Williams®
ELECTRONICS GAMES, INC.

JULY 1997
16-50059-101
FINAL

MEDIEVAL MADNESS

OPERATIONS MANUAL INCLUDES

Operations & Adjustments • Testing & Problem Diagnosis • Parts Information • Wiring Diagrams & Schematics

Williams Electronics Games, Inc., 3401 N. California Avenue, Chicago, IL 60618

DIP SWITCH SETTINGS AND JUMPERS

EPROM Jumper Settings for G11	W1	W2
1MEG, 2MEG, 4 MEG EPROM	In	Out

DIP Switch Chart

COUNTRY	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
AMERICA	Off	Off	On	On	On	On	On	On
EUROPEAN	Off	Off	On	On	On	Off	On	On
FRENCH	Off	Off	On	On	On	On	Off	Off
GERMAN	Off	Off	On	On	On	On	On	Off
SPAIN	Off	Off	On	On	Off	On	On	On

SOLENOID/FLASHER TABLE

Sol. No.	Function	Solenoid Type	Voltage Connections Playfield	Backbox	Cabinet	Drive Xistor	Drive Connections Playfield	Backbox	Cabinet	Drive Wire Color	Solenoid Part Number Flashlamp Type Playfield	Insert
01	AUTO PLUNGER	High Power	J133-2			Q72	J116-1			VIO-BRN	AE-23-800	
02	TROUGH EJECT	High Power	J133-2			Q68	J116-2			VIO-RED	AE-26-1500	
03	LEFT POPPER	High Power	J133-2			Q71	J116-4			VIO-ORG	AE-26-1200	
04	CASTLE	High Power	J133-2			Q67	J116-5			VIO-YEL	AE-26-1500	
05	CASTLE GATE POWER	High Power	J133-2			Q70	J116-6			VIO-GRN	A-20099	
06	CASTLE GATE HOLD	High Power				Q66	J116-7			VIO-BLU		
07	KNOCKER	High Power		J133-2		Q69		J116-8		VIO-BLK	AE-23-800	
08	CATAPULT	High Power	J133-2			Q65	J116-9			VIO-GRY	AL-23-800	
09	RIGHT EJECT	Low Power	J133-3			Q44	J113-1			BRN-BLK	AE-27-1200	
10	LEFT SLINGSHOT	Low Power	J133-3			Q48	J113-3			BRN-RED	AE-26-1200	
11	RIGHT SLINGSHOT	Low Power	J133-3			Q43	J113-4			BRN-ORG	AE-26-1200	
12	LEFT JET BUMPER	Low Power	J133-3			Q47	J113-5			BRN-YEL	AE-26-1200	
13	BOTTOM JET BUMPER	Low Power	J133-3			Q42	J113-6			BRN-GRN	AE-26-1200	
14	RIGHT JET BUMPER	Low Power	J133-3			Q46	J113-7			BRN-BLU	AE-26-1200	
15	TOWER DIVERTER PWR	Low Power	J133-3			Q41	J113-8			BRN-VIO	A-20099	
16	TOWER DIVERTER HOLD	Low Power				Q45	J113-9			BRN-GRY		
17	LEFT SIDE LOW FLSHRS	Flasher	J133-6	J134-5		Q28	J111-1	J112-1		BLK-BRN	#906 (1)	#906 (1)
18	LEFT RAMP FLASHERS	Flasher	J133-6	J134-5		Q32	J111-2	J112-2		BLK-RED	#89 (1)	#906 (1)
19	LEFT SIDE HIGH FLSHRS	Flasher	J133-6	J134-5		Q27	J111-3	J112-3		BLK-ORG	#906 (1)	#906 (1)
20	RIGHT SIDE HIGH FLSHRS	Flasher	J133-6	J134-5		Q31	J111-4	J112-4		BLK-YEL	#906 (1)	#906 (1)
21	RIGHT RAMP FLASHERS	Flasher	J133-6			Q26	J111-5			BLU-GRN	#906 (1), #89 (1)	
22	CASTLE RIGHT SIDE FLSHRS	Flasher	J133-6			Q30	J111-6			BLU-BLK	#906 (2)	
23	RIGHT SIDE LOW FLSHRS	Flasher	J133-6			Q25	J111-7			BLU-VIO	#906 (1), #89 (1)	
24	MOAT FLASHERS	Flasher	J133-6			Q29	J111-8			BLU-GRY	#89 (2)	
25	CASTLE LEFT SIDE FLSHRS	Gen. Purpose	J133-6			Q16	J109-1			BLU-BRN	#906 (2)	
26	*TOWER LOCK POST	Gen. Purpose	J133-1			Q15	J109-2			BLU-RED	AE-27-1200	
27	*RIGHT GATE	Gen. Purpose	J133-1			Q14	J109-3			BLU-ORG	A-14406	
28	*LEFT GATE	Gen. Purpose	J133-1			Q13	J109-4			BLU-YEL	A-14406	
General Illumination												
01	BOTTOM PLAYFIELD	G.I.	J106-1	J105-1		Q5	J106-7	J105-7		WHT-BRN	#44	#555
02	MIDDLE PLAYFIELD	G.I.		J105-2		Q4		J105-8		WHT-ORG		#555
03	TOP PLAYFIELD	G.I.		J105-3		Q3		J105-9		WHT-YEL		#555
04	**TOP INSERT	G.I.	J106-5			Q2	J106-10			WHT-GRN	#44	
05	**BOTTOM INSERT	G.I.	J106-6		J104-3	Q1	J106-11		J104-1	WHT-VIO	#44	

Flipper Circuits		Solenoid Type	Voltage Connection Playfield	Drive Xistors Power	Hold	Drive Connections Playfield	Drive Wire Colors Power	Hold	Coil Part No.	Coil Colors
29		Power	J119-1 (RED-GRN)	Q90		J120-13	YEL-GRN		FL-11629	BLUE
30	LOWER RIGHT FLIPPER	Hold	J119-1 (RED-GRN)		Q92	J120-11		ORG-GRN		
31		Power	J119-4 (RED-BLU)	Q87		J120-9	YEL-BLU		FL-11629	BLUE
32	LOWER LEFT FLIPPER	Hold	J119-4 (RED-BLU)		Q89	J120-7		ORG-BLU		
33		Power	J119-6 (RED-VIO)	Q84		J120-6	YEL-VIO		FL-11753	YELLOW
34	LEFT TROLL	Hold	J119-6 (RED-VIO)		Q86	J120-4		ORG-VIO		
35		Power	J119-8 (RED-GRY)	Q81		J120-3	YEL-GRY		FL-11753	YELLOW
36	RIGHT TROLL	Hold	J119-8 (RED-GRY)		Q83	J120-1		ORG-GRY		

Motor Circuit		Solenoid Type	Voltage Connections Playfield	Drive Gates	Drive Connections Playfield	Drive Wire Color	Device Part Number Playfield
37	DRAWBRIDGE MOTOR	Low Power	J139-2	U3A, U3B	J110-1	BRN-WHT	14-8015

J1XX = POWER DRIVER BOARD

24-6549 = #44 BULB; 24-8704 = #89 BULB; 24-8768 = #555 BULB; 24-8802 = #906 BULB

*TIEBACK DIODES FOR SOLENOIDS 26 THROUGH 28 ARE AT J109-6, J109-8, AND J109-9 RESPECTIVELY.

**THESE G.I. STRINGS DO NOT BRIGHTEN AND DIM, THEY ARE ALWAYS ON.

DECLARATION OF CONFORMITY

WILLIAMS ELECTRONICS GAMES, INC.

3401 N. CALIFORNIA AVE.
CHICAGO, IL 60618
U.S.A.

WE, HEREBY DECLARE UNDER SOLE RESPONSIBILITY THAT

THE MODEL: ***"MEDIEVAL MADNESS" 50259,50359,50459,50759,50959, 51059,51159,51359,51459,51859,52059,52159,52259, 52359, 57259 PIN***

TO WHICH THIS DECLARATION RELATES IS IN CONFORMITY WITH THE FOLLOWING EUROPEAN PRODUCT SAFETY DIRECTIVES:

ELECTROMAGNETIC COMPATABILITY DIRECTIVE
(89/336/EEC AND AMENDMENTS 91/C162/08, 92/31/EEC,93/68/EEC

ELECTRICAL EQUIPMENT DESIGNED FOR USE WITHIN CERTAIN VOLTAGE LIMITS DIRECTIVE
(73/23/EEC AND AMENDMENTS 88/C168/02, 92/C210/01, 93/68/EEC, 94/C199/03, 95/C214/02)

EN 55014:1993 EN55104:1995 EN61000-4-2: 1995
IEC 801-3: 1984 (EN61000-4-3) EN61000-4-4: 1995 EN61000-4-5: 1995
ENV50141: 1993 (EN61000-4-6) EN61000-4-11: 1994 EN60335-1: 1995
IEC 335-2-82 (DRAFT)

Date issued: **MAY 1, 1997**

MANUFACTURE'S SIGNATURE

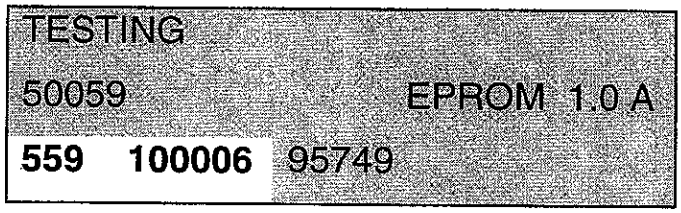
DAN GALARDE

CORPORATE V.P. OF QUALITY

ATTENTION

The game uses a Security CPU Board that is not downward compatible to the CPU boards used in previous games. The board has an added security chip that can be interchanged between other **MEDIEVAL MADNESS** games and software revision levels. The CPU board itself is interchangeable with later model games, but must be equipped with the correct security chip and software for that specific game.

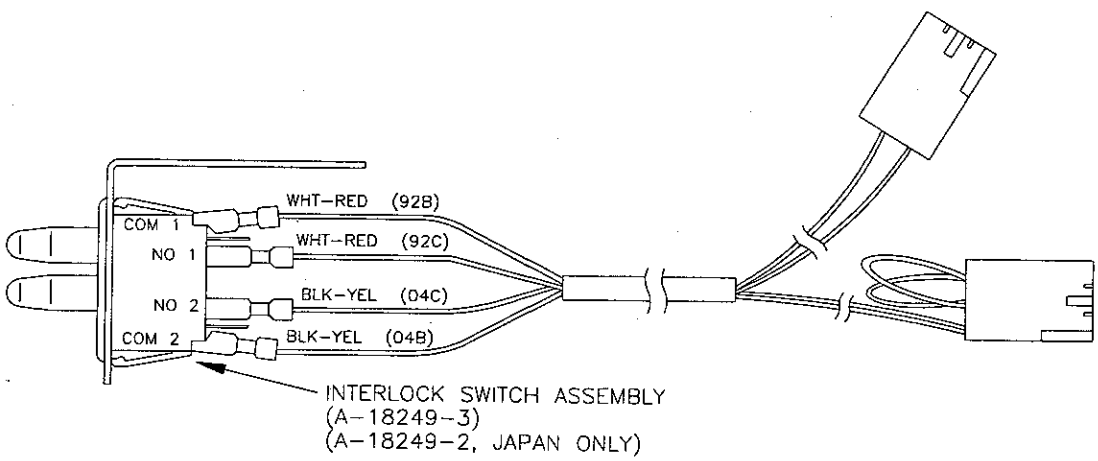
The games' electronic ID number is shown in the display during power-up. The number displayed is the same nine-digit number printed on the security chip label. The first three digits are the project number without the country specific code. An example of the power-up display is shown below, the electronic ID number is bolded.



IMPORTANT NOTICE

PLEASE READ

This pinball game is equipped with a SAFETY FEATURE to prevent shocks from the solenoid circuit when the coin door is opened. An interlock switch assembly (part no. A-18249-3), located at the left of the coin door opening, has been added to the game. This assembly consists of a bracket containing the existing memory protect switch on the bottom and a new interlock switch on the top. When the coin door is opened, this new interlock switch opens, breaking the connection to the +50V and +20V winding of the transformer secondary.



MEDIEVAL MADNESS

The information is current as of the time of its release.

Fill out and mail in game Registration card. Be sure to include the game serial number. For your records, write the PIC and game serial numbers in manual.

PIC Number _____ **Serial Number** _____

Williams Electronics Games, Inc. reserves the rights to make modifications and improvements to its products. The specifications and parts identified in this manual are subject to change without notice.

TABLE OF CONTENTS

Section 1 Continued...

Section 2 Continued...

Section 3 Continued...

MEDIEVAL MADNESS

Rules
&
Shotmaps

HOW TO PLAY MEDIEVAL MADNESS

SUPER SKILL SHOT - Hold left flipper button WHILE launching the ball. Make any flashing arrow shot to collect.

DESTROY CASTLES - Shoot drawbridge, then gate, then into castle to destroy. Destroy all the Baron's castles to attack the King of Payne!

EXTRA BALL - Destroy castles OR collect Hurry-ups OR collect castle multiball super jackpot(s) to light extra ball. Shoot right eject to collect extra ball.

RAID THE CASTLE MULTIBALL - Lock three balls in castle to start multiball. Shoot ramps to collect jackpots. Collect five jackpots to light super jackpot. Collect super jackpot(s) to light extra ball.

TROLLS! - Hit center yellow targets to light Trolls! Shoot right eject to start Trolls! Hit Trolls to destroy them and light Troll Madness at right eject.

MULTIBALL MADNESS - Complete one or more of: Joust Victory, Catapult Slam, Revolting Peasants, Save the Damsels, or Trolls to light Multiball Madness at right eject. The more you light the more you are rewarded. Shoot right eject to start Multiball Madness. Shoot flashing arrows for jackpots and strobing shots for super jackpots.

HURRY-UP - Start Hurry-up on center shot by completing one or more of Joust Victory, Catapult Slam, Revolting Peasant, Save the Damsel or Trolls AFTER Multiball Madness is lit. Shoot center shot to collect award.

ROYAL MADNESS - Complete Joust, Catapult, Peasants, Damsels, Trolls, and Multiball Madness to light Royal Madness at right eject. Shoot right eject to start. Complete all lit shots in the time allowed to collect Extra Ball.

BATTLE FOR THE KINGDOM - Collect three Joust Victories, three Catapult Slams, three Revolting Peasants, three Damsels, Destroy all Castles, and destroy ten Trolls to light Battle for the Kingdom. Shoot center shot to start. During Battle for the Kingdom, shoot all flashing shots to destroy the King of Payne and restore order to the land.

16-10489.1

Typical Medieval Madness Instruction Card.

RULES FOR PLAYING MEDIEVAL MADNESS

SUPER SKILL SHOT - Hold left flipper button WHILE launching the ball. Make any flashing arrow shot to collect.

DESTROY CASTLES - Shoot drawbridge, then gate, then into castle to destroy. Destroy all the Baron's castles to attack the King of Payne!

EXTRA BALL - Destroy castles OR collect Hurry-ups OR collect castle multiball super jackpot(s) to light extra ball. Shoot right eject to collect extra ball.

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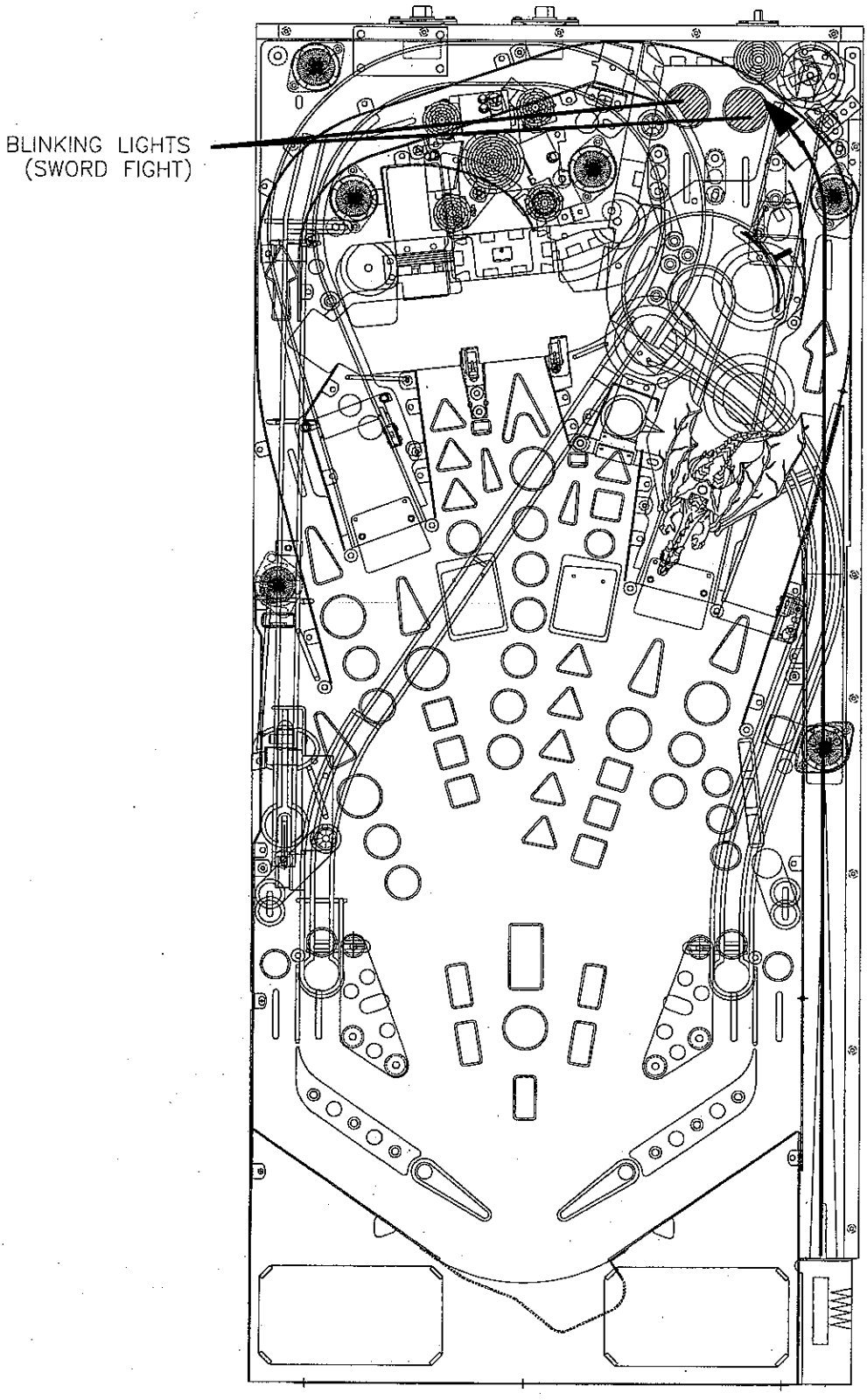
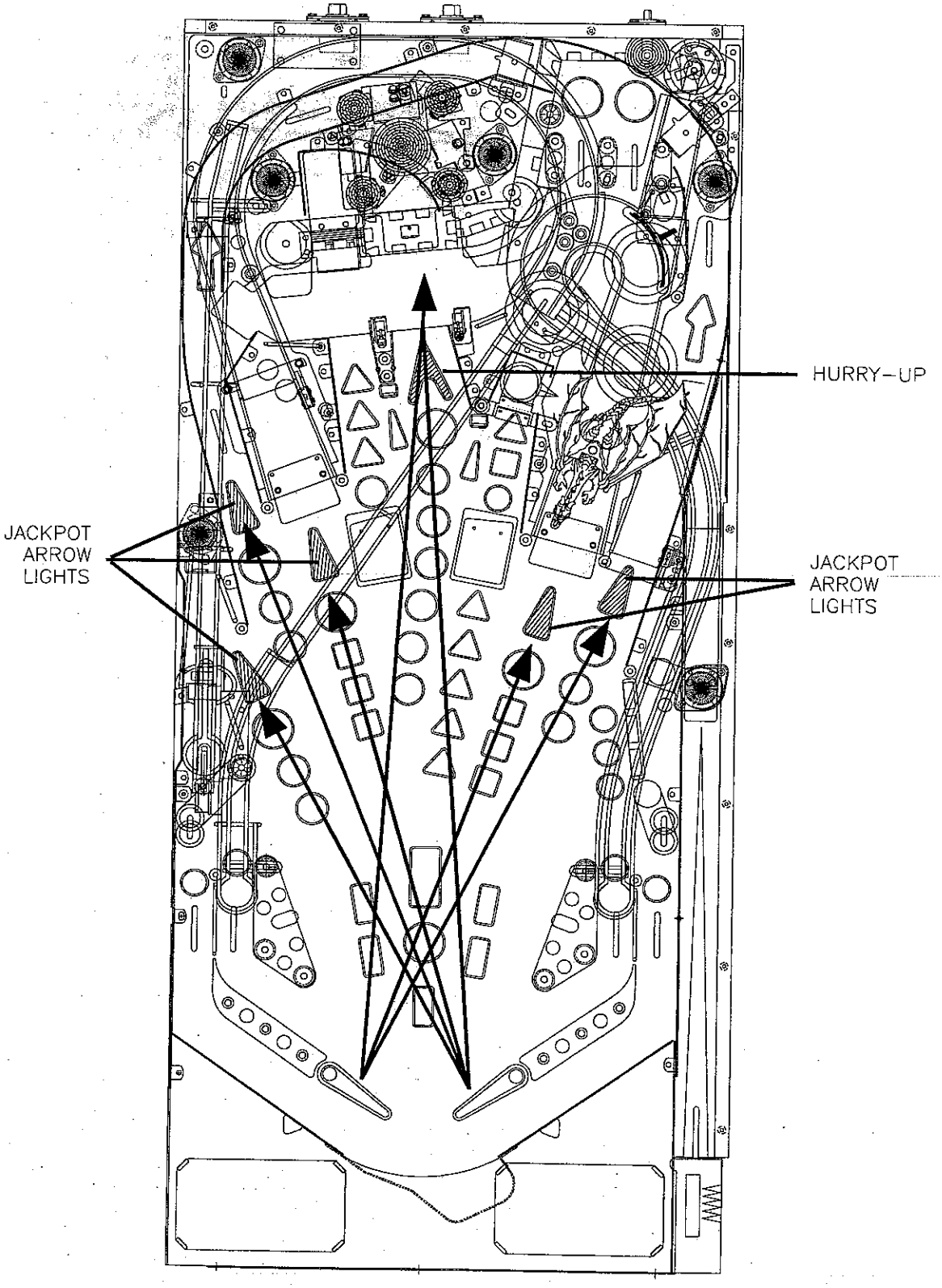
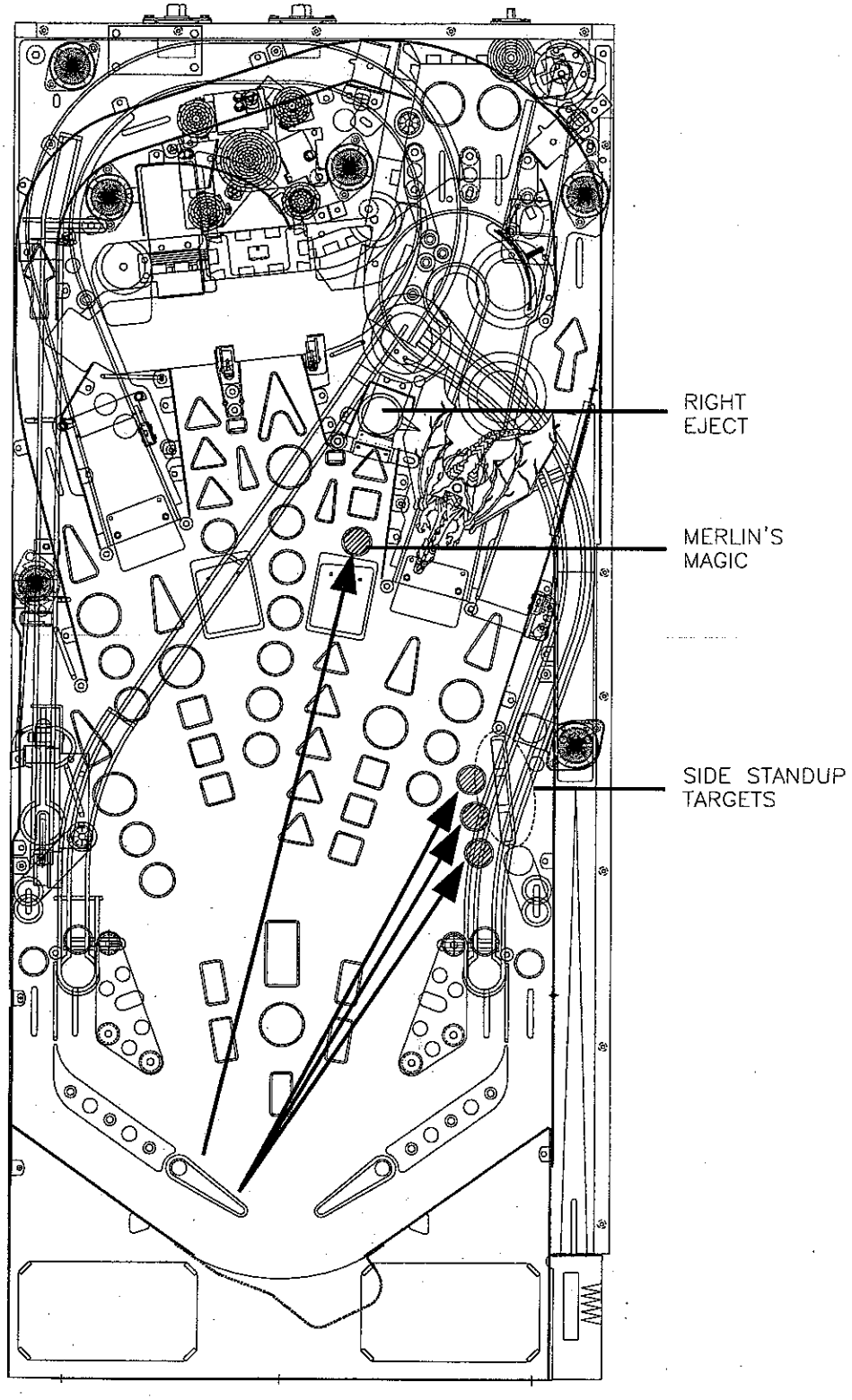
SKILL SHOT Collect Skill Shot at ball start by using flippers to move the blinking light on the top lanes to the same lane the ball rolls down. The right flipper button will move the light to the right; the left flipper button will move the light to the left. Skill Shot awards Big Points and Plus 5X Bonus.



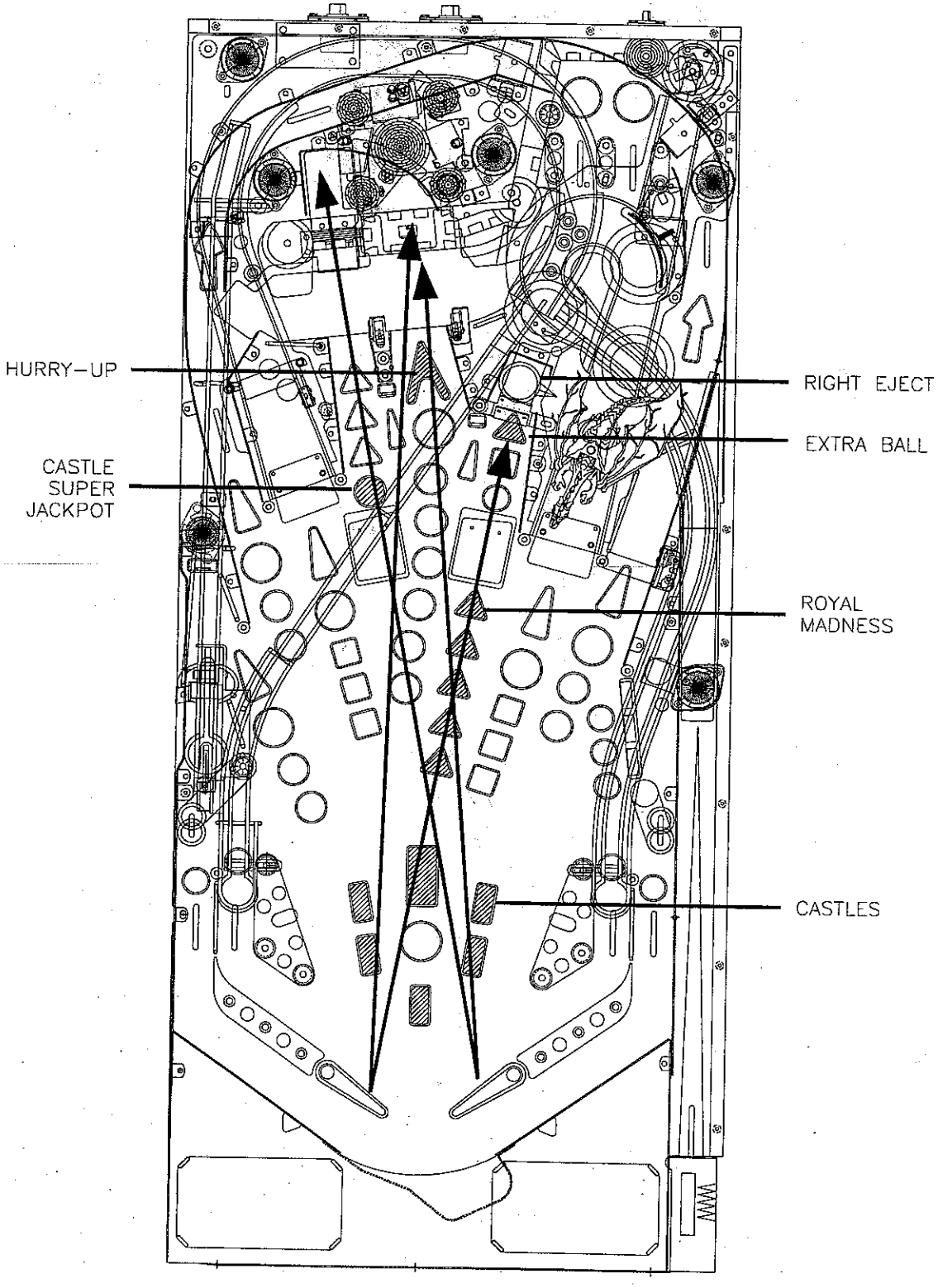
SUPER SKILL SHOT At ball start, hold left flipper while launching the ball. Then, make any flashing jackpot shot. Making a flashing shot awards Big Points and starts a Hurry-up on the center Castle Drawbridge shot.



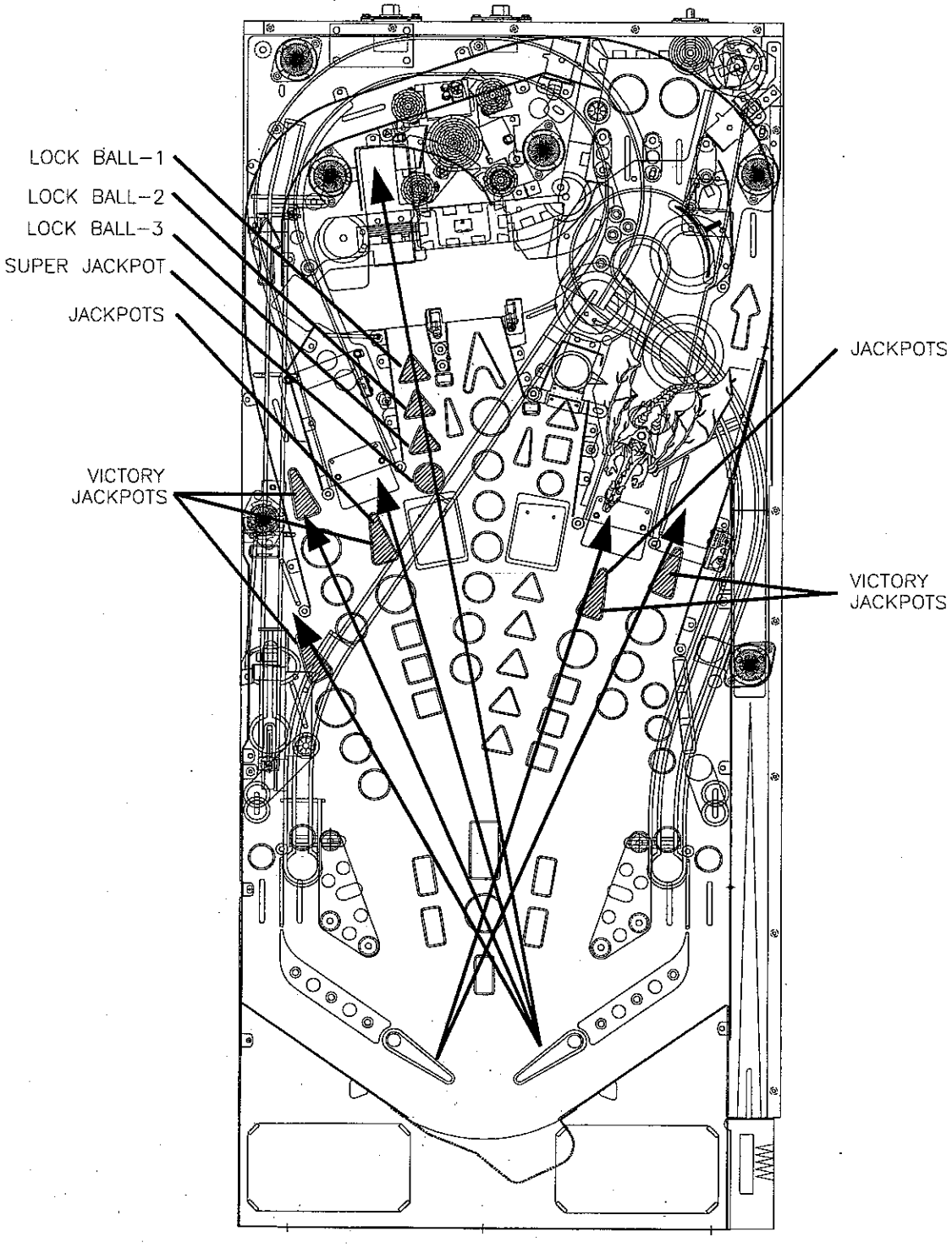
MERLIN'S MAGIC Complete the three right side Standup Targets to light Merlin's Magic located at the right eject hole. Make the right eject shot to collect Merlin's Magic Mystery Award, (shown in the display).



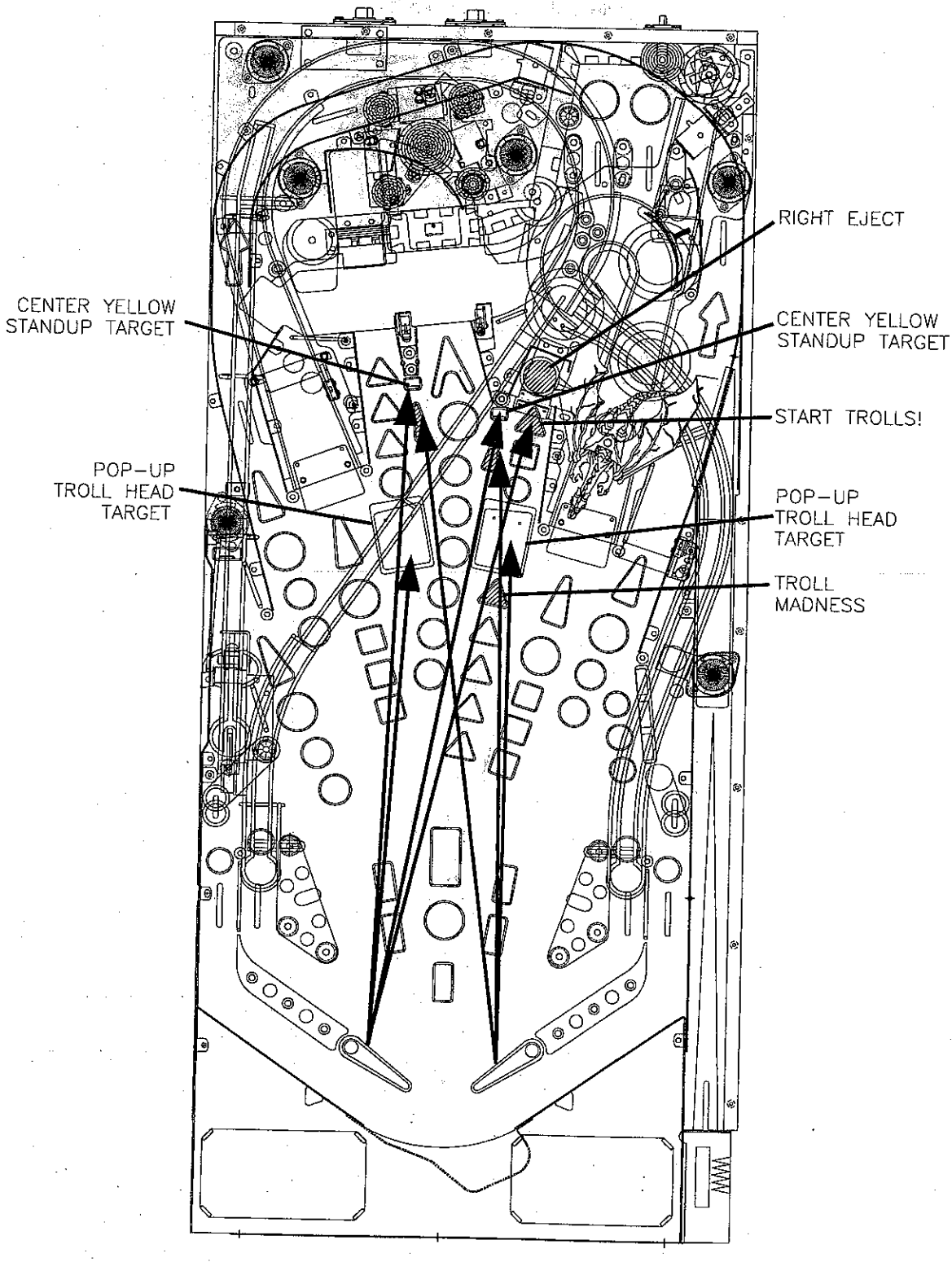
EXTRA BALL To light Extra Ball, destroy Castles, complete Hurry-ups (the displayed number of times), and/or collect Castle Multiball Super Jackpots (adjustable). Then, make the right eject shot to collect the Extra Ball. Completing Royal Madness also awards an Extra Ball (adjustable).



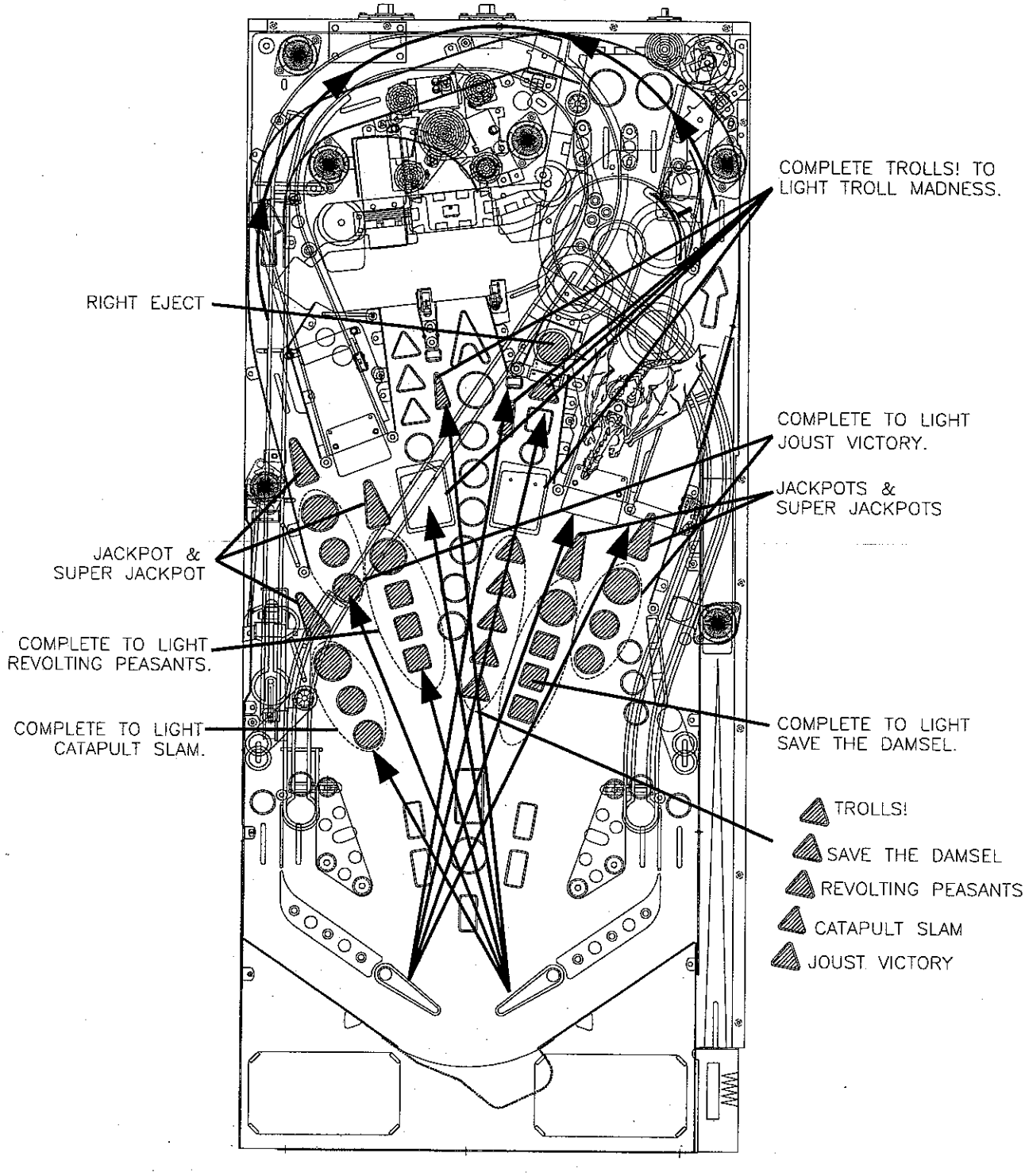
CASTLE MULTIBALL Lock three balls in the Castle, (complete Jump the Moat and Break Through the Castle Wall shot) to start Multiball. Shoot ramps to collect Jackpots. Collect five jackpots to light Super Jackpot. Collect Super Jackpot to light Victory Jackpots. Shoot ramps, loops and catapult to collect all Victory Jackpots.



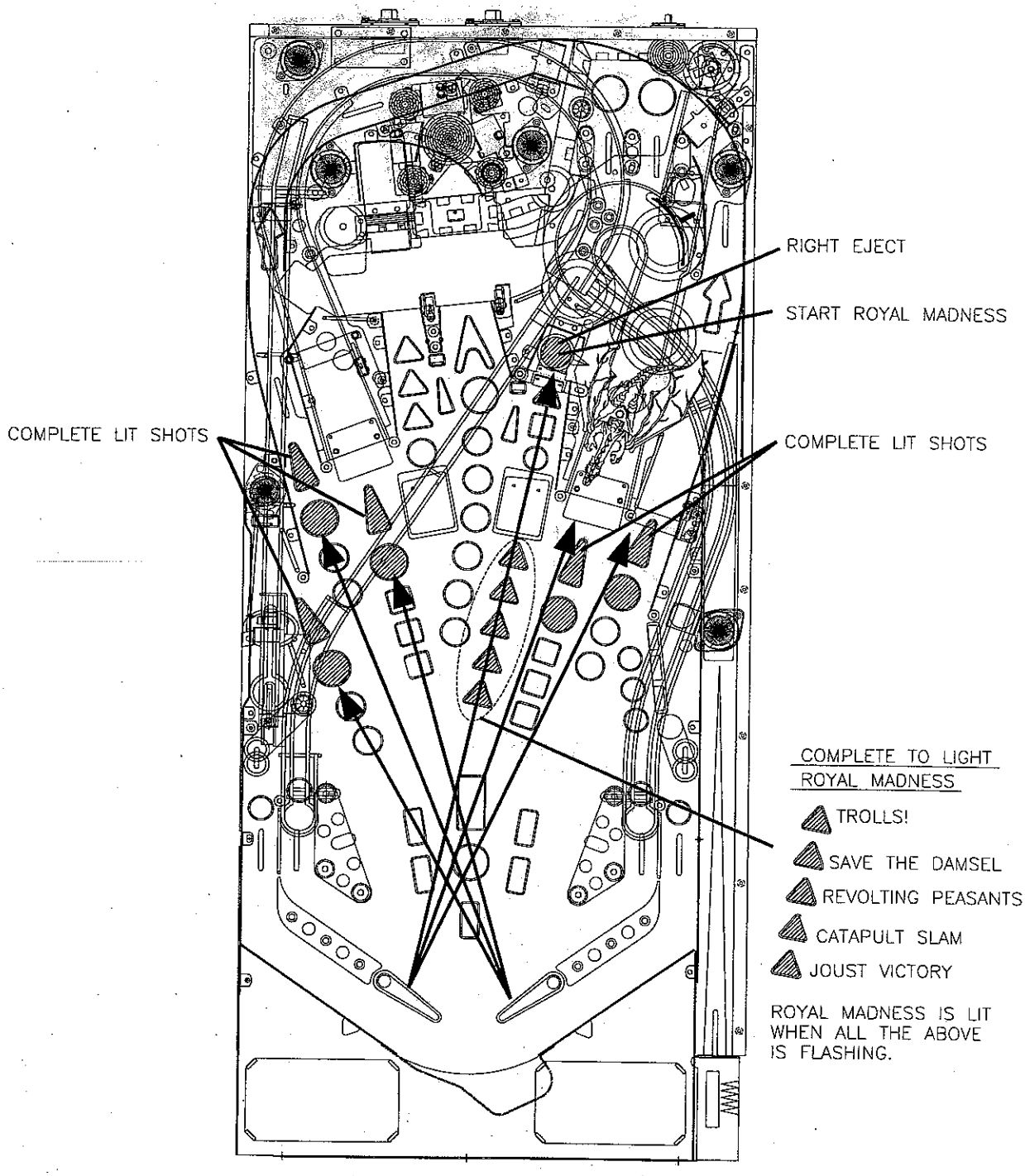
TROLLS! Hit the center yellow Standup Targets to light Trolls! (See display for number of hits needed.) Make the Right Eject shot to start Trolls! Hit pop-up troll heads to destroy them and light Troll Madness located at the Right Eject hole.



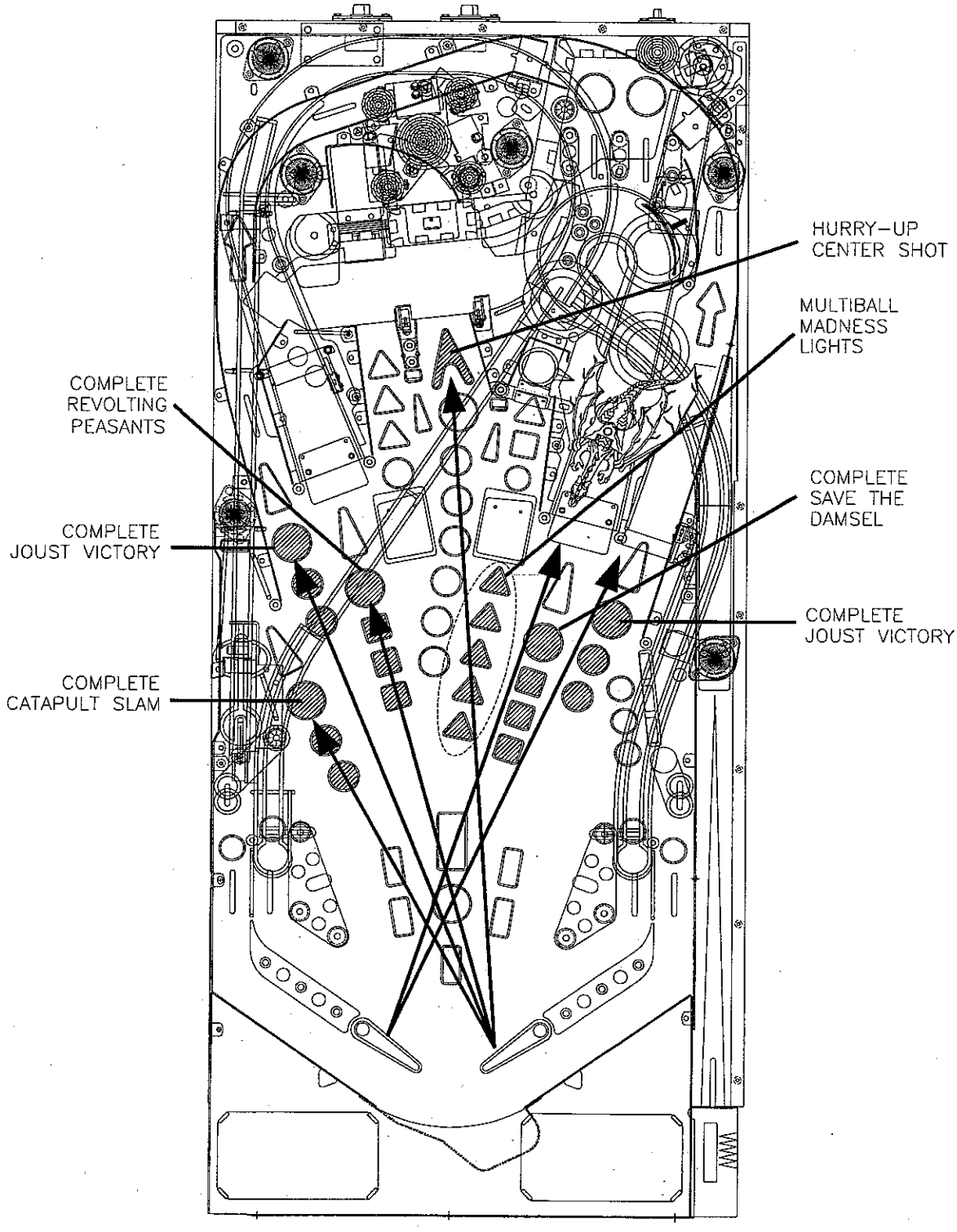
MULTIBALL MADNESS Complete one or more of: Joust Victory, Catapult Slam, Revolting Peasants, Save the Damsels, or Trolls to light Multiball Madness located at the Right Eject hole. Make the Right Eject shot to start Multiball Madness. Make flashing Arrows shots for Jackpot and strobing shots for Super Jackpots.



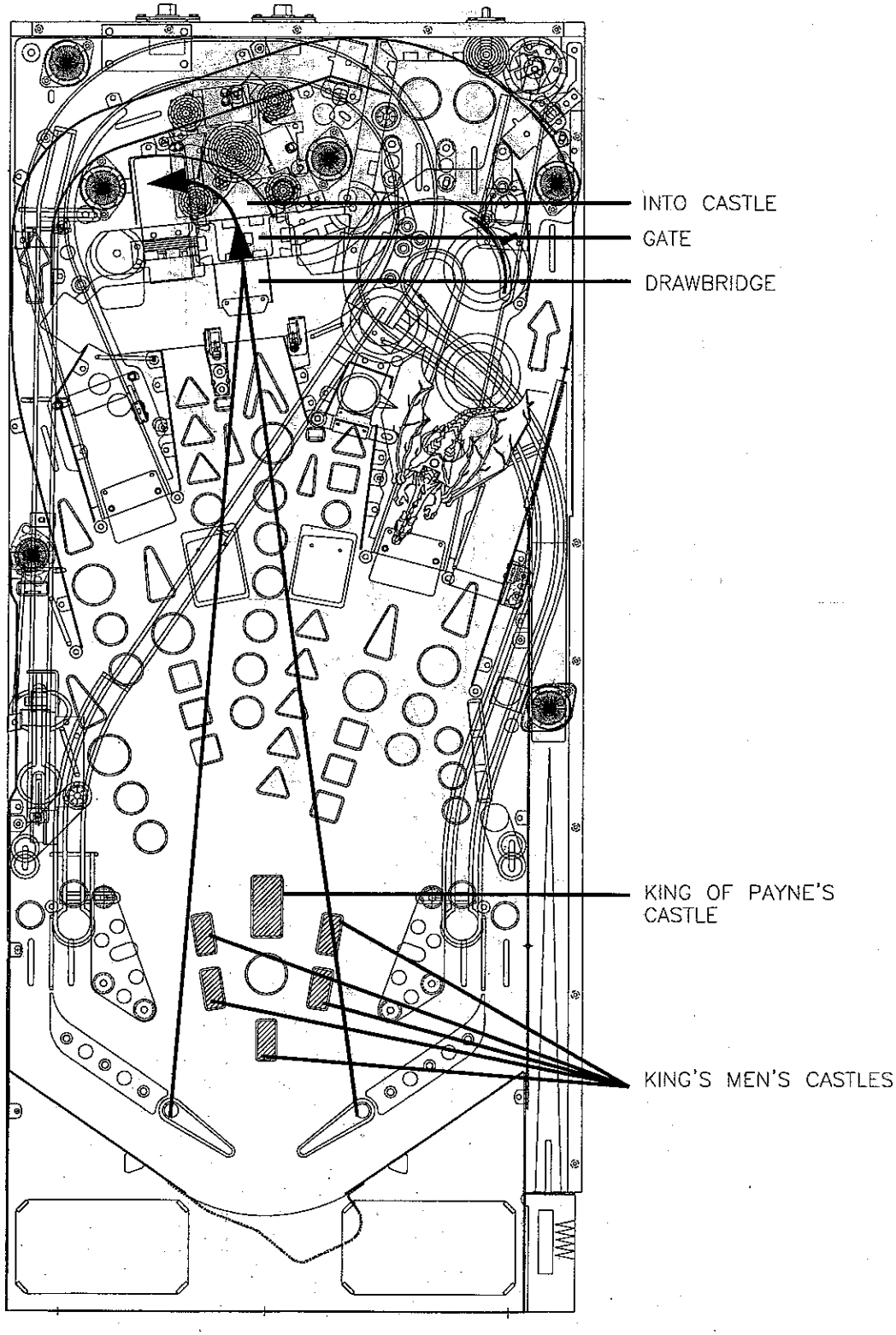
ROYAL MADNESS Complete Joust, Catapult, Peasants, Damsels, Trolls, and Multiball Madness to light Royal Madness located at the Right Eject hole. Make the Right Eject shot to start Royal Madness. Complete all lit shots in the time allowed, (adjustable) to collect Extra Ball.



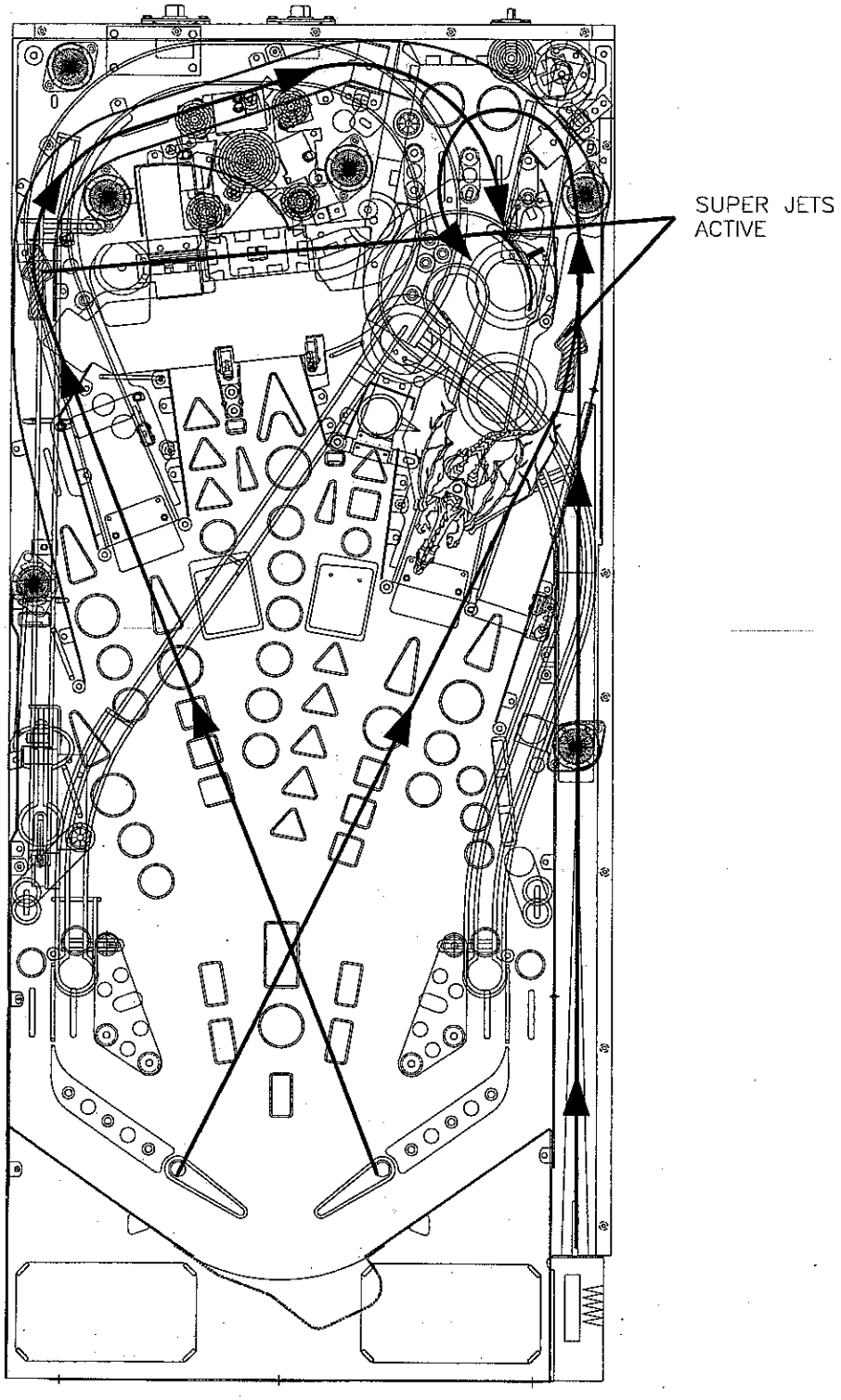
HURRY-UP Start Hurry-up on center shot by completing one or more of the following: Joust Victory, Catapult Slam, Revolting Peasants, Save the Damsel, or Trolls after its Multiball Madness light is lit. Make the center shot to collect Hurry-up Award.



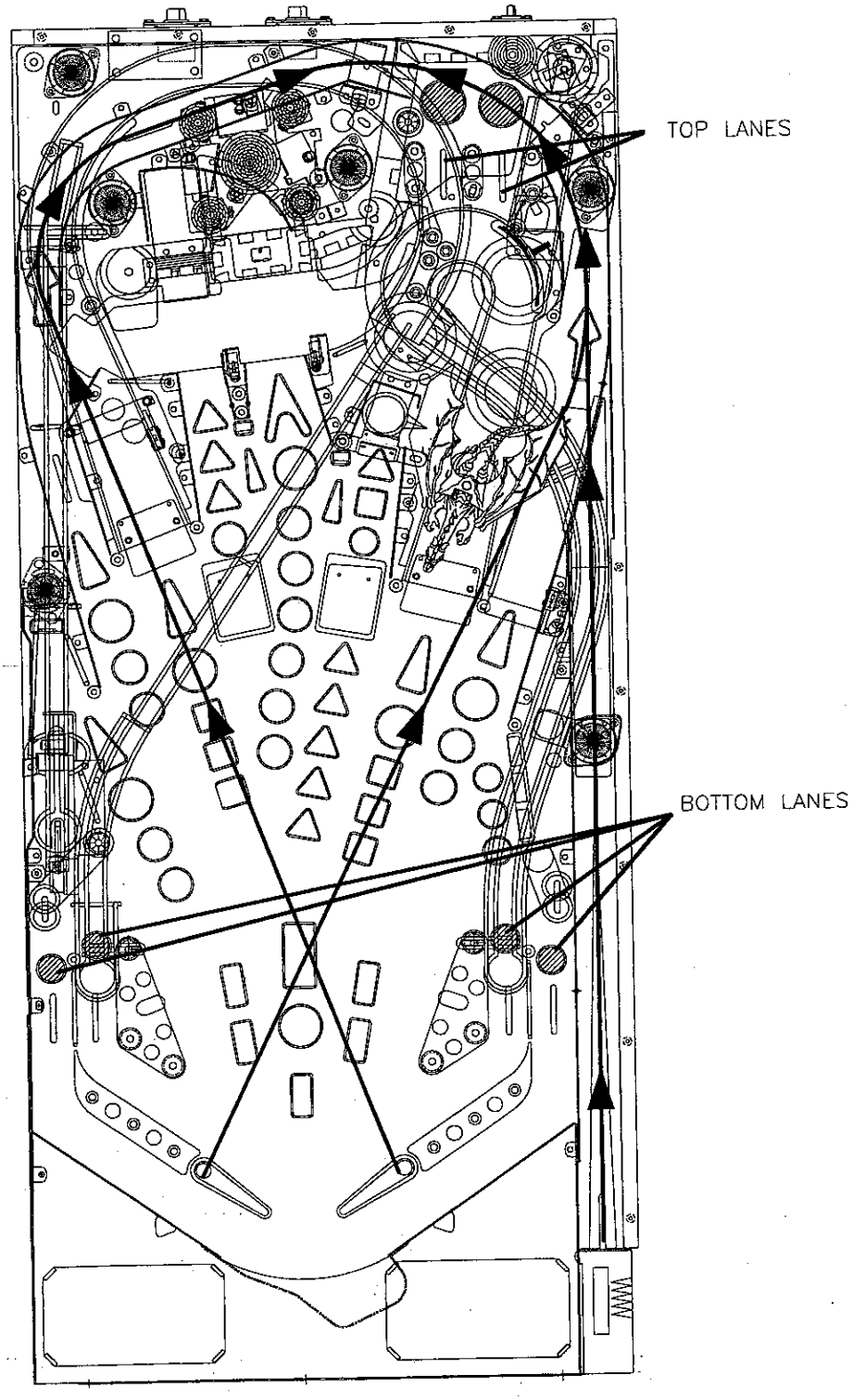
DESTROY CASTLES To destroy castles, shoot the drawbridge, then castle gate, then shoot into castle. Destroy each of the King's Men's Castles to attack the King of Payne.



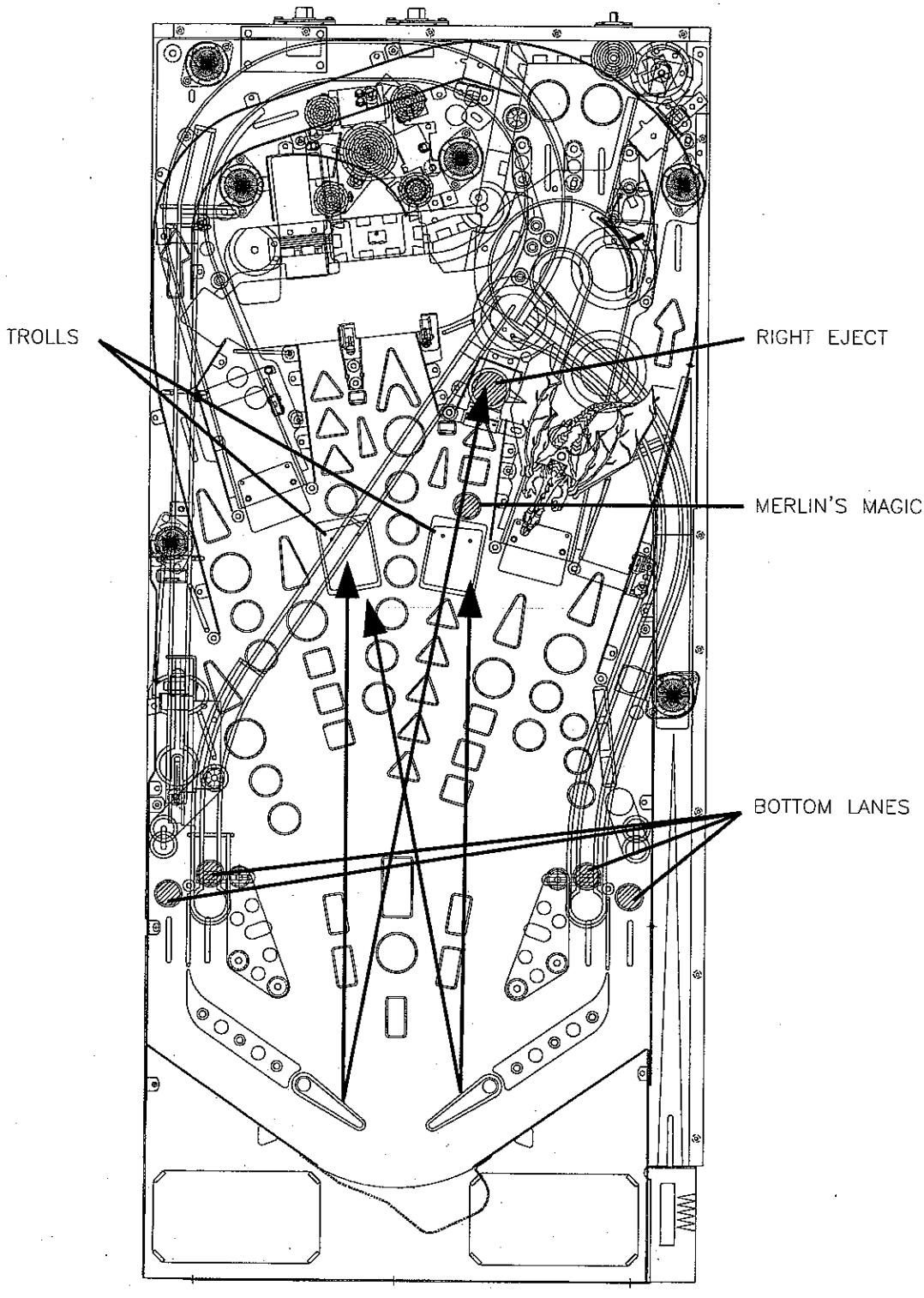
SUPER JETS Hit the jet bumpers the number of times needed (see display) to start Super Jets. Once Super Jets is started, hit the jet bumpers the number of times (see display again) for Big Points. Each time Super Jets is started, the value of each hit increases.



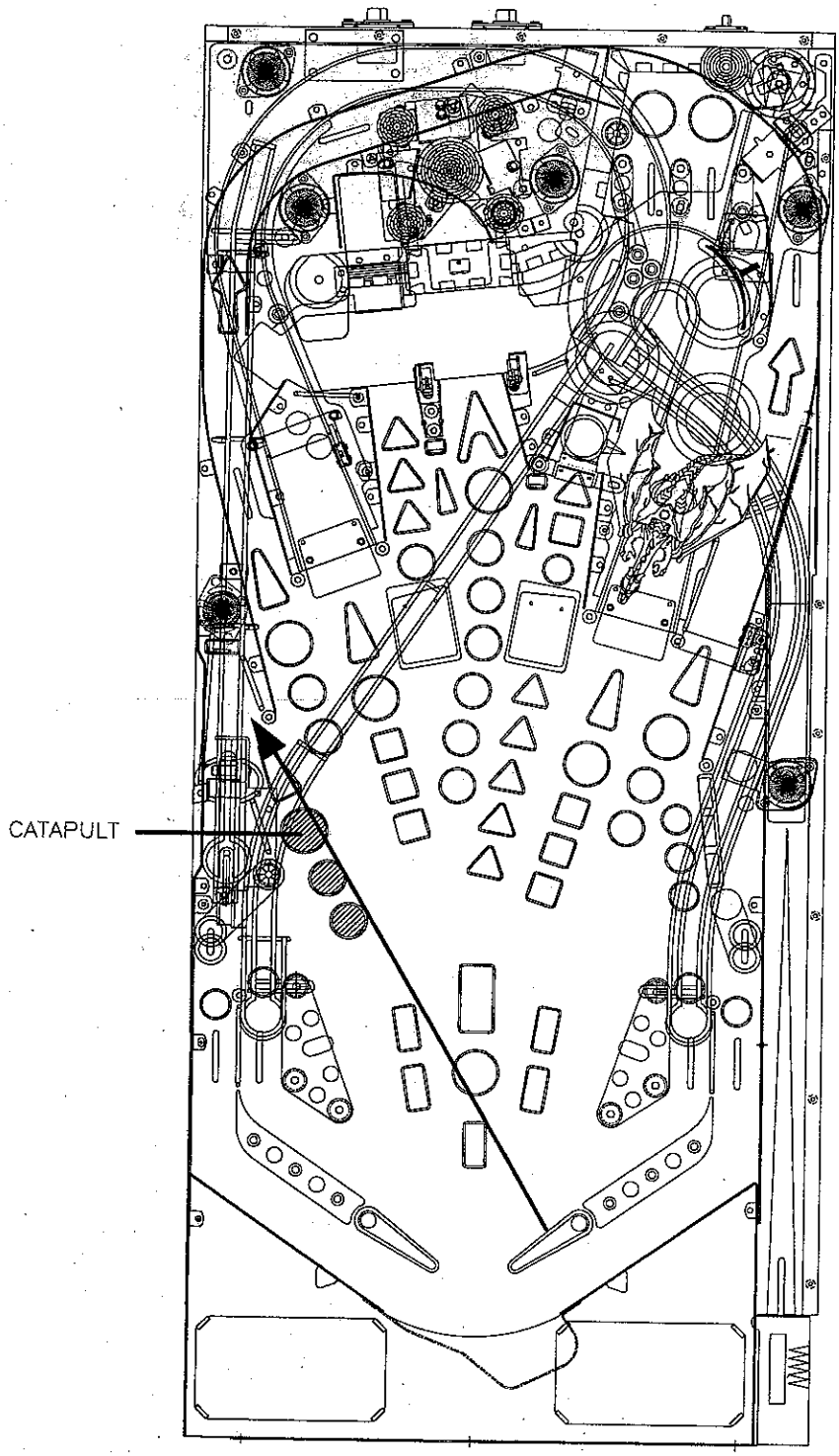
BONUS X Complete top lanes for End of Ball Bonus Multiplier. Complete bottom lanes for End of Ball Bonus Multiplier X2.



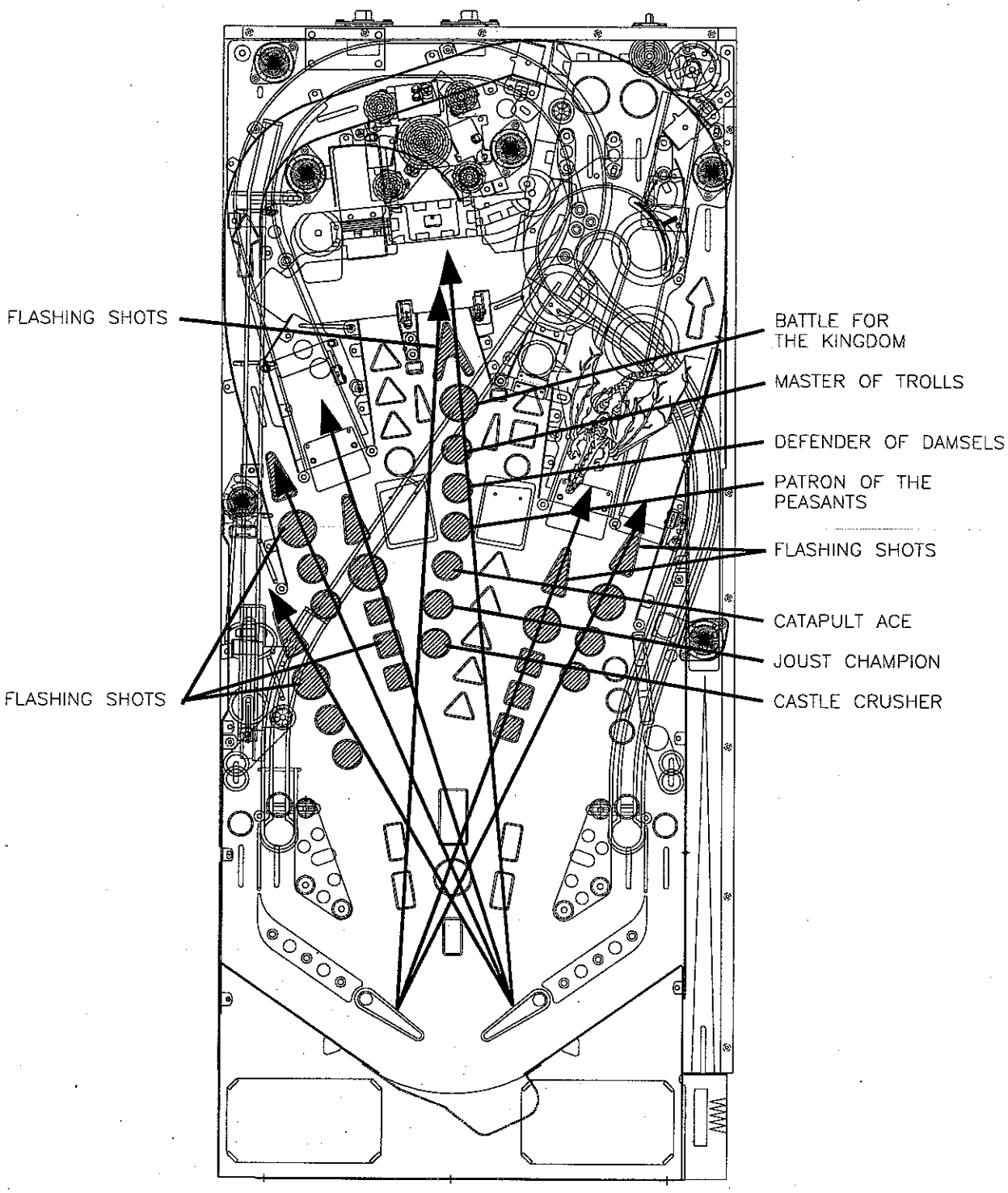
SMACK-A-TROLL Awarded randomly from the Merlin's Magic Mystery Award located at the Right Eject. Hit Trolls as they pop up the required number of times (see display) during the allowed time for Big Points.



BARNYARD MULTIBALL Collect (throw), all five different catapult projectiles to light Barnyard Multiball located at the catapult. Shoot the catapult to start. Make flashing shots while in multiball for Big Points and fun animal sounds.



BATTLE FOR THE KINGDOM Collect three joust victories (Joust Champion), three catapult slams (Catapult Ace), three revolting peasants (Patron of the Peasants), three damsels (Defender of Damsels), destroy ten trolls (Master of Trolls), and destroy all castles (Castle Crusher), to light Battle for the Kingdom. Make the center shot to start the Battle. During the Battle, make all of the flashing shots to destroy the King of Payne.



SECTION ONE

GAME OPERATION AND TEST INFORMATION

(System WPC) ROM SUMMARY

IC	TYPE	BOARD	LOCATION	PART NUMBER
Game 1	27c040	CPU	G11	A-5343-50059-1
Security Chip	PIC16C57	CPU	G10	A-5400-50059-1
Music/Speech	27c040	Audio	SU2	A-5343-50059-S2
Music/Speech	M27c801	Audio	SU3	5341-15451-SU3
Music/Speech	M27c801	Audio	SU4	5341-15451-SU4
Music/Speech	M27c801	Audio	SU5	5341-15451-SU5
Music/Speech	M27c801	Audio	SU6	5341-15451-SU6

NOTICE

Order replacement ROMS from your authorized Williams Electronics Games, Inc. distributor. Specify (1), part number (if available); (2), ROM level (number) on label; (3) game in which ROM is used.

PINBALL GAME ASSEMBLY INSTRUCTIONS

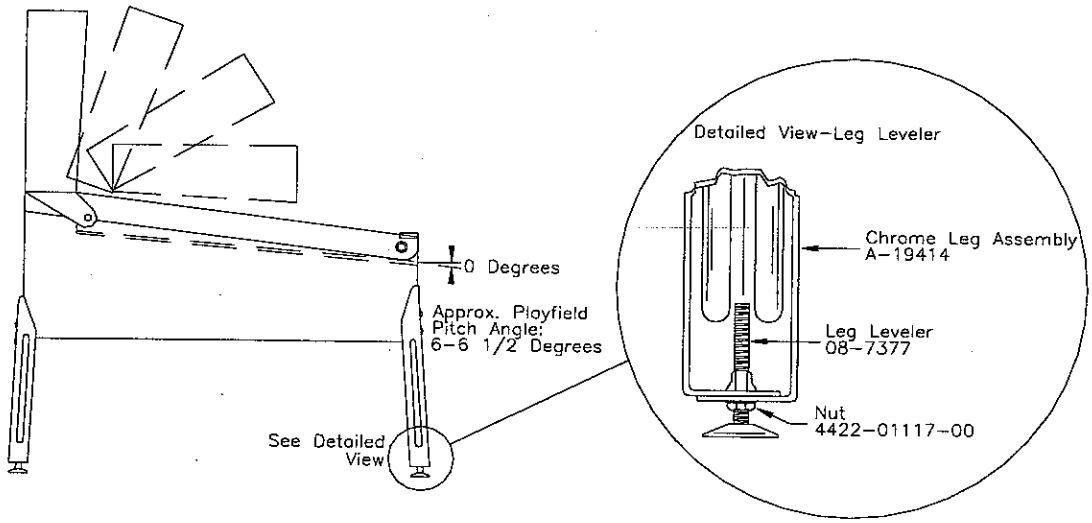
MEDIEVAL MADNESS IS A FOUR BALL GAME.

Power:	Domestic 120V @ 60Hz Foreign 230V @ 50Hz Japan 100V @ 50HZ	***Dimensions:***	Width: 29" approx. Depth: 52" approx. Height: 75" approx.
Temp:	32°F to 100° F, (0°C to 38°C)		
Humidity:	Not to exceed 95% relative.	***Weight:***	325 lb. approx. (crated)

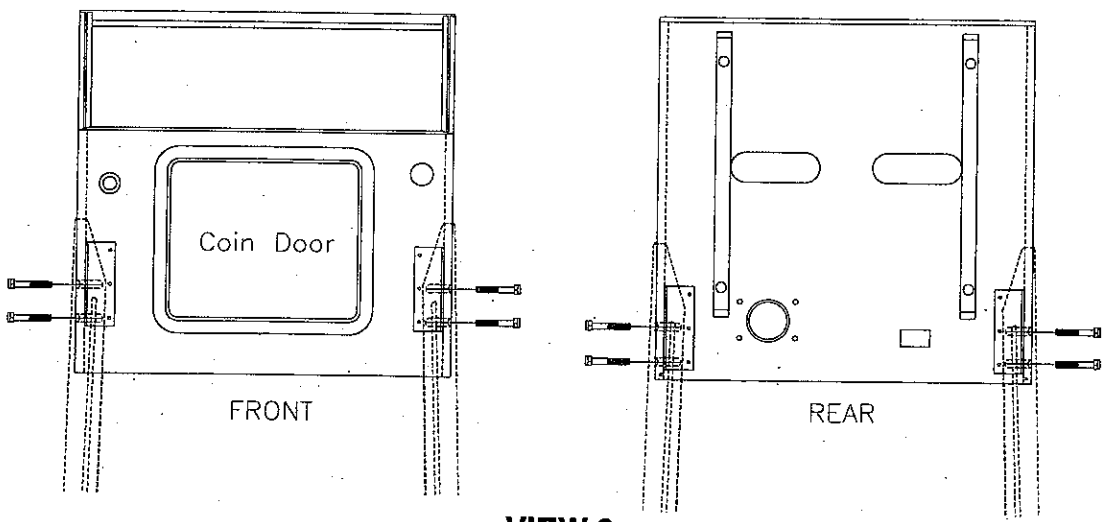
1. Remove all cartons, parts, and other items from the shipping container and set them aside.

2. Leg levelers and leg bolts are among the parts in the cash box. Install leg levelers on the front and rear legs (View 1). Place cabinet on a support and attach rear legs using leg bolts (View 2).

3. Attach front legs using leg bolts (View 2).



VIEW 1



VIEW 2

4. Reach into the cabinet and backbox and ensure that the interconnecting cables are not kinked or pinched. Be careful to avoid damaging wires at any stage of the assembly process.

5. Raise the hinged backbox upright and latch it into position.

Note: *The insert panel is no longer hinged to the backbox; it is attached to the backglass. The backglass and the insert panel are removed from the backbox housing as a single unit.*

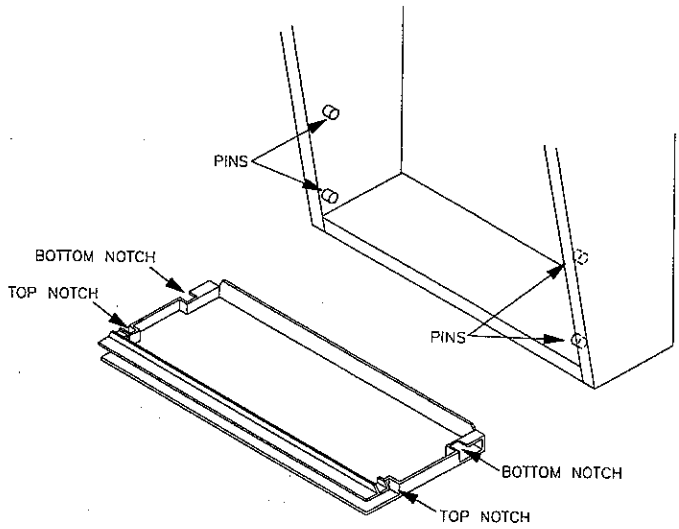
Unlock the backbox. Carefully, lift the backglass/insert panel from the bottom and slide it out of the backbox. Lay it down on the playfield glass. Unplug the cable extending from the backbox to the insert panel. Carefully, set the backglass/insert panel aside.

Note: *The speaker panel uses a new hinging system. The bottom of the speaker panel remains attached to the backbox unit when released.*

Carefully lift the speakers panel so that the top notches clear the top pins. Rotate it away from the backbox and toward the playfield glass. The bottom of the speaker panel remains attached to the backbox unit.

Lowering the speaker panel allows access to the holes for the bolts used to secure the backbox upright. Install one washer-head mounting bolt through each hole and into the threaded fasteners in the cabinet.

Note: *You have the option of removing the speaker panel completely. Lay the speaker panel on the playfield glass. Unplug the display cable, speaker cable, and ground strap. Line up the bottom notches with the bottom backbox pins. Lower the speaker panel through the notches and slide it under the backbox pins.*



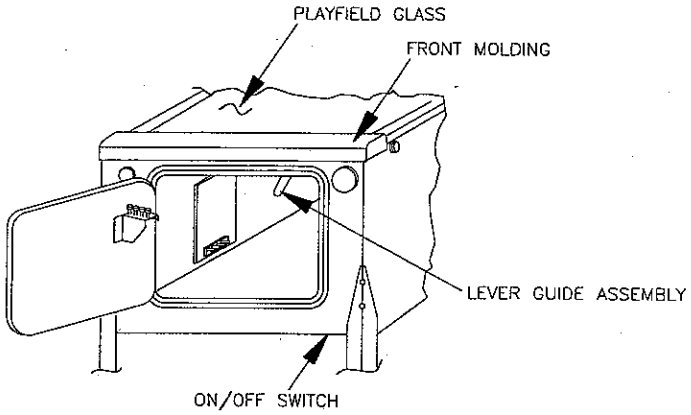
6. After the washer-head mounting bolts are installed, replace the speaker panel and the backglass/insert panel. Lock the backbox.

⚠ CAUTION

FAILURE TO INSTALL the backbox mounting hardware properly can cause personal injury. ***NEVER TRANSPORT*** a pinball game with the hinged backbox erect. Always lower the backbox forward onto the playfield cabinet on a layer of protective material to prevent marring or damage and possible personal injury.

7. Extend each leg leveler *slightly* below the leg bottom, so that all four foot pads are extended about the same distance. Remove the cabinet from its support and place it on the floor.

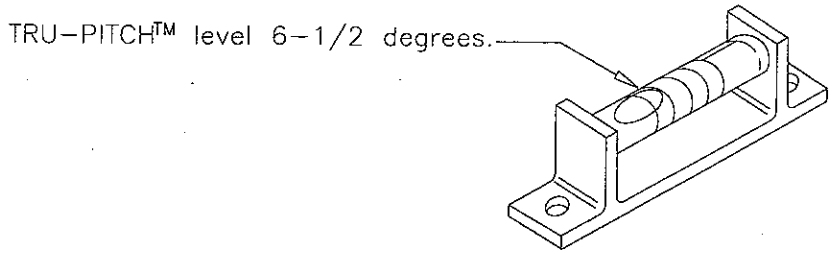
8. Unlock and open the coin door. Move the lever guide toward the left side of the game, and lift the front molding off of the playfield cover glass. Slide the lever guide to the right, and close the coin door. Carefully slide the glass downward, until it clears the grooves of the left and right side moldings. Lift the glass up and away from the game, storing it carefully to avoid breakage.



9. Place a level or an inclinometer on the playfield surface. Adjust the leg levelers for proper playfield level (side-to-side).

   Note: *This measurement must be made ON the playfield, not the cabinet or the playfield cover glass. Tighten the nut on each leg leveler shaft to maintain this setting.*

10. The TRU-PITCH™ level is located on the right shooter rail. This allows the playfield pitch angle to be properly adjusted WITHOUT REMOVING THE GLASS. The first line (closest to the front of the game) on the level is approximately 6 degrees. Every line thereafter is approximately another 1/2 degree of pitch. The recommended pitch is 6-1/2 degrees. The NOSE of the bubble should be between the first and second line on the level (see diagram below).



IMPORTANT!

Playfield pitch angle can affect the operation of the plumb bob tilt. The plumb bob weight is among the parts in the cash box; the operator should install the weight and adjust this tilt mechanism for proper operation, after completion of the desired playfield pitch angle setting. The unit is factory installed for a 6-1/2 degree angle. If an adjustment is necessary, loosen the screw at the bottom of the unit. Move the pointer, one grove at a time to the left or the right, depending on the degree desired. Hold the pointer in place and tighten screw

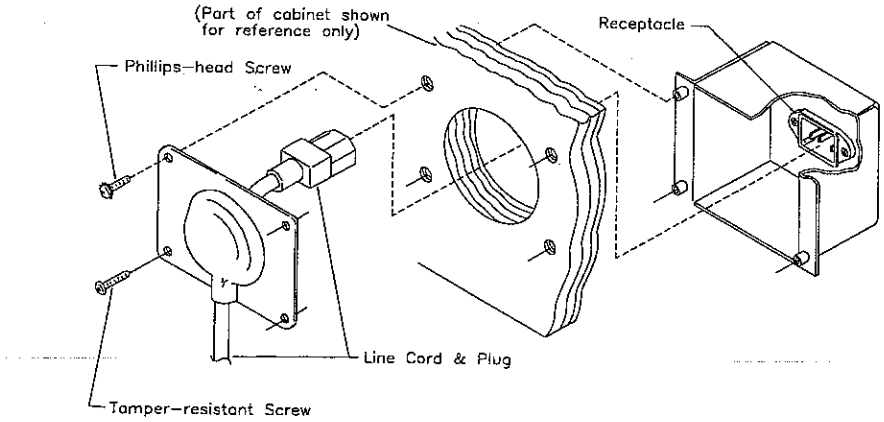
11. Be sure the ***required number*** of balls is installed. The ***MEDIEVAL MADNESS*** game uses FOUR balls.

12. Install full playfield Mylar, if desired.

Note: The ***MEDIEVAL MADNESS*** playfield is coated with a special hardcoat surface and does not require a protective Mylar. However, mylars can be purchased through your local Williams Distributor. Specify part number 03-9804-3 for full playfield Mylar.

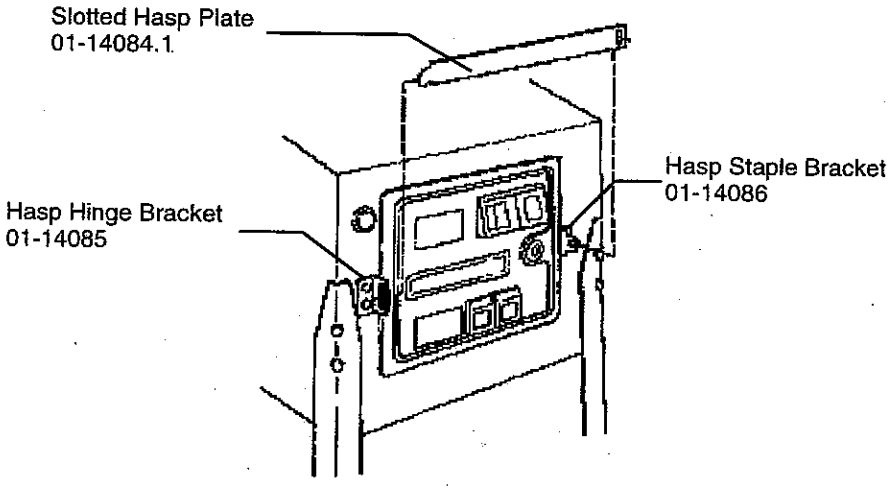
13. Clean and reinstall the playfield cover glass. Replace and lock the front molding.

14. To attach the line cord, remove the four Phillips-head screws that mount to line cord cover plate to the rear cabinet. Match the prongs on the plug with the holes in the receptacle, and push the line cord securely into place. Make sure the cord is aligned with the indentation on the cover plate (indentation should point toward bottom of the cabinet). Remount line cord cover plate. If desired, four tamper resistant screws have been provided, in the unique parts bag, to remount cover plate.



15. Move the game into the desired location; recheck the level and pitch angle of the playfield.

16. If a padlock is desired, install the security bar as shown below.



17 IMPORTANT: Fill out and return the registration card.

GAME CONTROL LOCATIONS

Cabinet Switches

The On-Off Switch is on the bottom of the cabinet near the right front leg.
The Start Button is a push-button to the left of the coin door on the cabinet exterior. Press the Start button to begin a game, or during the diagnostic mode, to ask for HELP.

Coin Door Buttons

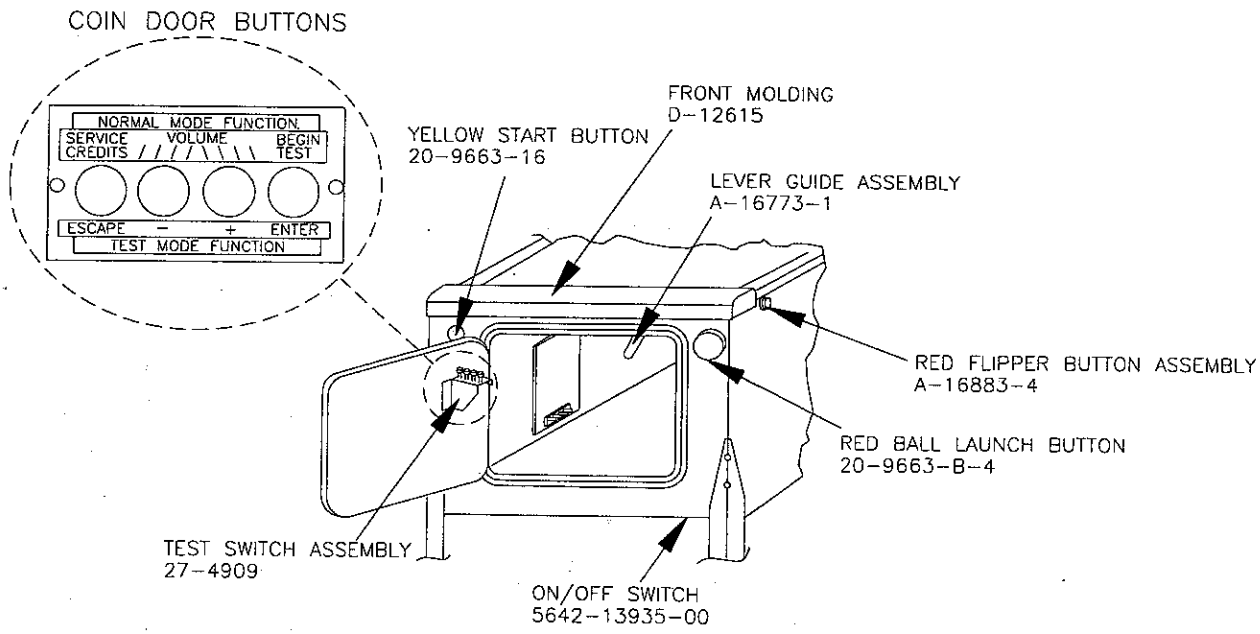
The operator controls all game adjustments, obtains bookkeeping information, and diagnoses problems, using only four push-button switches mounted on the inside of the coin door. The coin door buttons have two modes of operation Normal Function and Test Function.

Normal Function

The Service Credits button puts credits on the games that are not included in any of the game audits.
The Volume Up (+) button raises the sound level of the game. Press and hold the button until the desired level is reached.
The Volume Down (-) button lowers the sound level of the game. Press and hold the button until the desired level is reached. See Adjustment A.1 28 to turn sound off completely.
The Begin Test button starts the Menu System operation and changes the coin door buttons from Normal Function to Test Function.

Test Function

The Escape button allows you to get out of a menu selection or return to the Attract mode.
The Up (+) button allows you to cycle forward through the menu selections or adjustment choices.
The Down (-) button allows you to cycle backward through the menu selections or adjustment choices.
The *Enter button allows you to get into a menu selection or lock in an adjustment choice.



To reset High Score, hold down the Begin Test/Enter switch for five seconds while in the Attract mode.

GAME OPERATION

⚠ CAUTION

After assembly and installation at its site location, this game must be plugged into a properly grounded outlet to prevent shock hazard, and to assure proper game operation. DO NOT use a 'cheater' plug to defeat the ground pin on the line cord. DO NOT cut off the ground pin.

POWERING UP. With the coin door closed, plug the game in, and switch it on. In normal operation, TESTING shows in the displays as the game performs Start-up tests. Once the Start-up tests have been successfully completed the last score is displayed and the game goes into the Attract mode.

Note: *After the game has been on location for a time, the Start-up tests may contain messages concerning game problems. See 'Error Messages' for more detailed information regarding messages.*

Open the coin door and press the Begin Test switch. The display shows the game name, number, and software revision. The message changes and the display will show the sound software revision, the revision level of the system software, and the date the software was revised.

Example:	***MEDIEVAL MADNESS***		**Sound Rev. 1.0A**	
	50059	**Rev. 1.0A**	**SY. 0.X0**	**XX-XX-97**

Press the Enter button to enter the Menu System (refer to the section entitled "Menu System Operation" for more information). Perform the entire Test menu routine to verify that the game is operating satisfactorily.

In order to operate the tests that use the +50V or +20V circuits, pull the top interlock switch button out. The interlock switches are located on a bracket in the coin door opening.

ATTRACT MODE*. After completing the Test menu routine, press the Escape button three times to enter the Attract mode. During the Attract mode, the display shows a series of messages informing the player of the recent highest *scores, "*custom messages", and the score to obtain a replay *award.

CREDIT POSTING. Insert coin(s). A sound is heard for each coin, and the display shows the number of credits purchased. So long as the number of maximum allowable credits* are NOT exceeded by coin purchase or high score, credits are posted correctly.

STARTING A GAME. Press the Start button. A startup sound plays, and the credit amount shown in the display decreases by one. The display flashes 00 (until the first playfield switch is actuated), and shows ball 1. If credits are posted, additional players may enter the game by pressing the Start button once for each player, before the end of play on the first ball.

TILTS. Actuating the cabinet tilt switch inside the cabinet ends the current game and proceeds to the Game Over mode. With the third closure* of the plumb bob tilt switch, the player loses the remaining play of that ball, but can complete the game.

END OF A GAME. All earned scores and bonuses are awarded. If a player's final score exceeds the specified value, the player receives a designated award for achieving the current highest score. A random digit set* appears in the display. Credits* may be awarded, when the last two digits of any player's score match the random digits. Match, high score, and game over sounds are made.

GAME OVER MODE. The **Game Over** display shows the high scores and the game proceeds to the Attract Mode.

* - Operator-adjustable feature

RAISING THE PLAYFIELD

⚠ CAUTION

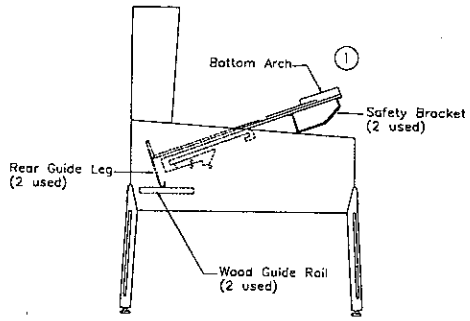
Do not raise the playfield straight up! This game uses a slide assembly to raise and lower the playfield.

Before Raising the Playfield:

Be sure there are no balls present in the ball trough or any of the other ball-holding playfield devices (i.e. poppers). Raising the playfield with balls present in these locations may cause them to come loose and damage the playfield. Use the "Empty Balls Test" to remove all of the balls from these locations.

To Raise the Playfield:

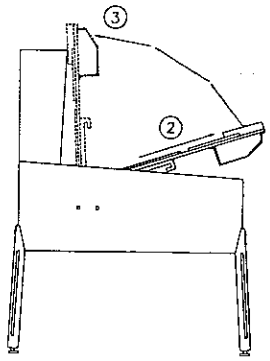
1. Grasp bottom arch and carefully lift up playfield only high enough to clear safety brackets. Rear guide legs should not hit wood guide rails, or be used to slide out playfield.



2. Pull the playfield out toward you until it stops (rest position), and raise it approximately 3".

   Be sure playfield is in locked position and does not slide back into cabinet. If it does, repeat Step 2 before proceeding to Step 3.

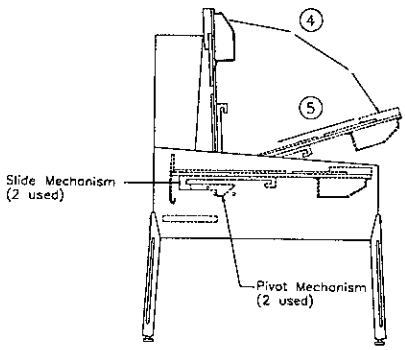
3. Rotate playfield to upright service position (lean on backbox) by pulling toward you and up. Listen for the sound of a click: this ensures locking and pivoting sequence.



To Lower the Playfield.

4. Rotate the playfield to the rest position. This unlocks the pivoting mechanism.

5. Push the playfield back into cabinet and into the playing position.



MENU SYSTEM OPERATION

The Main Menu allows you to choose from several options, which in turn lead to other menus to choose from. To access the Main Menu open the coin door, press the Begin Test button, then the Enter button. Press the Up and Down buttons to scroll through the Main Menu. To access a menu, (Bookkeeping, Printouts, etc.), from the Main Menu, press the Enter button. To return to the Main Menu (from Bookkeeping, Printouts, etc.) press the Escape button. Press the Start button for HELP.

MAIN MENU

B. BOOKKEEPING MENU

- B.1 Main Audits
- B.2 Earning Audits
- B.3 Standard Audits
- B.4 Feature Audits
- B.5 Histograms
- B.6 Time-Stamps

P. PRINTOUTS MENU

- P.1 Earnings Data
- P.2 Main Audits
- P.3 Standard Audits
- P.4 Feature Audits
- P.5 Score Histograms
- P.6 Time Histograms
- P.7 Time-Stamps
- P.8 All Data

T. TEST MENU

- T.1 Switch Edges Test
- T.2 Switch Levels Test
- T.3 Single Switches Test
- T.4 Solenoid Test
- T.5 Flasher Test
- T.6 General Illumination Test
- T.7 Sound and Music Test
- T.8 Single Lamp Test
- T.9 All Lamps Test
- T.10 Lamp and Flasher Test
- T.11 Display Test
- T.12 Flipper Coil Test
- T.13 Ordered Lamps Test
- T.14 Lamp Row-Col.
- T.15 DIP Switch Test
- T.16 Loop/Gate Test
- T.17 Tower Test
- T.18 Drawbridge Test
- T.19 Castle Gate Test
- T.20 Trolls Test
- T.21 Empty Balls Test

U. UTILITIES MENU

- U.1 Clear Audits
- U.2 Clear Coins
- U.3 Reset H.S.T.D.
- U.4 Set Time and Date
- U.5 Custom Message
- U.6 Set Game I.D.
- U.7 Factory Adjustments
- U.8 Factory Resets
- U.9 Presets
- U.10 Clear Credits
- U.11 Auto Burn-in

A. ADJUSTMENT MENU

- A.1 Standard Adjustments
- A.2 Feature Adjustments
- A.3 Pricing Adjustments
- A.4 H.S.T.D. Adjustments
- A.5 Printer Adjustments

Press Escape
To move out of a menu selection.

Press Enter
To get into a menu selection.

Press Up
Increases sequence; Example A.1, A.2, A.3, A.4.

Press Down
Decreases sequence; Example A.4, A.3, A.2, A.1.

Use Up or Down to cycle through the selections in a menu.

Use Escape and Enter to move into and out of the selected menu.

Press the Up or Down buttons to scroll through the Bookkeeping menu. Press the Enter button to access an audit menu. Press the Escape button to return to the Bookkeeping Menu.

B. BOOKKEEPING MENU

B.1 Main Audits
B.2 Earning Audits
B.3 Standard Audits
B.4 Feature Audits
B.5 Histograms
B.6 Time-Stamps

Using the One Button Audit System. *The Bookkeeping Menu is obtainable directly from the Attract Mode. Repeatedly pressing the Enter button, while in the Attract Mode, will cycle through all of the game audits.*

B.1 MAIN AUDITS

B.1	01	Total Earnings	00	B.1	06	Total Plays	00
B.1	02	Recent Earnings	00	B.1	07	Replay Awards	00
B.1	03	Free Play Percent	00	B.1	08	Percent Replays	00
B.1	04	Average Ball Time	00	B.1	09	Extra Balls	00
B.1	05	Time Per Credit	00	B.1	10	Percent Extra Ball	00

B.2 EARNING AUDITS

B.2	01	Recent Earnings	00	B.2	08	Total Earnings*	00
B.2	02	Recent Left Slot	00	B.2	09	Total Left Slot*	00
B.2	03	Recent Center Slot	00	B.2	10	Total Center Slot*	00
B.2	04	Recent Right Slot	00	B.2	11	Total Right Slot*	00
B.2	05	Recent 4th Slot	00	B.2	12	Total 4th Slot*	00
B.2	06	Recent Paid Credits	00	B.2	13	Total Paid Credits*	00
B.2	07	Recent Service Credits	00	B.2	14	Total Service Credits*	00

**These audits are NOT re-settable. They are a record of the earnings of the game since the "CLOCK 1ST SET" Time-stamp.*

B.3 STANDARD AUDITS

B.3	01	Games Started	00	B.3	22	Minutes On	00
B.3	02	Total Plays**	00	B.3	23	Balls Played	00
B.3	03	Total Free Play	00	B.3	24	Tilts	00
B.3	04	Free Play Percent	00	B.3	25	Replay 1 Awards	00
B.3	05	Replay Awards	00	B.3	26	Replay 2 Awards	00
B.3	06	Percent Replays	00	B.3	27	Replay 3 Awards	00
B.3	09	Match Awards	00	B.3	28	Replay 4 Awards	00
B.3	10	Percent Match	00	B.3	29	1 Player Games	00
B.3	11	H.S.T.D. Credits	00	B.3	30	2 Player Games	00
B.3	12	Percent H.S.T.D.	00	B.3	31	3 Player Games	00
B.3	13	Extra Ball	00	B.3	32	4 Player Games	00
B.3	14	Percent Extra Ball	00	B.3	33	H.S.T.D. Reset Count	00
B.3	15	Tickets Awarded	00	B.3	34	Burn-in Time†	00:00:00
B.3	16	Percent Tickets	00	B.3	35	1st Replay Level	00
B.3	17	Left Drains	00	B.3	36	Left Flipper	00
B.3	18	Right Drains	00	B.3	37	Right Flipper	00
B.3	19	Average Ball Time	00				
B.3	20	Average Game Time	00				
B.3	21	Play Time	00				

***"Total Plays" only counts on completed games. A game is considered complete when the final ball begins. Audit information from incomplete games is ignored. Operation for test and service do not affect audits. †This Audit cannot be reset.*

B.4 FEATURE AUDITS

B.4 01 Ball Saves 00% 00
The number of times the ball was saved.

B.4 02 Total Multiballs 00% 00
The number of times a Multiball Feature was started.

B.4 03 Balls Locked 00% 00
The number of times a ball was locked from the Castle Lock.

B.4 04 Castle Multiball Start 00% 00
The number of times the Castle Multiball feature was started.

B.4 05 Castle Multiball Jackpots 00% 00
The number of times a Castle Multiball Jackpot was awarded.

B.4 06 Castle Multiball Super Jackpots 00% 00
The number of times a Castle Multiball Super Jackpot was awarded.

B.4 07 Castle Multiball Extra Balls Lit 00% 00
The number of extra balls lit from Castle Multiball super jackpot awards.

B.4 08 Castle Attacks Started 00% 00
The total number of Castle Attacks started.

B.4 09 Castle Attacks Completed 00% 00
The total number of Castle Attacks completed.

B.4 10 Castle Attack Extra Balls Lit 00% 00
The total number of extra balls lit from Castle Attacks.

B.4 11 First Castle Attack Started 00% 00
The number of times a first Castle Attack was started.

B.4 12 First Castle Attack Completed 00% 00
The number of times a first Castle Attack was completed.

B.4 13 Second Castle Attack Started 00% 00
The number of times a second Castle Attack was started.

B.4 14 Second Castle Attack Completed 00% 00
The number of times a second Castle Attack was completed.

B.4 15 Third Castle Attack Started 00% 00
The number of times a third Castle Attack was started.

B.4 16 Third Castle Attack Completed 00% 00
The number of times a third Castle Attack was completed.

B.4 17 Fourth Castle Attack Started 00% 00
The number of times a fourth Castle Attack was started.

B.4 18 Fourth Castle Attack Completed 00% 00
The number of times a fourth Castle Attack was completed.

FEATURE AUDITS CONTINUED...

B.4 19 Fifth Castle Attack Started 00% 00
The number of times a fifth Castle Attack was started.

B.4 20 Fifth Castle Attack Completed 00% 00
The number of times a fifth Castle Attack was completed.

B.4 21 Sixth Castle Attack Started 00% 00
The number of times a sixth Castle Attack was started.

B.4 22 Sixth Castle Attack Completed 00% 00
The number of times a sixth Castle Attack was completed.

B.4 23 Trolls Lit 00% 00
The number of times the Troll feature was lit.

B.4 24 Trolls Started 00% 00
The number of times the Troll feature was started.

B.4 25 Trolls Completed 00% 00
The number of times the Troll feature was completed.

B.4 26 Troll Bombs Collected 00% 00
The total number of Troll Bombs collected.

B.4 27 Troll Bombs Used 00% 00
The total number of Troll Bombs used.

B.4 28 Joust Madness Lit 00% 00
The number of times the Joust Madness feature was lit.

B.4 29 Catapult Madness Lit 00% 00
The number of times the Catapult Madness feature was lit.

B.4 30 Peasant Madness Lit 00% 00
The number of times the Peasant Madness feature was lit.

B.4 31 Damsel Madness Lit 00% 00
The number of times the Damsel Madness feature was lit.

B.4 32 Troll Madness Lit 00% 00
The number of times the Troll Madness feature was lit.

B.4 33 Multiball Madness Starts 00% 00
The number of times a Multiball Madness feature was started.

B.4 34 1 Multiball Madness Starts 00% 00
The number of times a single Multiball Madness feature was started.

B.4 35 2 Multiball Madness Starts 00% 00
The number of times that two Multiball Madness features were started simultaneously.

B.4 36 3 Multiball Madness Starts 00% 00
The number of times that three Multiball Madness features were started simultaneously.

FEATURE AUDITS CONTINUED...

B.4 37 4 Multiball Madness Starts 00% 00
The number of times that four Multiball Madness features were started simultaneously.

B.4 38 5 Multiball Madness Starts 00% 00
The number of times all five Multiball Madness features were started simultaneously.

B.4 39 Multiball Madness Jackpots 00% 00
The number of times a Multiball Madness jackpot was awarded.

B.4 40 Multiball Madness Super Jackpots 00% 00
The number of times a Multiball Madness super jackpot was awarded.

B.4 41 Multiball Madness Double Super Jackpots 00% 00
The number of times a Multiball Madness double super jackpot was awarded.

B.4 42 Hurry-Ups Started 00% 00
The number of times the Hurry-up feature was started.

B.4 43 Hurry-Up Awards 00% 00
The number of times the Hurry-up feature was awarded.

B.4 44 Hurry-Up Extra Balls Lit 00% 00
The number of extra balls lit from the Hurry-up feature.

B.4 45 Royal Madness Starts 00% 00
The number of times the Royal Madness feature was started.

B.4 46 Royal Madness Completed 00% 00
The number of times the Royal Madness feature was completed.

B.4 47 Royal Madness Extra Balls 00% 00
The number of extra balls awarded from the completion of the Royal Madness feature.

B.4 48 Barnyard Multiball Started 00% 00
The number of times the Barnyard Multiball feature was started.

B.4 49 Battle For The Kingdom Started 00% 00
The number of times the Battle for the Kingdom feature was started.

B.4 50 Battle For The Kingdom Completed 00% 00
The number of times the Battle for the Kingdom feature was completed.

B.4 51 Super Skill Shot 00% 00
The number of times the Super Skill Shot was scored.

B.4 52 Super Jets Started 00% 00
The number of times the Super Jets feature was started.

B.4 53 Random Awards 00% 00
The number of times a Merlin's Magic Random Award feature was collected.

B.4 54 Random Award Extra Balls Lit 00% 00
The number of times Light Extra Ball was given as a Random Award.

FEATURE AUDITS CONTINUED...

B.4 55 Video Mode Started 00% 00
The number of times the Video Mode feature was started.

B.4 56 Video Mode Extra Balls 00% 00
The number of Extra Balls awarded from the Video Mode feature.

B.4 57 Video Mode Completed 00% 00
The number of times the Video Mode feature was completed.

B.4 58 Smack-A-Troll Started 00% 00
The number of times the Smack-A-Troll feature was started

B.5 HISTOGRAMS

B.5	**01**	0 - .99 Million Scores	00%	00
B.5	**02**	1 - 1.99 Million Scores	00%	00
B.5	**03**	2 - 4.99 Million Scores	00%	00
B.5	**04**	5 - 9.99 Million Scores	00%	00
B.5	**05**	10 - 19.99 Million Scores	00%	00
B.5	**06**	20 - 29.99 Million Scores	00%	00
B.5	**07**	30 - 39.99 Million Scores	00%	00
B.5	**08**	40 - 49.99 Million Scores	00%	00
B.5	**09**	50 - 59.99 Million Scores	00%	00
B.5	**10**	60 - 69.99 Million Scores	00%	00
B.5	**11**	70 - 79.99 Million Scores	00%	00
B.5	**12**	80 - 89.99 Million Scores	00%	00
B.5	**13**	Over 90 Million Scores	00%	00
B.5	**14**	Game Time 0.0-1.0 Minute	00%	00
B.5	**15**	Game Time 1.0-1.5 Minutes	00%	00
B.5	**16**	Game Time 1.5-2.0 Minutes	00%	00
B.5	**17**	Game Time 2.0-2.5 Minutes	00%	00
B.5	**18**	Game Time 2.5-3.0 Minutes	00%	00
B.5	**19**	Game Time 3.0-3.5 Minutes	00%	00
B.5	**20**	Game Time 3.5-4.0 Minutes	00%	00
B.5	**21**	Game Time 4-5 Minutes	00%	00
B.5	**22**	Game Time 5-6 Minutes	00%	00
B.5	**23**	Game Time 6-8 Minutes	00%	00
B.5	**24**	Game Time 8-10 Minutes	00%	00
B.5	**25**	Game Time 10-15 Minutes	00%	00
B.5	**26**	Game Time Over 15 Minutes	00%	00

B.6 TIME-STAMPS

B.6	**01**	Current Time
B.6	**02**	Clock 1st Set
B.6	**03**	Clock Last Set
B.6	**04**	Audits Cleared
B.6	**05**	Coins Cleared
B.6	**06**	Factory Setting
B.6	**07**	Last Game Start
B.6	**08**	Last Replay
B.6	**09**	Last H.S.T.D. Reset
B.6	**10**	Champion Reset
B.6	**11**	Last Printout
B.6	**12**	Last Service Credit

Time-Stamps Menu allows you to view dates and times that are important to game software.

Press the Up or Down buttons to scroll through the Printouts menu. Press the Enter button to access a menu. Press the Escape button to return to the Printouts menu.

P. PRINTOUTS MENU

(An optional board is required to use the Printouts menu's features.)

P.1 Earnings Data
P.2 Main Audits
P.3 Standard Audits
P.4 Feature Audits
P.5 Score Histograms
P.6 Time Histograms
P.7 Time-Stamps
P.8 All Data

The Printouts Menu is a combination of the other menus. This menu allows you to access and print information in the available menu selections.

If no printer is attached the message "Waiting for Printer" appears in the displays. ***Note:*** *Set the print specification from the Adjustment Menu, A.5 Printer Adjustments.*

Press the Up or Down buttons to scroll through the Test menu. Press the Enter button to access a test. Press the Escape button to return to the Test menu. During any test, press the Start button to obtain the wire color, driver number, connector number and fuse location.

T. TEST MENU

T.1 Switch Edges Test
T.2 Switch Levels Test
T.3 Single Switch Test
T.4 Solenoid Test
T.5 Flasher Test
T.6 General Illumination Test
T.7 Sound & Music Test
T.8 Single Lamps Test
T.9 All Lamps Test
T.10 Lamps And Flasher Test
T.11 Display Test
T.12 Flipper Coil Test
T.13 Ordered Lamps Test
T.14 Lamp Row-Col.
T.15 DIP Switch Test
T.16 Loop/Gate Test
T.17 Tower Test
T.18 Drawbridge Test
T.19 Castle Gate Test
T.20 Trolls Test
T.21 Empty Balls Test

In order to operate the tests that use the +50V or +20V circuits, pull the top interlock switch button out. The interlock switches are located on a bracket just inside the coin door opening.

The switch matrix, on the left side of the display, shows the state of all switches. A dot indicates the switch is open, a square indicates the switch is closed. The numbers assigned to each switch indicate where the switch is located in the matrix. The number on the left indicates the column, the number on the right indicates the row. Example - Switch 23 is 2nd column, 3rd row.

A short to ground - on either the row or column wire - appears as a shorted row(s). However, a column wire shorted to ground disappears when all of the indicated row switches are open. A row wire shorted to ground does not disappear.

A shorted diode in the switch matrix can cause other switches to appear closed. These "phantom" switches (though not actually closed), complete a rectangle in the switch matrix. Therefore, if two switches in the same column are closed (example; #22 and #24), and a third switch is pressed in another column but in the same row as one of the first two (example; #32), the "phantom" switch #34 is falsely indicated as closed. The switch with the shorted diode is diagonally opposite the "phantom" switch (in this case #22).

T.1 SWITCH EDGES TEST

Press each of the switches one at a time. The name and number of the switch is shown in the display. If a switch other than the one pressed, or no switch at all is indicated, the system has detected a problem with the switch circuit. To return the Test menu, press the Escape button.

T.2 SWITCH LEVELS TEST

This test automatically cycles through all switches that are detected closed. The name and number of each switch that is detected is shown in the display. A filled square indicates the switch's position in the matrix. To return the Test menu, press the Escape button.

T.3 SINGLE SWITCHES TEST

This test isolates a single switch and shows its state in the display. A mechanical switch is 'made' when the display reads closed. An opto switch is 'made' (opto beam broken) when the display reads open. Use the Up or Down buttons to select the switch to be tested. To return the Test menu, press the Escape button.

T.4 SOLENOID TEST

The Solenoid test has three modes -- Repeat, Stop, and Run. Only one solenoid should pulse at a time. The system has detected a problem if more than one solenoid pulses, a solenoid comes on and stays on, or no solenoids pulse during the Repeat and Run modes.

Repeat: The Repeat mode pulses an individual solenoid. Press the Enter button to start this test. The name of the first solenoid shows in the display and the corresponding coil pulses. Press the Up or Down buttons to cycle through the solenoids, one at a time. The same solenoid pulses until you press the Up or Down buttons to advance to the next one. To return the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Stop: The Stop mode halts the Solenoid test. No solenoids should be active. To return the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Run: The Run mode cycles through the solenoids automatically. The display shows the name and number of the solenoid currently being pulsed. To return the Test menu, press the Escape button. To return to the Repeat mode, press the Enter button.

T.5 FLASHER TEST

This tests the flashlamp part of the solenoid circuit. There are three modes -- Repeat, Stop, and Run. During this test the flashlamp circuit named in the display should blink. The system has detected a problem if more than one flashlamp circuit blinks, the lamps stays on, or no lamps blink during the Repeat and Run modes.

Repeat: The Repeat mode pulses an individual flashlamp. Press the Enter button to start this test. The name and number of the first flashlamp is displayed and the corresponding bulb(s) blinks. The same bulb(s) blinks until you press the Up or Down buttons to advance to the next one. To return to the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Stop: The Stop mode halts the Flasher test. There should not be any flashlamps lit during this mode. To return to the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Run: The Run mode cycles through the flashlamps automatically. The display shows the name and number of the flashlamp circuit currently being pulsed as the corresponding bulb(s) flashes. To return to the Test menu, press the Escape button. To return to the Repeat mode, press the Enter button.

T.6 GENERAL ILLUMINATION TEST

This test checks all of the General Illumination circuits. There are two modes of operation -- Stop and Run.

Note: General Illumination strings four & five do not brighten or dim, they are always ON.

Stop: The Stop mode allows you to cycle through the General Illumination test manually. Press the Up or Down buttons to advance through the test. All illumination is tested first, followed by an individual circuit test. The circuit name and number shows in the display while the corresponding bulbs light. If any other results occur the system has detected an error. To return to the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

T.6 GENERAL ILLUMINATION TEST CONTINUED...

Run: The Run mode cycles through the General Illumination test automatically. For each circuit shown in the display the corresponding bulbs should light. If any other results occur, the system has detected a problem. To return to the Test menu, press the Escape button. To return to the Stop mode, press the Enter button.

T.7 SOUND AND MUSIC TEST

The Sound and Music test checks the audio circuits. This test has three modes for testing the sound and music circuits -- Run, Repeat, and Stop.

Run: The Run mode steps through a sequence of sounds and music. Press the Up or Down buttons to advance to a particular sound or tune. A sound or tune should be heard for each name and number that appears in the display. Any other results indicate the system has detected a problem. To return to the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Repeat: The Repeat mode causes the program to stop and repeat a particular sound/tune. The same sound repeats continuously until you press the Up or Down buttons to advance to the next one. Any other results indicates the system has detected a problem. To return to the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Stop: The Stop mode stops this test altogether. Nothing should be heard. Any other results indicate the system has detected a problem. To return to the Test menu, press the Escape button. To return to the Run mode, press the Enter button.

T.8 SINGLE LAMP TEST

The number assigned to each lamp indicates the lamp's position in the matrix. The number on the left indicates the column. The number on the right indicates the row. Example - Lamp 23 means 2nd column, 3rd row.

The Single Lamp test checks each lamp circuit individually. Press the Up or Down buttons to scroll through this test. A lamp should light for each name and number that is displayed. Any other results indicate the system has detected a problem. To return to the Test menu, press the Escape button.

T.9 ALL LAMPS TEST

This test causes all the controlled lamps to flash at the same time. Every controlled lamp should flash. Any other results indicate the system has detected a problem. To return to the Test menu, press the Escape button.

T.10 LAMP AND FLASHER TEST

This test causes all the flashlamps and the controlled lamps to flash at the same time. The controlled lamps blink, while the flashlamps cycle from highest to lowest. Any other results indicate the system has detected a problem. To return to the Test menu, press the Escape button.

T.11 DISPLAY TEST

This test automatically checks every dot in the Dot Matrix Display board. A series of patterns appear in sequence. Each pattern turns on and off a section of dots. Every dot on the matrix display should be turned on and off during this test. To return to the Test menu, press the Escape button.

T.12 FLIPPER COIL TEST

The Flipper Coil test has three modes -- Repeat, Stop, and Run. Only one flipper should pulse at a time. The system has detected a problem if more than one flipper pulses, a flipper comes on and stays on, or no flippers pulse during the Repeat and Run modes.

Repeat: The Repeat mode pulses an individual flipper. Press the Enter button to begin the test. Press the Up or Down buttons to cycle through the flipper coils one at a time. To return to the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Stop: The Stop mode halts the Flipper Coil test. No coils should pulse while the test is stopped. To return to the Test menu, press the Escape button. To advance to the next test mode, press the Enter button.

Run: The Run mode cycles through the flippers automatically. The display shows the name and number of the flipper coil currently being pulsed. To return to the Test menu, press the Escape button. To return to the Repeat mode, press the Enter button.

T.13 ORDERED LAMPS TEST

The number assigned to each lamp indicates the lamp's position in the matrix. The number on the left indicates the column. The number on the right indicates the row. Example - Lamp 23 means 2nd column, 3rd row.

This test checks each lamp circuit individually. Press the Up or Down buttons to cycle through the lamps. Lamps light in a clock-wise or counter clock-wise direction starting from the bottom of the playfield. The direction depends on whether the Up or Down button is pressed. For each name and number that is shown in the display, the corresponding lamp should light. Any other results indicate the system has detected a problem. To return to the Test menu, press the Escape button.

T.14 LAMP ROW - COLUMN

This test allows individual rows and columns in the lamp matrix to be operated. This is useful for troubleshooting wiring and driver problems.

Press the Up and Down buttons to cycles through the different rows and columns.

To return to the Test menu, press the Escape button.

T.15 DIP SWITCH TEST

This test is used to show the positions of the DIP switches on the CPU board (U27).

To return to the Test menu, press the Escape button.

T.16 LOOP/GATE TEST

This test is used to verify proper ball delivery from the shooter lane onto the playfield, and to exercise the four loop switches and the two control gates. This test has two modes of operation:

Loops Mode: This mode is used to verify that the ball is able to pass through the control gates and around either of the loops. This is useful for clearing "Left Gate Stuck Closed" and "Right Gate Stuck Closed" errors that may appear in the test report. If an error exists, one of them will be shown on the bottom line of the display.

To verify loop switch and control gate operation in "Loops Mode", press the Up or Down buttons until the message "Test Mode: Around Loops" appears on the second line of the display. Roll a ball around either of the loops (a ball may be ejected from the trough by

pressing the launch button). A sound is made as the ball passes over the loop switches, and the state of the loop switches is updated in the display. If the ball is traveling around the loop from left to right, the right control gate should open upon activation of the second left loop switch (L.HI). If the ball is traveling around the loop from right to left, the left control gate should open upon activation of the second right loop switch (R.HI). When the ball has finished its path around the loop (either from left to right, or from right to left), the test should report "TEST PASSED - PRESS ENTER" on the bottom line of the display. Any other result indicates a problem with either the loop switches, or the control gates, or both. To re-test, press the Enter button.

"Left Gate Stuck Closed" errors can be cleared in "Loops Mode" by repeatedly testing the right loop (the Enter button must be pressed at the end of each test). The test will clear this error when there have been two consecutive successful right loop tests in this mode.

"Right Gate Stuck Closed" errors can be cleared in "Loops Mode" by repeatedly testing the left loop (the Enter button must be pressed at the end of each test). The test clears this error when there have been two consecutive successful left loop tests in this mode.

Jets Mode: This mode is used to verify that the ball is able to pass into either of the loops and be diverted into the jets. This is useful for clearing "Left Gate Stuck Open" and "Right Gate Stuck Open" errors that may appear in the test report. If an error exists, one of them will be shown on the bottom line of the display.

To verify loop switch and control gate operation in "Jets Mode", press the Up or Down buttons until the message "Test Mode: To Jet Bumpers" appears on the second line of the display. Roll a ball into either of the loops (a ball may be ejected from the trough by pressing the launch button). A sound is made as the ball passes over the loop switches, and the state of the loop switches is updated in the display. If the ball is traveling to the jets from left to right, the right control gate should remain closed upon activation of either of the left loop switches (L.LO and L.HI). If the ball is traveling to the jets from right to left, the left control gate should remain closed upon activation of either of the right loop switches (R.LO and R.HI). When the ball has finished its path into the jets (either from the left, or from the right), and makes contact with one of the top lane switches, the test should report "TEST PASSED - PRESS ENTER" on the bottom line of the display. Any other result indicates a problem with either the loop switches, or the control gates, or both. To re-test, press the Enter button.

"Left Gate Stuck Open" errors can be cleared in "Jets Mode" by repeatedly testing the right loop (the Enter button must be pressed at the end of each test). The test will clear this error when there have been two consecutive successful right loop tests in this mode.

"Right Gate Stuck Open" errors can be cleared in "Jets Mode" by repeatedly testing the left loop (the Enter button must be pressed at the end of each test). The test will clear this error when there have been two consecutive successful left loop tests in this mode.

Ball delivery from the shooter lane can be verified by this test in either "Loops Mode" or "Jets Mode" by placing a ball into the shooter lane, and pressing the launch button. When in "Loops Mode", the ball should travel all the way around the loop, and be delivered cleanly to the left flipper. When in "Jets Mode", the ball should be delivered into the loop, through one of the top lane switches, and into the jet bumpers.

During this test, the diagnostic test buttons inside the coin door act as follows:
Escape: This button returns to the previous menu.
Down/Up: These buttons toggle the test mode between "Loops Mode" and "Jets Mode".
Enter: This button is used to clear the "TEST PASSED/TEST FAILED" messages.

T.17 TOWER TEST

This test is used to verify proper operation of the tower (right ramp). It exercises the ramp and tower switches, the tower diverter, and the tower lock (post) mechanism. This test has two modes of operation:

Ramp Mode: This mode is used to verify that the ball is able to pass up the right ramp and back down to the right flipper. This is useful for clearing "Tower Diverter Stuck Open" errors that may appear in the test report. If the error exists, it will be shown on the bottom line of the display.

To verify right ramp switch and tower diverter operation in "Ramp Mode", press the Up or Down buttons until the message "Test Mode: Right Ramp" appears on the second line of the display. The tower diverter should set itself to the UP position when this mode is entered. Roll a ball up the right ramp. A sound is made as the ball passes under the switches, and the state of the switches is updated in the display. The ball should trigger the right ramp entrance switch (R.EN), followed by the right ramp exit switch (R.EX), and the test should report "TEST PASSED - PRESS ENTER" on the bottom line of the display. Any other result indicates a problem with either the ramp switches, or the tower diverter, or both. To re-test, press the Enter button.

"Tower Diverter Stuck Open" errors can be cleared in "Ramp Mode" by repeatedly testing the ramp (the Enter button must be pressed at the end of each test). The test will clear this error when there have been two consecutive successful right ramp tests in this mode.

Tower Lock Mode: This mode is used to verify that the ball is able to pass up the right ramp and into the tower lock mechanism. This is useful for verifying proper tower lock post operation, as well as clearing any "Tower Diverter Stuck Closed" errors that may appear in the test report. If the error exists, it will be shown on the bottom line of the display.

To verify tower lock mechanism and tower diverter operation in "Tower Lock Mode", press the Up or Down button until the message "Test Mode: Tower Lock" appears on the second line of the display. The tower diverter should set itself to the DOWN position when this mode is entered. Roll a ball up the right ramp. A sound is made as the ball passes under/over the switches, and the state of the switches are updated in the display. The ball should trigger the right ramp entrance switch (R.EN), activate the tower lock post, travel up the ramp into the tower mechanism, trigger the tower exit switch (T.EX), and the test should report "TEST PASSED - PRESS ENTER" on the bottom line of the display. Any other result indicates a problem with the ramp switch, the tower exit switch, the diverter, or the tower lock post. To re-test, press the Enter button.

"Tower Diverter Stuck Closed" errors can be cleared in "Tower Mode" by repeatedly testing the ramp (the Enter button must be pressed at the end of each test). The test will clear this error when there have been two consecutive successful right ramp tests in this mode.

Note that if the game is left idle in "Tower Mode", the test will change its mode of operation to "Ramp Mode" after two minutes. This keeps the tower diverter coil from overheating during long periods of inactivity.

During this test, the diagnostic test buttons inside the coin door act as follows:
Escape: This button returns to the previous menu.
Down/Up: These buttons toggle the test mode between "Ramp Mode" and "Tower Mode".
Enter: This button is used to clear the "TEST PASSED/TEST FAILED" messages.

T.18 DRAWBRIDGE TEST

This test is used to verify proper operation of the drawbridge. It exercises the drawbridge motor, and the drawbridge position switches.

This test is an automatic test. Upon entry, this test will continually run the drawbridge up and down (with small pauses in between when a drawbridge up/down switch edge is detected) while the test is running. To stop the drawbridge motor from running during this test, press the Enter button. To re-start the drawbridge motor, press the Enter button again.

This test is useful for clearing "Drawbridge Down Switch Bad" and "Drawbridge Up Switch Bad" errors that may appear in the test report. If errors exist, they will be shown on the bottom line of the display. The error(s) are cleared when the drawbridge completes two consecutive successful operations to either open or close the drawbridge.

During this test, the diagnostic test buttons on the coin door act as follows:
Escape: This button returns to the previous menu.
Enter: This button toggles the state of the test from Running to Stopped, or from Stopped to Running.

T.19 CASTLE GATE TEST

This test is used to verify proper operation of the castle gate and the exploding castle. It exercises the moat entrance, castle gate, and castle lock switches, along with the castle gate and the exploding castle.

When this test is entered, the test attempts to lower the drawbridge in order to provide access to the castle gate. The test does this by activating the drawbridge motor and waiting for the drawbridge "down" switch to close. If the test is unable to position the drawbridge in this manner, the message "DRAWBRIDGE ERROR - SEE T.18" will be shown on the bottom line of the display. If this occurs, it will be necessary to repair the drawbridge (use T.18 to verify proper drawbridge operation after it is repaired). This test will not operate at all if it cannot position the drawbridge properly. This test has two modes of operation:

Castle Gate Mode: This mode is used to verify that the ball is able to strike the castle gate. This is useful for clearing "Castle Gate Stuck Open" errors that may appear in the test report. If the error exists, it will be shown on the bottom line of the display.

To verify castle gate operation in "Castle Gate Mode", press the Up or Down buttons until the message "Test Mode: At Castle Gate" appears on the second line of the display. The castle gate should set itself to the Down position when this mode is entered. Roll a ball at the castle gate. A sound is made as the ball passes through the switches, and the state of the switches is updated in the display. The ball should trigger the moat entrance switch (M.EN), followed by the castle gate switch (C.GT), followed by the moat entrance switch (M.EN) again, and the test should report "TEST PASSED - PRESS ENTER" on the bottom line of the display. Any other result indicates a problem with either the switches, or the castle gate, or both. To re-test, press the Enter button.

"Castle Gate Stuck Open" errors can be cleared in "Castle Gate Mode" by repeatedly testing the castle gate (the Enter button must be pressed at the end of each test). The test will clear this error when there have been two consecutive successful castle gate tests in this mode.

Castle Mode: This mode is used to verify that the ball is able to pass through the castle gate and into the castle lock area. This is useful for clearing any "Castle Gate Stuck Closed" errors that may appear in the test report. If the error exists, it will be shown on the bottom line of the display.

T.19 CASTLE GATE TEST CONTINUED...

To verify castle gate operation in "Castle Mode", press the Up or Down buttons until the message "Test Mode: Into Castle" appears on the second line of the display. The castle gate should set itself to the UP position when this mode is entered. Roll a ball into the castle. A sound is made as the ball passes through/over the switches, and the state of the switches are updated in the display. The ball should trigger the moat entrance switch (M.EN), followed by the castle gate switch (C.GT), followed by the castle lock switch (C.LK), and the test should report "TEST PASSED - PRESS ENTER" on the bottom line of the display. Any other result indicates a problem with the switches, the castle gate, or both. To re-test, press the Enter button.

"Castle Gate Stuck Closed" errors can be cleared in "Castle Mode" by repeatedly testing the castle gate (the Enter button must be pressed at the end of each test). The test will clear this error when there have been two consecutive successful castle gate tests in this mode.

Note that if the game is left idle in "Castle Mode", the test will change its mode of operation to "Castle Gate Mode" after two minutes. This keeps the castle gate coil from overheating during long periods of inactivity.

This test can also be used to exercise the exploding castle. To test the exploding castle, press the Enter button. The castle should shake three times, and then explode for approximately four seconds.

During this test, the diagnostic test buttons inside the coin door act as follows:
Escape: This button returns to the previous menu.
Down/Up: These buttons toggle the test mode between "Castle Gate Mode" and "Castle Mode".
Enter: This button is used to clear the "TEST PASSED/TEST FAILED" messages.
Enter: This button is used to test the exploding castle when "PASSED/FAILED" does not appear on the display.

T.20 TROLLS TEST

This test is used to verify proper operation of the trolls.

To test the left troll, press the Down button. The left troll should pop up out of the playfield, and the left troll Up switch should close (a sound is made for this, and the status of the left troll Up switch is shown in the display). Roll a ball at the left troll while he is raised. A sound is made for the switch closure, and the picture of the left troll in the display should quickly invert, then return to normal. To lower the left troll, press the Down button again.

"Left Troll Up Switch Bad" errors can be cleared by repeatedly testing the left troll. The test will clear this error when there have been two consecutive successful attempts at raising the left troll (note that the left troll Up switch must close when the troll is raised each time for this to happen).

To test the right troll, press the Up button. The right troll should pop up out of the playfield, and the right troll Up switch should close (a sound is made for this, and the status of the right troll Up switch is shown in the display). Roll a ball at the right troll while he is raised. A sound is made for the switch closure, and the picture of the right troll in the display should quickly invert, then return to normal. To lower the right troll, press the Up button again.

"Right Troll Up Switch Bad" errors can be cleared by repeatedly testing the right troll. The test will clear this error when there have been two consecutive successful attempts at raising the right troll (note that the right troll Up switch must close when the troll is raised each time for this to happen).

T.20 TROLLS TEST CONTINUED...

Note that if the game is left idle with either troll in the raised position, the test will lower the raised troll(s) after two minutes. This keeps the troll coils from overheating during long periods of inactivity.

During this test, the diagnostic test buttons on the coin door act as follows:
Escape: This button returns to the previous menu.
Down: This button raises and lowers the left troll.
Up: This button raises and lowers the right troll.

T.21 EMPTY BALLS TEST

This test kicks out all balls loaded in troughs, lockups, poppers, and kick-outs until no balls remain in those locations.

Note: *As the trough kicks out balls, they will stack up in the shooter groove, which may require manual clearing in order to allow further balls to be kicked out.*

To scroll through the Utilities menu, press the Up or Down buttons. To access a utility, press the Enter button. To see the setting choices of a utility option, press the Up and Down buttons. Press the Enter button to lock in a choice. If you make a mistake, press Escape while "Saving Adjustment Value" is in the display. The original setting is retained and the new setting is ignored. To return to the Utilities menu, press the Escape button.

U. UTILITIES MENU

U.1	**Clear Audits**	**U.7**	**Factory Adjustments**
U.2	**Clear Coins**	**U.8**	**Factory Reset**
U.3	**Reset H.S.T.D.**	**U.9**	**Preset**
U.4	**Set Time & Date**	**U.10**	**Clear Coins**
U.5	**Custom Message**	**U.11**	**Auto Burn-in**
U.6	**Set Game I.D.**		

U.1 CLEAR AUDITS

Press the Enter button to clear the Standard Audits (except Burn-in Time), Feature Audits, and Histograms.

U.2 CLEAR COINS

Press the Enter button to clear the Earnings Audits.

U.3 RESET H.S.T.D.

Press the Enter button to clear the High Score to Date Table and the Grand Champion.

U.4 SET TIME AND DATE

Press the Enter button to activate the time and date. Use the Up or Down buttons to change the value, then press the Enter button to lock in that value. If you make a mistake press the Escape button while "Saving Adjustment Value" is displayed. The new value is ignored and the original value is retained.

U.5 CUSTOM MESSAGE

Set A.1 20 to ON before trying to write a custom message.

Press the Enter button to begin entry of the custom message. Use the Up or Down buttons to cycle through letters. Use the Start button to cycle through punctuation marks. Press the Enter button to lock in the desired letter and punctuation. If you make a mistake, use Up and Down to select the "back-arrow" character. The "back-arrow" character is located before the space character and after the number nine. Press Enter while the back-arrow shows to erase the previously entered character. Once the message is complete, press and hold the Enter button until "Message Stored" is displayed.

Press the Escape button to cancel the new message. The message "Press Enter to Reset" appears. If Enter is pressed, the custom message is cleared and no message is displayed. If Escape is pressed, the original message remains intact.

U.6 SET GAME I.D.

This utility allows for the installation of a message, such as game location, that only appears on the printouts. Press the Enter button to activate Set Game I.D. Use the Up or Down buttons to cycle through letters. Use the Start button to cycle through punctuation marks. Press the Enter button to lock in desired letters and punctuation marks.

U.7 FACTORY ADJUSTMENT

Press the Enter button to restore the adjustments to factory settings.

U.8 FACTORY RESET

Press the Enter button to restore the adjustments to their factory setting, clear the Audits, H.S.T.D. Table, and Custom Message/Game I.D.

U.9 PRESETS

Use the Up or Down buttons to cycle through the available Presets. When the desired Preset is displayed, press the Enter button to lock in that Preset. If you make a mistake, press the Escape button while "Saving Adjustment Value" is displayed. The new value is ignored and the original value is retained.

Game Difficulty Levels *The game play difficulty adjustments can be changed to a combination that is MUCH LESS to MUCH MORE difficult than Factory Settings. The Game Difficulty Setting Table lists the adjustments and settings that comprise the individual group.*

U.9 01 INSTALL EXTRA EASY	MUCH LESS difficult than factory setting.
U.9 02 INSTALL EASY	Somewhat LESS difficult than factory setting.
U.9 03 INSTALL MEDIUM	Nearly the SAME as factory setting.
U.9 04 INSTALL HARD	Somewhat MORE difficult than factory setting.
U.9 05 INSTALL EXTRA HARD	MUCH MORE difficult than factory setting.

DIFFICULTY SETTING TABLE FOR U.S., CANADIAN, FRENCH, GERMAN, AND EUROPEAN GAMES

Adj. #	Adj. Description	Extra Easy U.9 01	Easy U.9 02	Medium U.9 03 (factory)	Hard U.9 04	Extra Hard U.9 05
A.2 01	Ball Saves	02	01	01	01	00
A.2 02	Ball Save Time	06	05	04	03	N/A
A.2 03	Extra Ball Percent	35%	30%	25%	20%	15%
A.2 05	Castle Difficulty	EASY	EASY	HARD	HARD	HARD
A.2 07	First Hard Lock	03	02	02	02	01
A.2 08	Castle Multiball Extra Ball Difficulty	EASY	EASY	MED.	HARD	HARD
A.2 11	Trolls! Difficulty	EASY	EASY	MED.	HARD	HARD
A.2 17	Battle Kingdom Start Difficulty	EASY	EASY	EASY	HARD	HARD

U.9 06 INSTALL 5 BALL
U.9 07 INSTALL 3 BALL

Adjustments U.9 06 and U.9 07 can be used to change a game to 3 or 5 ball play, including changing of certain features to the recommended 3-and 5-ball level. The Preset Game Adjustments Table for U.S./Canadian Games lists the adjustments and settings that comprise the individual groups.

PRESET ADJUSTMENTS TABLE FOR U.S. AND CANADIAN GAMES

Adj. #	Adj. Description	Install 5-ball U.9 06	Install 3-ball U.9 07
A.1 01	Balls Per Game	05	03
A.1 07	Replay Start	42,000,000	28,000,000
A.2 06	Castle Extra Ball	03	02
A.2 07	First Hard Lock	01	02

U.9 08 INSTALL ADD-A-BALL

This option deletes all Free Play awards and replaces them with Extra Ball awards. Individual adjustments are affected, as follows:

Adjust.	Name	New Settings
A.1 13	Replay Boost	Off
A.1 14	Replay Award	Extra Ball
A.1 15	Special Award	Extra Ball
A.1 17	Extra Ball Ticket	No
A.1 19	Match Feature	Off
A.4 04	Champion Credits	00
A.4 05	High Score 1 Credits	00
A.4 06	High Score 2 Credits	00
A.4 07	High Score 3 Credits	00
A.4 08	High Score 4 Credits	00
A.4 16	Castle Credits	00
A.4 18	Joust Credits	00
A.4 20	Catapult Credits	00
A.4 22	Peasant Credits	00
A.4 24	Damsel Credits	00
A.4 26	Troll Credits	00
A.4 28	Multiball Madness Credits	00
A.4 29	Battle Credits	00

U.9 09 INSTALL TICKET

This option deletes Credit awards and replaces them with Ticket awards. Individual adjustments are affected as follows:

Adjust.	Name	New Settings
A.1 14	Replay Award	Ticket
A.1 15	Special Award	Ticket
A.1 16	Match Award	Ticket
A.1 17	Extra Ball Ticket	Yes
A.1 31	Ticket Expansion Brd.	Yes
A.4 02	H.S.T.D. Award Ticket	Yes

U.9 10 INSTALL NOVELTY

This option removes all Free Play and Extra Ball awards. Individual adjustments are affected as follows:

Adjust.	Name	New Settings
A.1 04	Maximum Extra Ball	Off
A.1 05	Replay system	Fixed
A.1 09	Replay Level 1	Off
A.1 10	Replay Level 2	Off
A.1 11	Replay Level 3	Off
A.1 12	Replay Level 4	Off
A.1 15	Special Award	Points
A.1 19	Match Feature	Off
A.4 01	Highest Score	On
A.4 04	Champion Credit	00
A.4 05	High Score 1 Credits	00
A.4 06	High Score 2 Credits	00
A.4 07	High Score 3 Credits	00
A.4 08	High Score 4 Credits	00
A.4 16	Castle Credits	00
A.4 18	Joust Credits	00

U.9 10 INSTALL NOVELTY CONTINUED...

A.4 20	Catapult Credits	00
A.4 22	Peasant Credits	00
A.4 24	Damsel Credits	00
A.4 26	Troll Credits	00
A.4 28	Multiball Madness Credits	00
A.4 29	Battle Credits	00

U.9 11 NOT USED

U.9 12 SERIAL CAPTURE
This sets up the printer adjustments for a serial transmission to a laptop computer, (9600 baud, 40 column, no page breaks, serial printer). This option requires the installation of the optional printer kit; part number 63110.

U.9 13 TO U.9 16 NOT USED

U.9 17 INSTALL GERMAN 1
U.9 18 INSTALL GERMAN 2
U.9 19 INSTALL GERMAN 3
U.9 20 INSTALL GERMAN 4
U.9 21 INSTALL GERMAN 5
U.9 22 INSTALL GERMAN 6
Adjustments U.9 17 through U.9 22 are used to modify game pricing and type of play.

U.9 23 INSTALL FRENCH 1
U.9 24 INSTALL FRENCH 2
U.9 25 INSTALL FRENCH 3
U.9 26 INSTALL FRENCH 4
U.9 27 INSTALL FRENCH 5
U.9 28 INSTALL FRENCH 6
Adjustments U.9 23 through U.9 28 are used to modify game pricing and type of play.

U.10 CLEAR CREDITS
Press the Enter button to clear the game Credits.

U.11 AUTO BURN-IN
Press the Enter button to activate Auto Burn-in. This utility automatically cycles through several tests. This helps in finding intermittent problems. The tests that Auto Burn-in cycles through are: the Display Test, the Sound and Music Test, the All Lamps Test, the Solenoid Test, the Flashers Test, the General Illumination Test, and the Flipper Coil Test. All of the tests run concurrently. The time spent on the burn-in cycle and the total time the game has spent in burn-in are displayed.

Press the Up or Down buttons to scroll through the Adjustments menu. To access an adjustment menu option, press the Enter button. To see the setting choices for that option press the Up and Down buttons. To lock in a setting choice, press the Enter button. If you make a mistake, press the Escape button while "Saving Adjustment Value" is in the display. The original value is retained and the new value is ignored. Press the Escape button to return to the Adjustment menu.

A. ADJUSTMENTS MENU

A.1 Standard Adjustments
A.2 Feature Adjustments
A.3 Pricing Adjustments
A.4 H.S.T.D Adjustments
A.5 Printer Adjustments (optional board required)

A.1 STANDARD ADJUSTMENTS

A.1 01 BALLS PER GAME
A "game" is defined by specifying the number of balls to be played.

Settings: 1 to 10

Factory Default: 3

A.1 02 TILT WARNINGS
The number of total actuation's of the plumb bob that can occur before the game is "tilted".

Settings: 1 to 10

Factory Default: 3

A.1 03 MAXIMUM EXTRA BALLS COUNT
The number of extra balls that a player may accumulate.

Settings: 0 to 10
NO EXTRA BALL - No extra balls may be accumulated.

Factory Default: 4

A.1 04 MAXIMUM EXTRA BALLS PER BALL IN PLAY
The number of extra balls to be awarded per ball in play.

Settings: OFF - No maximum number of extra balls per ball in play.
1 to 10 - 1 through 10 extra balls per ball in play.

Factory Default: OFF

A.1 05 REPLAY SYSTEM
The type of replay system to be used.

Settings: FIXED - Replay value is set and does not change during game play.
AUTO % - Replay starting value is set but changes every 50 games to comply with the percentage of replays desired.
OFF - Disable the replay system. No replays are awarded.

Factory Default: AUTO %

A.1 06 REPLAY PERCENT

The percentage of replays the players are able to earn when Auto Replay is used.

Settings: 5% to 50%

Factory Default: 10%

A.1 07 REPLAY START

Replay Start value when Auto % Replay is used.

Settings: 5,000,000 to 105,000,000

Factory Default: 24,000,000

A.1 08 REPLAY LEVELS

The number of replay levels used by the Auto % Replay mode. When two replay levels are chosen, the second replay level is automatically adjusted to twice the starting replay level. When three of four replay levels are chosen, their values are automatically adjusted to three or four times the starting replay level.

Settings: 1 to 4

Factory Default: 1

A.1 09 REPLAY LEVEL 1
A.1 10 REPLAY LEVEL 2
A.1 11 REPLAY LEVEL 3
A.1 12 REPLAY LEVEL 4

The value to be used for the 1st through 4th Fixed Replay.

Settings: 00 to 105,000,000.

A.1 13 REPLAY BOOST

The replay score can be temporarily boosted by the selected amount EACH time the player reaches or exceeds the replay score. This temporary boost is canceled when credits equal 0; the player inserts another coin, or when Begin Test is pressed.

Settings: AUTO - The Replay Boost value is half of the current Replay value.
ON - Score is boosted between 2,000,000 and 20,000,000 points.
OFF - Replay score is not boosted.

Factory Default: AUTO

A.1 14 REPLAY AWARD

The form of award automatically provided when the player exceeds any replay level for either Auto % Replay or Fixed Replay.

Settings: CREDIT - Reaching each replay level awards credit.
TICKET - Reaching each replay level awards a ticket.
BALL - Reaching each replay level awards an extra ball.
AUDIT - Reaching each replay level awards nothing to the player; it does increase the entry value of the audit item(s) maintaining a tally of these awards.

Factory Default: CREDIT

A.1 15 NOT USED

A.1 16 MATCH AWARD
The award automatically provided when the players win a match.

Settings: CREDIT - Winning a match awards a credit.
TICKET - Winning a match awards a ticket.

Factory Default: CREDIT

A.1 17 EXTRA BALL TICKET
A ticket is awarded when the player earns an extra ball.

Settings: YES - The player is awarded a ticket in addition to an extra ball.
NO - The player is not awarded a ticket.

Factory Default: NO

A.1 18 MAXIMUM TICKET/PLAYER
The amount of tickets each player can earn.

Settings: 00 to 100.

Factory Default: 25

A.1 19 MATCH FEATURE
This is the desired percentage for the Match Feature occurring at the end of the game.

Settings: OFF - Match Feature is not available.
1 to 50% - 1% is 'hard'; 50% is 'extremely easy'. The Match Feature selects random points score value at the end of the game and compares each player's score for an identical match. A match of an entire score value results in an award of a Credit or a Ticket.

Factory Default: 7%

A.1 20 CUSTOM MESSAGE
The message displayed during the Attract mode.

Settings: ON - A message is displayed
OFF - A message is not displayed.

Factory Default: ON

A.1 21 LANGUAGE
The language the game uses.

Settings: ENGLISH, FRENCH, OR GERMAN

Factory Default: ENGLISH

A.1 22 CLOCK STYLE
The style of clock the game uses.

Settings: A.M./P.M. or 24 hours.

Factory Default: A.M./P.M.

A.1 23 DATE STYLE

The style of dates the game uses.

Settings: MONTH/DATE/YEAR OR DATE/MONTH/YEAR

Factory Default: MONTH/DATE/YEAR

A.1 24 SHOW DATE AND TIME

The date and time show in the Attract mode.

Settings: YES - Show the date, time in status report or in the Attract mode.
NO - Do not show date, time in status report or in the Attract mode.

Factory Default: NO

A.1 25 ALLOW DIM ILLUMINATION

The game program dims the general illumination for special effects and during the Attract mode.

Settings: YES - Dim the general illumination during the Attract mode.
NO - Do not dim the general illumination.

Factory Default: YES

A.1 26 TOURNAMENT PLAY

Equalize random game features and global score values during multi-player games.

Settings: YES - Equalize random game features and global score values.
NO - Do not equalize random game features and global score values.

Factory Default: NO

A.1 27 EUROPEAN SCORE FORMAT

Use either commas or dots between digits when numbers are displayed.

Settings: YES - Dots instead of commas, (example- 1.000.000).
NO - Commas instead of dots, (example- 1, 000, 000).

Factory Default: NO

A.1 28 MINIMUM VOLUME OVERRIDE

The volume can be turned off.

Settings: YES - Volume can be turned off.
NO - Volume can be turned down but not off.

Factory Default: NO

A.1 29 GENERAL ILLUMINATION POWER SAVER

This allows the general illumination and controlled lamps to be dimmed following a time interval after a game is played. Power Saver Level (A.1 30) determines dimness of the lamps. Using this feature substantially increases the life of the lamps.

Settings: OFF, 2 to 60 minutes.

Factory Default: 15 minutes

A.1 30 POWER SAVER LEVEL

When General Illumination Power Saver (A.1 29) is set for 2 to 60 minutes, the Power Saver Level controls the intensity of the general illumination and controlled lamps after the game has been idle for the specified period of time.

Settings: 4 to 7 (4 = dimmest, 7 = brightest)

Factory Default: 5

A.1 31 TICKET EXPANSION BOARD

When a Ticket Expansion board is connected, full control of the ticket dispenser is available. This includes a ticket low/error lamp, resume on ticket jam switch and manual ticket dispense switch.

Settings: YES - Ticket Expansion board is connected.
NO - Ticket Expansion board is NOT installed in the game.

Factory Default: NO

A.1 32 NO BONUS FLIPS

The activation of flippers during the end of ball "bonus" sequence. Setting to "YES" may extend the life of the flipper mechanisms.

Settings: YES, NO

Factory Default: YES

A.1 33 GAME RESTART

When you press the Start button during or after the 2nd ball, the game in progress ends and a new game begins. This adjustment has three settings to determine how to handle this.

Settings: NEVER - Do not allow a new game start until the current game is over.
SLOW - Restart if the Start button is pressed continuously for over 1/2 second. This helps to prevent the unintended restart of the game in progress.
INSTANTLY - Restart as soon as the Start button is pressed.

When you press the Start button during game over, or during the 1st ball (to add a player), it is always handled instantly.

Factory Default: SLOW

A.2 FEATURE ADJUSTMENTS

A.2 01 BALL SAVES

This adjustment determines the number of "full" Ball Saves that each player receives in a game. A ball that is "saved" will be returned to play without a change in the player up number or the ball in play number. A "full" Ball Save is "used" if a ball drains after it is launched into play within the amount of time specified in A.2 02 (Ball Save Time). Once all "full" Ball Saves are used, balls will no longer be returned to play should they drain quickly after being launched into play.

Settings: OFF - Balls will not be saved.
01 to 05 "full" Ball Saves given to each player per game.

A.2 02 BALL SAVE TIME

This adjustment determines the number of seconds in which a ball may drain after being launched into play, such that it will be returned to play without a change in the player up number or the ball in play number.

Settings: 03 to 15 seconds

A.2 03 EXTRA BALL PERCENTAGE

This adjustment determines the total percentage of Extra Balls desired (for all Extra Balls awarded from all features except Replay Score levels). The game will adjust the percentage of the Merlin's Magic "Light Extra Ball" Random Award to achieve the requested level (the percentage for this Random Award normally runs between 1% and 10%). When this adjustment is set to FIXED, no automatic percentaging will be done for the Merlin's Magic "Light Extra Ball" Award; it will operate with a FIXED percentage of 5%.

Settings: FIXED - Do not percentage the Merlin's Magic "Light Extra Ball" Award.
15% to 40% - Percentage the Merlin's Magic "Light Extra Ball" Award to achieve this percentage.

A.2 04 STARTING CASTLE

This adjustment is used to set the Baron with whom the first Castle Attack will occur. The Baron is set for all players at the start of a new game, and randomized by the left and right slingshots.

Settings: RANDOM - Start the first Castle Attack with a random Baron.
FRANCOIS D'GRIMM - Start the first Castle Attack with Francois D'Grimm.
HOWARD HURTZ - Start the first Castle Attack with Lord Howard Hurtz.
DUKE OF BOURBON - Start the first Castle Attack with the Duke Of Bourbon.
SIR PSYCHO - Start the first Castle Attack with Sir Psycho.
EARL OF EGO - Start the first Castle Attack with the Earl Of Ego.

A.2 05 CASTLE DIFFICULTY

This adjustment specifies the difficulty level for destroying a Castle. The adjustment affects the number of times the Castle Gate must be hit before the gate opens to allow a Castle to be destroyed.

Settings: EASY: The First Castle requires 1 hit on the Gate before the Gate will open for the Castle to be destroyed. Subsequent Castles require an additional hit each. The progression is; First Castle - 1 Gate Hit, Second Castle - 2 Gate Hits, Third Castle - 3 Gate Hits, etc.
HARD: The First Castle requires 2 hits on the Gate before the Gate will open for the Castle to be destroyed. Subsequent Castles require an additional hit each. The progression is; First Castle - 2 Gate Hits, Second Castle - 3 Gate Hits, Third Castle - 4 Gate Hits, etc.

A.2 06 CASTLE EXTRA BALL

This adjustment specifies the number of castles that need to be destroyed to light an Extra Ball.

Settings: NO EXTRA BALL - Do not light an Extra Ball after destroying a castle.
01 to 05 - Light an Extra Ball after destroying this many castles.

A.2 07 FIRST HARD LOCK

This adjustment affects the difficulty of earning Castle Multiball. An "easy" lock does not require the player to light any locks before locking balls for Castle Multiball; all of the locks are lit for them. A "hard" lock requires the player to light a lock by making a shot to the Castle Lock before they can lock a ball for Castle Multiball. This adjustment specifies the first Castle Multiball in which the player must light locks before locking balls for Castle Multiball. The lower this number is, the harder it is to achieve Castle Multiball.

Settings: 01-03: The first Castle Multiball in which the player must light locks.

A.2 08 CASTLE MULTIBALL EXTRA BALL DIFFICULTY

This adjustment specifies the difficulty with which the Castle Multiball Extra Ball is lit. Note that only ONE Castle Multiball Extra Ball can be lit PER Castle Multiball.

Settings: NO EXTRA BALL - Do NOT light the Castle Multiball Extra Ball.
EASY - The Extra Ball will light when the first Super Jackpot is collected.
MEDIUM - The Extra Ball will light when the first Super Jackpot is collected. Once this Extra Ball has been lit, subsequent Extra Balls will light when ALL of the Super Jackpots have been collected.
HARD - The Extra Ball will light when ALL of the Super Jackpots have been collected.

A.2 09 TROLL TARGET MEMORY

This adjustment determines whether or not scored Troll Targets remain in memory from ball to ball.

Settings: YES - Scored Troll Targets remain in memory from ball to ball.
NO - Scored Troll Targets reset at the start of a new ball.

A.2 10 TROLL TARGET COUNT

This adjustment determines the number of times the Troll Targets need to be hit before they will light the Troll Feature.

Settings: 06 to 10 - The number of Troll Targets needed to light the Troll Feature.

A.2 11 TROLL DIFFICULTY

This adjustment specifies the difficulty level of the Troll Feature. It directly affects the number of times each Troll needs to be hit during the Feature to complete the Feature.

Settings: EASY: Each Troll requires two (2) hits for completion of the feature.
MEDIUM: Each Troll requires three (3) hits for completion of the feature.
HARD: Each Troll requires four (4) hits for completion of the feature.

A.2 12 TROLL TIMER

This adjustment specifies the number of seconds the player is given to complete the Troll Feature.

Settings: 20-40: The number of seconds in which the Troll Feature must be completed.

A.2 13 HURRY UP EXTRA BALL 1

This adjustment specifies the number of times the Hurry-up Feature must be collected before lighting the first Extra Ball from this Feature.

Settings: NO EXTRA BALL - Do NOT light the first Hurry-up Extra Ball
1 to 15 - Light the first Extra Ball after this many Hurry-up Awards have been collected.

A.2 14 HURRY UP EXTRA BALL 2

This adjustment specifies the number of times the Hurry-up Feature must be collected before lighting the second Extra Ball from this Feature.

Settings: NO EXTRA BALL - Do NOT light the second Hurry-up Extra Ball.
30 to 50 - Light the second Extra Ball after this many Hurry-up Awards have been collected.

A.2 15 ROYAL MADNESS BALL SAVE

This adjustment specifies whether or not the Ball Save feature is activated at the start of the Royal Madness feature.

Settings: YES - Activate the ball saver for 5 seconds at the start of the Royal Madness feature.
NO - Do NOT activate the ball saver.

A.2 16 MAXIMUM ROYAL MADNESS EXTRA BALLS

This adjustment specifies the maximum number of Extra Balls that will be awarded to each player for completing the Royal Madness Feature.

Settings: NO EXTRA BALL: Do NOT award an Extra Ball for completing Royal Madness.
01-10: Award no more than this many Extra Balls to a player for completing Royal Madness this many times (subsequent completions will award additional points instead).
UNLIMITED: Each time a player completes Royal Madness, award an Extra Ball.

A.2 17 BATTLE FOR THE KINGDOM START DIFFICULTY

This adjustment specifies the difficulty in which the Battle For The Kingdom Feature is lit.

Settings: EASY: The player must earn: 1 Set of Castles, 3 Joust Victories, 3 Catapult Slams, 3 Peasant Revolts, 3 Damsels Saved, 10 Trolls Destroyed.
HARD: The player must earn: 1 Set of Castles, 5 Joust Victories, 5 Catapult Slams, 5 Peasant Revolts, 5 Damsels Saved, 20 Trolls Destroyed.

A.2 18 LANE VIDEO 1

This adjustment specifies the number of times the bottom lanes must be completed to light the first Video Mode, awarded from Merlin's Magic at the Right Eject.

Settings: 5 - 15: Light the first video mode with this many bottom lane completions.

A.2 19 LANE VIDEO 2

This adjustment specifies the number of times the bottom lanes must be completed to light the second Video Mode, awarded from Merlin's Magic at the Right Eject.

Settings: 30 - 50: Light the second video mode with this many bottom lane completions.

A.2 20 VIDEO EXTRA BALL

This adjustment specifies whether or not an Extra Ball is available from the Video Mode.

Settings: YES - An Extra Ball is available from the Video Mode.
NO - Video Mode should NOT give out an Extra Ball.

A.2 21 PLAYER TOURNAMENT MODE

This adjustment allows players to simulate the Tournament Mode setting in the game (see A.1 26 for a description of Tournament Mode). If this adjustment is set to YES, and there are credits posted on the game, Tournament Mode may be enabled for the next game start. To do this, hold in both flipper buttons for approximately two seconds and pressing the Start button while the "Tournament Mode Ready" message is shown on the dot-matrix display.

Settings; YES - Allow player-selectable Tournament Mode.
NO - Do NOT allow player-selectable Tournament Mode.

A.2 22 FAMILY MODE

This adjustment allows the game to operate in "Family Mode". Any possibly offensive or objectionable dot matrix images and sounds will not be utilized.

Settings: YES - Do NOT utilize any possibly offensive or objectionable dot matrix images and sounds.
NO - Utilize all dot matrix images and sounds.

A.2 23 ATTRACT MODE MUSIC

This adjustment is used to allow the playing of music in Attract Mode.

Settings: YES - Allow music to be played in Attract Mode.
NO - Do NOT allow music to be played in Attract Mode.

A.2 24 ATTRACT MODE SOUNDS

This adjustment is used to allow the playing of sound effects in Attract Mode.

Settings: YES - Allow sounds effects to be played in Attract Mode.
NO - Do NOT allow sound effects to be played in Attract Mode.

A.2 25 TIMED PLUNGER

This adjustment specifies the number of seconds before automatically plunging a ball onto the playfield that can otherwise be plunged by the player via the launch button.

Settings: OFF - Never automatically plunge a ball onto the playfield that can otherwise be plunged by the player via the launch button.
30-90 - The number of seconds before the game automatically plunges the ball onto the playfield.

A.2 26 FLIPPER PLUNGER

When this adjustment is set to YES, the right flipper will cause a ball sitting in the shooter lane to be launched onto the playfield. This adjustment is provided for use when the launch button is broken and/or intermittent. The game will automatically detect a broken launch button, but it may take several games to perform the detection. In this case, set this adjustment to YES until the launch button can be repaired.

Settings: YES - Allow the right flipper to launch a ball sitting in the shooter lane.
NO - Do NOT allow the right flipper to launch a ball sitting in the shooter lane.

A.2 27 DISABLE LEFT GATE

This adjustment is provided for use when the Left Gate is broken and/or intermittent. The game will automatically detect a broken Left Gate, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Left Gate can be repaired.

Settings: NO - Do NOT disable the Left Gate.
YES - Disable the Left Gate.

A.2 28 DISABLE RIGHT GATE

This adjustment is provided for use when the Right Gate is broken and/or intermittent. The game will automatically detect a broken Right Gate, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Right Gate can be repaired.

Settings: NO - Do NOT disable the Right Gate.
YES - Disable the Right Gate.

A.2 29 DISABLE TOWER DIVERTER

This adjustment is provided for use when the Tower Diverter (on the Right Ramp) is broken and/or intermittent. The game will automatically detect a broken Tower Diverter, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Tower Diverter can be repaired.

Settings: NO - Do NOT disable the Tower Diverter.
YES - Disable the Tower Diverter.

A.2 30 DISABLE TOWER LOCK POST

This adjustment is provided for use when the Tower Lock Post is broken and/or intermittent. The game will automatically detect a broken Tower Lock Post, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Tower Lock Post can be repaired.

Settings: NO - Do NOT disable the Tower Lock Post.
YES - Disable the Tower Lock Post.

A.2 31 DISABLE DRAWBRIDGE

This adjustment is provided for use when the Drawbridge is broken and/or intermittent. The game will automatically detect a broken Drawbridge, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Drawbridge can be repaired.

If it is necessary to set this adjustment to YES, and the motor is operable, use T.18 (Drawbridge Test) to move the Drawbridge to either its UP or its DOWN position. This will minimize possible damage to the top of the unit during game play, and allow for maximum game-play software compensation.

Settings: NO - Do NOT disable the Drawbridge.
YES - Disable the Drawbridge.

A.2 32 DISABLE CASTLE GATE

This adjustment is provided for use when the Castle Gate is broken and/or intermittent. The game will automatically detect a broken Castle Gate, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Castle Gate can be repaired.

Settings: NO - Do NOT disable the Castle Gate.
YES - Disable the Castle Gate.

A.2 33 DISABLE CASTLE

This adjustment is provided for use when the Castle is broken. In this case, set this adjustment to YES until the Castle can be repaired.

Settings: NO - Do NOT disable the Castle.
YES - Disable the Castle.

A.2 34 DISABLE LEFT TROLL

This adjustment is provided for use when the Left Troll is broken and/or intermittent. The game will automatically detect a broken Left Troll, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Left Troll can be repaired.

Settings: NO - Do NOT disable the Left Troll.
YES - Disable the Left Troll.

A.2 35 DISABLE RIGHT TROLL

This adjustment is provided for use when the Right Troll is broken and/or intermittent. The game will automatically detect a broken Right Troll, but it may take several games to perform the detection. In this case, set this adjustment to YES until the Right Troll can be repaired.

Settings: NO - Do NOT disable the Right Troll.
YES - Disable the Right Troll.

A. 3 PRICING ADJUSTMENTS

A.3 01 GAME PRICING (If set to custom, then 02 to 09 are available).
The cost of a game is selected here from the Standard Pricing Table or by using the custom pricing editor (A.3 27).

A.3 02 to A.2 09 NOT USED

A.3 10 COIN DOOR TYPE (If set to custom, then 11 to 15, 20 and 25 are available).
This adjustment is used to preset adjustments 11 through 15, 20 and 25, based on standard coin doors.

A.3 11 COLLECTION TEXT
The coin system is used to display the Earning Audits.

A.3 12 LEFT SLOT VALUE
A.3 13 CENTER SLOT VALUE
A.3 14 RIGHT SLOT VALUE
A.3 15 4TH SLOT VALUE
These are the values for the coins for these respective coin slots. These values are used for determining collection totals. The corresponding adjustments A.3 28 (Left Slot Credit Value) through A.3 31 (4th Slot Credit Value) typically contain the same values and are used to determine the number of credits awarded for the coin slot. Whenever these values are changed, the new value is copied to the corresponding A.3 28 through A.3 31 adjustment. If a bonus is desired for a particular coin (such as three credits for dollar coin), then the corresponding A.3 28 through A.3 31 "Credit Value" adjustment should be modified to award the bonus. See "Bonus for Special Coin" section for more information.

A.3 16 MAXIMUM CREDITS
The maximum number of credits the game can accumulate, either through game plays awards or coin purchases. The range of this setting is 5 through 99. Reaching the specified setting prevents the award of any credits. Factory default is 10.

A.3 17 FREE PLAY
A player can operate the game without a coin (free play), or with a coin.

NO - A coin is necessary for game play.
YES - Game play is free; no coin required.

A.3 18 HIDE COIN AUDITS
The coin audits may, or may not, be displayed.

YES - The coin audits are not displayed.
NO - The coin audits are displayed.
HIDE NAMES - The coin audit value is shown but not the audit name.

A.3 19 NOT USED

A.3 20 BASE COIN SIZE
This is the smallest unit of coin that may be used when creating a custom pricing mode using the Pricing Editor (A.3 27). For example, in the USA this is typically $0.25. All pricing levels are then specified in 25 cents (or greater) increments.

A.3 21 COIN METER UNITS

The adjustment determines the value of each coin unit on the coin meter. For example, to show the total amount of money collected as total quarters, set the adjustment to 0.25. To show the total amount of money collected as "total dollars", set this adjustment to 1.00. Setting this adjustment to anything other than OFF establishes the coin unit for the meter installed on the Coin Door Interface board. ***Note:*** *All WPC-95 games are cable ready to operate a coin meter mounted to the Coin Door Interface board. Boards without a meter can use the parts listed below to take advantage of the coin meter feature. The coin meter and spacer may be purchased from your distributor.* coin meter +6V p/n 20-9302-3; spacer p/n 20-9914

A.3 22 DOLLAR BILL SLOT

The system normally requires 150 microseconds between coin pulses. This is too long a delay for a fast-pulsing dollar bill validator. This adjustment may be used to tell the game that there is a fast-pulsing dollar bill validator connected to one of the coin switches.

NONE	=	No validator connected.
LEFT	=	Validator connected to left slot.
CENTER	=	Validator connected to center slot.
RIGHT	=	Validator connected to right slot
FOURTH	=	Validator connected to fourth.

A.3 23 MINIMUM COIN MILLISECONDS

This is the minimum width required for coin pulses to be accepted as valid coins. This may be changed to prevent certain kinds of cheating.

A.3 24 NOT USED

A.3 25 ALLOW HUNDREDTHS

This is used for a custom door specifier. If set to YES, then the values for A.3 12-15 are specified in units and hundredths (such as dollars and quarters). If set to NO, then all values are in units (such as Francs and Lire.)

A.3 26 CREDIT FRACTION

This determines the smallest fraction used for credits. It must be even to accommodate the extra ball buy-in option of 1/2 credit, and is typically 1/2 but may need to be a different value for modes requiring more coins per credit.

A.3 27 PRICING EDITOR

This function is now used to enter information for a custom pricing mode. The adjustment A.3 26 (Credit Fraction) may need to be set before entering the custom pricing editor. This specifies the smallest fraction available for partial credits.

Because of availability of an extra ball (buy-in) for 1/2 credit, this value is always even (1/2, 1/4, 1/6etc.). The typical setting for A.3 26 is 1/2 (such that there are only full credits and half credits) but you may need to used a different value for other pricing modes.

Please note that formerly, the coin values specified by custom coin doors adjustments A.3 12-15 only affected audit totals that showed collection totals. In the 10/94 pricing system, these coin values are added up for each coin received and credits are awarded based on pricing levels being reached. The pricing editor described here allows you to set these levels, however it may be necessary for you to set A.3 10 (Coin Door Type) to CUSTOM and then change A.3 11-15, 20 and 25 to reflect the value of the coins being used. This is usually NOT NECESSARY, but must be done BEFORE using the custom pricing editor when it is necessary.
Begin the custom pricing function by pressing the Enter button while A.3 27 Pricing Editor is showing in the display.

The pricing editor will now show the data for the currently selected pricing mode. If this is the 1st use of the pricing editor then this will show the last built-in pricing that was selected. Otherwise it will be the last custom mode created by this function. (Note that A.3 01 will display Custom any time a non-standard pricing has been selected.)

Assuming the last mode installed was 1/$0.50, 2/$0.75, 3/$1.00 the display appears as follows:

CUSTOM PRICING EDITOR		
1)	$0.25	1/2 cred.
2)	$0.50	1 cred.
3)	$0.75	2 cred.
4)	$1.00	3 cred.

DISPLAY VIEW

The $0.25 field will be flashing. You may now use the test mode buttons to perform the following functions:

Escape: Undo any changes to the current field and move to the previous field.
"-" (Down): Make the current field lower.
"+" (Up): Make the current field higher.
Enter: Save any changes to the current field and move to the next field. Note that there are 2 columns of fields. Price levels are in the left column and credit levels are in the right column. Pressing Enter will move from left column to right column before moving to the next line.
Start: Save the current price mode or start over

By using the above functions, you simply enumerate each pricing level and the number of credits that should be awarded at that level. Please note that you must specify each fractional level in sequence.

Example: 1/$0.50 2/$1.00 4/$1.50 6/$2.00

1)$0.25	1/2 cred.
2)$0.50	1 cred.
3)$0.75	1 1/2 cred.
4)$1.00	2 cred.
5)$1.25	2 1/2 cred.
6)$1.50	4 cred.
7)$1.75	4 1/2 cred
8)$2.00	6 cred.

Also note that once the value of the coins repeat that no further specification is necessary.

Example: 1/$0.50 2/$1.00

1) $0.25 1/2 cred.

In the above example, only one line needs to be specified, indicating that 1/2 credit is awarded for each $0.25 received.

Special Features:
There are some special features available by pressing the Down button while in the left column. The following words will be displayed instead of a pricing level:

End	*Repeat 5*	*Repeat 13*
Delete	*Repeat 6*	*Repeat 14*
Insert	*Repeat 7*	*Repeat 15*
Clear	*Repeat 8*	*Repeat 16*
Repeat 1	*Repeat 9*	*Repeat 17*
Repeat 2	*Repeat 10*	*Repeat 18*
Repeat 3	*Repeat 11*	*Repeat 19*
Repeat 4	*Repeat 12*	*Repeat 20*

Pressing Enter with the above words selected will activate the following instructions:

End; This is the same as pressing the Start button. A menu of choices will be provided (see Start Button later in this section).

Delete; This deletes the current level from the pricing mode.

Insert; This inserts a new pricing level ABOVE the current level. The current level will be unaffected. There must be room for at least one coin between the current level and the previous level, and at least one fractional credit unit between the current level and the previous level.

Example: Inserting a new pricing level.

CUSTOM PRICING EDITOR		
1)	$0.50	1 cred.
2)	$1.00	2 cred.
3)	$1.50	4 cred.
4)	$2.00	6 cred

DISPLAY VIEW

Use the Enter button to move to the $1.50 field. Now press the Down button once to create the following display:

CUSTOM PRICING EDITOR		
1)	$0.50	1 cred.
2)	$1.00	2 cred.
3)	INSERT	4 cred.
4)	$2.00	6 cred

DISPLAY VIEW

Now press the Enter button. The display will now show:

CUSTOM PRICING EDITOR		
1)	$0.50	1 cred.
2)	$1.00	2 cred.
3)	$1.25	2 1/2 cred.
4)	$1.50	4 cred

DISPLAY VIEW

Note that the line "5) $2.00 6 cred." No longer fits on the display. Whenever there are more than four pricing levels that the display will scroll up and down as Enter and Escape are used to move from field to field. If you repeatedly press Enter the display will then show:

CUSTOM PRICING EDITOR		
2)	$1.00	2 cred.
3)	$1.25	2 1/2 cred.
4)	$1.50	4 cred.
5)	$2.00	6 cred

DISPLAY VIEW

Clear; This clears out the current entries to allow a new pricing mode to be entered.

Repeat (1-20); This causes all of the entries above the current line to be repeated the number of times specified. This is only available when there are no pricing levels below the current line.

Example: 1/$0.50 2/$1.00 15/$5.00

Use the "Edit New Pricing Mode" feature described below to clear out the current levels. Use the Up and Enter buttons to specify 1/2 credit for $0.25:

CUSTOM PRICING EDITOR		
1)	$0.25	1/2 cred.

DISPLAY VIEW

Now, use the Up button until the display shows "Repeat 20". The display looks like this:

CUSTOM PRICING EDITOR		
1)	$0.50	1 cred.
2)	REPEAT 20	

DISPLAY VIEW

Press the Enter button and the display will show the following:

CUSTOM PRICING EDITOR		
1)	$0.25	1/2 cred.
2)	$0.50	1 cred.
3)	$0.75	1 1/2 cred.
4)	$1.00	2 cred

DISPLAY VIEW

Actually, by repeating the 1st line 20 times the pricing mode is currently set up as follows, but only the 1st four lines are displayed.

CUSTOM PRICING EDITOR		
1)	$0.25	1 /2 cred.
2)	$0.50	1 cred.
3)	$0.75	1 1/2 cred.
4)	$1.00	2 cred.
5)	$1.25	2 1/2 cred.
6)	$1.50	3 cred.
7)	$1.75	3 1/2 cred.
8)	$2.00	4 cred.
9)	$2.25	4 1/2 cred.
10)	$2.50	5 cred.
11)	$2.75	5 1/2 cred.
12)	$3.00	6 cred.
13)	$3.25	6 1/2 cred.
14)	$3.50	7 cred.
15)	$3.75	7 1/2 cred.
16)	$4.00	8 cred.
17)	$4.25	8 1/2 cred
18)	$4.50	9 cred.
19)	$4.75	9 1/2 cred.
20)	$5.00	10 cred

Now repeatedly press the Enter button to move the right hand column to the 20th level. The display will show (with "10 cred." Blinking):

CUSTOM PRICING EDITOR		
17)	$4.25	8 1/2 cred.
18)	$4.50	9 cred.
19)	$4.75	9 1/2 cred.
20)	$5.00	10 cred

DISPLAY VIEW

Now press the Up button repeatedly until the right hand column of line 20 reads "15 cred."

Start Button: Once the pricing mode has be specified, you exit the custom pricing editor by pressing the 'Start" button. This will bring up a menu with some or all of the following choices:

Choose an Option:
- Return to Editor
- Clear Pricing
- Ignore Changes
- Save Changes

DISPLAY VIEW

Use the Up and Down buttons to select your choice and press the Enter button to activate it. The selections cause the following actions:

Return To Editor: This option will allow you to continue to edit the pricing information.

Clear Pricing: This option will clear out all pricing levels and bring you back to the pricing editor to create a pricing mode from scratch.

Ignore Changes: This option will discard the work done in the previous pricing editor and leave the previously installed pricing mode in the game.

Save Changes: Press the Enter button to save your custom edited pricing mode and install it as the pricing for the game. Note that this choice will not be displayed if there is not at least one pricing level specified in the pricing editor, or if no changes have been made.

Exit Pricing Editor: This option will appear if no changes have been made. It will exit the Pricing Editor leaving the pricing as is.

Bonus for Special Coins

For most coin modes, the system allows the mixing of any combination of any size coin and awards credits as each appropriate amount is accumulated. With A.3 10 (Coin Door Type) set to "custom", the value of each coin slot may be entered for adjustments A.3 12 (Left Slot Value) through A.3 15 (4th slot value). Whenever these values are changed, the new values are copied to A.3 28 (Left Slot Credit Value) through A.3 31 (4th Slot Credit Value) respectively. To give a bonus for a particular coin, you need to modify the Credit Value adjustment to specify the value to be given for the bonus coin.

For example, in a game with a Left Coin Slot that takes quarters and a center coin slot that takes dollars, if you wish to charge 50 cents for 1 play and $1.00 for 2 plays, you setup the pricing editor to show:

CUSTOM PRICING EDITOR		
1)	$0.25	1/2 cred.
2)	$0.50	1 cred.
3)	$0.75	1-1/2 cred.
4)	$1.00	2 cred

DISPLAY VIEW

If you set A.3 10 (Coin Door Type) to Custom you will see the following coin door specifier adjustments:

A.3 12	Left Slot Value	0.25
A.3 13	Center Slot Value	1.00
A.3 28	Left Slot Credit Value	0.25
A.3 29	Center Slot Credit Value	1.00

To change the pricing to 1 play for $0.50, 2 plays for $1.00 and 3 plays for a dollar coin, you change A.3 29 (Center Slot Credit Value) to 1.50. This will result in the following settings:

A.3 12	Left Slot Value	0.25
A.3 13	Center Slot Value	1.00
A.3 28	Left Slot Credit Value	0.25
A.3 29	Center Slot Credit Value	1.50

This will cause $1.50 worth of credits (3) to be awarded for each coin inserted in the center coin slot (dollar coin). This is due to the $1.50 setting of A.3 29 (Center Slot CREDIT VALUE). Note that the 1.00 setting of A.3 13 tells the game that each coin in the center slot adds $1.00 to the total collection.

A.3 28 LEFT SLOT CREDIT VALUE
A.3 29 CENTER SLOT CREDIT VALUE
A.3 30 RIGHT SLOT CREDIT VALUE
A.3 31 4TH SLOT CREDIT VALUE

This adjustment specifies the value to be used for awarding credits. It is typically the same value as the corresponding A.3 12 (Left Slot Value) through A.3 15 (4th Slot Value) adjustment.

The A.3 12 through A.3 15 values are used to determine the auditing value of each coin (for collection totals) while the A.3 28 through A.3 31 value determine the coin value for awarding credits. By making this "Credit Value" adjustment higher than the A.3 12 through A.3 15 "Value" adjustment, a bonus may be given for a specific call (see Bonus for Special Coin section for more information).

Pricing Table

Country	Coin Chutes Left	Center	Right	4th Chute	Games/Coins	Display	Pricing Adjustments A3 02 03 04 05 06 07 08 09
USA	25¢	$1.00*	25¢	$1.00	1/50¢, 2/75¢, 3/$1[2]	50¢, 75¢, $1.00	
	25¢	$1.00*	25¢	$1.00	1/75¢, 2/$1.50, 3/$2.00[2]	1/.75, 3/2.00	
	25¢	$1.00	25¢	$1.00	1/3X25¢[2]	USA 1/$0.75	
	25¢	$1.00	25¢	$1.00	1/50¢, 2/$1[2]	USA 2/$1.00	
	25¢	$1.00	25¢	$1.00	1/50¢, 3/$1.00[2]	USA 3/$1.00	
	25¢	$1.00	25¢	$1.00	1/2x25¢, 2/$1.00, 3/$1.50, 6/$2.00[2]	USA 6/$2.00	
	25¢	$1.00	25¢	$1.00	1/2x25¢, 2/$1.00, 3/$1.50, 5/$2.00[1,2]	USA 5/$2.00	
	25¢	$1.00	25¢	$1.00	1/3x25¢, 2/$1.50, 4/$2.00[2]	1/.75, 4/$2.00	
	25¢	$1.00	25¢	$1.00	1/2x25¢, 2/$1.00, 4/$1.50, 6/$2.00[2]	6/$2. 00 4/$1.50	
	25¢	25¢	25¢	-	1/4x25¢, 6/$5.00[3]	1/1, 6/5	
	25¢	25¢	25¢	-	1/4x25¢[2]	1/$1.00	
Canada	25¢	-	$1.00	-	1/50¢, 2/75¢, 3/$1[2]	CAN. 50-75-1	
	25¢	-	$1.00	-	1/50¢, 2/$1[2]	CAN. 2/$1.00	
	25¢	-	$1.00	-	1/50¢, 3/$1.00[2]	CAN. 3/$1.00	
	25¢	-	$1.00	-	1/2x25¢, 2/4x25¢, 3/$1.00[2]	3/$1.00 Coin	
	25¢	-	$1.00	-	1/2x25¢, 2/$1.00, 3/$1.50, 6/$2.00[2]	CAN. 6/$2.00	
	25¢	-	$1.00	-	1/2x25¢, 2/$1.00, 3/$1.50, 5/$2.00[1,2]	CAN. 5/$2.00	
	25¢	-	$1.00	-	1/2x25¢, 2/$1.00, 4/$1.50, 6/$2.00[2]	6/$2, 4/1.50	
	25¢	-	$1.00	-	1/3x25¢, 2/$1.50, 4/$2.00[2]	1/.75, 4/2.00	
	25¢	-	$1.00	-	1/75¢, 2/$1.50, 3/$2.00[2]	1/.75, 3/2.00	
Canada 3/Dollar Coin	25¢	-	$1.00	-	1/3X25¢ 1/0.50, 2/$1.00, 3/$1.00-Coin[2]	CAN. 1/$0.75	
Austria	5sch	10sch	10sch	-	1/2x5sch, 3/2x10sch[2]	CAN.$ BONUS	
	5sch	-	10sch	-	12/5sch, 5/10sch	AUSTRIA CUSTOM	02 00 05 00 01 00 01 00
Australia	20¢	$1	$1	$2	1/$1, 3/$2[2]	AUSTRALIA 1	
	20¢	$1	$1	$2	1/$1, 2/$2	AUSTRALIA 2	
U.K.	£1.00	50P	20P	10P	1/3x10P, 2/50P, 4/£1[2]	U. KINGDOM	
Switzerland	1Fr	2Fr	5Fr	-	1/1Fr, 3/2Fr, 7/5Fr[2]	SWISS 1	
Swiss 2	1Fr	2Fr	5Fr	-	1/2Fr, 2/3Fr, 3/4Fr, 5/5Fr	SWISS 2	
Swiss 3	1Fr	2Fr	5Fr	-	1/1Fr, 5/5Fr	SWISS 3	
Swiss 4	1Fr	2Fr	5Fr	-	1/1Fr, 2/2Fr, 3/3Fr, 4/4Fr, 6/5Fr[1]	SWISS 4	
Swiss 5	1Fr	1Fr	1Fr	-	1/1Fr (all slots = 1Fr)	SWISS 5	
Belgium	5Fr	20Fr	50Fr	-	1/4x5Fr, 1/20Fr , 3/50Fr[2]	BELGIUM	
Belgium 2	5Fr	20Fr	50Fr	-	1/20Fr, 3/60Fr, 3/50Fr-Coin	BELG. BONUS	
Germany	1DM	2DM	5DM	-	1/1DM, 2/2DM, 6/5DM[1,2]	GER. 6/5DM	
					1/2DM, 2/3DM, 3/4DM, 4/5DM[2]	GER. 4/5DM	
					1/2DM, 2/3DM, 3/4DM, 5/5DM[2]	GER. 1/2DM	
					1/1DM, 2/2DM, 5/5DM[2]	GER. 1/1DM	
Holland	1G	-	1G	-	1/1G[2]	HOLLAND	
Sweden	1Kr	5Kr	10Kr	1Kr	1/10Kr, 2/15Kr, 3/20Kr[1,2]	SWEDEN 1	
	1Kr	5Kr	10Kr	1Kr	1/5Kr[2]	SWEDEN 2	
France	1Fr	5Fr	10Fr	20Fr	1/3x1Fr, 2/5Fr, 5/10Fr , 10/20Fr[2,3]	TARIFF 1	
	1Fr	5Fr	10Fr	20Fr	1/2x1Fr, 3/5Fr, 7/10Fr , 14/20Fr[2,3]	TARIFF 2	
	1Fr	5Fr	10Fr	20Fr	1/5Fr, 3/10Fr, 7/2x10Fr , 7/20Fr[1,2,3]	TARIFF 3	
	1Fr	5Fr	10Fr	20Fr	2/5Fr, 4/10Fr, 9/2x10Fr , 9/20Fr[2,3]	TARIFF 4	
	1Fr	5Fr	10Fr	20Fr	2/5Fr, 5/10Fr, 11/2x10Fr , 11/20Fr[2,3]	TARIFF 5	
	1Fr	5Fr	10Fr	20Fr	1/5Fr, 3/10Fr , 6/20Fr[2,3]	TARIFF 6	
Italy	500L	500L	500L	-	1/500L[2]	ITALY 1	
	500L	500L	500L	-	1/2x500L, 3/4x500L[1,2]	ITALY 2	
	500L	500L	500L	-	1/2x500L, 2/4x500L[2]	ITALY 3	
Spain	100P	-	500P	-	1/100P, 6/500P[2]	SPAIN	
	25P	-	100P	-	1/25P, 5/100P	CUSTOM	01 00 04 00 01 04 01 00
	25P	-	100P	-	1/25P, 4/100P	CUSTOM	01 00 04 00 01 00 01 00
	25P	-	100P	-	1/2x25P, 2/100P	CUSTOM	01 00 04 00 02 00 01 00
	25P	-	100P	-	1/2x25P, 3/100P	CUSTOM	03 00 12 00 04 00 01 06
Japan	100¥	-	100¥	-	1/100¥[2]	JAPAN	
Chile	Token	-	Token	-	1/1Token[2]	CHILE	
Denmark	1Kr	5Kr	10Kr	20Kr	1/2x1 Kr, 3/5 Kr, 7/10 Kr[2]	DENMARK 1	
	1Kr	5Kr	10Kr	20Kr	1/5 Kr, 3/10 Kr, 6/20 Kr[1,2]	DENMARK 2	
Finland	1Mka	-	5Mka	-	1/2x1Mka, 3/5Mka[2]	FINLAND 1	
	1Mka	-	5Mka	-	1/3x1Mka, 2/5Mka[2]	FINLAND 2	
New Zealand	$1.00	-	$2.00	-	1/$1, 3/$2[2]	NEW ZEALAND 1	
	$2.00	-	$1.00	-	1/$1, 3/$2, ($2-$1 door)	NEW ZEALAND 2	
Norway	5Kr	-	10Kr	-	1/5Kr, 2/10Kr, 5/20Kr[2]	NORWAY	
Argentina	10¢	10¢	10¢	-	1/1 Token[2]	ARGENTINA	
Greece	10D	20D	50D	-	1/2x10D, 1/20D, 3/50D	GREECE	
Antilles	25¢	25¢	1G	-	1/25¢, 4/1G	ANTILLES	
Netherlands	1HFl	2.5HFl	2.5HFl	-	1/1Hfl, 3/2.5Hfl	NETHERLANDS	
Netherlands 2	1HFl	2.5HFl	2.5HFl	-	1/1HFl, 3/3HFl, 3/2.5HFl-Coin	NETH. BONUS	
Hungary	20 Old	20 New	50F	-	1/40F, 2/60F, 4/100F	HUNGARY	

Note: 1. Factory Default. 2. Standard Setting - Change by pressing Enter button. 3. Other functions are also affected.
* Only if Bill Acceptor and Center Chute are available.

A.4 HIGH SCORE TO DATE (H.S.T.D.) ADJUSTMENTS

A.4 01 HIGHEST SCORES
The game maintains a record of the four highest scores achieved to date.

OFF - No high scores are recorded, or displayed.
ON - The four highest scores are stored in memory and displayed in Attract Mode.

A.4 02 H.S.T.D. AWARD
This is the award given for achieving the High Score to Date or the Champion High Score to Date. Credit or Ticket

A.4 03 CHAMPION H.S.T.D.
The "Highest" High Score can be displayed in the Attract Mode. This score is not cleared when "High Score Reset Every" occurs.

ON - The "Highest" High Score is retained in memory and displayed.
OFF - The "Highest" High Score is not retained.

A.4 04 CHAMPION CREDITS
The number of credits or tickets awarded for a Grand Champion Score.

Range: 00 to 10.

A.4 05 H.S.T.D. 1 CREDITS
A.4 06 H.S.T.D. 2 CREDITS
A.4 07 H.S.T.D. 3 CREDITS
A.4 08 H.S.T.D. 4 CREDITS
The number of credits or tickets awarded whenever a player exceeds the four highest scores.

Range: 00 to 10.

A.4 09 HIGH SCORE RESET EVERY
The number of games to be played before an automatic reset of the displayed Highest Score occurs. The operator selects the values provided at reset in the Back-up High Scores.

Range: OFF (disabled), 250 to 20,000.

A.4 10 BACKUP CHAMPION
The Back-up Grand Champion Score.

Range: 00 to 120,000,000

A.4 11 BACKUP H.S.T.D. 1
A.4 12 BACKUP H.S.T.D. 2
A.4 13 BACKUP H.S.T.D. 3
A.4 14 BACKUP H.S.T.D. 4
The first through fourth Back-up High Score values. The game automatically restores this value when the "High Score Reset Every" value is reached.

Range: 00 to 120,000,000

A.4 15 CASTLE CHAMPION

This adjustment is used to set the number of Castles that must be destroyed in a game to become the New Castle Champion.

Range: 1-10

A.4 16 CASTLE CHAMPION CREDITS

This adjustment specifies the number of credits to award to the new Castle Champion at the end of a game.

Range: 00-03

A.4 17 JOUST CHAMPION

This adjustment is used to set the number of Joust Victories that must be earned in a game to become the new Joust Champion.

Range: 1-10

A.4 18 JOUST CHAMPION CREDITS

This adjustment specifies the number of credits to award to the new Joust Champion at the end of a game.

Range: 00-03

A.4 19 CATAPULT CHAMPION

This adjustment is used to set the number of Catapult Slams that must be earned in a game to become the new Catapult Champion.

Range: 1-10

A.4 20 CATAPULT CHAMPION CREDITS

This adjustment specifies the number of credits to award to the new Catapult Champion at the end of a game.

Range: 00-03

A.4 21 PEASANT CHAMPION

This adjustment is used to set the number of Peasant Revolts that must be earned in a game to become the new Peasant Champion.

Range: 1-10

A.4 22 PEASANT CHAMPION CREDITS

This adjustment specifies the number of credits to award to the new Peasant Champion at the end of a game.

Range: 00-03

A.4 23 DAMSEL CHAMPION

This adjustment is used to set the number of Damsels that must be saved in a game to become the new Damsel Champion.

Range: 1-10

A.4 24 DAMSEL CHAMPION CREDITS

This adjustment specifies the number of credits to award to the new Damsel Champion at the end of a game.

Range: 00-03

A.4 25 TROLL CHAMPION

This adjustment is used to set the number of Trolls that must be destroyed in a game to become the new Troll Champion.

Range: 10-40

A.4 26 TROLL CHAMPION CREDITS

This adjustment specifies the number of credits to award to the new Troll Champion at the end of a game.

Range: 00-03

A.4 27 MULTIBALL MADNESS CHAMPION

This adjustment is used to set the score that must be beaten during a single Multiball Madness Multiball to become the new Multiball Madness Champion.

Range: 5,000,000 - 40,000,000

A.4 28 MULTIBALL MADNESS CREDITS

This adjustment specifies the number of credits to award to the new Multiball Madness Champion at the end of a game.

Range: 00-03

A.4 29 BATTLE FOR THE KINGDOM CHAMPION CREDITS

This adjustment specifies the number of credits to award to the new Battle For The Kingdom Champion at the end of a game.

Range: 00-03

A.5 PRINTER ADJUSTMENTS (optional board required)

A.5 01 COLUMN WIDTH
The column width to be printed. Range: 22 to 80.

A.5 02 LINES PER PAGE
This is the amount of lines per page. Range: 20 to 80.

A.5 03 PAUSE EVERY PAGE
Choose whether the printer pauses at the end of a page.

YES - The printer does pause.
NO - The printer doesn't pause.

A.5 04 PRINTER TYPE
Select the type of printer: Parallel, Serial, ADP, Mini-Drucker, or NSM.

A.5 05 SERIAL BAUD RATE
Select which baud rate to use for serial or ADP communications (bit rate): 300, 600, 1200, 2400, 4800, or 9600.

A.5 06 SERIAL D.T.R. (DATA TERMINAL READY)
When a serial printer is used, this line may be connected to a printer output line signaling that the printer is busy.

NORMAL - Normal D.T.R. signal goes low to indicate the printer is not ready.
INVERTED - Inverted D.T.R. (busy) signal goes high to indicate the printer is not ready.
IGNORE - D.T.R. signal is ignored.

A.5 07 AUTO PRINTOUT
With the optional printer board installed, this adjustment allows the initiation of printouts whenever the game detects a printer connected to the game. Parallel printers are detected automatically by plugging them in and putting then on-line. Serial printers (or computers) are detected by sending a carriage return (ASCII 0x0D) or XON (ASCII 0x11).

This adjustment has the following settings:

OFF	Disable automatic printouts
MAIN AUDITS	Main Audit Table (B.1)
EARNINGS	Earning Audits (B.2)
STD. AUDITS	Standard Audits (B.3)
FEATURES	Feature Audits (B.4)
HISTOGRAMS	Histograms (B.5)
TIMESTAMPS	Time Stamps (B.6)
ALL DATA	All of the above data

The table specified above will automatically be printed when a printer (or computer) is detected.

If the printer is detected during game over or test mode, the printout will be taken right away.

If the printer is connected while a game is being played, it will take up to 10 seconds to be detected, after which the printout will occur. The game will resume after the printout is complete.

Automatic printouts will only take place if the coin door is open.

After an automatic printout has been generated, a 2nd automatic printout will not be possible until a new game has started, or test mode begins.

ERROR MESSAGES

The WPC-95 game program has the capability to aid the operator and service personnel. At game turn-on, or after pressing the Begin Test switch, once the game has been operating for an extended period, the display may signal with a message, "Press ENTER for Test Report". This indicates the game program has detected a possible problem with the game.

To obtain details of the problem open the coin door and press the Begin Test switch. Press the Enter button to begin displaying the message(s). The following messages apply to your game.

CHECK LEFT GATE - STUCK CLOSED

The game has detected that the Left Gate is stuck closed. Use T.16 (Loop/Gate Test), Loops Mode, to verify that all of the Loop switches and the Left Gate are operating properly.

CHECK LEFT GATE - STUCK OPEN

The game has detected that the Left Gate is stuck open. Use T.16 (Loop/Gate Test), Jets Mode to verify that the Right Loop switches and the Left Gate are operating properly.

CHECK RIGHT GATE - STUCK CLOSED

The game has detected that the Right Gate is stuck closed. Use T.16 (Loop/Gate Test), Loops Mode, to verify that all of the Loop switches and the Right Gate are operating properly.

CHECK RIGHT GATE - STUCK OPEN

The game has detected that the Right Gate is stuck open. Use T.16 (Loop/Gate Test), Jets Mode to verify that the Left Loop switches and the Right Gate are operating properly.

CHECK TOWER DIVERTER - STUCK CLOSED

The game has detected that the Tower Diverter is stuck closed. Use T.17 (Tower Test), Tower Mode, to verify that the Right Ramp Entrance switch, the Tower Diverter, the Tower Lock Post, and the Tower Exit switch are operating properly.

CHECK TOWER DIVERTER - STUCK OPEN

The game has detected that the Tower Diverter is stuck open. Use T.17 (Tower Test), Ramp Mode, to verify that the Right Ramp Entrance switch, the Right Ramp Exit switch, and the Tower Diverter are operating properly.

CHECK DRAWBRIDGE - DOWN SWITCH BAD

The game has detected that the Drawbridge DOWN switch is bad. Use T.18, Drawbridge Test, to verify that the switch closes when the Drawbridge is DOWN, and opens when the Drawbridge is NOT DOWN.

CHECK DRAWBRIDGE - UP SWITCH BAD

The game has detected that the Drawbridge UP switch is bad. Use T.18, Drawbridge Test, to verify that the switch closes when the Drawbridge is UP, and opens when the Drawbridge is NOT UP.

CHECK CASTLE GATE - STUCK CLOSED

The game has detected that the Castle Gate is stuck closed. Use T.19 (Castle Gate Test), Castle Mode, to verify that the Moat Entrance switch, the Castle Gate switch, the Castle Lock switch, and the Castle Gate are operating properly.

CHECK CASTLE GATE - STUCK OPEN

The game has detected that the Castle Gate is stuck open. Use T.19 (Castle Gate Test), Castle Gate Mode, to verify that the Moat Entrance Switch, the Castle Gate Switch, and the Castle Gate are operating properly.

CHECK LEFT TROLL - UP SWITCH BAD

The game has detected that the Left Troll UP switch is bad. Use T.20 (Trolls Test) to verify proper operation of the Left Troll.

CHECK RIGHT TROLL - UP SWITCH BAD

The game has detected that the Right Troll UP switch is bad. Use T.20 (Trolls Test) to verify proper operation of the Right Troll.

CHECK SWITCH ##

This message indicates that at least one switch was stuck 'On' at game turn-on or has NOT been actuated during ball play (for 60 balls or apx. 20 games). The game program compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep your game earning, until the service technician can repair the problem. To verify the problem, refer to the Test Menu text describing Switch Testing, and check each reported switch using applicable switch tests. Always check switch operation using a ball, to simulate game conditions. Switch problems may often be resolved by adjusting the wire switch actuators, fixing switch circuitry problems, securing loose connectors, etc. Mechanisms using 'opto switches' (drop targets, etc.) need to be checked for proper power connections (+12V dc and ground).

CHECK FUSES F115 AND F116 AND OPTO 12V SUPPLY

This message will be displayed if the game senses that all optical switches are not functioning. This usually occurs when there is no +12V supply to the playfield optics.

The problem is likely to be a blown fuse (F109), or at connectors J138, J139, J140 or J141 on the power driver board.

OPTO TROUGH BAD CHECK CONNECTORS, WIRES AND 12V SUPPLY

This message will be displayed if all of the opto switches in the playfield ball trough are not functioning. This is usually caused by a problem with a ball trough connector supplying +12V and ground for the optical circuits.

PINBALL MISSING

This game normally uses four balls, however, it will operate with less. This message announces that a ball is missing or stuck. When the ball is located, return it to the game via the Outhole. Other possibilities for this problem could be malfunctions of the Ball Trough switches or the Ball Shooter switch.

XXXX SW. IS STUCK ON

This message indicates that a switch, which is not usually On, remains in the On position after the game is switched On. The stuck switch is essential for game play (for example, a coin chute switch, the slam tilt switch, and the plumb bob tilt switch), and should be cleared to permit proper game operation.

GROUND SHORT ROW - N, WHT - XXX

This message indicates that the switch wires being called out are touching a grounded part on the playfield or coin door. The following should be checked:

1. Slam tilt (or other coin door switch) touching the grounded coin door.
2. A leaf-type, playfield switch touching a grounded part.
3. Players poking metallic objects (wires, coat hangers, etc.) into the game.
4. Switch cable insulation pierced or damaged allowing bare wire contact with a grounded part.
5. All switches in a row closing at the same time. **Note:** This is NOT a switch problem; however, for most games it is a very rare possibility.

G10 ERROR

The security chip is incorrect or faulty. If this occurs, replace the security chip.

G11 CHECKSUM ERROR

The game ROM checksum is invalid. If this occurs replace the game ROM.

TIME AND DATE NOT SET.

The real time clock is not set. Go to U.4 of the Utilities Menu and set the time and date.

FACTORY SETTINGS RESTORED.

This message indicates that the CMOS RAM (U8) no longer retains any custom Pricing or Game Adjustment settings and has reverted to factory default settings. Generally, the following CPU checks will isolate the cause of the CMOS RAM memory failure. The voltages at pin 28 and pin 26 of U8 should be +5V (game turned On) and at least +4V (game turned Off). When the voltage drops below +4V, memory reset occurs. Check the batteries and battery holder. Be sure that the batteries are good and that there is no contamination on the battery holder terminals. Turn the game OFF, and use an ohmmeter to check diodes D1 and D2 on the CPU Board. D1 should read 0 ohms when forward-biased and infinite ohms when reverse-biased. D2 should read 15 ohms when forward-biased and infinite ohms when reverse-biased. (Readings taken with an analog meter.) This message can also indicate that there is an open diode on a 50V coil circuit and noise is entering the circuit.

CPU AND AUDIO VISUAL BOARD ERROR CODES

The CPU has three LED's, 201, 202, and 203. At game turn-on LED 201 and LED 202 are on, LED 203 is off. During normal operation LED 201 is off, LED 202 is on, and LED 203 is flashing.

If the system detects an error the following happens:

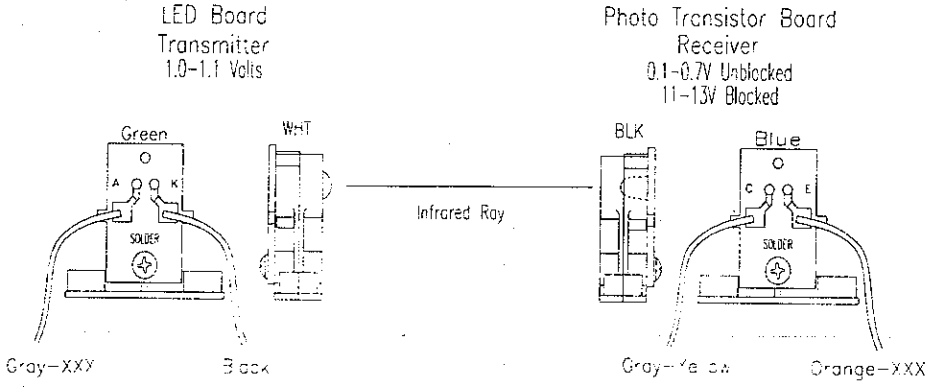
CPU BOARD LED ERROR CODES		
	Center LED blinks once	= G11 ROM Failure
	Center LED blinks twice	= U8 RAM Failure
	Center LED blinks three times	= G10 Security Chip Failure

Upon game turn-on you will hear one of the following.

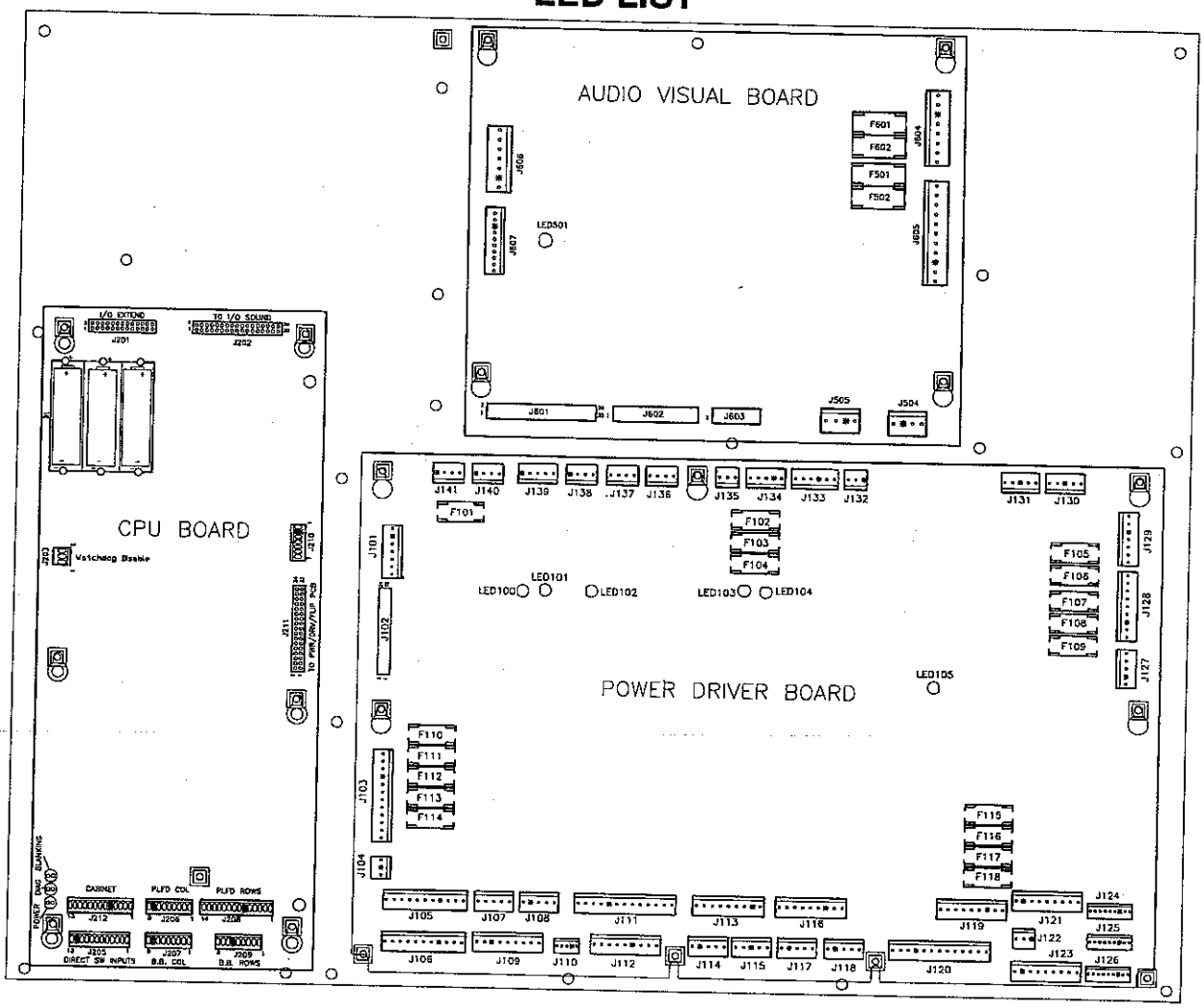
AUDIO VISUAL BOARD BEEP ERROR CODES		
	1 Beep	= Audio Visual Board is O.K.
	2 Beeps	= S2 Failure
	3 Beeps	= S3 Failure
	4 Beeps	= S4 Failure
	5 Beeps	= S5 Failure
	6 Beeps	= S6 Failure
	7 Beeps	= S7 Failure
	10 Beeps	= Audio Static RAM Failure

OPTO THEORY

The opto receiver (photo transistor) should be approximately 0.1 - 0.7 volts when the opto beam is unblocked and approximately 11 - 13 volts when the opto beam is blocked. The opto transmitter (LED) should always be approximately 1.4 volts. *The transmitter (LED) is larger than the receiver (photo transistor); it protrudes further from its case.*



LED LIST



CPU BOARD

LED 201 Blanking
LED 202 Power
LED 203 Diagnostics

At game turn-on, LED 201 and LED 202 are on, LED 203 is off. During normal operation LED 201 is off, LED 202 is on, and LED 203 is flashing.

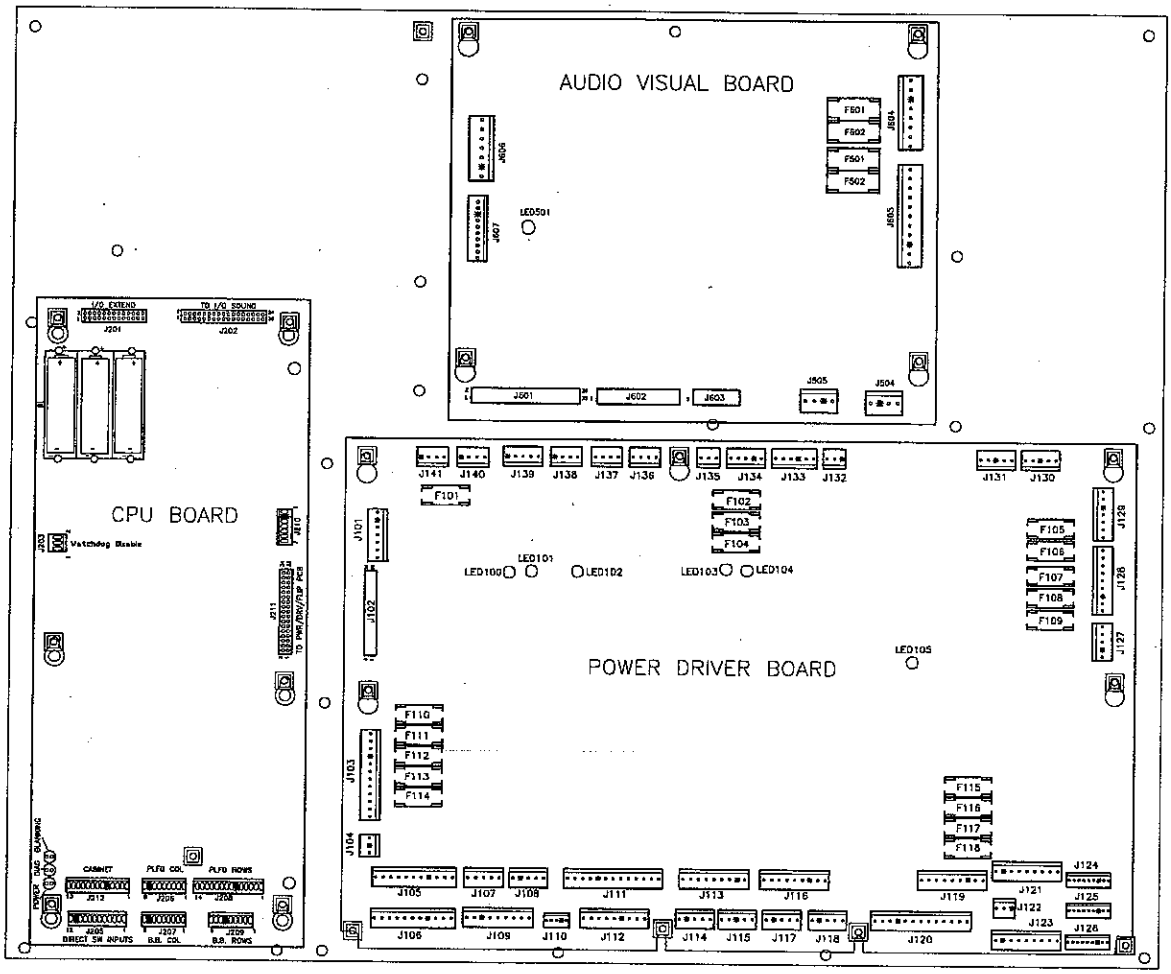
AUDIO VISUAL BOARD

LED 501 +5VDC, Normally flashing, but at a slower rate than LED 203.

POWER DRIVER BOARD

LED 100 +12VDC Regulated, Normally On
LED 101 +5VDC Digital, Normally On
LED 102 +18VDC Lamps, Normally On
LED 103 +12VDC Unregulated, Normally On
LED 104 +20VDC Flashlamps, Normally On
LED 105 +50VDC Coils, Normally On

FUSE LIST



AUDIO VIDEO BOARD

Loc.	Description	Part Number	Value
F501	-25V	5731-14532-00	T2.5A, 250V
F502	+25V	5731-14532-00	T2.5A, 250V
F601	+62V	5731-14840-00	T0.315A, 250V
F602	-113V & -125V	5731-14840-00	T0.315A, 250V

CPU BOARD

There are no fuses on the CPU board.

POWER DRIVER BOARD

Loc.	Description	Part Number	Value
F101	Regulated 12V	5731-14531-00	T0.63A, 250v
F102	Solenoid. #25 to #28	5731-14530-00	T4.0A, 250V
F103	Solenoid #1-#8	5731-14530-00	T4.0A, 250V
F104	Solenoid #9 to #16	5731-14530-00	T4.0A, 250V
F105	+5V Logic	5731-14530-00	T4.0A, 250V
F106	+18V Lamp Matrix	5731-14046-00	T5.0A, 250V
F107	Flasher Secondary	5731-14530-00	T4.0A, 250V
F108	Solenoid Secondary	5731-14529-00	T6.3A, 250
F109	Unregulated 12V	5731-14530-00	T4.0A, 250V

Loc.	Description	Part Number	Value
F110	G.I. #5 WHT-VIO	5731-14530-00	T4.0A, 250V
F111	G.I. #4 WHT-GRN	5731-14530-00	T4.0A, 250V
F112	G.I. #3 WHT-YEL	5731-14530-00	T4.0A, 250V
F113	G.I. #2 WHT-ORG	5731-14530-00	T4.0A, 250V
F114	G.I. #1 WHT-BRN	5731-14530-00	T4.0A, 250V
F115	+50V Flippers	5731-14530-00	T4.0A, 250V
F116	+50V Flippers	5731-14530-00	T4.0A, 250V
F117	+50V Flippers	5731-14530-00	T4.0A, 250V
F118	+50V Flippers	5731-14530-00	T4.0A, 250V

LINE FILTER

Loc.	Part Number	Value
Foreign	5731-14530-00	T4.0A, 250V
Domestic	5731-14046-00	T5.0A, 250V

MAINTENANCE INFORMATION

LUBRICATION

The two main lubrication points of the Ball Release mechanism are the pivots for the arm. The mechanisms of other playfield devices are somewhat similar to the Ball Release device, and have the same lubrication requirements. A medium viscosity oil (switch target grease) is satisfactory for these devices.

Because of the functional design (arm-actuated via solenoid plunger operation), the pivot points of the Left and Right Kickers ("Slingshots") all require lubrication as a regular servicing procedure.

Lubrication to ensure proper operation also applies to the target blades of the Drop Targets. MBI Instrument Grease, also known as Drop Target Switch Lubricant, with a Williams' part number of EI165, is a recommended lubricant.

SWITCH CONTACTS

Playfield Switches

For proper game operation, switch contacts should be free of dust, dirt, contamination, and corrosion. Blade switch contacts are plated to resist corrosion. Cleaning blade switch contacts requires gentle closing of the contacts on a clean business card or piece of paper, and then pulling the paper about 2 inches, which should restore the clean contact surface. Adjust the switch contacts to a 1/16-inch gap.

Flipper Switches

This game uses the new Fliptronic II Electronic Flipper System. The End-of-Stroke switches are NORMALLY OPEN. The switch should close when the flipper is energized. All E.O.S. switches are gold flashed computer grade leaf switches. Only low computer current is carried through these switches. DO NOT FILE or abrasively clean these switches! DO NOT REPLACE these switches with the tungsten high current switches, as intermittent operation could occur.

Note: *Unlike the old style of flipper, an E.O.S. switch failure does not harm the flipper. The game notifies the operator that the switch is misadjusted in the test report, but continues to play. The E.O.S. switches are a means by which the new electronic flippers feel and play with all of the subtleties of the old flippers.*

CLEANING

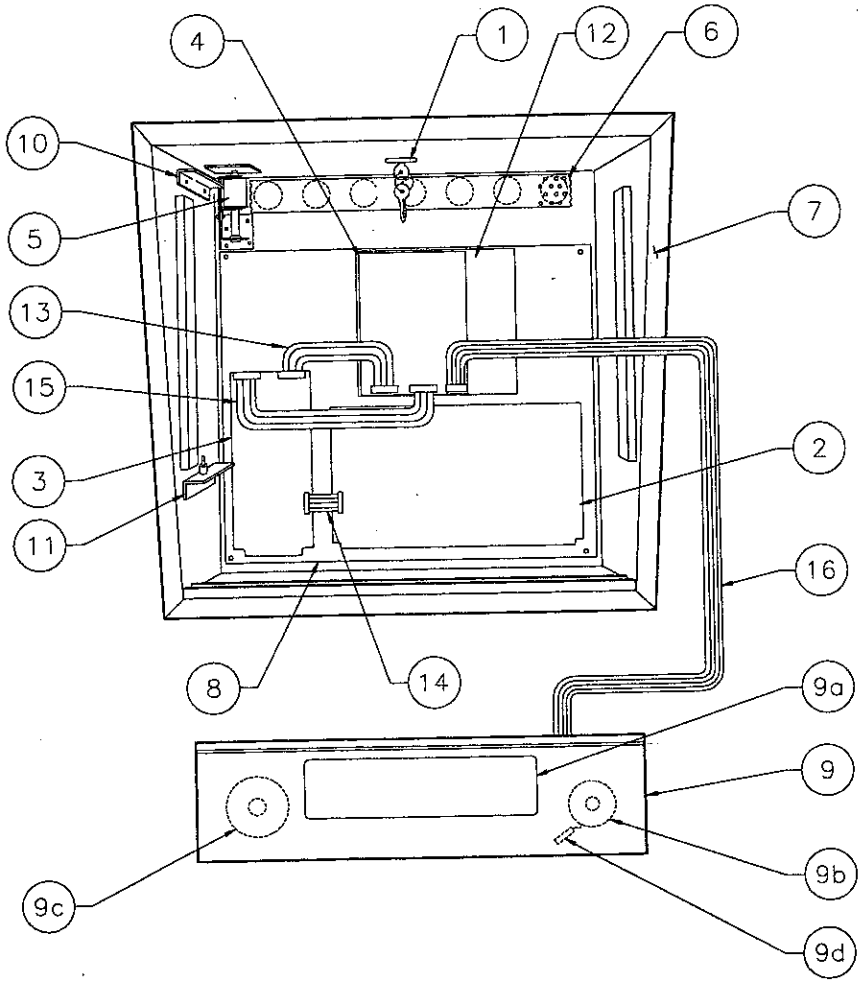
Good game action and extended playfield life are the results of regular playfield cleaning. During each collection stop, the playfield glass should be removed and thoroughly cleaned and the playfield should be wiped off with a clean, lint-free cloth. The game balls should be cleaned and inspected for any chips, nicks, or pits. Replace any damaged balls to prevent playfield damage.

Regular, more extensive, playfield cleaning is recommended. However, avoid excessive use of water and caustic or abrasive cleaners because they tend to damage the playfield surface. Playfield wax (or any carnauba based wax), or polish may be used sparingly, to prevent a buildup on the playfield surface. Do not use cleaners containing petroleum distillates on any playfield plastics because they may dissolve the plastic material or damage the artwork.

SECTION TWO

PARTS INFORMATION

50059-BB
Backbox Assembly



Item	Part Number	Description
1	A-13379	Lock & Plate Assembly
a)	20-9637	Lock & Cam Kit
2	A-20028	WPC '95 Power Driver PCB
3	A-21377-50059	WPC '95 CPU/Flipper PCB Assy.
4	A-20516-50059	WPC '95 Audio Visual PCB Assy.
5	B-10686-1	Knocker Assembly
6	01-6645	Vent Screen
7	04-10450-50059	Wood Backbox
8	A-14092-7	Mounting Plate Assembly
9	A-21559	Speaker/Display Assembly
a)	5901-12784-00	Dot Matrix Display/Driver Board
b)	5555-12924-00	Tweeter, 4Ω, 15w
c)	5555-12856-00	Speaker, 5-1/4" , 4 Ω, 25w
d)	5045-12914-00	Capacitor, 10mfd, 50v, +/-20%
10	A-12497	Insert Hinge Assy., Upper
11	A-12498	Insert Hinge Assy., Lower
12	01-14480	Audio Visual Shield

Ribbon Cables:

Item	Part Number	Description
13	5795-12653-15	Ribbon Cable, 34-Pin, 2 Conn.
14	5795-12653-03	Ribbon Cable, 34-Pin, 3"
15	5795-10938-19	Ribbon Cable, 26-Pin, 2 Conn.
16	5795-13434-25	Ribbon Cable, 14 Pin w/Ferrite

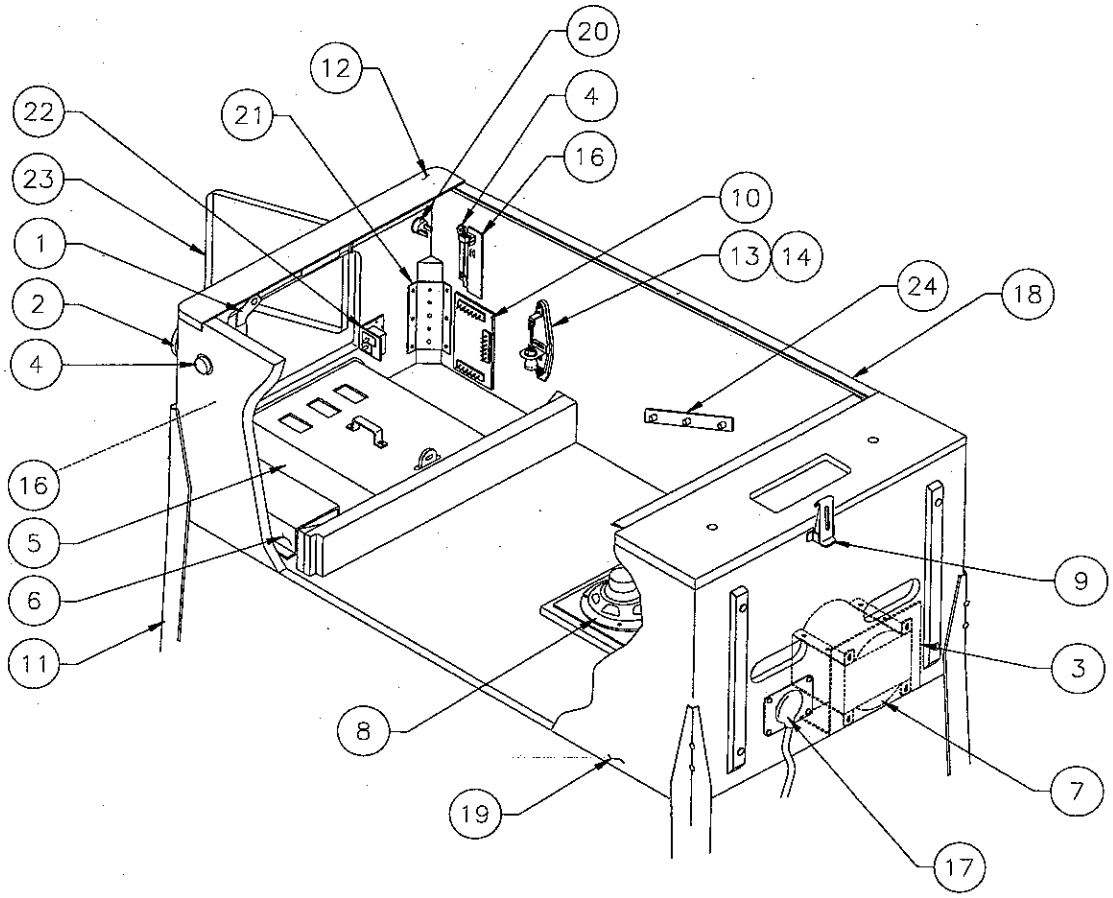
Miscellaneous Parts:
(Not shown)

02-5223	Bushing Button - Speaker Panel
08-7456	Backbox Glass, 27 x 18-7/8"
31-1357-50059	Screened Translite

Cables:

H-20477	Logic Power Cable
H-20478	Secondary Cable
H-20479	Dot Matrix Power Cable

50059-CAB
Cabinet Assembly



Item	Part Number	Description
1	A-16773	Lever Guide Assembly
2	20-9663-B-4	Push Button , Round
3	01-13936	Drip Plate - Narrow
4	A-16883-4	Flipper Button w/Spring (2)
5	A-20729-5	4-Ball Cashbox Assembly
6	A-20871	Power Interface Assy.
7	5610-14515-01	WPC Transformer
8	5555-12929-00	Speaker, 4Ω, 6", 25w
9	20-9347	Toggle Latch
10	A-20580	Coin Door Interface Board
11	A-19514	Leg Assembly, Chrome (4)
12	D-12615	Front Molding Assembly
13	20-6502-A	Plumb Bob
14	04-10346	Tilt Mechanism Assembly
15	*	Cordset
16	A-17316	Opto Flipper Assembly (2)
17	01-10714	Line Cord Cover
18	A-12359-3	Side Molding Assembly (2)
19	11-1347	Wood Cabinet
20	20-9663-16	Push Button w/Sw., *Start* (Yellow)
21	01-11400	Leg Plate (4)
22	A-18249-3	Cable & Interlock Switch Assy.
23	09-61000-1	Coin Door-U.S.A.
24	01-11408	Plate Spacer (2)

* See Application Chart p.2-39.

Miscellaneous Parts (Not Shown)

Part Number	Description
A-17195	Tilt Switch Assy. w/Cable
A-19562.1	Stay Arm Assembly
01-12352	Clip Bracket
01-9011.1-L	Backbox Mtg. Bracket, Left
01-9011.1-R	Backbox Mtg. Bracket, Right
01-6389-1	Cashbox Lock Bracket
08-7028-T	Playfield Glass
08-7377	Leg Leveler Adjuster, 3"
20-6500	Steel Ball, 1-1/16" (4")

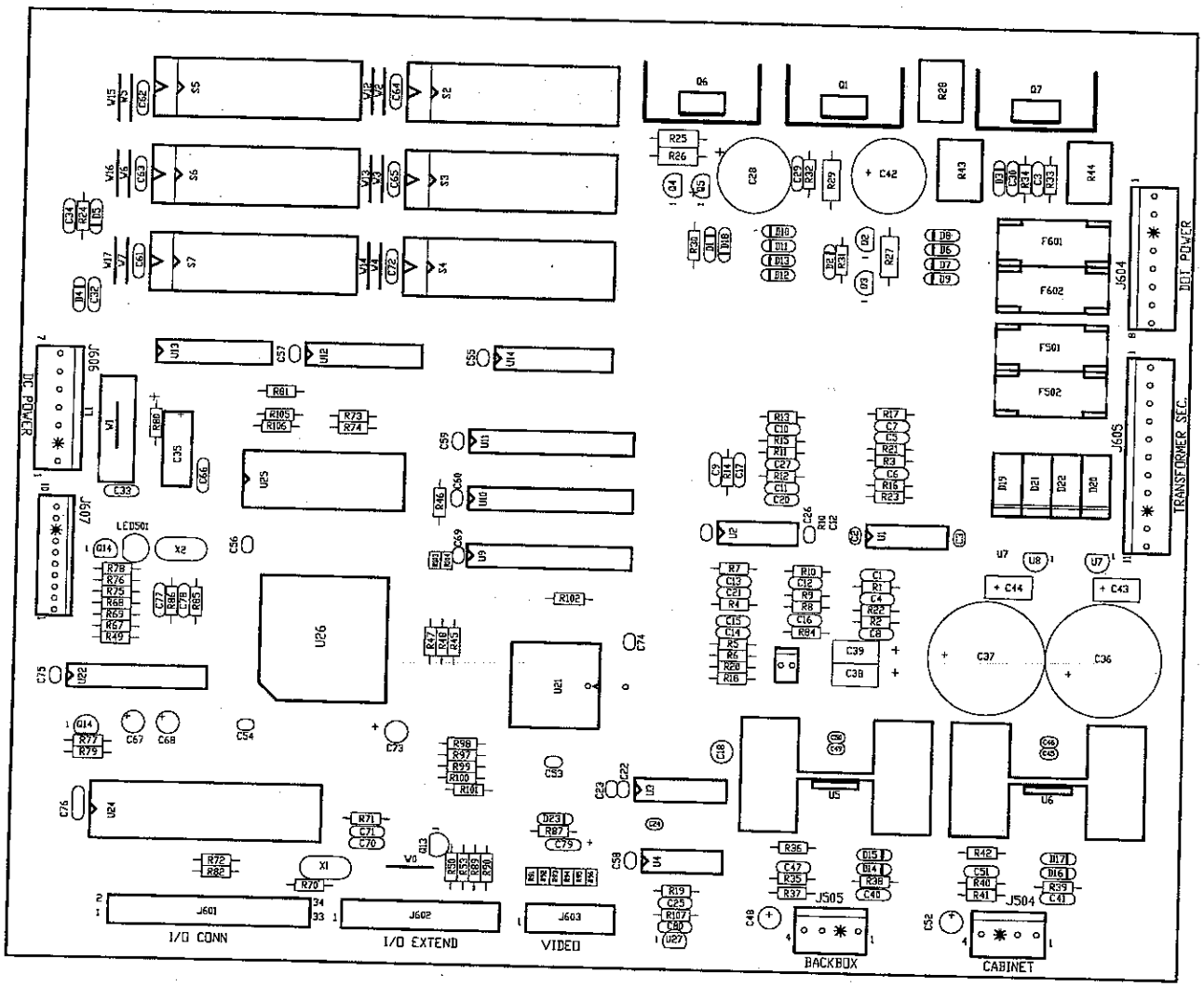
Cabinet Cables:

A-20201	Cable & Jumper Assy., Coin Door
H-17217.1	Plumb/Bob Mech. Protect Cable
H-17837-2	Voltage Program Jumper Cable
H-20599-1.1	WPC '95 Cabinet Cable
H-19601-1	Power Extension Cable
H-21838	Cabinet Switch/Lamp Cable

A-20516-50059
WPC '95 Audio Visual PCB Assembly

Part Number	Designator	Description
4004-01005-06	-	Mach. Screw, 4-40 x 3/8"
4404-01119-00	-	Nut 4-40 ESN
5010-08774-00	R2, R17, R22, R23, R35, R36, R40,R42, R87	Resistor, 22KΩ, ¼w, 5%
5010-08991-00	R20, R46-R48, R50, R72, R76, R77, R81, R107	Resistor, 4.7KΩ, ¼w, 5%
5010-09034-00	R21	Resistor, 10KΩ, ¼w, 5%
5010-09036-00	R19	Resistor, 100Ω, ¼w, 5%
5010-09134-00	R32-R34	Resistor, 150KΩ, ¼w, 5%
5010-09219-00	R1, R3	Resistor, 8.2KΩ, ¼w, 5%
5010-09416-00	R73, R74, R82, R88, R105, R106	Resistor, 470Ω, ¼w, 5%
5010-09807-00	R30, R31, R67-R69, R102	Resistor, 120Ω, ¼w, 5%
5010-10171-00	R24	Resistor, 56Ω, ¼w, 5%
5010-10258-00	R86	Resistor, 1MΩ, ¼w, 5%
5010-10983-00	R53, R75, R79, R84, R85, R89, R90	Resistor, 1.8KΩ, ¼w, 5%
5010-12832-00	R25, R26, R27, R29	Resistor, 47KΩ, ¼w, 5%
5010-13215-00	R78, R97-R101	Resistor, 200KΩ, ¼w, 5%
5010-13372-00	R91-R96, R103, R104	Resistor, 220Ω, 1/8w, 5%
5010-13420-00	R37, R41	Resistor, 680Ω, ¼w, 5%
5010-13517-00	R38, R39	Resistor, 15Ω, ¼w, 5%
5010-13607-00	R4, R5, R7-R15	Resistor, 6.19KΩ,1/8w, 1%
5012-14558-00	R44	Resistor, 1.8KΩ, 5w vertical
5012-14559-00	R43	Resistor, 4.7KΩ, 5w vertical
5012-14560-00	R28	Resistor, 120Ω, 5w vertical
5013-13661-00	R16	Resistor, 9.09KΩ, ¼w, 1%
5013-14456-00	R6, R18	Resistor, 3.32KΩ, ¼w, 1%
5040-14569-00	C35	Cap., 100mf, 25v, Axial
5040-09365-00	C38, C39, C43, C44	Cap.,1m, 63v(+50,-10%)Ax.
5040-12750-00	C48, C52, C73	Cap., 22m, 35v Radial
5040-13098-00	C18, C67, C68	Cap., 4.7µ, 35v (±20%)
5040-15413-00	C36, C37	Cap., 10000µf, 35v, 25mm
5040-14564-00	C28, C42	Cap., 150µf, 160v, 20%Rad.
5043-08996-00	C2, C3, C19, C22-C24, C26, C32, C34, C45, C46, C49, C50, C53-C66, C69, C72, C74-C76, C79, C80	Cap., 0.1µf, 50v (±20%) Ax.
5048-10992-00	C27	Cap., .0047m, 50v, 10% Ax.
5048-11028-00	C77	Cap., 22p, 50v, Axial
5048-11029-00	C25	Cap., 100p, 50v, 5% Axial
5048-11030-00	C7	Cap., 470p, 50v, Axial
5048-11033-00	C1	Cap., .022m, 50v, 10% Ax.
5048-12036-00	C40, C41	Cap., .22m, 50v, Axial
5048-13172-00	C78	Cap., 47pf, 50v, 20% Ax.
5048-13418-00	C4 - C6	Cap., .047m, 50v, 5% Ax.
5048-13609-00	C9, C12, C15	Cap., 3900pf, 50v, 5% Ax.
5048-13610-00	C8, C10, C11, C13, C14	Cap., 1000pf, 50v, 5% Ax.
5048-13611-00	C16, C17, C20, C21	Cap., 680pf, 50v, 5% Ax.
5048-14563-00	C29-C31, C81, C82	Cap., .01µf, 200v, 10% Axial
5070-09045-00	D19-D22	Diode MR501, 3.0A
5070-09054-00	D4, D6-D17, D23	Diode 1N4004, 1.0A
5075-12823-00	D1, D18	Zener, 1N4758A 56v, 1w
5075-12824-00	D3, D5	Zener, 1N4742A 12v, 1w
5075-12826-00	D2	Zener, 1N4759, 62v, 1w
5160-08938-00	Q13-Q15	Transistor, 2N4401 NPN
5164-09056-00	Q2, Q3	Transistor, MPSD02 NPN
5164-12154-00	Q1, Q7	Transistor, MJE15030 NPN
5194-09055-00	Q4, Q5	Transistor, MPSD52 PNP
5194-12155-00	Q6	Transistor, MJE15031 PNP
5250-13302-00	U7	Reg. 78L05T 5v
5250-13303-00	U8	Reg. 79L05T 5v
5311-12538-00	U4	IC 74HC14 Hex. S-T
5317-12211-00	U12-U14	IC Octal Buffer 74ALS541
5340-12278-00	U25	S/Ram 2064 150NS
5370-12687-00	U27	IC MC 340640Reset Chp
5349-15440-00	U9-U11	SRAm 8Kx8-35ms, 28pdip
5370-12730-00	U1, U2	IC Op Amp TL084
5370-13419-00	U5, U6	IC TDA 2030AV 18w, Audio Amp
5371-13299-00	U3	IC Ad-1851 16bit mono
5520-14561-00	X2	Crystal 20mHz, parallel 20pf
5671-14516-00	LED 501	Led-Display Red T 1-3/4
5700-08985-00	U24	Socket IC 40-pin .6
5700-12047-00	U22	Socket IC 24.3P
5700-12088-00	S2-S7	Socket Dip 32.6P"
5705-12638-00	U5, U6	Heatsink 5298B
5705-14562-00	Q1, Q6, Q7	Heatsink 10-220 wave sol 287
5733-14528-00	F501, F502, F601, F602	Fuse Holder 5x20mm 10A.
5731-14532-00	F501, F502	Fuse 5x20mm T2.5A., 250V
5731-14840-00	F601, F602	Fuse 5x20mm T0.315A., 250V
5791-10850-00	J602	Connector, 26-pin Header Str.
5791-10862-04	J504, J505	Connector, 4-pin Header Str.
5791-10862-07	J606	Connector, 7-pin Header Str.
5791-10862-08	J604	Connector, 8-pin Header Str.
5791-10862-11	J605	Connector, 11-pin Header Str.
5791-12516-00	J601	Connector, 34 hdr 2 x 17 .100
5791-12827-00	J603	Connector, 14 Hen 7x2 Str.
5791-13830-10	J607	Connector, 10-pin Str. Sq.
5010-09534-00	W0, W1, W12-W17, R49	Resistor, 0Ω, 0w
A-5343-50059-S2	S2	ROM Assembly
5341-15451-SU3	S3	Masked Sound ROM Assembly
5341-15451-SU4	S4	Masked Sound ROM Assembly
5341-15451-SU5	S5	Masked Sound ROM Assembly
5341-15451-SU6	S6	Masked Sound ROM Assembly

A-20516-50059
WPC '95 Audio Visual PCB Assembly

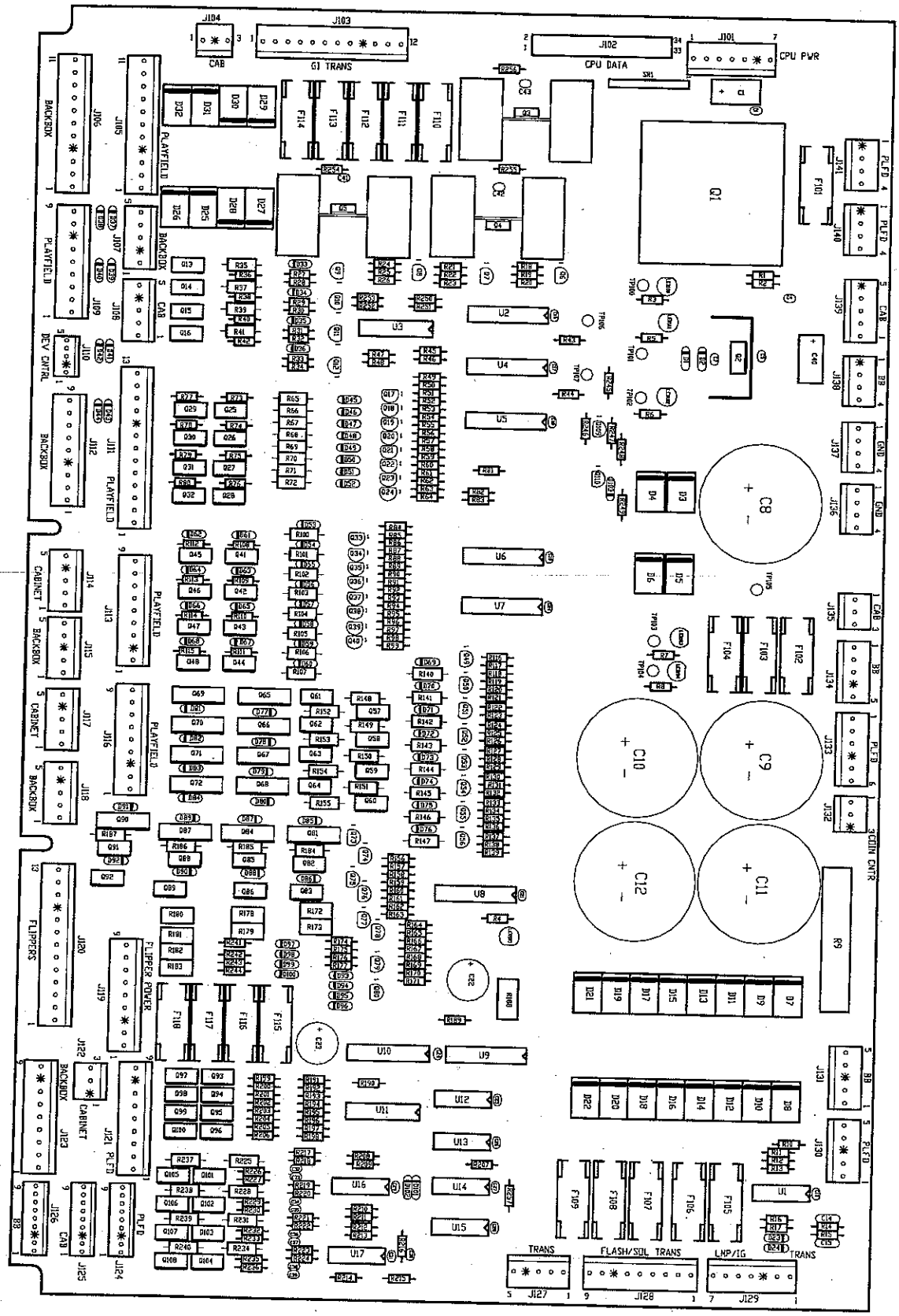


A-20028
WPC '95 Power Driver PCB Assembly

Part Number	Designator	Description
5040-14569-00	C1, C40	Capacitor, 100µF, 25v, Ax.
5043-08996-00	C2, C4, C5, C7, C13, C16-C21, C24-C39, C41-C43	Capacitor, 0.1m, 50v (±20%) Ax.
5040-13417-00	C8 - C12	Capacitor, 10000µf, 35v Radial
5048-11031-00	C14, C15	Capacitor, .001m, 50v, 10% Ax.
5040-09537-00	C22, C23	Capacitor, 100µ, 100v (±20%) Radial
5070-09054-00	D1, D2, D23, D24, D33 - D100, D103	Diode 1N4004 1.0A.
5070-14526-00	D3-D22	Diode P600G 6A 400 PIV
5070-08919-00	D101, D102	Diode, 1N4148 150mA.
5731-14531-00	F101	Fuse 5 x 20mm T.63A., 250V
5731-14530-00	F102-F105, F107, F109-F118	Fuse 5 x 20mm T 4A, 250V
5731-14046-00	F106	Fuse, 5x20mm T5.0A, 250V
5731-14529-00	F108	Fuse 5 x 20mm T6.3A, 250V
5733-14528-00	F101-F118	Fuse Holder 5 x 20mm10A
5705-14724-00	Q1	Heat Sink TO-3 5.1DEG/W
5701-09652-00	Q1	Thermal Pad TO-3
4406-01128-00	Q1	Nut 6-32 KEPS
4006-01005-06	Q1	Mach. Screw, 6-32 x 3/8"
5705-14562-00	Q2	Heat Sink 10-220 Wave Sol 287
4004-01005-06	Q2-Q5	Mach. Screw, 4-40 x 3/8"
4404-01119-00	Q2-Q5	Nut 4-40 ESN
5705-12638-00	Q3-Q5	Heat Sink 5298B
5791-10862-07	J101, J129	Connector, 7-pin Header Str.
5791-12516-00	J102	Connector, 34 Hdr 2x17
5791-10862-12	J103	Connector, 12-pin Header Str.
5791-10862-03	J104, J122, J132, J135	Connector, 3-pin Header Str.
5791-10862-11	J105, J106	Connector, 11-pin Header Str.
5791-10862-05	J107, J108, J114, J115, J117, J118, J127, J130, J131, J134, J139	Connector, 5-pin Header Str.
5791-10862-09	J109, J112, J113, J116, J119, J121, J123, J128	Connector, 9-pin Header Str.
5791-10862-13	J111, J120	Connector, 13-pin Header Str.
5791-13830-09	J124-J126	Connector, 9-pin Header Str.
5791-10862-06	J133	Connector, 6-pin Header Str.
5791-10862-04	J136-J138, J140, J141	Connector, 4-pin Header Str.
5671-14516-00	LED100-LED105	LED Dspl Red T-1
5250-14527-00	Q1	Regulator Voltage LM317K
5460-12423-00	Q2	I.C. LM7812
5131-12725-00	Q3-Q5	Triac BT138E
5194-09055-00	Q6-Q12, Q17-Q24, Q33-Q40, Q49-Q56, Q109	Transistor, MPSD52 PNP
5162-12635-00	Q13-Q16, Q25-Q32, Q41-Q48, Q57-Q64, Q82, Q83, Q85, Q86, Q88, Q89, Q91, Q92, Q101-Q108	Transistor, TIP102
5191-12179-00	Q65-Q72, Q81, Q84, Q87, Q90	Transistor, TIP36C
5190-09016-00	Q73 - Q80	Transistor, 2N4403 PNP
5192-12428-00	Q93 - Q100	Transistor, TIP107
5160-10269-00	Q110	Transistor, 2N3904
5013-14535-00	R1	Resistor, 750Ω, 1/4w, 1%
5013-14534-00	R2	Resistor, 243Ω, 1/4w, 1%
5010-09224-00	R5, R14-R17	Resistor, 270Ω, 1/4w, 1%

Part Number	Designator	Description
5010-09999-00	R3, R4, R6-R8, R43, R44, R81-R83, R190	Resistor, 2KΩ, 1/4w, 5%
5012-12632-00	R9	Resistor, .12Ω, 10w, 5%
5010-09324-00	R10	Resistor, 27KΩ, 1/4w, 5%
5010-09358-00	R11, R157, R159, R161, R163, R165, R167, R169, R171, R216-R224	Resistor, 1KΩ, 1/4w, 5%
5010-09036-00	R247	Resistor, 100Ω, 1/4w, 5%
5010-09034-00	R12, R13, R189, R208-R215, R248	Resistor, 10KΩ, 1/4w, 5%
5010-08992-00	R18, R21, R24, R192, R194, R196, R198, R200, R202, R204, R206	Resistor, 560Ω, 1/4w, 5%
5010-08991-00	R19, R22, R25, R28, R30, R32, R34, R50, R52, R54, R56, R58, R60, R62, R64, R84, R86, R88, R90, R92, R94, R96, R98, R116, R119, R122, R125,R128, R131, R134, R137,R246	Resistor, 4.7KΩ, 1/4w, 5%
5010-11079-00	R20, R23, R26, R254-R256	Resistor, 51Ω, 1/4w, 5%
5010-09416-00	R27, R29, R31, R33, R45-R49, R51, R53, R55, R57, R59, R61, R63, R85, R87, R89, R91, R93, R95, R97, R99, R117, R120, R123, R126, R129, R132, R135, R138, R156, R158, R160, R162, R164, R166, R168, R170, R245, R250-R253, R257	Resistor, 470Ω, 1/4w, 5%
5010-08993-00	R35, R37, R39, R41, R65-R72, R100-R107, R140-R147	Resistor, 68Ω, 1/4w, 5%
5010-08997-00	R36, R38, R40, R42, R73-R80, R108, R109, R110-R115, R118, R121, R124, R127, R130, R133, R136, R139	Resistor, 2.7kΩ, 1/4w, 5%
5010-09361-00	R148-R155, R184-R187	Resistor, 220Ω, 1/4w, 5%
5011-12956-00	R172, R173, R178-R183	Resistor, 2.7KΩ,1/4w, 5%
5010-10171-00	R174-R177, R241-R244	Resistor, 56Ω, 1/4w, 5%
5010-14711-00	R188	Resistor, 10KΩ, 1/4w, 5%
5010-09314-00	R191, R193, R195, R197, R199, R201, R203, R205	Resistor, 1.2kΩ, 1/4w, 5%
5010-09086-00	R207	Resistor, 6.8kΩ, 1/4w, 5%
5010-12427-00	R225, R228, R231, R234, R237-R240	Resistor, .22kΩ, 1/4w, 5%
5010-08998-00	R226, R227, R229, R230, R232, R233, R235, R236	Resistor, 2.2kΩ, 1/4w, 5%
5010-13517-00	R249	Resistor, 150Ω, 1/4w, 5%
5010-09534-00	D25-D32	Resistor, 0Ω, 0w
5019-10143-00	SRI	SIP RES 470 x 9R
5824-09248-00	TP100-TP107	Test Point #1502-1
5370-12272-00	U1, U16, U17	I.C. LM339 Quad Comp
5281-09486-00	U2, U4-U8, U10	I.C. 74LS374 8df/f
5162-12422-00	U3, U11	Trans uln 2803 Oc-drl
5281-10182-00	U9	I.C. 74LS240 I/drvr
5281-09487-00	U12 - U15	I.C. 74LS74 Dual d f/f
5791-13830-05	J110	Connector, 5-pin Header

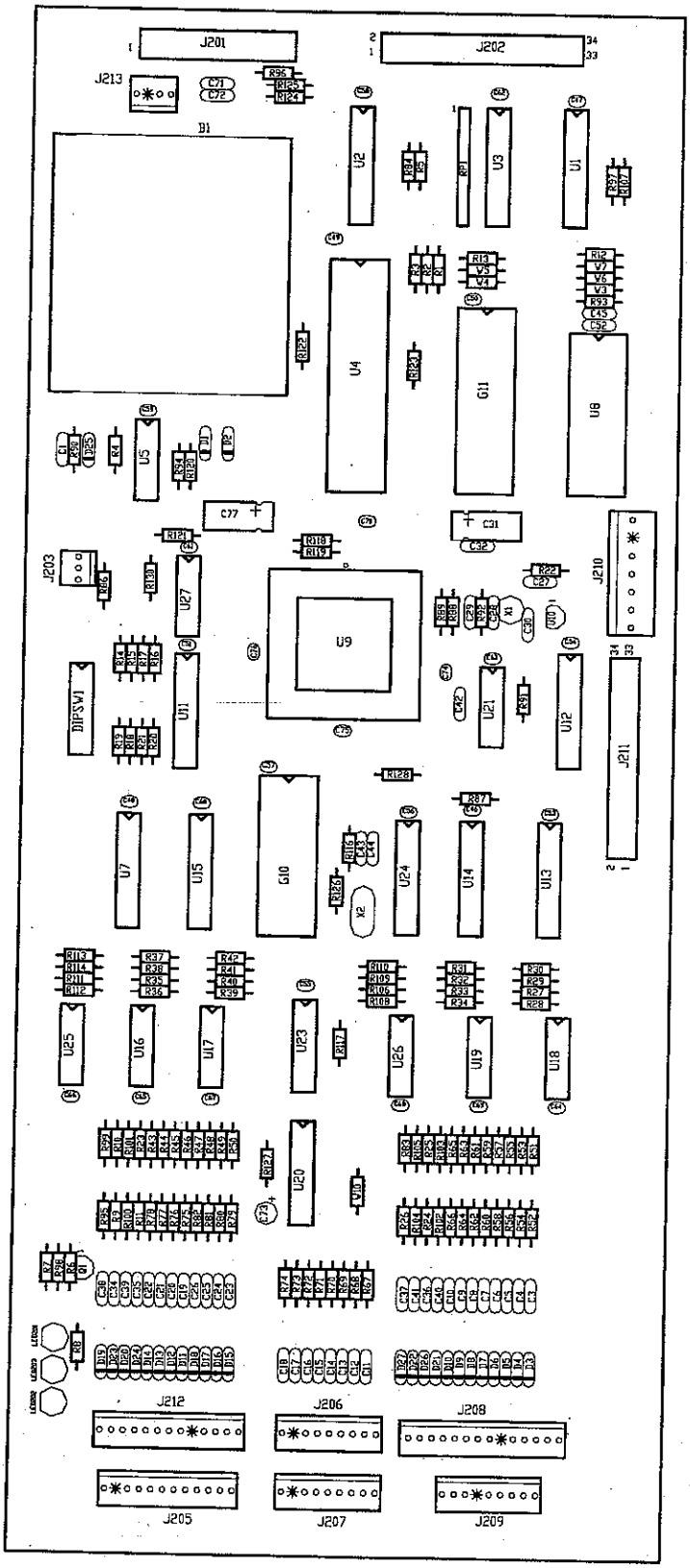
A-20028
WPC '95 Power Driver PCB Assembly



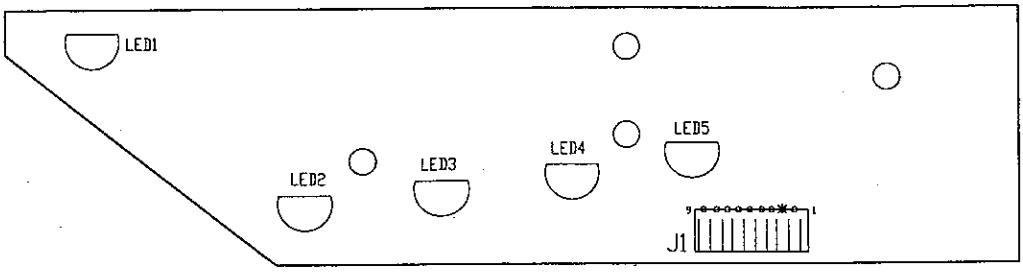
A-21377-50059
WPC '95 CPU PCB Assembly

Part Number	Designator	Description
A-15814	B1	Battery Holder
5048-11033-00	C1, C42	Capacitor, .022m, 50v, 10% Axial
5048-11030-00	C3-C26, C34-C41	Capacitor, 470p, 50v, Axial
5043-09030-00	C27	Capacitor, .047m, 50v (±20%) Axial
5048-13375-00	C28	Capacitor, 100p, 50v (10%) Axial
5048-11028-00	C29, C30, C43, C44	Capacitor, 22p, 50v Axial
5040-14569-00	C31, C77	Capacitor, 100mf, 25v Axial
5048-11031-00	C32	Capacitor, .001m, 50v, 10% Axial
5043-08996-00	C45-C70, C74-C76	Capacitor, 0.1m, 50v (±20%) Axial
5040-13098-00	C73	Capacitor, 4.7µF, @35v (±20%)
5645-09025-00	DIPSW1	Switch Dip 8 Pos
5070-09266-00	D1, D25	Diode 1N5817 1.0A.
5070-08919-00	D2-D24, D26, D27	Diode 1N4148 150ma
5700-10176-00	G10A	Socket Dip 28.6
5700-12088-00	G11	Socket Dip 32.6p"
5700-08985-00	U4	Socket I C 40Pl N .6
5700-12424-00	U9	socket 84 Pl N PL CC
5700-10389-00	U20	Socket I C 18 PIN 3"
5791-10850-00	J201	26H STR Sq. .100
5791-12516-00	J211, J202	34 HDR 2x17 .100
5791-13830-12	J205	12H STR Sq. Pin .100 Solid Tab
5791-13830-09	J206, J207, J209	9H STR Sq. Pin .100 Solid Tab
5791-13830-14	J208	14H STR Sq. Pin .100 Solid Tab
5791-10862-07	J210	7H STR Sq. Pin .156
5791-13830-13	J212	13H STR Sq. Pin .100 Solid Tab
5671-14516-00	LED201, LED202, LED203	LED DSPL RED T-1 3/4
5160-10269-00	Q1	Trans 2N3904 NPN
5019-09669-00	RP1	SIP 1K 9R 10 5%
5010-09358-00	R1, R2, R3, R4, R9, R10, R11, R23, R24, R25, R26, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R93, R95, R96, R97, R99, R100, R101, R102, R103, R104, R105, R106 R107, R108, R109, R110, R111, R112, R113, R114, R117	Resistor, 1KΩ, 1/4w, 5%
5010-09416-00	R5, R6, R7, R8, R12, R13, R87, R88, R89	Resistor, 470Ω, 1/4w, 5%
5010-09034-00	R14, R15, R16, R17, R18, R19, R20, R21, R22, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R86, R90, R94, R98	Resistor, 10KΩ, 1/4w, 5%
5010-12104-00	R91	Resistor, 22M, 1/4w, 5%
5010-10989-00	R92	Resistor, 470KΩ, 1/4w, 5%
5010-09187-00	R118, R119, R120, R121, R122 R123, R128, R130	Resistor, 150Ω, 1/4w, 5%
5010-09534-00	W3, W4, W7, R124, R125	Resistor, 0Ω, 0w
5010-10258-00	R126	Resistor, 1M, 1/4w, 5%
5010-09040-00	R127	Resistor, 33Ω, 1/4w, 5%
5281-09867-00	U1, U2	I C 74LS244 OCT BUF
5281-09308-00	U3	I C 74LS245 TRNC
5281-09851-00	U5	I C 74LS14 SMT/TRG
5315-12031-00	U7	I C 74HCT244
5340-12558-00	U8	IC RAM 8K x8 Static Cmos 100ns
5370-12687-00	U10	I C MC 34064 Reset CHP
5281-10182-00	U11, U12, U13, U15	I C 74LS240 L/DRVR
5311-14068-00	U14, U24	I C 74HC574 OCTAL D-Latch
5370-12272-00	U16, U17, U18, U19, U25, U26	I C LM339 Quad Comp
5284-12651-00	U21	I C 4584 Hex Schmtt
5311-14554-00	U23	U I C 74HC237 3 to 8 NON I NV DE
5281-09247-00	U27	I C 74LS02 Quad Nor
5520-12084-00	X1	Crystal 32. 768 KHZ
5520-14761-00	X2	XTL 8MHz Anti-Res Parallel Cut
A-5400-50059-1	G10	PIC16C57 Assembly
A-5343-50059-1	G11	Game ROM Assembly
5880-09022-00	B1	Battery 1.5v, AA Alk.
5400-10320-00	U4	IC MPU 68B09E
5410-12426-00	U9	IC WPC-89 ASIC
5162-12422-00	U20	Trans Uln 2803 Oc-Drl

A-21377-50059
WPC '95 CPU PCB Assembly

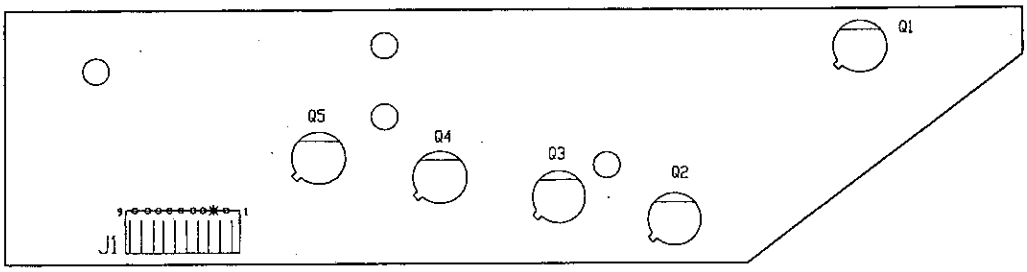


A-18617-1
Trough IR LED PCB Assembly



Part Number	Designator	Description
5671-12731-00	LED1 - LED5	Infra Red Diode
5791-12622-09	J1	Connector, 9-pin Header Sq.

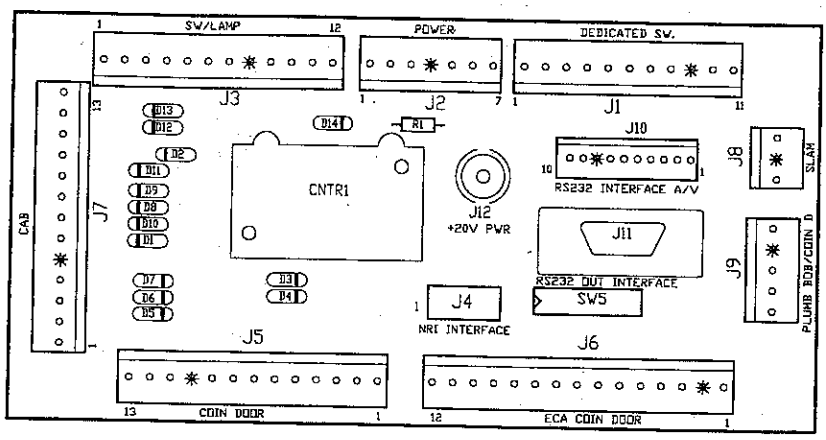
A-18618-1
Trough IR Photo Transistor PCB Assembly



Part Number	Designator	Description
5163-14114-00	Q1 - Q5	Infra Red Photo Transistor
5791-12622-09	J1	Connector, 9-pin Header Sq.

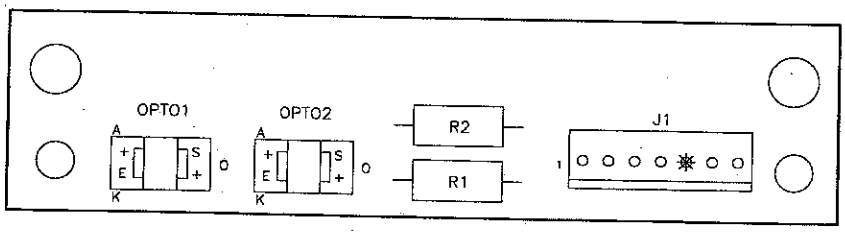
A-20580
Coin Interface PCB Assembly

(This board does not contain optional items such as the coin counter and printer interface.)



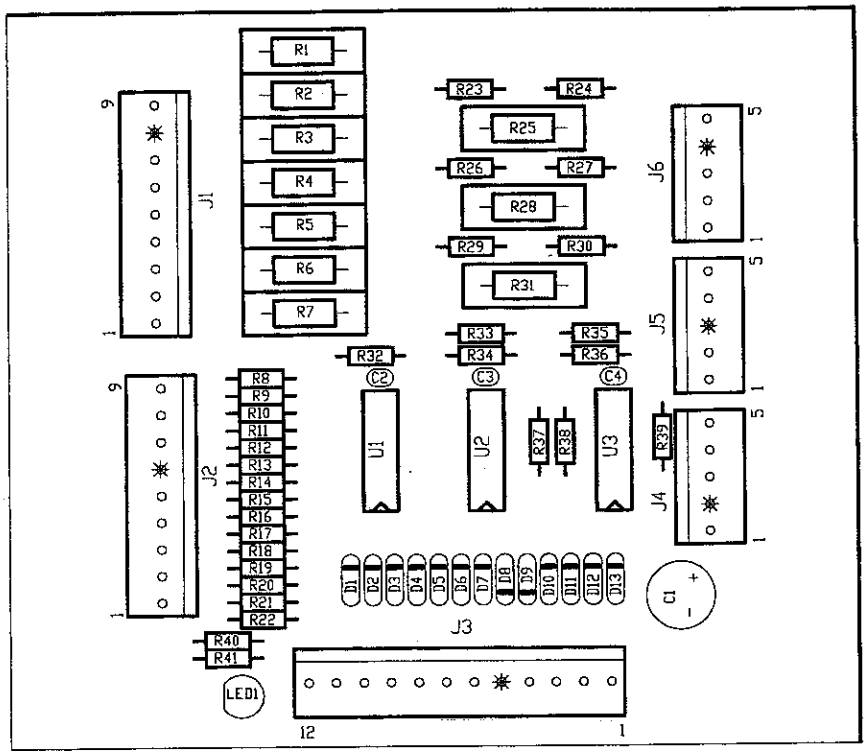
Part Number	Designator	Description
5070-09054-00	D1-D14	Diode 1N4004 1.0A.
5791-10862-11	J1	Connector, 11-pin Header Str. Sq.
5791-10862-07	J2	Connector, 7-pin Header Str. Sq.
5791-10862-12	J3	Connector, 12-pin Header Str. Sq.
5791-11000-10	J4	Connector, 10-pin Header Str. Sq.
5791-10862-13	J5, J7	Connector, 13-pin Header Str. Sq.
5791-10862-15	J6	Connector, 15-pin Header Str. Sq.
5791-10862-03	J8	Connector, 3-pin Header Str. Sq.
5791-10862-05	J9	Connector, 5-pin Header Str. Sq.
5791-12462-10	J10	Connector, 10-pin Header Str. Sq.
5010-13517-00	R1	Resistor, 15Ω, ¼w, 5%
5645-09025-00	SW5	Switch DIP 8 Pos.

A-17316
Flipper Opto PCB Assembly



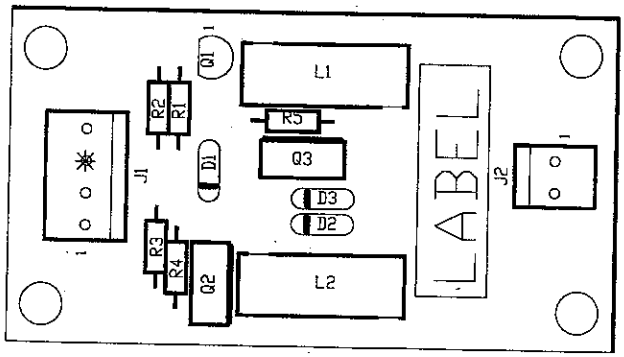
Part Number	Designator	Description
A-20207.1	-	Flipper Opto Switch PCB
5010-09061-00	R1, R2	Resistor, 680Ω, 1/2w, 5%
5490-14575-00	OPTO1, OPTO2	IC Opto Integ Schmitt 10mA.
5791-13830-07	J1	Connector, 7-pin Header Solid Sq.
03-9001.1	-	Interrupter Flip-Opto
01-14348	-	Spring Flipper Switch

A-20246
10-Opto PCB Assembly w/Bracket



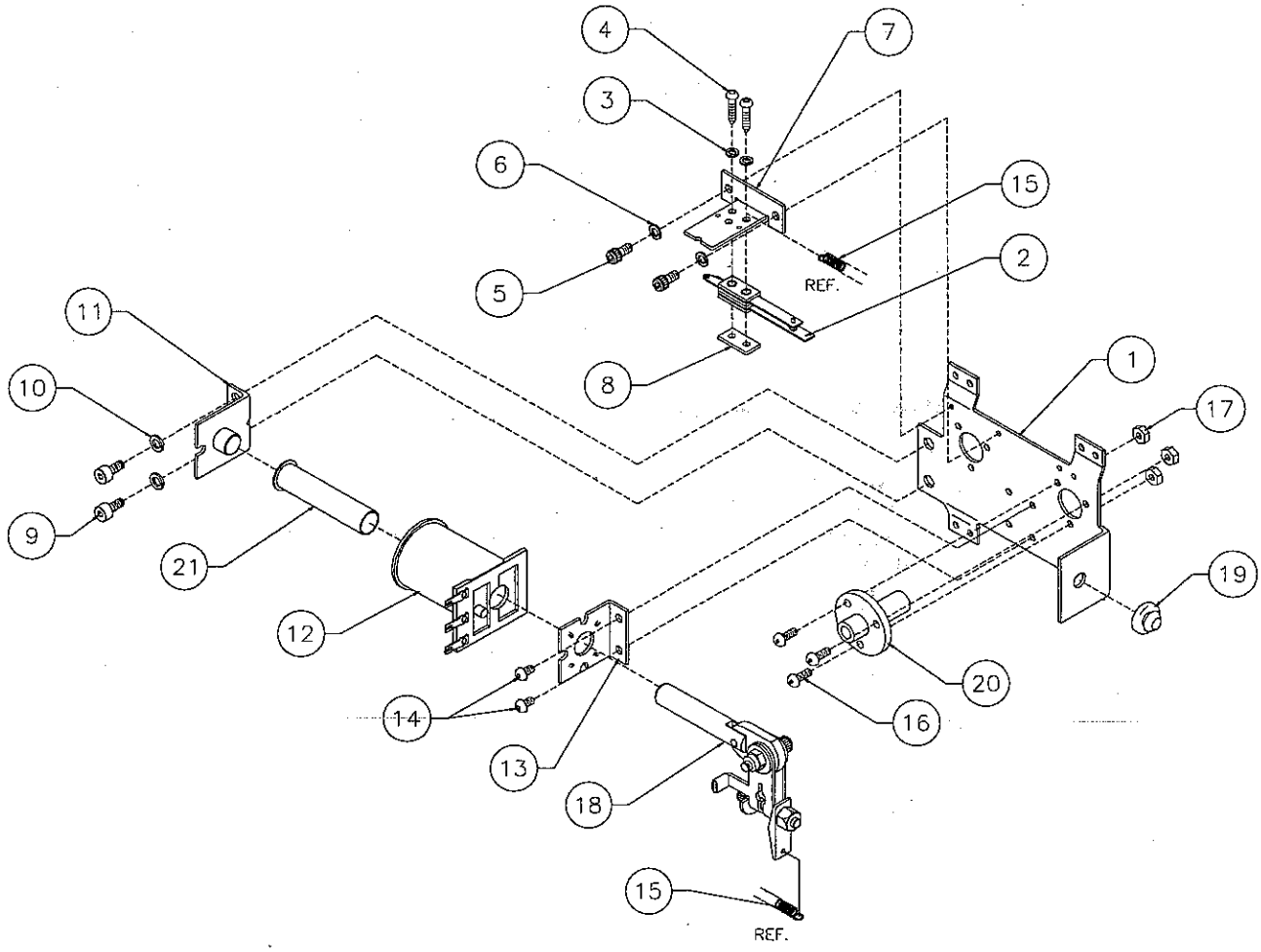
Part Number	Designator	Description
A-18159.1	-	10-opto PCB Assembly
5040-10974-00	C1	Capacitor, 100M, 35v Radial
5043-08996-00	C2-C4	Capacitor, 0.1M, 50v ±20% Ax.
5070-09054-00	D1-D13	Diode 1N4004, 1.0A.
5791-10862-09	J1, J2	Connector, 9-pin Header
5791-10862-12	J3	Connector, 12-pin Header
5791-10862-05	J4-J6	Connector, 5-pin Header
5671-14516-00	LED1	LED Dspl Red T-1 ¾
5010-12928-00	R1-R7, R28, R31, R50	Resistor, 270Ω, 2w, 5%
5010-09999-00	R8-R24, R26, R27, R29, R30	Resistor, 2KΩ, 1/4w, 5%
5010-09162-00	R32, R35, R39-R41	Resistor, 100KΩ, 1/4w, 5%
5010-08774-00	R33, R34, R36-R38	Resistor, 22KΩ, 1/4w, 5%
5370-12272-00	U1-U3	IC LM339 Quad Comp
01-10756	-	PCB Mounting Bracket
07-6688-18N	-	Rivet: 1/8 x 3/16"

A-21708-1
Motor Driver w/EMI Assembly



Part Number	Designator	Description
5070-09054-00	D1-D3	Diode 1N4004, 1.0A.
5010-09416-00	R1	Resistor, 470Ω, ¼w
5010-08991-00	R2	Resistor, 4.7KΩ, ¼w
5010-08993-00	R3	Resistor, 68Ω, ¼w
5010-08997-00	R4	Resistor, 2.7KΩ, ¼w
5010-08998-00	R5	Resistor, 2.2KΩ, ¼w
5551-09822-00	L1, L2	Ind. 4.7µH, 3A
5194-09055-00	Q1	Trans. MPSD52 PNP
5162-12635-00	Q2, Q3	Trans. TIP102
5791-10862-04	J1	Connector, 4-pin Header
5791-10862-02	J2	Connector, 2-pin Header

A-15849-L-2
Flipper Assembly



Item	Part Number	Description
1	B-13104-L	Flipper Base Assembly, Left
2	SW-1A-194	Switch Assembly
3	4701-00002-00	Lock Washer #6 Split
4	4105-01019-10	Sh. Metal Screw, #5 x 5/8"
5	4008-01079-05	Mach. Screw, 8-32 x 5/16"
6	4701-00003-00	Lock Washer #8 Split
7	01-9375	Switch Mounting Bracket
8	20-6516	Speednut, Tinnerman
9	4010-01066-06	Cap Screw, 10-32 x 3/8"
10	4701-00004-00	Lock Washer #10 Split
11	A-12390	Flipper Stop Assembly
12	FL-11629	Flipper Coil, Blue
13	01-7695-1	Solenoid Bracket
14	4006-01017-04	Mach. Screw, 6-32 x 1/4"
15	10-364	Spring
16	4006-01005-06	Mach. Screw, 6-32 x 3/8"
17	4406-01117-00	Nut 6-32 Hex.

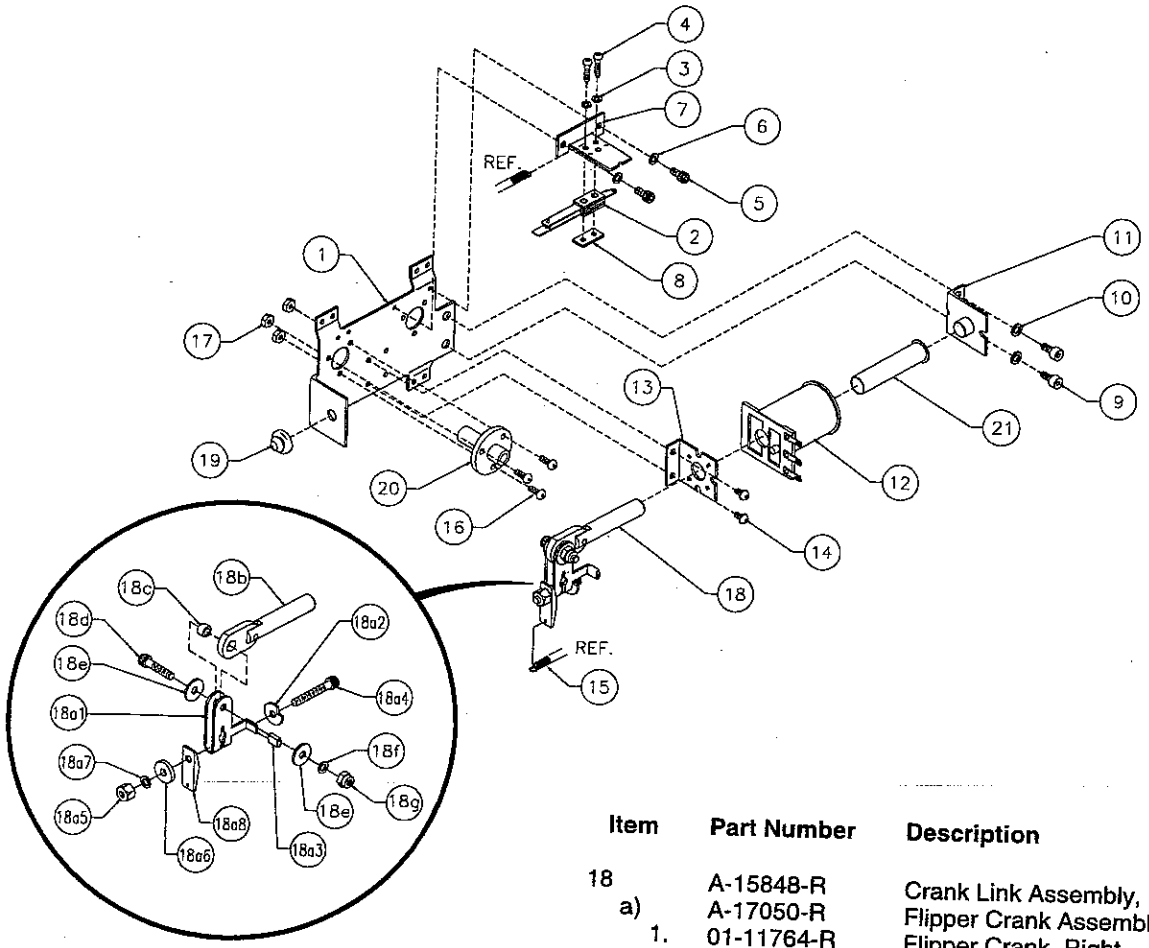
Item	Part Number	Description
*18	A-15848-L	Crank Link Assembly, Left
a)	A-17050-L	Flipper Crank Assembly, Left
b)	A-15847	Flipper Link Assembly
c)	02-4676	Link Spacer Bushing
d)	4010-01086-14	Cap Screw, 10-32 x 7/8"
e)	4700-00023-00	Flat Washer, 5/8 x 13/64 x 16ga.
f)	4701-00004-00	Lock Washer #10 Split
g)	4410-01132-00	Nut 10-32 ESN
19	23-6577	Bumper Plug, 5/8"
20	03-7568	Flipper Bushing
21	03-7066-5	Coil Tubing

Associated Parts:
(Not Shown)

23-6695	Flipper Ring
20-10110-5	Flipper Bat w/Shaft

* *See page 2-15 for assembly detail drawing.*

A-15849-R-2
Flipper Assembly



Item	Part Number	Description
1	B-13104-R	Flipper Base Assembly, Right
2	SW-1A-194	Switch Assembly
3	4701-00002-00	Lock Washer #6 Split
4	4105-01019-10	Sh. Metal Screw, #5 x 5/8"
5	4008-01079-05	Mach. Screw, 8-32 x 5/16"
6	4701-00003-00	Lock Washer #8 Split
7	01-9375	Switch Mounting Bracket
8	20-6516	Speednut, Tinnerman
9	4010-01066-06	Cap Screw, 10-32 x 3/8"
10	4701-00004-00	Lock Washer #10 Split
11	A-12390	Flipper Stop Assembly
12	FL-11629	Flipper Coil, Blue
13	01-7695-1	Solenoid Bracket
14	4006-01017-04	Mach. Screw, 6-32 x 1/4"
15	10-364	Spring
16	4006-01005-06	Mach. Screw, 6-32 x 3/8"
17	4406-01117-00	Nut 6-32 Hex.

Item	Part Number	Description
18	A-15848-R	Crank Link Assembly, Right
a)	A-17050-R	Flipper Crank Assembly, Right
1.	01-11764-R	Flipper Crank, Right
2.	4700-00107-01	Mod Crank Washer
3.	RM-23-06	H.S. Tubing, ¼"
4.	4010-01066-20	MS, 10-32 x 1-1/4"
5.	4410-01127-00	Nut, 10-32 Hex.
6.	4700-00107-00	FW, 13/64 x 5/8 x 12ga.
7.	4701-00004-00	Lockwasher #10 Split
8.	01-9376	Spring Retainer Bracket
b)	A-15847	Flipper Link Assembly
c)	02-4676	Link Spacer Bushing
d)	4010-01086-14	Cap Screw, 10-32 x 7/8"
e)	4700-00023-00	Flat Washer, 5/8 x 13/64 x 16ga.
f)	4701-00004-00	Lock Washer #10 Split
g)	4410-01132-00	Nut 10-32 ESN
19	23-6577	Bumper Plug, 5/8"
20	03-7568	Flipper Bushing
21	03-7066-5	Coil Tubing

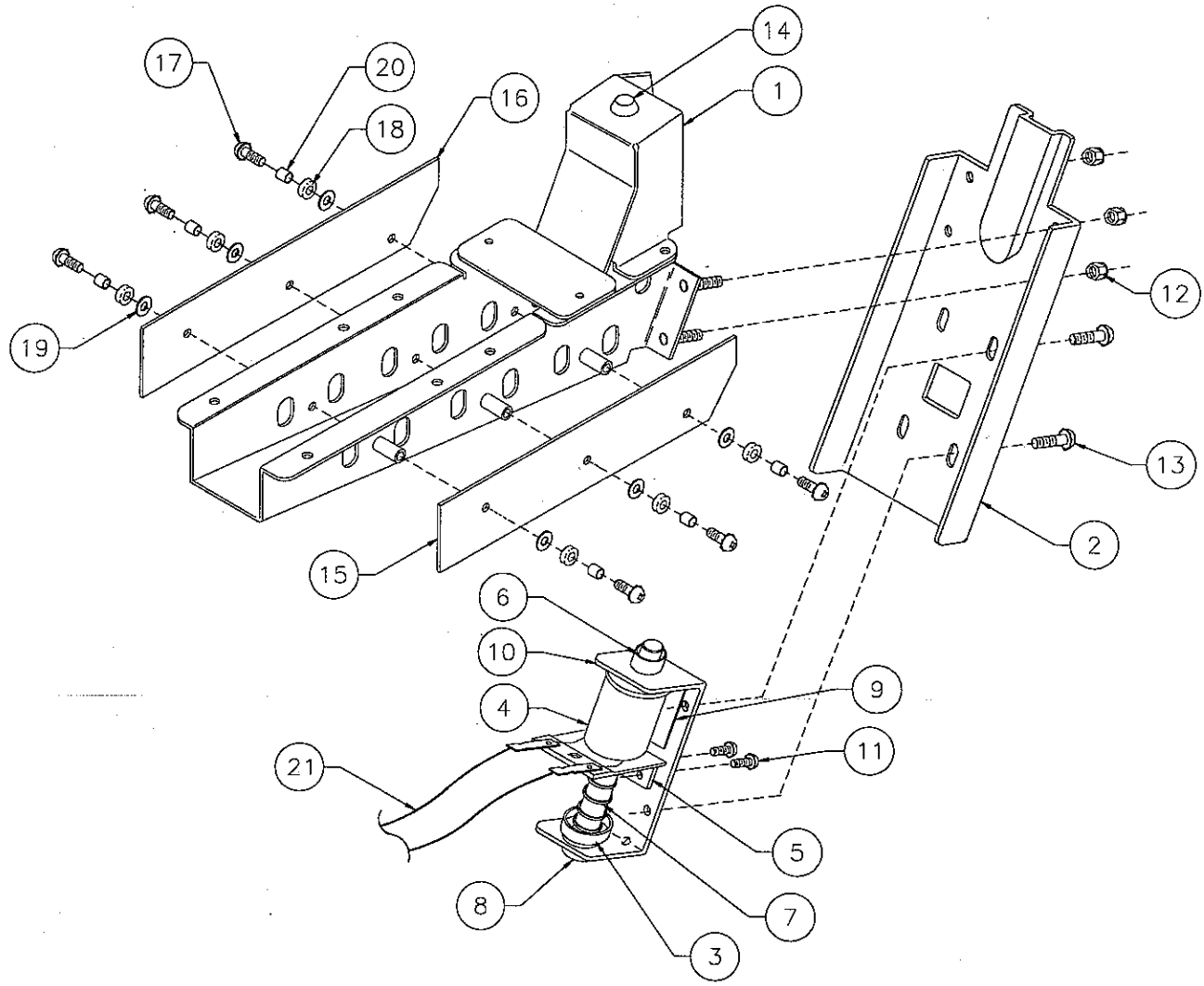
Associated Parts:
(Not Shown)

23-6695	Flipper Ring
20-10110-5	Flipper Bat w/Shaft

Flipper Notes...

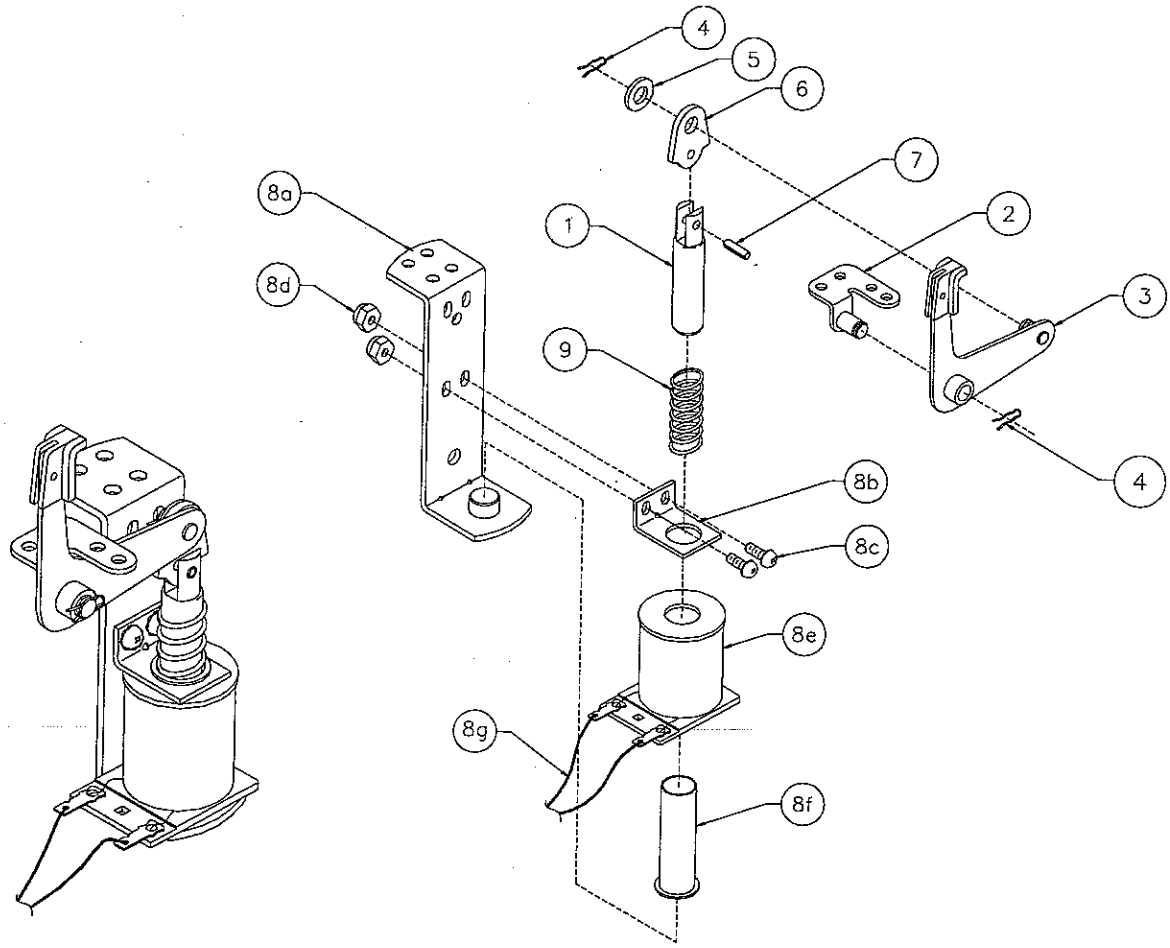
1. *Each Flipper Assembly is mounted beneath the playfield, in conjunction with the Plastic Flipper & Shaft, and Flipper Rubber on the upper side of the playfield.*
2. *With the flipper, in the non-activated position, the E.O.S. Switch contacts must have a gap of .062 (±.015) inch. When flipper is activated switch must close.*
3. *Any adjustment of the E.O.S. switch must be made at a minimum distance of 0.25 inch from the switch body.*
4. *Longer blade of E.O.S. switch must be made straight. Gap adjustment is done by adjusting shorter blade.*
5. *All moving elements of the assembly must operate freely without any evidence of binding.*
6. *Apply Loctite™ 245 when reattaching screws to the Flipper Stop Assembly, the Solenoid Bracket, and the Flipper Bushing.*

A-19963-1
Ball Trough Assembly Complete



Item	Part Number	Description	Item	Part Number	Description
1	A-16809-2	Ball Trough Welded Assy.	12	4408-01119-00	Nut 8-32 ESN
2	01-11587	Ball Trough Front	13	4008-01017-06	Mach. Screw, 8-32 x 3/8"
3	A-6306-2	Bell Armature Assembly	14	23-6702	Bumper Plug
4	AE-26-1500	Coil Assembly	15	A-18617-1	Trough IRED LED PCB Assembly
5	01-8-508-T	Solenoid Assembly	16	A-18618-1	Trough IRED Transistor PCB Assy.
6	03-7067-5	Coil Tubing	17	4006-01003-10	Mach. Screw, 6-32 x 5/8" SEMS
7	10-135	Spring	18	23-6626	Rubber Grommet
8	23-6420	Rubber Grommet	19	4700-00004-00	Flat Washer, 9/64 x 7/16 x 21ga.
9	03-8523	Insulator	20	02-4975	Bushing
10	01-11586	Coil Mounting Bracket	21	H-19523	Mini Solenoid Cable
11	4008-01017-05	Mach. Screw, 8-32 x 5/16"			

A-17811
Kicker Arm (Slingshot) Assembly

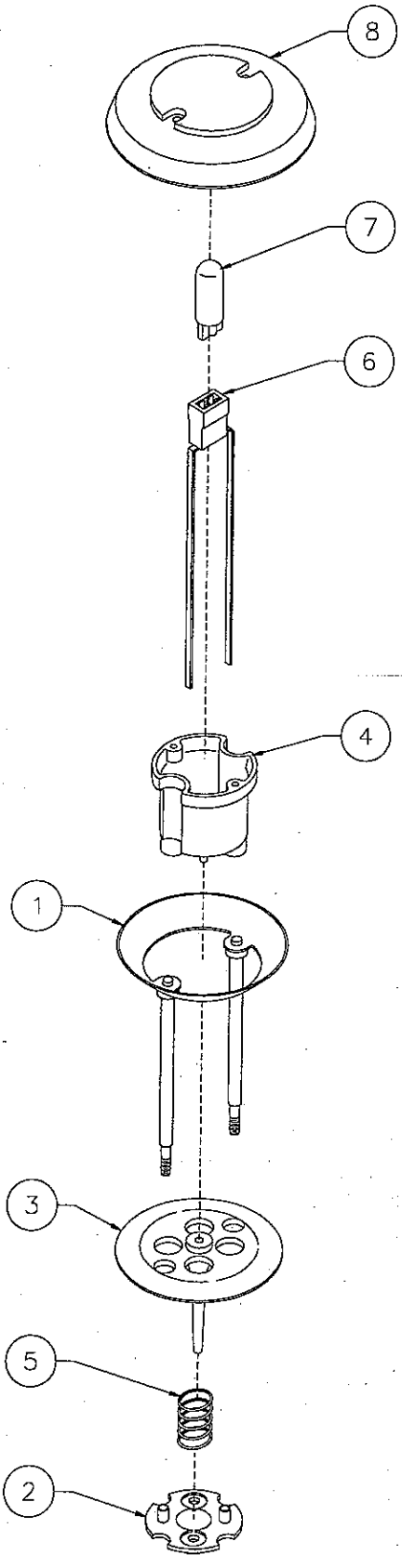


Item	Part Number	Description
1	02-2364	Coil Plunger
2	A-17810	Mounting Bracket Assembly
3	A-12664	Kicker Crank Assembly
4	12-6227	Hairpin Clip
5	4700-00030-00	FW, 17/64 x 1/2 x 15ga.
6	03-8085	Armature Link
7	20-8716-5	Roll Pin, 1/8 x 7/16"

Associated Parts for Right & Left Kickers:

Item	Part Number	Description
8	**B-9362-R-3**	**Coil & Bracket Assembly, Right**
	B-9362-L-2	**Coil & Bracket Assembly, Left**
a)	A-17808	Bracket & Stop Assembly
b)	01-8-508-S	Coil Retaining Bracket
c)	4006-01017-06	Mach. Screw, 6-32 x 3/8"
d)	4406-01119-00	Nut, 6-32 ESN
e)	AE-26-1200	Coil Assembly
f)	03-7066	Coil Tubing
g)	H-19523	Mini Solenoid Cable
9	10-128	Spring

B-9414-6
Jet Bumper Assembly

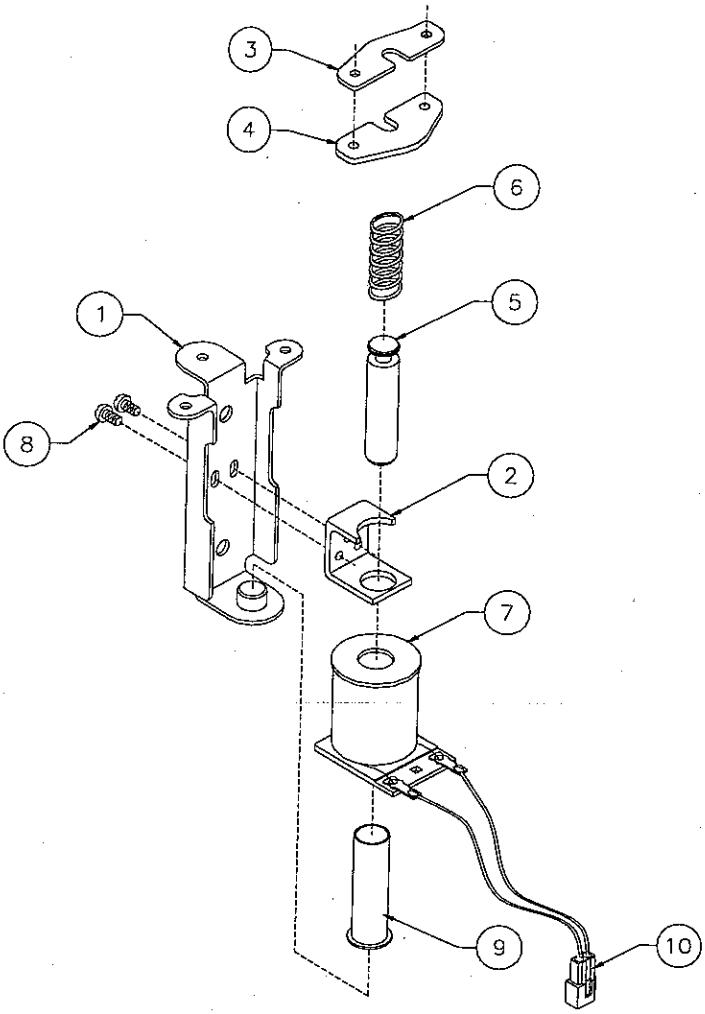


Item	Part Number	Description
1	A-4754	Bumper Ring Assembly
2	03-6009-A5	Bumper Base, White
3	03-6035-7	Bumper Wafer, Black
4	03-7443-5	Bumper Body, White
5	10-7	Spring
6	24-8776	Socket-Wedge Base
7	24-8768	Bulb #555(6.5v., 0.25A.)

Associated Parts:

8	03-8254-18	Jet Bumper Cap (2)
	03-9831	Jet Bumper Cap, Modified (1)

A-9415-2
Jet Bumper Coil Assembly



Item	Part Number	Description
1	04-10888	Bracket & Stop Assembly
2	01-1747	Coil Retaining Bracket
3	01-5492	Armature Link, Steel
4	01-5493	Armature Link, Bakeline
5	02-3406-1	Coil Plunger
6	10-326	Armature Spring
7	AE-26-1200	Coil Assembly
8	4006-01017-04	Mach. Screw, 6-32 x 1/4"
9	03-7066	Coil Tubing
10	H-19523	Cable

Associated Parts:
(Not Shown)

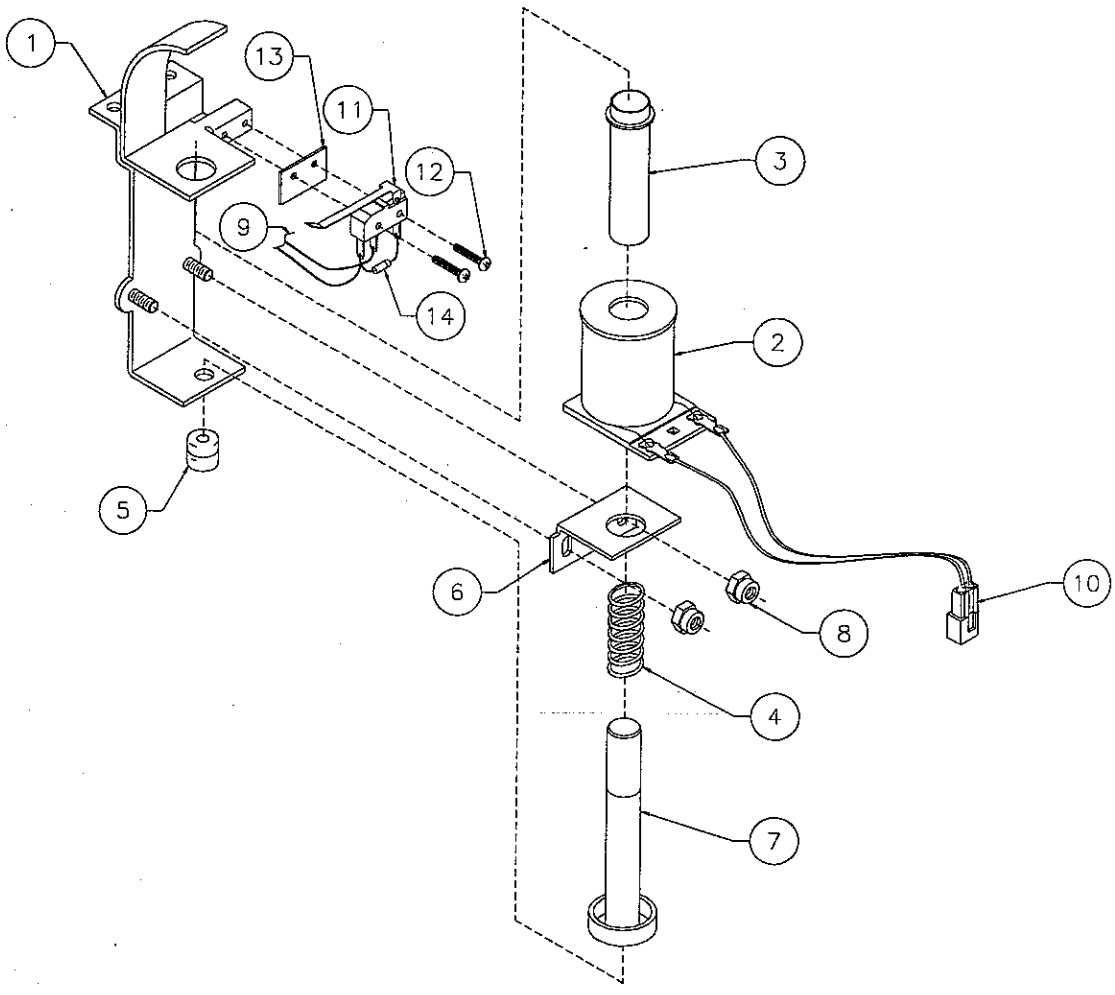
11	B-12030-2	Leaf Switch Assembly
a)	A-16443	Switch & Diode Assembly
b)	01-1168	Switch Mounting Bracket
c)	01-3670	Switch Plate
d)	03-7395	Switch Actuator
e)	4005-01003-12	Mach. Screw, 5-40 x 3/4"
f)	4405-01117-00	Nut 5-40 Hex.

A-9415-3
Jet Bumper Coil Assembly

(Same as **A-9415-2** except for the following item):

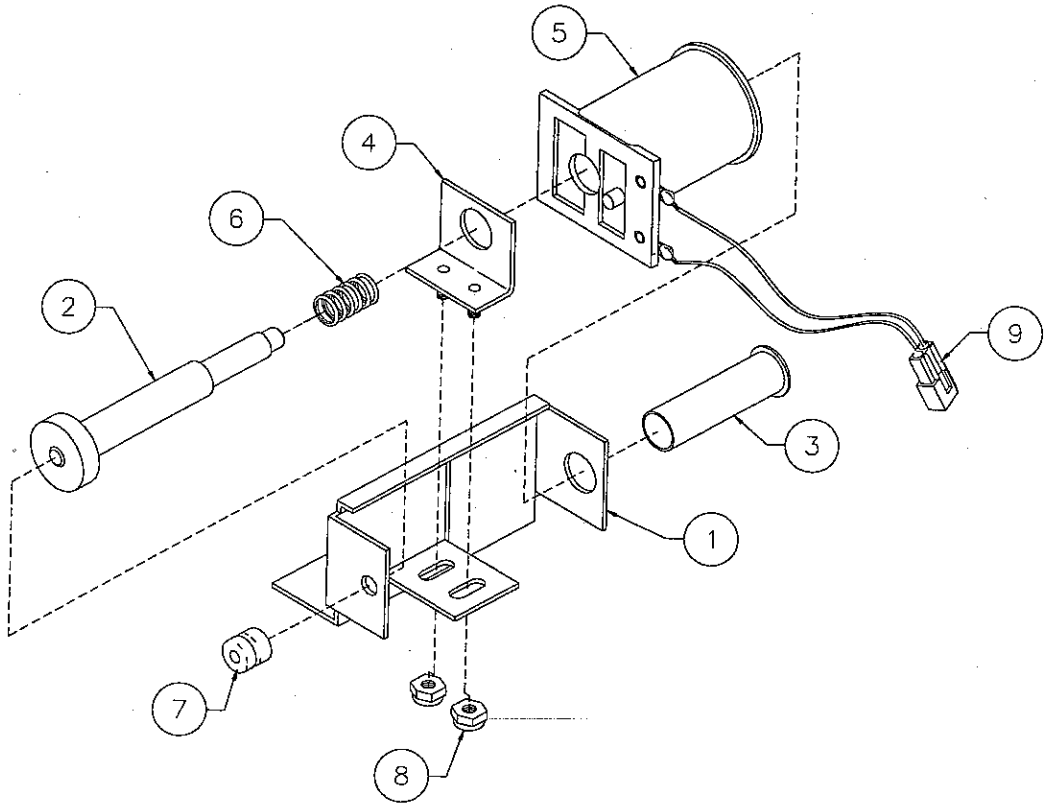
Item	Part Number	Description
10	H-19523-1	Cable

A-21970
Popper Assembly (Right)



Item	Part Number	Description
1	04-10948.1	Popper Bracket
2	AE-27-1200	Coil Assembly
3	03-7067	Coil Tubing
4	10-135	Solenoid Spring
5	23-6420	Rubber Grommet
6	01-9784	Coil Bracket
7	A-17767	Bell Armature Assembly
8	4408-01119-00	Nut #8-32 ESN
9	H-16437	Switch Cable
10	H-19523	Mini Coil Switch Cable
11	5647-12693-43	Micro Switch
12	4002-01105-08	Mach. Screw: 2-56 x ½"
13	01-8600	Switch Insulator
14	5070-09054-00	Diode 1N4004

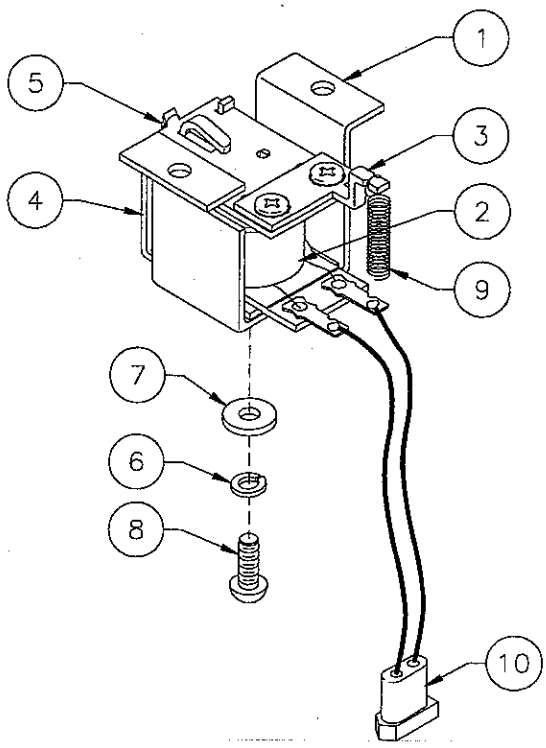
A-21553-1
Auto-Fire Assembly



Item	Part Number	Description
1	01-14618	Bracket Assembly
2	A-6306-2	Plunger Assembly
3	03-7067	Coil Tubing
4	04-10322-2	Coil Bracket
5	AE-23-800	Coil Sub-Assembly
6	10-135	Spring
7	23-6420	Rubber Grommet
8	4408-01119-00	Nut 8-32 ESN
9	H-19523	Mini Solenoid Cable

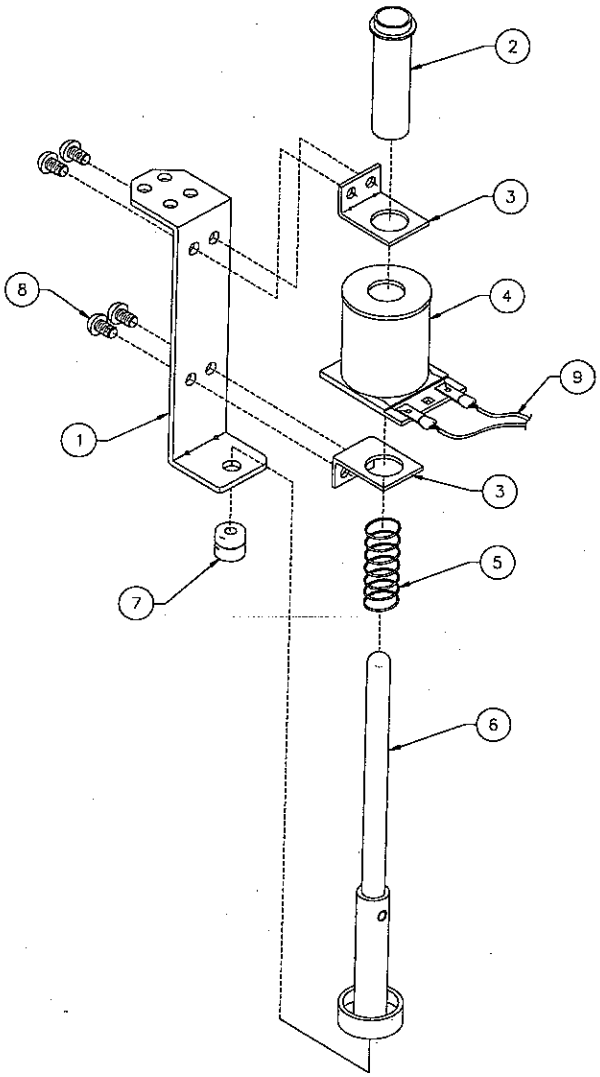
A-17796-1
Ball Gate Actuator Assembly

Item	Part Number	Description
1	01-12348	Ball Gate Coil Bracket
2	A-14406	Coil Assembly
3	A-11146	Armature Assembly
4	A-6892	Frame & Eyelet Assy.
5	10-120	Spring
6	4701-00003-00	Lockwasher #18 Split
7	4700-00089-00	Flat Washer: 11/64 x 7/16 x 16ga.
8	4008-01021-07	Mach. Screw, 8-32 x 7/16"
9	10-194	Extension Spring
10	H-19523-1	Cable



A-21712-2
Up Down Post Assembly

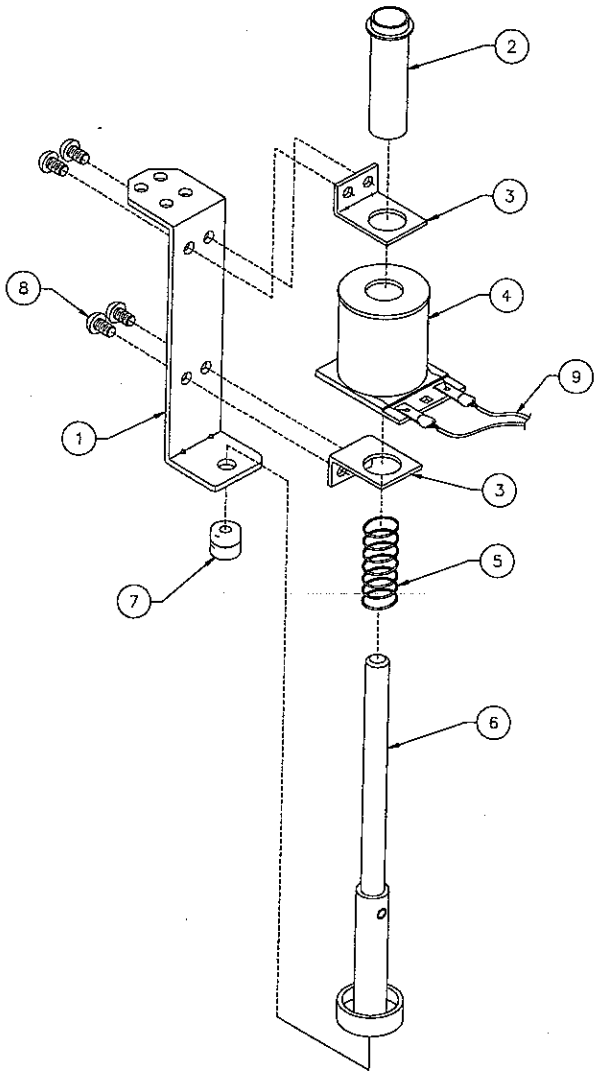
*This assembly is used in games produced **before July 21, 1997.***



Item	Part Number	Description
1	01-12441	Diverter Post Bracket
2	03-7067-5	Coil Tubing
3	01-8-508-T	Coil Retainer Bracket
4	AE-27-1200	Coil Assembly
5	10-135	Spring
6	04-10772	Armature Assembly, Tower
7	23-6420	Rubber Grommet
8	4008-01017-04	Mach. Screw, 8-32 x ¼"
9	H-19523	Mini Solenoid Cable

A-21712-5
Up Down Post Assembly

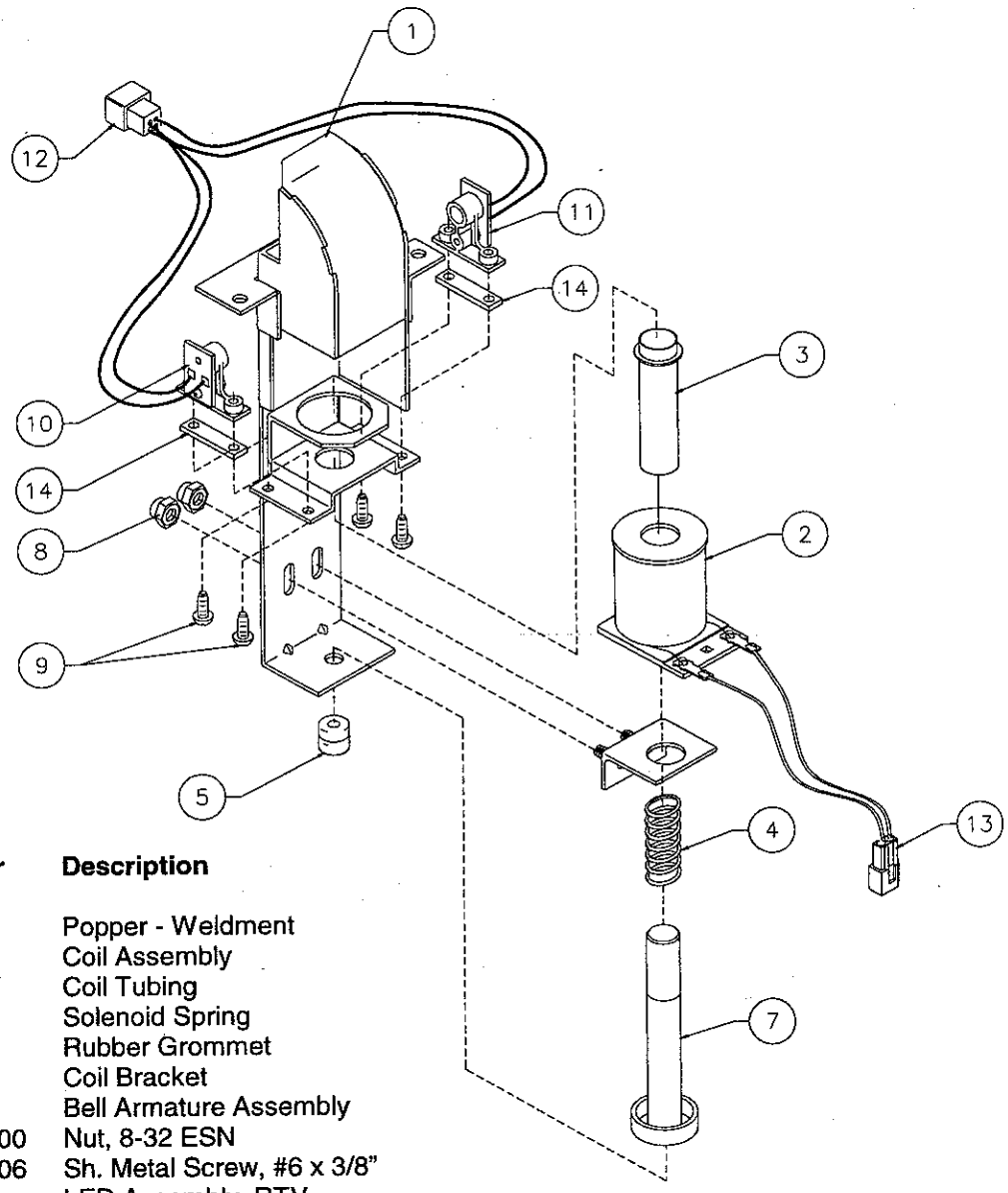
*This assembly is used in games produced **after July 21, 1997.***



Item	Part Number	Description
1	01-12441	Diverter Post Bracket
2	03-7067-5	Coil Tubing
3	01-8-508-T	Coil Retainer Bracket
4	AE-27-1200	Coil Assembly
5	10-135	Spring
6	04-10996	Armature Assembly, Tower
7	23-6420	Rubber Grommet
8	4008-01017-04	Mach. Screw, 8-32 x ¼"
9	H-19523	Mini Solenoid Cable

A-21733
Popper Assembly

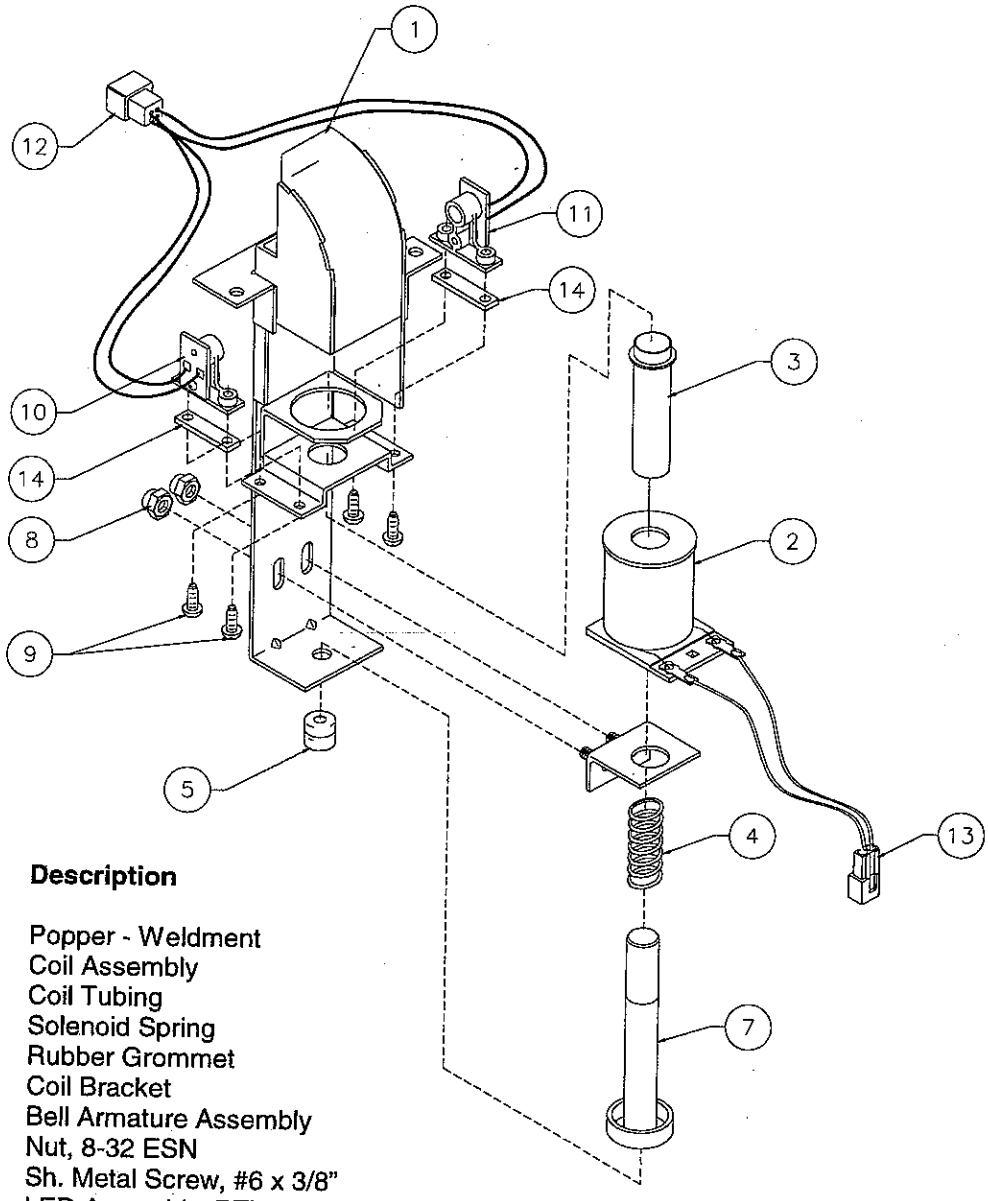
This assembly is used in games produced ***before July 21, 1997.***



Item	Part Number	Description
1	04-10745.2	Popper - Weldment
2	AE-26-1200	Coil Assembly
3	03-7067	Coil Tubing
4	10-135	Solenoid Spring
5	23-6420	Rubber Grommet
6	04-10322-2	Coil Bracket
7	A-17767	Bell Armature Assembly
8	4408-01119-00	Nut, 8-32 ESN
9	4106-01013-06	Sh. Metal Screw, #6 x 3/8"
10	A-16908	LED Assembly, RTV
11	A-16909	Photo Trans. Assembly, RTV
12	H-17609-5	Gen. Opto Cable
13	H-19523	Cable Assembly
14	03-9832	Playfield Plastic Spacer

A-22027
Popper Assembly

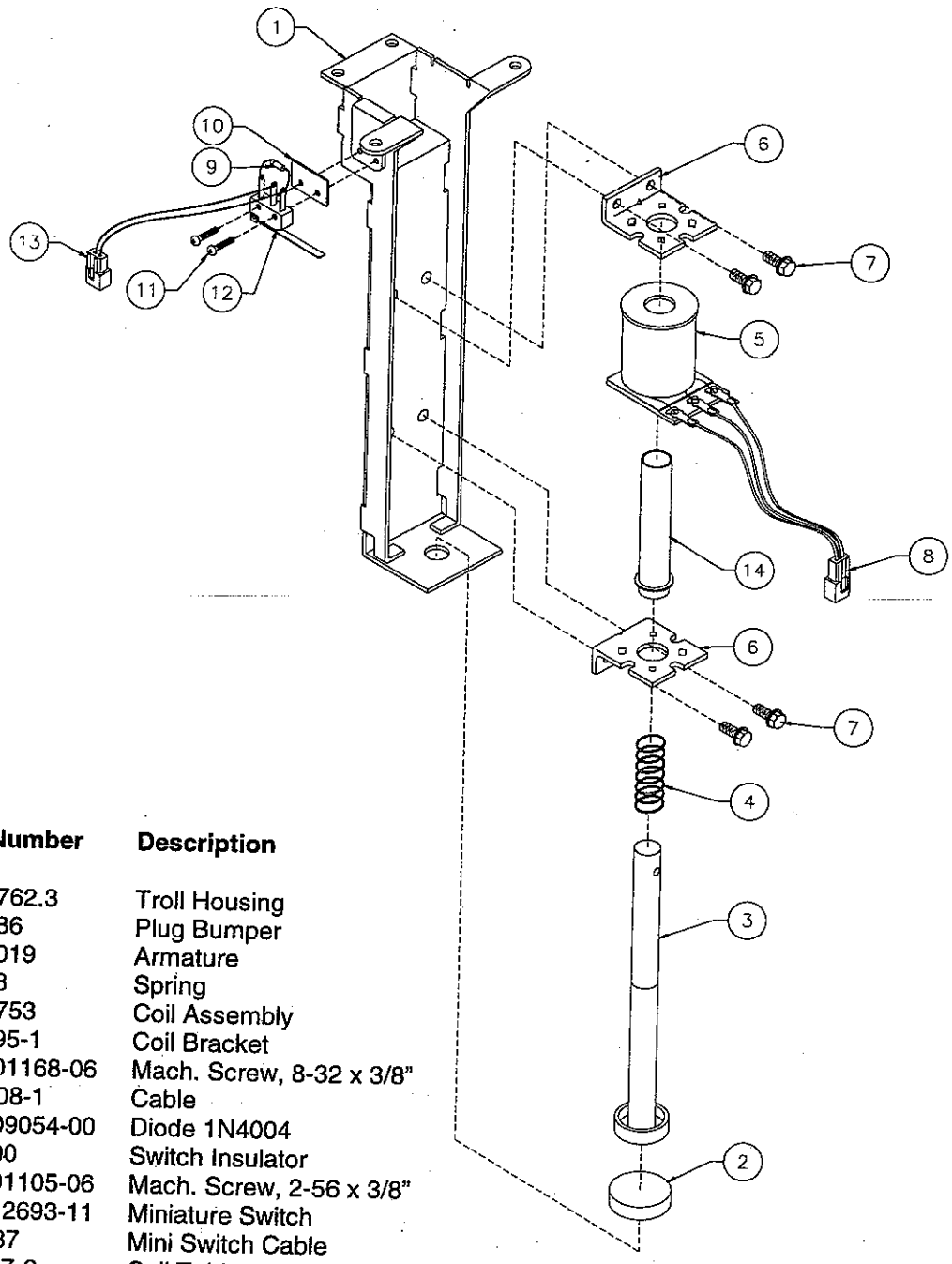
This assembly is used in games produced ***after July 21, 1997.***



Item	Part Number	Description
1	04-10979	Popper - Weldment
2	AE-26-1200	Coil Assembly
3	03-7067	Coil Tubing
4	10-135	Solenoid Spring
5	23-6420	Rubber Grommet
6	04-10322-2	Coil Bracket
7	A-17767	Bell Armature Assembly
8	4408-01119-00	Nut, 8-32 ESN
9	4106-01013-06	Sh. Metal Screw, #6 x 3/8"
10	A-16908	LED Assembly, RTV
11	A-16909	Photo Trans. Assembly, RTV
12	H-17609-5	Gen. Opto Cable
13	H-19523	Cable Assembly
14	03-9832	Playfield Plastic Spacer

A-21719
Troll Assembly

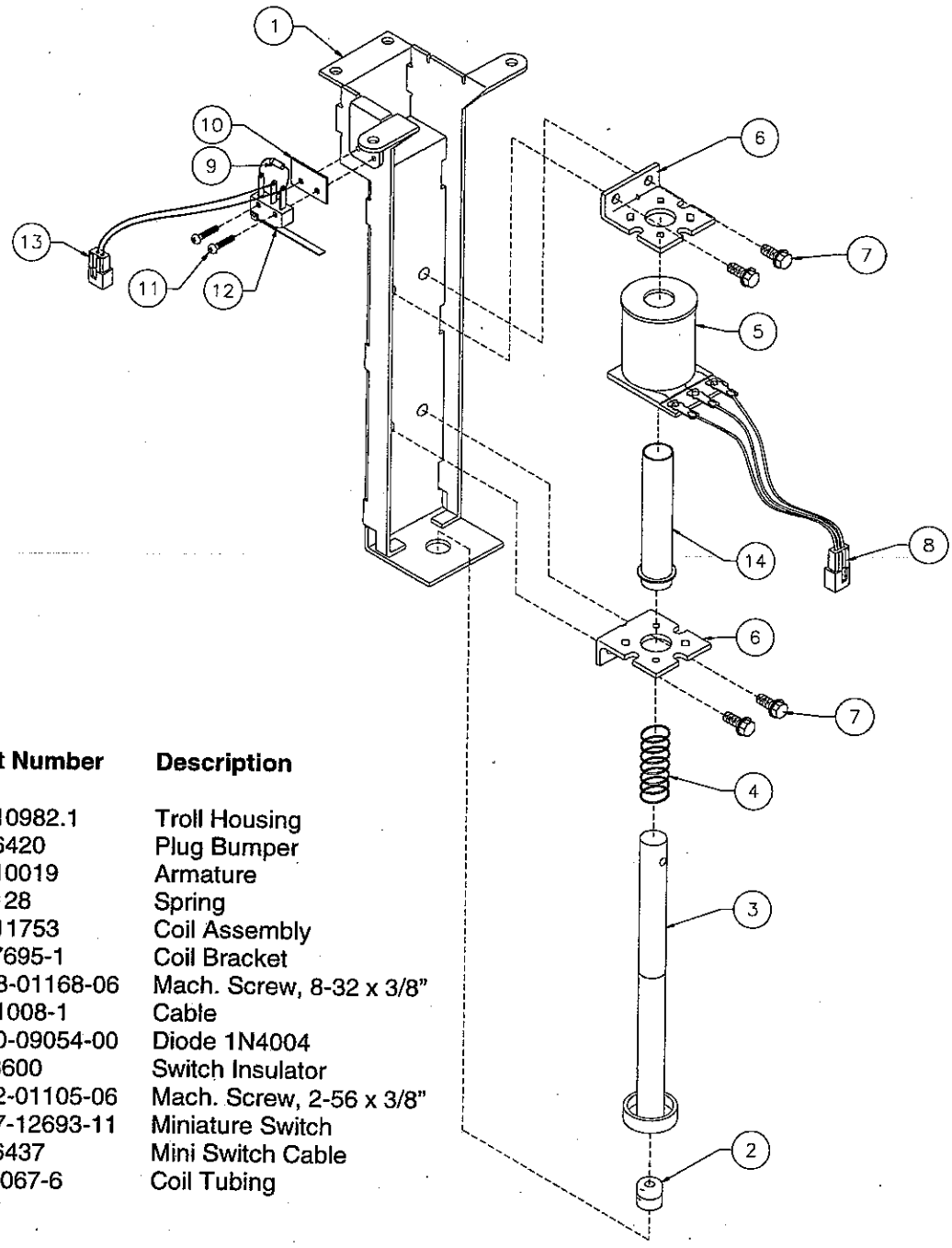
This assembly is used in games produced ***before July 21, 1997.***



Item	Part Number	Description
1	04-10762.3	Troll Housing
2	23-6686	Plug Bumper
3	04-10019	Armature
4	10-128	Spring
5	FL-11753	Coil Assembly
6	01-7695-1	Coil Bracket
7	4008-01168-06	Mach. Screw, 8-32 x 3/8"
8	H-21008-1	Cable
9	5070-09054-00	Diode 1N4004
10	01-8600	Switch Insulator
11	4002-01105-06	Mach. Screw, 2-56 x 3/8"
12	5647-12693-11	Miniature Switch
13	H-16437	Mini Switch Cable
14	03-7067-6	Coil Tubing

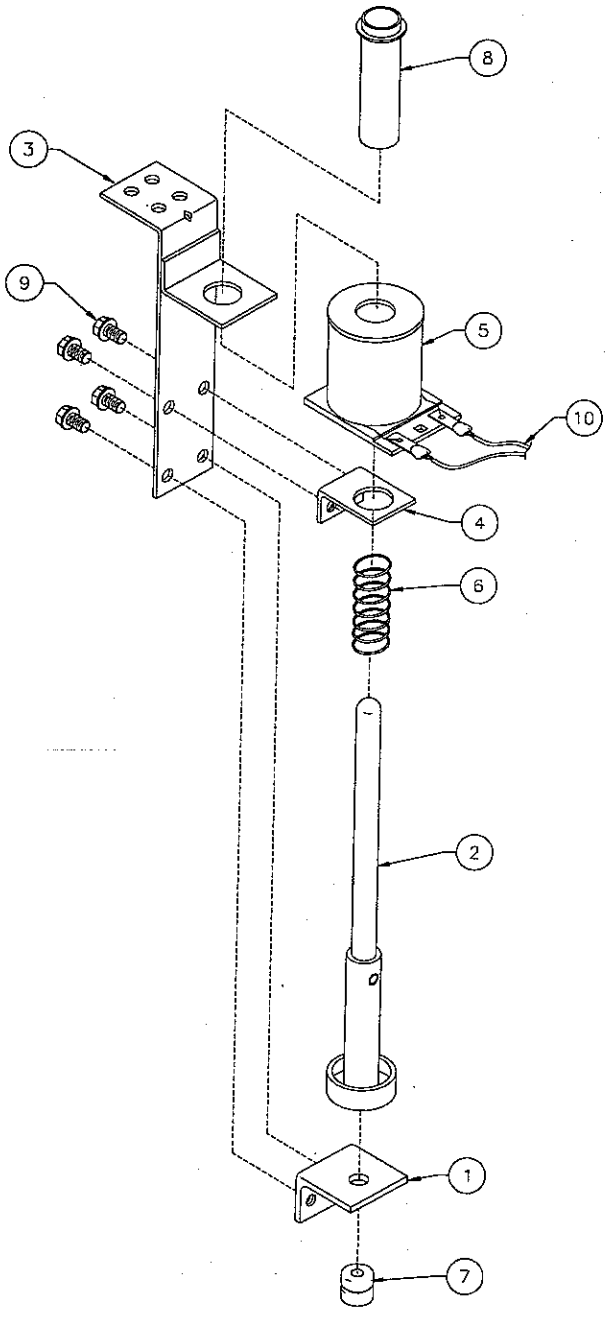
A-22034
Troll Assembly

This assembly is used in games produced ***after July 21, 1997.***



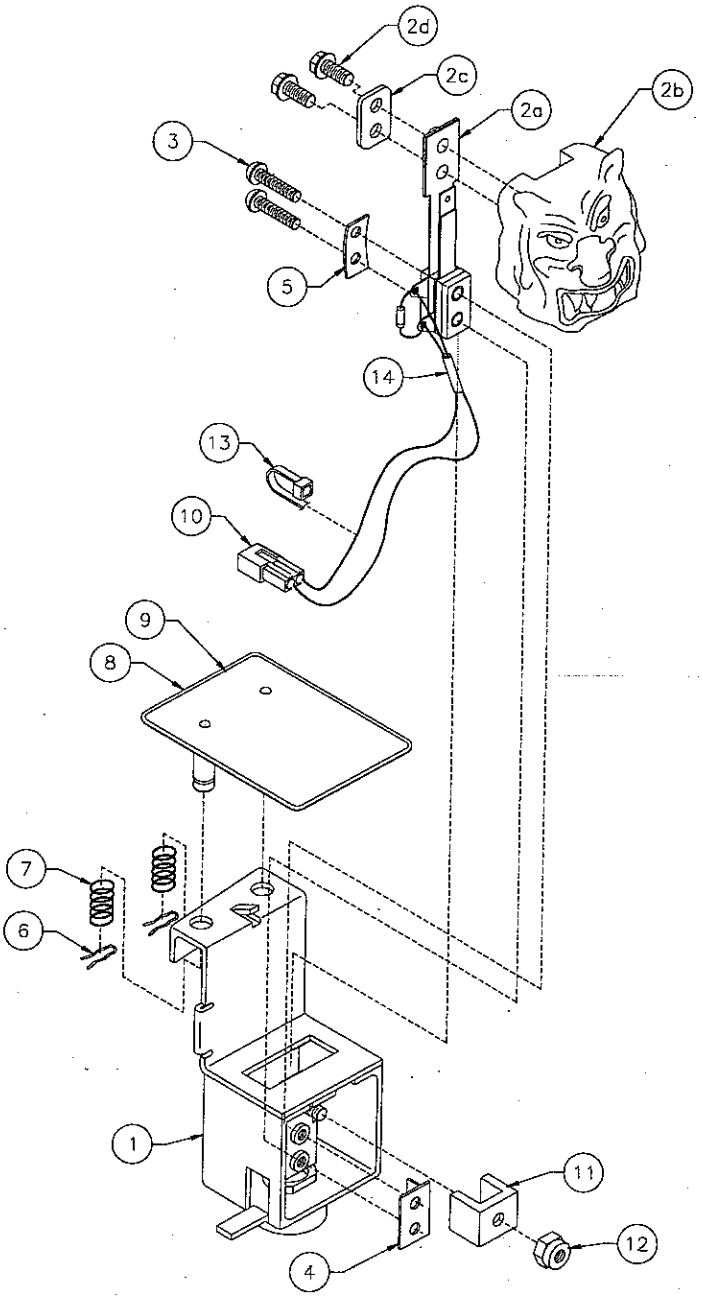
Item	Part Number	Description
1	04-10982.1	Troll Housing
2	23-6420	Plug Bumper
3	04-10019	Armature
4	10-128	Spring
5	FL-11753	Coil Assembly
6	01-7695-1	Coil Bracket
7	4008-01168-06	Mach. Screw, 8-32 x 3/8"
8	H-21008-1	Cable
9	5070-09054-00	Diode 1N4004
10	01-8600	Switch Insulator
11	4002-01105-06	Mach. Screw, 2-56 x 3/8"
12	5647-12693-11	Miniature Switch
13	H-16437	Mini Switch Cable
14	03-7067-6	Coil Tubing

A-21718
Castle Actuator Assembly



Item	Part Number	Description
1	01-14172	Coil Stop Bracket
2	04-10878.3	Armature Assembly
3	04-10933	Castle Actuator Bracket
4	01-8-508-T	Coil Retainer Bracket
5	AE-26-1500	Coil Assembly
6	10-135	Plunger Spring
7	23-6420	Rubber Grommet
8	03-7067	Coil Tubing
9	4008-01168-04	Mach. Screw: 8-32 x ¼"
10	H-19523-1	Cable Assy.

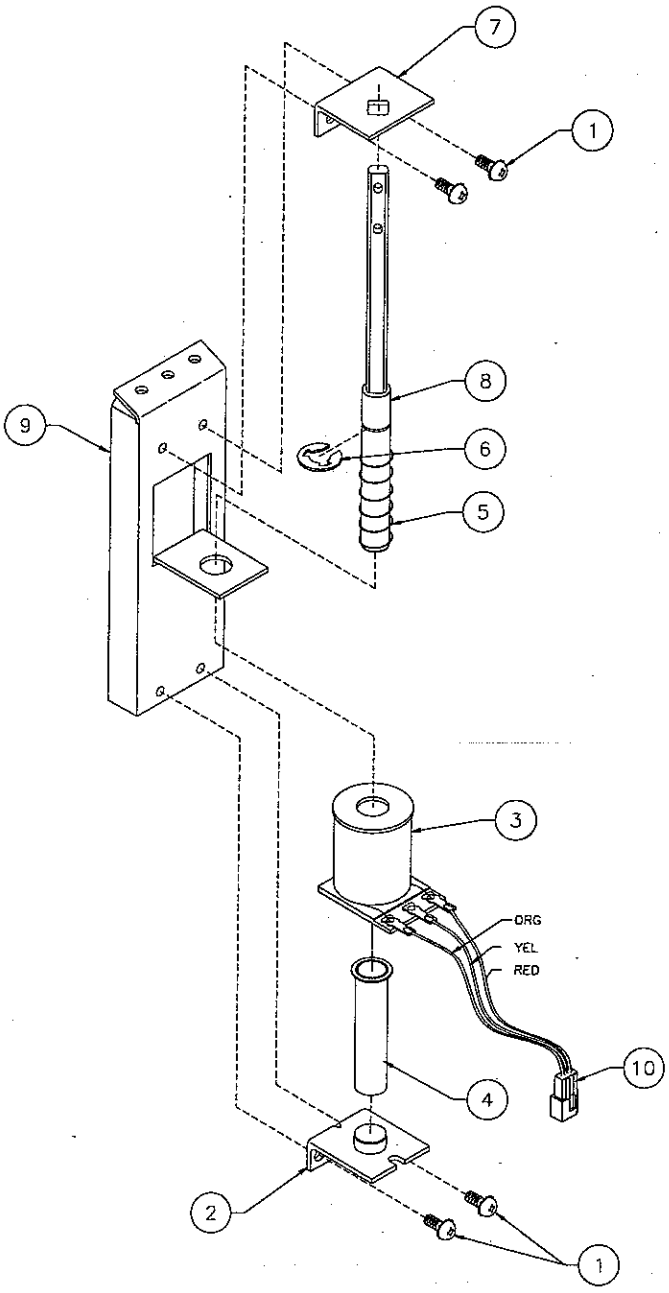
A-21744
Troll Carriage Assembly



Item	Part Number	Description
1	04-10763.1	Troll Carriage
2	A-21724	Troll Target Assembly
a)	A-21743	Troll Target Switch Assy.
b)	31-2824	Troll Head
c)	01-14672	Washer-Troll
d)	4008-01168-06	Mach. Screw: 8-32 x 3/8"
3	4006-01003-10	Mach. Screw, 6-32 x 5/8"
4	01-14680.1	Troll Switch Bracket Assy.-Guard
5	01-3670	Curved Switch Plate
6	12-6227	Hairpin Clip
7	10-392-1	Spring
8	04-10761.2	Troll Flap
9	31-2840-2A	Decal
10	H-18214-1	Cable
11	03-9808	Troll Locator
12	4408-01119-00	Nut 8-32 ESNA
13	03-9454	Ty-Wrap
14	RM-21-03	Vinyl Tubing: .106 x 1.0" Long

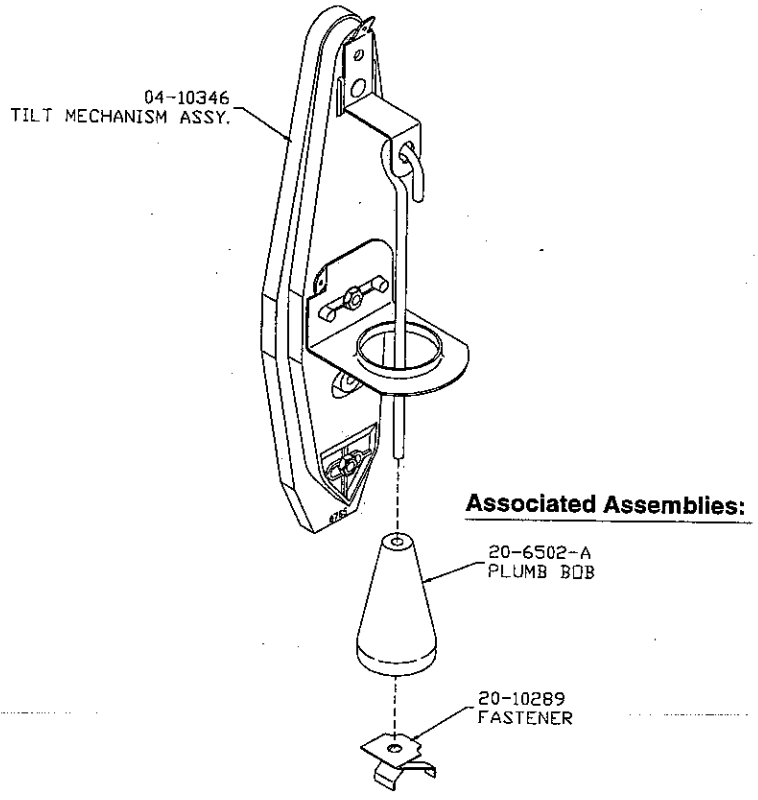
* Not available for individual sale. Order Decal Set 31-2840.

A-21706
Divertor Assembly

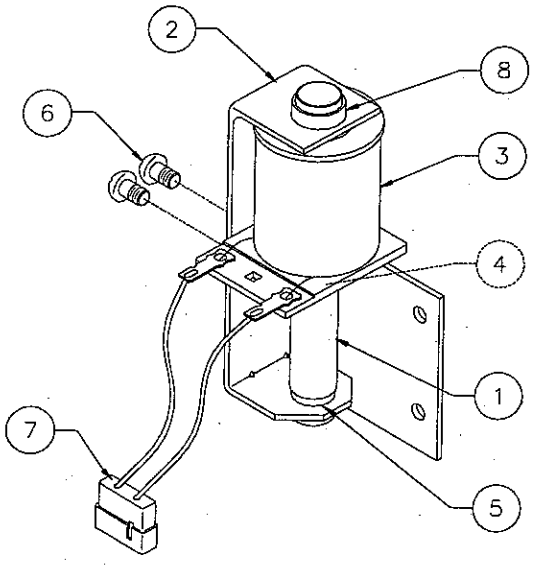


Item	Part Number	Description
1	4008-01017-06	Mach. Screw, 8-32 x 3/8"
2	A-12390	Coil Stop Bracket
3	A-20099	Coil Assembly
4	03-7066-5	Coil Tubing, 2-7/8"
5	10-437	Spring
6	20-8712-43	E-Ring
7	01-14655	Divertor Bracket
8	02-5298	Divertor Shaft
9	04-10748	Divertor Main Bracket
10	H-21008	Mini Divertor Cable

04-10346
Tilt Mechanism Assembly

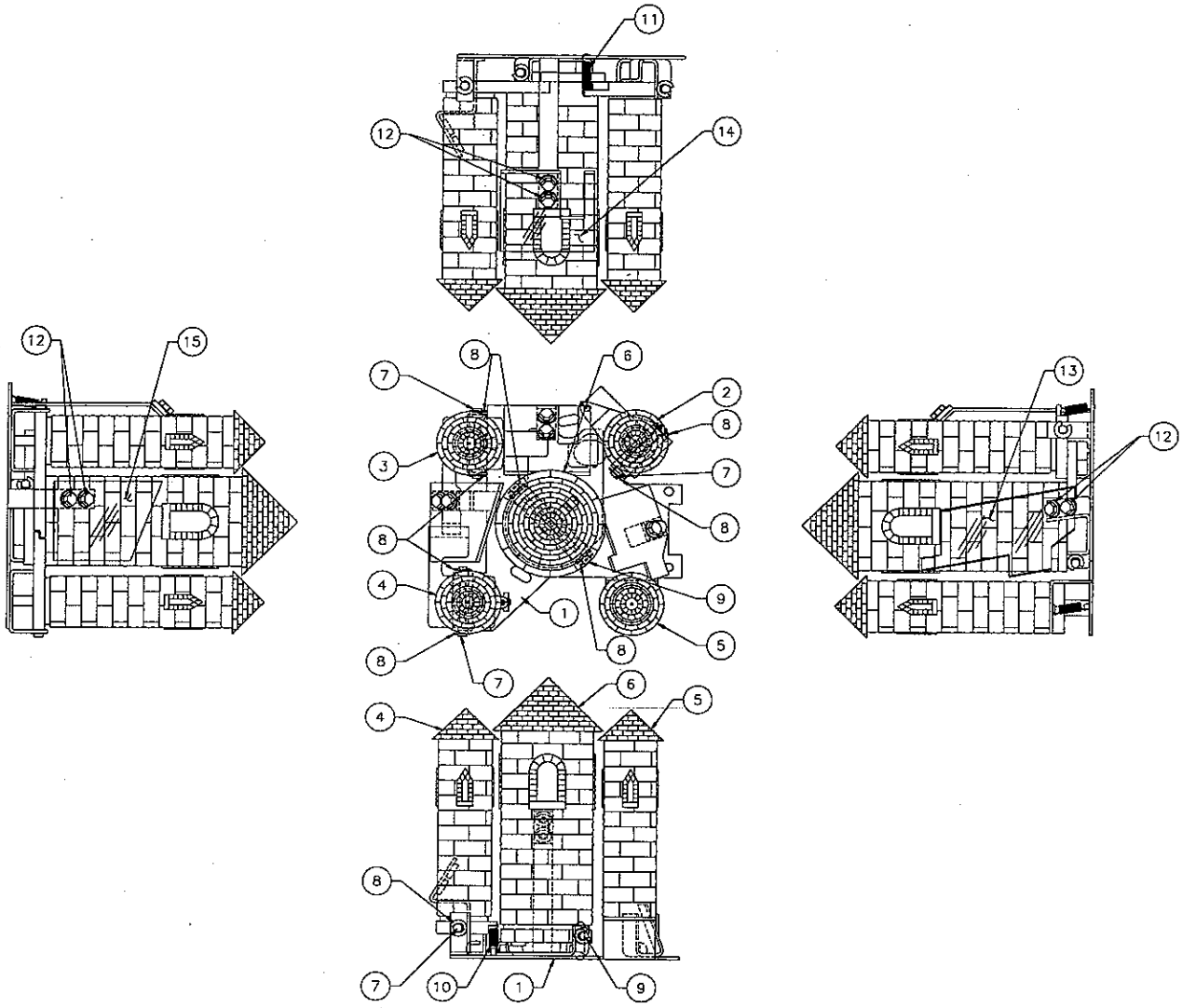


B-10686-1
Knocker Assembly



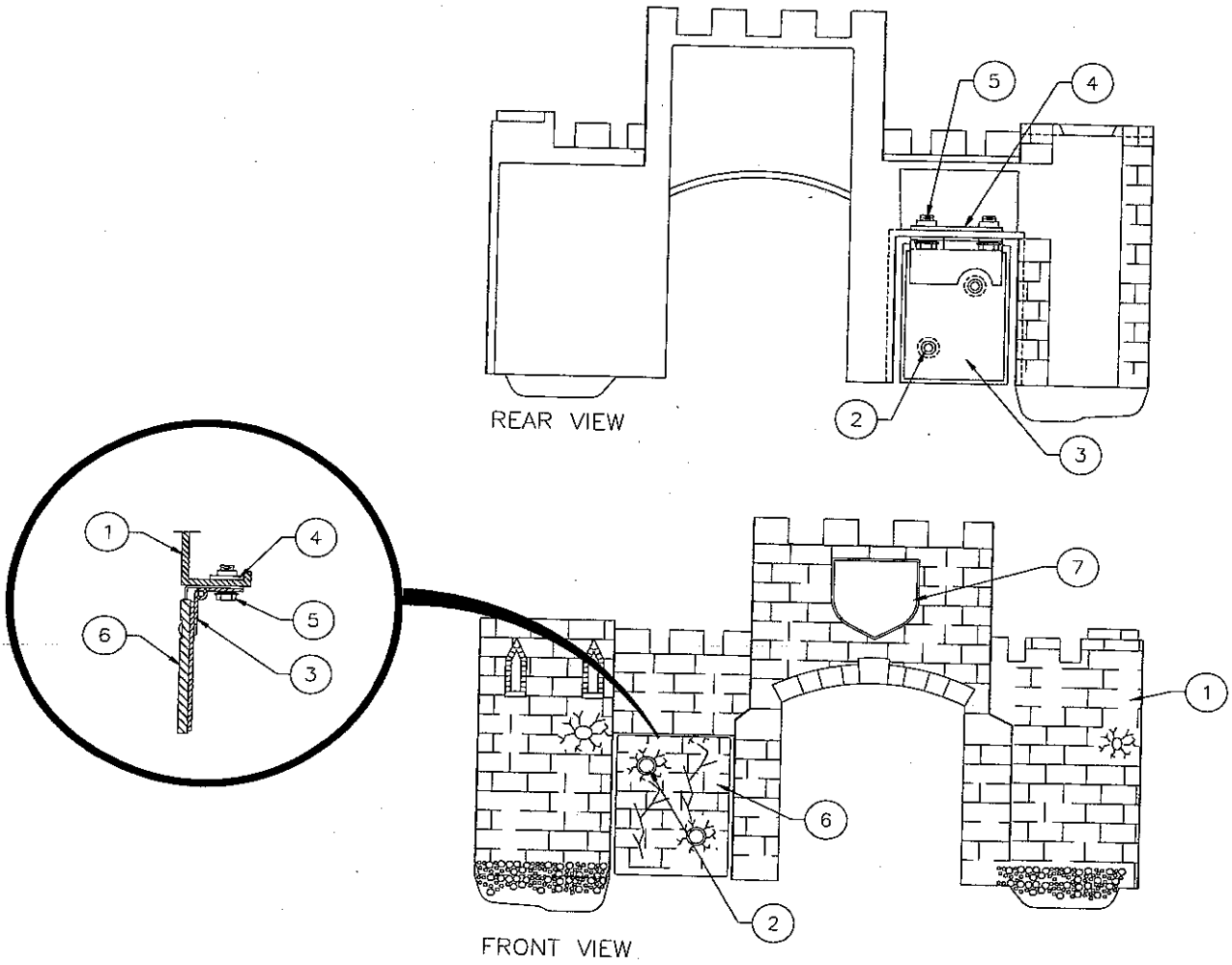
Item	Part Number	Description
1	A-5387	Coil Plunger Assembly
2	01-11273	Mounting Bracket Assembly
3	AE-23-800	Coil Sub-Assembly
4	01-8-508-T	Coil Retaining Bracket
5	23-6420	Rubber Grommet
6	40008-01017-04	Mach. Screw, 8-32 x ¼"
7	H-11835	Knocker Cable
8	03-7067-5	Coil Tubing

A-21728
Exploding Castle Assembly



Item	Part Number	Description
1	04-10879.2	Bracket-Castle
2	04-10942.2	Up/Right Tower Sub-Assembly
3	04-10941.2	Up/Left Tower Sub-Assembly
4	04-10943.2	Lo/Left Tower Sub Assembly
5	31-2827	Tower
6	04-10944.2	Center Tower Sub-Assembly
7	02-5309.1	Pivot Shaft Short
8	20-8712-18	E-Ring: 3/16" Shaft
9	02-5310.1	Pivot Shaft Long
10	10-520	Spring
11	10-521	Spring (Red)
12	4008-01168-06	Mach. Screw: #8-32 x 3/8"
13	31-2949-3	Playfield Plastic
14	31-2949-2	Playfield Plastic
15	31-2949-1	Playfield Plastic

A-21755
Castle Assembly



Item	Part Number	Description
1	31-2826-4A	Castle Front
2	07-6697-8	Rivet-Black Oval Hd.
3	04-10889.3	Hinge Flap Sub-Assembly
4	04-10897	Washer Flap
5	4008-01168-06	Mach. Screw, 8-32 x 3/8"
6	31-2826-3B	Hinge - Flap
*7	31-2841-2	Decal

*Not available for individual sale. Order Decal Set 31-2842.

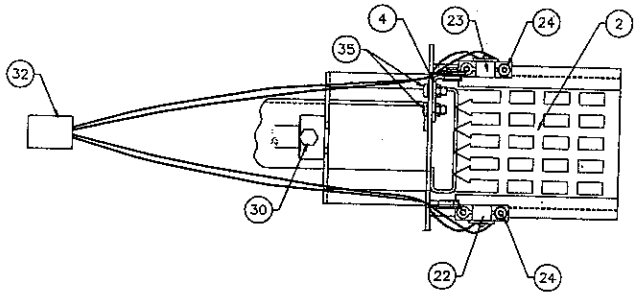
A-21723
Drawbridge Gate Assembly

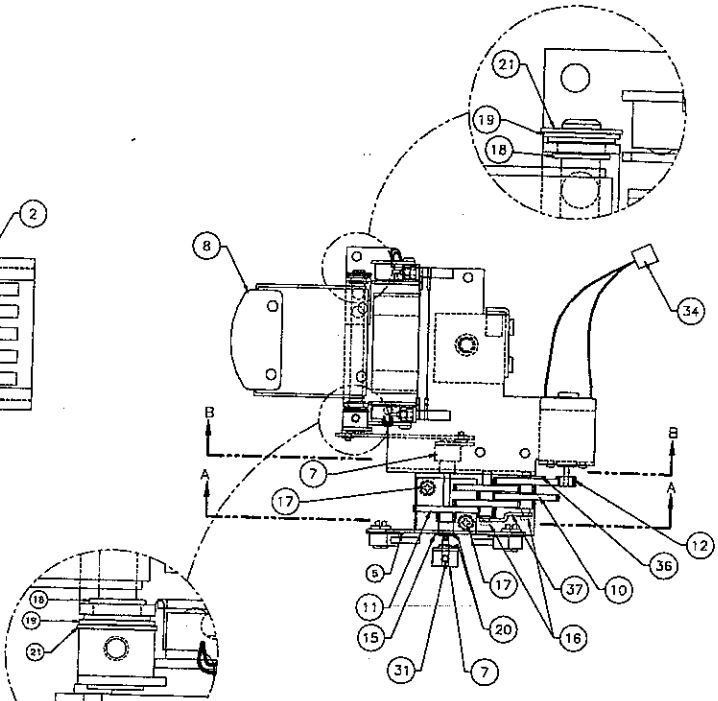
This assembly is used in games produced ***before July 21, 1997.***

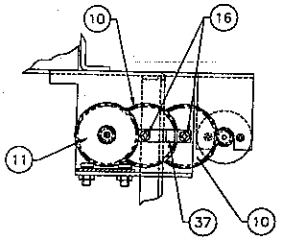
Item	Part Number	Description
1	04-10774.1	Drawbridge Gate Bracket
2	04-10773.1	Gate-Castle
3	04-10019	Armature Assembly
4	04-10771	Pivot Bracket
5	A-21976	Switch/Bracket Assembly
6	04-10768	Link 2
7	04-10767	Link 1
8	A-21722	Bridge Sub-Assembly
9	01-14674	Linkage
10	03-9219-1	Gear - Cluster
11	04-10886	Gear & Shaft Assembly
12	03-9222	Pinion Gear
13	14-8015	Motor - Gear Box
14	20-10131-07Y	Metric Screw, M2.6 x 8
15	4700-00005-00	Flat Washer: 9/64 x 7/16 x 21ga.
16	4004-01003-03	Mach. Screw, 4-40 x 3/16"
17	4008-01157-06	Mach. Screw, 8-32 x 3/8"
18	20-8790	Nyliner Bearing
19	4700-00072-00	Flat Washer, 17/64 x ½ x 21ga.
20	20-8712-12	E-Ring, 1/8" Shaft
21	20-8712-25	E-Ring, ¼" Shaft
22	A-16908	Opto LED Assembly
23	A-16909	Opto Photo/Transistor Assembly
24	4404-01119-00	Nut 4-40 ESN
25	4010-01196-12	SS 10-32 x ¾"
26	10-128	Spring Kicker
27	A-20099	Coil Assembly
28	01-7695-1	Solenoid Bracket
29	03-7067-6	Coil Tubing
30	02-5161	Screw Pin Scoop
31	4008-01083-04	SS 8-32 x ¼"
32	H-22011	Opto Cable - Square
33	H-21008-1	Solenoid Cable
34	H-22008-10	2P Reverse Motor Cable
35	4008-01157-04	Mach. Screw, 8-32 x 3/8"
36	03-9823	Spacer
37	01-14746	Z-Bracket

A-21723
Drawbridge Gate Assembly

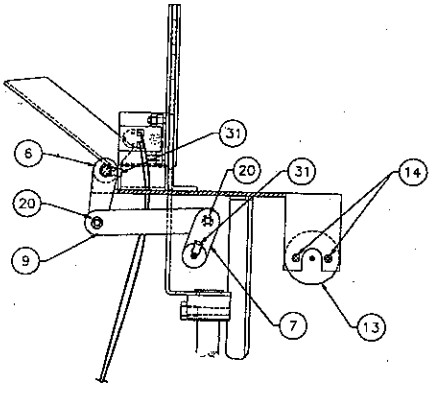
This assembly is used in games produced ***before July 21, 1997.***



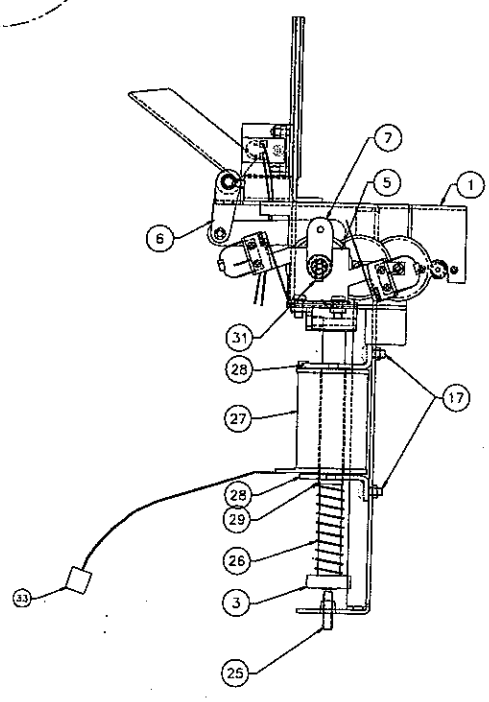




SECTION A–A



SECTION B–B



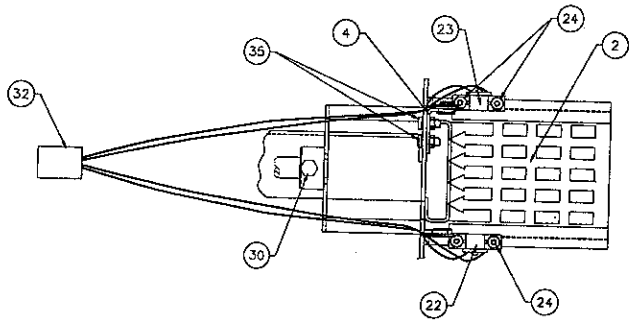
A-22033
Drawbridge Gate Assembly

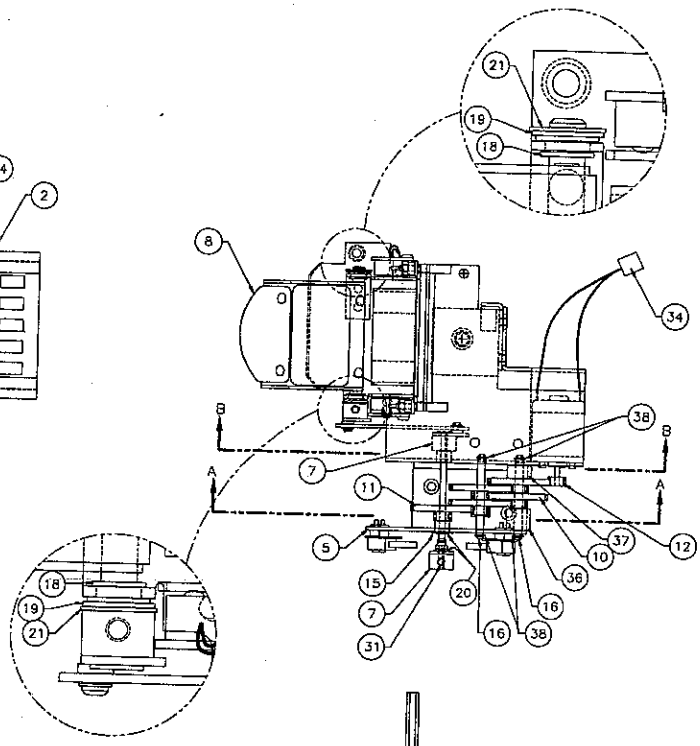
*This assembly is used in games produced **after July 21, 1997.***

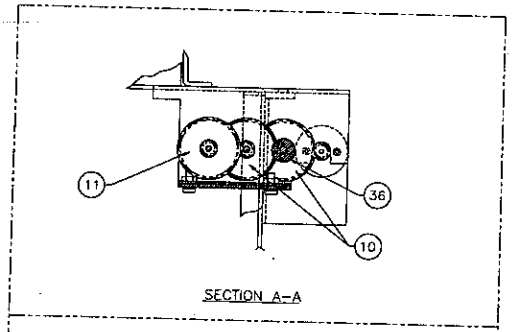
Item	Part Number	Description
1	04-10989	Drawbridge Gate Bracket
2	04-10773.1	Gate-Castle
3	04-10019	Armature Assembly
4	04-10771	Pivot Bracket
5	A-22036	Switch/Bracket Assembly
6	04-10986	Link 2
7	04-10985	Link 1
8	A-21722	Bridge Sub-Assembly
9	01-14748	Linkage
10	03-9219-1	Gear - Cluster
11	04-10988.1	Gear & Shaft Assembly
12	03-9222	Pinion Gear
13	14-8015	Motor - Gear Box
14	20-10131-07Y	Metric Screw, M2.6 x 8
15	4700-00005-00	Flat Washer: 9/64 x 7/16 x 21ga.
16	02-5324	Gear Shaft
17	4008-01157-06	Mach. Screw, 8-32 x 3/8"
18	20-8790	Nyliner Bearing
19	4700-00072-00	Flat Washer, 17/64 x ½ x 21ga.
20	20-8712-12	E-Ring, 1/8" Shaft
21	20-8712-25	E-Ring, ¼" Shaft
22	A-16908	Opto LED Assembly
23	A-16909	Opto Photo/Transistor Assembly
24	4404-01119-00	Nut 4-40 ESN
25	4010-01196-12	SS 10-32 x ¾"
26	10-128	Spring Kicker
27	A-20099	Coil Assembly
28	01-7695-1	Solenoid Bracket
29	03-7067-6	Coil Tubing
30	02-5161	Screw Pin Scoop
31	4008-01083-04	SS 8-32 x ¼"
32	H-22011	Opto Cable - Square
33	H-21008-1	Solenoid Cable
34	H-22008-10	2P Reverse Motor Cable
35	4008-01157-04	Mach. Screw, 8-32 x 3/8"
36	03-9834-1	Spacer, 31/64" Long
37	03-9834-2	Spacer, ¼" Long
38	20-8712-15	E-Ring, 5/32" Shaft
39	20-8712-18	E-Ring, 3/16" Shaft

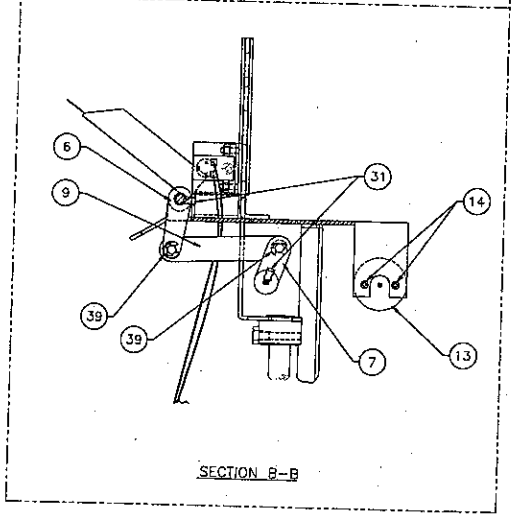
A-22033
Drawbridge Gate Assembly

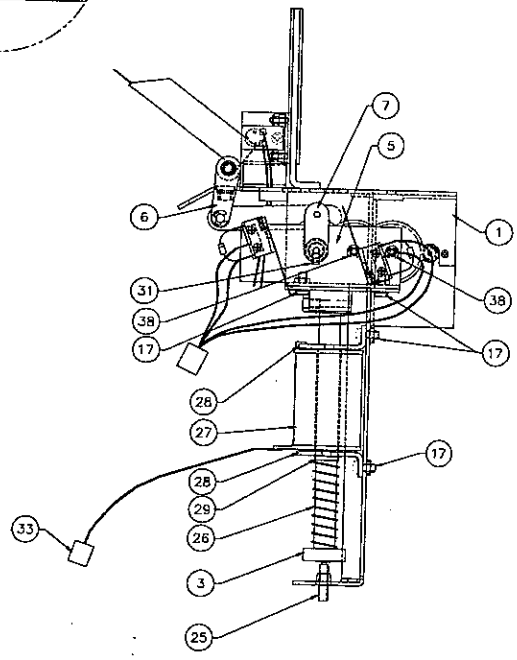
This assembly is used in games produced ***after July 21, 1997.***



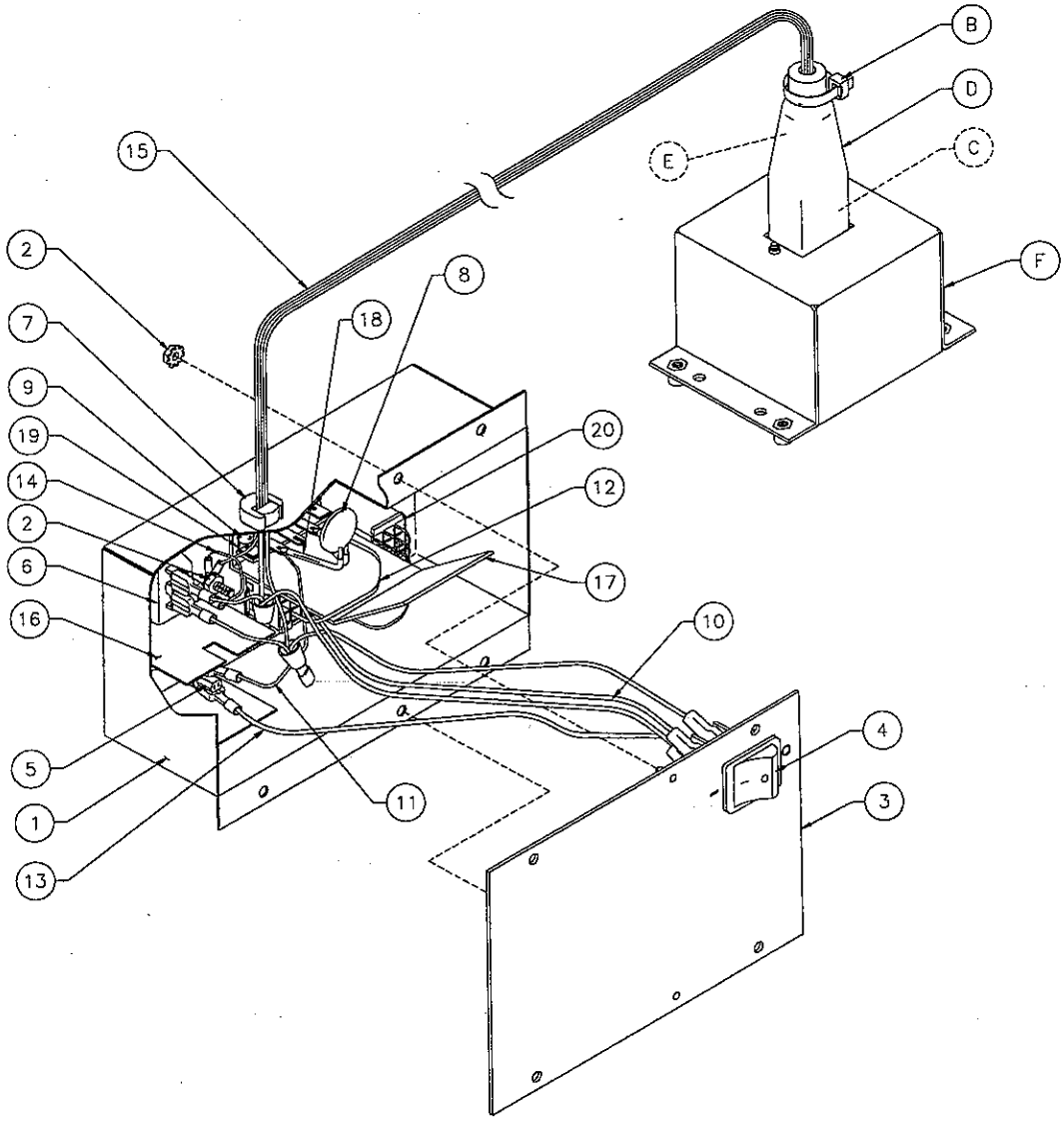








A-20871
Power Interface Assembly



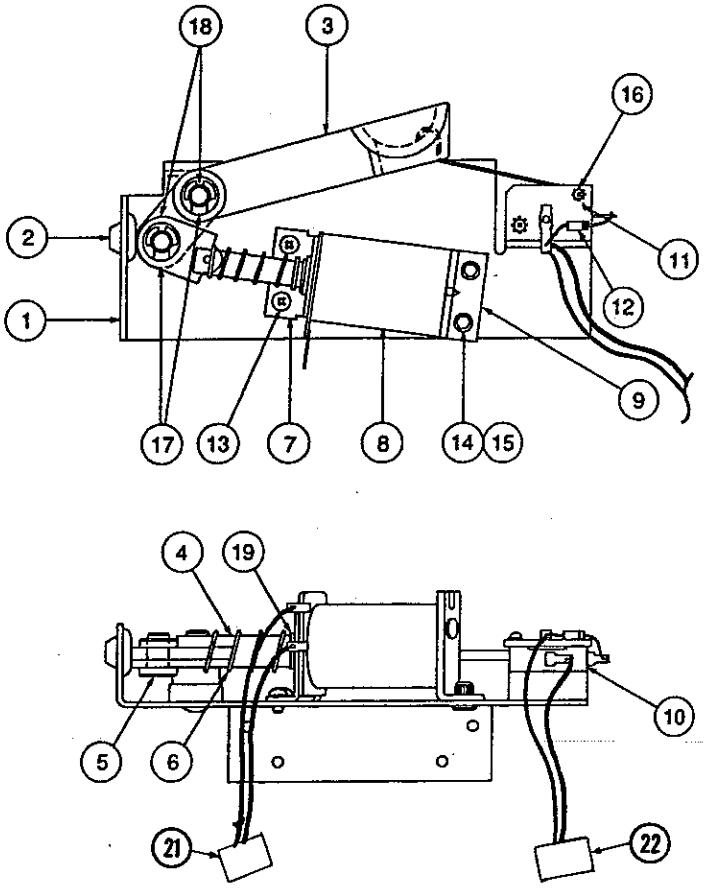
Item	Part Number	Description
A	A-20872	Power Control Chassis Assembly
1)	04-10292	Power Control Chassis Box
2)	4406-01128-00	Nut #6-32 KEPS (3)
3)	01-12294	Switch Mounting Plate Assembly
4)	5642-13935-00	Power Switch
5)	5733-14734-00	Fuse Holder Panel (5x20mm)
6)	5851-13867-00	Outlet-IEC Conn. 237 Socket
7)	03-8712	Strain Relief Bushing
8)	5016-12978-00	Thermistor 8A., 2.5R25
9)	4006-01003-10	Mach. Screw, #6-32 x 5/8"
10)	H-17992	Jumper Cable Neutral Sw/1FC
11)	H-17543	Hot Jumper Black Cable
12)	H-17546	Jumper Interface Hot Black Cable
13)	H-17545	Jumper Switch/Fuse Black Cable

Item	Part Number	Description
14)	H-17542	Ground Jumper Grn/Yel Cable
15)	5797-13940-01	Jumper Cable
16)	01-10623	Insulator, Thermistor
17)	01-12299	Insulator, Terminal Strip
18)	RM-21-06	#18 Vinyl Fgls
19)	5822-13865-00	Terminal Strip 3-CKT 2-Mtg.
20)	H-18050	Jumper Cable, Transformer Prog.
B	03-7933	Ty-Wrap Nylon
C	5045-14007-00	Capacitor, 1µF 275v
D	23-6776-4	Heat Shrink
E	RM-21-06	#18 Vinyl Sleeving
F	A-20873	Line Filter Entry Chassis

Power Interface/Cordset Application

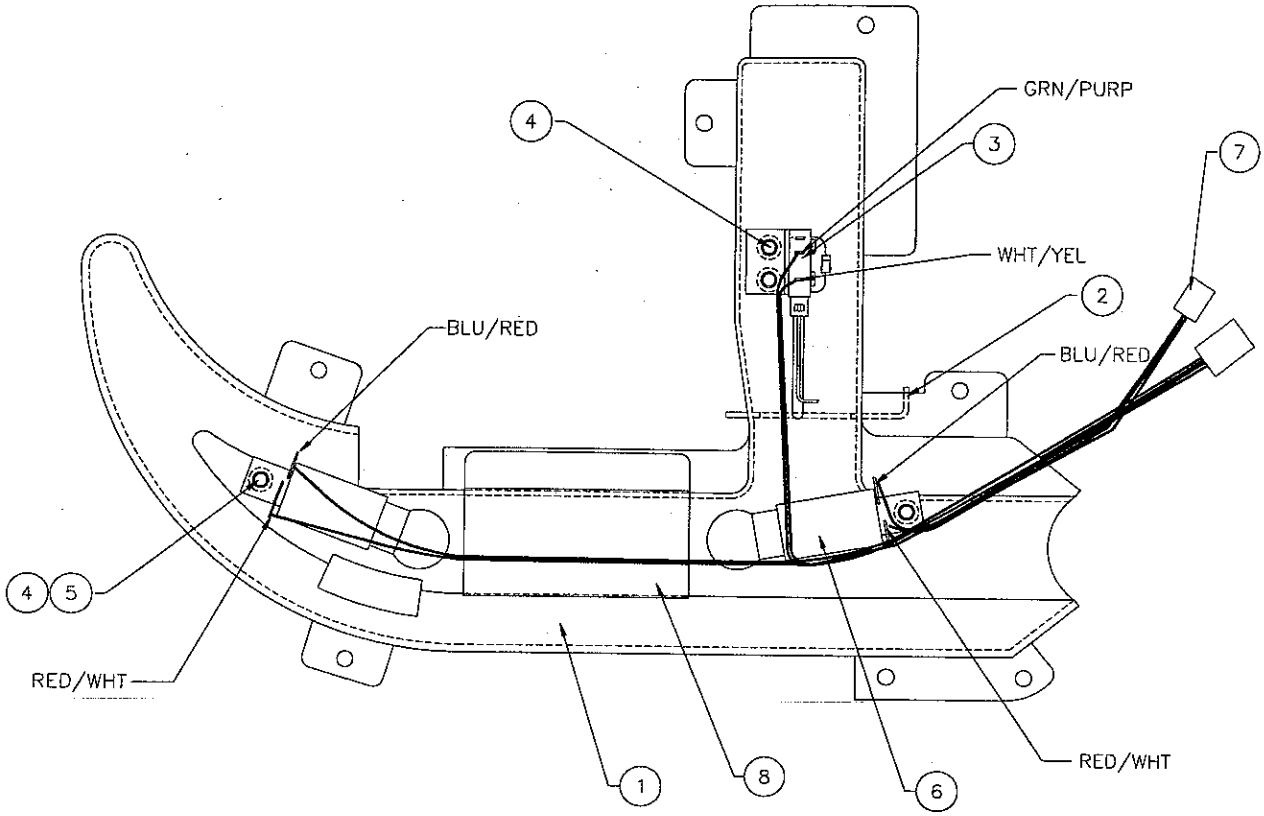
COUNTRY	UNIVERSAL PWR. INTERFACE ASSEMBLY	VOLTAGE PROGRAMMING JUMP CABLE				4AMP FUSE/ LABEL		5AMP FUSE/ LABEL		LABEL HIGH/ VOLTAGE CAUTION	POWER ADAPTER CORD	CORDSET								
	A-20871	H-17837-1	H-17837-2	H-17837-3	H-17837-4	5731-14530-00 FUSE	16-10145 LABEL	5731-14046-00 FUSE	16-9698 LABEL	16-9669	5850-14052-00	5850-13271-00	5850-13272-00	5850-13273-00	5850-13274-00	5850-13275-00	5850-13276-00	5850-13277-00	5850-13278-00	A-17175-2
UNITED STATES	X		X					X	X		X	X								
CANADA	X	X						X	X			X								
TAIWAN	X		X					X	X			X								
MEXICO	X		X					X	X			X								
CENTRAL AMERICA	X		X					X	X			X								
SOUTH KOREA	X		X					X	X			X								
PUERTO RICO	X		X					X	X			X								
AUSTRIA	X			X		X	X			X			X							
BELGIUM	X			X		X	X			X			X							
FINLAND	X			X		X	X			X			X							
FRANCE	X			X		X	X			X			X							
GREECE	X			X		X	X			X			X							
HOLLAND	X			X		X	X			X			X							
HUNGARY	X			X		X	X			X			X							
NETHERLANDS	X			X		X	X			X			X							
NETH. ANTILLES	X			X		X	X			X			X							
NORWAY	X			X		X	X			X			X							
POLAND	X			X		X	X			X			X							
PORTUGAL	X			X		X	X			X			X							
SPAIN	X			X		X	X			X			X							
SWEDEN	X			X		X	X			X			X							
TURKEY	X			X		X	X			X			X							
WEST GERMANY	X			X		X	X			X			X							
UNITED KINGDOM	X			X		X	X			X				X						
IRELAND	X			X		X	X			X				X						
HONG KONG	X			X		X	X			X				X						
DENMARK	X			X		X	X			X					X					
ITALY	X			X		X	X			X						X				
CHILE	X			X		X	X			X						X				
PEOPLE'S REP. OF CHINA	X			X		X	X			X						X				
SWITZERLAND	X			X		X	X			X							X			
AUSTRALIA	X			X		X	X			X								X		
NEW ZEALAND	X			X		X	X			X								X		
ARGENTINA	X			X		X	X			X								X		
JAPAN	X				X			X	X										X	X
CROATIA	X			X		X	X			X		X								

A-14947-1
Catapult Unit Assembly



Item	Part Number	Description
1	A-14946	Catapult Bracket Assembly
2	23-6577	Plug Bumper, 5/8"
3	03-8089	Catapult Arm
4	04-10952.1	Plunger Assembly
5	02-4301	Catapult Arm Pin
6	10-135	Thumper Bumper Spring
7	01-8413	Coil Mounting Bracket
8	AL-23-800	Coil Sub-Assembly
9	A-10821	Flipper Stop Bracket Assembly
10	5647-12133-12	Miniature Switch
11	A-7438-1	Terminal Strip Assembly
12	5070-09054-00	Diode 1N4004 1.0A.
13	4008-01017-04	Mach. Screw, #8-32 x ¼"
14	4010-01066-06	Cap Screw, #10-32 x 3/8"
15	4701-00004-00	Lockwasher #10 Split
16	4004-01003-10	Mach. Screw, #4-40 x 5/8"
17	4700-00104-00	FW, 5/16 x ½ x 16ga.
18	20-8712-31	Retaining Ring
19	03-7066	Coil Tubing
20	23-6622	Foam Tape Double Sided
21	H-19523	Cable
22	H-16437	Cable- Gen. Switch

A-21703
Moat Assembly

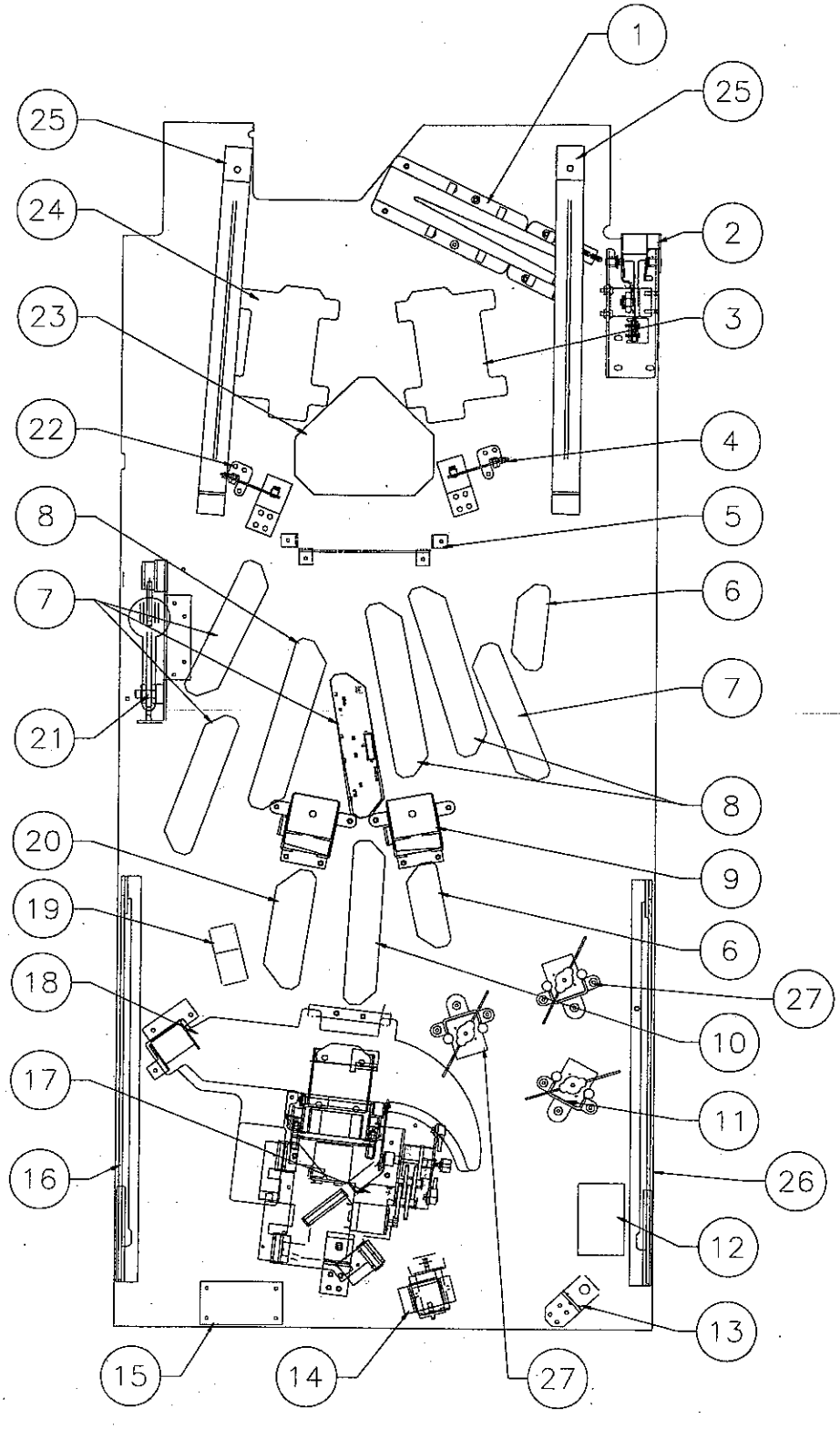


Item	Part Number	Description
1	03-9681.6	Moat
2	12-7380	Wire
3	A-21800	Switch Assembly
4	07-6688-19N	Rivet: 1/8 x 7/32"
5	4700-00003-00	Flat Washer: 1/8 x 9/32 x 21ga.
6	A-17803	Flasher Lay-Down
7	H-21767	Moat Cable Assembly
8	03-9804	Playfield Mylar

Lower Playfield Parts

Item	Part Number	Description
1	A-19963-1	Ball Trough Assembly Complete
2	A-21553-1	Auto Fire Assembly
3	A-15849-R-2	Flipper Assembly
4	B-9362-R-3	Coil & Bracket Assembly
5	A-20246	10-Opto PCB Assembly
6	A-21322	3-Lamp PCB (2)
7	A-21740	4-Lamp PCB (4)
8	A-21738	5-Lamp PCB (3)
9	A-22034	Troll Assembly
10	A-21741	4-Lamp PCB Assembly
11	A-9415-2	Jet Bumper Coil Assembly
12	A-21706	Divertor Assembly
13	A-21712-5	Up Down Post Assembly
14	A-17796-1	Ball Gate Actuator Assembly
15	A-21708-1	Motor Driver w/EMI Assembly
16	A-17749.1-1	Playfield Slide Assembly, Left
17	A-22033	Drawbridge /Gate Assembly
18	A-21703	Moat Assembly
19	A-22027	Popper Assembly
20	A-21551	4-Lamp PCB Assembly
21	A-14947-1	Catapult Assembly
22	B-9362-L-2	Coil & Bracket Assembly
23	A-21739	7-Lamp PCB Assembly
24	A-15849-L-2	Flipper Assembly
25	01-11781	Support Bracket (2)
26	A-17749.1-2	Slide Playfield Assembly, Right
27	B-9415-3	Jet Bumper Coil Assembly (2)

Lower Playfield Parts



Underside of playfield, viewed in raised position.

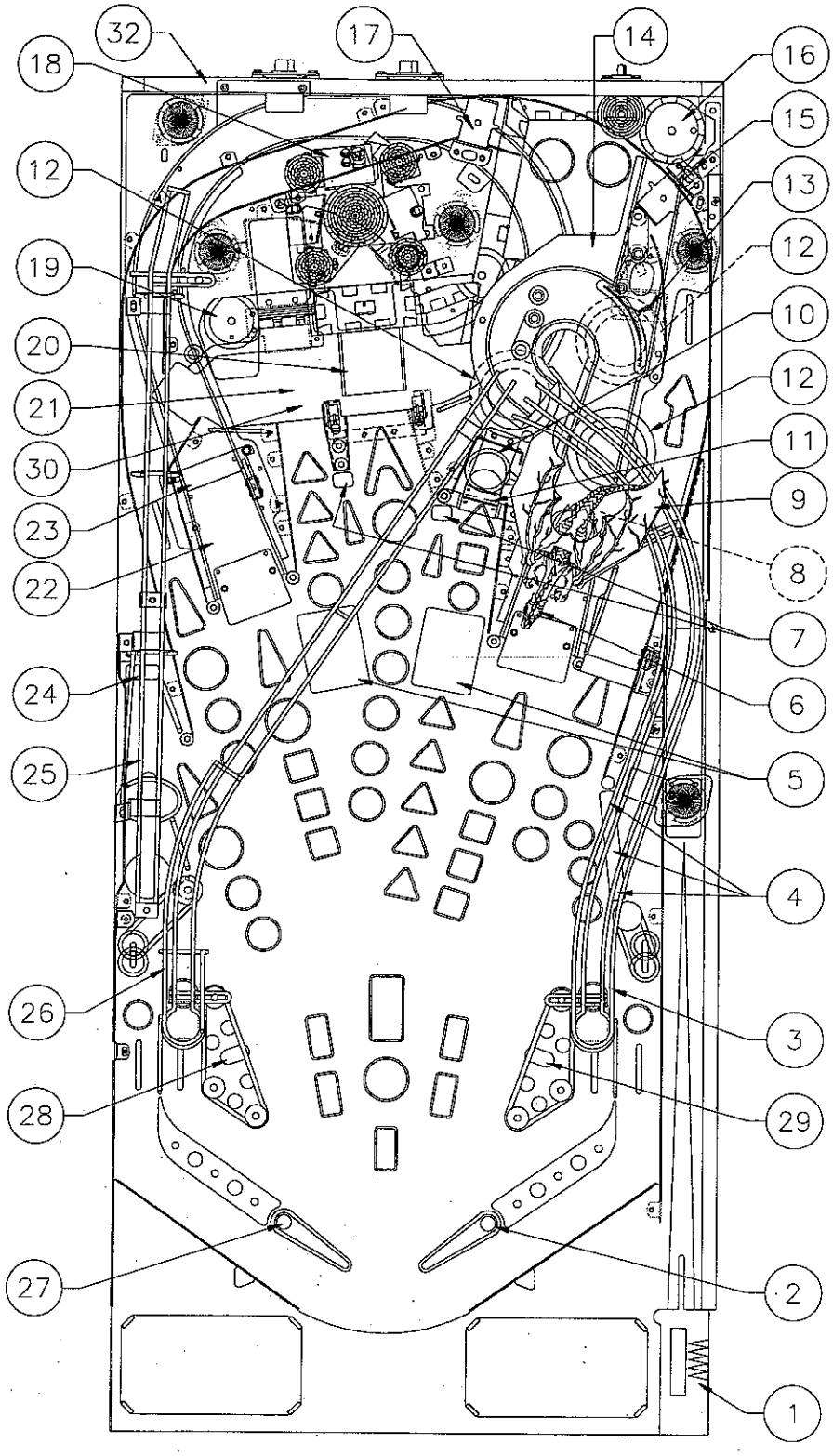
Upper Playfield Parts

Item No.	Part Number	Description
1	A-21553-1	Auto Fire Plunger Assembly
2a	A-21805-15	Right Flipper Ball Guide
2b	A-15849-R-2	Flipper Coil & Bracket Assembly
2c	20-10110-5	Flipper Bat & Shaft - White
3	A-21697	Right Ramp Assembly
4	A-21576-4	Red Standup Targets
5a	A-22034	Troll Assembly
5b	A-21744	Troll Carriage Assembly
5c	31-2824	Troll Head
6	31-2818	Dragon Body
7	A-18530-6	Yellow Troll Standup Target s
8	A-21777	Dragon Switch Gate Assembly
9	31-2819	Dragon Wings
10	A-21970	Right Troll Eject Popper Assembly
11	A-21714	Gate Assembly w/Spring
12a	A-9415-2	Jet Bumper Coil Assembly
12b	B-9414-6	Jet Bumper Assembly
13	A-21706	Tower Diverter Assembly
14	A-21702	Right Plastic Ramp Assembly
15a	A-17797-1	Right Gate Assembly
15b	A-17796	Ball Gate Actuator
16	A-21712-5	Up/Down Tower Lock Post
17a	A-17797-1	Left Gate Assembly
17b	A-17796-1	Ball Gate Actuator
18a	A-21718	Castle Actuator Assembly
18b	A-21728	Exploding Castle Assembly
19	A-21755	Castle Assembly
20	A-22033	Drawbridge/Gate Assembly
21	A-21703	Moat Assembly
22	A-21701	Left Plastic Ramp Assembly
23	A-21799	Switch Gate Assembly
24	A-21990-4	Red Catapult Standup Target
25	A-21751	Catapult Ramp
26	12-7377.1	Left Wire Ramp
27a	A-21805-15	Right Flipper Ball Guide
27b	A-15849-R-2	Flipper Coil & Bracket Assembly
27c	20-10110-5	Flipper Bat & Shaft - White
28a	A-17811	Kicker Assembly
28b	B-9362-L-2	Coil & Bracket Assembly
29a	A-17811	Kicker Assembly
29b	B-9362-R-3	Coil & Bracket Assembly
30	A-22027	Popper
31a	A-9415-3	Jet Bumper Coil Assembly
31b	B-9414-6	Jet Bumper Assembly
32	A-21750	Back Panel Assembly

Not Shown:		
	A-13204-50059	Bottom Arch Assembly
	31-2820.2	Screened Bottom Arch
	A-14265-13	Receptacle & Skirt - clear
	A-19514	Chrome Leg Assembly
	03-8633	Level Mount
	08-7028-T	Playfield Glass
	08-7377	Leg Adjuster Leveler
	20-6500	Steel Balls (4)
	20-6502-A	Plumb Bob
	20-9045	Clear Plastic Card Cover
	20-9691	Level
	31-1357-50059	Backglass Translite
	36-50059	Screened Hardcoat Playfield

*The *MEDIEVAL MADNESS* hardcoat playfield does not require a full Mylar. However, mylars can be purchased through your local Williams Distributor.

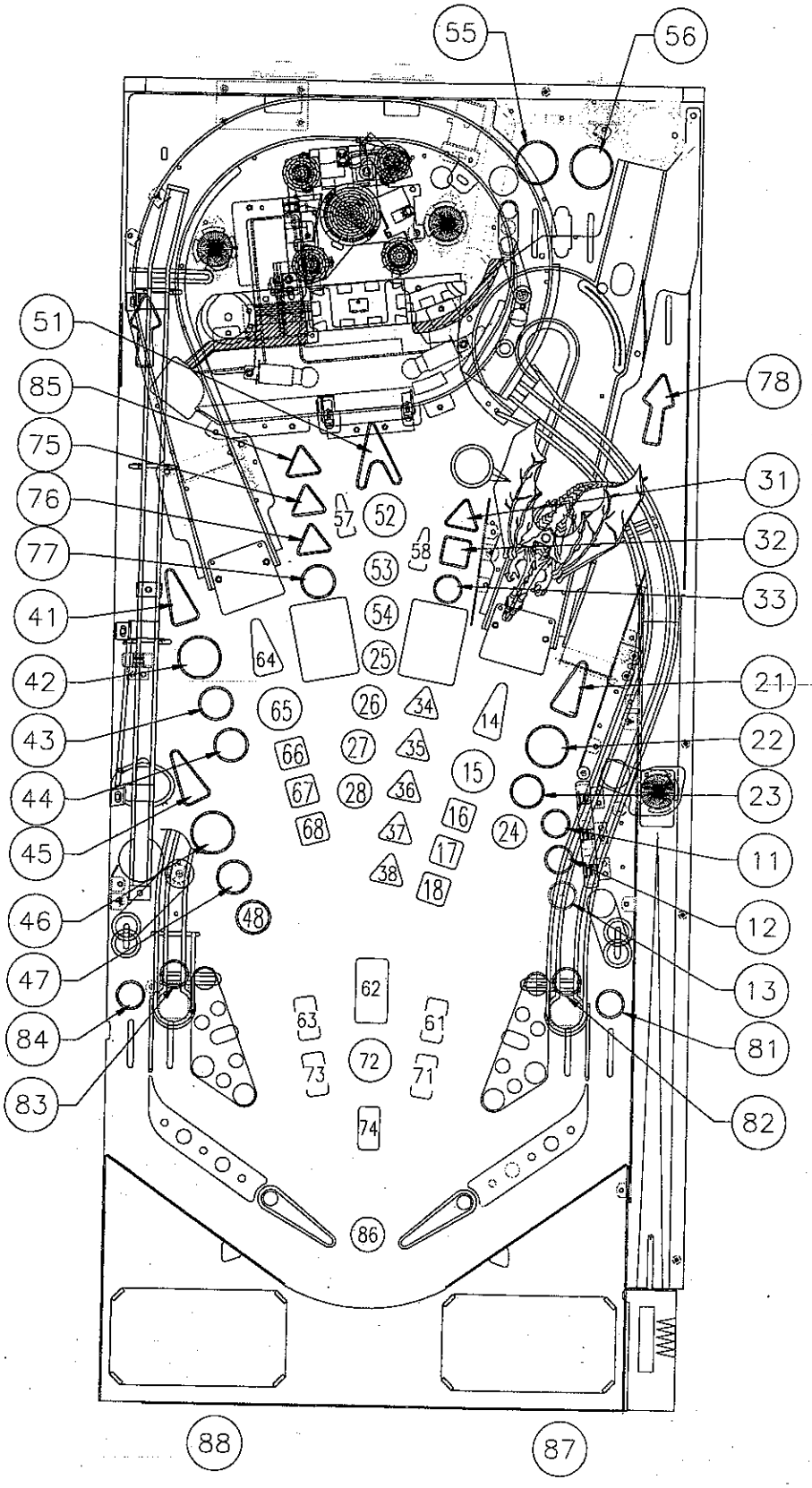
Upper Playfield Parts



Lamp Locations

Item Number	Lamp Assembly Part Number	Bulb Type	Bulb Part Number	Socket Part Number	Description
11	A-21322	#555	24-8768	24-8767	RIGHT BANK TOP
12	A-21322	#555	24-8768	24-8767	RIGHT BANK MIDDLE
13	A-21322	#555	24-8768	24-8767	RIGHT BANK BOTTOM
14	A-21738	#555	24-8768	24-8767	RIGHT RAMP JACKPOT
15	A-21738	#555	24-8768	24-8767	SAVE THE DAMSEL! (2)
16	A-21738	#555	24-8768	24-8767	DRAGON DEATH
17	A-21738	#555	24-8768	24-8767	DRAGON SNACK
18	A-21738	#555	24-8768	24-8767	DRAGON BREATH
21	A-21740	#555	24-8768	24-8767	RIGHT LOOP JACKPOT
22	A-21740	#555	24-8768	24-8767	RIGHT JOUST VICTORY!
23	A-21740	#555	24-8768	24-8767	RIGHT CLASH!
24	A-21740	#555	24-8768	24-8767	RIGHT CHARGE!
25	A-21740	#555	24-8768	24-8767	PATRON OF THE PEASANTS
26	A-21740	#555	24-8768	24-8767	CATAPULT ACE
27	A-21740	#555	24-8768	24-8767	JOUST CHAMPION
28	A-21740	#555	24-8768	24-8767	CASTLE CRUSHER
31	A-21322	#555	24-8768	24-8767	TROLLS!
32	A-21322	#555	24-8768	24-8767	EXTRA BALL
33	A-21322	#555	24-8768	24-8767	MERLIN'S MAGIC
34	A-21738	#555	24-8768	24-8767	TROLL MADNESS
35	A-21738	#555	24-8768	24-8767	DAMSEL MADNESS
36	A-21738	#555	24-8768	24-8767	PEASANT MADNESS
37	A-21738	#555	24-8768	24-8767	CATAPULT MADNESS
38	A-21738	#555	24-8768	24-8767	JOUST MADNESS
41	A-21740	#555	24-8768	24-8767	LEFT LOOP JACKPOT
42	A-21740	#555	24-8768	24-8767	LEFT JOUST VICTORY!
43	A-21740	#555	24-8768	24-8767	LEFT CLASH!
44	A-21740	#555	24-8768	24-8767	LEFT CHARGE!
45	A-21740	#555	24-8768	24-8767	CATAPULT JACKPOT
46	A-21740	#555	24-8768	24-8767	CATAPULT SLAM!
47	A-21740	#555	24-8768	24-8767	BAM!
48	A-21740	#555	24-8768	24-8767	WAM!
51	A-21741	#555	24-8768	24-8767	CENTER ARROW
52	A-21741	#555	24-8768	24-8767	BATTLE FOR THE KINGDOM
53	A-21741	#555	24-8768	24-8767	MASTER OF TROLLS
54	A-21741	#555	24-8768	24-8767	DEFENDER OF DAMSELS
55	A-17807	#44	24-6549	Not Sold Separate	LEFT TOP LANE
56	A-17807	#44	24-6549	Not Sold Separate	RIGHT TOP LANE
57	A-17835	#44	24-6549	Not Sold Separate	LEFT TROLL TARGET
58	A-17835	#44	24-6549	Not Sold Separate	RIGHT TROLL TARGET
61	A-21739	#555	24-8768	24-8767	FRANCOIS D'GRIMM
62	A-21739	#555	24-8768	24-8767	KING OF PAYNE
63	A-21739	#555	24-8768	24-8767	EARL OF EGO
64	A-21738	#555	24-8768	24-8767	LEFT RAMP JACKPOT
65	A-21738	#555	24-8768	24-8767	REVOLTING PEASANTS!
66	A-21738	#555	24-8768	24-8767	UGLY ROIT!
67	A-21738	#555	24-8768	24-8767	ANGRY MOB!
68	A-21738	#555	24-8768	24-8767	RABBLE ROUSER
71	A-21739	#555	24-8768	24-8767	HOWARD HURTZ
72	A-21739	#555	24-8768	24-8767	BALL SAVE
73	A-21739	#555	24-8768	24-8767	SIR PSYCHO
74	A-21739	#555	24-8768	24-8767	DUKE OF BOURBON
75	A-21551	#555	24-8768	24-8767	CASTLE LOCK 2
76	A-21551	#555	24-8768	24-8767	CASTLE LOCK 1
77	A-21551	#555	24-8768	24-8767	SUPER JACKPOT
78	A-17807	#44	24-6549	Not Sold Separate	SUPER JETS (2)
81	A-17835	#44	24-6549	Not Sold Separate	RIGHT OUTLANE
82	A-17807	#44	24-6549	Not Sold Separate	RIGHT RETURN
83	A-17835	#44	24-6549	Not Sold Separate	LEFT RETURN
84	A-17807	#44	24-6549	Not Sold Separate	LEFT OUTLANE
85	A-21551	#555	24-8768	24-8767	CASTLE LOCK 3
86	A-17087	#44	24-6549	Not Sold Separate	SHOOT AGAIN
87	20-9663-B-4		-----	Not Sold Separate	LAUNCH BUTTON
88	20-9663-16		-----	Not Sold Separate	START BUTTON

Lamp Locations



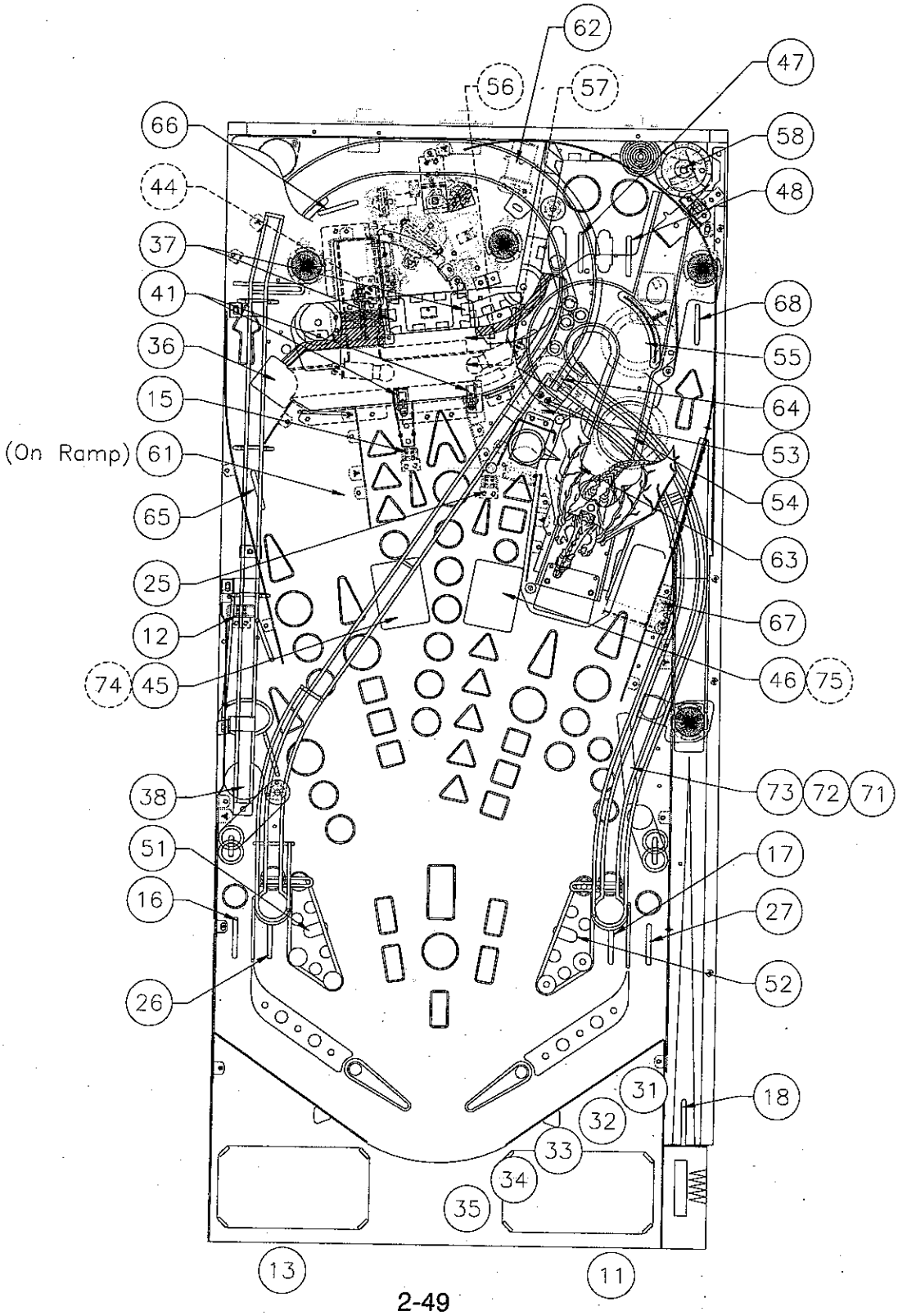
Switch Locations

Item Number	Switch Assembly Part Number *OR* Opto Assembly Part Number	Switch Part Number	Description
F1	-----	SW-1A-194	*LOWER RIGHT FLIPPER E.O.S.
F2	A-17316	-----	*LOWER RIGHT FLIPPER CABINET
F3	-----	SW-1A-194	*LOWER LEFT FLIPPER E.O.S.
F4	A-17316	-----	*LOWER LEFT FLIPPER CABINET
F5	NOT USED		UPPER RIGHT FLIPPER E.O.S.
F6	NOT USED		UPPER RIGHT FLIPPER CABINET
F7	NOT USED		UPPER LEFT FLIPPER E.O.S.
F8	NOT USED		UPPER LEFT FLIPPER CABINET
11	20-9663-B-4	-----	BALL LAUNCH
12	A-21990-4	-----	CATAPULT TARGET
13	20-9663-16	-----	START BUTTON
14	-----	04-10346	*PLUMB BOB TILT
15	A-18530-6	-----	LEFT TROLL TARGET
16	A-17813	5647-12693-19	LEFT OUTLANE
17	A-17813	5647-12693-19	RIGHT RETURN LANE
18	A-17791	5647-12693-32	SHOOTER LANE
21	A-17238	-----	*SLAM TILT
22	-----	5643-09268-00	*COIN DOOR CLOSED
23	NOT USED		
24	-----	5643-15190-00	*ALWAYS CLOSED
25	A-18530-6	-----	RIGHT TROLL TARGET
26	A-17813	5647-12693-19	LEFT RETURN LANE
27	A-17813	5647-12693-19	RIGHT OUTLANE
28	A-21970 **(SEE NOTE 1)**	5647-12693-43	RIGHT EJECT
31	A-18617-1 (LED) A-18618-1 (PHOTO TRANS)	----- -----	TROUGH ELECT
32	A-18617-1 (LED) A-18618-1 (PHOTO TRANS)	----- -----	TROUGH BALL 1
33	A-18617-1 (LED) A-18618-1 (PHOTO TRANS)	----- -----	TROUGH BALL 2
34	A-18617-1 (LED) A-18618-1 (PHOTO TRANS)	----- -----	TROUGH BALL 3
35	A-18617-1 (LED) A-18618-1 (PHOTO TRANS)	----- -----	TROUGH BALL 4
36	A-16908 (LED) A-16909 (PHOTO TRANS)	----- -----	LEFT POPPER
37	A-16908 (LED) A-16909 (PHOTO TRANS)	----- -----	CASTLE GATE
38	A-14947-1 **(SEE NOTE 1)**	5647-12133-12	CATAPULT
41	A-16908 (LED) A-16909 (PHOTO TRANS)	----- -----	MOAT ENTER
42	NOT USED		
43	NOT USED		
44	A-21800	5647-12693-67	CASTLE LOCK
45	A-21724	A-21743	LEFT TROLL (UNDER PLAYFIELD)
46	A-21724	A-21743	RIGHT TROLL (UNDER PLAYFIELD)
47	A-17813	5647-12693-19	LEFT TOP LANE
48	A-17813	5647-12693-19	RIGHT TOP LANE
51	A-17800 (KICK) A-17794 (**SCORE)	SW-1A-114 SW-1A-120	LEFT SLINGSHOT
52	A-17800 (KICK) A-17794 (**SCORE)	SW-1A-114 SW-1A-120	RIGHT SLINGSHOT
53	A-12030-3	A-16443-1	LEFT JET BUMPER
54	A-12030-3	A-16443-1	BOTTOM JET BUMPER
55	A-12030-3	A-16443-1	RIGHT JET BUMPER
56	A-22036 **(SEE NOTE 1)**	5647-12693-11	DRAWBRIDGE UP
57		5647-12693-11	DRAWBRIDGE DOWN
58	A-21734 **(SEE NOTE 1)**	5647-12693-06	TOWER EXIT
61	A-21799	5647-12693-11	LEFT RAMP ENTER
62	A-21821	5647-12693-13	LEFT RAMP EXIT
63	A-21777	5647-12693-11	RIGHT RAMP ENTER
64	A-21820	5647-12693-13	RIGHT RAMP EXIT
65	A-17813	5647-12693-19	LEFT LOOP LOW
66	A-17813	5647-12693-19	LEFT LOOP HIGH
67	A-21737	5647-12693-36	RIGHT LOOP LOW
68	A-17813	5647-12693-19	RIGHT LOOP HIGH
71	A-21576-4	-----	RIGHT BANK TOP
72	A-21576-4	-----	RIGHT BANK MIDDLE

Switch Locations

Item Number	Switch Assembly Part Number *OR* Opto Assembly Part Number	Switch Part Number	Description
73	A-21576-4	-----	RIGHT BANK BOTTOM
74	A-22034	5647-12693-11	LEFT TROLL UP
75	A-22034	5647-12693-11	RIGHT TROLL UP
76 to 88	NOT USED		

***NOT SHOWN. **SCORE SWITCHES HAVE DIODES ATTACHED.**
NOTE 1 - THIS IS A COMPLETE ASSEMBLY, NOT JUST A SWITCH ASSEMBLY.



Solenoid/Flashlamp Locations

Item Number	Coil or Flasher Assembly Part Number	Coil or Flasher Part Number	Description
01	A-21553-1	AE-23-800	Auto Plunger
02	A-19963-1	AE-26-1500	Trough Eject
03	A-22027	AE-26-1200	Left Popper
04	A-21718	AE-26-1500	Castle
05	A-22033	A-20099	Castle Gate Power
06			Castle Gate Hold
07	B-10686-1	AE-23-800	Knocker
08	A-14947-1	AL-23-800	Catapult
09	A-21970	AE-27-1200	Right Eject
10	B-9362-L-2	AE-26-1200	Left Slingshot
11	B-9362-R-3	AE-26-1200	Right Slingshot
12	A-9415-3	AE-26-1200	Left Jet Bumper
13	A-9415-3	AE-26-1200	Bottom Jet Bumper
14	A-9415-2	AE-26-1200	Right Jet Bumper
15	A-21706	A-20099	Tower Diverter Power
16			Tower Diverter Hold
17	**SEE NOTE 1**	#906 (1)	Left Side Low Flasher
17	-----	#906 (1)	Insert Panel Flasher
18	A-17983	#89 (1)	Left Ramp Flasher
18	-----	#906 (1)	Insert Panel Flasher
19	**SEE NOTE 1**	#906 (1)	Left Side High Flasher
19	-----	#906 (1)	Insert Panel Flasher
20	**SEE NOTE 1**	#906 (1)	Right Side High Flasher
20	-----	#906 (1)	Insert Panel Flasher
21	A-17802	#906 (1)	Right Ramp Flashers
	A-17983	#89 (1)	
22	**SEE NOTES 1 AND 2**	#906 (2)	Castle Right Side Flashers
23	**SEE NOTE 1**	#906 (1)	Right Side Low Flashers
	A-17983	#89 (1)	
24	A-17803	#89 (2)	Moat Flashers
25	**SEE NOTES 1 AND 2**	#906 (2)	Castle Left Side Flashers
26	A-21712-5	AE-27-1200	Tower Lock Post
27	A-17796	A-14406	Right Gate
28	A-17796-1	A-14406	Left Gate

Flippers

Item Number	Coil or Flasher Assembly Part Number	Coil or Flasher Part Number	Description
29-30	A-15849-R-2	FL-11629	Lower Right Flipper
31-32	A-15849-L-2	FL-11629	Lower Left Flipper
33-34	A-22034	FL-11753	Left Troll
35-36	A-22034	FL-11753	Right Troll

Motor

Item Number	Assembly Part Number	PC Board Part Number	Device Part Number	Description
37	A-22033	A-21708-1	14-8015	Drawbridge Motor

General Illumination

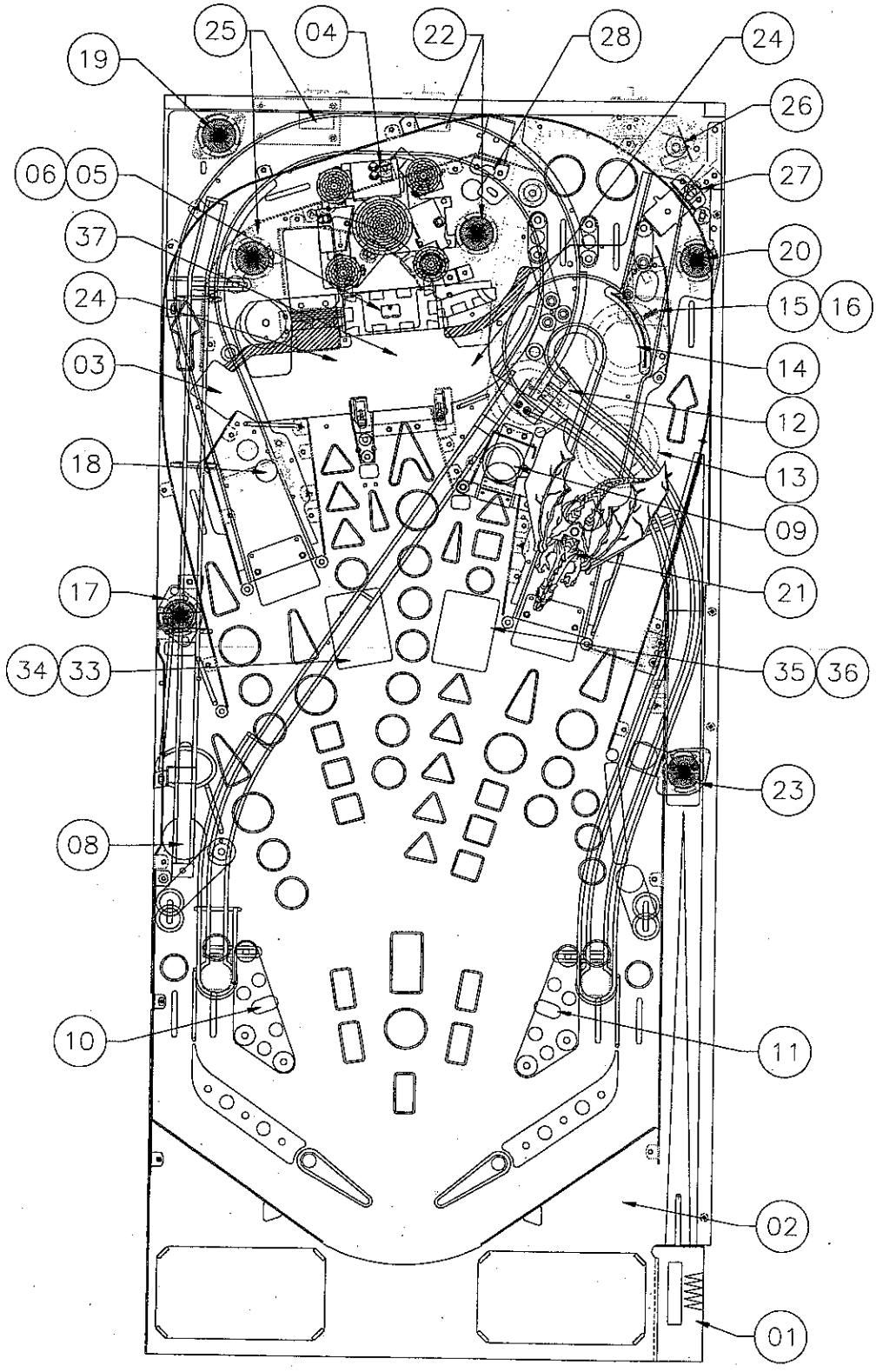
Item Number	Bulb Number	Description
01	#44 / #555	Bottom Playfield
02	#555	Middle Playfield
03	#555	Top Playfield
04	#44	Top Insert Panel
05	#44	Bottom Insert Panel

24-6549 = #44 BULB; 24-8768 = #555 BULB; 24-8802 = #906 BULB

NOTE 1 - Located on the playfield. The playfield assembly consists of three parts: a receptacle and skirt #A-14265-13; a red dome #03-8171-9, and a #906 bulb #24-8802.

NOTE 2: - There is one bulb located on the playfield and one located on the back panel. The back panel assembly consists of one part, #A-20158.

Solenoid/Flashlamp Locations



LAMP MATRIX

Yellow (B+) — Red

Column / Row	1 Yellow-Brown J121-1 Q96	2 Yellow-Red J121-2 Q100	3 Yellow-Orange J121-3 Q95	4 Yellow-Black J121-4 Q99	5 Yellow-Green J121-5 Q94	6 Yellow-Blue J121-6 Q98	7 Yellow-Violet J121-7 Q93	8 Yellow-Gray J121-9 Q97
1 Red-Brown J125-1 Q104	RIGHT BANK TOP 11	RIGHT LOOP JACKPOT 21	TROLLS! 31	LEFT LOOP JACKPOT 41	CENTER ARROW 51	FRANCOIS D'GRIMM 61	HOWARD HURTZ 71	RIGHT OUTLANE 81
2 Red-Black J125-2 Q108	RIGHT BANK MIDDLE 12	RIGHT JOUST VICTORY! 22	EXTRA BALL 32	LEFT JOUST VICTORY! 42	BATTLE FOR THE KINGDOM 52	KING OF PAYNE 62	MAGIC SHIELD 72	RIGHT RETURN 82
3 Red-Orange J125-4 Q103	RIGHT BANK BOTTOM 13	RIGHT CLASH! 23	MERLIN'S MAGIC 33	LEFT CLASH! 43	MASTER OF TROLLS 53	EARL OF EGO 63	SIR PSYCHO 73	LEFT RETURN 83
4 Red-Yellow J125-5 Q107	RIGHT RAMP JACKPOT 14	RIGHT CHARGE! 24	TROLL MADNESS 34	LEFT CHARGE! 44	DEFENDER OF DAMSELS 54	LEFT RAMP JACKPOT 64	DUKE OF BOURBON 74	LEFT OUTLANE 84
5 Red-Green J125-6 Q102	SAVE THE DAMSEL! (2) 15	PATRON OF THE PEASANTS 25	DAMSEL MADNESS 35	CATAPULT JACKPOT 45	LEFT TOP LANE 55	REVOLTING PEASANTS! 65	CASTLE LOCK 2 75	CASTLE LOCK 3 85
6 Red-Blue J125-7 Q106	DRAGON DEATH 16	CATAPULT ACE 26	PEASANT MADNESS 36	CATAPULT SLAM! 46	RIGHT TOP LANE 56	UGLY RIOT! 66	CASTLE LOCK 1 76	SHOOT AGAIN 86
7 Red-Violet J125-8 Q101	DRAGON SNACK 17	JOUST CHAMPION 27	CATAPULT MADNESS 37	BAM! 47	LEFT TROLL TARGET 57	ANGRY MOB! 67	SUPER JACKPOT 77	LAUNCH BUTTON 87
8 Red-Gray J125-9 Q105	DRAGON BREATH 18	CASTLE CRUSHER 28	JOUST MADNESS 38	WAM! 48	RIGHT TROLL TARGET 58	RABBLE ROUSER 68	SUPER JETS (2) 78	START BUTTON 88

J1XX = Power Driver Board

SWITCH MATRIX

White —▶|— o⁄ o— Green

Dedicated Grounded Switches	Column / Row	1 Green-Brown J206-1 U20-18	2 Green-Red J206-2 U20-17	3 Green-Orange J206-3 U20-16	4 Green-White J206-4 U20-15	5 Green-Black J206-5 U20-14	6 Green-Blue J206-6 U20-13	7 Green-Violet J206-7 U20-12	8 Green-Gray J206-9 U20-11	Flipper Grounded Switches
Orange-Brown J205-1 Left Coin Chute U17-5 D1	**1 White-Brown** J208-1 U18-11	LAUNCH BALL 11	SLAM TILT 21	TROUGH EJECT 31	MOAT ENTER 41	LEFT SLINGSHOT 51	LEFT RAMP ENTER 61	RIGHT BANK TOP 71	NOT USED 81	**Black-Green J208-13** Lower Right Flipper E.O.S. F1
Orange-Red J205-2 Center Coin Chute U17-7 D2	**2 White-Red** J208-2 U18-9	CATAPULT TARGET 12	COIN DOOR CLOSED 22	TROUGH BALL 1 32	NOT USED 42	RIGHT SLINGSHOT 52	LEFT RAMP EXIT 62	RIGHT BANK MIDDLE 72	NOT USED 82	**Blue-Violet J212-12** Lower Right Flipper Opto F2
Orange-Black J205-3 Right Coin Chute U17-11 D3	**3 White-Orange** J208-3 U18-5	START BUTTON 13	NOT USED 23	TROUGH BALL 2 33	NOT USED 43	LEFT JET BUMPER 53	RIGHT RAMP ENTER 63	RIGHT BANK BOTTOM 73	NOT USED 83	**Black-Blue J208-12** Lower Left Flipper E.O.S. F3
Orange-Yellow J205-4 4th Coin Chute U17-9 D4	**4 White-Yellow** J208-4 U18-7	PLUMB BOB TILT 14	ALWAYS CLOSED 24	TROUGH BALL 3 34	CASTLE LOCK 44	BOTTOM JET BUMPER 54	RIGHT RAMP EXIT 64	LEFT TROLL UP 74	NOT USED 84	**Blue-Gray J212-11** Lower Left Flipper Opto F4
Orange-Green J205-6 U16-9 Normal Function Srv Crdts / Test Function Escape D5	**5 White-Green** J208-5 U19-11	LEFT TROLL TARGET 15	RIGHT TROLL TARGET 25	TROUGH BALL 4 35	LEFT TROLL (UNDER PLAYFIELD) 45	RIGHT JET BUMPER 55	LEFT LOOP LOW 65	RIGHT TROLL UP 75	NOT USED 85	**Black-Violet J208-11** Upper Right Flipper E.O.S. F5
Orange-Blue J205-7 U16-11 Normal Function Volume Dn / Test Function Down D6	**6 White-Blue** U208-7 U19-9	LEFT OUTLANE 16	LEFT RETURN LANE 26	LEFT POPPER 36	RIGHT TROLL (UNDER PLAYFIELD) 46	DRAW-BRIDGE UP 56	LEFT LOOP HIGH 66	NOT USED 76	NOT USED 86	**Black-Yellow J212-10** Upper Right Flipper Opto F6
Orange-Violet J205-8 U16-7 Normal Function Volume Up / Test Function Up D7	**7 White-Violet** J208-8 U19-5	RIGHT RETURN LANE 17	RIGHT OUTLANE 27	CASTLE GATE 37	LEFT TOP LANE 47	DRAW-BRIDGE DOWN 57	RIGHT LOOP LOW 67	NOT USED 77	NOT USED 87	**Black–Gray J208-10** Upper Left Flipper E.O.S. F7
Orange-Gray J205-9 U16-5 Normal Function Begin Test / Test Function Enter D8	**8 White-Gray** J208-9 U19-7	SHOOTER LANE 18	RIGHT EJECT 28	CATAPULT 38	RIGHT TOP LANE 48	TOWER EXIT 58	RIGHT LOOP HIGH 68	NOT USED 78	NOT USED 88	**Black-Blue J212-9** Upper Left Flipper Opto F8

J2XX = CPU BOARD   [shaded] = OPTO, TYPICALLY CLOSED

SOLENOID/FLASHER TABLE

Sol. No.	Function	Solenoid Type	Voltage Connections Playfield	Backbox	Cabinet	Drive Xistor	Drive Connections Playfield	Backbox	Cabinet	Drive Wire Color	Solenoid Part Number Flashlamp Type Playfield	Insert
01	AUTO PLUNGER	High Power	J133-2			Q72	J116-1			VIO-BRN	AE-23-800	
02	TROUGH EJECT	High Power	J133-2			Q68	J116-2			VIO-RED	AE-26-1500	
03	LEFT POPPER	High Power	J133-2			Q71	J116-4			VIO-ORG	AE-26-1200	
04	CASTLE	High Power	J133-2			Q67	J116-5			VIO-YEL	AE-26-1500	
05	CASTLE GATE POWER	High Power	J133-2			Q70	J116-6			VIO-GRN	A-20099	
06	CASTLE GATE HOLD	High Power				Q66	J116-7			VIO-BLU		
07	KNOCKER	High Power		J133-2		Q69		J116-8		VIO-BLK	AE-23-800	
08	CATAPULT	High Power	J133-2			Q65	J116-9			VIO-GRY	AL-23-800	
09	RIGHT EJECT	Low Power	J133-3			Q44	J113-1			BRN-BLK	AE-27-1200	
10	LEFT SLINGSHOT	Low Power	J133-3			Q48	J113-3			BRN-RED	AE-26-1200	
11	RIGHT SLINGSHOT	Low Power	J133-3			Q43	J113-4			BRN-ORG	AE-26-1200	
12	LEFT JET BUMPER	Low Power	J133-3			Q47	J113-5			BRN-YEL	AE-26-1200	
13	BOTTOM JET BUMPER	Low Power	J133-3			Q42	J113-6			BRN-GRN	AE-26-1200	
14	RIGHT JET BUMPER	Low Power	J133-3			Q46	J113-7			BRN-BLU	AE-26-1200	
15	TOWER DIVERTER PWR	Low Power	J133-3			Q41	J113-8			BRN-VIO	A-20099	
16	TOWER DIVERTER HOLD	Low Power				Q45	J113-9			BRN-GRY		
17	LEFT SIDE LOW FLSHRS	Flasher	J133-6	J134-5		Q28	J111-1	J112-1		BLK-BRN	#906 (1)	#906 (1)
18	LEFT RAMP FLASHERS	Flasher	J133-6	J134-5		Q32	J111-2	J112-2		BLK-RED	#89 (1)	#906 (1)
19	LEFT SIDE HIGH FLSHRS	Flasher	J133-6	J134-5		Q27	J111-3	J112-3		BLK-ORG	#906 (1)	#906 (1)
20	RIGHT SIDE HIGH FLSHRS	Flasher	J133-6	J134-5		Q31	J111-4	J112-4		BLK-YEL	#906 (1)	#906 (1)
21	RIGHT RAMP FLASHERS	Flasher	J133-6			Q26	J111-5			BLU-GRN	#906 (1), #89 (1)	
22	CASTLE RIGHT SIDE FLSHRS	Flasher	J133-6			Q30	J111-6			BLU-BLK	#906 (2)	
23	RIGHT SIDE LOW FLSHRS	Flasher	J133-6			Q25	J111-7			BLU-VIO	#906 (1), #89 (1)	
24	MOAT FLASHERS	Flasher	J133-6			Q29	J111-8			BLU-GRY	#89 (2)	
25	CASTLE LEFT SIDE FLSHRS	Gen. Purpose	J133-6			Q16	J109-1			BLU-BRN	#906 (2)	
26	*TOWER LOCK POST	Gen. Purpose	J133-1			Q15	J109-2			BLU-RED	AE-27-1200	
27	*RIGHT GATE	Gen. Purpose	J133-1			Q14	J109-3			BLU-ORG	A-14406	
28	*LEFT GATE	Gen. Purpose	J133-1			Q13	J109-4			BLU-YEL	A-14406	
	General Illumination											
01	BOTTOM PLAYFIELD	G.I.	J106-1	J105-1		Q5	J106-7	J105-7		WHT-BRN	#44	#555
02	MIDDLE PLAYFIELD	G.I.		J105-2		Q4		J105-8		WHT-ORG		#555
03	TOP PLAYFIELD	G.I.		J105-3		Q3		J105-9		WHT-YEL		#555
04	**TOP INSERT	G.I.	J106-5			Q2	J106-10			WHT-GRN	#44	
05	**BOTTOM INSERT	G.I.	J106-6		J104-3	Q1	J106-11		J104-1	WHT-VIO	#44	

	Flipper Circuits	Solenoid Type	Voltage Connection Playfield	Drive Xistors Power	Hold	Drive Connections Playfield	Drive Wire Colors Power	Hold	Coil Part No.	Coil Colors
29		Power	J119-1 (RED-GRN)	Q90		J120-13	YEL-GRN		FL-11629	BLUE
30	LOWER RIGHT FLIPPER	Hold	J119-1 (RED-GRN)		Q92	J120-11		ORG-GRN		
31		Power	J119-4 (RED-BLU)	Q87		J120-9	YEL-BLU		FL-11629	BLUE
32	LOWER LEFT FLIPPER	Hold	J119-4 (RED-BLU)		Q89	J120-7		ORG-BLU		
33		Power	J119-6 (RED-VIO)	Q84		J120-6	YEL-VIO		FL-11753	YELLOW
34	LEFT TROLL	Hold	J119-6 (RED-VIO)		Q86	J120-4		ORG-VIO		
35		Power	J119-8 (RED-GRY)	Q81		J120-3	YEL-GRY		FL-11753	YELLOW
36	RIGHT TROLL	Hold	J119-8 (RED-GRY)		Q83	J120-1		ORG-GRY		

	Motor Circuit	Solenoid Type	Voltage Connections Playfield	Drive Gates	Drive Connections Playfield	Drive Wire Color	Device Part Number Playfield
37	DRAWBRIDGE MOTOR	Low Power	J139-2	U3A, U3B	J110-1	BRN-WHT	14-8015

J1XX = POWER DRIVER BOARD

24-6549 = #44 BULB; 24-8704 = #89 BULB; 24-8768 = #555 BULB; 24-8802 = #906 BULB

*TIEBACK DIODES FOR SOLENOIDS 26 THROUGH 28 ARE AT J109-6, J109-8, AND J109-9 RESPECTIVELY.

**THESE G.I. STRINGS DO NOT BRIGHTEN AND DIM, THEY ARE ALWAYS ON.

SECTION THREE

GAME WIRING AND SCHEMATICS

CONNECTOR & COMPONENT IDENTIFICATION

Each plug or jack receives a number that identifies the circuit board and the position on that board that it connects to. J-designations refer to a male connector. P-designations refer to a female connector. For example, J101 designates jack 1 of board 1 (a Power Driver board jack); P206 designates plug 6 of board 2 (a CPU board plug). Identifying the specific pin number of a connector involves a hyphen, which separates the pin number from the plug or jack designation. For example, J101-3 refers to pin 3 of jack 1 on board 1.

Other game components may also have similar numbers to clarify their locations or related circuits. For example, F501 is a fuse on the Audio Video board.

Prefix numbers for WPC circuit boards are listed below.
J1XX - Power Driver board jacks; F1XX - Power Driver board fuses
J2XX - CPU Board (There are no fuses on the CPU board.)
J5XX and J6XX - Audio Video board (AV board) jacks; F5XX and F6XX - Audio Video board fuses

Schematics for standard WPC backbox boards are found in the WPC Schematics Manual. Playfield, cabinet and all other backbox board schematics are found in this section.

SWITCH MATRIX

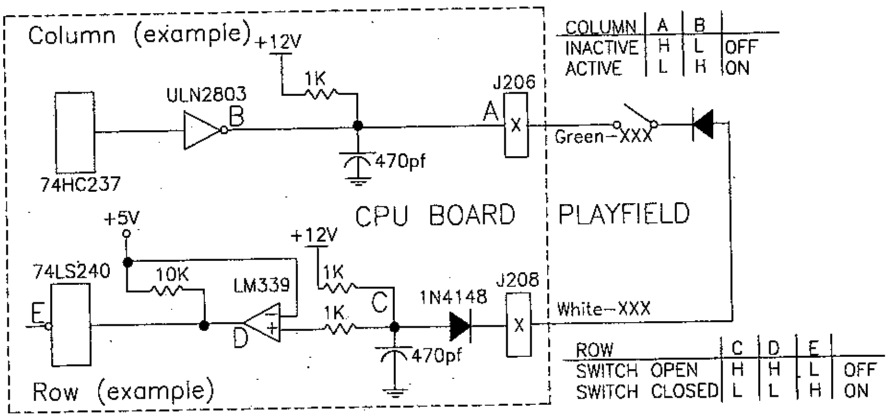
White —▸|—o/ o— Green

Dedicated Grounded Switches	Column / Row	1 Green-Brown J206-1 U20-18	2 Green-Red J206-2 U20-17	3 Green-Orange J206-3 U20-16	4 Green-White J206-4 U20-15	5 Green-Black J206-5 U20-14	6 Green-Blue J206-6 U20-13	7 Green-Violet J206-7 U20-12	8 Green-Gray J206-9 U20-11	Flipper Grounded Switches
Orange-Brown J205-1 Left Coin Chute U17-5 D1	**1 White-Brown** J208-1 U18-11	LAUNCH BALL 11	SLAM TILT 21	TROUGH EJECT 31	MOAT ENTER 41	LEFT SLINGSHOT 51	LEFT RAMP ENTER 61	RIGHT BANK TOP 71	NOT USED 81	**Black-Green J208-13** Lower Right Flipper E.O.S. F1
Orange-Red J205-2 Center Coin Chute U17-7 D2	**2 White-Red** J208-2 U18-9	CATAPULT TARGET 12	COIN DOOR CLOSED 22	TROUGH BALL 1 32	NOT USED 42	RIGHT SLINGSHOT 52	LEFT RAMP EXIT 62	RIGHT BANK MIDDLE 72	NOT USED 82	**Blue-Violet J212-12** Lower Right Flipper Opto F2
Orange-Black J205-3 Right Coin Chute U17-11 D3	**3 White-Orange** J208-3 U18-5	START BUTTON 13	NOT USED 23	TROUGH BALL 2 33	NOT USED 43	LEFT JET BUMPER 53	RIGHT RAMP ENTER 63	RIGHT BANK BOTTOM 73	NOT USED 83	**Black-Blue J208-12** Lower Left Flipper E.O.S. F3
Orange-Yellow J205-4 4th Coin Chute U17-9 D4	**4 White-Yellow** J208-4 U18-7	PLUMB BOB TILT 14	ALWAYS CLOSED 24	TROUGH BALL 3 34	CASTLE LOCK 44	BOTTOM JET BUMPER 54	RIGHT RAMP EXIT 64	LEFT TROLL UP 74	NOT USED 84	**Blue-Gray J212-11** Lower Left Flipper Opto F4
Orange-Green J205-6 U16-9 Normal Function Srv Crdts / Test Function Escape D5	**5 White-Green** J208-5 U19-11	LEFT TROLL TARGET 15	RIGHT TROLL TARGET 25	TROUGH BALL 4 35	LEFT TROLL (UNDER PLAYFIELD) 45	RIGHT JET BUMPER 55	LEFT LOOP LOW 65	RIGHT TROLL UP 75	NOT USED 85	**Black-Violet J208-11** Upper Right Flipper E.O.S. F5
Orange-Blue J205-7 U16-11 Normal Function Volume Dn / Test Function Down D6	**6 White-Blue** U208-7 U19-9	LEFT OUTLANE 16	LEFT RETURN LANE 26	LEFT POPPER 36	RIGHT TROLL (UNDER PLAYFIELD) 46	DRAW-BRIDGE UP 56	LEFT LOOP HIGH 66	NOT USED 76	NOT USED 86	**Black-Yellow J212-10** Upper Right Flipper Opto F6
Orange-Violet J205-8 U16-7 Normal Function Volume Up / Test Function Up D7	**7 White-Violet** J208-8 U19-5	RIGHT RETURN LANE 17	RIGHT OUTLANE 27	CASTLE GATE 37	LEFT TOP LANE 47	DRAW-BRIDGE DOWN 57	RIGHT LOOP LOW 67	NOT USED 77	NOT USED 87	**Black-Gray J208-10** Upper Left Flipper E.O.S. F7
Orange-Gray J205-9 U16-5 Normal Function Begin Test / Test Function Enter D8	**8 White-Gray** J208-9 U19-7	SHOOTER LANE 18	RIGHT EJECT 28	CATAPULT 38	RIGHT TOP LANE 48	TOWER EXIT 58	RIGHT LOOP HIGH 68	NOT USED 78	NOT USED 88	**Black-Blue J212-9** Upper Left Flipper Opto F8

J2XX = CPU BOARD

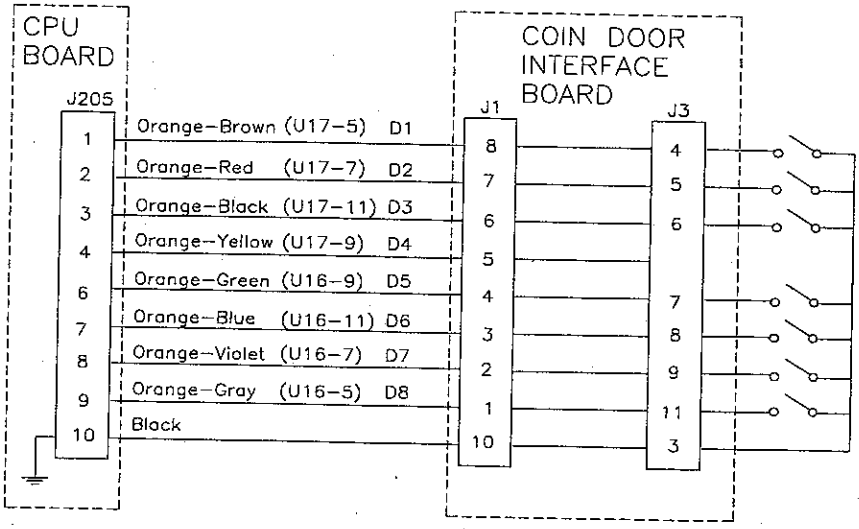
(shaded) = OPTO, TYPICALLY CLOSED

SWITCH MATRIX CIRCUIT



The microprocessor is constantly strobing the column side of the switch. When point "A" on the column circuit toggles low, the column side is active. When a switch closes, the row side of the circuit activates. The "+" input to the LM339 drops below +5V, therefore, its output is low. Corresponding row and column switches must be low at the same time for the switch to be considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row is inactive.

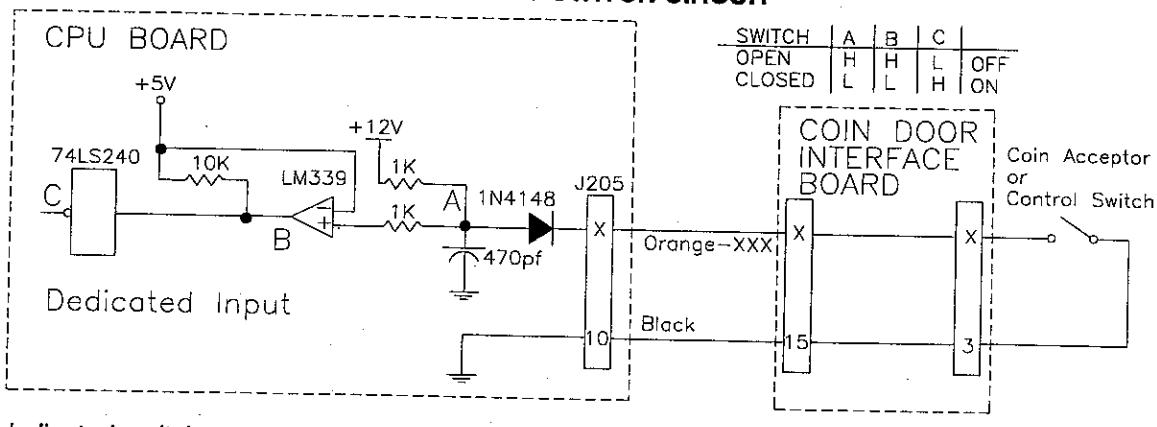
DEDICATED SWITCHES



Coin Acceptor Switches
D1 - Left Coin Chute
D2 - Center Coin Chute
D3 - Right Coin Chute
D4 - Fourth Coin Chute

Control Switches
D5 - Normal Function, Service Credits; Test Function, Escape
D6 - Normal Function, Volume Down; Test Function, Down
D7 - Normal Function, Volume Up; Test Function, Up
D8 - Normal Function, Begin Test; Test Function, Enter

DEDICATED SWITCH CIRCUIT



The dedicated switches operate similar in the matrix, except that instead of a column circuit there is a direct tie to ground. Therefore, the column side is constantly active (low).

When a switch closes, the row side (dedicated input) of the circuit activates. The "+" input to the LM339 drops below +5V, therefore the output is low. Since the row circuit (dedicated input) is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, it output is high and the row is inactive

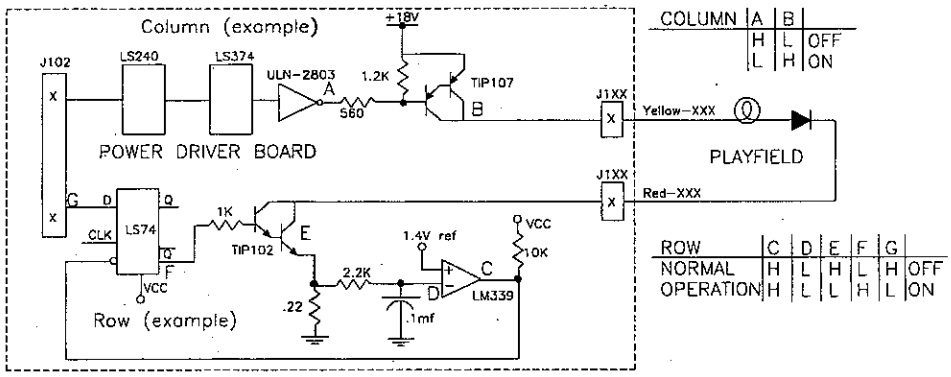
LAMP MATRIX

Yellow (B+) — Red

Column / Row	1 Yellow-Brown J121-1 Q96	2 Yellow-Red J121-2 Q100	3 Yellow-Orange J121-3 Q95	4 Yellow-Black J121-4 Q99	5 Yellow-Green J121-5 Q94	6 Yellow-Blue J121-6 Q98	7 Yellow-Violet J121-7 Q93	8 Yellow-Gray J121-9 Q97
1 Red-Brown J125-1 Q104	RIGHT BANK TOP 11	RIGHT LOOP JACKPOT 21	TROLLS! 31	LEFT LOOP JACKPOT 41	CENTER ARROW 51	FRANCOIS D'GRIMM 61	HOWARD HURTZ 71	RIGHT OUTLANE 81
2 Red-Black J125-2 Q108	RIGHT BANK MIDDLE 12	RIGHT JOUST VICTORY! 22	EXTRA BALL 32	LEFT JOUST VICTORY! 42	BATTLE FOR THE KINGDOM 52	KING OF PAYNE 62	MAGIC SHIELD 72	RIGHT RETURN 82
3 Red-Orange J125-4 Q103	RIGHT BANK BOTTOM 13	RIGHT CLASH! 23	MERLIN'S MAGIC 33	LEFT CLASH! 43	MASTER OF TROLLS 53	EARL OF EGO 63	SIR PSYCHO 73	LEFT RETURN 83
4 Red-Yellow J125-5 Q107	RIGHT RAMP JACKPOT 14	RIGHT CHARGE! 24	TROLL MADNESS 34	LEFT CHARGE! 44	DEFENDER OF DAMSELS 54	LEFT RAMP JACKPOT 64	DUKE OF BOURBON 74	LEFT OUTLANE 84
5 Red-Green J125-6 Q102	SAVE THE DAMSEL! (2) 15	PATRON OF THE PEASANTS 25	DAMSEL MADNESS 35	CATAPULT JACKPOT 45	LEFT TOP LANE 55	REVOLTING PEASANTS! 65	CASTLE LOCK 2 75	CASTLE LOCK 3 85
6 Red-Blue J125-7 Q106	DRAGON DEATH 16	CATAPULT ACE 26	PEASANT MADNESS 36	CATAPULT SLAM! 46	RIGHT TOP LANE 56	UGLY RIOT! 66	CASTLE LOCK 1 76	SHOOT AGAIN 86
7 Red-Violet J125-8 Q101	DRAGON SNACK 17	JOUST CHAMPION 27	CATAPULT MADNESS 37	BAM! 47	LEFT TROLL TARGET 57	ANGRY MOB! 67	SUPER JACKPOT 77	LAUNCH BUTTON 87
8 Red-Gray J125-9 Q105	DRAGON BREATH 18	CASTLE CRUSHER 28	JOUST MADNESS 38	WAM! 48	RIGHT TROLL TARGET 58	RABBLE ROUSER 68	SUPER JETS (2) 78	START BUTTON 88

J1XX = Power Driver Board

LAMP MATRIX CIRCUIT



The microprocessor sends a signal to the column circuit causing the output of the UNL-2803 to toggle. When point "A" drops low, the TIP107 transistor conducts and point "B" changes to a high state. At the same time, the microprocessor drives the input of the 74LS74 low, causing a high at output "F". A high state at the base of the TIP102 causes the transistor to conducts, bringing the row circuit to ground and turning the lamp on. The microprocessor changes the input of the 74LS74 to a high state to turn the lamp off. In overcurrent conditions, the lamp is shut off through the comparator. If the voltage at the negative input of the LM339 rises above 1.4V, the output changes to a low, which is fed back to the 74LS74 and shuts the circuit off.

SOLENOID/FLASHER TABLE

Sol. No.	Function	Solenoid Type	Voltage Connections			Drive Xistor	Drive Connections			Drive Wire Color	Solenoid Part Number Flashlamp Type	
			Playfield	Backbox	Cabinet		Playfield	Backbox	Cabinet		Playfield	Insert
01	AUTO PLUNGER	High Power	J133-2			Q72	J116-1			VIO-BRN	AE-23-800	
02	TROUGH EJECT	High Power	J133-2			Q68	J116-2			VIO-RED	AE-26-1500	
03	LEFT POPPER	High Power	J133-2			Q71	J116-4			VIO-ORG	AE-26-1200	
04	CASTLE	High Power	J133-2			Q67	J116-5			VIO-YEL	AE-26-1500	
05	CASTLE GATE POWER	High Power	J133-2			Q70	J116-6			VIO-GRN	A-20099	
06	CASTLE GATE HOLD	High Power				Q66	J116-7			VIO-BLU		
07	KNOCKER	High Power		J133-2		Q69		J116-8		VIO-BLK	AE-23-800	
08	CATAPULT	High Power	J133-2			Q65	J116-9			VIO-GRY	AL-23-800	
09	RIGHT EJECT	Low Power	J133-3			Q44	J113-1			BRN-BLK	AE-27-1200	
10	LEFT SLINGSHOT	Low Power	J133-3			Q48	J113-3			BRN-RED	AE-26-1200	
11	RIGHT SLINGSHOT	Low Power	J133-3			Q43	J113-4			BRN-ORG	AE-26-1200	
12	LEFT JET BUMPER	Low Power	J133-3			Q47	J113-5			BRN-YEL	AE-26-1200	
13	BOTTOM JET BUMPER	Low Power	J133-3			Q42	J113-6			BRN-GRN	AE-26-1200	
14	RIGHT JET BUMPER	Low Power	J133-3			Q46	J113-7			BRN-BLU	AE-26-1200	
15	TOWER DIVERTER PWR	Low Power	J133-3			Q41	J113-8			BRN-VIO	A-20099	
16	TOWER DIVERTER HOLD	Low Power				Q45	J113-9			BRN-GRY		
17	LEFT SIDE LOW FLSHRS	Flasher	J133-6	J134-5		Q28	J111-1	J112-1		BLK-BRN	#906 (1)	#906 (1)
18	LEFT RAMP FLASHERS	Flasher	J133-6	J134-5		Q32	J111-2	J112-2		BLK-RED	#89 (1)	#906 (1)
19	LEFT SIDE HIGH FLSHRS	Flasher	J133-6	J134-5		Q27	J111-3	J112-3		BLK-ORG	#906 (1)	#906 (1)
20	RIGHT SIDE HIGH FLSHRS	Flasher	J133-6	J134-5		Q31	J111-4	J112-4		BLK-YEL	#906 (1)	#906 (1)
21	RIGHT RAMP FLASHERS	Flasher	J133-6			Q26	J111-5			BLU-GRN	#906 (1), #89 (1)	
22	CASTLE RIGHT SIDE FLSHRS	Flasher	J133-6			Q30	J111-6			BLU-BLK	#906 (2)	
23	RIGHT SIDE LOW FLSHRS	Flasher	J133-6			Q25	J111-7			BLU-VIO	#906 (1), #89 (1)	
24	MOAT FLASHERS	Flasher	J133-6			Q29	J111-8			BLU-GRY	#89 (2)	
25	CASTLE LEFT SIDE FLSHRS	Gen. Purpose	J133-6			Q16	J109-1			BLU-BRN	#906 (2)	
26	*TOWER LOCK POST	Gen. Purpose	J133-1			Q15	J109-2			BLU-RED	AE-27-1200	
27	*RIGHT GATE	Gen. Purpose	J133-1			Q14	J109-3			BLU-ORG	A-14406	
28	*LEFT GATE	Gen. Purpose	J133-1			Q13	J109-4			BLU-YEL	A-14406	
General Illumination												
01	BOTTOM PLAYFIELD	G.I.	J106-1	J105-1		Q5	J106-7	J105-7		WHT-BRN	#44	#555
02	MIDDLE PLAYFIELD	G.I.		J105-2		Q4		J105-8		WHT-ORG		#555
03	TOP PLAYFIELD	G.I.		J105-3		Q3		J105-9		WHT-YEL		#555
04	**TOP INSERT	G.I.	J106-5			Q2	J106-10			WHT-GRN	#44	
05	**BOTTOM INSERT	G.I.	J106-6		J104-3	Q1	J106-11		J104-1	WHT-VIO	#44	

Flipper Circuits		Solenoid Type	Voltage Connection Playfield	Drive Xistors Power	Drive Xistors Hold	Drive Connections Playfield	Drive Wire Colors Power	Drive Wire Colors Hold	Coil Part No.	Coil Colors
29		Power	J119-1 (RED-GRN)	Q90		J120-13	YEL-GRN		FL-11629	BLUE
30	LOWER RIGHT FLIPPER	Hold	J119-1 (RED-GRN)		Q92	J120-11		ORG-GRN		
31		Power	J119-4 (RED-BLU)	Q87		J120-9	YEL-BLU		FL-11629	BLUE
32	LOWER LEFT FLIPPER	Hold	J119-4 (RED-BLU)		Q89	J120-7		ORG-BLU		
33		Power	J119-6 (RED-VIO)	Q84		J120-6	YEL-VIO		FL-11753	YELLOW
34	LEFT TROLL	Hold	J119-6 (RED-VIO)		Q86	J120-4		ORG-VIO		
35		Power	J119-8 (RED-GRY)	Q81		J120-3	YEL-GRY		FL-11753	YELLOW
36	RIGHT TROLL	Hold	J119-8 (RED-GRY)		Q83	J120-1		ORG-GRY		

Motor Circuit		Solenoid Type	Voltage Connections Playfield	Drive Gates	Drive Connections Playfield	Drive Wire Color	Device Part Number Playfield
37	DRAWBRIDGE MOTOR	Low Power	J139-2	U3A, U3B	J110-1	BRN-WHT	14-8015

J1XX = POWER DRIVER BOARD

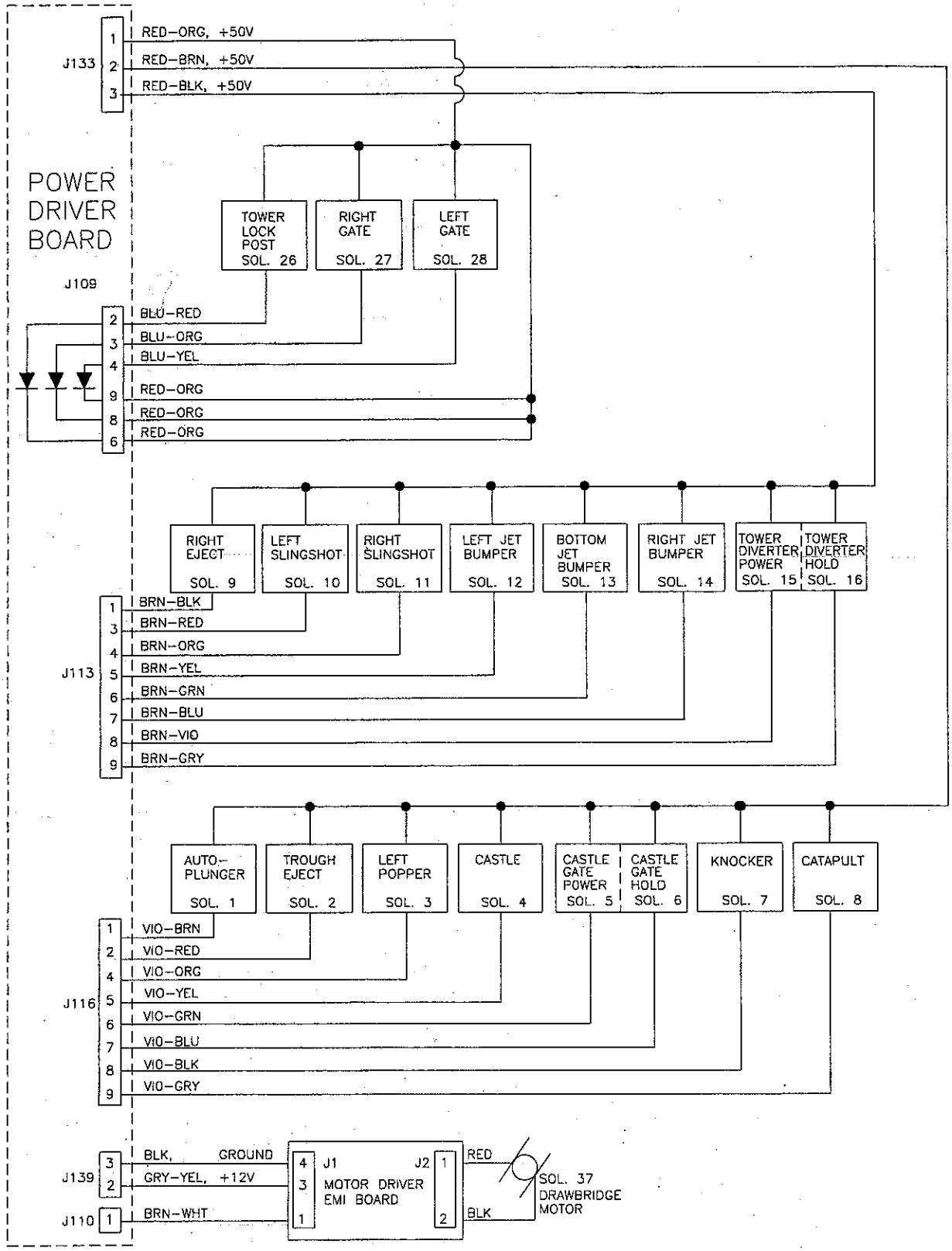
24-6549 = #44 BULB; 24-8704 = #89 BULB; 24-8768 = #555 BULB; 24-8802 = #906 BULB

*TIEBACK DIODES FOR SOLENOIDS 26 THROUGH 28 ARE AT J109-6, J109-8, AND J109-9 RESPECTIVELY.

**THESE G.I. STRINGS DO NOT BRIGHTEN AND DIM, THEY ARE ALWAYS ON.

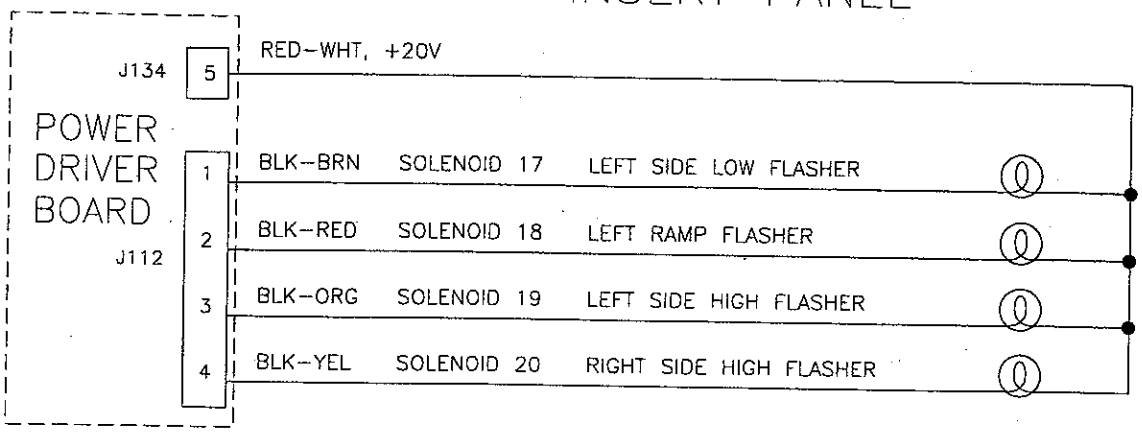
SOLENOID WIRING

COILS

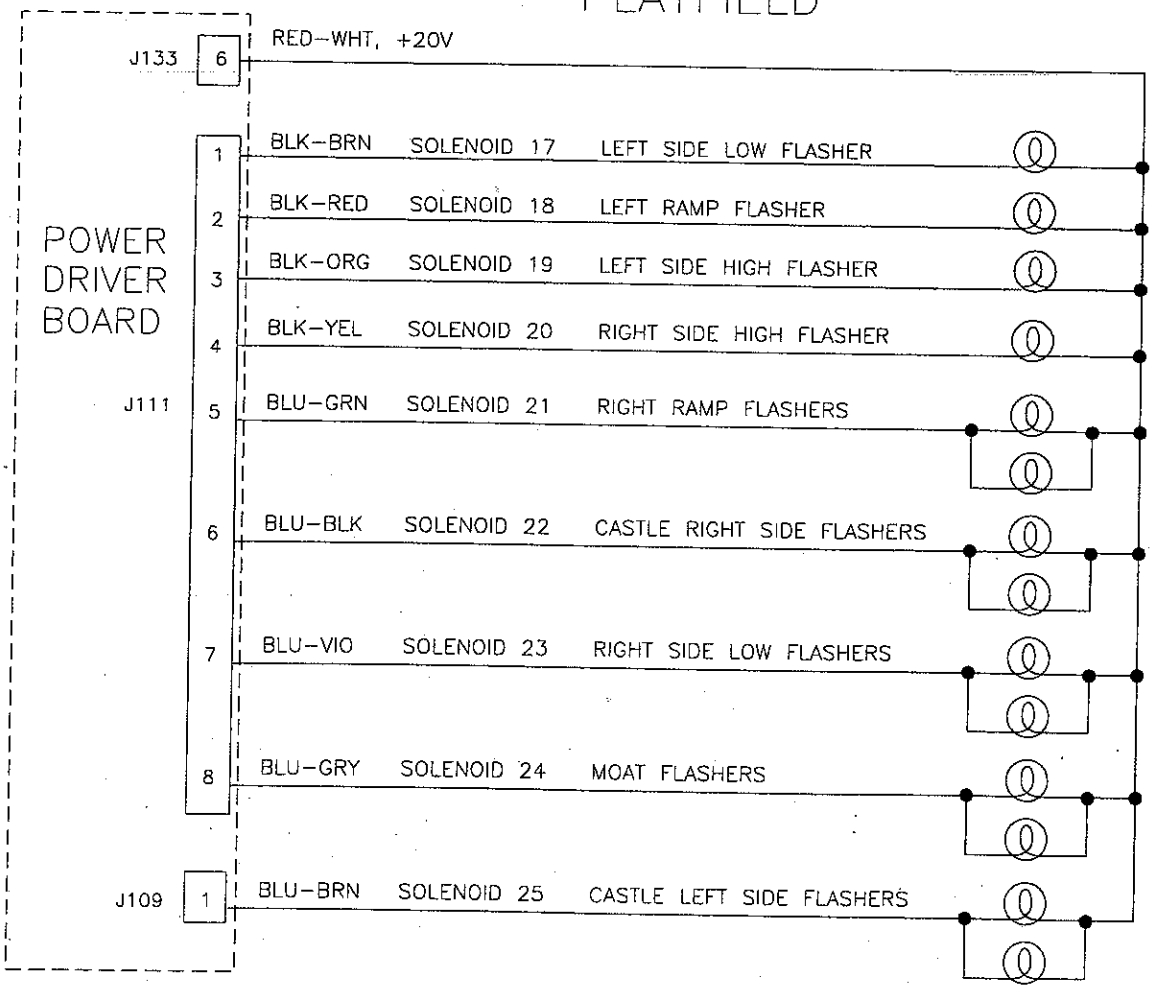


FLASHLAMPS

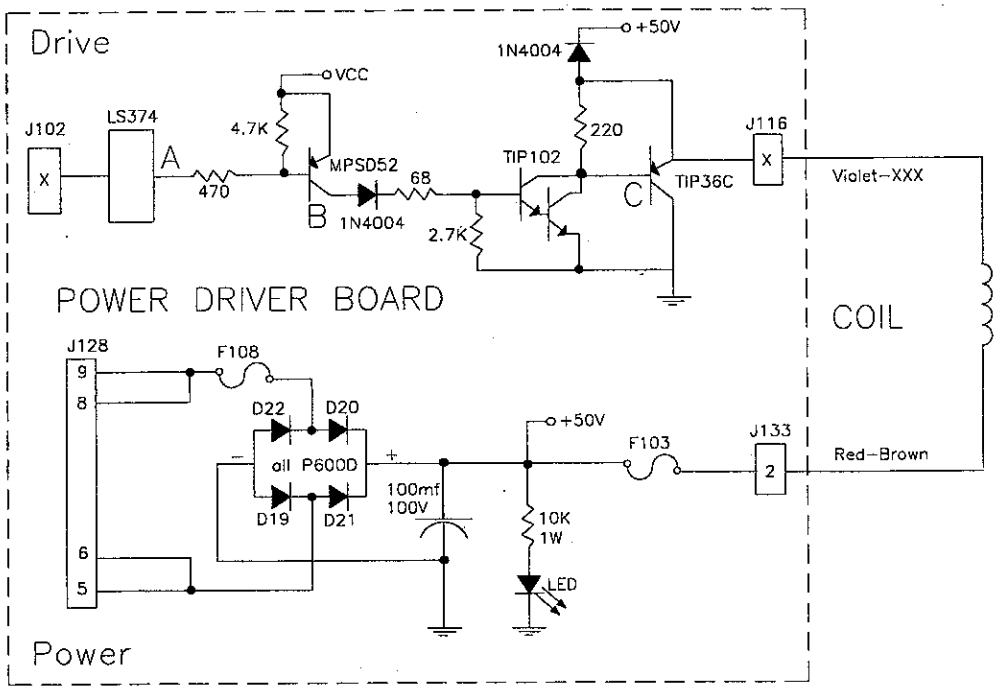
INSERT PANEL



PLAYFIELD

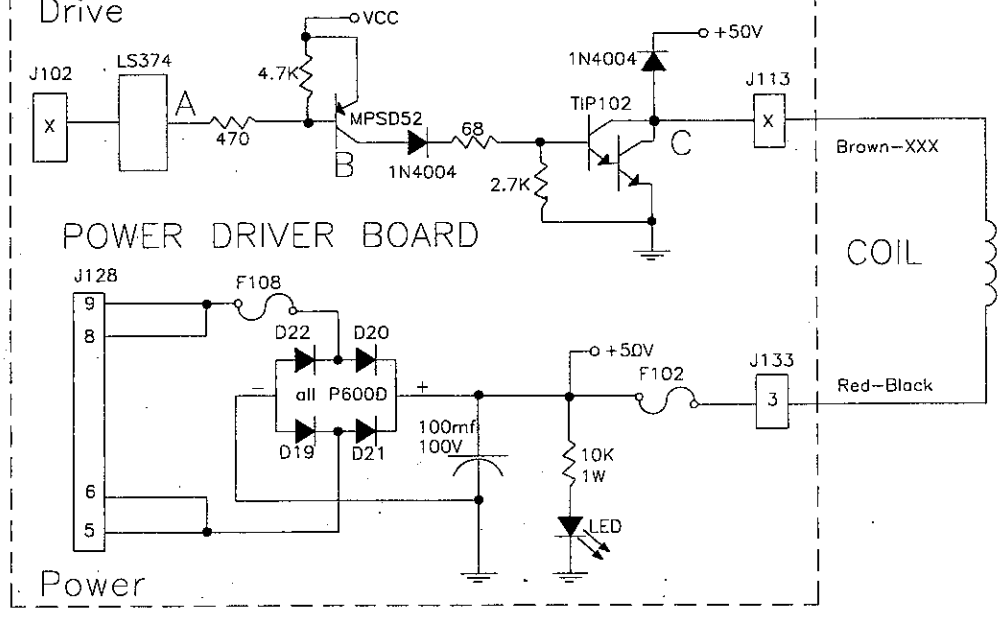


HIGH POWER SOLENOID CIRCUIT



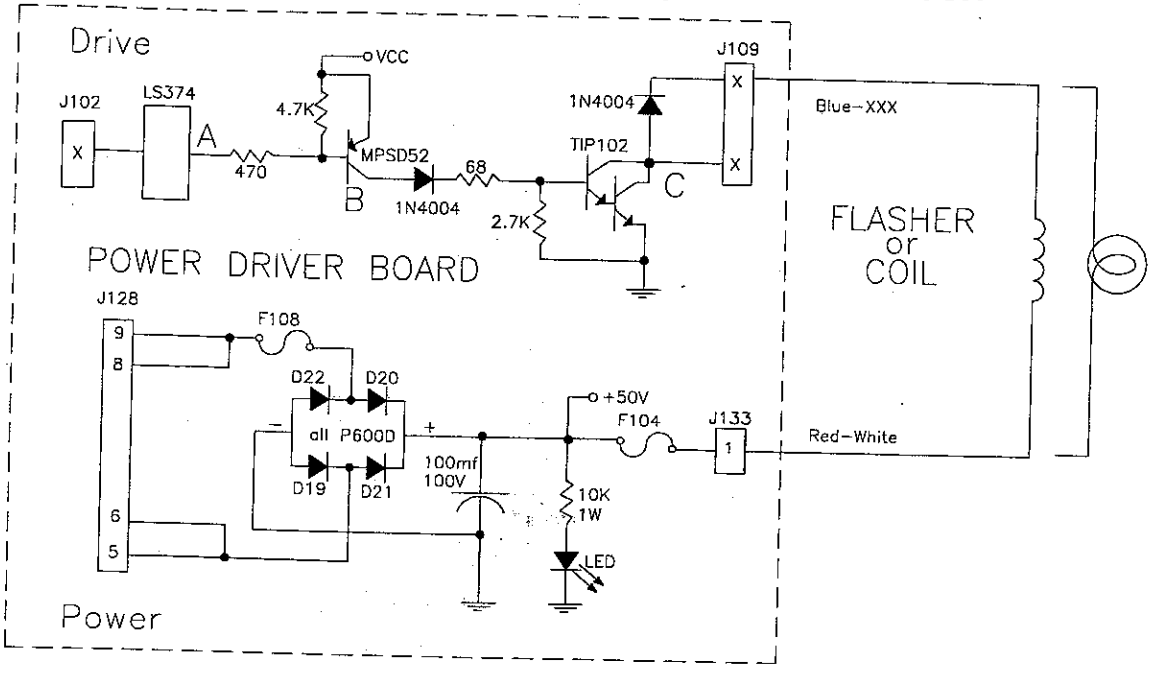
The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B", the collector of the 2N5401 transistor, is high. A high at point "B" causes point "C", the collector of the TIP102 transistor and point "D", the emitter of the TIP36C transistor, to drop low. When point "D" is low, the coil is grounded through the transistor and turns on. The coil shuts off when point "A" toggles high.

LOW POWER SOLENOID CIRCUIT



The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B", the collector of the 2N5401 transistor, is high. A high at point "B" turns on the TIP102 transistor and causes point "C" to drop low. When point "C" is low the coil is grounded through the transistor and turns on. The coil shuts off when point "A" toggles high.

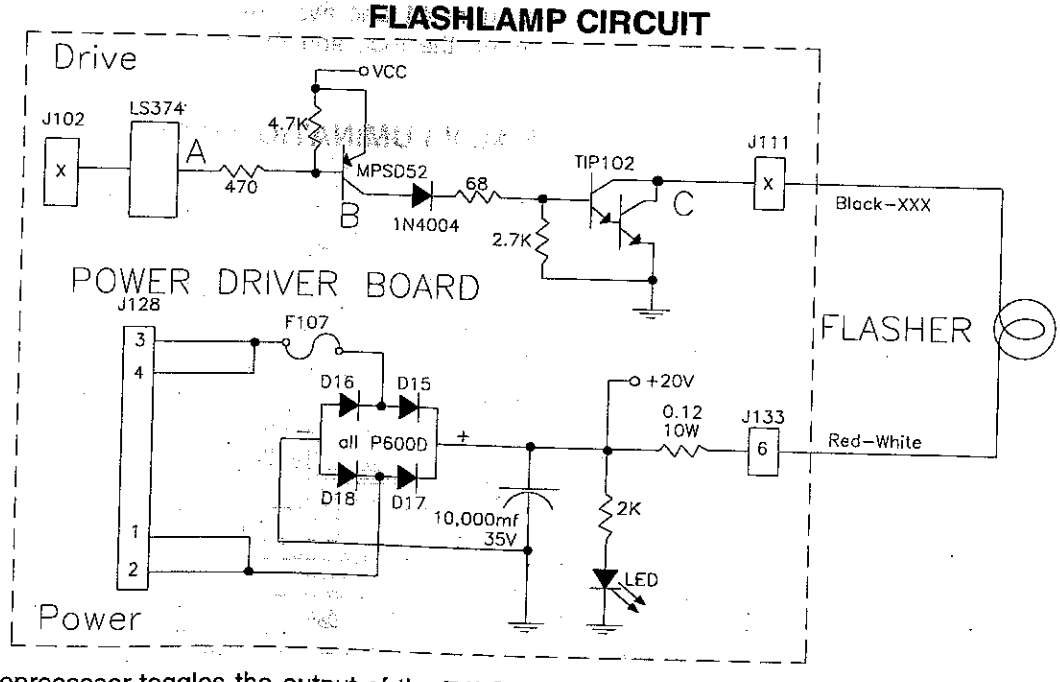
SPECIAL (GENERAL PURPOSE) SOLENOID CIRCUIT



The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B" the collector of the 2N5401 transistor , is high. A high at point "B" causes a low at point "C". When point "C" is low, the coil/flashlamp is grounded through the transistor and turns on. When point "A" toggles high the coil/flashlamp turns off.

* Tieback diode is not used for flashlamp circuit.

FLASHLAMP CIRCUIT



The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B" the collector of the 2N5401 transistor, is high. Once point "B" is high, point "C" the collector of the TIP102 transistor is low. When point "C" is low, the flashlamp is grounded through the transistor and turns on. When point "A" toggles high, the current shuts off.

GENERAL ILLUMINATION CIRCUIT

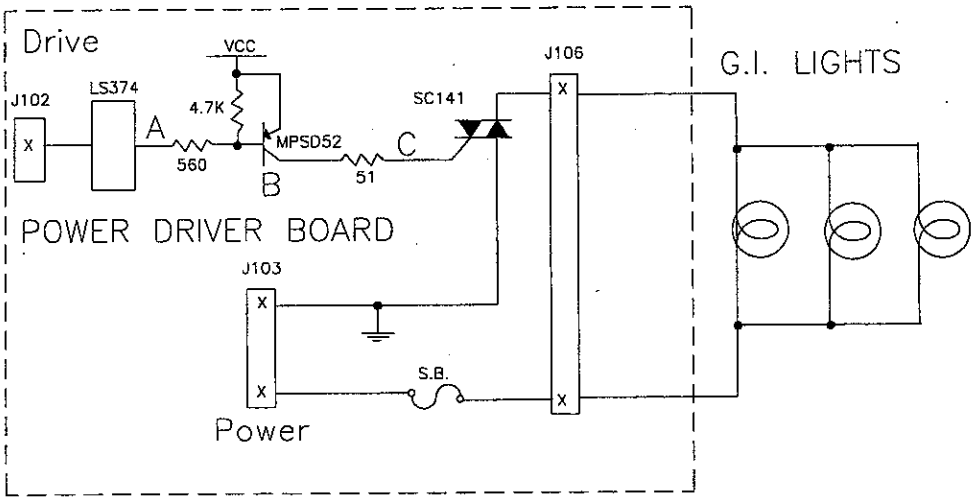


Figure #1

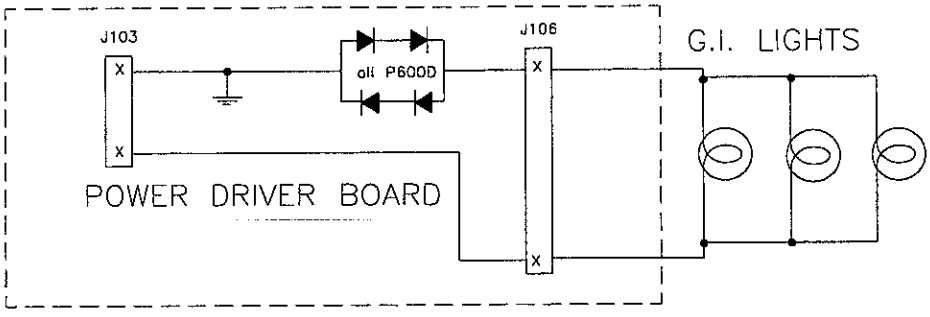
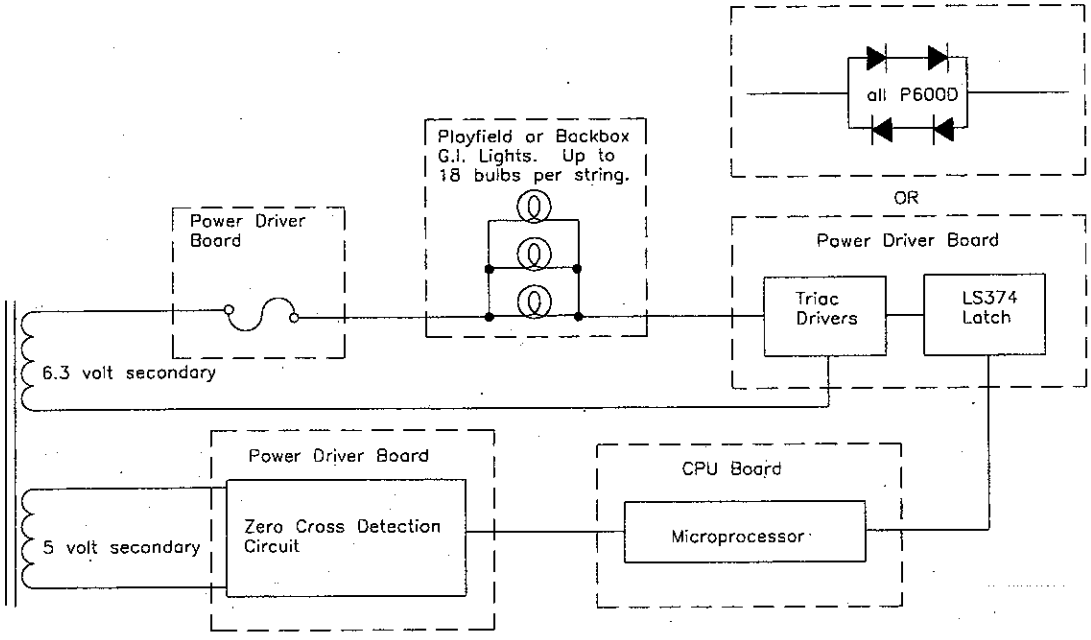


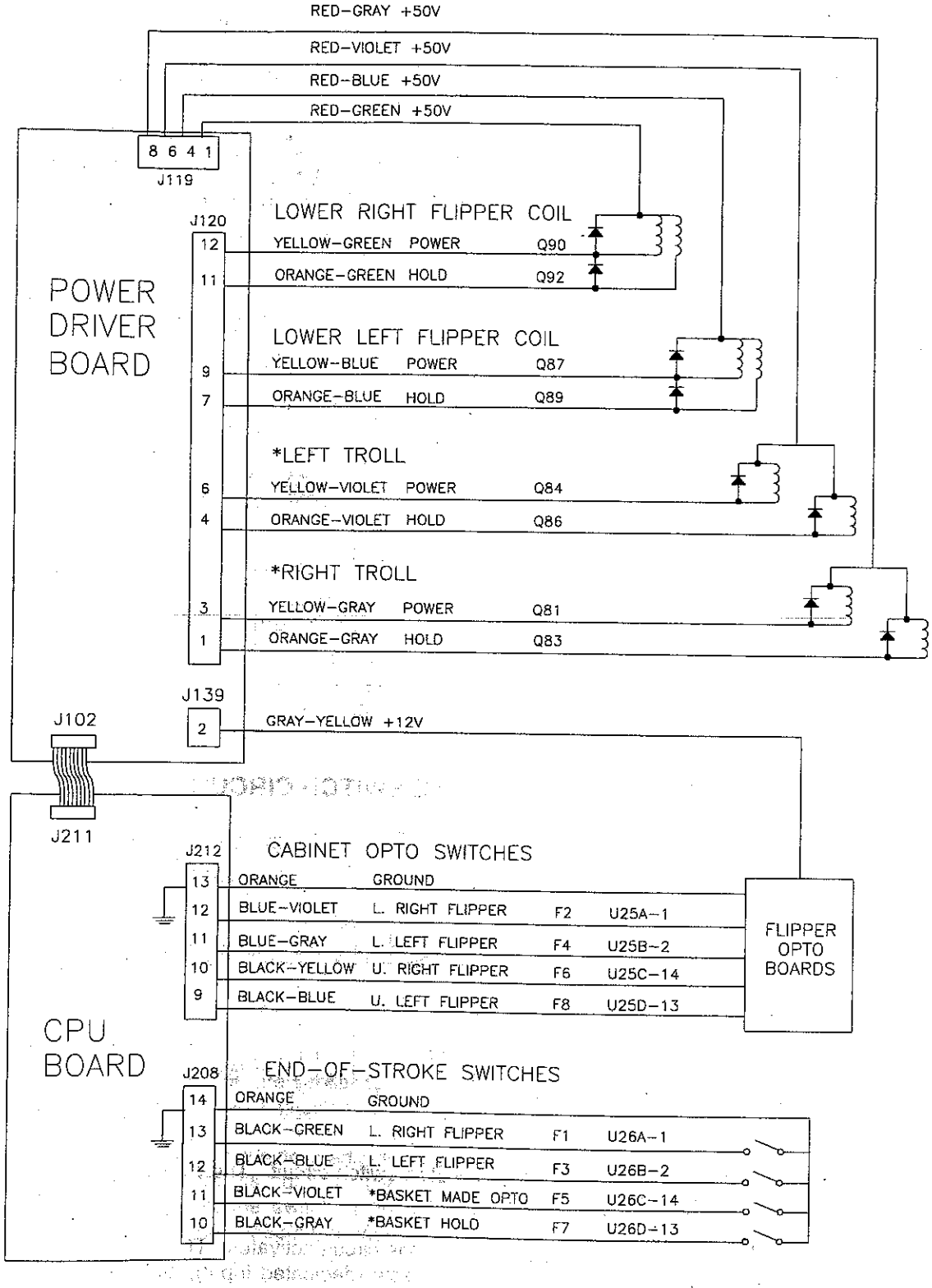
Figure #2

There are five general illumination strings; three like figure #1 and two like figure #2. When point "A" toggles low, points, "B" and "C" are high. This turns on the triac and the desired general illumination string of lights.

BLOCK DIAGRAM OF GENERAL ILLUMINATION CIRCUIT



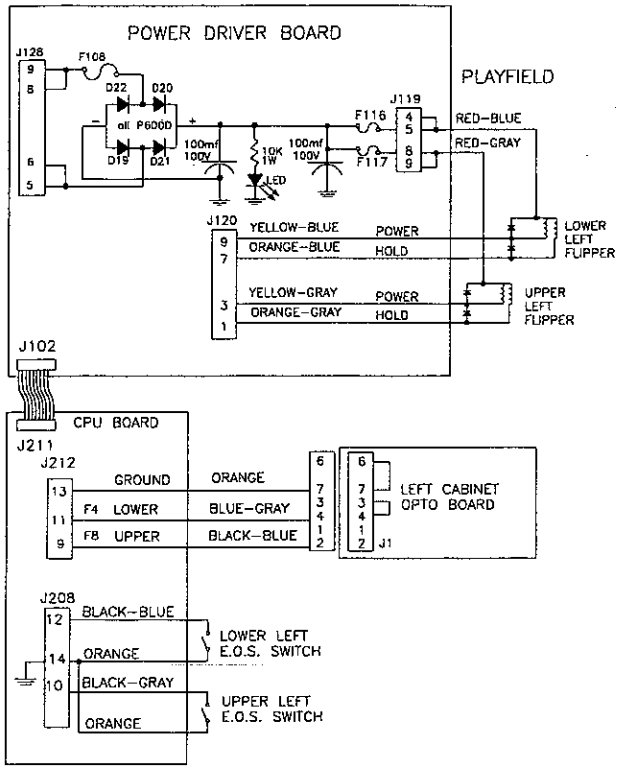
FLIPPER CIRCUIT DIAGRAM



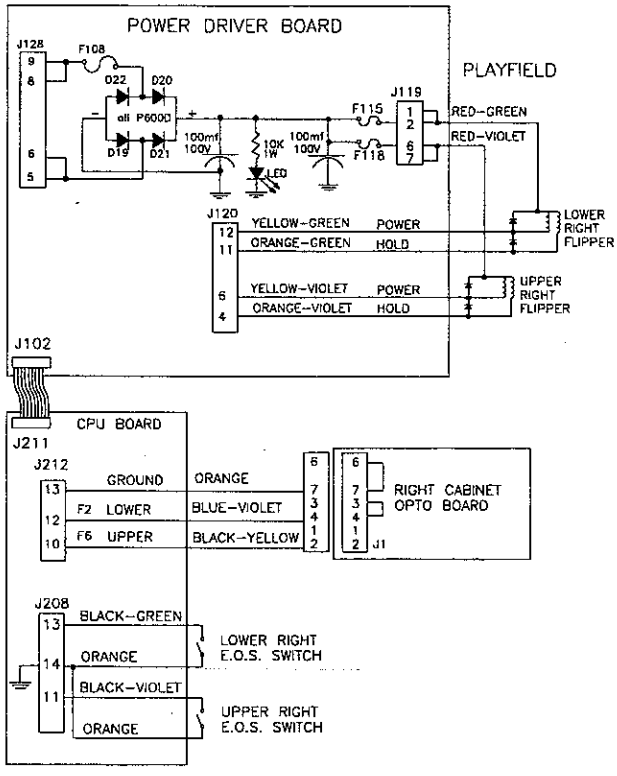
*** The UPPER RIGHT FLIPPER circuit is used for the LEFT TROLL. The UPPER LEFT FLIPPER circuit is used for the RIGHT TROLL.**

FLIPPER COIL CIRCUITS

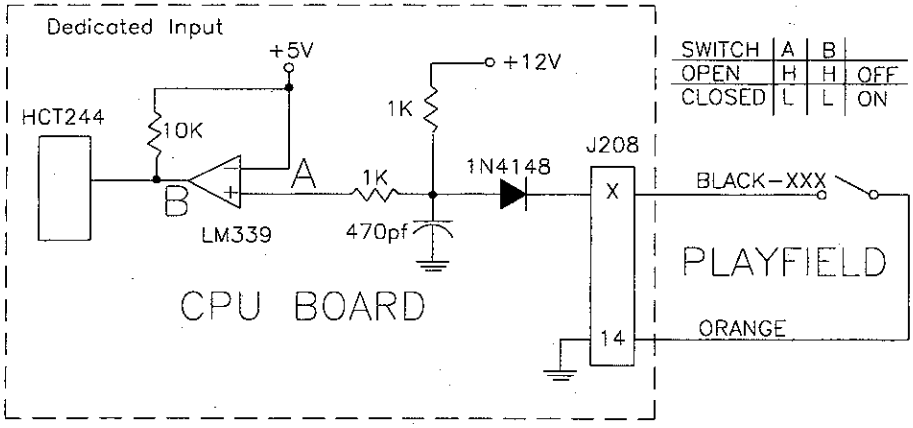
LEFT FLIPPER CIRCUIT



RIGHT FLIPPER CIRCUIT



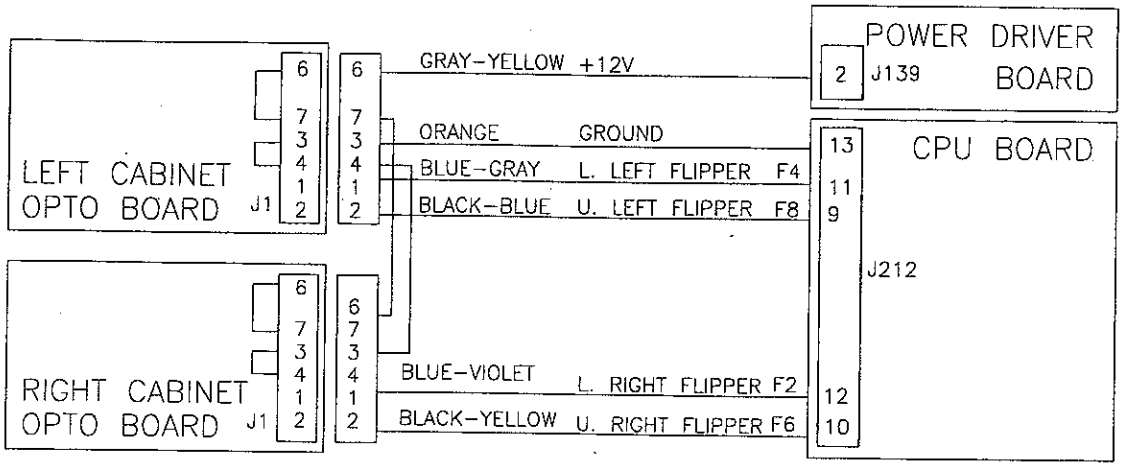
FLIPPER END-OF-STROKE SWITCH CIRCUIT

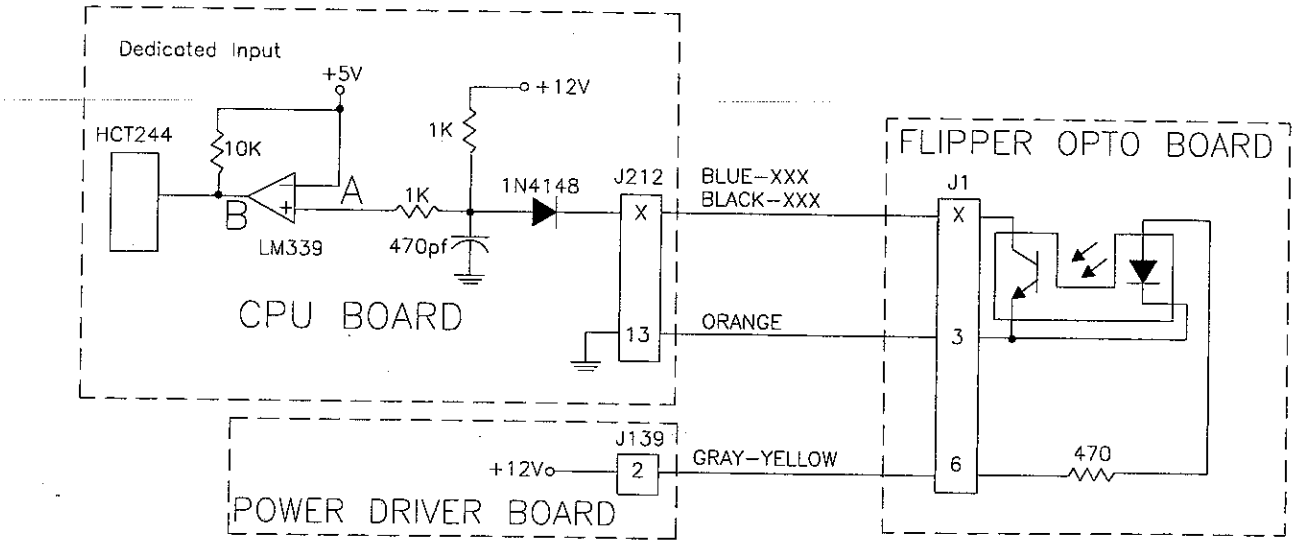


The flipper E.O.S. circuits operate similar to the dedicated switch circuit. The circuits are active low and tied to ground through the switch.

When a switch closes, the row side, (dedicated input), of the circuit activates. The "+" input of the LM339 drops below +5V therefore its output is low. Since the row (dedicated input), circuit is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row (dedicated input) is inactive.

FLIPPER CABINET SWITCH CIRCUITS

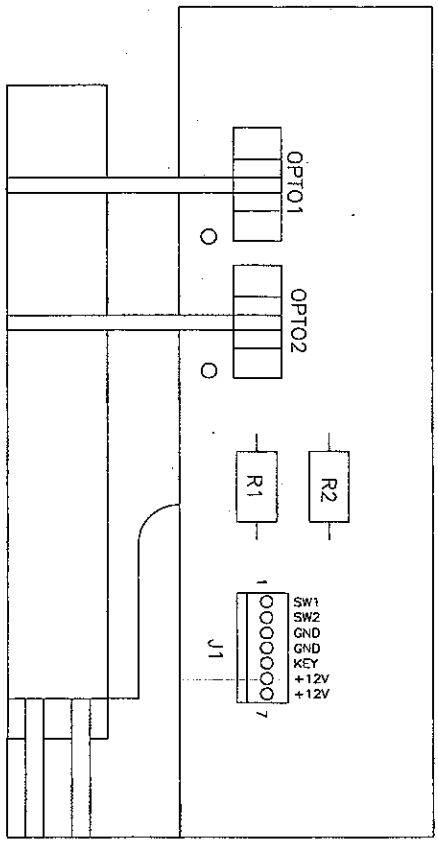


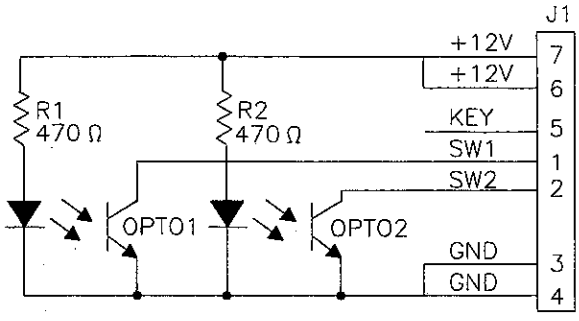


The flipper switch circuits operate similar to the dedicated switch circuit. The circuits are active low and tied to ground through the switch circuit.

When a switch closes, the row side (dedicated input) of the circuit activates. The "+" input to the LM339 drops below +5V, therefore, its output is low. Since the row, (dedicated input) circuit is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row, (dedicated Input) is inactive.

FLIPPER OPTO BOARD ASSEMBLY
A-17316





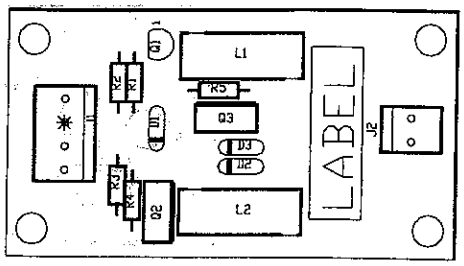
Left Flipper Opto Board Assembly

J1-1 Black-Blue from CPU board J212-9
J1-2 Blue-Gray from CPU board J212-11
J1-3 N/C
J1-4 Orange from CPU board J212-13
J1-5 N/C
J1-6 Gray-Yellow from Power Driver Board J139-2
J1-7 Gray-Yellow from Power Driver Board J139-2

Right Flipper Opto Board Assembly

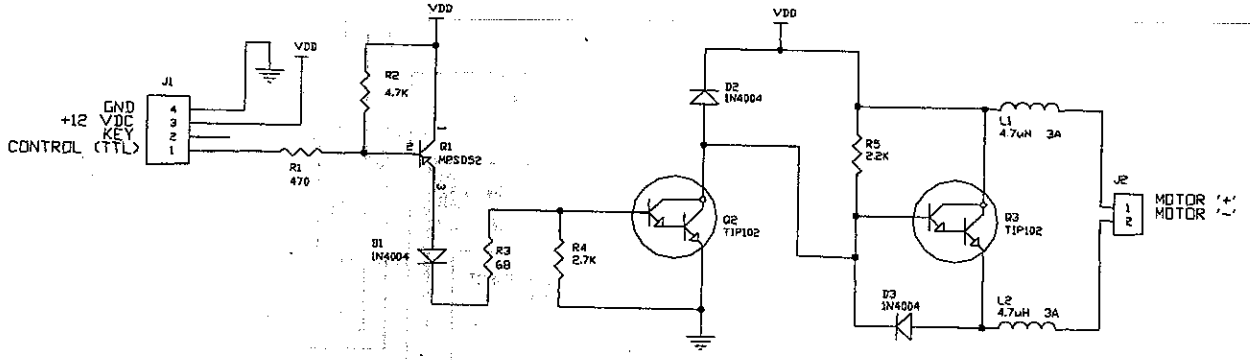
J1-1 Black-Yellow from CPU board J212-10
J1-2 Blue-Violet from CPU board J212-12
J1-3 Orange from CPU board J212-13
J1-4 Orange from Left Flipper Opto Board Assy J1-4
J1-5 N/C
J1-6 Gray-Yellow from Left Flipper Opto Board Assy J1-6
J1-7 N/C

Motor Driver EMI w/Brake Board Assembly
A-21708-1
(FOR DRAWBRIDGE UP/DOWN MOTOR)

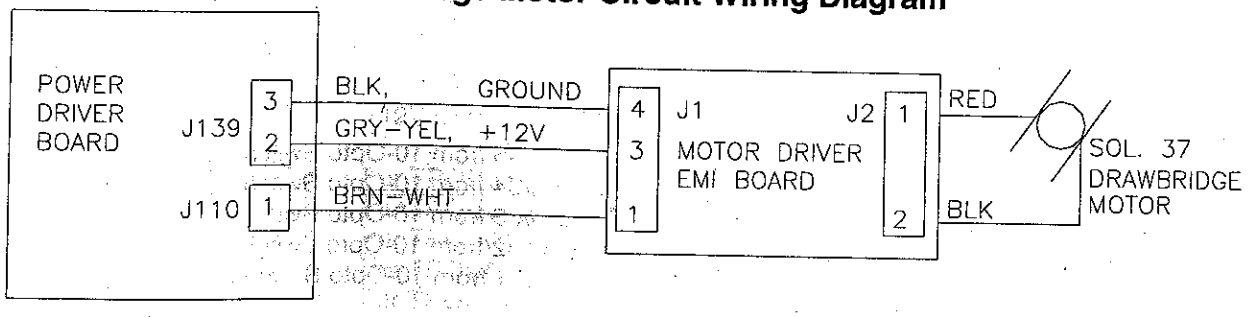


J1-1	BRN-WHT	Solenoid #37 drive from Power Driver Board J110-1
J1-2	KEY	
J1-3	GRY-YEL	+12V from Power Driver Board J139-2
J1-4	BLK	Ground from Power Driver Board J139-3
J2-1	RED	Power to DRAWBRIDGE MOTOR solenoid #37
J2-2	BLK	Ground to DRAWBRIDGE MOTOR solenoid #37

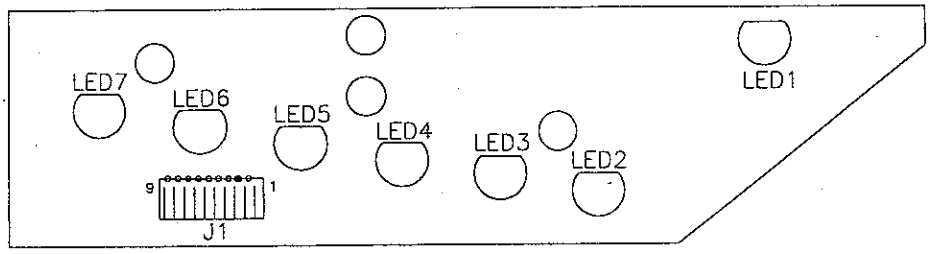
Motor Driver EMI w/Brake Schematic

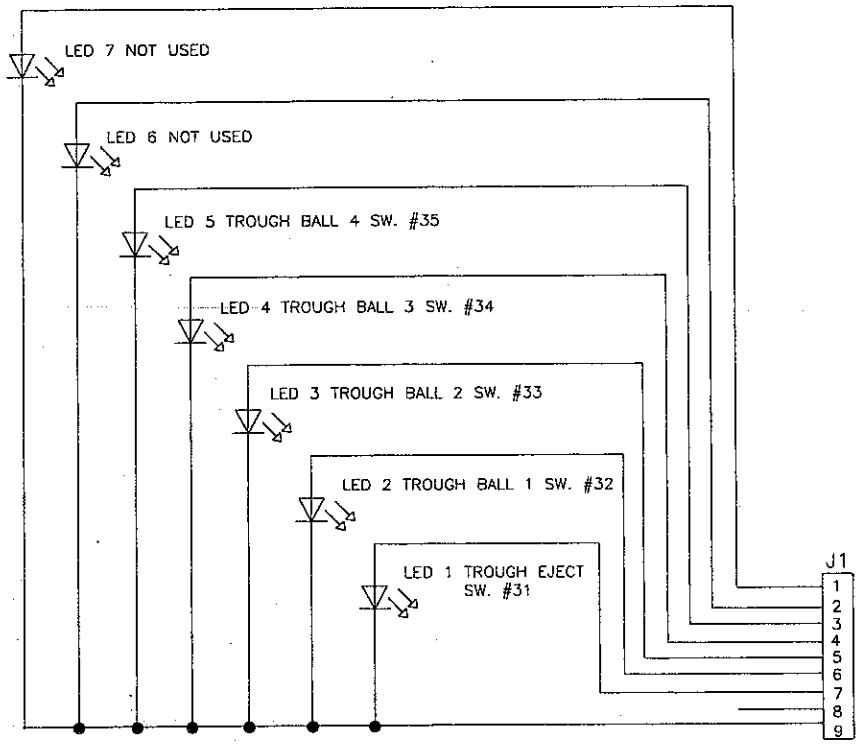


Drawbridge Motor Circuit Wiring Diagram



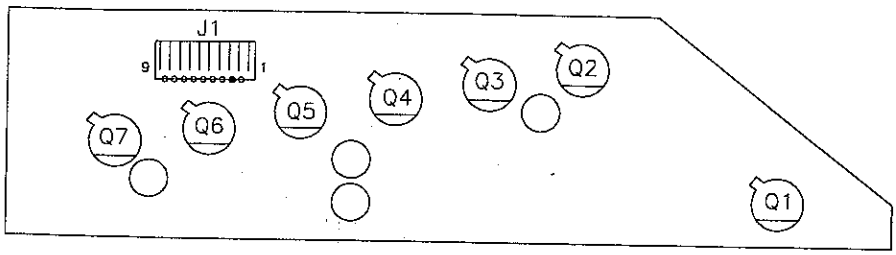
Trough IR LED Board Assembly
(transmitter - green board)
A-18617-1

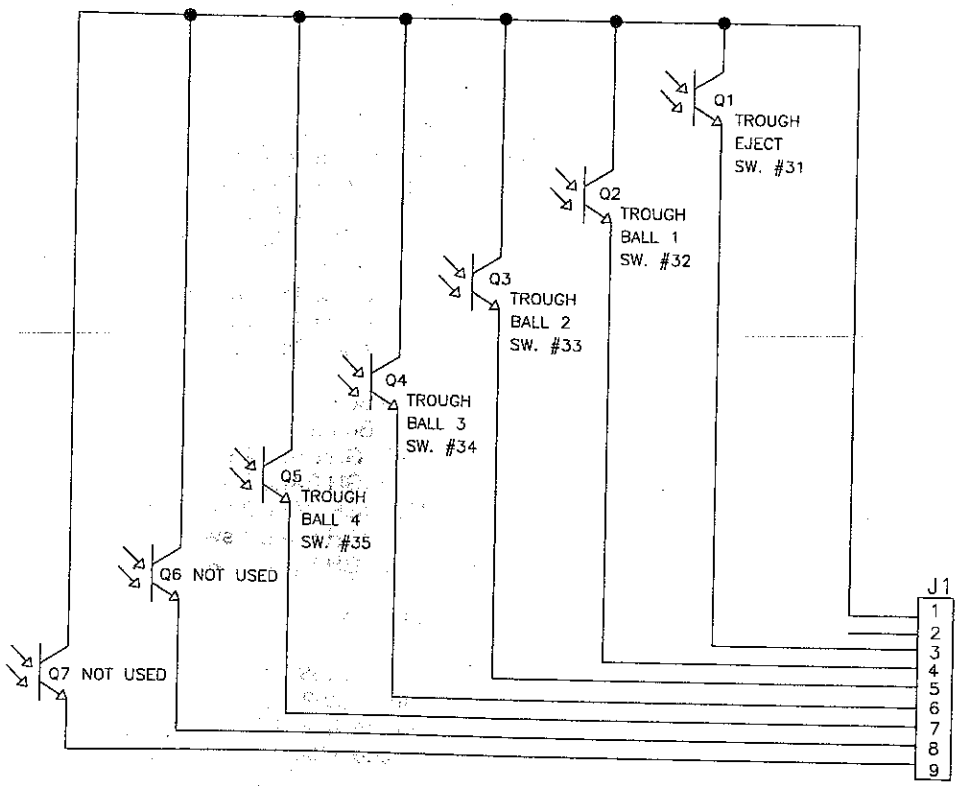




J1-1	N/C	
J1-2	N/C	
J1-3	GRY-GRN,	For TROUGH BALL 4 switch #35 from 10-Opto Switch Board J1-3
J1-4	GRY-BLK,	For TROUGH BALL 3 switch #34 from 10-Opto Switch Board J1-4
J1-5	GRY-ORG,	For TROUGH BALL 2 switch #33 from 10-Opto Switch Board J1-5
J1-6	GRY-RED,	For TROUGH BALL 1 switch #32 from 10-Opto Switch Board J1-6
J1-7	GRY-BRN,	For TROUGH EJECT switch #31 from 10-Opto Switch Board J1-7
J1-8	KEY	
J1-9	BLK,	Ground from 10-Opto Switch Board J1-9

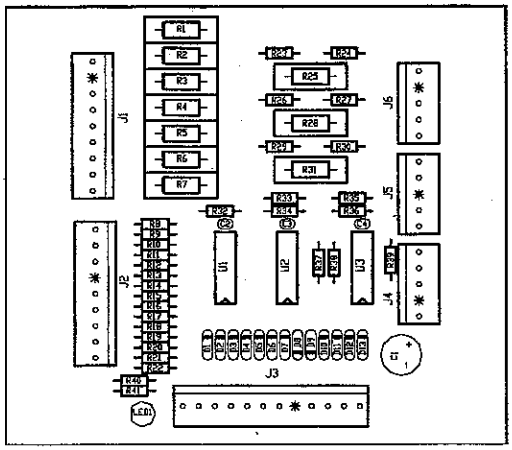
Trough IR Photo Transistor Board Assembly
(receiver - blue board)
A-18618-1





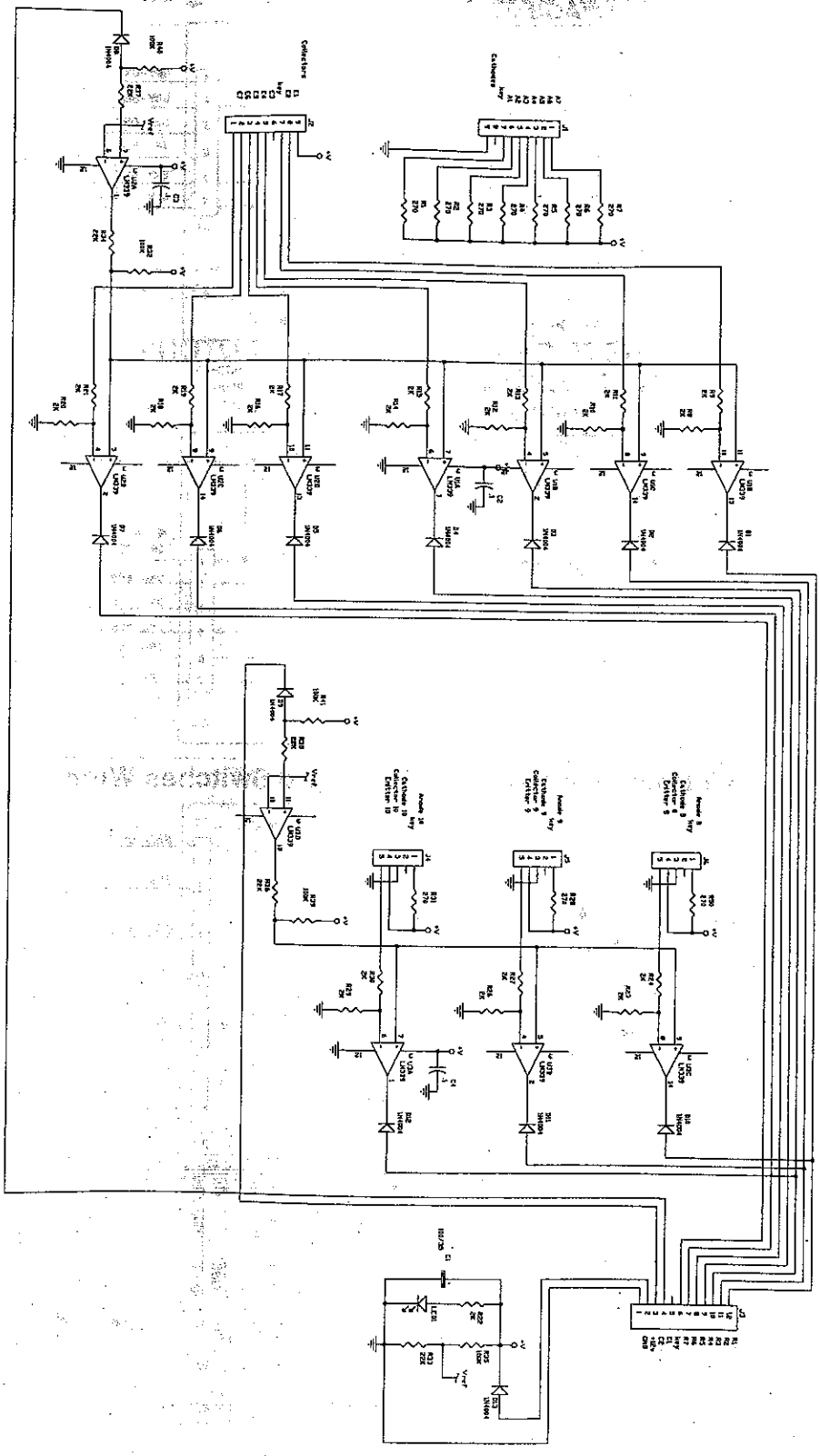
J1-1	GRY-YEL,	+12V from 10-Opto Switch Board J2-9
J1-2	KEY	
J1-3	ORG-BRN,	For TROUGH EJECT switch #31 from 10-Opto Switch Board J2-8
J1-4	ORG-RED,	For TROUGH BALL 1 switch #32 from 10-Opto Switch Board J2-7
J1-5	ORG-BLK,	For TROUGH BALL 2 switch #33 from 10-Opto Switch Board J2-5
J1-6	ORG-YEL,	For TROUGH BALL 3 switch #34 from 10-Opto Switch Board J2-4
J1-7	ORG-GRN,	For TROUGH BALL 4 switch #35 from 10-Opto Switch Board J2-3
J1-8	N/C	
J1-9	N/C	

10-Opto Switch Board Assembly
A-18159.1
(FOR BALL TROUGH, MOAT ENTER, LEFT POPPER, AND CASTLE GATE OPTO SWITCHES)



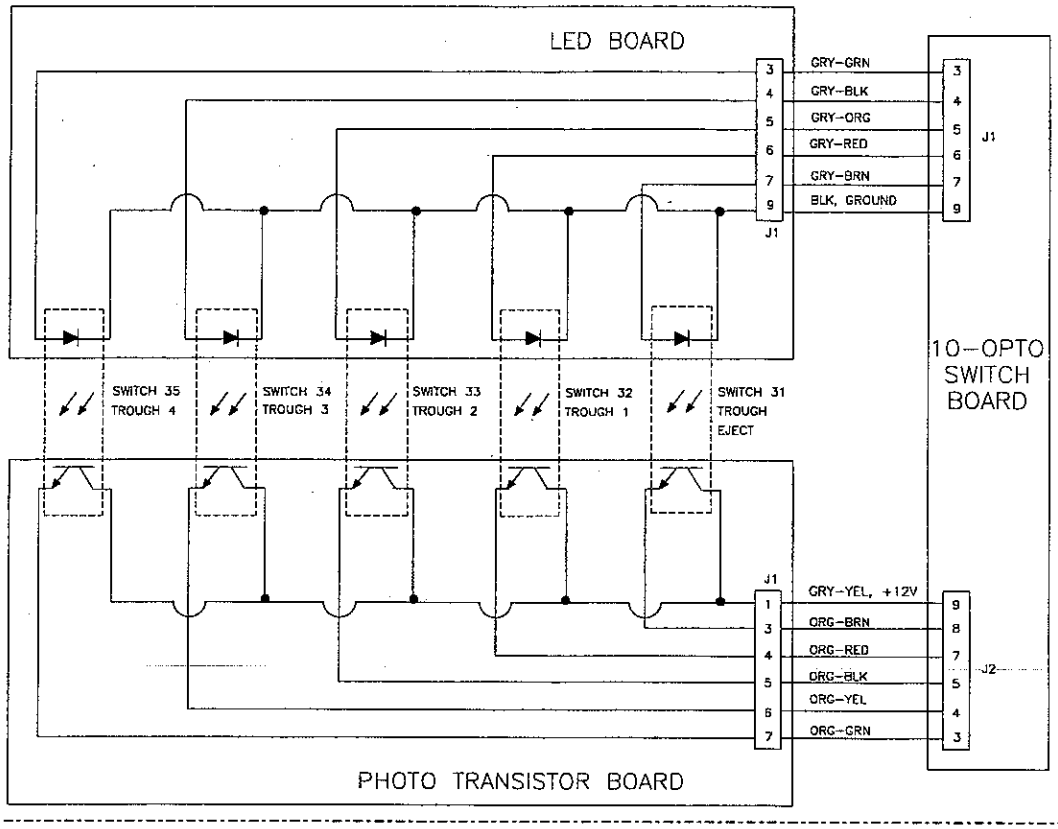
J1-1	ORG-VIO,	To CASTLE GATE switch #37 Photo Transistor Board
J1-2	ORG-BLU,	To LEFT POPPER switch #36 Photo Transistor Board
J1-3	ORG-GRN,	To Ball Trough Photo Transistor Board for TROUGH BALL 4 switch #35
J1-4	ORG-YEL,	To Ball Trough Photo Transistor Board for TROUGH BALL 3 switch #34
J1-5	ORG-BLK,	To Ball Trough Photo Transistor Board for TROUGH BALL 2 switch #33
J1-6	KEY	
J1-7	ORG-RED,	To Ball Trough Photo Transistor Board for TROUGH BALL 1 switch #32
J1-8	ORG-BRN,	To Ball Trough Photo Transistor Board for TROUGH EJECT switch #31
J1-9	GRY-YEL,	+12V to the above listed Photo Transistor Boards
J2-1	GRY-VIO,	To CASTLE GATE switch #37 LED Board
J2-2	GRY-BLU,	To LEFT POPPER switch #36 LED Board
J2-3	GRY-GRN,	To Ball Trough LED Board for TROUGH BALL 4 switch #35
J2-4	GRY-BLK,	To Ball Trough LED Board for TROUGH BALL 3 switch #34
J2-5	GRY-ORG,	To Ball Trough LED Board for TROUGH BALL 2 switch #33
J2-6	GRY-RED,	To Ball Trough LED Board for TROUGH BALL 1 switch #32
J2-7	GRY-BRN,	To Ball Trough LED Board for TROUGH EJECT switch #31
J2-8	KEY	
J2-9	BLK,	Ground to the above listed LED Boards
J3-1	BLK,	For Ground from Power Driver Board J139-3
J3-2	GRY-YEL,	For +12V from Power Driver Board J139-2
J3-3	GRN-WHT,	For switch column 4 from CPU Board J206-4
J3-4	GRN-ORG,	For switch column 3 from CPU Board J206-3
J3-5	KEY	
J3-6	WHT-VIO,	For switch row 7 from CPU Board J208-8
J3-7	WHT-BLU,	For switch row 6 from CPU Board J208-7
J3-8	WHT-GRN,	For switch row 5 from CPU Board J208-5
J3-9	WHT-YEL,	For switch row 4 from CPU Board J208-4
J3-10	WHT-ORG,	For switch row 3 from CPU Board J208-3
J3-11	WHT-RED,	For switch row 2 from CPU Board J208-2
J3-12	WHT-BRN,	For switch row 1 from CPU Board J208-1
J4		NOT USED
J5		NOT USED
J6-1	GRN-BRN,	To MOAT ENTER switch #41 LED Board
J6-2	KEY	
J6-3	BLK,	Ground to MOAT ENTER switch #41 LED Board
J6-4	GRY-YEL,	+12V to MOAT ENTER switch #41 Photo Transistor Board
J6-5	WHT-BRN,	To MOAT ENTER switch #41 Photo Transistor Board

10-Opto Switch Board Schematic
A-18159.1
(FOR BALL TROUGH, MOAT ENTER, LEFT POPPER, AND CASTLE GATE OPTO SWITCHES)

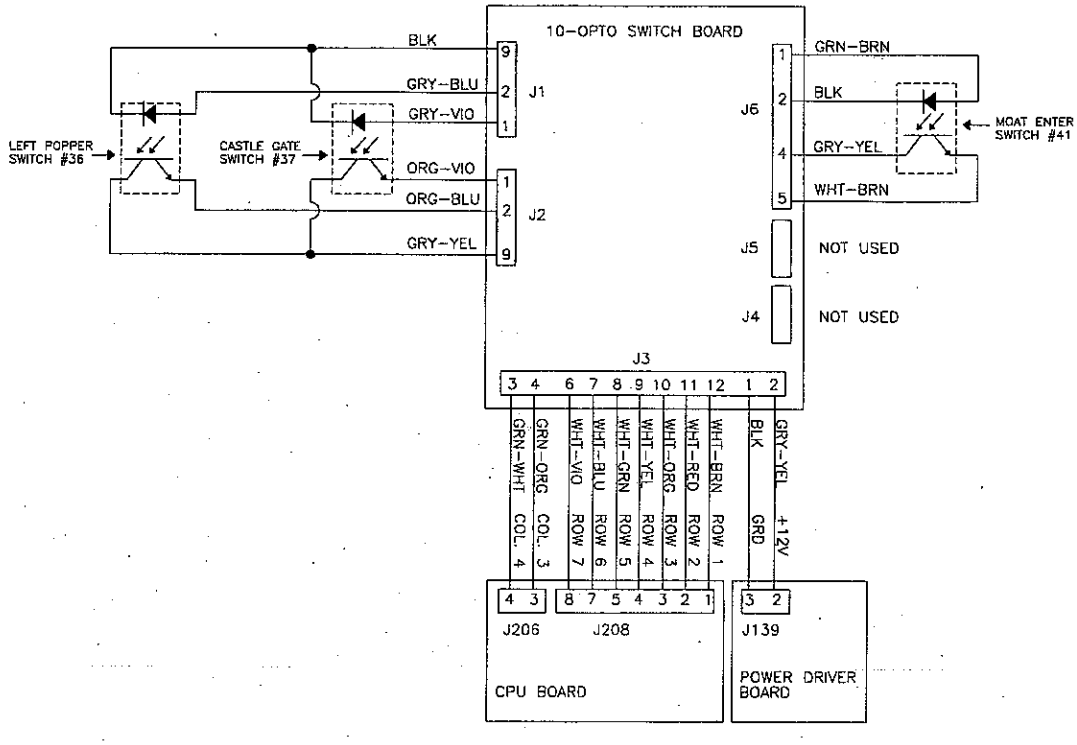


IN OPTO SWITCHES, THE BALL ROLLS BETWEEN THE LED BOARD AND THE PHOTO TRANSISTOR BOARD AND BREAKS THE BEAM. THE BROKEN BEAM 'MAKES' THE SWITCH.

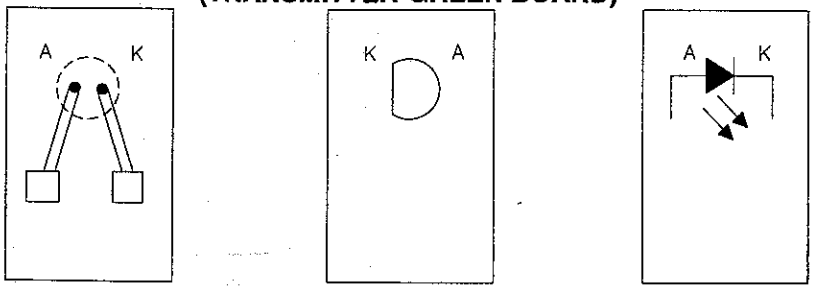
Ball Trough Opto Switches Wiring Diagram



Moat Enter, Left Popper, and Castle Gate Opto Switches Wiring Diagram

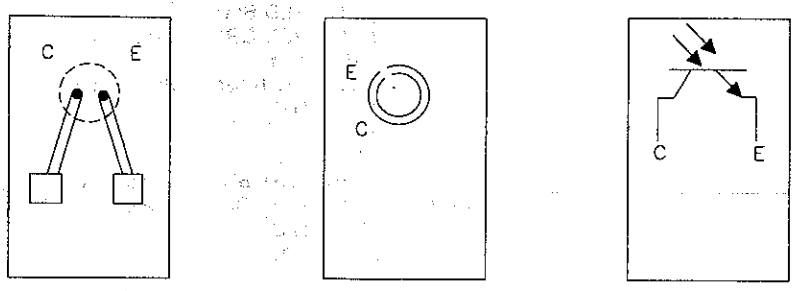


LED BOARD ASSEMBLY
A-16908
(TRANSMITTER-GREEN BOARD)



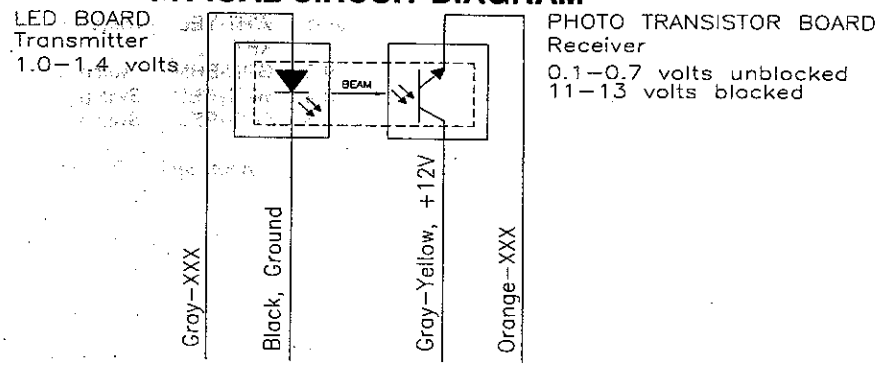
solder side component side schematic

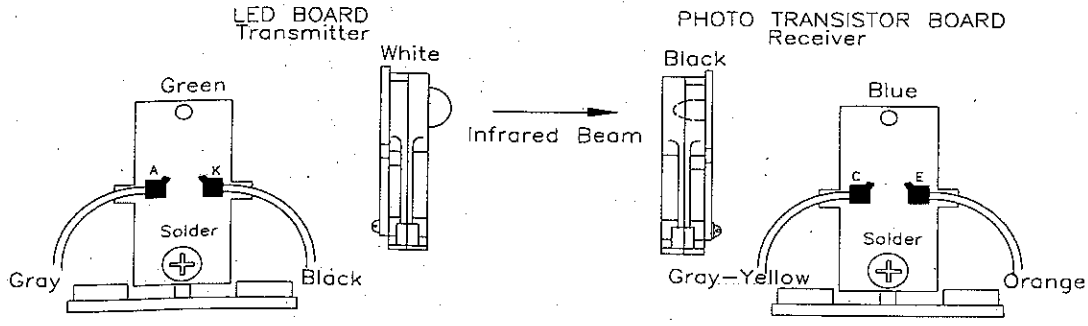
PHOTO TRANSISTOR BOARD ASSEMBLY
A-16909
(RECEIVER-BLUE BOARD)



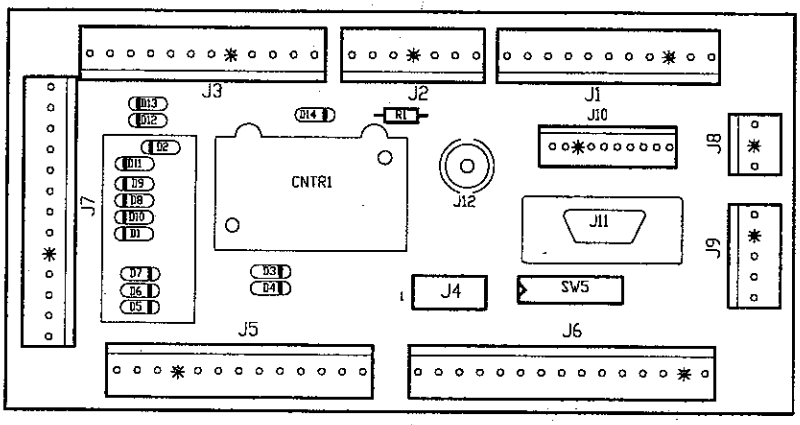
solder side component side schematic

TYPICAL CIRCUIT DIAGRAM





Coin Door Interface Board
A-20580



J1-1	ORG-GRY	Dedicated sw row #8 from CPU J205-9.
J1-2	ORG-VIO	Dedicated sw row #7 from CPU J205-8.
J1-3	ORG-BLU	Dedicated sw row #6 from CPU J205-7.
J1-4	ORG-GRN	Dedicated sw row #5 from CPU J205-6.
J1-5	ORG-YEL	Dedicated sw row #4 from CPU J205-4.
J1-6	ORG-BLK	Dedicated sw row #3 from CPU J205-3.
J1-7	ORG-RED	Dedicated sw row #2 from CPU J205-2.
J1-8	ORG-BRN	Dedicated sw row #1 from CPU J205-1.
J1-9	KEY	
J1-10	BLK	Ground from CPU J205-10
J1-11	ORG-WHT	Switch enable from CPU J205-12.

J2-1	BLK	Ground from Power Driver board J141-3.
J2-2	GRY-YEL	+12VAC from Power Driver board J141-2.
J2-3	WHT-VIO	6.8VAC from Power Driver board J104-1.
J2-4	KEY	
J2-5	VIO	For G.I. from Power Driver board J104-3.
J2-6	N/C	
J2-7	BLK-WHT	Signal for coin meter from Power Driver board J139-5.

J3-1	GRN-BRN	Switch column #1 from CPU J212-1.
J3-2	GRN-RED	Switch column #2 from CPU J212-2.
J3-3	WHT-BRN	Switch row #1 from CPU J212-4.
J3-4	WHT-RED	Switch row #2 from CPU J212-5.
J3-5	WHT-ORG	Switch row #3 from CPU J212-6.
J3-6	WHT-YEL	Switch row #4 from CPU J212-7.
J3-7	KEY	
J3-8	YEL-GRY	Lamp col #8 from Pwr Drvr brd J122-3.
J3-9	RED-BLU	Lamp row #6 from Pwr Drvr brd J125-7.
J3-10	RED-VIO	Lamp row #7 from Pwr Drvr brd J125-8.
J3-11	RED-GRY	Lamp row #8 from Pwr Drvr brd J125-9.

J4 NOT USED

J5-1	VIO	Return to coin door.
J5-2	WHT-VIO	6.8VAC for G.I. to coin door.
J5-3	BLK	Ground to coin door.
J5-4	ORG-BRN	Dedicated switch row #1 to coin door.
J5-5	ORG-RED	Dedicated switch row #2 to coin door.
J5-6	ORG-BLK	Dedicated switch row #3 to coin door.
J5-7	ORG-GRN	Dedicated switch row #5 to coin door.
J5-8	ORG-BLU	Dedicated switch row #6 to coin door.
J5-9	ORG-VIO	Dedicated switch row #7 to coin door.
J5-10	KEY	
J5-11	ORG-GRY	Dedicated switch row #8 to coin door.
J5-12	GRN-RED	Switch column #2 to coin door Slam Tilt.
J5-13	WHT-BRN	Switch row #1 to coin door Slam Tilt.

J6 NOT USED

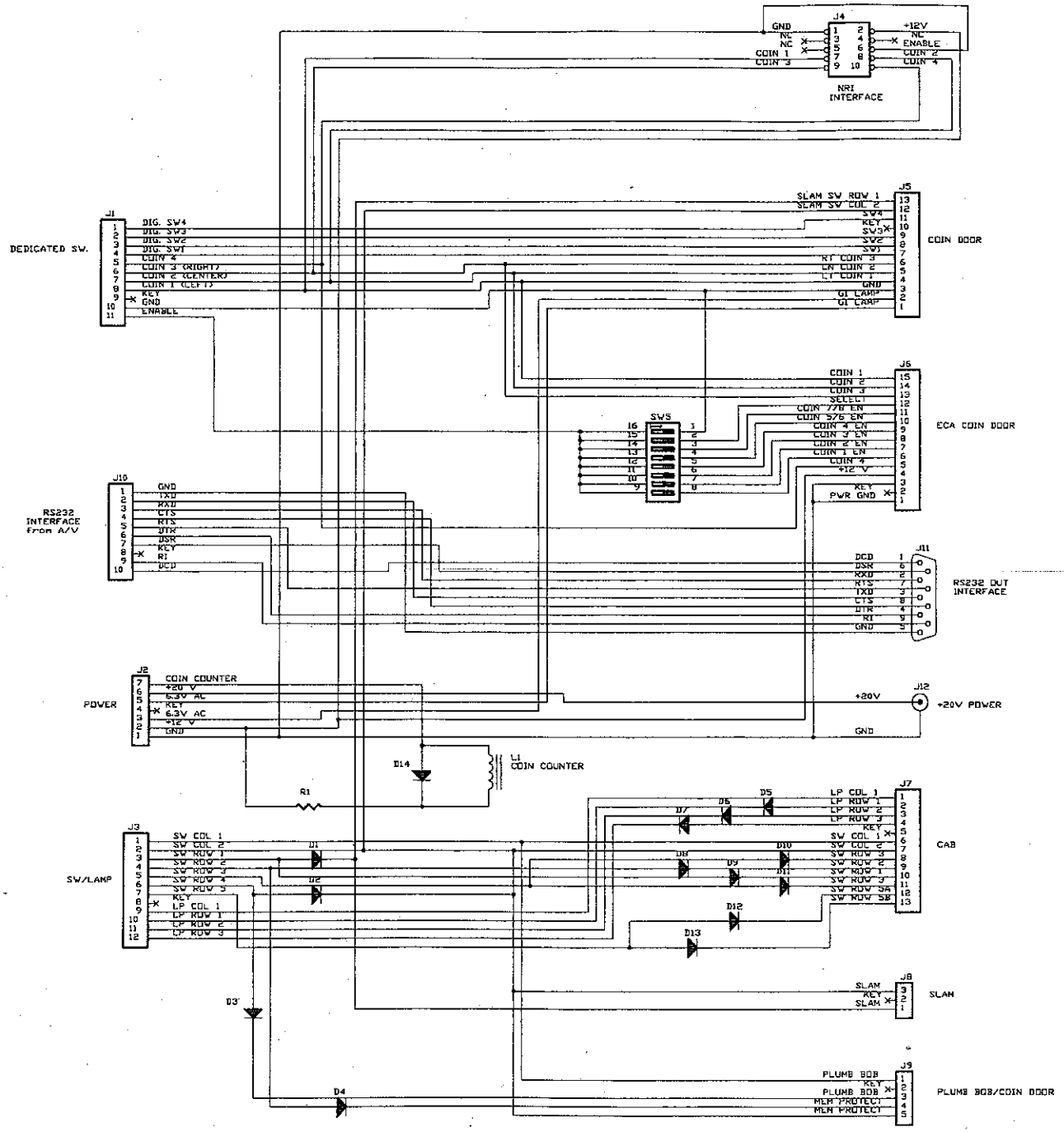
J7-1	YEL-GRY	Lamp column #8 to cabinet.
J7-2	N/C	
J7-3	RED-BLU	Lamp row #6 to cabinet.
J7-4	RED-GRY	Lamp row #8 to cabinet.
J7-5	KEY	
J7-6	GRN-BRN	Switch column #1 to cabinet.
J7-7	N/C	
J7-8	N/C	
J7-9	N/C	
J7-10	WHT-BRN	Switch row #1 to cabinet.
J7-11	WHT-ORG	Switch row #3 to cabinet.
J7-12	N/C	
J7-13	N/C	

J8-1	WHT	Switch row to cabinet for Slam tilt.
J8-2	KEY	
J8-3	GRN	Switch column to cabinet for Slam Tilt.

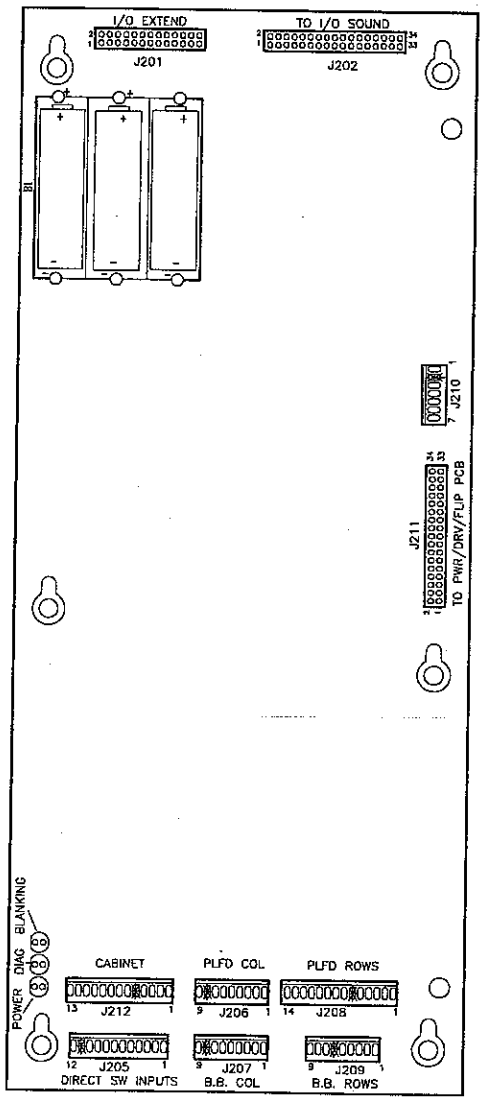
J9-1	WHT-YEL	Switch row #4 to Plumb Bob Tilt.
J9-2	KEY	
J9-3	GRN-BRN	Switch column #1 to Plumb Bob Tilt.
J9-4	WHT-RED	Switch row #2 to Interlock Switch.
J7-5	GRN-RED	Switch column #2 to Interlock Switch.

J10 Ribbon cable To cash flow mechanism (if used).

Coin Door Interface Board Schematic
A-20580



Security CPU Board Assembly
A-21377-50059



J201	26-pin ribbon cable	Data to/from J602.
J202	34-pin ribbon cable	Data to/from J601.
J203	NOT USED	
J204	NOT USED	

J205-1	ORG-BRN	Dedicate sw row #1 to Coin Door brd J1-8.
J205-2	ORG-RED	Dedicate sw row #2 to Coin Door brd J1-7.
J205-3	ORG-BLK	Dedicate sw row #3 to Coin Door brd J1-6.
J205-4	ORG-YEL	Dedicate sw row #4 to Coin Door brd J1-5.
J205-5	N/C	
J205-6	ORG-GRN	Dedicate sw row #5 to Coin Door brd J1-4.
J205-7	ORG-BLU	Dedicate sw row #6 to Coin Door brd J1-3.
J205-8	ORG-VIO	Dedicate sw row #7 to Coin Door brd J1-2.
J205-9	ORG-GRY	Dedicate sw row #8 to Coin Door brd J1-1.
J205-10	BLK	Ground to Coin Door board J1-10.
J205-11	KEY	
J205-12	ORG-WHT	Switch enable to Coin Door brd J1-11.

J206-1	GRN-BRN	Switch column #1 to playfield switches.
J206-2	GRN-RED	Switch column #2 to playfield switches.
J206-3	GRN-ORG	Switch column #3 to playfield switches.
J206-4	GRN-WHT	Switch column #4 to playfield switches.
J206-5	GRN-BLK	Switch column #5 to playfield switches.
J206-6	GRN-BLU	Switch column #6 to playfield switches.
J206-7	GRN-VIO	Switch column #7 to playfield switches.
J206-8	KEY	
J206-9	N/C	

J207	NOT USED

J208-1	WHT-BRN	Switch row #1 to playfield switches.
J208-2	WHT-RED	Switch row #2 to playfield switches.
J208-3	WHT-ORG	Switch row #3 to playfield switches.
J208-4	WHT-YEL	Switch row #4 to playfield switches.
J208-5	WHT-GRN	Switch row #5 to playfield switches.
J208-6	KEY	
J208-7	WHT-BLU	Switch row #6 to playfield switches.
J208-8	WHT-VIO	Switch row #7 to playfield switches.
J208-9	WHT-GRY	Switch row #8 to playfield switches.
J208-10	N/C	
J208-11	N/C	
J208-12	BLK-BLU	To lower left E.O.S. switch #F3.
J208-13	BLK-GRN	To lower right E.O.S. switch #F1.
J208-14	ORG	E.O.S. switch ground.

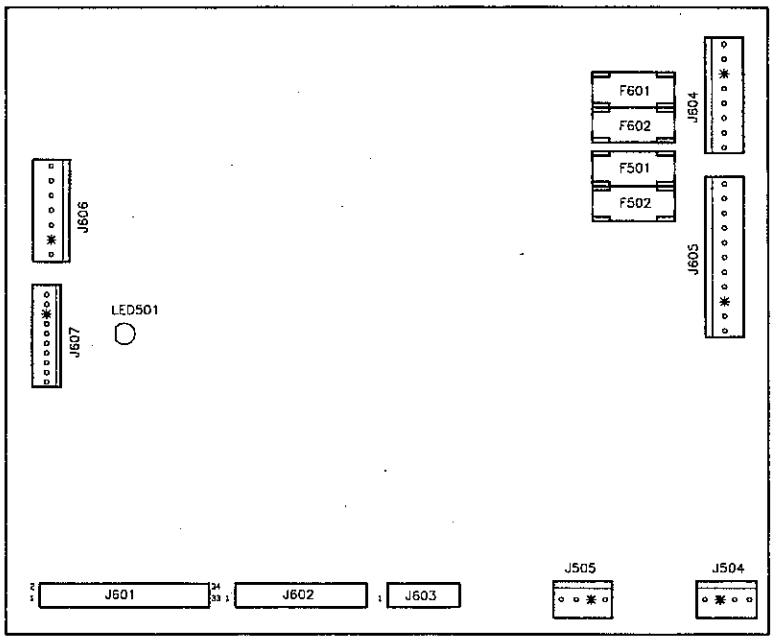
J209	NOT USED

J210-1	BLK	Ground from Power Driver brd J101-5, 7.
J210-2	KEY	
J210-3	BLK	Ground from Power Driver brd J101-5, 7.
J210-4	GRY	+5V from Power Driver board J101-3, 4.
J210-5	GRY	+5V from Power Driver board J101-3, 4.
J210-6	GRY-GRN	+12V from Power Driver board J101-1, 2.
J210-7	GRY-GRN	+12V from Power Driver board J101-1, 2.

J211	34-pin ribbon cable	Data to/from J102.

J212-1	GRN-BRN	Switch col. #1 to Coin Door board J3-1.
J212-2	GRN-RED	Switch col. #2 to Coin Door board J3-2.
J212-3	N/C	
J212-4	WHT-BRN	Switch row #1 to Coin Door board J3-3.
J212-5	KEY	
J212-6	WHT-RED	Switch row #2 to Coin Door board J3-4.
J212-7	WHT-ORG	Switch row #3 to Coin Door board J3-5
J212-8	WHT-YEL	Switch row #4 to Coin Door board J3-6
J212-9	BLK-BLU	To switch #F8 left flipper opto brd J1-1.
J212-10	BLK-YEL	To switch #F6 right flipper opto brd J1-1.
J212-11	BLU-GRY	To switch #F4 left flipper opto brd J1-2.
J212-12	BLU-VIO	To switch #F2 right flipper opto brd J1-2.
J212-13	ORG	Ground to left flipper opto board J1-4.

Audio Visual Board Assembly
A-20516-50059



J601	34-pin ribbon cable	Data to/from CPU J202.
J602	26-pin ribbon cable	Data to/from CPU J201.
J603	14-pin ribbon cable	Data to/from Dot Matrix Display Driver board.

J604-1	ORG	-125V to display driver pin 1.
J604-2	BLU	-113V to display driver pin 2.
J604-3	KEY	
J604-4	BLK	Ground to display driver pin 4.
J604-5	BLK	Ground to display driver pin 5.
J604-6	GRY	+5V to display driver pin 6.
J604-7	GRY-YEL	+12V to display driver pin 7.
J604-8	BRN	+62 to display driver pin 8.

J605-1	WHT	80VAC from transformer secondary.
J605-2	WHT	80VAC from transformer secondary.
J605-3	VIO	100VAC from transformer secondary.
J605-4	VIO	100VAC from transformer secondary.
J605-5	GRY-WHT	18VAC from transformer secondary.
J605-6	GRY-WHT	Loop from J605-7.
J605-7	GRY	18VAC from transformer secondary.
J605-8	GRY	Loop from J605-7.
J605-9	KEY	
J605-10	GRY-GRN	18VAC from transformer secondary.
J605-11	GRY-GRN	Loop from J605-10.

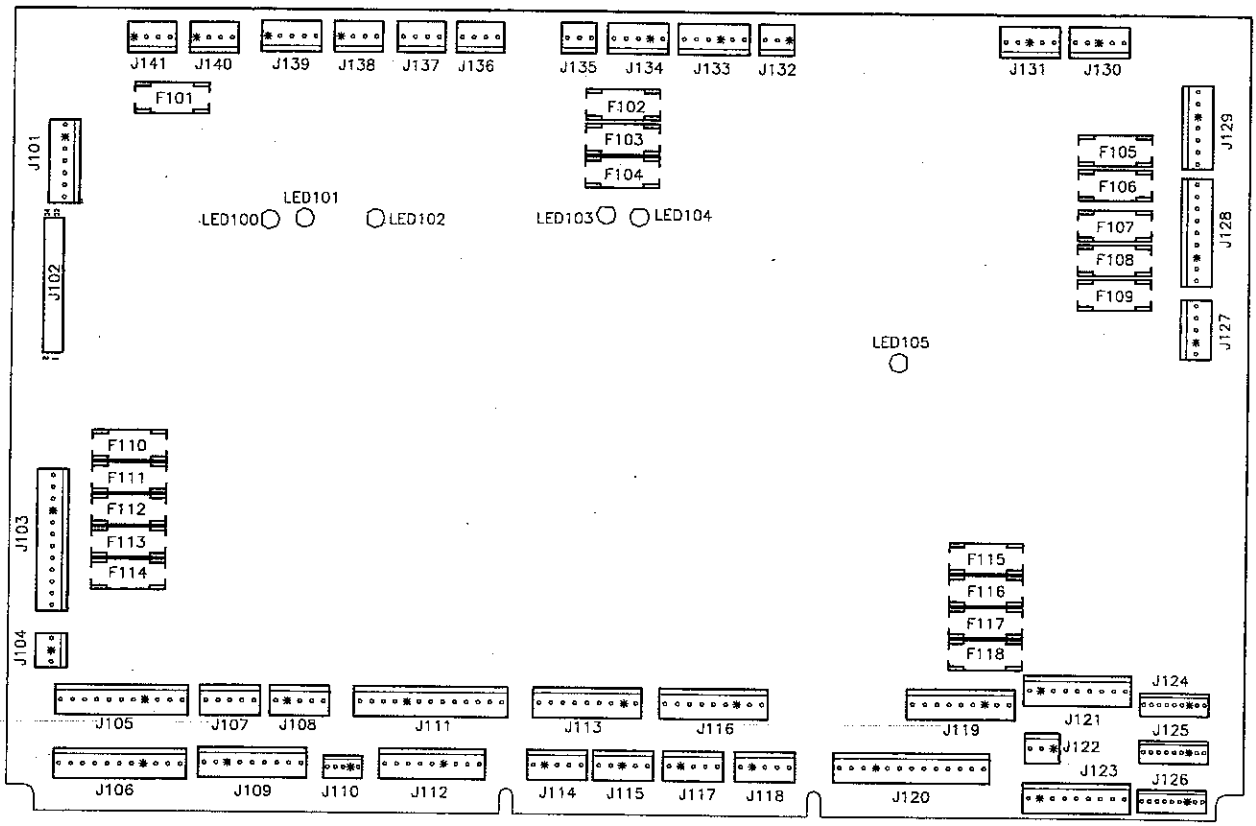
J606-1	BLK	Ground form Power Driver brd J101-7.
J606-2	KEY	
J606-3	BLK	Ground from Power Driver brd J101-5.
J606-4	GRY	+5V from Power Driver board J101-4.
J606-5	GRY	+5V from Power Driver board J101-3.
J606-6	GRY-GRN	+12V from Power Driver board J101-2.
J606-7	GRY-GRN	+12V from Power Driver board J101-1.

J607 NOT USED

J504-1	BLK-YEL	Signal to speaker.
J504-2	KEY	
J504-3	N/C	
J504-4	BLK	Signal to speaker.

J505-1	BLK-YEL	Signal to speaker.
J505-2	KEY	
J505-3	N/C	
J505-4	BLK	Signal to speaker.

Power Driver Board Assembly
A-20028



J101-1	GRY-GRN	+12V to J210-6, 7; J606-1.
J101-2	GRY-GRN	+12V to J210-6, 7; J606-2.
J101-3	GRY	+5V to J210-4, 5; J3-1, 3; J606-3.
J101-4	GRY	+5V to J210-4, 5; J3-1, 3; J606-4.
J101-5	BLK	Ground to J210-1, 3; J606-5.
J101-6	KEY	
J101-7	BLK	Ground to J210-1,3; J606-7.

J102	34-pin ribbon cable	Data to/from CPU J211.

J103-1	YEL-WHT	6.8Vac from transformer secondary.
J103-2	WHT-BRN	6.8Vac from transformer secondary.
J103-3	WHT-BRN	6.8Vac from transformer secondary.
J103-4	WHT-ORG	6.8Vac from transformer secondary.
J103-5	WHT-YEL	6.8Vac from transformer secondary.
J103-6	WHT-YEL	6.8Vac from transformer secondary.
J103-7	ORG	6.8Vac from transformer secondary.
J103-8	ORG	6.8Vac from transformer secondary.
J103-9	KEY	
J103-10	GRN	6.8Vac from transformer secondary.
J103-11	BRN	6.8Vac from transformer secondary.
J103-12	BRN	6.8Vac from transformer secondary.

J104-1	VIO	Return for G.I. to Coin Door board J2-3.
J104-2	KEY	
J104-3	WHT-VIO	6.8VAC for G.I. to Coin Door brd J2-5.

J105-1	BRN	Return for G.I. to insert panel.
J105-2	ORG	Return for G.I. to insert panel.
J105-3	YEL	Return for G.I. to insert panel.
J105-4	KEY	
J105-5	N/C	
J105-6	N/C	
J105-7	WHT-BRN	6.8VAC for G.I. to insert panel.
J105-8	WHT-ORG	6.8VAC for G.I. to insert panel.
J105-9	WHT-YEL	6.8VAC for G.I. to insert panel.
J105-10	N/C	
J105-11	N/C	

J106-1	BRN	Return for G.I. to playfield.
J106-2	N/C	
J106-3	N/C	
J106-4	KEY	
J106-5	GRN	Return for G.I. to playfield.
J106-6	VIO	Return for G.I. to playfield.
J106-7	WHT-BRN	6.8VAC for G.I. to playfield.
J106-8	N/C	
J106-9	N/C	
J106-10	WHT-GRN	6.8VAC for G.I. to playfield.
J106-11	WHT-VIO	6.8VAC for G.I. to playfield.

J107	NOT USED

J108	NOT USED

Power Driver Board Continued...

J109-1	BLU-BRN	For solenoid #25 drive to Moat Flashers.
J109-2	BLU-RED	For slnd #26 drive to Tower Lock Post.
J109-3	BLU-ORG	For solenoid #27 drive to Right Gate.
J109-4	BLU-YEL	For solenoid #28 drive to Left Gate.
J109-5	N/C	
J109-6	RED-ORG	Tieback diode
J109-7	KEY	
J109-8	RED-ORG	Tieback diode
J109-9	RED-ORG	Tieback diode

J110-1	BRN-WHT	For solenoid #37 drive to High Current Driver board.
J110-2	KEY	
J110-3	N/C	
J110-4	N/C	
J110-5	N/C	

J111-1	BLK-BRN	For solenoid #17 drive to playfield flasher.
J111-2	BLK-RED	For solenoid #18 drive to playfield flasher.
J111-3	BLK-ORG	For solenoid #19 drive to playfield flasher.
J111-4	BLK-YEL	For solenoid #20 drive to playfield flasher.
J111-5	BLU-GRN	For solenoid #21 drive to playfield flasher.
J111-6	BLU-BLK	For solenoid #22 drive to playfield flasher.
J111-7	BLU-VIO	For solenoid #23 drive to playfield flasher.
J111-8	BLU-GRY	For solenoid #24 drive to playfield flasher.
J111-9	KEY	
J111-10	N/C	
J111-11	N/C	
J111-12	N/C	
J111-13	N/C	

J112-1	BLK-BRN	For solenoid #17 drive to playfield flasher.
J112-2	BLK-RED	For solenoid #18 drive to playfield flasher.
J112-3	BLK-ORG	For solenoid #19 drive to playfield flasher.
J112-4	KEY	
J112-5	BLK-YEL	For solenoid #20 drive to playfield flasher.
J112-6	N/C	
J112-7	N/C	
J112-8	N/C	
J112-9	N/C	

J113-1	BRN-BLK	For solenoid #9 drive to playfield coil.
J113-2	KEY	
J113-3	BRN-RED	For solenoid #10 drive to playfield coil.
J113-4	BRN-ORG	For solenoid #11 drive to playfield coil.
J113-5	BRN-YEL	For solenoid #12 drive to playfield coil.
J113-6	BRN-GRN	For solenoid #13 drive to playfield coil.
J113-7	BRN-BLU	For solenoid #14 drive to playfield coil.
J113-8	BRN-VIO	For solenoid #15 drive to playfield coil.
J113-9	BRN-GRY	For solenoid #16 drive to playfield coil.

J114	NOT USED	

J115	NOT USED	

J116-1	VIO-BRN	For solenoid #1 drive to playfield coil.
J116-2	VIO-RED	For solenoid #2 drive to playfield coil.
J116-3	KEY	
J116-4	VIO-ORG	For solenoid #3 drive to playfield coil.
J116-5	VIO-YEL	For solenoid #4 drive to playfield coil.
J116-6	VIO-GRN	For solenoid #5 drive to playfield coil.
J116-7	VIO-BLU	For solenoid #6 drive to playfield coil.
J116-8	VIO-BLK	For solenoid #7 drive to playfield coil.
J116-9	VIO-GRY	For solenoid #8 drive to playfield coil.

J117	NOT USED	

J118	NOT USED	

J119-1	RED-GRN	+50V to lower right flipper coil.
J119-2	RED-GRN	Loop from J119-1.
J119-3	KEY	
J119-4	RED-BLU	Loop from J119-5.
J119-5	RED-BLU	+50V to lower left flipper coil.
J119-6	RED-VIO	Loop from J119-7.
J119-7	RED-VIO	+50V to Left Troll.
J119-8	RED-GRY	Loop from J119-9.
J119-9	RED-GRY	+50 V to Right Troll.

J120-1	ORG-GRY	For sol. #36 hold drive to Right Troll.
J120-2	N/C	
J120-3	YEL-GRY	For sol. #35 power drive to Right Troll.
J120-4	N/C	
J120-5	ORG-VIO	For sol. #34 hold drive to Left Troll.
J120-6	YEL-VIO	For sol. #33 power drive to Left Troll.
J120-7	ORG-BLU	For sol. #32 hold drive to low left flipper.
J120-8	N/C	
J120-9	YEL-BLU	For sol. #31 power drive to low left flipper.
J120-10	KEY	
J120-11	ORG-GRN	For sol. #30 hold drive to low right flipper.
J120-12	N/C	
J120-13	YEL-GRN	For sol. #29 power drive to low right flipper.

J121	NOT USED	

J122-1	KEY	
J122-2	N/C	
J122-3	YEL-GRY	For lamp column #8 to cabinet.

J123-1	YEL-BRN	For lamp column #1 to playfield.
J123-2	YEL-RED	For lamp column #2 to playfield.
J123-3	YEL-ORG	For lamp column #3 to playfield.
J123-4	YEL-BLK	For lamp column #4 to playfield.
J123-5	YEL-GRN	For lamp column #5 to playfield.
J123-6	YEL-BLU	For lamp column #6 to playfield.
J123-7	YEL-VIO	For lamp column #7 to playfield.
J123-8	KEY	
J123-9	YEL-GRY	For lamp column #8 to playfield.

J124-1	RED-BRN	For lamp row #1 to playfield.
J124-2	RED-BLK	For lamp row #2 to playfield.
J124-3	KEY	
J124-4	RED-ORG	For lamp row #3 to playfield.
J124-5	RED-YEL	For lamp row #4 to playfield.
J124-6	RED-GRN	For lamp row #5 to playfield.
J124-7	RED-BLU	For lamp row #6 to playfield.
J124-8	RED-VIO	For lamp row #7 to playfield.
J124-9	RED-GRY	For lamp row #8 to playfield.

J125-1	N/C	
J125-2	N/C	
J125-3	KEY	
J125-4	N/C	
J125-5	N/C	
J125-6	N/C	
J125-7	RED-BLU	For lamp row #6 to coin door board J3-9.
J125-8	RED-VIO	For lamp row #7 to coin door brd J3-10.
J125-9	RED-GRY	For lamp row #8 to coin door brd J3-11.

J126	NOT USED	

J127-1	WHT-GRN	9.8VAC from transformer secondary.
J127-2	WHT-GRN	9.8VAC loop from J127-1.
J127-3	WHT-GRN	9.8VAC from transformer secondary.
J127-4	KEY	
J127-5	WHT-GRN	9.8VAC loop from J127-3.

Power Driver Board Continued...

J128-1	WHT-RED	16VAC loop from J128-2.
J128-2	WHT-RED	16VAC from transformer secondary.
J128-3	WHT-RED	16VAC loop from J128-4.
J128-4	WHT-RED	16VAC from transformer secondary.
J128-5	BLK-YEL	16VAC loop from J128-6
J128-6	BLK-YEL	16VAC from transformer secondary.
J128-7	KEY	
J128-8	BLK-YEL	16VAC loop from J128-9.
J128-9	BLK-YEL	16VAC from transformer secondary.

J129-1	RED	9VAC from transformer secondary.
J129-2	RED	9VAC from transformer secondary.
J129-3	KEY	
J129-4	BLU-WHT	13VAC from transformer secondary.
J129-5	BLU-WHT	13VAC loop from J129-4.
J129-6	BLU-WHT	13VAC from transformer secondary.
J129-7	BLU-WHT	13VAC loop from J129-6.

J130	NOT USED

J131	NOT USED

J132	NOT USED

J133-1	RED-ORG	+50V to coils.
J133-2	RED-BRN	+50V to coils.
J133-3	RED-BLK	+50V to coils.
J133-4	KEY	
J133-5	N/C	
J133-6	RED-WHT	+20V to playfield flashers.

J134-1	N/C	
J134-2	N/C	
J134-3	N/C	
J134-4	KEY	
J134-5	RED-WHT	+20V to insert panel flashers.

J135	NOT USED

J136	NOT USED

J137	NOT USED

J138	NOT USED

J139-1	KEY	
J139-2	GRY-YEL	+12V to playfield PC boards.
J139-3	BLK	Ground to playfield PC boards.
J139-4	N/C	
J139-5	BLK-WHT	Signal for coin meter to coin door brd J2-7.

J140-1	KEY	
J140-2	GRY-YEL	+12V
J140-3	BLK	Ground
J140-4	N/C	

J141-1	KEY	
J141-2	GRY-YEL	+12V to Coin Door board J2-2.
J141-3	BLK	Ground to Coin Door board J2-1.
J141-4	N/C	

LAMP MATRIX

Yellow (B+) — Red

Column / Row	1 Yellow-Brown J121-1 Q96	2 Yellow-Red J121-2 Q100	3 Yellow-Orange J121-3 Q95	4 Yellow-Black J121-4 Q99	5 Yellow-Green J121-5 Q94	6 Yellow-Blue J121-6 Q98	7 Yellow-Violet J121-7 Q93	8 Yellow-Gray J121-9 Q97
1 Red-Brown J125-1 Q104	RIGHT BANK TOP 11	RIGHT LOOP JACKPOT 21	TROLLS! 31	LEFT LOOP JACKPOT 41	CENTER ARROW 51	FRANCOIS D'GRIMM 61	HOWARD HURTZ 71	RIGHT OUTLANE 81
2 Red-Black J125-2 Q108	RIGHT BANK MIDDLE 12	RIGHT JOUST VICTORY! 22	EXTRA BALL 32	LEFT JOUST VICTORY! 42	BATTLE FOR THE KINGDOM 52	KING OF PAYNE 62	MAGIC SHIELD 72	RIGHT RETURN 82
3 Red-Orange J125-4 Q103	RIGHT BANK BOTTOM 13	RIGHT CLASH! 23	MERLIN'S MAGIC 33	LEFT CLASH! 43	MASTER OF TROLLS 53	EARL OF EGO 63	SIR PSYCHO 73	LEFT RETURN 83
4 Red-Yellow J125-5 Q107	RIGHT RAMP JACKPOT 14	RIGHT CHARGE! 24	TROLL MADNESS 34	LEFT CHARGE! 44	DEFENDER OF DAMSELS 54	LEFT RAMP JACKPOT 64	DUKE OF BOURBON 74	LEFT OUTLANE 84
5 Red-Green J125-6 Q102	SAVE THE DAMSEL! (2) 15	PATRON OF THE PEASANTS 25	DAMSEL MADNESS 35	CATAPULT JACKPOT 45	LEFT TOP LANE 55	REVOLTING PEASANTS! 65	CASTLE LOCK 2 75	CASTLE LOCK 3 85
6 Red-Blue J125-7 Q106	DRAGON DEATH 16	CATAPULT ACE 26	PEASANT MADNESS 36	CATAPULT SLAM! 46	RIGHT TOP LANE 56	UGLY RIOT! 66	CASTLE LOCK 1 76	SHOOT AGAIN 86
7 Red-Violet J125-8 Q101	DRAGON SNACK 17	JOUST CHAMPION 27	CATAPULT MADNESS 37	BAM! 47	LEFT TROLL TARGET 57	ANGRY MOB! 67	SUPER JACKPOT 77	LAUNCH BUTTON 87
8 Red-Gray J125-9 Q105	DRAGON BREATH 18	CASTLE CRUSHER 28	JOUST MADNESS 38	WAM! 48	RIGHT TROLL TARGET 58	RABBLE ROUSER 68	SUPER JETS (2) 78	START BUTTON 88

J1XX = Power Driver Board

SWITCH MATRIX

White — Green

Dedicated Grounded Switches	Column / Row	1 Green-Brown J206-1 U20-18	2 Green-Red J206-2 U20-17	3 Green-Orange J206-3 U20-16	4 Green-White J206-4 U20-15	5 Green-Black J206-5 U20-14	6 Green-Blue J206-6 U20-13	7 Green-Violet J206-7 U20-12	8 Green-Gray J206-9 U20-11	Flipper Grounded Switches
Orange-Brown J205-1 Left Coin Chute U17-5 D1	1 White-Brown J208-1 U18-11	LAUNCH BALL 11	SLAM TILT 21	TROUGH EJECT 31	MOAT ENTER 41	LEFT SLINGSHOT 51	LEFT RAMP ENTER 61	RIGHT BANK TOP 71	NOT USED 81	Black-Green J208-13 Lower Right Flipper E.O.S. F1
Orange-Red J205-2 Center Coin Chute U17-7 D2	2 White-Red J208-2 U18-9	CATAPULT TARGET 12	COIN DOOR CLOSED 22	TROUGH BALL 1 32	NOT USED 42	RIGHT SLINGSHOT 52	LEFT RAMP EXIT 62	RIGHT BANK MIDDLE 72	NOT USED 82	Blue-Violet J212-12 Lower Right Flipper Opto F2
Orange-Black J205-3 Right Coin Chute U17-11 D3	3 White-Orange J208-3 U18-5	START BUTTON 13	NOT USED 23	TROUGH BALL 2 33	NOT USED 43	LEFT JET BUMPER 53	RIGHT RAMP ENTER 63	RIGHT BANK BOTTOM 73	NOT USED 83	Black-Blue J208-12 Lower Left Flipper E.O.S. F3
Orange-Yellow J205-4 4th Coin Chute U17-9 D4	4 White-Yellow J208-4 U18-7	PLUMB BOB TILT 14	ALWAYS CLOSED 24	TROUGH BALL 3 34	CASTLE LOCK 44	BOTTOM JET BUMPER 54	RIGHT RAMP EXIT 64	LEFT TROLL UP 74	NOT USED 84	Blue-Gray J212-11 Lower Left Flipper Opto F4
Orange-Green J205-6 U16-9 Normal Function / Srv Crdts; Test Function / Escape D5	5 White-Green J208-5 U19-11	LEFT TROLL TARGET 15	RIGHT TROLL TARGET 25	TROUGH BALL 4 35	LEFT TROLL (UNDER PLAYFIELD) 45	RIGHT JET BUMPER 55	LEFT LOOP LOW 65	RIGHT TROLL UP 75	NOT USED 85	Black-Violet J208-11 Upper Right Flipper E.O.S. F5
Orange-Blue J205-7 U16-11 Normal Function / Volume Dn; Test Function / Down D6	6 White-Blue J208-7 U19-9	LEFT OUTLANE 16	LEFT RETURN LANE 26	LEFT POPPER 36	RIGHT TROLL (UNDER PLAYFIELD) 46	DRAW-BRIDGE UP 56	LEFT LOOP HIGH 66	NOT USED 76	NOT USED 86	Black-Yellow J212-10 Upper Right Flipper Opto F6
Orange-Violet J205-8 U16-7 Normal Function / Volume Up; Test Function / Up D7	7 White-Violet J208-8 U19-5	RIGHT RETURN LANE 17	RIGHT OUTLANE 27	CASTLE GATE 37	LEFT TOP LANE 47	DRAW-BRIDGE DOWN 57	RIGHT LOOP LOW 67	NOT USED 77	NOT USED 87	Black-Gray J208-10 Upper Left Flipper E.O.S. F7
Orange-Gray J205-9 U16-5 Normal Function / Begin Test; Test Function / Enter D8	8 White-Gray J208-9 U19-7	SHOOTER LANE 18	RIGHT EJECT 28	CATAPULT 38	RIGHT TOP LANE 48	TOWER EXIT 58	RIGHT LOOP HIGH 68	NOT USED 78	NOT USED 88	Black-Blue J212-9 Upper Left Flipper Opto F8

J2XX = CPU BOARD

= OPTO, TYPICALLY CLOSED

WARNINGS & NOTICES

WARNING

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