

October 2007

# SLOT TECH MAGAZINE

Slot Machine Technology for the International Gaming Industry



Popcorn!  
Get Your  
Popcorn!

What Kind of Slot  
Machine Technician  
Are You?

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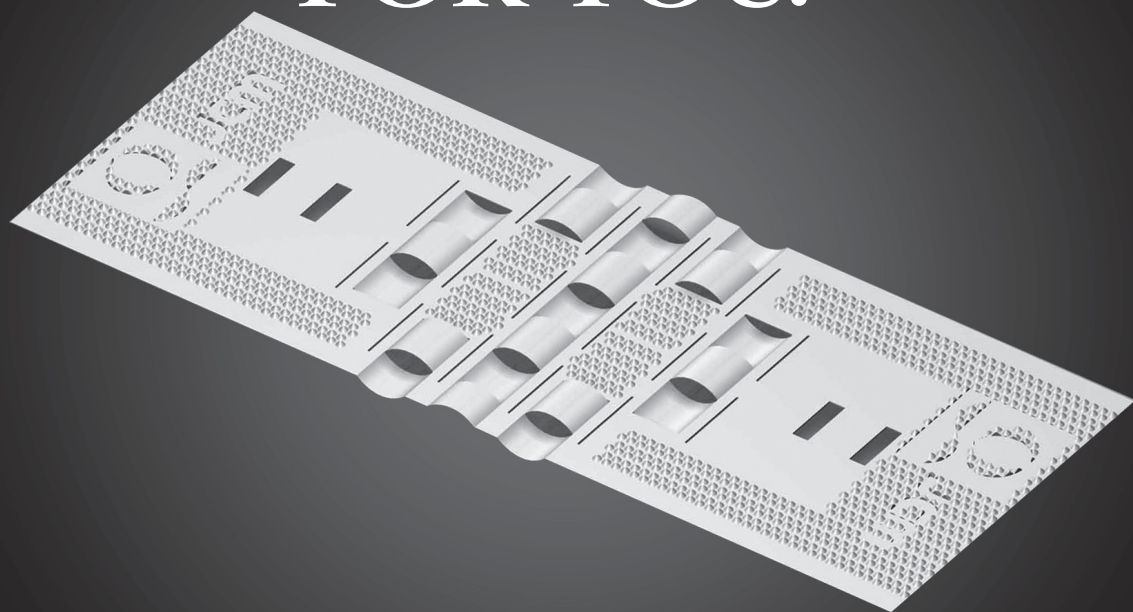


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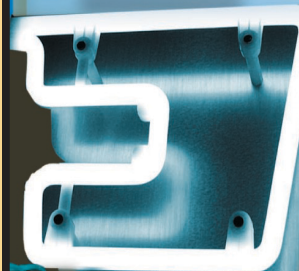
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## Introducing SlotFest

Last month, I made a sort of low-key announcement for a major change in this Autumn's TechFest program with the addition of a gaming management seminar program called SlotFest. This month, I'd like to take a few moments to explain the new SlotFest program and exactly what it is that we're offering.

SlotFest is a seminar program for slot management, presented by the prestigious University of Nevada, Reno. It is three days of training on the ins and outs of a modern casino's Slot Department, not from the technical side (that's TechFest, as you know) but from the management side.

The philosophy of this "fest" is the same; it is all about education and training and never a sales presentation. However, the format is a bit different. Where TechFest neces-

sarily features a series of two or three hour seminars on all of the different slot machine sub-assemblies (printers, bill validators, touchscreens, etc.) the SlotFest gaming management program is one, complete class over three full days. Training begins at 9:00 am and ends at 5:30 pm daily. This is the same schedule as TechFest, including meal and coffee breaks so we can all enjoy each other's company during these all-too-brief interludes (it's pretty much non-stop training at the Fest).

Key topics covered at SlotFest include:

- Par Sheets/Pay Tables
- Slot Math
- Slot Machine Systems, Reports & Analysis
- Daily Slot Operations
- Floor Design and Layout
- Cashless operations
- Key measures/revenue maximization/floor performance

Please visit the website at [slot-techs.com/slotfest](http://slot-techs.com/slotfest) and check out the schedule for more details on the SlotFest program.

### Who Should Attend?

According to the University of Nevada, Reno's Cheryl Olson, Assistant Director of the Gaming Management and Specialty Programs, the program is geared toward slot managers, supervisors, and anyone that works with the slot department that needs a clear understanding of the entire slot operation.

In discussing this program with Ms. Olson over the past year or so, I get the sense that the program will be highly effective for those who want to make the transition from technical to management, for those just entering a management position or for those who have been on the job for a while and are looking to see how the same tasks of operating a slot department might be accomplished differently or more efficiently.



I look at it in much the same way as learning a second language. You can likely pick it up on the street and end up with a working understanding of the language OR you can learn from an instructor and in a short time, have a complete grasp of the correct way to speak the language.

A good instructor can change your life and SlotFest has one of the best in Ken Moberly. Ken has been a guest speaker and instructor in the Gaming Management Program at the University of Nevada, Reno for over eight years. Previously, Ken was the Director of Professional Services at International Game Technology. Prior to service at IGT, Ken was the General Manager and Vice-President of Slot Operations for the Peppermill Hotel Casino in Reno, as well as the Corporate Slot Director for five Nevada gaming properties owned by Peppermill, Incorporated.

Attendance at SlotFest is highly limited so please, if you're interested in attending, contact us as soon as possible. You can download an enrollment form from the website at [slot-techs.com](http://slot-techs.com).

See you at SlotFest.

*Randy Fromm*  
Randy Fromm

### Randy Fromm's Slot Tech Magazine

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Who doesn't love popcorn, especially that stuff you get in the theaters, all smothered in a fatty, buttery-like substance and covered in yellow dye no.5?

Yummy!

As I'm sure you've guessed by now, this article is about POPCORN. No, not the movie variety but the slot machine of the same name from AC Coin and Slots.

In June's issue of Slot Tech Magazine, Pat Porath mentions this game in his monthly column (ok, he actually was speaking about Bingo Nights, but the premise is the same). If you haven't read Pat's article, I would highly recommend that you do. We'll touch a little more on what Pat presented and show you exactly what he was speaking about.

Figure one shows the actual game, with a close up insert

# Popcorn! Get Your Popcorn!

By Ted Befus

of the player's view of the top box. Now, I'm, going to tell you something that I can't believe I did. I looked at the top box from the outside and saw all these beautiful little balls scattered inside and wondered how the heck they can control the outcome of all these things. Can you believe

I actually asked the salesman how that's possible? Oh my God, if I would have only pulled out the top glass, I would have seen how it's all possible.

Editor's note: If it's any comfort to you, Ted, I did exactly the same. I am a big fan of







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magic and this illusion really knocked my socks off. I KNEW it was impossible for it to be doing what it appeared to do and yet I couldn't figure out how it worked. I had to read about it in the June 2004 issue of Slot Tech Magazine!

With that confession made, that's where we'll focus on this article, the top box. After all, the base game is a standard, run-of-the-mill, S2000 cabinet. I'm sure we're all familiar with those.

Figure two shows the top box without the belly glass installed.

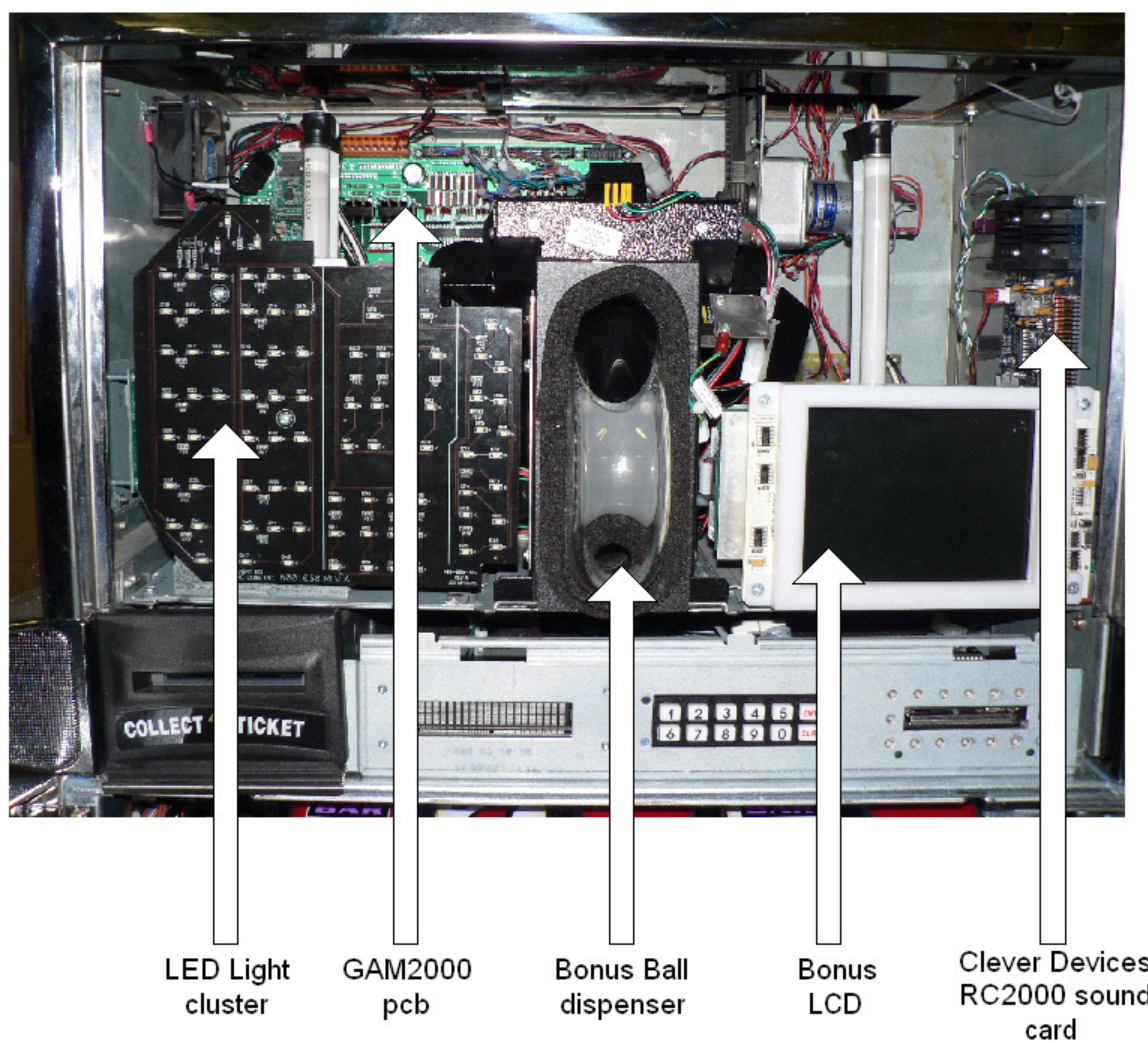
As we work our way left to right, you see the LED light cluster. Its only job is to indicate which size popcorn you get in the bonus feature and to flash during the attract mode.

Next you find the GAM2000 board. The GAM2000 board controls all aspects of the bonus feature. It has an EPROM that contains the bonus percentage information as well as knowing the location and value of each ball in the ball dispenser. It also works in conjunction with the LCD to display the outcome of each bonus feature as well as controlling the

attract modes. Along with all that, it controls the Clever devices RC2000 sound card for the attract sounds and bonus sound files.

After that you find the ball dispenser. This dispenses the balls for the bonus feature. We'll get more in-depth with this later in this article.

Next, you have the LCD panel. It displays attract mode information, bonus feature information and any top box related errors. It contains a graphic controller EPROM as well as a flash card that has the game graphics stored on it.





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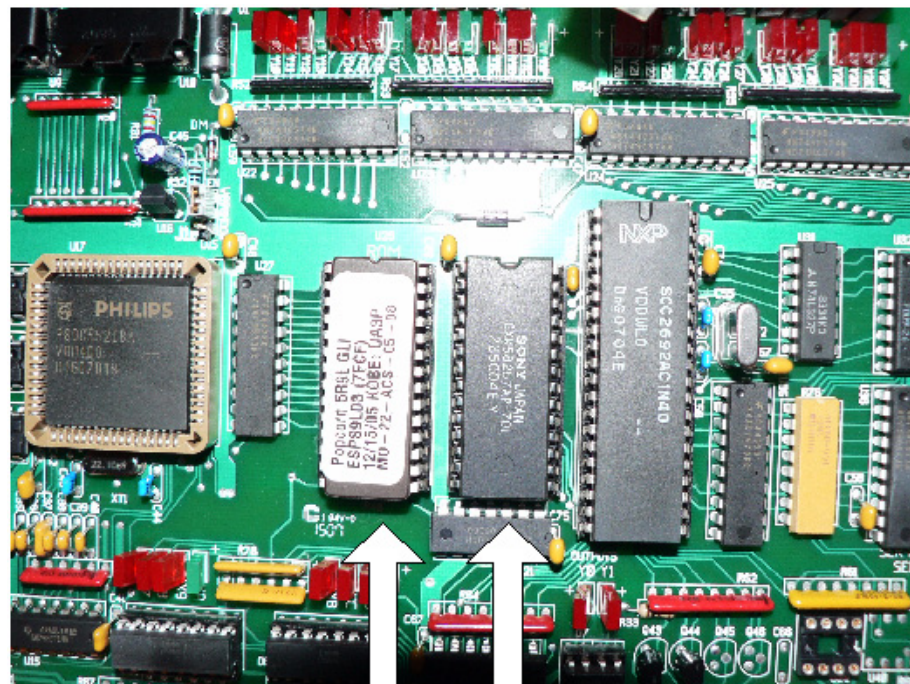




Last but not least (well, maybe least as I'm absolutely sure you don't need sound for a game to be playable) we find the Clever devices RC2000 sound card. I don't know how many of you have ever used these cards. We used to use them exclusively to trigger an audio override of our house sound system whenever anyone won a mystery jackpot. It has a flash card that has all sound files loaded into it. This device can be controlled serially (which is the case with these games) or it can be controlled by contact closure.

I should mention that in the event of any top box errors, you can reset the top box with the use of the reset button (on our games this is a cherry switch located on the left hand side of the bill validator enclosure). In the event that you continue to get errors on the top box, you can clear the RAM located on the GAM2000 PCB. It is located next to the EPROM. Our rep simply instructed us to remove the RAM, ground it to the chassis of the game, replace it and clear any RNG errors that appear. Once these errors are cleared, the RNG will be re-seeded and the game should hopefully work. Figure three shows the location of the GAM2000 EPROM and RAM.

Ok, now on to the ball dispenser portion of the top box. The dispenser is laid out in figures four through six. The dispenser is pretty much the heart of the bonus; it's also



Bonus Game  
EPROM

Bonus Game  
RAM

the most mechanical piece. Essentially it's similar to an IGT reel mechanism. It uses the same timing and reel sensor but instead of a reel, you have a rack loaded with balls. Starting with figure four, you see the side view of the dispenser. From left to right you see the reel sensor, blower fan, ball eject solenoid and ball present sensor.

Obviously the reel sensor monitors the position of the reel based on the slots cut into the reel flag.

The blower fan is used after the bonus has been played and the ball needs to be transported back to the basket. This is one area to keep an eye on. The hose between the fan and the ball is pretty stocky so it shouldn't be too susceptible to problems.

However, if you don't keep an eye on dust in your top boxes, you risk contaminating this fan. Also, if your machines are in a smoking area, you may want to step up

preventative maintenance on this unit.

The ball eject solenoid was mentioned in Pat's article. Its job is to release the ball from the rack down into the player's view. When the ball is returned to the rack, the solenoid is de-energized, holding the ball chute closed.

Lastly in this figure is the ball present sensor. Basically it lets the game know if the ball is present in the rack. It will also let you know if the ball fails to dispense. Again, if you work in a smoking environment, be sure to keep this clean.



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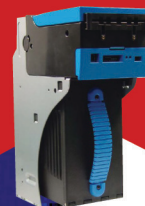
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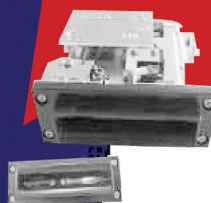
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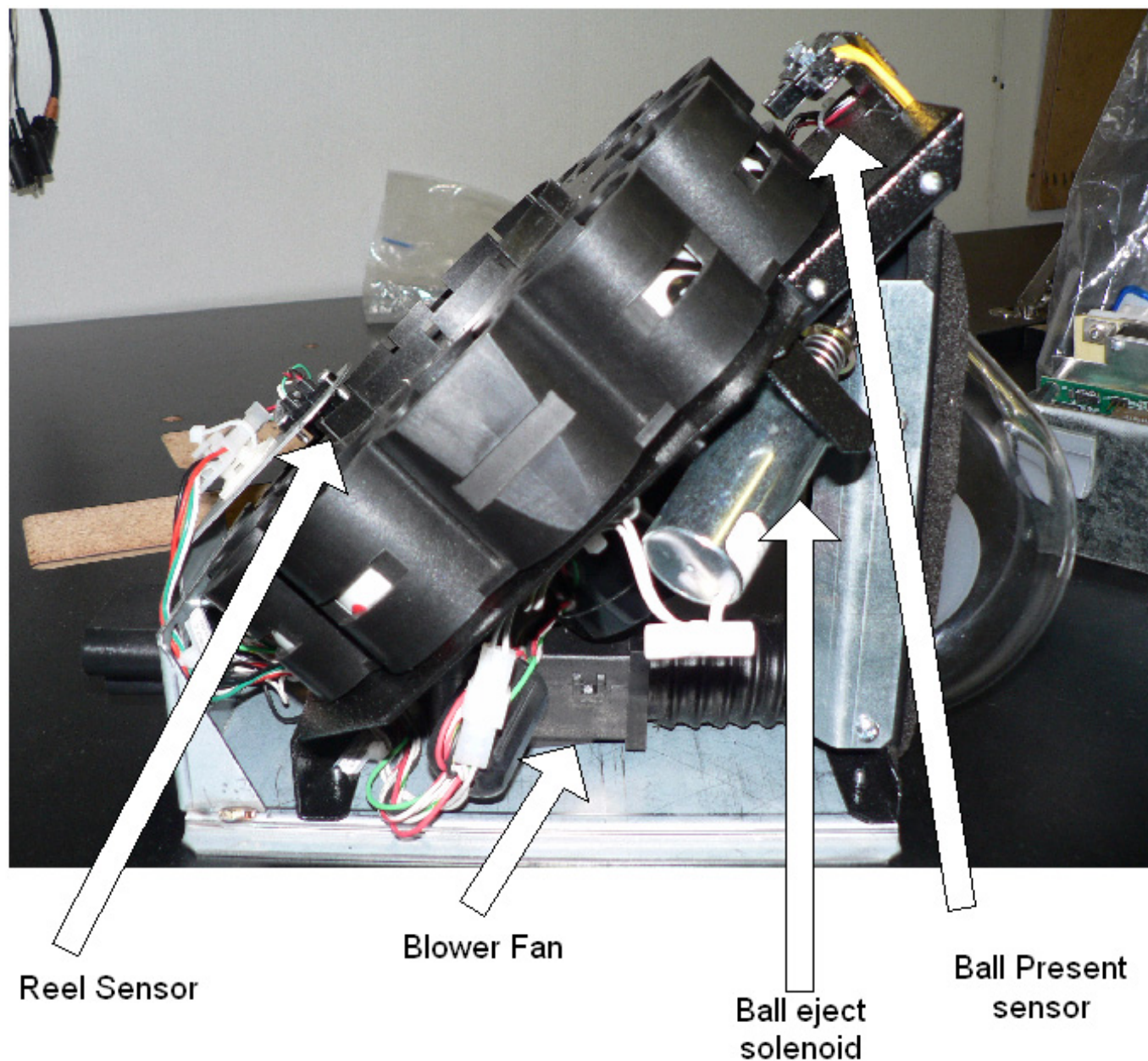


Figure five shows you the view from the front and side. You can once again see the ball present sensor. However, you can now see the slots cut in each basket that the ball present sensor looks through.

Below that you see the ball drop sensor. This is watching for the ball to pass by making sure that it has been dispensed. It also tracks whether or not the ball has been returned to its place in

the rack.

Figure six shows you the reel timing flags (slots) again, shows you the reel sensor and shows you the reel home position.

Notice that the reel timing flag for the home position is double the width of all the other slots.

Also, you will notice that the home position is incapable of housing a ball in it. This is in

case you wish to remove the balls for cleaning, this way you don't accidentally put a ball in the home position. If you look carefully, you'll see that each slot is numbered. If you're going to remove the balls for cleaning, make sure you take note of which slot each ball belongs in.

Now, I know that I said that this is run-of-the-mill IGT S2000 cabinet (which it is) but it has one difference. This software is NOT written by IGT. AC coin buys the



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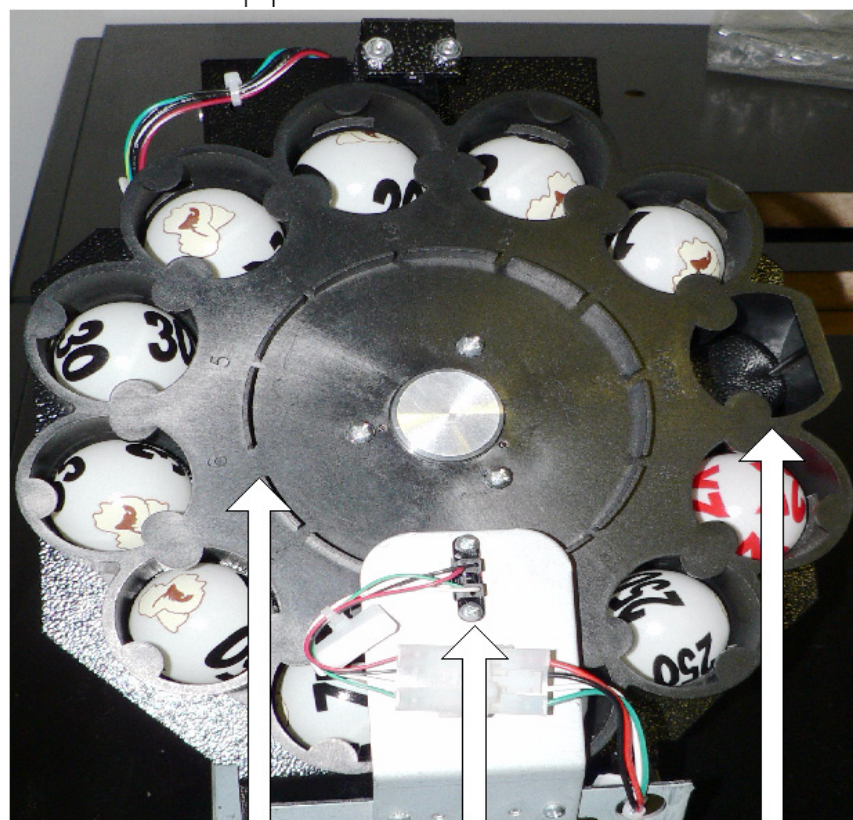
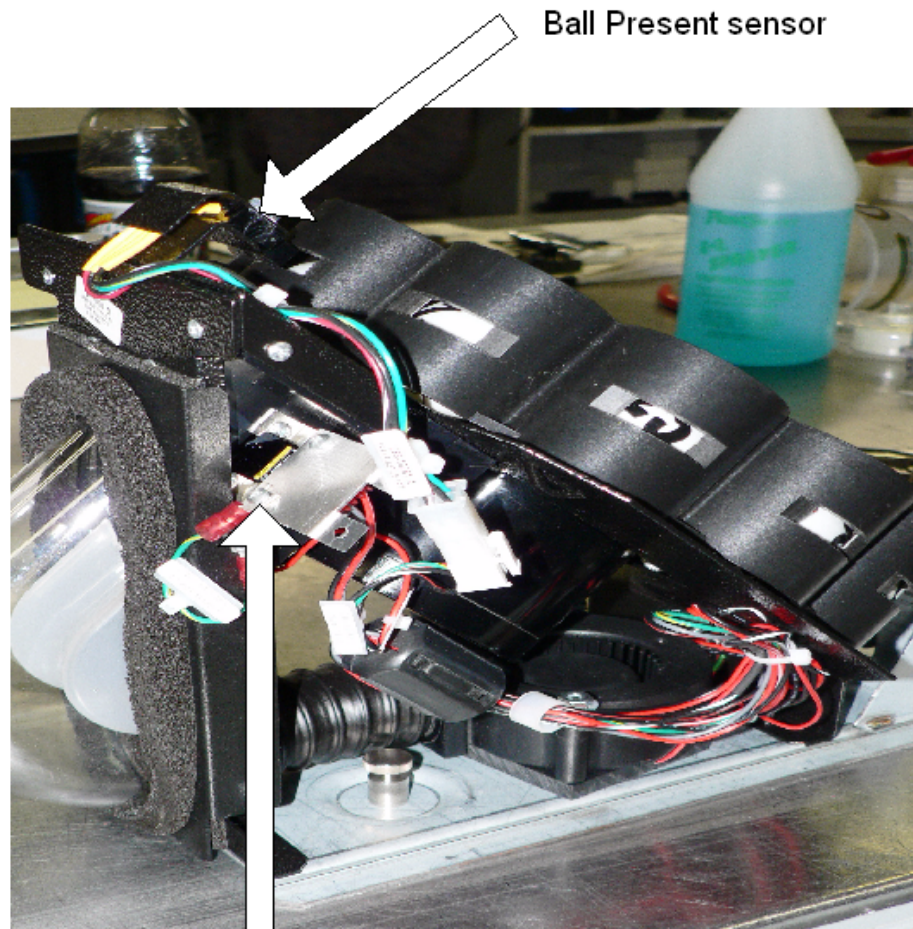


cabinets and has access to IGT's game library (as I understand it). AC Coin writes the code for the EPROMs for both the game and the top box.

Why do I mention this? I mention this because it changes one thing in game setup. I did mention earlier that the GAM2000 EPROM houses the operating percentage of the bonus feature. This percentage is hard coded into the EPROM. When you set the base game percentage, you will notice it's a heck of a lot lower than you'll be used to. When I set it up and saw a base percentage of 65% I kind of rocked back on my heels and wondered what the heck was going on. After all, my paperwork said that I was enabling a 92.50% game. I sure didn't see any 65% games. Then I remembered the salesman telling me about the bonus percentage. Out came the GLI letter, I looked at the bonus percentage numbers, added them to the base game percentage and came up with 92.50%. I guess sometimes it just helps to read things.

I've gotta run, I've got some popcorn popping! See you next time.

- Ted Befus  
tbefus@slot-techs.com







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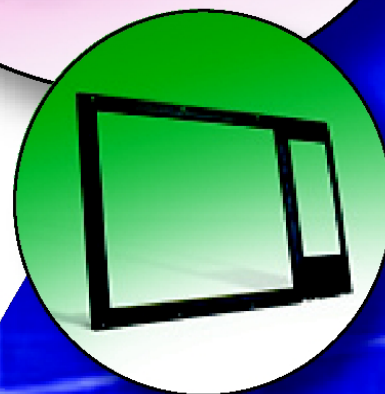
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# Quick & Simple Repairs # 30

By Pat Porath

## **R**eel tilt on a slant top Bally

How could a simple reel tilt on a newer Bally slant top be so frustrating? It seemed like I couldn't clear it to save my own life. Numerous "door resets" were done, the reels were reseated and the reel connections were checked. I have run into other occasions where on inside of the reel connector located on the reel driver board, a wire would work itself a bit loose and have to be pushed in with a small screwdriver. This wasn't the case with this game. Naturally the customer had credits on the game; the repair needed to be done as soon as possible. No luck there. We had to make a handpay.

The main processor board was removed and all of the chips were snug in place. None had what some refer to as "chip creep" (chip creep is when a chip works it way loose in a socket because of the heat and vibration of a game). With the processor

board back in, it rebooted for a third time with the same symptom, a reel tilt.

By this time, I was thinking that the stepper motor may have gone bad, so the reel was pulled again. The movement of it felt normal and the reel optic and optic encoder were in place. No matter what I tried, the reel tilt wouldn't clear. After boot up, the number one reel would not stop. During one of the boot-ups, the game went into a test code 5, which is a reel test. The weird thing is the reels worked PERFECTLY in test mode. What in the world was up with that? They must have spun at least six times without an error.

I thought to myself "A slot machine is made by man and can be conquered by man." meaning it WILL get repaired, I really had to try to think of "Bally repair tricks" to get it running again. I finally remembered the "change button reset." On a bank of Ballys (which have been converted for a while) when one would have an error that wouldn't clear or when the game wouldn't boot up, simply press and hold the "change" (or service) button

until the game boots back up. Why not try it with this Bally? I held down the "change" button during the complete boot up, and the reel tilt disappeared. Finally the game was back up, and I haven't heard of a complaint from it since.

What does the "change button reset" ACTUALLY do? Well, I was told it is a "partial RAM clear" where not the COMPLETE RAM is cleared on a game. When a complete or full RAM clear is done, the game needs to be gone though and options need to be setup. With the reel tilt problem that wouldn't clear with this particular Bally but the "change button" reset worked great. No doubt worth a try.

## **Problems With an IGT Belly Door Switch**

IGT has an improved belly door switch bracket. If there is an upright IGT S2000 that has problems with a belly door switch showing open and the bracket is the problem, you may need an improved bracket. It looks to me like it is a bracket with heavier gauge steel, which will be more durable. The IGT part number is 67340500

# SlotFest

## Featuring TechFest 16

### Las Vegas, Nevada - December 4-6 2007

### Tuscany Suites and Casino

#### This is TechFest

The TechFest is geared for working slot techs and technical managers who are looking for a way to make a dramatic improvement in their understanding of video slot monitors and more.

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MEI - Bill Validators  
Sencore - LCD Repair and Test Equipment

TechFest 16 also includes a presentation on monitor repair (CRT & LCD) presented by Slot Tech Magazine publisher Randy Fromm. Learn some very easy ways to fix monitors without wasting time and without an extensive background in electronics.

#### Who Should Attend?

TechFest is for slot techs of all skill levels, from novice techs who need the basics to advanced techs who need to brush up on monitor repair.

THE ORIGINAL "FEST" IS NOW  
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#### It's a TechFest.

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TechFest is geared toward learning the latest technical information about slot machine sub-assemblies such as monitors, bill validators, touchscreens, printers and more. You simply cannot learn more in three days.

#### It's a SlotFest.

Are you interested in slot management? Slot Tech Magazine is pleased to team up with the prestigious University of Nevada, Reno to present an outstanding opportunity for you to put your suit on and leave it on.

Unlike other seminar programs, SlotFest is not a parade of guest speakers, each trying to sell you something. SlotFest is a University program that provides attendees with a single, coherent training session over three days.

This unique course provides the management skills you need to run your slot operation more efficiently and improve your bottom line.

#### This is SlotFest

Course Title:  
Slot Management Essentials

Explore the essential tools used in managing a successful slot operation and gain an understanding of the tools and techniques that successful slot directors and managers use to analyze slot department performance.

Key topics include:

- Par Sheets/Pay Tables
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and the part description is "mount-switch, B-door." This improved bracket is for all S2000 uprights and "Reel Touch" uprights.

### **IGT That Would Not Clear "Reel Disconnected"**

Recently, we had an IGT S2000 that would not clear a "reel disconnected" error no matter what we did. Darned near everything was swapped out on it and all of the five reels were reseated. The main processor was swapped, the I/O cards were swapped, and the power supply behind the reels was swapped. Even the "deluxe motherboard" was changed out on it and still no change in the error. What was the deal with this game? The motherboard connections were checked and rechecked and nothing. When we double-checked the reels, we found it. One of the reel connectors in the game itself was crooked and had partially come out of its socket. Once the reel WAS properly connected, the "reels disconnected" error went away. When I reseated the reels they had felt normal to me and I had assumed they did have a good connection and had not looking into them further. Since it was a reel tilt, I should have looked further into the reel connections themselves, duh. It just shows that you can't win them all. After the reels were properly seated, the game came up error free and was fine.

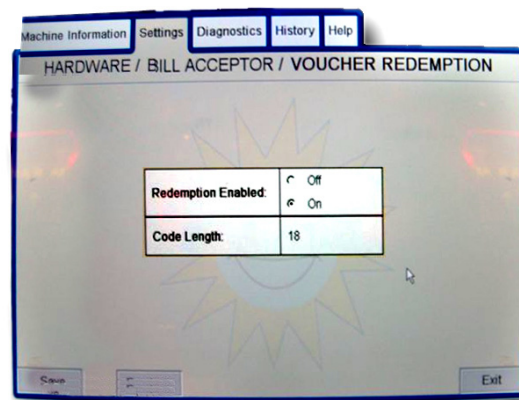
### **Atronic e-motion Not Taking Tickets**

Have you ever run across an e-motion game that wouldn't take a ticket? A tech call was made from a slot attendant that the game wouldn't take a ticket but it would take a bill on the first try (The game happened to be a "Deal or No Deal"). I thought that it was somewhat interesting, so we checked out the JCM WBA bill acceptor for any dirt and grime. It was clean. This made it even more interesting. The customer inserted the same ticket into a game a few down and it took it right away. This told me that there wasn't anything wrong with the ticket. We swapped bill acceptors with the game next door and the customer tried the ticket in the original game. It still wouldn't accept it.

At this point it looked like some type of software issue. I know we had game communication with our tracking system because of a "door open" and "door closed" showing on the system display and with the "tech card" also known as a "mechanic card" it displayed a checksum. What is a checksum? Well, it is when the Sentinel is talking to the pollers. In other words, the game is communicating with the CDS tracking system. To achieve this, in-

sert your tech card and simply press the enter button on the keypad twice. If letters and numbers appear, you have communication. If you do not, it will display "com down." So far with this "Deal or No Deal" game I know that the bill acceptor does accept bills, the game has communication with the Sentinel and the Sentinel is working properly with the rest of the system. I also know that the ticket the customer tried was indeed a valid ticket because the other game accepted it.

What's left to take a look at? The answer is game options. It didn't take very long after comparing options from the problem game to a known working game to find where the incorrect setting was. Some how, the "voucher redemption" option was turned off. This setting, "voucher redemption off" tells the game NOT to take a ticket. The option was turned ON, a ticket was tested and it worked on the first try. In conclusion, if an e-motion doesn't take a ticket, the "voucher redemption" option may be set to OFF instead of ON.





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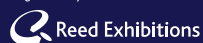
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Editor's Note: Do you have evil gnomes at your casino that run amok during the graveyard shift, changing options? In many casinos, it requires TWO slot techs to sign off on any configuration changes, one following the other after the initial changes are made.

### **WMS Mermaid's Gold Possible Credit Meter Issue**

Nothing is physically wrong with the credit meter but it may be perceived that there is after the "Treasure Chest" bonus round. The software is S849-000-1010. Directly after the bonus round is complete, the credit meter already includes the bonus won but the machine then adds the bonus credits to the credit meter a second time. Subsequently, it subtracts the credits away. So "technically" nothing is wrong, it just appears to be. This also includes the winner paid meter. The game "soft meters" increment correctly and the proper signals are sent to host systems correctly too. It is simply a temporary display problem and the final credit meter and cashout amounts are correct. WMS is in the process of having corrected software approved by GLI. More info can be found at [www.wmsgaming.com](http://www.wmsgaming.com).

If I may say so, the WMS website has come a LONG way in the past couple of years (I should say "secure website"). It seems it wasn't all that long ago there wasn't

much available. Now there is a ton of information available from the secure area of [www.wmsgaming.com](http://www.wmsgaming.com). Simply register for an account and fill in the information. It includes name, company you work for, job title, job address, etc. Not just anyone can obtain access either, because they DO check. It was funny a while back one of my bosses asked me what I was up to because a slot manufacturer called him and was asking questions about me. The company was inquiring about me to give me access to the "good stuff." WMS, along with others, has downloadable machine manuals, technical bulletins, customer notifications, sometimes an actual reason why software is revoked and a pile of other info.

### **Bally S6000 Pro Slot "Code 88"**

The vast majority of us know that on a Bally game, a code 88 isn't a good thing. Usually a full RAM clear and optioning needs to be performed. But if the "Mains" (Bally calls the game's EPROMS the Mains) are S6MxDS4C0008-00, there is an imbedded feature in the chips to simply recover from the code 88 failure. If your Mains have been upgraded within the last year, you may have this feature available and not even know it. It is simple. On the main processor, locate DIP switch #1 pack, marked on the board DS1 (near the left edge) and

find DIP switch 7. If the switch is in the ON position, turn it to the OFF position. If it is ON and the game goes into a "non-recoverable" code 88 failure, a RAM clear needs to be done. With DIP 7 in the OFF position and nothing major is wrong, the game will go into a code 99 error and is repaired by OPENING AND CLOSING THE MAIN DOOR! Wow! Which repair would you want to do, a "SafeRAM" clear procedure or a simple door reset? I'll take the door reset.

### **AC-Coin "Seaside Fries" Printer Problem That Wouldn't Clear**

With this particular game, darned near everything was changed out (some even a few times) and nothing would cure the original GEN 2 printer problem. I would say five different printers were swapped out, including one from the game next to it that had a known working printer. The main processor was changed out (probably twice) RAM was cleared on the game and the printer cable was swapped. I even tried different Netplex ports in the top part of the game. Nothing would cure it.

The Netplex was then "zeroed." The printer, the bill acceptor and the monitor were all disconnected from the system and the game was powered back up, allowing the Netplex to fail to "see" the devices. Powered the game down, reconnected the items and powered back up. This



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is where the Netplex communications are re-established. Well, that of course didn't do anything either or I probably wouldn't be writing about it.

Connections and pins were checked and rechecked. Around nine years ago, a co-worker and I worked on a brand new game that had just come off the truck with two Molex pins NOT inserted all the way in one of the connections at a power supply. I would rather not say how long it took to find that problem. With the IGT-based AC-Coin game and the printer STILL not working, what in the world was left to change out? We are only talking about a printer problem, not a main wire harness melt-

down. Finally a tech came up with the idea to change out the motherboard. Crazy as it was to me, IT WORKED. This was the first time on any IGT game that I had heard of a bad game motherboard (yes the one behind the game main processor) that caused a printer not to work. The machine's motherboard (not the printer's) was replaced, game options were checked and it printed demo tickets without a problem. I haven't heard of a printer problem with that particular game since. So if the printer doesn't work and is swapped out with a known good one and other parts have been changed with known good parts and you think to yourself "what the world is left to

change out?" there is a chance it is a bad motherboard on the game end.

- Pat Porath  
pporath@slot-techs.com

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# What Kind of Slot Machine Technician Are You?

By Kevin Noble

**Editor's Note:** *Slot Tech Magazine contributor Kevin Noble is back (Hooray!) with his research into the various definitions for the job title "slot Tech." This is a much discussed topic among slot departments and the definitions can range as broadly as what defines a good beer. They're all good definitions and their all different. This is not meant to be the definitive word on job descriptions.*

I first met Ritchie on a scouting trip for Vince Perri the once owner and operator of Amber Coast Casino in the Dominican Republic. Ritchie gave me a tour of the warehouses, the repair shop, and the showroom. That's where I had this puzzled look on my face, in shock with the fact that you can open and close the door of a slot machine without signing a M.E.A.L. book, I did not have to clear my hands when I was entering and exiting a game, and witnessed

hundreds of slot machines and Casino equipment not guarded by a Security Officer.

This routine had been etched in to my head over 12 years. There are times I catch myself clearing my hands at the checkout counter at the local grocery store. I was only exposed only to the Casino's policies and procedures for years. I was amazed by the freedom of repairing, storing, and selling games without a set of guide lines set forth by a "head office" and the regulations outlined by "the Gaming Commission". Ritchie had no restrictions on how to repair, modify, and reprogram machines, but found it impossible to obtain new parts, equipment, and manuals from the big manufacturers.

I wondered what differences there were between a gaming floor Slot Technician (like me) and the licensed distributor Technician (like Ritchie) but I could not forget about the Service Technician employed by the Gaming manufacturers who are specialists in their field. I started referencing the Casino Slot Techni-

cian on the Internet when I stumbled upon more types of Slot Technician classifications with many different duties. The different policies, procedures, and responsibilities being set by different gaming establishments and gaming commissions can make no two Casino Technicians the same. I could not find one constant job outline describing the duties but I needed to include a brief outline about the other important types of Technicians and how they contribute to the success of the casino, the manufacturer and the distributor.

### Casino Technician

In order to work in a Casino environment, you must pass a security background check, pre-employment and for-cause drug tests in some jurisdictions. You also must maintain and possess a Provincial or State Gaming License. It is very important that the Casino Technician verifies and maintains consistency in the compliance of State and Provincial laws, regulations and company in-



ternal policies and procedures.

### **Preventative Maintenance Slot Technician**

The Preventative Maintenance Technician responsibilities are to clean and perform preventative maintenance, initial installation, and relocation on all gaming equipment including signage. They are also called upon to assist with any minor tilts or jams on the gaming floor.

**Slot Utility Technician** The Slot Utility Technician is responsible for minor maintenance on the slot machines interior and visual aesthetics that include cleaning reel, glass, monitors and the exterior of any signs. They are responsible to report any machine malfunctions they encounter to the Tech shop personnel.

### **Slot Technician (Slot Tech)**

The Slot Technician or Slot tech is usually the first person responding to a call for a minor repair such as clearing coin, ticket, and bill jams and replacing burned out lamps. They are given work assignments and floor responsibilities to be completed in a timely manner to limit machine downtime and ensure quick response times to calls. They also perform all preventative maintenance functions; perform game changes, conversions,

moves, and upgrades when projects are submitted.

The Slot Tech can receive and unpack parts, order parts, take part in inventory control and help in the training of new Technicians. Interaction with other departments is promoted to solve machine problems through service reports, jackpot not reporting and coin flow analysis reports to solve any Audit problems. The Slot Tech can perform Technical Shift Jackpots inspections, are encouraged to write reports, proposals, and suggest floor improvements. Accompanying the Gaming Control Officer when they perform machine inspections, any modifications, progressive sign testing, and the sealing & unsealing of game EPROMS.

The Slot Tech also plays a vital part in the training of any new technicians entering the department. They are trained on gaming equipment, safety, policies and procedures, and the signing out of parts and labeling of bad parts.

### **Slot Technician – Lead**

The Lead Slot Technician duties consist of troubleshooting and repair of all mechanical and electrical components and the diagnoses and repairs of electronic circuit boards. They are asked to perform general and preventative maintenance, inspections, moves and installations.



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The Lead is often called upon to serve as a trainer, provide leadership, add input into departmental planning and act as a specialist in both mechanical and electronic areas. The Lead is asked to maintain an advanced skill level, develop additional knowledge when needed for new technologies for slot machines, accept assignments for complex repair work and when assigned, provides relief supervision or staff work coordination.

### **Senior Slot Technician**

The Senior Slot Technician is responsible for the coordination and supervision of all slot technicians on an assigned shift by assigning responsibilities and duties and making recommendations and suggestions to hire, transfer, suspend, promote, discharge, evaluate, assign and discipline all Slot Technicians in a fair and equitable manner. They must process the necessary paperwork for auditing and data processing purposes for the initial set-up and checkout of new slot machines and keep an accurate count of machines on the floor, matching the units licensed; maintains records of all percentage sheets as required by the Gaming Commission.

The Senior Slot Technician also has floor duties that include the repair, overhaul, and proper preventative maintenance of all slot machines to ensure optimal operation, responsible for the

break down, relocation, and re-set-up of machines to be relocated and assists in the training of new Slot Technicians.

### **Cruise Ship Slot Technician**

A Cruise ship Technician must successfully complete a police background check and a medical examination including drug screening. This classification of Technician must also have a valid passport and possess the ability to obtain a C-1/D working visa prior to being assigned to a ship. The new Cruise ship Technicians will receive detailed information regarding the requirements for Merchant Mariner Licensing. The Cruise ship Technician must resolve all technical and electrical faults found in Slot machines, cash desk apparatus and gaming table equipment. Perform general maintenance and upkeep of all Slot machines including cleaning, illumination and all working parts.

They are responsible for securing and balancing any cash floats issued, initiate and process payments of jackpots after approval and verification. They initiate and process the refilling of slot and bill exchange machines

### **Bench/Slot Technician (Robert Sult)**

The Journey begins with graduating from a recognized slot repair school. A minimum of three years slot repair experience is required

and working knowledge of all the various types of slot machines, change machines, coin wrappers, and any other equipment associated with slot repair is necessary to become a Journeyman Technician.

The Slot Bench Technician requires a minimum of 5 years of actual technical experience (slot repair experience) and a minimum of three years electronics experience. The Bench Technician is the same as the Slot Tech listed above PLUS has a deeper knowledge of electronics.

Additionally they are required to troubleshoot the bad units from the games down to a component, repair and test the units.

The Bench Technician troubleshoots and repairs all electronic related casino equipment from Slot Machines, Signs, Bill Validators, Ticket Printers, monitors, boards and all circuitry including electrical components. They must be able to order, maintain, and control inventory of components and tools and be available to assist with machine moves, conversions and installations.

### **Service Technician**

The same set of background checks, gaming licenses (Part III letter), and in some cases a drug test still apply (except in Canada) to the Service



Technician working the gaming floor. The Canadian Service Technician has to complete the OLG Contractor Safety course and stay WHIMIS certified. In our case they need a Security escort and Technician to enter the game and no keys or cards are issued. The Service Technician is the same as the Slot Tech listed above but has a deeper knowledge of the Manufacturer he/she is working for thus becoming a specialist. It will not be uncommon for the tech to remember what program or program versions go to which game and the Dip switch settings, they will know the machines inside and out.

The service Technician performs a variety of duties related to the troubleshooting, maintenance and repair of video lottery/gaming terminals down to the component level and boards under general supervision. The Service technician continually travels to client sites for installations, removals, conversions, perform preventative maintenance, prep games, set options, repair games, educate customers, provide support to clients and other technicians, and work on projects as assigned in a field environment.

The ability to obtain and keep gaming and drivers licenses with a clean driving record is vital to their job. The Service Technician drives to the location, they will be thinking about what was the reported problem, and in most cases

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will have the problem fixed in their head before they get to the parking lot.

The Service Technician must follow policies, procedures and safety guidelines set forth by the sites and Manufacturers standards. They must maintain a neat appearance; maintain personal tools for their position, properly document repair orders, preventive maintenance, machine prep, standard power analysis and the pre-site paperwork.

Working in a team oriented environment is very important with the willingness to adapt to various jurisdictions and in-house policies and procedures. The education of customers of basic game functions, continued customer service is essential to the position and most importantly to the training of Slot Technicians on new software upgrades and new products development.

### **Distributor Technician (L.A. Slots)**

There is no special licensing required to be a technician. They train their own technicians in house on the variety of machines. An electrical and/or computer background is helpful, and the ability to work with one's hands is a requirement. They have separate shipping and packing department, so generally, technicians are not responsible for this activity.

On many occasions, clients

will need repairs or technical service. Each technician is trained in-house on how to respond to clients with issues regarding their machine(s). As they offer an excellent warranty and on many occasions free telephone support, each technician is adept at diagnosing issues and providing the clients with telephonic expert advice to get the machine(s) up and running in many different languages.

Each is also adept at repairing machines, in house, if necessary. 1) Parts knowledge ability is a must for their technicians. 2) They also maintain a tremendous inventory of manuals and catalogs for slot machines and related devices, so even if the individual technician is not personally familiar with a particular machine, that technician has available to him the necessary written schematics to resolve virtually any issue.

The Distributor Technician's other responsibilities start when the machines are loaded into 53-foot trailers and transported to L.A. Slots Corporate headquarters. Each machine is off loaded individually. As the machine is off-loaded, a technician is on hand to document the serial number, model of machine, etc., and to document which parts, if any, are missing and then placed into inventory.

When an order comes in, the machines are then pulled out

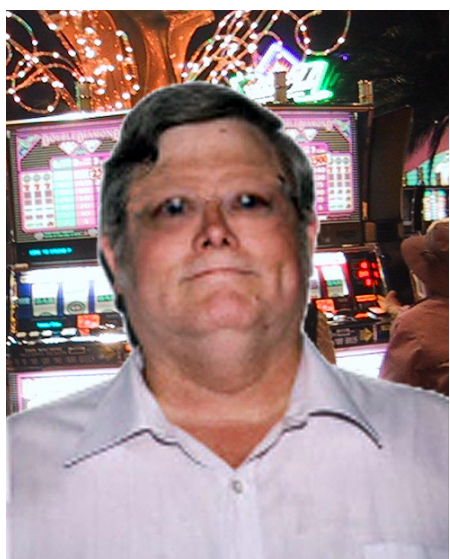
of inventory and brought to the technician's bench. The technician will read from the order form exactly what is needed for the order. The order may be for "shopped" machines, may be for "as is, complete and working" machines, may be for "as is, complete" or may be for whatever condition the machines are in. The technician will make certain that the machine meets the client's exact specification. 1) Often, due to the fact that their clients are from dozens and dozens of different countries, the client may wish to have the bill validators modified to take the currency of their chosen country. In those cases, the technician will perform the bill validator's conversion. 2) The client may wish to change the denomination, yet another task the technician performs. 3) The clients generally have specific game choices. The technicians are responsible for switching glass and EPROMs to make certain that the client gets the exact game he specifies 4) More often than not, the client has a specific percentage requirement. The technicians are responsible for this modification as well.

**- Kevin Noble**  
**knoble@slot-techs.com**

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### Flatliners

Okay it wasn't my favorite movie. I thought it had kind of a bad plot, but that's not what this article is all about anyway. In this plot, the villain is a Williams 550 game with a Wells-Gardner monitor. The game had a single clearly defined colored line

going across the middle of the screen. Talking to the tech I was training, I described what we could see as symptoms. We do have a picture on the screen it was just compressed down to one line with no vertical deflection. We had high voltage and Horizontal was working. The video beam was being pulled to the left and right. We had video. We could see colors and the screen change. We just had no Vertical Deflection pulling the beam up or down. 95% of our monitor was not suspect.

Our symptoms got us down to only a handful of components on the main board. This was good because we had no tech manual for these games or any information on the monitor.

Putting in another monitor, we pulled the known bad monitor out and took it down to the shop. Ever though we had no schematic all was not lost. Knowing our problem was vertical drive we located the vertical yoke wires and followed then down to the board connector. The wires looked okay. We removed the

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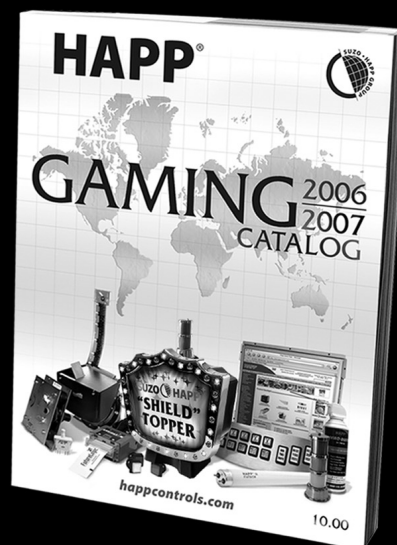


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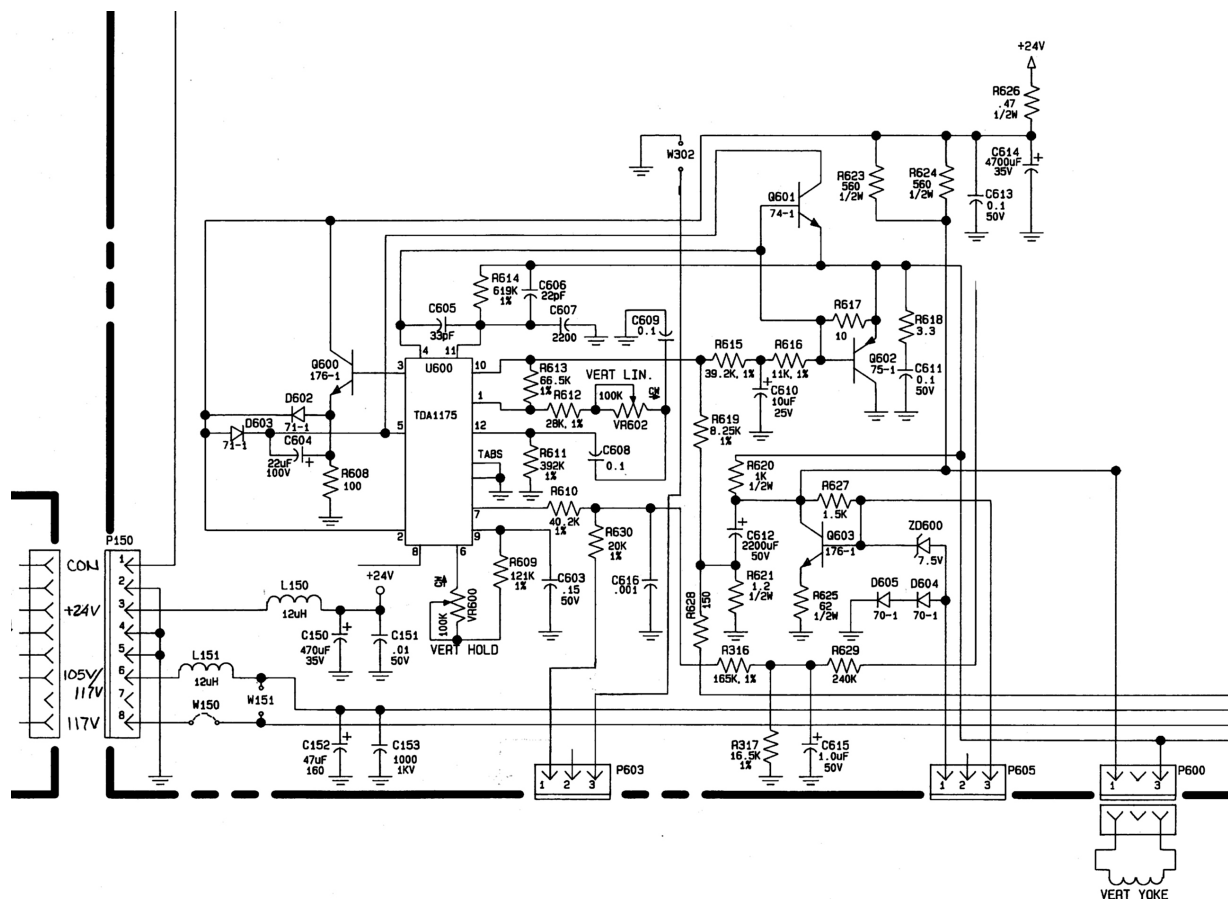
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main board from the chassis. The connector looked like it has healthy solder joints. Either of these could possibly be the problem, but not today. Following one side of the yoke connector back we traced it to a couple of transistors, Q601 and Q602. Taking out our trusty meter we set it for "Diode Check" scale and checked the transistors. Just as expected we found a very low resistance all around the transistors. Every thing we measured was either "002" or "010" with a beep. Putting the meter on the 200 ohm scale we confirmed very low resistances all around.

Pulling out Q602, we double-checked the transistor before replacing it. Oops! The transistor checked good

out of the circuit. Removing Q601 we found the same thing. Going back to the board we found we still had the low resistances on the board. Following out circuit on the board we discovered that the Emitters and Bases of Q601 and Q602 were connected together with a 10 ohm resistor between them. Okay that explains the 10 ohm resistances. We now knew that our solution lie in the direction of the final short on the bases of the transistors. Following the trace back through a winding path we followed it to a 16-pin IC with a big brass heat sink on it. The trace led back to pin 6. Sure enough pin 5 was grounded and we had a short between pins 5 and 6 on the

IC. Referencing another board we found no such short. Now normally I would just remove the IC by cutting the leads close to the body then pulling out the pins individually. This is a method that makes less stress on the board at the sacrifice of a relatively cheap IC. But the teacher in me wanted to keep the good example of a bad IC so I chose to take the IC out intact. Using solder wick coated with a little rosin core flux, I removed all the solder from the pins and the heat sink which was soldered to the board. After removing the solder I wiggled each pin to be sure they were free then removed the IC. Pointing out the heat sink compound between the





heat sink and the IC we cleaned off the IC to find a part number, TDA1175. Going to our Inventory system on the computer we found it said we had three in stock. A quick cursor move over to the Location column found it empty. We had three somewhere in the shop but didn't know where. We're still organizing our shop. A not so quick check of all the likely places I would have put an IC turned up nothing. In keeping with all true nerd tradition, after getting all my stuff together I forgot where I put it. As a last resort we decided to remove the chip from another board we had been scrapping for parts we finally got it installed in the board. We double checked the board. Cleaned it. Then triple checked everything we touched. We reinstalled the board back in the monitor. Installed the monitor back in the game and smiled with satisfaction as the screen came back to life. I love it when a plan comes together. (Okay that was another bad movie but even bad movies can have a few great lines.)

### Cheap Test Fixture

Every bench needs one of these: an isolated variable AC source. You can buy a really nice one for around \$895 or you can build a "keep it simple" version for under \$200 and a few hours of work. "Living, simplified," says Thoreau while sitting at Walden's pond. "Testing simplified," says Herschel. The basic operation is simple. First, we use an isolation transformer to get rid of the reference to ground. If you don't know why, I'll explain that in a minute. We'll also use a variable transformer that's really not a transformer. A meter is handy to monitor the output voltage, a switch will turn it on and off and a fuse will limit the current. What more do you really need?

Let me introduce you to the major players in this show. All parts are available from Jameco. The part numbers are Jameco's. p/n 18877 - An instrument case to put it all in, 10" x 7.5" x 3.1". Cost about \$10.00. p/n 316718 - AC Voltmeter, 0 to 150 V AC. Cost about \$9.00. p/n 149324 - Variable trans-

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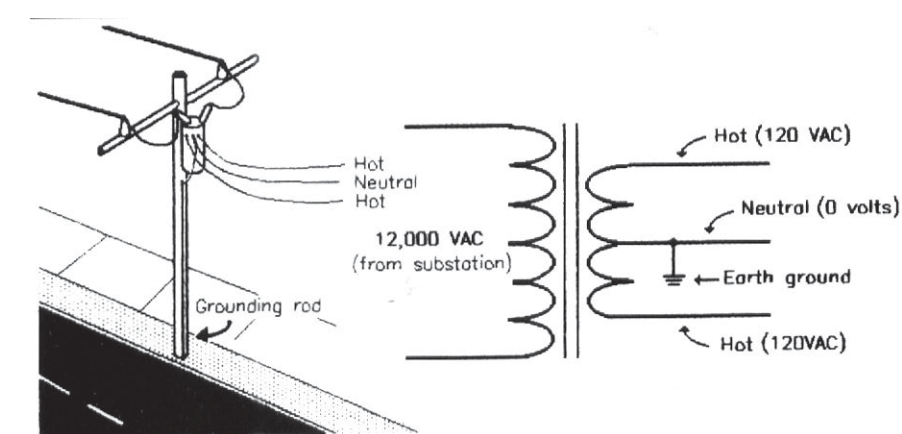
former, 120 VAC in, 0 to 130 VAC out. 2.5 A. Cost about \$55.00. p/n 14719 - AC inlet. Cost about \$0.65. p/n 181315 - Isolation transformer, 2.5 A. Cost about \$55.00. (Not the one I used.) Power switch of your choice. AC outlet of your choice. Fuse holder of your choice.

I didn't actually buy all the above stuff. Keeping with a minimum cost philosophy, we used what we had on hand when we could. The first three items are all we actually had to buy. The rest we salvaged from scrapped games and such. The isolation transformer came from a video game. The one listed matches the 2.5 Amp rating of the variable transformer but I don't think it will fit in the case mentioned. The one we actually used does fit. My build cost was actually around \$100.00 and a few hours of work.

The schematic is simplicity itself. AC power comes in to the switch. The switch feeds the isolation transformer. Coming out of the isolation transformer, we apply power to the variable transformer. Out of that we go to a fuse, then an AC Volt meter. We put them in that order so if the fuse blows we can see it on the meter. The fuse protects both transformers.

### The Circuit

The isolation transformer isolates Earth ground from our output circuit. The objective here is to remove the human



from likely connection between a high voltage and ground. Most switching power supplies for games and monitors rectify the 120 VAC coming in to generate a high DC voltage. If plugged into a live outlet, this high voltage is quite lethal if you connect yourself between the high voltage and ground. We also have a whopping 15 or 20 Amps at 120 V that can give us kilowatts of energy to make smoke and flames before blowing a fuse. The isolation transformer does not prevent you from getting shocked at all. It just limits the possibilities of the shock being lethal.

An isolation transformer uses 120 volts AC as an input and produces 120 volts AC as an output. It seems silly doesn't it? Why not connect the monitor directly to the 120 volts that comes through the line cord in the game?

To get a better understanding of isolation, we need to take a look at the way the AC power distribution system works. In a typical overhead power system, the wires carry 12,000 volts AC from the gen-

erating facility or substation. A pole mounted transformer is used to step the voltage down. The output of the transformer is a center-tapped, step-down winding that has just one turn of wire for every fifty turns of wire on the input winding. This 50:1 ratio is known as the "turns ratio" and it's the turns ratio that determines the output voltage of a transformer. In this case, the transformer on the pole receives a 12,000 volt AC input and produces a 240 volt AC output. The center-tap allows the 240 volt AC output to be split into two, 120 volt AC outputs.

The center-tap of the transformer is known as the "neutral" connection. It is electrically neutral, having neither positive nor negative voltage. The neutral connection is always at 0 volts and provides the "return-path" for the alternating current. The two outside leads are called "hot" connections. It is from the hot connections that we get our 120 or 240 volts AC.

At each pole-mounted transformer, the neutral connection is grounded. As the



name implies, "grounding" means connecting the neutral lead of the transformer to the Earth itself. This is accomplished by driving a long, metal stake into the dirt at the base of the pole. A heavy wire runs down the side of the pole, connecting the neutral to the metal stake. By grounding each transformer, a common reference point is created for balancing the entire power distribution system. This so-called "Earth ground" can also provide a measure of defense against shock in case of electrical failures.

The important thing to realize here is that the Earth ground provides almost as good a connection to the center-tap of the transformer as the metallic connection provided by the neutral wire itself. The Earth is a very good conductor of this type of alternating current. A load connected between hot and neutral will receive essentially the same voltage as a load that is connected between hot and earth ground.

### Hot Primary

Now let's take a look at the monitor and see how it fits in the picture. More specifically, let's look at the bridge rectifier in the monitor's power supply. The 120 volt AC power connects to the bridge rectifier through a fuse. The negative output of the bridge is connected to the common side of the primary power supply..

If you attempt to make any measurements on the primary side using a Earth grounded piece of test equipment such as an oscilloscope, you will ground one side of the bridge rectifier, instantly destroying the two, negative-going diodes and likely vaporizing the copper trace right off the board.

When the Earth ground is connected to the common ground on the primary side of the power supply, it short circuits one of the negative diodes in the bridge rectifier. This causes a massive amount of current to flow through the other negative diode, causing it to fail. It's normal to find one or both of

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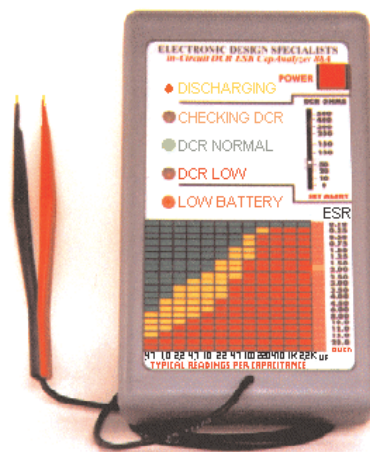
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the negative diodes shorted in a situation like this. As a matter of fact, it's just about the only thing that causes these diodes to fail. Most of the time, it's the positive diodes that fail.

### Isolation

We get around all of these problems by using an isolation transformer. An isolation transformer has a 1:1 turns ratio, producing an output voltage that matches the input voltage. We get 120 volts AC from the output of the transformer but lose the ground. In other words, there is no longer a neutral side that is connected to the Earth. The transformer has a 120 volt AC output that is "isolated" from any connection or reference to the Earth. With the neutral/Earth ground connection broken, the common primary ground

can be safely grounded to the oscilloscope without shorting the diodes in the monitor's power supply. Isolation from a ground referenced source of power also reduces the chance of shock.

### VARIAC

The variable AC voltage lets us creep up the voltage on those assemblies that draw excessive current due to a malfunction. This problem can show itself even at a low voltage. If we only put 10 Volts or so in we can troubleshoot the problem more easily and safely. This also lets us run the power supply under marginal line voltage to see if it works okay. We can see if it responds properly to a low line voltage. We can see what it does when line voltage surges.

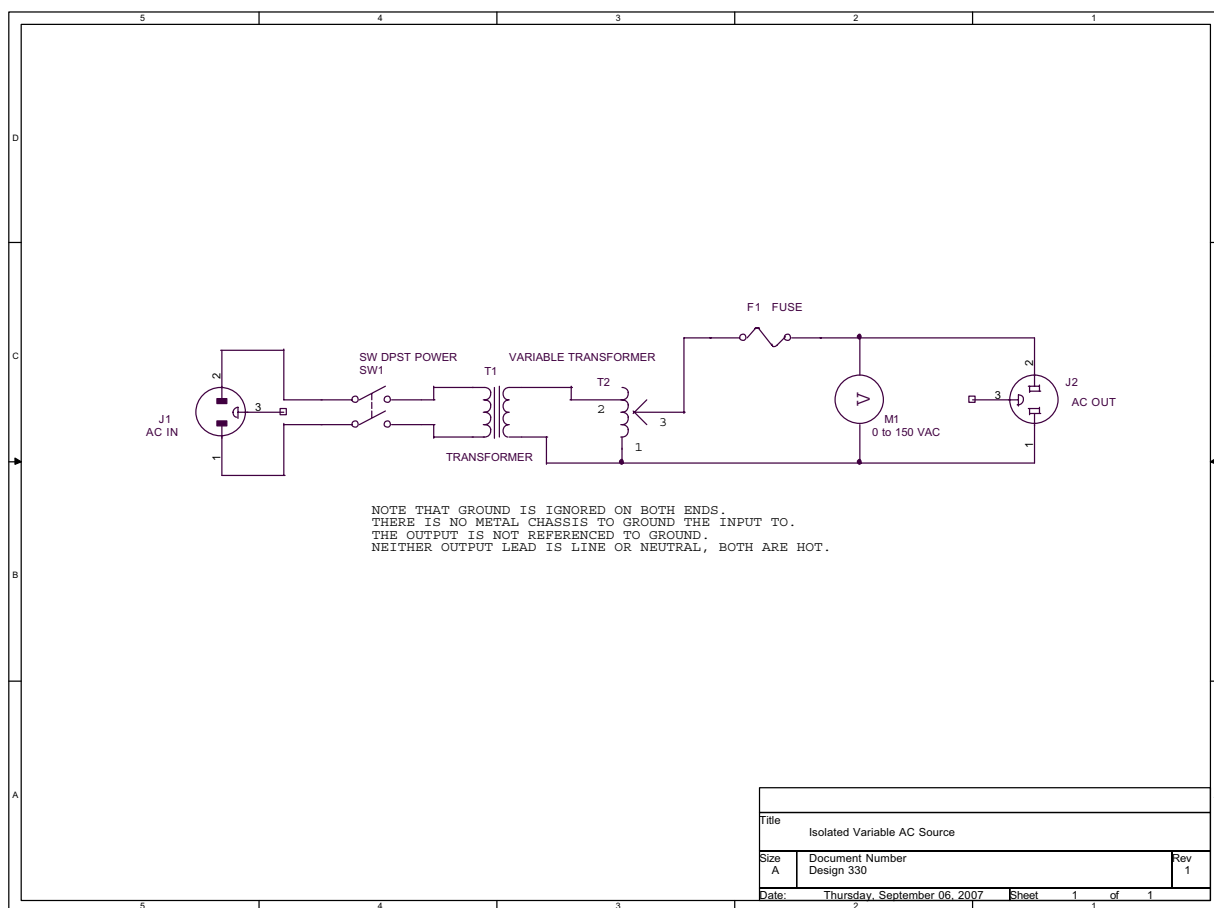
Note: The variable trans-

former (VARIAC) is not really a transformer with a primary and secondary. It is a single winding with a slider on it to tap for the output. These typically take a 120 V AC input and allow for a 0 to 130 Volt output. Due to the isolation transformer I used, I actually get up to 150 V AC out of mine under no-load conditions. Like all transformers, the voltage we get out depends on how much we load it down, so a dial with set numbers isn't much good but for a general idea of what the output should be. Absolutely use an AC voltmeter (and maybe a better one than I used).

By using a fuse we can set the current limit to just above what we expect the current should be so our fuse blows at the first sign of trouble.



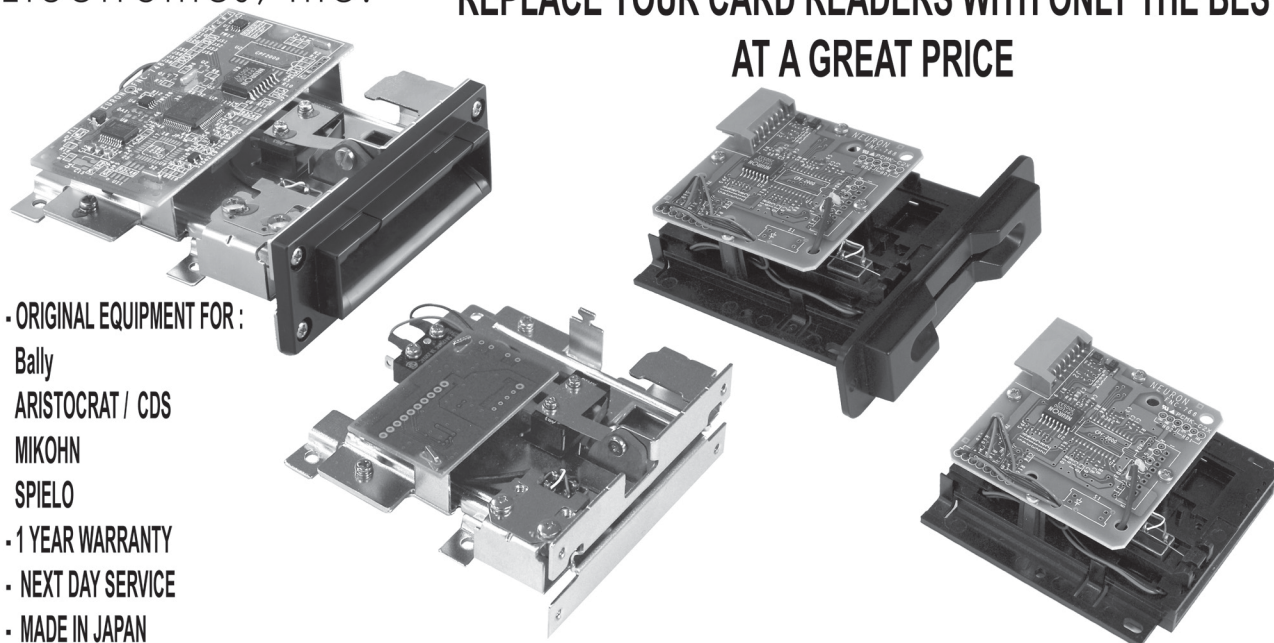




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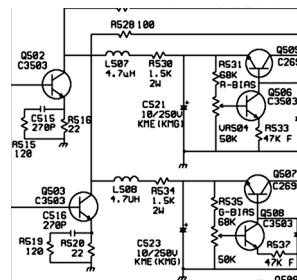
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

## ELECTRONIC COMPONENTS

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

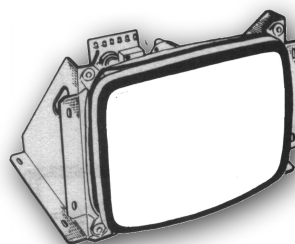
## SCHEMATIC DIAGRAMS

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



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## After Thoughts

The variable transformer comes with a dial that is measured 0 to 13, implying 0 Volts to 130 Volts I suppose. No good to me. I get up to 150 Volts out. The meter goes from 0 to 150 Volts, which would seem to be ideal. But if I put an AC Volt meter on the output I get an actual 150 Volts out with no load while the panel meter only indicates about 130 Volts. The meter has a zeroing adjustment but no full scale adjustment. I could have spent a few more bucks and got a better meter. But as long as I'm aware of the problem I can make allowances for the readings not being what the dial or panel meter say. I might also consider adding an AC Amps panel meter. A bigger case might be a good idea also. The one listed is kind of tight in a few places, giving me bad heat dissipation in a plastic case.

The 300ish Watt limitation fits well with most game power supplies and CRT or LCD monitors. It should be able to power most monitors up to 19" and most game power supplies even under full load conditions but it would not likely power a full game.

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

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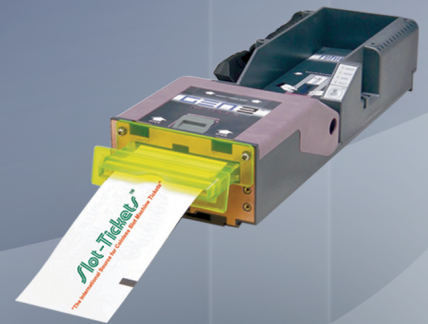
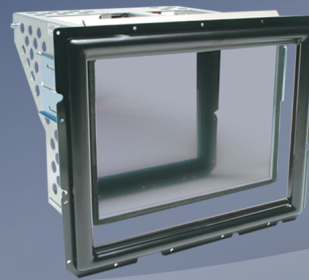
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