Inside Slot Tech Magazine

August, 2003

Page 2 - Editorial

Page 4 - Jackpots & Machine Inspection

Page 8 - Memory

Page 14 - Atronic Presents: The Sign of Zodiac

Page 16 - Money Controls Hits the Road With New SR5i Coin Acceptor
- plus - Money Controls in Asia - plus - New Oval Bezel

Page 20 - Dion's Corner

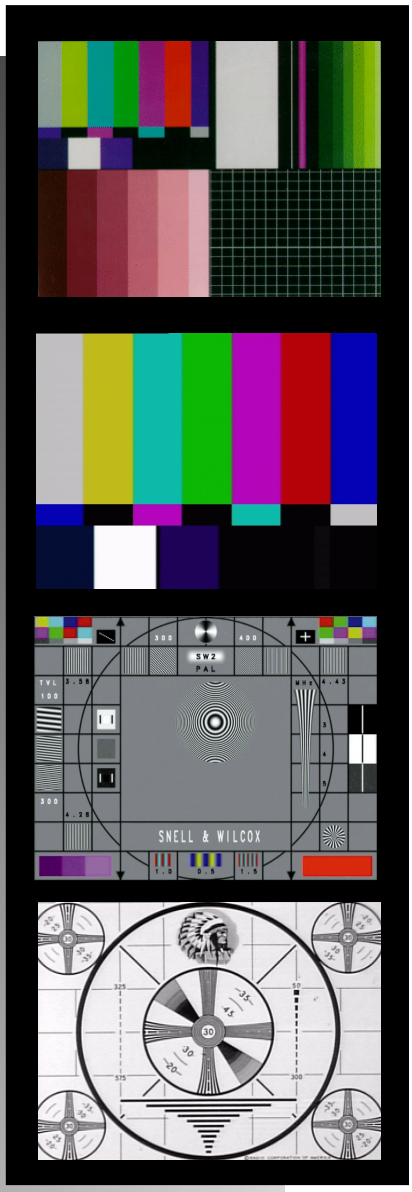
Page 22 - Happ Controls Releases 2004 Gaming Products Catalog

Page 23 - TechFest 7 TechFest 7 TechFest 7 Atlantic City, NJ - October 21, 22, 23 2003

Page 24 - International View

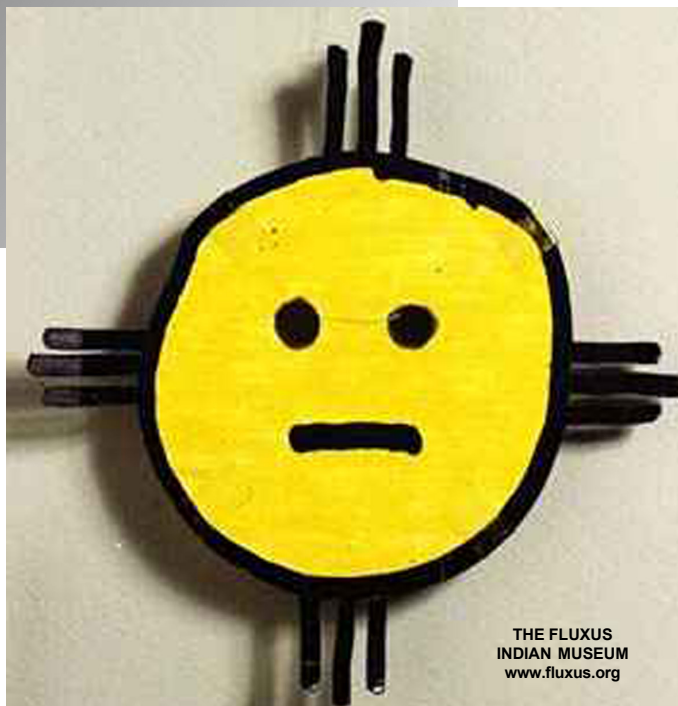
Page 28 - Vertical Deflection Circuits - part 3

Page 36 - Subscriptions and Back Issues Order form



Probably the most famous American B&W test pattern is the so-called "Indian Head" monoscope pattern. This pattern was originated by RCA in 1939; it was designed to be generated using a special tube called a monoscope, a CRT which had a metal plate target on which the pattern was printed. The black lines of the pattern would interrupt current flow as the pattern was scanned to provide the desired video output. These tubes could only handle black and white - no shades of grey hence they had to be simulated either with a halftone dot pattern or with patterns of fine lines.

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



Slot Tech Editorial

The doldrums of summer don't last long. Already, things are starting to pick up as we move toward the dynamic fall season and the Global Gaming Expo in September. The Borgata has opened (coinless!) and reservations are being accepted for TechFest 7, to be held October 21-23 in Atlantic City.

Since this TechFest will be held at the campus of Atlantic Cape Community College, attendance will be strictly limited to the number of seats in the lecture halls. Unlike past TechFests, which have been largely held at casino/hotel meeting rooms, we cannot expand to a larger room to accommodate last minute sign-ups. If you're interested in attending, please try to sign up as soon as possible as most TechFests have been sold-out. Visit the website at slot-techs.com for an enrollment form.

Dion's Back! Dion Anderson returns to the fold, and returns to slot machine repair as well, after a brief stint as an amusement machine technician. Read about his hair-raising adventures with 50-inch projection monitors (and more) starting on page 20.

This month, Kevin Noble turns to jackpots and machine inspection. He details the reporting and inspection procedure, Canadian Style. Beauty, eh?

Herschel Peeler takes Slot Tech Magazine's "Digital" series to the next level. As you recall, we left off with flip-flops (Slot Tech Magazine, September 2002). As you'll see, this is a primitive, one-bit memory. See how the concept is expanded to encompass a range of memory devices such as ROMs, EPROMs and EEPROMs, starting on page eight.

This issue presents part 3 of our look at the vertical deflection circuit. This month, we get down to the heart of the matter with a detailed look at the almost-identical vertical deflection circuitry in two of gaming's popular monitors, Kortek and Kristel. The fun continues on page 28. Next month, we'll feature the vertical deflection circuitry used in gaming's legacy monitor manufacturer, Ceronix.

By the way, the French were extremely nice to us during our river cruise last month. In fact, the folks we met often went overboard to assist us and show us a good time. They all stressed that they like the Americans. They were simply opposed to the war in Iraq. Ces't la vie.

-- and you can call me "Captain Randy."

Enjoy the rest of your summer. See you at the casino.

Randy Fromm - Publisher

Randy Fromm's
Slot Tech Magazine

Editor
Randy Fromm

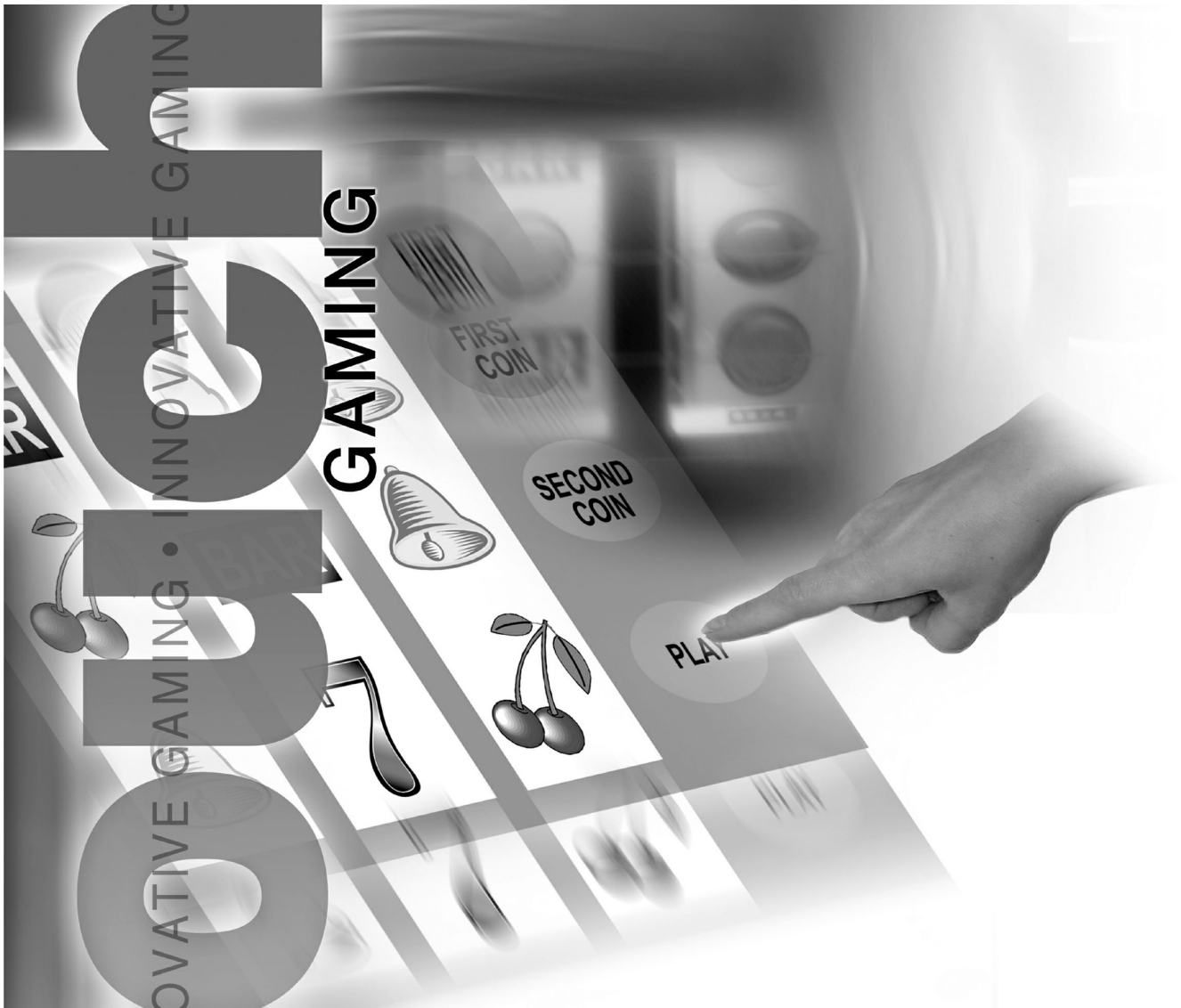
Technical Writers

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*

Technical Shift

Jackpots & Machine Inspection

By Kevin Noble

The purpose of the machine inspection to make sure the machine has not been tampered with, and that it is a valid jackpot. Jackpots of $10,000 and above do require a slot technician to be present and inspect the game's integrity. Having the technician present might deter potential cheating of the game as well as increasing the odds that a cheat would be noticed and reported. Jackpots over $30,000 must require the EGO (Electronic Gaming Officer) to be present to verify EPROMs and seals. They also perform their own pre-inspection of the machine before we can enter. Their presence alone draws much attention to the machine and makes someone trying to cheat the game very much on edge if they were watching.

When approaching the machine after we are first notified that a Technical Jackpot has gone off, the Shift Manager on duty alerts all the proper personal involved in this procedure. The Jackpot verification sheet hanging in the shop is brought out to the location and our own pre-inspection begins. Approaching the machine we can start matching the reel combination with the award glass for the correct pay, the tower light operation, the sound the game is making and that all doors are secure.

The Inspection Sheet

Before entering the machine: The Technical jackpot inspection sheet has a variety of items that needs to be checked, verified, and checked off. Game information such as location, asset number, time/date, serial number, manufacturer, denomination, top award, and progressive information (if it is a progressive) that includes link ID, number, and the link theme. This is all information about the machine before we have authority to enter.
Some other information that could be logged might be the symbol on reel 1, reel 2, and reel 3, the amount of coins or credits wagered, coins won, credits remaining, the jackpot amount, sound, and the tower light configuration.

Permission to enter the machine: After all parties have been contacted, the proper staff is in place and permission has been granted to enter the machine, we can begin the internal inspection listed on the inspection sheet. The items on this sheet include checking that the reel strips are in the correct positions, that no slugs or foreign coins are in the hopper, that all locks are tight and the cams are secure, the integrity of the machine and the seal numbers on the EPROMs.

General Integrity: This item is on the list and is basically up to the technician performing the inspection. When I perform my inspection, I power down the machine and check for the correct IDX version, spacers, and optic position, BV dips switches, BV EPROM version, moving the reels out of position, and anything that could affect the outcome of the game. After powering back up and closing the door, the machine is allowed to re-spin to the correct winning combination while listening again for the sounds.

AGCO Inspection: Jackpots of $30,000 and above require the EGO to be present. We cannot open the machine until the officer grants permission. They have their own set of guidelines and procedures that they must follow which I am not going to get into. It is always a pleasure working with them doing these jackpots.
The Approval: After the visual and physical checks are complete, and the machine passes your inspection, it is now time to inform the Shift Manager that they can begin the final process of paying out the patron. Being present at the machine is also mandatory when the patron is being paid out. You are another witness in the payout of the funds to the customer so we can reset the machine back into play mode. So far, I have not experienced any wrongdoings and I hope I never will.

The Taking of the final meters: Once the inspection is complete and the patron has been paid out, the final process begins with the logging of the meters. Depending on the game, the hard meters may

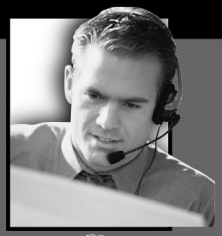
Pro'sKit®
Tool Kit
Order #22-3283

VISIT US AT G2E BOOTH #3117

DURACELL® PROCELL®
Alkaline Batteries

Dataman S4 Validator/Programmer
Order #72-6980

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 ST06

have to be taken when the door is open during your physical inspection. In most cases, all meter information is logged when the machine door is closed and the machine has been reset. All machines require the soft, Mikohn, and hard meters to be recorded on the inspection sheet, along with Game State Audit Trial on the IGT reels. Logging every other number for the GSAT until we reach the number 0800 verifies that the machine has valid hand pay jackpot.

Mission complete: The floor supervisor first alerts the Shift Manager, then the procedure of alerting the proper authorities is started, getting permission to enter and begin the inspection, the visual and physical inspections, the paying of the patron, meters and now signing off the inspection sheets completes our mission. The Shift Manager now seeks out other signatures, and files the sheet into their logbook.

Game state audit trail (IGT #3):

When in soft meter mode, we can access the Game State Audit trail by turning the reset key until #3 appears in the coin played window. By logging the first set of 4 digits and pressing the spin button twice each time afterward, logging the new 4 digit numbers until 0800 is attained. * 0001-0204-0507-0009-0001-0204-0800 * Our audit trail skips every other digit. * For evaluation purpose this would read from left to right and show that the previous game from an idle state and coins and credits were inserted to the maximum bet. The reels were spun and the game was evaluated to a win with the winning credits being added to the credit meter. After returning to an idle mode, the player then cashed out. The next game would show the exact result except for a handpay situation came up and returned to idle mode.

Overview

Here is just another unexpected task that seems to pop up when all hell breaks loose on the floor. It seems like when everybody is tied up, this situation arises. Usually from start to finish the complete process takes about 20 minutes and if AGCO is needed depending on the time and situation it could take between 20 minutes to an hour.

From experience, the patrons don't mind the wait knowing the money is on its way and it's another way to interact with the customer. When first approaching the machine and introducing myself, explaining the task that I am about to perform, it is nice to hear the pure joy and excitement from the customer explaining what just took place. Wanting to contact family and friends that accompanied them to the Casino, or simply stepping off the floor to call their loved ones. Sometimes it is the opposite to hear the customer rant and rave how much money they spent.

There are many other behind-the-scenes procedures that take place from the Operations and Cage and Coin sides not mentioned. Many departments are involved and it usually goes down without a hitch.

In our department, everybody is trained to perform these inspections; never knowing when one might go off. The technician on duty must be able to interpret the inspection sheet, fill out all the information, follow the procedures, count in their head the amount of money that has changed hands, and be accountable for the inspection when they sign off on the jackpot.

Every technician has his or her own way of performing the inspection. I feel that if my name is on the sheet, I will go that extra mile to ensure other those items not on the list get a glance. I have never experienced whether a customer is going or not going to be paid out, nor is it my decision to get involved. I report my inspection results to all persons involved and allow the Shift Manager on duty make that final decision.

- Kevin Noble
- Knoble@slot-techs.com

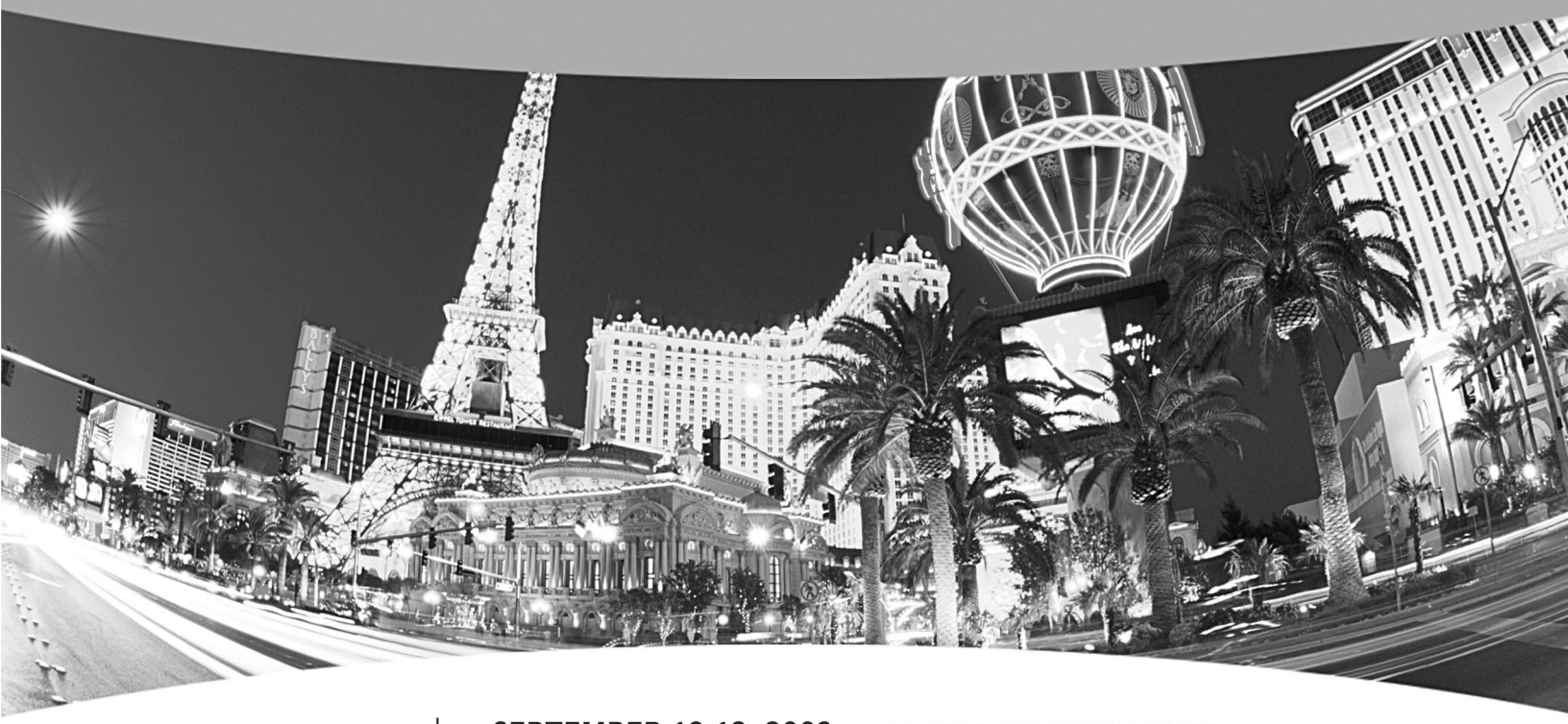
00	**Idle, waiting for coin in**
01	**Coin is inserted, waiting for more**
02	**Max bet is wagered, waiting for spin**
03	**The game has won, paid to hopper**
04	**The reels started to spin**
05	**The reels have stopped, evaluation begins**
06	**The game was lost**
07	**The game won, credits to credit meter**
08	**The game has won, resulting in a HANDPAY.**
09	**The player cashes out credit meter**
10	**Power is lost from game during Bill transaction**
11	**Bill inserted and cashed out from hopper**
12	**Bill inserted and added to credit meter**
13	**For special features (NUDGE, SPIN TILL WIN)**
14	**Cashes transaction from host system to game**
15	**Credits transferred from system to game**
16	**Credits transferred from game to system.**
22	**Pay SAS bonus amount**

you're trying to

grow your markets

and you're running out of time.

so what do you say to a few days in vegas?



global g2e gaming expo

SEPTEMBER 16-18, 2003 • LAS VEGAS CONVENTION CENTER

SEPTEMBER 15, 2003 • G2E TRAINING & DEVELOPMENT INSTITUTE

Competition in gaming is fierce. That's why we suggest you get away for a few days to Vegas and this year's Global Gaming Expo (G2E). We've got the products and technologies you need to grow your markets and get time back on your side. So, what do you say to a few days in the Mecca of gaming?

Hone your competitive edge and enjoy discounts to the Show and Conference.
Register by August 18 at www.globalgamingexpo.com/ad

An American Gaming Association Event

Organized by Reed Exhibitions

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

Memory

By Herschel Peeler

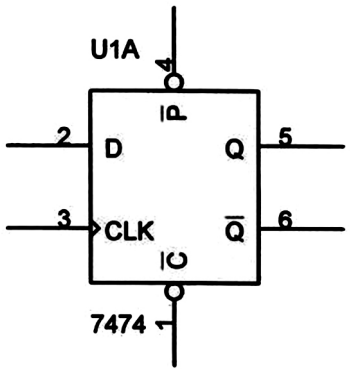
The Possible Brain of Herschel Peeler

If you have been following the articles on Basic Electronic Components and Digital Logic you are ready for the next step in the development. Previous courses have introduced you to basic passive components (resistors, capacitors and diodes). You should have a good grasp of various transistors. We have used those basic building blocks to introduce you to what is inside Digital Integrated Circuits, and followed that up with a course on Basic Logic Gates and Latches (Slot Tech Magazine, October 2002). Now that you know what gates and latches are, let's build on that knowledge and venture into more complex logic.

If you remember our old friend, the D-Type Logic Gate, we have a basic memory element. We can apply a pulse to it and latch it into a Set state. It stays Set until we send it another pulse to Reset (Clear) it. The Data (D) input determines whether it will Set or Clear. If D is High when we get a Clock Pulse, the latch will Set. The Q output goes High, Q-Not goes low. If D is Low when we get a Clock Pulse, the latch will Clear. The Q output goes Low, and Q-Not goes High.

Registers

A Register is nothing more than a bank of D-Type Flip Flops tied together. In the example shown we have four "D" inputs, named "D0", "D1", "D2", and "D3". The four "Q" outputs are named "Q0", "Q1", "Q2", and "Q3". All the Clock inputs are connected together and are fed from one input, our Common Clock input. In this case, or Clock input is a High-Edge Trigger. When the Clock input goes high the Data present at the "D" inputs gets latched into the latches. If we take a close look at the clock input ("CLK") of the latches, we see a line and a triangle. The line (instead of a dot) means that the signal will be High oriented. The triangle shape indicates that the signal is Edge Triggered.



BASIC D-TYPE FLIP FLOP

All of the Clear* inputs are also tied together. When Reset* goes low all of the latches will go into the Clear state. Since a Preset input (P*) is of no use to the register of our design, we have simple eliminated it from the drawing to simplify the drawing.

With this Four-bit Register we can latch four bits of data and save them for posterity. There are ICs in the TTL and CMOS family that are registers just as we have described. The 7475 is a 4-bit register. The 74174 is a 6-bit register. More popularly these come as 8-bit registers to go with 8-bit microprocessors, allowing us to store one byte of information going in or out of a microprocessor. The 74273 is such an 8-bit register. He has a brother, 74373, that has a tri-state buffer on the output. With the 74373 we can latch a byte of data in it,

and read that data by pulling OE* (Output Enable*) low.

SRAM

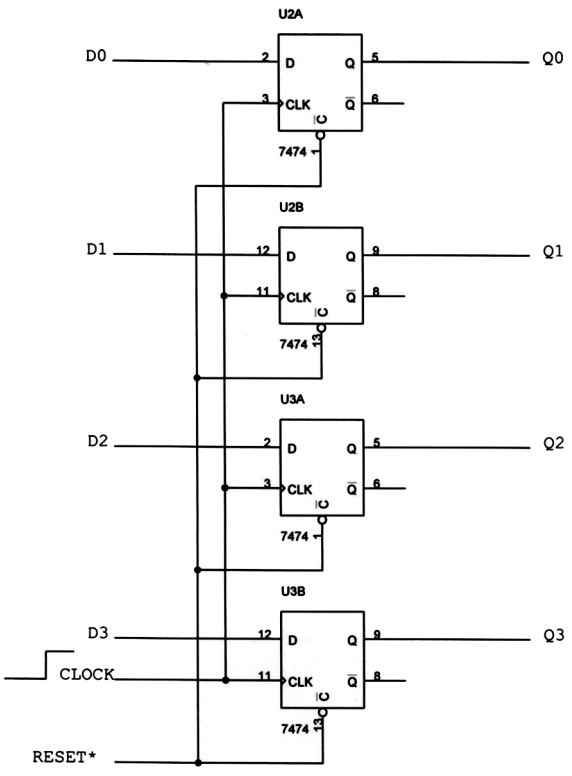
All the games you have on your floor use Static Random Address Memory (SRAM) to store game data. For the purposes of basic understanding SRAM is no more than an array of register just as we have described above. A basic example of what the insides of a SRAM looks like is shown. In this case we have four 8-bit registers (made up of 74373's). The objective of a Write Operation is to apply 8-bits of data to the Data Buss, select one of the registers, and store the Data into the selected register. In a Read operation, we select one of the registers, and read the contents of that register out onto the Data Buss.

To select which register we want to access we use a decoder. The lines that do this selection are called Address Lines, or Address Buss collectively. To select one of four registers we need two address lines, named "A0", and "A1".

The 74139 is a basic Decoder. A binary value applied to the "A" and "B" inputs makes one of the four outputs ("Y0*", "Y1*", "Y2*", or "Y3*") go low when the Gate* input (G*) also goes low.

A	B	Out 0 0	Y0*
1	0	Y1* 0 1	Y2*
1	1	Y3*	

For our purposes the "A" and "B" inputs are connected to our Address Buss. One de-



A Register is a bank of D-Type Flip Flops tied together.

coder has the G* tied to the WR* (Write*) line. When Write* goes low we generate a Write strobe to one of the 74373's LE* (Latch Enable*) inputs. The other decoder has the G* input tied to the RD* (Read*) line. When RD* goes low we will generate a Read strobe to one of the 74373's, enabling the outputs of that latch onto the Data Buss.

Write Operation

The microprocessor applies 8-bits of data to the Data Buss, sends out an address that will determine which of the latches we will write to, then makes WR* go low. The Data is applied to all four latches, but will only get loaded into the one that gets the Latch Enable Strobe.

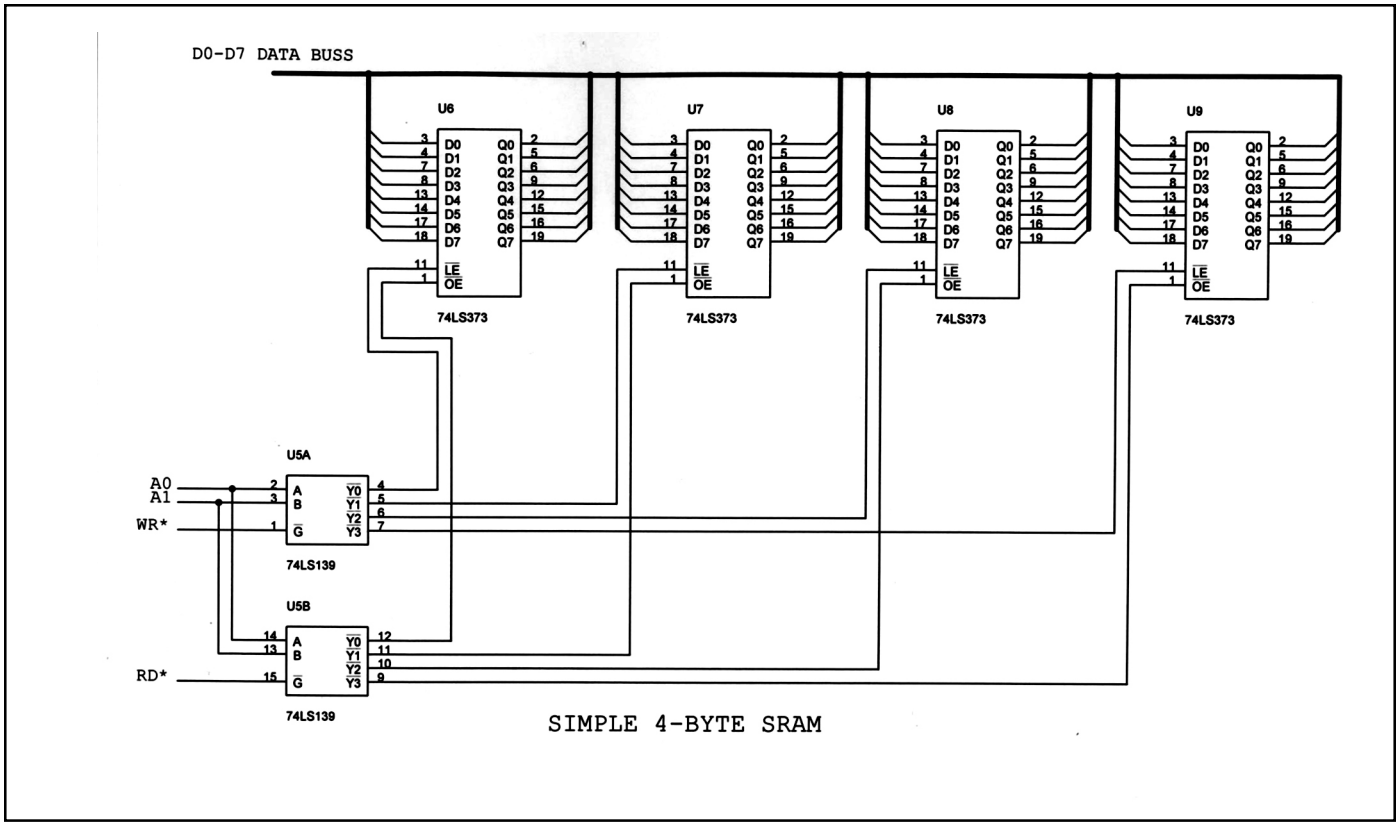
Read Operation

The microprocessor applies an address then pulls RD* low. This generates a Read Strobe to one of the 74373's which enables the latch outputs onto the Data Buss. The microprocessor then reads this data from the Data Buss.

Volatile memory Since our memory device in a SRAM is just a latch, when we remove power, the contents are lost. On power up, contents of memory may be random, or at least unpredictable. For this reason most of the games have a battery to keep power on the SRAM when the game is turned off.

Real Devices As well as Address and Data lines, we have a combination of Write enables and Chip Select lines (some high, some low) to enable memory. SRAMs are pretty simple devices. Depending on the technology used to make the device, the device also has a speed rating. The complexity of the circuit requires a certain degree of time to work. To read data, there is a delay from the time RD* goes low to the time data actually appears at the output of the IC and is stable. This Access time is also a determining factor when replacing memory chips. Write also has a time lag. The length of the WR* pulse must be long enough to assure that the data applied has reached the memory cell and has stabilized. This speed rating is usually indicated by a suffix added on to the end of the part number. A "-10" or "-100" would likely mean a 100 ns access time. You can replace a slow components with a faster one with no penalty, but before you replace a faster on with a slower one, take a close look at the design and see how much access time the design actually allows.

Older games used a 6116-type device that had 2,048 bytes of memory. This would be like having 2,048 of these 74373's in one package. To access 2,048 individual addresses we need 11 address lines (A0 through A10). Operation is the same. We just have more Address lines than the four-byte device we previ-



ously described. Just for the knowledge, the "..16" part of the 6116 part number is the number of bits the RAM can store. 16K, or 2K by 8 (2K address of 8-bits each).

Not so old games may have had a 6264-type device. Function is the same. Just more Address lines. The "...64" means 64K bits, or 8K address of 8-bits. Following devices were "...128 (16K x 8), ...256 (32K x 8), or ...512 (64K x 8).

Newer devices may have megabytes of memory. The part numbering system has devolved into a number of different standards. With a little knowledge and imagination you can usually look at the part number and tell what the capability of the device is.

ROMs

Read Only Memories are even simpler devices. There are Mask programmable ROMs that must have the contents specified at the time the chip is manufactured. In the gam-

ing industry we will only find these in really old games. PROM's are Field Programmable Read Only Memories. They have the advantage of being programmed after manufacturing. The memory cell is nothing more than a fusible link that is blown away by a high power pulse when the device is programmed. In either case, once the device is programmed, the contents stays even after power is removed. This is typical of all members of the ROM family. These devices have Address Lines, Data Lines, and Enable Lines, but no Write lines.

EPROMs are Erasable Programmable Read Only Memories. This almost seems a contradiction of terms to call something Erasable and Programmable, yet still call it a Read Only Memory. They qualify as a ROM because they retain their contents when power is removed. They are programmable, meaning their contents may be structured in the post-manufacturing world. It is Erasable by Ultraviolet light, which sets the contents back to all "1's". This is the most popular type of ROM used in the games. These can be readily identified by the glass (actually it's crystal) window in the device. These devices will have Address Lines, Data Lines, Enable lines, and perhaps a Program input that must be activated to program the device.

EEPROMs are Electrically Erasable Programmable read Only Memories. Instead of having a window that allows the device to be exposed to UV light, it may be erased with a command code sent from the microprocessor. These are used in games as a Secure Memory to backup CMOS RAM. Most games use such devices.

FlashROM is more state of the art. This is a combination of the best features of RAM (we can read and write to it) and ROM (it does not loose its contents when power is removed). BIOS in most of today's desktop computers is this type of device. They are also used in Bill Validators and such. FlashROM is finding its way into many functions in more modern game designs. These devices have a pinout somewhat like a SRAM.

- Herschel Peeler
hpeeler@slot-techs.com

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

Atronic Presents: The Sign of Zodiac

The Sign of Zodiac will bring fortune to you!

The Sign of the Zodiac features mystical, animated symbols and a high hit frequency. All wins are paid left to right and right to left, and two or more Horoscope symbols anywhere pay scatter wins.

3 or more consecutive Zodiac symbols on an active payline trigger the ZODIAC OF FORTUNE BONUS, showing 2 concentric rings with credit amounts around them. The player selects one "ring of fortune". Both rings spin, and the corresponding credit amount on the selected "ring of fortune" is the player's Zodiac of Fortune Bonus win. 3 of more Horoscope symbols anywhere trigger the HOROSCOPE BONUS, where players may choose the bonus win type: family & friendship (win in credits), love & emotion (win in free games), or health & fitness (spin as long as you win).

Available versions **(max bet in parentheses):**

Multi-coin	**551(5), 591(9) and 5201(20)**
Multi-coin / Multi-line	**555 (25), 595 (45), 590 (90), 5205 (100) and 52010 (200)**

Paytable variations**: 88% - 98% in 2% steps**

Progressive handling**: 5 Star symbols; max bet on winning payline required to win progressive.**

Game Information:

Base game: all wins paid left to right & right to left
Substitute: n/a
Scatter: Horoscope
2 or more Horoscope symbols anywhere pay scatter wins
Trigger: Zodiac
3 or more consecutive Zodiac symbols on an active payline trigger the Zodiac of Fortune Bonus
Horoscope
3 or more Horoscope symbols anywhere trigger the Horoscope Bonus

Zodiac of Fortune Bonus: 3 or more consecutive Zodiac symbols on an active payline trigger the Zodiac of Fortune Bonus. The player enters the mystical Zodiac realm, showing 2 concentric rings with credit amounts around them. The player selects one "ring of fortune". Both rings spin, and the corresponding credit amount on the selected "ring of fortune" is the player's Zodiac of Fortune Bonus win.

Horoscope Bonus: 3 or more Horoscope symbols anywhere trigger the Horoscope Bonus, where the player may select the bonus event type. There are 3 possible horoscope bonus event types: family & friendship (win in credits), love & emotion (win in free games), or health & fitness (spin as long as you win). If the player selects family & friendship, a win amount in credits (multiplied by the total bet) will be awarded. If the player selects love & emotion, the player will win between 10 and 25 free games with all wins doubled. If the player selects health & fitness, the player will be enter "spin as long as you win" mode. In "spin as long as you win," the reel symbols change (for more possible wins) and all scattered wins are paid from left to right & right to left. The player may continue to spin as long as he achieves winning games. Jokers may save the player in a non-winning spin by awarding a mystery win and continuing play.

For more information, please contact Katie Davis, Marketing Manager at 480-922-0707.

Money Controls Hits the Road With New SR5i Coin Acceptor

Money Controls, manufacturer of components for secure money systems, is to release a ground-breaking new product to major amusement operators during a series of seminars on payment de-regulation.

The SR5i, the latest addition to the market-leading SR Series of coin acceptors, offers a real breakthrough in security and first time acceptance, thanks to its intelligent expert system AccepTelligence(tm), resulting in incomparable fraud rejection.

The product has been demonstrated during Money Controls' May roadshow, which visited key OEMs, JPM Bell-Fruit, Maygay and Barcrest. The roadshow is continuing to visit other major OEMS.

The roadshow has been organised to discuss, with OEMs and other related operators the government's proposed changes to regulations on gaming machines and the potential impacts on money peripherals.

Amendments to the Gaming Act 1968 will allow players to use banknotes and smartcards on jackpot machines, and for winnings from these to be paid by either cheque, credit transferred to the player's smartcard, credit note or token redeemable by the operator. For higher value AWP machines, banknotes will be allowed for acceptance, with payout in banknotes and coins.

Whilst the changes will save the industry millions of pounds each year through reduced maintenance costs and downtime caused by wear and tear on coin mechanisms, it will also intensify the need for security against fraud attacks.

The SR5i's exceptional rate of first time true coin acceptance, which enables an equally exceptional security and fraud rejection, creates an inherently more secure product.

Further benefits of the SR5i include: * Resistance to manipulation, with no learning, drifting or manipulation from fixed reference limits. * Ease of update and reprogramming, thus reducing downtime. For example, offering downloadable coin specifications. * Rapid updates and availability of information in serial mode - increasing system security, facilitating situation diagnostics and reducing downtime. * Reduced operating costs with a lower requirement for field visits.

The SR5i is a valuable addition to the SR Series, so named because of its use of 'Series Resonance' technology. This unique patented circuitry rapidly samples sensors to obtain detailed readings from all areas of a coin, offering more coin readings at more frequencies over more areas, resulting in an extremely high level of coin discrimination.

The SR Series acceptors can be configured to be backward

compatible with most acceptors currently used in virtually all applications throughout the amusement, specialist vending and leisure industries. Changes to coin sets, new coin introductions and security upgrades are accommodated through simple reconfiguration, either locally or, with the SR5i, by remote download for added convenience.

Money Controls European Marketing Manager Felice Hurlstone, explained: "Our customers primarily want a mechanism that accepts all true coins first time. Then they want to reject all known frauds. Because we can now detect fraud attack we are able go into "High Alert " to fraud and keep frauds out - with a short lived reduction in true coin acceptance rates".

Felice commented "So we switch-in an effect that is similar to having a "exceptional high-security mode", higher than conventional high security windows, hence we get a perceived higher security. So, it is true to say that SR5i is more secure - but its greatest value is its very high first time accept of true coins. Historically you had to choose either high first time acceptance rates or high security. With SR5i AccepTelligence(tm) you can have both."

The SR5i goes on general launch in August.

Oval Bezel Offered

New for 2003 is the attractive, illuminated, space-saving Oval Bezel, available in the latest solid and translucent materials - or as a combination to produce a halo effect around the button base of your machine for a variety of visual effects.

Designed by Money Controls, a manufacturer of components for all types of payment systems in the gaming, amusement, telecoms, transportation, leisure, retail and specialist vending markets, Oval Bezel meets the high demand for an aesthetically pleasing product, as fashion meets function with a soft curved style and illumination.

Oval Bezel is also an excellent space-saving alternative to less adaptable products on the market as its small body enables the bezel to be fitted into confined spaces. Quick and easy to fit, Oval Bezel offers complete flexibility for positioning on the glass.

This single coin entry accessory comes in two build options, red and clear, and is available with bulb illumination for increased reliability over filament bulbs.

It is already experiencing high acceptance within the industry, with Astra Games, designers and manufacturers of amusement machines for the UK and overseas, one of the first companies to be supplied with the product. Astra Games Development Support Manager Tim O'Gorman, commented: "We quickly identified the benefits of incorpo-

rating the new Oval Bezel design on a brand new cabinet development. It is a very attractive and practical addition that complements our cabinet and game artwork perfectly.

Tim added: "It's just the product the industry has been waiting for."

Other customers who have already taken an order for the Oval Bezel include Bell-Fruit Games, market leaders in the design and manufacture of fruit machines and other pay to play amusements.

Money Controls chief executive Mike Innes is delighted with the industry's response, as the product has been designed to meet all the criteria required: "We have developed a product with a soft, ergonomic design which can be fitted quickly and easily," he said.

"This is a big improvement on its predecessor, the square bezel, as the new oval bezel incorporates the same features without compromising the aesthetics of the game machine, and is therefore eye-catching to the player."

Money Controls is a specialist global provider of automated transaction solutions for all types of payment systems in the gaming, amusement, leisure and specialist vending markets. The company has more than 40 years of experience designing, manufacturing and supplying technologically advanced electronic products to accept and pay out coins, banknotes and other forms of payment. Money Controls serves a 500 million dollar worldwide market. The company is committed to providing quality system solutions together with industry leading levels of support.

Money Controls in Asia

Money Controls Pty moves to new premises in Australia this month following a successful six years trading from its current offices in Gladesville.

The Asian operation of Money Controls, manufacturer of components for secure money systems, has outgrown its present facility and has signed a five-year lease on a warehouse and office three times the size.

The move follows an extremely successful 12 months expansion within the Asian market with Money Controls Pty securing some major contracts.

These include the announcement in August last year of two new distribution contracts in China and Korea, currently broadening Money Controls' customer base throughout Asia. The appointments of Shanghai Sotec based in Shanghai (China) and Hwasung Electronics based in Seoul (Korea) were necessary to deal with the steady increase in business opportunities.

Then in September, Stargames Corporation Limited became the latest blue chip company to strike a deal with Money Controls, whose products are designed for all types of payment systems in the gaming, amusement, telecoms, transportation, leisure, retail and specialist vending markets. Famed for the design, manufacture and marketing of PC3 video games and gaming machines, Stargames is one of just three Australian gaming equipment and technology companies listed on the Australian Stock Exchange. Money Controls was signed up to provide its Universal Hoppers and Condor Plus for Stargames' PC3 gaming machine platform. As a distributor of Starpoint products in Asia Pacific, Money Controls also supplies Stargames with Starpoint buttons. Money Controls' Universal Hopper, a large capacity, single denomination coin payout unit, designed to handle over 95% of the world's coin sets, and the Condor/Condor Plus acceptors have proved to be popular products with key players in Asia.

With over 100,000 Condors in operation throughout Australia, New Zealand and Asia, Condor Plus provides gaming machine manufacturers with proven technology, advanced discrimination techniques and high-speed acceptance of coins and tokens. In March this year Money Controls announced that IGT, a world leader in the design, development and manufacture of

micro-processor-based gaming and video lottery products and software systems, had selected Condor Plus for its new AVP (Advanced Video Platform) hardware platform.

Bill Murphy, Money Controls Sales Director Asia Pacific, said: "The new location will provide ample room for our current business requirements and will also allow for future growth. Money Controls has developed a solid foundation in Asia, securing several high profile customers. The move to new premises will allow us to support existing customers whilst expanding and developing new business.

He added: "We are confident that Money Controls will continue to expand within the exciting Asian market and these premises will allow us to achieve this."

The new contact details for Money Controls Pty are as follows:

Money Controls Pty Ltd
Unit 1/2 Morton Street
Parramatta, NSW 2150
Australia

Tel: 02-96835033
Fax: 02-96835055

Money Controls Limited
Coin House, New Coin Street
Royton, Oldham
Lancashire OL2 6JZ
Tel: +44 (0) 161 678 0111
Fax: +44 (0) 161 626 7674
www.moneycontrols.com

Dion's Corner

By Dion ANderson

It has been a long time since I have written an article for the magazine so hopefully Randy will not be too peeved at me and let me back in the pages.

The Sept. 11th thing sent me on a whole new adventure. I ended up working in the arcade and let me tell you, it is a whole different animal! The 50" projection monitors are a nightmare . . . It takes you about 30 minutes to get the 4-6 boards out and then trying to troubleshoot it . . . Fun!

One tip is for if you every try to dabble in it and you have no high voltage. The one I was working on was a Toshiba. It had a whole mess of anode leads (well, one for each tube) and two horizontal outputs. One kicks on the HV and the other turns on the horizontal. Well, the main horizontal was frying, you would think the flyback. At least that's what a major arcade monitor guy informed me. Thanks for the help but that wasn't the problem. What I learned was to check all your MOSFETs as they were the problem. There was a shorted gate that was taking out the horizontal transistor. Check these in your slot monitors also. They do go out. Anyway, the vertical section on it was shot also so I left it at that... too much surface mount. Oh, and if you decide to play around with the main anode lead, stand back. What an arc! It will make all the hair on your body stand up. It looks cool though and sounds pretty wicked.

So, now I am back in the slot repair business at the Golden Phoenix in Reno. Great place. Here are a few things I have come across since I've been back:

First is the Tatung monitor. I get here and I have this one that will not lock vertical hold. So I dig into it a little and test some things. Well, all the caps were replaced and the vertical circuit was in perfect working order, all except the whole vertical hold problem. So, after looking and looking over the schematic I checked out all of my resistors in the circuit, just for fun. Still nothing, so, it's already broke right? The schematic calls for two 47uf 16volt caps C222 and C226. Let's put in a couple 47u 63v caps to give it a quick smoke test. Amazing. It works fine. Vertical lock is there and after the old burn test, it's still going. Maybe I have the wrong schematic. If you have the same one as I do, you might want to go write in the 47uf 63v caps.

Second, it's Wells Gardner (Williams). This one started off needing to be capped to bring the picture back to life. So, after the cap job there is no high voltage. How, I haven't a clue, but the MOSFET in the power supply died. Replacing that brought it back up and yes, the picture was 10x better. The MOSFET is Q101 and the NTE cross-reference is a 2379. So, the whole big screen experiment saved me some time in the long run.

Third, the Ceronix 2093 with touchscreen. IGT Good monitor, except for the wave or ripple effect once they get old. This could make some people think it would be in the main chassis itself because it looks like it could be there at a glance. But if you look close enough, it is on the surface of the screen, therefore it lies in the touchscreen board. You can cap it and it will help a little but you'll probably have to get a new touchscreen board. Even if

AESI

When It Comes To Service Our Promise Is Clear.

We Provide The Best Service The Gaming Industry Has Ever Seen.

There Is One Catch Though; You Have To Be Using Our Products. Which, By Design, Are Also The Best.

- ➢Part Sales
- ➢Repair Service
- ➢Technical Support

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

Advanced Electronic Systems, Inc.

Service Coast To Coast

Call Customer Service At: (702) 597-4840

www.gamingstuff.com

SII Seiko Instruments Inc.

kortek

STARpoint

mei

you can get the parts, it is difficult to work on as it is a multi-layer board and as far as I know, there are no schematics (at least I have none). By replacing the 47uf 50v caps you can clear it up a little. Check the 12v regulator to make sure it's working fine also. If you have a 2093 with color over drive and your drive transistors (C3467) check good, replace LM324 in the color section, the one in the back left corner of the board. This should clear up the problem.

Fourth, the Ceronix 1492... I ended up with one of these on the bench with a double picture, one on top and one on the bottom, split in the middle, and blinking rapidly. If you ever get one like this, replace PRA "H." It probably stole some coins or it could have just had a bad day and had a few drinks. Anyway, that should restore normal operations.

Fifth, the WBA power supply. Dead. Replace C101 100uf 25v. While you're in there, you might as well double the voltage so you don't have to come back to it for a while. Replace C11, C9, and C10 also. They are 1000uf 16v. Double those also. When you do double the voltage for the caps on anything you are working on, you might want to write on the chassis that it has been done so if it comes back later you don't end up quadrupling it.

Sixth, another Wells Gardner (Williams) tip. If you don't have any slant top chassis and you have an upright chassis you're not using, you can convert the upright monitor chassis to fit the slant top tube. You just need to add a coil L700, up the value of C720, change some 7 resistor values, run your PY jumper to a PYY, 1 diode, and a couple of ceramic caps and it is now a slant top chassis. What can I say? I was bored and I needed a slant chassis for my tester.

Seventh, and last, when I arrived at the Golden Phoenix and went to open a slot door, I was informed to wait until the display read mode 00 before cracking the door. For anyone who deals with this system, that takes forever so just put the card in, hit enter, and it goes right to transmitting the mode 00 in seconds and saves tons of time.

Well, I hope you can all get some use out of this stuff and, until next time, take care of yourselves and one another. Oh, before I finish I gotta gloat... my wife and I are expecting *TWINS* around September.

- **Dion Anderson**
Danderson@slottechs.com

Congratulations to you both - ed.

Happ Controls Releases 2004 Gaming Products Catalog

Happ Controls has published their largest ever Gaming Products catalog. This 272-page catalog contains a wide array of casino products including hard-to-find slot machine parts.

The catalog is 30% larger and contains many new items such as 3M MicroTouch Touch Screens, JCM Bill Validators, Sencore Test Equipment, Surveillance Products, Hakko Soldering Equipment, LEDs, Fiber Optic Cable, and much, much more.

In addition, this Gaming Products catalog along with new products for the Gaming industry are available on-line at www.happcontrols.com

To receive your copy of the new 2004 Gaming Catalog, contact:
Happ Controls
106 Garlisch Drive, Elk Grove, IL 60007 U.S.A.
Toll Free Phone 888-BUY-HAPP (289-4277)
Toll Free Fax 800-593-HAPP (4277)
Phone (847) 593-6130 Fax (847) 593-6137
or request the catalog on-line at www.happcontrols.com

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 Touchsystems - 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.

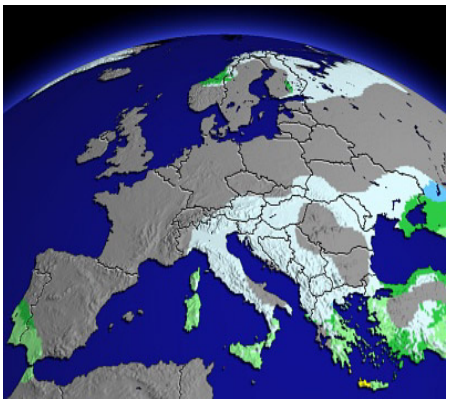
3:30pm - 5:30pm
JCM - Bill Validator Troubleshooting and Repair

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



International View

By Martin Dempsey

Expanding ICE Attracts Faster Flow Of Exhibitors

The 2004 International Casino Exhibition (ICE) is already looking like a sell-out event with six months still remaining until the doors open at London's Earls Court Exhibition Centre. Show organisers, ATE have declared that sales of ICE floor space are at a very advanced stage, already four months ahead of the same amount recorded for last January's event.

The move from Earls Court 1 Level 1 to Earls Court 2 will result in net floor space increasing from 7,500 square metres (80,700 sq.ft.) to 10,000 sq.m. (107,600 sq.ft.) at ICE 2004.

For more information on ICE 2004, visit http://www.ATEOnline.co.uk/ICE or contact Karen Cooke on (t) +44 (0) 20 7713 0302; (e):kcooke@ateonline.co.uk

New Sales Manager For Janshen-Hahnraths Wholesale

Janshen-Hahnraths Group is pleased to announce the addition of Hein van Hout as sales manager to the wholesale team. In this role Hein van Hout will take care of the European market in particular. Together with Theo Vranken (export manager), he will travel all over Europe to look after the existing customers and to find new countries with business opportunities. Van Hout, known in the business for 17 years, started in the operation division of Vale Automaten, then moved to Elam Group, where he was commercial manager for two years.

Hein van Hout can be reached at + 31 (0) 45 5 428 428 via telephone, at:hvanhout@jhgroup.nl via e-mail and + 31 (0) 6 53 824 188 via mobile.

A Look Into The Future

The National Motorcycle Museum in Birmingham was the venue for a unique event in June when visitors from across the UK and Ireland gained a fascinating insight into the future of money processing. Hosted by SCAN COIN, the two-day event included demonstrations, seminars and plenty of hands-on experience. It is the only event of its kind devoted exclusively to money processing and is designed to let visitors see the systems and technology that could impact on their business within the next year.

"We tried to recreate a typical working environment for each of the sectors in which we operate," said SCAN COIN's Steve Fitton. "They included amusement, retail, banking, local government and transport. It's so much easier to understand how different systems and machines relate to each other and how they can be successfully integrated within an existing set up."

For further information email:sfitton@scancoin.co.uk

International Game Design Studio (IGDS)

JCM Europe are pleased to announce the agreement reached with the management of IGDS for the establishing of a "JCM Service Centre" in Bulgaria.

The company name is new and so are the premises where it will be housed, but a 13 years experience is behind the management and technicians who have planned, designed and built games in Sofia, selling them successfully throughout Europe.

Bulgaria is one of the most advanced countries for electronics and software design and as the economy of the country develops, there will be a larger need for the advanced technology offered by JCM products for banking and vending applications.

For further information contact Bepi Mottes by email at:mottes@jcm-germany.com

Red Launches A Gem Of A Game

Red Gaming has launched its latest AWP gem - 'Jewel Strike' - providing players with a dual trail game. As the name suggests, 'Jewel Strike' uses a colourful gem theme which provides a dazzling array of features including 'Diamond Geezer', 'Gem'll Fix It' and 'Gemmoney Cricket'.

The twin hi/lo gamble allows players to gain from cash awards and the 'Xchange' point feature. At the 'Xchange' point, the player can choose between eight different features including the 'Colour Flip Gems'. By playing strategically to find the Hidden Treasure, players are offered the chance of 'Big Wins'.

For further information please contact Clare McMillan @ england.
Tel: + 44 (0)113 234 5600.
Fax: + 44 (0)113 234 5601.
Email:clare.mcmillan@englandagency.com

Barcrest Games Takes Soap Starring Role

Barcrest Games' popular AWPs Top Dog, Do$h 'n' Pecks and Cash Bang Wallop are currently enjoying their 15 minutes of fame, on location in EastEnders' Queen Vic.

The three games are the latest Barcrest Games machines to take starring roles in the BBC1 soap. Barcrest Games has supplied machines to the programme for a number of years to help the Queen Vic

portray an authentic pub atmosphere.

Barcrest Games' Director of UK Sales Barry Knowles said: "As Top Dog, Do$h 'n' Pecks and Cash Bang Wallop have already displayed their star qualities to players, they were a natural choice for the set."

For further information please contact: Clare McMillan @ england. Tel: + 44 (0)113 234 5600. Fax: + 44 (0)113 234 5601. Email:clare.mcmillan@englandagency.com

Firecracker Blasts In

Over the last year JPM have made extensive changes to its organisational structure and also its approach to games design. The new R&D team led by Leon Eaton recently released the first of the new titles, Firecracker, at the Park Avenue Open Day.

The new game builds heavily on the combined experiences of the entire team and presents a combination of proven and unique game features to offer an all round, well-balanced game that will prove to be a winner. With Firecracker only on its initial tests, approvals have been high, with a major UK retail chain adding the title to its approval list. Players are treated to a totally new base game with feature entry that is varied enough to interest and retain players.

For further information email:gamingco@blueyonder.co.uk

Cyberview Technology Enters Agreement With Shuffle Master

Cyberview Technology recently announced that it has entered into a distribution agreement with Las Vegas-based Shuffle Master, providing Shuffle Master's branded game content to be available on Cyberview's central server-based downloadable gaming terminals worldwide.

The company was ranked: the 35th best small company in America by Forbes magazine in its October 2002 survey. Information about the Company and its products can be found on the Internet at http://www.shufflemaster.com Founded in 1995, Cyberview Technology develops, produces and implements innovative, integrated solutions for the gaming, betting and leisure industries. For further information, visit the company's website at http://cybview.com.

For more information please contact Roy Student, Cyberview Technology, Inc. Ph. +1 (702) 696-9870. email:roy.student@cybview.com

Barcrest Games Sets Gold Standard

Barcrest Games has been in training and is now looking to the winner's podium as it launches its latest hi-tech £250 dedicated club product 'Go For Gold'.

The design team has been flexing its muscles to devise this sporting new product, which has an Olympic theme. Developed especially for the members club sector, this hotly anticipated machine demonstrates Barcrest Games' commitment to this key market sector.

The player travels round a wraparound feature trail to win cash shots, features, nudges, fruit shots and icons for different awards. Using colourful imagery, players can pursue any of three cash zones - bronze, silver or gold -which each have their own feature stack.

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

New Cashcode Metal Bezel Combats Em"bezzle"ment

CashCode Company, Inc., the innovative manufacturer of high-security bill validators, has introduced a new high-security motorised metal bezel with a vandal-resistant and coin-resistant design.

"The metal bezel may deter theft, due to its strength.", said Leon Saltsov, CashCode's Senior VP of Engineering and Manufacturing. "It is also designed to be coin-resistant to prevent downtime. Further, the motorised mechanism in the bezel reduces jams in case of insertion of soft or worn bills."

CashCode's metal bezel is compatible with the BackLoad SM and Stackerless VU bill validators, and is ideal for operators who wish to further street-proof their units. A natural for outdoor applications, the bezel excels in instances where there is minimal equipment supervision.

For further information, please contact Jenna Snyder Medvedev on +1 (905)303-8874, ext 2304. Email:jennasnyder@cashcode.com

European Casino Operators To Have One Voice

What do Finland, Spain, Portugal, Greece, Switzerland, UK and Austria all have in common? These are the countries from where casino operators have come together to form a new casino operators organisation for Europe as a division of the EGO organisation.

In Amsterdam on 25th June the inaugural meeting took place leading to the creation of an interim steering committee comprising of Interim Chairman Jan Rodrigo (Grupo Amorim Portugal), Interim Vice Chairman Jaime Banos (Grupo Comar Spain), Lars Porko (PAF Finland), Ian Gosling (Hyatt Regency Greece) and Tim Cullimore (Casino Crans Montana Switzerland).

Casino operators interested in further information about the new organisation should contact Keith Fagan at:ego@ego.nl or call +44 (0)1772 682865.

AWP To Fore At World Of Entertainment Exhibition Svet Zabavy 2003

The World Of Entertainment exhibition was held at Vystaviste, Prague, Czech Republic from 13 to 15 May 2003. The event filled the right and middle halls and for the first time a number of companies had to be left out because of lack of space. This will be rectified next year when the left and middle halls will be used, adding 1,500 sqm of exhibition space.

AWP machines were what this show was all. All the major AWP suppliers were represented, each offering a number different models in 300 and 750 versions, suitable for bars and arcades. This well regulated market is now an example to other countries in the region and an indication of what they can achieve in the future. For further information email:wax@vol.cz

The Flags Are Flying On Royal Castle In The Czech Republic

STELLA International, a member of the Gauselmann Group, is proud to announce the approval of its latest AWP machine for the Czech Republic, Royal Castle. The approval was issued by the Czech administration office (EZU) June 18th, 2003.

Royal Castle caused a tremendous interest at the "World of Entertainment" in Prague, when unveiled at the stand of STELLA and their Czech partners, Hornet and Lekram. The clue to Royal Castle is the option of choosing between two different bonus features.

To find out more information about STELLA International, please visit the website at http://www.stella-international.de or contact Susanne Wesemann, STELLA INTERNATIONAL. Phone: +49-5741-273 515. Email::swesemann@stella-international.de

Martin Dempsey
MD Associates
Enterprise Centre
Melitta Road
Kildare, Ireland

Email:mdassociates@eircom.net
Phone + 353 (0)45 521190
Fax + 353 (0)45 521198
Mobile + 353 (0)87 2209732

Vertical Deflection Circuits - part 3

Integrated Circuit Design

The use of an integrated circuit greatly simplifies the design of the vertical drive circuit. All modern monitors use integrated circuits in the vertical deflection circuit. In most cases, there are two integrated circuits. One IC contains the vertical oscillator and drive circuitry. The other integrated circuit is the vertical output device. In some monitor designs, you may even find just a single integrated circuit module that contains all three stages: The oscillator, the vertical drive and the output circuit.

The first circuit we'll look at is from Kortek's popular KT1703. We have looked at quite a bit of this schematic diagram in past issues. For the sake of clarity, all circuitry that is not part of the vertical deflection circuit has been deleted. Compare the schematic diagram in figure 6 with the entire schematic diagram (published as the centerfold in the June, 2003 issue) and you'll see that once you're able to separate the circuit under discussion from rest of the schematic diagram, it becomes much easier to understand. This is one of the things that I really like about Kortek. Their schematic diagrams are very well drawn.

Notice that the B+ power supply has nothing at all to do with the vertical deflection circuit. The vertical deflection circuit uses nice, safe, friendly low voltages. Two different voltages are required and the SMPS provides them both. The vertical oscillator/drive IC requires a +12 volt DC power supply. The vertical output stage typically requires about twice that. In this case, it's a +26 volt power supply. In other types of monitors, this can be as high as +30 VDC, especially when driving larger CRTs.

The oscillator/drive IC is the popular TDA9102. This is a rugged IC that I have never seen fail. This holds true of virtually all modern monitor designs. The vertical oscillator/drive IC doesn't have to work very hard and operates on just 12 volts, so what's to fail?

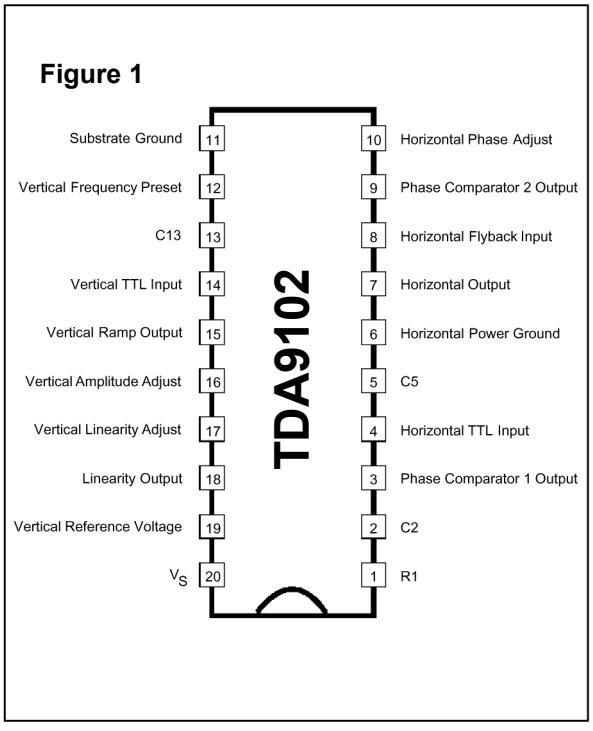
Vertical oscillator

BRAIN FRY ALERT: The following was taken directly from the data sheet. It describes precisely how the TDA9102 operates. While it is an interesting read, if you're only interested in fixing this circuit and you don't really care how it operates, you may want to skip the following six paragraphs. They're in italics.

A new concept of vertical oscillator is implemented in this IC whose resistor divider, used to set the lower and higher

PIN CONNECTIONS

Figure 1



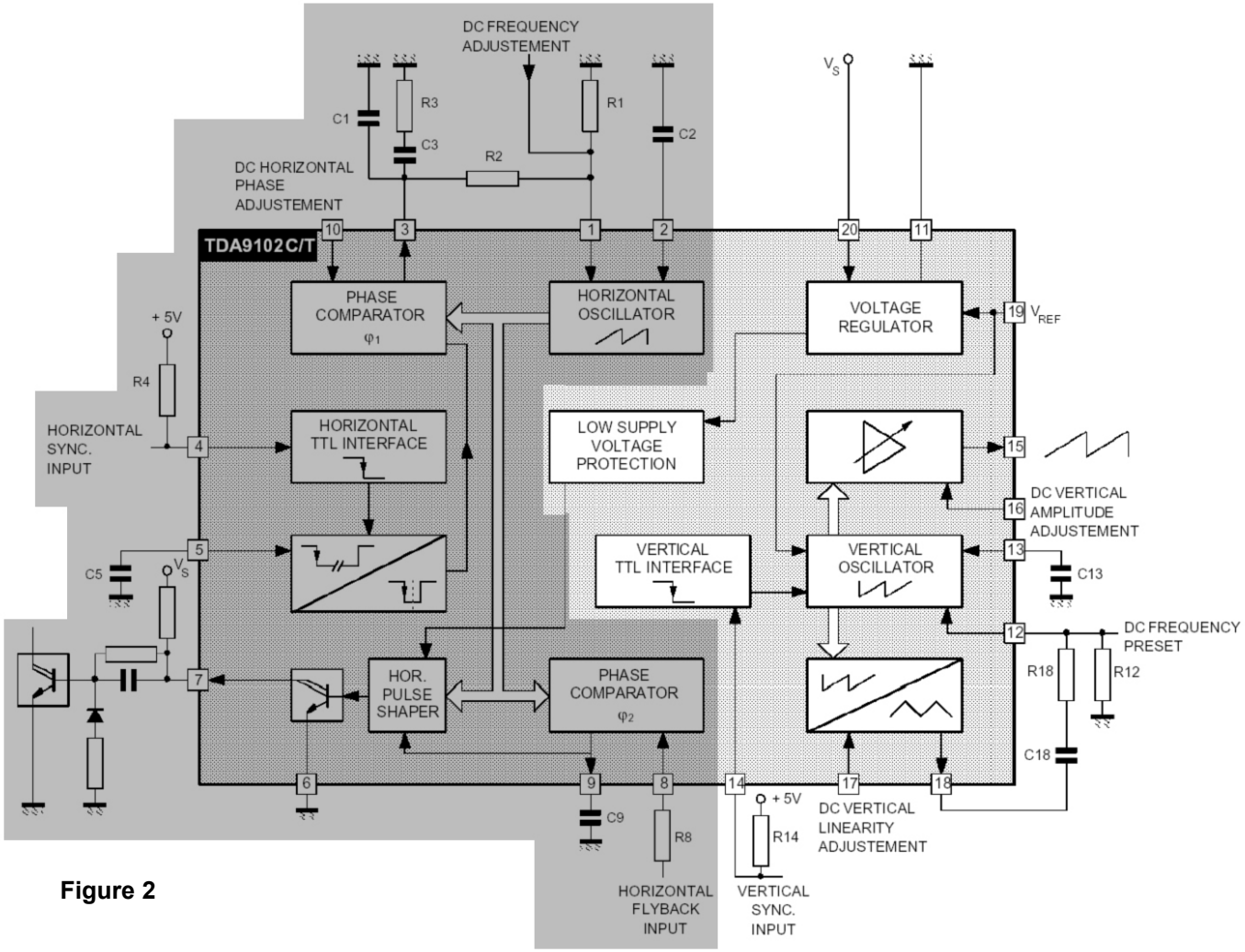


Figure 2

This is the block diagram of the TDA9102. This IC is the vertical oscillator and vertical driver. The sections in gray are used in the horizontal deflection circuit and are not part of this discussion.

thresholds (V_{low} = 2V ; V_{high} = 6.8V), is not commutated. The circuit shown in Figure 3 works by charging an external capacitor connected at Pin 13 with a current set at Pin 12 and reflected to Pin 13 through a current mirror. As soon as the ramp gets V_m or V_{high} the capacitor is quickly discharged by a Darlington. The voltage on the capacitor quickly will fall until it reaches the lower threshold. At this point, the Darlington will be turned off and the current will charge the capacitor once again. A buffer is used to decouple the ramp generator from other circuits (like linearity correction and amplitude regulation circuits).

The lower threshold is detected by a differential stage whose current generator is only activated during the discharge phase. A comparator detects the higher threshold corre-

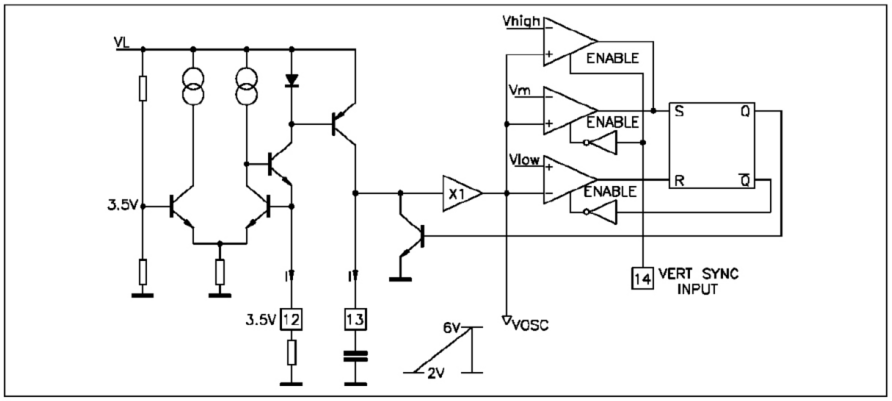


Figure 3

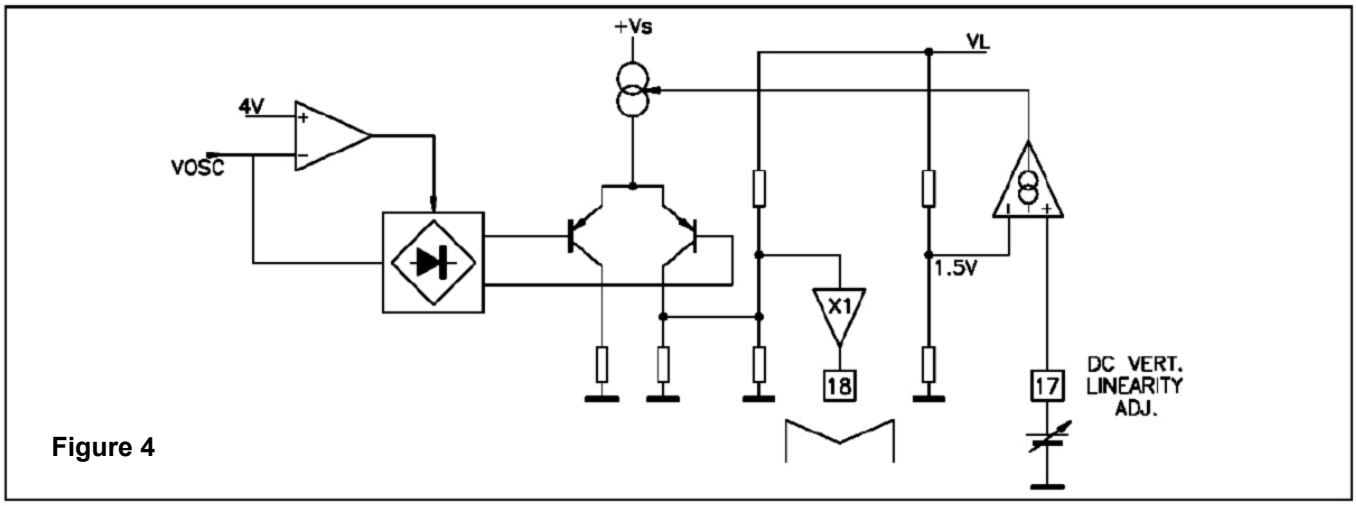


Figure 4

sponding to the free running frequency. If no sync pulse (negative edge) is applied on Pin 14, this stage is continually fed and the capacitor at Pin 13 is discharged when the vertical ramp reaches V_{high}. If the sync pulse is present, the previous comparator will be inhibited and another comparator, which has the threshold at 5.2V (V_m), will be activated. This last comparator, when it is set going, is able to cause the discharge of the capacitor at Pin 13 if the vertical ramp is between the thresholds V_m and V_{high}. In this way, the vertical synchronization is established.

To guarantee that the vertical oscillator is locked in the middle of the pull-in range. It is necessary to adjust the current at Pin 12 until the peak of the vertical sawtooth, in locking condition, reaches the voltage equal to:

$$V_P = \frac{V_m + V_{high}}{2} = 6\ V$$

That means Vpp = 4V.

Correction Circuit and DC Linearity Adjustment

The circuit that is used to realize a new concept of vertical linearity regulation is shown in Figure 4. A comparator rectifies the vertical sawtooth using as voltage reference a fixed value (4V) that is the average value of the sawtooth. This squared signal is used to drive a particular configuration of differential stage in order to obtain, in terms of current, a triangular waveform, which inverts its slope just when the original sawtooth crosses the voltage reference.

This current signal is converted in voltage by a resistor divider and transferred on Pin 18 through a buffer. The peak to peak voltage on this pin depends on the maximum current that the output differential stage is able to handle. The value of this current can be externally regulated by means of Pin 17 through a transconductance amplifier. An external feedback resistor in series with a capacitor (to avoid any DC offset) must be connected between Pins 18 and 12 in order to obtain the proper S correction.

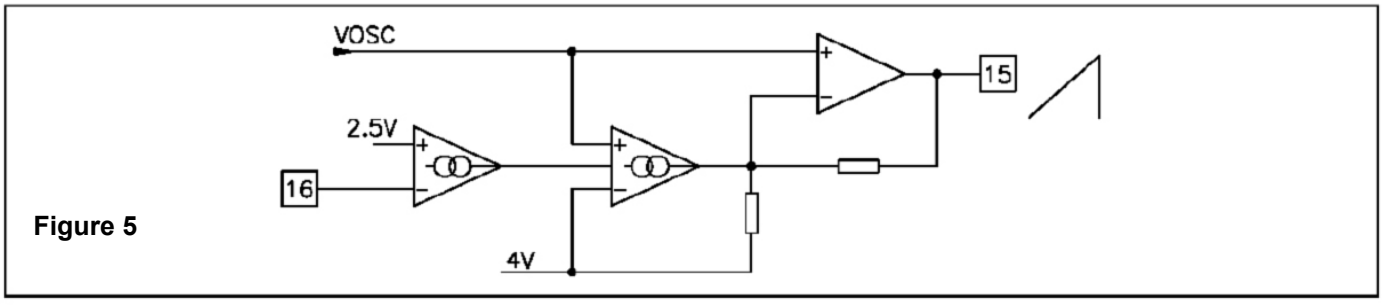


Figure 5

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

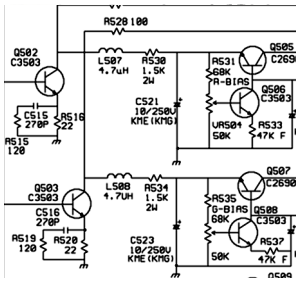
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

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.

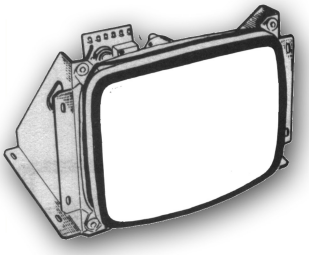
SCHEMATIC DIAGRAMS

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

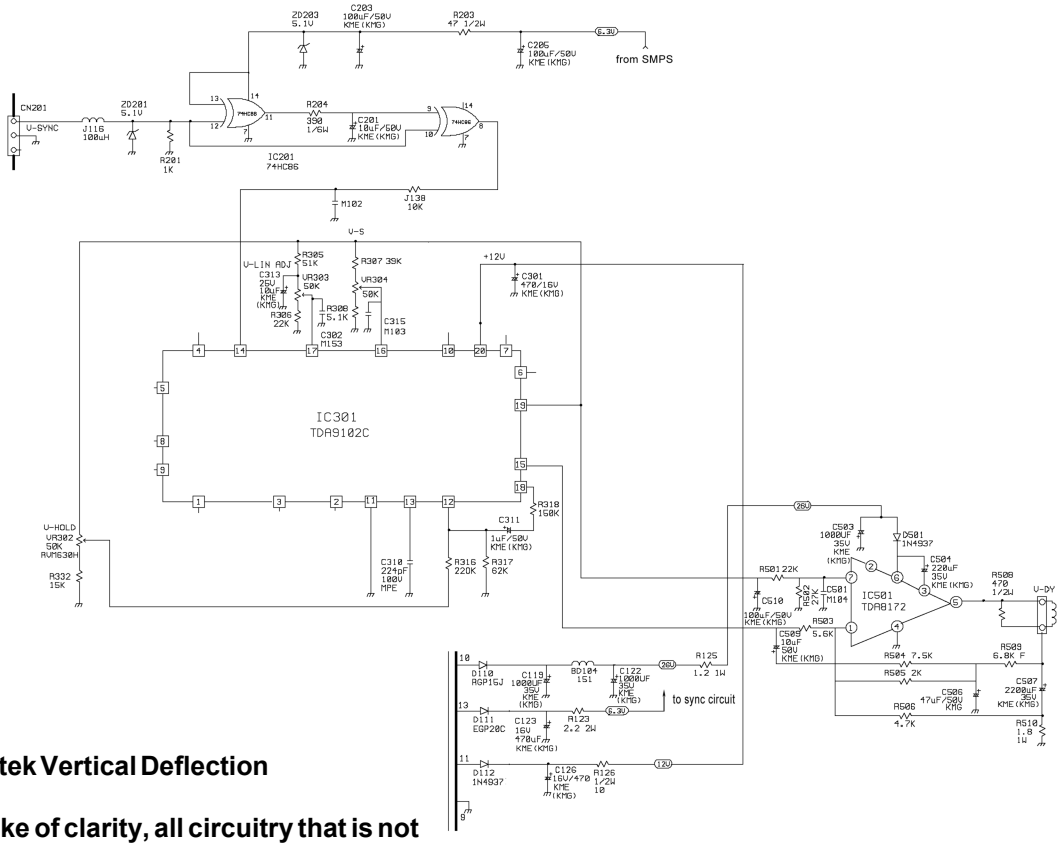


Figure 6 - Kortek Vertical Deflection

For the sake of clarity, all circuitry that is not part of the vertical deflection circuit has been deleted. Compare this schematic diagram with the entire schematic diagram (published as the centerfold in the June, 2003 issue) and you'll see that once you're able to separate the circuit under discussion from rest of the schematic diagram, it becomes much easier to understand.

Vertical Amplitude Regulation Circuit

This function has been implemented using the circuit configuration that can be seen in Figure 5. It consists of an Op-Amp in non-inverting input configuration and of a variable gain OTA whose gain can be set by means of the Pin 16 through a transconductance amplifier. Both the inputs of the two circuits handle the vertical ramp and the output of

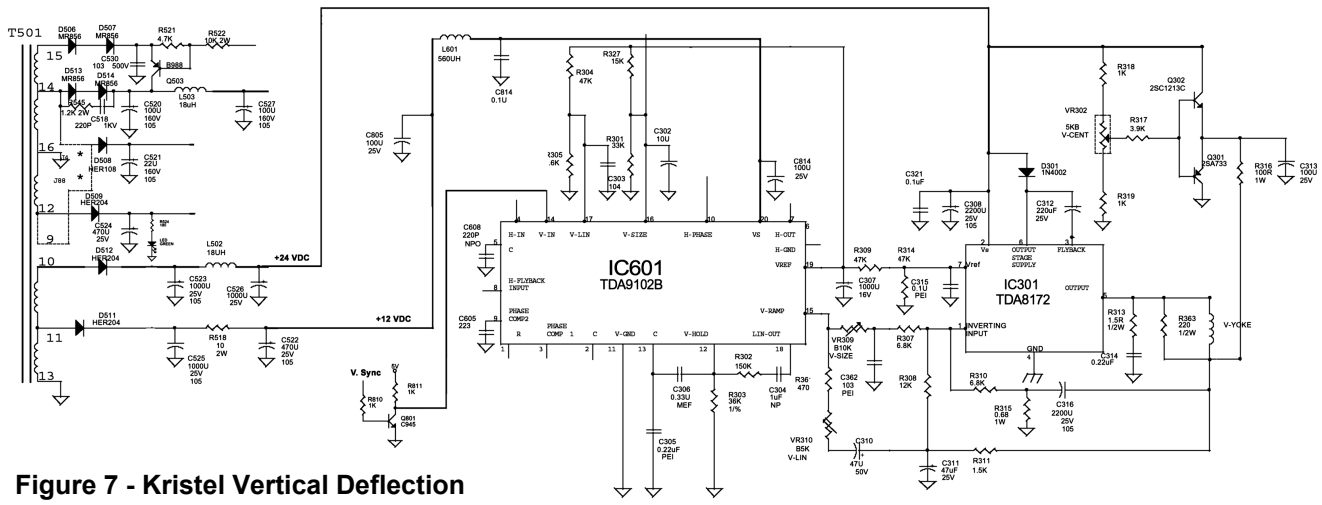


Figure 7 - Kristel Vertical Deflection

Compare this schematic diagram with the entire schematic diagram, published as the centerfold in the May, 2003 issue.

the multiplier is fed back to the inverting input. The control circuit is a transconductance amplifier that modulates the current of the variable gain OTA depending on the DC voltage applied on Pin 16. This circuit guarantees a gain adjustment of 20% around the nominal value.

The Vertical Output Circuit

Sticking with Kortek, the vertical output device is a TDA8172. Here, we do find problems. Since this is an output device, it works very hard. You'll always find the vertical output IC mounted on a heatsink. When you replace this device, you should make certain that you use a dab of heatsink compound to assure good transfer of heat from the IC to the heatsink. This IC generally runs very hot. Failure to provide proper heatsinking can lead to premature failure, causing a flatline on the screen.

The vertical deflection circuit is well known to technicians as having lots of problems with electrolytic capacitors. It gets plenty hot inside a slot machine and that heat will really accelerate capacitor failures. Always use 105-degree capacitors as replacements. Avoid 85-degree capacitors like the plague.

There are a couple of common capacitor failures that you should look for when you have problems filling the screen with raster in the vertical direction. One of these is in the yoke coupling capacitor. It's capacitor C507 in the Kortek schematic. It's C316 in the Kristel schematic, which, you will notice, is all but identical to the Kortek. Is there some kind of piracy going on here? Nope. These monitor circuits are pretty straightforward. In fact, once an engineer has decided which of the available ICs he wants to use in his design, the IC manufacturers' data sheets more or less dictate how that device is to be used. An engineer may noodle around with things like component values but the basic design will be more-or-less the same between two monitors that utilize the same integrated circuits.

The value of this capacitor is typically 2200 microfarads at 25 or 35 volts. This capacitor provides the return path for all of the deflection current in the vertical deflection coil of the yoke. As this capacitor begins to fail (typically over a period of three to six months following a few years of 24/7 service) the picture will begin to shrink in the vertical direction. This is often accompanied by poor vertical linearity, with the raster lines squeezed together at the top of the screen. The spacing between raster lines is supposed to be equal from the top of the screen to the bottom.

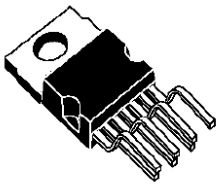
Another bad boy is the "boost" capacitor, also known as the "pump" capacitor. In the Kortek, it's C504. In Kristel, it's C312. Typical value for this cap is 220 microfarads at 25 or 35 volts. This capacitor is important (I suppose they all are, to some extent). During operation, this capacitor is charged by the +24 volt power supply, and then placed in series with the supply in order to provide around +48 volts for full vertical deflection. As this capacitor fails, it causes some loss of vertical deflection. What typically happens however, is that when a slight loss of vertical deflection is noticed on the slot floor, the vertical size (height) potentiometer is adjusted to compensate. It's a natural thing to do. This

SGS-THOMSON MICROELECTRONICS

TDA8172

TV VERTICAL DEFLECTION OUTPUT CIRCUIT

- POWER AMPLIFIER
- FLYBACK GENERATOR
- THERMAL PROTECTION



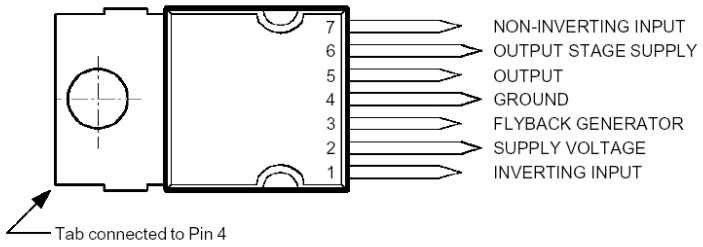
HEPTAWATT
(Plastic Package)

ORDER CODE : TDA8172

DESCRIPTION

The TDA8172 is a monolithic integrated circuit in HEPTAWATT™ package. It is a high efficiency power booster for direct driving of vertical windings of TV yokes. It is intended for use in Color and B & W television as well as in monitors and displays.

PIN CONNECTIONS (top view)



BLOCK DIAGRAM

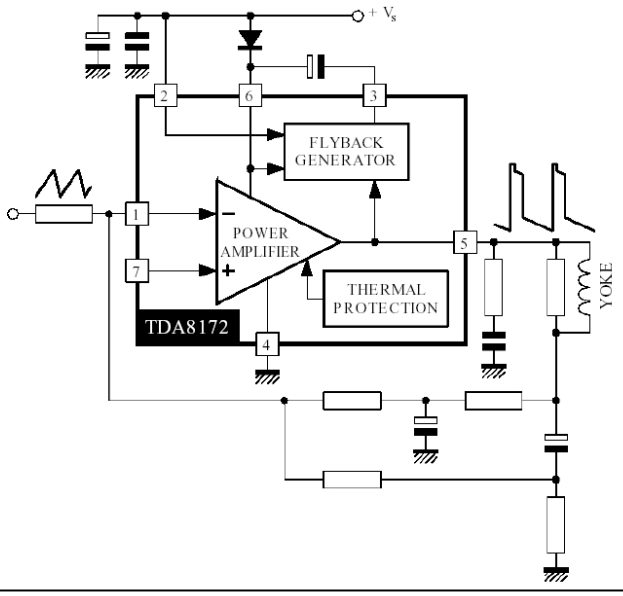


Figure 8 - The Vertical Output IC

keeps happening over a period of time as the capacitor gets worse and worse.

"So what?" you might ask. "If the raster can be adjusted to its full size, no harm, no foul, right?"

Unfortunately, loss of the charge provided by the boost capacitor causes the vertical output IC to work extra hard and can cause premature failure. I have spoken to quite a few monitor technicians who recommend that when you have to replace the output IC (it often dead shorts, see below) you replace the boost capacitor at the same time. I have to agree with them. It's cheap insurance to replace a 15 cent capacitor. Don't even bother testing it. This will prevent the "I replaced the vertical output IC and it lasted 4 days before blowing again" syndrome.

There are other electrolytic capacitors in this circuit as well. Failure of any one of them can and will cause some sort of distortion in the vertical deflection. There might be six or eight electrolytics that have something to do with vertical deflection. Of course, in a monitor where each section has its own series of part numbers, locating these capacitors is a breeze. Notice that all the parts in the vertical section are the 500 series for Kortek and the 300 series for Kristel. If you're having trouble figuring out which capacitors to test and/or replace, just look for any cap that starts with a 5 (Kortek) or a 3 (Kristel).

Because of the plethora of capacitors and capacitor failures in vertical deflection circuit, it is not a bad idea to replace all the electrolytic capacitors. This will reduce the chances of another failure further down the road. This is one of the few places that you can actually perform preventive maintenance and save yourself some time and trouble later.

When troubleshooting a monitor with total loss of vertical deflection, you should begin by checking for the +24 volts at the Vs pin (Pin 2) of the output IC. If it's missing, look for an open resistor between the SMPS and the IC. If it exists, it will typically be something like 1.2 ohms. It's likely to be a metal-oxide or fusible resistor. Kristel doesn't have one but in the Kortek, it's resistor R125.

This resistor may open for one of two reasons. It may simply have failed, cutting off the +24 volts to the IC (hence, the flatline). In that case, all you need do is to replace the resistor and you're off and running. A much more likely scenario however, is that the IC itself has failed. It often will short-circuit. This draws too much current and causes the resistor to open. Don't be surprised if you replace an open resistor and when you energize the monitor, the new resistor smokes.

To prevent that from happening, you may approach this in two different ways: one is high-tech, the other is not. The high-tech way (the proper way) is that having found the +24 volts to be missing, and having found an open resistor, with the power turned off, measure the resistance between the Vs pin and ground. Typically, this might be a couple of hundred ohms, more or less. If you find it to be much lower (maybe 10 ohms) the IC is shorted and there's no sense applying power until you replace it.

The low-tech way is to use your finger. After replacing the open resistor, fire up the monitor with your finger on the resistor. If it instantly gets hot (you won't be able to keep your finger on it) turn off the monitor and replace the vertical output IC.

And speaking of fingers, one of them (your choice. I prefer right index) makes a great temperature probe. A bad vertical output IC that does not cause a series resistor to open nor shut down the SMPS due to excessive current, will, almost certainly, be extremely hot to the touch. I've seen it time and time again where a novice technician, working on a monitor with total loss of vertical deflection and making all kinds of tests and measurements with an oscilloscope and a meter, neglects the simplest test of all, touching the damn thing to see if it's hot!

Next month: Part 4
How Ceronix does it.

- Slot Tech Magazine

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