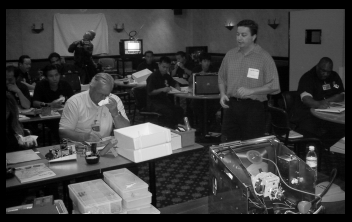
Inside Slot Tech Magazine

September, 2003



Slot Tech Magazine is an official publication of the Global Gaming Expo

global g2e gaming expo

Slot Tech Editorial

Happy September, everyone. Why happy? Because this is the month of the big Global Gaming Expo in Las Vegas and I, for one, really look forward to this show, where I have the opportunity to see all of the new offerings. Of course, Slot Tech Magazine concentrates not so much on new game titles but rather new gaming technologies.

Sometimes, new technology doesn't translate as high-tech. In fact, one such new product is decidedly low-tech. This month, Transact Technologies announces a new bezel for their 800 series printers that can go a long way toward reducing ticket jams. This clever bezel has some extra space inside, where a ticket can flex if blocked by a player with his or her hand over the exit slot. No harm, no foul! Read about it on page 12.

Our Canadian Correspondent, Kevin Noble has also provided us with a low-tech look at tools in his contribution entitled Tool Belts, Pouches, Belts, and Compartments starting on page four.

I had a wonderful time at the Table Mountain Casino last month. I was there for two weeks of slot tech training and I have to tell you that I have never spent time with a more competent, professional and totally hilarious team than these folks. It almost seems like we spent as much time laughing as learning but when it came to business, they got right down to it, attacking monitor repair, BV diagnostics and coin comparator testing with speed and skill. It was a beautiful thing. Thank you for making me feel at home and a big Slot Tech Thank You to all of our guest instructors. There are some snaps of the event on page 14.

Other technical articles in this month's Slot Tech Magazine include an introduction to stepper motors on page 20 and part 4 of our look at a monitor's vertical deflection circuit (this month, it's a look at how Ceronix does it) on page 30.

That's all for this month. See you at the Global Gaming Expo, booth 3236.

Randy Fromm

Randy Fromm - Publisher

Randy Fromm's
Slot Tech Magazine

Editor
Randy Fromm

Technical Writers

Dion Anderson
Martin Dempsey
Bart Holden
Ken Locke
Kevin Noble
Herschel W. Peeler
Scott Reynolds

Advertising Manager
Dennis Sable

Slot Tech Magazine is published monthly by
Slot Tech Magazine
1944 Falmouth Dr.
El Cajon, CA 92020-2827
tel.619.593.6131
fax.619.593.6132
e-mail
editor@slot-techs.com
Visit the website at
slot-techs.com

SUBSCRIPTIONS
Domestic (USA)
1 year - $60.00
2 years - $120.00
International
1 year - $120.00
2 years - $240.00

Innovation players touch.

For more than a decade, MicroTouch™ touch solutions have helped establish players' preference for touch games, while providing game manufacturers the reliability they require to help keep their machines operating around the clock.

By improving game usability and providing access to exciting software enhancements, our touch screens have helped encourage players to use touch games longer...years longer. And through all those years, the reliability and durability of MicroTouch™ touch screens have made them the preferred touch screen of game machine manufacturers around the world.

In the end, you, your players, and your game machines can rely on 3M's *reputation of product innovation and quality* to help enhance future generations of touch screen games and the machines that run them.

For more information and to receive your Slot Tech Gaming shirt, call 888-659-1080

www.3Mtouch.com/info/st

MicroTouch

3M *Innovation*

Tool Belts

Pouches, Belts, and Compartments

By Kevin Noble

Let's look at the tool belt, shall we? They are big, small, black, brown, leather, perhaps, an essential piece of equipment never ever mentioned in any articles, yet always take time to be reorganized after a big project. Remembering what went where and most of the time an empty spot where something went missing. Sometimes modified to fit more tools, sometimes modified to fit parts, or even slot notes or cheat sheets. I have seen the belt itself look like an ammo belt with parts attached to it and hanging off, an old camera bag to house whatever they carry in there. Pouches that carried a whole shop, around his waist, even one that weighed so much I am surprised it did not come with wheels, and the most amazing tool pouch that held a screwdriver and a pair of needle nose pliers (I wonder how many heads were stripped by those technicians?). In Vegas, I met a technician named George who pushed a tool cart around for his tool belt, complete with an ashtray and cup of coffee. So what I am saying is "to each his own, and whatever you feel comfortable with to get the job done right."

My Tool Pouch

My tool pouch is medium sized, with enough tools packed away to repair most tasks on the floor or in the cage. It's neither too heavy nor too light. It's just perfect for me, for my size and height. The color is brown but who cares anyway? It stops me from calling others away for tools or screws, and getting in others' way. Most times I don't need to lock the machine back up, sign the MEAL book, and head to the shop to get the necessary part or equipment needed. My pouch is modified to suit my needs, with a money pouch on the back, a parts compartment mounted on the front and an extra piece of strapping in the pouch itself for an extra tool. My belt is tie wrapped to the pouch itself so it does not move or slip and adjusted just perfectly to fit around my left shoulder and the money pouch rests on my left hip, thus stopping my pants from fraying.

FOR EVERYTHING YOU NEED TO PROTECT MEDECO HAS THE SOLUTION.

From slot doors to cash boxes, Medeco provides a series of high security gaming locks for virtually every application on the casino floor. Medeco's DuraCam gaming locks are used in casinos throughout the world and are equipped with one of the strongest keys on the market. Additionally, the DuraCam keys carry a lifetime guarantee against key breakage.

For applications where the risk associated with a lost or stolen key is immense Medeco offers the DuraCam II, which features a removable core to make changing locks quick and easy. Changing the core of the lock takes only a matter of seconds, saving the casino time and money. The DuraCam and DuraCam II designs are available in a variety of different lock formats such as cam locks, padlocks and furniture locks. Whatever the application, Medeco's full line of gaming products can offer the solution.

For more information about which product mix is right for you, contact Medeco today at **1-888-633-3261** or visit us on the web at **www.medeco.com**

medeco®
HIGH SECURITY LOCKS

My Tools

My tool pouch consists of a 3 position ratchet Snap-on screwdriver, a pair of small wire cutters, needle-nosed pliers, normal flat head screwdriver, 4" adjustable wrench, small paint brush (for cleaning optics and removing coin dust), medical clamp (placing the IDX ribbon cable back in position), small ratchet driver, vise grips, small butane torch lighter (soldering right on the spot), soap dish filled with a complete set of sockets, hand wipes (cleaning optics), a long pair of tweezers with points on the ends (for removing coins in those hard to reach areas, especially in the wrappers), a set of Allen wrenches, hopper probe jumper, IGT door jumper, scotch tape, and a stubby screwdriver. I cannot forget my new LED flashlight. What a wonderful tool. Just shine it in the game and the whole compartment lights up. No need to have the light pen pointed on the problem in question and the fabricated lock wrench for all those lock projects...

The Tackle Box

Mounted in the front of my tool pouch is a modification. I added a holder to allow my parts container (a small fishing tackle box) to sit outside my belt in order to free up some space inside the tool pouch itself. The small tackle box holds all the nuts, bolts, springs, screws, lights, fuses, washers, and whatever parts I seem to find in the machine itself.

The Money Belt

This was a great little find and modification to the tool pouch, a money belt with compartments to separate the denomination of bills. They were once used by the Slot Attendants. This allows me to store all my cheat sheets, flip books from all the manufacturers, clear and set procedures, small pieces of shrink wrap, a small pair of fold up scissors, small wire ties, and small strips of sand paper used for lightly sanding the jet sort pads when coins start to mix in the bags. Other uses are to protect my clothing from the rivets (stops my pants from fraying) and acts like a cushion on my hip.

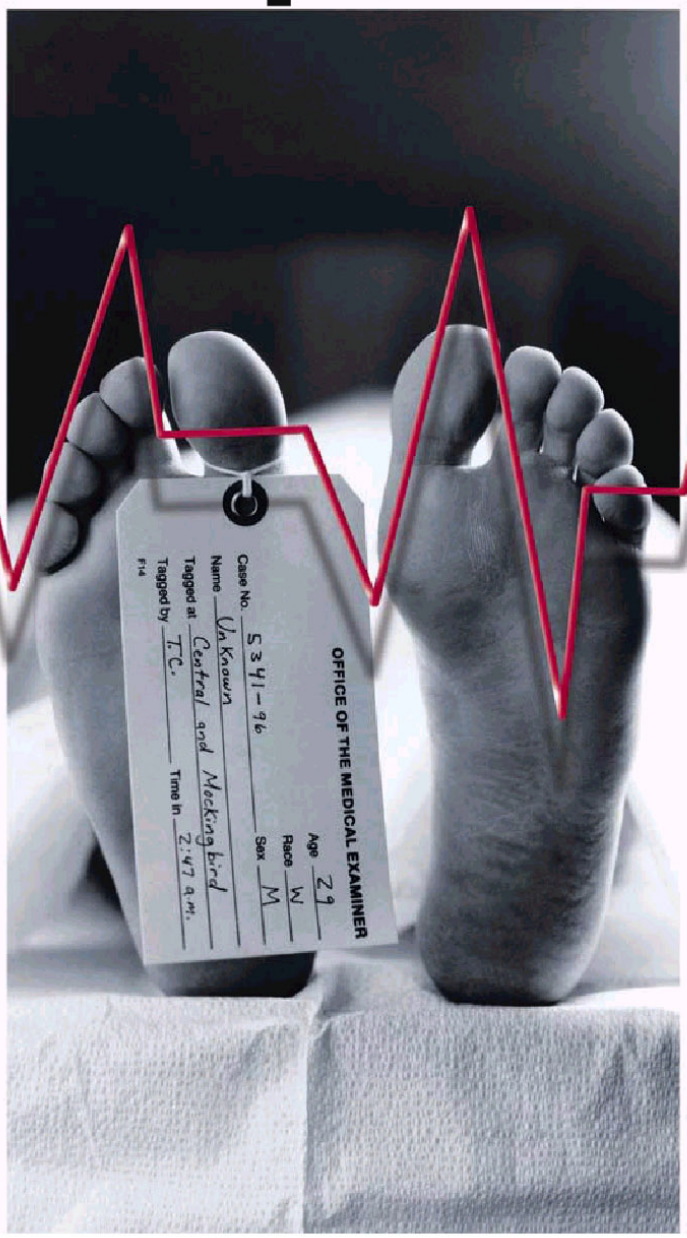
My Pocket Protector

I cannot forget about this. My Sigma pocket protector that holds the black magic marker for inventory (writing part numbers on bags and boxes) a Williams combination small screwdriver, (great for Sigma SIB Boards), Bally interchangeable tip pocket screwdriver, paperclips (slant top escalator rails) LED pen-light flashlight, my trusty blue pen (color used for Technician entries into the MEAL book), plastic see-through tongue depressor (for clearing coin in jams) and my small tube of Rosin Core solder just for the small emergencies for the broken wires found in the machines.

The most important is the pocket sized cheat sheet I carry with me at all times. This is the options setting for all the reel games on the floor. This is my quick reference guide used most often when I am flagged down on the floor or when another technician calls me

The contents of the money belt

Keep Your Machines Alive With AESI...



BECAUSE THE ALTERNATIVE IS COSTLY. ***We Provide The Best Service The Gaming Industry Has Ever Seen... but don't take our word for it, let us prove it to you.***

There is one catch. You have to be using our products. Which, by design, are also the best.

- **PART SALES**
- **REPAIR SERVICE**
- **TECHNICAL SUPPORT**

- **Seiko Printers**
- **Kortek Monitors**
- **MEI Bill Acceptors**
- **Starpoint Push Buttons**

SII Seiko Instruments Inc.

FutureLogic

kortek

STARpoint

mei

Service Coast To Coast

CALL CUSTOMER SERVICE AT: (702) 597-4840

www.gamingstuff.com

ADVANCED ELECTRONIC SYSTEMS INC.

How much can you fit into your breast pocket?

when I am without my tool belt. Another small important item is the "mushroom", a small piece of paper the Slot Attendants insert into the coin heads to signal the paying out of a jackpot, or that the machine is on hold waiting for the Technician. This is a great piece of paper used to remember what location I was just called to, or writing the day's events to add to the daily shift reports.

Cheat Sheets & Flipbooks

I just recently wrote an article on the cheat sheet and how much of an advantage it has to just pull it out and take a quick glance without second guessing yourself, or running back to the shop. Currently in the back of my money pouch is all the information from flipbooks from the leading manufacturers and notes made up to help make decisions and referencing material. Some of the notes include the Bally 6000/Gamemaker flipbook, Atronic Advanced and Basic pocket guide, IGT flip book, JCM WBA flipbook, Jet Sort options, Aristocrat clear/set procedures, Atronic option settings cheat sheet, and IGT/Bally/Williams video and reels clear/set procedures.

Project Carts

We currently have one cart set up used for reprogramming the IDXs. The lap top computer along with the X-key and harness are permanent fixtures of this cart. Stored in the sensitive room (computer and X-key are deemed sensitive items) it can easily be rolled out to its destination for the IDX and the Mikohn signs to be programmed. The other cart takes just a minute to set up depending on which project we are about to undertake. When projects are on the agenda, the cart is loaded up with the required equipment such as glass cleaner and rags, the light bulb container (a plastic see-through container with compartments with all manufactures bulbs sorted out), EPROM tubes and the necessary clear chips for upgrades, and the cordless drills, tie wraps, and the necessary sockets (if required) for any moves and conversions. The project cart is also a great table for upgrading hoppers out on the floor.

Editor's Note: I agree with the use of the cart. This business of working on monitors/hoppers/BVs, etc. on a patron's chair is unprofessional at best. Here's a tip: If you have one of the gray, metal carts (Grainger part number 2W273) mount the top shelf upside down. Instead of just a "parts cart" you now have a mobile table with a parts bin below. – rf.

My Locker

My locker holds most of the notes that I have collected over the years, specialty tools that are needed for projects only, a clip board for service reports and meter taking, extra harnesses (because the

Flipping the top shelf turns the parts cart into a mobile workbench

ones in the shop are usually broken so we make our own) pens, makers, paper clips, label tape, highlighters, and all the office supplies to complete most paperwork associated with a technical shop.

Overview

I feel that I carry a fair amount of tools and parts to repair any job that I am called to but like anything else, unexpected problems arise where you need to close the machine and head to the shop or ask another technician that is not tied up to bring you a part from the shop. Most calls require a BV calibration, clearing a hopper jam, coin-in jams, and buttons not working. The distance from the shop to the floor is not that far away, and most patrons don't mind if you have to pack up for a couple of minutes in order to retrieve a part in the shop. Under some of the bases in the electrical access door, some technician had a brilliant idea and started placing the fluorescent tubes so they could replace burned out bulbs without going to the shop. I posted this question on the Slot Tech forum on what other technicians are carrying, and received some other interesting items like a set of Molex crimpers (casinokid 20), dentist pic (billk08230), small channel lock pliers (tyelprat), and electrical tape and a leatherman (slot doctor). Thanks guys for your input.

- Kevin Noble
knoble@slot-techs.com

New Banknote Acceptor Cuts Upgrade Time

The AstroSystems GBA C2E note acceptor from Eurocoin is now available with an even faster upgrade option which facilitates reliable reprogramming of the unit in just minutes, either on-site or in the workshop.

The GBA C2E now offers two upgrade options: a traditional EPROM and a new Flash ROM feature. With Flash ROM the engineer simply downloads the upgrade direct to the unit's built-in memory without having to remove and replace the EPROM.

There are three ways in which the Flash ROM upgrade can be completed. The engineer can carry out the work on-site without removing the unit from the machine by downloading from a laptop computer. Alternatively, the download can be carried out in the workshop using a standard PC. The third method allows 'cloning' of units, in which an upgraded note acceptor is used to carry out the download instead of a PC.

In addition to its fast upgrade options, the unit is designed with a host of other features for ease of maintenance throughout its lifetime. It has built-in diagnostics with information conveyed on the unit's LED, and is supported by a range of tools for simple, fast configuration. The note path is easy to clean, without the need for tools, to assist routine maintenance throughout its long life. The use of an optical anti-stringing device also maximises uptime by avoiding the risks of jamming associated with traditional mechanical devices.

More information from Garry Holland at Eurocoin:
Tel: +44 (0) 208 275 3000
Garry.Holland@eurocoin.co.uk
www.eurocoin.co.uk

Slot Tech Company News

Coin Mechanisms Enters Into Agreement With Summitech

Coin Mechanisms Incorporated has announced that the company has entered into an agreement with Summitech of Reno, Nev. Under the agreement, Summitech will represent Coin Mechanisms' portfolio of products exclusively to slot machine manufacturer International Game Technology (IGT) also in Reno, Nev.

Stan Pierz, President of Coin Mechanisms commented, "We are excited by the addition of Summitech to the Coin Mech Team. The Gaming Industry is experiencing unprecedented advances in technology and our customers are leading the way in implementing new applications for these technologies. Summitech is an important new enhancement in our effort to maintain real-time understanding of OEM needs as they evolve, permitting us to supply technologically advanced products and services that meet the demands of the future."

Speaking for Summitech, Mike Hoy, Engineering Manager said, "This agreement falls in line with Summitech's corporate goal of becoming a leader in technology driven customer interface. It benefits both parties because, by working together we will be strengthening the technical support for a major client of both companies."
For further information, contact:
Michael K. Meisinger
Coin Mechanisms, Inc.
400 Regency Drive
Glendale Heights, IL 60139
Toll Free 800-323-6498
Tel. 630-924-7070
Fax 630-924-7088
Email: mikem@coinmech.com

1 YEAR LIMITED WARRANTY

SENCORE

VP300 VideoPro Multimedia Generator

Order # 78-195

RIPOFFS MADE IN U.S.A.

Four Pocket Clip-On Holster

•Model #CO-44

Order # 22-8090

DURACELL® PROCELL® Alkaline Batteries

MCM stocks over 10,000 quality semiconductors

Over 40,000 Products Stocked

FREE CATALOG

- Access to over 1.5 million electronic parts and related products
- Superior customer service
- Special offers and discounts
- Quotation team, send us your quotes for quick response
- State-of-the-art automated warehouse

call toll free

1-800-543-4330

or visit

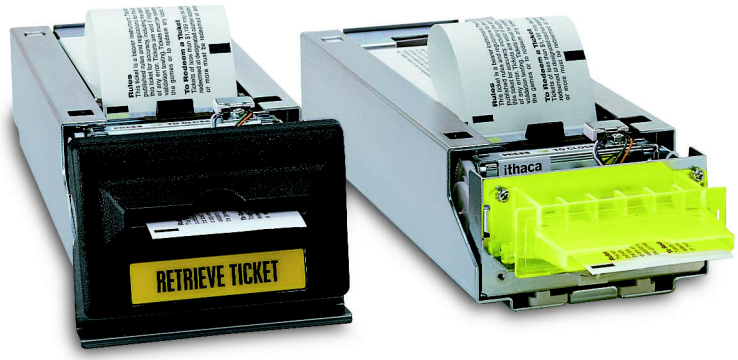
www.mcminone.com/magazine

MCM an in one company

Source Code ST07

Slot Tech Product Announcement

Transact Launches Industry's First Jam-resistant Bezels



Patent Pending Innovation Offered Exclusively on Ithaca Series 800 Thermal Gaming Printers For Coinless Slot Machines

TransAct Technologies Incorporated (Nasdaq: TACT), a leading producer of transaction-based printers for customers worldwide, has announced the gaming industry's first jam-resistant printer bezels. The patent pending advanced feature is offered exclusively on TransAct's Ithaca(r) Series 800 thermal gaming printers, and can be mounted internally or externally on a slot machine.

Vice President and Business Manager of Gaming for TransAct Technologies, Jon Berkley, commented, "Printer jamming by a customer when using a coinless slot machine is a concern for the gaming industry and we are pleased to bring an innovative product to market to address the issue. Many different solutions have been proposed but have proved too cumbersome, ineffective or expensive. TransAct's philosophy is that you don't solve a problem by overloading the printer with more electronics and other devices than are necessary, as it can compound the problem. Therefore, we developed a simple solution to a complex problem; one that keeps slot machines working and gamers playing. No jams. No game downtime. No lost revenue. An easy and low cost solution for the gaming industry."

The bezels' Flex-Zone(tm) feature allows tickets to bend rather than jam if the exit path is blocked by the player. In addition, the bezels' spill resistant design directs liquids away from critical components, keeping slot machines running smoothly. Both bezel models are available with integrated LEDs to provide bright, consistent, highly visible lighting. The internal and external bezels are available as kits to upgrade existing Ithaca Series 800 printers or as installed options on any new Series 800 printer.

TransAct will be demonstrating the new gaming printer bezels at the G2E Show (booth #2723), September 16-18, in Las Vegas.

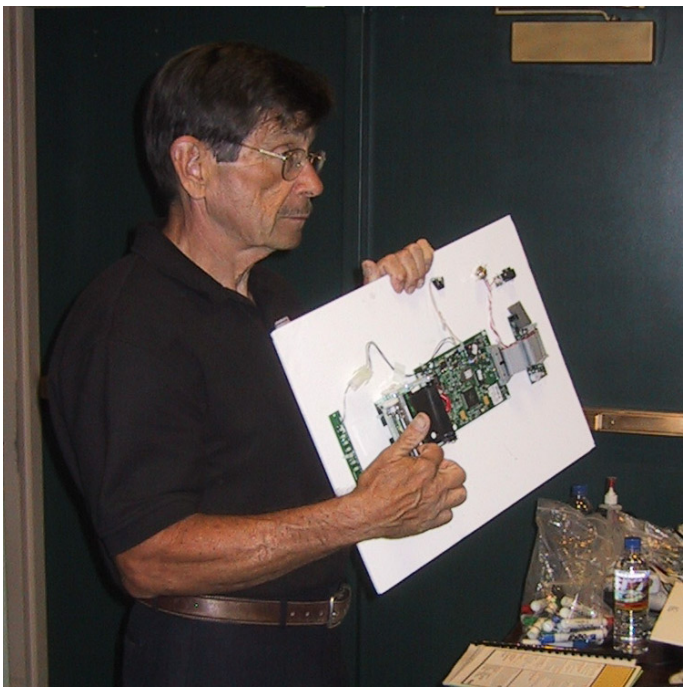
Visit www.transact-tech.com for more information.

Borgata and MEI Executives

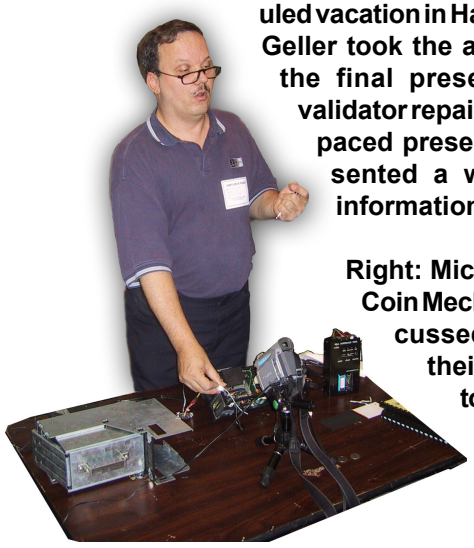
Borgata and MEI executives met prior to Borgata's July opening to discuss the MEI CASHFLOW™ SC66 bill acceptor, which is included in all IGT, Bally and AC Coin & Slot gaming products for the property. Borgata is the first casino to fully integrate MEI CASHFLOW SC66 across the game floor.

MEI CASHFLOW SC66 technology is equipped with advanced digital processing technology, sophisticated design engineering and algorithms, translating into performance that increases customer satisfaction and reduces operating costs.

From left to right:
Paul Tjoumakaris, Borgata vice president of slot operations
Jim Gabriele, MEI gaming industry manager
Larry Mullin, Borgata executive vice president.

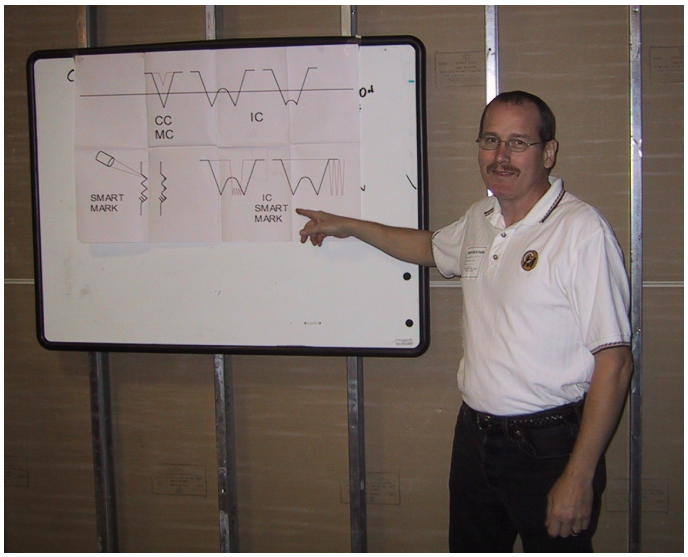


Above: Ramiro Limon of Ceronix points out the dual focus pins of a CRT. His full-day presentation on Ceronix monitor repair was brilliant.
Left: Dennis Salmela explains Ithaca printers.
Below: Rich Raley of AESI discussed FutureLogic (Sieko) printers and MEI's new Cashflow SC66 bill validator.



Left: Just one day before his scheduled vacation in Hawaii, JCM's Jack Geller took the anchor spot with the final presentation on bill validator repair. This was a fast-paced presentation that presented a wealth of repair information.

Right: Michael Harris from Coin Mechanisms, Inc. discussed calibration of their Coin Comparators.



Monitor repair was the name of the game during the two-week class. Clockwise from above: Elizar "Leo" Ramirez and Map Khiev, Aileen Trometer and Gilbert Johnson, and Thao Moua, Vang Lee and Brian Rankin.

August blows hot into central California, heart of the Golden State's agricultural region. About 20 miles east of Fresno, sits the Table Mountain Rancheria, home of the Table Mountain Casino and its 1650 slot machines. Slot Tech Magazine's crack team of technical instructors were on hand for an intensive, two-weeks of slot tech training August 4th – 15th, 2003.

"This was arguably the best two-week slot tech training session I have ever held, thanks to the participation of my guest instructors," said Randy Fromm, who instructed during the first week of training and moderated the balance of the presentation. "At TechFest, we have to cram it all in in just three days. Having a full two weeks is really a luxury."

Guest instructors included Dennis Salmela for Transact Technologies (Ithaca printers), Ramiro Limon from Ceronix, Michael Harris from Coin Mechanisms, Inc., Rich Raley of Advanced Electronic Systems, Inc. (AESI) for FutureLogic (Seiko) printers and MEI bill validators, and Jack Geller of JCM.

Attending the session were: Gilbert Johnson, Aileen Trometer, Kao Insyarath, Andre Chang, Elizar "Leo" Ramirez, Map Khiev, Vang Lee, Brian Rankin, Thao Moua, Khamphay Syharath, Jeffrey Aquino, Outhay Insyarath, Andrew Harris, Michael Garcia and Felipe Valdez.

Money Controls to Demonstrate New WACS 5 and USB Products at G2E

Money Controls will reveal the latest addition to its Complete Gaming Range, from coin acceptance and coin payout to bill acceptance and ticket payout, at G2E, Las Vegas Convention Centre, 16th-18th September

For an entire selection of gaming products and the latest industry developments, check out the Money Controls stand, number 2523.

New for G2E is the Wacs 5, (World Acceptor Cassette System) a world proven, self contained bill and optional barcoded ticket/coupon acceptor, with a cassette stacking system that offers high performance, high security and fast, trouble-free bill and ticket/coupon handling. Available for a wide range of applications. Based on world-proven Ardac technology, WACS 5 also delivers a new barcode reading option for the latest ticket applications and a range of enhanced protocols including - Ardac2 and ID003.

Ardac Smart incorporates a cassette with optional smart chip, which allows the cassette to link into Ardac Smart, Money Controls intelligent cassette system. This delivers improvements in accountability and tracking procedures, reducing both counting and security costs. The cassette is available in metal, or lightweight, highly durable plastic. Money Controls will be showing the first USB gaming acceptor the Condor Plus, providing the latest in communications standards.

New developments for the Condor Plus include the addition of a toolkit - a programming pod that allows the user to securely change the nominated coin set. This is ideal for customers who only want one coin live at any one time for maximum security but also want the flexibility of having a highly secure and flexible method of coin selection - thereby enabling the acceptor to meet all the coin set requirements on a casino floor. High security allied to high speed and now additional flexibility makes the Condor Plus the ideal gaming acceptor. The Condor Plus handles up to 10 coins per second and has programming flexibility for a range of configurations. It accepts over 95% of the world's coin sets and has wide international Gaming Board approvals.

Other products on show will include the most up-to-date version of the Paycheck thermal printer, which is Plug & Play into industry standard ticket-in/ticket-out applications. Offering exceptional performance and printer reliability, the high speed, secure quality graphic printing and top quality bar code reliability are ideal for a range of coinless gaming applications. PayCheck is future proof with the inclusion of a USB port built into the mechanism, and is available with Check After Print TM verification to enhance security.

Money Controls brings the full range of Hopper products from the very large capacity Gamesman, now increasing its penetration of the US market, to the large capacity and highly coin tolerant Universal Hopper and the Cyclone hopper, the ideal flexible capacity hopper where either space is limited or multi-pay machines are operated. Also on show will be the latest developments for USB with Universal Hopper.
Money Controls continues to develop its serial and systems expertise including USB. As a recognized leader in high security peripherals, Money Controls has gained invaluable experience in meeting the high demands of the gaming industry. With over 40 years of experience in developing innovative solutions, together with the widest range of premium products, Money Controls is uniquely placed to meet casino operators' demands.

For additional information on The Complete Gaming Range visit www.moneycontrols.com

VST Printer ideal for slim gaming machines

New Gen2™ Printer featuring Tamper-Resistant Ticket™ and Intelligent Ticket Handling™

1,000,000,000 Tickets Printed. Every Year.

Odds are that all your cashless gaming machines are equipped with printers from just one manufacturer: FutureLogic. That's because 90% of all gaming machines in play today have FutureLogic printers inside. That's over one billion tickets per year, and experience in design and manufacturing innovations that's light years ahead of the competition.

Major manufacturers including IGT, Bally, Atronic, Aristocrat, and others rely on FutureLogic to keep pace with their requirements for innovative solutions such as Tamper-Resistant Ticket™ and Intelligent Ticket Handling™ featured in our new Gen2 printer.

When it comes to cashless gaming printers, don't gamble. The smart money is on FutureLogic.

FutureLogic™
Innovative Engineering for OEM Applications

FutureLogic, Inc. / 425 E. Colorado Street, Suite 100 / Glendale, CA 91205
Tel 818.244.4700 x236 / Fax 818.244.4764 / **www.futurelogic-inc.com**

G2E Booth 2551

Quartermillion$, New Cash for Life and Saturday Night Live Titles Lead Bally's G2E List

Bally Gaming plans to present approximately 110 unique game titles at the 2003 Global Gaming Expo in Las Vegas, including Quartermillion$, an exciting new wide-area progressive link designed to complement its existing wide-area progressive systems.

Taking center stage will be a new series of reel-spinning and interactive video slots based on the landmark NBC television program, Saturday Night Live. A variety of games featuring such legendary SNL stars as Dan Aykroyd, Dana Carvey, Gilda Radner, John Belushi, Adam Sandler and Mike Myers promise to generate a new level of hilarious gaming action. Carvey and Myers star in the new Wayne's World game and Sandler brings his Operaman character to life in a raucous new slot.

Joining the new Saturday Night Live slots in the spotlight is Quartermillion$, an all-new wide-area progressive link that offers quarter slot players a chance at a spectacular super progressive jackpot that resets at $250,000. Quartermillion$ will ultimately be deployed both on slant-top and upright cabinet models utilizing a variety of game configurations. These debut games include In The Money , Lucky Wheel and Tower Of Power , all of which offer unique top-wheel, or other special bonus features. The Quartermillion$ link is designed to complement the existing Thrillions link that features popular games resetting at $25,000 (Blondie), $100,000 (Betty Boop and Popeye) and $1 million (Millionaire 777s).

Cash For Life, the new breakthrough progressive slot link with the unique $1,000-a-week-for-life jackpot, will introduce two new game titles in the EVO HYBRID platform: Higher And Lower and King Tut Treasure .

In addition, another new Cash For Life game, entitled Bonus Spin , will join the Concentration EVO VIDEO and Triple Spin slots on display at the Bally booth. Other Cash For Life games include Bob Eubanks EVO VIDEO, Rich & Famous ProSlot 6000 and Two Times Jackpot ProSlot 6000.

In an important development, Bally Gaming will demonstrate its new multi-coin and multi-line capability on a variety of EVO HYBRID games at the show. These multi-coin and multi-denomination games feature a special LED display that permits the player to select from up to five line-bet options. It also allows the operator to configure the game in a variety of denominations.

The Las Vegas-based slot manufacturer will use this year's G2E conclave to introduce new EVO VIDEO and ProSlot 6000 slant-top versions of the hugely successful Millionaire 777s series of exciting reel-spinning slots.

Amplifying on last year's blockbuster debut of slot machines based one of the world's most recognizable entertainment brands, Play-

boy, Bally Gaming will use this year's gaming show to debut even more new EVO VIDEO, EVO HYBRID and ProSlot 6000 reel-spinning versions of this seductive brand. Playboy-themed games presented at this year's show will include two new Playmate Frenzy reel-spinners which showcase a fourth reel in the top box, as well as two new Playboy multi-line, multi-coin games.

Capitalizing on the proven success of unique, oversized "novelty" slot machines found in casinos throughout the U.S., Bally Gaming will introduce a new collection of extra-large slot machines. Appropriately dubbed the "Big Series," the first three oversized reel-spinning slots featured at this year's show include a new Cash For Life Big Slot ProSlot 6000, a "Big Monte version of the European-inspired Monte Carlo slot and a Big Slot edition of the new Cash For Life Triple Spin game.

Bally Gaming will also introduce a number of new licensed titles to the gaming industry. These include interactive video games based on such popular cartoon characters as Felix The Cat and L'il Abner , as well as the nostalgic S&H Green Stamps brand and the popular television cooking show, Iron Chef . In addition, the company will highlight a number of new reel-spinning and video slot devices featuring a variety of proprietary game themes, including such titles as Captain Jackpot , Bikini Contest , Multiplier Man , Instant Repay Castle of Cash , Luau Party and Money Garden , among others.

The global slot machine manufacturer will also debut 10 new versions of its highly popular Bonus Frenzy series of slots with a "bonus" fourth-reel feature. These game titles include Quick Hit Frenzy , Pool Ball Frenzy , Money Frenzy , Two Can Win Frenzy ,

- Slot Tech Magazine

Introduction to Stepper Motors

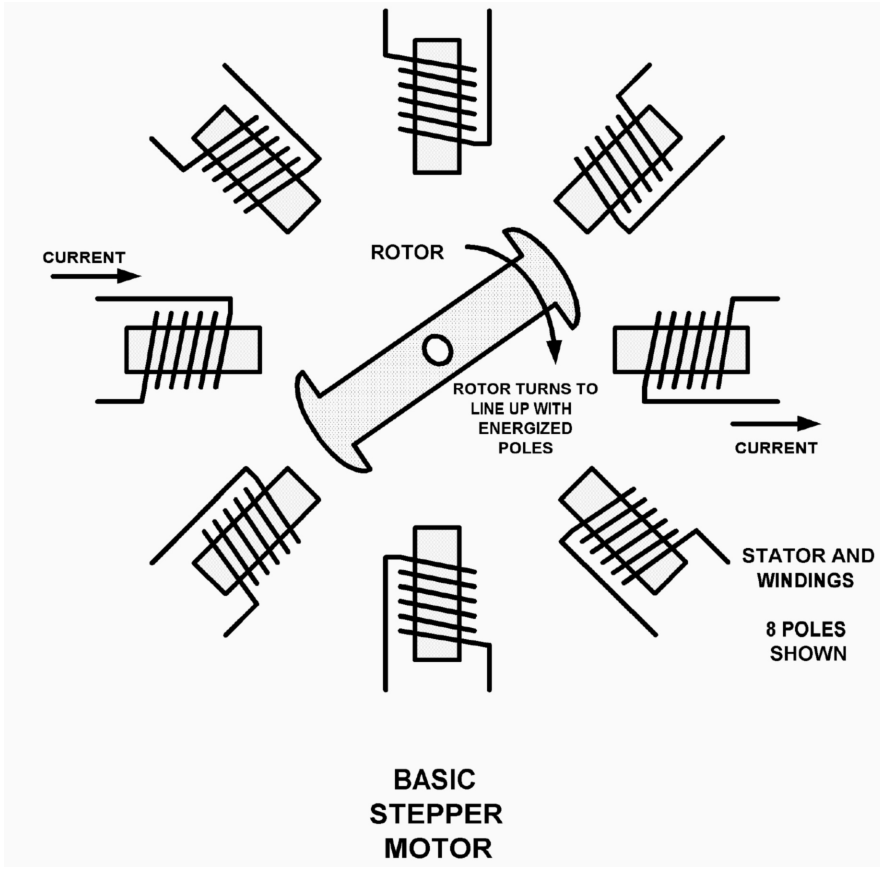
By Rudolf F. Graf) and William Sheets

A stepper motor is a device that translates an electrical signal to a change in position of a shaft or other actuator. In gaming, stepper motors are used to turn the reels. While DC or AC motors are driven continuously, a stepper motor is driven by pulses. Stepper motors are somewhat similar to reluctance motors, i.e. they depend on attraction or repulsion of magnetic structures and derive their torque solely on the change of reluctance of a magnetic circuit, whereby a conventional motor derives its torque from the interaction of current carrying conductors with magnetic fields.

A stepper motor cannot draw a higher current in a stalled rotor condition, to rapidly accelerate a load from rest to speed. This stalled rotor condition is momentarily encountered during startup of conventional motors due to mechanical inertia. It causes an initially high current to be drawn by the motor. DC and AC motors can, within reason, draw the higher current they need to start up quickly. Stepper motors depend on reluctance torque only, so they cannot start up as large a load as a comparable conventional motor. This is why we can use a stepper motor to turn a lightweight reel but we require much more powerful motors for things like coin hoppers.

A stepper motor will rotate a certain discrete amount for each pulse applied, then stop and do nothing until another pulse is applied. Fig 1 shows a basic stepper motor. The armature or moving part, is a magnetic structure that may be only soft iron, (reluctance type) or may be a permanent magnet itself (hybrid type). Several electromagnets (poles), called the stator, are arranged around the armature, or rotor.

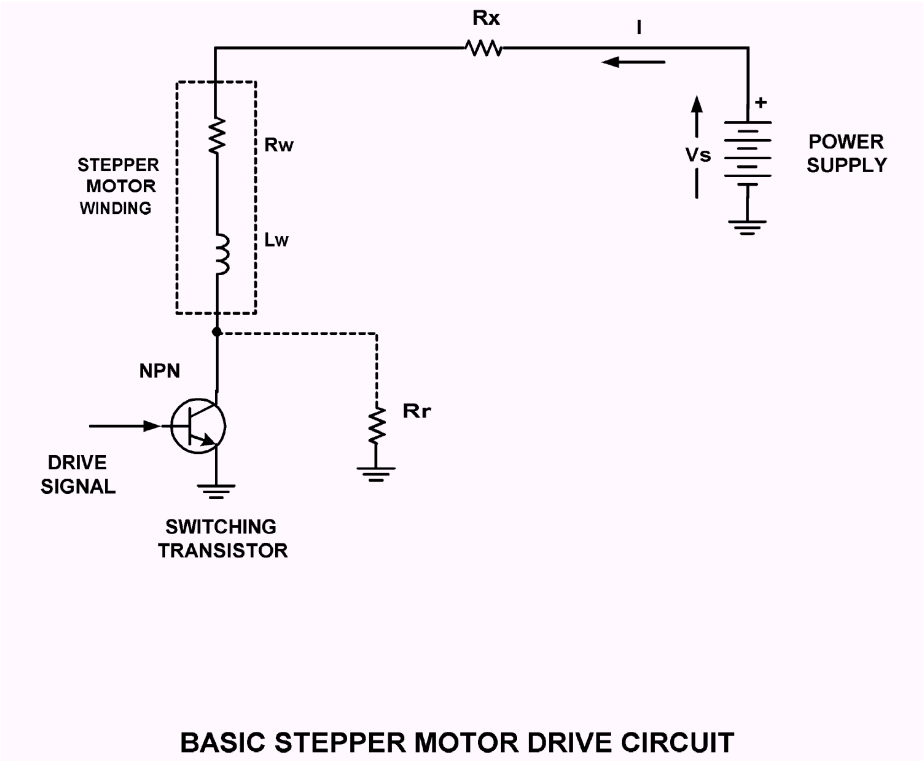
When the electromagnets are energized as shown, the rotor will turn until it lines up with the opposite poles. The figure shows the final position of the rotor as well. If two adjacent stator magnets are energized so that the polarity is the same, the rotor will tend to line up between these poles such that the magnetic circuit has minimum reluctance, which is the easiest path for the magnetic lines of force. After this occurs, nothing else will happen. The electromagnets have a steady state current now flowing in their windings. The current flow will hold the rotor in position and a certain externally applied torque will be needed to move the rotor out



BASIC STEPPER MOTOR

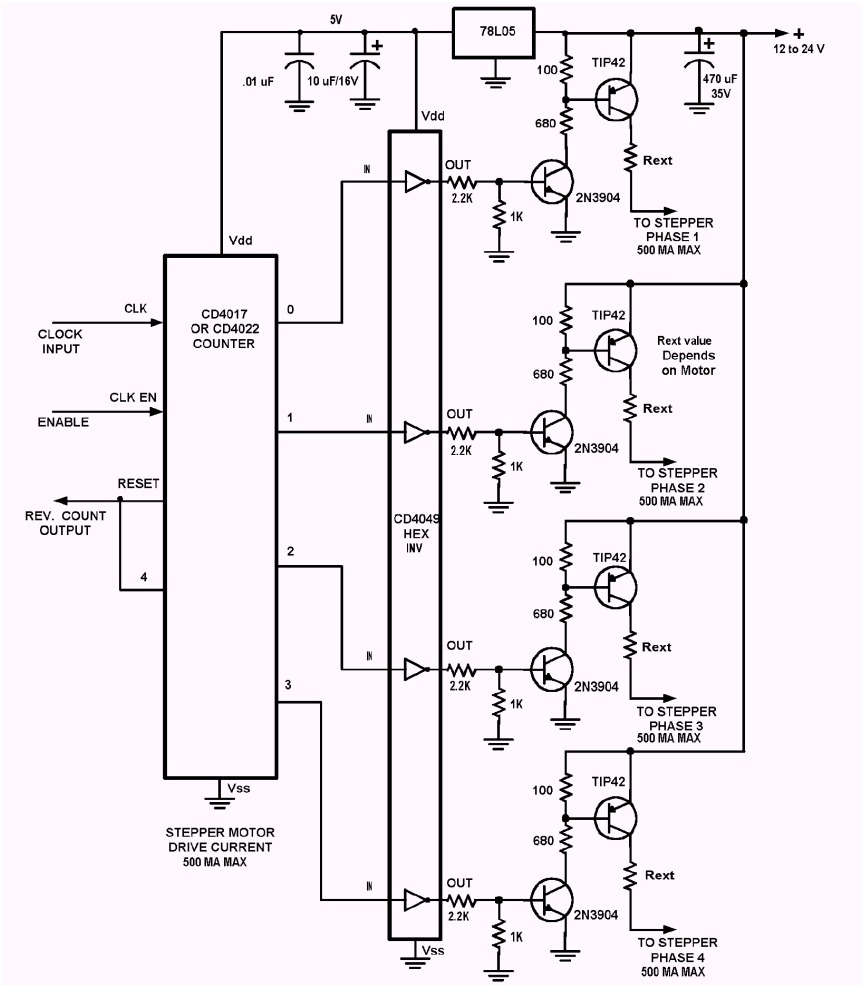
of this position. This current flow acts as a brake, and therefore no external brake mechanism is needed. This is what holds the reels in place and in position. Motors with a permanent magnet rotor have a residual magnetism present and therefore a braking effect still exists with no current flow in the stator windings.

Stepper motor speeds are best suited to low speed applications, so they're a natural for the reels. Naturally, a stepper motor physically like the one shown would not be very useful as only large angles of rotation (45 degrees or multiples of this) could be obtained unless gearing was used. Real world stepping motors have toothed rotors that often will resemble a gear, 48 or more discrete steps, with usually 200 or sometimes 400 steps. This allows 1.8 degree or 0.9 degree increments respectively, or even smaller by using half or mini stepping methods. Common stepper motors are usually two or four phase, depending on the number of windings on the stator. Usually there are two or four, and often the windings may be connected internally, to reduce the number of external leads. This is often done with the ground connections. All stepper motors will have at least two phases, with four commonly used. There are also six phase stepper motors available. There are 3 basic types of stepper motors. The VR (variable reluctance) type has a soft iron rotor and can be turned when de-energized, since there is no holding torque. The PM (Permanent magnet type has a radially magnetized rotor.



BASIC STEPPER MOTOR DRIVE CIRCUIT

This type has detents when de-energized, which may present a problem in some applications. It is not suitable for small step angles. The hybrid type has an axially polarized rotor with 2 sections, one with all north poles, the other with all south poles, and is a combination of the



STEPPER MOTOR DRIVE CIRCUIT
FULL STEPPING
4 PHASE UNIPOLAR DRIVE

VR and PM type. The hybrid and variable reluctance types are the most commonly used.

Stepper motors have several advantages: a) They can be operated in open loop systems b) Position error is that of a single step. c) Error is non-cumulative between steps d) Discrete pulses control motor position e) Interface well to digital and microcontroller systems f) Mechanically simple, no brushes, highly reliable

Stepper motors must be interfaced with drive circuitry in order to be useful for performing a task. Basically, the problem is to drive the stepper motor windings, which are represented by a series circuit containing resistance and inductance (R-L circuit). These windings must be driven with correct current and voltage drive levels and pulse widths. Normally, a series resistance is used to limit the current, or a constant current source can be used. The time constant of the L-R circuit is equal to L/R, which means that a low inductance, high resistance circuit will have a shorter time constant. This implies using a high voltage and a high circuit impedance, or a current source.

Power supply voltages may be 12, 24, 48, or higher. The higher voltages are advantageous in allowing a larger series resistance and shorter L-R time constant. From the driver point of view, the problem is one of driving a series L-R circuit and maintaining good control of waveforms, and avoiding damage from inductive switching transients. Either bipolar or MOS technology can be used for the drivers and the associated logic circuitry. MOS has the advantages of "rail to rail" capability, but at most reasonable voltages this is not usually a problem and bipolar devices will usually be adequate. Several approaches can be used. While discrete component circuitry can be built up from individual components, it may be simpler and more cost effective to use IC devices for this function, at least for the logic, sequencing, and control circuitry.

A basic driver circuit is shown in the figures, using a switching transistor, motor winding, and power supply.

There are two basic drive formats used to drive stepper motors. Unipolar drive uses a bipolar motor winding, with one coil energized at a time, current flowing in only one direction. This does not fully use both windings. At low step rates torque and performance are sacrificed, but the drive circuitry is simplified, since only one switch transistor per winding is needed. The bipolar format employs a reversal of winding current to reverse the stator flux. Current flows in all windings at the same time. Full use is made of the windings, and at low and medium step rates performance is improved.

TechFest 7 TechFest 7 TechFest 7

Atlantic City, NJ - October 21, 22, 23 2003

Make plans today to join the gaming industry's top engineers, technicians, technical writers and instructors for 3 days of technical seminars and presentations that will enhance your performance as a technician and dramatically increase your value to your employer.

TechFest 7 will be held October 21-23, 2003 at the Atlantic City campus of the slot tech training specialists at Atlantic Cape Community College. For more information about the college, visit their website at http://www.atlantic.edu/casino/slot.shtml. Registration fee for TechFest 7 is $390.00 per person and includes lunch each day.

This is a technical presentation. The TechFest is geared for working slot techs and technical managers who are looking for a way to make a dramatic improvement in their understanding of video slot monitors, touchscreens, bill validators, hoppers and more with no-nonsense technical presentations from:

- **Asahi Seiko - Coin Hoppers**
- **Coin Mechanisms, Inc. - Coin Comparitors**
- **Mars - Bill Validators**
- **3M Touch Systems - Touchscreens**
- **Sencore - Test Equipment**
- **Seiko - Ticket Printers**
- **IDX - Coin Validator**
- **Money Controls - Coin Validator/Coin Hoppers**
- **JCM - Bill Validators**

- PLUS - A special instructional series on video slot monitor repair presented by Randy Fromm

BE A BETTER SLOT TECH

Come and spend 3 days at TechFest 3. With engineering and technical representatives on hand from the gaming industry's leading suppliers of touchscreens, bill validators, coin comparitors, hoppers and monitors, YOU have a chance to ask about YOUR problems. You have a chance to get REAL answers to your questions, face-to-face with some of the most qualified technical experts in the industry.

TechFest is for slot techs of all skill levels, from novice techs who want to learn the basics of BV and hopper maintenance to advanced techs that need to brush up on monitor repair.

Schedule of Events

Events subject to change

Tuesday, October 21st, 2003

9:00 am - 12:00pm
How Monitors Work - Part 1
Theory of Operation - Beginning level

1:15pm - 3:15pm
Mars Electronics, Inc. - BV troubleshooting and repair

3:30pm - 5:30pm
Seiko Printers - Printer troubleshooting and repair

Wednesday, October 22nd, 2003

9:00 am - 12:00pm
How Monitors Work - Part 2
Narrow Down the Problem - Intermediate Level

1:15pm - 3:15pm
Asahi Seiko - Hopper troubleshooting and repair

3:30pm - 5:30pm
Coin Mechanisms, Inc. - Coin Comparitor technology and repair

Thursday, October 23rd, 2003

9:00 am - 12:00pm
How Monitors Work - Part 3
Circuit Analysis and Component Level Troubleshooting - Advanced Level

1:15pm - 3:15pm
Money Controls - Coin validator and coin hopper maintenance and repair.

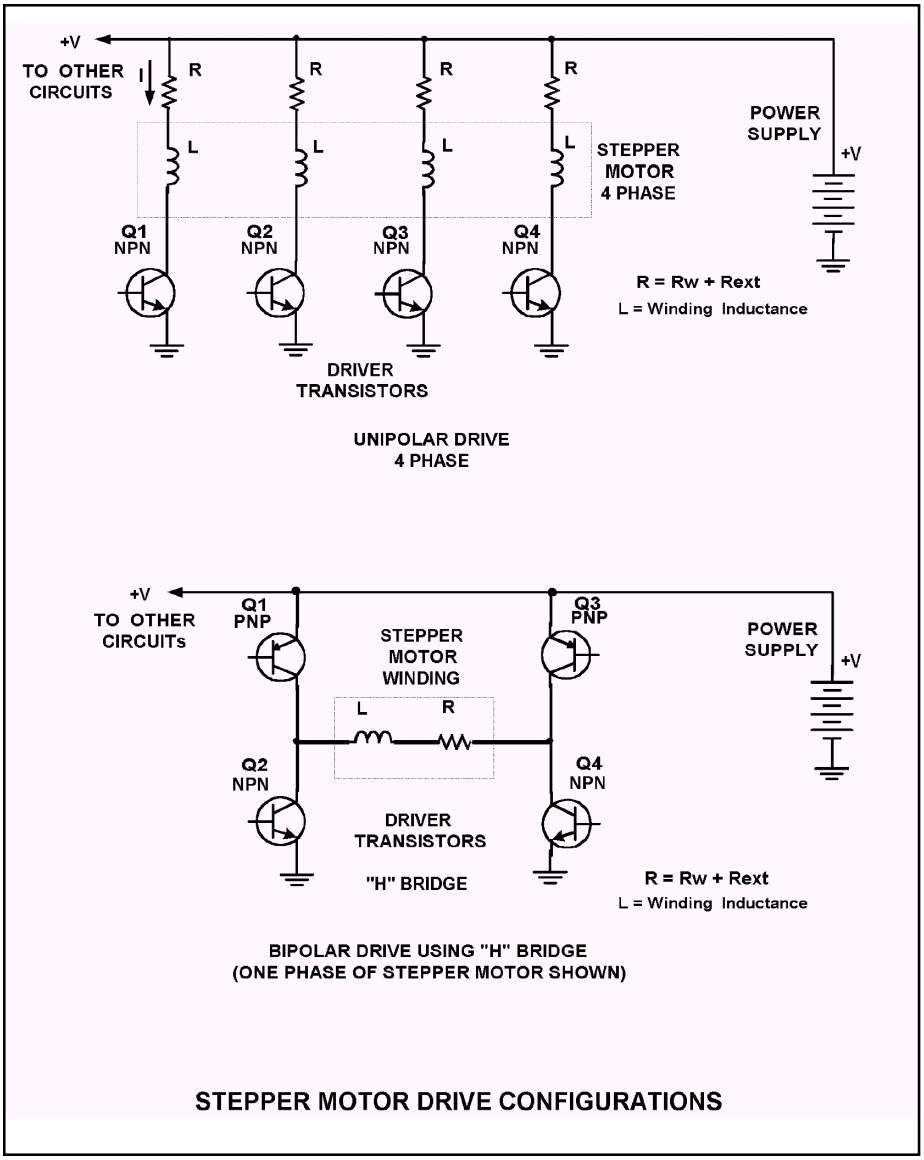
3:30pm - 5:30pm
JCM - Bill Validator Troubleshooting and Repair

Visit the website at slot-techs.com for more information

Space is limited - Register today!

PLUS - Bonus sessions from 3M Touchsystems (MicroTouch) IDX (Coin validators) and Sencore (Test equipment to speed through monitor repairs)

Dates and times to be announced



STEPPER MOTOR DRIVE CONFIGURATIONS

However this requires more complex drive circuitry, since a bridge type driver output circuit is required. This is generally an H bridge. See figs for driver configurations. H-bridge IC drivers are available for the power stages that drive the windings.

Alternatively, complete IC devices including drivers can be used. In addition to these basic formats there are several others that can be used. They are called full step, half step, and mini or micro stepping. They differ in the energization sequence or polarity of the current in the windings, at various times. An illustration of these stepping methods is shown in the figures. This is simply one phase at a time, in a 1-2-3-4 sequence. The shaft rotation direction is controlled by the sequence, reversal of which will reverse the direction.

The sequence is called wave drive. Since one winding is energized at a time, it consumes the least power. Positional accuracy is good since the rotor and stator teeth are aligned at one time. This is a full step mode, with a step angle of 360 degrees divided by the number of steps per revolution. This method can be used with either unipolar or bipolar drive format. Another full stepping method employs sequentially energizing two adjacent motor phases, in a 1-2, 2-3, 3-4, 4-1 overlapping sequence. This uses two windings at a time and gives a higher torque, better damping, and better immunity to resonance effects. However, it uses twice the drive power since two phases are used at once, and can suffer from imbalance. Any variation in the windings or driver can unbalance the magnetism produced by two adjacent windings, and they may not be exactly equal. This unbalance can cause detent position errors, since the effective pole lies between the adjacent pole positions.

Another method is called half stepping or alternating drive. This method combines the two previous methods, in a 1, 1-2, 2, 2-3, 3, 3-4, 4, and 4-1, yielding double the number of steps as compared to the two previous methods. The wave drive has stable positions when the rotor teeth are aligned, and the overlapping drive has stable positions in between two rotor teeth. This effectively doubles the angular resolution, making 400 steps from a 200 step motor, for example. This produces smoother operation, is quieter, and has better acceleration characteristics. However, more complex drive and logic circuitry is needed to generate the signals for the switching transistors.

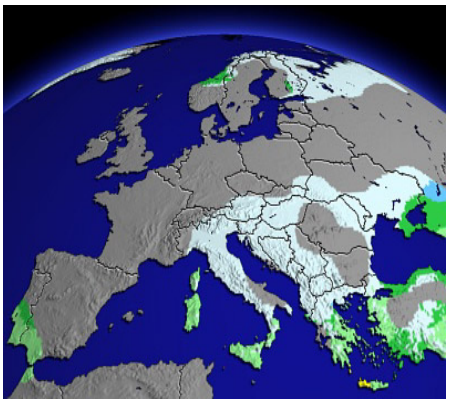
For even finer steps mini or micro stepping can be employed. Half stepping uses one or two phases fully excited. If one phase was to be fully excited, and the other only half excited, a new stable position would be generated. If, in the previous sequence, instead od 1 followed by 1-2, we would have 1 followed by 1 plus half 2, then 1-2, then

half 1 plus 2, then 2, and so on. This would yield quarter steps, giving 800 stable positions for a 200-position motor, as compared to using full stepping. This can be carried even further into "micro"stepping, by varying the drive currents in four excitation levels, giving 8 positions per step, or 1600 total. As one may imagine, this can become quite complex, and more expensive. However, with LSI IC devices, this can be quite feasible. Care must be used in maintaining drive waveforms, as more steps demand more precision as to drive currents, in contrast to the simple on-off requirements of full or half stepping.

Single ended stages may be used for unipolar stepper motor drive applications. However, for bipolar applications a dual polarity driver is required. This can be achieved with the "H" bridge as was shown in the figures. This uses four transistors. Each transistor has a driver included to form Darlington pairs. This structure can easily be made in monolithic form. Q1 and Q3 are PNP, whileQ2 and Q4 are NPN devices. Care must be taken to see that Q1 and Q2 are not turned on at the same time, as this would cause a short circuit across the power supply, with large current spikes. This also applies to Q3 and Q4. In this circuit we have two voltage drops, one in each transistor pair, resulting in a loss of 1.5 to 3 volts of supply voltage, but this is usually not a problem. The use of a monolithic array for Q1 through Q4, including their drivers is a good idea, since it simplifies PC board layout and eliminates possible transistor matching problems. The design of the driver circuitry is another topic and we will not go into this aspect of stepper motors in this article. Fig XX shows a typical unipolar driver circuit using TIP32 or TIP42 plastic power transistors and a few logic gates.

Note also that the waveforms needed can easily be generated using a micro-controller. The micro-controller can also be programmed to perform other necessary functions, such as on-off, positioning, counting, speed control, stepping mode (full, half, etc), speed regulation, and fault protection. The drive waveform(s) can be generated with a routine incorporated into the micro-controller firmware. From the viewpoint of the experimenter, the micro-controller approach has the advantage of programmability for specific applications and is probably the most versatile way of generating stepper motor control signals.

- Slot Tech Magazine



International View

By Martin Dempsey

Waiting List For ICE 2004

With demand for space exceeding supply, organisers of London's International Casino Exhibition (ICE) have been forced into drawing up a 14-strong waiting list of companies still wanting to exhibit at the 2004 show.

Despite a 33 per cent increase (2,500sq.m./26,900sq.ft) in available floor space, made possible by the relocation of ICE to Earls Court 2, the extra space has been rapidly absorbed by existing exhibitors increasing the size of their stands and by new entrants confirming booths at a very early stage.

ICE Sales Manager Karen Cooke explained: "As we get closer to the show it's not uncommon for exhibitors to refine their stand requirements. If this results in space being freed up then the companies we have on the waiting list will be given first option.

The demand for space is not only a reflection on the dynamics of the UK market as it moves towards deregulation but also a recognition that ICE consistently brings together leading suppliers with the most influential international buyers."

Anyone concerned about their inclusion on the ICE 2004 floor plan should contact Karen Cooke on (t) +44 (0) 20 7713 0302; (e) kcooke@ateonline.co.uk

Pronto Consulting Appointed To Represent JCM In Estonia

JCM Germany GmbH are pleased to announce the agreement with Pronto Consulting for the servicing of their products in Estonia.

Pronto, a company dedicated to servicing bill acceptors and many other currency related products, is based in Tallinn. Slava Balonev will be the contact person appointed by Haakan Soederstroem, the Managing Director of the company.

"We are confident that our products will receive the appropriate service in Estonia, the technical preparation of this small company is based on many years of experience of some of the senior management" said Bepi Mottes.

Pronto will be expanding their service to sectors of the market ignored till this moment, such as petrol pumps, vending machines, parking and vending. For further information email mottes@jcm-germany.com

A Multistake Innovation From Barcrest Games

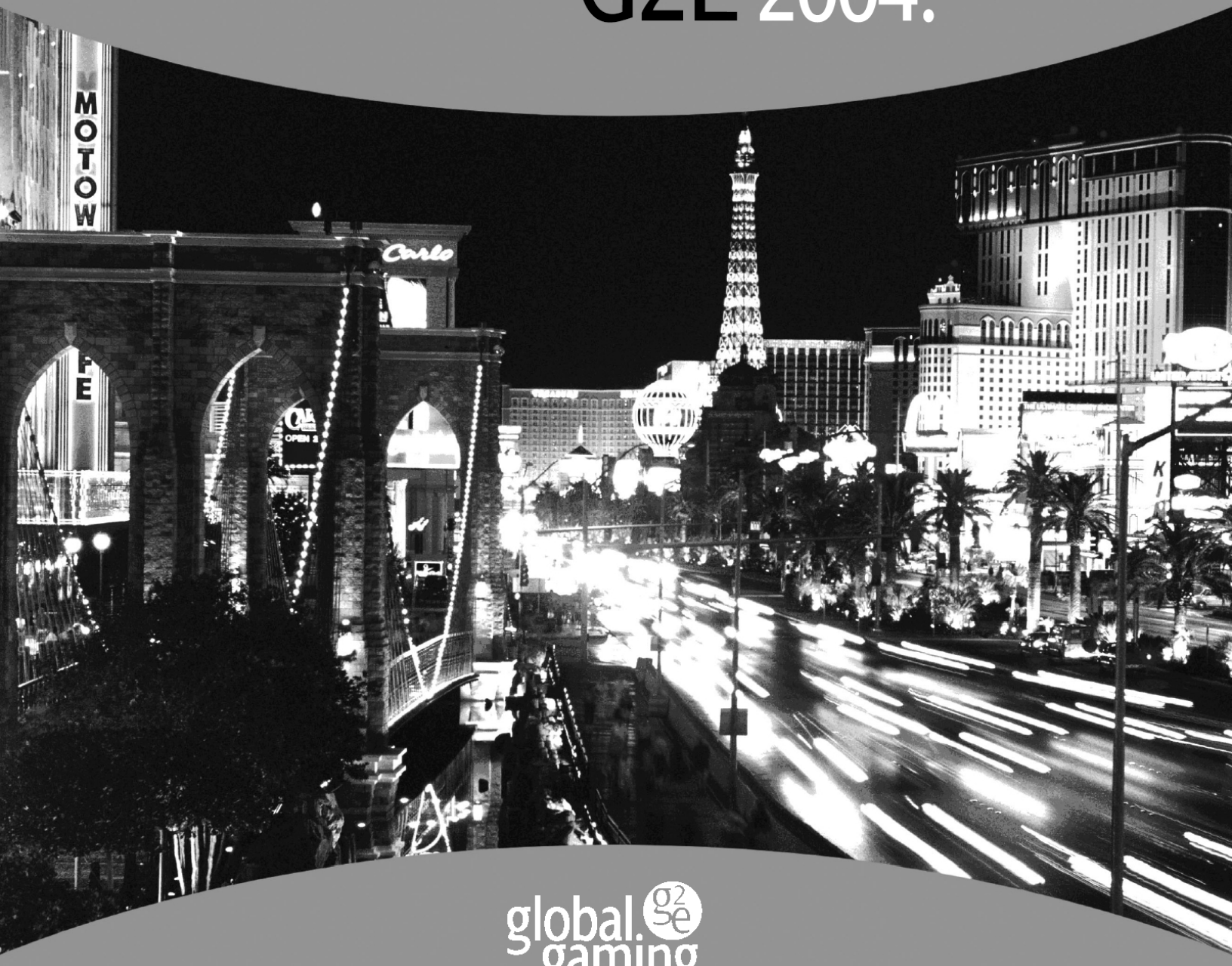
Barcrest Games has launched its latest multistake hi-tech AWP - Gimme Gimme Gimme. Following in the footsteps of Barcrest Games' top-selling multistake success, this new product continues the line of innovative, quality products that customers and players alike have come to expect from Barcrest Games.

The game operates with five paylines on the top stake of 30p and features 'super shots' in the 'super zone' and extra bonuses. This versatile game format means that it appeals to a very wide range of players, making it an ideal product for a range of different sites.

Barcrest Games' Director of UK Sales, Barry Knowles says: "Gimme Gimme Gimme promises to be a hit with players and the cashbox success of its multistake predecessor suggests that it will prove to be a favourite with operators too."

For further information

save the date–
G2E 2004.



global gaming expo g2e

October 5-7, 2004 Las Vegas Convention Center | **October 4, 2004** G2E Training & Development Institute

Global Gaming Expo (G2E) 2004 will attract thousands of gaming professionals from around the world who'll come to sharpen their competitive edge. Join us, and ensure you stay ahead in this challenging market.

MARK THE DATE ON YOUR CALENDAR.

For more information, visit **www.globalgamingexpo.com**

An American Gaming Association Event

Organized by Reed Exhibitions

1-888-314-1378
1-203-840-5626

please contact Sam Drakeford / Clare McMillan@ england. Tel: + 44 (0)113 234 5600. Fax: + 44 (0)113 234 5601. Email: sam.drakeford@englandagency.com

10th Slovakia Show Welcomes Visitors To Bratislava

The international exhibition Slovakia Show is the professional exhibition for the entertainment equipment industry in the Slovak Republic. Many new different types of products will be on show at this year's exhibition, including electronic roulette, gaming machines, snooker and pool tables, accessories, jukeboxes etc.

The exhibition's first year was in 1993 and the exhibition's founder is Jozef Nagy. During its ten years, exhibitors have tried out all available exhibition halls in Bratislava. PKO was the favourite for the exhibitors, but last year for technical reasons the organisers were forced to move the exhibition into the renovated B Hall at the exhibition centre Incheba.

Incheba is a new exhibition complex at which many exhibitions, fairs and congresses are held at international level. It has large capacity, better access for cars and most importantly is technically very well equipped.

Given the satisfaction of exhibitors, organisers and visitors, the organisers had a simple time deciding where to hold the tenth jubilee anniversary exhibition. There is also a hotel in the exhibition area, if exhibitors from abroad need accommodation close to the exhibition. On 15 April the director of the organising agency 4P Publications, Jozef Nagy, appointed Lucia Ciripova as exhibition director. She has great experience in arranging exhibitions. For two years she helped in organising Slovakia Show and was also involved in the birth of the exhibition Expolonia. This year Slovakia Show is prepared as never before.

There are also many new stands that Slovakia Show had previously not had (NOVOMATIC EDP 224 m2, PLAY&WIN 154 m2, Fortunato 120 m2, EUROGAME 100 m2, EVONA 100 m2). The increased interest of international manufacturers is a consequence of the openness of the Slovak market and its stability. Suppliers value the stability of operators and their cultivated manner and reliability in business and therefore are trying to come closer to them. Also thanks to Slovakia's coming entry to the European Union, not only European firms are expressing an interest in the Slovak market and the possibility of doing business in it. Besides international manufacturers, there are also domestic exhibitors. All Slovak firms that primarily produce and deal with the distribution and rental of entertainment equipment and gaming machines already have their place reserved at Incheba.

The organisers are prepared to provide their exhibitors with the best conditions for presenting their firms and their new products. This is also an excellent opportunity to tie

up business contacts with other firms. The tenth jubilee anniversary of the Slovakia Show exhibition will open its gates on 24 September at 10.00.

The exhibition is planned to close on 25 September at 18.00. During both these days the exhibition will be open to the general public. Hot and cold catering at the organiser's expense will be on offer for the exhibitors and visitors. A rich accompanying programme will also be prepared for both exhibition days.

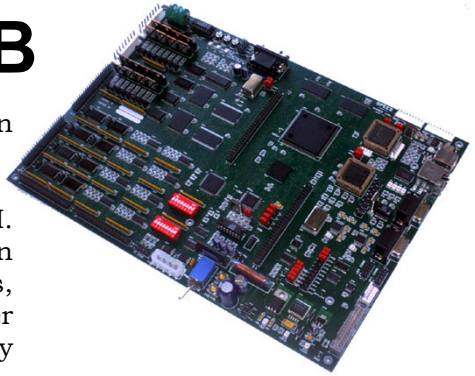
The first day's banquet is now a traditional feature. Last year it was held at the FOOTBAL pub. The popular Slovak singer Marián Greksa sang during the evening and Fredy's Dance Group followed. A great surprise awaits all who come this year, and good, food, music and entertainment will be part of the presentation.

If you would like to participate, further information is available on: + 421 252 634 864, or by e-mail at: gaming@gaming.sk. You can also find an application form on the website at http://www.slovakiashow.sk

Martin Dempsey
MD Associates

The Irish Are Coming! The Irish Are Coming!

Kimble Debuts SPEED PCB



Kimble are proud to announce the release of their new SPEED PCB. The Board, which has taken over two years in the developing promises to give a state of the art platform, which enables the customer to design world-class games. The Idea for this came about after extensive research into the gaming market, which showed the need for a superior platform for games development.

Over the years Kimble have travelled to many different countries throughout the world. What they discovered was the there was great need for programmes that suited the market place and laws of that certain country or indeed state or province. This board allows companies to create these games themselves and gives them a state of the art PCB on which to run these games.

The board, which was designed pacifically with video, based games in mind offers Game developers the highest quality graphic facilities on the market at present using a Fujitsu Crimson graphic processor. The Fujitsu Crimson can display resolutions up to 1024 x 768. It provides 4 layers of overlay display with the bottom 2 layers being split into separate segments and includes various kinds of 2D/ 3D graphic acceleration functions.

SPEED also uses 32MB of Flash memory as opposed to 2MB or 5MB EPROM's. Apart from giving larger memory it also cuts costs for the games developer. It allows the game to be written straight to the board and there is no need for an EPROM programmer. It also allows sectors of the games to be erased to make changes as opposed to erasing the whole programme on the EPROM. The board also contains 16 MB of Graphics RAM. All this is built in to the board and does not require any add on expansion boards.

SPEED PCB uses 32k of NVS RAM. This stores temporary information such as wins or meter readings, which is held if there is a power cut. Non-volatile static memory does not use a battery to hold information this prevents anyone form erasing the information from the chip. To do this they would have to remove the chip from the board.

SPEED uses a Motorola Coldfire processor as the CPU. This allows the board to run at a top speed of 66MHz giving top class performance and game play.

There are 7 different communications ports in total, 1 RJ45 Ethernet Connector, 1 QSPI Header, 1 USB hub, 1 RS232 @ TTL levels and 3 RS232.

The Board also has built in Stereo sound, can drive a 64 Lamp Matrix and has a real time calendar clock.

In order to make writing games to the PCB as easy as possible a development kit will be supplied.

The Development kit contains a CD and a BDM cable.
Included on the CD are:

- A Compiler and Assembler used to convert the programme from C language to machine code.
- Utility programmes which convert Images and sounds, saved on your PC or Mac, such as JPEG and WAV files to header files so the programme can read them.
- Flash programmer for writing the programme to the flash memory using the BDM cable included.
- Software drivers
- Debugger
- Documentation for both hardware and software.
- Sample programmes.

In terms of security each SPEED PCB is given its own individual ID number that is encrypted into the board. This ID is supplied with the board and cannot be obtained by anyone else. This prevents the programme from being copied to another board.

Kimble will be providing a full customer support with some one on hand at all times to help customers with any difficulties that may arise.

Contact:
Kimble Manufacturing
Bachelors Walk
Dundalk
Co. Louth
Ireland
Mr Paul Hoey
00353 42 9336574
00353 42 9333251
kimble@iol.ie
www.kimble.ie

Jim, Martin & Yuri of Kimble

Vertical Deflection Circuits - part 4

How Ceronix Does It

In part 3 of Slot Tech Magazine's look at vertical deflection, we took a detailed look at the all-but-identical vertical deflection circuits in monitors manufactured by Kortek and Kristel.

Of course, no discussion of gaming monitors would be complete without looking at Ceronix, arguably the most well-known name in the industry.

In order to present a complete picture of all the vertical deflection circuits you are likely to encounter, part 4 presents vertical deflection, Ceronix style. Straight from the horse's mouth, this technical description, with accompanying illustrations is reprinted courtesy of Ceronix.

Ceronix Vertical Deflection

The LA7851 IC is used for the vertical oscillator. The LA7838 is a vertical deflection control and high efficiency vertical yoke driver IC. Together they form a compact and efficient vertical deflection system.

The vertical oscillator in the LA7851 supplies timing to the vertical deflection IC to maintain a raster with no sync present. Vertical sync supplies the timing when sync is present.

The one shot in the LA7838 clamps the ramp forming capacitor 401 to 5V during the first half of vertical retrace.

The ramp forming capacitor is supplied with current by a current source at pin 6. The current source has a fixed 6 volt input voltage at pin 4. A linear ramp is generated if a fixed resistor is connected from pin 4 to GND.

Feedback from the yoke current, via resistor 403, is used to modify the linear ramp which helps correct for nonlinearity introduced by the voltage feedback circuit connected to pin 7. The vertical size control is connected to the current source input since adjusting the slope of the ramp adjusts the vertical size. This ramp with the clamp, as the discharge, produces a sawtooth waveform which is connected to the + input of the vertical control differential amplifier at pin 6.

The combination, voltage and current, feedback circuit senses the parabolic waveform on the yoke coupling capacitor 449 and is connected to the yoke current sense resistor 193. This circuit is then connected to the other input of the differential amplifier at pin 7. A capacitor 391 smoothes the parabolic waveform and a voltage divider is used to set the output bias voltage. The time constant of capacitor 391 and resistor 392 is set to produce good vertical linearity. An additional linearity correction circuit is added to fine tune vertical linearity. This circuit can be set to add or subtract deflection from the upper and lower portions of the raster.

The differential amplifier controls the power output stage, which drives the vertical deflection yoke. The retrace booster is turned on when the ramp voltage is set to the clamp voltage and is reset when the yoke feedback voltage balances the ramp voltage.

The vertical sync comes from the synchronized vertical sync interface circuit for monitors without interlace. For monitors with interlace the vertical sync comes from the sync comparator via a coupling capacitor and bypasses

ADVERTISEMENT

Randy Fromm's Casino School

On-Site Technician training

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

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

Students learn how to work with:

THE DIGITAL MULTIMETER

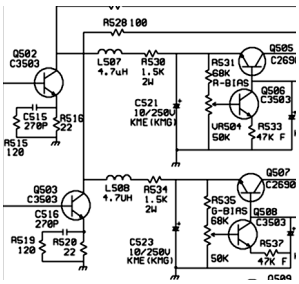
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

ELECTRONIC COMPONENTS

The individual components used in games are introduced. Parts such as resistors, capacitors, diodes, potentiometers and transistors are covered individually. Students learn how the components work and how to test them using the meter.

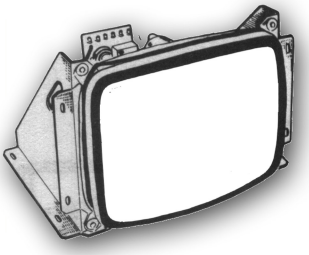
SCHEMATIC DIAGRAMS

Schematic diagrams are the "blueprints" for electronics. Learning to read schematics is easy once you know how the parts work!



POWER SUPPLIES

Power supply failure is a common complaint in many different types of systems.. Power supply failures are discussed during the class, along with shortcuts for troubleshooting and repairing them.

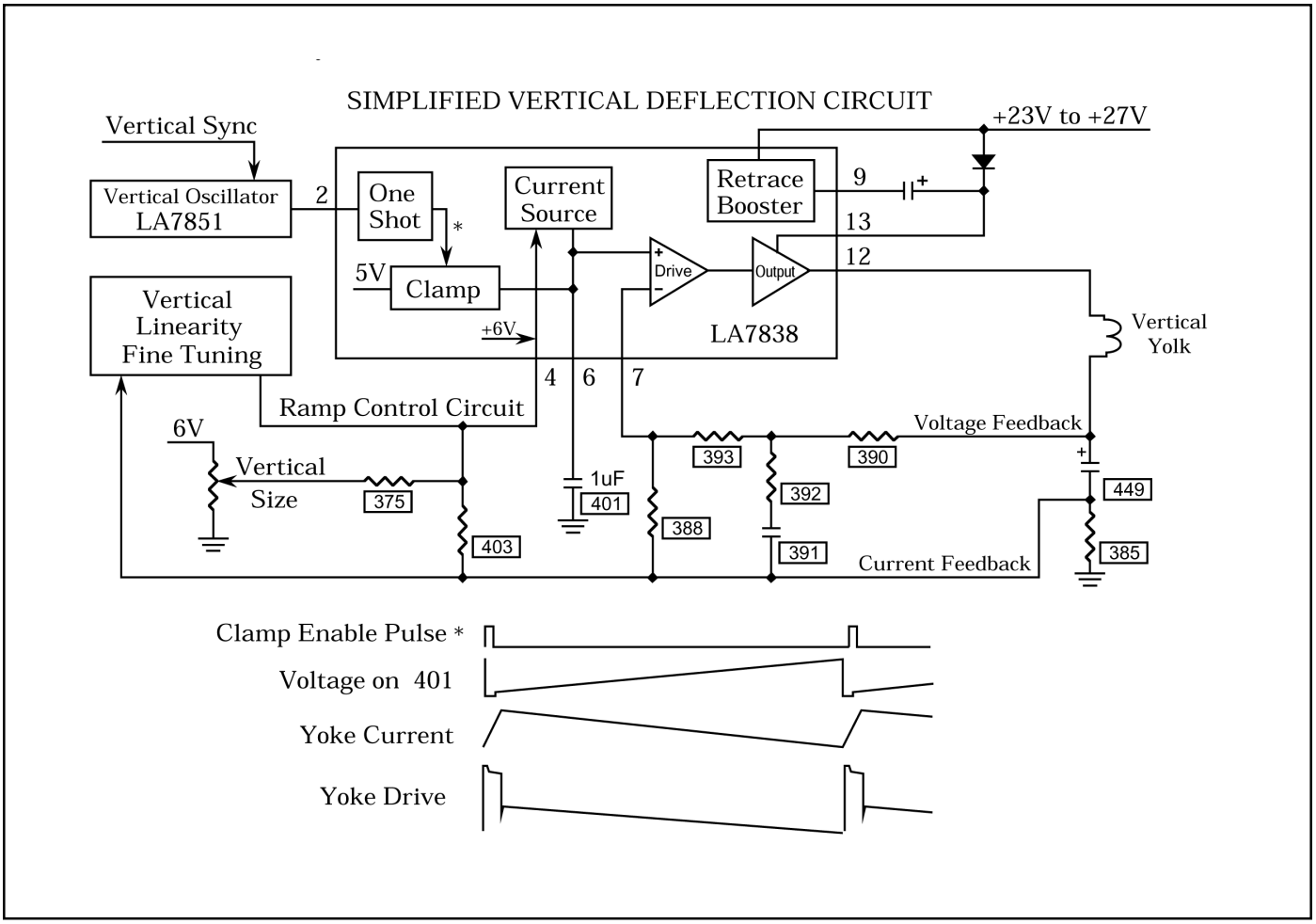


MONITOR REPAIR

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

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

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



the synchronizing circuit. Pin 19 of the LA7851 is the vertical sync input and will start the next oscillator cycle on either the positive or negative sync pulse. The vertical oscillator capacitor 410 discharges to 4 volts on the leading edge of the vertical sync by the action of an internal transistor and resistor. Capacitor 410 is then charged by resistor 362 until the next sync pulse or to 8 volts, which ever comes first. The V. osc. frequency is set low such that the adjustment resistor 363 can be used to act as a vertical hold adjustment. Solder connection V is used to make this adjustment.

The vertical oscillator triggers the vertical oscillator one shot, which outputs a pulse to trigger the vertical sync input, pin 2, of the LA7838. This one shot is also used to synchronize the CRT auto bias IC. Resistor 361 & capacitor 414 set the timeout which must be longer than the CRT auto bias Vs delay and shorter than the vertical blanking. Resistors 370 & 408 supply the pullup for this one shot.

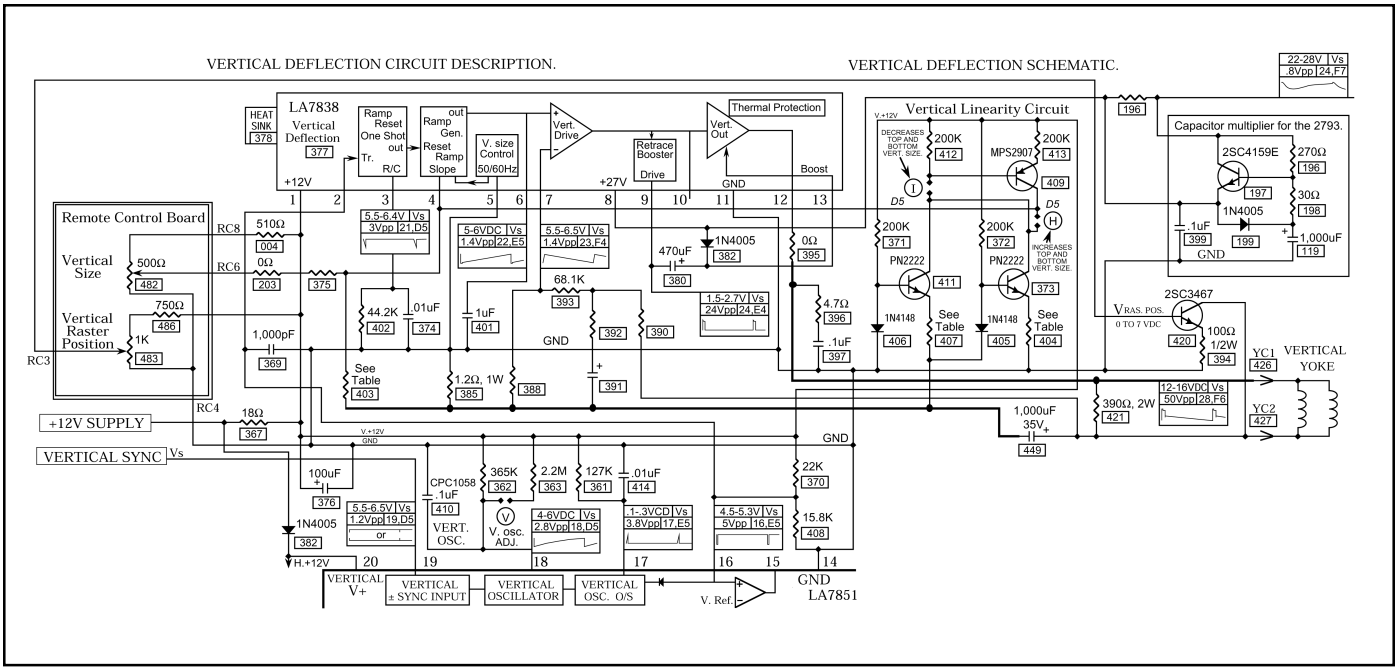
The one shot in the LA7838 clamps the ramp forming capacitor 401 to 5 volts for about half of the vertical retrace time. Capacitor 374 and resistor 402 form the RC circuit for the ramp reset one shot.

The ramp capacitor 401 is charged by current from a current generator with a 6 volt input node at pin 4. The vertical size is adjusted by the vertical size control 482 which is connected to pin 4 via resistors 003 & 375. The adjustment range is set by resistor 375 and the maximum deflection is set by resistor 403. A third input to pin 4 comes from the vertical linearity circuit. This circuit uses the above and below GND parts of the vertical current waveform separately. Transistor 411 conducts when the vertical current waveform is below GND. This transistor's emitter is referenced to GND by diode 406 and resistor 371. The emitter is connected to the vertical current waveform through resistor 407 which is adjusted for each tube and yoke combination.

In similar manner, the posi-

Don't forget to sign up for TechFest 7 Atlantic City, NJ
October 21st - 23rd, 2003

See the website at slot-tech.com for details and enrollment form



tive half of the vertical current waveform is conducted by transistor 373 diode 405 , and resistors 372 and 404 . Both transistors 373 and 411 may be connected to pin 4 via solder connection H or they may be connected to inverting transistor 409 and resistors 412 and 413 . The inverting transistor is connected with solder connection I and decreases the vertical size at the top and bottom of the screen.

The ramp capacitor 401 is connected to a differential amplifier at pin 6 and the negative feedback from the yoke return line is connected to pin 7. This negative feedback, which senses the DC component of the vertical output voltage, is also the current feedback for the LA7838. It is made up of voltage divider resistors 388 and 390 + 393 and a wave shaping integrator. The wave shaping integrator, capacitor 391 and resistor 392 , is used as the primary vertical linearity adjustment.

The output of the vertical drive, differential amplifier, is connected to the power amplifier which drives the yoke. A booster circuit is connected to the the power amplifier supply via capacitor 380 and clamp diode 382 such that when the booster is active, during vertical retrace, the power supply to the vertical output amplifier is doubled. Resistor 396 and capacitor 397 make up a high frequency vertical output stabilization circuit.

The vertical output at pin 12 is connected to the vertical yoke. Resistor 421 is a load resistor across the yoke which stabilizes the vertical deflection feedback loop. The yoke return is decoupled by capacitor 449 and the vertical current is sensed by resistor 385 . The vertical raster position is adjusted by injecting current in the vertical yoke return. This is accomplished by transistor 420 , with emitter resistor 394 , and the V. RAS. POS. control 483 .

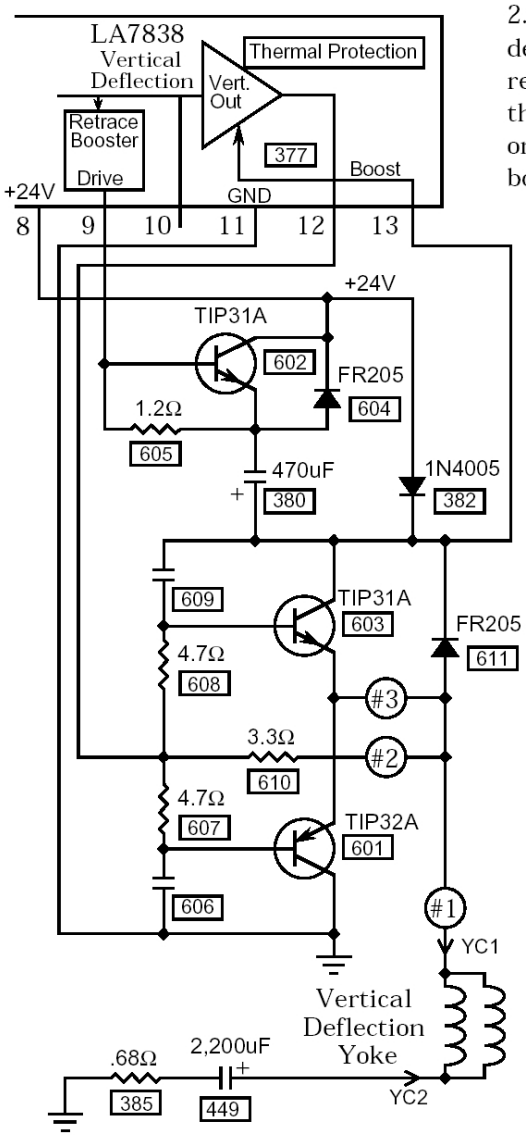
A capacitive multiplier circuit is connected in series with the 27 volt line, in the 27" monitor, to reduce the ripple voltage due to beam current variations. Transistor 197 conducts current from the 27 volt line to the LA7838 deflection supply input pin 8. Capacitor 119 and resistors 196 and 198 form a low pass filter which is connected to the base of this transistor. Diode 199 conducts the inductive current from the vertical yoke during the first part of retrace. A jumper at 196 replaces the capacitive multiplier circuit in the chassis with smaller CRTs.

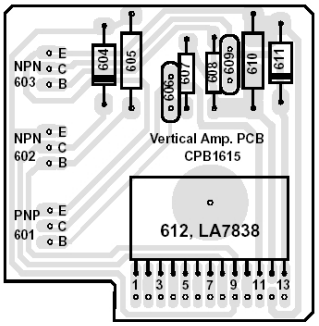
Next Month: Troubleshooting shortcuts for Ceronix monitors that make troubleshooting a snap.

- Slot Tech Magazine

Vertical Booster Amplifier Circuit, Circuit And Function Description.

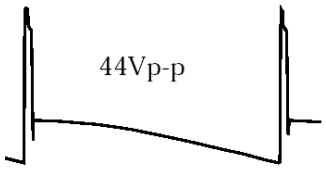
Monitors with vertical deflection current which exceeds 2.2 Ap-p cannot be driven directly by the LA7838 vertical deflection IC. The vertical booster amplifier circuit reduces the output current of the LA7838 by amplifying the vertical deflection current. The LA7838 is mounted on the vertical booster amplifier circuit board to allow the boosters circuit to be inserted at the output of the LA7838.



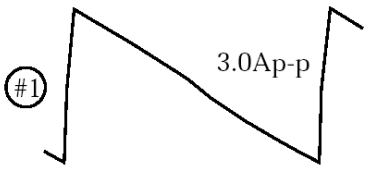


PCB View;
Foil Side.

Vertical Booster Circuit, Operation. The following waveforms are taken from the 2793-VGA monitor. See waveform #1 for the vertical deflection current. Waveform #2 shows the LA7838 output current. Waveform #3 shows the current supplied by the vertical booster amplifier circuit. These current waveforms describe how the vertical booster circuit reduces the LA7838 output current to a current which is well within the specification of the IC.

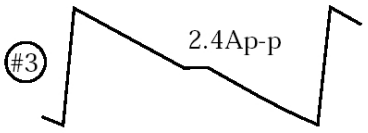


Vertical yoke drive, voltage waveform.



Vertical yoke drive, current waveform.

LA7838 output, current waveform.



Vertical booster, current waveform.

The output of the LA7838 is connected to the yoke by a 3.3Ω resister at 610. It also drives the bases of transistors 601 and 603 through 4.7Ω stabilization resistors. When the voltage drop across resistor 610 reaches ±.7V the respective transistor (601 for -.7V & 603 for +.7V) takes over most of the additional vertical yoke drive current.

The retrace booster pulse, from the LA7838 pin 9, is connected to the retrace booster capacitor at 380 and is also buffered by an NPN transistor at 602. The output of the retrace boost is connected to the LA7838 at pin 13 and to the vertical booster NPN transistor at 603.

Diodes 604 and 611 conduct current, right at the start of retrace. This current is produced by the energy in the yoke, from the end of the last trace. Diode 382 supplies the deflection current to both the LA7838 and the booster amplifier circuits during trace time.

Stabilization capacitors 606 and 609 are not used at present, but may be needed with other output transistors.

Subscriptions & Back Issues

Why back issues of Slot Tech Magazine are important to own . . .

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

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

Randy Fromm's
Slot Tech Magazine is published monthly by:
Slot Tech Magazine
1944 Falmouth Dr.
El Cajon, CA 92020-2827
tel.619.593.6131
fax.619.593.6132
e-mail editor@slot-techs.com

Subscription rates:

Domestic (USA)
1 year - $60.00
2 years - $120.00

International
1 year - $120.00
2 years - $240.00

Back Issues

All single issues of Slot Tech Magazine are $10.00/ea. For further details on the contents of each issue, please refer to the website at slot-techs.com

- ☐ May, 2001
- ☐ June, 2001
- ☐ July, 2001
- ☐ August, 2001
- ☐ September, 2001
- ☐ October, 2001
- ☐ November, 2001
- ☐ December, 2001
- ☐ January, 2002
- ☐ February, 2002
- ☐ March, 2002
- ☐ April, 2002
- ☐ May, 2002
- ☐ June, 2002
- ☐ July, 2002
- ☐ August, 2002
- ☐ September, 2002
- ☐ October, 2002
- ☐ November, 2002
- ☐ December, 2002
- ☐ January, 2003
- ☐ February, 2003
- ☐ March, 2003
- ☐ April, 2003
- ☐ May, 2003
- ☐ June, 2003
- ☐ July, 2003
- ☐ August, 2003

Company Name _____

Contact _____

Address _____

Address _____

City _____ **State/Prov.** _____

Country _____ **Zip/Postal Code** _____

Telephone _____ **Fax** _____

E-mail _____

Type of card: [ ] American Express
[ ] Discover
[ ] MasterCard
[ ] Visa

Account Number: _____

Expiration Date: _____

- [ ] 1 year subscription, domestic
- [ ] 1 year subscription, international
- [ ] 2 year subscription, domestic
- [ ] 2 year subscription, international