

OPERATOR REFERENCE GUIDE

Installation and User Guide

A plain-language guide to installation, jumper settings, game rules, diagnostics, and service tests

The one rule to remember

No decimal point means a score. A decimal point means the machine is talking to you.

Bally Home Replacement Controller | Firmware 2.02

Installation

Follow this procedure to replace the original power-supply and controller boards with the Bally Home replacement system.

Safety and compatibility

WARNING: Switch the pinball machine off and unplug it from the wall outlet before opening the cabinet or disconnecting any wiring. Never perform installation work while the machine is energized.

IMPORTANT: The original power-supply board is not compatible with the replacement system and **MUST** be removed. Do not attempt to operate the replacement controller with the original power-supply board installed.

Board installation

1. Confirm that the machine is switched off and unplugged from the wall outlet.
2. Locate the original power-supply board on the lower rear wall inside the pinball cabinet.
3. Disconnect the two original wiring-harness connectors from the power-supply board, then remove the original board from the cabinet.
4. Install and securely fasten the new jumper board in place of the original power-supply board. Connect the two original wiring-harness connectors to the matching connectors on the jumper board.
5. Connect the supplied two-wire cable to J3, the two-pin connector on the jumper board. Route the cable upward through the cabinet alongside the original wiring. Keep it clear of moving mechanisms, sharp edges, and pinch points.
6. Remove the original controller board and securely install the replacement controller. Connect the original wiring to the replacement controller exactly as shown in the applicable System 1 or System 2 connection diagram.
7. Connect the other end of the supplied two-wire cable to the replacement controller's two-pin power input. This is the new controller power connection; the machine will not power up if this cable is not connected at both ends.
8. Verify that both replacement boards are secure, every connector is fully seated, and all wiring is safely routed before closing the cabinet.

Initial power-up

9. Plug the pinball machine into the wall outlet and switch it on.
10. Observe the startup display and confirm that the controller completes its power-on checks.
11. If a 9.xx message appears, use the Power-on error chart and troubleshooting instructions in this guide to identify and correct the reported switch fault.

Game setup jumpers

JP1, JP2, and JP3 are three-pin selectors on the replacement controller. The same pin positions and functions apply to both the System 1 and System 2 boards. Pin 1 is identified by the board's pin-1 mark.

WARNING: Switch the machine off and unplug it before moving any jumper. Never move a shunt while the controller is powered.

How to change a setting

1. Switch the machine off and unplug it from the wall outlet.
2. Locate JP1, JP2, or JP3 on the replacement controller and identify the pin-1 end from the board marking.
3. Pull the removable shunt straight off the two pins. Do not twist or bend the header pins.
4. Install the shunt over pins 1-2 or pins 2-3 as listed below. The center pin, pin 2, must always be covered.
5. Recheck the setting before restoring power. Do not leave the shunt parked on only one pin.

Jumper	Shunt position	Selected setting	What the setting does
JP1	Pins 1-2	Enhanced rules	Enables the enhanced/advanced rule set, including speech, ball save, and the timed flashing-target feature.
JP1	Pins 2-3	Standard rules	Uses the standard scoring, bonus, extra-ball, player, and ball sequence without enhanced speech or timed features.
JP2	Pins 1-2	100,000-point step	Awards score-based extra balls at 100,000, 200,000, and 300,000 points for each player.
JP2	Pins 2-3	50,000-point step	Awards score-based extra balls at 50,000, 100,000, and 150,000 points for each player.
JP3	Pins 1-2	TEST	Starts the eight-page service-test sequence at power-up.
JP3	Pins 2-3	NORMAL	Starts normal attract and gameplay operation after the power-on switch check.

When settings take effect

- JP1 is read when the first START press begins a new game. The selected rule set remains active for that entire game.
- JP2 controls score-based extra-ball thresholds. For predictable operation, choose the setting before starting the game.

- JP3 is read continuously to select service mode. Always switch power off before changing it; return JP3 to NORMAL after testing.

Standard game rules

Set JP1 to pins 2-3 for the Standard rule set. The following scoring, bonus, player, ball, and extra-ball rules also form the base of the Enhanced rule set.

Starting a game and adding players

- The first START press immediately turns off GAME OVER, starts Player 1 on Ball 1, resets all player scores, and ejects the ball.
- Press and release START again to add Player 2, Player 3, and Player 4. A maximum of four players may be registered.
- Players may be added only until Player 1 on Ball 1 first scores or that ball drains. After scoring begins, additional START presses do not add players.
- For one second after each player is added, every selected player lamp is lit. The display then returns to exactly one lamp: the player currently scoring.

Player and ball order

- Each selected player completes the current ball before the ball number advances. For example: Player 1/Ball 1, Player 2/Ball 1, then Player 1/Ball 2.
- Each player receives five numbered balls, plus any earned extra balls. An extra ball keeps the same player and ball number for the replacement shot.
- Outside the player-registration display, exactly one player lamp and one ball lamp remain lit.

Playfield scoring

Switch or feature	Standard scoring and action
S1-S4 - top letter lanes	Every closure scores 1,000 points and adds 1,000 stored bonus, whether its letter lamp is on or off. A lit matching letter turns off on its first hit. When all four letters are off, award 25,000 points and relight all four so the bank may be completed again without limit during the ball.
S5, S6, S9 - number targets	Every hit scores 500 points, adds 1,000 stored bonus, and alternates the lit outside extra-ball lane between L21 and L22. The matching number lamp turns off on its first hit. Targets 1 and 2 together qualify Double Bonus; adding target 3 qualifies Triple Bonus.
S7 - left thumper bumper	Scores 100 points and pulses the left thumper coil.
S8 - right thumper bumper	Scores 100 points and pulses the right thumper coil.
S10 and S11 - spinners	Score 100 points for each accepted closure. Fast spinner contacts use the short spinner debounce so rapid turns are captured; a held contact cannot score repeatedly.

Switch or feature	Standard scoring and action
S12 and S13 - side-rubber switches	Each hit scores 50 points and adds 1,000 stored bonus.
S14/S15 - left lower slingshot	Scores 100 points and pulses its coil. The lower slingshots share a 500 ms scoring-and-coil lockout to suppress rubber and playfield bounce.
S16/S17 - right lower slingshot	Scores 100 points and pulses its coil. It shares the same 500 ms lockout with the left lower slingshot.
S18 and S19 - lower inside rollovers	Each closure scores 500 points and adds 1,000 stored bonus.
S21 and S22 - lower outside lanes	Each closure always scores 500 points. If that lane's L21 or L22 Extra Ball When Lit lamp is on, it also awards an extra ball. These lane switches never alternate the lit side.
S20 - ball trough/drain	After the launched ball has left the trough, the next valid closure ends the ball, counts the stored bonus, and advances to the next player or ball unless an extra ball or enhanced ball save applies.
TILT	Turns off the controlled coils, cancels the current player's stored bonus and multiplier, and forfeits the current ball when it returns to the trough.

Bonus and multiplier rules

- Stored bonus advances in 1,000-point steps and continues above 19,000 points. The 1,000-through-10,000 lamps show the current partial 10,000-point block. Each completed 10,000-point block adds another upper bonus lamp as a storage marker: 10,000 lights L10, 20,000 also lights L11, 30,000 also lights L12, and so on. Stored bonus continues accumulating after all available markers are in use.
- The four top letter lamps and three number lamps begin lit for every new ball and reset for every player. Their scoring still applies after a lamp has turned off.
- Turning off both number target 1 (S6/L6) and number target 2 (S5/L5) qualifies Double Bonus and lights L7. The targets may be hit in either order.
- Triple Bonus lights L8 when all three number targets are complete: target 1 (S6/L6), target 2 (S5/L5), and target 3 (S9/L9). The four-letter S1-S4 bank is independent of multiplier qualification.
- At ball end, the bonus lamps count upward from the bottom at 250 ms per 1,000 points. Double Bonus repeats the complete count twice; Triple Bonus repeats it three times. The stored bonus is counted once per pass, not displayed as one larger scoring jump.

Extra-ball rules

- JP2 selects three score-based extra-ball awards per player: either 50,000/100,000/150,000 or 100,000/200,000/300,000.
- S5, S6, and S9 are the only switches that alternate which outside lane is lit for Extra Ball When Lit.

- S21 and S22 always score 500 points; entering the currently lit lane also banks an extra ball.
- L20, Same Player Shoots Again, remains on while the current player has at least one banked extra ball.

End of game

After the last selected player's fifth ball and any earned extra balls are complete, GAME OVER lights and the display returns to the stored high score.

Enhanced (advanced) game rules

Set JP1 to pins 1-2 for Enhanced rules. All Standard scoring, bonus, extra-ball, player, and ball-sequence rules remain active. Enhanced mode adds speech, a one-use ball save on each ball, a repeating timed flashing-target opportunity, and flashing storage markers for completed additional 10,000-point bonus blocks below L10.

Musical cues and enhanced speech

Tone replacement notice

To reduce possible copyright concerns, this replacement firmware uses newly composed event cues in place of several named melodies documented for the original machine. The cues identify the same gameplay events without reproducing those melodies. Beethoven's Fifth remains because its composition is in the public domain. Enhanced-mode speech is unchanged.

Sound cue	When it plays
Beethoven's Fifth - public-domain composition	The first START press begins a new game.
Original top-lane chime	Every accepted S1-S4 top rollover closure.
Original double-bonus rise	Number targets 1 and 2 qualify Double Bonus.
Original triple-bonus fanfare	Number targets 1, 2, and 3 qualify Triple Bonus.
Original extra-ball celebration	The current player earns an extra ball.
Original tilt warning	The current ball is tilted.
Original game-over close	The final selected player completes the game.
Let's Play - Enhanced speech	After the new-game cue on the first START press.
Double Bonus - Enhanced speech	After the Double Bonus cue when targets 1 and 2 are complete.
Triple Bonus - Enhanced speech	After the Triple Bonus cue when all three number targets are complete.
Extra Ball - Enhanced speech	After the extra-ball cue when an extra ball is awarded.
Shoot the Flashing Light - Enhanced speech	A timed S5/S6/S9 target opportunity begins.
Big Score - Enhanced speech	The four top letters complete for 25,000 points, or the active flashing target is hit for 10,000 additional points.
Game Over - Enhanced speech	After the game-over cue at the end of the final player's game.

Enhanced ball save

- Ball save is prepared for each new ball but does not begin or flash immediately after launch.
- The first accepted S1-S4 top-lane closure starts the timer. Later top-lane hits do not restart or extend it.
- L20 flashes slowly during the normal save window, then rapidly during the final three seconds. The visible save window is 10 seconds, followed by a 2-second drain grace period.
- A saved drain ejects a replacement ball without changing the player or ball number. Score, stored bonus, feature progress, multiplier progress, and banked extra balls are retained.
- The save is consumed after one drain and is not restarted for the replacement launch.

Shoot the flashing light

- Forty-five seconds after the launched ball is confirmed in play, the controller selects S5, S6, or S9 and rapidly flashes that target's lamp.
- The target remains active for 30 seconds. A hit adds 10,000 points plus its normal 500 points and 1,000 bonus, then plays Big Score. If not hit, the opportunity expires.
- After a 30-second cooldown, another target is selected while the ball remains in play. A shuffled group uses S5, S6, and S9 once before repeating, avoids an immediate repeat at the group boundary, and skips a target disabled by switch-fault protection.

How to read the display

The decimal point separates system information from ordinary scoring. The number before the decimal identifies the test or message family. The digits after it identify the item being examined.

Display format	Plain-language meaning
T.xx	Test number followed by a one- or two-digit item number
T.xxx	The same format when an item needs three digits
9.xx	A switch problem found during the power-on check
2.02	The installed firmware version

Examples

- 2.20 means test 2 is examining trough switch S20.
- 4.03 means test 4 is operating solenoid 3.
- 9.20 means the power-on check found a problem involving S20.

Power-on switch check

At startup, the controller checks the playfield before allowing a game to begin. This machine uses microswitches. In this guide, open and closed describe the electrical state reported to the controller: a microswitch should report open when its actuator is released and closed when the playfield mechanism presses the actuator. Every playfield microswitch should report open except S20, which should report closed because the ball is resting in the trough. Each detected fault is recorded once in the persistent error log. The controller's response depends on whether the microswitch belongs to a spinner, an ordinary point/control feature, or a coil-driving safety circuit.

How startup responds

Spinner advisory - S10 or S11 flashes as 9.10 or 9.11 and beeps three times. The fault is logged once, but the game is allowed to continue and the spinner remains usable.

Ordinary switch lockout - A closed non-spinner, non-coil switch flashes and beeps three times, is logged once, and has its function disabled until the next restart. The game then continues.

Safety halt - S7, S8, S14/S15, S16/S17, and S20 hold the 9.xx message and prevent startup. The controller keeps scanning and proceeds automatically only after the fault clears.

Power-on error chart

Display	Playfield component or cabinet control
9.01	Leftmost top rollover lane (S1)
9.02	Left-center top rollover lane (S2)
9.03	Right-center top rollover lane (S3)
9.04	Rightmost top rollover lane (S4)
9.05	Number 2 stand-up target (S5)
9.06	Number 1 stand-up target (S6)
9.07	Left thumper bumper (S7)
9.08	Right thumper bumper (S8)
9.09	Number 3 stand-up target (S9)
9.10	Left spinner target (S10)
9.11	Right spinner target (S11)
9.12	Left side-rubber switch (S12)
9.13	Right side-rubber switch (S13)
9.14	Left lower slingshot - combined S14/S15 circuit
9.16	Right lower slingshot - combined S16/S17 circuit
9.18	Left lower inside rollover (S18)
9.19	Right lower inside rollover (S19)
9.20	Ball-return/trough switch (S20)
9.21	Left lower outside extra-ball rollover (S21)
9.22	Right lower outside extra-ball rollover (S22)
9.23	Cabinet pendulum tilt switch
9.24	Cabinet start button

There are no separate 9.15 or 9.17 messages because S14/S15 and S16/S17 are shared electrical circuits.

What to do when an error appears

12. Write down the displayed number, or review it later in Test 6.
13. If startup is halted, switch the machine off before inspecting the playfield.
14. Locate the indicated switch.
15. Look for a trapped ball, a sticking microswitch actuator, a cracked or broken solder joint, a damaged circuit-board pad or trace, shorted wiring, or a failed microswitch.
16. Correct the problem and restart the machine so the boot test can evaluate the switch again.

Startup self-test bypass

Use this procedure when troubleshooting requires the machine to enter normal game mode even though the power-on switch check would otherwise stop at a 9.xx message. The bypass does not repair, ignore, or clear the physical switch problem.

1. Switch the machine off.
2. Press and hold the TEST ADVANCE switch.
3. Switch the machine on while continuing to hold TEST ADVANCE.
4. Release TEST ADVANCE after the startup version appears. The controller skips the power-on switch self-test and proceeds to normal operation.

Important: The bypass applies only to the power-on switch self-test. If JP3 is set to TEST (pins 1-2), the controller still enters service-test mode. Always locate and correct the switch fault before returning the machine to unattended or customer operation.

Gameplay stuck-switch lockout

Firmware 2.02 uses an automatic two-second gameplay lockout to limit the effect of a switch that becomes stuck after play begins. This runtime protection is separate from the boot lockout and does not conceal switch states from Test 2 diagnostics.

- A normal switch closure performs its intended function when it is first detected.
- If that switch remains continuously closed for more than two seconds, its gameplay function is suppressed.
- When the switch returns to its debounced open state, the lockout clears automatically and the next closure operates normally.
- S20 is exempt because it is the ball-trough and drain-status switch required by normal game operation.
- A non-coil switch rejected during the power-on check remains disabled for the complete boot session, even if it later opens. Restart after correcting it so the startup test can enable it again.
- Spinner microswitches S10 and S11 score 100 points only on a debounced closure. Releasing the actuator does not score, and a microswitch that remains closed cannot score repeatedly.

- The lower slingshot circuits S14/S15 and S16/S17 score 100 points and fire their coil once, then share a 500 ms lockout that suppresses repeated scoring and coil pulses from playfield bounce.

Troubleshooting note: A feature that works once and then stops responding until its microswitch opens is a strong indication that the switch remained closed long enough to activate the runtime lockout. Inspect for a trapped ball, a sticking actuator, a cracked or broken solder joint, a damaged circuit-board pad or trace, a failed microswitch, or a shorted switch wire.

Special case: 9.20

Confirm that the ball is physically sitting in the trough and pressing S20.

Safety

Never reach inside the machine while power is applied.

Troubleshooting

Safety first: Turn the machine off and unplug it before inspecting or replacing microswitches, resoldering connections, repairing wiring, checking coils, or replacing a fuse. Do not bypass a startup safety lockout.

9.20 - Ball-trough switch fault

Error 9.20 means the controller does not see ball-trough microswitch S20 closed. Confirm that a ball is present in the trough at the drain position and is pressing the S20 actuator. If the ball is present, inspect S20 for a sticking actuator, a cracked or broken solder joint, a damaged circuit-board pad or trace, loose or broken wiring, or a failed microswitch. Repair the fault before continuing; the game will remain in the startup check until S20 reports the correct state.

A playfield switch does not score

A switch that does not score may have a mechanical or electrical fault, or the firmware may have disabled it for the current boot because the startup check detected an invalid closed state. When this occurs, the display flashes 9.xx three times, where xx is the number of the affected switch. The error is recorded in the switch-error log, and a non-coil scoring switch remains disabled until the next restart. Correct the switch or wiring fault, then restart the machine so the power-on test can evaluate it again. Use Test 2 to observe the live switch state and Test 6 to review the stored error log.

9.10 or 9.11 - Spinner resting-position warning

Error 9.10 identifies the left spinner (S10); error 9.11 identifies the right spinner (S11). A spinner microswitch should normally report open with its actuator released. These warnings are advisory, so the game may continue and the spinner may appear to work. However, a sticking or failed microswitch, broken solder joint, damaged circuit-board trace, or wiring fault can produce extra or missed pulses, causing the spinner to over-score or under-score. Confirm that the spinner mechanism presses and releases the actuator freely, then inspect the solder joints, circuit-board pads and traces, connectors, and wiring. Replace the microswitch if it does not change state cleanly.

A 9.xx error remains displayed and gameplay will not start

This is a safety halt. If the startup check detects an invalid closed state on S7, S8, S14/S15, S16/S17, or S20, the controller will not enter gameplay. The first four circuits operate coil-driven playfield mechanisms; S20 confirms the ball-trough state. A continuously energized coil can overheat and damage the coil, driver components, wiring, or nearby cabinet parts. Do not bypass the warning. Turn the

machine off, unplug it, and repair the switch, mechanism, or wiring fault. After power is restored, the controller will continue only when the required switch states are valid.

Flippers do not operate

The most likely first cause is an open flipper fuse on the jumper board installed in the original power-supply-board location. Before replacing the fuse, turn the machine off and unplug it, then correct the cause of the failure, such as a stuck flipper mechanism, shorted wiring, or a damaged coil. Replace the fuse only with a 2.5 A slow-blow fuse, also called a time-delay fuse, of the same voltage rating and physical type. Never install a higher-current fuse or bypass the fuse. If the replacement fuse opens again, stop using the machine and diagnose the flipper circuit before making another replacement.

Service-test chart

With power off, set JP3 to TEST (pins 1-2), then power on. Service mode contains eight test pages. The number before the decimal point is the test page; the number after it identifies the item or state currently being checked.

Test	Display	Purpose
0	0.00	Display test
1	1.xx	Lamp test
2	2.xx	Switch test
3	3.xx	Sound test
4	4.xx	Solenoid test
5	5.on / 5.oFF	All-lamps test
6	6.xx	Persistent switch-error log
7	7.xx	Gated manual lamp connection test

Test 0 - Display test

The display first shows 0.00 for one second so the operator knows test page 0 is selected. It then cycles 000000 through 999999. All six positions participate, making missing segments, weak digits, and mismatched digits easy to see.

Test 1 - Lamp test

One lamp turns on at a time. The display shows its diagnostic number. See the chart below.

Display	Designation	Bulb location text / function
1.01	GAME OVER	Game Over
1.02	L1	Bonus-advance feature 1 (paired with S1)
1.03	L2	Bonus-advance feature 2 (paired with S2)

Display	Designation	Bulb location text / function
1.04	L3	Bonus-advance feature 3 (paired with S3)
1.05	L4	Bonus-advance feature 4 (paired with S4)
1.06	L5	Bonus (paired with S5 Left stand up target)
1.07	L6	Bonus (paired with S6 Right stand up target)
1.08	L7	Double Bonus
1.09	L8	Triple Bonus
1.10	L9	Bonus (paired with S9 top middle stand up target)
1.11	L10	10,000 bonus
1.12	L11	9,000 bonus
1.13	L12	8,000 bonus
1.14	L13	7,000 bonus
1.15	L14	6,000 bonus
1.16	L15	5,000 bonus
1.17	L16	4,000 bonus
1.18	L17	3,000 bonus
1.19	L18	2,000 bonus
1.20	L19	1,000 bonus
1.21	L20	Same Player Shoots Again
1.22	L21	Lower outside Extra Ball When Lit left side (L21 side)
1.23	L22	Lower outside Extra Ball When Lit right side (L22 side)
1.24	B1	Ball 1 in Play
1.25	B2	Ball 2 in Play
1.26	B3	Ball 3 in Play
1.27	B4	Ball 4 in Play
1.28	B5	Ball 5 in Play

Display	Designation	Bulb location text / function
1.29	P1	Player 1 Up
1.30	P2	Player 2 Up
1.31	P3	Player 3 Up
1.32	P4	Player 4 Up

Designation note

The L, B, and P labels are the electrical identifiers used by the matrix and firmware. The final column gives the plain-language playfield text or recorded function for locating the bulb.

Test 2 - Switch test

The display identifies a switch while it is closed. A recently pressed switch remains visible briefly so there is time to read it. If several switches are closed, their numbers rotate on the display.

Display	Meaning
2.00	No switch detected
2.07	Switch S7 is closed
2.20	Trough switch S20 is closed
2.23	Tilt switch is closed
2.24	Start button is pressed

Test 2 uses the same switch numbers as the power-on chart, but begins with 2 instead of 9.

Test 3 - Sound test

The sound test cycles through the eight-note scale, a six-note rising calibration cue, and the programmed scoring and gameplay cues. The item number identifies the note or sequence currently playing, making a missing, weak, or distorted sound easier to isolate.

Display	Sound
3.01-3.08	Eight-note scale
3.09-3.14	Original rising calibration cue, one note at a time
3.20-3.32	Programmed score tones and gameplay cues

Test 4 - Solenoid test

The solenoid test automatically pulses SOL2 through SOL6 in sequence. The display identifies the active output, each pulse is limited to 25 ms, and the sequence advances to the next output once per second.

Display	Mechanism
4.00	Page selected; automatic sequence begins
4.02	Ball-eject solenoid
4.03	Left slingshot
4.04	Right slingshot
4.05	Left thumper bumper
4.06	Right thumper bumper

Built-in protection

Each activation is a short 25 ms pulse. To stop the sequence, switch power off and return JP3 to NORMAL (pins 2-3). All coil outputs turn off at power-down.

Test 5 - All-lamps test

All matrix lamps alternate on and off once per second. The display shows 5.on while they are energized and 5.oFF while they are off. This quickly reveals a dark lamp, weak connection, or row/return problem.

Test 6 - Persistent switch-error log

Test 6 displays the unique switch faults recorded by the power-on check. Logged switches rotate once per second as 6.xx messages; 6.00 means the log is empty. Repeated failures of the same switch occupy only one entry, and the log remains available after power is removed.

- While in Test 6, hold TEST ADVANCE for two seconds to clear the entire error log and remain in Test 6. A short press advances to Test 7.

Test 7 - Manual lamp connection test

At 7.00, hold TEST ADVANCE for two seconds to enter. A short press skips the manual lamp test and returns to Test 0.

- Item 0 scans all eight lamp source rows while every lamp return remains off. Items 1 through 32 hold one lamp on continuously. Press TEST ADVANCE briefly to move to the next item; after item 32, the controller returns to Test 0.

REFERENCE - PLAYFIELD SWITCH AND COIL LOCATIONS

