

# SLOT TECH MAGAZINE

Slot Machine Technology for the International Gaming Industry

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PCB Bottom  
Pre-Heating  
for SMD  
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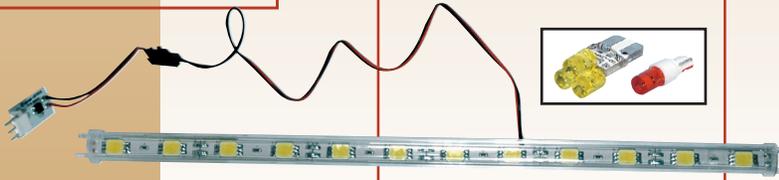


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June 2007

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Peace

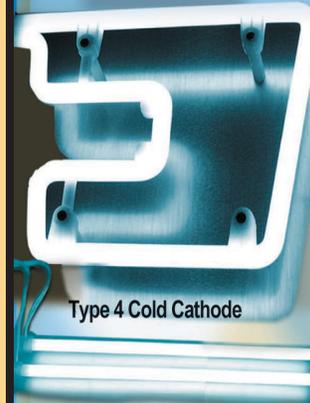
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Last month's TechFest (held May 1-3 at Mystic Lake Casino in Prior Lake, Minnesota) was the usual mix of technical presentations and food. Of course, I gave my presentation on CRT monitor repair (not too much longer, I suspect) and once again, we saw outstanding presentations from the gaming industry's top technical trainers and engineers.

Fueled by a four-pak of Red Bull, my buddy Dave Oldham (AESI) gave us a dynamic presentation on the MEI CashFlow SC66 bill validator, followed by an equally dynamic look at FutureLogic printers. Dave gave a very complete presentation on both products, including a step-by-step guide on how to use both diagnostic and configuration software.

The following day, Paul Hatin of 3M

Touch Systems stopped by to talk about touchscreen technology and to show us his newly updated presentation on touchscreen construction, operation and troubleshooting. A copy is available from the technical server at slot-tech.com in the "interesting stuff" sub-dir.

Paul also brought with him black, Slot Tech T-Shirts, cans of special touchscreen aerosol cleaner (branded "TechFest 15." Cool) little Post-it Note holders and really powerful, magnetic chip-clips for everyone at TechFest. Paul also brought with him ONE SPECIAL DOOR PRIZE: A really nice, 17" touchscreen monitor for a PC. One lucky person went home with it following a random draw. You'll have to read inside to find out who won.

Transact Technologies' Russ Wigé's handout was a bit more prosaic perhaps but no less well received: Top of form reset chips for the Ithaca 850 printers. Hooray! If you need one, you can contact Russ at their Las Vegas office.

The final day brought Ceronix's ace bench technician Troy Nofziger. Troy commenced a rapid-fire three hours of no-nonsense procedures for ferreting out failures in Ceronix monitors. This guy really knows his stuff and he was able to show us a tremendous amount of stuff in just a short time. It's a good thing that he also handed out a very detailed, step-by-step troubleshooting guide as well because it would be impossible to take notes as fast as this stuff was coming at us. Troy's handout is also available on the Slot Technical Server at slot-tech.com in the ceronix sub-dir.

Wrapping things up was Sencore's Don Multerer. Don's four hour afternoon presentation on test equipment and LCD repair was really heroic. He crammed more LCD repair information in an afternoon than I thought was even remotely possible. Really



good stuff. Sencore also awarded three digital multimeters worth a couple of bills each so that was really cool.

While all of this was going on, Slot Machine University's Cris Challander and Technical Trainer Ron Parido were conducting an alternative training session in another meeting room nearby. SMU is a really remarkable, online training program that is available right now for your casino. We covered it a bit in a previous Slot Tech Magazine. This was a chance for participants to try it for themselves and see how they like it. Did they like it? They DID! Everyone thought it was really a fun way to learn otherwise mundane things like jumper settings and configuration issues.

It pays to come to TechFest in so many ways. Thank you to my hosts at Mystic Lake Casino.

TechFest 16 will be in New Mexico in October.

See you at the Casino.

Randy Fromm

## Randy Fromm's Slot Tech Magazine

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Slot Tech Magazine is published monthly by Slot Tech Magazine 1944 Falmouth Dr. El Cajon, CA 92020-2827 tel.619.593.6131 fax.619.593.6132 e-mail editor@slot-techs.com Visit the website at slot-techs.com

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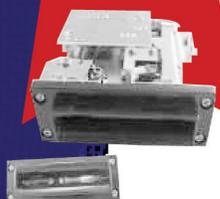
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# Acres Bonus Engine II Board

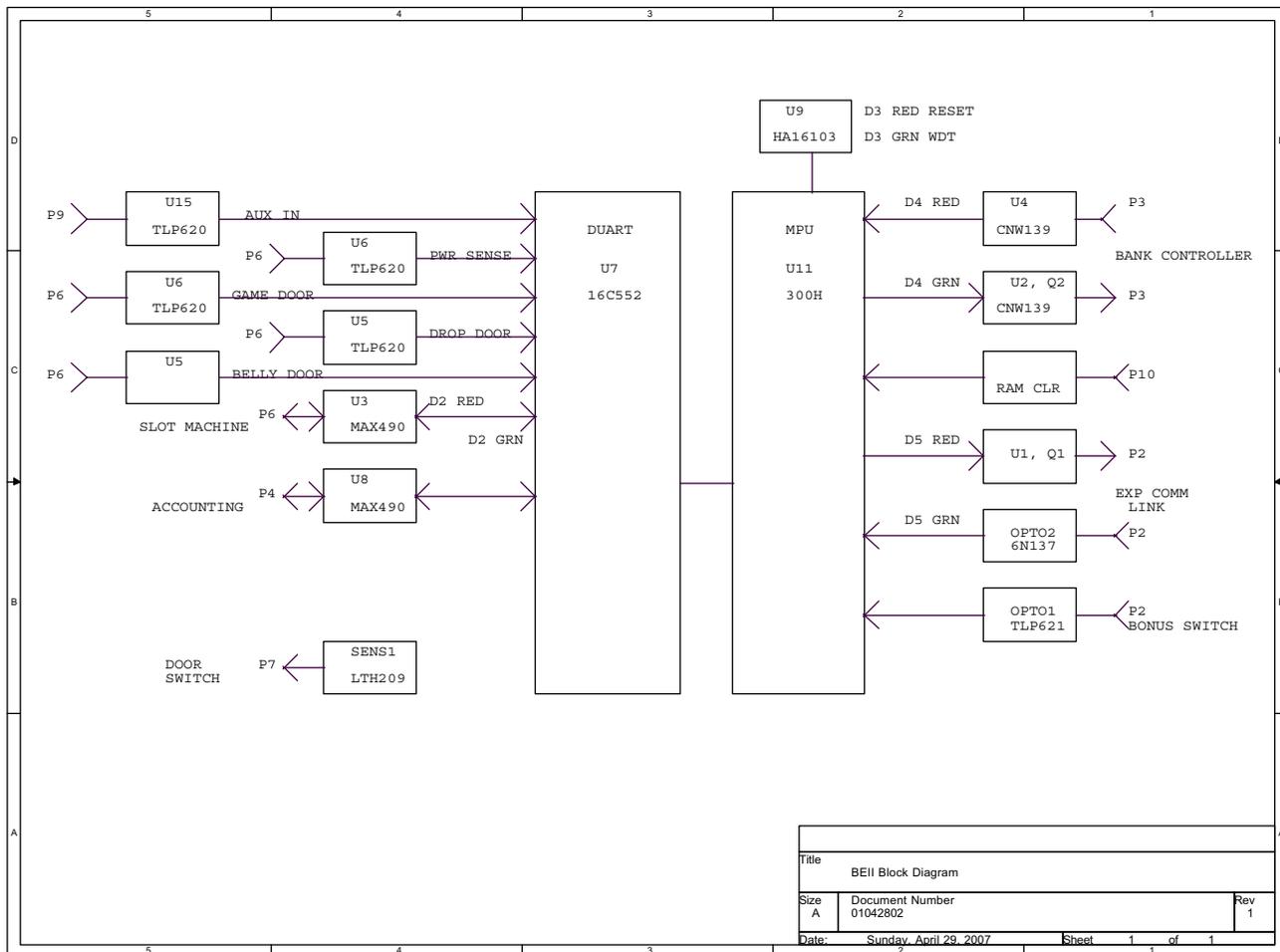
By Herschel Peeler

Bench Tech forums concerning testing and repairing this stuff. I recently had a request for a design for an OL line cable tester. I thought everybody had one of these already. I guess not. So here is a design for such a tester and... well, read on for more.

called the OL Line connects to the Bank Controller. Multiple games (multiple BEIIs) can be connected together in parallel along the OL Line. Usually, a bank of games connects together and a Home Run Cable connects the OL Line to the Bank Controller. The Bank Controller has two channels. Somewhere in the bowels of your casino is a room filled with Bank Controllers. The Bank Controllers connect to digital switches (multiplexers). The

Testing the Acres Bonusing System BEII (BE2) board seems to be a popular topic. I still get an occasional e-mail or see a topic on the Slot Tech or

The BEII usually resides in the game and connects the game to the Bank Controller. It connects to a serial port of the game and game door switches. A four-wire cable



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switches connect to a computer (a server). This server has various other computer terminals connected to it. Managers, bean counters, or other important people can sit at one of these terminals and tell what is going on at any game at any time. The Bank Controller collects data from the banks of games. The server collects data from the bank controllers and organizes it for the users. Each bank controller has a dongle on it that gives the bank controller a unique address. Any game in the system has a unique address assigned to it in much the same fashion as a URL on the internet. Acres has a TCP/IP structure just like the internet. Each game has a unique

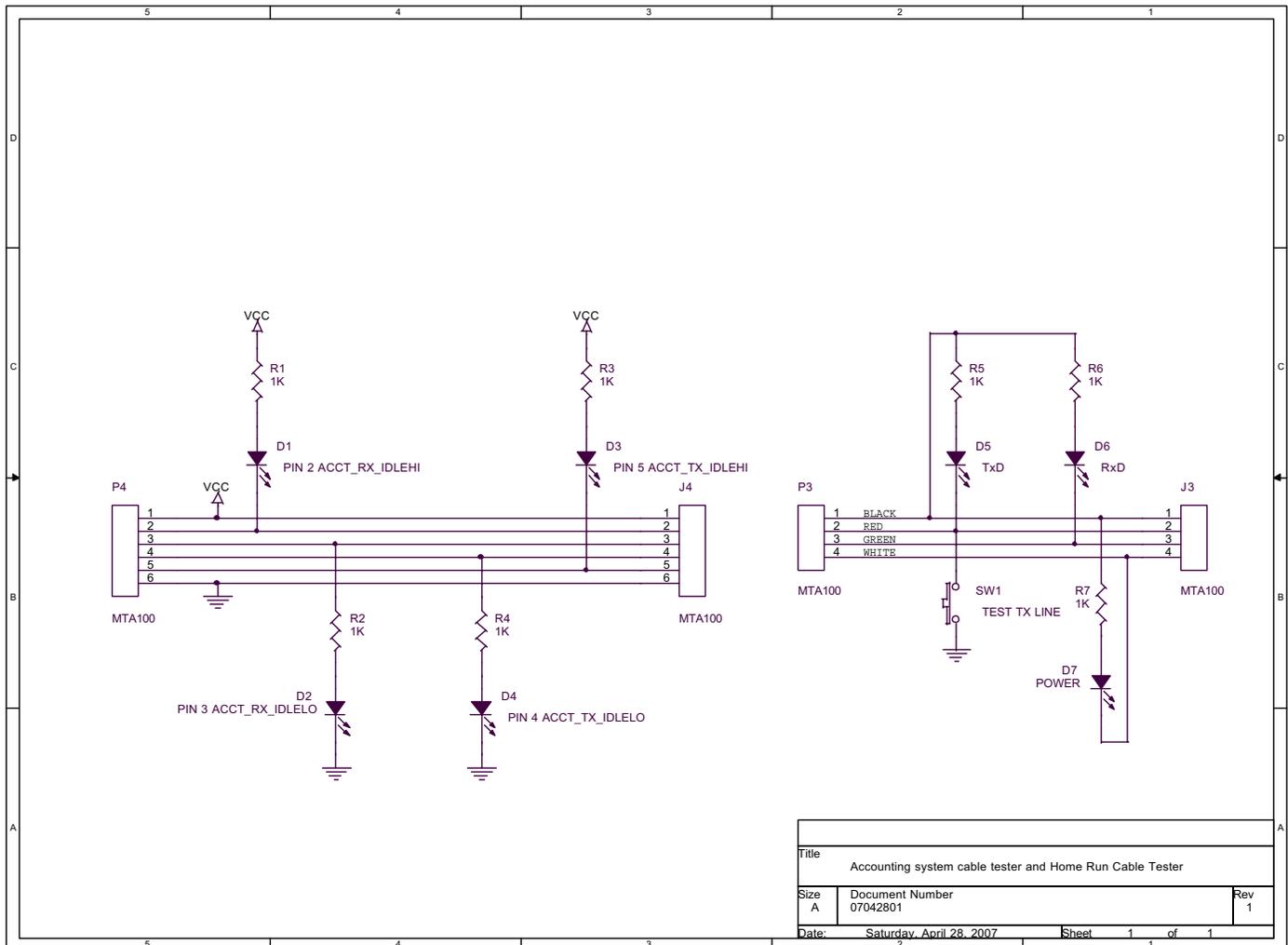
###.###.###.### number structure just the same as your computer has on the Internet. This number, I suppose, breaks down to a game being number such-and-such on server yada-yada.

In a simpler system, the accounting system would connect to the game through a serial port. The BEII is positioned in between the game and the system. It takes info from the game, adds stuff to it and passes the data on to the system. Between the system (Bank Controller) and the Game, received data flows from the Bank Controller to the BEII and from the BEII to the Game. Transmitted Data flows from the Game to the BEII and from the BEII

to the Bank Controller.

Received data flows into the BEII on P6 as a differential signal (RS485). This feeds U3 and gets passed on to the DUART, U7. From here the Microprocessor reads the data from the DUART. The magic of the microprocessor (HD6413003TF) we will simplify by just saying that the data is passed through the MPU and stored in RAM.

The MPU collects other data through the DUART, U7 (16C552), from the game switch interface and the Accounting system (if connected). All this data is put together in an organized form in RAM and sent out another serial port built into the Microprocessor on Port 9. This





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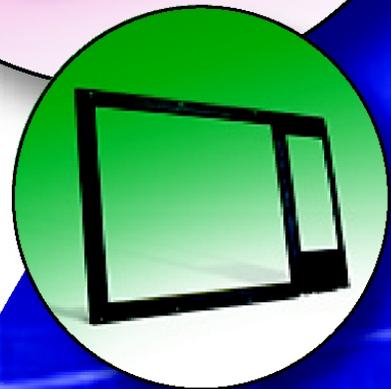
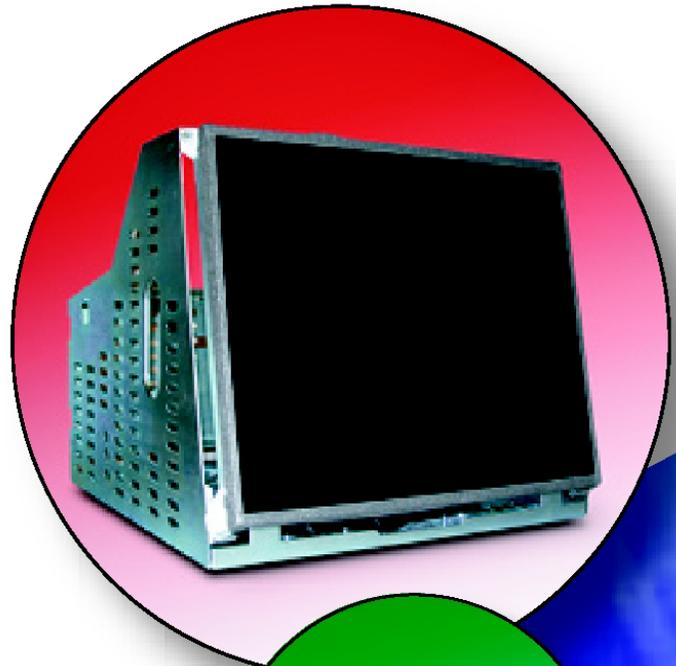
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For further information regarding Ceronix's products or services, please contact Sandi Viscuso at (530) 886-6404 – sandi@ceronix.com or check the website at: [www.ceronix.com](http://www.ceronix.com).



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data is sent out through U2, Q2, and to Plug P3. This feeds the OL line and gets passed on to the Bank Controller.

Data coming in from the Bank Controller follows the opposite path, P3 through U4 to the microprocessor Port 9 and to RAM, then out of RAM to the DUART, U3, and out J6 to the game. See the block diagram to follow this.

On another accompanying page is a design for two cable testers, one for the OL Line with three LEDs and another for the Accounting System cable with four LEDs. Data going in or out of the BEII on a serial port has one of these two structures. The OL Line is a four wire cable with (typically) Black (pin 1), Red (pin 2), Green (pin 3) and White (pin 4) wires. The Black wire is Power, supplied from the game interface. The White wire is ground. The Red wire is Receive Data and forms a current loop with pin 4. The green wire, Pin 3, is Transmit Data and forms a current loop with pin 1.

The tester has two LEDs that monitor the active data lines on pins 2 and 3. Also included on this version is a test switch to make the TxD line go low. The Red LED (D4) on the BEII should light when the test button is pressed.

The tester is intended to connect into the OL line at any point. Connector adapters may have to be made to fit your system. The TxD and RxD LEDs should light as the system operates. The third

LED indicates power on the line and should be on all the time the system is active. The third LED connects across power on the OL Line. This tests continuity of all the lines. The Power LED not lighting indicates the white line is open. No LEDs lighting indicates the black line may be open. The TxD or RxD line not lighting indicates a problem with the red or green line individually.

The four LED tester is intended to test the Accounting System interface. Since this is a Differential Interface, each signal has two lines associated with it. We have two LEDs for each line. There is a High side of the line and a Low side of the line. If pin 1 (Power) is open D1 and D3 will not light. If pin 6 (Ground) is open D2 and D4 will not light. Otherwise, any one LED not lighting indicates a problem on that line. D1 and D2 lighting indicates an active signal on the Receive Line. D3 and D4 lighting indicates an active signal on the Transmit Line.

### BEII Troubleshooting

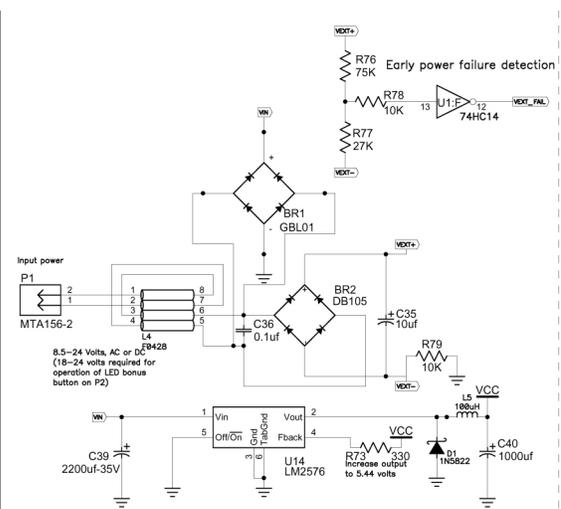
Most failures on the BEII occur in the interface circuits so we will spend a bit of time discussing these circuits and the power supply section. There is not much else to the board other than the microprocessor and these circuits

we will discuss.

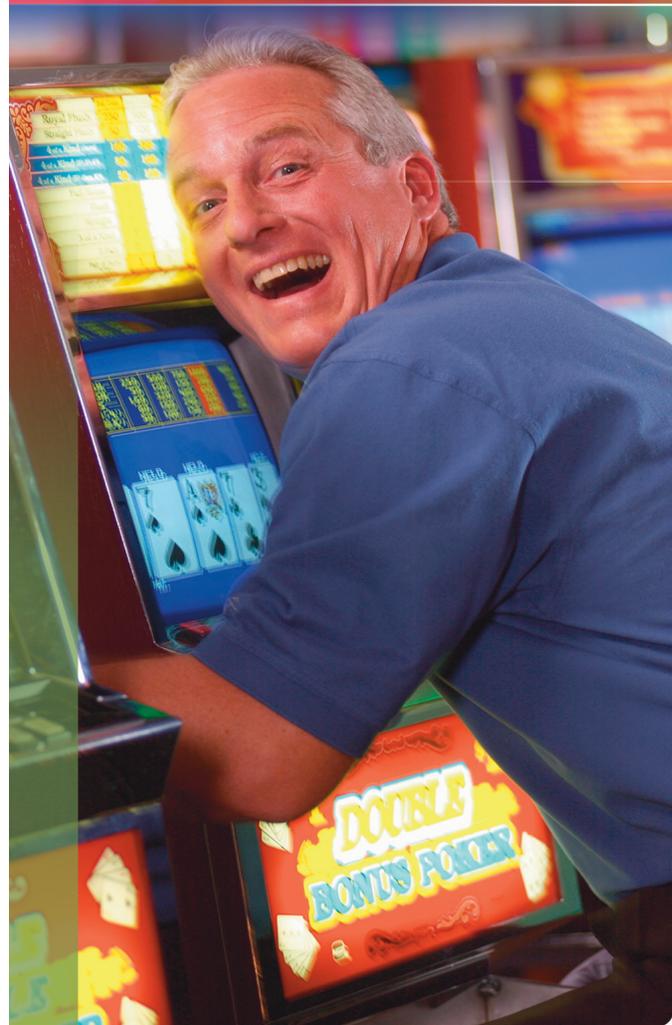
### Power Section

Power comes into the board on P1 as 18 to 24 Volts, AC or DC. As DC it can be connected either way. There are two bridge rectifiers on the power input line. BR1 creates VIN that powers most of the circuits on the board. BR2 creates VEXT+ and VEXT- to power a few miscellaneous circuits. We will cover those when we get to them. BR1 should output about 24 V DC. This is applied to pin 1 of U14 (LM2576) that generates the VCC (+5 Volts) to power most of the logic on the board. Pin 2 should have about 5 Volts to 5.5 Volts on it with no ripple. This 5 Volts can be found across D1 (1N5822). If the board is completely brain, dead check +5 Volts and D1 especially.

Q3 is the power switch to turn power to the microprocessor on and off during Standby mode. When not in Standby, you should have 5 Volts on the Emitter and Collector of Q3.



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## Link Interface, P3

The OL Line connects to P3. This is the four-wire line from the game to the Bank Controller. Data not leaving the BEII is likely to be Q2 or U2. Data not coming into the BEII may be a problem with U4. LED D4 indicates data going in and out of this port. This is a dual element LED. It has a red LED and a green LED in it. The red LED indicates data coming into the BEII on the red wire. The green LED indicates data leaving the BEII out the green wire.

## Expansion Communication Link, P2

Structured much like the circuitry on P3 we have another similar interface. Activity through P2 is shown on LED D5 in much the same way: Red for activity on the red wire going out of the BEII from the line. Problems in this area may be Opto2.

Also on P2 we have three wires of interest. The blue wire on pin 1 is where the Bonus Switch connects. Pin 2 (Brown, VEXT-) and pin 3 (orange, VEXT+) are power for this switch circuit. Malfunctions in this area may be Opto1.

## Door Switches

Drop Door Switch - U5 pins 1, 2, 7 and 8.  
 Belly Door Switch - U5 pins 3, 4, 5 and 6.  
 Game Door Switch - U6 pins

1, 2, 7 and 8.

Machine Power monitor - U6 pins 3, 4, 5, and 6.

AUX1 line - U15 pins 1, 2, 7 and 8.

AUX2 line - U15 pins 3, 4, 5 and 6.

P4, Accounting System Problems on this line are likely to be U8, MAX490ECPA.

## P7, Mechanical Door Switch Enable

P7 is a two-pin connector that has a ground and an active low output signal that goes out to the mechanical door switch (an option). If VCC on the BEII is lost, this signal goes high and registers a Door Open to the game. Problems in this area are likely to be VCC related or the

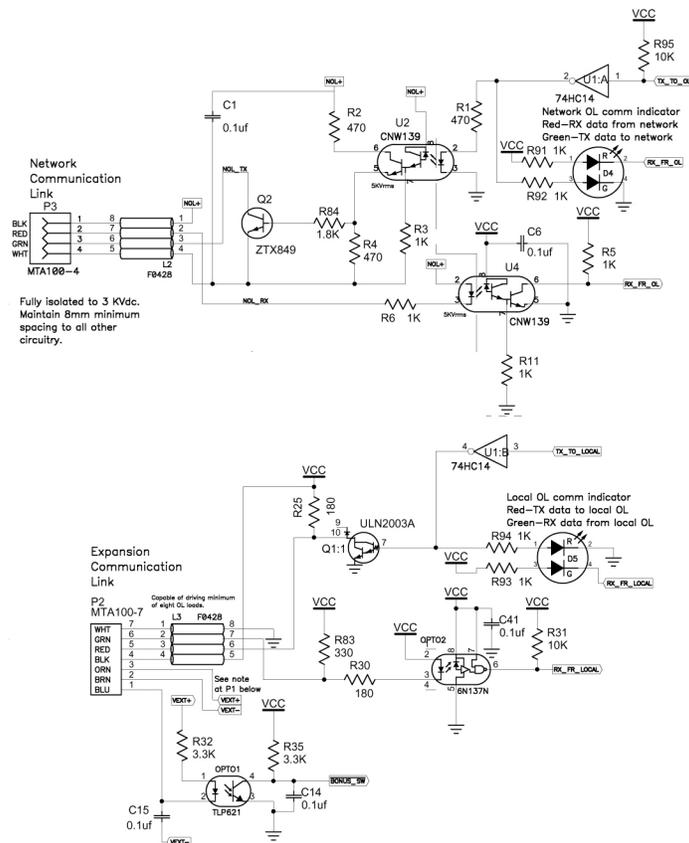
optoisolator SENS1. This output is hard wired and does not come from other circuits. It runs as long as the board is powered up, Standby or not.

## P5, General Purpose Outputs

P5 is a 6-pin connector with four open collector outputs (OUT\_0, OUT\_1, OUT\_2 and OUT\_3). Problems in this area are likely to be Q1, a ULN2003 seven section Darlington. The other three sections are associated with P2, pin 3; and Q3, Standby. The seventh section is not used.

## U9, HA16103FPJ, System Reset.

This chip generates a Reset



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signal to the microprocessor, Standby signal for Q1 and Q3, Power Failure Warning to the microprocessor. This chip also has the Watchdog Timer. PRUN is a signal from the microprocessor that clears the WDT and should be about 40 Hz.

The circuits around U9 monitor the power systems on the board. It should signal register VCC as bad if VCC drops below 4.7, or Standby (VBB) drops below 4.5 Volts.

D3 is another dual element LED. It turns Red during Reset and Green during PRUN being inactive (on means WDT is active?).

## P10, RAM CLEAR

To do a RAM Clear on the BEII, you short pins 1 and 2 of P10. This is a software reset signal. It does not pull on the Reset line of the BEII directly. It is a software readable input (Port B, bit 5). In order to do this RAM Clear, the processor has to be alive and running. I think it only

reads this line on Power Up but don't quote me on that. If you have an alternate story I would like to hear it and I will print a correction promptly.

## P6

P6 is the big connector that connects to the game circuits. Here is where the door switches come into the BEII, Game RS485 serial port, the DS2224 game UID chip in the harness and Configuration bits.

The DS2224 is the Unique ID (UID) chip that is built into the harness of the game and gives this BEII a unique identification number in the system.

The interface to the serial port on the slot machine is a Differential signal that goes through U3, MAX490ECPA and is monitored by yet another dual element LED, D2. The red LED indicates activity on the Transmit side (BEII to game). The green LED indicates activity on the Receive side (Game to BEII).

## U7, DUART

U7 is a dual UART. Channel 0 is a serial interface to the slot machine, through U3. Channel 1 is a serial interface to the Accounting System, if it is used, through U8. Also included here is a Debug Port (P8) used by the manufacturer. We can't do much with this to my knowledge. I confess I've never tried.

Problems in U7 can have many indications. The handshaking lines of the serial ports are used for many signals. Configuration bits, Door Switches and a few other things go through U7.

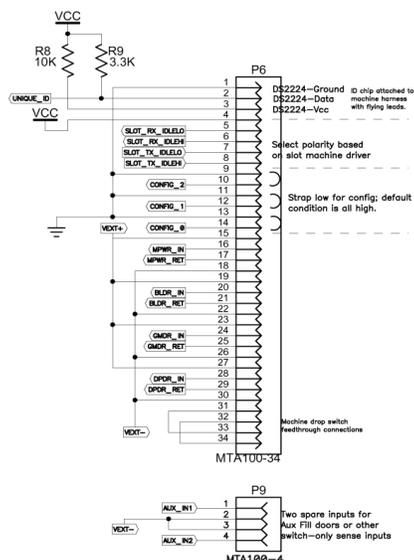
## U1, 74HC14

U1 has six sections that all do different things. This is a simple Inverter. Each section should have a Low out for a High in, or a High out for a Low in.

Section 1 (pin 1 input; pin 2 output). P3 Link data output. A high output turns LED D4 red. Section 2 (pin 3 input; pin 4 output). P2 Expansion Port Data Out. A High out turns LED D5 red. Section 3 (pin 5 input; pin 6 output). Pin 5 should always be Low. Pin 6 should always be High. This section can be used as a confidence check for U1. If these voltages are wrong U1 is certainly bad (assuming power is okay). Section 4 (pin 9 input; pin 8 output). Accounting System Interrupt Request. From U7. Section 5 (pin 11 input; pin 10 output). Slot machine Interface Interrupt Request. From U7. Section 6 (pin 13 input; pin 12 output). VEXT monitor line. Pin 13 should always be High. Pin 12 should always be Low. If not check Bridge Rectifier BR2.

## U11, the microprocessor

The overall operation of the BEII is simple. It gathers data from serial ports, door switches and such, and or-



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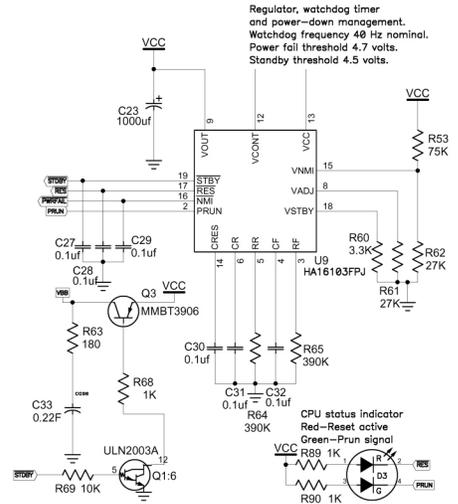
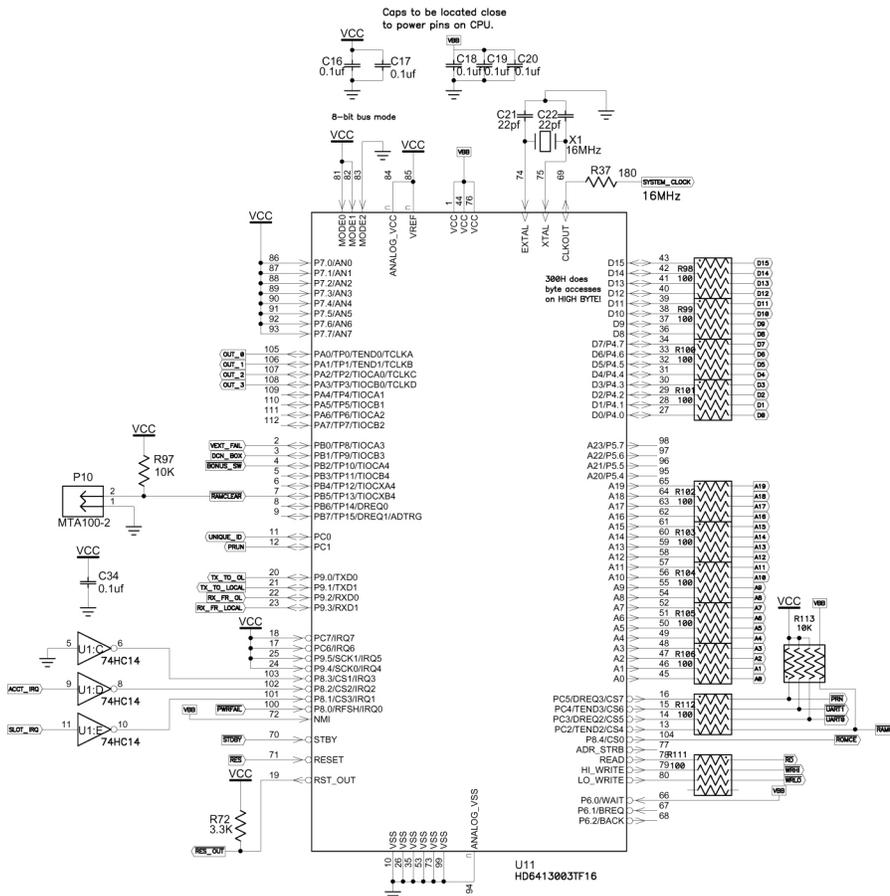
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ganizes the data to send it out to the Acres Player Tracking system through the OL line. Operations are controlled by routines written into the EPROM (U10).

Troubleshooting is limited to general approach troubleshooting of microprocessors. Is it a power problem? Check this for +5 Volts at the Collector of Q3. Is the oscillator running? Check this at R37. You should find a 16 MHz System Clock. Is it being held in Reset? Is LED D3 red? Force a REST condition by faking a NMI (Non-Maskable Interrupt). You can do this by pulling the NMI line low (short across R62, the 27K). This will put U9 into a Reset condition. The Standby, Reset and NMI outputs should

go Low and the show should come to a stop with all Address and Data lines tri-stated. You can now check for improper voltages on all these pins. Check to see if anything is getting warm. After removing the short across R62, the board should try to come alive. Address and Data lines should show activity. The BEII should attempt communication on all the ports.

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Create trouble-shooting routines in EPROM that are specific in operation. Do a Loop Back test on one comm. channel. Do a RAM test. Create an EPROM with an endless routine of No Op instruc-

For schematics, software, service manuals and many other things (not all of which begin with the letter S) visit the Slot Tech Magazine ftp server.

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## Acres Tips and Tricks

By Ryan Young

**I**GT's Advantage system is a great tool for the casino industry. Not only is it a reliable slot accounting system, but it can also be a great marketing tool. The NexGen display is relatively advanced compared to the older VFD systems, and brings a great deal of possibilities to the casino floor.

The best way to help understand ABS better is to know what each of the components does. The following is written in regards to ABS on a bank controller setup, without the Magic Card system.

The BEII (Bonus Engine 2) board is the primary communications piece linking the machine to the server, as well as to the NexGen (or VFD). The NexGen is what stores all the cool promotional messages that the customer sees. The problem is that the BEII and the NexGen are very separate entities. The NexGen has a much higher ratio of visible failure, while the BEII is usually the cause of the more difficult to track problems.

If a machine is rejecting customer cards, but not 9s cards, you will want to check your communications numbers presented on screen when the 9s card is inserted. This number should be around 144.16. When this number drops, it means the BEII is no longer fully able to communicate with the system. When this occurs, you will want to try to perform a

soft ram clear on the BEII. To perform a soft ram clear, unplug power to the BEII. Next, jumper the two pins on connector P10 near the bottom of the board. Reconnect power and after about ten seconds, LED D5 should flash red once. After the flash, disconnect power, remove the jumper, and reconnect power. The BEII should recover, and you should see



your communications numbers increase back to 144.16.

Before you ever replace a BEII, I would recommend performing a hard ram clear. To do this, you will need to remove power and short C33 to ground for about 10 seconds. This will wipe all information stored on the BEII and you will have to reprogram it. If this doesn't clear up the problem, then I would recommend a BEII swap.

Any promotional information displayed on the NexGen is stored within the NexGen. If a power outage occurs or you need to unplug the NexGen, you may lose this information. This is usually caused by a battery failure. This doesn't mean the NexGen is bad, simply that it needs to download all its information again. I would recommend replacing the battery on the back to keep it from doing this at every power outage. Another thing to remember is that these are rechargeable batteries but the NexGen does not recharge them. You may want to look into a battery charging system.

When a NexGen displays the "Not Registered" message, this means there is a conflict in the system. Either the BEII has no information, or the wrong information. If you insert your employee card, it should give you a message, such as "NO ASSET" or "DUPLICATE ASSET." Duplicate means that your machine and another machine are sharing the same asset number in the system. If you get this message after programming a BEII, you may have entered some information incorrectly. If your information is correct, you may have to start looking for the other machine.

If you have a "UID MISMATCH" displayed on the NexGen, you more than likely have problem with the UID or the system. Resetting the UID in the Machine Wizard program will typically clear this up.

A message of "NOT IN USE" will almost always lead to a problem with the UID harness. The UID harness attaches to the BEII

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The advertisement features several product images: a blue sign for LED replacement boards, a slot machine bill acceptor, a Game King Multi Game board, a green PCB, an orange Extech multimeter, a digital display, a yellow Fluke clamp meter, a slot machine harness, a blue spray can of Tech-Spray Duster, a white container of LCD Cleaning Wipes, and a blue spray can of Tech-Spray Blue Shower.

and has a small DS2224 IC soldered inline with it. This little IC stores an imbedded 32-bit Unique ID, which the system uses to identify each BEII board. The first step would be to power down the BEII and unplug the UID harness. Next, power the BEII back up. Once you have left it up for approximately 30 seconds, power it down and reconnect the UID harness. If this doesn't work, I would recommend replacing the UID harness.

### Touch screen Calibration

We have had numerous machines that will not calibrate or seem to lose calibration. Before you swap out the NexGen, I would recommend trying to relocate your

grounding points. Most of the NexGens that pass across my bench for non-calibration don't actually have anything wrong with them other than I have a much better ground than when they were in a machine.

Another great tool with ABS is the number of access cards that do various things. A 9s card is great for all sorts of diagnostic information, as well as resetting the BEII and calibrating the NexGen screen. A 2s card is simply for calibrating the NexGen, and a 1s card can reset the BEII without accessing the machine. You can use a card writer and some free software from the Internet to make your own test cards. When

doing so, write 99999991 to track 2 of the card for a 1's card, and 99999992 for a 2's card.

I would strongly recommend a regular floor reset for all casinos that use bank controllers. Reset your controllers once a week or so and you should keep your issues to a minimum. If you have any kind of promotional credit or playable credit system, I would also recommend a calibration schedule to keep customer frustrations to a minimum.

- Ryan Young  
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## BALLY TECHNOLOGIES ANNOUNCES MAJOR GAME AND SYSTEM INSTALLATION AT DEJOPE GAMING LAS VEGAS

Bally Technologies, Inc. has announced that it has recently completed a major installation of Bally slot titles and a new back-end casino management system at the Ho-Chunk Nation Dejope Gaming located near Madison, Wis.

“During a recent expansion from 340 Class II bingo-style games to more than 1,100 games, Dejope selected Bally for approximately 600 games or nearly half of their slot floor,” noted Alex Dungan, Vice President, Class II & Central Determination Markets. “This marks a significant increase of Bally slot titles at this premier gaming facility.”

According to Dungan, a variety of popular Bally reel-spinning and video titles on both the new ALPHA Elite™ S9E and wide-screen CineVision™ cabinets are now available for play at the Dejope Gaming facility. These include: Hee Haw™, Lucky Wheel™, Blues Brothers™, In The Money™, Penny Frenzy™, Double Blazing 7s™, Mystic Lamp™ and Fireball Frenzy™.

Additionally, the Class II gaming facility recently converted its entire casino floor from a competing back-end casino management accounting system to the Bally One System™.

“We are delighted that Dejope selected the Bally One System as their preferred casino management application,” stated Dungan. “The Bally One System is designed to give Class II/Central Determination operations such as Dejope the capability of integrating all of their diverse casino products from different manufacturers into one comprehensive back-end management system. This creates greater cost efficiencies in the manage-

ment of the casino floor, as well as provides patrons with a single player’s club card that works across all products. This consolidation helps to drive player loyalty

at the machine and minimizes player confusion resulting from multiple ticketing/card-based systems.” - **Slot Tech Magazine**

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## FutureLogic Expands Global Support and Distribution Network with New Facilities in Macau, China



FutureLogic, Inc., the world's leading manufacturer of thermal ticket printers for cashless gaming, announced today that it has expanded its global support and distribution network into the Asia Pacific market, with the official opening of its new sales, service and distribution centres in Macau, China.

The launch of FutureLogic Asia was celebrated with a customer appreciation event on April 19, 2007 at the Macau Tower. Activities offered were Sky Walking, Sky Jumping and Bungee Jumping, followed by a reception at the 360 Restaurant at Macau Tower.

At 233 meters, AJ Hackett's Macau Tower Bungee is the highest commercial Bungee jump in the world, and guests from MGM Grand Macau, IGT and Aristocrat suited up and participated in the venue's thrilling experiences. Peter Johns of MGM Grand Macau remarked, "I've never seen a company launch taken to such an extreme. FutureLogic certainly knows how to make an impact."

US, Europe and Asia, FutureLogic dominates the TITO (Ticket-In/Ticket-Out) market. By combining local service strategies with a global support infrastructure, the company is able to provide a rapid response to OEM and casino requests for new product development, as well as changes in firmware, ticket design, language, graphics and other peripheral functionality.

The Macau operation is headed by Daniel Turner, a 12-year veteran of system, peripheral and gaming industry sales. Dan earned a Physics Degree from the University of Manchester Institute of Science and Technology, UK. He spent eight years with IBM in their Mid Market Sales Division, and opened IBM's direct sales office in Beijing, China. In 2004 he joined the gaming industry, initially with Endx, now part of Progressive Gaming and later with Money Controls as Sales Manager for Europe, Middle East and Africa.

"Since joining us in October of last year, Dan has become a key member of FutureLogic's International Team," said John Edmunds, Gen-

eral Manager of Europe, Africa and Asia and VP of International Sales. "His enthusiasm, technical expertise and knowledge of the region have already helped him establish FutureLogic as the dominant thermal printer for TITO applications in casinos in Macau and across Asia."

eral Manager of Europe, Africa and Asia and VP of International Sales. "His enthusiasm, technical expertise and knowledge of the region have already helped him establish FutureLogic as the dominant thermal printer for TITO applications in casinos in Macau and across Asia."

FutureLogic developed and launched its first TITO printer in collaboration with IGT designers for the introduction of EZ Pay™ in 1999, and proudly maintains its status as default printer supplier for IGT worldwide. The company will exhibit their new GEN2 Universal™ printers and the ProMatrix™ coupon solution at G2E Asia (stand 314), to be held in Macau on June 13-14.

The GEN2 Universal printer is designed to communicate with the processing unit of an electronic gaming device and supports all current and emerging game types by incorporating three game ports, including RS232, NetPlex and USB 2.0. The printer anticipates new standards for downloadable games and permits in-game firmware and promotional updates via the USB port.

FutureLogic will also display the ProMatrix coupon solution, a flexible promotional couponing and trigger system that utilizes a second port on the GEN2 Universal printer to deliver colourful coupons at the game. FutureLogic is actively working with casinos in Asia to trial the ProMatrix coupon solution to enhance current Player Reward Programs.

For further information, contact FutureLogic Europe at +44.1628.760.083 for sales inquiries, or +44.1628.760.082 for technical service.



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# Kingbright Releases New Catalog Introduces Warm White LEDs

Kingbright Corporation, a TS 16949, ISO 9001, ISO 14001 certified LED manufacturer has released its 2007-2008 optoelectronics catalog featuring diverse range of high brightness and power efficient LEDs. The full-color literature contains detailed product descriptions, specifications, and diagrams for its full line low profile SMD Displays, bi-color and full color LED Lamps, and high power white, blue, red, yellow, green SMD LEDs. The new catalog offers comprehensive solution guide that genuinely assists design engineers to meet their ultimate design requirements. Online catalog version is also available on [www.us.kingbright.com](http://www.us.kingbright.com) with easy downloading feature. With utmost quality, reliability, and capability, Kingbright provides 3D specifications through website and full custom tooling for engineers and designers to enhance their solutions to the next altitude of success.

## Kingbright Warm White LEDs

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ing to achieve the ultimate warm-white illumination. This brilliant, intrinsically innovative light source is ideal for various gaming applications. The low power consumption, IR reflow solderable, and automation friendly device meets industrial temperature ratings of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  with enhanced

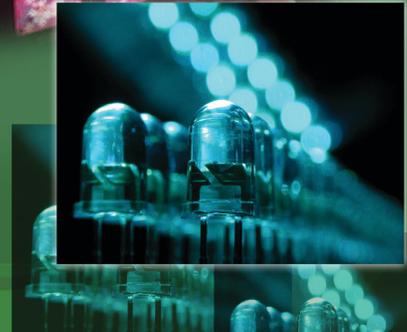
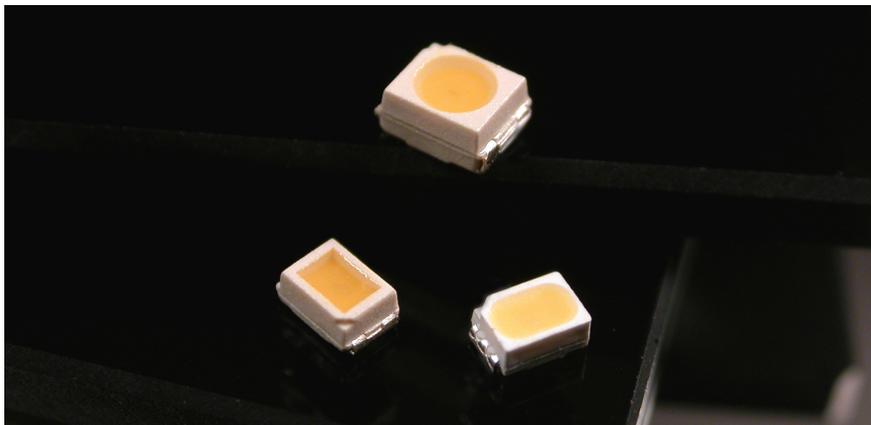


feature specially designed for automatic pick-and-place mounting process to reduce manufacturing cost.

Kingbright Corporation is a leading component manufacturer of RGB Full Color LEDs, High Brightness XPower LEDs, Blue & White LEDs, LED Lamps, SMD Lamps, SMD Displays, and other LED related products with various color selections including pink and purple. Kingbright operates four manufacturing plants in Shenzhen, China, all accredited with TS 16949, ISO 9001, ISO 14001 certifica-

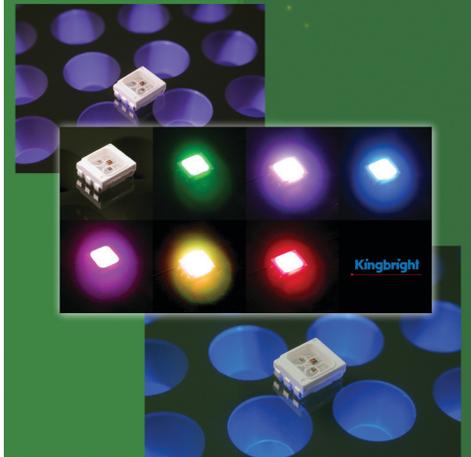
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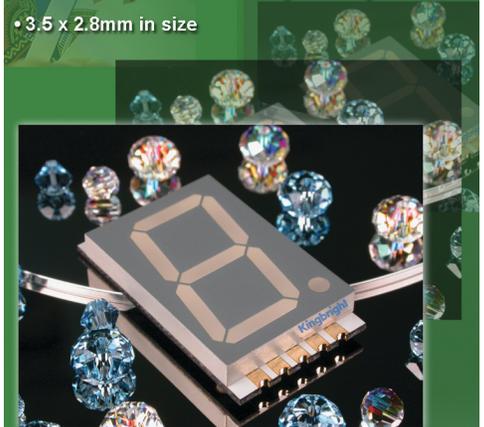
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## Quick & Simple Repairs #26

By Pat Porath

### Do we have a "handle" on things?

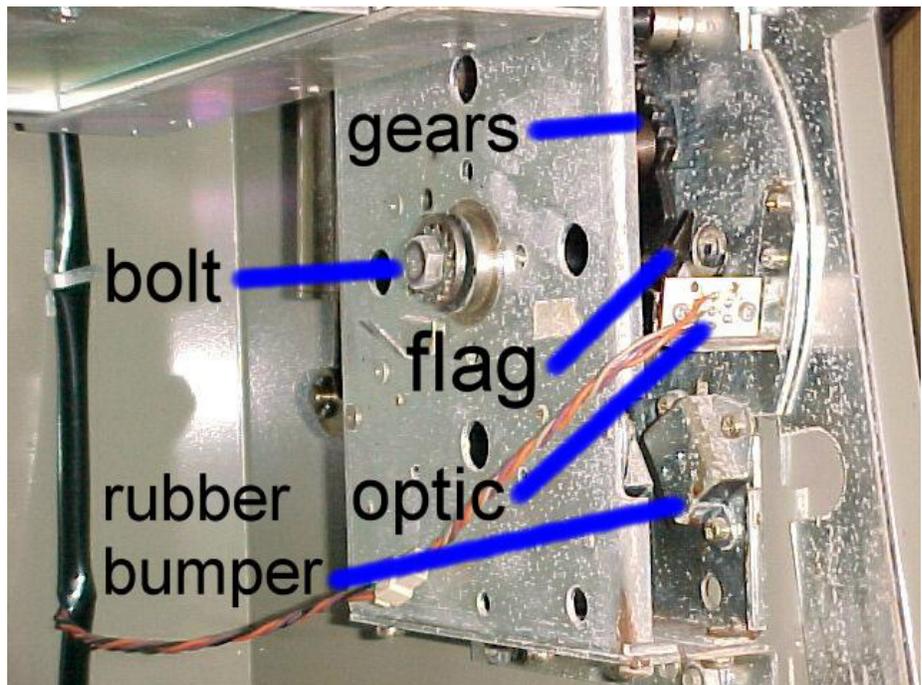
Some people may think that slot machine handles are "old school" and are on the way out. As we know, a lot of games don't even come with one anymore. Such as the IGT Trimline, the Atronic E-Motion, and all of the slant-top games out there. In my personal opinion, they will be around for a while. While walking around the gaming floor, I still see that some individuals like to use the handle instead of the spin button. Even in casino commercials on television, they show players using the handle. Some new games still do come with a handle to give the customer the option of a "pull" or a press of a spin button. Some of these games include the WMS "Can't Lose" and the IGT S2000.

So what can be done if there is a problem with a handle assembly and the customer doesn't like to press the spin button? The main parts of an

assembly consist of the handle bolt, the optic (or micro switch), return spring, anti-return spring, gears, and a rubber stopper. Have you ever moved a machine for carpet replacement or to move it to a new location and grabbed the handle and it was loose? The large handle bolt needs to be very tight. If a customer is rough with a game, over time, it may loosen up. In the worst case, the assembly will start to fall apart. The assembly also has an optic or a micro switch in it. After the first coin or credit is accepted, the solenoid releases and the handle can be pulled downward. The sole-

noid noise and the clicking noise are all made only to have a flag or a lever go through the optic or press the micro switch. Not like in the old days of slots, when the handle pressed on a lever connected to some springs to another mechanism to make it spin. Far, far away from the electronic games of today.

Back to the basic handle assembly, there is the return spring. Obviously this is to bring the handle back to the upright position. If a handle is stuck in the downward position, it may be a broken return spring or something may be jammed. A jammed



assembly can sometimes be tricky. You have to be very careful. If your fingers get in the way of the gears, they will get hurt. If the situation occurs that the handle won't pull at all, it may be a broken anti-return spring. It may also be a bad solenoid. Under normal circumstances, if the solenoid doesn't release, the handle can't be pulled. Once the first coin or credit is bet on a game, you should be hear it click. If not, try pressing the plunger of the solenoid. The handle should release. If it doesn't work electronically but does manually, the solenoid may be bad.

Why would there be a rubber stopper inside of a handle assembly? It's there in order to absorb some of the shock or rapid movement when it comes to a sudden stop. Instead of two pieces of steel coming together, there is a piece of rubber (replaceable) that takes some of the strain off of the game once the handle is in the upright position. Handle gears? Ah yes, this is to give the noise when the handle is being pulled. In conclusion, I personally think that it's pretty cool that some of the new stepper slot machines still come with a handle on them.

**IGT Video "Fort Knox" Door Open Errors**

I recently ran into something a bit unusual on a "Fort Knox" video game. There were three doors that wouldn't show "closed" on the

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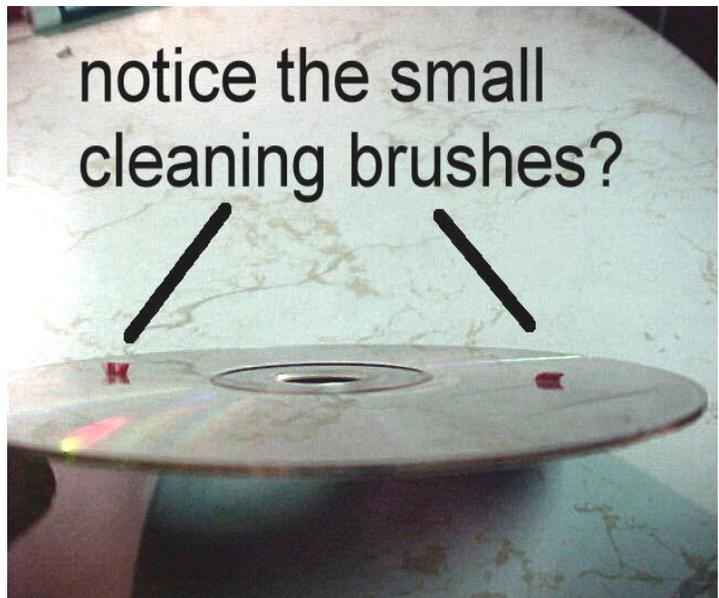
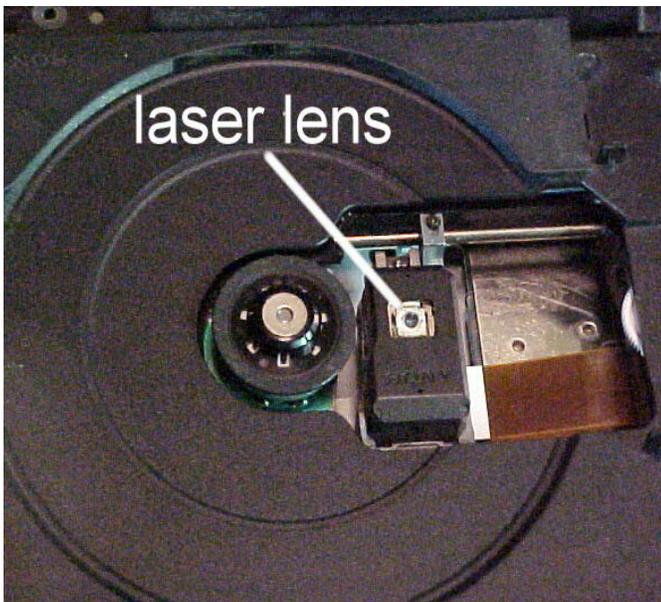
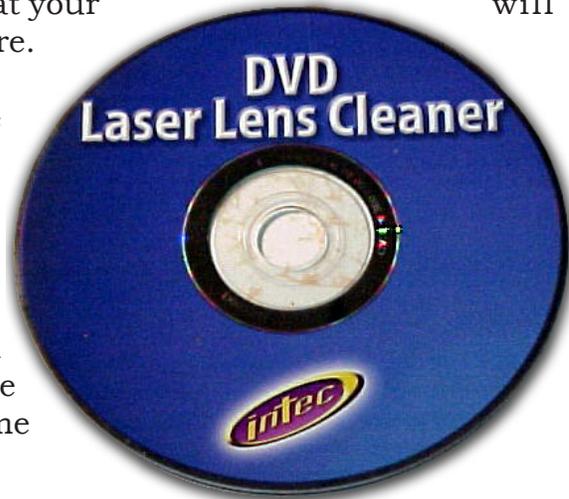
game. No matter what I did, the "drop coin" door, "main" door, and "bill acceptor" door would still show an "open" state. With the game power off, I checked the three I/O cards (two in the door and one in the game) and checked the main processor board. They were all in place as they should be. Next, with power applied and the game booted up, I tried a few main door resets, only to have the same result. The bill acceptor stacker door and main door appeared to close properly, so what was the problem? I asked for some advice over the radio and I was told that the bill acceptor stacker door had to be closed FIRST. Hmm, ok why not? With the main door closed, I opened up the belly door. Next I unlocked and re-closed the stacker access door, then closed the belly door, then opened and closed the main slot door. Eureka! The problem went away. All of the slot doors were now showing closed.

### Atronic e-motion "System Halted"

During the boot process on an e-motion game, it was noticed that in the icon in the left corner of the screen it displayed "no media" when checking the Compact Disk. In some cases, the problem is simply a dirty CD. Clean the disk and the game is good to go. In other situations, a dirty lens in the disk drive is the culprit. Running a "cleaning disk" in the drive may cure the issue. A cleaning disk looks like a normal CD on the top but on the bottom there are two small brushes that wipe the laser lens. They can be purchased at your local computer store.

If you've tried the cleaning disk and the freshly cleaned CD but the game still doesn't work, try swapping CDs with a game of the same program. If the game

STILL won't boot up and "no media" is displayed in the icon before "system halted" is displayed on the screen, you may have a bad CD drive. It is rare but it does happen. Within the last year, we have replaced two of them. The procedure is similar to replacing one in your home PC. In a nutshell, open the logic door, then the mother board door. Way in the back (kind of hidden) there are two screws that need to be removed. Once they are out, there are two connectors, one for power and one for data (the data is the ribbon cable). You also will notice a jumper placement. It will be



labeled as either "slave" or "master." Make sure before the replacement CD drive is installed that the jumper setting is exactly the same as the original or it WILL NOT work. Install the replacement drive and power up the game in order to set the CD in the tray. Reboot the game, and it should be good to go.

### Konami Printer Communication Problem

The game was a Konami slant top. The problem was a "printer com error." Having this particular error on this particular game made me a bit upset. Why you may ask? Because I was in the game earlier testing out a printer that I repaired in the shop, and the original printer, which WAS WORKING FINE,

now wasn't working. The original printer was swapped out for the one that I tried to repair and the original was put back in its place. I did not wait (like I was suppose to and should have) for the game to fully boot up and make sure that it was back in working order. What I didn't do is wait for the game to fully boot up, show the printer error, and simply reset it with the jackpot reset switch. The slot attendant had already rebooted the game and checked connections, and when I arrived a simple key reset got it back running again. If you are in a hurry and don't wait for a game to fully boot up and walk away, there is a chance you will get called back to it. There is a saying that goes something like, "There isn't

time to do it right the first time but always time to do it over." Also, check to make sure that the printer optics are clear of paper and dust.

### IGTS2000 Reel Tilt

We have a bank of "slot tournament" games which are IGTS2000s. One of them had a severe case of #3 reel tilts. The games are all five reel, but on this particular one, the third reel would only spin once and then tilt again. Being that it is a tournament game, it would not be good if it was down for very long. I checked right away to see if we had a spare reel assembly in the shop and sure enough, we had three of them. Simply replace the reel strip, perform a payable test and all would be good. Well,



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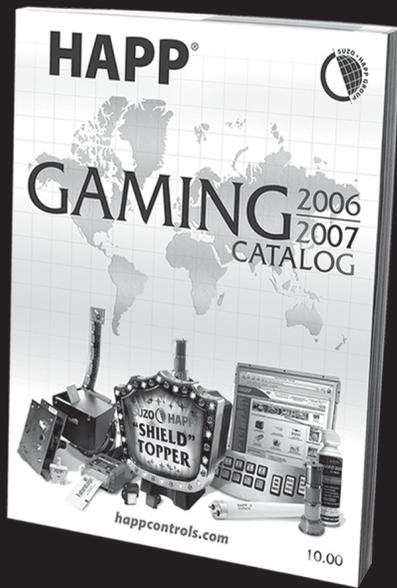
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as most of us know that's not how it usually goes. I grabbed the so-called replacement reel and headed out for the game. Before replacing the reel strip, I thought it would be best to try the reel without it, just in case it didn't work; and I'm glad I did. The reel appeared to be very similar. Same stepper motor, the same number of pins for connection, and what appeared to be the same mounting. For some reason or another, the replacement wouldn't fit in place. It looks like there are TWO DIFFERENT reel assemblies for S2000 games (I need to verify this). Well, the game needed to be fixed so a simple swap of stepper motors was affected. For one reel it only takes one E-clip, one connector and four stepper motor bolts. In no time, the swap was made.

With power reapplied to the game, the problem still existed. Connections were checked on the mother board, where the reel harness comes from the reels to the board but the connections were perfect. Nothing was loose at all. I checked for a loose chip on the main processor but that too looked good.

I wasn't sure what to do next on it. The following morning a co-worker explained that he had gotten the game up and running.

"What in the world was the cure?" I was very curious.

He told me that the main pro-

cessor board was faulty. I was almost at a loss for words. He explained that on a S2000, if the problem isn't obvious (such as something rubbing on the reel basket) and a known good reel is in place and the game STILL tilts, it's a bad main processor. This was a news flash to me. I haven't read or heard of this before at all. So, if all of the so called "normal" things are done (if I may use the term normal) and the reel tilts won't go away on a S2000 five reel game, try replacing the main processor board. "Normal" things would include (but not limited to) inspecting the reel optic to make sure it's clean, inspecting the reel basket for cracks, checking the connector pins to make sure they are straight and in place, observe if there are any obstructions of the reel such as a wire behind the reel or last but not least, an obstruction on the main slot door.

### AC Coin "Bingo Nights" Bonus Error

As you most likely know, AC Coin uses an IGT platform and adds their own theme and top box bonus to it. Examples are "Bingo Nights," "Bank Roll," "Popcorn," "Hotdogs," and "Slotto." Some of these games use a "turret." It's similar to a coin hopper but with numbered balls in it as well as some optics and a solenoid (basically speaking). This time, the bonus error would not reset at all. The "bonus reset button" (the cherry switch attached to the

side of the stacker frame) was pressed numerous times but it still wouldn't reset the error. Next, the turret was looked at and it was noticed that the solenoid wasn't working as freely as it should have been. Upon further inspection, the solenoid linkage was slightly bent. The piece was straightened, and then it was working properly. The game was closed, the tilt cleared, and I haven't heard a problem from it since. The "bonus ball" moved freely in and out of the turret when bonus rounds were hit, and the game was back online.

- Pat Porath

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# Troubleshooting the Mysterious IGT “M” Door

By Vic Fortenbach

Picture this. You’re walking the floor when you come upon an IGT slant top I game with its tower light flashing. You check the monitor to see if any M door open messages are displayed. Yes, the message “M DOOR OPEN” is display in the corner of the monitor. You think, I will just open the close the hood door and that will be the end of that. So you proceed to open and close the door tightly but to your surprise, the “M DOOR OPEN” message remains.

You try the door again, same message: “M DOOR OPEN.” You check the top box. It’s closed. You check the outside Acceptor door. It’s tight. Maybe it’s the large access door under the player panel causing the problem. You check that but it’s closed as well. Maybe it’s the drop door. You check that but same daunting “M DOOR OPEN” message persists on the monitor. By now, you’re getting frustrated, you have checked all the M doors on the game, but the message is still there, haunting you.

Troubleshooting M door problems in an IGT slant machine can be a challenge. All of the M doors are wired

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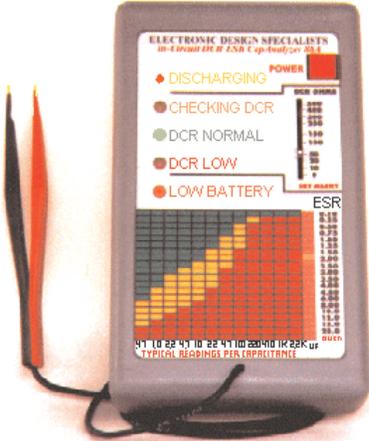
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in series, which makes trouble shooting a daunting task. Some IGT slant machines can have up to eight M door switches: The top box, main hood (two), acceptor door, coin tray, large access door, and lower right and left drop doors.

The main hood door has two switches, one that is not really a switch at all. It's an emitter and detector optic design. The second is a white cherry switch that is wired in series with the optic that is connected to your player tracking.

The best place to start troubleshooting is to check the doors used most often. These are the main door switches and the acceptor door switch. Since the acceptor door switch is mini micro switch, the pull team has a habit of destroying it. Poke it with a small screw driver in order to actuate the switch. Listen for the click. If the switch clicks, 99% of the time the switch is good. But is the switch lever being actuated when the door is closed? Listen for the click as you close the door. If you don't hear the click, adjust the switch's lever so closing the door clicks the switch. Adjusting or replacing the acceptor door micro switch requires access to the acceptor stacker, so your gaming authority will be involved.

If the acceptor door switch has checked out ok, check the hood door. Is the emitter optic emitting light? Since the light is infrared, you can't just look at it and see light. On IGT machines, the optic light is pulsed, so you can't just shine a flashlight on the optic like you can on Bally

reel machines. But there is an easy way to see the light. Grab a camera phone and point it at the emitter. Not sure which optic is the emitter? The emitter wires are black and red and it's mounted to the hood door (the detector wires are red and white). When you point the camera phone at the emitter optic, you should see a visible light when you look at the camera's display. You do not have to take a picture. No light? You have a bad optic or wiring.

If you don't have access to a camera phone, you can make an optic extender harness. The harness is just a long (about three feet) wire with an emitter optic on one end and a two pin connector on the other. You just connect the extender harness in place of the original emitter and hold

it close to the detector mounted on the cabinet. If the problem is a bad emitter, then the M door message on the monitor will disappear. You can also make a detector extender harness. The IGT part number for the emitter is 57506900 and the detector is 57506800. If your IGT slant machine has ticket capabilities, then the coin tray has been replaced with a solid cover. The design of the cover retains the original cherry switch and its M door connections. Don't overlook this cover as a possible problem area. IGT upright machines have the same M door switch circuit design as a slant top, except on an upright machine, there are only two M door switches: The main door and the belly door.

**- Vic Fortenbach**  
**-vfortenbach@slot-techs.com**





Longer heating periods will allow damaging heat to be transferred to undesired areas, causing lifted pads, board delamination and damage to adjacent and underside components. As you can see, the control of temperature in a specific location for a controlled amount of time will determine the quality of the rework and reduce the potential for inflicted damage. This controlled temperature process is called thermal profiling.

### Bottom Side PCB Pre-Heat

Bottom heating the PCB under the site where the rework is to take place will allow the temperature to be gradually raised to a safe point prior to reworking the SMD. This is done by placing the PCB in a horizontal bracket and applying focused hot air from a pre-heater directly under the site to be reworked. The distance below the PCB and the focused heat must be controlled to deliver a safe temperature just below reflow. For traditional boards, the temperature is 300° F. By focusing hot air under the PCB, the heat will gradually transfer through the board, to the pads and to the SMD component to be reworked. This gradual rising temperature slope of controlled hot air will prevent damage to some of the more sensitive components. Now whatever rework that is done on the top side of the board will be enhanced. Soldering, de-soldering and solder removal will be safer, faster and more efficient.

### USING CHIP QUIK® WITH PREHEAT FOR SAFE SMD REMOVAL

Due to the low melting temperature of Chip Quik® removal alloy (136°F.) an SMD can be removed using bottom heat only. With the PCB bottom heated to a safe bottom temperature of 300° F, apply flux to all leads of the SMD. Apply Chip Quik low

temperature alloy to all the pins. The removal alloy will easily become molten because all the pin pad connections are now preheated to 300° F. The applied alloy will melt and fuse into each individual pin /pad connection resulting in a new low temperature alloy with increased thermal mass. While in this molten state the SMD can easily be removed.

### SOLDER PAD CLEAN UP

After the SMD is removed, it is important that all pads be cleaned thoroughly. While pads are still being heated, apply flux to the end of a swab and push all of the excess to an unused section of the board. Clean and polish each individual pad. Clean up remaining residue with isopropyl alcohol. You are now ready to install the new SMD.

### INSTALLING THE NEW SMD WITH A PREHEATER AND A HOT AIR PENCIL

Place the PCB in a horizontal fixture that allows the pre-heater to be placed under the PCB rework area at the correct

height. The pre-heater will blow focused hot air under the PCB.

The heater is set at the correct temperature to maintain the bottom of the PCB at a constant 300°F. At this safe low temperature, the risk of thermal damage has been eliminated, including the bottom side components directly under the heat. The heat will be transferred through the board, to the pin/pads and to the SMD. This safe temperature is maintained on the board throughout the rework process.

PREPARING FOR THE SOLDER PROCESS Check the pads on the PCB for coplanarity (equal height) and clean tinned pad surfaces with a good cleaning solvent. Using a syringe apply a thin bead of solder paste 63/37 w/flux along all of the pads. The amount of paste dispensed will depend on the size of the nozzle. It will take some practice to judge just how much paste to apply for different size SMDs. Carefully place the SMD directly into the paste on the pads. Use magnification to insure accurate pin / pad placement on all sides. Once the SMD is set in place, be careful not to move it.



## USING A HOT AIR PENCIL AND BOTTOM HEAT

Apply bottom heat and wait until solder paste starts to activate. This will be visible when the flux in the solder paste starts to smoke. Now set the air pencil for low air velocity and a temperature of 500°F. Using the solder pencil, slowly move from pin to pin and apply heat. Watch each pin/pad solder joint as it is formed and then move on to the next. If a solder bridge is formed, apply more paste flux and heat again. If this does not work, use solder braid while heating with the hot air pencil. Clean all connections with an acid brush and flux cleaner. Check with magnification for accuracy. Place pre-heater on cool air and allow rework site to slowly go back to room temperature. This method works quite well with fine pitch components.

Rework with the use of preheat and a hot air pencil may seem



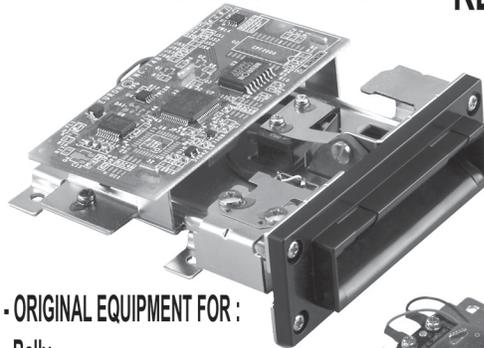
like a drastic change from traditional solder/desolder methods. This basic method is widely used throughout the rework industry. You will find that in many cases, this new method will be the determining factor of

whether certain PCBs can be repaired rather than trashed.

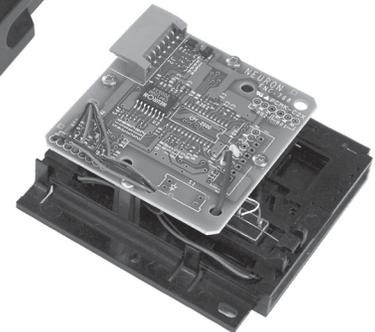
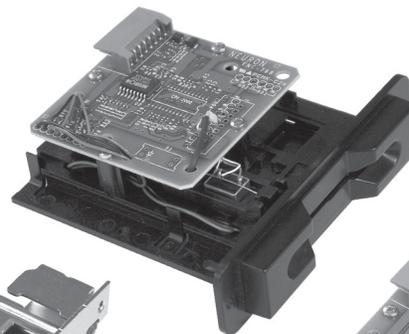
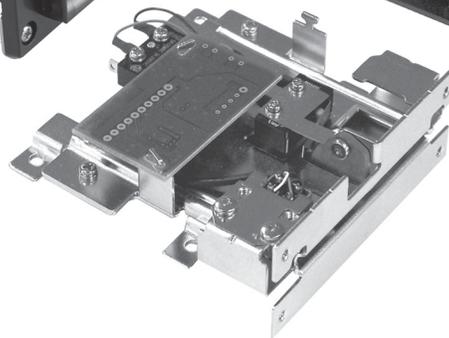
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## Slot Machine University @ TechFest



**T**oo much cool stuff at TechFest 15! Slot Machine University made their premiere showing with a full-day program, repeated all three days. Thanks to Ron Parido and Cris Challerder.

In addition to three days of technical training on BVs, Printers, monitors and touchscreens, some lucky folks won some pretty cool door prizes. Dominic Gehant (top, right) from Mystic Lake Casino won a \$300 kit of replacement components from Ceronix's Troy Nofziger, Donald Yellow (also Mystic Lake) won a digital multimeter (two others were also awarded) while Thurston Scott (Inn of the Mountain Gods) won a touchscreen computer monitor from 3M Touch Systems. Congratulations to everyone. It was fun!

**These two people actually didn't know each other, believe it or not.**





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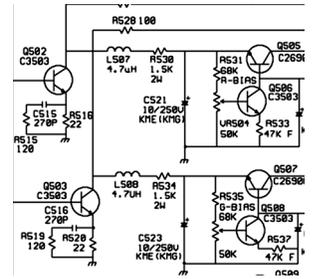
### THE DIGITAL MULTIMETER

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

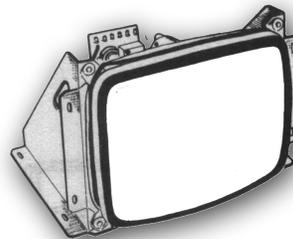
The individual components used in games are introduced. Parts such as resistors, capacitors, diodes, potentiometers and transistors are covered individually. Students learn how the components work and how to test them using the meter.

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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**Randy Fromm's  
Slot Tech Magazine is  
published monthly by:**  
Slot Tech Magazine  
1944 Falmouth Dr.  
El Cajon, CA 92020-2827  
tel.619.593.6131  
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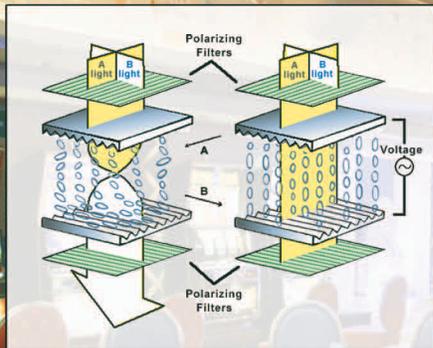
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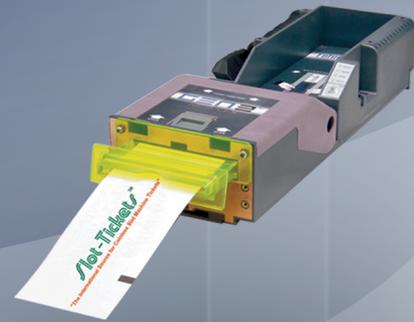
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