

WillFA7

Williams SYS3–SYS7 · FPGA MPU + Driver Board

User Manual

Software Version x.17 · Hardware Version 1.3

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⚠ **WARNING** WillFA7 can damage your pinball machine if installed or configured incorrectly. This is a community project with no commercial backing. The author accepts no liability for any damage that may result from its use. Proceed at your own risk.

1. Introduction

WillFA7 is an FPGA-based replacement for Williams System 3 through System 7 MPU and driver boards. The driver board is integrated directly on the PCB — WillFA7 replaces both boards in a single drop-in.

2. Installation

WillFA7 uses the same connectors and mounting holes as the original Williams System 3–7 MPU and driver board. Install WillFA7 at the location of the original driver board — no rewiring or mechanical modification required.

On first power-up with a game, set option Dip 1 (Init NVRAM) to ON:

1. Power on the machine. The display shows the Williams PROM number. Wait until the Diag LED goes off.
2. Power off the machine and turn Dip 1 back to OFF.
3. Power on. The board is now ready for normal play.

3. DIP Switch Settings

3.1 S1 — Game Select

S1 selects which ROM image WillFA7 loads from the SD card. Set the switches to match your machine using Appendix A.

3.2 S2 — Board Options

Default setting is all switches OFF.

DIP	Label	Description
Dip 1	Init NVRAM	When ON, clears all NVRAM for the selected game during boot. Use on first power-up or to perform a full factory reset. Turn OFF after initialisation is complete.
Dip 2 + Dip 3	Solenoid Pulse Time	Sets the pulse duration for special solenoids. Both OFF (default): 60 ms. Dip 3 ON only: 50 ms. Dip 2 ON only: 40 ms. Both ON: 35 ms. The default 60 ms matches original gameplay for most machines.
Dip 4	Not Used	Not implemented.
Dip 5	Not Used	Not implemented.
Dip 6	Solenoid 22 Always Active	Required for Contact (SYS3) — the moving target relay solenoid must remain permanently energised. Do not enable for any other game.

Solenoid Pulse Time Reference

Dip 2	Dip 3	Pulse Time
OFF	OFF	60 ms (default)
OFF	ON	50 ms
ON	OFF	40 ms
ON	ON	35 ms

Boot Sequence

On power-up, WillFA7 runs through three boot phases. Progress is shown on the playfield displays.

Phase 1 — Initialisation

Immediately after power-on, the ON LED illuminates and the playfield displays show:

- Player 1: FPGA program version.
- Player 2: Selected game number (S1 value).
- Player 3: lisy.dev FPGA board identifier.
- Player 4: Current boot phase.
- Credit display: Option DIP bank value (S2).

Phase 2 — SD Card Read

The board reads the SD card and loads the ROM image selected by the game select DIP bank.

> **ℹ NOTE** If the SD card cannot be read, the red SD Error LED illuminates and Player 4 shows '56'. Verify the card is seated correctly.

Phase 3 — Game Execution

The ROM indicated by the game select switch is loaded and executed.
The selected ROM is loaded and executed. When the game is running normally (regular display strobes present), the Active LED illuminates.

5. Game Settings

WillFA7 stores game settings in flash memory individually per game. Access them the same way as on the original MPU board. Note the following system-specific details.

5.1 System 3

WillFA7 provides a single diagnostic LED plus Data, Enter, Diagnostic, and Function buttons in the same positions as the original board. To change a game setting:

4. Power the machine off and back on (fresh boot).
5. Press the Diag button on the WillFA7 board — the nearby LED blinks twice.
6. Refer to Table 1 in your game manual to find the function number you want to change.
7. Set the bottom switch to that function number.
8. Set the top switch to the desired value.
9. Press Enter — the LED blinks to confirm the change.

5.2 Systems 4, 6, and 7

Settings for System 4, 6, and 7 machines are accessed the same way as on the original Williams MPU for that system. Refer to your machine's game manual for the full list of adjustable functions.

Appendix A — Supported Game List

All SYS3–SYS7 titles are supported.

No	ON Switches	System	Game
0	all OFF	SYS3	Hot Tip
1	S1	SYS3	Lucky Seven
2	S2	SYS3	World Cup
3	S1,S2	SYS3	Contact
4	S3	SYS3	Disco Fever
5	S1,S3	SYS4	Pokerino
6	S2,S3	SYS4	Phoenix
7	S1,S2,S3	SYS4	Flash
8	S4	SYS4	Stellar Wars
9	S1,S4	SYS6	Tri Zone
10	S2,S4	SYS6	Time Warp
11	S1,S2,S4	SYS6	Gorgar
12	S3,S4	SYS6	Laser Ball
13	S1,S3,S4	SYS6	Firepower
14	S2,S3,S4	SYS6	Blackout
15	S1,S2,S3,S4	SYS6	Scorpion
16	S5	SYS6A	Algar
17	S1,S5	SYS6A	Alien Poker
18	S2,S5	SYS7	Black Knight
19	S1,S2,S5	SYS7	Jungle Lord
20	S3,S5	SYS7	Pharaoh
21	S1,S3,S5	SYS7	Solar Fire
22	S2,S3,S5	SYS7	Barracora
23	S1,S2,S3,S5	SYS7	Cosmic Gunfight
24	S4,S5	SYS7	Varkon
25	S1,S4,S5	SYS7	Warlok
26	S2,S4,S5	SYS7	Time Fantasy
27	S1,S2,S4,S5	SYS7	Joust
28	S3,S4,S5	SYS7	Firepower II
29	S1,S3,S4,S5	SYS7	Laser Cue
30	S2,S3,S4,S5	SYS7	Defender
31	S1,S2,S3,S4,S5	SYS7	Star Light