

SLOT TECH MAGAZINE

Slot Machine Technology for the International Gaming Industry

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Acres Bonus
Engine II**

**FutureLogic
Wins Gaming
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**Game Level
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July 2007

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Innovation through Technology

Hi Randy:

Just wanted to share this with you. It is because of your style of training that I was able to do this. I remember you saying about power supplies on a CRT Monitor that basically a power supply is a power supply. They are all the same. The other day I took off the back of an LCD monitor that was in a blackout state. I took off the back access panel and right in front of me was a power supply board with three capacitors staring me in the face that were blown. I replaced the three caps and voila! It came up. You know

when I came to your [TechFest] training, my main interest was trying to learn as much as I can about the LCDs. I guess it was a good thing that I was paying attention when you explained the diagnosis of CRT power supplies.

I'm looking forward to reading the upcoming article that we were discussing about the Atronic and the issue with the fan stopping and overheating the LCDs. If you need any further information that I may help you with on this issue, I've done a lot of investigating on this and have talked to Atronic I would be more than willing to share anything on this subject.

Bill Mikulski
Greektown Casino

Dear Bill,

Thanks for the nice comments. As you have discovered, electronic repair can be just as simple as that. Most of the time, you don't need to be a genius to repair power supplies and monitors.

Regarding the problem with Atronic's e-motion fans: Since you know so much about this problem, why don't YOU write about it? I think it's an important article. Please consider and let me know.

Randy



Dear Readers,

This month, I am happy to introduce you to Bill Mikulski from Greektown Casino. As you read above, I met Bill at TechFest 15 and subsequently asked him to write up the issue with this "hidden" fan. Bill's premier article begins on page six. Nice job, Bill.

Of course, you'll also find Pat Porath's Quick and Simple Repairs column as well as a nice piece on general game troubleshooting from Herschel Peeler.

Also this month, we continue the saga of the Acres Bonus Engine II. In this issue, you'll find an easy to build a test fixture for the BEII and its associated peripheral devices such as the card reader, keypad and Vacuum Fluorescent Display (VFD).

See you at the casino.

Randy Fromm

Randy Fromm's Slot Tech Magazine

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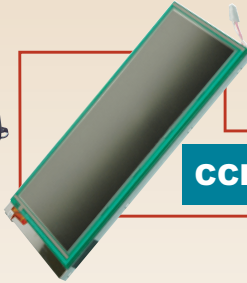
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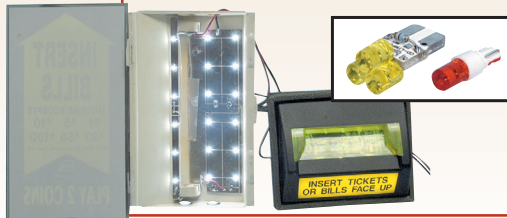
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LCDs and Fans need PMs Too

By Bill Mikulski



In this article, we are going to direct our attention toward the Atronic e-motion games. I first noticed an issue with our e-motion games approximately five months ago; we were having some LCDs go out on us. After about the fourth LCD going out, I started taking a closer look at why this might be happening. We have had our e-motion games a little over two years now. This seems to be the age of the games when these problems first occur.

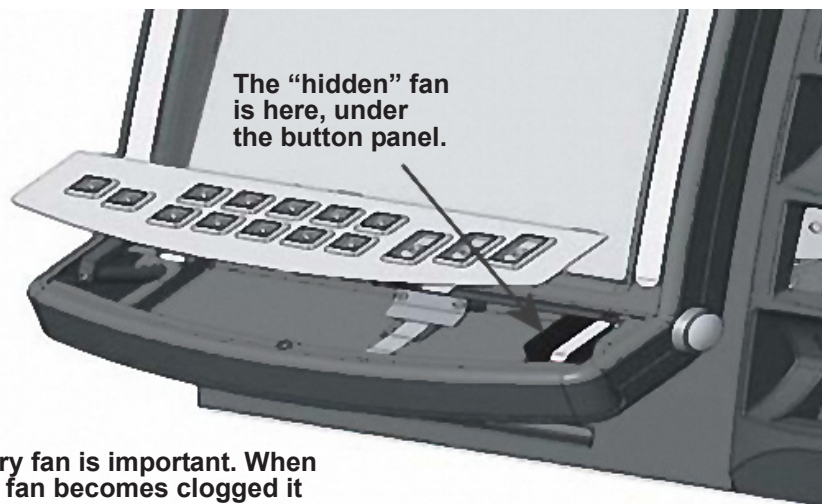
With this new game design, some of the fans for keeping the machine cool are not obvious. They're kind of hidden away. I had been looking into this issue at our casino, and I was amazed at where some of the fans are located and how fast they get clogged. It is easy for this fan to be neglected and overlooked because it is so well hidden. The days of rebuilding hoppers are mostly in the past but the need to do preventative maintenance (PM) in games may be more important than ever. It is time to look at taking

care of our expensive components. For instance, our LCDs (yes, our LCDs) need PMs too!

I would like to take a moment to elaborate on the labor required to change these LCDs. I would say to anyone who has not yet changed one of these that it is a "challenging" repair, which is a sort of polite way of saying that it's not much fun. The labor time for an average tech is around ninety minutes. However, I must say that if it takes you three hours the first time, don't be discouraged. They get easier as you change more of them. I've provided a direct link to the Atronic's service manual. This gives you step by step instructions on how to remove the playfield and change out these LCDs: <http://tinyurl.com/27j3c7> The file is actually located on Slot

Tech magazine's technical server. I must say if you haven't been there yet, take the time to look around at slot-tech.com. There's tons of great information on all the things we do as technicians.

I recently attended Tech Fest 15 at Mystic Lake Casino in Prior Lake, Minnesota and was curious to talk to other techs across the nation about this issue. I was very much surprised when I brought this up. The attention and questions came up about this problem and one of the ways to help or fix it. As I was discussing this with one of the techs during break-time, we had more and more techs gathering around and getting involved in the conversation. This is where the idea for this article came about, because there were so many questions. So as a slot tech myself, I thought this might also



Every fan is important. When this fan becomes clogged it can cause premature LCD monitor failure.

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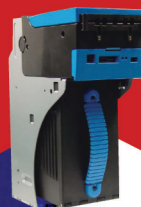
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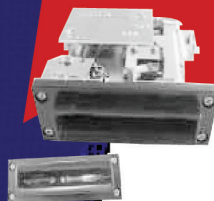


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be of interest to other techs (now that I know it is an issue in other casinos also). Our games at Greektown casino in Detroit are now somewhat close to two years old. We have 30 e-motion games on our floor and in this two year period, we have had ten LCDs go out on us.

What's going on here? What could be contributing to these LCDs failing prematurely? Let me start out by saying that I love the new design of the e-motion cabinets. Unfortunately, the cabinet design may be a contributor to the premature failure of the LCD. In the design of the cabinet, they have what they call the "playfield" which houses the two LCDs. Unfortunately, the playfield design does not leave much space for airflow. LCDs get relatively hot and as they get older, they tend to get even hotter. In the playfield, there is a space of less than two inches between the front and back of the LCD. Also, the design of stacking two LCDs in the same space, one on top of the other, creates more heat in the same space. Although Atronic did keep this in mind when they designed this cabinet, it still holds heat and the heat seems to shorten the life of the LCDs.

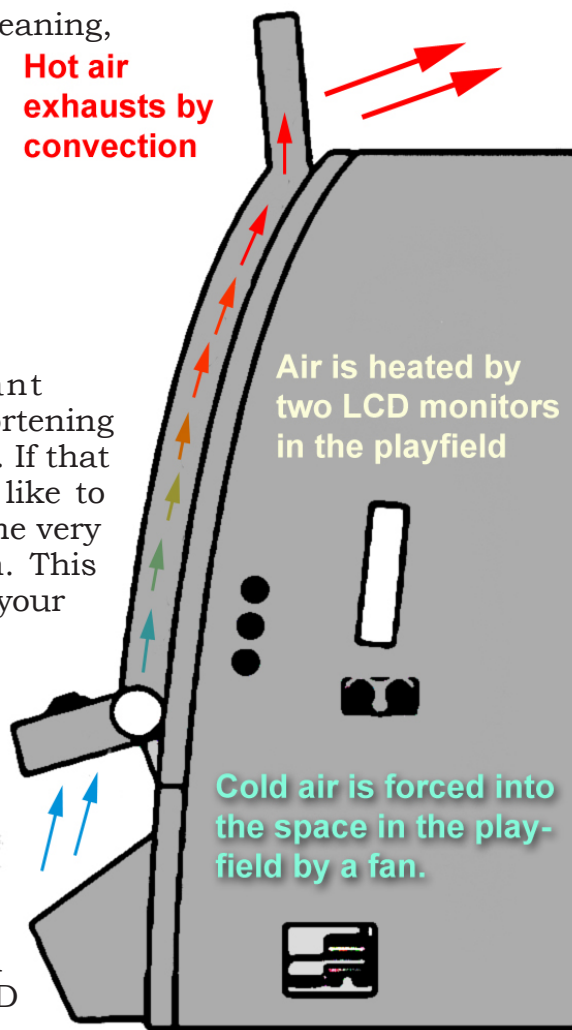
Unlike most fans that exhaust the air, the fan in this cabinet takes outside air and blows it up through the space in the playfield and out the vents on the top of the cabinet. Unfortunately, the fan (which is located below the button panel) develops a build-up of dust and dirt that slows the fan, sometime bringing it to a complete stop.

Of course, this also restricts or stops any airflow through the playfield, causing a build-up of heat which causes break down of the components. 95% of the time, it seems to be the top LCD. This might be due to the fact that the heated air generated by the bottom LCD rises, causing even more heat at the top LCD panel.

Ok, so here's what we can do to help prolong the life of our LCDs. This fan under the button panel is quite hidden. With the game door open, on the inside of the door there are two latches. One latch releases the top glass. The one directly below it releases the button panel. Once you have lifted the button panel, on the bottom right you'll see this fan. After a simple cleaning, you will see a substantial difference in the airflow of the fan. Simple, huh?

Unfortunately, by the time this dirty fan is noticed there may have already been a significant buildup of heat, shortening the life of your LCDs. If that is the case, I would like to provide you with some very valuable information. This information will save your casino hundreds of dollars. We were sending our LCDs out in exchange for reconditioned LCDs at \$400 apiece, until I attended Tech Fest 15 and picked up this valuable bit of knowledge. You can repair these LCD monitors for \$22.60.

Once you have removed your LCD, you will find four screws, two on either side of the LCD panel. With glass side down, carefully remove all four screws. Slowly lift the metal casing (I repeat, slowly). There will be four connectors going to a small board and one connector going to your LCD inner panel. Carefully remove these connectors. Once you have removed the back, you will see one small board, approximately four inches long and one inch wide. This is the inverter board. Out of all the LCDs I've changed out, 99% of the time it is this board. The part number is 492758-00 and the phone number to Happ Controls (where you can buy a replacement) is 1-888-289-4277.



Direction of airflow

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Troubleshooting LCDs

An LCD can be broken down into just a small handful of sub-assemblies: LCD glass panel, CCFLs, Inverter, Power Supply and Video Controller board. The CCFLs themselves can be replaced. The topic has been covered a couple of times here in Slot Tech Magazine. If you look at the CCFLs, they'll likely be darkened at the ends. If this is the case, you most likely have a bad CCFL. Bad CCFLs can also cause the inverter to shut down. The symptom in this case is a lamp that turns on for a few seconds and then winks out. CCFLs are available from many of the advertisers you'll see in this very issue of Slot Tech Magazine.

The inverter board is used to convert 12VDC to high voltage AC to power the CCFLs. A volt meter can be used to determine the working state of the inverter board. Expect an AC output as high as 2kV. There is a three amp surface mount fuse that blows on this inverter board. I am not a board tech so I can't break down the components any further. Some of the techs were telling me that they actually jumper the fuse. I can't recommend this but if it works for you, it's hard to

argue against it. However, for \$22.20, is it worth the risk? Changing this inverter board is quite simple.

I truly hope you all find this information useful. And I'd like to thank Randy for giving me the opportunity and most of all the encouragement to write this article. I have been in this business over 25 years now. I started out in the vending business repairing pinball machines, jukeboxes and amusement devices. I have been at Greektown casino in Detroit since they've been open, almost eight years now in October. I truly mean this: If any of you techs out there are thinking of attending one of the TechFests, don't hesitate. As I said, I've been in this business quite a while but I have learned so much in the three days that I attended TechFest 15, I just can't believe it. It started the moment I walked in the door. Even though I'm pretty secure with my tech skills, I was walking into a room 700 miles away from home with 50 or 60 techs from across the United States and from other parts of the world. So I might say I was a bit nervous, and curious. But once Randy started the training I knew I had made a good choice and I

started to relax.

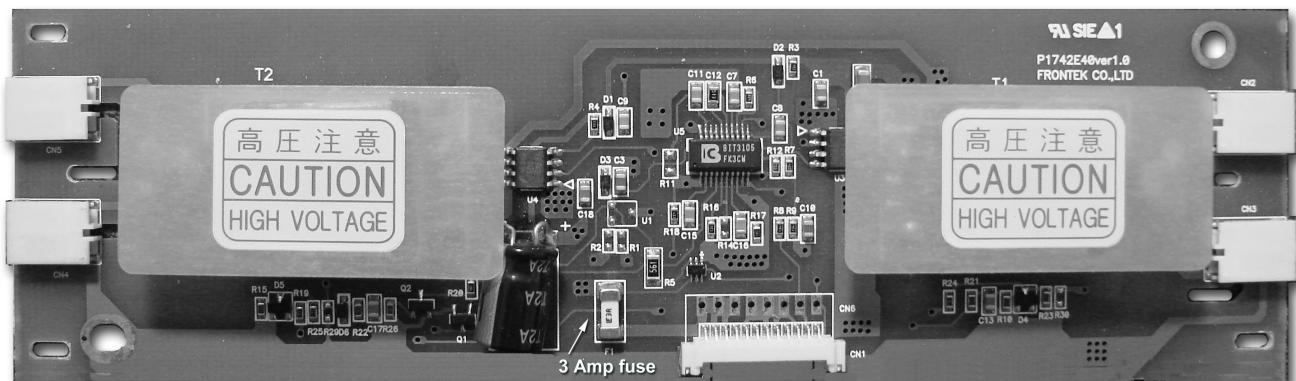
One thing I enjoyed the most that I didn't expect was talking to all the other techs from across the nation. From time to time, we would take a 15 minute break and then an hour or so lunch break. On these breaks, we would discuss the different problems we would have at our casinos. This is where I picked up a lot of great information from other techs just like you and me. This was an added bonus. We discussed everything from ticketing issues to how the food was at their casino. And this is how it came about that I wrote this article.

On the lighter side - As I walked in the casino, I passed some Siamese twins on their way out. I said, "Did you win?" They said, "Yes and no."

Okay, okay, okay, I did mention I was a technician not a comedian.

I would like to leave you with this thought. Always remember: Have fun! That's our business.

- Bill Mikulski
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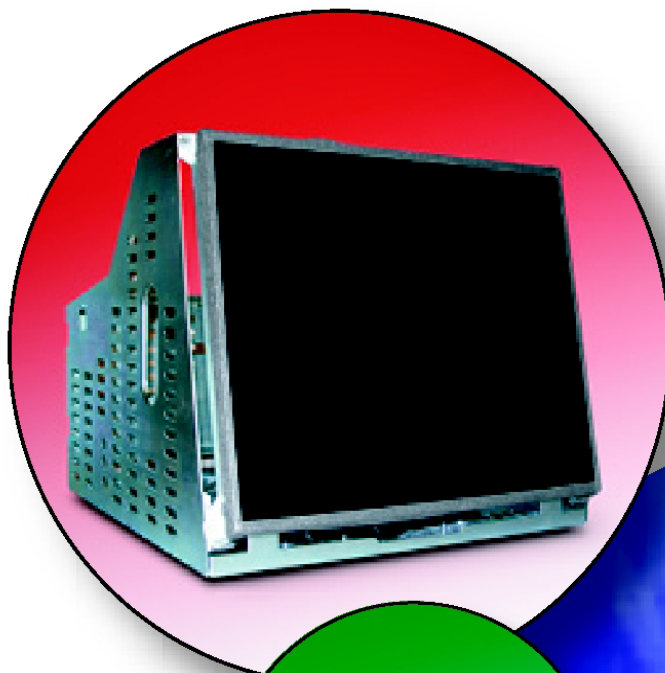
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The DBV Without VDC

While working on a DBV 200 bill acceptor assembly, nothing I did would make a difference in the operation. The power connector was unplugged and re-plugged numerous times, the stacker box was reseated a few times, connections were checked on the bill acceptor power supply end and nothing. The whole unit was completely dead, no sign of life at all. So, it was off to the shop to look for a replacement bill head.

With the replacement bill acceptor head installed, it was still dead. Back to the shop again to look for a power sup-



Quick Simple Repairs # 27

By Pat Porath

ply. No luck. I didn't see a complete spare. Maybe there happened to be one at our warehouse. I let a co-worker know I was headed over there and I would be off the floor for a few minutes. He mentioned that there should be spare DBV power supply boards in the shop. Darn! I didn't think to look for that. It ended up that there were three spare boards waiting and ready.

Back at the game with the power supply removed and the cover off, it was obvious that the unit was fried. There was the classic smell of "cooked electronics." The fuse was blown badly and there were some black spots on the board. Once everything was put back together, it was time for the test. As soon as power was applied to the game and it started to initialize, the bill acceptor cycled just as if it were new. A simple replacement of the bill acceptor power supply board and it was good to go.

acceptor was cleaned, then the slot attendant called and stated that the game wouldn't boot up properly. It ended up that the bill acceptor had nothing to do with the game not coming up. It just happened to have an error at that time. The weird thing was that the game displayed something on the order of "authentication required."

I asked a fellow tech what was up with this thing. I

The IGT AVP That Wouldn't Boot Up Properly

This particular game was running fine until the bill



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hadn't seen this before. He said that the game was stuck in the "boot menu." I hadn't noticed the lower left corner of the screen where it displayed "boot menu."

Some way, some how, the test button had been pressed in and wouldn't release. In other words the test button was stuck in the "on" position. When this occurs on an AVP, it goes to the boot menu. We tried to make the switch release, but no luck, and to have a game down because of a faulty switch was unacceptable. We could have replaced the complete processor board but then, as most of us know, it would be quite the procedure. Breaking the EPROM tape, a RAM clear, having to keychip the game, etc.

In the end, we simply replaced the switch. There were only five solder points. I found a bad board and we used the good switch from it. With the processor ready for boot up, power was applied and the game was back online.

IGT PE Plus

This was an older IGT PE Plus progressive that didn't have COM to the sign. What an ordeal this game was. The problem was the machine would not communicate with the progressive sign. The game was gone through up, down and sideways. Darn near everything was checked and rechecked, still when the game was being played, the sign would not increment. We could not leave it running because if a customer hit the

royal flush jackpot and the sign didn't lockup, there would be MAJOR problems.

One of the first things that were checked was the game options. If "SAS" wasn't turned on, then the game wouldn't communicate. Sure enough "SAS" was on and the address was set the meter incremented. The laptop was even taken out to have the game checked but still no signal was sent increment to the sign. A RAM clear was performed and game options were set up but still nothing.

Connections were checked and rechecked under the game where it plugs into the progressive wire harness, connections were also checked at the backplane board of the game. Nothing made sense, everything looked in order. It was possible something on the processor board died, so that was replaced. STILL no signal to the progressive sign.

One thing that is fortunate for us is good old "swaptronics." This is where it is sometimes possible to swap parts back and forth from a game next door to troubleshoot what is good and bad. Two similar games, one working and one not. Since practically everything had been checked and the game had been "gone through" I thought to check out the game next to it. Machine options were checked once again, wires were checked for good connections, wait a minute... What was this? Why in the world is this progressive cable MISPINNED? Ok, this game

is working fine, talking to the sign and the cable is mispinned? I've seen weirder things so why not? The non-working game was shut down and the cable was put back on, displaced by one pin (the same as the working game) and guess what? The game worked perfectly! Logically looking at the cable, a tech would think "Off by one pin? Connect it properly and it should work."

Not in this case. Sometimes slot repair doesn't make much sense. Like the times working on a bill acceptor and it is totally dead, you swap it with the game next to it and BOTH work. Or an LCD that is black and only a simple reboot gets it working again. Anyway, by comparison with the game next to the bad one the game finally was put back in play.

Atronic e-motion That Won't Show Bill Door Closed

On the e-motion games, the bill door switch is located at the far lower left of the game, behind the hopper door. The door has to come off so the switch can be examined to make sure that it's hooked up and didn't get smashed. To remove the hopper door, simply unlock it, slide the door to the left and lift upward. The switch is in the upper left quadrant of the hopper area (if the game has a hopper). When you look at the door, you can see where the "switch striker plate" touches when the door is in the closed and locked position. The

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problem with this particular game was that the bill door switch wasn't getting pressed enough to ensure a switch closure. A VERY slight bend in the "striker plate" cured the problem. Once this was done, the game showed the proper "open and closed" bill door display on the game screen. Be careful because too much of a bend in the plate may break the switch.

Aristocrat System Bonus Problem

Aristocrat has come out with a newer version of the SPC2 EPROM. (A.K.A. the communication board chip). If your system is running "SAS Bonusing" you may need the upgrade to prevent errors. The upgrade starts at version 01.04.04 or higher. We recently did a conversion on a bank of Aristocrat penny games back to the popular "CASHMAN" theme. Included in the conversion kit was the new version of the SPC2 chip which was 01.04.07. It is easy to spot the SPC2 board and the EPROM. Take off the game top glass and on most games it is right there. The chip is marked U3.

No Power to the Bill Acceptor on an Upright Aristocrat

This was a weird one. The symptom was obvious. There was no power to the bill acceptor. I guess it could have fried, but none the less, there weren't any of the power lights lit up on it. The unit in the game is a UBA and it was swapped with the game next to it. Same outcome though, no power. The boards were reseated. Maybe the I/O

board came loose somehow but that didn't help either. Power problem right? Why not check the power supply connections and swap power supplies? It was done, still the same thing. The 24 pin connector directly behind the bill acceptor assembly was checked again and somehow, some way, it had been plugged in BACKWARDS (which included bent pins). Finally the problem area had been identified, now the cure. The 24 pin "union" between the connections got straightened out and carefully put back into the game, with power off of course. Once the main power switch was turned on, BINGO! Bill acceptor power had been established. It cycled and lit up beautiful.

IGT Indiana Jones - No Display

I received a call on an IGT "Indiana Jones" progressive game. It didn't have the seven segment display lit up. A customer was in the middle of playing it and she complained that she couldn't see her credits. That is a problem. One of the first items I checked for was loose I/O cards. Sometimes there are two in the main slot door and one inside of the game. With the power off, I lightly pressed on each of the cards on the slot door and one was loose. With power back to the game and snug I/O cards, the display and credits came right back. Be sure to power down the game when checking for loose cards. First, look closely to see if one sticks out farther than the other or farther out of the frame. If so, it may

be loose. Be sure to power the game off BEFORE pushing in the cards. They do not like to be "hot swapped" and they will go bad if plugged in "hot."

Numbers Inoperative on the CDS Keypad

At the casino I work, we are running CDS also known as the "Oasis" system. Once in a great while, a select few of the numbers won't work on the keypad so a slot attendant can't punch in his or her failure or repair code. Recently, the number five wouldn't work when pressed, the first thing I thought of was to replace the unit. Then I thought again. Why not check into the problem first?

With the player tracking bracket removed and the cables still attached, I used a small flat blade screwdriver and pressed each wire firmly into its place. Next, came the test. The number five and all of the rest of the buttons worked great. This saved a trip to the shop and saved time by not having to replace it. So, if a number or two isn't working on a CDS keypad, check to make sure all of the wires are snug in place. Not only have I seen this with the keypad but also with COM in and COM out cables on the Sentinal end. A poor connection makes for poor slot machine communication. Card reader cables too. If it isn't working properly, it may have a poor connection.

- Pat Porath
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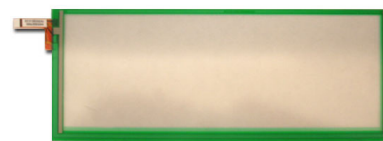
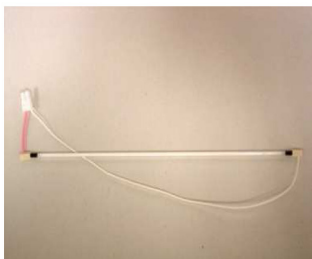


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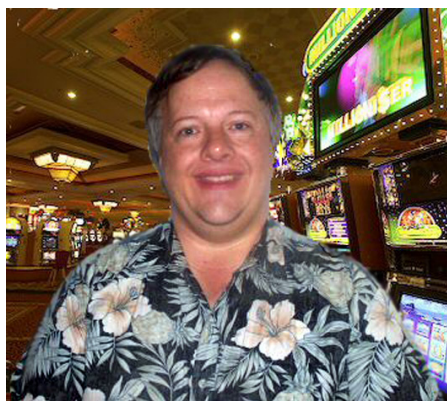
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Building a BEII test fixture

By Vic Fortenbach

Troubleshooting and testing the Acres tracking system and its associated parts can be simplified by building a bench test fixture. The “brain” for the test fixture is the Acres BEII, which is short for Bonus Engine Two. The BEII connects everything together inside the game machine and the test fixture. Two notes before we proceed: For this article I used the VFD (Vacuum Fluorescent Display) version of the BEII setup. There is a touch screen version called Nexgen, but that is reserved for a future article. For this article, I have used the VFD and card reader programs. The versions are both 4.02D. The menu version for the BEII is 18.08L-00. IGT has purchased the Acres player tracking system and renamed it IGT Advantage system. Because of the name change, IGT may have made some minor changes to newer installations to which this article does not apply.

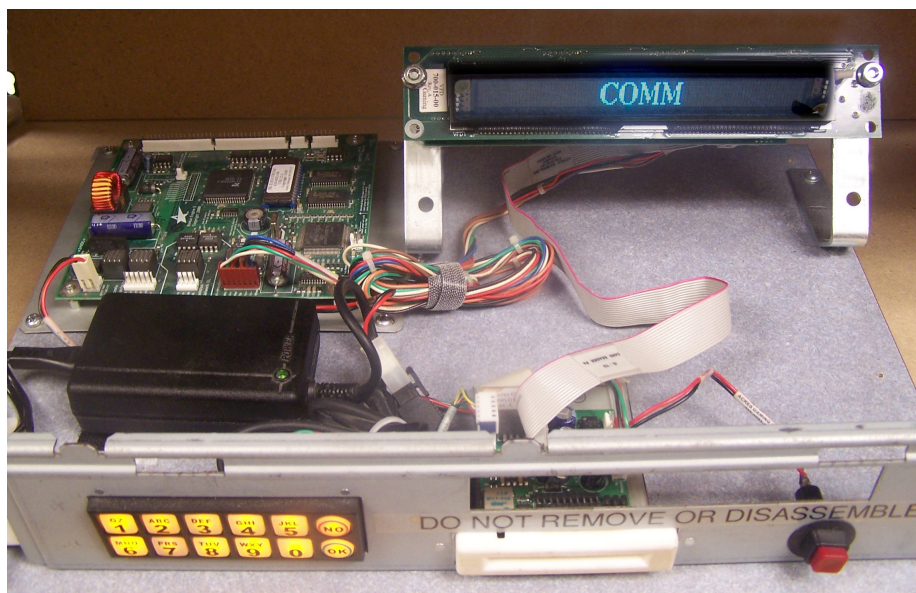
This test fixture will let you completely test the card reader, keypad and the VFD display easier than if you had

to do it on the casino floor. Also, using a little known and undocumented feature within the BEII program, you can test the BEII RAM and I/O ports.

To assemble the test fixture, you will need one BEII as well as one of each of the following sub-assemblies: a card reader, keypad, VFD and power supply. Don't forget that you will also need all of the harnesses that connect everything together to make your test fixture functional. The UID (Unique Identifier) harness which connects to the game machine harness is not required for the test fixture to operate. If you have trouble identifying harnesses, the game machine harness is the one with the

long white 26 pin connector. The UID harness connects to the game machine harness and has a small black shrink wrap covered circuit board attached. The UID harness is game specific and sometimes the UID harness can be quite large. You can easily test those harnesses at a later date. Don't forget the BEII to VFD 7 pin harness, the VFD to card reader grey 16 pin ribbon cable and the short 3 pin keypad to card reader harness. There will be a few more custom harnesses you will need to create to be able to do additional testing. I will cover those later.

As you can see in the picture, I assembled everything on a piece of wood that was about 17 inches by 12 inches that





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was lying around the shop. I used some wood screws and Velcro to attach everything to the wood. To make testing the keypad and card reader easier, I used a standard mounting panel from a game machine. The Acres VFD come in three sizes: a five inch, a seven inch and a large mounting seven inch. I chose to use a large mounting seven inch VFD for the test fixture for a few reasons. The large seven inch VFD is only used on a very few machines and we had a stockpile of them. There is less chance of someone stealing it off the test fixture in using it for a game on the floor.

Because the chosen VFD had large mounting, it would not fit on the metal bracket. I mounted the VFD on 2 angle brackets and bent them for the desired viewing angle. This makes it very easy to see the VFD display when the

test fixture is on the bench. For the test fixture's on/off switch, I connected a white cherry switch up to the power supply. This type of switch is perfect, since it has a momentary push on, as well as a pull on to stay on feature. The push on function of the switch to monetarily power the test fixture is handy for troubleshooting.

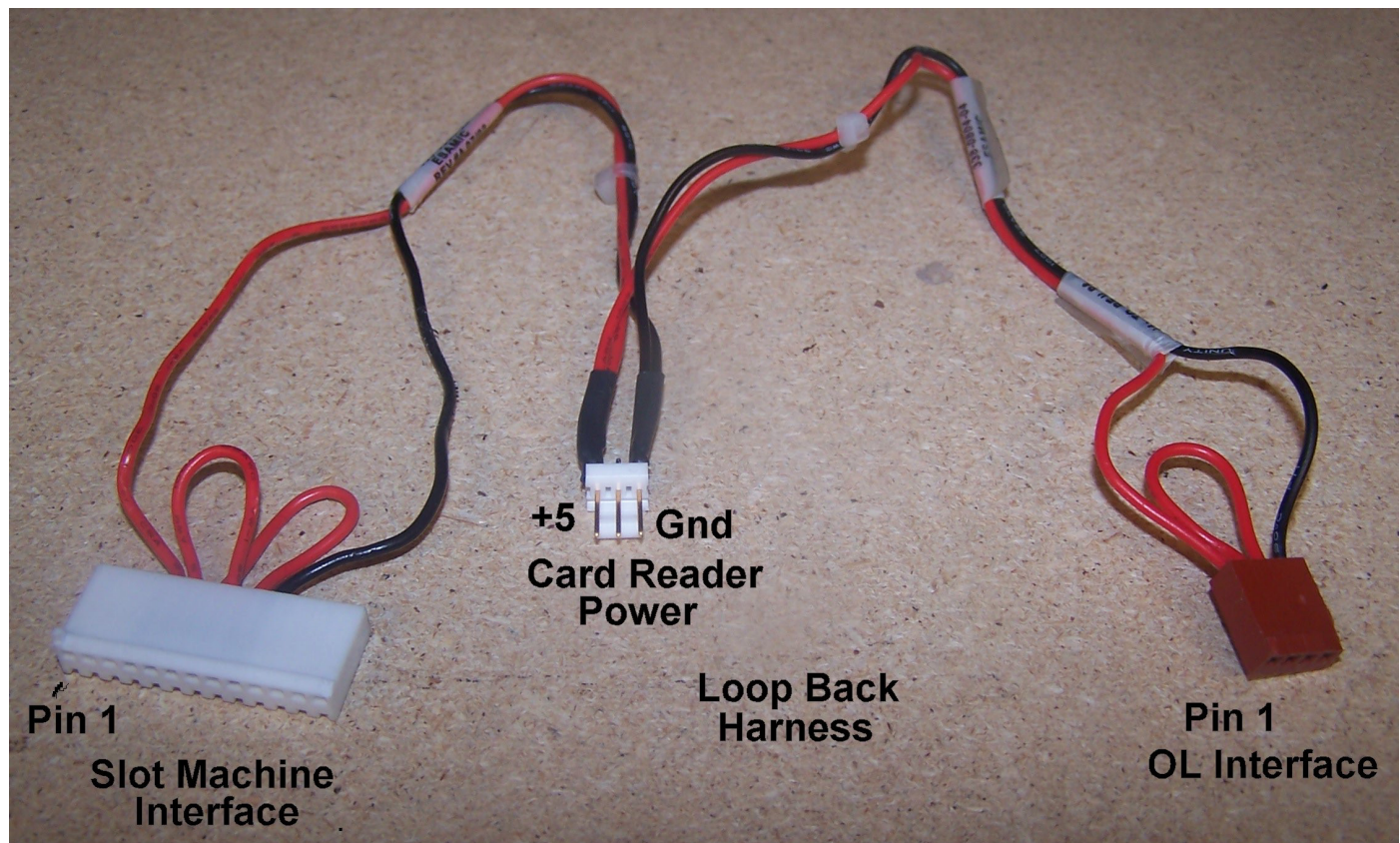
You don't have to follow my placement of the components, feel free to arrange the components to make testing easier for you. You should have no problems connecting up the harnesses to the various devices. All the connectors are the same as if you were connecting everything to the BEII and to a game machine's player tracking panel.

Once you have assembled, connected, and double-checked your work, quickly

push and release the power switch. If there is no smoke, it's safe to pull the switch to watch the test fixture come to life. If all is well, the card reader will beep and the card reader's LED bezel will light a flashing yellow color. The VFD will display the words "Acres Gaming VFD16 B0.02I Player Tracking." Then the VFD will then display "COMM." COMM is short for communicating and is an indicator that the BEII is trying to download code or communicate to the network.

I know what you're thinking, "I can't test a BEII system on a bench since I do not have a connection to the network."

You really do not need a connection to the network to test all the functions of the BEII and its related components. You probably already know about the dip switch test mode that is available on the



VFD. By moving dip switch number 8 on the VFD to “on” to enable the “test mode 0” you can then push buttons on the keypad or move additional dip switches to enable a series of test modes for testing the VFD display, card reader, card reader bezel colors and keypad functions. Since this test is pretty standard, I’m not going to spend a lot of time on this. While these tests are good, it does not do any “in depth” testing of the BEII. Specifically, it does not test the I/O ports and the BEII RAM

To do a more complete test on the BEII, you will need to access the undocumented test mode I mentioned earlier. This test mode is already built into the BEII and accessed only by the pressing bonus button. Again you’re probably thinking that the bonus button is no longer used. True, it’s not used for player use but that does not stop the technician. To access this test mode, you first need to connect the bonus button. On the card reader board are three connectors: P1, P3 and P6. The bonus button is connected to the card reader on a four pin connector labeled P3. There are a total of three connectors on the edge of the card reader’s circuit board. P1 is for a key switch that is not used and P6 is for the keypad.

The bonus button connection to the card reader uses the two pins closest to the P6 keypad connector. The other two pins on the bonus button connector (P3) are for the bonus button light. Since the bonus button light will not function, you can use any normally open push button switch. You can see the bonus button mounted on my test fixture below the cutout for the VFD on the metal panel.

Once you have connected the bonus button, you will also have to create the previously mentioned additional harnesses to perform some in depth BEII testing. On the BEII there are three data ports. The first one is the OL network isolated port, labeled P3 on the BEII. Do not confuse this P3 connector on the BEII with the Bonus button connector also labeled P3 on the card reader. The second port on the BEII is the game machine port or slot machine interface (remember the long 26 pin connector) and the third one is the account-

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ing port. I'm not going to cover the accounting port, since very few casinos use it. I'm sure you're familiar with the OL port; it's the four pin connector that is connected to the OL wire that is run beneath the game machines in the base area. You also use this port to "shoot" the BEII with game data from a laptop computer called the Libretto. The game machine port is the long series of pins on the edge of the BEII. To test either the OL port or the game machine interface port, you will need to create a special harness. This harness has two connectors and is called a "loop back." The loop back harness does just what its name implies. It will "loop back" a signal or pulse generated on its output port to its input port to be read by the BEII. This test checks both the input and the output port circuitry at the same time. Obviously, if the output signal does not loop back into the input port, something is wrong with the ports circuitry. To assemble the loop back connector harness, you will need a one, four pin and

one, six pin connector body, eight male pins and some wire. I made one complete harness assembly for both the OL and game machine's ports. The picture shows the construction of the loop back harness and connectors.

Since the BEII I/O ports are isolated from the rest of the BEII, you will need to provide power to the ports for them to function. Normally the bank controller and the game machine would provide +12 volts to the I/O ports, but since +12 is not easily available on the test fixture, I found that +5 volts provides enough voltage to power and test the I/O ports with no problems. For the OL connector, pin 1 (+5, Vcc) and pin 4 (ground) provide power to the port. For the game machine interface connector, pin 4 is +5 and pin 9 is ground. The first three pins on the game machine interface are for the UID harness connection. The pin labels are silk-screened on the BEII board for easily identification. The easiest way get a power connection to the I/O ports is make the

loop back harness so it simply plugs into the keypad harness, in place of the keypad. Since you are not going to test the keypad and perform the BEII I/O port test at the same time, this +5volt connection is ideal. Once you have created the loop back connectors, you're good to go with testing the BEII I/O ports.

Each I/O port on the BEII has a red and green LED indicator near each connector. This LED indicator will be the key to troubleshooting the I/O ports. The red LED is for the data in to the port and green is for data out from the port. If you watch the port LEDs when the BEII is installed in a game machine, you will notice the red LED is brighter and lit more of the time than the green LED is. The reason is because more data coming in to the BEII from the network than there is data going out. When you test the I/O ports, the pulse signal is so fast, both colors of the LED will appear to be lit for the same time, although the red LED will seem

Test Number	Tested Function	Displayed On VFD	Test Comments
1	Aux Input Ports	AFKU 01	A & K Tests P9 Of The BEII
2	Card Reader	No Card	Insert Card To View Card Numbers
3	UID Test	4294967295	Connect Harness To Test
4	Game Asset # Display	Asset 0	Program Asset # into BEII
5	Game Denomination	Denom 1	Program Game Denom into BEII
6	Game Floor Location	Not Set !	Program Game Location into BEII
7	BEII Program Version	Ver BE.02A, 1EC5	Version of the BEII Program
8	Bezel Color Display Test	BEZEL XX ##	XX = Flash/Solid, ## = Color
9	Card Reader Annunciator	ABI	Card Reader Beeper Test
10	Keypad Test	KEY: ATT:N SVC:N	KEY: Displays Pushed Key
11	BEII RAM Test	RAM PAGE XX	XX = 1 Through 16 RAM Pages
12	BEII Accounting Port Test	NIKO No ACCT	No Additional Information
13	OL Loop Test	OL LOOP XXX	XXX = Failed or OK
14	EGM Loop Test	EGM LOOP XXX	XXX = Failed or OK
15	ACCT Loop Test	ACCT LOOP XXX	XXX = Failed or OK
16	OFF LINE	OFF LINE	System Status

brighter.

You already know that the bonus button accesses the in-depth mode of the BEII. In fact, there are over 16 different tests you can perform on the BEII using this test. A few of the tests are duplicated from the VFD dip switch test so you can use either test mode but I find using only the bonus button mode is the easiest.

Connect the loop back harness you made to the card reader harness, P3 on the BEII OL connector and to the Slot Machine Interface. After you have powered up your BEII test fixture, you should have the familiar COMM on the VFD. Don't panic, this is good. Start the in-depth test by pushing the bonus button. Since this in-depth test is undocumented, there are a few tests that I have not figured out what they do.

Chart #1 lists each test and what it seems to do. The first test displays the letters AFKU 01 on the VFD. The A and the F "map" to the Aux inputs (P9) below the game machines interface connector. If you want to see this test in action, take a screwdriver or clip lead and short together two pins on one of the two aux ports. The A or F letter will not be displayed when the aux port is shorted. The text for which aux port and pins is silk screened on the BEII board. Very few casinos use these AUX ports. The second test is for the card reader. This is self-explanatory. The third test is the UID test. This will display the serial number of the UID chip. If you do not have an UID

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harness connected to the test fixture, the VFD will display the numbers 4294967295. The fourth through the eighth tests, again, are self-explanatory. The ninth test displays letters ABI on the VFD and turns on the "beeper" on the card reader. Test number ten is for the keypad. The VFD display reads KEY: the other two abbreviations are ATT and SVC.

Now this is where it gets fun. The eleventh test is the now famous BEII RAM test. You do not need to do anything to start this test. This tests all 16 pages of the BEII RAM. An OK will display after each page has been tested. I set the test fixture to run this test overnight when I have a problem with a heat sensitive BEII. So far I have found three BEII boards with bad RAM pages. The twelfth test seems to be for the accounting port, but I'm not sure. It displays on the VFD, NIKO No ACT. The last three tests utilize the loop back harness you created earlier. The VFD will display the following text for each push of the bonus button; OL LOOP FAILED (or OK) EGM LOOP FAILED (or OK). The accounting loop is the last test in this set. The second test is labeled EGM but it actually tests the game machine interface connector. Like the OL LOOP, test failed or OK is displayed. After you have advanced through the bonus button tests, the words OFF LINE are displayed. To restart this series of tests, just push the bonus button again.

- Vic Fortenbach
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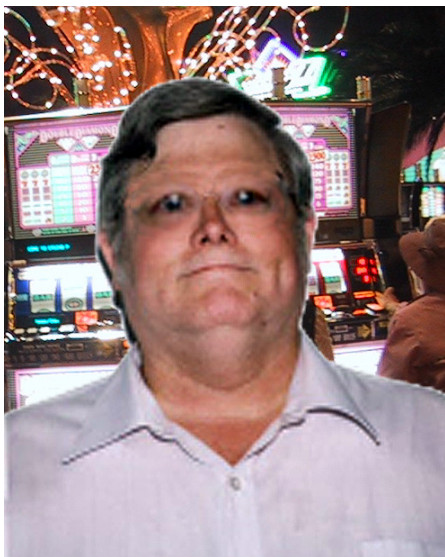
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Game Level Troubleshooting

By Herschel Peeler

All techs face this problem every day: Game down. This is what we are there for. Most problems we have seen a zillion times and know what the problem is from first hand experience. But how do you approach those problems that are new to you or intermittent problems that only come up once in a while and then magically disappear? Most of the following will be obvious to seasoned techs. For those experts, y'all can pass on this article unless you just want something to read. For newer techs, you might find it helpful.

Just tell me what part to change! Nothing wrong with this at all. The likelihood that the problem you are experiencing has been experienced by somebody else before is pretty good. Don't be afraid to "phone a friend." The Slot Tech forum is a great place to reach other techs at other

casinos in one user-friendly place. This can be found at forums.delphiforums.com/slottech. There is no fee to join Delphi forums at the basic level but joining can be done at a small fee with more than basic features. My anti-virus software flags the forum as a "dirty site" because of some adware they use. I think this adware is harmless. I just have the software mark it as friendly. It is not malicious or viral. Perhaps you can just look at it as the cost of joining the forum that is otherwise free. I have never had the hint that they sell my email name. I use my real name on the forum and have never had any trouble because of it.

Those who hang out in the forum are people of the best quality, not hackers, gamers or spammers. There are quite a few top-notch techs on the forum that freely share their knowledge and experience with others.

What does the error report actually mean? Sometimes you get no actual error report. The game just malfunctions with no message. For those times when you do get

an error report, make an effort to understand what the error report actually means. Sometimes they will point you to an operation you can relate to a circuit. Sometimes not.

The game just hangs up!

What is the game trying to do? In many cases the game cannot do another operation until the present operation is completed. The game is not malfunctioning. It is doing exactly what it is designed to do. The next game cannot start until the accounting of the last game is properly completed. If the customer is cashing out, the game may not be able to do a different operation until the printing or cashing out is properly completed.

Identify what the game last was doing before it hung up. Try to figure out what the game is trying to do now. Most games have an actions list that describes what the game is doing at any given time. Somewhere in the bowels of the menus is a history of operations where it makes a note of what action it starts and what actions get com-

pleted. This can give you an idea of what circuit is malfunctioning.

RAM Clear

Clearing RAM does not fix a problem. It only makes the game forget that there was a problem. Whatever it was that caused your problem is still in the game. When that condition occurs again the game will fail again.

Most events that occur in a game are represented by data that is stored in RAM. Clearing RAM erases the fact that the problem existed. Unfortunately, clearing RAM can also lose accounting and/or options. Most games have different levels of clearing RAM: Clearing errors, clearing errors and accounting or clearing options and everything. If you do a RAM Clear, it is always a good idea to go back and check options to make sure you didn't change anything else that was important. When in doubt, check options with a similar game to be sure they are set right.

Clearing RAM also does not actually Clear RAM. It sets RAM back up to a known condition, sets specific options, enables or disables certain features in the game. The conditions it sets are not always zeros.

Get it down to an assembly

If you can, swap out the most likely assemblies. First choice is to swap in a known good assembly from a stock

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of good assemblies. Another option is to swap assemblies from a known good game. In either case, make sure the assemblies are swappable. A bill validator for a Bally game may not work on an IGT game. A bill validator for one model IGT game may not work on another model of IGT game. The wisdom is in knowing the difference.

MAKE A NOTE. Make a clear note in the involved game(s) that you have changed the assemblies so somebody following your act can clearly understand what was done.

Does the Game Pass Power-On Self Test?

I can't think of a game that doesn't have a POST. Your PC does this on power up. The microprocessor goes out and checks as much of the system as it can. It checks for memory and I/O to be where it is supposed to be. Checks memory to be the right type. It tests RAM. It does a checksum of EPROMs. It may go out and check a disk, DVD or CD drive. The more memory the system has, the longer it can take.

Memory tests are probably the biggest reason it takes some games so long to power up. Many games are not state-of-the-art but are 16-bit machines running at low two-digit speeds. This puts them on par with the processing power of an original IBM PC AT. It just doesn't take much to play a game. Newer games may be a last

generation personal computer with a few bells and whistles added to make it a slot machine. If you understand what POST does and how your computer (or game) works, you can make good sense of POST failures. In this is the value of A-Plus certification that some manufacturers are starting to require of their techs.

POST is not all-encompassing. Passing POST just says the game does not have major integrity issues. Tests go by fairly quickly in POST. Intermittent problems can be glossed over quickly and not fail in POST.

Does the problem show up in game diagnostics?

I can't think of a game that does not have diagnostics you can run to check operation of specific circuits. Memory tests can be run at length to check for intermittent operation. Serial I/O ports can be put in Loopback mode and tested better than POST can. Most major peripheral assemblies also have a microprocessor in them. Tests in peripheral devices can often be invoked through game diagnostics.

Use these diagnostics. If you are having a bill validator problem but the bill validator constantly passes diagnostics, this points to a problem in software that is unique to the software version and not the bill validator itself. Use diagnostics to define if a problem is hardware or soft-

ware oriented.

Serial I/O Loopback Test

Not done in POST, most games have a test that allows the transmit side of the communications channel to be fed back to the receive side and let the serial port talk to itself. This can be done at different levels in most UARTs. The loopback can be built into the UART to test the UART. If this works but it fails when the loopback plug is plugged into the backplane it identifies the problem to be in the interface of the board or to the backplane. If it works at the backplane but not if the loopback is placed at the far end of the cable, you have the problem narrowed down to a cable.

The design of the loopback is usually pretty simple. Most serial ports just use TxD and RxD. Tie them together. Open the circuit. Insert the loopback and run Loopback test.

What Does the Tech Manual Have to Say?

Okay this can be a joke. Some manuals have little or no help here. Some give only vague or obvious hints on troubleshooting. Some tech manuals are good, some are not. Few are REALLY good. For an example of a good tech manual, look at a Ceronix monitor tech manual. It describes overall operation of the monitor. It breaks down each circuit and describes how it works. Compare this

to some manufacturer's manuals that contain instructions on how to operate the game and set up options. A few tech manuals are complete enough in that they at least have overall wiring diagrams and wiring diagrams of the boards with a parts list.

Was the Game Doing Any Particular Operation Just Before Failure?

This would help get the problem down to a particular circuit or software routine. Does it happen when the game is idle, during normal game play or just when doing a particular operation?

Is it Thermal?

A more difficult troubleshooting since I don't think some manufacturers make a test

fixture for their games. Under normal operation (so you are using parts of software other than diagnostics and are using the software routines that fail) put a heat gun to the board and see if you can find a component that fails when heated and gives the symptoms you are looking for. See if you can narrow it down with freeze spray and a heat gun.

Test fixtures are games turned inside out so you have access to the boards for testing and troubleshooting. Often the same software is used as is used in the game. Sometimes jurisdictional rules take over and the software is just the game diagnostics with no ability to play a game. If the manufacturer doesn't sell one, you can build one by gutting a game and creat-

ing your own. Price is about the same as buying a test fixture.

The decision to build your own test fixture is based on how many of these games will need to be supported and how many board problems you expect to run into. It may be cheaper to just buy your way out of board problems instead of buying or building test fixtures and training techs on component level troubleshooting.

Is there a software difference between those games that have this failure and ones that do not?

This might point to a software problem that the manufacturer might have a solution for already. Not always an option in most jurisdictions



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but if you move that MPU board to another game, does the problem move with it? Same with I/O boards. Can you get it down to an assembly you can move between games? Is this problem specific to a particular game theme? This points to a problem in Game Software specifically, a Game-specific EPROM or PAL. If the problem is experienced on various game themes but is limited to a certain game model the problem may be unique to Operating System or Main EPROMs.

Call the Manufacturer

Okay, this can also be a joke. Sometimes the manufacturers have a quite friendly web site or even a forum where you can get to the tech support. Other times you get a person who only reads from a script and answers only specific questions with canned answers. Sometimes you can't get any help at all.

Power Supply Related?

AC supply looks good for voltage and noise? DC power on the board looks good for voltage and noise compared to a game that does not show this problem? Ideally, this requires a meter and scope. Trying to measure AC ripple on a DC line with a meter is questionable. Most common meters will measure accurate AC only at low frequencies and will not measure higher frequencies from switching power supplies. An oscilloscope is best for looking at

noise on DC lines. It is hard to do this on the floor. Doing it at the bench requires that the board be powered up. It doesn't have to be in full operation.

No Blinking Fluorescent Lamps?

Keep in mind the lamp can be flashing faster than the eye can react so you can't see it and still cause a malfunction in the game. Remove the lamps and see if the game still fails. Blinking fluorescents create a mess of electromagnetic noise that can bleed over into over lines and wreak havoc.

These same steps would be useful on any game or model. It doesn't require a highly technical ability to do them, but it doesn't hurt to have a working understanding of embedded microprocessor operations to make sense of the symptoms you see. The more you understand of what you see the better you can troubleshoot the game. You can always just change parts until the problem goes away but there are potential problems here. This will not find a cabling problem. If the cabling problem is what is killing the board, you will just keep destroying board after board and come to no conclusion. If it is a bad power supply killing boards, you could kill a lot of high dollar boards before finding the problem. If it is a board that is killing power supplies, you could go through a lot of power supplies before realiz-

ing what is going on.

Cost of Repairs

If a game is set for a Hold of 5%, every dollar the repair costs loses the casino twenty dollars of Handle. That game will not make a profit again until the cost of the repair is covered. A \$1,000 assembly replaced loses the casino \$20,000 in Handle. Just because the game is working again does not mean it is creating revenue. Defective games can be replaced with new games. This is the most expensive solution but requires no technician at all, hardly. Games can be repaired by replacing assemblies at high cost. This requires a minimal of technical talent. Boards and assemblies can be repaired at the component level for small change or small dollars. This requires the heaviest technical talent. Every casino must, at some point in their development, decide what method they are going to use. Most fall on some level between the three choices listed above.

Cost of training

Do you promote from within and do your own training for technicians or do you hire trained technicians from the outside? Again, most casinos choose a point somewhere between these two extremes. In any case, the training should match the job descriptions. Evaluation of technicians should match the training. What is the cost of training compared to the cost



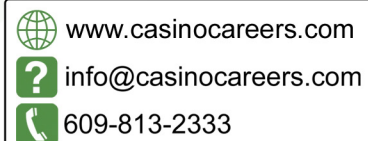
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of having down games or doing expensive repairs? Randy Fromm (publisher of this magazine) offers an excellent training program that takes two weeks to complete. It assumes no previous knowledge of electronics and covers basic electronics, power supply repair, CRT monitor repair and LCD monitor repair. It can be customized to add printer repair and BV repair as well.

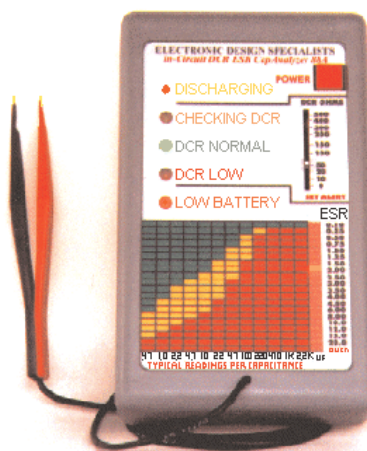
An alternate is to hire a senior level tech that can do training of the techs. Usually these techs ask a higher than normal price and expect solid employment in the long run. An alternate is to hire a senior level tech for a pre-arranged short period at a highly salary. Such a tech

should have a very specific task to be accomplished in a set time of, say, two to four years. In that time the objective would be to develop a training program and set up

operations that would survive after he left.

- **Herschel Peeler**
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New Guide to Power Factor and Harmonics from Staco Energy Products

A new guide to power factor and harmonics is now available from Staco Energy Products. This full-color 42-page catalog serves as a primer for understanding the causes of poor power factor and harmonics, how these problems are manifest in various facilities, and how they can be corrected. Readers of all knowledge levels will appreciate the color illustrations, examples, checklists and reference tables included which help to better explain power factor and harmonics, and how the various solutions discussed can be employed. Many examples, including ROI and payback periods are also included. Selection guides included are easy to read and simple to understand. Copies of this new literature may be ordered at www.stacoenergy.com.

The most common symptom of poor power factor (or inefficient use of supplied power) is higher utility bills – whether companies are invoiced on a KVA or KW basis. Load types that can cause poor power factor include induction motors, electric arc furnaces, machining, stamping, welding, variable frequency

drives, fluorescent lights with magnetic ballasts, computers, computer controlled equipment, and more. Solutions to correct the power factor can be installed at various locations including at motors, at feeders and at service entrance. The cost/benefit ratio of each is detailed, along with a quick reference for KVAR needed based on current power factor and corrected power factor desired.

Harmonics may be present in wide ranging facilities from as large manufacturing plants to small accounting firms. A term to explain currents and voltages that have multiplied within an electrical system, harmonics can be caused by adjustable speed drives, variable frequency drives, electric arc furnaces, electronic welding equipment, transformers and generators, UPS and storage systems, medical imaging equipment, dental equipment, lighting controls/dimmers, computers, copiers, scanners and more. The presence of harmonics can cause serious problems including interference with telephones and communications systems, overheated bus bars,

conductors and switch-gear, tripped or arcing circuit breakers, overheated motors, breakdown of insulation reduced equipment life and more. Checklists are provided to help walk users through appropriate mitigation of harmonics which are present. Passive and active harmonic filters are discussed.

Staco Energy Products Co. is a major provider of voltage control and voltage regulation products, as well as a complete line of advanced power conditioners and uninterruptible power supplies. For more than 70 years, customers worldwide have relied on Staco Energy Products as their dependable source for standard and custom solutions to a wide range of electrical power problems. Headquartered in Dayton, Ohio, Staco Energy Products is a wholly owned subsidiary of Component Corporation of America, located in Dallas, Texas.

For more information, visit www.stacoenergy.com, call 866-266-1191, write to Staco Energy Products Co, 301 Gaddis Blvd, Dayton, OH 45403, or via e-mail to sales@stacoenergy.com.

FutureLogic Printers Win Casino Journal's Top 20 Most Innovative Gaming Technology Products Awards 2006

FutureLogic, Inc., the leading manufacturer of thermal ticket printers for cashless gaming, announced today that its GEN2 Universal™ printer with the ProMatrix™ coupon solution has received one of Casino Journal's Top 20 Most Innovative Gaming Technology Products 2006 awards.

Now in its 10th year, these awards recognize the most innovative offerings in the gaming industry. A panel of expert judges evaluated this year's entries and chose the Top 20 products.

The only printer to be recognized in the awards program, the GEN2 Universal printer supports all current and emerging game types by incorporating three game ports, including RS232, NetPlex and USB 2.0. The hardware component anticipates new GSA standards for downloadable games and permits in-game firmware and promotional updates via the USB port.

The ProMatrix coupon solution, a flexible promotional couponing and trigger solution, enables proactive marketing functions on the casino floor – by turning ordinary vouchers into colorful,

eye-catching coupons.

"FutureLogic is honored by the recognition of these distinguished judges and gaming executives, and proud to be in the company of industry-leading providers such as Aristocrat, Bally, Gaming Standards Association, IGT, Station Casinos and WMS Gaming," said Nick Micalizzi, VP Sales & Marketing of FutureLogic, Inc. "These awards represent the successful implementation of our new technology initiatives and our commitment to setting new standards for reliable, multi-function ticket printer solutions.

FutureLogic printers have received nine gaming industry awards over the past three years, are used by more than 35 gaming OEMs worldwide and are the standard default printer for International Gaming Technology .

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TL431 and Frequency Compensation

Basic to modern, switching power supply design is the concept of optical feedback. You will see various modifications of this design but in general, they are all more or less the same.

Why Optical Feedback?

In a switched-mode power supply, circuitry on the primary side of the power transformer must remain distinctly separate from the circuitry on the secondary. They must be totally “isolated” from each other. Isolation, in this case, means that there is no direct metallic (Galvanic) connection between the primary winding and the secondary winding.

Isolation is a good thing. We have covered the topic of isolation as far back as the October 2001 issue with a brief look at the isolation transformer. In conventional SMPS designs, isolation is provided the power transformer itself. Just about all transformers (with the notable exception of the “autotransformer”) have the inherent property of isolation, provided by the fact that primary and secondary windings are not connected to each other. They are simply two windings, wound on the same core. They share the magnetic field of the core, nothing more.

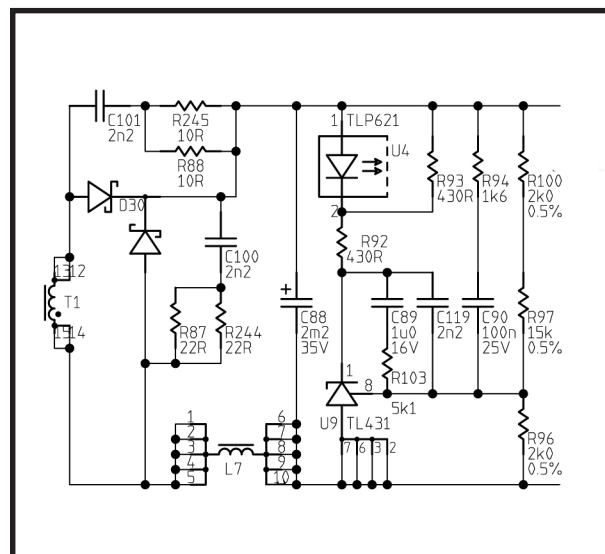
In an SMPS, we maintain isolation by using an opto-isolator for our regulation feedback. Again, we have covered this topic extensively in previous issues (September 2004) and I don’t want to re-hash the same old subject. We light up the LED in the opto-isolator with voltage from the secondary output of the power supply. The higher the voltage, the brighter the LED shines. We read the brightness of the LED with the phototransistor in the opto-isolator, which is connected to the PWM control circuitry on the primary side of the transformer. In this way, the secondary can “talk” to the primary without actually touching it, which is forbidden if you want to keep some and flames to a minimum.

But if you want to maintain tight voltage regulation, you need to go just one step further. You need to control the brightness of the LED under a variety of changing load conditions of both high and low frequencies. You need one more element in the chain of regulation so get to know the TL431 because the little thing is in darned near everything these days. In our

industry, we find them used in monitors and we find them used in low voltage power supplies as well. For the sake of discussion, this example is from an Aristocrat 14 VDC power supply but this same discussion applies to any output voltage.

You can think of the TL431 as a sort of programmable Zener diode. It is a “shunt regulator” that can be programmed to be any voltage from a minimum of 2.5 volts to a maximum of 37 volts. Inside the device, an internal 2.5 volt reference is compared to the voltage that is applied at the reference pin input. This reference voltage is derived by a resistor voltage divider (R96, R97, and R100). The TL431 provides the gain that is needed at low

Con’t pge 36





Double Dragon Deluxe ALPHA™ S9C – Class III

Fire-breathing twin dragons spell good fortune for players on this exciting new five-reel stepper slot from Bally. Double Dragon Deluxe offers 30 lines of play with a 600-credit max bet. The game is multi-line, multi-credit and multi-denom configurable and supports external progressive functions. Double Dragon Deluxe also features an action-packed secondary bonus. When the Fire Dragon, Yin/Yang and Water Dragon symbols appear on lines two, three and four respectively, the player is prompted to choose either the Fire Dragon or Water Dragon symbols. Each dragon symbol has seven additional symbols associated with it. The reels spin three times and each time a symbol relating to the selected Dragon symbol appears, the player is awarded one times the total credits bet. If an equal number of Fire and Water Dragon symbols appear, the player receives an additional 40 times the total credits wagered. In addition, scattered Pagoda symbols pay from two up to 80 times the total credits bet. Top award is 800 times the total credits bet.



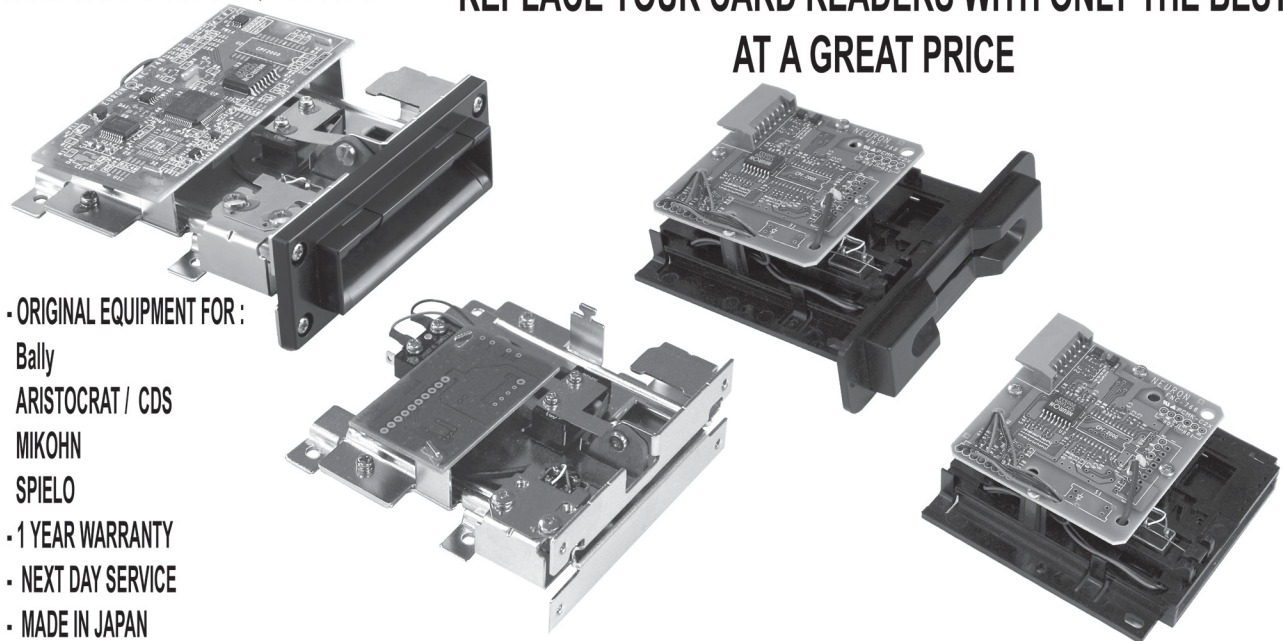
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frequencies so that the LED in the opto-isolator will produce enough of a change in brightness in order to signal the primary side and compensate for the low frequency changes in the load.

But this gain is not needed at high frequencies. The gain of the opto-isolator itself (the CTR or current transfer ratio) works just fine, without any assistance from the TL431's gain, thank you very much. This leads to a sort of engineering dilemma where high frequency changes in load can produce larger voltage swings than low frequency loads, making tight regulation impossible.

Compensation

I'm not talking about what you'll receive from the government if you smash your foot by dropping a slot machine on it. In this case "compensation" is "frequency compensation" which is the way we can control the frequency response of various circuitry. By using a combination of resistors and capacitors primarily, we can integrate the various load frequencies and "tell" the TL431 how to behave at certain frequencies. In the example shown, the compensation network is made from C119, R103 and C89, a 1 uf, bipolar capacitor. The compensation network allows the TL431 to maximize its contribution at very low frequencies and to remove its influence at higher frequencies. The connection of C89 and R103 between the cathode and the reference terminal of

the TL431 allows maximum loop gain at DC for the best voltage regulation.

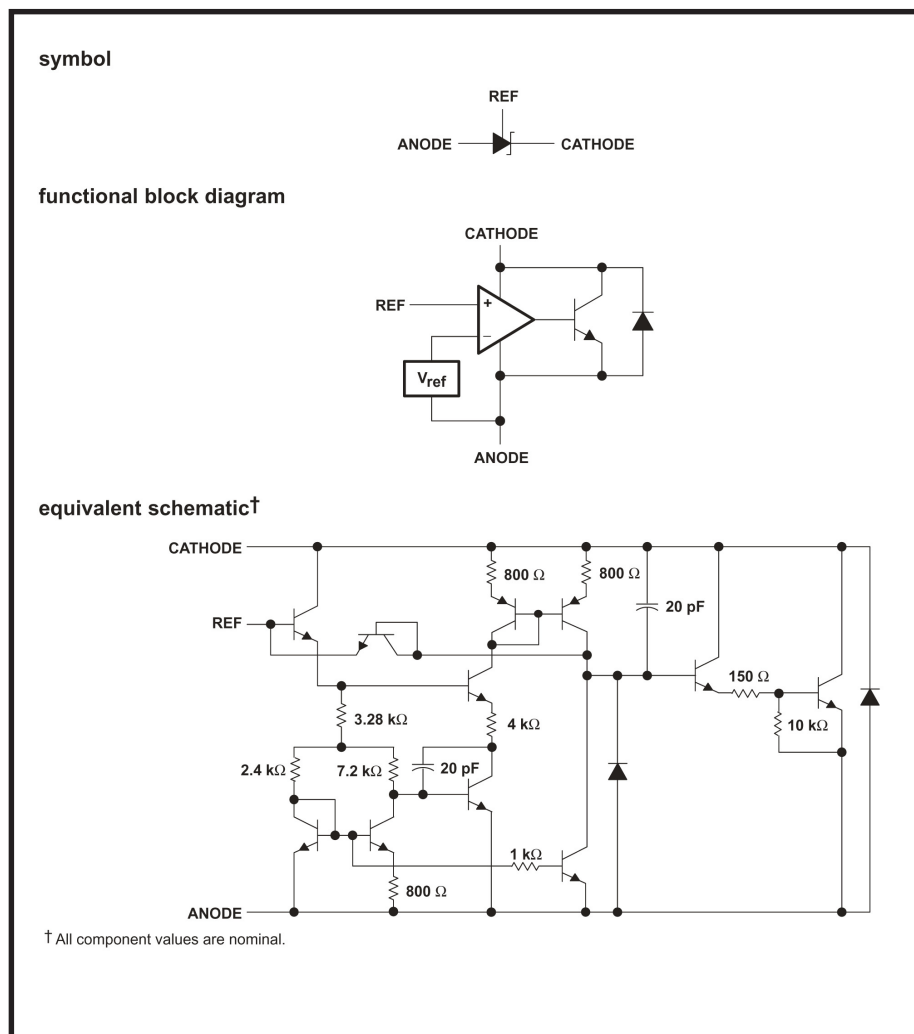
When you have weird regulation problems (such as low voltage) and yet all of the secondary filter capacitors test out perfectly good (or you have replaced them to no avail) this is one place to look. If the capacitor in the compensation network goes wonky, regulation will suffer.

I see this time and time again in my tech classes. A group will be struggling with a power supply, trying to get the voltage to come up to a proper level. They will have

tested/replaced all of the BIG capacitors but with no success. They will ask for my help and I'll point to some dinky little 1 uf cap and ask them if they checked it. The answer is invariably "no" followed by the comment that goes something like "But that's so small! That can't be it, can it?"

Shucks, every part does something! Just 'cause it's dinky, doesn't mean that its failure won't cause the exact symptom you're looking at.

- Slot Tech Magazine





"On behalf of Table Mountain Casino I just wanted to express our thanks to you and your team. I couldn't have asked for anything better."

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On-Site Slot Tech Training Customized Classes Available

Randy Fromm's Casino School is a 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:



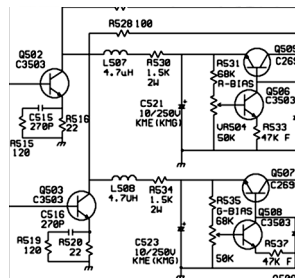
THE DIGITAL MULTIMETER

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

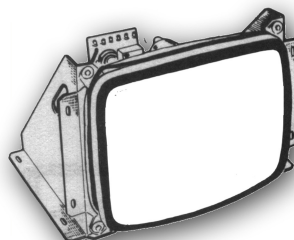
The individual components used in games are introduced. Parts such as resistors, capacitors, diodes, potentiometers and transistors are covered individually. Students learn how the components work and how to test them using the meter.

Schematic diagrams 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.



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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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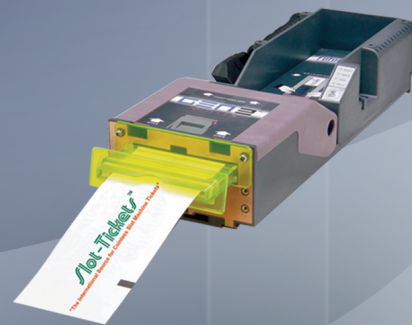
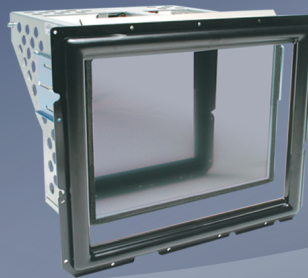
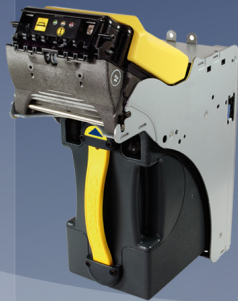
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