

Pinball Mind Manual

Nightmare Park Games

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Introduction

Thank you for your purchase of Nightmare Park's Pinball Mind to bring your Bally Brain© pinball back to life. The Pinball Mind has many features for ease of maintenance and player enjoyment.

With the corporate-speak out of the way, thank YOU. This has been a labor of love and need for years. Let me fill you in.

Game designer here. Formerly of Romstar and SNK. Side gig at Eldorado Games. The average was about 20 phone calls a day to repair the Bally Brain boards. Until the Pinball Mind was released, there was no feasible repair method.

The biggest reason for the Bally Brain failure was the main CPU, the F8 or the MK3850 (A 1 chip version of the 3 chip F8 chipset). Both were embedded systems with the program built in. Many things were learned from speaking with the original programmer. The knowledge helped in the design of the Pinball Mind.

The Pinball Mind was designed as a piggyback board to plug into the main Bally Brain board. It will work for both Series 1 and Series 2 Bally Brains. It was designed using far more common chips and easier to service. It has evolved into a 2 boardset with a generic type CPU board and the adapter board. An improved power supply box is also available.

Some will ask about using a PC running Linux or some such OS system. The two main arguments against going this route:

1. Cost. The chips alone would add more than \$200 to the cost. An extra cost you don't need.
2. Performance. The program is written with the exact task at hand. The biggest problem in using an external OS in realtime applications is the OS will grab time when it wants. This will cause the program performance to suffer. If you go online and read about home-made pinball machines, this is the largest complaint you will find, updating and real-time switch reading suffers. Controlled coil timing also suffers from issues.

So let us see, lower cost and better performance. Not a hard choice at all.

Now, let us talk a minute about processors. There are many past and present, but only one was the logical choice for this design for many reasons. The Western Design Center's 65C02.

The 6502 was literally the most important chip of the computer revolution. The Apple][, the Atari 400 and 800, the Vic-20 and Commodore 64 all used the 6502. Many famous arcade games also used it, such as Asteroids and Burgertime in the arcade. The Atari 2600 and Nintendo Entertainment system in the home also used it. The Zen-like design and massive support made this CPU stand out. Even today, the improved 65C02 version is still used, with over 150 million shipped each year for embedded applications. As an aside, it is the only CPU medically rated to be implanted in the human body. So if you have a heart pacemaker for example, the chance of it being run by a 65C02 is 100%.

A Brief History of the Bally Home Professional Pinball

The Bally Brain was originally designed by Dave Nutting of Nutting Associates for Bally as the first electronic pinball computer for Bally. It sported a 4004 4 bit cpu chip. It was used on 2 modified Flicker pinballs, used in a lawsuit about electronic pinballs.

The next generation Bally Brain used the Fairchild F-8 triple chip system and later used a Mostek MK3780 single chip version of this system. It was used in the very popular professional home pinball series. Over 15,000 Fireball home pinballs were sold with a smaller unknown (at present) amount of Captain Fantastic, Evel Knievel and Galaxy Ranger pinballs. The pinball was a modified layout of a Bally electromechanical pinball called "Hokus Pokus." Each of the 4 used the same programming and sounds and game rules. (Galaxy Ranger and Evel Knievel missed the right inlane and added an extra right flipper, though).

System requirements

A Bally Home Pinball series utilizing the Bally Brain® computer system. The 4 pinballs in this series are:

- Fireball
- Captain Fantastic
- Evel Knievel
- Galaxy Ranger

New power system. The following options are available:

A: New power box.

B: Customer purchases switching regulator power supply only, uses old transformer and power board

PLEASE NOTE: If you purchase the new power box, the old transformer and power supply board

are sent back for partial credit.

It is also suggested to send back the power supply board and main CPU for repair and refurbishment. Boards will be repaired and tested and carry a 1 year warranty. The kit modifications installed on the main CPU board will be free of charge.

Kit Inventory

CD-rom with instruction manual and EPROM images and test suite
Pinball Mind motherboard
Series 1/2 Adapter board
50 pin interboard cable
40 pin ribbon cable, series 1 and 2
2 40 pin adapters, series 1
1 16 pin cable, series 1
Power cable
Mounting brackets

Purchased seperately:
Switching regulator power supply or new power box

Kit Installation

Cabinet Preparation

1. Remove the playfield glass by unscrewing the two front screws and lifting off the glass holder. Slide the playfield glass out carefully. Place both in a safe place away from the work area.
2. Remove the back masonite cover from the backbox. Unplug the 2 wire harnesses from the Bally Brain© motherboard. Remove the Bally Brain© and set it aside for now on a work table.
3. Lift up the playfield and set it against the back cabinet. Pull the wiring harness carefully through from the backbox access hole. Now remove the entire playfield and set it aside for now.
4. The power supply is located on the inside against the right side of the cabinet. Remove the harness plugs and remove the power supply board. Set it aside for now.
5. Remove the back transformer box and set aside.
6. Now remove the entire wiring harness and set aside as well. The cabinet and backbox should be free of electronics, save for a general illumination lamp harness in the backbox.

(drawing of wiring harness route)

7. Clean out the cabinet. A good vacuuming will make for a more pleasant work area as well as ease of installation. If the cabinet and backbox has loose wood, shore up using brackets and screws or any wood working method of your choice. Painting and restoration may also be done at this point. Be sure to mask off metal or glass when repainting and restoring. The backglass and playfield glass can be cleaned with a glass cleaner and soft cloth.

Front Control Panel Mounting

1. Use the supplied template to drill the mounting holes for the new front control panel. Use a jigsaw for the panel cut. Vacuum out the cabinet and area of wood chips.

2. Mount the new front panel using the supplied bolting hardware. The diagram for the installation of the bolts is as follows: Install all 4 loosely, verify that everything fits well then tighten the bolts.

(bolt sequence diagram here)

Note

At this point, you may elect to use your original transformer and the external switching power supply. Or you can use the new power box which replaces the original transformer and power supply board.

New power box features:

Each voltage seperately fused

LED voltage indicators

All voltages shielded against accidental touching

Switching power supply and external voltages built into box, so the old power supply board is no longer required.

If you purchase the new power box, you will be asked to return your original transformer and power supply for credit towards the purchase of this unit.

If you are using the new power box for this installation, skip the original transformer and power supply board instructions and go directly to the new power box installation instructions.

Original Transformer

1. Take the transformer box and remove the covers. Inspect for damaged internal wiring or bad solder connections. Clean up inside with a vacuum and brush. Verify that the circuit breakers work by measuring with a meter set on continuity or resistance. The table below shows the continuity chart to the wiring harness.

Please note that the Series 2 transformer box has 5 circuit breakers and the Series 1 has a single breaker and one panel mounted fuse.

2. Once the transformer box is verified good, re-install it back inside the cabinet. Set the meter to the AC voltage setting. Use a power strip and plug the transformer box alone into the strip. Attach the meter leads to the appropriate transformer winding pair and power up the transformer. The voltage readings should match the table below.

(table for transformer windings resistance and voltage)

Original Power Supply Board Inspection and Repair

1. Carefully inspect the power supply board on a static safe work area. Make note of any burned connectors or components for replacement.

2. Clean the board if it is dusty or dirty. A brush should be sufficient for surface dust. Other dirt and foreign materials can be removed by washing the board. Use a brush and liquid dishwashing detergent to clean the board. Use an air gun to remove moisture and a heat gun or hair dryer to remove moisture from under components.

3. Inspect the connector pins. If they are burned or unsoldered, repair them by cleaning with a crocus cloth and resoldering them, or replacing them.

4. Make sure all components are not burned or unsoldered. It is highly suggested to replace all electrolytic capacitors, due to the age of the machine (capacitor kit available if required).

5. Perform a resistance check on the power supply pins according to the table below. If it appears good, then go ahead and install the power supply board back into the cabinet. Plug the transformer harness back into the power supply board.

(resistance chart goes here)

6. Power up the cabinet. It is suggested to use a power strip to plug the cabinet into. Now

measure the voltages at the power supply board according to the table below.

(voltage table goes here)

New Switching Power Supply installation

The new switching power supply is required for the newer electronics system.

1. Install the power supply harness as shown in the diagram below. The 120 volt wiring harness is also attached at this time. Cover all of the power supply terminals with electrical tape to prevent shock hazard.

(diagram of power supply wiring harness)

2. Drill the bottom of the cabinet per the supplied power supply template. If you purchased the power supply separately, follow the hole pattern on your supply. Install the mounting bolts per the diagram below. Mount the power supply as shown and install the mounting nuts and tighten. Vacuum up all wood drilling debris.

(diagram of bolts and power supply on the bottom of the cabinet)

3. The 3 wire harness (black, red, yellow) is threaded up through the head unit. (this 3 wire harness will plug into the new boardset)

4. The 120 volt power harness (single power cord) will go in the back through a hole drilled in the back cabinet. A power strip will be used that will power both plugs simultaneously.

New Power Box Installation

1. Remove the cabinet wiring harness and set aside.

2. Use the supplied template to cut the proper mounting and access holes for the new power box on the back of the main body cabinet. Vacuum up all wood drilling debris.

3. Mount the new power box against the back inside. Loosely thread the mounting screws through the holes drilled in back. Make sure they sit comfortably and the new power box is flush against the back of the cabinet. Once everything is in place, tighten the mounting screws.

4. Use the supplied cable clamps to mount the new power box cable along the right side of the cabinet. The end should be located where the old power supply board end plug was located. See diagram below.

(diagram of new power box cable dressed to cabinet)

5. Power up the cabinet. It is suggested to use a power strip to plug the cabinet into. Verify that the 4 voltage LEDs are lit up on the power box. Now measure the voltages at the new power cable connectors according to the table below.

(voltage table goes here)

Cabinet wiring

1. Take the cabinet wiring harness and inspect it. Make sure there are no bare wire spots or kinks or abrasions on the harness. If there is wiring damage, replace the wire length using wire of the same diameter and color and either solder and heat shrink tube, or use butt connectors. Check all connectors to see that the pins are clean, that they are not burned, and also have the right springiness to maintain full contact. Use a sharp point to remove the pins, 1 at a time and repair accordingly if required.

When the harness is in good order, reinstall it back in the cabinet using the clamps and screws.

Playfield

1. Clear out a floor or table area the size of the playfield. Use a blanket or cloth to cover the work area. Place the playfield with the playing surface facing down so the electronics and wiring is facing upwards.

2. Inspect the two circuit boards for breaks or burns or bad wiring. Repair if needed.

3. Inspect the wiring harnesses. Repair if needed

4. Inspect the solenoids. Make sure the wiring and diodes are ok and not broken off. Activate the plungers by hand to make sure they travel freely and the spring returns them back to position. Repair if needed.

PRO EXPERT MODIFICATION: If you are a hardcore pinball type, you may wish to rewire the

playfield with standard pinball switches and light sockets to remove the two large circuit boards. Use the paperwork within this manual to perform this modification.

5. Make sure you have blocks over 4 inches tall to support the playing field. Turn the playing field over and place onto the blocks so the solenoids do not touch the work surface.

6. Inspect the playing field in general. If the rubber rings are worn or dirty, replace or clean them. The complete rubber ring kit is available, and Wildcat RC-88 Rubber Ring Cleaner is best for cleaning the rubber rings. Use Novus # 2 Plastic Polish to clean the playfield surface.

7.

Computer

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