

# GAMEROOM

Your Guide to the Ultimate Home Game Room

January 2009 Volume 21, Number 1

www.gameroommagazine.com  
\$5.95

## Seeburg's Ray-O-Lite

Shooting with a beam of light, circa 1939

## Coinocopia: Adventures in Coin-Op

A new column by Jimmy Rosen

## Top 40 Electromechanical Pins

Bruce Moyer shares his faves

Rob Craig's

# Tales of the Silverball

FREE PLAY.



## Replacement Pinball Circuit Boards Galore

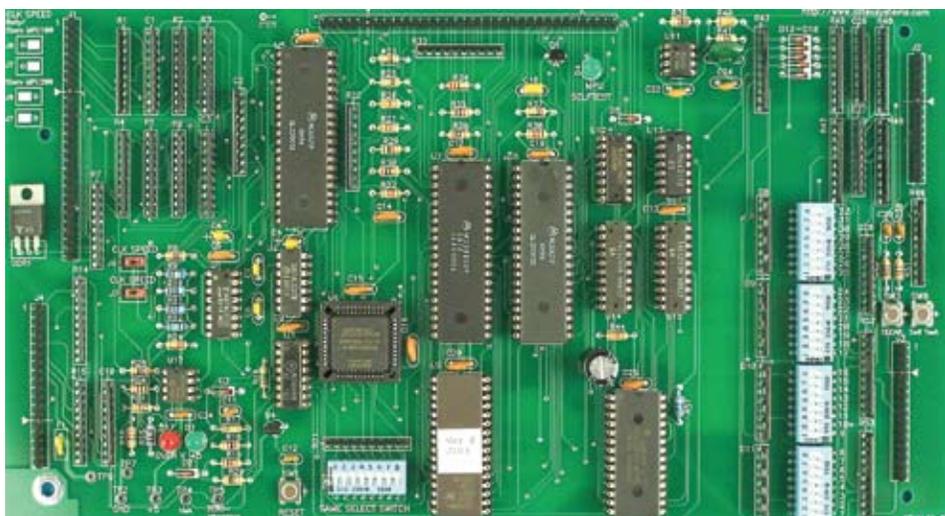
I'm increasingly impressed by the number of options that are available to hobbyists today when it comes to the restoration of electronic pinball machines. There was a time when I used to go to arcade auctions, or to an operator's warehouse, and look over the budget lineup of machines. In those earlier days, the biggest risk was buying a machine that was missing a board or two. "You can't fix what isn't there"—a line I used to say often.

While that will always be true, there are opportunities to get brand new boards that offer the same compatibility, or even add features to the original boards that they replace. Just this past year at Pinball Expo, I couldn't help but notice the trend in exhibitors that were selling replacement electronics, and the number of customers they fielded.

I was one of them, a fan of "new" when it's replacing something that is broken, pushing 30 years old, and had several laps of repair. For the pinball collectors out there that don't have a passion for cleaning up acid damaged CPU boards, working out issues with the high voltage supply for displays, or figuring out why the power supply board doesn't supply power, there are a lot of options for you besides finding a used board or sending yours out for repair.

That's good news since the number of good used boards on the market are sometimes few, and it's not always easy to find someone you trust to repair your original board at a good price—especially in the case of battery acid damage. I'll stop the jabber and jump right in with a list of some of the available replacement boards.

Please note that this article is not an exhaustive or complete list of all boards available, neither is it the "final word" on the best of what is available. I'm not endorsing any



The Ultimate MPU – Roughly ½ the size of the original Bally or Stern MPU boards.

board in particular in this article (although I have in the past very clearly). In several cases, these are boards that I have personally used in practice and found to be worthy replacements for missing originals, or those requiring more repair hours that I care to invest.

I also need to mention that when I refer to the "main pinball parts suppliers", I mean *Marco Specialties*, *Pinball Life*, *Pinball Resource*, and *Bay Area Amusements*.

### Bally / Stern Replacement Boards (Bally -17/ -35, Stern M-100 / M-200)

**CPU Boards:** With CPU boards of this era, there is always a potential problem with battery leakage that will or has already caused damage to your circuit board. Another issue when considering a swap from various Bally machines is the different sizes of game code stored in ROM's. While there have been a few different replacement boards on the market for these early Bally machines, the



Alltek's Ultimate Solenoid Driver board is a fine improvement over the original board.

only one I will mention here is the *Ultimate MPU* by Alltek Systems. It's been around for several years now with good fanfare. I've owned almost a dozen and have always found them reliable and easy to install. You have a set of DIP switches that are used to select the proper code for your game. Over 90 machines are supported at the flick of a few switches. Another great update to the later boards is the memory system that doesn't

require batteries. Visit Alltek at [www.alltek-systems.com](http://www.alltek-systems.com) for more information on this board, available there and at the common pinball parts suppliers.

**Solenoid / Driver Board:** This is the board that holds all the driving transistors for coils. It also handles critical voltage conversion and regulation, including CPU voltage and display voltage. These boards fail and are usually a breeze to repair. But if that isn't your idea of fun, check out Alltek's *Ultimate Solenoid Driver*. The board provides LED indicators for each coil, assisting in future troubleshooting. It also adds fuses to the flippers, something we didn't have previously on the original. It runs more efficiently and cooler too. I have one of these boards and find it to be a fantastic update. Read more about it at [www.alltek-systems.com](http://www.alltek-systems.com). There is another replacement (the BPS022) with similar features available from Rottendog Amusements at [www.rottendog.us](http://www.rottendog.us).

**Lamp Driver:** While this board is rarely damaged beyond repair, there might be a need for it in some cases. Alltek Systems has managed to re-create this one as well. Learn more about the *Ultimate Lamp Driver* board at [www.alltek-systems.com](http://www.alltek-systems.com).

**Power Supplies aka Rectifier Board:** There were a few different power supplies over the early Bally and Stern years. The earliest suffer from under qualified bridge rectifiers (too small to properly handle the machine's demand), and connector pin hot spots. I've had to re-pin most early Bally power supply boards, along with adding a new connector or three. Bridge Rectifier replacements are also required in all cases. There are options to replace your charbroiled power supply board at Tom Callahan's website [www.pin-logic.com](http://www.pin-logic.com) and at the Great Plains Electronics website ([www.greatplainselectronics.com](http://www.greatplainselectronics.com)).

## Williams Replacement Boards (System 3 thru 7)

**CPU Boards (System 3,4, 6, & 7):** Kohout Enterprises (James Kohout) has done a similar job with the early Williams board set as Alltek has with Bally / Stern boards. Williams boards had batteries installed on the CPU board. These are common AA's, as opposed to rechargeable Ni-Cad's in the previous case. While not as prevalent, the CPU boards can suffer from acid damage from leaky batteries. More common is the problem of interconnect issues between the CPU and

driver boards. Williams literally sandwiched the two together via a large connector. This connection fails over time and results in intermittent or complete game failure. Like Bally, the original board required adjustments (jumper connections) to install in some of the different machines of the same generation.



Kohout Enterprises' CPU Board for Williams System 3, 4, 6, and 7 pins

Kohout has done a fantastic job in offering a plug-in replacement of the original CPU along with an optional updated connector (ribbon style) should you also use his updated driver board. I've had a CPU / driver board set for a couple of years now and have not found any failure point in the updated ribbon cable connection. Kohout doesn't integrate the game code in his CPU board, so hang on to your EPROM's. You'll need 'em. Any previously necessary jumpers are now solderless. The board is battery-less, incorporating a similar retention system as the Alltek boards. It also has several status LED's to assist in future troubleshooting. It replaces the original CPU board in about 40 machines, including several shuffle alley games. See more at [www.pinballpcb.com](http://www.pinballpcb.com).

**Driver Boards (System 3,4, 6, & 7):** Unlike Bally, Williams put both lamp and solenoid control on a single driver board (among other things). As previously mentioned, the large interconnect is what plagues the original board with intermittent problems. While you can opt for an original connector (for only replacing the driver board and keeping an original CPU board or vice-versa), you can choose to take advantage of the ribbon style connector if you plan on also using both of the Kohout boards. There is also a heat problem that often occurs in the lamp matrix area of the board resulting in large charred areas. This has been remedied, among several other things. Status of the coils, switches, and lamp matrix are provided in real time through LEDs. See more at [www.pinballpcb.com](http://www.pinballpcb.com).



Kohout Enterprises' Driver Boards for Williams System 3, 4, 6, and 7 pins

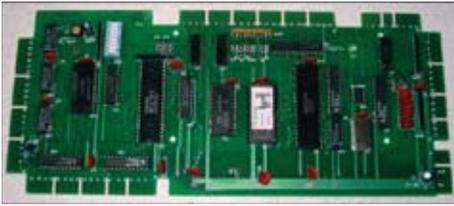
One might suggest that the two boards be joined together to make a single board. This should become a reality soon with an upcoming combo board supporting Williams System 3 thru System 7 by Rottendog Amusements. Stay tuned to [www.rottendog.us](http://www.rottendog.us) for more details.

**Power Supply:** Rottendog offers a power supply replacement for Williams System 3 thru System 6 (WPS 346). This encompasses 16 game titles, and looks to be a more modern and efficient update to an aging system. There is another Rottendog option for System 7 and 9 machines (WPS 079), supporting 18 more titles. Of the big 3 manufacturers of the time, the Williams power supply board has been the one that I rarely have to work on. I hope your luck is the same, but if it isn't, see [www.rottendog.us](http://www.rottendog.us) and look up the WPS 346 and WPS 079 for options.

## Gottlieb Replacement Boards (System 1 and 80)

**CPU Boards (System 1)** – Gottlieb started their solid state venture with their System 1 board set from Rockwell. This CPU board causes several issues for collectors today in obsolete components that are fragile, a rechargeable battery that is prone to leaking, an obsolete PROM chip making it difficult to get the proper code in various System 1 games, and finally the connection method that was used to interface the board to the other boards in the system (power supply, driver board, etc.). The first group to provide a replacement board for Gottlieb System 1 CPU boards was Ni-Wumph. These guys were perhaps the inspiration for many to pursue other board re-designs. It is a half-sized board that contains all the game code for each System 1 pinball machine. It is available from several of the common pinball parts suppliers.

Pascal Janin took this a step further in his design of the Pi-1 and Pi-1X4 board. The



The Ni-Wumph Replacement CPU board for all Gottlieb System 1 machines.

Pi-1 is a half-sized board that also contains all the code for each game. Rather than DIP switches, the end user selects which game they want in software at start up. His board also adds alternate versions of the games that add some additional features. There are skill shots, faster bonus countdowns, and various lighting effects to the previously stagnant original code. For those that don't like this extra 'bling', the original versions are also selectable. The Pi-1X4 is simply a Pi-1 CPU replacement with hardware that replaces the original power supply board, driver board, and the basic sound board. It's an all-in-one package that can take a board-less machine and bring it back to life in an instant. I'm not doing this summary justice as there are too many features to just summarize with Pascal's boards. You can learn more about the Pi-1 and the Pi-1X4 at [www.flipp.fr/en](http://www.flipp.fr/en).

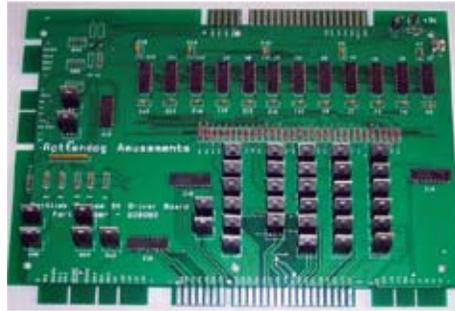


Pascal Janin's Pi-1 CPU replacement for Gottlieb System 1 machines



The Pi-1X4 adding hardware for the power supply, driver board, and sound board, all in one package!

**Driver Boards (System 1 / 80):** Outside of the normal issues with blown transistors, there really aren't too many System 1 driver boards that become un-repairable. There are a couple of replacement options though. The Pi-1X4 mentioned above does manage to cram the hardware into its single printed circuit board. There are also plenty of tested and/or repaired boards available in the used parts market. The Boston Pinball Company has a replacement that is pretty much an exact replica of the original, albeit with new

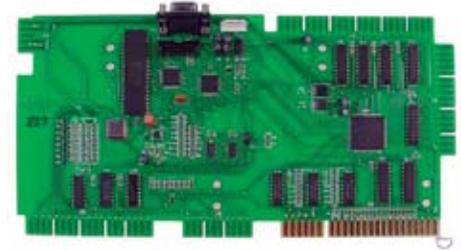


The Rottendog GDB080 Gottlieb System 80 Replacement Driver Board

components and ground modifications built-in. You can learn more about that board by visiting [www.bostonpinballcompany.com](http://www.bostonpinballcompany.com). Rottendog Amusements has a pair of driver boards, one for the System 1, another for the System 80. Both are re-designed and use better transistors than the original board. See more of them at [www.rottenog.us](http://www.rottenog.us). Ni-Wumph has also designed a System 80 driver board, available at Marco Specialties. While these original driver boards are easy to repair, it's good to know that other options do exist.

**CPU Board (System 80):** Gottlieb quickly changed its board-set after reaching the limitations of System 1. The System 80 (or Star 80 series) uses components that we can still find today, thus making repairs possible. Still, it suffered from battery acid leakage from the rechargeable battery which can leave the board un-repairable. And the boards in games today can have the same connection issues that System 1 machines have. There are some that provide replacement "interconnect" cables that go between the CPU and driver board for both System 1 and 80 and Big Daddy is one of them ([www.bigdaddy-enterprises.com](http://www.bigdaddy-enterprises.com)). Ni-Wumph has taken on the task to create a replacement System 80 CPU board. These boards are sold for specific games and it doesn't appear that all games are yet supported. Pascal Janin is also working on his version of the System 80 replacement board with another multi-board integration. The end result should be a single board that takes the place of the power supply, CPU, and driver board. It is not yet available, but is quickly moving along in development. Rottendog Amusements has also had the System 80 CPU board on their "coming soon" list for some time. Someday we might see their version of a replacement CPU board enter the market.

**Power Supplies (System 1 / 80)** – There are several providers of replacement power supply boards for the early Gottlieb solid state machines. The System 1 supply is highly



The Ni-Wumph 80 board, sold at Marco Specialties.

problematic while the System 80 supply seems to be a bit better design with fewer problems. It is my opinion that any modern replacement power supply for the early electronic pinball machines is a good investment – *IF* you have a defective original. These newer supplies are smaller, more efficient, and produce less heat. Most are easily serviceable should you have a breakdown later. The two main suppliers for both System 1 and 80 replacements are Rottendog Amusements and Great Plains Electronics. Both sell from their respective web sites, as well as through retailers like Marco Specialties.

## The Wrap-Up

It doesn't seem to be that long ago that there were literally no replacement boards of any kind on the market. In those days, you either figured out how to fix your board, or you sent it somewhere to be repaired. I'm a strong advocate of electronics education. It's a big part of the fun experience of pinball maintenance. However, I'm not naïve enough to think that it's for everybody. This hobby has grown beyond belief, and not everyone wants to learn board repair. I have tried to provide an insight into what is currently on the market. There is a lot more beyond just these early pinball replacements. Competition and the growing consumer of repairable pinball machines have driven demand upward, resulting in cheaper boards for all. There is however a golden rule that I try to live by ... *"If it ain't broke, don't fix it"*. But if it does break, it's good to know you have options. **GR**

## On the Web

Feel free to look at older reviews on some of these boards at the Tales of the Silverball Archive, available at [www.popbumper.com](http://www.popbumper.com), or dig up your back issues of GameRoom Magazine.

- Kohout Williams CPU & Driver Board Review (June 2006)
- Pascal Janin and the Pi-1X4 (May 2007)
- The Ultimate Driver Board (Sept. 2007)
- PinScore LED Replacement Displays (May 2008)