

**JUNE, 2003**

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## Be Observant!

Part of what goes into being a good diagnostician is to be as observant as possible. The more clues you can gather, the easier it is to spot trouble, pinpoint the cause and rectify the situation.

This includes using all of your senses. You look for obvious signs of trouble. "Hey! - Is that a puff of smoke I see over there?" You sniff around at things. "Hey! - Is that smoke I smell?" You feel things to

see if they're getting too warm. "Hey! - This thing feels really hot and it's starting to smoke!" You listen to see if things are making the types of sounds you expect or if they're making sounds that they're not supposed to. "Hey! - That smoking thingy is starting to make some sort of frying sound. Is it supposed to do that?"

I don't suppose you'll actually do much diagnostic tasting as a slot technician but my point is this: The more aware you are, the easier your job will be. To quote Don Seagle, mechanical engineer for Asahi Seiko (maker of fine hoppers and other coin handling equipment) "If it feels funny, if it acts funny, if it sounds funny, it probably is funny and you need to fix it."

Two cases in point: A casino in its "formative years" accidentally installs bill validators in small bank of dollar machines with their dipswitch options set incorrectly, giving four credit pulses for each dollar inserted. Oops. Each dollar inserted gave four dollars in credit. How could you not notice such a thing when you tested the machine? They had been working all day on quarter machines, they were tired and nobody noticed. It was hours before the mistake was realized and the patrons shooed off the machines so the BVs could be reconfigured for one credit per dollar.

In this month's Slot Tech



Magazine, we carry another story, courtesy of The Daily Herald, in Everett, Washington. You may have seen this story in the news as well. A machine was opened for play on the slot floor, while it was still set in a demonstration mode. As you will read, this caused a bit of confusion when a patron hit the machine for a \$12,000.00 payoff. There's not much you can do in a situation like that but to pay the customer. The words "demo mode" were displayed on the screen but nobody caught it. Hey, look . . . We're all human and every once in a while, even the best of individuals slip up. I just thought that this particular situation was a sort of wakeup call to remind us all to be on our toes. Read "She's a Winner After All" on page 28.

Let's more on the inside, including a **free "Slot Tech" T-shirt** that's yours for the asking from your friends at 3M Touchsystems. See page nine for details. Don't be shy about asking. Just give 'em a call and they'll send you one.

See you at the casino.

*Randy Fromm*

Randy Fromm - Publisher  
June, 2003

### Randy Fromm's Slot Tech Magazine

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# Service Reports

By Kevin Noble

Technical department. Most of them are because of variances in the hard drop and soft drop. Some other reports that are issued to us are meters not reporting, manual jackpots and a coin flow analysis report.

### Greater than or Less Than

The majority of the service reports consist of Metered Hard (hard count variance minimum threshold) or Soft drop (accounts for all variances) that is  $<$  or  $>$  than the actual hard or soft count. When the Auditing department shifts through all the paper work and the figures just don't add up, we are issued these service reports to help their department account for any variances. At the same time, the service report alerts us to any potential problems. If a problem is encountered, it is repaired and submitted back to Auditing. If there are no problems encountered, the simple message "NO PROBLEMS FOUND" is written.

### The Inspection

Before the hard drop service report is started, I start a visual inspection of the all the components that might effect the way the coins fall in

the game. I check for any obstructions in the drop chutes, the diverter, wiring, coin acceptor alignment, and the hopper probe condition. Next I test the hopper probe, the diverter engaging, hopper limits set correctly, options, SAS address and communicating. These are all done in the test modes provided by the game.

The most import is the MEAL book entries. Were there any drop jams? How many service reports have been done on this game? Does the game have any BV disputes? And if there is a problem, how did it start? After a hopper fill? These are some of the clues I tend to look for.

### The Hard Drop

The hard drop service report (actual coin drop equals metered coin drop, then minimum threshold is established) is about the correct number of coins entering the hopper, and the correct number of coins dropped with the hopper probe grounded. My first check is the MEAL book for any signs of any problems encountered by the attendant, any repairs from a technician and how many of these reports were done on this game. Our coin test starts

**I**n the perfect world, every coin enters to the hopper, the diverter engages and diverts all the coin to the drop, the BV accepts and stacks bills in the cashbox, and the machine gets all the correct data, interprets it, and increments the soft, accounting, and hard meters correctly. There is not one single coin lying on the bottom of the machine, plugging the drop chute or laying on the drop floor.

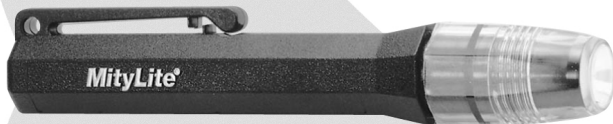
When opening some machines, I am amazed where coins will end up. In some IGT games, I have found coins on top of the CPU board housing, motherboards, on the power supply, and even inside a reel basket on the slant tops. Bally games have some interesting places to hide as well: behind the door, lodged behind the diverter, and underneath the hopper just to name a few.

There are many reasons why service reports (or auditing reports) are issued to the Slot





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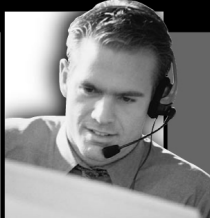
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with writing all the game information such as the serial number, game type, game theme, and the SMIB ID number. We verify the information the Auditing department is correct with our slot file. The asset number and location are given on the service report from Auditing. The before meters consist of soft coin in, coin out, coin drop, games played, and hand-pay jackpots (on the progressive machines we add the progressive hits and the progressive amount).

At our site, we test the machine with five coins to the hopper, ground the probe, and then five coins to the drop, one coin at a time. I usually add an eleventh coin to make sure the diverter returns back. The best troubleshooting for this test is my ears. I can listen to the coin actually make it way to its destination, whether it's the drop bucket, or hopper, and the click of the diverter engaging. Each sound has its own distinct set of noises. The last step is retaking the after meters to make sure the correct number of coins ended up where they are supposed to go, and any repairs or observations found. On the progressive, this helps to make sure the display has incremented the correct amount.

### **Hard Drop Problems**

Many of the hard drop problems can be attributed to the diverter and/or the hopper probe. Some problems found

with the diverter are, broken linkage, broken wires, misaligned coin comparator brackets, coins wedged in diverter, bad coils, drop chute blockages, and paper. The probe problems were broken wires, unplugged, hopper connector pin bent or pushed out, and coin out driver boards on the IGT to name a few.

### **The Soft Drop Report**

The soft drop service report consists of live bill testing on the floor. This time, all the before meters are taken, including the bill denomination. A test cashbox (clearly marked) is inserted into the game and one bill from each denomination is inserted. They all should be accepted. The machine is then cashed out and the coins placed back into the hopper. The after meters are now logged on the sheet, making certain that the correct number of credits is given for the denomination of the bill inserted, that all meters have incremented and the BV is working properly.

### **Soft Drop Problems (actual drop equals metered drop)**

This, I feel, is the hardest to troubleshoot. Not much physical evidence to shift through, except for the MEAL book entries. This could include BV disputes (if logged in the book by an attendant or supervisor) or somebody actually witnessed the bill being accepted and not returning any credit. Often, a bill is either found behind

the cashbox (where it is not picked up by the count team,) it is stuck in the transport, or the case of some Bally reels, the DUART. This is a good sign to clean and calibrate the BV head and transport.

### **Other Auditing Reports**

Some other reports handed down from Auditing are jackpot meters not equal to the hard pay, jackpot reporting (the Mikohn does not report IGT stand-alone progressives, 10 MEG board link progressives, and the new Bally 7-07 and 7-08 mains) coin flow analysis (variances greater than established thresholds) reports, and month end variances (are cumulative non-compensating variances and trend analysis), excessive fills, and meter run-a-ways to name a few.

### **Meter Sheet / Service Report**

The one luxury we have with the Auditing Department is the ability to alter the service report as new manufacturers and/or software enters the gaming floor. We try to make the necessary changes to help the Technician take the correct meter information right on the sheet, therefore we add the reel games meter information for IGT, Bally, Williams, Sigma, and the Mini-Bertha's. Additional information is also added to alert the Auditing Department what task the technician performed (either coin or bill test), if there was a machine move, an upgrade, set to tournament mode, or a conversion.



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## The Before, the After, and the AGCO

The before meters are first taken before any coin or bill test is performed, when the machine is first coming on line on the floor. The last time the meters are taken on the game is when the game is leaving the floor or being converted to another denomination or theme.

The after meters are the next or last step in a service report. After the coin test or bill test is complete, we take these sets of meters and compare it to the actual figures that were tested for any variances.

The AGCO meters are only completed when the game has been cleared or new on the floor. After our testing is completed, AGCO has to perform their own inspections, including a coin test. These meters are then returned to Auditing so they can be copied, (a copy to AGCO, tech room, and Operations Manager) and filed in our room so we can track the games that are having continuous problems.

### Overview

Service reports or Auditing reports should be listed on the job posting. Say what? Yes. This is one duty that is constant in our department. Handed down everyday, completed, and handed back in. They could be as little as one or two or as many as 20 or 30 at our site (for 750 machines). Any technician can do them, but it takes troubleshooting skills to repair them. I have

seen on many occasions when a report was done, and the MEAL book had the same report logged for that game many times in a week; all the figures incremented correctly, but the coins were not going where they are supposed to go.

This should instantly alert the technician that there is a problem, but in many cases it doesn't. Another thing that I try to stress is to write all the information in the MEAL book such as "if it was soft or hard drops", if it was "greater or less than" and, if a problem was found, what was done to repair that problem. The MEAL book is written into the Service Report.

The greatest problem that I run into is that one day it is greater than and two days

later (we do the hard drop one day, and the soft the next) on the same game it is less than. This also goes with the soft count. Why is the service report then given to the technician? Could it be stapled to the first report and written off? I am sure this would help. Some other weird service reports were the entire same theme once, and many times games that were back to back. I am sure there were many times the drop buckets were placed in the correct base, and surely it had to happen with a cashbox. Should the technician spend a couple of days with the Auditing department to see how the service report is born?

- Kevin Noble

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## Tiny Logic

By Herschel Peeler

Okay, we've had mini-computers and micro-processors, now we have "tiny-logic." Why not? Digital ICs have been around for quite a while. We can get a 14 or 16 pin IC that has four or six individual gates in it. This is common these days. What do you use if you only need one gate of an IC? One OR-Gate? One AND-Gate? One Flip-Flop? Tiny Logic to the rescue!

Fairchild, Toshiba, Maxim, TI, and most other manufacturers, make a line of TTL compatible CMOS devices that come one-to-a-package. Typically these are the SOT23 and SC70 surface mount packages.

Shown in figure 1, as close to actual size as I can get, we can see the "larger" SOT23, 5-lead package, compared in size to the "medium-size" SC70 case. They are shown in larger size just below that to have a picture large enough to show dimensions on.

These are the same cases used to enclose surface mount diodes, transistors, and linear ICs. They're just like a box of Forrest Gump's chocolates; "You can't tell what's inside." There is so

little room on the case that only a few letters are used to label and describe the device inside the package. Getting familiar with the labeling used is a necessity for the bench tech of today. For instance the TI part number for a single 74AHCT00 type gate (a two-input NAND) would be SN74AHCT1G00. Added on to the end of this number would be another letter or two describing which case the device is in. This is boiled down to just saying "00" on the case.

There are cases smaller than the SC70. The leads are just bumps on the bottom of the package, about half the size of the SC70 case. I haven't seen any of these in the gaming industry yet, so we'll cover them later. Consider that just a word of warning to get com-

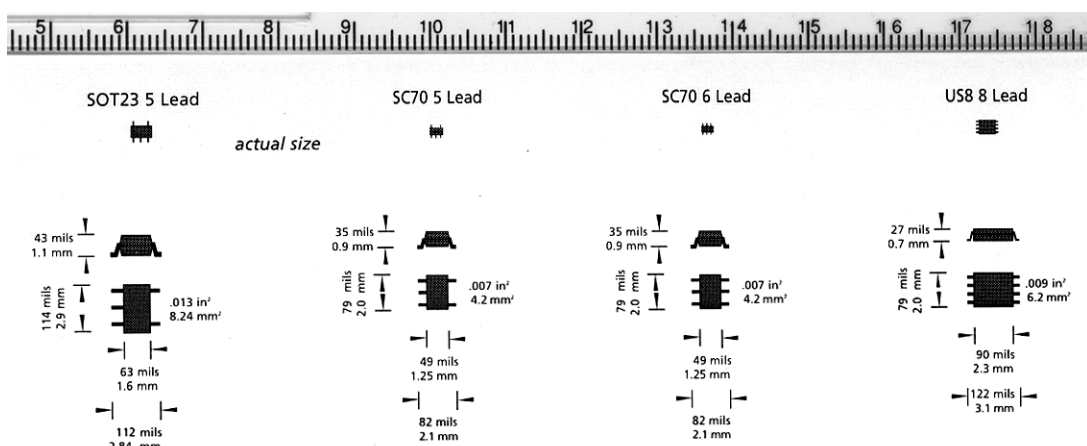


Figure 1. We can see the "larger" SOT23, 5-lead package, compared in size to the "medium-size" SC70 case. They are shown in larger size just below that to have a picture large enough to show dimensions on.



fortable with the SC70 being the "medium" size package.

Most of the basic gates are available in the Tiny-Logic family. The pinout starts at the upper-left corner, as the pictures in Figure 1 show looking down from the top of the IC, and counts down and around the IC, just as DIP (Dual In-Line Packages) and SOIC (Small Outline Integrated Circuit) packages do.

### Pinout standards

On almost all 5-pin packages (SOT23 or SC70), pin 3 is commonly ground, and pin 5 is commonly VCC. I have found no exceptions to this rule, but there is room in reality for something I haven't seen yet. Single, two-input gates usually have pins 1 and 2 being the inputs, and pin 4 as the output.

On 6-pin packages (SC70 mostly) pin 2 is ground and pin 5 is VCC. Gates in this line may come two-to-a-package (for inverters and buffers). The low numbered side is usually inputs. The high numbered side is usually outputs (not always).

On 8-pin packages (US8-8) pin 4 is ground and pin 8 is VCC. The low numbered side is usually inputs. The high numbered side is usually outputs (not always).

Figure 2 shows some examples of the pinouts used for simple gates.

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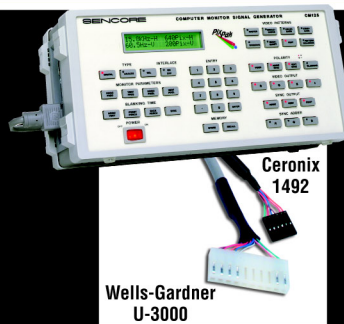
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## State of Development

At present, I know of only a few dozen devices in this family but they are growing in number every year and gaming shows show them coming. They are available from various manufacturers with compatibility for all CMOS families. I have not seen them in TTL devices but they may exist.

## Troubleshooting and Replacing

Troubleshooting the devices is easy as long as you know what's inside the package. Taking a bad one off the board is not hard (though often destructive). Putting the new one on can be done with a small tipped soldering iron (25 Watts or so) and a pair of good tweezers to hold the part in place while soldering. It

takes some practice, like anything else, but it can be done without super-human abilities. The cost of these devices does not warrant trying to remove a device intact, at the expense of damaging the board. Get the old one off with the least stress to the board as possible.

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

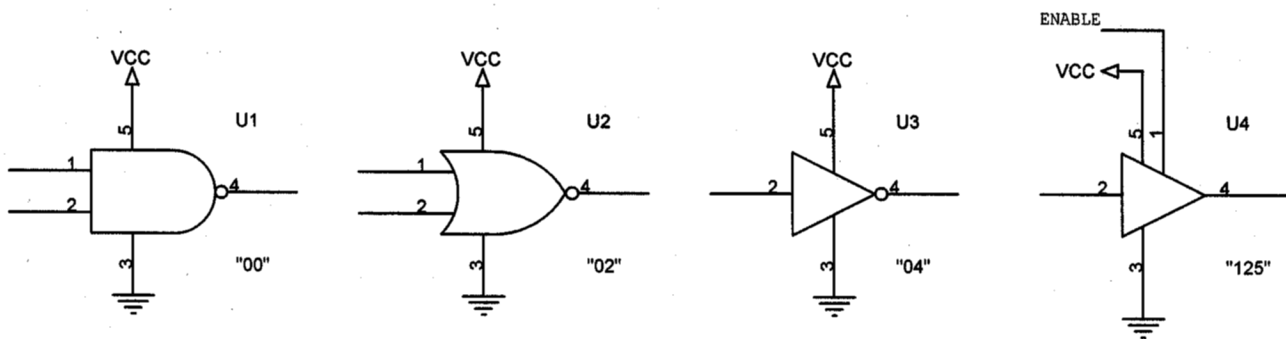


Figure 2. Typical "tiny logic" gates

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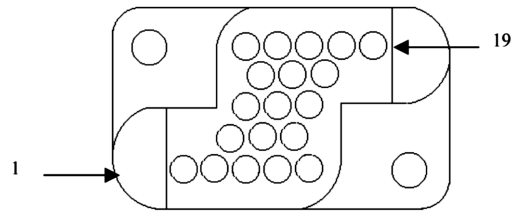
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38	75	640x480
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47	75	800x600
48	72	800x600
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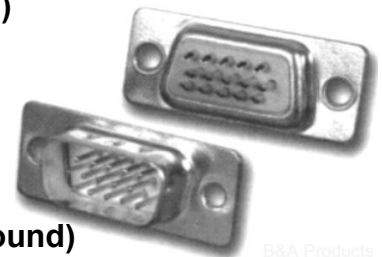
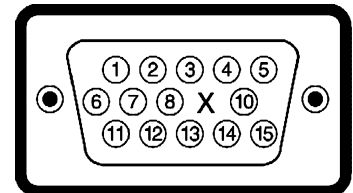
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NO.	DESCRIPTION	NO.	DESCRIPTION
1		11	TOUCH_RxD
2	VIDEO RED	12	NET GND
3	VIDEO BLUE	13	AC GND
4	VIDEO GREEN	14	AC2
5	HOR-SYNC	15	AC1
6	VER-SYNC	16	A GND
7	VIDEO GND	17	+13V DC(A)
8		18	AC2
9	TOUCH_TxD	19	AC1
10			

## Pin # Description

- 1 Red Video
- 2 Green Video
- 3 Blue Video
- 4 Sense 2 (Monitor ID bit 2)
- 5 Self Test (TTL Ground)
- 6 Red Ground
- 7 Green Ground
- 8 Blue Ground
- 9 Key - reserved, no pin
- 10 Logic Ground (Sync Ground)
- 11 Sense 0 (Monitor ID bit 0)
- 12 Sense 1 (Monitor ID bit 1)
- 13 Horizontal Sync
- 14 Vertical Sync
- 15 Sense 3 - often not used

## VGA Connector



B&A Products



## Entropy International Introduces New End Caps

Parts supplier Entropy International of Elk Grove Village, IL has produced off-the-shelf End Caps for use in the gaming industry. The chrome-plated, zinc die cast end caps were designed with input from several cabinet and OEM slot machine manufacturers.

Sales Manager Fred Kesselman said "we were approached by several of our valued customers to design and build custom end caps for their particular cabinets. We saw an opportunity to make a universal end cap with the features and requirements that all these customers wanted. We have designed a simple set of end caps that any manufacturer can use."

Samples of the end caps are currently available while production lots will be made available with a short lead time. Entropy is also working on a coin tray that will be used in conjunction with the end cap set.

Entropy International has been a parts supplier in the coin-operated industry for 23 years. While working mostly with OEMs on custom assemblies and parts, Entropy is a supplier of their own line



of coin doors and ticket dispensers for the coin-op industry.

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# What Kind of Training, Son? Aaaarmy Training, Sir!



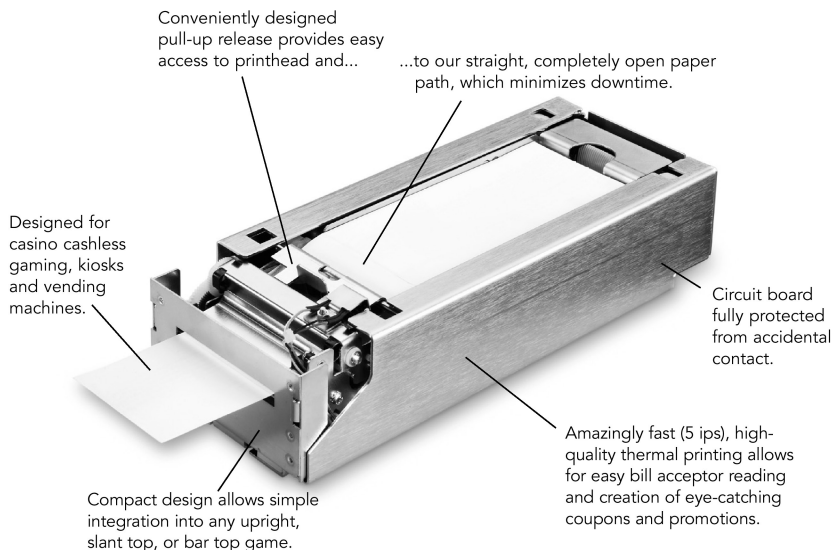
Some training missions are just a wee bit more interesting than others. Here we see some of the men and women technicians from the United States Army Recreation Machine Program during a recent train-

ing session in Germany. From left to right are: Anthony Morrow, England, Chris Tate, Vilseck, Brett Holdren, Wuerzburg, Jason Pokoj, Mannheim, Shane Stewart, Garmisch, Ron Quiroz, K-Town, Sharon Parker,

Frankfurt, Tim Pond, Vicenza, Charles Partee, Mannheim, Aundra Hill, Frankfurt, Adrian Horrell, Vicenza with technical instructor (and Slot Tech Magazine publisher) Randy Fromm.

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# Kortek Confusion Cleared

**E**ditor's Note: I would like to address a concern regarding field confusion over the warranty term for Kortek monitors, supported by Kortek and CasinoTech - its authorized service center. The nature of the confusion seems to be that most casinos base the warranty of the monitor on the game warranty. The game warranty is counted in days, the monitor warranty in years. Kortek and CasinoTech have asked Slot Tech Magazine to make an informational announcement clearing this up. As follows:

**K**ortek Corporation, manufacturer of video monitors for the gaming industry, would like to formally announce its warranty term on its past and current lineup of video monitors currently installed and shipping in gaming machines offered by several game equipment

manufacturers. The warranties on Kortek video monitors are shown in the chart at the bottom of this page.

Please note there are some variations by gaming equipment supplier. Please contact CasinoTech for exact information. Touchscreen and controller is included in the warranty.

This announcement is offered to clear up known confusion in the casino industry regarding the monitor's warranty versus the warranty of the whole game. Whereas the game is sold under a warranty that may be as short as 90 days, the monitor's warranty is considerably longer. As a result, the bench tech can continue to receive FREE warranty repair service for the monitor itself, well beyond the warranty of the game. CasinoTech located in Las Vegas, is the authorized Ko-

rtek service center and fully honors the warranty of all Kortek video monitors. Kortek recommends that warranty service be performed only by its authorized service center. Failure to do so will void the warranty.

Kortek is a leading supplier of video monitors to the gaming industry and has provided video solutions for such leading suppliers IGT, Bally, Sigma, Sierra Design, VLC, Konami, Atronic and others. Kortek can be reached at 702-736-8472.

CasinoTech, located in Las Vegas, is Kortek's authorized service center. They have solely serviced Kortek monitors for the last 3 years and specialize in quick turnaround. They are located in Park 2000 and can be reached at 702-736-8472 or [casinotech@lvcm.com](mailto:casinotech@lvcm.com)

### Kortek Monitor Warranties

**KTXX01M Series (14" and 20" CGA Monitors): 1 year from date of manufacture**  
**KTXX02M Series (14" and 20" EGA Monitors): 1 year from date of manufacture**  
**KTXX01N Series (14" and 20" CGA Monitors): 1 year from date of manufacture**  
**KTXX03V Series (14", 17" and 20" VGA Monitors): 1 year from date of manufacture**  
**KTXX03N Series (14", 17" and 19" VGA Monitors): 2 years from date of manufacture;**  
**except KT2003N (20" VGA Monitor): 1 year from date of manufacture**  
**KTXX48 Series (17" and 19" SVGA Monitors): 1 year from date of manufacture**  
**KTXX82 Series (17" and 19" XGA Monitors): 2 years from date of manufacture**

# Got That Shaky Feeling?

**A**s an electronics technician, one of the things that I really enjoy is circuit analysis. When I encounter a new piece of equipment or a circuit with which I am unfamiliar (and when I'm lucky enough to have the schematic diagram) I get a great deal of satisfaction from pouring over the prints to see just how the engineers have put things together. There are many ways to skin a cat in the world of electronics. It's fun to see just how things work.

It's just as fun to see how things fail. Failure analysis is, of course, the key to troubleshooting. Knowing how something works is interesting. Knowing how things fail pays the bills.

With that in mind, I'd like to present those of you who are just starting out in electronics with a simple look at failure analysis. Mid-level or advanced techs - you already know this stuff so you might want to move on in the magazine.

Still here? Good, because this is a real-world failure that you quite possibly will see, right now, in Kortek monitors on the slot floor (or maybe you've already seen the problem and the monitor has been

pulled and is sitting on the shelf, awaiting repair. In that case, pull out your soldering iron and plug it in. This monitor will be repaired in less than ten minutes and it will cost you a quarter).

## The Symptom

The symptom under discussion is not a common one but the actual cause of the failure is the most common failure in monitors. The symptom is loss of horizontal sync. You can try adjusting the horizontal hold potentiometer (VR301) but the sync won't remain locked.

Sync failures are rare because the sync circuits don't work very hard. In fact, the sync circuits are generally among the most reliable of all the circuits in a monitor. All the sync does is tell the oscillator what to do. The sync signal simply applies a slight correction to the oscillator so that it maintains operation at the correct frequency and is oscillating in phase with the video signals that are coming from the game's CPU or graphics generator.

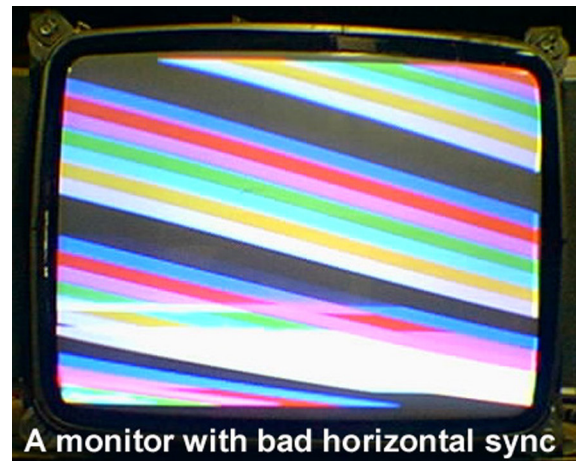
Well, as the expression goes, "garbage

in - garbage out." In this case, the output from the sync circuit must be "garbage" because our symptom is loss of horizontal sync. So how about the input? How is the sync signal coming from the CPU? We know that's okay because as soon as we throw a different monitor in the machine, the problem goes away. That's the miracle of swaptronics.

So, even without any actual testing with an oscilloscope or multimeter, we can deduce where our problem lies. It has to be a problem with the sync circuitry — or does it?

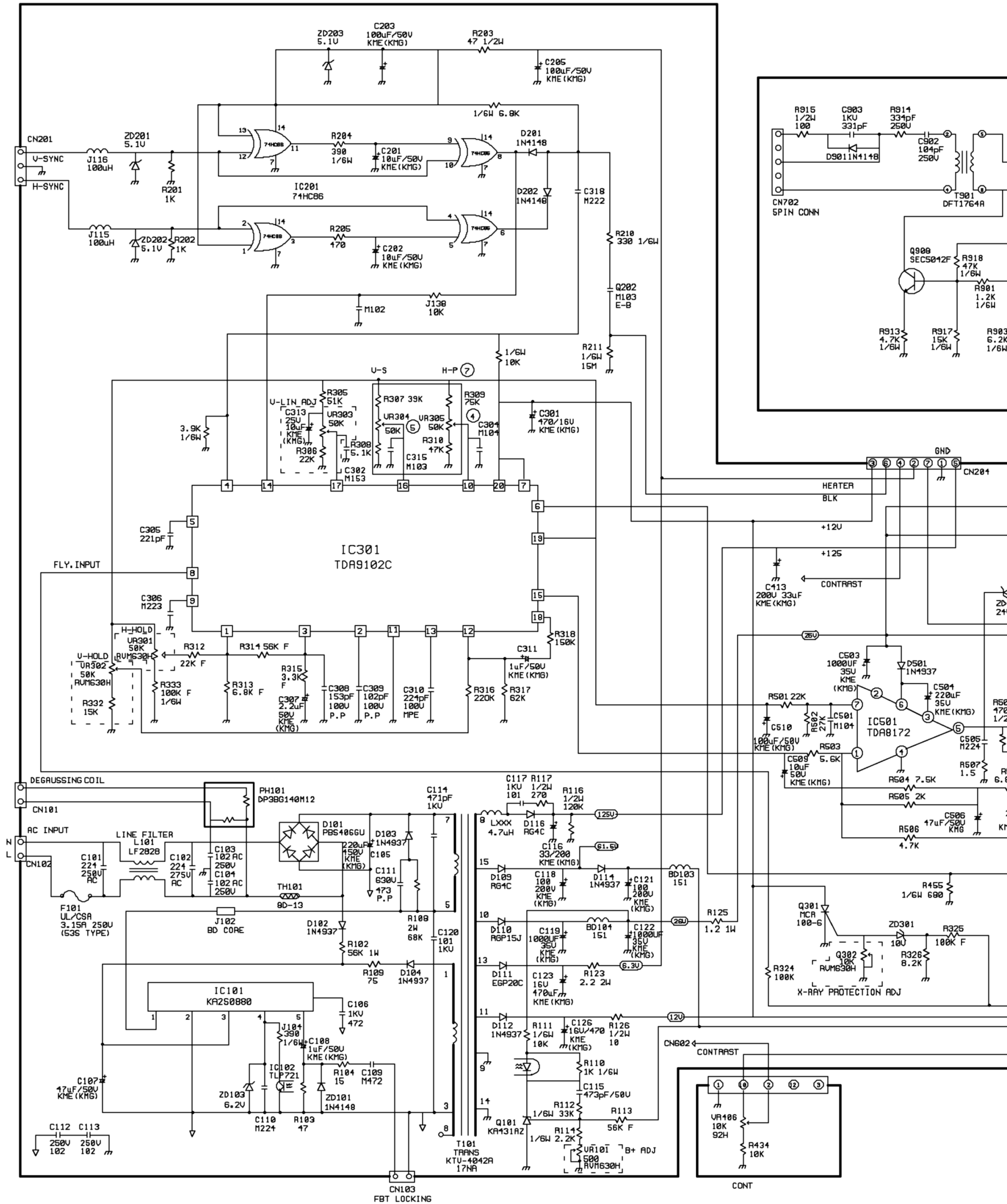
## The Power Supply

There are actually two types of inputs in the sync circuit. One is the sync signals themselves (both vertical sync and horizontal sync). These sync signals are just momentary pulses.

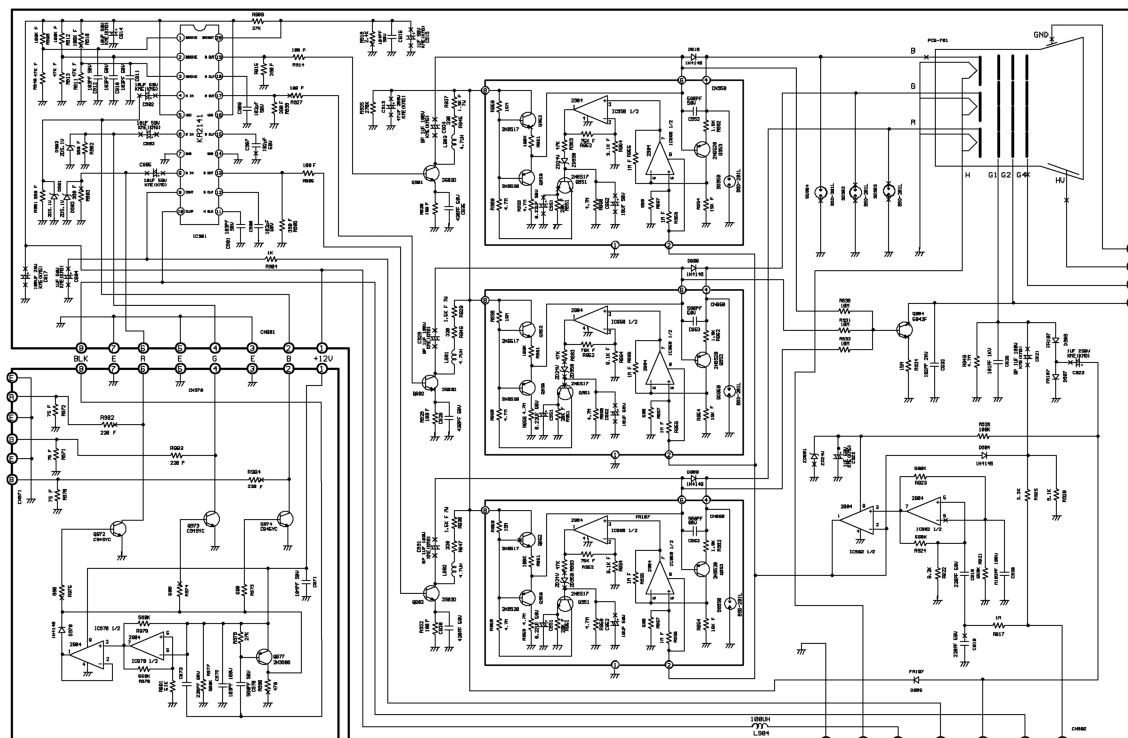


A monitor with bad horizontal sync

# Kortek KT1703







The horizontal sync signal comes at the end of each raster line. It is the horizontal sync signal that tells the monitor to stop drawing each horizontal line and quickly return to the left side of the CRT to begin the next line. This is known as the horizontal retrace.

The vertical sync pulse is sent out by the computer when the beam is down in the lower right corner. The vertical sync signal tells the monitor to start the vertical retrace sequence, turning the electron gun off and returning it to the top of the CRT.

Computers may produce either one of two types of sync signals. The vertical and horizontal sync signals may be positive sync or negative sync.

Negative sync starts at a high level, pulses briefly down to 0 volts and back high. Positive sync does just the opposite. It's normally at 0 volts, pulsing high briefly and back to 0 in order to synchronize the monitor.

Both sync systems are equally effective. In order to make their monitors compatible with any type of sync, most monitor manufacturers have designed their monitors to accept both positive and negative sync inputs. Monitors are designed to accept either sync polarity; automatically detecting its polarity.

In this case, the sync circuit uses an exclusive-OR gate,

type 74HC86. This is a common type of sync circuit because it allows a monitor to use sync pulses of either polarity, positive sync or negative sync.

The other input to the sync circuit is the power supply. The 74HC86 requires a +5 VDC power supply. But since this is the only device in the entire monitor that requires +5 VDC as a power source, and because it is a circuit that requires very little current, it would be a waste of money to create a separate power supply (with its own transformer secondary winding, diode, and filter capacitors) for it. Surely there is a place we can tap into in order to obtain the +5 VDC we're looking for.

In this case, we already have a power supply that is very close to 5 volts. It's the 6.3 volt power supply that is used to drive the CRT heater. The CRT heater (the thingy that you see glowing in the neck of the picture tube) is designed to work off of 6.3 volts. It doesn't actually have to be DC. The heater works equally well when powered by an AC source. In many monitors, the heater is actually driven by a low-voltage winding on the flyback transformer. In this case, however, there is a 6.3 volt DC output from the SMPS; the "switched-mode power supply."

So, getting back to the "circuit analysis" part of the discussion, when I first looked at this monitor, I had looked at the 6.3 volt DC output of the

SMPS and thought to myself "Hmmm . . . That's interesting. I wonder why they would go through the bother of rectifying the 6.3 volts with a diode and filtering it with a capacitor when the CRT heater doesn't care if it's powered by DC or AC. Why not run the 6.3 VAC output of the SMPS transformer directly to the CRT heater?"

I then took a closer look and saw that the 6.3 VDC not only connects to the CRT heater but also connects through R203 (a 47 ohm resistor) to the Vcc input (the +5 VDC power input) of the 74HC86 sync circuit. No wonder they are using 6.3 volts DC. We need DC to power the 74HC86. Since the 6.3 VDC power supply is just a wee bit too high for Vcc, the combination of resistor R203 and Zener diode ZD203 is used to peg the voltage at 5.1 volts DC.

### **So, What's the Problem, Already?**

Okay, here's the deal . . . In this case, we have a problem with sync. The sync signal coming in to the monitor is good (swaptronics, remember?). You might take a guess and call the 74HC86 bad but before you do that, you want to check the Vcc at pin 14 of the IC. This is best accomplished with an oscilloscope (as covered in last month's "Electronics 101" in Slot Tech Magazine). What you're looking for is ripple in the power supply, in this case, caused by failure of the filter capacitor in the 6.3 VDC power supply, C123.

This might be a tough one to find using just a digital multimeter to measure the Vcc voltage because the high frequency ripple may not cause a significant change in the voltage reading. You may see a fraction of a volt drop in the DC voltage reading (or you may not, depending on the brand and model of meter you are using) which you might consider within tolerance.

“What about C203 and/or C205,” you might ask. “Won’t they take over if C123 has failed?”

No, they cannot. Despite the fact that they are hanging on the power line, they are on the other side of resistor R123 and cannot obtain enough current (called the “ripple current”) to charge sufficiently to overcome the shortfall caused by failure of C123.

You might also wonder why the horizontal sync is the one that is severely affected by this ripple and not the vertical sync. The same 74HC86 IC is used for both the horizontal and vertical sync. If the power supply has a ton of ripple in it, why doesn’t it affect both circuits equally?

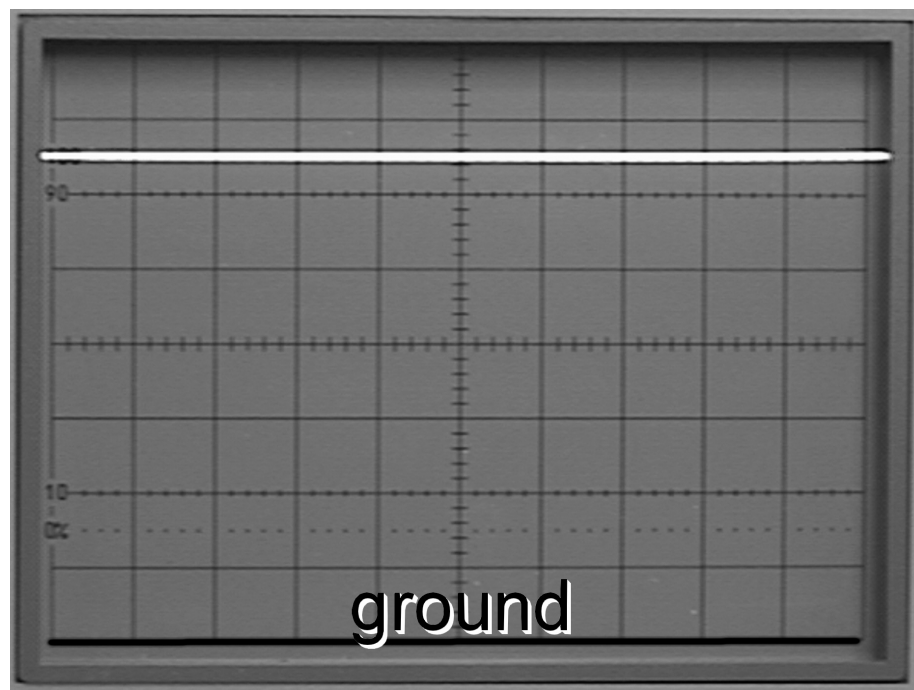
The answer is that the horizontal sync is high frequency, just as the SMPS is. In fact, in many SMPS designs, the SMPS operation is actually synchronized to the horizontal frequency through the use of turn of wire taken around the core of the fly-

back transformer. You’ll notice it on the schematic diagram, labeled as “FBT Locking.” The horizontal sync circuit is, therefore, sensitive to ripple.

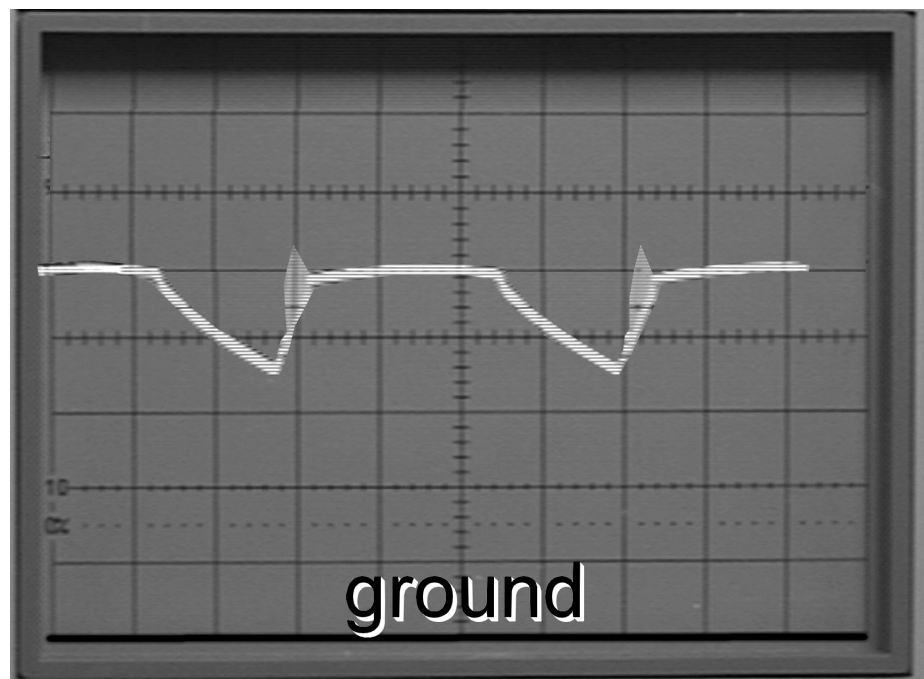
The vertical sync, on the other hand, is very low frequency,

typically just 60-75 Hz. Since the vertical oscillator isn’t looking for anything that is high frequency, it ignores the high frequency ripple in the power supply that has been caused by failure of capacitor C123.

- Slot Tech Magazine

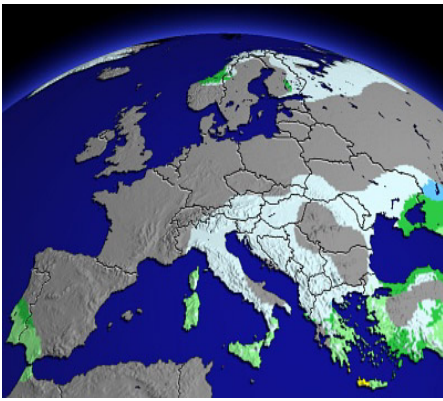


The output of the 6.3 VDC power supply should look like this. The vertical input is set for 1v/div.



When C123 fails, ripple is allowed to creep into the power supply.





## **'Have You Seen The Future?'**

'Have You Seen The Future' is a unique event being held at the National Motorcycle Museum, Birmingham, on June 11th and 12th.

Hosted by SCAN COIN, it is the only event of its kind devoted exclusively to money processing and is designed to give visitors direct access to the systems and technology that are likely to impact on their business within the next year.

A wide range of hardware and software solutions will be featured and demonstrated systems will appeal to a wide cross section of visitors. There are sections devoted to systems for gaming and casinos, retailing and self-service banking, intelligent queue management systems, account payment kiosks, transport cash solutions and software systems to suit all sectors.

There will also be a series of seminars on issues relevant to most industries - in fact,

something to interest everyone. You can find out more and register to attend by visiting the website at:

<http://www.HaveYouSeenTheFuture.com>

## **Kimble Setting Up Shop In Las Vegas**

Kimble are to take a stand at this year's G2E exhibition in Las Vegas, which will be the first year the Irish firm have exhibited there.

Kimble's managing director Jim McCann had this to say "We are very excited to be exhibiting at G2E in the home of gambling, Las Vegas. We feel that the time is right for us to go there after 30 years in business we should be there with the rest of the major companies.

Kimble will be launching a new product at the show, which will for now stay secret. But we will say this - that it will be very exciting. We will also be exhibiting a

**By Martin Dempsey**

range of reconditioned slots, video slots and pokers. Our staff are looking forward to meeting friends - old and new."

Kimble are exhibiting on stand number 2228, which is located front centre in the hall facing John Huxley and beside ATE International. For further information phone 042 9336574 or email [kimble@iol.ie](mailto:kimble@iol.ie)

## **Innovative Technology Ltd Appoints Micro Electronic Services As ASC**

With the announcement of payment deregulation and the Gaming and Amusement Industry preparing itself for the introduction of note



**The CDS2000 proved a to be popular attraction at last year's 'Have You Seen The Future?' with its ability to handle coins, bank notes and cheques**

readers in machines later this year, it comes as no surprise that Innovative Technology Limited has looked at the best support solution for its product range.

Having investigated a range of alternatives Innovative Technology Ltd has selected Micro Electronic Services Limited (MES) as its Approved Service Centre. Established in 1988 MES has a proven track record of support for the Gaming & Amusement Industry. While still specialising in the servicing of all types of coin mechanisms, MES has broadened its product base to include note readers, monitors, power supplies and control boards.

MES Managing Director Paul Boxall said "Including Innovative Technology note readers into our product portfolio was a very important part of our strategy to become a one stop shop for electronics service within the industry".

For further information email  
[mdokie@microelectronicservices.co.uk](mailto:mdokie@microelectronicservices.co.uk)

### **Eurobaz To Introduce Hide 'N' Seek Poker To UK Market!**

Eurobaz International Ltd and Catalana Technologies of Spain are introducing to the UK market place a video poker game with a secondary feature which is fun, fun, fun!

In fact the secondary feature can be more powerful and exciting to play than the primary feature of straight poker game. Its called 'Hide

'N' Seek Poker. As well as participating in a real poker style game, certain win features kick in a 'Hide 'N' Seek feature, second to none.

Five Cards are laid out on the table with amounts varying between £1 and £25 and they are placed under the cards. The cards are shuffled and the player has to select which

card is concealing the money. When the money can vary between £1 and £25 its a tough decision for the player to make.

For further information contact Barrington Thompson, Eurobaz International Ltd.  
Email  
[Barrington@eurobaz.co.uk](mailto:Barrington@eurobaz.co.uk)

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## Polish President Signs New Gaming Bill

By the end of March 2003 the organisers have received many applications from Polish as well as international companies interested in participation in the 2nd International Salon of Entertainment Devices and Technology -SUREXPO 2003.

Since we would like SUREXPO Salon to be advertised and promoted all over the world, we are constantly in touch with Polish and international publishers and trade associations. The proof of this is our co-operation with organisations such as ALAJA from South America, AAMA from the United States and many others. Moreover, our advertisements have already been published in magazines including Coin-Op News (Europe), Jackpot (Slovakia), Trh Zabavy (Czech Republic), Play Machine Europe (Italy) and Game Time International (Taiwan). For further information contact Witold Malinowski by email at [office@wigor.wroc.pl](mailto:office@wigor.wroc.pl)

## Kiev Tenth Exhibition Is Booming

The Ukrainian Chamber of Commerce and Industry - the organiser of the 10th international specialised exhibition "Entertainment Industry" which will be held in Kiev, Ukraine from the 24th to the 26th of September -



The view from last year's show, the 9th International Specialized Exhibition "Entertainment Industry-2002" held in Kiev.

has announced that by the 30th of April the sold space exceeded the area occupied by the exhibition of 2002 by 10%.

65 companies from Bulgaria, Canada, Czech Republic, Britain, Holland, Ireland, Korea, Latvia, Lithuania, Poland, Russia, Slovenia, Taiwan, Ukraine and USA have already confirmed their participation in the Jubilee Exhibition.

For further information contact Valeriy Valyayev, Ukrainian Chamber of Commerce and Industry, 33, V. Zhytomyrska Str., Kiev 01601, Ukraine.  
Phone: +380-44 / 568 57 52.  
Fax: +380-44 / 568 57 51.  
Email: [vuv-expo@ucci.org.ua](mailto:vuv-expo@ucci.org.ua)  
Website:

<http://www.ucci.org.ua>

## EiG 2003 Maintains Effective Formula

The second annual European i-Gaming Congress & Expo (EiG) will take place at the Hotel Rey Juan Carlos, Barcelona, Spain on 11-12 November 2003.

Co-organisers, ATE and The River City Group have put together an outline conference programme for EiG 2003, which will comprise around 30 top level speakers with expertise in areas including: applications and market development, methods of content delivery and emerging platforms, social responsibility, regulatory issues, payment systems, marketing, promotions, and game development.

For more information on EiG 2003, visit

<http://www.ATEOnline.co.uk/conferences>  
or <http://www.eigexpo.com>  
email [info@sjc.co.uk](mailto:info@sjc.co.uk)





# BELL-FRUIT GAMES

## Bell Fruit Games First For Czech Market

After extensive research Bell-Fruit Games has developed its first game for the Czech market for some time. Working in partnership with distributors Comax, BFG's HOT SPINNER has already produced excellent test results, and is tipped to generate healthy sales.

Export Manager Mick Lee told us : "Re-entering the Czech market is part of our growth strategy in overseas sectors. We are very pleased to be working with a well-established distributor in Comax, and are looking forward to a successful future with them".

HOT SPINNER has a simple easy-to-play basic game played on 5 Winline; alternatively the player can choose to play the 'HOT' game. The aim is to achieve 3 HOT SPINNER symbols to activate the entertaining HOT SPINNER feature disc.

For further information email [mariakidulis@bellfruitgames.co.uk](mailto:mariakidulis@bellfruitgames.co.uk)

## Revenue From Gaming & Amusement Licences 2002

Figures issued by the Revenue Commissioners in Dublin recently show that in 2002 there were 125 Gaming (Premises) Licences, yielding EUR 55,970; 11,400 Gaming Machine Licences, yielding EUR 1,483,134 and 7,009 Amusement Machine Licences, yielding EUR 830,429. Total income from 18,534 licences was EUR 2,369,533.

These figures represent an increase from 115 Gaming (Premises) Licences and EUR 54,281 the previous year; an increase from 9,997 Gaming Machine Licences and EUR 1,415,948 and an increase from 5,579 Amusement Machine Licences and EUR 649,344.

Gaming (Premises) Licences are issued in four categories - not exceeding three months - EUR 155; exceeding three months but not exceeding six months - EUR 315; exceeding six months but not exceeding nine months - EUR 475 and exceeding nine months - EUR 630.

## Hey Presto!

Move over David Blaine, there's a new magician on the scene! Red Gaming's latest AWP, That's Magic is sure to present players with some 'tricky' challenges.

Rapid progression through the game can be achieved by the tactical use of nudges for the chance of a themed feature or a win on the Hi Lo gamble. When the bonus circle is activated, players are offered the unique opportunity of banking the current amount on the award decal within the bonus circle, even if they lose the gamble!

Steve Wooding of Red Gaming said: "Players will love this new game, which offers the great depth of gameplay that has come to be expected from Red. We are really pleased to see 'That's Magic' receiving a broad sweep of retailer approvals, from both the Pub and Betting Office sectors of the market."



For further information please contact Sam Drakeford / Clare McMillan@england. Tel: 0113 234 5600. Fax: 0113 234 5601. Email: [sam.drakeford@englandagency.com](mailto:sam.drakeford@englandagency.com)

## Brent Raises Alarm Stakes

UK-based spares, components and equipment supplier, Brent Electronic has announced the launch of its Secur-It alarm, an easy-to-install boxed alarm developed to work across AWP / gaming machine, video and vending products. According to Brent, the alarm is the most cost-effective unit of its type currently on the market.

Available exclusively from Brent Electronic, the bespoke product has been created to satisfy stringent operational requirements. The microprocessor-controlled unit is boxed with two mounting lugs, enabling easy installation, has a 110-decibel alarm sounder, intelligent 'arming' mode and uses rechargeable batteries. The Secur-It alarm is the latest addition to Brent Electronic's family of anti-theft products including the SecurDor range, which has sold in excess of 20,000 units since its introduction in 1998.

For further information email [pmurphy@namco.co.uk](mailto:pmurphy@namco.co.uk)

## Capital Gaming Ltd - The New Coinmaster

The future of the Coinmaster product range - it's multi-player roulette, Winning Post horse racing game and single player machines - has now been secured.

Capital Gaming Ltd of Cardiff

purchased the assets of Coinmaster on 11th April 2003, from the receivers, Adrian Wolstenholme and Ian Best of Ernst and Young.

Capital Gaming, a privately owned company, is headed by some of the former management of Coinmaster - Keith Ingram, Adrian Parker, Ken Kennedy and John Evans. The new venture was financed by Bank of Scotland Corporate Banking.

For further information contact Capital Gaming Ltd., 321 Penarth Road, Cardiff, CF11 8TT, UK. Tel: + 44 2920 649500. Fax: + 44 2920 649549. Email: [sales@capital-gaming.com](mailto:sales@capital-gaming.com)

## There's More Hopping At Casino Daugava Than IGT's Kanga'Roo'

Casino Daugava officially opened at the end of April and IGT's fun character 'Roo' from the video slot theme Deep Pockets, will help keep the place hopping. Olympic Casino Group's (OCG) first Latvian venture will treat Riga gamers to a full range of IGT's most widely accepted video themes from both this year's and last year's offerings.



Drawing on experience gained in its Lithuanian and Estonian operations, OCG selected proven producers like Texas Tea, The Frog Prince and Enchanted Unicorn along with plus bonus-popular Deep Pockets - an Aussie-themed game hosted by nothing less than a kangaroo.

For more information on International Game Technology, visit the company web site at <http://www.IGT.com> or contact Karen Thompson at +31 23 568 7100 or email [Karen.Thompson@igt.com](mailto:Karen.Thompson@igt.com)

## Barcrest Group To Present New Machines At Svet Zabavy

Barcrest Group is delighted to confirm that two of its brands will be presenting new completed products for the Czech market at the forthcoming exhibition in Prague. Barcrest Games will present Fair Play Gold on the Fairplay Trend stand, while Red Gaming's Starburst will be exhibited on the Jamp stand.

Willem Korteweg, Director of Overseas Sales at Barcrest Group commented: "The Czech market is an important market for Barcrest Group and we continually monitor feedback to ensure that the games we develop are ideally suited to the Czech player."

The teams at Barcrest Games and Red have worked hard to carefully design two

targeted new games which will allow Barcrest Group to gain a strong foothold in this developing market.”

Both games have been developed for the Czech pub and arcade market but are also suitable for the Slovakian market.

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

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# She's a Winner After All

Marysville woman gets disputed casino bounty



Deborah Hughes flashed her \$12,000 check in gambling winnings at the Tulalip Casino

**Editor's Note:** *The following article has been reprinted courtesy of The Daily Herald, Everett, Washington. I wanted to use it to illustrate a point. **BE OBSERVANT!** The daily job of a slot tech is filled with routine duties. It's easy to become complacent. In this case, had anyone noticed that this machine had been operating in the "demo mode" \$12,000 that had not truly been won, would have been saved. 'Nuff said?*

MARYSVILLE — With a squeal of joy, Deborah Hughes flashed her \$12,000 check in gambling winnings at the Tulalip Casino here Monday.

"I got it! Check it out, you guys!" she said excitedly to reporters and photographers on hand for the presentation of the check. "This has just been an awesome, awesome day!"

Hughes won the money in a slot machine glitch Friday night, unaware until she went to cash in her winnings that she was playing on a machine that erroneously was in a dem-

onstration mode that runs much faster — and allows 200 times more wins — than a slot machine is intended to do.

Hughes and her sister, Linda Jensen, were upset when she discovered the mistake. Demo mode is used by technicians to test out new

or updated games before they are set for public play.

But officials of Multimedia Games, Inc., of Austin, Texas, the machine's manufacturer, promised to pay Hughes anyway. She hadn't heard from the company until she called Tulalip Casino chief operating officer Chuck James Sunday.

Within an hour, she received a phone call telling her the check would be available Monday.

Hughes already has plans for the money.

"I'm going to find myself an apartment and pay off some bills," the 49-year-old Marysville woman said.

She had moved to Elko, Nev., where she put everything in storage to take care of her mother, who was seriously ill. After her mother died, Hughes had no job, was behind on her bills, and her family was in

By Cathy Logg Herald Writer

Washington, so she moved back, she said.

State and tribal gaming officials were aware of the mistake, but no sanctions were imposed.

"It was an unusual occurrence, and it had never happened before," James said. "It should be reimbursed."

He grinned and gave Hughes a congratulatory hug after she received her check.

Multimedia's attorney, Frank Miller, said additional steps have been added so that the mistake doesn't happen again after machines are tested.

"My clients pride themselves on public relations," he said. "This was an unfortunate situation. She probably thought it was the hottest machine in the world."

Hughes did. She was playing a \$10 card, but won every three or four games.

"I was a nervous wreck because of the amount that was on there," she said. "It's going to put me on the right track."

The cook and caterer, only an occasional small-stakes gambler, still has her \$10 card, but doesn't plan to play it anytime soon.

"Probably not for a long time," she said. "You don't want to push your luck."

Reporter Cathy Logg: 425-339-3437 or [logg@heraldnet.com](mailto:logg@heraldnet.com).



# Mechanical **RE-PROGRAMMABLE** High Security Gaming Lock Series 500

*"The best solution to protect machines, business and profit"*

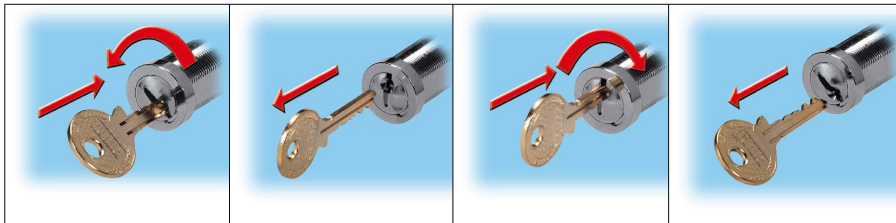
The success of RIELDA was the ability to understand and meet the Security and Key Control problem that the Gaming Industry and Casinos industry face every day. Security and Key Control problems represent a big concern and a threat for the Game equipment and profit on most Slot Machines. When keys go lost or stolen, having the suspect that previous employees have a copy of the keys, in all those cases it is need to regenerate the Game-machines lock security ! Now RIELDA offer a Revolutionary range of **Reprogrammable** High Security Lock specifically designed for the Gaming Industry, that enables the Game machines Operator to regenerate the lock machine security in a flexible, cost-effective and time-saving way.

*RIELDA **Re-programmable** Locks enables the Game Operator to change the key being used with one completely different without having to replace the locks. It is possible to Re-Program the locks as many time as necessary with **16384** different combinations. **16384 locks in one !** Just a half a turn of the **Programming Key** will change the lock combination and cancel the previous key.*

Lost, stolen or non-returned keys, or those which have ended up in wrong hands are easily disabled. RIELDA Re-Programmable locks offer a quick, cost-effective and time-saving solution for Security and Key Control problems. The Programming and Reprogramming steps can be carried out, directly by the Slot Operator without external intervention:

## Programming

## Reprogramming



1. Insert the Programming Key (Gold).
2. Rotate half a turn and withdraw.  
Now the lock is ready for the Use Key (Silver).

3. Insert the original Programming Key (Gold).
4. Rotate half a turn and withdraw.  
Now the lock is ready to be Programmed by a new Key Kit Pic1 & 2.

Why change the locks when you only need to change the keys ?

The Reprogramming feature allows the Slot Manager to restore the Security level of the Game machines, reducing the stop of the time machines. No loss of selling time while waiting to have locks changed.

*What's more, the **Re-programmable** locks provide the solution to the Key Lock Handling problem.*

*The Re-programmable locks allow simple, flexible, low-cost and instant "**Key Unification**" – just a single key to manage all the Gaming equipment. Even additional Game machines can be operated by the same key.*

*Thank to the Reprogramming feature, the key management can be changed whenever you want.*

**RIELDA Re-programmable Locks Series 500** features :drilling resistance, picking resistance, pulling/pushing resistance, Patented lock and Key, - Engineered with the RIELDA patented "Double-Locking-System" to prevent plug rotation and plug extraction, wide Retrofitting capacity, master key capability. RIELDA Key is constructed of solid Nickel-Silver for lasting durability. Key resistant to bending, twisting and breaking due to its heavy duty construction. Key codes assigned on an exclusive basis.

RIELDA Reprogrammable High Security Lock represent the **STRONG – SECURE – KEY CONTROL SOLUTION** for the Gaming Industry " Thought for the Casino site in mind".



For more information, contact **RIELDA** Company :

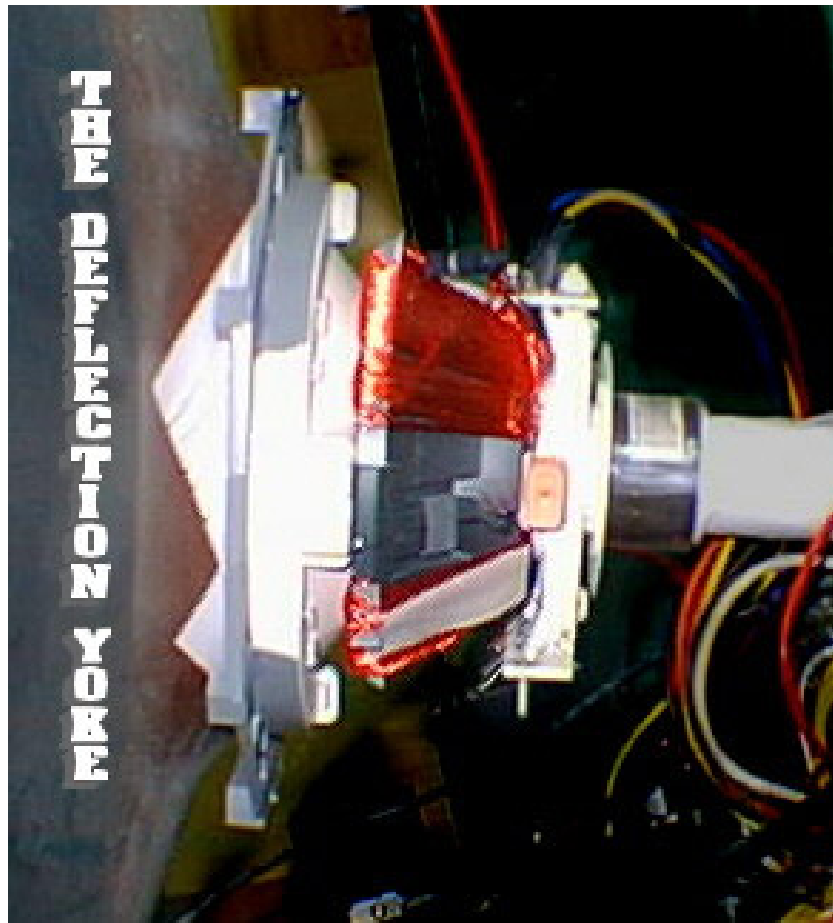
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# Vertical Deflection

The image on the screen of your videogame monitor is made of hundreds of individual lines. Each of these lines is called a “raster line” or a “video line.” The number of lines will vary between monitors of different resolution. A standard resolution image is made of approximately 240 lines. Some games use a VGA resolution monitor that will display 480 lines. Many new games fall into this category or even the higher 800 X 600 SVGA resolution. We’ve covered this before here in Slot Tech Magazine. More lines will give you a better picture but regardless of how many there are, the lines are stacked so close together that when viewed from any distance at all they seem to blend together into one seamless picture.



The part of the monitor that’s in charge of stacking the lines is called the “vertical deflection circuit.” It’s also called the “vertical sweep.” When the vertical deflection circuit is doing its job properly, it will place each consecutive line of the picture, one beneath the other and space them evenly across the screen from top to bottom. The spacing between the lines is important. It’s called “vertical linearity.” If the vertical linearity is not correct (due to a component failure or poor adjustment) the picture will appear distorted. Round objects, for example, may ap-

pear pear-shaped if the lines at the top of the picture are spaced further apart than those at the bottom.

It’s not at all unusual to encounter problems in the vertical deflection circuit of a monitor. In fact, in older monitors this is one of the most common failures you’ll see. There are a few different symptoms, depending upon the nature of the failure. You might see a picture that doesn’t quite fill the screen from the top to the bottom, no matter how you adjust the vertical size or height control. Another

# 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



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**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

**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

Events subject to change

**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

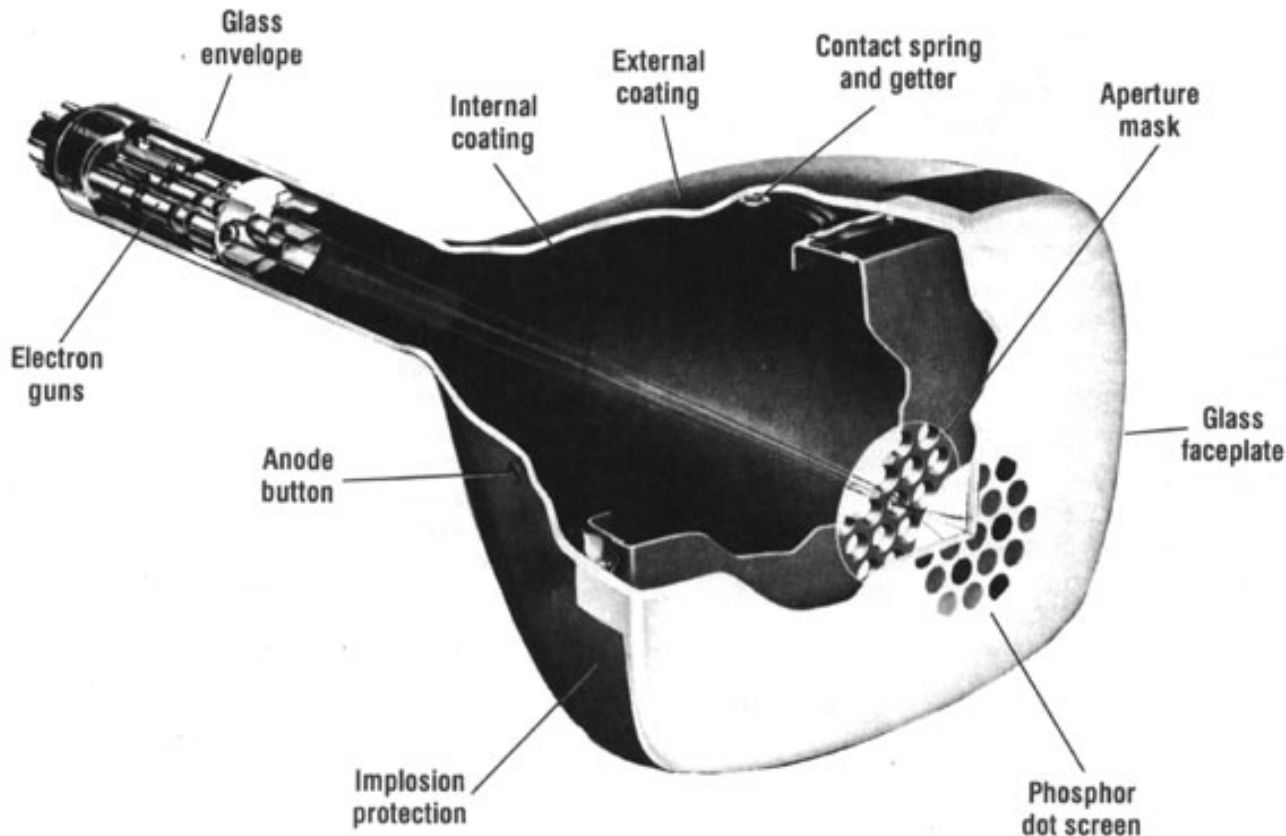
**PLUS - Bonus sessions from 3M Touchsystems (MicroTouch) IDX (Coin validators) and Sencore (Test equipment to speed through monitor repairs)**

*Dates and times to be announced*



Visit the website at [slot-techs.com](http://slot-techs.com)  
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Space is limited - Register today!



Inside the slender neck of a monitor's picture tube, an "electron gun assembly" creates three beams of high-energy electrons. These electron beams are shot toward the screen, which is coated on the inside with red, green and blue "phosphor."

symptom is a picture that's squashed (squished?) at the top of the screen, cutting off the picture. The top of the picture may be so distorted that it actually appears to fold over onto itself and display a bit of the image upside down and backwards in a symptom known as "vertical foldover." In many cases, the vertical deflection circuit fails completely, leaving just a single horizontal line running down the center of the monitor.

## Theory of Operation

Inside the slender neck of a

monitor's picture tube, an "electron gun assembly" creates three beams of high-energy electrons. These electron beams are shot toward the screen, which is coated on the inside with red, green and blue "phosphor." Each gun is precisely aligned so that it strikes just one color phosphor. When the high-energy electrons strike the phosphor coating, they cause the phosphor coating to glow.

But the electron gun assembly simply points at the exact center of the picture

tube and cannot move. It's stuck in the neck of the picture tube. By itself, it can only produce a dot at the center of the screen (not too entertaining). In order to move the electron beams around the screen, the beams are "deflected"; they are pushed around with magnetism.

Mounted on the neck of the picture tube are two pairs of coils that make up an electromagnet assembly called the "yoke." The yoke is powered by two different circuits on the monitor chassis and generates two separate



## 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

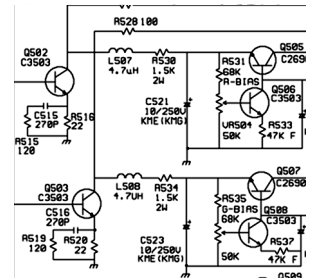
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

### 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.

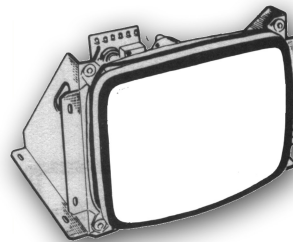
### SCHEMATIC DIAGRAMS

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.

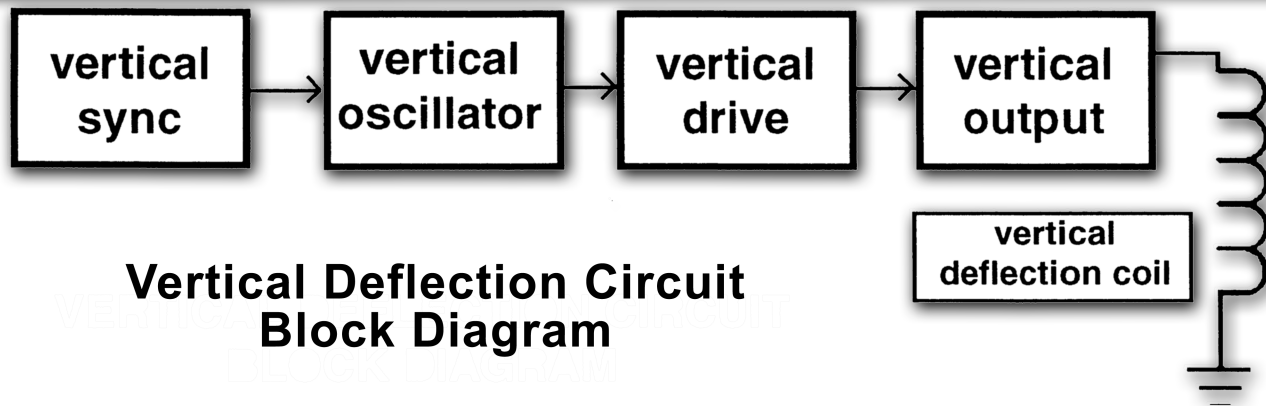
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**Figure 3**



**Vertical Deflection Circuit  
Block Diagram**

and very powerful magnetic fields. One of the magnetic fields is generated by the “horizontal deflection coils” in the yoke and is used to scan the electron beam in the picture tube from left to right. This brightens the phosphor coating, drawing a single raster line as the beams move across the screen.

The other magnetic field is created by the “vertical deflection coils.” The magnetic field from the vertical deflection coils in the yoke starts the scanning beam at the top of the screen so it can draw the first line of the picture where it belongs. For the second line, the magnetic field from the vertical deflection coils pushes the beam down a tiny bit. When the next horizontal scan occurs, the second raster line is placed right underneath the first one. Again, the beam is pushed down a little so the third line can be drawn underneath the sec-

ond one. The process is repeated for each line, with the vertical sweep pushing the beam down as each line is drawn. This vertical deflection is continuously pushing the beam down such that the raster lines are actually moving down at a slight angle. You cannot see this, however, as the yoke itself is rotated ever-so-slightly in order to display a straight raster.

Eventually, the entire screen is filled with raster lines. It takes approximately 1/60 of a second from the time the first line is drawn at the top of the screen until the last line is drawn at the bottom. One complete screen full of lines is called a “field” and the vertical deflection circuit in the monitor generates approximately 60 fields per second.

The frequency of the vertical sweep is approximately 60 cycles per second or 60

Hertz (60 Hz.) You may notice that this is the same frequency as our household 120-volt AC power. However, the monitor does not depend on the 60 Hz AC power for its vertical sweep. It just happens to be the same frequency. The 60 Hz vertical sweep is generated internally by the vertical deflection circuit of the monitor itself. After all, if a monitor depended on the 120-volt AC power for its 60 Hz vertical sweep, you couldn’t have battery operated televisions, could you?

After completing one field, the beams are now positioned at the bottom of the screen. The vertical sweep now reverses direction and quickly brings the beams back to the top of the screen where the scanning beams start all over again drawing lines 1,2,3 . . . etc. This is called the “vertical retrace.”

To prevent any lines from being drawn across the screen as the beam races

from the bottom to the top during the vertical retrace, another monitor circuit known as the “blanking” circuit, turns off all three guns.

### **Vertical Deflection Circuits**

There are a few different types of vertical deflection circuits in monitors. Older monitors used all discrete components (individual parts like transistors, diodes, capacitors and resistors.) Some monitors combined an integrated circuit with a pair of transistors while modern monitors typically use a pair of integrated circuits. There are even monitors that use just a single integrated circuit and a small handful of other components for the vertical deflection circuit.

Naturally, troubleshooting each of these circuits will be a little different. Fortunately, there are some common troubleshooting techniques that apply to all vertical deflection circuits. Just as fortunately, there are some common failures as well. Once you know what to look for, troubleshooting most vertical deflection failures is really pretty easy.

Regardless of the specific hardware, all monitors use the same basic concept for vertical deflection. The easiest way to understand the vertical deflection circuit is to look at it in the form of a “block diagram.” A block

diagram is a way that we can look at how a circuit functions, without having to look at the actual components and how they’re all interconnected. We are just looking at the function of each part of the circuit. This is actually known as a “functional block diagram” for that reason.

The CPU or graphics board in the game generates a signal known as “vertical synchronization” or “vertical sync.” This is simply a momentary pulse that the computer sends out at the end of every field. Naturally, there is a wire that carries this pulse from the board to the sync input connector of the monitor. The monitor starts drawing the first line of each field (the top line of the picture) after the sync pulse ends. The vertical sync pulse keeps the picture from rolling. Without it, the first line of the picture might appear at the middle or bottom of the screen; wherever the beam happened to be at the time.

The sync pulse is passed to a circuit called the “vertical oscillator.” The vertical oscillator generates the 60 Hz signal that will eventually drive the vertical deflection coils in the yoke. By triggering on the vertical sync pulse, the vertical oscillator stays exactly in step with the logic board. Without the vertical sync signal, the vertical oscillator will still op-

erate. It will simply operate at its own internal frequency; the frequency set by the position of the vertical hold control.

The output of the vertical oscillator is nowhere near powerful enough to drive the vertical deflection coils in the yoke. It has to be amplified first. There is a stage of amplification that takes the weak signal from the vertical oscillator and boosts it in voltage and current. This vertical amplifier circuit is called the “vertical drive.”

But we’re not through yet! There’s still one more stage of amplification needed. Following the vertical drive, a higher-powered “vertical output” circuit is then used to drive the vertical deflection coils in the yoke. It is in this vertical output circuit that we find a lot of our component failures.

**- Slot Tech Magazine**

**Next month - A closer look at the actual circuitry in the vertical deflection circuit.**

Slot Tech Magazine is an official publication of the



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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

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