

WILLIAMS

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M Y S T I C M A R A T H O N ®

SERVICE MANUAL

For service...

Call your authorized
WILLIAMS distributor

WILLIAMS
Electronics, Inc.
3401 N. California Ave.
Chicago, IL 60618

ROM SUMMARY

ROM	PART NO.	DESCRIPTION	IC NO.	BOARD
Sound ROM	A-5343-10510	2764 PROM, 8Kx8	IC8	CPU
MARATHON 2	A-5343-10511	2732 PROM, 4Kx8	IC9	CPU
MARATHON 3	A-5343-10512	2732 PROM, 4Kx8	IC10	CPU
MARATHON 4	A-5343-10513	2764 PROM, 8Kx8	IC11	CPU
MARATHON 5	A-5343-10514	2764 PROM, 8Kx8	IC12	CPU
MARATHON 6	A-5343-10515	2764 PROM, 8Kx8	IC13	CPU
MARATHON 7	A-5343-10516	2764 PROM, 8Kx8	IC14	CPU
MARATHON 8	A-5343-10517	2764 PROM, 8Kx8	IC15	CPU
MARATHON 9	A-5343-10518	2764 PROM, 8Kx8	IC16	CPU
MARATHON 10	A-5343-10519	2764 PROM, 8Kx8	IC17	CPU
MARATHON 11	A-5343-10520	2764 PROM, 8Kx8	IC18	CPU
MARATHON 12	A-5343-10521	2764 PROM, 8Kx8	IC19	CPU
MARATHON 13	A-5343-10522	2764 PROM, 8Kx8	IC21	CPU
MARATHON 14	A-5343-10523	2764 PROM, 8Kx8	IC22	CPU
MARATHON 15	A-5343-10524	2764 PROM, 8Kx8	IC23	CPU
MARATHON 16	A-5343-10525	2764 PROM, 8Kx8	IC24	CPU
MARATHON 17	A-5343-10526	2764 PROM, 8Kx8	IC25	CPU
MARATHON 18	A-5343-10527	2764 PROM, 8Kx8	IC26	CPU
Special Chip 2	A-5410-10083	Special Chip	IC29	CPU
Special Chip 2	A-5410-10083	Special Chip	IC30	CPU
Clock-ROM 1	A-5282-10295	82S123 ROM, 32x8	IC14	VIDEO
MARATHON 19	A-5343-10337	2764 PROM, 8Kx8	IC41	VIDEO
Horiz-sync ROM 1	A-5282-10294	82S129 ROM, 256x4	IC47	VIDEO
MARATHON 20	A-5343-10335	2764 PROM, 8Kx8	IC57	VIDEO
MARATHON 21	A-5343-10336	2764 PROM, 8Kx8	IC58	VIDEO
Decoder-ROM 5A (Horizontal)	A-5282-10292	6349 ROM, 512x8	IC60	VIDEO

CPU-BOARD JUMPERS: W1, W3, W6, W7, W10, W11. Remove jumper W11 for cocktail games.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been certified to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to correct the interference.

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MYSTIC MARATHON Conversion-Kit K1 For DEFENDER

I. WARNING

Some parts salvaged from an old game are required to complete your kit. These salvaged parts MUST operate perfectly, or the converted game cannot perform properly or safely. ALWAYS repair circuitboard malfunctions and cabinet damage before conversion is attempted.

II. PARTS PROVIDED

- circuitboard panel with CPU and video boards (1)
- marquee glass (1)
- CRT glass (1)

- speaker cable (1)
- power cable (1)
- logic harness (1)

- control panel with joystick (1)
- side decals (2)

...plus hardware, cable ties, etc. (complete list is at end of assembly procedure)

III. TOOLS AND SUPPLIES REQUIRED

- electric screwdriver
- wire cutters
- pliers

- soldering iron & solder
- Phillips screwdriver
- 1/4" hex nut driver

- adjustable wrench
- 180-grit sandpaper (sander)
- black, high-gloss latex paint

IV. PROCEDURE

- A. Installing PC Boards
- 1. Remove the main harness.
- 2. Unsolder the wires on the MEMORY-PROTECT switch. Clean both wire contacts on the switch.
- 3. Carefully remove the metal circuitboard panel. Leave the transformer board in the game.

- [] B. Installing the PCB Plate Assembly (Circuitboard Panel)
- [] 4. Using 6 H-F screws (supplied), mount the PCB support bracket assembly in the center of the cabinet floor.
- [] 5. Attach the PCB plate assembly to the PCB support bracket assembly. The boards should face the back door.
- [] 6. Screw the two side-brackets onto the PCB plate assembly with finger tightness.
- [] 7. Mount the side brackets into the sides of the cabinet and move the ground braid on the right side (looking from the back of the game) under the bracket.
- [] 8. Tighten the side-bracket screws into the PCB plate assembly.
- [] 9. Remove one of the screws holding the line filter to the transformer board. Replace this screw, securing one end of the green logic-ground wire (supplied) to the line filter (ground).
- [] 10. Remove one of the screws holding the PCB support bracket assembly to the top of the cabinet floor. Replace this screw, securing the remaining end of the green logic-ground wire to the PCB support-bracket assembly.
- [] 11. Locate the two loose ends of ground braid originally connected behind the DEFENDER circuitboard panel. Using a screw, connect these two ends together and fasten them to the cabinet.
- [] 12. Remove the volume control from the DEFENDER circuitboard panel.
- [] 13. Remount the volume-control bracket close enough to the PCB plate assembly so that the cable can reach CPU-board jack 1J3. Mount the bracket with one screw connecting to the ground braid. The control will be lower in the cabinet than it was originally, but you should still be able to adjust volume from the coin door.
- [] C. Installing Interboard Wiring
- [] 14. Following the interboard-wiring diagram in your service manual, connect the main cable that runs between the boards and coin door.
- [] 15. Check and clean the input jack on the power-supply board. Replace any burned or damaged pins.
- [] 16. Check the green wires between the transformer secondary and the transformer-input connector. Replace these wires if they look burned.

[] D. Installing the Control Panel

- [] 17. Remove the DEFENDER control panel.
- [] 18. Mount the new MYSTIC MARATHON control panel.
- [] 19. If necessary, move the trunk latches in the cabinet down to securely hold the new control panel in place.

[] E. Installing Cables

- [] 20. Plug the new control-panel cable onto CPU-board jacks 1J5 and 1J6.
- [] 21. Connect the four-pin power connector (with one black and one gray wire) to the control panel cable.
- [] 22. Use the push-on lugs to attach the green-brown and red wires to the contacts of the MEMORY-PROTECT switch on the coin door.
- [] 23. Use the new shielded cable to attach Video-Board jack 2J2 to the monitor's video and sync inputs.
- [] 24. Attach the speaker extension-cable (supplied) to the old speaker cable and to CPU-Board jack 1J2. Route this cable through the space between the monitor and monitor cover.

[] F. Cabinet Modifications

- [] 25. Position the FCC sticker near the line cord at the left-rear side of the cabinet.
- [] 26. Sand the sides of the cabinet with 180-grit sandpaper. Clean off the sawdust.
- [] 27. Paint the sides of the cabinet with black, high-gloss latex paint.
- [] 28. Install each game-decal (two supplied) parallel to the back edge of the cabinet.
- [] 29. Replace the old marquee glass with the new glass (supplied).
- [] 30. Replace the old CRT glass with the new glass (supplied).

- [] G. Electrical and Functional Checkout
- [] 31. Check for wiring errors and leftover parts.
- [] 32. Run the game through all its built-in diagnostics.
- [] 33. Check the monitor using adjustment patterns and adjust if necessary.
- [] 34. Burn in the game by leaving it in Auto-Cycle Mode for at least an hour. Check for error messages.
- [] 35. Turn the game off. Zero the program in CMOS by removing one battery and then returning it to the CPU board. Turn the game off and on twice.
- [] 36. Play the game several times before releasing it to a location.

NOTICE

"MYSTIC MARATHON" and "DEFENDER" are registered trademarks of WILLIAMS ELECTRONICS, INC.

MYSTIC MARATHON K-1 PARTS LIST

PCB support mounting-bracket assembly	A-10266	2 required
PCB support-bracket assembly	B-10391	
PCB-plate assembly	D-9881-1	
Including:		
CPU Board	D-9411	
Video Board	D-9413	
Control panel assembly	D-10385	
Speaker cable	H-10350	
Transformer cable	H-10352	
PCB interconnection cable	H-10387-1	
Video-signal cable	H-9784-1	
CRT cover	17-1062	
Marquee	31-1301-3008-K	
Decal, left side	31-1303-3008-K	
Decal, right side	31-1304-3008-K	
Machine screw 8-32x1/2	P-RH-S 4008-01017-08	6 required
Nut 8-32x1/2	KEPS 4408-01128-00	6 required
H-F screw #8x11/16	PL-HWH 4608-01081-11	15 required

MYSTIC MARATHON Conversion-Kits K2 & K3

I. Kit K2: for JOUST, ROBOTRON and STARGATE

II. Kit K3: for BUBBLES

III. WARNING

Parts salvaged from an old game are required to complete your kit. These salvaged parts MUST operate perfectly, or the converted game cannot perform properly or safely. ALWAYS repair circuitboard malfunctions and cabinet damage before conversion is attempted.

IV. PARTS PROVIDED

I] circuitboard panel with CPU and video boards	(1)
I] marquee glass	(1)
I] CRT glass	(1)
I] speaker cable	(1)
I] power cable	(1)
I] logic harness	(1)
I] control panel with joystick	(1)
I] side decals	(2)

...plus hardware, cable ties, etc. (complete list is at end of assembly procedure)

V. TOOLS AND SUPPLIES REQUIRED

I] keyhole saw or coping saw
I] electric screwdriver
I] wire cutters
I] soldering iron & solder
I] pliers
I] Phillips screwdriver
I] hex driver
I] 180-grit sandpaper (sander)
I] black, high-gloss latex paint

VI. PROCEDURE

I] A. Installing PC Boards

- | | |
|----|--|
| I] | 1. Carefully remove all circuitboards and remove the metal circuitboard panel. Set these aside for later use. Leave the transformer chassis in the game. |
| I] | 2. Unsolder the wires on the MEMORY-PROTECT and cashbox ADVANCE switches. Clean wire contacts on both switches. |

- [] 3. Remove the logic harness. (The power harness should remain in the game.)
- [] 4. Remount the power-supply board (board with numerous fuses) on the opposite side of the circuitboard panel from the CPU board.
- [] 5. Remount the metal heatsink beside the power-supply board.
- [] 6. Attach the heatsink cable to its power-supply connector.

[] B. Installing Interboard Wiring

- [] 7. Following the interboard-wiring diagram in your service manual, connect all cables that run between the boards.
- [] 8. Carefully cut off the transformer-secondary connector near the body of the connector.
- [] 9. Butt the orange wire from the transformer secondary with the orange wire in the power harness (supplied). Place a one-in, one-out plastic splice (supplied) over the two wires. Using pliers, crimp the splice tightly together.
- [] 10. Proceeding wire color by wire color, use this technique with all but the black, green and gray-green secondary-wires.
- [] 11. Place a one-in, two-out plastic splice (supplied) over the black wire from the transformer secondary and the looped black wire from the power harness. Using pliers, crimp the splice tightly together.
- [] 12. Repeat the previous step with the green and gray-green wires from the transformer secondary.
- [] 13. Check and clean the input jack on the power-supply board. Replace any burned or damaged pins.

[] C. Installing the Circuitboard Panel

- [] 14. Using the L-bracket and screws (supplied), mount the new circuitboard panel to the top of the cashbox vault. The power-supply board should face the coin door.
- [] 15. JOUST CONVERSIONS ONLY: Clip the extra secondary wire off at the transformer tab.
- [] 16. Screw the two side-brackets onto the circuitboard panel with finger tightness.
- [] 17. Mount the side brackets into the sides of the cabinet.
- [] 18. Tighten the side-bracket screws into the circuitboard panel.

- I] 19. Remove one of the screws holding the line filter to the transformer board (or chassis). Replacing this screw, secure one end of the green logic-ground wire (supplied) to the line filter (ground).
- I] 20. Remove one of the screws holding the circuitboard panel to the top of the cashbox vault. Replacing this screw, secure the remaining end of the green logic-ground wire to the circuitboard panel.
- I] 21. Remove the volume control from its cabinet bracket.
- I] 22. Remount the volume-control bracket close enough to the circuitboard panel so that the cable can reach the CPU board. The control will be lower in the cabinet than it was originally, but you should still be able to adjust volume from the coin door.

- I] D. Installing the Control Panel
- I] 23. Leaving the hinge with the game, remove the control panel. Save the five mounting bolts, nuts and washers from the control panel.
- I] 24. Using a keyhole or coping saw, cut about a foot from the center of the rail that holds up the CRT glass. Leave a few inches of this rail under each side of the CRT glass.
- I] 25. Using the old bolts, mount the new control panel to the hinge.

- I] E. Installing Cables
- I] 26. Connect cabinet, power, monitor and general-illumination cables.
- I] 27. Plug the new control-panel cable into the control panel and CPU board.
- I] 28. Use the push-on lugs to attach the green-brown and red wires to the contacts of the MEMORY-PROTECT switch on the coin door.
- I] 29. Use the push-on lugs to attach the green-brown and green wires to the ADVANCE switch on the coin door.
- I] 30. Unplug the coin door from the old harness and plug it into the new harness (wires going to Video and CPU Boards).
- I] 31. Use the new shielded cable to attach Video-Board jack 2J2 to the monitor's video and sync inputs.
- I] 32. Attach the speaker extension-cable (supplied) to the old speaker cable and to the CPU Board.

I] F. Cabinet Modifications

- I] 33. Position the FCC sticker near the line cord at the left-rear side of the cabinet.
- I] 34. Sand the sides of the cabinet with 180-grit sandpaper. Clean off the sawdust.
- I] 35. Paint the sides of the cabinet with black, high-gloss latex paint.
- I] 36. Install each game decal (two supplied) parallel to the back edge of the cabinet.
- I] 37. Replace the old marquee glass with the new glass (supplied).
- I] 38. Replace the old CRT glass with the new glass (supplied).

I] G. Hardware and Software Examination

- I] 39. Check for wiring errors and leftover parts.
- I] 40. Run the game through all its built-in diagnostics.
- I] 41. Burn in the game by leaving it in Auto-Cycle Mode for at least an hour. Check for error messages.
- I] 42. Turn the game off. Zero the program in CMOS by removing one battery and then returning it to the CPU board. Turn the game off and on twice.
- I] 43. Play the game several times before releasing it to a location.

NOTICE

"MYSTIC MARATHON," "BUBBLES," "JOUST," "ROBOTRON" and "STARGATE" ARE registered trademarks of WILLIAMS ELECTRONICS, INC.

MYSTIC MARATHON K-2 PARTS LIST

PCB-support mounting-bracket assembly	A-10266	2 required
PEM-stud bracket assembly (PCB mounting-bracket assembly)	B-9980	
PCB-plate assembly	D-9881-2	
Including:		
CPU Board	D-9411	
Video Board	D-9413	
Control-panel assembly	D-9831-1	
Speaker cable	H-10350	
Transformer cable	H-10352	
PCB interconnection-cable	H-10387-2	
Video-signal cable	H-9784-1	
CRT cover	31-1302-3008-K	
Marquee	31-1301-3008-K	
Decal, left side	31-1303-3008-K	
Decal, right side	31-1304-3008-K	
Machine screw 8-32x1/2 P-RH-S	4008-01017-08	6 required
Nut 8-32x1/2 KEPS	4408-01128-00	6 required
H-F screw #8x11/16 PL-HWH	4608-01081-11	15 required
AMP 'wire tap' 18-14 Ga.	5822-10695-00	10 required

MYSTIC MARATHON K-3 PARTS LIST

PCB-support mounting-bracket assembly	A-10214	2 required
PEM-stud bracket assembly (PCB mounting-bracket assembly)	B-9980	
PCB-plate assembly	D-9881-2	
Including:		
CPU Board	D-9411	
Video Board	D-9413	
Control-panel assembly	D-9831-2	
Speaker cable	H-10350	
Transformer cable	H-10352	
PCB interconnection-cable	H-10387-2	
Video-signal cable	H-9784-1	
CRT cover	17-1065	
Marquee	17-1064	
Decal, left side	31-1303-3008-K	
Decal, right side	31-1304-3008-K	
Machine screw 8-32x1/2 P-RH-S	4008-01017-08	6 required
Nut 8-32x1/2 KEPS	4408-01128-00	6 required
H-F screw #8x11/16 PL-HWH	4608-01081-11	15 required
AMP 'wire tap' 18-14 Ga.	5822-10695-00	10 required

Power Turn-On

WARNING

THREE-WIRE PLUG. 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 power cord, and DO NOT cut off the ground pin.

WHEN THE GAME IS FIRST TURNED ON general illumination should light. A moment later the scanning "rug pattern" indicating RAM/ROM test should appear on the screen.

IN A CORRECTLY-RUNNING GAME tests will be followed by the message "INITIAL CHECKS INDICATE ALL SYSTEMS GO." If failure messages come up on the screen instead, refer to An Outline Of Built-In Test Procedures.

Game Operation

GAME START

INSERT COINS. The game allocates an adjustable number of credits per coin and displays this number on the CRT. Factory settings are one credit per quarter. Players are allowed to buy in (continue on the last wave they played) for an additional quarter. At factory settings, when two credits are displayed, pressing 2-PLAYER START initiates a two-player game.

PLAYER CONTROLS

//MOVE in any direction using the 8-way joystick.

//JUMP over obstacles! Press the JUMP button.

GAME PLAY

THE PLAYER CONTROLS THE JOYSTICK and JUMP button to compete in a marathon across several mystic isles. He must finish in the top three to go on to the next race.

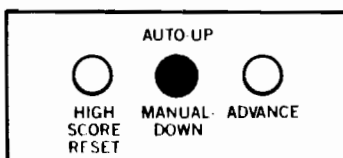
THE HAZARDS. Foot-stomping ogres, apple-tossing trees, whirlpools, rock monsters, geysers, sharks, wizards, giant clams, meanie mushrooms, lightning bolts, tornadoes, water monsters and rolling stones all suddenly appear and use their special powers to delay the player.

THE PLAYER COLLECTS THE CRYSTALS, pearls and golden mushrooms for bonus points. He can use his friends the helping hands, or find caves, bridges and holes that offer shortcuts. Butterflies, birds and balloons can fly the player above the hazards. Sleeping dragons act as slides. Leaf boats and sea horses ride the player over the water.

THE BUY-IN OPTION allows the player to re-race the marathon.

Bookkeeping Totals

BOOKKEEPING TOTALS SHOW YOU AT A GLANCE if game settings are bringing you a satisfactory return on your investment! Only games by WILLIAMS ELECTRONICS have this feature. Think of it as a unique way to keep your MYSTIC MARATHON game the leader of the pack when it comes to earnings...location after location, week in and week out!



Diagnostic Button Switches

ENTERING BOOKKEEPING MODE. Inside the coin door is a bracket with three button switches. Set the AUTO-UP/MANUAL-DOWN (center) switch to AUTO-UP. Press the ADVANCE switch to display BOOKKEEPING TOTALS on the screen. Now check those totals. Here's what to look for...

BOOKKEEPING TOTALS

LEFT SLOT COINS	432
CENTER SLOT COINS	0
RIGHT SLOT COINS	398
PAID CREDITS....	830
TOTAL BUY-INS	204
TOTAL TIME IN MINUTES	1826
TOTAL WAVES RUN	1666
TOTAL SINGLE PLAYER	689
TOTAL DUAL PLAYER	141
TOTAL CREDITS PLAYED.	830
AVERAGE TIME PER CREDIT	2:13

Bookkeeping Screen

NOTE: TOTAL CREDITS PLAYED = TOTAL SINGLE PLAYER + TOTAL DUAL PLAYER.
For the actual total, add TOTAL CREDITS PLAYED and TOTAL BUY-INS.

AVERAGE TIME PER CREDIT: TWO AND A HALF MINUTES. Your most important figure on the BOOKEEPPING TOTALS screen is AVERAGE TIME PER CREDIT. You'll want to pay special attention to this figure every day for this reason: Thorough field and factory research has shown that two and a half minute games both satisfy players and also keep the quarters flowing.

If games aren't running about two and a half minutes long, then collections probably aren't at their peak. You'll want to tailor your game to your game-playing public. It's easy. But only WILLIAMS games let you do it!

GAME ADJUSTMENTS

HIGH SCORE TO DATE ALLOWED	YES
PRICING SELECTION	3
LEFT SLOT UNITS	1
CENTER SLOT UNITS	4
RIGHT SLOT UNITS	1
UNITS REQUIRED FOR CREDIT	1
UNITS REQUIRED FOR BONUS CREDIT	0
MINIMUM UNITS FOR ANY CREDIT	0
DIFFICULTY OF PLAY	5
LETTERS FOR HIGHEST SCORE	3
RESTORE FACTORY SETTINGS	NO
CLEAR BOOKKEEPING TOTALS	NO
HIGH SCORE TABLE RESET	NO
AUTO CYCLE	NO
SET ATTRACT MODE MESSAGE	NO
SET HIGHEST SCORE NAME	NO

USE 'MOVE U-D' TO SELECT ADJUSTMENT
USE 'MOVE L-R' TO CHANGE THE VALUE
PRESS ADVANCE TO EXIT

Adjustments screen showing factory settings

Exclusive Game-Adjustments

1. Inside the coin door is a bracket with three button-switches. Set the AUTO-UP/MANUAL-DOWN (center) switch to AUTO-UP. Press the ADVANCE switch twice to display GAME ADJUSTMENTS on the screen.
2. With the AUTO-UP/MANUAL-DOWN switch set to AUTO-UP press the ADVANCE switch twice. The GAME ADJUSTMENTS screen will come up.
3. Next use the joystick: MOVE up or down to position the cursor beside the desired adjustment.
4. MOVE left or right to alter the value of an adjustment.

Now for the multiple-choice section! Choose one or more:

//MOVE left or right to choose the appropriate difficulty level (0 = easiest or extra liberal, 5 = average, 9 = hardest or extra conservative).

//SELECT GAME PRICING with standard or custom settings. See the Pricing Table later in this chapter.

//PUT YOUR OWN SLOGAN ON THE SCREEN! Another WILLIAMS exclusive! Here's how: (1) With the AUTO-UP/MANUAL-DOWN switch set to AUTO-UP, press ADVANCE twice so that the GAME ADJUSTMENTS screen comes up. (2) MOVE down to position the cursor beside SET ATTRACT MODE MESSAGE. (3) MOVE right to display YES. (4) Press ADVANCE to bring up the ATTRACT MODE MESSAGE screen. (5) Now enter up to two lines of 25 characters by following the instructions on the screen. (6) Once a message is entered, press ADVANCE to restore Game-Over Mode.

Will your message fit on the screen? Try it here first...

Pricing Table

Coin-Door Mechanism	Games/Price	Pricing Selection	Left Slot Units	Center Slot Units	Right Slot Units	Units Req'd For Credit	Units Req'd For Bonus Credit	Min. Units For Any Credit
Twin Quarter	●1/25¢, 4/\$1	3	1	4	1	1	0	0
Quarter,	1/25¢, 5/\$1	0	1	4	1	1	4	0
Dollar,	2/50¢, 4/\$1	0	1	4	1	1	0	2
Quarter	2/50¢, 5/\$1	0	1	4	1	1	4	2
	1/50¢, 2/\$1	5	1	4	1	2	0	0
	1/50¢, 3/\$1, 4/\$1.25	0	3	12	3	4	15	0
	1/\$1	0	1	4	1	4	0	0
	1/50¢, 3/\$1, 7/\$2	0	12	48	12	14	96	24
1DM, 5DM	2/1DM, 12/5DM	0	12	0	2	2	0	0
	●1/1DM, 6/5DM	2	6	0	1	1	0	0
1 Franc, 5 Franc	●1/2F, 3/5F only	4	1	16	6	2	0	0
25-Cent,	●1/25¢, 4/1G	6	1	0	4	1	0	0
1 Guilder	1/25¢, 5/1G	0	1	0	4	1	4	0
5 Franc,	●1/5F, 2/10F	7	1	0	2	1	0	0
10 Franc	●1/10F	8	1	0	2	2	0	0
1 Franc, 2 Franc	●2/1F, 5/2F	2	6	0	1	1	0	0
100 Lire, 200 Lire	●1/200 Lire	8	1	0	2	2	0	0
Twin Coin	●1/1 Coin	3	1	4	1	1	0	0
	●1/2 Coins	5	1	4	1	2	0	0
	1/4 Coins	0	1	4	1	4	0	0
	1/2 Coins, 3/4 Coins	1	1	4	1	2	4	0
	1/3 Coins, 2/5 Coins	0	2	0	2	5	0	0
1-Unit,	●1/2, 3/5	4	1	16	6	2	0	0
5-Unit	1/1, 5/5	0	1	0	5	1	0	0
	1/3, 2/5	0	2	0	10	5	0	0
Any	●Free Play	9	0	0	0	0	0	0

Game Pricing

PRICING SELECTION allows a shorthand method of setting the pricing functions. If a number from one to nine is entered into the PRICING SELECTION function, a corresponding standard setting (shown in the pricing table above) will be entered into the game. The rest of the pricing functions are automatically set for that standard.

FOR CUSTOM SETTINGS first set PRICING SELECTION to zero. Then set the remaining values according to the Pricing Table.

THE GAMES : PRICE RATIO TO START A GAME is equivalent to the ratio X : VS where:

X = SLOT UNITS

V = COIN VALUE

S = UNITS FOR START CREDIT

For example at factory settings with quarter chutes the variables produce 1 : 25x1 or one starting-game for 25¢.

THE GAMES : PRICE RATIO TO BUY IN is equivalent to the ratio X : VB
where:

B = UNITS FOR BUY-IN CREDIT (other variables as above)

For example, at factory settings the variables produce 1 : 25x1 or one buy-in game for 25¢.

Diagnostic-Mode Tests

SET THE AUTO-UP/MANUAL-DOWN SWITCH to the MANUAL-DOWN position and press ADVANCE. The game is now in its Diagnostic Mode and a ROM test is performed. With ROM test results present on the CRT display, set the AUTO-UP/MANUAL-DOWN switch to the AUTO-UP position. Enter subsequent tests by pressing ADVANCE once more for each test. After the last test, Game-Over Mode commences.

AUTO-CYCLE MODE permits continuous ROM, RAM and CMOS RAM tests to detect failures that only appear after numerous checksum comparisons. If an error is detected, Auto-Cycle Mode is aborted and a failure message is displayed on the CRT.

1. Open the coin door. It must remain open for AUTO CYCLE.
2. Display GAME ADJUSTMENTS.
3. MOVE down to AUTO CYCLE.
4. MOVE right to display YES.
5. Press ADVANCE.
6. To enter Game-Over Mode turn the game off and on.

An Outline Of Built-In Test Procedures

I. Power-Up Tests

A. RAM test

1. rug pattern as on other games using the WILLIAMS system
2. bad RAM is indicated on the CPU-board LED-indicator by an error code between 100 and 199 (eg., 1-3-1)

B. ROM test

1. bad ROM is indicated on the CPU-board LED-indicator by an error code between 200 and 299 (eg., 2-1-1)
 - a) error message may also appear on CRT
2. test has been passed when ALL SYSTEMS GO appears on the screen

C. CMOS-data test

1. checksums are compared
 - a) if CMOS fails test FACTORY SETTINGS RESTORED appears

II. Diagnostic-Mode Tests

A. ROM test (as above)

B. RAM test (as above)

C. CMOS-RAM test

1. error is displayed on CRT and LED readout on CPU board
2. if CMOS RAM is bad, error code 3 will appear on LED readout

D. sound test

1. sound-lines 1-8 are tested
2. bad sound-lines are indicated on the screen
3. use AUTO-UP to cycle through all the sounds and MANUAL-DOWN to continuously test one sound-line

- E. switch test
 - 1. the name of the switch is shown when that switch is closed
- F. crosshatch pattern (top screen only)
 - 1. aids technician in converging monitor
- G. purity screens
 - 1. solid red, green and blue screens
 - 2. for monitor adjustments and for checking color RAMs
 - a) tainted colors: degauss screen and adjust purity magnets
 - b) missing colors or vertical lines: possible color-RAM error
- H. color bars
 - 1. for monitor adjustments and for checking color RAMs
 - a) adjust color drives and cutoffs, screen and black-level controls for proper colors
 - b) missing colors or wrong colors: possible color-RAM error

Sound Self-Test

1. PRESS THE DIAGNOSTIC BUTTON on the CPU Board. Several electronic sounds should be produced. This sequence of sounds is repeated until the game is turned OFF and back ON.
2. NO SOUND IN DIAGNOSTIC TEST (but sounds are present in the Self-Test): Check the sound-select inputs (pins 2 through 9 of IC4) or replace the CPU Board and rerun the Diagnostic Test (see SOUND TEST above).
3. NO SOUND: Check the -12V-supply voltage on the CPU Board. If this voltage is low (or AC ripple seems too high)...
 - (A) check the power supply at TP6 for -14.8VDC;
 - (B) check for excessive AC (over 0.075VAC) at power-supply TP6.
 - (C) If you find too much AC, replace C3 on the power supply.
4. STILL NO SOUND: Turn the volume control all the way up. With the game turned on, momentarily place a powered-up AC soldering-pencil on the center tap of the volume control. DO NOT use a soldering iron of over 40 watts. Cordless models will NOT work here.
 - (A) If you hear a low hum, the power-amplifier chip (TDA2002), volume control and speaker are okay. replace C27 and C26.
 - (B) If you don't hear a hum, try the test again with the volume control turned halfway up.

