

SLOT TECH MAGAZINE

Slot Machine Technology for the International Gaming Industry

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Fairchild Power Switch
Quick and Simple Repairs
Global Gaming Expo Photos
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5 SLOTTech MAGAZINE PAYS 50,000 CREDIT JACKPOT WHEN MAXIMUM CREDITS PLAYED.

SLOTTech VIDEO MATH SERIES - PART 3.0

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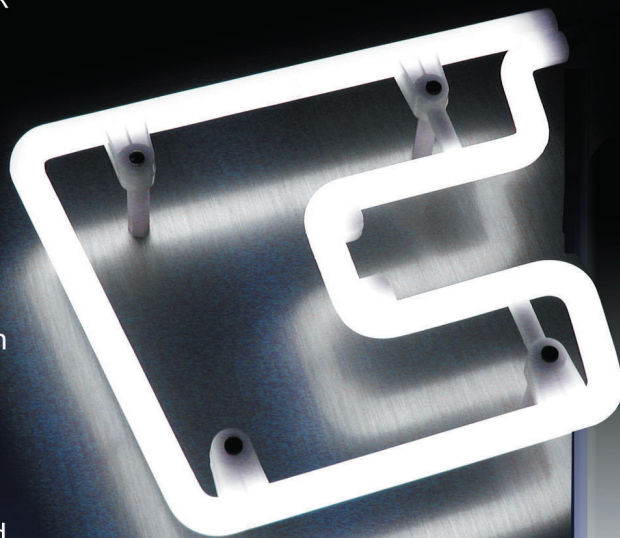
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October 2005

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Dear Friends of Slot Tech Magazine,

As you know, the fifth annual Global Gaming Expo has concluded and, as usual, Slot Tech Magazine was there to cover the show. There were lots of new game titles, of course. There were thousands of them in all. I'm glad to be on the technical side of things because I'd hate to have to sift through all of the PAR sheets necessary to determine which of these new games

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Randy Fromm's

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to run on the floor. Add to that considerations like aesthetics (is this slot machine in a nice cabinet? How are the game graphics? Is there some sort of attractive general illumination? Perhaps a movable screen that can adjust to a player's comfort?) and you begin to understand the complexities of the task. Not my task, fortunately.

Nope! I was there to look at the components and subassemblies that make it all work and I found my "pick of the show" at the Atronic booth. I was attracted there like a moth to a flame by, of all things, a button. Let me back up . . .

I like Atronic's e-Motion cabinet. I like it for its appearance and functionality. The linear motor that raises and lowers the playfield is a very nice player accommodation. The muted light of the multicolored LEDs that illuminate the machine from behind their translucent shroud, provide a wonderful spectral ambiance that really enhances the mood of the game. Since they are RGB (the three primary colors of light) their intensity can be modulated to provide any color in the visible spectrum, allowing the general illumination to match (or complement) the color scheme of the twin LCD displays.

Atronic has taken another step in this direction by fulfilling two diverse requirements of functionality in a clever new button that also incorporates the aesthetic beauty that is the hallmark of the e-Motion cabinet. It's an illuminated, Max Bet/Jackpot button that has an integral numerical display that shows the current jackpot amount. The oval button is illuminated by RGB LEDs so, like the aforementioned general illumination, the color of the button can be modulated at will. At G2E, Atronic was showing a game entitled "Miami Vice." The



overall theme color of the displays and the general illumination was pink (think, Flamingo) with the button following suit. Aesthetically, a very nice touch and a constant reminder to the player that all they have to do is touch the button for a chance at the jackpot amount, which they cannot help but see every time they glance at the control panel of the machine.

The button was developed as a joint venture between Atronic, Gamesman and Coin mechanisms, Inc., with Atronic developing the electronics for the controller itself, in order to interface with their platform. Coin Mechanisms, Inc. is the distributor for Gamesman products in North and South America.

The old news that's NOT old news is that many of our fellow casino workers lost everything in the recent hurricane. A special website has been established at casinocareers.com to help connect casinos with displaced casino workers. I urge all slot departments to look deep into their budgets and see if you can possibly afford to hire (and maybe even help with relocation costs) just one, fully qualified, experienced slot tech from the Gulf Region. Thank you

Randy Fromm



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FS6S1265RB Fairchild Power Switch

By Herschel Peeler

Kortek Monitors have a chip that integrates the functions of the Pulse Width Modulator (PWM) chip and the MOSFET switching transistor all into one chip. This makes for fewer parts to stuff onto the monitor board and requires less board space.

The FS6S1265RB does the same functions as the UC3842N and the usual switching transistor. It does this magic using only five pins.

Pin 1 – Drain. This is the Drain of the switching transistor. It drives the primary of the transformer to ground. Normally, the current through the Drain should be 8 Amps or less. Maximum voltage is 650 Volts.

Pin 2 – Ground.

Pin 3 – VCC. This is power to the PWM circuits in the FS6S1265RB and has many of the same functions associ-

ated with it as we find in the UC3842N. Typically, this voltage should be between 12 and 23 Volts. It must exceed 15 Volts to start the regulator working. The regulator drops out of operation if VCC drops below 9 Volts so the voltage here need not be tightly regulated.

VCC is usually powered from two sources. One source comes from the rectified line voltage to start the chip and the system going. Once the regulator (and the power supply) is working, it is powered by a second source, derived from the transformer in the power supply.

Pin 4 – Feedback. This is the signal coming back from the transformer secondary circuit that keeps the voltage regulated. The voltage here should be between 0.3 Volts and VCC. The pulses from the oscillator start the PWM timing cycle. The Feedback signal ends the PWM timing cycle. The time between these two pulses determines the output voltage of the power supply by modulating (varying) the width of the pulse, therefore we get the name

Pulse Width Modulation.

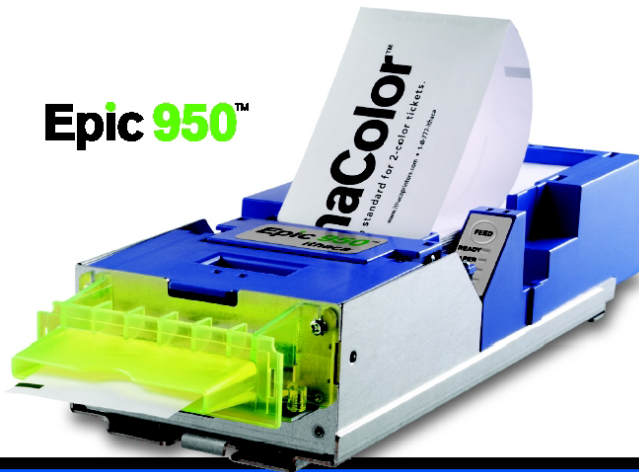
Pin 5 – Soft Start and Sync. This input can sync the internal oscillator to an external source, or provide a slow power-up, if desired. In this case, it is used to sync the operation of the SMPS to the horizontal deflection.

Operational features:

Overcurrent sense and related circuits

The MOSFET transistor built into the FS6S1265RB is actually a SenseFET. Built into the Source lead is a resistor that is used to sense the current level flowing through the Source. As more current flows, the voltage across this resistor increases. We can (and do) monitor this voltage so we can tell when excessive current is flowing through the transistor. When it rises to more than 1 Volt (12 Amps for longer than 130 ns) this circuit outputs a High that goes through an OR gate and sets a latch. The Q side of the latch goes to another OR/NOR gate. The output of this gate turns on an NPN transistor that turns off the

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SenseFET. This same circuit is used if the case temperature exceeds 160 degrees Centigrade. In order to clear either condition, VCC must drop below 9 Volts. This same latch is also set if VCC exceeds 30 Volts (OVP - Over Voltage Protection) or if the Feedback voltage should rise above 7.5 Volts (OLP, Over Load Protection). Again, to clear these conditions, the VCC line must drop below 9 Volts.

The Oscillator and Normal Operation:

Normal frequency of operation is around 25 KHz. The output of the oscillator is a short pulse that sets a latch. The output of this latch feeds an OR/NOR gate. This OR/NOR gate, as the name implies, has two outputs: a High output (the OR function) and a Low output (the NOR function). With any High in, the High output goes high and the Low output goes low. All lows in reverses the outputs. The Low output goes high and the High output goes low. When the Low output is high and the High output is low, the top NPN transistor is turned on and the SenseFET is on. During this time, we are powering up the primary winding of the transformer.

In normal operation, the Feedback signal comes into the FS6S1265RB and

clears the latch, turning off the SenseFET. The time between setting and clearing the latch determines how much power we send to the transformer and therefore the output voltage. In this way, we regulate the output voltage. Any error condition causes a High into the OR/NOR gate, turning off the top NPN, turning on the bottom NPN and turning off the SenseFET.

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



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Fairchild Power Switch(FPS)

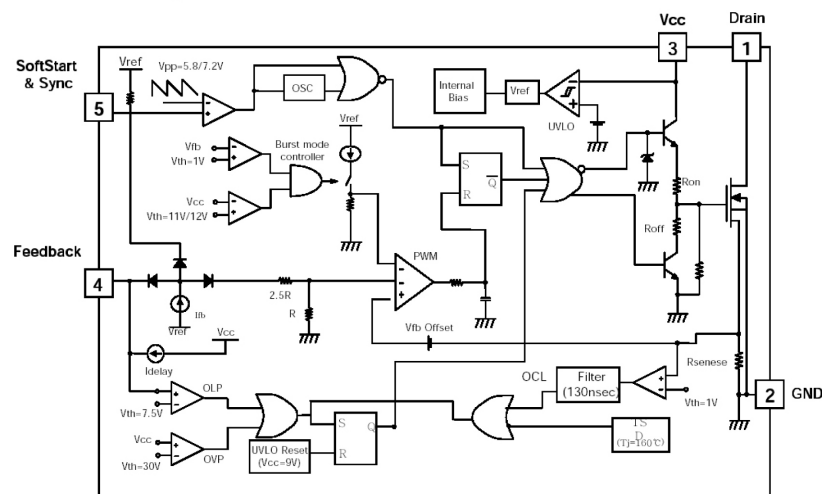
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Internal Block Diagram

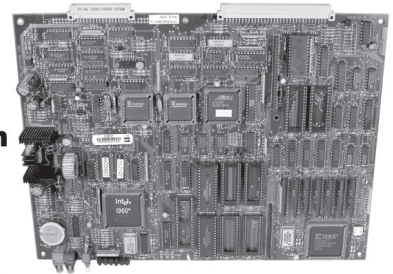


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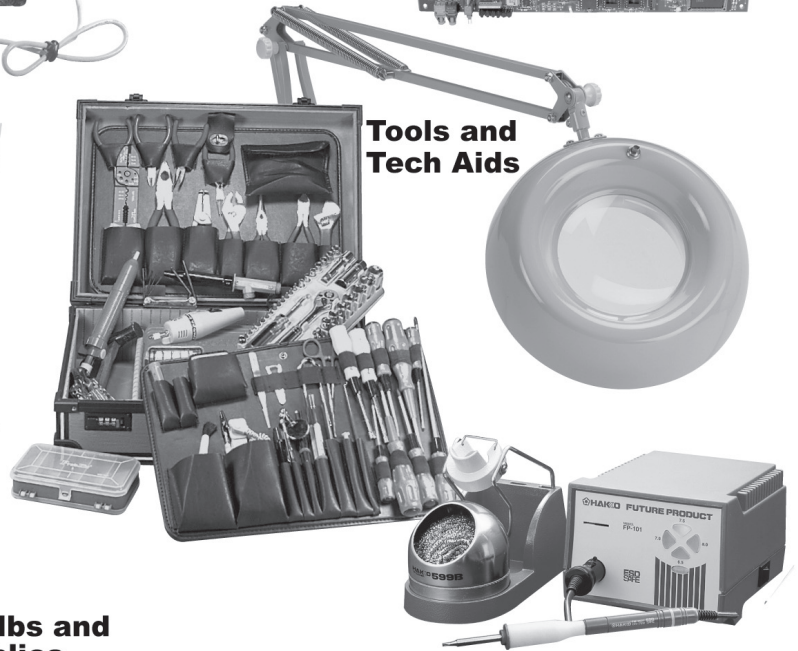


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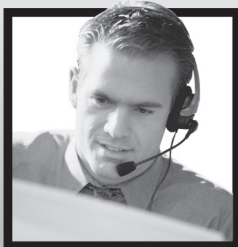
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Quick and Simple Repairs # 7

Tips for Ticket Printers

By Pat Porath



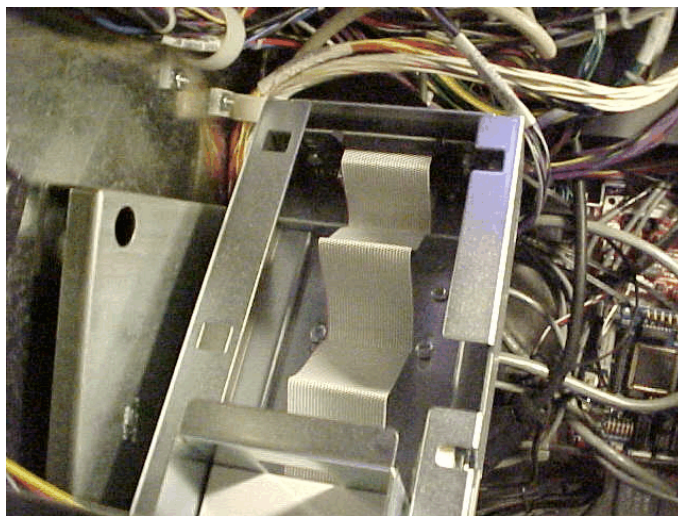
With slot machine hoppers not even installed in most games, the ticket printer looks like it has almost taken over. A lot of our games now are coinless. For many of you that are new to the business,

you may never have seen a hopper before at all. I don't miss the coins. No more coin-in jams, hopper jams, "My coin didn't register," etc.

The thermal ticket printer looks like it is here to stay for a while. We have a variety of manufacturers (Transact, FutureLogic and JCM) and so there is a variety of problems that a tech can run into. When loading paper in them, for example, they are not all loaded the same. If a slot attendant isn't paying attention and loads the paper incorrectly, then you have a problem. If a customer presses their cashout button on the game and receives a blank ticket or has a ticket error display on the game, then a floor supervisor has to retrieve the ticket number from the system (the number that was supposed to have been printed on the ticket) and do a manual payout for the amount.

One common problem is with the ribbon cable. On the earlier design, it was just a simple ribbon cable, nothing special. For the Ithaca printers a newer type cable came out. It seems to work a lot better. It is an

"accordion" style, with a plastic part on it that protects it from being pinched in a game. It also retains its shape when the printer is slid in and out of its frame.



Above is a picture of an Ithaca 850 printer inside of an upright WMS Bluebird game. Notice that this style of cable is the old type; it doesn't have the protective plastic on it.



Here is a photo of the newer type of ribbon cable, notice the plastic surrounding the majority of it? The plastic shield protects it very well.

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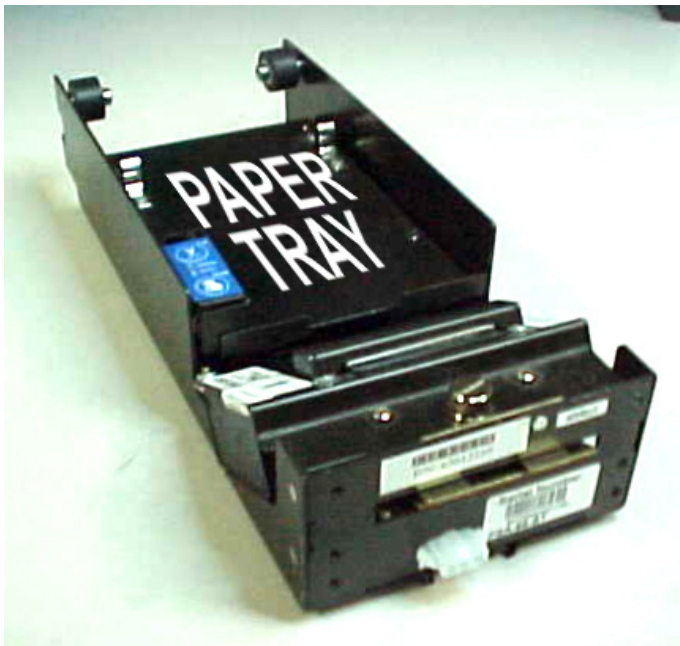

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We often run into printer communication errors and other printer failures. On the FutureLogic printers, some of these errors can be corrected by replacing the motherboard. It is located under the paper tray.

If you have a few spares lying around, try swapping out the board. Remove the four screws, the attached cables and the small ribbon cable. Don't worry about the orientation of the small ribbon cable; it simply pulls out of the socket. If you look closely at it, there is a small number 1 on it.

Remove the screws that hold in the board itself, replace it, and put it back together. I have fixed a few of these by doing this. We had six of them that we tested. Three were bad so I made a good one out of the three bad ones. If it seems like the printer head itself is bad, try using the mother board out of it. One of them only needed a simple cleaning. I used canned air and a dry Q-tip to get out the dust bunnies.

When testing the printer out to make sure it works, make sure the paper is installed correctly and all of your connections are nice and snug. Your machine options have to be set correctly as well. On an IGT S-2000, the machine address has to be set to 1, your SAS has to be turned on, printer options need to

be set at secured enhanced, etc. All of the settings have to be perfect or the game will not print tickets.

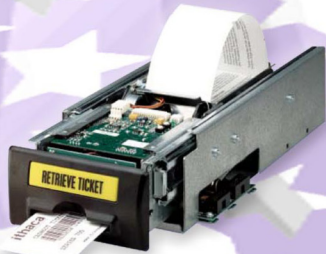
Sometimes it will print a ticket just fine, but it won't take a ticket. Then it could be a bill acceptor problem, a game option problem or maybe even a system problem, depending on whether you have CDS, SDS or whatever.

Testing the printer in a WMS video Bluebird game is very simple. Open the machine, press the diagnostic button and follow the easy on screen instructions. On IGT, Bally or any modern video machine, it is very simple to test out printers or any specific device.

With the simple to use on screen instructions on the newer video games, it is very easy to find and repair the problem. Even the stepper slots are pretty easy. The IGT 2-2000's will tell you what the problem is on the VFD. On a Bally, a problem with the printer will display a code 36 or 37.

Anyway, it sure looks to me that the ticket printer is here to stay. I must say that the paper fills are lighter and the printers are much easier to deal with than a bulky hopper. I would MUCH rather clear a paper jam than a coin-out jam any day. Our customers seem to be happy with them also. Not all, but the majority. I hear comments like "With tickets you don't have all that coin to deal with." Which is faster, 800 nickels coming out of a hopper or a ticket? We went from coins to bills and from bills to tickets. Now we've gone from hoppers to tickets. What's next? I have been reading about some new technologies that allow uploading and downloading almost everything on a type of casino credit card. Slide your card into the card reader of a game, download say \$20.00, and play a little while. If you happen to win or you need to leave the game, simply upload the credits onto your card. You've got to love modern technology.

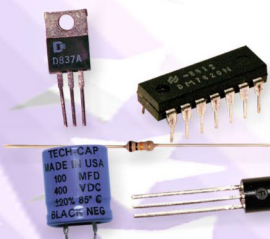
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Understanding Video Reels **Part 3**

By John Wilson

We have learned that two of the key features of video reels are that there are no blanks and there are three symbols visible on each reel. A couple of new video slot games have five symbols visible, allowing for a great deal more combinations. Of course, the main reason for this is to come up with something fresh and to develop something different in a game that will set it apart from all of the others.

Virtual Reels? We don't need no stinkin' virtual reels!

Before we start with the creation of our game, we need to consider one small but quite significant point. First of all, why won't we use virtual reels? The primary reason is that we don't need to. If you refer back to the first installment of this series, you can see that video reels can be as long (or as short) as we want them to be and each reel can be a different length. Be-

cause of this capability, virtual reels are unnecessary. As there is no 'physical' plastic reel strip, we have avoided physical problems. For example, the longer the reel strip, the larger the reel basket we need. This would mean that a small reel strip would have a small diameter basket. A very large reel strip would need a large diameter basket. This could also result in the reels having to spin at different speeds. This means that variable-length physical reel strips cause too many problems and are too costly. In a video representation however, the 'fantasy world' of the video reel removes all of these problems. If you had varying size reel baskets, your job as a slot tech would be even more troublesome. Imagine having an inventory of these baskets based upon size as well as manufacturer. There is, however, another significant reason why we rarely use virtual stops on a video reels.

Some manufacturers call their video reels 'Virtual Reels' and say that there are no physical strips. In my definition, I call the physical strips the ones that the players actually see (remember the term Player Amusement Reels?). Virtual reels are the repre-

sentation of the physical strip based upon different numbers of reel stops. While the other definition is technically correct (there are no physical plastic reel strips in a video machine) I prefer to call any reel strips the players see (actual physical strips or reel strips drawn on a video screen) physical strips.

One of the first reasons video reels became popular is that they avoided having to use technology covered by the Telnaes patent. The Telnaes patent covered slot machines using virtual reel mapping. If you didn't use virtual reels, you wouldn't have to pay a royalty to manufacture your slot machine using the Telnaes patent.

One mathematical problem still exists with virtual reels and it's because of the capabilities of video reels that this mathematical nightmare exists. Let's consider the problem:

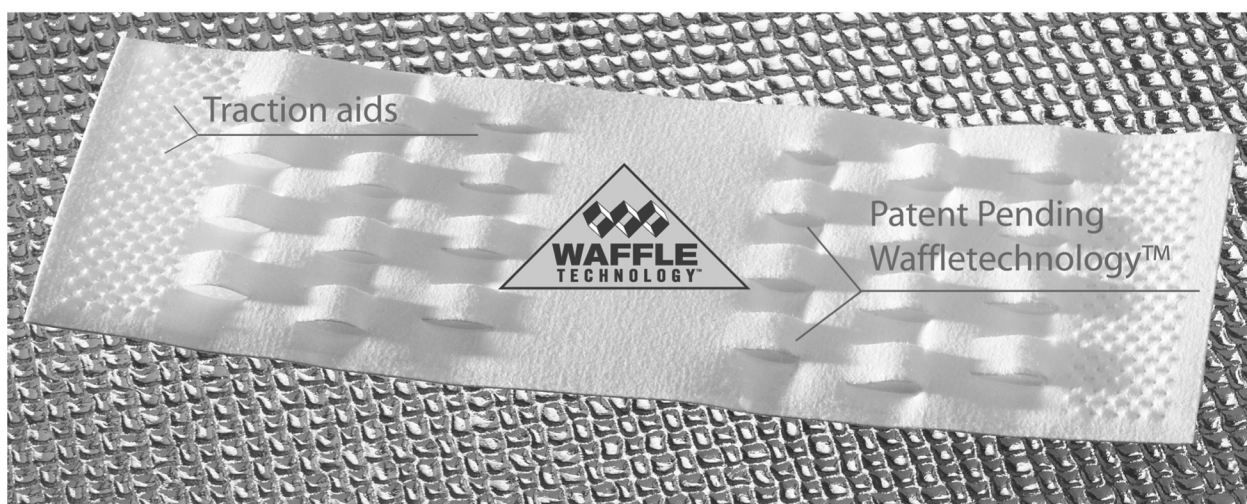
Video slots generally have five reels. Some emulate the three reel stepper motors, some have four reels for variety, but most video slots have five reels. As a result, there are a large number of combinations of game outcome. You will see three Blazin' 7s symbols

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land on the payline much more frequently than you will see five of the same symbols. Because of this, designers had to come up with a way to increase the overall hit frequency and allow for more winning combinations. They took a simple and familiar road to the solution. This road was multiple paylines.

Let's study how multiple paylines can create a headache for game designers, and why virtual reel stops and multiple paylines go together like oil and water.

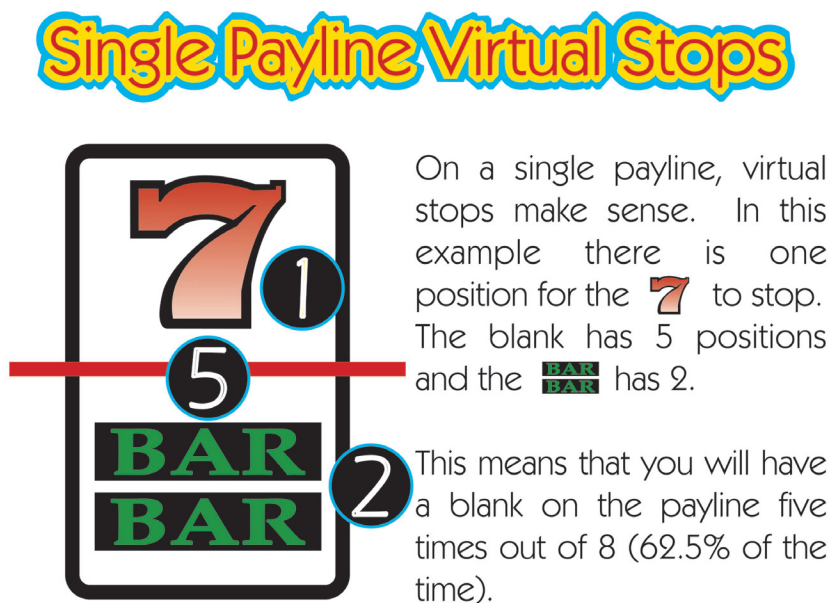
Figure 1 shows a stepper slot reel. We have a Red 7 just above the payline, a blank on the payline and a Double Bar just below the payline. The virtual stops for each of the three symbols are shown in the circle. The three symbols shown in the window (the blank counts as a symbol) total eight. If the blank has a virtual stop value of five (5), then it will land on the payline five times out of eight. We've discussed this in previous articles. However, the Red 7 has a virtual stop of one (1), so it will land only once for the eight stops shown, or 12.5% of the time. Look at Figure 2 and you can see that we've done nothing other than add two more paylines. It's now a three-payline game and we still have the same virtual stops. When selecting the position where the reel will stop, we always use the first payline. We always work with the first payline

With slot machines there are few absolutes. Different programmers can create games

that work under different rules. However, for multi-line games, the stop positions are determined by the first payline. The reason for this is simple. Since the symbols are on a continuous strip (whether actual plastic strips or simulated video strips) one symbol always follows another one. If you pick the symbol for the first payline, you can look at the strip and know what symbol will be above it and also what symbol will be below it. You can't pick the stopping position based upon multiple paylines because your reel strip is already defined.

On our example in figure 2, if we select the blank as our stopping position, the Red 7 will be above it and the Double

Bar will be below it. Using virtual stops, we know that the blank will come up five times compared to the Red 7 landing once and the Double Bar landing twice. This means that while the blank will be on the first payline 62.5% of the time, the Red 7 will be on the 2nd payline 62.5% of the time as well. Using virtual stops on a video slot makes the underlying slot math very complicated. By adding more blanks to the reels we're also making the symbol before and after come up just as frequently. This means that we have to see what affect our virtual stops have on other paylines. Create a game with 20 paylines and it becomes a nightmare. As a result it's much, much easier to make each symbol



HOWEVER, this also means that the 7 will appear above the payline 62.5% of the time. This is very significant for multi-payline games.

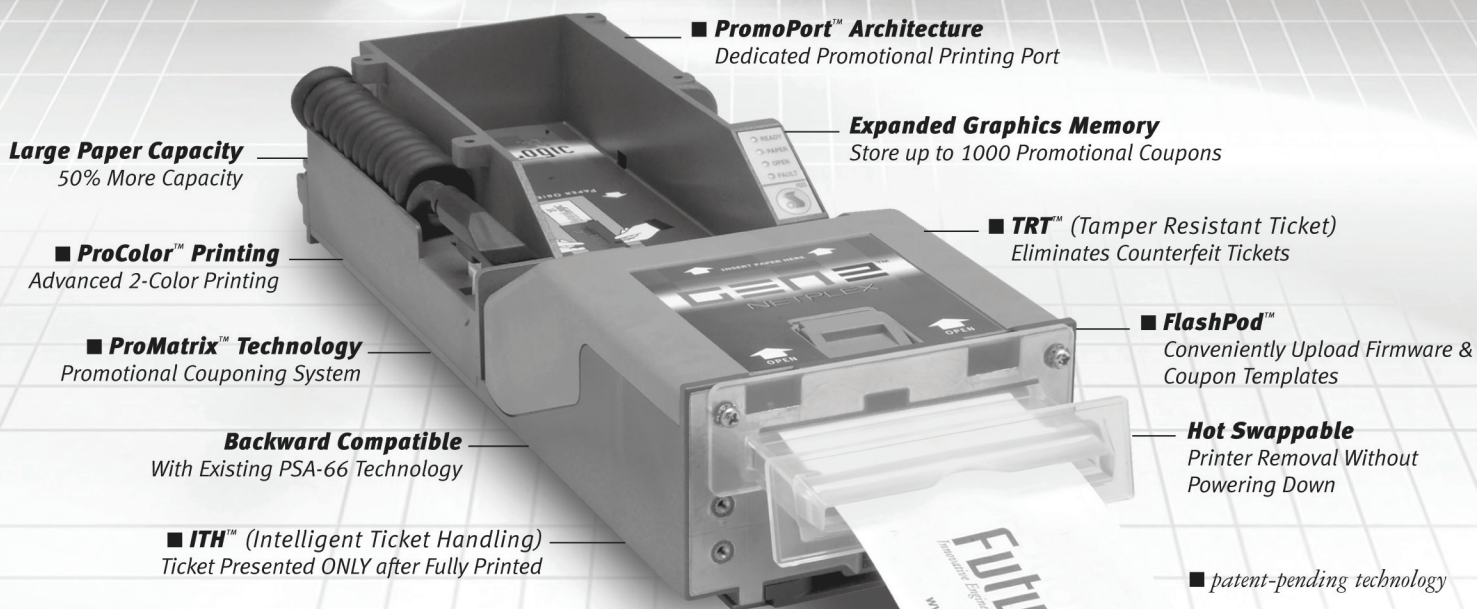


The number in the circle represents the number of virtual stops for each symbol.

Figure 1

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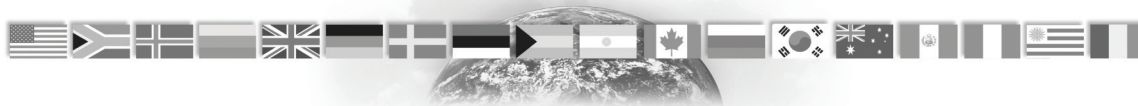
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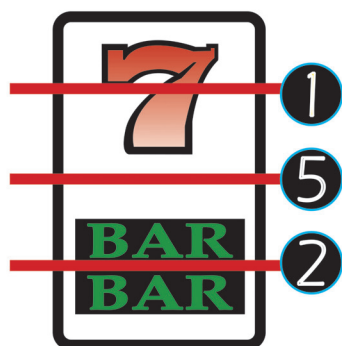


Figure 2

Now things get very complicated!

have the same probability. This way you don't favour one symbol over another, and accidentally cause the jackpot symbol to hit frequently on another payline. It's a little bit confusing, but let's try some other examples to further illustrate our point.

Looking at Figure 3, we see a three-reel stepper game with five paylines. We have a limited number of winning combinations available. With the alternating patterns of symbols and blanks, you will win on payline 1 only, paylines 2 and 3 only or paylines 4 and

5 only. If we pay for three blanks then we can win on lines one, two and three. Three blanks on payline one means three symbols on paylines two and three. Consequently, three symbols on payline one means three blanks on paylines two and three.

Single symbol payouts - To the rescue?

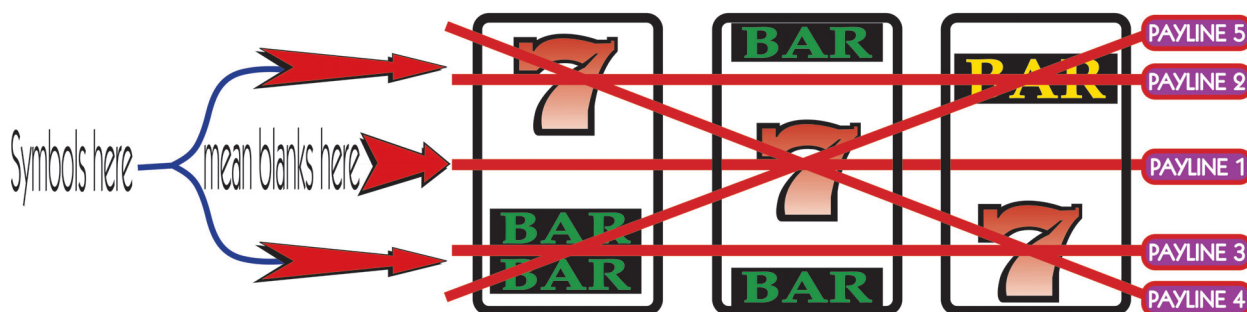
Adding in a single-symbol payout, like a cherry symbol, you can win on all five paylines. Figure 4 shows such an example. This allows a greater hit frequency for our game, but the wins will be

small. They are small because we can only pay for the single symbol on many of the lines. In order to further increase our hit frequency, we need to be able to have more winning combinations. Changing the pattern of alternating symbols and blanks to only symbols allows more winning combinations and a greater hit frequency. See the changes in figure 5.

As you might expect, this benefit does come with some cost. We can make the hit frequency so high that the paying combinations pay out too much. It's not very good to take a 90% payout machine with only a 2% hit frequency and increase the hit frequency to 45% but have the payout rise to 125%. There's quite a balancing act, as you'll see in future instalments.

Adding in more reels gives us a whole host of new payline possibilities. With three reels you're more or less limited to 27 possible paylines. By ex-

Five Paylines on a Three-Reel Stepper Slot



Unless you have a single-symbol win (like a cherry), a win on payline #4 and payline #5 means that paylines 1 through 3 won't win.

Figure 3

This gives us a limited number of winning combinations available at the same time.

Adding more reels doesn't improve the hit frequency very much.

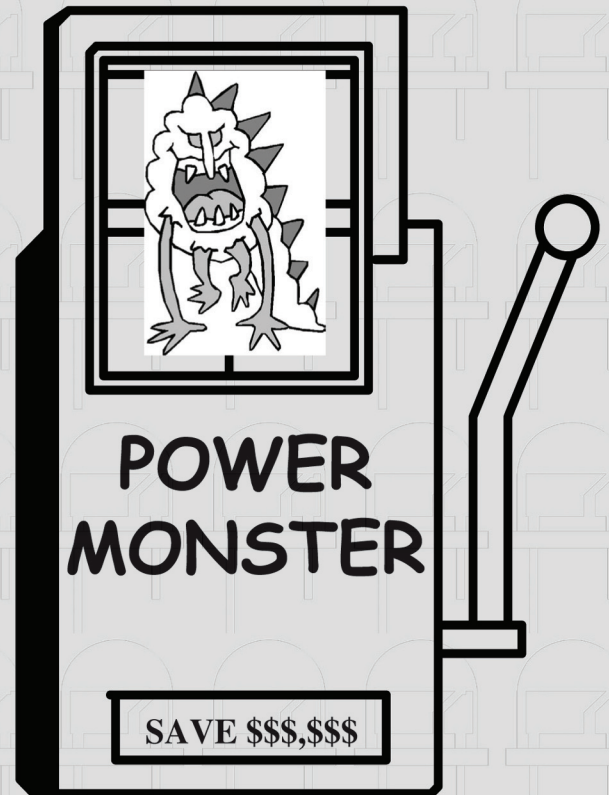
However, removing the blanks and allowing for three symbols visible in each reel window creates an ENORMOUS possibility of winning combinations.

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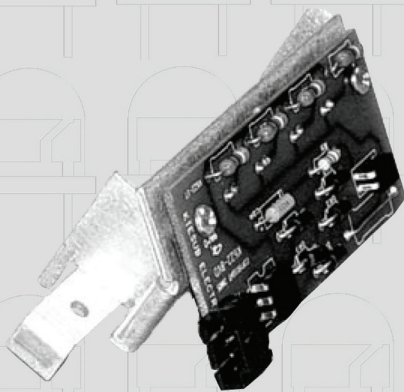
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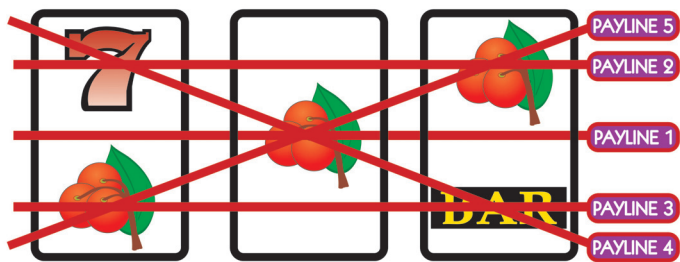
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Five Paylines on a Three-Reel Stepper Slot



With a single-symbol cherry symbol, we pay on all five paylines:

- P1 - One cherry
- P2 - One Cherry
- P3 - One Cherry
- P4 - One Cherry
- P5 - Five Cherries

Figure 4

panding to five reels, we could create 243 paylines. Interestingly enough, there are a few new video machines with

243 paylines. Once you get beyond five paylines, many players have a difficult time following the winning combi-

nations on the various paylines. Some can follow seven or nine by becoming familiar with various patterns. Fifteen or twenty paylines gets very difficult to visualize. That's exactly why a video slot will cycle through each winning combination showing the symbols and the payline. The players leave it up to the slot machine and trust the software to pick out the winning combinations on whatever payline it is supposed to be. You've likely heard conversations where someone asks a player how they won and they respond that they haven't any idea. The players accept this, but for slot design, you have to be very careful with the underlying math, probabilities, combinations, etc. A simple

A Slot Machine of the Future????

Figure 5



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- Relate SMPS and Inverter power supply block diagram test points to the equivalent schematic test point
- Understand multi-mode formats and circuit operation



- Understand analog (RGB) and digital signal formats and connectors (DVI)
- Explain the advantages and limitations of CRT vs. LCD displays
- Understand the theory and operation of fixed pixel displays, including LCD panel operation, signal processing, and backlighting
- Perform an LCD backlight replacement
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Course Description:

Equipment Familiarization/LCD Displays

The course begins with equipment familiarization and an overview of LCD displays. Students will discover how LCD panels work by learning the major functional blocks of an LCD monitor. Sencore has developed specific LCD trainers for hands –on demonstrations and troubleshooting exercises.

DAY 1

Hands-On LCD Monitor Troubleshooting

The second day of this course provides an introduction to troubleshooting LCD monitors. Entry level technicians and seasoned veterans will learn troubleshooting techniques and short cuts by using block diagrams and hands – on lab exercises.

DAY 2

LCD Inverter power supply and SMPS Troubleshooting

The last day of the course provides an introduction to power supplies and their uses. The students then learn how each type of SMPS and inverter power supply works by performing experiments on a working model. This course is truly a hands-on course with approximately 70% devoted to lab time performing tests utilizing an exclusive Sencore power supply trainer.

DAY 3

Students will also be presented with Certificates of Completion following the Tech School.

This course is eligible for Continuing Education Credits (CEU).



mistake or omission could cost the casino a lot of money when the payout is considerably higher than it has been calculated.

Looking at some new slot machines where there are five symbols visible on each of the five paylines, you could have 3,125 paylines to worry about. Perhaps we could make a seven reel slot? 78,125 paylines. You get the picture. As slot machines become fancier, provide more entertainment value and are more fun for the players, they grow exponentially in complexity. This makes your job harder as you are expected to explain how the machines work to the players. It's pretty hard to describe how the machine has over three thousand paylines! Not to mention calculating the math for each of these three thousand paylines! Of course, the slot machine has to go through the payable and find winning combinations on each payline, so you're looking at a lot of processing time at the end of the game. Faster processors and more complex software add even more complexity to your job. Sounds like you're ready for a raise, doesn't it?

Don't fear. Next month we'll continue our journey and see that it's not as hard as you might think. We just have to be careful in our calculations. You just need to be a mathemagician for it to all come together.

- John Wilson
jwilson@slot-techs.com

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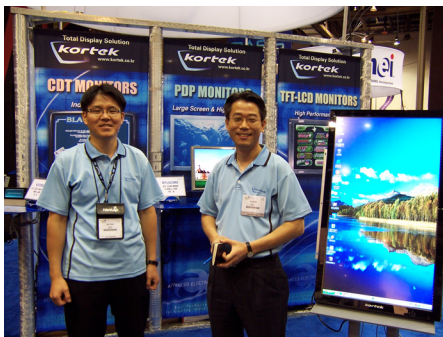
Global Gaming Expo Gallery of Gaming Suppliers and Manufacture



The staff at JCM are numerous to say the least. I started to gather names but it got a little nuts toward the end so I gave up.



At the Wells-Gardner booth with Barry Kesselman, Jeff Gardner, Bob Lube and Fran Rossini.



SH Cha and JK Son of KorteK Monitors



Fred Brendel (AESI), Phil Wesel and Trevor Dunjwa of MEI.



From the left: Frank Happ, Vice-Chairman, Suizo-Happ Group, Patrick Suverein, CEO, SUZO, Juan Gomez, Manager Brazil & Argentina Operations, Suzo, Jim Brendel, President, Advanced Electronic Systems Inc., Tom Happ, President, HAPP, Jim Norton, Managing Director, Pfingsten Partners, LLC, John Starcevich, Vice President, Pfingsten Partners, LLC



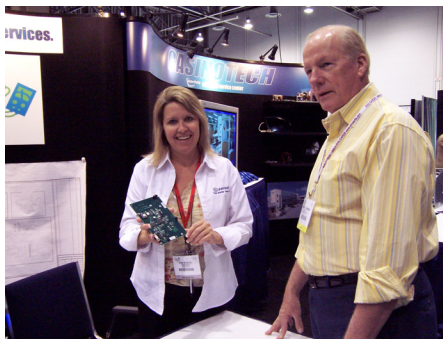
Sherwood Taylor and Tommy "Tommy G" Giardina of Atlantic Cape Community College.



Eternally cheerful Don Multerer (Sencore) is flanked by Keith Petri (I) and Kevin Michael of Kristel Monitors.



Kiesub Electronics showed their LED replacement solutions for slots.



Ann O'Hara discusses Casinotech's monitor services with Robert Chambers



Your friends at MCM Electronics, Kiki Schockling, Andy Viso and Gina Bohman



My friends at the 3M TouchSystems booth, Paul Hatin, Dan Margolien and Mark Lavoie.

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Harry Clarke's Pentranic (monitors) booth was well-visited.



The Boys from Arkansas (IDX) were showing their new "Wickets" RFID system for slots. Interesting!



Ruse Wige and Michael Benson of Transact Technologies (printers).



Above: Robert Bird (I) and Tommy Talbot showed AstroSystem's MicroCoin coin acceptor.



Above: Greg Kobe (Kobetron) is always smiling, seen here with Yvon Blais.



Above: Cole makes casino cabinets for the world!



Left: FutureLogic's Nick Micalizzi demonstrated their new ProMatrix coupon authoring system that allows casinos to produce their own coupons. The coupons are printed and delivered to the player right at the slot machine.



Yes, I do have friends in high places. This is me (Randy Fromm) with world famous game designer Joe Kaminkow of IGT.

Right: Coin Mechanisms, Inc. showed one of the smallest but most interesting items at the show: A jackpot/Max Bet button made with RGB LEDs that can make the button ANY COLOR. It was shown in action at the Atronic booth. I caught prexy Stan Pierz in action, making deals.



Eleven slot techs from California, Washington and Oklahoma spent two weeks at the Sycuan Casino in beautiful San Diego, California for some technical training at Slot Tech Magazine's Casino School. As usual, the emphasis of the class was monitor repair, including several days of hands-on monitor repair where students brought in bad monitors from their own casinos and repaired them. The class was held from August 22 - September 2 2005 at the new training facility at Sycuan Casino.



Coin Mechanisms, Inc.'s Michael Harris demonstrated Coin Comparator alignment and repair as well as the company's new CCFL lighting system.



Through the miracle of Photoshop, David Oldham (I) of AESI (seen here demonstrating the MEI CashFlow bill validator) shares the stage with Jack Geller of competing BV manufacturer JCM. They actually appeared on consecutive days. Oldham also demonstrated printer repair as well



Attending the class were Brian Stanger (Mill Bay Casino), Chris Moreno (Golden Acorn Casino), Rudy Madrid, Roy Joven and Norman Barrios (Eagle Mountain Casino), Daniel Moore (Caddo Kiowa Technology Center), Wes Clark (Wes Watkins Technology Center), Bill Griffin (Cahuilla Casino), De Carlos (PD) Jackson and Anthony "Tony Fresh" Houghton (Sycuan Casino) and Jim Kitchen of Colorado Springs. Also pictured is world-famous technical trainer Jack Geller of JCM.



It's statistically improbable that there is anything more exciting than my job as Slot Tech Magazine's Slot Mathematician. With stacks of probabilities, standard deviation charts and numbers filling my computer screens, could anything be more exciting?

A call (actually, it was an e-mail) from Slot Tech Magazine's head office pried me away from my statistical analysis for some investigative reporting. A new slot machine ticket printer has been developed and it means a trip to New Brunswick to look at the new product. Nanoptix, the printer manufacturer, will give me a detailed look at Canada's latest contribution to the world (following Dan Akroyd, James Doohan, Mike Meyers, John Candy, Avril Levine and snow). Fortunately, my lab coat is back from the cleaners so I am all packed and ready to go. What a great way for me to get away from a grumpy editor!

"Who is Nanoptix?"

Strategically located in Dieppe, New Brunswick - a suburb of Moncton - Nanoptix is geographically poised to address the world market. Jean-Louis "JL" Drapeau, Vice Presi-

dent Sales & Marketing explains that their Canadian location is a great asset.

"Some of our competitors have big plants in Las Vegas but what about the rest of the customers? You have to be set up to meet their needs also," commented Drapeau. "Today's marketplace," he explains, "is not like it used to be. Location is no longer a concern and is certainly not an excuse. If a customer runs into problems in Oklahoma,



The head opens easily for cleaning out paper dust, The platen pops off with no tools at all, for full access to the print head itself.

Nanoptix is on a flight to Oklahoma."

Customer service is a priority and they do what it takes to provide it. They are a problem-solving company full of engineers. If I had to coin a phrase, I would say that they are a solutions provider, rather than a printer sales force. Let's take a look at some of their products in order to see what I mean:

All of the printers are designed and engineered in-house, from the lab where research and development is carried out, to the circuit board design, to the testing and final assembly line. There are engineering reports, charts & graphs, oscilloscopes and test equipment throughout the facility. The surface mount circuit boards are manufactured locally. They create the firmware for the thermal printers in-house. In short, they know what goes into each printer because they make them from scratch. I had read that they were an OEM, but didn't realize to what extent.

Great Beginnings

Their EZ-Load printer was designed as a "drop-in" replacement for a competitor's impact printer. Customers complained of down-time and the cost of replacement ribbons. Changing the ribbons and paper took some time, was messy and not "user friendly." The marketplace demanded a thermal printer without expensive ribbons,



The PayCheck II printer shown with 800 ticket cassette installed. Beside it are cassettes which hold 600, 400 and 200 tickets.

that had fewer mechanical parts and was quieter and cheaper to operate. Nanoptix came up with a solution that is a simple, direct replacement for the old industry standard. Not only is their printer easy to use (with a 5-second paper change) but it is easy to install as well. The slot tech simply pulled out the old printer and put the new one in its place. In casinos for 3 years, their customers are seeing tangible cost savings. How is their printer described? "A Tank."

With the introduction of ticket-in, ticket-out, gaming industry customers started looking for TITO printing solutions. Nanoptix engineers developed a printer called the PayCheck II ticket printer. This is a simple slide-in package, meeting all industry standards for TITO printing. The base configuration takes 200 fanfold thermal tickets, the industry standard for quite

some time. A simple switch of the metal cassette which holds the tickets allows more - 400, 600 even 800 tickets. This means less downtime for the machine, fewer ticket reloads and less chance of the printer running out of paper.

While meeting industry standards is a must, Nanoptix isn't satisfied unless they're pushing the envelope. Yes, these crazy Canadians always think "outside of the box." The original connector used in their earliest production was temperamental so the Nanoptix engineer team reworked it, replacing it with a much easier to use and more robust connector. Once again, the customers can drive the technological advances of the products.

The PayCheck was the first to offer USB support with not one but two USB ports. One, at the rear of the printer, al-

lows the slot machine to communicate with the printer. The second, accessible from the side after sliding the printer out, allows diagnostic functions and firmware upgrades. The printer is easily swapped out as well. Simply slide the printer forward, push the release lever on the side of the printer and pull the printer out. Once a single ribbon cable is removed, the old printer is out of the slot machine. To replace it with a new printer, simply attach the ribbon cable to the new printer, slide it into the metal harness and your job is done! A technician can swap a printer in just a couple of minutes.

While offering the capability of increased ticket supply in the printer, the engineers worked towards an even better solution. By using roll stock, 1300 tickets could be loaded into the printer at once. This removed the high cost of specialized fanfold, perforated stock and allowed over six times the ticket inventory from the original 200-ticket standard. The only problem was separating the tickets. The Heavy-Duty Kiosk printer used roll paper with two options of cutters. The standard cutter would make short work of the ticket paper. The printers (used in transit and parking applications) have a heavy-duty cutter that even cuts cardboard. While the cutter was not a real concern, the engineers weren't satisfied with using this in the gaming industry.

"The cutter is a mechanical part. We want to reduce as many mechanical parts as we can," explains Drapeau. "In the case of transportation kiosks located in York Region, just outside of Toronto, Nanoptix has seven ticket printers and seventy pounds of paper helping move commuters." The EZ-Tear 65 has a specialized cutter bar that cuts the stock when the player pulls on the ticket. Specifically engineered to be

problem free and easy to tear, this unit takes advantage of the human factor as well. People love to grab their ticket out of the slot machine. A custom-designed sensor monitors the ticket progress. If it jams, it instantly signals the printer to stop until the jam is cleared. After spending some time trying to force a printer jam, I was finally able to see this feature in operation. Once the paper had been jammed, printing



The EZ-Tear's paper roll can be mounted in any position the customer desires. It can be located behind, above, below or beside the printer. Small and compact, the EZ-Tear has few mechanical parts to ensure low-cost, reliable performance.

stopped. Removing the jam caused the ticket to continue printing. I carefully examined the resulting ticket but could not find any indication of a problem. The barcode was clean and the text was uninterrupted. This same printer is also used in the ATM market.

"This always has to be effortless for the customer, from a mechanical point of view and a firmware point of view," said Michel Vienneau, Vice President of R&D, discussing his engineering philosophy. "They shouldn't have to feel the pain of having to change. Changing software is not always a pleasant experience. We always try to avoid that." "We don't ask the customer to change anything," added Drapeau. "We make it work for them. Basically, they should be able to take anything out that they are using now and put ours in and it will work. If not, then we will make it work."

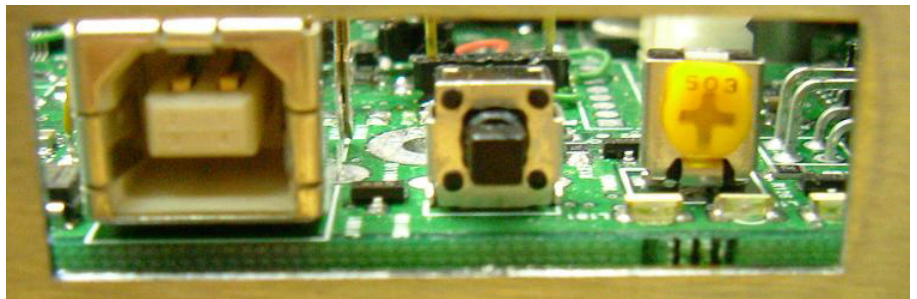
Drapeau and Vienneau related the story of a casino that had had a problem with the printers in their slot machines. Frustrated that a solution couldn't be found, they turned to Nanoptix. Before presenting their solution, Michel investigated the problem in order to gain all of the facts. In doing so, he found the solution to the problem - an error in the printer command. The fix would be quick and easy, saving the casino a lot of time and money. It wouldn't, however, be a good financial solution for

Nanoptix. It meant that a potential sale of hundreds of printers would not take place. What did they do? Vienneau informed the casino of the problem and helped them fix it so that their current printers would function properly. In the end, the casino was so impressed that they ordered the new printers anyway. They saw customer support as a valuable resource to have.

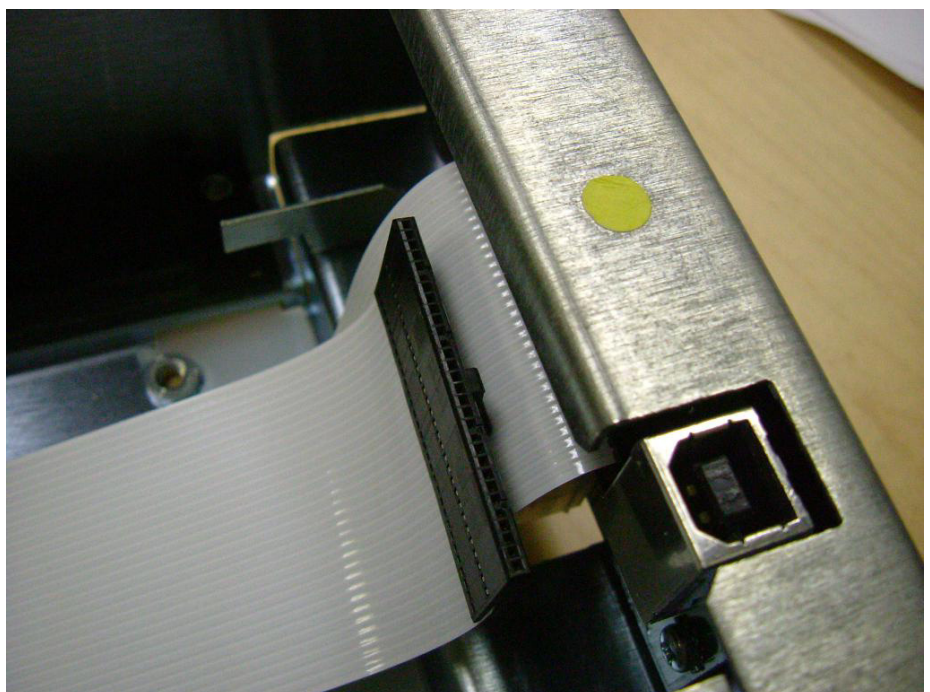
Who Ordered the Code Red?

There is a situation at Nanoptix called Code Red. If

a customer calls with a problem, they drop everything to help the customer and continue until the customer is satisfied. This means that an engineer immediately starts to work on the problem, flying to their location if required. It is expected that a timely solution to the problem will be found and the customer decides when the "Code Red" is over. Of course, this doesn't mean that other customers are ignored. They have an ample staff of engineers, production crew, designers, testers, etc. to en-



Above: The side-mounted USB port allows for diagnostics and easy firmware upgrades. A feed button also adds diagnostic functionality. These controls are hidden when the printer is locked in place within the slot machine.



Above: The rear USB connector is shown along with the ribbon cable, shown here removed from the circuit board. With simple installation and removal, this printer minimizes costly downtime.

sure that work continues as it should.

"When we tell a customer that we ship 24 hours after the order is received," explains Drapeau, "they're blown away. There are a number of good manufacturers out there that make good products. Nanoptix works on the premise that their customers are their best advertisement and that their own success is what they focus on."

What strikes me as unusual, or certainly unexpected, is the underlying philosophy of the company. I was expecting a sales presentation where I would be introduced to their product line, given a tour the plant and would learn about the benefits and advantages of their products. What I found, however, is very different and unique. Nanoptix doesn't have a sales team. There is one salesman (who also has an engineering background). He isn't in the office, because, in the words of Jean-Louis Drapeau, "he's not paid to be here." Instead, I found a team of engineers who know their products inside and out.

New products, once engineered, designed, tested and reworked, are created in the final assembly line. Every printer leaving their facility is tested to ensure that it works. For a new line, they will manufacture the first 500 to 1000 units themselves, testing each one. This allows them to work out the 'bugs' often found in a new product line.

Once they're completely satisfied with the performance of the product (and only then) will production ramp up. In-house, they can produce up to 500 units per day. Other local contract manufacturers are used to increase production by an additional 1,500 units per day. Regardless of where the units are manufactured, each printer is fully tested to ensure proper operation and quality control.

Complete with a woodworking and metal shop, they are able to create prototypes to assist with the design and testing of their new products. In the case of the EZ-Tear 65 printer, an hydraulic arm was created to reach out and grab each ticket, tearing it from the printer. And speaking of testing, the printers are put through a rigorous testing process. During my visit I saw two printers sitting on top of an industrial-sized recycling bin, continually spitting out test tickets. One

printer had just completed number 408,364.

"We want to make sure that ticket number one prints the same as ticket number 100,000," said Drapeau.

Testing to the life of the print head ensures that the quality of the printed result is maintained. Of course, testing doesn't stop once they've reached the expected limit. By finding out when the printer will wear out, they can continue to improve their products. As it is, their print heads are rated for 60 miles of ticket printing.

The new EZ Tear 65 printer is rated at an impressive five inches per second. What's more, the roll stock further enhances the speed capabilities. Paul Chiasson, Director of Customer Relations explains that the TITO ticket is the same size as the American dollar bill. This makes sense, since both currency



Left: Jean-Louis "JL" Drapeau, Vice President Sales & Marketing and Paul Chiasson at the recent Global Gaming Expo.

and TITO tickets can be inserted into the bill validator.

"But we're not limited to this standard," he explains. "We can print any length, and the customer can put graphics or other promotional information on the ticket."

With the fast speed of printing, the customer isn't waiting while a casino logo is put on their cashout ticket. And speaking of bill validators, one casino approached Nanoptix with a problem with their bill validators. It seems that the green LED bezel on the PayCheck II Printer was so bright, customers were always trying to stuff money into it, thinking it was the bill validator. They wondered if they could come up with a solution to make the bill validators more noticeable. Always interested in customer service, they developed a bright retrofit for the validators to draw attention away from their printer and let the customer easily find the bill validator. It appears that "a solutions provider" is a fair label after all.

The customer also receives great support in accessing the printer's features. Each customer has a personal ID to the Nanoptix website in order to access technical documentation, user manuals and software tools. Nanoptix printers include font editors, allowing the customer to create their own fonts, perfect for specialized logos. Of course, adding graphics is

easy as well. One large gaming manufacturer was suitably impressed with not only the large selection of international fonts, but also with how good they look.

Nanoptix has a long history in the lottery business, especially in Europe. Meeting the strict demands of the European market was not difficult for Nanoptix, but formed a basis for the company. With a history of quality control, meeting the demands of the North American gaming industry was easy to do. A certified supplier to the world's largest international lottery provider, Nanoptix is well aware of the strict demands and requirements they have to meet in order to become certified.

What's in store for Nanoptix - and you?

The future looks bright for Canada's Nanoptix, the little company that delivers. I am impressed with their frank, candid discussion about the

gaming marketplace and their technology and philosophy. Building from the ground up, they know the intimate details of their products and can provide exceptional customer support. While I had expected to see scores of complete printers coming in from overseas, instead I see scores of engineers designing circuit boards and firmware. Nanoptix carries an impressive inventory of spare parts, with a clean, modern assembly facility and a true QA process.

During G2E, I noted quite a few Class II game manufacturers with Nanoptix printers inside. It appears that you will be seeing much more of this company and its products.

Now it's back to the office where I have to finish up an interesting study of video slot math.

- John Wilson
jwilson@slot-techs.com



The new spill proof printer is an excellent choice for restaurants and bars. How many times have your slot machines in the bar area been ruined by spilled drinks? The clamshell top is watertight saving costly repairs, and the printer operates at ten inches per second!



Lead-Free Solder Will Challenge the Gaming Technician

By Marv Cohen

As service technicians, most of us have developed our rework skills through years of experience and training. The traditional solder alloy that we have been using is 63/37 (63% tin 37% lead) with a melting temperature of 361°F (183°C). This alloy has been the standard solder used in almost all manufactured PC boards for many years. When the board manufacturers introduced SMT (surface mount technology), the industry continued using the same 63/37 alloy for both manufacturing and rework. The use of 63/37 alloy has always determined the method, settings and profiles of our existing solder desolder equipment.

Well, as they say “good things do not last forever.” Get ready for a challenge that is already in progress. Say good bye to lead and welcome to the new lead-free era. Most manufacturers are already making the transition to lead-free circuit boards ever since the Euro-

pean Union’s Restriction of Hazardous Substances (RoHS) mandated that all products sold in Europe after July 1, 2006 will be free of lead. This move has put pressure on the commercial electronics market to use lead-free circuit boards world wide. In order for OEMs and circuit board manufacturers to remain in the world market, they must comply with the new, no-lead requirements. We are now in the count down period as lead-free circuit boards are starting to appear on the work bench. This new standard also requires that individual circuit component leads are all tinned without lead. As you can see this is a major change will affect the entire global supply chain.

Many technicians do not have any idea of what to expect once these new circuit boards start to appear. I have already received inquiries from technicians and engineers with these typical questions and comments about lead-free circuit boards.

- Will my present rework equipment be adequate?
- The solder joints don’t look the same.
- When I use my hot air blower

on an SMD, by the time the solder starts to reflows, I have done damage.

·At what temperature do I set my iron?

·Does Chip Quik® work on lead free solder?

·Does Chip Quik have lead in it? Our company must have a lead free environment in order to comply.

·What is the major difference in doing solder/desolder rework with lead-free solder.



The completed lead-free solder joint looks different from what technicians would consider a perfect solder joint. The new appearance has a grainy dull look that most would consider a defective solder joint and will take some getting used to.

Lead-Free Solder/Desolder/Rework for the Technician

The most popular lead-free alloy now being used on PC boards is Sn Ag Cu (Tin Silver Copper) with a new higher melting temperature of 218°C (424°F), resulting in a temperature increase of 35°C and 63°F. This new alloy also has different wetting characteristics resulting in a longer dwell time (the amount of time that the reflow heat is applied to create the solder joint). Finally the completed lead-free solder joint looks different from what technicians would consider a perfect solder joint. The new appearance has a grainy dull look that most would consider a defective solder joint and will take some getting used to. With the new higher melting temperature, thermal safety margins are pushed to the limit and the potential for circuit board damage increases. As technicians we must become familiar with the new properties and characteristics of this new alloy but we must abide by the old adage of heat, time and damage.

Reduce Heat – Reduce Time – Reduce Damage

With Lead-Free alloy, higher temperatures and slower wetting times have challenged the traditional rework methods of thermal conduction, thermal convection, and hand soldering. Hand soldering is still the most popular method used for low volume rework by the slot technician. It is affordable, easy to learn, and in many cases the only way to repair and save the circuit board. The choice of soldering iron is now more important than ever. The soldering iron tip should always maintain the set temperature under varying thermal loads. This means that when the tip is placed into the solder joint, the temperature does not drop and slowly recover. This temperature stability will effectively allow you to operate at a safe, lower temperature and still improve the dwell time. It is very important to select a well-kept, clean and tinned soldering tip, with a size and shape that will allow maximum heat transfer to the solder joint. Use a good, active rework paste flux that is formulated for lead-free soldering. These in-

dividual selections will all contribute to the quality of your lead-free rework. You will immediately notice the slower wetting as you watch each solder joint being formed. Also the appearance of the new solder joint will be unfamiliar to you.

Removing Components from Lead-Free Circuit Boards

For SMD desoldering, the Chip Quik® SMD Removal Kit has been tested and evaluated on PC boards that were manufactured with no-lead solder. The results were excellent. Also, for those that are required to work in a lead-free environment, the new Chip Quik® No Lead Formula is now available. Many solder braid and solder supply manufacturers specify that their products are lead-free compliant. When using convection and conduction equipment for rework, extreme caution must be taken to prevent inflicted damage. For thru-hole rework, the same basic principals used for working at higher temperatures and slower wetting still apply.

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My Own Personal Experience

My own initial experience with lead-free solder and desoldering has shown good results. At the Chip Quick test lab, I have evaluated lead-free test boards that have SMT components mounted on them. Taking into consideration all of the lead-free recommended rework requirements, I proceeded to remove a 208pin quad flat pack with Chip Quik®. I used an iron set at 600°F. After generously applying the paste flux to all the leads, I slowly applied the Chip Quik® removal alloy with a chisel tip in the normal manner. I found that the wetting was a little slower but the overall results were the same. The SMD was easily lifted off the pads without any dam-

age. The pads cleaned up equally as well using the recommended clean up procedure.

Now I was ready to install the new 208 pin SMD. Using the same paste flux in a syringe, I applied a generous bead on all the pads. With a freshly tinned chisel solder tip and a popular brand no-lead solder, I accurately placed the SMD and tacked down three locations. As I started to drag solder across the pin, I found that the iron had to be moved a lot more slowly in order to allow each individual solder joint to be formed. I also found that the cooling rate was slower. The solder joints definitely did not have the same appearance that we are used to.

After careful inspection with good lighting and magnification, I found that my new lead-free removal & replacement passed inspection. Now that I have had a lot of experience soldering and desoldering numerous configurations of SMDs, I feel confident and comfortable performing lead-free rework. To all Gaming Technicians: go ahead and attempt the lead-free challenge. You can do it.

Marv Cohen
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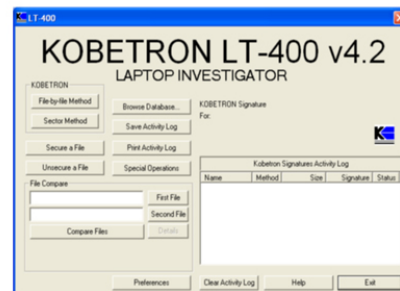
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3M Inks Deal With Immersion Corporation for Tactile Touchscreen

Leading touchscreen provider 3M Touch Systems, has announced an agreement with Immersion Corporation (Nasdaq: IMMR), a leading developer of tactile feedback technology, for 3M to manufacture and distribute MicroTouch™ touch screens that incorporate Immersion TouchSense® technology for the casino gaming and bar-top amusement industries. This enhanced touch solution provides fast, tactile response for on-screen buttons commonly used in video gaming devices.

TouchSense technology enables touch screens to generate tactile cues, promoting a more intuitive, engaging, and natural experience for the player. Players perceive that on-screen buttons press and release as if they were physical buttons. In addition, TouchSense tactile sensations can be synchronized with sound and graphical images, creating a game-playing experience with even greater immersion.

“TouchSense tactile feedback can add a whole new dimension to the player’s enjoyment of the game. Game designers have the opportunity to further differentiate their con-

tent through distinctive tactile sensations,” said Immersion Vice President Mike Levin. “We believe 3M Touch Systems’ experience and industry leadership puts it in a unique position to deliver Immersion’s innovative technology to the gaming industry.”

“3M Touch Systems is well-known in the gaming industry for enhancing the user experience through touch innovation. Incorporating Immersion’s TouchSense technology with MicroTouch

touch screens heightens player interaction, enabling gaming developers to provide a rich, multisensory experience,” said Terry Jones, general manager, 3M Touch Systems. “We look forward to working closely with Immersion to bring this solution to customers.”

For further information, contact:

Michael Levin
Immersion Corporation
801 Fox Lane
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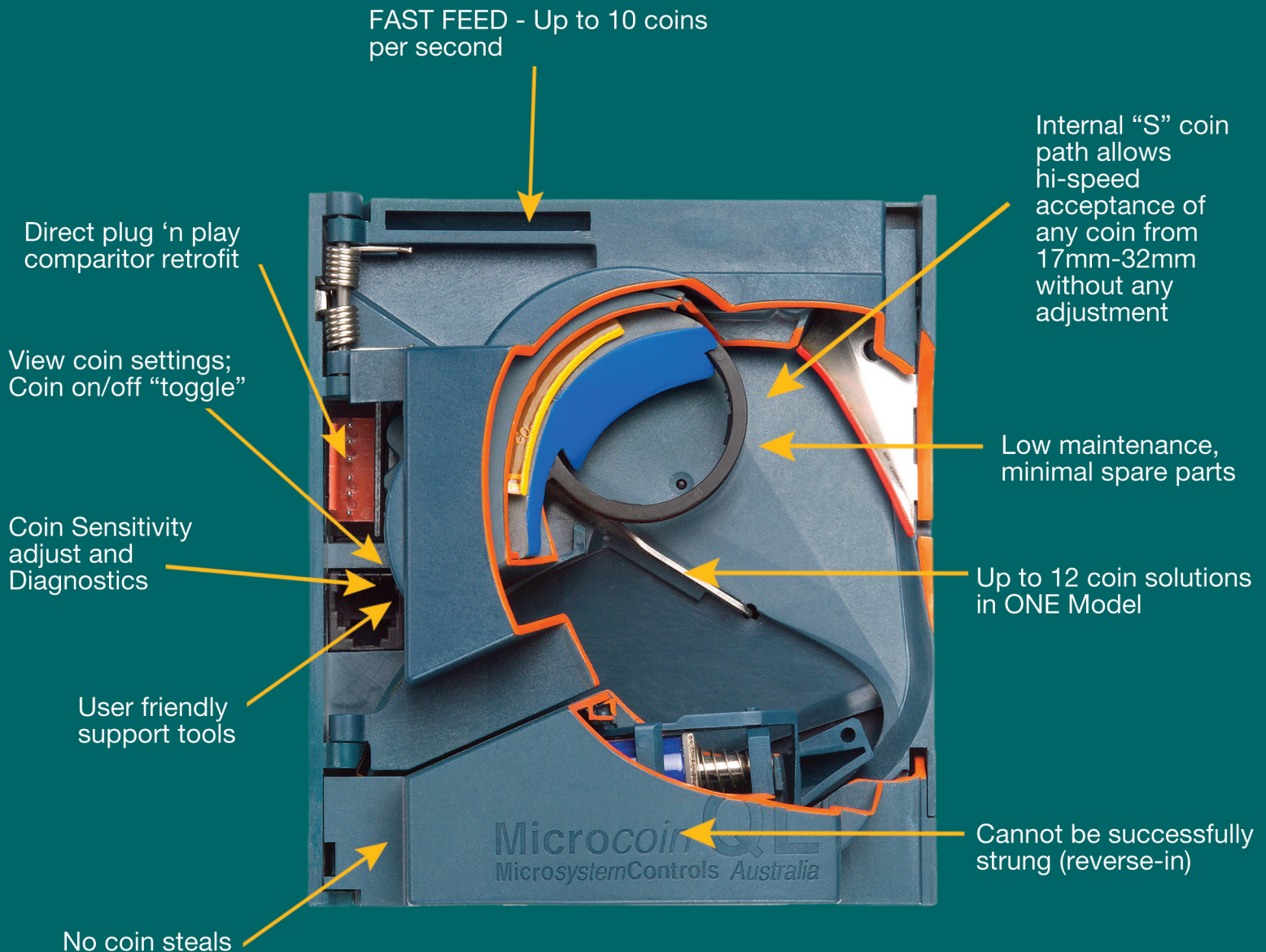
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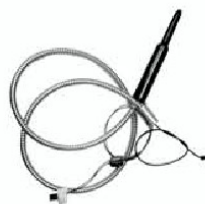
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