

September 2012

# SLOT TECH

## MAGAZINE

Slot Machine Technology for the International Casino & Gaming Industry

Slot Tech Magazine

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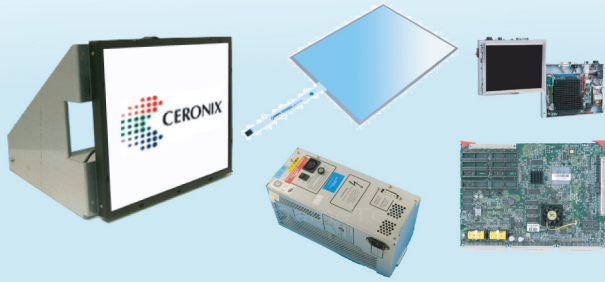
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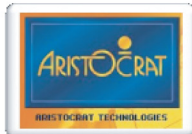
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# Slot Tech Magazine

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Randy Fromm

This month, we have another nice contribution from our friend James Borg from Malta. I like James' stories because even if you don't have any reason to repair the exact item he features in the story (in this case, a Wells-Gardner CRT monitor) the lesson learned is quite often relative to repair work in general and really not so specific to the repair job being described. In this case, we learn how to troubleshoot a shorted power buss (specifically, the 80 volt line). We also learn to be on the lookout for . . . Well, I won't spoil the suspense. A Crackling Experience begins on page six.

Also this month, Pat Porath is back after his brief Summer hiatus with Quick and Simple Repairs #88. Thank you, Pat, for yet another great look at your day-to-day repair experiences at the Island Resort.

I want to remind you that the next TechFest is coming up soon. Many events sell out so if you're interested in attending TechFest 26 (to be held at the Motor City Casino in Detroit, Michigan) please visit the website at [slot-techs.com](http://slot-techs.com) and follow the appropriate links to download the enrollment form and send it in.

Remember, if I can help you with your slot tech training requirements, please let me know. It's a pleasure to show my fellow technicians how easy most electronics repairs can be. My recent class at the Isle of Capri in Lula, Mississippi was a blast.

A handwritten signature in black ink that reads 'Randy Fromm'.

Publisher-Slot Tech Magazine

## Randy Fromm's Slot Tech Magazine

### Editor

Randy Fromm

### Technical Writers

James Borg, Vic  
Fortenbach, Chuck  
Lentine, Craig Nelson,  
Kevin Noble, Pat Porath

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tel.619.838.7111 fax.619.593.6132  
e-mail [editor@slot-techs.com](mailto:editor@slot-techs.com)  
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It is true what they say that sometimes, the obvious is never as obvious as it seems. Such a phenomenon happened to me when least expected, one fine evening over at the Oracle Casino here in my island nation of Malta, while working on a Wells Gardner monitor, pulled out from an Aristocrat Xcite.

The machine had been noted to go off a few times. Previously, all it took to return to normal was just to turn the slot machine off and back on again. This particular evening, it wouldn't come to life no matter how many times that was tried.

Yours truly was called in on the scene and with my expert Sherlock Holmes detective skills, I had deduced that the machine itself was fine while the monitor had gone Fubar. I reached this conclusion because everything was fine on initial inspection. The lights were all on and the BV was flashing its bezel lights. On powering up the machine, the BV even cycled normally, sure-

# A Crackling Experience

By James Borg

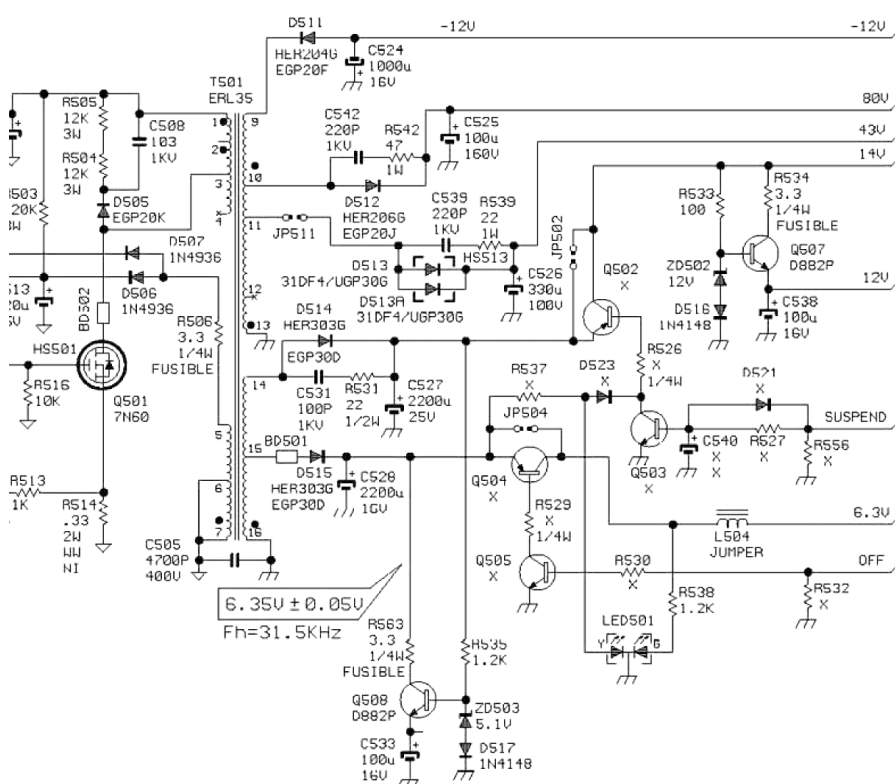
enough signs that the machine itself likely was fully operational. The only thing missing was the picture. This would obviously pose some problems for anybody wishing to play on it.

A minor detail, Watson.

Switching it off and putting my right ear next to the monitor further confirmed that the monitor wasn't working. There was not a sign of life at all. There wasn't the initial high tension crackling from within. I have had cases where the slot machine's motherboard

had gone funny, and not sending video signals to the monitor, the result of which would simulate a dead CRT. However, if the motherboard was not working properly, the crackling would still be heard but no picture at all would be visible.

It wasn't so in this case. The monitor had to be pulled out of its cosy nest-ing place and taken to my workshop. My workshop is also cosy, so cosy, I had to move some things about to make some room for the new patient that was on the way.







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Visually scanning the main board's electronics didn't reveal anything that shouldn't be, for example, a charred component or a capacitor that had decided to blow its top or anything else that was too ghastly to mention or even to think about.

A quick check on the flyback transistor Q220, a 2SC5387 by Toshiba, showed that this wasn't shorted. All signs showed that it shouldn't be a difficult fault to tackle. My main concern was if the flyback transformer itself had gone to meet its maker. Once that's gone, it's curtains for the monitor as I don't have the transformers as spares any more. It would find itself on a pile to be cannibalized from.

Morale levels were high, although I had a list of problems as long as my arm to see to on other slot machines and didn't want to end up spending hours on this baby.

After applying juice to it, nothing happened. I mean NOTHING, NADA, and even ZILCH. No indication at all that I had just plugged in a lethal dose of 220 VAC into it. It was just as if somebody had pulled the fuse out while I wasn't looking but that wasn't the case.

Hmmmm. A power supply fault? Had a secondary diode decided to call it a day? A filtering capacitor

that filtered no more and had started to turn the once perfect DC voltage into a mixture of noise and hideous ripples?

The best way to check such issues is by using an oscilloscope. Prodding and poking the capacitors, along with the cathodes on the diodes should show something but then again, I had a vision. It appeared like a flash of lightning in the middle of the night. I was on the wrong track, totally. If the supply wasn't coming on at all, how was I going to see anything in the first place, so the 'scope idea was promptly scrapped.

The best and only available approach at this point, would be just to carry out meter checks on the secondary diodes, namely D511 (-12V), D512 (80V), D513 (43V), D514 (14V) and D515 (6.35V). I even checked out ZD503 (5.1V Zener) and D517 (1N4148).

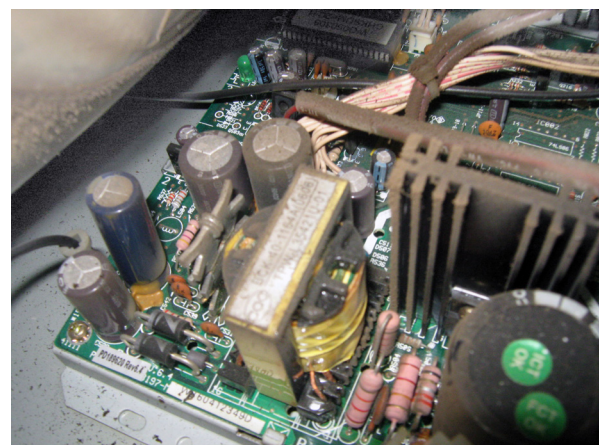
Unfortunately, all my tests proved fruitless and I ended up scratching my head. I hadn't worked on this model of monitor often in the past so my experience on them was limited. In other words, I didn't have any aces or a list of previous faults up my sleeve to fall

back on to. The only thing I could rely on was the drawing my sense of logic, coupled with some years of experience in the field.

It was no good simply looking at the monitor as it certainly wasn't going to get repaired by itself. I took a deep breath and dived in again, head first. I re-assembled the monitor to be able to try it out once more. Being somewhat crowded, I had removed all the wiring to the CRT and to the outside world, along with the neck-board, in order to access the components I had tested before.

I wasn't expecting anything to happen once I applied juice to it but for kicks, I still energized it. Of course, nothing was heard, no sign of life, no noise in the background. I was basically gazing at a corpse made up of colourful components, with wires sticking out of it.

The first thing I did was to pull the neck-board out



**Testing the secondary output diodes proved fruitless. All tested good.**



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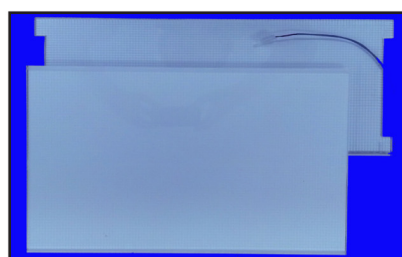
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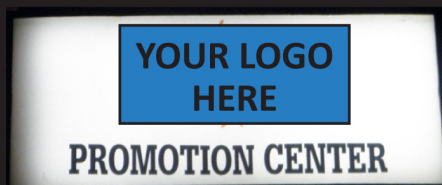
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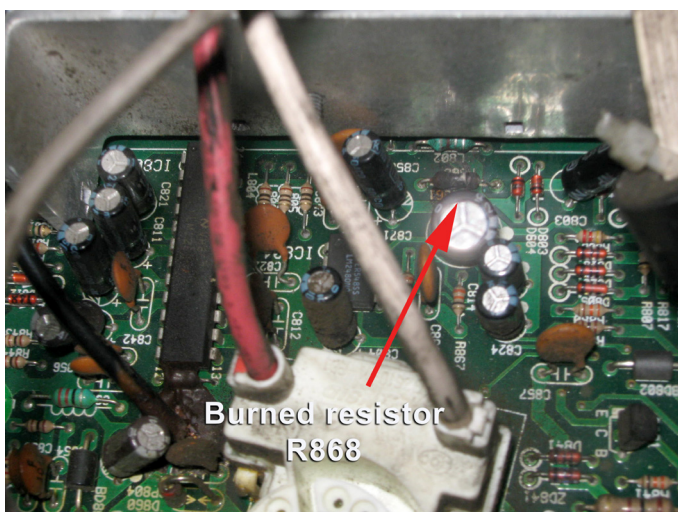
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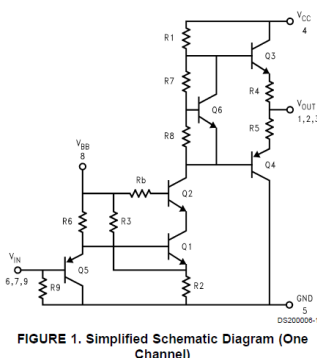
completely, juiced up, and wonder of wonders, there was a sign of life. The crackling had been heard. Hmmmmm.... Interesting, or so I thought to myself. I wondered what would happen if I was to put the neck board back in its place yet again. I did, and the original symptom surfaced, a completely dead monitor.

Aha... I've got a FUBAR neck-board, which quickly prompted me for a visual, which I hadn't done before, since I only previously really looked at the main board itself. My eyes widened at the sight of a well and truly baked resistor.



The designation on board of the remains of the resistor was R868, a quarter watt 10 ohm component. A quick look at the schematic showed that the video driver chip, an LM2469TA, was being fed its juice of 80V through this resistor, on to pin 4. Oh crap! I didn't have this chip available so I wasn't very amused for two reasons. This chip was a Monolithic Triple 9nS High Gain CRT Driver.

Schematic Diagram



Connection Diagram

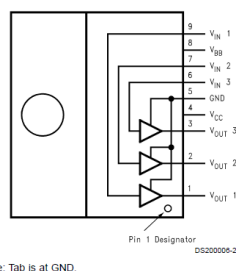


FIGURE 2. Top View  
Order Number: LM2469TA  
NS package Number: TA09A

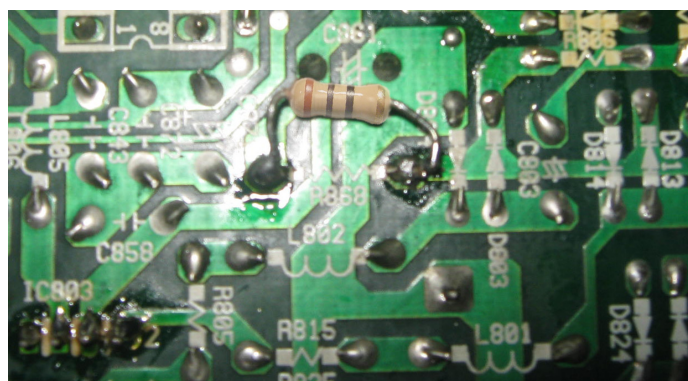
One reason was that I couldn't carry on with the repair, thereby leaving a slot machine dead. The second reason was that I was going to leave this monstrosity of a monitor on my work bench, a luxury I couldn't afford, space-wise, that is.

Thankfully, a few days later, the LM2469TA chip arrived. I was eager to get cracking again on this monitor and have it kicked out as soon as possible. I desperately needed the space to work on other things.

Replacing the chip wasn't a great deal of trouble but since the resistor was over-cooked badly and in an awkward position to pull out, I decided to leave it where it was, in its final resting place, and just solder a new component on the solder side of the PCB. This is something I don't really enjoy doing (and really quite naughty) but at times, drastic situations call for drastic measures. Time has always been against me and that day was no different from others.

Through sheer force of habit, I decided to take some resistance readings, just to make sure the resistor won't blow smoke out at me on powering up the unit.

On the chip's side of R868, I had low resistance readings but this didn't surprise me in the least as the chip was a power guzzling one and obviously needed quite a bit of juice when in operation. I was about to



Since the resistor was over-cooked badly and in an awkward position to pull out, I decided to leave it where it was, in its final resting place, and just solder a new component on the solder side of the PCB.





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cry victory but stopped halfway in my tracks. The hair-raising part of it was actually on the other side of the resistor, the supply side. I had a nice juicy ZERO ohms going to ground, which was not acceptable at all. The funny part (however, extremely weird) was that on the supply side of the resistor, I only had a handful of components which, even if they went FUBAR, wouldn't produce such low resistance readings.

I didn't quite understand what was going on, so I checked again. Once more, the same readings were taken. I started to doubt myself whether I was checking the correct component and actually where I was probing. After some head scratching and blank looks into the distance, I confirmed I was right and where I kept finding the short circuit, I should have had 80V.

The only thing left to do was to start eliminating everything, and anything, on this supply rail which could somehow produce this short circuit. I started with C857, a 4.7nF/500V cap to ground. The short persisted. I then removed link BD802 and still the short was present.

I then went on to check and eliminate all the components actually on the 80V rail

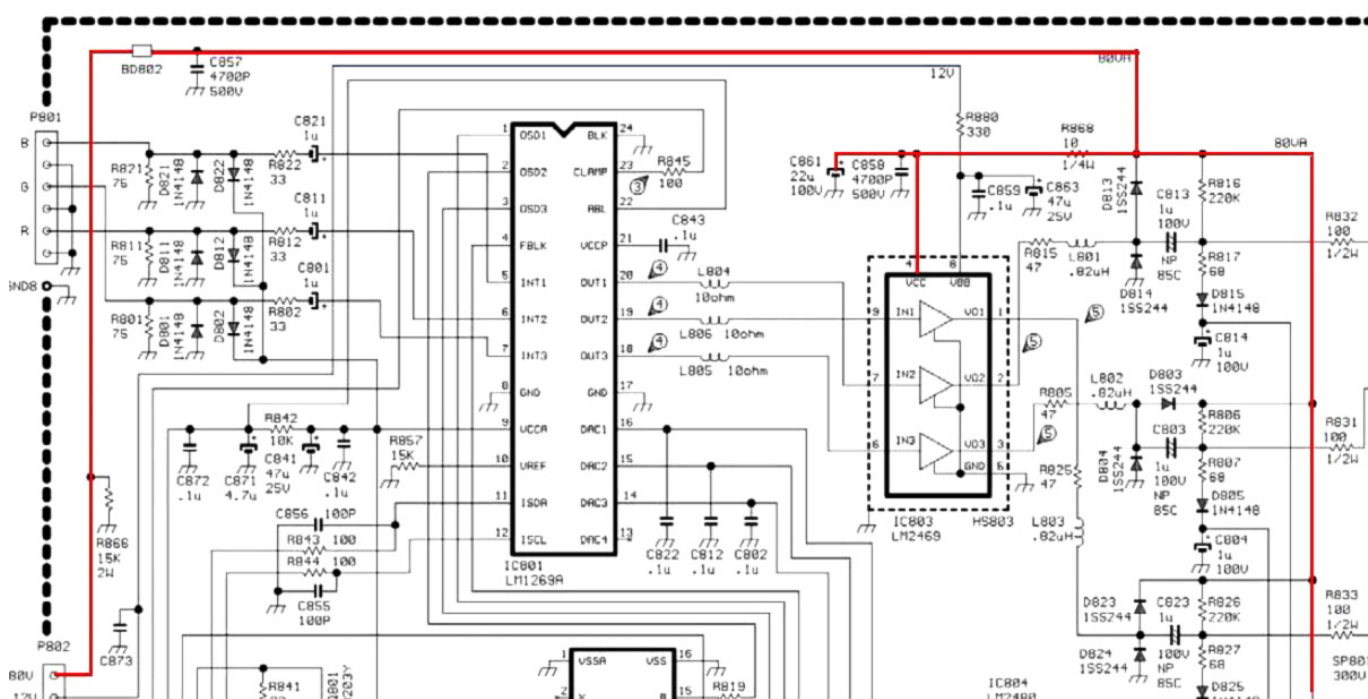
but whatever I removed, the short still persisted. I was on the verge of panicking as my options were quickly running out. Not many components left to eliminate.

Eventually, I had removed everything from the circuit, but the blooming low resistance was still looking at me in the face. It was time to press the PANIC BUTTON! I just couldn't understand why and where this short was.

When faced with such a dilemma, I end up with no other choice but to do something which I totally despise doing and that is cutting the copper tracks running along the board. Some of you might shudder at the thought. Believe me, so do I but I just had to find out what was causing such a problem.

Chopping here and chopping there (checking out the supply rail side of the resistor after each chop) kept showing me a short circuit. Finally, I had nothing else left to chop out but the short was still there. I honestly started doubting my electronic fault-finding skills as there was absolutely nothing, NOTHING at all left for me to eliminate.

What on Earth was the cause of this short







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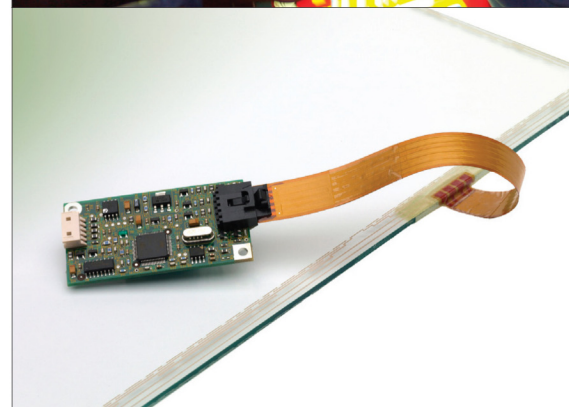
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circuit? The schematic was spot-on with the type of monitor in question so it wasn't a question of thinking of tracking something, when I could have been on the wrong track in the first place. Everything was in order and, sadly enough, so was the short.

After I don't know how long, I had to throw the towel in and escape for a cup of tea and a smoke, regroup my thoughts and try again. The problem was where was I going to start, as I had eliminated everything that could have been causing this frustration? I even thought about resigning from my post and doing something else for a living. At least it wouldn't be as frustrating and confusing as the faults I sometimes come across. But no. I couldn't do that to myself. I had to reign, I had to win this battle and eventually the war. I was determined to walk away triumphant, even if it took my last breath away.

After what I considered a well-deserved break, my senses started to become sharp once more and I walked to where the monitor lay looking at me. For a moment, I imagined a duel between the monitor and myself, a duel to the end. Gunfight at the OK Corral came to mind. A duel that was about to leave one of us scarred for life or even worse.

Rolling up my sleeves, I started to dissect all my previous moves, my fault-finding techniques, my process of elimination and tried to find my sanity at the same time. Not easy doing all those things in one go.

I re-traced my steps back and found that the short circuit on the supply side of the 10 Ohm resistor persisted. The only thing that didn't tie in was that I had eliminated everything leading up to this resistor, apart from the resistor itself. I felt my left eyebrow lift, imitating Mr. Spock, from Star Trek. I heard myself saying "Fascinating" but no Kirk or Bones in the vicinity for any enlightening comments.


I decided to attempt pulling out this 10 Ohm resistor, R868, or at least what was left of it. I lifted it from one side, and just for kicks, I

checked out to see if the short circuit was still there. Believe it or not, it was gone. GONE.... but where, and how?

Right, I needed to do some quick thinking here. That resistor was made of carbon, and carbon NEVER goes short, no matter how many times the sun rises and sets. To add insult to injury, the resistor was baked, cooked, fried, barbecued, nuked and also smoked. Now, when all these things, not necessarily in any particular order, befall a helpless little resistor, this tends to go high in value, and most probably, even goes 'open-circuit'. The part I couldn't understand was, why in all that's sacred, was this component giving me a short-circuit on the 80V line?

I looked hard at the resistor, checked it out with my multimeter, and true





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enough, it was open-circuit. Why? What was going on? The short-circuit had gone once I had lifted this component up. I brought some tea, and just stared at this mystery, till the mystery was no more. The solution was looking straight at me in the face, and I wasn't even seeing it.

Another vision suddenly struck me (I get plenty of those), so I took a closer look at the resistor.

I needed to be sure of this, reason it out, before I ended up crawling up the wall. The ends of a carbon resistor have metal caps, from which the leads protrude. Of course! Why didn't I realize this before?



**Typical Carbon-film resistor with metal end caps (before painting).**

In my case, the resistor had got so badly burnt, the insulation coating had dissolved, exposing the metal end-cap, which was sitting just on top of a grounded track, where its own green insulation coating had gone, thereby causing my short-circuit. I had to take a deep breath, and sit down.

Ladies and gentlemen, I rest my case.

- James Borg  
[jborg@slot-techs.com](mailto:jborg@slot-techs.com)

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# Lovely Time in Lula, Mississippi

This was a fun class for me because these guys were funny as hell, always joking around. They even got some of MY corny jokes. However, when it came to classroom work, they were serious students and the results showed. After covering the usual mix of Basic Electronics and Component Identification and Testing, they whipped right through the soldering test with ease. They were absorbing the material so quickly that we actually had a couple of extra precious hours to include some Hands-On Repair Lab. We grabbed up a few bad LCD monitors they had in the shop for repair, brought them back to the classroom and in an hour or so had them all up and working with time to spare. If we had had a vacuum de-soldering unit to help us remove the bad components, it would have gone even faster. We were using solder wick! Nice job, gentlemen.

In the end, when I asked them to come out front for our class picture, they spontaneously grabbed one of the repaired monitors to include in the picture. I suggested that we light it up and so we did!

Thanks guys. It was fun.



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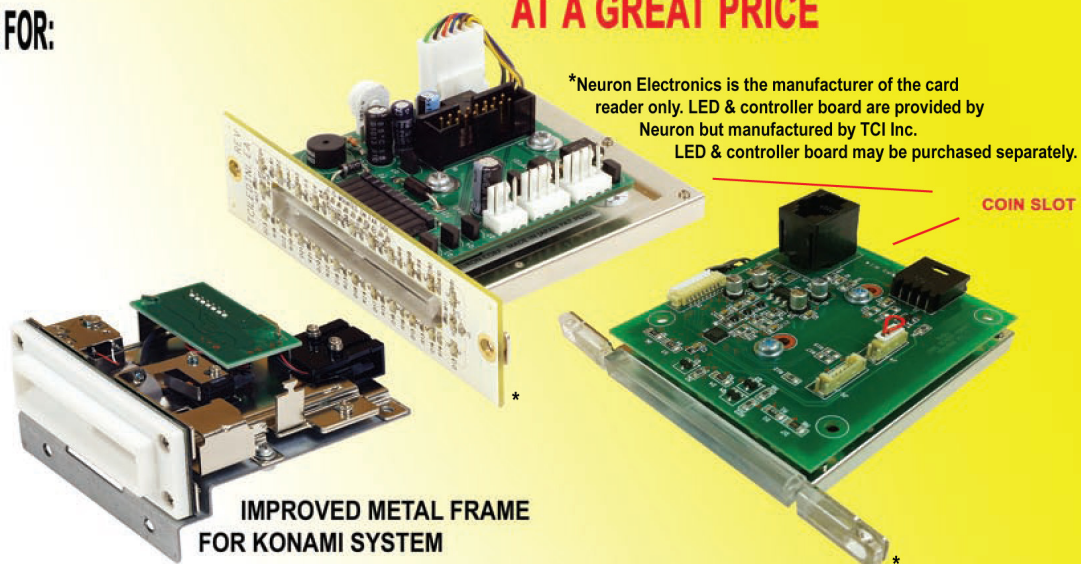
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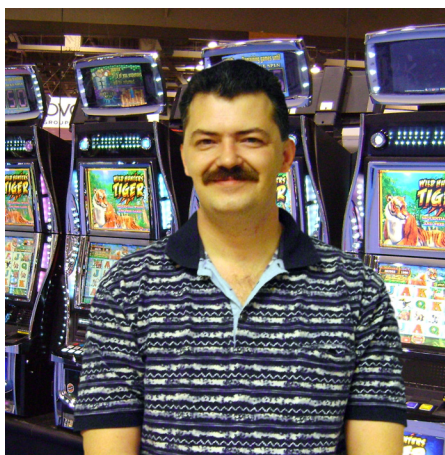
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## Slot Tech Feature Article



### WMS XD Slant Top No OASIS Communication

I received a complaint that a WMS XD slant top game lost communication with our OASIS system, therefore the game locked up for a small hand pay of \$10.60. One way to tell if the game is or isn't communicating with the system is to open the belly door of the game. If only the main door (the "h" door) is open, our system won't show a door open on the OASIS display. Once the "belly door" is open, then the display will show an open door. It's a similar deal with our IGT AVP 3.5 slant tops games. The "main door" won't show open, only the "belly door" will. When the door is physically opened and closed and the OASIS doesn't display properly, it is a very good indication that the game has indeed lost communication with the system.

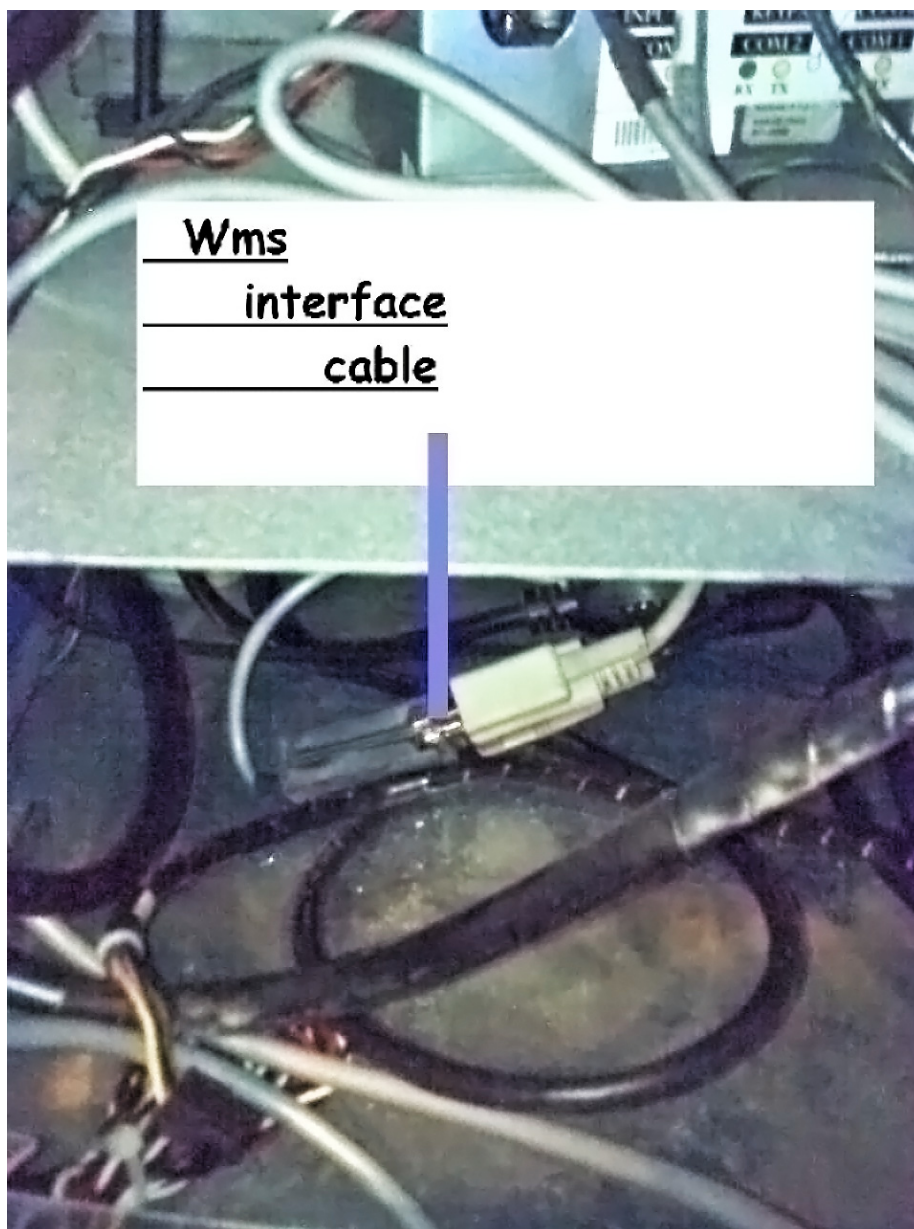
Another way to tell, with

## Quick & Simple Repairs #88

By Pat Porath

OASIS Sentinel IIIs is to insert your "mechanic" or "tech" card and look for the communication icon. Once in that menu, it will display EGM NOT CONNECTED. In this case, the display did indeed read NOT CONNECTED so no doubt I had a problem. Many of the common items were done or checked such as

rebooting the Sentinel, rebooting the game, checking the slot mast identification number, the game communication address which was set at 1 like it was supposed to be. On the bottom right hand side of the backplane board is where the DB9 connector (game COM signals) comes FROM and goes TO the





Sentinel III. The cable was snug in its socket like it was supposed to be.

What was left to check? What was I missing? To make darned sure, I followed the DB9 cable from the backplane board toward the Sentinel. To my surprise, located near the back of the game behind the OASIS faceplate was where I found the problem. Somehow the cable had become disconnected from the game interface cable. In other words, the "game interface extension cable" was disconnected from the Sentinel. No wonder a signal wasn't being received at the Sentinel. Within a few seconds of making the connection the OASIS display showed "EGM CONNECTED." Finally, the game was repaired.

### **Bally Cinevision Scrambled LCD**

When I arrived at the start of my shift, I was told a Bally Cinevision game was shut down because of scrambled video on the LCD and because the inside of the game was very warm. Later in the morning, the game was opened up and turned on. One of the first things inspected was all of the cooling fans. It appeared all were working OK. The fans in the power supplies, the fan on the "brainbox" and even the fan in the topbox area looked good. As I looked at the LCD, it had backlight-

ing, but no text or graphics at all. Next, I took a visual on the "brainbox hard drive busy LED." This small red LED will blink off and on or flash rapidly when the game is booting up. It looked good; it was flashing rapidly so I assumed the game was loading even though nothing appeared on the LCD. After a few minutes, I heard the bill acceptor cycle. This indicated to me that the game did boot up. A second, then a third reboot was tried (main reboot, not cabinet reboot). On the third or fourth try, very scrambled text appeared on the screen. After a moment, the LCD lost it, and was only back lit. All of the above symptoms pointed toward a bad LCD. With the help of a co-worker, the unit was removed and a spare was installed. As soon as the main power switch was turned to the ON position, text appeared. Following that were the game graphics. With the LCD replaced, the game was back online.

### **IGT AVP 3.5 Rebooting Itself**

A complaint was received about an IGT AVP 3.5 rebooting itself a few times within a half hour. When I walked up to the game, sure enough it was rebooting itself. When it was finished, the customer cashed out his credits so I could check it out. One of the first things I checked was the brainbox air filter.



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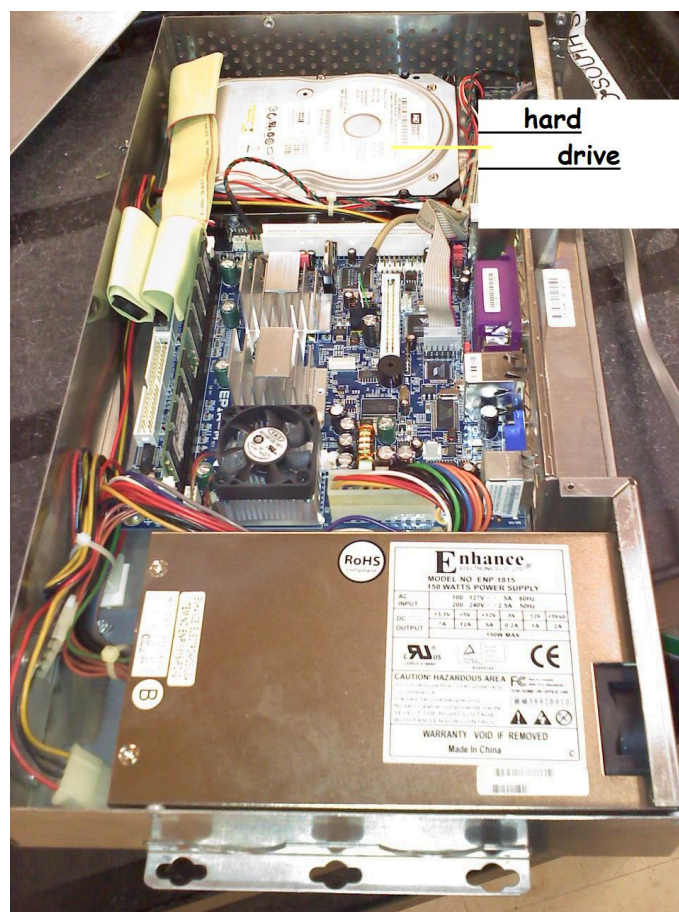


It was plugged with dust. The game was turned off and the filter was cleaned. Then, I took the brainbox out of the game to see if anything inside of it was very hot. Nothing I noticed was extremely hot and the processor chip cooling fan spun very freely so it appeared to be good. The cover was put back on the brainbox and it was put back into the game. With the air filter removed, I turned the game power switch ON and let it run for about five minutes or so to let the fans do their job like they are supposed to. Then, the air filter was put back in place. I checked “tilt history” along with “system monitor” in the diagnostics area of the game and didn’t see anything abnormal. A couple of the temperatures were a bit high but not extreme. The game was closed up and almost ready for play. I sat in front of it for a few minutes to see if it rebooted, which it did not. For the remainder of the day, I didn’t receive a complaint or see it reboot again. I’m pretty sure a slot attendant would have let me know if it happened again.



### Paltronics Sign Controller Problem

We had one of our progressive sign controllers go bad. All that appeared on the sign was backlighting from the LCD. No text, no graphics, not even an error was displayed. Just as a note, what I call a sign controller is similar to a personal computer tower; it has a motherboard, RAM and a hard drive. It has the same connections a computer does such as mouse, keyboard, USB and of course, video connections. There is a CAT5 connection which is used for the progressive sign information too. Quite a few of ours are Windows XP based.



Back to the bad sign controller... Nothing appeared on the display. After a cleaning with compressed air along with a reboot, text appeared for a moment, a “One Link” logo would appear for a second, then nothing. I took the cover off of the unit. Nothing looked unusual so I gave it to a co-worker for a second opinion. The individual stated maybe the hard drive was bad but was not sure.

We had a few similar spare sign controllers



in stock. My problem was, how would I obtain software for a progressive bank of Konami games that would work with a Paltronics controller? Thinking more and more about the problem and how I could resolve it (because a blank sign on the gaming floor looks really bad) I finally came up with a plan. Maybe the hard drive wasn't bad. What would happen if I took it out of the bad controller and put it in one of the spare sign controllers? I originally thought the hard drive might be bad too. What did I have to lose?

I gathered up some parts and made my work bench into a temporary "sign controller test bench." A spare computer LCD with the proper VGA cable was used, a keyboard, mouse, power cables and a power strip. A spare controller was located, the hard drives were swapped with each other and it was time for the test.

With the original hard drive in a spare controller, the power switch was turned ON. To my surprise and a bit of amazement, the controller was booting up properly because I had text on the LCD. After a minute or two, beautiful Konami sign graphics appeared! It wasn't the hard drive that was bad, it was the motherboard. When taking a closer look at it, how did I not notice all of the domed capacitors? Obviously bad caps would cause problems. I put the cover back on the spare controller, disconnected all of the cables and headed for the progressive sign on the gaming floor. With a ladder in one hand and the controller in the other, it was time for the real test. Once all of the cables were connected to it at the sign, it was time once again to turn ON the power switch. Yes I have power, next text on the sign LCD and after that, awesome sign graphics appeared. It took some time and some troubleshooting but finally, the sign was back in operation and looking good as it should.

## Bally V32 Printer Jams

A complaint was received that an upright Bally V32 game (such as a newer "Betty Boop" or "King of Pop" game) had excessive paper jams in the printer. These types of games have a single exterior bezel where bills are accepted AND tickets are issued. On the inside of the game, the printer bezel has a pretty sharp angle that sends the ticket into this single bezel. As I was checking out the bezels, the printer's had a crack in it and was misaligned. As a result, the majority of the time a ticket was printed it would jam up in the printer bezel.

A spare replaced the cracked one (a good idea to have a few of these on hand) it was tested, and all was OK. I've run into a few cases where misalignment of the printer bezel was the only problem with ticket jams in Bally games that have the Ithaca 950s installed. If a slot attendant doesn't set the printer back in place properly after loading paper, the bezels won't line up like they should and the paper jams. Pressing the "feed button" on the printer prints a test ticket to make sure it comes out of the bezel properly.

- Pat Porath  
pporath@slot-techs.com

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About Randy Fromm: I am the publisher of Slot Tech Magazine. First published in 2001, Slot Tech Magazine is a monthly trade journal focusing on casino slot machine repair. I have been repairing electronics for the gaming industry since 1972. I really enjoy what I do and I love showing others how easy it can be. ***No previous knowledge of electronics is required.***

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