Bally

Bally Cirqus Voltaire ™

C E (UL) c(UL)

OPERATIONS MANUAL INCLUDES

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

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

This scan was done by:

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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	Voltage Connections Backbox	Voltage Connections Cabinet	Drive Xistor	Drive Connections Playfield	Drive Connections Backbox	Drive Connections Cabinet	Drive Wire Color	Solenoid Part Number Flashlamp Type Playfield	Insert
01	PLUNGER	High Power	J133-2			Q72	J116-1			VIO-BRN	AE-23-800	
02	BACKBOX KICK	High Power		J134-3		Q68		J118-2		VIO-RED	AE-23-800	
03	LEFT LOOP MAGNET	High Power	J133-2			Q71	J116-4			VIO-ORG	20-10197	
04	MIDDLE JET BUMPER	High Power	J133-2			Q67	J116-5			VIO-YEL	AE-23-800	
05	RAMP MAGNET	High Power	J133-2			Q70	J116-6			VIO-GRN	20-10197	
06	DIVERTER POWER	High Power	J133-2			Q66	J116-7			VIO-BLU	FL-11753	
07	JET UP	High Power	J133-2			Q69	J116-8			VIO-BLK	FL-11630	
08	JET RELEASE	High Power	J133-2			Q65	J116-9			VIO-GRY	SM1-26-600	
09	TROUGH EJECT	Low Power	J133-3			Q44	J114-1			BRN-BLK	AE-26-1500	
10	LEFT SLINGSHOT	Low Power	J133-3			Q48	J114-3			BRN-RED	AE-26-1200	
11	RIGHT SLINGSHOT	Low Power	J133-3			Q43	J114-4			BRN-ORG	AE-26-1200	
12	UPPER JET BUMPER	Low Power	J133-3			Q47	J114-5			BRN-YEL	AE-26-1200	
13	LOWER JET BUMPER	Low Power	J133-3			Q42	J114-6			BRN-GRN	AE-26-1200	
14	LEFT SAUCER	Low Power	J133-3			Q46	J114-7			BRN-BLU	AE-27-1200	
15	RIGHT SAUCER	Low Power	J133-3			Q41	J114-8			BRN-VIO	AE-27-1200	
16	LOCK POST	Low Power	J133-3			Q45	J114-9			BRN-GRY	AE-26-1500	
17	JOIN FLASHERS	Flasher	J133-6			Q28	J111-1			BLK-BRN	#906	
18	RING #1 FLASHERS	Flasher	J133-6			Q32	J111-2			BLK-RED	#906	
19	RING #2 FLASHERS	Flasher	J133-6			Q27	J111-3			BLK-ORG	#906	
20	RING #3 FLASHERS	Flasher	J133-6			Q31	J111-4			BLK-YEL	#906	
21	RIGHT PLAYFIELD FLASHER	Flasher	J133-6			Q26	J111-5			BLU-GRN	#906	
21	UPPER RIGHT BACKBOX FLS	Flasher		J134-5		Q26		J112-6		BLU-GRN		#906
22	MOTOR ENABLE	Flasher	J133-6			Q30	J111-6			BLU-BLK	A-15680	
23	JET FLASHER	Flasher	J133-6			Q25	J111-7			BLU-VIO	#906	
24	LEFT PLAYFIELD FLASHER	Flasher	J133-6			Q29	J111-8			BLU-GRY	#906	
24	UPPER LEFT BACKBOX FLS	Flasher		J134-5		Q29		J112-9		BLU-GRY		#906
25	UPPER LEFT FLASHER	Gen. Purpose	J133-6			Q16	J109-1			BLU-BRN	#906	
26	UP. RIGHT PLAYFIELD FLS	Gen. Purpose	J133-6			Q15	J109-2			BLU-RED	#906	
26	LOWER LEFT BACKBOX FLS	Gen. Purpose		J134-5		Q15		J107-3		BLU-RED		#906
27	RINGMASTER FLASHERS (2)	Gen. Purpose	J133-6			Q14	J109-3			BLU-ORG	#906	
28	BEAR PLAYFIELD FLASHER	Gen. Purpose	J133-6			Q13	J109-4			BLU-YEL	#906	
28	LOWER RIGHT BACKBOX FLS	Gen. Purpose		J134-5		Q13		J107-5		BLU-YEL		#906

General Illumination

01	PLAYFIELD RIGHT	G.I.	J105-1			Q5	J105-7			WHT-BRN	#44	
02	PLAYFIELD MIDDLE	G.I.	J105-2			Q4	J105-8			WHT-ORG	#44	
03	PLAYFIELD LEFT	G.I.	J105-3			Q3	J105-9			WHT-YEL	#44	
04	**BACKBOX 2	G.I.		J106-5		Q2		J106-10		WHT-GRN		#555
05	**BACKBOX 1	G.I.		J106-6	J104-3	Q1		J106-11	J104-1	WHT-VIO		#555

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-11630	RED
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-11630	RED
32	LOWER LEFT FLIPPER	Hold	J119-4 (RED-BLU)		Q89	J120-7		ORG-BLU		
33	POPPER	Power	J119-6 (RED-VIO)	Q84		J120-6	YEL-VIO		AL-25-1000	BROWN
34	DIVERTER HOLD	Hold	J119-6 (RED-VIO)		Q86	J120-4		ORG-VIO	FL-11730	YELLOW
35	RINGMASTER MAGNET	Power	J119-8 (RED-GRY)	Q81		J120-3	YEL-GRY		20-10197	
36	UPPER POST	Hold	J119-8 (RED-GRY)		Q83	J120-1		ORG-GRY	AE-27-1200	WHITE

Motor Circuit		Solenoid Type	Voltage Connections Playfield	Drive Gates	Drive Connections Playfield	Drive Wire Color	Device Part Number Playfield
37	NEON	Low Power	J139-2	U3A, U3B	J110-1	BRN-WHT	A-21577
38	NOT USED						
39	MOTOR DIRECTION	Low Power	J133-6	U3G, U3H	J110-4	YEL-WHT	A-15680
40	EDDY BOARD	Low Power	J139-2	U3E, U3F	J110-5	BLU-WHT	A-21745-2

J1XX = POWER DRIVER BOARD
24-6549 = #44 BULB; 24-8704 = #89 BULB; 24-8768 = #555 BULB; 24-8802 = #906 BULB
**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: "CIRQUS VOLTAIRE" 50262,50362,50462,50762, 50962, 51062,51162,51362,51462,51862,52062,52162,52262,52362,57262   PIN

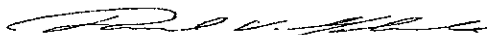TO WHICH THIS DECLARATION RELATES IS IN CONFORMITY WITH THE FOLLOWING EUROPEAN PRODUCT SAFETY DIRECTIVES:

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: JULY 30, 1997

MANUFACTURE'S SIGNATURE

DAN GALARDE

CORPORATE V.P. OF QUALITY

Remember that: If you clean them, they will earn!

A note from the CIRQUS VOLTAIRE design team.

This game has been designed and built with maintenance in mind. All the devices are easy to get to, the playfield is easy to clean, and the software does all it can to detect faults and problems. Games that are clean and working WILL EARN MORE then dirty, broken games with no lights. It doesn't take long to clean the playfield and change bulbs if it is done weekly or every two weeks (according to how much play the machine gets). Check the Test Report (displayed as soon as the coin door is opened) and fix any problems that the game has detected. Pinball is a game of FUN, and people have the most fun on bright happy games that work.
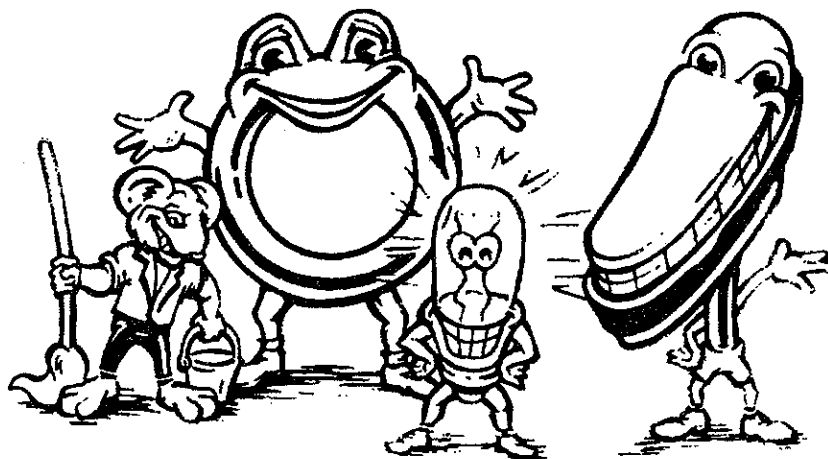
Mr. Squeaky   Mr. Ring   Mr. Bulb   Mr. Flipper

ATTENTION

The Security CPU Board has an added security chip that can be interchanged between other **CIRQUS VOLTAIRE** 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.
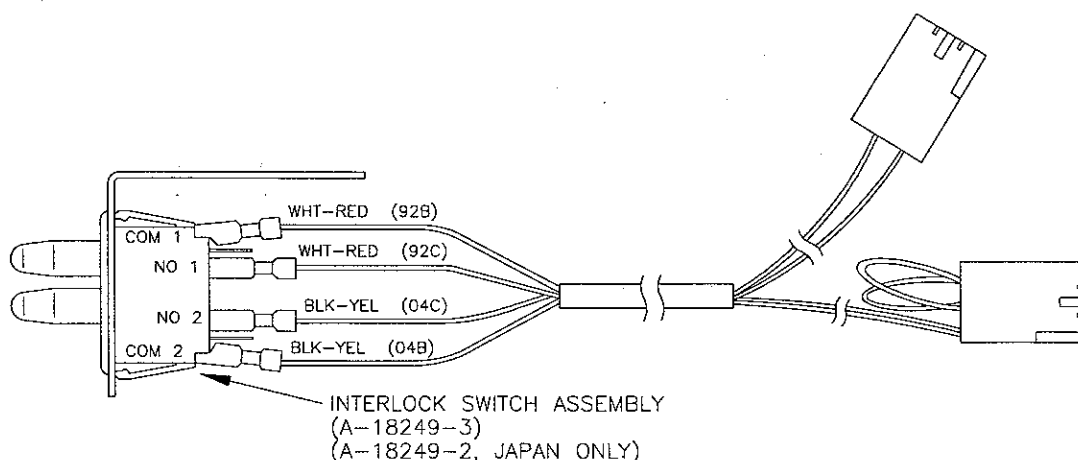
The games' electronic ID number is shown in the display during power-up. The number displayed is the same nine-digit number printed on the security chip label. The first three digits are the project number without the country specific code. An example of the power-up display is shown below, the electronic ID number is bolded.

```
TESTING
50062                        EPROM 1.0 A
562   100006  95749
```

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.


```
COM 1
NO 1          WHT-RED  (92B)
              WHT-RED  (92C)
NO 2          BLK-YEL  (04C)
COM 2         BLK-YEL  (04B)
```

INTERLOCK SWITCH ASSEMBLY
(A-18249-3)
(A-18249-2, JAPAN ONLY)

Bally
Cirqus Voltaire ™

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 562 200057   Serial Number 511622 00057

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Section 3 Continued...

CIRQUS NOTES

Cirqus Voltaire

Rules

CIRQUS VOLTAIRE
Show Program

- **OBJECT** - Complete all nine MARVELS to light CIRQUS and JOIN The Troupe Voltaire.
- **SKILL SHOT** - Shoot the ball into play, Hit The Ringmaster's RING.
- **RINGMASTER** - Spell WOW then shoot the RINGMASTER while he's up.
- **MARVELS** - Complete MARVELS in a line to light CIRQUS letters.
- **MULTIBALL** - LOCK balls up the HIGHWIRE ramp, then start HW Multiball.
- **JACKPOT** - During Multiball shoot the lit ARROWS or inside RINGMASTER.
- **VOLTS** - Rollover Buttons add VOLTAGE to CHARGE the BOOM BALLON.
- **SIDESHOW** - Hit two side RINGMASTER targets to Light BALLYHOO SIDESHOW.
- **JOIN CIRQUS** - Collect all six CIRQUS LETTERS to begin CIRQUS CHALLENGE.
- **EXTRA BALL** - Shoot Left Lane when lit for Extra Ball.

16-10513

RULES and THEORY

Cirqus Voltaire
"There are truths which are not for all men, nor for all times."
Voltaire ~ 1761

A Little Circus History

The electrifying performances of the circus' of old were very different than today. It has evolved from the early Roman acts of bravery and challenge. The Romans themselves were the greatest audiences holding daily performances in the Arena, which hosted juggling, tightrope walking and fire eating as well as gladiators and chariot races. The word "circus" literally means "ring", and was established to set a boundary for the animals to work within.

After the fall of Rome in 476 A.D., the performers disbanded and scattered throughout the known World for other places to practice their arts.

"M.Voltaire" ~ (Francois Marie Arouet)
(1694 - 1778)

Born in Paris, Voltaire was the most influential writer and philosopher of the French Enlightenment. A man of noble background, he was inclined to aristocracy. He adopted the name Voltaire after his imprisonment in the Bastille (1717-1718) for writing satiric verse. Jailed again briefly in the Bastille in 1726, he was exiled to England for three years, then lived in France and Germany, and returned to Paris in 1772.

Best known for his classical tragedies, he was also a poet and a correspondent of tremendous value. Voltaire was also known as a fighter for social reform. As a leader of the philosophies, he tried to reform the hierarchical French Ancient Regime, and the system of criminal justice and taxation. Voltaire opposed persecution and rejected materialism in favor of determinism. He pioneered modern historiography with his valuable historical works, such as the *History of Charles XII, Age of Louis XIV*, and *Essay on Manners*. The frivolity of the Cirqus had always appealed to his manner, and took on the task of forming his own.

History of the Cirqus Voltaire.

In the most rebellious of times during 1771, one of the authors of the new time was indeed Voltaire, a scholarly rascal with a vivid tongue and sharp quill. Along with other men of valor, began a movement of "Enlightenment" based in the scientific revolution of Galileo and Newton from the previous century. They felt the universe was infinite and that the spirit of man should be free to wander as well.

Voltaire himself then brought together a group of the most talented street performers and philosophers of modern day France and founded the "Troupe des Voltaire" or Voltaire's Group in 1772. The men would speak from inside the masterful "ring" and voice their ideas to France and the World through the audience.

This new name, "Cirqus Voltaire" was adopted and first spoken by Voltaire himself during a tense game of "9 Hole" Bagatelle at the Cafe Procope in Paris. Along with their romantic works of the pen, the Cirqus talent included jugglers, tiger tamers, high wire fellows, an old lady, and of course the lightning-ball walkers and throwers. The "Group des Voltaire" had the most marvelous acts, those of electricity, fire and passion, the same that willed France toward revolution in 1789.

Cirqus Voltaire - The Pinball

Along with any good story, the Cirqus Voltaire "Troupe" were among the best of bagatelle players in France. Many a night was illuminated with wild games against French Soldiers and their Captains. Today this spirit will continue in our new pinball table as you try to JOIN the Cirqus Voltaire.

As the player you enter the great CIRQUS THEATRE in the heart of Paris and are requested to perform before the audience and mysterious judges. Your first SKILL task is to charge the Ringmaster's Ring. This will guide you to the place where the Cirqus is performing.

Once there you have nothing to keep you from discovering the splendor and thrill of the Cirqus. For you the player, the RINGMASTER is the key and challenging him to speak and reign over the Cirqus is your best hope. Amidst the three RINGS are the Cirqus Marvels to be found and accomplished. The pinball will find the Menagerie, Juggler, High Voltage High Wire, The Crank, Amazing Acrobats, Boom Balloons and of course the BallyHoo Sideshow.

The enchanting "Lady of the Cirqus" will guide and show you the way of Voltaire's greatest Cirqus. You must complete all nine Marvels of the Cirqus to Join the Troupe Voltaire and continue on in Cirqus immortality. This is where VOLTAIRE appears during the final challenge.

OBJECT

The main goal is to complete all nine Cirqus Marvels located on the center grid of lights on the playfield. Completing any three Marvels in a line will illuminate the corresponding CIRQUS letter. You must light all CIRQUS letters to light "Join the Cirqus" and continue on to Cirqus Immortality as a performer.

RINGMASTER SKILL SHOT

Plunge the ball with a soft touch and try to hit the RING of the Ringmaster to award the skill value.

CIRQUS MARVELS

On the playfield is a grid of nine CIRQUS MARVELS to be completed in any order during game play. They are as follows:

- Menagerie - Hit the "Wild Ball" to tame the MENAGERIE animals to new levels.
- Juggler - Shoot left lane to advance Juggler through 1-2-3. Juggle three balls in the Juggler Multiball.
- BallyHoo Sideshow - Hit the Ringmaster targets to light sideshow, then shoot it.
- High Wire Multiball - Hit LIGHT-LOCK targets then shoot ramp to LOCK balls.
- Ringmaster - Shoot "WOW" targets to raise Ringmaster, then hit him while he's up.
- Boom Balloons - Add VOLTS to charge BOOM BALLOON and raise it.
- Amazing Acrobats - Shoot the right lane to light 1-2-3 ACROBATS.
- Crank Him - Shoot the pinball around the CRANK as much as you can,

Light a row of three MARVELS to light the corresponding letter in CIRQUS. Try and complete all CIRQUS letters.

THE RINGMASTER

At the top of the playfield is the Cirqus RINGMASTER named "Jack". Shoot the ball and complete the "WOW" sequence of targets to raise the Ringmaster. While he's up shoot the ball at him to ADVANCE his five collar lights. Defeat the Ringmaster for:

- FRENZIE - this is a fast multiball round. Shoot into the Ringmaster for Jackpots.
- RAZZ - this multiball has cool pinball action as he raises up.
- SPECIAL - this mega multi-ball completes all three rounds.

BALLYHOO SIDESHOW
Shoot the pinball and HIT the Jack side targets to light side show in the left lane. Going into the sideshow will award a Cirqus event or give you points. Watch for the ball coming back onto the playfield. Events are as follows:
- Amazing Roonie - Video mode featuring Roonie the Kangaroo on his mini-cycle. Use the flippers to jump over objects (there are short and long objects)
- Cannonball - Press flipper buttons to fire the cannon.
- Popcorn Mania - Every switch adds a piece of popcorn until the display is FULL. Then get a jackpot.
- Ringmaster Hat Trick - Shoot three balls into Jack as he throws his hats.

HIGH WIRE MULTIBALL
Hit the LIGHT and LOCK targets to light LOCK. Lock three balls for MULTIBALL. Jackpots are Left Loop, Right Loop and the Center loop. At the start of multiball, all jackpots are lit. After a number, then only one is lit at a time, but it moves.

JUGGLER
Shoot the left loop four times to light the juggler. Lock two balls to start JUGGLER MULTIBALL. Both loops award jackpots. Double jackpot is available for 10 seconds after a jackpot. Super jackpot is available ten seconds after a double

STRIKE AN ARC MULTIBALL
Shoot the high wire ramp a number of times to Strike an Arc. If LOCK or MULTIBALL is lit together with strike an arc, then both will happen on the same ramp shot. During ARC MULTIBALL, every switch adds voltage, at 100% the Arc Jackpot is awarded

R-I-N-G LETTERS
Shooting into the Menagerie area or the right lower red target will SPELL RING. Spelling RING on the playfield lights up the next ring your in, beginning at RING ONE. Each ring has it's own Cirqus Acts and Animals. You must progress through all the rings (3) to get higher point values and multiply Bonus X.

ACROBATS
Complete the right loop to get the AMAZING ACROBATS into action. Each shot advances them through 1-2-3 until the ACROBATS light comes on. Start the Acrobats to get both spinners worth 5,000 a spin.

MENAGERIE
Tame the animals from the Cirqus, even the talking ones, with the RING & "WILD BALL" on the left side of the playfield. Each time you shoot into the MENAGERIE area a new animal is tamed and then released for you. Listen to the growls and animals as you play. Try and cage them all - like the tigers, camels, penguins, flies, lions, leopards, panthers and cheetahs. Tame them all to increase Menagerie level.

VOLT ROLLOVERS
Rolling over and lighting the four "ADD VOLTS" rollover buttons will advance the CIRQUS VOLTAGE in the game and charge the BOOM BALLOON. Enough VOLTAGE will bring up the BOOM DISAPPEARING JET BUMPER for added play and explosive action. Once raised, each jet is 1000x number of balloons inflated. Up/Down jet is worth double. Once up in play, the BOOM BALLOON will POP or explode any balloons inflated from the regular jet bumpers.

THE JUDGES BONUS & AWARDS
At the end of each ball in play a motley group of JUDGES will score you on your past performance. The JUDGES will display a score from 1-10. All scores are tabulated and added to your main game score along with any LIGHTNING BALLS shot out of the CANNON or other awards completed.

JOIN THE CIRQUS VOLTAIRE

After you have collected all the CIRQUS MARVELS and lit all the CIRQUS LETTERS, the JOIN THE CIRQUS emblem will begin to glow. The outer lanes will become alive for you to shoot them and begin the process of joining the CIRQUS. To JOIN you must complete THREE separate tests or ROUNDS of VOLTAIRE. The first wants you to shoot all the playfield shots that light up the letters CIRQUS. The next round will bring up the RINGMASTER and challenge you unmask him. The third and final round is the most electrifying.

EXTRA BALL

The player can score an Extra Ball by shooting the left lane when lit. Extra Ball can be lit from a random Sideshow award or other ways.

Welcome to Cirqus Voltaire!

PLAYFIELD SHOTS

SIDESHOW   HIGHWIRE RAMP

JUGGLER GRABBER

JUGGLER

HIGHWIRE LOCK

SPINNER

SKILL RING

ACROBAT WIRE

BEAR

MENAGERIE RING

WILD BALL

VOLT ROLLOVER

NEON CATWALK

HIGHWIRE PLATFORM

WOW TARGET

RINGMASTER

SPINNER

POPPER

BALLOON JET

BOOM BALLOON
DISAPPEARING JET

SHOOTER

Bally

6

PLAYFIELD SHOT LAMPS

EXTRA BALL
WHEN LIT

JACKPOT

MULTIBALL LOCK
SIDESHOW
LIGHT LOCK

JUGGLER
1-2-3

(R)-(I)-(N)-(G)

CIRQUS LETTERS

RING 1

LOAD CANNON (L)

SHOOT AGAIN

"WOW"

RINGMASTER HITS

CRANK

RINGMASTER

SPECIAL

RAZZ

FRENZY

LIGHT LOCK

JOIN CIRQUS

RING 2

CIRQUS MARVELS
COMPLETE ALL 9

LOAD CANNON (R)

SKILL SHOT
1) Shoot rail to hit Ringmaster "Ring".
2) Skill value awarded.
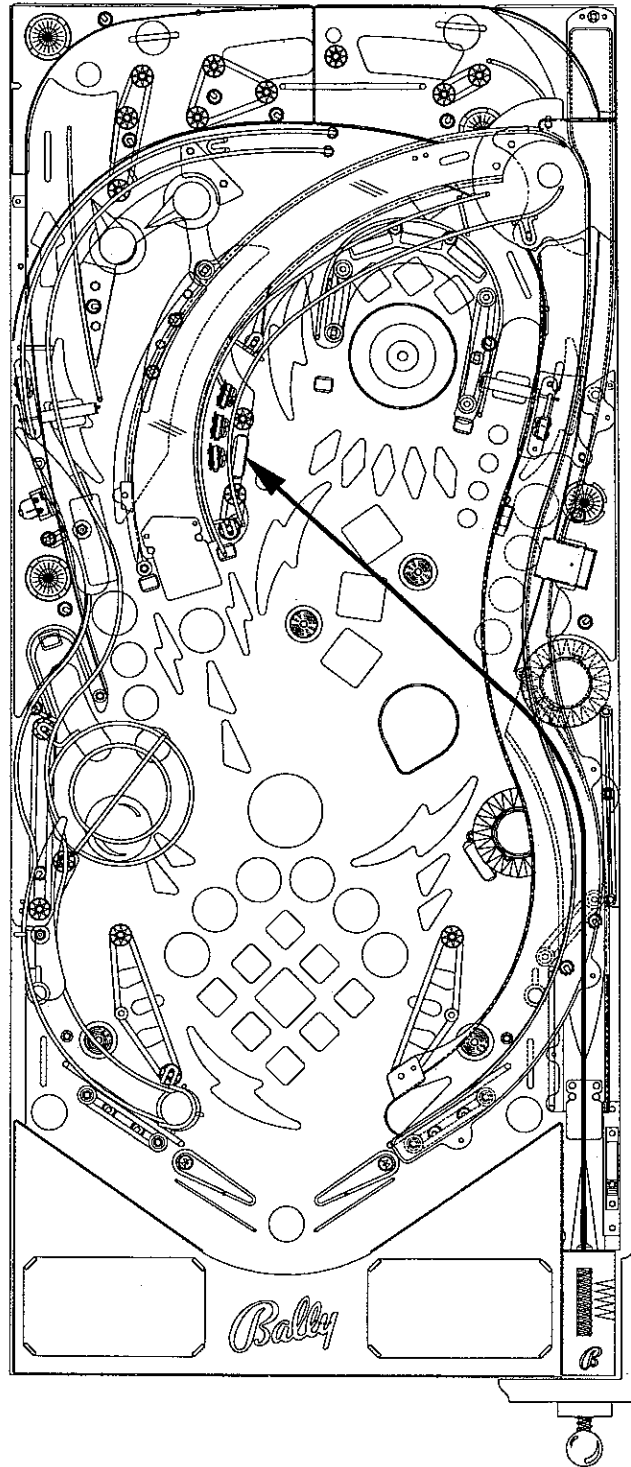
COMPLETE "CIRQUS" LETTERS
1) Complete three Marvels in a line to light a letter.
2) Complete all six letters in "CIRQUS" to light "JOIN THE CIRQUS" lamp.

CIRQUS LETTERS

JOIN THE
CIRQUS

MARVELS
MARVELS ARE LOCATED
THROUGHOUT THE
CIRQUS PLAYFIELD.
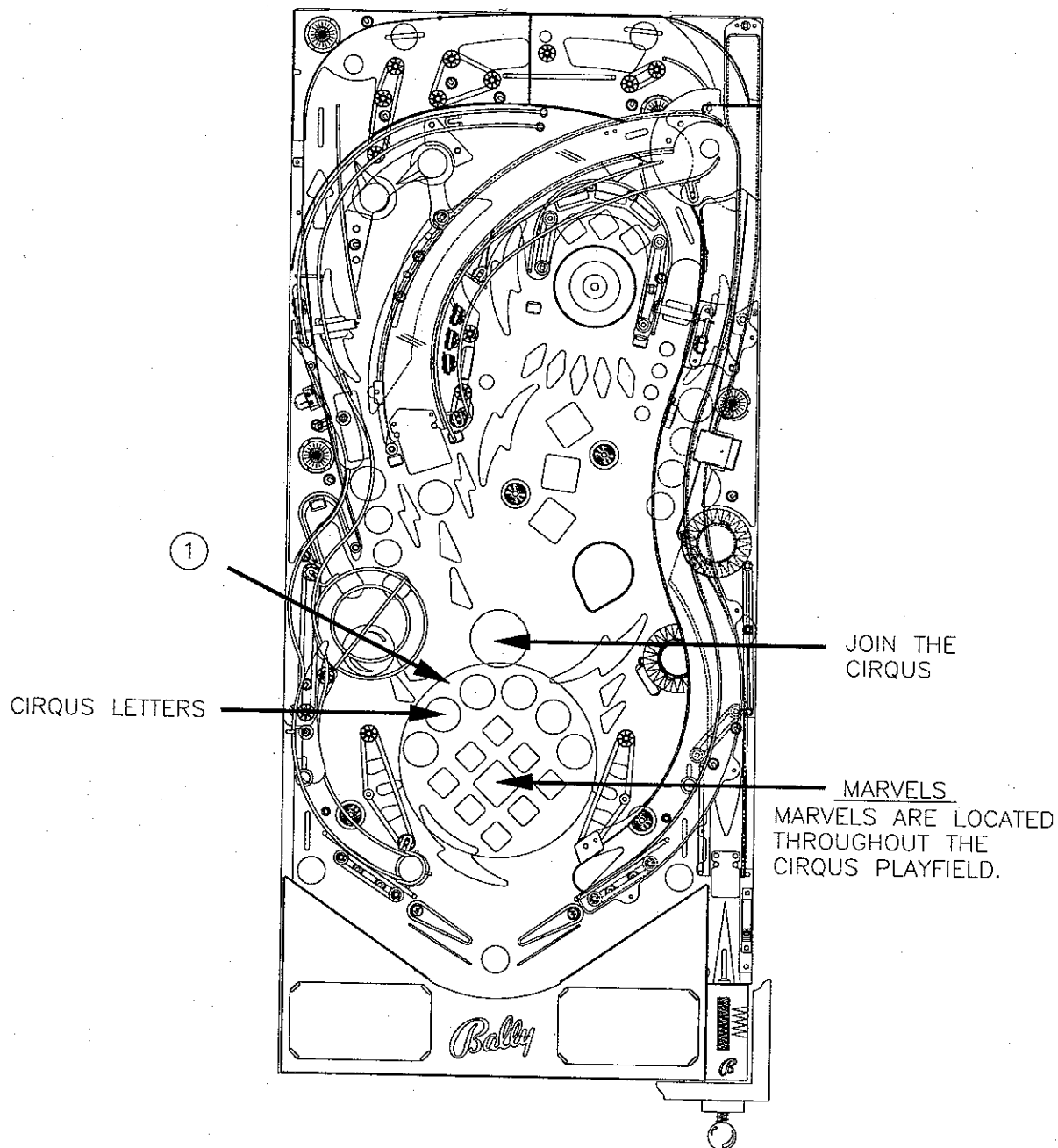
MARVELS

Shoot Marvel shots to award Marvels

1) Shoot "WOW" targets to summon "Ringmaster". Hit the Ringmaster to advance collar hits.

2) Crank the Ringmaster to advance lights.

3) Advance Acrobats through 1-2-3 status.

4) Shoot the ball at "Boom Balloon", when it is up, to explode balloons.

RINGMASTER FRENZY

ACROBATS

BOOM
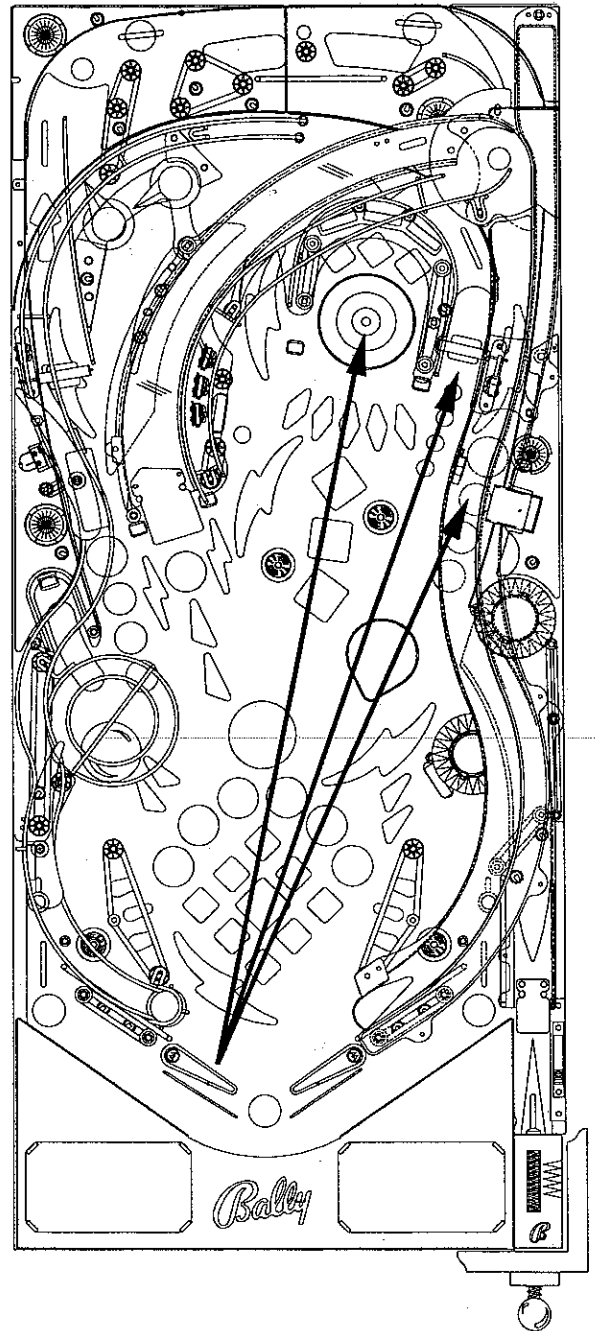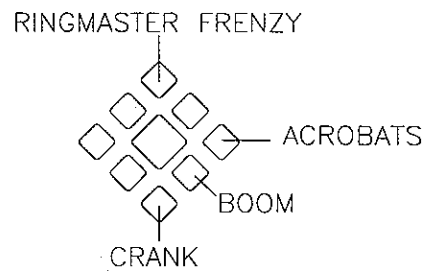
CRANK

CIRQUS MARVELS

Complete all "Cirqus Marvels" to light CIRQUS.
1) Shoot wild ball to advance menagerie level.
2) Advance Juggler through 1-2-3 levels.
3) Shoot 'Light Lock' then make High Wire shot to lock.
4) Crank Ringmaster through Loop.

ADVANCE
(R)(I)(N)(G)
TO 1-2-3.

SIDE SHOW

HIGHWIRE
MULTIBALL

JUGGLER

ACROBATS

MENAGERIE

CRANK
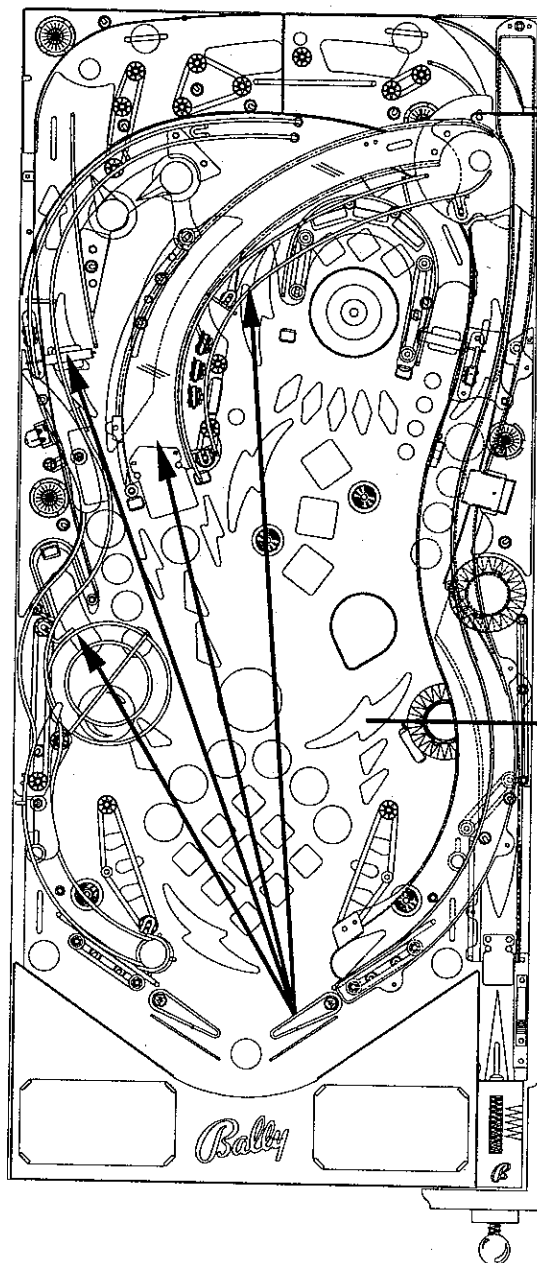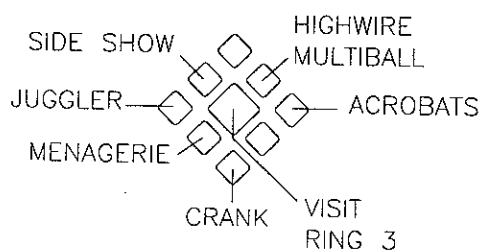
VISIT
RING 3

THE RINGMASTER

1) Spell "WOW" letters to raise the Ringmaster.

2) Now shoot at the Ringmaster to advance his five collar lights.

3) Then shoot to defeat the Ringmaster and start Ringmaster Frenzy, Razz or Special Multiballs.

4) Shoot into the Ringmaster for Jackpots.
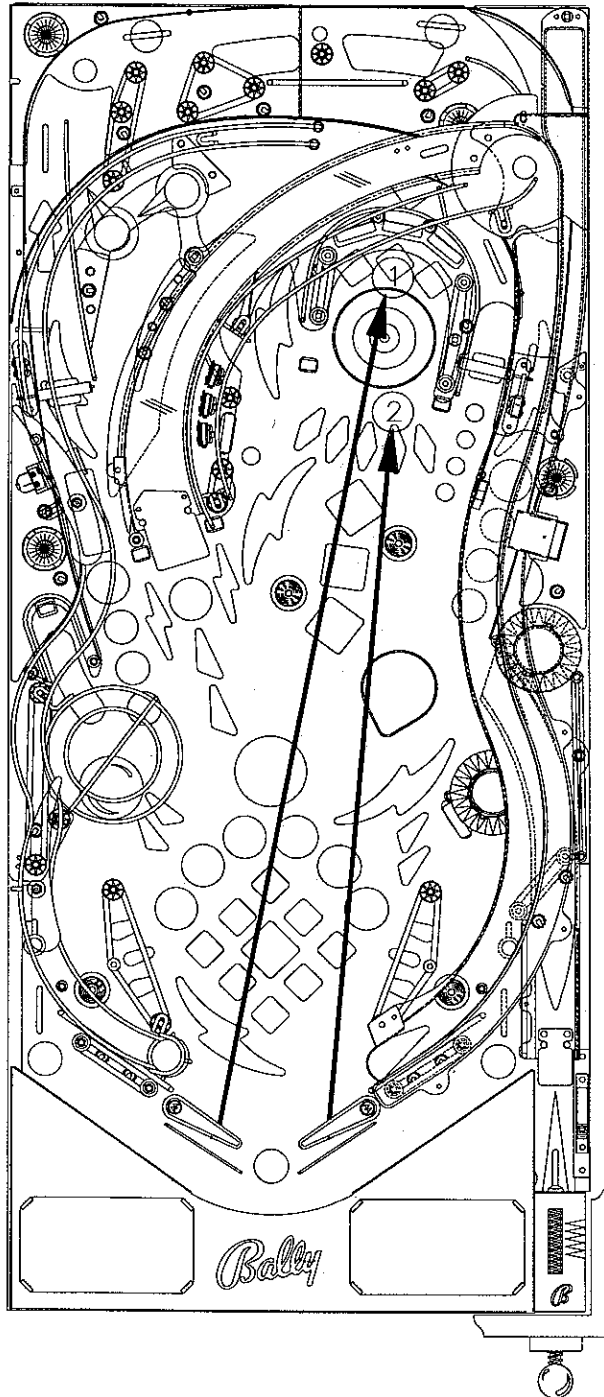
HIGH WIRE MULTIBALL

1) Hit the Light & Lock targets to light Lock.
2) Then shoot the High Voltage High Wire to Lock balls. Locking three balls starts Multiball.
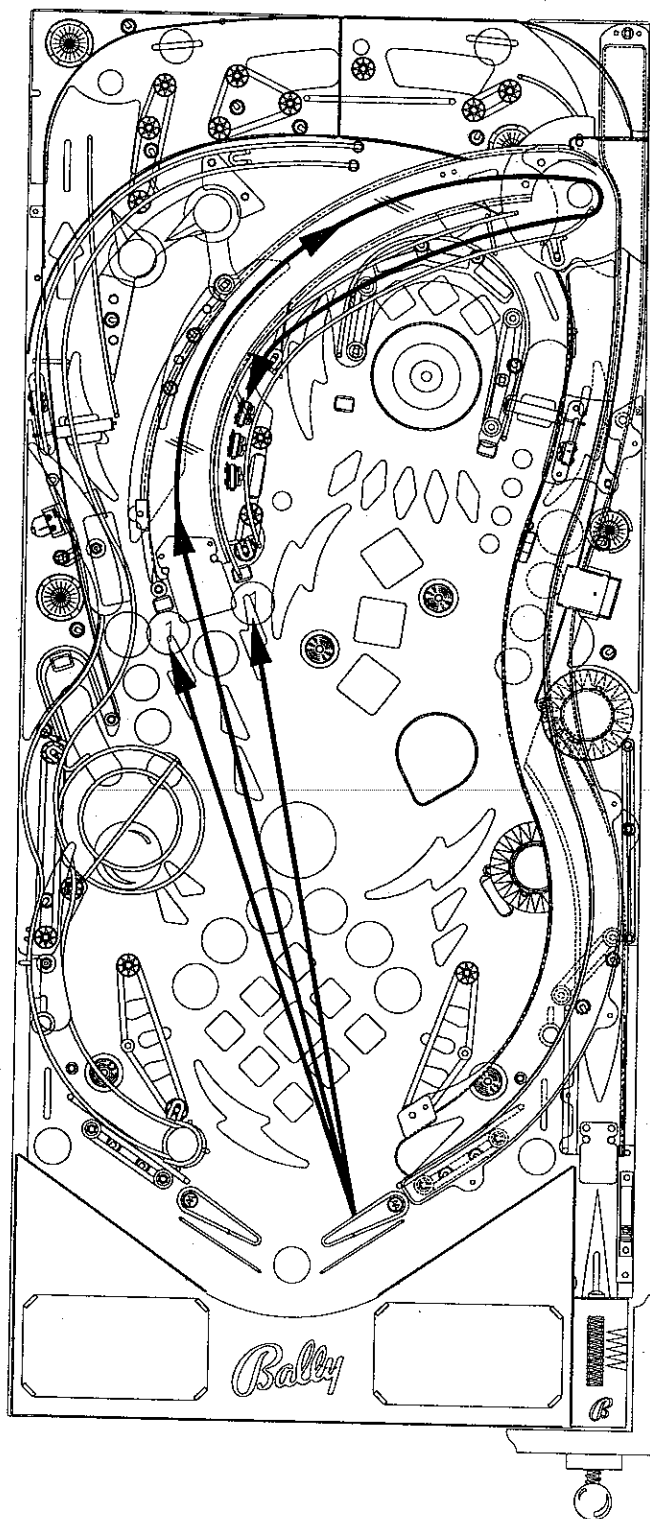
THE JUGGLER
1) Shoot the left lane to advance 1-2-3 all the way to Juggler.
2) Then shoot the lane when Juggler is lit to lock balls and juggle.
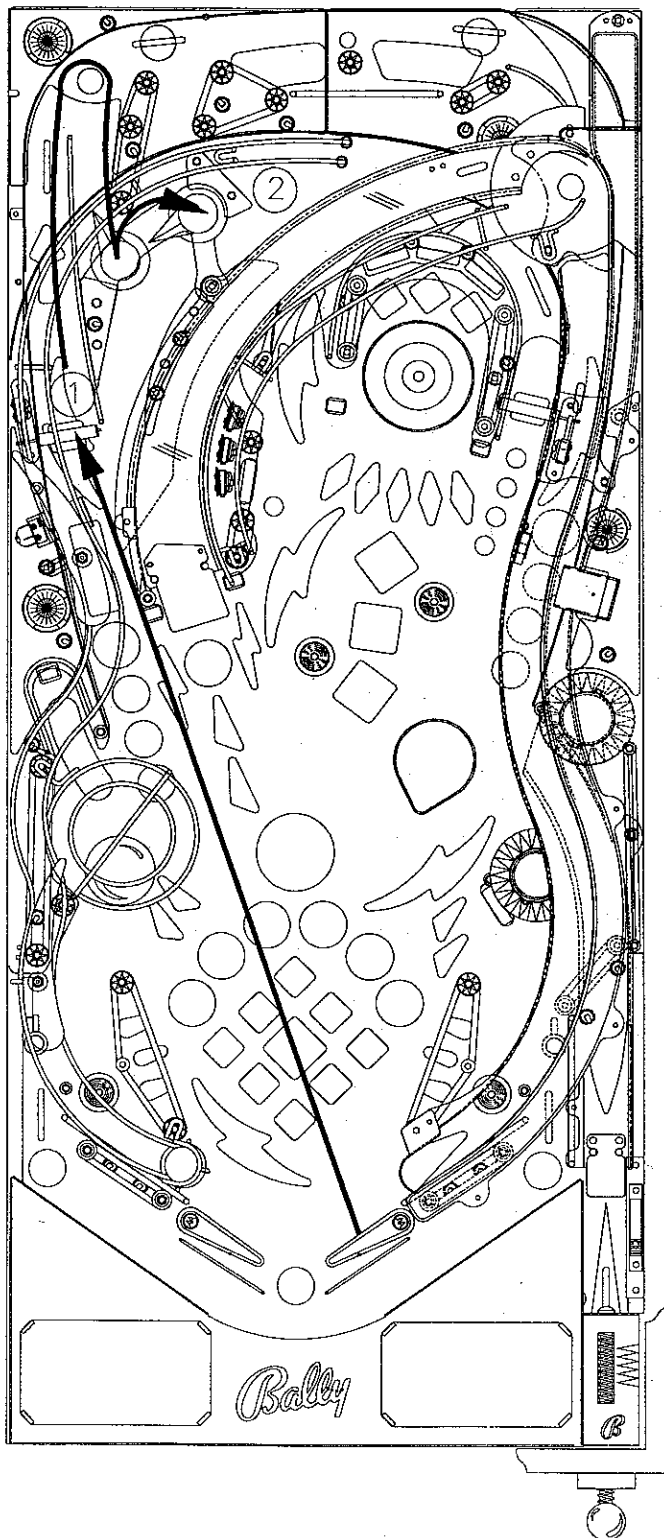
STRIKE AN ARC MULTIBALL
1) Shoot up the High Wire to strike an Arc.
2) Many shots will advance to strike an Arc.

BOOM BALLOON
3) Rollover Volt buttons to charge Balloon.
4) Hit raised Boom Balloon to pop inflated ones.
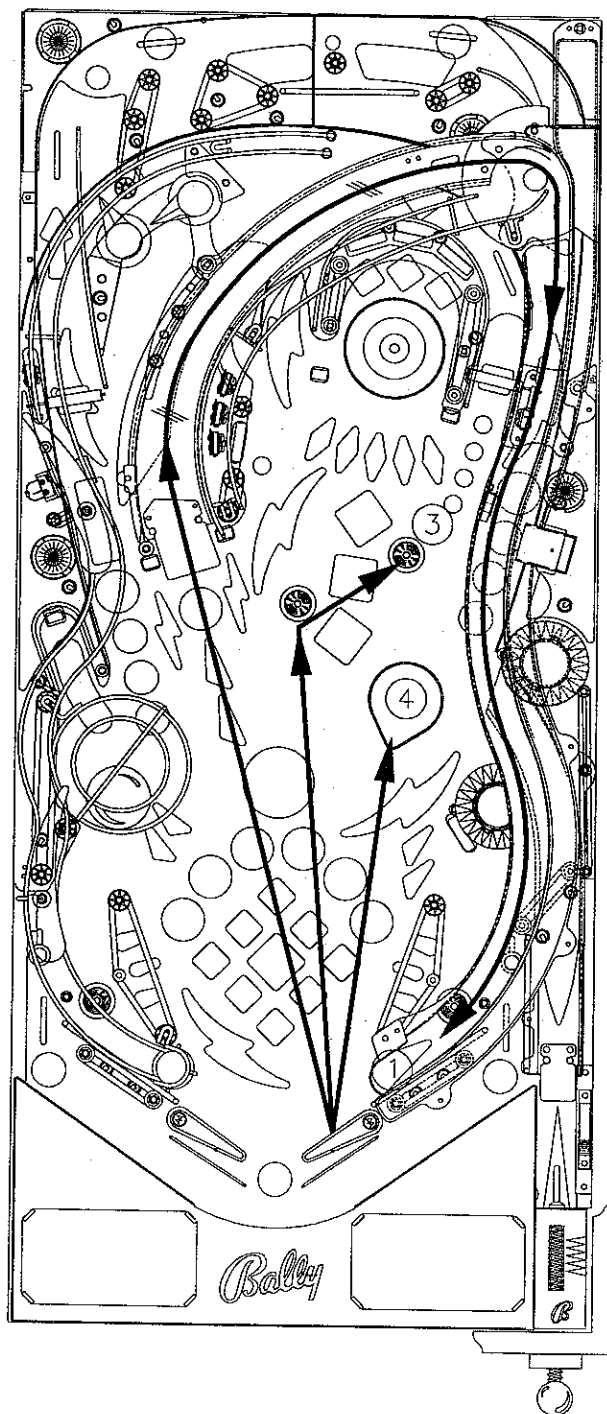
RING LETTERS

1) Shoot at the Menagerie or the right-side target to spell R-I-N-G and advance for Ring 1-2-3. All shots increase in value and Bonus X is advanced ("ring" multiplies end-of - ball bonus).

ACROBATS

2) Shoot right lane to advance 1-2-3 then Acrobats.
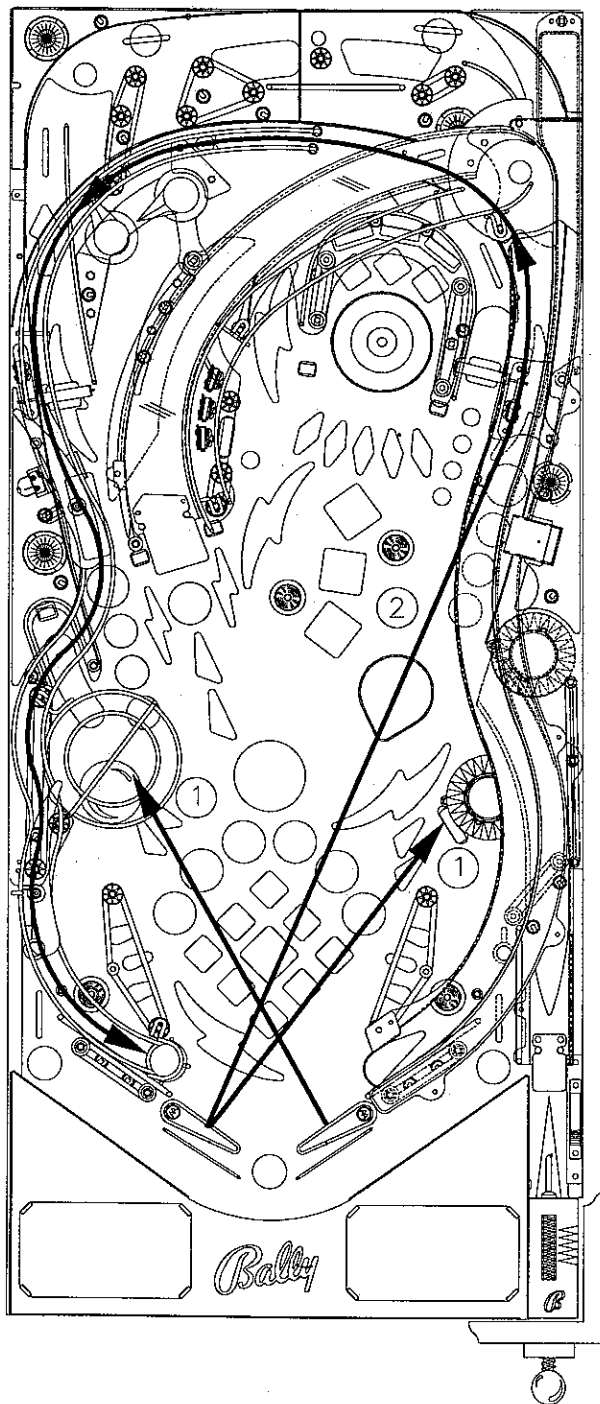
CANNON BALLS
1) Shoot the center loop and Crank the Ringmaster. When all four blue lamps are lit, one cannon ball is fired up.

BALLYHOO SIDESHOW
2) Hit the targets near Jack the Ringmaster to light sideshow.
3) Then shoot the left lane to go to the Ballyhoo Sideshow.
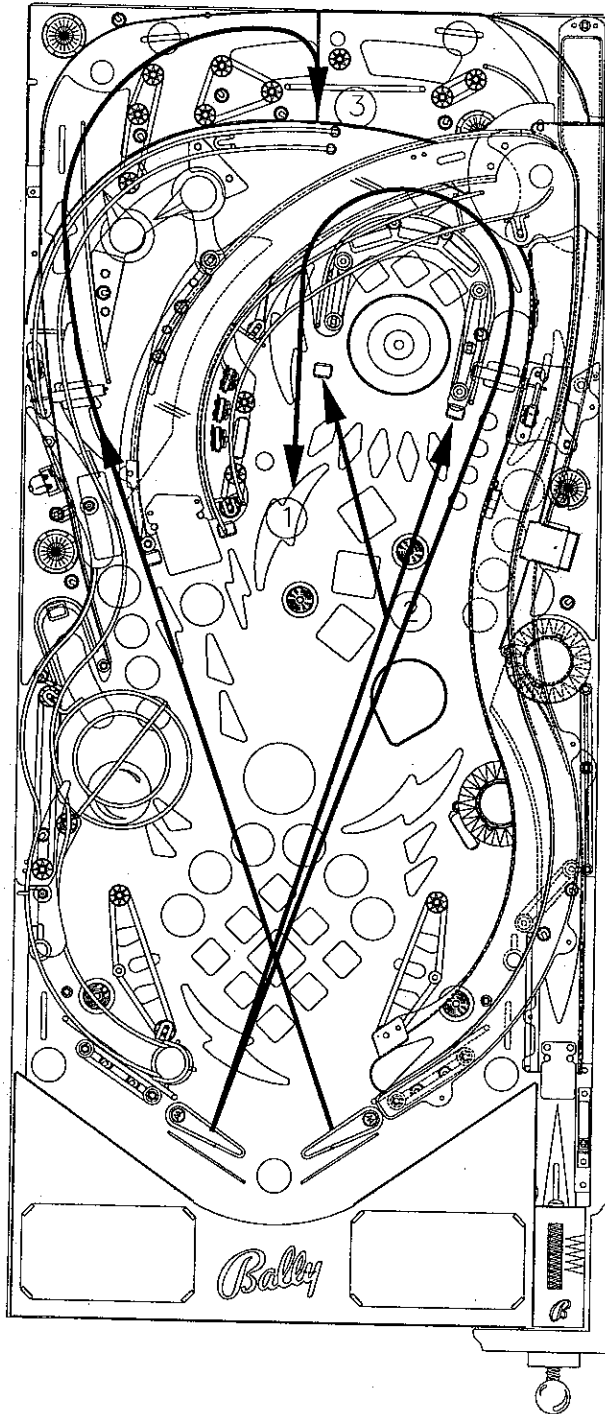
JOIN THE CIRQUS

Once you have spelled "CIRQUS" the outer lanes will light to begin the final round. Shoot the ball up the outer lanes.
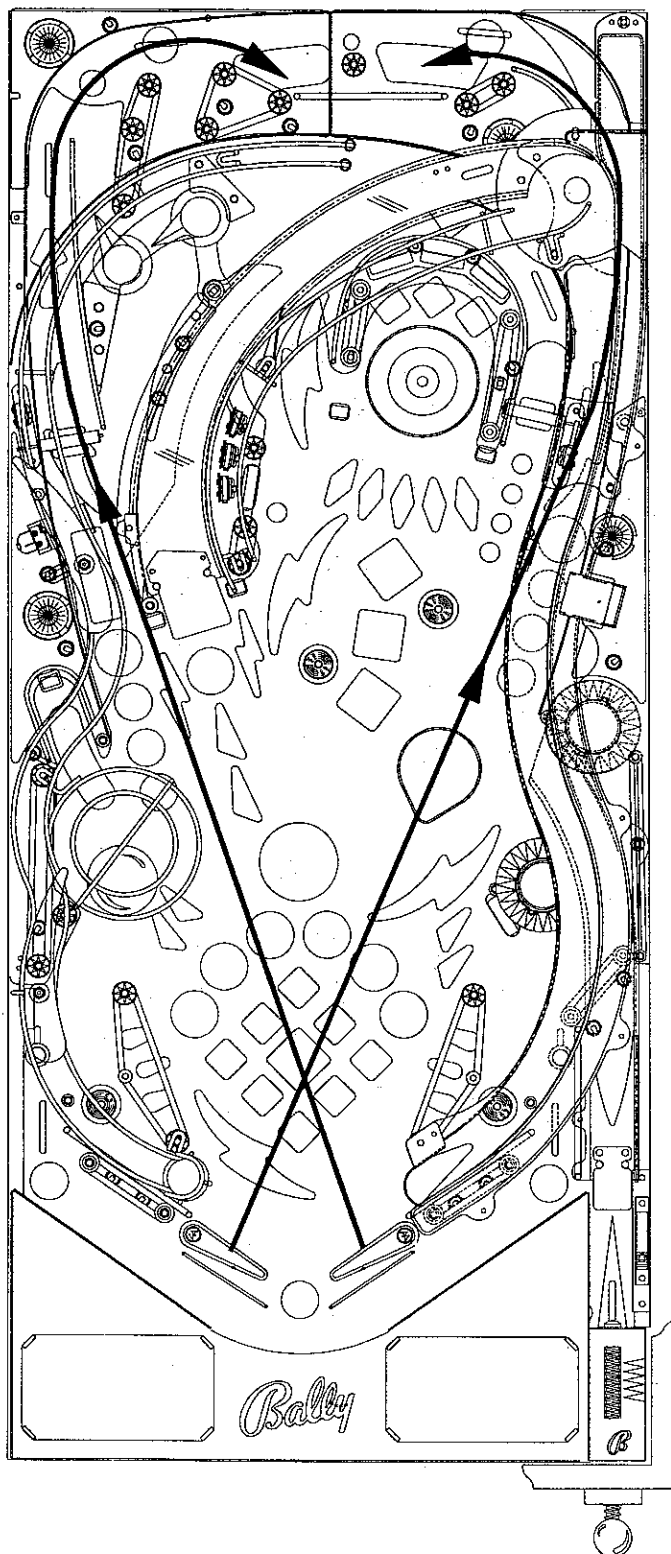
JOIN THE CIRQUS
ROUND 1

Complete "Cirqus Flash". Each shot corresponds to the nearest letter. Shoot all of these to complete the letters.
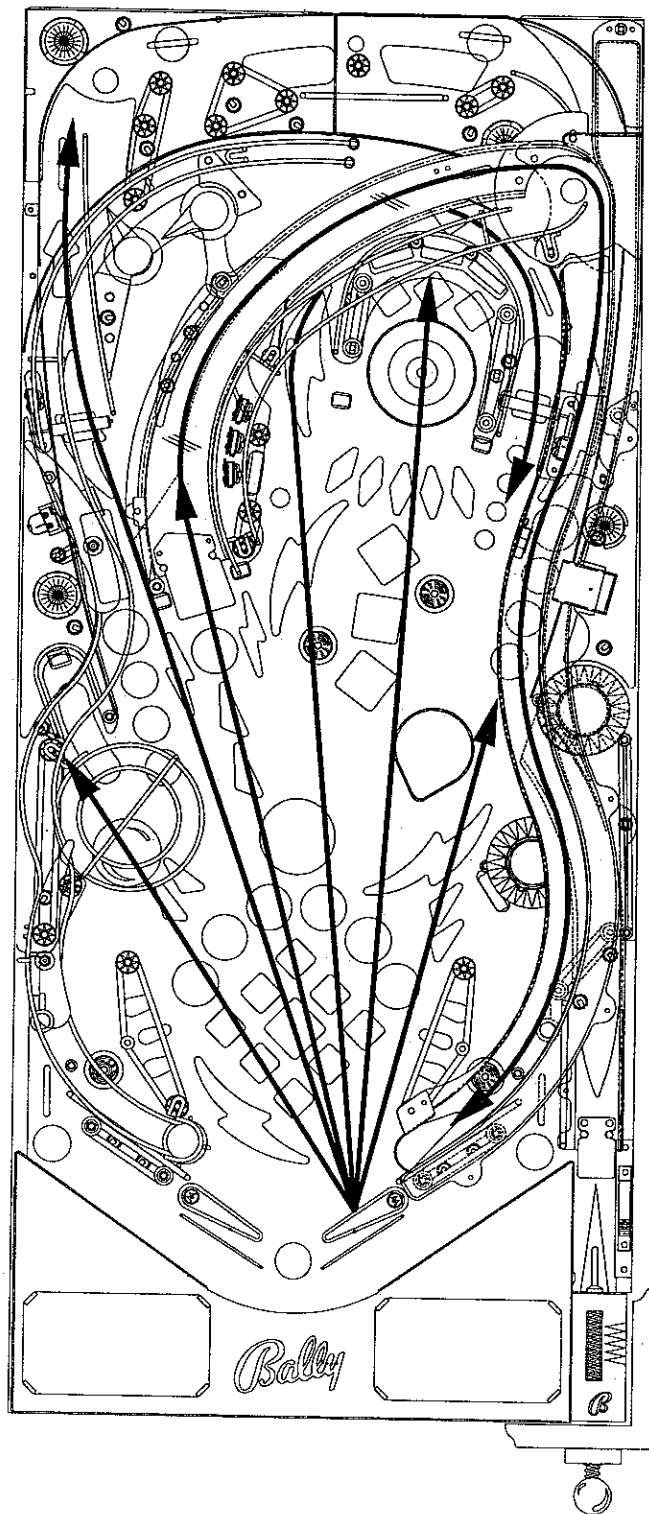
JOIN THE CIRQUS
ROUND 2

1) Once all of the letters are lit, the Ringmaster will rise and you must shoot the ball at him to unmask VOLTAIRE.

2) Then shoot the High Wire ramp. Repeat.
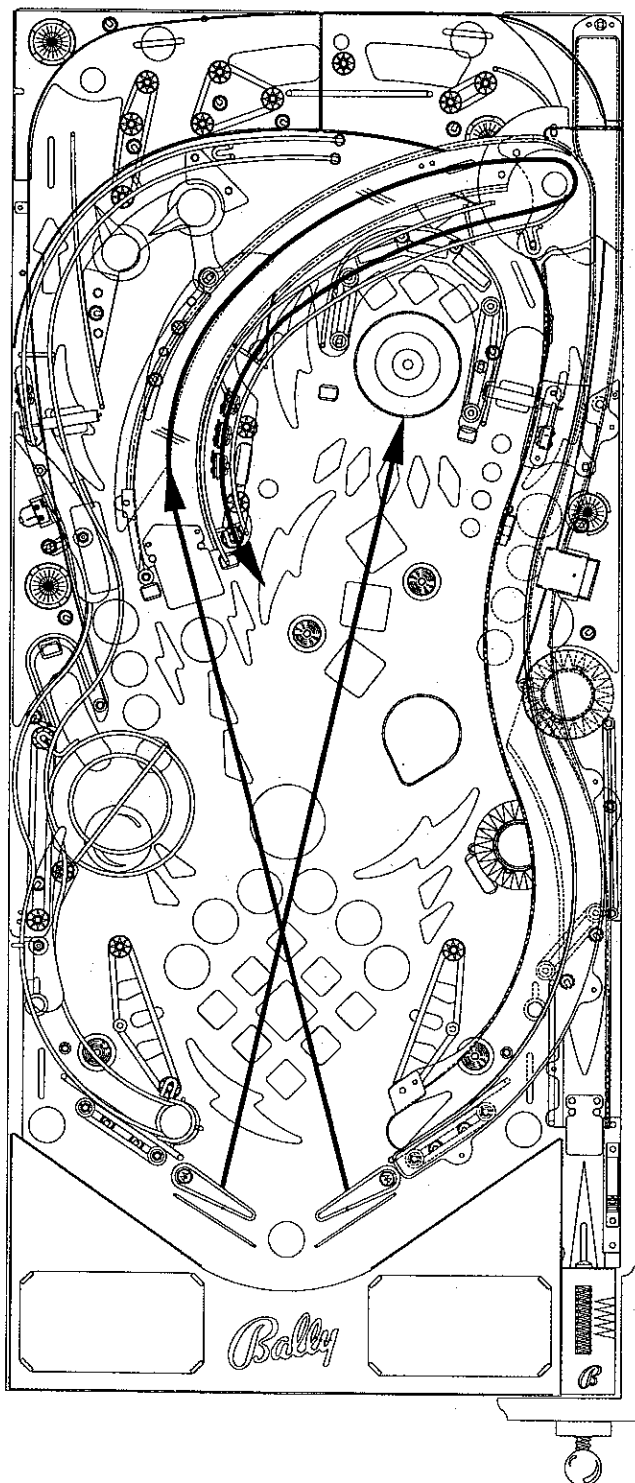
JOIN THE CIRQUS
ROUND 3 - FINALE
The playfield will come alive as you "Join the Cirqus" and the performers.

CIRQUS NOTES
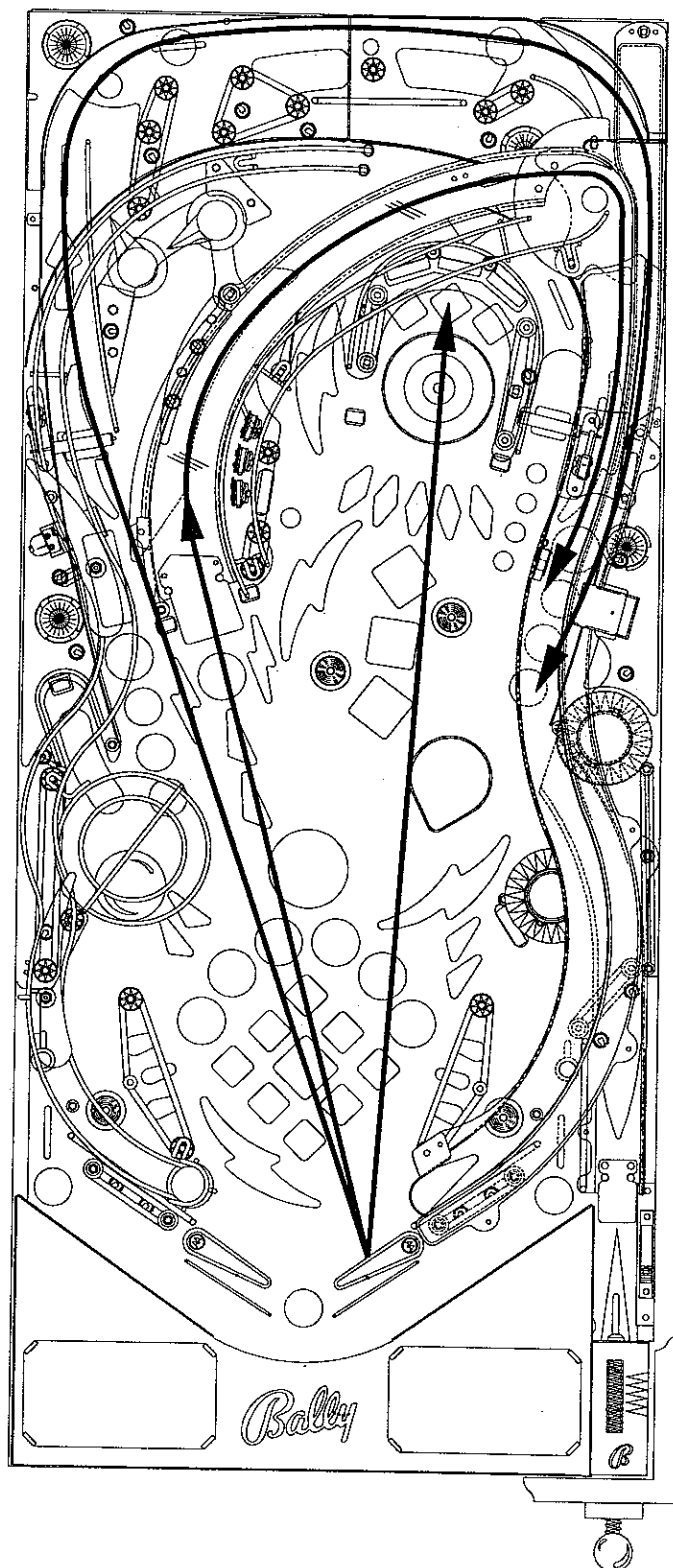
SECTION ONE

GAME OPERATION
AND TEST INFORMATION

(System WPC) ROM SUMMARY

IC	TYPE	BOARD	LOCATION	PART NUMBER
Game 1	M27c801	CPU	G11	A-5343-50062-1
Security Chip	PIC16c57	CPU	G10	A-5400-50062-1
Music/Speech	27c040	Audio	SU2	A-5343-50062-S2
Music/Speech	M27c801	Audio	SU3	A-5343-50062-S3
Music/Speech	M27c801	Audio	SU4	A-5343-50062-S4
Music/Speech	M27c801	Audio	SU5	A-5343-50062-S5
Music/Speech	M27c801	Audio	SU6	A-5343-50062-S6

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

CIRQUS VOLTAIRE IS A FOUR BALL GAME.

Power: Domestic 120V @ 60Hz   **Dimensions:**   Width: 29" approx.
              Foreign 230V @ 50Hz   Depth: 52" approx.
              Japan 100V @ 50HZ   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

FRONT   REAR
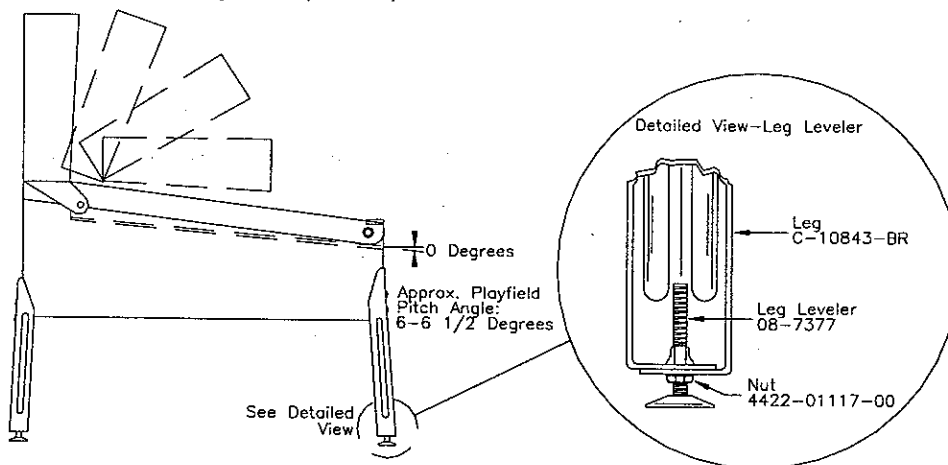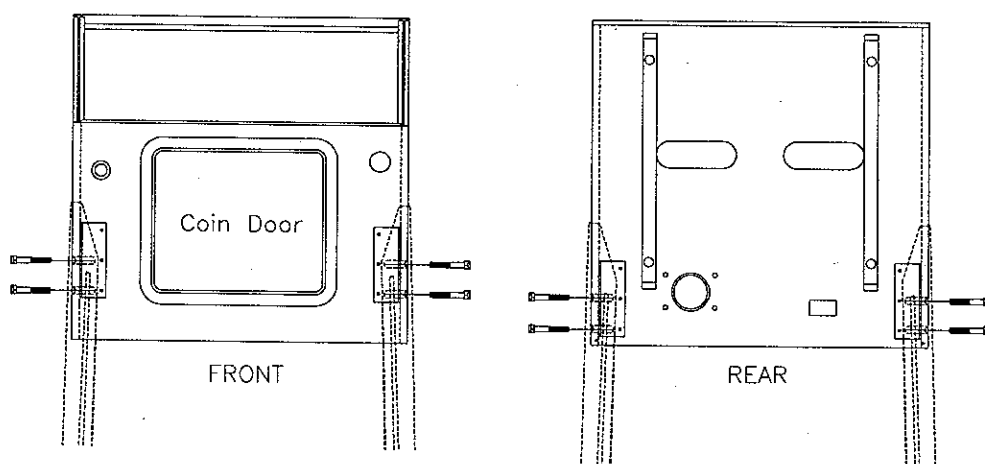
VIEW 2

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: This game doesn't use a speaker panel. Instead the insert panel and speakers are attached to the backglass. The speakers, insert panel, and backglass form a single unit in the backbox housing.

   Unlock the backbox. Carefully, lift the backglass/insert panel from the bottom. Slide it down and out of the backbox grooves. Rotate it forward and lay it down on the playfield glass. Unplug the cables extending from the backbox to the insert panel and speakers. Carefully, set the backglass/insert panel aside.

   Once the backglass/insert panel is removed the holes needed to secure the backbox upright are accessible. To secure the backbox, install the washer-head mounting bolts through the holes in the bottom of the backbox. Be sure that the bolts extend into the threaded fasteners in the cabinet.

6.   After the washer-head mounting bolts are installed, replace the backglass/insert panel. Take care when plugging in the connectors. Connectors should plug in easily. Do not force the connectors.

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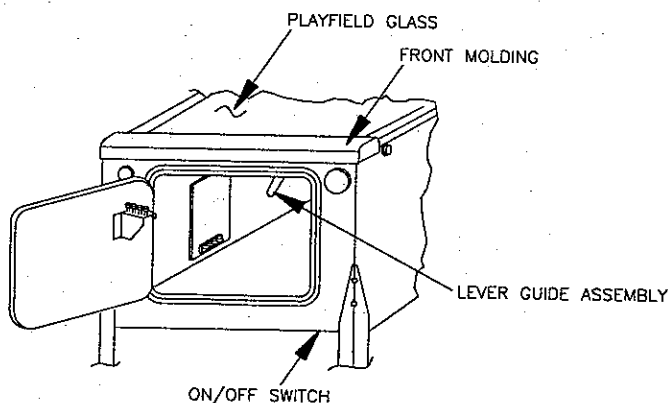
9.   Place a level or an inclinometer on the playfield surface. Adjust the leg levelers for proper playfield level (side-to-side).

   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).

TRU-PITCH™ level 6-1/2 degrees.
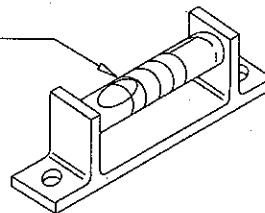
IMPORTANT!

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 **CIRQUS VOLTAIRE** game uses FOUR balls.

12. Install full playfield Mylar, if desired.

Note: The **CIRQUS VOLTAIRE** 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 03-9700-1 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.
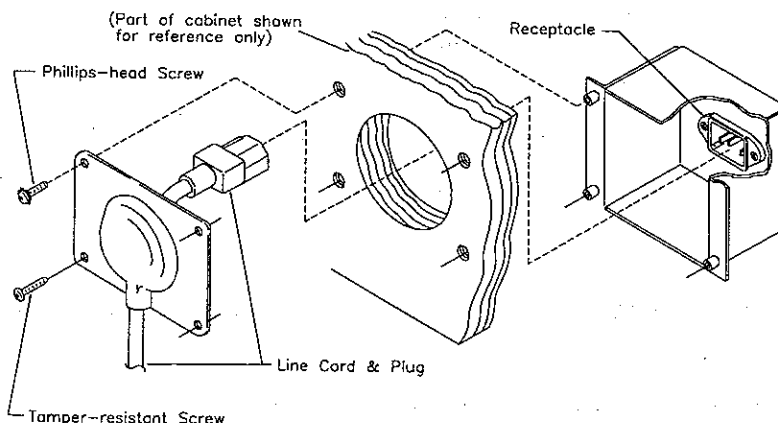
15. Move the game into the desired location; recheck the level and pitch angle of the playfield.

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

Slotted Hasp Plate
01-14084.1

Hasp Staple Bracket
01-14086

Hasp Hinge Bracket
01-14085
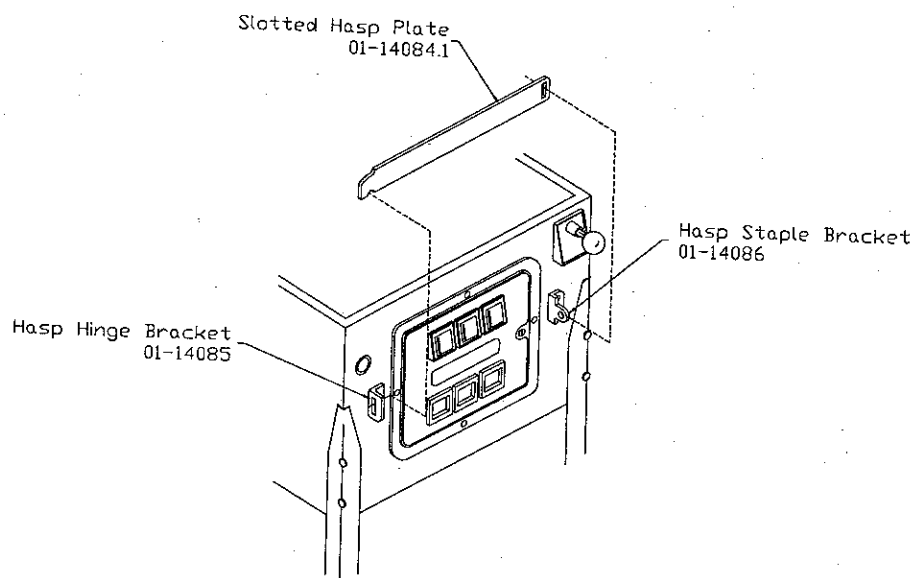
17.   IMPORTANT: Fill out and return the registration card.

GAME CONTROL LOCATIONS

CIRQUS VOLTAIRE is the first game to feature the new coin door display. When the coin door is open (in Attract mode and game play), the display shows that the high-power has been disabled. It also shows the Test Report (if there is anything to report), and some game specific information. Use the flipper buttons to page through this information.

Cabinet Switches

The <u>On-Off Switch</u> is on the bottom of the cabinet near the right front leg.
The <u>Start Button</u> 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 <u>Service Credits</u> button puts credits on the games that are not included in any of the game audits.
The <u>Volume Up</u> (+) button raises the sound level of the game. Press and hold the button until the desired level is reached.
The <u>Volume Down (-)</u> 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 <u>Begin Test</u> button starts the Menu System operation and changes the coin door buttons from Normal Function to Test Function.

Test Function

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

COIN DOOR BUTTONS

NORMAL MODE FUNCTION
SERVICE CREDITS / VOLUME / BEGIN TEST
ESCAPE   -   +   ENTER
TEST MODE FUNCTION

FRONT MOLDING
D-12615

YELLOW START BUTTON
20-9663-16

LEVER GUIDE ASSEMBLY
A-16773-1

WHITE FLIPPER BUTTON ASSEMBLY
A-16883-5

BALL SHOOTER ASSEMBLY
WITH SILVER KNOB
A-17730-1

TEST SWITCH ASSEMBLY
27-4909

ON/OFF SWITCH
5642-13935-00
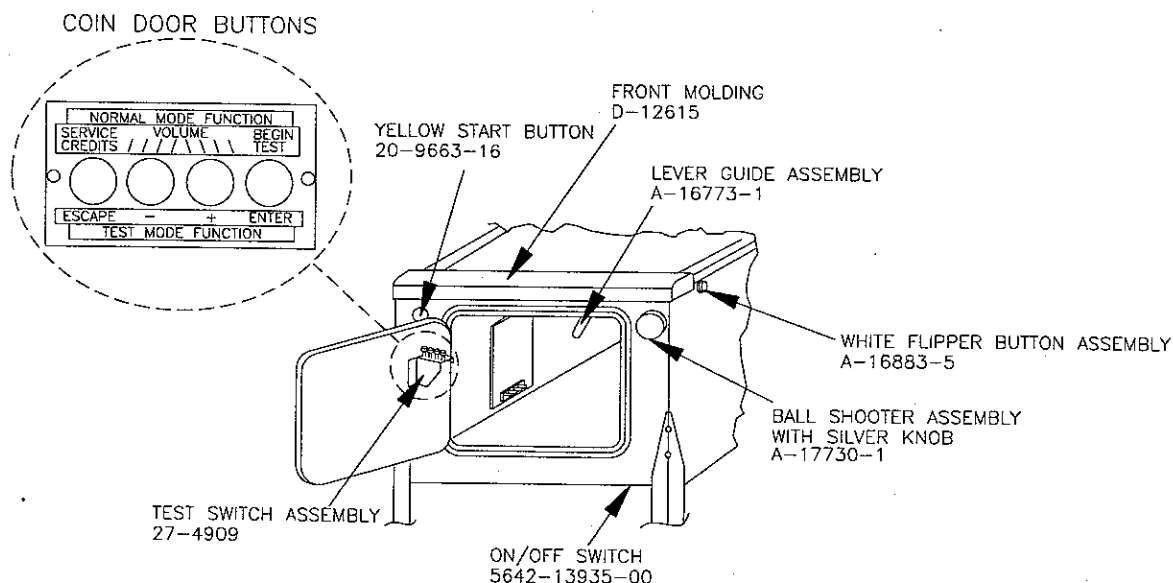
To reset High Score, hold down the Begin Test/Enter switch for five seconds while in the Attract mode.

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:	*CIRQUS VOLTAIRE*		Sound Rev. 1.0A
50062	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, the music plays for one minute, 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 slam 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.

SEE DETAILED DRAWING ON NEXT PAGE.

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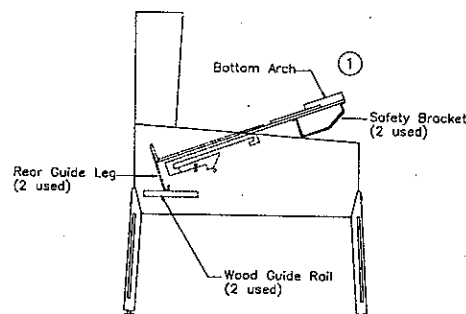
2. Pull the playfield out toward you until it stops (rest position), and raise it approximately 3".

   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. The latch will engage at the upper position.
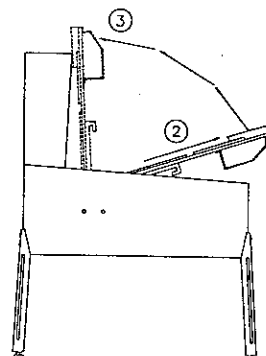
To Lower the Playfield

4. Press down on the latch end to disengage (see decal) and rotate the playfield to the rest position. This unlocks the pivoting mechanism.

5. Push the playfield back into cabinet and into the playing position.
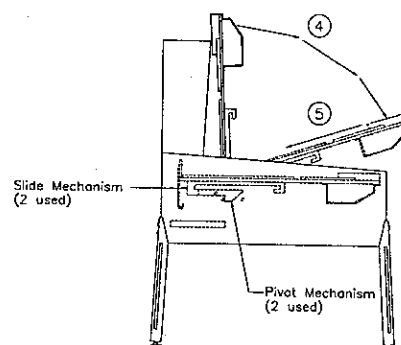
1-8

PLAYFIELD LOCKING SUPPORT ARM

Cirqus Voltaire comes with a left-side mounted playfield locking support arm. When you lift the playfield fully up the metal arm automatically moves into place. Press the arm down to unlock it before lowering the playfield.

Important!

CORRECT ALIGNMENT

PRESS here then LOWER playfield

Loosen to adjust ARM
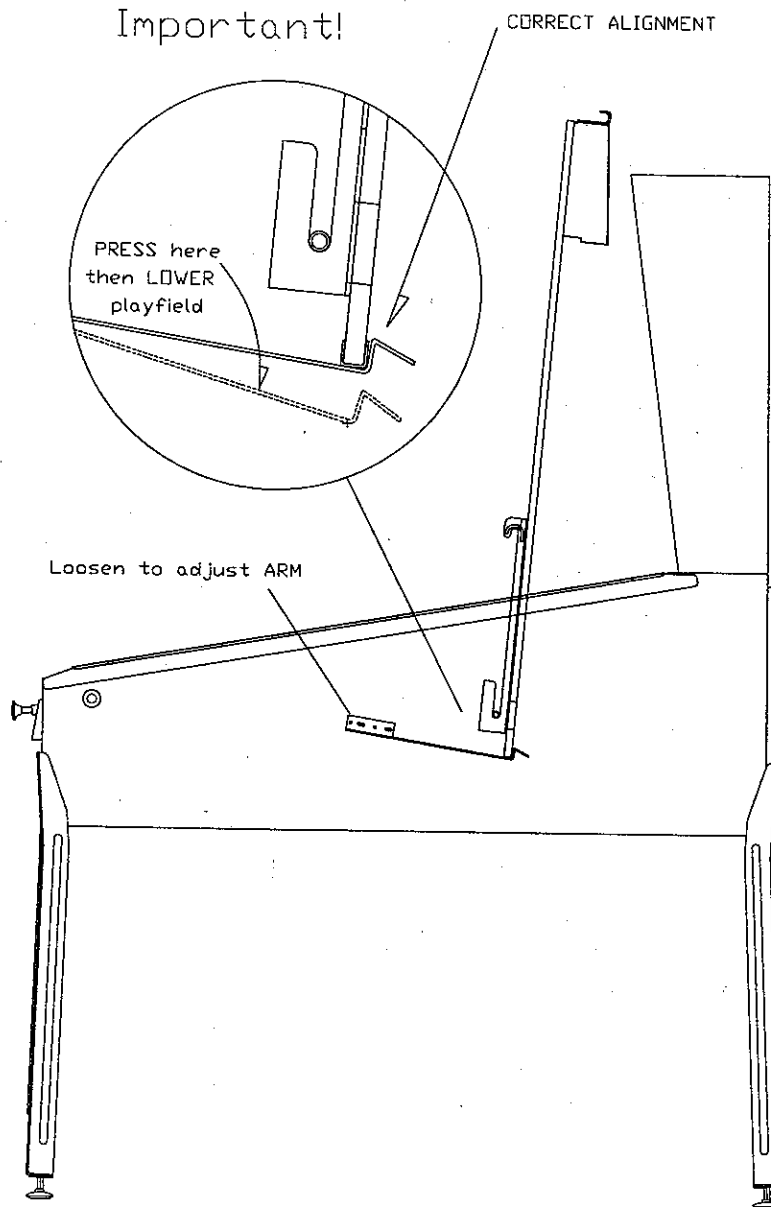
TO RE-ADJUST THE ARM:
1 - Loosen both ESNA NUTS.
2 - SLIDE the bracket forward.
3 - CHECK the Playfield Alignment.
4 - Re-tighten the ESNA NUTS. Install two SCREWS (4808-01175-08) to SECURE SAFETY ARM in place.

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

Press Escape
To move out of a menu selection.

Press Enter
To get into a menu selection.

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

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.

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 Up/Down Jet Test
T.17 Diverter Test
T.18 Magnet Test
T.19 Ringmaster Test
T.20 Empty Balls Test

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

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
U.12 Shipping

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 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	TOTAL MULTIBALLS	00%	00
B.4 02	CIRQUS MARVELS	00%	00
B.4 03	"WOW" COMPLETE	00%	00
B.4 04	GAMES NO RINGMASTER	00%	00
B.4 05	TIME PER CREDIT	00%	00
B.4 06	BALL SAVES	00%	00
B.4 07	MAIN MULTIBALLS	00%	00
B.4 08	MAIN MULTIBALL JACKPOTS	00%	00
B.4 09	RINGMASTER FRENZY	00%	00
B.4 10	FRENZY JACKPOTS	00%	00
B.4 11	RINGMASTER RAZZ	00%	00
B.4 12	RAZZ JACKPOTS	00%	00
B.4 13	RINGMASTER SPECIAL	00%	00
B.4 14	SPECIAL JACKPOTS	00%	00
B.4 15	RINGMASTER BATTLES	00%	00
B.4 16	BATTLE WINS	00%	00
B.4 17	NEON MULTIBALLS	00%	00
B.4 18	NEON JACKPOTS	00%	00
B.4 19	ARC MULTIBALLS	00%	00
B.4 20	ARC JACKPOTS	00%	00
B.4 21	JUGGLE MULTIBALLS	00%	00
B.4 22	JUGGLE JACKPOTS	00%	00
B.4 23	RING COMPLETE	00%	00
B.4 24	SKILL SHOTS	00%	00
B.4 25	MENAGERIE AWARDS	00%	00
B.4 26	ACROBATS START	00%	00

B.4 27	SUPER JETS START	00%	00
B.4 28	POPCORN MANIA	00%	00
B.4 29	POPCORN JACKPOTS	00%	00
B.4 30	ROONIE START	00%	00
B.4 31	ROONIE WINS	00%	00
B.4 32	HAT-TRICK STARTS	00%	00
B.4 33	HAT-TRICK WINS	00%	00
B.4 34	CANNON MODE START	00%	00
B.4 35	CANNON MODE WIN	00%	00
B.4 36	VOLT SPELLED	00%	00
B.4 37	CANNON BALLS	00%	00
B.4 38	CRANK MARVEL	00%	00
B.4 39	MENAGERIE MARVEL	00%	00
B.4 40	BOOM MARVEL	00%	00
B.4 41	JUGGLER MARVEL	00%	00
B.4 42	DEFEAT MARVEL	00%	00
B.4 43	ACROBATS MARVEL	00%	00
B.4 44	SIDESHOW MARVEL	00%	00
B.4 45	MULTIBALL MARVEL	00%	00
B.4 46	FRENZY MARVEL	00%	00
B.4 47	CIRQUS COMPLETE	00%	00
B.4 48	FINAL MODE START	00%	00
B.4 49	FINAL 1 WINS	00%	00
B.4 50	FINAL 2 WINS	00%	00
B.4 51	FINAL 3 WINS	00%	00
B.4 52	PARTY MULTIBALL	00%	00
B.4 53	MULTI-JACKPOTS	00%	00

FEATURE AUDITS CONTINUED...

B.4 54	SNEAKY LOCK	00%	00
B.4 55	RINGMASTER HIDEOUT	00%	00
B.4 56	MAIN RAMP SHOTS	00%	00
B.4 57	BACK RAMP SHOTS	00%	00
B.4 58	BIG LOOP LEFT	00%	00
B.4 59	BIG LOOP RIGHT	00%	00
B.4 60	SMALL LOOP LEFT	00%	00
B.4 61	SMALL LOOP RIGHT	00%	00
B.4 62	RINGMASTER TIMEOUTS	00%	00

B.5 HISTOGRAMS

B.5	01	0 - 1 Million Scores	00%	00
B.5	02	1 - 2 Million Scores	00%	00
B.5	03	2 - 3 Million Scores	00%	00
B.5	04	3 - 4 Million Scores	00%	00
B.5	05	4 - 5 Million Scores	00%	00
B.5	06	5 - 10 Million Scores	00%	00
B.5	07	10 - 20 Million Scores	00%	00
B.5	08	20 - 30 Million Scores	00%	00
B.5	09	30 - 40 Million Scores	00%	00
B.5	10	40 - 50 Million Scores	00%	00
B.5	11	100 - 150 Million Scores	00%	00
B.5	12	150 - 200 Million Scores	00%	00
B.5	13	Over 200 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

(Optional board required to use Printouts feature.)

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.11 Display Test
T.2 Switch Levels Test	T.12 Flipper Coil Test
T.3 Single Switch Test	T.13 Ordered Lamps Test
T.4 Solenoid Test	T.14 Lamp Row-Col.
T.5 Flasher Test	T.15 DIP Switch Test
T.6 General Illumination Test	T.16 Up/Down Jet Test
T.7 Sound & Music Test	T.17 Diverter Test
T.8 Single Lamps Test	T.18 Magnet Test
T.9 All Lamps Test	T.19 Ringmaster Test
T.10 Lamps And Flasher Test	T.20 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.

1-17

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 UP/DOWN JET TEST

For the UP/DOWN JET test, the display shows:
- Current position of the Jet bumper (Up or Down)
- The status of the 'UP' coil
- The status of the 'RELEASE' coil
- The status of the Jet Bumper switch
- The status of the Jet Bumper coil

NOTE: The jet bumper switch may occasionally activate while the jet bumper coil fires, or while the device is moving up or down. This is normal.

T.16 UP/DOWN JET TEST CONTINUED...
The test has two modes.

Manual: Press the Up button to toggle the position of the jet bumper. (Up or Down). Press the Down button to fire the jet bumper coil. *The bumper will also fire if the switch is activated. This is a great method of testing the device.*

If the device does not move up, check the coil and wiring. Manually move the device to be sure that it is smooth and nothing binds. Make sure all wiring is clear and moves freely with the device. Check the fuse and terminals on the coil.

If the device moves up, but immediately drops (i.e.: it doesn't stay up), check the latch and make sure it catches the device correctly.

If the device does not drop down, check the release coil and wiring. Manually move the latch to be sure that it is smooth and nothing binds. Be sure all wiring is clear and moves freely with the device. Check the fuse and terminals on the coil. Be sure that the release latch has not been pushed too far from the release coil.

If the jet bumper coil does not fire when the Up button is pressed, check the coil, wiring and the fuse. Manually move the bumper ring to be sure that it is smooth and nothing binds.

If the jet bumper does not activate when a ball hits it check the jet bumper switch (switch 54). Be sure the switch is adjusted so that the contacts close when the ball hits the bumper. Check the plug and switch wiring. **(Note:** A broken wire on the same switch row or column could cause this switch not to work.)

Automatic: In automatic mode, the bumper runs a cycle. It is pushed up, the jet is fired, then it is dropped down and the jet fired again. This cycle repeats 20 times, then stops for five minutes to allow the coils to cool.

T.17 DIVERTER TEST
For the Diverter test, the display shows:
- Current position of the diverter, (open or closed).

During the test, press the Up button to open the diverter, and the down button to close the diverter. Press the Escape button to exit the test.

If the diverter does not move at all check the fuses, as the coil is probably not getting 50 volts.

If the diverter opens, but does not stay open, check the terminal for the Hold Coil on the diverter coil. Check all wiring, plugs and solder.

If the diverter opens 'lazily', check the terminal for the Power Coil on the diverter coil. Check all wiring, plugs and solder.

T.18 MAGNET TEST
Note: The diverter will be OPEN (activated) during this test if it has not been disabled by the adjustment.

WARNING!
The magnets get very hot. Do not run this test over and over again without letting the magnets cool. If a magnet becomes too hot a thermal cutout will stop the magnet from working until it has cooled. This device is built into the magnets and must not be tampered with!

T.18 MAGNET TEST CONTINUED...
For the Magnet tests, the display shows:
- Status of the left loop magnet
- Status of the ramp magnet
- Status of the Ringmaster magnet

Left Loop Magnet

To test the left loop magnet, roll the ball up the left loop. The magnet should catch the ball, and let it roll into the Juggler Saucers. The saucers will kick the ball out.

If the magnet does not activate on screen, the left loop enter switch (switch 48) doesn't work. Check the switch and try again. (**Note:** A broken wire on the same switch row or column could cause this switch not to work.)

If the magnet activates on screen but the physical magnet does not turn on, check the fuse and magnet wiring. Check the magnet in Solenoid test too.

If the diverter has not been disabled by the adjustment, then it will be open (active) during the test. Roll the ball up the right loop to test the magnet as well. Careful, the ball may fall into the trough behind the display, the popper will kick the ball out.

If the magnet does not activate on screen, the left loop upper switch (switch 15) doesn't work. Check the switch and try again. (**Note:** A broken wire on the same switch row or column could cause this switch to not work.)

If the magnet activates on screen but the physical magnet does not turn on, check the fuse and magnet wiring. Check the magnet in Solenoid test too.

Ramp Magnet

To test the ramp magnet, roll the ball up the main ramp. The magnet should catch the ball, and let it drop into the ramp lockup (which will release the ball).

If the magnet does not activate on screen, the ramp magnet switch (switch 64) doesn't work. Check the switch and try again. (**Note:** A broken wire on the same switch row or column could cause this switch to not work.)

If the magnet activates on screen but the physical magnet does not turn on, check the fuse and magnet wiring. Check the magnet in Solenoid test too.

Ringmaster Magnet

To test the Ringmaster magnet, make sure the Ringmaster is in the DOWN position and roll the ball into the WOW targets. The magnet should grab the ball, hold it, and then throw it away. **Note:** The magnet will occasionally miss the ball, especially fast balls, and if the magnet is hot. This is normal.

If the magnet does not activate on screen, the WOW targets (switch 37) do not work. Check all three targets and try again (**Note:** A broken wire on the same switch row or column could cause this switch to not work.)

If the magnet activates on screen but the physical magnet does not turn on, check the fuse and magnet wiring. Check the magnet in Solenoid test and the Ringmaster test too.

T. 19 RINGMASTER TEST

For the Ringmaster test, the display shows:
- Status of the UP switch
- Status of the MIDDLE switch
- Status of the DOWN switch
- Status of the motor drives (see note below)
- Status of the flasher
- Status of the magnet

Note on the motor drive: The motor is controlled by two drives. The ENABLE drive MUST be active for the motor to run at all. The second drive determines the direction. EG: If the enable AND direction drives are both on, then the motor will turn one way; if just the enable drive is on, the motor will turn the other way. As long as the motor drive is off the motor will not run, regardless of the direction drive.

The motor drive status line on the test page shows the status of both drivers. The left indicator is the enable driver; the right indicator is the direction driver.

During the test, the flasher and magnet will be cycled. These devices are run at very low power during the test. Use the Solenoid Test to test these drivers fully. The magnet will only activate ten times during the test.

The ringmaster test has two modes. The current mode is displayed on the top/ right corner of the display. In any mode, press the Enter button to change modes, and Escape button to exit the test.

Manual: Press the Up button to run the motor. Press the Down button to run the motor in the opposite direction.

If the motor does not move at all check the wiring to the motor, and the motor driver board located on the Ringmaster bracket. Be sure this board has +20 volts (the LED should be on) and that the drivers are connected.

If the motor only moves in one direction, check the direction driver.

Automatic: In automatic, the Ringmaster runs a cycle. It is moved into the down position, then the middle, then upper, then back to the middle and finally down again. The cycle repeats as long as the test is active. The status is printed on the bottom line of the display. If there is an error, the test stops and the error is printed on the bottom line of the display.

If the Ringmaster cannot find a position, check the relative position switch, and the motor drives.

T.20   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.12	Shipping

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	2	1	1	1	OFF
A.2 03	BALL SAVE TIME	8	6	4	2	see below
A.2 04	MULTIBALL BALL SAVER	9	7	5	3	1
A.2 05	RINGMASTER MULTIBALL BALL SAVER	9	7	5	3	1
A.2 06	ARC MULTIBALL BALL SAVER	9	7	5	3	1
A.2 07	JUGGLER MULTIBALL BALL SAVER	9	7	5	3	1
A.2 08	NEON MULTIBALL BALL SAVER	12	10	8	6	4
A.2 09	RINGMASTER EXTRA BALL	1	2	3	4	5
A.2 10	BALLOONS FOR EXTRA BALL	5	10	15	20	25
A.2 11	RAMP DIFFICULTY	EX. EASY	EASY	MEDIUM	HARD	EX. HARD
A.2 12	RING MEMORY	YES	YES	NO	NO	NO
A.2 13	SIDESHOW LIT	YES	YES	YES	NO	NO
A.2 14	SUPER JETS TIME	15	13	10	7	5
A.2 15	POPCORN TIME	30	25	20	15	10
A.2 16	ROONIE TIMER	30	25	20	15	10
A.2 17	HAT-TRICK TIMER	30	25	20	15	10
A.2 18	CANNON MODE TIME	15	12	10	8	6
A.2 19	MULTIBALL STACK LOCKS	3	2	1	0	0

Ball Save Time does not apply for Extra Hard settings.

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	5	3
A.1 07	REPLAY START	35,000,000	25,000,000
A.2 01	BALL SAVES	1	1
A.2 03	BALL SAVE TIME	3	4
A.2 04	MULTIBALL BALL SAVER	4	5
A.2.05	RINGMASTER MULTIBALL BALL SAVER	4	5
A.2 06	ARC MULTIBALL BALL SAVER	4	5
A.2 07	JUGGLER MULTIBALL BALL SAVER	4	5
A.2 08	NEON MULTIBALL BALL SAVER	6	8
A.2 09	RINGMASTER EXTRA BALL	4	3
A.2 10	BALLOONS FOR EXTRA BALL	20	15
A.2 11	RAMP DIFFICULTY	HARD	MEDIUM
A.2 12	RING MEMORY	NO	NO
A.2 13	SIDESHOW LIT	NO	YES
A.2 14	SUPER JETS TIME	10	10
A.2 15	POPCORN TIME	15	20
A.2 16	ROONIE TIMER	15	20
A.2 17	HAT-TRICK TIMER	15	20
A.2 18	CANNON MODE TIME	8	10
A.2 19	MULTIBALL STACK LOCKS	0	1

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	Members Credits	00
A.4 18	Cannon 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.2 09	Ringmaster Extra Ball	00
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	Cirqus Members	On
A.4 17	Cirqus Credits	00
A.4 18	Cannon Champion	50
A.4 19	Cannon 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.

U.12 SHIPPING

This utility sets up the Ringmaster and the Disappearing Jet assemblies for shipping. If the ringmaster is DOWN when the game is shipped, the lid may scratch the playfield slightly. This utility will move the Ringmaster into a position that is suitable for shipping. It also raises the Up/Down jet bumper so that it doesn't fall when the machine is moved.

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   *5* *15 ooo ooo*

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 ball saves allowed per player, per game.   After the number of ball saves the ball saver still runs, but for a very short time.

Settings: OFF - No ball saver
                 1 to 5

Factory Setting: 1

A.2 02   TIMED PLUNGER

This adjustment sets a time limit (in seconds) before the ball will be automatically kicked into play at the start of a ball, and after a lock.

Settings: 30-90 Seconds
                 OFF - No timer

Factory Setting: Off

A.2. 03   BALL SAVE TIME

This adjustment sets the time (in seconds) for the ball saver during regular single-ball play.

Settings: 2 - 15 Seconds

Factory Setting: 6

A.2 04   MULTIBALL BALL SAVER

This adjustment sets the time (in seconds) for the ball saver during the main multiball (High Wire Multiball).

Settings: 1-15 Seconds

Factory Setting: 5 Seconds

A.2 05   RINGMASTER MULTIBALL BALL SAVER

This adjustment sets the time (in seconds) for the ball saver during Ringmaster Multiball (Frenzy, Razz and Special).

Settings: 1-15 Seconds

Factory Setting: 5 Seconds

A.2 06   ARC MULTIBALL BALL SAVER

This adjustment sets the time (in seconds) for the ball saver during the Arc Multiball.

Settings: 1-15 Seconds

Factory Setting: 5 Seconds

A.2 07   JUGGLER MULTIBALL BALL SAVER

This adjustment sets the time (in seconds) for the ball saver during Juggler Multiball.

Settings: 1-15 Seconds

Factory Setting: 5 Seconds

A.2 08 NEON MULTIBALL BALL SAVER

This adjustment sets the time (in seconds) for the ball saver during the Neon Multiball. [NOTE: A short ball saver (2 seconds) is also activated at the end of Neon Multiball]

Settings: 1-20 Seconds

Factory Setting: 8 Seconds

A.2 09 RINGMASTER EXTRA BALL

This sets the number of times the Ringmaster must be defeated to light the Extra Ball.

Settings: 0-10

Factory Setting: 3

A.2 10 BALLOONS FOR EXTRA BALL

This sets the number of BOOM hits to light Extra Ball.

Settings: 5-25

. Factory Setting: 15

A.2 11 RAMP DIFFICULTY

This sets the difficulty of the main ramp counter for starting Arc Multiball.

Settings: EXTRA EASY
                 EASY
                 MEDIUM
                 HARD
                 EXTRA HARD

Factory Setting: MEDIUM

A.2 12 "RING" MEMORY

This adjustment can enable the memory feature for the current RING level of the player.

Settings: YES - The Ring number remains between balls
                 NO - The Ring number is reset to Ring 1 between balls

Factory Setting: NO

A.2 13 SIDESHOW LIT

This adjustment causes the sideshow to be lit at the start of the game.

Settings: YES - Sideshow is lit at game start.
                 NO - Sideshow is NOT lit at game start.

Factory Setting: YES

A.2 14 SUPER JETS TIME

This adjustment sets the number of seconds Super Jets runs. Note: Super jets does NOT end until the ball leaves the jet bumper area.

Settings: 5-15 Seconds

Factory Setting: 10 Seconds

A.2 15 POPCORN TIME
This adjustment sets the time in seconds of the Popcorn Mania mode.

Settings: 10-30 Seconds

Factory Setting: 20 Seconds

A.2 16 ROONIE TIMER
This adjustment sets the time in seconds of the Roonie video mode.

Settings: 10-30 Seconds

Factory Setting: 20 Seconds

A.2 17 HAT-TRICK TIMER
This adjustment sets the time in seconds for the Ringmaster Hat-Trick mode.

Settings: 10-30 Seconds

Factory Setting: 20 Seconds

A.2 18 CANNON MODE TIME
This adjustment sets the time limit for the Cannon Fire mode.

Settings: 5-15 Seconds

Factory Setting: 10 Seconds

A.2 19 MULTIBALL STACK LOCKS
This adjustment sets the number of multiballs where the player can stack locks (ie: light lock 2 while lock 1 is still lit).

Settings: 0-3

Factory Setting: 1

A.2 20 FLIPPERS ABORT ANIMATION
This adjustment sets the method that the player can use to abort long animation during the game.

Settings: DELAYED - Flippers must be held for one second.
                   INSTANT - Flippers must pressed.
                   NEVER - It is impossible to abort long animation.

Factory Setting: INSTANT

A.2 21 PLAYER TOURNAMENT
This adjustment can disable the player select tournament mode feature.

Settings: YES - Player select tournament mode is available.
                   NO - Player select tournament mode is NOT available.

Factory Setting: YES

A.2 22 ATTRACT MODE MUSIC

This adjustment sets the interval between attract mode music. Music will play in attract mode for 30 seconds according to the timer set here.

Settings: 5-120 Minutes
OFF - No attract mode music

Factory Setting: OFF

A.2 23 ATTRACT MODE SOUNDS

This adjustment sets the interval between attract mode sounds and effects. Short sounds or speech will play in attract mode according to the timer set here.

Settings: 5-60 Minutes
OFF - No attract mode sounds

Factory Setting: OFF

A.2 24 ATTRACT MODE FLIPPER SOUNDS

This adjustment disables the flipper button sounds in the Attract mode.

Settings: YES - Flipper buttons will make sounds in attract mode.
NO - Flipper buttons won't make sounds in attract mode.

Factory Setting: YES

A.2 25 COIN START

This adjustment sets the Coin Start feature. This allows the game to start as soon as coins are inserted.

Settings: YES - Game will start as soon as coins are inserted.
NO - Game will start ONLY with the Start button.

Factory Setting: NO

A.2 26 NEON OFF TIME

Some neon tubes have a gas that's an Argon/Mercury mixture. When it is turned on, the Mercury gives off a lot of UV, which is transformed into visible light by the Phosphorous coating on the inside of the tube.

If the tube is left off for a long time, the Mercury cools; this means that when the tube is next turned on there may be some dull spots for a while, as the Mercury is not giving off so much UV. To keep the Neon looking its best, it is turned on occasionally during attract mode.

NOTE: THIS DOES NOT EFFECT THE OPERATION OR SAFETY OF THE NEON TUBE OR THE GAME IN ANY WAY. It is purely cosmetic.

This adjustment sets the OFF time for the neon. Note: this period is timed during a game, test mode and attract mode. However, the tube will only be turned on in Attract mode.

If the game has been off for more then twice as long as the Off time (set here), then the neon will be turned on for twice the on time set in the adjustment below.

Settings: 30-180 Minutes

Factory Setting: 60 Minutes (1 hour)

A.2 27 NEON ON TIME

Some neon tubes have a gas that's an Argon/Mercury mixture. When it is turned on, the Mercury gives off a lot of UV, which is transformed into visible light by the Phosphorous coating on the inside of the tube.

If the tube is left off for a long time, the Mercury cools; this means that when the tube is next turned on there may be some dull spots for a while, as the Mercury is not giving off so much UV. To keep the Neon looking its best, it is turned on occasionally during attract mode.

NOTE: THIS DOES NOT EFFECT THE OPERATION OR SAFETY OF THE NEON TUBE OR THE GAME IN ANY WAY. It is purely cosmetic.

This adjustment sets the ON time for the neon. Note: If this time is interrupted (by starting a game, turning the machine off, slam tilting, or entering test mode) then the timer will reset back to the adjustment value (i.e.: it will NOT continue to time from the point of the interruption).

If the game has been off for more then twice as long as the Off time (set in the adjustment above), then the neon will be turned on for twice the on time set here.

Settings: 5-50 Minutes

Factory Setting: 5 Minutes

A.2 28 BACKBOX

This adjustment disables the backbox lightning ball kicker.

Settings: ON - The backbox feature is used
                  OFF - The backbox feature is simulated

Factory Setting: ON

A.2 29 RINGMASTER

This adjustment disables the Ringmaster feature.

Settings: ON - The device runs normally.
                  OFF - The device is not used. Game software will compensate.

Factory Setting: ON

A.2 30 DIVERTER

This adjustment disables the Diverter.

Settings: ON - The diverter is used normally.
                  OFF - The diverter remains closed.

Factory Setting: ON

A.2 31 KNOCKER VOLUME

This adjustment sets the volume level for the Knocker. NOTE: If the Standard Adjustment MINIMUM VOLUME OVERRIDE (A.1 28) is YES (factory setting) then the knocker volume cannot be set below 20.

Settings: 1-31 = Volume level to use for the Knocker.
                  OFF = No Knocker sound will be heard.

Factory Setting: 31

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.

1-39

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

DISPLAY VIEW

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.

1-43

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	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¢	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	1/1, 6/5	
	25¢	25¢	25¢	.	1/4x25¢	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	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¢	CAN. 1/$0.75	
					1/0.50, 2/$1.00, 3/$1.00-Coin [2]	CAN.$ BONUS	
Austria	5sch	10sch	10sch	-	1/2x5sch, 3/2x10sch	AUSTRIA	
	5sch	-	10sch	.	12/5sch, 5/10sch	AUSTRIA	
Australia	20¢	$1	$1	$2	1/$1, 3/$2	CUSTOM	02 00 05 00 01 00 01 00
	20¢	$1	$1	$2	1/$1, 2/$2	AUSTRALIA 1	
U.K.	£1.00	50P	20P	10P	1/3x10P, 2/50P, 4/£1	AUSTRALIA 2	
Switzerland	1Fr	2Fr	5Fr	-		U. KINGDOM	
Swiss 2	1Fr	2Fr	5Fr	-	1/1Fr, 3/2Fr, 7/5Fr [2]	SWISS 1	
Swiss 3	1Fr	2Fr	5Fr	-	1/2Fr, 2/3Fr, 3/4Fr, 5/5Fr	SWISS 2	
Swiss 4	1Fr	2Fr	5Fr	-	1/1Fr, 5/5Fr	SWISS 3	
Swiss 5	1Fr	1Fr	1Fr	-	1/1Fr, 2/2Fr, 3/3Fr, 4/4Fr, 6/5Fr [1]	SWISS 4	
Belgium	5Fr	20Fr	50Fr		1/1Fr (all slots = 1Fr)	SWISS 5	
Belgium 2	5Fr	20Fr	50Fr		1/4x5Fr, 1/20Fr, 3/50Fr	BELGIUM	
Germany	1DM	2DM	5DM	-	1/20Fr, 3/60Fr, 3/50Fr-Coin [1,2]	BELG. BONUS	
					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	
Holland	1G	-	1G	-	1/1DM, 2/2DM, 5/5DM	GER. 1/1DM	
Sweden	1Kr	5Kr	10Kr	1Kr	1/1G [2]	HOLLAND	
	1Kr	5Kr	10Kr	1Kr	1/10Kr, 2/15Kr, 3/20Kr [1,2]	SWEDEN 1	
France	1Fr	5Fr	10Fr	20Fr	1/5Kr [2]	SWEDEN 2	
	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 [1,3]	TARIFF 2	
	1Fr	5Fr	10Fr	20Fr	1/5Fr, 3/10Fr, 7/2x10Fr, 7/20Fr [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	
Italy	500L	500L	500L	-	1/5Fr, 3/10Fr, 6/20Fr [2,3]	TARIFF 6	
	500L	500L	500L	-	1/500L	ITALY 1	
	500L	500L	500L	-	1/2x500L, 3/4x500L [1,2]	ITALY 2	
Spain	100P	-	500P	-	1/2x500L, 2/4x500L [2]	ITALY 3	
	25P	-	100P	-	1/100P, 6/500P	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
Japan	100¥	-	100¥	-	1/2x25P, 3/100P [2]	CUSTOM	03 00 12 00 04 00 01 06
Chile	Token	-	Token	-	1/100¥ [2]	JAPAN	
Denmark	1Kr	5Kr	10Kr	20Kr	1/1Token	CHILE	
	1Kr	5Kr	10Kr	20Kr	1/2x1 Kr, 3/5 Kr, 7/10 Kr [2]	DENMARK 1	
Finland	1Mka	-	5Mka	-	1/5 Kr, 3/10 Kr, 6/20 Kr [1,3]	DENMARK 2	
	1Mka	-	5Mka	-	1/2x1Mka, 3/5Mka [4]	FINLAND 1	
New Zealand	$1.00	-	$2.00	-	1/3x1Mka, 2/5Mka [2]	FINLAND 2	
	$2.00	-	$1.00	-	1/$1, 3/$2 [2]	NEW ZEALAND 1	
Norway	5Kr	-	10Kr	-	1/$1, 3/$2, ($2-$1 door)	NEW ZEALAND 2	
Argentina	10¢	10¢	10¢	-	1/5Kr, 2/10Kr, 5/20Kr	NORWAY	
Greece	10D	20D	50D	-	1/1 Token	ARGENTINA	
Antilles	25¢	25¢	1G	-	1/2x10D, 1/20D, 3/50D	GREECE	
Netherlands	1HFl	2.5HFl	2.5HFl	-	1/25¢, 4/1G	ANTILLES	
Netherlands 2	1HFl	2.5HFl	2.5HFl	-	1/1HFl, 3/2.5Hfl	NETHERLANDS	
Hungary	20 Old	20 New	50F	-	1/1HFl, 3/3HFl, 3/2.5HFl-Coin	NETH. BONUS	
					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 CIRQUS MEMBERS

This adjustment can disable the Cirqus Member feature. If this is OFF, then no initials will be taken for Cirqus Members, and the table will not be displayed in Attract mode.

Settings:
ON - Cirqus member initials operate.
OFF - No initials will be taken for Cirqus member.

Factory Setting: ON

A.4 16 MEMBERS CREDITS

This sets the number of credits to award for a Cirqus Member.

Settings: 0-3 Credits

Factory Setting: 0 Credits

A.4 17 CANNON CHAMPION

This adjustment can disable the Cannon Champion feature. Players who beat the current Cannon Ball Champion enter their initials. This adjustment sets the default Cannon Ball Champion value.

Settings: 1-80 Cannon Balls (Default setting)
OFF - Initials will not be accepted from the player.

Factory Setting: 50

A.4 18 CANNON CREDITS

This adjustment set the number of credits awarded to any player who beats the Cannon Champion.

Settings: 0-3

Factory Setting: 1

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.

CIRQUS VOLTAIRE is the first game to feature the new coin door display. When the coin door is open (in Attract mode and game play), the display shows that the high-power has been disabled. It also shows the Test Report (if there is anything to report), and some game specific information. Use the flipper buttons to page through this information.

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.

If the Ringmaster has been disabled by the Adjustment, the test report shows:
"RINGMASTER OFF"
"BY ADJUSTMENT"

If the Ringmaster has detected that any of the three positions switches is bad, the test report shows one or more of:

"CHECK SWITCH 42"	**"CHECK SWITCH 43"**	**"CHECK SWITCH 44"**
"RINGMASTER UP"	**"RINGMASTER MID."**	**"RINGMASTER DOWN"**

A Ringmaster test (T.18) is provided, use it to check the device.

If the Ringmaster has detected that the Motor Drive does not work, the test report shows:
"RINGMASTER ERROR"
"NO MOTION"
A Ringmaster test (T.18) is provided, use it to check the device.

If the Ringmaster has detected that the Direction Drive does not work, the test report shows:
"RINGMASTER ERROR"
"NO REV. MOTION"   **(No reverse motion)**
A Ringmaster test (T.18) is provided, use it to check the device.

If the Diverter has been disabled by the adjustment, the test report shows:
"DIVERTER OFF"
"BY ADJ A.2 31"

If the Diverter has detected that it is stuck Open or Closed, the test report shows one of:

"DIVERTER ERROR"	**"DIVERTER ERROR"**
"STUCK OPEN"	**"STUCK CLOSED"**

A Diverter test (T.17) is provided, use it to check the device.

If the Backbox has been disabled by the Adjustment, the test report shows:
"BACKBOX DISABLED"
"BY ADJ A.2 29"

If the game determines that the Ringmaster Magnet is bad, the test report shows:
"CHECK COIL 35"
"RINGMASTER MGNT."
A Magnet test (T.19) is provided, use it to check the magnet.

If the game determines that the Ramp Magnet is bad, the test report shows:
"CHECK COIL 05"
"RAMP MAGNET"
A Magnet test (T.19) is provided, use it to check the magnet.

If the game determines that the Loop Magnet is bad, the test report shows:
"CHECK COIL 03"
"LEFT LOOP MAGNET"
A Magnet test (T.19) is provided, use it to check the magnet.

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 90 balls or apx. 30 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	Center LED blinks once	= G11 ROM Failure
LED ERROR CODES	Center LED blinks twice	= U8 RAM Failure
	Center LED blinks three times	= G10 Security Chip Failure

CPU and Audio Visual board error codes continued...

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

AUDIO VISUAL BOARD	1 Beep	= Audio Visual Board is O.K.
BEEP ERROR CODES	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.

Note: The transmitter (LED) is larger than the receiver (Photo Transistor); it protrudes further from its case.

LED Board
Transmitter
1.0-1.1 Volts

Photo Transistor Board
Receiver
0.1-0.7V Unblocked
11-13V Blocked

Green   WHT   BLK   Blue

Infrared Ray

Gray-XXX   Black   Gray-Yellow   Orange-XXX

1-53
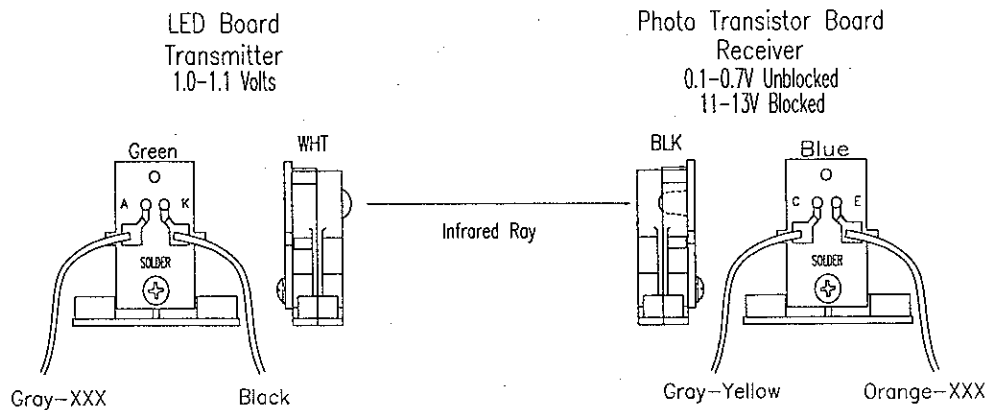
LED LIST
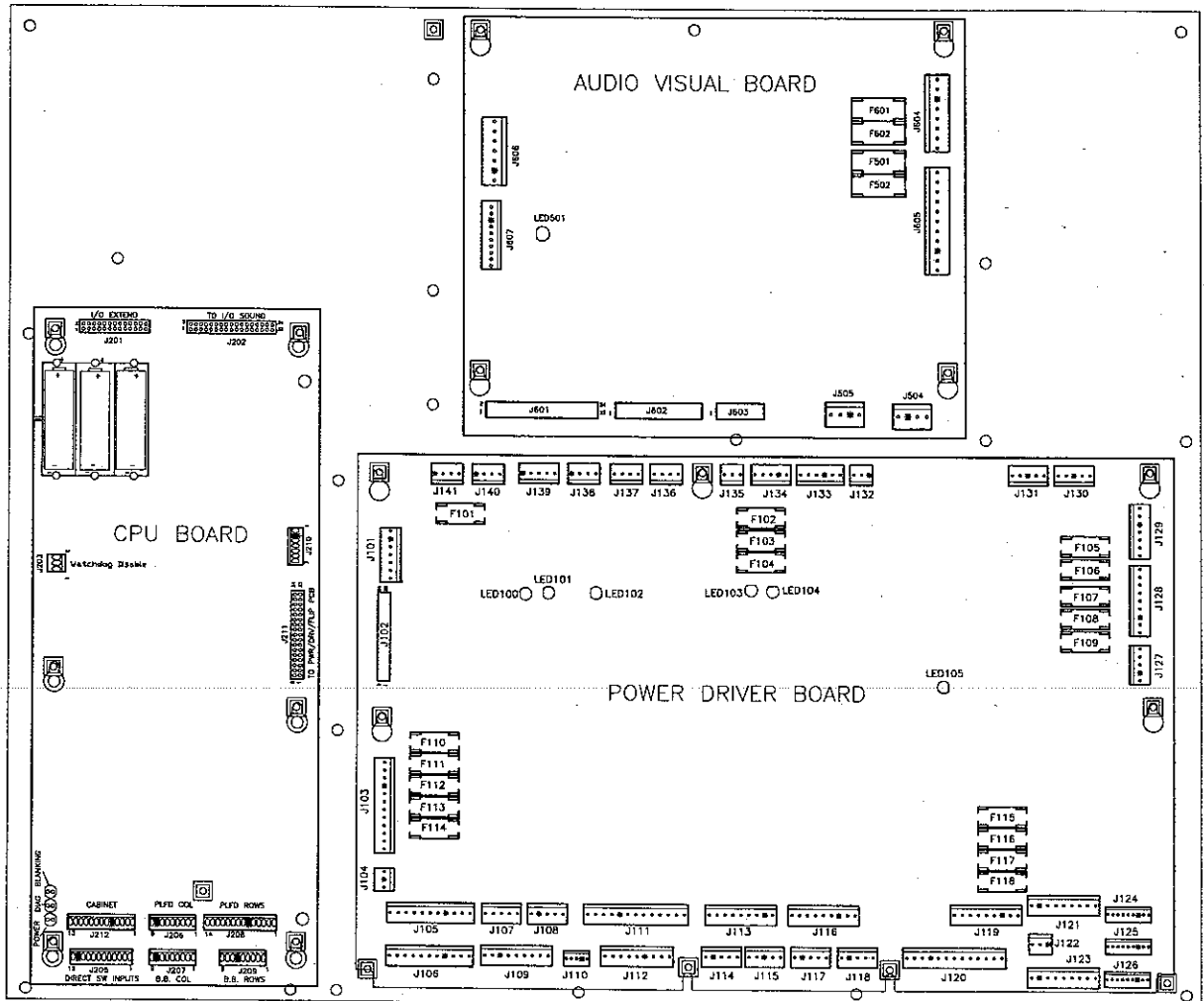
CPU BOARD
LED 201   Blanking
LED 202   Power
LED 203   Diagnostics
At game turn-on, LED 201 and LED 202 are on, LED 203 is off. During normal operation LED 201 is off, LED 202 is on, and LED 203 is flashing.

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
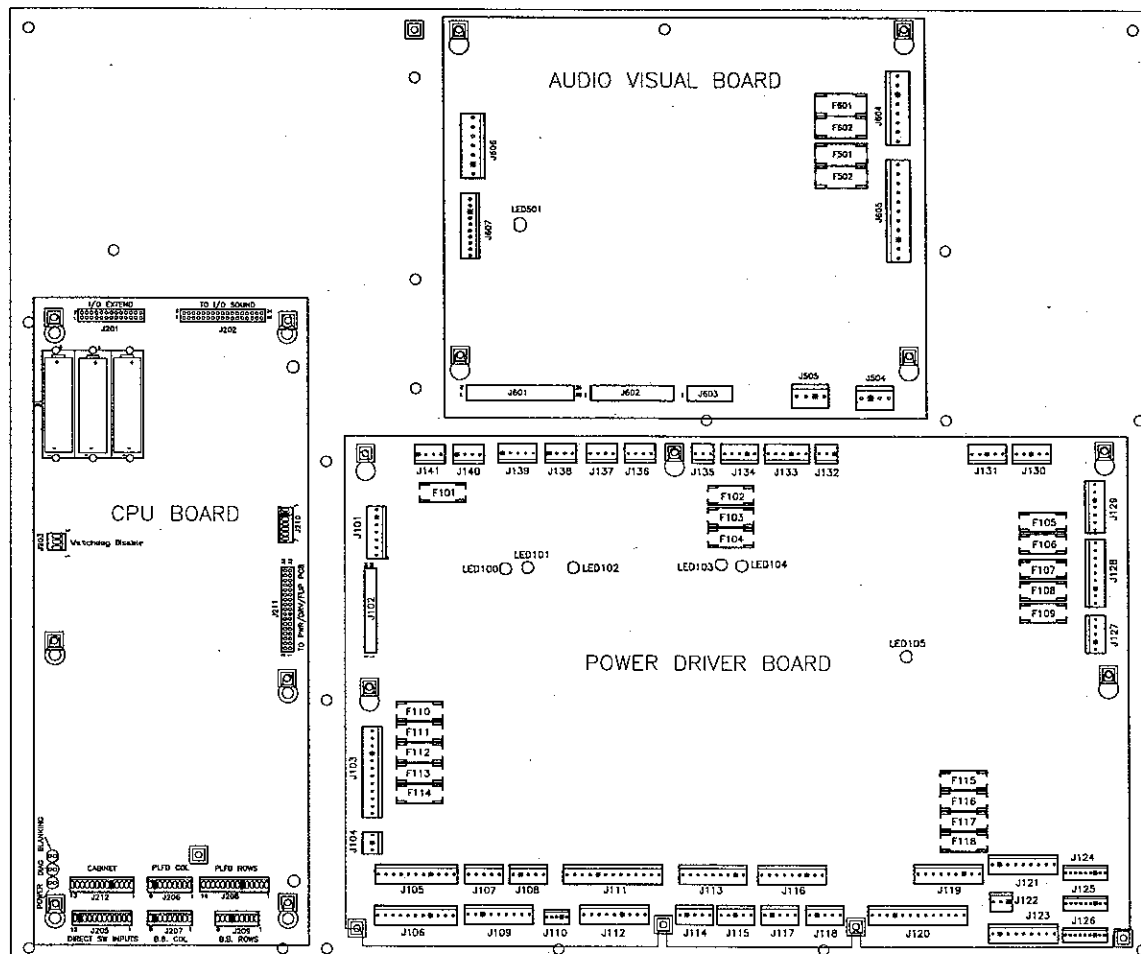
AUDIO VIDEO BOARD

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	Loc.	Description	Part Number	Value
F101	Regulated 12V	5731-14531-00	T0.63A, 250v	F110	G.I. #5 WHT-VIO	5731-14530-00	T4.0A, 250V
F102	Solenoid. #25 to #28	5731-14530-00	T4.0A, 250V	F111	G.I. #4 WHT-GRN	5731-14530-00	T4.0A, 250V
F103	Solenoid #1-#8	5731-14530-00	T4.0A, 250V	F112	G.I. #3 WHT-YEL	5731-14530-00	T4.0A, 250V
F104	Solenoid #9 to #16	5731-14530-00	T4.0A, 250V	F113	G.I. #2 WHT-ORG	5731-14530-00	T4.0A, 250V
F105	+5V Logic	5731-14530-00	T4.0A, 250V	F114	G.I. #1 WHT-BRN	5731-14530-00	T4.0A, 250V
F106	+18V Lamp Matrix	5731-14046-00	T5.0A, 250V	F115	+50V Flippers	5731-14530-00	T4.0A, 250V
F107	Flasher Secondary	5731-14530-00	T4.0A, 250V	F116	+50V Flippers	5731-14530-00	T4.0A, 250V
F108	Solenoid Secondary	5731-14529-00	T6.3A, 250	F117	+50V Flippers	5731-14530-00	T4.0A, 250V
F109	Unregulated 12V	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.

MECHANICAL DEVICE DISASSEMBLY

PLAYFIELD LOCKING SUPPORT ARM

Cirqus Voltaire comes with a left-side mounted playfield locking support arm. When you lift the playfield fully up the metal arm automatically moves into place. Press the arm down to unlock it before lowering the playfield.

Important!

CORRECT ALIGNMENT

PRESS here
then LOWER
playfield

Loosen to adjust ARM
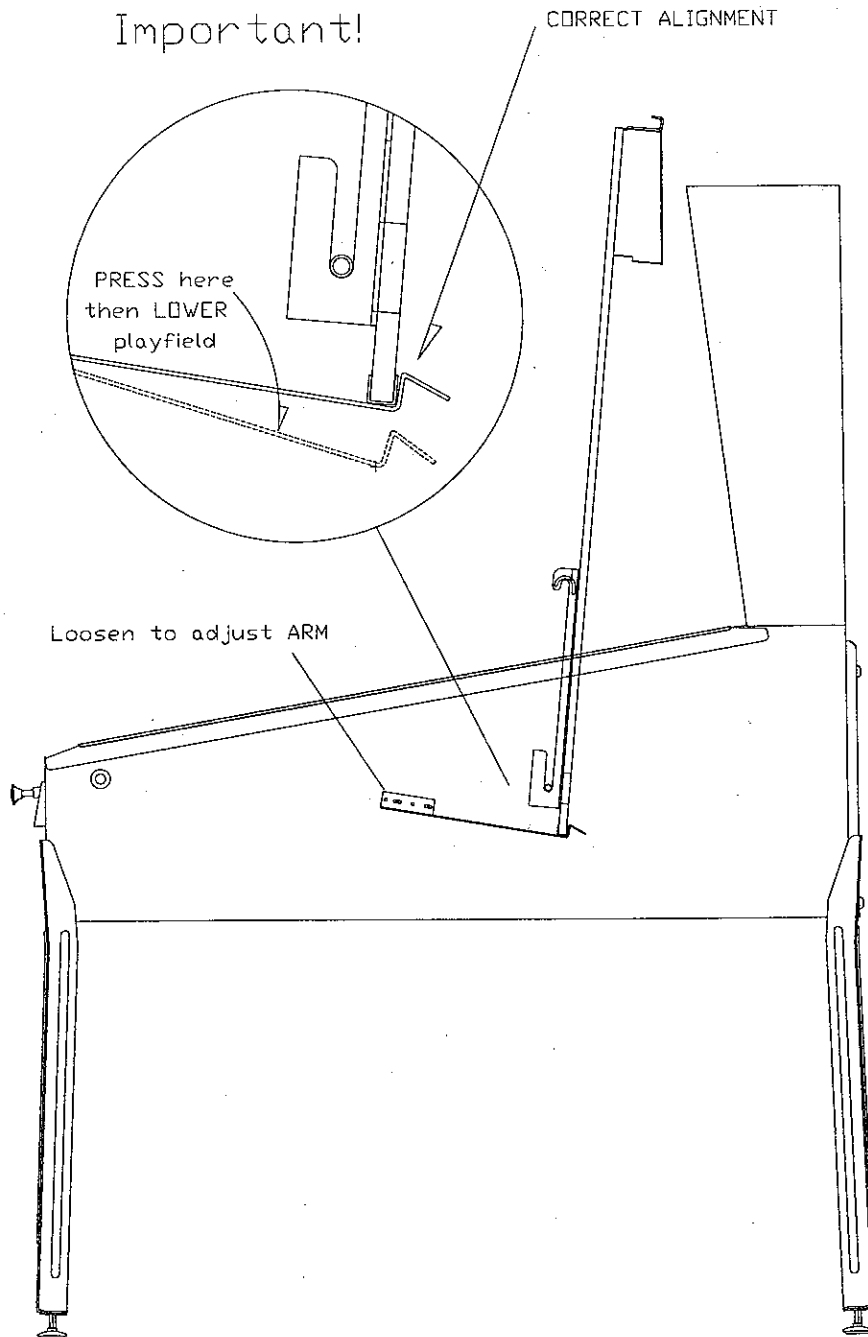
DISAPPEARING JET - BOOM BALLOON

The game contains a Disappearing Jet Bumper that raises and lowers during game play. A coil lifts the jet mechanism up to playfield level, where a latch holds the jet up in position. Balls from the playfield can now hit the bumper. Then the latch coil pulls in and the jet lowers back down to be flush with the playfield.

adjustable cap

jet assembly

switches

bumper coil

B O O M

lift coil

height adjustment

UP

latch coil assy

main pin assy

lift spring

main shaft

The jet assembly requires little if no adjustment. Be sure the jet cap is level with the playfield (1). Adjust the main height screw at the bottom (2) or adjust the height by tightening the front screw on the jet cap bumper (1).

(1) Adjust cap screws to raise or lower the cap.

IMPORTANT!
Cap must be flush
for smooth play.

(2) Adjust main height screws.

To service the jet you could remove it by loosening the wood screws (4) that hold it in place. Then disconnect the cables. Next lower the jet from the playfield so you can get at it.

① Remove (4) wood screws then lower Jet.

③ Lift out bumper assy.

② remove E clip & washers. Slide out pin.

④ Remove latch coil assy. if needed.
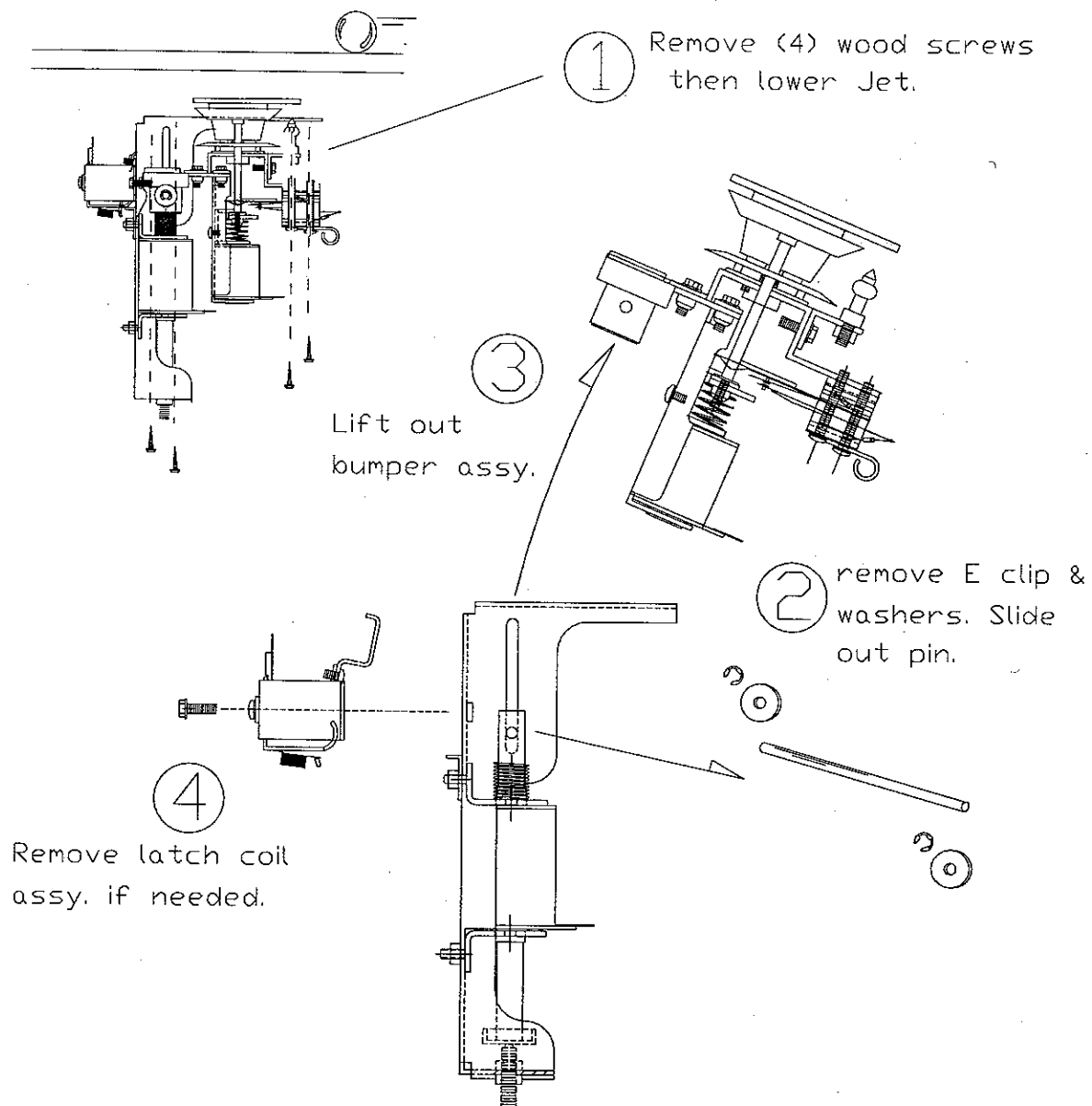
RINGMASTER ASSEMBLY

The Ringmaster is an animated character within the Cirqus. When you hit the WOW targets, a motor drives the cam that lifts the Ringmaster. While up, a self-adjusting eddy sensor detects the pinball being flipped toward the device.

Ringmaster Head

Metal Lid

Neck Spring

Switch & Motor Bracket

Jackpot Cup

Lift Bracket

Lift Rails

Main Bracket

12v Motor

FIG. 1 Loosen four screws before adjusting height.

Height Adjustment Screw
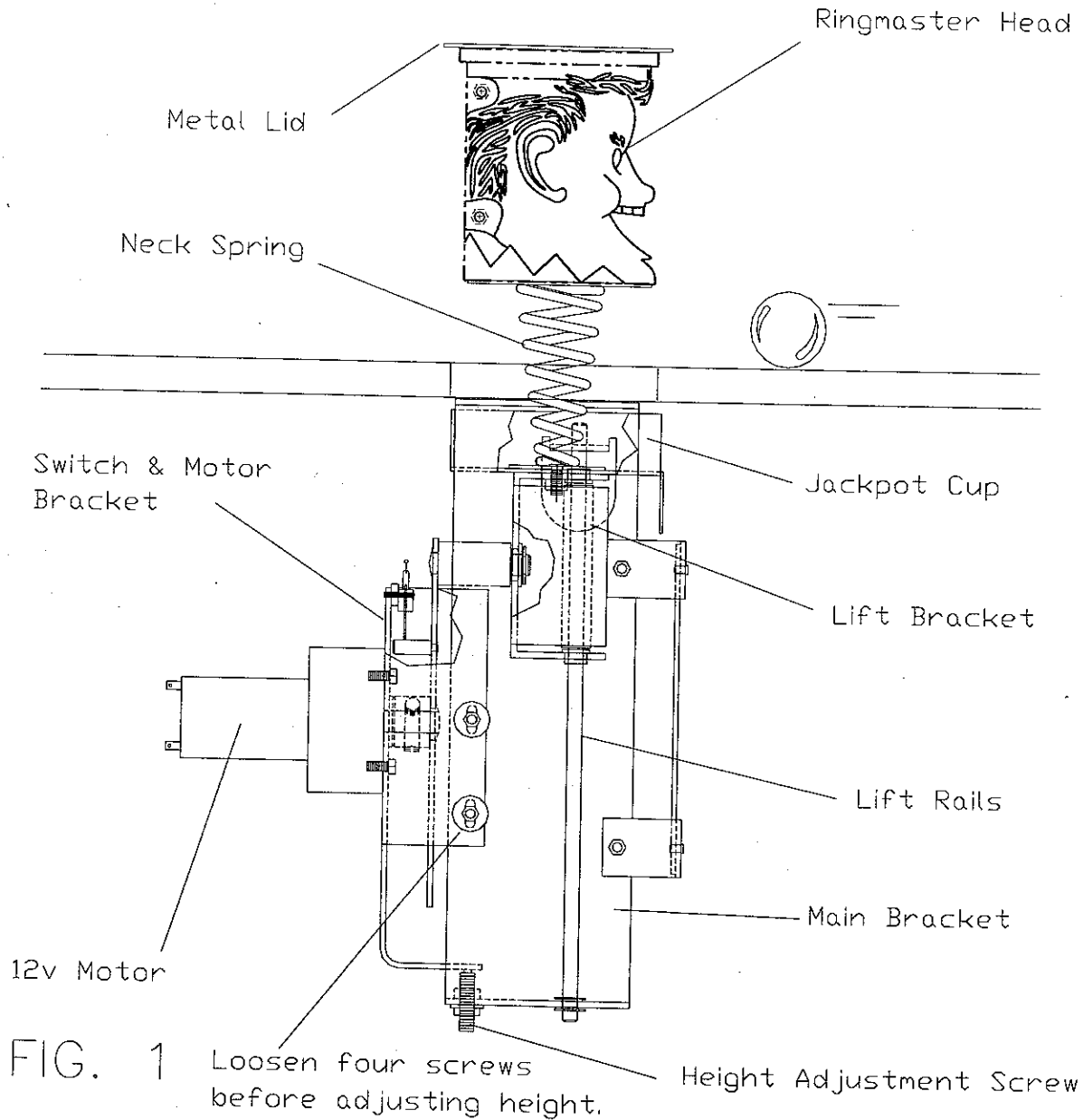
RINGMASTER ASSEMBLY CONTINUED...

RINGMASTER - FRONT

The Ringmaster moves up and down to one of three positions. At rest he is all the way down and flush with the playfield. When up you can hit him or shoot balls into his Jackpot Collar.

Ringmaster Head
(removeable)

Jackpot Collar

Slide Bracket

Safety Shield

Micro Switch
top position

Micro Switch
middle position

Motor PCB

Main Cam

FIG. 2   Adjustment Screw

Micro Switch
lower position
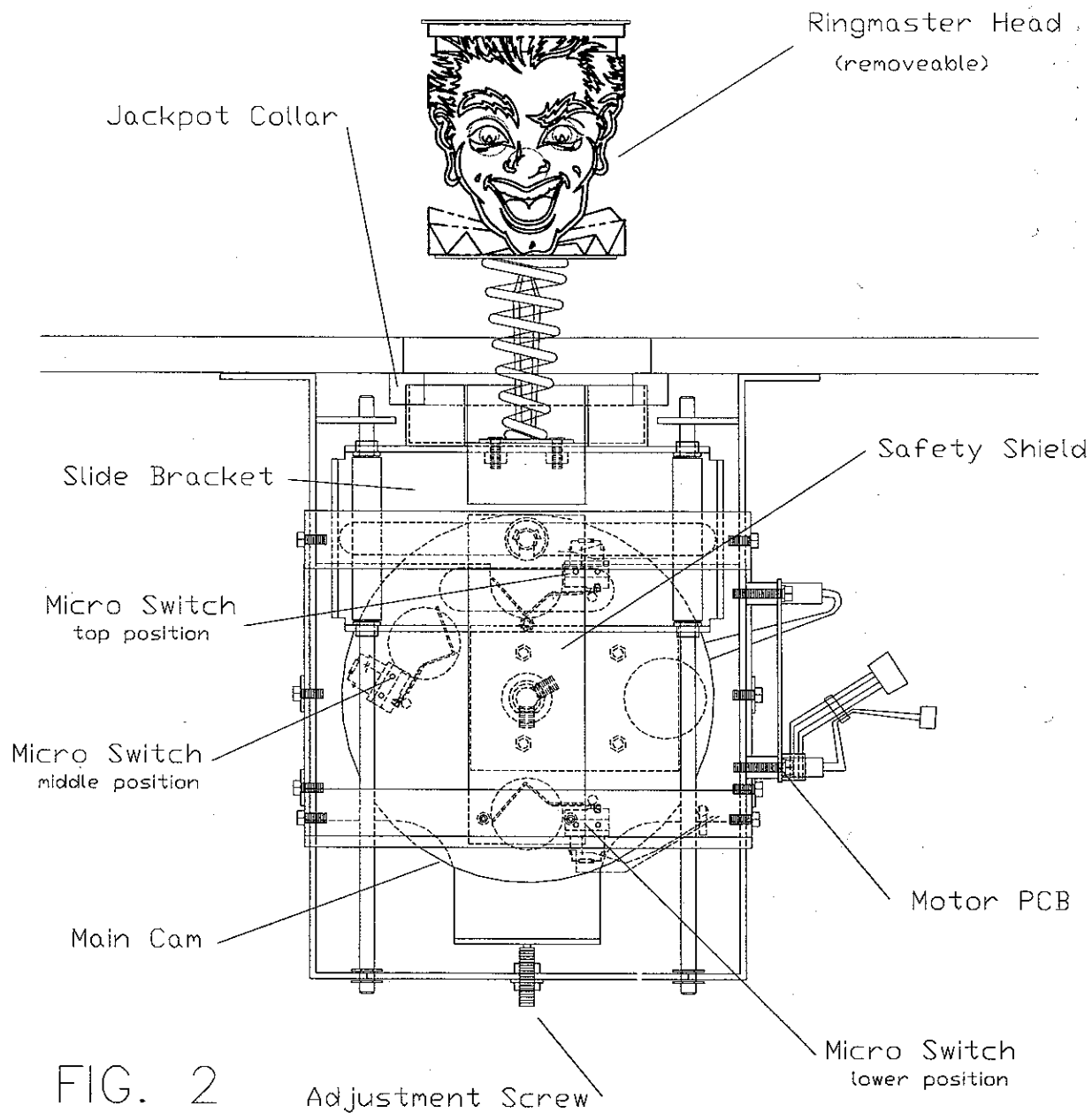
RINGMASTER ASSEMBLY CONTINUED...

TO REMOVE RINGMASTER'S HEAD.

The Ringmaster has very few parts that need service. A flasher and magnet coil are located within his head and only three micro switches are needed. You can remove the head for cleaning or the replace the flasher bulb as shown below.

① Remove #10 screw & Lift metal lid.

Move head to up position!

② Remove (2) #8 screws from the back side & pull off head.

③ Replace flasher or magnet as required

④ Replace all parts so the head is tight and flush.
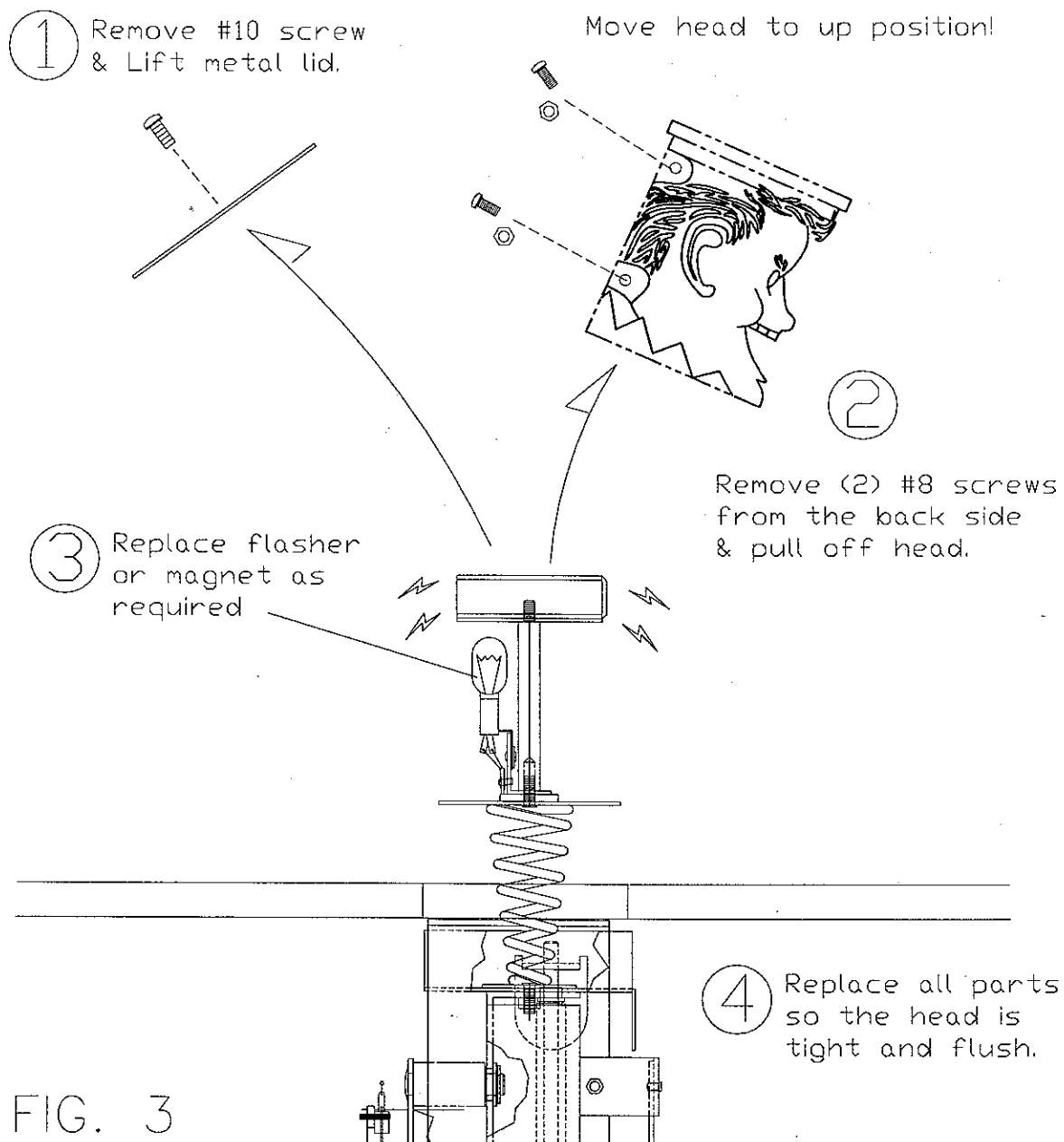
FIG. 3

RINGMASTER ASSEMBLY CONTINUED...

THE RINGMASTER SHOULD BE FLUSH!

After re-installing the Ringmaster's head and top plate, make sure he's flush with the playfield when done. If not adjust the height with the adjustment screw below the mechanism.

Target

Smooth Ball Action

Down Position

Loosen four screws
before adjusting
height.

FIG. 4

Side View

Height Adjustment
Screw if needed.
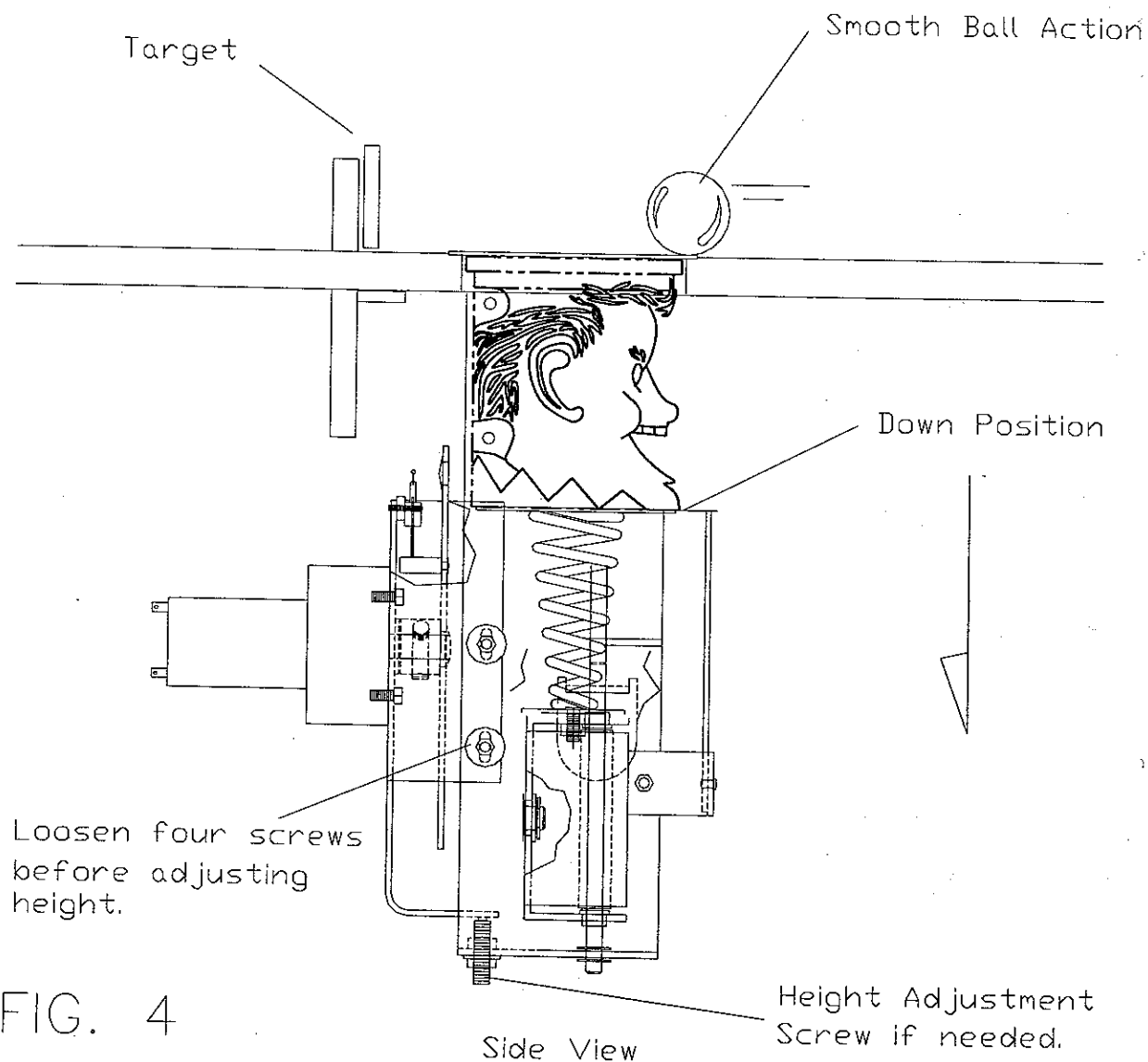
RINGMASTER ASSEMBLY CONTINUED...

ADJUST POSITION SWITCHES

Move the Ringmaster to the down position, then carefully remove the E-ring and bearing from the cam hub. Loosen the four (4) #8 screws that hold the motor bracket on. Gently lower the bracket and disconnect the cable attached. The micro switches can now be adjusted to close while on the apex of the switch wire.

1 Put Ringmaster in lowest positon.

2 Remove (4) #8 screws & washers

3 disconnect cables

Lift Out

4 adjust switches as needed see next page.
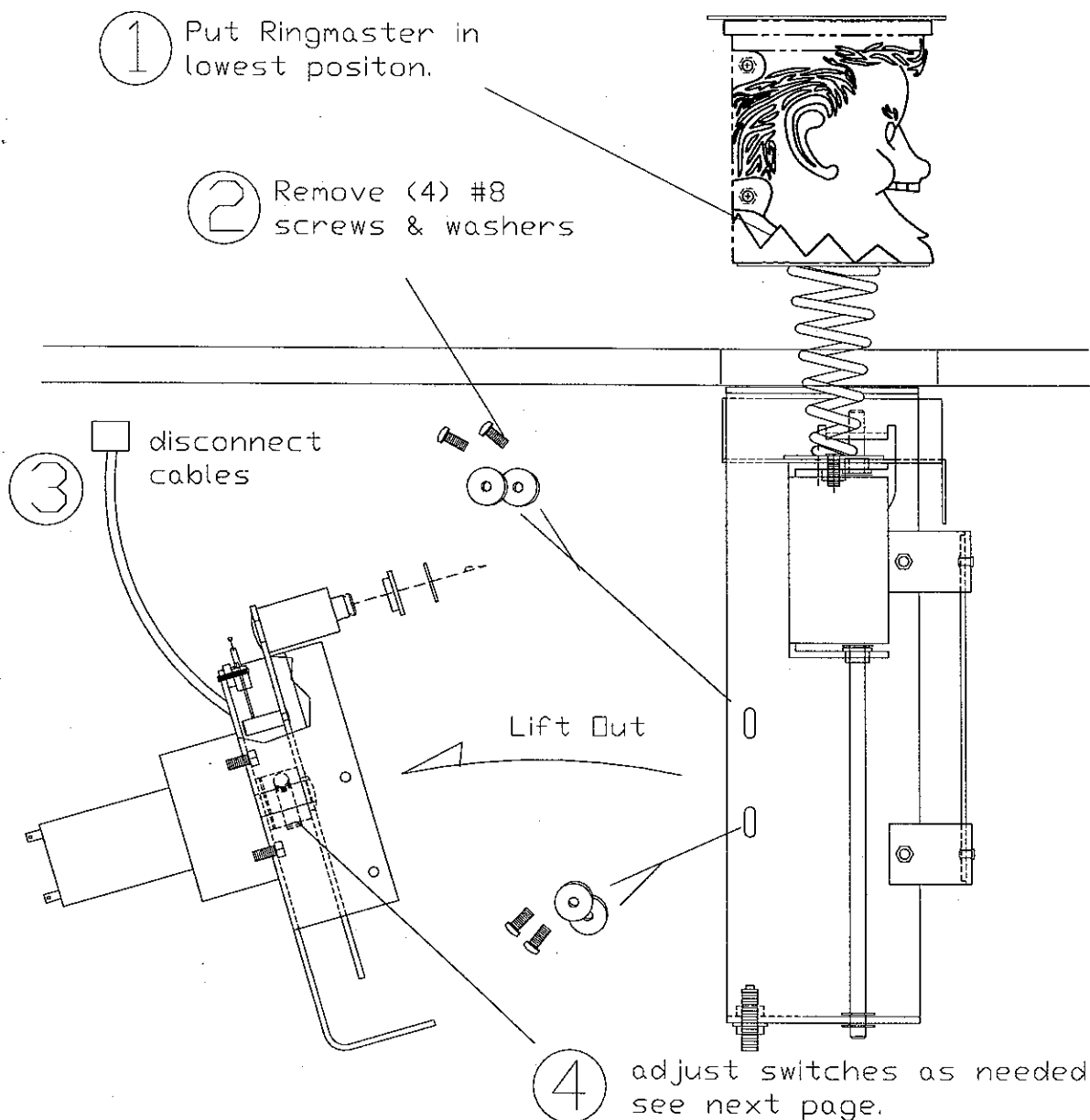
CORRECT ADJUSTMENT

Once you remove the Switch and Motor bracket, rotate the cam and be sure the apex of the micro switch (lower figure) closes as shown below on each switch. This will ensure the Ringmaster stops at the correct height each time.

① Rotate cam to check switches

Rotate
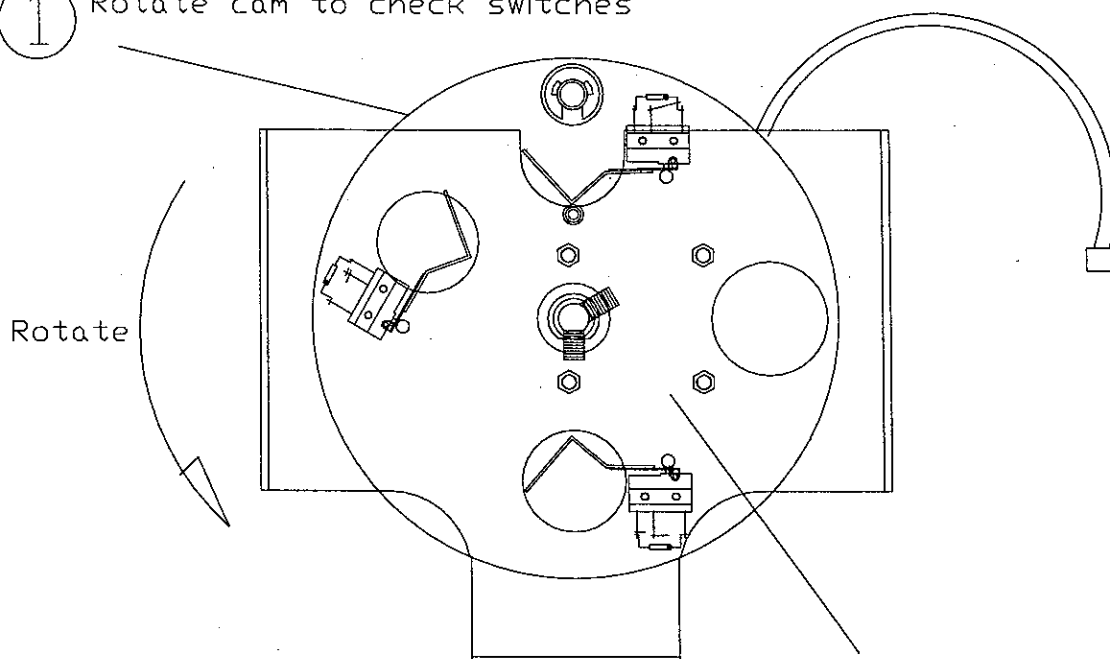
IMPORTANT !

② Switches should activate (close), while the cam pin on the apex of the micro switch!

click!
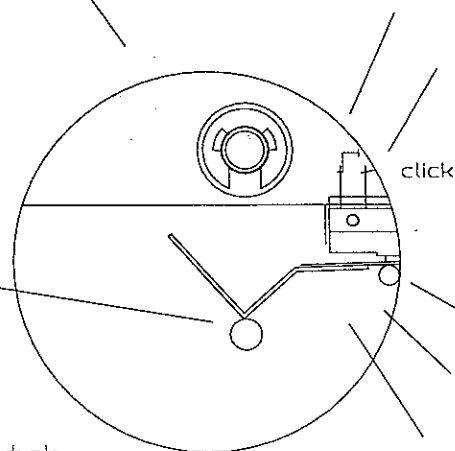
Micro Switch
correct adjustment

③ Re-install Motor and Switch Bracket.

1-66

SECTION TWO

PARTS INFORMATION

50062-BB
Backbox Assembly
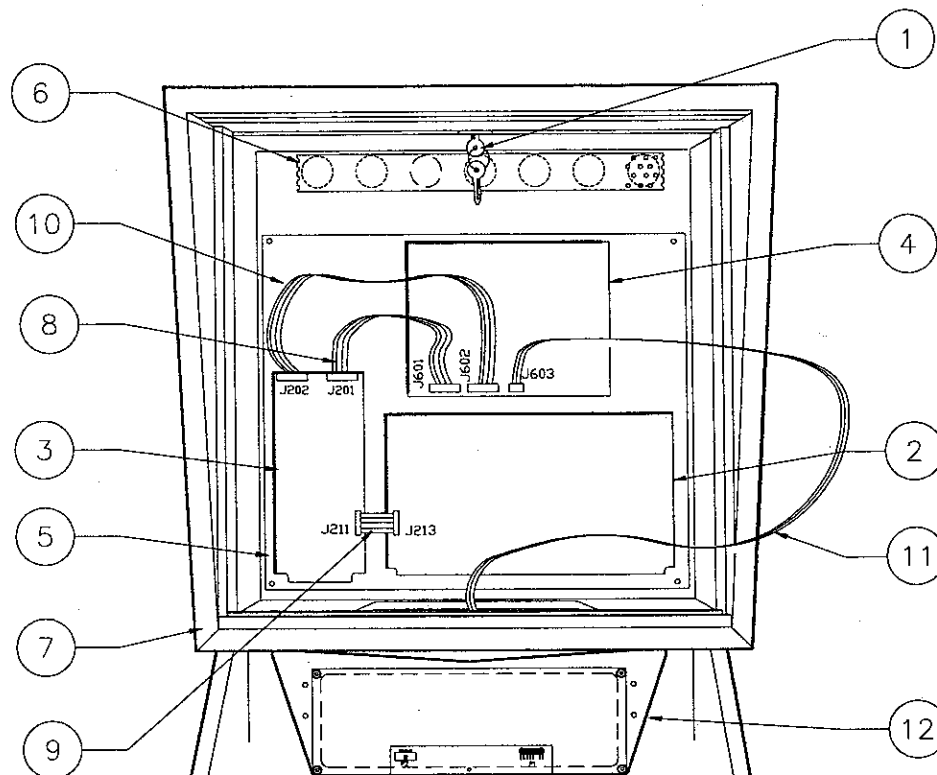
Item	Part Number	Description
1	A-13379	Lock & Plate Assembly
a)	20-9637	Lock & Cam Kit
2	A-20028	WPC '95 Power Driver PCB
3	A-21377-50062	WPC '95 CPU PCB Assy.
4	A-20516-50062	WPC '95 Audio Visual PCB Assy.
5	A-14092-7	Mounting Plate Assembly
6	01-6645	Vent Screen
7	04-10926-50062	Wood Backbox

Ribbon Cables:

8	5795-12653-15	Ribbon Cable, 34-Pin, 2 Conn.
9	5795-12653-03	Ribbon Cable, 34-Pin, 3"
10	5795-10938-19	Ribbon Cable, 26-Pin, 2 Conn.
11	5795-15449-54	Ribbon Cable, 14 Pin w/Ferrite

Associated Assembly:

12	A-21958	Dot Matrix Panel Assembly
a)	5901-12784-00	Dot Matrix Display
b)	01-13636	Shield Display

Miscellaneous Parts: (Not Shown)

Part Number	Description
01-8569	Bracket-Lower Speaker
01-8397	Bracket Trunk Latch

Cables:

H-20477	Logic Power Cable
H-20478	Secondary Cable
H-21840	Extended 72" Dot Power Cable
H-21985-2.1	Insert Backbox Cable

50062-CAB
Cabinet Assembly
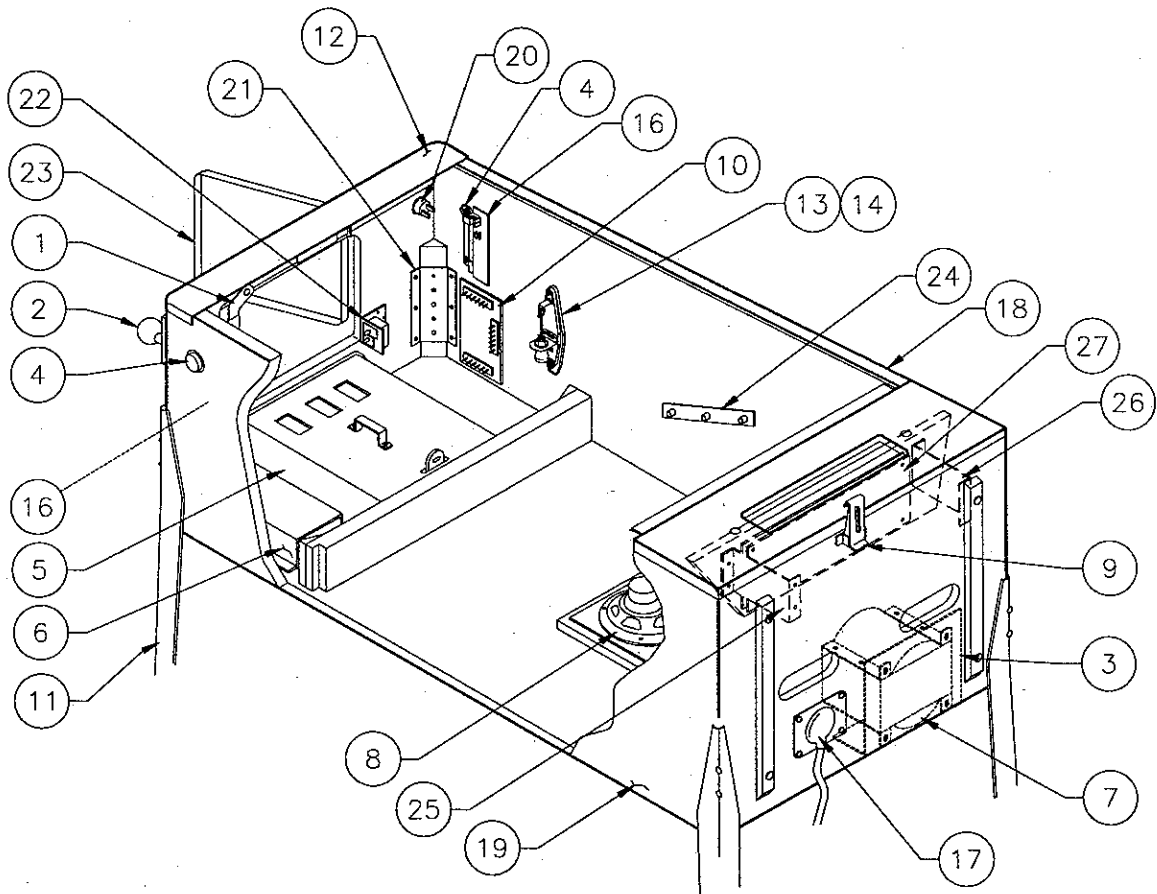
Item	Part Number	Description	Item	Part Number	Description
1	A-16773-1	Lever Guide Assembly	25	04-10935-1	Bracket-Right Side Dot Display
2	A-17730-1	Ball Shooter Assy. W/Silver Knob	26	A-22021	Bracket Assy.-Left Side Dot Display
3	01-13936	Drip Plate – Narrow	27	A-21958	Dot Matrix Panel Assembly
4	A-16883-5	Flipper Button w/Spring (2)			
5	A-20729-5	4-Ball Cashbox Assembly	**Miscellaneous Parts:** (Not Shown)		
6	A-20871	Power Interface Assy.		A-17195	Tilt Switch Assy. w/Cable
7	5610-14515-00	WPC Transformer		A-19562.1	Stay Arm Assembly
8	5555-12929-00	Speaker, 4•, 6", 25w		01-12352	Clip Bracket
9	20-9347	Toggle Latch		01-9011.1-L	Backbox Mtg. Bracket, Left
10	A-20580	Coin Door Interface Board		01-9011.1-R	Backbox Mtg. Bracket, Right
11	A-19514	Leg Assembly, Chrome (4)		01-6389-1	Cashbox Lock Bracket
12	D-12615	Front Molding Assembly		08-7028-T	Playfield Glass
13	20-6502-A	Plumb Bob		08-7377	Leg Leveler Adjuster, 3"
14	04-10346	Tilt Mechanism Assembly		20-6500	Steel Ball, 1-1/16" (4)
15	*	Cordset		01-3535	Rod Mounting Plate
16	A-17316	Opto Flipper Assembly (2)			
17	01-10714	Line Cord Cover			
18	A-12359-3	Side Molding Assembly (2)	**Cabinet Cables:**		
19	11-1345	Wood Cabinet		A-20201	Cable & Jumper Assy., Coin Door
20	20-9663-16	Push Button w/Sw., *Start* (Yellow)		H-17217.1	Plumb/Bob Mech. Protect Cable
21	01-11400	Leg Plate (4)		H-17837-2	Voltage Program Jumper Cable
22	A-18249-3	Cable & Interlock Switch Assy.		H-20599-1.1	WPC '95 Cabinet Cable
23	09-61000-1	Coin Door-U.S.A.		H-19601-1	Power Extension Cable
24	01-11408	Plate Spacer (2)		H-20856	Cabinet Switch/Lamp Cable

* See Power Interface/Cordset Application Chart on page 2-33.

Part Number	Designator	Description	Part Number	Designator	Description
4004-01005-06	-	Mach. Screw, 4-40 x 3/8"	5048-13418-00	C4 - C6	Cap., .047m, 50v, 5% Ax.
4404-01119-00	-	Nut 4-40 ESN	5048-13609-00	C9, C12, C15	Cap., 3900pf, 50v, 5% Ax.
5010-08774-00	R2, R17, R22, R23, R35, R36, R40, R42, R87	Resistor, 22KΩ, ¼w, 5%	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
5010-08991-00	R20, R46-R48, R50, R72, R76, R77, R81, R107	Resistor, 4.7KΩ, ¼w, 5%	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
5010-09034-00	R21	Resistor, 10KΩ, ¼w, 5%	5075-12824-00	D3, D5	Zener, 1N4742A 12v, 1w
5010-09036-00	R19	Resistor, 100Ω, ¼w, 5%	5075-12826-00	D2	Zener, 1N4759, 62v, 1w
5010-09134-00	R32-R34	Resistor, 150KΩ, ¼w, 5%	5160-08938-00	Q13-Q15	Transistor, 2N4401 NPN
5010-09219-00	R1, R3	Resistor, 8.2KΩ, ¼w, 5%	5164-09056-00	Q2, Q3	Transistor, MPSD02 NPN
5010-09416-00	R73, R74, R82, R88, R105, R106	Resistor, 470Ω, ¼w, 5%	5164-12154-00	Q1, Q7	Transistor, MJE15030 NPN
			5194-09055-00	Q4, Q5	Transistor, MPSD52 PNP
5010-09807-00	R30, R31, R67-R69, R102	Resistor, 120Ω, ¼w, 5%	5194-12155-00	Q6	Transistor, MJE15031 PNP
			5250-13302-00	U7	Reg. 78L05T 5v
5010-10171-00	R24	Resistor, 56Ω, ¼w, 5%	5250-13303-00	U8	Reg. 79L05T 5v
5010-10258-00	R86	Resistor, 1MΩ, ¼w, 5%	5311-12538-00	U4	IC 74HC14 Hex. S-T
5010-10983-00	R53, R75, R79, R84, R85, R89, R90	Resistor, 1.8KΩ, ¼w, 5%	5317-12211-00	U12-U14	IC Octal Buffer 74ALS541
			5340-12278-00	U25	S/Ram 2064 150NS
5010-12832-00	R25, R26, R27, R29	Resistor, 47KΩ, ¼w, 5%	5370-12687-00	U27	IC MC 340640Reset Chp
5010-13215-00	R78, R97-R101	Resistor, 200KΩ, ¼w, 5%	5349-14351-00	U9-U11	SRAm 8Kx8-35ms, 28pdlp
5010-13372-00	R91-R96, R103, R104	Resistor, 220Ω, 1/8w, 5%	5370-12730-00	U1, U2	IC Op Amp TL084
5010-13420-00	R37, R41	Resistor, 680Ω, ¼w, 5%	5370-13419-00	U5, U6	IC TDA 2030AV 18w, Audio Amp
5010-13517-00	R38, R39	Resistor, 15Ω, ¼w, 5%	5371-13299-00	U3	IC Ad-1851 16bit mono
5010-13607-00	R4, R5, R7-R15	Resistor, 6.19KΩ, 1/8w, 1%	5520-14561-00	X2	Crystal 20mHz, parallel 20pf
5012-14558-00	R44	Resistor, 1.8KΩ, 5w vertical	5671-14516-00	LED 501	Led-Display Red T 1-3/4
5012-14559-00	R43	Resistor, 4.7KΩ, 5w vertical	5700-08985-00	U24	Socket IC 40-pin .6
5012-14560-00	R28	Resistor, 120Ω, 5w vertical	5700-12047-00	U22	Socket IC 24.3P
5013-13661-00	R16	Resistor, 9.09KΩ, ¼w, 1%	5700-12088-00	S2-S7	Socket Dip 32.6P"
5013-14456-00	R6, R18	Resistor, 3.32KΩ, ¼w, 1%	5705-12638-00	U5, U6	Heatsink 5298B
5040-14569-00	C35	Cap., 100mf, 25v, Axial	5705-14562-00	Q1, Q6, Q7	Heatsink 10-220 wave sol 287
5040-09365-00	C38, C39, C43, C44	Cap., 1m, 63v(+50,-10%)Ax.	5733-14528-00	F501, F502, F601, F602	Fuse Holder 5x20mm 10A.
5040-12750-00	C48, C52, C73	Cap., 22m, 35v Radial	5731-14532-00	F501, F502	Fuse 5x20mm T2.5A., 250V
5040-13098-00	C18, C67, C68	Cap., 4.7µ, 35v (±20%)	5731-14840-00	F601, F602	Fuse 5x20mm T0.315A., 250V
5040-15413-00	C36, C37	Cap., 10000µf, 35v, 25mm	5791-10850-00	J602	Connector, 26-pin Header Str.
5040-14564-00	C28, C42	Cap., 150µf, 160v, 20%Rad.	5791-10862-04	J504, J505	Connector, 4-pin Header Str.
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.	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.
5048-10992-00	C27	Cap., .0047m, 50v, 10% Ax.	5791-13830-10	J607	Connector, 10-pin Str. Sq.
5048-11028-00	C77	Cap., 22p, 50v, Axial	5010-09534-00	W0, W1, W12-W17, R49	Resistor, 0Ω, 0w
5048-11029-00	C25	Cap., 100p, 50v, 5% Axial	A-5343-50062-S2	S2	ROM Assembly
5048-11030-00	C7	Cap., 470p, 50v, Axial	A-5343-50062-S3	S3	ROM Assembly
5048-11033-00	C1	Cap., .022m, 50v, 10% Ax.	A-5343-50062-S4	S4	ROM Assembly
5048-12036-00	C40, C41	Cap., .22m, 50v, Axial	A-5343-50062-S5	S5	ROM Assembly
5048-13172-00	C78	Cap., 47pf, 50v, 20% Ax.	A-5343-50062-S6	S6	ROM 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 4 Quad Low Gate Current
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-21377-50062
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 40PI N .6
5700-12424-00	U9	socket 84 PI 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-5400-50062-1	G10	PIC16C57 Assembly
A-5343-50062-1	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
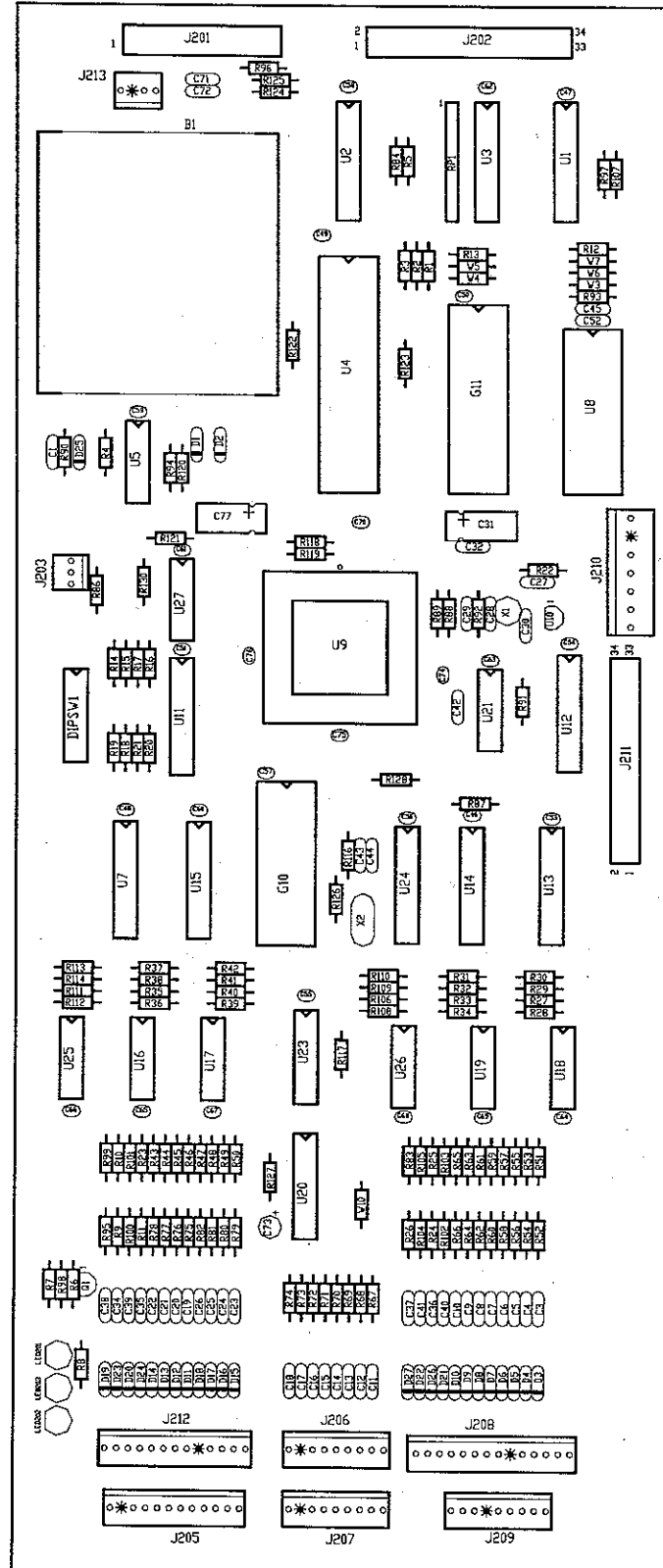
A-18617-1
Trough IR LED PCB Assembly
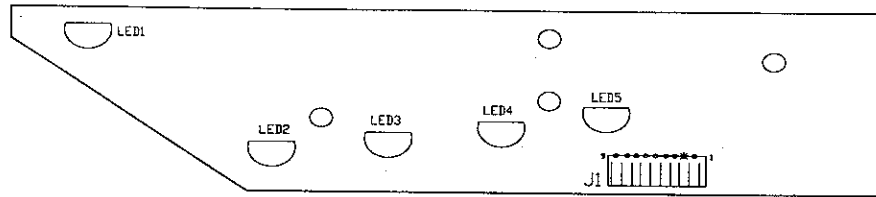
Part Number	Description	Description
5671-12731-00	LED1 - LED	Infra Red Diode
5791-12622-09	J1	Connector, 9-pin Header Sq.

A-18618-1
Trough IR Photo Transistor PCB Assembly
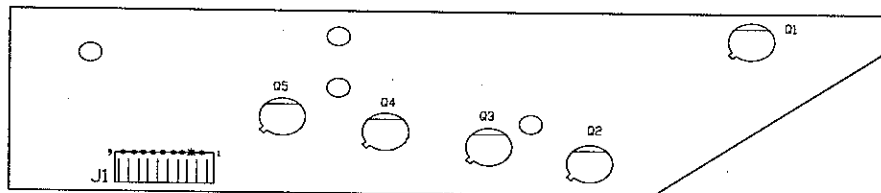
Part Number	Description	Description
5163-14114-00	Q1 – Q5	Infra Red Photo Transistor
5791-12622-09	J1	Connector, 9-pin Header Sq.

A-20036
Magic Eddy Coil PCB Assembly
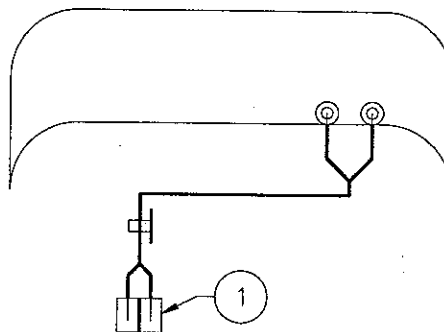
Item	Part Number	Description
1	H-19236	Dozer Eddy Coil Cable

A-20580
Coin Interface PCB Assembly
(This board does not contain optional items such as the coin counter and printer interface.)
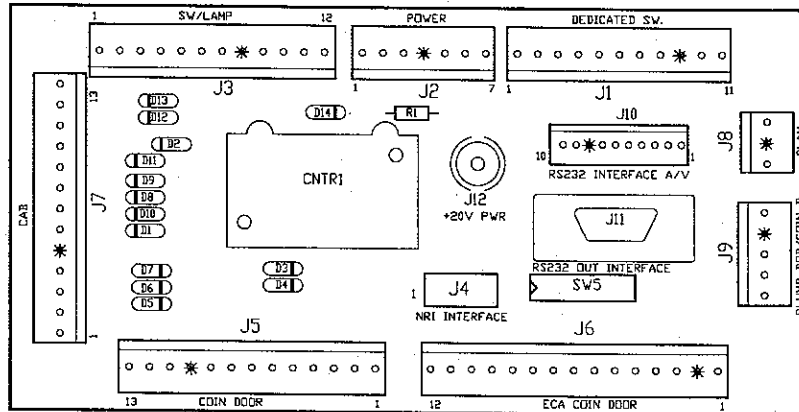
Part Number	Designator	Description
5070-09054-00	D1-D14	Diode 1N4004 1.0A.
5791-10862-11	J1	Connector, 11-pin Header Str. Sq.
5791-10862-07	J2	Connector, 7-pin Header Str. Sq.
5791-10862-12	J3	Connector, 12-pin Header Str. Sq.
5791-11000-10	J4	Connector, 10-pin Header Str. Sq.
5791-10862-13	J5, J7	Connector, 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
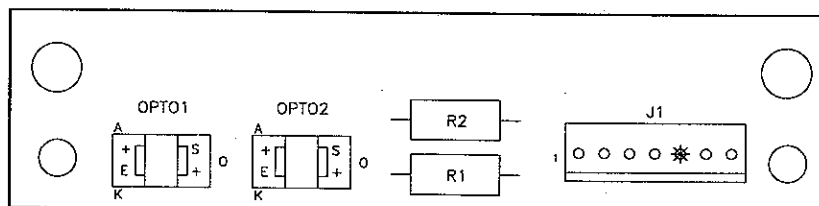
Part Number	Designator	Description
A-20207.1	-	Flipper Opto Switch PCB
5010-09061-00	R1, R2	Resistor, 680Ω, 1/2w, 5%
5490-14575-00	OPTO1, OPTO2	IC Opto Integ Schmitt 10mA.
5791-13830-07	J1	Connector, 7-pin Header Solid Sq.
03-9001.1	-	Interrupter Flip-Opto
01-14348	-	Spring Flipper Switch

A-22149-2
Auto Adjust Eddy Sensor PCB
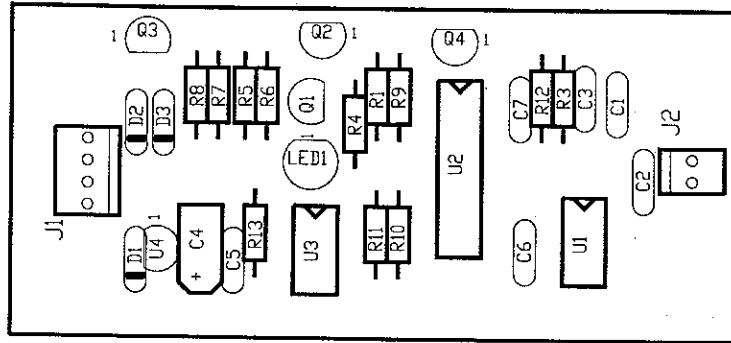
Part Number	Designator	Description
5048-12036-00	C3	Capacitor, .22m, 50v, Axial
5010-09999-00	R5, R6, R8, R10	Resistor, 2KΩ, 1/4w, 5%
5010-08992-00	R4, R12	Resistor, 560Ω, 1/4w, 5%
5010-09034-00	R7, R11	Resistor, 10KΩ, 1/4w, 5%
5010-09807-00	R3	Resistor, 120Ω, 1/4w, 5%
5010-09534-00	R1	Resistor, 0Ω
5010-09160-00	R13	Resistor, 220Ω, 1/4w, 5%
5041-09031-00	C4	Capacitor, 1M, 25v, ±20% Axial
5048-13611-00	C1	Capacitor, 680pf, 50v, ±15% Axial
5048-12506-00	C2	Capacitor, 820pf Axial
5043-08996-00	C5-C7	Capacitor, 0.1m, 50v, ±20% Axial
5070-08919-00	D1-D3	Diode 1N4148 150ma
5160-10269-00	Q1, Q3, Q4	Trans 2N3904 NPN
5190-10270-00	Q2	Trans 2N3906
5250-13302-00	U4	Reg. 78l05t 5v
5370-13452-00	U1	IC TDA0161 Prox Sensor
04-11001	U3	IC Auto Adjust Eddy Controller
5432-15411-00	U2	IC Dual E2POT X9221W
5671-13732-00	LED1	Led Dspl Red
5791-13830-02	J2	Connector, 2-pin Header Str Sq.
5791-13830-04	J1	Connector, 4-pin Header Str Sq.
5700-09329-00	U3	Socket Dip 8 pin

A-15680
Bidirectional Motor Drive Assembly
(See PCB illustration on page 2-13.)

Part Number	Designator	Description
5162-12635-00	Q1, Q3, Q5	Trans., TIP 102
5192-12428-00	Q2, Q4	Trans., TIP 107
5370-12272-00	U1	ICLM339 Quad Comp
5551-09822-00	L1, L2	Ind., 4.7µH 3A
5791-12273-04	J2	Connector, 4-pin Header STR LCK .156
5791-12273-05	J1	Connector, 4-pin Header STR LCK .156
5070-09054-00	D1-D9	Diode 1N4004 1.0A.
5043-08996-00	C2	Capacitor, 0.1µF (±20%)
5040-10974-00	C1	Capacitor, 100µF, 35v (+80, -20%)
5043-08980-00	C3-C5	Capacitor, 0.01µF, 50v (±20%)
5010-09085-00	R2, R3, R9	Resistor, 1.5KΩ, 1/4w, 5%
5010-09034-00	R4, R5	Resistor, 10KΩ, 1/4w, 5%
5010-08991-00	R7, R8, R10, R11	Resistor, 4.7KΩ, 1/4w, 5%
5010-08991-00	R1, R6	Resistor, 680Ω, 1/2w, 5%
5671-13732-00	LED1	Display LED Red

A-15595
7-Switch Opto PCB Assembly w/Bracket
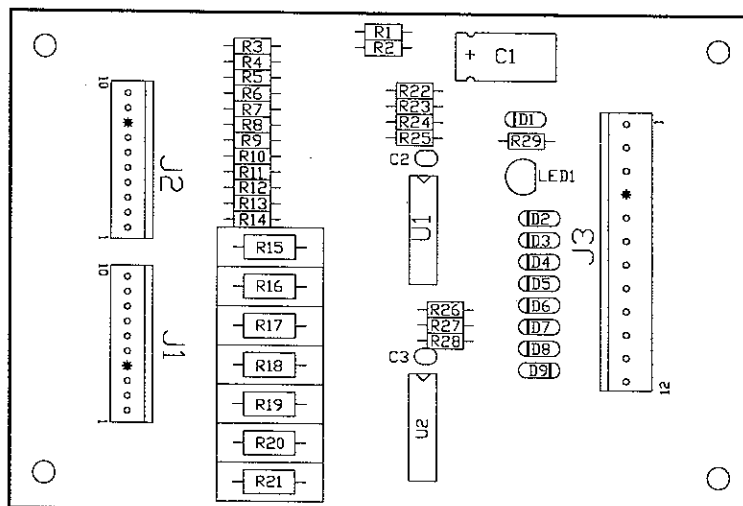
Part Number	Designator	Description
A-15576.1	-	7-Opto PCB Assembly
5040-12298-00	C1	Capacitor, 100M, 40v (±50%)
5043-08996-00	C2, C3	Capacitor, 0.01µ, 50v
5671-14516-00	LED1	Display LED Red
5370-12272-00	U1, U2	ICLM339 Quad
5070-09054-00	D1 - D9	Diode 1N4004 1.0A.
5010-12928-00	R15 - R21	Resistor, 270Ω, 2w, 5%
5010-09999-00	R1 - R14, R29	Resistor, 2KΩ, 1/4w, 5%
5010-09162-00	R23, R25, R26	Resistor, 100KΩ, 1/4w, 5%
5010-08774-00	R22, R24, R28	Resistor, 22KΩ, 1/4w, 5%
5791-10862-12	J3	Connector, 12-pin Header Sq.
5791-13830-10	J1, J2	Connector, 10-pin Header Sq.
01-10756	-	PCB Mounting Bracket
07-6688-18N	-	Rivet: 1/8 x 3/16"

A-15680
Bidirectional Motor Drive Assembly
(See PCB parts listing on page 2-12.)

A-15849-L
Flipper Assembly

Item	Part Number	Description	Item	Part Number	Description
1	B-13104-L	Flipper Base Assembly, Left	*18	A-15848-L	Crank Link Assembly, Left
2	SW-1A-194	Switch Assembly	a)	A-17050-L	Flipper Crank Assembly, Left
3	4701-00002-00	Lock Washer #6 Split	b)	A-15847	Flipper Link Assembly
4	4105-01019-10	Sh. Metal Screw, #5 x 5/8"	c)	02-4676	Link Spacer Bushing
5	4008-01079-05	Mach. Screw, 8-32 x 5/16"	d)	4010-01086-14	Cap Screw, 10-32 x 7/8"
6	4701-00003-00	Lock Washer #8 Split	e)	4700-00023-00	Flat Washer, 5/8 x 13/64 x 16ga.
7	01-9375	Switch Mounting Bracket	f)	4701-00004-00	Lock Washer #10 Split
8	20-6516	Speednut, Tinnerman	g)	4410-01132-00	Nut 10-32 ESN
9	4010-01066-06	Cap Screw, 10-32 x 3/8"	19	23-6577	Bumper Plug, 5/8"
10	4701-00004-00	Lock Washer #10 Split	20	03-7568	Flipper Bushing
11	A-12390	Flipper Stop Assembly	21	03-7066-5	Coil Tubing
12	FL-11630	Flipper Coil, Red			
13	01-7695-1	Solenoid Bracket			
14	4006-01017-04	Mach. Screw, 6-32 x 1/4"		**Associated Parts: (Not Shown)**	
15	10-364	Spring			
16	4006-01005-06	Mach. Screw, 6-32 x 3/8"		23-6695	Flipper Ring
17	4406-01117-00	Nut 6-32 Hex.		20-10110-5	Flipper Bat w/Shaft

* See page 2-15 for assembly detail drawing.

A-14876-R
Flipper Assembly

Item	Part Number	Description
16	4006-01005-06	Mach. Screw, 6-32 x 3/8"
17	4406-01117-00	Nut 6-32 Hex.
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	Mach. Screw, 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

Item	Part Number	Description
1	A-14877-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-11630	Flipper Coil, Red
13	01-7695-1	Solenoid Bracket
14	4006-01017-04	Mach. Screw, 6-32 x 1/4"
15	10-364	Spring

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
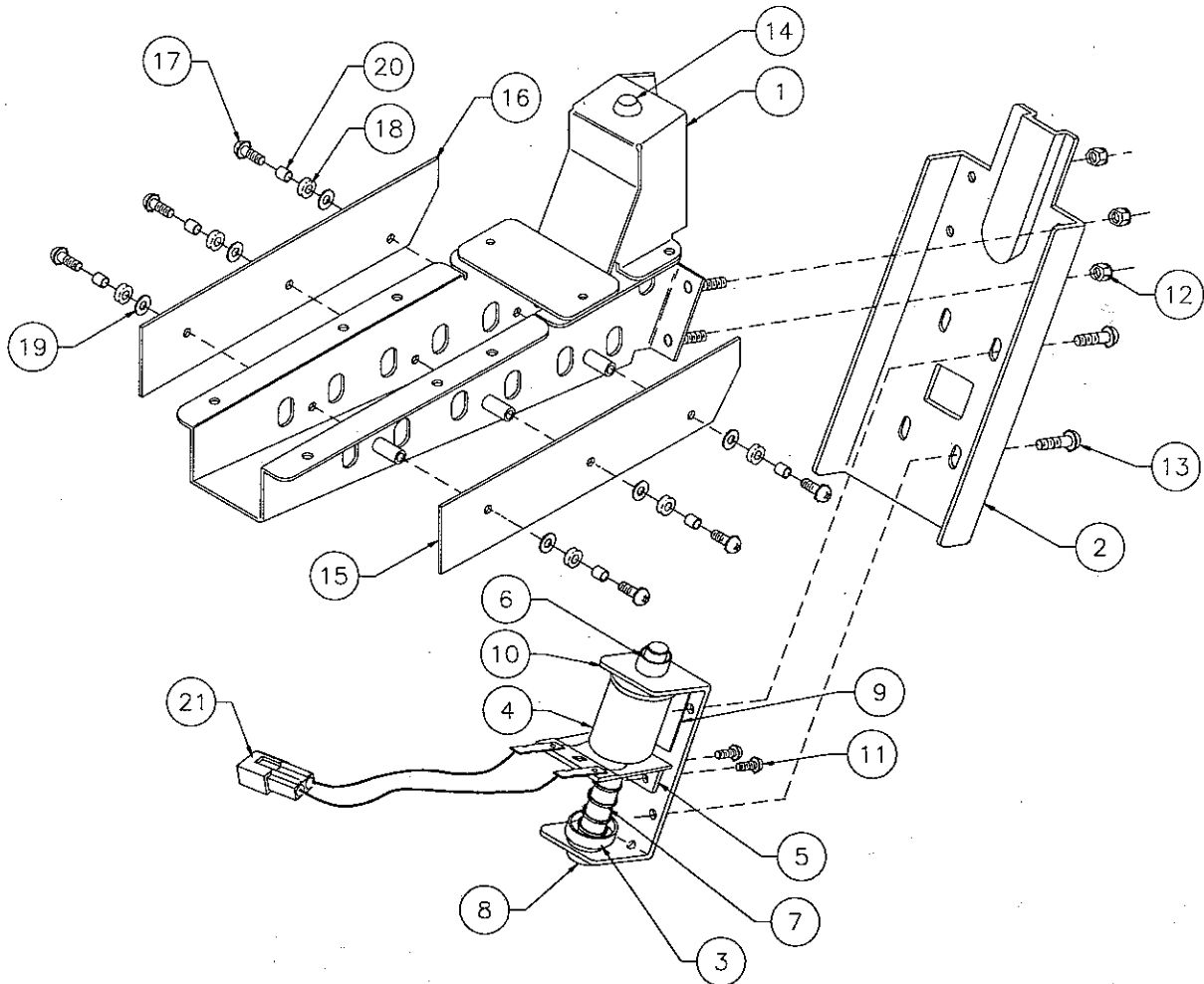
Item	Part Number	Description	Item	Part Number	Description
1	A-16809-2	Ball Trough Welded Assy.	12	4408-01119-00	Nut 8-32 ESN
2	01-11587	Ball Trough Front	13	4008-01017-06	Mach. Screw, 8-32 x 3/8"
3	A-6306-2	Bell Armature Assembly	14	23-6702	Bumper Plug
4	AE-26-1500	Coil Assembly	15	A-18617-1	Trough IRED 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-21527
Slingshot Assembly
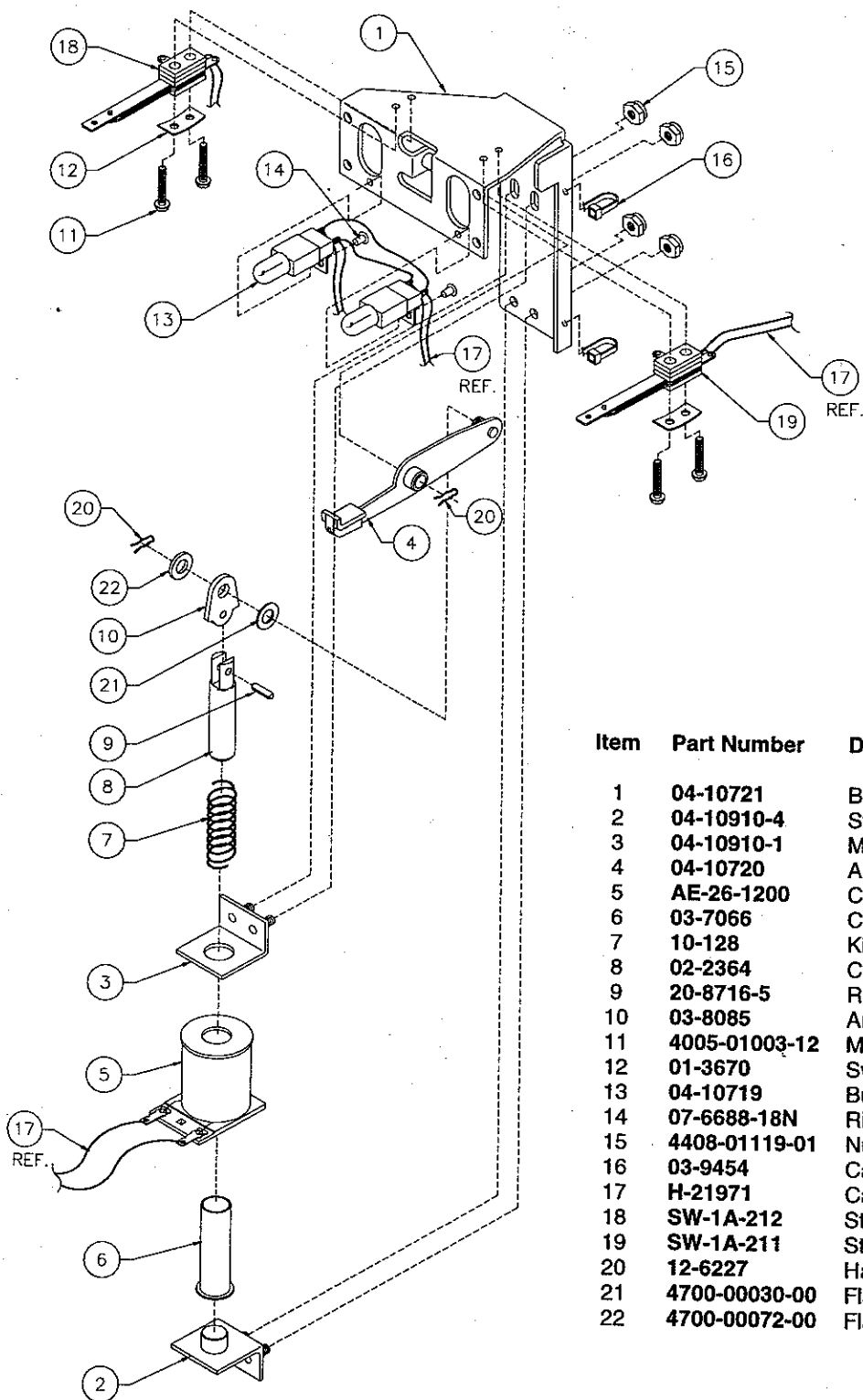
Item	Part Number	Description
1	04-10721	Bracket Slingshot
2	04-10910-4	Stop Bracket Assembly
3	04-10910-1	Mounting Bracket
4	04-10720	Arm Slingshot
5	AE-26-1200	Coil Sub-Assembly
6	03-7066	Coil Tubing
7	10-128	Kicker Spring
8	02-2364	Coil Plunger
9	20-8716-5	Roll Pin: 1/8 x 7/16" Long
10	03-8085	Armature Link
11	4005-01003-12	Mach. Screw, #5-40 x ¾" (4)
12	01-3670	Switch Plate (2)
13	04-10719	Bulb & Socket Assembly 92
14	07-6688-18N	Rivet: 1/8 x 3/16" Long (2)
15	4408-01119-01	Nut #8-32 ESN (4)
16	03-9454	Cable Tie 4" (2)
17	H-21971	Cable Assembly
18	SW-1A-212	Standup Switch w/Diode
19	SW-1A-211	Standup Switch
20	12-6227	Hairpin Clip (2)
21	4700-00030-00	Flat Washer: 17/64 x ½ x 15ga.
22	4700-00072-00	Flat Washer: 17/64 x ½ x 21ga.

A-21565-5
Jet Bumper Assembly
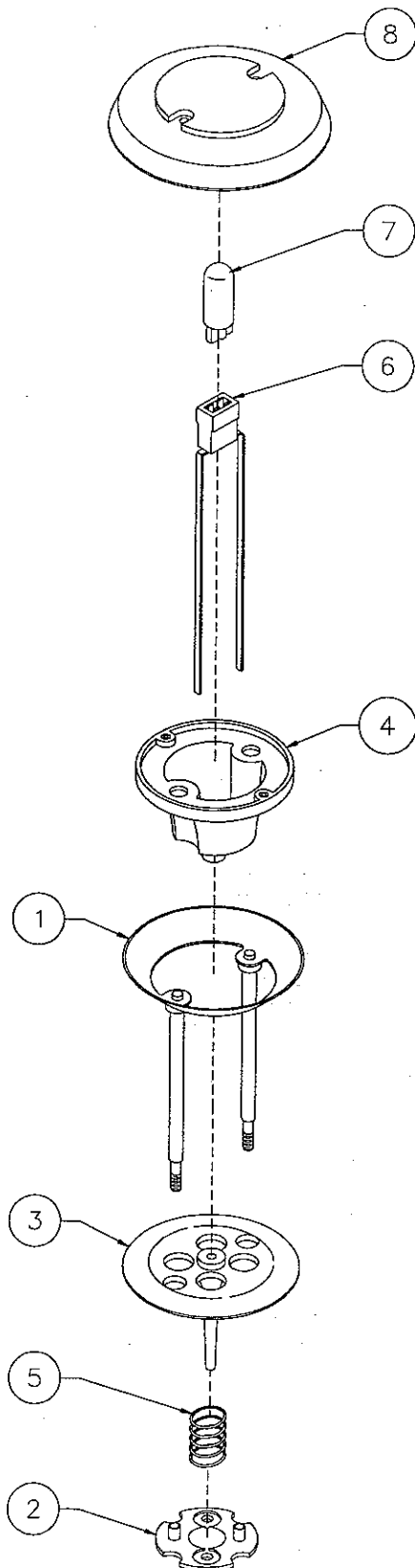
Item	Part Number	Description
1	A-4754	Bumper Ring Assembly
2	03-6009-A5	Bumper Base, White
3	03-6035-15	Bumper Wafer, Orange
4	03-9675	Bumper Body
5	10-7	Spring
6	24-8776	Socket-Wedge Base
7	24-8768	Bulb #555(6.5v., 0.25A.)

Associated Parts:

8	03-9676-12	Jet Bumper Cap (2)

A-9415-2
Jet Bumper Coil Assembly
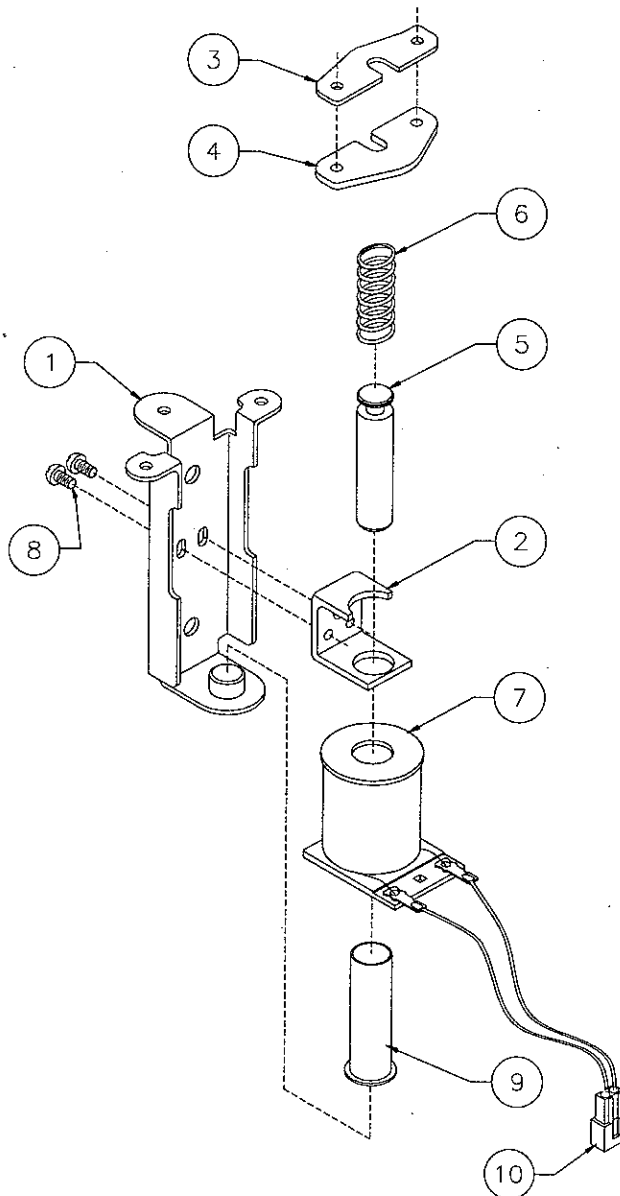
Item	Part Number	Description
1	04-10888	Bracket & Stop Assembly
2	01-1747	Coil Retaining Bracket
3	01-5492	Armature Link, Steel
4	01-5493	Armature Link, Bakeline
5	02-3406-1	Coil Plunger
6	10-326	Armature Spring
7	AE-26-1200	Coil Assembly
8	4006-01017-04	Mach. Screw, 6-32 x 1/4"
9	03-7066	Coil Tubing
10	H-19523	Cable

Associated Parts: (Not Shown)

Item	Part Number	Description
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-22035
Diverter Assembly
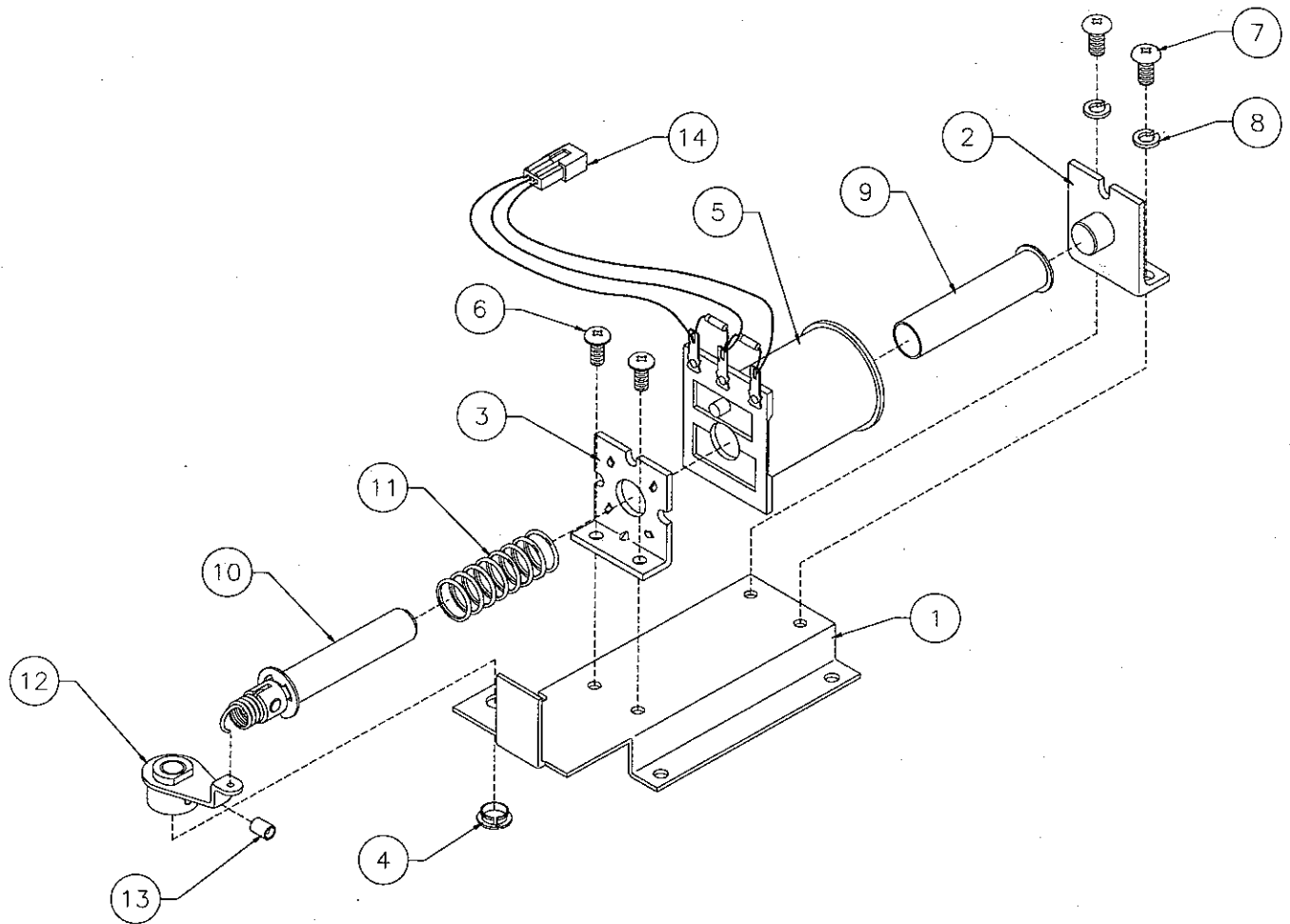
Item	Part Number	Description
1	04-10306	Diverter Bracket
2	04-10994	Diverter Stop Bracket Assembly
3	01-7695-1	Solenoid Bracket
4	20-8790	Nyliner
5	FL-11753-50V	Coil Assembly
6	4008-01003-06	Mach. Screw: 8-32 x 3/8"
7	4010-01008-06	Mach. Screw: 10-32 x 3/8"
8	4701-00004-00	Lock Washer #10 Split
9	03-7066-5	Coil Tubing
10	A-16636	Diverter Plunger Assembly
11	10-303	Spring
12	A-14185	Driver Arm Assembly
13	4010-01169-04	Set Screw: 10-32 x ¼"
14	H-21008-1	Mini Diverter Cable (3-pin)

Associated Assembly: (Not Shown)
   A-21752   Diverter Ball Guide Assembly

A-21829
Eject Assembly
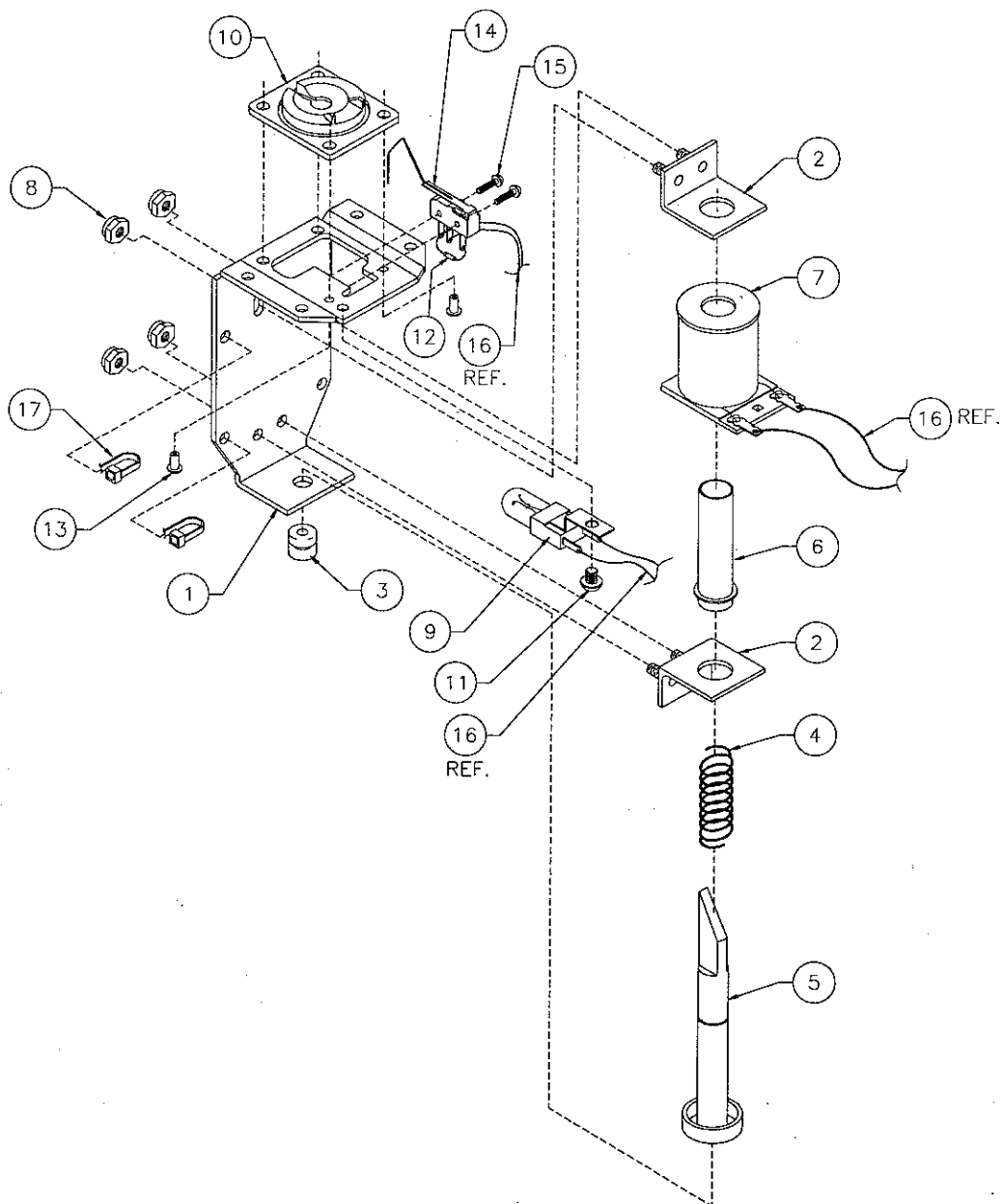
Item	Part Number	Description		Item	Part Number	Description
1	01-14704	Eject Assembly		10	03-9101-9	Eject Shield (Red)
2	04-10910-1	5/8 Coil Centering Bracket		11	4008-01003-03	Mach. Screw #8-32 x 3/16"
3	23-6420	Rubber Grommet		12	5070-09054-00	Diode 1N4004
4	10-135	Spring		13	07-6688-20	Rivet 1/8 x ¼ Nickel
5	04-10932	Eject Plunger Assembly		14	5647-12693-66	Switch
6	03-7067-5	Coil Tubing		15	4002-01105-06	Mach. Screw, #2-56 x 3/8"
7	AE-27-1200	Coil (White)		16	H-21974	Cable
8	4408-01119-01	Nut #8-32 ESN		17	03-9454	Cable Tie 4"
9	A-17826	Bulb & Socket Assembly				

A-17932
Disappearing Post Assembly
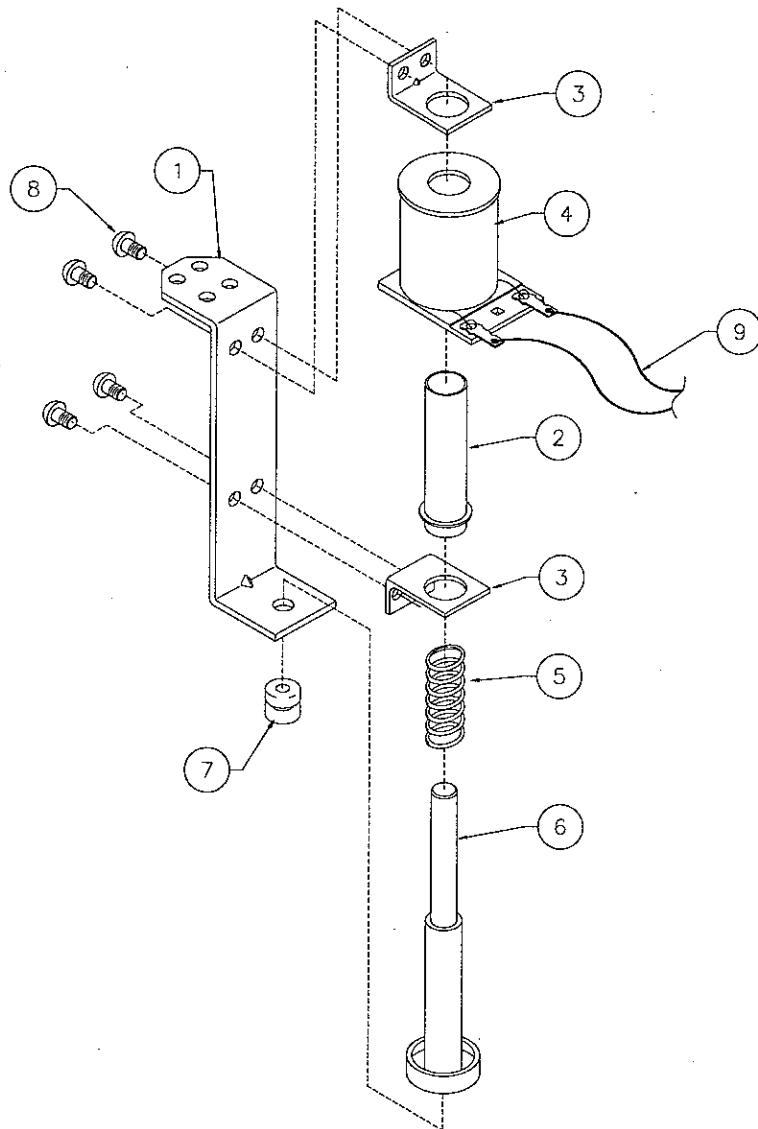
Item	Part Number	Description
1	01-12441	Diverter Post Bracket
2	03-7067-5	Coil Tubing
3	01-8-508-T	Coil Retainer Bracket
4	AE-27-1200	Coil Sub-Assembly
5	10-135	Spring
6	A-17986	Bell Armature Assembly
7	23-6420	Rubber Grommet
8	4008-01017-04	Mach. Screw: 8/32 x ¼"
9	H-19523-1	Mini Solenoid Cable (3 Pin)

B-11873
Bottom Arch Kicker Assembly
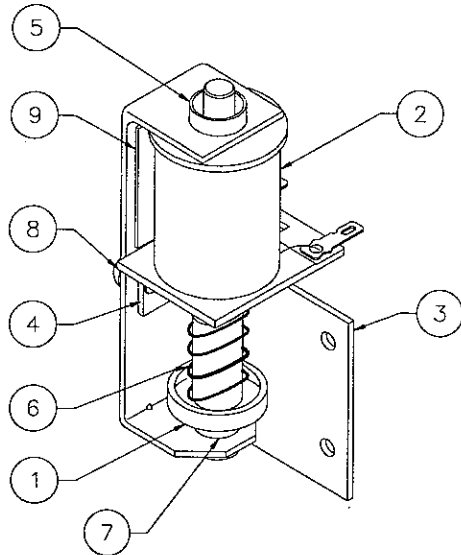
Item	Part Number	Description
1	A-6306-2	Bell Armature Assembly
2	AE-23-800	Coil Sub-Assembly
3	01-11273	Mounting Bracket
4	01-8-508-T	Solenoid Bracket
5	03-7067-5	Coil Tubing
6	10-135	Solenoid Spring
7	23-6420	Rubber Grommet
8	4008-01017-04	Mach. Screw, 8-32 x 1/4"
9	03-8523	Insulator

A-21825
Up/Down Post Assembly
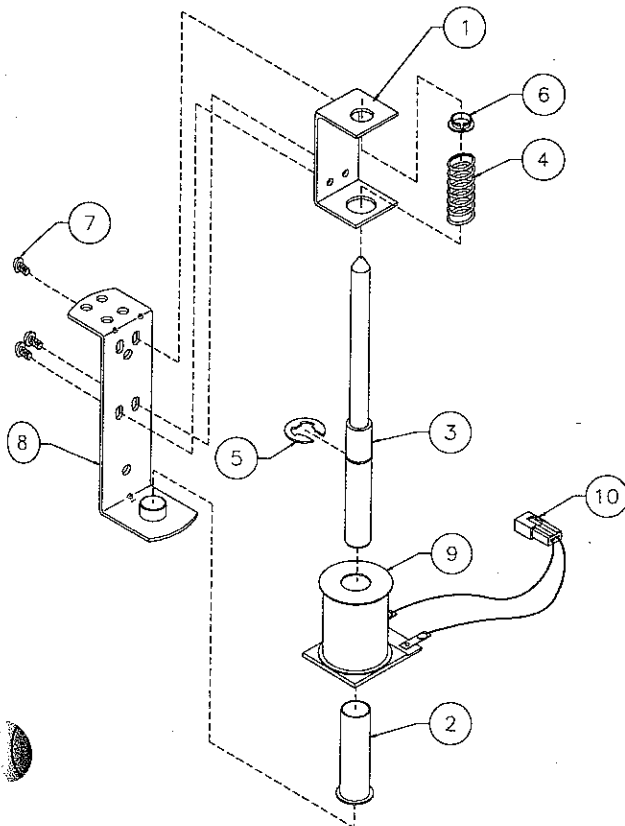
Item	Part Number	Description
1	01-14185	Coil Bracket
2	03-7066	Coil Tubing
3	02-5308.1	Up/Down Plunger
4	10-303	Spring
5	20-8712-43	"E" Retaining Ring
6	20-8790-2	Nyliner Bearing
7	4006-01003-04	Mach. Screw, #6-32 x ¼"
8	A-17808	Bracket & Stop Assembly
9	AE-26-1500	Coil Assembly
10	H-19523	Cable Assembly

A-21824
Ball PopperAssembly
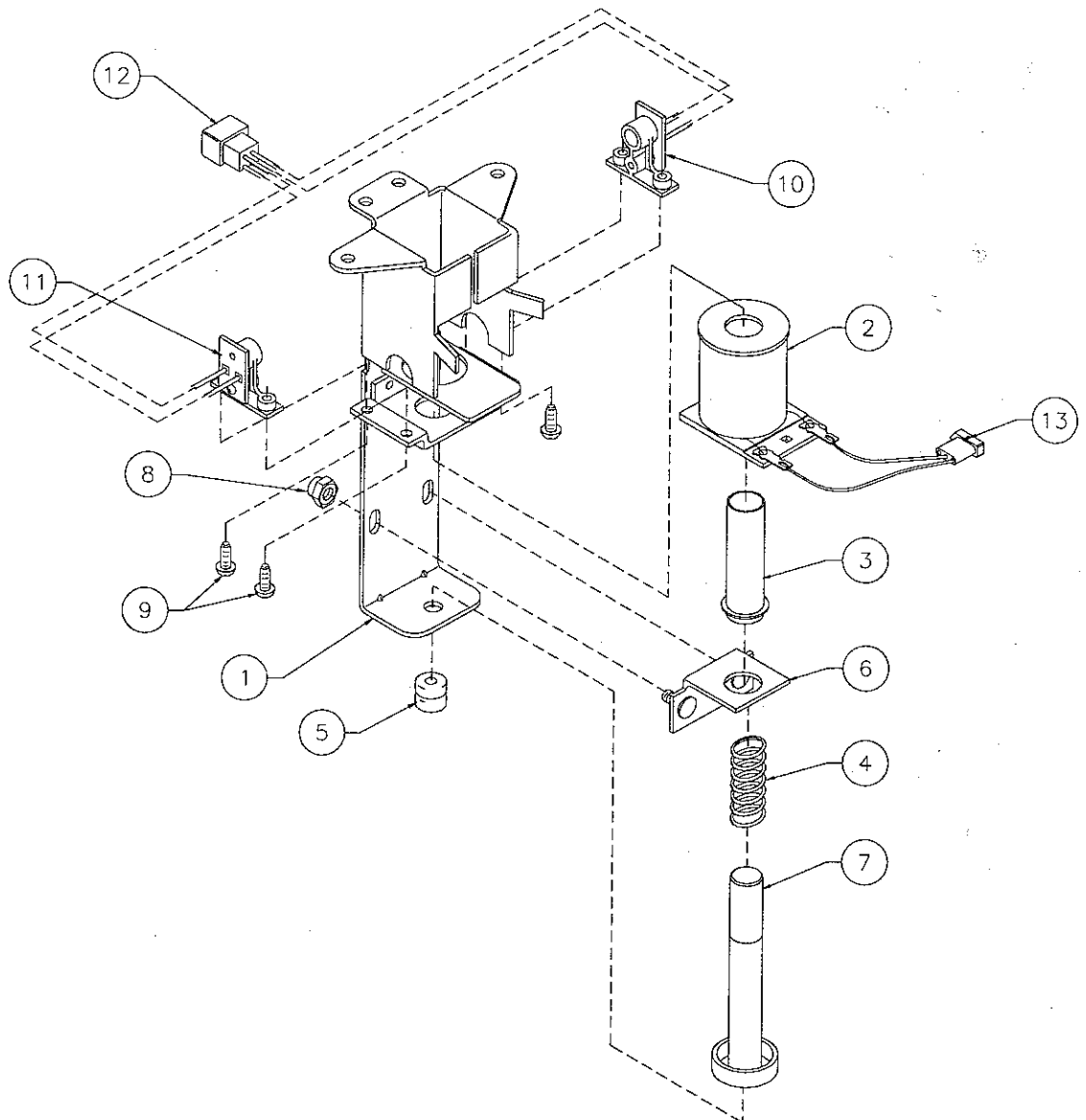
Item	Part Number	Description
1	04-10930.1	Ball Popper Bracket
2	AL-25-1000	Coil Assembly
3	03-7067	Coil Tubing
4	10-135	Solenoid Spring
5	23-6420	Rubber Grommet
6	04-10910-1	Mounting Bracket
7	A-17767	Bell Armature Assembly
8	4408-01119-01	Nut #8-32 ESN
9	4106-01013-06	Sh. Metal Screw: #6 x 3/8"
10	A-16908	LED Assembly – RTV
11	A-16909	Photo Transistor Assy., RTV
12	H-17609-5	Cable – Gen. Opto
13	H-19523	Cable – Mini Solenoid

A-21022
Shooter Lane Kicker Assembly
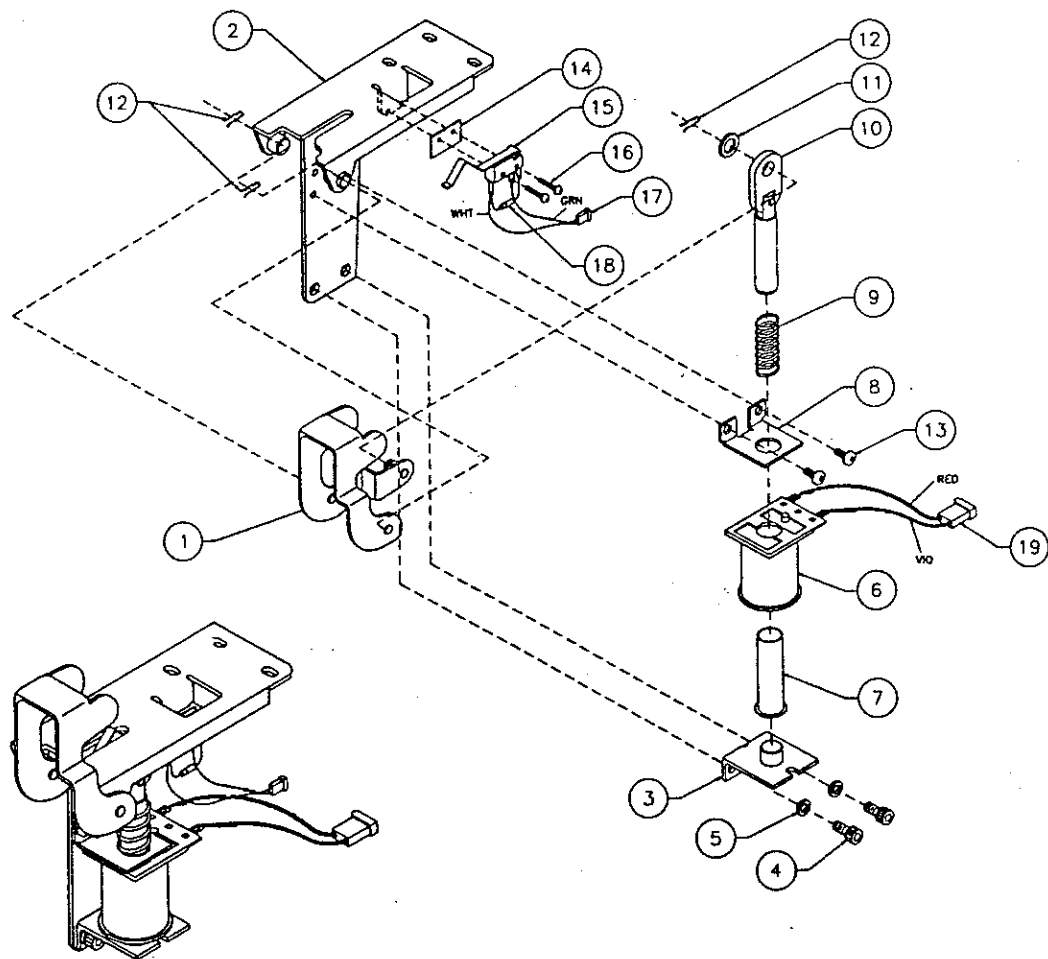
Item	Part Number	Description
1	04-10210.4	Kicker Crank
2	04-10211.5	Coil Mounting Bracket
3	04-10461	Flipper Stop Bracket Assembly
4	4010-01066-06	Cap Screw, #10 x 3/8"
5	4701-00004-00	Lock Washer #10 Split
6	AE-23-800	Coil Assembly
7	03-7066	Coil Tubing
8	01-8413	Coil Mounting Bracket
9	10-128	Spring
10	A-15847	Flipper Link Assembly
11	4700-00104-00	Flat Washer, 23/64 x ½ x 16ga.
12	12-6227	Hair Pin Clip
13	4006-01003-05	Mach. Screw, 6-32 x 5/16"
14	01-8600	Insulator
15	5647-12693-68	Mini-Micro Switch
16	4002-01105-08	Mach. Screw, 2-56 x ½"
17	H-16437	Cable
18	5070-09054-00	Diode
19	H-19523	Cable

A-21564
Disappear Jet Bump Assembly

Item	Part Number	Description
1	04-10732	Jet Bumper Main Bracket
2	04-10733	Armature Assembly
3	04-10911-1	¾ Coil Centering Bracket
4	FL-11630/50V	Flipper Coil (Red)
5	10-517	Spring
6	02-5297	Guide Shaft
7	4700-00023-00	Flat Washer: 13/64 x 5/8 x 16ga.
8	20-8712-18	Retaining Ring
9	4020-01196-16	Set Screw: #1/4-20 x 1.0
10	4420-01117-00	Hex Nut #1/4-20
11	4700-00005-00	Flat Washer: 9/64 x 7/16 x 21ga.
12	AE-23-800	Coil Assembly (Yellow)
13	04-10731.2	Jet Bumper Mounting Bracket
14	4008-01168-08	Mach. Screw #8-32 x ½"
15	4408-01119-01	Hex Nut #8-32 ESN
16	A-21554	Jet Bumper Lamp PCB Assy.
17	03-9674	Bumper Cap – Flat
18	4104-01042-06	Sh. Metal Screw: #4 x 3/8"
19	4006-01003-10	Mach. Screw: #6-32 x 5/8"
20	A-4754	Bumper Ring Assembly
21	03-9675	Bumper Body – Foremost
22	03-6035-15	Bumper Wafer (Orange)
23	03-6009-A5	Bumper Base (White)
24	10-7	Spring
25	23-6702	Bumper Plug
26	4406-01119-00	Hex Nut #6-32 ESN
27	SW-1A-213	Jet Bumper Switch Assembly
28	01-3670	Switch Plate
29	4005-01005-16	Mach. Screw: #5-40 x 1.0
30	H-21972.1	Cable Assembly
31	03-9454	Cable Tie 4" (Not Shown)
32	03-7067-6	Coil Tubing
33	4700-00007-00	Flat Washer: 5/320x 7/16 x 16ga.
34	03-7655-4	Harness Clip ¼"
35	10-96	Spring
36	A-6892	Frame & Eyelet Assembly
37	SM1-26-600	Coil Assembly
38	4008-01021-07	Mach. Screw: #8-32 x 7/16"
39	4701-00003-00	Lockwasher #8 Split
40	4700-00089-00	Flat Washer: 11/64 x 7/16 x 16ga.
41	01-12348	Ball Gate Coil Bracket
42	4006-01003-04	Mach. Screw: #6-32 x ¼"
43	A-15821	Armature Sub- Assembly
44	01-14677.2	Armature Latch Bracket
45	4410-01132-01	Nut #10-32 ESN
46	01-14678	Jet Bumper Bracket
47	23-6694-1	Rubber Ring 3/32" (Black)
48	02-5303	Jet Bumper Post
49	31-2835-9	Decal
50	04-10888	Jet Bump Bracket/Stop Assy.
51	01-1747	Coil Retainer Bracket
52	01-5492	Link Armature – Steel
53	01-5493	Link Armature – Bakelite
54	02-3406-1	Coil Plunger
55	10-326	Spring
56	03-7066	Coil Tubing
57	23-6626	Rubber Grommet
58	RM-23-01	Heat Shrink 1" Long
59	01-14803	Support Bracket

A-21564
Disappear Jet Bump Assembly
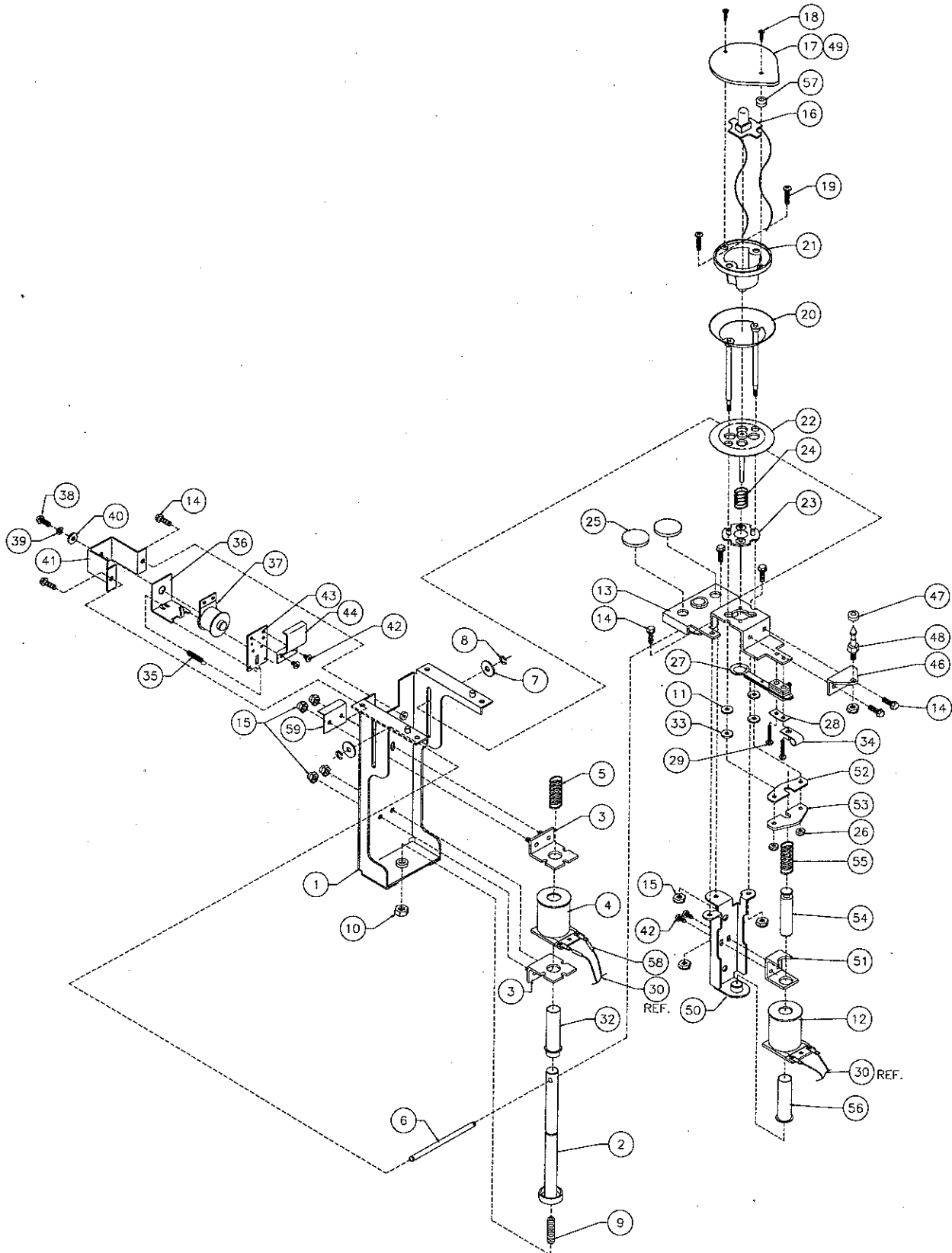
A-21953
Ring Master Assembly

Item	Part Number	Description
1	04-10938	Main Mounting Bracket
2	04-10940.1	Motor & Cam Bracket
3	14-8035	Motor
4	04-10937.1	Cam Assembly
5	01-14709	Shield Bracket
6	31-2952-1	Shield
7	4020-01196-16	Set Screw: #1/4-20 x 1.0
8	4420-01141-00	Nut #1/4-20 Flangrip
9	4008-01168-06	Mach. Screw: #8-32 x 3/8"
10	H-21975	Cable Assembly
11	4700-00080-00	Flat Washer: 5/16 x ¾ x 16ga.
12	4323-01158-06	Set Screw: #1/4-28 x 3/8"
13	07-6688-19N	Rivet: 1/8 x 7/32" Long
14	4700-00070-00	Flat Washer: 3/16 x 5/8 x 16ga.
15	5070-09054-00	Diode, 1N4004
16	5647-12693-01	Switch
17	03-9822	Switch Spacer
18	4002-01105-10	Mach. Screw: #2-56 x 5/8"
19	02-4576	Roller Cam
20	20-8712-37	Retaining Ring
21	H-21973	Cable Assembly
22	02-5313	Guide Lift Rod
23	20-8712-25	Retaining Ring
24	H-18601-10	Cable Assembly
25	01-14708.1	Lift Bracket
26	20-9610	Bearing - Flange
27	03-9821	Spacer Lift Rod
28	01-14707	Ball Cup Bracket
29	04-10939	Spring Assembly
30	4408-01119-01	Nut #8-32 ESN
31	A-15782	Motor Cir Bd w/Spacers
32	4008-01168-14	Mach. Screw: #8-32 x 7/8"
33	5792-09110-00	Connector
34	31-2833-13	Plastic Washer
35	01-14712	Bulb & Socket Bracket
36	07-6688-17N	Rivet: 1/8 x 5/32" Long
37	4700-00004-00	Flat Washer: 5/32 x 3/8 x 21ga.
38	A-17802	Socket & 906 Bulb Assembly
39	02-5312	Magnet Post
40	01-14710	Magnet Plate (Bottom)
41	20-10197	Magnet w/Breaker
42	01-5311	Magnet Core
43	31-2947.1	Ring Master
44	03-9454	Cable Tie 4"
45	03-7655-4	¼" Cable Clamp
46	4408-01128-00	Nut #8-32 KEPS
47	4008-01003-08	Mach. Screw: #8-32 x ½"
48	01-8240	Nut Plate #2-56
49	RM-23-01	Heat Shrink 1" Long

* Not available for individual sale. Order Decal Set 31-2833.

A-21953
Ring Master Assembly
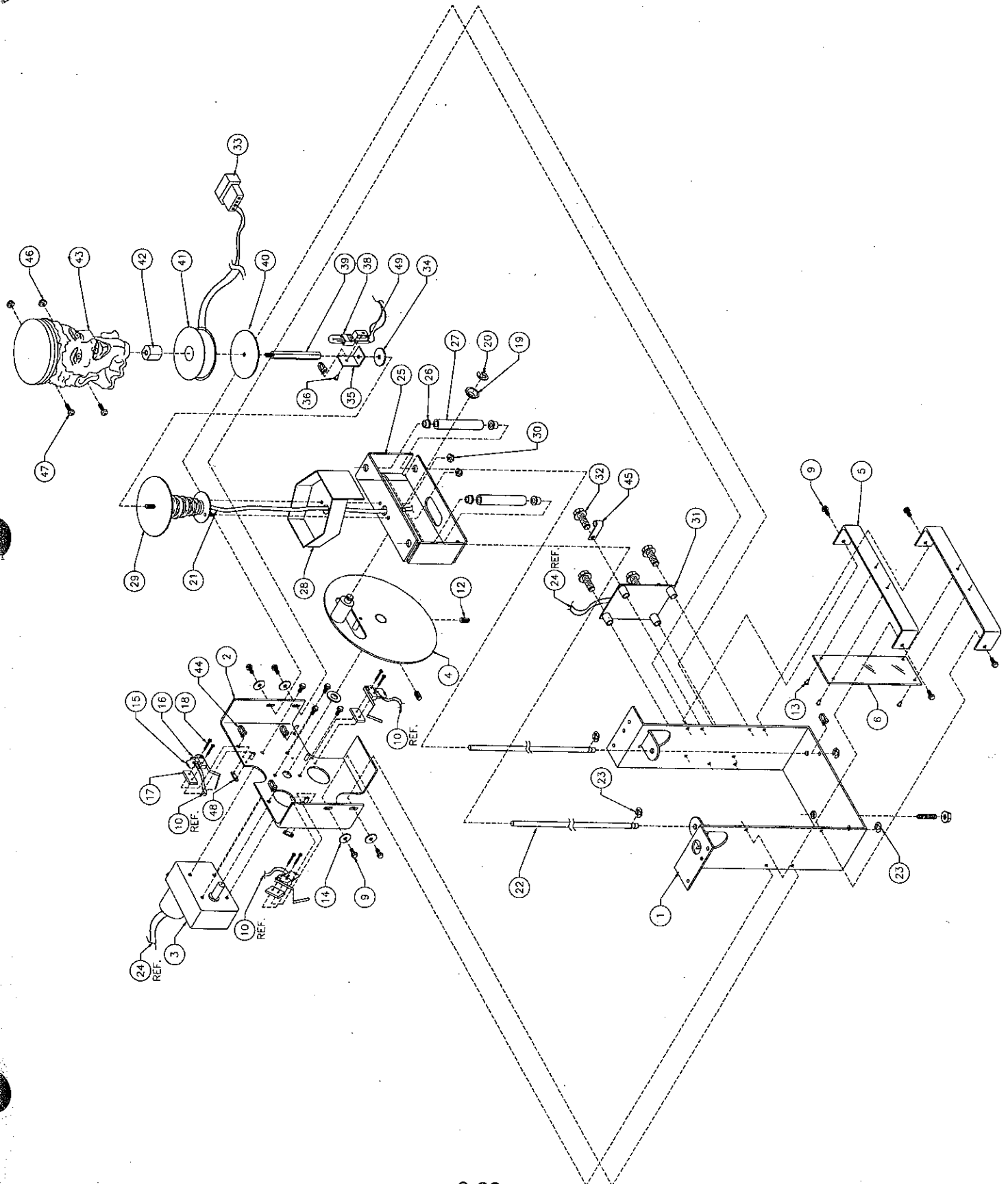
A-17730-1
Ball Shooter Rod Assembly w/Silver Knob
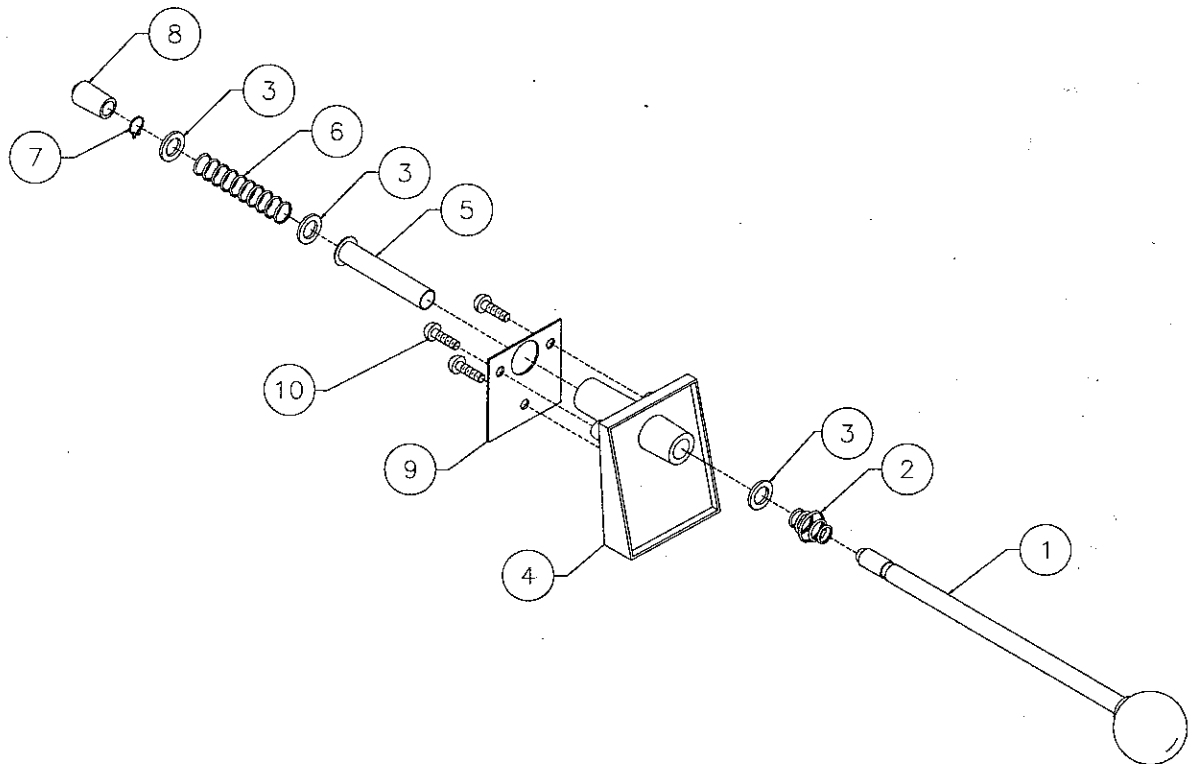
Item	Part Number	Description
1	20-9927-1	Ball Shooter Knob w/Shaft, Silver
2	10-149	Shooter Rod Spring
3	4700-00051-00	FW, 25/64 x 5/8 x 16ga.
4	21-6645-1	Shooter Housing
5	03-7357	Shooter Sleeve
6	10-148-4	Power Spring (Green)
7	20-8714-37	External Retainer Ring
8	23-6327	Ball Shooter Tip

Associated Assemblies:

9	01-3535	Rod Mounting Bracket
10	4010-01006-10	Mach. Screw: 10-32 x 5/8"

Posts

02-5243-1
Post #8-32/#9 SMS (12)

02-4425-1
Post #8-32/#8-32 (5)
02-4425-3
Post #8-32/#8-32 (3)

02-4678
Double Bumper Post (2)
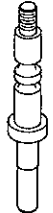
02-5250
Double Bumper 10-32 Post (1)

02-4660
Mini-Post Single Bumper (3)

02-4765-7
Mounting Post (1)
02-4765-12
Mounting Post (1)

02-5318-43
Extended M-M Post, 2.39" (1)
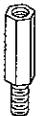
02-5295-12
¼ Hex Post-8M/8F, ¾" (2)
02-5295-18
¼ Hex Post-8M/8F, 1.13" (2)
02-5295-20
¼ Hex Post-8M/8F, 1.25" (1)
02-5295-36
¼ Hex Post-8M/8F, 2.25" (1)

02-5107
Adjusting Post (2)

03-8365-8
Post #8, Trans Amber (16)
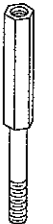
02-5317-21
Extended M-F Post, 1.31" (1)
02-5317-26
Extended M-F Post 1.63" (1)

03-8319-8
Post (22)

A-20871
Power Interface Assembly
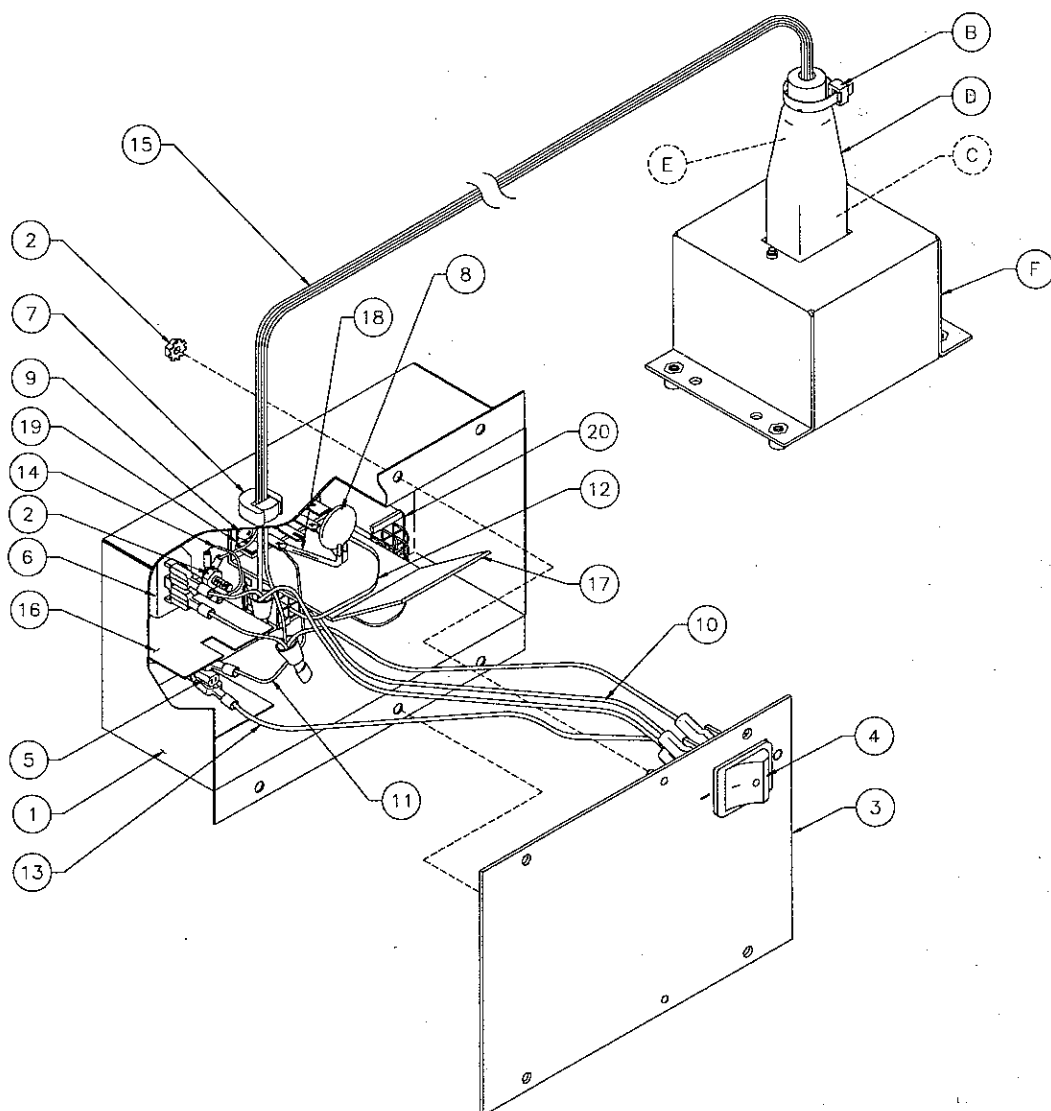
Item	Part Number	Description	Item	Part Number	Description
A	A-20872	Power Control Chassis Assembly	14)	H-17542	Ground Jumper Grn/Yel Cable
1)	04-10292	Power Control Chassis Box	15)	5797-13940-01	Jumper Cable
2)	4406-01128-00	Nut #6-32 KEPS (3)	16)	01-10623	Insulator, Thermistor
3)	01-12294	Switch Mounting Plate Assembly	17)	01-12299	Insulator, Terminal Strip
4)	5642-13935-00	Power Switch	18)	RM-21-06	#18 Vinyl Fgls
5)	5733-14734-00	Fuse Holder Panel (5x20mm)	19)	5822-13865-00	Terminal Strip 3-CKT 2-Mtg.
6)	5851-13867-00	Outlet-IEC Conn. 237 Socket	20)	H-18050	Jumper Cable, Transformer Prog
7)	03-8712	Strain Relief Bushing	B	03-7933	Ty-Wrap Nylon
8)	5016-12978-00	Thermistor 8A., 2.5R25	C	5045-14007-00	Capacitor, 1μF 275v
9)	4006-01003-10	Mach. Screw, #6-32 x 5/8"	D	23-6776-4	Heat Shrink
10)	H-17992	Jumper Cable Neutral Sw/1FC	E	RM-21-06	#18 Vinyl Sleeving
11)	H-17543	Hot Jumper Black Cable	F	A-20873	Line Filter Entry Chassis
12)	H-17546	Jumper Interface Hot Black Cable			
13)	H-17545	Jumper Switch/Fuse Black Cable			

Power Interface/Cordset Application Chart

COUNTRY	UNIVERSAL PWR. INTERFACE ASSEMBLY 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							

2-33

50062-IN
Backbox Insert Assembly

Item	Part Number	Description	Item	Part Number	Description
1	03-9696.1	Insert Body	30	H-22001	Cable Assembly
2	03-9698-1	Channel –Top	31	31-2952-3	Plastic – Clear
3	03-9698-2	Channel – Side	32	07-6688-19N	Rivet: 1/8 x 7/32" Long
4	03-9697	Channel – Lift	33	4006-01003-08	Mach. Screw, #6-32 x ½"
5	31-2832	Backglass – Screened	34	4700-00005-00	Flat Washer: 9/64 x 7/16 x 21ga.
*6	31-2836-1	Decal	35	4406-01119-00	Nut #6-32 ESN
7	04-10916	Grille – Large	36	20-8712-25	Retaining Ring ¼" Dia.
8	04-10917	Grille – Small	37	4700-00072-00	Flat Washer: 17/64 x ½ x 21ga.
9	B-11873	Bottom Arch Kick Assy.	38	04-10914	Shaft – Plastic Spinner
10	4008-01003-08	Mach. Screw: #8-32 x ½"	39	03-7568	Flipper Bushing
*11	31-2835-2	Decal	40	31-2833-2	Plastic – Clear
12	4408-01119-01	Nut #8-32 ESN	41	RM-23-01	Shrink Tubing
13	20-10451	Ball Plastic, 1-1/4"	42	5045-12914-00	Capacitor, .10MFD, 50V, ±20%
14	31-2833-5	Plastic Clear	43	03-7655-4	Clip Harness ¼"
15	31-2833-7	Plastic Clear	44	RM-21-06	#18 Vinyl Flgs Sleeve
16	31-2833-8	Plastic Clear	45	4406-01128-00	Nut #6-32 KEPS
17	31-2833-4	Plastic Clear	46	5555-12924-00	Speaker – Tweeter
18	31-2833-1	Plastic Clear	47	5555-12856-00	Speaker – Mid Range
19	20-9658-1	Standoff – PCB Supt. ½"	48	03-9454	Cable Tie 4" Long
20	20-9658-2	Standoff – PCB Supt. ¾"	49	03-7722-4	Quick Clip, ¼"
21	03-8044-13	Post Clear	50	5647-12693-19	Subminiature Switch
22	23-6694-1	Rubber Ring, Black	51	01-14800	Support Bracket
23	4106-01114-08	TCS #6 x ½"	52	01-14659	Rollover Switch Bracket
24	24-8768	Bulb #555 6.3V,, .25A.	53	4002-01105-06	Mach. Screw, #2-56 x 3/8"
25	24-8863	Socket G.I. White	54	5070-09054-00	Diode 1N4004
26	24-8802	Bulb #906 13v, 0.69A.	55	H-21985-1.1	Cable Assembly
27	24-8861	Socket – Flasher Black	*56	31-2835-2	Decal
28	4008-01113-20	Mach. Screw, #8-32 x 1-1/4"	*57	31-2835-3	Decal
29	03-9255-5	Spacer, #8, .733 Long			

* Not available for individual sale. Order decal set 31-2835 & 31-2836 respectively.

SECTION F-F

SECTION E-E

SECTION D-D

SECTION C-C

SECTION B-B

SECTION A-A

REAR VIEW

VIEW X-X

FRONT VIEW
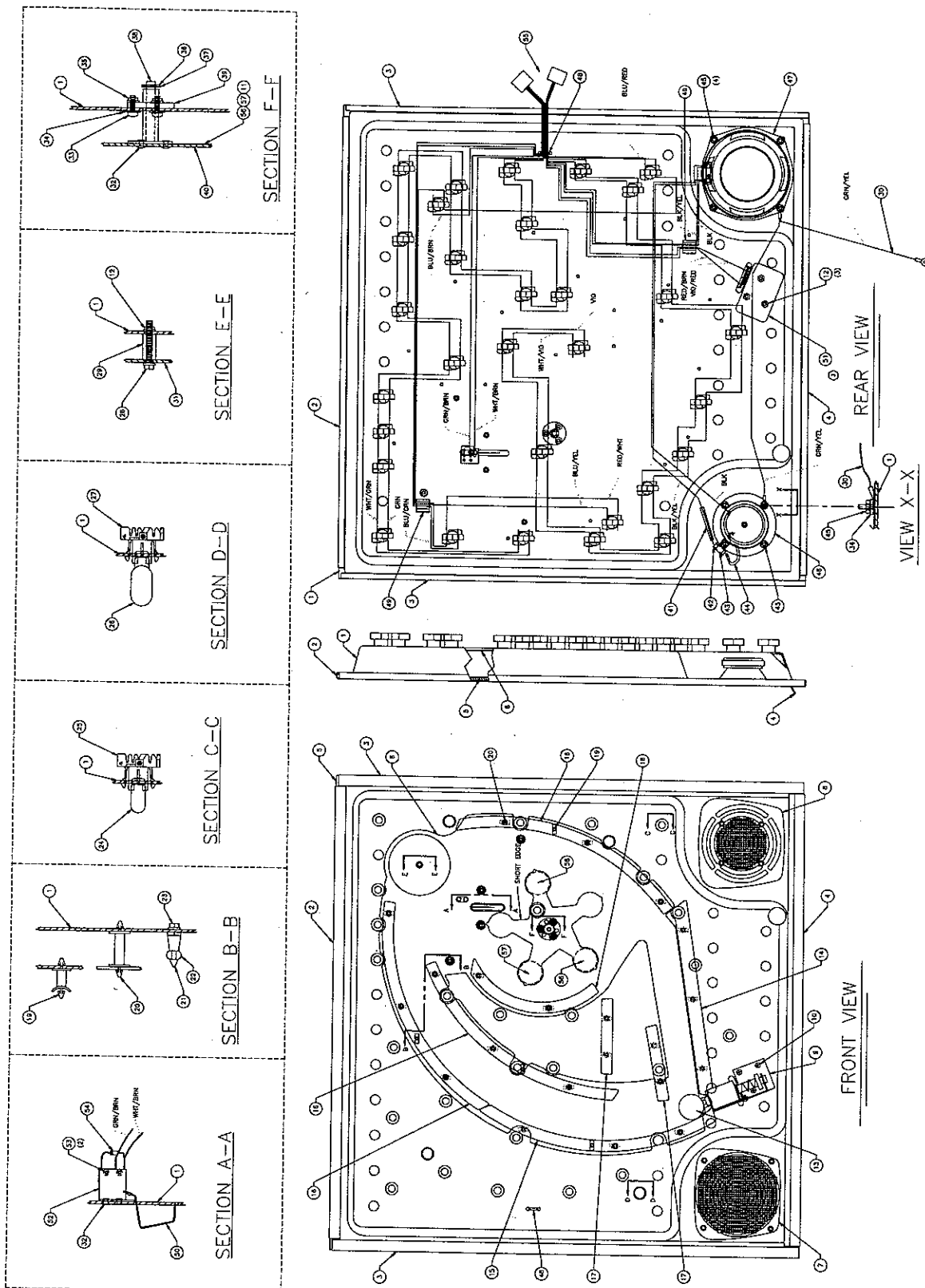
A-21959
Mini Playfield Assembly
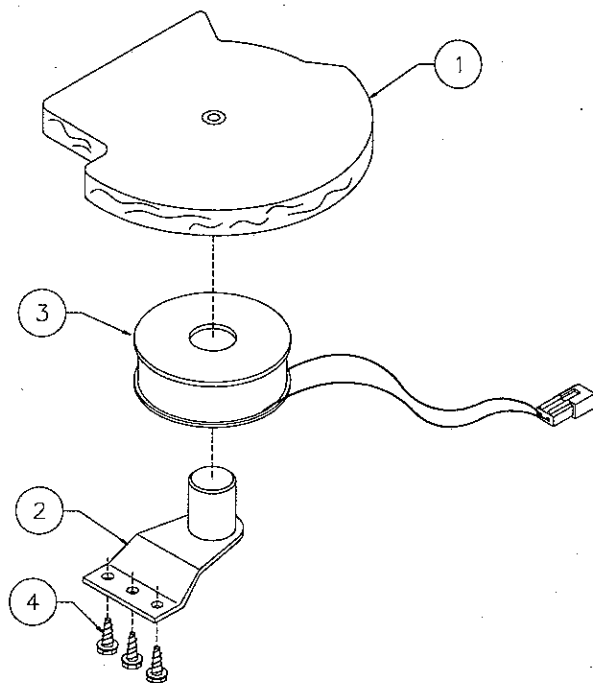
Item	Part Number	Description
1	36-50062-1	Mini Plfd. Screened Hardcoat
2	A-18157	Bracket & Pole Piece Assembly
3	20-10197	Magnet
4	4808-01175-08	E-P 8-32 x ½" IND PL-HWH

Rubber Rings
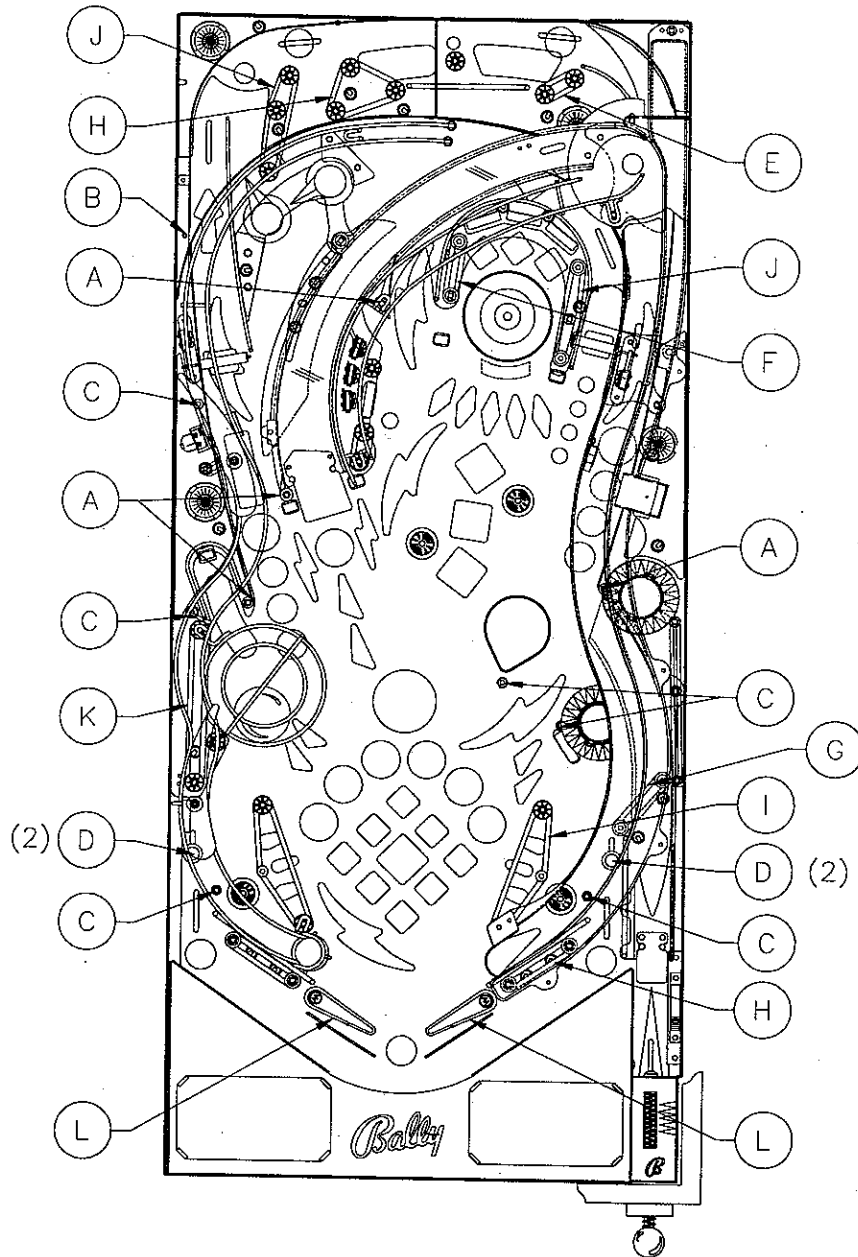
Item No.	Part No.	Description	Quantity
A	23-6556	Black Rubber Bumper	4
B	23-6641	Black Rubber Bumper	1
C	23-6694-1	3/32" Black Rubber Ring	6
D	23-6694-3	5/16" Black Rubber Ring	6
E	23-6694-6	1" Black Rubber Ring	2
F	23-6694-7	1-1/4" Black Rubber Ring	1
G	23-6694-8	1-1/2" Black Rubber Ring	1
H	23-6694-9	2" Black Rubber Ring	3
I	23-6694-10	2-1/2" Black Rubber Ring	2
J	23-6694-11	3" Black Rubber Ring	2
K	23-6694-12	3-1/2" Black Rubber Ring	1
L	23-6695	Black Flipper Ring	2

Upper Playfield Parts

Item Number	Part Number	Description
1	12-7210	Rebound Wire
2	A-21022	Shooter Lane Auto Kicker
3	A-14876-R	Flipper Coil Assembly
	20-10110-5	Flipper Bat and Shaft
4	03-8633	Level Mount
	20-9691	Level
5	12-7386	Wire Ball Guide #1
6	A-21790	Shooter Ramp Assembly
7	A-18008-1	Rollover Button w/cable
	01-13204	Spacer
8	A-21527	Slingshot
9	A-20846-9	Red Standup Target
10	A-9415-2	Jet Bumper Coil Assembly
	A-21565-5	Wafer Assembly
	B-12030-2	Leaf Switch Assembly
11	A-21564	Disappearing Post
12	A-21824	Ball Popper Assembly
	04-10931	Scoop
13	A-21817	Ball Guide Assembly #2
14	A-18530-6	Yellow Standup Target
15	A-21801-2	Right Spinner
16	A-21953	Ringmaster Assembly
	14-8035	Motor
	20-10197	Coil Magnet
	20-9612	Wave Spring Washer
17	12-7389	Wire Ball Guide #4
18	A-21752	Diverter Ball Guide
	A-22035	Diverter Coil Assembly
19	A-21960-6	Yellow Standup Trgts (3)
20	A-21959	Mini Playfield
	20-10197	Coil Magnet
	20-9612	Wave Spring Washer
21	A-21851	Center Wire Ramp
22	A-21806	Center Ramp (plastic)
23	A-21577	Neon Ramp Assembly**
24	12-7397	Wire Ball Guide #6
25	04-10893.1	Ball Guide #1
26	A-17932	Disappearing Upper Post
27	A-21787	Left Wire Ramp Assembly
28	20-10197	Coil Magnet
	20-9612	Wave Spring Washer
29	12-7387	Wire Ball Guide #2
30	A-21829	Eject Assembly
31	A-21965	Ball Guide #3
32	A-21801-1	Left Spinner
33	12-7388	Wire Ball Guide #3
34	A-21825	Up/Down Lock Post
35	A-18530-5	White Standup Target
36	12-7390	Wire Ball Guide #5
37	A-17794	Kicker Switch Assembly
38	20-10454	2" Hollow Ball
39	12-7394	Wire Basket
40	A-15849-L	Flipper Coil Assembly
	20-10110-5	Flipper Bat and Shaft

Not Shown: Part Number	Description
A-13204-50062	Bottom Arch Assembly
A-17730-1	Ball Shooter w/ Silver Knob
A-19514	Chrome Leg Assembly
A-19963-1	Ball Trough Assembly
A-21788	Trough #1
A-21789	Trough #2
A-21958	Dot Matrix Panel Assembly
01-12624	Lower Arch Mounting Bracket
03-9700-1	Full Playfield Mylar*
03-9700-2	Mylar
03-9700-3	Mylar (2)
03-9700-4	Mylar
08-7028-T	Playfield Glass
20-6500	1-1/16" Steel Ball (4)
20-10451	1-1/4" Plastic Ball (insert)

*The CIRQUS VOLTAIRE hardcoat playfield does not require a full Mylar. However, mylars can be purchased through your local Bally Distributor.
** This item comes in many colors. The replacement part may not be the same color as the original item.
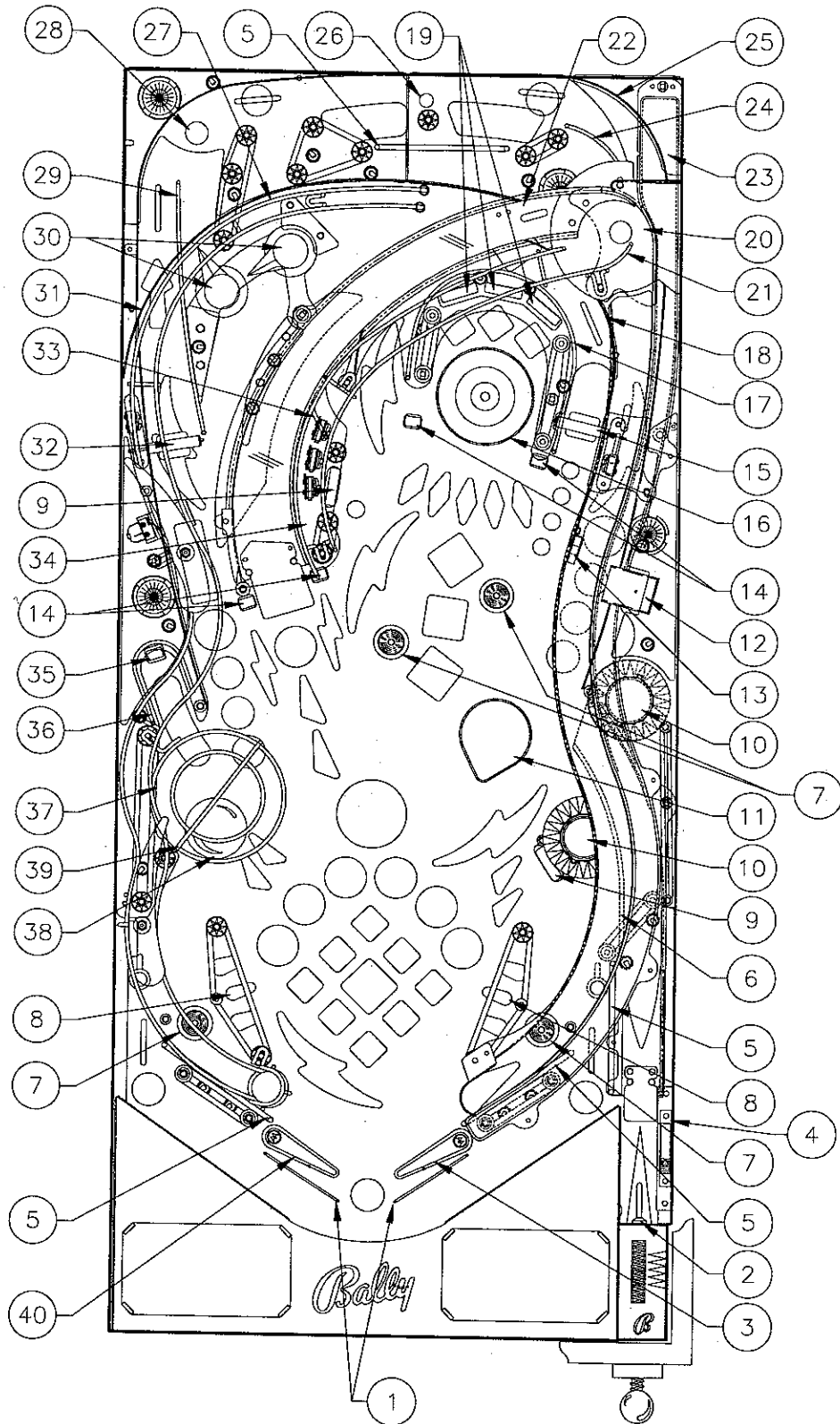
Lower Playfield Parts

Item	Part Number	Description
1	A-19963-1	Ball Trough Assembly w/Cable
2	01-11781	Support Bracket (2)
3	A-21022	Shooter Lane Auto kicker
4	A-14876-R	Flipper Assembly
5	A-21527	Slingshot Assembly (2)
6	A-21809	15-Lamp PCB Assembly
7	A-9415-2	Jet Bumper Coil Assembly (2)
8	A-21564	Disappear Jet Bump Assembly
9	A-21813	8-Lamp PCB Assembly
10	A-21789	Trough Assembly #2
11	A-21953	Ring Master Assembly
12	A-21788	Trough Assembly #1
13	A-22035	Diverter Assembly
14	A-17932	Up/Down Post #1
15	A-18157	Magnet Bracket & Pole Piece
	20-10197	Magnet
16	A-21829	Eject Assembly (2)
17	A-17749.1-1	Playfield Slide Mech. – Left
18	A-17749.1-2	Playfield Slide Mech. – Right
19	A-22149-2	Auto Adjust Eddy Sensor PCB
20	A-20890	5-Lamp PCB Assembly
21	A-21825	Up/Down Post Assembly
22	A-21818	5-Lamp PCB Assembly
23	A-21290	3-Lamp PCB Assembly
24	A-15576	7-Opto PCB Assembly
25	A-15849-L	Flipper Assembly
26	A-21808	3-Lamp PCB Assembly
27	A-21824	Ball Popper Assembly
28	A-20036	Magic Eddy Coil PCB Assembly

Lower Playfield Parts
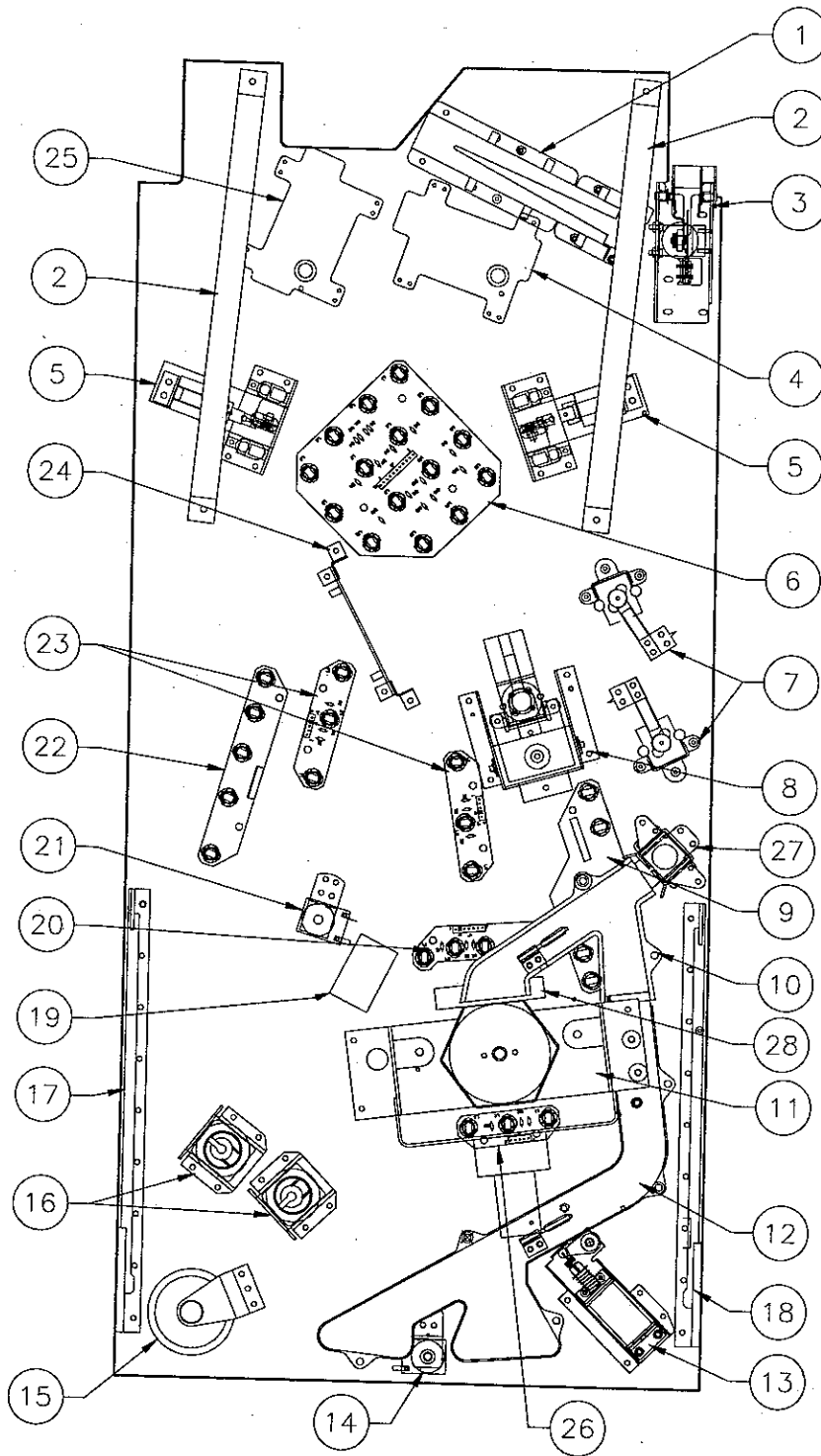
Lamp Locations

| Item Number	Lamp Assembly Part Number	Bulb Type	Bulb Part Number	Socket Part Number	Description
11	A-21809	#555	24-8768	24-8767	CIRQUS "R"
12	A-21809	#555	24-8768	24-8767	GRID TOP
13	A-21809	#555	24-8768	24-8767	CIRQUS "Q"
14	A-21809	#555	24-8768	24-8767	CIRQUS "U"
15	A-21809	#555	24-8768	24-8767	GRID TOP/RIGHT
16	A-21809	#555	24-8768	24-8767	CIRQUS "S"
17	A-21809	#555	24-8768	24-8767	GRID MIDDLE/RIGHT
18	A-17807	#44	24-6549	Not Sold Separate	LEFT JACKPOT
21	A-21809	#555	24-8768	24-8767	CIRQUS "I"
22	A-21809	#555	24-8768	24-8767	CIRQUS "C"
23	A-21809	#555	24-8768	24-8767	GRID MIDDLE/LEFT
24	A-21809	#555	24-8768	24-8767	GRID BOTTOM/LEFT
25	A-21809	#555	24-8768	24-8767	GRID BOTTOM
26	A-21809	#555	24-8768	24-8767	GRID MIDDLE
27	A-21809	#555	24-8768	24-8767	GRID BOTTOM/RIGHT
28	A-21809	#555	24-8768	24-8767	GRID TOP/LEFT
31	A-21818	#555	24-8768	24-8767	SID SHOW
32	A-21818	#555	24-8768	24-8767	LEFT LOOP TOP
33	A-21818	#555	24-8768	24-8767	LEFT LOOP 3
34	A-21818	#555	24-8768	24-8767	LEFT LOOP 2
35	A-21818	#555	24-8768	24-8767	LEFT LOOP 1
36	A-21290	#555	24-8768	24-8767	MULTIBALL
37	A-21290	#555	24-8768	24-8767	LOCK
38	A-21290	#555	24-8768	24-8767	SPOT MARVEL
41	A-20890	#555	24-8768	24-8767	RING MASTER LEFT
42	A-20890	#555	24-8768	24-8767	RINGMASTER 2
43	A-20890	#555	24-8768	24-8767	RINGMASTER 3
44	A-20890	#555	24-8768	24-8767	RINGMASTER 4
45	A-20890	#555	24-8768	24-8767	RINGMASTER RIGHT
46	A-21290	#555	24-8768	24-8767	SPECIAL
47	A-21290	#555	24-8768	24-8767	RAZZ
48	A-21290	#555	24-8768	24-8767	FRENZY
51	A-21813	#555	24-8768	24-8767	CRANK TOP
52	A-21813	#555	24-8768	24-8767	CRANK 2
53	A-21813	#555	24-8768	24-8767	CRANK 3
54	A-21813	#555	24-8768	24-8767	CRANK BOTTOM
55	A-21813	#555	24-8768	24-8767	RIGHT LOOP TOP
56	A-21813	#555	24-8768	24-8767	RIGHT LOOP 3
57	A-21813	#555	24-8768	24-8767	RIGHT LOOP 2
58	A-21813	#555	24-8768	24-8767	RIGHT LOOP 1
61	A-17807	#44	24-6549	Not Sold Separate	MIDDLE JACKPOT
62	A-17807	#44	24-6549	Not Sold Separate	RIGHT JACKPOT
63	A-17807	#44	24-6549	Not Sold Separate	"LIGHT" STANDUP
64	A-17807	#44	24-6549	Not Sold Separate	"LOCK" STANDUP
65	A-17835	#44	24-6549	Not Sold Separate	RING "R"
66	A-17835	#44	24-6549	Not Sold Separate	RING "I"
67	A-17807	#44	24-6549	Not Sold Separate	SHOOT AGAIN
68	A-17835	#44	24-6549	Not Sold Separate	LEFT OUTLANE
71	A-21808	#555	24-8768	24-8767	WOW RIGHT "W"
72	A-21808	#555	24-8768	24-8767	WOW "O"
73	A-21808	#555	24-8768	24-8767	WOW LEFT "W"
74	A-17835	#44	24-6549	Not Sold Separate	RING "N"
75	A-17835	#44	24-6549	Not Sold Separate	RING "G"
76	A-17835	#44	24-6549	Not Sold Separate	RIGHT OUTLANE
77	A-17807	#44	24-6549	Not Sold Separate	LEFT INLANE
78	A-17807	#44	24-6549	Not Sold Separate	SKILL RING
81	A-17807	#44	24-6549	Not Sold Separate	EXTRA BALL
82	——	#555	24-8768	24-8776	TOP JET
83	A-21554	#555	24-8768	24-8767	MIDDLE JET
84	——	#44	24-6549	Not Sold Separate	LOWER JET
85	A-17807	#44	24-6549	Not Sold Separate	RIGHT INLANE
86	A-17807	#44	24-6549	Not Sold Separate	"VOLT" LEFT
87	A-17807	#44	24-6549	Not Sold Separate	"VOLT" RIGHT
88	20-9663-16	-----	-----	-----	START BUTTON

Lamp Locations
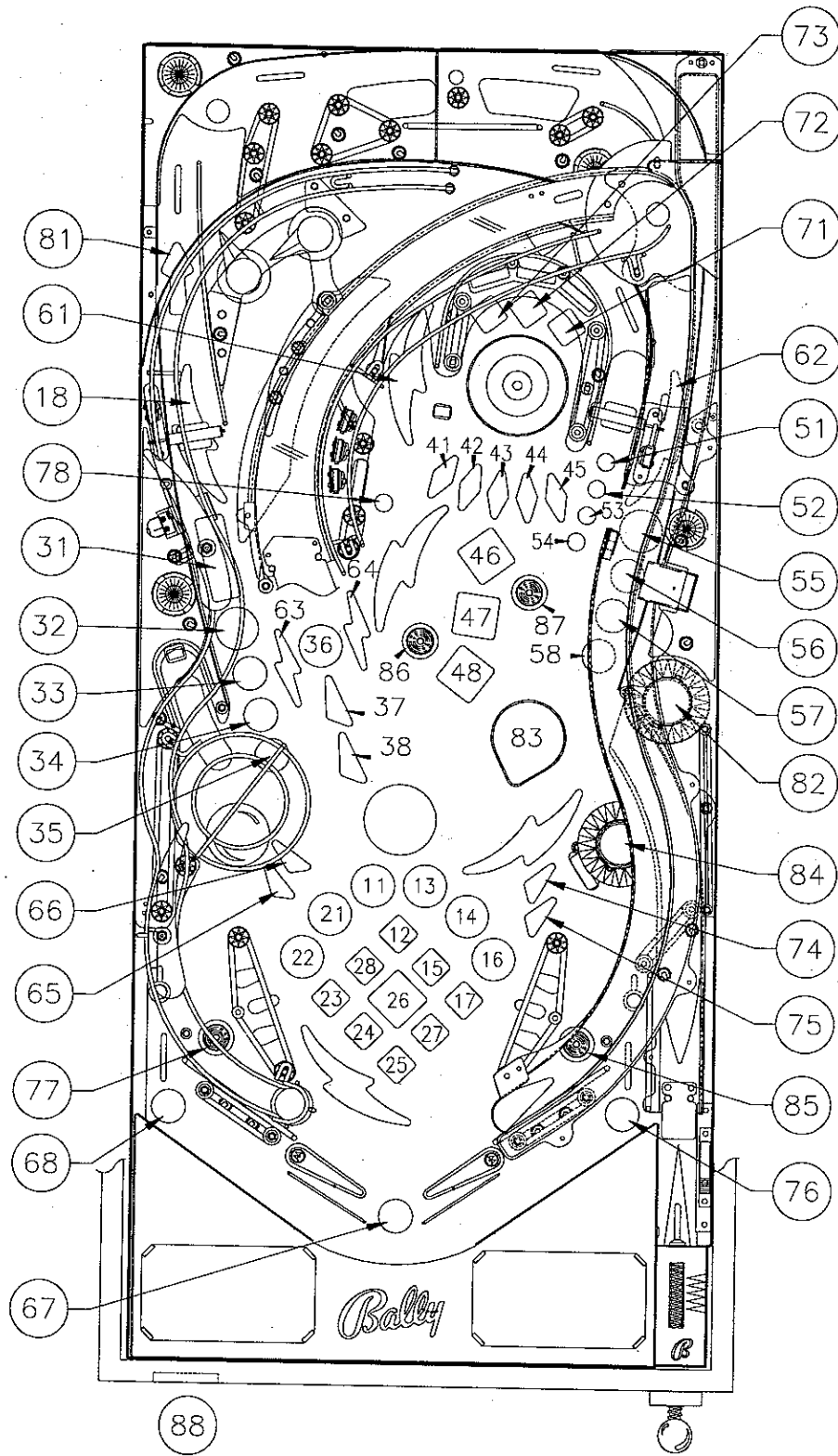
Switch Locations

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	A-21801-2	5647-12693-24	RIGHT SPINNER
F6	NOT USED		UPPER RIGHT FLIPPER CABINET
F7	A-21801-1	5647-12693-24	LEFT SPINNER
F8	NOT USED		UPPER LEFT FLIPPER CABINET
11	—	5647-12693-19	BACKBOX LUCK
12	—	5647-12693-13	WIRE RAMP ENTER
13	20-9663-16	—	START BUTTON
14	—	04-10346	*PLUMB BOB TILT
15	A-17813	5647-12693-19	LEFT LOOP UPPER
16	A-20036	—	TOP EDDY
17	A-18008-1	A-16443	RIGHT INLANE
18	—	5647-12693-68	SHOOTER LANE
21	A-17238	—	*SLAM TILT
22	—	5643-09268-00	*COIN DOOR CLOSED
23	A-17813-1	5647-12693-19	RIGHT LOOP UPPER
24	—	5643-15190-00	*ALWAYS CLOSED
25	A-17813	5647-12693-19	INNER LOOP LEFT
26	A-18008-1	A-16443	LEFT INLANE
27	A-17813-1	5647-12693-19	LEFT OUTLANE
28	A-17813-1	5647-12693-19	INNER LOOP RIGHT
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)	— / —	POPPER
37	A-21960-6	—	"WOW" TARGETS (3)
38	A-18530-6	—	TOP TARGETS (2)
41	A-18530-5	—	LEFT LANE
42	—	5647-12693-01	RINGMASTER UP
43	—	5647-12693-01	RINGMASTER MIDDLE
44	—	5647-12693-01	RINGMASTER DOWN
45	—	5647-12693-21	LEFT RAMP MADE
46	—	5647-12693-13	TROUGH UPPER
47	—	5647-12693-13	TROUGH MIDDLE
48	A-17813-1	5647-12693-19	LEFT LOOP ENTER
51	— / —	SW-1A-212 (**SCORE) / SW-1A-211 (KICK)	LEFT SLINGSHOT
52	— / —	SW-1A-212(**SCORE) / SW-1A-211 (KICK)	RIGHT SLINGSHOT
53	B-12030-2	A-16443	UPPER JET BUMPER
54	—	SW-1A-213	MIDDLE JET BUMPER
55	B-12030-2	A-16443	LOWER JET BUMPER
56	A-20846-9	—	SKILL SHOT
57	A-17813	5647-12693-19	RIGHT OUTLANE
58	A-20846-9	—	RING "N" & "G"
61	A-18530-6	—	"LIGHT" STANDUP TARGET
62	A-18530-6	—	"LOCK" STANDUP TARGET
63	—	20-10293	RAMP ENTER
64	—	5647-12693-13	RAMP MAGNET
65	—	5647-12693-13	RAMP MADE
66	—	5647-12693-66	RAMP LOCK LOW
67	—	5647-12693-66	RAMP LOCK MIDDLE
68	—	5647-12693-66	RAMP LOCK HIGH
71	—	5647-12693-66	LEFT SAUCER
72	—	5647-12693-66	RIGHT SAUCER
73			NOT USED

Switch Locations

Item Number	Switch Assembly Part Number OR Opto Assembly Part Number	Switch Part Number	Description
74	A-17794	A-17793	BIG BALL REBOUND
75	A-18008-1	A-16443	"VOLT" RIGHT
76	A-18008-1	A-16443	"VOLT" LEFT
77 to 88			NOT USED

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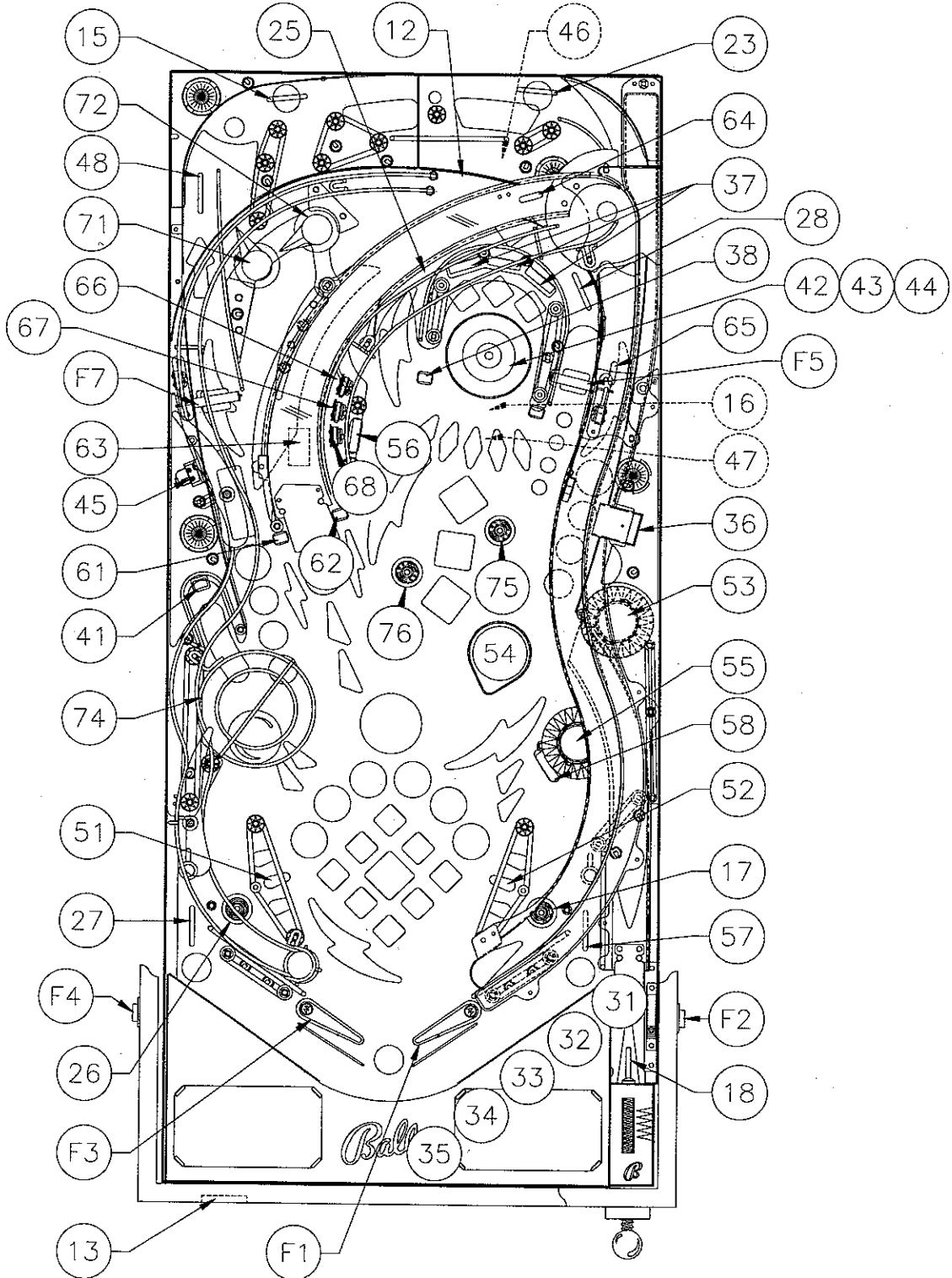
Solenoid/Flashlamp Locations

Item Number	Coil or Flasher Assembly Part Number	Coil or Flasher Part Number	Description
01	A-21022	AE-23-800	AUTO PLUNGER
02	B-11873	AE-23-800	BACKBOX KICKER
03	-----	20-10197	LEFT LOOP MAGNET
04	A-21564	AE-23-800	MIDDLE JET BUMPER
05	A-21959	20-10197	RAMP MAGNET
06	A-22035	FL-11753	DIVERTER POWER
07	A-21564	FL-11630	JET UP
08	A-21564	SM1-26-600	JET RELEASE
09	A-19963-1	AE-26-1500	TROUGH EJECT
10	A-21527	AE-26-1200	LEFT SLINGSHOT
11	A-21527	AE-26-1200	RIGHT SLINGSHOT
12	A-9415-2	AE-26-1200	UPPER JET BUMPER
13	A-9415-2	AE-26-1200	LOWER JET BUMPER
14	A-21829	AE-27-1200	LEFT SAUCER
15	A-21829	AE-27-1200	RIGHT SAUCER
16	A-21825	AE-26-1500	LOCK POST
17	A-17802	#906	JOIN FLASHER
18	A-17802	#906	RING 1 FLASHER
19	A-17802	#906	RING 2 FLASHER
20	A-17802	#906	RING 3 FLASHER
21	A-22007-6	#906	RIGHT PLAYFIELD FLASHER
21	—	#906	UPPER RIGHT BACKBOX FLASHER
22	A-21953	A-15680	MOTOR ENABLE
23	A-17802	#906	JET FLASHER
24	A-22007-7	#906	LEFT PLAYFIELD FLASHER
24	-----	#906	UPPER LEFT BACKBOX FLASHER
25	A-22007-5	#906	UPPER LEFT PLAYFIELD FLASHER
26	A-22007-4	#906	UPPER RIGHT PLAYFIELD FLASHER
26	-----	#906	LOWER LEFT BACKBOX FLASHER
27	A-17802	#906	RINGMASTER FLASHERS (2)
28	A-17802	#906	BEAR PLAYFIELD FLASHER
28	-----	#906	LOWER RIGHT BACKBOX FLASHER

Flippers

Item Number	Coil or Flasher Assembly Part Number	Coil or Flasher Part Number	Description
29-30	A-14876-R	FL-11630	LOWER RIGHT FLIPPER
31-32	A-15849-L	FL-11630	LOWER LEFT FLIPPER
33	A-21824	AL-25-1000	POPPER
34	A-22035	FL-11730	DIVERTER HOLD
35	A-21953	20-10197	RINGMASTER MAGNET
36	A-17932	AE-27-1200	UPPER POST

Motor

Item Number	Assembly Part Number	PC Board Part Number	Device Part Number	Description
37	A-21577	----	-----	NEON
38				NOT USED
39	A-21953	A-15680	-----	MOTOR DIRECTION
40	----	A-22151-2	-----	EDDY BOARD

General Illumination

Item Number	Bulb Number	Bulb Type	Description
01	24-6549	#44	PLAYFIELD RIGHT
02	24-6549	#44	PLAYFIELD MIDDLE
03	24-6549	#44	PLAYFIELD LEFT
04	24-8768	#555	BACKBOX 1
05	24-8768	#555	BACKBOX 2

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

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	CIRQUS "R" 11	CIRQUS "I" 21	SIDE SHOW 31	RING-MASTER LEFT 41	CRANK TOP 51	MIDDLE JACKPOT 61	WOW RIGHT "W" TARGET 71	EXTRA BALL 81
2 Red-Black J125-2 Q108	GRID TOP 12	CIRQUS "C" 22	LEFT LOOP TOP 32	RING-MASTER 2 42	CRANK 2 52	RIGHT JACKPOT 62	WOW "O" TARGET 72	TOP JET BUMPER 82
3 Red-Orange J125-4 Q103	CIRQUS "Q" 13	GRID MIDDLE/LEFT 23	LEFT LOOP 3 33	RING-MASTER 3 43	CRANK 3 53	LIGHT STANDUP TARGET 63	WOW LEFT "W" TARGET 73	MIDDLE JET BUMPER 83
4 Red-Yellow J125-5 Q107	CIRQUS "U" 14	GRID BOTTOM/LEFT 24	LEFT LOOP 2 34	RING-MASTER 4 44	CRANK BOTTOM 54	LOCK STANDUP TARGET 64	RING "N" 74	LOWER JET BUMPER 84
5 Red-Green J125-6 Q102	GRID TOP/RIGHT 15	GRID BOTTOM 25	LEFT LOOP 1 35	RING-MASTER RIGHT 45	RIGHT LOOP TOP 55	RING "R" 65	RING "G" 75	RIGHT IN-LANE 85
6 Red-Blue J125-7 Q106	CIRQUS "S" 16	GRID MIDDLE 26	MULTIBALL 36	SPECIAL 46	RIGHT LOOP 3 56	RING "I" 66	RIGHT OUTLANE 76	VOLT LEFT 86
7 Red-Violet J125-8 Q101	GRID MIDDLE/RIGHT 17	GRID BOTTOM/RIGHT 27	LOCK 37	RAZZ 47	RIGHT LOOP 2 57	SHOOT AGAIN 67	LEFT IN-LANE 77	VOLT RIGHT 87
8 Red-Gray J125-9 Q105	LEFT JACKPOT 18	GRID TOP/LEFT 28	SPOT MARVEL 38	FRENZY 48	RIGHT LOOP 1 58	LEFT OUTLANE 68	SKILL RING 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	BACKBOX LUCK 11	SLAM TILT 21	TROUGH EJECT 31	LEFT LANE 41	LEFT SLINGSHOT 51	LIGHT STANDUP TARGET 61	LEFT SAUCER 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	WIRE RAMP ENTER 12	COIN DOOR CLOSED 22	TROUGH BALL 1 32	RING-MASTER UP 42	RIGHT SLINGSHOT 52	LOCK STANDUP TARGET 62	RIGHT SAUCER 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	RIGHT LOOP UPPER 23	TROUGH BALL 2 33	RING-MASTER MIDDLE 43	UPPER JET BUMPER 53	RAMP ENTER 63	NOT USED 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	RING-MASTER DOWN 44	MIDDLE JET BUMPER 54	RAMP MAGNET 64	BIG BALL REBOUND 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 LOOP UPPER 15	INNER LOOP LEFT 25	TROUGH BALL 4 35	LEFT RAMP MADE 45	LOWER JET BUMPER 55	RAMP MADE 65	VOLT RIGHT 75	NOT USED 85	BLACK-VIOLET J208-11 RIGHT SPINNER F5
Orange-Blue J205-7 U16-11 Normal Function Volume Dn / Test Function Down D6	6 White-Blue U208-7 U19-9	TOP EDDY 16	LEFT IN-LANE 26	POPPER OPTO 36	TROUGH UPPER 46	SKILL SHOT 56	RAMP LOCK LOW 66	VOLT LEFT 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 IN-LANE 17	LEFT OUTLANE 27	"WOW" TARGETS 37	TROUGH MIDDLE 47	RIGHT OUTLANE 57	RAMP LOCK MIDDLE 67	NOT USED 77	NOT USED 87	BLACK-GRAY J208-10 LEFT SPINNER 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	INNER LOOP RIGHT 28	TOP TARGETS 38	LEFT LOOP ENTER 48	RING 'N', 'G' 58	RAMP LOCK HIGH 68	NOT USED 78	NOT USED 88	BLACK-BLUE J212-9 UPPER LEFT FLIPPER OPTO F8

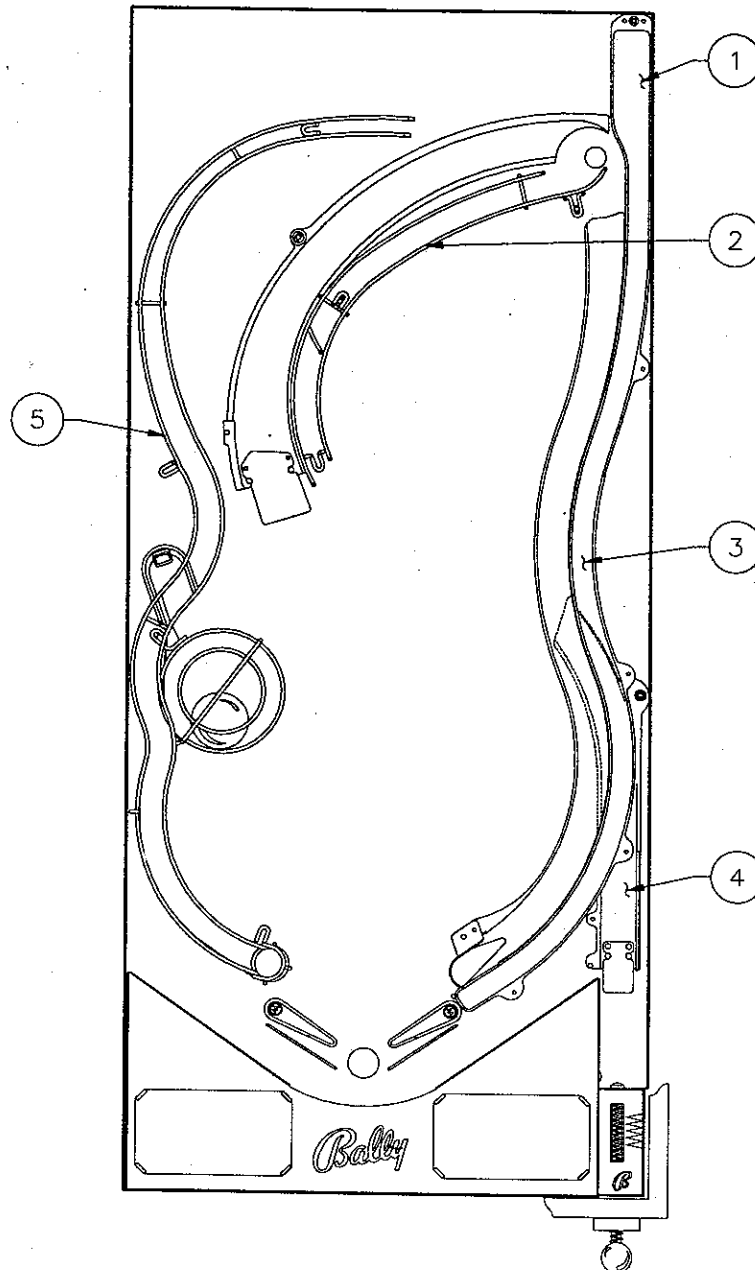J2XX = CPU BOARD   ▨▨▨▨ = OPTO, TYPICALLY CLOSED

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	PLUNGER	High Power	J133-2			Q72	J116-1			VIO-BRN	AE-23-800	
02	BACKBOX KICK	High Power		J134-3		Q68		J118-2		VIO-RED	AE-23-800	
03	LEFT LOOP MAGNET	High Power	J133-2			Q71	J116-4			VIO-ORG	20-10197	
04	MIDDLE JET BUMPER	High Power	J133-2			Q67	J116-5			VIO-YEL	AE-23-800	
05	RAMP MAGNET	High Power	J133-2			Q70	J116-6			VIO-GRN	20-10197	
06	DIVERTER POWER	High Power	J133-2			Q66	J116-7			VIO-BLU	FL-11753	
07	JET UP	High Power	J133-2			Q69	J116-8			VIO-BLK	FL-11630	
08	JET RELEASE	High Power	J133-2			Q65	J116-9			VIO-GRY	SM1-26-600	
09	TROUGH EJECT	Low Power	J133-3			Q44	J114-1			BRN-BLK	AE-26-1500	
10	LEFT SLINGSHOT	Low Power	J133-3			Q48	J114-3			BRN-RED	AE-26-1200	
11	RIGHT SLINGSHOT	Low Power	J133-3			Q43	J114-4			BRN-ORG	AE-26-1200	
12	UPPER JET BUMPER	Low Power	J133-3			Q47	J114-5			BRN-YEL	AE-26-1200	
13	LOWER JET BUMPER	Low Power	J133-3			Q42	J114-6			BRN-GRN	AE-26-1200	
14	LEFT SAUCER	Low Power	J133-3			Q46	J114-7			BRN-BLU	AE-27-1200	
15	RIGHT SAUCER	Low Power	J133-3			Q41	J114-8			BRN-VIO	AE-27-1200	
16	LOCK POST	Low Power	J133-3			Q45	J114-9			BRN-GRY	AE-26-1500	
17	JOIN FLASHERS	Flasher	J133-6			Q28	J111-1			BLK-BRN	#906	
18	RING #1 FLASHERS	Flasher	J133-6			Q32	J111-2			BLK-RED	#906	
19	RING #2 FLASHERS	Flasher	J133-6			Q27	J111-3			BLK-ORG	#906	
20	RING #3 FLASHERS	Flasher	J133-6			Q31	J111-4			BLK-YEL	#906	
21	RIGHT PLAYFIELD FLASHER	Flasher	J133-6			Q26	J111-5			BLU-GRN	#906	
21	UPPER RIGHT BACKBOX FLS	Flasher		J134-5		Q26		J112-6		BLU-GRN		#906
22	MOTOR ENABLE	Flasher	J133-6			Q30	J111-6			BLU-BLK	A-15680	
23	JET FLASHER	Flasher	J133-6			Q25	J111-7			BLU-VIO	#906	
24	LEFT PLAYFIELD FLASHER	Flasher	J133-6			Q29	J111-8			BLU-GRY	#906	
24	UPPER LEFT BACKBOX FLS	Flasher		J134-5		Q29		J112-9		BLU-GRY		#906
25	UPPER LEFT FLASHER	Gen. Purpose	J133-6			Q16	J109-1			BLU-BRN	#906	
26	UP. RIGHT PLAYFIELD FLS	Gen. Purpose	J133-6			Q15	J109-2			BLU-RED	#906	
26	LOWER LEFT BACKBOX FLS	Gen. Purpose		J134-5		Q15		J107-3		BLU-RED		#906
27	RINGMASTER FLASHERS (2)	Gen. Purpose	J133-6			Q14	J109-3			BLU-ORG	#906	
28	BEAR PLAYFIELD FLASHER	Gen. Purpose	J133-6			Q13	J109-4			BLU-YEL	#906	
28	LOWER RIGHT BACKBOX FLS	Gen. Purpose		J134-5		Q13		J107-5		BLU-YEL		#906

General Illumination

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	PLAYFIELD RIGHT	G.I.	J105-1			Q5	J105-7			WHT-BRN	#44	
02	PLAYFIELD MIDDLE	G.I.	J105-2			Q4	J105-8			WHT-ORG	#44	
03	PLAYFIELD LEFT	G.I.	J105-3			Q3	J105-9			WHT-YEL	#44	
04	**BACKBOX 2	G.I.		J106-5		Q2		J106-10		WHT-GRN		#555
05	**BACKBOX 1	G.I.		J106-6	J104-3	Q1		J106-11	J104-1	WHT-VIO		#555

Flipper Circuits		Solenoid Type	Voltage Connection Playfield	Drive Xistors Power	Hold	Drive Connections Playfield Power	Hold	Drive Wire Colors Power	Hold	Coil Part No.	Coil Colors
29		Power	J119-1 (RED-GRN)	Q90		J120-13		YEL-GRN		FL-11630	RED
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-11630	RED
32	LOWER LEFT FLIPPER	Hold	J119-4 (RED-BLU)		Q89	J120-7			ORG-BLU		
33	POPPER	Power	J119-6 (RED-VIO)	Q84		J120-6		YEL-VIO		AL-25-1000	BROWN
34	DIVERTER HOLD	Hold	J119-6 (RED-VIO)		Q86	J120-4			ORG-VIO	FL-11730	YELLOW
35	RINGMASTER MAGNET	Power	J119-8 (RED-GRY)	Q81		J120-3		YEL-GRY		20-10197	
36	UPPER POST	Hold	J119-8 (RED-GRY)		Q83	J120-1			ORG-GRY	AE-27-1200	WHITE

Motor Circuit		Solenoid Type	Voltage Connections Playfield	Drive Gates	Drive Connections Playfield	Drive Wire Color	Device Part Number Playfield
37	NEON	Low Power	J139-2	U3A, U3B	J110-1	BRN-WHT	A-21577
38	NOT USED						
39	MOTOR DIRECTION	Low Power	J133-6	U3G, U3H	J110-4	YEL-WHT	A-15680
40	EDDY BOARD	Low Power	J139-2	U3E, U3F	J110-5	BLU-WHT	A-22151-2

J1XX = POWER DRIVER BOARD
24-6549 = #44 BULB; 24-8704 = #89 BULB; 24-8768 = #555 BULB; 24-8802 = #906 BULB
**THESE G.I. STRINGS DO NOT BRIGHTEN AND DIM, THEY ARE ALWAYS ON.

Ramps

Item	Part Number	Description
1	A-21577	Neon Ramp Assembly
2	A-21851	Center Wire Ramp Assy.
3	A-21806	Center Ramp Assembly
4	A-21790	Shooter Ramp Assembly
5	A-21787	Left Wire Ramp Assembly

CIRQUS NOTES

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.
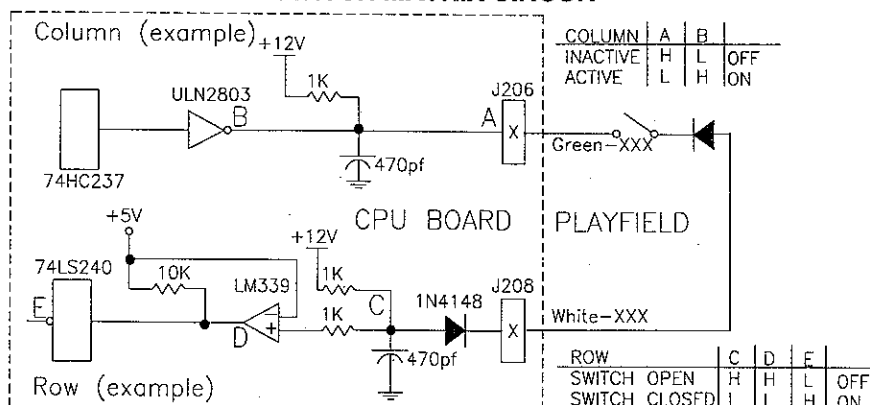
SWITCH MATRIX

White —▷|—oo— Green

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	BACKBOX LUCK 11	SLAM TILT 21	TROUGH EJECT 31	LEFT LANE 41	LEFT SLINGSHOT 51	LIGHT STANDUP TARGET 61	LEFT SAUCER 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	WIRE RAMP ENTER 12	COIN DOOR CLOSED 22	TROUGH BALL 1 32	RING-MASTER UP 42	RIGHT SLINGSHOT 52	LOCK STANDUP TARGET 62	RIGHT SAUCER 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	RIGHT LOOP UPPER 23	TROUGH BALL 2 33	RING-MASTER MIDDLE 43	UPPER JET BUMPER 53	RAMP ENTER 63	NOT USED 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	RING-MASTER DOWN 44	MIDDLE JET BUMPER 54	RAMP MAGNET 64	BIG BALL REBOUND 74	NOT USED 84	BLUE-GRAY J212-11 LOWER LEFT FLIPPER OPTO F4
Orange-Green J205-6 U16-9 Normal: Srv Crdts / Test: Escape Function D5	5 White-Green J208-5 U19-11	LEFT LOOP UPPER 15	INNER LOOP LEFT 25	TROUGH BALL 4 35	LEFT RAMP MADE 45	LOWER JET BUMPER 55	RAMP MADE 65	VOLT RIGHT 75	NOT USED 85	BLACK-VIOLET J208-11 RIGHT SPINNER F5
Orange-Blue J205-7 U16-11 Normal: Volume Dn / Test: Down Function D6	6 White-Blue U208-7 U19-9	TOP EDDY 16	LEFT IN-LANE 26	POPPER OPTO 36	TROUGH UPPER 46	SKILL SHOT 56	RAMP LOCK LOW 66	VOLT LEFT 76	NOT USED 86	BLACK-YELLOW J212-10 UPPER RIGHT FLIPPER OPTO F6
Orange-Violet J205-8 U16-7 Normal: Volume Up / Test: Up Function D7	7 White-Violet J208-8 U19-5	RIGHT IN-LANE 17	LEFT OUTLANE 27	"WOW" TARGETS 37	TROUGH MIDDLE 47	RIGHT OUTLANE 57	RAMP LOCK MIDDLE 67	NOT USED 77	NOT USED 87	BLACK-GRAY J208-10 LEFT SPINNER F7
Orange-Gray J205-9 U16-5 Normal: Begin Test / Test: Enter Function D8	8 White-Gray J208-9 U19-7	SHOOTER LANE 18	INNER LOOP RIGHT 28	TOP TARGETS 38	LEFT LOOP ENTER 48	RING 'N', 'G' 58	RAMP LOCK HIGH 68	NOT USED 78	NOT USED 88	BLACK-BLUE J212-9 UPPER LEFT FLIPPER OPTO F8

J2XX = CPU BOARD ▨▨▨ = OPTO, TYPICALLY CLOSED

SWITCH MATRIX CIRCUIT

COLUMN	A	B	
INACTIVE	H	L	OFF
ACTIVE	L	H	ON

ROW	C	D	E	
SWITCH OPEN	H	H	L	OFF
SWITCH CLOSED	L	L	H	ON

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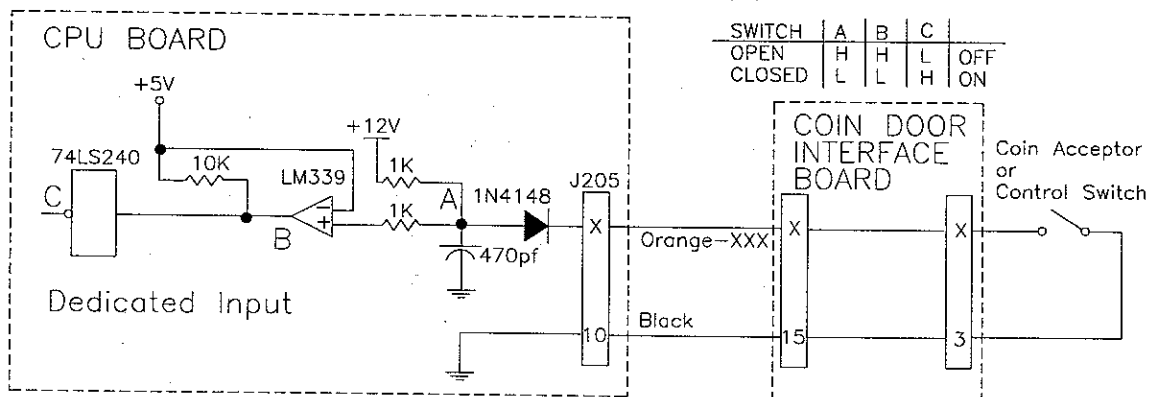
DEDICATED SWITCHES
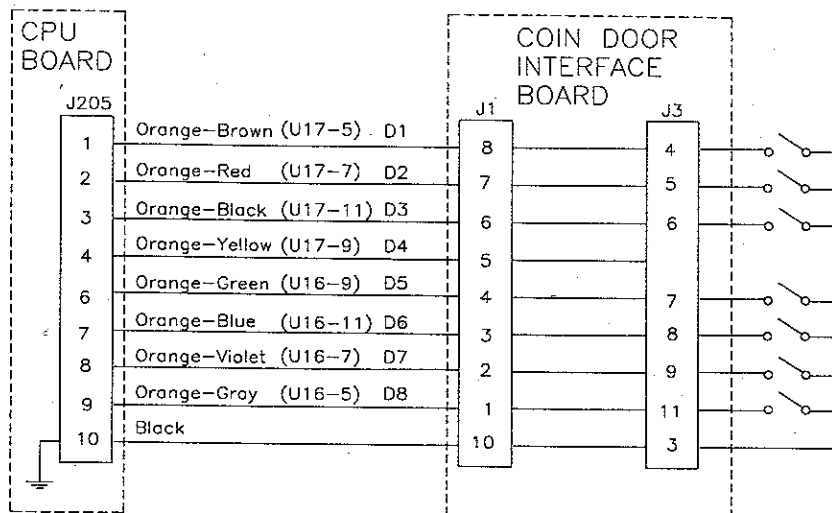
Coin Acceptor Switches
D1 - Left Coin Chute
D2 - Center Coin Chute
D3 - Right Coin Chute
D4 - Fourth Coin Chute

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

SWITCH	A	B	C	
OPEN	H	H	L	OFF
CLOSED	L	L	H	ON

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

3-3

LAMP MATRIX

Yellow (B+) —⊛— Red

Row \ Column	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	CIRQUS "R" 11	CIRQUS "I" 21	SIDE SHOW 31	RING-MASTER LEFT 41	CRANK TOP 51	MIDDLE JACKPOT 61	WOW RIGHT "W" TARGET 71	EXTRA BALL 81
2 Red-Black J125-2 Q108	GRID TOP 12	CIRQUS "C" 22	LEFT LOOP TOP 32	RING-MASTER 2 42	CRANK 2 52	RIGHT JACKPOT 62	WOW "O" TARGET 72	TOP JET BUMPER 82
3 Red-Orange J125-4 Q103	CIRQUS "Q" 13	GRID MIDDLE/LEFT 23	LEFT LOOP 3 33	RING-MASTER 3 43	CRANK 3 53	LIGHT STANDUP TARGET 63	WOW LEFT "W" TARGET 73	MIDDLE JET BUMPER 83
4 Red-Yellow J125-5 Q107	CIRQUS "U" 14	GRID BOTTOM/LEFT 24	LEFT LOOP 2 34	RING-MASTER 4 44	CRANK BOTTOM 54	LOCK STANDUP TARGET 64	RING "N" 74	LOWER JET BUMPER 84
5 Red-Green J125-6 Q102	GRID TOP/RIGHT 15	GRID BOTTOM 25	LEFT LOOP 1 35	RING-MASTER RIGHT 45	RIGHT LOOP TOP 55	RING "R" 65	RING "G" 75	RIGHT IN-LANE 85
6 Red-Blue J125-7 Q106	CIRQUS "S" 16	GRID MIDDLE 26	MULTIBALL 36	SPECIAL 46	RIGHT LOOP 3 56	RING "I" 66	RIGHT OUTLANE 76	VOLT LEFT 86
7 Red-Violet J125-8 Q101	GRID MIDDLE/RIGHT 17	GRID BOTTOM/RIGHT 27	LOCK 37	RAZZ 47	RIGHT LOOP 2 57	SHOOT AGAIN 67	LEFT IN-LANE 77	VOLT RIGHT 87
8 Red-Gray J125-9 Q105	LEFT JACKPOT 18	GRID TOP/LEFT 28	SPOT MARVEL 38	FRENZY 48	RIGHT LOOP 1 58	LEFT OUTLANE 68	SKILL RING 78	START BUTTON 88

J1XX = Power Driver Board

LAMP MATRIX CIRCUIT
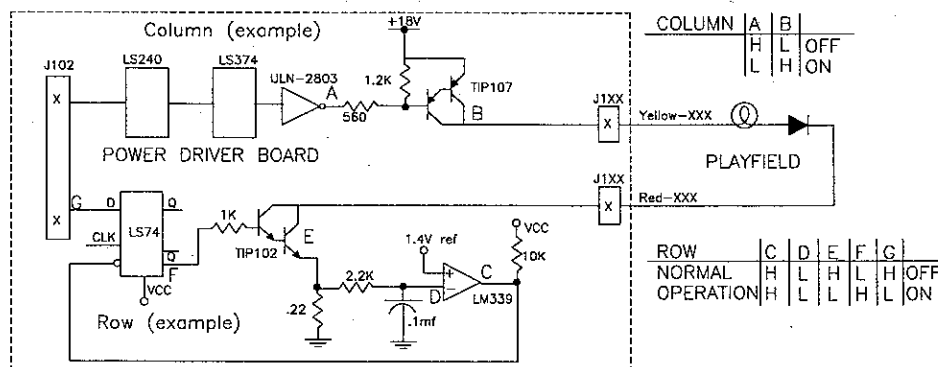
The microprocessor sends a signal to the column circuit causing the output of the UNL-2803 to toggle. When point "A" drops low, the TIP107 transistor conducts and point "B" changes to a high state. At the same time, the microprocessor drives the input of the 74LS74 low, causing a high at output "F". 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 Playfield	Backbox	Cabinet	Drive Xistor	Drive Connections Playfield	Backbox	Cabinet	Drive Wire Color	Solenoid Part Number Flashlamp Type Playfield	Insert
01	PLUNGER	High Power	J133-2			Q72	J116-1			VIO-BRN	AE-23-800	
02	BACKBOX KICK	High Power		J134-3		Q68		J118-2		VIO-RED	AE-23-800	
03	LEFT LOOP MAGNET	High Power	J133-2			Q71	J116-4			VIO-ORG	20-10197	
04	MIDDLE JET BUMPER	High Power	J133-2			Q67	J116-5			VIO-YEL	AE-23-800	
05	RAMP MAGNET	High Power	J133-2			Q70	J116-6			VIO-GRN	20-10197	
06	DIVERTER POWER	High Power	J133-2			Q66	J116-7			VIO-BLU	FL-11753	
07	JET UP	High Power	J133-2			Q69	J116-8			VIO-BLK	FL-11630	
08	JET RELEASE	High Power	J133-2			Q65	J116-9			VIO-GRY	SM1-26-600	
09	TROUGH EJECT	Low Power	J133-3			Q44	J114-1			BRN-BLK	AE-26-1500	
10	LEFT SLINGSHOT	Low Power	J133-3			Q48	J114-3			BRN-RED	AE-26-1200	
11	RIGHT SLINGSHOT	Low Power	J133-3			Q43	J114-4			BRN-ORG	AE-26-1200	
12	UPPER JET BUMPER	Low Power	J133-3			Q47	J114-5			BRN-YEL	AE-26-1200	
13	LOWER JET BUMPER	Low Power	J133-3			Q42	J114-6			BRN-GRN	AE-26-1200	
14	LEFT SAUCER	Low Power	J133-3			Q46	J114-7			BRN-BLU	AE-27-1200	
15	RIGHT SAUCER	Low Power	J133-3			Q41	J114-8			BRN-VIO	AE-27-1200	
16	LOCK POST	Low Power	J133-3			Q45	J114-9			BRN-GRY	AE-26-1500	
17	JOIN FLASHERS	Flasher	J133-6			Q28	J111-1			BLK-BRN	#906	
18	RING #1 FLASHERS	Flasher	J133-6			Q32	J111-2			BLK-RED	#906	
19	RING #2 FLASHERS	Flasher	J133-6			Q27	J111-3			BLK-ORG	#906	
20	RING #3 FLASHERS	Flasher	J133-6			Q31	J111-4			BLK-YEL	#906	
21	RIGHT PLAYFIELD FLASHER	Flasher	J133-6			Q26	J111-5			BLU-GRN	#906	
21	UPPER RIGHT BACKBOX FLS	Flasher		J134-5		Q26		J112-6		BLU-GRN		#906
22	MOTOR ENABLE	Flasher	J133-6			Q30	J111-6			BLU-BLK	A-15680	
23	JET FLASHER	Flasher	J133-6			Q25	J111-7			BLU-VIO	#906	
24	LEFT PLAYFIELD FLASHER	Flasher	J133-6			Q29	J111-8			BLU-GRY	#906	
24	UPPER LEFT BACKBOX FLS	Flasher		J134-5		Q29		J112-9		BLU-GRY		#906
25	UPPER LEFT FLASHER	Gen. Purpose	J133-6			Q16	J109-1			BLU-BRN	#906	
26	UP. RIGHT PLAYFIELD FLS	Gen. Purpose	J133-6			Q15	J109-2			BLU-RED	#906	
26	LOWER LEFT BACKBOX FLS	Gen. Purpose		J134-5		Q15		J107-3		BLU-RED		#906
27	RINGMASTER FLASHERS (2)	Gen. Purpose	J133-6			Q14	J109-3			BLU-ORG	#906	
28	BEAR PLAYFIELD FLASHER	Gen. Purpose	J133-6			Q13	J109-4			BLU-YEL	#906	
28	LOWER RIGHT BACKBOX FLS	Gen. Purpose		J134-5		Q13		J107-5		BLU-YEL		#906

General Illumination

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	PLAYFIELD RIGHT	G.I.	J105-1			Q5	J105-7			WHT-BRN	#44	
02	PLAYFIELD MIDDLE	G.I.	J105-2			Q4	J105-8			WHT-ORG	#44	
03	PLAYFIELD LEFT	G.I.	J105-3			Q3	J105-9			WHT-YEL	#44	
04	**BACKBOX 2	G.I.		J106-5		Q2		J106-10		WHT-GRN		#555
05	**BACKBOX 1	G.I.		J106-6	J104-3	Q1		J106-11	J104-1	WHT-VIO		#555

	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-11630	RED
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-11630	RED
32	LOWER LEFT FLIPPER	Hold	J119-4 (RED-BLU)		Q89	J120-7		ORG-BLU		
33	POPPER	Power	J119-6 (RED-VIO)	Q84		J120-6	YEL-VIO		AL-25-1000	BROWN
34	DIVERTER HOLD	Hold	J119-6 (RED-VIO)		Q86	J120-4		ORG-VIO	FL-11730	YELLOW
35	RINGMASTER MAGNET	Power	J119-8 (RED-GRY)	Q81		J120-3	YEL-GRY		20-10197	
36	UPPER POST	Hold	J119-8 (RED-GRY)		Q83	J120-1		ORG-GRY	AE-27-1200	WHITE

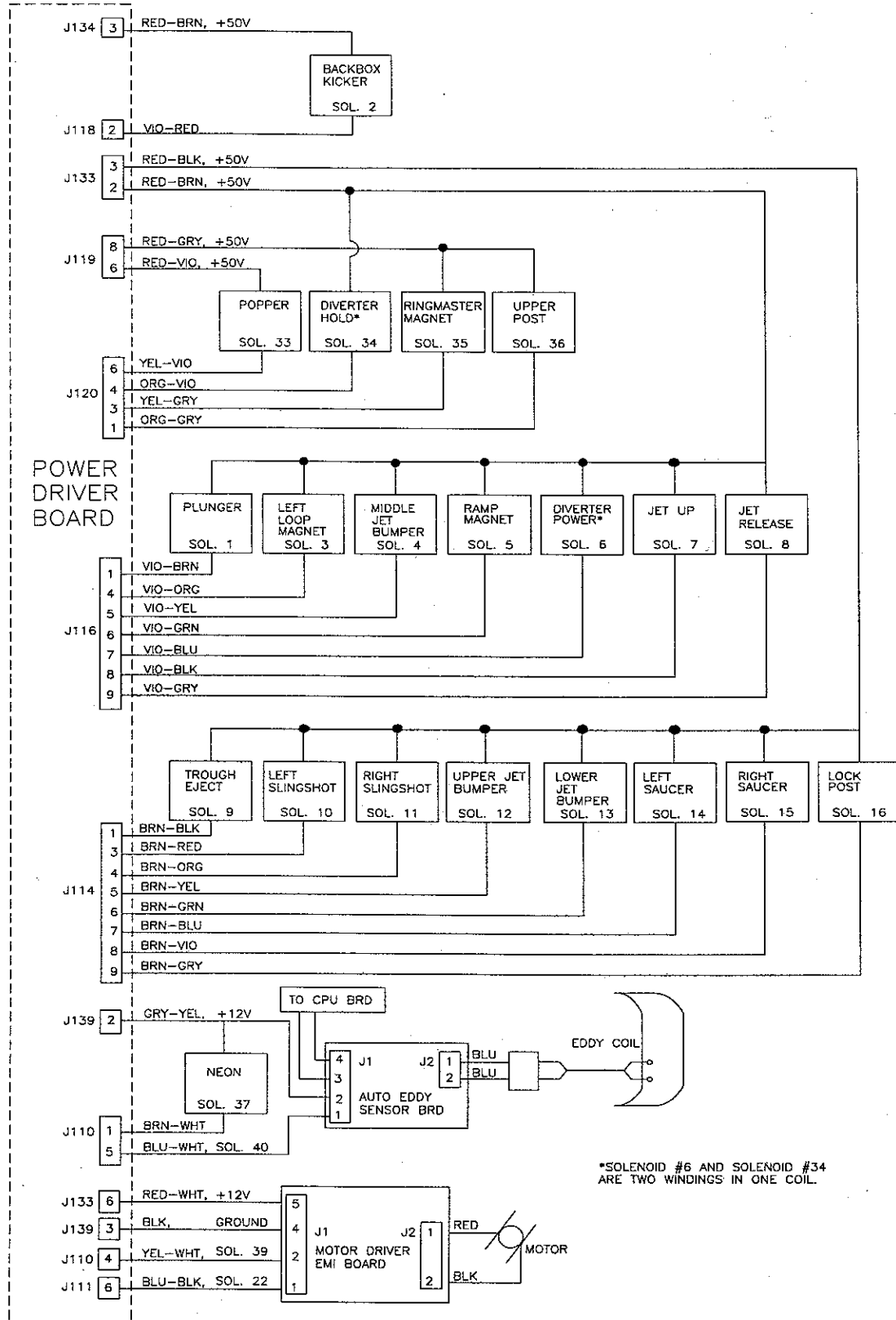|	Motor Circuit	Solenoid Type	Voltage Connections Playfield	Drive Gates	Drive Connections Playfield	Drive Wire Color	Device Part Number Playfield
37	NEON	Low Power	J139-2	U3A, U3B	J110-1	BRN-WHT	A-21577
38	NOT USED						
39	MOTOR DIRECTION	Low Power	J133-6	U3G, U3H	J110-4	YEL-WHT	A-15680
40	EDDY BOARD	Low Power	J139-2	U3E, U3F	J110-5	BLU-WHT	A-21745-2

J1XX = POWER DRIVER BOARD
24-6549 = #44 BULB; 24-8704 = #89 BULB; 24-8768 = #555 BULB; 24-8802 = #906 BULB
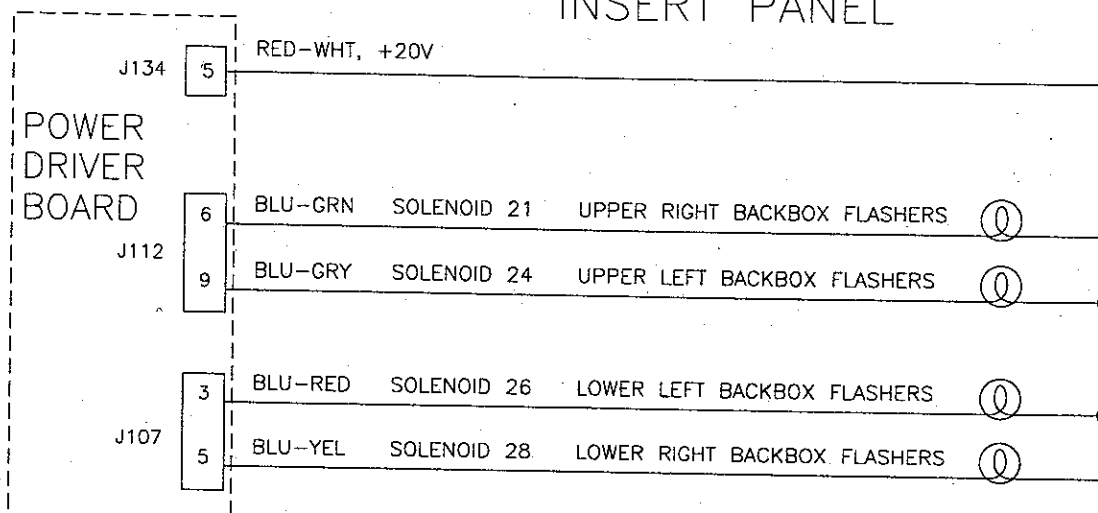**THESE G.I. STRINGS DO NOT BRIGHTEN AND DIM, THEY ARE ALWAYS ON.
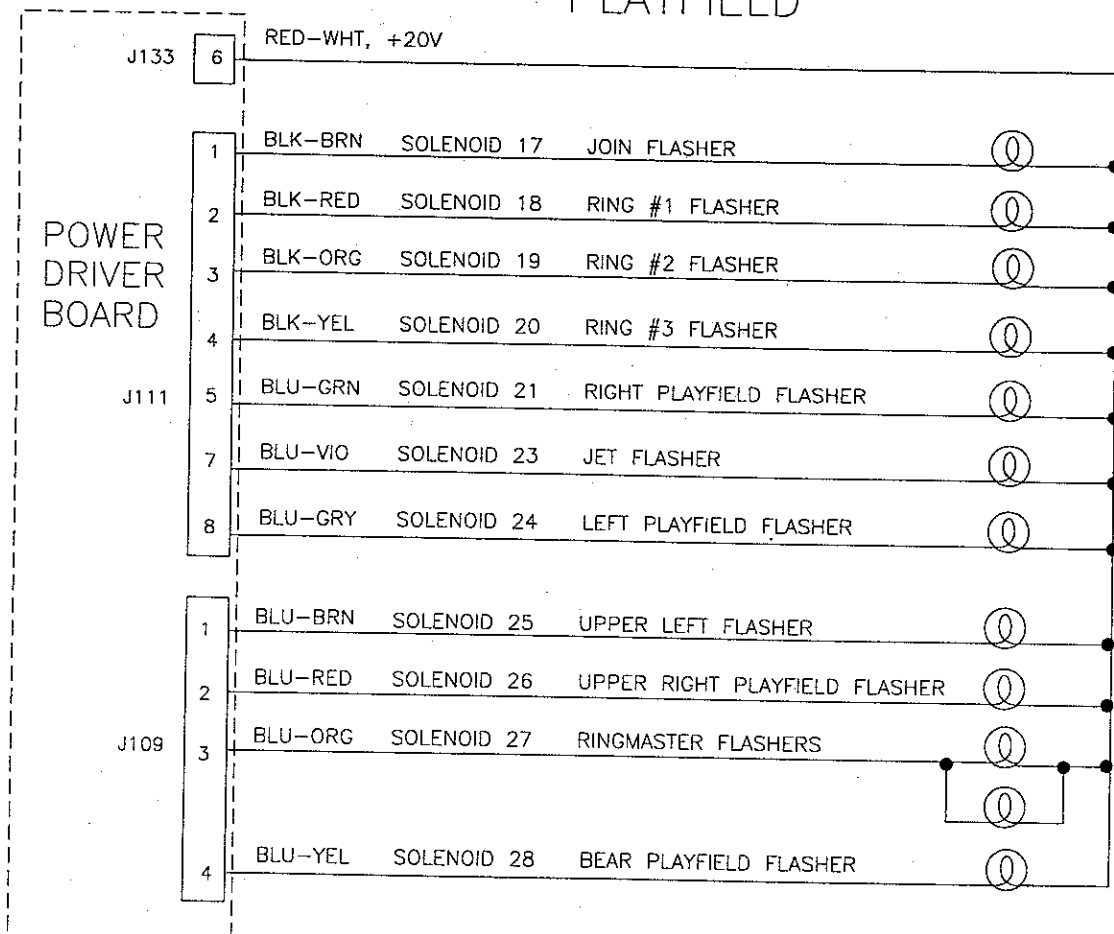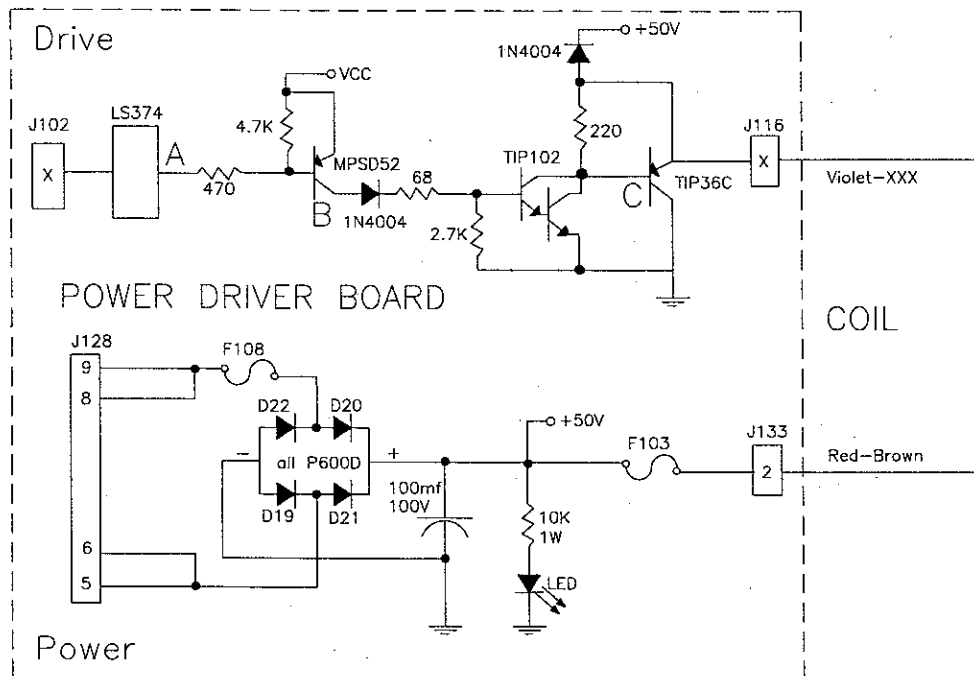
SOLENOID WIRING

COILS & MOTORS

POWER
DRIVER
BOARD

J134 [3] RED—BRN, +50V

BACKBOX
KICKER
SOL. 2

J118 [2] VIO—RED

J133 [3] RED—BLK, +50V
[2] RED—BRN, +50V

J119 [8] RED—GRY, +50V
[6] RED—VIO, +50V

POPPER	DIVERTER HOLD*	RINGMASTER MAGNET	UPPER POST
SOL. 33	SOL. 34	SOL. 35	SOL. 36

J120 [6] YEL—VIO
[4] ORG—VIO
[3] YEL—GRY
[1] ORG—GRY

PLUNGER	LEFT LOOP MAGNET	MIDDLE JET BUMPER	RAMP MAGNET	DIVERTER POWER*	JET UP	JET RELEASE
SOL. 1	SOL. 3	SOL. 4	SOL. 5	SOL. 6	SOL. 7	SOL. 8

J116 [1] VIO—BRN
[4] VIO—ORG
[5] VIO—YEL
[6] VIO—GRN
[7] VIO—BLU
[8] VIO—BLK
[9] VIO—GRY

TROUGH EJECT	LEFT SLINGSHOT	RIGHT SLINGSHOT	UPPER JET BUMPER	LOWER JET BUMPER	LEFT SAUCER	RIGHT SAUCER	LOCK POST
SOL. 9	SOL. 10	SOL. 11	SOL. 12	SOL. 13	SOL. 14	SOL. 15	SOL. 16

J114 [1] BRN—BLK
[3] BRN—RED
[4] BRN—ORG
[5] BRN—YEL
[6] BRN—GRN
[7] BRN—BLU
[8] BRN—VIO
[9] BRN—GRY

TO CPU BRD

J139 [2] GRY—YEL, +12V

NEON

SOL. 37

J110 [1] BRN—WHT
[5] BLU—WHT, SOL. 40

	J1	J2	
4		1	BLU
3	AUTO EDDY	2	BLU
2	SENSOR BRD		
1			

EDDY COIL

*SOLENOID #6 AND SOLENOID #34
ARE TWO WINDINGS IN ONE COIL.

J133 [6] RED—WHT, +12V
J139 [3] BLK, GROUND
J110 [4] YEL—WHT, SOL. 39
J111 [6] BLU—BLK, SOL. 22

	J1	J2	
5		1	RED
4	MOTOR DRIVER		
2	EMI BOARD		
1		2	BLK

MOTOR

FLASHLAMPS

INSERT PANEL

POWER DRIVER BOARD

J134 — 5 — RED–WHT, +20V

J112
6 — BLU–GRN — SOLENOID 21 — UPPER RIGHT BACKBOX FLASHERS
9 — BLU–GRY — SOLENOID 24 — UPPER LEFT BACKBOX FLASHERS

J107
3 — BLU–RED — SOLENOID 26 — LOWER LEFT BACKBOX FLASHERS
5 — BLU–YEL — SOLENOID 28 — LOWER RIGHT BACKBOX FLASHERS

PLAYFIELD

POWER DRIVER BOARD

J133 — 6 — RED–WHT, +20V

J111
1 — BLK–BRN — SOLENOID 17 — JOIN FLASHER
2 — BLK–RED — SOLENOID 18 — RING #1 FLASHER
3 — BLK–ORG — SOLENOID 19 — RING #2 FLASHER
4 — BLK–YEL — SOLENOID 20 — RING #3 FLASHER
5 — BLU–GRN — SOLENOID 21 — RIGHT PLAYFIELD FLASHER
7 — BLU–VIO — SOLENOID 23 — JET FLASHER
8 — BLU–GRY — SOLENOID 24 — LEFT PLAYFIELD FLASHER

J109
1 — BLU–BRN — SOLENOID 25 — UPPER LEFT FLASHER
2 — BLU–RED — SOLENOID 26 — UPPER RIGHT PLAYFIELD FLASHER
3 — BLU–ORG — SOLENOID 27 — RINGMASTER FLASHERS
4 — BLU–YEL — SOLENOID 28 — BEAR PLAYFIELD FLASHER

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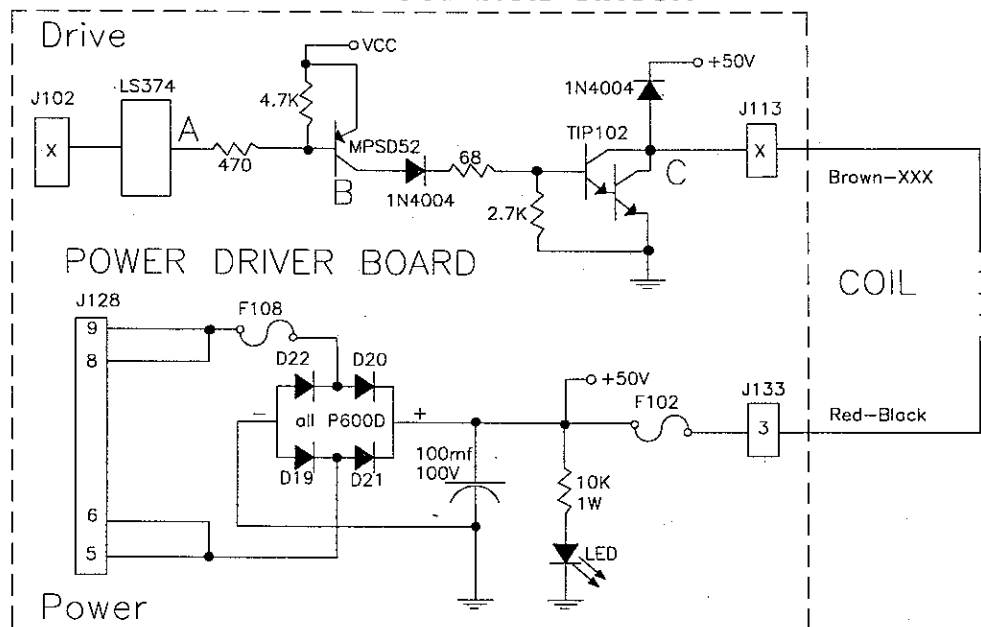
The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B", the collector of the 2N5401 transistor, is high. A high at point "B" turns on the TIP102 transistor and causes point "C" to drop low. When point "C" is low the coil is grounded through the transistor and turns on.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

3-8

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.
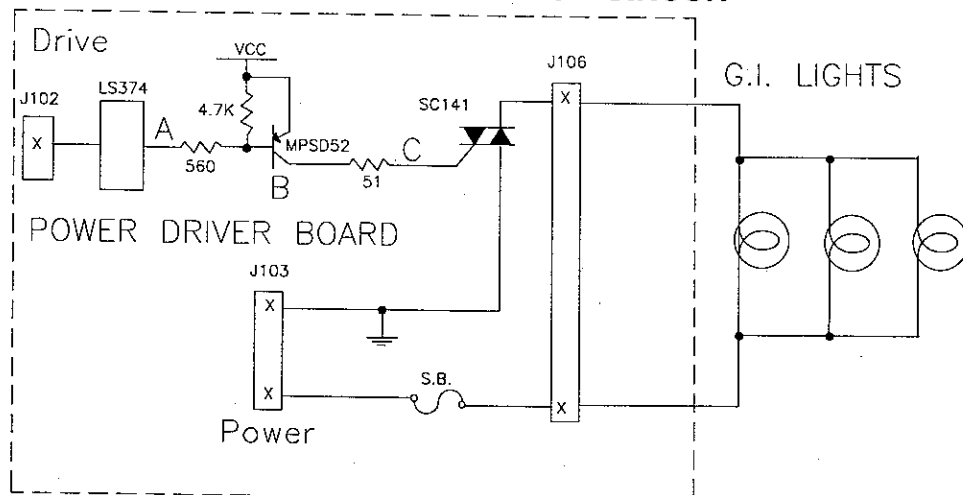
GENERAL ILLUMINATION CIRCUIT
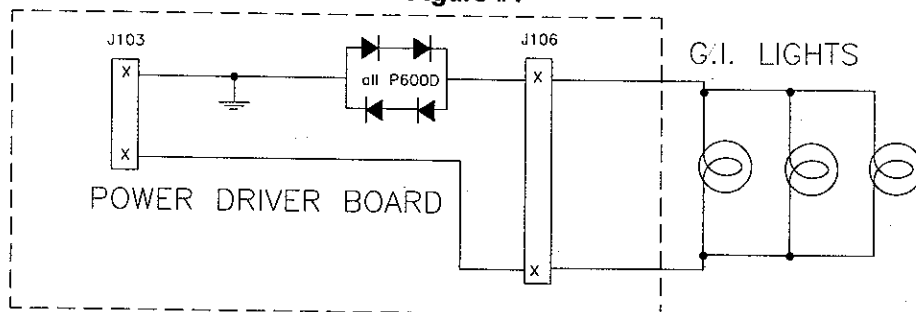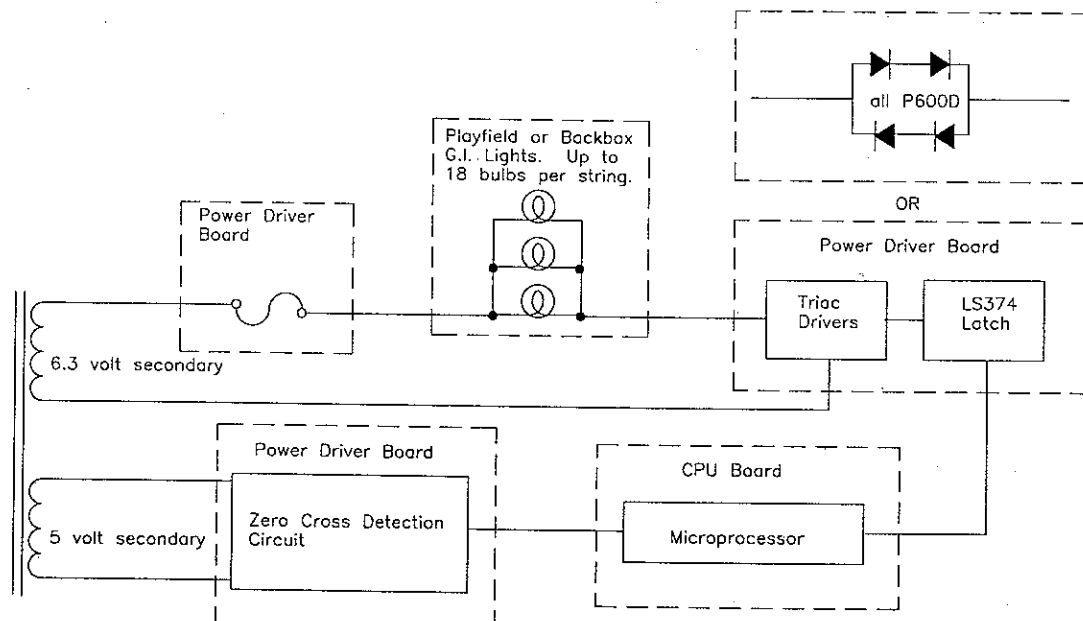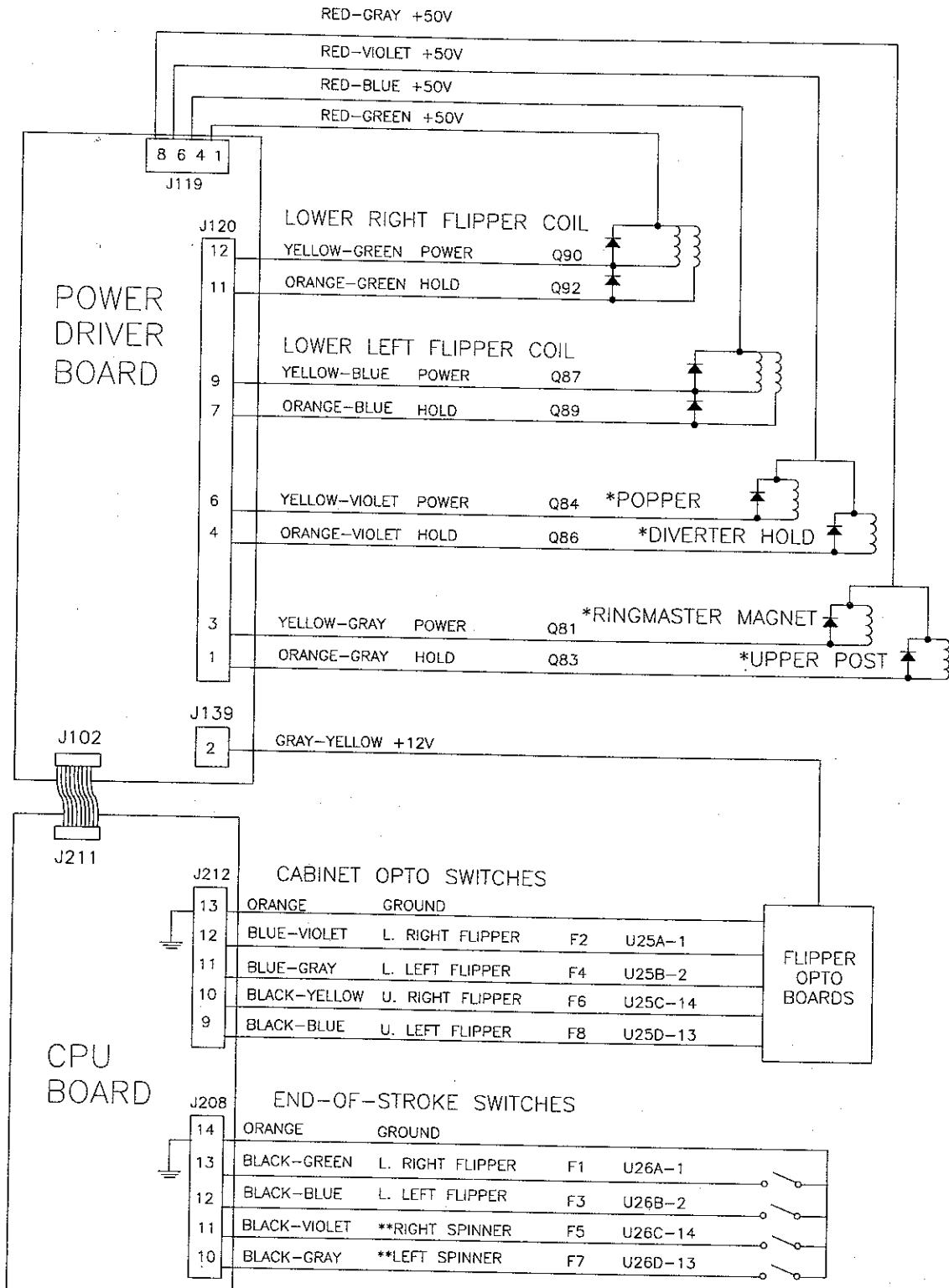

Figure #1

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
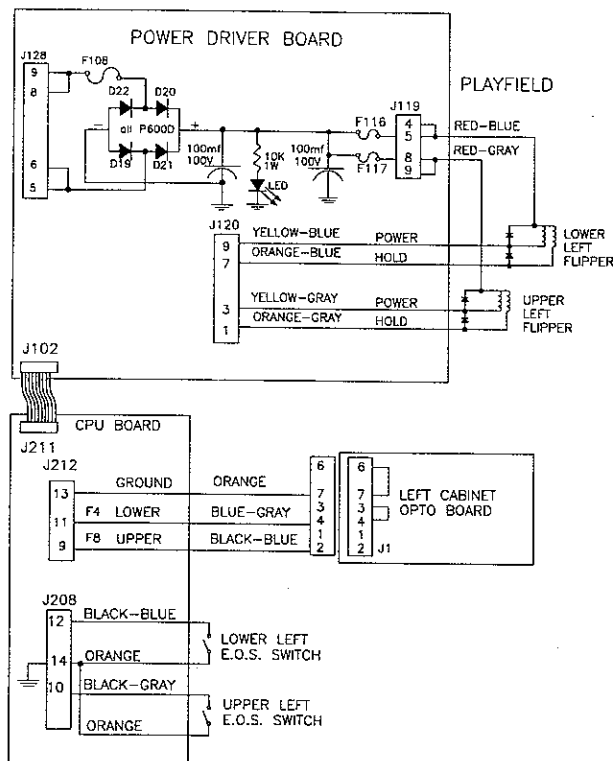
FLIPPER CIRCUIT DIAGRAM

RED—GRAY +50V

RED—VIOLET +50V

RED—BLUE +50V

RED—GREEN +50V

```
8 6 4 1
J119
```

POWER DRIVER BOARD

J120

12	LOWER RIGHT FLIPPER COIL		
	YELLOW—GREEN POWER	Q90	
11	ORANGE—GREEN HOLD	Q92	
	LOWER LEFT FLIPPER COIL		
9	YELLOW—BLUE POWER	Q87	
7	ORANGE—BLUE HOLD	Q89	
6	YELLOW—VIOLET POWER	Q84	*POPPER
4	ORANGE—VIOLET HOLD	Q86	*DIVERTER HOLD
3	YELLOW—GRAY POWER	Q81	*RINGMASTER MAGNET
1	ORANGE—GRAY HOLD	Q83	*UPPER POST

J139

2	GRAY—YELLOW +12V

J102

J211

CPU BOARD

J212 — CABINET OPTO SWITCHES

13	ORANGE	GROUND		
12	BLUE—VIOLET	L. RIGHT FLIPPER	F2	U25A—1
11	BLUE—GRAY	L. LEFT FLIPPER	F4	U25B—2
10	BLACK—YELLOW	U. RIGHT FLIPPER	F6	U25C—14
9	BLACK—BLUE	U. LEFT FLIPPER	F8	U25D—13

FLIPPER OPTO BOARDS

J208 — END—OF—STROKE SWITCHES

14	ORANGE	GROUND		
13	BLACK—GREEN	L. RIGHT FLIPPER	F1	U26A—1
12	BLACK—BLUE	L. LEFT FLIPPER	F3	U26B—2
11	BLACK—VIOLET	**RIGHT SPINNER	F5	U26C—14
10	BLACK—GRAY	**LEFT SPINNER	F7	U26D—13

* The **UPPER RIGHT FLIPPER** circuit is used for the **POPPER** and for **DIVERTER HOLD**. The **UPPER LEFT FLIPPER** circuit is used for the **RINGMASTER MAGNET** and the **UPPER POST**.
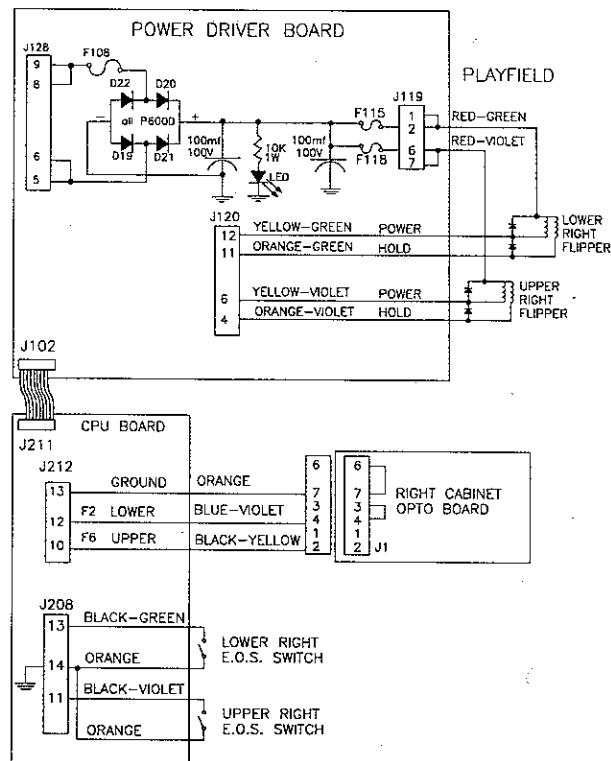**The **UPPER RIGHT E.O.S.** circuit is used for the **RIGHT SPINNER** and the **UPPER LEFT E.O.S.** circuit is used for the **LEFT SPINNER**.
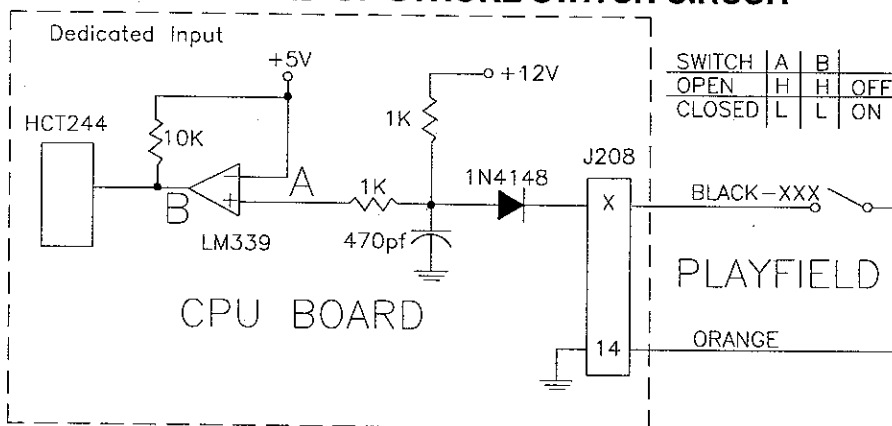
FLIPPER COIL CIRCUITS

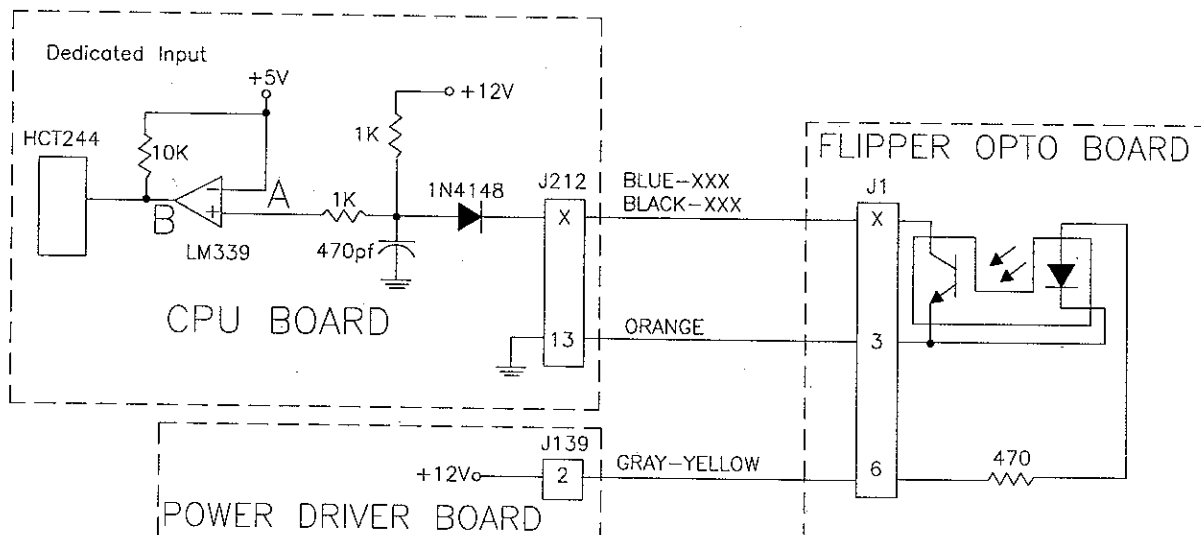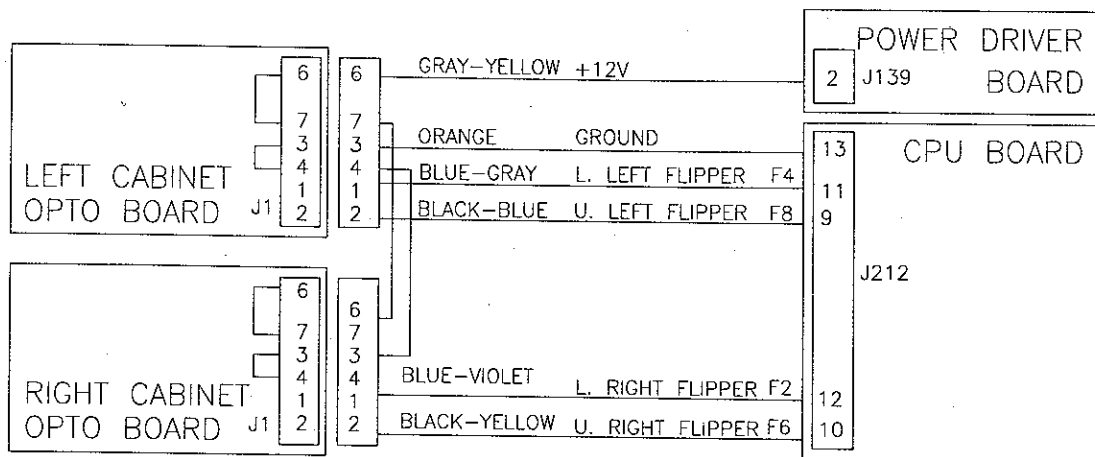## LEFT FLIPPER CIRCUIT

RIGHT FLIPPER CIRCUIT

FLIPPER END-OF-STROKE SWITCH CIRCUIT

SWITCH	A	B	
OPEN	H	H	OFF
CLOSED	L	L	ON

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.

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.
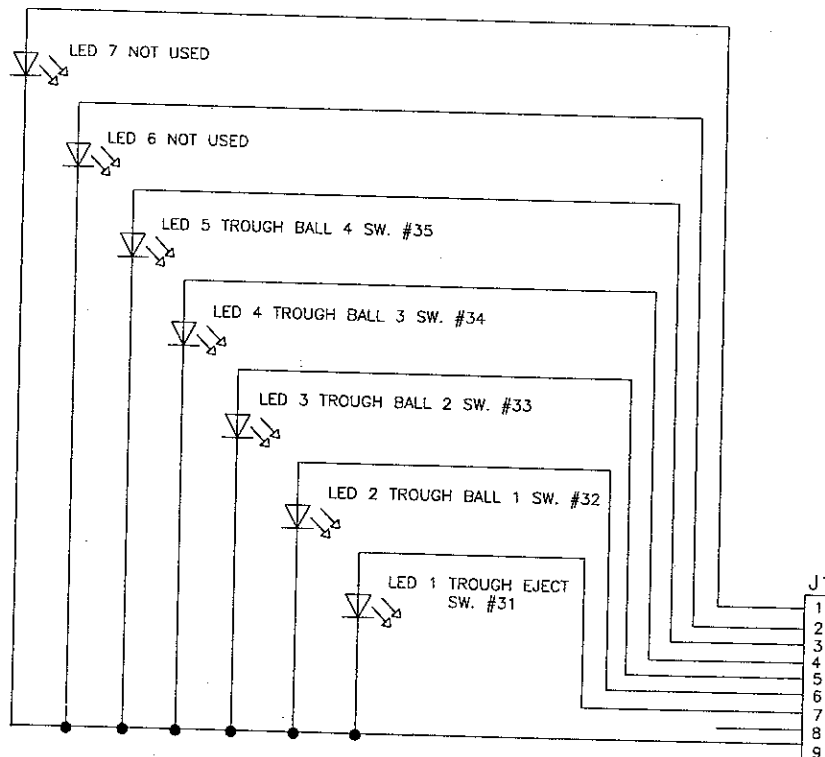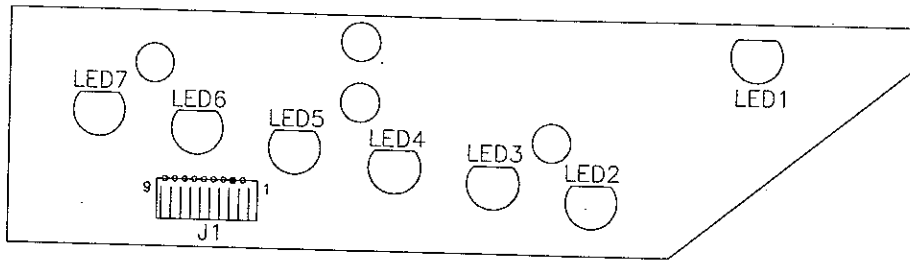
FLIPPER OPTO BOARD ASSEMBLY
A-17316
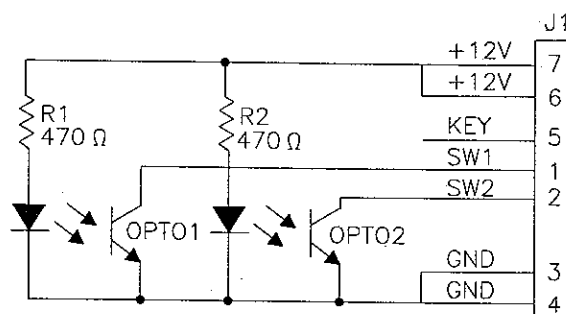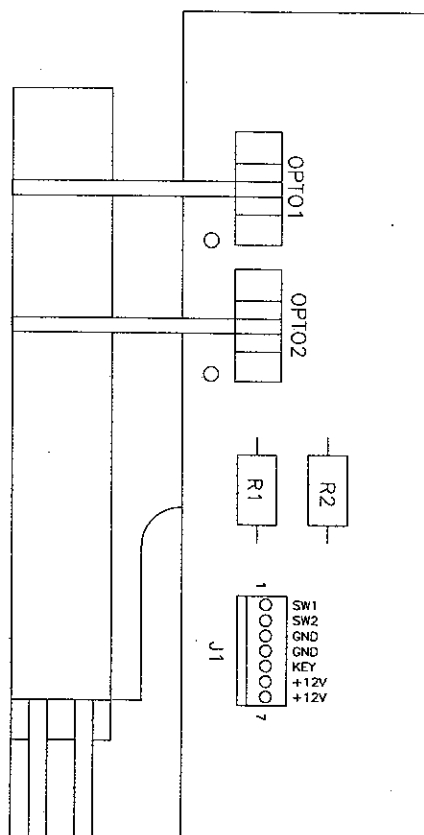
Left Flipper Opto Board Assembly
J1-1   Black-Blue from CPU board J212-9
J1-2   Blue-Gray from CPU board J212-11
J1-3   N/C
J1-4   Orange from CPU board J212-13
J1-5   N/C
J1-6   Gray-Yellow from Power Driver Board J139-2
J1-7   Gray-Yellow from Power Driver Board J139-2

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

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

LED 7 NOT USED

LED 6 NOT USED

LED 5 TROUGH BALL 4 SW. #35

LED 4 TROUGH BALL 3 SW. #34

LED 3 TROUGH BALL 2 SW. #33

LED 2 TROUGH BALL 1 SW. #32

LED 1 TROUGH EJECT SW. #31

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

Trough IR Photo Transistor Board Assembly
(receiver - blue board)
A-18618-1
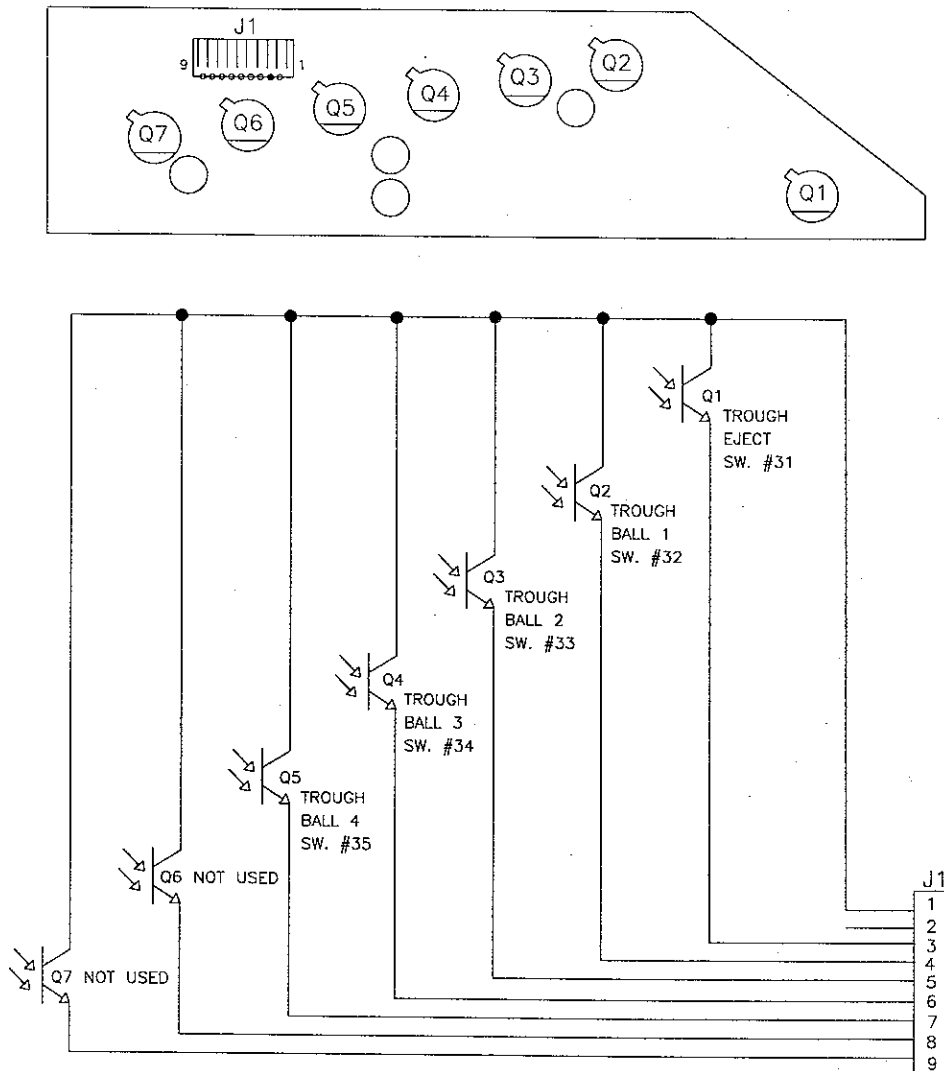
| J1-1	GRY-YEL,	+12V from 7-Opto Switch Board J2-9
J1-2	KEY	
J1-3	ORG-BRN,	For TROUGH EJECT switch #31 from 7-Opto Switch Board J2-7
J1-4	ORG-RED,	For TROUGH BALL 1 switch #32 from 7-Opto Switch Board J2-6
J1-5	ORG-BLK,	For TROUGH BALL 2 switch #33 from 7-Opto Switch Board J2-5
J1-6	ORG-YEL,	For TROUGH BALL 3 switch #34 from 7-Opto Switch Board J2-4
J1-7	ORG-GRN,	For TROUGH BALL 4 switch #35 from 7-Opto Switch Board J2-3
J1-8	N/C	
J1-9	N/C	

7-Opto Switch Board Assembly
A-15576.1
(FOR BALL TROUGH AND POPPER SWITCHES)
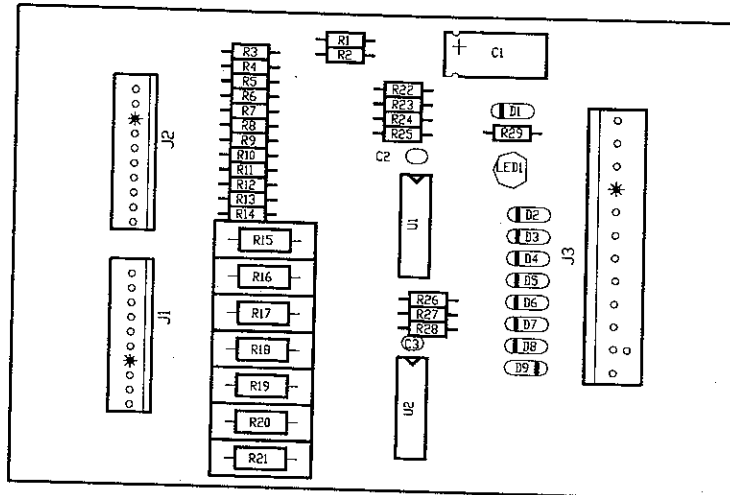
J1-1	N/C	
J1-2	GRY-BLU	To switch #36, POPPER OPTO LED board
J1-3	GRY-GRN	To switch #35, BALL TROUGH, LED board
J1-4	N/C	
J1-5	GRY-BLK	To switch #34, BALL TROUGH LED board
J1-6	GRY-ORG	To switch #33, BALL TROUGH LED board
J1-7	GRY-RED	To switch #32, BALL TROUGH LED board
J1-8	GRY-BRN	To switch #31, BALL TROUGH LED board
J1-9	BLK	Ground to LED boards
J1-10	BLK	Ground to LED boards
J2-1	N/C	
J2-2	ORG-BLU	To switch #36, POPPER OPTO PHOTO TRANS. board
J2-3	ORG-GRN	To switch #35, BALL TROUGH PHOTO TRANS. board
J2-4	ORG-YEL	To switch #34, BALL TROUGH PHOTO TRANS. board
J2-5	ORG-BLK	To switch #33, BALL TROUGH PHOTO TRANS. board
J2-6	ORG-RED	To switch #32, BALL TROUGH PHOTO TRANS. board
J2-7	ORG-BRN	To switch #31, BALL TROUGH PHOTO TRANS. board
J2-8	N/C	
J2-9	GRY-YEL	+12V to PHOTO TRANS. boards
J2-10	GRY-YEL	+12V to PHOTO TRANS. boards
J3-1	N/C	
J3-2	GRY-YEL	+12V from POWER DRIVER board J139-2
J3-3	BLK	Ground from POWER DRIVER board J139-3
J3-4	N/C	
J3-5	WHT-BRN	Switch Row 1, from CPU board J208-1
J3-6	WHT-RED	Switch Row 2, from CPU board J208-2
J3-7	WHT-ORG	Switch Row 3, from CPU board J208-3
J3-8	WHT-YEL	Switch Row 4, from CPU board J208-4
J3-9	WHT-GRN	Switch Row 5, from CPU board J208-5
J3-10	WHT-BLU	Switch Row 6, from CPU board J208-7
J3-11	N/C	
J3-12	GRN-ORG	Switch Column 3, from CPU board J206-3

7-Opto Switch Board Schematic
A-15576.1
(FOR BALL TROUGH AND POPPER OPTO SWITCHES)
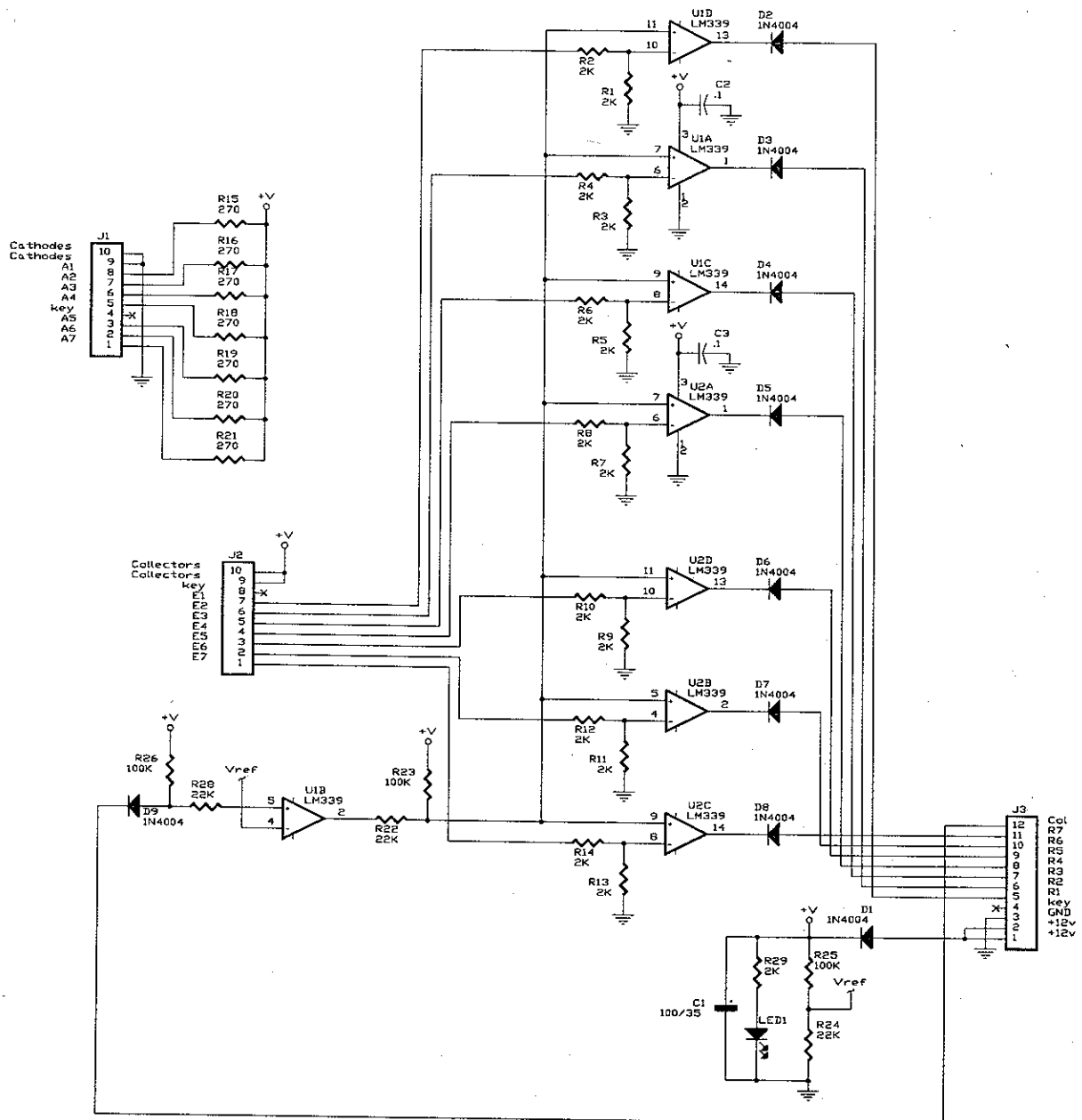
OPTO SWITCH OPERATION:
The Ball Rolls Between The LED Board And The Photo Transistor Board And Breaks The Beam.
The Broken Beam 'Makes' the Switch.

Ball Trough Opto Switches Wiring Diagram

LED BOARD

3	GRY–GRN	3
4	GRY–BLK	5
5	GRY–ORG	6
6	GRY–RED	7
7	GRY–BRN	8
9	BLK, GROUND	9

J1

SWITCH 35 TROUGH 4   SWITCH 34 TROUGH 3   SWITCH 33 TROUGH 2   SWITCH 32 TROUGH 1   SWITCH 31 TROUGH EJECT

7–OPTO SWITCH BOARD

J1		
1	GRY–YEL, +12V	9
3	ORG–BRN	7
4	ORG–RED	6
5	ORG–BLK	5
6	ORG–YEL	4
7	ORG–GRN	3

J2

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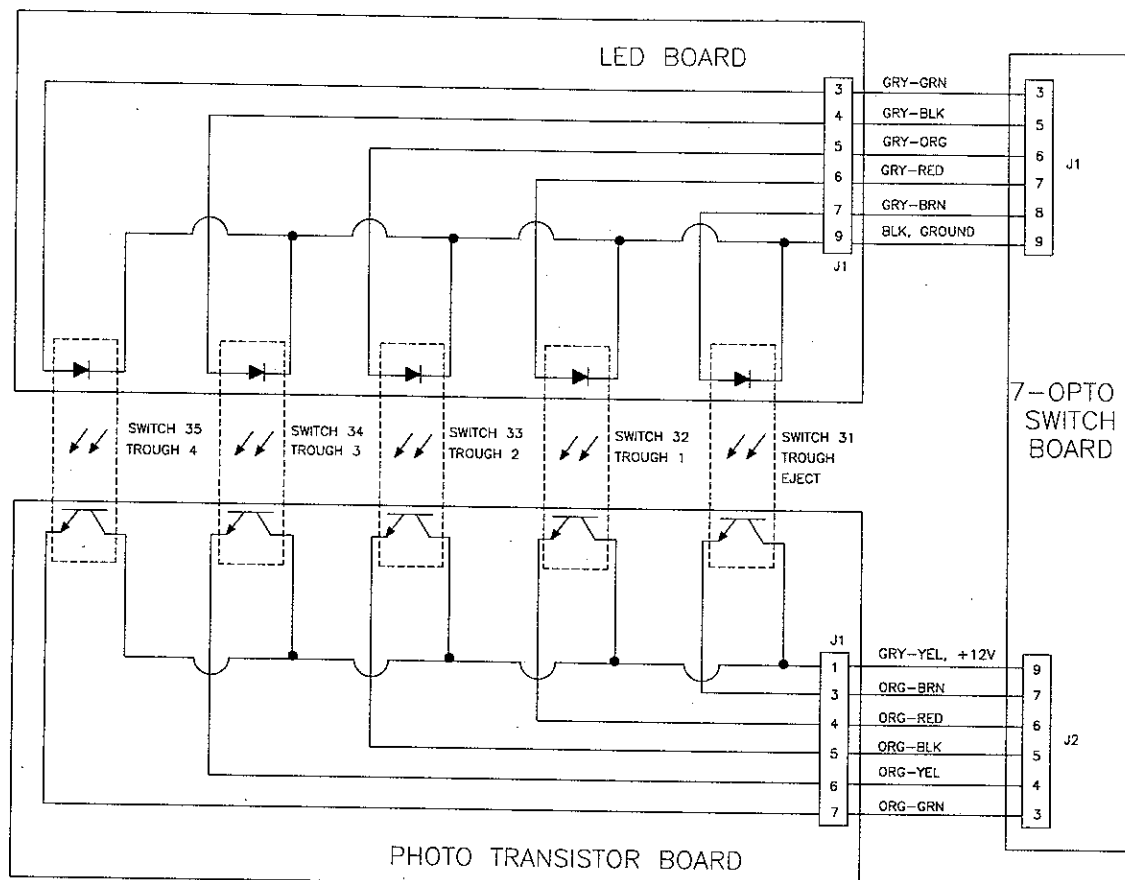
LED BOARD ASSEMBLY
A-16908
(TRANSMITTER-GREEN BOARD)

A   K

K   A

A   K
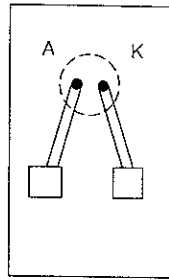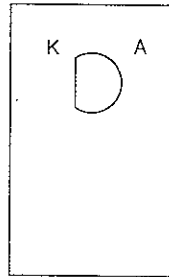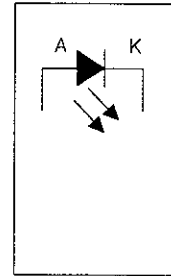
solder side   component side   schematic

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

C   E

E
C

C   E
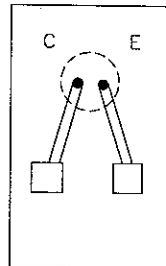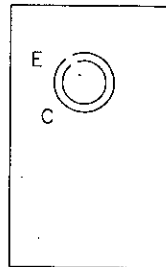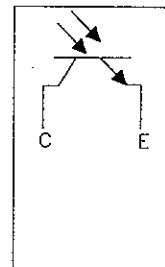
solder side   component side   schematic

TYPICAL CIRCUIT DIAGRAM

LED BOARD
Transmitter
1.0−1.4 volts

BEAM
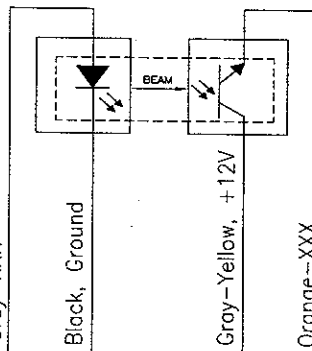
PHOTO TRANSISTOR BOARD
Receiver
0.1−0.7 volts unblocked
11−13 volts blocked

Gray−XXX

Black, Ground

Gray−Yellow, +12V

Orange−XXX

LED BOARD
Transmitter

White

PHOTO TRANSISTOR BOARD
Receiver

Black

Green

Blue

A   K

C   E

Solder

Solder

Infrared Beam

Gray

Black

Gray−Yellow

Orange

3-20
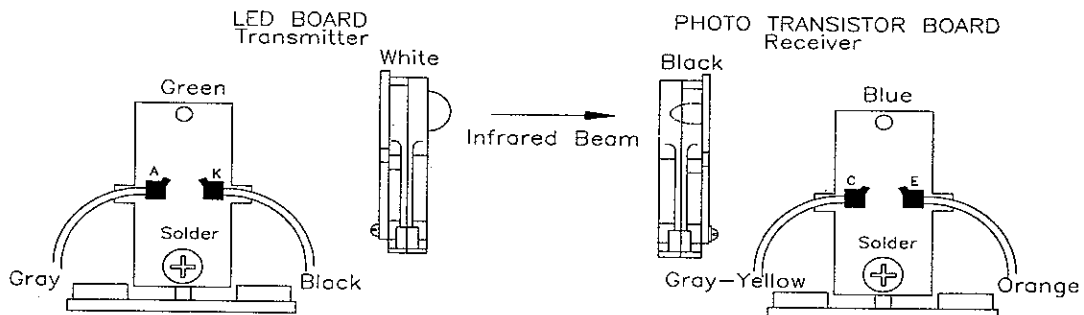
Auto Eddy Sensor Board
A-21745-2
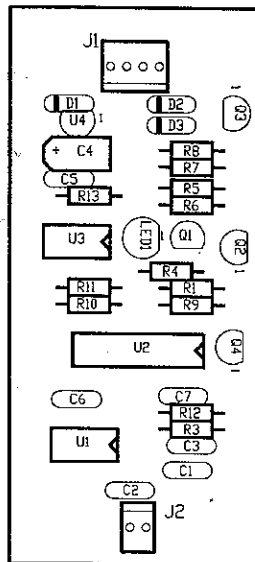
J1-1	BLU WHT	Solenoid #40 Drive	**J2-1**	BLU	To Eddy Coil
J1-2	GRY-YEL	+12V	**J2-2**	BLU	To Eddy Coil
J1-3	GRN-BRN	Switch Column #1			
J1-4	WHT-BLU	Switch Row #6			

Eddy Coil Board
A-20036
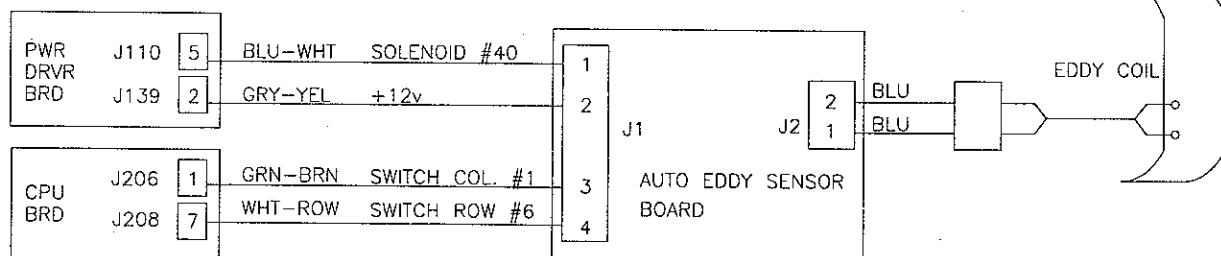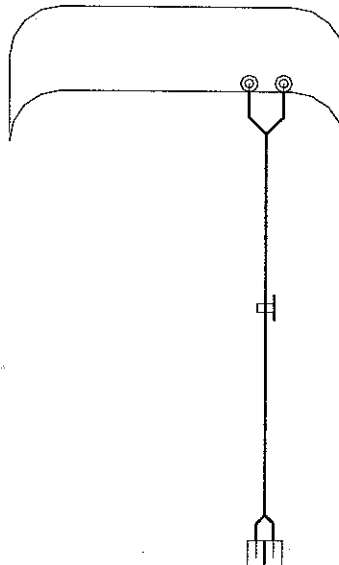
Auto Eddy Sensor Board Schematic
A-21745-2

Pin 4 will be 'LOW' when object is sensed.
Pin 4 will be 'HIGH' when object is not
sensed.
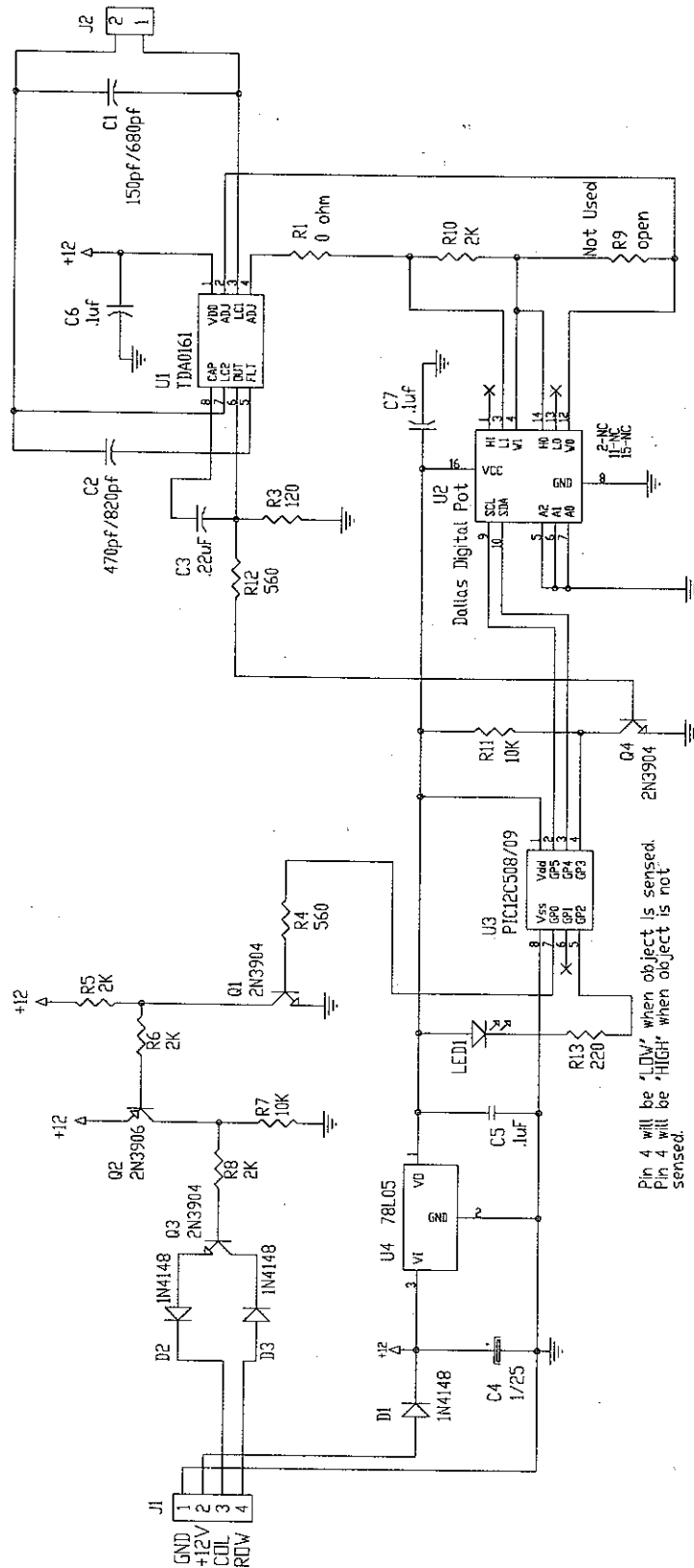
Bi-directional Motor Driver Board
A-15680
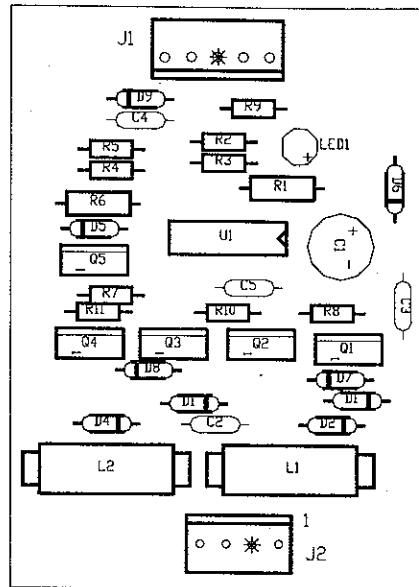
J1-1	RED-WHT	+12V		**J2-1**	RED	+MOTOR
J1-2	BLK	Ground		**J2-2**	N/C	
J1-3	KEY			**J2-3**	KEY	
J1-4	YEL-WHT	Solenoid #39 Drive		**J2-4**	BLK	-MOTOR
J1-5	BLU-BLK	Solenoid #22 Drive				
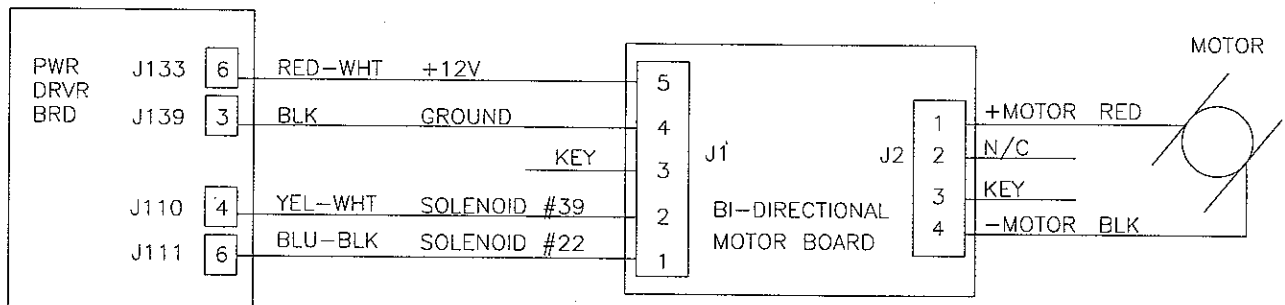
Bi-directional Motor Driver Board Schematic
A-15680
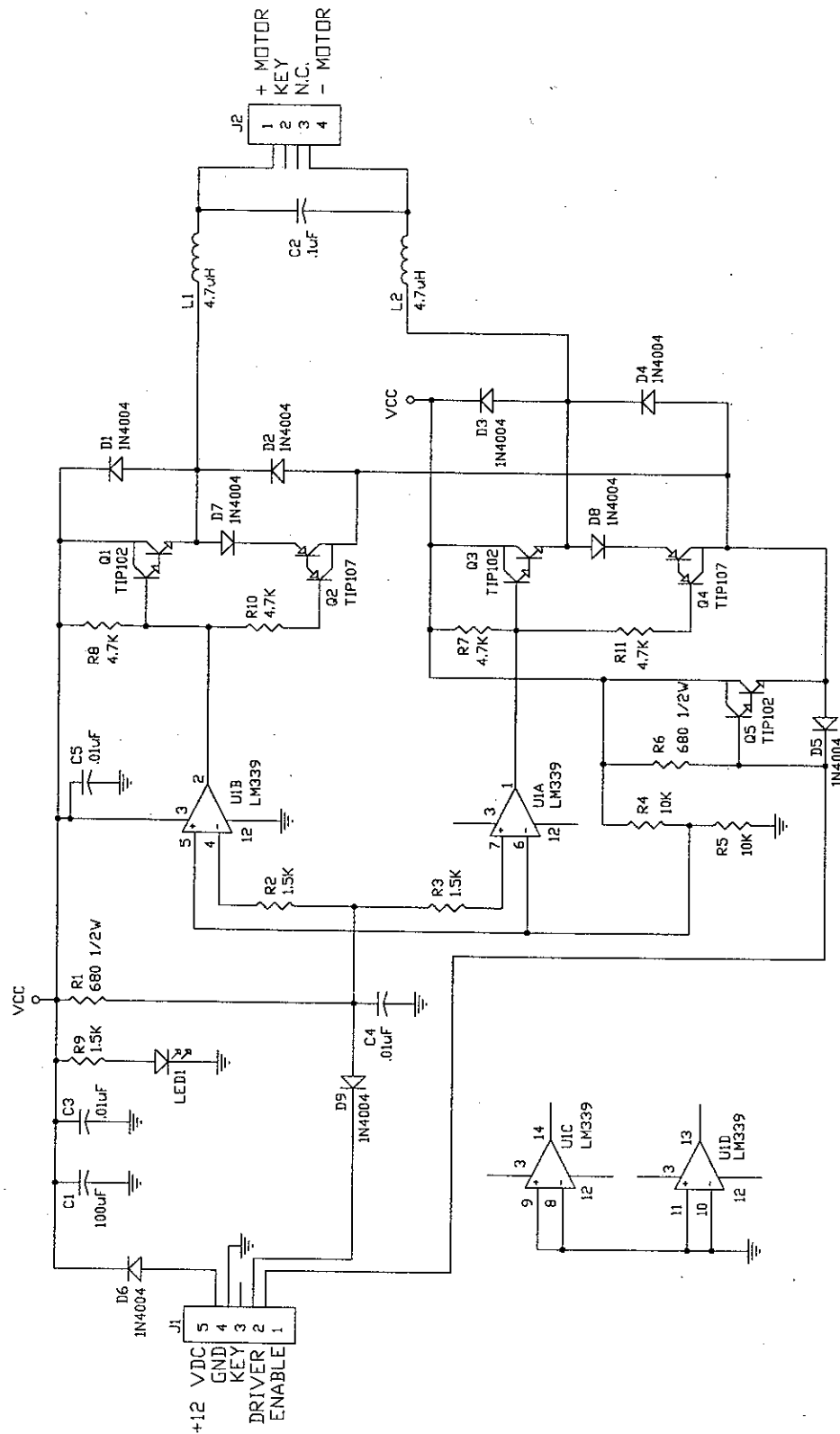
Coin Door Interface Board
A-20580
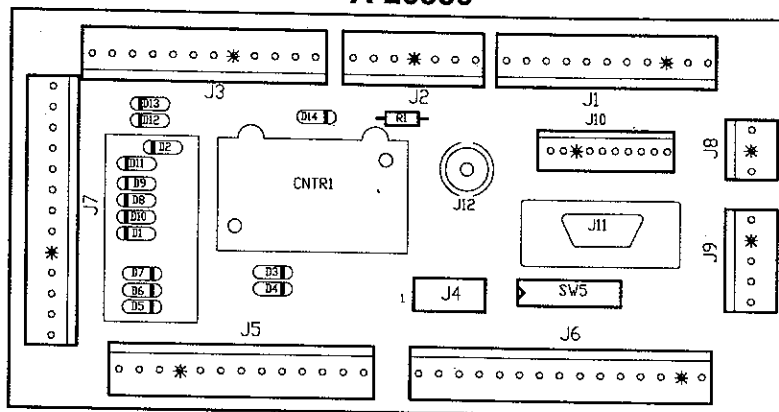
J1-1	ORG-GRY	Dedicated sw row #8 from CPU J205-9.
J1-2	ORG-VIO	Dedicated sw row #7 from CPU J205-8.
J1-3	ORG-BLU	Dedicated sw row #6 from CPU J205-7.
J1-4	ORG-GRN	Dedicated sw row #5 from CPU J205-6.
J1-5	ORG-YEL	Dedicated sw row #4 from CPU J205-4.
J1-6	ORG-BLK	Dedicated sw row #3 from CPU J205-3.
J1-7	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).

3-25

Coin Door Interface Board Schematic
A-20580

Security CPU Board Assembly
A-21377-50062

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	
J207-1	GRN-BRN	Switch column #1 to insert panel switch
J207-2	N/C	
J207-3	N/C	
J207-4	N/C	
J207-5	N/C	
J207-6	N/C	
J207-7	N/C	
J207-8	KEY	
J207-9	N/C	
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	BLK-GRY	To Left Spinner switch #F7
J208-11	BLK-VIO	To Right Spinner switch #F5
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.
J209-1	WHT-BRN	Switch row #1 to insert panel switch
J209-2	N/C	
J209-3	N/C	
J209-4	N/C	
J209-5	N/C	
J209-6	KEY	
J209-7	N/C	
J209-8	N/C	
J209-9	N/C	
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.

J201   26-pin ribbon cable   Data to/from J602.

J202   34-pin ribbon cable   Data to/from J601.

J203 & 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.

Audio Visual Board Assembly
A-20516-50062
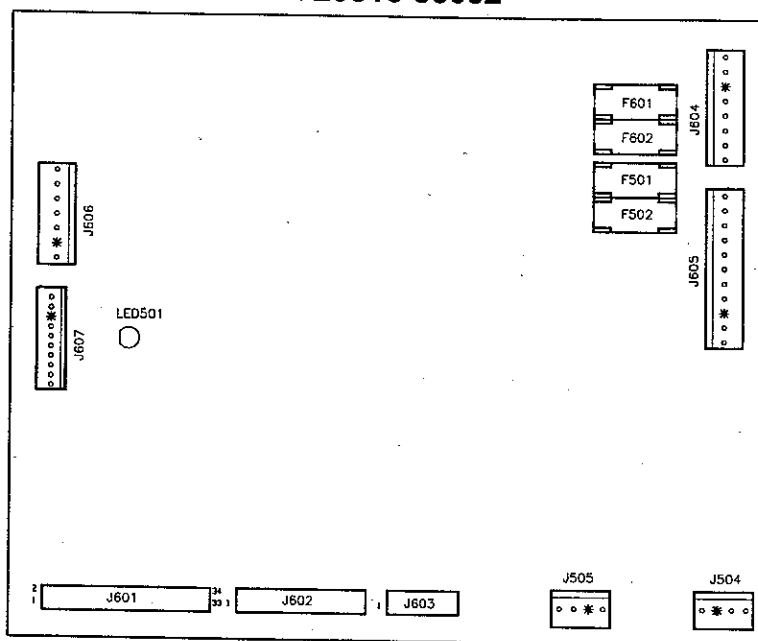
J601	34-pin ribbon cable	Data to/from CPU J202.
J602	26-pin ribbon cable	Data to/from CPU J201.
J603	14-pin ribbon cable	Data to/from Dot Matrix Display Driver board.

J604-1	GRN
J604-2	BRN
J604-3	KEY
J604-4	ORG
J604-5	BLK
J604-6	RED
J604-7	WHT
J604-8	BLU

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.

3-28

Power Driver Board Assembly
A-20028
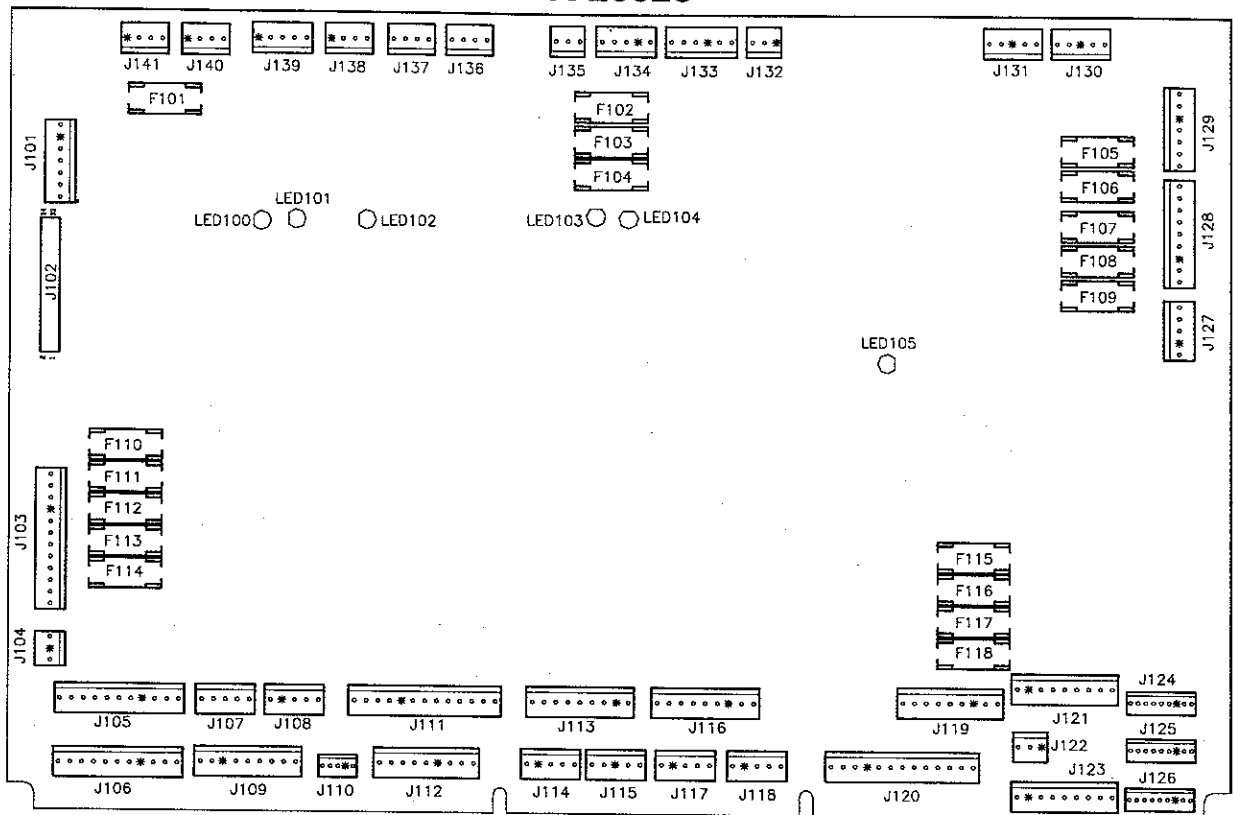
J101-1	GRY-GRN	+12V to J210-6, 7; J606-1.
J101-2	GRY-GRN	+12V to J210-6, 7; J606-2.
J101-3	GRY	+5V to J210-4, 5; J3-1, 3; J606-3.
J101-4	GRY	+5V to J210-4, 5; J3-1, 3; J606-4.
J101-5	BLK	Ground to J210-1, 3; J606-5.
J101-6	KEY	
J101-7	BLK	Ground to J210-1,3; J606-7.

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	N/C	
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	N/C	
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.

J107-1	N/C	
J107-2	KEY	
J107-3	BLU-RED	For solenoid #26 drive to insert flasher
J107-4	N/C	
J107-5	BLU-YEL	For solenoid #28 drive to insert flasher

J108	NOT USED

J109-1	BLU-BRN	For solenoid #25 drive to plyfld flasher
J109-2	BLU-RED	For solenoid #26 drive to plyfld flasher
J109-3	BLU-ORG	For solenoid #27 drive to plyfld flasher
J109-4	BLU-YEL	For solenoid #28 drive to plyfd flasher
J109-5	N/C	
J109-6	N/C	
J109-7	KEY	
J109-8	N/C	
J109-9	N/C	
J110-1	BRN-WHT	For solenoid #37 drive to Neon
J110-2	KEY	
J110-3	ORG-WHT	N/C
J110-4	YEL-WHT	For solenoid #38 drive to Motor PC Board
J110-5	BLU-WHT	For solenoid #39 drive Eddy Sensor Brd
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	N/C	
J112-2	N/C	
J112-3	N/C	
J112-4	KEY	
J112-5	N/C	
J112-6	BLU-GRN	For solenoid #21 drive to insert flasher.
J112-7	N/C	
J112-8	N/C	
J112-9	BLU-GRY	For solenoid #24 drive to insert flasher.
J113	NOT USED	
J114-1	BRN-BLK	For solenoid #9 drive to playfield coil.
J114-2	KEY	
J114-3	BRN-RED	For solenoid #10 drive to playfield coil.
J114-4	BRN-ORG	For solenoid #11 drive to playfield coil.
J114-5	BRN-YEL	For solenoid #12 drive to playfield coil.
J114-6	BRN-GRN	For solenoid #13 drive to playfield coil.
J114-7	BRN-BLU	For solenoid #14 drive to playfield coil.
J114-8	BRN-VIO	For solenoid #15 drive to playfield coil.
J114-9	BRN-GRY	For solenoid #16 drive to playfield coil.
J115	NOT USED	
J116-1	VIO-BRN	For solenoid #1 drive to playfield coil.
J116-2	N/C	
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	

J118-1	N/C	
J118-2	VIO-RED	For solenoid #2 to insert coil
J118-3	N/C	
J118-4	KEY	
J118-5	N/C	
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	+50V to solenoid #33 for Popper
J119-7	RED-VIO	+50V to solenoid #34 for Diverter Hold
J119-8	RED-GRY	+50V to solenoid #35 for Ringmaster Mgt
J119-9	RED-GRY	+50 V to solenoid #36 for Upper Post
J120-1	ORG-GRY	For sol. #36 hold drive to Upper Post
J120-2	N/C	
J120-3	YEL-GRY	For sol. #35 power drive to Ringmaster Mgt
J120-4	N/C	
J120-5	ORG-VIO	For sol. #34 hold drive to Diverter Hold
J120-6	YEL-VIO	For sol. #33 power drive to Popper
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	NOT USED	
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.
J126-1	RED-BRN	For lamp row #1 to playfield.
J126-2	RED-BLK	For lamp row #2 to playfield.
J126-3	KEY	
J126-4	RED-ORG	For lamp row #3 to playfield.
J126-5	RED-YEL	For lamp row #4 to playfield.
J126-6	RED-GRN	For lamp row #5 to playfield.
J126-7	RED-BLU	For lamp row #6 to playfield.
J126-8	RED-VIO	For lamp row #7 to playfield.
J126-9	RED-GRY	For lamp row #8 to playfield.

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.

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   N/C
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   RED-BLK   +50V to insert panel coil
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

CIRQUS NOTES

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	CIRQUS "R" (11)	CIRQUS "I" (21)	SIDE SHOW (31)	RING-MASTER LEFT (41)	CRANK TOP (51)	MIDDLE JACKPOT (61)	WOW RIGHT "W" TARGET (71)	EXTRA BALL (81)
2 Red-Black J125-2 Q108	GRID TOP (12)	CIRQUS "C" (22)	LEFT LOOP TOP (32)	RING-MASTER 2 (42)	CRANK 2 (52)	RIGHT JACKPOT (62)	WOW "O" TARGET (72)	TOP JET BUMPER (82)
3 Red-Orange J125-4 Q103	CIRQUS "Q" (13)	GRID MIDDLE/LEFT (23)	LEFT LOOP 3 (33)	RING-MASTER 3 (43)	CRANK 3 (53)	LIGHT STANDUP TARGET (63)	WOW LEFT "W" TARGET (73)	MIDDLE JET BUMPER (83)
4 Red-Yellow J125-5 Q107	CIRQUS "U" (14)	GRID BOTTOM/LEFT (24)	LEFT LOOP 2 (34)	RING-MASTER 4 (44)	CRANK BOTTOM (54)	LOCK STANDUP TARGET (64)	RING "N" (74)	LOWER JET BUMPER (84)
5 Red-Green J125-6 Q102	GRID TOP/RIGHT (15)	GRID BOTTOM (25)	LEFT LOOP 1 (35)	RING-MASTER RIGHT (45)	RIGHT LOOP TOP (55)	RING "R" (65)	RING "G" (75)	RIGHT IN-LANE (85)
6 Red-Blue J125-7 Q106	CIRQUS "S" (16)	GRID MIDDLE (26)	MULTIBALL (36)	SPECIAL (46)	RIGHT LOOP 3 (56)	RING "I" (66)	RIGHT OUTLANE (76)	VOLT LEFT (86)
7 Red-Violet J125-8 Q101	GRID MIDDLE/RIGHT (17)	GRID BOTTOM/RIGHT (27)	LOCK (37)	RAZZ (47)	RIGHT LOOP 2 (57)	SHOOT AGAIN (67)	LEFT IN-LANE (77)	VOLT RIGHT (87)
8 Red-Gray J125-9 Q105	LEFT JACKPOT (18)	GRID TOP/LEFT (28)	SPOT MARVEL (38)	FRENZY (48)	RIGHT LOOP 1 (58)	LEFT OUTLANE (68)	SKILL RING (78)	START BUTTON (88)

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	BACKBOX LUCK (11)	SLAM TILT (21)	TROUGH EJECT (31)	LEFT LANE (41)	LEFT SLINGSHOT (51)	LIGHT STANDUP TARGET (61)	LEFT SAUCER (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	WIRE RAMP ENTER (12)	COIN DOOR CLOSED (22)	TROUGH BALL 1 (32)	RING-MASTER UP (42)	RIGHT SLINGSHOT (52)	LOCK STANDUP TARGET (62)	RIGHT SAUCER (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)	RIGHT LOOP UPPER (23)	TROUGH BALL 2 (33)	RING-MASTER MIDDLE (43)	UPPER JET BUMPER (53)	RAMP ENTER (63)	NOT USED (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)	RING-MASTER DOWN (44)	MIDDLE JET BUMPER (54)	RAMP MAGNET (64)	BIG BALL REBOUND (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 LOOP UPPER (15)	INNER LOOP LEFT (25)	TROUGH BALL 4 (35)	LEFT RAMP MADE (45)	LOWER JET BUMPER (55)	RAMP MADE (65)	VOLT RIGHT (75)	NOT USED (85)	BLACK-VIOLET J208-11 RIGHT SPINNER F5
Orange-Blue J205-7 U16-11 Normal Function Volume Dn / Test Function Down D6	6 White-Blue U208-7 U19-9	TOP EDDY (16)	LEFT IN-LANE (26)	POPPER OPTO (36)	TROUGH UPPER (46)	SKILL SHOT (56)	RAMP LOCK LOW (66)	VOLT LEFT (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 IN-LANE (17)	LEFT OUTLANE (27)	"WOW" TARGETS (37)	TROUGH MIDDLE (47)	RIGHT OUTLANE (57)	RAMP LOCK MIDDLE (67)	NOT USED (77)	NOT USED (87)	BLACK-GRAY J208-10 LEFT SPINNER 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)	INNER LOOP RIGHT (28)	TOP TARGETS (38)	LEFT LOOP ENTER (48)	RING 'N', 'G' (58)	RAMP LOCK HIGH (68)	NOT USED (78)	NOT USED (88)	BLACK-BLUE J212-9 UPPER LEFT FLIPPER OPTO F8

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