
# Slot Tech Magazine

Slot Machine Technology for the North American Gaming Industry

July 2009

# 100TH ISSUE

**Bottoms Up! - A Vertical Deflection Mystery**

**Installing Epic 950 Printers in IGT's AVP Slot Machines**

$10.00

Slot Tech Magazine


Bob Yabroff
*President*

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"But to tell you the truth, the content of this magazine is gobbledygook to a seating guy like me."

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## Inside Slot Tech Magazine

### July 2009



This is issue 100 of Slot Tech Magazine. I suppose it's something of a milestone but the real reason I bring it up is that I have to fill this little space in the front of the magazine with something really profound and there is absolutely nothing else happening of interest. TechFest 19 has come and gone--TechFest Africa is planned for September 28th through October 2nd. It's a special, five-day event this time--and I haven't held any regional classes this month (although I am off to the Winnavegas Casino in Sloan, Iowa in a couple of days. I'll let you know how it went next month).

As promised, our new friends at ERG have provided us with a universal replacement guide for LCD backlight inverters. It's on page 14. Also, I had a chat with another Slot Tech Magazine supporter and advertiser, CI Innovations, regarding replacement inverters and such. Harry Iverson at CI Innovations wanted me to remind you that he also provides replacement inverters. Additionally, I want to remind all readers that CI Innovations sells a CCFL tester that is an absolute MUST HAVE tool for working on LCD monitors. Last week, I was giving a lecture in the ballroom of the Hilton Hotel in Milwaukee, Wisconsin. We had a full day of hands-on LCD monitor repair for 30 people. I brought a box full of spare inverters (courtesy of ERG), replacement tubes (courtesy of Ceronix ), and my CCFL tester (courtesy of CI Innovations) and we went nuts fixing LCD monitors. It was sort of scary as I forgot to tell everyone to bring white cotton gloves to handle the films inside the LCD and we weren't exactly in a clean room environment but we were very successful and repaired quite a few units. We diagnosed many more that we were unable to repair simply because I didn't have the correct length tubes.

I guess I had a busy month after all! See you at the casino.

Randy Fromm

**Randy Fromm - Publisher**

Printed back issues are available for only one year from the date of publication. 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-techs.com. To order, fax a PO or e-mail a note listing the issues you need.

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**Randy Fromm**


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

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# The New Las Vegas Strip.

## Command™ Strips for Touch Sensors

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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.

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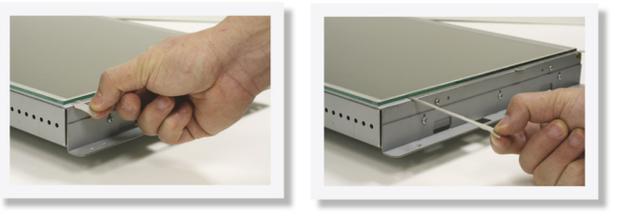

1 Pull Tab at 90 Degrees

## Easy to Integrate

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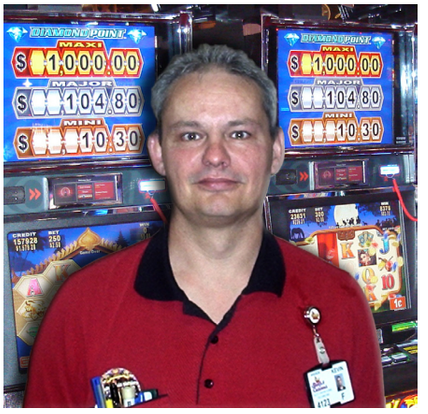

# Game, Set, Problems

**By Kevin Noble**

**Atronic e-motion - Game of Life Freezing in Bonus Round**

Richard Haddow, the Senior Slot Technician at Georgian Downs, had the time of his life trying to solve this problem that grew into a much bigger problem as you will see. This issue began about a month ago when all six games would freeze up when it went into bonus round. Richard powered cycled the master game and all the games started working again. After some time, one game started freezing before the first progressive dollar amount was reached. Other technicians tried various methods to clear the game but it would not clear. The game was stuck in tilt mode. Next, the game was RAM cleared and tested but the with same result. The game was next cleared again just in case but with the same result.

Digging deeper into solving this problem, the CPU was replaced, RAM cleared, and tested but the problem still existed and showed no signs of letting go. The multimedia board, the power supply and the Comm board were all replaced but the game was not going to release its grip on this problem. While trying to troubleshoot this game with another game of the same theme, the second machine started to display the same symptoms as the game that was already down. And you guessed it, two games with the same problem.

New software was then ordered and placed in the game but the problem would not go away. Starting again from scratch, the backplane board, multimedia board, filter board, CD drive were replaced and a RAM clear was performed but the problem continued. It would freeze in bonus round, just before the first progressive was reached.

Later, I messaged Richard regarding any progress on his game. He replied “Yes. If we change the A-Link ID # with another working game and power down the working game beforehand, it works consistently. We did testing for over 20 Hours yesterday with no issues. Every time we got the bonus, it worked.”

Richard also stated “Whenever you change A2204 & A2206 A-Link ID they work, but when you put them back to their original A-Link ID # they freeze.”

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numbers have been changed to 7 and 8 to get the bank up and running. Richard informed me that the A-Link ID numbers were changed, the master game was rebooted to accept the changes, verified and placed back in service. Awesome troubleshooting Richard.

**BALLY REEL S6000 – Four-Banks Going Online-Offline**

Finishing up on a major internal move and new game refresh, we had a power outage sometime during the night. Going through the floor and checking what damage was done, we had to reset about 20 IGT S2000 reel tilts, an Atronic progressive bank with APL initialization errors, the Wide Area Progressive sign in a C1 + 3 games on that bank needed Central Accounting to re-enroll the progressives. These were the easy ones. Back in the corner you could hear the dreaded sounds of Atronic e-motions going in "System Down" errors. Each game on the back had had this continuing ongoing process since the early morning hours. I checked the CVT for errors but there was not one. I went back to the shop and checked the TPE log and found out this CVT started with loop down and loop up errors since 3:30 AM. Next I checked the floor plan to see how the fiber was run and which banks it affected. We wanted to half the four-bank into two to see if the problem continued. Once we removed the two banks, the e-motions sat quietly with not a peep out of them. We added the next bank and the beeping started back up. We had now limited the problem to one bank of machines. We decided to half the bank of ten games and found that the problem existed on the front half of the bank. We checked each individual game and found the fiber board on the second game was glowing red. When we bypassed the fiber board, the e-motions became silent again. We plugged the fiber back in the board with the CPU power off and the games were still quiet. As soon as we connected power to the CPU board, the banks would go down. We replaced the CPU and set the options. We verified the TPE log to make sure the loop down error message was gone.

**IGT S2000 EZ Pay and Mikohn Going Offline + Manual Jackpots**

This one is from my good friend Wendell, the IGT Representative for Southwest Ontario. He wanted to share this problem he had encountered in case anybody runs across this in the future. It was reported to him that the EZ Pay system and the Mikohn system would randomly drop offline. One system was up while the other one would go down or sometimes both at the same time. The odd thing about this game was that the results of any repair were not known for about two days. If you swapped out any part, it would act fine until a couple of days passed. Wendell was called into this situation about this game and he first asked them what parts have been changed. Parts such as CPU, motherboard, Comm board, and both power supplies have already been changed once. The next step was to see if

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8480-Single RAW cold cathode lamp for 10 inch LCD monitor in IGT games

#8920- Single RAW cold cathode lamp for 15 inch LCD monitor in IGT games

#9670- Single RAW cold cathode lamp for 15 inch LCD monitor in IGT games

#9290- Single RAW cold cathode lamp for 19 inch LCD monitor in IGT games

FOR BALLY GAMES

#8650- Single cold cathode lamp assembly for Bally IView player tracking system 6.2 inch "IDW" LCD

#8950- Touch screen kit for Bally Iview player tracking system 6.2 inch "IDW" LCD (includes 5 wire touch screen & metal housing)

#9190- Mylar protective sheet (peel & stick) for the touch screen on Bally Iview player tracking system 6.2 inch "IDW" LCD

#9080- Single RAW cold cathode lamp for 19 inch LCD monitor in Bally games

FOR KONAMI GAMES

#8700- Dual cold cathode lamp assembly & 12 volt inverter for Konami belly glass that is edge-lit with cold cathode

#9240- LED edge-lit panel for Konami K2V belly glass cabinet

#9780-"L" shaped cold cathode lamp assembly for Konami 7 inch bonus screen LCD

#8600- Dual cold cathode lamp assembly for Konami slot machine with 17" LCD monitor

FOR WMS (Williams)GAMES

#8520- Triple cold cathode lamp assembly for WMS slot machine with a 18" LCD monitor

#9300- Single RAW cold cathode lamp for WMS games with 19 inch LCD monitor

#8470- Single cold cathode lamp assembly for 6.4" LCD LG #LB064V02 in WMS BlueBird bonus screen

8490-6.4" LCD LG #LB064V02 for WMS Bluebird machines bonus screen (does **NOT** come with touch screen)

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something attached to the player tracking was shorting the Comm board, so the site tried unplugging everything that was associated with Mikohn. The SMIB (Slot Machine Interface Board) was unplugged along with the card reader, keypad and display. The problem came back. Wendell suggested unplugging anything to do with Netplex such as the printer and the Bill Validator but the problem continued. Wendell headed up to the site where this was happening and said he noticed that the Sentry Bezel and the blue VFD were not working. The motherboard was next in line to be replaced again. It was changed out, the RAM clear was performed, game options set, bill and ticket tested and everything worked to prove that all the communications at the game are working. Wendell suggested leaving the Mikohn unplugged at the Comm board to see if the EZ Pay would drop. Two days later, the E Z Pay dropped again. The next step was to unplug the ribbon cable between the Comm board and motherboard and that did not stop the E Z Pay from dropping.

Wendell decided to start working on this problem again from the beginning. He insisted on swapping out the power supply again, specifically the power supply into which the power cable plugs because that supplies the un-switched power to the Comm board. He mentioned that it was brought to his attention that they had already performed this operation but who knows if the last power supplies were good? Wendell stated that since the power supply was replaced, the site has not had any problems with the Mikohn or E Z Pay system.

Editor's Note: Again with the power supply! This mantra runs through everything, doesn't it? In some cases, power supplies with swollen, obviously bad electrolytic capacitors seem to function perfectly well while in other cases, power supplies with perfectly clean and correct DC outputs don't function at all or cause intermittent issues with other systems. This is why power supply design and repair has been and continues to be a much-covered topic here in the pages of Slot Tech Magazine.

**IGT AVP MIKOHN - Mikohn Display Errors**

During a recent project that included new SAVP and G20s on our gaming floor, we ran into Mikohn messages being flashed on the display from the Mikohn system. The messages "NO PROPS, NO DELTAS, and NO PROG" continued to alternate nonstop. This was the first time that I had seen this message being displayed by our Mikohn system. We were told to clear the SMIB and that this would clear all the messages but it did not. During this installation, we received help from Dave Dalli, a field service Technician from our warehouse. Dave said that our central accounting needed to reboot the SYSCOMM process in the Mikohn Casinolink program. We were told that they could not reboot when we were open and that they would do it when we were closed. The next morning when we came back in, the two games were scrolling the correct welcome messages that all 750 machines display. We alarm tested the two games to verify that they were communicating with surveillance and inserted cashboxes. We proceeded to complete our bill and ticket test which allowed us to place these games in service.

**CVT - All Games are Manual Jackpots**

On a small, five-game theme, slant-top Cinevision conversion, we had to go into the CVT room to clear a duplicate address off the CVT that controlled the bank of games we were working on. While in the CVT room, Reggie received a call regarding manual jackpots on all games on another CVT. With all games responding, he proceeded to check the status of each game on the CVT when he discovered

that the second game on the CVT had cashbox open/ closed constantly flipping back and forth. He checked the next machine in line on the CVT and that displayed "Security Buffer Overload." He knew that the cashbox door alarms were bringing the CVT down, thus making all the games manual jackpots. Reggie requested a Security escort to work on the cashbox switch. Once it was repaired, he checked the TPE_LOG and the messages went away. Great job, Reggie.

**ARISTOCRAT VIDEO - Solid Red Light on Fiber Board**

After attending EZ Pay training in Burlington, Ontario, our technicians are now armed with new information on troubleshooting EZ Pay problems. We knew how to read the TPE-Log but we did not know how to interpret it. A couple of time a day, we open up the TPE_log to see if everything is running smoothly. This time, we opened it up and noticed "No Machine ID" was found on every game on the CVT. We also noticed "Security Event Buffer Overload" had started to be displayed on a handful of games on that CVT as well. Once the report is displayed on the computer screen, we were able to scroll up to find out when the problem started and noticed that the CVT began having problem with one game having VGM "door open/door closed" messages every half a second. On the first game that started this whole mess, we opened the door to do a visual check when we noticed the fiber board red LED light flickering so fast that it looked like it was constantly on. We replaced the fiber board but the same red LED was still burning bright. We replaced the SCPII board but the same problem still existed. We next checked the CVT in question and it had no errors. We did a force download on the CVT but no effect on the game. When we powered down the game, we noticed that the fiber board lost power and we knew right away that the problem existed with the game. When we rebooted the machine, the same condition came back. We checked the TPE_log again and the "VGM door open/ door closed" error was still being reported. We knew that one of the doors was just barely making contact to get the door open/ door closed to flicker. When we beat on the CPU door, all the error messages went away and the fiber board LED acted normal. The door switch was then adjusted for a permanent fix.

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

# Design Considerations for LCD Inverters

On a practical level, LCD monitor repair is sure a lot easier than CRT monitor repair. The most common LCD panel repairs aren't in the complex electronics that take the analog video signal and convert it into digital. The A to D conversion is pretty reliable. So is (believe it or not) the fragile glass panel that contains thousands of microscopic transistors and their transparent electrodes, sandwiched together with a molecules-thin film of liquid crystals. Nope, all of that stuff is pretty reliable, mostly because it doesn't have to work very hard. Where we see most of our failures is in the backlighting system. The repair we perform most often is replacement of the Cold Cathode Florescent Lamps that illuminate the backlight of the monitor or replacement of the inverter that drives them.

To select the right replacement DC/AC inverter to power a backlit LCD, it can be helpful for the technician to understand how to properly drive a cold-cathode fluorescent lamp (CCFL). We will also provide a cross-reference chart that will be helpful in selecting the correct replacement.

An inverter that does not produce the specified lamp current, frequency, and minimum discharge and operating voltages compromises the integrity of the system, as well as the readability of the display and the lifespan of the backlight. Selecting the right inverter also involves knowing how many CCFLs are to be lighted and what (if any) dimming techniques will be used.

When not lit, the CCFL essentially exhibits infinite impedance. Once lit, however, it appears primarily as resistive impedance. The key is to light the lamp (starting voltage) and, once it is lit, limit and maintain the current passing through the CCFL (nominal lamp current).

Looking at a typical CCFL specification, the three most important parameters are:
**1. Starting voltage –** This should be specified for the worst-case conditions of age

and temperature. The connections between the inverter output and the CCFL (PCB traces, wires, connectors, etc.) will also have an impact on CCFL/display operation.

**2. Lamp current –** Specify lamp current so that, at a maximum, a given lamp life can be expected. Cold-temperature operation may necessitate a minimum lamp current specification to maintain an acceptable minimum bulb temperature – something to consider if you employ dimming.

**3. Lamp operating voltage –** This should be stated in conjunction with a given nominal lamp current.

## How a CCFL Inverter Works

Until the CCFL ignites, the full starting voltage remains at the output of the inverter. Therefore, regardless of the style of CCFL, no time criteria concerning the inverter need be known. In almost all cases, the CCFL lights within the first couple of cycles. If it doesn't light, assuming lamp integrity is intact, the only reason for a failure in lighting can be inadequate starting voltage available at the CCFL.

If the inverter has been selected to provide the specified starting voltage, the most common problems are losses in voltage between the inverter and the CCFL due to one or more of the following:

- Lead lengths
- Wire type
- Display enclosure specifics
- Relative humidity
- PCB layout in the case of a board mountable inverter
- Connector material type and spacing
- Film contaminants on the PCB including cleaning solvents

A properly designed CCFL inverter acts as a constant-current source. For any reasonable change in load impedance, the resulting change in current can stay well within the manufacturer's stated limits for the CCFL.

## Know Your Input Voltage

Since the output of your inverter is a function of the input voltage, it is important that you clearly define the input voltage at the beginning. There is really no such thing as "12 volts." Some tolerance always exists. For example, dips and spikes can be generated on the input supply voltage if there are other active devices – such as a relay or a solenoid – being operated off the same input voltage. If a 2-volt spike

| Wells-Gardner | ERG Production Inverter Model | Generic or Common Inverter |
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| LCD PANEL 15" SAMSUNG #LTM150X0-L01 (A) | LD2885 | D12LD80J |
| LCD PANEL 17" SAMSUNG #LTM170E6-L02 | DMD42880 | DMD42896 |
| LCD PANEL 17" CMO #M170E5-L01 | DMD42896 | DMD42896 |
| LCD PANEL 17" CHUNGHWA #CLAA170EA02 | DMD43174 | DMD42896 |
| LCD PANEL 17" AU #M170EG01 VD | DMD43174 | DMD43325 |
| LCD PANEL 17" LG PHILIPS #LM170E01-A6 (A) | DMD42996 | DMD42896 |
| LCD PANEL 19" AU #M190EN02-1 (A-) | DMD43175 | DMD43325 |
| LCD PANEL 19" FUJITSU #FLC48SXCV-02 | DMD43209 | |
| LCD PANEL 19" SAMSUNG #LTM190E1-L03 (A) | DMD42896 | DMD42896 |
| LCD PANEL 12.1" SHARP #LQ121S1LG41 | DMA22514 | DMA260J |
| LCD PANEL 19" LG PHILIPS #LM190E01-C4 (A) | DMD43325 | DMD43325 |
| LCD PANEL 18.1" LG PHILIPS #LM181E06-D4K2 (A) | 8MF62763 | D8MF70J2 |
| LCD PANEL 17" SHARP #LQ170E1LG11 (A) | DMD43216 | DMD42896 |
| LCD PANEL 19" SAMSUNG #LTM190E4-L02 (A) | DMD42896 | DMD42896 |
| LCD PANEL 15" SHARP #LQ150X1LW71N (A) | DMD42850 | DMD60J2 |
| LCD PANEL 19" LG PHILIPS #LM190E02-A4 (A) | DMD43325 | DMD43325 |
| LCD PANEL 19" AU #M190EN03 (A) | DMD43050 | DMD470J4 |
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| LCD PANEL 17" SAMSUNG #LTM170E8-L01 (A) | DMD42880 | DMD42896 |
| LCD PANEL 15" SAMSUNG #LTM150X0-L01 (A-) | LD2885 | D12LD80J |
| LCD PANEL 19" LG PHILIPS #LM190E02-A4 (A-) | DMD43325 | DMD43325 |
| LCD PANEL 19" LG PHILIPS #LM190E05-SL03 (A) | DMF63297 | |
| LCD PANEL 19" LG PHILIPS #LM190E05-SL03 (A-) | DMF63297 | |
| LCD PANEL 17" LG PHILIPS #LM170E01-TLAB (A-) | DMD42996 | DMD42896 |
| LCD PANEL 6.4" LG PHILIPS #LB064V02 (A) | 8M122947 | SFWA160J2F |
| LCD PANEL 19" AU #M190EG02 V.4 (TN TYPE W/ENHANCED FILM) | DMD42896 | DMD42896 |
| LCD PANEL 19" SAMSUNG #LTM190EX-L31 (TN) | DMD42896 | DMD42896 |
| LCD PANEL 19" AU #M190EG01 (A) | DMD43175 | DMD43325 |
| LCD PANEL 19" LG PHILIPS #LM190E03-TLB4 (TN) | DMD43325 | DMD43325 |
| LCD PANEL 19" LG PHILIPS #LM190E03-TLB1 (TN) | DMD43325 | DMD43325 |
| LCD PANEL 19" AU #M190EG01 (A-) | DMD43325 | DMD43325 |
| LCD PANEL 19" SAMSUNG #LTM190E4-L02 (A-) | DMD42896 | DMD42896 |
| LCD PANEL 15" SAMSUNG #LTB150X1-L01 (A) | DMD43246 | DMD42896 |
| LCD PANEL 19" AU #M190EG01 V.D (A) | DMD43175 | DMD43325 |
| LCD PANEL 19" AU #M190EG02 (TN) | DMD43175 | DMD43325 |
| LCD PANEL 19" LG PHILIPS #LM190E08-TLL3 (TN)(A) | DMD43325 | DMD43325 |
| LCD PANEL 19" AU #M190EG02 (TN)(B) | DMD43325 | DMD43325 |
| LCD PANEL 8.4" AU #G084SN03 V.1 (SINGLE LAMP) | 8M123287 | SFWA160J2F |
| LCD PANEL 17" SAMSUNG #LTM170EU-L31 (TN)(B) | DMD42880 | DMD42896 |
| LCD PANEL 19" SAMSUNG #LTM190EX-L31 (TN)(B) | DMD42896 | DMD42896 |
| LCD PANEL 19" SAMSUNG #LTM190EX-L31 (TN)(A-) | DMD42896 | DMD42896 |
| LCD PANEL 17" SAMSUNG #LTM170EU-L31 (TN)(A-) | DMD42880 | DMD42896 |
| LCD PANEL 17" SAMSUNG #LTM170EU-L31 (TN) | DMD42880 | DMD42896 |
| LCD PANEL 19" AU #M190EG01 V.2 (PR) | DMD42896 | DMD42896 |
| LCD PANEL 19" SAMSUNG #LTM190E4-L02 (A) | DMD42896 | DMD42896 |
| LCD PANEL 19" LG PHILIPS #LM190E05-SL03 (A) | DMD43520 | DMD43325 |
| LCD PANEL 19" SAMSUNG #LTM190EX-L31 (TN) | DMD42896 | DMD42896 |
| LCD PANEL 19" AU #M190EG01 (A) | DMD43325 | DMD43325 |

| Ceronix Monitors | ERG Part Number | Generic or Common | |
|---|---|---|---|
| 17" TFT LCD Panel- . Samsung #LTM 170E8-LO 1-L | DMD42880 | DMD42896 | |
| 19" TFT LCD PANEL.. Samsung LTM190E4 | DMD42896 | DMD42896 | SFWF470J2F for +24 VDC |
| 15" TFT LCD PANEL..Samsung LTM150X0-LO1 | LD2885 | D12LD80J | LD3818F for +24 VDC |
| 15" TFT LCD PANEL SPVA..Samsung LTB150X1-LO1 | dmd43246F | DMD42896 | SFWF470J2F for +24 VDC |
| 19" TFT LCD Panel 16:10 TN.. Samsung LTN190M2-L31 | DMD42896 | DMD42896 | SFWF470J2F for +24 VDC |

on a 5-volt power supply exists, your DC-AC inverter will actually detect 7 volts. This can cause flickering, damage and unpredictable behavior in the lamp and the inverter. Remember that Ceronix is now on a +24 VDC system. If you use +12 VDC inverters, you're gonna blow something up and it may not be pretty.

Bottom line: Things are not always what they appear to be. It is therefore important to define and know your input voltage as closely as possible. Additionally, make sure dips and spikes are minimized and contained within the stated tolerance.

**Lamp Brightness**

Tight control over lamp current does not necessarily mean tight control over lamp brightness. Warm-up characteristics, age, ambient temperature – these factors and more will affect the CCFL brightness regardless of lamp current. Most LCD backlight applications can tolerate these factors. That is why the basic inverter, as it is applied to these applications, works well.

**Lighting Multiple Lamps**

When lighting multiple lamps, providing the lamp current for all lamps with a single inverter rather than multiple inverters is desirable. Not only are the economics of space and price more attractive, but when dimming, multiple inverters all running asynchronous to each other can cause visual interference problems with the display scanning rates. The single inverter solution eliminates this.

Multiple lamp lighting poses some interesting challenges. New backlight assemblies facilitate retrofitting of some popular flat-panel displays (FPDs), thereby increasing their overall brightness capability. But some of these use as many as 14 CCFLs. Packaging constraints aside, electrical efficiency and dimming capability requirements are pushed to the limits. It is not uncommon for a typical wish list to include a 100-to-1 dimming ratio with efficiencies in the 90% range. In these cases, it is best to have one controllable inverter supplying lamp current for all of the CCFLs, since multiple asynchronous inverters can cause interference problems.

Sometimes, however, multiple inverters are required due to power or number of lamps. In these cases the dimming modulation should be synchronized between the inverters to prevent interference. Open-loop and closed-loop As previously stated, the need for tight control over brightness may necessitate an optical sensor providing the feedback signal in a closed-loop scheme. However, more is not always better. Inverters using a closed-loop approach to control lamp current may require custom ICs designed specifically to drive the CCFLs. Obviously, this can result in increased mechanical circuit complexity and costs.

It is important not to overlook the possibility that a well-designed open-loop inverter circuit will provide the most practical solution. In such an open-loop circuit, the CCFL current will vary by no more than 2% for any practical range – generally ±10% – of lamp impedance.

The information in this article is based on ERG's 25+ years of LCD power supply design and manufacturing experience. Further information may be obtained by visiting the interactive web site – www.ergpower.com – or by phoning ERG at 1-800-215-5866 or 607-754-9187.

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TRANSACT
Technologies Incorporated

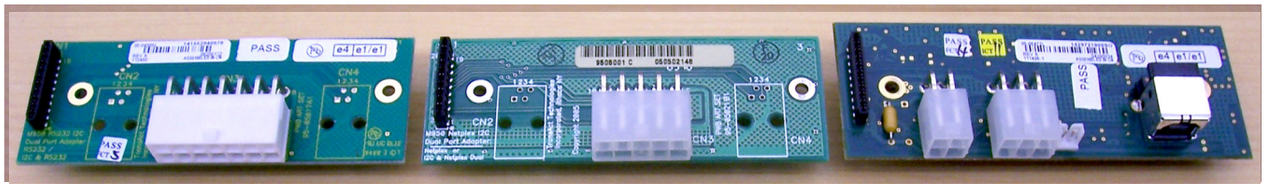
# Epic 950 Ticket Printer installed in IGT's AVP Platforms

The following information would be helpful to those that need to support Ticket Printers and is geared specifically to some of the unique requirements of the Epic 950 ticket printer when installed in IGT's newer AVP game platforms.

## Ticket Printer Hardware Interfaces

The Epic 950 was designed so that the majority of the printer's hardware is easily removable and flashable with printer firmware to support any interface type. This is possible because the interface board is attached to the printer's frame and remains with the game when the printer is removed and is advantageous because with the Epic 950, you don't need to inventory spare printers that are interface specific.

There are a number of different interface types being used on today's games. Serial is by far the most popular and can be identified by the interface board's Standard 14-pin Molex connector. Legacy IGT games like the S2000 and GameKing use the Netplex interface. It can be identified by its 10-pin Molex connector. When IGT came out with their AVP platform, they started out with their legacy Netplex interface then migrated to a combo USB/Netplex interface board. This board can be identified by its USB, 6-pin Netplex and 4-pin Power connectors.



## Ticket Printer Communication Protocols

Serial printers normally use proprietary communication protocols that are unique to the printer manufacturer. GSA (Gaming Standards Association) has defined a new open protocol called GDS (Game Device Standards) for communicating with peripherals over USB but to date no one is shipping games using this protocol.

IGT uses their proprietary Netplex protocol when communicating over the Netplex interface for printing Vouchers and their new SPC (Secure Peripheral Communication) protocol when communicating over the USB interface for printing Vouchers and updating printer firmware.

## Epic 950 Printer Firmware

The first letter in the Epic 950's firmware naming convention can be used to determine the interface and protocol that the specific version supports e.g. 'S' denotes Serial interface & TransAct's protocol, 'V' denotes Netplex interface & Netplex protocol (IGT Legacy), 'N' denotes Serial interface & Netplex protocol (WMS BlueBird). A backwards compatible firmware family can be determined by the first three digits following this letter e.g. S001xx and S035xx belong to two different families.

The standard naming convention was changed for IGT's AVP platforms that use the combo interface board e.g. firmware that begins with 'IUU' (Ithaca Universal USB) supports game titles that have been "ported" and 'IUN' (Ithaca Universal Netplex) supports game titles that are being "emulated." The family for ether IUU or IUN firmware can be determined by the first three digits following the first three letters e.g. IUx001xxxx and IUx007xxxx belong to two different firmware families.

**NOTE:** It is possible that you could have games running both types of firmware and from the printer's perspective the only way to tell what type to use is to printout a self-test ticket to see the firmware version loaded in the printer.

**To view this document with active hyperlinks, go to http://tr.im/igtavp**

## Epic 950 Firmware Boot Loader

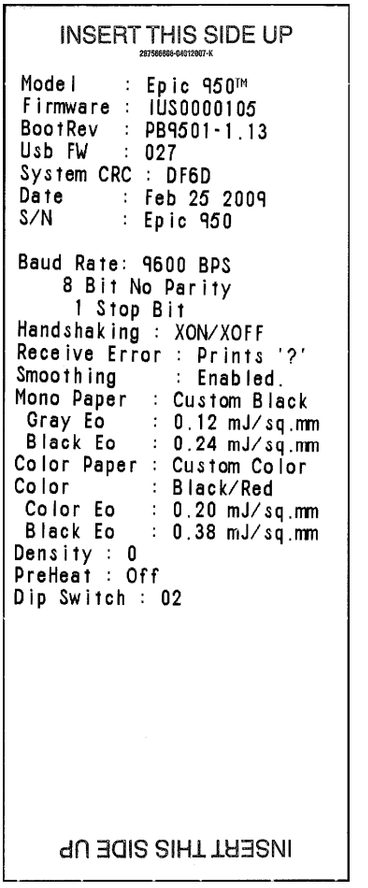
The Epic 950 has what is referred to as a Boot Loader that basically contains enough code to allow the printer to be flashed with printer firmware via the serial interface located on the printer's imPort. The Boot Loader's revision can be identified on ether the Self-Test ticket to the right of the printed text "BootRev" or on TransAct's Download utility after clicking the "Get Printer Information" button and referencing the textbox titled "Boot Loader Rev."

There is a requirement of a Boot Loader Revision of 1.13 or greater for all IUS, IUN, and IUU printer firmware. If you attempt to flash a printer with an older Boot Loader you will be unable to print a Self-Test ticket and it will not communicate with the game. Flashing the boot loader is quick but it also erases the current firmware leaving the printer in Boot Load Mode so that the firmware can be flashed with the appropriate firmware version. As of this writing, this version of the boot loader is backwards compatible with all firmware versions and is only a requirement for printers using the USB/Netplex interface board. The following is a procedure to update the Boot Loader and printer firmware using TransAct's Download Utility.

1. Make the cable connections as depicted in the **Printer Setup** section of the Download Instructions
2. Change the printer's mode as documented in the **Enter Download Mode** section of the Download Instructions
3. Run the Download Utility and configure the utility's port setting as documented in the Download Instructions
4. Click the **Get Printer Information** button and verify that the **Boot Loader Rev:** PB9501-x.xx is 1.13 or greater
5. If the Boot Loader doesn't require updating, skip to step #11
6. Download the latest Boot Loader file from our FTP site
7. Click the **Select file to Download** button and browse to where you saved the file in step #6
8. Select the boot loader file <*.bot> and click the **Open** button
9. Begin flashing the printer by clicking the **Download Now** button
10. After the download completes, wait for the printer's LED's to indicate it is back in Download Mode before proceeding. The READY lamp should be blinking and the FAULT lamp on solid.
11. Most firmware files are available in the Firmware directory on our FTP site. IUS (Serial), IUN (Netplex), IUU (USB). If the version you need is not available, please use the contacts listed on the last page of this document.
12. Click the **Select file to Download** button and browse to where you saved the firmware file in step #11
13. Select the firmware file <*.cbt> and click the **Open** button
14. Begin flashing the printer by clicking the **Download Now** button
15. After the download completes, wait about 10 seconds for the flash process to complete. Only the READY lamp should be blinking at a constant interval.
16. Power cycle the printer, printout a Self-Test ticket and verify the BootRev and Firmware version.

**USB/Netplex Interface Board's Firmware:**

Unlike the Serial and Netplex interface boards, the USB/Netplex interface board has additional circuitry that converts Serial to USB and some program storage to provide the USB Device identification and other functionality. The USB interface board's firmware revision is identified by printing and referencing a Self Test Ticket where the line titled "Usb FW" has the revision number to the right of this text.


INSERT THIS SIDE UP

Model : Epic 950™
Firmware : IUS0000105
BootRev : PB9501-1.13
Usb FW : 027
System CRC : DF6D
Date : Feb 25 2009
S/N : Epic 950

Baud Rate: 9600 BPS
8 Bit No Parity
1 Stop Bit
Handshaking : XON/XOFF
Receive Error : Prints '?'
Smoothing : Enabled.
Mono Paper : Custom Black
Gray Eo : 0.12 mJ/sq.mm
Black Eo : 0.24 mJ/sq.mm
Color Paper : Custom Color
Color : Black/Red
Color Eo : 0.20 mJ/sq.mm
Black Eo : 0.38 mJ/sq.mm
Density : 0
PreHeat : Off
Dip Switch : 02

INSERT THIS SIDE UP

By now you might be wondering what 'IUS' (Ithaca Universal Serial) is used for. This is a factory firmware that is loaded in all IGT production USB/Netplex printers and is the only way to update firmware residing on the USB/Netplex interface board. From time to time the interface board's firmware may require updating to resolve known issues and as of this writing a new firmware version IUS0000105 was just released that updates the interface board's firmware to revision **027** to fix some known issues. See the sample self test ticket image on the right.

From a Slot Tech perspective this doesn't complicate matters so long as you understand how it works and have a procedure to follow. The following is an easy procedure to update the interface board's firmware and verify the revision number.

1. Take a spare printer and flash it with the 'IUS' following the instructions above. Note – the printer can be flashed using a printer frame with the Serial interface but if you do, note that the "Usb F/W" information will not printout on the Self-Test ticket.
2. Take the printer without its frame and onto the gaming floor as a temporary flashing tool.
3. Identify the printers that need their interface board's firmware updated by printing out a Self-Test ticket. Note - the firmware version should begin with ether 'IUN' or 'IUU' and the "Usb F/W" should be less then the revision number above.
4. Remove the printer from its frame and install the spare printer. The printer will need about 10 seconds with POWER APPLIED to update the interface board's firmware and once done, the READY lamp will be on solid. Note – follow your standard practices with regards to hot swapping or powering the game down.
5. Reinstall the original printer, printout another Self-Test ticket and verify the revision number.

TransAct Firmware Disclaimer - The firmware within all gaming ticket printers are subject to regulatory approval. It is the casino's responsibility to ensure that only approved firmware for the specific game platform is installed to avoid potential fines imposed by the regulatory body. Please contact the game manufacturer and/or regulatory agency to confirm the approval status prior to changing to a version other then what was originally flashed by the game manufacture.

**Contact Information**

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Website: www.transact-tech.com | FTP site: ftp://gaming:CAs1no123@ftp.transact-tech.com/

# Bottoms Up!

## A Vertical Deflection Mystery

By James Borg

I don't know how some people manage to spend hours upon hours on the same machine and don't end up having square eyes. I've seen it done more than once. I've seen people not even going to the powder room and end up being in physical discomfort but they still won't budge from their machine so that they won't miss a few spins on their slot machine. Some even forget to eat and drink and when they suddenly realize that their tummy is rumbling and they have become dehydrated, they eventually will look out for a coffee hostess, always not leaving the chair they are sitting on. They get so engrossed in their game. No wonder some say that they feel dizzy after spending so much time on the same machine. Some see stars, some blank out, some start talking to the machine or to an imaginary friend, and some even see the screen distorted. The latter was what had got my attention when a client said the screen wasn't as it should be. For a few moments, I imagined that the client's perception of "should be" could have been slightly exaggerated for reasons as explained above. It didn't take long to be directed to the machine in question and it turned out that the client was right. The screen was well and truly distorted. The vertical section had pulled a fast one and the picture was really bad from about half the screen down, becoming worse and worse the further you go down to the bottom. It also seemed like

there was some fold-over present, but couldn't really be sure. The picture was however much brighter where the distortion was and it was quite cramped (see figure 1).

The client wasn't exactly pleased with it and I wasn't surprised. It's bad enough straining ones' eyes looking at a good picture, so you can imagine the how it must have been like looking at one that's going on the blink. The only solution was to pull the monitor out and have a look at it in the workshop. With any luck it didn't look to be a very difficult fault to tackle, but having said that, I kept getting this Déjà vu feeling. The monitor wasn't exactly ancient and I had never actually had any problems with this model...yet. However, all that was to change though as there's always a first time for everything. The client's credits were removed to be able to take the monitor out as there really was no telling how long this repair operation could take.

The unit under the spot light was a Wells Gardner, model PD189300. It weighed a ton although it wasn't really that big. In a few moments, it was out of its machine and making its way to my workshop. It took me a few moments to have a look around inside and get accustomed with it. Somehow, the layout was strange. It was like some-

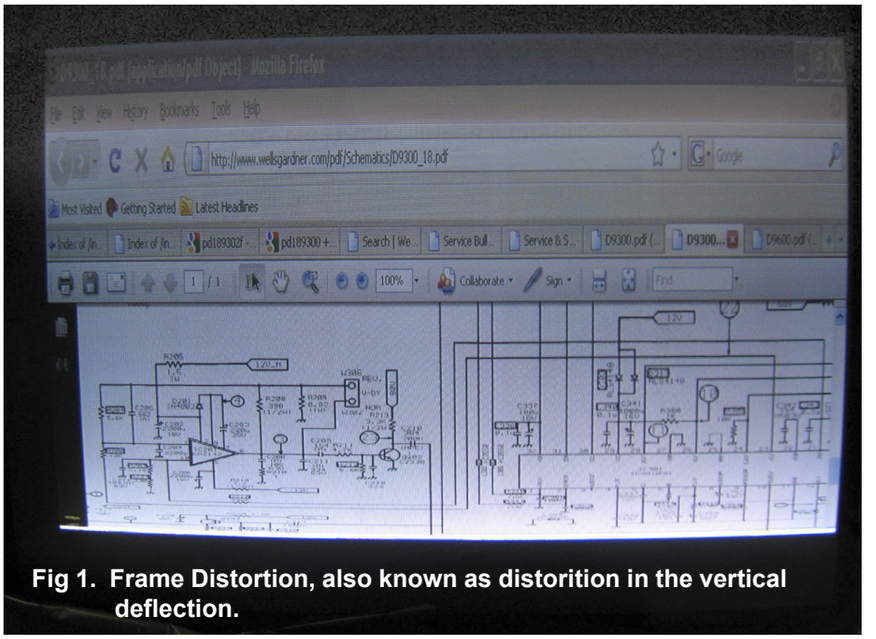

**Fig 1. Frame Distortion, also known as distorition in the vertical deflection.**

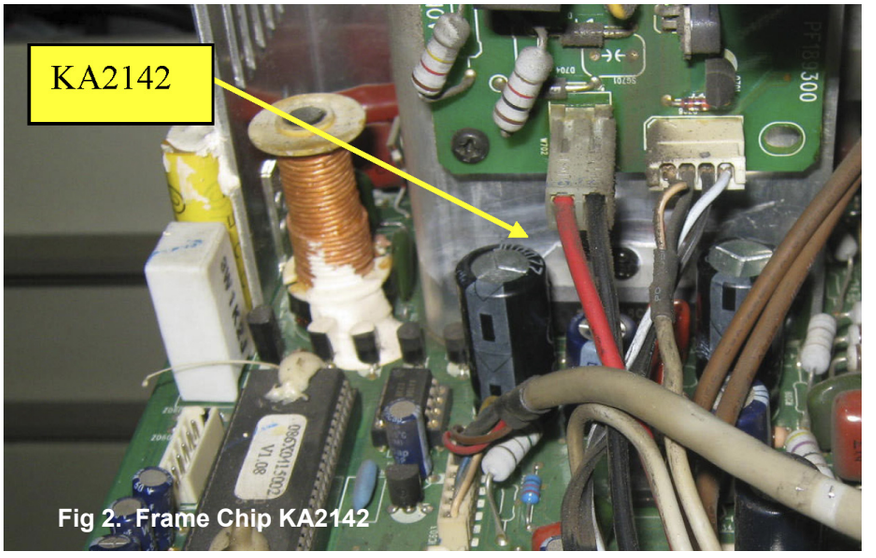


**Fig 2.- Frame Chip KA2142**

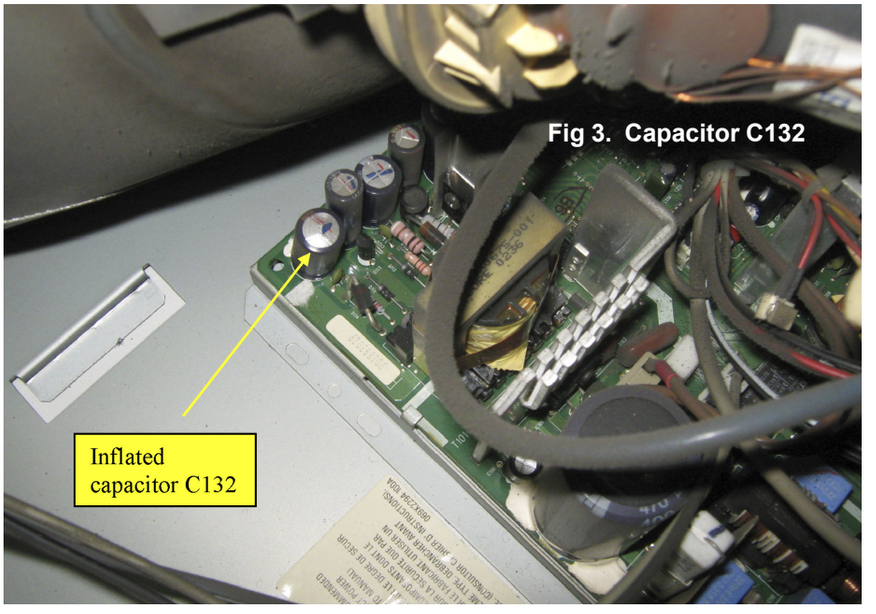


**Fig 3. Capacitor C132**

thing alien, a design I've never seen before. The print was double sided with through plating being used as well. There were surface mounted components on the bottom side. I don't really know why surface mount devices are used as there are no space restrictions inside a CRT monitor. Designing the unit wasn't my department. Repairing the sick and the dying however, was.

I couldn't find the vertical chip initially as it was hiding safely under a daughter board surrounded by wires, but with my trusty little pen light, it was soon rooted out.

It's usually on a juicy heatsink for obvious reasons. The vertical chip turned out to be a KA2142, and it was designated as IC201 on the board. I've never come across this particular chip before so if things got a bit sticky, I would have had to pull out some info on it, but fingers crossed that that wasn't going to be necessary. From the corner of my eye, I happened to notice an inflated capacitor in the power supply area.

Inflated capacitors on monitors don't really go together. When something like that happens, there's usually a side-effect along the line, and this can easily be echoed or amplified with some sort of distortion in any form in the picture. This capacitor was C132, a 2200uF/16V capacitor. It turned out to be really FUBAR as it only showed about 25uF when checked out. That was a definite No-No, even more so since this was on the +12V rail which happened to feed the frame chip and could easily have contributed to the vertical distortion. Incidentally, and most unfortunate for me, it wasn't the case as after having it replaced, my chin hit the deck when the distortion was still on the screen. Keeping my fingers crossed while I turned it on and the picture appeared, didn't do any bit of good at all. Oh crap! So much for thinking that I was going to get away with a 'quickie' here, it just didn't happen. It was simply too much to hope for. It looked like I was going to have to tackle a chip which I had never worked on before. Just as well as it gets my adrenaline pumping like crazy.

The KA2142 is a monolithic linear IC designed for colour TV and monitor vertical deflection output. It is intended for direct drive of the deflection coils with a high efficiency. The chip boasts of high output current, a pump-up circuit, low dissipation, minimum number of external parts required, can drive directly the deflection coils and also has an internal thermal shutdown circuit. In other words, this was a chip which demanded respect and it was going to get it. With all these features, can it ever go wrong?

From previous experience with frame chips, these have a very nasty habit of having their pins develop a defective solder joint. I have found this many times before, however, this is usually the case on the TDA1675. It seems like the chip tends to heat up so

much, that the heat travels down to its pins and eventually destroys the solder joint. Still wonder why it happens as the heat-sink connected to it seems more than suitable. This would most times be an easy repair job and just freshly soldering the pins gets the picture as it should be. I wasn't as lucky with this frame chip though as all the solder joints on the pins were perfect. I still went over them with fresh solder, just for the sake of it, but the fault persisted. Lucky me!

The frame chip utilizes two supply rails, a +12V and a -12V to have enough drive for the picture to be displayed properly. The positive line is fed onto pin 2 via safety resistor R205 (1.5 Ohm 1 Watt) and the negative line is fed to the 'ground', which is pin 5, always via another safety resistor, R219 (1.2 Ohm 0.5 Watt). Both these lines have additional filtering capacitors of 2200uF/16V designated as C202 and C206.

Voltage readings on these supply rails showed that the +12V was present and correct, while the -12V wasn't quite so lucky, and neither was I. It read about -10V on my digital multi meter. A scope test showed a slight ripple present and it turned out that C206 was in fact on the verge of going FUBAR. We're on to something here…as ripples of

Fig.4

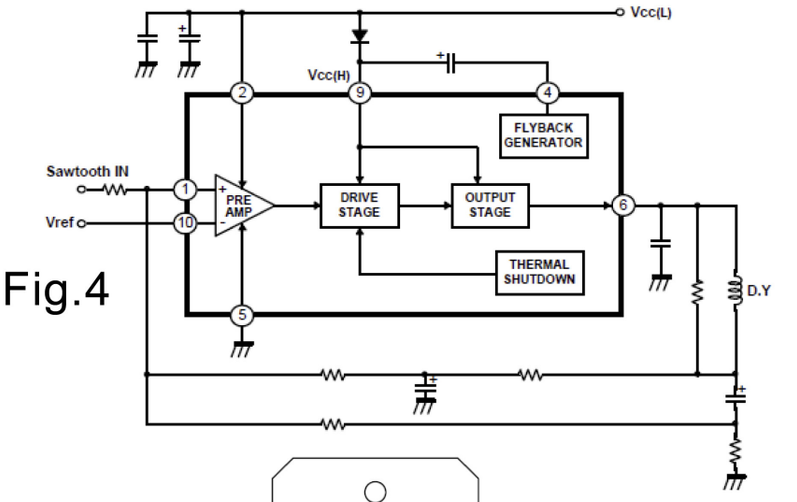


Fig.5

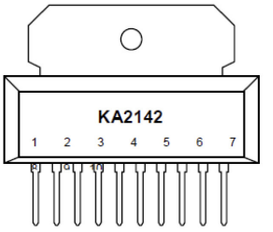


**Fig 4. KA2142 Internal Block Diagram**

**Fig. 5 Pin Assignments**

| Pin Number | Pin Name | I/O | Pin Function Descrition |
|---|---|---|---|
| 1 | Vin ( - ) | I | Inverting Input |
| 2 | Vcc(L) | I | Supply Voltage |
| 3 | - | - | N.C. |
| 4 | F.G | O | Flyback Generator |
| 5 | GND | - | Ground |
| 6 | Vo | O | Output |
| 7 | - | - | N.C. |
| 8 | - | - | N.C. |
| 9 | Vcc(H) | I | Output Stage Supply Voltage |
| 10 | Vin ( + ) | I | Non-Inverting Input |

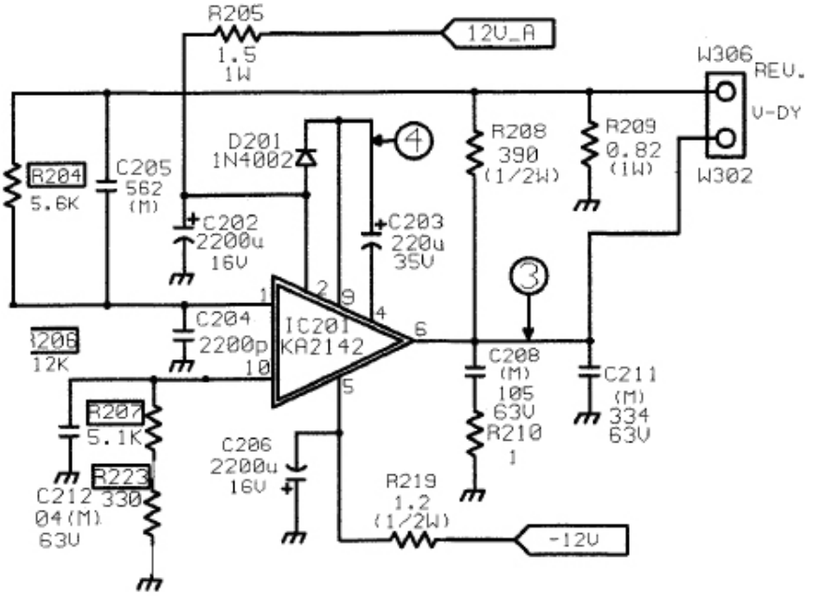


**Fig 6. Frame circuit using the KA2142**

excitement started to be generated in the nether regions. Fortunately enough, I had an endless supply of 2200uF/16V capacitors so anything which didn't meet my blessing was shot down (or even replaced) in the ongoing fault-finding-saga. It was a pain replacing the components on this monitor due to the through-plating, but having a good SMD soldering station helped tremendously. Once the new capacitor (C206) was in place, the juice was applied once again with the hope of seeing a nice and clean -12V rail, and even more so with the hope of seeing a good picture on the screen. Both my hopes went up in smoke as the -12V rail was still low and the screen was still distorted. Just great. Fabulous even.

To add to the mystery, the -12V line was sometimes -10V and it seemed to be fluctuating upwards and on the low side whenever it feels like it. The source of the -12V was a secondary tapping from the high tension transformer, namely on pin 5 (20) to cathode side of diode D507 (D2L20U).

Checking with the scope showed a ripple on the anode side. It was a good time to check out C506 (1000uF/16V). It was not brilliant so I changed it with the hope that things will be fine on the negative

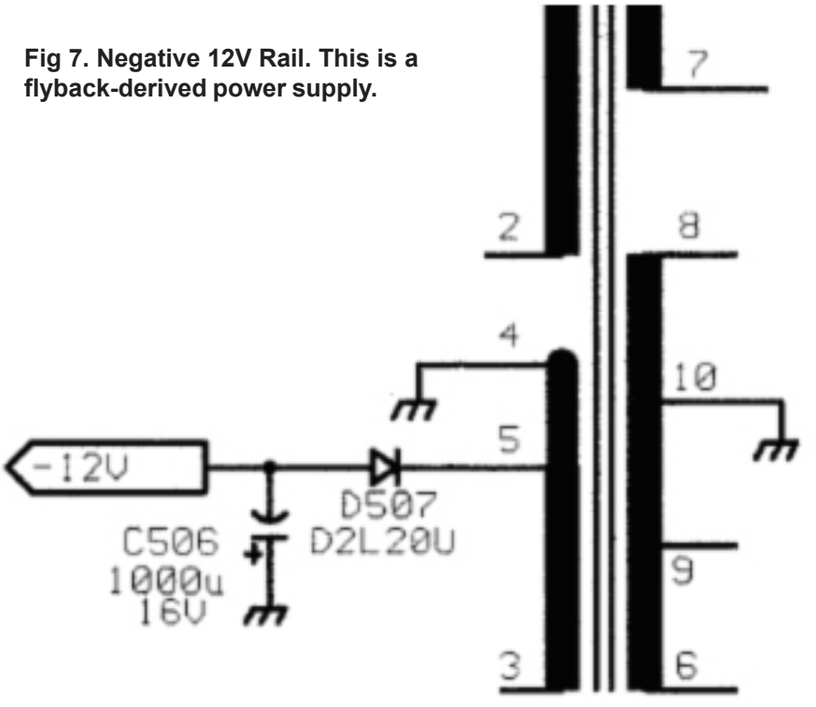


**Fig 7. Negative 12V Rail. This is a flyback-derived power supply.**

supply rail. The situation improved, but sadly, not enough. I still had the bottom part of the picture

distorted and the supply was still playing up on the negative side. The two capacitors, namely C202 and C206, both play a rather delicate role in the circuit and have been replaced already while the voltage is still not up to scratch. Was I barking up the wrong tree? Did I take a wrong turn and at this rate will end up in Outer Mongolia or some other country not on the map (again?)? It was high time to adopt a slightly different approach.

The chip itself uses a pump-up capacitor and this could be a possible cause of the vertical distortion I've been experiencing. The capacitor in question is C203, namely a 220uF/35V component connected between pins 9 and 4 of the chip. The positive terminal goes on to pin 9. I didn't bother to use any test equipment to ensure it hasn't lost its value in-circuit but actually pulled it out to check it on its own as things were getting slightly on the desperate side. Unfortunately, this capacitor was working fine, within tolerance and so I basically pulled it out for nothing. It was worth a shot anyway since capacitors tend to send vertical driver chips bananas (as well as the technician working on them). It was time to time-out for a nice warm drink, some head scratching, and having a look at the drawing board.

Diode D507 (D2L20U) which is feeding off the high tension transformer from pin 5 could be defective, perhaps breaking down when it feels like it hence the fluctuation in the -12V rail. This component is a super fast recovery rectifier diode rated at 200V 1.5A. I didn't have a direct replacement for it so I used the first one I could lay my hands on and it turned out to be a PR1005G. This is a fast recovery diode but rated at 1A. I didn't have much to lose at this point so I still tried it out. The voltage on its anode was measured at only 7V or so which was even worse than before. I suppose the fact that it was somewhat under rated, current-wise, and the fact that it wasn't a 'super' fast recovery diode did somehow fall flat on its face. I was expecting too much from the poor devil. It was also getting hot which is really pretty understandable. That meant I had to look for another diode to use in this circuit. Luckily enough, I came across a FUF5407 which is a 3A ultra fast recovery rectifier. I thought this was it. At last I found a decent diode. After soldering it in place however, its output was low as well. This certainly didn't help matters one little bit. Not at all, and it was making things difficult for me. I didn't want to kill the frame chip off at this stage so I went around the supply rail even further. As luck would have it, in the workshop I found a similar damaged board. Just waiting for me to pull out the proper diode from it and try it out on mine. If the voltage is still low at the anode side, then I'll have to seriously think about this fault. This was basically the turning point in this situation. If the voltage remains low, then something else is causing this drop and have to locate it one way or another. With the proper diode (D2L20U) in place, the voltage still remained low. Crap! This means…this means…Aaaaggggghhhh!!! I had to do what I didn't want to do. There wasn't much else left to do at this point but to go for the chip itself, head on, starting with the de-soldering of pin 5 (-12V line). The -12V rail went 'up' beautifully while my chin went down. Damn! It seems like the chip was itself faulty all along. It didn't take me all that long to pull it out.

While the device was on the worktop, I was curious enough to take resistance reading between a known good one and the suspect chip. These were as follows:

On Pin 6 (Output) on the new chip gave a reading of 12Mohm whilst on the FUBAR device, this was approximately 3Kohm when taken with reference to ground.

On Pin 5 (Negative line), on the new chip gave a reading of 56 Ohms and 84 Ohms (changing over probes on the multi-meter), while on the FUBAR device, the readings were of 46 Ohms and 64 Ohms…somewhat lower than expected.

I couldn't solder in the new chip fast enough as I wanted to know if it was the culprit that had me pulling my hair out, and low and behold, the frame was as perfect as it could ever be. That's a nice fault to put to experience. You live and learn…sometimes the hard way…but the end justifies the means after all.

During the course of my testing and diagnosis, I searched the internet to see if I can find some information regarding this chip, or if some other poor soul had come across this fault on this type of monitor. I was surprised to find next to nothing apart from its pdf file from Fairchild. This could mean that it's either a very new chip (which I was told it wasn't) or one which never fails, hence nobody has bothered to write anything about it. If that's the case, then it's just my rotten luck to have one fail within my jurisdiction and knowing my luck, according to Sod's Law (or was it Murphy's Law?) it could be the case that I've come across the first chip of its kind ever to fail. NEXT!

**- James Borg**
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**Editor's note:** I had the exact same monitor failure but the fault was thermal so diagnoses was almost instantaneous. When I first energized the monitor, it was perfect but within a couple of minutes, it was "bottoms up" just as you experienced here. I didn't have any freeze spray so I inverted a can of Liquid Air and sprayed a few drops on the heatsink. The instant it cooled, the picture was corrected. I used a hot air gun to verify. I heated the heatsink for a few seconds and it was "bottoms up," cooled it with the spray and it was back to normal. This is the only example I have seen where a bad output IC allowed for some vertical deflection. Generally speaking, if there is any vertical deflection at all, the output IC is good and you are looking for bad capacitors. I don't blame Mr. Borg for being led astray. The IC would have been the last thing I would have suspected here as well. - rf


**Fig 8. The repaired monitor. That's what it's all about!**

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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.***

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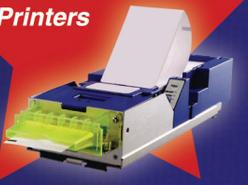

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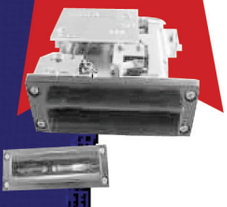

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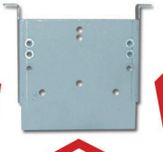

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