

SERVICE BULLETIN BOOK

1990

WMS GAMES

**WILLIAMS ELECTRONICS GAMES, INC.
MIDWAY MANUFACTURING COMPANY
*MAKERS OF WILLIAMS AND BALLY AMUSEMENT GAMES***

**3401 N. CALIFORNIA AVE.
CHICAGO, ILLINOIS 60618
SERVICE DEPT. PHONE: (312) 509-6544 FAX: (312) 267-5054**

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WILLIAMS

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BALLY/MIDWAY

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Williams Electronic Games

SERVICE BULLETINS

SERVICE BULLETIN

SUBJECT: Solution of possible problems with 3-Bank Drop Target Opto Boards. Problems may include (a) unexpected TILTS or (b) unearned CREDITS.

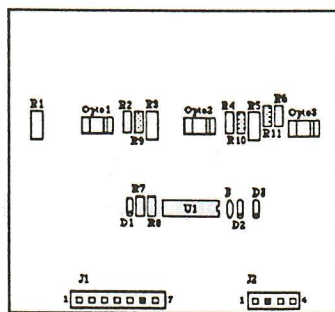
Information: Figure 1 provides a reference illustration.

Procedure:

1. Make sure that the plugs on connectors J1 and J2 of the Opto Board are making proper electrical connections.
2. Check to verify that each of the three 1N4004 diodes (for noise suppression and blocking) on the 3-Bank Opto Board is functioning properly. (See Figure 1.) The cathodes of these diodes connect to the outputs of IC1 (Pins 1, 13, and 14), and the anodes connect to, respectively, Pins 4, 5, and 7 of J1.

For older Opto Boards (C-11318-1) experiencing the problems mentioned above, these diodes can be added, using the proper technique, as follows:

- (A) Cut the circuit board trace between IC pin 1 and J1-4. Connect (solder) the anode of a 1N4004 diode to the trace connected to J1-4. Connect (solder) the cathode of that 1N4004 diode to the trace connected to IC pin 1.
- (B) Cut the circuit board trace between IC pin 13 and J1-5. Connect (solder) the anode of a 1N4004 diode to the trace connected to J1-5. Connect (solder) the cathode of that 1N4004 diode to the trace connected to IC pin 13.
- (C) Cut the circuit board trace between IC pin 14 and J1-7. Connect (solder) the anode of a 1N4004 diode to the trace connected to J1-7. Connect (solder) the cathode of that 1N4004 diode to the trace connected to IC pin 14.



3-Bank Drop Target Opto Board
p/n C-12559

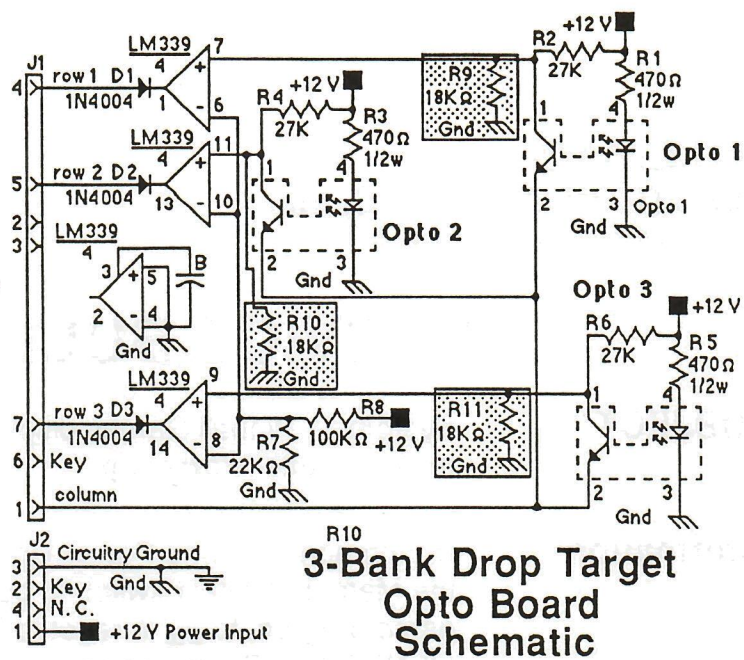


Figure 1. 3-Bank Drop Target Opto Board

SERVICE BULLETIN

SUBJECT: System 11 Pinball Games display the ADJUSTMENT FAILURE message after Power-Up.

Information: During normal game Power-Up, the Coin Door is closed, causing the Memory Protect switch to be actuated. If a problem causes the game program to try to reset to Factory Settings, the ADJUSTMENT FAILURE message appears, when the game program fails to complete the reset operation.

This indicates a problem with the Memory Protect circuitry (which may include the batteries, diodes, U25, U36, or switch and wiring).

- PROCEDURE:**
1. Check that the CPU Board batteries are firmly in place in the battery holder and that they have good electrical contact with the holder's terminals.
 2. With the game turned off, check for a minimum battery voltage of 3.8V dc at pin 24 of U25. Replace batteries if voltage is low.
 3. Check for proper diode action of CPU Board diodes D1 and D2.
 4. Check CPU Board CMOS RAM U25 and associated circuitry.
 5. Check the Coin Door wiring, including the action of the Memory Protect switch.
 6. Check CPU Board U36 (Memory Protect circuit) for proper operation.

SERVICE BULLETIN

SUBJECT: Solution of possible problems with welded Hinge Mounting Plate of the Coin Door.

Information: Figure 1 provides a reference illustration.

Procedure:

1. Open the Coin Door fully to permit access to welded Hinge Mounting Plate of the Coin Door.
2. Drill four holes in the approximate locations shown in Figure 1, using a #32 (0.116 in.) drill bit. Note that the upper hole must be located so that the screw to be installed does NOT interfere with the top mounting screw on the door frame Hinge Mounting Plate.
3. Install four 6-32 Self-Tapping screws - 3/8" long in the drilled holes. Tighten them securely to provide maximum assurance against separation of the weld on the Hinge Mounting Plate.

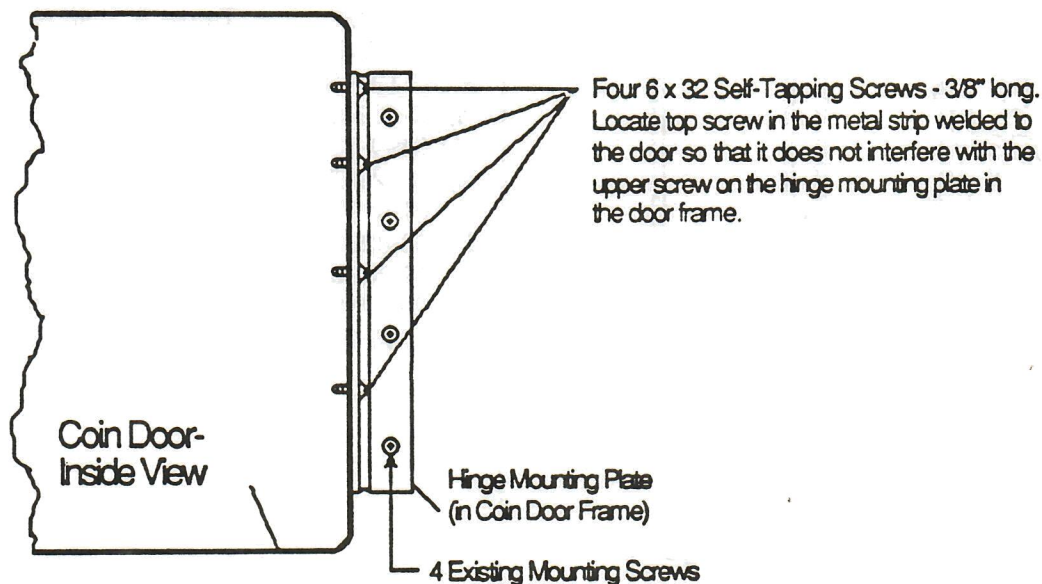
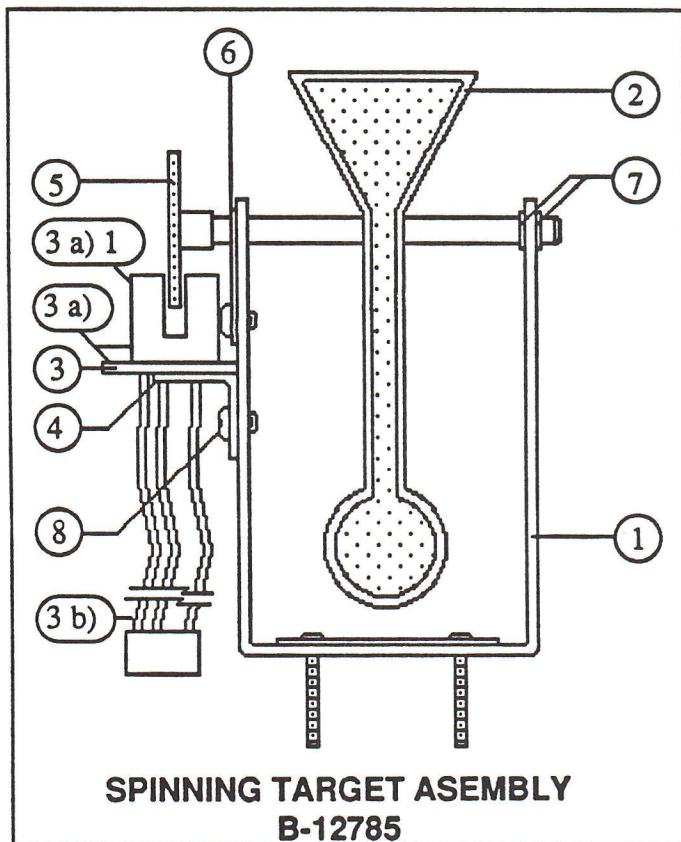


Figure 1. Inner View of Coin Door Showing Installation.

SERVICE BULLETIN

SUBJECT: Corrected Parts List and Illustration for **POLICE FORCE** Spinning Target Assembly

Information: Please correct the Parts List and Illustration, on page 58 of your game manual, for the Spinning Target Assembly, p/n B-12785. (The callouts in the game manual are incorrect. We are also adding the part number for the Optotransistor, mounted on the Opto Switch & Cable Assembly.)



SPINNING TARGET ASSEMBLY B-12785

- | | | |
|----|---------------|-----------------------------------|
| 1 | B-12788 | Spng Target Mounting Bracket Assy |
| 2 | B-12941 | Spng Target & Decal Assy |
| a) | B-12791 | Target & Shaft Assy |
| b) | 31-1510-573 | Target Decal |
| 3 | C-12946-1 | Opto Switch & Cable Assy |
| a) | C-12946 | Opto Switch Assy |
| 1) | 5490-12451-00 | Optotransistor |
| b) | H-12968 | Cable Assy |
| 4 | 01-9197 | Opto Assy Mounting Bracket |
| 5 | 03-8280 | Interrupter Disk |
| 6 | 12-6866 | Target Shaft Clip |
| 7 | 20-8712-12 | "E" Ring, 1/8" shaft |
| 8 | 4006-01003-04 | Mach. Screw, 6-32 x 1/4" |

SERVICE BULLETIN

Subject: The following description of changes that have been made to the CPU Board from System 11 to System 11C may help you recognize the CPU Board used in your game.

System 11 (p/n D-10881-Game Number)

System 11 uses a 7-segment LED to display the game's diagnostic codes. This CPU contains the amplification circuit for the Sound Board and a complete, but unused, opto switch circuit.

System 11A (p/n D-11392-Game Number)

System 11A uses 3 LEDs to replace the 7-segment LED, (and its related components) for the game's diagnostic code display. The special solenoid circuit changed. Pins 6 and 7 on jack 1J18 were connected to ground. Zener Diodes (1N5234, 6.2V) ZR3-ZR8, were added. In the logic circuit, W16 and W17 were added to ground pin 38 of Motorola microprocessors. If a Motorola, ST, or any other brand of microprocessor that must have pin 38 grounded is used, then W16 and W17 must be connected. If the microprocessor used does not require pin 38 to be grounded, then W16 and W17 must be disconnected.

System 11B (p/n D-11883-Game Number)

Note: Changes to System 11B occurred in two phases.

Phase 1

System 11B modified the CPU further. The opto switch circuit and SRC6, as well as the sound amplification circuit, were removed.

Phase 2

The layout and type of the switch circuit transistors changed. Q42-Q49 changed from two rows of four transistors to a single row of eight transistors, as well as from 2N3094 to 2N5550.

System 11C (p/n D-11883-Game Number)

System 11C eliminates the sound circuit entirely. (All audio processing occurs on the Audio Board now.)

WILLIAMS AND BALLY GAMES BY SYSTEM

BELOW IS A LISTING OF GAMES BY THE CPU SYSTEM IT USED.
 11A BOARDS CAN BE USED FOR 11 AND 11A GAMES. 11B BOARDS
 CAN BE USED FOR SYSTEMS 11A, 11B AND 11C. SYSTEMS 9, 11
 AND 11C CAN ONLY BE USED FOR THEIR OWN SYSTEMS
 RESPECTIVELY.

GAME	SYSTEM
SPACE SHUTTLE	9
SORCERER	9
COMET	9
STRIKE ZONE	9
HIGH SPEED	11
GRAND LIZARD	11
ROAD KINGS	11
ALLEY CATS	11
PINBOT	11A
MILLIONAIRE	11A
F-14 TOMCAT	11A
FIRE!	11A
TIC TAC STRIKE	11A
BIG GUNS	11A & 11B
SPACE STATION	11B
CYCLONE	11B
BANZAI RUN	11B
SWORDS OF FURY	11B
TAXI	11B
JOKERZ	11B
GOLD MINE	11B
TOP DAWG	11B
EARTHSHAKER	11B
BLACK KNIGHT 2000	11B
POLICE FORCE	11B
ELVIRA	11B
TRANSPORTER	11B
BAD CATS	11B
SHUFFLE INN	11B
MOUSIN' AROUND	11B
WHIRLWIND	11B
GAME SHOW	11C
POOL SHARKS	11C
ROLLER GAMES	11C
RADICAL	11C
DINER	11C

SERVICE BULLETIN

SUBJECT: ROLLER GAMES "Deep Freeze" Magnet Performance Adjustments

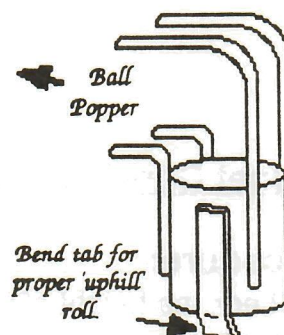
Information: Three adjustments are recommended, to ensure proper "Deep Freeze" Magnet operation. Determine which is applicable for your game. (Some games may need only one; some may need more than one.)

The first adjustment affects the ball direction, as it exits the tube at the end of the Ball Popper Wire Ramp. The second adjustment affects the ball location when 'frozen' by the magnet. The third adjustment affects the magnet core height.

Ball Popper Wire Ramp Exit Tube Adjustment

Procedure:

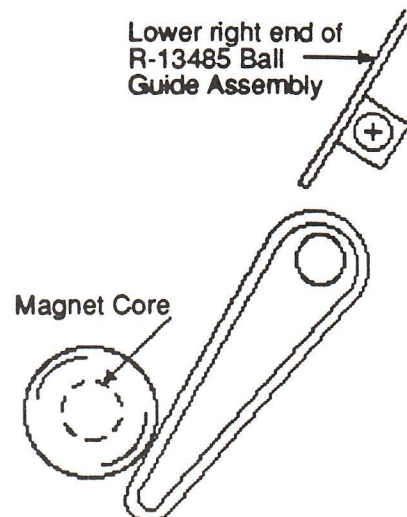
1. Check the direction and distance of ball movement as it exits the Ball Popper Wire Ramp tube. As it drops out of the tube, the tab at the bottom of the tube should send the ball rolling 'uphill' (upward on the playfield) approximately 1 inch, before rolling down the ball guide into the "Deep Freeze" Magnet region, near the Upper Right Flipper.
2. Adjust the tab at the lower end of the Ramp tube to obtain the proper 'uphill' roll. Be careful of the 'uphill' roll distance because too long an 'uphill' roll can cause the ball to gain too much momentum and roll completely through the magnet area too fast for the magnet to 'freeze' (hold) it. Also, be careful of the direction of the roll. The tab should direct the ball slightly toward the ball guide to ensure that the ball will roll through the magnet region, rather than possibly bouncing away from the magnet region.



Upper Right Flipper Paddle Adjustment

Procedure:

1. Check the ball movement as the magnet 'freezes' (holds) it. Ideally, the ball will be rubbing on the red flipper rubber, during the 'freeze'. This dampens the magnetic oscillations much faster and allows a well-aligned shot up the left Upper Plastic Ramp.
2. Adjust the Upper Right Flipper paddle position, if possible, to allow the ball to rest on the red flipper rubber, while the magnet is holding it.
3. Be careful during this adjustment to **avoid** making the "loop" shot around the ball guide at the top of the playfield end in an 'outhole' drain (up the left side of the ball guide, around the upper rim, and down the right side of the ball guide, past the flipper paddle, and down between both lower flippers into the outhole). The Upper Right Flipper paddle should send the ball onto the lower right flipper, when properly adjusted.

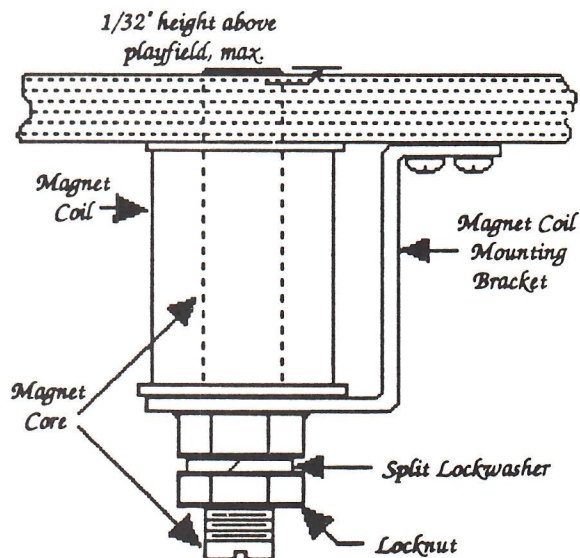


Ball resting on Upper Right Flipper rubber, during Magnet 'Freeze'

Magnet Core Height Adjustment

Procedure:

1. Check the height of the metal "Deep Freeze" magnet core above the playfield surface. The optimum height is approximately $1/32$ ". This height causes the ball to "freeze" faster, by reducing the speed of the ball movement, yet it does not apparently interfere with other shots.
2. Raise the playfield to allow a straight-bladed screwdriver blade to turn the core for the proper height. If necessary, slightly loosen the locknut securing the core in its bracket. Retighten the locknut following the height adjustment to secure the core at the desired height.

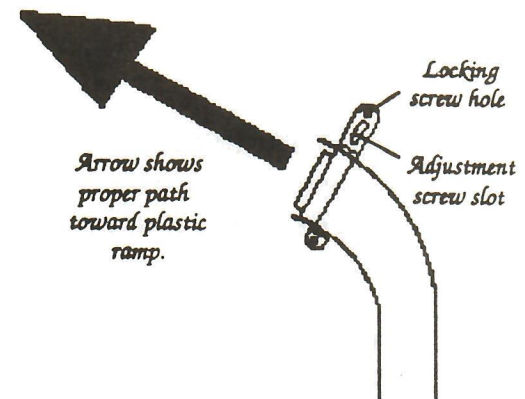


Shooter Lane Exit Path Adjustment

Information: As the ball exits the shooter lane, it should proceed across the playfield and go up the plastic ramp (as shown by the dark arrow). Adjustment of the shooter lane ball guide may be necessary to obtain this ramp shot.

Procedure:

1. Check the ball trajectory (path) from the shooter lane ball guide toward the plastic ramp. The ball should move smoothly up the ramp entrance.
2. If necessary, loosen the ball guide screw in the ball guide slot, and reposition the ramp to obtain the proper ramp entry.
3. To maintain the ball guide position, install another screw in the Locking Screw hole.



SERVICE BULLETIN

SUBJECT: ROLLERGAMES Upper Diverter Assembly Improvements

Information: Improvements to the Upper Diverter Assembly, p/n C-13489, include (1) a coil change (replace the AE-23-800 coil with one marked AE-26-1200); (2) a Solenoid Bracket Assembly, p/n B-13488, change; and (3) a change to the assembly comprising the coil plunger, drive link, and spring.

It is suggested that these changes can occur in the order listed in the preceding paragraph; that is, coil replacement should be first, followed by replacing the Solenoid Bracket Assembly. If necessary, the more complex change of the coil plunger, drive link, and spring should resolve all associated problems with the Upper Diverter Assembly.

See the accompanying diagram for details. The parenthetical numbers in the following procedure refer to the diagram's parts. (Some parts shown in the ROLLERGAMES manual (p.61) are not used in this new assembly.)

PROCEDURE:

NOTE: The following procedures require access to the upper portion of the playfield; however, the playfield can remain in the game, while the work is being done, and none of the playfield cables requires disconnection. Turn OFF the game. Remove the playfield glass. Lift the playfield from its tilting hinge brackets, until the upper portion is accessible. Place the playfield on the cabinet carefully to avoid damaging any parts. Remove the screws mounting the plastic shield to the end of the playfield.

1. Coil and Solenoid Bracket Assembly Replacement:

- A. Unsolder the wires connected to the Coil, noting each wire's coil terminal.
- B. Remove the solenoid bracket Mounting Screws (19), retaining them for reassembly.
- C. Remove the AE-23-800 Coil (1), and replace it with an AE-26-1200 Coil.
- D. Replace the Solenoid Bracket Assembly, p/n B-13488, (3) with a new 'revision A' Assembly. (The revision A Solenoid Bracket Assembly has a slightly shorter solenoid stop than the original assembly.)
- E. Mount the Coil (1) and Solenoid Bracket Assembly (3), as they were on the original unit; install and tighten the bracket Mounting Screws (19), using Loc-Tite.
- F. Solder the wires to the new Coil, connecting them to the proper terminals (noted in step A).

2. Coil Plunger, Drive Link, and Spring Replacement:

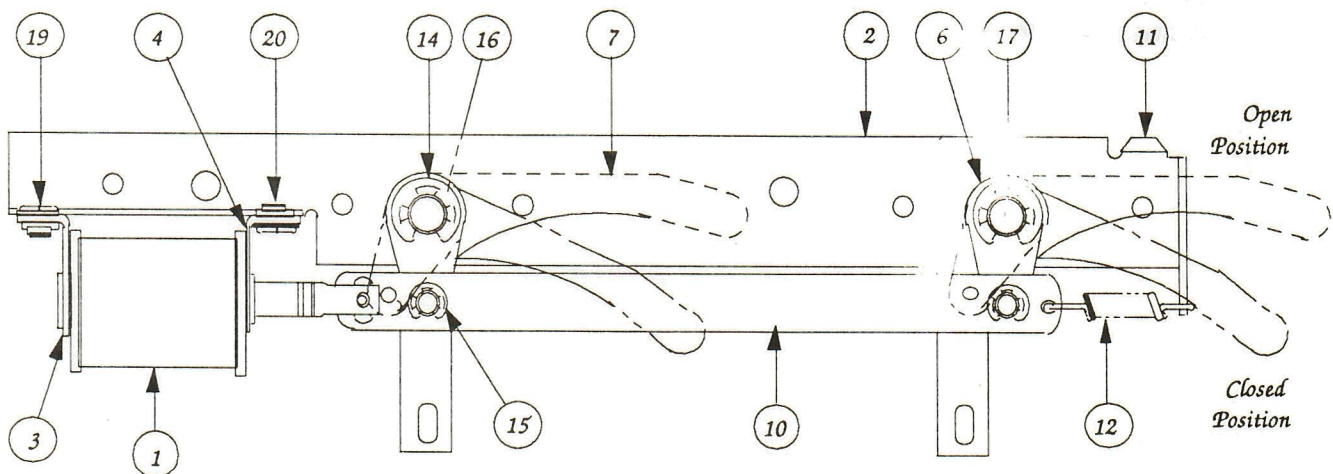
- A. Remove the two "E" Rings attaching the old Diverter Drive Link to the two black, plastic Arm Assemblies; retain these "E" Rings for reassembly.
- B. Remove the spring at the end of the old Drive Link; remove the old Drive Link, including the spring-attached Coil Plunger.

2. Coil Plunger, Drive Link, and Spring Replacement (Continued)

- C. Replace all of the old Drive Link parts (coil plunger, springs, etc.) with the new Link-Plunger-Spring Assembly (10), p/n B-13843, sliding the plunger into the coil and inserting the post of each Arm Assembly (7) into the proper hole of the new Link-Plunger-Spring Assembly.
- D. Attach an "E" Ring on each Arm Assembly post to reassemble the Link-Plunger-Spring Assembly. Slip the loop of the Spring into the hole of the Diverter bracket, where the old spring was removed.
- E. Move the updated Diverter Assembly back and forth several times to verify that it is moving freely, without binding. If necessary, apply a small amount of Williams' Drop Target Grease (or similar lubricant) to the rotating posts on each Arm Assembly.

3. Final Preparation.

- A. After the Upper Diverter Assembly improvements are completed, reinstall the plastic shield on the playfield, carefully reinstall the playfield in the game cabinet, and check to see that all cables are properly located (not kinked or binding).
- B. Reinstall the playfield glass, and prepare the game for play. Play several games to verify that the Upper Diverter Assembly is operating satisfactorily. NOTE: Installation of Revision 2 (or higher) game software is recommended for satisfactory operation.



Upper Diverter Assembly
p/n C-13489 , Rev. C

Item	Part Number	Description	Item	Part Number	Description
1	AE-26-1200	Coil Assembly	11	23-6577	Rubber Bumper
2	C-13490	Diverter Bracket Assy	12	10-362	Spring
3	B-13488	Solenoid Bracket Assy	13	Not Used on rev. C	
4	01-8-508-S	Solenoid Bracket	14	20-8712-25	"E" Ring, 1/4" Shaft
5	Not Used on rev. C		15	20-8712-18	"E" Ring, 3/16" Shaft
6	A-13491	Drive Arm Assy	16	4700-00073-00	Flatwasher
7	C-13432	Diverter Gate/Shaft Assy	17	20-8716-2	Roll Pin, 3/32 x 5/8
8	Not Used on rev. C		18	Not Used on rev. C	
9	Not Used on rev. C		19	4008-01017-06	M/Screw, #8-32 x 3/8
10	B-13843	Plunger Assembly	20	4006-01003-06	M/Screw, #6-32 x 3/8

SERVICE BULLETIN

INCREASING SMASH TV EARNINGS!

Information:

If your Smash TV is in a location where there are many younger players (under 15), or if your Average Player Game Time is less than 2:00 minutes, Earnings can be **INCREASED 20% to 40%** by reducing game difficulty.

Procedure:

We suggest setting the Game Difficulty Level to 2 (easier), and the Lives Per Play Adjustment to 4.

D I N E R

OPERATIONS MANUAL

AMENDMENT #1

The following corrections affect the Operations Manual (16-571-101) for the *D I N E R* game.

- 1. The coil for the Diverter on the Right Ramp was listed as AE-26-1200; it should be AE-26-1500. Please mark this correction in your manual, as follows:**
 - A. Inside Front Cover: Change Solenoid Table entry for Sol. No. 14, Diverter, in rightmost column from AE-26-1200 to AE-26-1500.**
 - B. Page 32: Change Solenoid Table entry for Sol. No. 14, Diverter, in rightmost column from AE-26-1200 to AE-26-1500.**
 - C. Page 61: Change part number of coil [item 6 in the Ramp Diverter Assembly (p/n B-13346) listing] from AE-26-1200 to AE-26-1500.**
- 2. The Fuse Listing on page 40 should be corrected as follows:**
 - A. The Aux Power Driver Board shown in the diagram should have a part number of D-12247-566, NOT -571.**
 - B. The item 2 entry for fuse F1 on the Aux Power Driver Board should be changed to 2-1/2A. This fuse designator can join F2A, F3, and F4 on the line above its present entry.**

Beginning with *DINER*, Williams Electronics Games is using a group of new lamp sockets on the Insert Board for Backglass illumination. Prior to *DINER*, Insert Boards were typically assembled with sockets that required screwing, stapling, and soldering.

From the player's point of view, the game lighting is much like other pinball games.

For the manufacturer *and* the game service technician, these new sockets represent an increase in reliability and a decrease in lamp problems on the Insert Board. They also aid in locating any lamp problems and reduce the amount of work involved in remedying these problems by eliminating the desoldering and soldering, required to replace a lamp socket on earlier games. Now, the repair is simply applying pressure on the wires from both sides of a vertical terminal, to ensure good electrical contact in the socket. Bulb replacement is simplified to a 'snap out-snap in' technique, using #555 bulbs for general and feature illumination and #906 bulbs for flashlamp circuits.

Lamp Socket Identification:

- 24-8817 WHITE socket for #555 bulb (24-8768), without diode, for general illumination locations.
- 24-8818 BLACK socket for #906 Flashlamp (24-8802), without diode.
- 24-8817 WHITE socket for #555 bulb (24-8768), with 1N4004 diode, for controlled, feature lamp locations.



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Midway Mfg. Co.

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January 31, 1990

S E R V I C E B U L L E T I N

GAME: "TRI-SPORTS" (KIT)

SUBJECT: POSSIBLE PROGRAM ERROR

ON "TRI-SPORTS" WHEN TRYING TO SELECT A GAME, IF YOU MOVE THE TRACKBALL IN THE UP DIRECTION AND THE GAME RESETS, YOU HAVE A PROGRAM ERROR. PROGRAM ROMS LABELED VERSION 3 (V-3) CORRECT THIS CONDITION.

NOTE: THE PROGRAM ROMS ARE AT LOCATIONS A5,A6,B5, & B6.

ONLY THESE FOUR ROMS NEED TO BE VERSION 3.

THANK YOU,

MIDWAY MANUFACTURING COMPANY
SERVICE DEPARTMENT



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S E R V I C E B U L L E T I N

DATE: MARCH 13, 1990

SB16

GAME: TRI-SPORTS (KIT)

SUBJECT: ERROR IN THE OPERATIONS MANUAL

AN ERROR HAS BEEN DETECTED IN THE TRI-SPORTS KIT MANUAL. ON PAGE 1-2, IN THE SECTION THAT TALKS ABOUT MONITORS, IT INCORRECTLY STATES THAT THE MONITOR SHOULD BE HORIZONTALLY MOUNTED. THIS GAME NEEDS A VERTICALLY MOUNTED MONITOR. PLEASE KEEP THIS IN MIND WHEN INSTALLING ANY TRI-SPORTS KITS.

WE ARE SORRY FOR ANY INCONVENIENCES THAT MAY HAVE OCCURRED DUE TO THIS ERROR.

BALLY\MIDWAY
CUSTOMER SERVICE



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SEPTEMBER 17, 1990

SB17B

S E R V I C E B U L L E T I N

GAME: POOL SHARKS

SUBJECT: A/C SELECT RELAY (SOLENOID 12) FAILURE.

INFORMATION: FOUR PROCEDURES ARE RECOMMENDED TO PREVENT FAILURE
 OF THE A/C SELECT RELAY (SOLENOID 12) LOCATED ON THE
 AUX POWER DRIVER BOARD.

1. ROM UPDATE:
 A SOFTWARE PROBLEM MAY CAUSE THE A/C SELECT RELAY (SOL. 12)
 TO FAIL. REPLACE THE ROMS CURRENTLY IN POSITIONS U26 AND U27
 WITH ROMS LABELED LA5.
2. KNOCKER COIL BRACKET SHORTED TO GROUND:
 THE KNOCKER COIL BRACKET, LOCATED IN THE UPPER LEFT CORNER OF
 THE BACKBOX SHOULD NOT COME IN CONTACT WITH GROUND. BE SURE
 THAT THE GROUND BRAID DOES NOT TOUCH THIS BRACKET.
3. DIVERTER COIL SHORTED TO GROUND:
 CHECK TO MAKE SURE THAT THE GROUND BRAID THAT GOES BETWEEN THE
 BACKBOX AND THE LOWER CABINET, HAS A CLEAR PLASTIC INSULATOR
 SLEEVE AND IS POSITIONED SO THE BRAID WON'T TOUCH THE DIVERTER
 COIL. (THE DIVERTER COIL IS LOCATED ON THE VERY BACK OF THE
 PLAYFIELD).
4. ADD A 2.2uf, 250V, 20% CAPACITOR ACROSS PINS 2 AND 6 OF THE
 A\C SELECT RELAY.

THANK YOU,

MIDWAY MANUFACTURING CO.
SERVICE DEPARTMENT



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JULY 20, 1990

SB19

S E R V I C E B U L L E T I N

SUBJECT: INTERMITTENT LAMPS ON "PIGSKIN"

IF YOU ARE EXPERIENCING INTERMITTENT FAILURES ON EITHER THE BLOCK, SCATTER, BAD ATTITUDE, GET THE BALL, OR MAN TO MAN LAMPS, CHECK THE LAMP BOARDS FOR IMPROPER MASKING.

TO GET AT THE LAMP BOARDS FOLLOW THESE STEPS:

- * REMOVE THE SCREWS FROM THE PLASTIC STRIP THAT HOLD THE SCREENED OVERLAY IN PLACE.
- * UNLATCH AND REMOVE THE CONTROL PANEL.
- * LIFT OFF SCREENED OVERLAY

THERE ARE TWO LAMP BOARDS ON EACH SIDE OF THE MONITOR. USING A 1/4" NUT DRIVER, REMOVE THE MOUNTING SCREWS. NOW LOOK AT THE BACKSIDE OF THE PCB., CHECK TO MAKE SURE THAT THE WHITE MASKING THAT GOES AROUND THE SOCKET TRACES IS NOT TOUCHING THE TRACE WHERE THE SOCKET FINGERS WOULD BE TOUCHING. IF THIS DID HAPPEN, THE WHITE MASKING WOULD ACT AS AN INSULATOR, RESULTING IN INTERMITTENT LAMP ACTION OR THE LAMP NOT LIGHTING AT ALL. THIS MASKING CAN BE REMOVED EASILY WITH AN INDUSTRIAL BRUSH-ERASER.

THANK YOU,

MIDWAY MANUFACTURING SERVICE DEPT.

GENERAL PINBALL TROUBLESHOOTING

PROBLEM: BALL KICKS OUT INTO SHOOTER LANE, ONLY TO BOUNCE BACK INTO TROUGH.

SOLUTION: FROM THE SHOOTER LANE, BEND THE TROUGH'S VERTICAL BALL GUIDE, THAT IS CLOSEST TO THE BACKBOX, AWAY FROM THE BACKBOX. THIS WILL DEFLECT THE BALL DOWN AND AWAY FROM THE TROUGH.

PROBLEM: 2 (OR MORE) BALLS ARE SERVED INTO THE SHOOTER LANE.

SOLUTION: ADJUST THE TROUGH SWITCHES, ONE IS STICKING "ON". MAKE SURE THAT NONE OF THE TROUGH SWITCHES RUB AGAINST 1) EACH OTHER, 2) THE EDGE OF THE TROUGH SLIT, 3) THE TROUGH KICKER. ANOTHER POSSIBILITY IS THAT A LOCK SWITCH (IF THE GAME HAS MULTIBALL) JUST TURNED "ON" WITHOUT A BALL. EXAMINE THE LOCK SWITCHES, AND SEE THAT THEY OPEN AND CLOSE (WITH A BALL) IN THE DIAGNOSTIC "SWITCH EDGES".

PROBLEM: THE GAME KICKS OUT A LOCKED BALL WHEN IT IS NOT SUPPOSED TO START MULTIBALL.

SOLUTION: THAT BALL HOLDER SWITCH HAS TURNED "OFF" AND REMAINED "OFF" FOR TOO LONG. PROBABLY DUE TO VIBRATION AND A SWITCH THAT JUST BARELY TURNS "ON". IF THE LOCK HAS MULTIPLE SWITCHES, AN ILLEGAL PATTERN OF "ON" AND "OFF" SWITCHES CAN OCCUR FORCING THE GAME TO KICK THE LOCK. ADJUST THE SWITCH(S).

PROBLEM: ALL OR PARTIAL DROP TARGET SWITCHES DO NOT WORK.

SOLUTION: GO TO THE DIAGNOSTIC "SWITCH LEVEL" TEST, AND DROP ALL TARGETS. IF NO DROP TARGET SWITCHES ARE CLOSED, MAKE SURE THAT ALL THE 12 VOLT 3 PIN CONNECTORS ON THE INTERCONNECT BOARD AND ON THE DROP TARGET(S) ARE CONNECTED. IF SOME OF THE SWITCHES OPERATE, CLEAN THE OPTOS WITH A NON-OIL BASE (SAFE FOR PLASTIC) CLEANER. IF THIS HAS NO EFFECT, CHECK FOR BAD CONNECTIONS ON THE SWITCH CONNECTOR, OR MAKE SURE THAT THE OPTO INTERRUPTERS HAVE NOT BEEN HIT, BY THE TARGETS, AND HAVE BROKEN THE WIRES THAT CONNECT THE OPTO TO THE CIRCUIT BOARD.

PROBLEM: THE GAME SAYS TO ADJUST A SWITCH, BUT THE SWITCH WORKS WHEN I HIT IT WITH A BALL.

SOLUTION: THE "ADJUST SWITCH" SOFTWARE HAS BEEN FOOLED, NO ADJUSTMENT IS REQUIRED. IF IT IS A HARD SWITCH TO HIT BY YOUR PLAYERS, CONSIDER MAKING THE GAME EASIER TO PLAY.

PROBLEM: DURING A GAME, IT SOMETIMES ENDS A GAME AND SAYS "PINBALL MISSING", OR "WAITING FOR PINBALLS".

SOLUTION: YOUR GAME HAS JUST SLAMMED. ADJUST YOUR "SLAM TILT" SWITCH IN THE COIN DOOR. THE WEIGHT SHOULD BE RESTING ON THE INSULATED PORTION OF THE COIN DOOR. THE GAP SHOULD BE AT LEAST 1/8 INCH, MORE IF AFTER YOU CLOSE AND LOCK THE COIN DOOR IT CAN RATTLE. IF THE SLAM SWITCH IS NOT THE PROBLEM, CONFIRM THAT THE 5 VOLTS ON THE CPU BOARD IS BETWEEN 4.95 AND 5.25 VOLTS. IF NOT, CHECK FOR A BAD POWER SUPPLY, OR A BAD BOARD THAT REQUIRES TOO MUCH 5 VOLT POWER.

PROBLEM: A PLAYER HAS PLAYED A GREAT GAME, AND IS READY TO ENTER THEIR INITIALS. HOWEVER, WHEN ENTERING INITIALS THE DISPLAY LOCKS UP AND WILL NOT LET ME ENTER MY INITIALS.

SOLUTION: YOUR "GAME START" SWITCH IS STUCK "ON", ADJUST THE SWITCH.

PROBLEM: THE GAME WILL NOT END A BALL, ALL BALLS ARE IN THE TROUGH.

SOLUTION: WHEN THIS PROBLEM IS HAPPENING, GO INTO THE DIAGNOSTIC "SWITCH LEVELS" (NOTE, BE SURE NOT TO GO INTO COIL TEST AND FIRE ANY COILS), AND CONFIRM THAT ALL THE TROUGH SWITCHES ARE "ON". NORMALLY, ONE IS NOT DISPLAYED, AND THAT IS THE SWITCH THAT NEEDS ADJUSTMENT.

PROBLEM: A PLAYER SHOOTS A BALL INTO A BALL HOLDING DEVICE (AN EJECT, BALL POPPER, KICKER, ETC.) AND NOTHING HAPPENS (NO POINTS OR SOUND) FOR ABOUT 10-20 SECONDS, THEN THE BALL IS KICKED OUT.

SOLUTION: THE SWITCH IN THE BALL HOLDING DEVICE DID NOT TURN "ON", ADJUST THE SWITCH.