

May 2013

# SLOT TECH MAGAZINE

Slot Machine Technology for the International Casino & Gaming Industry



Slot Tech Magazine

The Case For Making PAR  
Sheets Public Knowledge

Revealing Slots Secrets:  
Generating a PAR Sheet  
Through Statistical Methods

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# Slot Tech Magazine

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Dear Friends of Slot Tech Magazine,

I received a very interesting (to me, anyway) contribution out of the blue last month. If you have no interest in slot math, this is not going to interest you. Move on in the magazine. But if the whole idea of "odds" and the actual numbers behind the slot math DOES interest you, this might be something that will shake you up a little. It did me, and prompted me to finally publish an editorial opinion article that I wrote a decade ago but never had a reason (read "courage") to publish until now.

Romanian slot math guru Catalin Barboianu has sent in a wonderful article entitled "Revealing Slots Secrets: Generating a PAR Sheet Through Statistical Methods." It shows us ways to look at the slot math of a specific machine, without being privy to the actual PAR sheet (the so-called "Paytable and Reel Strip" information that indicates the payout and probability of every possible combination of symbols-yes, a "blank" is a symbol). Honestly, I am not so much interested in the mathematics as I am his opening comments that players, more-or-less, are buying a pig-in-a-poke when they sit down to play and doesn't that sort of seem a little bit shady?

In ten years, I had NEVER heard anyone express this in virtually the exact same way as I had (although, prior to publication, I did run this by the industry's most famous and well-respected gaming business publisher-just to see if I was committing suicide-and he told me that he has been a proponent of the "Open PAR Sheet" for many years).

So, I apologize if I have failed you in the "hardware" department this month but I believe this is important stuff. I am just a technician. I REALLY only care about things that aren't working properly and how to fix them when they fail. Regardless, I am a part (a really small part) of the international casino business and I'd like to be proud of the industry where I've made my home. In general, I am. We provide first-class entertainment to much of the world. But in this respect (and only this respect) I am somewhat embarrassed. I'm not going to mount a "crusade" for disclosure but I feel that it's inevitable that these data are disclosed to the players. Failure to do so is deceptive and I am not comfortable with deceit, ESPECIALLY so in this industry.

*Randy Fromm*

**Publisher  
Slot Tech Magazine**



**Randy Fromm**

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# Revealing Slots Secrets: Generating a PAR Sheet Through Statistical Methods

by Catalin Barboianu

For decades, the slots game has remained one of the most popular games of chance, despite a specific element that could limit its appeal, namely non-transparency: Players do not know the parametric configurations of the machines they play at, as this information is rarely exposed. Card players know the composition of the decks in play, roulette players know the numbers on the wheel, lottery players know the numbers from which the winning line is drawn, and so on. Slots remains the only game in which players are not aware of the essential parameters of the game, such as number of stops of the reels, number of symbols and their distribution on the reels, which makes the slot games unique in this respect.

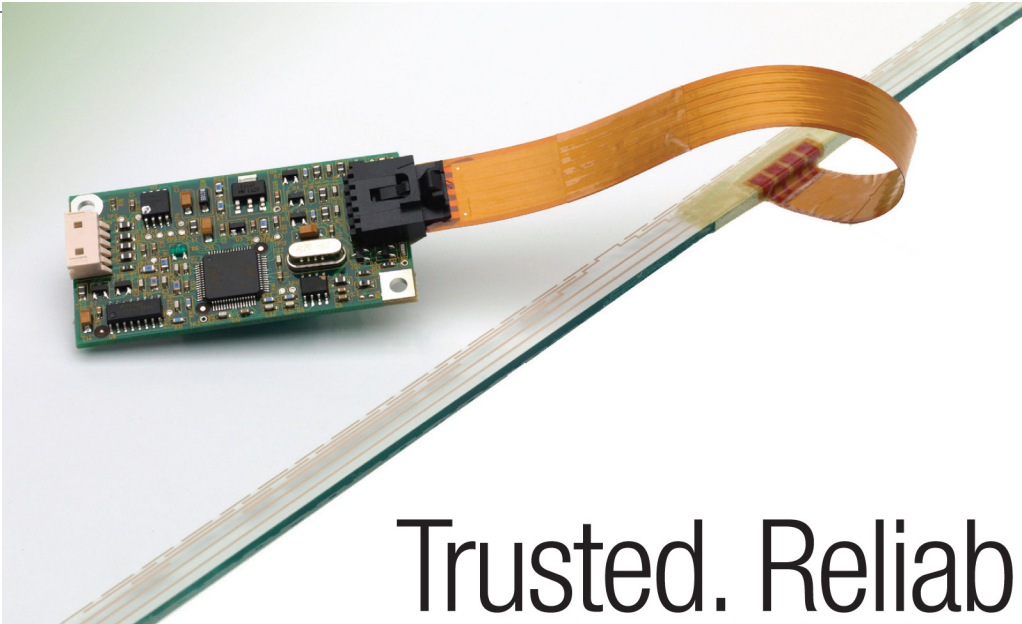
Obviously, the lack of data regarding the parametric configuration of a machine prevents people from computing

the odds of winning and other mathematical indicators, since the probability formulas hold as variables those parameters. The PAR sheets (Probability Accounting Reports), exposing these parameters of the machines and probabilities associated with the winning combinations are not publicly exposed and can be only retrieved upon request from the game producers, usually via legal intervention (for example, through FIPPA, Freedom of Information and Protection of Privacy Act).

Regarding the possible reasons of the game producers for keeping the PAR sheets far away from the public, there is a stated reason expressed by producers who declined the requests, in their appeals to the court decisions, through the fact that PAR sheets contain information considered to be trade secrets in the gaming industry and consist of mathematical formulas and equations developed by their engineers and that information significantly prejudices their competitive position. There are debates on whether such reason is justified and the opponents argue that it fails against the generality of the math formulas

and equations – although the parametric details vary from game to game, the mathematical results concerning probability, expected value, and other statistical indicators are just *applications* of general formulas that are publicly available in mathematics and common across all slot machines, and no individual or corporate body can claim ownership of such a pattern or formula; they also claim that the competitive prejudice reason fails against the open possibility for all slot producers to configure, test, and use any parametric design for their slot machines and the producer can manipulate the game parameters, including the payout schedule, in unlimited ways, so as to obtain the desired statistical indicators for the house. Another possible reason is the hypothetical fear of losing players who face the real odds and expected values of their games, which is criticisable through the *a priori* expectation of the players for low and very low odds of winning induced by the experienced secrecy of PAR sheets and through the lottery example, in which lottery players continue to play against the (well known) lowest odds of





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winning from all games of chance due to other addictive elements that slots also hold.

Ongoing studies debate on the ethical aspects of the exposure of the mathematical facts behind games of chance and on whether the exposure should be limited to the parametric configuration, basic numerical results (such as probabilities for basic winning events and expected value) or more advanced mathematical results and their interpretations.

Mathematics has its role in this issue and its main contribution is not only another argument on the insubstantiality of the secrecy of slots PAR sheets, but a practical one: Mathematics provides players and professionals with some statistical methods for retrieving these missing data. Having these data along with the mathematical formulas, anyone can generate the PAR sheet of any slot machine.

The configuration of a reel refers to the distribution of the symbols over the stops of that reel. Denoting by  $t$  the number of stops and by  $p$  the number of distinct symbols  $S_1, S_2, \dots, S_p$  on the reel, and denoting by  $c_i$  the number of symbol  $S_i$  on the reel ( $1 \leq i \leq p \leq t$ ), then the vector  $(c_1, c_2, \dots, c_p)$  is called the *distribution of the symbols*  $S_1, S_2, \dots, S_p$  on the reel, also known as the *weighting* of a reel. Each reel has its own distribution of symbols. We can assume the same number of distinct symbols on each reel ( $p$ ) through a convention: if a symbol does not appear on a reel, we could simply take its distribution on that reel as being zero. A blank is considered as a distinct symbol within the mathematical model.

### The Raw Approximation.

This method is based on the well-known result from probability theory called the Bernoulli's Theorem, which states that in a sequence of independent experiments performed under

identical conditions, the sequence of the relative frequencies of the occurrence of an event is convergent toward the probability of that event.

Applied to slots, that principle says that if  $N$  is the number of spins of a reel with  $t$  stops where we observe as an outcome a specific symbol  $S$  that is placed on  $c$  stops and  $n(N)$  is the number of occurrences of  $S$  after the  $N$  spins, then the sequence  $(n / N)_N$  is convergent toward the probability of occurrence of  $S$ , namely  $P(S) = c/t$ .

The ratio  $n / N$  is the relative frequency of occurrence of  $S$ . It follows that for large values of  $N$ , the relative frequency of occurrence of  $S$  approximates the probability of  $S$  occurring. The higher  $N$ , the more accurate this approximation. Obviously, the number of spins  $N$  must be large enough for obtaining good approximations of the ratios  $c_i / t$ , and this is the main issue of this method. As theory does not provide us with tools for choosing  $N$  for a given error range, all we have is the principle "the larger  $N$ , the better."

As one can notice, this method of approximation based on statistical observation is subject to errors coming from idealizations and various assumptions, and the error ranges are not even quantifiable. Note that the described method provides us with approximations of the ratios  $c_i / t$  (usually labeled as "hit frequency" in PAR sheets) for each reel and not the parameters of the configuration individually ( $c_i$  and  $t$ ). However, knowing the basic probabilities is enough for any probability computation for a slot game. A more accurate approximation of the ratios  $c_i / t$  and even of  $c_i$  and  $t$  individually is still possible through statistical observation, using a method which can refine the raw estimations obtained through the previously described method. Such a method is briefly described further.

$(c_1, c_2, \dots, c_p)$





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## Denominator-Match Method

Denote by  $n_1(N), n_2(N), K, n_p(N)$  the number of occurrences of symbols  $S_1$  to  $S_p$  respectively after  $N$  spins of a reel. There is a slight correlation between the recorded values  $n_1, n_2, K, n_p$  for various large numbers of spins  $N$ . Based upon this correlation, we can refine the estimation of the ratios  $c_i / t$  obtained through the previous method

and also find estimations for  $(c_1, c_2, K, c_p)$  and  $t$ , by recognizing a numerical pattern across some sequences of fractions representing the ratios between possible values for  $c_i$  and  $t$ .

The denominator-match method is based on the numerical analysis of the fractions  $n_i / N$  and on a five-step algorithm, which I describe very briefly in this article and is explained at large in my last book *The Mathematics of Slots: Configurations, Combinations, Probabilities*:

We write each fraction  $n_i / N$  as a chain of equal fractions, having numerators from 1 upward and denominators not necessarily integers, for every  $i$  from 1 to  $p$ . Across the  $p$  chains of equal fractions obtained, we choose that of the minimal length (let  $m$  be the minimal length). Then, across the  $p$  chains of equal fractions, we extract  $m$  sequences of fractions (one fraction from each equality chain), having the denominators the nearest to the denominators from the minimal equality chain respectively. From the  $m$  sequences of fractions obtained, we choose one sequence of  $p$  fractions by applying progressively the following filtering criteria: having denominators as close to each other as possible, having the highest number of instances of the same denominator, and the repeating denominator with the largest share being an integer. As final step, we adjust the numerators of the final sequence of fractions, through an approximation algorithm that leads to one denominator for all the fractions,

being the sum of the numerators, as it is the relation between  $t$  and numbers  $c_i$ .

This method provides us with the most probable number of stops  $t$  and associated symbol distribution  $(c_1, c_2, K, c_p)$  of a reel in a certain probability field; the error range of this approximation is quantifiable in terms of probability.

Regarding the practical application of the methods through statistical observation, it is obviously an arduous task, since we have to watch and record spins in numbers of thousands.

Any information acquired on  $t$  besides the presented statistical methods of estimation is useful with respect to the accuracy of the approximations because it can give a clue as to how high we should choose  $N$  for avoiding irrelevant results (for example, if  $t = 100$ , we intuit that choosing  $N = 1,000$  or lower would not be high enough for relevant results). Besides the methods based on statistical observation, there exists a method of estimating  $t$  through physical measurements, applicable to some particular types of slot machines. This method exploits the information given by the appearance of the reel on the display. As we know, only a small part of the reel (either physical or virtual) is visible on the display and this part can be seen as one or several adjacent stops (usually 3, up to 5). So we can view from 1 up to 5 consecutive stops of the reel. If the appearance of this part of the reel is three-dimensional (which is possible for both physical and virtual reels), by measuring some parameters of this image, we can deduce an estimation for the number of stops of that reel ( $t$ ). Basically, the apparent lengths of the visible stops give full information on the curvature of the reel, which then leads to an estimation of the entire number of stops, since the number of visible stops per the circular length of the visible reel is proportional to the total number of stops per the circular length of the entire reel. This method can be applied only to reels showing at least two consecutive stops on



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#8650 - Single cold cathode lamp assembly for Bally IView player tracking system 6.2 inch "IDW" LCD

#8680 -- Single cold cathode lamp assembly for Bally IView player tracking system 6.2 inch "IDW" LCD

#9890 – 5 wire touch screen for Bally IView 6.2 inch Hitachi LCD

#8950- 5 wire touch screen kit for Bally Iview 6.2 inch "IDW" LCD

#1240 – 6.2" Hitachi LCD \$TX16D11VM2CCA

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#9780-"L" shape cold cathode lamp assembly for 7 inch AU Optronics LCD

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the display in three-dimensional view. The method cannot be applied to virtual reels showing several consecutive stops in flat image. As in the case of the previous method through statistical observation, there are issues with the practical application of the method through physical measurements. There might be technical issues regarding acquiring the proper position for measurement or placing the measurement tool on the surface of the machine. Also for this method, an alternative would be for the observer to take photos and make the measurements on the photos. Of course, the slot machine operator might not allow the direct measurement and/or taking photos.

An applied mathematics unit using the denominator-match method applied on statistical records for retrieving the missing parametric configurations of the existent slot machines and generating their attached probability results is in project.

With regard to problem gambling, past empirical studies found that *facing the odds* does not change much gamblers' behavior toward a decrease, however a clear conclusion is not drawn yet. As regard to the slots game itself, the odds and other mathematical facts do count as information in a trivial strategic sense: It is as if someone asks you to bet you can jump from a high place and land on your feet; of course, it is an advantage for you to know in advance the height from which you will jump or measure it before you bet, as you might decline the bet or propose another one for a certain measurement, and this means *decision*.

#### **Author's Biography:**

Catalin Barboianu is a Romanian gaming mathematician, author of eight books on mathematics of gambling, published in several languages and listed in the official bibliographies for students at several gaming institutes around the globe. He maintains a website dedicated to probability theory and its applications for the non-mathematician at <http://probability.infarom.ro> and is a proponent of the public exposure of the mathematical facts of games of chance.

Contact Mr. Barboianu directly at **cb@infarom.-STM**

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## Regional Slot Tech Training

I was asked to hold a slot tech class at the Apache Casino in Lawton, Oklahoma from June 18-21, 2013. I have six available openings for the class. This four-day class will cover the following subjects:

### Day One

#### *Beginning Electronics for Slot Machine Technicians*

Let's face it. When it comes to fixing slot machines, there's a lot of stuff that you just don't need to know. Why try to learn electronics from an engineering standpoint (the way they teach in college and technical schools) when all you need is enough electronics training to fix things?

This segment assumes that you have no previous electronics training and takes you through a simple, NO MATH look at electronic components, electronic circuits, schematic diagrams and more! Understanding electronics is easy when you learn the basics of how circuits and components operate.

#### *Using a Digital Multimeter*

The DMM is the single most important piece of test equipment you can use. The Casino School program shows you how to use the meter to make the tests and measurements necessary for fixing reel slots, video slots and other types of gaming machines.

#### *Electronic Components*

All of the individual components used in gaming machines are introduced. Parts such as resistors, potentiometers and capacitors are covered individually. Students learn how the components function in the circuits and how to test them for proper operation using the digital multimeter.

#### *Schematic Diagrams*

*Schematic diagrams* are the blueprints for electronic circuits. Learning to interpret schematic diagrams is a natural part of the Casino School. The schematic symbols are used throughout the course and students become familiar with schematic diagrams throughout the class.

### Day Two

#### *Diodes, Transistors & Other Semiconductors*

#### *Hands-on Transistor Testing Lab*

Semiconductors are the basis for just about everything in today's gaming equipment. Semiconductor failures of all types are among the most common of problems you will encounter when fixing power supplies and monitors. This part of the school takes a look at all of the different types of semiconductors commonly seen in gaming machines. We'll take a look at the operation of each component, along with testing procedures to determine if the part is good or bad. Students will have ample opportunities to practice their testing skills during the hands-on transistor lab. Replacement components will also be discussed. Never get stuck for a replacement part again!

### Day Three-Morning Session

#### *Soldering*

Component removal and replacement is a better term for this segment. Good soldering technique takes practice but there are some tricks that can really help speed things along and minimize the chance of damage to the PCB. During this segment, each student will be provided with their own soldering station, solder and desoldering supplies. This equipment will be theirs to keep. We will be assembling a kit that includes all of the electronic components we have just studied.

### Day Three-Afternoon Session (Continues through Day Four morning session)

#### *Power Supplies*

Power supplies are at the heart of all electronic systems and power supply failure is common in all of them. Slot machines are certainly not immune. It is not uncommon for a slot machine to have a half dozen power supplies working together. This module covers all types of power supplies, including linear power supplies and the Switched-Mode Power Supply (SMPS) found in LCD (and even CRT) monitors.

### Day Four-Afternoon Session

#### *LCD Monitor Repair*

LCD Monitor repair is generally pretty easy thanks to their modular design. This segment covers the theory of operation of LCD monitors. There will be a presentation on the repair techniques including CCFL testing and replacement. Repair of inverter PCBs and Scalar (video) PCBs will also be covered.

The class assumes no previous knowledge of electronics. However, this is a SERIOUS CLASS and expect my students to be professional, show up on time and pay attention. We have homework and everything (just reading assignments, actually). Class begins at 9:00 am and ends at 4:00 pm daily with an hour break for lunch at noon. It is six hours per day of training.

The four-day class is \$995.00 per person. This includes all textbooks and classroom materials. Each student receives their own digital multimeter (theirs to keep) and soldering tools and supplies as well as samples of electronic components. Transportation, meals and lodging are the responsibility of the student. To register, visit the website at [slot-techs.com](http://slot-techs.com). -rf

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May 2013



## The Case For Making PAR Sheets Public Information

By Randy Fromm

In our daily life, disclosures of all types surround us. Go to a supermarket and the price of each item is clearly marked. Pick up a processed food item and all of the ingredients are listed on the package. Any medicine will have a list of potential side effects and their remedies. When you purchase a new vehicle, the fuel mileage is plastered on the passenger's side window in giant numbers.

So why is it that a slot machine player has very little idea of what he or she is paying for when they play a slot machine? If you think about it in the context mentioned above, it doesn't even seem like something that should be considered "legal and proper" in today's climate of consumer protection and disclosure. Oh sure, there are laws in place that guarantee, for example, at least 75% payback but there's a big difference between 75% and 97% and players (generally) have no way of

knowing where they stand (or sit) when they insert their money into a machine.

Times have changed in the gaming industry. Today, no law enforcement agency in the world would allow someone to set up a card table on the street for a little Three-Card Monte but in an Old West saloon, it wouldn't have been a problem. Maybe it's time to open the books on slot machine mathematics . . . Maybe.

### The Case for Disclosure

Why the heck would we want to? What would be the point? How would publication of the PAR sheets or even payout and hold percentages improve upon our current operation?

**Disclosure** shows that as an industry, we have nothing to hide. This is a wonderful business full of professional business people. The public is chock-full of misconceptions about the industry as a whole and certainly about the machines themselves. Many of those misconceptions have

been dispelled through television. The Travel Channel led the way with their documentary series on the inner workings of Las Vegas casinos. They showed the public into such previously verboten areas as Soft Count and Surveillance.

A reality TV program called American Casino went, as they promoted in advertising "behind the scene at the glamorous four diamond Green Valley Ranch Resort and Casino and reveals just what it takes to lure the rich, the famous, and the high rollers away from the Las Vegas strip to their intimate and extravagant resort and casino." There was also a program set at the Golden Nugget called "The Casino" and another entitled "Casino Diaries." Programming like this showed us as the dynamic, exciting industry that we are.

**Marketing tool** - Display the odds and draw them in. Show folks how HIGH the payback is on your machines. Why do stores hold sales? Surely, they are making less profit per item if they sell it more cheaply.



Why would they want to do that? You don't need me to tell you that while they're at the store, they will purchase something else (at full price) in addition to the sale item. Which leads us to . . .

**People play what's available** - If your high-percentage machines are occupied, they'll play something else. Guaranteed.

**People play what's appealing to them** - If your highest payback machines aren't appealing to the player - for whatever the reason - Game theme, bonus rounds (or lack thereof), complexity, reel Vs. video - your guests will play a different machine or machines. This is more or less the same as . . .

**People play where they feel comfortable** - It's obvious to the player that the dollar video poker has a better payback than the nickel machines. It's printed right on the glass or on the screen. And yet I'm not telling you anything you don't know when I point out that time and again, you see players sitting down at a machine with a lower payback than a similar machine just a bank away or even right next door!

I found myself doing it during a recent trip to Laughlin, Nevada. I went down to the lobby of a casino for a cup of coffee from Starbucks and looked for a place to sit down and enjoy it. I don't play often but I bore easily and since I hadn't brought a book with me, I looked for a suitable location to sit and play video poker. I walked around a bit, looking at denoms and paytables but I finally settled into a quiet corner where I felt comfortable, regardless of the fact that the machine wasn't the most generous on the gaming floor.

**Maybe (MAYBE!) it's the "right thing to do."** The odds for other casino games (roulette, craps, blackjack, etc.) are known to the players. Why should a slot machine be any different?

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## The Case Against Disclosure and Self-Rebuttal

***“It’s none of anyone’s business but my own.”*** - A natural response to anyone inquiring of the details of one’s business. Slot math is “proprietary” information and the folks that make the math are entitled to keep it secret. However, this gives the appearance of having something to hide, raising suspicions.

***Team Play*** might become a factor, with team members monopolizing the generous machine. So what? A player is a player when it comes to slot machines. There is no such thing as a “good player” or a “bad player.”

***People would fight over playing certain machines*** - It doesn’t often happen now when casinos are packed on weekends and folks are waiting in line behind occupied machines.

***Price wars (payout percentage wars) will drive down the profit margin.*** - There is great stability in capitalism and consumerism over the long term. However, major players sometimes shake-out smaller competitors and so it is hard to argue that this is not a possible side-effect of disclosure where there is close competition between casinos and players have a choice of where to play.

## Implementation

I suppose there are many ways to implement this but what I have envisioned is something like a three-ring binder with a list of all the machines sorted by property number and the payout percentage for each one. In the back of the book (or in a separate binder) would be the PAR sheets themselves, included as an appendix. Naturally, there are far fewer PAR sheets than there are machines on the floor as there are multiple games of each title. The book would be made available for inspection at the players club or customer service area. It would not be removable from the viewing area.

An alternative (and much better) method would be a computer-based system. A kiosk or stand-alone terminal can use a simple database with a really dumbed-down GUI that would sort machines by payout percentage, title, location, etc.

It would be a snap to incorporate an online casino map that will route the player from the kiosk to the destination. A little bit of collaboration between the casino’s marketing department and the slot director can create a “virtual path” through the casino from each kiosk to each of your highest payback machines, a path that can be lined with anything imaginable. The marketing possibilities

are almost endless.

I would love to hear from others in this regard. I am certain that there is a myriad of other factors that I haven’t considered on both sides of the argument.

- STM

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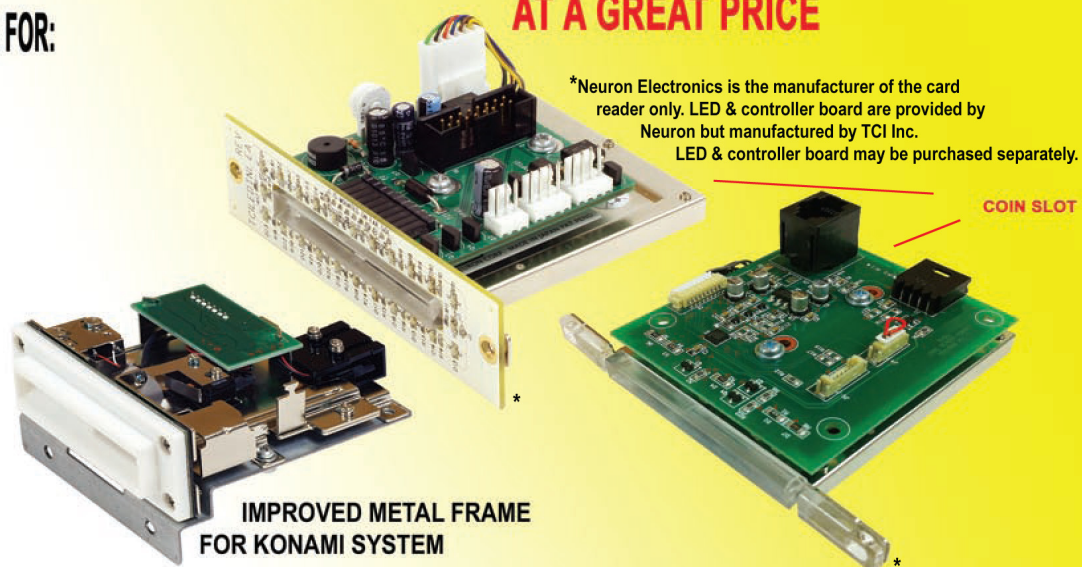
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### IGT S2000 “Bad PGM”

I admit I had no idea where even to start with this error. On the VFD it showed “bad PGM” as pictured. A co-worker was called for assistance and the individual arrived with a replacement VFD. What is the VFD for? It appears to be working, is it for a different game? The individual stated they had run into this error before on a S2000 where one of the PLCC chips were bad. Instead of swapping chips around, simply replace the complete VFD. As sure as the sun rises in the morning, after the unit was replaced with the spare it booted up perfectly. No errors and was ready for play. Definitely something to try to keep in the back of your mind, “bad PGM” = replace the VFD.

### WMS Upright BlueBird 1, No Game Power

## Quick & Simple Repairs #95

By Pat Porath

A slot attendant told me the game had a totally black screen so it was power cycled. Unfortunately, it didn't turn back on. The only power it seemed to have was unswitched power so the Oasis Sentinel was lit as was the interior game light. From experience, this indicates a bad power supply. On a BlueBird 1 upright game it is very easy to replace. Only one small bolt holds it in place, and there are only three connectors. It was replaced with a spare without success. I grabbed a second spare just to make sure, yet again no game power.

Maybe there was a fuse somewhere I didn't know about or a loose connection somewhere? All connections were checked on the motherboard, the game processor board was reseated, the fuse on the “power distribution unit”

was removed. I know it was good because when I removed the fuse, the interior game light went out. Once it was put back in, the light came on.

Next, the “110v power distribution block” was removed from the back of the game. This is the location of switched and unswitched 110vac power. It is somewhat buried in the game but not really difficult to remove. All of the connections looked good and there aren't any fuses located in the unit so I assumed it was





good. A co-worker walked up and I gave the individual the scoop on what was done thus far. He indicated a possible bad main game power switch. Well, might as well take that out too. After the main game power switch was removed, a meter was used to test it. The meter was set to measure resistance. The switch failed the test. With one meter lead on one side of the switch and the other meter lead on the other side of the switch, there was not a change in the resistance (Ohms). In other words, it didn't matter which position it was in, the display didn't change on the meter. Without a doubt the switch was bad. It was replaced with a spare which worked perfectly. Pretty unusual to have a bad main power switch.

#### Aristocrat Mark IV Ticket Issues

A call was received in which an older Aristocrat Mark IV had issues printing tickets throughout the day. Once again, so I was told, the game printed a blank ticket to a customer. Since I wanted to see for myself what the game was doing, two, 5-cent tickets were obtained. The game wouldn't even accept the ticket! It wouldn't even think about accepting, it would reject it right away. The ticket was tried in a game next door and it took it right away so I knew it was good. To me the problem seemed to be software related, such as "accept tickets disabled" or "thermal printer disabled." Game options checked to be OK, nothing was seen out of the ordinary. So, instead of screwing around with the bill acceptor and since I had complaints about the ticket printer too, BOTH of them were replaced with spares. After they were replaced it appeared communication had been lost FROM the game TO the Oasis Sentinel. What is up with this game today? Overall, older Aristocrat games run OK in my opinion. SPC board memory was cleared with software, which didn't





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work. This time power was cycled on the board. Once again communication was checked, and now I had a door OPEN and door CLOSED showing on my Oasis display (corresponding with the physical main slot door being opened and closed) this indicated good COM. Back to the original problem, after both the WBA JCM bill acceptor and Ithaca 850 printer were replaced, a valid ticket was inserted. We have a bingo! The ticket was inserted, accepted, cashed out, and printed. A quick inspection of the ticket, all looked good. After inserting a ticket, and cashing out five times, it was considered repaired.

#### IGT S2000 "Insert Disk" Error on Upper LCD

This was an S2000, five-reel stepper game with an upper LCD such as "Lobster Mania" or "Denver Duck." The upper LCD is also referred to as MCB2, it includes "Halo Lighting," RAM memory sticks, a hard drive, a CD drive and many other items. This unit had two obvious problems. One of them was an "insert disk" error that displayed right on the front of it, the other was that the unit was VERY hot to the touch. A failure of the top cooling fan was definitely the cause of the heat. With a little luck, after allowing the unit to cool down and replacing the bad fan, it would work properly again. Unfortu-

nately it didn't work. After one power cycle the LCD would only be "back lit." On the next, "insert disk" error would appear again. A few unsuccessful reboots later, I called for assistance. A co-worker repaired the LCD (replaced caps) but used the original hard drive because it had the correct game software on it. After it was replaced back into the game, it worked perfectly. Sometimes, when an upper MCB2 is opened up the caps are obviously domed and need to be replaced. I've also run into a few situations where the power supply (located behind the MCB2) is bad and needs to be replaced.

- Pat Porath  
pporath@slot-techs.com

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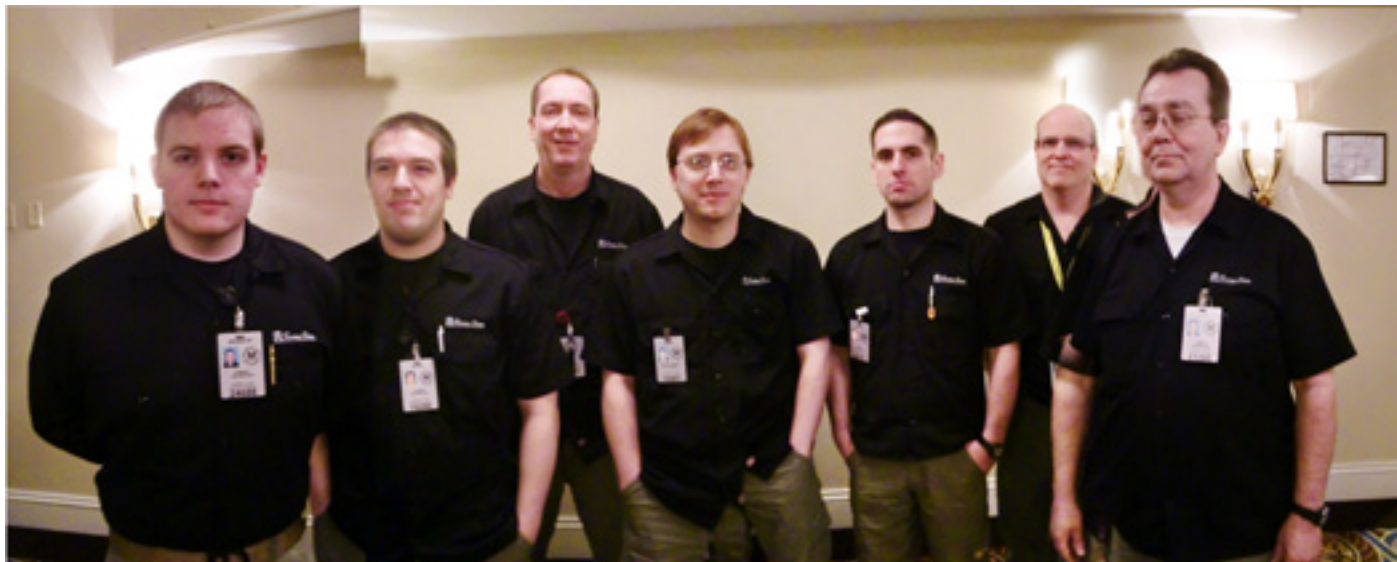


# No Class Too Small

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project (a two-tone siren with flashing lights that introduces the concepts of the oscillator and multivibrator) as well as the SMD (surface-mount device) "Decision-Maker," a sort of electronic "Magic Eight-Ball."—**STM**

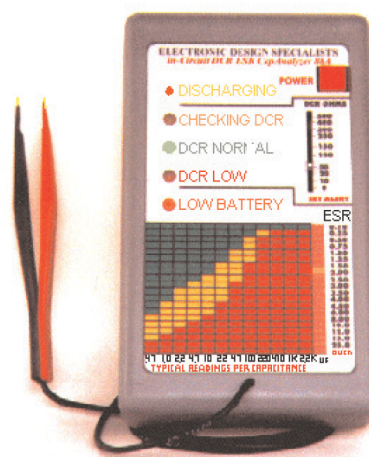


Attending the four-day tech class were Brandon Kiehn, Kevin McCormick, Thomas Chesbro, Todd King, Steven Kurilovitch, Gordon Combs and John Groth.

This was my "normal" four-day class. We cover a mix of subjects but the final upshot of the class is the ability of the student technicians to repair power supplies and LCD monitors as quickly and as easily as possible, without the requirement of special test equipment (other than a capacitor "ESR" meter that costs just \$220).

Soldering skills are an important part of being a competent technician. I was pleased that all of the students were able to successfully complete both their "through-hole" soldering

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### IGT IGAME PLUS "Line Frequency Detect " Error

I saw this error in a slant top machine, while I was checking the floor after the drop team had finished the drop collection.

I had realized for a while now, that most of the problems I deal with in the morning shift had to do with drop collection.

*Editor's Note: The drop team is "job security" to slot techs, worldwide. There is a love/hate relationship between the two.*

I tried to open/close the main door and cycle power, but the error was still on the screen.

After I opened and closed the bill door the error disappeared, but I was very curious what had caused this problem.

I repeated the cash box collection procedure many times and this error came up often.

## Two Quick Things

By Babis Ziropiannis

After a closer look I noticed that the harness at the bill door that gives power to the lamp was damaged and sometimes it was making contact with the door.

I replaced the harness and the error never appeared again.

### A Different "General Reel Tilt" Error

I had to deal with a "general reel tilt" error at an upright IGT s2000 machine.

Some common errors that slot tech's have to deal with IGT s2000 machines are door errors. When a "door open" indication appears while the machine is playing, then a "general reel tilt" error appears.

When I dealt with that error, door optics were aligned properly, all doors seemed latched and all micro switches were also ok.

However, the 'general reel tilt' error kept appearing the minute I was walking away from the machine. As long as I was there it was working properly. I had to check if the customer was doing something that was causing

that error when I was leaving. At the casino I work, customers tend to stick various objects in the spin button( member cards, toothpicks, paper clips) to keep it pressed in.

That way they just put a note and watch the slot machine play.

The specific customer, when I was leaving, he put both his legs between tray and main door and moved his body back and front again like he was sitting in a rocking chair!

As a result of this strong pressure on the main door, the optics misaligned and caused the general tilt error. When I kindly ask him to stop doing that for his own safety, the tilt error didn't appear again.

*Mr. Ziropiannis is a slot technician at Club Hotel Casino Loutraki in Greece. He has been a slot tech at this casino since 1999.*

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About Randy Fromm: I am the publisher of Slot Tech Magazine. First published in 2001, Slot Tech Magazine is a monthly trade journal focusing on casino slot machine repair. I have been repairing electronics for the gaming industry since 1972. I really enjoy what I do and I love showing others how easy it can be. ***No previous knowledge of electronics is required.***

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