



2600 Connection

September / October 1992

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Issue Number 12

A Look at the Past

by Mark Androvich

Nolan Bushnell founded Atari in 1972 with \$500 and started the videogame craze with a simple black and white game called *Pong*. Four years later, Atari was sold to Warner Communications for 28 million dollars. By 1982, Atari had become a two-billion-dollar-a-year company—the fastest growing company in the history of America. At their peak, Atari controlled 80 percent of the videogame market. Today, Atari presents no challenge to the Nintendo and Sega domination of the market.

The Atari Video Computer System, later known as the 2600, was introduced to the world in 1977. Unlike the videogames of its day, the 2600 was programmable. Instead of playing only one or two games, it could play as many as Atari could eventually produce. Sales were slow at first, as the unit was fairly expensive. Early game programs consisted of graphically-simple driving games, target games, and sports simulations. Many were home versions of black-and-white arcade games. When *Space Invaders* became the first arcade game sensation, Atari scored big by licensing it for the 2600. Thus began the practice of licensing popular coin-ops for home versions. By 1979, the Atari 2600 VCS had caught on big with the public.

Meanwhile, a group of former Atari programmers left the company to form Activision—the first third-party videogame company. Atari resisted at first, but then realized that consumers would have to buy a 2600 VCS in order to play Activision games. If Activision games became popular, Atari would see increased sales. Unfortunately, Atari made no attempt to control the number of companies entering the market. Dozens of companies—many with simplistic and unoriginal games—jumped on the bandwagon. Many of these companies did not meet the profits they were expecting. The companies began to drop out of the market, selling their inventories at incredibly low prices. Consumers stopped buying expensive games, as they could buy several cheaper ones instead. Games could be purchased at discount prices if they waited long enough. Consumers who continued to buy games at \$40 stopped when the same game was selling for under \$20 a few months later.

Atari had been quite successful in licensing coin-op games for home versions. Many of the arcade hits of the time were produced by Atari's coin-op division already, thus making it easier to create 2600 versions. Original games were still being produced, but there were few. As Christmas 1982 approached, Atari was banking heavily on *E.T.* and *Raiders of the Lost Ark*—two videogames based on highly successful movies. This time, the licensing failed. People loved the movies, but they didn't love the games. *Raiders of the Lost Ark* required two joysticks and was too complex for many people. *E.T.* lacked the quality that made the movie the most successful film of all-time. Both games failed miserably. Atari lost money, most of its competitors went out of business, and the videogame market crashed. Although Atari continued to produce home versions of coin-op favorites, arcade games began to utilize advanced graphics. The 2600 did not have the memory necessary to play the new, more sophisticated arcade games. **To be continued in issue #13**



PVV Resurfaces

by Tim Duarte

Many people complained about Pleasant Valley Video's slow service. I even wrote some harsh, negative comments about PVV in issue #6. I shouldn't have done this and offer my apologies to Jim Redd. I was wrong to say Jim is a crook just because it took three months to receive my order. During that period, I lacked the information and facts. Owner Jim Redd claimed that his half-page mention in the March 1991 issue of VG&CE magazine generated a large amount of inquiries and orders. He explained that he became very ill for a few months, and he was unable to work. The inquiries kept coming in and began to pile up. According to Jim, everyone should have received their orders by now and the business is back to normal operation.

PVV remains a great source for obtaining some of those hard-to-find games. Jim has some never-before-heard-of 2600 game ROM chips. The chips are in PAL format, and do not have a casing. Still, fans may want to "build their own cases" and add these games to their collections. The games are *A Mysterious Thief*, *Missile Attack*, *Wolf Fighting*, *Ski Runner*, *Brick Kick*, *Treasure Island*, *Clown Down Town*, *Panda Chase*, *Fireball Spinner*, *UFO Patrol*, and others. Contact Jim at (513) 787-3682 for more details.

SURVEY

Please answer the following questions on a postcard. Your input in this survey is very important. Plus, by taking the survey, you qualify to win a free game: **Demons to Diamonds** (by Atari).

1. What is your favorite game for the 2600?
2. How many 2600 games do you own?
3. What changes would you like to see in this newsletter? How can it be better?
4. Are you for or against an increase in pages? This would probably mean a price increase.

2600 Connection Survey
PO Box 3993
Westport, MA 02790



Dear Editor: I recently read about *The 2600 Connection* in *AtariUser* magazine. I think the concept of your club is very good, especially since the demise of Atari's own Atarian Club three years ago. How much are the dues and/or subscription fee? How many people are in the club? I have a number of new (condition wise) 2600 games that I want to sell. What is the cost to advertise in the newsletter?

—Jeremy Wilburne
7755 El Modena Ave.
Elverta, CA 95626

Believe it or not, the 2600 market is still alive. It may be a small market compared to Nintendo and Sega, but there are a lot of people still interested in the 2600. After all, it was once the most popular system years ago. The 2600 Connection is a newsletter-based user group, or "club." There are currently 150 subscribers. Subscriptions are available for \$6 (more info on page 7). Readers can place a classified ad for \$1.

Dear Editor: The interview with Warren Robinett was very interesting. I told you there was no wizard in *Adventure!* (see issue 5, page 2) I really love *The 2600 Connection*. The only change I would like to see would be an increase in pages, even if it meant an increase in price. After all, this is the only source of 2600 information I have these days.

Regarding the games you listed by Fox, I don't know if *The Fall Guy* was ever released for the 2600. It was released for Colecovision/Adam. It's a very rare cart, but has been widely duplicated on tape and disk for the Adam. The game uses Coleco's driving controller and is pretty good.

—David Allen
P.O. Box 72
Rockland, ME 04841

*Thanks for your suggestion and the information on Fox games, David. Apparently, a 2600 version of *The Fall Guy* was never made.*

There is a possibility for an either an increase in the number of pages or a switch to 12 issues per year (monthly) instead of six. Readers, please take the survey on the first page so we can determine what you would like to see happen in the future.

Dear Editor: I have a few comments about a letter you answered in issue 7. Regarding Imagic's *Beauty and the Beast* for the 2600 in "How to Win at Home Video Games," I have that issue and it was published by *Joystick* magazine. *Joystick*, along with a few other videogame magazines, was notorious for creating game reviews from press releases. In one issue, they review a game for the 2600, informing the reader that some functions of the game are accessed from the "lower action button" on the controller. I often wanted to write a letter to them, requesting that they show me exactly where this button might be! The only magazine I ever trusted for reviews was *Electronic Games*. I have a near-complete collection, and I have never seen *Beauty and the Beast* reviewed for the 2600. These dubious reviews in *Joystick* and other magazines were always a cause of confusion to collectors, myself included.

—Greg Bendokus
RD #1 52A
Nesquehoning, PA 18240

*As stated in issue #7, a 2600 version of *Beauty and the Beast* was probably in the works, but never completed. It is highly doubtful that the game was officially released for the 2600. Perhaps we can track down an Imagic programmer and ask about this. Yes, *Electronic Games* was the leading magazine and the favorite of many, including yours truly.*

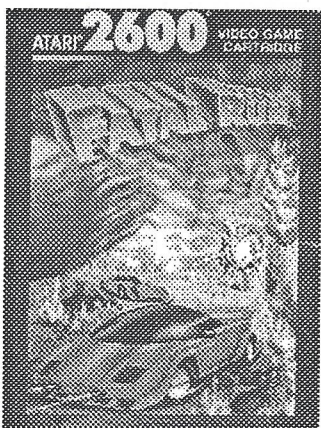
Russ Perry Jr. has informed me that *The Challenge of Nexar* in Cartridge List #10: Fox Games was originally planned to be a Fox game. The programmer, David Lubar, left Fox and joined Spectravision, releasing the game under their label.

Scott Stilphen noted the omission of *Gremlins* (by Atari) in issue #11's "Games Based on Movies." *The Last Starfighter* is another, but Atari never released a 2600 version. A prototype may exist.

Dominick Roman wrote in to tell us *Revenge of the Beefsteak Tomatoes* (by Fox) is not based on a movie of the same name. It's based on the two B-movies *Attack of the Killer Tomatoes* and *Return of the Killer Tomatoes*. A third movie, in which the giant tomatoes invade Paris, is currently in the works.

News & Notes

Journalists **Arnie Katz**, **Bill Kunkel**, and **Joyce Worley** have left the staff of *Video Games and Computer Entertainment* magazine to form their own magazine, *Electronic Games*. Yes, they received the rights to use the same name as the great magazine of the 1980s. "It's the revival of the spirit of the old EG, but a lot of time has passed. We want to try new things," stated Katz in a recent phone conversation. The monthly magazine, due to hit the newsstands during the first week of September, will cover all platforms and is targeted for the high school level and up. Look for a review of *The 2600 Connection* in the first issue's *Fandom Central*, EG's column for videogame fanzines.



Discovery: Werner Bleys, our source from Belgium, sent *Fatal Run* (CX26162), another Atari game that wasn't released in the U.S. The player must race to deliver a radiation vaccine, while henchmen try to knock your car off the road. Shoot the enemies as you drive to find a rocket that can be launched to counteract the radiation and save the world. In future issues, look for more Discoveries. Another additional column, "The 2600 Treasure Chest," will spotlight outstanding games for your 2600. Treasure Chest debuts next issue.

Atari has moved their Customer Relations and Ordering department back to Sunnyvale, CA. The new address and telephone number can be found on page 3.

Cartridge List Part 11: Games by Apollo

As one of the early third party game developers, Apollo released a number of games for the Atari 2600. Some of the games have interesting stories behind them. **Space Chase**, a basic shoot 'em up, was also offered in a special custom "monogrammed" edition. If you sent \$99 to Apollo, they would program your initials into the game. Your initials would appear on the screen when the enemies blew up. Just how many people acted upon this offer is unknown.

Lost Luggage, a game in which the player must catch suitcases thrown from a baggage terminal gone wild, exists in two versions. One version has a green label and one has a blue label. The blue label version also has an extra opening screen. The green label cart is more common than the blue label cart.

Shark Attack was originally released as **Lochjaw**. MCA/Universal, owners of the Jaws trademark, forced Apollo to change the name of the game to Shark Attack. MCA thought Lochjaw was an infringement upon their famous killer shark. If you have an original Lochjaw, hold onto it. It's rare and a definite collector's item.

Apollo's games are not spectacular, but some of them do stand out. **Final Approach** is an air traffic controller simulation game. **Wabbit** isn't very unique, but is quite amusing to play. The object is to protect your garden from an attack of invading rabbits by throwing rotten eggs at them. **Space Cavern** is another shoot 'em up. Creatures fly above and ground creatures occasionally attack the player from the right and left.

Various videogame magazines reported that Pat Roper, Apollo's owner and president, used the earned profits from the first few games to buy a helicopter. With the advent of the videogame market crash, it wasn't too long before Apollo was faced with hard times. Apollo has gone down in history as the first third-party company to go out of business.

—Intro by Tim Duarte —List by Russ Perry Jr.

The 3rd Annual 2600 Connection Mail Order Guide

by Tim Duarte

The exhaustive search for places to buy games for your 2600 is over—well, at least for this year. Once again, I have contacted numerous mail order companies. Since most toy stores no longer sell 2600 games, mail order companies provide a great source for finding games. If you prefer to buy games in person and don't like dealing with companies, then try going to yard sales, flea markets, thrift shops, and computer swap meets. The classified ads in this newsletter have also been a reliable method of obtaining games for your system. However, some of the mail order companies have impressive inventories and are worth looking into. Call or write for a catalog and see for yourself. Don't forget to mention you heard about their mail order business through *The 2600 Connection*.

CONTEST WINNER

Galen Komatsu of Pearl City, HI answered last issue's trivia question correctly. Toshihiro Nishikado created the arcade version of *Space Invaders* in 1978 for Taito. Galen's prize is **Space Jockey** (by U.S. Games). It's easier than ever to win this time; just take the survey on page 1. Our mailing address appears on that page.

AP1001 Skeet Shoot
AP2001 Space Chase
AP2002 Space Cavern
AP2003 Racquet Ball
AP2004 Lost Luggage
AP2005 Shark Attack (Lochjaw)
AP2006 Infiltrate
AP2007 Kyphus*
AP2008 Guardian
AP2009 Final Approach
AP2010 Wabbit
AP2011 Pompeii*
AP2012 Squoosh*

* = unconfirmed release 

Order Department
Atari Corporation
1196 Borregas Ave.
Sunnyvale, CA 94089-1302
(408) 745-2000, (408) 745-2031

Atari-ville
113 S. Plant
Boerne, TX 78006
(512) 249-3024

Best Electronics
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San Jose, CA 95126-1127
(408) 243-6950*

Computer/Electronics Source
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Woodside, NY 11377-3952
(718) 426-9614

Games & More
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Waterford, MI 48328
(313) 683-8555

Mars Merchandising
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Lombard, IL 60148-2059
(708) 627-7462


Pleasant Valley Video
8141 Pleasant Valley Rd.
Camden, OH 45311
(513) 787-3682

Starbase Atari Computers
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San Antonio, TX 78218
(512) 590-7122

Telegames
Box 901
Lancaster, TX 75146
(214) 227-7694
(214) 218-5800**

Video 61
22735 Congo St., N.E.
Stacy, MN 55079
(612) 462-2500

* = send S.A.S.E. ; request 2600 list
** = 24-hour order line

Let's not forget the tried-and-true collectors. Frank Polosky, Scott Stilphen, Al Backiel, Jeff Adkins, Kevin Oleniacz, John Marcin, Earl Carsner, Sam Twiford, Ron Milford, myself, and others sell games. You can find their addresses and phone numbers in the classified ads of the current and back issues. 

A Conversation with David Crane, Master of the 2600

by Tim Duarte

Most videogame fans are familiar with the name David Crane; he is a very popular videogame designer. Today, David is a senior designer for Absolute Entertainment. He is a fascinating individual, and the probably the most successful game designer of all time.

Q. Let's talk about your newest game, *Amazing Tennis* for the Super Nintendo.

DC: *The Super NES provides hardware capabilities that no other videogame system has ever had. This is a real-perspective tennis game—with pseudo-perspective displays. There have been many tennis videogames over the years, and most of them are glorified versions of Pong. The games are masked with enhanced graphics and sound effects. Amazing Tennis has a 3-D display, with a camera perspective right behind the player. You feel like you are on the screen. I've been a tournament tennis player for years, and that really helped with the perspective.*

Q. How long have you been working on *Amazing Tennis*?

DC: *I've been working on it since September 1991 and I'm bringing it all together now. It will be available in October 1992.*

Q. What do you think of the Super NES?

DC: *Every few years, the technology improves. All the companies release bigger and better systems. The Super Nintendo has some wonderful hardware—a 3-D rotation scaling display device—that allows enhanced graphics.*

Q. What do you think of the potential of CD-ROM games?

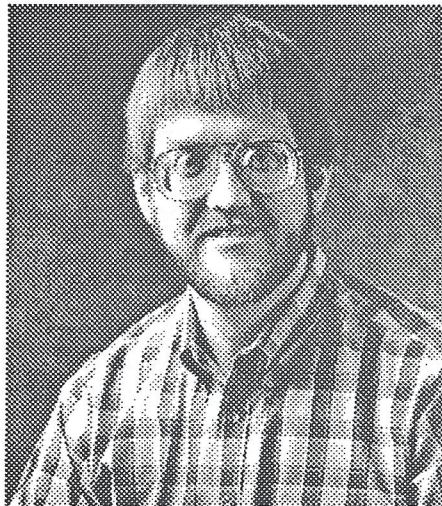
DC: *CD-ROMs are an evolution, not a revolution. There's nothing new about it. When I began designing games on the Atari 2600, the biggest configuration for a game was 2K (2048 bytes). Amazing Tennis is one million bytes—occupying as much space allowed on a cartridge ROM. The games of today are bigger and better, but a good game is a good game despite great graphics.*

CD-ROMs can store 5 or 600 million bytes of data, but if there's only one megabyte (one million bytes) of RAM in the videogame system, there's a constraint as far as the game ROM is considered. CDs can store massive amounts of data. We all know the high-quality that CDs handle audio information. It can also store picture images.

In terms of game development, just because the potential for large data storage on CDs is available, this doesn't mean that games will be 500 times bigger than they are now. There's an advantage because now there will be more images, and sound effects, which will be great for adventure-type games. But, the bigger the game is, the harder it will be to build.

Q. How do you compare the design of a videogame—then and now?

DC: *Back with the 2600, the business was made up of a handful of people. Game design and programming were two separate tasks—many people don't realize this. On a light schedule, it took me three to four months to complete a game back then. Today, it's a group effort—the work of others is compiled. With today's demands for games, you have video transfers, studio musicians to play the game soundtrack, and so on...*



Q. I must commend you with your past work. The games you created for the Atari 2600 were mind-blowing back in the early 1980s. The Activision games were fantastic. What was the "magic" in these games?

DC: *Activision had the top few game designers in the industry—Al Miller, Bob Whitehead, Larry Kaplan, and myself. We worked in a single room together—in a closed, laboratory environment. We had the knowledge and technical expertise to create a good display on the 2600. Our talents were not all the same, so we played off of each others ideas and capabilities. A game wasn't complete until it was good enough for everyone.*

*The Atari 2600 was designed to output two moving tanks and two bullets—which were dots. It was meant to play *Tank and Pong*, and that's all. I remember one day when the designer of the 2600 display chip was standing behind me as I was programming. He never envisioned all of the things we were doing. When I programmed *Dragster*, the moving object across the screen—the dragster—was 32 times larger than a tank. It moved across the screen with the same detail of resolution.*

Having an artistic eye helped, too. We tried some things with colors. The games had bordering colors with shadings—something that hadn't been done.

Q. They made the other Atari 2600 games on the market look inferior...

DC: *At the CES shows, people would stop by the Activision booth and ask, "Why do your games look better?" This happened at the Winter 1992 CES show in Las Vegas. Some of Nintendo's technical staff members stopped by the Absolute booth and asked the same question. As they previewed *Amazing Tennis*, they asked, "How can you do this? You're mastering the Super NES already, almost right out of the gate." We have this "Activision capability" at Absolute.*

Q. How did you get involved with Atari?

DC: *I was playing tennis with Alan Miller, who designed games for Atari at the time. He lived in the same apartment complex as I did in Sunnyvale, CA. I was designing chips for National Semiconductor at the time. Al asked me if I wanted to see the ad that Atari was placing in the newspaper. They were looking for game designers, so I talked to Atari the next day, and then I was in.*

Q. What games did you design there?

DC: *The first game was *Outlaw*. Then, I designed *Slot Machine*. I also did *Canyon Bomber*, too. There was another popular coin-op game at the time called *Depth Charge*. I put both *Canyon Bomber* and *Depth Charge* into the 2600 version of *Canyon Bomber*—\$4,000 worth of hardware (two coin-op machines) into one \$30 game for the 2600.*

I was also on the design team for the Atari 800 computer. That was a lot of fun.

Q. What was it that inspired you to leave?

DC: There were a lot of reasons—lack of designer recognition, for one thing. Atari looked at game designing as just manufacturing a product.

Q. Do you think it caused game designers to include their name in the programs? Were the “Easter Eggs” programmed on purpose or possibly out of resent for lack of recognition?

DC: No, there's a myth about Easter Eggs and hidden initials. People say that they're in there to help the sales of the game. Game designers put them in there as a technical teaser. If they can do it, they will.

Q. What do you think of first when you design a videogame?

DC: I'm looking for different ideas all the time. I try to predict what people will want next year. Since it takes about a year for a game, it works out well to think in advance. Most programmers work on a game and it comes out a year later, when it's too late.

Q. How do you know if the game you are working on is good?

DC: I spend anywhere from 1,000 to 2,000 hours working on a game. If I don't like it, I'm in trouble.

Q. Some of those games, like Pitfall, are still enjoyable to play today. There was nothing like it at the time. Was there anything that gave you the idea for Pitfall?

DC: The concept for Pitfall took less than 10 minutes. The difficult part was sitting at the computer, for over 1,000 hours, and making it happen. I had been intrigued by the animation of a running man. I had a program of a man, but he never panned out in any of the games. I then asked myself, where can I have the man run? Where are there paths? The answer came to me—the jungle. Then I had him pick up some treasures as he ran. The scorpions, the ladder, the vines, and all the other things then logically came to mind.

Q. Pitfall II is a great game, much like some of the games for the Nintendo today. There's a lot of similarities with A Boy and his Blob (for Nintendo).

DC: No, not really. It's much more similar to Pitfall. Pitfall was a one-dimensional game, so with Pitfall II, I gave it an up and down. There's a lot of the same creatures in both games, too. Pitfall II is a stand-alone game in its own right and there's a lot more in it than the original Pitfall. I wanted Pitfall Harry to be able to fly vertically, so I added the balloons. It's a 3-D maze game.

A Boy and his Blob is a tool-using adventure game. You feed the blob different colored jellybeans to make him change his shape. If I do another “Blob” game, I want to give the Blob more personality.

Q. Super Pitfall was created for Nintendo as well. It expands on the original Pitfall games...

DC: I had no connection with the Nintendo version, nor the coin-op version of Super Pitfall.

Q. What is your favorite game?

DC: I've been asked this question many times. I've really enjoyed working on Amazing Tennis. Whichever game I am currently working on is my favorite—it has to be.

Q. After talking with Garry Kitchen, I have learned you have a great working relationship with Absolute. You work for Garry now, but in the past, he worked for you at Activision. How did you discover Garry?

DC: At the time, there was only four or five of us working in the lab at Activision. We realized there wasn't much potential for growth. We wanted to maintain the synergy, but still have the ability to grow. Garry came to us and we knew he had designed some games for other companies. He could have went to work for Atari, but he wanted to come and work for us. But, he didn't want to move from New Jersey, so using the “design center concept,” we opened a design center on the East Coast. We also had design centers in Boston, Pasadena, and Sacramento. After the crash, these other centers closed, and the designers had the choice to relocate if they wished. Activision kept the offices open in NJ. None of them were as successful as Garry's center.

Q. How did you get back with him at Absolute?

DC: I left Activision in 1987. From there, I worked on a phenomenal piece of technology that never made it to the market. I called Garry after Absolute had already started up. I worked as an outside contractor at first, and am now an employee.

Q. What is your opinion on the current state of videogames?

DC: It's in one of the healthiest phases. When there's two (or more) systems with roughly equal competition and similar marketshares, it's healthy. There will be cycles, though. There's always new machines. Overall, there must be games that are fun to play. All it takes is 10 minutes for any gamer to decide whether a game is garbage or not.

Q. Can you predict the state of video games 5 years from now—in 1997?

DC: CD-ROM will be the distribution medium. Video games will not phase out like they did before. There's a definite force behind them.

Q. What do you think you'll be doing 10 years from now?

DC: It's hard to say. In 1977, I could not predict I would still be designing games in 1992. I've been to so many trade shows—I'm going on my 26th consecutive show. I've been in the business for a long time.



David Crane's Softwareology

For Atari 2600:

Outlaw (Atari)
Slot Machine (Atari)
Canyon Bomber (Atari)
Dragster (Activision)
Fishing Derby (Activision)
Laser Blast (Activision)
Freeway (Activision)
Grand Prix (Activision)
Pitfall (Activision)
Decathlon (Activision)
Pitfall II: Lost Caverns (Activision)
Ghostbusters* (Activision)
Skateboardin' (Absolute Entertainment)

For Atari 7800:

Super Skateboardin'
(Absolute Entertainment)

For Commodore 64:

Ghostbusters (Activision)
Little Computer People (Activision)
Transformers (Activision)

For Nintendo:

A Boy and His Blob
(Absolute Entertainment)

For Nintendo Game Boy:

The Rescue of Princess Blobette
(Absolute Entertainment)

For Super Nintendo:

Amazing Tennis
(Absolute Entertainment)

* David designed the concept and Dan Kitchen programmed the game.

2600 CONNECTION BACK ISSUES
are available! \$1.50 each
Send an S.A.S.E. for an index

*Tricks and Tips***COMBAT**

by Andy Floyd and Scott Stilphen

Super Long Shots: Normally your tank has a limited range of fire. This sneaky trick will give you a one-point advantage at the start! Select any tank version with an open playfield. Hold down RESET and press the fire button. Release the RESET switch when the shot is about half-way across the screen. Your shot will keep going and hit the other tank. (SS)

Corner Warping: Position your tank in any of the four corners so that the cannon touches the left wall—as close as possible—in perspective to the corner. Quickly push up and left. Your tank will warp in a counter-clockwise direction to the next corner. Take your opponent by surprise with this move. Another way to “jump” across the screen is to have one tank in a corner while the second tank approaches it in a diagonal path towards the corner. If the second tank shoots the first tank just before a collision, the second tank will continue moving into the corner and warp around to another corner. Both tanks should be close to each other since they both warp from the original corner. (SS)

Bouncing Shot Warp: Select game #7. Move the left tank above the barrier it appears behind. Position the tank just above the one corner under the small block just above it (upper right outside corner). Move the tank so the back end is even with the small block. Turn around towards the left wall and shoot. The shot should bounce and go into the upper left corner and come out of the upper right corner. It does not work in any other corner nor with the right player's tank. It is important that your tank is in the right spot. Take your time to figure this one out. (AF)

Warp Speed Tank: This one is just for fun. It requires you to take apart a joystick. If you hold down both the left and right switches, the tank moves along rather fast. It moves even faster if you hold down both the up and down switches. This trick is fairly useless because the tank always rotates to the right. (AF)



PART TWO OF FOUR

Programming the 2600

by Harry Dodgson



In this installment, I will focus on graphics on the 2600. There are no bit-mapped graphics on the 2600. When it was made, memory was very expensive. Therefore, the Stella chip has 35 write-only control registers and eight read-only collision registers to control screen display. There are two types of graphics on the 2600: playfield graphics and player-missile graphics. The playfield graphics are the simpler ones, so I will begin with them.

Playfield Graphics

There are three registers for the pattern to be stored. One of them only uses four of the bits. Get used to this—many of the registers are used in unusual ways. This gives 20 bits of resolution. This only covers half of the screen though. To cover the full screen, the registers are reused. This gives a playfield width of 40 bits—not much resolution compared to the 320 or 640 width of today's units. There is one register each which set the foreground color and the background color.

There are bits in another register that control whether the bits are reused in the same order or in reversed order to form a left-right reflection. This does not mean that both sides of the screen have to use the same pattern. There is also a bit for setting the color of the left/right foreground to match the player colors or to set both sides to the foreground color. Lastly, there is a bit to set the priority of the playfield in relation to the player graphics which determines if a player appears to move in front of or behind the foreground.

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A few points to remember: Although it is only 40 bits wide, there are 192 usable lines on a television screen, even for playfield graphics. Most of these registers can be and are changed at any time by the CPU (Central Processing Unit).

Player-Missile Graphics

Each of the two players has an 8-bit register for its pattern. There is also a corresponding missile for each player and a ball which is, in most respects, a third missile. For each player, there is a set of registers to control the way it is displayed. Some of these affect the corresponding missile at the time and fashion as the player. There are similar registers available to affect the ball.

The options available for the players are:

- 1) direction that bits are read, so changing direction 180 degrees is simple
- 2) magnification of bit size by 1, 2, or 4 times (only in width) -affects missile
- 3) number of times to repeat pattern on screen and distance apart. This and 2) are closely related and very limited in selection -affects missile
- 4) player and missile color (the ball color is always the foreground color)
- 5) reset missile horizontal position to the center of its player
- 6) place player, missile, or ball on screen at position given by time delay since start of scan line
- 7) move player, missile, or ball between -8 and +7 pixels horizontally
- 8) enable graphics for missiles and ball (can be thought of as a 1-bit display pattern)

Then there are the collision registers which are two bits each and cover all possible overlapping conditions of the graphics. These registers are set automatically by the TIA chip when it generates the graphics. They must be examined and reset by the program if they are used.


```

; Color Demo from the Magicard manual
; shows almost all the colors on the left side
; of the screen and cycles slowly on the right
; New equates for Part 2
COLUP0 .EQU $06
COLUP1 .EQU $07
CNTRLPF .EQU $0A
PF2 .EQU $0F
SWCHB .EQU $0282

Init: LDA #$E0
      STA $80 ; initialize time counter

Start: LDA $81 ; get contents into memory
       STA $PF2 ; save into a pattern control register
       LDA $03 ; set right side to reflection of left
       STA $CNTRLPF ; set background control register
       LDA $55
       STA $COLUP1 ; set right side color

Loop1: LDA #02
       STA WSYNC ; wait for horizontal sync
       STA VBLANK ; start vertical blanking
       STA VSYNC ; start vertical retrace
       LDA $2A
       STA TIM8T ; set timer for vertical retrace duration
Loop1: LDY INTIM
       BNE Loop1 ; waste time
       STY WSYNC ; wait for horizontal sync
       STY VSYNC ; end vertical retrace period

Proc: LDA #24
       STA TIM64T ; set timer for next wait

LDA SWCHB
AND #01 ; check for reset switch
BNE NReset
BRK ; only interrupt available - need vector set
NReset: INC $80 ; increment right side color cycle counter
        BNE Loop2
        LDA $E0 ; change color every 32/60 seconds
        STA $80 ; reset counter
        INC $81
        LDA $81 ; increment left side color
        STA $COLUP0 ; store it in color register


Loop2: LDY INTIM
        BNE Loop2 ; waste time
        STY WSYNC ; wait for horizontal sync
        STY VBLANK ; end vertical blanking
        LDX #E4 ; number of lines to draw on screen
Loop3: STY WSYNC ; wait for horizontal sync
        STX $PF1 ; change the background pattern with each line
        STX $COLUP1 ; change right side color with each line

DEX
BNE loop3
JMP Start ; do next screen (every 1/60th second)

.END
    
```

Examples of player-missile graphics tend to be much bigger. Here is an algorithm for what needs to be done:

- Set initial values of control registers
- Set initial placement of players and/or missiles
- Initialize values for game such as scores, vertical locations, and timers
- Start main game loop
- Start vertical blanking/retrace
- do game logic
- end vertical blanking/retrace - start display mode
- on each line that has something to be displayed,
- store the value into the appropriate register(s)
- end display mode

 = code repeated from Part One in Issue #8

This is how Combat (by Atari) displays the players, missiles, and foreground. It is a fairly complex and ingenious algorithm. One of the things to notice is that the loop extends for two scan lines, not one. This provides extra time for processing where all the objects are to be placed.

```

GRP0 .EQU $1B ; 8-bit pattern for player 0
GRP1 .EQU $1C ; 8-bit pattern for player 1

B10DF: LDX #1E
        TXS ; very sneaky - set stack to missile requesters
        SEC
        LDA $A4 ; check vertical location 1
        SBC $B4
        AND $FE
        TAX
        AND $F0 ; do these on even lines
        BEQ B10F2
        LDA #00
        BEQ B10F4
B10F2: LDA $BD, X ; get player pattern
B10F4: STA WSYNC ; end of 1 line
        STA GRP0
        LDA $A7
        EOR $B4
        AND $FE
        PHP ; this turns the missile 1 on/off
        LDA $A6
        EOR $B4
        AND $FE
        PHP ; this turns the missile 0 on/off
        LDA $B4
        BPL B110C
        EOR $F8 ; foreground color does not change at top/bottom
B110C: CMP #20
        BCC B1114
        LSR A
        LSR A
        LSR A ; foreground changes every 8 lines only
        TAY
B1114: LDA $A5 ; check vertical location 2
        SEC
        SBC $B4
        INC $B4
        NOP
        ORA #01 ; do these on odd lines
        TAX
        AND $F0
        BEQ B1127
        LDA #00
        BEQ B1129 ; branch always
B1127: LDA $BD, X
B1129: BIT $82
        STA GRP1
        BMI B113B
        LDA ($B5), Y ; display foreground
        STA PF0
        LDA ($B7), Y
        STA PF1
        LDA ($B9), Y
        STA PF2
B113B: INC $B4
        LDA $B4
        EOR $SEC ; last line is #236
        BNE B10DF
        LDX $D3 ; restore stack pointer
        TXS
    
```

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