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## Wow, what a TechFest!

If you were there, you know what I mean. For something that was supposed to have been a one-time event, TechFest has now grown to encompass a record number of outstanding technical presentations. This iteration of TechFest was (once again) sold-out and included first-time presenters David Oldham from AESI (representing FutureLogic printers and MEI bill validators) Ron Parido from WMS Gaming with his most excellent multimedia presenta-

tion on WMS' Bluebird and CPU-NXT, and ICS Gaming's John Wilson with his outstanding and humorous presentation on slot math. Whodathunkit that slot math could actually be entertaining? Technicians and gaming commission members alike came away with a new understanding (a REAL understanding) of how slot math relates to slot revenue.

And speaking of slot revenue, this month marks another first for Slot Tech Magazine: A free, downloadable piece of software that will enable you to predict slot income based on factors that are specific to each machine and to your casino. John Wilson has created the proggy and has written about it in the final installment of his five-part series on PAR sheets and slot math. The fun begins on page 24.

Kevin Noble is getting technical again with his shocking expose of AC Coin and Slot's Power Slotto video slot machine. He presents us with a nice theory of operation and troubleshooting guide, beginning on page four.

Crossing the line between the analog and digital worlds, a voltage comparator is sort of an amplifier gone wild. Herschel Peeler explains what they are and how they operate, beginning on page 12.

I picked up an interesting article off the newswire that I've reprinted here in case you missed it (you can pick up all the latest news about slot ma-



chines each day at the slot-tech.com website). It concerned an alternative to the problem of "lost keys" that I had never considered. Typically, a set of lost keys is much more likely to be the result of an employee accidentally leaving the casino with the keys rather than something sinister or nefarious. Regardless, once the keys leave the premises, most casinos require complete re-securing of the assets through lock replacement, core replacement or re-keying of all slot machine locks. This clever solution prevents the keys from ever leaving the premises in the first place. Read how RFID may be the solution for you as it was for Delta Downs on page 31.

Finally, a word about my friends at Umicor. I am happy to see their latest successes in the Russian (CIS) gaming industry. The pictures were taken at the Umicor launch party, held April 29th. It looks like it was a pretty wacky, fifth-element sort of affair. You can read more about it on page 32 and find out just what the heck Australian gaming legend Len Ainsworth was doing there.

Until next month. See you at the casino.

*Randy Fromm*  
Randy Fromm - Publisher

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# Introduction To AC Coin Video Slots

## By Kevin Noble



**Coin  
and Slot  
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Whenever there is a new machine or a new manufacturer entering our gaming floor, I like to enlighten the technicians with whatever information I have acquired. Quite a few of the Casinos have already had these manufacturers' equipment on the floor for months (some for years) but for me and for many of the OLGC sites (using the Mikohn Casinolink system) this is new technology. Keeping this in mind, just before Christmas we put a number of new games on the floor. A

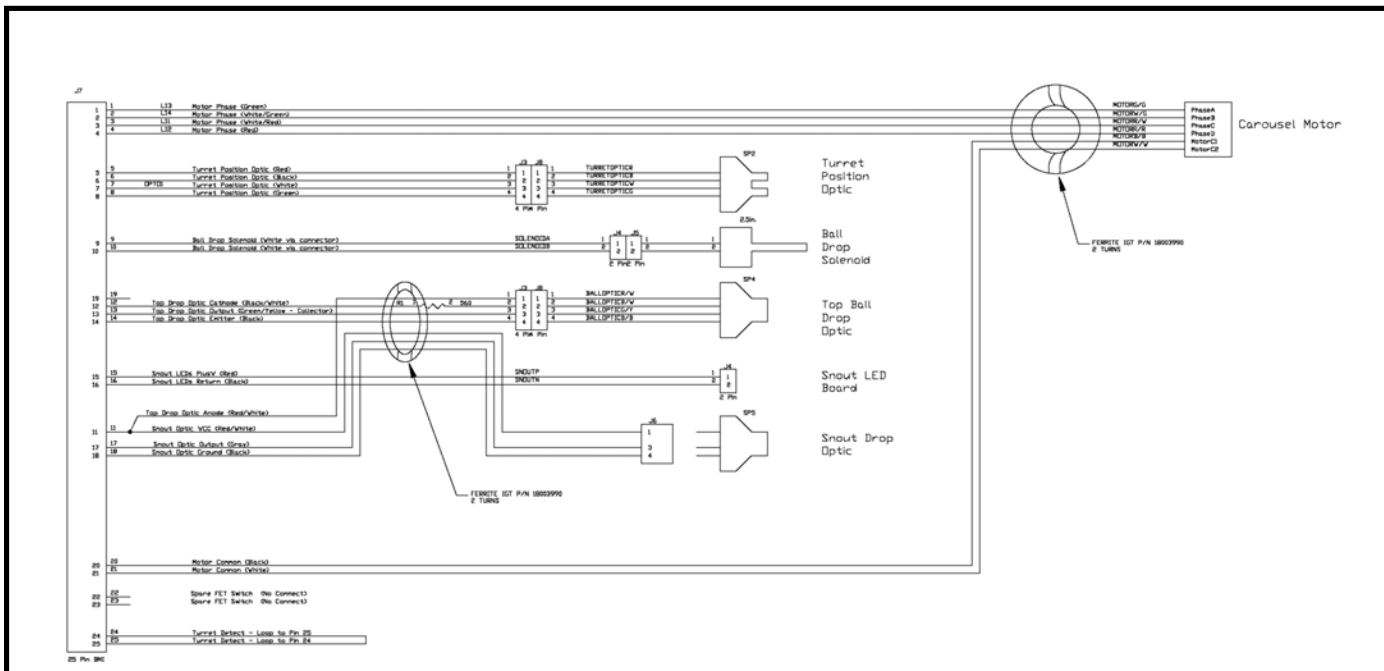
couple of the new products that made their way on to our gaming floor are AC Coin's "Bewitched" and "Power Slotto" video slot machines. These two themes are IGT video "I" games. The set and clear procedures are the same but in the diagnostics, a drop down menu has an extra box called "top box." This allows you to troubleshoot the bonus devices used in the award glass.

## The Set-up

There were a number of things that caught my eye when the truck dropped off these games. First was how tall the machines are and second was the design of the globes. It was easy to see that balls in

the globe made their way down into the snout of the award glass showing you your award value. Good thing I kept my observations to myself that day.

Once the machines were placed on the bases, wired, locks installed and we have performed our 6- point inspections, AGCO will come in, seal the EPROMs and perform the final inspections so we can get these machines working for the public. When the machines were first turned on, they reminded me of the actual game of BINGO with all the balls bouncing around in the plastic globe. This was our time now to explore what made the game tick.





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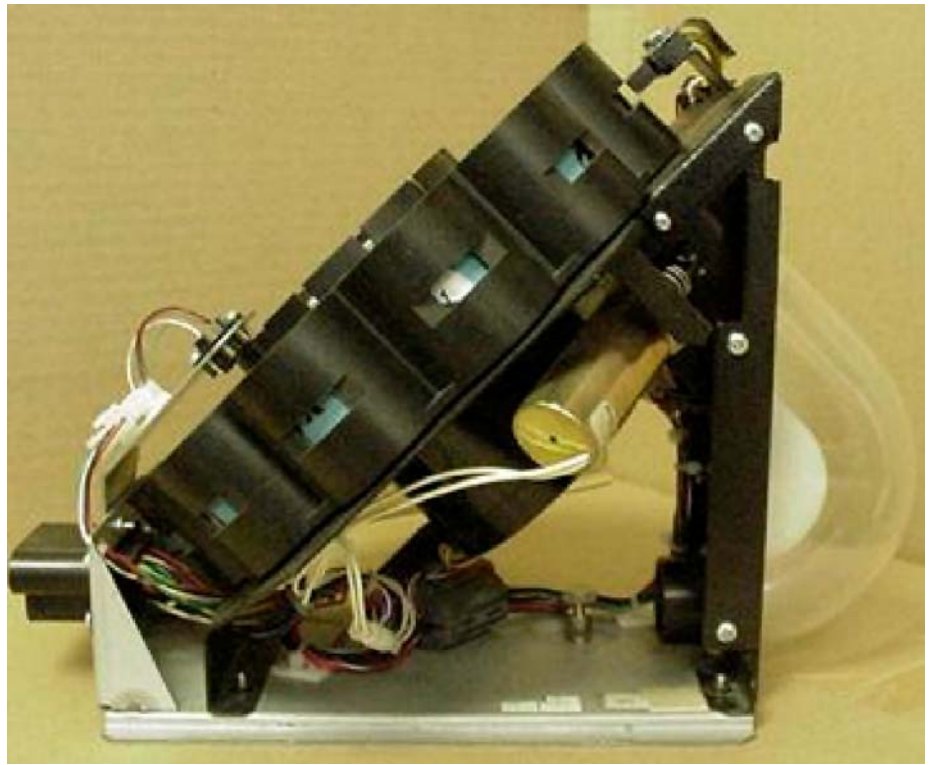


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## Training

On this day, we had Wendell Rubio from Hi-Tech Gaming come in and provide some training on turret adjustments, basic service requirements and on all the inner workings in the top award glass as well as the globe itself. This is where we gathered a lot of useful information from Wendell. I made sure to take notes on all his demonstrations. Here we learned about adjusting the voltage on the Bewitched themes and preventative maintenance procedures for the globe and turret.



## Diagnostic test Screen

When entering the diagnostic mode, there will be a box called "Top Box." When selecting this option, you will see another drop down box called "Slotto Diag." Once you have selected the top box, menu buttons appear to allow you to perform a variety of tests for troubleshooting. Using the Bewitched theme as an example, we have the following tests:

**Home** - The turret will go to home position.

**Self Test** - The blower will start and the turret will rotate to home position and wait.

**Ball Drop Test** - The physical test to ensure all the functions of a drop ball are working.  
20X, 10X, 9X ... : The ability to test each individual bonus ball value.

## The Turret, Solenoid, and Optics

**Snout Light:** on or off

**Slow or Faster Flash**

**Ball drop Solenoid**

**Blower diverter:** open or closed

**Blower:** on or off

## Operation

As mentioned earlier, my initial reaction on how this game worked was not quite right. The true operation never allows the balls to leave the globe but a representation of each figure is set inside the turret. This is a pretty neat concept, allowing the patrons to think that they actually selected the right box or that the wheel actually landed on that figure. As technicians, we know it really does not work that way. The basic operation for initialization begins with the blower motor mixing all the balls in the globe. The turret will now rotate around one time and test

for the home position. After the first spin, the turret will now stop briefly at each ball position and look for a ball. If all balls are detected, the turret will stop at home position and sit idle until further inputs from the game either in test mode or if the patron is in the bonus round.

## The Drop Ball Operation

Once the game is in the bonus round (or test mode was selected for the value of ball to be displayed) the turret will rotate and pass the home position to the desired ball location. The air valve will close, the solenoid will engage and open the gate, allowing the ball to drop. The drop optic will detect the ball dropping into the laminated snout and the gate will close. The air valve and gate will now open causing the blower air to return the ball back



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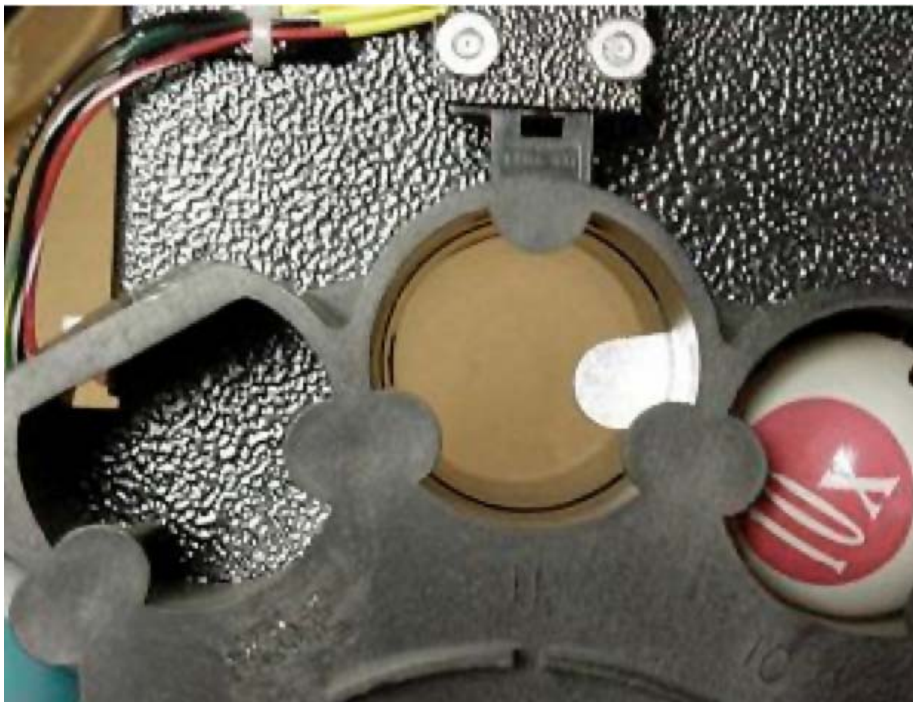
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**Drop Optic:** This optic is used to detect the ball as it passes in and out of the turret.

into the turret wheel. Once the ball has returned, the drop optic senses the ball's return and the gate will close.

## The Parts

The Turret: Currently there are two types of turrets used in the machines: ferrite and non-ferrite turrets. Ferrites are used to reduce the EMF associated with the white harness that is attached to the ballasts found on the right and left side of the turret. Another reason ferrites are used is to stop the EMF from interfering with optics in the turret.

The turret is housed in the award glass. It resembles a hopper without the bowl. The turret allows the ball with the designated value to be dropped in the snout of the award glass and then be recovered. Each value of ball in the globe is represented in

the turret from highest value to lowest.

## Troubleshooting

### Turret never finds home position

- 1 Encoder may be set too high
- 2 Dirty optics
- 3 Rubbing between ring and optic
- 4 Loose motor or carousel

### Turret stops at home, never checks ball locations

- 1 Encoder optic misaligned
- 2 Recall optic misaligned or bad

- 3 Drop optic misaligned or bad
- 4 Pinched wire

### Turret stops at any ball location with no pauses

- 1 Encoder optic may be rubbing on ring
- 2 Encoder optic misaligned or dirty
- 3 Loose motor, bad or vibrating
- 4 Carousel wheel unstable

### Turret fails to drop the ball and shuts down

- 1 Encoder optic misaligned or dirty
- 2 Solenoid
- 3 Gate may be loose or stuck
- 4 Air valve and diverter assembly
- 5 Drop optic
- 6 Recall optic
- 7 Encoder optic

### Turret drops the ball but fails to recover it

- 1 Gate operation
- 2 Recall optic dirty

### Bewitched Games Only

- 1 Adjust the blue pot to 25.1 volts on the bottom power supply.

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**The Solenoid:** The purpose of the solenoid is to engage when the selected value ball has reached the drop point even with the snout and release when the ball is back in the turret location.



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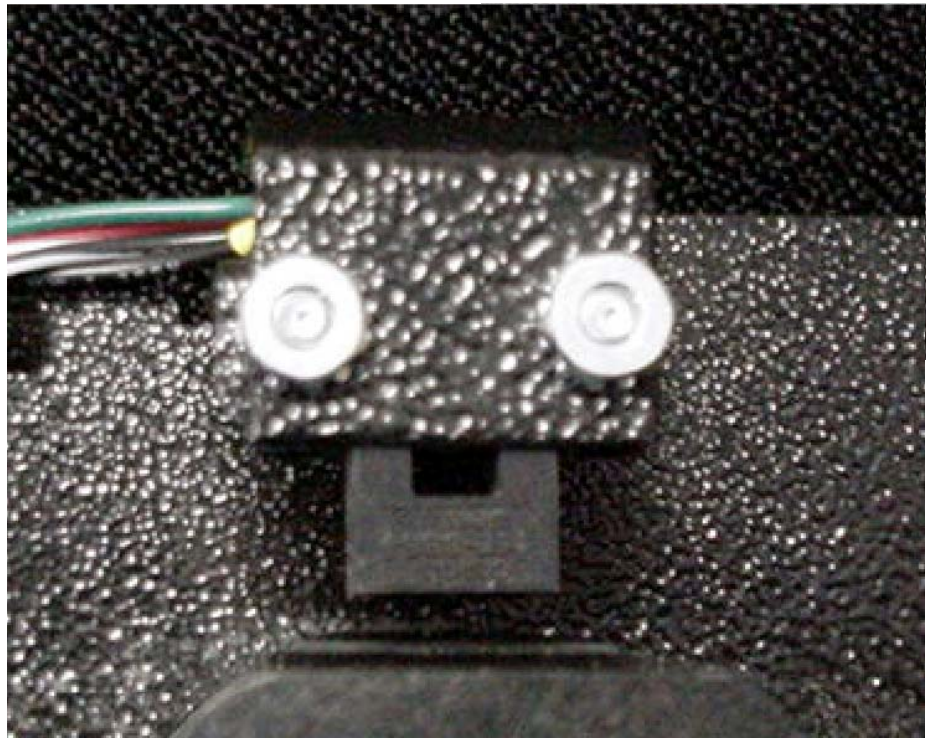
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## Overview

The biggest problems with these new machines were that the globes attract dust from both the inside and out very easily. We were told that you needed to clean the globes about every 3 to 4 months but at our site it is about every other month. The amount of static electricity generated inside the globes is quite shocking I must say. Instead of dumping the balls out to be cleaned I tried reaching in to retrieve them. That was a mistake. I received a good jolt that woke my butt up instantly. Like any other lesson, that was not good enough. I figured the initial shock was now done. Well, was I wrong again. As I reached in there again there was a snap and a quick reflex of the arm. The lesson was now learned. I now dump the balls out and spray my cleaner inside the globe to add humidity. Then I insert my arm to clean the inside of the globe. I must say I never received another shock after that.

The cleaning and maintenance of machine and globes are not all that time-consuming. Removing three plugs and about six wingnuts in the top box allows for the removal of the whole globe and its contents. Just have a small box to dump the balls into before cleaning the inside and outside of the globes. We used anti-static glass cleaner on both the globe and the ping-

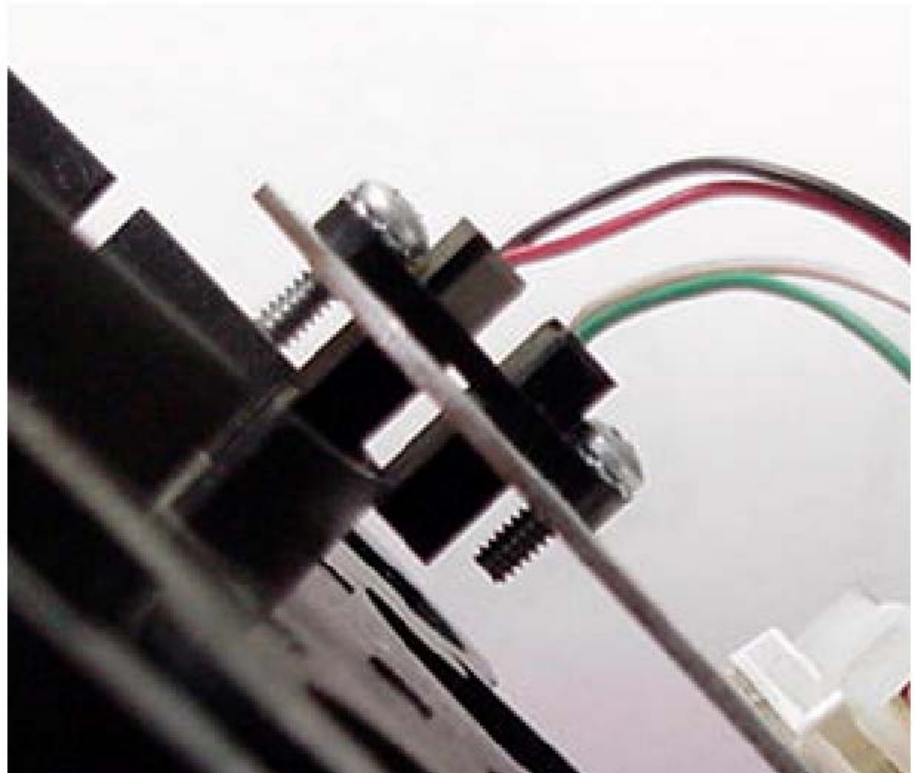


**Recall Optic:** This verifies that the ball is in home position.


pong balls. This certainly did a great job on the cleaning but most importantly, it didn't remove any of the lettering from the balls.

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**[knoble@slot-techs.com](mailto:knoble@slot-techs.com)**

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**Encoder Optic:** This operates exactly like the encoder rings on a reel bracket allowing for positioning of each ball's location.



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## Voltage Comparators

By Herschel Peeler

**V**oltage Comparators are one of the basic building blocks of the analog world of integrated circuits. Being closely related to Operational Amplifiers, they have the same schematic symbol. This makes reading schematics a little confusing but all it takes is some degree of familiarity with Op Amps and Voltage Comparators to tell the difference.

The Voltage Comparator popular in older games was the LM311. We will start with

this one first. Once you understand it, all mysteries concerning Voltage Comparators should be resolved.

Voltage Comparators may be used to interface between the analog world and the Digital. The inputs are usually varying voltages (analog) but the output is either High or Low (Digital or Binary). We have two inputs: The Inverting input, symbolized by a negative sign (-) and the Non-Inverting input, symbolized by a positive sign (+).

The rules of operation are simple: If the voltage on the Non-Inverting (+) input is higher than the voltage on the Inverting (-) input the output will be high. If the voltage on the Inverting (-)

input is higher than the voltage on the Non-Inverting (+) input the output will be low. In the big picture, that's really all it boils down to.

Voltage Comparators popularly come one, two or four to a package. There are three generations of devices we need concern ourselves with. The LM311 comes one device to a package and is the early-middle generation. We will not concern ourselves with anything older than the LM311 since they are not often found in the gaming industry.

Figure 1 shows a typical application of the LM311. On one input, we set up a voltage divider, setting the trigger voltage for operation. The sig-

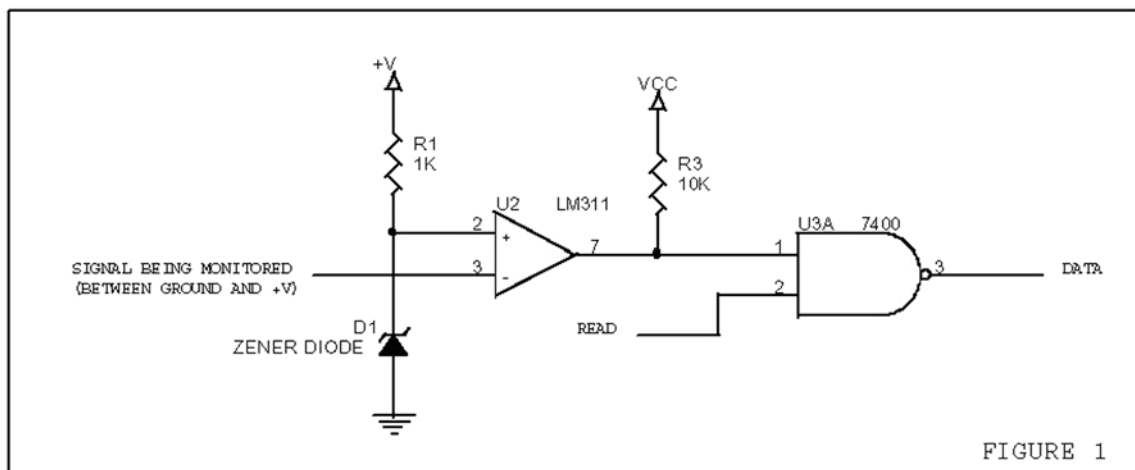


FIGURE 1

nal we want to monitor is applied to the other input. We may set the trip point on either input and apply a signal to the other. In the Figure 1 example we are looking for a condition that would generate a high out, which means that we are looking for the voltage on pin 3 to go below the trip point we set up on pin 2. Our voltage divider may be a resistor and a Zener diode as shown, or just two resistors. Use of the Zener diode offers better precision. Use of resistors gives us more flexibility of voltages and is cheaper.

We could use such a circuit to monitor the voltage on a battery to sense when the battery voltage goes low. We may use resistors to check a switch input to see if a switch is closed.

As usual with ICs power and ground are not shown in the schematic.

Figure 2 shows the power pin arrangement for the LM311. Pin 8 is the +V power pin, +5 to +12 V usually. Pin 4 is Ground.

Also not shown is the Offset adjustment we find on most Op Amps and Voltage Comparators that come one to a package. Figure 3 shows how Offset is typically used. A potentiometer of about 300 ohms is typical. To properly adjust the pot, short both inputs together and ground them. Adjust the pot to where the output just drops to the Low level (0 Volts out).

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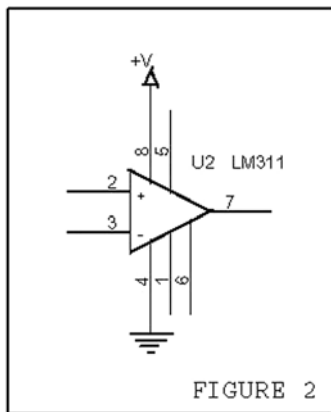


FIGURE 2

Single units with an offset adjustment are used where precision is required. Some degree of error is apparent in all op amps and voltage comparators. This error is called “Input Offset” error and can be measured as a voltage or current.

Not obvious in the picture at all are the details of how the output transistor is structured. As shown in figure 4, the output transistor of the LM311 has both the Emitter and Collector available as an output. Normally pin 6 (the Emitter) is tied to ground and the output only pulls actively low. If not low the output

must be pulled high by an external resistor. Alternately, pin 7 (the Collector) may be tied to VCC and the output is taken from pin 6 (the Emitter) with a pull down resistor providing a path to ground. Both of these arrangements allow multiple outputs to be tied together, and a few other design alternatives we won’t go into here.

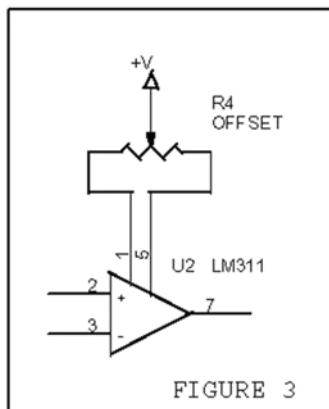


FIGURE 3

Most other Voltage Comparators are simpler devices. The newer generation single device is the TL712. It and its CMOS brother the TLC712 work the same way as the LM311 without the fancy output. Dual units are the LM319

(older) LM393 and LM2903 (middle-newer generation LM311 era) and the TL372 (newer). By dual units, I mean that there are two Voltage Comparators in one package. These are 8-pin devices also with no Offset Adjustment capability and only an Open-Collector output (or Open-Drain on CMOS devices). Quad units are the LM2901, LM3302 and LM339. These are also middle-newer generation devices of the LM311 era.

For the most part, LM393 and LM2903 are replacements for one another except in the most critical designs (none of which we find in gaming). Likewise most of the Quad units (LM2901, LM3302 and LM339) are pin and function compatible to one another.

The suffix added to the end of the part numbers primarily indicates the case style. An “N” indicates a DIP package. A “D” indicates a Gull-wing SOIC surface mount package.

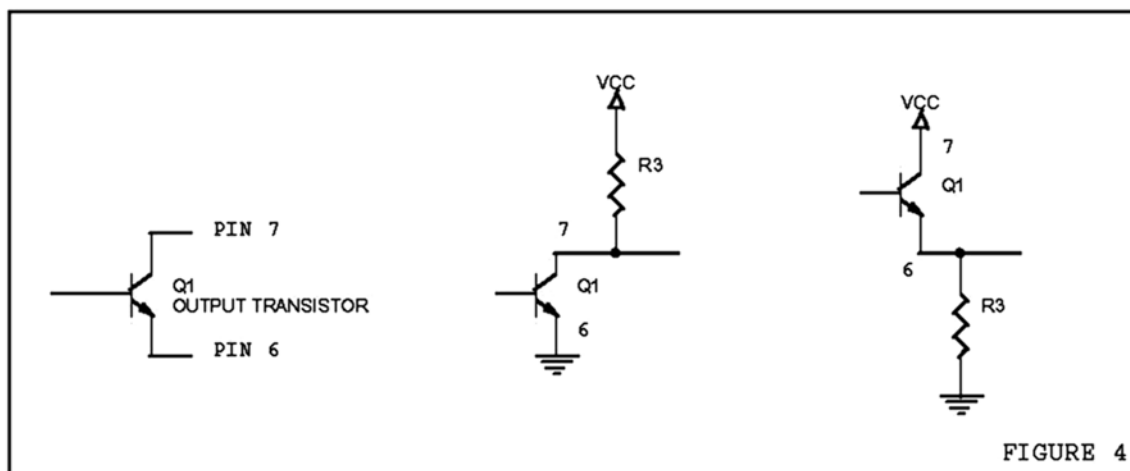


FIGURE 4

When you run across a Voltage Comparator in a circuit, it looks just like an Op Amp but if you don't know them by part number all is not lost. Usually Voltage Comparators do not have the feedback resistor going from the output back to the input. Op Amps usually have the feedback resistor. This is not true in all circumstances. There are design features that can be brought out using feedback in Voltage Comparators but we don't see that much in gaming. Most of the time we can say that if there is no feedback resistor it is a Voltage Comparator not an Op Amp (But it certainly doesn't hurt to get to know them by part number).

- **Herschel Peeler**  
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**TechFest 9 was held at Mystic Lake Casino, May 4-6 2004. 75 slot techs from across the country attended the sold-out event.**

**Left:** Transact Technologies' Denny Salmela points out the print head on their Ithaca Model 850 thermal printer.



**Above:** (left) JCM's Jack Geller discussed WBA calibration and repair. (center) IDX's Brian Tindall presented a look at their coin validator products and discussed the advantages of tokenization and the use of promotional tokens in the casino. (right) Ron Parido of WMS Gaming gave his first national TechFest presentation with a remarkable look at WMS' new Bluebird and CPU-NXT systems. Ron has produced the most educational powerpoint presentation I have ever seen on the subject, including short video presentations on such topics as installation, initial setup and diagnostics of the Bluebird. Well done, Ron. I hope to have WMS as a key component of all future TechFests.

**Left:** Also a first at TechFest 9 was a wonderful presentation on slot math, given by Slot Tech Magazine's resident mathematics guru, John Wilson of ICS Gaming. Can slot math actually be fun and entertaining? You bet! This seminar was a crack-up! He made slot math understandable for everyone in attendance, from slot techs to gaming commission members.



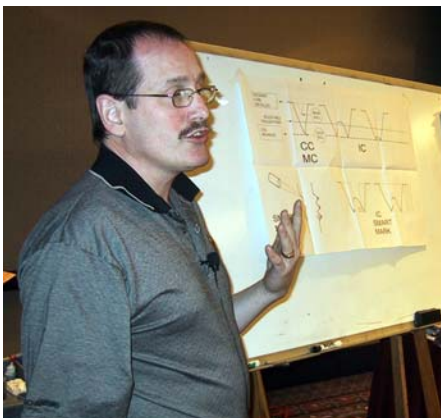
**Above:** Randy Fromm keeps an eye on the 3M Touch Systems training team of Paul Hatin and Mark Roberts (they're the tiny specks, standing at the front of the room, left) as they discussed touchscreen technology and fielded questions about such issues as calibration and repair. Everyone in attendance received a Slot Tech T-shirt as well as a technical information package including a CD-ROM full of diagnostic programs.



**Left:** Sencore's John Thomson presented each person with CDs full of schematic diagrams and other valuable information, as well as tech tips. John showed his line of test equipment meant to aid in the repair of monitors.



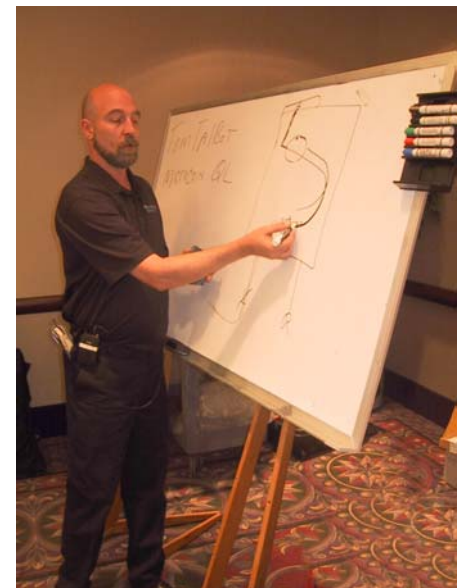
**Right:** Money Controls' Armando Gomez provided a detailed look at the Condor coin validator and their Gamesman coin hopper from a repair perspective. He also demonstrated hopper denomination conversion. Both side-exit and escalator hoppers were presented.



**Left:** Coin Mechanisms' Mike Harris discussed calibration and programming of the stable of Coin Mech products.



**Right:** Tommy Talbot of AstroSystems, Inc. discussed the new MicroCoin unit. He discussed the operation of the unit and calibration (none required) as well as programming.



**Left:** David Oldham of Advanced Electronic Systems, Inc. addressed the group as the first guest presenter at TechFest 9, held at the Mystic Lake Casino and Hotel in Minnesota. David presented a technical look at MEI's Cashflow SC66 bill validator and the FutureLogic printer.

**Luncheon sponsored by Medeco High Security Locks.** Thanks to Dan Flom and Frank Santorelli for their outstanding presentation which I totally forgot to photograph as I was stuffing my face at the time. - rf

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John Hamilton  
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Josh Miller  
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Kelley Boyko  
Kevin Frechette  
Lance Hofland

Mystic Lake Casino  
Isle of Capri Marquette  
Fond-du-Luth Casino  
Seneca Niagara Casino  
Prairie's Edge Casino Resort  
Seven Clans Casino  
Prairie Knights Casino  
Isle of Capri Marquette  
Seven Clans Casino  
Ojibwa Casino Marquette  
Prairie Knights Casino  
Fort Randall Casino  
Mystic Lake Casino  
Ojibwa Casino Marquette  
Mystic Lake Casino  
Seven Clans Casino  
Prairie's Edge Casino Resort  
Mohican North Star Casino and Bingo  
Nez Perce Tribal Gaming Enterprise  
Dakota Magic Casino  
Gold Eagle Casino/SIGA  
Fort Randall Casino  
Ojibwa Casino Resort  
Gold Eagle Casino/SIGA  
Nez Perce Tribal Gaming Enterprise  
Nez Perce Tribal Gaming Enterprise  
Mystic Lake Casino  
Little Six Casino  
KLA-MO-YA Casino  
Seven Clans Casino  
Leech Lake Gaming (White Oak Casino)  
Dakota Sioux Casino  
Isle of Capri Marquette  
Northern Lights Casino/SIGA  
Saskatchewan Indian Gaming Authority  
Mystic Lake Casino  
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# TechR Mystic Lake May 4th -



**SENCORE** ELECTRONIC TEST INSTRUMENTS

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# Fest 9 Casino Hotel 6th 2004



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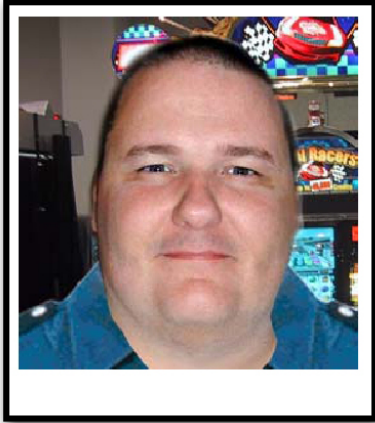
**Microcoin**



Lisa Stabler  
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Lois Weddel  
Lorne Lowe  
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Mel Nelson  
Michael Green  
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Casino Omaha  
Casino Omaha  
Fort Randall Casino  
Dakota Sioux Casino  
Bear Claw Casino/SIGA  
Two Rivers Casino  
Mystic Lake Casino  
KLA-MO-YA Casino  
Ojibwa Casino Resort  
Mohican North Star Casino and Bingo  
Fort Randall Casino  
Painted Hand Casino/SIGA  
Seven Clans Casino  
Apache Nugget Corporation  
Casino Omaha  
Fort Randall Casino  
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Mystic Lake Casino  
Two Rivers Casino  
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Mystic Lake Casino  
Mystic Lake Casino  
Mohican North Star Casino and Bingo  
Little Six Casino  
Mohican North Star Casino and Bingo  
Prairie Knights Casino  
Fond-du-Luth Casino  
Wild Card Saloon  
Mystic Lake Casino  
Dakota Sioux Casino  
  
Wild Card Saloon  
Seven Clans Casino  
Painted Hand Casino/SIGA  
Mystic Lake Casino



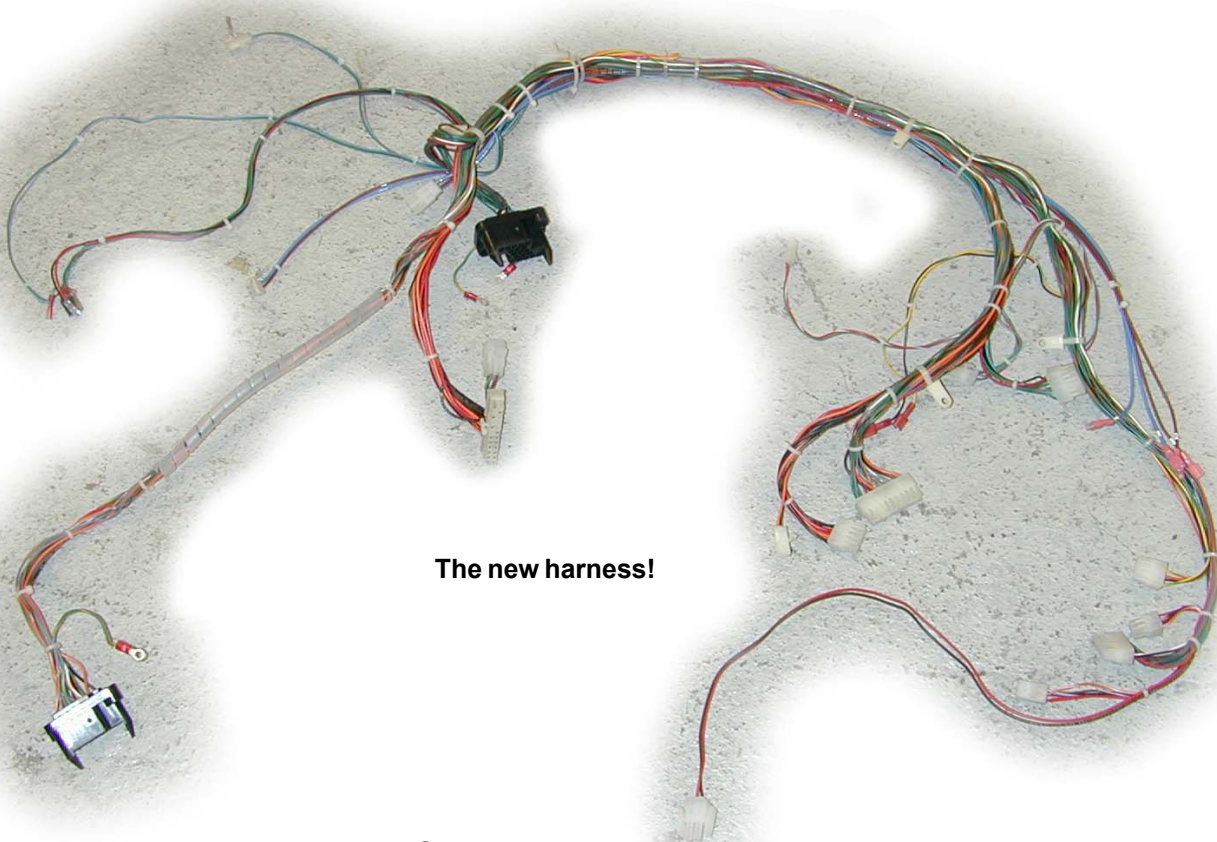


**W**hen I got to work this morning, my supervisor, handed me a wiring harness and said "Scott, this is for you." He asked me to install the harness using the machine next to it as a guide. I must tell you that I was a little overwhelmed at first, looking at this mass of wires and plugs out of their element but was soon forging ahead at full steam.



Let me take you back a few months. At the time, I worked for a casino operating company in Las Vegas, Nevada. We had eight "locals" casinos throughout the valley that shared several warehouses. One of those warehouses is

filled with nothing but slot machines and signage. A while ago, we brought back four IGT Game King 13" up-rights for future use. Now, I don't know about other casinos but generally, when we take a machine to the ware-



**The new harness!**

house, it is stripped of locks and player tracking and for the most part is ready for someone else to use right away. The machines we picked up however needed a good deal of work and specifically, the machine I was working on today needed not only the harness I was replacing but my supervisor had replaced the other main harness a few days before; the monitor also needed work but that's another story.

I got the harness installed in about an hour and a half (I know, a little slow but I'd never done anything like this before). I booted the machine and was immediately greeted with "MB Door Open", "Bill Stacker Error" and "Coin-In Timeout" error messages. First I noticed the coin comparator harness was unplugged, "Coin-In Timeout" taken care of. Next, there was no cash can. I inserted one and closed the door, "Bill Stacker Error" and "B Door" errors gone.

Unfortunately, after closing the main door I still had that "M Door Open" message staring me in the face. I tried jumping the optics but that didn't work which told me that the problem was somewhere else in the machine besides the optics themselves.

For those not familiar with an optic jumper, it is simply a length of cable about 4 feet long with Molex connectors on either end so you can plug it into the wiring harness

where the optics themselves would normally go. In the center of this cable is spliced the business ends of a set of optics, the emitter and the receiver. This device lets you fool a game into thinking a door is closed when it isn't, so you may troubleshoot it with the door open and the game running normally.

My boss suggested that I check the serial numbers on the new harness and compare it with the an old harness to see if they were in fact the same item (one of the reasons for this was an extra pair of wires and connector on the new harness that didn't exist on the old and they didn't seem to go anywhere). After a call to IGT, we found out that

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the new harness we had was a direct replacement for the old one but the fellow we talked to couldn't explain what the extra wires might be for. We just happened to have another new harness identical to the first so on the off chance that the first had a problem, I swapped them (only took me 25 minutes this time). The error didn't clear up. With two brand new harnesses, I doubted that there was a wiring issue so I swapped the MPU board with a known good one. The problem stayed with the machine. One of my other supervisors suggested going into diagnostic mode and checking all buttons and switches. He said that sometimes a malfunctioning switch could cause such a problem. I ran the test and everything checked out fine.

Ok, on to the wiring, I got out my multi-tester and ran a continuity check from the optic wires on the machine through the harness I had

just installed and ending at a plug leading to the I/O board. Continuity checked out fine there. I proceeded to trace the optic wires on the door side and found a problem. One of the wires on the door optic goes directly to the I/O board but the other does not. Instead, it is terminated with another wire in a Molex connector. This second wire then goes to the I/O board. In order for the door optic to work, this Molex connector must be jumped and it wasn't.

I checked continuity at all points to make sure that was the only problem, created a jumper, reconnected all the optics and closed the door; proud of the fact that I had found the problem so quickly. I waited and waited, but that blasted "M Door Open" message remained. Ok, to recap what we have done so far:

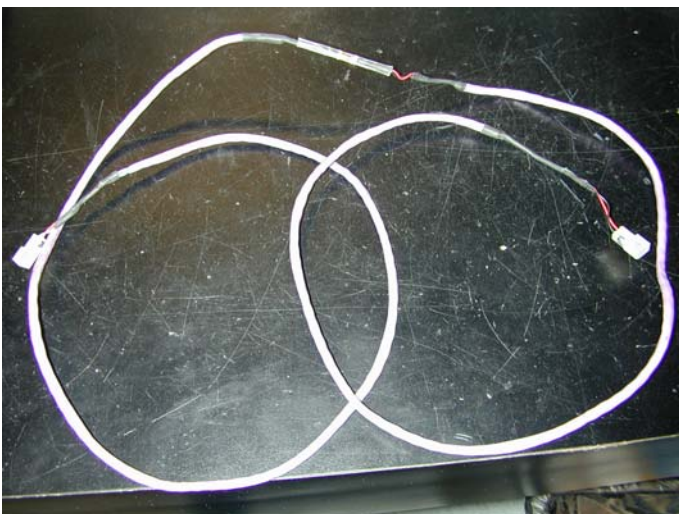
1. Jumped the optics to eliminate problems with them
2. Swapped MPU board with a known good one

3. Checked all buttons and switches in diagnostic mode
4. Continuity checked both optics
5. Jumpered the door optics

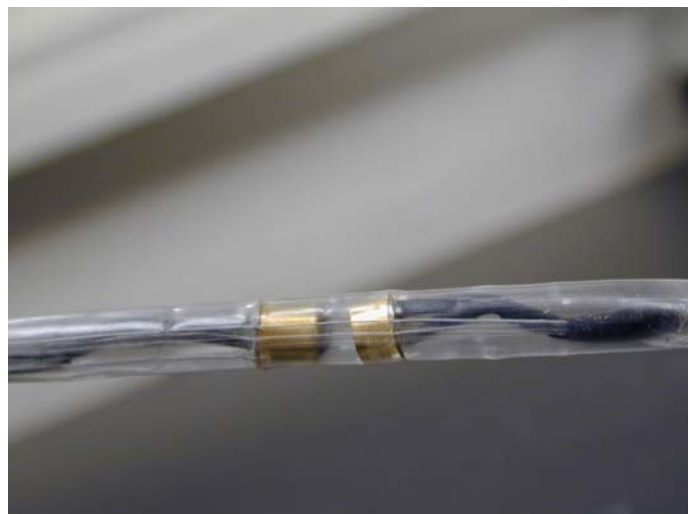
"What's next?" you might ask. I know I did! I talked to my boss who suggested that I replace the e-squared on the motherboard (backplane board). I did but it didn't help. As a last ditch effort, I replaced the entire motherboard and guess what? "M Door Open" still showed on the screen.

About that time, our E-Tech came by to see what was going on and had a look. After looking at the female end of the Molex connectors on the optics he suggested I use a sharp pick to try and close the ends as they were spread open too much and possibly not making contact. I borrowed a pick from Steve and did as Adam suggested, lo and behold... It worked.

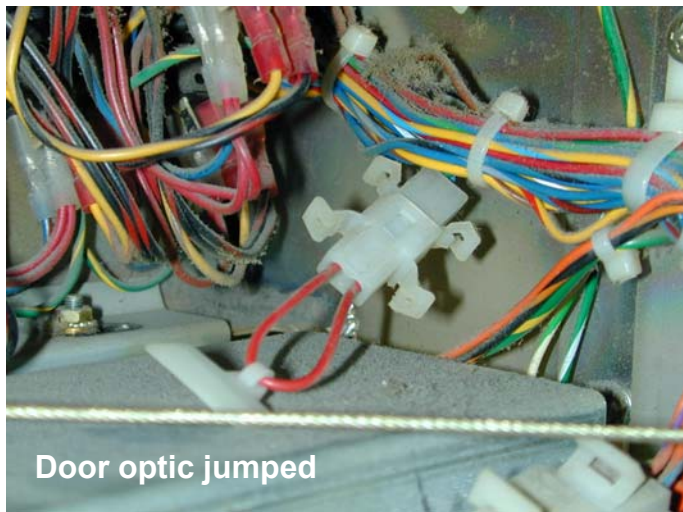
It turns out that the optics



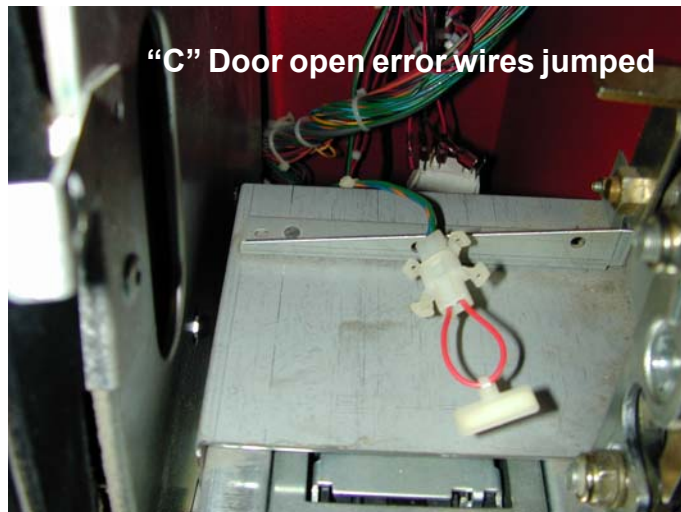
The optic jumper is a length of cable about 4 feet long with Molex connectors on either end so you can plug it into the wiring harness where the optics themselves would normally go.



In the center of this cable is spliced the business ends of a set of optics, the emitter and the receiver.



Door optic jumped



"C" Door open error wires jumped

would have worked in the beginning except for the fact that the jumper was not installed on the door side of the harness and later on, when I did the continuity check, I stuck the probe into the end of the Molex connector and basically created a faulty connection by spreading the female end of the connectors open too far. Live and learn.

Here is one more thing to pass along. A while back, one of our Floor Techs found a Game King upright in a "C Door Open" error. No one on the floor seemed to know exactly what this "C Door" was ("M" Main and "B" Bill doors are about all we contend with).

When the shift changed, an oncoming Tech seemed to recall something in his notes and suggested that the "C Door" stood for Cassette Door and it was a switch wired to the cash can enclosure that would indicate the cash can had been removed. While I can't go into detail, we don't use this particular connection. After tracing some wires on the harness, we found that

there was a pair hanging down and caught under the machine, the insulation had worn away and was shorting against the metal cabinet causing the error.

If you ever have a similar problem, here's where to find the pair: on the main harness running along the right side of the game (the one with the hopper and monitor drawer connectors attached) look for a pair of wires coming off of the main

harness right next to the monitor connector. One will be solid green and the other blue with an orange stripe and they will terminate in a female Molex connector. Simply make a jumper with a male Molex connector and attach. Problem solved.

Well, that's it for this month. Until next time, stay safe.

- **Scott Reynolds**  
[sreynolds@slot-techs.com](mailto:sreynolds@slot-techs.com)

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## PAR Excellence - Part V The End is Here!

By John Wilson

### Some Basic Information

One of the basic assumptions we made in the Volatility Index was the number of games played in a certain time frame. The model stated that the average player will play 10 games per minute. To get our standard 10,000 game goal for the volatility index, we need a total of 1,000 minutes of play, based upon this ten game per minute assumption.

Using a 5% occupancy rate, we can determine how much a game is played in one 24-hour period. If the casino is not open 24 hours, not only will the time available change, but your machine occupancy rate will likely vary as well.

In 24 hours, you have 1,440 minutes of machine time available. At 10 games per minute, that's a potential for 14,400 games per day. With 5% occupancy, the actual games played is reduced to 720.

Suppose that your casino opens at 10 a.m., closing at 3 a.m. You have only 17 hours, or 1,020 minutes of machine time. At 5% occupancy, you have game play of 51 minutes. It will take you 29% longer than if you were open 24 hours.

By using the table below, you can get a general feel for the amount of play you will get in your casino. Some machines

This is the final installment for our 'PAR Excellence' series. In future articles, however, we will continue to explore some of the special features of the machines, how these features are implemented, and the math behind them. This month we'll examine some of the revenue estimates that you can calculate from the PAR sheets to determine what you can reasonably expect to gain from any particular game.

The information shown in this column as well as the software calculator was covered in the presentation at TechFest 9. Play around with the calculator; you'll find it easy to use. Should you have any comments or suggestions on new features it can do, please send me an e-mail. I'll try and incorporate your changes into future updates.

	24 HOURS	8 am - 3 am	9 am - 3 am	10 am - 3 am	10 am - 1 am	11 am - 1 am
HOURS OPEN	24	19	18	17	15	14
MINUTES OPEN	1,440	1,140	1,080	1,020	900	840
5% MINUTES OF PLAY	72	57	54	51	45	42
8% MINUTES OF PLAY	115	91	86	82	72	67
10% MINUTES OF PLAY	144	114	108	102	90	84
15% MINUTES OF PLAY	216	171	162	153	135	126

receive less play, and if it's considerably less, they are replaced or converted. Some will receive more play than others. You should be able to get a general range of play levels for your particular casino, however. Your slot management software will be able to generate reports to give you play activity. At the least, you can take meter readings for games played. Take a reading and then 24 hours later take another reading. The difference between the two readings is your actual games played.

The 10,000 games is the magic number for volatility. Suppose that you receive 5% play on a 24-hour basis. At 72 minutes per day, and 720 games per day (72 minutes \* 10 games per minute), it will take you  $10000/720 = 13.9$  days to reach this level. At 5% play on a 15-hour basis, you're looking at 45 minutes per day and 450 games per day. That means that you will have to wait 22.2 days to reach the same level of play. After this point, you should be within the volatility range shown in the PAR sheet.

Remember that this is a range. It tells you how much you can reasonably expect to receive from the game, 90% of the time. You may take in more than you pay out, or you may pay out more than you take in. Looking further in the table, to perhaps 100,000 games, you can see that the range narrows, and that you'll be coming closer to the theoretical play value.

## Hold Estimates

When determining if you are going to purchase a slot machine for your casino floor, you need to make an informed decision on your expected revenue. Using our PAR sheet and simple math, you can determine your expected play for a day, week, month, year, or whatever time period you want.

There are two methods by which you can make these calculations. The first is Theoretical, and the second is Proposed. The theoretical calculation uses the calculated payout percentage while the second uses the Volatility Index to determine a range of expected revenue.

The calculated percentage appears on the PAR sheets. Subtract this value from 100% to determine your hold percentage. A 92.7% payout means that you can expect to hold 7.3% of the coin-in. After determining your level of play for 24 hours (or expected level of play), multiply this by the maximum coin-in and then by the coin value.

Eg: 720 games in 1 day. 3-coin quarter machine. 7.3% hold

$$\begin{aligned} & 720 \text{ game} \times 3 \text{ coins} \times \\ & \$0.25 \text{ per coin} \times 7.3\% \\ & = 720 \times \$0.75 \times 7.3\% \\ & = \$540 \times 7.3\% \\ & = \$39.42 \end{aligned}$$

For \$540 coin-in, you will hold \$39.42, paying out the difference, \$500.58

Obviously, you can multiply this value by 7 to determine your weekly total, etc. In one year, you should hold \$14,388.30.

Remember that the hold percentage is theoretical, and exists only in a perfect world. Furthermore, the payout percentage is not the same as the cash-out value. Players will put some of their winning back into the machine and some of this will be held. Consider the following simplified situation:

- 1 \$1,000 is taken to a slot machine in \$1 tokens.
- 2 Each token is played in the machine, and all winnings are cashed out to the coin tray.
- 3 The machine pays back 90% during this session. The player counts \$900 in tokens in the coin tray.
- 4 The player puts the \$900 back into the machine.
- 5 90% is again paid with \$810 received in winnings.
- 6 The \$810 is placed into the machine and the player receives 90% back.
- 7 \$729 is won and cashed out of the machine.

Although the player received 90%, they cashed out only 72.9% You can reasonably expect to hold more than the specified payout percentage, in the long term. Using your slot management reports, you should be able to determine the actual hold percentage of your games.

Although it seems hard to believe, I'm sure that there are a couple of readers who

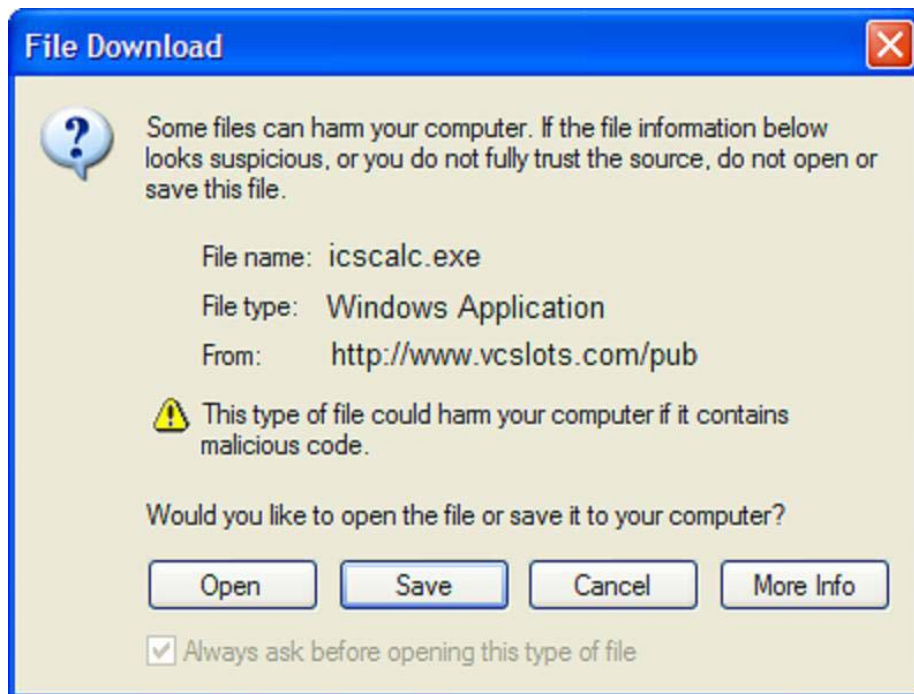
don't like sitting down with a pencil and paper and actually figuring out these values. In order to help the numerically-challenged, I have come up with a small software program to do the work for you. The calculator is specifically designed to calculate theoretical revenue and provide a range of values based upon the volatility index as well. By providing a few simple values, the calculator will do the rest.

The first step is to download the program and install it on your computer. You are licensed to use it at home or at work, and feel free to distribute it to your friends throughout the gaming industry. In order to ensure that the program functions properly, it comes with an installation and uninstall utility. It works on Windows (95, 98, ME, NT, 2000 and XP). A MAC version is not available.

The calculator can be found by following the link at the slot-tech.com website.

When asked what you want to do with this file, select SAVE, remembering the folder where you saved the file. At the end of the download, click on START, RUN, BROWSE, and locate the file.

The installation utility is straightforward. Simply follow the directions as they appear. You can install the calculator in any folder you wish and you have the opportunity to create a shortcut on your desktop and Start-Menu



as well.

The first time you run the calculator, you will be asked to enter a password. This is a simple attempt to ensure that only gaming personnel use the software. If you give the calculator away to your friends, make sure that you give them the password as well! The password is cc2301a7f. Let's take a look at the calculator and see what it does for us!

The screen shot shows a sample calculation. There are six separate areas on the screen.

Under the File menu, you have 2 options. New will clear out any information you have entered and allow you to easily enter the data for a new slot machine. Exit will close the program

The Help menu has one option, About. This will show

you the calculator version and provide contact information, should you wish to email us about the program. I can provide simple email support for this utility but due to the nature of varying hardware, software and network configurations, I may not be able to help with detailed technical problems. Should you have any suggestions for additions to the calculator, please email me so that I can review them.

In the "Open Time" and "Game Play by Machine" boxes, there is a calculate button. If you enter the total hours in the first box or the total games per day in the latter, you do not need to press the calculate button. It calculates the total from the opening and closing time and the beginning and ending meter readings.

#### **Open Time (per 24-hour period)**

You must tell the calculator

ICS Gaming - <http://www.vcslots.com> - Game Play Analysis

File Help

Open time (per 24 hour period)

Hours:

or, Opening time

Closing time

24 hour clock. (0800, 2300)

Game play per Machine

Closing meter reading

Opening meter reading

Games per Day

Game Parameters

Payback %

Hold %

Volatility Index

Calculate!

Maximum Coins

Denomination

☐ 0.05   ☒ 0.25   ☐ 1.00   ☐ 5.00   ☐ 20.00   ☐ 100.00  
☐ 0.10   ☐ 0.50   ☐ 2.00   ☐ 10.00   ☐ 25.00   ☐ 500.00

Time	Coin In	Pay	Hold	Games
Hourly	\$11.54	\$10.70	\$0.84	15
Daily	\$225.00	\$208.62	\$16.38	300
Weekly	\$1,575.00	\$1,460.34	\$114.66	2,100
Monthly	\$6,825.00	\$6,328.14	\$496.86	9,100
Quarter	\$20,475.00	\$18,984.42	\$1,490.58	27,300
Yearly	\$81,900.00	\$75,937.68	\$5,962.32	109,200
33.33 days LO range	\$7,500.00	\$6,034.50	\$1,465.50	10,000
33.33 days HI range	\$7,500.00	\$7,873.50	-\$373.50	10,000

Enter the number of hours your casino is open (during one 24-hour period).

The calculator can determine your open time as well. Just enter the opening time and closing time and click on the calculator button.

in the "Hours" box for you. If you make a mistake entering the times, a help screen will appear.

## Game Play per Machine

This section will allow you to enter the number of games you are expected to receive in the open time during a 24-hour period. You may enter just the estimated number of games or you can take a meter reading. Enter the game meter at the beginning of the open time and then again at closing time (or 24 hours later if you never close). If you make a mistake entering the values (such as entering a lower count for the closing reading), the calculator will assist you in correcting your entries.

how many hours your casino is open. You may type the number of hours in the box beside "Hours" or you can have the computer calculate it for you. If you wish to enter the opening and closing time, ensure that you use a 24-hour format. The calculator button on the lower-left will determine the hours you are open and place it

Please correct the opening and closing times.

Opening and Closing times:

Please enter your times in a 24-hour format. Each time must be 4 digits.

Eg:

Midnight: 0000	Noon: 1200
1 am: 0100	1 pm: 1300
2 am: 0200	2 pm: 1400
3 am: 0300	3 pm: 1500
4 am: 0400	4 pm: 1600
5 am: 0500	5 pm: 1700
6 am: 0600	6 pm: 1800
7 am: 0700	7 pm: 1900
8 am: 0800	8 pm: 2000
9 am: 0900	9 pm: 2100
10 am: 1000	10 pm: 2200
11 am: 1100	11 pm: 2300

Close

## Game Parameters

This is where you will enter the general game parameters. You will need to know the normal payout percentage. Enter is as a percentage, for example: 92.72% would be entered as 92.72

The calculator will determine the hold % automatically for you.

Enter the volatility index from the PAR sheet as well. This is used in calculations shown later.

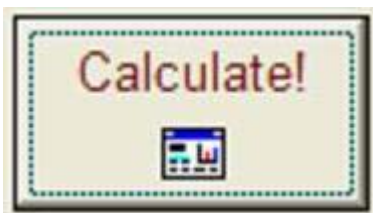
## Miscellaneous

You will also need to enter the denomination of the machine. Simply click on the button beside the appropriate denomination. A 25-cent machine is selected by default.

The maximum number of coins must also be indicated. Click on the track-bar to change from 1 to 10 coins.

## Calculating

When you have entered all of the required information, click on the large Calculate button. The calculator will complete the mini-spreadsheet at the bottom of the screen.



Game play per Machine

Closing meter reading 3125126

Opening meter reading 3124695

Games per Day 431

Enter the expected games played during one day. If you are unsure, take a meter reading at the start of the day and then again at the end and enter those values.

Click on the calculator button in order to calculate the games played from the meter readings.

Game Parameters

Payback % 90

Hold % 10

Volatility Index 10

From the PAR sheet, determine the normal payout percentage and the Volatility Index.

The calculator will automatically determine the hold percentage.

Maximum Coins

Denomination

0.05 0.10 0.25 1.00 2.00 5.00 10.00 20.00 25.00 100.00 500.00

Select the maximum number of coins available in this machine. Click on the trackbar to select 1 to 10 coins.

Click on the appropriate denomination of this slot machine.

## What's Shown & What it all Means

The spreadsheet at the bottom shows estimated play and revenue values for the following time periods: hourly, daily, weekly, monthly and quarterly. These values are based upon your play level in one day and the time you are open during the same period.

At the bottom of this table is a range of expected values based upon the volatility index. It will show you how long it will take to reach the 10,000 game level and give you results based upon the lower and higher limit. The coin-in and number of games

will not change. Examining the volatility index table, you will see a lower and upper range of payout percentage. These are the values used to make the entries in this table.

For each time period you will see the following information:

### Coin-in

Based upon the expected game play, the coin-in is determined from play using the maximum number of coins. The coin-in value is shown in dollars, and uses the denomination to determine this.

### Pay

The payout amount is the

coin-in value multiplied by the theoretical payout percentage.

### Hold

The hold is the difference between coin-in and pay. Note that this is the theoretical hold value, using the payout percentage. The actual hold value will likely be higher, as the amount taken from the machine is generally less than the payout percent. On a 90% payout machine, the customers may take 70% out

of the machine, replaying the other 20%.

### Games

This is the expected number of games during the time period. Your open time and expected daily game estimates generate this value.

### Using this calculator in your casino

Feel free to use this software for any use you have. It may

be beneficial to analyze expected play and revenue from a game you are considering purchasing or converting. By considering not only the payout percentage but the volatility of the game as well, you can obtain some figures that will make a proposal or budget stand out!

- John Wilson  
[jwilson@slot-techs.com](mailto:jwilson@slot-techs.com)

Time	Coin In	Pay	Hold	Games
Hourly	\$11.54	\$10.70	\$0.84	15
Daily	\$225.00	\$208.62	\$16.38	300
Weekly	\$1,575.00	\$1,460.34	\$114.66	2,100
Monthly	\$6,825.00	\$6,328.14	\$496.86	9,100
Quarter	\$20,475.00	\$18,984.42	\$1,490.58	27,300
Yearly	\$81,900.00	\$75,937.68	\$5,962.32	109,200
33.33 days LO range	\$7,500.00	\$6,034.50	\$1,465.50	10,000
33.33 days HI range	\$7,500.00	\$7,873.50	-\$373.50	10,000

## Transact Awarded New Patent Covering External Bezel Design for Tickets and Vouchers

TransAct Technologies Inc. announced that on April 13, 2004, it was awarded a U.S. design patent covering its proprietary technology for external bezel design for tickets and vouchers.

TransAct's jam-resistant bezel is offered exclusively on the Company's Series 800 thermal gaming printer, with the option to configure the bezel to be mounted internally or externally on the slot machine.

Patent no. D488,512S was granted by the U.S. Patent and Trademark Office and covers design methods for allowing tickets to bend inside the bezel if the exit path is blocked by the slot player. In addition, TransAct's bezel is designed with a liquid spill resistant configuration, which directs

liquids away from critical components, helping to keep slot machines running smoothly if a slot player accidentally spills a drink near the printer.

TransAct offers both internal and external bezel models as an upgrade option for existing printers or as an installed option on any new printer. Both bezel models also come with integrated LEDs to provide bright, consistent, highly visible lighting so the player can see the ticket as it exits.

Bart C. Shuldman, Chairman, CEO and President said, "We are extremely pleased to receive our latest patent, as it adds to our growing portfolio of patents and further strengthens our competitive advantage in the marketplace. Ticket jamming

caused by a player interfering with the ticket when printing in a coinless slot machine has been highlighted as a potential concern by casinos. In our efforts to fully support the casinos in their transition to ticket-in/ticket-out (TITO) slot machines, we developed this simplified, low cost solution to address this concern. As a result of our innovative technology, there are no ticket jams causing game downtime and lost revenue for the casinos. This is just another example of how we continue to meet the needs of our customers and this latest patent underscores the strength of TransAct's position as a technology leader in the industry."

For more information, visit the website at <http://www.transact-tech.com>

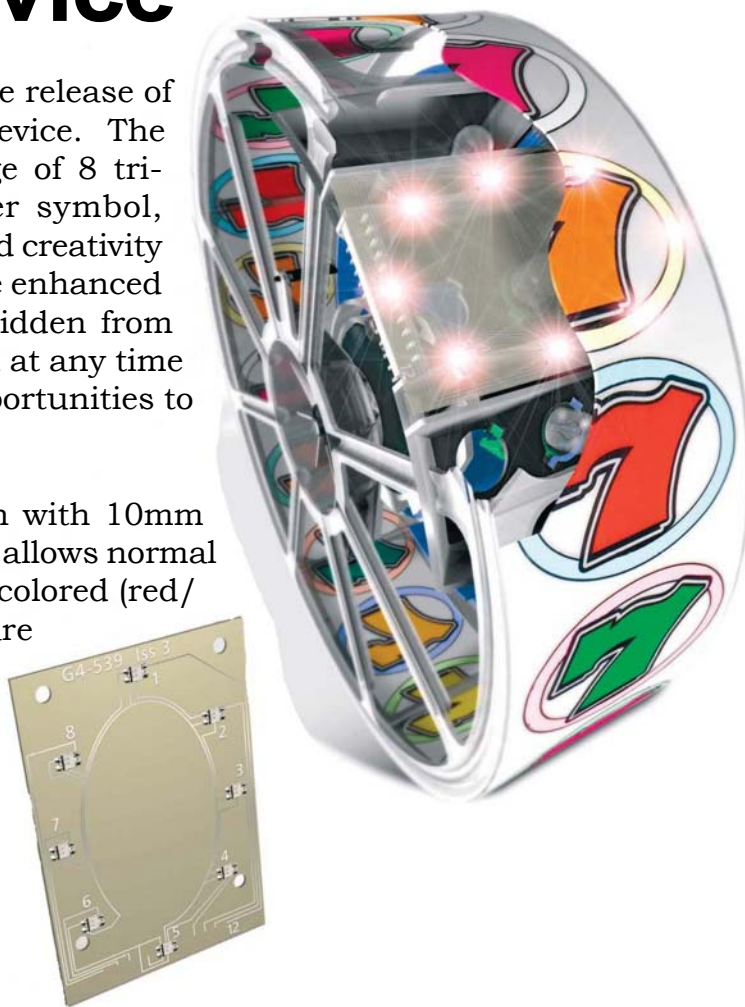
Gamesman Brand Products by Coin Mechanisms Inc.

# Gameline Device

Coin Mechanisms Inc. announces the release of the Gamesman Brand Gameline Device. The Gameline Device consists of a package of 8 tri-colored LED's surrounding the center symbol, giving game designers more flexibility and creativity when highlighting wins or features. The enhanced visual effect of the Gameline can be hidden from players in general play, but can be used at any time to bring the symbols and game play opportunities to life.

Features include standard illumination with 10mm lamps; translucent PC board with LED's allows normal illumination of the center symbol; 8 tri-colored (red/green/amber) surface mount LED's are available with common anode or cathode configuration; easy electrical connection via a standard 0.1" pitch 10-way connector.

For further information, visit [www.coinmech.com](http://www.coinmech.com)



## Coin Mechanisms' Defender Approved In All Gaming Jurisdictions



Leading international coin validation equipment manufacturer Coin Mechanisms Incorporated has announced that its latest high security product, the Defender, has now been approved in all U.S. gaming jurisdictions for use in at least one manufacturer's machines. Additionally, the Defender has approval in all GLI jurisdictions and by New Jersey's Division of Gaming Enforcement for use in all major gaming machine brands sold in their jurisdictions. Casinos are now able to specify Defender when they order new machines. They also can be purchased from authorized Coin Mechanisms' distributors or directly from Coin Mechanisms Inc.

For more information on Defender visit the website [www.coinmech.com](http://www.coinmech.com)

## Delta Downs Racetrack and Casino Implements RFID Tags on Slot Machine Keys to Avoid Costly Shutdowns and Re-keying

**A**XCESS International Inc., an RFID and digital video solutions provider of physical security and asset management today announced that Delta Downs Racetrack and Casino will implement AXCESS' ActiveTag(TM) RFID technology to prevent state-ordered shutdowns of its slot machine operations in the event of lost slot machine keys.

AXCESS' wireless radio frequency identification (RFID) tags are affixed to the keys and are identified at doorways to prevent them from being removed from the casino.

Hershel Richard, Sr. Sales Representative for Interface Security Systems, LLC of Lake Charles, Louisiana, has implemented several other security projects in casinos using the AXCESS ActiveTag(TM) system. Mr. Richard realized that given outside elements and the distance that needed to be covered, only an "Active RFID" solution could be used. "Passive tags wouldn't work for the solution I needed," said Richard.

"Mr. Richard approached us about his situation and it became evident he required our 'Active' Tag solution," commented Ben Donohue, VP of Business Development for AXCESS Inc. The AXCESS ActiveTag(TM) system that In-

terface Security installed sounds a warning before the employee leaves the premises. By state police requirement, once a slot machine key leaves the casino, the casino is shut down and all slot machines have to be re-keyed. The superior range and reliability of the AXCESS active RFID system catches the employee before it is too late.

AXCESS' ActiveTag(TM) RFID product uses small, battery powered tags (called generically "active" tags) that when automatically activated at control points throughout a facility, transmit a wireless message typically 30 to 100 feet to palm size receivers networked on the existing corporate network. Tag identification and location information is instantly forwarded over the network to a host computer. The system dynamically tracks assets as they move throughout a facility to monitor their whereabouts, detect theft, and prevent loss. The beaconing feature allows inventory to be automatically counted and monitored, even while stationary.

### About AXCESS Inc.

AXCESS Inc., headquartered in greater Dallas, Texas, provides intelligent electronic security surveillance systems that locate, identify, track, monitor, count, and protect people, assets, and vehicles. The network-based systems



reduce loss, liability, and security system costs, while boosting effectiveness and extending system coverage. AXCESS utilizes two patented and integrated technologies: battery-powered wireless tagging (commonly referred to as Active-Radio Frequency Identification or RFID) and network-based, streaming digital video (or CCTV). A particular focus is on automatic incident detection, recording, and notification. The main applications are network-based security video recording and surveillance, automatic personnel and vehicle access control, and automatic electronic asset surveillance, management and protection. AXCESS is a VennWorks LLC partner company. More information is available at <http://www.axsi.com>.

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# Unicum Announces 24 New Slot Machines

New games presentation for three different platforms produced by the leading Russian manufacturer and distributor, Unicum, took place in Moscow on April, 29th. The organizers of the event occupied the fresh-built casino and entertainment centre "Molodaya Gvardia" and gathered over 400 gaming executives and operators from all regions of Russia and CIS, and Unicum's international partners.

Two major developments in Unicum's recent activities became a reason for this meeting. Since March 2004, Unicum has started producing Celebrity and Ambassador slot machines for the Russian and CIS markets. The popularity of Australian games in this region made the company's specialists adapt over two dozens of

Ainsworth's games. Australian and European representatives, including the founder of the company, Len Ainsworth, came to Moscow to see a launch of Russians version of 14 new games for Unicum Celebrity machines and 13 games for the Unicum Ambassador platform ready to face the market.

"The main advantage in the cooperation between Unicum and Ainsworth is that we are producing machines of different levels under the brand name of Unicum. It gives more confidence to customers, because Unicum stands for security and credibility in the Russian market. What we see as another big advantage is that Unicum produces slot machines in Russia. It is much cheaper than it takes Ainsworth to manufacture a machine and then to ship it

here" - commented Georg Steiner, the managing director of Ainsworth.

Another very special and important announcement made by Unicum's representatives at the party was a launch of Unicum's own product, the platform AIT-5. The machine is designed to provide an extended set of features typical for the premium-class slots for an affordable price. AIT-5 supports multigame mode (four video slots and a video poker), fascinating 3D graphics, advanced animation and possesses a touchscreen feature. All these advantages were presented in a new game TamTam, developed by Unicum's programmers and designers. Its game story is rather unusual for slot plots and amazed the visitors with "Black flowers dance" and "Spirits smile" bonus games.



Len Ainsworth (founder of Ainsworth) & Yuri Larichev (vice-president, Unicum)



Unicum launch party, featuring 24 new Unicum machines

TamTam's rich animation and detailed graphics attracted a great number of people to these machines.

"While working on the Tamtam project we tried to consider all specifics of the gaming process and offer a player something really entertaining. Popularity of video games and their "interactivity" induced our designers to come up with a game that would capture player's mind not only with alluring bonuses but also with an interesting storyline and pictures. The game is ready to go out to the Russian market and we are planning to start sales in June." - comments Yury Larichev, the vice-president of Unicum.

Overall, the organizers of the event point out a great interest shown by the Unicum's guests to its latest games and solutions. The expending Russian gaming market follows every new product and technology in the pace for the player. The atmosphere of the coming May holidays was also heated up by modern hi-tech decoration of the entertainment centre and a show based on a Hollywood movie "The fifth element". The brand new Unicum's machines, bright displays and games fitted well in the movie theme, model stewardesses and live music.

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# Atronic @ NIGA

Atronic, leading slot manufacturer, celebrates the results of its most productive NIGA show yet along with success stories from recent installs of its innovative e-motion cabinet. Atronic's striking booth highlighted a variety of product groups and new games at the National Indian Gaming Association (NIGA) trade show, which took place in the Albuquerque Convention Center on April 6-7th.

"We were pleased to show our largest ever variety of new game titles and products at this year's NIGA," said Joe Bailo, COO of Atronic Americas. "The response to e-motion continues to be powerful, and customers are also anticipating our latest Towerline and Cashline titles, resulting in our highest yet sales figures from a NIGA show. In addition, we were pleased to celebrate the overwhelming success of our first e-motion installation in New Mexico, at Sandia Casino, where it has exceeded expectations many times over."

Atronic featured e-motion, distinguished as the industry's first height adjustable slot machine, with models demonstrating the comfort both tall and short players enjoy on the innovative new machines. The e-motion games Deal or No Deal and Time for Money were a hit at the show, intensifying customers' desire for the latest

and greatest new titles on the platform.

Current titles including Xanadu and The Sign of Zodiac were shown fully merchandised, and customers who had not yet ordered the successful titles made sure to do so.

Atronic's new Towerline game Spirit Magic, featuring a Native American theme and music by Brule, was also

a show favorite. New Mexico Magic customers can look forward to the new penny WAP link featuring the Towerline game Xandau Magic. A variety of new Cashline and reel slot titles complimented the mix available from Atronic.

To find out more information about Atronic, please visit the company's website at [www.atronic.com](http://www.atronic.com).





"On behalf of Table Mountain Casino I just wanted to express our thanks to you and your team. I couldn't have asked for anything better."

**Brian Rankin** - Slot Technical Manager

## 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

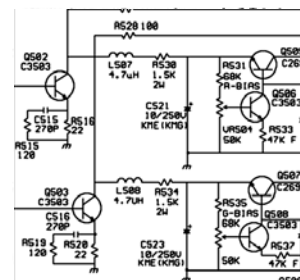
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

### 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.

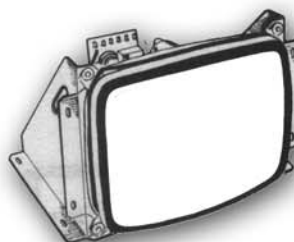
### SCHEMATIC DIAGRAMS

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  
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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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