# DIY

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## Pascal Janin  and the Pi-1X4

If your pinball collection includes games like Buck Rogers, Cleopatra, Sinbad, or Genie, you might have heard of Pascal Janin or at least own one of his products. He's the humble mastermind behind several replacement circuit boards for early electronic Gottlieb pinball machines. When I was writing exclusively for Popbumper.com, I wrote up a "one on one" review for Pascal's (then new) Pi-1 replacement CPU for Gottlieb System 1 machines where he clearly inched out the Ni-Wumph board. I'll get into the latest revision of the Pi-1 a bit later in this article. But for those of you not in the Gottlieb early solid state pinball fan base, you'll still want to read on as we discover a little about the inventive mind of a French pinball enthusiast and the story behind his passion.

### The story behind the inventor
Pascal Janin is just like most of the readers of this column. He loves pinball. And like a sub-segment of you all (and very much like me), he especially loves the electronics inside that make them work. But more significantly, he manages to bring forth real solutions to complicated electronic problems in pinball machines. I was introduced to him through the Gottlieb pinball collector Peter Hall who resides in Switzerland. Peter had hailed about Pascal's work with reproducing Gottlieb's ever-failing electronic circuit boards. That started a relationship between me and the Frenchman that has lasted several years now.

Pascal's story starts in France in the 70's. His parents would take Pascal and his younger sister to camp sites in Italy, Spain, and Yugoslavia. There were plenty of games for him to play, at costs that were less than 1 cent per game. Aside from this, his grandfather owned a butcher shop across the street

from a bar. With this connection, Pascal was allowed entry as a minor to play some of the later Gottlieb, Williams, and Bally EM machines. Soon afterwards, early solid state games like Gottlieb's Buck Rogers showed up on the pinball scene. Prices per play were slightly less (20 US cents) than the quarters we were dropping here in the US. By 1983



and 84, Pascal and friends were playing *Panthera* and *Pink Panther* every Monday after school with pinball in good circulation at the time. In 1987, he played his last System 1 machine in a street location — a *Countdown* in Lyon, France. He explains that pinball in public places today is just as scarce in France as it is in the US. "Nowadays, it is almost impossible to find a pinball game in a bar, and most of the game rooms have closed down. The last one we had in Grenoble (biggest city close to my home) closed down in

the Summer of 2005. This was the last place around where I could play recent pinball games (*X-files, Tales of the Arabian Nights, Monopoly*..).  I know of another game room in Chambery (1 hour drive) which still has 5 pinball games: *Lord of the Rings, Medieval Madness, Attack from Mars, Star Wars Episode 1*, and *Ripley's*."

And the electronics interest gripped Pascal even earlier than pinball. As a child, he used to keep count of the power transformers around the neighborhood. "When I was very young (3 years old), I always begged my aunt to go on a walk in her village to go see all those huge transformers that were humming out loud. I knew the location of every single transformer by heart. My first electronics kit, a digital clock, was soldered at the age of 9 with a soldering iron with a tip as wide as my thumb. Upon the first trial, I had reversed the transformer by accident and the whole house went dark! After I changed the transformer, it performed well and still does, some 30+ years later!

As the young electronics enthusiast matured, he worked on (and completed) his Electrical Engineering degree. He spent 14 months in Japan and 15 more months in the US before heading back to France to work for ST Microelectronics in 1995.

"It was actually my wife, being from southern Marseille, France who tentatively dragged me down there and sent me employment leaflets that she had collected at an exhibition. And then I started to work for ST on April 1995. In October 2000, I moved to Grenoble (300km North of Marseille). Since I was hired, I have been working on components testing, application customer support on computer displays, and sound chips for the television market."
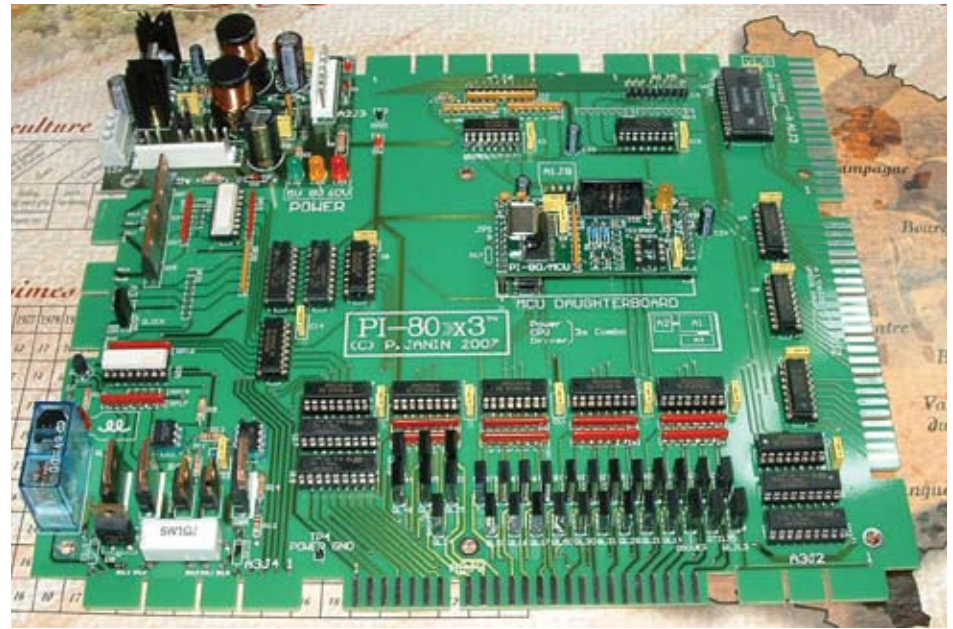
Being at ST has allowed Pascal to fully understand the capabilities of their processor lineup, specifically the ST-7 MCU of which an early generation is used in the Pi-1 and a faster, smaller ST-7 on the Pi-1X4 that replaces nearly all the Gottlieb System 1 hardware. In fact, this little processor is primarily used in computer monitor displays.

### Engineer and pinball hobbyist converge

Pinball met engineer when Pascal bought his first few pinball machines. From his childhood pinball memories, early Gottlieb solid state pinball machines were his throwback games of choice. It was while he was working on his second game, a technically disturbed Close Encounters of the Third Kind, that Pascal studied the System 1 board set and realized that its days were numbered. In 1999, he was given a Gottlieb Genie machine and took advantage of a business trip to Taiwan in April 2000 to start work on his own schematics for what would become the Pi-1 CPU board. It was not until a year or so later that news of a replacement board in the US was on the market. Pascal explains, "I had only vaguely heard about the existing Ni-Wumpf board, but the French complained that it had to be ordered from USA, it was expensive (due to unfavorable exchange rates at the time) and additional import custom taxes would apply (25% extra). So I realized that my board could prove helpful to a lot more people than I first thought." Amazingly, from initial concept to real-world working prototype took him only a few months.

It wasn't long until he decided to incorporate the troublesome power supply board, driver board, and eventually the basic sound board into the printed circuit board ultimately giving birth to what is called the Pi-1X4. With this board, you can remove and discard the large interconnect cable that formally connected the CPU board to the driver board, and also the power supply cable that ran from the power supply board to the CPU board. The x4 name comes from this integration of the 4 parts (CPU, driver board, power supply, and sound board). When asked about the issues involved, he replies, "There were not that many challenges, apart from making sure that the game behaved 100% like the original CPU. There was never any compromise. After I started to design my board, I got feedback from friends that I could split in 2 groups: those who enjoyed novelty and every new feature I could put in and those who wanted the board to be an exact replacement and disabled ALL my new features. I even know a person who never installs one of my boards in his game! He only uses it to debug the game during the fixing phase then he puts an original CPU inside." And as I will explain later, you'll see that the Pi-1 is virtually indestructible when it comes to foul voltages coming from switch or lamp matrix voltages, coil feedback voltage, and even messed up display voltages — all of which would take out "spider chips" on the original CPU board and the custom PAL's on the Ni-Wumph board.

### But there's more!

But there is, of course, more inventions to discuss. Starting in 1998, a series of ROM adapters were built. Then a new power supply for the speech capable System 80 and 80A machines, and finally a replacement pop bumper driver board, for System 80 and 80A machines. And there is still more to come with a Pi-FX universal sound board that replaces the sound boards in at least 26 titles, 28 if you include the non-speech export versions of Volcano and Black Hole. The Pi-1X4 will get a 'type 2' plug-in sound board for those later System 1 machines. But the most exciting item in the testing phase is the replacement System 80 and 80A CPU board.

Is there a demand for early Gottlieb CPU replacements? Consider this: The Pi-1 was first sold in 2001 when 30 boards were distributed at the French pinball expo Vierzon. Since then he averages 80 Pi-1's sold per year and another 50 Pi-1X4's per year. Only 25% are sold to US customers, 5% to Australia, and the majority staying in France. With US sales growing, you still might think that the volume for this product seems low considering the US collector market. There are some interesting French business circumstances along with Pascal's own determination to keep quality at the highest level that keeps the product numbers at some lower numbers. Pascal explains, "in France, starting your own (small or large scale) business is something closer to a nightmare than a dream-come-true. Unthinkable administration hassle (papers, registrations) and high fees and taxes block your way. Considering all of this, if I had to become a professional seller, and made a living out of selling my boards, I would have to work on them night and day, struggle with banks, administration, and double up the prices to pay the tax. I said no-thanks and created my own non-profit association in Dec 2001 to allow me to have a professional bank account and let me distribute my boards at a nominal cost that barely covers my expenses (manufacturing, develop-

ment, protos) and new purchases (software, hardware), without tax and administration hassles. I don't get a single cent on the sales. It's just pure fun as it was meant to be! I also received many proposals from US vendors to distribute my boards there. My major drawback is that all my boards are assembled by non-professional manufacturers (but all the parts are new & professionally made: PCB, components etc., nothing substandard or refurbished), so the manufacturing delays vary a *lot*. And I am also very picky about the manufacturing quality. I want to have control over it. So this is the price to pay to propose the best boards I have at the lowest possible price and to the maximum of pinball fans around the world. Amateur boards made in a professional way? At least trying to. Of course, if I could make some money out of this, I'd be happy to. But the hassle is just not worth it." So if you want to order a Pascal Janin product, you just have to drop him an e-mail at pascalpi1@aol.com. He'll explain the current production run and give you details on the process to get on the list.

## Examining the Pi-1 Product – for the Player

The Pi-1 replacement CPU board is a complete replacement board for the very obsolete original Gottlieb CPU board. Without a complete working board, you don't have a working game. And there are options for you. You can try to find someone to repair your board but this will be quite a project since the majority of the components are no longer available. As mentioned earlier, there is another reproduction that has been around the US for a long time in the Ni-Wumph which includes all the game code for every System 1 machine that was made. Some say that the Ni-Wumph suffers from inaccurate emulation of the original game code. While I can not recall to this personally, I can admit that it doesn't offer too many advances in protection from stray voltages that can take out custom PIC chips. If this happens, your board has to be repaired by Ni-Wumph or someone with an "in" to obtain their custom IC's. That's where Pascal's board takes a nice departure.

With the Pi-1, you can go the quick route and just plug in the board and power on the machine. Note that these are my words after spending a lot of time with the original board and the Ni-Wumph of which I wouldn't dare plug and play without voltage measurements and careful connector pin inspection. Immediately you will notice text flowing across the cool blue florescent displays. Here you select

the language for displayed text. And there is a lot of text that allows you to control this board's options. In software you select the specific game you have the board installed in. Once done, you decide which options to install for the game code. There is a 100% original option which doesn't use any of the original code, but very closely emulates the original. Then there are software dipswitch settings that set up number of balls, match configuration, coin mechanism configuration, etc. But from there, things get very interesting. Pascal has jazzed up the original code to make it more like a mid-80's machine. While you can keep it all original, who would want to? Installing the custom versions of the Pascal's game code really brings the game to life. An attract lighting mode runs its routine when the game is at rest. You won't need to drop coins, the board comes up and stays on 99 credits. Hitting the credit button kicks off intro lighting and then a flashing lamp on a random rollover lane (available for most machines) which identifies the new skill shot feature. Making the skill shot flashes all playfield lamps and sends calls to the sound board or chimes unit making sure you are aware of the reward. Should you lose a ball within the first few seconds of play, you get an "I suck extra ball" kicked out to the shooter lane. Every switch that has an associated lamp does a little light flicker show when a ball has tripped the switch. And when you lose the ball, the bonus countdown moves much faster than it used to. If you're able to really pull off a one of a kind game,

you'll have the opportunity to input a 4 digit name. The Pi-1 stores the best 5 scores and scrolls them across the displays during attract mode. Can you roll the game? Pascal's board offers the option of a divide by 10 (losing the last digit) to record those world class scores without a witness!

Doesn't this cheapen the original masterpiece as it was intended to be enjoyed by the end player? That answer is for you to decide. And with Pascal's Pi-1, you get to make a choice. For me, I've been able to see the Pi-1's additional features in Charlie's Angels, Cleopatra, Sinbad, and for this new revision of the board, Genie. Each time I've given the game a first run on the original emulated code and then switched over to the more flashy version. I've yet to convince myself to go backward, and after you see it, I doubt you will, either.

## Examining the Pi-1 Product – for the Pinball Repair People

Back in 2003, I received an early version of this board to review on popbumper.com. Today, the board has evolved through several changes. In brief, the prototype was put together around June of 2000. In March of 2001, the earliest revision was built which evolved into a 2 sided PCB in 2002. Minor improvements continued through 2005 with items like silk-screening connecter locations on the PCB. But since 2005, the board was completely re-drawn with component layout changing and a very stout switch matrix buffer capable of withstanding a direct 30V

short without feedback damage. And since Fall of 2006, all PCB's now have gold plated contact points to ensure "a lifetime of flawless performance" according to Pascal.

If you are looking for something made strong with easily replaceable components, you'll love this board. Putting the board in your hands will convince you that it's well made. There are multiple ways to connect the playfield switch row and column connections. Pascal put together .100" pins that parallel J-6 and J-7 so you can build custom connectors for in the event that you've "had it" with some of those original edge connectors. LED's indicate that you have proper CPU voltage (green) and give you the pulse of the ST-7 brain (red). Everything is laid out in machined sockets for easy replacement should you need it. Silkscreened information covers the front side to make it smooth in connecting to original connectors. And there's this one little jumper near the bottom left that kills off the troublesome Slam Tilt switch that was designed to be normally closed. Should you power up and get "SLAM TILT" displaying in your blue fluorescents, simply plug in a jumper here and your problem tilt switch no longer matters.

Troubleshooting issues with the board is a breeze due to the large amount of feedback you get from the software. You can pulse each individual coil and lamp, test all switches and obtain switch number feedback on the displays, and run display tests. Since connectors seem to be a large problem with these machines, Pascal's diagnostics can pretty much lead you right to the switch pin(s) that are causing dead columns or rows. But the

real strength with the board in my opinion is its ability to take a voltage hit from feedback. With the original board set, if you had a coil that had lost its diode and was feeding back a high magnetic collapse voltage into the driver board, it could pass this as a spike into the CPU board and take out one of the spider chips. On the Ni-Wumph, it would destroy one of the custom PIC chips. The same protection is true for the high voltage displays. If disconnected or re-connected while the machine is on, you could expect the same result with the original board or the Ni-Wumph. But the Pi-1 is loaded with protection from the end user and aging (and shorting) connector pins.

And one of the best freebies that come with any of Pascal's products is the open line

of communication with the developer. If you think you have a great idea that should be included in a specific game package, an improvement to the physical system, or even a discovered typo in the operating manual, simply drop him an e-mail.

If you can believe it, there is even more to this board. The old review of the 2003 Pi-1 is still available for you to read in its entirety on Popbumper.com under Legacy Articles / Reviews and covers many of those details. Pascal Janin can be reached at pascalpi1@aol.com for more information. You can expect more reviews of Pascal's products in upcoming issues of GameRoom Magazine, including the System 80 replacement which will feature many of the same "beyond original" items found in the Pi-1. **GR**