SERVICE BULLETIN BOOK

1997

WILLIAMS ELECTRONICS GAMES, INC.

WILLIAMS ELECTRONIC GAMES, INC.
MIDWAY GAMES INC.

2704 W. Roscoe St.
Chicago, Il 60618
Service Dept. Phone: (773) 961-1544 Fax: (773) 961-1080
Website http://www.wms.com

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BULLETINS, TIPS, & NOTICES

AMENDMENTS

WILLIAMS AND BALLY GAMES BY SYSTEM

THIS IS A LISTING OF GAMES BY THE CPU SYSTEM IT USED. 11A BOARDS CAN BE USED FOR 11 AND 11A GAMES. 11B BOARDS CAN BE USED FOR 11A, 11B, AND 11C. SYSTEM 9, 11, AND 11C CAN ONLY BE USED FOR THEIR OWN SYSTEMS RESPECTIVELY. WPC CPU'S BEFORE "INDIANA JONES" CAN ONLY BE USED ON GAMES MADE BEFORE "INDY". ANY WPC CPU'S AFTER "INDY" (GAMES WITH A "*" AFTER THEM) ARE DOWNWARD COMPATIBLE. STARTING WITH "WORLD CUP" (GAMES WITH A "S" AFTER THEM) WE WILL BE USING A SECURITY CPU, THESE CPU'S ARE NOT DOWNWARD COMPATIBLE.

GAME	SYSTEM
SPACE SHUTTLE	9
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FUNHOUSE	WPC
HARLEY DAVIDSON	WPC
THE MACHINE	WPC
SLUGFEST	WPC
GILLIGAN'S ISLAND	WPC
TERMINATOR 2	WPC
PARTY ZONE	WPC
ADDAMS FAMILY	WPC
STRIKE MASTER	WPC
STRIKE MASTER JR.	WPC
HURRICANE	WPC
THE GETAWAY	WPC
BLACK ROSE	WPC
FISHTALES	WPC
DOCTOR WHO	WPC
CREATURE FROM THE BLACK LAGOON	WPC
WHITE WATER	WPC
HOT SHOT	WPC
DRACULA	WPC
TWILIGHT ZONE	WPC
INDIANA JONES	WPC*
JUDGE DREDD	WPC*
STAR TREK	WPC*
POPEYE	WPC*
DEMOLITION MAN	WPC*
LEAGUE CHAMP	WPC*
WORLD CUP	WPC(S)
THE FLINTSTONES	WPC(S)
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ATTACK FROM MARS	WPC95

GAME	SYSTEM
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TICKET-TAC-TOE	WPC95
TALES OF THE ARABIAN NIGHTS	WPC95
SCARED STIFF	WPC95
JUNKYARD	WPC95

WILLIAMS ELECTRONICS GAMES, INC.
3401 N. California Ave. Chicago, IL 60618
Tel.773-961-1544 Fax.773-961-1080

Service Tip

Flipper Coils Used In Williams And Bally Pinball Machines

At Williams Bally Midway, we try to have a balance of power for the flippers which is really based on the layout and design of a given game. Obviously, flippers are one of the most important parts for player satisfaction. And, if you have a weak flipper it can adversely effect a player's enjoyment and ability to play a machine. Conversely, if the flipper is too strong, the ball will tend to bounce and could cause unnecessary damage to the playfield.

Going from the lightest, or weakest, this is a handy reference list.

FL-11753 Yellow: Used with short flippers and close shots.

FL-11722 Green: Used for close shots near drop targets.

FL-11630 Red: The standard and most frequently used.

FL-15411 Orange: Used on long playfield shots.

FL-11629 Blue: Used on long shots and high ramps.

In rebuilding older 50 volt (Firepower II up to F-14 Tomcat) game flippers that did not have parallel wound style coils, make certain that you do not have an over-powered coil (too strong), because the playfields did not have the extra support for the plastic posts and playfield ramps that are built into today's games.

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3401 N. CALIFORNIA AVE. CHICAGO, IL 60618
TEL. 312-961-1544 FAX.312-961-1080

SERVICE BULLETIN

DATE: 3-19-96 SB87

GAME: "JOHNNY MNEMONIC"

SUBJECT: HAND MAGNET CAUSING FUSE TO BLOW INTERMITTENTLY.

This procedure will move the hand electromagnet power supply circuit from fuse F104 to fuse F103, which is not used by any other circuit in the game. These fuses are located on the Power Driver Board Assembly.

---

1. Remove the balls from the game and disconnect the power.

2. Raise the playfield and lean it against the backbox.

3. Locate the 6-pin connector containing two red/brown 18 ga. wires in the same pin, two red/white wires in the same pin, one blue/yellow wire in its own pin, and one purple/blue wire in its own pin. This connector comes off the back panel assembly and is located at the back of the playfield.

4. Cut the paired red/brown wires on the side of the connector going away from the playfield and towards the backbox as shown in DIAGRAM A.

5. Splice the wires as shown in DIAGRAM B.

6. Cut an 8 ft. length of 18 ga. wire and splice into the wire end left at the connector. Run the other end into the backbox and press the wire end into position no. 1 at the insulation displacement connector J107, located on the Power Driver Board Assembly.
   NOTE: IT IS VERY IMPORTANT THAT GOOD ELECTRICAL CONTACT IS MADE AT THE IDC (J107) WHEN INSTALLING THE 18 GA. WIRE!

7. Replace the fuse at position F103 with a 4 amp slow blow 250v fuse.

8. Dress the new 18 ga. jumper wire inside the black corrugated cable tube at the right side of the backbox. Wire tie as needed at the playfield, making sure to stay clear of all moving mechanisms. Route the jumper inside the backbox as needed.

LOCATE 6-PIN CONNECTOR WITH RED/BROWN 18 GA, WIRE AS SHOWN AND MODIFY PER DIAGRAM.

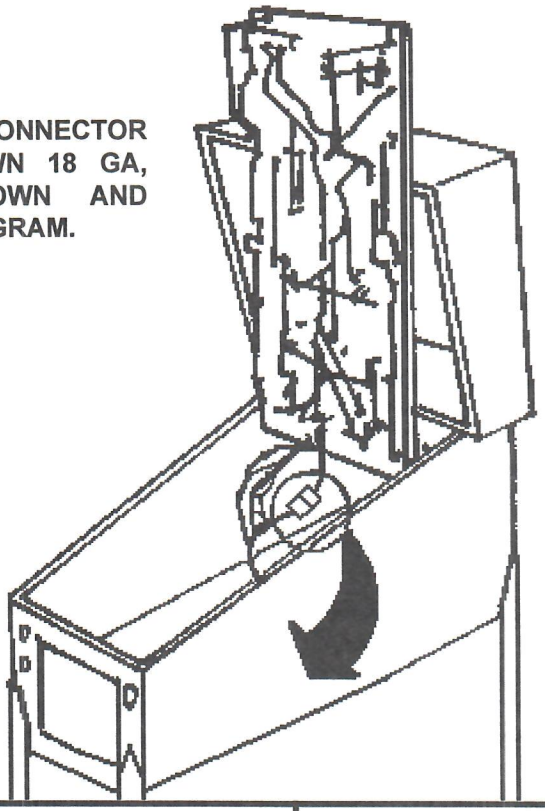


DIAGRAM A

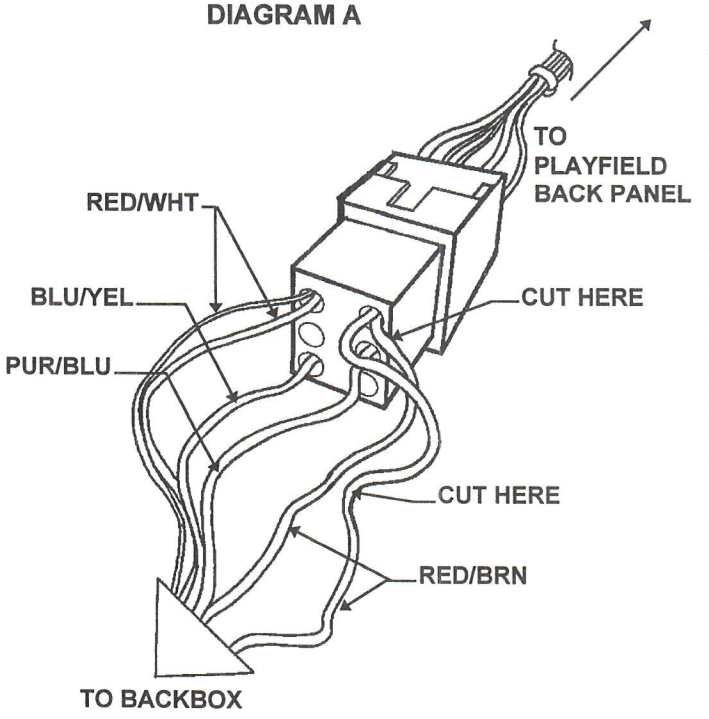
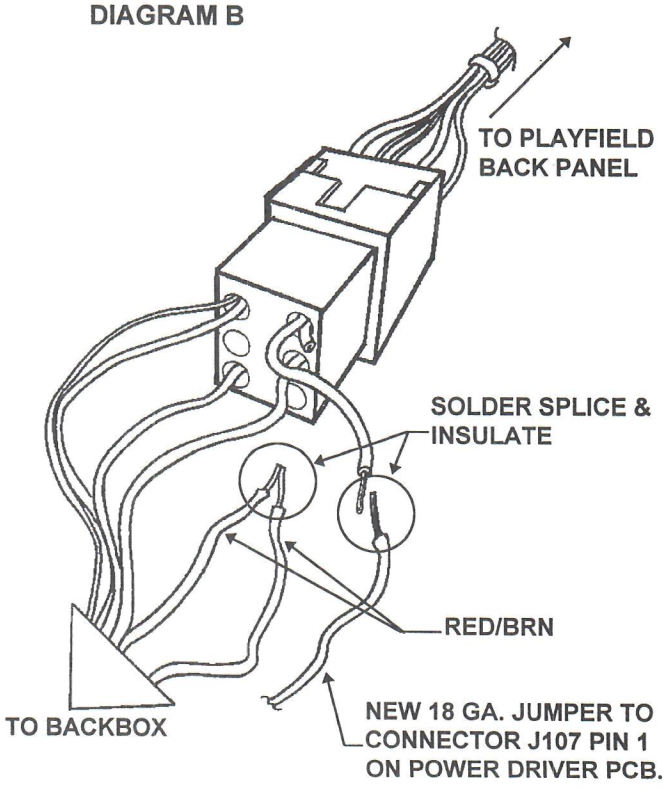


DIAGRAM B



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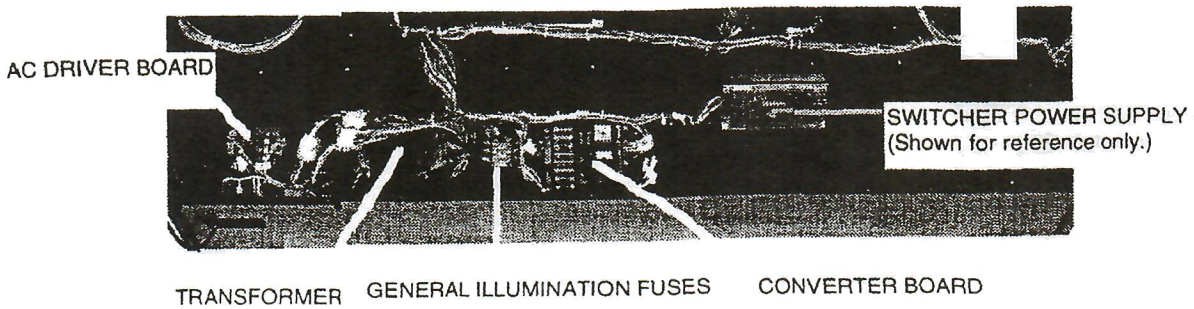
SERVICE BULLETIN

DATE: 3-19-96 SB88

GAME: "WHEEL OF FORTUNE"

SUBJECT: General Illumination Fuses Blowing

Currently "Wheel of Fortune" uses 5 AMP fuses for the 3 G. I. circuits. Please upgrade the three general illumination fuses to 8.5 Amp slow blow fuses. The fuses are located in the back of the machine next to the transformer. Please refer to the figure below if needed.



Thank You

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SERVICE BULLETIN

DATE: MAY 15, 1996 SB 89

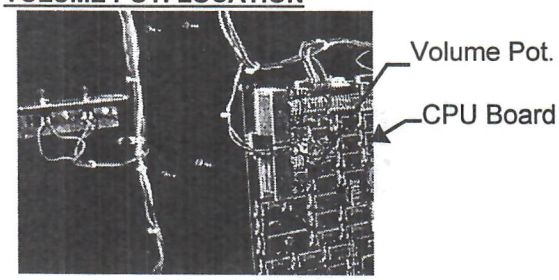
GAME: WHEEL OF FORTUNE

SUBJECT: INFORMATION FOR MANUAL 16-80009-101 (USED WITH FIRST 100 GAMES).

IMPORTANT NOTICE

"The manufacturer intends that this game is to be operated for amusement purposes only and not in contravention of any federal, state or local laws or regulations of the Untied States or any foreign country governing gaming devices. All operators of this game are responsible for its operation in accordance with such laws and regulations. The manufacturer's factory settings for this game may require adjustment in order to comply with laws applicable in an operator's specific jurisdiction. It is the operator's responsibility to determine whether adjustments are necessary and, if they are, to make the appropriate adjustments prior to operating the amusement game."

VOLUME POT. LOCATION



POWER RATING:

1.50 AMPS	193 WATTS	(START)
2.60 AMPS	220 WATTS	(OPERATING)
3.00 AMPS	440 WATTS	(MAXIMUM)

FUSES:

Line Fuse	5A, S.B., 250V
General Illumination Fuse	8A, S.B., 250V

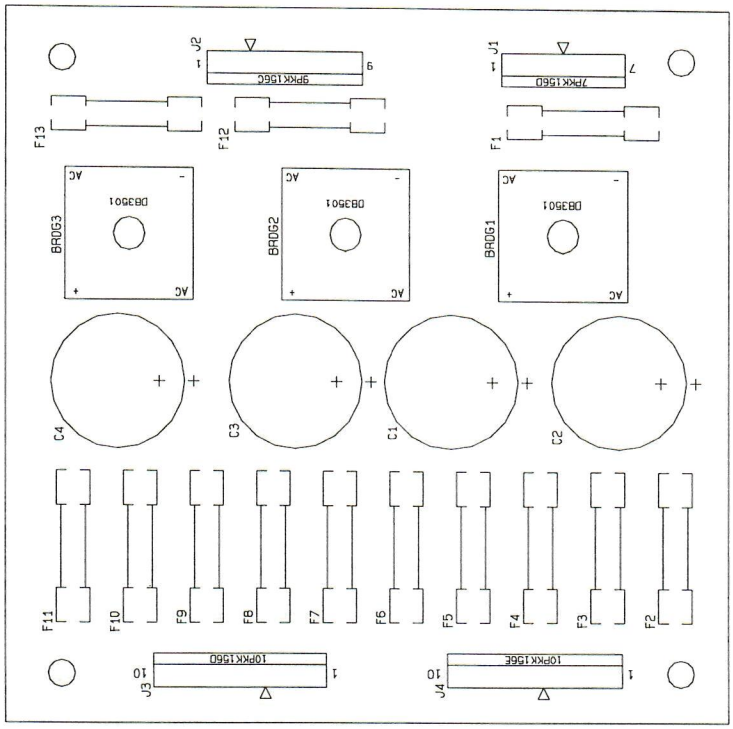
POWER SUPPLY PC BOARD PIN-OUT

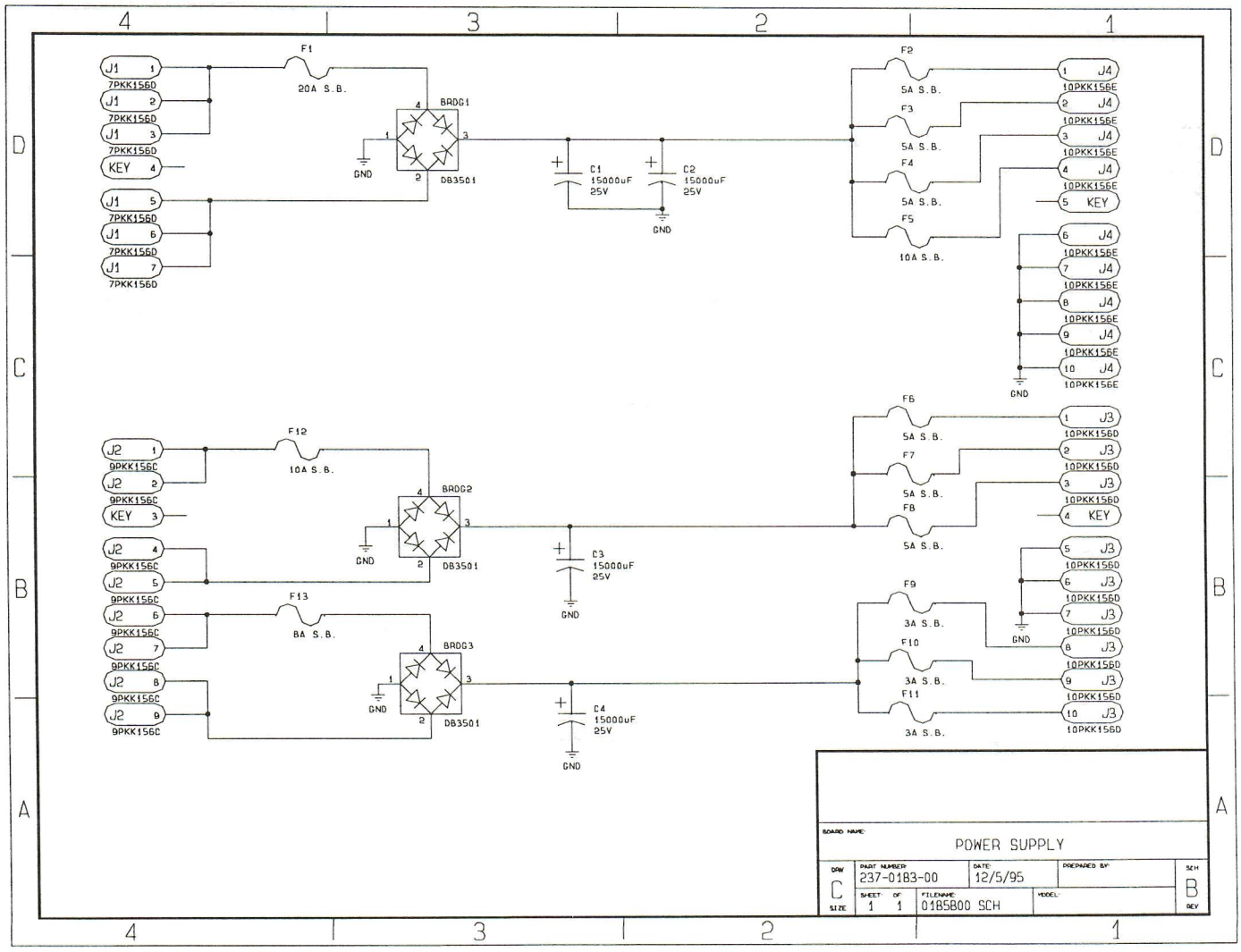
J1-1	10.7V @ 20A
J1-2	10.7V @ 20A
J1-3	10.7V @ 20A
J1-4	N/C
J1-5	10.7V @ 20A
J1-6	10.7V @ 20A
J1-7	10.7V @ 20A
J2-1	16V @ 12A
J2-2	16V @ 12A
J2-3	N/C
J2-4	16V @ 12A
J2-5	16V @ 12A
J2-6	10.7V @ 10A
J2-7	10.7V @ 10A
J2-8	10.7V @ 10A
J2-9	10.7V @ 10A

J3-1	21V, Flashers 37, 43, 46-49
J3-2	21V, Flashers 38, 44, 50-53
J3-3	21V, Flashers 39, 45, 54-57
J3-4	Key
J3-5	Ground
J3-6	Ground
J3-7	Ground
J3-8	10V, Mars Light
J3-9	10V, Mars Light
J3-10	10V, Mars Light

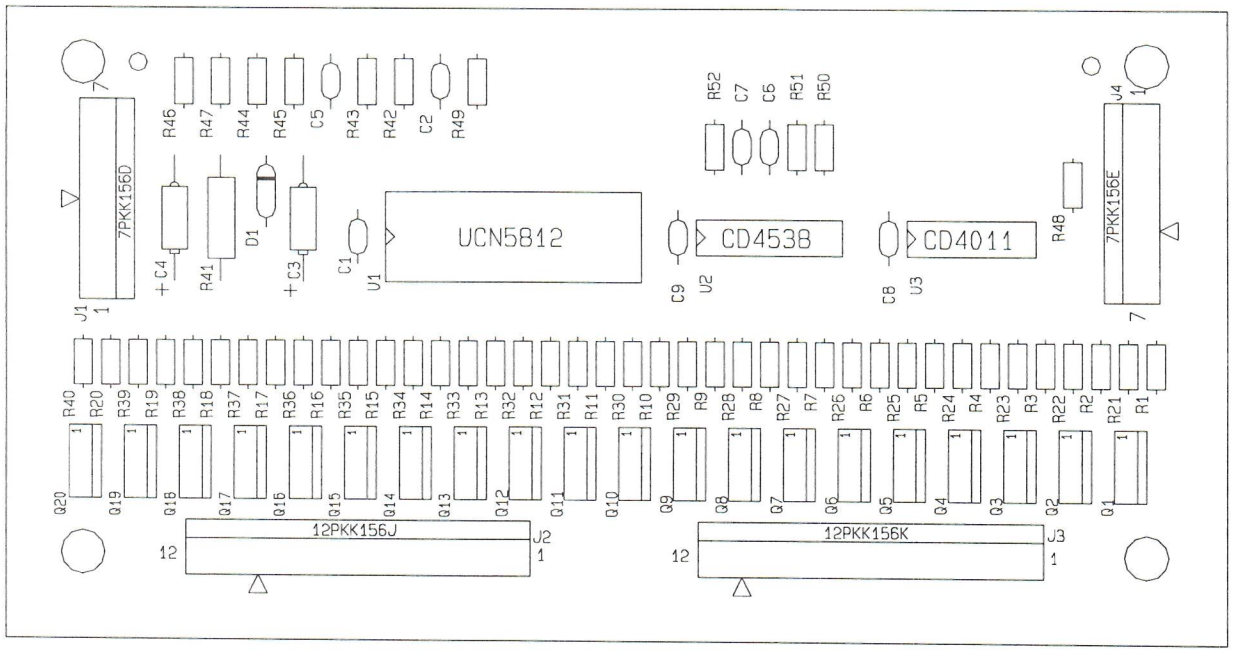
J4-1	12V, 1-12 Wheel
J4-2	12V, 13-24 Wheel
J4-3	12V, 25-36 Wheel
J4-4	N/C
J4-5	N/C
J4-6	Ground, I/O #1
J4-7	Ground, I/O #2
J4-8	Ground, I/O #3
J4-9	Ground
J4-10	Ground

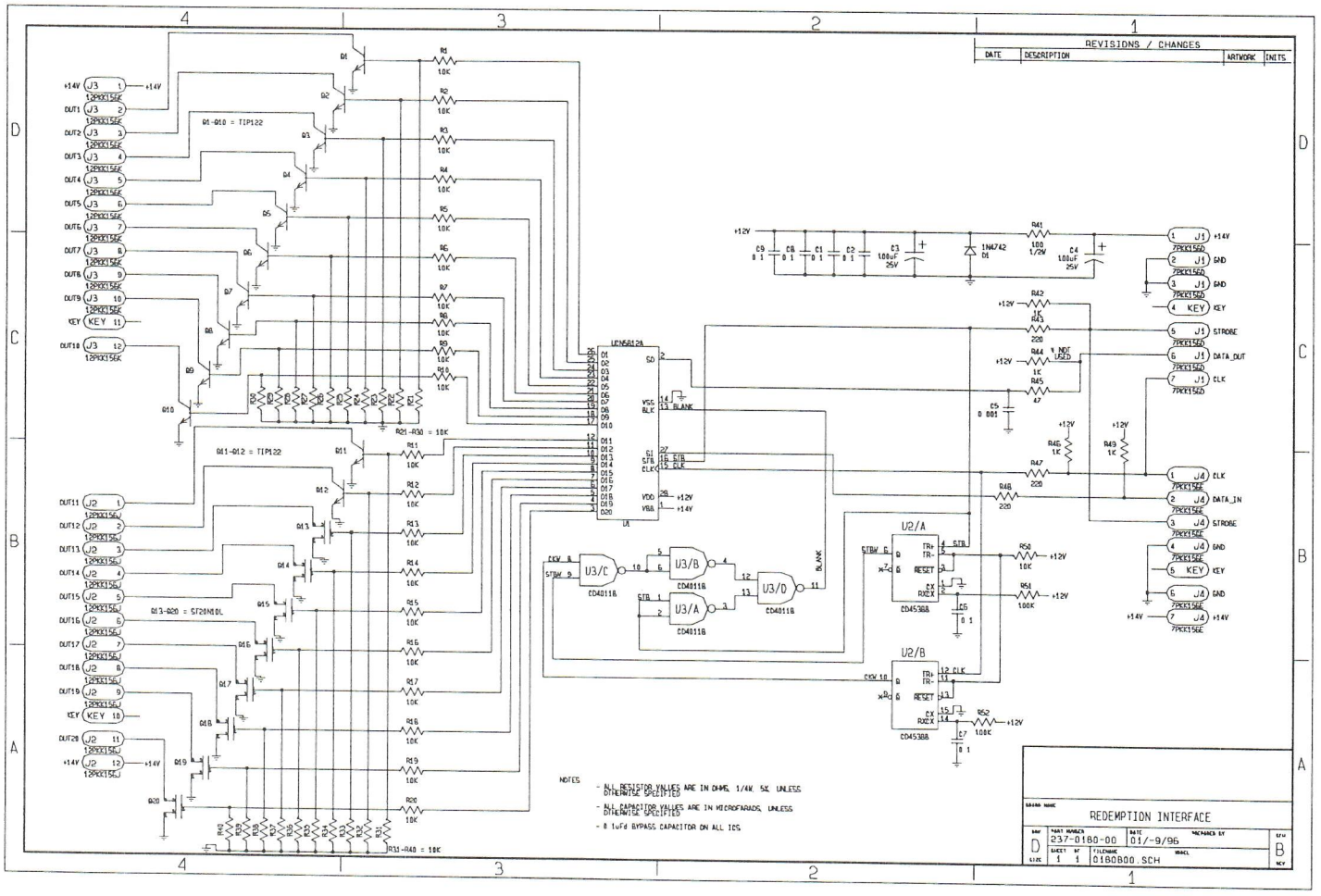
POWER SUPPLY BOARD





SERIAL DEVICE DRIVER BOARD
(may be refered to as Redemption Interface Board)





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3401 N. California Ave. Chicago, IL 60618
Tel.312-961-1544 Fax.312-961-1080

Service Bulletin

Date: May 24, 1996 SB90

Game: "Safecracker"

Subject: Intermittent dispensing of tokens on games manufactured between 5/2/96 and 5/20/96.

If you're having a problem with tokens not always dispensing on "Safecracker", replace the stop brackets (item 24 on pages 2-32 & 2-33 in the operation manual) on the shuttle plunger assembly (item 5 on pages 2-33 in operations manual). The new stop bracket is part number 04-10506. Keep in mind that there are 2 coils that need the stop brackets changed.

The following is the procedure for changing the stop brackets.

1) Turn off the power to the game.
2) Unlock the backbox and remove the backglass, storing it carefully to avoid damage.
3) Grasp the upper insert unit and pull it away from the backbox, toward the playfield glass.
4) Remove both 10-32 x 3/8" cap screws using a 5/32 allen wrench (2 cap screws for each stop bracket).
5) Remove original stop bracket and install updated stop bracket.
6) Put a dab of locktight #245 on the cap screw threads and re-tighten securely.
7) Lift the insert panel back to its original position.
8) Replace backglass and lock the backbox.
9) Turn on power to the game and test the token dispenser.

Thank you,

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Tel.312-961-1544 Fax.312-961-1080

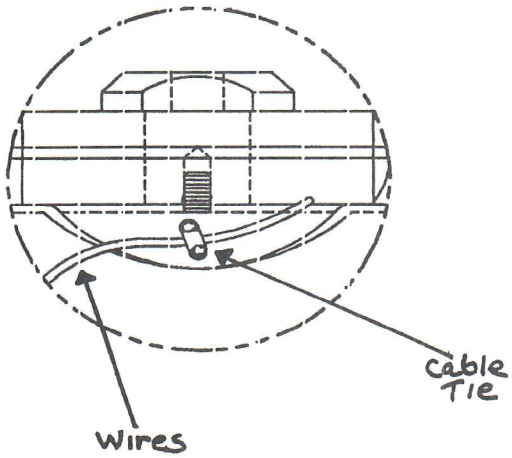
Service Bulletin

Date: July 17, 1996 SB91

Game: "Tales of the Arabian Nights"

Subject: Improper wire dressing on the vanishing magnet assembly.

On the vanishing magnet assembly, the cable tie that keeps magnet coil wires in their proper place was improperly installed. Games made prior to July 16, 1996 might be affected and should be checked and corrected if wrong. The magnet is mounted to a plate (part # 01-14179). One end of the plate has a 90 degree bend and 2 holes in that area. The cable tie should go from one hole and into the other hole. If dressed incorrectly, the wires may get cut by the plate. Please refer to the drawing below if necessary.



Thank you,

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Service Bulletin

Date: November 25, 1996 SB92

Game: "Junkyard"

Subject: Wrecking ball wire cable replacement

The wrecking ball on the sample "Junkyard" pinball machines was attached to a wire cable. We have found these to break prematurely. The cable will be replaced by a chain in production. Page 2 of this bulletin is a copy of the instructions you will receive with the chains that replace the cables on your sample games. Please update.

Thank You,

WMS GAMES Parts & Service Inc.

JUNKYARD

Wrecking Ball Chain Replacement Instructions

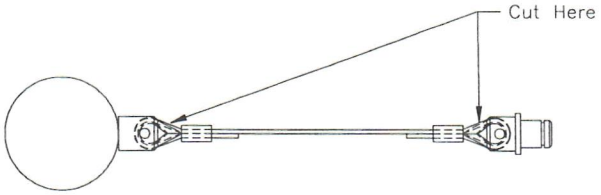
Because of a premature failure, the cable (p/n 04-10580.1) on the crane assembly is being replaced with a chain (p/n 04-10744).

1. Turn Off and unplug the game.

2. Open the coin door. Slide the lever guide assembly to the left. Lift the front molding off of the playfield glass. Slide the playfield glass down until it clears the side grooves and lift it off of the game. Carefully, set the glass aside.

3. Remove the "E"-ring from the front of the crane assembly. Lower the swivel pin and the wrecking ball assembly from the crane. Be careful, do not to loose the washer under the "E"-ring.

4. Cut the wire cable at the wrecking ball and the swivel mount. Discard the wire cable.

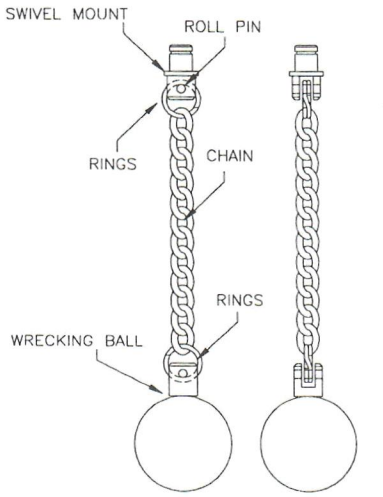


5. Separate the rings (use a flat washer or a small coin the achieve this). Push the roll pin from the swivel mount between the rings and thread it all the way through to the end of the rings, as you would put a key on a key ring.

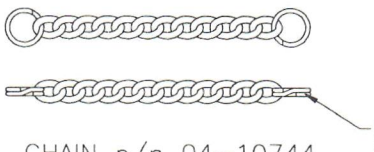
6. Do the same with the wrecking ball.

7. Insert the wrecking ball assembly back onto the crane. Replace the washer and the "E"-ring.

8. Replace the playfield glass and front molding. Close and lock the coin door.



WRECKING BALL WITH CHAIN ATTACHED.



CHAIN p/n 04-10744

SEPARATE THE RINGS. PUSH THE ROLL PIN BETWEEN THE RINGS AND THREAD IT ALL THE WAY THROUGH TO THE END, JUST AS YOU WOULD THREAD A KEY ON A KEY RING.

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3401 N. California Ave. Chicago, IL 60618
Tel.773-961-1544 Fax.773-961-1080

Service Bulletin

Date: December 20, 1996 SB93

Game: "Scared Stiff'

It has come to our attention that some customers are experiencing problems with a few of the mechanisms on Scared Stiff, most are solved as follows;

COFFIN ASSEMBLY:

1) The door opening shaft assy. part# 04-10419 was changed to #04-10419.1 to correct loosening of the door opening pin.
Games manufactured after (approximately) 10/20/96 have this new part, which is a direct replacement so no modification is necessary to update earlier games.
2) Some games experience trouble clearing balls from the coffin, adjust as follows;

A) Be sure you are using game ROM 1.3 or later, this software rev. has enhanced ball search and coffin trough logic that will solve most eject misfires.
B) Check to see that the body plate part# 04-10420 pivots freely.
C) If the game clears multiple balls but has trouble with the last ball, the eject plunger and coil need to be aligned with the tube leading upwards in to the coffin, most often this is solved by adding a thin washer between the top coil mounting bracket part# 01-9794 and the popper assy. weldment part# 04-10349, alternately the washer can be added to the lower coil mounting bracket to move the plunger the other direction if necessary.

TRAP DOOR ASSEMBLY:

It may be noticed that the right popper assy. part# A20716 has trouble shooting balls up through the trap door and into the bony beast ramp, this happens during multiball when 2 or more balls enter the popper.

A)The trap door is designed so the blue steel flap that is riveted to the ramp acts as a spring to slow the ball as it raises the pivoting trap door flap part# 04-10457.1, you can slightly bend the mounting bracket part# 01-14385.1 forward or backwards to adjust the tension.
B)It may also be necessary to align the popper part# A-20716 as follows; raise the playfield and slightly bend the popper downward, this helps to use the inside wall to guide the ball upwards.
C) Make sure all ramp and bracket mounting screws are secure.

After the above adjustment the popper will clear 4 balls consistently.

SPINNING SPIDER IN BACKBOX:

Some customers have had the spider wheel assy. part# A-21023 become loose repeatedly, this is usually caused by the operator or tech overtightening the set screw causing the brass insert to back out. Games after approximately #700 had an improved insert, but it will still back out with too much force.

When replacing the spider wheel use Loc-tight #425 sparingly on the motor shaft and on the set screw , then tighten set screw until snug. Select Wheel Test from the test menu to insure the wheel is attached properly. It is also important to ensure the legs of the spider are adjusted so that they do not rub or drag against the insert panel or backglass. This is very important because the rubbing may cause the wheel to loosen or become slow, causing the software to assume the wheel is loose and stop spinning. It should be noted that if the spider wheel becomes loose, the software is designed to detect the malfunction and respond by spinning the lamps instead of the spider, allowing the player to choose the backbox item. The game will play near normal until the next collection or cleaning, eliminating the need for an immediate service call.

LEAPING FROG TARGETS:

Some of the frog assemblies (part# 04-10510) are missing the loc-tight on the threads of the rod. This causes the frog to unwind itself from the rod, simply reattach the frog using loc-tight #425. If the 3/8 plastic spacer that sits on the rod under the frog has disappeared, you can find a replacement under the slingshot plastics, you will need to replace the spacer removed from the slingshot with washers or something of the same height so the slingshot leaf switches will not touch the plastic covers.

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3401 N. California Ave. Chicago, IL 60618
Tel.773-961-1544 Fax.773-961-1080

Service Bulletin

Date: January 15, 1997 SB94

Game: Wpc95 Power Driver Board

Subject: General Illumination

If you see that the diodes (D25 thru D32) in the General Illumination circuit are getting hot and discoloring the pcb, remove the diodes and replace with zero ohm jumpers. If you don't have a zero ohm jumper use 18 gauge wire jumpers. All games now being produced will reflect this change.

Thank you,

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3401 N. CALIFORNIA AVE. CHICAGO, IL 60618
TEL.773-961-1544 FAX.773-961-1080

SERVICE BULLETIN

Date: January 16, 1997 SB95

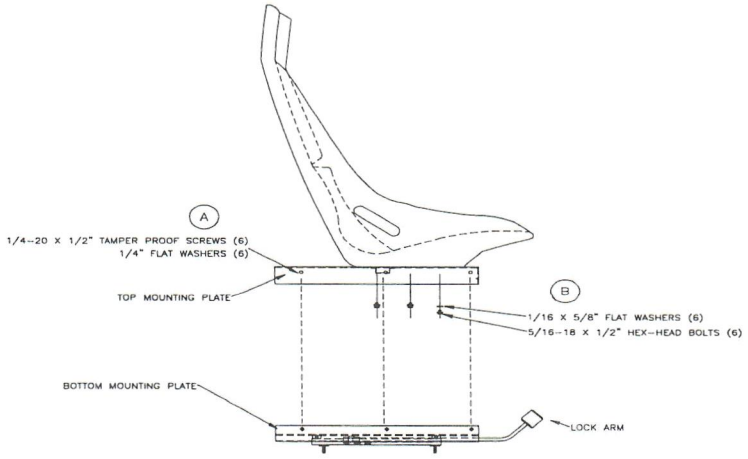
Game: "Cruis'n World"

Subject: Seat slide assembly mounting bolts

"Cruis'n World" games manufactured between December 9, 1996 and January 10, 1997 need to have Loctite added to the 6 tamper proof screws on the seat slide assembly.

Please refer to the drawing below and follow these steps..

1) Remove 6 tamper proof screws that hold the top mounting plate to the bottom mounting plate on the seat slide assembly.(Item "A" on drawing)
2) Put Loctite blue 242-31 on the tamper proof screws and torque screws to 5-7 Ft-lbs.



Thank you,
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3401 N. California Ave. Chicago, IL 60618
Tel.773-961-1544 Fax.773-961-1080

Service Bulletin

Date: February 11, 1997 SB96

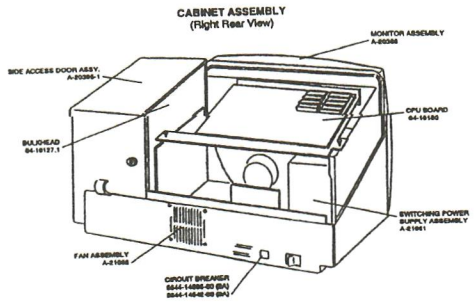
Game: TouchMaster Countertop

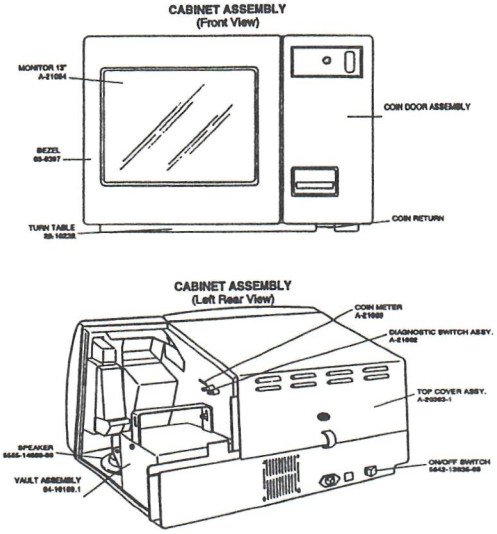
Subject: Degaussing Procedure

Symptom: Purity tests fill the screen with 100% of the chosen color at normal intensity. Each screen should be absolutely uniform from top to bottom and side to side. Refer to this procedure only if you have a game that has a purity problem (portions of red screen in video test will be faded or pink) and "normal" degaussing doesn't help.

Degaussing is a very significant step in the proper setup of any video game. Because the "TouchMaster" countertop game has the capabilities of swiveling and has primarily a metal cabinet, this is especially important. In addition to the "normal" degaussing of the picture tube, we recommend that you degauss other components as well. Please refer to the attached drawings and degauss using the following instructions:

1. Switch off game power. Disconnect the line cord from the A.C. power.
2. Turn the unit so it is facing south or is in its normal operating position and carefully lay the complete cabinet on it's back, making sure that you don't damage the on/off switch or lay it on it's left (monitor) side and degauss the entire base. Turn the cabinet back to it's upright position.
3. Remove the Top Cover Assembly, the Side Access Door Assembly, and the Vault Assembly (cash box). Run the degaussing coil all around these items.
4. Loosen but do not remove the large slotted screw in the upper door support plate or bulkhead (near the coin meter). A spring will cause this captive screw to pop out when it is loose enough. Pull the coin door forward and allow it to rest on the front of the cabinet. Do not apply any pressure to the door in this position. Disconnect the wiring harness cable and remove door. Now you should have clearance to degauss the bulkhead plate.
5. Re-assemble the game, degauss the monitor.
6. Apply power and calibrate the touch screen.
7. Enter diagnostics and run each of the video tests.





Typical degaussing procedure:

1. Stand about 7 feet from picture tube, turn degausser on.
2. With degaussing coil parallel to screen, move in a circular motion moving slowly toward tube.
3. In a circular motion, move degausser across front, top, and sides for approximately 2 minutes.
4. Continuing in a circular motion, holding degausser parallel to receiver, moving backward from tube.
5. Turn degausser off.

Thank you,

Williams Electronics Games, Inc. Service Department

WMS GAMES

PARTS & SERVICE INC.

3401 N. CALIFORNIA AVE. CHICAGO, IL 60618
TEL.312-961-1544 FAX.312-961-1080

PARTS NOTICE

DATE: September 11, 1996

GAME: "Touchmaster"

SUBJECT: Adding a Mars DBV.

The dollar bill validator to be used in the "Touchmaster" countertop game is a Mars bill validator model #VN2511. This model also requires an additional connecting block. The Mars part number for the connecting block is #250074011-PAK2.

When available from Mars, (no date yet) we will be using DBV model # AE2411. This new model will not need the connecting block.

Thank You,

WMS GAMES Parts & Service Inc.

DATE: 10 FEB. 97

PARTS KITS FOR SERVICE BOOK

FLIPPER REBUILD KITS

A-17222	LEFT& RIGHT PLUNGER ASSEMBLY WITH STOP BRACKETS
A-13524-1	REBUILD KIT FOR FLIPPERS BEFORE ADDAMS FAMILY
A-13524-8	REBUILD KIT FOR FLIPTRONIC FLIPPERS STARTING AT ADDAMS FAMILY
A-21042	FLIPPER BUTTON BACK-UP WHITE INTERRUPTER WITH SPRING
A-21201	FLIPPER BUTTON SWITCH ASSEMBLY WITH OPTO PC BOARD.

OTHER PARTS COMMONLY USED
A-16908 LED BOARD
A-16909 TRANSISTOR BOARD

AMENDMENTS

WWF WRESTLEMANIA

MANUAL AMENDMENT

Page 1-12 **DIP Switch Settings**
Table 1: SW4 is now used. SW8 was removed.
Table 2: SW5, SW6 & SW7 are no longer used.

DIP Switch 1 Setting Table

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Test Switch	Off* On							
Powerup Test		Off* On						
Not Used			Off* On					
Time/Date				Off* On				
Not Used					Off* On	Off* On		
No Dollar Bill Validator Dollar Bill Validator Installed							Off* On	
Not Used								Off* On

DIP Switch 2 Setting Table

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
One Coin Counter, 1Count/Coin One Coin Counter, Totalizing Two Coin Counters, 1Count/Coin One Coin Counter, 1Count/Coin	Off* On Off On	Off* Off On On						
Country USA French German Unused			Off* On Off On	Off* Off On On				
Not Used					Off* On	Off* On	Off* On	
DIP Switch Coinage CMOS Coinage								Off* On

Page 1-15 Game Audits

Several game play statistics were added to the following audit tables.

TOTAL GAME UPTIME (HRS:MINS)	00:00
TOTAL GAME PLAY TIME (HRS:MINS)	00:00
ONE-PLAYER PLAY	00%
TWO-PLAYER PLAY	00%
TOTAL STARTS	00
ATTRACT MODE STARTS	00
CONTINUES OFFERED	00
CONTINUES TAKEN	00
1P GAMES BEGUN	00
1P GAMES FINISHED	00
CPU VICTORIES	00%
AVG 1 PLAYER TIME PER CREDIT	00:00
INTER BELT CHOSEN	00
WWF BELT CHOSEN	00
NEXT AUDIT PAGE	
RETURN TO MAIN MENU	

Page 1 of Audit Table

AVG MATCH TIME (MIN: SEC)	0:00
AVG HUMAN VS HUMAN TIME	0:00
AVG CPU WIN TIME	0:00
AVG CPU LOSS TIME	0:00
FASTEST 2-PLAYER WIN	0:00
FASTEST CPU WIN	0:00
HUMAN COMBO GAMES	0%
FASTEST CPU LOSS	0:00
DOGS	00
PROCESS KO	00
SND ERR #1 (IRQ)	00
SND ERR #2 (ROM CHECKSUM)	00
SND ERR #3 (RAM TEST)	00
SND ERR #4 (SDAV)	00
NEXT AUDIT PAGE	
PREVIOUS AUDIT PAGE	

Page 2 of Audit Table

HEAD TO HEAD GAMES	00
ROYAL RUMBLE GAMES	00
ROYAL RUMBLE WINS	00
PLAYER 1 MAX ICONS	00
PLAYER 2 MAX ICONS	00
NEXT AUDIT PAGE	
PREVIOUS AUDIT PAGE	

Page 3 of Audit Table

	PLAYER		CPU	
BRET HART	USES	WINS	USES	WINS
RAZOR RAMON	00	00%	00	00%
UNDERTAKER	00	00%	00	00%
YOKOZUNA	00	00%	00	00%
SHAWN MICHAELS	00	00%	00	00%
BAM BAM BIGELOW	00	00%	00	00%
DOINK THE CLOWN	00	00%	00	00%
LEX LUGER	00	00%	00	00%
RETURN TO MAIN MENU				
PREVIOUS AUDIT MENU				

Page 4 of Audit Table

Page 1-16 Game Adjustment

Add Average Game Time to the game adjustment menu. Game Timer Speed was removed.

SELECT WITH ANY STICK PRESS A BUTTON TO MODIFY
RETURN TO MAIN MENU
STANDARD PRICING
CUSTOM MULTIPLIERS
CUSTOM PRICING
FREE PLAY
GAME DIFFICULTY
AVERAGE GAME TIME
ATTRACT MODE SOUND
RETURN TO MAIN MENU

Game Adjustment Menu

Average Game Time

Allows the operator to control the overall average match time. The setting range is:

-Slowest: 1
-Fastest: 5
-Factory Setting: 3

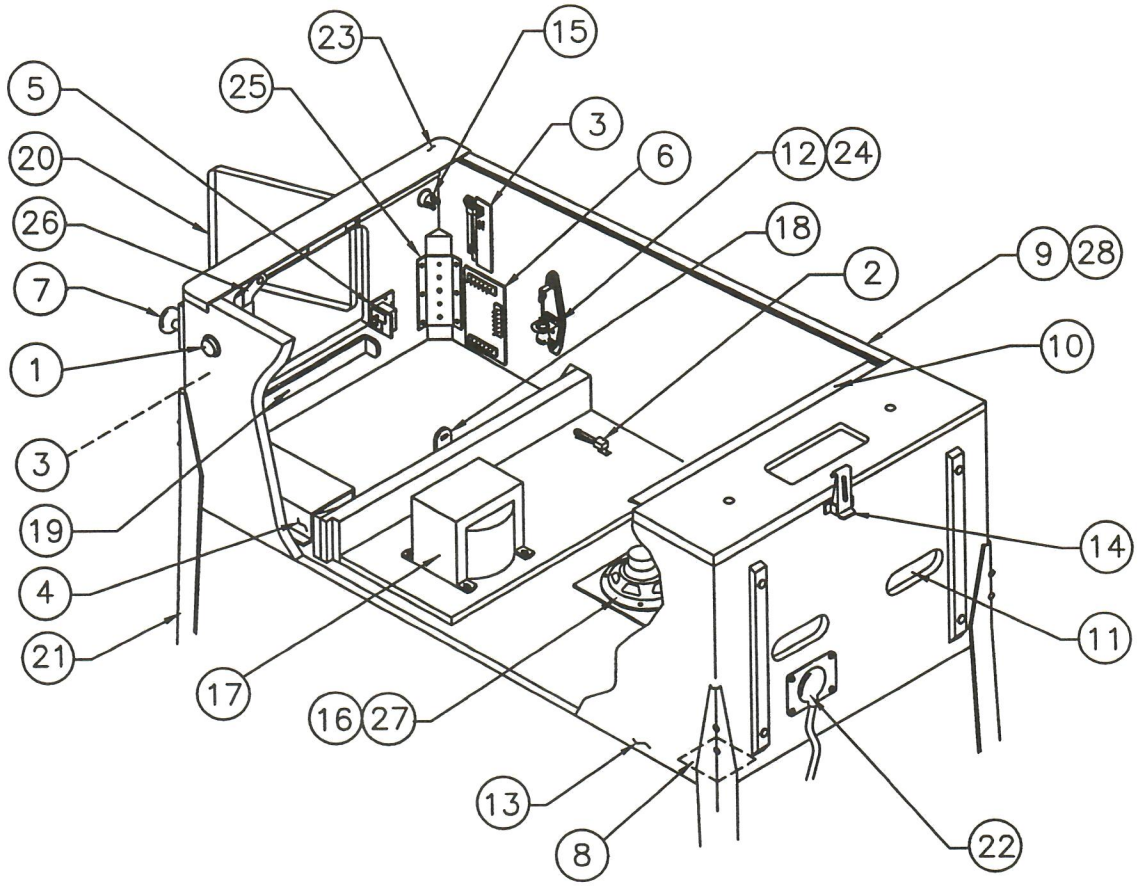
Page 2-2 Parts List

Add 31-2360 WWF Instruction Card to parts list.

Page 2-7 A-20076-40030 WWF Unit Final Assembly Parts List

	Item	Part Number	Description	Location
Old Number	3	A-20094	ASSY PIC 1657 28DIPW	U64
New Number	3	A-20019	U64 PIC ASSY	U64

90003–CAB
SAFECRACKER
Cabinet Assembly



Item	Part Number	Description
1	A–16883–4	Button Ass'y w/Spring, Red (2)
2	A–17195–1	Slam Tilt Switch w/Cable
3	A–17316	Flipper Opto Assembly (2)
4	A–17540–1	Universal Power Interface Ass'y
5	A–18249–1	Interlock Switch & Bracket Ass'y
6	A–20949	Coin Door Interface PCB Ass'y
7	B–12445	Ball Shooter Assembly
8	01–8169	Vent Hole Screen
9	03–7135–9	Side Molding, 35–7/8" (2)
10	03–8091.1–3	Rear Molding
11	03–8603–2	Vent Screen, 2–1/2" Sq. (2)
12	04–10346	Tilt Mechanism Assembly
13	11–1323.2	Cabinet, Wood
14	20–9347	Toggle Latch
15	20–9663–16	Push Button w/Switch, Yellow
16	5555–12929–00	Speaker, 4 Ohm, 6", 25w
17	5610–14515–00	WPC Transformer, Wide Mount
18	01–14016	Cashbox Lock Plate
19	01–6389–2	Cashbox Nest Bracket
20	09–85000–1	Coin Door, 2–Slot Domestic
21	A–19514	Leg Assembly, Chrome (4)
22	01–10714	Line Cord Cover
23	04–10362	Front Molding Assembly

Item	Part Number	Description
24	20–6502–A	Plumb Bob
25	01–11400	Leg Plate (4)
26	A–20740	Lever Guide Assembly
27	03–8603–1	Speaker Vent
28	A–12359–6	Side Molding Assembly

Miscellaneous Parts (not shown):

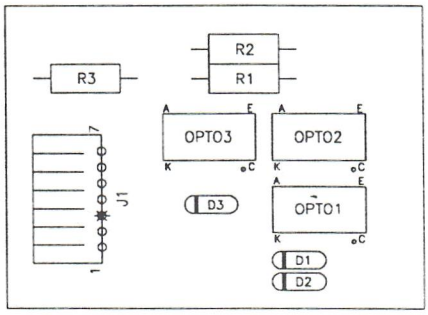
Part Number	Description
A–20201	Cable & Jumper Plug Assembly
H–17217.1	Plumb Bob/Mem. Protect Cable
H–17837–2	Voltage Program Jumper Cable
H–20841	Cabinet Switch/Lamp Cable
H–20924.1	Cabinet Cable
H–20925	Slam Tilt Switch Cable
H–20992	Secondary Cable
01–3535	Rod Mounting Plate
01–14085	Hasp Hinge Bracket
01–14086	Hasp Staple Bracket
01–14382	Playfield Track (2)
08–8103	Playfield Glass

May 22, 1996
16-10258

SAFECRACKER

Amendment

The following corrections/changes have been made to the **Safecracker** Operations Manual. Please keep this amendment with your manual for future reference.



Page 2-13 **3-Opto Vari-Target PCB Assembly (A-20906)**
Replace the following pictorial and parts listing.

Part Number	Designator	Description
5070-09054-00	D1-D3	Diode 1N4004 1.0A.
5010-08930-00	R1-R3	Resistor, 470Ω, ½w, 5%
5791-12622-07	J1	Connector, 7-pin Header
5490-12451-00	Opto1-Opto3	IC Opto Inter

Page 2-15 **Flipper Assembly**
Item #12 has been changed to FL-11629 (Flipper Coil Assembly).
Add item #23, 03-7066-5 (Coil Tubing). Correct pictorial, item 12a should be item #23.

Page 2-16 **Flipper Assembly**
Add item #23 03-7066-5 (Coil Tubing). Correct pictorial, item 12a should be item #23.

Page 2-17 **Flipper Assembly**
Add item #23 03-7066-5 (Coil Tubing). Correct pictorial; item 12a should be item #23.

Page 2-18 **Kicker Arm** (Slingshot) **Assembly**
Item #8g has been changed to H-19523 (Mini Solenoid Cable).

Page 2-19 **Ball Trough Assembly**
Item #10 should be listed as 01-11586 (Coil Mounting Bracket).

Page 2-22 **Vari-Target Assembly**
Item #8 has been changed to 01-14332.1 (Stop Plate).

Page 2-24 **3-Bank Target Assembly (1 Ramp)**
Item #1 was changed to 04-10403.1 (Bracket & Post Assembly).
Item # 9 should be listed as 03-8750 (Flush Target).
Item #18 should be listed as 20-8712-18 ("E" Ring 3/16" Shaft).
Item #19 should be listed as 03-8334-3 (Target Stop 3-15/16").
Item #20 should be listed as 4004-01005-04 (Mach. Screw, 4-40 x ¼").
Add item #24 20-10318 (Silver Prism Foil).

Page 2-25 **3-Bank Target Assembly (2 Ramp)**
Item #1 was changed to 04-10403.1 (Bracket & Post Assembly).
Item # 9 should be listed as 03-8750 (Flush Target).
Item #18 should be listed as 20-8712-18 ("E" Ring 3/16" Shaft).
Item #19 should be listed as 03-8334-3 (Target Stop, 3-15/16").
Item #20 should be listed as 4004-01005-04 (Mach. Screw 4-40 x ¼").
Item #24 has been changed to 20-10318 (Silver Prism Foil).

Page 2-26 **3-Bank Target Assembly**
Item #1 was changed to 04-10403.1 (Bracket & Post Assembly).
Pictorial correction, cable should be item #23.

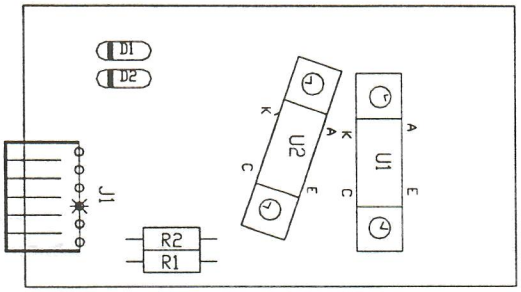
Page 2-30 **Multi-Ball Assembly**
Item #9 has been changed to 10-437 (Spring).

Page 2-32 **Speaker Display Token Insert Assembly**
Item #5 has been changed to A-21256 (Shuttle Assembly).
Item #10 has been changed to 20-10325 (Hose Clamp).
Items #15, 16, 17 (Mirror Assembly) have been changed to 04-10430.1-1, 04-10430.1-2 and 04-10430.1-3 respectively.
Item #24 has been changed to 04-10506 (Stop Assembly).
Item #39 has been changed to 04-10397-1 (Speaker Panel Sub-Assembly).

The following information was not available at time of publication.

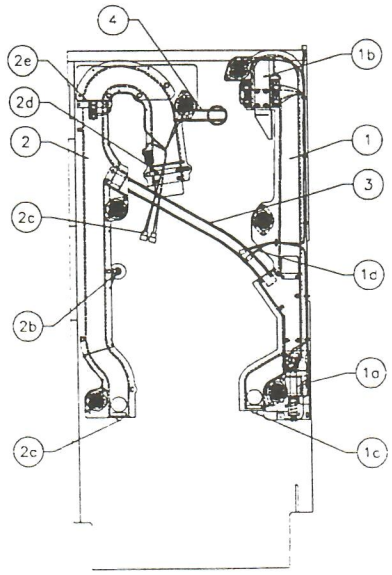
A-20952 Spin Disc Opto PCB Assembly

Part Number	Designator	Description
5070-09054-00	D1, D2	Diode 1N4004 1.0A.
5010-09083-00	R1, R2	Resistor, 470Ω, ½w, 10%
5791-12622-06	J1	Connector, 6-pin Header
5490-13341-00	U1, U2	IC Opto Inter
20-9864	@U1x2, @U2x2	Eyelet, 1/8 x 7/32"



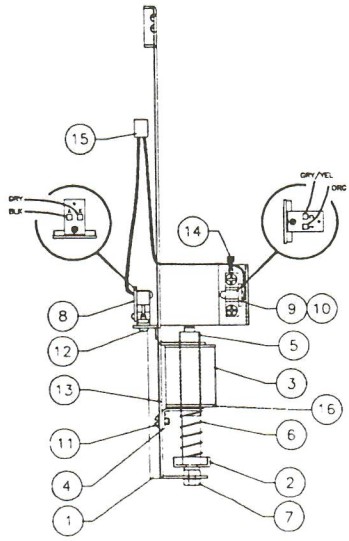
Ramps

Item	Part Number	Description
1	A-20944	Right Ramp Assembly
a)	A-20959	Ramp/Coil Plate Assembly
b)	04-10395.1	Upper Ramp Floor Plate
c)	23-6686	Round Pad
d)	H-20927.1	Cable
2	A-20958	Left Ramp Assembly
a)	23-6686	Round Pad
b)	A-20977	Light Assembly
c)	H-20932	Cable
d)	A-20908	Switch Gate Bracket Assy.
3	12-7344.2	Center Wire Ramp
4	12-7330.2	Popper Wire Ramp



A-20959 Ramp/Coil Plate Assembly

Item	Part Number	Description
1	04-10394.1	Ramp/Coil Plate
2	A-6306-02	Bell Armature Assy.
3	AE-23-800	Coil Assembly
4	01-14384	Solenoid Bracket
5	03-7067-5	Coil Tubing
6	10-135	Spring
7	23-6420	Rubber Grommet
8	A-16908	RTV Opto LED Assy.
9	A-16909	RTV Opto P/T Assy.
10	01-14349	Fish Paper
11	4008-01017-04	MS, 8-32 x ¼"
12	4106-01013-06	SMS, 6-32 x 3/8"
13	03-8523	Insulator
14	03-9454	Ty-Wrap, Nylon
15	H-17607-5	Cable
16	H-18216-11	Cable



June 13, 1996
16-10293

SAFECRACKER

Amendment

Change to Standard Adjustment A.1 16

A.1 16 Match Award This allows the match to give out a token or credit. This defaults to credit. The percentage is controlled by adjustment A.1 19 (Match Feature).

Update to Feature Adjustments

A.2 1 A-MODE MUSIC
This adjustment will allow the playing of music and speech in the Attract Mode. Factory default is NO.

NO	Do NOT allow music to be played in the Attract Mode.
YES	Allow music to be played in the Attract Mode.

A.2 2 TIMED PLUNGER
This is the number of seconds before the game will automatically plunge the ball. Factory default is OFF.

29	Minimum value
90	Maximum value

A.2 3 FLIPPER PLUNGER
When this is set, the game will plunge the ball with a press of the flipper. Factory default is NO.

NO	Do NOT allow the flipper to launch the ball.
YES	Allow the flipper to launch the ball.

A.2 4 STARTING BONUS X
This adjustment chooses which Bonus X will lite at game start. Factory default is 1.

1	Minimum value
3	Maximum value

A.2 5 DROP SEQUENCE
Chooses what light-up order the drop targets start at. This is roughly used as how difficult it will be to lite the locks shot. Factory default is 0.

0	Minimum value
3	Maximum value

A.2 6 TIMER DIFFICULTY
How fast the game will attempt to take time away from the player. Factory default is EX SLOW.

EX. SLOW	Minimum value
EX. FAST	Maximum value

A.2 7 TIMER STARTS AT
Amount of time on the clock at first ball. Factory default is 45 MINUTES.

15 MINUTES	Minimum value
55 MINUTES	Maximum value

A.2 8 ENDGAME LOCK RELEASE

Are top lockup locks released at the end of the game. Factory default is YES.

YES Release lockups at end of game.
NO Do NOT release lockups at end of game.

A.2 10 FIRST WHEEL POSITION

First ball - starting wheel position. This is the award collected by shooting into the "bank" entrance. Factory default is RANDOM

Possible Settings:
RANDOM
CALL GUARD
LITE LOCK
DISABLE COMPUTER
LITE DEPOSIT

A.2 11 1ST COLLECT LIT

First ball - Is Collect Wheel lit? If this is set to YES, the "bank" will be lit immediately to give one of the 4 wheel awards. Factory default is YES.

YES Start 1st Collect light on first ball.
NO Do NOT start 1st Collect light on first ball.

A.2 13 VAULT JACKPOT ALLOWED

Vault Jackpot - is it allowed? The Vault Jackpot is a progressive jackpot of tokens that is slowly built up over many games. Factory default is YES.

YES Allow Vault Jackpot.
NO Do NOT allow Vault Jackpot.

A.2 14 ALARM RESET

Alarm reset difficulty. Factory default is EASY.

EASY Any disabled alarms will stay disabled until the player has successfully reached the vault.

HARD All disabled alarms will be reset when the player finishes playing the board game, regardless of how he finishes.

A.2 15 MAX TOKENS/PLAYER

Maximum Token Payout Per Player. This is also used to completely disable tokens. Note that this adjustment does not affect the ability for match to pay out a token. Factory default is 10.

OFF Do NOT allow maximum tokens per player.
1 thru 10 Allow (choice of 1 thru 10) maximum tokens per player.

A.2 16 START TOKEN JACKPOT

Starting value for token jackpot after it is won. Factory default is 2.

1 Minimum value
5 Maximum value

A.2 19 CONTINUE CHOICE

Does board game give you a choice of continue/quit? This presents the player with the choice to drop out of the board game at any time, or to continue and risk the current winnings. Factory default is NO.

NO Do NOT allow the player to drop out of the board game.
YES Allow the player to drop out of the board game.

A.2 20 RANDOM KNOB NUMBERS

Are the safe knob's numbers sequential when spinning in the board game? Factory default is YES.

YES Numbers are sequential.
NO Numbers are NOT sequential.

A.2 21 TOKEN PAYOUT %

Adjusted ideal payout percentage. This is the payout percentage the game will attempt to reach. The game will learn about its location and attempt to reach this over several hundred games. Changes to this adjustment may not be immediately seen. Note that this adjustment does not affect the match feature when match is set to give a token. Factory default is 12.

5	Minimum value
25	Maximum value

A.2 22 MAGIC TOKEN ACCEPT

This says how magic tokens are handled when received. Factory default is ON/FEATURE.

ON/FEATURE	Magic Tokens can be accepted and will give the player a credit plus enable "Assault On The Vault" when inserted.
OFF	Magic Tokens are not allowed to be put back into the game.
TIMED/CREDIT	Magic Tokens can only be accepted within a short time immediately after winning them. The token will give only a credit.
ON/CREDIT	Magic Tokens can be accepted and will give the player a credit.
TIMED/FEATURE	Magic Tokens can only be accepted within a short time immediately after winning them. Within this window, the player will be awarded a credit, plus the token will enable the "Assault On The Vault" feature. Inserting a token outside of the timed window will enable the feature only, but will not give a credit.

A.2 23 FAMILY MODE

This adjustment enables family mode. Factory default is NO.

YES	Enable Family Mode.
NO	Do NOT enable Family Mode

A.2 24 START BANK LIT

This determines whether the bank is lit for a break in at game start. Factory default is NO.

YES	Lite bank for a break at game start.
NO	Do NOT lite bank for a break at game start.

A.2 25 LOCK FOR BANK

This determines whether the player must lock a ball before playing the board game. Factory default is YES.

YES	Player must lock at least 1 ball before break in.
NO	Player must only complete drop banks to break in.

The following pages are normally found in section one of any pinball manual. We feel that the information found here is very important. Please take the time and familiarize yourself with these items.

ERROR MESSAGES

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

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

CHECK 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 optics 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, the plumb bob tilt switch), and should be cleared to permit proper game operation.

GROUND SHORT ROW - N, WHT - XXX.

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

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

G10 ERROR

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

G11 CHECKSUM ERROR.

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

TIME AND DATE NOT SET.

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

FACTORY SETTINGS RESTORED.

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

CPU AND AUDIO VISUAL BOARD ERROR CODES

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

If the system detects an error the following happens:

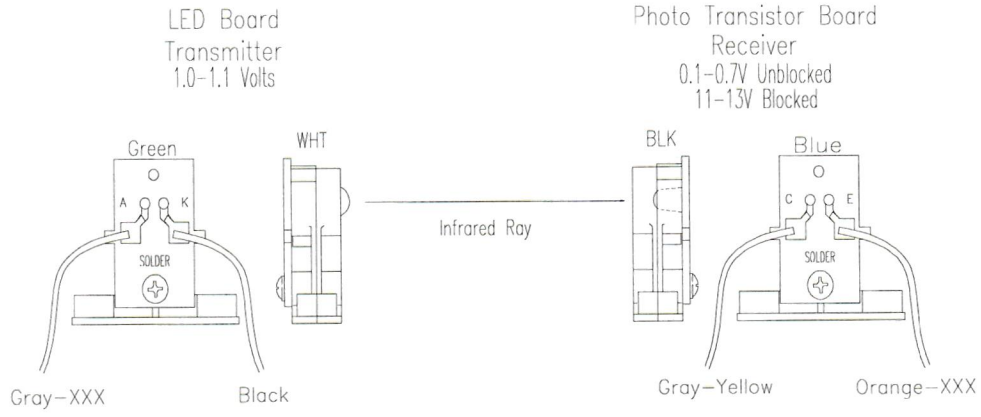
CPU BOARD LED ERROR CODES		
	Center LED blinks once	= G11 ROM Failure
	Center LED blinks twice	= U8 RAM Failure
	Center LED blinks three times	= G10 Security Chip Failure

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

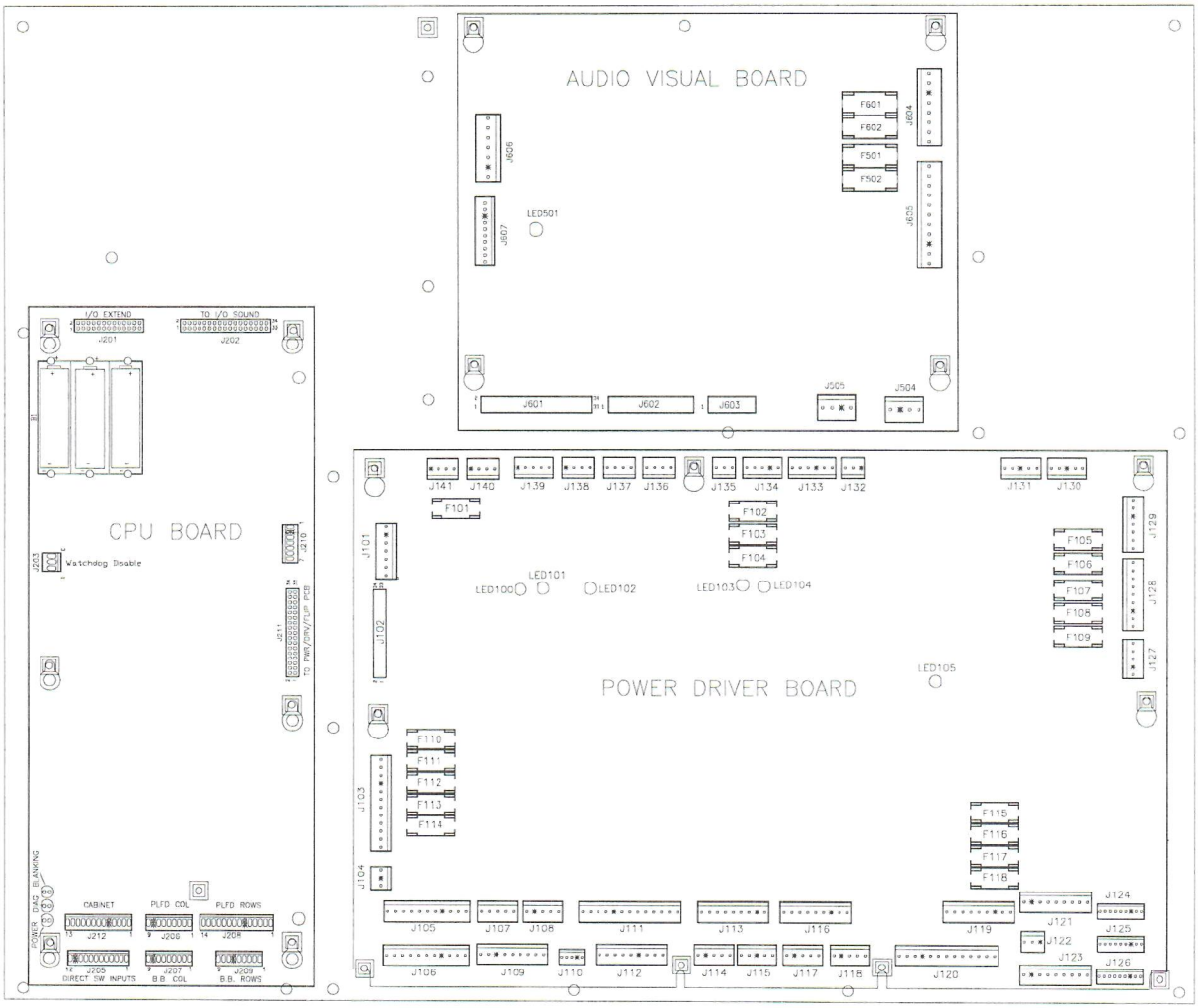
AUDIO VISUAL BOARD BEEP ERROR CODES		
	1 Beep	= Audio Visual Board is O.K.
	2 Beeps	= S2 Failure
	3 Beeps	= S3 Failure
	4 Beeps	= S4 Failure
	5 Beeps	= S5 Failure
	6 Beeps	= S6 Failure
	7 Beeps	= S7 Failure
	10 Beeps	= Audio Static RAM Failure

OPTO THEORY

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



LED LIST



CPU BOARD

LED 201 Blanking
LED 202 Power
LED 203 Diagnostics

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

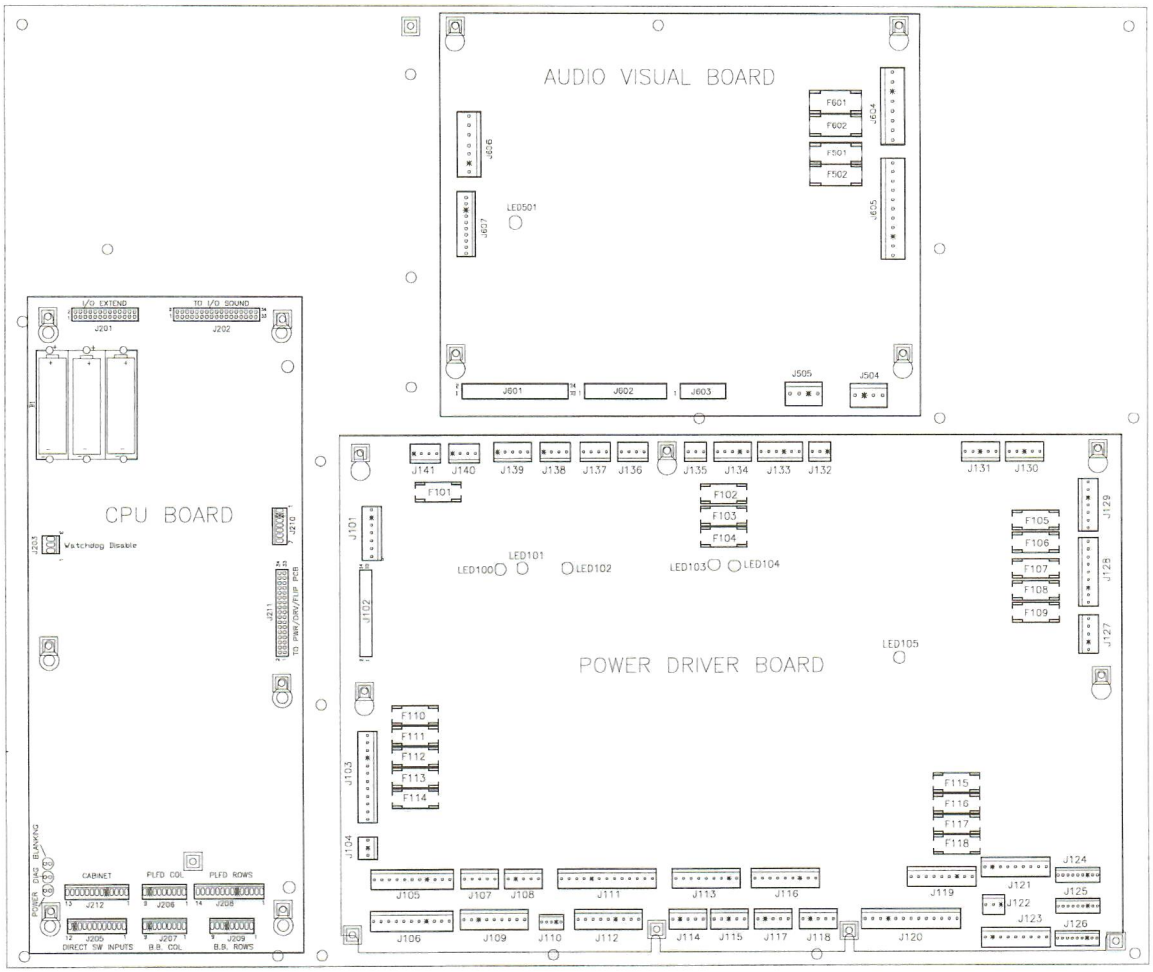
AUDIO VISUAL BOARD

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

POWER DRIVER BOARD

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

FUSE LIST



AUDIO VIDEO BOARD

Loc.	Description	Part Number	Value
F501	-25V	5731-14532-00	T2.5A, 250V
F502	+25V	5731-14532-00	T2.5A, 250V
F601	+62V	5731-14533-00	T0.25A, 250V
F602	-113V & -125V	5731-14533-00	T0.25A, 250V

CPU BOARD

There are no fuses on the CPU board.

POWER DRIVER BOARD

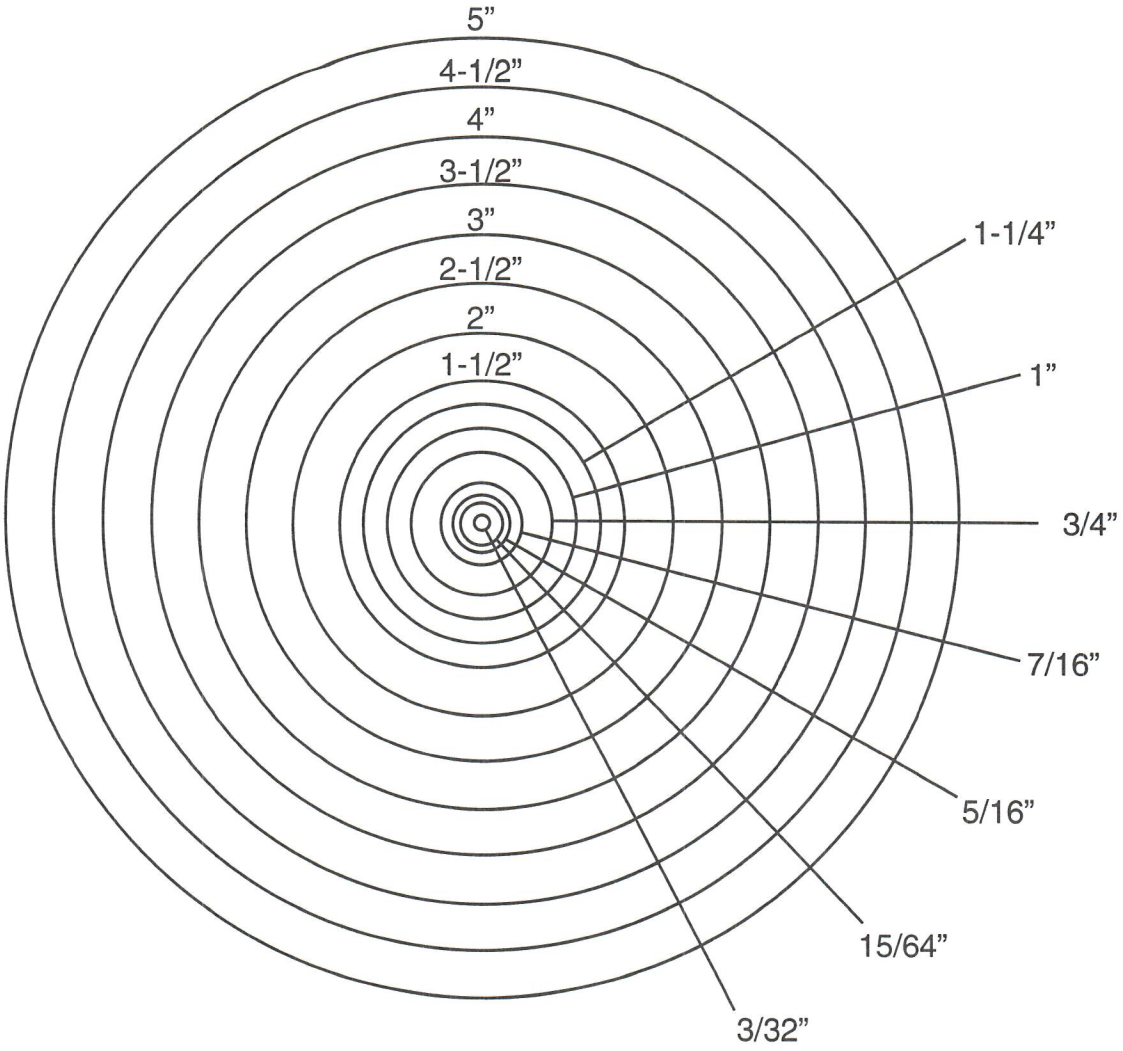
Loc.	Description	Part Number	Value
F101	Regulated 12V	5731-14531-00	T0.63A, 250v
F102	Solenoid. #25 to #28	5731-14530-00	T4.0A, 250V
F103	Solenoid #1-#8	5731-14530-00	T4.0A, 250V
F104	Solenoid #9 to #16	5731-14530-00	T4.0A, 250V
F105	+5V Logic	5731-14530-00	T4.0A, 250V
F106	+18V Lamp Matrix	5731-14046-00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

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

LINE FILTER

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

Rubber Rings
(Inside Dimension Reference)



Also available in black per charts:

Black Part No.	I.D.	White Part No.
23-6694-1	3/32	23-6535
23-6694-2	15/64	23-6641-1
23-6694-3	5/16	23-6300
23-6694-4	7/16	23-6599
23-6694-5	3/4	23-6301
23-6694-6	1	23-6302
23-6694-7	1-1/4	23-6303

Black Part No.	I.D.	White Part No.
23-6694-8	1-1/2	23-6304
23-6694-9	2	23-6305
23-6694-10	2-1/2	23-6306
23-6694-11	3	23-6307
23-6694-12	3-1/2	23-6308
23-6694-13	4	23-6309
23-6694-14	4-1/2	23-6530
23-6694-15	5	23-6310