**Hulk Hogan at NIGA**

**Slot Tech Magazine is an Official Publication of**

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# Slot Tech Editorial



**Randy Fromm**

This month's Slot Tech Magazine has a distinctly "world" feel to it with news and technical articles from Africa (South Africa, to be precise but it doesn't start with the letter "A") to the United Kingdom and from the Dominican Republic, through Spain to Taiwan.

Kevin Noble begins our world journey with his contribution on setting up the Amber Coast Casino on the island nation of the Dominican Republic. I suppose it's really a "half-island" nation as it shares the Greater Antilles island with Haiti but I digress. Kevin's adventure serves to prove, once again, that being a technician can provide lots of opportunity for world travel if you're looking for a little adventure in your life and you put a little bit of effort into finding it.

In this instance, Kevin hooked-up with the casino operator through the Slot Tech Forum, hosted by Pete Bachran. If you don't know what that is, you're missing out on a fabulous asset. There is a link to the forum at our own website at slot-tech.com.

Encoders and decoders allow computers to communicate with the outside world. In gaming, they are used to allow the CPU to do things like driving the hard meters among many other uses. Slot Tech Magazine's resident guru on such matters, Herschel Peeler, takes us on a journey through the next level of digital electronics starting on page 12.

Despite what you see on the cover, this is not Slot Tech Magazine's "Special Chair Issue." This is a technical magazine and there's not much to interest a slot tech in casino seating at this point in time. The fact of the matter is that I simply love the artwork created for Gary Platt Manufacturing by George Fung. Platt is promoting their new "Royale" line of casino seating. I have included a New Product announcement on page 19.

I know it's kind of a stretch to run an article on a chair but after all, they do have *something* to do with slot machines. In fact, when you consider that casinos used to be strictly stand-up affairs insofar as slot machines are concerned and that playtime has increased dramatically since the advent of casino seating, those chairs are likely the unsung heroes of the casino and are paying your salary!

John Wilson's fingers have thawed from the cold Canadian winter in time for him to present us with part IV of his "Trilogy in Five Parts" entitled Par Excellence. This in-depth discussion of slot math continues with a look at hit frequency and payouts starting on page 21. John will be one of the featured presenters at this month's sold-out TechFest, being held at Mystic Lake Casino May 4th through 9th.

If you missed TechFest this year, rest assured that the program is now a Spring tradition and will be presented again next year at a casino near you in Minnesota. The location has already been selected and will be announced in the coming months.

NIGA show coverage has been reduced to a page of snapshots in order to save space. I was there to cover the show and to distribute Slot Tech Magazines to the attendees. It was an interesting show for me because I don't care about new game titles and was able to concentrate on new technologies. You'll read all about it in future issues.

South Africa's Hendrik Sidaway rounds-out our technical presentations with a look at troubleshooting and repair for GPT's stacker starting on page 29.

Finally, a quick word about the pitfalls of translation and idiomatic expressions. I got such a big laugh out of Stella's press release regarding their show at Torremolinos, Spain that I just had to reprint it "as-is" without editing. I'm certain that what they had meant to say was "STELLA Pulls Out all the Stops at the Spanish Market in Torremolinos!" The title they sent was "STELLA Pulls the Finger Out at the Spanish Market in Torremolinos!" Somehow, I get the feeling that pulling out THE FINGER is probably not the best way to attract customers (not in the United States of America, anyway).

That's all for this month. See you at TechFest 9. Happy birthday, Mom.

*Randy Fromm*

**Randy Fromm - Publisher**

# Amber Coast Casino
## A Friend in Need

**By Kevin "Surf-Daddy" Noble**
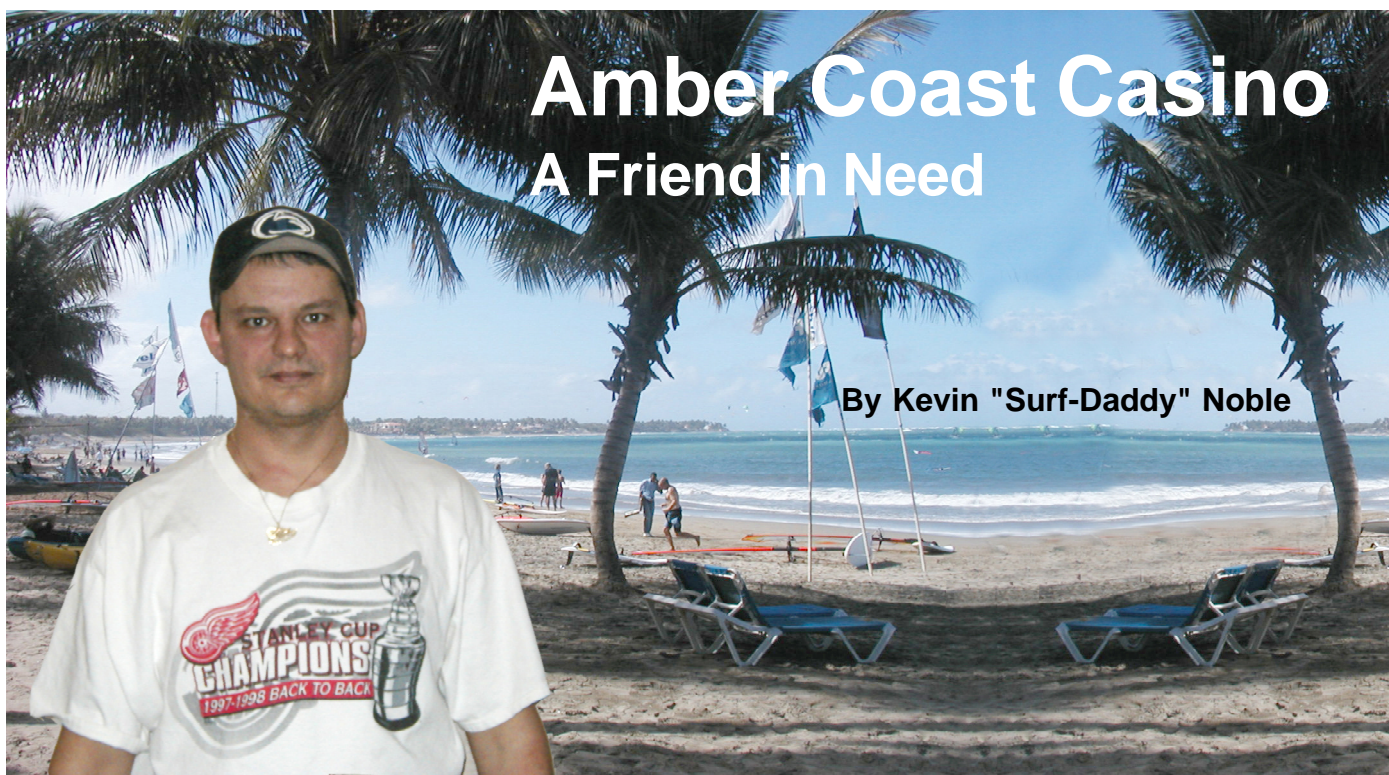
Located on the North coast of the Dominican Republic near the towns of Cabarete and Sosua in Puerto Plata, is the new casino at Breezes Puerto Plata Tropical Resort Spa and Casino. This was my "Dream Come True" in more ways then one. The chance to implement some ideas, train technicians, and jump in the ocean in the middle of an Ontario February.

The planning stages originated back in Miami, Florida with Vince Perri (Part Owner & Operator) who put this plan in action with nine other contributing partners to build a small Las Vegas-type Casino in a five-star resort. Meeting Vince and talking about casino operations for months and months before, the feeling-out process began. As Vince's area of casino expertise was not slot machines,

we talked about the operations, security and functions of slot machines from a technician's point of view. As the conversations proceeded over time, a good friendship

developed between us to the point that I was invited to the Dominican Republic to help him look at some machines that were coming in from the U.S. I worked closely with



**This is a casino? Yep! It's the Amber Coast Casino in the Dominican Republic.**

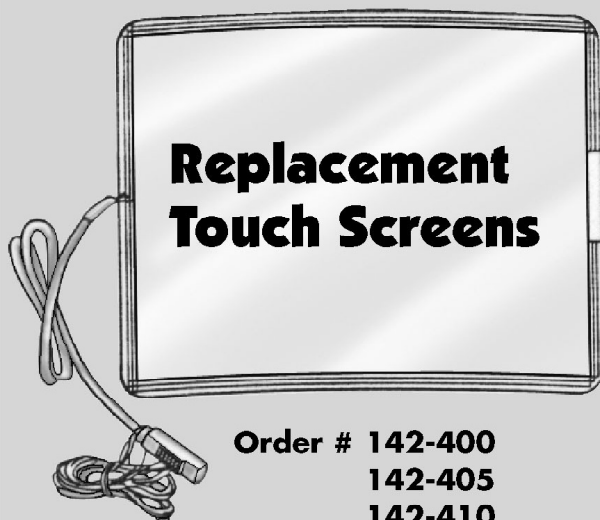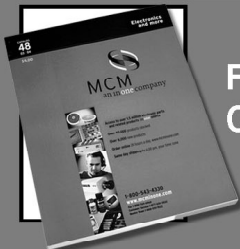Vince on the operations side of the slot department. I was able to pass along many of the policies and procedures that I have encountered over my years as a slot technician. I wanted to help him provide great customer service to his guests while also having the security in place to protect his assets and give the technicians the freedom to do their jobs.

I have had a number of setups under my belt and this was a challenge I just could not resist.

## Planning Stages

Not being part of the original planning stages for ordering and purchasing the games, Vince was able to provide me with a list of the machines he had purchased along with a floor layout of the Casino. From this, I was able to piece together much of the needed information on what manufacturers, game themes and EPROMs were being used. I could now begin to see the scope of what I was getting myself into but more importantly, I could begin to really assist Vince with some answers to his many questions.

One of the most import decisions Vince was faced with was the upgrading of some DBVs to WBAs. The supplier (as most suppliers will do) had quoted Vince with an unrealistic cost to perform this upgrade. When Vince began to involve me in these processes tend decisions, the playing field began to level. At this point our relationship

just took off. For the first time, we were working together and I felt that I was trusted. I felt important.

## Trip #1 Expectations

In July of 2003, a release date from the Dominican's Customs was announced for the releasing of the machines shipped and I finally had a date when my knowledge was needed. Hopping a plane and flying down to the island, I was very excited to meet Vince. I wanted to begin this task in earnest and provide him with a lot of information needed to get this project off the ground. Most importantly, I wanted to prove that I was the right man for this task.

The Casino was still under construction when I arrived and many important details were yet to be done. The carpeting was not yet installed. The machine wiring was not

done. The air conditioning hadn't been fully installed; the security cameras and many more things still lacked completion. There were 125 machines to be looked at, checked and verified to make sure that once the machines passed inspection of the Governmental Gaming Control Board, they would be able to be placed on the gaming floor and put into operation. This, of course, would be once the floor was completed.

Working in a very small office (the only one containing a semblance of air conditioning for as any of you with Caribbean experience know it's really hot and sticky in July in the islands) I was able to verify each game one at a time. Power the machines up, check options, do pay table tests and label any and all problems found on the machines so I could get back to them later. It took me four days to verify and complete

125 machines. Utilizing the general laborers Vince had hired to unload the two 40 foot sea containers (filled with machines, chairs and table games equipment) I was able to show them how to install all the locks on the games and on the bases before I had to leave to return home.

## Trip 1a & 1 b

As I could only spend a week there I could did not complete the project nor could I attend the grand opening of the Casino. This is where a couple of good friends that I have met, made trips down to the property to complete the project. Both guys had different chores and tasks to complete but as a team, we reached a common goal: the successful opening of a casino.

## Trip #2 Exploration

In February of 2004, nearly six months had passed and

Vince once again asked for my advice but more importantly, he requested I come back down to his casino for some repairs and training of staff and to set him up with suppliers so that he could keep his machines up and running. In advance, I had the technicians now working at the Amber Coast Casino

draw up a list of machines that were currently down and the problem(s) that they were currently facing. This would allow me to prepare and to see what problems lie ahead plus enabled me to give Vince a list of parts that would be needed.

When I first arrived, I was anxious to see my old friend again but also to step onto the casino floor which was now completed and in full operation. I had an idea of what the casino would look like but I could never have imagined how beautiful it now looked. All the machines were now on their bases. All the lights were on, the table games were all positioned and the casino just sparkled, ready for a daily opening at 4:00 PM. Armed with a list of about 30 machines, I had a chance to look at each machine individually and make my own troubleshooting notes on what I would need to re-



**Slot techs Harrison (left) and Ricky give Kevin Noble a big "thumbs-up, shown here with a member of the casino's secrity staff.**

Slot Tech Magazine  pair each game.

After seeing which machines were repairable and which needed major parts, I was able to get the majority of the machines up while I was there while at the same time, I had Vince order the parts that were needed. I then began training the technicians on the repairs of all the machines that were currently down.

**Training Explanations**

I was able to start a small basic training session for the technicians currently employed at the casino. Having trained many technicians back home, I was able to scale these classes down to the manufacturers currently on the floor.

The most difficult thing I came across was that the techs had absolutely no experience at all. I had to learn how fast they would be to catch on especially when their first language was Spanish. They had little information on the machines until I gave up my pocket books. My first sessions were all about how to read the IGT pocket book. We talked about setting options, what each option did and why we set the option to that value. I then instructed them on the selection of test modes and gave them some understanding of the test and its functions.

Once they understood the IGT book, we applied the same concept to the Bally cards. I showed them how to read the book and interpret the information and showed them how to apply each function to the

Bally machines. With an understanding of how things worked on the IGT, they applied the same concept to the new games and in no time, they were testing switches, lights, hoppers, buttons, handles and hoppers. We still had the IGT video to look over and this was easy because all the information was right on the screen. I had to make them apply each test themselves and allow them to see the final outcome in order to understand. The last chance I had was to go over some of the error codes in the pocket guides and what to look for.

**Technician's Dream**

In the beginning, my goal was to experience one more aspect of being a slot technician but to my surprise, it became slot technician's dream come true. Troubleshooting was never this easy; the "red tape" was gone. I could concentrate on being a technician and not worry if my signature was correct. Even better, no M.E.A.L. book for me to sign. It seemed a little strange but the policies and procedures that have been etched into my brain back home have been so embedded that I found myself still following them.

Vince trusts me. He knew I was not interested in his money or tokens but the chance to excel when given the opportunity that he had provided. Vince has become a great friend in the short amount of time that we have known each other and fun whenever there was down

time, which wasn't often. A great first impression and hard work goes a long way and I would have never been invited back again if Vince didn't trust me. At the same time, if I had not been treated right, I would never have accepted an invitation to go back.

This was a valuable lesson. I have experienced yet another aspect of setting up, training, planning and operating in a casino environment as a slot tech. Most of all, I have confidence in my ability to make the correct decision and to be a leader when the right opportunity comes knocking

I look forward to making the trip again and in the future, when Vince expands (he has plans for two more casinos in the area) share my experiences with others, as this was my chance of a lifetime to experience a slot technician's dream come true in more ways than one.

- **Kevin Noble**
**Knoble@slot-techs.com**

# save the date –
## G2E 2004.
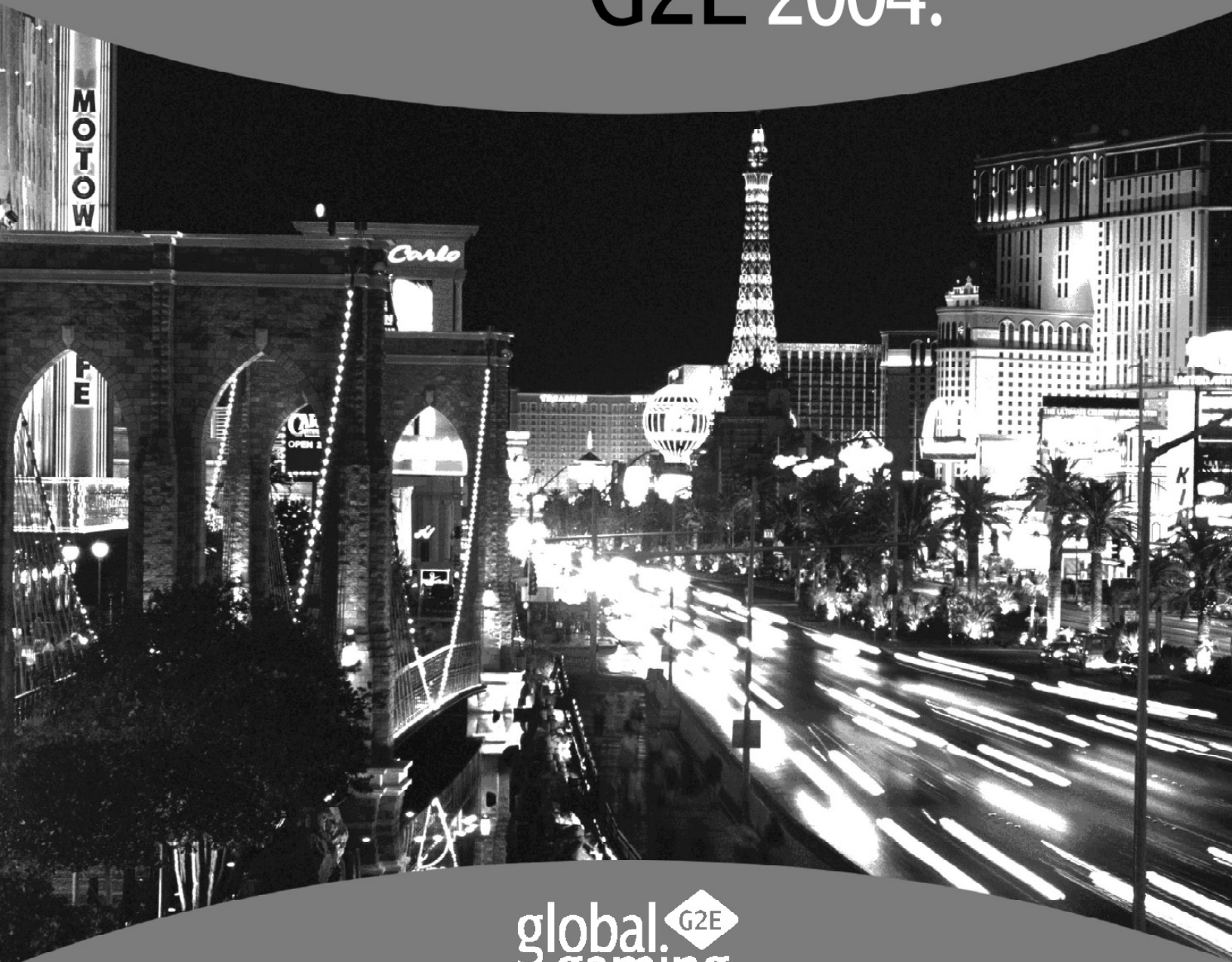
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# Encoders and Decoders

**By Herschel Peeler**

If you have been keeping up with our articles on Digital Electronics we have covered most of the basic gates. We will now use these basic gates to construct more complex circuits we find in other ICs. This article will cover Encoders and Decoders or Multiplexers and Demultiplexers as they are sometimes called. The names change depending on the manufacturer and the application of the part. The objective is to relate the part number to the function of that circuit. We will start with some of the easier and more popular circuits we find in the gaming industry.

## 74139
### Dual 2-bit binary to 1-of-4 decoder

As the name implies, there are two circuits to each package. It takes a two-bit binary value and converts it to four outputs, only one of which will be active at any time.

Figure 1 is a typical schematic symbol for a 74139. Note that Power and Ground connections are not shown. It assumes that you understand the device has power going to it, and that the highest numbered pin is $V_{CC}$ (+5 Volts), and that the pin in the opposite corner of power is ground. On the 74139, pin 16 is $V_{CC}$ and pin 8 is ground.

Looking at the pins of the IC we have two Address Lines "A" and "B." We have an Enable line, "G\." We have four output lines "Y0\," "Y1\," "Y2\" and "Y3\." When the Enable is low one of the output lines will go low. Which one depends on the value on the A and B lines.

| G\ | B | A | Y0\ | Y1\ | Y2\ | Y3\ |
|----|---|---|-----|-----|-----|-----|
| 1  | x | x | 1   | 1   | 1   | 1   |
| 0  | 0 | 0 | 0   | 1   | 1   | 1   |
| 0  | 0 | 1 | 1   | 0   | 1   | 1   |
| 0  | 1 | 0 | 1   | 1   | 0   | 1   |
| 0  | 1 | 1 | 1   | 1   | 1   | 0   |

As the chart shows, if Enable is high all outputs will be disabled (high). For any out to be active (Low) Enable must be Low. If Enable is low, the outputs are enabled. If A and B are Low, the Y0\ output will be active (Low). In this fashion, the binary value on A and B will be converted to one of the four outputs being active corresponding to the binary value.

Figure 2 shows what the insides of each section of the 74139 is like. We have four, 3-input NAND gates on the output. One side of each of these four gates comes from an inverter whose input is the Enable (G\) line. Before any output can go low, Enable must be low, applying a high to all four output gates. The other two inputs to the output gates come from the A and B inputs and a couple of inverters. If A and B are low, these get inverted and fed to



Figure 1
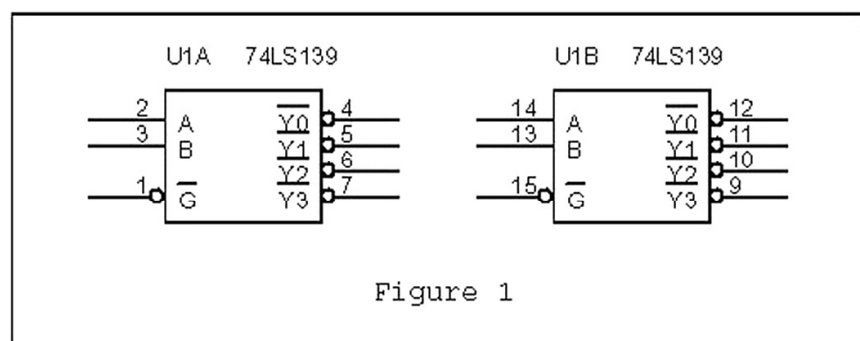
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the Y0\ output gate's other two inputs, completing the requirements for that gate to output a Low. No more than one output should be low at any given time.

### How do we use a 74139?

Most popular use of the 74139 is as an Address Decoder. For an example we will go to an IGT Game King. Figure 3 is an extract from page 3 of the schematics. The A and B inputs come from Address lines A21 and A22 out of the processor. Our Enable line (G\) goes low when the processor is selecting an EPROM (any address from 0x0000 0000 to 0x07FF FFFF).

A side note: The "0x" prefix indicates that the number is a hexadecimal number. In the prints, IGT uses a suffix of "H" to indicate a hexadecimal number but on the game in error reports they use the "0x" convention. I will stick to the "0x" use to identify a hexadecimal number.

When A21 and A22 are both zeros, the Y0\ output will go low. This will happen any time the processor is referencing an address between 0x##00 0000 and 0x##1F FFFF. If we AND this addressing range with the address range selected by the Enable input we get Y0\ going low only during address 0x0000 0000 and 0x001F FFFF. At address 0x0020 0000 Y1\ goes low. At 0x0040 0000 Y2\ goes low. At 0x0060 0000 Y3\ goes low.

### 74138
### 3-bit binary to 1-of-8 Decoder

Another Decoder is the 74138. The same operations apply. We have a 3-bit binary value being applied to pins A, B and C. We have eight outputs for our 3-binary value to be decoded. This left the designers with three extra pins on a 16-pin package so they made the Enable parts more flexible. In order for the outputs to be enabled, all three Enable lines must be made. Pins 4 and 5 must be Low, and Pin 6 must be High.

### TPIC6259
### Decoder and Driver

WMS uses another popular decoder of sorts on their Meter Driver Boards. The TPIC6259 is a 74138 type decoder with a latch and Open Drain Driver on the outputs. The function of the TPIC6259 is similar. Referencing Figure 6, we have three Addressing inputs (S0, S1 and S2) a Data Input, an Enable\ input and a Clear input. The Addressing and



Details of each section of a 74139.

Figure 2

```
             U41A   74HC139

A22 ─────── 2 ┌──────────┐ 4 ─── 0x0000 0000  Boot EPROM Select\
A21 ─────── 3 │ A     Y0 ├ 5 ─── 0x0020 0000  Epson RTC Select\
              │ B     Y1 ├ 6 ─── 0x0040 0000  XMB Select\ (Expanded Memory Bank)
EPROM SELECT\ 1 │ G    Y2 ├ 7 ─── 0x0060 0000  (not used)
              │      Y3 ├
              └──────────┘
```
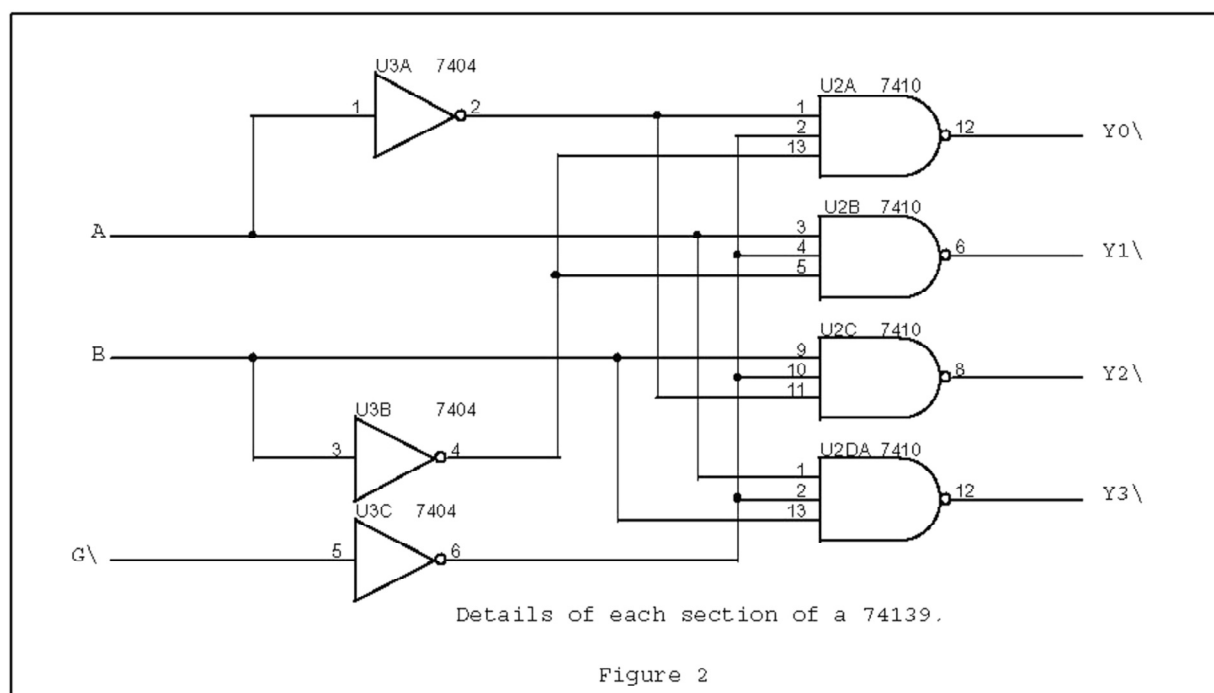
Part of Address Selection on a Game King (757 039 11, sheet 3).

Figure 3

Enable\ inputs work as they did on the 74138 or 74139. The Data input goes to the "D" input of eight latches. The decoded lines become Clock pulses to one of the eight latches. Th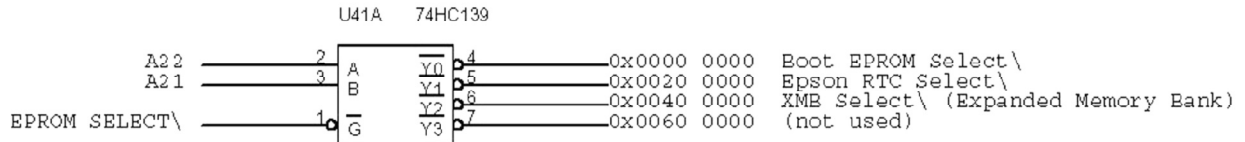e Clear\ input can be used to clear all of the latches at one time. The output of the latches feed a high current driver, simulated in Figure 6 by the ever-
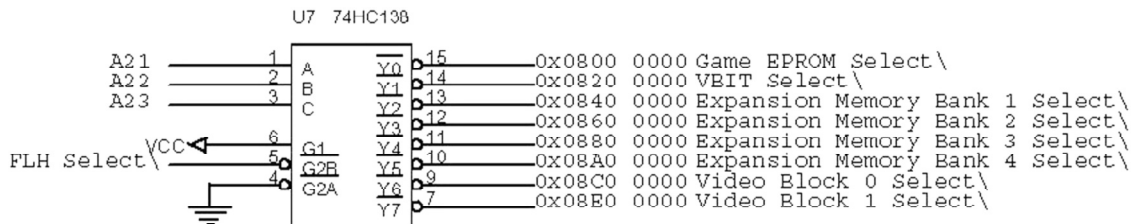


```
             U7   74HC138

A21 ─── 1 ┌──────────┐ 15 ─── 0x0800 0000 Game EPROM Select\
A22 ─── 2 │ A     Y0 ├ 14 ─── 0x0820 0000 VBIT Select\
A23 ─── 3 │ B     Y1 ├ 13 ─── 0x0840 0000 Expansion Memory Bank 1 Select\
          │ C     Y2 ├ 12 ─── 0x0860 0000 Expansion Memory Bank 2 Select\
          │       Y3 ├ 11 ─── 0x0880 0000 Expansion Memory Bank 3 Select\
VCC ◄── 6 │ G1    Y4 ├ 10 ─── 0x08A0 0000 Expansion Memory Bank 4 Select\
FLH Select\ 5 │ G2B  Y5 ├ 9 ─── 0x08C0 0000 Video Block 0 Select\
          4 │ G2A   Y6 ├ 7 ─── 0x08E0 0000 Video Block 1 Select\
          ┴ │       Y7 ├
            └──────────┘
```

Part of Address Selection on a Game King (757 039 11, sheet 3).

Figure 4
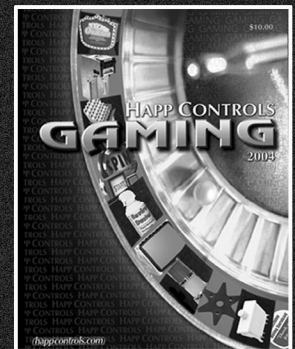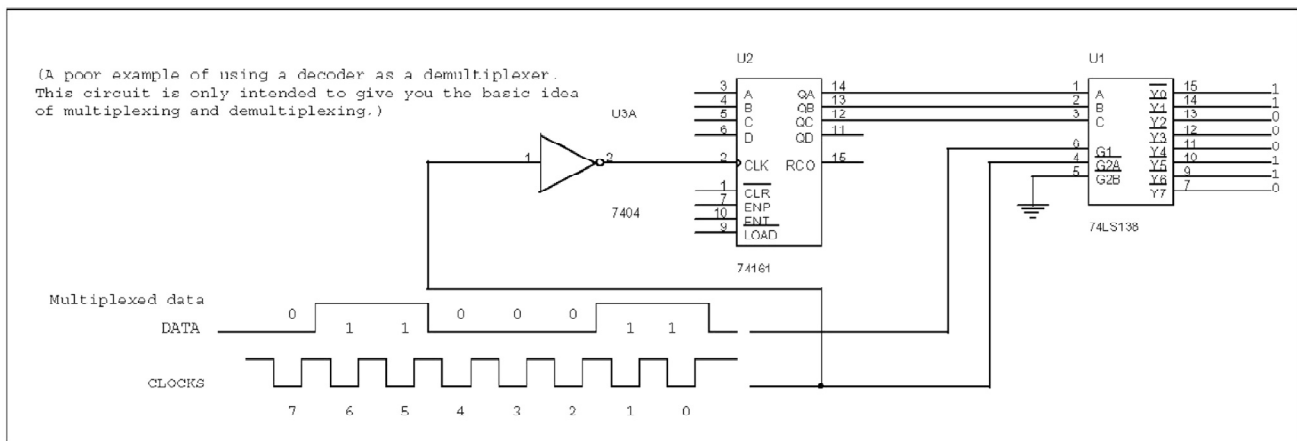
popular ULN2803. Actually the TPIC6259 uses a MOSFET transistor output, making the outputs Open-Drain, not Open-Emitter as the ULN2803 has, but function is the same.

On the WMS Meter Board, they tie the Data input High, so the latches set when they

are selected. The Clear\ input is held low (active). When the latch is selected it jams Set for as long as the Enable\ line is Low. When Enable\ returns high, the Clear regains control and the latch automatically clears itself. In operation, the processor selects the meter to be counted, monitors the two error lines

for a correct voltage, and then releases the meter, completing the count.

## So where do we get the Demultiplexing name?

The use described above is not the only way to use a 74138 or 74139. We may also
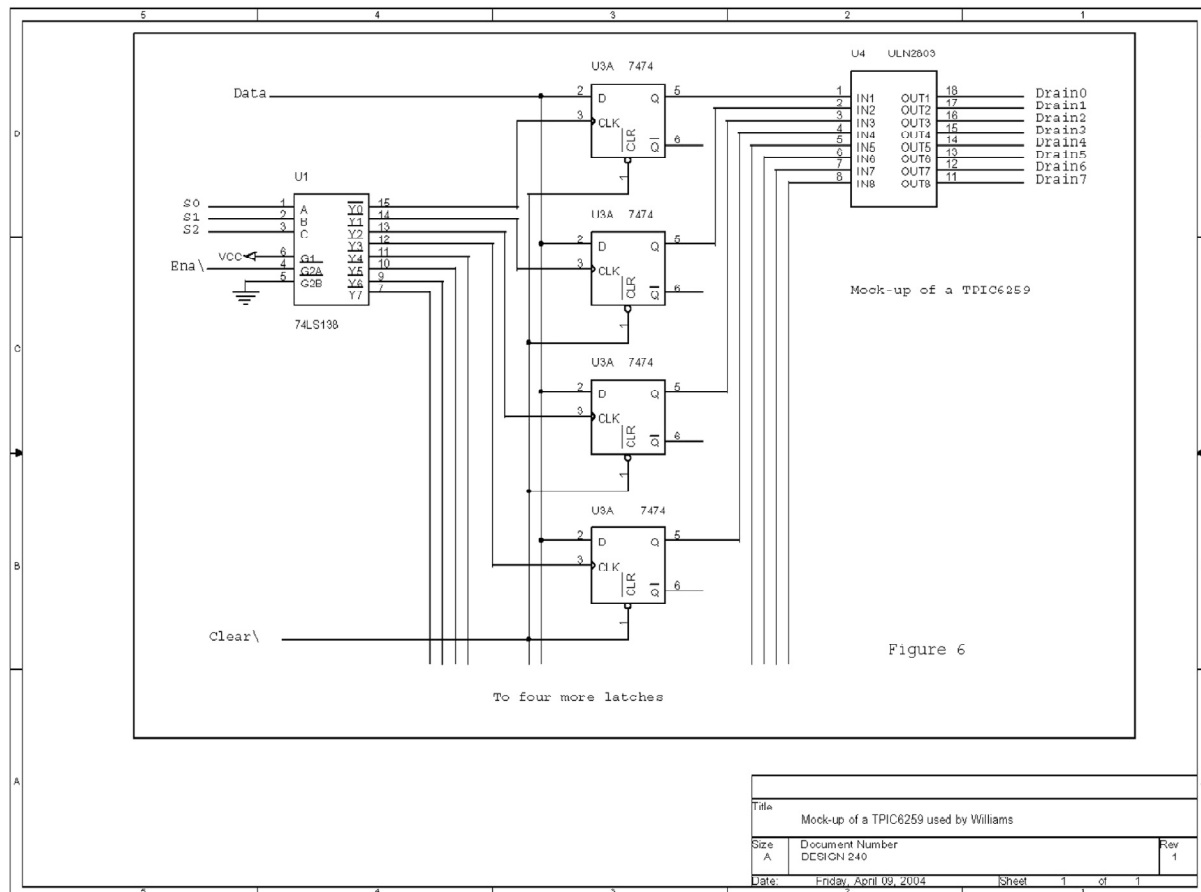


Figure 6

apply a serial string of data on the Enable line, and apply a pulse position counter on the Address lines. We can clock in data serially and convert it to parallel information. Figure 5 is an example (albeit a bad one) of how this works. Our incoming data is serial fashion, and is accompanied with another signal of clock pulses. There is one clock pulse for each bit position. As the clock pulses come in the counter is incremented. The Data string is applied to our Enable input. If the data associated with that bit position is a "0" the output at that position will be a "0." If not, it will be a "1."

This is an example of telemetry of long ago, about the time of Sputnik-era. At the transmitting end would be a Multiplexer that took the binary information from various places and put it all into one string of data. Each bit position had a predictable meaning and use. That brings us to Multiplexers.

**Data Selectors and Multiplexers**

Performing just the opposite function as the 74138 and 74139 we have the Data Selectors or Multiplexers. The 74151 (see Figure 7) does just the opposite as the 74181. We have eight individual inputs. The three Addressing lines select one of the eight inputs and that input shows up on the output (Y). We also have a "Y-not"

Slot Tech Magazine

output that is always the complement of "Y."

The 74157 is also very popular (See Figure 8). We have two sets of 4 inputs, "Set A" and "Set B." We have four outputs, "Y0 - Y3." We have our ever-popular "Enable\" line we have seen so often. We have one Address line "Select." If Select is Low, the four "A" inputs are gated to the "Y" outputs. If Select is High the "B" inputs are gated to the "Y" outputs. This is often used where we have four status lines with two sources of information.

**- Herschel Peeler**
**Hpeeler@slot-techs.com**
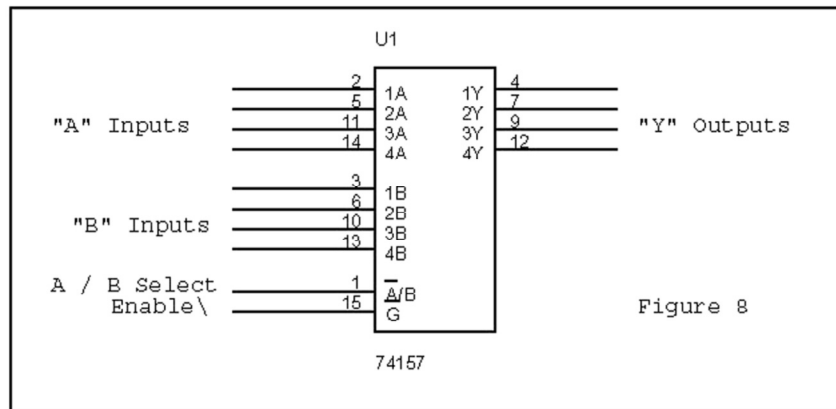


Figure 8
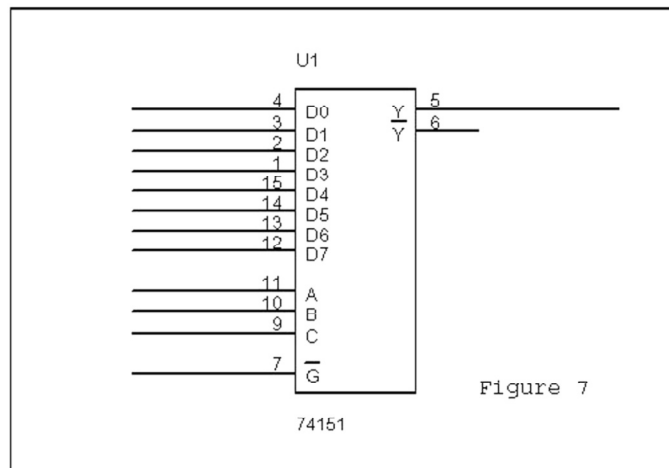


Figure 7

# Slot Tech News

# Broaden Your Vision at GTI EXPO 2004

Organized by Game Time International, the 11th GTI EXPO is taking place from June 24 to 27 at A & D Zone, Hall 1 of Taipei World Trade Center, Taipei, Taiwan. The official registration date for exhibitors kicked off on March 8 and so far 582 booths have been registered and the number is estimated to exceed 650. There are even companies from Hong Kong, Korea, China, Japan, and Spain still in the waiting list, all eager to be part of this great event and confirming the extensive support to GTI EXPO from around the world.

The annual show is always highly appraised and expected among the amusement/gaming industry in Taiwan. Since first in 1993, The number and scale has been meeting with a satisfactory growth, with international buyers progressively on the increase as well. Furthermore, the abundance, quality, and competitive prices of products GTI EXPO offers have made it the most visited and popular international show in Asia. Overseas buyers establish good relationship, expand market penetrations, and boost their sales through the indispensable trade event in Taiwan. Likewise, GTI EXPO builds up a global reputation and enables a promising future for the whole industry.

All those interested in visiting the show are most welcome to contact the organizer.

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**robert@taiwanslot.com.tw**
**www.taiwanslot.com.tw.**

## Gary Platt Offers "Royale Treatment" to Customers



G ary Platt Manufacturing expands its "X-Tended Play Seats" line of ergonomic gaming seating to include the "Royale" series.

"With the Royale group we continue to offer our customers our signature gaming comfort with more captivating styles," said Bob Yabroff, President. "The entire Royale line distinguishes itself by it the alluring "frame" look that is pleasant to the eye."

Included early in the series are the "Aspen Royale", "Barona Royale", "Sierra Royale" and the "Gazelle Royale".

For more information, please visit www.garyplatt.com or call toll-free 800-969-0999 for a catalog.

**Editor's Note: This was the NIGA show, held in April in Albuquerque, NM. What Hulk Hogan (upper-right) was doing there, I cannot say. I caught him as I was on my way out. - ed.**

**Regretfully, with all of the IMPORTANT stuff in this month's Slot Tech Magazine, there is not even enough room for captions! If your photograph is here, you know who you are and nobody else cares anyway.**

# PAR Excellence - Improving your Game - Part IV

**By John Wilson**

Last month we examined our Blazin' 7's slot machine game and looked at the paytable and associated statistics and formulas. This month, we'll examine some graphs in order to have a graphical view of the tables and columns we've looked at so far. We'll also run this game through a simulation to see if our numbers come out as predicted. Let's start with a review of the paytable chart from last month's article. Pull out the April 04 issue of Slot Tech Magazine and refer to Figure 1.

Column G, Total Hits, tells the frequency of each paying combination. By dividing the total number of hits by the cycle we see the percentage of each spin that this combination occurs. Fortunately, there's a ready-made calculation so we don't have to figure this out ourselves. Column H, % Hits gives us this information.

On most PAR sheets, the primary jackpot will show up close to 0.0% hits. It appears as 0 due to rounding of a very small number. It may be 5 digits before you see the actual value, such as 0.00008%. It's so small that it is reported as 0. On some machines with a relatively small jackpot, it may be around 0.2%. Generally speaking, the primary jackpot will have a hit frequency in this range. As this is generally our largest payout, it won't occur too frequently. In some cases, like a 10x multiplier, a red 7 with two 10x symbols could pay out more than the jackpot award. This will have a low frequency as well, probably the same 0.00%.

On a game with a single symbol payout (such as a cherry) the hit frequency for this symbol will be quite high. You might be looking at around 30% of all winning hits for a single symbol, and 25% of all coin-out coming from this one symbol.

In some cases, where there is a higher payout from intermediate-paying games, you could see 60-70% of the payout coming from the higher-end amounts. The hit frequency in this range however, will have to be a bit lower due to the fact that the amount being paid out is higher. It could be around 5-10% of hits. The lower payment (such as 2 or 5 coins) may also have a small hit frequency in the order of 5%-10%. This is much easier to see on a graph!

Why don't we examine a couple of graphs in order to illustrate what these results mean? Figure 2, Percent of Coin Out, shows us the paying amount and how much of each payout value makes up the total machine payout. I have shown both a line-graph and a pie chart (figure 2a). The circular format of the pie chart gives better visual representation of how much each 'slice' of the payout consumes.

The mixed bars payout, at 50% of the total, occurs most frequently - once out of every 12 games. By examining these graphs, you see the same information that is represented in the paytable chart but it may be a little easier to get a feel for what the data means when you see it in a graphical format.

In our game, it is easy to see that almost one half of the total payout is from a 5-coin amount, which is mixed bars. Any 3 symbols pays almost 15%,

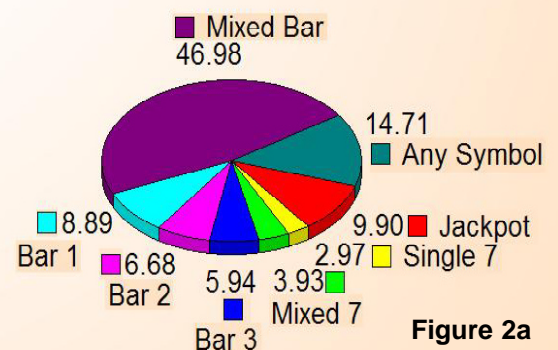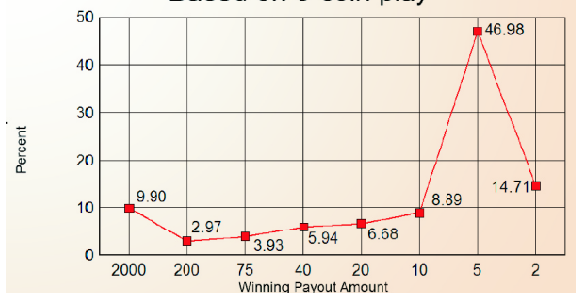**Figure 2**



Percent of Coin Out
Based on 3-coin play

**Figure 2a**

which is also significant. The middle-range payouts are all fairly close, ranging from roughly 3% to 9%. The jackpot payout for three double 7s accounts for almost 10% of the total payout. When we tie this together with the Games Between Wins graph, it becomes more relevant. While the jackpot pays 10% of the total coin-out, it occurs much less frequently, once every 21,845 games. This value is the Spin-Between-Wins (SBW) value from our paytable chart. If the SBW were very large (perhaps only 1 hit per cycle) then the jackpot amount would have to be very large as well in order to account for 10% of the coin-out. If the SBW of the jackpot is very low (meaning many jackpots exist) then the awarded amount must be fairly small due to the high frequency of hits. By examining the two charts together, you can get a feel for how the game plays. An intermediate-paying game, such as Bally Gaming's Blazing 7s (not to be confused with our smokin' hot Blazin 7s) will show a high percentage of coin-out in the 100-300 range. Since the payout amount in this range has a high value, the games-between-wins will be higher than for a single-coin symbol payout. Interesting, but does it really do anything for us?

It might not do too much for you as a slot technician, but for anyone who is deciding what types of games are played and where they are to be located then yes, it does give us a wealth of information. For example, the graphs shown in figures 3 and 3a illustrate a fictitious machine. Note that the payout from large-value awards is quite high. The jackpot amount plus the 200-coin payout accounts for almost 45% of the total coin-out. The games-

between-wins will likely be very high, as we're paying out a large amount of money each time. The lower-paying amounts have decreased in frequency, as have the larger-paying amounts. This means that we're paying out quite a bit more overall, but in fewer payments. The average pay per winning game has therefore increased. This game would appeal to those wanting large payouts and don't mind waiting for them. Players wanting frequent smaller wins to keep them in the game will not like this game as much. By examining both graphs together, you get a feeling for the type of game that it is.

If you are looking for a game with a large jackpot (perhaps a progressive) and quite a few large-amounts for your high-roller clients, you can determine this by examining the Hit % and Games Between Win values. Better yet, if these graphs are available, it is even easier to picture how the machine pays and plays. If you want a game with a smaller jackpot (that pays frequently) but numerous smaller awards paid frequently, you can determine this from the graphs as well. This gives you another tool to determine what machines are going to be placed on your floor and how

you are going to place them.

Any type of information from the PAR sheet can be charted. Not all manufacturers include charts but I think you will see more of them doing so in the future. As software becomes more graphically based and incorporates more advanced features, it will be easier for them to provide charts of their information, making it easier for you to get an overview of the game with a simple glance. If you were so inclined, you could take any PAR sheet and create a spreadsheet. From there, you could experiment with the numbers, create graphs, etc. Few people have the time (or ambition) to do that so most of the graphs and charts that you see will come directly from the manufacturer.

**Figure 3**



Percent of Coin Out
Based on 3-coin play
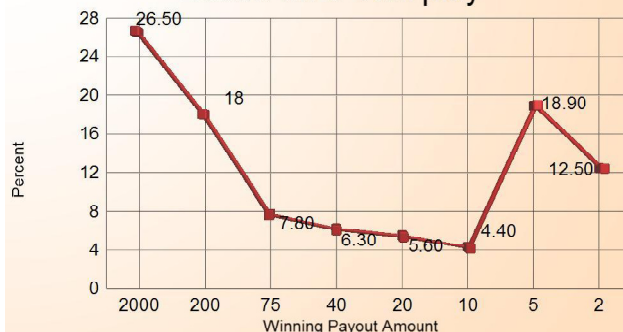
**Figure 3a**



Games Between Wins
Based on 3-coin play
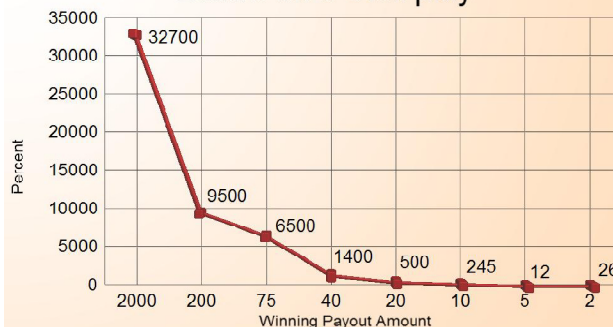
**Notice that when we change the frequency of the paying combinations, the games between each payout also changes. In order to maintain the same overall payout amount, we must adopt a "give and take" approach. In order to pay out more jackpots, smaller paying amounts have to be decreased.**

## Simulation

**Figure 4**

The final step to perform on our machine is verification of how the game actually plays. We've examined the theoretical payout in detail but how will it perform in the real world? One of the best ways to do this is to use a simulator to run through thousands of games using a random-number-generator just like the finished machine will use. This introduces an element of randomness to our calculations and this is where the volatility comes into play. Our volatility index is 23.127 and the standard payout is 92.47%. Therefore, at 10,000 games, our actual payout should be between 69.34% (92.47-23.127) and 115.60% (92.47%+23.127). This takes into account situations like paying a jackpot early in the machine's life (which will boost the actual payout up) and times when we'll fall slightly below the normal payout (which will drive the actual payout down). We can simulate as many games as we want, and the more games we include in our trial, the closer the payout should be to our theoretical calculations.

In this case, I chose 10,000 games, the standard number of games for volatility to be calculated. I ran the Blazin 7's game through 5 tests, and the results follow in figure 4. This chart shows each paying value and the difference from what we had expected to receive. In test #2, we received 65% more Mixed 7s than we expected and 5% fewer mixed bars.

Examining the chart, we see that the hit frequency ranges from 16.23% to 17.12%. The expected frequency is 16.8%. The maximum difference is 0.32%, so our results are very close!

Slot Tech Magazine

The Hit Frequency for each Payout Value is compared to what it should be (in theory).

| Game Trial | Total Hits | Jackpot | 77 | Mixed 7s | Bar 3 | Bar 2 | Bar 1 | Any Bar | Any Symbol |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 16.87% | -100% | -25% | +3% | +38% | -19% | -3% | -3% | +5% |
| 2 | 16.23% | +125% | -100% | +65% | +2% | -3% | +19% | -5% | 0% |
| 3 | 16.88% | -100% | +119% | +24% | +38% | -22% | +6% | 0% | +1% |
| 4 | 17.12% | -100% | -25% | +65% | -27% | +30% | -21% | +3% | +2% |
| 5 | 16.24% | +125% | +47% | -38% | -5% | -6% | +12% | -3% | -6% |

**The expected payout percentage range is shown here. For each of the five simulated runs, the payout percentage received is shown. We are well within the predicted range.**

The entire purpose of graphs in a PAR sheet is to provide a quick overview of various functions of a game. By presenting a visual interpretation of the game's configuration, you can easily decide if it suits your requirements and also determine the overall 'personality' of the machine. Graphs can also be made to explain long-term and short-term patterns in the play, what your payout ranges will be, and to help you to better manage your casino floor.

According to the Volatility Index, we should fall somewhere between 69.34% and 115.60%. Our five samples resulted in 82.84%, 99.05%, 88.53%, 85.02% and 101.39%. The maximum difference is 23.13%; well within the expected range. The simulation resulting in 101.39% had a jackpot win during the 10,000 games, which caused the payout to be much larger. It also had more hits in the larger amount. Figure 5 shows a graph of each of the simulations. The range within which we expect our payout percentage to fall is represented by the width of the graph. As you can see, while each run did vary, they all fell within our expected range.

Finally, Figure 6 shows a chart of all of the values from our table in Figure 4. The variance (both positive and negative) is charted for each payout type. The largest variance occurs on the payouts that happen less frequently.

The frequent payouts have less variance. After 10,000 games, the "Any Symbol" payout is very close to where it should be. This graph is almost perfect in its shape - showing that our game is playing and paying pretty much as we expect it to, and well within the range of volatility that it should be.

We will conclude our study of PAR sheets next month by bringing together any lose ends and studying some miscellaneous pieces of PAR sheet information.

**- John Wilson
Jwilson@slot-techs.com**



**Figure 6**

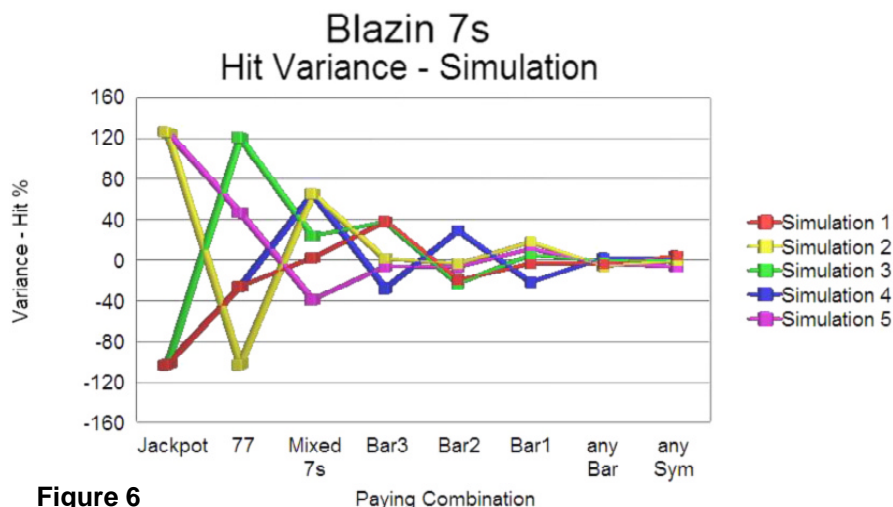**This graph shows how many hits each paying symbol combination has had. If the simulation had resulted in the exact number of hits, the variance would be 0. If there had been more hits than we had predicted, it would be in the positive range (E.G. 50% more hits than expected). If there had been fewer hits than predicted, the variance would be negative (E.G. 50% fewer hits yields a variance of -50%)**

# Big Impact From Big Reel

Starpoint has developed a large 400mm diameter reel, capable of carrying a reel band up to 200mm wide, to give games an even bigger impact. The new reel mechanism can be used on its own as a feature reel or, alternatively, three Mega Reels can be mounted alongside one another to create a larger-than life version of normal play reels. The increased dimensions of the reel allow for an enormous range in symbol size creating a new and dynamic display.

The light polystyrene moulded reel has a 200 step motor for total flexibility and is anchored in a sturdy metal/plastic fabricated frame. It has "quick release" feet to make it quick and easy to mount inside the game cabinet without the need for tools.

For more information, contact:
Lizanne Jakobs
Tel: (44) 208 391 7700
Fax: (44) 208 391 7760
Email: Ljakobs@starpoint.uk.com
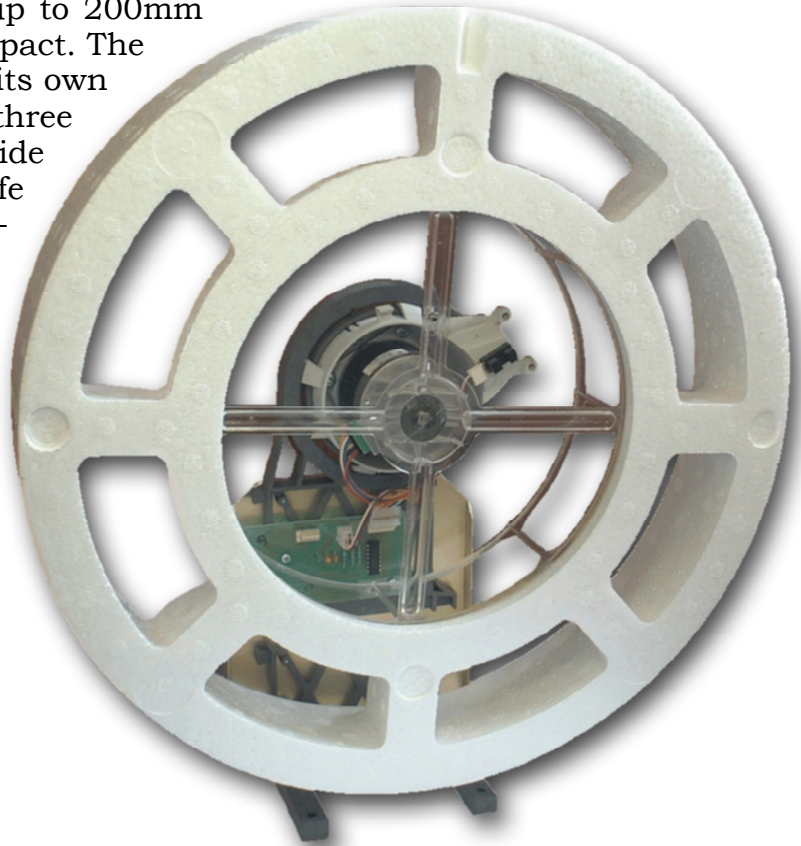
## Casinos-Resource.com, Inc. Announces
## Supervisory/Leadership Certification Program

Casinos-Resource.com, Inc. has announced their new "Supervisory/Leadership Certification Program for Casino Employees" is now available in Instructor Led and Web-Based formats. The program was designed by Industry Experts specifically for the development of Casino Employees. The Instructor Led (Classroom) program will be unveiled in Las Vegas in mid-June 2004. Casinos-Resource will start accepting registrations immediately via www.casinos-resource.com or by calling 888-498-7867.

The Supervisory/Leadership Certification Program for Casino Employee will take approximately six months to complete successfully. The Instructor Led program is a scheduled six month program; the Web-Based is self-paced. The curriculum will be facilitated by gaming experts covering a number of core competencies that supervisors, managers and leaders need to succeed within today's casino environment. The students will be provided with many tools to ensure they not only comprehended the material presented but also have the necessary resources to implement what they have learned into their daily routines. A continuous support system is also available after the training has been successfully completed. These tools are available to all the students attending the Instructor Led program as well as participating in the Web-Based program.

Further information contact:
Ray Humber
Senior Vice President of Development
888-498-QTMS (7867)
e-mail, rhumber@casinos-resource.com

# STELLA Pulls the Finger Out at the Spanish Market in Torremolinos!





At this years spring exhibition in Malaga, STELLA and its partner SENTE S.A. launch two rousing AWP games of type B for the Spanish market. These novelties are the brilliant "Magic Diamond" and "Lucky Cash". STELLA and SENTE will also show a new "Vegas Cash", which was first introduced at the Madrid show last year. It comes with an optimised basic game!

Spelunking "Magic Diamond" the sweet little trolls sculpture with hammer and chisel creating sparkling diamonds. So can you - join the game and be fascinated by the exciting colourful diamond feature! This feature is really a clue in the centre of the club game! The player must fill the diamond with colours to win up to 100 keys! In addition the white diamond acts as a Joker, winning chances are guaranteed! There are famous features like respins, autoholds and the well-known basic game. The club game contains 3 different stakes with the gold bar as top symbol. With max stake this symbol gets wild! "Magic Diamond" - it tells its own tale!

If you hear the funny dolphin laughing around, dip into the underwater world of "Lucky Cash"! STELLA`s
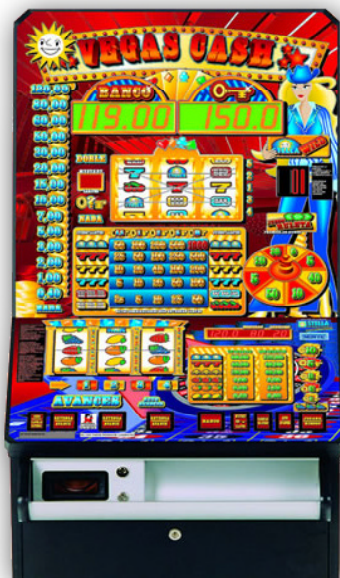
second game puts some oomph onto the SENTE booth. The "Lucky Cash" game system is based on celebrated features like the Sorpresa feature, where the player can multiply his win! The pearl is top symbol. "Lucky Cash" is offered in the upright cabinet and as a speciality in a comfortable table version! Be fortunate with "Lucky Cash" and capture your money! Let your players feel a lucky devil and let them hit the Jackpot with STELLA`s exciting "Mystery Jackpot"! This Jackpot can be linked up to 10 machines from STELLA and other fabricates. More fun in the arcades is guaranteed!

This wide range of AWP machines for the Spanish market demonstrates STELLA's high-quality preparation and their ability to respond

to all customers needs and to fit the future of AWP games! STELLA International is a member of the Gauselmann Group, which has sold more than 1.9 million machines since inception. The family-owned and operated Gauselmann Group is the second largest manufacturer of gaming devices worldwide. STELLA



is headquartered in Germany and has sales partners in Spain and Eastern Europe.

STELLA International is dedicated to producing only the highest quality of entertaining games and products. To find out more information about STELLA International, please visit the website at www.stella-international.de.

# Operator Forum Attracts Forward-Thinking Professionals From across Europe

Industry professionals from Europe's leading casinos will gather in Barcelona on May 13-14 for the International Casino Operator Forum.

Organised by ATE Conferences, this year's event has already secured a significant number of high profile delegates from operations based in Austria, Canada, Estonia, Finland, France, Gibraltar, Lithuania, Monaco, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom and USA. And with a number of jurisdictions facing deregulation, the prospect of pan-European legislation and the imminent accession of 10 new member states to the European Union, the International Casino Operator Forum is ideally placed to provide focus at a crucial time for the industry.

## Keynote Speakers

With a strong focus on income building operating techniques, the line-up of Forum speakers boasts a wealth of experience with experts including Vahe Baloulian (Director, Gaming and Industry Relations, Cassava Enterprises), Michael Boettcher (President & CEO, Storm International), David Wilson (Partner, Joelson Wilson), Tim Cullimore (General Manager, Casino Crans Montana), Yves Devin (Director of Operations, Casino de Montreal), Ander Galvensjo (CEO, Casino Cosmopol), Heliodoro Giner (Secretary General, European Casino Forum), Ian Gosling (Vice Chairman & COO, Regency Casinos), Jon Harris (CEO, Xanadu Casino Group), Armin Karu (CEO, Olympic Casino Group), Pieter Remmers (MD, Assissa Consultancy Europe), Paul Renney (Partner, Addleshaw Goddard), Jan Rodrigo (Executive Managing Director, Amorim Entertainment & Gaming International) and Jonathan Strock (Gaming Manager, Accor Electronic).

## Hot Topics

In addition to country-specific case studies from France, Russia, Baltic States and the CIS, major topics will include US ventures targeting Europe, 'Total Experience' gaming/leisure models, future prospects of state-owned casino companies, innovation in marketing and promotions, online gaming applications for land-based operators and social responsibility issues in continental Europe.

## Opportunities For All

To ensure the Forum remains accessible to the widest possible audience, the English conference programme will be simultaneously translated in French, German, Spanish and Italian, whilst delegates will benefit from a range of social networking events arranged across three days (May 12-14) arranged as part of an all inclusive package.

The International Casino Operator Forum takes place at the Hotel Gran Melia Sitges, Barcelona, Spain on May 13-14.

For more information, including speaker lists, conference programme, networking opportunities and online delegate registration, visit www.ATEOnline.co.uk/Conferences or contact:
Alex Fierek or Chris Jones at Scott & Jones Communications
Tel: +44 (0) 1273 204817
Fax: +44 (0) 1273 204827
Email: info@sjc.co.uk

# Global's GI and GII Currency Validator Stacker

### By Hendrik Sidaway

It has been a while since my last article, it being a Tech's life and all. The usual machine moves and maintenance schedules taking up 75% of the day and the rest of the time spent in the local pub.

In my article in the January edition of Slot Tech Magazine, I discussed a faultfinding method and listed the most common problems associated with the GI and GII Currency Validator. In this article, I am going to expand and discuss the stacker and the most common problems.

From what I have experienced with the CBV stackers, there aren't as many faults as would be expected. We generally use our test station accompanied with a working Bill Validator to test our stackers. The CBV stacker has 10 pins that connect it to the Bill Validator. It connects onto the Main PCB, which then in turn connects to rest of the BV.

Lets first start by looking at the configuration of the pins, as shown in figure 1:
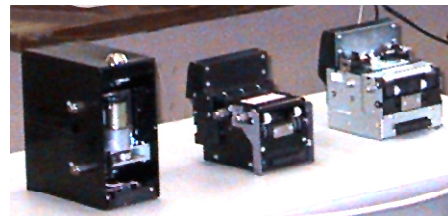
I have learned that knowing the pin configuration of any loom can cut down on faultfinding time and makes fixing problems so much easier.

Secondly, lets look all the possibilities as to what might be your problem in a machine:

You get called to a Universal Sunrise Series machine that has a "96" tilt and the stacker isn't cycling, or a video slot with "Bill Validator Full" message displayed on it. If the stacker isn't full as per most manual descriptions, it is obviously a problem with either the BV or the stacker. So you start by swapping out the BV with a working one and still no cycling stacker.

Ok so now you have established that it is not the BV as the BV works (if swapping method is used) in the machine right next to you. (Please note that I have experienced a Universal Sunrise Series machine having a RAM error without any tilt message and either the BV runway lights don't work or the stacker doesn't cycle.) You move onto the next obvious mechanical device: the stacker.

In my experience, there are mainly six things that can cause a CBV stacker not to cycle:

1. Gear Box has a broken gear.

    a. You could remove the motor and gearbox and strip it. If you clear the one broken tooth on the broken gear you should have a temporary solution. That is if spares are not available.

    b. Replace the broken gear with a new gear and apply some gearbox grease.

Pin 1 - connects to the negative of the stacker Dallas chip and is usually a green wire.
Pin 2 - connects to positive of the stacker motor and is usually a red wire.
Pin 3 - connects to your stacker optic and is usually a white wire.
Pin 4 - is open and not used.
Pin 5 - is open and not used.
Pin 6 - is usually a grey wire that loops to pin 9.
Pin 7 - connects to the stacker optic and is usually a red wire.
Pin 8 - connects to the negative of the stacker motor and is usually a black wire.
Pin 9 - is the loop wire connecting to pin 6.
Pin 10 - connects to the positive of the stacker Dallas Chip and is usually a green wire.
Pin 11 - connects to the stacker optic and is usually a green wire.
Pin 12 - connects to the stacker optic and is usually a black wire.
  **Figure 1**

2. There is an obstruction. Something is jamming the motor.

    a. Ah well it couldn't get any easier than this. Just remove the obstruction, test the stacker and you're well on your way.

3. The stacker has a Dallas chip connected to pins 1 and 10 that has either come loose, has a dry (fractured) solder joint or is faulty.

    a. Just make sure the polarity of the Dallas chip is correct and re-solder it if it is loose or has a dry joint.

    b. I have tried this numerous times and still to this day cannot get a stacker to work when replacing the Dallas chip. I might be doing something wrong and I have tried a few methods but to avail.

4. One of the input pins on the stacker has come loose and isn't making proper contact. (Either Pins 2 or 8)

    a. Do not despair as it isn't any sort of train smash to just take any pliers to pull the pin back into position. Please just ensure that the pin wouldn't push out again when you put it back into the machine.

5. The loom connecting the BV to the stacker has a plug in the middle.

    a. One of the Wires has broken or pulled out. (Usually the green wire, Pin 6, on the white plug). Just reconnect or repair the wire.

6. The plate that pushes the money into the back of the stacker has gone askew.

    a. Straighten and re-

align the plate inside the stacker and retighten the guides on the side of the plate.

If it is the BV, follow the guidelines as mentioned in my previous CBV article.

Now that that is out of the way, let's move onto the next type of problem associated with the CBV stacker.

You arrive at the machine with the same symptoms as above but the stacker cycles twice instead of the usual single cycle. You start the process again by replacing the BV with a working one and it isn't the BV.

Yet again there are mainly three things that can be wrong with the stacker:

1. The stacker optic has blown and it isn't "counting" or detecting the movement of the stacker plate.

    a. This is a difficult one to detect, as it isn't obvious to the eye to see when an optic is blown. Sometimes if you're lucky you can see a faded circle on the top indicating the optic has blown. Replace the optic and it should be fine.

2. One of the optic pins has pulled out of the stacker input plug.

    a. As before use pliers to pull the pin back into position and make sure the pins won't push back in. (Either pin 3, 7, 11 or 12)

If you get to the same Universal machine and a "95' tilt is displayed, being described as "Stacker Not Present" in the

manuals, it generally means the following;

1. You have a stopper plate at the back of the stacker housing that goes loose and the stacker goes in too far into the housing, missing the connection completely.

    a. Refasten the plate and reinsert the stacker, fixing the Problem very easily.

2. The stacker tracks inside the stacker housing broke.

    a. The Lift Weld Assembly connected to the Tracks doesn't lift the stacker high enough in order to make a connection with the BV. Replace the tracks and you should have a working machine.

3. Last but not least. An early indication of the stopper going loose is the bent plate on the stacker.

    a. This is the plate that the 12 Pin connection plug is attached to. It gets bent back into the stacker, causing the stacker to have no connection to the BV. The reason for this is the miss-alignment between the two connection plugs that the loose stopper causes.

I know I said there is much to a CBV stacker malfunction but these are basic errors with basic causes and it can be prevented with a scheduled machine maintenance program.

As we say here in South Africa, Cheers vir eers (Goodbye for now)

**- Hendrik Sidaway**
**Hsidaway@slot-techs.com**

# Coin Mech Supports Casino's Power to Choose

**Every casino has the power of choice . . .**



And Coin Mech wants you to know that you're in charge of what goes into YOUR slot machines.

"Some casinos might not realize they can choose the components that go into their gaming machines," said Vice President of Marketing and Sales Richard Currie. "Coin Mech wants to remind them that they have the right to specify what THEY want in their slots, not what the OEM wants to install."

Don't be satisfied with "stock" when you can specify a genuine Coin Mech, Inc. brand Coin Comparitor®, Micro Comparitor® or the latest in high-security, Coin Mechanism's new Defender® product. It's your choice. All a casino has to do is to tell their sales representative to install Coin Mech inside and they'll get the best mechanism money can buy. It's that simple.

"As the end customer, casinos have the right to choose what drives the functionality and security of every coin or token-based gaming machine in the world," said Currie. "Our American-ma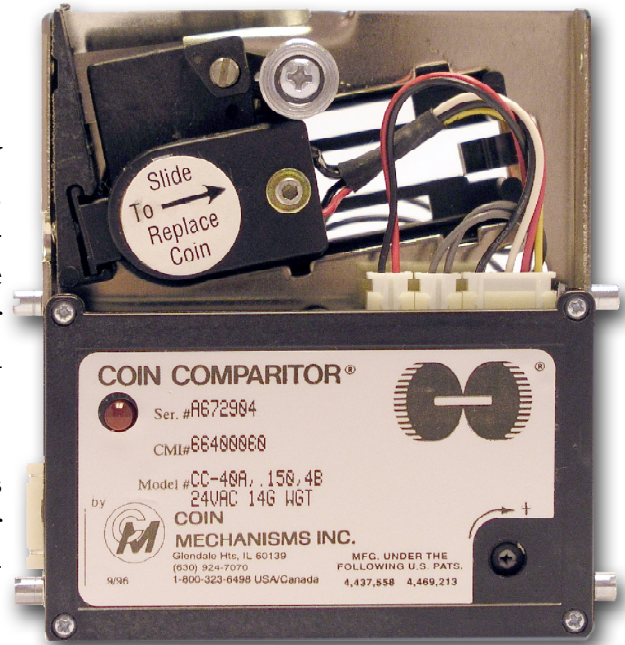de products are built to withstand the rigors of daily life in any casino, whether it's land-based, cruising the Mississippi River or sailing the high seas."

The company prides itself on its stellar reputation for customer service.

"We are happy to have an extremely loyal customer base," Currie said. "But just because we're the manufacturer of choice for the international gaming industry, we don't want our customers to assume they will always get our components - because in some cases they might not. If a customer wants us to be on the inside of every machine they buy, they have to ask for us to be in there."

This year, Coin Mech celebrates its 35th year in the gaming industry.

"We have a long and reputable history," said Currie. "We are now structuring an enhanced product platform that will position us for a strong future. We have built our company on product in-

novation, superior service and high quality. That heritage will continue."

Coin Mech is the leading manufacturer of Coin Comparitors® and slot components for casinos in the United States and around the world.

**For more information, contact:**
**Michael K. Meisinger**
**Coin Mechanisms, Inc.**
**400 Regency Drive**
**Glendale Heights, IL 60139**
**Toll Free  800-323-6498**
**Tel.   630-924-7070**
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**Email:**
**mikem@coinmech.com**

# Transact Extends Its Line of Thermal Printers With the Launch of 850-V

## Ithaca® Model 850-V To Support Growth of Slim Line and Slant Top Gaming Machines

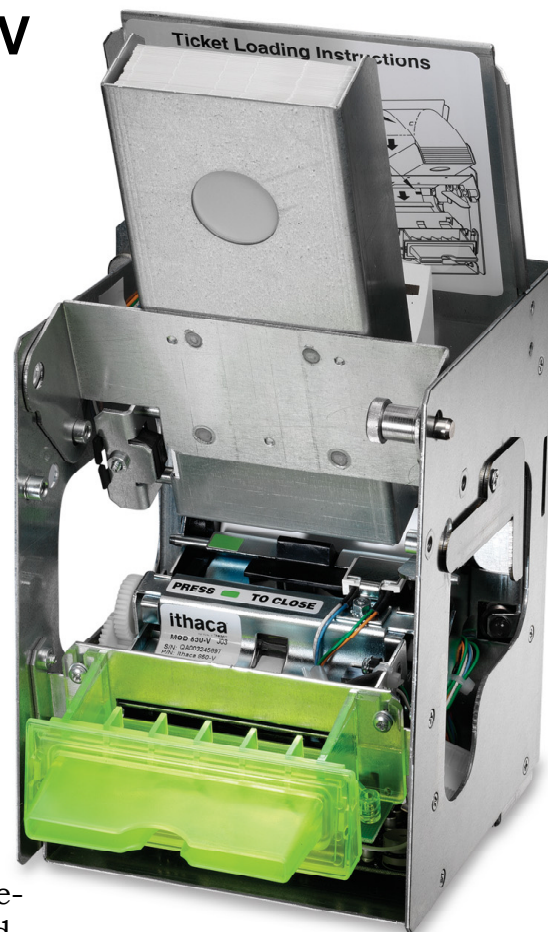TransAct Technologies Incorporated, producer of transaction-based printers for customers worldwide under the Ithaca® brand name, today announced the availability of its new Ithaca® brand Model 850-V thermal gaming printer. With the Model 850-V printer, TransAct adds a vertical option to its Series 800 family, thus continuing to support the migration to ticket-in/ticket-out coinless systems for the gaming and lottery industries.

The Model 850-V printer is built upon the same technology and firmware as the Company's industry-leading Ithaca® Model 850 thermal gaming printer, but configured vertically for slim line or slant top machines. The printer comes standard with a unique bezel with Flex-Zone, which prevents ticket jams by allowing the tickets to bend if the exit path is blocked. The bezel is lighted for high visibility. Additional features include ultra high-speed 5 inches per second printing and easy ticket loading.

TransAct Technologies' Vice President and Business Manager of Worldwide Gaming, Jon Berkley said, "We have been working with casino operators and slot machine manufacturers to bring the concept of coinless gaming to fruition in the U.S. over the last year. Extending the Series 800 product line further validates our efforts to support this initiative. The Ithaca® Model 850-V printer offers the same high quality functions and convenience of the industry-leading Model 850 gaming printer, but is designed in a vertical format to fit within the more stringent size constraints of slim line and slant top slot machines. We continue to expand our offerings in the casino market by providing solutions that meet customer needs. Our innovative printer designs and proven track record give us a competitive advantage in working with casinos and slot machine manufacturers."

### About TransAct Technologies Incorporated

TransAct designs, develops, manufactures and markets transaction-based printers under the ITHACA® and MAGNETEC® brand names. In addition, the company markets related consumables, spare parts and service. The company's printers are used worldwide to provide receipts, tickets, coupons, register journals and other documents. The company focuses on the following vertical markets: point-of-sale (POS), and gaming and lottery. All of TransAct's products are manufactured in ISO 9001 certified facilities. Visit www.transact-tech.com for more information.

**Jon Sander, Secretary of NIACTA (Northern Ireland Amusement Caterers Trade Association); Eduardo Antoja, President of Euromat (European Federation Of Coin Machine Associations) and Jim McCann, President of IAEA (Irish Amusement Equipment Association), on the occasion of the presentation of the First Mary Openshaw Memorial Award For Excellence to Eduardo Antoja at AmEx 2004 - The 25th Irish Amusement Trade Exhibition in Dublin.**

# Heber Announces Appointment

Heber Limited is pleased to announce that John Malin has joined their Sales and Marketing team as International Sales Manager. John brings with him over 18 years experience within the Gaming and Amusement market and has held similar positions within the industry for companies such as Cotswold Microsystems and Maygay Group. Based at their Gloucestershire Head Office, John will travel extensively to strengthen relationships with existing customers and promote the Heber brand in target markets.

"This has been a significant appointment for Heber and we are glad to welcome John to the company" said Richard Placito, Managing Director. "Developing customer awareness in an increasingly global market is a key element of our business strategy, and this will be an important part of John's role. We have ambitious plans for the future, and the sales and marketing team are crucial to achieving our goals".

The recruitment process is ongoing for Heber, who are now seeking to recruit a group Sales and Marketing Manager, a new position within the company.

Heber's core market is in the design, development and manufacture of electronic controls for the amusement industry. From 20 years experience within the market place Heber have created the Pluto range of control systems, which are in use by major manufacturers with over 250,000 machines worldwide. The Calypso range of video cards have been designed to interface with Pluto 5, Pluto 5 Casino and Pluto 6 and add high performance graphics to spin reel machines. The Pluto range is supported by two Development Kits, which provide the ideal test environment for either the Pluto 5 / Pluto 5 Casino or the Pluto 6 Control Systems. Heber Limited also offer the Firefly range of

boards. These are ideal for use in high performance video games and terminal applications. Based around PC technology the Firefly boards offer performance and flexibility, supported by longevity of supply normally missing in PC hardware. The most recent additions to this range of boards are the Firefly systems, comprising of the Firefly 700 base board and all other components (such as a processor, a hard drive etc) required to get a machine up and running.

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For further information about Heber Limited visit
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# On-Site Slot Tech Training
# Customized Classes Available

**Randy Fromm's Casino School** is a practical, no-nonsense look at how gaming machines work and how to repair them when they don't. **No previous knowledge of electronics is required** to get the most out of the school. The Casino School is geared for those who want to learn how to fix gaming devices without having to learn complex electronic theory or purchase expensive test equipment.

Be prepared for six hours of accelerated learning each day. Class begins at 9:00 am sharp each day and continues until 4:00 pm. The Casino School provides each student with reference materials and troubleshooting guides that will be valuable aids for repairing equipment on location and in the shop.

**Students learn how to work with:**

### THE DIGITAL MULTIMETER
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

## ELECTRONIC COMPONENTS
The individual components used in games are introduced. Parts such as resistors, capacitors, diodes, potentiometers and transistors are covered individually. Students learn how the components work and how to test them using the meter.
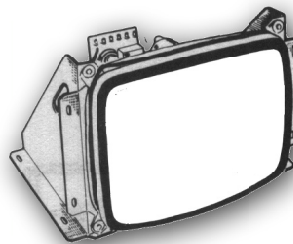
## SCHEMATIC DIAGRAMS
Schematic diagrams are the "blueprints" for electronics. Learning to read schematics is easy once you know how the parts work!
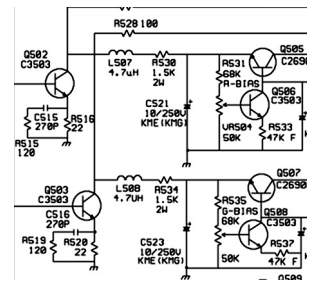
## POWER SUPPLIES
Power supply failure is a common complaint in many different types of systems.. Power supply failures are discussed during the class, along with shortcuts for troubleshooting and repairing them.

### MONITOR REPAIR
The monitors used in video slots are designed for quick, easy, and safe repair. Students will learn the theory of operation of all types of monitors and how to repair monitors down to the component level. Of course, monitor safety will also be discussed.

**You do not have to send your slot techs to Las Vegas or Atlantic City for training. The Casino School brings the training to you. Contact Randy Fromm's Casino School today to reserve a date for your tech school**

**Randy Fromm's Casino School 1944 Falmouth Dr. El Cajon, CA 92020-2827**
**tel.619.593.6131 fax.619.593.6132 e-mail CasinoSchool@slot-techs.com**
**For a complete brochure, visit the website at: slot-techs.com**

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Slot Tech Magazine is strictly technical. As such, the magazine's contents are not time critical. The repair information and technical data contained in past issues is just as valid today as it was the day it was published.

Additionally, current and future articles more-or-less assume that readers are already familiar with what has been covered in past issues. This editorial policy assures that Slot Tech Magazine's contributing writers are not limited to "writing down" to the level of a novice technician but are free to continue to produce the most comprehensive technical articles in the gaming industry.

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For further details on the contents of each issue,
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