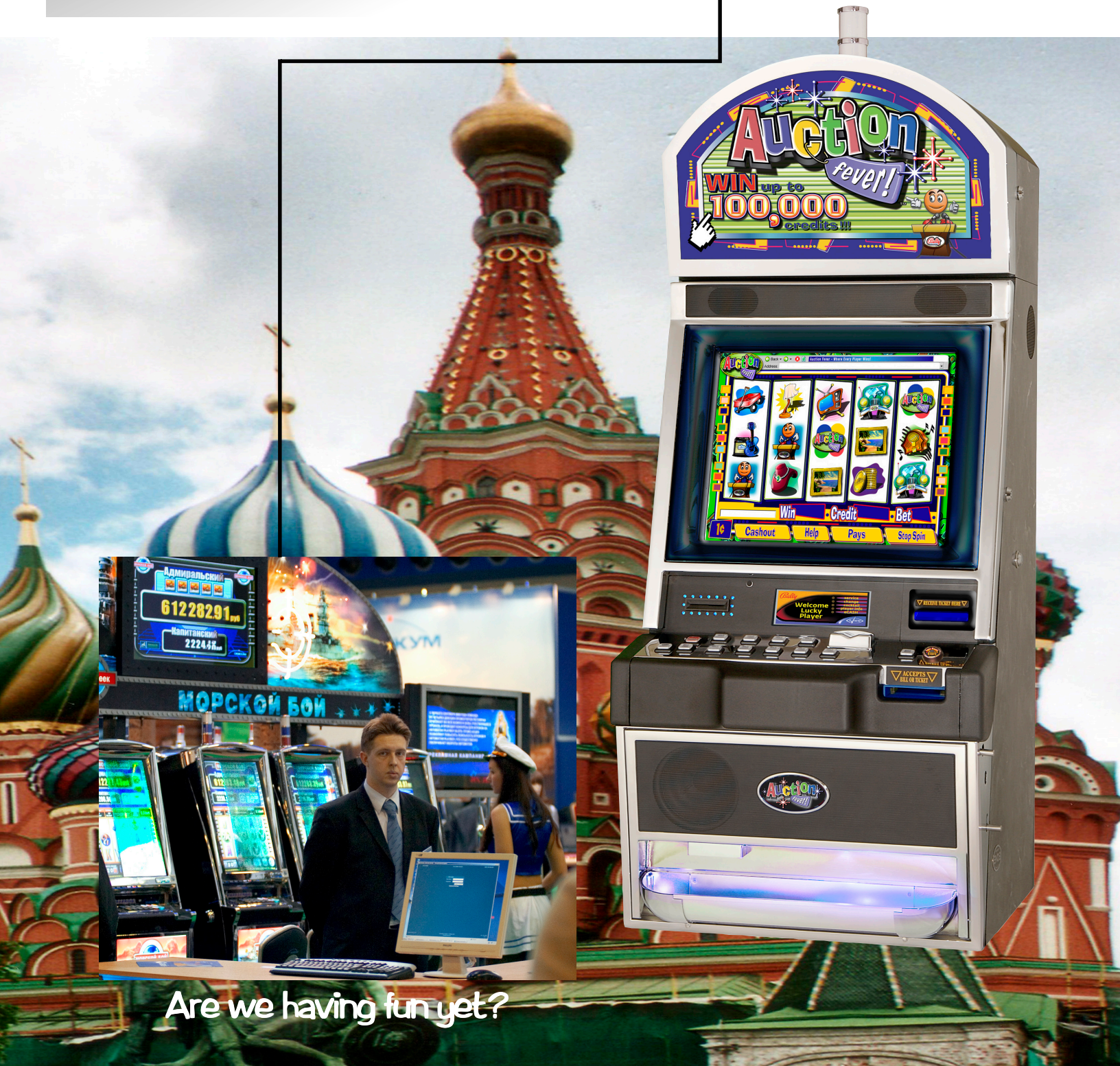

Slot Tech Editorial

This month, Slot Tech Magazine takes a look at the switched-mode power supply in the Tovis monitor. I know that we've covered SMPS operation in the past but this monitor adds an interesting new wrinkle to the design. In addition to the normal PWM scheme with which we are so familiar, this monitor includes an active circuit for power factor correction. This may seem like a small change but it actually heralds a new chapter in power supply design for all types of equipment, including industrial and consumer electronics. As fossil fuels become scarce and energy costs rise, design engineers have come up with a clever way to save energy in switched-mode power supplies by eliminating the wasteful third harmonic that is generated by conventional rectification and filtering techniques. Learn all about the "follower boost" and "active power factor correction" beginning on page 29.

Herschel Peeler is a very organized fellow. This month, he lets you into his neatly catagorized world with a look at how you can use Excel to catagorize and maintain your inventory. In a very special gesture of kindness, he has posted his inventory database (including part numbers, cross-references and suppliers) in the "The Herschel Peeler Collection" sub-directory of the Slot Tech Magazine FTP server. This will save you hundreds (if not, thousands) of hours of laborious data input sitting at a keyboard. His lead-off feature article can be found on page four.

This month's contribution from John Wilson features another piece of bonus software that you can download from the Slot Tech Magazine website. It's another simulator. This time, it's a simulation of the pull-tab game. Will the madness never end? I hope not!

There is more, of course, including a report on the EELEX show, held in Moscow in December, too late to make it into the January issue of the magazine.

That's all for now. See you at the casino.

Randy Fromm

Randy Fromm - Publisher

Randy Fromm's
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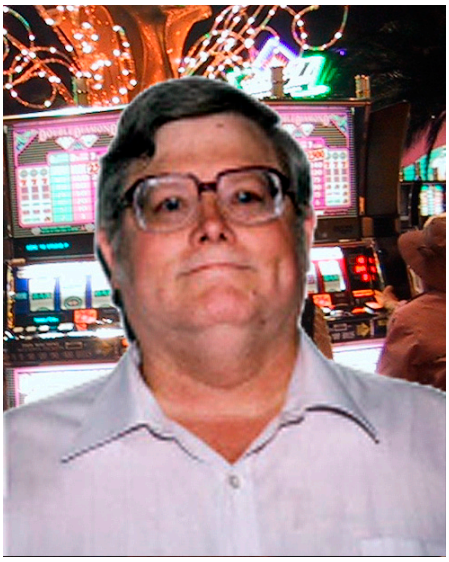

Using Excel for Inventory Control

By Herschel Peeler

The Slot Manager wants to know how much you have wrapped up in spare parts. You want to remember where you put those 1N4148s you bought last month. Where was it you bought them last? How much did you pay for them? What is IGT's part number for them? What is Bally's part number for them? What does the data sheet look like? Will you really have to start from scratch and create all this from nothing?

Excel is a basic spreadsheet program. It gives you a table of cells of lettered columns and numbered rows. Each cell is referenced by its particular letter and number (A1, A2, B3, etc.).

	A	B	C
1	(Cell A1)	(Cell B1)	(Cell C1)
2	(Cell A2)	(Cell B2)	(Cell C2)
3	(Cell A3)	(Cell B3)	(Cell C3)

Excel has limitations. There can only be 65,535 (or so) rows. That's probably enough for most companies unless you are IGT or Bally. IGT's parts list is about 100,000 items long. They have to use something like SQL, a more expensive program. If you don't need it, I don't suggest you buy it.

Excel is not the only spreadsheet. It is likely that it is already on your computer. If it isn't and you have to buy a spreadsheet, there are also cheap and almost free programs like Turbocalc that are similar. The advantage of using Excel is that the sheet described here already exists and can be downloaded for free from the Slot Tech Magazine FTP site. It's in the "The Herschel Peeler Collection" sub-dir. You won't have to start from scratch. The one already created is the result of years of development. It lists thousands of parts used in the gaming industry and crosses them to equivalent part numbers, lists prices and does all the things described above. This is a huge file. Don't try to print it.

Each row is a unique part and requires no label other than the main part number itself. We label each column to specify the type of information that will be stored in it and format that column for that type of information. Our label would be something like:

> Part Number (formatted as text)
> Quantity on Hand (formatted as a number, no decimal places)
> Cost (formatted as a number with 2 or 3 decimal places)
> Extended Value (a number, 2 decimal places)
> Manufacturer's or Distributor's part number and their price (text, "part number / price")
> Description of the part (text, give lots of room)
> A hyperlink that will bring up a picture of the item, a data sheet, or something that would clarify what this item is for a clear definition.

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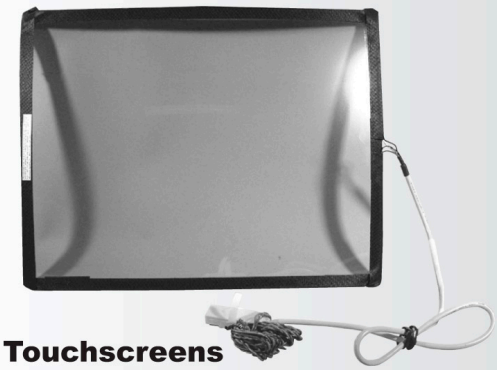

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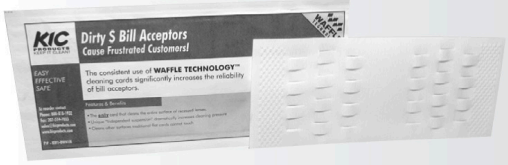
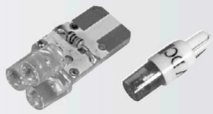


Bill Validator Cleaning Cards

Tools and Tech Aids



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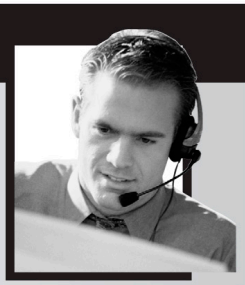
Cold Cathode Fluorescent Lamps



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We may also want to add other columns for things like:

> Date the last time this item was physically counted (formatted as a date)
> Whether or not the item is a controlled item that must be shipped through the Gaming Commissioner.
> How many we have on order already and when they were ordered.
> How many we have that are bad and waiting to be repaired.

The ready-made list assumes the Quantity on Hand is the number of good parts, assemblies ready to be installed, if it is an assembly. Defective assemblies removed from games go to the Bench Tech's room and would be counted on his list as To-Be-Repaired. The system uses two (or more) lists. One list for the parts room person that lists good assemblies and another list for the Bench Tech that lists assemblies being repaired and repair parts. The Bench Tech's list also includes tools, parts used in building test fixtures, parts used for the in-house training program and such. In the downloadable file, all of these lists have been combined into one list. Not everybody has separate individuals that handle the parts room, bench repairs, training and test fixture design.

Formatting a Column

Drag the cursor over the Column(s) or Cell(s) to be formatted, then select "Format", "Cell", and type of data from the selection list. If you do not deliberately format the cell, the format will automatically be assigned the first time you enter something in that cell. If you enter numbers only Excel will assume it is a number and format the cell as such, right justified. Some part numbers, like IGT's, are all numbers and would be formatted as a number, not text. If the first data you entered had numbers and letters the cell would be formatted as text, left justified.

	A	B	C
1	57115800		
2	1N4148		
3			

The example above shows how a number and text would be entered if you did not specify a format for that cell or column.

You may also specify the width of the column by selecting "Format", "Column, Width", and adjust the width of that column for your specific use.

The downloadable file uses Column A for the basic part number. The rows are sorted on this column. Column B is intended for a hyperlink that takes you to a data sheet or picture that further defines and identifies that part. To insert a hyperlink, enter the data you want to show in that cell, select the cell, do "Insert", "Hyperlink", then browse the directories of your computer to select the file you want to go to. I use an Adobe PDF or graphics file most of the time. If you use a graphics file, make it a *.jpg or *.gif format as opposed to a *.bmp. The bitmap (*.bmp) version of graphics is huge in comparison to other formats. As it is, the .jpg formats alone easily take up the space of a whole CD and therefore are not included in the downloadable file. The downloadable Excel and pictures may be obtained from the author for the asking (at least until my director says no). My contact info is at the end of the article.

	A	B	C
1	Part Number	Hyperlink	Quantity on hand
2	1N4148	1N4148	50
3	1N914	1N914	50

Note: Excel sorts by ASCII, not human alphanumeric as you are probably more comfortable with. That is why a list comes out sorted like a directory on your computer. "10" follows "1", not "9."

Making a Calculation

You may make calculations between cells by formatting a cell with the type of information (dollar value) and entering a formula in that cell that states what is to be done in the calculation. For example, column A might be the quantity on hand, column B might be the price you paid, and column C would be the total dollar value you have in stock for that

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item (Extended Price).

	A	B	C
1	Qty on hand	Price	Ext. Price
2	100	$0.05	$5.00
3			

We would format column A as a number, no decimal places, column B as a dollar value, and column C as a dollar value. Then we would select column C and enter the formula "=A2*B2". This takes cell A2 multiplies it by cell B2 and enters the value in cell C2. To make all of column C this same formula you copy C2 and paste it over all of the other cells in column C. In the same way formatting of the other columns can be done to format all the cells in that column as a number, text, or dollar value.

Columns (or cells) may also be formatted as a date or a handful of other characteristics we won't bother to go into here.

Creating the list on your own will take hundreds of hours. Collecting the data sheets and graphics files can take thousands of hours. Alternatively, you can down load the Excel file alone from the Slot Tech Magazine FTP site. I suggest you get familiar with FTP if you are not already. The FTP server has just a bunch of hard to find data available for you. If you are not FTP friendly, you can contact me and I'll send you a CD or two you can just copy over to your computer. I haven't counted it lately but the whole thing may take up more than one CD. It may take me a while to get it done for you. I'm never short on things that must be done.

The other columns of the spreadsheet are set up to make note of all the features listed above, allowing for a number of different sources and crossed part numbers. I allow ample space for a description. I so hate it when people "Greek" the text of their descriptions to fit into a small space. Space isn't that expensive, people. It doesn't have to be printable.

Summing up a column

At the bottom of the column you may want to add up the total value of that column. We do this do make our accounting people feel useful. To do so we just enter a formula that specifies a range of cells.

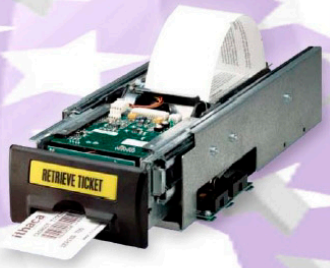
	A	B	C
1			$1.00
2			$3.50
3			$4.50
4			$5.00
5			
6	Total		$14.00

We would enter cell C6 the formula "=SUM(C1:C5)". SUM tells Excel to add. (C1:C5) specifies everything between Cell C1 and C5 are to be added together. This value is automatically updated as the information changes, so you always have the value available when called on.

As parts get put on order, I note on the spreadsheet how many and when they were ordered. When they come in, they are added to the Parts on Hand. When parts are removed from the parts bin, I subtract that value from Parts on Hand. This is called a Perpetual Inventory count. Once a year I actually count the parts in the bin to update my numbers. This is called a Real Inventory count. Believe it or not I do sometimes forget to update the count on hand as parts come and go.

We can search the spreadsheet to find data easily. This allows us to search on any part number or even a partial part number and find data. To do this we select "Edit", "Find", and enter the string of characters we want to search for.

Excel gives us a number of handy features we could not possibly cover in this article. This is a well-documented piece of software and you can find many books on the subject at reasonable cost or your local library.



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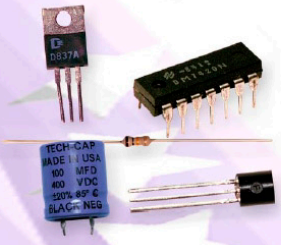

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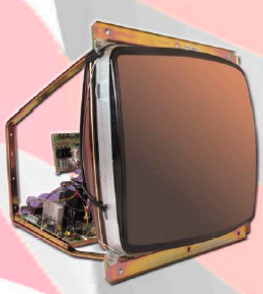

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The author, Herschel W. Peeler can be reached at the following address if you want the entire CD with the download, jpg files and pdf files. This information takes up a CD or two and is too much to download. Present cost is $0.00 (yes, that's free). I am currently getting excellent support from my manager for this project. Bless his soul.

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Using Excel for Electronics

Excel is as handy as a calculator for electronics. We can easily use it for Ohm's Law calculations or design calculations.

To calculate Ohms, given Volts and Amps, we would use a simple sheet like the following example:

	A	B	C
1	Volts	(Cell B1)	
2	Amps	(Cell B2)	
3	Ohms	(Cell B3)	

In cell B1 we would enter the Voltage across the part in question. In cell B2 we would enter the Current through that part. In cell B3 we would enter a formula to do the calculation, "=B1/B2".

As we enter the Voltage and Current values the resistance is automatically calculated for us.

To calculate Amps, given Volts and Resistance, we would use a simple sheet like the following example. To calculate Amps we would make a minor change as shown above. Same calculation, "=B1/B2".

	A	B	C
1	Volts	(Cell B1)	
2	Ohms	(Cell B2)	
3	Amps	(Cell B3)	

To calculate Volts, given Amps and Ohms, we would use a simple sheet like the following example:

	A	B	C
1	Amps	(Cell B1)	
2	Ohms	(Cell B2)	
3	Volts	(Cell B3)	

In cell B3 we would enter the formula to do the calculation, "=B1*B2".

To do a calculation for Watts we could use another spreadsheet. Given the values for Volts and Amps, we would have the following:

	A	B	C
1	Volts	(Cell B1)	
2	Amps	(Cell B2)	
3	Watts	(Cell B3)	

The formula for Cell B3 would be "=B1*B2".

We could combine all these into one spreadsheet as follows:

	A	B	C
1	Volts	(Cell B1)	(Cell C1)
2	Amps	(Cell B2)	(Cell C2)
3	Ohms	(Cell B3)	(Cell C3)
4	Watts	(Cell B4)	(Cell C4)
5			
6			

In cells B1, B2, B3 and B4 we would put the values for Volts, Amps, Ohms and Watts. In cell C1 we would put the formula for finding Volts, "=B2*B3". C2 would be, "=B1/B3". C3 would be, "=B1/B2". C4 would be, "=B1*B2".

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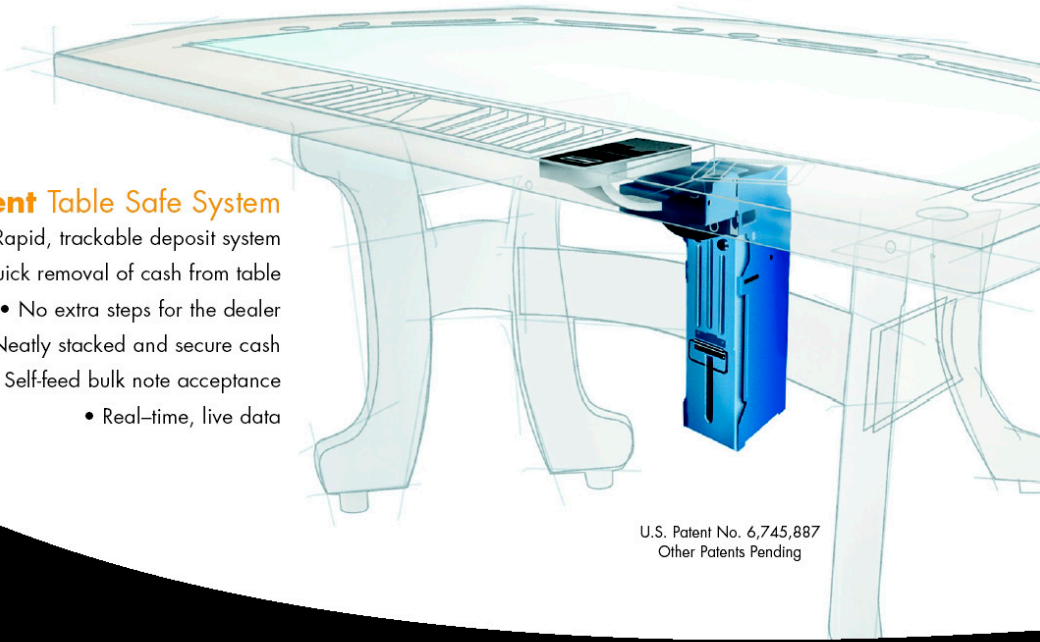

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LED Ballast Resistor Calculation.

For a simple circuit using a resistor and an LED connected between power and ground. We could have a sheet that would look something like the following:

	A	B	C
1	VCC	(Cell B1)	
2	V LED	(Cell B2)	
3	Current	(Cell B3)	
4	Resistor	(Cell B4)	(Cell C4)
5	Wattage		(Cell C5)
6			

In the B column we would enter the values we have to start with. "VCC" is the applied voltage to the circuit. "V LED" and "Current" we would get from a data sheet for the part, or just guestimate from general knowledge. In column C we would put our formulas that pull the information from column B to make calculations. C4 would be, "=(B1-B2)/B3". The value of VCC minus the voltage across the LED gives us the voltage across the resistor. Dividing that by the desired current we get the resistance of the resistor. Note that the voltage calculation is made first. Putting this part of the formula in brackets tells Excel to do this calculation first, then divide the result by B3.

We can now calculate the wattage for this resistor. In cell C5 we would put, "=(B1-B2)*C3". This calculates the voltage across the resistor times the current through it and gives us the wattage value for the resistor. Give yourself a good margin if the resistor is on for long periods of time. If it is pulses on only we have more room for design flexibility. If the design indicates the resistor should be a half watt resistor, but the LED is only flashed on for a second every ten seconds or so we can get away with using a quarter watt resistor with no likely problems.

Other Examples We Don't Have Room to Elaborate On

We could also use Excel to give us handy design aids to do things like . . .

> Calculate required transistor gain
> Design an oscillator using an LM555, or any other chip.
> Design an amplifier or oscillator using an Op Amp.

Anywhere we would otherwise pull out a calculator and make a calculation we can do it with Excel. Most any operation you could do with a calculator is available to you in Excel, trig functions, probability and statistics; you name it, it's in there.

- Herschel Peeler
hpeeler@slot-techs.com

Slot Tech Upcoming Event

AmEx 2005

Ireland's Industry Event Of The Year!

AmEx 2005 - The 26th Irish Amusement Trade Exhibition & Seminars will be held on Tuesday 1 and Wednesday 2 March 2005 at the Lynch Green Isle Hotel, Dublin. New opening hours will be from 11 am to 6 pm both days!

The Mary Openshaw Memorial Award For Excellence was inaugurated at AmEx 2004, in memory of the late Mary Openshaw, the renowned journalist who served the international amusement industry for over 35 years. The second recipient will be presented with the award at this year's show in one of the off floor events, which will also include a full programme of seminars, meetings, business presentations and social gatherings.

Equipment & Services at AmEx 2005 will include Accessories, AWPs, Casino Products, CCTV, Change Machines, Club Machines, Coin Pushers, Components, Currency Handling, Game Platforms, Gaming Machines, PCBs, Pokers, Promotional Gifts, Rebuilds, Reconditioned Equipment, Roulettes, Security Systems, Spares, Stools, SWPs, Trade Associations, Trade Press and Used Equipment.

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Email mdassociates@eircom.net

EELEX Shatters Record

EELEX draws a record number of attendees with over 11 thousand gaming representatives.

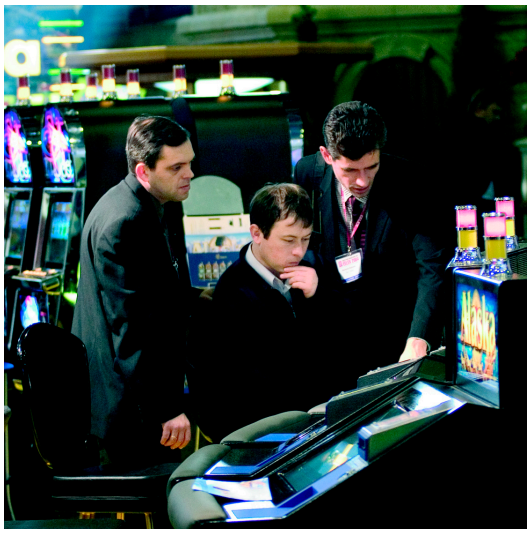
The 13th annual international East European gaming exhibition (EELEX) that took place in December (too late to make it into Slot Tech Magazine's January issue) has given further evidence of the intensive growth of the Russian gaming market. The tradeshow exceeded its past attendance record of 7,300 attendees with a final tally of 11,528 attendees by the close of the expo.

"While preparing for EELEX 2004, we expected to hit the ten thousand barrier but the actual figure came as a surprise. This year our registration numbers were tracking higher than ever before," said EELEX Director Daria Gorushkina, "and now as we are rounding out our event , we see even more new records. We are glad to observe that the show has become a leading industry

gathering place offering the best products and technology on the market."

The tradeshow, which grew by 40 percent from last year, featured over 200 companies. Exhibitors represented international and domestic casino, slot, amusement, billiards and bowling equipment producers and suppliers. Their proportion at EELEX attracted a similar number of gaming visitors: 70% - slot operations, 10% - casino operations, 20% - entertainment and amusement businesses.
The show results revealed to its organizers other amazing figures. Among all registrants, 70 percent attended this year's EELEX for the first time; 10 percent have traveled from outside Russia to attend. Visitors came from 61 different nations and have set another new record. Russian attendees came from 327 locations with over 50 percent from Moscow and Saint Petersburg regions.

International observers and industry professionals who are regular attendees of the Las Vegas G2E and London ICE exhibitions noted that EELEX has become a more and more significant industry event every year. The exposition includes the leading slot brands offering a surprising variety of products to the "curious" CIS gaming market. The number of exhibitors, new products, exhibition grounds and visitors has been constantly growing, driving to the EELEX show new attendees from all over Russia and neighboring countries. The quantity of Russia's regional operators and business representatives has grown up to 25% and is expected to increase substantially next year. It is another consequence of Russia's market development which obtained a new direction and now spreads from the largest cities Moscow and Saint Petersburg around other country's locations discovering new opportunities for gaming industry players.



EELEX officials predict further expansion of the show. The EELEX team has already started to make preliminary arrangements for the next exhibition. Most of them are determined by the interest of EELEX potential participants in available exhibition space. Experience has shown that EELEX stands are usually reserved by exhibitors in February. The exhibition grounds grow every year, but today the tradeshow organization committee expects the majority of EELEX 2005 stands to be gone by the end of January. EELEX 2005 will take place on December 14-16, in Expocentr.

For additional information:

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Boris Belotserkovsky, President of Unicum Group of Companies, enjoys a game of Super Chexx Hockey at EELEX 2004

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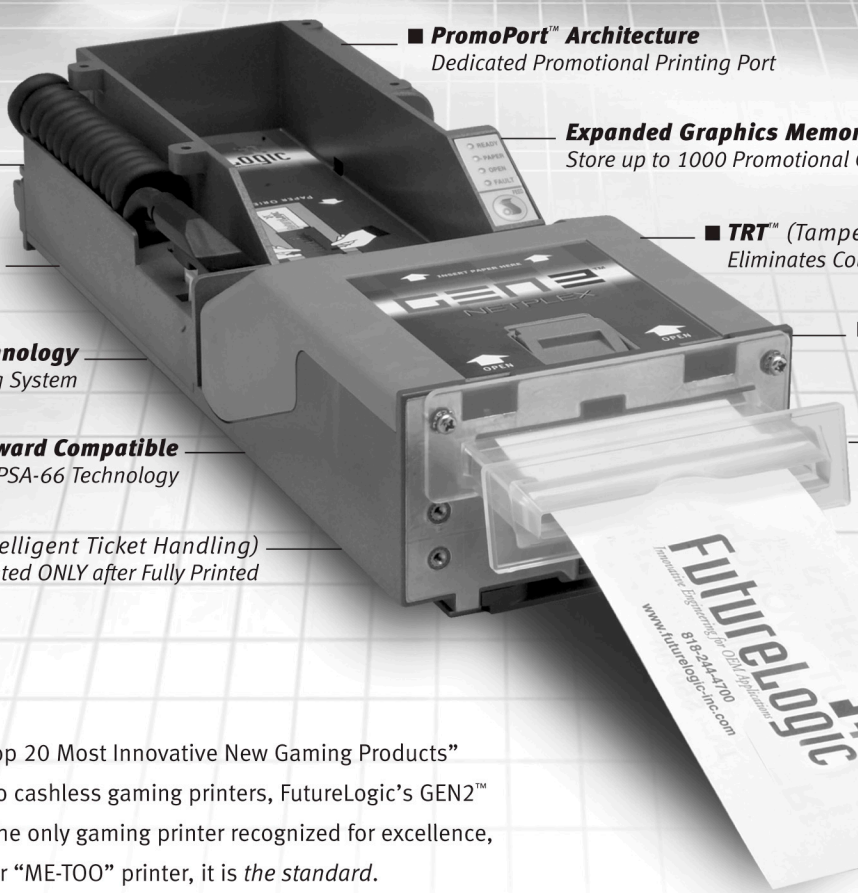

■ ***PromoPort™ Architecture***
Dedicated Promotional Printing Port

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50% More Capacity

■ ***TRT™*** *(Tamper Resistant Ticket)*
Eliminates Counterfeit Tickets

■ ***ProColor™ Printing***
Advanced 2-Color Printing

■ ***FlashPod™***
Conveniently Upload Firmware & Coupon Templates

■ ***ProMatrix™ Technology***
Promotional Couponing System

Hot Swappable
Printer Removal Without Powering Down

Backward Compatible
With Existing PSA-66 Technology

■ ***ITH™*** *(Intelligent Ticket Handling)*
Ticket Presented ONLY after Fully Printed

■ *patent-pending technology*

As evidenced by the "Top 20 Most Innovative New Gaming Products" award, when it comes to cashless gaming printers, FutureLogic's GEN2™ sets the bar for all. As the only gaming printer recognized for excellence, GEN2 is not just another "ME-TOO" printer, it is *the standard*.

Slot manufacturers concur. For the past several years, FutureLogic printers have remained the choice printer for Ainsworth, Aristocrat, Atronic, Bally, Cirsa, IGT, Mikohn, ShuffleMaster, Spielo, and WMS Gaming.

Now it's your turn to decide. Make GEN2, *your standard*.

2003 GEN2™ TOP 20 Most Innovative New Gaming Products — Casino Journal

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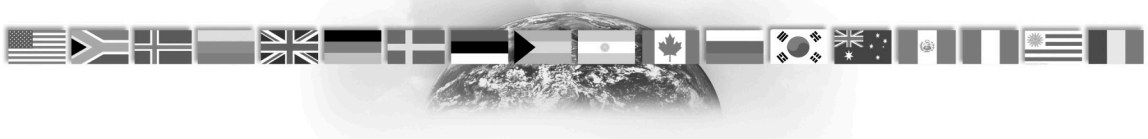

FutureLogic's New ProMatrix Couponing System Turns Ticket Printer into Dynamic Marketing Tool

FutureLogic, Inc. has introduced ProMatrix, a flexible and feature rich promotional couponing and trigger system. This integrated solution turns slot tickets into colorful, eye catching coupons and helps casino marketing departments deliver real time targeted promotions from any GEN2 printer equipped TITO (ticket-in/ticket-out) system. Like never before, ProMatrix makes promotional couponing a practical, cost-effective reality for casinos of all sizes.

Using ProMatrix's dynamic capabilities to dramatically improve a casino's merchandising program effectiveness is almost as easy as counting from one to four:

Step 1: Design Your Promotional Coupon
FutureLogic's TCLTM Editor program, a template-based Windows-compatible software, allows marketers to quickly create a variety of custom graphic coupons and set up their custom promotional campaign(s) using a wide variety of triggers: date, time of day, length of play, frequency of issue, wagering levels, and other user-definable criteria.

Step 2: Download Your Promotional Coupon
With an easy-to-use download tool (FlashPod), promotional campaigns developed in the TCL editor can be downloaded directly to the GEN2 printer installed in the slot machine for immediate implementation.

Step 3: Enhance Your Promotional Coupon
GEN2 printers are capable of providing a unique 2-color printing technology (ProColor) that allows the use of a second color to enhance the appearance and effectiveness of promotional coupons. Use the TCL editor to choose the location of barcodes and black-only print regions to enhance print clarity and ensure reliable validation by bill acceptors.

Step 4: Choose a Flexible Solution
GEN2's dedicated promotional printing port (PromoPort) can be used with jurisdictional approval to interact and implement promotional campaigns through player tracking systems. Alternatively, ProMatrix can interact directly with the game to produce highly effective in-house marketing campaigns.

Other key ProMatrix features include:

* Multiple pages of stored coupons-up to 100 for 1MB memory version; up to 1000 for 8MB;
* Exportable promotional campaign data may be used to measure campaign effectiveness;
* Firmware / promotional database may be upgraded without removing printer from game, eliminating downtime;
* Overlapping print regions can be used to create sophisticated-looking graphic elements;
* Simultaneous print orientation at 0, 90, 180 and 270 degrees maximizes content utilization;
* Wide variety of hi-res typefaces and sizes produces "magazine quality" promotions effortlessly.

For further information, contact FutureLogic at 949.487.4829 for sales inquiries and 702.597.5355 for the service department.

For more information visit the company web site at: www.futurelogic-inc.com.

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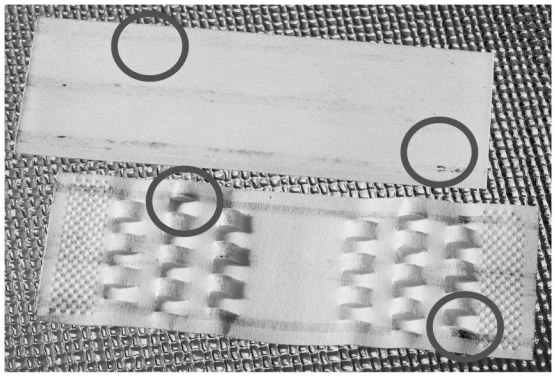

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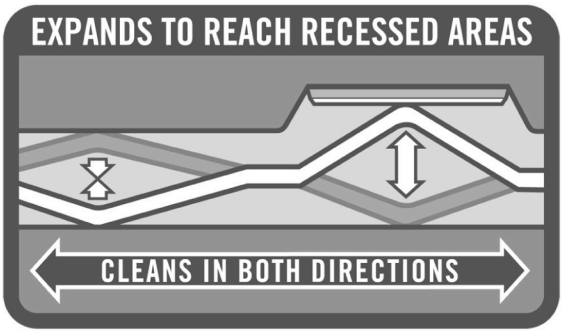

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Pull-itzer Prize

By John Wilson

Last month we studied the 'cycle' of a slot machine game. By using a comparison to a low-tech game, the petty pull-tab lottery, we were able to compare a slot machine cycle to a predetermined, small-cycle game of chance. In many ways, however, the slot machine is similar to the pull-tabs. Both have calculations showing all available outcomes of the game and all winning combinations with their respective payouts. Certainly, the slot machine payouts are much more detailed and larger in quantity. They both share many of the same properties.

The main difference, however, isn't in the random factor of the game, it's in the exclusion of previously selected awards. In the pull-tab game, when a prize is claimed, it is removed from the mix. It is no longer available to be won until every other combination has been selected by a player. With the slot machine, a winning combination is automatically replaced in the mix of available winning combinations after being paid. In reality, the winning combination has never actually been taken out of the slot machine, but this analogy might make it easier to visualize.

Consider the pull-tab to be a bucket of rocks. You can easily select one and remove it from the bucket. Once it's gone, it's gone. With the slot machine, however, we're dealing with a bucket of water. It's virtually impossible to pick out just one item and remove it. The water keeps falling through your fingers and back into the bucket.

The random factor applies to both games. In a slot machine, there is an electronic random number generator that automatically determines the outcome of the game for us. With the pull-tab, you are the random number generator. You reach into the pile and try to pick the ticket with the best aura. We'll look into slot machine random number generators in a couple of months. I think you'll find it fascinating!

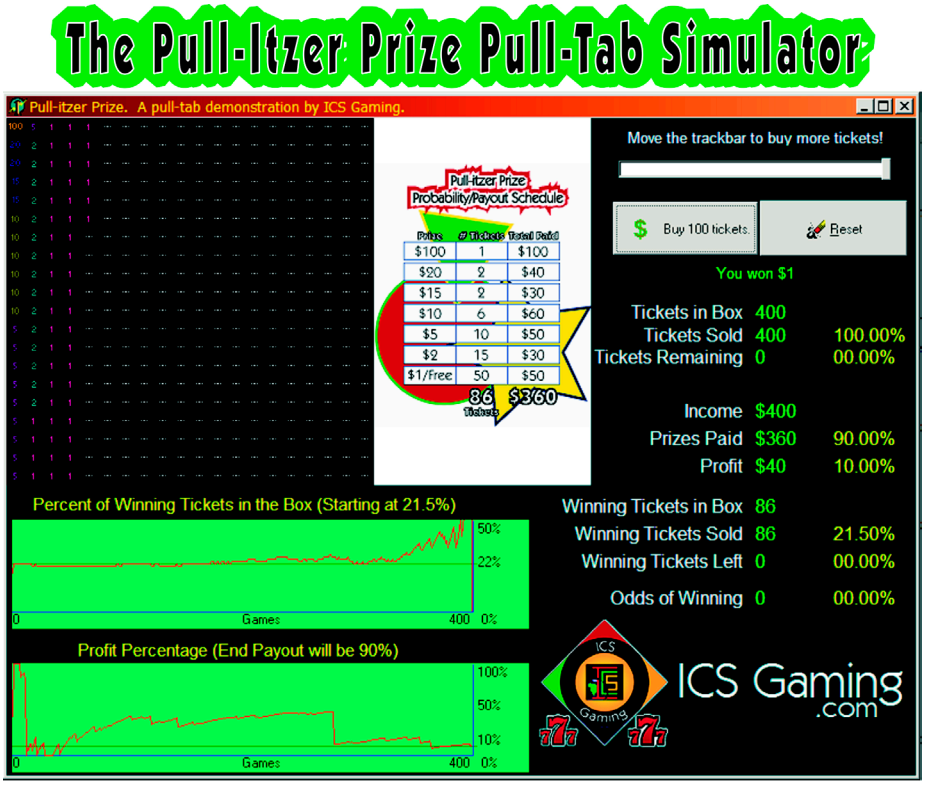


Figure 1. The Pull-itzer Prize pull-tab simulator

By studying the pull-tabs, and allowing for winning (and losing) combinations to be removed from the mix of available tickets, we can get a better understanding of how the cycle works. In order to illustrate further this point, I've developed another small program that will illustrate the process. It is available for download at slot-techs.com and icsgaming.com as well. We'll discuss the basics of the program here and you can then play around with it at your leisure.

Here we see how many winning tickets there are and how many have been sold. 21.5% of the 400 tickets in a box are winning tickets. As we play, this number will change. If we sell all of our winning tickets the display will show 0% winning tickets. This value is used to create the top graph.

Figure 1 shows the Pull-itzer Prize pull-tab simulator.

Statistics, Profits & Losses

The screen shows some basic statistics about the game. At the top, the number of games available (400) is shown along with the number of tickets sold and the remaining tickets below that. On the right-hand side of this are percentages. This shows the tickets sold and remaining tickets as a percentage of all of the tickets available.

Below this section is our income and profit. The income from tickets sold (at $1 per ticket) is shown, followed by the total amount of prizes paid out, then by the total profit we have made. From our calculations last month, we know that we will make a $40 profit by the time that all of the tickets are sold. This is guaranteed. In the short-term, we may show a higher profit (if we sell more losing tickets than winning tickets), or a negative profit (loss), if we sell more winning tickets early on. In theory, if we sold all of the 86 winning tickets at the start, we would have $86 income shown, and $360 prizes paid (the total amount of winning prizes available), and a loss of $86 - $360 or ($274). The non-winning tickets remaining would cover our losses, and in the end, we would be $40 ahead.

At the bottom of the screen is a display showing how many winning tickets are avail-

able. We always start with 86 winning tickets in a box of 400 tickets. As we take more tickets out of the box, watch the statistics. The number of winning tickets (and percentage, too) changes. It's quite likely that all of the winning tickets will be bought before all of the losing tickets are sold. In this case, the player has no chance of winning. It's also possible that the losing tickets are all sold, leaving only a handful of winning tickets. If the ticket operator were paying close attention to this, he or she could buy the remaining tickets and make a profit!

What Are the Odds?

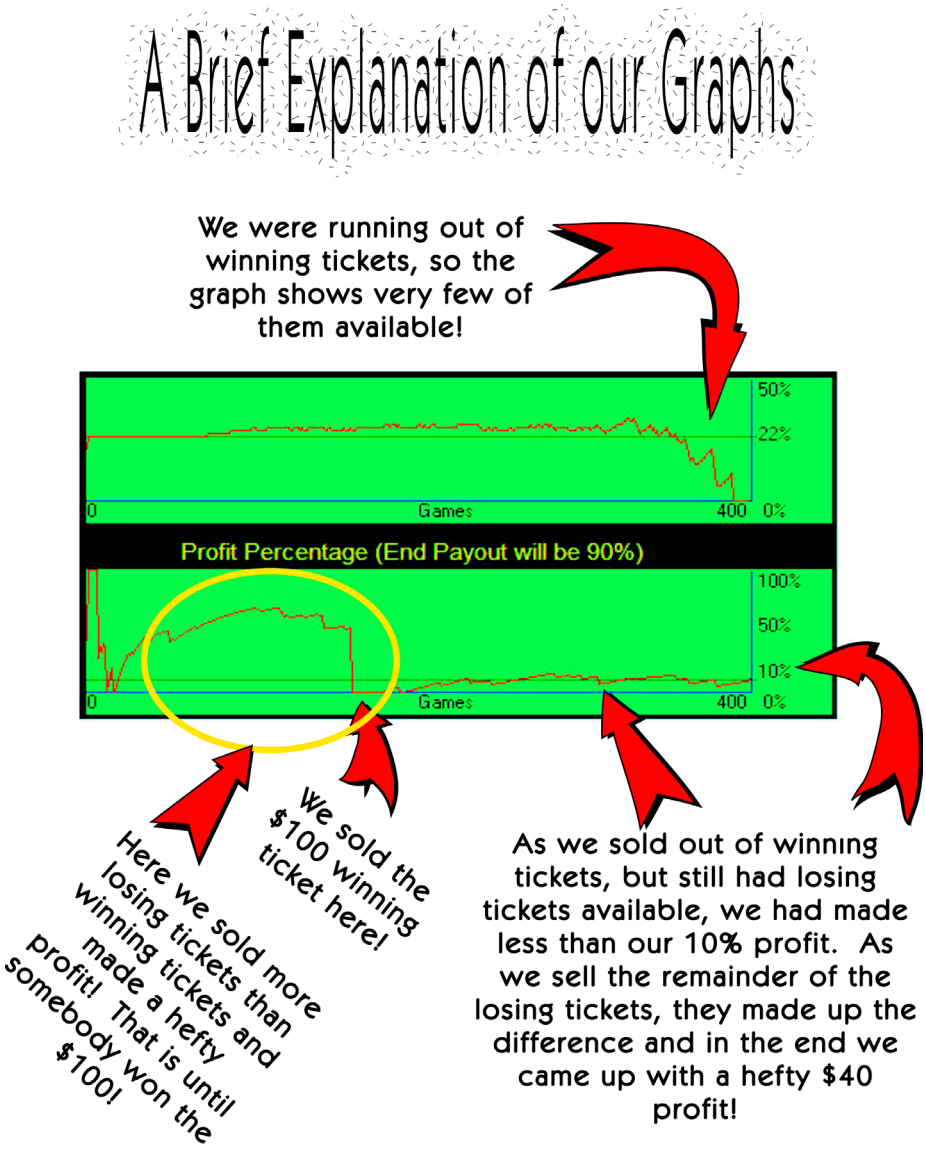
With slot machines, however, this never happens. If the odds of hitting the jackpot on a particular game is 1 in 32,768 spins, then the player will always have 1 chance in 32,768 spins. This is one area that the players believe that a slot machine actually works like the pull-tab tickets. Have you ever seen players around a progressive game when the jackpot rises above the "normal" payout amount? They feel that since the jackpot hasn't been paid yet, the machine will pay it soon. They feel that since there are so few 'chances' left in the machine, and one is the jackpot, that their odds of winning have increased.

This is the same perception that tells them the slot technician, "tinkering around inside the machine and pushing buttons" is resetting the game. In effect, they feel like you are opening up a new box of possible game outcomes and adding them to the machine. Just when they were on a lucky streak and winning, you added in a bunch more losing spins!

The truth, however, is that slot machines must always maintain the same probability of winning or losing from one spin to the next. There cannot be a change in the probability, nor can any other player have a better chance of winning (or losing).

A Graphical Look at the Game

As you play the pull-tab game, there are two graphs on the left-hand side of the screen that will be charted. The top graph shows the percentage of tickets in the box that are winning tickets. When the game starts, 21.5% of the tickets are winning tickets. This will increase or decrease depending upon the tickets selected. Watch the graph as you get closer to the end of the box. The first half of the graph is generally pretty well behaved, staying fairly close to the green line. As you get



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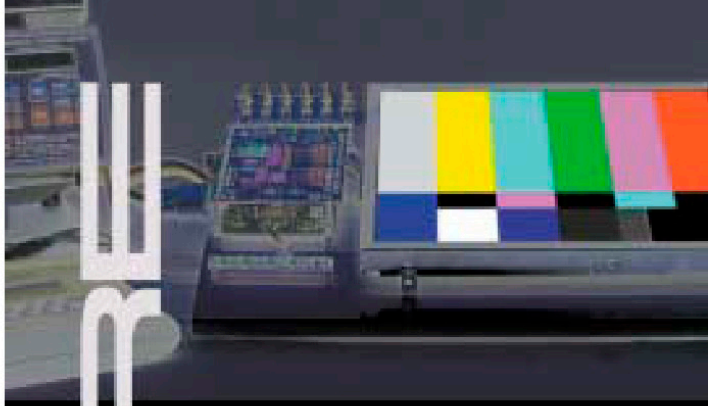

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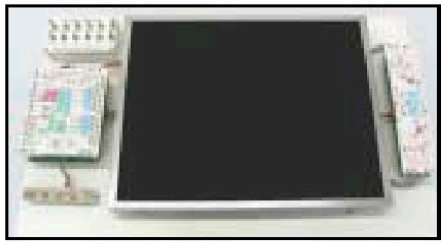
- *Be familiar with switch mode power supply (SMPS) and LCD Inverter power supply operation and troubleshooting*
- *Relate SMPS and Inverter power supply block diagram test points to the equivalent schematic test point*
- *Understand multi-mode formats and circuit operation*



- *Understand analog (RGB) and digital signal formats and connectors (DVI)*
- *Explain the advantages and limitations of CRT vs. LCD displays*
- *Understand the theory and operation of fixed pixel displays, including LCD panel operation, signal processing, and backlighting*
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The course begins with equipment familiarization and an overview of LCD displays. Students will discover how LCD panels work by learning the major functional blocks of an LCD monitor. Sencore has developed specific LCD trainers for hands –on demonstrations and troubleshooting exercises.

DAY 2

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The second day of this course provides an introduction to troubleshooting LCD monitors. Entry level technicians and seasoned veterans will learn troubleshooting techniques and short cuts by using block diagrams and hands – on lab exercises.

DAY 3

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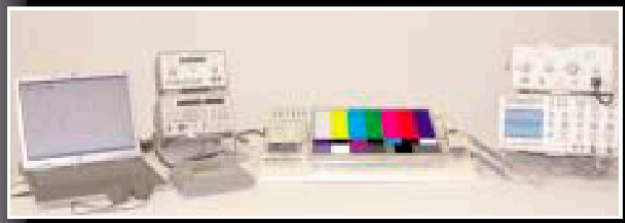
The last day of the course provides an introduction to power supplies and their uses. The students then learn how each type of SMPS and inverter power supply works by performing experiments on a working model. This course is truly a hands-on course with approximately 70% devoted to lab time performing tests utilizing an exclusive Sencore power supply trainer.

Students will also be presented with Certificates of Completion following the Tech School.

This course is eligible for Continuing Education Credits (CEU).



to the end of the box, however, this changes wildly. You may have more than 50% of the remaining tickets winners, or you may see that there are 0% winning tickets left. The graph always takes on this shape since we are removing tickets as we play them. On a slot machine, the graph would follow the green line exactly. If 21.5% of the possible outcomes are winning games, then this is always the case in a slot machine. We never remove any winning or losing combinations!

The lower graph shows our profit as a percentage of the money taken in. It will always end at 10% since we have a finite amount of tickets and a fixed set of winning and losing tickets. The graph will vary considerably, especially at the beginning of the box. We may have our ticket sales with no prizes being paid to the player (profit), or we may be paying out prizes with amounts larger than our ticket income (loss). In the end, however, we will always make a 10% profit!

The slot machine, in never removing the winning combinations, continually has a variance in money taken in and money paid out. A jackpot paid early in the life of the machine means that the game will report a loss. If the player is particularly unlucky, then the machine will make a larger profit. Eventually, however, the slot machine will report a profit much closer to the reported hold percentage of the game. This will experience some variance, though, due to the reasons we've just discussed. We'll discuss variance in more detail in future articles as well.

The top of the screen shows an x-ray look into the box of tickets. Prize tickets show the

monetary value of the prize they hold, and the losing tickets show up as a dashed line. As you start out all of the tickets are white. Once they are picked and removed from the box, they appear black. If you watch this display, you can easily relate it to the graph.

Playing the Simulator Game

When you first start, the simulator is set to play one ticket at a time. As you pick your ticket, the statistics are shown, the graph updated, and the x-ray box will show you the ticket you selected. The text below the "Buy" and "Reset" buttons will show you what you won. If you want the computer to select more than one ticket, move the slider bar at above these buttons. You can select 1 to 100 tickets at a time. If there aren't 100 tickets remaining, the slider bar will only move to the number of tickets remaining. The button also indicates how many tickets are going to be selected.

The Reset button starts the game over with a fresh box of tickets, new graphs and the statistics reset to the beginning values.

If you find this interesting and would like to see an expanded version, please send me an email and let me know. I can change the program so that it works like a slot machine, keeping each ticket in the mix rather than removing it. This shows the volatility of the slot machine but with a simple game base like the pull-tabs. It will show the number of boxes that tickets have been removed from, as the examples in last month's column did.

As you experiment with the simulator, try to think of the information in terms of a slot machine as well. Consider the prizes being awarded and the non-winning selections as well. How do you think the graphs would look if the $100 ticket were added back into the mix after being selected? What would the profit graph look like if a streak of non-winning tickets were selected? Would the replacement of non-winning tickets affect the odds of winning to the player? Feel free to tell your boss that you spent the entire day performing a detailed analysis of slot revenue and statistical investigation using a custom computer simulation!

Tips

When you start the simulator, click on "Buy a Ticket". After this, a dashed line will appear around the button. Press down the ENTER key and hold it. This will continue to buy one ticket at a time, allowing you to watch the process take place and the graphs being drawn.

When there are no more winning tickets left, a message will be displayed showing you how many losing tickets are still remaining. At this point, your customers cannot win. However, you still need to sell the remaining tickets to make up your profit. Can you imagine a slot machine where there were no more winning combinations remaining?

After all of the tickets have been purchased, a message will be displayed informing you that the simulation is complete. You can study the graphs and statistics for the complete game. Press the RESET button to start again.

Had enough? The Bye button will allow you to leave the simulation. If you ever decide to uninstall the simulator (why would you, though?), open up the Windows control panel and select "Add or Remove Programs". Look for "Pull-Itzer Prize" in the list, and then <sniff> uninstall the software. All of the simulators discussed in these articles are installed to c:\Program Files\ICS Gaming by default. You can change this during the installation procedure if you really want to.

That's all for this month. Next month, we start to examine how the machine can actually select the outcome of the game randomly and clear up quite a few misconceptions as well!

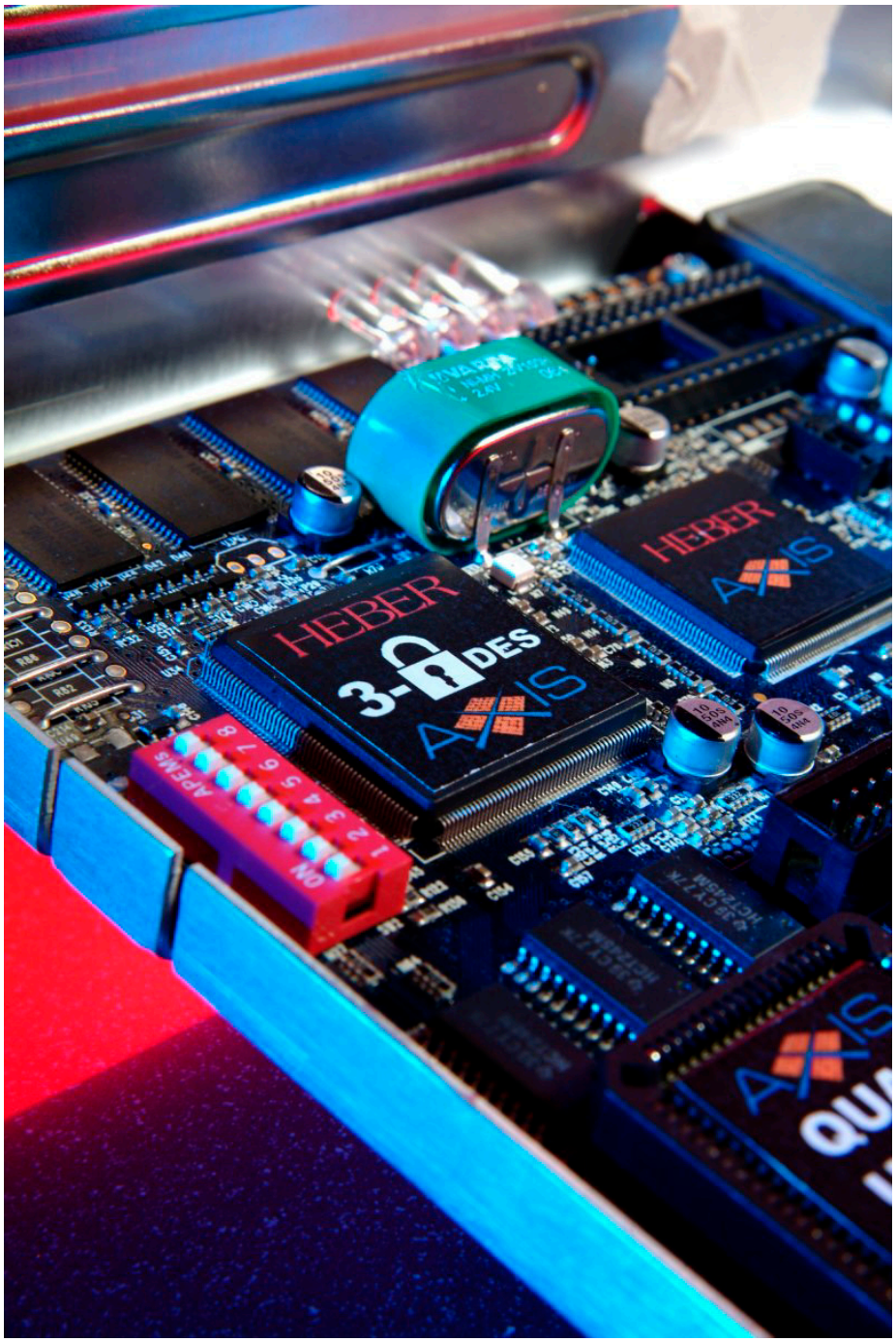
- John Wilson
jwilson@slot-techs.com

To download the software mentioned in this article, visit the website at slot-techs.com. You will find a link on the home page to "Pull-itzer Prize" Simulator.

Heber Launches Integrated Video Controller

Heber Limited have launched their new Integrated Video Controller range at ATEI 2005.

Axis is an entirely new range of compact control systems for the gaming industry. Based on the widely used Linux operating system, this dedicated video controller is passively cooled, with new levels of security and multiple I/O connectivity options. A range of Axis hardware shown at ATEI 2005, including a comprehensive development kit providing the ideal test environment for the Axis range.



'We are very excited about the launch of our new Axis range at ATEI 2005' said Richard Placito, Managing Director. 'This has been a major undertaking and represents our most significant new product release for some years. Axis is the result of a considerable amount of market research conducted worldwide, to enable Heber to better understand the forthcoming requirements of high-performance video controllers. This industry has demanding expectations of such technology, and Heber's research and development has been closely focused on meeting the price and performance targets - and I am proud to say I believe we have accomplished this.'

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But it's bankroll's unique and remarkable bonus display that will grab attention in every direction, and once players hear "You're getting a refund," they'll want in on the fun. And with Triple Stars and Double Diamond's successful track record, combined with the game's impressive display, players will earn a hefty return on their investment. Now that's something one can bank on!

TOVIS

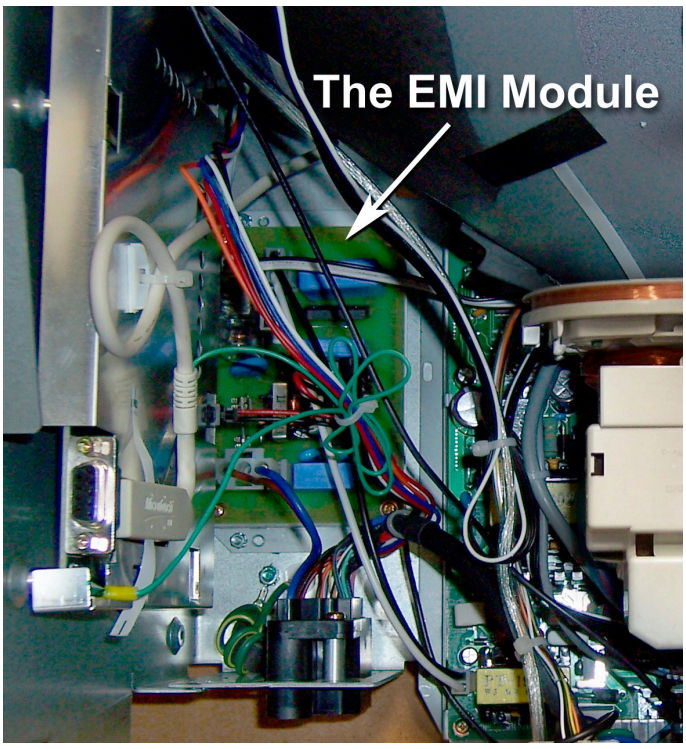
Part 2 - The Power Supply
An Introduction to Digital Monitors

Let's begin our detailed look at the Tovis digital monitor with the power supply. In fact, let's go back to the very beginning, at the AC (mains) input of the monitor. Right away, we see a notable difference between this monitor and the others we are used to repairing. Rather than connecting to an AC input connector on the deflection PCB, the AC input is connected to a separate "EMI Module." This is a small PCB upon which is mounted the components that we typically associate with the suppression of electromagnetic interference: AC input capacitors (C101, C102, C103, and C112) and the line filter itself. The engineers at Tovis have really taken this EMI suppression seriously, as there are two stages of EMI line filters (LF101 and LF102) in series. Nothing's going to get out of this monitor's SMPS and on to the AC power line, that's for sure. These components are typically low-to-zero failure devices.

Also included on the EMI Module is the degaussing circuitry. Unlike older, passive ADG (automatic degaussing) circuits, this one actually has a bit of active circuitry added that allows the ADG to operate under CPU control. It's a simple relay circuit that uses a transistor (Q102) as a "ground switch" to energize a relay coil. The base of the transistor is driven by the "degauss" output of IC801. What could be simpler?

Although we can now use an active control to turn the degaussing coil on and off, we still require a PTC thermistor (PTC101) in series with the degaussing coil. The degaussing coil's magnetic field can come on like a lion but it must leave like a lamb. That is to say, we cannot simply turn the coil off. The rapidly collapsing magnetic field would have just the opposite effect that we require, magnetizing the shadow mask of the CRT instead of demagnetizing it.

The positive temperature coefficient thermistor has a low resistance when it's cold but a high resistance when it's hot. As soon as the degaussing coil is energized, current flows through both the PTC and the degaussing coil which, as you can see, are in series each other. Of course, when current flows through a resistor, it generates heat and as the PTC heats, its resistance increases, slowly choking off the current to the degaussing coil. After a predetermined length of time to allow the PTC to reach its maximum resistance (but with no actual sensing involved) IC801 says "enough already" and removes the base voltage from transistor Q102, de-energizing the relay and removing power from the degaussing coil.



As with all such circuits, the degaussing coil will not operate again until the PTC thermistor cools off. However, unlike older designs, the PTC in this type of monitor does not require a "self-heating" element that keeps the PTC hot during monitor operation. Once the monitor has been degaussed (either automatically at start-up or manually) and the relay has dropped out, the PTC begins to cool and will be ready to go again in just a few minutes. A side benefit to this is that we save a watt or two of power as well. Energy saving is important in a monitor. There's no sense wasting power if we can find a somewhat "hi-tech" way to reduce the overall power consumption. You'll see in just a moment how the Tovis monitor carries this energy consciousness one step further.

Also included on the EMI module is the bridge rectifier (BD101) with an NTC thermistor (TH101) in its return path. The NTC thermistor is, of course, for inrush current protection as featured in the December 2004 issue of Slot Tech Magazine (page 33 - What a Rush!). Following the bridge rectifier, a .68 microfarad capacitor that is yet another link in the chain of EMI suppression.

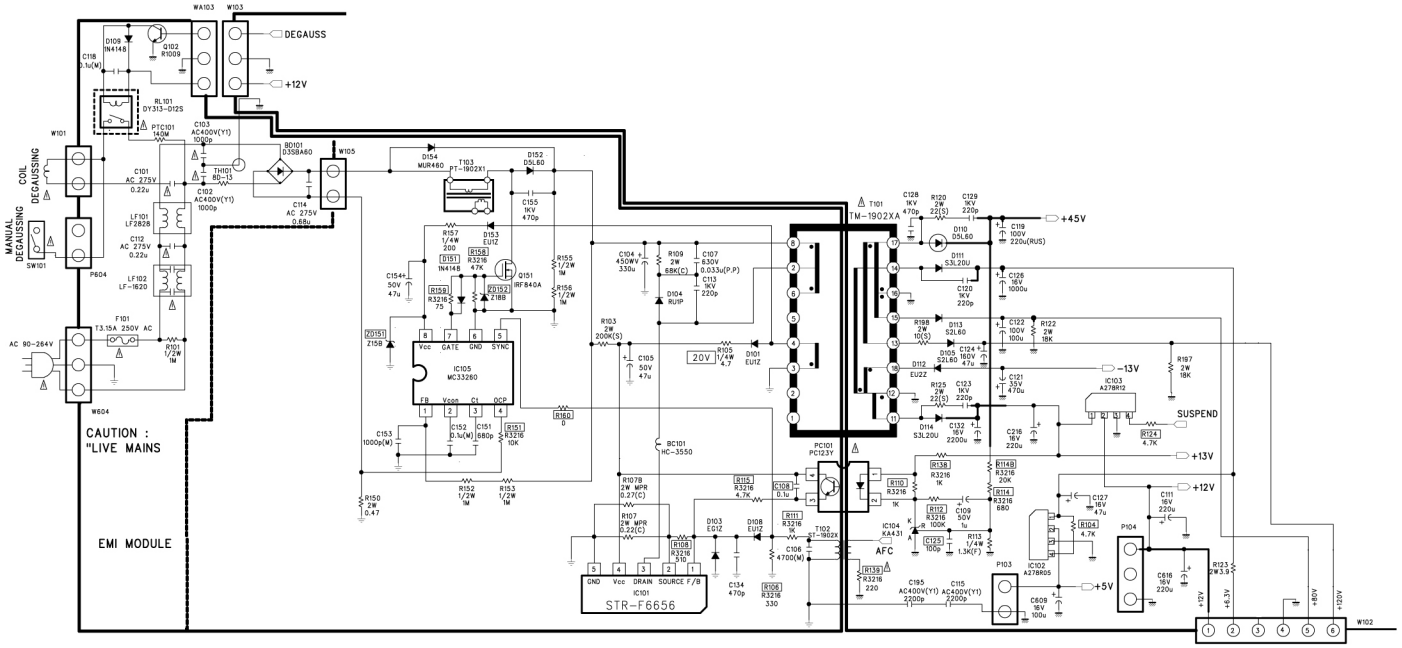
This EMI Module is starting to look a bit like a power supply but let's leave the EMI module now and make our way to the main deflection PCB of the monitor, where we see a very interesting new development in monitor SMPS design.

Think for just a moment about every power supply you have seen in your life as a technician. Whether we're talking about linear power supplies or switched-mode power supplies, what component almost always follows immediately after the bridge rectifier? It's the filter capacitor, of course. Look at a thousand different designs and you'll see it again and again: AC input connects to diode(s) followed by a filter capacitor.

However, in this design, the positive output of the bridge rectifier (at W105) is not connected directly to the positive terminal of the primary filter capacitor (C104). There are two paths that the output of the bridge rectifier can follow.

One path passes through diode D154 and then to C104. But why do we need the diode? It's already DC, isn't it? Sure it is. It's the output of a bridge rectifier and bridge rectifiers turn AC into DC. Is the current being "double-rectified" or something? Seems mysterious, doesn't it?

The answer lies down the other path so let's go back to the positive output of the bridge rectifier (at W105) and follow it straight across to what appears to be the pri-



mary winding of a transformer (T103) that is turned sideways, with nothing at all connected to the secondary winding. From the right side of this transformer winding, we can follow the current path through diode D152 and then to the positive lead of our friend the filter capacitor. What is going on here? Why are there two paths and why do we have the "extra" diodes?

Harmonic Currents and Active Power Factor Correction

If you're a regular reader of Slot Tech Magazine, you know all about harmonics and switched-mode power supplies. You know about the power-sapping third harmonic and how it robs your casino of power. If you need a refresher, the topic was covered extensively in the August 2004 issue.

Harmonic currents are a direct result of the way in which a switched-mode power supply (SMPS) draws current from the system. The input circuit of an SMPS is a bridge rectifier that changes the 120 volt AC input to DC. A capacitor smoothes this DC to eliminate voltage ripples and the resultant DC bus has a voltage of about 170 volts when the AC rms input is 120 volts. Although the AC voltage is a sine wave, the rectifier draws its current in spikes as shown in Figure 3. These spikes require that the AC supply system provide harmonic currents, primarily 3rd, 5th and 7th. These harmonic currents do not provide power to the SMPS, but they do take up distribution system capacity. The principal harmonic current is the 3rd (180 Hz) and the amplitude of this current can be equal to or even greater than that of the fundamental current.

The power supply used in the Tovis monitor is really two power supplies in one. At a glance, even a novice technician will recognize a standard SMPS design in power transformer T101 and its associated PWM controller/MOSFET, this time as a single module, IC101, an STR-F6656. The unregulated, filtered DC enters pin 8 on the primary winding of the transformer. The other end of the

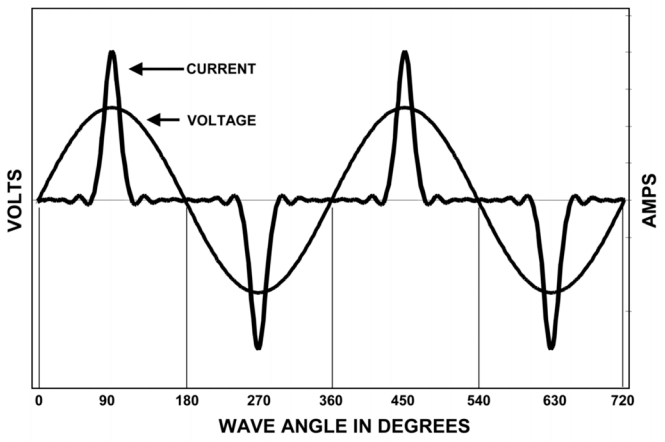


Figure 3. - Although the AC voltage is a sine wave, the rectifier draws its current in spikes

primary (pin 2) is connected to the drain of the MOSFET that's inside the STR-F6656.

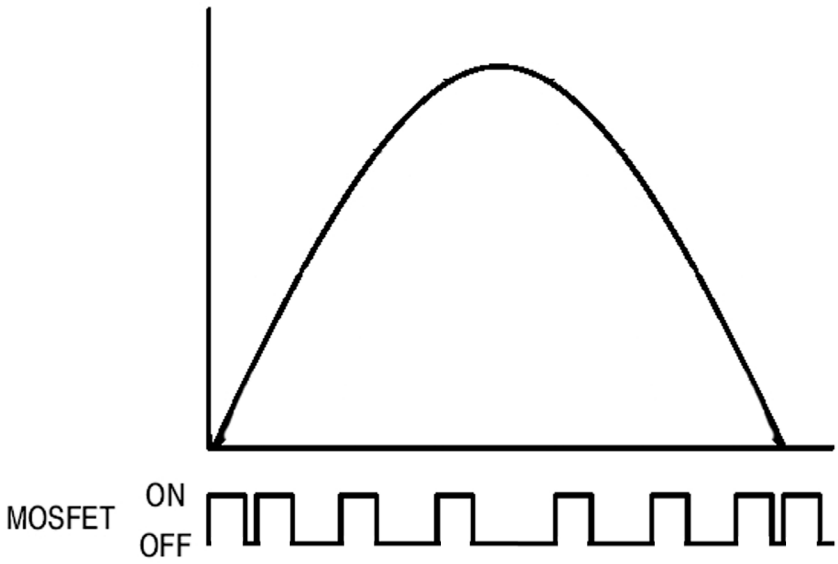
The source, as usual, is connected through a fraction of an ohm resistor (.22 ohm is typical) to ground. This is our over-current protection (OCP) detector. If too much current passes through this resistor (due to a shorted load, for example) it develops a substantial voltage due to IR drop. When IC101 see this voltage between its source and ground, it

says to itself "Holy Mackerel! There's a short somewhere!" and it turns itself off by removing the voltage from the gate of its internal MOSFET. About once a second, the STR-F6656 will try turning itself on, see the voltage and turn itself back off. That is what creates the ticking sound that you hear in a monitor with a shorted horizontal output transistor. It's the OCP in action.

The second power supply is really the first power supply! Look at the circuit made from MOSFET Q151 and its associated controller, IC105. It kind of looks like it is its own SMPS, doesn't it? However, the drain of the MOSFET is connected to the sideways transformer thingy, T103. What's this all about?

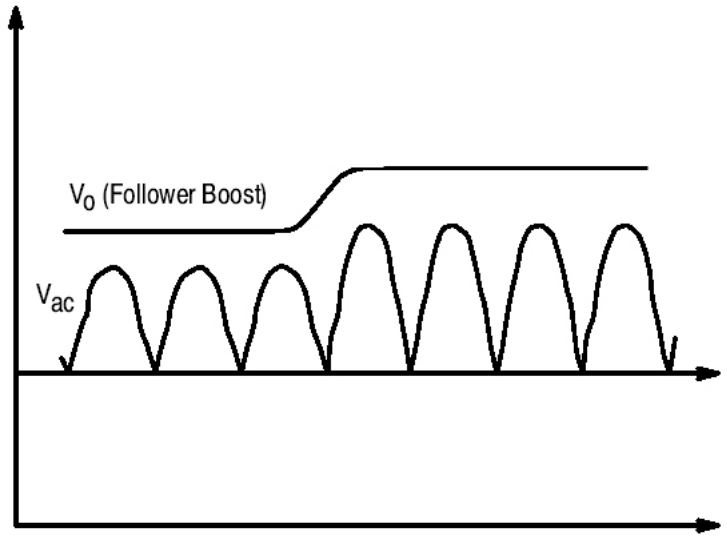
This, my friends, is a tricky little circuit called a "boost" power supply. In this case, it's more specifically called a "follower boost." The sideways transformer is, electrically speaking, just a coil. We're simply not using the secondary winding for anything. What we ARE using is the coil's ability to store energy, not as a charge (as we do with a capacitor) but in the form of a magnetic field.

Our goal here is to change the way the monitor's filter capacitor draws current from the bridge rectifier and, subsequently, the AC (mains). We're looking for a way to boost the pulsating DC output of the bridge rectifier so that instead of charging the filter capacitor with narrow, harmonic-producing spikes of current, we have a steady flow of current flowing from the bridge rectifier into the filter capacitor.



In the boost circuit, the pulses (the "on" time of the MOSFET) are of a fixed width. They come more rapidly when a large boost is needed and not at all when the AC sine wave is at its peak.

We accomplish this feat by pulsing MOSFET Q151. When Q151 is turned on, current will flow from the positive output of the bridge rectifier, through the coil in T103 and through Q151 to ground. The coil is our load and it builds up a nice big magnetic field. When Q151 is turned off, the magnetic field collapses. This



Follower Boost Characteristics

The "follower boost" circuit creates a voltage source that is added to the incoming AC voltage. If the incoming AC rises in voltage, the boost follows along, rising as well.

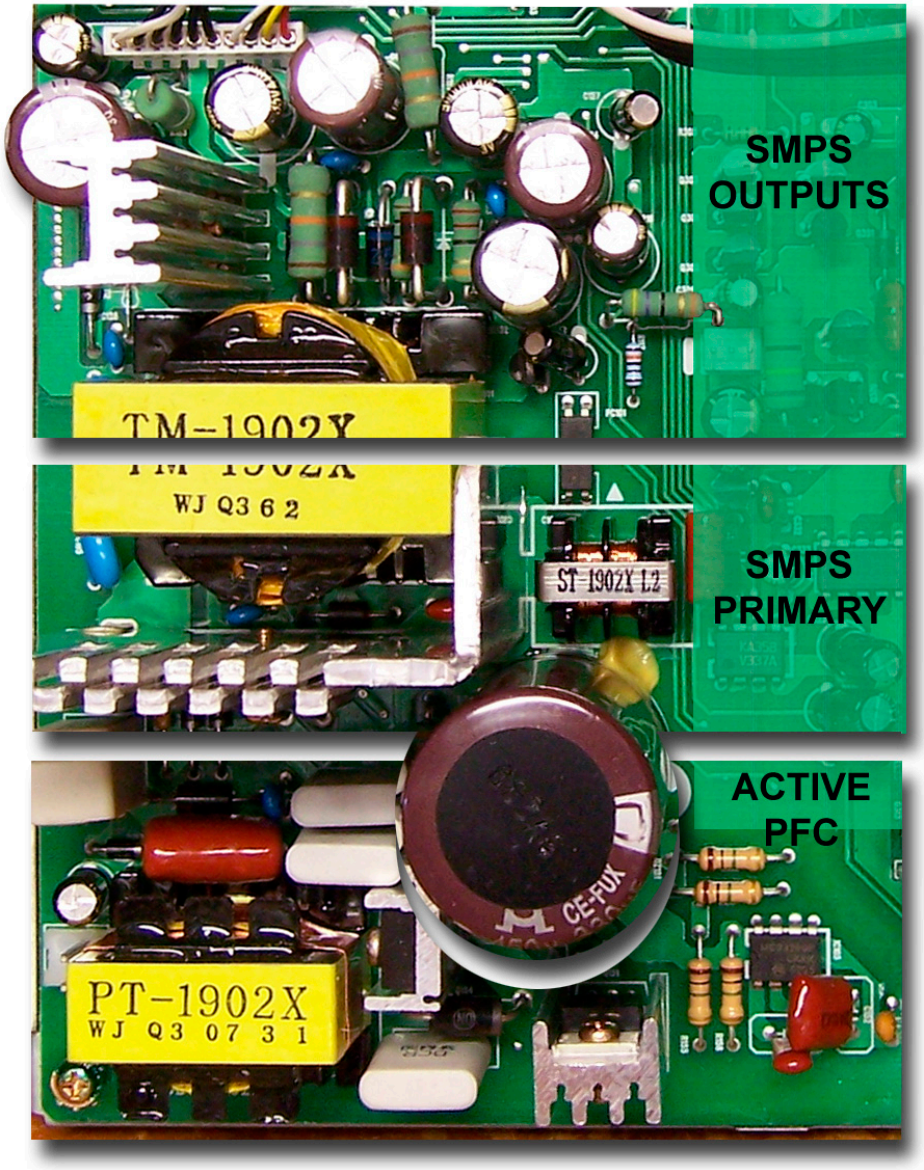
rapidly collapsing magnetic field slices across the coils of copper wire and turns the coil into an electric generator in a process called "induction." This newly generated voltage (you can kind of think of the coil as a battery for this moment in time) is now IN SERIES with the output of the bridge rectifier and, just like two or more dry cell batteries in series in a flashlight, the voltages are added together.

It's called a "follower boost" circuit because this newly generated voltage is added to the incoming voltage. If the incoming AC rises, the boost follows along, rising as well. We don't care about regulating the voltage at this point because we're going to do that next with the PWM part of the SMPS.

There is a notable difference between the way this circuit operates and the way the PWM controller works. PWM is just what it says; it is pulse-width modulation. The operating frequency remains constant while the duty-cycle of the pulse is shortened or lengthened in order to maintain a regulated output voltage.

In the boost circuit, the pulses (the "on" time of the MOSFET) are of a fixed width but they come more rapidly when a large boost is needed and not at all when the AC sine wave is at its peak.

The result is that we are taking a sine wave in and producing a constant voltage out and the upshot of this whole thing is that instead of charging the filter capacitor only during the brief peak period of the AC sine wave, we can keep a constant charge on it and substantially reduce (or eliminate altogether) the third-harmonic content of the system. This is known as "active power factor correction" or PFC.



The power supply can be divided into three sections: The active power factor correction, the SMPS primary and the SMPS outputs.

The diodes we were talking about at the beginning of this discussion (D152 and D154) are a sort of electronic "anti-siphon" valve. They are used to ensure that the current doesn't "backflow" when, for example, the output voltage of the boost follower circuit is higher than the output voltage of the bridge rectifier.

Other Things of Interest

Notice that IC105 gets its power (Vcc) from the 20 volt secondary of power transformer T101. The voltage is picked off at pin 4 of the transformer, rectified by di-

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GreenLine™ Compact Power Factor Controller: Innovative Circuit for Cost Effective Solutions

The MC33260 is a controller for Power Factor Correction preconverters meeting international standard requirements in electronic ballast and off−line power conversion applications. Designed to drive a free frequency discontinuous mode, it can also be synchronized and in any case, it features very effective protections that ensure a safe and reliable operation.

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Also able to function in a traditional way (constant output voltage regulation level), any intermediary solutions can be easily implemented. This flexibility makes it ideal to optimally cope with a wide range of applications.

General Features

- Standard Constant Output Voltage or "Follower Boost" Mode
- Switch Mode Operation: Voltage Mode
- Latching PWM for Cycle−by−Cycle On−Time Control
- Constant On−Time Operation That Saves the Use of an Extra Multiplier
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- Undervoltage Lockout with Hysteresis
- Low Start−Up and Operating Current
- Improved Regulation Block Dynamic Behavior
- Synchronization Capability
- Internally Trimmed Reference Current Source
- Pb−Free Package May be Available. The G−Suffix Denotes a Pb−Free Lead Finish

Safety Features

- Overvoltage Protection: Output Overvoltage Detection
- Undervoltage Protection: Protection Against Open Loop
- Effective Zero Current Detection
- Accurate and Adjustable Maximum On−Time Limitation
- Overcurrent Protection
- ESD Protection on Each Pin

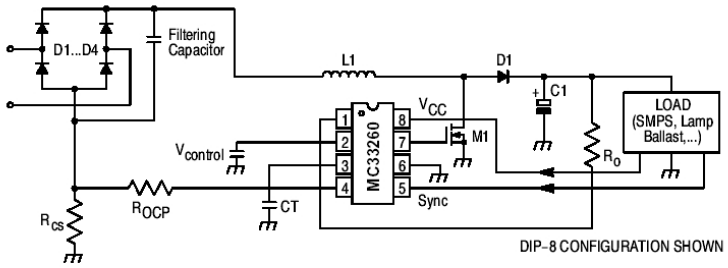

Figure 1. Typical Application

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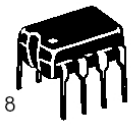
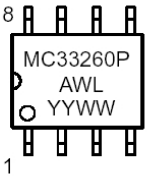
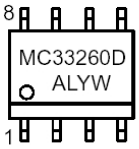
MARKING DIAGRAMS



DIP−8
P SUFFIX
CASE 626

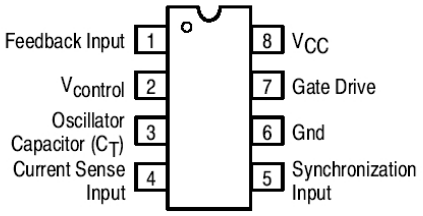


SO−8
D SUFFIX
CASE 751



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week

PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping†
MC33260P	Plastic DIP−8	50 Units/Rail
MC33260D	SO−8	98 Units/Rail
MC33260DR2	SO−8	2500 Tape & Reel
MC33260DR2G	SO−8 (Pb−Free)	2500 Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ode D153 and filtered by electrolytic capacitor C154. This means that the follower boost circuit actually doesn't begin operating until the main SMPS is already up and running. We can see how the STR-F6656 gets its "kick start" from the raw DC, through resistor R103 and thereafter runs from the same 20 volt transformer secondary, this time rectified by diode D101 and filtered by capacitor C105.

I suppose my point here is that, if the PFC circuit were not operating at all, you likely wouldn't know it, as the unit would simply carry on as a regular SMPS. A much more likely failure scenario is that Q151 would short-circuit. This would blow the fuse. If the MOSFET inside the STR-F6656 blows, this would also blow the fuse. In either case, pay close attention to resistor R150, .47 ohm, 2 watts. It's in the negative return path of the bridge rectifier. If any sort of high-current weirdness happens on the primary side of the power supply, R150 might open-circuit. Likely electrolytic capacitor failures to look out for are probably C105 and C154. I am not saying that these capacitors (or anything else, for that matter) WILL fail. I am just saying that, in my experience with all types of monitors, these will be the likely weak points. I understand from my source within the company that Tovis has used especially high quality, low-esr, capacitors in these critical applications.

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KA278R12

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- Overcurrent protection, Thermal shutdown
- Overvoltage protection, Short-Circuit protection
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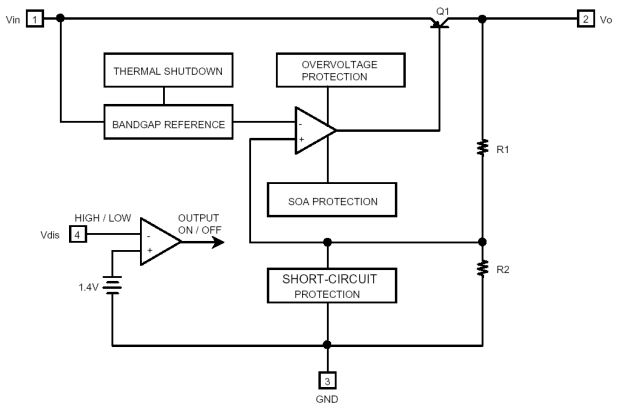
Description

The KA278R12 is a low-dropout voltage regulator suitable for various electronic equipments. It provide constant voltage power source with TO-220F-4 lead full mold package. Dropout voltage of KA278R12 is below 0.5V in full rated current(2A). This regulator has various function such as peak current protection, thermal shut down, overvoltage protection and output disable function.

TO-220F-4L

1. Vin 2. Vo 3. GND 4. Vdis

Internal Block Diagram



Rev. 1.0.2

The output side of the power supply is all completely standard with the exception of the A278R12 voltage regulator. This is a nifty little voltage regulator, used for the +12 VDC output. It's not so much that we really needed another regulator here - after all, the SMPS itself can provide us with a nice, regulated +12 VDC output. The A278R12 is cool because it has a "disable" input and can be turned on or off with an external signal from the monitor's processor. In this case, the signal is called "suspend." If the "suspend" signal is high, the regulator is turned on. If the "suspend" signal is low, the +12 VDC output is turned off. Since the +12 VDC is used to power things like the IC that controls the high voltage (we'll look at this in detail in a subsequent issue) killing the +12 VDC output is a handy way to handle things like EHT shutdown.

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