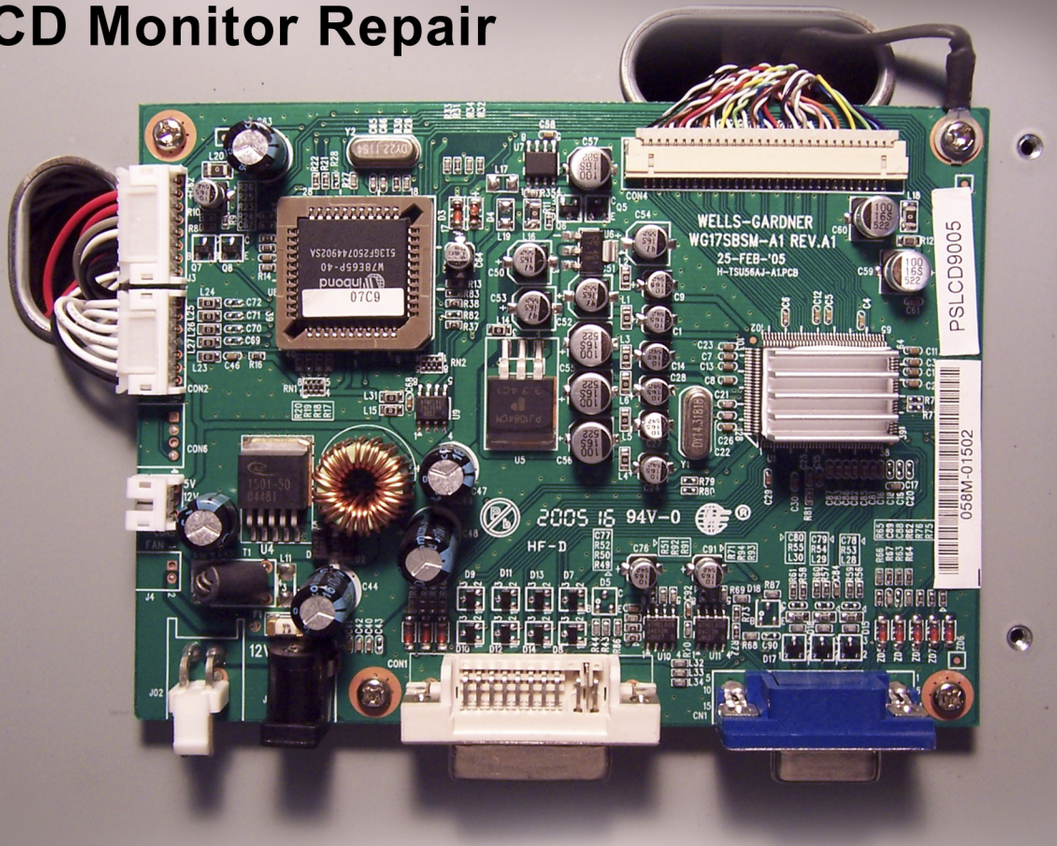
May 2010

SLOT TECH MAGAZINE

Slot Machine Technology for the International Casino & Gaming Industry

LCD Monitor Repair



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Left For Dead

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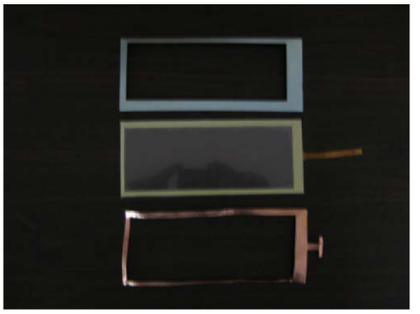
Slot Tech Magazine

Touch Screen Available Now For 6.2 inch IDW & Hitachi LCD's in Bally IView Player Tracking System



Part #8950

Part #8950

PARTS FOR BALLY IVIEW PLAYER TRACKING SYSTEM

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#9890 – 5 wire touch screen for 6.2 inch Hitachi LCD #TX16D11VM2CCA (does NOT include metal housing or copper foam)
#8650- Single cold cathode lamp assembly for 6.2 inch "IDW" LCD
#8680- Single cold cathode lamp assembly for 6.2 inch Hitachi LCD #TX16D11VM2CCA
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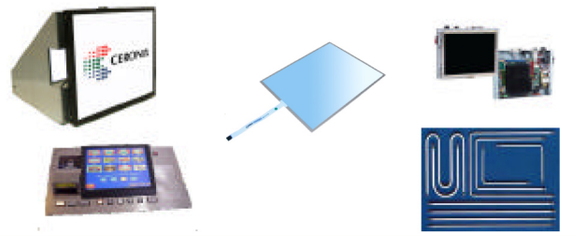

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Randy Fromm

As this issue goes to press, I am getting ready for TechFest 20 to be held at Mystic Lake Casino, as usual. There are some 60 slot techs scheduled to attend the event from 23 different properties located across the USA and from as far away as Austria (the one WITHOUT the "L" and no Kangaroos). I'll publish a full report next month.

The reason I mention it now is that I'd like some suggestions about where to hold the next event. Would you like to host TechFest at your property? I am wide open to suggestions about where to hold it. Events in Las Vegas and California don't seem to be well-attended so I am probably looking elsewhere but I am open minded.

This month, we're going to continue with our series on LCD monitor repair with a look at the video PCB, also known as the A-to-D PCB or the scalar. You'll see that broken down into just four sections (input, scalar, microcontroller and DC-to-DC conversion) it's really pretty easy to understand. Man, them parts is tiny though.

See you at the casino.

Randy Fromm

Randy Fromm - Publisher

Randy Fromm's
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Bob Yabroff
President

"I have always supported Slot Tech Magazine"

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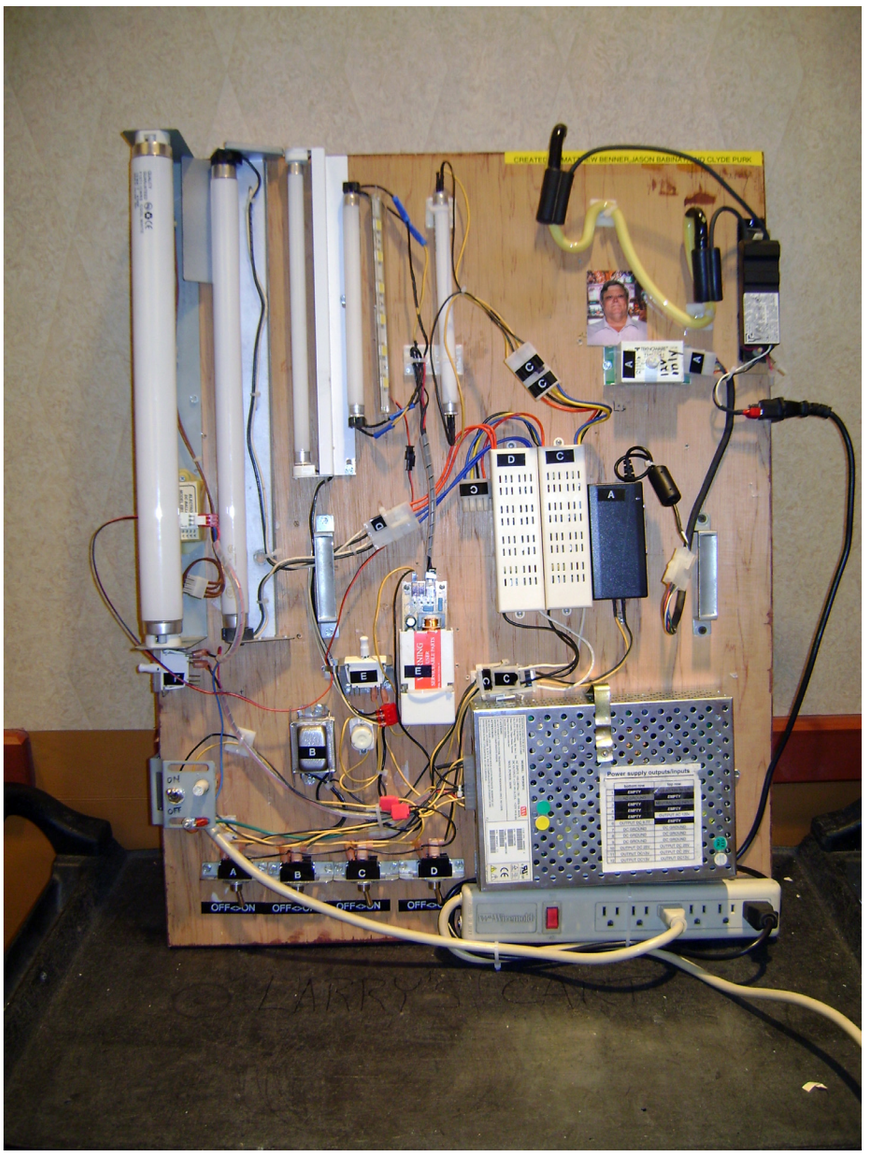
LIGHTBOARD

By Matt Benner and Clyde Purk

If you're like most casinos, you have a parts bin that tends to get filled up from time to time. At our casino, the procedure is to test the parts and label them before they get put back in stock. We needed a way to test our parts (specifically our ballasts) after we rebuilt them so we wouldn't have to go out to the floor and tie up a machine so we started to look around our tech office to see what we could put together. That's when we had the idea to utilize an IGT (WinTact) power supply within the design.

It started out as a simple IGT ballast tester that grew and grew as different techs added their own little touch to it. As more ballasts and lights were added and it became bigger, we were forced to change the layout of the board. We also realized that some safety features were needed so that no one got hurt. Toggle switches were added for the main power along with an LED indicator light to show that the 120vac is turned on. Each end of the ballast and light were labeled so you would know what bulb goes to what ballast. After that, we added the cherry switches for some of the smaller voltage ballasts. Then, we needed 120vac to run a couple of the ballasts so we ran heavy duty toggle switches for those. We use the IGT DC power supply to give us all the voltages we could ever need. Here's the pin-out of the power supply:



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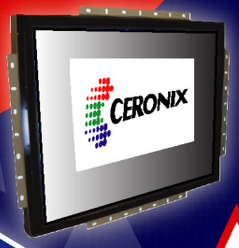

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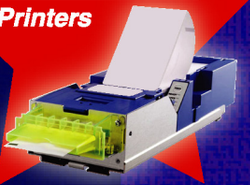

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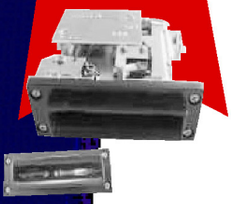

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6	OUTPUT 13v p=p SQ. WAVE reads ~6.6 VDC with DMM	EMPTY
7	DC GROUND	DC GROUND
8	DC GROUND	DC GROUND
9	DC GROUND	DC GROUND
10	OUTPUT DC 25V	OUTPUT DC 25V
11	OUTPUT DC 13 V	OUTPUT DC 25 V
12	OUTPUT DC 13 V	OUTPUT DC 13 V

We have the 13vdc, 25vdc, and 120vac. It works great!

We can test pretty much any ballast or light we come across on our floor. It's an excellent teaching tool as you can have new techs trace the wires and voltages from point A to point B and get them accustomed to using a multi-meter in a test setting without the risk of damaging a machine. It was also a good way for all of us techs (new and old) to familiarize ourselves with the functionality of this power supply. It's completely mobile. All it requires to work is 120vac. Everything you see on this board is stuff that you would normally find in a casino's tech office. It's amazing to think it started out with just an IGT ballast and an idea. We had a great time building this and we encourage everyone to try different projects (big or small) to better themselves as Brothers of the Bent Screwdriver! We'd also like to thank Herschel Peeler and Randy Fromm for the encouragement and inspiration for this build.

STM

Slot Tech Press Release

BALLY TECHNOLOGIES NAMES SUZO-HAPP AS ITS EXCLUSIVE DISTRIBUTOR FOR THE ILLINOIS VIDEO-LOTTERYMARKET

Bally Technologies, Inc.has named Suzo-Happ Group North America as its exclusive distributor for the new Illinois video-lottery market. Under the terms of the agreement, Suzo-Happ will promote, sell, service, and maintain Bally's gaming devices for the state's new video-lottery program, legalized in July 2009. The new program permits a limited number of video-lottery terminals in licensed bars, taverns, restaurants, truck stops, and certain other venues that offer onpremise alcohol consumption, and requires that the video-gaming devices be sold through a distributor. More than 21,000 Illinois restaurants and bars serve liquor.

"Partnering with Suzo-Happ as our exclusive distributor in Illinois makes good business sense because of the company's leadership position as a key supplier to both the gaming and amusement industries, their strong team, and the company's already well-established relationships with Illinois operators who currently market other products to bars, restaurants, and truck stops" said Gavin Isaacs, Chief Operating Officer of Bally Technologies.

"We're excited to help facilitate Bally's entry into the Illinois video-lottery market and represent Bally's cutting-edge games to our customers and partners throughout the state," said Tom Happ, Executive Vice President, Suzo-Happ. "As an Illinois founded and based company, with more than 150 employees in the state, we want to do everything possible to help this program succeed, and that's why we've teamed up with Bally Technologies, a 78-year old gaming leader with strong roots in Illinois."

The New Las Vegas Strip.

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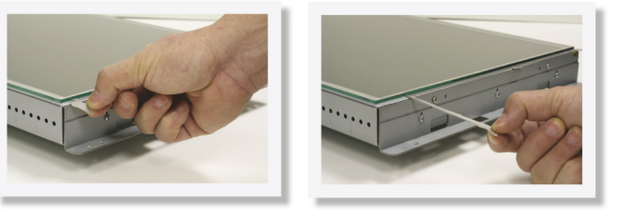
Command Strips for Touch Sensors help save slot technicians time and casinos money with a quick-to-remove and easy-to-integrate solution for touch displays. Once a touch sensor is mounted with Command Strips it takes only seconds to remove a damaged touch sensor or the working sensor from the damaged LCD display, and then only minutes to reintegrate it. Compared to today's 45-60 minute industry average for removing and integrating a touch sensor, that's time and money saved.

Quick to Remove

When a touch sensor needs to be removed, use Command's "stretch release technology" by pulling the "pull tab" at a 90 degree angle so the sensor pops free in seconds. And, these "no mess" strips don't leave an adhesive residue that can be difficult to clean up.

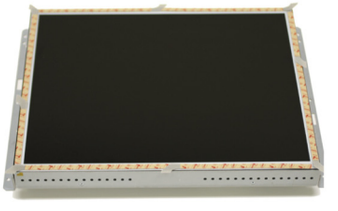


1 Pull Tab at 90 Degrees

Easy to Integrate

Using "peel and stick" Command Strips, a touch sensor can be easily integrated to a display in minutes and quickly put back into service.

1 Apply First Four Strips



2 Apply Next Four Strips

3 Mount The Touch Sensor

Watch Video

See how easy it is to use Command Strips for Touch Sensors to integrate sensors and to remove sensors at www.3m.com/touchstrips. Seeing is believing.

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Left for Dead

By Kevin Noble

IGT S2000
Left for Dead

We had a small, ten-game IGT S2000 tournament GME1 & GME2 software upgrade. This project went down without a hitch. The upgrade went smoothly, the options, ticket and bill testing went down without a flaw. We passed the sealing and final inspections on to the next shift. When we came in the next morning two games had no display and the BV light was blinking blue. At first we thought that one of the chips had been placed in backwards and that we were going to find a fried chip. First checking the game that was powered off we found a folded over pin on the base chip, on the second game we found the base chip moved one spot over in the socket. We could not believe that both games were left powered on all night and nobody tried to troubleshoot the both problems. We got lucky after reseating both chips correctly the games came back to life and no RAM clear or chips were needed.

IGT S2000
Manual Jackpots

After two and a half days sitting "out of order" on the floor, Reggie noticed that these two IGT S2000 games were out of service. When he opened the games, he discovered both games were looped out of the EZ Pay system and placed out of service on another shift. These games were not passed on in any shift reports or relayed to any other personnel in the department as to what the problem was or why they were down, so Reg decided to open the games up to see what the problem was. He did notice the fiber was disconnected and the game looped out so he decided to re-connect the fiber and placed them back in service. Reggie plugged in each game about an hour apart to see if any problems might arise. He did this to notice if any problems came up that would bring the bank down and he could troubleshoot right away. About two days later everything on that CVT was experiencing manual jackpots. Reggie remembered the exact two games that were looped out and decided to check the signal strength in the first game. Much to his surprise, it had no fiber signal. During a CVT report he noticed that the CVT was experiencing machine loop down. Reggie went back to the first game that had no fiber signal and looped out the game and the entire CVT game back online. He next changed out the power distribution box and the bank came back to life along with the second game that was placed out of service.

IGT I-GAME
No Power to CPU (Times 2?)

This game was passed on to the day shift also and it was brought to our attention that the power supply to the game had been replaced twice. Reggie checked the MEAL book where it was documented that the power supply had been changed and noticed that there were machine lights but no CPU lights. He checked one of the fuses on the motherboard and noticed it was popped. He replaced the fuse and noticed when the power was turned on the CPU

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would now flicker but the game lights were now off. When he removed the CPU and powered up, the machine lights would come back on. He next had the seals removed and he replaced the CPU, performed RAM clear, set options and discovered the CPU was causing the fuses to pop. The same thing happened to me on another game on the same bank. The day before I upgraded an IGT I-Game's motherboard and CPU with the legacy board. The game allowed me to RAM clear the game and set the options and all it needed was to be bill and voucher tested. The next morning I walked by the game and noticed it was powered off. I opened the machine door and noticed that the On/ Off switch was still turned on and there were no lights on the CPU. I powered down the game and powered back up and noticed the monitor flickered on for a second, no CPU lights and no machine lights. I removed the CPU and powered it back up and everything came on. I wanted to see if it was the legacy board with all the EPROMS on it or just the new CPU. I placed the CPU without the legacy board and powered up the problem came back. Funny how two CPUs on the same bank but two different situations with the same problems come up.

IGT I-GAME
No Power to CPU
(Different Game)

The exact same problem to us again that was described above except for no machine lights in the top box and no picture on the monitor. When entering the top box, he did notice the strong smell of something that had fried. Once the fluorescent bulb was removed from the game, the game powered back up. Andrew replaced the 15W ballast and replaced the bulb and power was restored back to the CPU. About 10 minutes later he was called back to the game with the exact same problem. He next tried the power supply and the problem has not resurfaced since.

Aristocrat Viridian
Game Fading On?

During recent software upgrade that started on another shift, this one machine was completely blank with no power. Coming in on the day shift it was passed on to us. After getting organized in the morning we strolled to the game and noticed that when you powered the game up and waited a couple of minutes, the game would slowly turn itself back on (it seemed). The game power supply was swapped out and the software upgrade was completed.

IGT I-Game
CGF Error

Running out of time to get the last of the obsolete conversion games converted before the theme has to be disabled we tried to get in two game projects but ran into two small problems. First we found out the CGF card was bad. We tried to clear the game but after the game prompted us to turn the reset key, the error "check the CGF card" appeared. We then used the other card from the other conversion game which allowed us to go through the RAM clear process and set the options. Moving to the other game in the project we borrowed the good CGF card and placed it in the new CPU board along with the clear chip and cleared the RAM. We inserted the new Base chip in and powered the machine up. When the machine prompted us to turn the reset key, the CGF error appeared on this game also. Knowing that the CGF board worked in the first game, I decided I was going to use the legacy board from the known good game when we discovered a capacitor had broken off and was lying on the CPU board. Comparing both CPU board we scanned each board for the placement of the missing Capacitor and noticed the C166 was missing. We reconnected the Capacitor and the CGF error went away after we re-cleared the game.

Subject: TechFest 20
Date of Event: May 4-6, 2010
Location: Mystic Lake Casino Hotel

Schedule of Events

Events subject to change

Tuesday, May 4, 2010
9:00 am - 12:00pm
Power Supply Repair - Presented by Randy Fromm - Let's face it, we have a lot of power supply failures in slot machines. Some power supplies are more-or-less disposible due to their cheap replacement cost but many of the supplies we find in slot machines are custom-built units costing hundreds of dollars. For example, the ability to repair Aristocrat and IGT power supplies (actually manufactured by Setec and Win-Tact respectively) in-house will save your casino hundreds or even thousands of dollars in a year. We will cover the operation and repair of power supplies in detail during this session.

1:15pm - 3:15pm MEI - BV troubleshooting and repair - Suzo-Happ's Director of Training and Service David Oldham will discuss BV operation and service. Troubleshooting guides and handouts will be presented to help speed through troubleshooting in the shop.

3:30pm - 5:30pm FutureLogic Ticket Printers - Suzo-Happ's Director of Training and Service David Oldham will discuss FutureLogic printer operation and service.

Wednesday, May 5, 2010
9:00 am - 12:00pm CRT & LCD Monitor Repair - Presented by Randy Fromm - Video slot monitors are a lot easier to fix once you know how they work. Some understanding of electronic components will be helpful as this session will be somewhat more advanced than at previous TechFests.

1:15pm - 3:15pm 3M Touchsystems Touch Screens - Touchscreen Technology Presented by Paul Hatin and Mark Roberts - 3M Touch Systems Field Application Engineers - It is really amazing how touchscreens actually operate. During this session, touchscreen theory of operation will be presented along with diagnostic and repair techniques.

3:30pm - 5:30pm Incredible Technologies Slot Machines - Incredible Technologies has been credited by many operators as one of the most important and innovative manufacturers of video games in the world. Their "Golden Tee Golf" game revolutionized the online game tournament. Now, IT brings their team of manufacturing and design experts to the casino industry and to TechFest 20 with a close look at their IT slot machine. You will not want to miss this presentation.

Thursday, May 6, 2010
9:00 am - 12:00pm Ceronix CRT and LCD Monitor Repair - Presented by Troy Nofziger - Ceronix
Armed with a general knowledge of how monitors work (and how to fix them when they don't) it's time to look at Ceronix. The Ceronix design is unique in the entire world and requires a bit of specialized knowledge in order to be successful at repair. LCD Monitor repair will also be covered. Ceronix's most experienced bench tech, Troy Nofziger will instruct.

1:15pm - 3:15pm Transact Technologies Ticket Printers - Transact Technologies' Russ Wigé presents servicing and troubleshooting Transact brand, thermal ticket printers. These units are simple to understand and troubleshoot, once you know how they're put together.

3:30pm - 5:30pm JCM Bill Validators - This is arguably the best seminar of its kind in the gaming industry so we've saved the best for last. This presentation will be given by JCM's Jack Geller. This is your chance to ask the world's #1 expert about your JCM "issues."

To sign up for TechFest 20, visit the website at Slot-Techs.com

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Bally Alpha S/A
Progressive
No Power
Slot Tech Gary was called to this game. The game was blanked out, displaying only the Mikohn display that was still scrolling. After troubleshooting the power problem, Gary noticed that the main fuse had been blown. After replacing the fuse, the reels would not do a recovery spin plus there were no lights and no printer. He also noticed the 24 V fan in the game was not working but the game did came up enough so he could go through the options and get the progressive figures. He had to change the 24 volt power supply.

Konami Advantage + Conversion
923 Software Error
Cannot Clear
During a recent conversion of Konami 3 reel advantage to 3 reel advantage + games, we had to exchange the top boxes, monitors, reel assemblies, and new cables. We also had to replace the CPU boards to ones with expansion boards and piggy back boards to complete the conversion. About a week after the project was completed and placed in service, the error message "923 Software error" came up. I powered down the machine and allowed it to reboot itself to witness what was happening. Once the game went through the boot up process and verified all its tests I would place the game in service, but it lasted about ten seconds and the error would came up thus disabling the game. I had to perform a soft clear, verified all the options, and tested the machine so it came to be ready for AGCO.

Konami Advantage + Conversion
Reel #2 Error
In the same conversion, we could not clear this reel #2 error. We first swapped the reel #2 with Reel #1 and the problem still existed. We tried swapping the complete reel bracket with all the reels and the problem did not move. Since it was a conversion and new parts were added, we decide to swap the new reel harness that plugged into the motherboard but that was not the problem. Next, we decide to swap the CPU with another game with the same theme and the game did come on line. So we replaced the CPU board and the game was eventually placed in service.

Konami Advantage + Conversion
System File Error
Finally the last but not least after converting this game, performing the RAM clear, when the game started performing its routine verification process "System File error" in nice red lettering reared its ugly head on the screen. After trying to reset the error, it would not go away. We swapped CPUs with another theme and the problem went away. Eventually the CPU was replaced and the game went in service.

IGT SAVP
No Signal Error
During another software upgrade we had to replace the Boot 1 and Boot 2 chips in all our SAVPs. We were hoping it would be a quick swap, boot up, and clear the errors to get the games back in service but it was not. We had to reset the enable the progressives, set the progressive values, and set a couple of minor options which was not too bad. This one game was a thorn in my side for a couple of weeks. After exchanging the chips the game went into "no signal" error. We tried swapping the PCI slot card and the game came up. After AGCO sealed the case the game went back into the "No Signal" error once again. We tried swapping a new card when I was removing the small chip I broke a pin. I had to order a new one. Once that came in and I removed it from the package I notice one on the legs was bent on a 30 degree angle. Another Tech tried bending it back in place and "SNAP" there goes the second one. Vowing that I am not going to touch this game ever again a third chip came in, it was replaced and the game and it came back to life. AGCO came in, sealed the cabinet and the game

was placed back in service. About a week passed and there was a message for me the next morning to look at the game because there was a “No Signal” error on the game. Sticking by my guns, Reggie had the seals broken on the game and noticed that when you bumped the cabinet or the protective shield that covered the CPU and wires, the game would black out. He starting troubleshooting further and discovered that the harness inside the CPU that plugs into the outside power cable had a loose pin and when it was bumped it would disconnect. We replace the cable inside the CPU case and the problem went away.

IGT SAVP AI014-045 to A1014-060 Monitor Problems

A very weird thing happening on this game right after we upgraded to the new AI software, the monitor shifted all the way to one side so that you could not set the options. When the old software was reloaded back in, the game the problem went away. We tried swapping monitors with another game but the problem stayed with the game. Our regional IGT Technician, Wendell, tried many different things to try and get this game running. He later found out that it might be the type of monitor being used in the game. A couple of games over from the bad game, the new software allowed the same theme to work. We noticed that the game had a Kortek monitor and the one that did not work had a Tovis. Upon installing a new Kortek monitor and powering up the game, we completed our upgrade, RAM cleared the game again, set the options and the game started to function normally. Just keep this in mind if you ever upgrade you games in the future.

- Kevin Noble
knoble@slot-techs.com

slot-tech.com=Technical Server

Slot Tech Training at Yakama Legends Casino

This was my new, four-day class that covers power supply repair and LCD monitor repair. We still have lots of fun, hands-on labs for component identification and testing (including the soldering lab (right) using junk chassis generously donated by my friends at Wells-Gradner Electronics) but I have dropped CRT monitor repair completely, cutting a full day off the class. I enjoyed my time in Toppenish, Washington and although the class photo looks like a rather serious affair, we all actually enjoyed the class a great deal. -rf

Matt Valencia and Rusty Mitchell hone their soldering skills by working on junk monitor chassis. Each student receives a digital multimeter and a soldering iron that is theirs to keep after the class. We also put together a fun "European Siren" project.

Back Row, Left Standing Candice Bueno, Rusty Mitchell, Willie Simms, Michael Adams- (Dark Glasses)Franklin Janis, Randy Fromm, Roma Sohappy-MA-Tech, Tyson Tahsequah, Darcy Stahi, Coyote Gunyon Front Row, Matt Valencia, Roger Steen, Eric Ganuelas, Darrel Sampson, Angelica Garcia

Quick & Simple Repairs #62

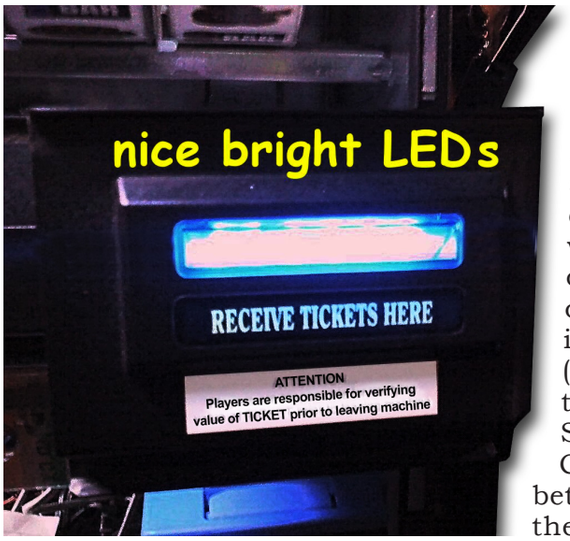
By Pat Porath

Bally Printer Bezels

We have had some Bally Alpha Series LED printer bezels go black on the floor. The games look a bit plain when they are out. To me it looks really tacky when a bank has a couple out and the rest are lit up. As pictured, each printer bezel LED board contains six LEDs that emit blue light and each game has two boards, one on top of the bezel and one on the bottom. The boards require 24vdc and each LED is wired in series. As a refresher for anyone, when lights are wired in series all of them must work for a complete working circuit. If one bulb or in this case an LED goes out, they all go out, similar to series-string Christmas tree lights; if one bulb goes out, they all do.

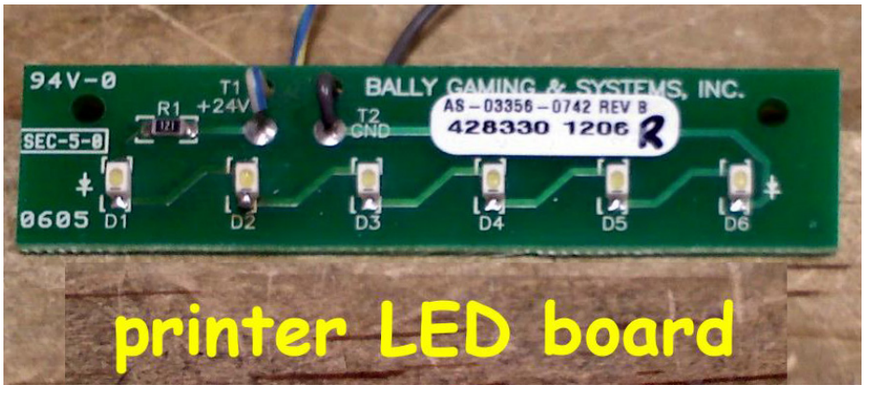
Back to the LED boards, I asked a bench tech to take a look at the boards to see if they could be repaired. The following day I had all of them that were removed, repaired and on my bench. They were installed in games and every one worked. I asked what the repair was and they said a couple of the LEDs were bad. I didn't think we had any just laying around so I asked where they got them from. They said the spare LEDs were removed from an old bonus device from a top box of a game that was going to be thrown away. Very cool I thought. I asked to have some replacement boards ordered so I can have some spares to work with. When all of the bad ones are replaced, I'll have some spares so I won't have to wait for them to get repaired or wait for more to be ordered. Once I get caught up with the bad ones, I should always have spares.

To replace them it is very simple, a total of 12 screws and one connector; that is all. Nothing difficult at all. These are on the "Bally Alpha Series" games, the Bally part number is AS-03356-0742 and there are two per game, one for the upper part of the bezel and one for the lower. With ALL of the lights lit up on a game, it looks good like it should.



Sentinel III Troubleshooting

A "yellow band" around the Oasis display - no COM with the game, check the connections on the interface cable. (Cable that connects the game to the Sentinel.) There is a COM problem between the game and the Sentinel.



A “red band” around the Oasis display - no COM with the poller, a Sentinel to poller problem.

A “white line” on the Oasis display - the EEPROM may not be seated properly or it needs to be replaced.

A “star burst” on the Oasis display - the power supply needs to be replaced

Black Oasis display, no graphics, no nothing - check the connectors on the display end and on the Sentinel end to make sure they are secure. Also check that the Sentinel has power to it.

Card reader not working - check connections on the card reader cable, on the Sentinel end and on the card reader itself. Try a different card just to make sure it is a card reader problem. Try rebooting the Sentinel. If it still doesn’t work properly, replace the card reader.

Touch screen not working properly on Oasis display - reboot the Sentinel. Next, try calibrating the display. Check display cable to make sure it is seated properly.

Sentinel III Hardware Features

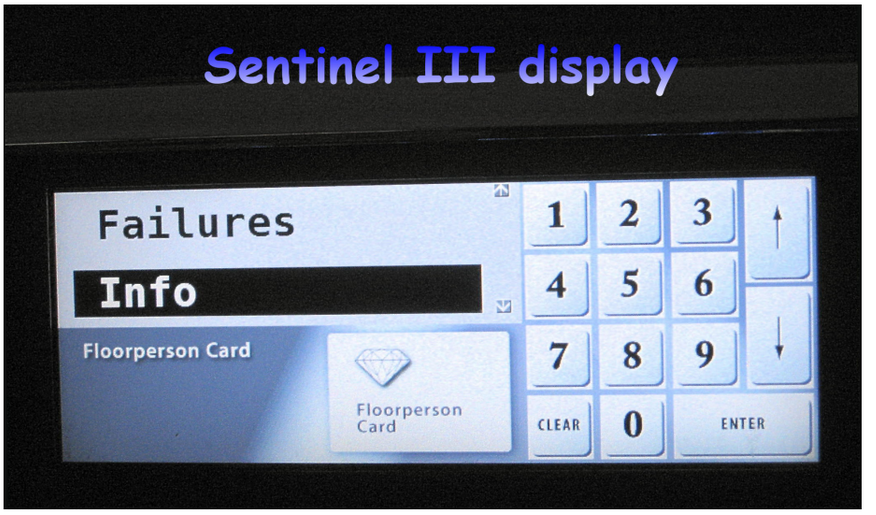
433 MHz processor
A “Windows based” CPU board
6.2 inch TFT active matrix LCD with touchscreen
1 MB non-volatile memory
128 MB processing memory
32 MB program storage
10/100 Mbps Ethernet interface
USB 1.1 host interface
Two Compact Flash memory cards, one OS card and one display media

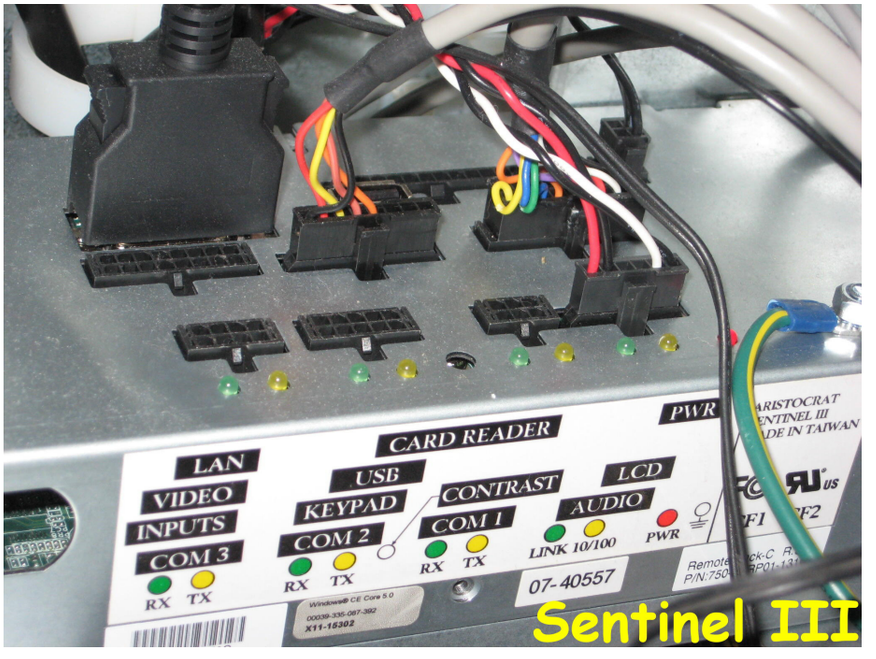
Compact Flash cards can be up to 1 GB each

Atronic e-motion “CD Error”

I received a call to an Atronic e-motion game that had a “CD Error.” I removed the disk from the drive to see if it was dirty or not. It was a little bit so I wiped it off with a soft cloth and tried another reboot on the game. Unfortunately, the same error appeared not long after I turned on the power switch. Another indication that there is a good chance of the game booting up is a white “loading bar” will appear at the bottom of the screen. During most of the troubleshooting process it didn’t appear.

Next I swapped the disks with the game next door. They both had “Golden Harp” programs, so I thought why not? With a different disk in the drive, the game was booted up once again but the error came back. It was looking like a CD drive problem now. I opened the drive and tried a bit of compressed air, but that





didn't help either. Now it looked to me like the drive needed to be replaced. We had plenty in stock so I installed a new one. This time when it booted up the "loading bar" appeared on the bottom of the screen and it looked like it was loading perfectly. Once complete, the game was back online. Simply a bad CD drive.

Bally Game Wouldn't Cash Out

I've had this specific repair happen a few times. I receive a call from a slot attendant that a Bally Cinevision or Reelvision game won't cash out. My first question, "Is it "promo cash?" (Also known as P.B.T. personal banker transactions.) If the credits are "promo" the game won't allow it to cash out. My second question, is the game "idle" and not in the middle of a game? Are there credits bet and the game needs to be played before it will cash out the credits? When the answer is NO to both questions, then it is time to look at the cashout button itself. I opened up the game to reveal the button area, only to find the cash out button connector almost falling off, not making connection to the button at all. Simply push the connector snug onto the button, that is it. Close the door and the game will cash out the credits. A possible theory on how the button becomes loose? Maybe from the door being opened and slammed shut numerous times or maybe from a customer pounding on the button.

Konami Advantage Bill Acceptor Problem

I had a Konami game with a UBA and it would not take a bill or ticket at all. Numerous times I tried reseating the stacker box and reseating the UBA itself without any luck. Visually, there didn't seem anything wrong with the stacker box. It was the "updated" type with the three white dots on top. I didn't see anything broken or out of place on it either.

After trying and trying it was decided to replace the stacker box with a brand new one. Not a used one, but a NEW one. I signed out the proper keys, got a security guard and proceeded to replace it. Once replaced, I should have signed out a "tech wallet" with cash and tested it just to make sure but it is a popular game and it wasn't long before a customer sat down and inserted a bill. On the first try the game accepted the bill without an error. I'm not exactly sure why but these games seem to like NEW stacker boxes. When the games were installed I think USED boxes were installed and it appears that was a mistake. We should have used the new ones. I didn't think it would really matter much, all the UBA boxes we have aren't very old and all of them were "updated." Since there were problems, I will only be installing new boxes with new games. Even if there are problems with a different manufacturer of game that has a UBA, I would try to replace a stacker box that is giving you problems with a new one if at all possible. It may save headaches down the road.

- Pat Porath
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LCD Monitor Repair
Scalar PCB Overview

Slot Techs are used to modular repair. Almost everything in a slot machine system is modular in its construction and can be treated as such when it comes to repair. A power supply goes bad? Pop it out and slap in a new one in just a few minutes. A defective reel slips out and a new one is installed in just seconds. You know the drill.

Of course, the same holds true for LCD monitors as well. If all indications point to a bad monitor (IE The game has power-fans running, lights on-the BV runway lights are flashing properly, accepts and properly displays when slot tech's card is inserted into the card reader, etc.) and yet all the connections to the monitor seem secure upon inspection, the next step in troubleshooting is generally to toss in a replacement monitor and see what happens.

With the bad monitor back on the workbench in the shop, troubleshooting becomes a simple matter of substituting modules. There are only four, generally speaking: The power supply (which may or may not even be a part of the monitor itself), the inverter(s) that drive the CCFLs in the panel, the LCD panel itself (with its replaceable CCFLs but otherwise non-repairable electronics) and the scalar PCB (also known as the A-to-D PCB or the video PCB) that takes in the analog or digital video signals from

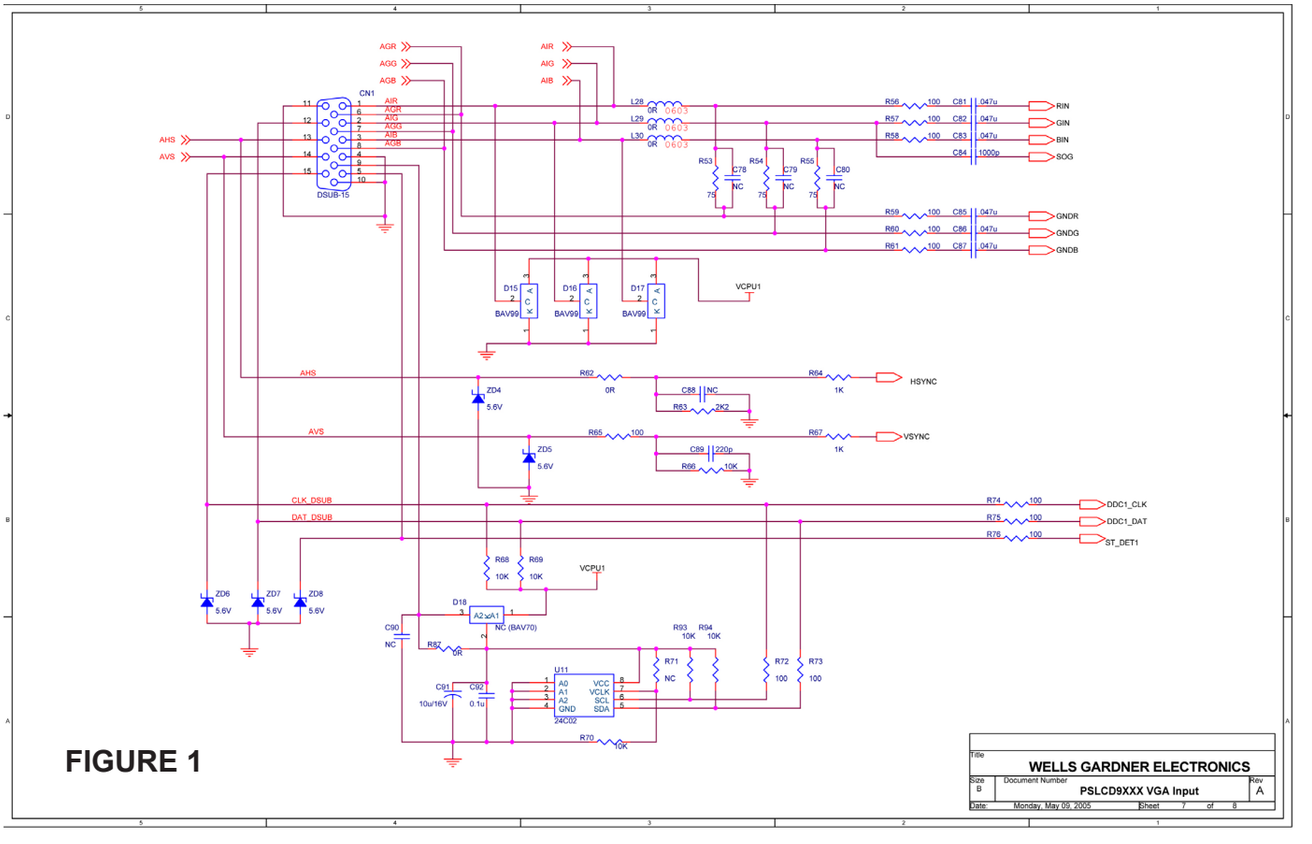


FIGURE 1

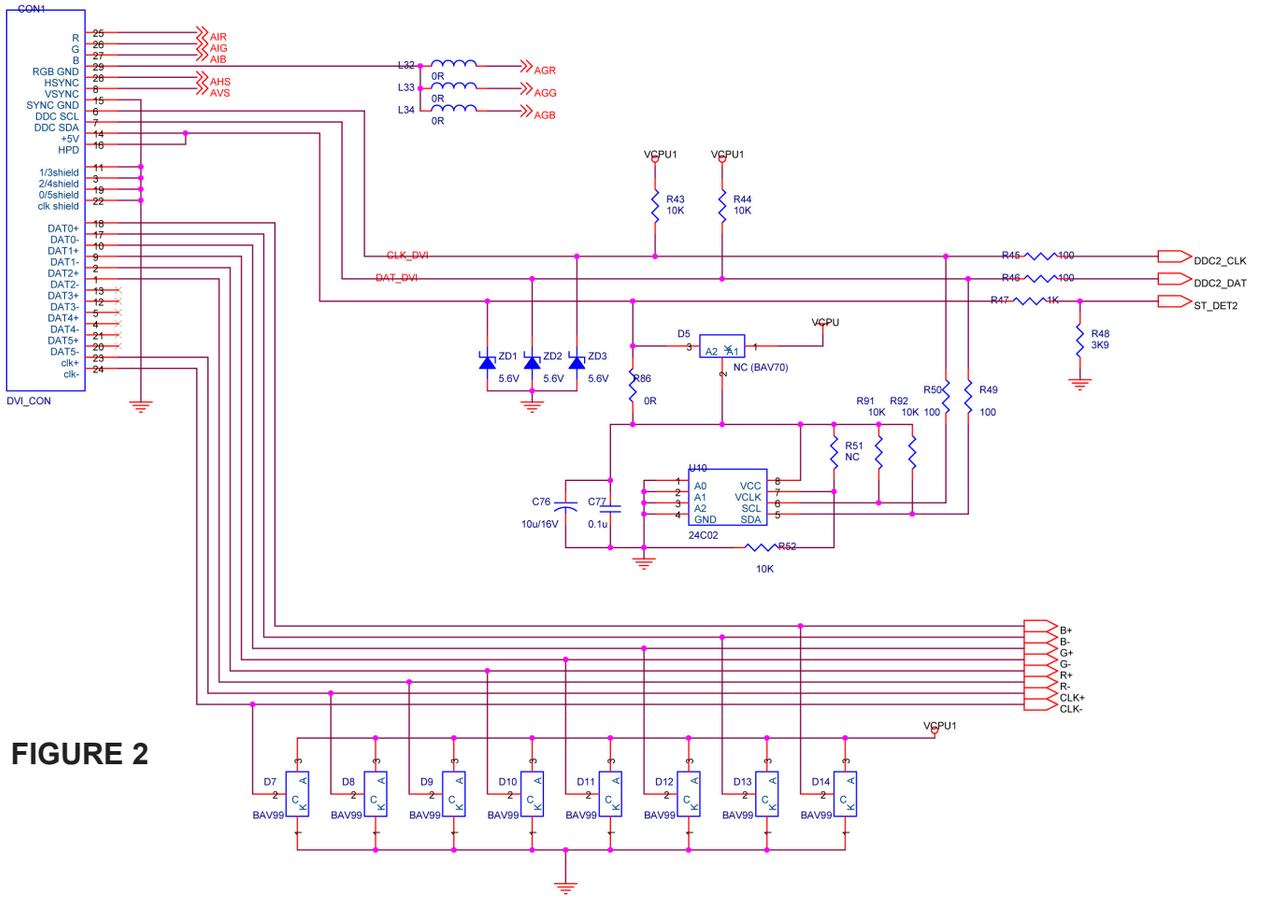


FIGURE 2

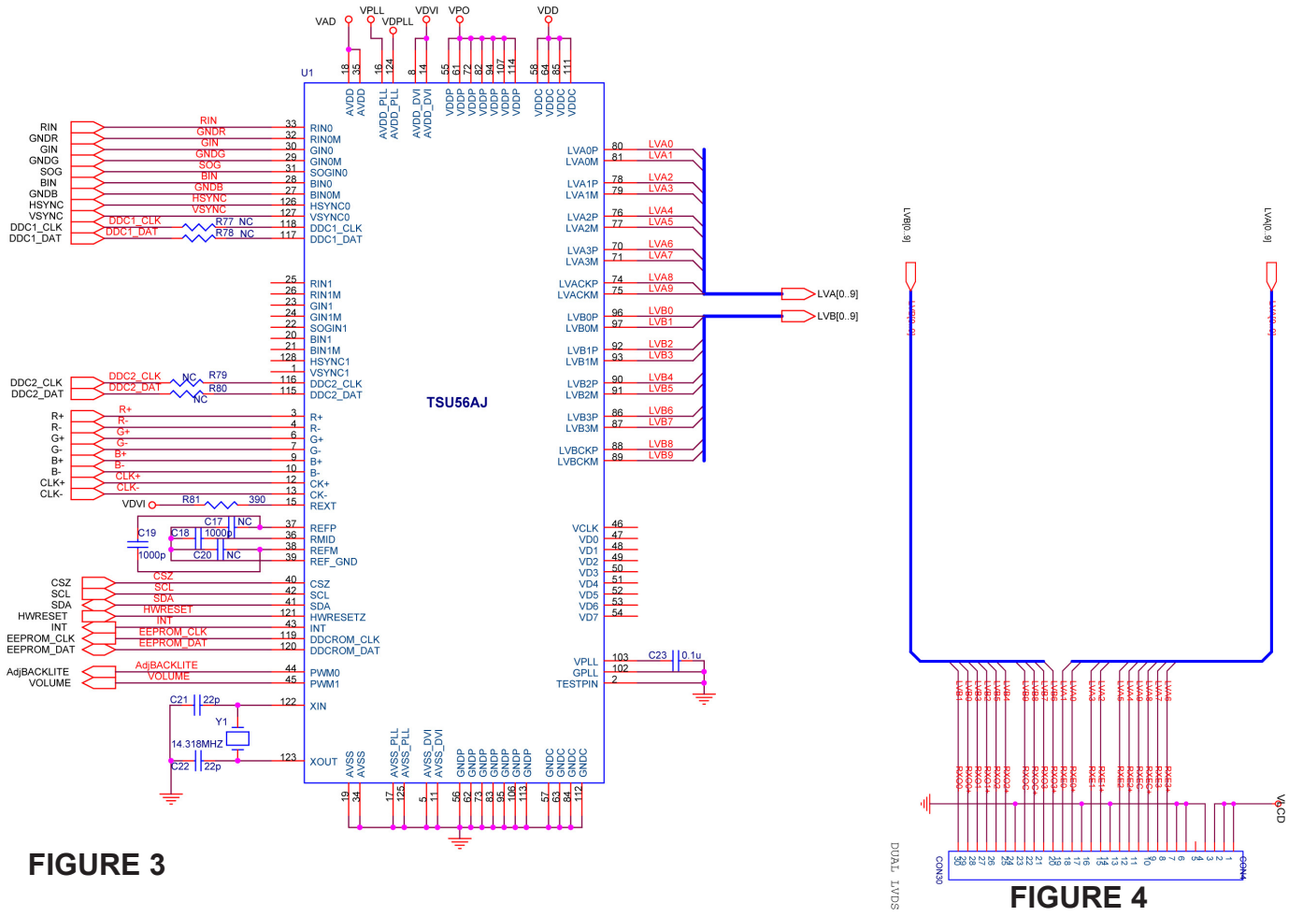
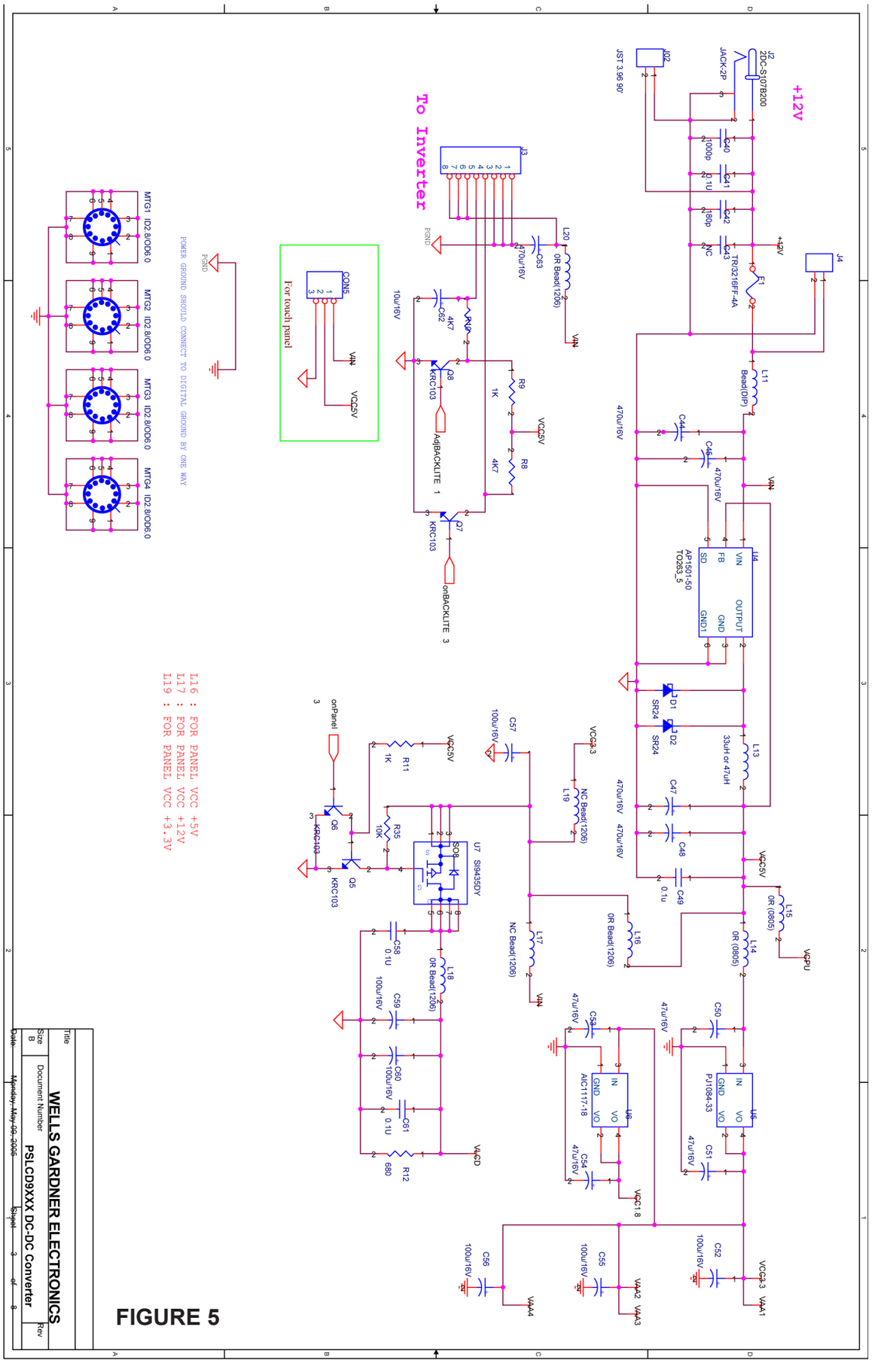


FIGURE 3

FIGURE 4


+12V
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L17 : FOR PANEL VCC +12V
L19 : FOR PANEL VCC +3.3V
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FIGURE 5

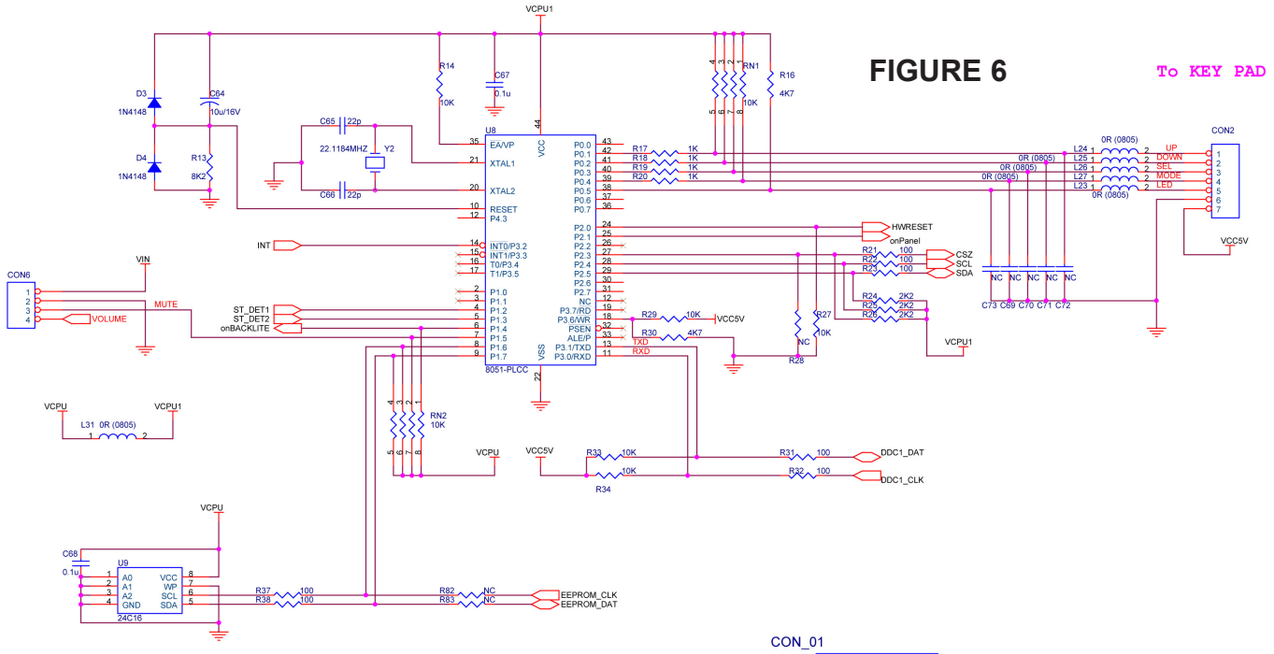
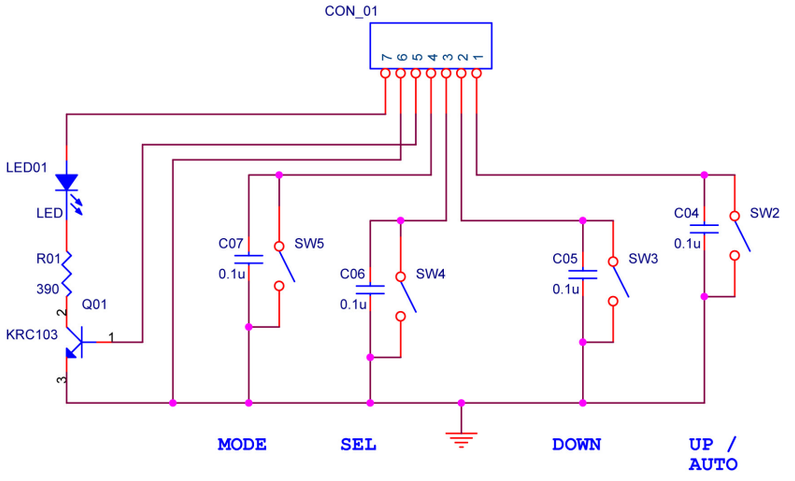


FIGURE 6



the game and converts it into the LVDS (low voltage differential signaling) output required by the LCD panel. The scalar PCB also contains the microprocessor which, in turn, controls all of the monitor functions including things like controlling the brightness of the CCFL backlighting (or turning it off altogether when, for example, there is no incoming video, in order to save energy and extend the life of the display).

The purpose of this brief article is to acquaint you with what's actually happening on a typical scalar PCB. You'll see that, broken down into sections, it's actually really easy to understand what's going on. If you enjoy using your oscilloscope, this stuff is easy to look at and see what's working and what's not. Often, you're simply looking for activity. You

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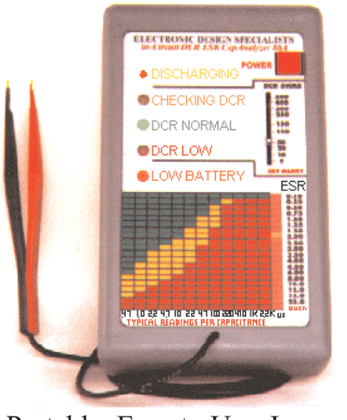

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don't actually have to interpret it. If it's there, it's good and if it's missing (stuck high or low, or at some crazy level that's totally not normal) it's bad.

That having been said, if you are limited in your electronics background, you'll likely find yourself likewise limited as to what you can accomplish in terms of repairing a scalar PCB. You will still be very successful finding (with an ESR meter) and replacing bad electrolytic capacitors (albeit they are surface mount devices so you will need SMD rework capabilities) without any other electronics knowledge. Bad transistors (FETs mostly) are easy to find too, using just a digital multimeter. Where you will likely fall short without the ability to use an oscilloscope or without electronics skills in general is in determining the functionality of integrated circuits. In reality, this is very easy to do as well but it is beyond the scope of this discussion.

Inputs

Let's start at the video input. A modern LCD monitor will typically have two video input connectors: One is a legacy, 15-pin, sub-D connector for analog, VGA input (figure 1) and the other is a Digital Video Interface or DVI connector (figure 2). Figure 3 is the scalar IC itself. This is a 128 pin, Quad Flat Pack package. Thank goodness it is not a common failure item as I just don't see where it's going to be practical for us to replace this device in most cases. I'm not saying that it is not possible. It is possible but it requires a great deal of skill and, typically, some sort of optical augmentation. The scalar accepts the video input and scales it, stretching or shrinking it as necessary so the entire screen is filled with the image. None of this stuff commonly fails. Figure 4 is simply the connector that takes the LVDS signal from the scalar IC and connects it to the LCD panel itself.

DC-to-DC Conversion

Figure 5 is where we have lots of failures. This is the DC-to-DC conversion section and it is the hardest-working section on the PCB. DC-to-DC conversion is another way to look at power supply regulation. We take a regulated (or unregulated, for that matter) DC input and simply run it through some sort of boost or buck regulator. Each little DC-to-DC converter is running at 150 kHz or so. It takes the DC in, chops it up PWM style, and spits it out. The longer the duty cycle, the higher the output voltage. Then we hang an electrolytic filter capacitor on the output and presto! We have a new DC output voltage that is proportional to the duty cycle. If, for example, we want a 3.3vdc output, we simply take the +12 vdc input from the power supply and, with a duty cycle of approximately 25% (27.5% to be precise) we get a 3.3vdc output. Sweet. As you can imagine, the 150kHz switching speed gobbles up these output electrolytic filter capacitors. When these capacitors fail, the 150kHz ripple wrecks havoc on the system with unpredictable symptoms ranging from disappearing or distorted columns or rows to total blackout or even whiteout!

Microprocessor

Everything is microprocessor controlled these days. I think my toaster even has one. Figure 6 is the microcontroller. You can see where the control panel buttons (figure 7) plug into it. This is a standard I2C buss microcontroller as discussed previously in Slot Tech Magazine (April 2005).

On the following page, I have printed the schematic diagram for the inverter. In some cases, you might consider them disposable but they're pretty easy to fix if you have SMD rework capabilities. In general, we need to replace the MOSFETs that drive the transformer primaries. They look like little ICs with eight pins but they're actually dual MOSFETs. They are Q3-Q6 in this example. **- STM**

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In truth, most electronic repairs are pretty easy. Often, it's just a matter of testing and replacing a small handful of inexpensive, off-the-shelf electronic components. Sometimes, it's just one. For example, it costs less than 25 cents in parts to repair the most common failure in Bally power supplies. The entire process takes about five minutes.

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

For more information, including course offerings and complete pricing information, please visit the website at slot-techs.com

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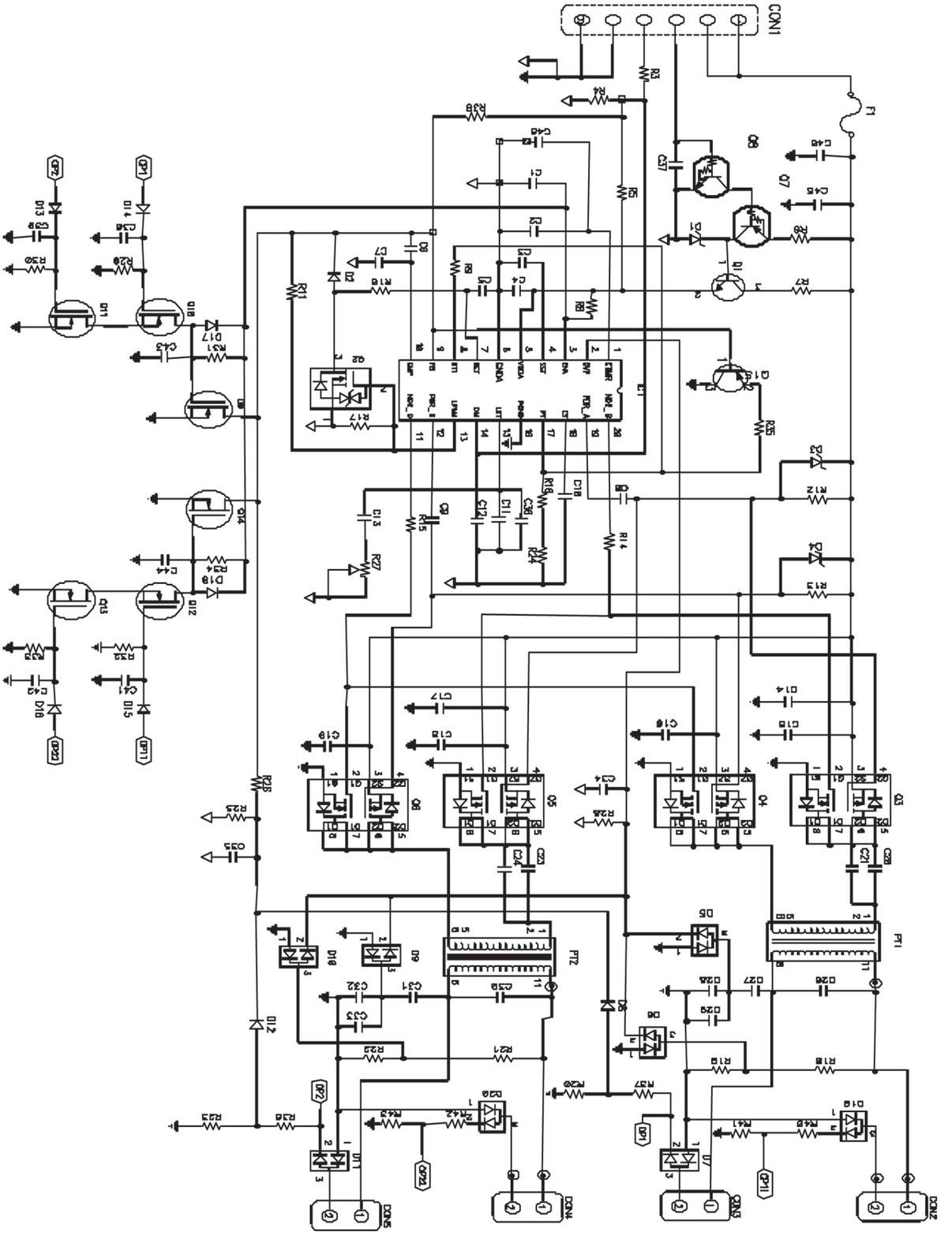
WELLS GARDNER ELECTRONICS INVERTER

.CIRCUIT DIAGRAM: PILCD9XXX



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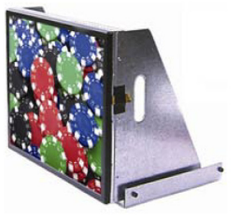

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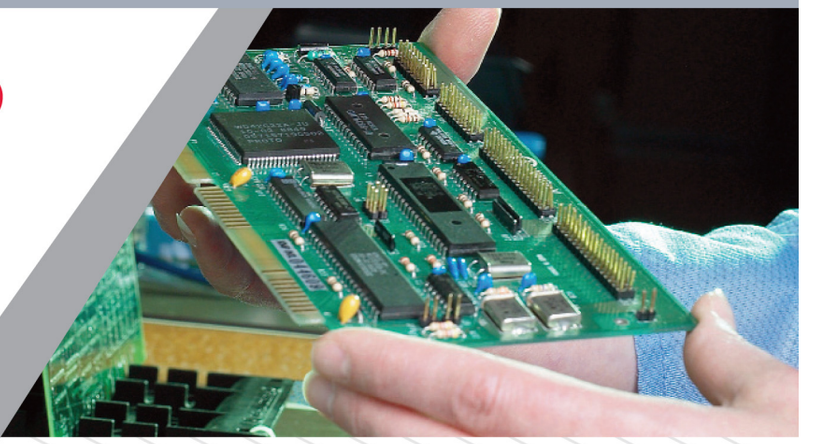

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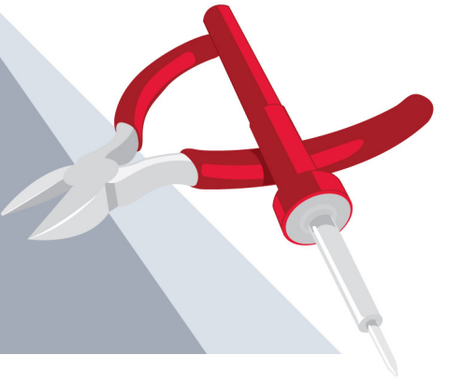

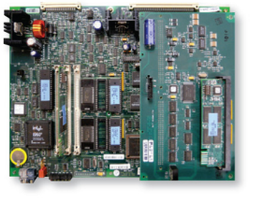

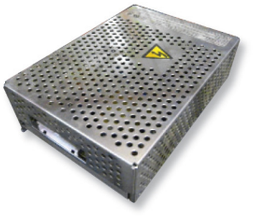

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