August 2007

Slot Tech Magazine

Slot Machine Technology for the International Gaming Industry

Slot Tech Training in Puerto Rico

Troubleshooting the Acres VFD, Card Reader and Keypad

Power-on Troubleshooting

BALLY TECHNOLOGIES RELEASES FOUR NEW ALPHA OS™ TITLES

An official publication of

global gaming expo G2E

Slot Tech Magazine

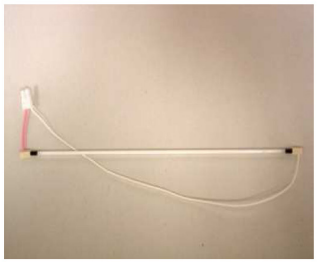
$10.00

COLD CATHODE REPLACEMENT LAMPS FOR LCD PANELS

All CI Innovations Cold Cathode Lamps are made in Germany & are 70,000 hour lamps

We have Cold Cathode Lamps for:

- WMS Bluebird 17" & 18" & 19" LCD monitors
- NexGen Player Tracking System 6.2" LCD screen
- Atronic 17" LCD monitors
- Konami edge-lit belly glass
- Konami Advantage 7" LCD bonus screen
- MORE CCFL LAMP ASSEMBLIES ARE ADDED EVERY MONTH
- If you need a CCFL lamp for any LCD monitor we will make it for you
- Contact us at 714-692-5548 for info & pricing from one of our distributors



We also have the following cold cathode and LCD related products for the casino industry:

- Mylar insert piece with copper tape attached for NexGen LCD panel
- Replacement Hitachi OEM touch screen for NexGen LCD panel
- Hitachi OEM LCD panel with touch screen for NexGen Player Tracking System
- OEM LCD panel with touch screen for Bally IVIEW player tracking system
- Cold Cathode replacement lamp system for all slot machines and video poker machines
- Cold Cathode slim edge-lit sign and stand for slot end banks graphic size 24" x 36"
- Contact us at 714-692-5548 for info & pricing from one of our distributors

DISTRIBUTOR INQUIRIES WELCOME CALL 714-692-5548 OR E-MAIL harry@ciinnovations.com

22445 E. La Palma Ave., Unit C • Yorba Linda, CA 92887
Phone: (714) 692-5548 • Fax: (714) 692-7708
e-mail: info@ciinnovations.com

Inside Slot Tech Magazine

August 2007

Peace

Slot Tech Editorial

Dear Friends,

July was an interesting month for me because I was able to spend more than half of it in Puerto Rico. Yep, it was back to the Caribbean for Jack Geller (JCM) and me as we continued our training mission, this time at the venerable El San Juan Hotel and Casino. Puerto Rico has dozens of casinos and Jack and I were there to train the techs from a handful of local properties.

Randy Fromm's
Slot Tech Magazine

Editor
Randy Fromm
Technical Writers
Ted Befus, Jason Czito, Herschel W. Peeler, Pat Porath, Vic Fortenbach

International Contributor
Martin Dempsey

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

SUBSCRIPTIONS
Domestic (USA)
1 year - $60.00 2 years - $120.00
International
1 year - $120.00 2 years - $240.00

This was really the Casino School (as I call the two-week class) at its finest. Everything we touched turned to gold in our hands as we fixed dozens of power supplies, CRT monitors and LCD monitors during three days of "hands-on" labs. For those properties that sent along stuff to repair, the class practically paid for itself in just those three days.

You can read more about the class on page 26. In addition, we experienced some interesting failures during the lab that are worth talking about. They illustrate some important concepts in repair techniques. The first part of this discussion begins on page 28. The conclusion will appear next month.

Of course, America's Favorite Slot Tech, Pat Porath, is back with installment #28 of his Quick and Simple Repairs series. This month Pat was busy with a wiggy problem on an S2000, a wacky Aristocrat hopper, an unresponsive e-motion and a couple of Bluebirds that needed his help to straighten up and fly

right.

Vic Fortenbach has more on the Acres system this month with a look at Troubleshooting the Acres VFD, Card Reader and Keypad.

Don't forget that TechFest 16 is coming up very soon (October 16-18) at the Sandia Casino in Albuquerque, New Mexico. If you like your chili hot, come on down and join us for three days of technical training on monitors, ticket printers, touchscreens, bill acceptors and more.

See you at the casino.

Randy Fromm

Randy Fromm

The **Most Decorated Printer** in Gaming

With over 900,000 printers installed, FutureLogic is the preferred printer of casino operators and manufacturers worldwide. And, as evidenced by the growing list of awards & recognition by industry experts, FutureLogic has demonstrated its leadership in gaming printer innovation and technology.

www.futurelogic-inc.com

Chosen by OEMs, preferred by casino operators, praised by industry experts, and backed by world-class service & support, it's no surprise that more casinos the world over are banking on FutureLogic — *the gold standard in gaming printers.*

Quick and Simple Repairs # 28

By Pat Porath

CDS Display That Was Scrambled

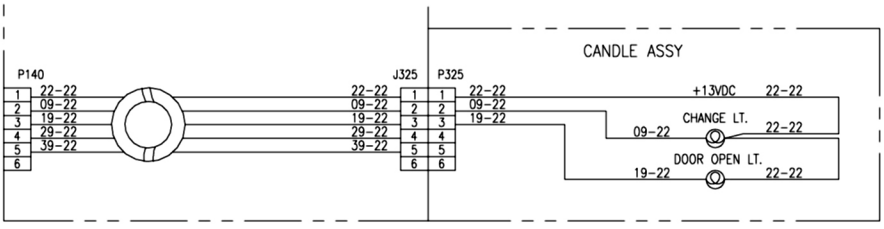
Have you ever had a CDS display that was scrambled? A slot attendant called me to the game and sure enough, the display wasn't readable at all. I was hoping a simple reboot of the Sentinal would do it but not this time. Right away I thought of replacing the complete Sentinal and/or the display. After the reboot, the display showed only the green background, without any text. I thought for sure a replacement would be needed this time but I was wrong again. Why not check the connection for display? I had power, and the Sentinal was working fine earlier, maybe it was only a loose connection? The display cable was disconnected from the display side, then reconnected and Bingo! It read "PLEASE INSERT PLAYER CARD" in capital letters. Why do I mention that the text is in caps? Because since the text was in caps, it meant that the Sentinal was communicating with the tracking system. It does not mean that the game is talking to the system or the game is talking to the Sentinal. It only means that communication has been established between the Sentinal and the tracking system. A quick check to see if the game is talking to the Sentinal is to insert your "slot floor card" or "mechanic card" and see if there is a door open and door closed with the main door of the slot machine. There are occasions where the Sentinal and the display need to be replaced if the display isn't working properly.

IGT S2000 Main Power Problem

But Why is the Candle to Blame?

I have heard of the "Candle Being the Culprit" on older Bally games and on a couple of IGT games. Well, it happened again. The candle, a.k.a. change light or tower light, "shorts out" the game bad enough to make it act very strangely, like the main processor board lights and interior service light will flash off and on every half a second or so. The game acts like it is a power supply problem. Weird acting power, change the power supply. Not in these cases. Back six months or so ago, I swapped darn near everything out on a game with the exception of the main wire harness and it did not cure the power problem. I asked an IGT tech what could possibly be wrong with this game. I told him what I done and he stated...THE CANDLE. Of course I said "Seriously...the candle?" He said yes.

Once the candle was removed from the game, it was obvious. During installation, somehow a wire became pinched and shorted to ground therefore, causing the game to have a short circuit. Not severe enough to blow a fuse or circuit breaker, just

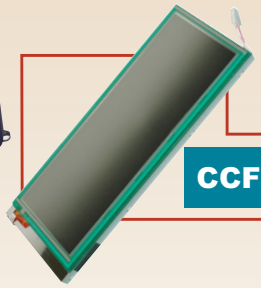


For All Your Slot Repair Needs!

Data Comm

Test Equipment

Kortek CRT Monitors offered by Casinotech



CCFL Backlighting

LED Replacement Bulbs and Assemblies

TouchInternational

Capacitive Touchscreens

FREE CATALOG 644 pages

Visit www.mcmelectronics.com/gaming

or call toll free

1-800-543-4330

- Over 40,000 products stocked
- Access to over 1.5 million electronic parts and related products
- Quotation Team, send us your quotes for quick response
- Gaming products: Drop in replacement LCDs for IGT games, replacement touchscreens, LEDs, replacement DVR drives
- RoHS compliant parts now available
- LCD monitor CCFL repair kits

Labeling

MCM

Source Code ST51

bad enough to really mess up the game. So…around six months later…a similar problem: A game appearing to have unusual power fluctuations (acting weird). I started to disconnect the bill accepter, the printer, and the light bulbs, still no change. Then it dawned on me, just for kicks, check the candle. Even though this game had been on the floor and running well for months, with the pinched wire between the candle and the game, it just decided to short to ground. The candle was removed, the wire repaired, and the game was up and running in no time.

Funny Stories from the Floor

I recently ran into a customer that had a ticket in her hand that only had half of a bar code, but did have the validation numbers on it. The ticket was only the value of 25 cents. She said that it was SUPPOSED to be $11.00. Here we go again with the lost ticket ordeal. Luckily it was nearby the cashier cage and we went right back to her game and there the ticket was…in the paper out chute. I removed it and the value was $55.00, 1100 credits. I asked if it was here ticket and she stated I guess so, I was just playing it. I explained it was a nickel game, NOT a penny game, and that's how the 1100 credits equal $55.00. The woman was so happy, she had to show the ticket to her husband a few aisles down!

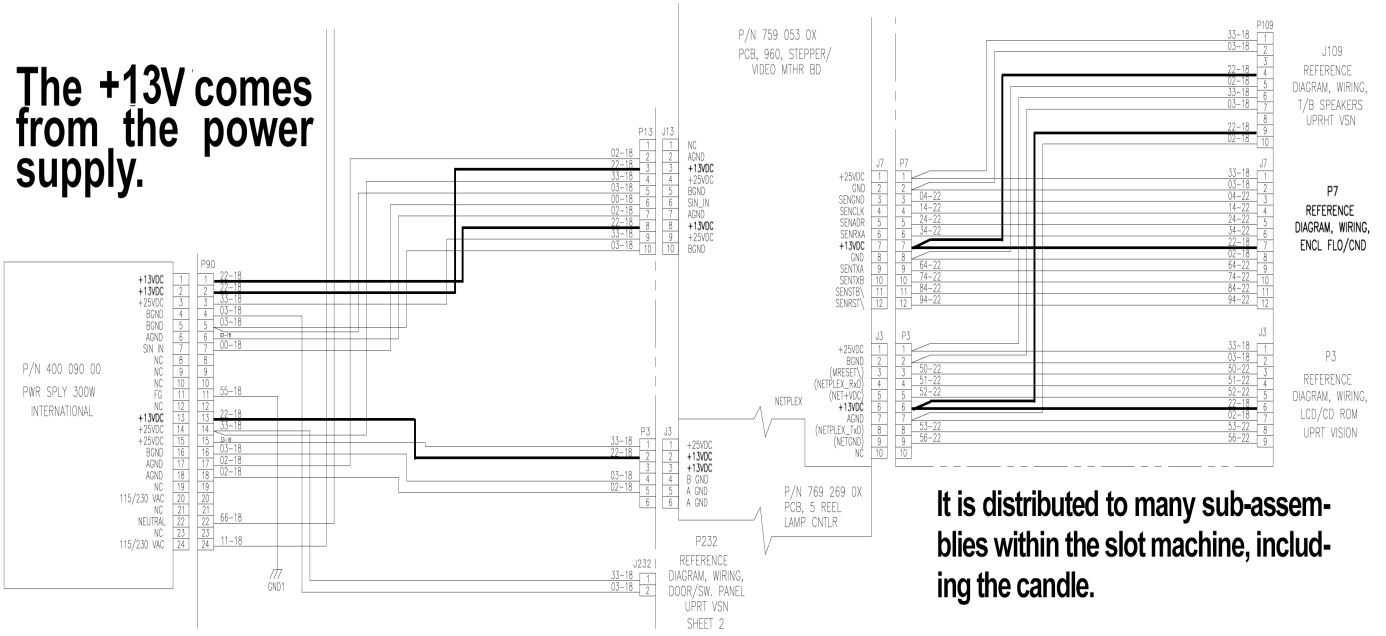
Not long ago (and this happens every so often) a customer will be a bit upset that their player card won't work in their machine. "I've tried and tried. Why won't this machine accept my card?" I explained that the card WASN'T from our casino, and it might work if she used a player card from our casino. This was funny too! Another customer stated she couldn't get her player card to work in ANY of the slot machines. I told her that the cardboard instruction sheet was only for reference, you have to put the PLASTIC card into the machine.

WMS Bluebird "Call Attendant"

I could not get this game to clear "Call Attendant." The game was rebooted several times, and the CF cards were reseated. The bill accepter and printer were checked out; they both looked ok. What was with it? It appeared to boot up normally but once fully booted it would only display "Call Attendant." A second tech looked at it. He thought it may be a bad backplane board but wanted more advice before doing "surgery". Another tech looked at it and found out that the main board was a little bit loose. It looked fine, but it wasn't. He pushed the board snugly into its place and it was good to go.

Aristocrat Dead Hopper

The game had been shut



It is distributed to many sub-assemblies within the slot machine, including the candle.

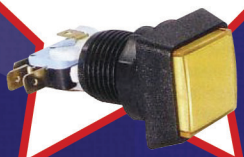
We Buy and Sell Used Machines and Gaming Parts

LCD Retro Kits

Remanufactured
Bill validators
Monitors
Printers
LCD's

Touch Screens
3M
Touch INT

Buttons & Switches



JCM AMERICAN CORPORATION

Bill validators

Lighting & LED's

Patriot Gaming has product solutions to fit every budget.

We focus on you the customer. To provide the very best service and products to fit your ever changing needs. Our pride rests on the fact that we offer a wide variety of products and alternatives, lower cost solutions and top notch repair services.

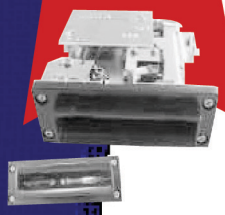
TRANSACT
Technologies Incorporated

Printers

Monitors
Ceronix
Tatung
Kristel
WG
Tovis
Kortek

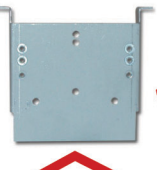
Cleaning Supplies

Used OEM Slot parts



Seating

Repair Center
Bill validators
Monitors
Printers



Metal Fabrication Brackets

One Call...One Voice... One Choice!

Call Patriot today for your FREE Catalog!

Service Center

- All repairs have a 90 day warranty

PATRIOT GAMING & ELECTRONICS INC.

217 N. Lindberg Street • Griffith, Indiana 46319 • Office: 219-922-6400 • Fax: 219-922-6466

down due to a possible bad hopper control board. The customer had credits on it and was going to cash out but the hopper wouldn't do anything. Well, my turn to look at it. I reseated it a few times. No luck there. A reboot was done, the main door was closed and the cashout switch was pressed. Bingo! It started to pay out coins. Now since it paid out the credits OK, why not do some hopper tests in diagnostic mode to make sure it's OK. Turn the "audit" key, use the on screen instructions to scroll down the menu until you reach "diagnostics" then follow the on screen instructions to choose item. Then press the cashout button to have the hopper pay out ten coins. The three hopper tests came out fine and I didn't hear any problems with the game for the rest of the day.

Aristocrat "No Signal" Displayed on the Monitor

Most of us know on an IGT AVP game and also on a WMS Bluebird that when "no signal" is shown on the display, it could mean a power problem. On the IGT there is a chance that the power supply towards the back on the game came loose and isn't sending power to the main board and so on. With the Bluebird, there is a chance that the lower right power supply has gone bad. Check to see if it is plugged in (of course) and to see if the power supply cooling fan is working. If the cooling fan isn't blowing air, more than likely it overheated and needs to be replaced.

But what does "no signal" displayed on an Aristocrat mean? It holds true that the monitor isn't getting a video signal from the game the same as the others but it isn't a power supply problem. The main board and the I/O boards were reseated, main power to the game was interrupted and the monitor was reseated. No change in the game. I even took out the batteries from the main board thinking that I would get something other than "no signal" and the same result occurred.

Starting to get a little desperate, I looked nearby for the same game program and no luck there either. Well, it wouldn't hurt to swap main boards with a game of a different program just to see if the "no signal" error would go away or would it? I installed the known working main board and the game started booting up perfectly normally. So, the problem is in the original main board. With a replacement the game will work fine.

WMS Bluebird "Gold Fish" Displaying "System BIOS Shadowed" and "Video BIOS Shadowed"

This game had me puzzled until I started swapping parts around. The night before we had a severe thunder storm roll through and a tornado may have touched down only ten miles down the road. As we know, with thunder storms some casinos lose power. Some have full backup generators and others have only emergency lights. At the casino where I work, we have two generators. They supply power for emergency lighting, the "eye in the sky" and, I believe, the elevators. They do not power the gaming floor.

With our recent expansion, the slot power panels have "surge protectors" and "power filters" on them but we always have a few games that have an error after a main power interruption. We had some signs that needed resetting and some other games that needed resetting and/or repairing but on this game, somehow the "game CF card" went bad. Since the game would more or less only display "system BIOS shadowed", "video BIOS shadowed", "Fixed disk 0" and "Fixed disk 1" something had to be wrong. I tried a RAM clear, and that wouldn't work either. Two different "operating cards" were even tried. A 1480 OS and the original 1490 version, still nothing.

The CPU boards were swapped with the game next door, and the problem game started to boot up right away. This indicated that the problem is somewhere in the CPU, but what part? The chips were nice and snug, so why not swap the game cards? As soon as I powered up the known good game with the possible bad game card, the problem was right there - a

Get With The Program

The AESI Partnership Program

AESI Provides The Best Products & Service The Gaming Industry Has Ever Seen...

SAVE MONEY WITH:

- Spare parts discounts
- Free direct exchange inventory of Bill Heads, Printers and Monitor PCBs
- Pick up and delivery service
- On site training
- Upgrade programs on printers, monitors, bill acceptors, and coin validators

- **PART SALES**
- **REPAIR SERVICE**
- **TECHNICAL SUPPORT**

FutureLogic™ — Innovative Engineering for OEM Applications
GEN 2™ THERMAL PRINTER

mei
CASHFLOW™ BILL ACCEPTOR

kortek LCD's
INDUSTRIAL MONITORS

DigiTech Systems
Digital Interface by Touch
TOUCH SYSTEMS

STEREOGRAPHICS®
GLASSES FREE 3D

Microcoin®
QL COIN ACCEPTOR™

STARPOINT
REEL MECHANISMS

Service Coast To Coast

CALL CUSTOMER SERVICE TOLL FREE AT:

1 (866) 736-2374 (AESI)

www.gamingstuff.com

ADVANCED ELECTRONIC SYSTEMS INC.

Taking Care of Business

bad game CF card. I made a phone call to the guys at WMS, gave them the serial number, and they said we should be receiving it the following day. Being that it is a "Gold Fish" leased game, there wasn't a charge for the replacement card. With the card replaced, the game was back online.

Atronic e-motion "parse error in script"

Upon walking up to the game, it had the following error: "parse error in script." Also showing was "description: subscript out of range identifier." I also noticed that the game's "see pays" button was lit up. To press or not to press the button. That is the question. I pressed the "see pays" button and the game went back into regular play mode. When the button was pressed again, it went back into the "parse error in script" screen. I thought, might as well start off with a reboot.

Once the game came back up, it was fine. I was thinking a full RAM clear was needed and it would need to be re-optioned but I was wrong. A simple reboot of the game did the trick. The "see pays" button interacted with the game perfectly.

A Video "Mega Bucks" That Didn't Want to Boot Up

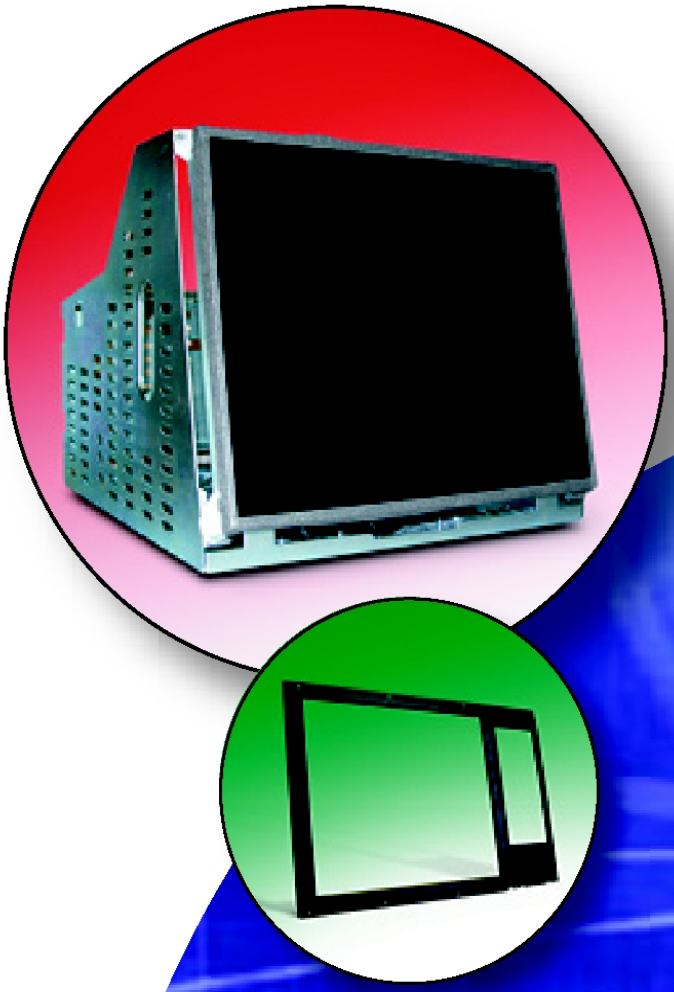
I was called to this game a bit earlier in the day. It had had a ticket cashout problem. The ticket wouldn't print but the bezel was flashing rapidly, which meant that it was in the process of printing. A reboot was done on the game. The printer acted normally but didn't print out the credits so a hand pay had to be done. Next, a reboot was done on the game and, as most of us do, I got called away to look at another game. Some time later I went back to the "Video Mega Bucks" game, which is known as a WAP game (wide area progressive). It hadn't booted up yet. It sure should have by this time. Time to try another reboot. I started it and got called away again. A few minutes later IGT Mega Jackpot Operations called. It was kind of funny, I told her I already know what game she is calling about. And, she said that yes it was. I stated I was working on it and would call back if I couldn't get it running. Back to the game the third time (getting close to calling an IGT tech) I thought, why not, one more try. Let's do a "hard boot". With computers selecting "reboot" it is known as a "soft boot up" and selecting "shut down" is known as a "hard boot." A hard boot is where the computer completely shuts off and then restarts, where a "soft boot" restarts without shutting down power. This is why I call it a "hard boot" on a game. The main incoming power cord to the main power supply is unplugged for a few seconds, and then plugged in again.

Once this procedure was done with the game in discussion, it came up fine.

- Pat Porath
pporath@slot-techs.com

CERONIX

Ceronix LCD Monitors



CERONIX, INC., the company you have relied upon to provide you with the highest quality video display monitors for over 20 years, now offers exceptional LCD Displays!

Ceronix LCD Displays are "drop-in" replacements for existing upright and slant top CRT and LCD monitors. Installation requires just a few screws and five minutes of your time. The Ceronix "**LCD UPGRADE KIT**" includes: LCD touch screen monitor and a **NEW Injection Molded Flat Bezel**.

Not only are Ceronix LCD Displays custom-manufactured in Auburn, California USA, they are reliable – back lamps lasting an average of six to eight years before needing replacement.

They weigh less and require less power and expense to operate! Check out the next generation LCD Touch Display created by Ceronix – the quality is "crystal" clear.

17" LCD Displays For the following replacements	
• CPA4050L	17" IGT Upright
• CPA4051L	17" IGT Slant
• CPA4090L	17" WMS Upright
• CPA4089L	17" Konami Upright
• CPA4067L	17" Bally Upright
• CPA4095L	17" Atronic Upright/Slant

Prices starting at $560.00 include a touch screen and controller.

19" LCD Displays For the following replacements	
• CPA4097L	19" IGT Slant
• CPA4062L	19" IGT Upright
• CPA4088L	19" Aristocrat Upright
• CPA4064L	'19V'/20" WMS Slant
• CPA4020L	'19V'/20" IGT Upright

Prices starting at $697.00 include a touch screen and controller.

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.

"Crystal" Clear Quality

CERONIX, INC.
13350 New Airport Road
Auburn, California 95602-2055
Phone: (530) 886-6400
Fax: (530) 888-1065
www.ceronix.com

Troubleshooting the Acres VFD, Card Reader and Keypad

By Vic Fortenbach

The Acres VFD, card reader and keypad are the most important pieces of the Acres player tracking system outside of the BEII.

You already know about the BEII and its functions from previous articles but little is known about the rest of the system components at the game level. The VFD (vacuum florescent display) is the blue green colored display that is mounted on the player panel and displays information to the player. The VFD also displays diagnostic information from its self test.

The VFD comes in two basic sizes: a five inch and a seven inch display. The five inch size is used for bar tops and some upright games while the seven inch size is mainly used on all upright slot machines. Both displays are functionally the same and have the same connections to the BEII and card reader.

Located on the back of the VFD display board is an eight-position dip switch bank. This bank of switches controls the various self tests programmed into the BEII and VFD. I'm not going to go over the self test procedures, since they have been covered in previous articles.

Also on the back of the VFD display board is a super cap. This super cap is located next to the ribbon cable on the display board. The location is basically the same for both the five inch and the seven inch displays. Hopefully, you're familiar with this device. There is one located on the BEII. The one on the BEII

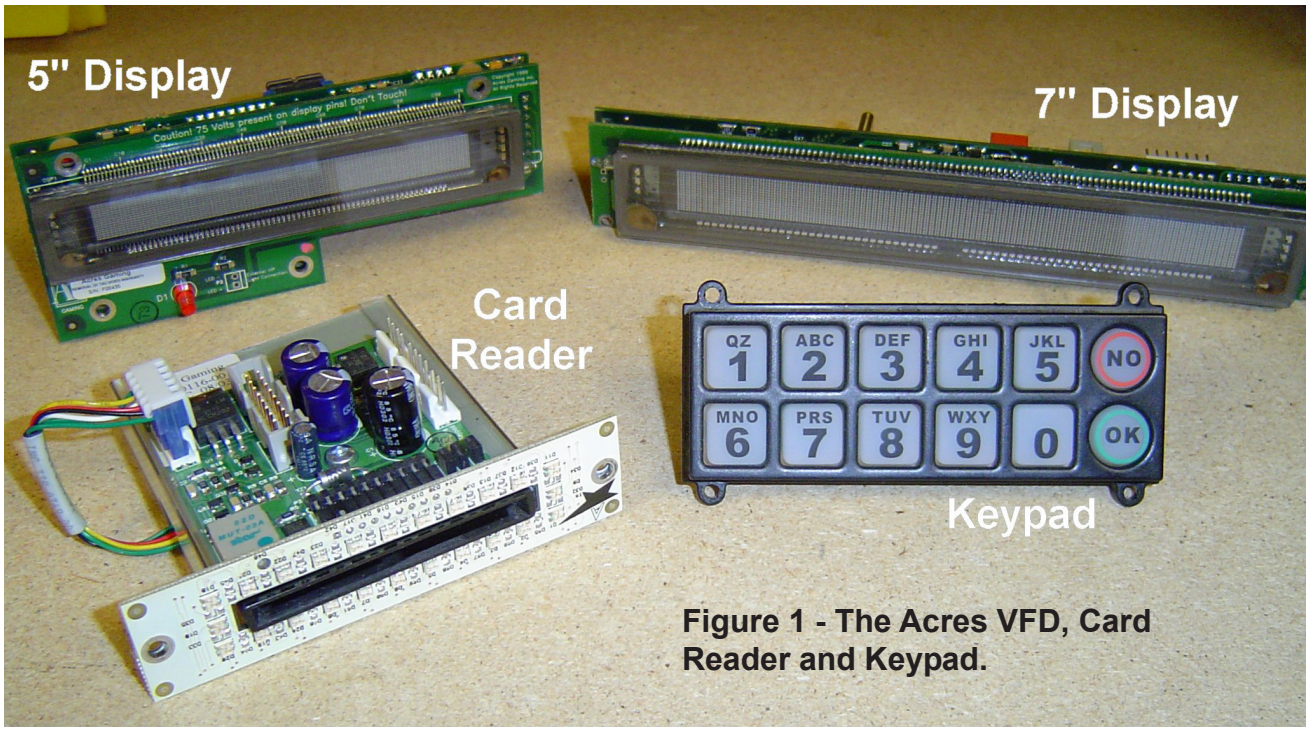


Figure 1 - The Acres VFD, Card Reader and Keypad.

Touch Gaming Standards

ClearTek™ II
Capacitive Touch System

A Touch Standard

For more than fifteen years, the **MicroTouch™ ClearTek™ Capacitive Touch System** has been a touch standard for leading game manufacturers. Now, with the introduction of the ClearTek II Capacitive Touch System, 3M is setting higher performance expectations for the touch gaming industry.

Better By Design

Combining **MicroTouch EX II electronics,** the industry's most widely-used and relied-upon touch electronics, and **ClearTek II touch sensors**, valued for proven surface durability and enhanced optical characteristics, creates a system that provides the superior touch interface game manufacturers expect from 3M.

Call 888-659-1080 or visit www.3M.com/touch for more information.

MicroTouch™

3M

is a bit larger than the one on the VFD but both serve the same purpose: to provide back up power to the RAM chips when main power has been removed. The VFD has two basic connectors on the rear of the display's circuit board. The grey 18 pin ribbon cable connects the VFD to the card reader. The seven pin cable from the BEII connects to the VFD display board.

The VFD glass tube is somewhat fragile and will break if mishandled. The glass tube or envelope as it's technically referred to, is soldered to the circuit board. The small nipple is positioned on the glass tube's lower right edge for the five inch display and the upper left edge for the seven inch display. This nipple is the most fragile part. It's used by the display's manufacturer to first evacuate and then fill the display tube with gas. If you have a VFD that is blank, check this nipple. Unfortunately, you cannot refill the glass tube, so the display glass will have to be replaced. Happ Controls (Suzo-Happ) sells the display glass for the seven inch size. IIGT sells the five inch size. The seven inch display glass tube is the same used on the IGT S2000 slot machines for the player information display. Figure 2 lists the part numbers from both the five inch and the seven inch display glass tubes.

The Acres card reader may look overwhelming at first but it's really quite simple. On the card reader, there are three circuit boards. One circuit board is located on the top, another is on the bottom of the card reader assembly and the third circuit board is actually the LED bezel board. The top circuit board is mounted with two screws to the card reader. The bottom board is part of the black plastic card reader and is mated to the read head. It's not mounted with any screws but with snap plastic latches. This board receives the pulses from the read head as the card is slid into the card reader. This board cleans up the pulses and sends them to the top mounted circuit board through a five pin cable. The signal then travels through the grey ribbon cable to the VFD. If the bottom board processes the player's card data, then what does the top board do? The main purpose of the top circuit board is to provide driver circuitry for the colored LEDs contained in the card reader's bezel. The top board does nothing to the signal coming from the bottom board. It simply routes it to the ribbon cable and then on to the VFD.

The Acres card reader functions like any other card reader. The player inserts a card in to the black plastic portion of the card reader assembly. Keep in mind the black plastic reader assembly AND the bottom circuit board are all part of the same assembly. They are both made by Panasonic and cannot be purchased separately.

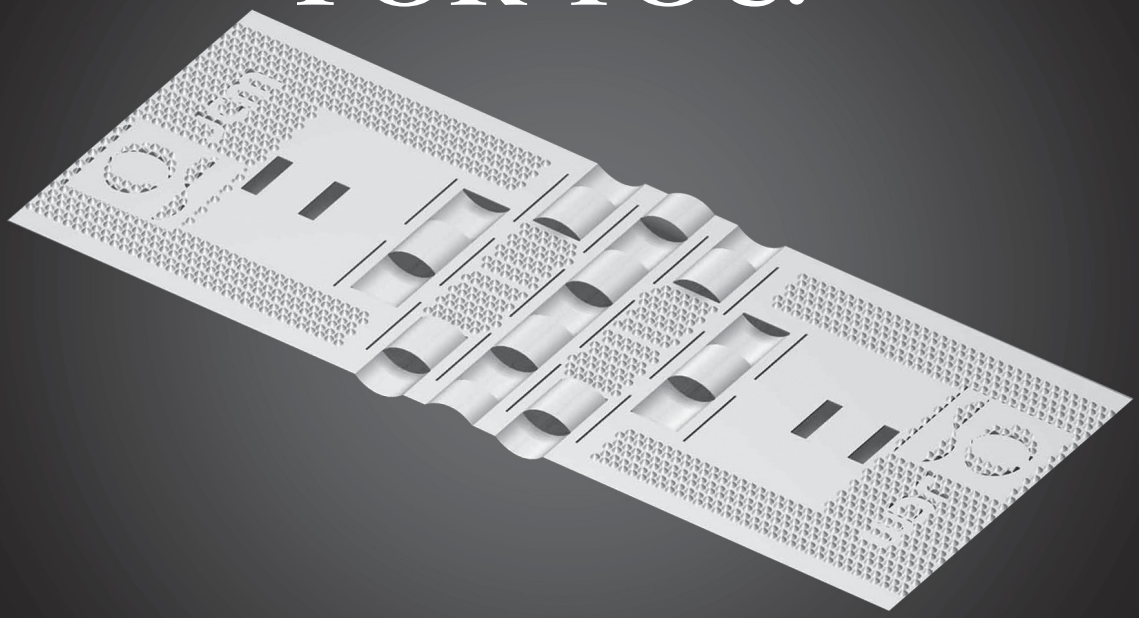
Inside the black plastic assembly is a spring loaded read head. This read head reads the magnetic strip on the back of the player's card. The black magnetic strip is encoded with a series of numbers which is the players account number. This same magnetic strip is also on the technician's "nines" card. The only difference is the strip contains all number nines instead of an account number. Since the strip is magnetic, keeping it away from magnetic pocket screwdrivers is a precaution that must be observed.

Despite some of the way players think, the Acres card reader will not change or write to the cards magnetic stripe. It just reads it.

Part	Supplier	Part Number	Part Description
5" Display tube	IGT	18031690	VFD - Mini Dspy 5in
Keypad Frame	IGT	500000200	Mold - Frame Keypad
Rubber Membrain	IGT	262051100	Keypad Membrn Wht
Complete Keypad	IGT	90012200	Acc- 2x6 12 Key Keypad
7" Display tube	Happ	49-2374-00	Noritake Dot Matrix Display 192x16

Figure 2. The part numbers from both the five inch and the seven inch display glass tubes.

LET US DO THE DIRTY WORK FOR YOU.



JCM AND KIC HAVE SPENT THE LAST FOUR YEARS FORMULATING A CLEANING TECHNOLOGY TO MAKE YOUR LIFE EASIER.

Just insert a clean Waffletechnology Cleaning System and it will pop out dirty. It grabs the dirt in seconds, leaving your JCM validators sparkling and ready to take more money! Maintenance made easy with an Automated Cleaning Cycle software upgrade.

To really clean up, call 888-JCM-0008 • jcmwaffletechnology.com

JCM® AMERICAN CORPORATION | WAFFLE TECHNOLOGY™

At each end of the bottom circuit board, which is part of the black plastic card reader assembly, are two optical sensors. In order for the card reader to send a complete "card read signal" to the VFD, both of these optic sensor must be clean and functioning correctly. Each optic sensor has a small plastic flag attached to a small spring. The front optic is blocked until a card has been inserted.

As a card is inserted into the card reader, the front flag opens allowing light to pass from the emitter to the sensor of the optic sensor. The rear optic is open or unblocked until a card has been fully inserted into the card reader. As the card slides into the reader and reaches the end of its travel, the rear black flag swings into place, covering the back sensor.

If either or both of these optic sensors are dirty, the plastic flags are broken, or the springs are bent, you will get an incomplete card read signal from the card reader. This incomplete card read signal is indicated by a flashing red bezel and a "please reinsert your card message" on the VFD.

Most of the card read problems will be associated with the optics, the plastic flags or the read head. Dirt accumulation on the read head will cause incomplete card reads. In my opinion, the waffle card is the best cleaner for the read head inside the card reader.

Some players insist that the card reader slot is the machine's coin slot. When a player makes the mistake of inserting a coin into the card reader slot, you will have to remove the coin, since the card reader will not function with a coin stopping a player's card from reaching the end.

Removing coins from a card reader is a challenge. You must be very careful not to break the front plastic flag on the inside front of the card reader. Since the front flag pushes down when a card is inserted, removing a coin may push the flag in the opposite direction, thus breaking it off or bending the small spring.

The best way to minimize any damage to the card reader is to not use a screwdriver to remove the coin but a modified player's card. You can easily cut a players card with scissors to form a "hook" to gently guide the coin out of the card reader (see figure 3).

Some technicians have had luck using a cashout ticket that has been folded long ways to remove a coin. To use this method, fold the cash out ticket long ways. Insert the ticket into the card reader slot pushing the ticket to sandwich the coin in between both folded edges of the ticket. Slowly pull the ticket out. If you're good, the coin will come out inside the folded ticket.

The card reader's bezel circuit board connects to the top circuit board on the card reader through a ten pin connector. Sometimes the bezel circuit board and the top

Figure 3. - Makeshift removal tools for removing coins from card slot without damaging the optic machanism.

G2E 2007

THE EPICENTER OF BRILLIANT IDEAS

COMING NOVEMBER 13-15, 2007—LAS VEGAS CONVENTION CENTER
NOVEMBER 12, 2007—G2E TRAINING & DEVELOPMENT INSTITUTE

NOVEMBER 11-13, 2007—NCRG CONFERENCE ON GAMBLING AND ADDICTION,
PARIS LAS VEGAS RESORT AND CASINO

AN AMERICAN GAMING ASSOCIATION EVENT • ORGANIZED BY REED EXHIBITIONS

28,000+ GAMING PROFESSIONALS FROM 105 COUNTRIES • 750+ LEADING EXHIBITORS • 100+ WORLD-CLASS CONFERENCE SESSIONS

THE WORLD'S PREMIER GAMING SHOW AND CONFERENCE FEATURING NEW PRODUCTS, LATEST TECHNOLOGIES, UNBEATABLE NETWORKING, NON-STOP LEARNING, DAILY SPECIAL EVENTS, F&B AT G2E, ALL OF VEGAS AND MORE. FOR MORE INFORMATION OR TO REGISTER, VISIT WWW.GLOBALGAMINGEXPO.COM

global gaming expo G2E

F&B A CULINARY MARKETPLACE AT G2E

An American Gaming Association Event

Organized by Reed Exhibitions

G2E GLOBAL G2E
WWW.GLOBALGAMINGEXPO.COM

board become disconnected. It's important to keep the card reader's mounting nuts tight.

The LEDs on the card reader's bezel are bi-color LEDs. This means that there are two LEDs (red and green) on the same surface mount package. By turning on both red and green LEDs at the same time, the color yellow is produced.

On the bezel is a small hole. This hole is for the sounding device. It's the "beep" you hear when the Acres system is powering up or you have just completed a BEII or VFD ram clear. The beeper also serves as an audio conformation that a key has been pushed. Since this hole is on the top edge of the bezel, its location is perfect for spilled drinks. If you do not hear a beep sound when an above action occurs, look for a bad "beeper" caused by a spilled drink.

The Acres keypad is used for inputting player data such as PINs or processing jackpots. A working keypad is essential. On the keypad are two rows of six keys. This type of keypad is referred to as a "two-by-six" keypad. The keypad is basically a black plastic frame with a rubber membrane with the numbers one through nine and the words "NO" and "OK." A circuit board on the back of the keypad with a decoding IC makes up the rest of the keypad assembly. IGT sells the black plastic frame, the rubber membrane and the complete keypad assembly. See the chart for the IGT part numbers.

The underside of the rubber membrane is coated with small carbon circles. Similar circles are also on the keypads circuit board. When pressure is applied to the rubber button, the circles touch. This completes the circuit and a "key pressed" signal is sent out of the keypad on the green wire to the card reader and then on to the VFD.

The beeper on the card reader beeps to confirm a key has been pressed. The VFD responds with the correct message, whether it is a "handpay jackpot message" or a menu for player options.

On the back of the keypad's circuit board is a three pin connector. This connector provides all the power and data to and from the keypad. The red and black wires are for +5 volts power to the keypad, the green is the data wire.

The three pin connector is fragile and sometimes breaks off. It can be resoldered with little effort. As with any keypad, some keys get used more often than others. The Acres keypad is no different. The number one and the OK keys are the ones that tend to wear out faster than the rest of the other keys. When a key wears out, what actually happens is that the carbon circles become cracked and are unable to make a complete contact when touched to the keypads circuit board. Since the rubber keys are all one piece you have to replace the complete rubber membrane.

Now I have covered the basics of the three pieces of hardware to which the player has access: The VFD, card reader and the keypad. Since all three devices work together, troubleshooting can get a bit confusing. The VFD, card reader and keypad form a chain in that order. Remove a middle part of the chain and the devices after the break will fail to operate.

Basic troubleshooting skills remind us to look and gather all the information before we start to tear into things. For example, here is a tough problem I encountered when we first installed the Acres system. I have seen this problem several times a year. The player inserts their card into the card reader; the VFD shows the letters UNK TOK (00, 00) with two sets of numbers in parentheses. Before we figured out what this problem was, we would replace the VFD and sometimes the card reader. The fix for this problem can be summed up in two words: RAM CLEAR. Don't RAM clear the BEII, RAM clear the VFD. RAM clearing the VFD

corrects this problem.

The procedure to RAM clear the VFD has been covered in past articles. What has not been covered is how to do it easily. Remember the super cap on the VFD I mentioned earlier? This is the key to the new and improved VFD RAM clear. With the VFD power turned off, just touch the top of the super cap on the VFD to ground, for about three to five seconds. Bingo! VFD RAM clear complete. No messing with dip switches. No fuss No muss. The RAM clear results are identical to the dip switch RAM clear, just easer.

Another problem that was encountered that required a VFD RAM clear was a card reader bezel that is lit up a very bright red and never changes color. Until we figured out the problem, we were changing the card readers and the VFD.

Keypad problems can some times be challenging. Just make sure that the problem is a problem and not confusion. Here is another situation we encountered: The card reader made no beep sound when the player pushed on the keypad but the VFD displayed the player's information. Sometimes this can be attributed to a static spike causing the keypad not to send key push data to the VFD. A simple power reset corrects that problem. But in this case, the player did not have a PIN issued to the player's account, so there was no reason for keypad to function with that card. Adding a PIN to the account corrected the problem. What if a keypad displays numbers that don't match up with the keys that were pressed in the keypad? An example might be, you press the number three key and the VFD displays a nine key as being pressed. Sorry, but the decoding IC on the back of the keypad is bad. To date, IGT has decided not to sell just the chip. You will have to buy the complete keypad assembly.

- Vic Fortenbach
vfortenbach@slot-techs.com

Bingo Gaming System

UNICUM GAMING presents its new product Bingo Gaming System that includes several games: 4-cards bingo and 3 bingo slot-simulations (Red Dragon Bingo, Papyrus, Safari and Bust da Safe). All player terminals are joined to Jackpot system.

Bingo Gaming System is flexible and scalable. The system supports up to 400 terminals and it contains internal payment cashless system. Cashless system includes cash desk and payment terminals that serve for players to deposit money to their personal account. Cashless system works with magnetic cards. Several payment terminals may be installed in one hall, which facilitates the cash desk operation.

Gaming System Server

Gaming system server works as application server and full functioning back-office server. Back-office includes: cash desk system, reporting system, fraud control system, monitoring system and technical analysis system. All these components make operation in a hall and hall-managers' duty much easier. The system allows to have remote control and to receive reports by remote method via web-server.

Player Terminal

Player terminal serves for player to play games, to display game results and acceptance of plastic cards, which are elements of gaming hall cashless system. Client application is installed on the player terminal. The client application interacts with gaming hall server by special protocols.

Player terminal is equipped with touch screen and keyboard, which serve for player to bet, to select bingo cards and active lines, to start the game to buy extra balls.

Every terminal is equipped with card reader that serves to accept magnetic cards, which are the elements of the cashless system.

The following equipment is installed in the player terminal:

* System board DPX116U SBC Sapphire (developed by Unicum company) * Processor Intel Pentium 1.5 GHz * Trancent CompactFlash Flash memory 2 Gb, 120?. * Expansion board DPX-116U Sapphire Backplane (developed by Unicum company) * Card reader KDU-3905 * Monitor Kortek - SMS19LTCJ

Windows XP Embedded is an operation system for player terminal functioning.


TechFest 16
Sandia Casino
Albuquerque, NM
October 16-18 2007
Get your tech on
Download the enrollment
form from the website at
slot-techs.com

BALLY TECHNOLOGIES RELEASES FOUR NEW ALPHA OS™ TITLES FOR DOMESTIC SALE

Bally Technologies, Inc. has announced that it has released four new slot products on the robust ALPHA OS to the North American gaming market.The four new titles just released for sale are: Half Cents™, 24 Karat™, Black Velvet Sevens™ and Lightning Sevens™.

Half Cents is a five-reel, 50-line penny-denom video slot housed in the ALPHA Elite™ V20 video cabinet. The game features a 1,000-credit max bet, configurable lines and credits and various multiplier reel symbols that multiply line pays for winning combinations. The Half-Cent bonus gives a player the opportunity to play one credit for two lines (one line for one cent and two lines for ½ cent for each line). Additionally, three or more scattered "free game" symbols award the player with 10 free games at two times the normal payout.

All that glitters is indeed gold with 24 Karat, a five-reel, 25-line reel-spinning slot on the ALPHA Elite S9E stepper platform. The game offers a 75-credit max bet, configurable lines and multiple denominations from one cent up to $2. Progressive awards range from 2,000 credits up to a maximum award of 100,000 credits times the denomination wagered. Three or more adjacent bonus symbols prompt the player to press the Spin/Re-bet button which slows the spinner, stopping at a random bonus amount.

Black Velvet Sevens entices players with the same 100,000-credit progressive top award and random Spin/Re-bet bonus feature found on its sister game, 24 Karat. Black Velvet Sevens is also a five-reel, 25-line stepper slot with a 75-credit max bet, configurable lines and range of denominations from one cent up to $2.

Configured as a five-credit, option buy-a-pay, Lightning Sevens electrifies players with a 100,000-credit top progressive jackpot, multiple denominations from one cent up to $50 and an overall hit frequency of 66%. A clone of the classic Blazing 7s® reel-spinner, Lightning Sevens is a three-reel, 25-line stepper slot offering a 125-credit max bet.

With a history dating back to 1932, Las Vegas-based Bally Technologies designs, manufactures, operates and distributes advanced gaming devices, systems and technology solutions worldwide. Bally's product line includes reel-spinning slot machines, video slots, wide-area progressives and Class II, lottery and central determination games and platforms. As the world's No. 1 gaming systems company, Bally also offers an array of casino management, slot accounting, bonusing, cashless and table management solutions. The Company also owns and operates Rainbow Casino in Vicksburg, Miss.

Additional Company information, including the Company's investor presentations, can be found at www.BallyTech.com.

Bienvenidos a Puerto Rico

Venerable El San Juan Hotel and Casino Hosts Invitational Event

July is the beginning of Hurricane season in Puerto Rico so what better time to schedule a Slot Tech training class? Actually, I had nothing to do with the scheduling. I was there at the request of Luis Del Valle, Director of Slots for what is arguably Puerto Rico's classiest casino. The casino at the El San Juan Hotel exudes an old world charm that rivals any of Europe's finest gaming venues. Vaulted ceilings and rich wood furnishings lead to the casino and the 300+ machine slot floor.

However, my two week slot tech class can accommodate up to 15 students and so Luis made private invitations to other casinos nearby allowing two or three slot techs from each of seven properties to attend. Participating in the class were: Ronald Ñeco, Rinaldo Berrios, Rafael Perez, Rafael Huertas, Michael Gomila, Luis Del Valle, Juan G. Coriano, Josué D. Báez, José E. Hernández, José González, Jesus A Diáz Mercado, Gabriel Santiago and Emerson Molina, representing the properties Posadas de Puerto Rico Associates - Condado Plaza, Posadas De San Juan - San Juan, William Hospitality Group LLC - Conquistador, Sheraton Old San Juan, Intercontinental Hotel Casino, Empresas Santana and San Juan Marriott Courtyard.

This class emphasized CRT and LCD monitor repair with a full three days of hands-on monitor repair. We fixed dozens of monitors during those three days, aided to a great extent by having a wealth of spare parts. As usual, I brought along my Big Bag O' Electrolytic Capacitors as well as a good assortment of horizontal output transistors, MOSFETs and vertical output ICs. I also carry low ohm (.22 ohm and 1.2 ohm) 2-watt resistors, all of which came in very handy during the lab (read more about some of the interesting repairs elsewhere in this issue). I also had shipped to me, the so-called "Randy Fromm Kit" (I'm not making this up) from Ceronix which is a $300 kit of EVERYTHING you need to repair dozens/hundreds of Ceronix monitors. What we didn't use, I left with Luis upon completion of the lab.

This class had another edge when it came to spare parts, however. Part of the "hands-on" training is component removal and replacement skills. It's more than just "soldering." The ability to remove and replace components without butchering the PCB is critical to the skill set of a good electronic technician.

To that end, my friends at Wells-Gardner Electronics generously provided each member of the class with their own "junk chassis" upon which to practice their soldering skills. These were factory fallouts that failed for some reason that made it impractical to repair or customer returns where WG simply sent them a new monitor in exchange.

First, students remove some of the components, then they identify them, test them and reinstall them. It turns out that these guys definitely did not need this training. It was pretty clear from the beginning that they all already possessed the soldering skills they need. As a side benefit to all this however, we ended up with a practically unlimited supply of spare parts, includ-

A group photograph taken in the lobby.

ing MOSFETS, SMPS Regulator ICs and even complete, working video PCBs (neck boards). A big thank you to Chuck Rabiola of Wells-Gardner for his assistance.

Also featured at the class was a day of training on the FutureLogic printer and the MEI SC66 bill acceptor, taught by Valentin Ayala-Cruz of Advanced Electronic Systems, Inc (AESI). As resident troubleshooter for Puerto Rico, Valentin was just the man to tap for the class as he was already well-known (and well-liked) by all of the techs attending the class and he was able, of course, to present the entire training session in Spanish. Thanks, Valentin.

The following day, Jack Geller of JCM gave a complete presentation of JCM's WBA and UBA bill acceptors. Jack is the best technical instructor in the gaming industry and I was pleased that he was able to participate in this outstanding event. Jack, your steaks are on their way.

If you are interested in hosting an event like this at your gaming property, please feel free to contact Slot Tech Magazine at 619.593.6131.

Featured at the class was a day of training on the FutureLogic printer and the MEI SC66 bill acceptor, taught by Valentin Ayala-Cruz of Advanced Electronic Systems, Inc (AESI).

The Next Step
Power-On Troubleshooting

It is no secret that I really love repairing electronics. I started out repairing consumer electronics. While I was in high school, the eight-track audio cassette was king of mobile audio. It was sort of a crazy concept, an endless loop of magnetic tape, wound on a single reel without any sort of rewinding or fast-forwarding capabilities. I had made a little business for myself by picking up bad units that had been dropped off at a nearby tape store, taking them home to repair them in my bedroom/shop and returning them, repaired, to the store.

I think I made ten bucks per unit as I recall. My friends were working for a buck, ninety per hour at gas stations and restaurants so if I could repair a couple of them each day, I was way ahead of the curve. I could call my own shots, make my own hours and still have plenty of time left over to pursue my other interests, important things like ham radio and experimental electronics. I built a set of electronic bongos as well as radio transmitters, neon lamp relaxation oscillators, Tesla Coils (of course) and too many "shock boxes" to even recall (you would have been well-advised to never touch anything you saw laying on my desk).

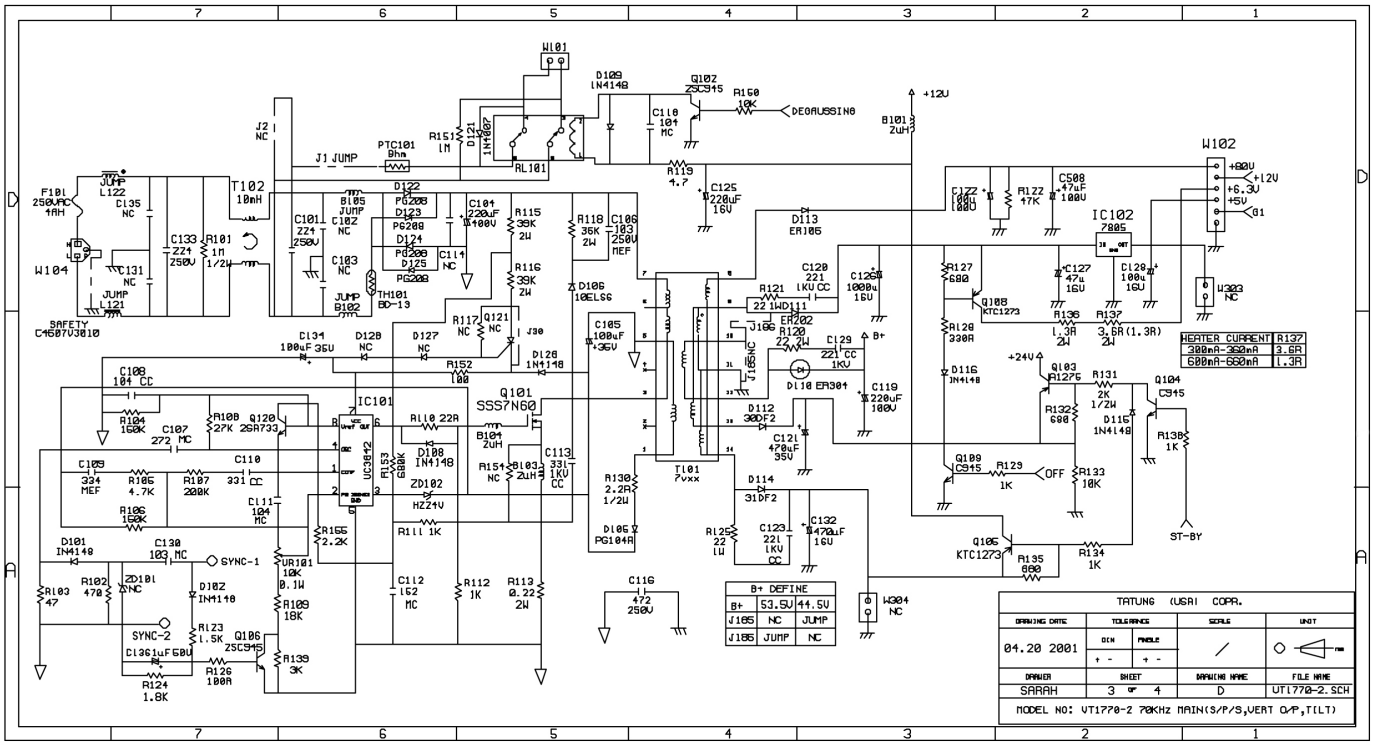
The point that I am making here (yes, there is one) is that many of the repair techniques that served me well back in the late sixties are still applicable today, the most important one being component identification and testing. If you know how to test components using a digital multimeter (and can solder well enough that you don't cause additional damage) you can fix a lot of stuff without having to know how it actually works. This enables you to repair things that you have never seen before and for which you have no schematic diagram and is a really good first step toward becoming an electronics technician (bench tech).

The Next Step

Step two happens over time as you work on a variety of equipment and quickly learn what fails the most. You immediately learn the importance of having a good capacitor ESR meter such as the Sencore LC103 (800-SENCORE) or the CapAnalyzer 88a from EDS (Electronic Design Specialists, Inc. 21621 Reflection Lane, Boca Raton, FL 33428 561-487-6103 phone / 561-487-2872 fax). Locating and replacing bad electrolytic capacitors fixes half the stuff right there. You don't have to know how the power supply/monitor/anything works. You just have to know how to test the capacitors.

You also learn that outputs fail more often than other semiconductors. This applies to both discrete components (diodes, transistors, MOSFETS, etc.) and integrated circuits such as vertical output devices and the new, integrated RGB output drivers that replace the video output transistors in a monitor.

Distilled to its most basic form, the big stuff fails way more often than the little stuff. Big things that are mounted on heat sinks are more likely to fail than little things that are not. Even if you haven't a clue as to how something works, you will often find the problem by quickly testing the big parts, primarily looking for a short circuit somewhere. To distill it even further, when you test any big, three-legged thingy mounted on a heat sink (with your meter set to "diode test" setting or equivalent resistance range) you should not have continuity between the

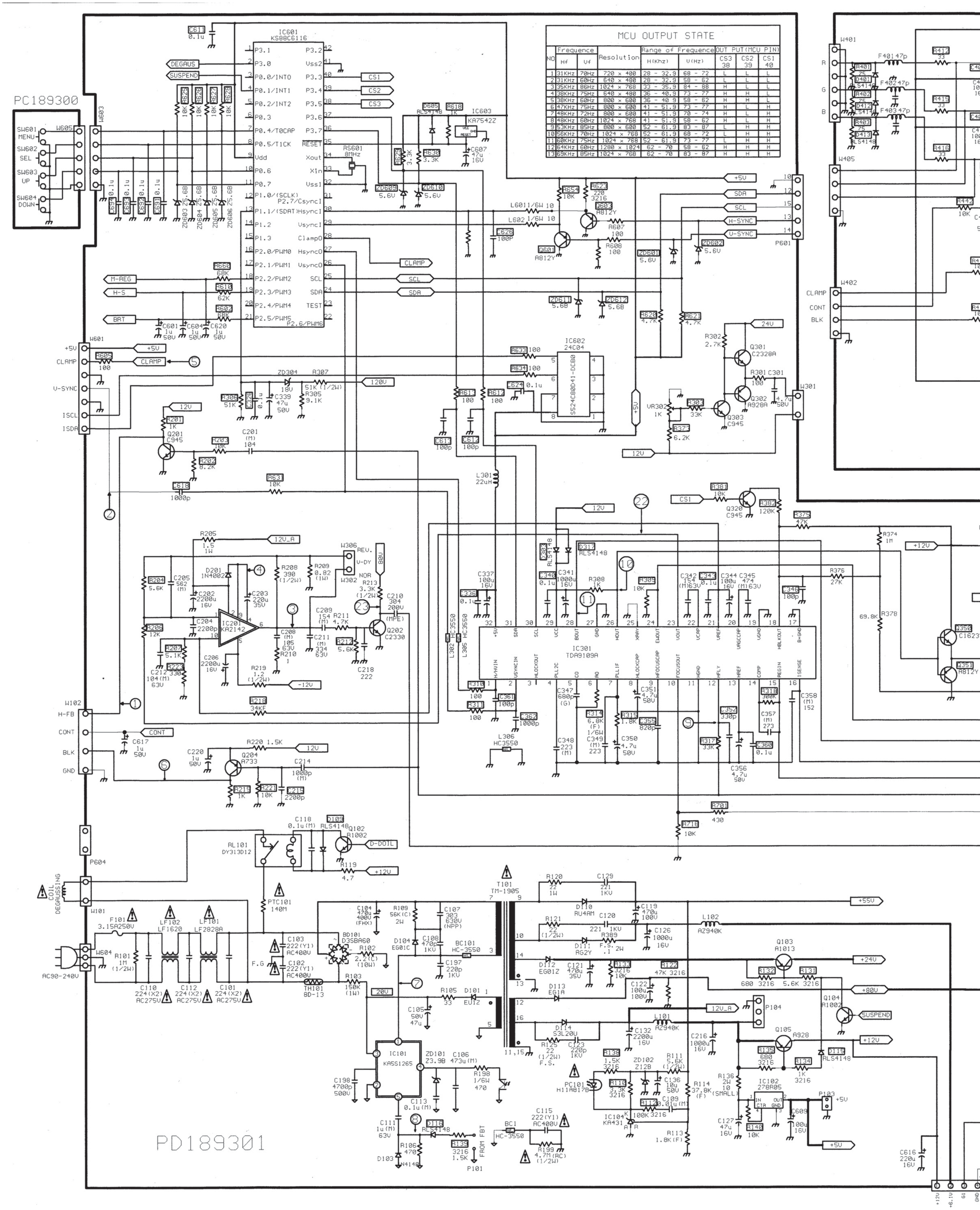


center leg and either of the two outer legs. That's it. You don't care about testing between the two outside legs (I won't get into details) just test between the center and left leg followed by testing between the center and the right leg (this is where you will most likely see the short circuit).

All of the above is so easy, it's ridiculous. It is really amazing what you can fix with just a little bit of knowledge and a couple of meters. Best of all, these tests are accomplished with the power turned off. You can accidentally slip with your meter probes all day and you can't damage anything. Cool.

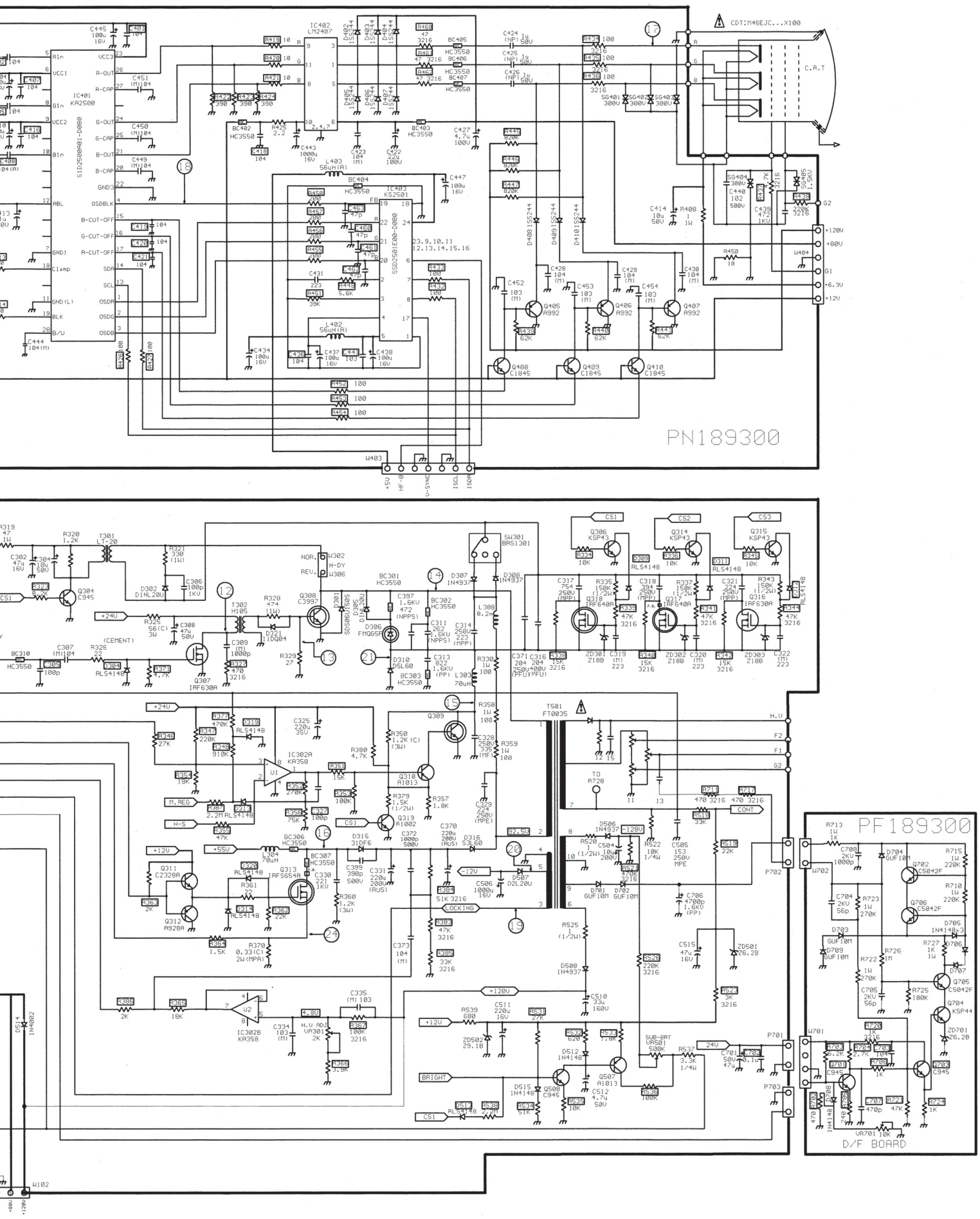
The Giant Leap

However, you quickly reach



MCU OUTPUT STATE

NO	Frequence Hf	Frequence Vf	Resolution	Range of Frequence H(Khz)	Range of Frequence V(Hz)	OUT PUT(MCU PIN) CS3 38	CS2 39	CS1 40
1	31KHz	70Hz	720 × 400	28 - 32.9	68 - 72	L	L	L
2	31KHz	60Hz	640 × 480	28 - 32.9	58 - 62	L	L	L
3	35KHz	86Hz	1024 × 768	33 - 35.9	84 - 88	H	L	L
4	38KHz	75Hz	640 × 480	36 - 40.9	73 - 77	H	H	L
5	38KHz	60Hz	800 × 600	36 - 40 9	58 - 62	H	H	L
6	47KHz	75Hz	800 × 600	41 - 51.9	73 - 77	H	L	H
7	48KHz	72Hz	800 × 600	41 - 51.9	70 - 74	H	L	H
8	48KHz	60Hz	1024 × 768	41 - 51.9	58 - 62	H	L	H
9	53KHz	85Hz	800 × 600	52 - 61.9	83 - 87	L	H	H
10	56KHz	70Hz	1024 × 768	52 - 61.9	68 - 72	L	H	H
11	60KHz	75Hz	1024 × 768	52 - 61.9	73 - 77	L	H	H
12	64KHz	60Hz	1280 × 1024	62 - 70	58 - 62	H	H	H
13	69KHz	85Hz	1024 × 768	62 - 70	83 - 87	H	H	H


PN189300
PF189300
D/F BOARD
C.R.T
CDT:M46EJC...X100
IC401 KA2500
IC402 LM2407
IC403 KS2501
SID2500F01-0000
SSD2501E00-D000
23.9.10.11
12.13.14.15.16
IC301A KA358
IC302A KA358
IC302B KA358
TS01 FT0035
SW301 BRS1301
W403
W102
W404
W702
W701
P701
P702
P703
+5V
HF-B
V-SYNC
ISCL
ISDA
+120V
+80V
+6.3V
+12V
+24V
-12V
-120V
BRIGHT
CONT
M.REG
H-S
H.V ADJ
SUB-BRT
LOCKING

a plateau where there are some things that you just cannot fix using the tools and skills at your command. You are fairly certain that is some simple component failure (because component failure pretty much defines the nature of what a bench tech does) but you are unable to locate the culprit. This is where you need to learn real electronics theory. This is also a substantial leap from simply finding and replacing bad parts. This is real, honest-to-goodness electronic troubleshooting that requires "power on" testing.

What follows then are some real-world troubleshooting events that occurred during the hands-on monitor lab in Puerto Rico. In each of these examples, it would have been possible to locate the problem using power-off testing but armed with a bit of knowledge and a DMM, voltage measurement was a powerful troubleshooting tool that pointed to the correct path.

Tatung 1770
Black Screen – No Raster Visible

Of course, there are dozens of things that can cause this so our first goal is to determine, as quickly as possible, what is missing from the CRT's requirements for producing visible raster: Heater voltage (6.3 VAC or VDC), Screen Grid voltage (0-+250 VDC, adjusted by the Screen potentiometer on the flyback transformer), EHT (+20 kVDC or higher) and, to some extent, the cathode voltages for each of the three electron guns, red, green and blue.

When the monitor was first turned on, you could hear the normal build-up of the static charge on the CRT. The brief hiss suggests that we have good EHT. This was confirmed by using an NE2 Neon lamp, held against the core of the flyback transformer. The continuous orange glow tells us that our EHT is good.

Cranking up the screen pot fully clockwise produced no visible raster.

Now it was time for a quick visual check of the CRT heater. No glow was visible in the neck of the CRT. This, taken by itself, means absolutely nothing. I have seen plenty of working monitors where I was unable to perceive the feeble, red-orange glow of the CRT heater, tucked away at the base of the CRT. If I HAD seen it, I could infer, of course, that the CRT heater circuit was operational and that it was receiving its 6.3 volts from either from the SMPS or from a low-voltage winding on the flyback. I don't care where it comes from; if it is glowing, it's working.

Touching the neck of the CRT with a fingertip, it was more-or-less at room temperature. It sure seems like we are closing in on the problem. We seem to have a problem with the CRT heater circuit.

We have not, at this point, used a meter to test anything at all. Our only piece of test equipment (if you can call it that) has been a Neon lamp and even that was used only to verify our deduction that the EHT is good because we could hear the static charge building up on the CRT.

But this is where it all comes to a grinding halt unless you do a little power-on testing. We need to verify a few things, don't we? Remember, we SUSPECT that the CRT heater voltage is missing. We really need to prove it by measuring the voltage at the heater pins. This is typically pins 9 and 10, typically the top two pins of the CRT socket and typically labeled "H" on the solder side of the neck PCB of the monitor. One pin is typically grounded but I find it easier (and technically a better place to perform the test) to just put one meter lead on each pin. I don't care about polarity. I'm just looking for voltage. Remember too that this voltage may be flyback derived (as it is in Ceronix monitors) and, as such, will be AC. Be sure to set your meter accordingly when you're measuring this voltage. If you don't get a reading with your meter set to read AC voltage, try it on DC. In this case, we had nothing, nada, bupkis.

Important Note: This test was performed with the PCB connected to the CRT. Why? Because in order to test this properly, I need to load the CRT heater source. If I measure the heater voltage at the

CRT socket without it being connected to the CRT itself, I no longer have any load on the CRT heater's power supply. That can produce some confusing readings if you are unaware.

Of course, a dead short CRT heater would also cause a zero volt reading at the CRT socket. I have never seen a CRT fail this way but I suppose anything is possible. I verified the resistance of the CRT heater at a normal five ohms only to be informed by one of the slot techs in the class that this was a working CRT that they had already used to fix another monitor. Doh!

Interestingly enough, when I measured the voltage at the heater pins with the neck PCB off the CRT, I did have the heater voltage. This is always a good thing to do (measure the heater voltage with the CRT disconnected) because if the voltage is there, I know that I don't have a broken connector (wire, trace, etc.).

So, now that we have made a couple of power-on voltage measurements (the first Great Leap) it's time to consult the schematic diagram (the second Great Leap). Up until now, we have been able to repair a ton of stuff without consulting the schematic diagram (finding bad caps and testing big semiconductors) but now, you really need to consult the schematic diagram or this repair is just going to take way too long, tracing the connections back from the heater pins on the CRT socket to wherever it is that they come from.

A quick glance at the schematic shows us the only possible culprits (as far as bad components are concerned) are series resistors R136 and R137 and transistor Q108. Q108 is a series-pass switch. It, along with Q109, allows the monitor's microprocessor to turn off the CRT heater. When the "OFF" signal is high, Q109 completes the ground connection, dragging down the base of PNP transistor Q108, turning it on. This allows current at approximately 8 volts DC to flow

from the emitter to the collector of Q108 (notice how the DC current follows the arrow in the transistor's schematic symbol). Why is it nearly 8 volts and not 6.3? Because we're going to use this same power supply to create a +5 VDC power supply by regulating it with IC102, a 7805, three-terminal voltage regulator. This regulator requires a minimum input of 7.5 volts in order to regulate properly. If the input drops below 7.5 volts, the output will drop out of regulation, with an output of less than 5 VDC.

But why on Earth would we ever want to turn off the CRT heater? The answer is, that WE wouldn't (WE being the slot machine business). WE want our slots on all the time. However, this same monitor can be used as a PC monitor and, as such, it's nice to have the ability to put the monitor to sleep when it's not being used. When the "OFF" signal drops to a logic low, Q109 turns off and so does Q109. This removes the voltage from the CRT heater, saving energy. Hey! That's our problem, isn't it? It sure is. We don't have any CRT heater voltage.

So, we might not have a component failure here at all. Maybe something is telling the CRT heater to stay turned off. Maybe our "OFF" signal is stuck low for some reason. We could continue power-on testing by measuring the voltage(s) at the resistors and the base and collector of Q108 but since the likely failure is in one of these components, why not just turn the monitor off and check these parts safely? If we can't find anything, then we can turn the power back on and measure a few voltages.

As it turns out, we didn't have to go any further. R137 was almost completely open. It had increased in resistance to something like 50 k Ohms. That is why we were able to measure the voltage with the neck PCB removed from the CRT but not when it was under load. See why that is important? Of course, you've figured out by now that the purpose of resistors R136 and R137 is to lower the voltage from nearly 8 VDC down to the 6.3 V required by the heater. Overdriving the heater will greatly shorten the life of the tube.

Wells-Gardner D9300
Black Screen – No Raster Visible

Same symptom, different monitor. In this case, there was an immediately noticeable difference however. There was no EHT static charge sound when we fired up the monitor. This was confirmed by the Neon lamp. It did not glow when held against the core of the flyback transformer. It didn't even flash once (an indication that the monitor has likely entered into a shutdown mode know as "X-Ray Protection," likely caused by a power supply that has gone into an over-voltage condition). There was no subtle "ticking" sound either, a tell tale sign that the power supply has entered into another type of protection mode, known as OCP or over-current protection. It was just plain dead.

With no visible or audible signs of life, it is always prudent to start with the DC outputs of the power supply and see what you have there. Generally speaking, you just hop from one output diode to the other, measuring the DC voltage at the cathode of each one. You don't even need a schematic diagram at this point because you're just looking for "normal" things like +12 VDC, +24 VDC, +6.3 VDC, etc. If you have some or all of them and they look fairly normal, you can be assured that the primary is working properly and you can stay away from that somewhat more dangerous side of troubleshooting. In this case, we had it all. I could immediately identify the standard DC outputs of +12 V, +24 V and 6.3 V. I also found the somewhat less standard but perfectly logical voltages of +80 VDC (the so-called "video B+" as it biases the cathodes in the electron gun) and +55 VDC that is used in the horizontal output and EHT generation circuits.

So, now what? This is where the method of "find bad parts, starting with the electrolytic capacitors and the big semiconductors" falls completely on its face. At this point, you could poke around forever trying to find bad components and never be successful. This is where the Big

Leap of being able to read a schematic diagram and understand exactly how the circuit is supposed to work really pays off. This is where a few quick voltage measurements (augmented by a bit of secondhand experience) point to the cause of the problem.

We may not know what the problem is at this point but we know what it is not. It is not a shorted output device. That would cause OCP and "ticking." We know it's not an X-Ray problem. That would have allowed the EHT to come on briefly and then shut down after a fraction of a second. We know it's not a power supply problem. We just tested all the outputs at the diodes and they all exist. With the schematic in hand, we can see a logical place to continue our troubleshooting. Although we have confirmed that the power supply itself is working properly, we are not at all certain the power supply outputs are reaching their intended destination(s). Just as we saw with the Tatung monitor in the first example, this digital monitor uses a microprocessor to control the outputs of the power supply. In this case, it is not the CRT heater that is controlled but rather the +12 VDC and the +24 VDC outputs.

Q104 is the "ground switch" that is operated by the microprocessor. In this case, the signal is called "SUSPEND" rather than "OFF" but the operation, as you can see, is identical. When the microprocessor brings the SUSPEND signal to a logic "high," Q104 turns on. That sucks the base voltage of both Q103 and Q105 down, turning them both on and allowing the +24 VDC current to pass through to the primary side of the horizontal drive transformer and the +12 VDC current to pass through to, well, to just about everywhere as the +12 VDC is used by almost all of the other ICs in the monitor, including the video output IC on the neck board. When the microprocessor wants to put the monitor to sleep (something we'd rather not see happen in a slot machine) it simply takes the base voltage away from Q104. This kills the horizon-

tal drive and almost everything else except the power supply and the microprocessor. It's interesting that this monitor doesn't kill the CRT heater as well (like the Tatung does) but that's a sort of engineering decision. Leaving the heater on doesn't save as much power when it goes to sleep but it allows instant restoration of the image when it wakes up, rather than waiting for the CRT heater to warm up. The point is moot anyway as our slot monitors aren't supposed to sleep.

But apparently nobody told that to this monitor. There was nothing wrong with the control circuitry. A quick check of the voltage at the base of Q104 (the SUSPEND signal) showed zero volts. The circuit was doing exactly what the microprocessor was telling it to do and that was sleep, sleep, sleep.

If this was the first time I had ever encountered this problem, my next step would have been to use a clip lead or jumper wire (or meter probe) to short the collector of Q104 to ground, listening for the monitor to wake up and give me a burst of EHT static. In this case, however, I recalled a conversation about this exact same problem that I had had some time earlier with Slot Tech Magazine part-time contributor and full-time Canadian, Ted Befus. Since the missing SUSPEND signal comes directly from pin 4 of the microprocessor and the microprocessor is socketed, why not change it out? It worked for Ted and it worked for us as well. In this case, the Great Leap took us right to the problem.

Wells-Gardner D9300
Black Screen – No Raster Visible

Here we go again! Sheesh. How many different failures can cause this same symptom? A lot. In fact, I can see that I am going to have to continue this discussion next month, with two more failures that cause a blank screen, one of which causes OCP shutdown (tick, tick, tick) on one that does not. Until then, happy troubleshooting!

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

- Slot Technical Manager

On-Site Slot Tech Training
Customized Classes Available

Randy Fromm's Casino School is a practical, no-nonsense look at how gaming machines work and how to repair them when they don't. **No previous knowledge of electronics is required** to get the most out of the school. The Casino School is geared for those who want to learn how to fix gaming devices without having to learn complex electronic theory or purchase expensive test equipment.

Be prepared for six hours of accelerated learning each day. Class begins at 9:00 am sharp each day and continues until 4:00 pm. The Casino School provides each student with reference materials and troubleshooting guides that will be valuable aids for repairing equipment on location and in the shop.

Students learn how to work with:

THE DIGITAL MULTIMETER

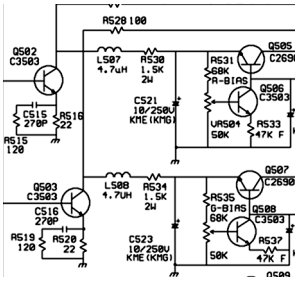
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

ELECTRONIC COMPONENTS

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

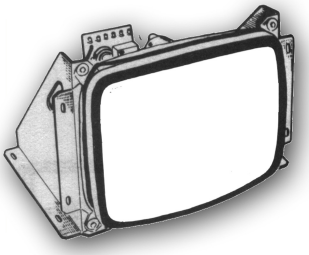
SCHEMATIC DIAGRAMS

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



POWER SUPPLIES

Power supply failure is a common complaint in many different types of systems. Power supply failures are discussed during the class, along with shortcuts for troubleshooting and repairing them.



MONITOR REPAIR

The monitors used in video slots are designed for quick, easy, and safe repair. Students will learn the theory of operation of all types of monitors and how to repair monitors down to the component level. Of course, monitor safety will also be discussed.

You do not have to send your slot techs to Las Vegas or Atlantic City for training. The Casino School brings the training to you. Contact Randy Fromm's Casino School today to reserve a date for your tech school

Randy Fromm's Casino School 1944 Falmouth Dr. El Cajon, CA 92020-2827
tel.619.593.6131 fax.619.593.6132 e-mail CasinoSchool@slot-techs.com
For a complete brochure, visit the website at: slot-techs.com

Subscriptions & Back Issues
Why back issues of Slot Tech Magazine are important to own . . .

Slot Tech Magazine is strictly technical. As such, the magazine's contents are not time critical. The repair information and technical data contained in past issues is just as valid today as it was the day it was published.

Additionally, current and future articles more-or-less assume that readers are already familiar with what has been covered in past issues. This editorial policy assures that Slot Tech Magazine's contributing writers are not limited to "writing down" to the level of a novice technician but are free to continue to produce the most comprehensive technical articles in the gaming industry.

Randy Fromm's 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

Subscription rates:

Domestic (USA & Canada)
1 year - $60.00
2 years - $120.00

International
1 year - $120.00
2 years - $240.00

Back Issues

All single issues of Slot Tech Magazine are $10.00/ea. For further details on the contents of each issue, please refer to the website at slot-tech.com

☐ **2001-2006 DVD Archive - $199.95**

2007 single issues @ $10.00 each
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6
☐ 7 ☐ 8 ☐ ~~9~~ ☐ ~~10~~ ☐ ~~11~~ ☐ ~~12~~

Invoice me!
PO Number_____

Company Name _____
Contact _____
Address _____
Address _____
City _____ **State/Prov.** _____
Country _____ **Zip/Postal Code** _____
Telephone _____ **Fax** _____
E-mail _____

[ ] 1 year subscription, domestic
[ ] 1 year subscription, international
[ ] 2 year subscription, domestic
[ ] 2 year subscription, international

Type of card: [ ] American Express
[ ] Discover
[ ] MasterCard
[ ] Visa

Account Number: _____
Expiration Date: _____

SENCORE

LCD Troubleshooting & Calibration Tech School

Day 1 - Equipment Familiarization Troubleshooting
- LCD Display Overview
- How LCDs work

Day 2 - Hands-on LCD Monitor Troubleshooting
- Techniques and Shortcuts
- Block Diagrams and Hands-on Exercises

Day 3 - LCD Inverter Power Supply and SMPS Troubleshooting
- Intro to Power Supplies and their Uses
- Experiment with SMPS and Inverter Power Supplies

Over 70% of Class Time is Hands-on!

Call today! Class size is limited to 20 for maximum hands-on experience!

http://www.sencore.com **email:gaming@sencore.com** **1.800.736.2673 or 1.605.339.0100**

THOUSANDS OF PARTS FOR ALL YOUR GAMING NEEDS

HAPP®

GAMING PARTS
PUSHBUTTONS
MATERIAL HANDLING
BILL VALIDATORS
SEATING

SECURITY
LIGHTING
CLEANING
& MAINTENANCE
TOOLS

ACCESSORIES
ELECTRICAL SUPPLIES
MONITORS
& TOUCHSCREENS
CONTROL BOARDS

Go Online to ***happ.com***
or Contact Us Directly
Toll Free Phone: 888-BUY-HAPP
Toll Free Fax: 800-593-HAPP

SUZO • HAPP GROUP

GO ONLINE OR CALL TODAY FOR OUR FULL COLOR GAMING CATALOG 2006-2007