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MAGAZINE

May 2011

Slot Machine Technology for the International Casino & Gaming Industry

Slot Tech Magazine

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Randy Fromm

Rival CasinoFest No Friend to Education

Dear Friends of Slot Tech Magazine,

As you likely know, my primary focus is on education. I am at home on an electronics repair bench and I really enjoy showing others how easy it is to fix most casino electronics. I am not alone in this endeavor, of course. There are others who feel as I do and I go out of my way to help them in any way I can. I do not charge vocational training facilities for magazine subscriptions and they are more than welcome to use any or all of my training materials, including the textbooks I have written or the technical training videos I have produced over the years (I have recently put dozens of instructional programs on YouTube. Just search for "Randy Fromm." I was going to give myself some sort of nom de guerre like "SuperTechInstructor3749871627364" but that name was already taken so I decided to go with "RandyFromm" as a YouTube username). I happily offer these materials free of charge. I also invite technical instructors to join me at any of my training sessions, such as TechFest or one of the regional slot tech classes I hold from time-to-time across the country and around the world.

So, when I found out that a three-day, slot tech training event was to be held in Oklahoma this month, I contacted Wes Clark of the Wes Watkins Technology Center in Wetumka, Oklahoma. Wes is Oklahoma's electronics guru. He has attended a couple of my training sessions and is always eager to learn anything he can in order to pass that information on to his students. Although this was not my event, many of the technical presenters and presentations were the same as those offered at my own TechFest program so I was felt it would be worthwhile. I told Wes about the event, certain that he'd be interested in attending, especially since it was in his own backyard, so to speak. Subsequently, I received the following letter from Mr. Clark:

Randy,

I am writing to thank you for your help the last several years by allowing me to attend your technical training for free in order to help my students (as you know, I can't afford to pay for such conferences on a public school's budget). Your input has been a tremendous help to my student's ability to get good paying jobs in the gaming industry. In fact, I just placed two students in jobs that START at $15,000 a year more than I make as a tenured instructor!

Unfortunately, your generosity apparently doesn't seem to apply to your competitors. When I asked the people at "CasinoFest" for the same consideration you give me routinely, they declined to allow me to attend without paying the full tuition of over $1,000 (ironic considering that helping to get students trained to work in the slot tech field is where their future customers will be coming from!).

One last "thank you" Randy: Due primarily to your input, in addition to helping students gain employment, my department has twice been recognized by the Oklahoma State Dept. of Career & Technology Education with the prestigious "New & Innovative Program" grant for providing gaming industry related training.

Hope to get away to attend your TechFest program at Mystic Lake in May.

Wes "W.D." Clark

Thanks for the nice letter, Wes. I sort of figured that might happen but it was worth a shot, anyway. In my opinion, the folks that run CasinoFest are just in it for the money. They don't really care about the technical community. They just see CasinoFest as a way to ride on the coattails of TechFest and take the money. You are always welcome at TechFest, free of charge. I'll even feed you (the food at Mystic Lake Casino is really good).

Randy Fromm - Publisher

**Registration Still Open!
TechFest 22
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Quick & Simple Repairs #74

By Pat Porath

WMS BB2 Conversion

Upon arrival to work to start my day, a co-worker was telling me about a WMS conversion that was supposed to have been started but the tech ran into a problem. When did Bluebird game conversions start coming with a "piggyback board" and a "dongle?" You may ask what is a "dongle" when applies to slot machines? How about a definition of a dongle? According to www.webster.com, the definition is: a small device that plugs into a computer (slot machine in this case) and serves as an adapter or as a security measure to enable the use of certain software. First known use: 1981. What does one look like? They come in a variety of shapes and sizes, for example on a Speilo game, they are about the size of an older printer port on a

computer, about 25 pins, with two connectors matched together (I wish I could see what's on the inside of it). On IGT games they are "keys" or dongles. We recently had some software issues with an IGT "Coyote Moon" game. I was asked to install the license

key into an available USB port and turn on the game. It was supposed to be "plug and play" and it actually was! When power was turned on, the game booted up, machine options were checked and it was back online.

CF card

piggyback board

WMS dongle
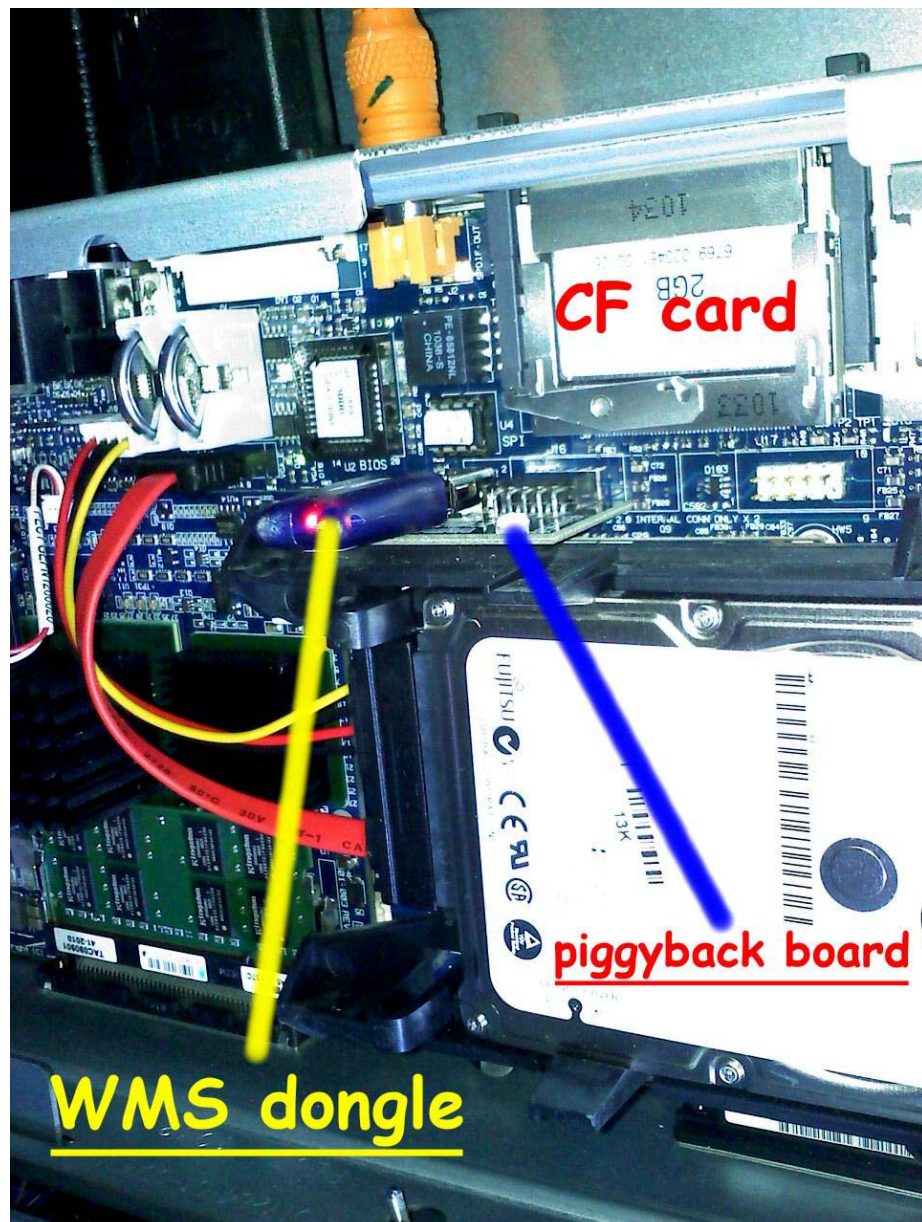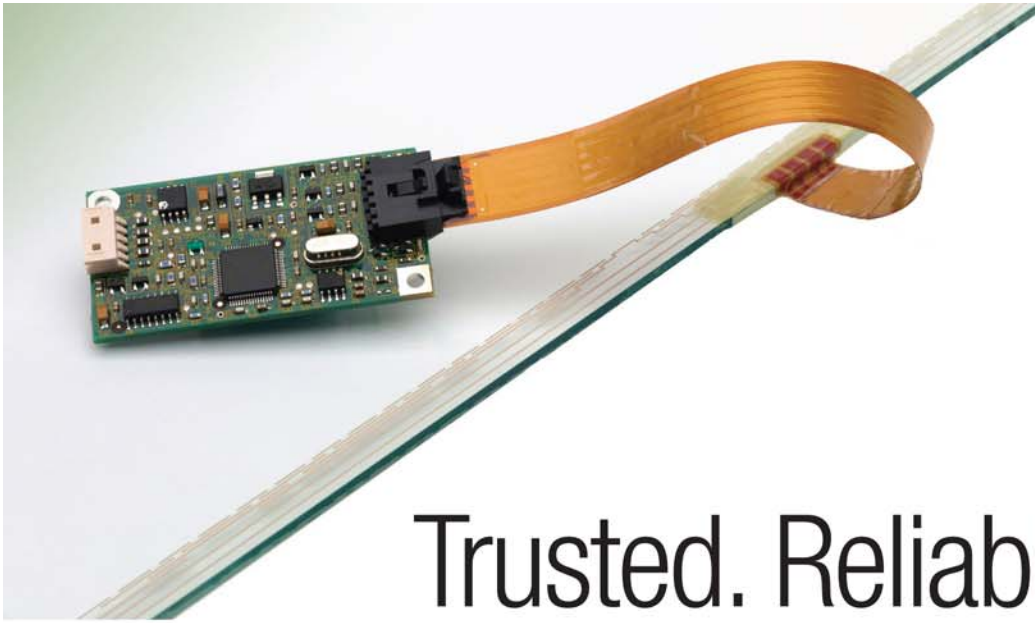
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IGTs also have setup keys. Not like to old days of the Game King physical privilege key but an electronic device that looks similar to a thumb drive, flash drive or data stick. Insert the "key" into a USB port and perform the task at hand. On new IGTs such as the G20, keys are used for setup, replacing the formerly used key chip EPROMS. On older Game Kings, to set specific options a key chip EPROM needed to be installed to perform certain tasks. Not anymore. Now with newer Speilo, IGT, and even some WMS Bluebird 2 games, an open USB port is used along with an electronic device such as a dongle, license key or thumb drive to download software to the game or to set specific game options. On newer Speilo games, one dongle is used for a RAM clear; a different one is used for setup and game optioning. Now it looks like (at least it looks like) some new WMS conversions may come with a dongle, such as a "Winning Bid 2" program. Simply plug the dongle into the piggyback board and plug the board into the left socket located right above the hard drive in the CPU area. Apply power to the game then start setting game options. The days of replacing the SS and SP chips on an IGT along with replacing the reel strips to do a game conversion look like they are long gone. Sometimes I will make a

joke and say "What happened to the good old days? Replace two chips, reel strips, and done!" Now it seems slot machine technology is getting wilder and wilder? Or should I say crazy? With USB ports, license dongles, thumb drives, server based gaming, games even displaying the internal temperature, it makes me wonder what could be next in the wild world of slot machines.

JCM UBA Software Update

From what I recently read, it looks like JCM has released some software updates, not only for the 2009 hundred dollar bill (sorry, not the new hundred. That isn't in circulation yet) but also for better bill acceptor communication between the game, along with components. Version UX4USA024V20628 has to do with improved acceptance with the hundred, along with a high security feature that was assigned for dip switch 7. The updates that have to do with software communication improvement are versions UX4USA028V20618 and version U25USA028V20618. These

feature better acceptance and security, a high security feature removed and assigned for dip switch 7, improved USB communication to better handle the sequence in which a bill is accepted from start to finish and improved stacker timing. More features include better "Intelligent Cashbox COM" (ICB) to prevent tilts. The CRC routine was also improved to prevent tilts; cashbox detection was improved, along with better power interruption status reporting. From what I gather, this may help with the UBA cashbox errors in which the cashbox has to sit perfectly in the game so it will function. As a note, I personally haven't heard anything concrete about the new $100 bill that was originally scheduled to be in pubic circulation. I haven't seen one in person yet, and as far as I know our cashier cage haven't received any yet.

Editor's Note: I ran this little tidbit by JCM's Jack Geller. Here is his response:

Hi Randy,

I have attached the Soft-

example of a thumb drive

ware Information Sheet from our web site for Version 2.06-28 ID-024 UBA 14/24 software. It does include the Next Gen $100. Which is the series 09. That is when it was designed even though it has taken more than a year to get it released and with the current printing problems it is uncertain when it will get released. The next Gen $100.00 Is the USD 100.3 note.

As for a release date on the Next Gen $100.00, check the Bureau of Engraving and Printing web site http://www.moneyfactory.gov/ for the latest information. They are the only ones who know.

Jack

Bally Conversion From CRT to LCD

This applies to the Bally V8700 game, removing the CRT and installing a 20'' LCD. The parts needed are as follows:
20'' LCD Part number 202914
DC power cable Part number 202950-00-0
LCD power supply Part number 204900
Right and left mounting brackets Part numbers 204904 and 204905
LCD mounting bezel Part number 204906
Door bezel Part number 204907
Door switch bracket Part number 205154
Optic mounting bracket

Part number 205155
Power supply bracket Part number 205350
LCD adaptor cable Part number 205953-00-0
Various nuts and bolts Part numbers NLS-00440-1112, NLS-00632-1112, LSPP-M04070-1205, and LSPP-00832-1106

The procedure is pretty easy. Simply remove the old parts and install the new ones.

Konami "Serial COM Down"

A complaint came from the individual working the slot dispatch computer that a "serial COM error" kept being received from a new Konami game that was being set up. The new bank of games were in the Oasis system and everything was supposed to be ready for testing but this game kept sending an error. When looking at the game, I

Software Information Sheet

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General Information

Model Name:	UBA-24-SS/SU, UBA-14-SS			SW.Req. No.	C10-039-02	A1851-03
SW. Name:	UBA-14/24 (USA)-SS/SU ID-024			Date: (mm,dd,yyyy)	7.29.2010	Rev: C2
SW. Version:	V2.06-28			Note:	IGT	
Country (Code):	United States of America (USA)			Guide:	Non	
Currency:	Dollar			CRC (seed= 0000):	EE8D	
Direction:	4Way			CRC32	FD6D2E8A	
External Boot ROM	ExBoot ID-024/ID-028 V1.29			External Boot Check Sum:	AEC9	
				Ex Boot Kobetron ID	27PP	
External Boot EPROM:	1 Mbit, 45 nano-second data access, or faster. ST Part M27C1001-45FX1 or equivalent					

Denomination: Years & MRI Ident # 73rd Edition	Denom.	Printed	Issued	MRI#	
	1	'85-'95, '99, '01, '03		USD1.1A, USD1.1B	
	5	'93-'95		USD5.1B	
	5	'99-		USD5.2	
	5	'06		USD5.3	
	10	'90-'95		USD10.1B	
	10	'99-'03		USD10.2	
	10	'04		USD10.3	
	20	'90-'95		USD20.1B	
	20	'99-'03		USD20.2	
	20	'04		USD20.3	
	50	'90-'93		USD50.1	
	50	'96-'01		USD50.2	
	50	'04		USD50.3	
	100	'90-'93		USD100.1B	
	100	'96-'06		USD100.2	
	100	'09		USD100.3	

JCM Tool Suite	JCM Tool Suite Standard Edition V1.04
ACCLOAD Program:	NEW ACCLOAD for UBA Tool Suite Edition V1.06
Barcode Ticket:	Accepts JCM specified barcode tickets.
ICB	ICB feature is enabled or disabled with ICB Enable / Disable setting barcode ticket.
Modifications:	

(Version 1.92-28→2.06-28) -07/2010
- **Banknote Recognition:** Added banknote recognition for USD100.3 notes.
- **Banknote Recognition:** Improved acceptance rate for USD100.2 notes.
- **Banknote Recognition:** Added counterfeit countermeasures for USD100.2 notes.
- **Machine Operation:** In the previous software, when the cash box was removed while a note was kept at the entry, "Cheated"was reported instead of "Pause". This has been corrected in this version.
- **Machine Operation:** Removed the high security mode option and assigned the $100 disable to dip switch #7.
- **Interface:** Added measures to prevent the USB enumeration from causing UBA to disable within Netplex easily.
- **Interface:** In the previous software, if an Ack from the host was missed after the escrow code had been sent, the Sequence Number of the Reject Code was not recorded due to the time-out. In this version, if the UBA receives the Stack Command or the Reject Command from the host without receiving an Ack after sending an escrow code, the UBA will work properly in accordance with those Commands.
- **Interface:** Added measures to prevent from missing an Ack.
  a. An interrupt will be allowed at the same time as the last send data is copied onto buffer.
  b. The AD interrupt will not be allowed when waiting for an Ack to an escrow.

didn't see anything un-usual. Game options looked OK, the "global" Oasis set-tings looked OK and the interface cable between the game and the Sentinel looked OK as well. The game did not show a "door open" and "door closed" when the main slot door was physically opened and closed so this told me that I did in fact have a communi-cation problem somewhere. Upon closer inspection of the interface cable, one of the three wires was par-tially out of the connector at the Sentinel side. Power was removed from the Sen-tinel, the wire was pushed snug back into the connec-tor and power was restored.

Dip Switch Settings

Dip Switch #	State	Setting OFF / Setting OFF	Enable/Disable
1	OFF / ON	1 / 1	ENABLE / DISABLE
2	OFF / ON	5 / 1	ENABLE / DISABLE
3	OFF / ON	5 / 5	ENABLE / DISABLE
4	OFF / ON	10 / 5	ENABLE / DISABLE
5	OFF / ON	20 / 10	ENABLE / DISABLE
6	OFF / ON	50 / 20	ENABLE / DISABLE
7	OFF / ON	100 / 50	ENABLE / DISABLE
8	OFF / ON	TEST MODE / 100	ENABLE / DISABLE

- **Interface:** In case of an external ROM error (SYSTEM ROM SUMCHECK Error), the communication with the Netplext will be discontinued.
- **Interface:** Modified the processing of download on the USB suite.

(Version 1.92-27 → 1.92-28) – 07/2009
- **Interface:** If UBA receives a Download Program Check error then discontinue Netplex communication.

(Version 1.91-24 → 1.92-27) – 07/2009
- **Interface:** Fixed root problem cause where UBA sometimes missed an Ack sent following a voucher in Escrow message.
  a. Enable Rx buffer sooner to prevent ACK message loss.
  b. Following escrow, when expecting an ACK, AD interrupt is disabled giving the serial interrupt a higher priority.
- **Interface:** If an Ack response [01] to the Escrow message is missed, and host sends an Accept command, UBA must assume that the Ack was sent. The note will be stacked.
- **Interface:** If an Ack response [01] to the Escrow message is missed for 8 seconds, UBA must change the Reject message sequence bits. In the previous version, Escrow and Reject message have the same sequence number in this case.
- **Interface:** USB enumeration should not cause UBA to disable within Netplex. USB function and Netplex function must be separate.
- **ICB:** In the previous version, UBA did not finish initializing completely if the ICB features were disabled.

(Version 1.76-24 → 1.91-24) – 03/2009
- **Machine Operation:** Added fix for sensor adjustment failures found in the field.
- **Machine Operation:** Added countermeasures for ICB problems found at Aliante Casino.
  a. Added a queue to store messages when an ESD shock occurs.
  b. ICB data/time correction – Changed byte order.
  c. Improved Checksum Error checking.
- **Interface:** Added countermeasure for CRC mismatch error reported by the game when there was no program change.
  a. Case where the USB cable is plugged in and the UBA is partially enumerated. The UBA will report "Stacker Open" when cashbox is removed.
  b. Compatible with USB cable being plugged in.
- **Machine Operation:** Added anti pullback countermeasures.

(Version 1.48-22 → 1.76-24) – 02/2008
- **Banknote Recognition:** Added the next generation $5 (2006 Series) notes.
- **Banknote Recognition:** Added supernote $100 counterfeit countermeasures.
- **Machine Operation:** When connecting to the front USB port, the UBA will reset.
- **Machine Operation:** Corrected IGT system download process.
- **Machine Operation:** UBA can now determine the size of the cashbox installed. This is related to reporting cashbox near full. (smaller cashbox – near full at 425 bills. Larger cashbox – near full at 825 bills).
- **Machine Operation:** Modified power recovery operation. If a polymer note is inserted and power is removed prior to escrow, there was a possibility that the note was not rejected due to the clear plastic window on the note. (No polymer notes in the USA; this is a change we are adding to all UBA software).
- **Machine Operation:** Supports the UBA USB Tool Suite program. (Able to download and get performance data using the front USB port).
- **Interface:** "Stacker Open"is now reported, even if a bill has just been rejected and is still at the entry.
- **Interface:** BV config command includes an escrow timer. This timer now applies to both bills and tickets. Previously, the timer applied only to tickets.
- **Interface:** Added the Bill Validator Hold command. Specifies a temporary escrow timer (Timer applies to the current note only. Escrow timer reverts back to the previous escrow timer state).
- **ICB:** Changed the timing for recording a barcode ticket number.
- **ICB:** If the Reset Command is received while writing onto the ICB, the Reset operation will be performed after the data has been completely written.
- **ICB:** UBA will check for presence of ICB more often. (Previously, ICB presence was only checked at power-up).
- **ICB:** ICB Remove / Install count will not be updated in case of the Reset.
- **ICB:** Communication retry after wake-up, stop communicating for about 160ms after sending the EOT. (ICB – UBA communication).

(Version 1.46-22 → 1.48-22) - 03/2007
- **Interface:** Changed the version response data.
  a. **Previous:** UBA-24 USA 024V1.46-22
  b. **Current:** UBA-14/24-USA 024 V1.48-22

(Version 1.44-21 → 1.46-22) – 02/2007
- **Interface:** Clear status command is allowed even if no error exists on feature 0. (For compatibility with IGT USB production downloader).
- **Interface:** If the control-in message is not received through the USB interface, then discontinue USB communication. (Case when UBA was waiting for USB host to get message, was interrupting Netplex communication).
- **Machine Operation:** Included compensation for push mechanism bounce condition. When the cashbox is nearly full, the push mechanism can bounce back from home position in some cases. (Minor adjustment).

(Version 1.44-21) – 07/2006
- **Interface:** Initial release, new software.

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Within 15 seconds, COM had been established, verified by once again door open and a door closed status on the Oasis display.

Aristocrat Viridian "bacc Signature Error"

A customer was playing the game when all of the sudden a "bacc signature error" appeared on the screen. The power was turned off then back on, the main processor board was reseated, the bill acceptor was reseated and the reset key switch was turned a few times. Nothing seemed to work. One of the worst things was that the error sounded familiar but unfortunately, I couldn't remember how to clear it. I could sort of tell that the customer wanted to move along because she looked at her watch and looked at the game a few times so a payout was made for the credits. Next, I reseated the "smart card" that is located on the processor board. Power was turned back on and the logic door was opened and re-closed to clear the open status of it. This time, when the main slot door was closed the error was cleared.

Now that the game was operational, a slot attendant asked if I wanted the original bill acceptor back in it. I thought this was interesting. I wasn't aware at the time that it had started that particular problem. The game was ready for play so why not leave well enough alone? My question was what had caused the signature error? I had to make a phone call to get the answer. The interpretation that I got was that since the bill acceptors had been swapped, the game had seen a different one installed, not the original. Maybe the Kobetron EPROM number or flash memory number associated with the specific type of bill acceptor software was slightly different than the original? My only concern was how to resolve the error. I was told that sometimes, when swapping bill acceptors or upgrading software on bill acceptors with Viridians, a signature error or signature mismatch may occur. I reseated the smart card but came to find out it didn't have anything to do with the error, only opening and closing the logic door on the game did. So if a signature error or signature mismatch appears on a Viridian, opening and closing the logic door should clear it. If it doesn't, I would try a different bill acceptor along with the logic door open and closure.

Server Based Gaming

The following is some basic information about server based gaming. At the casino in which I am employed, we currently have "WAGE-NET" which is a WMS version of server based gaming. WAGE-NET is actually an abbreviation for Wide Area Game Enhanced Network. We currently have a bank of games that are connected to the network which has been running very well. Basically, the games are all connected with CAT-5 cable, then connected to a network switch, then connected to a computer tower. To download a program (game software) and set some of the game options, it is all done on the computer. Of course ONLY a select few individuals have a logon and are allowed to have access rights to the computer or "server" to make changes, per the gaming commission and security procedures. In the near future, we will be installing the IGT version of "SBX" which stands for "server based experience." We will be taking 40 Trimline games, converting them and getting them ready for "SBX." It will be pretty cool to see their version of server based gaming. No doubt it will be a heck of a project though. At the game level (as far as I know) the brain boxes all need to be replaced, the backplane boards and the USB button panels need to be installed. Once complete, the 40 IGTs (along with the WMS server based games) can be converted with a keyboard and a mouse. No glass to change, no chips to change, no button legends to replace. It all is done with a computer. Thus far our WMS

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bank of server based games has been running very well. Basically, each game has a total of five cables from it. Two of them are for the Oasis system, one power cord, and two CAT5 cables. The CAT5 cables are plugged into a large "computer switch" and the "switch" is connected to a computer. It is pretty darned neat.

Aristocrat Mark VI "No Signal"

While making a round on the gaming floor, I came upon an older Aristocrat game that was displaying "No Signal" on the monitor. The error told me that there was a very good chance that the monitor wasn't receiving a video signal from the main processor in the game. Just for the heck of it I reseated the main and the I/O boards (of course, with the power off). Directly after the power was turned back on, game text appeared on the screen and the game started loading. After it booted up all the way, the machine was back online.

Door Open "C" on an IGT G20

A call was received from a slot attendant that a game showed a "door open C" and they were unable to clear it. Trying to recall exactly which door was "C," it finally came to me. If I recall correctly, it stands for "card cage" or brain box door. It's

the small door on the brain box (the main CPU of the game) in which the diagnostic key and setup keys can be inserted into a USB port. Depending on the version of the brain box, it may be a 2.0, 2.5. or 3.0, it may also have a small "read-write" toggle switch. The door that covers this specific area is the "C" door. I simply opened and shut the door and the error went away. I also made sure the door was secure so it wouldn't pop up again with the same error. If the problem did not go away and the door open "C" remained on the screen, then the brain box would have to be removed. Once removed, the cover would have to be taken off and the internal micro switch would need to be looked at and possibly replaced. On an IGT Trimline, the door open "C" refers to the main latch assembly that holds the

brain box in place. Sometimes, if I forget which door or which part goes with which letter, I'll try all of them. As an example, on a WMS XD, a slot attendant may run across a "main door open" that won't clear. Thinking that the main door would be the first door you open (and it sure looks like the main door) it is actually called the "hatch door." The main door refers to the door located directly under the hatch door. This one is opened to access the CPU area of the game. So if a call is received, the hatch door needs to be opened first, then open and close the lower door. Sometimes this clears it. If it doesn't, a cherry switch may need to be adjusted so the game will show a door closed status.

- **Pat Porath**
pporath@slot-techs.com

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See you at TechFest 22.

Randy Fromm

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Beware Image Sticking or Face the Consequences

Imagine this nightmare scenario:

You have convinced the powers that be that server-based gaming is the way to go because you can make a machine conversion without having to change anything at the game itself. All of the game graphics are beautifully displayed on the dual LCD monitors. You flip the switch on the new game, only to see that the display (which has been working perfectly with the old game for the past six months) looks absolutely horrible. Something is terribly wrong because you can still see the image from the old game on the screen.

It's not exactly "burn-in." The phenomenon of phosphor burn is well known for CRT monitors but phosphor burn produces a negative image. Where an image has been bright (in one place for an extended period of time) it is now dark. Where an image was blue, it is now yellow and so on. That is not what the LCD does. With the LCD, this unwanted effect is called "image retention" or "image sticking" and it's not always negative. Often, it's positive! Where the image was bright, the monitor still works more or less

normally but where the LCD screen has been dark for a long time (like months and months of 24/7 operation in a casino) the pixels may not turn back on properly. It's a sort of liquid crystal atrophy. If we don't keep the crystals moving around periodically, they can sort of freeze in the "off" mode where they are blocking light from the backlight or they can freeze in the "on" mode as well.

I saw this graphically illustrated to me at a local casino here in San Diego California. There was a full bank of wide-screen, sit-down video slots that were in the process of something. The bank was roped off, the doors were open and each machine showed a blank blue screen on the LCD. At least the screens were supposed to be blank but there was a clearly defined image on each screen. I could see all the old lines, borders and other images from the game. If I was the slot manager for this nationally famous casino, I would be forced to replace these with all new LCD panels. It's not a difficult job but it's expensive and time-consuming. AND, I'd be mad as hell, probably because I believed the "common wisdom" that LCD

monitors "can't burn." I suppose that technically, it's not a burn but the results are nothing short of disastrous for slot operators because otherwise, slot technicians can sort of keep LCD monitors going almost forever. However, if the panel is bad, it's expensive and it might not be practical to repair the unit.

Slot manufacturers should use any and every possible method to avoid this phenomenon. On a hardware level, I am begging you to please keep the monitors cool with proper (aggressive, even) ventilation. On a software level, please devise a scheme that will allow you to display a nice "attract mode" without leaving the image in the same place all the time. You have to do something or bad programming will be the direct cause of display failure.

Proper implementation of "screen saving" procedures will save casinos a lot of money over the life of the slot machine. I did a little digging and came up with the following from our friends at 3M, the people that make your favorite touchscreen:

3M Touch Systems Technical Note
LCD Monitors - Image Sticking

What is Image Sticking?

When utilizing TFT LCD panels in applications where a fixed or semi-fixed image remains displayed on the screen for extended periods of time, users may experience a phenomenon referred to by the LCD industry as *Image Sticking*. Image Sticking - sometimes also called "image retention" or "ghosting"- is a phenomenon where a faint outline of a previously displayed image remains visible on the screen when the image is changed. It can occur at variable levels of intensity depending on the specific image makeup, as well as the amount of time the core image elements are allowed to remain unchanged on the screen. In POS applications, for example, a button menu which remains fixed, or in which the "frame" elements (core image) remain fixed and the buttons may change, may be susceptible to image sticking. It is important to note that if the screen is used *exclusively* for this application, the user may never notice this phenomenon since the screen never displays other content. 'It is only when an image other than the "retained" image is shown on the screen that this issue becomes evident. Image sticking is different that the "burn-in" effect commonly associated with phosphor based devices.

What Causes Image Sticking?

Image sticking is an intrinsic behavior of TFT LCD displays due to the susceptibility to polarization of the interior materials (liquid crystals) when used under static, charged conditions (continuously displaying the same image). The individual liquid crystals in an LCD panel have unique electrical properties. Displaying a fixed pattern - such as the POS menu described above - over prolonged periods can cause a parasitic charge build-up (polarization) within the liquid crystals which affects the crystals' optical properties and ultimately prevents the liquid crystal from returning to its normal, relaxed state when the pattern is finally changed. This effect takes place at a cellular level within the LCD, and the effect can cause charged crystal alignment at the bottom or top of a crystal cell in the "z" axis, or even crystal *migration* to the edges of a cell, again based on their polarity. These conditions can cause image sticking over an entire area, or at boundaries of distinct color change respectively. **In either case, when the liquid crystals in the pixels and sub-pixels utilized to display the static image are polarized such that they can not return fully to their "relaxed" state upon deactivation, the result is a faint, visible, retained image on the panel upon presentation of a new, different image.** The actual rate of image retention depends on *variation factors* such as the specific image, how long it is displayed unchanged, the temperature within the panel and even the specific panel brand due to manufacturing differences amongst panel manufacturers.
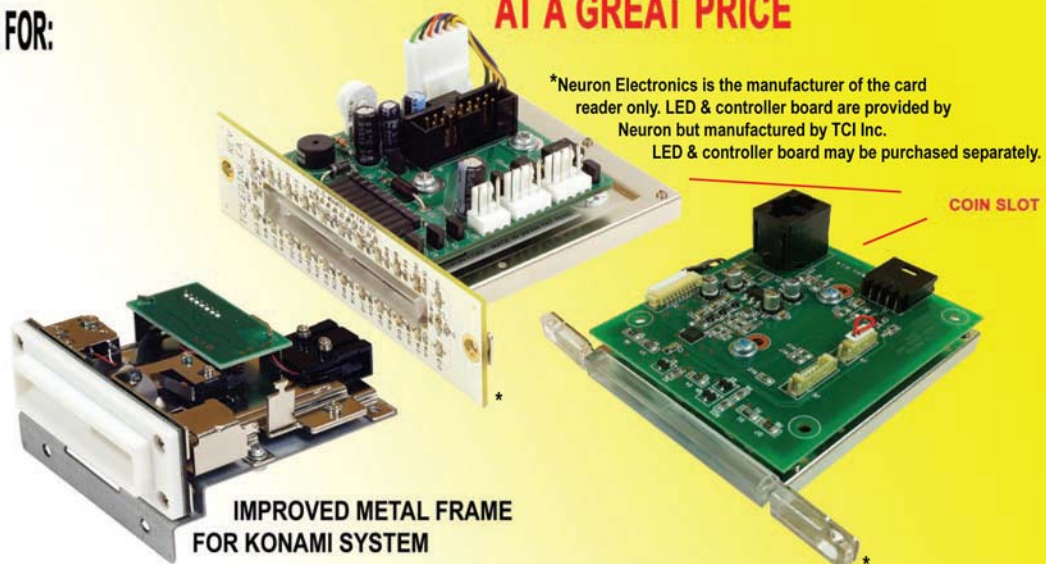
How Do I Avoid image Sticking In My Display?

There are a number of things that can be done to minimize this phenomenon.

For Monitor Operators

Try not to operate the LCD with a "fixed" image on the screen for more than two hours. If you are operating the monitor in an elevated temperature environment and with a displayed image which is contrary to the recommendations in "For Software Developers" below, image stick can occur in as little as 30 minutes. Adjust your screen saver settings accordingly.

Power down the unit during prolonged periods of inactivity such as the hours a store is closed or a shift during which the piece of equipment isn't used.
- Use a screensaver with a black or medium gray background that is automatically set to come on if the device is inactive for more than 5-10 minutes.
Avoid placing the monitor in poorly ventilated areas or in areas that will create excess heat around the monitor.

For Software Developers

In defining the icons, buttons, or windows in the screen, try to utilize block patterns instead of distinct lines as borders for dividing the display into distinct areas.
If is necessary to display a static image, try to use colors that are symmetric to the middle grey level at the boundary of two different colors, and slightly shift the borders line once in a while.
Try to utilize medium gray hues for those areas that will have prolonged display times or remain static as other menu elements change.

Can I Reverse This Effect?

Unlike the usually irreversible "burn-in" effects commonly associated with direct view phosphor display devices such as CRTs, *an image retained on an LCD display can be reversed — often to a point of total invisibility.* However, *the severity of the underlying causes (as described above) of the image retained on a specific display, as well as the variation factors (see "For Software Developers " above) under which the retained image was created, will dictate the final level of retention reversal.*

One way to erase a retained image on a panel is to run the screen (monitor "on") in an "all black" pattern for 4-6 hours. It is also helpful to do this in an elevated temperature environment of approximately 35° to 50°C. Again, utilizing a dynamic screen saver with an all black background during prolonged idle display periods is a good way to avoid image retention issues.

Editor's note number two: Stuck pixels can be fixed with software as well. A proggy called jscreenfix is one program that purports to help by exorcising the subpixels.

Build a People Counter

By Randy Fromm

Capturing "The Number"

As you can imagine, I visit a lot of casinos across the country and around the world. It is interesting to see how different properties run things. On more than one occasion, I have noticed the security guard at the door (or some other employee) with a hand-held tally counter, using it to keep track of the number of people entering the casino.

I realize that the employee is probably just standing there anyway and it likely doesn't cost the casino anything extra to do it but it's an onerous task and no human should have to perform a task that can easily be accomplished through electronics.

It's nothing new to have an "electric eye" at the entrance to a convenience store. It rings a bell when you enter the store in order to alert the clerk who might be in the back taking a smoke break or talking to a man about a horse. If you have an electric garage door opener, you have one there too. It reverses the door if the beam is broken while the door is descending. All we have to do is use one of

those and connect it to a "coin meter." Of course, they're not really coin meters anymore (much) so let's just call it a meter like this very nice meter from our friends at Suzo-Happ (below).

I think you already know where I'm going with this. It's so simple, once you look at the concept, you can easily put it together. You

can probably make it from parts you have lying around the shop (most likely from junk) but the best way to go is with the optics such as
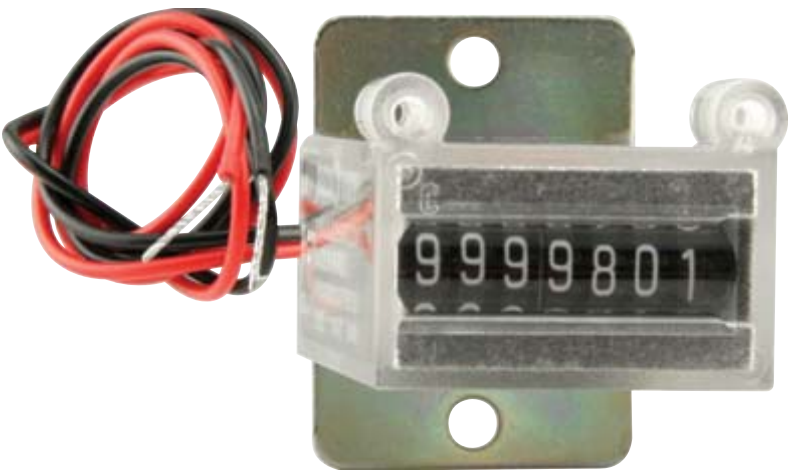
Suzo-Happ 7-Digit Meter with Bracket

Part Number	
42-08005-073	5vdc 7-digit meter with magnification lens with bracket
42-08012-073	12vdc 7-digit meter with magnification lens with bracket
42-08024-073	24vdc 7-digit meter with magnification lens with bracket

those used by a garage door opener. These are generally a matched, infrared emitter/sensor pair with collimating lenses for maximum range and sensitivity while rejecting nearly 100% of the ambient light.

I highly recommend using the garage door transmitter/receiver pair with the collimating lens assembly. Why mess around when you can get something off the shelf?

The Omron E3JK Photoelectric Sensor pair is exactly what we need. The E3JK-5S3-N 2M is the model we want to use. The E3JK-5L-N is the transmitter. E3JK-5DS3-N is the receiver. This is the unit with the solid-state relay output that uses infrared light for maximum range. We can cover an opening of up to 10 meters with this setup. Omron makes other, similar (almost identical) units but these incorporate delays (for use in garage doors) or

use visible, red light (which limits the range) so we definitely do not want to use them. It's around a hundred bucks for the pair so it's not cheap but it comes with everything you need, including mounting brackets. If you perform a Google search for it, you'll find them easily. Just connect it to the meter of your choice and let the counting begin!

Built-in Power Supply Photoelectric Sensor

E3JK

E3JK Pre-wired Models

- Slim body is economically priced and full of functions.

E3JK

Sensing method	Appearance	Connection method	Sensing distance	Operation mode		Output configuration	Model
Through-beam (Emitter + Receiver) *1			5 m	Light-ON		Relay	**E3JK-5M1-N 2M** Emitter E3JK-5L-N 2M Receiver E3JK-5DM1-N 2M
				Dark-ON			**E3JK-5M2-N 2M** Emitter E3JK-5L-N 2M Receiver E3JK-5DM2-N 2M
				Light-ON Dark-ON	Both selectable	DC SSR	**E3JK-5S3-N 2M** Emitter E3JK-5L-N 2M Receiver E3JK-5DS3-N 2M
Retro-reflec-tive with MSR function		Pre-wired (2 m)	2.5 m (3 m) *2	Light-ON		Relay	**E3JK-R2M1 2M**
				Dark-ON			**E3JK-R2M2 2M**
				Light-ON Dark-ON	Both selectable	DC SSR	**E3JK-R2S3 2M**
Retro-reflec-tive without MSR function	E39-R1 (provided)		4 m (5 m) *2	Light-ON		Relay	**E3JK-R4M1 2M**
				Dark-ON			**E3JK-R4M2 2M**
				Light-ON Dark-ON	Both selectable	DC SSR	**E3JK-R4S3 2M**
Diffuse-reflective			300 mm	Light-ON		Relay	**E3JK-DS30M1 2M**
				Dark-ON			**E3JK-DS30M2 2M**
				Light-ON Dark-ON	Both selectable	DC SSR	**E3JK-DS30S3 2M**

24 to 240 VAC
12 to 240 VDC

Brown — Power Source — No polarity

Note: Unit can be powered by almost anything!

Blue

D/ON — Gray

L/ON

Source voltage to match meter voltage (5vdc, 12vdc or 24vdc)

Drive Circuit

Drive Circuit

Photo-electric Sensor main circuit

White
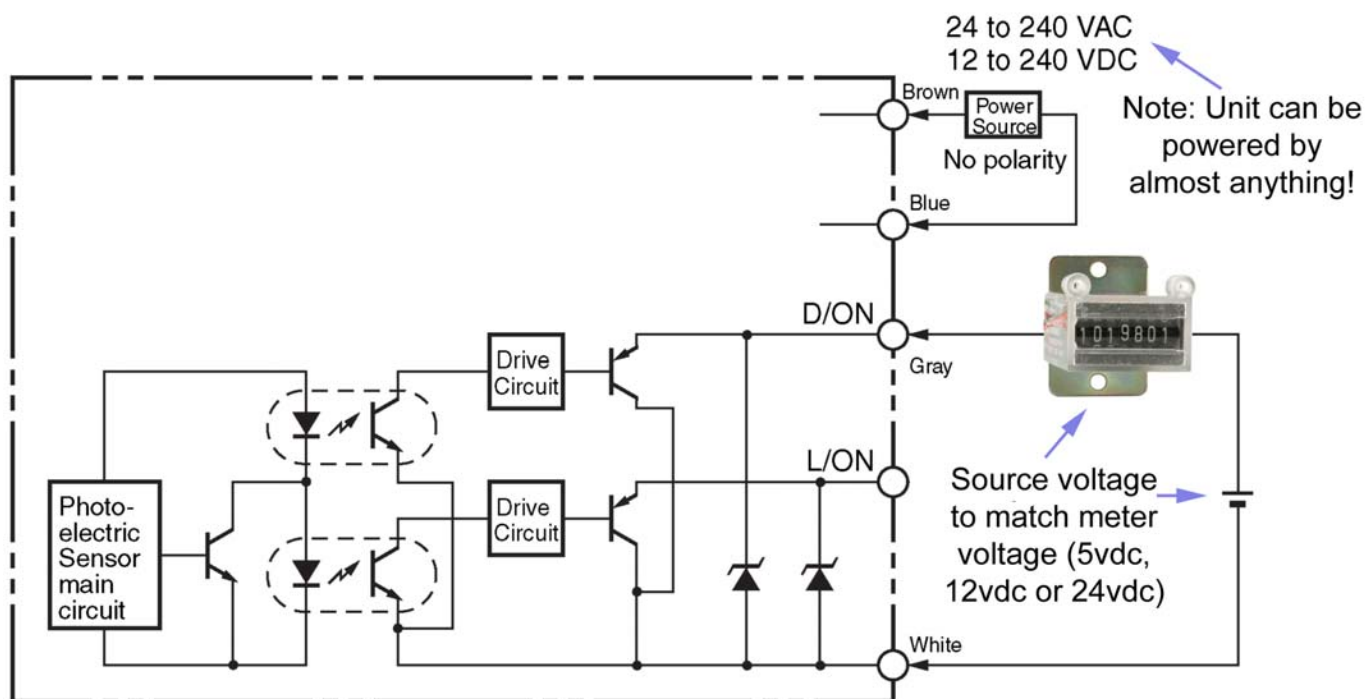
But Wait a Second, What If . . .

I know what you're thinking. "This thing can never give us an accurate head count because sometimes people will walk in groups and break the beam fewer times" or perhaps you thought "This thing will never work. People have two legs and sometimes they'll catch the beam twice as they pass and at other times, just once."

Well, you're correct in that this system will not give you an exact head count. However, it WILL give you an accurate average count. You just have to extrapolate it. When taken as a group, people move, more-or-less, in predictable and regular ways. For the first few days/weeks/months following installation of the people counter, you will naturally keep using your existing system of hand-counting. Simply take the meter reading each day, subtract the previous day's reading (giving you the daily count) and divide it by the hand tally or vice-versa. It doesn't matter which way you do it. They are

Operation

Note: ☐■ The white part of the DIP switch indicates which setting is selected.

	Switch configuration	Switch selection	Timing charts
Models without timer	MODE 0↔1 D-ON ☐ L-ON ↑ Operation selector	MODE 0↔1 D-ON ■☐ L-ON ← Light-ON, Relay ON, DC output switching element ON	We want to use the "dark on" setting so the meter increments when the beam is broken.
		MODE 0↔1 D-ON ☐■ L-ON ← Dark-ON, Relay ON DC output switching element ON	

The unit can operate in the "light-on" or "light-off" mode. This refers to the receiver, of course. We want the meter to increment when the beam is broken so we use the light-off mode.

reciprocal and you're just trying to establish a ratio.

And establish it you will. The ratio will be astonishingly regular. Eventually, you'll see that the variance is so small, it's simply not worth performing the hand count and you'll find yourself referring to the people counter number as "The Number" as in "Hey, Judy. What's The Number for last Saturday?" You likely won't even perform the extrapolation. After all, what's the point? It's sort of like using foreign currency when you're on the road somewhere. After a while, you get tired of figuring out what something costs in your own currency and you stop making the conversion.

Additionally, you will find another amazing thing- Regardless that you use sophisticated slot systems to keep you abreast of your casino's Win, once you start using this system, you will find yourself referring to The Number fairly often as a legitimately important piece of data. **- STM**
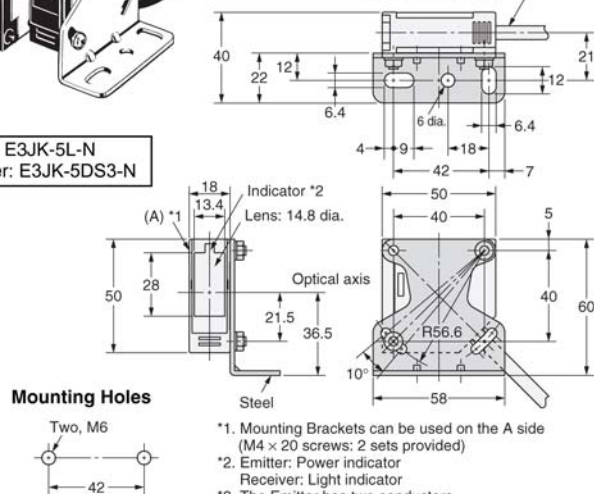
E3JK

With Mounting Bracket Attached

6-dia. vinyl-insulated round cable with 5 conductors (Conductor cross section: 0.3 mm², Insulator diameter: 1.5 mm), Standard length: 2 m *3
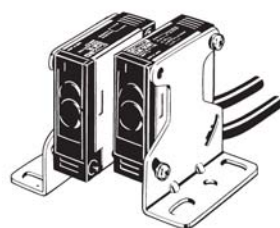
Emitter: E3JK-5L-N
Receiver: E3JK-5DS3-N

40   12   21
22   12
6.4
6 dia.   6.4
4 9 18
42   7

18   Indicator *2   50
13.4   Lens: 14.8 dia.   40
(A) *1   5

Optical axis
50   28   40   60
21.5   40
36.5   R56.6
10°

Mounting Holes   Steel   58

Two, M6
*1. Mounting Brackets can be used on the A side (M4 × 20 screws: 2 sets provided)
*2. Emitter: Power indicator
   Receiver: Light indicator
*3. The Emitter has two conductors.
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Small Class-Big Fun!

Although it's tough to beat TechFest when it comes to cramming in the most knowledge in the shortest period of time, my "regular" slot tech classes allow us to have a great deal of fun with the "hands-on" work that is afforded by a much smaller class size. Generally limited to just 15 students, my recent class at Clearwater Casino (my third visit to this beautiful property, located right on Puget Sound near Seattle, Washington) was for eight students (the slot tech manager joined us for the photo) while another recent class in Reno, Nevada (for street route operator Winner's Gaming) was for just five.

We had a real blast in Reno. We raided their storage unit for every bad power supply and monitor we could find and fixed everything except a 3Y power supply that needed a MOSFET that I didn't happen to have with me.

It looks like I'll be teaching a class near heidelberg, Germany in July so if you're in the area, stop by and say "Guten Tag." Otherwise, if you're interested in slot tech training in your area, please contact me and we'll work out a plan for you. **- Randy Fromm**

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