

SEGA™
PINBALL, INC.

MARY SHELLEY'S FRANKENSTEIN



Joe Blackwell
Technical Support Manager

Eric Winston
Technical Support Engineer

Ted Kilpin
Technical Support Engineer

Jay Alfer
Tech. Documentation Admin.

Sega Pinball, Inc.
Copyright © 1994, All Rights Reserved.

780-5036-00

MARY SHELLEY'S FRANKENSTEIN™ ©1994 TriStar Pictures, Inc. All Rights Reserved.

CPU JUMPER TABLE

Game	CPU* Ver.	ROM Position	Jumpers		Game	CPU* Ver.	ROM Position	Jumpers	
			Installed	Removed				Installed	Removed
01. Laser War	1	5C	J4 J6a J7a	J5 J6 J7b	14. Star Trek	3	5C	J5	J4
02. Secret Service	2	5B, 5C	J4	J5	15. Hook	3	5C	J5	J4
03. Torpedo Alley	2	5B, 5C	J4	J5	16. Lethal Weapon 3	3	5C	J5	J4
04. Time Machine	2	5B, 5C	J4	J5	17. Star Wars	3	5C	J5	J4
05. Playboy	2	5B, 5C	J4	J5	18. Rocky & Bullwinkle & Friends	3	5C	J5	J4
06. ABC Monday Night Football	2	5B, 5C	J4	J5	19. Jurassic Park	3	5C	J5	J4
07. Robocop	2	5B, 5C	J4	J5	20. Last Action Hero	3	5C	J5	J4
08. Phantom of the Opera	2	5B, 5C	J4	J5	21. Tales from the Crypt	3	5C	J5	J4
09. Back to the Future	3	5B, 5C	J4	J5	22. The Who's Tommy	3	5C	J5	J4
10. The Simpsons	3	5B, 5C	J4	J5	23. WWF Royal Rumble	3	5C	J5	J4
11. Checkpoint	3	5B, 5C	J4	J5	24. Guns N' Roses	3	5C	J5	J4
12. Teenage Mutant Ninja Turtles	3	5B, 5C	J4	J5	25. Maverick	3	5C	J5	J4
13. Batman	3	5B, 5C	J4	J5	26. Mary Shelley's Frankenstein	3	5C	J5	J4

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

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

Bd. Combinations w/ ROM at Loc. 5B, 5C (Games 2-13, Ver2/3) Installed J1b, J3, J4, J5b, J6b, J7b & J8 Removed J1a, J2, J5, J5a, J6a & J7a

Bd. Combinations with ROM at Loc. 5C (Games 14-25, Ver3) Installed J1b, J3, J5, J5b, J6b, J7b & J8 Removed J1a, J2, J4, J5a, J6a & J7a

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

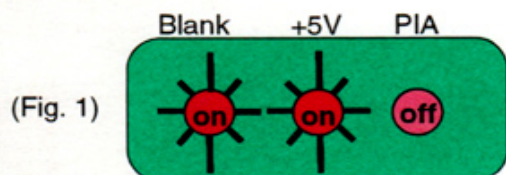
Board Compatibility (Reflexive & Non-Reflexive) of CPU Boards

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

Power-Up CPU Self Tests

Upon power-up, the CPU Board performs a series of self tests of major components. Turn the game on while observing the LEDs on the CPU Board. Tests of the PIAs, RAM, and EPROMs are performed automatically and results of the tests are indicated by the PIA LED.

With all tests passed, the LEDs illuminate in the following sequence at power turn-on. The PIA and +5v LEDs illuminate immediately. Approximately ½-second later, the PIA LED goes out and the Blanking LED illuminates; the +5v and Blanking LEDs remain illuminated until the game is turned off. Test failures are indicated with the PIA LED:



Normal Operation

PIA LED	SUSPECT COMPONENT
Stays On	One of the 6821 PIAs
Flashes 1 Time	6264 RAM at location D5
Flashes 2 Times	EPROM at location C5

DISPLAY READS "OPEN THE DOOR" -- This indicates a faulty memory condition in RAM. Opening the Coin Door will initiate a Factory Restore, by opening the Memory Protect Switch. Check battery voltage at CMOS RAM with power off.

QUICK REFERENCE FUSE CHART

PPB BOARD		POWER SUPPLY BOARD	
F1	5A Slo-Blo G.I. 6.3vAC	F1	7A Slo-Blo +5vDC Regulator Input (9vAC)
F2	5A Slo-Blo G.I. 6.3vAC	F2	7A Slo-Blo +5vDC Regulator Input (9vAC)
F3	5A Slo-Blo G.I. 6.3vAC	F3	Not Used
F4	5A Slo-Blo G.I. 6.3vAC	F4	8A Slo-Blo Switched Illumination Buss (18vDC)
F5	5A Slo-Blo Flipper Power & 50v coils	F5	4A Slo-Blo Solenoid (32vDC)...
F6	5A Slo-Blo Flash Lamps (32vDC) Right		Bumpers, Slingshots, etc.
F7	3A Slo-Blo Flipper Power & 32v coils Left	F6	5A Slo-Blo Solenoid Buss (32vDC)
F8	4A Slo-Blo 50v coils		
F9	5A Slo-Blo 50v coils		

MARY SHELLEY'S
FRANKENSTEIN
Table of Contents

GAME SPECIFICATIONS	1
Power Requirements	1
PROM Summary	1
Transportation	1
Overall Dimensions	1
Game Assembly Procedures	2
Leg Leveler Adjustment & Easy Access Service System	3
Backbox Layout, Fuse & Relay Locations	4
GAME OPERATION & FEATURES	5
Standard Features	5
Extra Ball (EB) Buyin Feature	5
Manual Percentaging	5
Playfield Overview and Game Rules	5
AUDIT FUNCTIONS	13
General	13
Audits - 'Quick Look' Functions (Au. 1 - Au. 12)	13
Audit Table (Au. 1 - Au. 67)	14
Audits - Expanded Generic Functions (Au. 13 - Au. 46)	15
Audits - Expanded Game Specific Functions (Au. 47 - Au. 67)	16
GAME ADJUSTMENTS	19
General	19
Replay and Generic Features	19
Adjustments - Replays (Adj. 1 - 6)	19
Game Adjustment Table (Adj. 1 - 60, 99)	20
Game Difficulty Adjustment (Adj. 7)	21
Novelty / 5-Ball / Add-A-Ball Settings	21
Tournament Mode Settings (Adj. 43)	21
Game Pricing Adjustment (Adj. 8)	22
Custom Pricing Table	22
Standard Pricing Table	23
Additional Generic Features (9-47, 55, 57-62, 99)	24
Game Specific Features (48-52, 56)	26
GAME DIAGNOSTICS	27
Entering Diagnostics	27
Service Credits	27
Tech Alert	27
Easy Trough Clear	28
Burn-In Minutes	28
Sound Tests	28
Speaker Phase Testing	28
Digital Display Test	29
Dot Matrix Display Test	29
Creature Head Motion Test	29
Laser Kick Test	29
Switch Tests & Switch Matrix Chart	30
Switch Matrix Locations, Descriptions & Switch Part Numbers	31
Lamp Tests & Lamp Matrix Chart	32
Lamp Matrix Locations & Descriptions	33
Lamp Tests Continued, Flash Lamp / Coil Tests	34
Playfield Coils / Backbox & Playfield Flash Lamp Locations	34, 35
Switch, CPU Controlled Auxillary & Constant Power Chart	36
Coil Chart Wiring Schematic	37

Continued on the next page.

PARTS IDENTIFICATION (PINK SECTION) Page Guide	39
Backbox Parts	40
Cabinet Parts	41
Playfield - Major Assemblies	42
Playfield - Ramps & Rails	43
Playfield - Butyrate	44
Playfield - Parts	45
Playfield - Rubber Parts	46
Playfield - Posts (Illustrations Shown Actual Size)	47
Playfield - Lamps with Sockets (Illustrations Shown Actual Size)	48, 49
Playfield - Lamp Boards	50
UNIQUE PARTS IDENTIFICATION (BLUE SECTION) Page Guide	51
Up / Down Lever Assembly (500-5918-00)	52
6-Ball Switch Assembly (500-5683-00)	53
Lock Ball Assembly (for 6-Ball Switch Ass'y) (500-5684-01)	53
Deflector (for 6-Ball Switch Ass'y) (535-6606-01)	53
Flipper Assembly, Lower: Right (500-5832-01), Left (500-5832-02)	54
Flipper Assembly, Upper: Right Only (500-5694-01)	55
Slingshot (Strong-Leg Bull) Assemblies (500-5849-00)	56
Knocker Assembly (500-5081-00)	56
Turbo Bumper Assemblies (500-5227-02)	57
Ball Kicker (Auto Launch) Assembly (500-5477-01)	58
Laser Kick Assembly (500-5838-00)	58
Vertical Up-Kicker (VUK) (500-5839-00)	59
Ball Eject Assembly (500-5664-01)	59
Power Scoop Assemblies (500-5809-00)	60
Kick Big Assemblies (500-5862-00)	60
Diverter Assembly (500-5654-00)	61
Diverter Plunger & Crank Arm Assembly (515-5453-00)	61
Frankenstein Assembly (500-5887-00)	62
Frankenstein Main Plate Assembly (515-6153-00)	63
Upper Level Plastic Ramp Assembly (500-5905-00)	64
Lower Level Plastic Ramp Assembly (500-5923-00)	65
Stand-Up Targets, 1" x 1½" (500-5321-08), 1" Sq. (500-5232-08), Narrow (500-5857-08)	66
SCHEMATICS / TROUBLESHOOTING (YELLOW SECTION) Page Guide	67
Power Wiring Diagram	69
Cabinet Wiring Diagram	70
Backbox Wiring Diagram	71
Playfield Coil / Flashlamp Wiring Diagram	72
Playfield Special Coil Diagram	73
Playfield Switch Wiring Diagram	74
Playfield Lamp Wiring Diagram	75
CPU Board Assembly Diagram	76
CPU Board Logic Diagram (Sheets 1-4)	77-80
Power Supply Board Schematic & Component Layout	81
Sound Board Schematic (520-5077-00)	82
Display Controller Board Schematic (Page 1 of 2)	83
Display Controller Board Schematic (Page 2 of 2)	84
Display Controller Board Component Layout	85
Display Driver, Dwg. 1 (Cherry), Dwg. 2 (Babcock), Dwg. 3 (Dale)	86-88
Solid State 3-Flipper Theory of Operation & Circuit Troubleshooting Flowchart	89
Solid State 3-Flipper Board Diagram	90
Solid State 3-Flipper Wiring Diagram	91
PPB Diagram	92
Creature Head Motion Servo Board — Theory of Operation & Schematic	93

GAME SPECIFICATIONS

POWER REQUIREMENTS

This game is provided with a 3-prong plug and **must be connected to a properly grounded outlet to reduce shock hazard** and insure proper game operation. Refer to AC Power Wiring Diagram for transformer connections required for normal, high, and low line conditions.

Normal Line:	109 to 129 -Volts AC (211 to 225 -Volts AC)
High Line:	(226 to 235 -Volts AC)-- European, International
Low Line:	95 to 108 -Volts AC (200 to 210 -Volts AC)

PROM SUMMARY

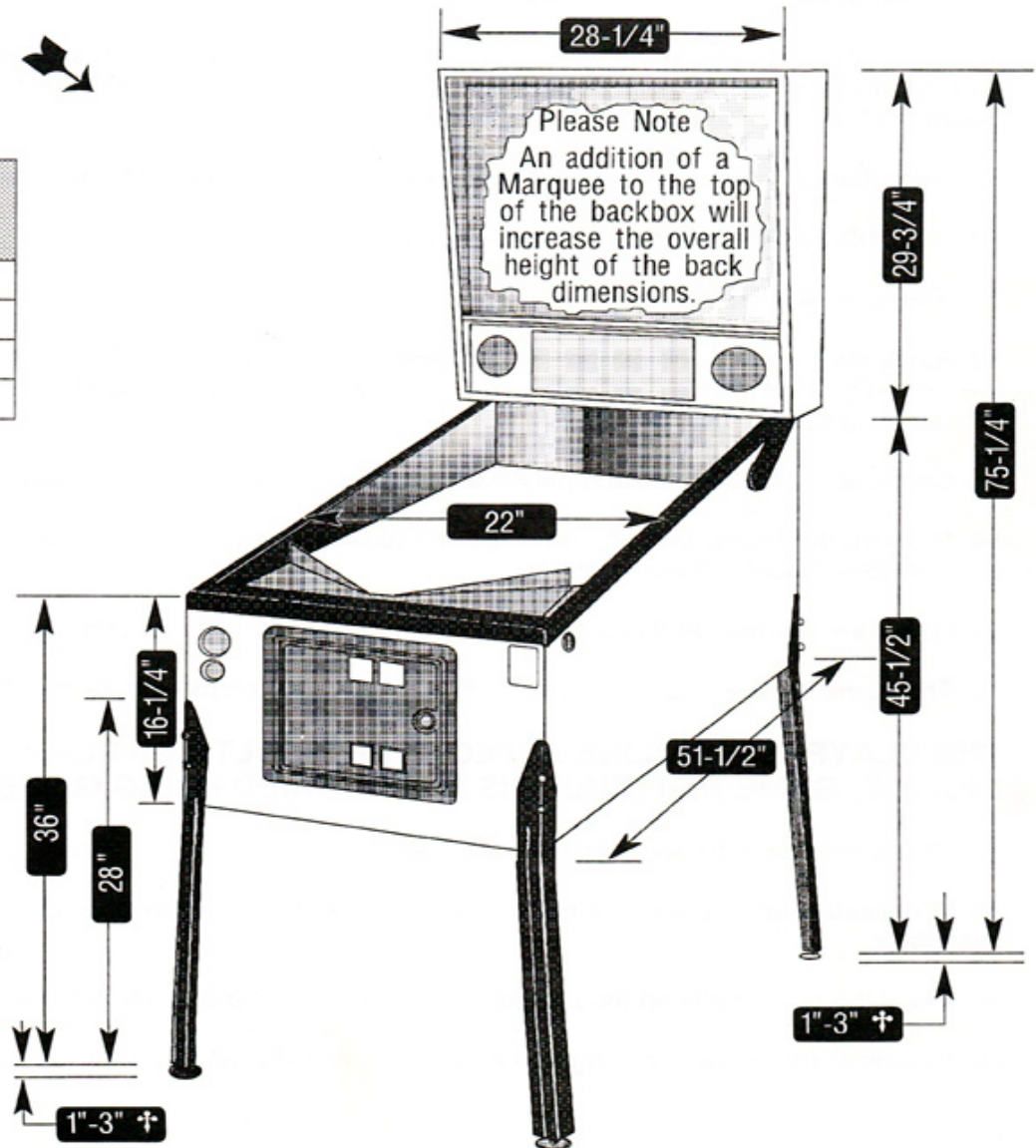
CPU Board:	Location C5
Sound Board:	Locations U17 (Voice ROM 1), U21 (Voice ROM 2), U36 (Voice ROM3) and U7 (Sound ROM)
Display Controller Board:	Location U1 (ROM 0) and U4 (ROM3)

TRANSPORTATION

To reduce the possibility of damage, observe the following precautions whenever transporting the game. Lower the backbox and secure it to the cabinet. Remove the legs and secure the game within the transporting vehicle.

OVERALL DIMENSIONS

Shipping Crate Dimensions	
Height	55-1/2"
Width	30-1/2"
Length	31"
Approx. Wt.	250 lbs.



† Note: The Leg Levellers can add up to 2 inches to the overall height of the front and back dimensions.

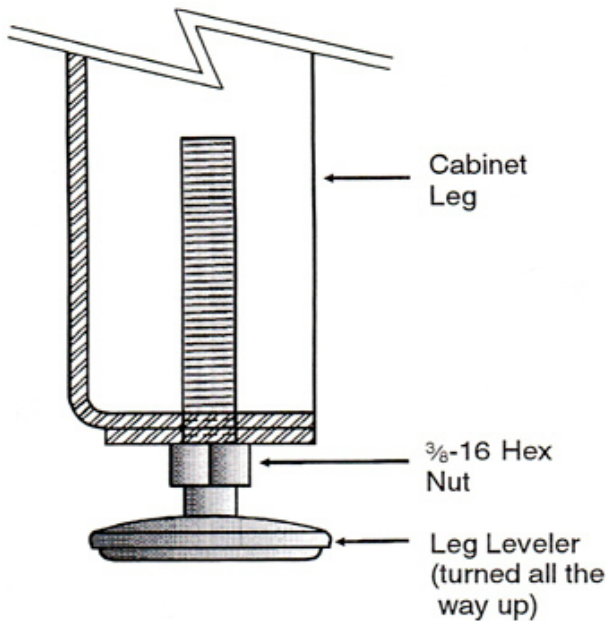
Game Assembly Procedures

(Refer to the Illustrations on pages 3 & 4)

1. Open the top of the carton and lay it on its side with the bottom of the cabinet down. Using the plastic banding strip as a handle, slide the game out of the carton.
 2. Remove all packing material. Cabinet legs are located on top of the front moulding above the coin door and the assembly parts package is in the cashbox. There should be four leg levelers, eight leg bolts, six pinballs and a large Allen Wrench, used for securing the backbox, is inserted & taped to the rear of cabinet.
 3. Leg Levelers should be attached. If not, attach Leg Levelers from the parts package to each leg, make sure that each leveler is threaded through a hex nut before threading it into the leg. See Illustration "Leg Leveler Adjustment" on the next page.
 4. Support rear of cabinet and attach rear legs using two leg bolts for each leg.
 5. Support front of cabinet and attach front legs using two leg bolts for each leg.
 6. While assuring that no cables are being pinched, carefully raise the backbox and secure it in its upright position with the Allen Wrench in the hole in the back of the cabinet and rotating the wrench 270° (¾ turn).
 7. Remove the backbox keys from the playfield glass, unlock and carefully remove the backglass. Set the backglass aside.
 8. 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 Board, Sound Board, Power Supply Board, and Display Board to check that they are properly seated.
 9. Check that the fuses on the Power Supply Board, PPB Board and Back Panel are seated properly.
 10. Carefully remove the playfield glass and set it aside.
 11. Remove all shipping tie downs.
 12. Raise the playfield and support it, by lifting the Stay Arm on the Right Side of the Cabinet and locking it into the slotted bracket on the playfield. (Use the instruction sheet provided in the game to see alternative methods of accessing the playfield bottom.)
 13. Check all cabinet cables and playfield Lamp Boards connector terminations.
 14. Remove the Plumb Bob tilt from the parts package and install on the pendulum wire on the inside left of the cabinet. (See Cabinet Parts Illustration.)
 15. Lower the playfield and ensure game is level side-to-side by adjusting Leg Levelers, if required.
 16. The game pitch should be at a 6.5° pitch. Depending on the condition of the floor, adjust as required.
- THE PLAYFIELD INCLINE AFFECTS DIFFICULTY OF PLAY. USE THE RECOMMENDED INCLINE; GAME DIFFICULTY IS BEST VARIED USING GAME ADJUSTMENTS.**
17. Check the plumb tilt and adjust as required.
 18. If desired, perform any self tests at this time. With the insert door closed, carefully reinstall and lock the backglass.
 19. Place the six pinballs on the playfield near the outhole and carefully reinstall the playfield glass.
 20. If desired, make game pricing and Add-A-Ball, Novelty, or 5-Ball Play adjustments at this time.

LEG LEVELER ADJUSTMENT

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



STEP 1

Assemble all (4) legs and levelers as shown in the diagram. Be sure the leveler is turned all the way in.

STEP 2

Attach leg assemblies to cabinet with leg bolts provided.

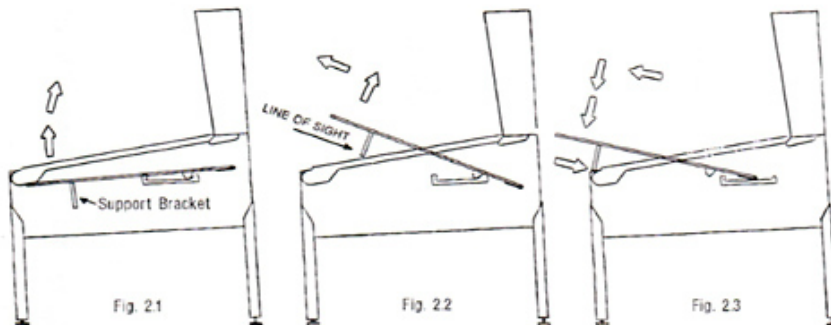
YOUR PLAYFIELD PITCH IS NOW AT 6.5° AS REQUIRED FOR PROPER GAME PLAY! See Step 3.

STEP 3

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

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

EASY ACCESS SERVICE SYSTEM

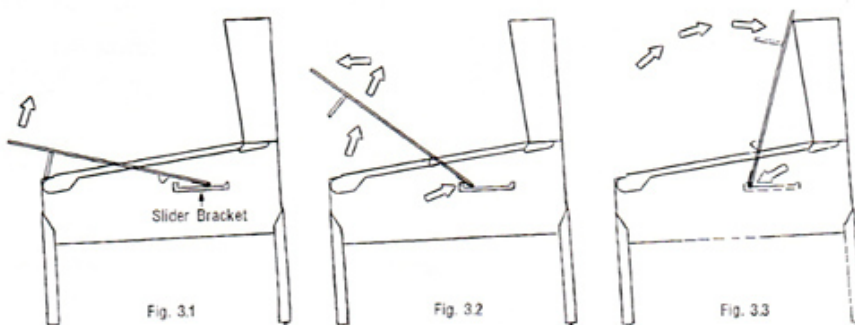


This position is useful to service:

Trough Switches, Connectors at back of cabinet, Cleaning the Playfield, etc.

SERVICE POSITION 1

Lift the playfield **using the left and right ball guides** upward (Fig. 2.1) until the playfield support brackets can be seen to clear cabinet front (Fig. 2.2). At this time, pull playfield toward the front of the cabinet, checking that the mechanical components clear the cabinet front (Fig. 2.3). Then rest the playfield on the support brackets at the front channel of cabinet. **Reverse procedure when service is complete.**



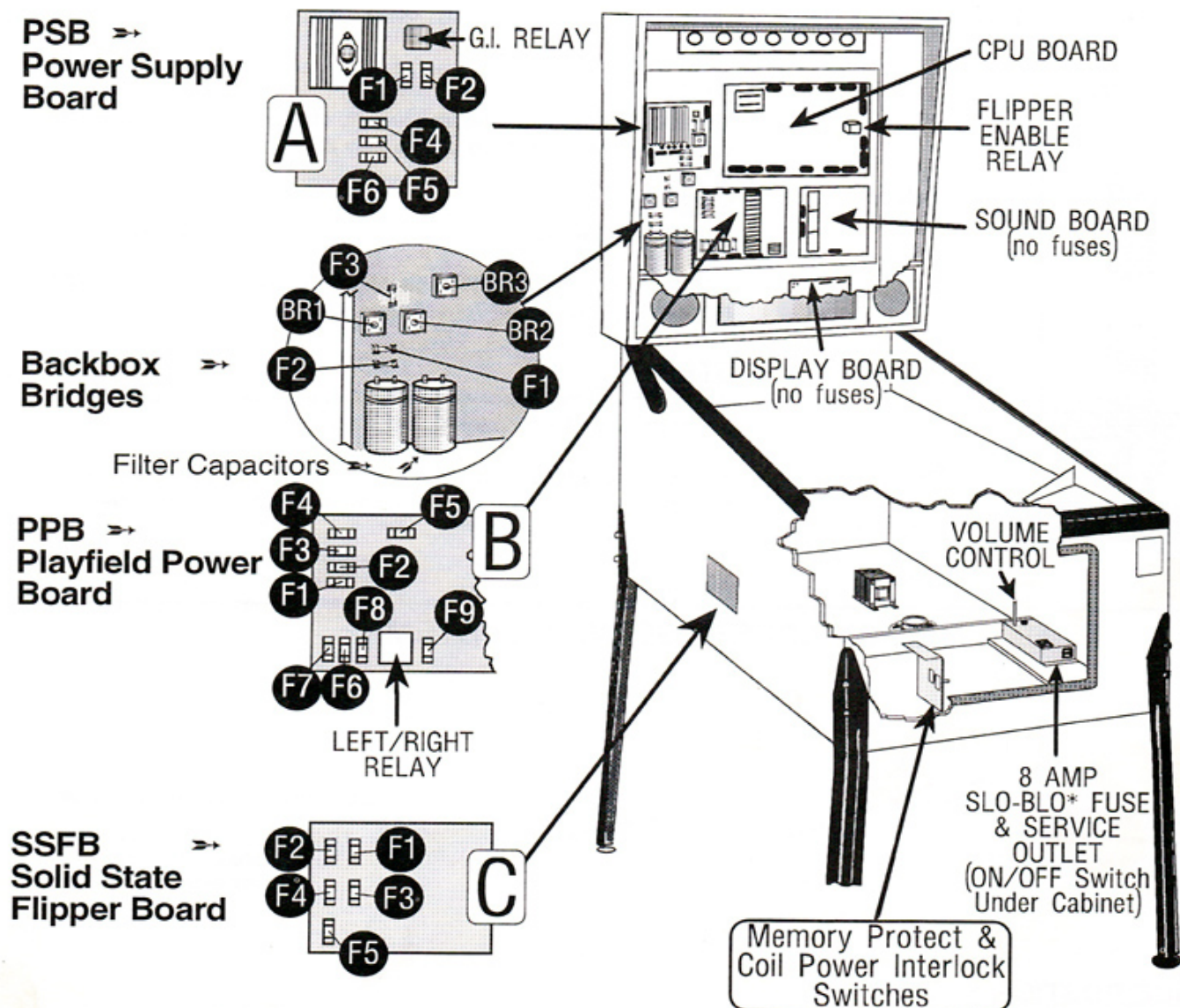
This position is useful to service:

All Playfield Bottom Components, Cabinet Components, etc.

SERVICE POSITION 2

With the playfield at rest (Fig. 3.1), hold sides of playfield and pull toward the front of the cabinet (approximately 6-8"), until resistance is felt from the slider brackets located on either side of the cabinet (Fig. 3.2). At this time, swivel playfield toward the backbox, then rest on top edge of the backbox. **Reverse procedure when service is complete.**

BACKBOX LAYOUT, FUSE & RELAY LOCATIONS



Note: Backbox Part Numbers on Page 38.

Service Switches are located on the Coin Door.

A: In the Backbox		B: In the Backbox		C: In the Cabinet		In the Backbox	
Power Supply Board PSB		Playfield Power Board PPB		Solid State 3-Flipper Bd. SSFB		Backbox Bridges Mounted in Backbox	
F1	7A Slo-Blo +5vDC Regulator Input (9vAC)	F1	G.I. 5A Slo-Blo Playfield	F1	3A 250v Slo-Blo 50v DC Output (All Fuses) Lower Right Flipper	F1	8A Slo-Blo 32v DC BR2 Coils/Flashers
F2	7A Slo-Blo +5vDC Regulator Input (9vAC)	F2	G.I. 5A Slo-Blo Backbox Dr./Spkr. Panel	F2	3A 250v Slo-Blo 9v AC Holding	F2	8A Slo-Blo 18v DC BR1 Lamps
F3	Not Used	F3	G.I. 5A Slo-Blo Playfield & Coin Door	F3	3A 250v Slo-Blo 50v DC Output Left Flipper	F3	8A Slo-Blo 18v DC BR3 Display
F4	8A Slo-Blo Switched Illum'tion Buss (18vDC)	F4	G.I. 5A Slo-Blo Backbox Door	F4	3A 250v Slo-Blo 9v AC Holding	Cabinet Fuses	
F5	4A Slo-Blo Solenoid (32vDC) Bumpers, Sling- shots, etc.	F5	50v 5A Flippers /All 50v Coils	F5	3A 250v Slo-Blo 50v DC Output Upper Right Flipper		
F6	5A Slo-Blo Solenoid Buss (34vDC) L/R Relay Coils/Flash	F6	32v Flash Lamps 3A Slo-Blo/Right			Main Fuse Line: 8A Slo-Blo 250v International 2X 4A Slo-Blo 250v	
		F7	32v 3A Coils/Flash Right/Left				
		F8	50v 4A / 50v Coils				
		F9	50v 5A Laser Kick				

GAME OPERATION & FEATURES

Standard Features

Insert coin(s), the game generates a sound ("SEGA!") for the first credit & for each subsequent coin(s) and the display indicates the number of credit(s) posted. Depress the Start Button and a start-up sound is produced, the posted credit(s) are reduced by one. The display now indicates the player or # of players selected from the total depressions of the credit button. The display indicates the ball in play, and a ball is served to the shooter lane. Additional players may be added by pressing the Start Button before the end of ball 1. At game start, an introduction is shown followed by Skill Shot Graphics. Depressing the Start Button after ball 1 of any player will start a new game (if credits are available) only if button is depressed for 2-3 seconds. This delay is to avoid accidental "re-starts" of a game. (Note: Any 1/2 credit remaining during game play after the end of ball 1, or power down, will be eliminated.)

The second closure (adjustable) or prolonged closure of the plumb bob tilt switch tilts the ball in play. Closure of the slam tilt switch on the coin door ends the current game(s).

At the end of each ball, earned bonuses are collected. If the player enabled the EB Buy-In Feature*, the player now has the option of purchasing an extra ball to continue game play (See Extra Ball (EB) Buy-In Feature below). Otherwise, the system produces a random 2-digit number (a multiple of 10; 00 to 90) for a Match feature (adjustable). Matching the last two digits of a player score with this number awards a credit. Some geographical areas do not allow the award of a free game, this can be adjusted with Adj. 4, Replay Award. Players exceeding high score levels receive free credits (adjustable) and are able to enter their initials with the new High Score achieved. To enter your initials, use the left & right flipper buttons to choose letter or character as seen on the Visual Display. Hitting the Start Button locks the letter or character in. Proceed with the 2nd & 3rd letter. The game then proceeds into the game-over mode and then to the attract mode. A custom message (adjustable) can be displayed during the attract mode.

*Extra Ball (EB) Buyin Feature

An option to add an extra ball(s) after the game is finished. TO ACTIVATE THE **EXTRA BALL BUY-IN FEATURE**, THE PLAYER MUST PRESS THE EB BUY-IN BUTTON DURING THE COURSE OF THE GAME. At the end of normal game play, the same player may choose to continue the game at the same score and features active by pressing the EXTRA BALL BUTTON prior to the expiration of the "countdown timer." Pressing the START BUTTON or BOTH FLIPPERS SIMULTANEOUSLY cancels this feature. If the player does not have any credits, the player will get "more time" to add credit. The number of extra balls which can be added to a game can be adjusted with Adj. 38, Extra Ball Buyin Count. Default is 1. Set to 1, will allow only 1 extra ball to be purchased per game. Set to **UNLIMITED**, after the end of the game the countdown will appear after the end of each ball for the option of purchasing another extra ball. Set to 0, will make this feature unavailable.

Manual Percentaging

This game is equipped with Manual Percentage Adjustment. As previously with our games, you can either set operator adjustments for a replay percent or you can set a fixed replay score.

If you set operator adjustments for a particular replay percent, the game will compute a recommended score to keep the game at that replay percentage. If a change is recommended and the game coin door is opened, the display will indicate a recommended replay score to beat and make a sound to alert the operator. By pressing the start button, the score to beat will be changed to the recommended level. If you close the coin door or go into Audit or Adjustment Mode, no score change will be made.

You may choose to ignore the recommended change; for example, you may not think last week's players were the usual crowd. Just close the door and the message will disappear without altering the existing level. Or you may choose to make a different score to beat adjustment; this is done by utilizing Adj. 02, Starting Replay Score.

Playfield Overview and Game Rules (See the following pages)

The following pages describe the Game Rules. On the next page is a playfield overview to show the locations of of the featured items. Your game includes an instruction card. The instruction card on the next page may be photo-copied as a temporary replacement if required. Please note, rules and featured items may be subject to change through production.

Playfield Overview & Game Rules

MARY SHELLEY'S FRANKENSTEIN

TRAP DOORS TO LEFT (LONG TROUGH) & RIGHT (SHORT TROUGH) CREATURE HANDS

LARGE RAMP EXIT GATE

UPPER LEVEL RAMP WITH TRAP DOORS TO CREATURE

1-WAY GATE TO BALL EJECT

BALL EJECT

TURBO BUMPER

ENTRANCE TO UPPER SCOOP (WITH KICK-BIG)

TURBO BUMPERS

SQUARE STAND-UP TARGET

ENTRANCE TO LOWER SCOOP (WITH KICK-BIG)

RECTANGLE STAND-UP TARGETS

RAMP EXIT HOLE TO LEFT RETURN LANE

SLINGSHOTS

LEFT RETURN LANE

LOWER FLIPPERS

LEFT OUTLANE

KICK BACK (UNDER ARCH)

6-BALL TROUGH (UNDER METAL ARCH)

START & EXTRA BALL BUYIN BUTTONS (ON FRONT OF CABINET)

DIVERTER ASSEMBLY (UNDER THE RAMPS)

FRANKENSTEIN'S CREATURE: (WHICH CAN HOLD 1 BALL IN EACH HAND TO THROW)

VERTICAL UP-KICKER (VUK)

LARGE RAMP

RAMP ENTRANCE GATE

SPINNER

NARROW STAND-UP TARGET

SQUARE STAND-UP TARGET

UPPER FLIPPER

RECTANGLE STAND-UP TARGET

WIRE RAMP FROM UPPER LEVEL RAMP TO RIGHT RETURN LANE

1-WAY SHOOTER LANE GATE

ADJUSTABLE POST TO SHORTEN OR WIDEN RIGHT OUTLANE ENTRANCE (UNDER BUTYRATE)

SHOOTER LANE

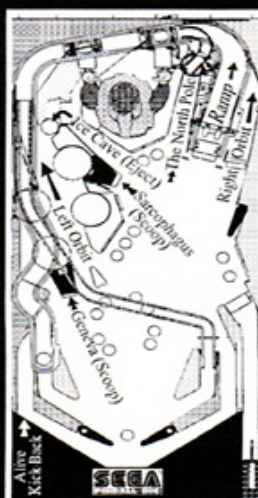
RIGHT RETURN LANE

RIGHT OUTLANE

BALL AUTO LAUNCH (UNDER BUTYRATE) CONNECTS WITH:

LEVER ASSEMBLY ("THE SWITCH")

Cut & Copy



MARY SHELLEY'S FRANKENSTEIN

Skill Shot → Throw *The Switch* to collect value highlighted in display.

Frankenstein → Complete FRANKENSTEIN Targets to start flashing feature. Shoot *Change Scene* to advance feature: North Pole, Sarcophagus and Ice Cave spot target(s).

Multiball → Shoot ramp to light lock, then lock ball at the North Pole (Vertical Up-Kicker) for 2-BALL PLAY. Relock balls at the North Pole for 3- to 6-BALL PLAY, then shoot for JACKPOTS.

Geneva → Shoot GENEVA (Lower Scoop) when lit to collect Geneva Letter. Complete for Geneva Multiball. Relight by shooting the Left Orbit or Right Inlane.

Alive! → Ball drains in Left Outlane will return to play when lit. Relight Alive (Kick-Back) by shooting the Ice Cave.

Sarcophagus → Shoot the Sarcophagus (Upper Scoop) when lit for accumulated value. Light by shooting the Left Orbit.

Ice Cave → Shoot the Ice Cave (Ball Eject) for award during 1-BALL PLAY.

Hint → Pressing the Extra Ball Buyin Button during the course of a game activates the Extra Ball Buyin Feature at the end of game play!

The Switch →

© 1994 SEGA PINBALL, INC. 755-5070-00



Skill Shot

Throw **The Switch** to score the shifting value indicated in the display.



Ice Cave

Shoot the **Ice Cave** (**Ball Eject**) during 1-Ball Play for a random award. The **Ice Cave**

also spots 2 letters of **FRANKENSTEIN**. When **Alive** (**Kickback Feature**) is not lit, the **Ice Cave** relights it.



Pop Bumpers

Pop Bumpers start at 250K per hit. The last **Pop Bumper** to be hit will flash. **Pop**

Bumper values are increased by the **Left Inlane** to **Spinner Shot**, adding 50K per spin to the flashing **Pop Bumper**. Bumpers can also be increased via the Ice Cave awards.



Sarcophagus

The **Sarcophagus** (**Upper Scoop**) starts each ball with a base value of 5M. When the

Scoop is unlit, each shot increases this value by 5M. The **Left Orbit** lights the **Scoop** for collection. Making the **Left Orbit** to **Scoop** Combo gives double the value. The **Sarcophagus** also spots 1 **FRANKENSTEIN** Letter: 2 when lit, 1 if not lit.

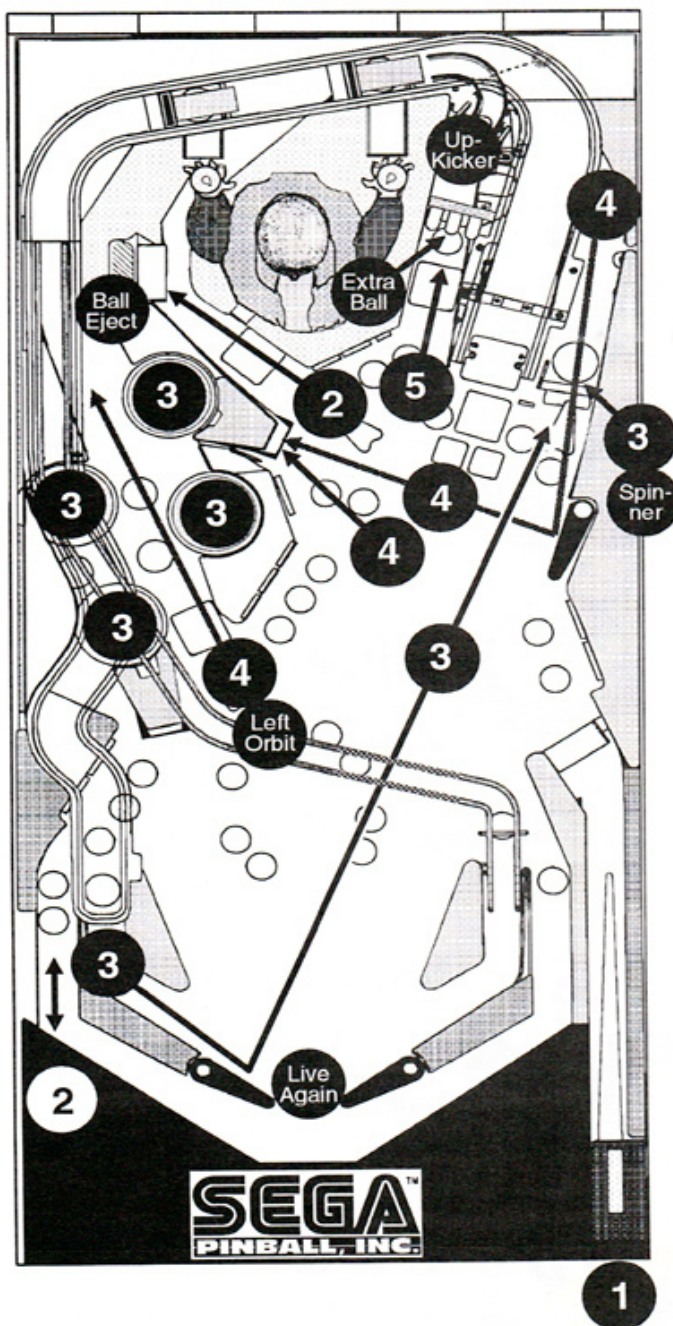


North Pole

During 1-Ball Play, the **North Pole** (**Vertical Up-Kicker** or **VUK**) spots 1 **FRANKEN-**

STEIN Letter, or 2 letters on an **Inlane** to **VUK** Combo. **Extra Ball** is also collected at the **North Pole** when lit. The **North Pole** is also used to lock balls and start **Multiball**.

Game Rules for MARY SHELLEY'S FRANKENSTEIN





Ingolstadt

During **1-Ball Play**, the **Ingolstadt Spinner** scores 100K per spin. An **Inlane** to **Spinner Combo Shot** adds 50K per spin to whichever **Pop Bumper** is flashing and scores 200K per spin. The **Ice Cave** may award "spinner at max" — 300K per spin.



Geneva

Shooting **Geneva** (**Lower Scoop**) when lit adds a Letter to **GENEVA**. The **Scoop** starts each ball lit, and after collection may be subsequently lit by shooting the **Left Orbit** (or by the **Right Inlane** for a short time). Completing **GENEVA** starts **Geneva Multiball**.



Alive

The **Left Outlane** provides the **Alive** feature (**Kick-Back**). When lit, if ball drains down the **Left Outlane** the ball will be "kicked-back" into play. Relight **Alive** by shooting the **Ice Cave**.



Double Bonus

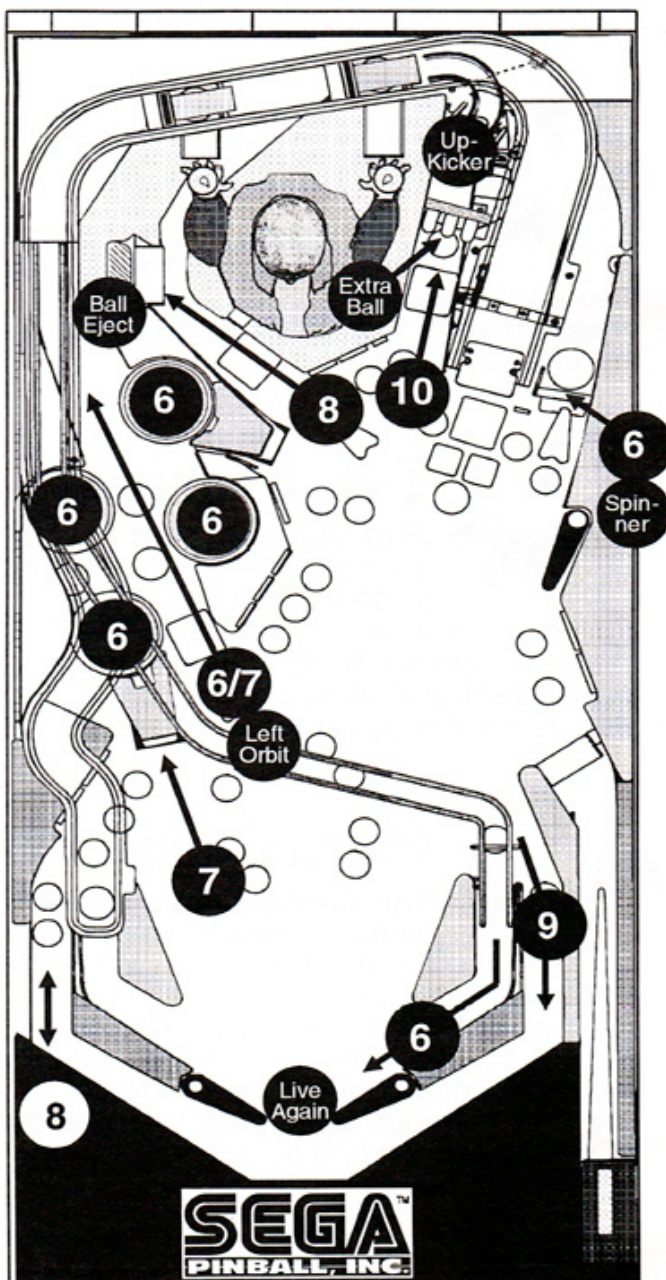
When lit, the **Right Outlane** doubles the player's end-of-ball bonus.



Extra Ball

An **Extra Ball** is collected at the **VUK** whenever it is lit during game play.

Game Rules for MARY SHELLEY'S FRANKENSTEIN



Frankenstein Features:

Game Rules for MARY SHELLEY'S FRANKENSTEIN

One of the following eight Features (**Frankenstein Millions**, **Stoning**, **Creature Feature**, **Lynch Justine**, **North Pole**, **Lite Extra Ball**, **Voltage Mode** & **Graveyard**) are started whenever a player completes the **FRANKENSTEIN TARGETS** on the playfield. The player may be spotted letters as detailed above. After completing all eight features, a **6-Ball Multiball** feature will be available. Shooting the **CHANGE SCENE TARGET** changes the next feature.



Frankenstein Millions

Frankenstein Targets are flashing to score million values - 6M per target for the first 6, 8M per target for the next 3, and 10M per target thereafter. This is a timed round that lasts 30 seconds.



Stoning

A fast-scoring round that last 30 seconds. Switch values start at 250K and increase based on the number of *switch closures* made.



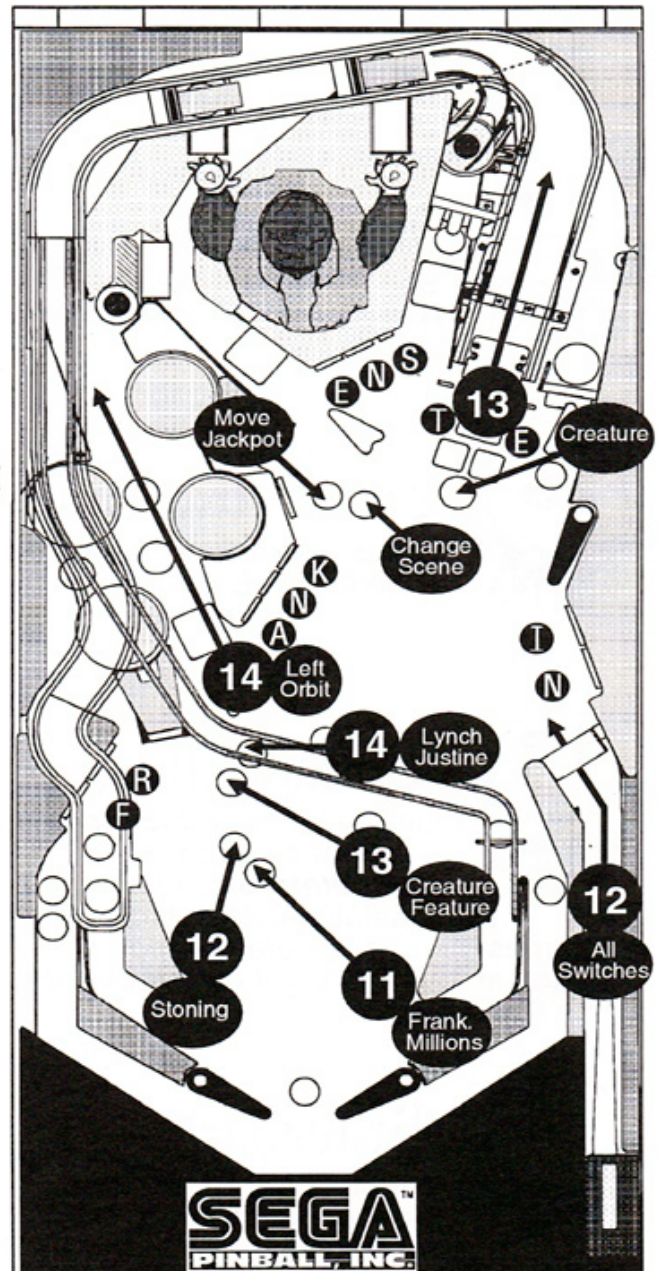
Creature Feature

Ramp Shots score millions - try to make 8 shots to spell **CREATURE** before the timer expires for a bonus. Inlane to Ramp shot may give 2 letters...



Lynch Justine

Shoot the *Left Orbit* for successive *Hurry-Up Values*. — 3 shots to complete...



Frankenstein Features Continued:



North Pole

Shoot the **North Pole** (Up-Kicker) for countdown value.



Lite Extra Ball

Lights **Extra Ball** at the **North Pole** for **LIVE AGAIN**.



Voltage Mode

One of the four **Jackpots** is lit — shoot it before the **Voltmeter** indicates low power. If successful, another **Jackpot** is lit which must be shot before the **meter** indicates an overload. All four **Jackpots** will be lit.



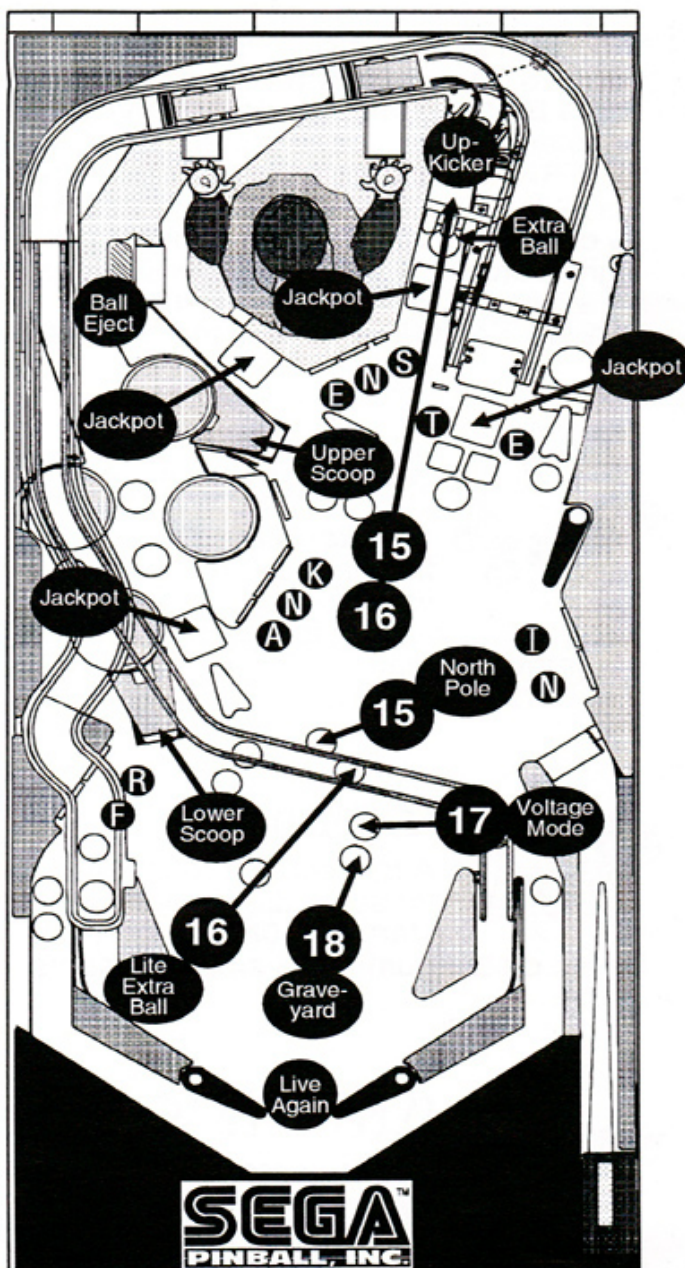
Graveyard

Various holes (Up-Kicker, Eject or Scoops) are lit to collect **Body Parts**. Collect 2

Legs, 2 **Arms**, a **Torso**, and a **Brain** for Score and Completion Bonus.

COMPLETE ALL MODES FOR SECRET CREATION 3-6 BALL FEATURE WITH BIG MONSTER POINTS!

Game Rules for MARY SHELLEY'S FRANKENSTEIN



Multiball Features:



Multi-Ball Ready

Shoot the Ramp to light Lock. Lock ball at the **North Pole** (VUK) for 2-Ball Play. Re-lock balls at the **North Pole** and after locking 1st ball, a timer starts with a countdown value of 59M. Shoot the **North Pole** again before timer expires to start **3-6 Ball Multiball**. The player's timing is important. A successful shot into the VUK very quickly will start 6-Ball Multiball; the longer it takes the player to shoot the VUK will determine if 3-5 Ball Multiball will be initiated.



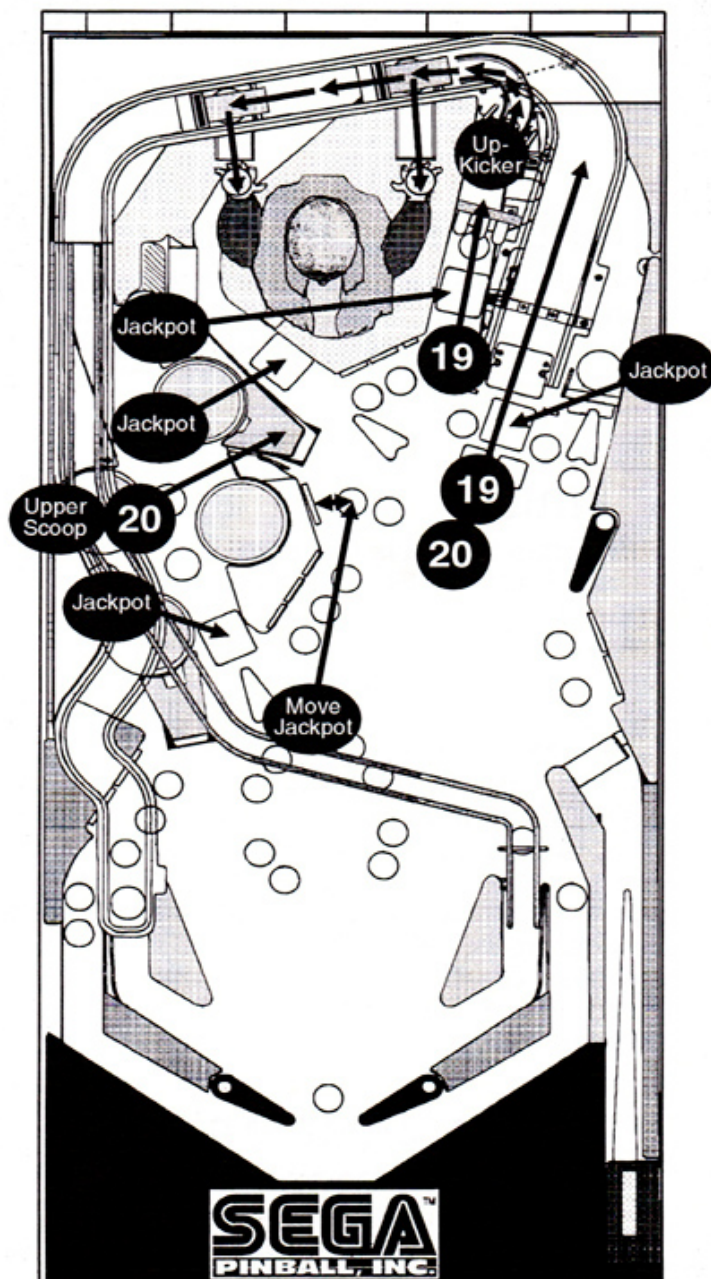
Multiball Jackpots

At the beginning of **Multiball**, two **Jackpots** are lit. These **Jackpots** may be shifted to a new location by hitting the **MOVE JACKPOT TARGET**. During **Multiball**, the **Spinner** increases the **Jackpot Value** by 1M per spin.

During this period **FRANKENSTEIN** Letters are being scored as well as **Jackpots** — completing the two **Jackpots** and all the letters lights **CREATURE JACKPOT** at the **Ramp**. Also, completing the two **Jackpots** adds one more ball into play.

Scoring **CREATURE JACKPOT** lights the **Sarcophagus** (**Upper Scoop**) for 50M. Shooting the **Sarcophagus** lights a roving **SUPER JACKPOT**. Once the **SUPER JACKPOT** is scored, the **Multiball Sequence** recycles, only with four **Jackpots** lit instead of two.

Game Rules for MARY SHELLEY'S FRANKENSTEIN



Special Game Notes:

Your Notes:

Combination Shots //

Frankenstein Features several **Multi-Way Combos**. These combo involve natural sequences of key shots in the game. Several undocumented difficult combos may also be present.

Bonus //

End of ball bonus is the sum of:
+ Main Playfield Shots (Ramp, Orbits, VUK, Upper/Lower Scoops, Eject) x 1M +
Frankenstein Letters completed x 1M.

Extra Ball Buy-In //

Pressing the EXTRA BALL BUY-IN BUTTON at any time during the course of a game activates the Extra Ball Buy-In Feature at the end of game play. Once the game ends, Extra Ball(s) may be purchased for one credit before the Buy-In Timer Expires. Cancel the Buy-In Feature by pressing the Start or both Flippers simultaneously.

Entering Your Initials //

The player may enter their initials if a High Score was achieved by using the Left or Right Flipper Buttons to choose a letter or character as seen on the Video Display. Hitting the Start Button locks the character in. Precede with the 2nd and 3rd letter. *Also, the player who was able to get **6-Ball Creature Multiball** can enter initials!*

Mad Scientist Note //

As in any scientific experiment, rules and point values are subject to change without notice!

AUDIT FUNCTIONS

General

There are 67 audit functions provided for accounting purposes and for evaluation of game difficulty adjustments. Audit functions are split into two groups. There are 12 most-used audits (1 through 12) in a 'quick look' group and 55 less-used audits (13 through 67), in an 'Expanded' Group. The various auditing functions are summarized in the **GAME AUDIT TABLE** and, when accessed, are shown on the Dot Matrix Display. The *Audit Number* is shown in the top of the display, the *Description* is shown next and the *Audit Total* in the display. Access and control is provided from switches located on the inside of the coin door.

To access audit functions, open the coin door and make sure that the **FORWARD/REVERSE** switch is in the **FORWARD** (up) position. Depress the **STEP** switch and the display indicates **AUDITS & ADJUSTMENTS**. This indicates access to audit functions.

With the **FORWARD/REVERSE** push-button switch still in the **FORWARD** (up) position, depressing the **STEP** push-button switch advances through the audit functions one at a time. To review lower-numbered functions, set the forward/reverse push-button switch to the **REVERSE** (down) position and operate the **STEP** push-button switch.

To access expanded audits, operate the step push-button until **AUDIT 12, Expand Audits** is displayed. Set the choice to **YES** as indicated in the lower display by depressing the Game Start push-button and then depress the step push-button. The request is installed and Audit 13 is displayed. When you exit audits and adjustments, the Audit 12 setting is returned to off for the next time that a review of audits are required.

Audit totals (except for Audits 1, 5-11) may be reset to zero using Game Adjustment, **ADJUSTMENT 10, Reset Game Audits**. Game adjustments (1 to 12 and 13 to 62) begin after the last audit function (12 or 67). Once audits functions have been recorded, and if no adjustments are required, you may return the game to the attract mode. If adjustments are required, continue pressing the **STEP** button until the game adjustments are reached. See Game Adjustments for details.

Audits - 'Quick Look' Functions (Au. 1 - 12)

Au. #	Audit Name	Audit Definition
Au. 1	Total Paid Credits	The total number of paid credits is displayed.
Au. 2	Free Game Percentage	The Total Free Plays (Audit 25) divided by Total Plays (Audit 26).
Au. 3	Average Ball Time	(In Seconds) The Total Play Time divided by Total Balls Played (Audit 13).
Au. 4	Average Game Time	The Average Game Time expressed in minutes and seconds.
Au. 5	Coins Thru Left Slot	The total amount of coins registered through the left slot.
Au. 6	Coins Thru Right Slot	The total amount of coins registered through the right slot.
Au. 7	Coins Thru Center Slot	The total amount of coins registered through the center slot.
Au. 8	Coins Thru 4th Slot	The total amount of coins registered through the fourth slot.
Au. 9	Total Coins	The total number of coins dropped through all four coin slots.
Au. 10	Total Earnings	The total cash value accumulated since the last Factory Restore occurred.
Au. 11	Meter Clicks	Provides the total number of money clicks accumulated, based on the country's lowest coin denomination used for the game credit.
Au. 12	Expand Audits?	(On/Off) This audit permits operator to proceed into expanded audits.

MARY SHELLEY'S FRANKENSTEIN

Game Audit Table

Item/Description			Item/Description		
1	TOTAL PAID CREDITS		35	PROPRIETARY	
2	FREE GAME PERCENTAGE		36	PROPRIETARY	
3	AVERAGE BALL TIME		37	PROPRIETARY	
4	AVERAGE GAME TIME		38	TOTAL BUYIN GAMES	
5	COINS THRU LEFT SLOT		39	TOTAL EXTRA BALL BUYINS	
6	COINS THRU RIGHT SLOT		40	EXTRA BALL BUYIN REPLAYS	
7	COINS THRU CENTER SLOT		41	EXTRA BALL BUYIN HSTD	
8	COINS THRU 4TH SLOT		42	LEFT DRAINS	
9	TOTAL COINS		43	CENTER DRAINS	
10	TOTAL EARNINGS		44	RIGHT DRAINS	
11	METER CLICKS		45	SLAM TILTS	
12	EXPAND AUDITS?		46	BALLS SAVED	
13	TOTAL BALLS PLAYED		47	RAMP SHOTS	
14	TOTAL EXTRA BALLS		48	MISSED RAMP SHOTS	
15	EXTRA BALL PERCENT		49	VUK SHOTS	
16	REPLAY 1 AWARDS		50	CENTER SCOOP SHOTS	
17	REPLAY 2+ AWARDS		51	EJECT SHOTS	
18	TOTAL REPLAYS		52	LOWER SCOOP SHOTS	
19	REPLAY PERCENT		53	RIGHT ORBITS	
20	TOTAL SPECIALS		54	LEFT ORBITS	
21	SPECIAL PERCENT		55	FRANKENSTEIN COMPLETED	
22	TOTAL MATCHES		56	CREATION SCENES STARTED	
23	HIGH SCORE AWARDS		57	2-BALL MULTIBALL READY	
24	HIGH SCORE PERCENT		58	2-BALL MULTIBALL STARTED	
25	TOTAL FREE PLAYS		59	BALLS LOCKED	
26	TOTAL PLAYS		60	1ST MULTIBALL STARTED	
27	0.0M TO 99.9M		61	MULTIBALL RESTARTS	
28	100.0M TO 199.9M		62	2ND+ MULTIBALL STARTED	
29	200.0M TO 299.9M		63	JACKPOTS SCORED	
30	300.0M TO 499.9M		64	CREATURE JACKPOTS SCORED	
31	500.0M TO 999.9M		65	SUPER JACKPOTS SCORED	
32	1.0B+ SCORES		66	GENEVA MULTIBALL STARTED	
33	AVERAGE SCORES		67	GENEVA MULTIBALL JACKPOTS	
34	SERVICE CREDITS				

Audits - 'Expanded' Generic Functions (Au. 13 - 38)

Au.#	Audit Name	Audit Definition
Au. 13	Total Balls Played	The total of regular and extra balls.
Au. 14	Total Extra Balls	The total number of extra balls awarded.
Au. 15	Extra Balls Percent	The Total Extra Balls (Au.14) divided by Total Plays (Au. 26).
Au. 16	Replay 1 Awards	The total awards (credit, extra ball, or audit) for level 1.
Au. 17	Replay 2+ Awards	The total awards (credit, extra ball, or audit) for level(s) 2 or higher.
Au. 18	Total Replays	The total awards (credits, extra balls, or audit only) for exceeding replay score levels.
Au. 19	Replay Percent	The Replay Total awards for exceeding replay score levels, Total Replays (Au. 18) divided by Total Plays (Au. 26).
Au.20	Total Specials	The total awards (credits, extra balls, or scores) for making specials.
Au. 21	Special Percent	The Total Specials (Au. 20) divided by Total Plays (Au. 26).
Au. 22	Total Matches	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 will be adjustable from 0% to 10%, by Adj. 13 (Match Percentage), if enabled.
Au. 23	High Score Awards	The total credits awarded for exceeding the High-Score-To-Date scores.
Au. 24	High Score Percent	The High Score Awards (Au. 23) divided by Total Plays (Au. 26).
Au. 25	Total Free Plays	The total free credits for replays, High-Score-To-Date, Specials, and Match.
Au. 26	Total Plays	The sum of Total Paid Credits (Au.1) and Total Free Plays (Au. 25). Note that free credits are not recorded in the Audit until they are actually used.
Au. 27	0.0M to 99.9M	Provides the total number of games the Player's final score was between 0 and 99,999,990 points.
Au. 28	100.0M to 199.9M	Provides the total number of games the Player's final score was between 100,000,000 and 199,999,990 points.
Au. 29	200.0M to 299.9M	Provides the total number of games the Player's final score was between 200,000,000 and 299,999,990 points.
Au. 30	300.0M to 499.9M	Provides the total number of games the Player's final score was between 300,000,000 and 499,999,990 points.
Au. 31	500.0M to 999.9M	Provides the total number of games the Player's final score was between 500,000,000 and 999,999,990 points.
Au. 32	1.0B+ Scores	Provides the total number of games the Player's final score was over 1,000,000,000 points.
Au. 33	Average Scores	Provides the Average Score by adding the Final Score of each game to a table and dividing this sum by the Total Plays (Au. 26).
Au. 34	Service Credits	Provides the total number of Service credits added to the game. <i>See Game Diagnostics on page 29 for instructions regarding entry of Service Credits.</i>
Au. 35, 36, 37	Proprietary	Provides information to the game designer to aid in design development (not for consumer use).
Au. 38	Total Buyin Games	Provides the number of times a player utilized the Buyin Feature.

Audits - 'Expanded' Generic Functions (Au. 39 - 46)

Au.#	Audit Name	Audit Definition
Au. 39	Total Extra Ball Buyins	Provides the total number of times the Extra Ball Buyin Feature was used.
Au. 40	Extra Ball Buyin Replays	Provides the total number of replay awards that resulted from the use of the Total Extra Ball Buyins (Au. 39) Feature.
Au. 41	Extra Ball Buyin HSTD	Provides the total number of times in which use of the Extra Ball Buyin Feature resulted from beating the High-Score-To-Date (HSTD).
Au. 42	Left Drains	Provides the number of times the ball drained out the left drain.
Au. 43	Center Drains	Provides the number of times the ball drained out the center drain.
Au. 44	Right Drains	Provides the number of times the ball drained out the right drain.
Au. 45	Slam Tilts	Provides the number of times the Slam Tilt switch was activated.
Au. 46	Total Balls Saved	Provides the total number of times the Total Balls Saved Feature was used. This feature is enabled at the start of each ball and is disabled as soon as the ball makes contact with 5 game switches or allocated time expired.

Audits - 'Expanded' Game Specific Functions (Au. 47 - 62)

Au.#	Audit Name	Audit Definition
Au. 47	Total Ramp Shots	Provides the total number of times the Right Ramp was scored.
Au. 48	Missed Ramp Shots	Provides the total number of times the Right Ramp was missed.
Au. 49	VUK Shots	Provides the total number of times the VUK was scored.
Au. 50	Center Scoop Shots	Provides the total number of times the Center (Upper) Scoop (Sarcaphogus) was scored.
Au. 51	Eject Shots	Provides the total number of times the Ball Eject was scored.
Au. 52	Lower Scoop Shots	Provides the total number of times the Lower Scoop (Geneva) was scored.
Au. 53	Right Orbits	Provides the total number of times the Right Orbit was scored.
Au. 54	Left Orbits	Provides the total number of times the Left Orbit was scored.
Au. 55	Frankenstein Completed	Provides the total number of times the total letters of F R A N K E N - S T E I N were completed.
Au. 56	Creation Scene Started	Provides the total number of times the Creation Scene Feature was started.
Au. 57	2-Ball Multiball Ready	Provides the total number of times 2-Ball Multiball Feature was ready.
Au. 58	2-Ball Multiball Started	Provides the total number of times 2-Ball Multiball Feature was started.
Au. 59	Ball Locked	Provides the total number of times balls were locked in Creature's hands.
Au. 60	1st Multiball Started	Provides the total number of times the 1st Multiball Feature was started.
Au. 61	Multiball Restarts	Provides the total number of times the Multiball Feature was restarted.
Au. 62	2nd+Ball Started	Provides the total number of times 2+ Multiball was started.

Audits - 'Expanded' Game Specific Functions (Au. 63 - 67)

Au.#	Audit Name	Audit Definition
Au. 63	Jackpots Scored	Provides the total number of times the Jackpots were scored.
Au. 64	Creature Jackpots Scored	Provides the total number of times the Creature Jackpots were scored.
Au. 65	Super Jackpots Scored	Provides the total number of times the Super Jackpots were scored.
Au. 66	Geneva Multiball Started	Provides the total number of times Geneva Multiball was started via the lower scoop by spelling G E N E V A.
Au. 67	Geneva Multiball Jackpots	Provides the total number of times Geneva Multiball Jackpots were scored.

[illegible]

GAME ADJUSTMENTS

General

There are 62 adjustable functions provided to vary difficulty of play and to periodically reset audits and the high score levels. The various game adjustments are summarized in the **Game Adjustments Table** and, when accessed, are shown on the player score display. The *Adjustment Number* is shown in the top of the display, the *Description* is shown next, and the setting, in the bottom of the display. Access and control is provided from switches located on the inside of the coin door.

Game adjustments are accessed from the audit mode. With the audits displaying **AUDIT 1** and the **FORWARD/REVERSE** switch in the **REVERSE** (down) position, depress the **STEP** switch and **ADJUSTMENT 99** is shown at the top of the display, *Factory Restore* is shown in the middle of the display, and **NO** is shown in the bottom of the display. With the audits displaying **AUDIT 10** or **99** and the **FORWARD / REVERSE** switch in the **FORWARD** (up) position, depress the **STEP** switch and **ADJUSTMENT 1** is shown in the top of the display, *Replay/Manual* is shown in the middle of the display, and the setting is shown in the bottom of the display.

With the **FORWARD / REVERSE** switch in the **FORWARD** (up) position, depressing the **STEP** switch advances through the game adjustments one at a time. With it in the **REVERSE** (down) position, the **STEP** switch selects lower-numbered adjustments. To rapidly scroll through adjustments, hold the **STEP** switch depressed. Adjustment values are changed by operating the **GAME START** push-button. The **FORWARD / REVERSE** switch setting determines whether the values are increased or decreased. (With the **FORWARD / REVERSE** switch up, the value increases, with it down, the value decreases). When the **STEP** switch is depressed the display indicates **REQUEST INSTALLED**.

Replay And Generic Features

Replays may be adjusted either for fixed levels or for a system-adjusted manual percentage of replay awards. Four levels may be selected. Adjustments allow awarding of a credit or an extra ball as each level is exceeded. With the manual percentage feature, if the actual replay percentage is higher or lower than that desired, the game computes new recommended manual percentage score(s). When the coin door is subsequently opened the player displays indicate the recommended level and a sound is made to alert the operator of a potential change. This new level is entered into adjustments simply by pressing the game start push-button. (If the coin door is closed or you enter audits/adjustments or diagnostics, the replay level is not changed.)

Adjustments - 'Replays' (Adj. 1 - 6)

Adj.#	Adjustment Name	Adjustment Definition
Adj. 1	Replays: Fixed/Manual	Adjust for percentage of awards for Replay Levels (1% through 50%). Proceed to Adj. 2 & 3 for Starting Replay Levels. Lower the automatic value to 0% and the display will indicate Fixed. Proceed to Adj. 2 & 3 for Fixed Replay Levels.
Adj. 2	Starting Replay Score	Adjust the Starting Replay 1 setting to between 100M and 9.99M.
Adj. 3	Replay Levels	Adjust the number of replay levels to be active (1 to 4). Any additional starting replay levels are automatically set to values higher than Replay 1. Adjust Replay 1 level to between 100M and 9.99M. (Same as Start Replay). If Adj. 3 is set for 2, 3, or 4, adjust Replay 2, 3, or 4 (respectively) level to between 100M & 9.99M.
Adj. 4	Replay Award	Set for replays to award: CREDIT, EXTRA BALL, NONE or SPECIAL (When score threshold is achieved, a Playfield Special is lit.)
Adj. 5	Free Game Limit	Adjust the max. # of free games that may be accumulated per game; 0 - 9 .
Adj. 6	Extra Ball Limit	Adjust the max. # of extra balls that may be accumulated per game; 1- 9 or OFF .

MARY SHELLEY'S FRANKENSTEIN

Game Adjustment Table

Adj. N°	Description	Factory Setting	Adj. N°	Description	Factory Setting
1	REPLAYS: FIXED/MANUAL	10%	33	FLASH LAMP POWER	Normal
2	STARTING REPLAY SCORE	900M	34	COIL PULSE POWER	Normal
3	REPLAY LEVELS †	1	35	GUARANTEED GAME TIME	0:00
4	REPLAY AWARD	Credit	36	NEXT GAME PROMOTION	Off
5	FREE GAME LIMIT	5	37	BUYIN TYPE	XBall
6	EXTRA BALL LIMIT	3	38	EXTRA BALL BUYIN COUNT	1
7	GAME DIFFICULTY †	Mod.	39	GAME RESTART	Yes
8	GAME PRICING †	USA 7	40	EXTRA BALL PERCENTAGE	25%
9	RESET COIN AUDITS	No	41	BACKGROUND MUSIC VOLUME	100%
10	RESET GAME AUDITS	No	42	BILL VALIDATOR	No
11	RESTORE HIGH SCORES	No	43	TOURNAMENT MODE	Off
12	EXPAND ADJUSTMENTS?	No	44	EXTERNAL REPLAY KNOCKER	Off
13	MATCH PERCENTAGE	09%	45	SPECIAL MEMORY	Yes
14	BALLS PER GAME	3	46	LASER KICK PRESENT	Yes
15	TILT WARNINGS	1	47	LASER KICK CRITERION	Mod.
16	REPLAY BOOST	Yes	48	GORE ALLOWED	Yes
17	CREDIT LIMIT	30	49	EASY MULTIBALL START	YES
18	ALLOW HIGH SCORES	Yes	50	MULTIBALL RESTART	Easy
19	AWARD FOR HIGH SCORE #1	3	51	ENABLE CREATURE THROW	Yes
20	AWARD FOR HIGH SCORE #2	1	52	CREATURE THROW PULSE	Normal
21	AWARD FOR HIGH SCORE #3	1	53	MULTIBALL DIFFICULTY	Mod.
22	AWARD FOR HIGH SCORE #4	0	54	EXTRA BALL MEMORY	Yes
23	DEFAULT HIGH SCORE #1	2.4M	55	RAMP MEMORY	Yes
24	DEFAULT HIGH SCORE #2	2.1M	56	EASY 2-BALL START	No
25	DEFAULT HIGH SCORE #3	1.95M	57	SOFTWARE METER	00
26	DEFAULT HIGH SCORE #4	1.8M	58	LOCATION ID	0
27	DEFAULT HIGH SCORE #5	1.65M	59	GAME ID	0
28	DEFAULT HIGH SCORE #6	1.5M	60	RESET PRINTER?	No
29	HSTD RESET COUNT	700	61	PRINTER INTERFACE	Press Start To Print
30	FREE PLAY	No	62	A.L.I.S.O.N. INTERFACE	See Adj. Definition
31	CUSTOM MESSAGE	Enable			
32	ATTRACT MODE MUSIC	On	99	Factory Restore	No

† Some settings result in Drop-Down Tables.
Review the following pages which define all of
the above adjustments.

Game Difficulty (Adj. 7)

Adj.#	Adjustment Name	Adjustment Definition
-------	-----------------	-----------------------

Adj. 7 Game Difficulty

Any one of five INSTALL settings for this adjustment may be activated to automatically select settings for multiple adjustments affecting game difficulty. Use the Start button to choose the difficulty level you require and press the step button to activate the setting. After activation, the individual adjustments may be readjusted if desired. Refer to Install Adjustment Table for details.

Set to EXTRA EASY, EASY, FACTORY, HARD or EXTRA HARD.

(Note: Additional game features are not adjustable in by the Expanded Adjustments may also change using this setting.)

Install Adjustments	Adj. 7 Extra Easy	Adj. 7 Easy	Adj. 7 Moderate	Adj. 7 Hard	Adj. 7 Extra Hard
(49) Multiball Restart	EXTRA EASY	EASY	EASY	HARD	EXTRA HARD
(51) Multiball Difficulty	EXTRA EASY	EASY	MODERATE	HARD	EXTRA HARD
(52) Extra Ball Memory	YES	YES	YES	YES	NO
(53) Ramp Memory	YES	YES	YES	NO	NO

NOVELTY / 5-BALL / ADD-A-BALL SETTINGS

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

Novelty Play Rules - Set to establish recommended settings for no free play or extra balls:

Adj.	Adj. Name	Setting	Adj.	Adj. Name	Setting
1	Replays: Fixed/Manual	Fixed	6	Extra Ball Limit	00
3	Replay Levels	None	13	Match Percentage	Off
4	Replay Award	None	19	Award for High Score #1	03
5	Free Game Limit	00	20	Award for High Score #2	01

5-Ball Play Rules - Set to establish recommended settings for 5-ball play:

Adj.	Adj. Name	Setting	Adj.	Adj. Name	Setting
1	Replays: Fixed/Manual	07%	6	Extra Ball Limit	03
2	Starting Replay Score	1,500,000,000	13	Match Percentage	04
3	Replay Levels	01	14	Balls Per Game	05
4	Replay Award	Credit	19	Award for High Score #1	03
5	Free Game Limit	05	20	Award for High Score #2	01

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

Adj.	Adj. Name	Setting	Adj.	Adj. Name	Setting
4	Replay Award	Extra Ball	18	Allow High Scores	No
5	Free Game Limit	00	19-22	Award for High Score #1 - #4	00
13	Match Percentage	Off			

TOURNAMENT MODE SETTINGS

Adj. 43, Tournament Mode determines the default conditions to quickly prepare a game for tournament play. When this setting is changed all audits will be reset and all adjustments will be initiated to the particular style selected. The game will then return to game over attract mode, as if a Factory Restore had been performed. **NONE** - Same as a Factory Reset conditions. **IFPA-Straight 50¢ play**, no replay, no Extra Ball, no High Scores, 2 Tilt Warnings and No Match. **PINBALL EXPO-PAPA**- Same as IFPA settings except Free Play is enabled. **HOME**-Sets game for Free Play, extra ball play, no replay, 10% Match & Extra Ball percent 30%.

Game Pricing (Adj. 8)

There are two methods available for coin switch programming; Standard and Custom. Standard pricing uses a single adjustment (Adj. 8) to select a pricing scheme shown in the **Custom & Standard Pricing Tables**. Custom pricing is used to select additional pricing schemes defined by a Drop Down Menu.

With Adj. 8 set to **CUSTOM** operating the step button again initiates a drop down menu representing coin switch pulses for the left, right, center and fourth coin slots. The prescribed the number of pulses are required for one credit. For example, if *Left Coin Pulses*, was set to 02 and *Coin Switch Pulses Required for 1 Credit*, to 01 a coin in the left slot would produce two credits. Further, if *Left Coin Pulses*, was set to 01 and *Coin Switch Pulses Required for 1 Credit*, to 02, two coins in the left slot would be required for one credit.

Coin Switch Pulses Required for Bonus Credit may be set to post bonus credits when a minimum amount of coins are inserted at one time. For example, if *Left Coin Pulses* was set to 01, *Coin Switch Pulses Required for 1 Credit* to 01 and *Coin Switch Pulses Required for Bonus Credit* to 04, one credit would be posted for each of the first three coins in the left slot and two credits for the fourth coin.

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

Left Coin Switch Pulses - Set the number of pulses registered for closure of the left coin switch; 00 to 99.

Right Coin Switch Pulses - Set the number of pulses registered for closure of the right coin switch; 00 to 99.

Center Coin Switch Pulses - Set the number of pulses registered for closure of the center coin switch; 00 to 99.

4th Coin Switch Pulses - Set the number of pulses registered for closure of the fourth coin switch; 00 to 99.

Coin Switch Pulses Required for 1 Credit - Set the number of coin switch pulses required to post one credit; 00 to 99.

Coin Switch Pulses Required for Bonus Credit - Set the number of coin switch pulses required to award the 1st bonus credit(s); 00 to 99.

Coin Switch Pulses Required for 2nd Bonus Credit - Set the number of coin switch pulses required to award the 2nd bonus credit; 00 to 99.

Credits awarded for 1st Bonus - Set the number of credits awarded for achieving the first Bonus level; 00 to 99.

CUSTOM PRICING TABLE													
Coin Mechs				Plays/Coins	Adjustments								
Left	Right	Center	4th		Left Pulses	Right Pulses	Mid Pulses	4th Pulses	Pulses /Credit	Pulses /Bonus	Pulses /2nd BONUS	Credit /1st BONUS	
25¢	25¢	\$1.00	N/U	1/25¢ 3/50¢	01	01	04	00	01	02	00	01	
				1/25¢ 5/\$1.00	01	01	04	00	01	04	00	01	
				1/25¢ 6/\$1.00	05	05	20	00	04	20	00	01	
5SCH	10SCH	10SCH	N/U	1/10 S	01	02	02	00	02	00	00	00	
				1/10 S 4/30 S	04	08	08	00	06	00	00	00	
10p	£1	50p	20p	1/30p 2/50p	01	15	06	02	03	00	00	00	
				5/£1	01	15	05	02	05	00	00	00	
				1/50p 3/£1	01	12	05	02	03	00	00	00	
				1/30p 4/£1									
20¢	\$1.00	N/U	N/U	1/60¢ 2/\$1.00	01	05	00	00	03	05	00	01	

Standard Pricing Table

Adj. 8 Standard Pricing Select	Coin Mechanisms				Pricing Scheme Explained			
	Left	Center	Right	Right	Number of "Plays" for Price Amount Shown			
	1st	2nd	3rd	4th				
USA 1	25¢	\$1	25¢		1/25¢			
USA 2	25¢	\$1	25¢		1/50¢	2/75¢	3/\$1	
USA 3	25¢	\$1	25¢		1/50¢			
USA 4	25¢		25¢		1/50¢			
USA 5	25¢	\$1	25¢		1/50¢	5/\$2		
USA 6	25¢	\$1	25¢		1/50¢	2/"4X25¢"	3/\$1 (bill)	Used to promote Bill Validator
USA 7 ★	25¢	\$1	25¢		1/50¢	4/\$1.50	6/\$2	
Austria	5S	10S	10S		1/10S	2/15S	3/20S	
Australia	20¢	\$A 1	\$A 2		1/\$A 1	3/\$A 2		
Australia 2	20¢	\$1	\$2		1/\$1	2/\$2		
Belgium	5 BF	20 BF	50 BF		1/20 BF	3/50 BF		
Canada	25¢	25¢	Can\$ 1		1/50¢	2/75¢	3/Can\$ 1	
Denmark 1	1DKr	5 DKr	10 DKr	20 DKr	1/3 DKr	2/5 DKr		
Denmark 2	1DKr	5 DKr	10 DKr	20 DKr	1/2 DKr	3/5 DKr	7/10 DKr	
Finland	1Fmk	5Fmk			1/3Fmk	2/5Fmk		
France 1 ★	1 Fr	5 Fr	10 Fr	20 Fr	1/3 Fr	2/5 Fr	5/10 Fr	11/20 Fr
France 2	1 Fr	5 Fr	10 Fr	20 Fr	1/5 Fr	3/10 Fr	7/20 Fr	
France 3	1 Fr	5 Fr	10 Fr	20 Fr	1/3 Fr	2/5 Fr	4/10 Fr	9/20 Fr
Germany 1	1DM	2DM	5DM		1/1 DM	5/5DM		
Germany 2	1DM	2DM	5DM		1/1DM	6/5DM		
Germany 3 ★ †	1DM	2DM	5DM		1/2DM	2/3DM	3/4DM6	6/6DM
Greece	50Dr		100Dr		1/50Dr	3/100Dr		
Holland (See Netherlands 2)								
Hungary	10 Ft	10 Ft	20 Ft		1/20 Ft	3/40 Ft		
Italy 1	500 Lit		500 Lit		1/500 Lit			
Italy 2	500 Lit		500 Lit		1/1000 Lit	3/2000 Lit		
Japan			100¥		1/100¥	3/200¥		
Korea	100Won		100Won		1/100Won			
Netherlands 1	1 Fls.	1 Fls.	2.5 Fls.		1/1Fls.	3/2.5 Fls.		
Netherlands 2 ★	1 Fls.	2.5 Fls.	5 Fls.		1/1Fls.	3/2.5 Fls.	6/5 Fls.	
New Zealand 1	\$NZ 1		\$NZ 2		1/\$NZ 1	2/\$NZ 2		
New Zealand 2	\$NZ 1		\$NZ 2		1/\$NZ 1	3/\$NZ 2		
Norway 1 †	5 NKr	10 NKr	20 NKr		1/5 NKr	2/10 NKr	4/20 NKr	
Norway 2 †	5 NKr	10 NKr	20 NKr		1/10 NKr	3/20 NKr		
Spain	100Pts		500Pts		1/100Pts	6/500Pts		
Sweden	1 SKr	5 SKr	10 SKr		1/10 SKr	2/15 SKr	3/20 SKr	
Switzerland 1 ★	1 SwF	2 SwF	5 SwF		1/1 SwF	6/5 SwF		
Switzerland 2	1 SwF	2 SwF	5 SwF		1/1 SwF	3/2 SwF	9/5 SwF	
UK 1	10p	50p	1£	20p	1/50p	3/1£		
UK 2	10p	50p	1£	20p	1/40p	3/1£		
UK 3 ★	10p	50p	1£	20p	1/50p			
Yugoslavia	5 Din		5 Din		1/5 Din			

★ Default Factory Setting. † New Settings.

Additional Generic Features (Adj. 9 - 30)

Adj.#	Adjustment Name	Adjustment Definition
Adj. 9	Reset Coin Audits	When enabled (set to YES) all coin / paid credit totals will be reset to zero when STEP is depressed.
Adj. 10	Reset Game Audit	When enabled (set to YES) all audit totals except for Au. 1, Total Paid Credits, Au. 5-8, Coins thru ... Slot, Au. 9, Total Coins, Au. 10, Total Earnings, & Au. 11, Meter Clicks, will be reset to zero when STEP is depressed.
Adj. 11	Restore High Scores	When enabled (set to YES) the High Score Levels and associated initials will be restored to backup settings when STEP is depressed .
Adj. 12	Expand Adjustments?	When set to NO , depressing the STEP push-button advances directly to Adj. 99, FACTORY RESTORE . When set to YES , depressing the STEP push-button sequences through the expanded adjustments. When exiting from expanded adjustments, this function is reset to OFF for the next time that adjustments are required.
Adj. 13	Match Percentage	Set Match percent from 00% to 10% or OFF . At 00% the match display occurs at the end of the game but never awards a credit.
Adj. 14	Balls Per Game	Adjust the number of balls per game; 2 to 5 .
Adj. 15	Tilt Warnings	Adjust the number of plumb bob tilt switch closures before the ball in play is tilted; 1, 2, 3 or OFF .
Adj. 16	Replay Boost	Set to YES or NO . When set to YES , exceeding a replay will set a temporary replay level for each time a replay level is surpassed. This new level will equal the previous replay level (when the replay was awarded) plus 50 Million for each following game, until the replays have all been played. At this time the previous level is resumed.
Adj. 17	Credit Limit	Adjust the maximum number of credits that may be posted; 4 to 50 .
Note: There are four of the six high score levels with associated player initials that are displayed during the attract mode. This provides a high-score-to-date feature. When players exceed these levels, the player initials may be entered to replace the previous ones. These levels may be adjusted to award credits and to be reset to backup values after a selected number of games.		
Adj. 18	Allow High Scores	Set to enable or disable the four high score levels; 00 .
Adj. 19	Award for High Score #1	Adjust the number of awards (0 to 4) awarded for exceeding level 1 (the highest of the four levels).
Adj. 20	Award for High Score #2	Adjust the number of awards (0 to 3) awarded for exceeding level 2.
Adj. 21	Award for High Score #3	Adjust the number of awards (0 to 2) awarded for exceeding level 3.
Adj. 22	Award for High Score #4	Adjust the number of awards (0 to 1) awarded for exceeding level 4.
Adj. 23 - 28	Default High Score #1 - #6	Adjust the score level to which the world record, (level 1) (the highest of the four levels) may be altered. This adjustment is not affected by Adj. 29, <i>Reset High Score To Date</i> . Adjust the backup score to which levels 2 - 6 may be reset, respectively.
Adj. 29	HSTD Reset Count	HSTD (High Score To Date) . Adjust the number of games between automatic resets of high score levels to backup settings and ball time averager adjustments; 100 to 900 or OFF (no reset or adjustment).
Adj. 30	Free Play	When set to YES , no coins are required for games.

Additional Generic Features (Adj. 31 - 42)

Adj.#	Adjustment Name	Adjustment Definition
Adj. 31	Custom Message	When desired, this function is used to establish a custom message periodically displayed during the attract mode. Set the feature to CHANGE using the Credit button and depress STEP . The letter A is indicated in the first position in the display. Vary the letter by operating the left and right flippers. With the desired letter indicated, depress the CREDIT button to lock in the letter and advance to the next character. Repeat this procedure until the desired message is completed in the display. Press the STEP push-button switch to advance to Attract Mode Music (Adj. 32).
Adj. 32	Attract Mode Music	Set to ON or OFF . When set to ON , Attraction Music is played between games.
Adj. 33	Flash Lamp Power	Set to NORMAL , DIM or OFF . When set to NORMAL the Flash Lamps are active, when DIM the Flash Lamps impulse power is reduced by 25% and when OFF the Flash Lamps do not flash.
Adj. 34	Coil Pulse Power	Set to NORMAL , HARD or SOFT . When HARD the coil pulse power is increased by 12.5% of the normal pulse rate. When set to SOFT the coil pulse power is reduced by 12.5% of the normal pulse rate. These adjustments are provided to compensate for Low Line or High Line voltage conditions where the solenoids appear to kicking too weak or too hard.
Adj. 35	Guaranteed Game Time	Default is 0:00 . Set between 0:00 - 8:59 for minimum game time. If the last ball in play drains prior to what the game time is set for, another ball will be served into the shooter lane and normal play will continue. Subsequent balls will continue to do be served into the shooter lane if the last ball still drains prior to and up until minimum game time is satisfied.
Adj. 36	Next Game Promotion	Set to ON or OFF . When set to ON , the game, in attract mode will randomly display a short promotion for our next game. When set to OFF , the game in attract mode will not generate any sounds or graphics referring to the next game.
Adj. 37	Buyin Type	Set to Extra-Ball Buyin . When set to EB Buyin , the game is set to Extra Ball Buyin. When set to Feature Buyin , the game is set to Game Buyin. Set to OFF to make Buyin Type inoperative.
Adj. 38	Extra Ball Buyin Count	1, 0 or UNLIMITED . Default is 1 . Allows the operator to adjust the number of Extra Ball (EB) Buysins allowed after normal game play. See page 5 Extra Ball (EB) Buyin Feature.
Adj. 39	Game Restart	Set to YES or NO . When set to YES , a new game may be started during any ball after the first ball is completed. (Note-Pressing start during the first ball will add additional players.) When set to NO , the game disables the start button after the first ball until the final ball is in play.
Adj. 40	Extra Ball Percentage	Set from 0 to 50 . Allows the operator to adjust how frequently the Extra Ball feature is made available to the player.
Adj. 41	Background Music Volume	Set to 0, 25, 50, 75 or 100 percent. Allows the operator to adjust the background music volume independently from the normal game sounds.
Adj. 42	Bill Validator	Set to YES or NO . When set to YES , the display, in game attract mode, will show an <i>"Insert Bill Animation"</i> . When set to NO , the display, in game attract mode will show <i>"Insert Coin Animation"</i> .

Add'l Generic (Adj. 43-47/50/ 57-99) & Game Specific Features (Adj. 48-52/56)

Adj.#	Adjustment Name	Adjustment Definition
Adj. 43	Tournament Mode	Set to NONE , PINBALL EXPO , IFPA-PAPA or HOME . See page 21.
Adj. 44	External Replay Kicker	Set to ON or OFF . When set to ON , the operator can enable the kicker in the cabinet to drive an external device without the game giving a replay.
Adj. 45	Special Memory	Set to YES or NO . When set to YES , the lit 'Special' light will be retained in memory from ball to ball for the same player. When set to NO , the lit 'Special' light will go out at the end of each ball.
Adj. 46	Laser Kick Present	Set to YES . When set to YES , the game equipped with a Laser Kick Coil will work as usual. Set to NO , the game (if not equipped) or if desired, "Virtual Kick-Back" can be set, whereas if the ball drains through the left outlane and if " ALIVE " is lit, the ball will be returned to the Shooter Lane and automatically <i>kicked</i> into play.
Adj. 47	Laser Kick Criterion	Set to MODERATE , HARD or EXHARD . Default is MODERATE . When set to MODERATE , the Laser Kick is ON at the beginning of each new ball. Set to HARD , the Laser Kick (whether in active mode or not) carries over from the last ball in play. Set to EXHARD , the Laser Kick is OFF at the beginning of each ball.
Adj. 48	Gore Allowed	Set to YES . Set to YES = Rated R . Set to NO = Rated G .
Adj. 49	Easy Multiball Start	Set to YES . When set to YES this will lite both Scoops & Ramp for Multiball for 1st Multiball only. Set to NO , shoot Ramp to lite Multiball and shoot VUK to start.
Adj. 50	Multiball Restart	Set to EXEASY , EASY , MODERATE , HARD or EXHARD . Default is EASY . Determines how Multiball can restart.
Adj. 51	Enable Creature Throw	Set to YES or NO . When set to NO , the Creature's Arms & the Trap Doors are disabled. Use this adjustment if awaiting repair/parts.
Adj. 52	Creature Throw Pulse	Set to SOFT , NORMAL , or HARD . Default is NORMAL . Adjustment is needed <i>only</i> if Creature is throwing balls to hard or to weak.
Adj. 53	Multiball Difficulty	Determines how Multiball Difficulty is achieved.
Adj. 54	Extra Ball Memory	Set to YES or NO . When set to YES , the lit 'Extra Ball' light will be retained in memory from ball to ball for the same player. When set to NO , the lit 'Extra Ball' light will go out at the end of each ball.
Adj. 55	Ramp Memory	Set to YES or NO . When set to YES , the 'Completed Number of Ramps' will be retained in memory from ball to ball for the same player to achieve set awards. When set to NO , the 'Completed Number of Ramps' will be reset at the end of each ball.
Adj. 56	Easy 2-Ball Start	Set to YES or NO . When set to NO , VUK must be shot to start. Set to YES , a right orbit shot will start 2-Ball M-Ball on 1st M-Ball only.
Adj. 57	Software Meter	Provides the operator with the total number of Meter Clicks.
Adj. 58	Location ID	0 to 9999 . Allows the operator to assign a location or game identification (respectively) number to the audit print-out sheet. (Will not be affected by Factory Restore.)
Adj. 59	& Game ID	
Adj. 60	Reset Printer?	Provides the operator with the ability to reset the printer option.
Adj. 61	Printer Interface	Allows the operator to print by pressing the Start Button.
Adj. 62	A.L.I.S.O.N. Interface	Allows the operator to down load to a lap top and process the information. Special equipment is needed. This will replace Adj. 59.
Adj. 99	Factory Restore	Allows the operator to reset all adjustments to the factory settings.

GAME DIAGNOSTICS

Please note: If the Display Reads "**OPEN THE DOOR**," this indicates a faulty memory condition in RAM. Opening the Coin Door will initiate a Factory Restore, by opening the Memory Protect Switch. Check battery voltage at CMOS RAM with power off.

The Data East Pinball system provides tests for sounds, digital displays, lamps, switches, and solenoids. Each feature may be tested manually or automatically using the **STEP** and **FORWARD/REVERSE** push-button switches inside the coin door and the white "Clear Ticket" button located next to the Diagnostic Switches. The automatic tests may be used for a quick verification of automatic test functions and the manual tests, for troubleshooting.

During game play, activation of switches and operation of coils with associated switches are monitored. If a switch is not made for 50 games it is considered faulty. When operation of a coil should close or open a switch and does not, the coil is considered faulty. In Game Over Attract Mode, faulty switches and coils (if any) are reported (See Tech Alert description below). Note that reporting of an unused switch does not constitute a problem and that a bad coil could mean that the associated switch requires adjustment.

Wiring to switches, solenoids and controlled lamps uses color-coded wires that basically follows a resistor color-code scheme for the eight rows and eight columns. During the switch tests and during the discrete lamp test, identification of the color of the row and column wires are indicated in the Dot Matrix Display. For example, making the right coin switch during the Switch Test results in the switch functional name (RIGHT COIN), the row (WHT-YEL) and column (GRN-BRN) wire color codes, and the switch number are shown in the display.

Color Abbreviations Used:

0	BLK = BLACK	3	ORN = ORANGE	6	BLU = BLUE	9	WHT = WHITE
1	BRN = BROWN	4	YEL = YELLOW	7	VIO = VIOLET		
2	RED = RED	5	GRN = GREEN	8	GRY = GREY		

Additional Abbreviations/Acronyms Used:

X	"Times" (Multiplier)	P/F	Playfield	D.T.	Drop Target(s)
LT	Left	S-U	Stand-Up (Targets)	PPB	Playfield Power Board
RT	Right	Au.	Audit(s)	SSFB	Solid State Flipper Board
BOT	Bottom	Adj.	Adjustments	PSB	Power Supply Board
MID	Middle	G.I.	General Illumination	SMB	Shaker Motor Board
CT	Center	R/O	Rollover (Switches)	N.C.	"Normally Closed"

Entering Diagnostics

With the game in the game-over mode, open the coin door and make sure that the **FORWARD/REVERSE** push-button switch is set to **REVERSE** (down) and depress the **STEP** push-button switch. The Player displays will show the toll-free Customer Service number 1-800-KICKERS, that is 1-800-542-5377 (U.S. including Illinois) and the toll number (708) 345-7700 (Outside the United States). This indicates entry into game diagnostics.

Service Credits

With the phone number displayed depress the **STEP** push-button switch. The game now gives the technician the option of adding 1 to 5 service credits. These credits allow the technician to test-play the game without adding any counts to the coin audits (Au. 01 & Au. 05 - 08). When the message appears, press and hold the Game Start pushbutton until the desired number of credits are shown on the display. Then press the step button again to add these credits to the game and enter Tech Alert. If no Service Credits are desired, press the step button with the initial message displayed.

Tech Alert

The display will now indicate if there are any faulty switches (i.e., Switches that are normally closed but remain open or open switches that have not been closed (activated) in 50 games.

Easy Trough Clear

Pressing the step button again displays the **EASY TROUGH CLEAR** message and instructs the technician to operate either flipper button to easily remove the balls from the trough. This is provided to allow the technician a simple method of removing the balls from the trough prior to entering the Active Switch Test, thereby reducing the number of switches closed. Also, to test functionality of trough, ensure proper trough operation.

Burn-In Minutes

Pressing the step button while in Tech Alert mode will step game into Burn-in Mode (factory use). At this stage pressing the game start button will cause the game to exercise all CPU I/O Functions. This is provided to constantly exercise sounds, solenoids, etc...

To stop the test press the start button again. Cumulative Burn-In minutes will be displayed. To reset Burn-In minutes to 00, you must perform an Audit Reset (Adj. 10) or a Factory Restore (Adj. 99).

Sound Tests

The Data East Pinball sound system produces true digital stereo sound on left and right speakers and mono on a center speaker. During Sound tests, the display shows the sound board circuit under test and the corresponding sounds are selected by operating the left and right flipper buttons to choose the circuit to be tested. Now press the start button to initiate the sound. Refer to the Sound Test Chart for the sound circuits displayed and the sounds produced.

The sound functions allow verification that all channels are functioning properly and that the speaker connections are correct. Speaker Phase Testing Procedures follow for checking speaker connections.

Sound Test Chart

Auto/Manual Tests	Sounds Produced	Auto/Manual Tests	Sounds Produced
Left Speaker	LEFT SINE	Voice Rom2 (Loc U21)	SPEECH PATTERN 2
Both Lt & Rt Speakers	CENTER SINE	Voice Rom3 (Loc U36)	SPEECH PATTERN 3
Right Speaker	RIGHT SINE	Music Test (Sound Rom, Loc U7)	LEVEL 1-3 MUSIC
Voice Rom1 (Loc U17)	SPEECH PATTERN 1		

Speaker Phase Testing

Connections to each of the three 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 two, 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 Left, Center, and Right Sine functions. If the Center Sine produces more volume and bass than the Left and Right Sines, 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 single-color wire (BLK, YEL or RED) is connected to the negative (-) terminal.
2. Disconnect the speaker output connector from the 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 (CN1- Pin 1, 3 or 6) each time. As the connection is made, check speaker cone movement; proper connections are indicated by outward movement.

Dot Matrix Display

The display utilizes a Micro-Processor Control Board mounted in piggyback fashion to the Dot Matrix Display Driver Board. The purpose behind this board is to provide more information (192 X 64 Dots) to the operator as well as displaying graphics to the player.

The board is controlled by a 68000 Microprocessor and its personality ROMs (Unique to the Game). It receives Data, Reset & Clock Information from the CPU 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.

Dot Matrix Display Test

To enter Dot Matrix Display Test, operate the STEP push-button switch after the Speaker Phase Test. The display will immediately illuminate one vertical column of dots, turning it off and illuminating the next column, until each column has been individually lit, while the other columns are off. It will make one pass. The display will then illuminate the top horizontal row of dots, and test by lighting the row of the display, then turning it off and illuminating the next row, until each row has been individually lit, while the other rows are off. The test will then illuminate all the dots in the display, except for one column. It will cycle this blank column from left to right for one pass. The display will then again illuminate all the dots except for the top row, and then turning it on and blanking the next row, until each row has been individually blanked, while the other rows are on. It will cycle this blank row for one pass. The next test begins with every other dot lit, in both the rows and columns. These dots then go out, and the unlit dots light, resulting in an alternating checkerboard pattern for approximately 4 seconds. An intensity test is also displayed at 30%, 70% & 100% brightness. The test will repeat these cycles indefinitely until advanced to the next test or until the power is removed. (Please Note: These tests may be interrupted at any time by operating the STEP push-button switch to advance to the next test.)

Creature Head Motion Test

To enter this test, operate the STEP push-button switch after above test. To initiate test, press the Start Button. The CPU sends instructions to the Servo Controller Board which triggers pre-recorded routines stored in the Micro-Controller on the Servo Board. The Head Motion should be the same as it is in game play.

Laser Kick Test

This test is provided to insure proper interaction between certain switches and their associated solenoids without entering game play. For example, by rolling the ball over the left outlane switch, the Laser Kick should fire. If it kicks too 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. (Note: During this function, similar tests may be performed on the Vertical Up Kickers or Ejects in the game.)

SWITCH TESTS

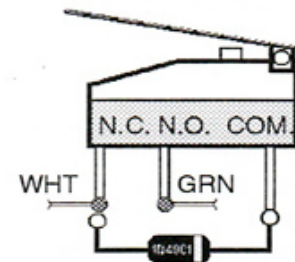
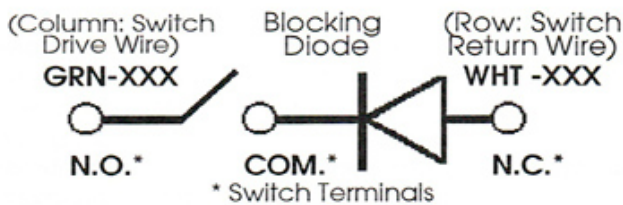
Switches are configured in an 8 x 8 matrix of columns (switch drives) and rows (switch returns) with up to 64 switches possible. The switch tests include three parts; switch test, active switches, and bad switches. Column and Row wire colors are indicated in each test using corresponding resistor color code numbers.

Switch Test

To initiate, push the STEP push-button switch, until the display indicates **SWITCH TEST**. Close each switch and observe the display. The display will indicate the switch name, column wire colors, row wire colors and the switch number. When a switch is released, the name and number disappear until another switch is closed or the test is exited.

Active Switches

Push the STEP push-button switch from the Switch Test. The display will indicate **ACTIVE SWITCHES**. If any switches are stuck closed (or made from the presence of a ball), the display sequences through switch names, and indicates the row and column wire colors, and the switch numbers are indicated in the display. This cycle continues until all switches are cleared or until the STEP push-button switch is depressed.



SWITCH MATRIX CHART

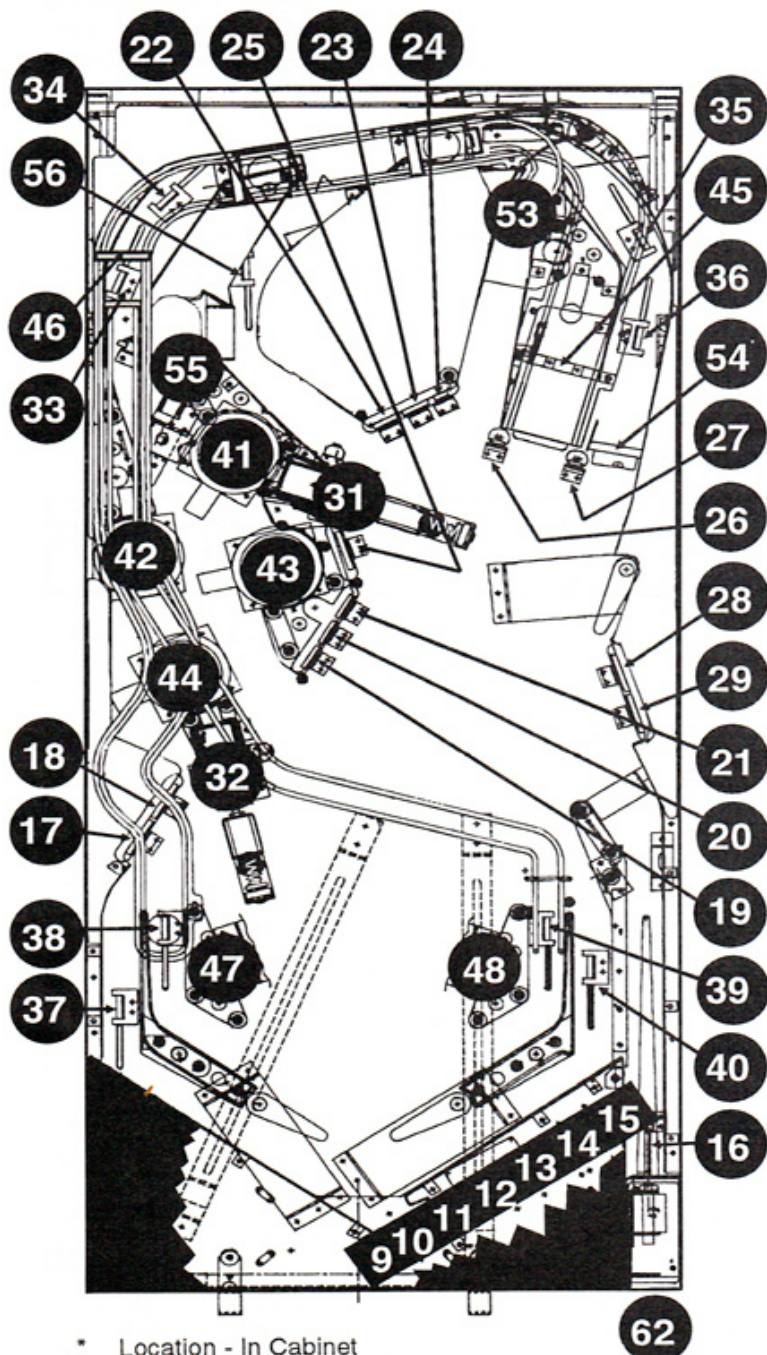
Diode 1N4001

Column (Drive)	1 Q55 GRN-BRN CN8-1	2 Q54 GRN-RED CN8-2	3 Q53 GRN-ORN CN8-3	4 Q52 GRN-YEL CN8-4	5 Q51 GRN-BLK CN8-5	6 Q50 GRN-BLU CN8-7	7 Q49 GRN-VIO CN8-8	8 Q48 GRN-GRY CN8-9
Row (Return)								
1 WHT-BRN CN10-9	Plumb Tilt 1	#1 (Left) Ball Trough 9	Bottom 2-Bank S-U Left "F" 17	Mid. 1-Bank S-U "Move Jackpot" 25	Left Orbit Rollover Bottom 33	Top Turbo Bumper 41	Not Used 49	Not Used 57
2 WHT-RED CN10-8	4th Coin 2	#2 Ball Trough 10	Bottom 2-Bank S-U Right "R" 18	Ramp 1-Bank S-U Left "T" 26	Left Orbit Rollover Top 34	Mid. Left Turbo Bumper 42	Not Used 50	Not Used 58
3 WHT-ORN CN10-7	Credit Button 3	#3 Ball Trough 11	Middle 3-Bank S-U Bot. "A" 19	Ramp 1-Bank S-U Right "E" 27	Right Orbit Rollover Top 35	Mid. Right Turbo Bumper 43	Not Used 51	Not Used 59
4 WHT-YEL CN10-6	Right Coin 4	#4 Ball Trough 12	Middle 3-Bank S-U Mid. "N" 20	Right 2-Bank S-U Top "I" 28	Right Orbit Rollover Bottom 36	Bottom Turbo Bumper 44	Not Used 52	Not Used 60
5 WHT-GRN CN10-5	Center Coin 5	#5 Ball Trough 13	Middle 3-Bank S-U Top "K" 21	Right 2-Bank S-U Bot. "N" 29	Left Outlane Rollover 37	Ramp Entrance Gate 45	"North Pole" VUK 53	Not Used 61
6 WHT-BLU CN10-3	Left Coin 6	#6 Ball Trough 14	Top 3-Bank S-U Left "E" 22	Not Used 30	Left Return Lane Rollover 38	Ramp Exit Gate 46	"Ingolstadt" Rt. Orbit Spinner 54	"The Switch" Lever 62
7 WHT-VIO CN10-2	Slam Tilt 7	#7 (Right) Ball Trough 15	Top 3-Bank S-U Mid. "N" 23	Sarcophagus Upper Scoop 31	Rt. Return Lane Rollover 39	Left Slingshot 47	"Ice Cave" above Ball Eject 55	Left Flipper Lower 63
8 WHT-GRY CN10-1	Extra Ball Button 8	Shooter Lane 16	Top 3-Bank S-U Right "S" 24	Geneva Lower Scoop 32	Right Outlane Rollover 40	Right Slingshot 48	Mini-Orbit Rollover By Eject 56	Right Flipper Uppr./Lwr. 64

Switch Matrix Locations, Descriptions & Switch Part Numbers†

Switch Matrix No. & Description	Part No.
1* Plumb Tilt (See Item 17, Cabinet Parts, Page 41)	
2* 4th Coin (On Coin Door)	---
3* Credit Button (Left of Coin Door)	500-5097-02
4* Right Coin (On Coin Door)	180-5024-00
5* Center Coin (On Coin Door)	180-5024-00
6* Left Coin (On Coin Door)	180-5024-00
7* Slam Tilt	180-5022-00
8* Extra Ball Button (Under 03)	180-5073-00
9 #1 (Left) Ball Trough	180-5119-00
10 #2 Ball Trough	180-5119-00
11 #3 Ball Trough	180-5119-00
12 #4 Ball Trough	180-5119-00

Switch Matrix No. & Description	Part No.
13 #5 Ball Trough	180-5119-00
14 #6 Ball Trough	180-5119-00
15 #7 (Right) Ball Trough	180-5118-00
16 Shooter Lane	180-5100-01
17 Bottom 2-Bank Stand-Up Left " F "	515-6027-08
18 Bottom 2-Bank Stand-Up Right " R "	515-6027-08
19 Middle 3-Bank Stand-Up Bottom " A "	515-5162-08
20 Middle 3-Bank Stand-Up Middle " N "	515-5162-08
21 Middle 3-Bank Stand-Up Top " K "	515-5162-08
22 Top 3-Bank Stand-Up Left " E "	515-5162-08
23 Top 3-Bank Stand-Up Middle " N "	515-5162-08
24 Top 3-Bank Stand-Up Top " S "	515-5967-08
25 Middle 1-Bank S-U "Move Jackpot"	515-6027-08
26 Ramp 1-bank Stand-Up Left " T "	515-5967-08
27 Ramp 1-bank Stand-Up Right " E "	515-5967-08
28 Right 2-Bank Stand-Up Top " I "	515-6027-08
29 Right 2-Bank Stand-Up Bottom " N "	515-6027-08
30 Not Used	---
31 Sarcophagus Upper Scoop	180-5057-00
32 Geneva Lower Scoop	180-5057-00
33 Left Orbit Rollover Bottom	500-5706-00
34 Left Orbit Rollover Top	500-5706-00
35 Right Orbit Rollover Top	500-5707-00
36 Right Orbit Rollover Bottom	500-5707-00
37 Left Outlane Rollover	500-5707-00
38 Left Return Rollover	500-5707-00
39 Right Return Rollover	500-5707-00
40 Right Outlane Rollover	500-5706-00
41 Top Turbo Bumper	180-5015-01
42 Middle Left Turbo Bumper	180-5015-01
43 Middle Right Turbo Bumper	180-5015-01
44 Bottom Turbo Bumper	180-5015-01
45 Ramp Entrance Gate	180-5090-00
46 Ramp Exit Gate	180-5087-00
47 Left Slingshot	180-5054-00
48 Right Slingshot	180-5054-00
49 Not Used	---
50 Not Used	---
51 Not Used	---
52 Not Used	---
53 "North Pole" VUK	180-5116-00
54 "Ingolstadt" Right Orbit Spinner	180-5010-04
55 "Ice Cave" above Ball Eject	180-5027-01
56 Mini-Orbit Rollover by Eject	500-5706-00
57 Not Used	---
58 Not Used	---
59 Not Used	---
60 Not Used	---
61 Not Used	---
62 "The Switch" Lever	180-5111-00
63* Lower Left Flipper Cabinet via Q7 (Transistor) on SSFB	180-5124-01
64* Lower & Upper Right Flipper Cabinet via Q5 (Transistor) on SSFB	180-5124-01



* Location - In Cabinet

† Specify Game N° (36) & decal description if applicable.

LAMP TESTS

Controlled lamps are configured in an 8 x 8 matrix of columns (lamp drives) and rows (lamp returns) with up to 64 lamps possible. The lamp tests include four parts, all lamps, lamp return (row), lamp drive (column), and discrete (individual) lamps. Row and column wire colors are indicated in the discrete lamp test using corresponding resistor color code numbers.

All Lamps

From the Active Switch test, operate the STEP push-button switch. The dot matrix display will indicate ALL LAMPS and all controlled lamps will light.

Lamp Returns (Row)

From the ALL LAMPS test, depress the STEP push-button switch. The display indicates LAMP RETURNS, wire color and the LAMP RETURN driver transistor. All controlled lamps in row 1 should be lit. Operating the Game Start push-button switch cycles through each of the rows separately.

Lamp Drives (Column)

From the LAMP RETURNS test, depress the STEP push-button switch. The display will indicate LAMP COLUMNS, wire color and the LAMP DRIVES driver transistor. All controlled lamps in column 1 should be lit. Operating the Game Start push-button switch, cycles through each of the columns separately.

Lamp Test Continued of page 34

LAMP MATRIX CHART

Column 18V Row GND	1 Q71 YEL-BRN CN7-1	2 Q70 YEL-RED CN7-2	3 Q69 YEL-ORN CN7-3	4 Q68 YEL-BLK CN7-4	5 Q67 YEL-GRN CN7-6	6 Q66 YEL-BLU CN7-7	7 Q65 YEL-VIO CN7-8	8 Q64 YEL-GRY CN7-9
1 Q72 RED-BRN CN6-1	F 01	T 09	Franken- stein Mil- lions Mode 17	Ramp Jackpot 25	Left Out- Lane Alive Kick-Back 33	Move Jackpot 41	Not Used 49	Not Used 57
2 Q73 RED-BLK CN6-2	R 02	E 10	Stoning Mode 18	North Pole VUK Jackpot 26	Left Outlane Special 34	Change Scene 42	Not Used 50	Not Used 58
3 Q74 RED-ORN CN6-3	A 03	I 11	Creature Feature Mode 19	Ice Cave Ball Eject Jackpot 27	Left Return Lane Lite Ingolstadt 35	Ingolstadt Spinner Mode 43	Not Used 51	Not Used 59
4 Q75 RED-YEL CN6-5	N 04	N 12	Lynch Justine Mode 20	Left Orbit Jackpot 28	Rt. Return Lane Lite Geneva 36	Jackpot Grows 44	Not Used 52	Not Used 60
5 Q76 RED-GRN CN6-6	K 05	Top Turbo Bumper 13	North Pole Mode 21	Geneva Lower Scoop 29	Rt. Outlane Double Bonus 37	Justine Mode 45	Not Used 53	Not Used 61
6 Q77 RED-BLU CN6-7	E 06	Mid. Left Turbo Bumper 14	Lite Extra Ball Mode 22	Sarcopha- gus Upper Scoop 30	Ice Cave Mode 38	Extra Ball 46	Not Used 54	Not Used 62
7 Q78 RED-VIO CN6-8	N 07	Mid. Right Turbo Bumper 15	Voltage Mode 23	VUK Entrance Left 31	Lite Lock 1 39	Creature Mode 47	Live Again 55	Extra-Ball Button 63
8 Q79 RED-GRY CN6-9	S 08	Bottom Turbo Bumper 16	Graveyard Mode 24	VUK Entrance Right 32	Lite Lock 2 40	Shooter Lane 48	VUK Entrance Middle 56	Start Button 64

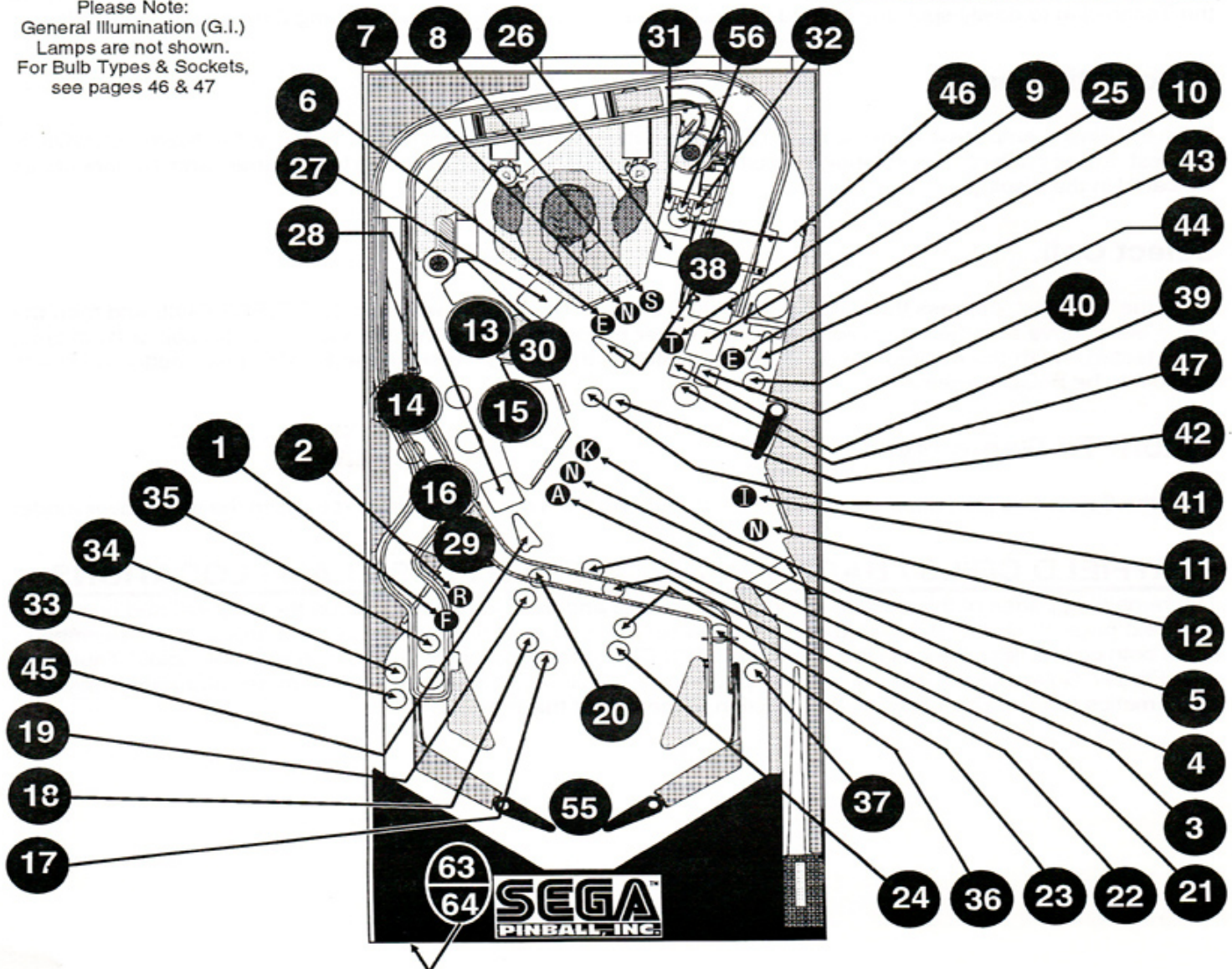
Lamp Matrix Location and Descriptions

Lamp Matrix No. & Description
01 F of : FRANKENSTEIN
02 R of : FRANKENSTEIN
03 A of : FRANKENSTEIN
04 N of : FRANKENSTEIN
05 K of : FRANKENSTEIN
06 E of : FRANKENSTEIN
07 N of : FRANKENSTEIN
08 S of : FRANKENSTEIN
09 T of : FRANKENSTEIN
10 E of : FRANKENSTEIN
11 I of : FRANKENSTEIN
12 N of : FRANKENSTEIN
13 Top Turbo Bumper
14 Middle Left Turbo Bumper
15 Middle Right Turbo Bumper
16 Bottom Turbo Bumper
17 Frankenstein Millions
18 Stoning Mode
19 Creature Feature Mode
20 Lynch Justine Mode
21 North Pole Mode

Lamp Matrix No. & Description
22 Lite Extra Ball Mode
23 Voltage Mode
24 Graveyard Mode
25 Ramp Jackpot
26 North Pole VUK Jackpot
27 Ice Cave Ball Eject Jackpot
28 Left Orbit Jackpot
29 Geneva Lower Scoop
30 Sarcophagus Upper Scoop
31 VUK Entrance Left
32 VUK Entrance Right
33 Left Outlane Alive Kick-Back
34 Left Outlane Special
35 Lt. Return Lane Lite Ingolstadt
36 Rt. Return Lane Lite Geneva
37 Right Outlane Double Bonus
38 Ice Cave Mode
39 Lite Lock 1
40 Lite Lock 2
41 Move Jackpot
42 Change Scene

Lamp Matrix No. & Description
43 Ingolstadt Spinner Mode
44 Jackpot Grows
45 Justine Mode
46 Extra Ball
47 Creature Mode
48 Shooter Lane
49 Not Used In This Game
50 Not Used In This Game
51 Not Used In This Game
52 Not Used In This Game
53 Not Used In This Game
54 Not Used In This Game
55 Live Again (Shoot Again)
56 VUK Entrance Middle
57 Not Used In This Game
58 Not Used In This Game
59 Not Used In This Game
60 Not Used In This Game
61 Not Used In This Game
62 Not Used In This Game
63 Extra-Ball Button (Buy-a-Ball)
64 Start Button

Please Note:
General Illumination (G.I.)
Lamps are not shown.
For Bulb Types & Sockets,
see pages 46 & 47



LAMP TESTS CONTINUED

Single Lamp

From the LAMP DRIVES test, depress the STEP push-button switch. The display will indicate the lamp name. The display indicates the row and column wire colors and the lamp matrix number. Lamp 01 should light. With the FORWARD/REVERSE push-button switch in the FORWARD (up) position, operating the Game Start push-button switch selects higher-numbered lamps; with it in the REVERSE (down) position, Game Start selects lower-numbered lamps.

FLASH LAMP / COIL TESTS

Twenty-Two regular (pulsed under microprocessor control) coil drivers are provided to switch ground to coils. The Left/Right Relay is used in conjunction with drives 1 through 8 to switch +32 volts between coils or flash lamps; these sets are termed "left" and "right". This relay is located on the PPB board which provides isolation diodes and current limiting resistors. This effectively provides 29 regular coils.

Flash Lamp

From the Single Lamp test, depress the STEP push-button switch. All Flash lamps will fire randomly. This allows the Technician to easily spot any burned out bulbs and replace them without stepping through the tests below.

Automatic Test

From the Flash Lamps test, depress the STEP push-button switch. The dot matrix display will indicate ALL COILS. The test pulses each regular solenoid or flash lamp sequentially with the coil/flash lamp names and the wire colors indicated in the display.

Select Coil

From the Coil Test, depress the STEP push-button switch. The display will indicate SELECT COIL and then the name of 1st drive and the wire colors. Operate either Flipper push-button switch to select the coil or flash lamp to be tested. With the desired drive number indicated in the display, depress the START push-button switch to cause it to be pulsed repeatedly.

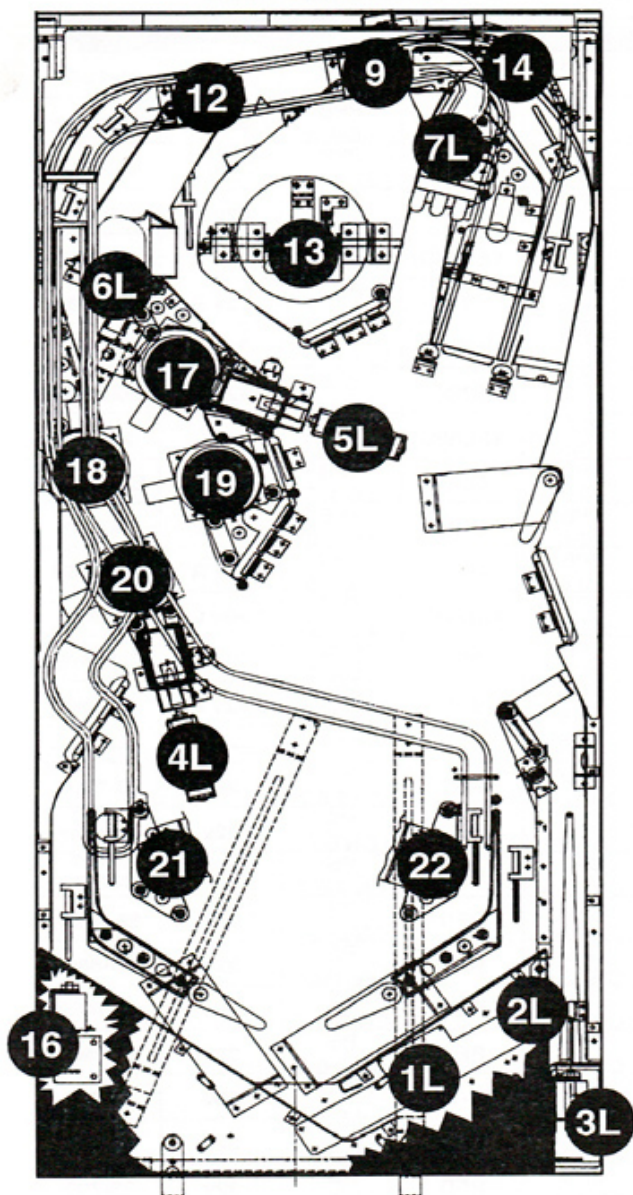
Return To Game Over

From the Select Coil test, depress the STEP push-button switch once. The game returns to the game-over mode.

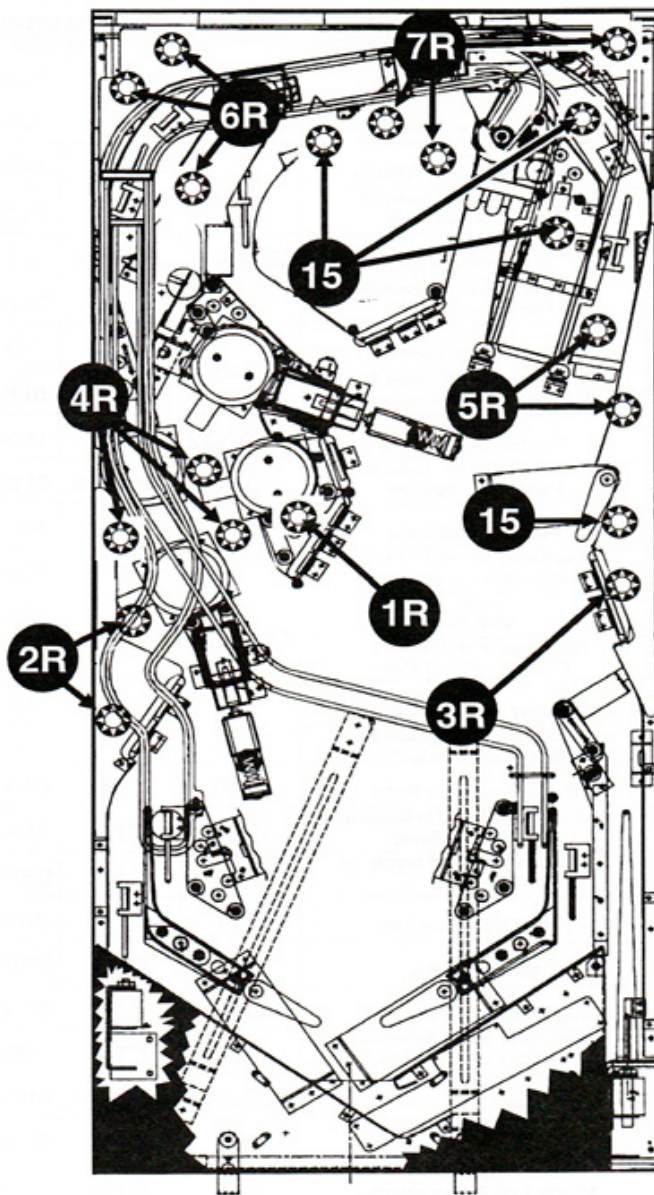
PLAYFIELD COILS / BACKBOX & PLAYFIELD FLASH LAMP LOCATIONS

The remaining pages of this section will identify the coils and flash lamp locations on the playfield and back box. The next page illustrates this with a mini-table naming each one. The last two pages of this section describe in detail both coils & flash lamps in the "Switched, CPU Controlled Auxillary & Constant Power Solenoids" Table and the "Flipper Solenoids" Table. The next page is the Coil Chart Schematic. For more information see the "Schematics / Troubleshooting" Yellow Section at the end of this manual.

Coil Locations

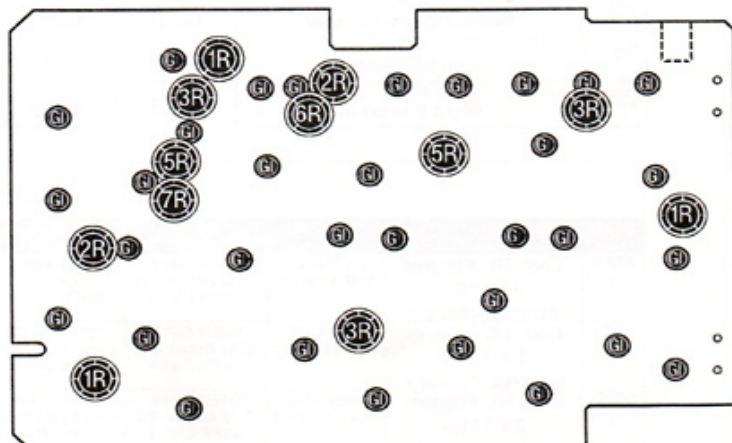


Flash Lamp Locations



1L	6-Ball Ass'y Lockout	8R	Not Used
1R	Flash above "A-N-K"	09	Ramp Trap Door Right
2L	Ball Eject to Shooter Lane	10	Left/Right (A/B) Relay
2R	Flashes above "F-R"	11	G.I. Relay
3L	Auto Launch 50v	12	Ramp Trap Door Left
3R	Flash above "I-N"	13	Monster Arms
4L	Bot. Scoop Kick-Blg 50v	14	Right Orbit Ball Diverter
4R	Flashes by Pop Bumpers	15	Flashes around VUK
5L	Top Scoop Kick-Blg 50v	16	Laser Kick 50v
5R	Flashes by Spinner	17	Top Turbo Bumper
6L	Playfield Ball Eject	18	Mld. Left Turbo Bumper
6R	Flashes Upper Left Corner	19	Mld. Right
7L	VUK 50v	20	Bottom Turbo Bumper
7R	Flashes around VUK	21	Left Slingshot
8L	Knocker 32v	22	Right Slingshot

Note: Shaded areas not shown on Diagrams.
G.I. = General Illumination Lamps



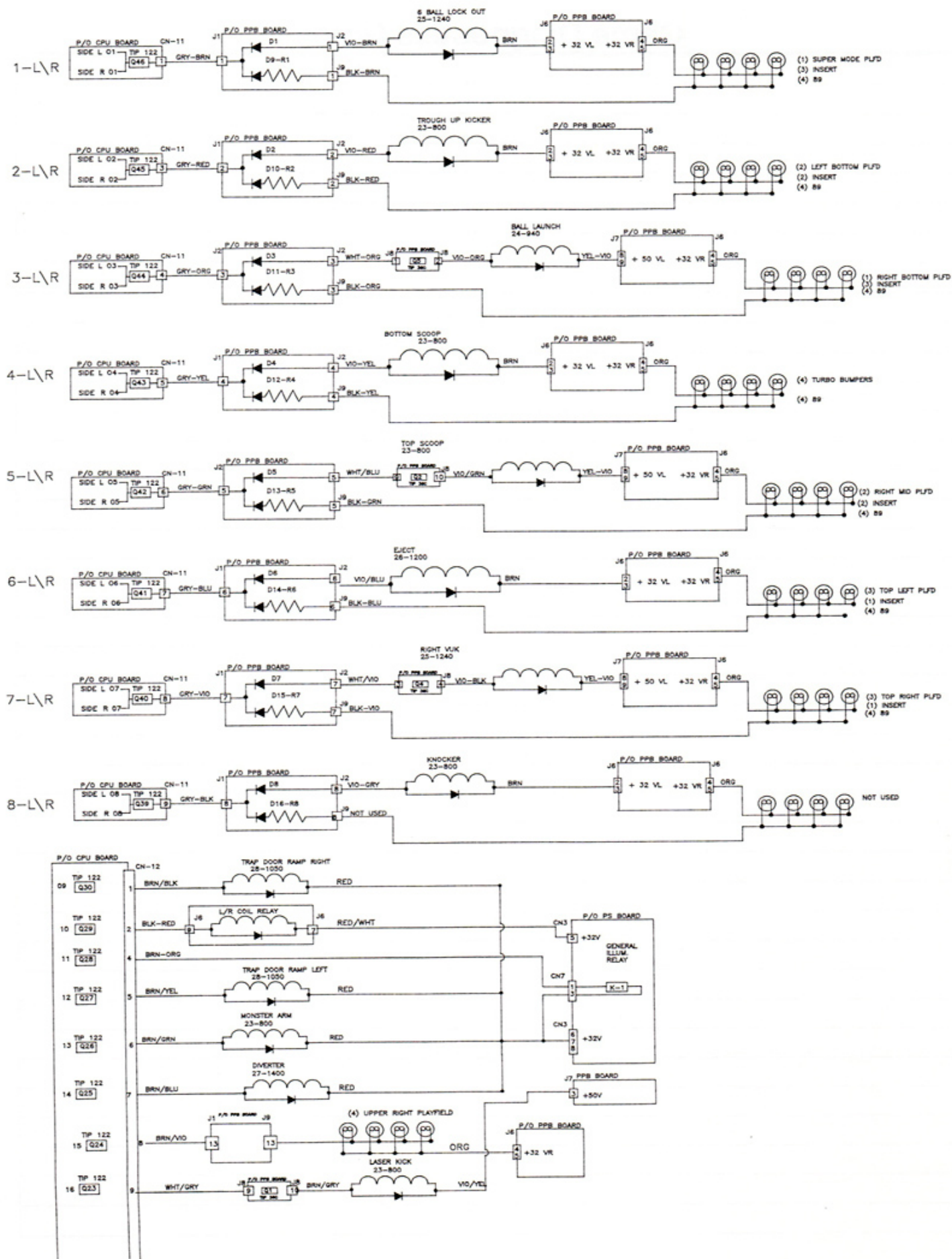
Backbox (Insert) Flash Lamps & G.I.s

Switched, CPU Controlled Auxillary & Constant Power Solenoids

Coil No.	Coil or Flashlamp Description	Drive Transistor (D.T.)	On Which Board?	D.T. Control Line	D.T. Control Line Connect	Power Line	Power Line Connection	Power Description	Coil or Flash Type
1L	Coil: 6-Ball Assembly Lockout	Q46	CPU	VIO-BRN	PPB J2-1	BRN	PPB J6-1, 2	32v L	25-1240
1R	Flashlamp: X1 P/F, Insert X3 Flash above "A-N-K"			BLK-BRN	PPB J9-1	ORN	PPB J6-4, 5	32v R	Bulb #89
2L	Coil: Trough Up-Kicker (TRUK)	Q45	CPU	VIO-RED	PPB J2-2	BRN	PPB J6-1, 2	32v L	23-800
2R	Flashlamp: X2 P/F, Insert X2 Flashes above "F-R"			BLK-RED	PPB J9-2	ORN	PPB J6-4, 5	32v R	Bulb #89
3L	Coil: Auto Launch 50v	Q44/Q5	CPU/PPB	VIO-ORN	PPB J8-2	YEL/VIO	PPB J7-8	50v L	24-940
3R	Flashlamp: X1 P/F, Insert X3 Flash above "I-N"	Q44	CPU	BLK-ORN	PPB J9-3	ORN	PPB J6-4, 5	32v R	Bulb #89
4L	Coil: Bottom Scoop Kick-Big	Q43	CPU	VIO-YEL	PPB J2-4	BRN	PPB J6-1, 2	32v L	23-800
4R	Flashlamp: X4 P/F, Insert X0 Flashes by Pop Bumpers			BLK-YEL	PPB J9-4	ORN	PPB J6-4, 5	32v R	Bulb #89
5L	Coil: Top Scoop Kick-Big	Q42/Q2	CPU	VIO-GRN	PPB J2-5	YEL/VIO	PPB J7-8	50v L	23-800
5R	Flashlamp: X2 P/F, Insert X2 Flashes by Spinner	Q42	CPU/PPB	BLK-GRN	PPB J9-5	ORN	PPB J6-4, 5	32v R	Bulb #89
6L	Coil: Playfield Ball Eject	Q41	PPB	VIO-BLU	PPB J2-6	BRN	PPB J6-1, 2	32v L	24-940
6R	Flashlamp: X3 P/F, Insert X1 Flashes Upper Left Corner		CPU	BLK-BLU	PPB J9-6	ORN	PPB J6-4, 5	32v R	Bulb #89
7L	Coil: VUK 50v	Q40/Q4	CPU	VIO-BLK	PPB J8-4	YEL/VIO	PPB J7-8, 2	50v L	24-940
7R	Flashlamp: X3 P/F, Insert X1 Flashes around VUK			BLK-VIO	PPB J9-7	ORN	PPB J6-4, 5	32v R	Bulb #89
8L	Coil: Knocker 32v (In Cabinet)	Q39	CPU	VIO-GRY	PPB J2-8	BRN	PPB J6-1, 2	32v L	23-800
8R	Flashlamp: X0 P/F, Insert X0 Not Used in this Game.			---	---	---	---	---	---
09	Coil: Ramp Trap Door Right	Q30	CPU	BRN-BLK	CPU CN 12-1	RED	PS CN 3-6, 7	32v	28-1050
10	Coil: Located on PPB in Backbox Left & Right Relay	Q29	CPU	BLK-RED	CPU CN 12-2	RED	PS CN 6-7	32v	24v DC 10A DPDT
11	Coil: Located on Power Supply Bd. G.I. Relay	Q28	CPU	BRN-ORN	CPU CN 12-4	RED	PS CN 3-6, 7	32v	24v DC 10A DPDT
12	Coil: Ramp Trap Door Left	Q27	CPU	BRN-YEL	CPU CN 12-5	RED	PS CN 3-6, 7	32v	28-1050
13	Coil: Monster Arms	Q26	CPU	BRN-GRN	CPU CN 12-6	RED	PS CN 3-6, 7	32v	23-800
14	Coil: Right Orbit Ball Diverter	Q25	CPU	BRN-BLU	CPU CN 12-7	RED	PS CN 3-6, 7	32v	27-1400
15	Flashlamp: X4 P/F, Insert X0 Flashes around VUK	Q24	CPU	BRN-VIO	CPU CN 12-8	RED	PS CN 3-6, 7	32v	27-1500
16	Coil: Laser Kick 50v	Q23/Q1	CPU/PPB	BRN-GRY	PPB J8-12	VIO-YEL	PPB J7-3	50v	23-800
17	Coil: Top Turbo Bumper	Q11	CPU	BLU-BRN	CPU CN 19-7	RED	PS CN 3-6	32v	23-700
18	Coil: Middle Left Turbo Bumper	Q9	CPU	BLU-RED	CPU CN 19-4	RED	PS CN 3-6	32v	23-700
19	Coil: Middle Right Turbo Bumper	Q8	CPU	BLU-ORN	CPU CN 19-3	RED	PS CN 3-6	32v	23-700
20	Coil: Bottom Turbo Bumper	Q10	CPU	BLU-YEL	CPU CN 19-6	RED	PS CN 6-6, 7	32v	23-800
21	Coil: Left Slingshot	Q12	CPU	BLU-GRN	CPU CN 19-8	RED	PS CN 6-6, 7	32v	23-800
22	Coil: Right Slingshot	Q13	CPU	BLU-BLK	CPU CN 19-9	RED	PS CN 6-6, 7	32v	23-800

Flipper Solenoids

SSFB No.	Flipper Coil	Cabinet Switch	Switch Drive	Switch Return	E.O.S.	GND	Flipper 50vDC Power	Flipper 8vAC Hold	Flipper Coil Output
SSFB 1	Lwr. Rt. Flipper 23-1100 BLU/YEL ORN/VIO	BLU-VIO SSFB CN1-7	GRN-GRY CPU CN8-9 TO SSFB CN1-4	WHT-GRY CPU CN10-1 TO SSFB CN1-3	BRN-VIO RT. EOS SW. TO CN1-1	BLK CPU CN5 TO CN1-6	BLK-WHT PPB J7-1, -5 to SSFB CN2-8, -9	GRY-GRN-GRY P/S CN1-10, -11, to SSFB CN2-7, -8	50v Q2, Q3, I SR1 CN2-7, 8
SSFB 1	Lwr. Lt. Flipper 23-1100 GRY/YEL ORN/GRY	BLU-GRY SSFB CN1-11	GRN-GRY CPU CN8-9 TO SSFB CN1-4	WHT-VIO CPU CN10-2 TO SSFB CN1-5	BRN-GRY LT. EOS SW. TO CN1-9	BLK CPU CN5 TO CN1-6	BLK-WHT PPB J7-1, -5 to SSFB CN2-8, -9	GRY-GRN-GRY P/S CN1-10, -11, to SSFB CN2-7, -8	50v Q10, Q9, I SR2 CN2-4, 5
SSFB 1	Upr. Rt. Flipper 23-1100 BLU/YEL ORN/GRY	GRY-VIO SSFB CN1-12	GRN-GRY CPU CN8-9 TO SSFB CN1-4	WHT-GRY CPU CN10-2 TO SSFB CN1-10	Not Used	BLK CPU CN5 TO CN1-6	BLK-WHT PPB J7-1, -5 to SSFB CN2-8, -9	GRY-GRN-GRY P/S CN1-10, -11, to SSFB CN2-7, -8	50v Q16, Q15, I SR3 CN2-1, 2



[illegible]

PARTS IDENTIFICATION (PINK SECTION) Page Guide

Page 42
Playfield:
Major Assemblies

Page 43
Playfield:
Ramps and Rails

Page 44
Playfield:
Butyrate

Page 45
Playfield:
Parts

Page 46
Playfield:
Rubber Parts

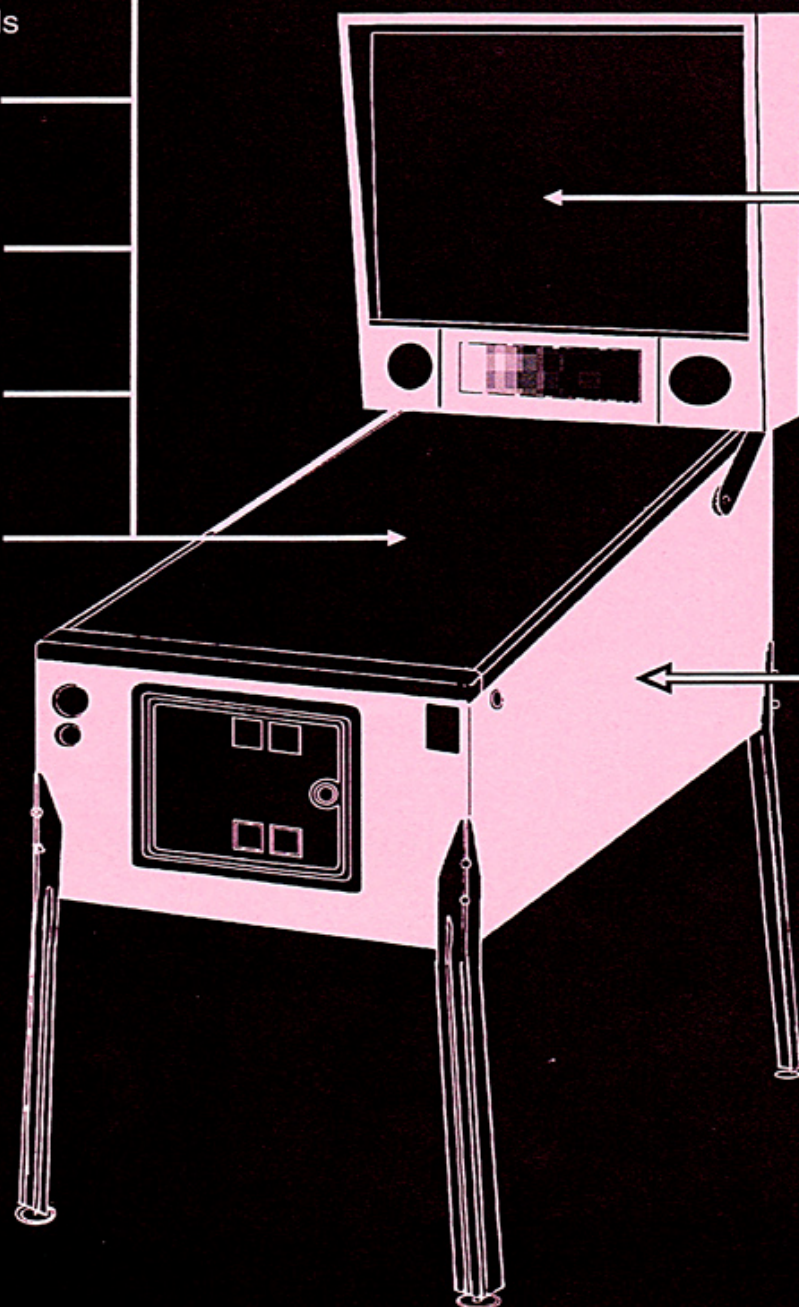
Page 47
Playfield:
Posts

Page 40
Backbox
Parts

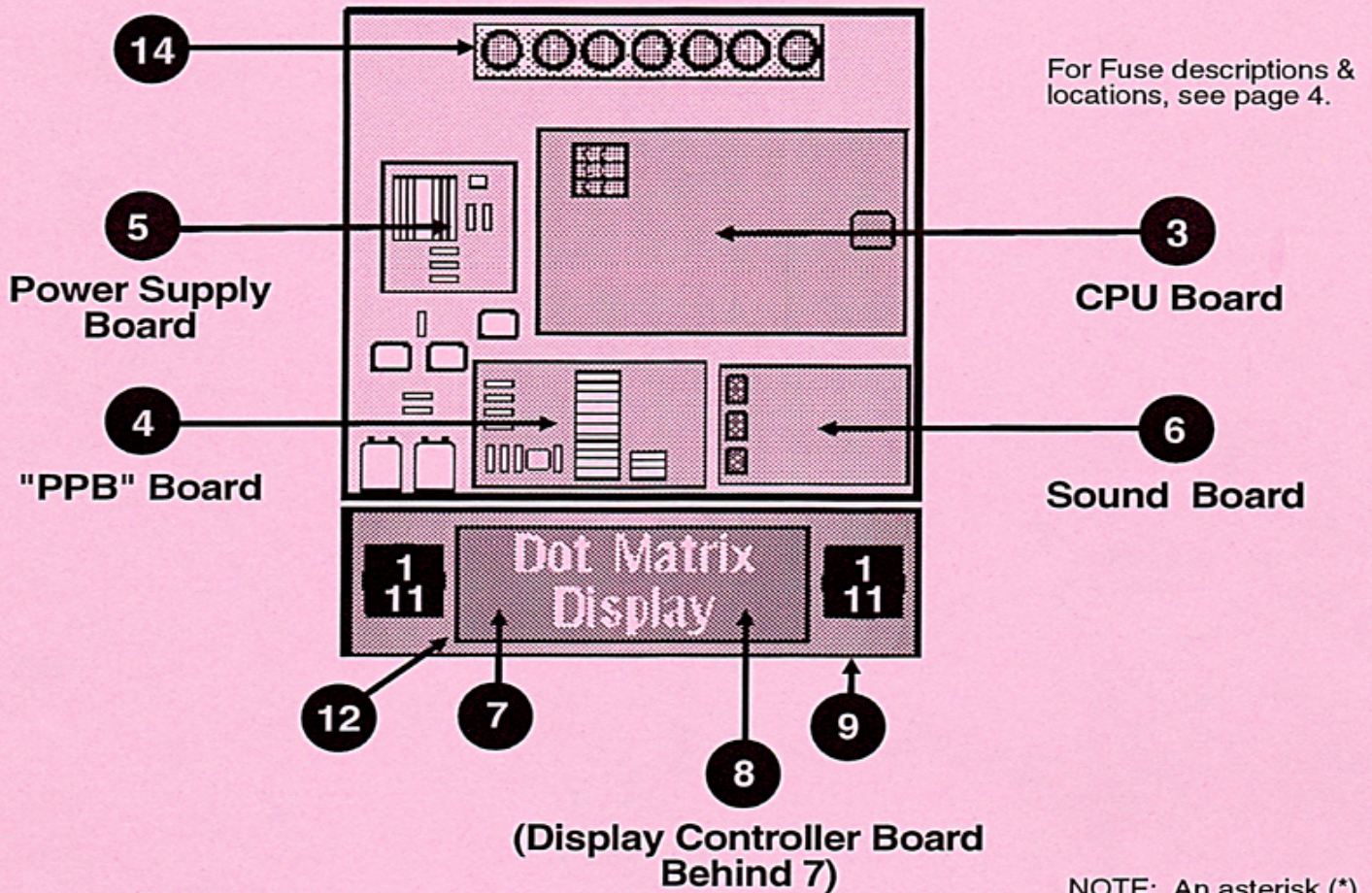
Pages 48 & 49
Backbox
Lamps & Sockets

Page 41
Cabinet
Parts

Pages 48 - 50
Under Playfield:
Lamps, Sockets
& Lamp Boards



BACKBOX - PARTS

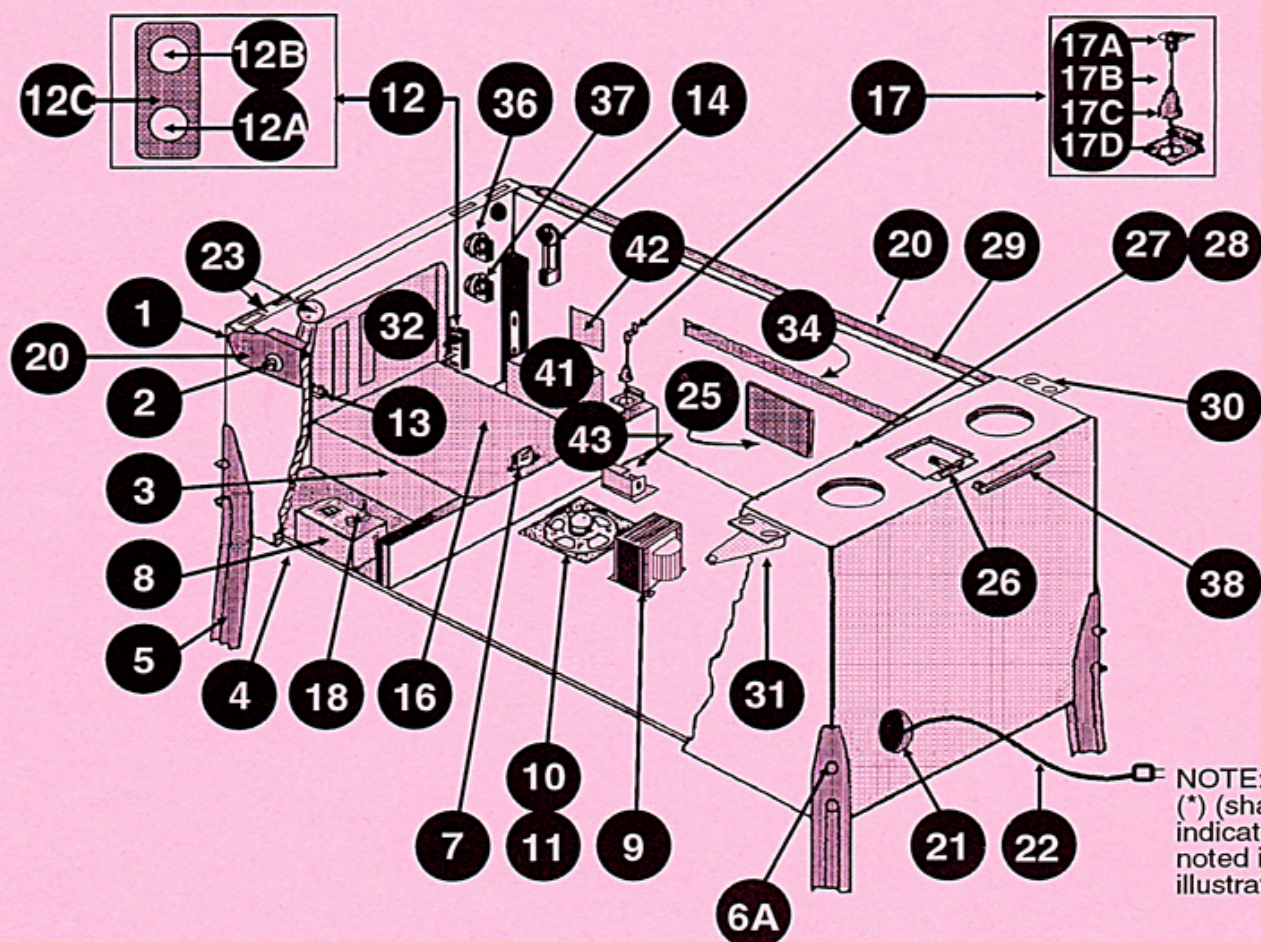


NOTE: An asterisk (*) (shaded items) indicates item is not noted in this illustration.

Item	Description	Part No.	Item	Description	Part No.
1	Speakers 4X4 Quam 89-9572 (X2)	031-5004-00	15 *	Static Shield *	535-6227-00
2 *	Back Box Lock	355-5008-00	16 *	Backglass Clear 26½" X 19¾" *	660-5018-00
3	CPU Bd. Non-Reflexive †	520-5003-04	17 *	26-7/16" Plastic Extrusion *	545-5018-08
4	PPB Board Ass'y Rev. C	520-5021-05	18 *	18¾" Plastic Extr. (Qty. 2) *	545-5018-09
5	Power Supply	520-5047-03	19 *	Glass Channel 26-7/16" *	545-5021-02
6	Sound Board 3X 4MB †	520-5077-03	20 *	MSF Lights Insert Assembly *	505-6003-36
7	New Large Dot Matrix Display Board 192 X 64! ††	520-5075-00	21 *	Ribbon Cable, 14-Pin * Display to Display	602-5005-14
8	Display Controller Bd. †	520-5092-01	22 *	Ribbon Cable, 20-Pin * CPU to Sound Board	602-5005-20
9	Speaker Panel Assembly	500-5915-00	23 *	Ribbon Cable, 26-Pin * CPU to Display	602-5005-26
10 *	MSF Backglass Artwork *	830-5236-00	24 *	Insert Door Slide Latch	535-5001-00
11	Mary Shelley's Frankenstein Speaker Grill w/Artwork	830-5637-00			
12	Mav. Speaker Plexi w/ Artwork	830-5636-00			
13	Item Number Not Used	— — — — —			
14	7 Vent Hole Grill 2½" X 18"	545-5072-02			

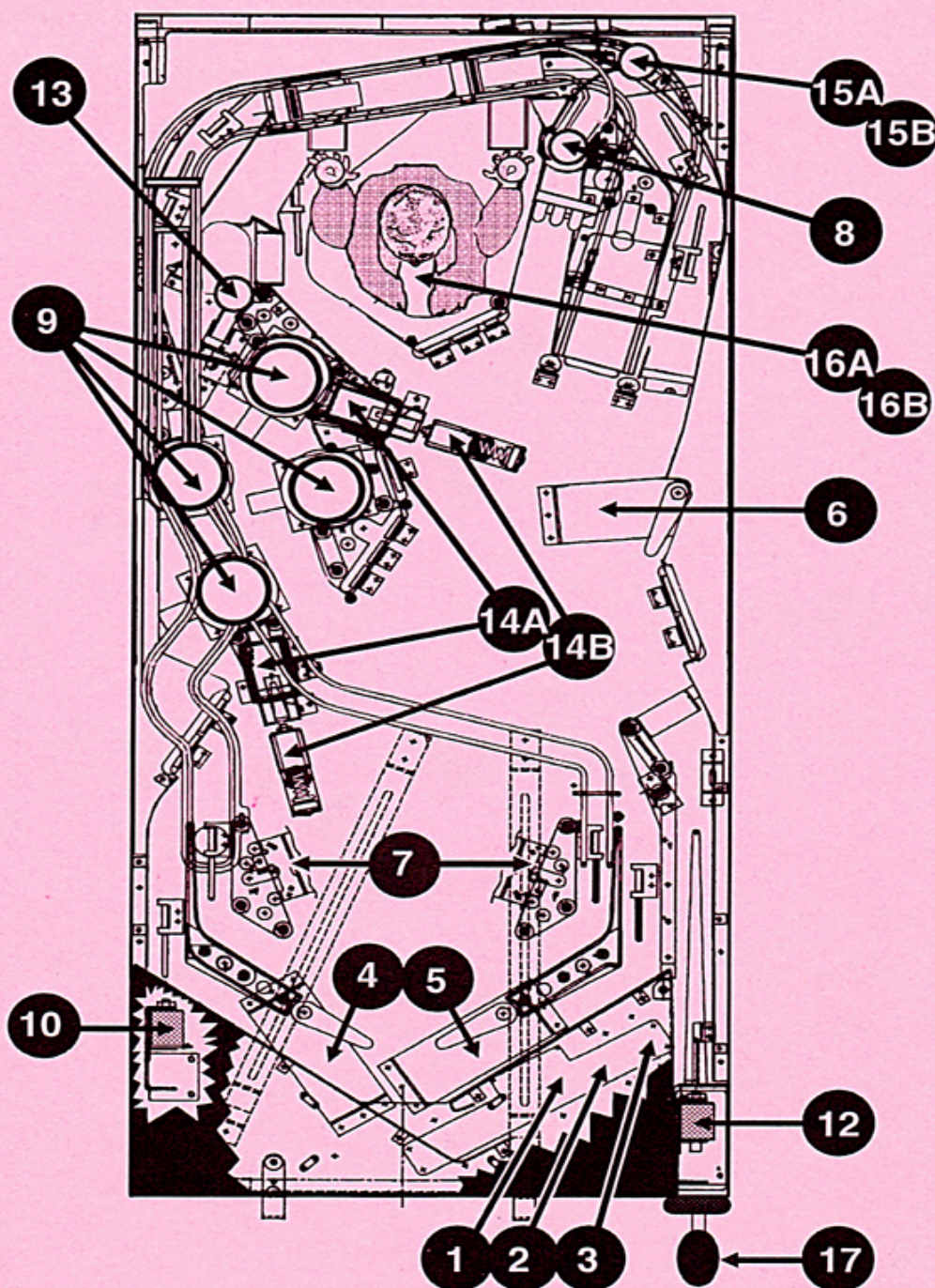
† When ordering PC Boards with ROMS, please specify the Game.
†† Indicate Manufacturer.

CABINET - PARTS



Item	Description	Part No.	Item	Description	Part No.
1	Up/Down Lever Assembly (see page 52)	500-5918-00	19 *	Playfield Glass (T.P.) 21" x 43" *	660-5001-00
2	Flipper Button Red Assy (Solid) (Qty. 2)	500-5026-32	20	Side Armor - Left & Right	535-6831-00
3	Cash Box Plastic Bottom	545-5090-00	21	Recessed Cup for Line Cord	545-5122-00
4	Power Sw. DPST Toggle (Under Cab.)	180-5001-00	22	Line Cord 10' ROJ 3" Maximum	034-5000-10
5	Leg (Black) (Qty. 4)	535-5020-50	23 *	Front Molding Lockdown Assy*	500-5020-01
6A	Leg Bolt (BLK) 3/8-16 x 2-3/8 Hex Hd. (Qty. 8)	231-5000-01	24 *	Front Molding - Black *	500-5757-01
6B *	Leg Leveler 3/8-16x3" (Qty. 4) *	500-5017-00	25	Solid State 3-Flipper Board (SSFB)	520-5076-00
7	Cash Box Lock Bracket	535-5215-00	26	#1 Roto Lock Male, (Female -02) *	355-5006-01
8	Service Outlet	180-5008-01	27	Rear Plastic Ext. P/F Glass 20-3/8"	545-5038-00
9	Transformer	010-5008-00	28	Mounting Fm. Rubber for Ext.	626-5001-00
10	Speaker-Round - 8"	031-5005-00	29	Plastic Channel Left & Right	545-5017-00
11	Speaker Grill 7 X 7	535-6830-00	30	Backbox Hinge Left	515-5987-00
12	Dual Switch Ass'y (Includes 12A-12C)	500-5808-00	31	Backbox Hinge Right	515-5987-01
12A	Memory Protect Switch	180-5000-00	32	Coin Door (w/Validator) USA	500-5018-17
12B	Interlock Switch	180-5136-00	33 *	Slide & Pivot Support Bracket Right*	535-5989-00
12C	Bracket	535-6958-00		Slide & Pivot Support Bracket Left	535-5990-00
13	Service Switch Set (Step Up / Down) Located on the Coin Door By Lock	180-5012-00	34 *	Edge Slide Bracket *	535-5988-00
14	Flipper Switch, Left	180-5122-01		Playfield Support Slide Rev. A *	535-6862-00
15 *	Flipper Switch, Right (Top/Bottom)	180-5048-00	35 *	Playfield Support Bar * (Stay Arm)	535-5019-00
16	Cash Box Cover (Validator)	535-5013-03	36	Start Button Switch Ass'y (Frankenstein)	500-5728-36
17	Plumb Bob Tilt Ass'y (Incl. 17A-17D)	500-5023-00	37	Extra Ball Switch Ass'y (Orange)	500-5779-07
17A	Hanger Bracket (tilt)	535-5221-00	38	5/16" Hex Key Allen Wrench	777-0001-00
17B	Hanger Wire (tilt) (Attach to *17A*)	535-5319-00	39 *	Backbox/Cabinet Matrix/Fuse Info *	820-6104-03
17C	Plumb Bob (tilt) (Attach to *17B*)	535-5029-00	40 *	3-Flipper Board Cover *	545-5165-02
17D	Contact Bracket (tilt)	535-5220-00	41 *	Shaker Motor (Not Used This Game)	515-5893-00
18	Volume Control Single 10K Pot	123-5000-02	42 *	Shaker Motor P.C. Board (Not Used)	520-5065-00
			43	Knocker Assembly (see page 56)	500-5081-00

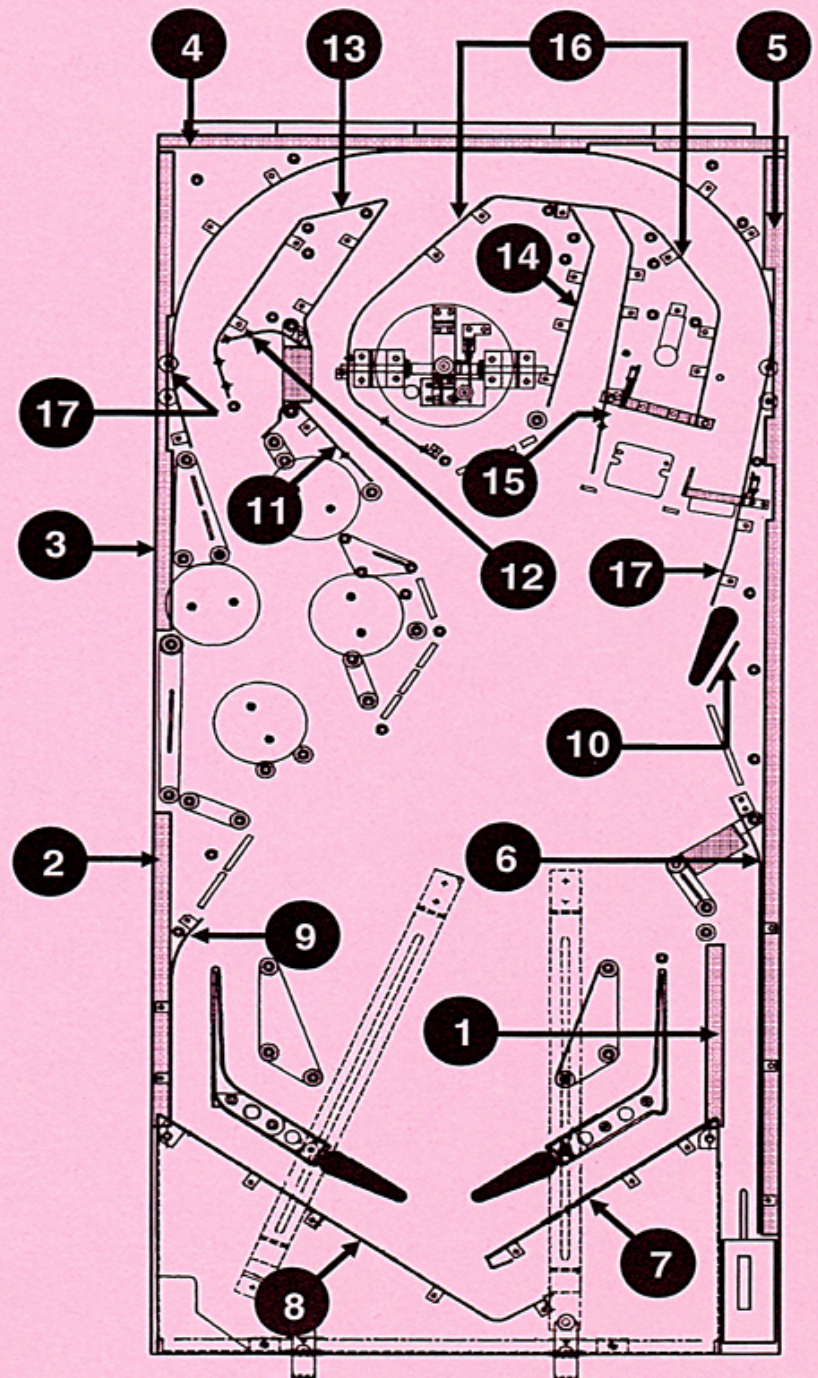
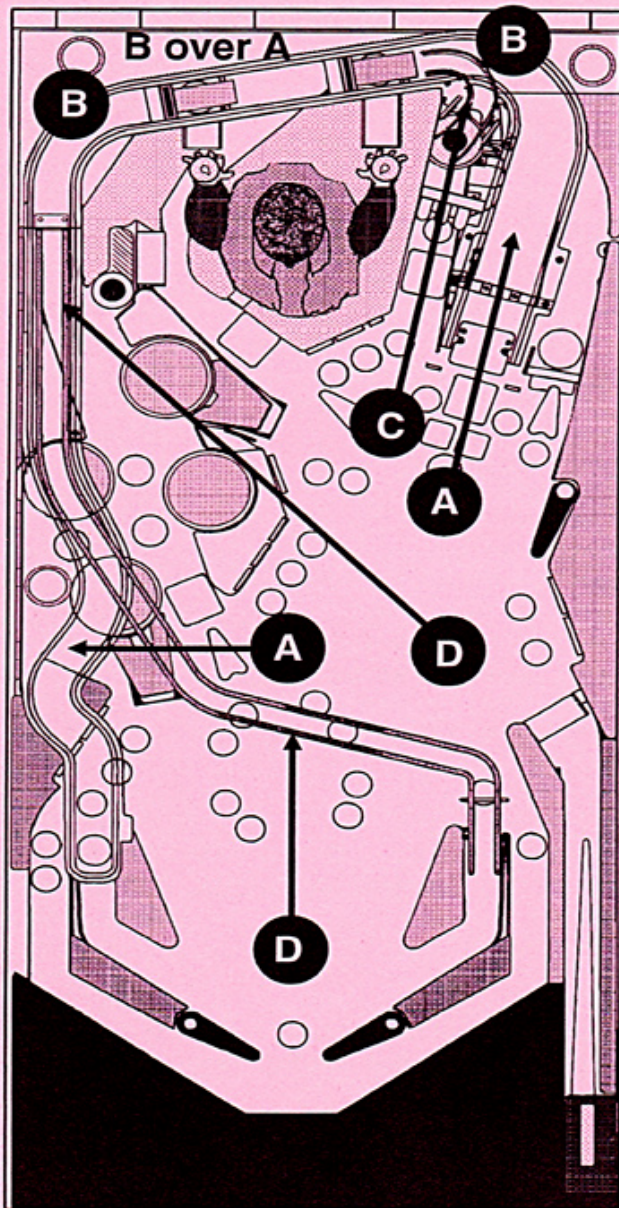
PLAYFIELD - MAJOR ASSEMBLIES †



Item	Description	Part No.	Item	Description	Part No.
1	6-Ball Sw. Asm. (Under P/F)	500-5683-03	11	Knocker Assembly (In Cabinet)	500-5081-00
2	Lock Ball Asm. (Under Arch)	500-5684-01	12	Ball Kicker (Auto Launch) Asm.	500-5477-01
3	Deflector for 4-Ball Asm.	535-6606-01	13	Ball Eject Assembly	500-5664-01
4	Flipper Asm., Lower Right	500-5832-01	14A	Power Scoop Asm. (Qty. 2)	500-5809-00
5	Flipper Asm., Lower Left	500-5832-02	14B	Kick-Big Assemblies (Qty. 2)	500-5862-00
6	Flipper Asm., Upper Right	500-5694-01	15A	Diverter Assembly	500-5654-00
7	Slingshot Assemblies (Qty. 2)	500-5849-00	15B	Diverter Plunger & Crank Arm	515-5453-00
8	Vertical Up-Kicker Asm. (VUK)	500-5839-00	16A	Frankenstein Assembly	500-5887-00
9	Turbo Bumper Asm. (Qty. 4)	500-5227-02	16B	Main Plate Asm. (Under 16A)	515-6153-00
10	Laser Kick Back Assembly	500-5838-00	17	Up/Down Lever Assembly	500-5918-00

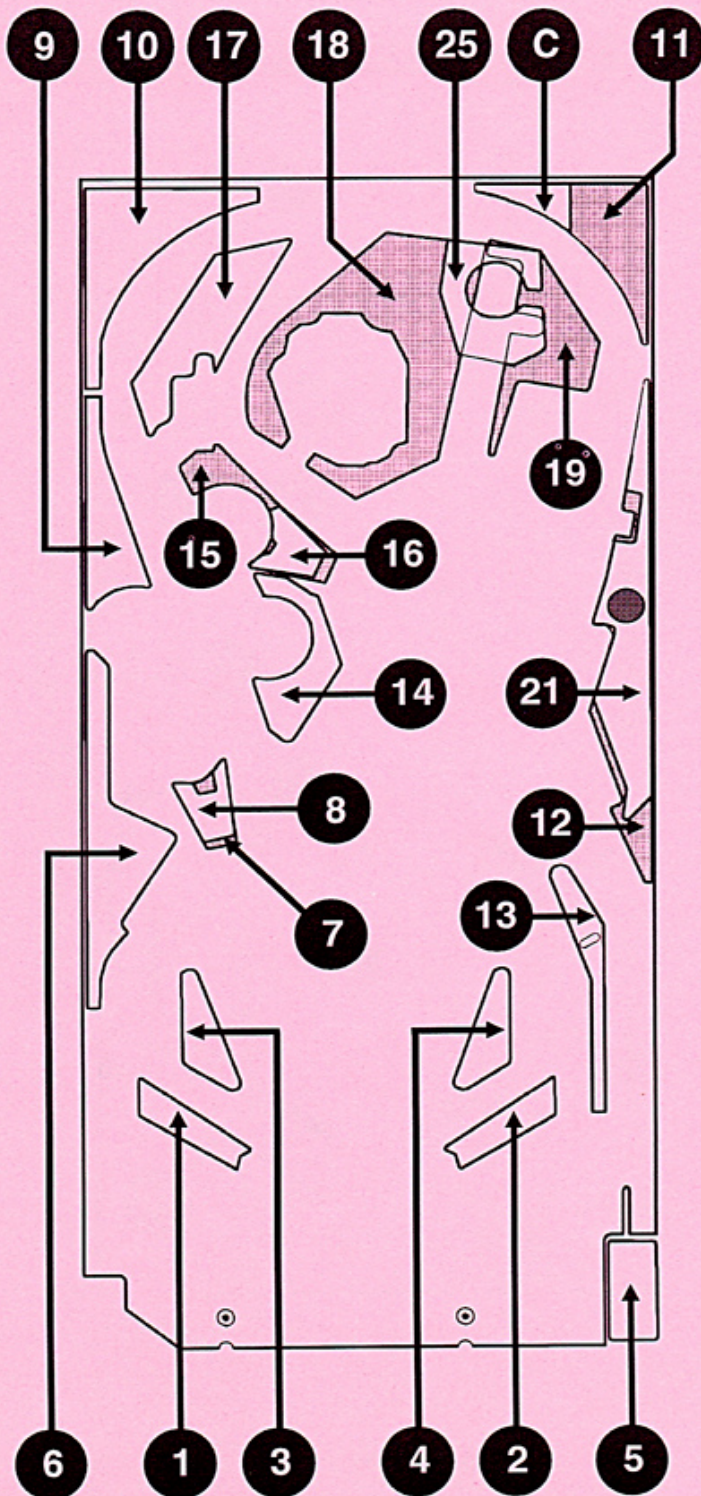
† See Unique Parts for Major Assembly Breakdowns.

PLAYFIELD - RAMPS † AND RAILS



Item	Desc.: Ramps	Part No.	Item	Desc.: Rails	Part No.
A †	Main Ramp Assembly	500-5923-00	7	Flat Rail - Arch/Right Outlane	515-6043-00
B †	Upper Small Ramp	500-5905-00	8	Flat Rail - Arch/Left Outlane	515-6042-00
C	VUK Wire Ramp to Upper Small Ramp	535-7139-00	9	Flat Rail - Left Outlane	535-7150-00
D	Wire Ramp from Upr. Ramp to Outlane	535-7207-00	10	Flat Rail - Behind Upper Flipper	535-7263-00
			11	Flat Rail - Over Top Pop to Eject	515-6189-00
			12	Flat Rail - Small Back of Eject	515-6193-00
			13	Flat Rail - Left Orbit Right Side	515-6191-00
			14	Flat Rail - To VUK Left Side	535-7148-00
			15	Flat Rail - To VUK Right Side	515-6190-00
			16	Flat Rail - Rt. Orbit Lt./Creature	515-6192-00
			17	Flat Rail - Full Outside Orbit	535-7147-00
			† See Unique Parts for Ramp Breakdowns.		
Item	Desc.: Rails	Part No.			
1	Wood Rail 6-3/4" Right Outlane	525-5007-04			
2	Wood Rail 11-9/16" Left Side P/F Bot.	525-5007-32			
3	Wood Rail 17-9/16" Left Side P/F Top	525-5010-12			
4	Wood Rail 20-1/4" Full Top Side P/F	525-5010-11			
5	Steel Rail Full Right Side Playfield	535-7178-00			
6	Flat Rail - Shooter Lane Right Side	535-7149-00			

PLAYFIELD - BUTYRATE



Shaded items indicate butyrate piece is lower than the unshaded item next to it.

Item	Desc.: Screened Butyrate	Part No.
XX	Butyrate Pieces Screened (1-25)	830-5473-XX
For entire sheet, order with the Part No. ending in -XX		
To order individual replacement Screened Butyrate, replace -XX with the correct 2-number ending.		
1	Over Ball Guide Left	830-5473-01
2	Over Ball Guide Right	830-5473-02
3	Over Slingshot Left	830-5473-03
4	Over Slingshot Right	830-5473-04
5	Over Auto Launch / Shooter Lane	830-5473-05
Note: Item 5 has a riveted Bulb & Wedge Socket.		
To order with bulb / socket use Part No.: 515-6196-00		
6	Left Playfield below Pop Bumpers	830-5473-06
7	Lower Scoop Lower Level	830-5473-07
8	Lower Scoop Upper Level	830-5473-08
Note: Item 8 has a riveted Bulb & Wedge Socket.		
To order with bulb / socket use Part No.: 515-6214-00		
9	Left Playfield next to Pop Bumpers	830-5473-09
10	Upper Left Corner	830-5473-10
11	Upper Right Corner Lower Level	830-5473-11
12	Right Playfield Lower Level	830-5473-12
13	Shooter Lane Lt. Side / Rt. Outlane Rt.	830-5473-13
14	Around Middle Right Pop Bumper	830-5473-14
15	Upper Scoop and Top Pop Lower Level	830-5473-15
16	Upper Scoop Upper Level	830-5473-16
Note: Item 16 has a riveted Bulb & Wedge Socket.		
To order with bulb / socket use Part No.: 515-6215-00		
17	Upper Left Orbit Right Side	830-5473-17
18	Around Monster & to VUK Left Side	830-5473-18
19	Under Big Ramp Right Orbit Left Side	830-5473-19
20 *	Key Chain *	830-5473-20
21	Right Playfield Upper Level	830-5473-21
Note: Item 21 has a Bulb, Socket & Red Mini-Mars.		
To order with bulb / socket use Part No.: 515-6209-00		
22 *	Backpanel *	830-5473-22
23	Number Not Used	---
24	Number Not Used	---
25	Around VUK	830-5473-25
Note: Item 25 has 3 riveted Bulb & Wedge Sockets.		
To order with bulb / socket use Part No.: 515-6217-00		

Item	Desc.: Clear Butyrate	Part No.
XX	Butyrate Pieces Clear (1-5)	830-5474-XX
For entire sheet, order with the Part No. ending in -XX		
To order individual replacement Clear Butyrate, replace -XX with the correct 2-number ending.		
A *	Long Piece to protect Pop Bumpers *	830-5474-01
B *	Back Cabinet / Playfield *	830-5474-02
C	Upper Right Corner Upper Level	830-5474-03
D *	Small Round Piece over Lower Pop *	830-5474-04
E *	On the Ramp Right Side *	830-5474-05

* - An asterisk indicates item is not noted in the illustration

PLAYFIELD - PARTS

Item	Desc.: Gen. Parts atop P/F	Part No.
1	Bottom Arch Assembly (Metal)	500-5911-00
	Bottom Arch (Plain)	535-7157-00
2 *	1-1/16" Steel Balls (6 Total)	260-5000-00
3A	Pop Bumper Cap (Red)	550-5057-02
3B	Pop Bumper Cap (Green)	550-5057-04
3C	Pop Bumper Cap (Blue)	550-5057-05
3D	Pop Bumper Cap (Yellow)	550-5057-06
4A	Flipper & Shaft Ass'y White Right X2 with Sonic The Hedgehog™ Logo	515-5133-01-03
4B	Flipper & Shaft Ass'y White X1 with Sonic The Hedgehog™ Logo	515-5133-01-04
5	1-Way Gate X2 (Shooter Lane/Eject)	500-5919-00
6	Spinner	500-5656-00
7A *	Spot-Lite Assembly X2 (Ramp/Lt. P/F)	500-5818-00
7B *	Spot-Lite Deflector Only X2	515-5026-11
8A *	Rubber Lite Cover - Red X2	545-5014-02
8B *	Rubber Lite Cover - Green X2	545-5014-04
8C *	Rubber Lite Cover - Yellow X3	545-5014-06
9 *	Mini-Mars Lite Covers - Red X4	550-5031-02

Item	Desc.: Gen. Parts under P/F	Part No.
10	Playfield Hanging Brackets X2	535-5216-03
11	Playfield "Slide-N-Rest" Brackets X2	535-6862-01
12 *	Stay Arm Holder	535-5747-00
Note: For Other Playfield Moving Devices See Cabinet Parts.		
13	Pivot Pin Bracket Assembly X2	500-5329-00
	Both include Pivot Bracket Screws X4	237-5907-00
	and T-Nuts X4	240-5101-00

Item	Desc.: Mylar	Part No.
M1 *	Mylar Pieces (Clear Pre-Scored)	820-5847-00
M2 *	Pop Bumper Area	820-5848-00
M3 *	Mylar Pad (Clear : 1" Sq.) X3	820-5815-00
M4 *	Front of Slingshot Clear Mylar	820-5821-00

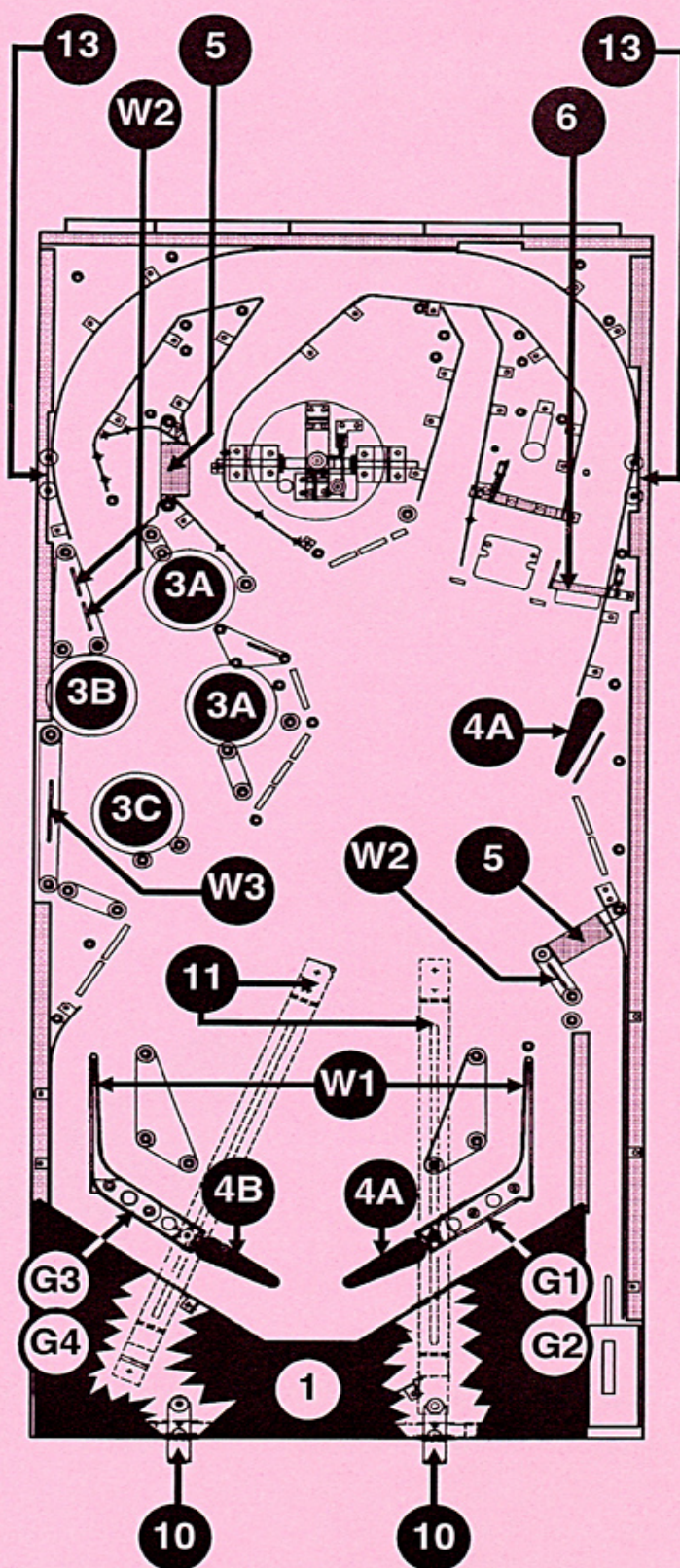
Item	Desc.: Decals	Part No.
D1 *	Decal Sheet (Complete)	820-6119-XX
-01 Arch Left, -02 Arch Right, -03 Arch Center, -04 Arch Raise Left, -05 Arch Raise Right, -06 Spinner Front, -07 Spinner Back, -09 Ramp Exit Left, -10 & -11 Trap Doors, -12 thru -15 Pops.		
D2 *	Decal Ramp Entrance	820-6121-00

Item	Desc.: Ball Guides (G)	Part No.
G1	Ball Guide Upper Right Return	550-5043-01
G2	Ball Guide Lower Right Return	550-5037-01
G3	Ball Guide Upper Left Return	550-5038-01
G4	Ball Guide Lower Left Return	550-5064-01

Item	Desc.: Wire Forms (W)	Part No.
W1	Wire Form on Ball Guides X2	535-5642-00
W2	Wire Form 1" X3	535-5300-05
W3	Wire Form 2.25"	535-5300-12

Pg.	Desc.: Other Part Numbers
40-41	Back Box & Cabinet Parts
42-43	Major Assemblies, Ramps and Rails
44	Butyrate
46-47	Rubber Parts & Posts
48-49	Lamps with Sockets
50	Lamp Boards

* - An asterisk indicates item is not noted in the illustration

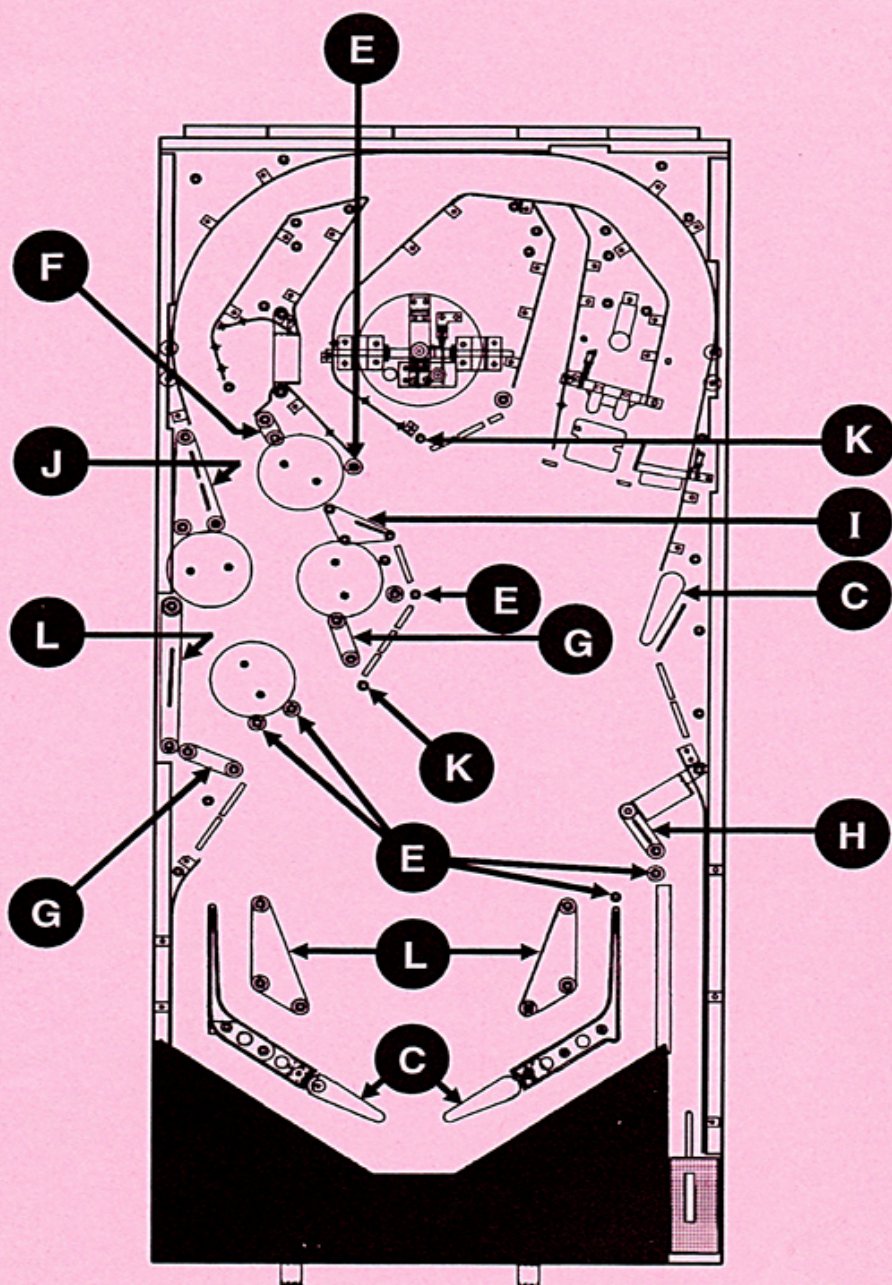


Butyrate, Light Inserts & Ramps are not shown on drawing for clarity. See Playfield - Ramps (pg. 43) & Unique Parts (pgs. 64-65) for other Top Parts on the ramps.

PLAYFIELD - RUBBER PARTS †

A
Item A is located on the Knocker, Auto Launch, VUK, Laser Kick Back and both Kick-Bigs.

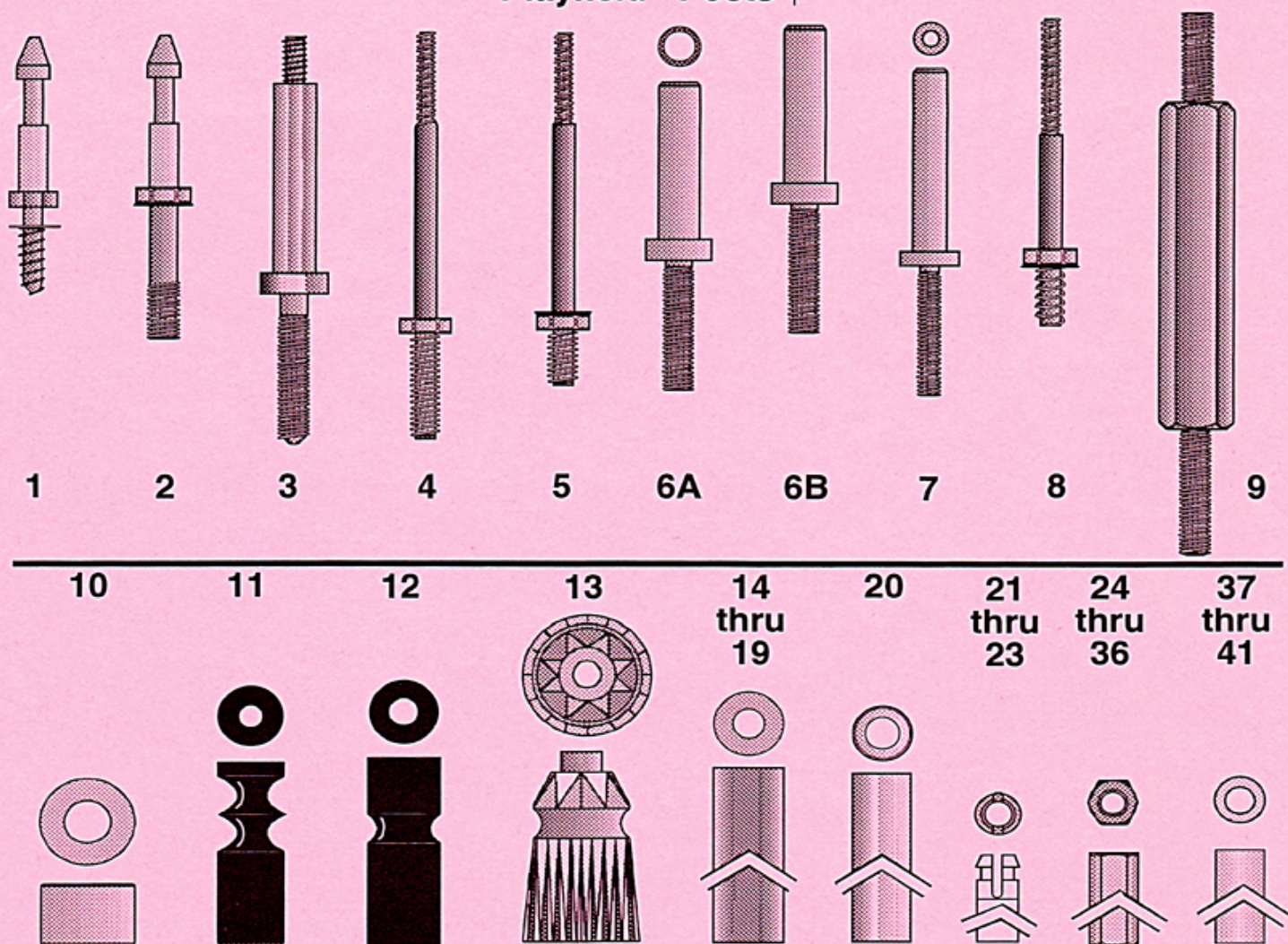
B
Item B is located on the Diverter Plunger.



Please note, the size and/or quantities may change as production continues.

Item	Description	Qty.	Part No.	Item	Description	Qty.	Part No.
A	Rubber Bumper	6	545-5105-00	H	1-1/4" I.D. Black Rubber Ring	1	545-5348-06
—	Post Rubber (Sleeve Short)	0	545-5151-00	I	1-1/2" I.D. Black Rubber Ring	1	545-5348-07
B	Flipper Bushing (Small)	1	545-5192-00	J	2" I.D. Black Rubber Ring	1	545-5348-08
C	Flipper Rubber Rings	3	545-5277-00	—	2-1/2" I.D. Black Rubber Ring	0	545-5348-09
D	Post Rubber (Sleeve Tall)	1	545-5308-00	K	3/8" O.D. Black Rubber Ring	2	545-5348-19
—	5/16" I.D. Black Rubber Ring	0	545-5348-02	L	2-3/4" I.D. Black Rubber Ring	3	545-5348-20
E	3/16" I.D. Black Rubber Ring	6	545-5348-01	—	Bumper Post Rubber	0	545-5009-00
F	3/4" I.D. Black Rubber Ring	1	545-5348-04	—	1-3/4" I.D. Black Rubber Ring	0	545-5348-21
G	1" I.D. Black Rubber Ring	2	545-5348-05	† Items with a Zero Qty. are not used in this game.			

Playfield - Posts †

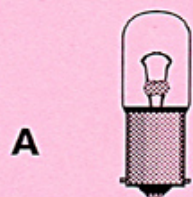


Please Note, the size and/or quantities may change as production continues.

Item	Description	Qty.	Part N ^o	Item	Description	Qty.	Part N ^o
1	Mini-Post-Wood Threaded	3	530-5004-00	21	Spacer 3/8" Plastic Slf. Rtn. SRS6-6-01	24	254-5007-01
2	Mini-Post-Machine Threaded	3	530-5005-00	22	Spacer 1/4" Plastic Slf. Rtn. SRS6-4-01	4	254-5007-02
3	Bumper Post -Machine Threaded	0	530-5007-00	23	Spacer 3/4" Plastic Slf. Rtn. SRS6-12-01	0	254-5007-03
4	Machine Post Screw Long	3	530-5008-00	24	Spacer 1/4" Hex Tapped 6-32	0	254-5008-00
5	Post Machine Screw	40	530-5012-02	25	Spacer 1/2" Hex Tapped 6-32	2	254-5008-03
6A	Bumper Post 8-32 Tapped.	0	530-5075-00	26	Spacer 5/8" Hex Tapped 6-32	8	254-5008-02
6B	Bumper Post Untapped	1	530-5057-01	27	Spacer 3/4" Hex Tapped 6-32	6	254-5008-04
7	Bumper Post 6-32 Tapped	0	530-5127-00	28	Spacer 1" Hex Tapped 6-32	0	254-5008-06
8	Post Machine Screw	0	530-5263-01	29	Spacer 2" Hex Tapped 6-32	0	254-5008-07
9	Mini-Playfield Support	0	530-5285-00	30	Spacer 2 5/8" Hex Tapped 6-32	0	254-5008-08
10	Spacer Backbox Hinge	2	530-5099-00	31	Spacer 1 1/2" Hex Tapped 6-32	1	254-5008-09
11	Stand-Off Double Groove 1-1/16"	0	530-5102-01	32	Spacer 1 1/4" Hex Tapped 6-32	0	254-5008-11
12	Plastice Post (Black)	49	550-5059-00	33	Spacer 2 1/2" Hex Tapped 6-32	1	254-5008-16
13	Small Jewel Post (Clear)	3	550-5034-01	34	Spacer 1 7/8" Hex Tapped 6-32	0	254-5008-20
14	Spacer 1/2" Plastic (Black) 3/8"	0	254-5000-01	35	Spacer 4 5/16" Hex Tap. 6-32 Thrd.	0	254-5018-00
15	Spacer 1/2" Plastic Narrow 3/8"	0	254-5000-03	36	Spacer 5 5/16" Hex Tap. 6-32 Thrd.	0	254-5018-01
16	Spacer 1" Plastic 3/8"	0	254-5000-04	37	Spacer 1/2" Long X 5/16" X .144 I.D.	3	254-5014-00
17	Spacer 1 1/4" Plastic 3/8"	0	254-5000-05	38	Spacer 3/4" Long X 5/16" X .144 I.D.	0	254-5014-01
18	Spacer 1 1/8" Plastic 3/8"	0	254-5000-06	39	Spacer 1.13" Lg. X 5/16" X .144 I.D.	6	254-5014-02
19	Spacer 3/4" Plastic 3/8"	2	254-5000-07	40	Spacer 1/4" Long X 5/16" X .144 I.D.	4	254-5014-03
20	Spacer 1" Lg Metal 5/16" X .144 I.D.	0	254-5001-00	41	Spacer 9/16" Long X 5/16" X .144 I.D.	3	254-5014-04

† Items with Ø Qty. are not used in this game. Items 14 -41 are shown "broken" to demonstrate variable sizes.

PLAYFIELD - LAMPS WITH SOCKETS



A



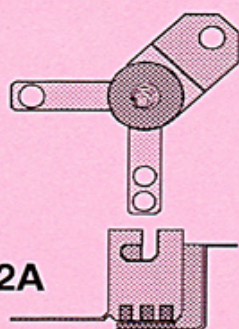
1A



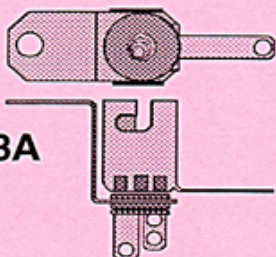
B



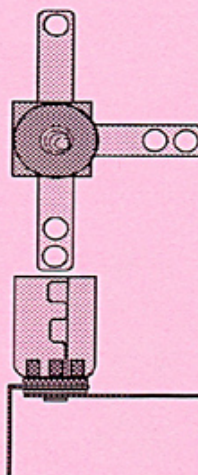
1B



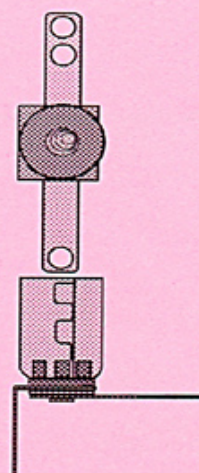
2A



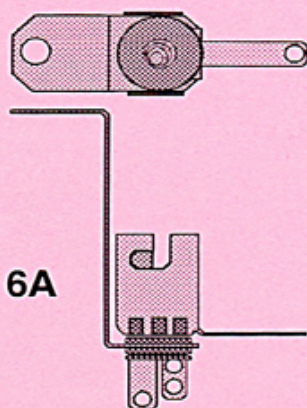
3A



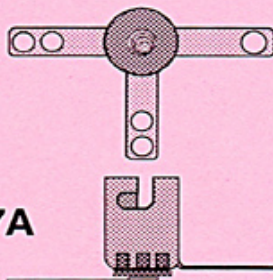
4A



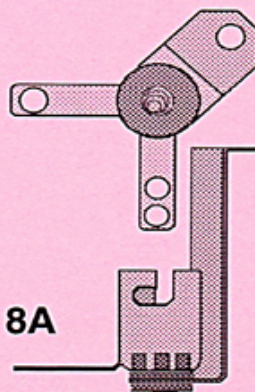
5A



6A



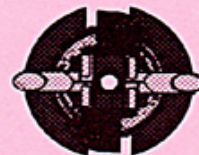
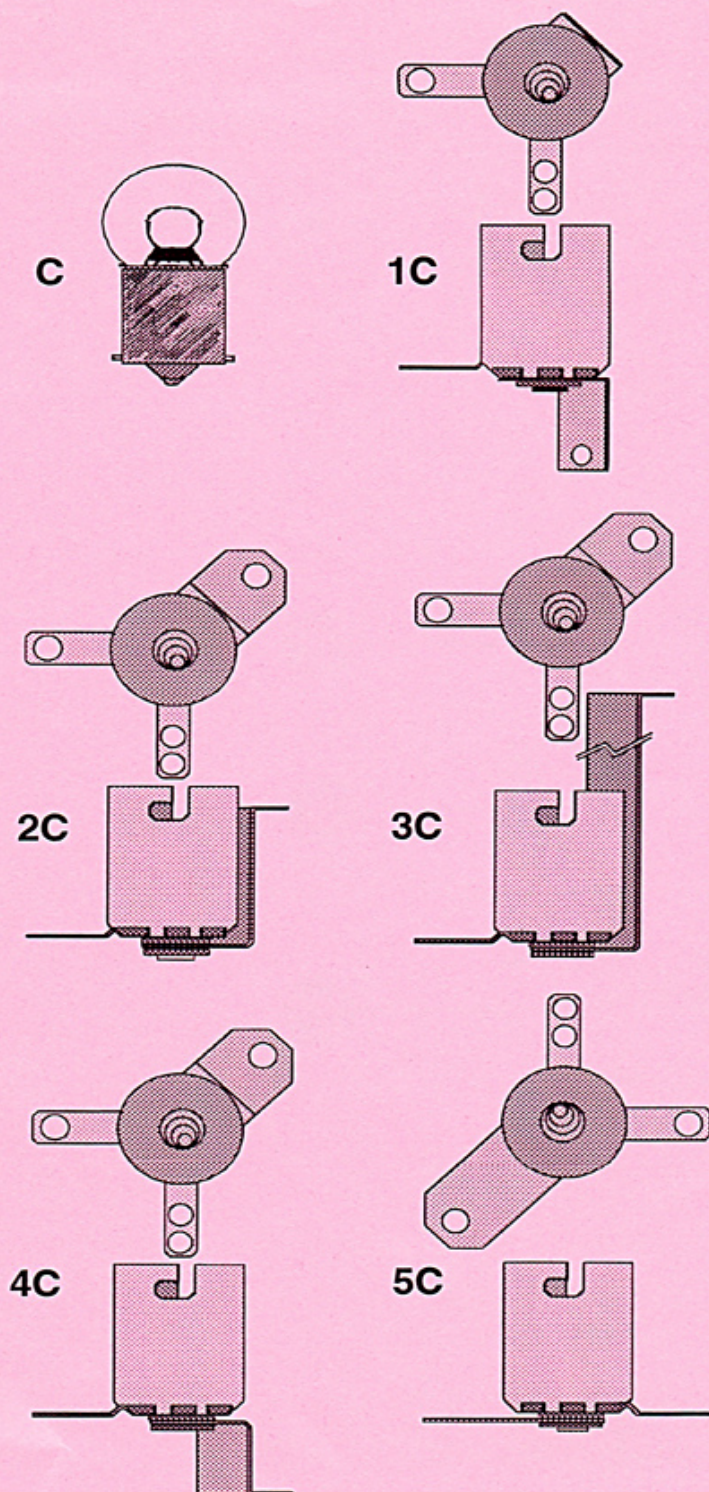
7A



8A

Item	Description	Qty.	Part No.	Item	Description	Qty.	Part No.
A	#44 Bulb	74	165-5000-44	6A	3-Lug Stand-Up Long Socket	9	077-5009-00
1A	2-Lug Staple Down Socket	65	077-5000-00	7A	3-Lug Staple Down Socket	0	077-5001-00
2A	2-Lug Stand-Up Short Socket	0	077-5002-00	8A	2-Lug Stand-Up Long Socket	0	077-5005-00
3A	3-Lug Stand-Up Short Socket	0	077-5008-00				
4A	3-Lug Laydown Socket	0	077-5006-00	B	#455 Twinkle Bulb	0	165-5000-89
5A	2-Lug Laydown Socket	0	077-5003-00	1B	1-Lug Stand-Up Long Socket	0	077-5012-00
1 Bulb per socket. Also note, Item B bulb normally goes with 1B but can be used in any #A Socket.							

PLAYFIELD - LAMPS WITH SOCKETS †



1D

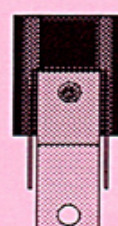
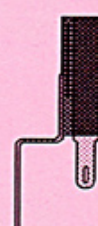
1E

** This socket normally used only on Lamp Bds.

Note the notch in the bracket. (Used with Reflectors.)

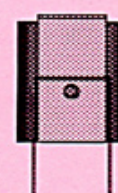
2D

3D

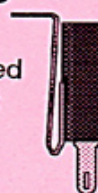


4D

4D



replaced with :



Item	Description	Qty.	Part No.
C	#89 Bulb	28	165-5000-89
1C	Laydown Standard Socket	1	077-5100-00
2C	Stand-Up, Short Socket	24	077-5101-00
3C	Stand-Up, Long Socket	4	077-5102-00
4C	Stand-Up, Socket Rev. Short	0	077-5103-00
5C	Straight Leg Socket	0	077-5107-00

† Items with a Zero Qty. not used in this game.

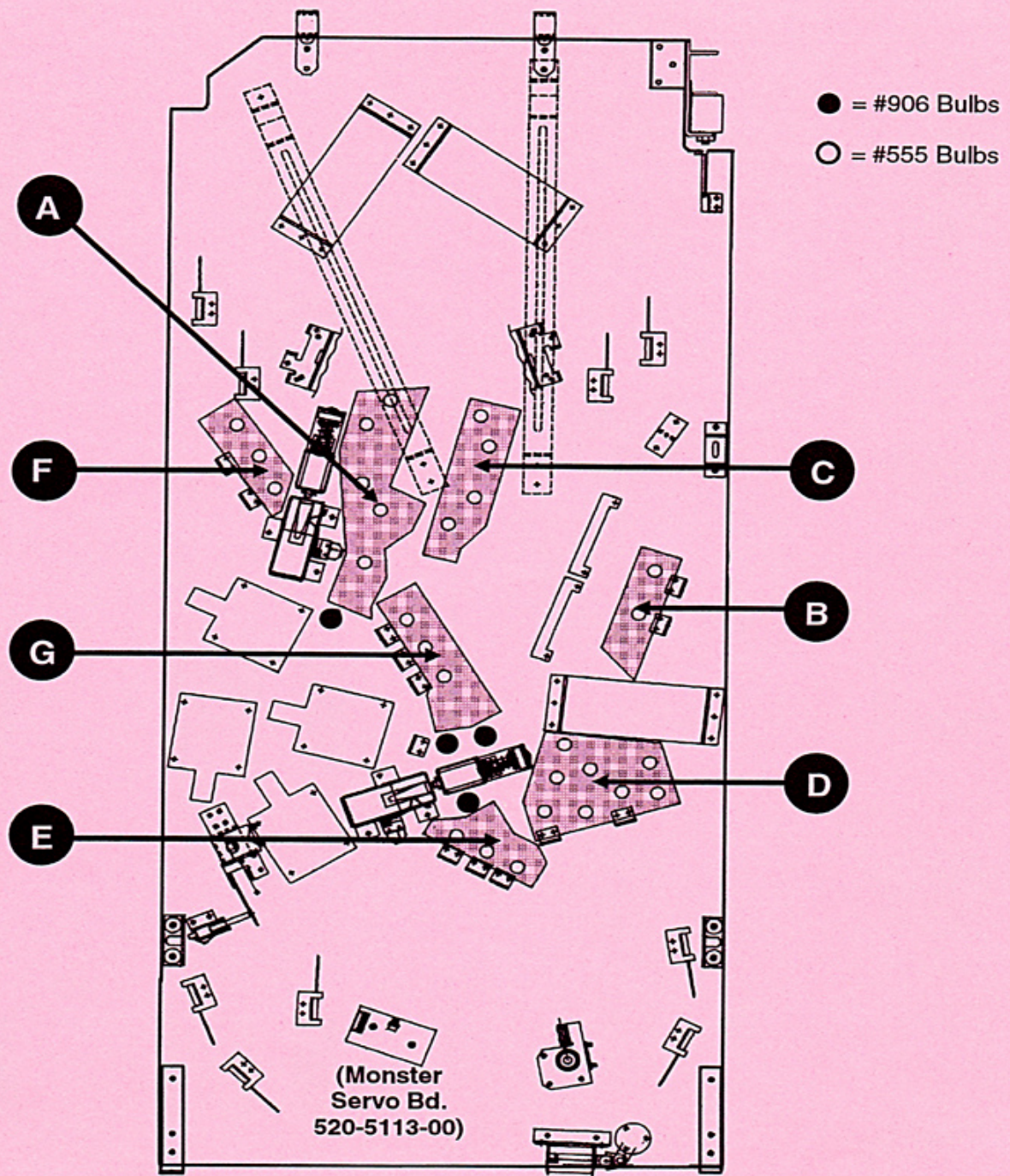
Item	Description (1 bulb per socket)	Qty.	Part No.
D	#555 Wedge Base Bulb *	40	165-5002-00
1D	555 Wedge Base Socket **	28	077-5007-00
2D	Laydown Wedge Base L/R BLK	8	077-5026-01
3D	Laydown Wedge Base Black	0	077-5026-00
4D	Wedge Offset Bracket Socket 2-Styles	0	077-5029-00

Note: - 4 extra #555 Bulb located 1 per Pop Bumper.

E	#906 Wedge Base Bulb	4	165-5004-00
1E	906 Wedge Base Socket	0	077-5016-00

Note: - #906 Bulbs used horizontal on the Lamp Boards (see next pg.)

PLAYFIELD - LAMP BOARDS

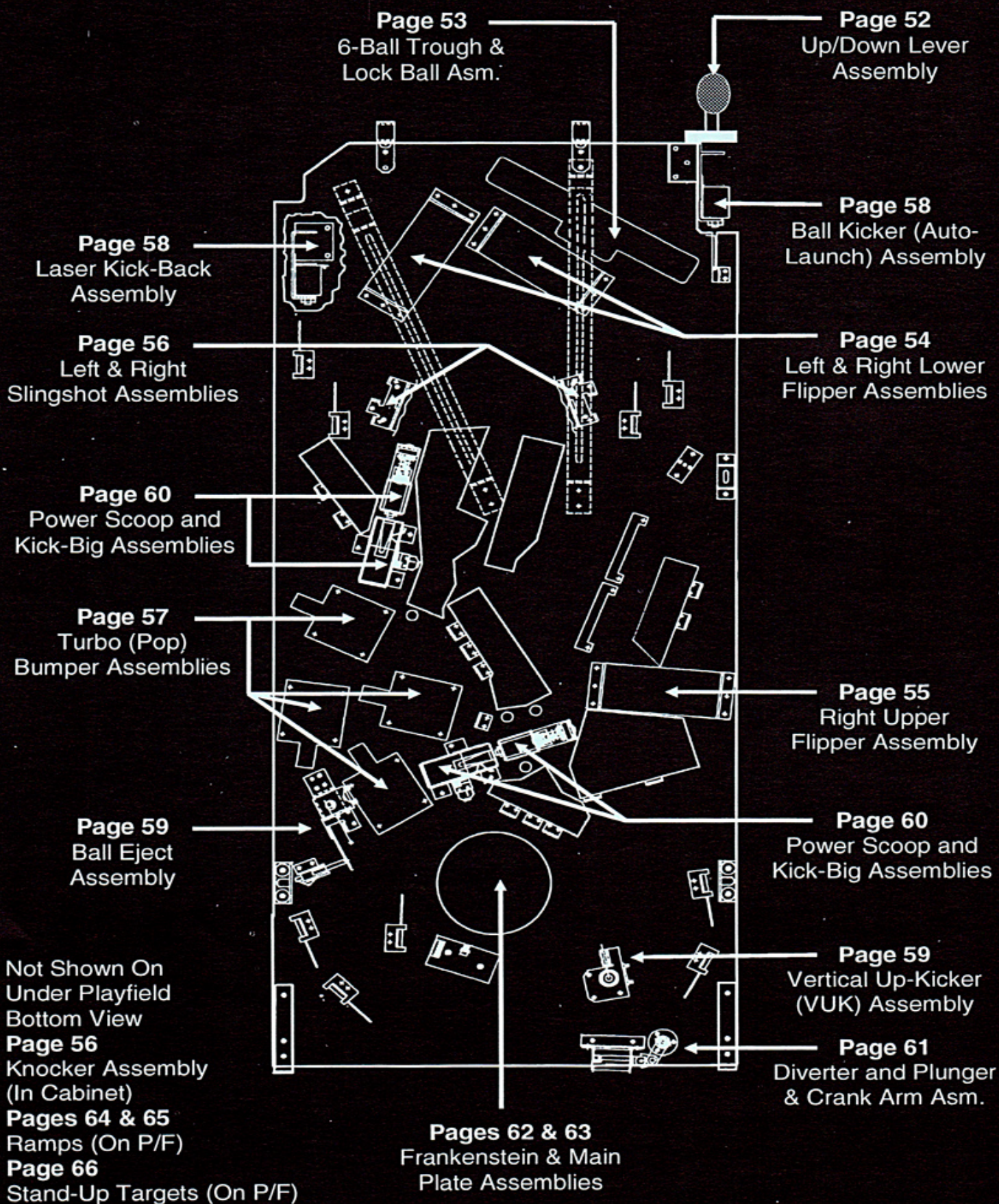


UNDER PLAYFIELD: BOTTOM VIEW

Item	Lamp Board P.N.	Item	Lamp Board P.N.	Item	Lamp Board P.N.	Item	Lamp Board P.N.
A	520-5112-01	C	520-5112-03	E	520-5112-05	G	520-5112-07
B	520-5112-02	D	520-5112-04	F	520-5112-06		

UNIQUE PARTS IDENTIFICATION (BLUE SECTION)

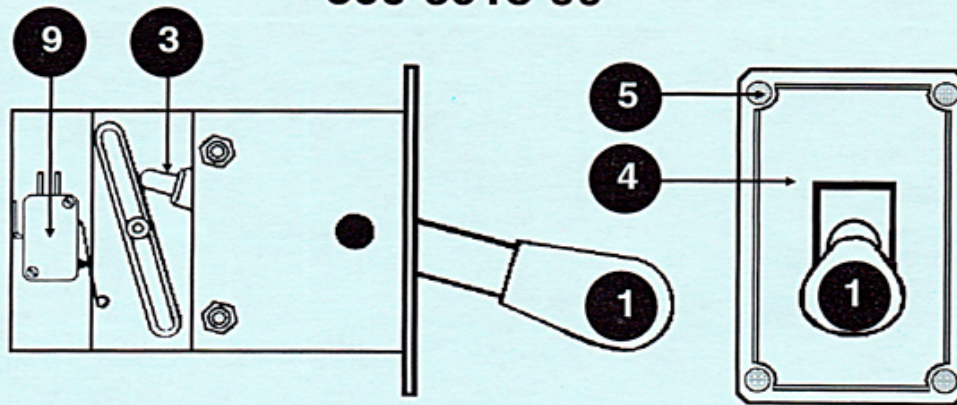
Page Guide



Unique Parts

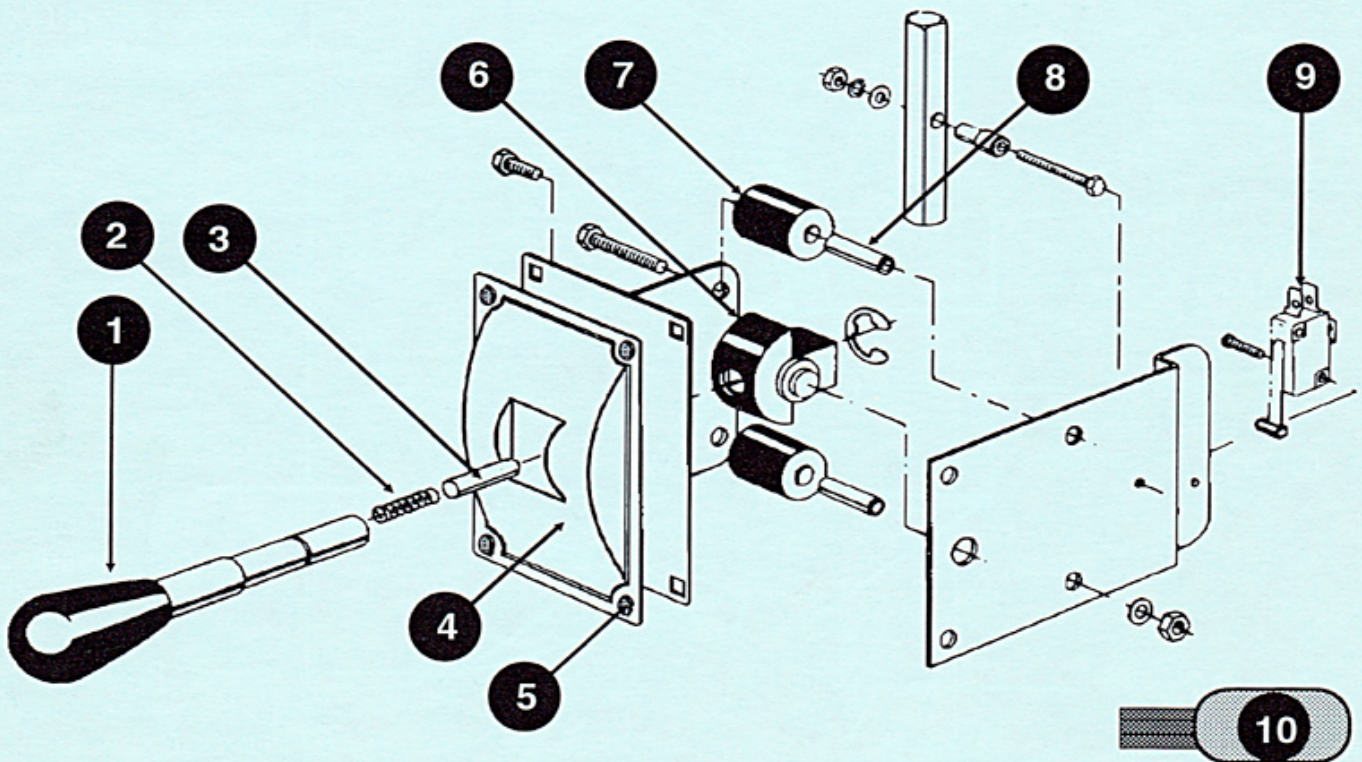
51

Up / Down Lever Assembly 500-5918-00



Side View

Front View



Exploded View

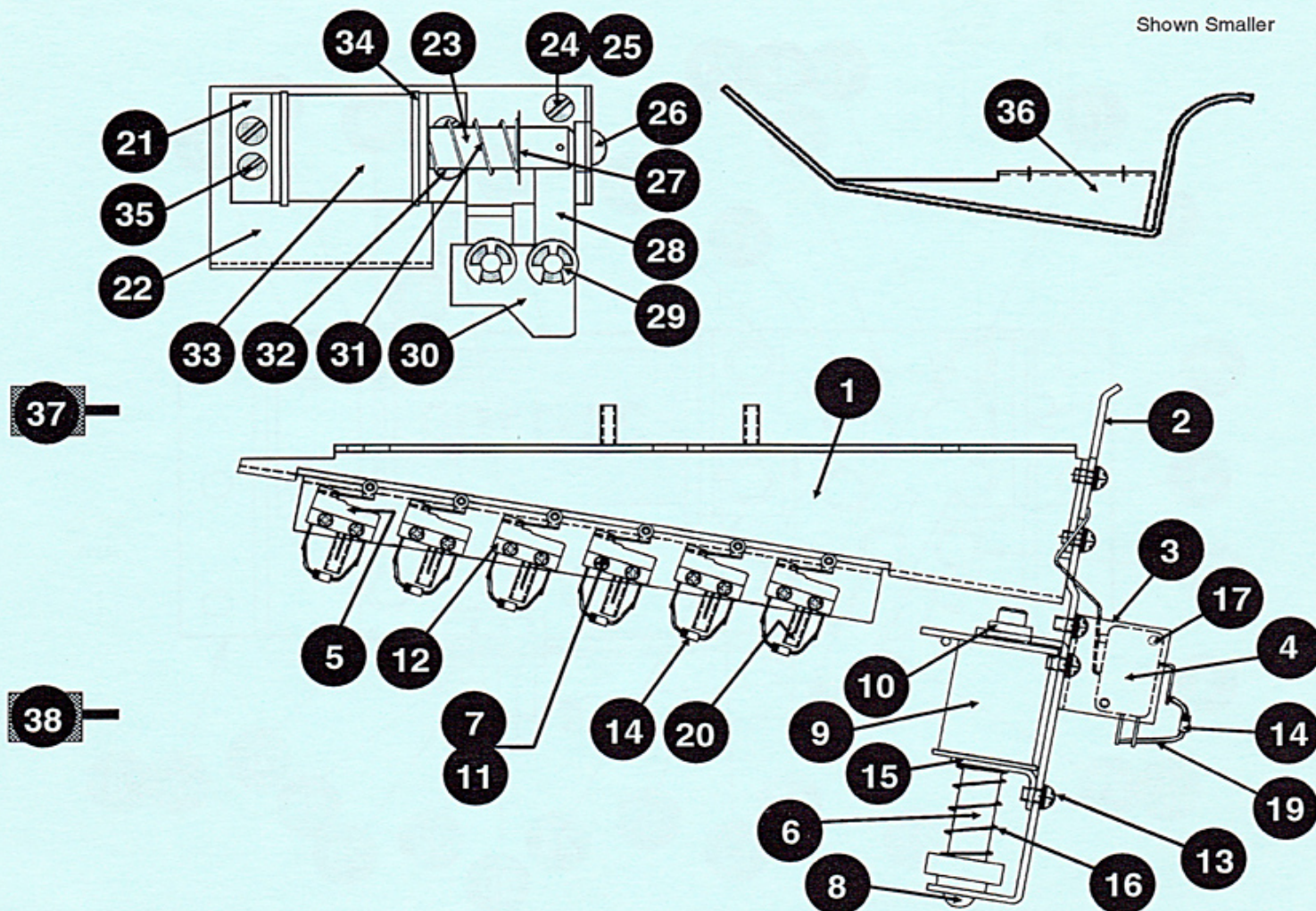
Item	Description	Part No.	Item	Description	Part No.
1	Standard Wooden Handle	515-6202-00	6	Mushroom Cam	545-5314-00
2	Spring	265-5039-00	7	Rubber Bushing (Qty. 2)	545-5239-00
3	Nylon Actuator Arm (Lever)	530-5152-00	8	Spacer (Qty. 2)	254-5016-00
4	Face Plate "Rounded Cover"	545-5593-00	9	Micro-Switch	180-5111-00
5	10-24 x 1 1/4 Carriage Bolt (Qty. 4)	231-5012-00	10	Wiring Harness	036-5350-06
	#10 Flat Washer	242-5003-00	Not a part of the above assembly (not shown):		
	#10 Lock Washer	246-5002-00			
	10-24 Hex Nut	240-5202-00	11	Installation Wrench	535-6410-01

Lock Ball Asm.
500-5684-01

6-Ball Trough Assembly 500-5683-03

Deflector
535-6606-01

Shown Smaller

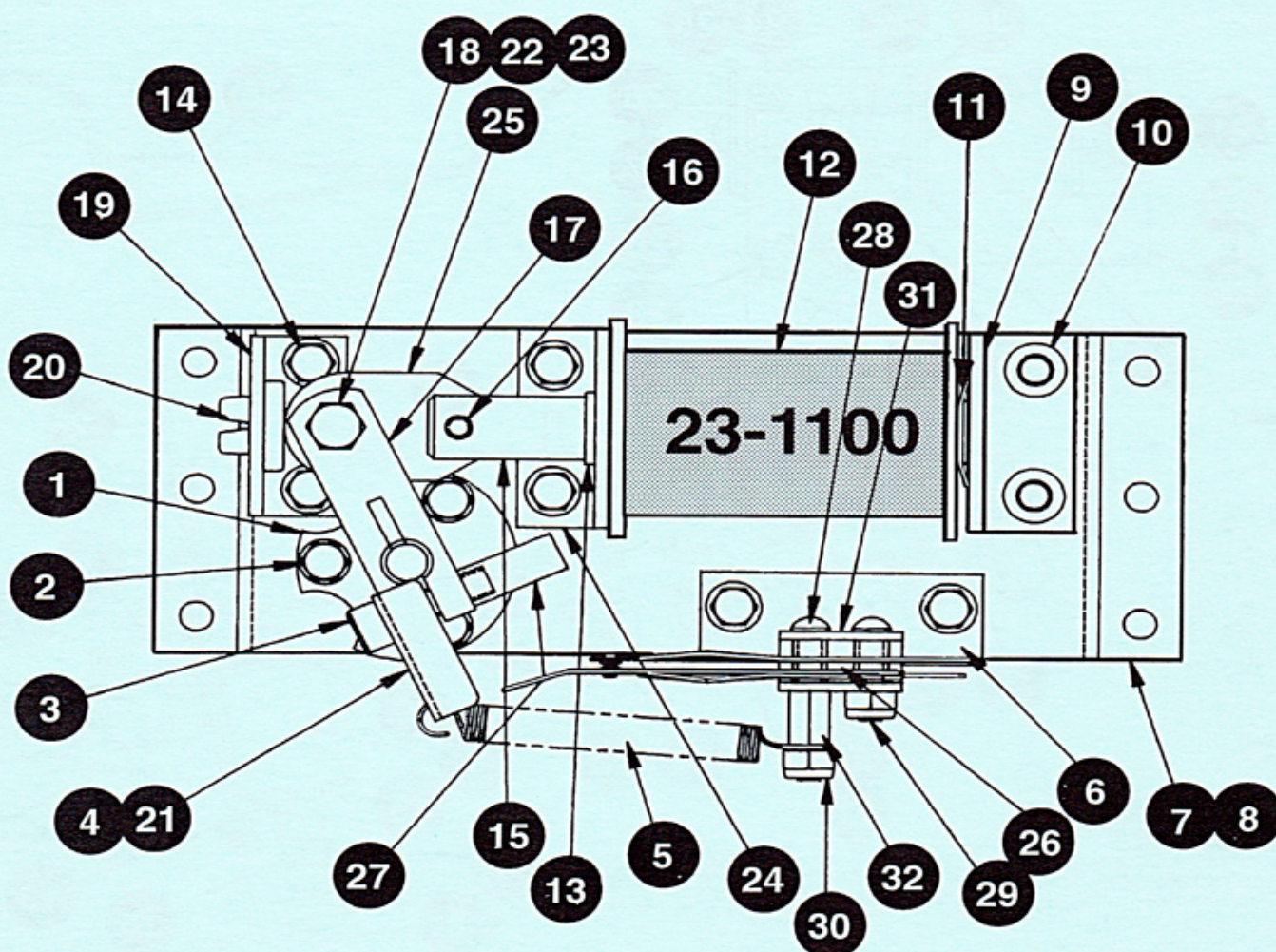


Item	Description	Part No.	Item	Description	Part No.
1	Outhole Mounting Bracket	535-6621-01	20	Insulating Tubing .17 FT.	605-5006-00
2	Coil Mounting Bracket	535-6622-01	21	Core Stop Assembly	515-5088-00
3	Switch Mounting Bracket	535-6623-00	22	Lock Ball Bracket Assembly	515-5817-01
4	Switch, Miniature	180-5118-00	23	Plunger $\varnothing 7/16 \times 2\frac{1}{4}$ LG	530-5250-01
5	Switch, Subminiature (Qty. 6)	180-5119-00	24	Spacer	545-5400-00
6	Plunger Assembly	515-5000-02	25	#8-32 PPH $\times 1"$ LG	232-1104-16
7	#2-56 PPH $\times .5$ LG (Qty. 8)	237-5806-00	26	Rubber Bumper	545-5105-00
8	Rubber Bumper	545-5105-00	27	E-Ring $\varnothing .44$ Shaft	270-5005-00
9	Coil, 23-800, incl. Coil Sleeve	090-5001-01	28	Link, Lock Ball	535-6649-00
10	Coil Sleeve	545-5076-00	29	E-Ring, .25 Shaft (Qty. 2)	250-0008-00
11	#2 Split LW (Qty. 8)	244-5001-00	30	Lock Ball Cam Assembly	515-5815-01
12	Switch Protector (Qty. 6)	535-6539-00	31	Spring	266-5000-00
13	#8-32 PPHW/SEM $\times .25$ LG (Qty. 8)	232-5300-00	32	Coil Retaining Bracket	535-6658-00
14	IN4001 Diode (Qty. 5)	112-5001-00	33	Coil, 25-1240, incl. Coil Sleeve	090-5034-00
15	Coil Retaining Bracket	535-5203-01	34	Coil Sleeve	545-5411-00
16	Spring	266-5020-00	35	#6-32 HWH TC $\times .38$ LG (Qty. 4)	237-5898-00
17	#4-40 PPH $\times .62$ LG (Qty. 2)	237-5832-00	36	Ball Deflector (Trough Entry Scoop)	535-6606-01
18	Cable Asm. (Not Shown)	036-5301-04	37	Wiring Harness (Lock Ball)	036-5301-01
19	Insulating Tubing .08 FT.	605-5003-00	38	Wiring Harness (6-Ball Trough)	036-5301-00

Unique Parts

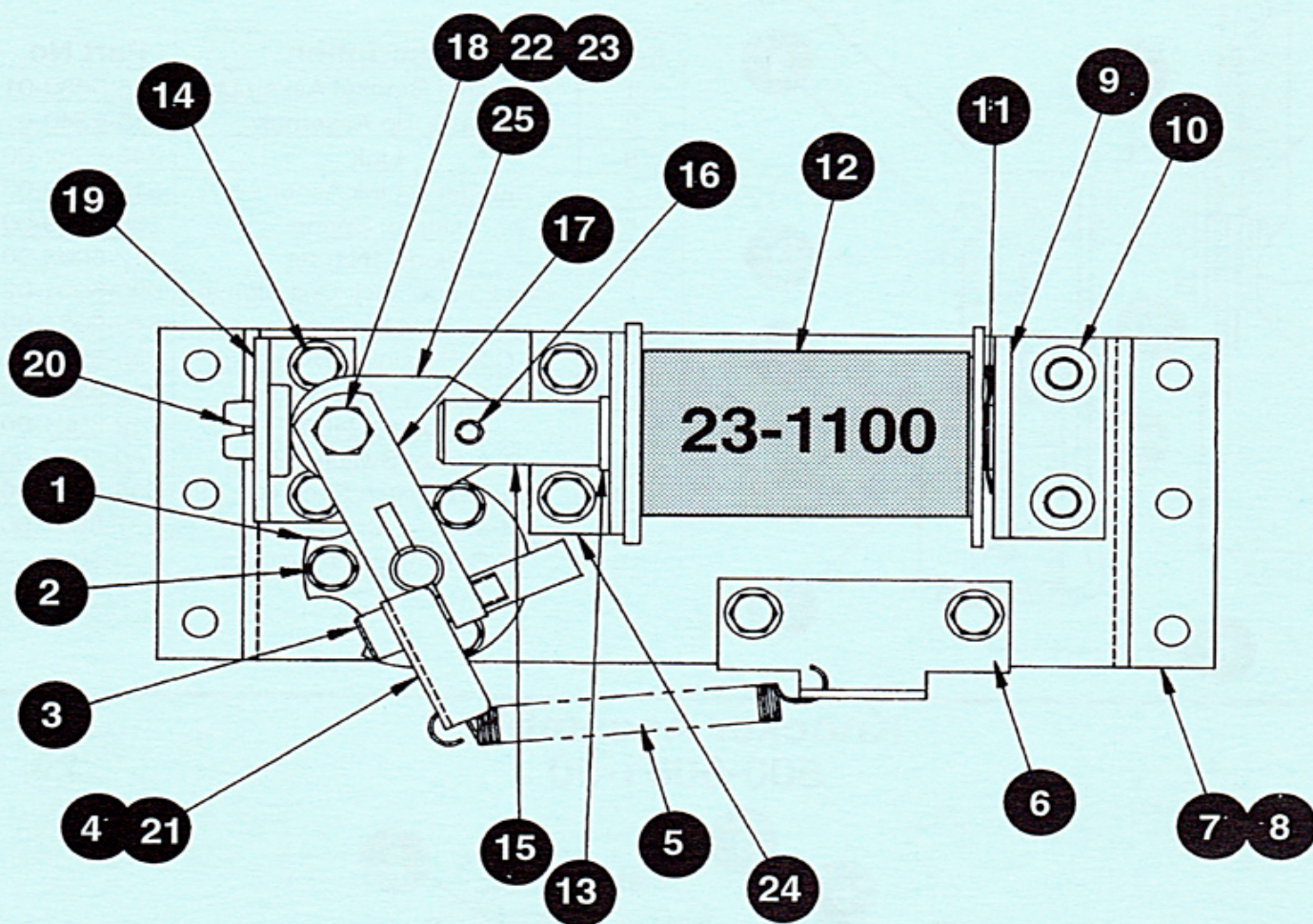
53

Flipper Assemblies, Lower 500-5832-01 (Right), 500-5832-02 (Left)



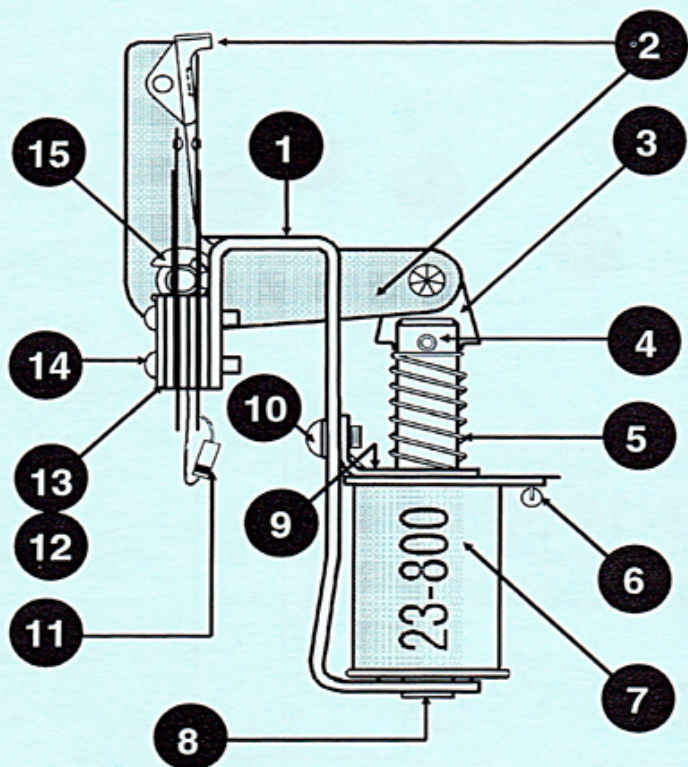
Item	Description	Part No.	Item	Description	Part No.
1	Flipper Bushing	545-5070-00	17	Pawl	530-5070-00
2	#6-32 X .38 LG HWH (Qty. 3)	237-5910-00	18	#10-32 X .75 LG Shoulder Bolt	231-5019-00
3	#10-32 SOC HD X .75 LG	237-5864-00	19	Plunger Stop Bracket	535-5279-01
4	Spring Bracket (Left)	535-6663-02	20	Nylon Stop	545-5445-00
5	Flipper Return Spring	265-5029-02	21	Spring Bracket (Right)	535-6663-01
6	Switch Mounting Bracket	535-6664-00	22	Bushing	530-5139-00
7	Flipper Base (Left)	515-5077-02	23	#10-32 Elastic Stop Nut	240-5203-00
8	Flipper Base (Right)	515-5077-01	24	Front Bracket	535-6453-00
9	Coil Stop Bracket	515-5346-00	25	Flipper Link	545-5401-00
10	1/4-20 SOC HD X .38 LG (Qty. 2)	237-5861-00	26	Power Switch	180-5124-01
11	Spring Washer	269-5002-00	27	Plastic Cap	545-5084-00
12	Coil 23-1100, incl. Coil Sleeve	090-5030-00	28	#6-32 X 1" LG PPH	237-5506-00
13	Coil Sleeve	545-5388-00	29	#6-32 X .63 LG PPH	237-5899-00
14	#8-32 X .38 LG HWH (Qty. 6)	237-5903-00	30	#6-32 Elastic Stop Nut	240-5005-00
15	Plunger and Link Assembly	515-5822-00	31	Switch Plate	535-5045-00
16	Roll Pin	251-5000-00	32	1/4 Hex Spacer (3/8" Long)	254-5008-12

Flipper Assembly, Upper 500-5694-01 (Right)



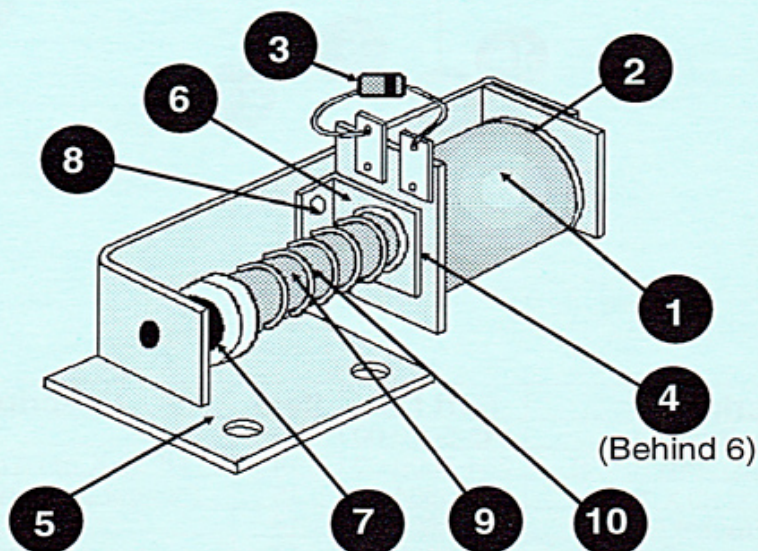
Item	Description	Part No.	Item	Description	Part No.
1	Flipper Bushing	545-5070-00	14	#8-32 X .38 LG HWH (Qty. 6)	234-5100-00
2	#6-32 X .38 LG HWH (Qty. 3)	234-5000-00	15	Plunger and Link Assembly	515-5822-00
3	#10-32 SOC HD X .75 LG	237-5864-00	16	Roll Pin	251-5000-00
4	Spring Bracket (Left)	535-6663-02	17	Pawl	530-5070-00
5	Flipper Return Spring	265-5029-02	18	#10-32 X .75 LG Shoulder Bolt	231-5019-00
6	Switch Mounting Bracket	535-6664-00	19	Plunger Stop Bracket	535-5279-01
7	Flipper Base (Left)	515-5077-02	20	Nylon Stop	545-5445-00
8	Flipper Base (Right)	515-5077-01	21	Spring Bracket (Right)	535-6663-01
9	Coil Stop Bracket	515-5346-00	22	Bushing	530-5139-00
10	¼-20 SOC HD X .38 LG (Qty. 2)	237-5861-00	23	#10-32 Elastic Stop Nut	240-5206-00
11	Spring Washer	269-5002-00	24	Front Bracket	535-6453-00
12	Coil 23-1100, incl. Coil Sleeve	090-5030-00	25	Flipper Link	545-5401-00
13	Coil Sleeve	545-5388-00			

Slingshot (Strong-Leg Bull) Assemblies 500-5849-00



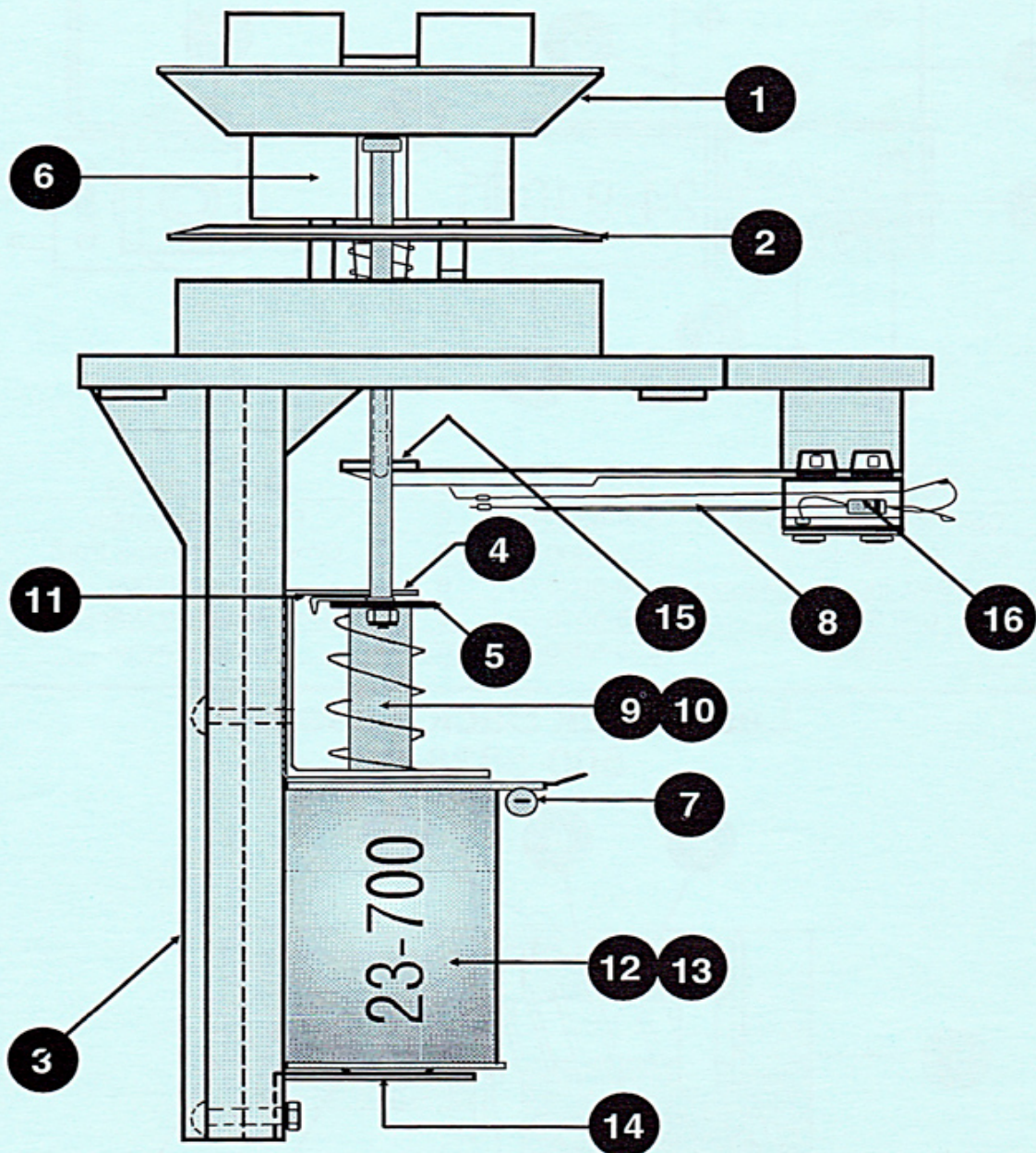
Item	Description	Part No.
1	Slingshot Bracket Assembly	515-5339-01
2	Arm & Tip Assembly	515-5340-01
3	Link	545-5062-00
4	Plunger & Link Assembly	515-5338-00
5	Comp. Spring	266-5020-00
6	Diode 1N4004	112-5003-00
7	Coil 23-800, incl. Coil Sleeve	090-5001-02
8	Coil Sleeve	545-5031-00
9	Coil Retaining Bracket	535-5203-03
10	#8-32 X 1/4" Screw (Qty. 2)	232-5300-00
11	Diode 1N4001	112-5001-00
12	Slingshot Switch (Qty. 2)	180-5054-00
13	Tension Switch Plate (Qty. 2)	535-5846-00
14	#4-40 X 1/2" Screw (Qty. 4)	237-5837-00
15	1/4" Retaining Ring (Qty. 2)	270-5002-00

Knocker Assembly 500-5081-00



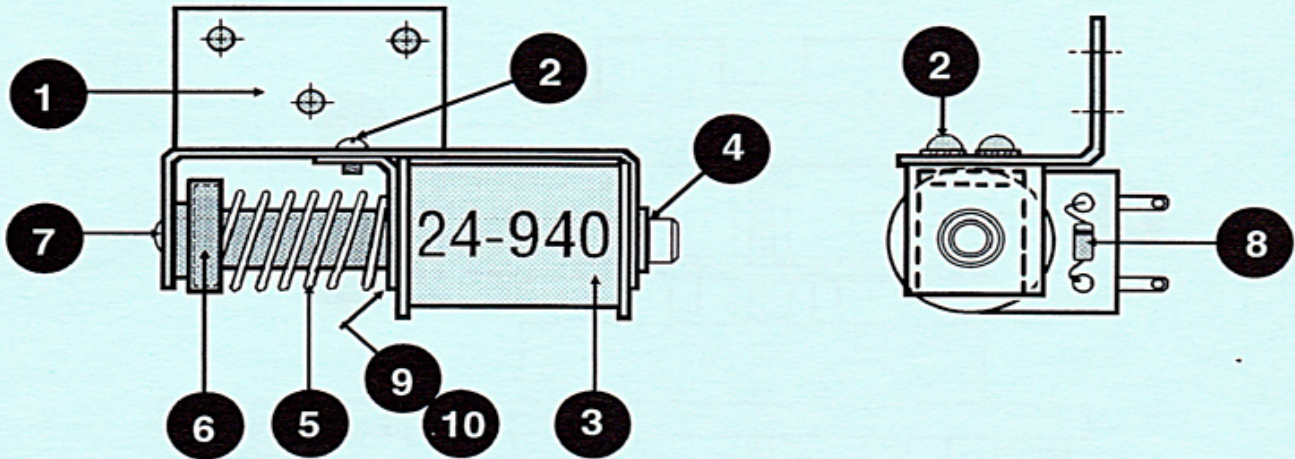
Item	Description	Part No.	Item	Description	Part No.
1	Coil 23-800, incl. Coil Sleeve	090-5001-01	6	Coil Retainer Bracket	535-5203-03
2	Coil Sleeve	545-5076-00	7	Bumper Pad	545-5105-00
3	Diode 1N4004	112-5003-00	8	#8-32 X 1/4" PH PAN SEMS (Qty. 2)	232-5300-00
4	Crescent Spring Washer	269-5002-00	9	Plunger Assembly	515-5000-02
5	Kickback/Knocker Bracket	535-5265-00	10	Spring	266-5020-00

Turbo Bumper Assemblies 500-5227-02†



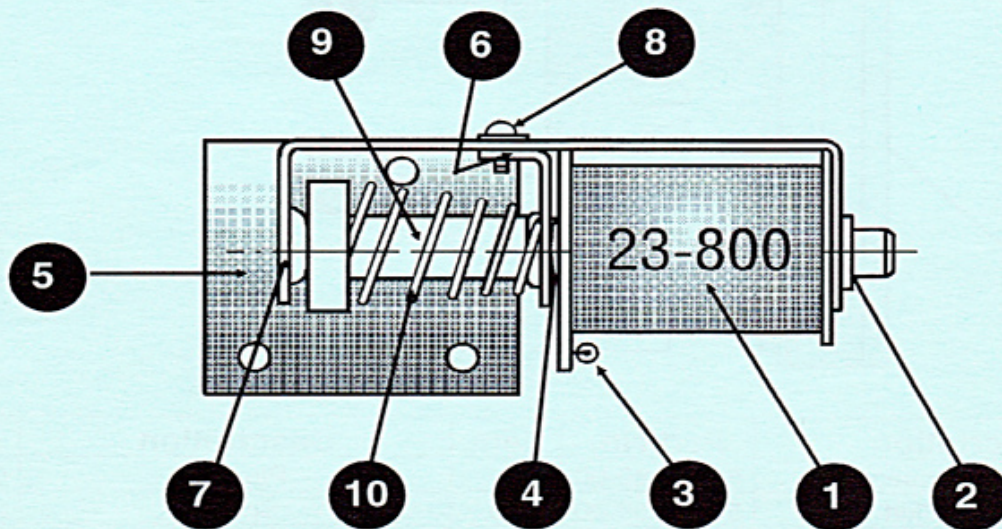
Item	Description	Part No.	Item	Description	Part No.
1	Rod & Ring Assembly	515-5085-00	9	Plunger	530-5062-00
2	Bumper Skirt	545-5098-00	10	Spring	266-5009-00
3	Bumper Housing	545-5100-00	11	Metal Yoke	535-5877-00
4	Plunger Bracket	535-5277-00	12	Coil 23-700, incl. Coil Sleeve	090-5022-02
5	Fiber Yoke	545-5120-00	13	Coil Sleeve	545-5031-00
6	Bumper Body	545-5197-00	14	Coil Stop Assembly	515-5088-00
7	Diode 1N4004	112-5003-00	15	Spoon Switch	545-5542-00
8	Switch	180-5015-01	16	Diode 1N4001	112-5001-00
† Bumper Cover(s) (not shown) not included with above assembly, it must be ordered separately.					
Note:	Bumper Cover	550-5057-XX	Replace -XX w/ color desired (This game colors are BOLD)		
Clear -01. Red -02 . Amber -03. Green -04 . Blue -05 . Yellow -06 . Orange -07. White -08. Purple -09.					

Ball Kicker (Auto Launch) Assembly 500-5477-01



Item	Description	Part No.	Item	Description	Part No.
1	Coil Mounting Bracket	535-6385-00	6	Plunger Assembly	515-5000-02
2	8-32 X 1/4 SEMS (Qty. 2)	232-5300-04	7	Grommet (Bumper Pad)	545-5105-00
3	Coil 24-940, incl. Coil Sleeve	090-5036-01	8	Diode 1N4004	112-5003-00
4	Coil Sleeve	545-5076-00	9	Coil Retaining Bracket	535-5203-03
5	Spring	266-5020-00	10	Spring Washer	269-5002-00

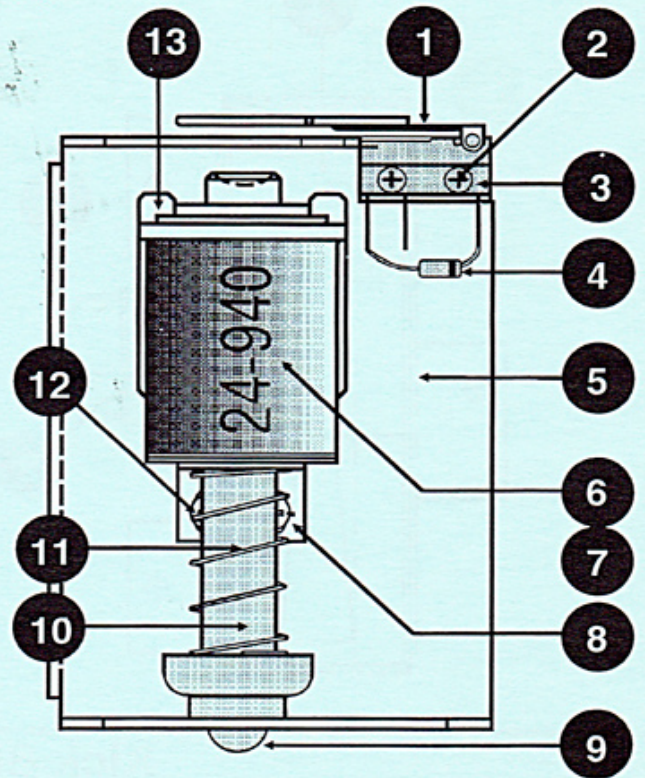
Laser Kick Back Assembly 500-5838-00



Item	Description	Part No.	Item	Description	Part No.
1	Coil 23-800, incl. Coil Sleeve	090-5001-01	6	Coil Retainer Bracket	535-5203-03
2	Coil Sleeve	545-5076-00	7	Bumper Pad	545-5105-00
3	Diode 1N4004	112-5003-00	8	#8-32 X 1/4 " PH PAN SEMS (Qty. 2)	232-5300-00
4	Crescent Spring Washer	269-5002-00	9	Plunger Assembly	515-5000-02
5	Kickback/Knocker Bracket	535-5265-00	10	Spring	266-5020-00

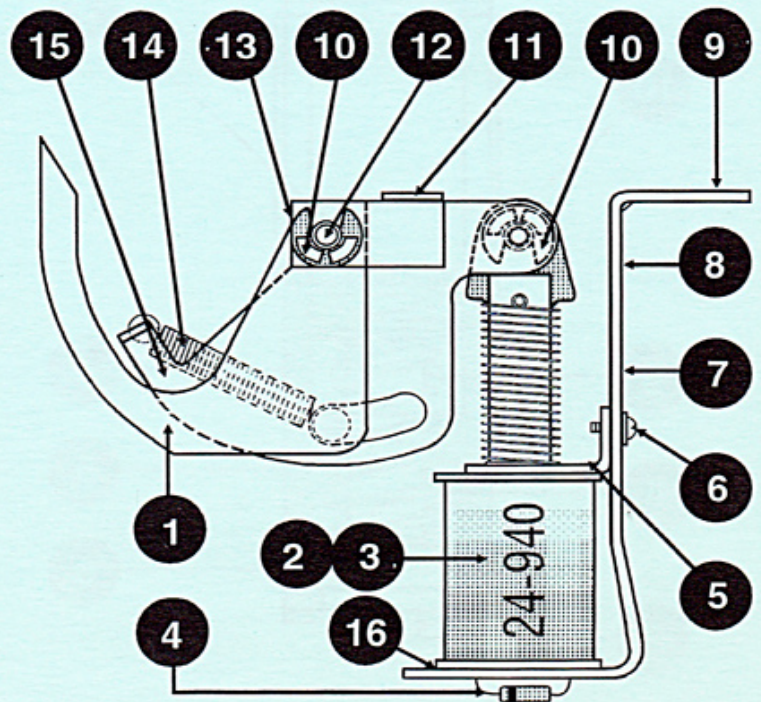
Vertical Up-Kicker (VUK) Assembly 500-5839-00

Item	Description	Part No.
1	Switch	180-5116-00
2	Screw (Qty. 2)	237-5806-00
	Washer (Qty. 2)	244-5001-00
3	Protector	535-6539-00
4	Diode 1N4001	112-5001-00
5	Bracket	535-6607-01
6	Coil 24-940, incl. Coil Sleeve	090-5036-01
7	Coil Sleeve	545-5076-00
8	Bracket	535-5203-01
9	Bumper Pad	545-5105-00
10	Spring	266-5020-00
11	Plunger	515-5941-01
12	Screw (Qty. 2)	232-5300-00
13	Insulation	545-5431-00



Ball Eject Assembly 500-5664-01

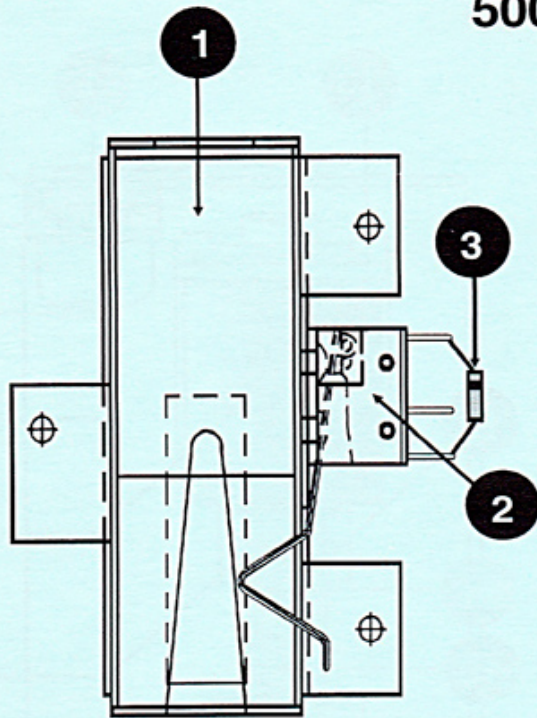
Item	Description	Part No.
1	Eject Cam Assembly	515-5042-00
2	Coil 24-940, incl. Coil Sleeve	090-5036-01
3	Coil Sleeve	545-5031-00
4	Diode 1N4004	112-5003-00
5	Coil Retainer Bracket	535-5203-01
6	8-32 1/4 SEMS (Qty. 2)	232-5300-04
7	Plunger Spring	266-5000-00
8	Plunger & Link Assembly	515-5338-00
9	Bracket & Stop Assembly	515-5011-00
10	"E" Ring (Qty. 2)	270-5002-00
11	Fulcrum Bracket	535-6446-01
12	Fulcrum Pin	530-5207-00
13	Shim Washer (Qty. 2) (If Required)	242-5013-00
14	Ext. Spring	265-5017-00
15	Spring Plate Assembly	515-5009-00
16	Insulator	545-5431-00



Unique Parts

59

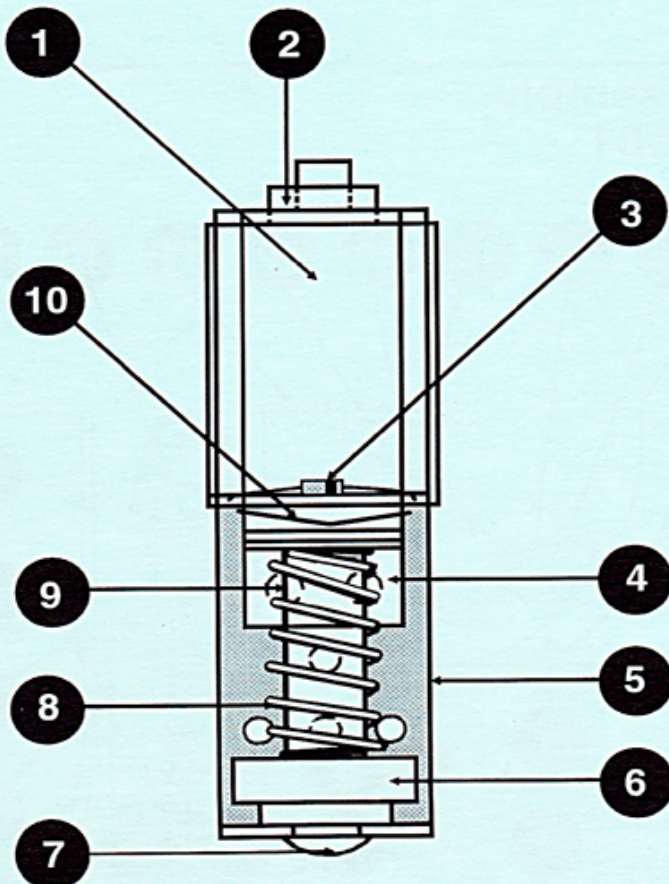
Power Scoop Assemblies 500-5809-00



Please Note:
The Power Scoop & Kick
Big Assemblies (2 ea.)
work in conjunction with
each other but are
separate assemblies.

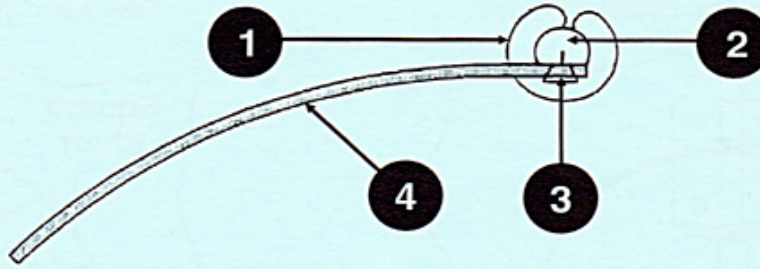
Item	Description	Part No.
1	Power Scoop Weld Assembly	515-6022-00
2	Micro Switch	180-5057-00
	Switch Protect Plate	535-6539-00
	#2 Lockwasher (Qty. 2)	244-5001-00
	2-56 Hex Nut (Qty. 2)	240-5301-00
	Micro Bracket	535-6193-00
	2-56 PHMS (Qty. 2)	237-5806-00
	6-32 PHMS (Qty. 2)	232-5200-00
3	Diode 1N4004	112-5003-00

Kick Big Assemblies 500-5862-00



Item	Description	Part No.
1	Coil 23-800, incl. Coil Sleeve	090-5001-01
2	Coil Sleeve	545-5076-00
3	Diode 1N4004	112-5003-00
4	Bracket	535-5203-01
5	Frame	535-6730-00
6	Plunger Assembly	515-5000-02
7	Rubber Grommet	545-5105-00
8	Spring	266-5020-00
9	8-32 X 1/4 SEMS (Qty. 2)	232-5300-04
10	Spring Washer	269-5002-00

Diverter Assembly 500-5654-00

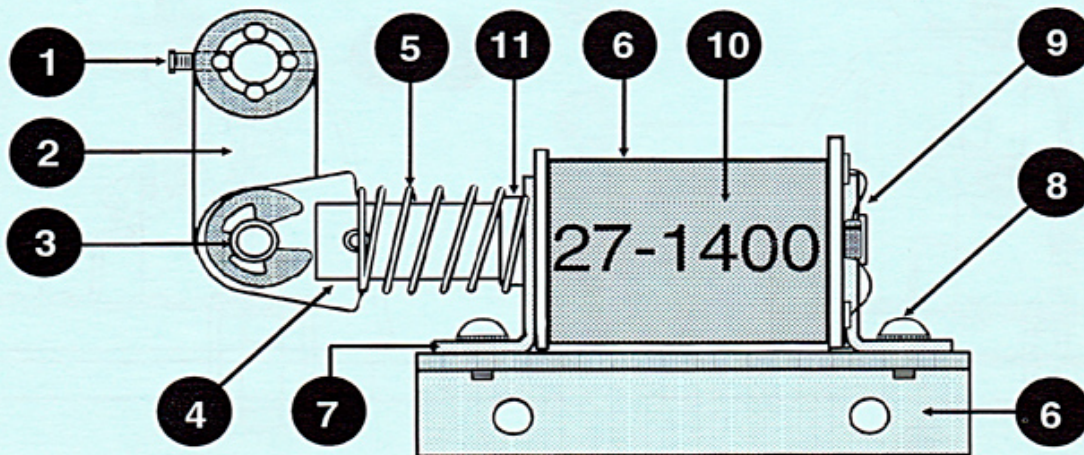


Please Note:

The Diverter Assembly & Diverter Plunger and Crank Arm Assembly work in conjunction with each other but are separate assemblies.

Item	Description	Part No.	Item	Description	Part No.
1	Retaining Ring	250-0008-00	3	6-32 X 3/8 FHMS (Qty. 4)	237-5501-00
2	Shaft	530-5235-00	4	Diverter	535-5126-00

Diverter Plunger and Crank Arm Assembly 515-5453-00



Item	Description	Part No.	Item	Description	Part No.
1	#8-32 3/8 Soc. Hd. Cap Screw	237-5897-00	7	Coil Mounting Bracket	535-6026-00
2	Crank Arm Assembly	515-5396-00	8	#6-32 X 1/4 Screw (Qty. 4)	232-5200-00
3	Retaining Ring ϕ 1/4 Shaft	270-5002-00	9	Coil Stop Bracket	515-5088-00
4	Plunger & Link Assembly	515-5338-00	10	Coil 27-1400, incl. Coil Sleeve	090-5015-00
5	Compression Spring	266-5000-00	11	Coil Sleeve	545-5031-00
6	Diverter Coil Assembly	515-5447-01	12	Fiche Paper (Insulator)	545-5431-00

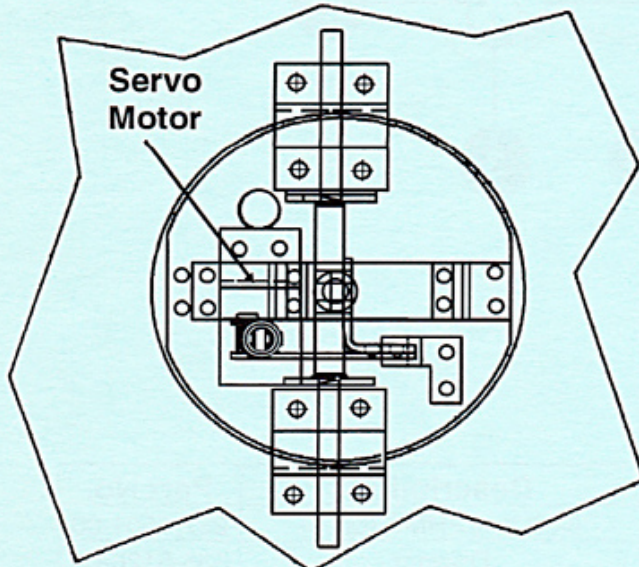
Note: Item 6 includes items 7 thru 11.

Unique Parts

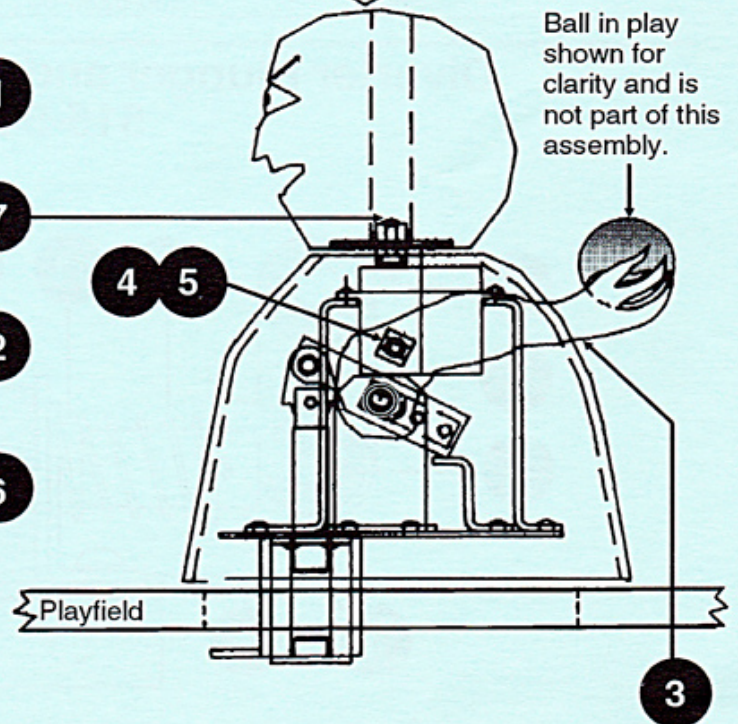
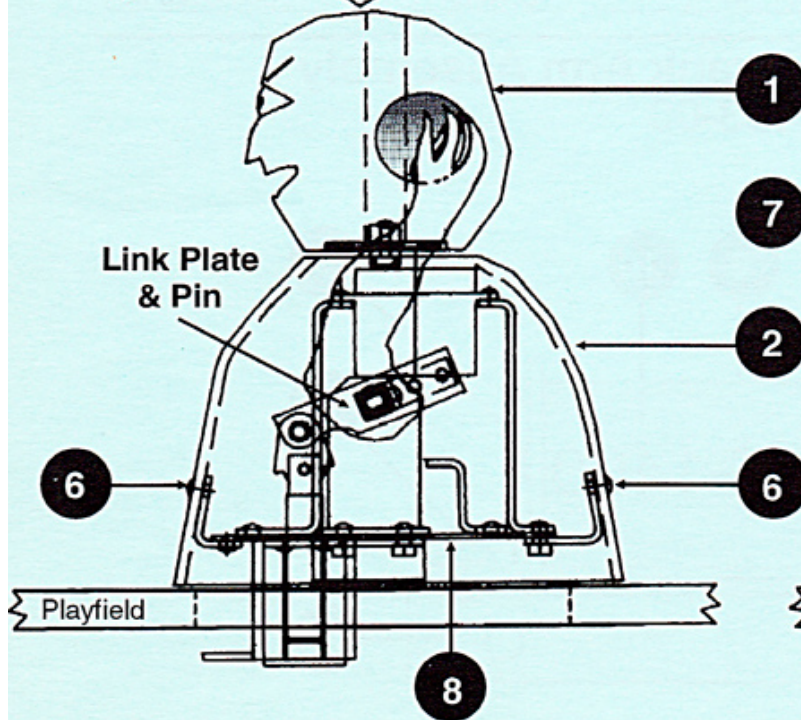
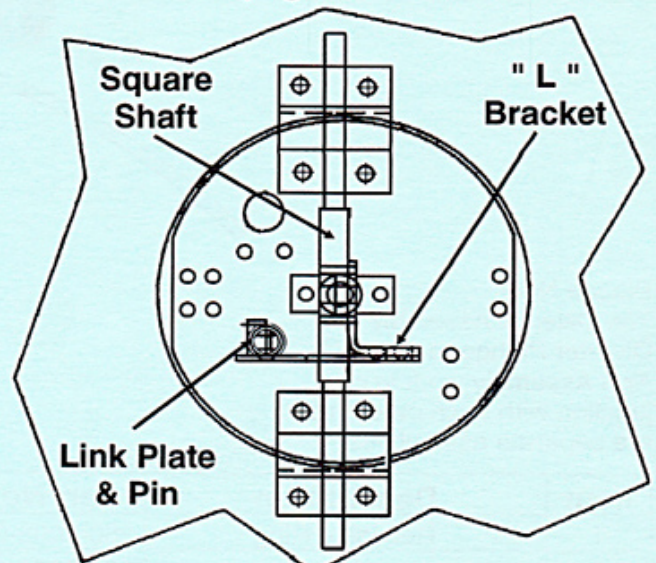
61

Frankenstein Assembly 500-5887-00

Top View Cut-Away
showing all components.
See next page for breakdowns.

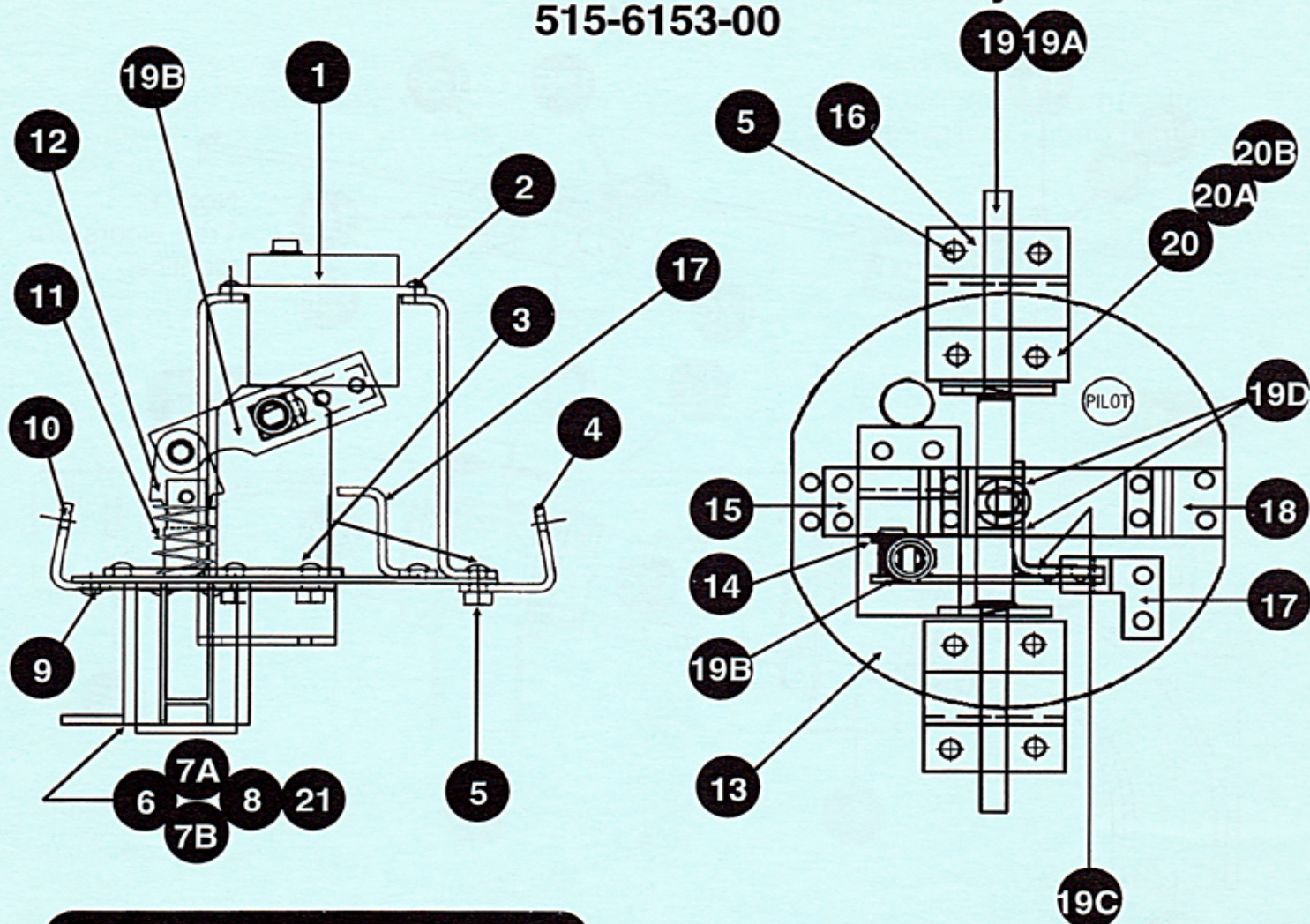


Top View Cut-Away
not showing Servo Motor.
See next page for breakdowns.



Item	Description	Part No.	Item	Description	Part No.
1	Head Assembly	515-6124-00	5	8-32 Stop Nut (Qty. 2)	240-5102-00
2	Body	545-5547-00	6	8-32 X 5/8 HWH Serated (Qty. 4)	237-5951-00
3	Arm Right (50° Travel)	545-5248-01	7	#4 Sheet Metal Screw	Supplied w/ Servo Motor
	Arm Left (50° Travel)	545-5248-02			
4	Square Spacer Right	535-7199-01	8	Main Plate Assembly (See breakdown of this assembly on the next page)	515-6153-00
	Square Spacer Left	535-7199-02			
Determination of Left / Right is View from Player.					

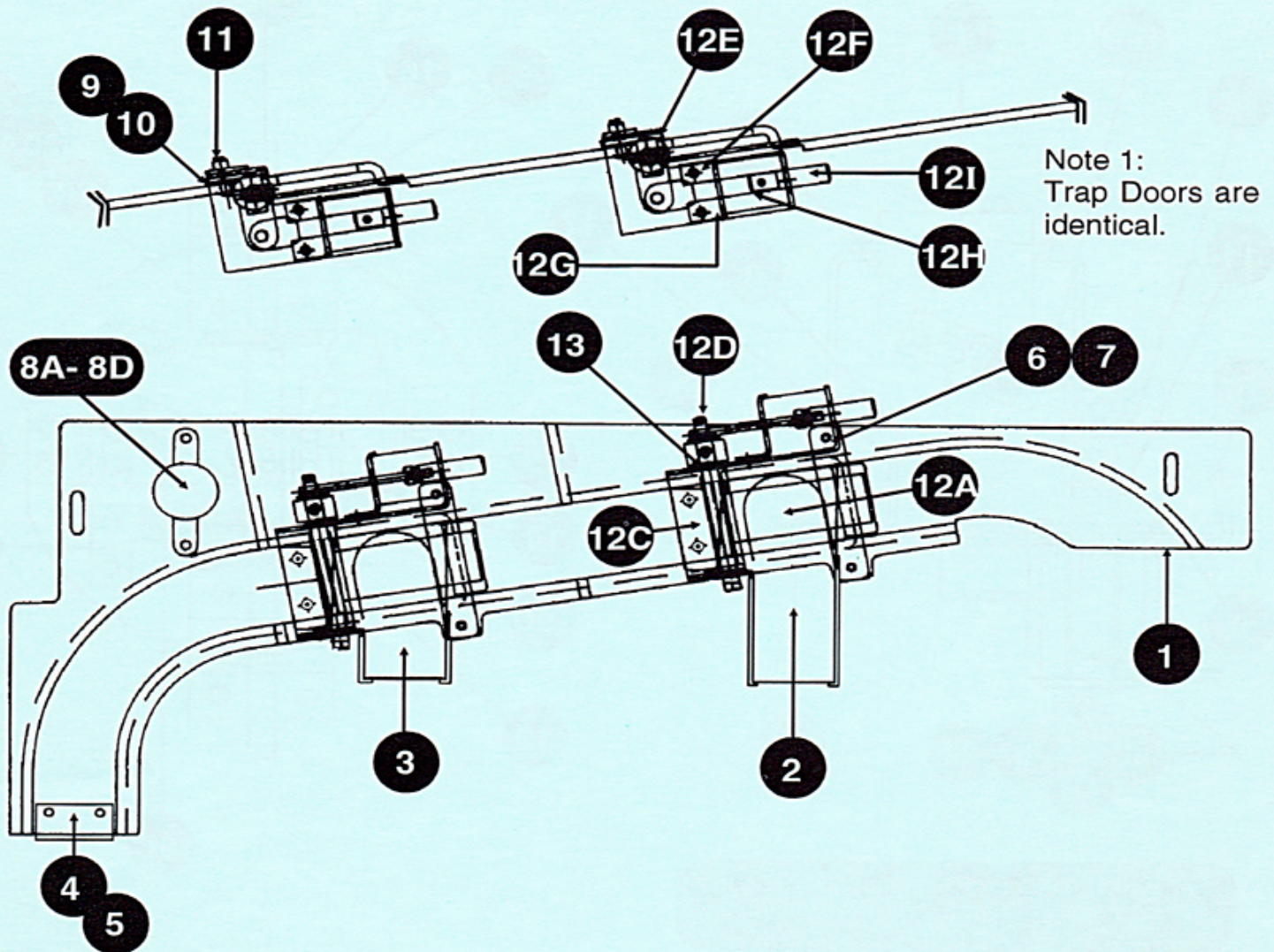
Frankenstein Main Plate Assembly 515-6153-00



For Troubleshooting / Schematics for the Servo Motor & Board, see the end of the YELLOW SECTION, page 93.

Item	Description	Part No.	Item	Description	Part No.
1	Servo Motor (94102)	041-5032-00	14	Retaining Ring on Pin	270-5002-00
* Not Shown	Servo Motor Monster Head Board* (Not a part of this Asm.)	520-5113-00	15	Mounting Bracket Servo Front	535-7042-01
2	4-40 X 5/8 HWH Serated (Qty. 4)	237-5945-00	16	Mounting Bracket (Qty. 2)	535-7198-00
3	8-32 X 1/2 HWH Serated (Qty. 6)	237-5905-00	17	Stop Bracket	535-6137-00
4	Bracket Body Back	535-7084-00	18	Mounting Bracket Servo Rear	535-7042-00
5	8-32 Stop Nut (Qty. 6)	240-5102-00	19	Square Shaft & Bracket Ass'y.	515-6126-00
6	Coil Bracket Assembly	515-6125-00	19A	Square Shaft	530-5151-00
7A	Coil 24-940, incl. Coil Sleeve	090-5036-00	19B	Link Plate & Pin Sub-Assembly	515-6132-00
7B	Coil Sleeve	545-5031-00	19C	"L" Bracket	535-6037-00
8	Diode 1N4004	112-5003-00	19D	8-32 X 3/8 Self Tap Serated (Qty. 4) all with Loctite	237-5903-00
9	8-32 X 3/8 HWH Serated (Qty. 6)	237-5903-00	20	Support Bracket Ass'y. (Qty. 2)	515-6133-00
10	Bracket Body Front	535-7083-00	20A	Support Bracket (Qty. 2)	535-6138-00
11	Spring (Qty. 2)	266-5011-00	20B	Nyliner (Not Shown) (Qty. 2)	545-5423-00
12	Plunger Assembly	515-5407-00	* See Lamp Board Diagram, Pg. 50, for location.		
13	Main Plate	535-7044-00	21	Large Fiche Paper (Insulator)	545-5599-00

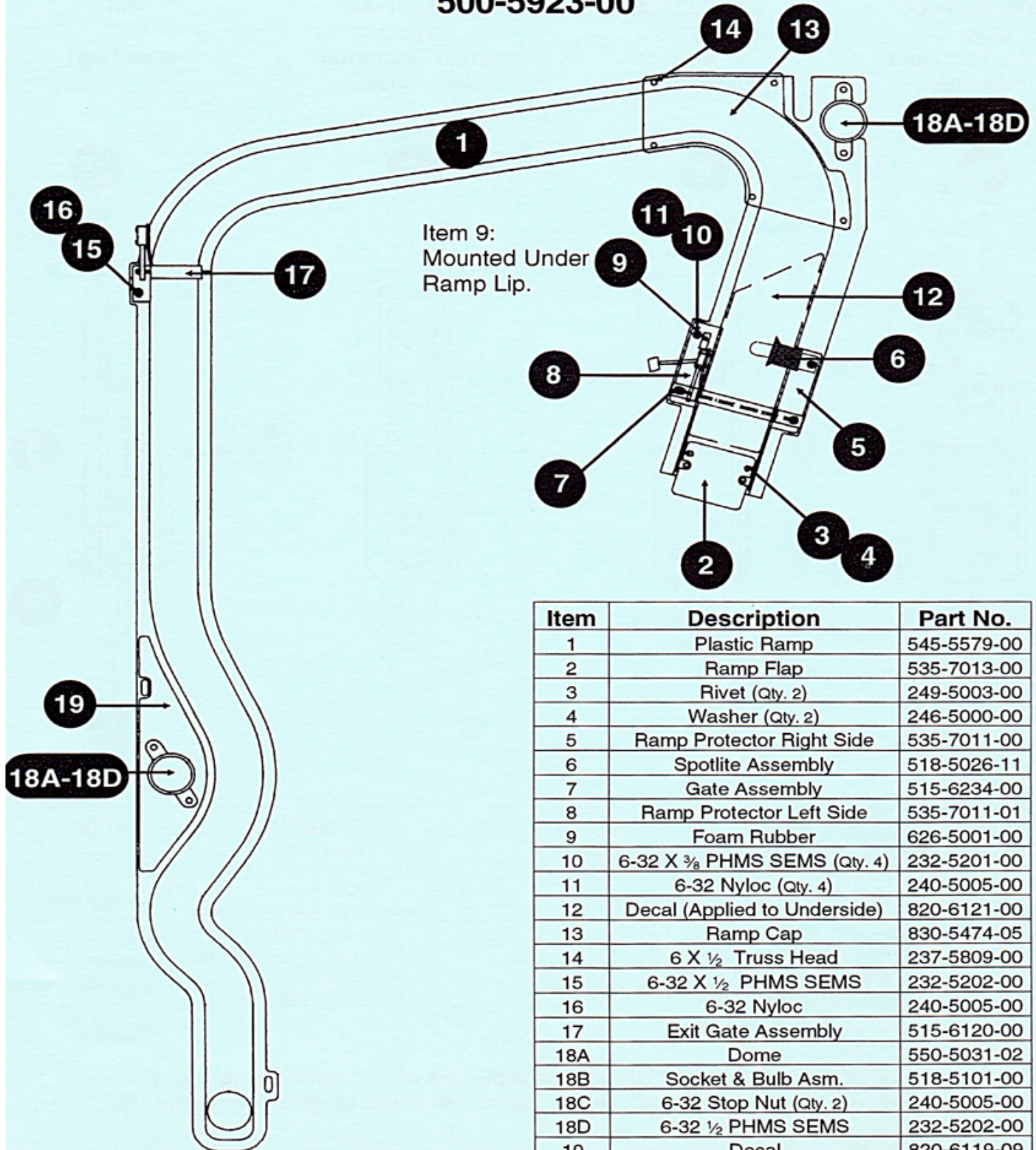
Upper Level Plastic Ramp Assembly 500-5905-00



Item	Description	Part No.	Item	Description	Part No.
1	Plastic Ramp	545-5565-00	12	Trap Door Assembly (Qty. 2)	500-5906-00
2	Mini Trough Large	535-7186-01	12A	Flap & Shaft Assembly	515-6185-00
3	Mini Trough Small	535-7186-00		Shaft (Trap Door Pivot), Flap (Trap Door), & Rivet	See Note 2
4	Ramp Bracket	535-5291-00	12B	Retaining Ring 1/4 (Qty. 2)	270-5002-00
5	Rivet (Qty. 2)	249-5003-00	12C	Trap Door Coil Bracket	535-7129-00
6	6 x 1/2 Truss Head (Qty. 4)	237-5809-00	12D	Retaining Ring 3/16	270-5001-00
7	Door/Ramp Bracket (Qty. 2)	535-7192-00	12E	Crank Arm Assembly	515-6184-00
8A	Dome	550-5031-02	12F	6-32 x 3/16 HWHMS (Qty. 2)	232-5209-00
8B	Socket & Bulb Asm.	518-5101-00	12G	Coil Bracket	535-6784-00
8C	6-32 Stop Nut (Qty. 2)	240-5005-00	12H	Coil, 28-1050	090-5046-00
8D	6-32 1/2 PHMS SEMS	232-5202-00		Coil Sleeve (Qty. 2)	545-5500-00
9	Nut Plate (Qty. 2)	535-7189-00	12I	Plunger Assembly	515-6057-00
10	6-32 Nyloc (Qty. 4)	240-5005-00	13	Flat Washer (Qty. 2)	242-5023-00
11	6-32 x 1/2 PHMS SEMS (Qty. 4)	237-5504-00			

Note 2: Item names are given for reference only and cannot be ordered.
For these items, the sub-assembly must be ordered.

Lower Level Plastic Ramp Assembly 500-5923-00



Item	Description	Part No.
1	Plastic Ramp	545-5579-00
2	Ramp Flap	535-7013-00
3	Rivet (Qty. 2)	249-5003-00
4	Washer (Qty. 2)	246-5000-00
5	Ramp Protector Right Side	535-7011-00
6	Spotlite Assembly	518-5026-11
7	Gate Assembly	515-6234-00
8	Ramp Protector Left Side	535-7011-01
9	Foam Rubber	626-5001-00
10	6-32 X 3/8 PHMS SEMS (Qty. 4)	232-5201-00
11	6-32 Nyloc (Qty. 4)	240-5005-00
12	Decal (Applied to Underside)	820-6121-00
13	Ramp Cap	830-5474-05
14	6 X 1/2 Truss Head	237-5809-00
15	6-32 X 1/2 PHMS SEMS	232-5202-00
16	6-32 Nyloc	240-5005-00
17	Exit Gate Assembly	515-6120-00
18A	Dome	550-5031-02
18B	Socket & Bulb Asm.	518-5101-00
18C	6-32 Stop Nut (Qty. 2)	240-5005-00
18D	6-32 1/2 PHMS SEMS	232-5202-00
19	Decal	820-6119-09
20 *	Back Panel Ramp Support Brackets	Right 535-7277-01 Left 535-7276-01

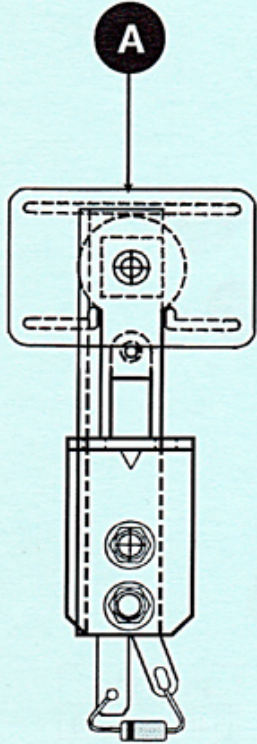
* Note: Item 20, not shown in this drawing, are attached to the Back Panel and are not a part of this assembly.

Unique Parts

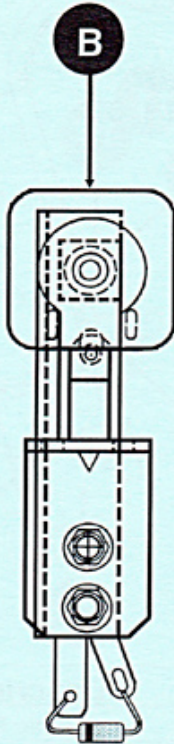
65

Stand-Up Target Assemblies:

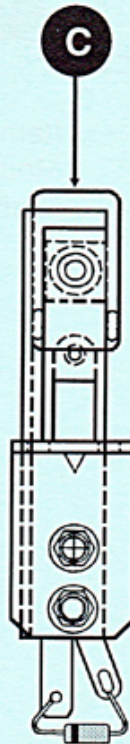
500-5321-XX
Qty.: 5
1" X 1-1/2" Rect.
(Front View)



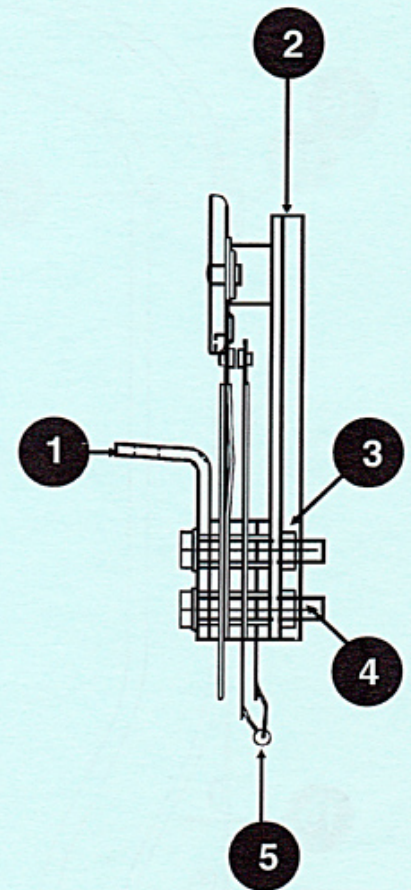
500-5232-XX
Qty.: 5
1" Square
(Front View)



500-5857-XX
Qty.: 3
Narrow Rectangle
(Front View)



All
(Side View)



Item	Description	Part No.	Item	Description	Part No.
A	Switch & Target Assembly 1" X 1-1/2" Rectangle (Flat)	515-6027-XX	2	Back Plate (Same for all above targets)	535-5116-00
B	Switch & Target Assembly 1" Square (Flat)	515-5162-XX	3	6-32 Nyloc (Same for all above targets)	240-5010-00
C	Switch & Target Assembly Narrow Rectangle (Flat)	515-5967-XX	4	6-32 X 3/4 HWHMS (Same for all above targets)	237-5893-00
1	Mounting Bracket (Same for all above targets)	535-6896-00	5	Diode 1N4001 (Same for all above targets)	112-5001-00

Target Color: The "-XX" should be replaced with the following 2-digit number for the color desired. On this game all white targets are used (-08).

-01:	Clear	-04:	Green	-07:	Orange
-02:	Red	-05:	Blue	-08:	White
-03:	Amber	-06:	Yellow	-09:	Purple

SCHEMATICS / TROUBLESHOOTING (YELLOW SECTION)

Page Guide

Pages 72-73
Coils & Flashlamps
Diagrams

Page 74
Switches
Diagrams

Page 75
Lamps
Diagrams

Page 93
Creature Head
Servo Controller
Board Theory of Op.
& Schematic

Page 71
Wiring
Diagram

Pages 76-80
CPU Board Asm. &
Logic Diagrams

Page 81
Power Supply
Bd. Schematic &
Component Layout

Page 82
Sound Board
Component Layout
& Schematic

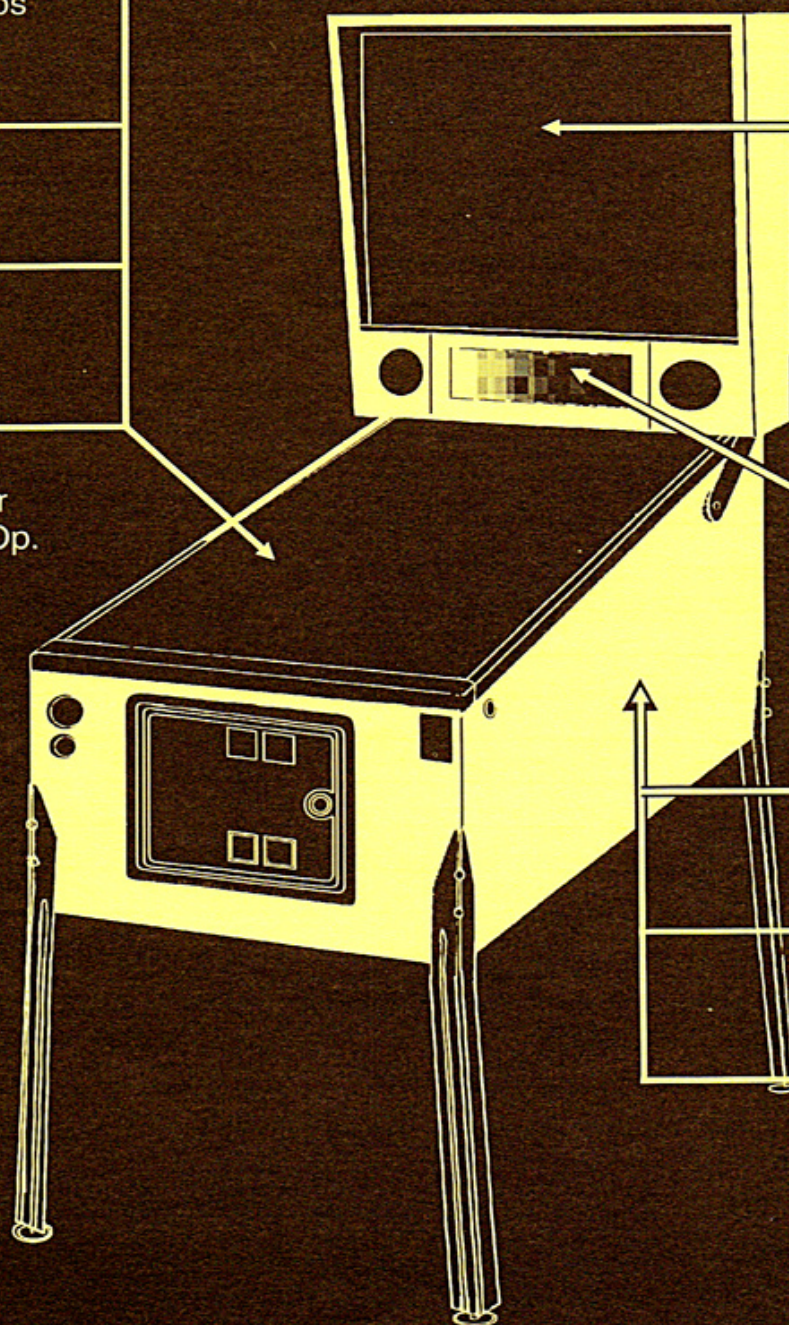
Page 92
PPB
Diagram

Pages 83-88
Display Controller
& Driver Bds.
Schematics &
Component Layouts

Page 69
Power
Wiring Diagram

Page 70
Cabinet
Wiring Diagram

Pages 89-91
Solid State 3-
Flipper Board
Theory of Op. &
Circuit Trouble-
shooting Flowchart,
Board & Wiring
Diagrams



[illegible]

SCHEMATICS / TROUBLESHOOTING (YELLOW SECTION)

Page Guide

Pages 72-73
Coils & Flashlamps
Diagrams

Page 74
Switches
Diagrams

Page 75
Lamps
Diagrams

Page 93
Creature Head
Servo Controller
Board Theory of Op.
& Schematic

Page 71
Wiring
Diagram

Pages 76-80
CPU Board Asm. &
Logic Diagrams

Page 81
Power Supply
Bd. Schematic &
Component Layout

Page 82
Sound Board
Component Layout
& Schematic

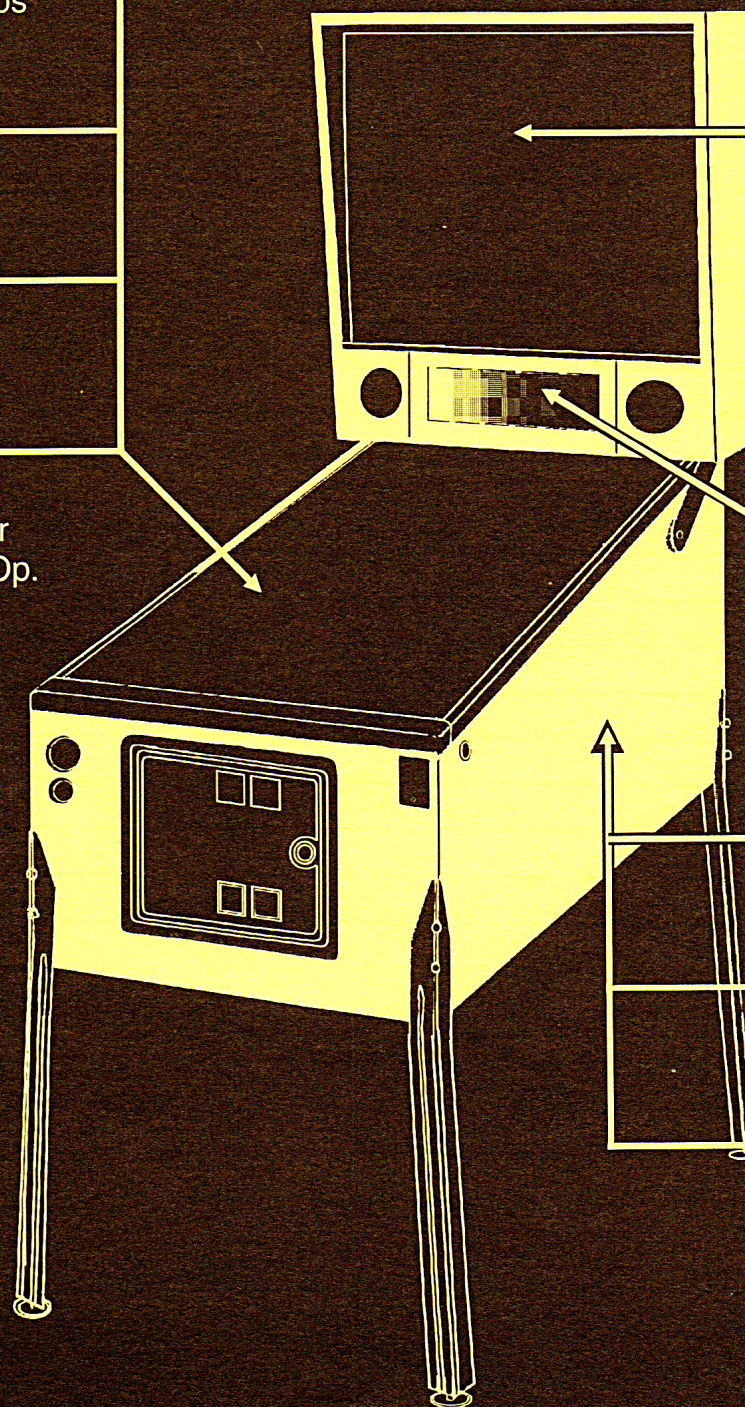
Page 92
PPB
Diagram

Pages 83-88
Display Controller
& Driver Bds.
Schematics &
Component Layouts

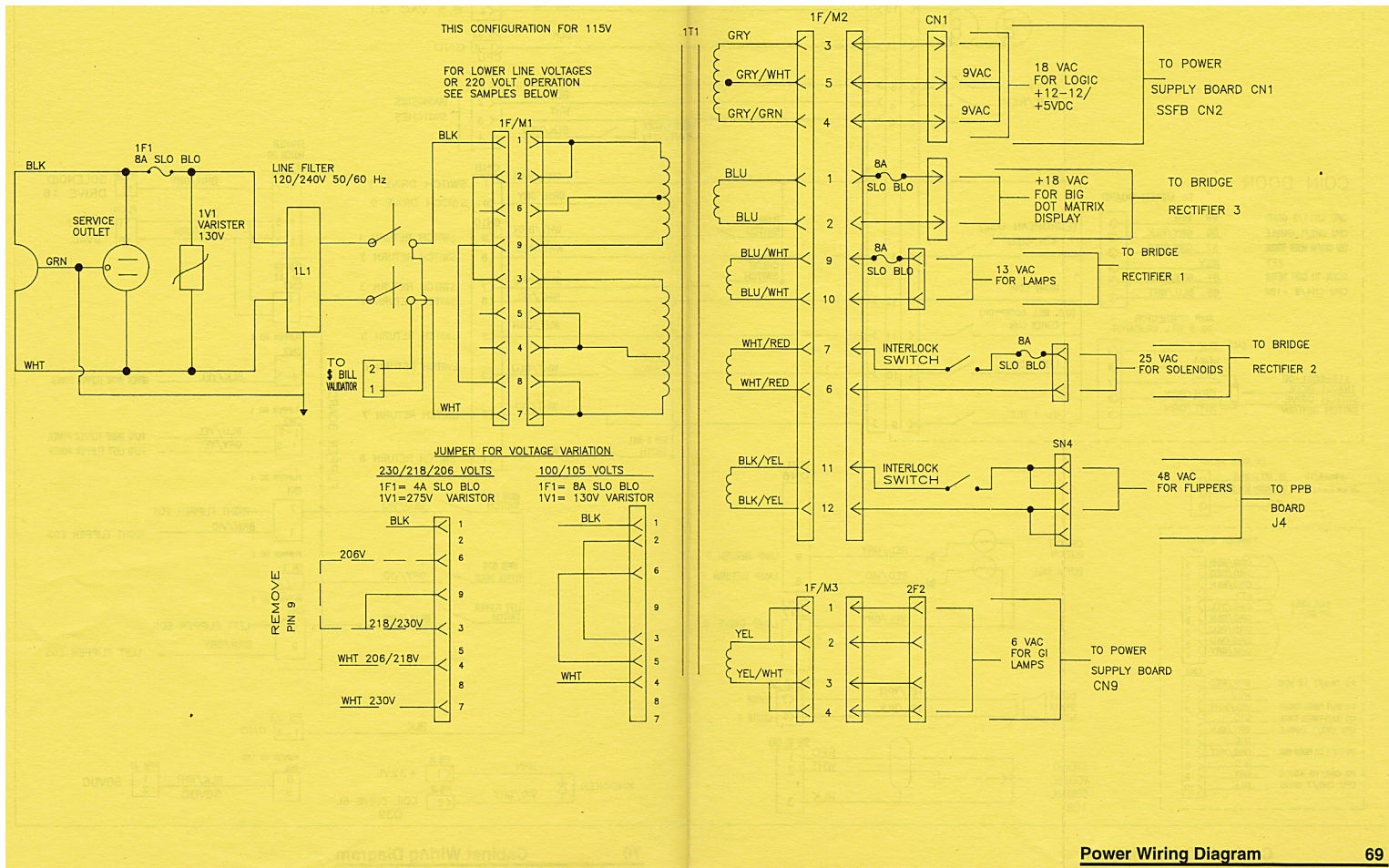
Page 69
Power
Wiring Diagram

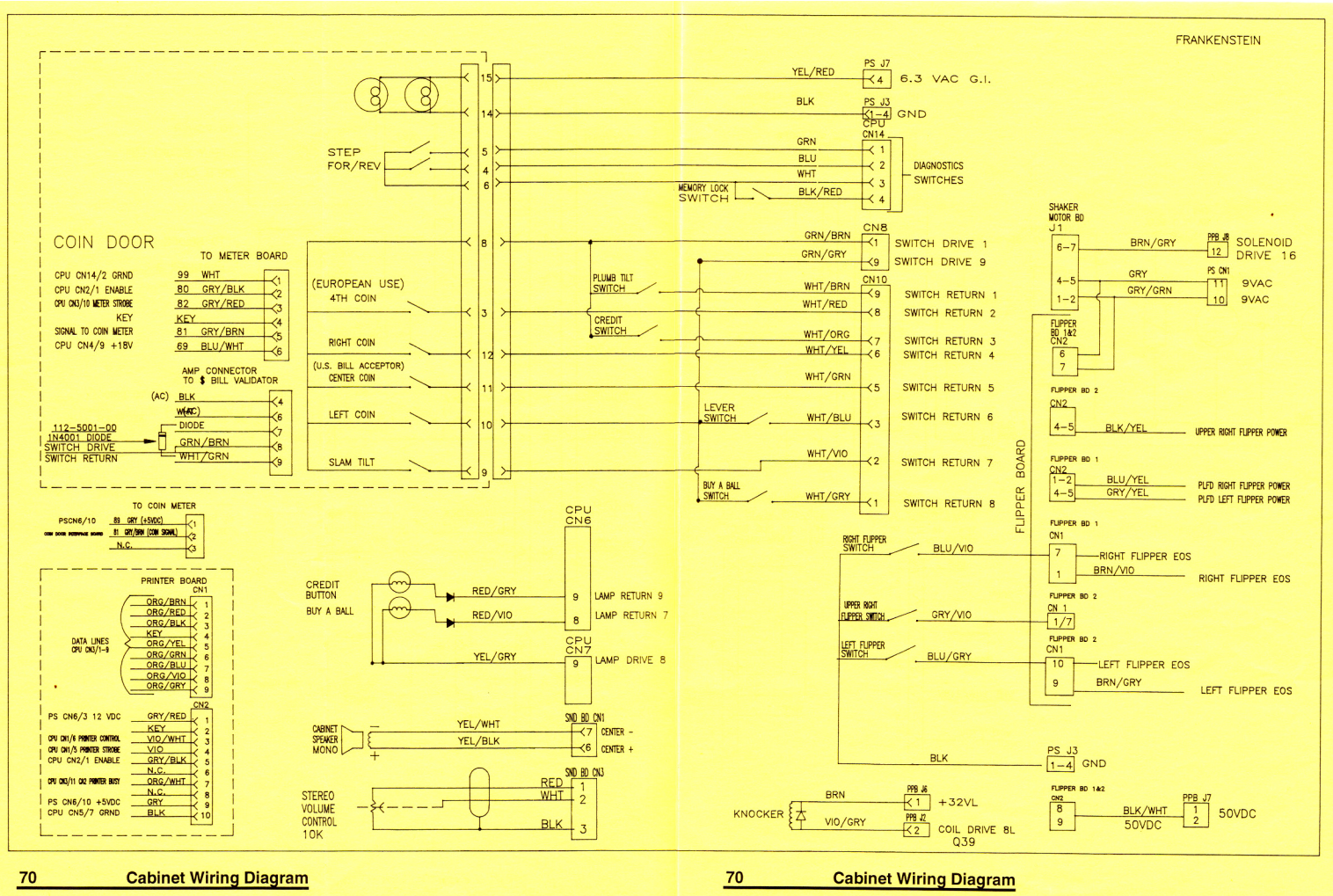
Page 70
Cabinet
Wiring Diagram

Pages 89-91
Solid State 3-
Flipper Board
Theory of Op. &
Circuit Trouble-
shooting Flowchart,
Board & Wiring
Diagrams



[illegible]

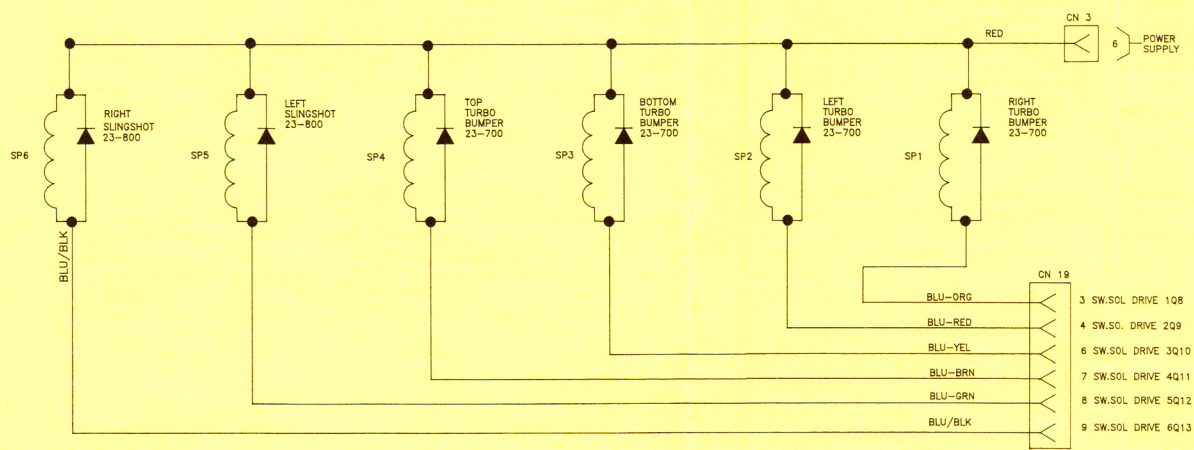






72

72

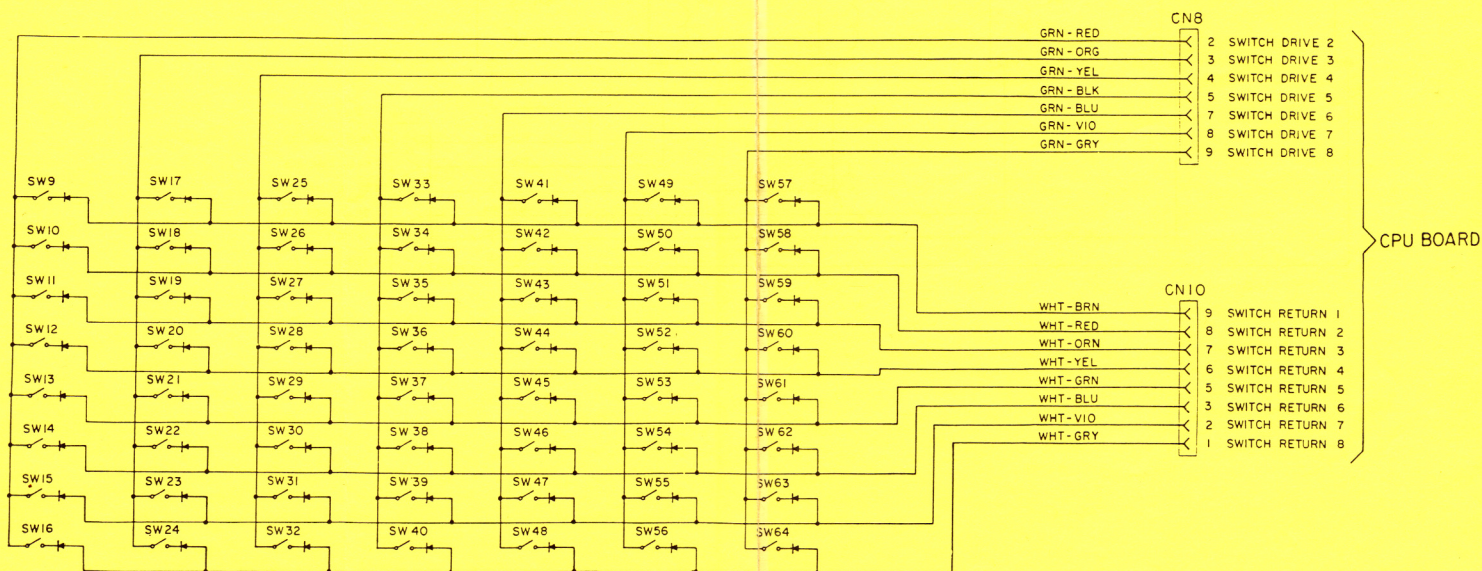


Switch Matrix No. & Description	Part No.
1* Plumb Tilt (See Item 17, Cabinet Parts, Page 41)	
2* 4th Coin (On Coin Door)	---
3* Credit Button (Left of Coin Door)	500-5097-02
4* Right Coin (On Coin Door)	180-5024-00
5* Center Coin (On Coin Door)	180-5024-00
6* Left Coin (On Coin Door)	180-5024-00
7* Slam Tilt	180-5022-00
8* Extra Ball Button (Under 03)	180-5073-00
9 #1 (Left) Ball Trough	180-5119-00
10 #2 Ball Trough	180-5119-00
11 #3 Ball Trough	180-5119-00
12 #4 Ball Trough	180-5119-00
13 #5 Ball Trough	180-5119-00
14 #6 Ball Trough	180-5119-00
15 #7 (Right) Ball Trough	180-5118-00
16 Shooter Lane	180-5100-01

Switch Matrix No. & Description	Part No.
17 Bottom 2-Bank Stand-Up Left "F"	515-6027-08
18 Bottom 2-Bank Stand-Up Right "R"	515-6027-08
19 Middle 3-Bank Stand-Up Bottom "A"	515-5162-08
20 Middle 3-Bank Stand-Up Middle "N"	515-5162-08
21 Middle 3-Bank Stand-Up Top "K"	515-5162-08
22 Top 3-Bank Stand-Up Left "E"	515-5162-08
23 Top 3-Bank Stand-Up Middle "N"	515-5162-08
24 Top 3-Bank Stand-Up Top "S"	515-5967-08
25 Middle 1-Bank S-U "Move Jackpot"	515-6027-08
26 Ramp 1-Bank Stand-Up Left "T"	515-5967-08
27 Ramp 1-Bank Stand-Up Right "E"	515-5967-08
28 Right 2-Bank Stand-Up Top "I"	515-6027-08
29 Right 2-Bank Stand-Up Bottom "N"	515-6027-08
30 Not Used	---
31 Sarcophagus Upper Scoop	180-5057-00
32 Geneva Lower Scoop	180-5057-00
33 Left Orbit Rollover Bottom	500-5706-00

Switch Matrix No. & Description	Part No.
34 Left Orbit Rollover Top	500-5706-00
35 Right Orbit Rollover Top	500-5707-00
36 Right Orbit Rollover Bottom	500-5707-00
37 Left Outlane Rollover	500-5707-00
38 Left Return Rollover	500-5707-00
39 Right Return Rollover	500-5707-00
40 Right Outlane Rollover	500-5706-00
41 Top Turbo Bumper	180-5015-01
42 Middle Left Turbo Bumper	180-5015-01
43 Middle Right Turbo Bumper	180-5015-01
44 Bottom Turbo Bumper	180-5015-01
45 Ramp Entrance Gate	180-5090-00
46 Ramp Exit Gate	180-5087-00
47 Left Slingshot	180-5054-00
48 Right Slingshot	180-5054-00
49 Not Used	---

Switch Matrix No. & Description	Part No.
50 Not Used	---
51 Not Used	---
52 Not Used	---
53 "North Pole" VUK	180-5116-00
54 "Ingolstadt" Right Orbit Spinner	180-5010-04
55 "Ice Cave" above Ball Elect	180-5027-01
56 Mini-Orbit Rollover by Elect	500-5706-00
57 Not Used	---
58 Not Used	---
59 Not Used	---
60 Not Used	---
61 Not Used	---
62 "The Switch" Lever	180-5111-00
63* Lower Left Flipper Cabinet via Q7 (Transistor) on SSFB	180-5124-01
64* Lower & Upper Right Flipper Cabinet via Q5 (Transistor) on SSFB	180-5124-01

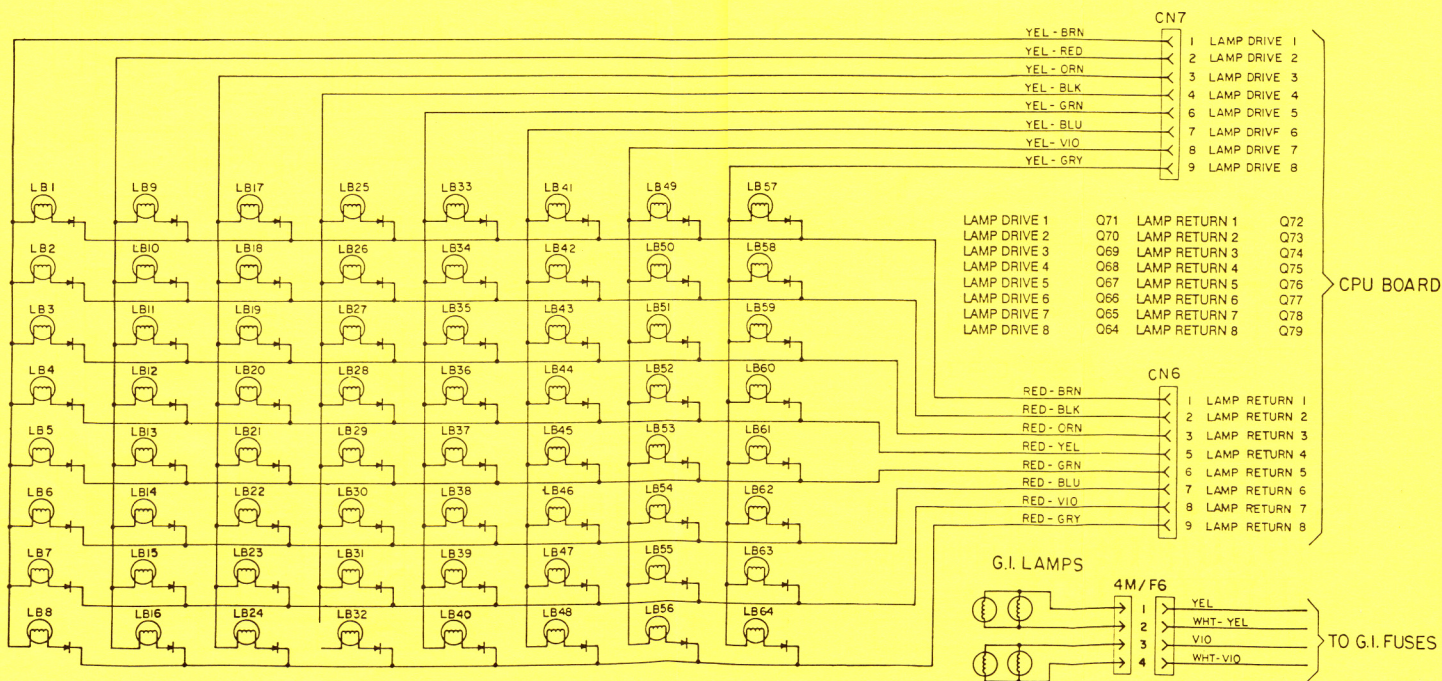


Lamp Matrix No. & Description
01 F of: FRANKENSTEIN
02 R of: FRANKENSTEIN
03 A of: FRANKENSTEIN
04 N of: FRANKENSTEIN
05 K of: FRANKENSTEIN
06 E of: FRANKENSTEIN
07 N of: FRANKENSTEIN
08 S of: FRANKENSTEIN
09 T of: FRANKENSTEIN
10 E of: FRANKENSTEIN
11 I of: FRANKENSTEIN
12 N of: FRANKENSTEIN
13 Top Turbo Bumper
14 Middle Left Turbo Bumper
15 Middle Right Turbo Bumper
16 Bottom Turbo Bumper

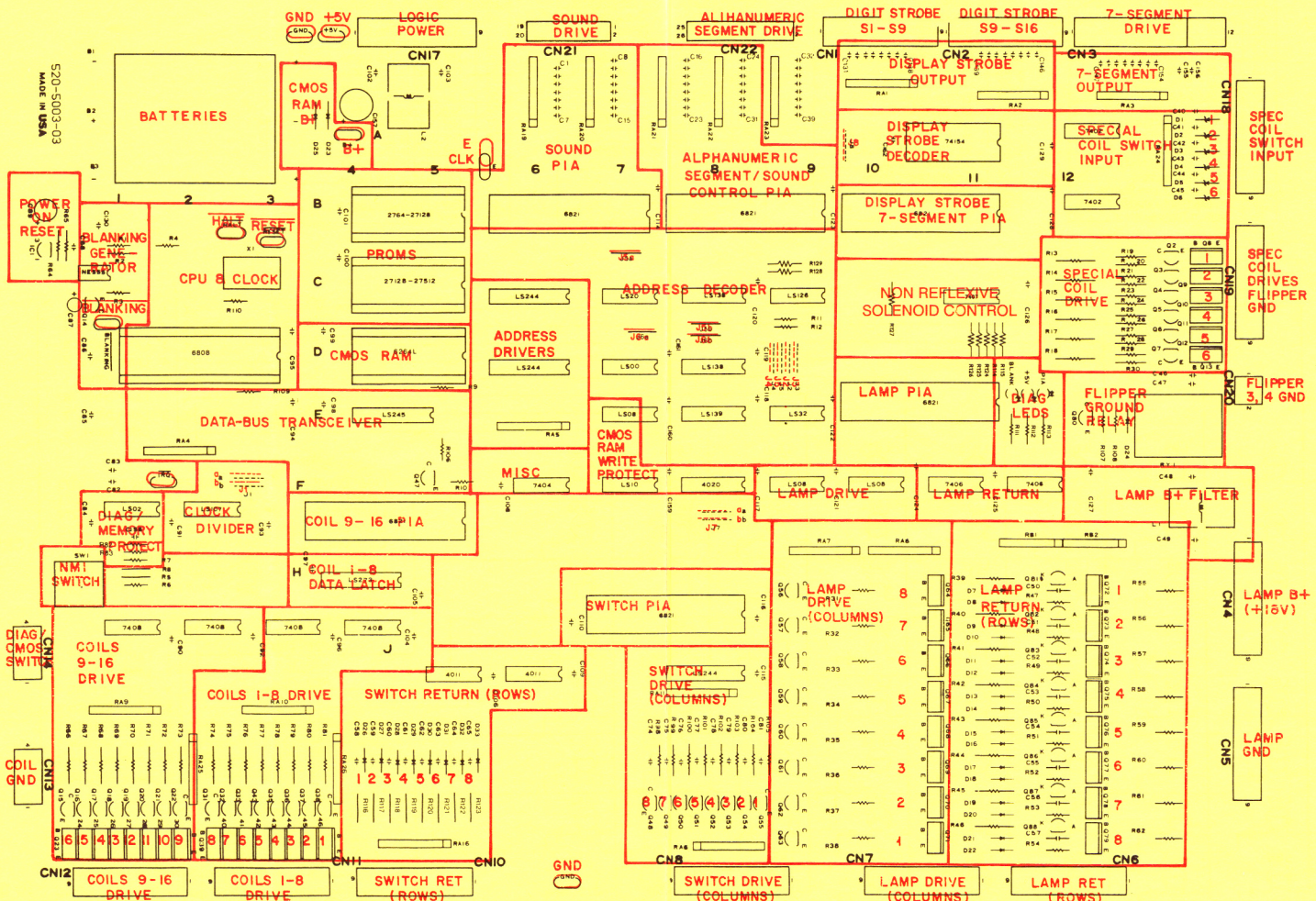
Lamp Matrix No. & Description
17 Frankenstein Millions
18 Stoning Mode
19 Creature Feature Mode
20 Lynch Justine Mode
21 North Pole Mode
22 Lite Extra Ball Mode
23 Voltage Mode
24 Graveyard Mode
25 Ramp Jackpot
26 North Pole VUK Jackpot
27 Ice Cave Ball Eject Jackpot
28 Left Orbit Jackpot
29 Geneva Lower Scoop
30 Sarcophagus Upper Scoop
31 VUK Entrance Left
32 VUK Entrance Right

Lamp Matrix No. & Description
33 Left Outlane Alive Kick-Back
34 Left Outlane Special
35 Lt. Return Lane Lite Ingolstadt
36 Rt. Return Lane Lite Geneva
37 Right Outlane Double Bonus
38 Ice Cave Mode
39 Lite Lock 1
40 Lite Lock 2
41 Move Jackpot
42 Change Scene
43 Ingolstadt Spinner Mode
44 Jackpot Grows
45 Justine Mode
46 Extra Ball
47 Creature Mode
48 Shooter Lane

Lamp Matrix No. & Description
49 Not Used In This Game
50 Not Used In This Game
51 Not Used In This Game
52 Not Used In This Game
53 Not Used In This Game
54 Not Used In This Game
55 Live Again (Shoot Again)
56 VUK Entrance Middle
57 Not Used In This Game
58 Not Used In This Game
59 Not Used In This Game
60 Not Used In This Game
61 Not Used In This Game
62 Not Used In This Game
63 Extra Ball Button (Buy-a-Ball)
64 Start Button

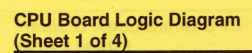


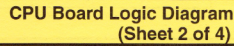
Playfield Lamp Wiring Diagram 75

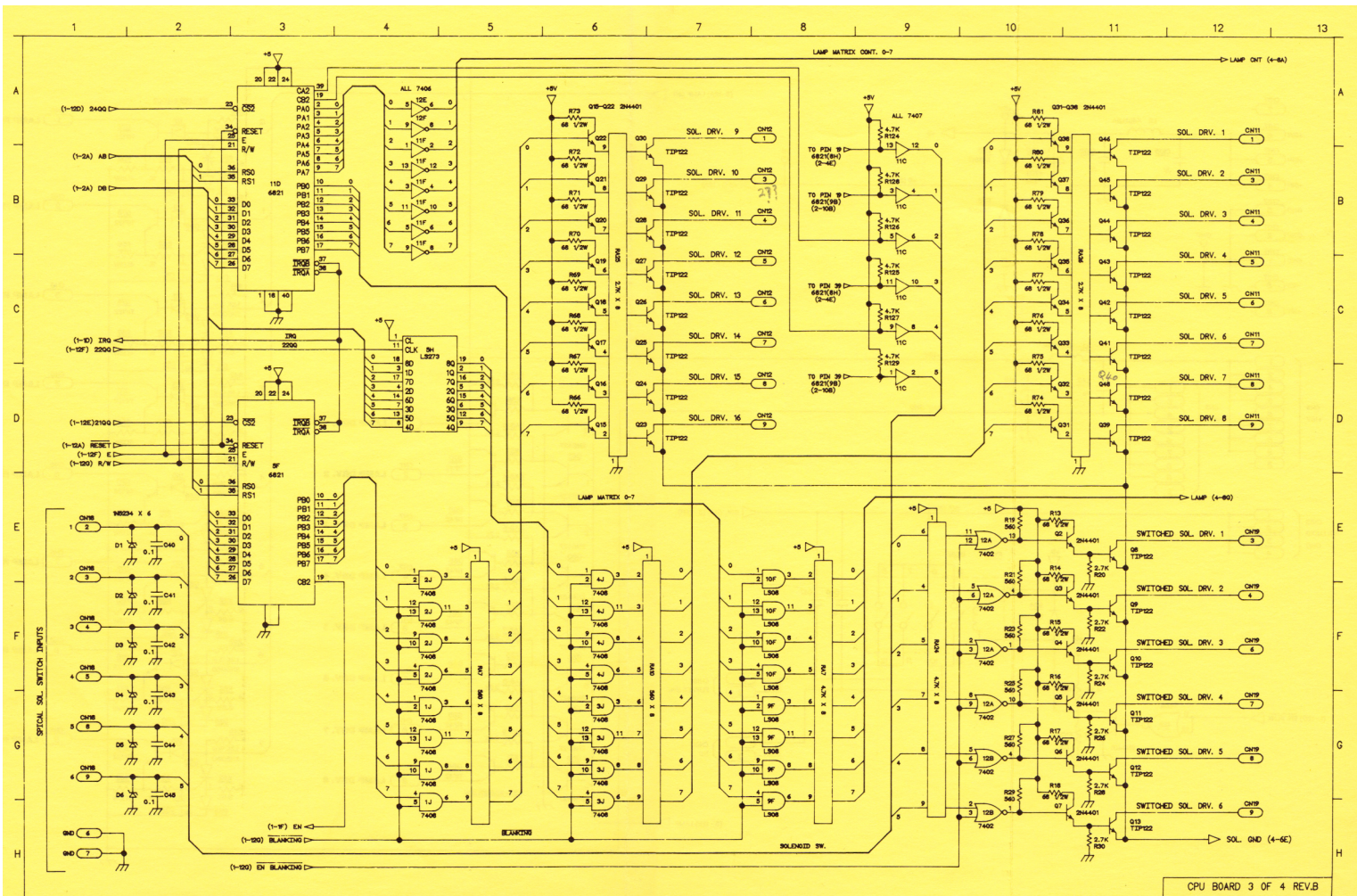


76 CPU Board Assembly Diagram

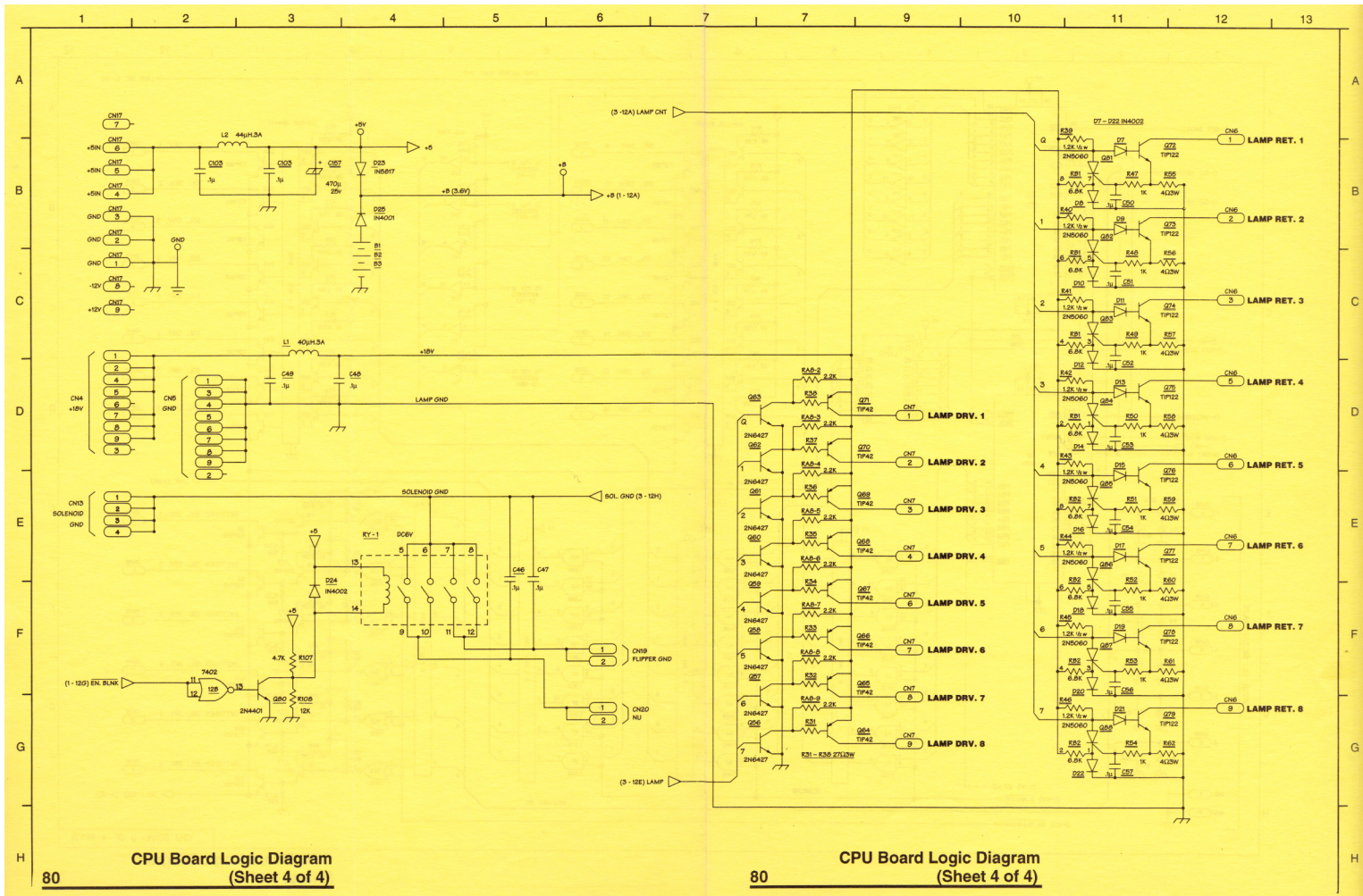
76 CPU Board Assembly Diagram

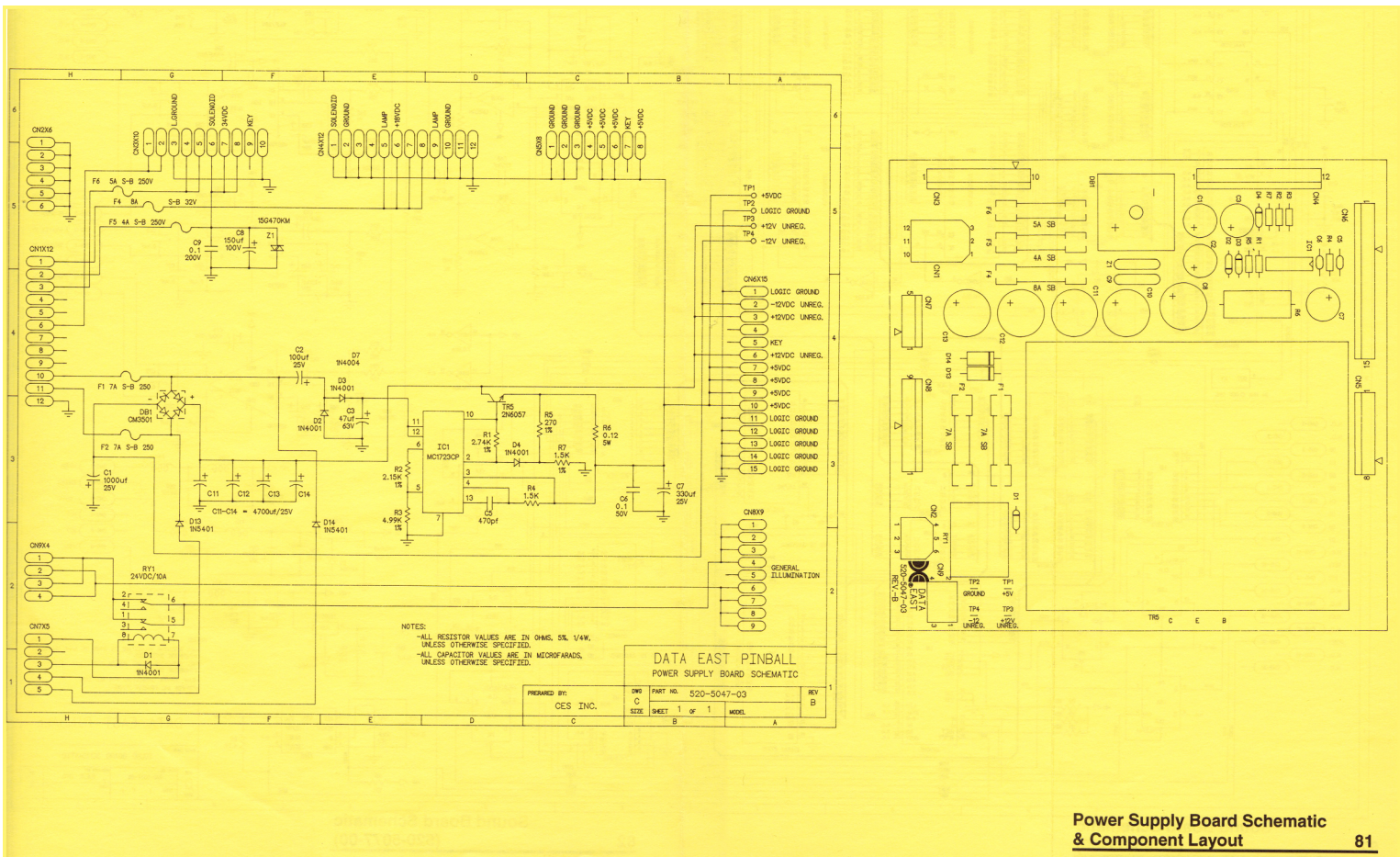


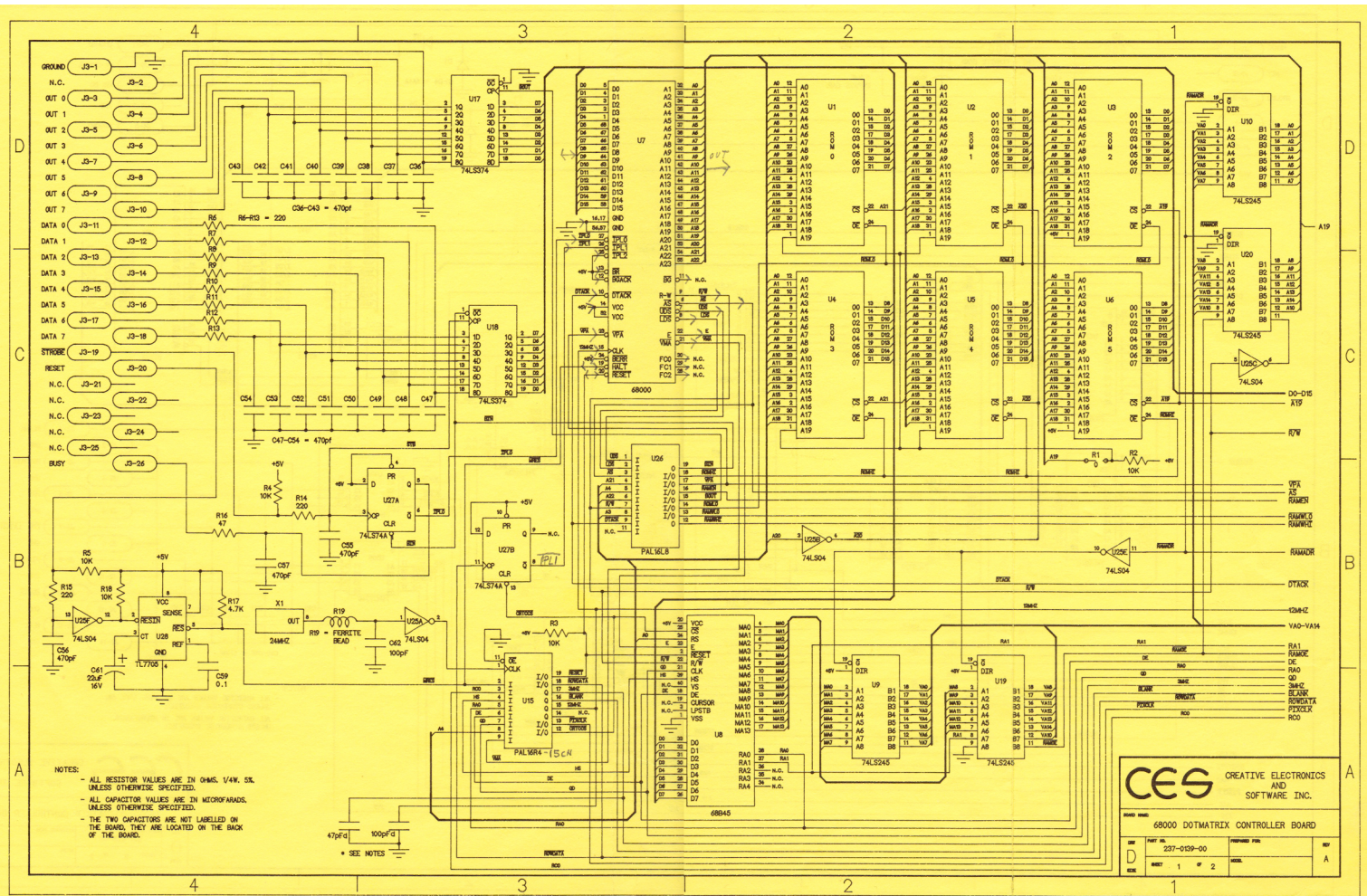


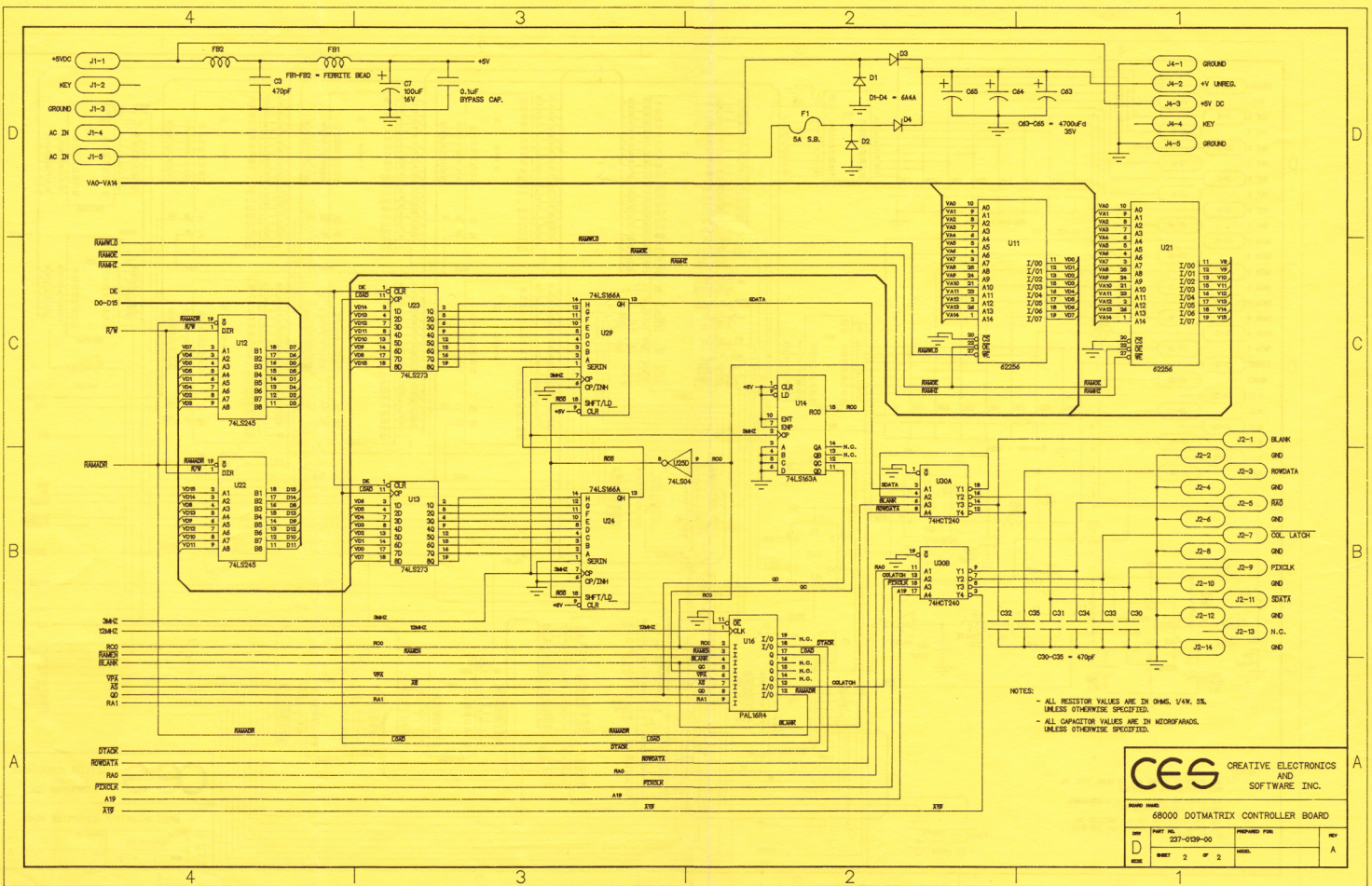


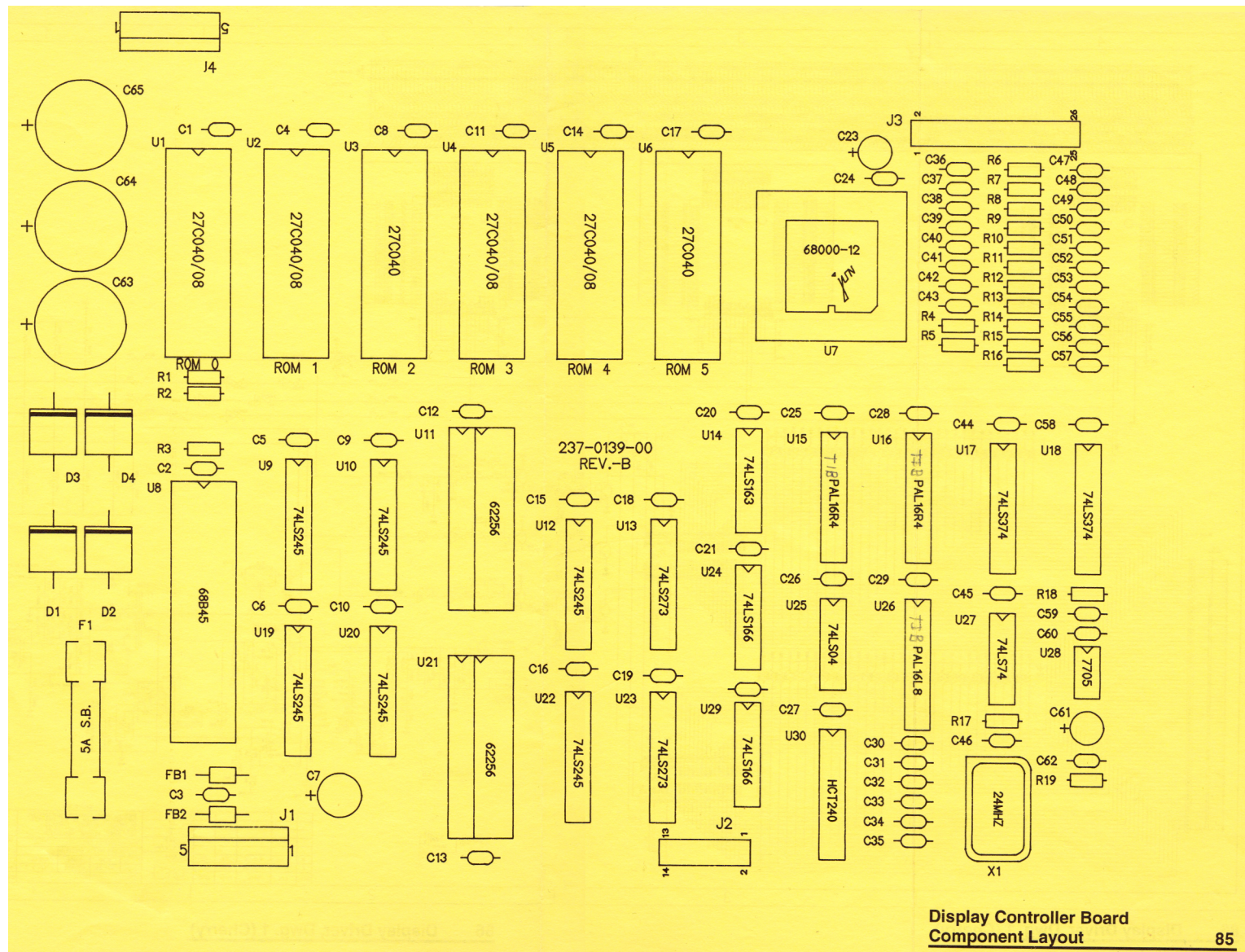
CPU Board Logic Diagram
(Sheet 3 of 4)

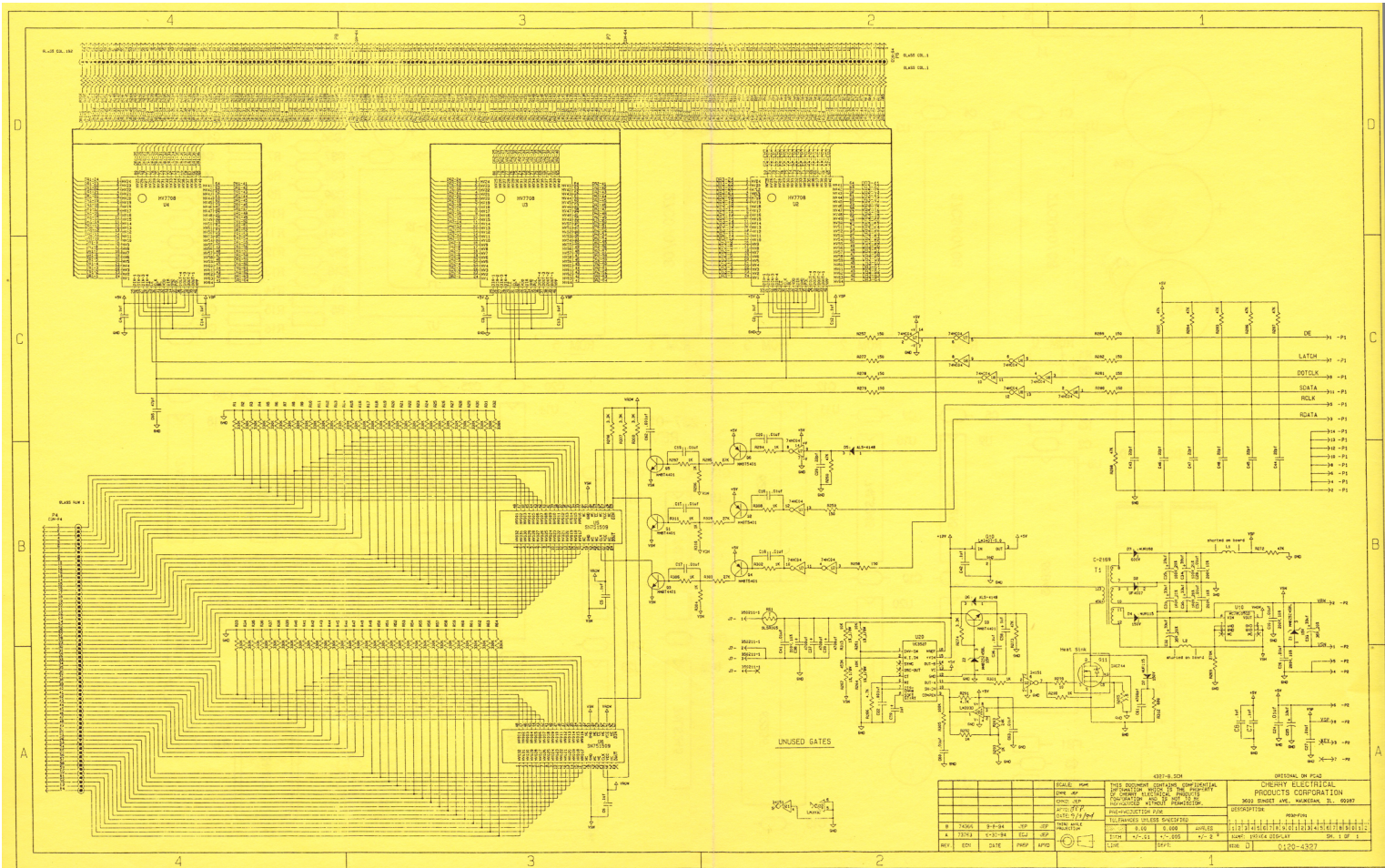












86 Display Driver, Dwg. 1 (Cherry)

86 Display Driver, Dwg. 1 (Cherry)

New Solid State Flipper Board

We have redesigned our Solid State Flipper Board (S.S.F.B.) so that a misadjustment or failure of the End-of-Stroke (E.O.S.) Switch will not affect the operation of the flippers. The flippers will still work! The E.O.S. switch is strictly an added feature, not a functional part of the circuit (see E.O.S. Theory of Operation).

Theory of Operation for the Solid State Flippers

The Solid State Flipper Board is a Multiple Flipper Solenoid Driver Circuit. Each solenoid driver circuit contains a One Shot Timer, a 50V Driver, and an 8V Driver.

Looking at one circuit, Schmidt NAND gates U1A, U1b, and U1D make up the One Shot Timer. The timer length is controlled by R10, R33 and C2. The output of the timer is gated at U1C with the buffered switch input from Q6. The output of U1C controls the 50V driver circuit consisting of Q4, Q1, Q2, Q3, and D1. As long as the flipper button is activated, Q6 will keep the 8V driver circuit, SR1, on.

The 50 volts provides the actuation power to the flipper solenoid while the 8 volts provides the holding power.

E.O.S. Switch Theory of Operation

The End of Stroke (E.O.S.) Switch used in our flipper circuit is a Gold Peened Contact, Blade Switch Assembly, mounted on the flipper assembly.

Electrically, it is connected in series with the Cabinet Flipper Switch and the Flipper E.O.S. input on the Solid State Flipper Board (S.S.F.B.) connector CN1 which enables the 50 Volt DC Drive Circuit.

Referring to the Flipper Wiring Diagram, one side of the Flipper Cabinet Switch is connected to ground (BLK-Wire), the other side (BLU-VIO Wire) is connected to the flipper switch input on the S.S.F.B. connector CN1 which enables your 9 Volt DC holding voltage and is connected in series to the E.O.S. switch which is a normally closed switch.

The function of the E.O.S. switch is to prevent the flipper bat from being knocked back by a high velocity shot on the playfield. If while holding the flipper in the up position, the bat is moved back 1/16" or more, the E.O.S. switch will close giving the coil another 50 Volt pulse.

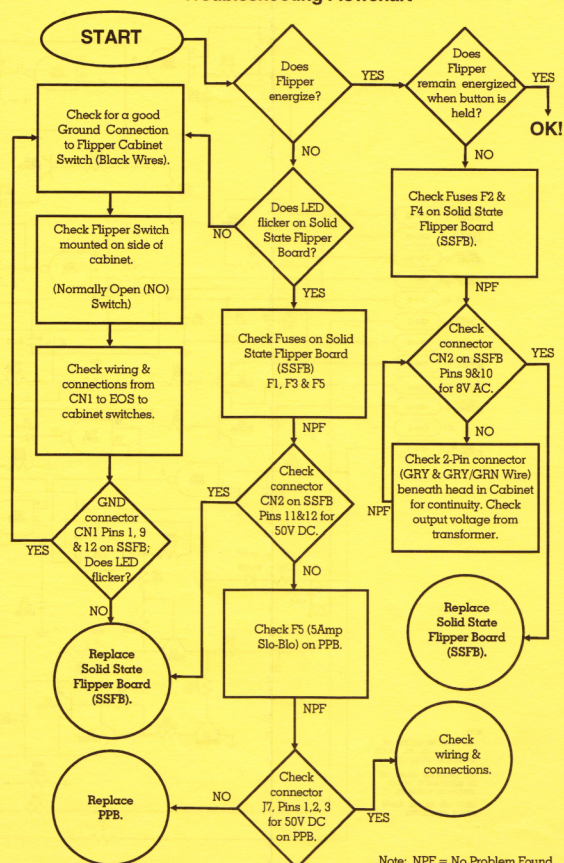
E.O.S. Switch Adjustment

The switch contacts should be adjusted so that when the solenoid is energized, the contacts stay closed for almost the full travel of the plunger. The contacts should open 1/16" before the plunger bottoms out or reaches maximum travel.

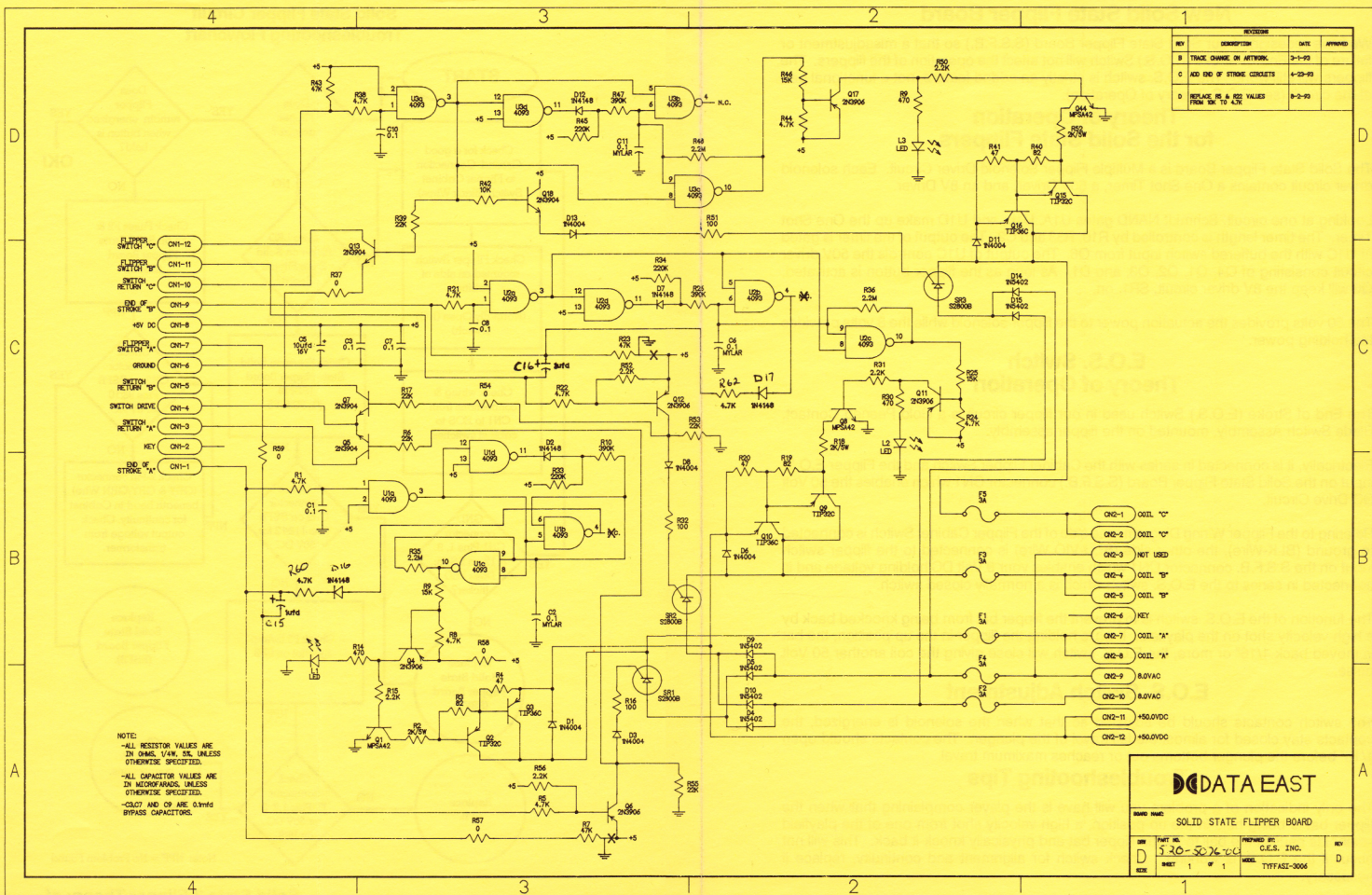
Troubleshooting Tips

The only indication of a problem you will have is the player complaining that when the flipper bat is being held in the up position, a high velocity shot from one of the playfield solenoids causes the ball to hit the flipper bat and physically knock it back. This will not occur if the E.O.S. is working. Check switch for alignment and continuity, replace if necessary.

Solid State Flipper Circuit Troubleshooting Flowchart

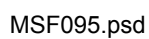


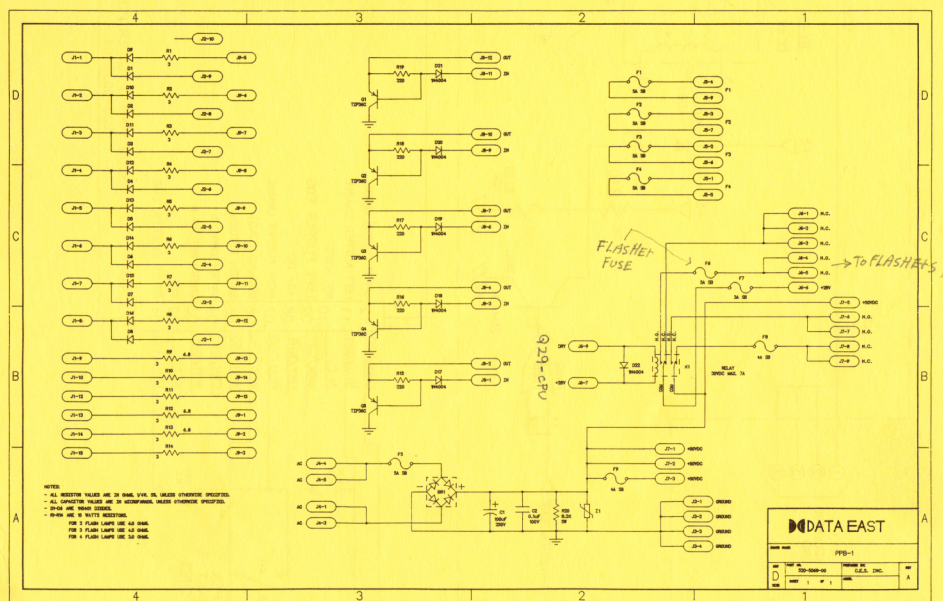
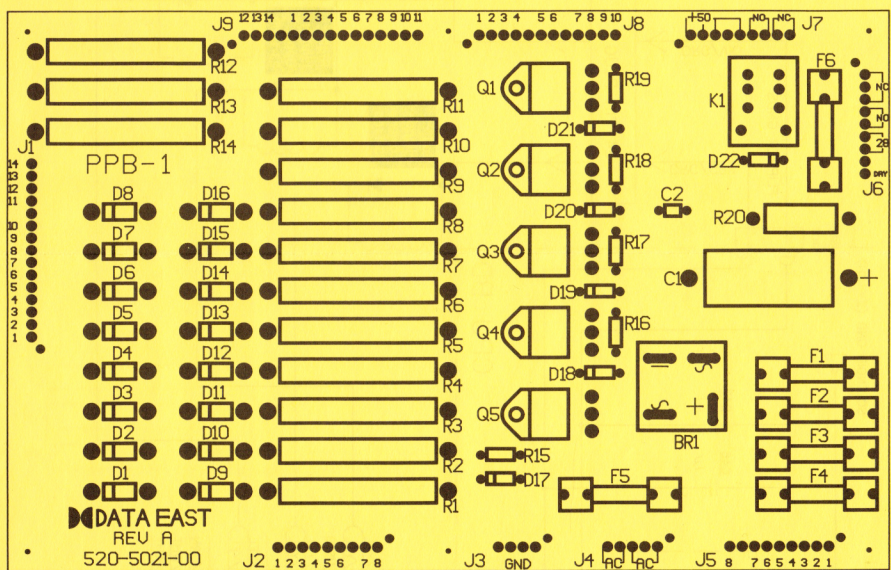
Solid State 3-Flipper Theory of Operation & Circuit Troubleshooting Flowchart



Solid State 3-Flipper Board
Diagram

Solid State 3-Flipper Board
Diagram





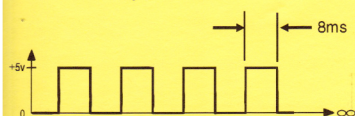
Creature Head Motion Servo Board

Theory of Operation

Serial Data is clocked out of the Main CPU Board to the Monster Head Motion Servo Board at 125 BPS. The data is accompanied by a Transition-Sensitive Clock (both rising and falling transitions) and an Active-High Enable. The CPU sends 8-bit Data Words to the Servo Board to trigger pre-recorded routines stored in the Micro-Controller on the Servo Board itself.

Since the clock is Transition-Sensitive, there are only 4 pulses on the clock for each 8-bit Data Word as shown:

Input from CPU

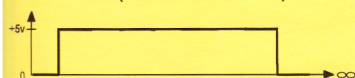


Data is sampled a fraction of a second after each transistion to insure a stable read of the Data State.

Clock (Ref. Servo Bd. CN1-2)

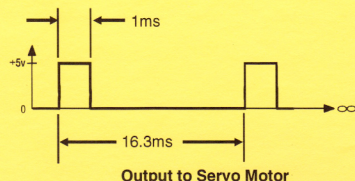


Data (Ref. Servo Bd. CN1-3)



Enable (Ref. Servo Bd. CN1-4)

The signal to the Servo Motor consists of a short pulse of +5v ranging in duration from .3 to 1.7 milliseconds, repeating every 16.3ms. The duration of the short pulse determines the Servo's position - at 1 millisecond the Servo is centered. On power-up, the Servo Board will blink it's LED a few times and then send centering signals to all 4 of it's Servo's until it receives a command code from the CPU. (Note: Only Servo Output #1 is being used for the Creature.)

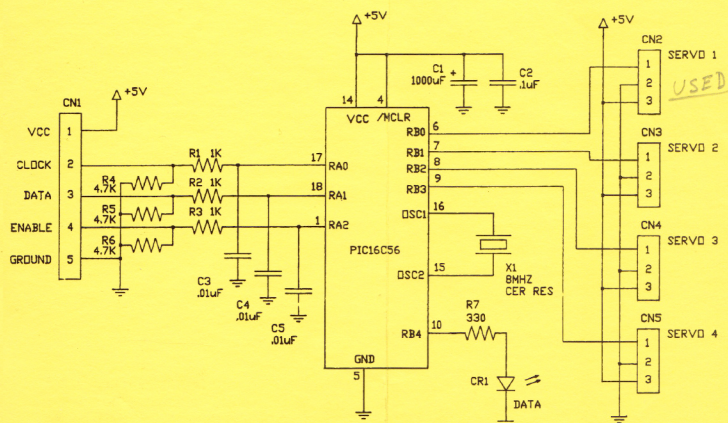


The signals should look like this:

Theory of Operation

Monster Head Motion Board, PN. 520-5113-00

Only Servo Output #1 is being used for the Creature



Creature Head Motion Servo Board
Theory of Operation & Schematic 93

