BLK CN5-P6	6: Q6 GRN-BLU CN5-P7	7: Q7 GRN-VIO CN5-P8	8: Q8 GRN-GRY CN5-P9
1: U400 WHT-BRN CN7-P9	1 Cabinet Side: LT BUTTON (UK ONLY)	9 Below P/F: LEFT VUK (DOTS)	17 Above P/F: SWORD LOCK HIGH	25 Above P/F: RIGHT RAMP ENTER (DOTS)	33 Mini-P/F: MINI PF U.L.	41 Below P/F: TOP VUK	49 Below P/F: LEFT BUMPER	57 Below P/F: LEFT OUTLANE
Sw. Part Number:	180-5160-00	180-5116-01	180-5119-02	180-5010-01	180-5057-00	*See Sw. 41 Note*	180-5015-03	500-6227-02
2: U400 WHT-RED CN7-P8	2 Coin Door: 4TH COIN SLOT	10 Below P/F: STANDUP	18 Above P/F: SWORD LOCK MID	26 NOT USED	34 Mini-P/F: MINI PF U.R.	42 Above P/F: INNER LOOP	50 Below P/F: RIGHT BUMPER	58 Below P/F: LEFT RETURN LANE
Sw. Part Number:	180-5204-00	515-6027-08	180-5119-02		180-5057-00	180-5190-28	180-5015-03	500-6227-02
3: U400 WHT-ORG CN7-P7	3 Coin Door: 6TH COIN SLOT	11 Below P/F: 4-BALL TROUGH #1 (LEFT)	19 Above P/F: SWORD LOCK LOW	27 NOT USED	35 Mini-P/F: MINI PF L.L.	43 Below P/F: LEFT TOP LANE	51 Below P/F: BOTTOM BUMPER	59 Below P/F: LEFT SLINGSHOT
Sw. Part Number:	*Future Use*	180-5119-02	180-5119-02		180-5057-00	500-6227-02	180-5015-03	180-5054-00 (x2)
4: U400 WHT-YEL CN7-P6	4 Coin Door: RIGHT COIN SLOT	12 Below P/F: 4-BALL TROUGH #2	20 Below P/F: RIGHT ORBIT LOW	28 Above P/F: BALROG HIT	36 Mini-P/F: MINI PF L.R.	44 Below P/F: MIDDLE TOP LANE	52 Above P/F: SPINNER	60 Below P/F: RIGHT OUTLANE
Sw. Part Number:	180-5204-00	180-5119-02	500-6227-02	180-5119-00	180-5057-00	500-6227-02	180-5190-28	500-6227-02
5: U401 WHT-GRN CN7-P5	5 Coin Door: CENTER COIN SLOT / DBA	13 Below P/F: 4-BALL TROUGH #3	21 Above P/F: RIGHT ORBIT HI	29 Below P/F: PALANTIR	37 Below P/F: LEFT ORBIT LOW	45 Below P/F: RIGHT TOP LANE	53 Below P/F: SPOT RING	61 Below P/F: RIGHT RETURN LANE
Sw. Part Number:	180-5204-00	180-5119-02	180-5190-28	515-5162-08	500-6227-02	500-6227-02	515-5162-08	500-6227-02
6: U401 WHT-BLU CN7-P3	6 Coin Door: LEFT COIN SLOT	14 Below P/F: 4-BALL TROUGH VUK OPTO	22 Above P/F: RAIL RAMP EXIT	30 Below P/F: RIGHT VUK (DOTS)	38 Below P/F: LEFT ORBIT HI	46 Below P/F: TOP SAUCER	54 In Cabinet: START BUTTON	62 Below P/F: RIGHT SLINGSHOT
Sw. Part Number:	180-5204-00	*See Sw. 14 Note*	180-5197-00	180-5116-01	500-6227-02	180-5186-00	180-5174-00	180-5054-00 (x2)
7: U401 WHT-VIO CN7-P2	7 Coin Door: 5TH COIN SLOT	15 Below P/F: 4-BALL STACKING OPTO	23 Above P/F: RIGHT RAMP TARGET	31 Below P/F: BALROG OPEN	39 Below P/F: LEFT RAMP ENTER	47 Back Panel: RING MADE	55 In Cabinet: TOURNAMENT START	63 NOT USED
Sw. Part Number:	*Future Use*	*See Sw. 15 Note*	515-6027-08	180-5119-02	500-6227-02	*See Sw. 47 Note*	180-5174-00	
8: U401 WHT-GRY CN7-P1	8 Cabinet Side: RT BUTTON (UK ONLY)	16 Below P/F: SHOOTER LANE	24 Above P/F: RIGHT RAMP MADE	32 Below P/F: BALROG CLOSED	40 Above P/F: LEFT RAMP MADE	48 Back Panel: BACK TROUGH	56 In Cabinet: PLUMB BOB TILT	64 NOT USED
Sw. Part Number:	180-5160-00	180-5157-00	180-5198-00	180-5119-02	180-5010-01	180-5057-00	*See Sw. 56 Note*	

GROUND IC U206 INPUTS	GROUND BLK CN6-P1, -P11
1: U206 GRY-BRN CN6-P2	DS-1 on Cabinet Side: #1 LEFT FLIPPER BUTTON
Sw. Part Number:	180-5160-00
2: U206 GRY-RED CN6-P3	DS-2 Below Playfield: #2 LEFT FLIPPER E.O.S (End-of-Stroke)
Sw. Part Number:	180-5149-00 *on Flipper*
3: U206 GRY-ORG CN6-P4	DS-3 on Cabinet Side: #3 RIGHT FLIPPER BUTTON
Sw. Part Number:	180-5164-00 *Doubled*
4: U206 GRY-YEL CN6-P6	DS-4 Below Playfield: #4 RIGHT FLIPPER E.O.S. (End-of-Stroke)
Sw. Part Number:	180-5149-00 *on Flipper*
5: U206 GRY-GRN CN6-P7	DS-5 NOT USED
Sw. Part Number:	
6: U206 GRY-BLU CN6-P8	DS-6 on Coin Door: #6 VOLUME (RED BUTTON) (In Test: LEFT)
Sw. Part Number:	180-5192-02
7: U206 GRY-VIO CN6-P9	DS-7 on Coin Door: #7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT)
Sw. Part Number:	180-5192-04
8: U206 GRY-BLK CN6-P10	DS-8 on Coin Door: #8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER)
Sw. Part Number:	180-5192-00





Switches 47 & 48 are located on the Back Panel *(Sw. 47 are OPTO PCBs and Switch 48 is located on the Ball Trough).*

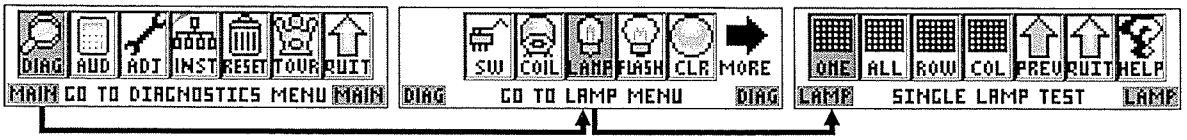
Playfield ▲
◀ Backpanel

= Switches above Playfield.
= Switches below Playfield.
= Switches not on Playfield.

Switch Part Notes: *¥ Yen Coin Switch is 180-5091-00. Part Numbers which start with 515- or 500- include the bracket, target, and/or housing.*
Sw. 14, 15, 41 & 47 Part Note: *OPTO PC Boards are used as Switches: Trans.: 515-0173-00 (Sw. 14 & 15); Receiver: 515-0174-00 (Sw. 14 &15); Transmitter 515-7307-00 (Sw. 41); Receiver 515-7308-00 (Sw. 41); Transmitter 500-6746-00 (Sw. 47); Receiver 500-6747-00 (Sw. 47);*
Sw. 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 may be located under the playfield, in the Cabinet or Backbox *on Terminal Strips or Diode Boards and not on the assemblies.*
DOTS: Diode On Terminal Strip, *see Sec. 5, Chp.2, Playfield Wiring.*

THE LORD OF THE RINGS™

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

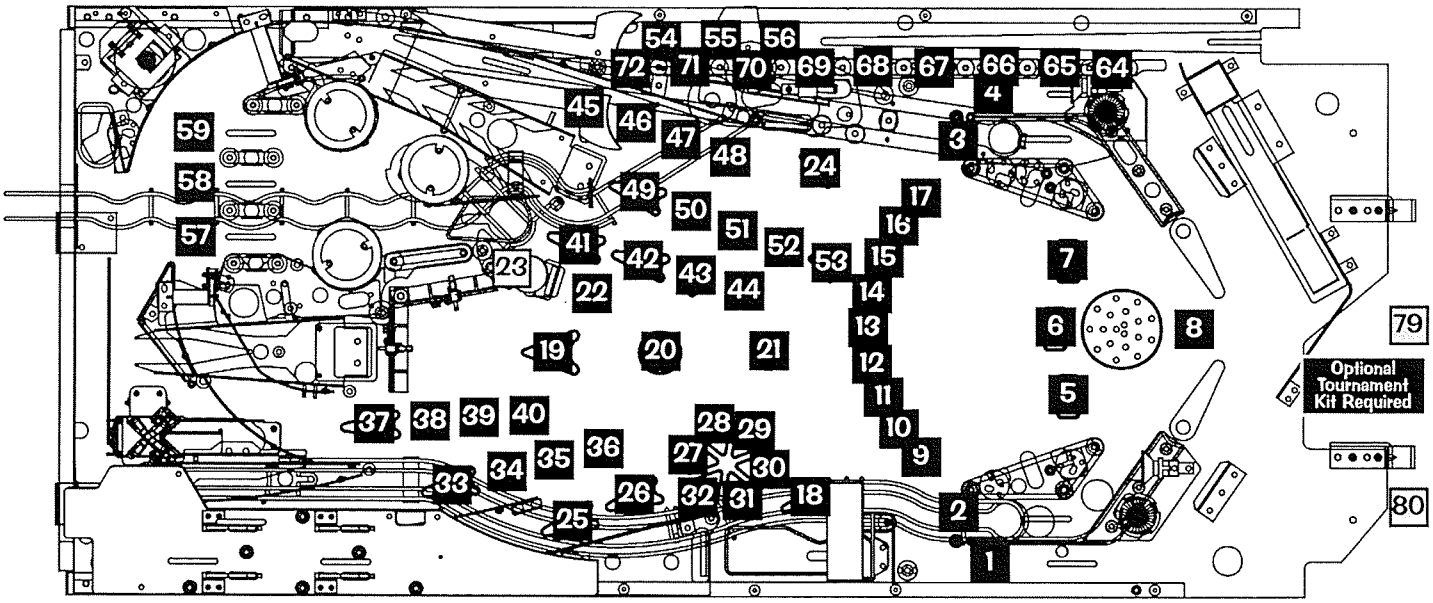


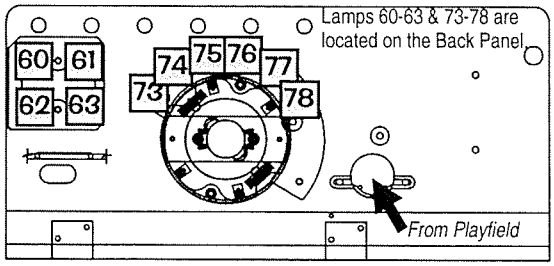
In LAMP MENU also select:

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 (K) EEP	2 #555 Bulb K (E) EP	3 #555 Bulb KE (E) P	4 #555 Bulb KEE (P)	4 #555 Bulb THE FELLOWSHIP OF THE RING	6 #555 Bulb THE TWO TOWERS	7 #555 Bulb THE RETURN OF THE KING	8 #555 Bulb SHOOT AGAIN
2: Q34 RED-BLK J12-P2	9 #555 Bulb PIPPIN	10 #555 Bulb MERRY	11 #555 Bulb SAM	12 #555 Bulb ARAGORN	13 #555 Bulb FRODO	14 #555 Bulb GANDALF	15 #555 Bulb LEGOLES	16 #555 Bulb GIMLI
3: Q35 RED-ORG J12-P3	17 #555 Bulb BOROMIR	18 #555 Bulb MYSTERY	19 #555 Bulb FRODO ARROW	20 #44 Bulb DESTROY RING	21 #555 Bulb MODE START	22 #555 Bulb PALANTIR	23 #44 Bulb PALANTIR GLOBE	24 #555 Bulb SPOT RING
4: Q36 RED-YEL J12-P4	25 #555 Bulb PIPPIN ARROW	26 #555 Bulb GIFT OF THE ELVES	27 #555 Bulb LIGHT EXTRA BALL	28 #555 Bulb RING MULTIBALL	29 #555 Bulb BIG POINTS	30 #555 Bulb LIGHT SPECIAL	31 #555 Bulb SUPER RING FRENZY	32 #555 Bulb 2X SCORING
5: Q37 RED-GRN J12-P5	33 #555 Bulb LEGOLES ARROW	34 #555 Bulb L RAMP MAN RING	35 #555 Bulb L RAMP DWARF RING	36 #555 Bulb L RAMP ELF RING	37 #555 Bulb GANDALF ARROW	38 #555 Bulb C LOOP MAN RING	39 #555 Bulb C LOOP DWARF RING	40 #555 Bulb C LOOP ELF RING
6: Q38 RED-BLU J12-P6	41 #555 Bulb GIMLI ARROW	42 #555 Bulb EXTRA BALL	43 #555 Bulb GOLLUM MULTIBALL	44 #555 Bulb SPECIAL	45 #555 Bulb MERRY ARROW	46 #555 Bulb R ORBIT MAN RING	47 #555 Bulb R ORBIT DWARF RING	48 #555 Bulb R ORBIT ELF RING
7: Q39 RED-VIO J12-P8	49 #555 Bulb ARAGORN ARROW	50 #555 Bulb R RAMP MAN RING	51 #555 Bulb R RAMP DWARF RING	52 #555 Bulb R RAMP ELF RING	53 #555 Bulb LOCK	54 #555 Bulb LANES	55 #555 Bulb TOWER	56 #555 Bulb FLIPPER
8: Q40 RED-GRY J12-P9	57 #555 Bulb (O) RC	58 #555 Bulb O (R) C	59 #555 Bulb OR (C)	60 #555 Grn. Bulb POTD U.L.	61 #555 Grn. Bulb POTD U.R.	62 #555 Grn. Bulb POTD L.L.	63 #555 Grn. Bulb POTD L.R.	64 #44 Bulb SHOOTER LANE #1 BOT
9: Q41 RED-WHT J12-P10	65 #44 Bulb SHOOTER LANE #2	66 #44 Bulb SHOOTER LANE #3	67 #44 Bulb SHOOTER LANE #4	68 #44 Bulb SHOOTER LANE #5	69 #44 Bulb SHOOTER LANE #6	70 #44 Bulb SHOOTER LANE #7	71 #44 Bulb SHOOTER LANE #8	72 #44 Bulb SHOOTER LANE #9 TOP
10: Q42 RED J12-P11	73 #44 Bulb ESCAPE THE RINGWRAITHS	74 #44 Bulb GANDALF VS SARUMAN	75 #44 Bulb WARG ATTACK	76 #44 Bulb WAR OF THE ENTS	77 #44 Bulb BATTLE WITH SHELOB	78 #44 Bulb DESTROY THE WITCH-KING	79 #555 Bulb TOURNAMENT BUTTON	80 #555 Bulb START BUTTON





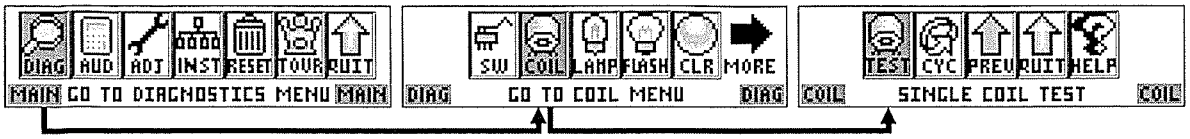
Playfield ▲
◀ Backpanel

= Lamps above Playfield.
= Lamps below Playfield.
= Lamps not on Playfield.

Lamp Part Notes: #555 Bulb Clear = 165-5002-00. #555 Bulb Green = 165-5054-04 . #44 Bulb Clear = 165-5000-44. See Section 4, Chapter 1, ***Parts Identification & Location***, Pages 72-74 for more details on bulbs and corresponding sockets.

Some Lamp Diodes may be located under the playfield, in the Cabinet or Backbox on Terminal Strips and not on or with the Lamp Socket.

DOTS: Diode On Terminal Strip, see Sec. 5, Chapter 2, ***Playfield Wiring***.



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	24-940 ↻ 090-5036-00T
#3	LEFT VUK	Q3		YEL-VIO	J10-P4/5	50v DC	BRN-ORG	J8-P4	26-1200 ↻ 090-5044-00B
#4	TOP VUK	Q4		YEL-VIO	J10-P4/5	50v DC	BRN-YEL	J8-P5	26-1200 ↻ 090-5044-00B
#5	RIGHT VUK	Q5		YEL-VIO	J10-P4/5	50v DC	BRN-GRN	J8-P6	26-1200 ↻ 090-5044-00B
#6	RING MAGNET	Q6		VIO-YEL	J10-P3	50v DC	BRN-BLU	J8-P7	20½-480 ↻ 090-5064-02
#7	RIGHT TOWER	Q7		YEL-VIO	J10-P4/5	50v DC	BRN-VIO	J8-P8	23-800 ↻ 090-5001-00B
#8	LOOP DIVERTER	Q8		GRY-YEL~3A Fuse~YEL-VIO	J10-P1/2	50v DC	BRN-GRY	J8-P9	22-1080 ↻ 090-5032-00T

	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	NOT USED	Q12					BLU-YEL	J9-P5	
#13	ORBIT PIN	Q13		BRN	J7-P1	20v DC	BLU-GRN	J9-P6	26-1200 ↻ 090-5044-00B
#14	FLASH: HELMS DEEP RT	Q14		ORG	J6-P10	50v DC	BLU-BLK	J9-P7	#906 Bulb 165-5004-00
#15	LEFT FLIPPER (50v RED/YEL)	Q15		GRY-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-GRY	J9-P8	22-900 ↻ 090-5020-20T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-VIO	J9-P9	22-900 ↻ 090-5020-20T

	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	TOP SAUCER	Q19		BRN	J7-P1	20v DC	VIO-ORG	J7-P4	26-1200 ↻ 090-5044-00B
#20	BALROG MOTOR RELAY	Q20		BRN	J7-P1	20v DC	VIO-YEL	J7-P6	DC Relay 520-5066-00
#21	SWORD LOCK RELEASE	Q21		BRN	J7-P1	20v DC	VIO-GRN	J7-P7	27-1500 ↻ 090-5004-00T
#22	BALROG MOTOR	Q22		BRN	J7-P1	20v DC	VIO-BLU	J7-P8	Motor 041-5088-01
#23	FLASH: HELMS DEEP LT	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: POPS X3	Q25	▲ I/O Power Driver ▼	ORG	J6-P10	20v DC	BLK-BRN	J6-P1	#906 Bulb 165-5004-00
#26	FLASH: RING	Q26		ORG	J6-P10	20v DC	BLK-RED	J6-P2	#906 Bulb 165-5004-00
#27	FLASH: BACK PANEL	Q27		ORG	J6-P10	20v DC	BLK-ORG	J6-P3	#906 Bulb 165-5004-00
#28	NOT USED	Q28					BLK-YEL	J6-P4	
#29	FLASH: RINGWRAITH	Q29		ORG	J6-P10	20v DC	BLK-GRN	J6-P5	#906 *Red* 165-5004-02
#30	FLASH: SWORD	Q30		ORG	J6-P10	20v DC	BLK-BLU	J6-P6	#906 Bulb 165-5004-00
#31	FLASH: DESTROY THE RING	Q31		ORG	J6-P10	20v DC	BLK-VIO	J6-P7	#89 Bulb 165-5000-89
#32	FLASH: BALROG	Q32		ORG	J6-P10	20v DC	BLK-GRY	J6-P8	#89 Bulb 165-5000-89

Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q14, Q23 & Q25-Q27, Q29-Q32)

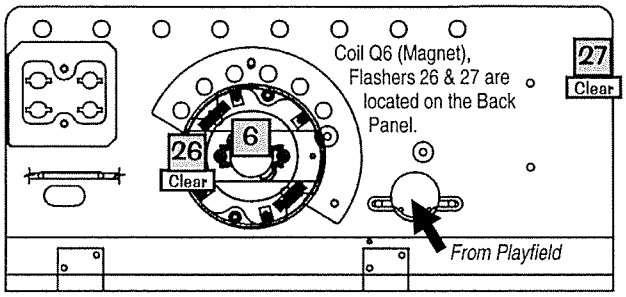
	Auxiliary (UK ONLY)	Drive Transistor	Driver Ouput Board	Power Line Color	Power Line Connection	Power Voltage	Drive Transistor Control Line Color	D.T. Control Line Connect	Coil GA-Turn
	AUX 1: LEFT UP/DOWN POST	Q1	Solenoid Expander Auxiliary	BRN	J7-P1	20v DC	WHT	CN2-P5	26-1200 ↻ 090-5044-00T
	AUX 2: CENTER 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 Note: ↻ Either -00B *or* -00T can be used for coil replacements. *B/T listed is preferable for easier diode access & may differ on game.*

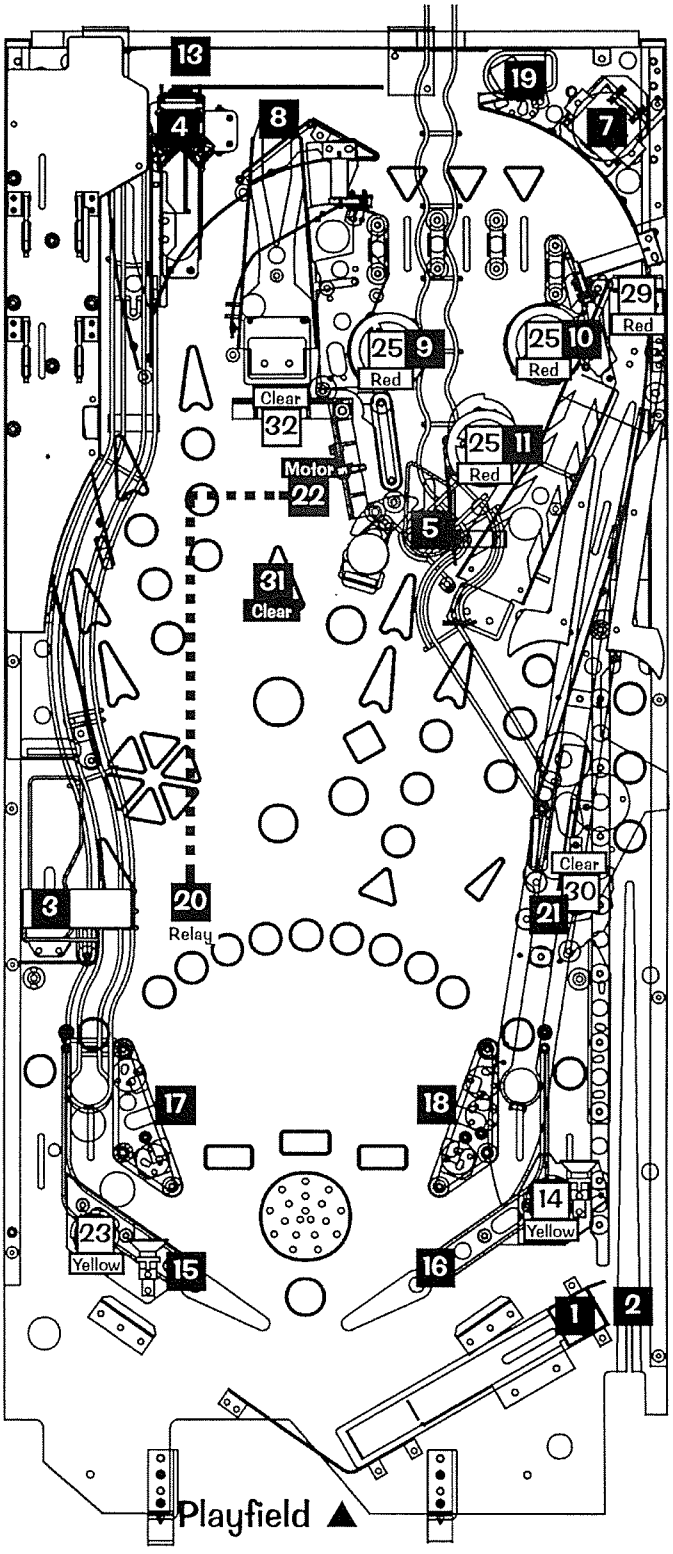
THE LORD OF THE RINGS™

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

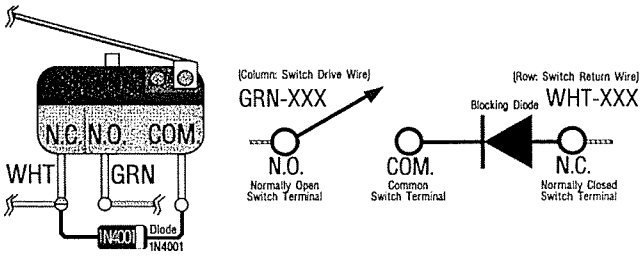
COIL & FLASH LAMP LOCATIONS



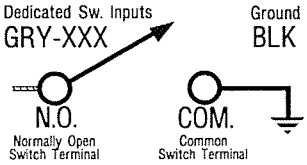
◀ Backpanel



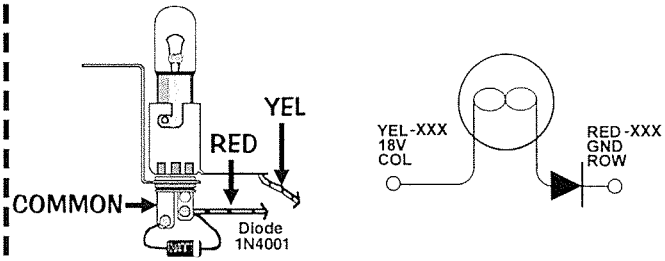
Typical Switch Wiring & Schematic



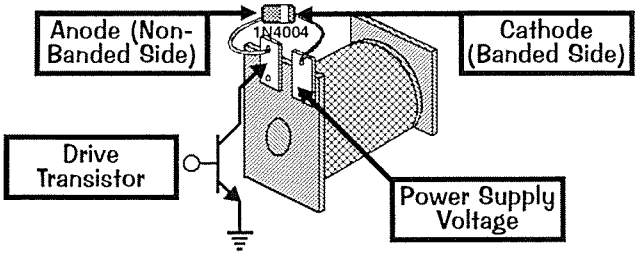
Dedicated Switch Schematic



Typical Lamp Wiring & Schematic



Typical Coil Wiring



= Coils / Flash Lamps above Playfield.

= Coils / Flash Lamps below Playfield.

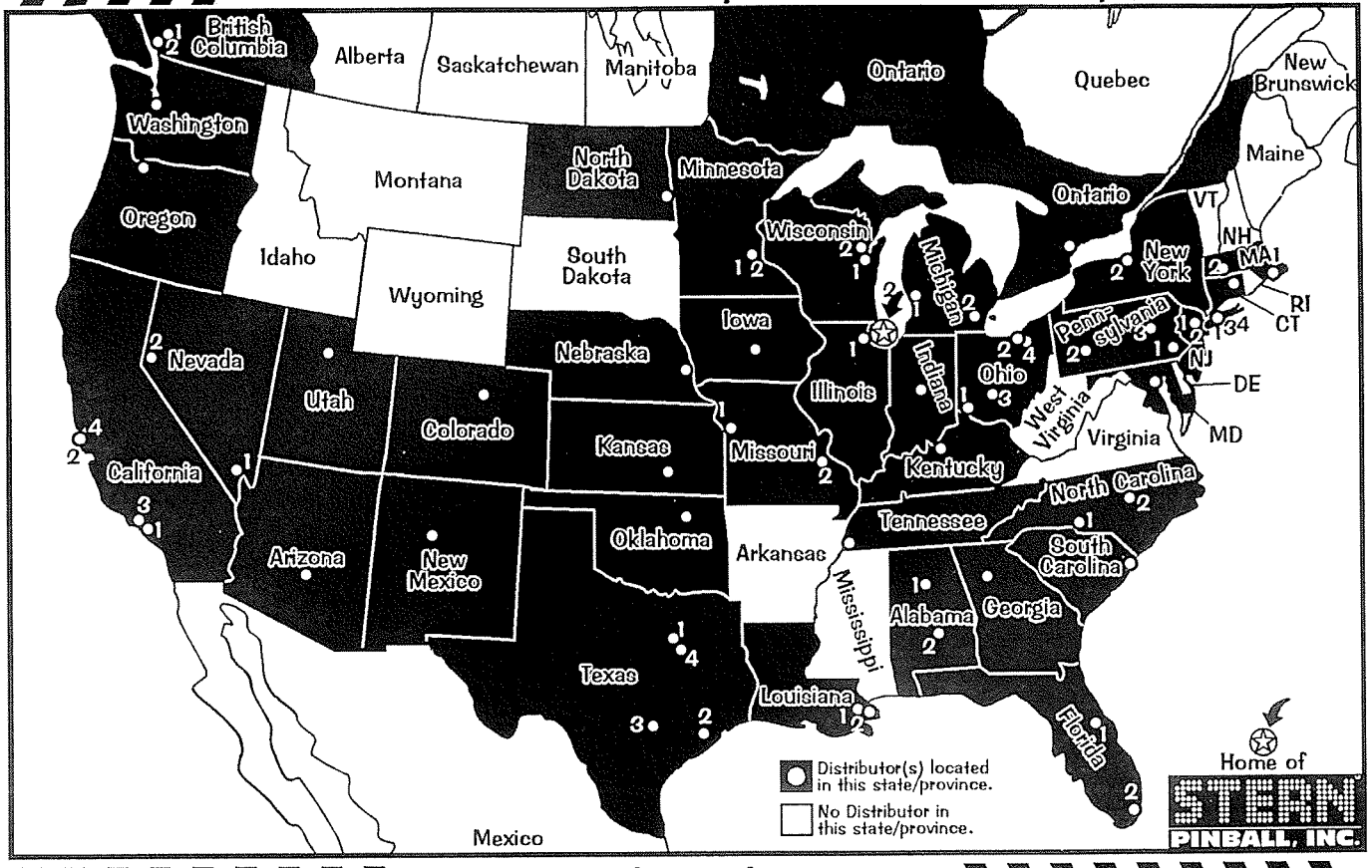
= Coils / Flash Lamps not on Playfield.

Color = Color of Mini-Mars of Flash Lamp Bulb.

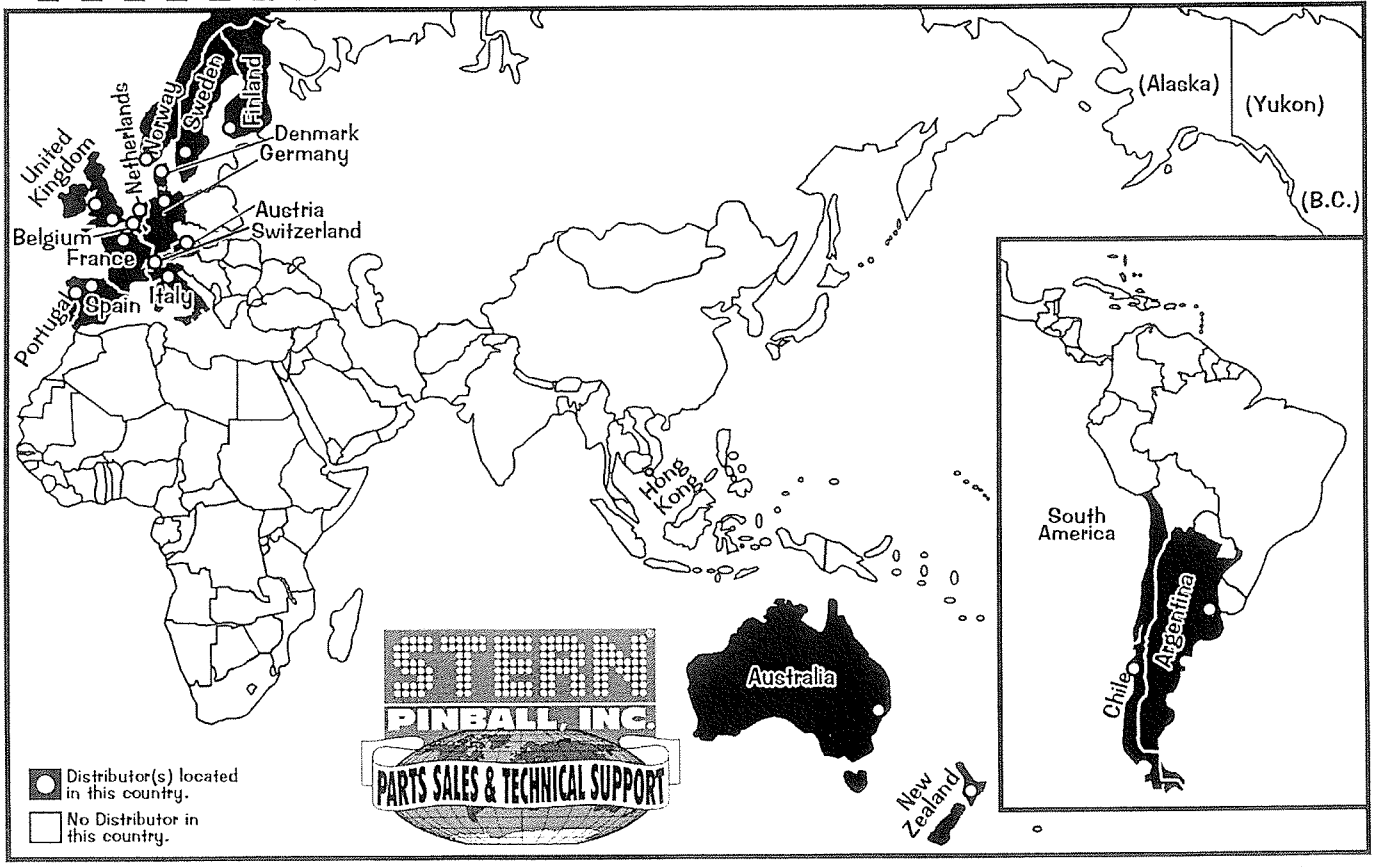
Some Coil or Flash Lamp Diodes may be located under the playfield, in the Cabinet or Backbox *on Terminal Strips* ***or*** *Diode Boards and not on the assemblies.*
DOTS: Diode On Terminal Strip *See Section 5, Chapter 2,* ***Playfield Wiring.***

Coil Q24 is Optional. *If either a Coin Meter, Token Dispenser or Knocker (all optional equipment) is required, call Technical Support for more information, 1-800-542-5377 or 1-708-345-7700.*

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 LORD OF THE RINGS™

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

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

Discount Arcade Games
Crowley (1)
1-817-297-0440

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

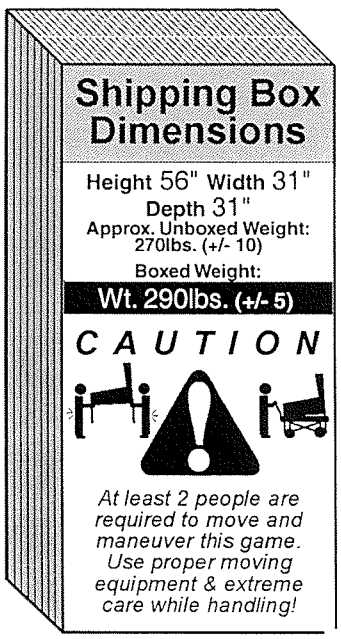
TRANSPORTATION

BEFORE TRANSPORTING

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 !

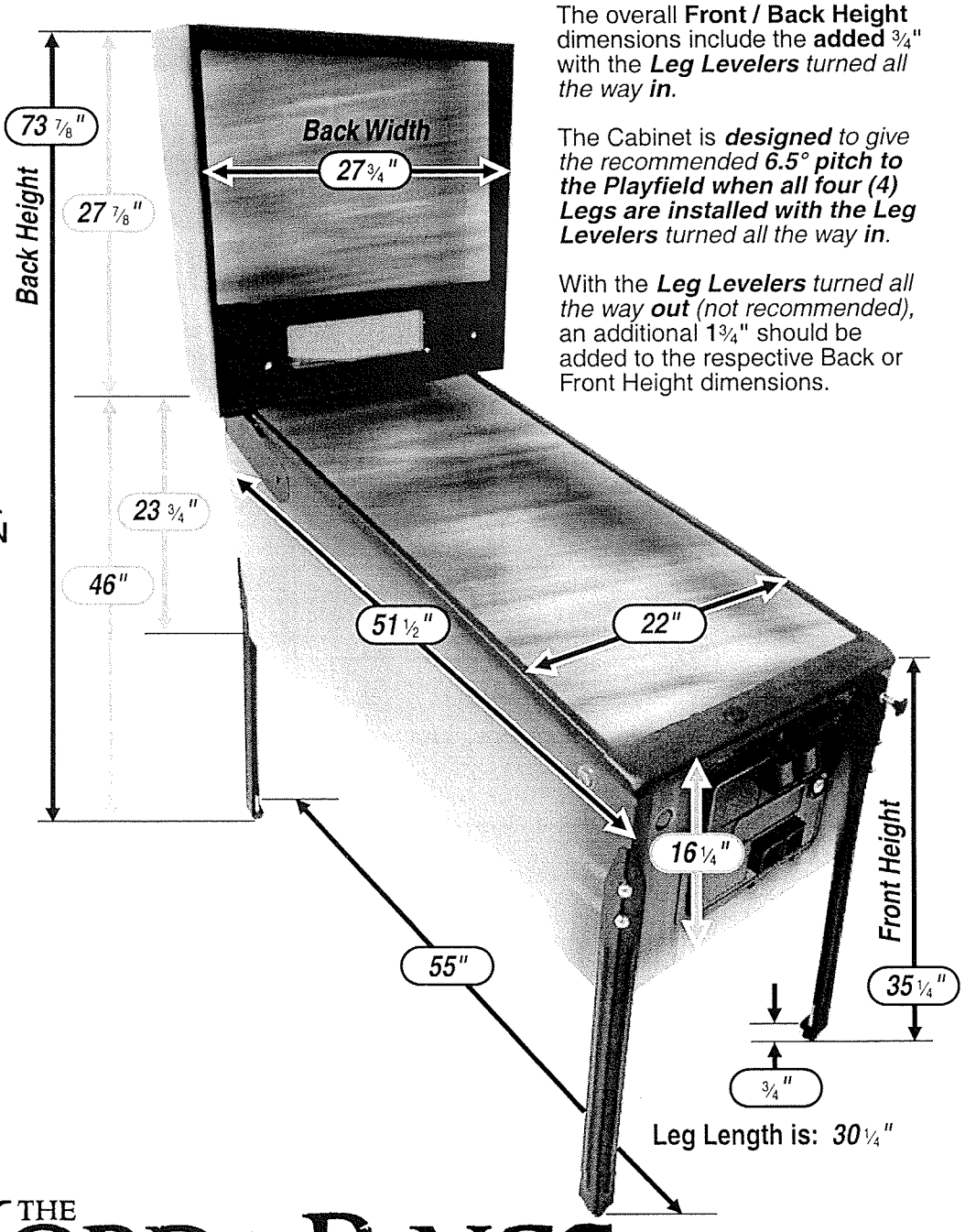


GAME DIMENSIONS

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

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.



Leg Length is: *30¼"*

THE LORD OF THE RINGS™

Find-It-In-Front: Dr. Pinball

STERN PINBALL, INC.

The The Lord of the Rings™ 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 Pinball Game, four (4) Pinballs must be installed!.....Inside Front

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▶ 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

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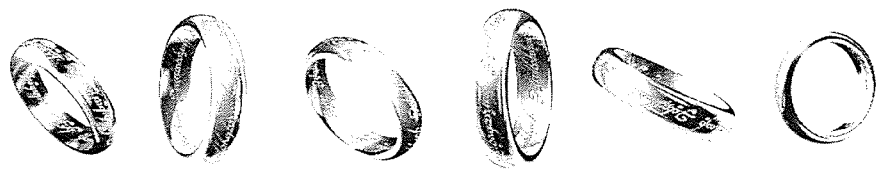
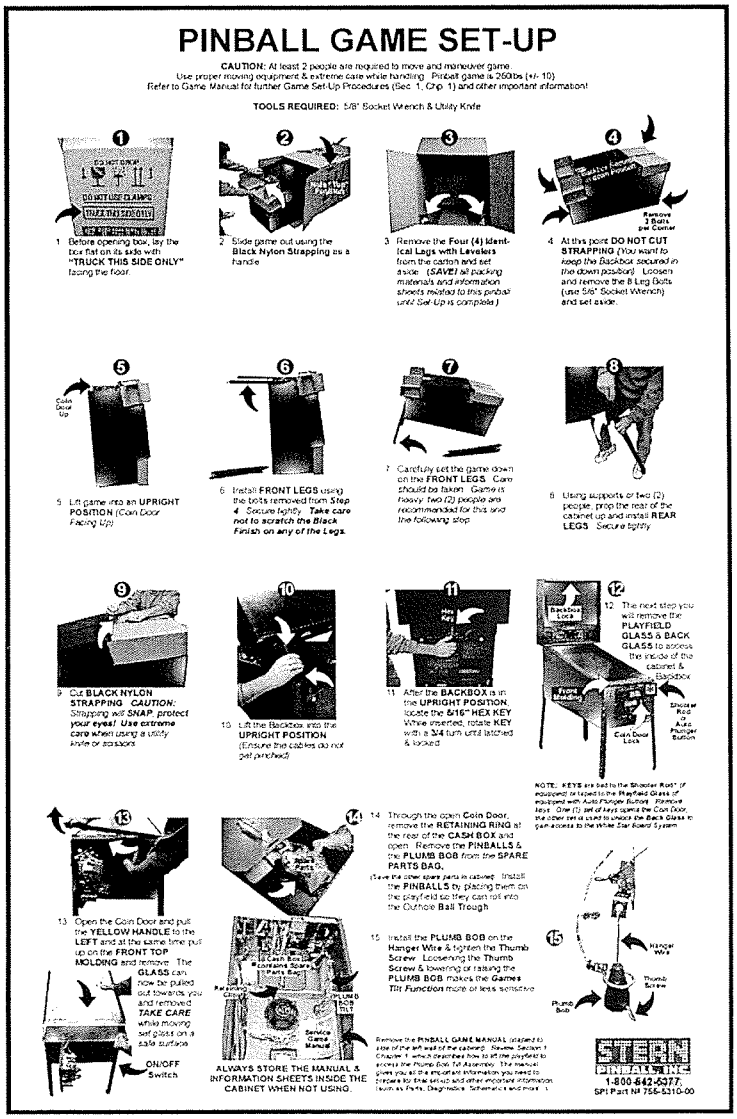


After Set-Up

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 INSTALLS MENU** to adjust **Game Difficulty**, 3- or 5-Ball Play, **Home** or **Tournament Settings**, **Novelty**, **Add-A-Ball**, etc.).*

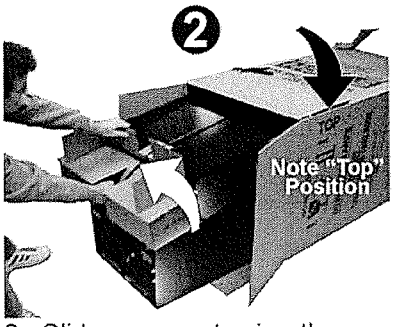
er CE: "The appliance has to be placed in a horizontal position." "This appliance is not to be cleaned by a Water Jet."

CE

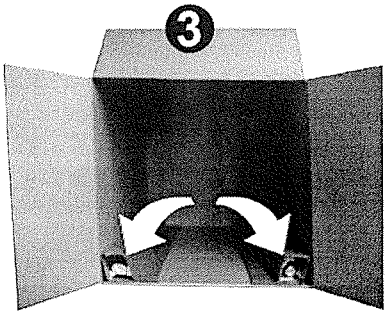
Pinball Game Set-Up Future Reference

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

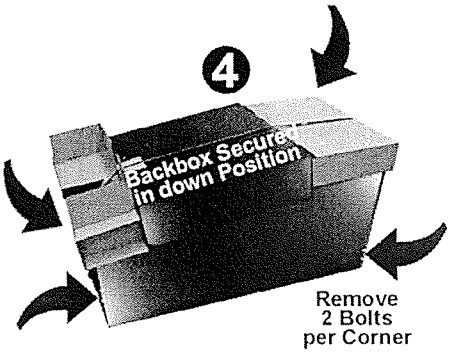
1. Before opening box, lay the box flat on its side with **"TRUCK THIS SIDE ONLY"** facing the floor.



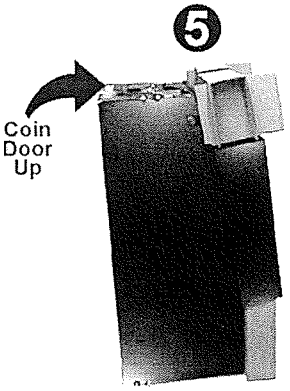
2. Slide game out using the **Black Nylon Strapping** as a handle.



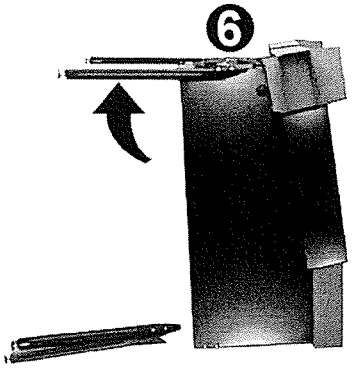
3. Remove the **Four (4) Identical Legs with Levelers** from the carton and set aside. (***SAVE!*** *all packing materials and information sheets related to this pinball until Set-Up is complete.)*



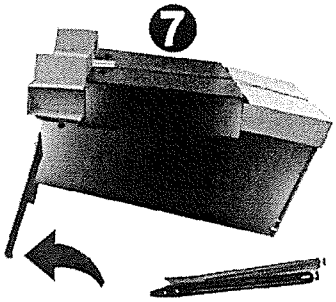
4. At this point **DO NOT CUT STRAPPING** *(You want to keep the Backbox secured in the down position).* Loosen and remove the 8 Leg Bolts (use 5/8" Socket Wrench) and set aside.



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

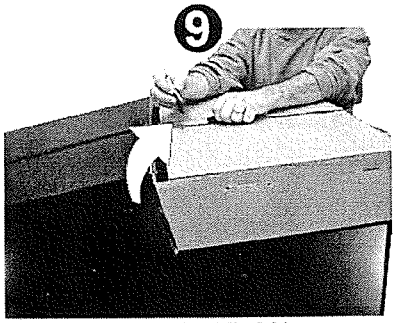


6. Install **FRONT LEGS** using the bolts removed from ***Step 4***. *Secure tightly.* ***Take care not to scratch the Black Finish on any of the Legs.***

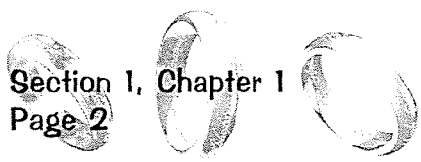


7. Carefully set the game down on the **FRONT LEGS**. *Care should be taken...Game is heavy, two (2) people are recommended for this and the following step.*

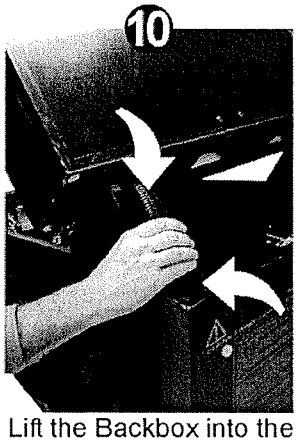
8. Using supports or two (2) people, prop the rear of the cabinet up and install **REAR LEGS**. *Secure tightly.*



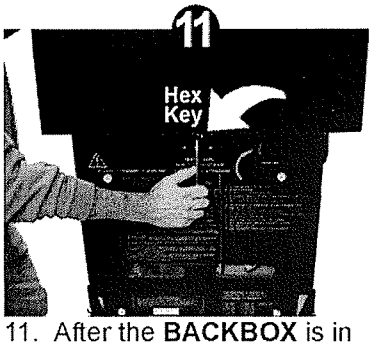
9. Cut **BLACK NYLON STRAPPING**. ***CAUTION:*** *Strapping will* ***SNAP, protect your eyes! Use extreme care*** *when using a utility knife or scissors.*



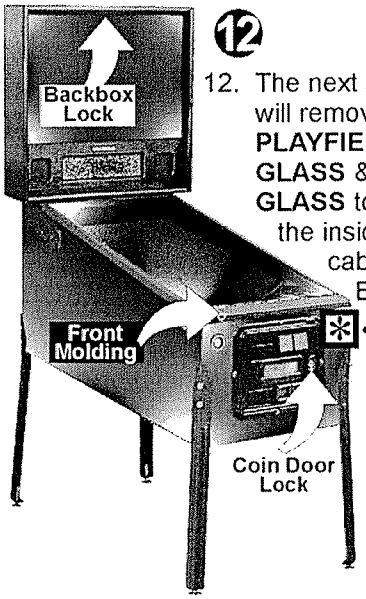
Pinball Game Set-Up Future Reference Continued



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

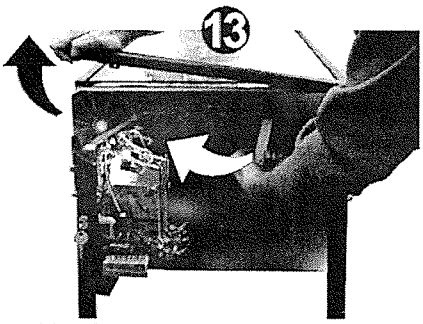


11. After the **BACKBOX** is in the **UPRIGHT POSITION**, locate the **5/16" HEX KEY**. While inserted, rotate **KEY** with a **3/4** turn until latched & locked.

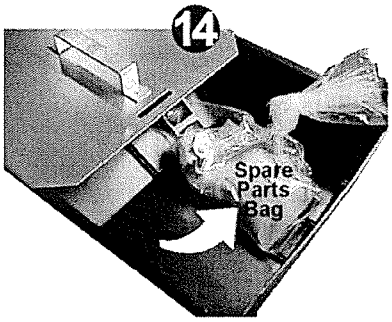


12. The next step you will remove the **PLAYFIELD GLASS & BACK GLASS** to access the inside of the cabinet & Backbox.

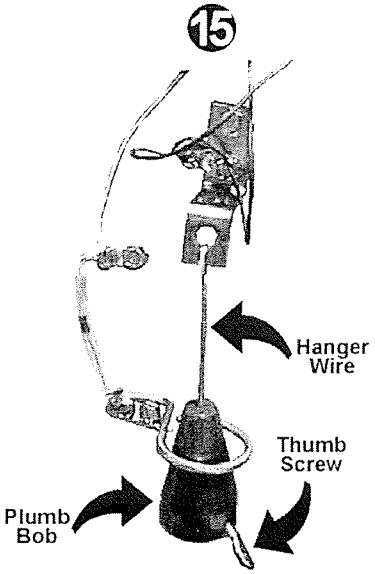
NOTE: **KEYS** are tied to the **Shooter Rod*** *(if equipped)* or taped to the **Playfield Glass** *(if equipped with Auto Plunger Button). Remove keys. One (1) set of keys opens the Coin Door, the other set is used to unlock the **Back Glass** to gain access to the White Star Board System.*



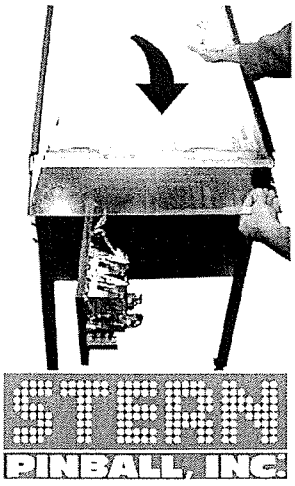
13. Open the Coin Door and pull the **YELLOW HANDLE** to the **LEFT** and at the same time pull up on the **FRONT TOP MOLDING** and remove. The **GLASS** can now be pulled out towards you and removed. *TAKE CARE while moving; set glass on a safe surface.*

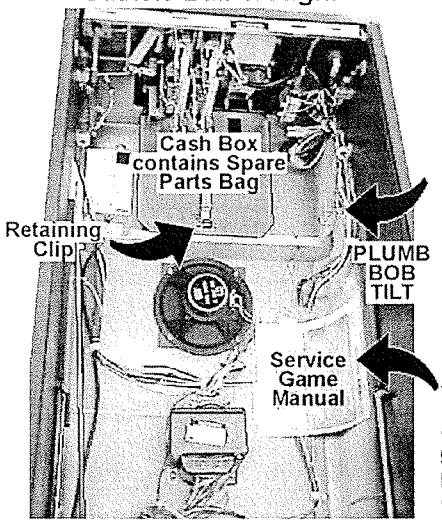


14. Through the open **Coin Door**, remove the **RETAINING RING** at the rear of the **CASH BOX** and open. Remove the **PINBALLS** & the **PLUMB BOB** *from the* **SPARE PARTS BAG.**
(Save the other spare parts in cabinet).
Install the **PINBALLS** by placing them on the playfield so they can roll into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



15. 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.



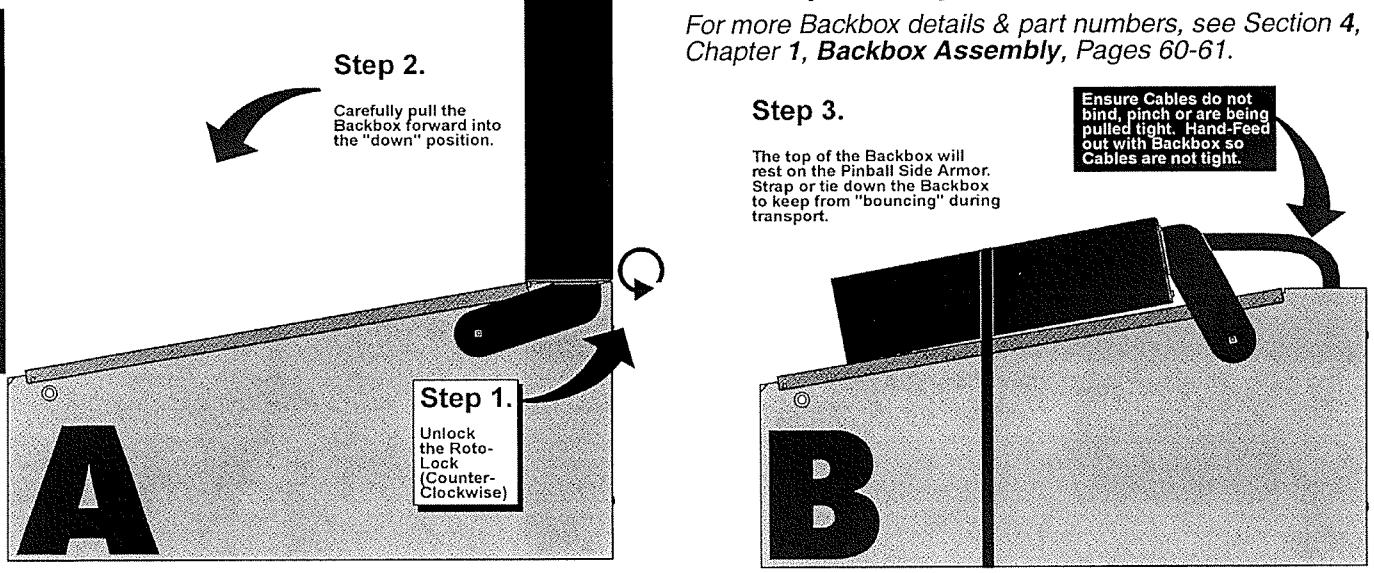


Remove the **PINBALL GAME MANUAL** *(stapled to side of the left wall of the cabinet). Review Section 1. Chapter 1, which describes how to lift the playfield to access the Plumb Bob Tilt Assembly.* The manual gives you all the important information you need to prepare for final set-up and other important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

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

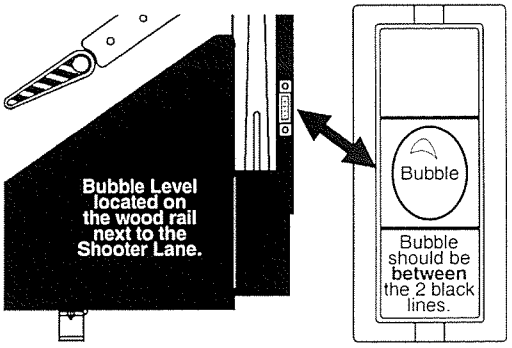
How to Secure the Backbox for Transporting

*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 .

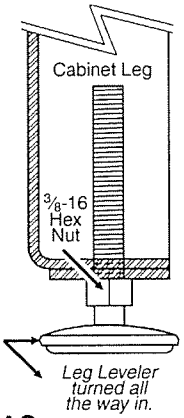


Start adjustment with the leg levelers *turned all the way in.*

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!

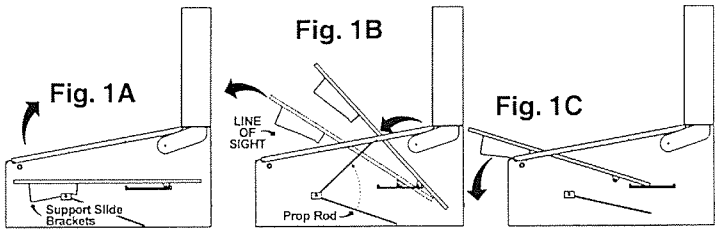
Note:** For custom adjustment greater than >6.5° can be achieved by turning out the rear leg leveler(s), however, **it is not recommended.

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).*

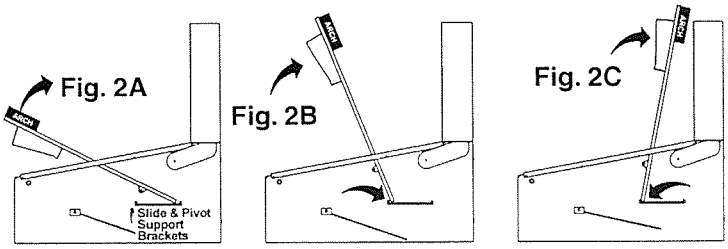
Positions 1 & 2

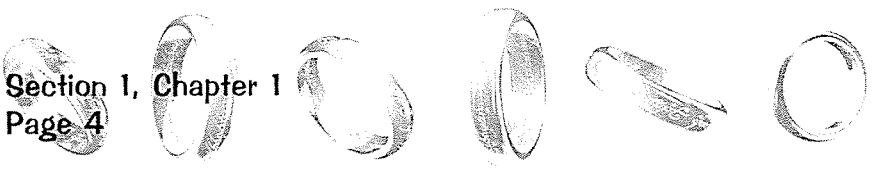
When lifted high enough, the ***Playfield Support Slide Brackets*** (**Fig. 1A**) can be seen & can clear the cabinet front. At this time, pull the playfield toward the front of the cabinet, checking that the mechanical components clear the cabinet front, then rest the playfield on the ***Playfield Support 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!)

This option is adjustable with **Standard Adj. 50, Team Scores** (Default = **NO**). If **Standard Adj. 50, Team Scores** is changed to **YES**, then Team Play will be made available. ***Team Play only works in a 4-Player Game.*** The totals for Players 1/ 3 (Team 1) & Players 2 / 4 (Team 2) are then displayed individually ***as well as*** the combined score for **BOTH TEAMS**.

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: 755-5180-00 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 LORD OF THE RINGS™

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

FOLD HERE

Skill Shot Time your plunge to select your target *(watch Shooter Lane).*

Rings of Power Shoot the 4 *Ring Shots* to collect **Rings of Power :**

- 3 Rings of Elves Lights **Mode Start** on *Center Ring Shot.*
- 7 Rings of Dwarves Lights *Mystery Award* on Hobbiton.
- 9 Rings of Men Lights **Gollum Multiball** on *Right Saucer.*

THE LORD OF THE RINGS™

Movie Multiballs Play all 3 *Movie Multiballs* to light **Destroy the Ring :**

- **The Fellowship of the Ring™** Shoot every shot to collect the 9 *Members of the Fellowship.*
- **The Two Towers™** Spell K E E P on *Bottom Lanes* to light *Sword Lock,* then lock 3 Balls on the Sword.
- **The Return of the King™** Collect 5,000 souls on the *Paths of the Dead (Mini-Playfield).*

Gifts of the Elves Win a *Ring Mode* or a *Movie Multiball* to earn a wondrous Gift from the Elves.

Palantir Shoot Barad-dûr to light the Palantir, then shoot the Palantir to aid your quest.

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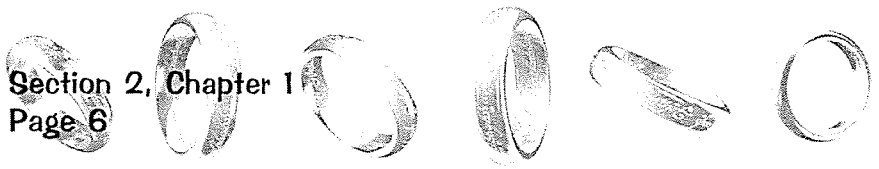

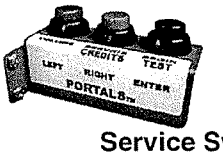

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Service Menu System
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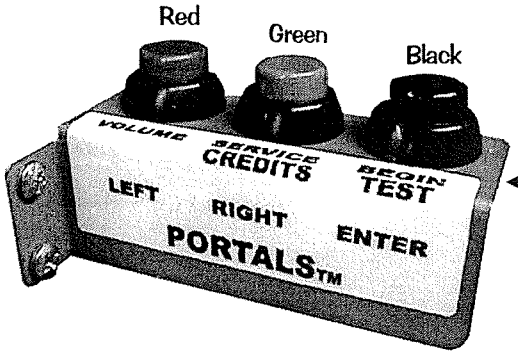
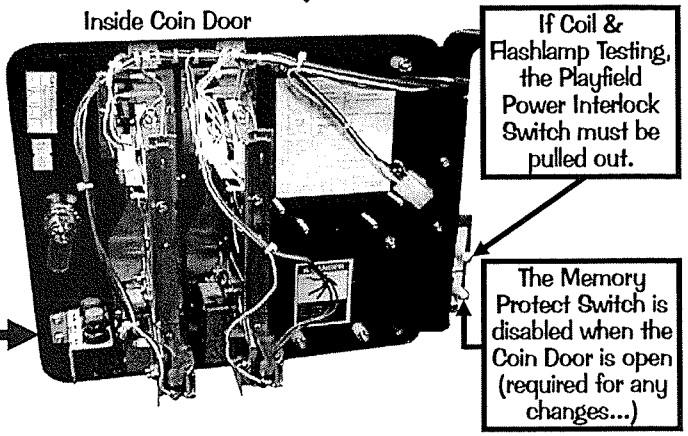
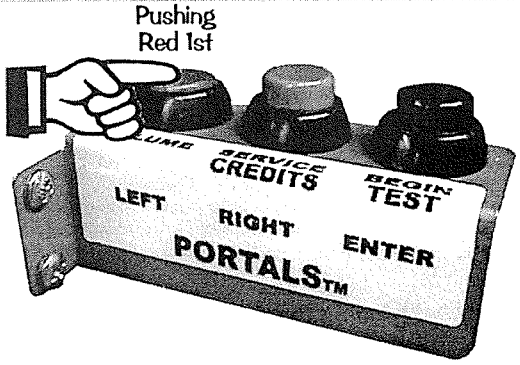
Service Switch Set (Red, Green & Black Buttons) Access & Use

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).*

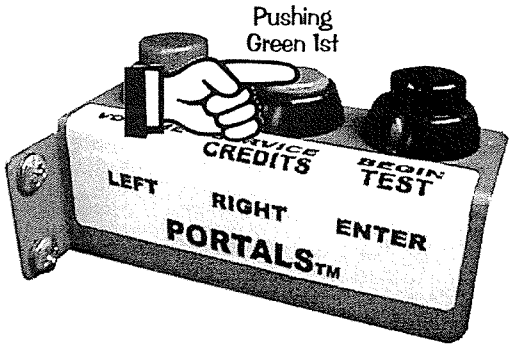


Function 1, Volume Menu

Pushing the ***Red "VOLUME" Button*** 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.*

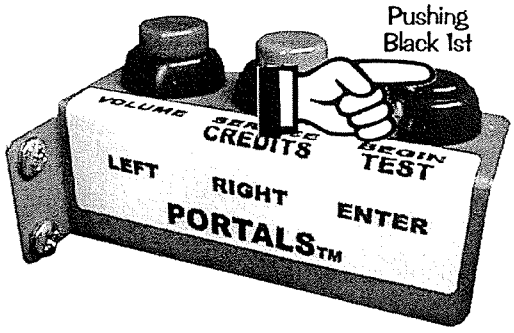
Set between **0-31**; Once your adjustments are made, this menu will ***automatically exit*** a few seconds after the last button depression.



Function 2, Service Credits Menu

Pushing the ***Green "SERVICE CREDITS" Button*** 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. **Std. 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 **Standard 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.).*



Function 3, Portals™ Service Menu

Pushing the ***Black "BEGIN TEST" Button*** 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!

Portals™ Service Menu Introduction

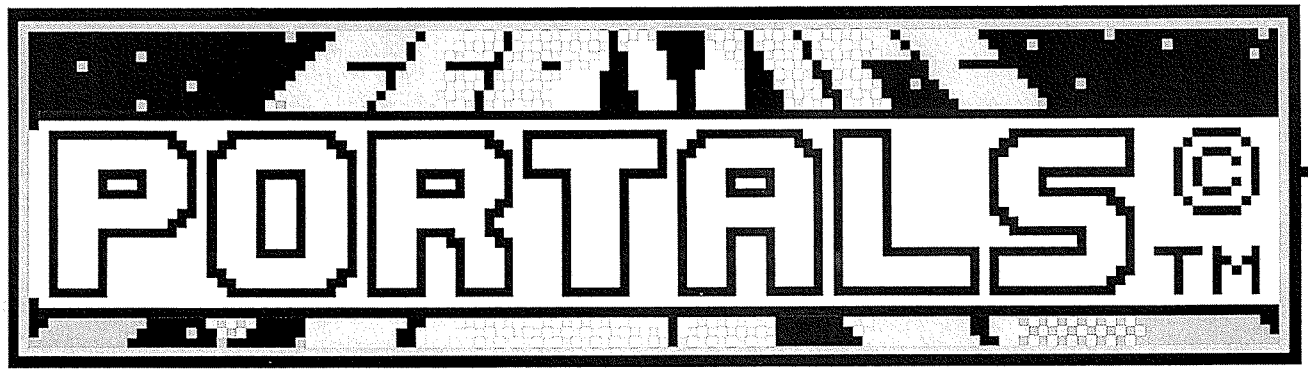
Portals™ Service Menu Introduction

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©TM"** 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 (DIAG) | GO TO AUDITS MENU (AUD) | GO TO ADJUSTMENTS MENU (ADJ) | GO TO INSTALLS MENU (INST) | GO TO RESET MENU (RESET) | GO TO TOURNAMENT MENU (TOUR) | QUIT THIS SESSION (QUIT)

MORE ← 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.

CONTINUED NEXT PAGE.

DIAGNOSTICS MENU

SW	* COIL	LAMP	* FLASH	* CLR	TECH	SERV	* PLAY	KNO-CKER	SPKR	BURN	DOT TEST	LOTR	FUSES	DR.
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	LOTR TESTS	GO TO FUSE TABLE	DR. PINBALL

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

SWITCH MENU

TEST	ACT	DED
SWITCH TEST	ACTIVE SWITCH TEST	DEDICATED SWITCH TEST

COIL MENU

TEST	CYC
SINGLE COIL TEST	CYCLING COIL TEST

LAMP MENU

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

LOTR MENU

RING	BLRG	LED
RING TEST	BALROG TEST	19-LED TEST

DR. PINBALL MENU

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

AUDITS MENU

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

ADJUSTMENTS MENU

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

PRINTER MENU

QUIK	ALL-SOM	RESET
QUICK PRINTOUT	FULL PRINTOUT	RESET PRINTER

*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	QUIT	HELP
Return to the **PREVIOUS** Menu.	**QUIT**, *exits & returns to the* ***Attract Mode***.	*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.*

◀◀ ▶▶	⊟ ⊞	RUN	DRAW	NO YES	END
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 **PULSE** *coil.*	*View the schematic* (**DRAW**ing) *of current display. Select while current switch, lamp or coil is viewed.*	*Answer* **NO** or **YES** *for Flow Chart Menu questions in Dr. Pinball Menus.*	**END** *current coil selection to select a new coil for diagnosing in Dr. Pinball Menus.*

THE LORD OF THE RINGS Portals™ Service Menu Icon Tree Continued
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.
SELECTING THIS ICON IN ANY MENU WILL EXIT PORTALS™ AND WILL RETURN TO THE ATTRACT MODE.
INSTALLS MENU
INSTALL EXTRA EASY
INSTALL EASY
INSTALL NORMAL
INSTALL HARD
INSTALL EXTRA HARD
INSTALL 3-BALL
INSTALL 5-BALL
$.50 COMPETITION
FREE PLAY COMPETITION
INSTALL HOME PLAY
FILM STAR RESET
INSTALL NOVELTY
INSTALL ADD-A-BALL
INSTALL FACTORY
REQUEST INSTALLED
AFTER FACTORY RESET IS INSTALLED, YOU WILL THEN EXIT PORTALS™ AND WILL RETURN TO THE ATTRACT MODE.
RESET MENU
RESET COIN AUDITS
RESET GAME AUDITS
RESET HIGH SCORES
RESET CREDITS
FACTORY RESET
TOURNAMENT MENU
TOURNAMENT ADJUSTMENTS
START TOURNAMENT
STOP TOURNAMENT
TOURNAMENT PRIZES
TOURNAMENT 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
For more detailed information on these Menus, review Chapters 1-7 in this Section 3.
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.

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:

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.*

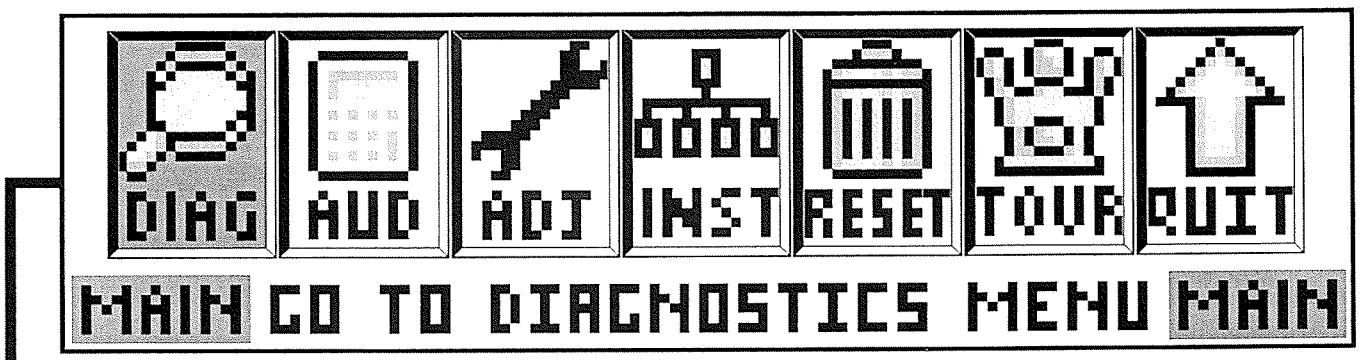
RUN *(or activate) selected test or coil*
PULSE *coil.*

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

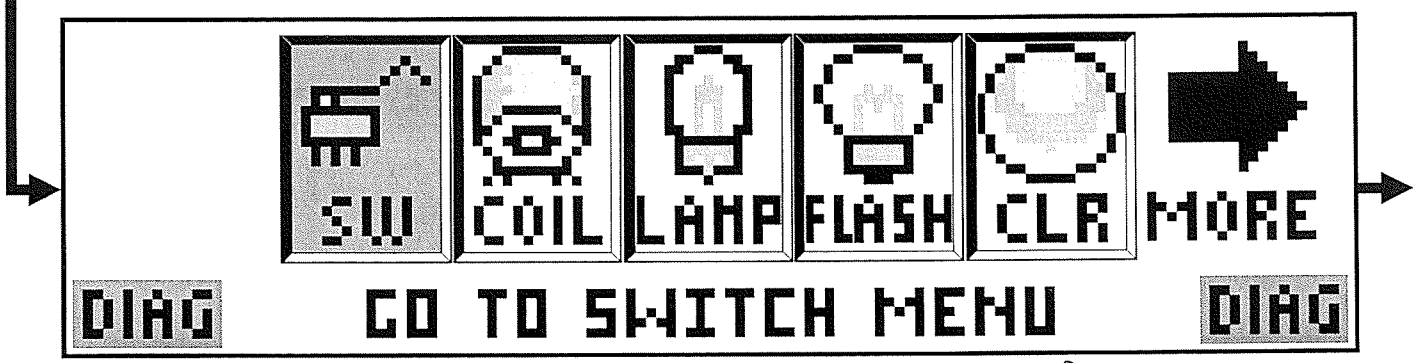
**** Help Note: An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.***

Example:

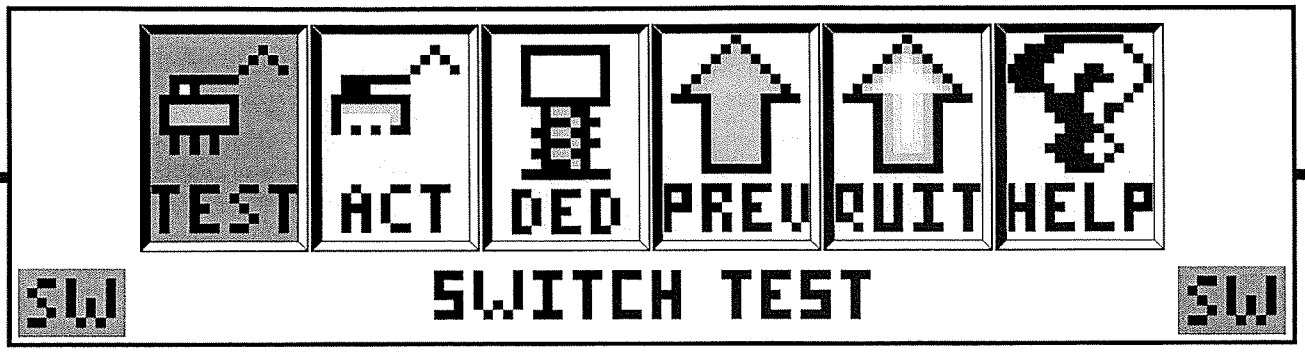
After entering **Portals™**, the **MAIN MENU** now appears with the **"DIAG"** *Icon* (**GO TO DIAGNOSTICS MENU**) flashing:



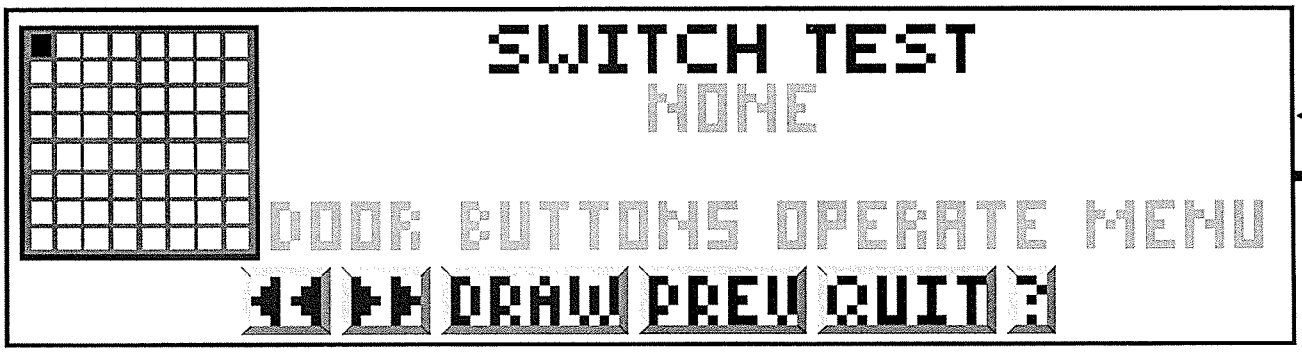
Press the **Black "ENTER" Button** to *activate* this **ICON**. The **DIAGNOSTICS MENU** now appears with the "SW" *Icon* (**GO TO SWITCH MENU**) flashing:



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

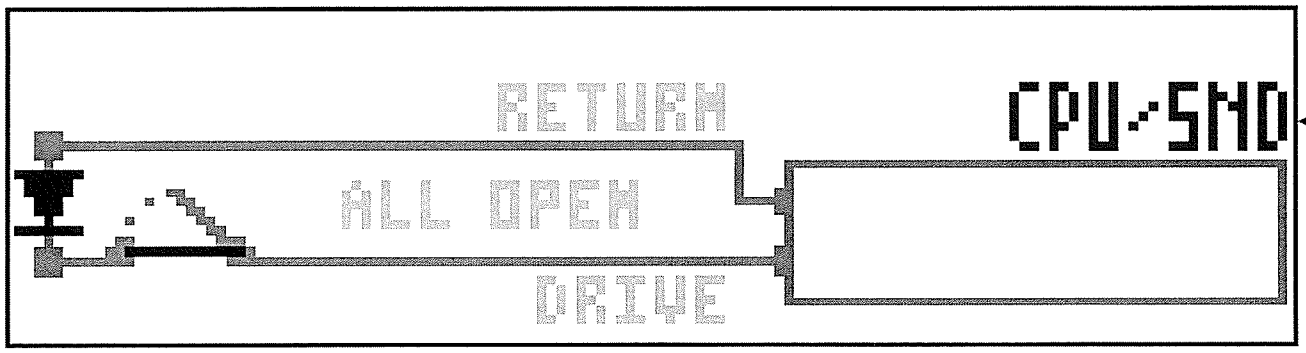


Press the **Black "ENTER" Button** to *activate* this icon. The **Switch Test Display** now appears.



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.



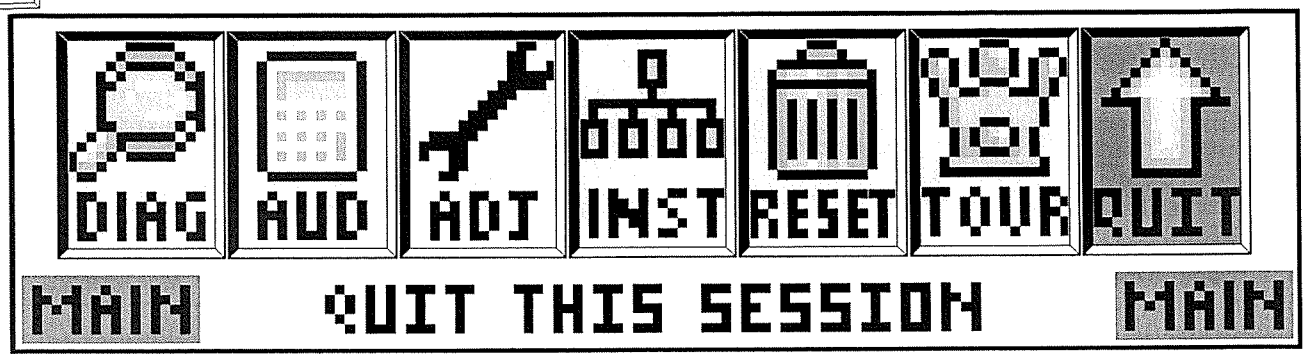
To ***exit any display where there are no Mini-Icons*** *(Schematics or Help Displays)*, ***press any button*** to return to the previous Menu.

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***.

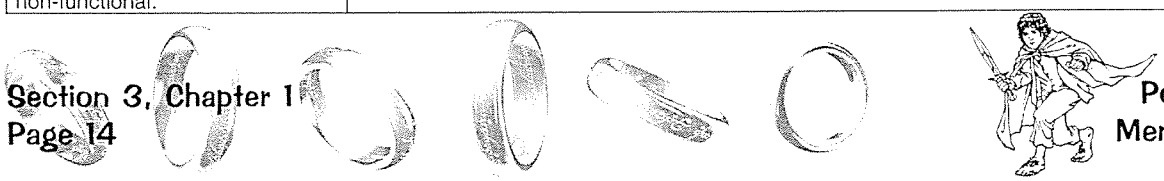


The game will go into the same *Power-Up Routine* as if turning on the game. Upon **Power-Up**, the CPU Game Code & Display Code versions with Check-Sums are shown, followed by the Location ID & Game ID Numbers and Alerts, if any *(see Section **3**, Chapter **2**, **GO TO DIAGNOSTICS MENU, Technician 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 Section **5**, Chapter **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 Section **3**, Chapter **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*** *(Game Reset) or opening the* ***Coin Door*** *watch the* ***Display*** *for any* ***Alerts.****

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).*

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.*

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****).*

* If this ***Tech Report Alert flashes*** *(along with an audible sound),* the game has detected faulty switches and/or missing pinballs. Select the "TECH" *Icon* for information *(review* ***Technician Alerts, Pages 24-25****).*
** For this* ***Alert display*** *to appear, Standard Adj.* ***49, must be changed*** *to* ***POWERUP, COIN DOOR*** *or* ***POWERUP AND COIN DOOR****, the default is* ***NEVER*** *(review Section 3, Chp. 4,* ***GO TO ADJUSTMENTS MENU****, Standard Adjustments, Page 44).*

⚠ **CAUTION:** Remove all pinballs from the Ball Trough prior to lifting the playfield to it's full upright position for servicing. **PULL OUT** the **Power Interlock Switch** for operation. To eject pinballs, 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* and press the **Black "ENTER" Button** *or* **Start Button** to remove one pinball at a time *(this feature also useful to retrieve a pinball for game testing in* ***Begin Play Test*** *&* ***Game Specific Tests****).*

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

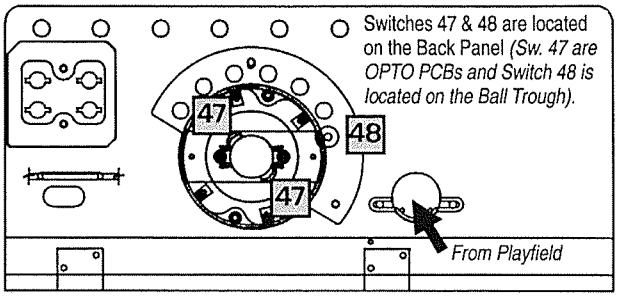
To initiate, from the **SWITCH MENU**, select the "DED" *Icon* with either **Flipper Button** & press the **Start Button** *(the Service Switches are deactivated during this test.)*. In **Dedicated Switch Test**, the display will describe the switch which includes the Switch Name, Return (Row) Wire,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

SWITCH MATRIX GRID & DEDICATED SWITCHES

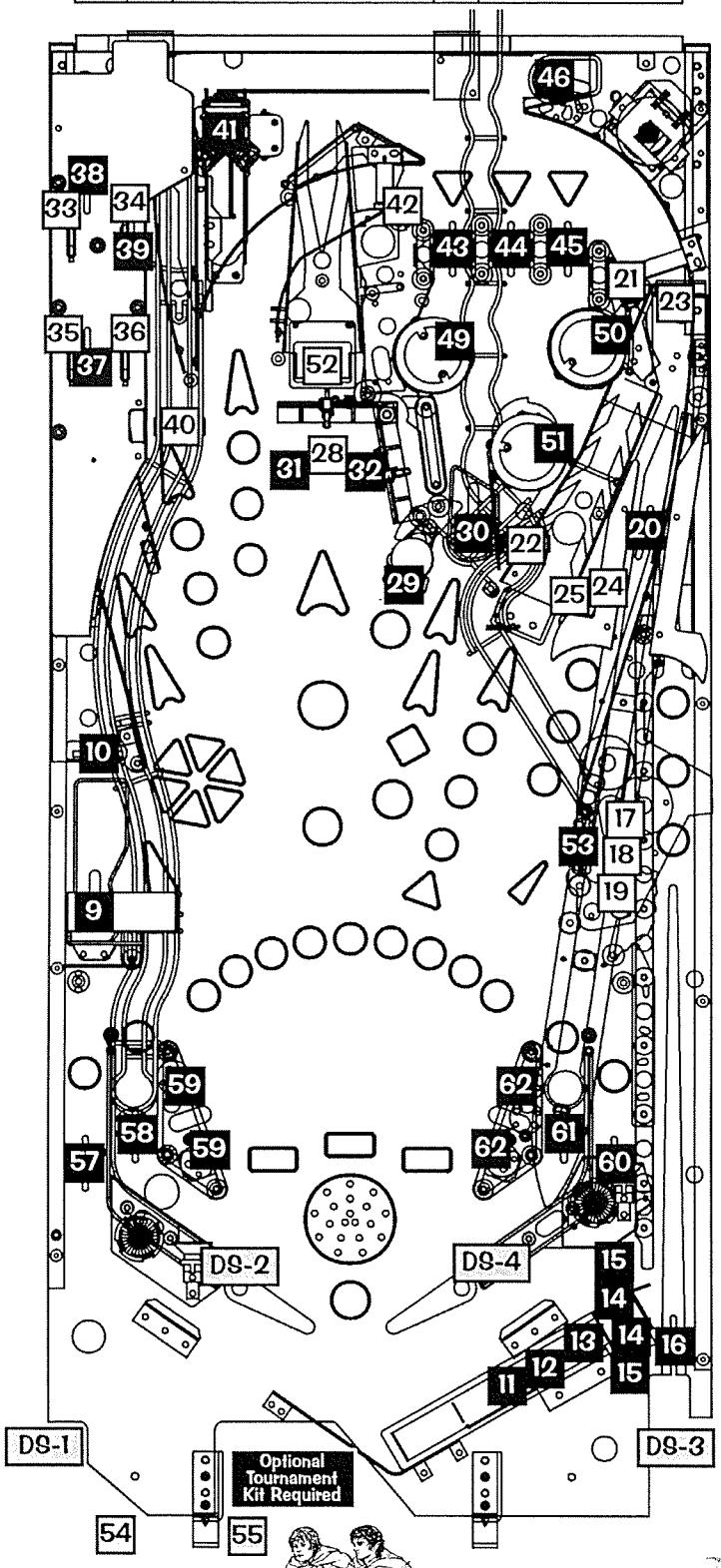
Column (Drive) / Row (Return)	1: Q1	2: Q2	3: Q3	4: Q4	5: Q5	6: Q6	7: Q7	8: Q8
	GRN-BRN CN5-P1	GRN-RED CN5-P3	GRN-ORG CN5-P4	GRN-YEL CN5-P5	GRN-BLK CN5-P6	GRN-BLU CN5-P7	GRN-VIO CN5-P8	GRN-GRY CN5-P9
1: U400	1 Cabinet Side LT BUTTON (UK ONLY) 180-5160-00	9 Below P/F LEFT VUK (DOTS) 180-5116-01	17 Above P/F SWORD LOCK HIGH 180-5119-02	25 Above P/F RIGHT RAMP ENTER (DOTS) 180-5010-01	33 Mini-P/F MINI PF U.L. 180-5057-00	41 Below P/F TOP VUK *See Sw. 41 Note*	49 Below P/F LEFT BUMPER 180-5015-03	57 Below P/F LEFT OUTLANE 500-6227-02
WHT-BRN CN7-P9								
Sw. Part Number:								
2: U400	2 Coin Door 4TH COIN SLOT 180-5204-00	10 Below P/F STANDUP 515-6027-08	18 Above P/F SWORD LOCK MID 180-5119-02	26 NOT USED	34 Mini-P/F MINI PF U.R. 180-5057-00	42 Above P/F INNER LOOP 180-5190-28	50 Below P/F RIGHT BUMPER 180-5015-03	58 Below P/F LEFT RETURN LANE 500-6227-02
WHT-RED CN7-P8								
Sw. Part Number:								
3: U400	3 Coin Door 6TH COIN SLOT *Future Use*	11 Below P/F 4-BALL TROUGH #1 (LEFT) 180-5119-02	19 Above P/F SWORD LOCK LOW 180-5119-02	27 NOT USED	35 Mini-P/F MINI PF L.L. 180-5057-00	43 Below P/F LEFT TOP LANE 500-6227-02	51 Below P/F BOTTOM BUMPER 180-5015-03	59 Below P/F LEFT SLINGSHOT 180-5054-00 (x2)
WHT-ORG CN7-P7								
Sw. Part Number:								
4: U400	4 Coin Door RIGHT COIN SLOT 180-5204-00	12 Below P/F 4-BALL TROUGH #2 180-5119-02	20 Below P/F RIGHT ORBIT LOW 500-6227-02	28 Above P/F BALROG HIT 180-5119-00	36 Mini-P/F MINI PF L.R. 180-5057-00	44 Below P/F MIDDLE TOP LANE 500-6227-02	52 Above P/F SPINNER 180-5190-28	60 Below P/F RIGHT OUTLANE 500-6227-02
WHT-YEL CN7-P6								
Sw. Part Number:								
5: U401	5 Coin Door CENTER COIN SLOT / DBA 180-5204-00	13 Below P/F 4-BALL TROUGH #3 180-5119-02	21 Above P/F RIGHT ORBIT HI 180-5190-28	29 Below P/F PALANTIR 515-5162-08	37 Below P/F LEFT ORBIT LOW 500-6227-02	45 Below P/F RIGHT TOP LANE 500-6227-02	53 Below P/F SPOT RING 515-5162-08	61 Below P/F RIGHT RETURN LANE 500-6227-02
WHT-GRN CN7-P5								
Sw. Part Number:								
6: U401	6 Coin Door LEFT COIN SLOT 180-5204-00	14 Below P/F 4-BALL TROUGH VUK OPTO *See Sw. 14 Note*	22 Above P/F RAIL RAMP EXIT 180-5197-00	30 Below P/F RIGHT VUK (DOTS) 180-5116-01	38 Below P/F LEFT ORBIT HI 500-6227-02	46 Below P/F TOP SAUCER 180-5186-00	54 In Cabinet START BUTTON 180-5174-00	62 Below P/F RIGHT SLINGSHOT 180-5054-00 (x2)
WHT-BLU CN7-P3								
Sw. Part Number:								
7: U401	7 Coin Door 5TH COIN SLOT *Future Use*	15 Below P/F 4-BALL STACKING OPTO *See Sw. 15 Note*	23 Above P/F RIGHT RAMP TARGET 515-6027-08	31 Below P/F BALROG OPEN 180-5119-02	39 Below P/F LEFT RAMP ENTER 500-6227-02	47 Back Panel RING MADE *See Sw. 47 Note*	55 In Cabinet TOURNAMENT START 180-5174-00	63 NOT USED
WHT-VIO CN7-P2								
Sw. Part Number:								
8: U401	8 Cabinet Side RT BUTTON (UK ONLY) 180-5160-00	16 Below P/F SHOOTER LANE 180-5157-00	24 Above P/F RIGHT RAMP MADE 180-5198-00	32 Below P/F BALROG CLOSED 180-5119-02	40 Above P/F LEFT RAMP MADE 180-5010-01	48 Back Panel BACK TROUGH 180-5057-00	56 In Cabinet PLUMB BOB TILT *See Sw. 56 Note*	64 NOT USED
WHT-GRY CN7-P1								
Sw. Part Number:								

GROUND / IC U208 INPUTS	GROUND BLK CN6-P1, -P11
1: U206	DS-1 on Cabinet Side #1 LEFT FLIPPER BUTTON 180-5160-00
GRY-BRN CN6-P2	
Sw. Part Number:	
2: U206	DS-2 Below Playfield #2 LEFT FLIPPER E.O.S (End-of-Stroke) 180-5149-00 *on Flipper*
GRY-RED CN6-P3	
Sw. Part Number:	
3: U206	DS-3 on Cabinet Side #3 RIGHT FLIPPER BUTTON 180-5164-00 *Doubled*
GRY-ORG CN6-P4	
Sw. Part Number:	
4: U206	DS-4 Below Playfield #4 RIGHT FLIPPER E.O.S. (End-of-Stroke) 180-5149-00 *on Flipper*
GRY-YEL CN6-P6	
Sw. Part Number:	
5: U206	DS-5 on Cabinet Side #5 UPPER RT. FLIPPER BUTTON 180-5164-00 *Doubled*
GRY-GRN CN6-P7	
Sw. Part Number:	
6: U206	DS-6 on Coin Door #6 VOLUME (RED BUTTON) (In Test: LEFT) 180-5192-02
GRY-BLU CN6-P8	
Sw. Part Number:	
7: U206	DS-7 on Coin Door #7 SERV. CRED. (GREEN BUTTON) (In Test: RIGHT) 180-5192-04
GRY-VIO CN6-P9	
Sw. Part Number:	
8: U206	DS-8 on Coin Door #8 BEGIN TEST (BLACK BUTTON) (In Test: ENTER) 180-5192-00
GRY-BLK CN6-P10	
Sw. Part Number:	

SWITCH MATRIX GRID LOCATIONS

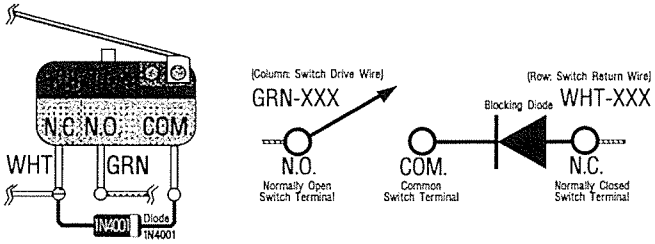


◀ Backpanel

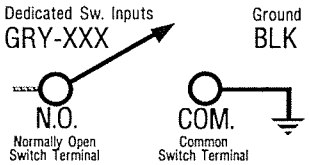


◀ Playfield

Typical Switch Wiring & Schematic



Dedicated Switch Schematic



= Switches above Playfield. = Switches below Playfield.

= Switches not on Playfield.

Switch Part Notes: *¥ Yen Coin Switch is 180-5091-00. Part Numbers which start with 515- or 500- include the bracket, target, and/or housing.*

Sw. 14, 15, 41 & 47 Part Note: *OPTO PC Boards are used as Switches: Trans.: 515-0173-00 (Sw. 14 & 15); Receiver: 515-0174-00 (Sw. 14 &15); Transmitter 515-7307-00 (Sw. 41); Rec. 515-7308-00 (Sw. 41); Transmitter 500-6746-00 (Sw. 47); Receiver 500-6747-00 (Sw. 47);*

Sw. 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 may be located under the playfield, in the Cabinet or Backbox *on Terminal Strips* ***or*** *Diode Boards and not on the assemblies.*

DOTS: Diode On Terminal Strip, *see Section 5, Chapter 2, Playfield Wiring.*

Go To Diagnostics Menu

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**.

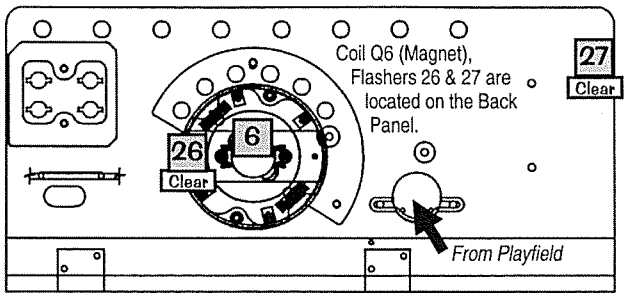
↻ **Coil Note:** ↻ Either -00**B** *or* -00**T** can be used for coil replacements. *B/T listed is preferable for easier diode access & may differ on game.*

PARTIAL COILS DETAILED CHART ...

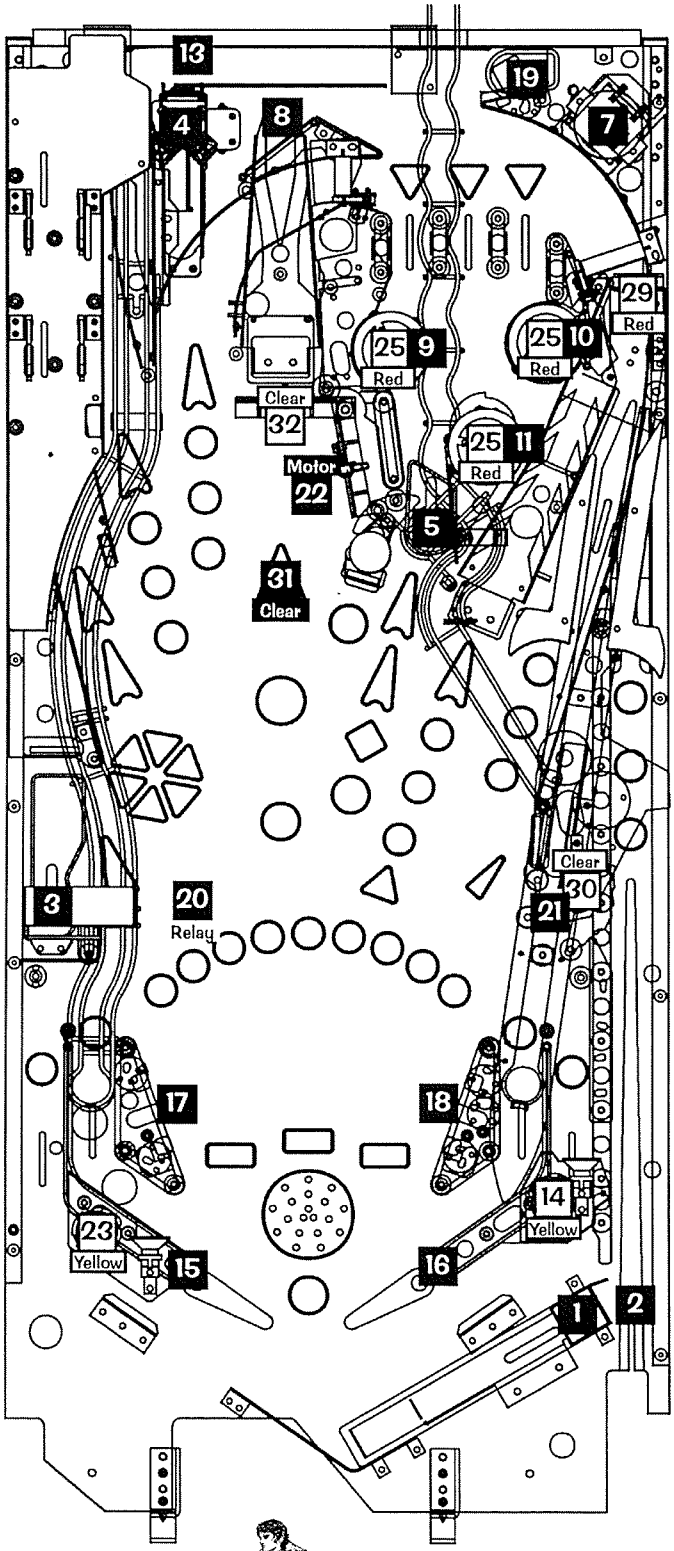
	High Current Coils Group 1	Drive Transistor	Coil GA-Turn or Bulb Type
#1	TROUGH UP-KICKER	Q1	26-1200 ↻ 090-5044-00T
#2	AUTO LAUNCH	Q2	24-940 ↻ 090-5036-00T
#3	LEFT VUK	Q3	26-1200 ↻ 090-5044-00B
#4	TOP VUK	Q4	26-1200 ↻ 090-5044-00B
#5	RIGHT VUK	Q5	26-1200 ↻ 090-5044-00B
#6	RING MAGNET	Q6	20½-480 ↻ 090-5064-02
#7	RIGHT TOWER	Q7	23-800 ↻ 090-5001-00B
#8	LOOP DIVERTER	Q8	22-1080 ↻ 090-5032-00T
	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	NOT USED	Q12	
#13	ORBIT PIN	Q13	26-1200 ↻ 090-5044-00B
#14	FLASH: HELMS DEEP RT	Q14	#906 Bulb 165-5004-00
#15	LEFT FLIPPER (50v RED/YEL)	Q15	22-900 ↻ 090-5020-20T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16	22-900 ↻ 090-5020-20T
	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	TOP SAUCER	Q19	26-1200 ↻ 090-5044-00B
#20	BALROG MOTOR RELAY	Q20	DC Relay 520-5066-00
#21	SWORD LOCK RELEASE	Q21	27-1500 ↻ 090-5004-00T
#22	BALROG MOTOR	Q22	Motor 041-5088-01
#23	FLASH: HELMS DEEP LT	Q23	#906 Bulb 165-5004-00
#24	OPTIONAL COIL	Q24	Opt. 5v
	Diode On Terminal Strip (if noted)		
	Low Current Coils Group 2	**Drive Transistor**	**Coil GA-Turn or Bulb Type**
#25	FLASH: POPS X3	Q25	#906 Bulb 165-5004-00
#26	FLASH: RING	Q26	#906 Bulb 165-5004-00
#27	FLASH: BACK PANEL	Q27	#906 Bulb 165-5004-00
#28	NOT USED	Q28	
#29	FLASH: RINGWRAITH	Q29	#906 *Red* 165-5004-02
#30	FLASH: SWORD	Q30	#906 Bulb 165-5004-00
#31	FLASH: DESTROY THE RING	Q31	#89 Bulb 165-5000-89
#32	FLASH: BALROG	Q32	#89 Bulb 165-5000-89

	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

COIL & FLASH LAMP LOCATIONS

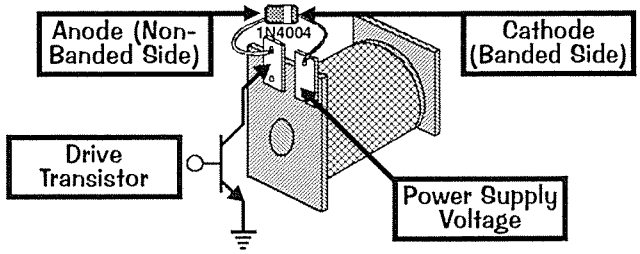


◀ Backpanel

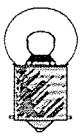


◀ Playfield

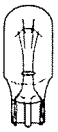
Typical Coil Wiring



Bulb Types used for Flash Lamps



#89 Bulb
(Bayonet)
165-5000-89



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

= Coils / Flash Lamps above Playfield.

= Coils / Flash Lamps below Playfield.

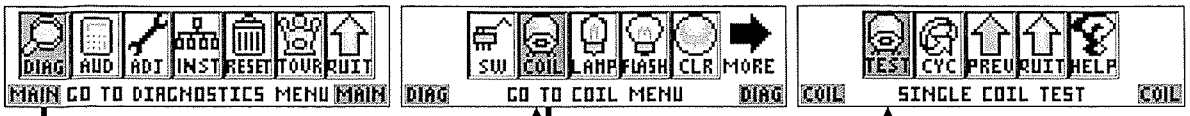
= Coils / Flash Lamps not on Playfield.

Color = Color of Mini-Mars of Flash Lamp Bulb.

Some Coil or Flash Lamp Diodes may be located under the playfield, in the Cabinet or Backbox *on Terminal Strips* ***or*** *Diode Boards and not on the assemblies.*
DOTS: Diode On Terminal Strip *See Section 5, Chapter 2,* ***Playfield Wiring****.*

Coil Q24 is Optional. *If either a Coin Meter, Token Dispenser or Knocker (all optional equipment) is required, call Technical Support for more information, 1-800-542-5377 or 1-708-345-7700.*

Go To Diagnostics Menu



In COIL MENU also select:

CYCLING COIL TEST

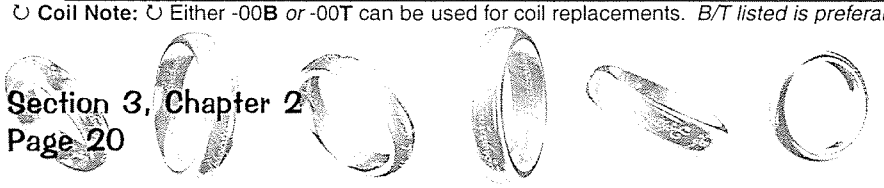
COILS DETAILED CHART TABLE

	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	24-940 ↻ 090-5036-00T
#3	LEFT VUK	Q3		YEL-VIO	J10-P4/5	50v DC	BRN-ORG	J8-P4	26-1200 ↻ 090-5044-00B
#4	TOP VUK	Q4		YEL-VIO	J10-P4/5	50v DC	BRN-YEL	J8-P5	26-1200 ↻ 090-5044-00B
#5	RIGHT VUK	Q5		YEL-VIO	J10-P4/5	50v DC	BRN-GRN	J8-P6	26-1200 ↻ 090-5044-00B
#6	RING MAGNET	Q6		VIO-YEL	J10-P3	50v DC	BRN-BLU	J8-P7	20½-480 ↻ 090-5064-02
#7	RIGHT TOWER	Q7		YEL-VIO	J10-P4/5	50v DC	BRN-VIO	J8-P8	23-800 ↻ 090-5001-00B
#8	LOOP DIVERTER	Q8		GRY-YEL~3A Fuse~YEL-VIO	J10-P1/2	50v DC	BRN-GRY	J8-P9	22-1080 ↻ 090-5032-00T
	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	NOT USED	Q12					BLU-YEL	J9-P5	
#13	ORBIT PIN	Q13		BRN	J7-P1	20v DC	BLU-GRN	J9-P6	26-1200 ↻ 090-5044-00B
#14	FLASH: HELMS DEEP RT	Q14		ORG	J6-P10	50v DC	BLU-BLK	J9-P7	#906 Bulb 165-5004-00
#15	LEFT FLIPPER (50v RED/YEL)	Q15		GRY-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-GRY	J9-P8	22-900 ↻ 090-5020-20T
#16	RIGHT FLIPPER (50v RED/YEL)	Q16		BLU-YEL~3A Fuse~RED-YEL	J10-P1/2	50v DC	ORG-VIO	J9-P9	22-900 ↻ 090-5020-20T
	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	TOP SAUCER	Q19		BRN	J7-P1	20v DC	VIO-ORG	J7-P4	26-1200 ↻ 090-5044-00B
#20	BALROG MOTOR RELAY	Q20		BRN	J7-P1	20v DC	VIO-YEL	J7-P6	DC Relay 520-5066-00
#21	SWORD LOCK RELEASE	Q21		BRN	J7-P1	20v DC	VIO-GRN	J7-P7	27-1500 ↻ 090-5004-00T
#22	BALROG MOTOR	Q22		BRN	J7-P1	20v DC	VIO-BLU	J7-P8	Motor 041-5088-01
#23	FLASH: HELMS DEEP LT	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: POPS X3	Q25	▲ I/O Power Driver ▼	ORG	J6-P10	20v DC	BLK-BRN	J6-P1	#906 Bulb 165-5004-00
#26	FLASH: RING	Q26		ORG	J6-P10	20v DC	BLK-RED	J6-P2	#906 Bulb 165-5004-00
#27	FLASH: BACK PANEL	Q27		ORG	J6-P10	20v DC	BLK-ORG	J6-P3	#906 Bulb 165-5004-00
#28	NOT USED	Q28					BLK-YEL	J6-P4	
#29	FLASH: RINGWRAITH	Q29		ORG	J6-P10	20v DC	BLK-GRN	J6-P5	#906 *Red* 165-5004-02
#30	FLASH: SWORD	Q30		ORG	J6-P10	20v DC	BLK-BLU	J6-P6	#906 Bulb 165-5004-00
#31	FLASH: DESTROY THE RING	Q31		ORG	J6-P10	20v DC	BLK-VIO	J6-P7	#89 Bulb 165-5000-89
#32	FLASH: BALROG	Q32		ORG	J6-P10	20v DC	BLK-GRY	J6-P8	#89 Bulb 165-5000-89

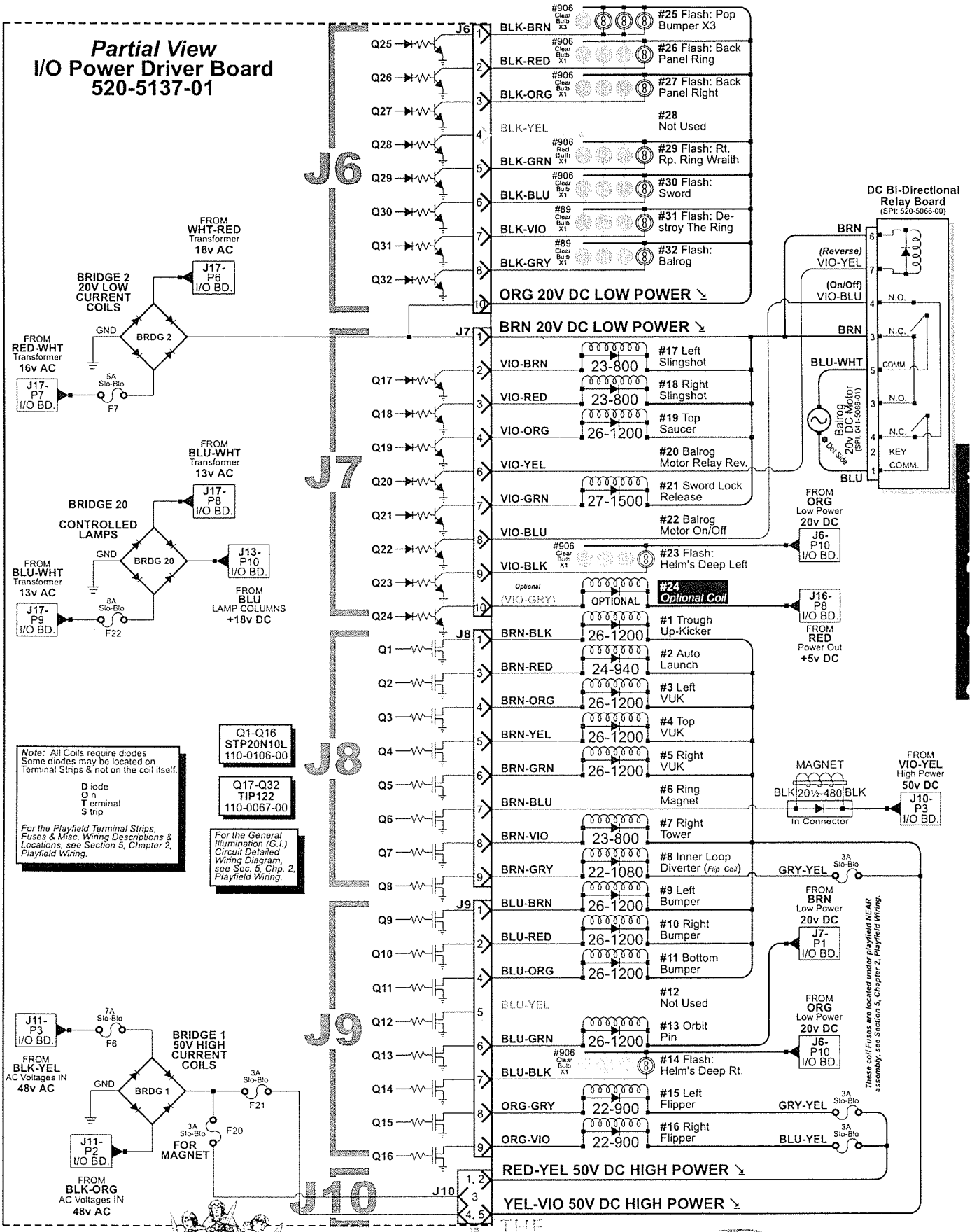
Note: In Test Flash Lamps Menu ("Flash" Icon), Flashers tested are all Flash Lamps located between Q1-Q32 (This Game: Q14, Q23 & Q25-Q27, Q29-Q32)

	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 Note:** ↻ Either -00B *or* -00T can be used for coil replacements. *B/T listed is preferable for easier diode access & may differ on game.*



Go To Diagnostics Menu


Partial View
I/O Power Driver Board
520-5137-01
J6
J7
J8
J9
J10
BLK-BRN #25 Flash: Pop Bumper X3
BLK-RED #26 Flash: Back Panel Ring
BLK-ORG #27 Flash: Back Panel Right
BLK-YEL #28 Not Used
BLK-GRN #29 Flash: Rt. Rp. Ring Wraith
BLK-BLU #30 Flash: Sword
BLK-VIO #31 Flash: De-stroy The Ring
BLK-GRY #32 Flash: Balrog
ORG 20V DC LOW POWER
BRN 20V DC LOW POWER
VIO-BRN #17 Left Slingshot 23-800
VIO-RED #18 Right Slingshot 23-800
VIO-ORG #19 Top Saucer 26-1200
VIO-YEL #20 Balrog Motor Relay Rev.
VIO-GRN #21 Sword Lock Release 27-1500
VIO-BLU #22 Balrog Motor On/Off
VIO-BLK #23 Flash: Helm's Deep Left
(VIO-GRY) #24 Optional Coil
BRN-BLK #1 Trough Up-Kicker 26-1200
BRN-RED #2 Auto Launch 24-940
BRN-ORG #3 Left VUK 26-1200
BRN-YEL #4 Top VUK 26-1200
BRN-GRN #5 Right VUK 26-1200
BRN-BLU #6 Ring Magnet
BRN-VIO #7 Right Tower 23-800
BRN-GRY #8 Inner Loop Diverter (Flip. Coil) 22-1080
BLU-BRN #9 Left Bumper 26-1200
BLU-RED #10 Right Bumper 26-1200
BLU-ORG #11 Bottom Bumper 26-1200
BLU-YEL #12 Not Used
BLU-GRN #13 Orbit Pin 26-1200
BLU-BLK #14 Flash: Helm's Deep Rt.
ORG-GRY #15 Left Flipper 22-900
ORG-VIO #16 Right Flipper 22-900
RED-YEL 50V DC HIGH POWER
YEL-VIO 50V DC HIGH POWER
DC Bi-Directional Relay Board (SPI: 520-5066-00)
(Reverse) VIO-YEL
(On/Off) VIO-BLU
BRN
BLU-WHT
BLU
N.O.
N.C.
COMM.
KEY
Balrog 20v DC Motor (SPI: 041-5008-01)
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
FROM BLU-WHT Transformer 13v AC
J17-P8 I/O BD.
BRIDGE 20 CONTROLLED LAMPS
BRDG 20
J13-P10 I/O BD.
FROM BLU LAMP COLUMNS +18v DC
J17-P9 I/O BD.
8A Slo-Blo F22
FROM ORG Low Power 20v DC
J6-P10 I/O BD.
J16-P8 I/O BD.
FROM RED Power Out +5v DC
Optional
#24 Optional Coil
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.
MAGNET
BLK 20½-480 BLK
In Connector
FROM VIO-YEL High Power 50v DC
J10-P3 I/O BD.
3A Slo-Blo
GRY-YEL
FROM BRN Low Power 20v DC
J7-P1 I/O BD.
FROM ORG Low Power 20v DC
J6-P10 I/O BD.
These coil Fuses are located under playfield NEAR assembly, see Section 5, Chapter 2, Playfield Wiring.
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
3A Slo-Blo F20
FOR MAGNET
J11-P2 I/O BD.
FROM BLK-ORG AC Voltages IN 48v AC

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.

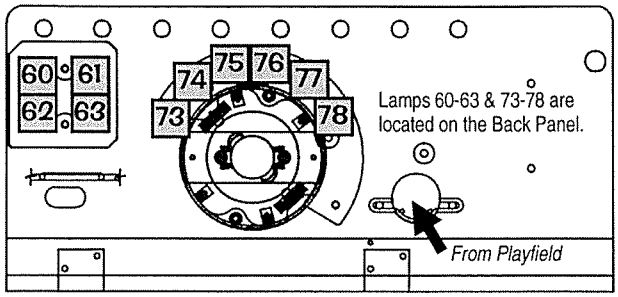
Row & Column Lamp Tests

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.

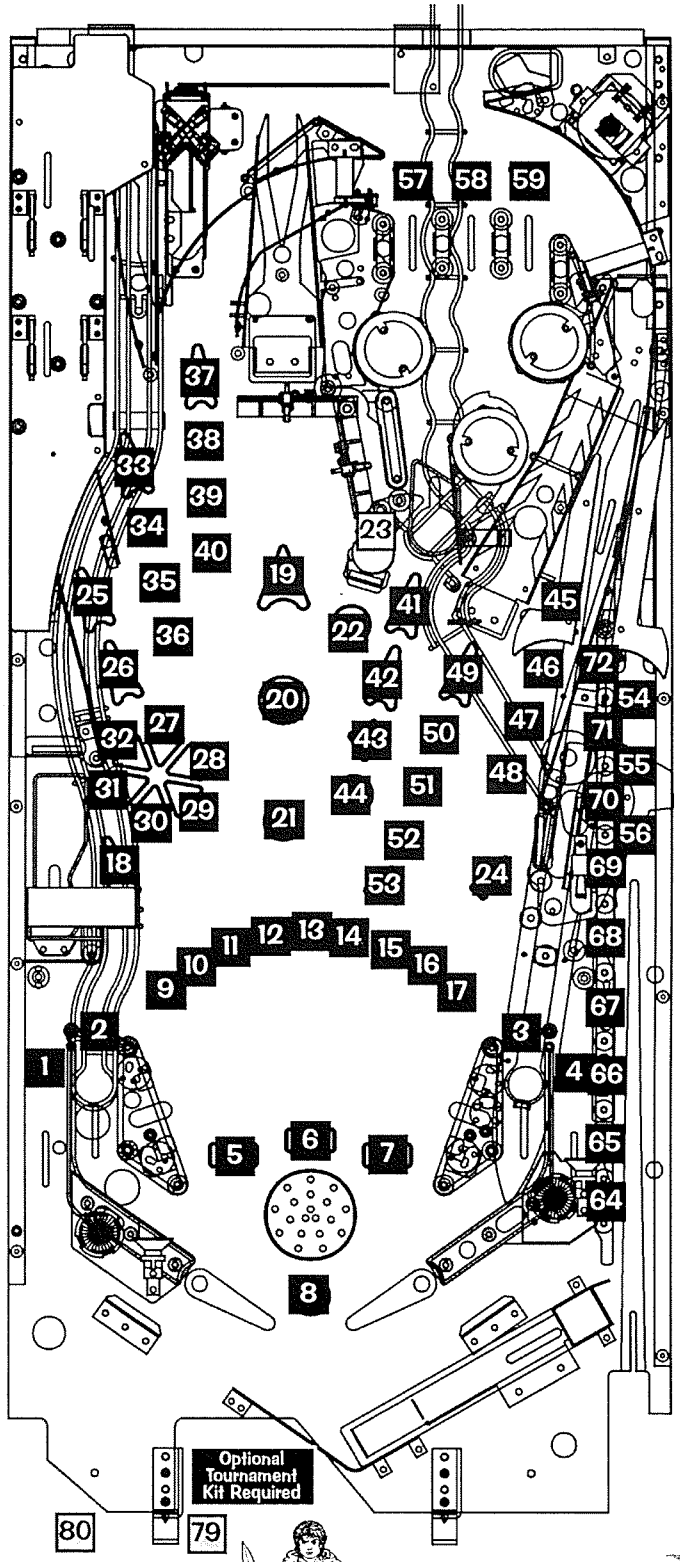
LAMP MATRIX GRID

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 (K) EEP	2 #555 Bulb K(E)EP	3 #555 Bulb KE(E)P	4 #555 Bulb KEE(P)	4 #555 Bulb THE FELLOWSHIP OF THE RING	6 #555 Bulb THE TWO TOWERS	7 #555 Bulb THE RETURN OF THE KING	8 #555 Bulb SHOOT AGAIN
2: Q34 RED-BLK J12-P2	9 #555 Bulb PIPPIN	10 #555 Bulb MERRY	11 #555 Bulb SAM	12 #555 Bulb ARAGORN	13 #555 Bulb FRODO	14 #555 Bulb GANDALF	15 #555 Bulb LEGOLES	16 #555 Bulb GIMLI
3: Q35 RED-ORG J12-P3	17 #555 Bulb BOROMIR	18 #555 Bulb MYSTERY	19 #555 Bulb FRODO ARROW	20 #44 Bulb DESTROY RING	21 #555 Bulb MODE START	22 #555 Bulb PALANTIR	23 #44 Bulb PALANTIR GLOBE	24 #555 Bulb SPOT RING
4: Q36 RED-YEL J12-P4	25 #555 Bulb PIPPIN ARROW	26 #555 Bulb GIFT OF THE ELVES	27 #555 Bulb LIGHT EXTRA BALL	28 #555 Bulb RING MULTIBALL	29 #555 Bulb BIG POINTS	30 #555 Bulb LIGHT SPECIAL	31 #555 Bulb SUPER RING FRENZY	32 #555 Bulb 2X SCORING
5: Q37 RED-GRN J12-P5	33 #555 Bulb LEGOLES ARROW	34 #555 Bulb L RAMP MAN RING	35 #555 Bulb L RAMP DWARF RING	36 #555 Bulb L RAMP ELF RING	37 #555 Bulb GANDALF ARROW	38 #555 Bulb C LOOP MAN RING	39 #555 Bulb C LOOP DWARF RING	40 #555 Bulb C LOOP ELF RING
6: Q38 RED-BLU J12-P6	41 #555 Bulb GIMLI ARROW	42 #555 Bulb EXTRA BALL	43 #555 Bulb GOLLUM MULTIBALL	44 #555 Bulb SPECIAL	45 #555 Bulb MERRY ARROW	46 #555 Bulb R ORBIT MAN RING	47 #555 Bulb R ORBIT DWARF RING	48 #555 Bulb R ORBIT ELF RING
7: Q39 RED-VIO J12-P8	49 #555 Bulb ARAGORN ARROW	50 #555 Bulb R RAMP MAN RING	51 #555 Bulb R RAMP DWARF RING	52 #555 Bulb R RAMP ELF RING	53 #555 Bulb LOCK	54 #555 Bulb LANES	55 #555 Bulb TOWER	56 #555 Bulb FLIPPER
8: Q40 RED-GRY J12-P9	57 #555 Bulb (O)RC	58 #555 Bulb O(R)C	59 #555 Bulb OR(C)	60 #555 Gm. Bulb POTD U.L.	61 #555 Gm. Bulb POTD U.R.	62 #555 Gm. Bulb POTD L.L.	63 #555 Gm. Bulb POTD L.R.	64 #44 Bulb SHOOTER LANE #1 BOT
9: Q41 RED-WHT J12-P10	65 #44 Bulb SHOOTER LANE #2	66 #44 Bulb SHOOTER LANE #3	67 #44 Bulb SHOOTER LANE #4	68 #44 Bulb SHOOTER LANE #5	69 #44 Bulb SHOOTER LANE #6	70 #44 Bulb SHOOTER LANE #7	71 #44 Bulb SHOOTER LANE #8	72 #44 Bulb SHOOTER LANE #9 TOP
10: Q42 RED J12-P11	73 #44 Bulb ESCAPE THE RINGWRAITHS	74 #44 Bulb GANDALF VS SARUMAN	75 #44 Bulb WARG ATTACK	76 #44 Bulb WAR OF THE ENTS	77 #44 Bulb BATTLE WITH SHELOB	78 #44 Bulb DESTROY THE WITCH-KING	79 #555 Bulb TOURNAMENT BUTTON	80 #555 Bulb START BUTTON

LAMP MATRIX GRID LOCATIONS

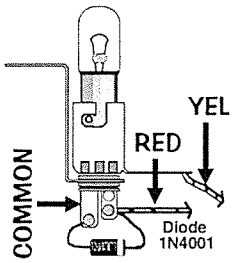


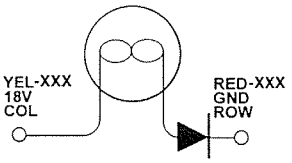
◀ Backpanel



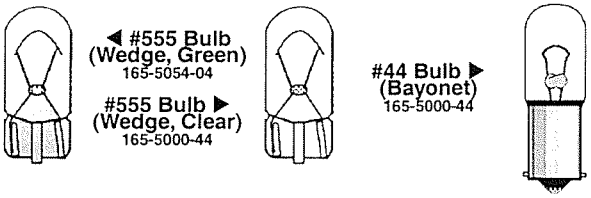
◀ Playfield

Typical Lamp Wiring & Schematic





Bulb Types used for Lamps



= Switches above Playfield.
= Switches below Playfield.
= Switches not on Playfield.

Lamp Part Notes: *#555 Bulb Clear = 165-5002-00. #555 Bulb Green = 165-5054-04 . #44 Bulb Clear = 165-5000-44.*
See Section 4, Chapter 1, ***Parts Identification & Location****, Pages 72-74 for more details on bulbs and corresponding sockets.*
Some Lamp Diodes may be located under the playfield, in the Cabinet or Backbox *on Terminal Strips* and not on or with the Lamp Socket.
DOTS: Diode On Terminal Strip, *see Section 5, Chapter 2,* ***Playfield Wiring****.*

Go To Diagnostics Menu

Test Flash Lamps

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 : **Q14, Q23, Q25-Q27 & Q29-Q32.**

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

Clear Ball Trough

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**.

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

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

Technician Alerts

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*, and if any of the below criteria is met, the display will indicate *any or all* of the following categories: **POSSIBLY BROKEN SWITCH, CHECK SWITCHES** and/or **HYPERSENSITIVE 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 the "PREV" *Mini-Icon* and press the **Black "ENTER" Button**.

Switch Detection

During game play, activation of 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.

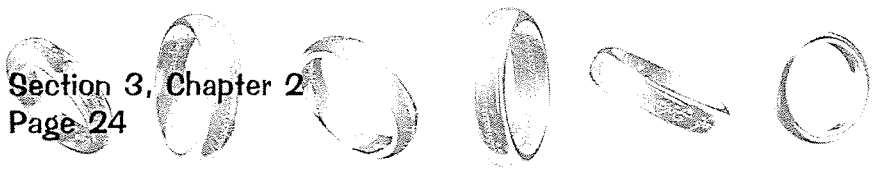
- Switches noted as **POSSIBLY BROKEN SWITCH** should be checked, then adjusted or replaced. ***Important:*** *A switch reported as "possibly broken" may actually be an unused switch due to* ***lack of usage*** *and* ***not because they're broken.*** *This can happen, if a switch is located in a "hard" 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 checked 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.*

Technicians Alerts continued on the next page.



Pinball Detection

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

Important: *Determine where the pinball is!* ***Do not add pinball(s)*** *until it is determined the pinball(s) are indeed missing & not just stuck. If pinball(s) are added, & 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).*

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),* this 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.*

Tech Report Alert Option

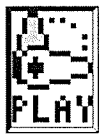
This game has the capability of ***automatically alerting*** the operator upon **Power-Up** and/or opening the **Coin Door** if any switch problems and/or missing pinballs has occurred. *Review Section 3, Chapter 4,* ***GO TO ADJUSTMENTS MENU,*** *Standard Adjustments.* The Standard Adjustment to change is **49**. The default for this feature is **NEVER**. The options are: **POWERUP**, **COIN DOOR** or **POWERUP AND COIN DOOR**.

Upon **Power-Up** *(Game Reset)* and/or opening the **Coin Door** *(depending on the option selected),* this ***display*** will flash three (3) times along with an audible sound. To find out the problem, enter this **Technicians Alert Menu** and wait for the displays.

Note: Coils ***are not reported*** in **Technician Alerts**, ***h o w e v e r,*** *if a faulty switch is the culprit, the switch will then be reported.* The below ***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 *(example shown is #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 (****o n l y i f*** *POWERUP, COIN DOOR or POWERUP AND COIN DOOR is selected in Standard Adjustment 49).*

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 Play Test, check all coil assemblies with related switches in the game. For unique Game Test(s), select the "****Ring****" Icon in the* ***DIAGNOSTICS MENU,*** *reviewed on Pages 27-28.*

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.*

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.

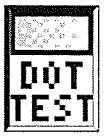
2. Disconnect the speaker output connector from the CPU / Sound Board and connect a 1.5-volt battery across each speaker pair one at a time while observing the speakers. Make sure the positive battery terminal is connected to the positive lead (CN4, Pin-3 (**RED-BLK**) or Pin-6 (**YEL-BLK**)) each time. 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

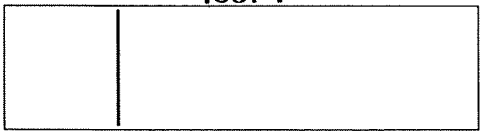
To initiate, from the **DIAGNOSTICS MENU**, select the "BURN" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. After selecting this *Icon* the ***Begin Burn-In Test*** will start. At this stage the game will exercise all CPU I/O Functions (**Dot 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

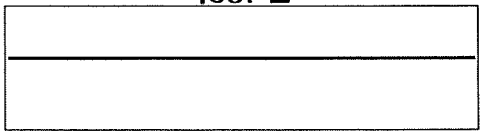
To initiate, from the **DIAGNOSTICS MENU**, select the "DOT TEST" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. After selecting this *Icon* the **Dot Matrix Test** immediately begins. ***Note:*** Pressing any button will exit the test & return to **DIAGNOSTICS MENU**. The display will immediately illuminate & cycle for 1 pass of each test continuously for each of the following:

Test 1

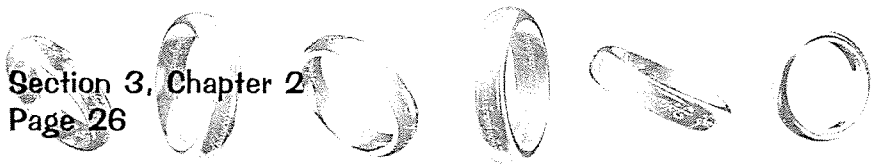


Illuminates **1 vertical column of dots**, turning it off & illuminating the *next column*, until each *column* has been individually lit, while the other *columns* are off.

Test 2

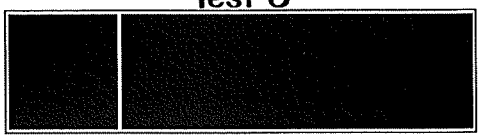


Illuminates **1 horizontal row of dots**, turning it off & illuminating the *next row*, until each *row* has been individually lit, while the other *rows* are off.



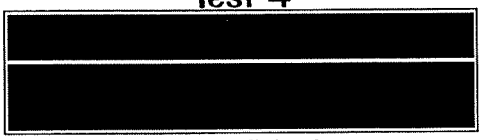
Dot Matrix Test Continued

Test 3



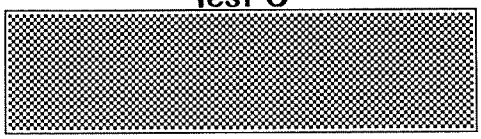
Illuminates **all the dots,**
except for one column from left to right.

Test 4



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

Test 5



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

Note: Pressing the **Red**, **Green**, **Black** or **Flipper Buttons** 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.

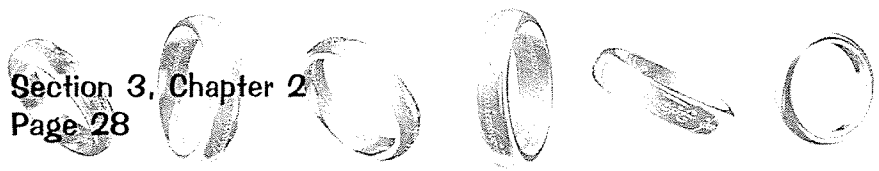
The board is controlled by a **6809E Microprocessor** and its personality ROM (Unique to the Game). It receives Data, Reset & Clock Information from the **CPU/Sound Board** via the ribbon cable and sends back multiple Status and Busy Signals to the **CPU**. This is to insure synchronized communication 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**.

LOTR Test

(EXPLANATION & GRAPHICS NOT AVAILABLE AT TIME OF PRINTING)

LOTR Test Menu continued on the next page.

(EXPLANATION & GRAPHICS NOT AVAILABLE AT TIME OF PRINTING)



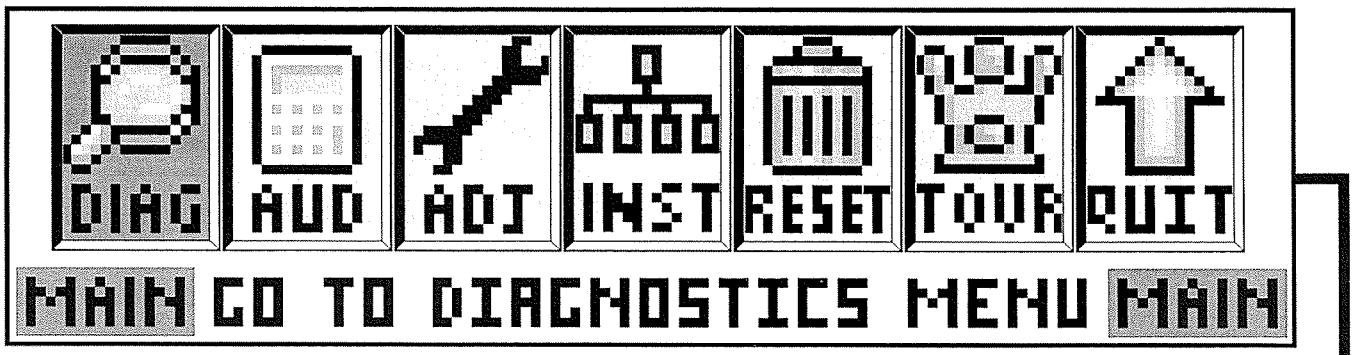
Go To
Diagnostics Menu

Go To Fuse Table

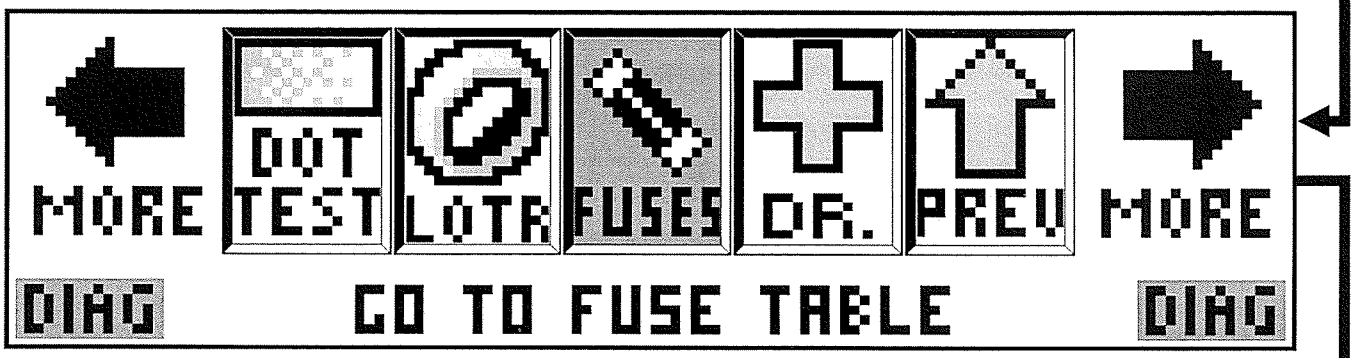
To initiate, from the **DIAGNOSTICS MENU**, select the "FUSES" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button**. The **FUSE TABLE MENU** now appears. This provides the technician with the current **Fuse Table** for this game *(also noted on a decal 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	3/4A 250v S.B.	90v DC	High Voltage Display
LOC:	**I / O POWER DRIVER BOARD**		
F6	7A 250v S.B.	50v DC	Primary High Power Coils/Flippers
F7	5A 250v S.B.	20v DC	Low Power Coils
F8	5A 250v S.B.	12v DC	Logic Power
F9	5A 250v S.B.	12v DC	Logic Power
F20	**4A 250v S.B.**	50v DC	Magnet ◀◀◀ **THIS GAME ONLY**
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**

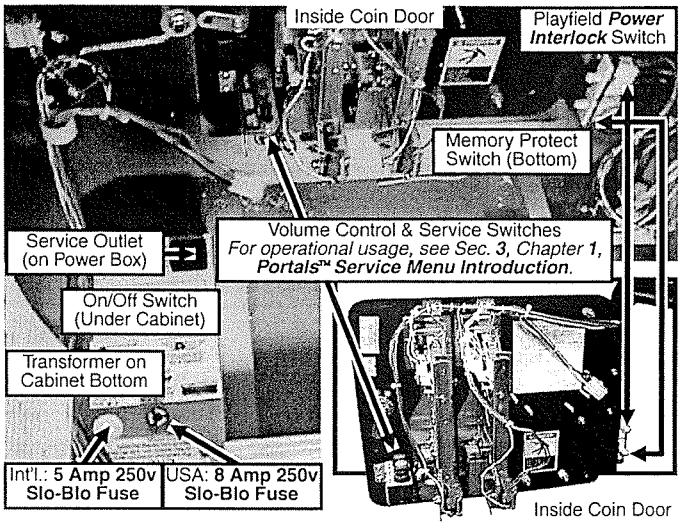
Cabinet Fuses

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)

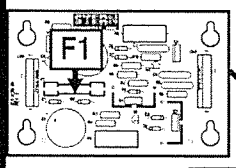
Playfield (P/F) Fuses

LOC:	UNDER PLAYFIELD (near Flippers)		
n/a	3A 250v S.B.	50v DC	Right Flipper (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	Loop Diverter (GRY-YEL⇆YEL-VIO)

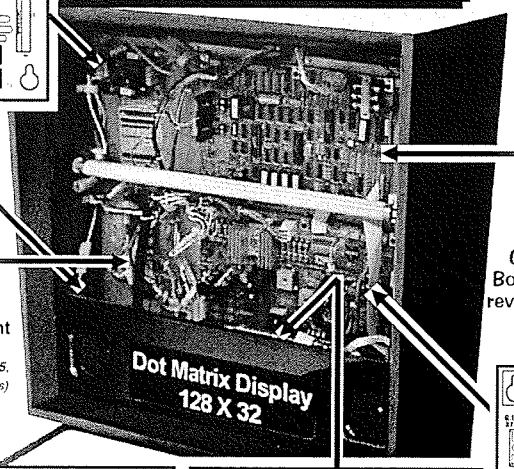
For locations & more information on fuses, see Sec. *5, Chapter 2.*



ROM TYPE on BD	LOCATION	SIZE	PART NUMBER
CPU Sound	U7	512K	965-0401-80
CPU Game	U210	1 MB	965-0402-80
CPU Voice ROM 1	U17	8 MB	965-0403-80
CPU Voice ROM 2	U21	8 MB	965-0404-80
CPU Voice ROM 3	U36	8 MB	965-0405-80
CPU Voice ROM 4	U37	8 MB	965-0406-80
DISPLAY Controller	U5	4 MB	965-0407-80



◀ Display Power Supply Bd.

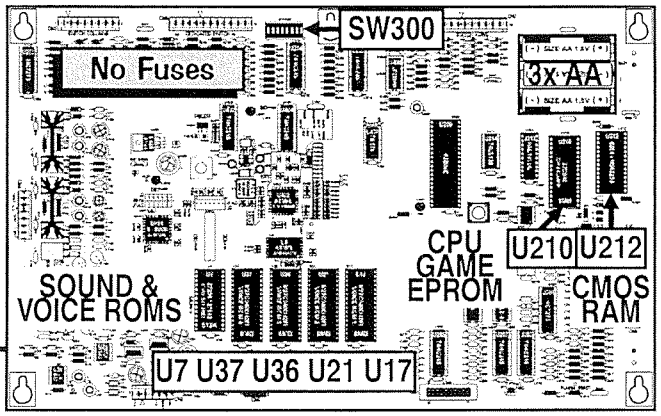


Solenoid Expander Board ‡

Tournament Interface Board ‡

‡ UK or Tournament GAMES ONLY

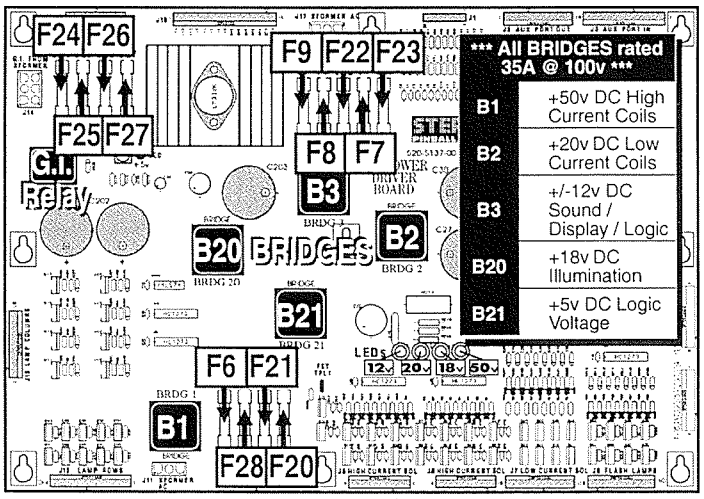
For more info., see Section 5, Chp. 4, PCBs (Yellow Pages)



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

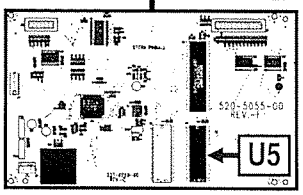
CPU/Sound Bd. II w/ATMEL ▲

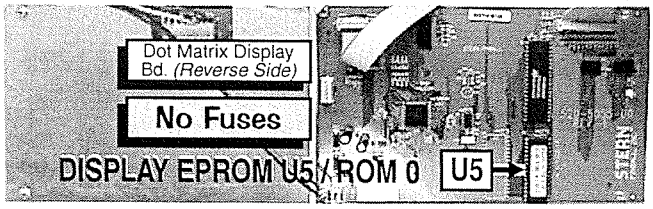
I/O Power Driver Board ▼



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.





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.

Copy this page for Field Audit Tracking Performance

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 :

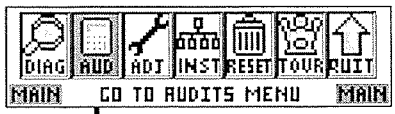
EARNINGS & STANDARD AUDIT TABLES

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

01-68 ✍ = ✎

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	0–1.9M SCORES
16	2M–3.9M SCORES
17	4M–5.9M SCORES
18	6M–7.9M SCORES
19	8M–9.9M SCORES
20	10M–12.4M SCORES
21	12.5M–14.9M SCORES
22	15M–17.4M SCORES
23	17.5M–19.9M SCORES
24	20M–22.4M SCORES
25	22.5M–24.9M SCORES
26	25M–34.9M SCORES
27	35M–49.9M SCORES
28	50M–74.9M SCORES
29	75M–99.9M SCORES
30	100M–149.9M SCORES
31	150M+ 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
68	RECENT REPLAY PERCENT

Note: Audits are subject to change (with or without notice).

Go To Audits Menu

Go To Audits Menu

Overview

The **Portals™ Service Menu System** provides 224 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 **01-68**) and • **Feature Audits (Programming Use Only)** (Audits **01-144**). *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:

Select and activate to:

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

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 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.

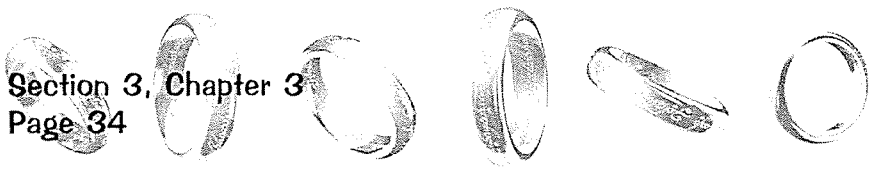
Nr.	EARNINGS AUDIT NAME: Definition
01	**TOTAL PAID CREDITS:** Provides the total number of *Paid Credits.*
02	**FREE GAME PERCENTAGE:** Provides the percentage total by dividing Standard Audit **13**, **TOTAL FREE PLAYS**, by Standard Audit **14**, **TOTAL PLAYS**.
03	**AVERAGE BALL TIME:** In seconds, 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 (01-68)

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	**0–1.9M SCORES:** Provides the total number of games the Player's final score was **0** and **1,999,990** points.
16	**2M–3.9M SCORES:** ... and the Player's final score was between **2,000,000** and **3,999,990** points.
17	**4M–5.9M SCORES:** ... and the Player's final score was between **4,000,000** and **5,999,990** points.
18	**6M–7.9M SCORES:** ... and the Player's final score was between **6,000,000** and **7,999,990** points.
19	**8M–9.9M SCORES:** ... and the Player's final score was between **8,000,000** and **9,999,990** points.
20	**10M–12.4M SCORES:** ... and the Player's final score was between **10,000,000** and **12,499,990** points.
21	**12.5M–14.9M SCORES:** ... and the Player's final score was between **12,500,000** and **14,499,990** points.
22	**15M–17.4M SCORES:** ... and the Player's final score was between **15,000,000** and **17,499,990** points.
23	**17.5M–19.9M SCORES:** ... and the Player's final score was between **17,500,000** and **19,999,990** points.
24	**20M–22.4M SCORES:** ... and the Player's final score was between **20,000,000** and **22,499,990** points.
25	**22.5M–24.9M SCORES:** ... and the Player's final score was between **22,500,000** and **24,999,990** points.
26	**25M–34.9M SCORES:** ... and the Player's final score was between **25,000,000** and **34,999,990** points.
27	**35M–49.9M SCORES:** ... and the Player's final score was between **35,000,000** and **49,999,990** points.
28	**50M–74.9M SCORES:** ... and the Player's final score was between **50,000,000** and **74,999,990** points.
29	**75M–99.9M SCORES:** ... and the Player's final score was between **75,000,000** and **99,999,990** points.
30	**100M–149.9M SCORES:** ... and the Player's final score was between **100,000,000** and **149,999,990** points.
31	**150M+ SCORES:** Provides the total number of games the Player's final score was **150,000,000** 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 33-68 continued on the next page.



Go To Audits Menu

	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.
68	**RECENT REPLAY PERCENT:** *Percent figured with programming thresholds for a determined number of games (again based on programming thresholds). The percentage reflects replay total awards for exceeding replay score levels.*

Feature Audits (01-144)

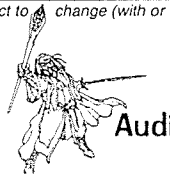
To initiate, from the **AUDITS MENU**, select the "LOTR" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button.** Select and *activate* either of the ">>" *Mini-Icons* to view the next or previous Audit in this group. The display will describe the **Audit 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
01-144 =
*** PROGRAMMING USE ONLY ***
UNLABELED BOXES ARE FOR FUTURE EXPANSION.

01	LEFT VUK	37	RING COMBOS	73	GOLLUM MULTIBALL LIT	109	ROTK MB STARTED
02	LEFT VUK DIRECT HIT	38	RING COMBO THRSHLDS	74	GOLLUM MBALL STARTED	110	ROTK MB 2+ STARTED
03	LEFT ORBIT	39	HUMAN RINGS COMPLETD	75	GOLLUM MBALL 2+ STRTD	111	ROTK JACKPOTS
04	LEFT RAMP	40	DWARF RINGS COMPLETD	76	FELLOWSHIP COLLECTED	112	ROTK LEVELS COMPLETE
05	CENTER LOOP	41	ELF RINGS COMPLETED	77	FELLOWSHIP COMPLETED	113	ROTK MULT INCREASED
06	SPINS	42	RING MANIA STARTED	78	FOTR MB STARTED	114	ROTK S. JACKPOT LIT
07	RING	43	RING MANIA 2+ STARTED	79	FOTR MB 2+ STARTED	115	ROTK SJP COLLECTED
08	RIGHT VUK	44	MANIA RINGS COLLECTD	80	FOTR MB WON	116	ROTK MB WON
09	RT VUK BEHIND	45	MANIA SHOTS COMPLETD	81	TROLL HITS	117	DESTROY RING LIT
10	RIGHT RAMP	46	MANIA 1X JACKPOT	82	TROLL KILLS	118	DESTROY RING STARTED
11	RINGWRAITH	47	MANIA 2X JACKPOT	83	BALROG HITS	119	DESTROY RING WON
12	RIGHT ORBIT	48	MANIA 3X JACKPOT	84	BRIDGE CROSSES	120	GIFT OF THE ELVES LT
13	SPOT RING TARGET	49	MANIA 4X JACKPOT	85	BALROG KILLS	121	GIFT EXTRA BALL
14	ORTHANC ARRIVALS	50	MANIA 5X JACKPOT	86	SWORD LOCKS LIT	122	GIFT RING MB
15	BARAD-DûR ARRIVALS	51	MANIA EXTRA BALL LIT	87	SWORD LOCK 1	123	GIFT BIG POINTS
16	ORC LANES	52	RING MODE LIT	88	SWORD LOCK 2	124	GIFT SPECIAL
17	POP HITS	53	ESCAPE MODE STARTED	89	TTT MB STARTED	125	GIFT 2X SCORING
18	LEFT OUTLANE	54	ESCAPE MODE WON	90	TTT MB 2+ STARTED	126	GIFT SUPER MANIA
19	LEFT INLANE	55	BATTLE MODE STARTED	91	TTT 1X JACKPOT	127	GIFT WIZARD MODE
20	RIGHT INLANE	56	BATTLE MODE WON	92	TTT 2X JACKPOT	128	PALANTIR LIT
21	RIGHT OUTLANE	57	WARG MODE STARTED	93	TTT 3X JACKPOT	129	PALANTIR COLLECTED
22	LANE S. S. PICKED	58	WARG MODE WON	94	TTT 4X JACKPOT	130	RING MB RING SHOTS
23	TOWER S. S. PICKED	59	ENT MODE STARTED	95	TTT 5X JACKPOT	131	RING MB S. JACKPOTS
24	FLIPPER S. S. PICKED	60	ENT MODE WON	96	TTT 6X JACKPOT	132	RING MB 2.5M
25	LANE SKILL SHOT MADE	61	SHELOB MODE STARTED	97	TTT 7X JACKPOT	133	RING MB LIGHT E. BALL
26	LANE S. S. MADE	62	SHELOB MODE WON	98	TTT STAGES SURVIVED	134	RING MB 5M
27	TOWER S. S. MADE	63	WITCHKING MODE STRTD	99	TTT S. JACKPOT LIT	135	RING MB LITE SPECIAL
28	FLIPPER S. S. MADE	64	WITCHKING MODE WON	100	TTT SJP COLLECTED	136	RING MB 7.5M
29	ORC COMPLETED	65	BOOK MODE LIT	101	TTT MB WON	137	SRMMB RING SHOTS
30	HUMAN RINGS COLLECTD	66	MOOK MODE STARTED	102	PATH ADVANCED	138	SRMMB SHOTS COMPLETE
31	DWARF RINGS COLLECTD	67	BOOK MODE JACKPOTS	103	PATH ACCESSED	139	SRMMB JACKPOTS
32	ELF RINGS COLLECTED	68	BOOK MODE WON	104	PATH TIME SOULS	140	SRMMB TOTAL JACKPT X
33	RINGS SPOTTED	69	MYSTERY LIT	105	PATH UNLIT SOULS	141	SRMMB SUPER JACKPOTS
34	HUMAN RING BONUS	70	MYSTERY COLLECTED	106	PATH LIT SOULS	142	VALINOR STARTED
35	DWARF RING BONUS	71	MYSTERY E. B. LIT	107	PATH BLINKING SOULS	143	BALROG STARTED
36	ELF RING BONUS	72	MYSTERY SPECIAL LIT	108	SOULS COMPLETED	144	BALROG HITS

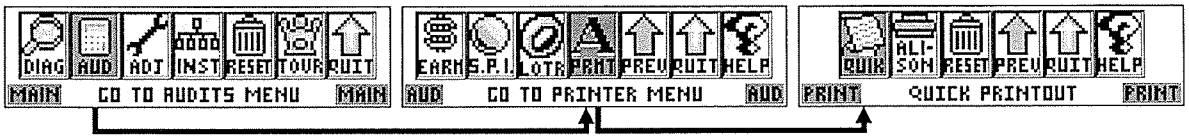
Note: Audits are subject to change (with or without notice).



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 or unique software (mentioned below) 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 **Printer Interface Board, "Hand-Held" Printer** & the **Alison Interface Program** 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.* For information or details on the required equipment in this Menu, call or eMail Technical Support *(contact info on the back cover).*



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

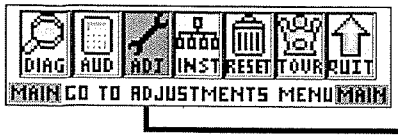
To initiate, from the **PRINTER MENU**, select the "RESET" *Icon* with either the **Red** or **Green Button** and press the **Black Button**. Select either the "-" or "+" *Mini-Icon* and press the **Black Button** to clear the "Nº of copies printed" count total appearing in the display. ***Operational 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**.

FEATURE AUDIT ABBREVIATIONS USED IN THIS CHAPTER:

FOTR : The Fellowship of the Ring™		**TTT :** The Two Towers™		**ROTK :** The Return of the King™	
	E. B. : Extra Ball		**LT :** Lit		**MB :** Multiball
S. S. : Skill Shot		**S. JACKPOT / SJP :** Super Jackpot		**SRMMB :** Super Ring Mania Multiball	

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

Go To Audits Menu



STANDARD & FEATURE ADJUSTMENT TABLES

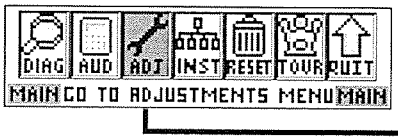
(Review Overview regarding changes)

STANDARD ADJUSTMENTS 01-52 ✍ = ✎

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
01	REPLAY TYPE	AUTO	
02*	REPLAY PERCENTAGE	10%	
03	REPLAY AWARD	CREDIT	
04*	REPLAY LEVELS	1: 20,000,000	
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	75,000,000	
24*	DEFAULT HIGH SCORE #1	60,000,000	
25*	DEFAULT HIGH SCORE #2	50,000,000	
26*	DEFAULT HIGH SCORE #3	45,000,000	
27*	DEFAULT HIGH SCORE #4	40,000,000	
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	YES	
46	Q24 OPTION	COIN METER	
47	TICKET DISP. INSTALLED	NO	
48	ALLOW PLAYER COMP. MODE	YES	
49	TECH ALERT WARNING	NEVER	
50	TEAM SCORES	NO	
51	LOCATION ID	00	
52	GAME ID	00	

** Defaults are subject to change during production (especially 02, 04, 07, 09, 10, 13, 23-27 & 38).*

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 01-32 ✍ = ✎

Nr.	ADJUSTMENT NAME	USA DEFAULT	YOUR SETTING
01	NUM. RING COMBOS-LEVEL	10	
02	TWO TOWERS MBALL DIFF	MODERATE	
03	1ST HARD TTT MB	1	
04	TTT LOCK DIFFICULTY	EX. EASY	
05	PALANTIR DIFFICULTY	EASY	
06	FELLOWSHIP DIFFICULTY	EASY	
07	RING MULTIBALL DIFF	MODERATE	
08	RING MBALL E. BALL MEM	NO	
09	RING MBALL SPECIAL MEM	NO	
10	ELF GIFT E. BALL MEM	YES	
11	ELF GIFT SPECIAL MEM	YES	
12	RING FRENZY E. BALL DIFF	MODERATE	
13	RING FRENZY E. BALL MEM	NO	
14	RING MODE DIFFICULTY	EASY	
15	PATHS OF THE DEAD DIFF	MODERATE	
16	MYSTERY DIFFICULTY	HARD	
17	MYSTERY EB MEM	NO	
18	MYSTERY SPECIAL MEM	NO	
19	SPOT RING DIFF.	EASY	
20	ELF RING SPOTTING	MODERATE	
21	DWARF RING SPOTTING	EASY	
22	HUMAN RING SPOTTING	MODERATE	
23	FELLOWSHIP MBALL DIFF	MODERATE	
24	ROTK MBALL DIFF	MODERATE	
25	CONSOLATION MYSTERY	YES	
26	ALLOW VOLUME EFFECTS	YES	
27	GAME START BALROG ROAR	YES	
28	BARAD-DÛR DIFFICULTY	MODERATE	
29	BARAD-DÛR E. BALL MEM.	YES	
30	SPOT FELLOWSHIP MEMBERS	YES	
31	GOLLUM'S CAVE DIFF.	MODERATE	
32	BARAD-DÛR EARLY CRASH	YES	

Go To Adjustments Menu

Overview

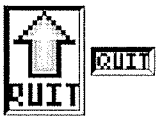
The **Portals™ Service Menu System** provides 84 Adjustments to vary Game Functions to customize for your particular needs. The Adjustments are divided into 2 groups: • **Standard Adjustments** (01-52) and • **Feature Adjustments** (01-27). Game code may get upgraded during production; compare all Adjustments 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:

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 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 (01-52)

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 Adjustments Continued.

	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 / ON ▲ / OFF ▼▼▼▼▼▼▼▼	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).								
	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 /$A2		755-5406-00 (Side 1)
	Australia 2					1 /$A1			
Pos. 1 2 3 4 5 6 7 8 / ON ▲ / OFF ▼▼▼▼▼▼▼▼	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).								
	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 (2-Sided)
	Denmark 2					1 /2 DKr	3 /5 DKr	7 /10 DKr	
Pos. 1 2 3 4 5 6 7 8 / ON ▲ ▲ / OFF ▼▼▼▼▼▼▼▼	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).								
	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 / ON ▲ ▲ / OFF ▼▼▼▼▼▼▼▼	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).								
	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 / ON ▲ ▲ ▲ / OFF ▼▼▼▼▼▼▼▼	*Germany: For different Euro Pricing Scheme (other than below settings), go to Adjustment 06 and scroll to Custom for this Unique Coin Door & Mech.*								
	Germany 1	€0,50	€1,00	€2,00		1 /0,50¢			755-5401-01
	Germany 2 «					» 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 / ON ▲ ▲ ▲ ▲ / OFF ▼▼▼▼	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).								
	Greece **Euro 6**	€.50	€1.00	€2.00		2 /€.50			755-5401-06
Pos. 1 2 3 4 5 6 7 8 / ON ▲ / OFF ▼▼▼ ▼▼▼▼	*Italy: For different Euro Pricing Scheme (other than below settings), go to Adjustment 06 and scroll to Custom for this Unique Coin Door & Mech.*								
	Italy 1 «	€.50		€.50		» 1 /.50¢			755-5401-01 & 755-5401-08
	Italy 2					1 /.50¢	3 /€2.00		
Pos. 1 2 3 4 5 6 7 8 / ON ▲ / OFF ▼▼ ▼▼▼▼▼	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).								
	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 (Side 2)
	New Zealand 2					1 /$NZ1	3 /$NZ2		
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 (2-Sided)
	Norway 2					1 /10 NKr	3 /20 NKr		
Pos. 1 2 3 4 5 6 7 8 / ON ▲ ▲ / OFF ▼▼▼ ▼▼▼▼	*Portugal: For different Euro Pricing Scheme (other than below settings), go to Adjustment 06 and scroll to Custom for this Unique Coin Door & Mech.*								
	Portugal	€.50		€.50		1 /€.50			755-5401-01
Pos. 1 2 3 4 5 6 7 8 / ON ▲ ▲ / OFF ▼ ▼▼▼▼▼	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).								
	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 (2-Sided)
	Sweden 2					1 /5 SKr			
Pos. 1 2 3 4 5 6 7 8 / ON ▲ ▲ / OFF ▼▼ ▼▼▼▼▼	**Switzerland 1** «	1 SwF	2 SwF	5 SwF		» 1 /1 SwF	6 /5 SwF		755-5405-00 (2-Sided)
	Switzerland 2					1 /1 SwF	3 /2 SwF	9 /5 SwF	

Pos. 1 2 3 4 5 6 7 8 / ON ▲ ▲ ▲ / OFF ▼ ▼▼▼▼▼		LEFT	CENTER	RIGHT	4TH	5TH	UK also utilizes the 5th Coin Slot Switch (not available with Custom Pricing).			
	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).*

Std. Adj. 11, Custom Pricing, and Std. Adj. 12-31 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	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				optional	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 - 10**. 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 75,000,000. 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 60,000,000. 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 50,000,000. 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 45,000,000. 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 40,000,000. 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.

Standard Adjustments 32-48 continued on the next page.

Standard Adjustments Continued.

	STANDARD ADJUSTMENT NAME: Definition
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.
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 Comp.** was made *(changing default to **YES**),* and was changed back to **NO**, the **COMPETITION MODE** will be turned **OFF** *(see Sec. 3, Chp. 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 **YES**. When set to **NO** *or if you hold the RIGHT Flipper Button during Power-Up*, 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 competitions. 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.

Standard Adjustments 49-52 continued on the next page.

Standard Adjustments Continued.

	STANDARD ADJUSTMENT NAME: Definition
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	**TEAM SCORES:** Set to **YES** or **NO**. Default is **NO**. Set to **YES**, then Team Play will be made available. ***Team Play only works in a 4-Player Game.*** The totals for Players 1 / 3 (Team 1) & Players 2 / 4 (Team 2) are then displayed individually ***as well as*** the combined score for **BOTH TEAMS** to enable **Team Play (Doubles)**. *See Section 2, Chapter **1, Game Operation & Features**, for non-adjustable Features.*
51	**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.)*
52	**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 (01-32)

To initiate, from the **ADJUSTMENTS MENU**, select the "LOTR" *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. ***Game Play, Rules, Settings and Explanation Subject to Change.***

Nr.	FEATURE ADJUSTMENT NAME: Definition
01	**NUMBER RING COMBOS - (PER) LEVEL :** Set between **05 - 15**. Default is **10**. *Note: This adjustment controls how many combos until the difficulty and points increase.*
02	**TWO TOWERS MULTIBALL DIFFICULTY :** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. *Note: This adjustment controls how long we need to survive.*
03	**1ST HARD THE TWO TOWERS MULTIBALL :** Set between **01 - 03**. Default is **1**. *Note: This adjustment determines which Multiball does the player need to light the locks for.*
04	**THE TWO TOWERS LOCK DIFFICULTY :** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **EXEASY**. *Note: This adjustment controls how hard it is to light locks. **EXTRA EASY** = No Locks Lit, 2 KEEP Letters, Lane Memory and Locks Stackable. **EASY** = No Locks Lit, 1 KEEP Letter, Lane Memory and Locks Stackable. **MODERATE** = No Locks Lit, 1 KEEP Letter, Lane Memory and Locks Unstackable. **HARD** = No Locks Lit, 1 KEEP Letter, No Lane Memory and Locks Unstackable. **EXTRA HARD** = No Locks Lit, 1 KEEP Letter, Lanes Toggle and Locks Unstackable.*
05	**PALANTIR DIFFICULTY :** Set to **EASY, MODERATE, HARD** or **EXHARD**. Default is **EASY**. *Note: This adjustment controls how often the Palantir is lit. **EASY** = At Ball Start. **MODERATE** = At Game Start. **HARD** = Never. **EXTRA HARD** = Off at Ball Start.*
06	**FELLOWSHIP (OF THE RING) MBALL DIFF. :** Set to **EASY, MODERATE, HARD** or **EXHARD**. Default is **EASY**. *Note: This adjustment controls how many shots for each member. **EASY** = 1 shot. **MODERATE** = 1 shot (only 1 lit at a time, randomly). **HARD** = 2 shots. **EXTRA HARD** = 2 shots per member in-a-row.*
07	**RING MULTIBALL DIFFICULTY :** Set to **EASY, MODERATE** or **HARD**. Default is **MODERATE**. *Note: This adjustment controls how hard it is to get cool awards.*
08	**RING MULTIBALL EXTRA BALL MEMORY :** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Ring MB EB) lit* 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.
09	**RING MULTIBALL SPECIAL MEMORY :** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Ring MB Special) lit* 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.
10	**ELF GIFT EXTRA BALL MEMORY :** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, this feature bonus *(Elf Gift EB) lit* 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.
11	**ELF GIFT SPECIAL MEMORY :** Set to **YES** or **NO**. Default is **YES**. When set to **YES**, this feature bonus *(Elf Gift Special) lit* will be retained in memory... *(same definition as Feature Adjustment 09).*
12	**RING FRENZY EXTRA BALL DIFFICULTY :** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. *Note: This adjustment determines the multiplier needed.*
13	**RING FRENZY EXTRA BALL MEMORY :** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Ring Frenzy EB)) lit* 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.

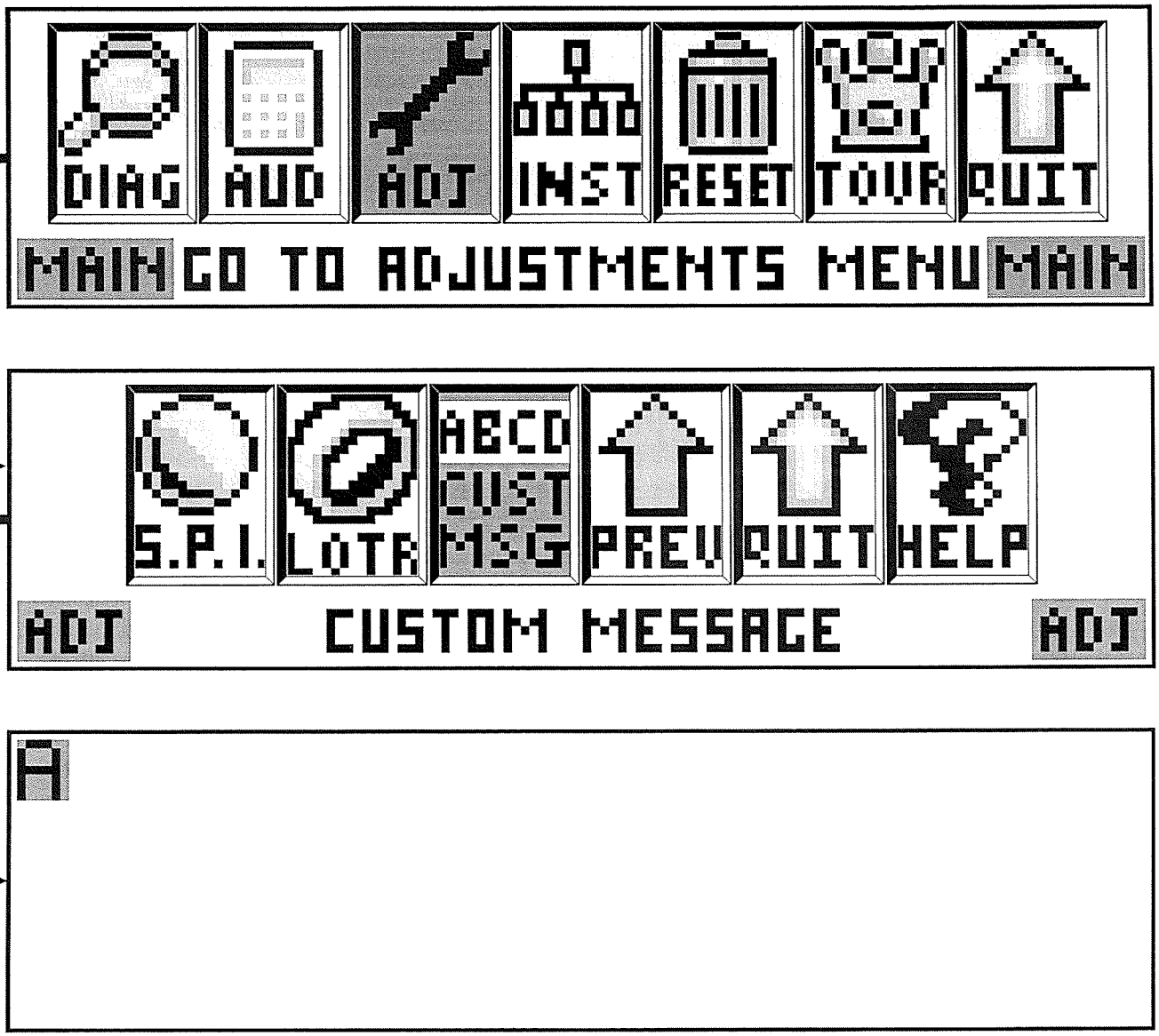
Feature Adjustments 14-32 continued on the next page.

	FEATURE ADJUSTMENT NAME: Definition
14	**RING MODE DIFFICULTY :** Set to **EASY, MODERATE, HARD** or **EXHARD**. Default is **EASY**. *Note: This adjustment controls how often the Ring Mode is lit.* ***EASY*** *= Lit at Ball Start.* ***MODERATE*** *= Lit at Game Start, with Memory.* ***HARD*** *= Off at Game Start, with Memory.* ***EXTRA HARD*** *= Off at Ball Start.*
15	**PATHS OF THE DEAD DIFFICULTY :** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. *Note: This adjustment controls how Spots are lit.* ***EXTRA EASY*** *= 5 Spots Lit.* ***EASY*** *= 4 Spots Lit.* ***MODERATE*** *= 3 Spots Lit.* ***HARD*** *= 2 Spots Lit.* ***EXTRA HARD*** *= 1 Spot Lit.*
16	**MYSTERY DIFFICULTY :** Set to **EASY, MODERATE, HARD** or **EXHARD**. Default is **HARD**. *Note: This adjustment controls how often the Mystery Mode is lit.* ***EASY*** *= Lit at Ball Start.* ***MODERATE*** *= Lit at Game Start, with Memory.* ***HARD*** *= Off at Game Start, with Memory.* ***EXTRA HARD*** *= Off at Ball Start.*
17	**MYSTERY EXTRA BALL MEMORY :** Set to **YES** or **NO**. Default is **NO**. When set to **YES**, this feature bonus *(Mystery EB) lit* 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.
18	**MYSTERY SPECIAL MEMORY :** Set to **YES** or **NO**. Default is **NO**. *When set to* **YES**, this feature bonus *(Mystery Special) lit* 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.
19	**SPOT RING (TARGET) DIFFICULTY :** Set to **EASY, MODERATE, HARD** or **EXHARD**. Default is **EASY**. *Note: Controls when the spot ring target is lit:* ***EASY*** *= On at ball start.* ***MODERATE*** *= On at game start with memory.* ***HARD*** *= Off at game start with memory.* ***EXTRA HARD*** *= Off at ball start.*
20	**ELF RING SPOTTING (DIFFICULTY) :** Set to **EXEASY, EASY, MODERATE** or **HARD**. Default is **MODERATE**. *Note: Controls the number of cycles through the modes (i.e. a player has played all 6 modes) where shooting an unlit ring during normal play will spot an elf ring towards relighting the ring:* ***EXTRA EASY*** *= 3 cycles.* ***EASY*** *= 2 cycles.* ***MODERATE*** *= 1 cycle.* ***HARD*** *= Never.*
21	**DWARF RING SPOTTING (DIFFICULTY) :** Set to **EXEASY, EASY, MODERATE** or **HARD**. Default is **EASY**. *Note: Controls the number of mystery awards that can be collected where shooting an unlit mystery shot (Left VUK) will spot a dwarf ring towards relighting mystery:* ***EXTRA EASY*** *= 3 mysteries.* ***EASY*** *= 2 mysteries.* ***MODERATE*** *= 1 mystery.* ***HARD*** *= Never.*
22	**HUMAN RING SPOTTING (DIFFICULTY) :** Set to **EXEASY, EASY, MODERATE** or **HARD**. Default is **MODERATE**. *Note: Controls the number of Gollum Multiballs that can be collected where shooting an unlit Gollum Multiball shot (Right VUK) will spot a human ring towards lighting Gollum Multiball:* ***EXTRA EASY*** *= 3 Multiballs.* ***EASY*** *= 2 Multiballs.* ***MODERATE*** *= 1 Multiball.* ***HARD*** *= Never.*
23	**FELLOWSHIP (OF THE RING) MULTIBALL DIFFICULTY :** Set to **EASY, MODERATE** or **HARD**. Default is **MODERATE**. *Note: Controls which shots are lit to start Fellowship of the Ring Multiball:* ***EASY*** *= Left VUK / Orthanc / Top Saucer / Rt. VUK.* ***MODERATE*** *= Top Saucer / Rt. VUK.* ***HARD*** *= Top Saucer.*
24	**RETURN OF THE KING MULTIBALL DIFFICULTY :** Set to **EASY, MODERATE** or **HARD**. Default is **MODERATE**. *Note: Controls which shots are lit to start Return of the King Multiball:* EASY *= Lt VUK / Orthanc / Top Saucer / Rt VUK.* ***MODERATE*** *= Orthanc / Rt VUK.* ***HARD*** *= Orthanc.*
25	**CONSOLATION MYSTERY :** Set to **YES** or **NO**. Default is **YES**. *Note: Controls whether the game can light the mystery award for free on ball 3 if the player is having a poor game. If the game is set on competition mode, this adjustment will be treated as if set to No.*
26	**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.*
27	**GAME START BALROG ROAR:** Set to **YES** or **NO**. Default is **YES**. Set to **NO** to disable this feature. *Note: This controls whether or not the Balrog roars as it closes at the start of a game.*
28	**BARAD-DÛR DIFFICULTY:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. *Note: This controls how may shots are required for the initial award from Barad-dûr.*
29	**BARAD-DÛR EXTRA BALL MEMORY:** Set to **YES** or **NO**. Default is **YES**. Set to **NO** to disable this feature. When set to **YES**, this feature bonus *(Barad-dûr EB) lit* 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.
30	**SPOT FELLOWSHIP MEMBERS:** Set to **YES** or **NO**. Default is **YES**. Set to **NO** to disable this feature. When set to **YES**, after a player's 1st ball, 1 Fellowship member will be spotted at each ball start until the Fellowship of the Ring Multiball is played.
31	**GOLLUM'S CAVE DIFFICULTY:** Set to **EXEASY, EASY, MODERATE, HARD** or **EXHARD**. Default is **MODERATE**. *Note: This controls how many shots are required for the initial award from Gollum's Cave.*
32	**BARAD-DÛR EARLY CRASH:** Set to **YES** or **NO**. Default is **YES**. Set to **NO** to disable this feature. *Note: This controls whether Barad-dûr can "fall over" other than winning "Destroy the Ring."*

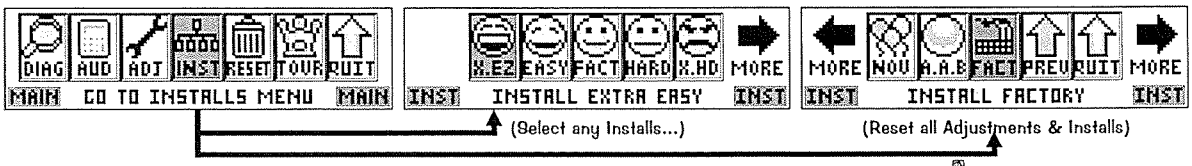
For further customization of Game Play Difficulty or Game Play Type or how to RESET ONLY the Adjustments, see Section 3, Chapter 5, GO TO INSTALLS MENU.

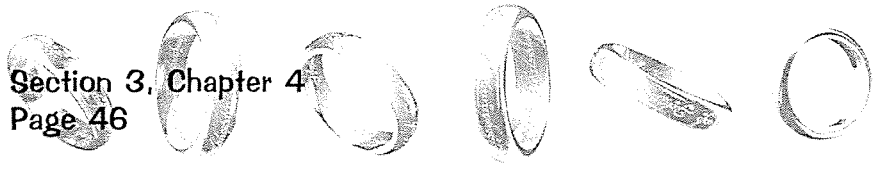
Custom Message

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 (Feature Adjustments) Difficulty** or **Game Play Type** and **Install Factory** *(restores all adjustments to Factory Defaults).*

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**.

*View Pages **49** & **50** for an Overview of the Standard & Feature Adjustment(s) which have changed upon selection.*

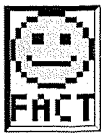
Install Extra Easy

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.

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.

*View Pages **49** & **50** for an Overview of the Standard & Feature Adjustment(s) which have changed upon selection.*



Install Normal

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 Difficuly** is reset to **Factory Default Settings. "REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "FACT" *Icon* flashing.

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.

Install Extra Hard

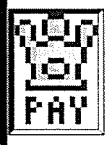
To initiate, from the **INSTALLS MENU**, select the "X.HD" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button. Game Play Difficulty** is set to **EX. HARD. "REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "X.HD" *Icon* flashing.

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.

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.



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

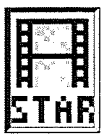
To initiate, from the **INSTALLS MENU**, select the "PAY" *Icon* with either the **Red "LEFT"** or **Green "RIGHT" Buttons** and press the **Black "ENTER" Button. Game Play Type** is set to **TOURNAMENT PAY MODE. "REQUEST INSTALLED"** is indicated and returns to the **INSTALLS MENU** with the "PAY" *Icon* flashing.

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.

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.



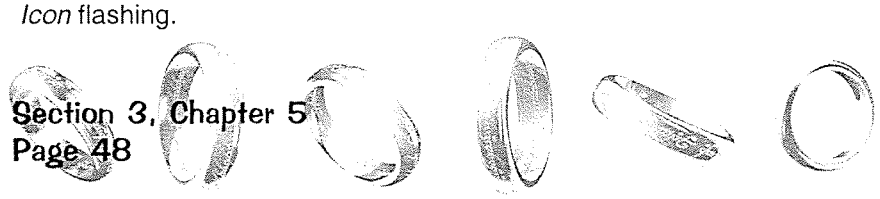
Film Star Reset

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.

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.

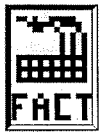


*View **below** & **next** page for an Overview of the Std. & Feature Adjustment(s) which have changed upon selection.*

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.



Install Factory (ONLY affects all Adjustments/Installs)

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.** ⚠ All Standard & Feature Adjustments which were changed in the **INSTALLS** or **ADJUSTMENTS MENU** are returned to the ***Factory Defaults.***

Overview of Standard Adjustment Changes upon selection of an Install:

ONLY THE STANDARD ADJUSTMENTS LISTED ARE AFFECTED AS NOTED IN THE TABLES BELOW.

Nr.	STANDARD ADJUSTMENT NAME	INSTALL EXTRA EASY	INSTALL EASY	INSTALL NORMAL	INSTALL HARD	INSTALL EXTRA HARD	INSTALL 3-BALL	INSTALL 5-BALL
10	EXTRA BALL PERCENTAGE	30%	25%	20%	15%	10%	20%	10%
14	BALLS PER GAME						03	05
38	FREEZE TIME	0:12	0:10	0:08	OFF	OFF	0:08	AUTO

ONLY THE STANDARD ADJUSTMENTS LISTED ARE AFFECTED AS NOTED IN THE TABLES BELOW.

Nr.	STANDARD ADJUSTMENT NAME	$ .50 COMPE-TITION *	FREE PLAY COMP. *	INSTALL HOME PLAY	FILM STAR RESET	INSTALL NOVELTY	INSTALL ADD-A-BALL	INSTALL FACTORY
01	REPLAY TYPE					NONE		
03	REPLAY AWARD						EX. BALL	
04	REPLAY LEVELS					NONE		
06	SPECIAL AWARD					POINTS	EX. BALL	
08	FREE GAME LIMIT					NO FREE..	NO FREE..	
09	EXTRA BALL LIMIT					NO EXTRA...	09	
10	EXTRA BALL PERCENTAGE			20%	20%			
11	GAME PRICING	USA 3						
13	MATCH PERCENTAGE			10%		OFF	OFF	
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	
23	GRAND CHAMPION SCORE			25,000,000				
24	DEFAULT HIGH SCORE #1			20,000,000				
25	DEFAULT HIGH SCORE #2			15,000,000				
26	DEFAULT HIGH SCORE #3			10,000,000				
27	DEFAULT HIGH SCORE #4			5,000,000				
30	FREE PLAY	NO	YES	YES	YES			
35	GAME RESTART	NO	NO					
38	FREEZE TIME				0:10			
42	COINDOOR BALL SAVER **	(YES) **	(YES) **					
43	COMPETITION MODE ***	YES ***	YES ***					

CAUTION! : Upon selection of **Install Factory** *("FACT" Icon)*, all Standard & Feature Adjustments which were changed in the **INSTALLS** or **ADJUSTMENTS MENU** are returned to the ***Factory Defaults*** *(see the Adjustment Tables on Page 38 for details).*

* If ***Competition Mode*** was set, it is suggested to **Install Factory** to restore all Adjustments *to the Factory Defaults.* Then recustomize, if desired.

*** Adjustment 42 Default **will not change**; Installing $ .50 **or** Free Play Competition will override this Adjustment regardless of the setting.*
**** If Adjustment 43 is changed back to **NO** after this Install, the Competition Mode Install will be canceled (turned off).*

Go To Installs Menu

Overview of Feature Adjustment Changes upon selection of an Install:

ONLY THE FEATURE ADJUSTMENTS LISTED ARE AFFECTED AS NOTED IN THE TABLES BELOW.

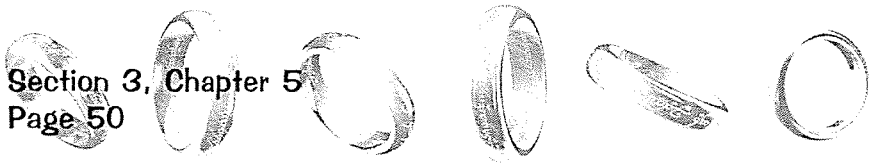
Nr.	FEATURE ADJUSTMENT NAME	INSTALL EXTRA EASY	INSTALL EASY	INSTALL NORMAL (FACTORY)	INSTALL HARD	INSTALL EXTRA HARD	INSTALL 3-BALL	INSTALL 5-BALL	FILM STAR RESET
01	NUM. RING COMBOS-LEVEL	15	12	10	8	5	10	10	15
02	TWO TOWERS MB DIFF	EX. EASY	EASY	MODERATE	HARD	EX. HARD	MODERATE	HARD	EX. EASY
03	1ST HARD TTT MB	2	2	1	1	1	1	1	2
04	TTT LOCK DIFFICULTY	EX. EASY	EX. EASY	EX. EASY	EASY	MODERATE	EX. EASY	EASY	EX. EASY
05	PALANTIR DIFFICULTY	EASY	EASY	EASY	MODERATE	HARD	EASY	MODERATE	EASY
06	FELLOWSHIP DIFFICULTY	EASY	EASY	EASY	MODERATE	HARD	EASY	EASY	EASY
07	RING MULTIBALL DIFF	EASY	EASY	MODERATE	MODERATE	HARD	MODERATE	MODERATE	EASY
08	RING MBALL E. BALL MEM	YES	YES	NO	NO	NO	NO	NO	YES
09	RING MBALL SPECIAL MEM	YES	NO	NO	NO	NO	NO	NO	YES
10	ELF GIFT E. BALL MEM	YES	YES	YES	YES	NO	YES	YES	YES
11	ELF GIFT SPECIAL MEM	YES	YES	YES	NO	NO	YES	NO	YES
12	RING FRENZY E. BALL DIFF	EX. EASY	EASY	MODERATE	HARD	EX. HARD	MODERATE	HARD	EX. EASY
13	RING FRENZY E. BALL MEM	YES	YES	NO	NO	NO	NO	NO	YES
14	RING MODE DIFFICULTY	EASY	EASY	EASY	MODERATE	HARD	EASY	MODERATE	EASY
15	PATHS OF THE DEAD DIFF	EX. EASY	EASY	MODERATE	HARD	EX. HARD	MODERATE	HARD	EX. EASY
16	MYSTERY DIFFICULTY	EASY	MODERATE	HARD	HARD	HARD	HARD	HARD	EASY
17	MYSTERY EB MEMORY	YES	YES	NO	NO	NO	NO	NO	YES
18	MYSTERY SPECIAL MEM.	YES	NO	NO	NO	NO	NO	NO	YES
19	RING TARGET DIFF.	EASY	EASY	EASY	HARD	EX. HARD	EASY	HARD	EASY
20	ELF RING DIFFICULTY	EX. EASY	EASY	MODERATE	HARD	HARD	MODERATE	MODERATE	EX. EASY
21	DWARF RING DIFF	EX. EASY	EASY	EASY	MODERATE	HARD	EASY	MODERATE	EX. EASY
22	HUMAN RING DIFF	EX. EASY	EASY	MODERATE	HARD	HARD	MODERATE	MODERATE	EX. EASY
23	FOTR MB START DIFF	EASY	EASY	MODERATE	HARD	HARD	MODERATE	MODERATE	EASY
24	ROTK MB START DIFF	EASY	EASY	MODERATE	HARD	HARD	MODERATE	MODERATE	EASY
25	CONSOLATION MYSTERY	YES	YES	YES	NO	NO	YES	NO	YES
26	ALLOW VOLUME EFFECTS	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
27	GAME START BALROG ROAR			YES			YES		
28	BARAD-DÛR DIFFICULTY			MODERATE			MODERATE		
29	BARAD-DÛR E. BALL MEM.			YES			YES		
30	SPOT FELLOWSHIP ...			YES			YES		
31	GOLLUM'S CAVE DIFF.			MODERATE			MODERATE		
32	BARAD-DÛR EARLY CRASH			YES			YES		

ONLY THE FEATURE ADJUSTMENTS LISTED ARE AFFECTED AS NOTED IN THE TABLES BELOW.

Nr.	FEATURE ADJUSTMENT NAME	$ .50 COMPE-TITION *	FREE PLAY COMP. *	INSTALL HOME PLAY	FILM STAR RESET	INSTALL NOVELTY	INSTALL ADD-A-BALL	INSTALL FACTORY
01-26	See Table above for listing of Feature Adjustments which change with Install.	No Change	No Change	No Change	SEE TABLE ABOVE	No Change	No Change	

CAUTION! : Upon selection of **Install Factory** *("FACT" Icon)*, all Standard & Feature Adjustments which were changed in the **INSTALLS** or **ADJUSTMENTS MENU** are returned to the ***Factory Defaults*** *(see the Adjustment Tables on Page 38 for details).*

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



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

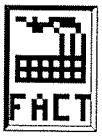
To initiate, from the **RESET MENU**, select the "AUD" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button.** ⚠ **ONLY** the **Game Audits** ***(01-04)*** *&* ***Standard Audits (01-67)*** will be reset to zero (0), *Factory Default Settings.* ***Note: Coin Audits (05-13)*** *&* ***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.

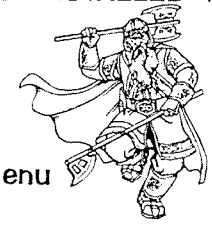
Reset Credits

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

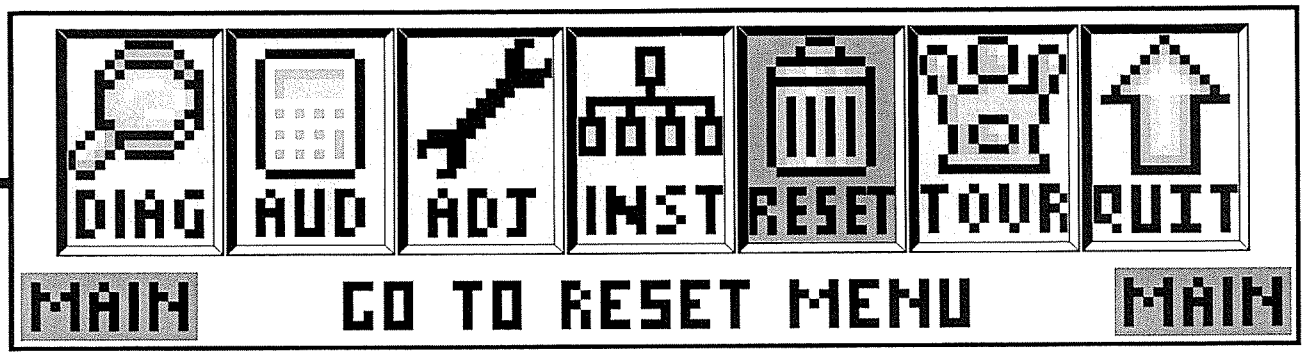
To initiate, from the **RESET MENU**, select the "FACT" *Icon* with either the **Red** or **Green Buttons** and press the **Black Button.** ⚠ All **Audits** *(except for Audit* ***14, Software Meter****)*, all **Adjustments** and **Installs** will be reset to the *Factory Default Settings.* ***Note:*** *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.***



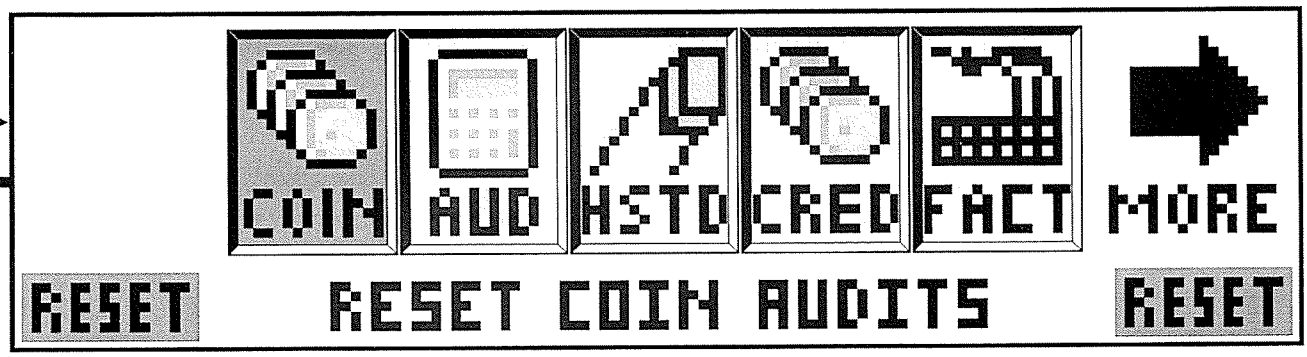
Go To Reset Menu

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
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**.*

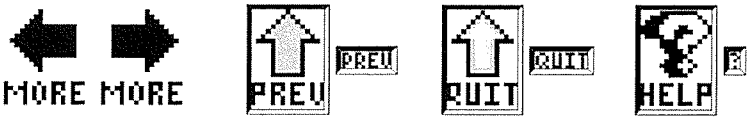
For more details on the equipment & hardware required, Installation and Set-up, read the **ToPS™ Tournament Pinball System Kit Installation Manual** *(SPI Part Number: 780-6011-00)* provided in the ***Optional Tournament Kit*** *(SPI Part Number: 502-5011-00)*, not included with this *ToPS™ Ready Pinball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

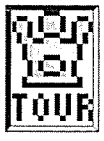
Select and activate to view **HELP** *Screens of the current Menu*.*

Select and activate to:

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

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

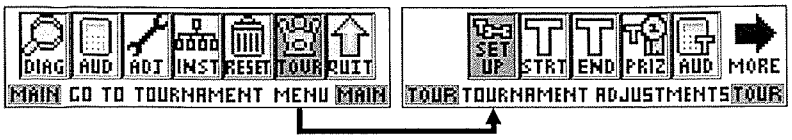
** **Help Note:** An explanation of each Mini-Icon at that menu level will cycle continuously. To exit a display where no Mini-Icons are available for selection, pressing any button will exit the display.*



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.



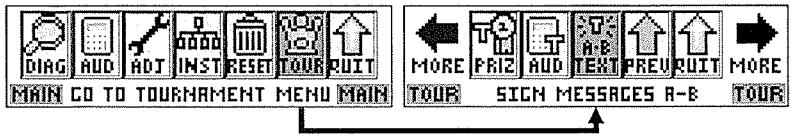
TOURNAMENT ADJUSTMENT TABLES

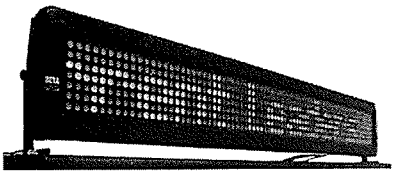
TOURNAMENT ADJUSTMENTS 01-10 =

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) :

AUDITOR'S NAME :

CURRENT VOLUME SETTING:

CURRENT METER Reading :

AUDIT Date (MM/DD/YR) :

CPU Version :

DISPLAY Version :

GAME LOCATION NAME :

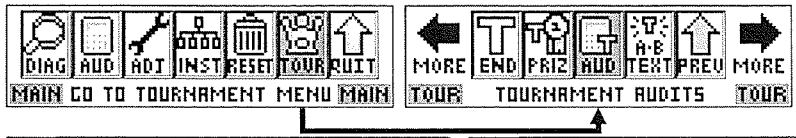
Copy this page for Field Audit Tracking Performance

See Adj. 06 & 07 above >>

TOURNAMENT START DATE :

TOURNAMENT END DATE :

TOURNAMENT AUDIT TABLE



TOURNAMENT AUDITS 01-12 =

Audit definitions follow in this Chapter.

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		

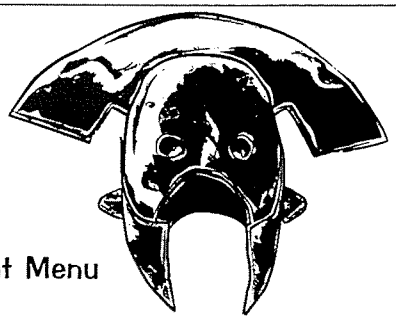
Tournament Adjustments (01-10)

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-Icons* 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.

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!***

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.

Tournament Audits Continued.

TOURNAMENT AUDIT NAME: Definition	
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!	
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.

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-Icons* 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.

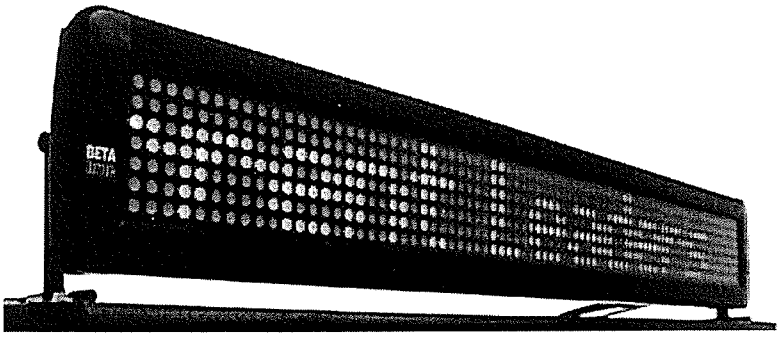
Nr.	TOURNAMENT ADJUSTMENT NAME: Definition
11	**LOCATION MESSAGE:** Set to **ON, CHANGE** or **OFF**. Default is **ON**. When set to **CHANGE**, a new message can be set or the old one can be edited *(select the "+" Mini-Icon to change settings until "CHANGE" appears in the display, then select the ">>" 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:

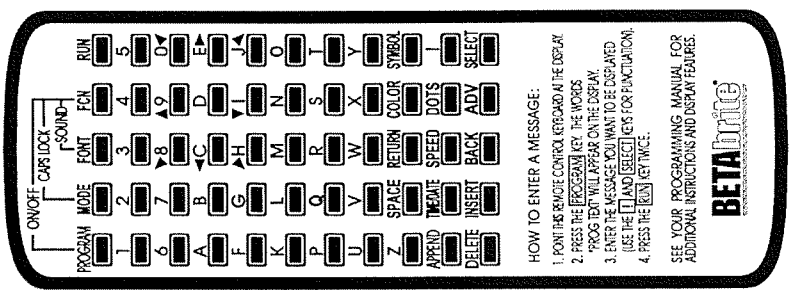
STERN PINBALL PROUDLY PRESENTS...

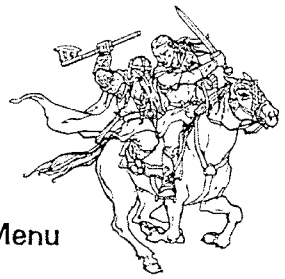
The ***DEFAULT PRIZE MESSAGE*** is:

YOU CAN BE THE NEXT BIG WINNER!

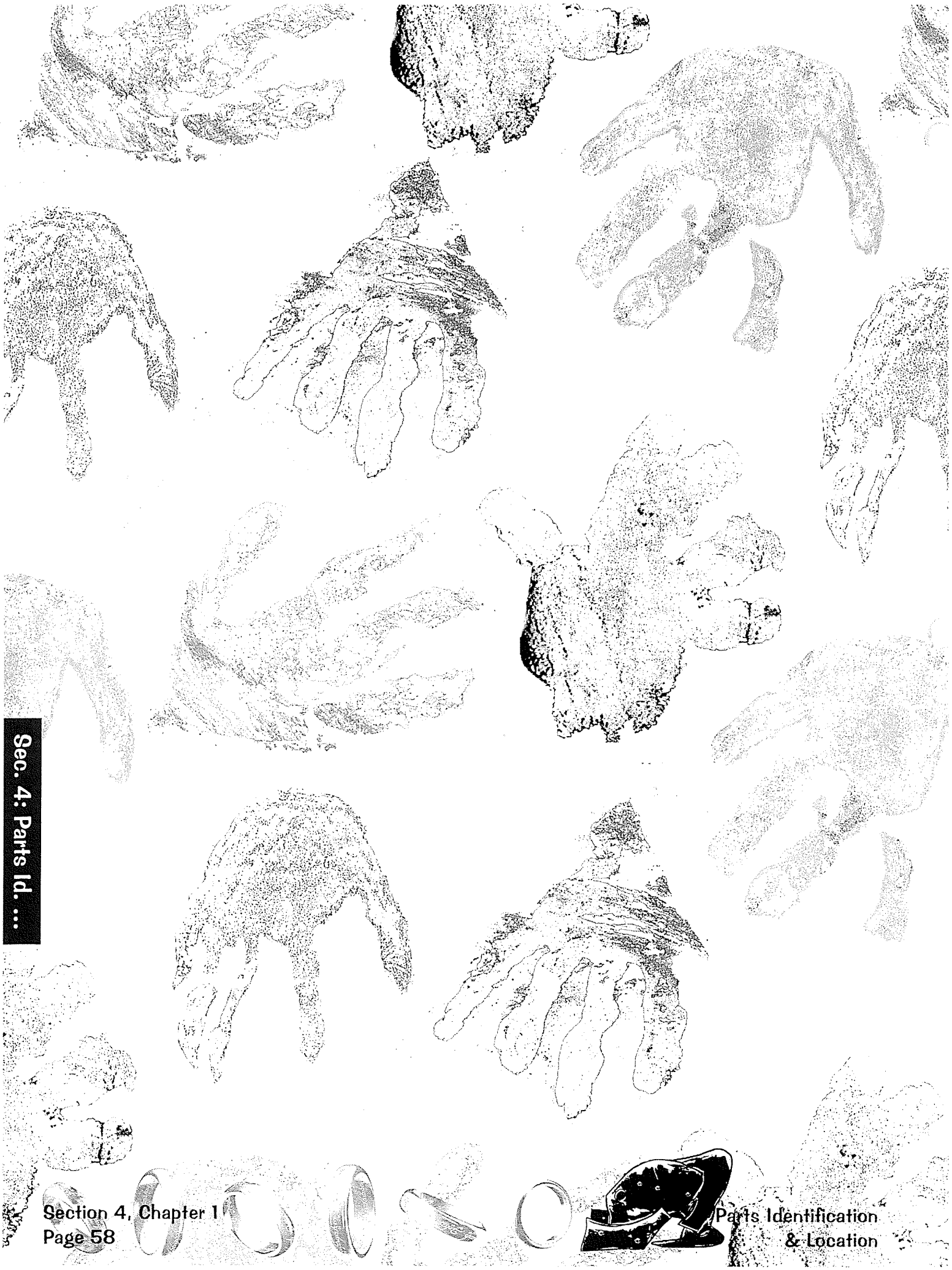


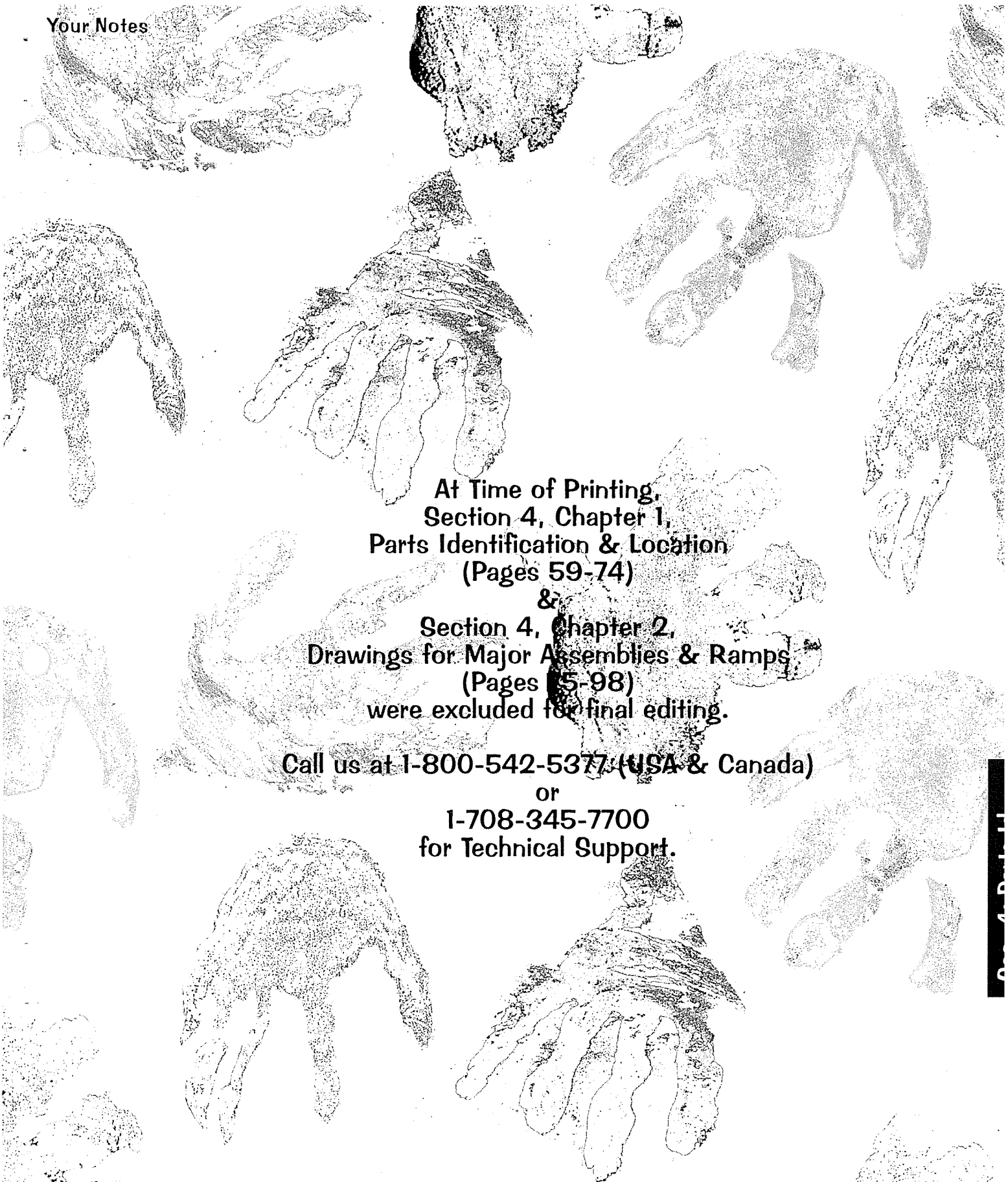
IMPORTANT FOR TOURNAMENT USERS: ***2 additional messages can be added*** by using the **Beta Brite® Remote**. More details in the **ToPS™ Tournament Pinball System Kit Installation Manual** *(SPI Part Number: 780-6011-00)* provided in the ***Optional Tournament Kit*** *(SPI Part Number: 502-5011-00).*





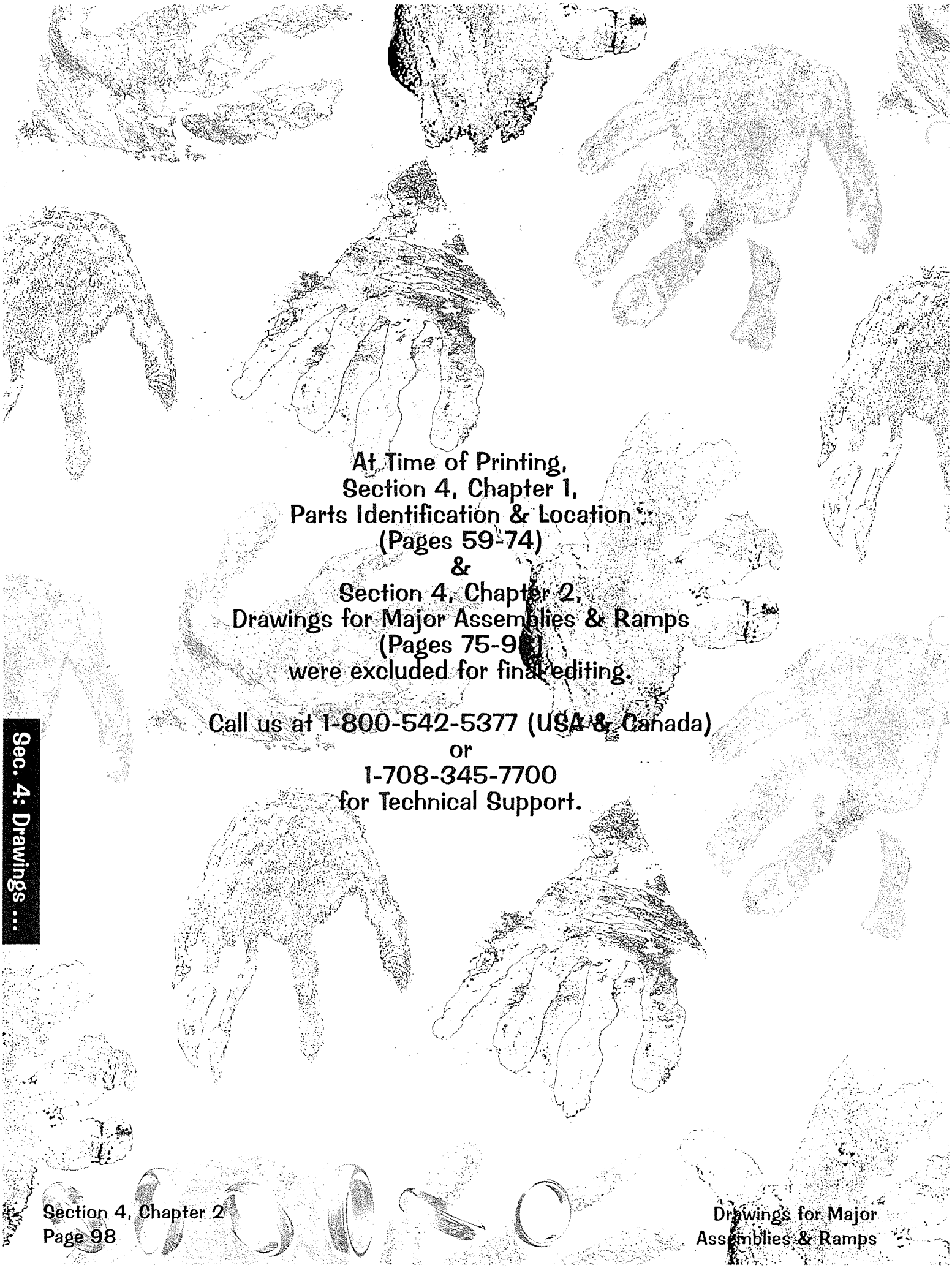
Go To
Tournament Menu





At Time of Printing,
Section 4, Chapter 1,
Parts Identification & Location
(Pages 59-74)
&
Section 4, Chapter 2,
Drawings for Major Assemblies & Ramps
(Pages 75-98)
were excluded for final editing.

Call us at 1-800-542-5377 (USA & Canada)
or
1-708-345-7700
for Technical Support.



At Time of Printing,
Section 4, Chapter 1,
Parts Identification & Location
(Pages 59-74)
&
Section 4, Chapter 2,
Drawings for Major Assemblies & Ramps
(Pages 75-90)
were excluded for final editing.

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or
1-708-345-7700
for Technical Support.

Section 5
Schematics & Troubleshooting
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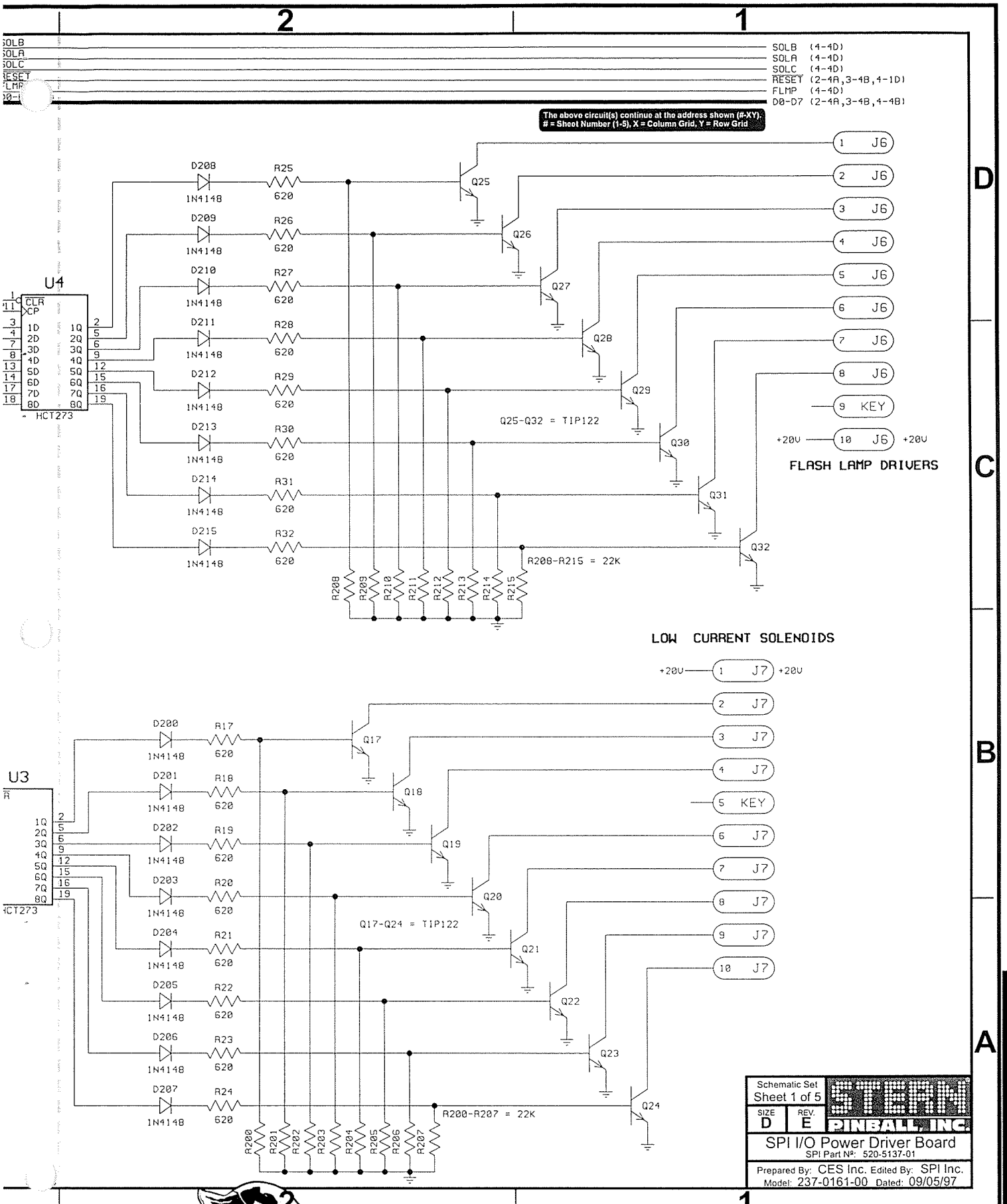
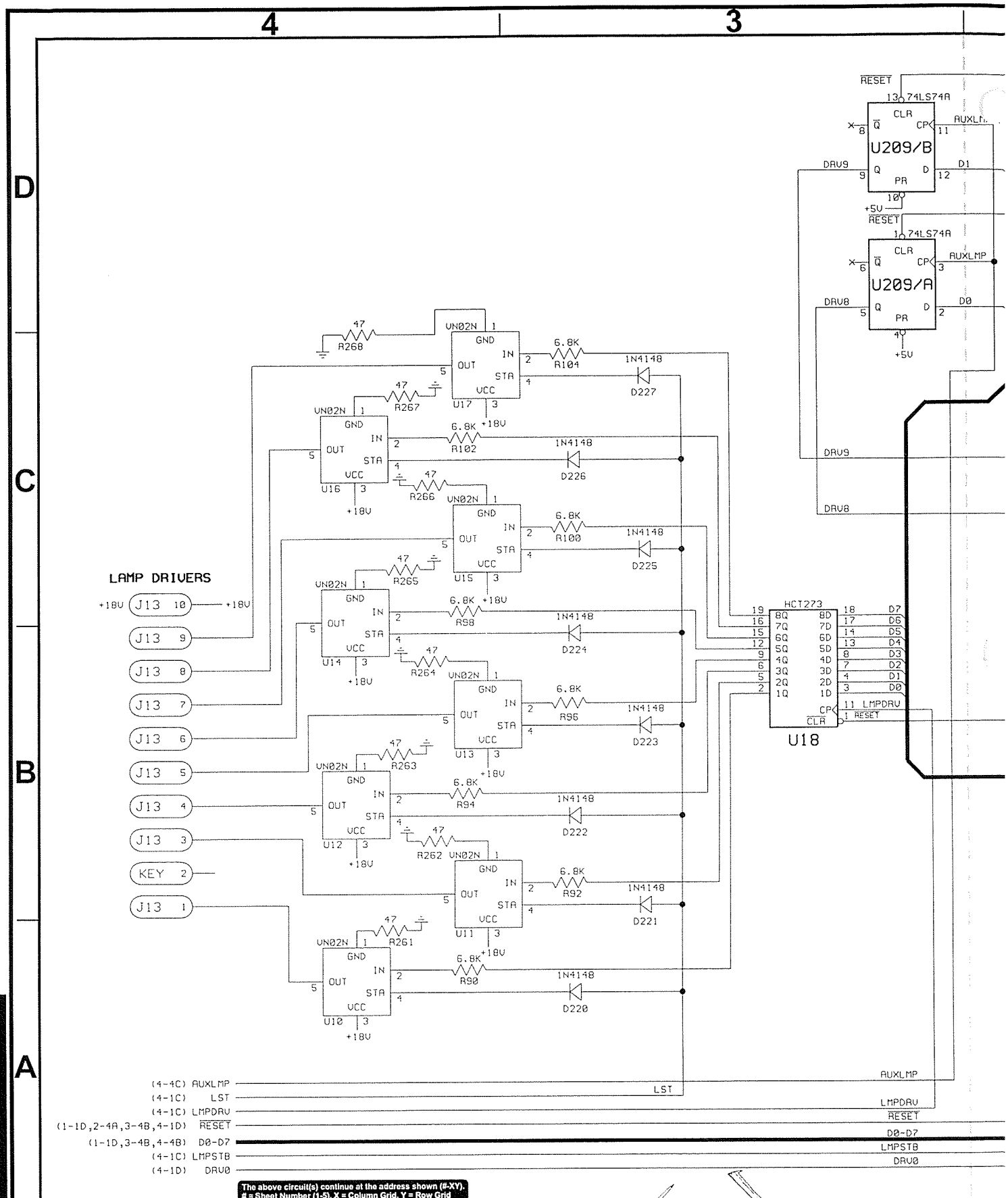
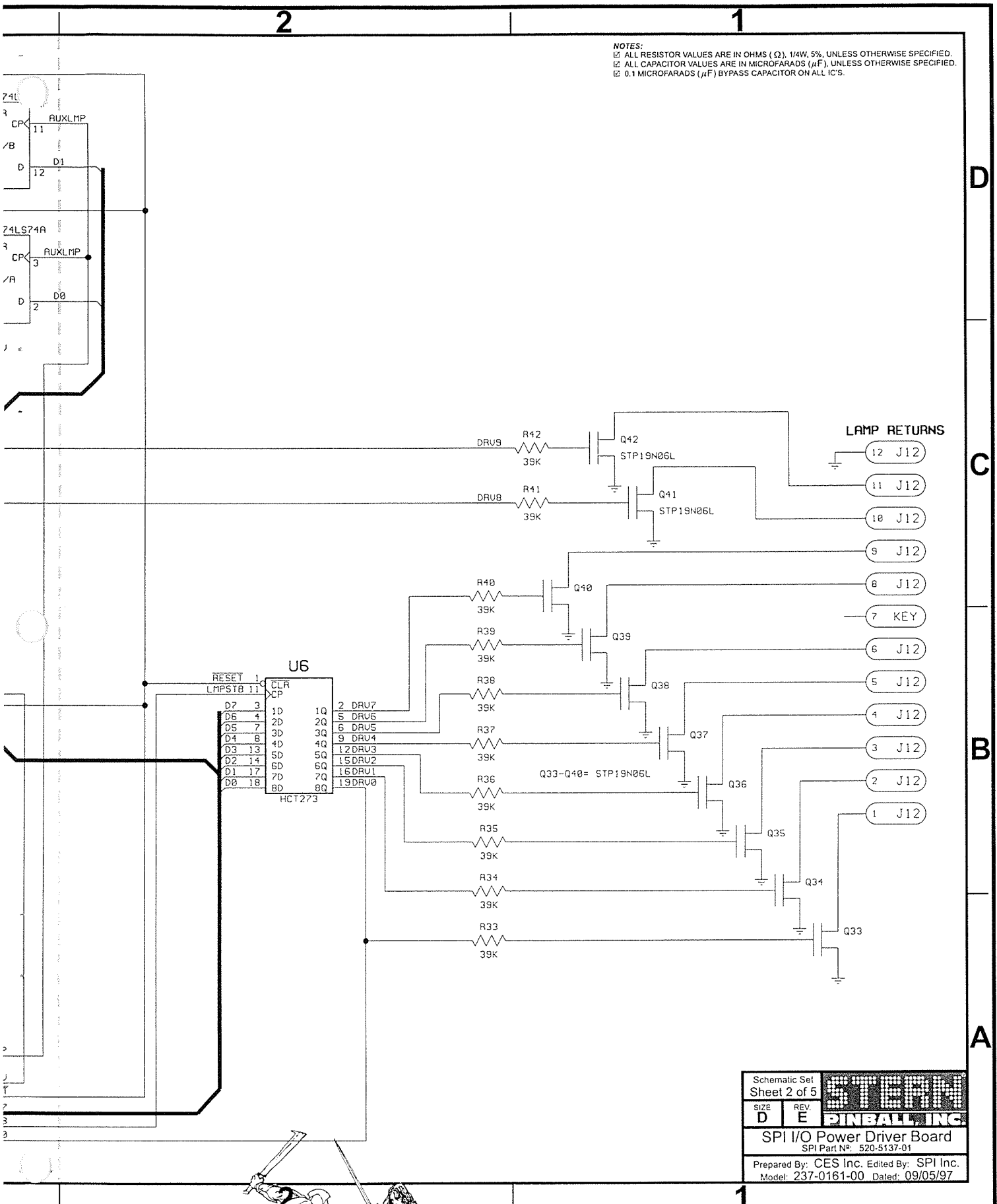
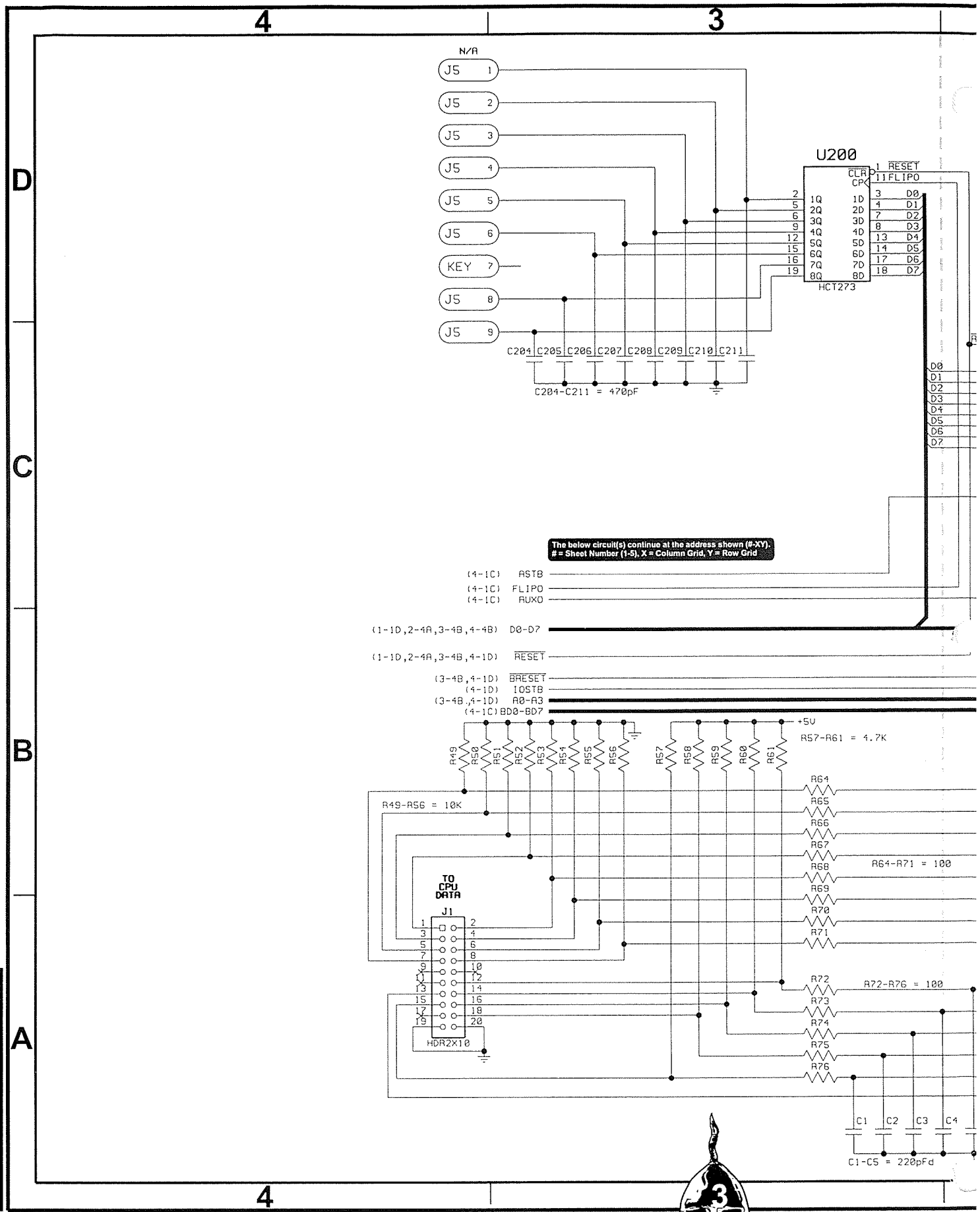
Visit www.SternPinball.com/schematics.htm for the latest 11" X 17" Schematics (or "Split 8-1/2" X 11") for the Display Power Supply, Display Controller, I/O Power Driver & CPU/Sound Boards (White Star™ System Only). Along with the schematics, you'll find the component layout and theory of operation. 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 web site only, but once on your harddrive they "open fast". Inside the schematics, you'll find hyperlinks that direct you to another sheet in the schematic set (forward, back, or to a specific sheet). Some schematics may direct you to another schematic altogether.


2
1
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
D208 R25 Q25 1 J6
D209 R26 Q26 2 J6
D210 R27 Q27 3 J6
D211 R28 Q28 4 J6
D212 R29 Q29 5 J6
D213 R30 Q30 6 J6
D214 R31 Q31 7 J6
D215 R32 Q32 8 J6
9 KEY
+20V 10 J6 +20V
1N4148
620
Q25-Q32 = TIP122
R208-R215 = 22K
R208 R209 R210 R211 R212 R213 R214 R215
FLASH LAMP DRIVERS
LOW CURRENT SOLENOIDS
U3
HCT273
D200 R17 Q17 +20V 1 J7 +20V
D201 R18 Q18 2 J7
D202 R19 Q19 3 J7
D203 R20 Q20 4 J7
D204 R21 Q21 5 KEY
D205 R22 Q22 6 J7
D206 R23 Q23 7 J7
D207 R24 Q24 8 J7
9 J7
10 J7
Q17-Q24 = TIP122
R200-R207 = 22K
R200 R201 R202 R203 R204 R205 R206 R207
D C B A
Schematic Set Sheet 1 of 5
SIZE D REV. E
SPI 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

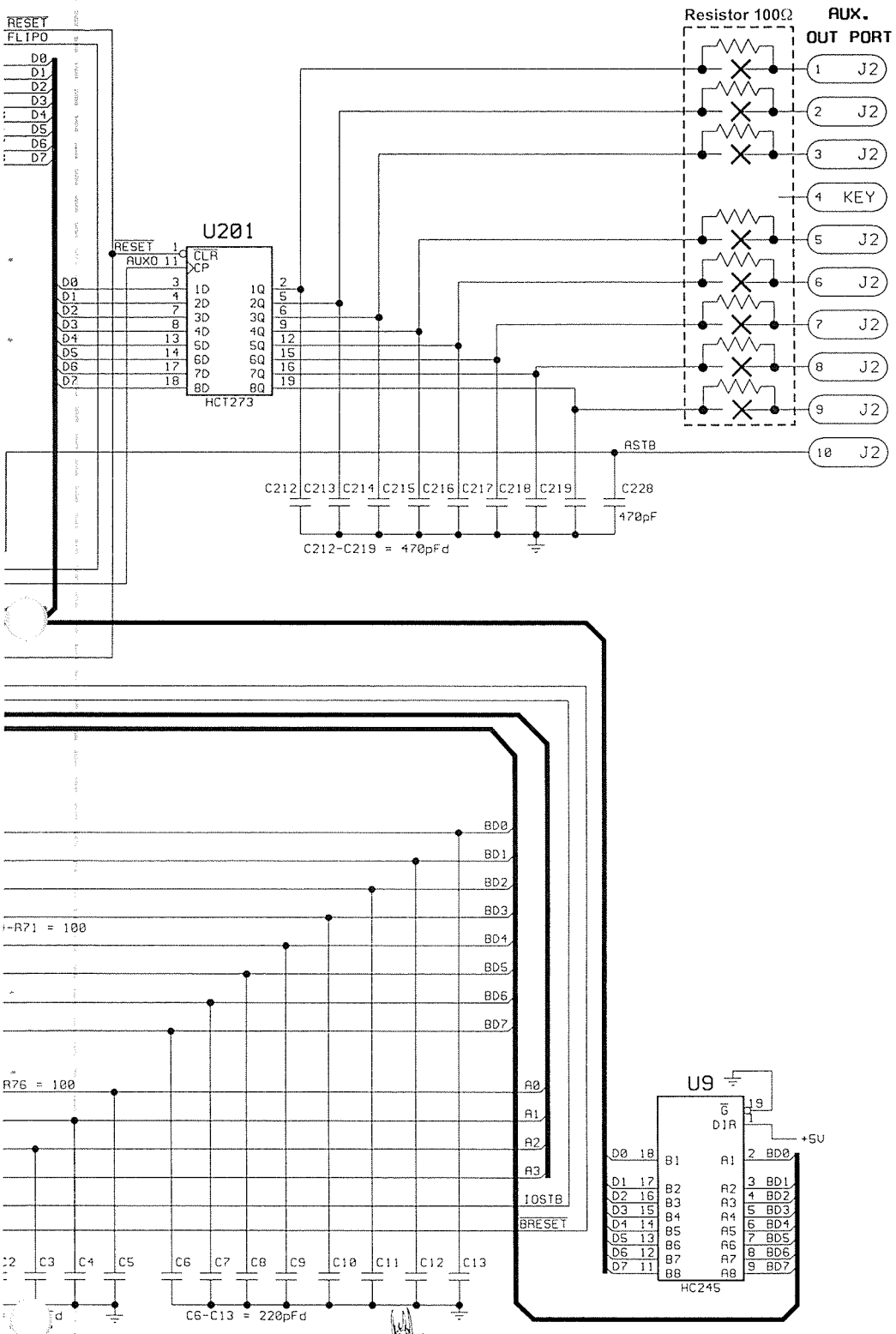

4
3
D
C
B
A
LAMP DRIVERS
+18U
J13 10
J13 9
J13 8
J13 7
J13 6
J13 5
J13 4
J13 3
KEY 2
J13 1
U209/B
U209/A
74LS74A
RESET
+5U
DRV9
DRV8
D1
D0
AUXLMP
U17
U16
U15
U14
U13
U12
U11
U10
UN02N
R268
R267
R266
R265
R264
R263
R262
R261
R104
R102
R100
R98
R96
R94
R92
R90
6.8K
47
1N4148
D227
D226
D225
D224
D223
D222
D221
D220
U18
HCT273
LMPDRU
(4-4C) AUXLMP
(4-1C) LST
(4-1C) LMPDRU
(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


2
1
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.
D
C
B
A
74LS74A
AUXLMP
D1
D0
U6
RESET
LMPSTB
HCT273
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
LAMP RETURNS
12 J12
11 J12
10 J12
9 J12
8 J12
7 KEY
6 J12
5 J12
4 J12
3 J12
2 J12
1 J12
Schematic Set
Sheet 2 of 5
SIZE D
REV. E
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
N/A
J5 1
J5 2
J5 3
J5 4
J5 5
J5 6
KEY 7
J5 8
J5 9
U200
HCT273
1 RESET
11 FLIPO
1Q 2Q 3Q 4Q 5Q 6Q 7Q 8Q
1D 2D 3D 4D 5D 6D 7D 8D
D0 D1 D2 D3 D4 D5 D6 D7
C204 C205 C206 C207 C208 C209 C210 C211
C204-C211 = 470pF
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
R72 R73 R74 R75 R76
R72-R76 = 100
TO CPU DATA
J1
HDR2X10
C1 C2 C3 C4
C1-C5 = 220pFd

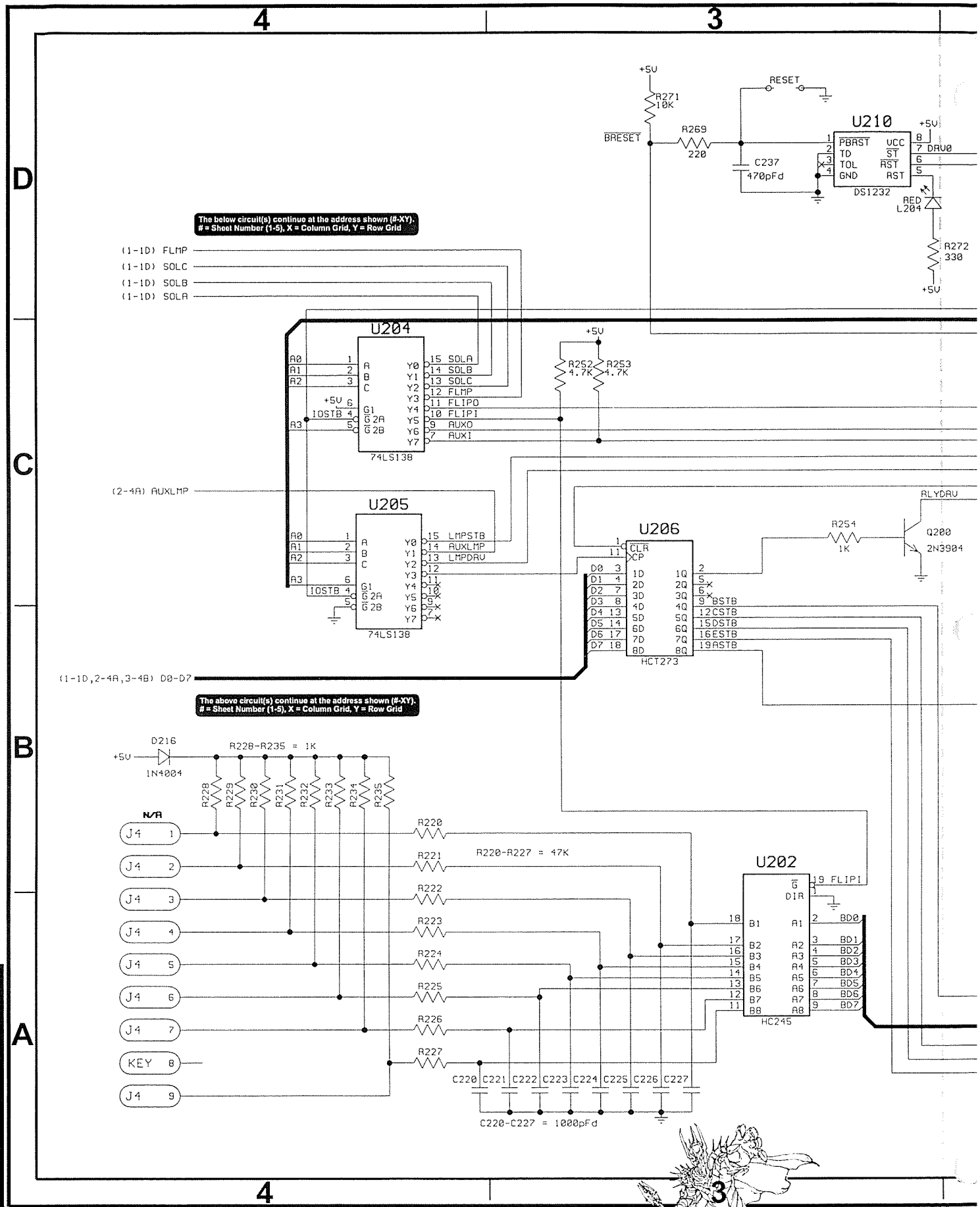
NOTES:
- ☑ ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ☑ ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
- ☑ 0.1 MICROFARADS (μF) BYPASS CAPACITOR ON ALL IC'S.

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

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
+5V
DRV0
RED
L204
R272
330
+5V
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
G2A
G2B
Y0 SOLA
Y1 SOLB
Y2 SOLC
Y3 FLMP
Y4 FLIPO
Y5 FLIPI
Y6 AUXO
Y7 AUXI
74LS138
+5V
R252
4.7K
R253
4.7K
(2-4A) AUXLMP
U205
Y0 LMPSTB
Y1 AUXLMP
Y2 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
HCT273
R254
1K
Q200
2N3904
ALYDRV
BSTB
CSTB
DSTB
ESTB
ASTB
(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
+5V
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
B1
B2
B3
B4
B5
B6
B7
B8
A1
A2
A3
A4
A5
A6
A7
A8
19 FLIPI
BD0
BD1
BD2
BD3
BD4
BD5
BD6
BD7
HC245
C220
C221
C222
C223
C224
C225
C226
C227
C220-C227 = 1000pFd

DATE	DESCRIPTION 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.

+5V
R270 4.7K
RESET
BLANKING
+5V
DRV0
RED L204
R272 330
+5V

RESET (1-1D,2-4A,3-4B,4-1D)
DRV0 (2-4A)
IOSTB (3-4B)
A0-A3 (3-4B)
BRESET (3-4B)

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

FLIPO (3-4C)
AUXO (3-4C)
LMPSTB (2-4A)
LMPDRV (2-4A)
RLYDRV (5-4C)
ASTB (3-4C)
BD0-BD7 (3-4B)
LST (2-4A)

RLYDRV
Q200
2N3904

+5V
R256 4.7K
LST
D228
1N4148
R255 10K
C236 470pF
R245-R251 = 1K
D217
1N4004
+5V
R245 R246 R247 R248 R249 R250 R251

AUX. IN PORT
1 J3
2 J3
3 J3
4 J3
5 J3
6 J3
7 J3
8 KEY
9 J3
10 J3
11 J3
12 J3

U203
AUX1 1
G
DIR
BD0 2
BD1 3
BD2 4
BD3 5
BD4 6
BD5 7
BD6 8
BD7 9
A1 A2 A3 A4 A5 A6 A7 A8
B1 B2 B3 B4 B5 B6 B7 B8
18 17 16 15 14 13 12 11
HC245

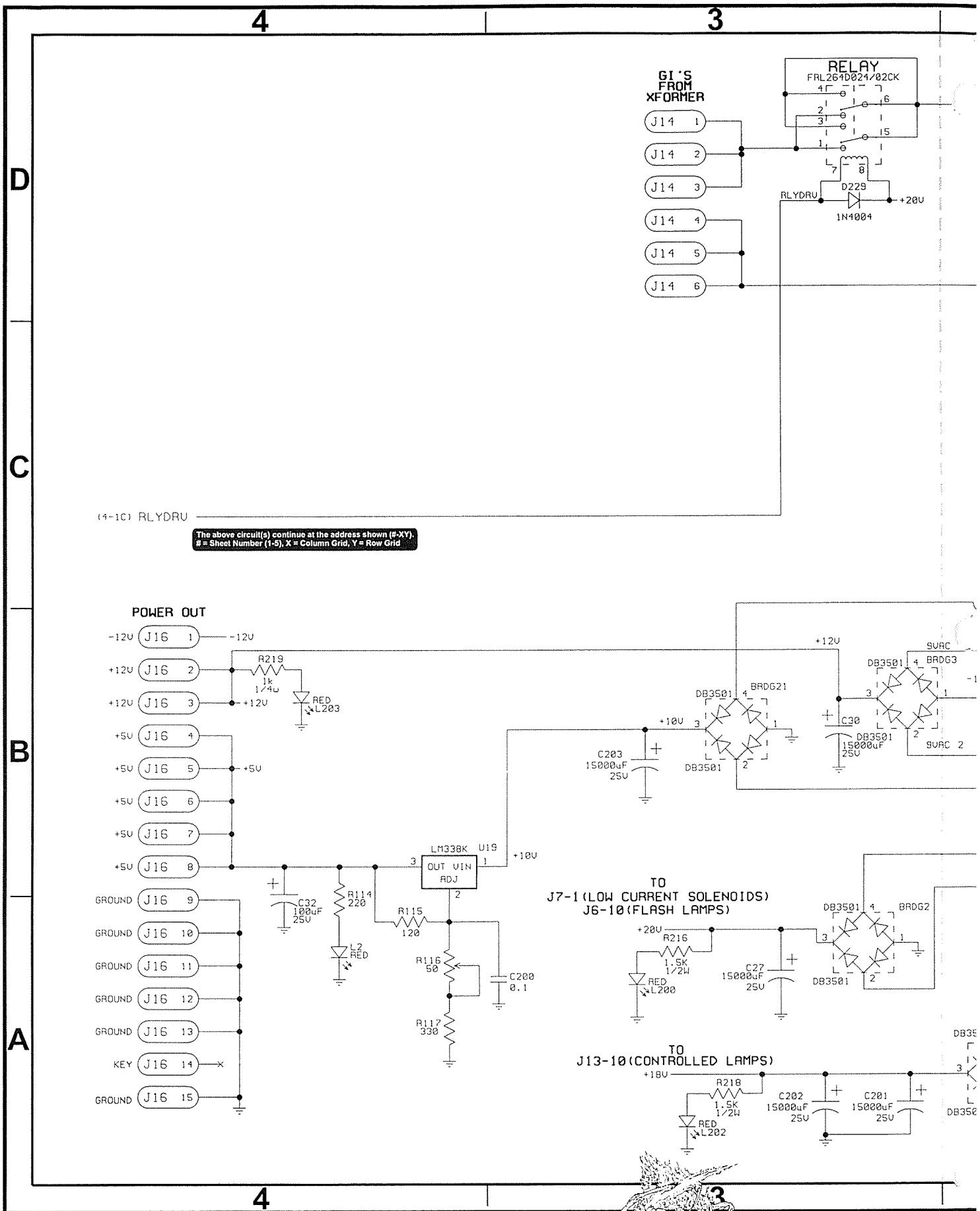
R236
R237
R238
R239
R240
R241
R242
R236-R243 = 39K

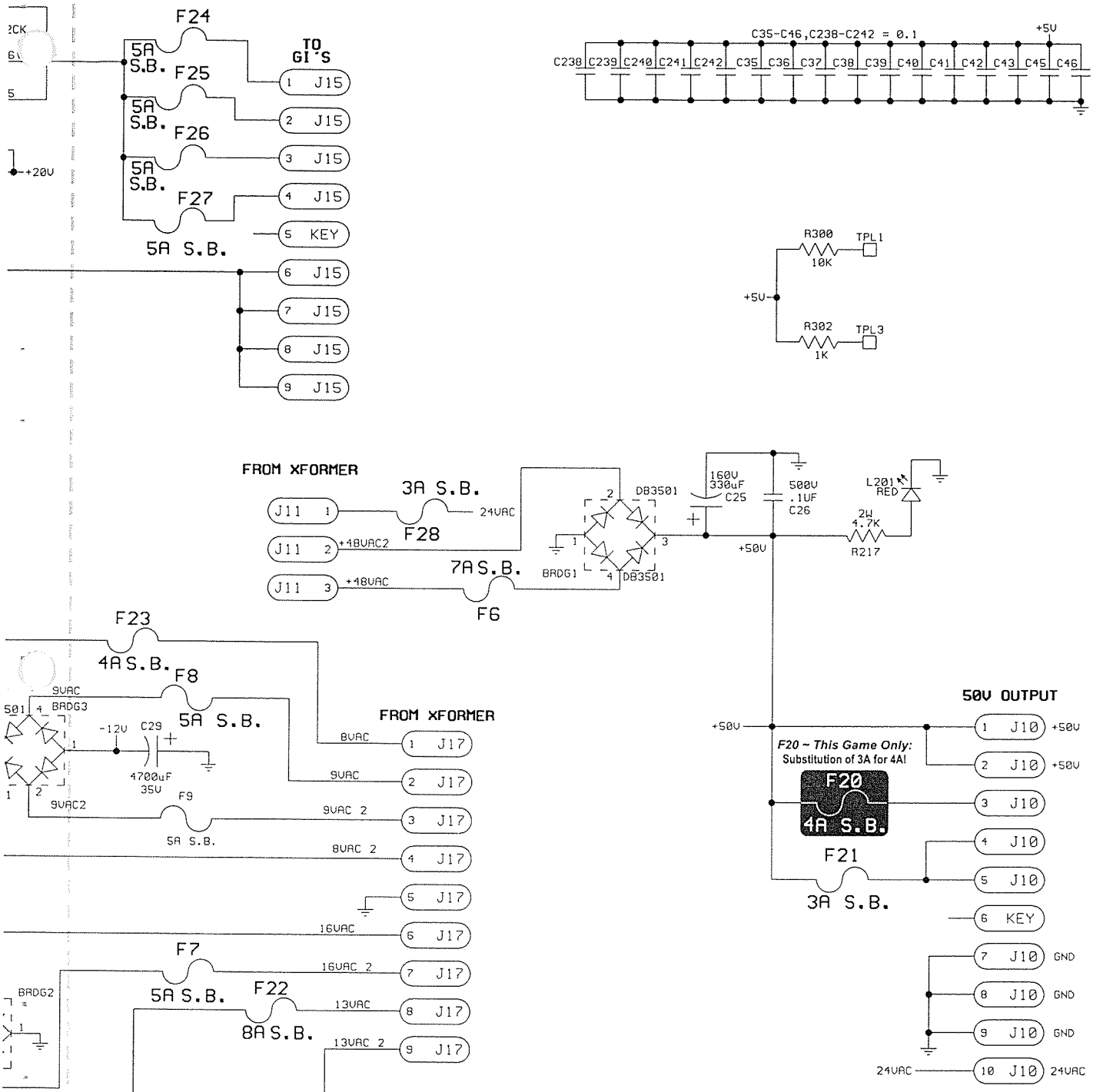
C229 C230 C231 C232 C233 C234 C235
C228-C235 = 470pFd

C243 C244 C245 C246
C243-C246 = 470pFd

Schematic Set	Sheet 4 of 5
SIZE	D
REV.	E

SPI 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
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
LM338K U19
OUT VIN
ADJ
+10V
C32
100uF
25V
R114
220
L2
RED
R115
120
R116
50
R117
330
C200
0.1
C203
15000uF
25V
DB3501 BRDG21
DB3501
C30
15000uF
25V
DB3501 BRDG3
SVAC
SVAC 2
TO
J7-1(LOW CURRENT SOLENOIDS)
J6-10(FLASH LAMPS)
+20V
R216
1.5K
1/2W
RED
L200
C27
15000uF
25V
DB3501 BRDG2
TO
J13-10(CONTROLLED LAMPS)
+18V
R218
1.5K
1/2W
RED
L202
C202
15000uF
25V
C201
15000uF
25V



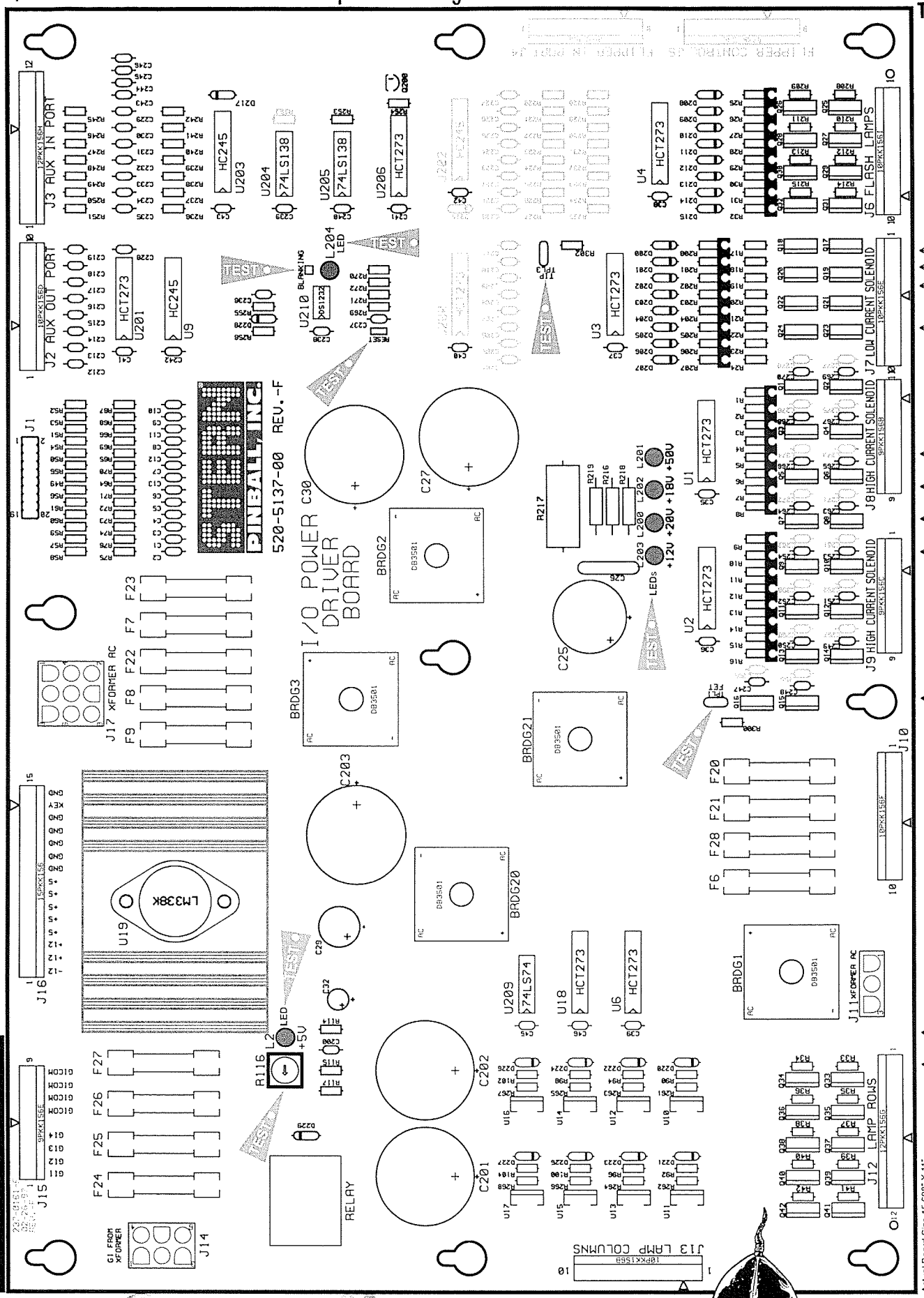
NOTES:
- ALL RESISTOR VALUES ARE IN OHMS (Ω), 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
- ALL CAPACITOR VALUES ARE IN MICROFARADS (μF), UNLESS OTHERWISE SPECIFIED.
- 0.1 MICROFARADS (μF) BYPASS CAPACITOR ON ALL IC'S.

Schematic Set	Sheet 5 of 5
SIZE	D
REV.	E

STERN PINBALL, INC.

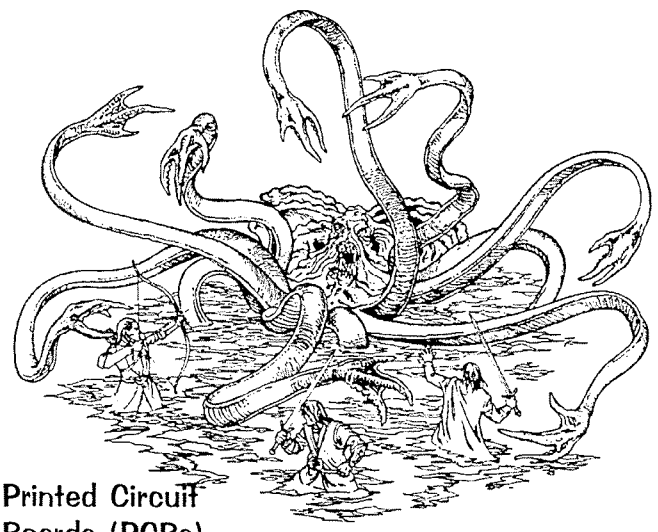
SPI I/O Power Driver Board
SPI Part №: 520-5137-01
Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0161-00 Dated: 09/05/97

I/O Power Driver Board Component Layout



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	2	200-5000-08	F21, F28	3A 250v S.B. Fuse
19	1	200-5000-05	F22	8A 250v S.B. Fuse
20	2	200-5000-06	F20, 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
24	0	n/a	(J4, J5: NS)	
25	1	045-5013-00	J8 (Key Pin-2), J9 (Key Pin-3), J15 (Key Pin-5)	9PKK156
26	1	045-0014-03	J11	10-84-4030 (3-Pin MOLEX)
27	1	045-5015-00	J12 (Key Pin-7)	12PKK156
28	1	045-0014-06	J14	10-84-4060 (6-Pin MOLEX)
29	1	045-5016-00	J16 (Key Pin-14)	15PKK156
30	1	045-0014-09	J17	10-84-4090 (9-Pin MOLEX)
31	6	165-5099-00	L2, L200, L201, L202, L203, L204	LED T1-3/4 DIFFUSER LED
32	16	110-0106-00	Q1>Q16	22NE10L STP, Transistor
33	16	110-0067-00	Q17>Q24, Q25>Q32	TIP122
34	10	110-0088-00	Q33>Q42	19N06L STP, Transistor
35	1	110-0069-00	Q200	2N3904, Transistor.
36	32	121-5042-00	R1>R8, R9>R16, R200>R207, R208>R215	22K Ω 1/4W Res.
37	16	121-5003-00	R17>R24, R25>R32	620 Ω 1/4W Res.
38	17	121-5045-00	R33>R42, R236>R242	39K Ω 1/4W Res.
39	8	121-5021-00	R49, R57>R61, R253, R256, R270 (R252: NS)	4.7K Ω 1/4W Res.
40	11	121-5011-00	R50>R56, R255, R271, R300	10K Ω 1/4W Res.
41	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 (R226>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

CPU/Sound Board II (with ATMEL Processor) Theory of Operation

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:

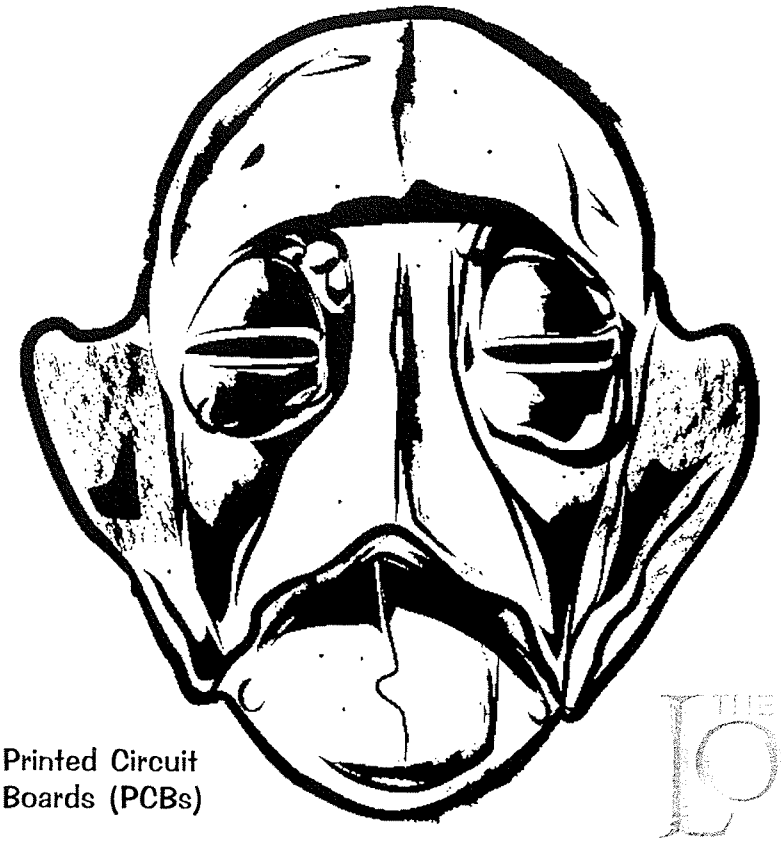
The Switch Matrix consists of eight (8) **2N3904** Transistors(**Q1-Q8**) which pull one of 8 strobes 'low' to *activate* a Single Column of switches. The *Switch Return Signals* are fed into **CN7** [SWITCH ROWS] and are highly filtered and compared to a 2.5v *reference voltage*. The *Switch Return 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:

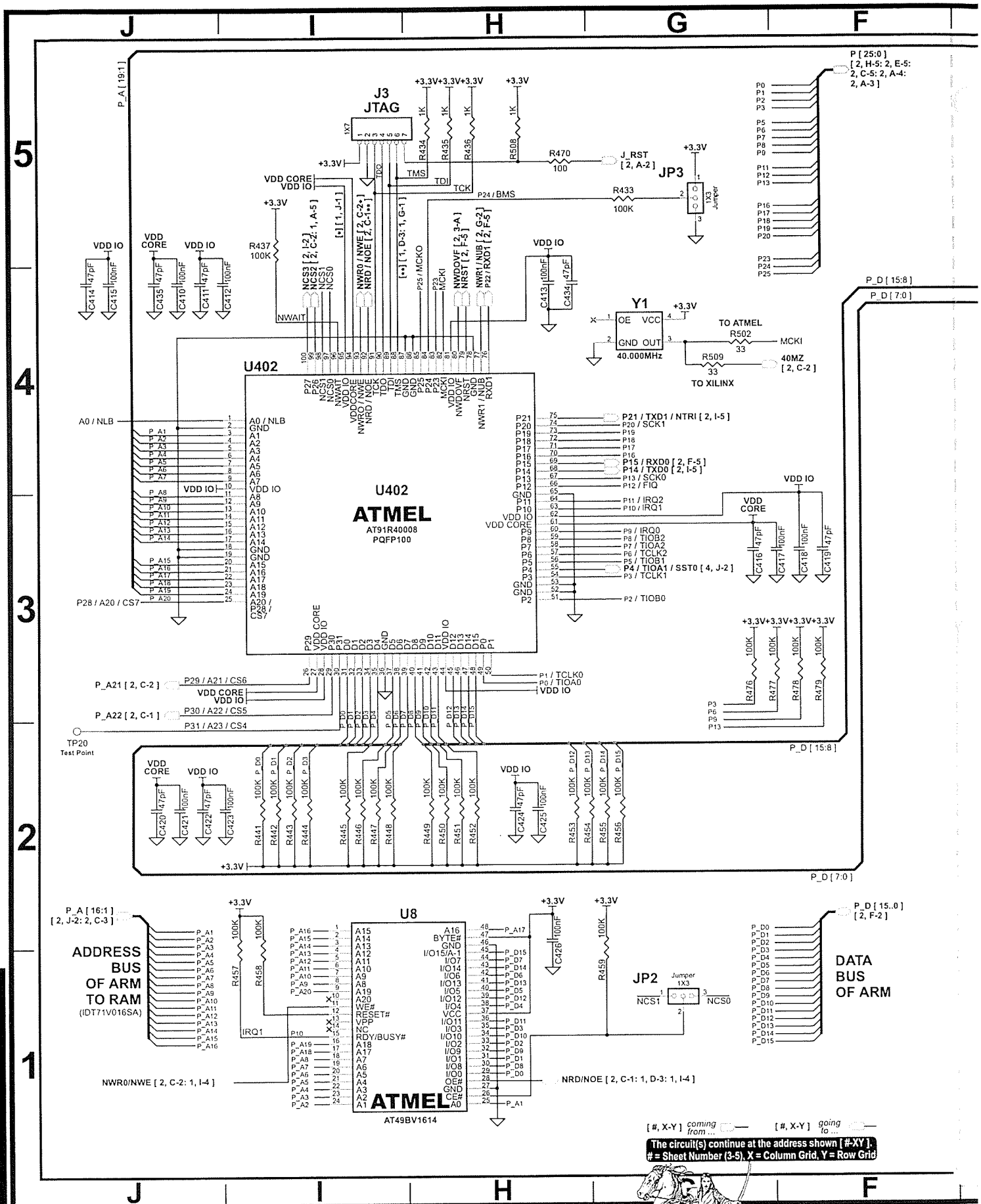
The data path for communication to and from the **Plasma Controller Board** is 8 bits wide. There are separate *Input* and *Output Busses*. Data going out to the controller comes from the **CPU**'s *Data Bus* through **U201** and onto **CN8-Pins 11-18**. Status back from the Plasma Controller comes in 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.

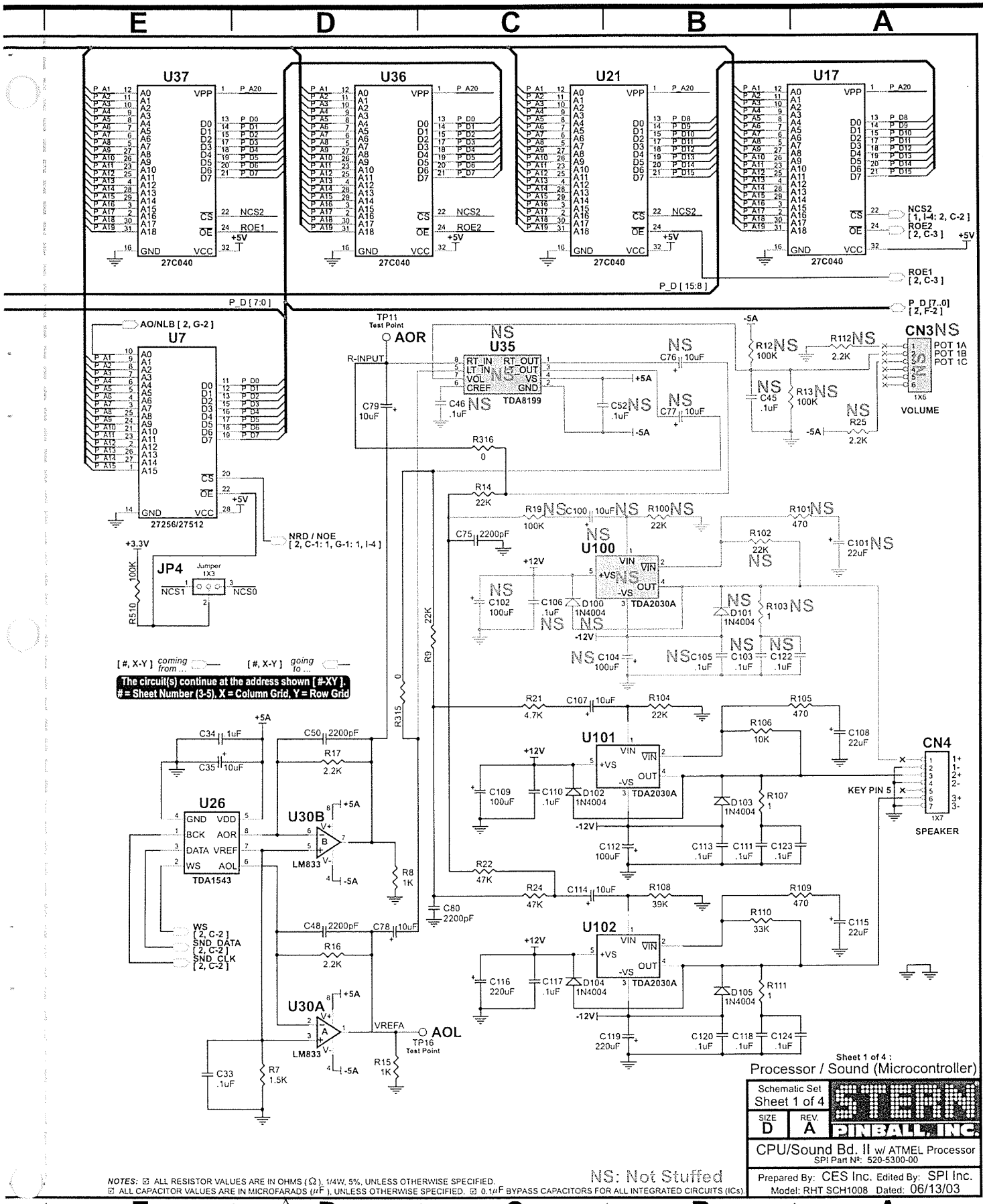
Other Test Points (TP):

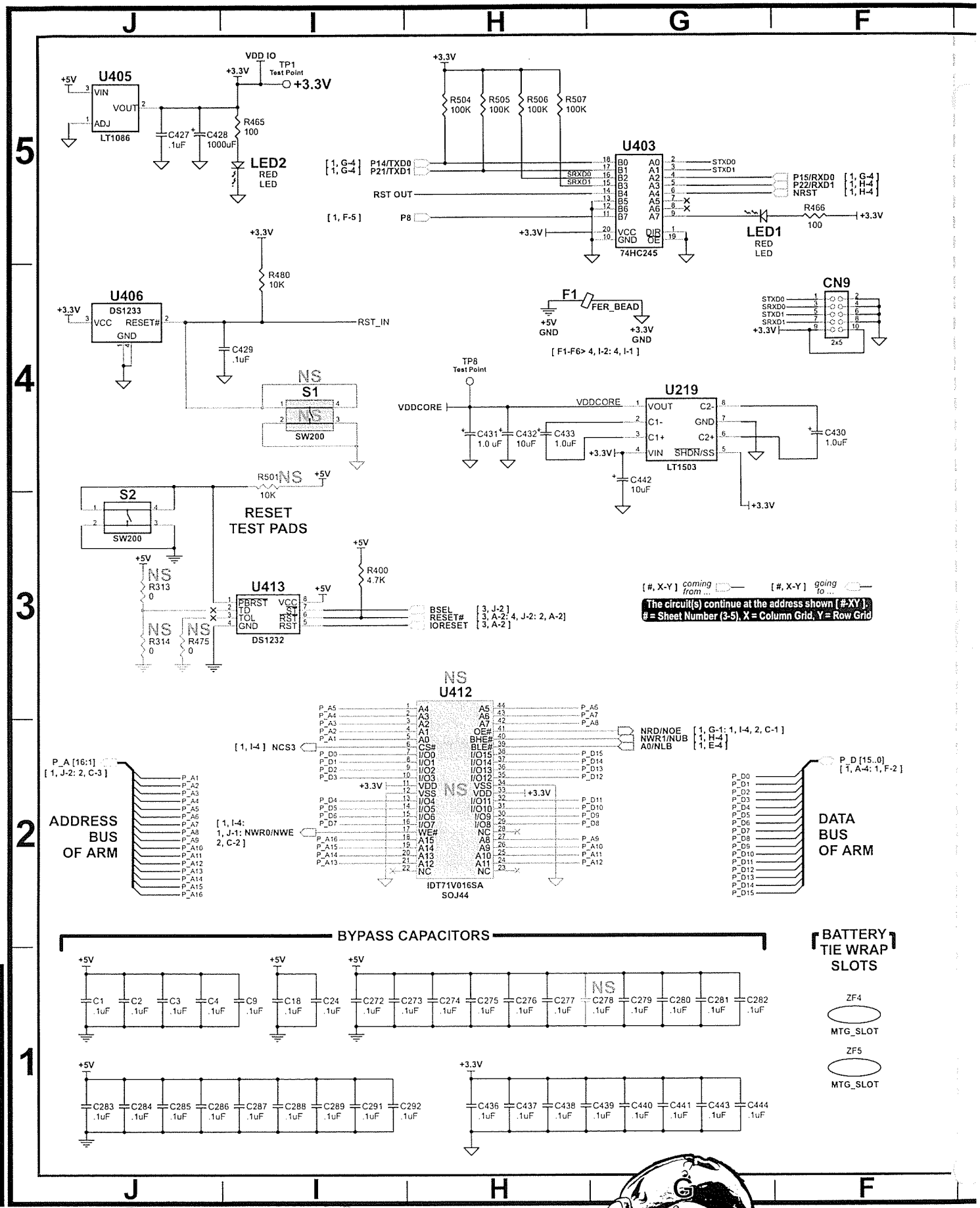
TP 7: E & **TP5: Q** - The **CPU** signals for both **68B09E** processors. Should be at 2Mhz with **Q** leading **E** by ***500 nsec***. **TP2: P0. TP3: P1. TP4: P2. TP20:** *(near U402)*. **TP8:** *(near U219)*. **TP1: +3.3V.**

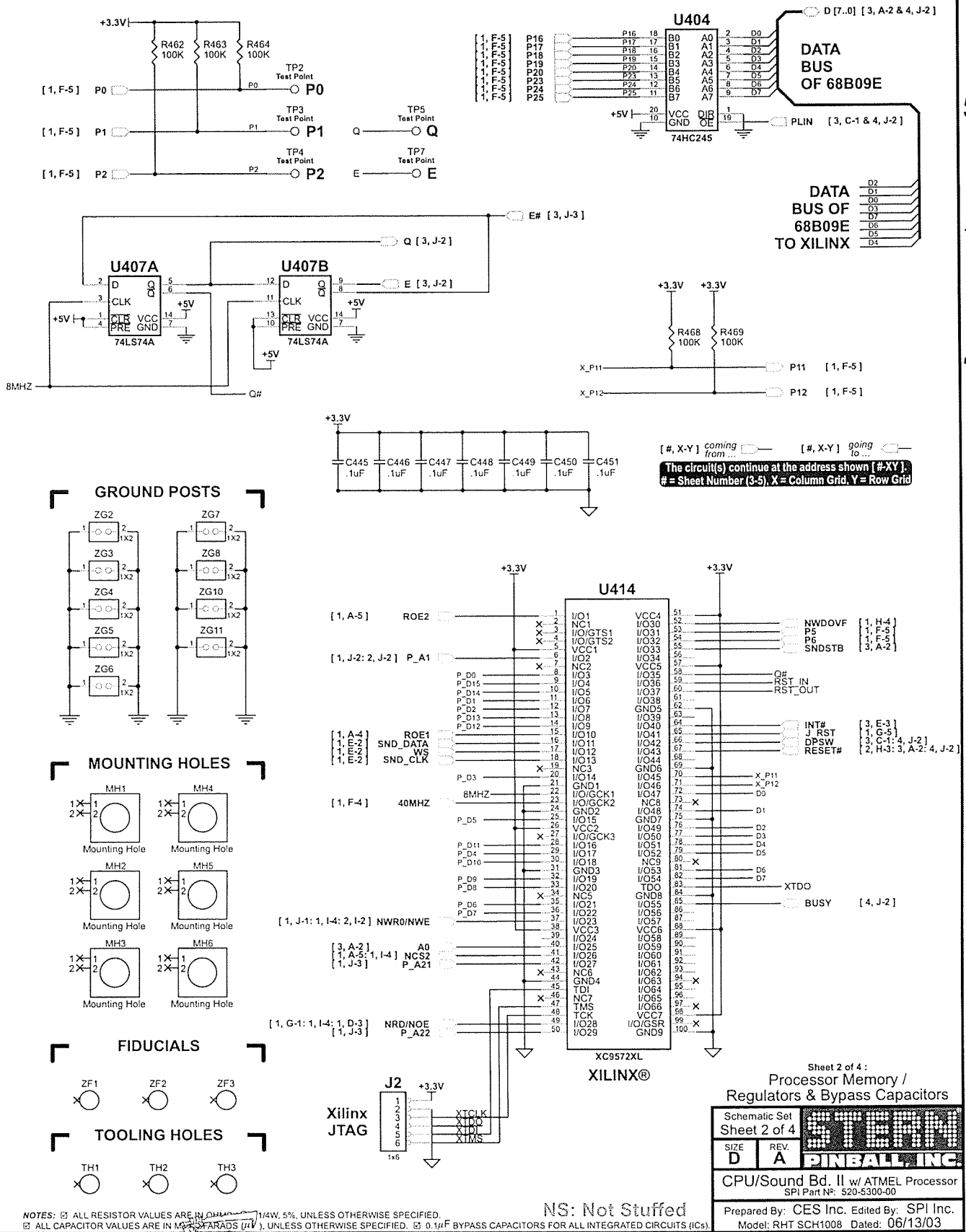


Printed Circuit Boards (PCBs)


J3
JTAG
JP3
JP2
Y1
40.000MHz
U402
ATMEL
AT91R40008
PQFP100
U8
AT49BV1614
ADDRESS BUS OF ARM TO RAM
(IDT71V016SA)
DATA BUS OF ARM
TO ATMEL
TO XILINX
TP20
Test Point
The circuit(s) continue at the address shown [#-XY].
= Sheet Number (3-5), X = Column Grid, Y = Row Grid


E
D
C
B
A
5
4
3
2
1
U37
U36
U21
U17
27C040
P_D [7:0]
P_D [15:8]
ROE1 [2, C-3]
P_D [7..0] [2, F-2]
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
TP11 Test Point
AOR
U35
TDA8199
R-INPUT
CN3
POT 1A
POT 1B
POT 1C
VOLUME
U100
U101
U102
TDA2030A
CN4
KEY PIN 5
SPEAKER
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
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
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).


J
I
H
G
F
5
4
3
2
1
U405
LT1086
VDD IO
TP1
Test Point
+3.3V
R465
100
C427
.1uF
C428
1000uF
LED2
RED
LED
R504
100K
R505
100K
R506
100K
R507
100K
U403
74HC245
P14/TXD0
P21/TXD1
RST OUT
P8
STXD0
STXD1
P15/RXD0
P22/RXD1
NRST
R466
100
LED1
RED
LED
U406
DS1233
RST_IN
R480
10K
C429
.1uF
F1
FER_BEAD
CN9
2x5
S1
SW200
NS
TP8
Test Point
VDDCORE
U219
LT1503
C431
1.0 uF
C432
10uF
C433
1.0uF
C430
1.0uF
C442
10uF
S2
SW200
R501
10K
RESET
TEST PADS
R313
0
R314
0
R475
0
R400
4.7K
U413
DS1232
BSEL
RESET#
IORESET
[#, 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
U412
IDT71V016SA
SOJ44
NRD/NOE
NWR1/NUB
A0/NLB
NCS3
NWR0/NWE
P_A [16:1]
ADDRESS
BUS
OF ARM
P_D [15..0]
DATA
BUS
OF ARM
BYPASS CAPACITORS
BATTERY
TIE WRAP
SLOTS
ZF4
MTG_SLOT
ZF5
MTG_SLOT



NS: Not Stuffed

NOTES: ☑ ALL RESISTOR VALUES ARE IN OHMS, 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 2 of 4 :
Processor Memory / Regulators & Bypass Capacitors

Schematic Set Sheet 2 of 4		
SIZE D	REV. A	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

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
	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, C52, C102, 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.
Capacitors*	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 (C103, 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, C201, C202, C203 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**
	34	3	124-5064-00	R310, R315, R316 (R304, R305, R306, R307, R308 NS)	0Ω Jumper Res. (1-Stripe)
	35	2	121-5041-00	R107, R111 (R106 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 (R28, R418 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.
Resistors / Transistors*	40	36	121-5011-00	R106, R224>R228, R244>R251,R260>R267, R296>R299, R301>R306, R413, R431, R432 (R105, R107, R407 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 (R413, R423 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, R103 NS)	470 Ω 1/4W Res.
	48	16	121-5047-00	R401>R408, R423>R430	560 Ω 1/4W Res.
	49	1		F1	SMT 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 (U201 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)
	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)*	

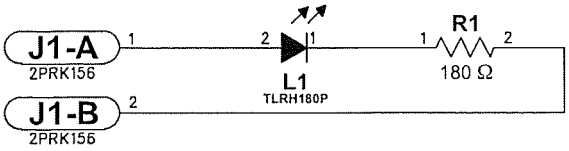
Test Point Wire (24ga.) Loops:
VBATT, GND *(near CN7)*,
GND *(near CN9)*, GND *(near L200)*,
GND_SIGNAL *(near U405)*

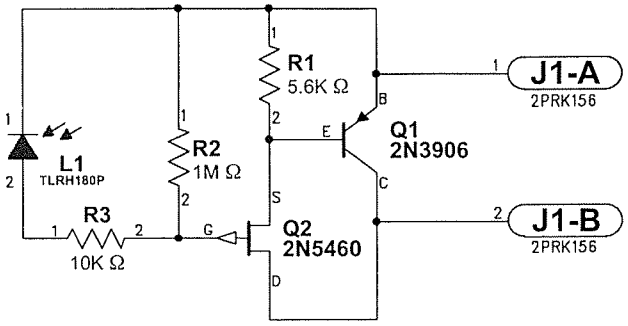
Test Point Pads:
TP1>TP5, TP7, TP8, TP11,
TP12, TP16, TP17, TP20

* *Surface Mounts (SMT) are not listed.*

If a part is required where a part number is not provided, call Tech. Support (see back of cover).

Playfield Switch Single OPTO Transmitter & Receiver Boards Schematic

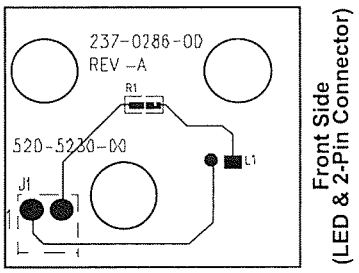




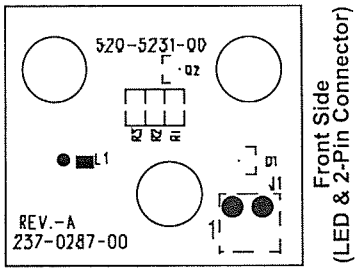
Single OPTO Transmitter
515-7307-00

Single OPTO Receiver
515-7308-00

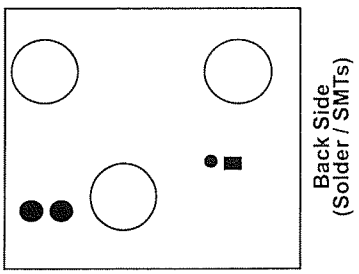
Playfield Switch Single OPTO Trans. & Rec. Boards Component Layout & Parts

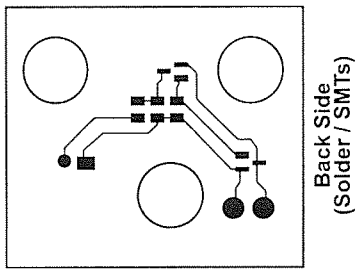


515-7307-00 (TRANS)

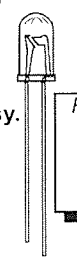


515-7308-00 (REC)



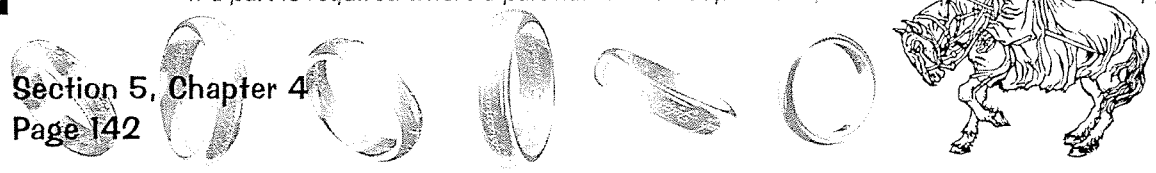


ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
A	1	**515-7307-00**	**Single OPTO Trans. Bd. Assy.**	**PCB Assy.** (with all **Items 1-5**)
—	1	**520-5230-00**	**Single OPTO Trans. Board**	**PCB Assy.** (with Items **1-3** only)
01	1	045-5111-02	J1	2X, .156" Rt. Angle (26-60-5020) Conn.
02	1	165-5052-00	L1	LED TLRH180P (Ultra Bright Red)
03	1	121-5067-00	R1	SMT 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	**515-7308-00**	**Single OPTO Rec. Bd. Assy.**	**PCB Assy.** (with all **Items 1-9**)
—	1	**520-5231-00**	**Single OPTO Rec. Board**	**PCB Assy.** (with **Items 1-7** only)
01	1	045-5111-02	J1	2X, .156" Rt. Angle (26-60-5030) Conn.
02	1	165-5052-00	L1	LED TLRH180P (Ultra Bright Red)
03	1	110-5006-00	Q1	2N3906, Transistor (P-FET SOT-23)
04	1	110-0086-00	Q2	2N5460, Transistor
05	1		R1	SMT 5.6K Ω 1/8W Chip Res. (CRCW)
06	1		R2	SMT 1M Ω 1/8W Chip Res. (CRCW)
07	1	121-5011-00	R3	SMT 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

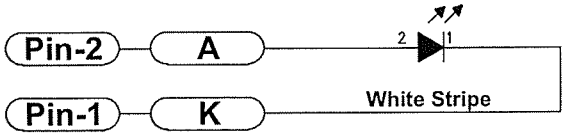


Replacement Part:
LED TLRH180P
(T1-3/4 GaAlAs)
SPI Part №:
165-5052-00

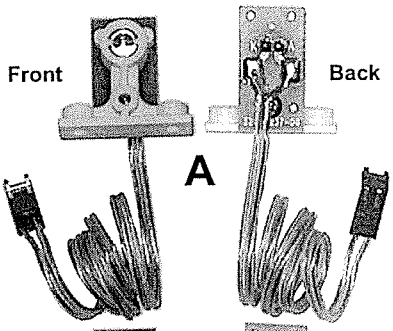
If a part is required where a part number is not provided, call Tech. Support (see back of cover).

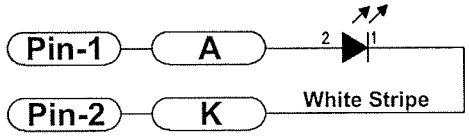


Back Panel Switch Mini OPTO Transmitter & Receiver Boards Schematic, Component Layout & Parts

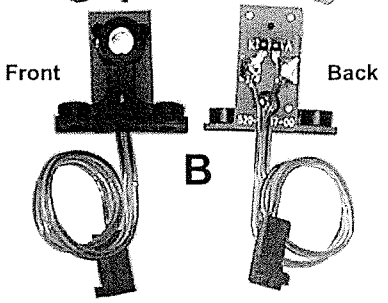


Mini PCB OPTO 12" Lead (White Bracket) 500-6746-00



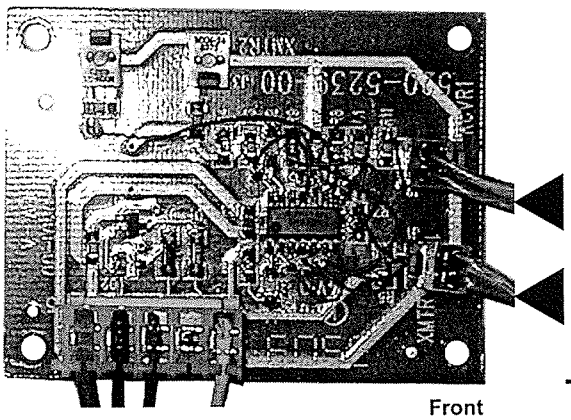


Mini PCB OPTO 6" Lead (Black Bracket) 500-6747-00



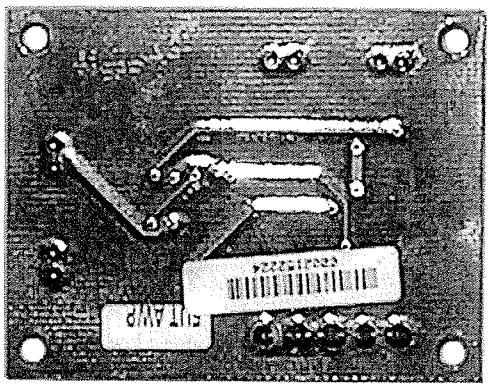
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
A	1	**500-6746-00**	**MINI PCB OPTO ASM WHT / 12" LEAD**	**PCB Assy.** (with all **Items 1-5**)
—	1	520-5237-00	**Mini OPTO Trans. or Rec. Board**	**PCB Only Plain**
01	1	545-6092-01		White Bracket (Plastic) Holder
02	1	237-5909-00		#4-40 X 1/4 PPH Screw
03	1	**165-5052-00**		**LED (Ultra Bright Red)**
04	1	601-5023-12	K, A	12" Speaker Wire (1-Side White Stripe)
05	1	045-5020-02	*Note White Strip to Pin-1*	2-Pin Cn., .100 KK Cmp Trm Molex 08-50-0
B	1	**500-6747-00**	**MINI PCB OPTO ASM BLK / 6" LEAD**	**PCB Assy.** (with all **Items 1-5**)
—	1	520-5237-00	**Mini OPTO Trans. or Rec. Board**	**PCB Only Plain**
01	1	045-6092-00		Black Bracket (Plastic) Holder
02	1	237-5909-00		#4-40 X 1/4 PPH Screw
03	1	**165-5052-00**		**LED (Ultra Bright Red)**
04	1	601-5023-06	K, A	6" Speaker Wire (1-Side White Stripe)
05	1	045-5020-02	*Note White Strip to Pin-2*	2-Pin Cn., .100 KK Cmp Trm Molex 08-50-0

Back Panel OPTO Transmitter / Receiver Amplifier Board Component Layout



Front

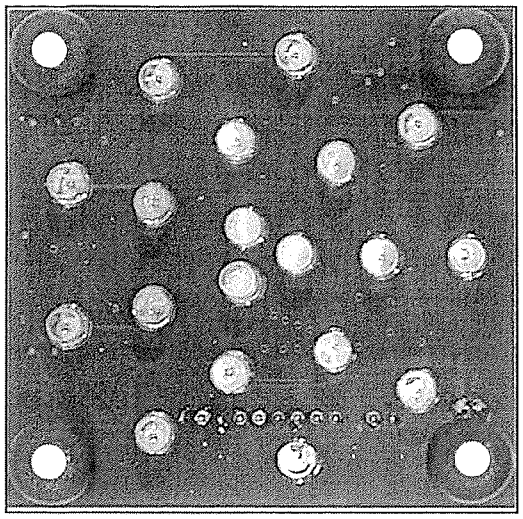
OPTO Transmitter / Receiver Amplifier PCB 520-5239-00



Back

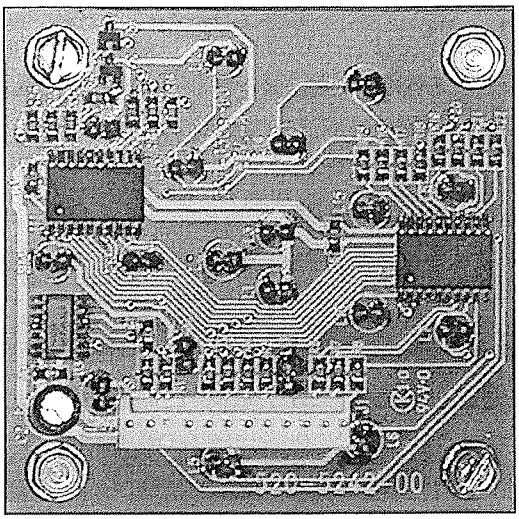
ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5239-00	OPTO Transmitter/Receiver Amplifier Board	Complete PCB Assembly

Playfield 19-LED PC Board Component Layout



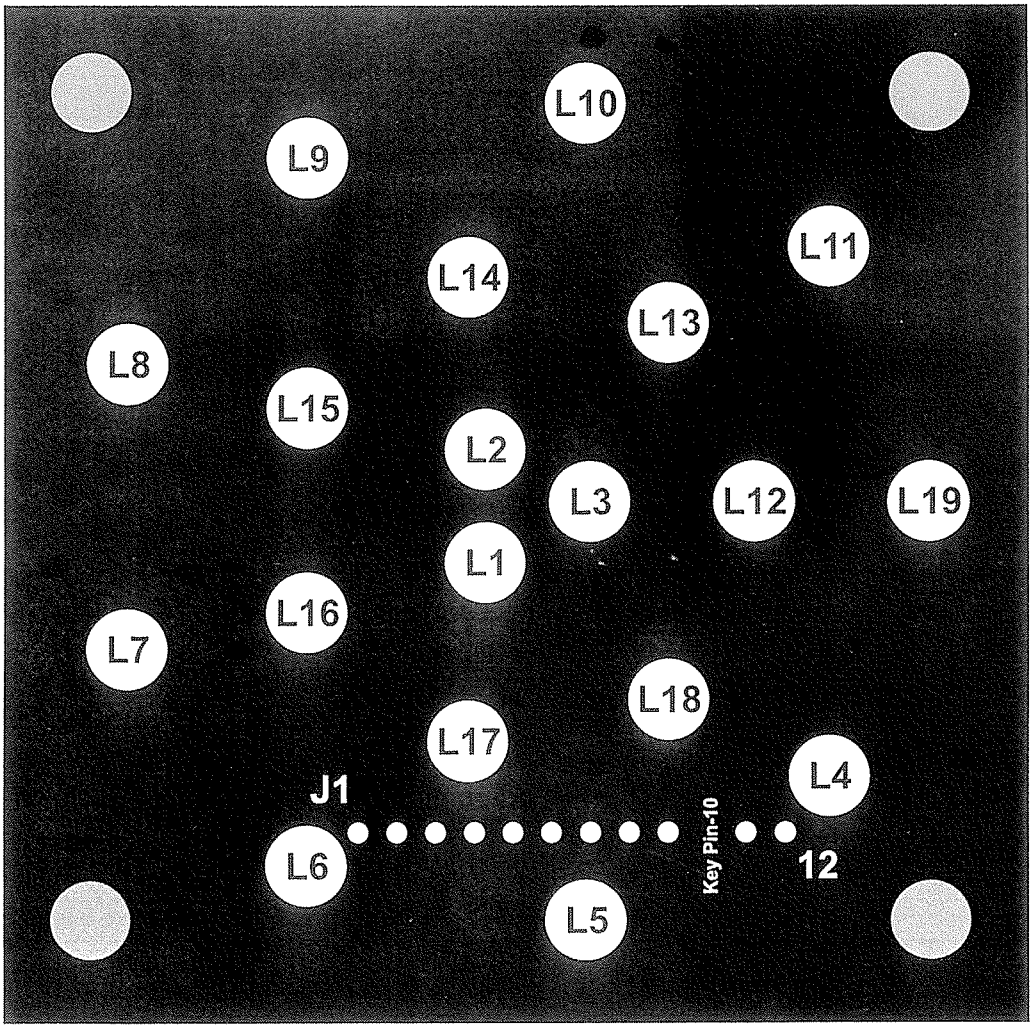
Front

19-LED PCB
520-5242-00



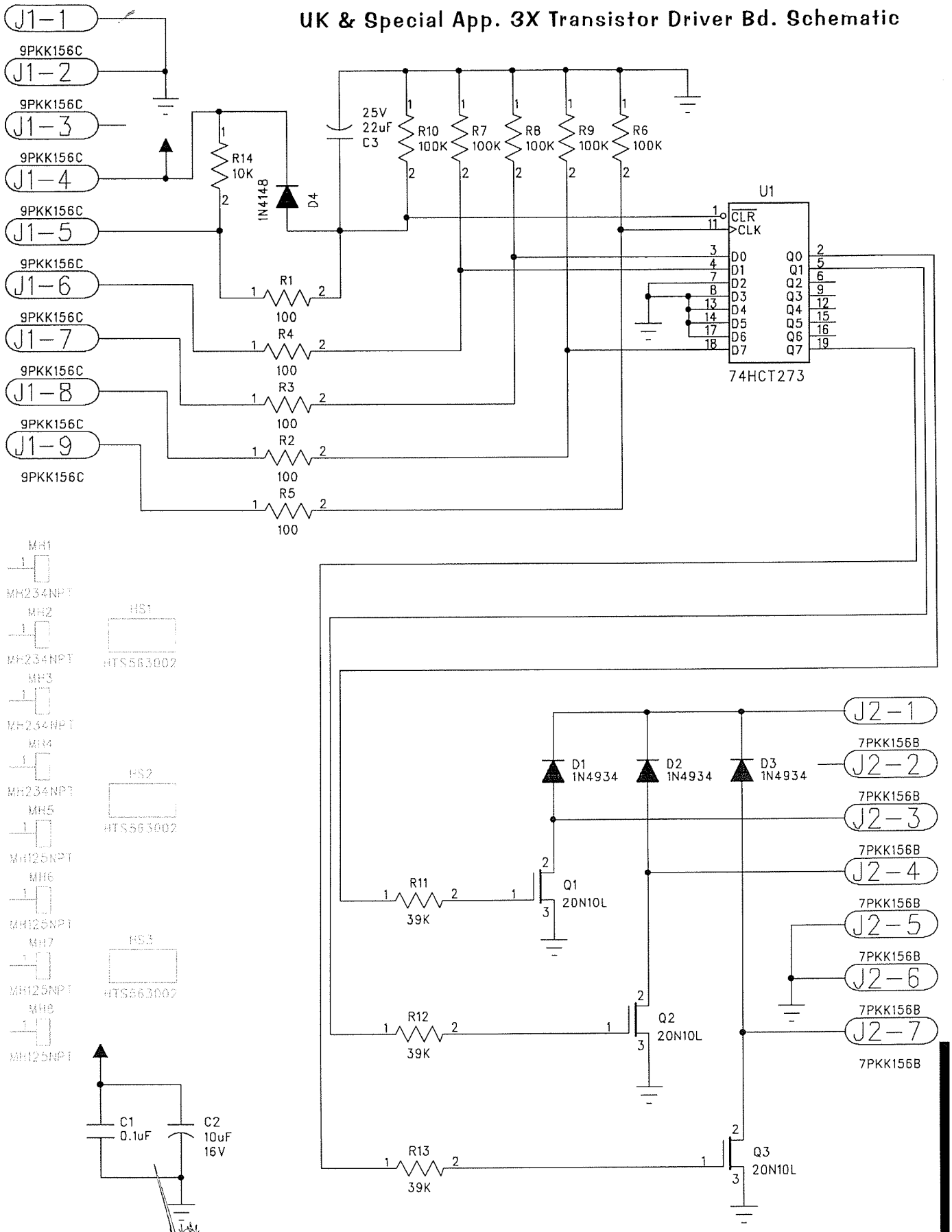
Back

Front

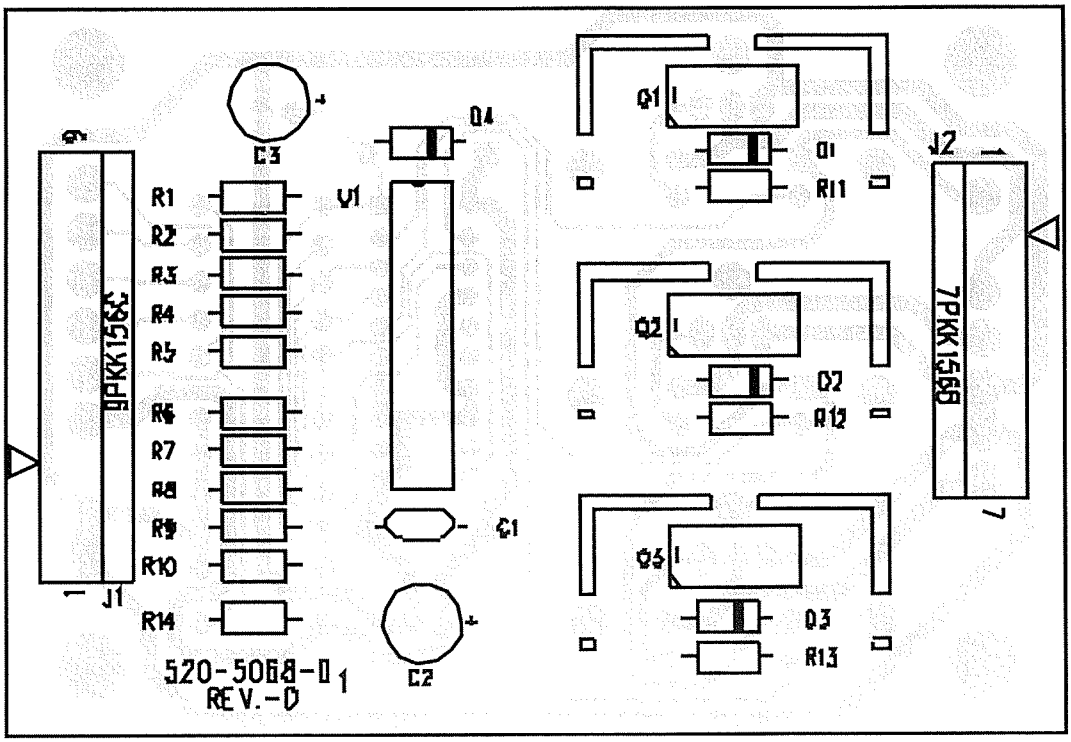


ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5242-00	Playfield 19-LED PC Board	Complete PCB Assembly

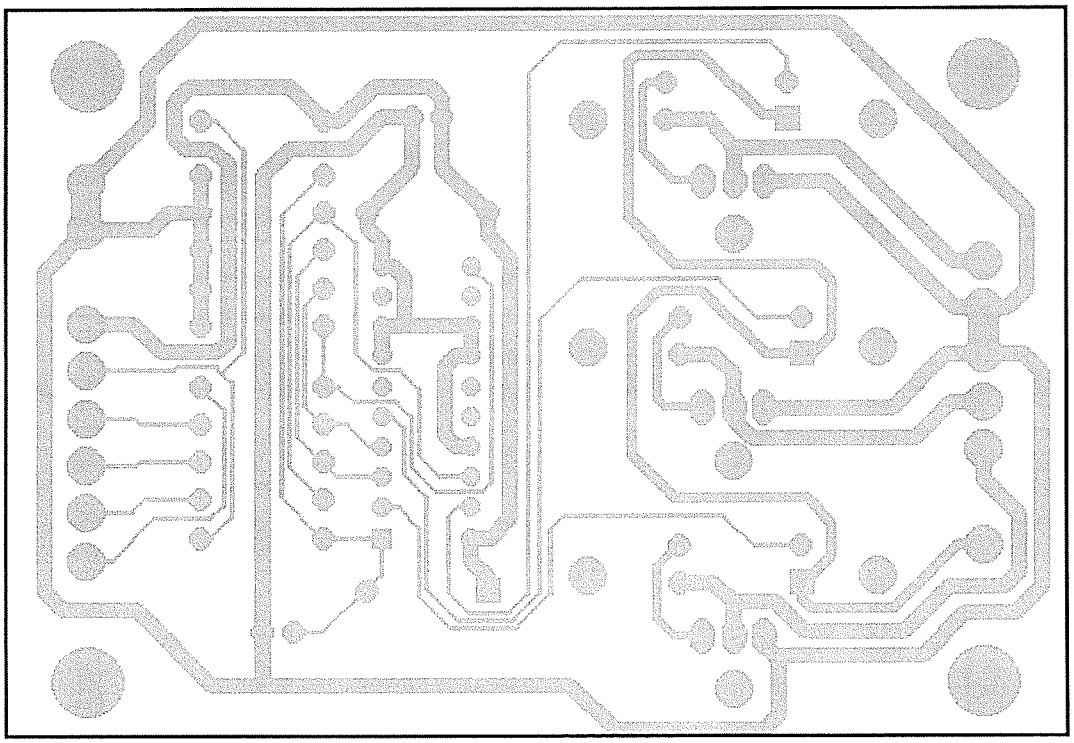
UK & Special App. 3X Transistor Driver Bd. Schematic



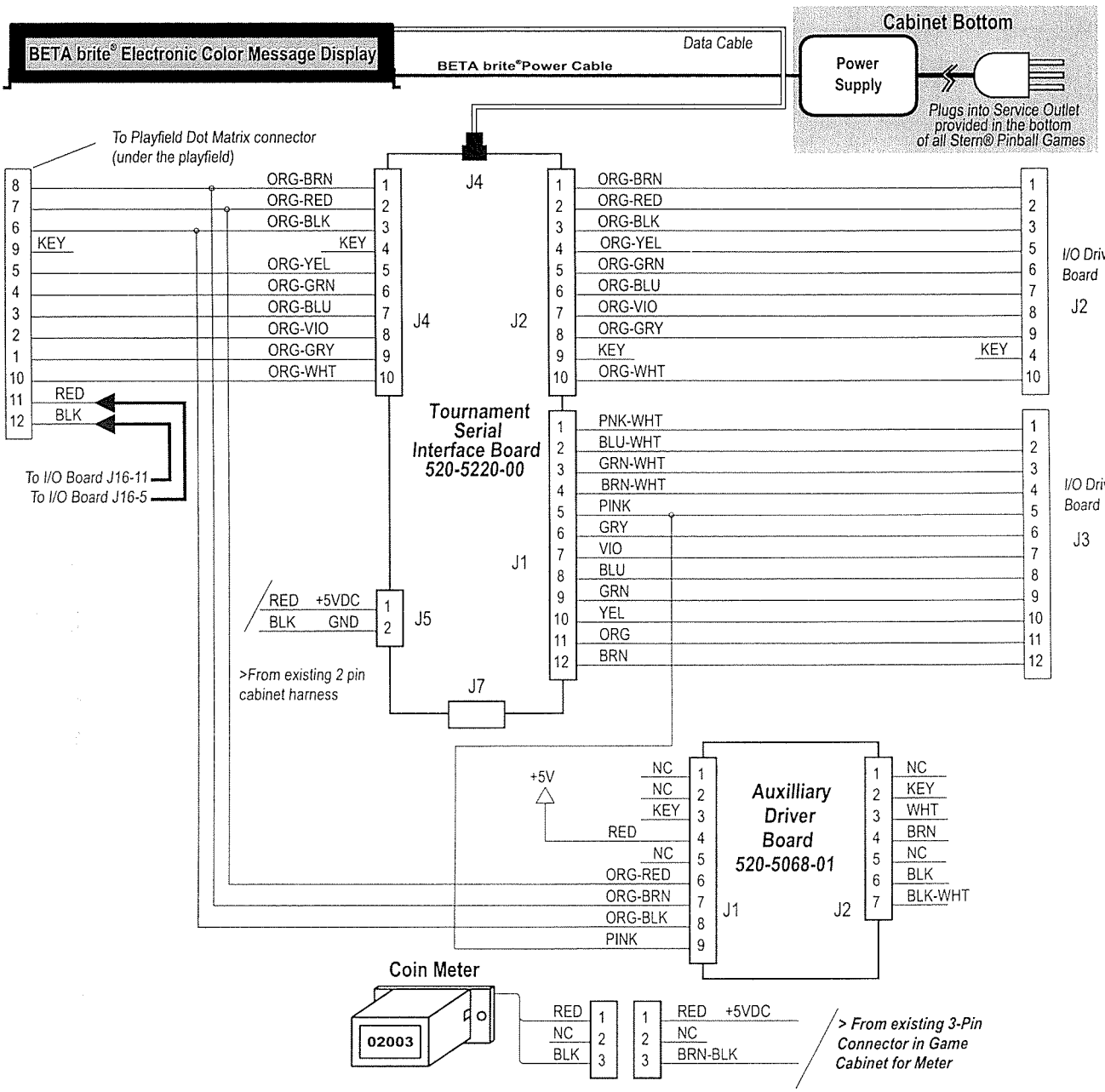
UK & Special App. 3X Transistor Driver Bd. Component Layout (Sol. Exp. Bd.)



Note: Board Shown Enlarged for better detail.

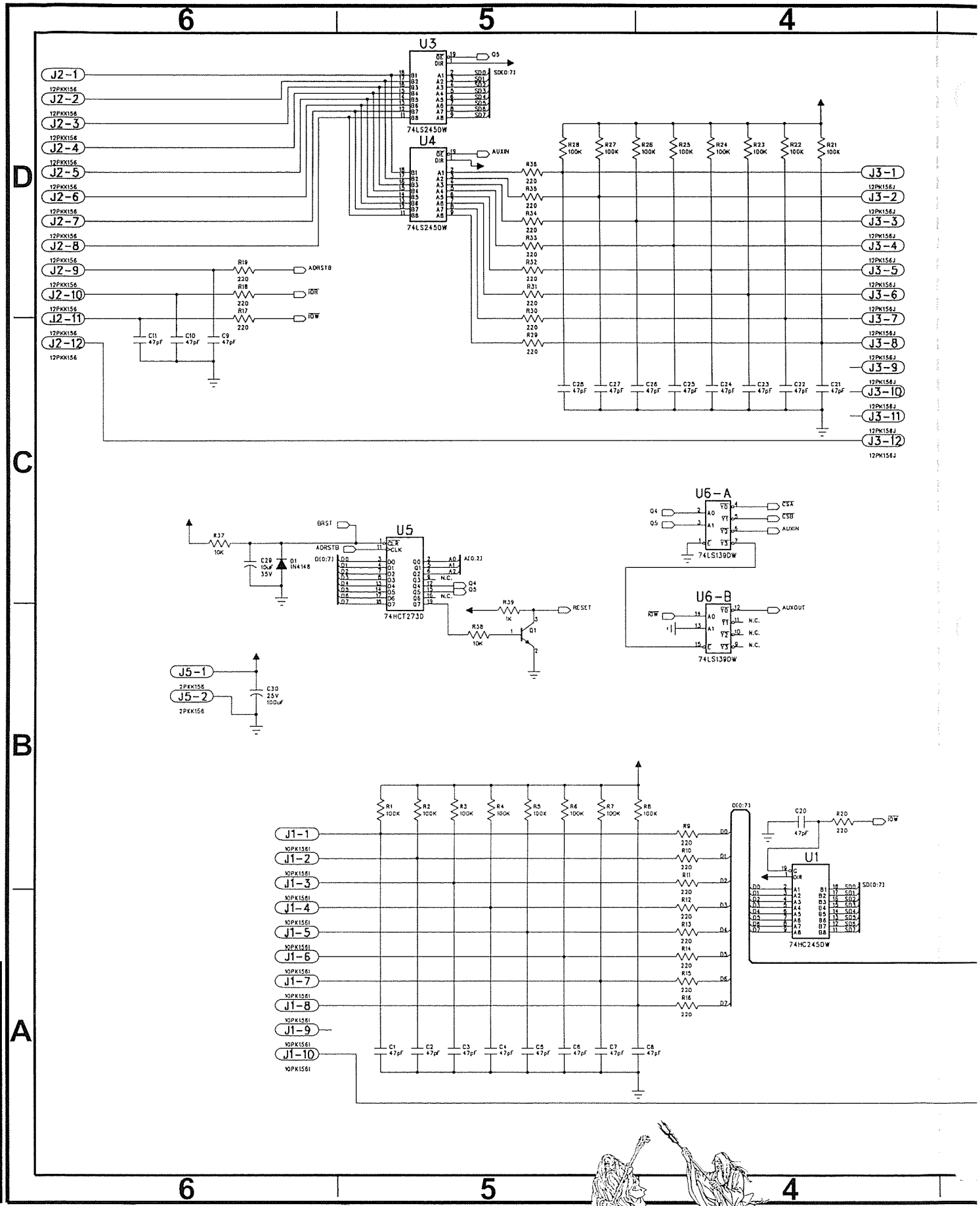


ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
—	1	520-5068-01	Solenoid Expander (x3 Transistor) PC Board	Complete PCB Assembly



Order the Optional ToPS™ (Tournament Pinball System) Kit!
Call Technical Support at 1-800-542-5377 for more information

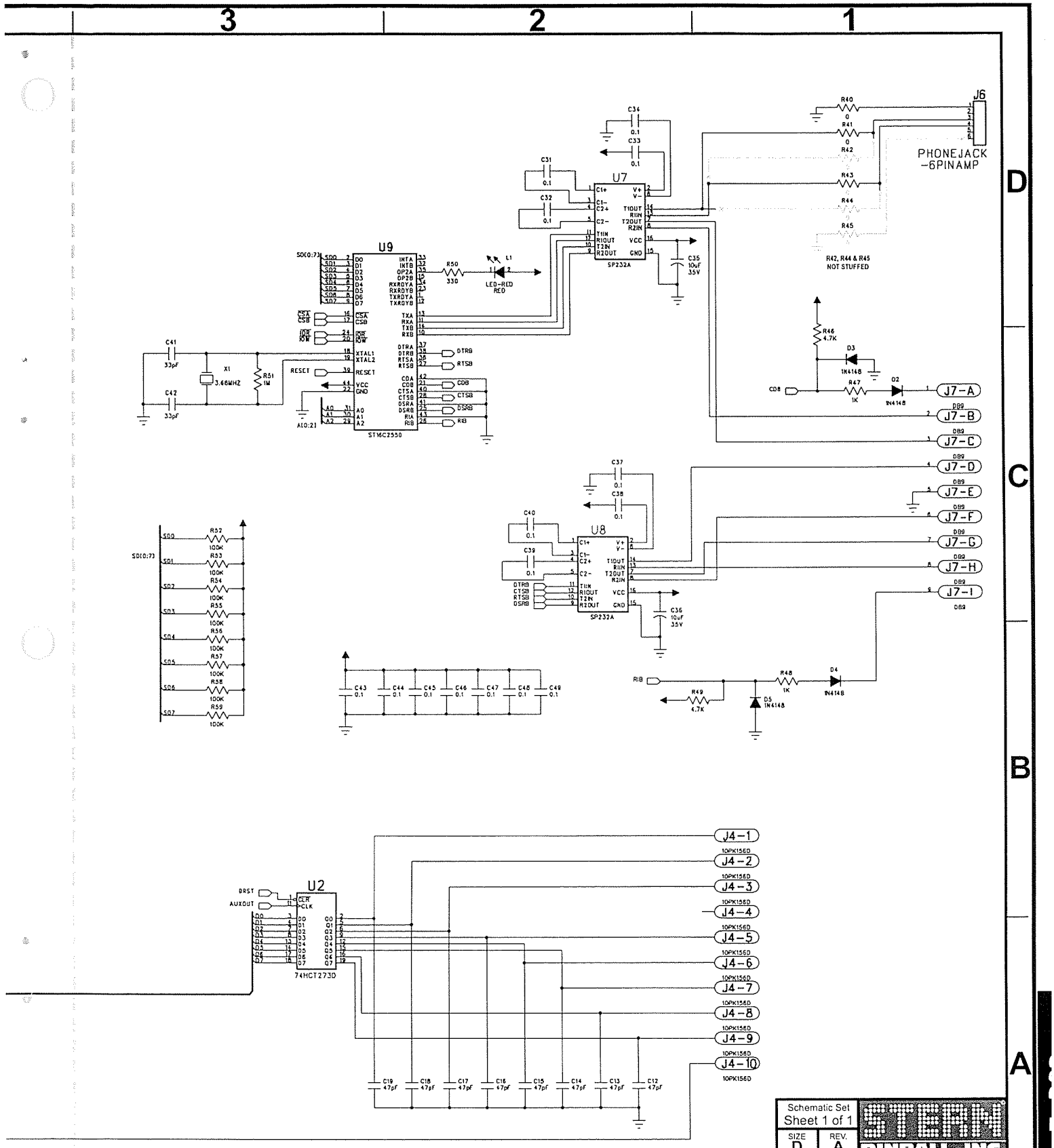
Tournament Serial Interface Board Schematic (Sheet 1 of 1)



Sec. 5: PCBs

Section 5, Chapter 4
Page 148

Printed Circuit
Boards (PCBs)



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

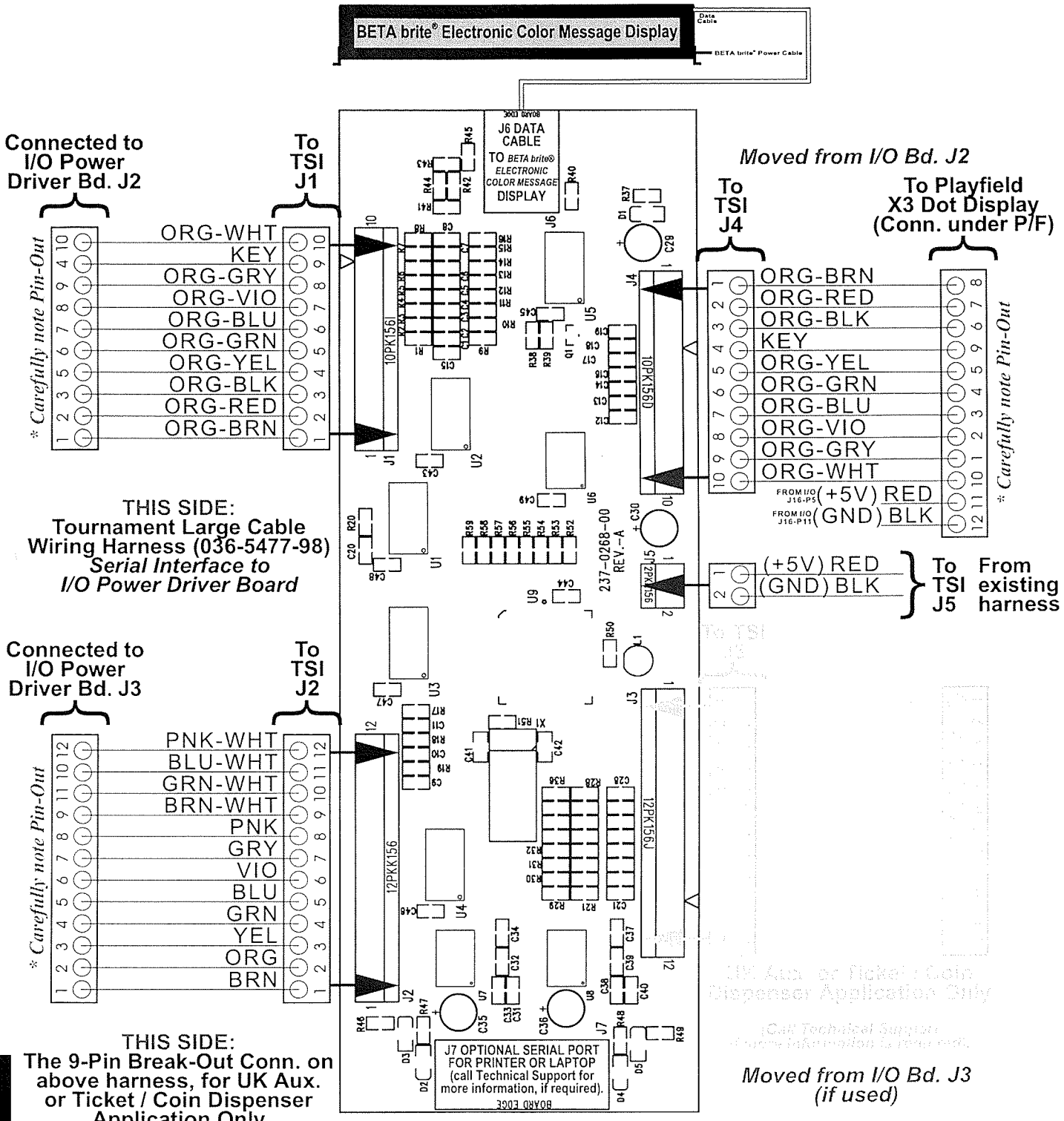
Schematic Set	Sheet 1 of 1
SIZE	D
REV.	A

PINBALL INC.

SPI Tournament Serial Interface Bd.
SPI Part Nº: 520-5220-00

Prepared By: CES Inc. Edited By: SPI Inc.
Model: 237-0268-00 Dated: 08/2002

Tournament Serial Interface Board Component Layout



ITEM	QTY	PART NUMBER	REF-DESIGNATOR	DESCRIPTION
--	1	520-5220-00	Tournament Serial Interface (TSI) Board	PCB Assembly

GLOSSARY OF TERMS

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

AC (Acronym) **A**lternating **C**urrent.

Adj. (Abbreviation) Adjustment(s).

Assy. (Abbreviation) Assembly.

Au. (Abbreviation) Audit(s).

Bd. (Abbreviation) Board.

BOT (Abbreviation) Bottom.

Brkt. (Abbreviation) Bracket.

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

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

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

Conn. (Abbreviation) Connector.

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

CN (Abbreviation) Connector (e.g. **CN**5-P3).

CT (Abbreviation) Center.

DC (Abbreviation) Direct Current.

DT (Abbreviation) Drop Target(s).

DOTS (Acronym) **D**iode **O**n **T**erminal **S**trip.

EB (Abbreviation) Extra Ball.

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

EPROM (Acronym) **E**rasable **P**rogrammable **R**ead **O**nly **M**emory. Can be erased using UV Light and re-programmed.

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

EOS (Acronym) **E**nd-**O**f-**S**troke (i.e. Switch for flipper).

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

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

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

HWH (Abbreviation) Hex Washer Head.

IC (Acronym) **I**ntegrated **C**ircuit (As in after 24-Pin IC).

ID or I.D. (Acronym) **I**nside **D**imension.

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

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

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

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

LED (Acronym) **L**ight **E**mitting **D**iode.

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

Lwr. (Abbreviation) Lower.

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

MB (Abbreviation) Magnet Board.

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

MID (Abbreviation) Middle

Non-Reflexive See Reflexive.

No. or Nº or # (Abbreviation) Number

NPF (Acronym) **N**o **P**roblem **F**ound.

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

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

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

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

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

PCB (Acronym) **P**rinted **C**ircuit **B**oard

P/F (Abbreviation) Playfield.

PIA LED (Acronym) **P**eripheral **I**nterface **A**dapter **L**ight **E**mitting **D**iode.. This is a diagnostic LED on the CPU; it should not be lit during normal operation of a pinball game.

Plumb Bob Tilt Weight on Tilt Assembly.

PPH (Abbreviation) Phillips Pan Head.

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

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

PREV (Abbreviation) Previous.

PSB (Abbreviation) Power Supply Board

RAM (Acronym) **R**andom **A**ccess **M**emory. RAM **can** store input instructions and supply output information.

Reflexive/Non-Reflexive **Reflexive**—Solenoid Drive Transistor is enabled directly by a switch closure on the (Relating to CPU Boards) solenoid assembly (Ver. 1/2).
Non-Reflexive—Solenoid Drive Transistor is enabled by the CPU after reading a switch closure in the Switch Matrix (Ver. 3). Also note: All CPU Boards are backwards compatible (e.g. Jurassic Park/Ver. 3 to Time Machine/ Ver. 2). Swapping a Ver. 2 Board to a Ver. 3 is not possible due to the special solenoids section (i.e. Slingshots, Turbo Bumpers, etc.) changing from ***REFLEXIVE*** to ***NON-REFLEXIVE*** on Ver. 3 Boards.

Relay An automatic switch operated by current in a coil.

ROM (Acronym) **R**ead **O**nly **M**emory. ROM **cannot** store input instructions but can supply output information. ROM can be programmed only once.

RMA (Abbreviation) Return Merchandise Authorization Number

RT, Rt. or R. (Abbreviation) Right; ("**R**" at the end of Target Assy. Part Nº signifies Target Insert is **R**eversed.)

RO (Abbreviation) Rollover (switches).

Saucer See Eject.

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

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

SMB (Abbreviation) Shaker Motor Board.

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

SSFB (Abbreviation) Solid State Flipper Board.

STEP Refers to the service switches on the coin door.

Sub-Assy. (Abbreviation) Sub-Assembly.

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

TM (Abbreviation) Trademark

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

Tri-Ball Three balls in play.

TTL (Abbreviation) Transistor-Transistor Logic

Upr. (Abbreviation) Upper.

V or v (Abbreviation) Volt(s).

Ver. (Abbreviation) Version.

VUK (Acronym) **V**ertical **U**p-**K**icker (Super or Standard).

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

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

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

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

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

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THE LORD OF THE RINGS

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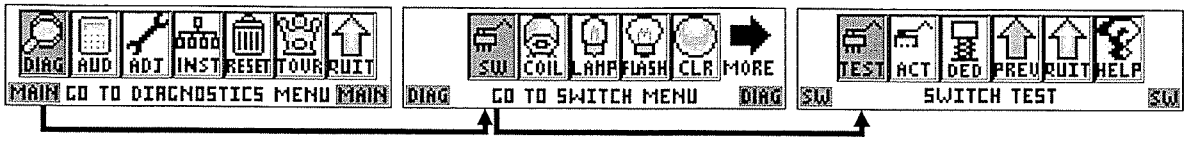


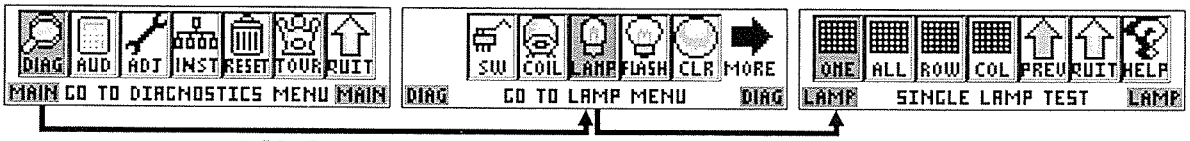
In SWITCH MENU also select:

ACTIVE and DEDICATED SWITCH TESTS

SWITCH MATRIX GRID & DEDICATED SWITCHES (for notes & locations, see Page DR. 4 or 17)

Column (Drive) / Row (Return)	1: Q1 GRN-BRN CN5-P1	2: Q2 GRN-RED CN5-P3	3: Q3 GRN-ORG CN5-P4	4: Q4 GRN-YEL CN5-P5	5: Q5 GRN-BLK CN5-P6	6: Q6 GRN-BLU CN5-P7	7: Q7 GRN-VIO CN5-P8	8: Q8 GRN-GRY CN5-P9
1: U400 WHT-BRN CN7-P9	1 Cabinet Side: LT BUTTON (UK ONLY) 180-5160-00	9 Below P/F: LEFT VUK (2 BOTS) 180-5116-01	17 Above P/F: SWORD LOCK HIGH 180-5119-02	25 Above P/F: RIGHT RAMP ENTER (2 BOTS) 180-5010-01	33 Mini-P/F: MINI PF U.L. 180-5057-00	41 Below P/F: TOP VUK *See Sw. 41 Note*	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: STANDUP 515-6027-08	18 Above P/F: SWORD LOCK MID 180-5119-02	26 NOT USED	34 Mini-P/F: MINI PF U.R. 180-5057-00	42 Above P/F: INNER LOOP 180-5190-28	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: 4-BALL TROUGH #1 (LEFT) 180-5119-02	19 Above P/F: SWORD LOCK LOW 180-5119-02	27 NOT USED	35 Mini-P/F: MINI PF L.L. 180-5057-00	43 Below P/F: LEFT TOP LANE 500-6227-02	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: 4-BALL TROUGH #2 180-5119-02	20 Below P/F: RIGHT ORBIT LOW 500-6227-02	28 Above P/F: BALROG HIT 180-5119-00	36 Mini-P/F: MINI PF L.R. 180-5057-00	44 Below P/F: MIDDLE TOP LANE 500-6227-02	52 Above P/F: SPINNER 180-5190-28	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: 4-BALL TROUGH #3 180-5119-02	21 Below P/F: RIGHT ORBIT HI 180-5190-28	29 Below P/F: PALANTIR 515-5162-08	37 Below P/F: LEFT ORBIT LOW 500-6227-02	45 Below P/F: RIGHT TOP LANE 500-6227-02	53 Below P/F: SPOT RING 515-5162-08	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: 4-BALL TROUGH VUK OPTO *See Sw. 14 Note*	22 Above P/F: RAIL RAMP EXIT 180-5010-01	30 Below P/F: RIGHT VUK (2 BOTS) 180-5116-01	38 Below P/F: LEFT ORBIT HI 500-6227-02	46 Below P/F: TOP SAUCER 180-5186-00	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: 4-BALL STACKING OPTO *See Sw. 15 Note*	23 Above P/F: RIGHT RAMP TARGET 515-6027-08	31 Below P/F: BALROG OPEN 180-5119-02	39 Below P/F: LEFT RAMP ENTER 500-6227-02	47 Back Panel: RING MADE *See Sw. 47 Note*	55 In Cabinet: TOURNAMENT START 180-5174-00	63 NOT USED
8: U401 WHT-GRY CN7-P1	8 Cabinet Side: RT BUTTON (UK ONLY) 180-5160-00	16 Below P/F: SHOOTER LANE 180-5157-00	24 Above P/F: RIGHT RAMP MADE 180-5010-01	32 Below P/F: BALROG CLOSED 180-5119-02	40 Above P/F: LEFT RAMP MADE 180-5010-01	48 Back Panel: BACK TROUGH 180-5057-00	56 In Cabinet: PLUMB BOB TILT *See Sw. 56 Note*	64 NOT USED

GROUND IC U206 INPUTS	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



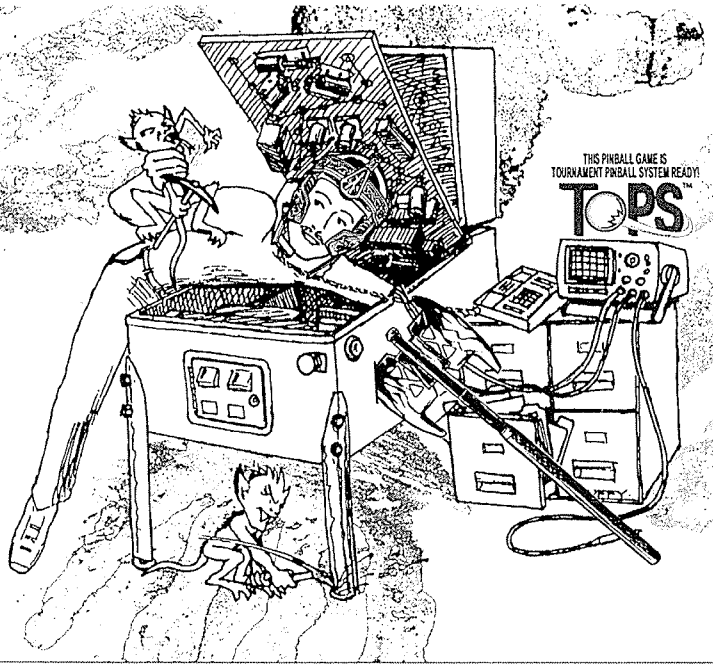
In LAMP MENU also select:

TEST ALL LAMPS, ROW & COLUMN LAMP TESTS

LAMP MATRIX GRID (for notes & locations, see Page DR. 5 or 23)

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: (K) EEP	2 #555 Bulb: K (E) EP	3 #555 Bulb: KE (E) P	4 #555 Bulb: KEE (P)	4 #555 Bulb: THE FELLOWSHIP OF THE RING	6 #555 Bulb: THE TWO TOWERS	7 #555 Bulb: THE RETURN OF THE KING	8 #555 Bulb: SHOOT AGAIN
2: Q34 RED-BLK J12-P2	9 #555 Bulb: PIPPIN	10 #555 Bulb: MERRY	11 #555 Bulb: SAM	12 #555 Bulb: ARAGORN	13 #555 Bulb: FRODO	14 #555 Bulb: GANDALF	15 #555 Bulb: LEGOLES	16 #555 Bulb: GIMLI
3: Q35 RED-ORG J12-P3	17 #555 Bulb: BOROMIR	18 #555 Bulb: MYSTERY	19 #555 Bulb: FRODO ARROW	20 #44 Bulb: DESTROY RING	21 #555 Bulb: MODE START	22 #555 Bulb: PALANTIR	23 #44 Bulb: PALANTIR GLOBE	24 #555 Bulb: SPOT RING
4: Q36 RED-YEL J12-P4	25 #555 Bulb: PIPPIN ARROW	26 #555 Bulb: GIFT OF THE ELVES	27 #555 Bulb: LIGHT EXTRA BALL	28 #555 Bulb: RING MULTIBALL	29 #555 Bulb: BIG POINTS	30 #555 Bulb: LIGHT SPECIAL	31 #555 Bulb: SUPER RING FRENZY	32 #555 Bulb: 2X SCORING
5: Q37 RED-GRN J12-P5	33 #555 Bulb: LEGOLES ARROW	34 #555 Bulb: L RAMP MAN RING	35 #555 Bulb: L RAMP DWARF RING	36 #555 Bulb: L RAMP ELF RING	37 #555 Bulb: GANDALF ARROW	38 #555 Bulb: C LOOP MAN RING	39 #555 Bulb: C LOOP DWARF RING	40 #555 Bulb: C LOOP ELF RING
6: Q38 RED-BLU J12-P6	41 #555 Bulb: GIMLI ARROW	42 #555 Bulb: EXTRA BALL	43 #555 Bulb: GOLLUM MULTIBALL	44 #555 Bulb: SPECIAL	45 #555 Bulb: MERRY ARROW	46 #555 Bulb: R ORBIT MAN RING	47 #555 Bulb: R ORBIT DWARF RING	48 #555 Bulb: R ORBIT ELF RING
7: Q39 RED-VIO J12-P8	49 #555 Bulb: ARAGORN ARROW	50 #555 Bulb: R RAMP MAN RING	51 #555 Bulb: R RAMP DWARF RING	52 #555 Bulb: R RAMP ELF RING	53 #555 Bulb: LOCK	54 #555 Bulb: LANES	55 #555 Bulb: TOWER	56 #555 Bulb: FLIPPER
8: Q40 RED-GRY J12-P9	57 #555 Bulb: (O) RC	58 #555 Bulb: O (R) C	59 #555 Bulb: OR (C)	60 #555 Red Bulb: POTD U.L.	61 #555 Red Bulb: POTD U.R.	62 #555 Red Bulb: POTD L.L.	63 #555 Red Bulb: POTD L.R.	64 #44 Bulb: SHOOTER LANE #1 BOT
9: Q41 RED-WHT J12-P10	65 #44 Bulb: SHOOTER LANE #2	66 #44 Bulb: SHOOTER LANE #3	67 #44 Bulb: SHOOTER LANE #4	68 #44 Bulb: SHOOTER LANE #5	69 #44 Bulb: SHOOTER LANE #6	70 #44 Bulb: SHOOTER LANE #7	71 #44 Bulb: SHOOTER LANE #8	72 #44 Bulb: SHOOTER LANE #9 TOP
10: Q42 RED J12-P11	73 #44 Bulb: ESCAPE THE RINGWRAITHS	74 #44 Bulb: GANDALF VS SARUMAN	75 #44 Bulb: WARG ATTACK	76 #44 Bulb: WAR OF THE ENTS	77 #44 Bulb: BATTLE WITH SHELOB	78 #44 Bulb: DESTROY THE WITCH-KING	79 #555 Bulb: TOURNAMENT BUTTON	80 #555 Bulb: START BUTTON

▼ 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"

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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).

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