

BAD CATS™



A.u.S. Spielgeräte GesmbH
Scheydgasse 48 A-1210 Wien
Tel. +43-1-271 66 00 Fax.+43-1-271 66 00 75
E-mail: verkauf@aus.at
<http://www.aus.at> <http://www.garlando.at>
Öffnungszeiten: Mo-Do 9-18 und Fr. 9-17 Uhr

OPERATIONS MANUAL

including

**Essential Information concerning
Game Operation & Adjustments,
Game Testing & Problem Diagnosis,
Parts Information, &
Reference Diagrams**

BAD CATS ROM and Jumper Table

Game	System 11B CPU Rev.	P/N - U15 Game μP	P/N - U27 G. ROM 1	P/N - U26 G. ROM 2	P/N - U21 S. ROM 1	P/N - U22 S. ROM 2	P/N - U24 Sound μP	Jumpers
BIG GUNS	-	5400-09150-00	A-5343-557-2	A-5343-557-1	A-5343-557-4	A-5343-557-3	5400-09150-00	W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
SPACE STATION	-		A-5343-552-2	A-5343-552-1	A-5343-552-4	A-5343-552-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
CYCLONE	-		A-5343-564-2	A-5343-564-1	A-5343-564-4	A-5343-564-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
BANZAI RUN	-		A-5343-566-2	A-5343-566-1	A-5343-566-4	A-5343-566-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
SWORDS OF FURY	-		A-5343-559-2	A-5343-559-1	A-5343-559-4	A-5343-559-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
TAXI	-		A-5343-553-2	A-5343-553-1	A-5343-553-4	A-5343-553-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
JOKERZ	-		A-5343-567-2	A-5343-567-1	A-5343-567-4	A-5343-567-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
EARTH-SHAKER	-		A-5343-568-2	A-5343-568-1	A-5343-568-4	A-5343-568-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
Black Knight 2000	-		A-5343-563-2	A-5343-563-1	A-5343-563-4	A-5343-563-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
POLICE FORCE	-		A-5343-573-2	A-5343-573-1	A-5343-573-4	A-5343-573-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19
BAD CATS	-		A-5343-575-2	A-5343-575-1	A-5343-575-4	A-5343-575-3		W1, 2, 4, 5, 7, 8, 11, 14, 16, 17, and 19

BAD CATS Solenoid Table

Sol. No.	Function	Solenoid Type	Wire Color	Connections		Driver Trmr	Solenoid Part Number Flashlamp Type b- Backbox; p-Playfield
				CPU Bd	Playfield/ Cabinet		
01A ³	Outhole Kicker	Switched	Vio-Brn	1P11-1	5J1-9: 5J4-9 (A)	Q33	AE-23-800
01C ³	Fish/Trash Flashers	Switched	Blk-Brn	(Gry-Brn)	5J5-9 (C)	Q33	#906/#89 flashlamps 1p,1b
02A ³	Knocker	Switched	Vio-Red	1P11-3	5J1-7: 5J4-8 (A)	Q25	AE-23-800
02C ³	Tiger Flasher	Switched	Blk-Red	(Gry-Red)	5J5-8 (C)	Q25	#906/#89 flashlamps 1p,1b
03A ³	Doghouse Kickbig	Switched	Vio-Orn	1P11-4	5J1-6: 5J4-7 (A)	Q32	AE-23-800
03C ³	Bird Bank Flashers	Switched	Blk-Orn	(Gry-Orn)	5J5-7(C)	Q32	#906/#89 flashlamps 1p,1b
04A ³	Milk Bottle Bank (3-Dr Tgt)	Switched	Vio-Yel	1P11-5	5J1-5: 5J4-6 (A)	Q24	AE-26-1200
04C ³	Left Tiger Flashers	Switched	Blk-Yel	(Gry-Yel)	5J5-5 (C)	Q24	#906/#89 flashlamps 1p,1b
05A ³	Garbage Can (Eject)	Switched	Vio-Grn	1P11-6	5J1-4: 5J4-5 (A)	Q31	AE-23-800
05C ³	Jackpot Flashers	Switched	Blk-Grn	(Gry-Grn)	5J5-4 (C)	Q31	#906/#89 flashlamps 1p,1b
06A ³	Bird Cage Bank (5-Dr Tgt)	Switched	Vio-Blu	1P11-7	5J1-3: 5J4-4 (A)	Q23	AE-24-900
06C ³	Seafood Flasher	Switched	Blk-Blu	(Gry-Blu)	5J5-3 (C)	Q23	#906 flashlamps 3p
07A ³	(Not Used)	Switched	Vio-Blk	1P11-8	5J1-2: 5J4-2 (A)	Q30	
07C ³	Doghouse Flashers	Switched	Blk-Vio	(Gry-Vio)	5J5-2 (C)	Q30	#906/#89 flashlamps 1p,1b
08A ³	(Not Used)	Switched	Vio-Gry	1P11-9	5J1-1: 5J4-1 (A)	Q22	
08C ³	Barbeque Flashers	Switched	Blk-Gry	(Gry-Blk)	5J5-1 (C)	Q22	#906/#89 flashlamps 1p,1b
09	Cat (Backbox) Motor	Controlled	Bm-Blk	1P12-1	5J2-9: 5J6-9: 2J4-3	Q17	Motor p/n14-7954
10	Playfield Grl Illum Relay	Controlled	Bm-Red	1P12-2	5J2-8: 5J6-8: 2J4-5	Q9	5580-09555-01 4a
11	Backbox Grl Illum Relay	Controlled	Bm-Orn	1P12-4	5J2-6: 5J6-7: 2J4-6	Q16	5580-09555-01 4a
12	A/C Select Relay	Controlled	Bm-Yel	1P12-5	5J2-5	Q8	5580-09555-01 5
13	Woman (Backbox) Motor	Controlled	Bm-Grn	1P12-6	5J2-4: 5J6-5	Q15	Motor p/n14-7954
14	BAD CATS Flashers (Backbox)	Controlled	Bm-Blu	1P12-7	5J2-4: 5J6-3	Q7	#89 flashlamps 4b
15	Seafood Wheel Coil 2	Controlled	Bm-Vio	1P12-8	5J2-2: 5J6-2	Q14	
16	Seafood Wheel Coil 1	Controlled	Bm-Gry	1P12-9	5J2-1: 5J6-1	Q6	} Stepper Motor p/n14-7948
17	Left Jet Bumper	Special #1	Blu-Brn	1P19-7	5J3-7: 5J7-7	Q75	AE-23-800
18	Left Kicker ("sling")	Special #2	Blu-Red	1P19-4	5J3-6: 5J7-6	Q71	AE-26-1500
19	Right Jet Bumper	Special #3	Blu-Orn	1P19-3	5J3-3: 5J7-3	Q73	AE-23-800
20	Right Kicker ("sling")	Special #4	Blu-Yel	1P19-6	5J3-4: 5J7-5	Q69	AE-26-1500
21	Lower Jet Bumper	Special #5	Blu-Grn	1P19-8	5J3-2: 5J7-2	Q77	AE-23-800
22	(Not Used)	Special #6	Blu-Blk	1P19-9	5J3-1: 5J7-1	Q79	
-	<u>Right Flipper</u>	-	Om-Vio	1P19-1	2J5-5: 2J10-7	-	
-	Lower Right Flipper	-	[Blu-Vio] ²		[2J10-1: 2J8-15]	-	FL11630/50VDC
-	<u>Left Flipper</u>	-	Om-Gry	1P19-2	2J5-4: 2J10-8	-	
-	Lower Left Flipper	-	[Blu-Gry] ²		[2J10-2: 2J8-4]	-	FL11630/50VDC

Notes 1. Wire colors, except flipper Om-Vio and Om-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Om-Vio and Om-Gry wires connect from CPU Board to flipper switch. 2. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" circuits are pulsed, when Sol. 12 is de-energized; "C" circuits are pulsed, with Sol. 12 energized. Wire colors in brackets are those from respective A and C terminals corresponding to the J1-terminal connection listed for the Aux Power Driver Bd, which controls the device pulsing by Sol. 12. 4. Relay is mounted on Relay Bd, (4a) p/n C-11998-1; (4b) C-11902-1. 5. Relay is mounted on Aux Power Driver Bd, D-12247 in the backbox.

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Section 1

Game Operation & Test Information

- **BAD CATS (System 11B) ROM Summary**
- **Pinball Game Assembly Instructions**
- **Game Play**
- **Game Status Displays**
- **Game Adjustment Procedure**
- **Game Pricing**
- **Test/Diagnostic Procedures**

BAD CATS (System 11B) ROM Summary

IC	DESCRIPTION	TYPE	IDENTIFIER	BOARD	PART NUMBER
Game ROM 1	32K x 8 ROM	27256	U27	CPU	A-5343-575-2
Game ROM 2	32K x 8 ROM	27256	U26	CPU	A-5343-575-1
Sound ROM 1	32K x 8 ROM	27256	U21	CPU	A-5343-575-4
Sound ROM 2	32K x 8 ROM	27256	U22	CPU	A-5343-575-3
Music/Speech ROM1	32K x 8 ROM	27256	U4	Audio	A-5343-575-5
Music/Speech ROM1	32K x 8 ROM	27256	U19	Audio	A-5343-575-6

NOTICE

To order a replacement ROM from your authorized WILLIAMS ELECTRONICS GAMES distributor, specify: (1) part number (if available); (2) ROM label color; (3) ROM level (number) on the label; (4) which game the ROM is used in.

CONNECTOR & COMPONENT IDENTIFICATION

WILLIAMS ELECTRONICS GAMES uses a special technique to identify connectors and other game components. Each plug or jack receives a prefix number (which identifies the circuit board), a letter, and a number. J-designations refer to the male part of a connector. P-designations refer to the female part of a connector. For example, 1J1 designates jack 1 of board 1 (a CPU Board jack); 3P6 designates plug 6 of board 3 (a Power Supply 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, 1J1-3 refers to pin 3 of jack 1 on board 1.

Other game components may also have similar prefixes preceding their designator to clarify their locations or related circuit.

Prefix numbers for the System 11B circuit boards and other major assemblies are listed below. A prefix number may precede a component designator to identify its associated unit (e.g., Backbox fuse 6F1).

1 - CPU	5 - Aux Power Driver	9 - Insert Board
2 - Master Interconnect	6 - Backbox	10 - Audio
3 - Backbox Power Supply	7 - Cabinet	
4 - Alphanumeric Display	8 - Playfield	

BAD CATS CIRCUIT BOARDS

System 11B Circuit Boards for **BAD CATS** are in the backbox. They are accessible by unlocking the Backbox lock, removing the Backbox glass, unlatching the Insert Board, and swinging it open.

The Master Display Board is mounted on the front of the Insert Board, along with the 7-Segment Display Board. To access the Master Display Board, unlock the Backbox and remove the Backbox glass.

Lamp circuit boards are mounted on the Playfield and on top of the Backbox under the **BAD CATS** Dome.

CPU BOARD. The System 11B CPU Board (p/n D-11883-575) must be equipped with the ROMs specified in the **BAD CATS** (System 11B) ROM Summary. CPU Board jumpers W1, W2, W4, W5, W7, W8, W11, W14, W16, W17, and W19 must be connected.

AUDIO BOARD. The Audio Board is p/n D-11581-575, including ROMs and microprocessor.

DISPLAY BOARD. The Alphanumeric Display Unit Board is p/n D-12232-1.

POWER SUPPLY BOARD. The Power Supply Board is p/n D-12246.

AUX POWER DRIVER BOARD. The Aux Power Driver Board is D-12247-566.

MASTER INTERCONNECT BOARD. The Master Interconnect Board is D-12313-575.

Figure 1 shows the locations of these circuit boards, as well as other devices especially located to make **BAD CATS** a great game.

BAD CATS GAME CONTROL LOCATIONS

Figure 2 shows the locations of the following switches, except for the last two (CPU and Sound Diagnostic switches, which are shown in the Backbox portion of Figure 1, along the left edge of the CPU Board).

The On-Off switch is on the bottom of the cabinet near the right front leg.

The Volume Control is on the left inner wall of the cabinet on the tilt mechanisms board. It is accessible by opening the coin box door.

The Credit switch is a pushbutton to the left of the coin door on the cabinet exterior.

GAME ADJUSTMENT/DIAGNOSTIC SWITCHES. **BAD CATS** allows the operator to control all game adjustments, obtain bookkeeping information, and diagnose problems, using only three switches mounted on the inside of the coin door, along with the Credit button beside the coin door.

ADVANCE, AUTO-UP/MANUAL-DOWN, and HIGH-SCORE RESET are the switches located on the inside of the coin door. Refer to the text discussing Game Status Displays and the Test/Diagnostic Procedures for details concerning button operation.

The Memory Protect switch is on the inside frame of the coin door. This interlock switch must be open to clear bookkeeping totals and to make game adjustments. It automatically opens, when the coin door opens.

Figure 1 shows the locations of the two CPU Board switches (left edge of CPU Board, Backbox View).

The CPU Diagnostic switch (SW 2) is the lower switch (of the two switches mounted on the left edge of the CPU Board) near a large, socketed microprocessor chip. This switch initiates the Memory Chip Test explained in the Test/Diagnostic Procedures.

The Sound Diagnostic switch (SW 1) is the upper switch of the two mounted on the left edge of the CPU Board. This switch initiates the Sound Section Test. Refer to the Test/Diagnostic Procedures.

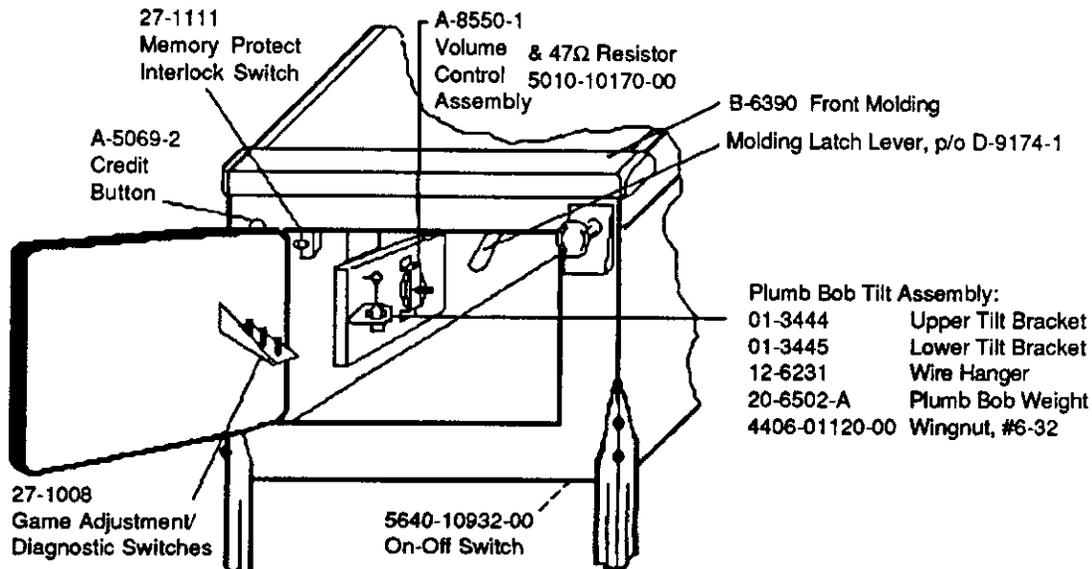


Figure 2. Pinball Game Controls Locations

PINBALL GAME ASSEMBLY INSTRUCTIONS

1. Open the shipping container; remove all cartons, parts, and other items, and set them aside.
2. Place cabinet on a support and attach rear legs (after installing leg levellers), using leg bolts. Leg levellers and leg bolts are both provided among the parts in the cash box.
3. Attach the front legs (after installing leg levellers), using leg bolts. See Figure 3 for details.

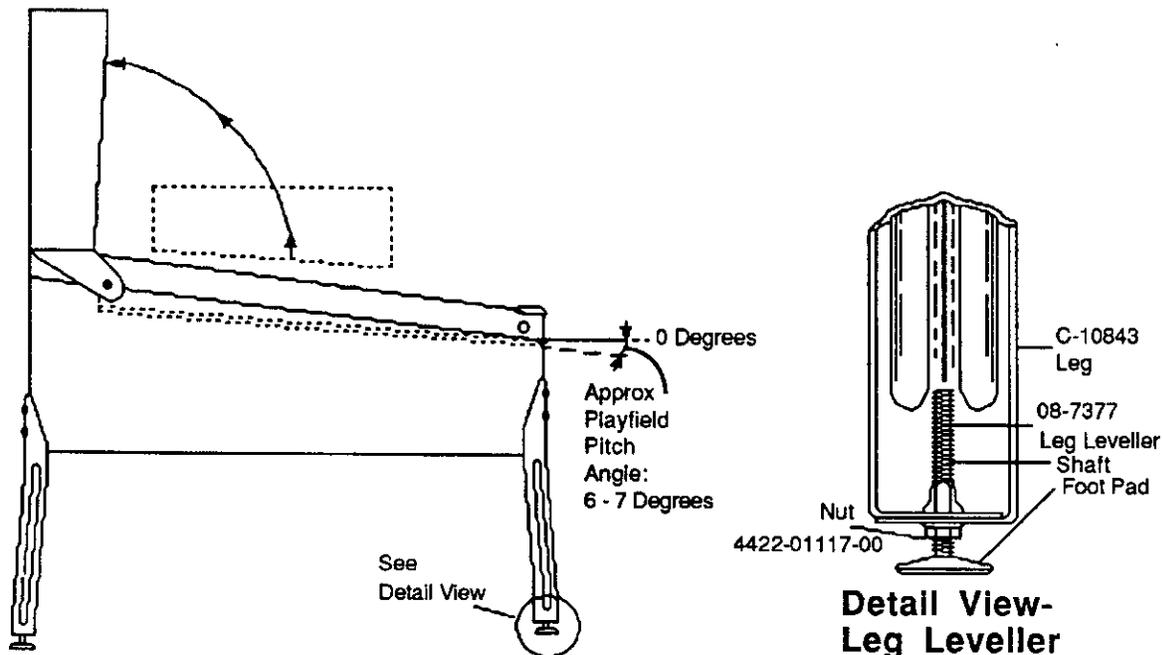


Figure 3. Pinball Assembly, Playfield Pitch Angle, and Leg Leveller Details.

4. Reach into the cabinet and backbox and ensure that the interconnecting cables are free to move (not kinked or pinched). Be careful to avoid damaging wires at any stage of the assembly process.
5. Raise the hinged backbox upright and stabilize it into position. Unlock the backbox, and remove the backbox glass, storing it carefully to avoid scratches. Remove the shipping block holding the Insert Board. Unlatch the Insert Board and open it; lift the Speaker/Display Panel and lay it on the playfield glass. This allows access to the bolt holes used for securing the backbox upright. Install the washer-head mounting bolts through the bottom holes of the backbox into the threaded fasteners in the cabinet to secure the backbox. Remount the Speaker/Display Panel; close the Insert Board and latch it in position. Reinstall the backbox glass, and lock the backbox.

WARNING

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.

6. Extend each leg leveller *slightly* below the leg bottom, so that all four foot pads are extended about the same distance. Remove the cabinet from its support and place it on the floor.
7. Unlock and open the coin door. Locate the Molding Latch Lever (shown in Figure 2), and move the lever toward the left side of the game, to release the Front Molding. Lift the Front Molding off the playfield cover glass; return the Latch Lever toward 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.

PINBALL GAME ASSEMBLY INSTRUCTIONS (Continued)

8. Place a level or an inclinometer on the playfield surface. Adjust the leg levellers for proper playfield level (side-to-side) and playfield pitch angle (incline) of approximately 6-7 degrees. NOTE: It is recommended that these measurements be made ON the playfield, not the cabinet nor the playfield cover glass. Tighten the nut on each leg leveller shaft to maintain this setting, as shown in Figure 3.

CAUTION

Playfield pitch angle adjustments can affect the operation of the plumb bob tilt, inside the cabinet. 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.

9. Move the game into the desired location; recheck the level and pitch angle of the playfield.
10. Verify that the **required number** of balls are installed in the game. (BAD CATS: 1 ball.)
11. Clean and reinstall the playfield cover glass, reversing the procedure of step 7. Prepare the game for player operation.

GAME OPERATION

WARNING

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. Perform the following 'power up' routine upon completion of the assembly and installation procedure, as well as at the beginning of each period of game operation. Initially, it will confirm that the game is in proper operating condition; later, it will aid the operator via its messages.

Procedure. With the coin door closed, plug the game in, and switch it ON, using the On-Off switch. In normal operation, the player 1 score display initially shows 00. Then, the game goes into the Attract Mode (playfield and backbox lamps flashing, sounds being heard, etc., if the operator does not change the Factory Setting).

Open the coin door and press the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN. Press the ADVANCE button to begin the game test routine. Return to AUTO-UP and perform the entire test routine to verify that the game is operating satisfactorily. Successful completion of the tests shows that the game is ready to begin earning your investment return.

After the game has been on location for a period of time, the test routine may be preceded by messages concerning game problems. The text entitled 'Problem Analysis Messages' at the end of the Text/Diagnostic Procedures contains more details concerning messages displayed at each game turn-on.

ATTRACT MODE*. Playfield and backbox lamps blink. The player score displays exhibit a series of messages informing the player concerning:

- A. Recent highest scores*;
- B. A "custom message"
("THERE IS MORE ... THAN ONE WAY TO ... SKIN A BAD CAT");
- C. The score to achieve to obtain a Replay award*;

These (or similar) displays reappear occasionally, accompanied by sounds and music, until a player initiates game play by inserting a coin or, when credits are available, pressing the Credit button.

GAME OPERATION (Continued)

CREDIT POSTING. Insert coin(s). A sound is heard for each coin, and the player score displays show 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 Credit button once. A startup sound plays, and the Credit amount shown in the player score display decreases by one. The upper Player Score Display flashes 00 (until the first playfield switch is actuated), and the lower Player Score Display shows **ball 1**, except for 4-player games where the **ball #** shows in the individual player's display. Additional players may enter the game by pressing the Credit button once for each player, before the end of play on the first ball.

TILT. Actuating the Slam Tilt switch on the coin door inside the cabinet ends the current game; **BAD CATS** then proceeds to the Game Over Mode. With the actuation of the playfield tilt switch, or 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 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 Match display. Credit* may be awarded, when the last two digits of any player's score display (1 through 4) match the random digits of the Match display. Match, high score, and game over sounds are made, as appropriate.

GAME OVER MODE. The GAME OVER display shows in the player score displays. Then, the high scores flash on the appropriate player score displays. The game proceeds to the Attract Mode.

* - operator-adjustable feature

BAD CATS GAME STATUS DISPLAYS

BAD CATS provides the game owner/operator with a display of information concerning the game's bookkeeping and game play feature adjustments. Basically, three classes of information now become available in this status display mode: **Id** (Identification); **Au** (Audit); **Ad** (Adjustment). Each of the underscored two-letter abbreviations for these classes appears in the Player Score Displays, while the system microprocessor for the BAD CATS game is displaying the items within each class.

Identification Information--Id

With the game turned on, the coin door open, and the AUTO-UP/MANUAL-DOWN switch in the AUTO-UP position, the operator can press the ADVANCE switch once, briefly. Player displays immediately change from the Attract Mode to the Game Status Display or Identification (Id) Mode. This is evident by the following display, shown in columnar form. The column headings refer to the two backbox displays.

Upper Player Score Display	Lower Player Score Display
BAD CATS 575	L-x* Id 00

* x - indicates ROM revision level; e.g., 1 is initial issue; 2, 3, etc. for later revisions.

The game is named in the upper Player Score display. The game's identification number, the ROM revision level, and the Id Mode stage (**Id 00**) shows in the Lower Player Score display.

Pressing ADVANCE once more causes the **Id 01** display to appear. This display describes the installed software more fully; that is, country; development stage; date of revision.

Pressing ADVANCE once more causes the **Id 02** display to appear. This display describes which of the "Install" options is currently in effect. For example, if the YES option of the INSTALL FACTORY Adjustment Item (**Ad 70**) was last selected, *FACTORY SETTING* appears on the player score displays. Changing the setting of any other game adjustment item, after selecting the YES option for **Ad 70** causes the display to change to *FACTORY ALTERED*. Similarly, if the operator selects the YES option for **INSTALL HARD (Ad 65)**, the display indicates *HARD SETTING*. Changing a game adjustment item later then causes the display to show *HARD ALTERED*.

Audit Information--Au

While the AUTO-UP switch remains in the Up position, the operator can press the ADVANCE switch once, briefly, to begin the backbox displays of Audit (sometimes called "bookkeeping") Information. Fifty-three audit entries are now available. Calculation of the various factors is no longer necessary because the System 11B game program now performs all the mathematical factor computations. This information is intended to aid the owner/operator in evaluating how the game is performing in each location, by providing knowledge about which game features are receiving the most play. With this information, the owner/operator can determine whether adjusting the game features to other settings will contribute to increased game earnings.

The operator can press the ADVANCE button once to view each Audit Information display item. To proceed more rapidly through this information, the operator only has to press and hold the ADVANCE button. If a desired item is passed, the operator can use the MANUAL-DOWN switch position with the ADVANCE button to back up to the desired item.

The **BAD CATS Audit Table** lists the 53 Audit Items of the **BAD CATS** Game Status Displays. Presentation of these Audit Items again utilizes the player score displays: The Audit Item entry appears in the lower Player Score Display accompanied by the Item's data, while the upper display shows the Item description. A few example entries are shown in the table. Detection of erroneous data affecting any of the counters used in these audit items causes the message, **ERROR**, to be displayed during display of any audit item associated with that particular counter. (The program does not analyze the cause of the error; it merely alerts the operator of the error's existence by the message.)

BAD CATS GAME STATUS DISPLAYS (Continued)

BAD CATS Audit Table

Audit Item (Lower)	Descriptive Phrase (Upper Display)	Audit Item Value (Lower Display)
AU 01	LEFT COINS [chute next to coin door hinge]	432
02	CENTER COINS	0
03	RIGHT COINS	398
04	PAID CREDITS	830
05	TOTAL PLAYS	
06	TOTAL FREE (Total Free Plays)	
07	PERCENT FREE (% Free Plays)	
08	REPLAY AWARDS	
09	PERCENT REPLAY (% Replay Awards)	
10	SPECIAL AWARDS	
11	PERCENT SPECIAL (% Special Awards)	
12	MATCH AWARDS	
13	HSTD (High Score to Date) CREDITS	
14	PERCENT HSTD (% HSTD Credits)	
15	EXTRA BALLS	
16	PERCENT EX. BALL (% Extra Balls)	
17	AV. BALL TIME (Average Time in Seconds)	
18	MINUTES OF PLAY (Minutes of Play)	
19	BALLS PLAYED	
20	REPLAY1 AWARDS	
21	REPLAY2 AWARDS	
22	REPLAY3 AWARDS	
23	REPLAY4 AWARDS	
24	1 PLAYER GAMES	
25	2 PLAYER GAMES	
26	3 PLAYER GAMES	
27	4 PLAYER GAMES	
28	BURN IN CYCLES	
29	UNLM. MIL. LIT (# of times 'Unlimited Million' was lit)	
30	UNLM. MIL. AWARDED (# of awards of 'Unlimited Million')	
31	TWENTY MIL. LIT (# of times 20 Million was lit)	
32	TWENTY MIL. AWARDED (# of times 20 Million awarded)	
33	TGR. RMP. COMPL. (# of Tiger Ramp Completions)	
34	TGR RAMP MISSED (# of Tiger Ramp Noncompletions)	
35	GOLDFISH RAMPS (# of Center Ramp shots)	
36	JACKPOTS AWARDED (# of times 'JACKPOT' awarded)	
37	TOTAL WHEEL SPINS (# of spins of Seafood Wheel)	
38	CURIOSITY SPINS (# of 'Curiosity' Spins)	
39	H.S.RESET COUNTER	
40	0.0-0.4 MIL. SCORE (# of games <500K)	
41	0.5-0.9 MIL. SCORE (# of games ≥500K, <1M)	
42	1.0-1.4 MIL. SCORE (# of games ≥1M, <1.5M)	
43	1.5-1.9 MIL. SCORE (# of games ≥1.5M, <2.0M)	
44	2.0-2.9 MIL. SCORE (# of games ≥2.0M, <3.0M)	
45	3.0-3.9 MIL. SCORE (# of games ≥3.0M, <4.0M)	
46	4.0-4.9 MIL. SCORE (# of games ≥4.0M, <5.0M)	
47	5.0-5.9 MIL. SCORE (# of games ≥5.0M, <5.0M)	
48	6.0-7.9 MIL. SCORE (# of games ≥6.0M, <8.0M)	
49	8.0-9.9 MIL. SCORE (# of games ≥8.0M, <10.0M)	
50	10M - 99.9MIL. SCORE (# of games ≥10M, <99.9M)	
51	AV. MIN. GAME TIME (Average Game in Minutes)	
52	TOTAL FISH COL.	
53	FISH COL. 10X	
54	FISH 5 MILLION	
55	BONUS MULTIPLIER	
56	LEFT DRAINS	
57	RIGHT DRAINS	
58	CONSOL. EX. BALLS	

NOTE: 1. The numbers shown in this column for Items 1 through 4 are examples. Entries for all items depend on the amount of play; thus, they will vary from location to location.

BAD CATS GAME STATUS DISPLAYS (Continued)

Adjustment Information--Ad

At end of the Audit Information presentation, with the AUTO-UP switch in the Up position, the operator can press the ADVANCE button to proceed to the Adjustment Information portion of the BAD CATS Game Status Displays, as shown in the Player Score Displays. A list of the Game Adjustments appears in the BAD CATS Game Adjustment Table.

The operator can press the ADVANCE button once to view each Adjustment Information display item. To proceed more rapidly through this information, the operator only has to press and hold the ADVANCE button. If a desired item is passed, the operator can use the MANUAL-DOWN switch position with the ADVANCE button to back up to the desired item.

The BAD CATS Game Adjustment Table lists the 70 items of the Adjustment Information portion of the BAD CATS Game Status Displays. Presentation of the displays is similar to that for the Audit Information (that is, the upper display shows a descriptive phrase; the light type below the column headings names the respective backbox displays where the information appears, etc.).

The BAD CATS Game-specific Adjustments Table lists those Game-specific Adjustment Items for which settings vary between the major models of pinball products.

The Game Adjustment Table, along with the Game-specific Adjustment Table, provides the Factory Settings for the three major models of pinball products (defined by its country/language designation).

POLICE FORCE Game-specific Adjustments Table

Adjustment Item (Lower)	Descriptive Phras (Upper Display)	Factory Settl (Lower)		
		Domestic (US/Can.)	French	W Ger/ European
Ad 31	1/2 PRICE BUY IN	NO		
32	PROGRESSIVE / NORMAL / CONTEST GAME	Progress.		
33	LIBERALIZER	YES	NO	
46	EX. BALLS / GAME	33%		
47	SPECIALS / GAME	5%		
48	A. MODE SOUNDS	YES		NO
51	CONSOL. BALL TIME	45 sec	50 sec	
52	NORMAL / DIM / DIMMEST FLASHERS	NORMAL		

NOTE

In both of these tables, each Adjustment Item's Factory Setting for each of the three major models of pinball products is that shown in the 'Domestic' (US / Can.) column, unless a superseding entry appears in the French or West German columns of these tables. A superseding entry takes precedence over the 'Domestic' entry for the only the particular model indicated by its column.

BAD CATS GAME STATUS DISPLAYS (Continued)

BAD CATS Game Adjustment Table

Adjustment Item (Lower)	Descriptive Phrase (Upper Display)	Factory Setting 6 (Lower)		
		Domestic (US/Can.)	French	W Ger/ European
Ad 01	AUTO REPLAY ¹ or FIXED REPLAY ¹	10 (%)		
02	REPLAY START (or REPLAY LEVEL 1) ¹	SCORES		4,000,000
03	REPLAY LEVELS (or REPLAY LEVEL 2) ¹	5,000,000		02
04	(REPLAY LEVEL 3) ¹	01 (or OFF)		
05	(REPLAY LEVEL 4) ¹	(see text)		
06	REPLAY AWARD	(see text)		
07	SPECIAL AWARD	Credit		
08	MATCH FEATURE	Credit		
09	BALLS / GAME	10 (%)	8%	
10	TILT WARNING	03		
11	MAXIMUM EX. BALL	03	01	
12	MAXIMUM CREDITS	12		
13	HIGHEST SCORES	10	20	30
14	BACKUP HI. SCR.1	On		
15	BACKUP HI. SCR. 2	5,000,000		7,000,000
16	BACKUP HI. SCR. 3	4,500,000		6,500,000
17	BACKUP HI. SCR. 4	4,000,000		6,000,000
18	HI. SCR.1 CREDITS	3,500,000		5,500,000
19	HI. SCR.2 CREDITS	01	03	03
20	HI. SCR.3 CREDITS	01		00
21	HI. SCR.4 CREDITS	01		00
22	H. S. RESET EVERY	01		00
23	FREE PLAY	3,000		1000
24	U.S.A. 2 COINAGE (2 COINS 1 PLAY) ^{2,3,4}	NO		
25	LEFT UNITS	USA 2	French 1	German 2
26	CENTER UNITS	01	02	06
27	RIGHT UNITS	04	10	12
28	UNITS/ CREDIT	01	20	30
29	UNITS/ BONUS	01	05	05
30	MINIMUM UNITS	00	20	00
31 - 58	Game-specific Play / Coinage Adjustments (detailed in text, the Game-specific Adjustments Setting Table and the Difficulty Setting Comparison Table)			
59 ⁵	INSTALL ADDABALL	NO		
60 ⁵	INSTALL 5-BALL	NO		
61 ⁵	INSTALL NOVELTY	NO		
62 ⁵	INSTALL EX. EASY	NO		
63 ⁵	INSTALL EASY	NO		
64 ⁵	INSTALL MEDIUM	NO		
65 ⁵	INSTALL HARD	NO		
66 ⁵	INSTALL EX. HARD	NO		
67	AUTO BURN-IN	NO		
68	CLEAR COINS	NO		
69	CLEAR AUDITS	NO		
70	INSTALL FACTORY	NO		

NOTES:

1. Automatic Replay percentage value range is adjustable from 5 to 25%, via the Credit Button. Item 02 permits changing the factory setting value for Replay Start Level (valid for next 50 games played). Item 03 permits setting up to four replay levels, with values as detailed in text describing Item 03. For Fixed Replay Scores, set Auto Replay value to 1 less than 5(%) via the Credit Button. Go to Items 02, 03, 04, and 05; install their replay level scores. Turn off any replay level by setting 00 as its value.
2. Phrase in parentheses is Factory Setting. Phrase appears in player displays. Press Credit Button to change setting of the game pricing of Item 24.
3. To change country OR coinage setting, press Credit button to obtain 24 Standard Settings, followed by a Custom Setting. The Custom Setting activates Items 25 through 30. When a Standard Setting is used, items 25 through 30 are set automatically, and cannot be changed.
4. Refer to Pricing Table and text describing these items.
5. Special Preset Adjustment, whose effects are noted in the Game Adjustment text.
6. Entries in Factory Setting columns for French and W. German games show only differences from entries in first (US / Can.) column.

BAD CATS GAME STATUS DISPLAYS (Continued)

One of the following **BAD CATS Game Difficulty Setting Tables** shows the five game 'difficulty' Adjustment Items (ranging from Ad 62 - Extra Easy through Ad 66 - Extra Hard) for the major models of pinball products (defined by country-language designations). Installing any one of these 'difficulty' Adjustments causes the values shown for each of the included game play Adjustment Items to be installed as a group, changing the level of play from one difficulty level to another. The owner/operator can use the information provided by the Audit Table items to determine whether the 'difficulty level' for this game in this location needs to change to obtain a higher level of earnings from the game or to provide a greater challenge to the location's players.

Once the 'difficulty level' is changed, a careful review of the Audit Items will reveal whether the change has achieved this higher-earnings goal. Sometimes, one (or more) of the Adjustment Items needs further change to keep the number of plays high, while still keeping the earnings level high. "Fine-tuning" of the game's Adjustment Items is a key feature of Williams Electronic Games products.

BAD CATS

Game Difficulty Setting Table for US / Canadian / French Games

Adj #	Adj Description	Extra Easy Ad 62	Easy Ad 63	Medium Ad (Factory) 64	Hard Ad 65	Extra Hard Ad 66
31	B-A-D C-A-T-S Memory	Yes	Yes	Yes	No	No
32	Doghouse Timer	30 sec	25 sec	20 sec	10 sec	10 sec
33	Fish Bone-Us Timer	30 sec	25 sec	20 sec	15 sec	10 sec
34	10X Fish Bonus Memory	Yes	Yes	Yes	No	No
35	Tiger Ramp Start Value	200K	100K	50K	None	None
36	Bonus Multipl Difficulty	Easiest	Easiest	Easy	Normal	Normal
37	Goldfish Ramp	Easiest	Easy	Easy	Hard	Hardest
45	JACKPOTS / Game	10%	8%	5%	3%	2%
46	Extra Balls / Game	40%	40%	33%	25%	20%
47	SPECIALS / Game	8%	6%	5%	3%	2%

NOTE

The 'difficulty' Factory Setting for French games is the equivalent of Ad 64 Medium, with 3 balls/game. German/European games also use the equivalent of Ad 64 Medium, with 3 balls/game.

BAD CATS

Game Difficulty Setting Table for German / European Games

Adj #	Adj Description	Extra Easy Ad 62	Easy Ad 63	Medium Ad (Factory) 64	Hard Ad 65	Extra Hard Ad 66
31	B-A-D C-A-T-S Memory	Yes	Yes	Yes	No	No
32	Doghouse Timer	30 sec	25 sec	20 sec	10 sec	10 sec
33	Fish Bone-Us Timer	30 sec	25 sec	20 sec	15 sec	10 sec
34	10X Fish Bonus Memory	Yes	Yes	Yes	No	No
35	Tiger Ramp Start Value	200K	100K	50K	None	None
36	Bonus Multipl Difficulty	Easiest	Easiest	Easy	Normal	Normal
37	Goldfish Ramp	Easiest	Easy	Easy	Hard	Hardest
45	JACKPOTS / Game	10%	8%	5%	3%	2%
46	Extra Balls / Game	40%	40%	33%	25%	20%
47	SPECIALS / Game	8%	6%	5%	3%	2%

GAME ADJUSTMENT PROCEDURE

Adjustment Items 01 through 70

The coin door must be open to access the Game Adjustment/Diagnostic switches. All readings and setting changes require operation of these coin door switches. Some setting changes utilize the Credit button; some also use the flipper button(s). *Additional text describing the game adjustment items follows this procedure; the value of the Factory Setting for each Game Adjustment item is in the preceding BAD CATS Game Adjustment Table.*

1. Use AUTO-UP and press ADVANCE. The Id 00 display initially appears. Press ADVANCE until the Player 3 display indicates **Ad 01**. If the factory setting has not changed, the upper Player Score display indicates AUTO REPLAY, and the lower display shows 10%, indicating a 10% replay percentage. (The game program adjusts itself automatically, as discussed in the following text concerning the 'details' about Adjustment Item 01.)
2. To reach a higher item number (in the lower display), use AUTO-UP and press ADVANCE. To return to a previous item number, use MANUAL-DOWN and press ADVANCE.
3. With the desired Game Adjustment Item number showing in the lower display, increase the setting value (or select another option) shown in the lower display by using AUTO-UP and pressing the Credit button. Repeat this step for each item, until all changes to the factory settings for the Game Adjustment Items have been made. The preceding Game Adjustment Table consolidates the Factory Settings into one grouping.

(The same procedure can be used for Audit Items. To zero **Au 01 - 04** (concerning the coin chutes and the total coins), the operator can proceed to item 68, Clear Coins, and press the Credit button to obtain the YES option. The operator then presses the ADVANCE button and notes the "DONE" display, which verifies that the entry values for items 01 through 04 of the Audit Items are now reset to zero.)

For example, the operator may desire to change the degree of game play difficulty from the Factory Setting (equivalent to the Install Medium [Ad 64] difficulty, along with a number of other automatically installed settings, as shown in the right column of the Game Adjustment Table) to another difficulty more suitable for the players at a particular game site. Four other 'automatic' play difficulty settings (Ad 62 - Ad 66) are available, each of which, if selected, installs all the adjustments listed for that difficulty in the Game Adjustment Setting Comparison Table, which precedes the 'details' text.

4. To proceed rapidly through the entire adjustments series, press *and hold* ADVANCE, until **Ad 70** shows in the lower display. From item 70, you can: (A) return to the Game-Over Mode; or (B) restore factory settings and zero audit (bookkeeping) totals. Perform either of the following, as desired:
 - A. To reach Game-Over Mode, use AUTO-UP and press ADVANCE once. **BAD CATS** now goes to the Game-Over Mode.
 - B. To restore the Factory Settings for Game Adjustment Items (as listed in the Game Adjustments Table), zero all audit (bookkeeping) totals, *and* return to Game-Over Mode, use AUTO-UP or MANUAL-DOWN to display Ad 70 in the lower display. Press the Credit button to display the YES option in the lower display. Using AUTO-UP, press ADVANCE once. **BAD CATS** now zeroes ALL Audit Item totals and changes ALL Game Adjustment Items back to those originally selected as Factory Settings. It then shows the operator a message ("FACTORY SETTING") that this has occurred. (A problem in the Memory Protection circuit or closing the coin door will cause the message "ADJUST FAILURE" to appear.) Press ADVANCE once more to return to the Game-Over Mode.

GAME ADJUSTMENT PROCEDURE (Continued)

Details of Adjustment Items 01 through 70

01 Auto Replay (or Fixed Replay)

Of the two options, AUTO REPLAY is the percentage of replays automatically awarded per game. The game program aids a pinball's initial installation by causing a comparison of the value of the Replay Level to the value of all players' scores every 50 games. At each comparison, the program increases (or decreases) the Replay Level by an amount necessary to achieve the replay percentage specified either via the factory setting or later operator selection. Use the Credit button to change the percentage within the range of 5 to 25 (%), with the value increasing using AUTO-UP (or decreasing using MANUAL-DOWN). The next Credit button change below 5%, selects the FIXED REPLAY option.

For AUTO REPLAY, Ad 02 provides the Starting Replay Level (the upper display shows REPLAY START). Ad 03 provides the number of replay levels (01, 02, 03, or 04). BAD CATS then proceeds to Ad 06 automatically.

For FIXED REPLAY, Ad 02 is the first replay level (REPLAY LEVEL 1). Ad 03, 04, and 05 are the other replay levels.

02 Starting Replay Level (or Replay Level 1)

For AUTO REPLAY (refer to Ad 01), the initial Factory Setting is listed in the Game Adjustment Table. The range of settings is 800,000 through 9,800,000 (by increments of 100,000 with AUTO-UP or decrements of 100,000 with MANUAL-DOWN).

For FIXED REPLAY, the operator can enter the value to be used for the first fixed replay score level via the Credit button. The range of settings is: OFF; 100,000 through 9,900,000 (by increments of 100,000 with AUTO-UP, or decrements of 100,000 with MANUAL-DOWN).

03 Replay Levels (or Replay Level 2)

For AUTO REPLAY (refer to Ad 01), this is the number of replay levels in a game. The option range is one, two, three, or four replay level(s). When the operator chooses two replay levels, BAD CATS automatically adjusts the second replay level to be twice the value selected for Ad 02, the starting replay level. Choosing three or four replay levels automatically adjusts their replay levels to three times or four times the Ad 02 value.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

04 (Replay Level 3)

For AUTO REPLAY, this Adjustment Item is not applicable. BAD CATS automatically bypasses this adjustment.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

05 (Replay Level 4)

For AUTO REPLAY, this Adjustment Item is not applicable. BAD CATS automatically bypasses this adjustment.

For FIXED REPLAY, the technique of value entry and the range of settings are identical to those of Ad 02.

GAME ADJUSTMENT PROCEDURE (Continued)

06 Replay Award

For either AUTO REPLAY or FIXED REPLAY (Ad 01), the operator can select the form of the award automatically provided when the player exceeds any Replay Level (Automatic or Fixed). The choices are:

- Credit* - Reaching each replay level obtains a credit (free game).
- Ball* - Reaching each replay level obtains an extra ball.
- Audit* - Reaching each replay level obtains nothing to the player; it does increase the entry value of the Audit Item(s) maintaining a tally of these awards (Au 08, and Au 20 through 23, as applicable).

07 Special Award

The operator can select the form of the award automatically provided when the player scores a Special. The choices are:

- Credit* - Scoring each Special, when lit, obtains a credit (free game).
- Ball* - Scoring each Special, when lit, obtains an extra ball.
- Score* - Scoring each Special, when lit, obtains a score advance of 100,000 points to the player.

08 Match Award

The operator can select (via the Credit button) the desired percentage for the Match action occurring at the completion of each game. The choices are:

- 1%-50%* - 1% is 'hard'; 50% is 'extremely easy'. During Match action, the game selects a random two-digit number at end of game and compares each player's score for an identical two digits in the rightmost two positions. A matching of the two digits results in the award of a credit.
- Off* - The MATCH display does not operate at completion of the game; no award is given.

09 Balls / Game

The operator can define a "game" by specifying the number of balls to be played. The range of this setting is 1 through 9.

10 Tilt Warning

The operator can specify the number of total actuations of the plumb bob mechanism that can occur before the game is "tilted". The range of this setting is 1 through 5.

11 Maximum Extra Ball

The operator can choose (via the Credit button) the number of Extra Balls to be awarded to a player. The range of this setting is:

- 00* - NO extra ball play; displays a message, NO EX. BALL. A score is awarded in lieu of the Extra Ball.
- 1-9 Extra Balls* - 1 through 9 Extra Balls per game.

12 Maximum Credits

The operator can specify the maximum number of credits the game can accumulate, either through game play awards or coin purchases. The range of settings is 5 through 10. Reaching the specified setting prevents the award of any credits.

GAME ADJUSTMENT PROCEDURE (Continued)

13 Highest Scores

The operator can specify (via the Credit button) whether the game is to maintain a record of the four highest scores achieved to date. The choices are:

Off - NO high scores are recorded.

On - The four highest scores are stored in memory for use by Game Adjustment 22.

14 Backup High Score 1

The operator can set the Backup High Score value in the upper display (for Player 1), using the Credit button. The game automatically restores this value, when the operator presses, and holds, the HIGH SCORE RESET switch, or when an automatic High Score Reset event (Ad 22) occurs.

15 Backup High Score 2

This adjustment is similar to Ad 14, except that this applies to the Player 2 Score display. The adjustment technique is identical to Ad 14. It is also restored as described for Ad 14.

16 Backup High Score 3

This adjustment is similar to Ad 14, except that this applies to the Player 3 Score display. The adjustment technique is identical to Ad 14. It is also restored as described for Ad 14.

17 Backup High Score 4

This adjustment is similar to Ad 14, except that this applies to the Player 4 Score display. The adjustment technique is identical to Ad 14. It is also restored as described for Ad 14.

18 Credits for Highest Score 1

The operator can select the number of credits to be awarded, by using the Credit button, whenever a player exceeds the previous Highest Score. The range of this setting is 00 through 10.

19 Credits for Highest Score 2

This adjustment is similar to Ad 18, except that this applies to the player's exceeding the second highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03.

20 Credits for Highest Score 3

This adjustment is similar to Ad 18, except that this applies to the player's exceeding the third highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03.

21 Credits for Highest Score 4

This adjustment is similar to Ad 18, except that this applies to the player's exceeding the fourth highest score. The Credit button adjustment technique is the same as for Ad 18. The range of this setting is 00 through 03.

22 Automatic High Score Reset

The operator can specify (via Credit button) that the game will provide an automatic reset of the displayed "Highest Scores", and the number of games to be played before the reset occurs. (Audit item 39 displays the games remaining before the reset.) The values provided upon reset are those selected by the operator in Ad 14 through 17, the Backup High Scores. The range of this setting is *Off* (to disable this adjustment), and 250 to 24,750 games (in increments of 250).

23 Free Play

The operator can select (via the Credit button) whether a player can operate the game without a coin (free play) or with a coin. The choices are:

No - A coin is necessary for game play.

Yes - Game play is free; no coin is required.

GAME ADJUSTMENT PROCEDURE (Continued)

24 Coinage Selections

The operator can specify (via the Credit button) any of the 23 Standard Settings for game pricing, each of which exhibits a message identifying the country and the number of coins required and the number of games that the coin requirement purchases. Choosing a Standard Setting permits the game to omit items Ad 25 through 30, which are adjustments allowing for a special custom coinage setting.

Following the last Standard Setting is a Custom Coinage Setting, which allows the operator to utilize Ad 25 through 30 in establishing a special coinage setting. A message, CUSTOM COINAGE, indicates that the operator can enter the appropriate values into the Ad 25 through 30 adjustment items.

The values for Ad 25 through 30 of each Standard Setting, as well as other possible values for the Custom Coinage Setting are shown in the **Pricing Table**.

25 Left Chute Coin Units

The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the left coin chute.

26 Center Chute Coin Units

The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the center coin chute.

27 Right Chute Coin Units

The operator can specify (via the Credit button) the number of coin units purchased by a coin passing through the right coin chute.

28 Units Required for Credit

The operator can define (via the Credit button) the number of coin units required to obtain 1 Credit. A coin unit counter in the game program totals the number of coin units purchased through all coin chutes prior to each game. If the total of these coin units matches, or exceeds, the Units per Credit value by a multiple (or more, coin units) of the specified Units per Credit value, the Credits display shows the proper number of Credits. The coin unit counter retains any remaining coin units, until the start of a game; then, the coin unit counter is cleared (its contents are zeroed).

29 Units Required for Bonus

The operator can specify (via the Credit button) that 1 additional Credit is to be indicated in the Credits display, when a certain number of coin units are accumulated.

30 Minimum Units Required for any Credits Posted

The operator can specify that NO Credits are to be posted (indicated in the Credits display), until the credit units counter reaches a particular value, by setting this value to 02 (or more). A setting of 01 allows the Credits display to show fractional coin units.

The System 11B game program defines the following 28 Adjustment Items as "game-specific"; that is, they are unique for each game. The Game Designer/Engineer/Programmer team members work together to use these as controlling factors for game play. By varying the setting of these Adjustment Items, it is possible to "fine-tune" a game to suit a particular location, enabling the owner/operator to reap maximum earnings, while still providing the players with sufficient challenge to keep them playing.

GAME ADJUSTMENT PROCEDURE (Continued)

31 BAD CATS MEMORY

The operator can choose (via the Credit button) whether the lighted B-A-D C-A-T-S letters are carried over for 'next-ball' play. The choices are:

Yes - (Liberal) Any lighted B-A-D- C-A-T-S lamps are stored in memory.

No - (Conservative) Any lighted lamps are turned off at the end of each ball.

32 DOGHOUSE TIMER

The operator can specify (via the Credit button) the Time Limit for lighting the Doghouse lamp to allow spinning the SEAFOOD TABLE. The Doghouse lamp is lighted (feature enabled) by passing through the Left Return lane, when that lane's "Lites Doghouse" lamp is lighted; to collect the Seafood Table spin requires a shot into the Doghouse while the feature lamp is lighted. The range of this setting is *4 seconds* (Conservative) through *99 seconds* (Liberal).

33 FISH BONE-US TIMER

The operator can choose (via the Credit button) the Time Limit for lighting the Fish Bone-Us lamp. The Fish Bone-Us lamp is lighted (feature enabled) by hitting the Linear Target. To collect the Fish Bone-Us requires a shot into the Garbage Can (Top Left Eject Hole). The range of this setting is *4 seconds* (Conservative) through *99 seconds* (Liberal).

34 FISH BONE-US 10X MEMORY

The operator can choose (via the Credit button) whether the lighting of the Fish Bone-Us 10X feature is retained in memory for 'next-ball' play. The choices are:

Yes - (Liberal) The Fish Bone-Us feature is retained in memory for 'next-ball' play.

No - (Conservative) The Fish Bone-Us feature is NOT retained in memory.

35 START RAMP VALUE

The operator can specify (via the Credit button) the starting value (shown by the lighted lamp) for the Tiger (left) Ram. This can reduce the number of consecutive ramp shots to increase the ramp value to its 20 Million top score. The range of this setting is *None* (Conservative; no lighted lamp) through *Million* (Liberal).

36 BONUS MULTIPLIER DIFFICULTY

The operator can choose (via the Credit button) the difficulty for increasing the Bonus Multiplier values. The value of the Bonus Multiplier advances with each completion of the word, T-O-Y. The choices are:

Easiest - (Liberal) Passing through the lighted Return Lane spots a letter in T-O-Y.

Easy - Passing through the lighted Return Lane spots a T-O-Y letter; return lane lamps alternate after spotting a letter.

Normal - Spelling T-O-Y, by passing through T-O-Y lanes, is the only method of increasing the Bonus Multiplier value.

37 GOLDFISH RAMP TIME

The operator can specify (via the Credit button) the difficulty for Goldfish (center) Ramp scoring, after it is lit. The range of this setting is *Hardest* (Conservative) through *Easiest* (Liberal).

GAME ADJUSTMENT PROCEDURE (Continued)

38 PRELITE GOLDFISH RAMP

The operator can specify (via the Credit button) the starting conditions for the Goldfish Ramp play. Completion of these starting conditions must occur before ramp scores are awarded. The choices are:

- YES - (Liberal) The Ramp's 30K lamp is lighted, at game start, allowing ramp shots to advance the ramp's scoring value (shown by lighted lamp).
- NO - (Conservative) The feature is disabled; only completion of either the 5-Bank or 3-Bank Drop Targets advances the ramp's scoring value.

39 CONSOL. BALL TIME

The operator can choose (via the Credit button) whether to award the less-skilled player a Consolation Extra Ball, based on the the Average Game Time. If a player's last ball drains while the length of that game is less than two-thirds of the Average Game Time calculated by the game computer, the game system can award this player a Consolation Extra Ball, via the 'Curiosity Spin'. NOTE: Consolation Extra Balls are NOT audited as Extra Balls. The choices are:

- YES - The Consolation Extra Ball feature is activated, allowing this award.
- NO - The feature is disabled; no Extra Ball is awarded.

40 JACKPOT MEMORY

The operator can choose (via the Credit button) whether the lighted JACKPOT lamp is carried over for 'next-ball' play. The choices are:

- Yes - (Liberal) The JACKPOT lamp, if lighted, is stored in memory.
- No - (Conservative) The JACKPOT lamp, if lighted, is turned off at the end of each ball.

41 - 44 NOT USED

45 JACKPOTS / GAME

The operator can choose (via the Credit button) the MINIMUM number of JACKPOTS awarded per game. This adjustment controls how many JACKPOTS are awarded by the Seafood Wheel feature. The range of this adjustment setting is *Enabled 1%* (Conservative) through *99%* (Extremely Liberal). This adjustment can also be turned off, via a setting of *0 (Off)*.

46 EX. BALLS / GAME

The operator can choose (via the Credit button) the MINIMUM value of ALL Extra Balls awarded per game. This adjustment controls how many Extra Balls are awarded by the Seafood Wheel feature. The range of this adjustment setting is *Enabled 1%* (Conservative) through *99%* (Extremely Liberal). This adjustment can also be turned off, via a setting of *0 (Off)*.

47 SPECIALS / GAME

The operator can choose (via the Credit button) the MINIMUM AMOUNT OF ALL Specials awarded during a single game. This adjustment controls how many Specials are awarded by the Seafood Wheel feature. The range of this adjustment setting is *Enabled 1%* (Conservative) through *99%* (Extremely Liberal). This adjustment can also be turned off, via a setting of *0 (Off)*.

GAME ADJUSTMENT PROCEDURE (Continued)

48 ATTRACT MODE SOUNDS

The operator can choose (via the Credit button) the amount of sounds to be heard during the Attract Mode. The choices are:

- YES - Sounds are heard during Attract Mode.
- NO - No sounds are heard during Attract Mode.

49 Custom Message

The operator can choose (via the Credit button) whether to display a message during the Attract Mode. (When display of a message is selected, the operator can either utilize the message provided or change the message.) Three choices are available:

- 1 - Display a message during the Attract Mode. The lower display shows this choice as ON. The 3-line message provided is:
THERE IS MORE ... THAN ONE WAY TO ... SKIN A BAD CAT.
- 2 - Do NOT display a message during the Attract Mode. (Lower display shows OFF.)
- 3 - The lower display shows this choice as CHANGE. The operator can enter a special ("custom") message, as follows:
 - A. Press ADVANCE once. The operator can now enter as many as three 14-character lines for display during the Attract Mode.
 - B. Use the flipper button(s) to select each message character (alphabet, numbers, and special symbols are available). In case of error, enter a "back arrow" (just before "space") to correct, followed by correct character. For a period after any letter, use letters with periods (following the special symbols). The entire character set is the following:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 < > ? - / * '
A . B . C . D . E . F . G . H . I . J . K . L . M . N . O . P . Q . R . S . T . U . V . W . X . Y . Z . _
 - C. Move to the next character via the Credit button. The game program does not allow entirely blank lines to be displayed.

50 DISPLAY AU 01 - 04

The operator can choose (via the Credit button) how to display the coinage audit information, Au 01 - 04. No information is lost; it remains stored in the CPU memory. The information is now available for readout via the player score displays. Three choices are available:

- Yes - Both the audit text (slot identification) and the value is displayed.
- Nbr - Only the numerical value is displayed.
- No - NO display occurs.

51 - 52 NOT USED

53 - 58 Special Preset Adjustment Settings

SPECIAL PRESET ADJUSTMENTS CAUTION

Adjustments 53 through 66 are Special Preset Adjustments to enable the operator to perform the setting of multiple adjustments at once. They permit the operator to: (1) modify the game for a specific area (for example, coinage settings for a country); (2) change a group of adjustments to conform with laws of certain localities; and (3) change the degree of difficulty of game play (Ad 62 through 66). Whenever the operator chooses to use any Special Preset Adjustment, the operator can later access any or all of the individual Adjustments affected by that Special Adjustment for subsequent changes.

A similar technique is recommended in the event of error or uncertainty concerning any Special Preset Adjustment, after the operator selects it: The operator can restore the factory setting of each individual Adjustment, then select the desired Special Preset Adjustment, and then return to any of the preceding individual adjustments to determine whether use of the Special Adjustment has had the desired effect.

GAME ADJUSTMENT PROCEDURE (Continued)

SPECIAL PRESET ADJUSTMENTS CAUTION (Continued)

The Backbox displays for each Special Preset Adjustment indicate whether the operator has selected it, by identifying the Adjustment in the upper displays by name and the selection choice of NO, meaning Not Selected (this is the Factory Setting), or YES, meaning Selected, in the lower display. Operator installation of the 'selected' Preset Adjustment occurs by using the Credit button to choose YES and then pressing the ADVANCE switch. The displays then show the name of the Adjustment again, with DONE to show that the installation is now in effect.

Note that, when an operator installs any of the Special Preset Adjustments, Adjustment Items using the automatic adjust feature of the game program reset to the INITIAL auto adjust value listed for that Adjustment Item.

NOTE

A game in which the CPU has ROMs installed for German (Deutsch) or French (Francais) language and play adjustments automatically has certain Adjustment Items preset. The following tables show these Preset Adjustment Items for each of the special language games.

53 through 58 For German/European Games Only: Install German 1, 2, 3, 4, 5 or 6
The operator can use these Adjustment Items to modify the game pricing selection of Standard Setting named "German 2 or German 1" in the **Pricing Table** to permit the style of play for the particular price shown in the **BAD CATS Preset Game Adjustments Table for German/European Games**.

BAD CATS

Preset Game Adjustments Table for German/European Games

Adj #	Adj Description	German Ad 1 53	German Ad 2 54	German Ad 3 55	German Ad 4 56	German Ad 5 57	German Ad 6 58
06	Replay Award	Credit	Coil	Audit	Credit	Coil	Audit
07	Special Award	Credit	Ball	Score	Credit	Ball	Score
08	Match Feature	10 %	10 %	Off	10 %	10 %	Off
09	Match Feature	10 %	10 %	Off	10 %	10 %	Off
14	Backup High Score 1	7.000.000	7.000.000	00	7.000.000	7.000.000	00
15	Backup High Score 2	6.500.000	6.500.000	00	6.500.000	6.500.000	00
16	Backup High Score 3	6.000.000	6.000.000	00	6.000.000	6.000.000	00
17	Backup High Score 4	5.500.000	5.500.000	00	5.500.000	5.500.000	00
18	High Score 1 Credits	03	03	00	03	03	00
19	High Score 2 Credits	00	00	00	00	00	00
20	High Score 3 Credits	00	00	00	00	00	00
21	High Score 4 Credits	00	00	00	00	00	00
24	Coinage Setting	6 spiele/5 DM	6 spiele/5 DM	6 spiele/5 DM	7 spiele/5 DM	7 spiele/5 DM	7 spiele/5 DM

GAME ADJUSTMENT PROCEDURE (Continued)

53 through 57 *For French Games Only: Install French 1, 2, 3, 4, or 5*

The operator can use these Adjustment Items to modify the style of play for the particular setting shown in the **BAD CATS Preset Game Adjustments Table for French Games**. NOTE: No preset Game Adjustment is applicable for Ad 58.

POLICE FORCE

Preset Game Adjustments Table for French Games

Adj #	Adj Description	French 1	Ad 53	French 2	Ad 54	French 3	Ad 55	French 4	Ad 56	French 5	Ad 57
46	Extra Ball / Game	25%		20%		33%		25%		25%	
51	Consol. Ball Time	50 sec		40 sec		70 sec		50 sec		50 sec	

53 **ADVERTISEMENT? (For USA / Canadian Games only)**

The operator can choose (via the Credit button) whether to display an advertisement provided by the manufacturer. The choices are:

Yes - Display the advertisement message.

No - Do NOT display the message.

54 through 58 (For USA / Canadian Games only)

The operator can use these Adjustment Items to modify the game pricing selection and select either the 3-ball or 5-ball style of play.

BAD CATS

Preset Game Adjustments Table for US / Canadian Games

Adj #	Adj Description	1 Coin Buy-in	Ad 54	Install 3 Ball	Ad 55	3 Balls/ 2 Coins	Ad 56	3 Balls/ 1 Coin	Ad 57	5 Balls/ 2 Coins	Ad 58
02	Replay Start	-		3,500,000		3,500,000		3,500,000		5,000,000	
09	Balls / Game	-		3		3		3		5	
14	Backup High Score 1	-		5,000,000		5,000,000		5,000,000		6,000,000	
15	Backup High Score 2	-		4,500,000		4,500,000		4,500,000		5,500,000	
16	Backup High Score 3	-		4,000,000		4,000,000		4,000,000		4,000,000	
17	Backup High Score 4	-		3,500,000		3,500,000		3,500,000		3,500,000	
24	Coinage Setting	USA 3		-		USA 2		USA 1		USA 2	
31	Half Price Buyin	Yes		No		No		No		No	
64	Install Medium	No		Yes		Yes		Yes		No	
65	Install Hard	No		No		No		No		Yes	

59 Install Add-A-Ball The operator can utilize this option to delete all Free Play awards and replace them with Extra Ball awards. Individual Adjustments are affected, as follows:

<u>Ad Name</u>	<u>New Setting</u>	<u>Ad Name</u>	<u>New Setting</u>
06 Replay Award	Ball	18 Hi Scr 1 Credits	00
07 Special Award	Ball	19 Hi Scr 2 Credits	00
08 Match Feature	Off	20 Hi Scr 3 Credits	00
11 Ex. Ball	4/BIP	21 Hi Scr 4 Credits	00

GAME ADJUSTMENT PROCEDURE (Continued)

60 Install 5 Ball

The operator can change the game to 5-ball play, including the changing of certain features to the recommended 5-ball difficulty level. NOTE: Ad 65 (Install HARD) settings are also set when the game is changed to '5-ball Play'. Other Adjustments are affected, as follows:

<u>Ad Name</u>	<u>New Setting</u>	<u>Ad Name</u>	<u>New Setting</u>
02 Replay Start	5,000,000	09 Balls / Game	05

61 Install Novelty

The operator can remove all Free Play and Extra Ball awards. Individual Adjustments are affected, as follows:

<u>Ad Name</u>	<u>New Setting</u>	<u>Ad Name</u>	<u>New Setting</u>
01 Fixed Replay	SCORES	07 Special Award	Score
02 Replay Level 1	Off	08 Match Feature	Off
03 Replay Level 2	Off	11 No Extra Ball	00
04 Replay Level 3	Off	18 Hi Scr 1 Credits	00
05 Replay Level 4	Off	19 Hi Scr 2 Credits	00
06 Replay Award	Audit	20 Hi Scr 3 Credits	00
		21 Hi Scr 4 Credits	00

62 Install Extra Easy

The operator can change the game play difficulty adjustments to a combination that is extremely easy (sometimes called "liberal"). The Game Difficulty Setting Table, which precedes these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Extra Easy' group.

63 Install Easy

The operator can change the game play difficulty adjustments to a combination that is slightly easier than the Factory Settings. The Game Difficulty Setting Table, which precedes these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Easy' group.

64 Install Medium

The operator can change the game play difficulty adjustments to a combination that matches the Factory Settings. The Game Difficulty Setting Table, which precedes these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Medium' group.

65 Install Hard

The operator can change the game play difficulty adjustments to a combination that is more difficult than the Factory Settings. The Game Difficulty Setting Table, which precedes these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Hard' group.

66 Install Extra Hard

The operator can change the game play difficulty adjustments to a combination that is much more difficult than the Factory Settings. The Game Difficulty Setting Table, which precedes these 70 individual Adjustments descriptions, lists the Adjustments and the settings that comprise the 'Extra Hard' group.

67 Auto Burn-In

The operator can choose the YES option for this Special Preset Adjustment to perform certain automatic testing of the game, as used in the factory. It does not affect the game operation, but merely provides for a cyclic testing of most of the game's mechanisms.

GAME ADJUSTMENT PROCEDURE (Continued)

68 Clear Coins

The operator can request the clearing of the coinage audits (Au 01 through 04) by selecting (via the Credit button) the YES option, as shown in the lower display. This adjustment zeroes the counters tallying the number of coins through each slot, the Paid Credits counter, and the Credits display. After the YES option is displayed, the operator must press the ADVANCE button. The game then displays DONE to show that the coinage audits were reset to zero.

69 Clear Audits

The operator can request the clearing of the non-coinage audits (Au 05 through 55) by selecting (via the Credit button) the YES option, as shown in the lower display. This Adjustment zeroes the counters tallying the remaining Audit factors. Please note that this does NOT affect the Automatic Replay Percentaging data nor the automatic High Score Reset counter. After the YES option is displayed, the operator must press the ADVANCE button. The game then displays DONE to show that the non-coinage audits were reset to zero.

70 Install Factory

The operator can request the game (via the Credit button) to provide the normal Factory Settings, essentially restoring the game to its 'factory condition'. The operator must select the 'YES' option for this adjustment. This Adjustment clears all Audits, resets all Game Adjustments to the respective Factory Settings, and provides a restart of the Auto Replay (Ad 01). After selecting the YES option, the operator must press the ADVANCE button. The game then displays FACTORY SETTING.

Closing of the coin door before appearance of the FACTORY SETTING message or a problem in the Memory Protect circuit will cause the game to display ADJUST FAILURE. A loss of battery power or improper treatment of the Game Adjustments will cause the game to attempt to restore Factory Settings. The game announces the results of this reset process with the appropriate message, FACTORY SETTING or ADJUST FAILURE.

GAME ADJUSTMENT PROCEDURE (Continued)

RESETTING THE HIGH SCORES

The challenge of exceeding the High Score (either the factory setting or a higher score by another player) is the goal of many pinball game players. To keep a pinball game challenging requires a method of resetting the High Score value for those occasions when a skilled player registers a truly excellent score. Other players note this score and may decide not to play simply because their skill is not adequate to exceed an extremely high score.

For **BAD CATS**, in fact, three methods of resetting the High Score values are available. The simplest method involves allowing Game Adjustment Item Ad 22 to reset the High Score values automatically after the specified number of plays designated by the operator. The second method requires pressing the High Score Reset switch on the inside of the coin door in the Attract Mode. This action simply erases the previous high score values and replaces them with the Backup High Score values. The third method establishes new values replacing the factory setting values or previous operator setting values; it requires performing the following steps:

1. Using AUTO-UP or MANUAL-DOWN, reach item Ad 14 (and items Ad 15, 16, and 17, if desired). The High Score value of the factory setting (or previous operator-adjusted setting) appears in the upper display. If this value is satisfactory, go to step 4 below.
2. If you wish to increase the High Score value from that displayed in the upper display, use AUTO-UP, and press the Credit button, until the desired value shows in the upper display.
3. If you wish to decrease the High Score value, use MANUAL-DOWN, and press the Credit button, until the desired value shows in the upper display.
4. Using AUTO-UP, press and hold down ADVANCE, until the lower display shows **Ad 70**. Press ADVANCE once, to return to Game-Over Mode.
5. Press the High Score Reset switch (on coin door), and listen for the sound signifying that the score reset action is complete. Observe player score displays to verify that the new High Score values are displayed.

GAME PRICING

PRICING MADE EASY. Game Adjustment Item Ad 24 allows the operator an easy method of setting the pricing functions. Pressing the Credit button allows the operator a choice of one of the 16 "Standard" Settings, with associated automatic pricing (the upper display shows the Country identifier, with a number for a country having more than one "Standard" Setting; the lower displays show the games per coin(s) information). In the *Pricing Table*, each "Standard" Setting is denoted by a Country Identifier. Automatic Pricing causes each of the other pricing items (columns 25 through 30) to change to the value shown in the table for that selected "Standard" Setting. In the table where the word "CUSTOM" appears, the owner/operator must enter the values shown (columns 25 through 30) to obtain the games per coin factor shown in the Games/Coin column of the table. To make these setting adjustments, the owner/operator must press the Credit button until the words "CUSTOM COINAGE" appear in the player score displays.

CUSTOM PRICING. Adjustment Item 24 must be set to the Custom Coinage Setting (upper display showing CUSTOM COINAGE) to enable the operator to enter desired custom pricing selections for Items 25 through 30, based on the *Pricing Table*. Item 25 is the left coin chute multiplier. Item 26 is the center coin chute multiplier. Item 27 is the right coin chute multiplier. Item 28 is the number of coin units equal to one Credit. (A Credit is usually equal to one game.)

The calculation of the ratio of Games : Price uses the ratio equation of $X : VC$, where:

X = Coin Chute Multiplier (Item 25, 26, or 27 in *Pricing Table*);

V = Value of coin;

C = Coin units equivalent to one Credit (Item 28).

For example, for 25¢ chutes at the factory setting, substituting values in the Games : Price ratio calculation gives $1 : 25 \times 1$, or one game for 25¢.

UNITS REQUIRED FOR BONUS CREDIT. Item 29 is the number of coin units that must pass through the coin chute(s) before an additional Credit (game) is posted (displayed). At the factory setting, the number in this item is 00. (This 00 means that NO bonus credit (free game) is awarded, although purchase of more than one game at a time occurs.)

MINIMUM COIN UNITS. Item 30 determines the number of coin units that must pass through the coin chute(s) before play may begin. The Factory Setting for this item is 00. (This 00 means that the Minimum Coin Units feature (Item 30) is disabled; a 01 setting also means that this feature is still disabled, yet the Credits message display should display fractional coin units.)

BAD CATS Pricing Table

Country	Coin Chute			Games/Coin	Ad 24 Display	Pricing Functions					
	Left	Center	Right			25	26	27	28	29	30
USA and Canada	25¢	-	25¢	1/25¢, 4/\$1 ²	U.S.A. 1	01	04	01	01	00	00
				1/50¢, 2/75¢, 3/\$1 ^{1,2}	U.S.A. 2	03	12	03	04	00	00
				1/50¢, 2/\$1 ²	U.S.A. 3	01	04	01	02	00	01
				1/25¢, 3/\$1 ²	U.S.A. 4	01	00	01	02	04	01
				1/25¢, 3/50¢, 6/\$1	CUSTOM	01	04	01	01	02	00
				1/25¢, 5/\$1	CUSTOM	01	00	01	01	04	00
				1/50¢ ; Add'l game: 25¢	CUSTOM	98	00	98	99	00	00
Austria	5 Sch	10 Sch	10 Sch	1/2x5 Sch, 3/2x10 Sch ²	AUSTRIA	01	02	02	02	04	01
	5 Sch	-	10 Sch	2/5 Sch, 5/10 Schilling	CUSTOM	02	00	05	01	00	00
	1 Sch	5 Sch	10 Sch	2/5x1 Sch, 2/5 Sch, 5/10 Sch	CUSTOM	02	10	25	05	00	00
Australia	20¢	-	\$1	1/3x20¢, 2/\$1 ²	AUSTRAL.	02	00	10	05	00	00
United Kingdom	10 P	50 P	1£	1/2x10 P, 3/50 P, 7/1£ ²	U.K.	03	15	30	05	30	00
	10 P	50 P	20 P	1/10 P, 5/50 P, 2/20 Pence	CUSTOM	03	15	30	05	30	00
Switzerland	1 F	2 F	5 F	1/1 F, 3/2 F, 7/5 Franc ²	SWISS	01	03	07	01	00	00
	1 F	-	2 F	1/1 F, 3/2 F	CUSTOM	03	00	06	02	00	00

GAME PRICING (Continued)

BAD CATS Pricing Table (Continued)

Country	Coin Chute			Games/Coin	Ad 24 Display	Pricing Functions					
	Left	Center	Right			25	26	27	28	29	30
Belgium	20 F	20 F	20 F	3/20 Franc ²	BELGIUM	03	03	03	01	00	00
	5 F	-	20 F	1/2x5 F, 2/20 Franc	CUSTOM	01	00	04	02	00	01
	5 F	20 F	20 F	1/2x5 F, 2/20 F, 2/20 F	CUSTOM	01	04	04	02	00	01
	5 F	5 F	20 F	1/2X5 F, 1/2X5 F, 2/20 F	CUSTOM	01	01	04	02	00	01
West Germany	1 DM	2 DM	5 DM	1/1 DM, 2/2 DM, 7/5 DMark ^{2,3}	GERMAN1	06	12	30	05	30	00
				1/1 DM, 2/2 DM, 6/5 DM ^{1,2}	GERMAN2	06	12	30	05	00	00
				1/1 DM, 3/2 DM, 9/5 DM	CUSTOM	09	18	45	05	00	00
				1/2x1 DM, 1/2 DM, 3/5 DM	CUSTOM	03	06	15	05	00	00
				2/1 DM, 5/2 DM, 14/5 DM	CUSTOM	13	26	65	05	65	00
Netherlands	1 Hfl	2.5 Hfl	2.5 Hfl	1/1 Hfl, 3/2.5 Holland Florin ²	NETHERL.	06	15	15	05	00	00
	25c	-	1 G	1/25c, 5/1 Guilder	CUSTOM	01	00	05	01	00	00
	1 G	-	1 G	1/1 Guilder ²	HOLLAND	01	00	01	01	00	00
Sweden	5 Kr	5 Kr	5 Kr	1/5 Krona ²	SWEDEN	01	01	01	01	00	00
	1 Kr	-	1 Kr	1/2x1 Krona	CUSTOM	01	04	01	02	00	01
France	1 F	5 F	10 F	1/3x1 F, 2/5 F, 5/10 Franc ^{1,2}	FRANCE	02	10	20	05	20	00
	1 F	5 F	10 F	1/2x1 F, 3/5 F, 7/10 Franc	CUSTOM	03	15	30	05	30	00
	5 F	10 F	10 F	1/5 F, 3/10 F, 7/2x10 Franc	CUSTOM	03	15	30	10	60	15
	5 F	10 F	10 F	2/5 F, 4/10 F, 9/2x10 Franc	CUSTOM	02	10	20	05	40	10
	5 F	10 F	10 F	2/5 F, 5/10 F, 11/2x10 Franc	CUSTOM	01	05	10	02	20	05
Italy	500 L	500L	500 L	1/500 Lire ²	ITALY	01	01	01	01	00	00
Spain	25 P	-	100P	1/25 P, 5/100 Peseta ²	SPAIN	05	00	20	04	00	00
	25 P	-	100P	1/25 P, 4/100 Peseta	CUSTOM	01	00	04	01	00	00
	25 P	-	100P	1/2x25 P, 2/100 Peseta	CUSTOM	01	00	04	02	00	00
	25 P	-	100P	1/2x25 P, 3/100 Peseta	CUSTOM	03	00	12	04	00	06
Japan	-	100 ¥	-	1/100 Yen ²	JAPAN	01	00	01	01	00	00
	100 ¥	-	100 ¥	2/100 ¥	CUSTOM	01	04	01	02	00	01
Antilles, Netherl.	25c	-	1 G	1/25c, 4/1 Guilder ²	ANTILLES	01	01	04	01	00	00
Chile	Token	-	Token	1/1 Token ²	CHILE	01	04	01	01	00	00
Denmark	1 Kr	5 Kr	10 Kr	1/2x1 Kr, 3/5 Kr, 7/10 Krone ²	DENMARK	03	15	30	05	30	00
Finland	1 Mka	-	5 Mka	1/2x1 Mka, 3/5 Markka ²	FINLAND	03	00	15	05	00	00
New Zealand	20c	-	20c	1/3x20c ²	N. Z.	01	00	01	03	00	01
Norway	1 Kr	-	1 Kr	1/2x1 Kr, 3/5x1 Krone ²	NORWAY	01	00	01	02	05	00
Argentina	10c	10c	10c	1/1 Token ²	ARG.	01	01	01	01	00	00
Greece	10D	20D	50D	1/2x10D, 1/20D, 3/50 Drachma ²	GREECE	03	06	15	05	00	00

Notes:

1. Factory Default. 2. Standard Setting - Change by pressing Credit button. 3. Other functions are also affected; see the explanations for Adjustment Items 53 through 58.

TEST/DIAGNOSTIC PROCEDURES

WILLIAMS ELECTRONICS GAMES also provides a series of diagnostic tests to aid the operator in determining game condition (that is, whether the game's features and highlights are operating satisfactorily). These tests activate virtually all the electronic and electromechanical devices comprising the game, so that the operator can readily locate a malfunctioning device or simply verify that all devices are working properly. In order, these tests deal with the music, the displays, the game sounds, the lamps, the solenoids, and the switches.

In addition to the diagnostic testing, a feature called the Auto Burn-in Mode is available. Activating this mode enables the operator to observe the game while all of the diagnostic tests, *except the switch tests*, occur. This can be very helpful in locating 'intermittent' problems.

Activating either the entire test series or one of the individual tests requires use of the Game Adjustment/ Diagnostic switches. Open the coin door for access to these switches. To proceed to the Diagnostic Tests, the operator must simply switch the game On, set the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN, and press the ADVANCE button.

CAUTION

The System-11B game program greatly aids the operator and service personnel: At the beginning of the Test/Diagnostic Procedures (and also at game Turn-On), the player score displays now signal, with a message ("Press ADVANCE for Report") that the game program has detected a problem that affects game play. Messages for BAD CATS include "Adjust Switch ##", "Pinball Missing", and "Music Failure". Refer to the text on Problem Analysis Messages at the end of the Test/Diagnostic Procedures for more details concerning the messages' meaning. To proceed with the Test/Diagnostic Procedures, use AUTO-UP, and press ADVANCE.

MUSIC TEST.

1. In the Music Test, observe that the upper displays show the message, MUSIC TEST. Switching to AUTO-UP, observe that the message now reads MUSIC OFF, and that the lower display shows 00 00. Press the Credit button to select the desired music selection: 01 - 'Main Theme' through 05 - 'Hi. Score Theme' (the selections repeat). Adjust the volume control for proper sound level for the game location.
2. Use the AUTO-UP position.

DISPLAY TEST.

1. To initiate the Display Test, press ADVANCE. Observe that upper display briefly shows the message, DISPLAY TEST, and that the lower display shows 01 (the Display Test identifier).
2. Use AUTO-UP. Observe that all displays begin a display cycle of all 0s through all 9s, one digit at a time. Verify that the proper comma segments light during display of the odd-numbered digits. Next, a special "all segments" character 'walks' from left to right across each player score display.
3. To halt the display cycle, use MANUAL-DOWN. Then, press ADVANCE to step through the sequential digit display, digit by digit, and the subsequent "all segments" characters display test. Use AUTO-UP to resume cycling, and to proceed to the next test.

SOUND TEST.

1. (From Display Test) To initiate the Sound Test, press ADVANCE. Observe that the upper displays show the message, SOUND TEST, and that the lower display shows 02 (the Sound Test identifier). The lower display shows a series of test steps from 00 through 07. Verify that a different sound is heard each time the number in the display changes.
2. To repeatedly pulse a single sound, use MANUAL-DOWN. Verify that one particular sound repeats. Press ADVANCE to step to the next sound, which repeats until ADVANCE is pressed again. Use AUTO-UP to resume cycling the sounds, and to proceed to the next test.

TEST/DIAGNOSTIC PROCEDURES (Continued)

LAMP TESTS.

1. All Lamps.

(From Sound Test) To initiate the first Lamps Test, press ADVANCE. Observe that the upper displays show the message, ALL LAMPS, and that the lower display shows 03 (All Lamps Test identifier) and that all feature lamps (playfield and backbox) blink on and off. (Note, however, that the General Illumination lamps remain lighted steadily.) To locate the wiring associated with a particular feature lamp, refer to the Lamp-Matrix Table. CPU Board connections at jacks 1J6 (columns) and 1J7 (rows) are also listed in the table.

2. Single Lamps.

From the All Lamps test, using AUTO-UP, press ADVANCE to initiate the Single Lamps Test. The upper displays initially show the message, SINGLE LAMPS, and the lower display shows 04. Then, the lower display shows 04 01, and the upper displays change to show "HOT SCORE", the name of the lamp currently blinking. Press the Credit button to proceed through an ascending series of designator numbers (01 through 64), with the upper displays showing the individual lamp's name. (To proceed through a descending series of lamp identifiers, use MANUAL-DOWN.) Press and hold the Credit button to proceed rapidly to the desired lamp.

BAD CATS Lamp-Matrix Table

COLUMN ROW	1 Q66 YEL-BRN 1J7-1	2 Q64 YEL-RED 1J7-2	3 Q62 YEL-ORN 1J7-3	4 Q60 YEL-BLK 1J7-4	5 Q58 YEL-GRN 1J7-6	6 Q56 YEL-BLU 1J7-7	7 Q54 YEL-VIO 1J7-8	8 Q52 YEL-GRY 1J7-9
Q80 RED- BRN 1J6-1	Meow Again 1	50K (Tiger Ramp) 9	T (Top Panel) 17	5,000 (Jet Bumpers) 25	B 33	Seafood Wheel 1 41	25K (Fishbone) 49	1,000,000 JACKPOT (Backglass) 57
Q81 RED- BLK 1J6-2	2X 2	100K (Tiger Ramp) 10	O (Top Panel) 18	Left Return Lane 26	A 34	Seafood Wheel 2 42	50K (Fishbone) 50	2,000,000 JACKPOT (Backglass) 58
Q82 RED- ORN 1J6-3	3X 3	200K (Tiger Ramp) 11	Y (Top Panel) 19	SPECIAL (Left Outlane) 27	D 35	Seafood Wheel 3 43	75K (Fishbone) 51	3,000,000 JACKPOT (Backglass) 59
Q83 RED- YEL 1J6-5	4X 4	Unlimited Million (Tiger Ramp) 12	JACKPOT (Cntr Ramp) 20	SPECIAL (Right Outlane) 28	C 36	Seafood Wheel 4 44	100K (Fishbone) 52	4,000,000 JACKPOT (Backglass) 60
Q84 RED- GRN 1J6-6	5X 5	20,000,000 (Tiger Ramp) 13	30K (Cntr Ramp) 21	Right Return Lane 29	A 37	Seafood Wheel 5 45	500K (Fishbone) 53	5,000,000 JACKPOT (Backglass) 61
Q85 RED- BLU 1J6-7	6X 6	T (Playfield) 14	50K (Cntr Ramp) 22	SPIN (Seafood Wheel) 30	T 38	Seafood Wheel 6 46	Lamp (Shed) (Backglass) 54	6,000,000 JACKPOT (Backglass) 62
Q86 RED- VIO 1J6-8	7X 7	O (Playfield) 15	100K (Cntr Ramp) 23	Seafood Arrow 1 31	S 39	Seafood Wheel 7 47	JACKPOT (Backglass) 55	7,000,000 JACKPOT (Backglass) 63
Q87 RED- GRY 1J6-9	Collect Fish 8	Y (Playfield) 16	EX. BALL (Cntr Ramp) 24	Seafood Arrow 2 32	Collect 10X (Fish) 40	Seafood Wheel 8 48	Candle (Backglass) 56	8,000,000 JACKPOT (Backglass) 64

TEST/DIAGNOSTIC PROCEDURES (Continued)

SOLENOID TEST.

1. (From Lamp Test) Using AUTO-UP, press ADVANCE. Observe that the upper display shows the message, COIL TEST, the lower display shows 05 (Solenoid Test identifier). Next, the lower display shows a series of test steps from 01 through 22, while the upper display shows the solenoid/circuit name. During each of these steps, pulsing of the respective solenoid/circuit occurs. The test cycles repeatedly, unless halted via the MANUAL-DOWN switch. Refer to the **Solenoid Table** for solenoid numbers and wiring information. CPU Board connections at 1P11, 1P12, and 1P19 are also listed in the table.

To continuously pulse a single solenoid/circuit, use MANUAL-DOWN. Press ADVANCE to sequence through the switched, controlled, and special solenoids. Use AUTO-UP to resume test cycling, and to proceed to the next test.

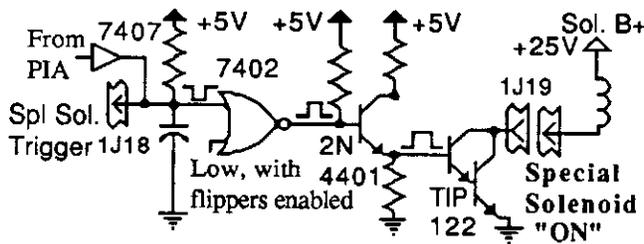
BAD CATS Solenoid Table

Sol. No.	Function	Solenoid Type	Wire Color	Connections		Driver Tmetr	Solenoid Part Number Flashlamp Type <small>b= Backbox; p=Plfield</small>
				CPU Bd	Playfield/ Cabinet		
01A ³	Outsole Kicker	Switched	Vio-Brn	1P11-1	5J1-9: 5J4-9 (A)	Q33	AE-23-800
01C ³	Fish/Trash Flashers	Switched	Blk-Brn	(Gry-Brn)	5J5-9 (C)	Q33	#906/#89 flashlamps 1p,1b
02A ³	Knocker	Switched	Vio-Red	1P11-3	5J1-7: 5J4-8 (A)	Q25	AE-23-800
02C ³	Tiger Flasher	Switched	Blk-Red	(Gry-Red)	5J5-8 (C)	Q25	#906/#89 flashlamps 1p,1b
03A ³	Doghouse Kickbig	Switched	Vio-Om	1P11-4	5J1-6: 5J4-7 (A)	Q32	AE-23-800
03C ³	Bird Bank Flashers	Switched	Blk-Om	(Gry-Om)	5J5-7 (C)	Q32	#906/#89 flashlamps 1p,1b
04A ³	Milk Bottle Bank (3-Dr Tgt)	Switched	Vio-Yel	1P11-5	5J1-5: 5J4-6 (A)	Q24	AE-26-1200
04C ³	Left Tiger Flashers	Switched	Blk-Yel	(Gry-Yel)	5J5-5 (C)	Q24	#906/#89 flashlamps 1p,1b
05A ³	Garbage Can (Eject)	Switched	Vio-Gm	1P11-6	5J1-4: 5J4-5 (A)	Q31	AE-23-800
05C ³	Jackpot Flashers	Switched	Blk-Gm	(Gry-Gm)	5J5-4 (C)	Q31	#906/#89 flashlamps 1p,1b
06A ³	Bird Cage Bank (5-Dr Tgt)	Switched	Vio-Blu	1P11-7	5J1-3: 5J4-4 (A)	Q23	AE-24-900
06C ³	Seafood Flasher	Switched	Blk-Blu	(Gry-Blu)	5J5-3 (C)	Q23	#906 flashlamps 3p
07A ³	(Not Used)	Switched	Vio-Blk	1P11-8	5J1-2: 5J4-2 (A)	Q30	
07C ³	Doghouse Flashers	Switched	Blk-Vio	(Gry-Vio)	5J5-2 (C)	Q30	#906/#89 flashlamps 1p,1b
08A ³	(Not Used)	Switched	Vio-Gry	1P11-9	5J1-1: 5J4-1 (A)	Q22	
08C ³	Barbeque Flashers	Switched	Blk-Gry	(Gry-Blk)	5J5-1 (C)	Q22	#906/#89 flashlamps 1p,1b
09	Cat (Backbox) Motor	Controlled	Bm-Blk	1P12-1	5J2-9: 5J6-9: 2J4-3	Q17	Motor p/n14-7954
10	Playfield Gnl Illum Relay	Controlled	Bm-Red	1P12-2	5J2-8: 5J6-8: 2J4-5	Q9	5580-09555-01 4a
11	Backbox Gnl Illum Relay	Controlled	Bm-Orn	1P12-4	5J2-6: 5J6-7: 2J4-6	Q16	5580-09555-01 4a
12	A/C Select Relay	Controlled	Bm-Yel	1P12-5	5J2-5	Q8	5580-09555-01 5
13	Woman (Backbox) Motor	Controlled	Bm-Gm	1P12-6	5J2-4: 5J6-5	Q15	Motor p/n14-7954
14	BAD CATS Flashers (Backbox)	Controlled	Bm-Blu	1P12-7	5J2-4: 5J6-3	Q7	#89 flashlamps 4b
15	Seafood Wheel Coil 2	Controlled	Bm-Vio	1P12-8	5J2-2: 5J6-2	Q14	} Stepper Motor p/n14-7948
16	Seafood Wheel Coil 1	Controlled	Bm-Gry	1P12-9	5J2-1: 5J6-1	Q6	
17	Left Jet Bumper	Special #1	Blu-Brn	1P19-7	5J3-7: 5J7-7	Q75	AE-23-800
18	Left Kicker ("sling")	Special #2	Blu-Red	1P19-4	5J3-6: 5J7-6	Q71	AE-26-1500
19	Right Jet Bumper	Special #3	Blu-Orn	1P19-3	5J3-3: 5J7-3	Q73	AE-23-800
20	Right Kicker ("sling")	Special #4	Blu-Yel	1P19-6	5J3-4: 5J7-5	Q69	AE-26-1500
21	Lower Jet Bumper	Special #5	Blu-Gm	1P19-8	5J3-2: 5J7-2	Q77	AE-23-800
22	(Not Used)	Special #6	Blu-Blk	1P19-9	5J3-1: 5J7-1	Q79	
-	<u>Right Flipper</u>	-	Om-Vio	1P19-1	2J5-5: 2J10-7	-	
-	Lower Right Flipper	-	[Blu-Vio] ²		[2J10-1: 2J8-15]	-	FL11630/50VDC
-	<u>Left Flipper</u>	-	Om-Gry	1P19-2	2J5-4: 2J10-8	-	
-	Lower Left Flipper	-	[Blu-Gry] ²		[2J10-2: 2J8-4]	-	FL11630/50VDC

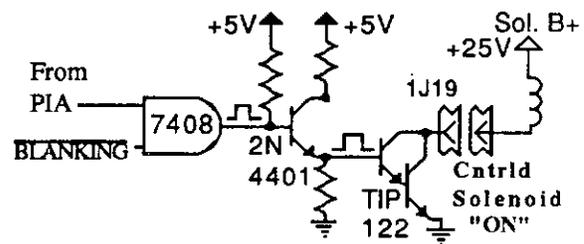
Notes: 1. Wire colors, except flipper Om-Vio and Om-Gry, are ground connections (to coil terminal with unbanded end of diode). Flipper Om-Vio and Om-Gry wires connect from CPU Board to flipper switch. 2. Flipper connections shown in braces are from flipper switch to flipper coil. 3. "A" circuits are pulsed, when Sol. 12 is de-energized; "C" circuits are pulsed, with Sol. 12 energized. Wire colors in brackets are those from respective A and C terminals corresponding to the J1-terminal connection listed for the Aux Power Driver Bd, which controls the device pulsing by Sol. 12. 4. Relay is mounted on Relay Bd, (4a) p/n C-11998-1; (4b) C-11902-1. 5. Relay is mounted on Aux Power Driver Bd, D-12247 in the backbox.

TEST/DIAGNOSTIC PROCEDURES (Continued)

"On" State Logic - Special Solenoid



"On" State Logic - Controlled Solenoid



"Off" State - Special Solenoid:

The Special Switch Trigger Input goes low. Meanwhile, the PIA line remains high. The remaining signals reverse their states.

"Off" State - Controlled Solenoid:

The Enable input (from the PIA) goes low. Meanwhile, the BLANKING signal remains high. The rest of the signals reverse their states.

NOTE

As directed by the game program, the Solenoid A/C Select Relay (solenoid 12) switches the solenoid B+ power between two power busses to permit actuating two groups of solenoids at the proper times. In its de-energized state, the Relay connects the 'circuit A power' to 16 "controlled" and "switched" solenoids (identified in the table with no suffix letter or the letter A, after the solenoid number). Individual solenoid operation then depends on the game program enabling the ground path for solenoid actuation via the driver transistor associated with each solenoid circuit. For example, the game program can actuate the Outhole Kicker solenoid (sol. 01A), via the driver transistor Q33.

When the game program determines that the Solenoid A/C Select Relay (sol. 12) must be energized, the relay connects 'circuit C power' to eight group C solenoids (01C through 08C). Now, driver transistor Q33 can actuate the Shark Flashers circuit (sol. 01C), which has two lamp circuits, one to the Insert Board and one to the playfield. Using this "multiplexing" technique, the same driver transistor can control actuation of two separate (A side and C side) solenoid circuits.

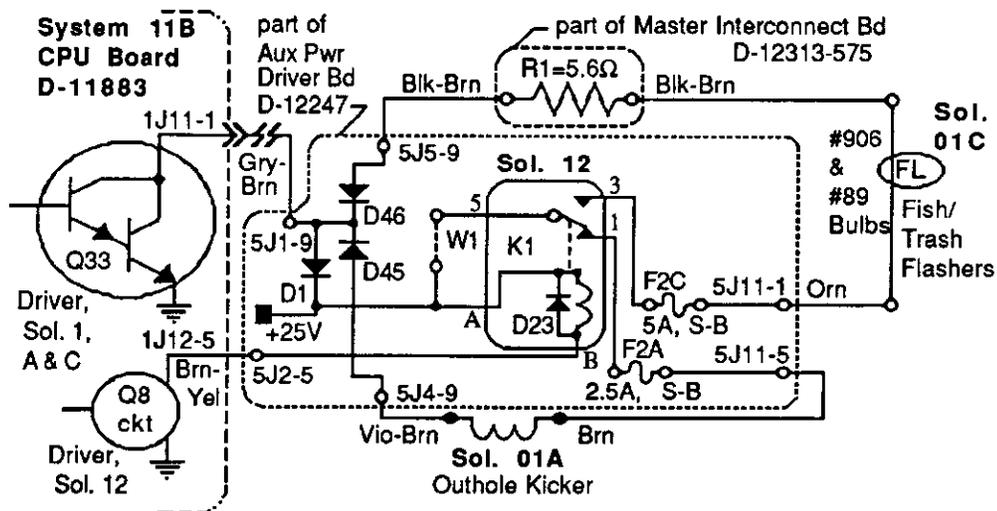


Figure 4. Typical Solenoid A/C Select Relay Circuit, showing the function of Solenoid 12, the Solenoid A/C Select Relay.

TEST/DIAGNOSTIC PROCEDURES (Continued)

SWITCH TESTS.

1. Switch Levels.

(From Solenoid Test) To initiate the Switch Levels Test, press ADVANCE. Observe that the upper display shows the message, SWITCH LEVELS, and the lower display shows 06 (Switch Levels Test identifier). Normally, the right portion of the lower display remains blank, indicating that no switch is actuated.

If, however, a switch is actuated (possibly stuck closed), the lower display shows that switch's number, while the upper displays indicate the switch's name. A sound also accompanies the displays. (This is another facet of the BAD CATS System-11B's switch testing capability.) If more than one switch is closed, a series of displays show each actuated switch's name and number.

(In addition, either of these problems could result in the reporting of a switch problem (or problems) at game Turn-On or at the beginning of Diagnostic Tests.)

As soon as the operator opens a closed switch, its name and number are eliminated from the Switch Levels display series. For BAD CATS, switch numbers can range from 01 through 64. Refer to the **Switch-Matrix Table** for switch numbers and wiring information. CPU Board connections at jacks 1J8 (columns) and 1J10 (rows) are also listed in the table.

BAD CATS Switch-Matrix Table

COLUMN ROW	1 Q45 GRN-BRN 1J8-1	2 Q49 GRN-RED 1J8-2	3 Q44 GRN-ORN 1J8-3	4 Q48 GRN-YEL 1J8-4	5 Q43 GRN-BLK 1J8-5	6 Q47 GRN-BLU 1J8-7	7 Q42 GRN-VIO 1J8-8	8 Q46 GRN-GRY 1J8-9
1	WHT-BRN 1J10-9 Plumb Bob Tilt 1	Playfield Tilt 9	17	Bird Target 1 25	Rubber 1 33	Exit Tiger Ramp 41	49	Flipper Right 57
2	WHT-RED 1J10-8 C Side Power A/C Relay 2	Outhole 10	18	Bird Target 2 26	Rubber 2 34	42	50	Flipper Left 58
3	WHT-ORN 1J10-7 Credit Button 3	T 11	In-line Fish Target 19	Bird Target 3 27	Left Drain Lane 35	Exit Cntr Ramp 43	51	59
4	WHT-YEL 1J10-6 Right Coin Chute 4	O 12	20	Bird Target 4 28	Right Drain Lane 36	Seafood Wheel 44	52	Left Jet Bumper 60
5	WHT-GRN 1J10-5 Center Coin Chute 5	Y 13	21	Bird Target 5 29	Milk Target 1 37	45	53	Right Jet Bumper 61
6	WHT-BLU 1J10-3 Left Coin Chute 6	Ball Shooter 14	Doghouse Kickbig 22	Left Return Lane 30	Milk Target 2 38	46	54	Lwr Jet Bumper 62
7	WHT-VIO 1J10-2 Slam Tilt 7	15	Enter Tiger Ramp 23	Right Return Lane 31	Milk Target 3 39	47	55	BL Kicker ("sling") 63
8	WHT-GRY 1J10-1 High Score Reset 8	Enter Cntr Ramp 16	Fish Collect 24	32	Rubber 3 40	48	56	BR Kicker ("sling") 64

BL = Bottom Left BR = Bottom Right

Row Problems. If a display of two (or more) switch numbers of a row occurs, although only one switch is closed, check for a short circuit between the column wires.

Multiple Switch Number Indications. Check the associated column wire for a short circuit to ground.

Column Problems. If display of two (or more) switch numbers in a column occurs (while only one switch is actuated), check for a short circuit between the row wires.

Use AUTO-UP to proceed to the next test.

TEST/DIAGNOSTIC PROCEDURES (Continued)

SWITCH TESTS (Continued).

2. Switch Edges.

From the Switch Levels Test, press ADVANCE. Observe that the upper display shows the message, SWITCH EDGES; the lower display shows 07 (Switch Edges Test identifier). The right portion of the lower display is blank, indicating that no switch is actuated.

This test permits the operator to test whether actuating a switch provides the proper signal to the System-11B switch testing program. When actuating a switch, the operator should see the switch's name and number in the displays. If no indication appears at the time the switch is actuated, the operator then knows that there is a malfunction associated with that switch.

Using this technique, the operator can test each switch appearing in the **BAD CATS** switch problem reporting displays (either at game Turn-On or at the beginning of the Diagnostic Tests) to determine whether the switch can be actuated. If the switch's name and number are displayed while the operator checks its operation, the operator then knows that the reported problem with that switch is NOT currently caused by a switch malfunction. The operator can then seek other causes for the reported problem, being almost certain now that the switch did not fail. *This test is also useful when the operator is adjusting the sensitivity of a particular switch's actuation mechanism.*

Among the possibilities is the fact that the players have not actuated that switch because of some other problem; the operator should try to analyze what could cause the switch to be missed during game play, and remedy that problem cause. With these new tests, switch problems are, therefore, more easily isolated.

3. *Playfield or CPU Board?* To determine whether a switch problem is in the playfield or the CPU Board, remove connectors 1P8 and 1P10 from the CPU Board. Begin the Switch Test. Use a jumper wire to simulate switch actuation. For example, placing a jumper between 1J10-9 and 1J8-2 should (based on the **Switch-Matrix Table**) should produce an indication of switch 09 being actuated.

WHEEL TEST

From the Switch Edges Test, press ADVANCE. Observe that the Player 1 and 2 displays show the message, WHEEL TEST, and that the Player 3 displays shows 08 (Wheel Test identifier).

The Player 2 display now shows the last known position of the Wheel, while the Player 4 display is divided to show the 'state' of the Home Switch. On the left of the Player 4 display, an "H" means that the Home Switch is open or the opto is interrupted; on the right, a number shows the count of the stepper wheel (1-200; however, if the Home Switch is not working, the number can go as high as 256).

Using AUTO-UP, the test is automatic: The wheel spins, waits for 2 seconds, then spins again. The wheel stops on the next counterclockwise position of the wheel, if the Home Switch works.

Using MANUAL-DOWN, press ADVANCE to spin the wheel. The wheel stops on the next counterclockwise position of the wheel, if the Home Switch works. If the wheel is not spinning, you can manually step the motor by pressing Credit button.

During the test, the Player 3 display shows 08Err, if errors occur (the game program did not detect the Home Switch).

EST/DIAGNOSTIC PROCEDURES (Continued)

ENDING THE DIAGNOSTIC TESTS.

To end the Diagnostic Tests, reach the Car Test (09 in the Player 3 display), use AUTO-UP and press ADVANCE. The backbox displays should show the **BAD CATS** game's Identification Information (the **Id 00** screen). Use MANUAL-DOWN, and press ADVANCE to reach Adjustment Item 70 (INSTALL FACTORY). Use AUTO-UP, and press ADVANCE to go to the Attract Mode.

AUTO BURN-IN MODE.

The Auto Burn-in Mode permits the operator to check intermittent (or nonrecurring) problems associated with most portions of the game's circuitry. Repeatedly cycling through a group of tests can sometimes bring a problem, which occurs only randomly or occasionally, to exhibit itself more frequently, thereby aiding in the isolation of the problem. To activate the Auto Burn-in Mode:

1. While in the Game Adjustments, reach Ad 67 and change the Factory Setting of NO to YES, via the Credit button. Set the AUTO-UP/MANUAL-DOWN switch to AUTO-UP.
2. Press ADVANCE to start the Auto Burn-in Mode. This mode repeatedly sequences through the Music Test, the Display Test, the Sound Test, the All Lamps portion of the Lamp Test, and the Solenoid Test.
3. To halt the Auto Burn-in Mode, switch the game Off and then On. **BAD CATS** now starts in the Attract Mode. (If a switch problem is now reported by the displays, perform the Switch Tests again to determine the nature of the problem; then, perform necessary repairs.)

SYSTEM-11B MEMORY CHIP TEST.

A new feature is now included in the Memory Chip Test for System 11B. During power-up, the CPU performs a self-testing routine. When all tests are satisfactory, the game proceeds to the Attract Mode, allowing players to use the game. Whenever a portion of the testing does not produce satisfactory results, the game displays a message, before proceeding to the next portion of the testing. ONLY after all tests are satisfactory does the game allow play to begin.

In addition to the displayed message, when any part of the self-test routine fails, LED2 ('DIAGNOSTIC'), mounted on the CPU Board, can be observed to determine the probable cause of the problem. This LED blinks, or flashes, a certain number of times to identify the probable cause, as described in the **CPU LED Indicator Codes Table**. The operator can also start the self-test routine by pressing the CPU Diagnostic Switch (SW 2) on the edge of the CPU Board.

TEST/DIAGNOSTIC PROCEDURES (Continued)

CPU LED Indicator Codes Table

Diagnostic LED		
Blinks/ Flashes	Display Message	Explanation
1	U25 RAM FAILURE	U25 RAM could not be used properly (NO other tests are performed; the game is locked here, until the game is turned off).
2	MEM. PROT. FAILURE	This message means that (A) the Coin Door may be shut; (B) the Memory Protect Switch may be stuck in the ON position; (C) the memory protect logic is protecting the memory; or (D) a U25 RAM failure is occurring. (See Note 1)
3	U51 PIA FAILURE	U51 has a malfunction. (See Note 2)
4	U38 PIA FAILURE	U38 has a malfunction. (See Note 2)
5	U41 PIA FAILURE	U41 has a malfunction. (See Note 2)
6	U42 PIA FAILURE	U42 has a malfunction. (See Note 2)
7	U54 PIA FAILURE	U54 has a malfunction. (See Note 2)
8	U10 PIA FAILURE	U10 has a malfunction. (See Note 2)
9	IRQ FAILURE	IRQ has a malfunction. It may be missing or too fast or too slow.
10	U27 ROM FAILURE	U27's internal checksums do not match. It may be a ROM failure, or its associated connections and connecting devices are causing it to appear to have a problem. (The following U26 test is skipped.)
11	U26 ROM FAILURE	U26's internal checksums do not match.

Notes: 1. This test assumes that the Coin Door is OPEN; it is initiated ONLY by pressing the CPU Diagnostic Switch (SW2).
2. Alternatively, its associated connections or connecting devices are causing the IC to appear to have problems.

SYSTEM-11B SOUND CIRCUITRY TESTS.

Tests of the System-11B Sound circuitry, including the Audio Board, are possible only after successful completion of the System-11B Memory Chip Test.

- 1. Audio Board Test.** A brief check of the Audio Board (D-11581) circuitry occurs at game Turn-on; the game reports the test results by brief sounds, as follows: No sound = Audio Board is not operating, or a failure is affecting the sound circuitry (broken cable; dead amplifier; etc.); 1 sound = system OK; 2 sounds = RAM problem; 3 sounds = U4 problem; 4 sounds = U19 problem.
- 2. General System-11B Sound Test.** Press the Sound Diagnostic Switch (SW 1) on left edge of the CPU Board. Listen for the two test sounds, showing that both the CVSD (Continuously Variable Slope Delta) Modulator, which provides the voices for BAD CATS, and the DAC (Digital-to-Analog Converter) sound circuits are functioning properly.

If no sound is heard, refer to the text entitled "NO SOUND ...". If one "ring" is heard, this indicates a malfunction of the U23 RAM Chip. If either two or four "rings" is heard, this indicates a problem associated with the U21 ROM Chip. If either three or five "rings" is heard, this indicates a problem with the U22 ROM Chip.

NO SOUND DURING THIS TEST (but sound can be heard during the Diagnostic Tests).

Check the sound-select inputs (pins 2 through 9 of U9) to see if they pulse during Sound Test 01. Also, check the -12 V supply voltage on the CPU Board. If this voltage is low (or AC ripple seems too high), perform the following checks:

1. The gray and gray-green transformer secondary wires for 19.4 VAC.
2. The CPU Board filter capacitor C26 for -12 VDC.
3. The filter capacitor C26 for excessive AC ripple (over 0.75VAC).

TEST/DIAGNOSTIC PROCEDURES (Continued)

SYSTEM-11B SOUND CIRCUITRY TESTS (Continued)

If the previous checks did not isolate the problem, turn the Volume Control for maximum output. Momentarily touch a powered-up AC soldering pencil on the center tap of the Volume Control.

CAUTION

DO NOT use a soldering iron over 40 watts. Note also that cordless soldering irons will NOT work for this test.

Hearing a low hum or a 'click' indicates that the power amplifier (U1, TDA2002), the Volume Control, and the speaker are operating satisfactorily, as is the sound circuit cabling. Not hearing a sound requires repeating the test with the Volume Control turned part way down, to determine whether the Volume Control is faulty. Also, check the cable connectors for proper mating, and that no broken wires affect this circuit.

PROBLEM ANALYSIS MESSAGES.

The SYSTEM 11B game program has a great capability to aid the operator and service personnel: At Game Turn-on (and also at the beginning of the ITest/Diagnostic Procedures) after the game has been operating for an extended period, the player score displays now *may* signal with a message, "Press ADVANCE for Report", that the game program has detected a possible problem with the game.

To obtain details of the problem, open the coin door and press the AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN. Press the ADVANCE button to begin displaying the message(s). The following messages apply to your **BAD CATS** game.

Adjust 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 ~30 games) by displaying the message "Adjust Switch ##", listing each problem switch by number. (The game program compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep **BAD CATS** earning good profits!)

To verify the problem, refer to the Test/ Diagnostic Procedures text describing Switch Testing, and check each reported switch using applicable Switch Levels and Switch Edges 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 electric switch problems, securing loose connectors, etc. Mechanisms using 'opto switches' (drop targets, etc.) need to be checked for proper power connections (12V dc and ground).

Pinball Missing. **BAD CATS** normally uses one ball. This message announces that the ball is missing or stuck somewhere. When the ball is located, return it to the game via the Outhole. Other possibilities for this problem could be malfunctions of the Trash switch (#), the Outhole switch (#10), Seafood Spin switch (#44), or the Ball Shooter switch (#14).

MAINTENANCE INFORMATION

Figure 5 shows the two main lubrication points of the Eject Hole Device. The shaded arrows show the directions in which the Eject Hole Device and other parts of its related assemblies can be adjusted for proper operation. Note that the mechanism of the Doghouse Kickbig Arm Assembly is quite similar to the Eject Hole Device; it has the same lubrication requirements and adjustment capabilities as the Eject Hole Device.

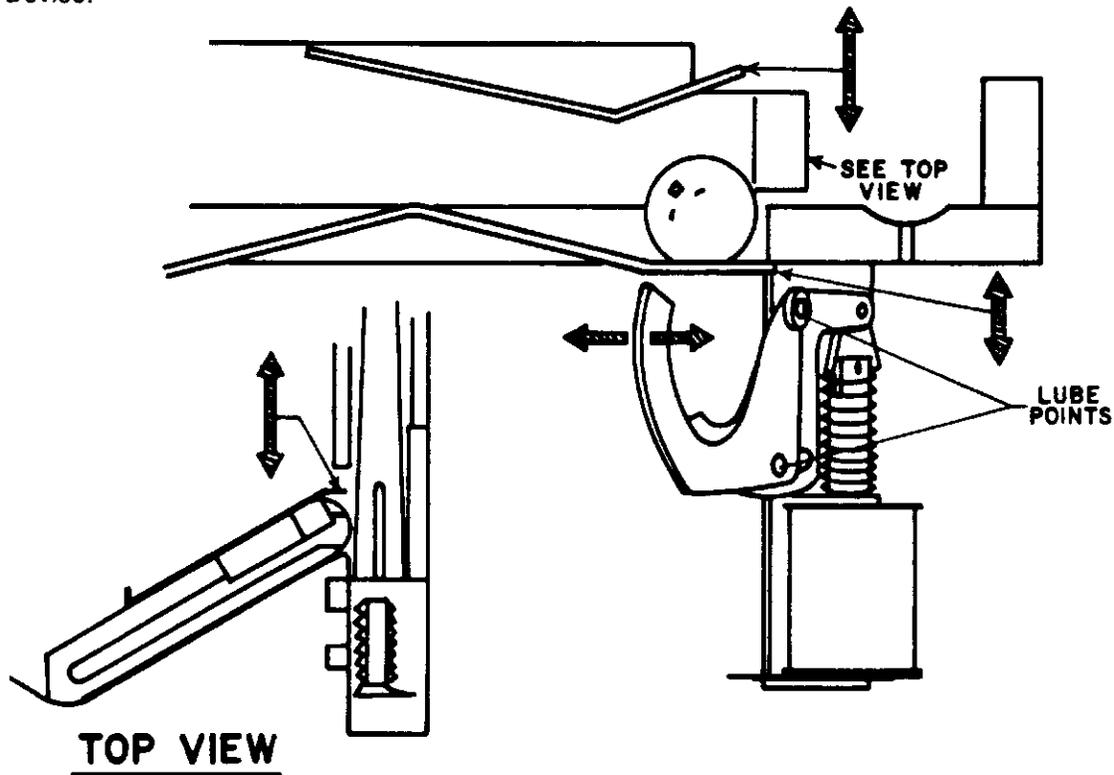
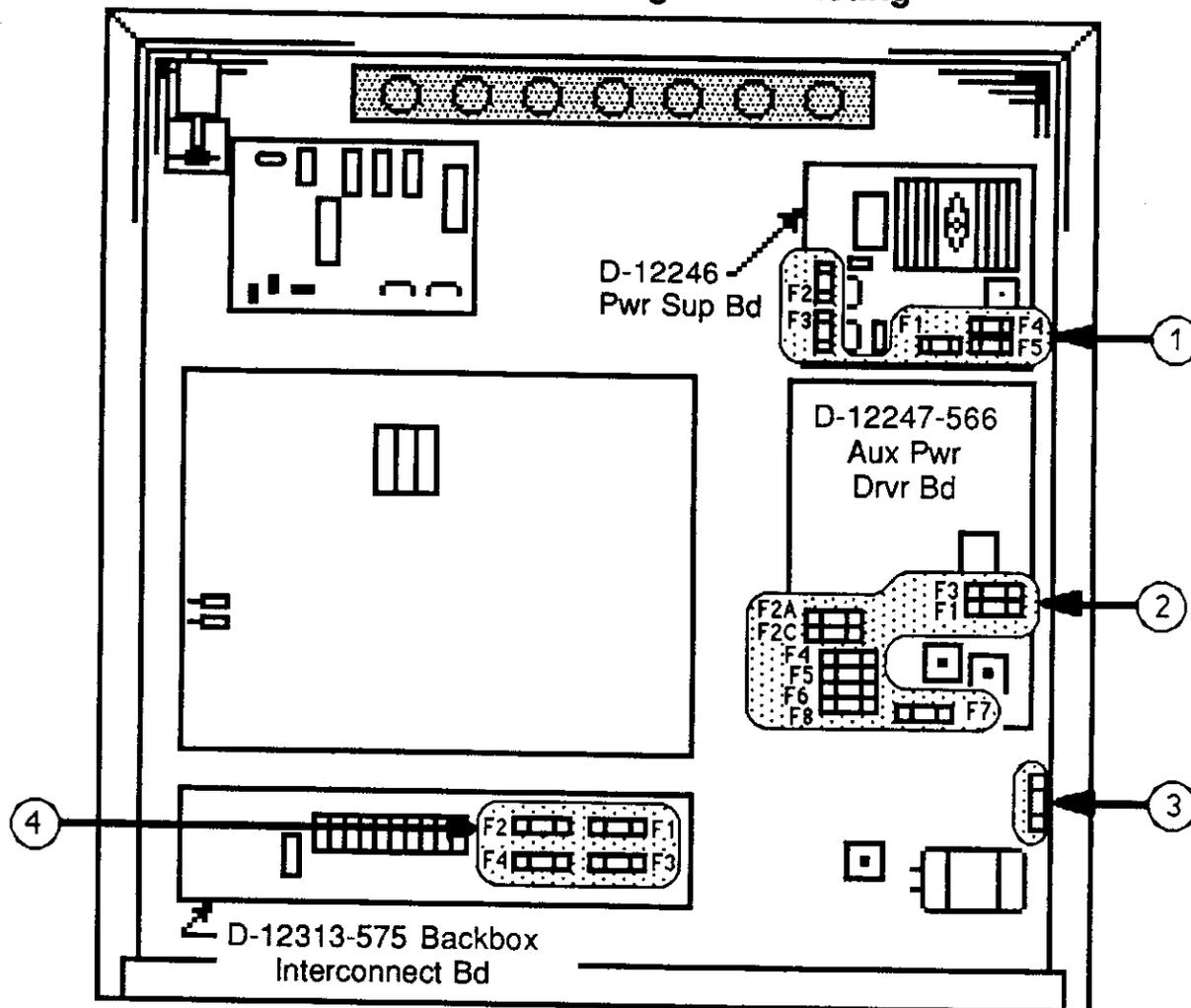


Figure 5. Adjustments and Lubrication Points, Eject Hole Device.

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. Mechanical adjustments are simple and somewhat similar to the Eject Hole Device. These mechanisms should also be checked for proper fit (snugly tight) where they attach to the playfield. Lubrication to ensure proper operation also applies to the target blades of the 3-Bank and 5-Bank Drop Targets. Regular maintenance is essential to a game's continuing contribution to the operator's earnings.

Fuse Locations Diagram & Listing



Fuse Listing

Item	Part Number	Description	Circuit/Location
1	5731-12328-00	Fuse, 3/8A., Slow-Blow (S-B), 250V	F1; D-12246 Power Supply Board
1	5731-12327-00	Fuse, 1/8A., S-B, 250V	F2, F3; D-12246 Power Supply Board
1	5731-09432-00	Fuse, 7A S-B, 250v	F4, F5; D-12246 Power Supply Board
2	5731-09128-00	Fuse, 2-1/2A., S-B, 250v	F1, F2A, F3, F4; D-12247 Aux Pwr Driver Board
2	5731-09651-00	Fuse, 5A., S-B, 250v	F2C; D-12247 Aux Pwr Driver Board
2	5731-08665-00	Fuse, 2A., S-B, 250v	F5, F6; D-12247 Aux Pwr Driver Board
2	5731-06314-00	Fuse, 4A., S-B, 250v	F7; D-12247 Aux Pwr Driver Board
2	5731-09432-00	Fuse, 7A., S-B, 250v	F8; D-12247 Aux Pwr Driver Board
3	5730-09071-00	Fuse, 8A., Normal-Blow (N-B), 32v	+18 Vdc Lamp Ckt/ Lwr Rt B'box fuseholder (1)
4	5731-09651-00	Fuse, 5A., S-B, 250v	F1 - F4: Gen. Illumin/B'box Interconnect Board
-	5730-09252-00	Fuse, 8A., N-B, 125v	Input ("high voltage") Power Line/Cabinet Box*

* One 4A., S-B, 250v fuse (5731-06314-00) is provided for an overseas (220v) game installation.

Section 2

Game

Parts

Information

- ***Parts Lists & Diagrams***

Locations:

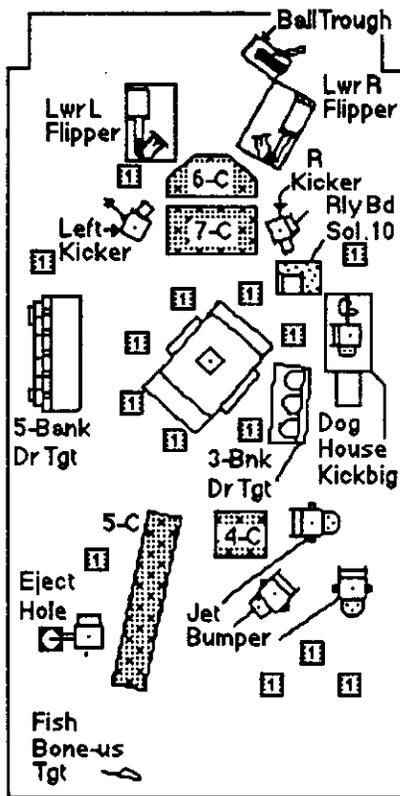
Game Circuit Boards and Major Mechanisms

Solenoids/Flashers & Rubber Parts

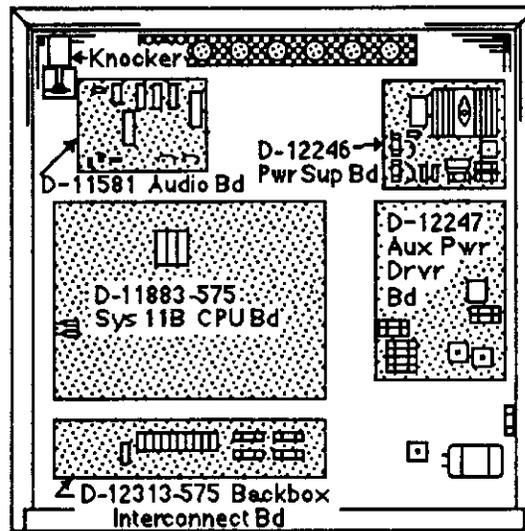
Switches

Lamps

Playfield Parts



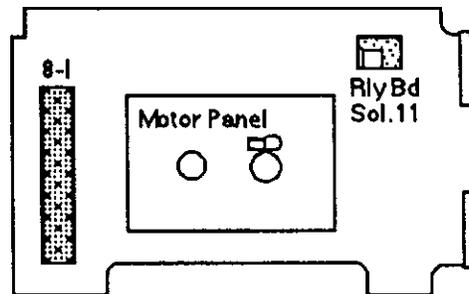
*Under side of Playfield,
Viewed in Raised Position*



Backbox



Display/Speaker Panel, Rear View



Insert Board, Inner Side View

LOCATIONS

Circuit Boards

Lamp Boards

Major Mechanisms

Locations Diagram - Game Circuit Boards and Major Mechanisms

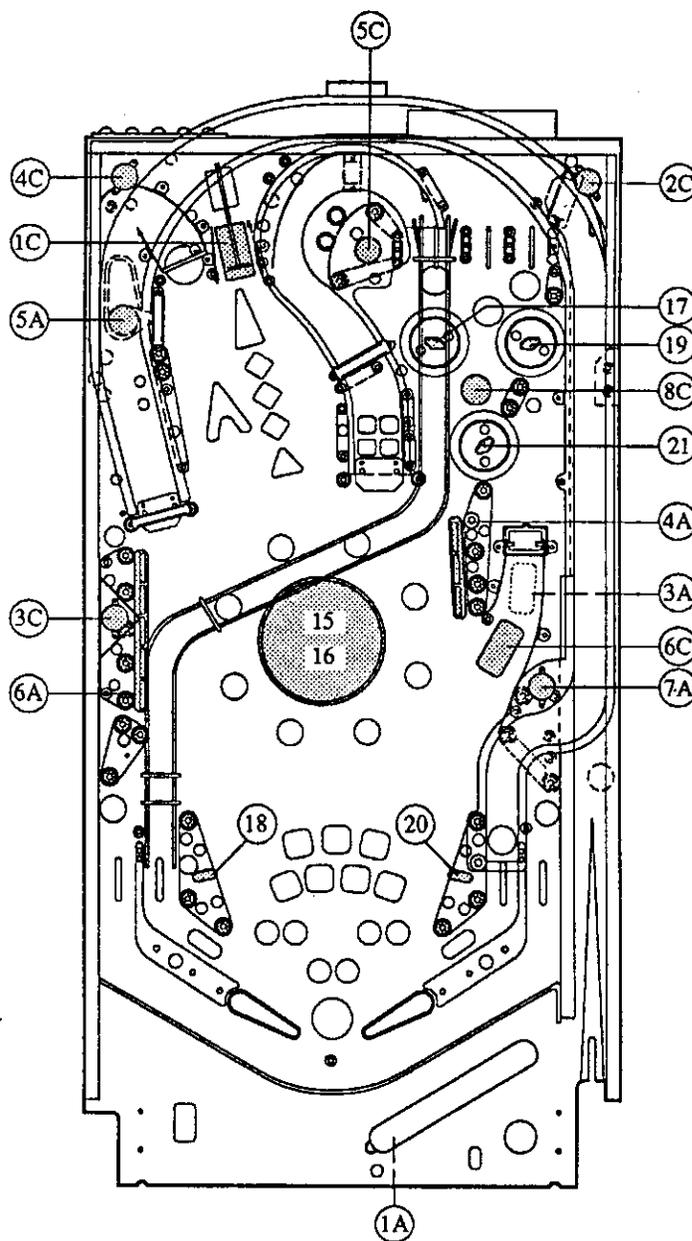
- | | | | |
|-------------|---------------------------------------|-------------|---|
| B-8039-2 | Ball Trough Kicker / Shtr Lane Feeder | B-9361-R-5 | Garbage Can (TL Eject Hole) Arm Assy |
| C-11626-L-1 | Lower Left Flipper | B-9362-R-1 | Coil & Bracket Assembly |
| C-11626-R-1 | Lower Right Flipper | B-13016 | Linear Target ("Fish Bone-Us") Assembly |
| B-12224 | Lamp Board ("1") | | |
| C-12985 | Lamp Board ("6-C") | | |
| B-12665 | Left & Right Kicker Arm Assembly | B-10686-1 | Knocker Assembly |
| B-11203-R-1 | Coil & Bracket Assembly | D-11581-573 | Audio Board |
| C-13093 | Lamp Board ("7-C") | D-12246 | Power Supply Board |
| C-11998-1 | Relay Board (Sol. 10 Gen. Illum) | D-11883-575 | System 11B CPU Board |
| C-13116 | 5-Bank Drop Target | D-12247-566 | Aux Power Driver Board |
| C-13239 | 5-Bank Opto Board | D-12313-575 | Backbox Interconnect Board |
| C-12036-2 | Seafood Wheel Assembly | | |
| D12045 | Motor Control Board | D-12232-1 | Master Display Board |
| C-11223-1 | 3-Bank Drop Target | | |
| C-12559 | 3-Bank Opto Board | C-12098 | Lamp Board ("8-I") |
| C-11987-1 | Doghouse Kickbig Assembly | C-13180 | Insert Board Feature Assembly |
| C-13067 | Lamp Board ("5-C") | C-13094-1 | Motor EMI Filter Assembly |
| C-12983 | Lamp Board ("4-C") | C-11998-1 | Relay Board (Sol. 11 Gen. Illum) |
| B-9414 | Jet Bumper (2-Lwr, R) | | |
| B-13123 | Jet Bumper (1-L) | | |
| B-9415-1 | Bumper Coil & Bracket Assy (3) | | |

Solenoids/Flashers

Item	Part No.	Description
1A	AE-23-800	Outhole Kicker
1C	#906/89 Flashlamps	Fish/Trash Flashers
2A	AE-23-800	Knocker
2C	#906/89 Flashlamps	Tiger Flashers
3A	AE-23-800	Doghouse Kickbig
3C	#906/89 Flashlamps	Bird Bank Flashers
4A	AE-26-1200	Milk Bottle 3-Bank Dr Tgt
4C	#906/89 Flashlamps	Left Tiger Flashers
5A	AE-23-800	Garbage Can Eject
5C	#906/89 Flashlamps	Jackpot Flashers
6A	AE-24-900	Bird Cage 5-Bank Dr Tgt
6C	#906 Flashlamps	Seafood Flasher
7A	Not Used	
7C	#906/89 Flashlamps	Doghouse Flashers
8A	Not Used	
8C	#906/89 Flashlamps	Barbecue Flashers
9	14-7954	Cat (Backbox) Motor
10	5580-09555-01	Playfield Gen Illumin Relay *
11	5580-09555-01	Backbox Gen Illumin Relay *
12	5580-09555-01	Solenoid A/C Select Relay**
13	14-7954	Woman (Backbox) Motor
14	#906 Flashlamps	BAD CATS Flashers
15	14-7948	Seafood Wheel (Coil 2)
16	14-7948	Seafood Wheel (Coil 1)
17	AE-23-800	Left Jet Bumper
18	AE-26-1500	Left Kicker ("Sling")
19	AE-23-800	Right Jet Bumper
20	AE-26-1500	Right Kicker ("Sling")
21	AE-23-800	Lower Jet Bumper
22	Not Used	
-	FL 11630/50VDC	Lower Left and Right Flipper

* - On Relay Board, C-11998-1, on Playfield and Insert Board

** - In backbox on Aux Power Driver Bd, D-12247

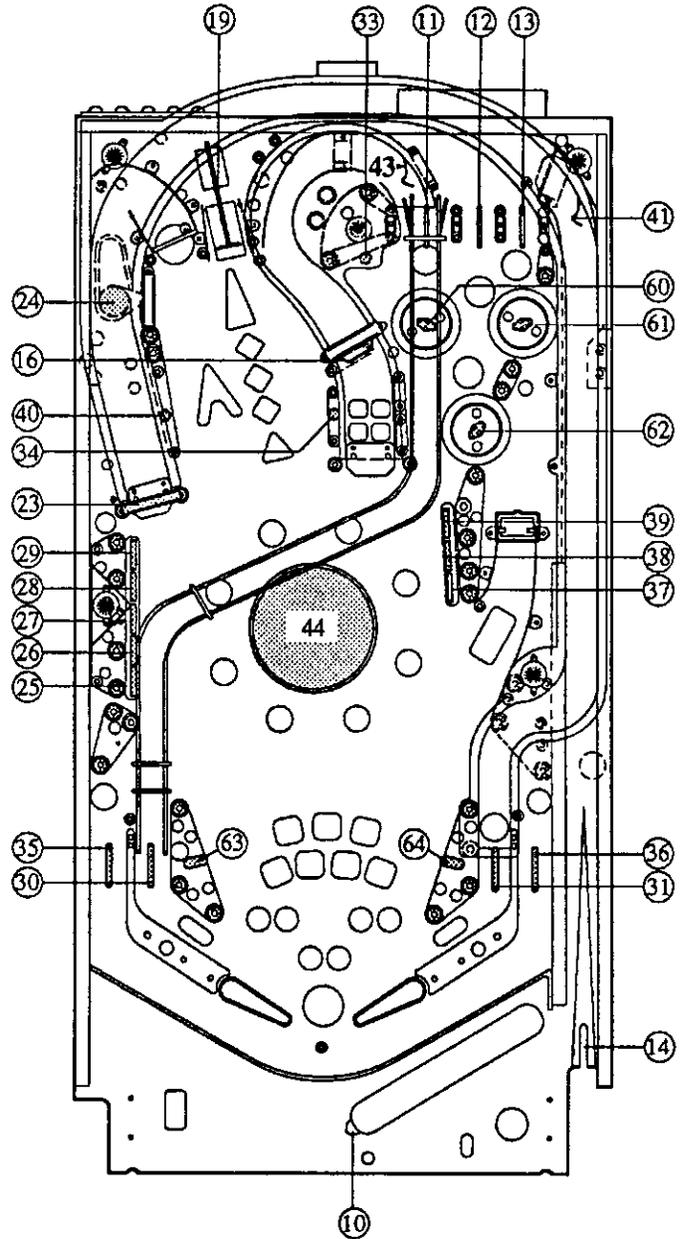


Rubber Parts

Part No.	Description	Qty	Part No.	Description	Qty
23-6300	5/16" Ring	7	23-6327	Ball Shooter Tip	1
23-6303	1-1/4" Ring	3	23-6519-4	Lg Red Flipper Ring	2
23-6304	1-1/2" Ring	1	23-6535	Bumper	2
23-6305	2" Ring	1	23-6552	Sleeving, Yellow	4
23-6306	2-1/2" Ring	2	23-6626	Grommet	6
23-6308	3-1/2" Ring	1	23-6629	Bumper Pad	1
23-6309	4" Ring	1	23-6638	Belt, Round	1
23-6313-1	Grommet	1			

Switches

Item	Part No.	Description
1	(See Figure 2)	Plumb Bob Tilt
2	5580-09555-01	C Side Power/A-C Relay
3	SW-1A-126	Credit Button
4	27-1092	R Coin Chute (USA)
5	Not Used (USA)	Center Coin Chute
6	27-1092	L Coin Chute (USA)
7	27-1066	Slam Tilt
8	27-1008	High Score Reset*
9	B-8306-1	Playfield Tilt
10	5647-12133-12	Outhole
11	5647-12073-19	T (Rollover Lane in T-O-Y)
12	5647-12073-19	O (Rollover Lane in T-O-Y)
13	5647-12073-19	Y (Rollover Lane in T-O-Y)
14	5647-12073-04	Ball Shooter Lane
15	Not Used	
16	5647-12133-08	Enter Center Ramp
17	Not Used	
18	Not Used	
19	p/o C-12935	In-Line Fish Target
20	Not Used	
21	Not Used	
22	5647-12073-20	DOGHOUSE Kickbig
23	5647-12133-08	Enter Tiger Ramp
24	5647-12133-11	Fish Collect
25	p/o C-13239	Bird Target 1
26	p/o C-13239	Bird Target 2
27	p/o C-13239	Bird Target 3
28	p/o C-13239	Bird Target 4
29	p/o C-13239	Bird Target 5
30	5647-12073-19	Left Return Lane
31	5647-12073-19	Right Return Lane
32	Not Used	
33	SW-1A-120	Rubber 1
34	SW-1A-120	Rubber 2
35	5647-12073-19	Left Drain Lane
36	5647-12073-19	Right Drain Lane
37	p/o C-13205	Milk Target 1
38	p/o C-13205	Milk Target 2
39	p/o C-13205	Milk Target 3
40	SW-1A-120	Rubber 3
41	5647-12073-21	Exit Tiger Ramp
42	Not Used	
43	5647-12073-21	Exit Center Ramp
44	p/o D-12046	Seafood Wheel
45	Not Used	
46	Not Used	
47	Not Used	
48	Not Used	
49	Not Used	
50	Not Used	
51	Not Used	
52	Not Used	
53	Not Used	

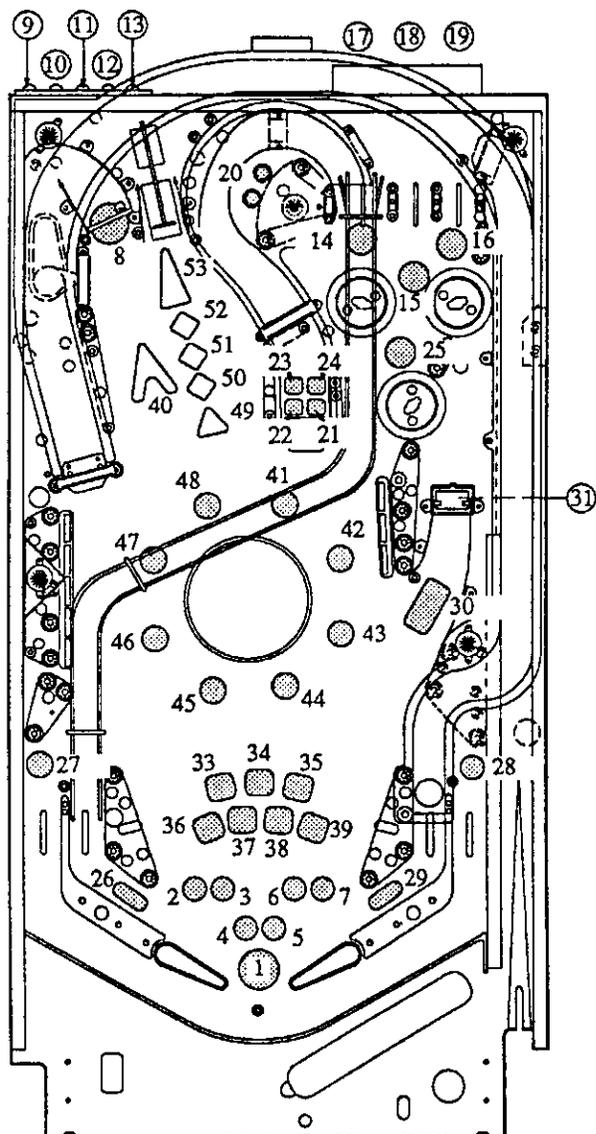


Item	Part No.	Description
54	Not Used	
55	Not Used	
56	Not Used	
57	-	R Flipper Lane Change**
58	-	L Flipper Lane Change**
59	Not Used	
60	B-12030-2	Left Jet Bumper
61	B-12030-2	Right Jet Bumper
62	B-12030-2	Lower Jet Bumper
63	-	BL Kicker***
64	-	BR Kicker***
-	SW-10A-48	Flipper Button (Cabinet sides)

Notes: * Part Number is for entire Diagnostic Switch Assembly, including H S Reset Switch;

** Optotransistor on Backbox Interconnect Bd; *** [Paired Kicker Actuating Sw: A-4834-H; B-8734-1]

Lamps



Lamp Location/Description

Lamp Location/Description

- 1 MEOW AGAIN
- 2 2X
- 3 3X
- 4 4X
- 5 5X
- 6 6X
- 7 7X
- 8 COLLECT FISH BONE - US
- 9 50K (Tiger Ramp)
- 10 100K (Tiger Ramp)
- 11 200K (Tiger Ramp)
- 12 Unlimited Million (Tiger Ramp)
- 13 20,000,000 (Tiger Ramp)
- 14 T (in Playfield T-O-Y)
- 15 O (in Playfield T-O-Y)
- 16 Y (in Playfield T-O-Y)
- 17 T (in Back panel T-O-Y)
- 18 O (in Back panel T-O-Y)
- 19 Y (in Back panel T-O-Y)
- 20 JACKPOT (Center Ramp)
- 21 30K (Center Ramp)
- 22 50K (Center Ramp)
- 23 100K (Center Ramp)
- 24 Extra Ball (Center Ramp)
- 25 5,000 (Barbecue Jet Bumpers)
- 26 Left Return Lane
- 27 SPECIAL (Left Outlane)
- 28 SPECIAL (Right Outlane)
- 29 Right Return Lane
- 30 SPIN (Seafood Wheel)
- 31 DOGHOUSE
- 32
- 33 B (in B-A-D C-A-T-S)
- 34 A (in B-A-D C-A-T-S)
- 35 D (in B-A-D C-A-T-S)
- 36 C (in B-A-D C-A-T-S)
- 37 A (in B-A-D C-A-T-S)
- 38 T (in B-A-D C-A-T-S)
- 39 S (in B-A-D C-A-T-S)
- 40 Collect 10X (Fish)
- 41 Seafood Wheel 1
- 42 Seafood Wheel 2
- 43 Seafood Wheel 3
- 44 Seafood Wheel 4
- 45 Seafood Wheel 5
- 46 Seafood Wheel 6
- 47 Seafood Wheel 7
- 48 Seafood Wheel 8
- 49 25K (Fishbone)
- 50 50K (Fishbone)
- 51 75K (Fishbone)
- 52 100K (Fishbone)
- 53 500K (Fishbone)
- 54 Lamp (Shed) (Backglass)
- 55 Barbecue (Backglass)
- 56 Candle (Backglass)
- 57 1,000,000 J'POT (Backglass)
- 58 2,000,000 J'POT (Backglass)
- 59 3,000,000 J'POT (Backglass)
- 60 4,000,000 J'POT (Backglass)
- 61 5,000,000 J'POT (Backglass)
- 62 6,000,000 J'POT (Backglass)
- 63 7,000,000 J'POT (Backglass)
- 64 8,000,000 J'POT (Backglass)

- 1 MEOW AGAIN
- 2 2X
- 3 3X
- 4 4X
- 5 5X
- 6 6X
- 7 7X
- 8 COLLECT FISH BONE - US
- 9 50K (Tiger Ramp)
- 10 100K (Tiger Ramp)
- 11 200K (Tiger Ramp)
- 12 Unlimited Million (Tiger Ramp)
- 13 20,000,000 (Tiger Ramp)
- 14 T (in Playfield T-O-Y)
- 15 O (in Playfield T-O-Y)
- 16 Y (in Playfield T-O-Y)
- 17 T (in Back panel T-O-Y)
- 18 O (in Back panel T-O-Y)
- 19 Y (in Back panel T-O-Y)
- 20 JACKPOT (Center Ramp)
- 21 30K (Center Ramp)
- 22 50K (Center Ramp)
- 23 100K (Center Ramp)
- 24 Extra Ball (Center Ramp)
- 25 5,000 (Barbecue Jet Bumpers)
- 26 Left Return Lane
- 27 SPECIAL (Left Outlane)
- 28 SPECIAL (Right Outlane)
- 29 Right Return Lane
- 30 SPIN (Seafood Wheel)
- 31 DOGHOUSE
- 32
- 33 B (in B-A-D C-A-T-S)
- 34 A (in B-A-D C-A-T-S)
- 35 D (in B-A-D C-A-T-S)
- 36 C (in B-A-D C-A-T-S)
- 37 A (in B-A-D C-A-T-S)
- 38 T (in B-A-D C-A-T-S)
- 39 S (in B-A-D C-A-T-S)
- 40 Collect 10X (Fish)
- 41 Seafood Wheel 1
- 42 Seafood Wheel 2
- 43 Seafood Wheel 3
- 44 Seafood Wheel 4
- 45 Seafood Wheel 5
- 46 Seafood Wheel 6
- 47 Seafood Wheel 7
- 48 Seafood Wheel 8
- 49 25K (Fishbone)
- 50 50K (Fishbone)
- 51 75K (Fishbone)
- 52 100K (Fishbone)
- 53 500K (Fishbone)
- 54 Lamp (Shed) (Backglass)

Playfield Parts

Item	Part No.	Description
1	03-7542-9	Post
a)	23-6300	Rubber
2	12-6842	Bottom Arch Fence
3	C-11626-L-3	Lwr Left Flipper Assy
a)	20-9250-6	Lg Flipper Paddle & Shaft
4	B-12363-L	Left Flipper Return Frame
5	B-12665	Kicker Arm ("Sling") Assy
a)	B-11203-R-1	Coil & Bracket Assy
6	12-6865	Wire Ramp
7	C-13116	5-Bank Drop Target Assy
8	A-13109	Left Ramp Ball Gate (Entry)
a)	12-6874	Gate Wire
b)	12-6853-1	Switch Actuating Wire
9	R-12974	Left Ramp Assembly
10	A-12846	Cntr Ramp Ball Gate (Entry)
a)	12-6847	Gate Wire
b)	12-6873-1	Switch Actuating Wire
11	D-12975	Center Ramp Assembly
12	B-9361-R-5	Top Left Eject Hole
a)	B-9362-R-1	Coil & Bracket Assembly
b)	03-7351-1-9	Tr Red Plastic Ball Seat
13	A-9465-L	Ball Gate Assembly
a)	12-6565	Gate Wire
14	A-13161	Ball Guide Assy
15	B-13110	Ball Guide Assy
16	A-13019	Ball Guide Assembly
17	B-13016	Linear Target Arm Assy
18	A-13019	Ball Guide Assembly
19	C-13021	Ball Guide Assembly
20	12-6868	Wireform
21	A-12511	1-Way Ball Gate
22	12-6466-3	Wireform, 3/4" (2 ea, 4 sites)
23	A-12511	1-Way Ball Gate
24	B-13123	Jet Bumper Assy
a)	B-9415-1	Bmpr Coil/Bracket Assy
25	B-9414	Jet Bumper Assy (2)
a)	B-9415-1	Bmpr Coil/Bracket Assy
26	C-11223-1	3-Bank Drop Target Assy
27	C-11987-1	Doghouse Kickbig Assembly
28	A-13249	Ball Guide Assy
29	B-13248	Ball Guide Assy
30	C-12036-2	Seafood Wheel Assembly
31	12-6466-5	Wireform, 1-1/4"
32	B-12363-R	Right Flipper Return Frame
33	C-11626-R-3	Lwr Right Flipper Assy
a)	20-9250-6	Flipper Arm on Shaft
34	Parts below are located beneath Bottom Arch:	
a)	01-3569	Ball Trough (runway)
b)	01-3570-3	Upper Ball Trough Guide
c)	01-3571-3	Lower Ball Trough Guide
d)	12-6557	Baffle Wire
e)	B-8039-2	Outhole Kicker

