

# **Paleoferrosaurus Retrocomputing Challenge 2009**

## **(Updated July 31, 2009)**

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### **Contact Information for the Paleoferrosaurus Website:**

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### **Links to Other Website Content:**

For links to the usual website content (not necessarily associated with the Retrocomputing Challenge), use one of the following links.

- [The Main Paleoferrosaurus Page](#)
- [The Documents Folder](#)
- [The File Server](#)
- [The Dynamic DNS Link to the LAN](#)

### **Links Specific to the 2009 Retrocomputing Challenge:**

- <http://retrochallenge.net/2009/>
  - [Follow the Retrochallenge on Twitter](#)
  - [My own stupid tweets on Twitter](#)
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### **The Project:**

The project is very simple -- to use a vintage Macintosh SE (circa 1987) as my primary personal computer for the month of July. Specific Applications will include word processing, electronic mail, web access, and software development.

The purpose of this project is to demonstrate that it's not only possible, but downright easy, to make use of "vintage" hardware and software to perform most, if not all, of the tasks typically done with a modern personal computer.

I chose the Macintosh SE for several reasons. First, despite the age of the system, it has no hardware issues that I've been able to identify. It simply works. I purchased this particular machine (used) in 1993. It was my main "office" computer until 1995 when I took it home and continued using it until 1999. The machine has been stored for just over ten years, and after a

quick "wipe down" with a damp cloth, I was able to boot the system and use it without any problems.

## **The Hardware:**

As advertised, the computer itself is an un-modified Apple Macintosh SE. As shipped, the computer had 1 megabyte of RAM and a 20 megabyte SCSI hard drive. Shortly after acquiring it, the RAM was upgraded to 4 megabytes and the hard drive was upgraded to 40 megabytes. The only problem I can recall with the actual upgrade was finding a Torx screwdriver long enough to reach the two screws securing the top of the case (on either side of the) handle.

Some report the necessity of obtaining a Macintosh "Case Cracker" in order to split the front bezel from the back half of the case, but I didn't have any trouble getting it started with my finger nails and letting gravity do the work (protecting the face of the CRT with a pillow. The case opened without any difficulty and the upgrades took less than 15 minutes to accomplish in total.

The only difficulty I can recall having with this system was with installing System 7. The software shipped on high density floppy disks, and this computer has only the 800k DSDD drive. Apple was kind enough to ship me a set of System 7 installation disks, and the problem was solved after little more than a week of waiting. The only reason I chose to upgrade from System 6 was that I wanted to use the Stylewriter II inkjet printer, and the Stylewriter software required System 7. I've since been told that there is some way of using the Stylewriter with System 6, but since I already installed System 7, the point is somewhat moot.

Along with the basic system unit, this Mac is equipped with the aforementioned Stylewriter II printer, a U.S. Robotics 56k Modem, an Apple Extended Keyboard, and a somewhat newer-style ADB Mouse. A somewhat more unusual peripheral is a Kantronics PK232 TNC for Amateur Radio Use. The following photograph shows the system as currently configured:



## The Software:

Perhaps more important than the hardware, the software I'm using is going to either make or break the success of this project. I'll write more about this as the project develops.

### SimpleText

I suppose all the introductory books for UNIX have the right idea; the first and foremost thing you always need to DO with a computer is edit text. I'm starting out pretty basic on the Macintosh SE and using the traditional **SimpleText** program from Apple Computer to create this web-page.

This particular version of **SimpleText** identifies itself as version 1.3.2 and carries a copyright date (range) of 1985 to 1996, making it fairly old software by current standards, but not quite as old as the rest of the computer system. The author is identified as Tom Dowdy. The "About SimpleText" box also acknowledges earlier works by "Ken, Hoon, Francis, and Bryan."

As text editors go, **SimpleText** is VERY basic and can't handle files larger than 32k. I may have an old copy of BBEdit on hand that I can use when this file outgrows **SimpleText**, but I'll have to go looking for it.

### Microsoft Works Version 3.0

This is one of the low-end "does everything" suites of typical productivity software. It's a leftover from when I first bought the computer and carries a creation date of Sept. 4, 1992. Like most 68k versions of Appleworks, it has the integrated Word Processor, Spreadsheet, Database, Charting, and Drawing Applications. Most importantly, it also has a "communications" tool that serves as a terminal emulator. Until I manage to get a functional Web Browser on this machine, I'll be using the communications tool to access the Internet via a Unix Shell Account.

More about software to come. Right now, I need to check my mail and pay some bills online. I'll report on how that goes when I get a minute.

### MacWeb

I'll confess, my first attempts at doing actual internet "work" this morning was more dependent on the Unix system than the Macintosh SE itself. Using MUTT for email and LYNX for web access had a nice nostalgic feel, reminiscent of the old BBS days. Still, the goal here is to actually *use* the Macintosh SE instead of some distant server.

My first attempt at using a browser native to the Mac SE was MacWeb. This program carries a 1994-1995 copyright held by Microelectronics and Computer Technology Corporation. It actually does make a good attempt at running on the SE. It doesn't even try to render images on this machine (I assume because of the 8 MHz CPU, limited memory, and monochrome display.)

Rendering simple text is exceptionally slow, even when loading a page from disk rather than off the network.

Using MacTCP over a PPP connection, I'm able to dial out and connect to my ISP (Windstream.) MacWeb makes a good attempt at loading Google, but only displays the text of various scripts that Google serves up when you access your home page. Attempts to access my own website result in "Error 400" (Bad Request). I believe that this results from the way that MacWeb formats its GET request. This might take a little more work.

Incidentally, I'm planning on trying to use some of the earlier versions of NCSA Mosaic, as soon as I can get them onto the SE. We'll see how this goes this afternoon.

As far as bill-paying and email are concerned, MUTT (running on a DEC Alpha Server under NetBSD) did a fine job handling all my email. Lynx was equally adept at getting me online for several of my bill paying chores. Simple forms were working OK, but I couldn't use a secure connection or access any page that was dependant on client-side scripts.

I think it's time to start re-organizing this page from a simple narrative into more of a web-log. Further updates, including the descriptions of software and hardware products will be entered by date, with the most recent posts at the "top" of the page. I'll try and get to that this afternoon.

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*Okay, that worked for the daily updates to the web log, but I found it easier to go back and read it by putting the pages back into chronological order. This entire document was reformatted on Sunday, July 26, 2009 using a laborious cut-copy-paste scheme that could probably be automated, but I'm too lazy to write the program. Entries made after July 26, 2009 were simply appended to this document as they were generated.*

*Since the source document is hand-coded html that doesn't actually meet any standards whatsoever, it's tempting to export everything into a word-processor and reformat the document for later "publication" as a single document -- probably using Adobe Acrobat on a slightly newer computer system. My feelings about this sort of document consolidation are mixed -- the PDF file is easier to store and retrieve as a unit, preventing lost image files and certain types of dead links. On the other hand, some objects (like audio and video clips) cannot be easily embedded in the PDF and the document loses some of its living character.*

*Likewise, since this was created as an ad-hoc document with frequent updates, it will probably come across as rather amateurish when assembled into a monolithic document. I hope the reader will recall is original intent and manner of creation. It's a web-log, not the great American Novel.*

# July 1, 2009 14:00 HRS EDST

## Beginning of the Web Log

Starting now, Updates go **HERE** at the top of the page. everything **BELOW** this post is from before the Afternoon of July 1, 2009.

I just ran into my first hardware problem. The SCSI interface on the SE is acting up and I can't connect the CD-ROM to load the Apple Internet Connection Kit.

Not sure what exactly the problem is, but the system won't even try to boot with the CD-ROM connected. The terminator works OK and I confirmed operation of the CD drive with another computer. My first concern here is to backup the hard-drive in my SE so I don't lose any work.

I just hooked up my equally vintage Macintosh LC 475 through a localtalk connection, and I'm backing up the SE onto a zip disk. Since the hard drive is only 40MB, I've got plenty of room to maneuver.



*Yes, that's a Digital Equipment RX02 Disk Drive under the LC.  
No, it isn't hooked up to anything at the moment!*

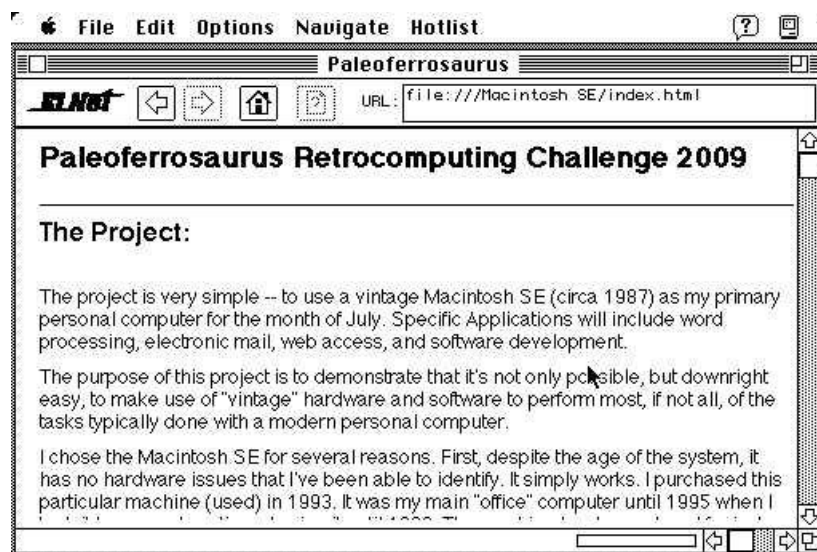
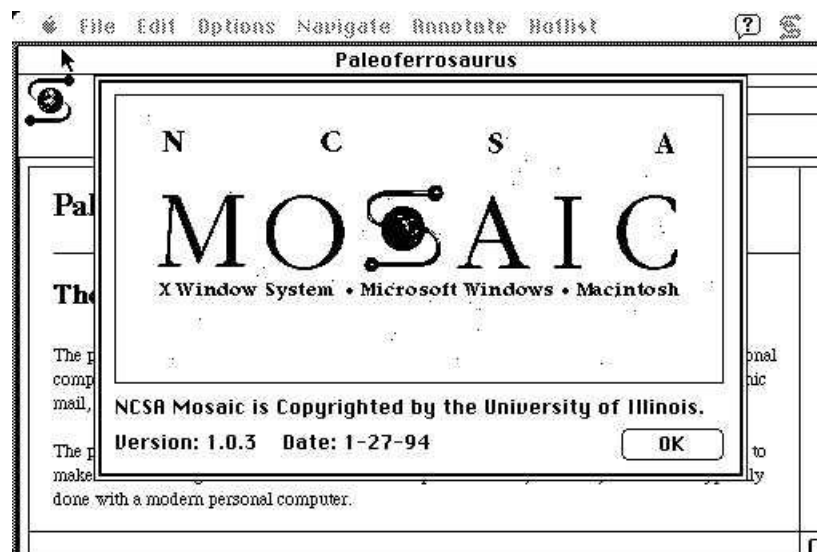
**July 1, 2009 15:45 HRS EDST**

## **Comparison of Web Browsers on the Macintosh SE**

After backing up the entire hard drive on the Mac SE, I used the same localtalk networking setup to install NCSA Mosaic 1.0.3 for a comparison with MacWeb.

Mosaic is having the same problems with "Error 400" that MacWeb was having. My guess is that many of the newer web servers just don't understand the "classic" browsers. I'm still looking for a solution to these problems.

Until I get something working to the point where I can actually show some progress, I'll finish this update with a couple of screen shots from MacWeb and NCSA Mosaic.



## **July 2, 2009 13:15 HRS EDST**

### **Finally, A Working Web Browser**

After spending most of yesterday fighting with localtalk and getting the hard drive backed up, I finally had a chance to sit down and do a realistic assessment of the web browsers that would run on the Macintosh SE. The clear winner is MacLynx. Despite its lack of inline graphics, it is the most usable, most stable, and fastest browser available for the Macintosh SE. It's getting a little hard to find, since the developer apparently went 404, but persistence pays off.

While playing with the various browsers, I also discovered that my ISP has apparently been cutting corners with its dialup service. The 56K modem can rarely connect at any more than 28k. Even at 28k, the overall throughput is incredibly slow -- much slower than even AOL at its worst in the late 1990's. I checked the phone lines for noise, and it's not a problem with the modems trying to "retrain" the connection. The modems are just fine, the bottleneck seems to be upstream from the modem on the ISP's end. Maybe they're just trying to encourage the die-hard dialup users to upgrade.

Another problem I discovered is that my ISP (Windstream) is now requiring authentication for outgoing mail at the SMPT server. None of the "vintage" email applications I have are able to provide this authentication. Thus, I'm still looking for a working email client that runs native on the SE.

### **Programming the Macintosh SE in BASIC**

I promised to do some programming during this challenge, and the best environment I've found that fits the nostalgic nature of this challenge is Chipmunk BASIC by R.H. Nicholson. The language is rich in features that allow the programmer to easily generate and display graphics. Likewise, it's capable of generating some pretty good sounds and music -- including the ability to store System 7 sounds as a resource within the program. The programming paradigm is familiar to anyone who used Applesoft BASIC on the Apple II or programmed a TRS-80: line numbers, console-mode program entry, and no structured-programming nonsense or strong typing to get in the way. At the same time, it has plenty of control structures that allow you to create politically correct programs without the annoying use of brackets, semi-colons, or other vestiges of the Third Reich.

**July 2, 2009 19:00 HRS EDST**

**Political Activism on the Macintosh SE**

Late this afternoon, I received a "Survey" from the Republican National Committee that was a thinly disguised attempt at bashing President Obama's domestic agenda coupled with a typical fundraising ploy -- "Donate now to stop this pinko commie from destroying our American Dream."

Now understand, I'm a registered Republican. That doesn't mean I'm some right-wing neo-Nazi nutjob. The Republican party has a long history of progressive social reform. It was the first Republican president (Abraham Lincoln) that fought the civil war, freed the slaves, and preserved the Union. The very first "Environmental" president was Theodore Roosevelt. He created the first National Parks and tried to preserve whatever wilderness survived the depredations of the 19th century. Roosevelt was also the first president to take on the illegal trusts that controlled business in the first decade of the 20th century. He was so effective at annoying the "money men" that they wouldn't nominate him for a second term.

Another notable Republican president was Dwight D. Eisenhower; a successful soldier who went straight from the battlefields of Korea to the White House. He ended the Korean War and oversaw one of the most prosperous times in American History.

None of these men was a Saint. I understand and appreciate the individual and collective faults of the group; but I can't help but wonder what they would think of the recent administration. I can't imagine them involved in the obstructionist policies and partisan bullshit that resulted in the legislative gridlock of the 1990's.

You might gather then, that I'm a disgruntled member of the political party. You would be correct.

No, I can't switch sides like Arlen Specter did. I can't stomach much of what the Democratic Party stands for either. Gun Control? Please... People will kill each other with sticks and stones if they don't have guns. Britain outlawed guns and is suffering an epidemic of stabbings. Canada banned handguns and the only folks who have been protected by this were bears, burglars, and drug smugglers.

I guess I just don't believe in the Nanny State. It goes against the grain of my Libertarian philosophy. Gay marriage? That is an issue for the gays and the churches and none of my damn business. I don't care who you marry, or how many. Yes, I've got a soft spot for polygamy -- both polygyny and polyandry.

Anyway, enough of my own opinions. My point is that I used my vintage computer to send out a few nasty letters to the republican party and my elected representatives. We need to be active and get our messages across to the politicians. We need to stay involved and make our voices heard. I'd like to encourage everybody who takes part in this exercise (the retrocomputing community) to take some positive action during the challenge. End of political crap. [Soapbox Mode Off]

**July 2, 2009 23:45 HRS EDST**

### **Getting Digital Photos onto The Macintosh SE**

Given the memory, processor speed, display, and I/O interfaces available on the Macintosh SE, it can be a real pain-in-the-butt to get digital photos onto the machine. I'm using photos in this blog, and since those photos are being uploaded to the web using the Mac one might ask how the pictures are getting there.

First of all, I haven't found software for the SE that can practically display the average JPG on the 1-bit black-and-white display. JPEGView has been suggested, but it requires a 68020 CPU at a minimum. Memory constraints come into play as well; the architectural limit of the unexpanded SE is a mere 4MB. Many color photographs exceed that total, making it difficult to work with a single picture, let alone several pictures simultaneously.

Given these limitations of the machine, where can we make a compromise that allows us to engage in SOME degree of digital photography using this machine. My solution is three-fold:

1. The SE can store, retrieve, send, and receive JPG's just fine; even if it can't display them.
2. Using a Sony Mavica (a digital camera built around a floppy disk drive), one can take the photographs and load them into the computer.
3. Off-line processing on the Macintosh LC 475 (already hooked up as a backup device via localtalk) can turn the JPG's into a 1-bit black-and-white photograph in PICT format that can be displayed using SimpleText. One excellent shareware program that easily does this is GraphicConverter.

As it turns out, a full-screen pict file only requires around 80Kb of storage; so the limited (40Mb) hard drive can still store quite a few digital images. I'm actually storing both the original JPEG file -AND- a low-res PICT file, so I'm wasting plenty of space. If circumstances require, I'll just dump the high-resolution images to the web server and allocate the limited hard drive space to the PICT files.

Here's a "self portrait" image to demonstrate what the images actually look like on the SE:



*The Macintosh SE shown displaying a digital image of the Macintosh SE*

**July 3, 2009 15:15 HRS EDST**

**More on Digital Photos and Email Troubles**

One of the bloggers on Twitter remarked that I should get another vintage peripheral for my Mac SE. Specifically, he (or she, however unlikely) suggested a Thunderscan for some truly retro 1-bit digital images. I'm only too happy to comply.

For those that missed this particular era in digital scanners, the Thunderscan was a wonderful hack that replaced the ribbon cartridge in the Apple Imagewriter printer with a photocell. The software, called "Thunderware", used the ribbon transport mechanism of the Imagewriter to move the photocell across the page while the normal roller / platen movement scanned down the image. It was a small matter of programming (SMOP) to then input the varying output of the photocell, assemble a bit-map image, and convert it to a PICT for storage on the floppy disk. Amazingly enough, the Thunderscan worked pretty well, even on the 128K original Macintosh.

Here's a photograph of the Thunderscan cartridge and attached electronic hardware:



*The Thunderscan Cartridge and Association Electronics.*

Likewise, here's a nice photo of a young lady (much too young to have ever USED a Thunderscan) scanned using the device. Conversion from PICT to JPG again courtesy of GraphicConverter.



*Thunderscan Pornography by Paleoferrosaurus*

In other news, I'm fighting with the email server at my local ISP. The smtp server wants authentication before it will accept an outgoing message. Unfortunately, none of the "classic" email clients at my disposal know how to validate an outgoing message. In the days before Spambot networks and zombie PC's, the outgoing mail server was rarely secure. Nowadays, the ISP's have to demand authentication or they would be over-run with outgoing junk mail.

I've found an add-on program (Baton) that claims to be able to act as an intermediary between the older email clients and the newer servers. Unfortunately, Stuffit doesn't seem to be able to decode the SIT file that I downloaded from the MythTech website. I'm still having some intermittent trouble with the SCSI port, so I can't even get my Aladdin CD to be read on the Mac. Until I can find a way to decode the file, my email has to be sent via the Unix box. More on this as things develop.

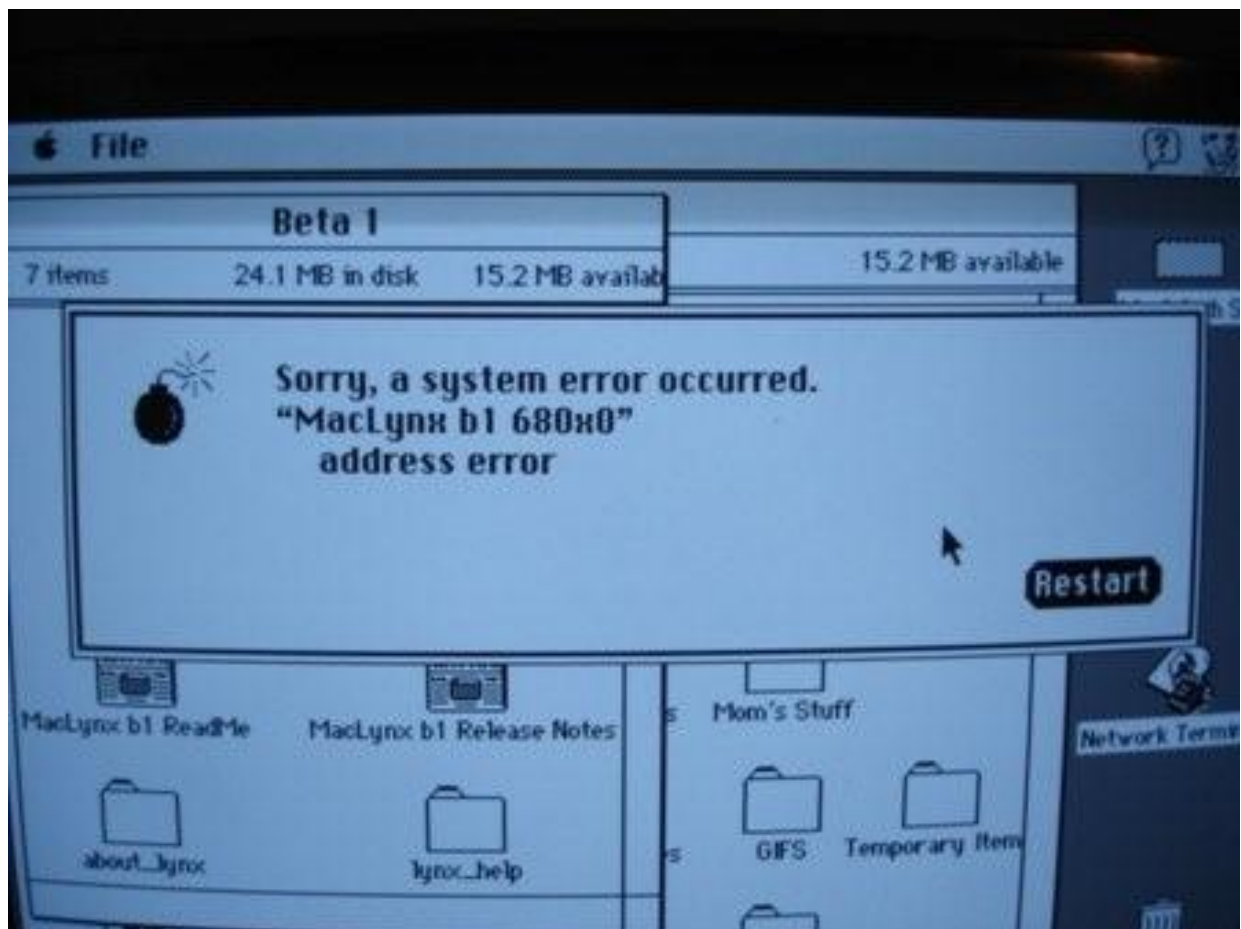
**July 4, 2009 16:48 HRS EDST**

### **Random Crashes, Memory Problems, and Shoddy Software (Mine)**

Well, everything was going fairly well. Then the system went a little flakey. I lost substantial work since I hadn't saved in a few hours. Now, I'm getting random crashes every few minutes and I'm pushing the limits of the relatively tiny memory.

Even MacLynx has been getting unstable this afternoon, so I had to use Fetch to upload these updates (and accompanying photograph.) Maybe the streaming video idea isn't such a good one after all; I can only buffer a few frames at a time; the serial port is too slow; the SCSI port is too flakey; and my electronic skills aren't what they should be.

Still, I guess that if you want to make an omelet, you have got to break a few eggs...



## **July 4, 2009 12:25 HRS EDST**

### **"Today we celebrate our Independence Day!"**

Didn't anybody else like that movie? I know, I know... Laughable use of a Macintosh Powerbook. Highly improbable hack of the mother ship's computer...

But come on! It had Will Smith, Jeff Goldblum, Judd Hirsch, Apple Computers, Ham Radio, and even Commander Data playing a mad scientist! That dude that played the President... He gave a truly awesome speech! A shame that I can't play a DVD on the Macintosh SE. Hey!....{mumbles something about USB drive enclosures, PIC microcontrollers, RS-232 conversion, 1-bit video streams...}.

[Watch that speech on Youtube](#)

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## **July 5, 2009 15:26 HRS EDST**

### **System Very Unstable**

Not sure what I did to the little piece of crap. Can't stay up and running for more than 45 minutes or so. I'm going to tear it down and see if I can find any obvious hardware issues -- I've already restored the software to a known "good" state and removed all my crummy hacks. Might take this opportunity to upgrade to a FDHD machine. I've got the ROMS and the disk drive. Now off to work again.

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## **July 6, 2009 16:00 HRS EDST**

### **Working at Work -- Can't Post to the Website**

Sorry, but the old iron lizard is actually working at work and can't get to the website. This update won't be made until tomorrow. Most days and nights at work don't interfere with my hobbies much, but folks seem intent on making less than optimal use of the emergency services tonight. Gotta figure out why we had a lag this year between all the drinking on July 4 and illness on July 6. Ah, well. Something for the public health wonks to figure out.

I should really blog about the computer, but alas, I won't see it till the end of this 24 hour shift.

## **July 7, 2009 10:30 HRS EDST**

### **Actual "Work" Interferes with Retrochallenge**

I know, I got to get my priorities straight, but yesterday was pretty much lost to the retrochallenge. While working, I guess I had some problems with the webhosting server. I also need to finish debugging the SE so I have a stable system to work with.

Hey, Kudos to the guy keeping track of all this stuff on twitter. You're doing a great job recording everybody's progress, triumphs and tribulations. Nice work!

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## **July 8, 2009 16:38 HRS EDST**

### **Everything is Going Completely According to Plan**

No problems with the ROM transplant; the Macintosh SE is now officially one of the FDHD Models. The floppy disk drive was another story, it's not one of the Apple Superdrive models. Heck, it's not even a Macintosh drive. It's a DSDD PC drive with a net capacity of 720k. So much for the upgrade. At least I've got the ROMS on board now. If and when I find a functional superdrive, my SE will be able to communicate with slightly more modern systems.

Now, getting back to video. I have a "Compu-Eyes" frame grabber / video digitizer that dates to the late 1980's. While the software is set up for single-frame video capture, it looks like the hardware could respond fast enough to get 10-12 BW frames per second out of the computer. The "flaky" nature of the setup seems to be in the serial link. The frame grabber runs at 9600 baud, a nice conservative speed given the capabilities of the Mac Plus / Mac SE. Even though the ports *should* be able to run (theoretically) at 56k, the buffer isn't big enough and the CPU isn't fast enough to grab (and store) data at that rate. I need to find out what the CPU hog is, but that means getting into the Macintosh ROMS and figure out what's using all the cycles. I suspect it's the "Vertical Retrace Interval" when most of the interrupts occur. There's no chance of stealing those cycles, because I also believe that's when memory refresh occurs. No wonder the system gets flaky when it gets too busy!

At any rate, the computer still works, and I'm having a blast figuring out whatever I can here. I realize it's eight days into the challenge and I haven't written any new code. At this rate, I might not actually get anything accomplished but it's been a lot of fun.

**July 8, 2009 23:35 HRS EDST**

### **Fun Trivia About the Vertical Retrace Interval**

Okay... I'm not the expert here. If I **WAS** the expert, I wouldn't consistently have trouble applying this stuff...

Basically, the Mac spends much of its time streaming out bits to the video display. Since there isn't a dedicated display controller, the Mac uses an area of main memory as a frame buffer and uses the CPU to generate the video image. This isn't a onetime task -- it has to redraw the entire screen 60 times every second. The biggest slice of "free time" the 68000 microprocessor has is during the "vertical retrace interval" when the raster is blanked and moved from the lower right corner of the screen to the "home" position in the upper left corner of the screen. This interval, where the computer isn't actively sending a lengthy stream of data out to the CRT is where many housekeeping tasks get done -- working on compute-bound user tasks; checking the keyboard, mouse, and I/O ports for instance; refreshing the dynamic RAMS; updating the TOY (time-of-year) clock; etc. In the Mac system software, there's actually a "Vertical Retrace Manager" that dispatches a variety of tasks during this period. The "cooperative multitasking" scheme also uses this interval to switch between tasks that are executing concurrently. Even PC's with dedicated display controllers generally keep track of the VRI so that screen updates can occur during these periods and minimize the flicker that results when the display is updated while the raster scan is occurring.

It's just hard for me to remember that, despite my (typical) programmer's view, there's always more than one program running at any given time. My program gets its little time slice whenever the computer "gets around to it" but doesn't have exclusive access to the hardware. This is where operating systems like RT-11 (on the Venerable PDP-11) really shine; they guarantee a particular minimum latency in dealing with interrupts and silly things like user programs. The Macintosh operating system makes no such promises. Windows is even worse (part of its VMS heritage, no doubt.)

- [The requisite Wikipedia Article](#)
- [An article describing how to use the Vertical Retrace Manager for task scheduling](#)

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**July 9, 2009 12:17 HRS EDST**

### **This Isn't Going to Work!**

Okay, I give up. With the processor chugging along at 8 MHz, there's no way I can grab enough data over the serial line to display streaming video. If I could "turn off" most of the Mac OS, I might have a chance -- but then I'd have a fancy digital video monitor and not a general-purpose computer. I suppose I could create a "soft switch" that puts the 68000 into a wait state; then use

outboard hardware to drive the video circuits directly (some guy did that with a homebrew MP3 player stuffed into a Mac SE.) That wouldn't be a Macintosh project, though. Switching back into Macintosh mode would also be a manual control, so it's not an "elegant" solution. Frankly, it's also not worth it to do all this work in order to watch a movie on a 9" black & white display.

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## **July 10, 2009 14:00 HRS EDST**

### **Blogging with a 32K Limit**

Well, as I was typing today's entry, I ran across the 32K limit that Simpletext imposes on file length. It didn't fail gracefully either, it just told me that my prose was getting too wordy and exited. Thus, I'm now switching to BBEdit for the remainder of this exercise.

Since the Mac SE isn't going to let me turn it into a television set, digital or otherwise, I'm looking for an equally mindless application for my 22 year old chunk of silicon. Until I figure that out, it's a good time to take stock of my progress and document the current state of the system. So, without further ado, this is my project status as of July 10, 2009:

### **Hardware:**

- Apple Macintosh SE with 4 meg RAM / 40 Meg Hard Drive
- Apple FDHD ROM Upgrade with Non-Functioning Floppy Drive
- Apple Stylewriter II Inkjet Printer
- U.S. Robotics - Sportster 56K Modem
- Flaky, Almost Functional Packet Modem (PK232)
- Apple Imagewriter (I) Printer
- Thunderware Thunderscan (Presently Installed in Imagewriter)
- Computereyes Video Frame-Grabber (Too Slow for my TV Project)
- Misc. Half-Built Crappy Scan Converter (Non-Functional)
- Singer CSM-1 Service Monitor (Analog) Connected to above scan converter
- Apple Macintosh LC-475 (Working) - Connected to SE via localtalk as fileserver and internet router

### **Software:**

- System Software 7.1
- MS Works 3.0
- Chipmunk Basic V3.2.8b
- Hypercard Player 2.3.5
- The Printshop 1.3.2
- MaxLynx b1 680x0
- SimpleText 1.3.3
- Eudora 3.1.3

- MacWeb 1.0 Alpha 3.2
- Fetch 3.0.1
- MacPing 3.0
- NCSA Telnet 2.6
- NCSA Mosaic 1.0.3
- ZTerm (Version Unknown)
- BBEdit Lite 4.6
- Think C
- Compu-Eyes (Not Loaded)
- Thunderware

Given that software load, I'm using roughly 75% of the available space on the hard disk. The largest chunk of disk space is the Think C libraries, which I might as well dump since my talents as a C programmer leave much to be desired. Maybe I'll just stick with BASIC for now.



**July 11, 2009 00:15 HRS EDST**

### **Characteristics of the Macintosh SE Video Display**

While I was messing around with the idea of video I/O for the Mac, I had occasion to research some of the display's analog video characteristics. Like the Apple II, the compact Macs manage to wring quite a bit of performance out of minimal hardware. I'll leave out most of the miserable details, at least on this page, but I DO want to document some of the Mac SE's video specifications for posterity.

Please note that these values were determined empirically, using un-calibrated test equipment. They also apply to one particular specimen and may not accurately reflect the optimum (or even average) specifications of the computer as a class.

### **Macintosh SE**

- **Horizontal Resolution:** 512 pixels
- **Vertical Resolution:** 342 pixels
- **Color Depth:** 1 bit (black and white)
- **Horizontal Sweep:** 22 kHz
- **Vertical Sweep:** 60 Hz

Of course, I need to compare this to another video system to lend those numbers a little bit of perspective:

### **Macintosh LC 475 (with 14" Apple Color Display)**

- **Horizontal Resolution:** 640 pixels
- **Vertical Resolution:** 480 pixels
- **Color Depth:** 8 bits (256 colors)
- **Horizontal Sweep:** 35 kHz
- **Vertical Sweep:** 66.67 Hz

This compares quite favorably to a plain vanilla VGA display on an early 1990's clone PC:

### **VGA Standard Display**

- **Horizontal Resolution:** 640 pixels
- **Vertical Resolution:** 480 pixels
- **Color Depth:** 8 bits (256 colors)
- **Horizontal Sweep:** 31.47 kHz
- **Vertical Sweep:** 59.94 Hz

Finally, when we make a rough comparison to NTSC video (remember, this is a purely analog system with interlaced odd / even fields instead of full frames) we can see why VGA is the easiest to convert to and from:

### **NTSC Analog Video**

- **Horizontal Resolution:** Continuous Variation w/o discrete pixels
- **Vertical Resolution:** 525 Lines (480 visible - 45 overscan)
- **Color Depth:** Continuous Variation
- **Horizontal Sweep:** 15.734 kHz (somewhat variable - "Horizontal Hold")
- **Vertical Sweep:** 59.94 Hz

Naturally, since the NTSC is an analog signal devised in 1943, we don't have any established equivalent in terms of discrete pixels. The original consumer-grade DVD players assumed a horizontal resolution of 720 pixels with a vertical resolution of 480 lines. VHS Videocassette recorders only recorded half the signals (every other frame) for a vertical resolution of 240 lines. VGA converters assume that NTSC can display the full 640x480 picture, but this almost always appears blurred when compared to the native VGA Display. If you actually sit down and count the dots on an "average" color TV (and I did) from the 1980's, you get a miserable 338x480.

I guess I just need to leave the test equipment alone for a while and stop thinking in analog terms. My brain is starting to hurt. Goodnight!



---

**July 12, 2009 08:11 HRS EDST**

### **The Doldrums**

What should I do next? I've got the SE running OK for productivity apps like word processing, spreadsheets, and silly little database management tasks. The MacLynx browser is functional and utilitarian without being too much of a resource hog. Email is accomplished, albeit indirectly, using MUTT via a shell account. Terminal emulation is working OK. The FDHD upgrade is lacking a HD floppy drive, but that will depend upon serindipity and the discovery of a free or cheap Apple Superdrive. Digital photos are done (in glorious black & white) using the Thunderscan. Color photos are created using the Mavica, converted using the LC 475, and stored / uploaded by the SE. We've ruled out video input and playback for the moment -- at least using serial I/O on the SE. An external monitor / video scan converter is doable, if not particularly

interesting anymore. Quicktime doesn't like the 1-bit display, the 24-bit addressing, or the "straight" 68k microprocessor.

Overall, the Mac SE is proving to be an able workhorse for most of the computer tasks I require.

Still, I haven't been able to really accomplish anything worthwhile in the area of programming. The short "quick and dirty" programs written using Chipmunk BASIC have been just that -- some simply utilities to convert text files and such. The source code is downright embarrassing, and won't be posted here. Think C (and the MPW versions) occupy huge sections of disk space, and don't really provide much advantage (except perhaps speed) over BASIC. I'm not enough of a C or C++ programmer to make effective use of them anyway.

Hardware projects are more 'sexy' than software anyway. I enjoyed the ROM upgrade and was disappointed to discover that the floppy was the wrong type. Pissing around with the video was fun, even if I didn't accomplish anything. I was thinking last night of using some of my pdp-11 spares to jazz up the SE and make this entry a little more worthy in the "retro" sense. Maybe that's the direction I can take for the rest of the day. We'll see how this works out.

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## **July 12, 2009 13:45 HRS EDST**

### **Taking Stock of PDP-11 Spares**

After digging through my spares, it appears that I've got almost everything needed to put together another LSI-11 based PDP-11 (the prime system is documented elsewhere on my website.) The difference here is that I plan on using the Macintosh SE as a front-end and console for the machine. Since the SE is a little "smarter" than the average VT-100, I can use both the Mac's hard drive and floppy (assuming I find the requisite superdrive) as additional I/O for the PDP-11.

#### **Central Processing Unit:**



This is the lsi-11/2 central processing unit made by Digital Equipment Corporation in 1979. It replaced the original (wider) lsi-11 that was produced beginning in 1975. This implementation of the pdp-11 architecture supports 16-bit addressing, with 4kw dedicated to I/O address space. Thus, I can use up to 28kw (56kb) of memory. There's no memory-management unit, so UNIX isn't going to run, but I can manage RT-11 just fine.

---

**July 13, 2009 10:02 HRS EDST**

### **Complete PDP-11/03 Coming Together**

Well, building it from spares isn't proving too difficult. So far, I've got a working CPU, 32k Memory, Asynch (Serial) Comm Board, bootstrap/terminator, and power supply. The hold up right now is a backplane with the correct wiring (qbus backplanes came in a half-dozen different versions, only a couple of which seem to accept 16-bit addresses rather than 18 or 22 bit addresses. I have an "extra" RX02 floppy disk system (the one pictured earlier under the LC-475), but it's wired up for use with a DecMate (pdp-8/a) instead of the LSI-11. I'm also lacking a

controller for the RX02, but I suppose I could "borrow" that from the other system to get some disk images into the new monster.

Actually, I might take this opportunity to archive my paper-tape software (mostly MAINDEC diagnostics from the mid-1970's.) I'll get back to this when I get done with work today.

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## July 14, 2009 07:13 HRS EDST

### A Serpent in the Garden

I knew everything was going too easily. Cards, power supply, even some cabling was turning up. Now, I find that the backplane I was planning to use is a Q22 version from a later system (probably an 11/23+). They bastardized some of the signals to accomodate the 22-bit address space. I'm also not sure how the bus itself is wired -- do we have a "linear" bus that goes straight down from top to bottom? No, it looks like the first few slots are wired in a linear fashion and the bottom slots are wired in a serpentine configuration!

Lacking any absolute reference for the backplane I'm working with, I'm just going to have to compare the actual wiring on THIS backplane to my working 11/03 and see what the manuals have to say about rewiring a backplane. It looks like a whole lot of soldering and/or wire wrapping to reconfigure the bus.

At least the power supply looks good, I'm going to "reform" the capacitors just to be safe and bring up the supply under load so I don't blow anything up. I've got some "minimum load cards", consisting of a bunch of resistors and a few LED's that I can wire up to the PSU. Since these cards were actually designed for a Unibus system, it isn't going to be pretty, but I want to protect the actual hardware wherever possible.

Assuming I get everything configured, I hope to have *something* running by the end of the week.

Although systems didn't start shipping until 1970, the pdp-11 design was finalized in 1968 and had running prototypes in 1969. That's close enough for me to choose to "celebrate" the 40th anniversary of the architecture. Another historic first we can associate with this month is the Apollo 11 lunar mission, that launched forty years ago on July 16, with the subsequent landing on the lunar surface on July 20.

I think then, that an appropriate goal is to have a version of "Lunar Lander" running on pdp-11 hardware by 9:00 PM on Monday, July 20, 2009. We'll see if I can make this deadline.

**July 14, 2009 09:56 HRS EDST**

**Macintosh SE to PDP-11 Serial Cable**

Just getting some information together for interfacing the Mac SE to the PDP-11. The Serial I/O card on the LSI-11 has these tiny little rectangular connectors for serial I/O that are pretty unique. I don't know where to obtain new ones, so I'm going to "recycle" some similar plugs to make my Mac to PDP-11 serial cable. Actually, I probably need to make at least two, since I'm probably going to use a serial connection to a second machine for mass storage.

Although I have the RX02 disk drive(s) and installation media for RT-11, I don't have many blank 8" floppy disks to play with. Even if I did, I'm not sure that I'd trust the media itself -- how good was the binding agent used to make the little flecks of iron stick to the plastic?

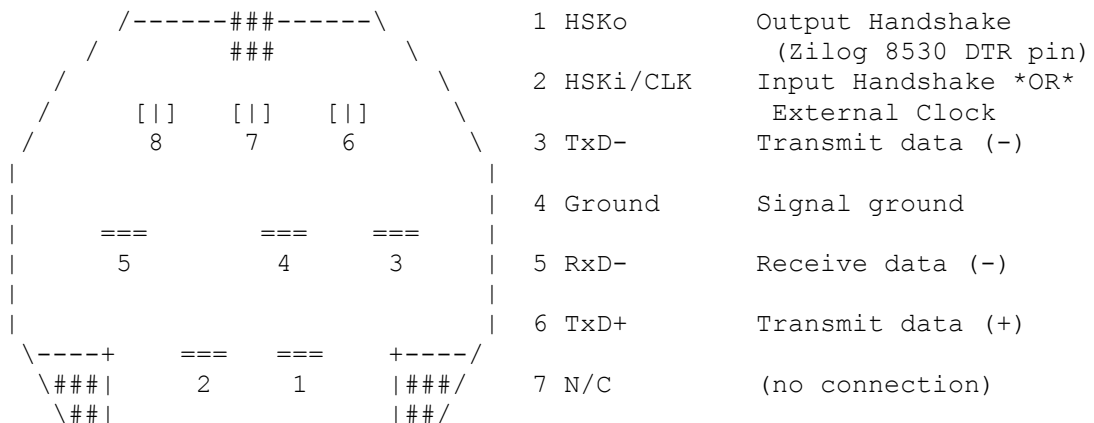
Anyway, the current plan is to use another computer to emulate a tape drive -- probably a TU58 - over a serial link.

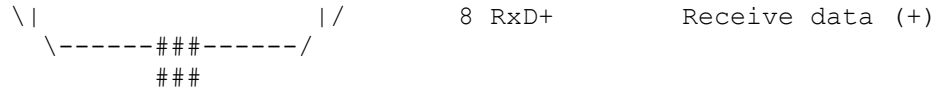
So, here's the first hurdle -- a serial pinout for the MAC SE:

Null Modem Connections:

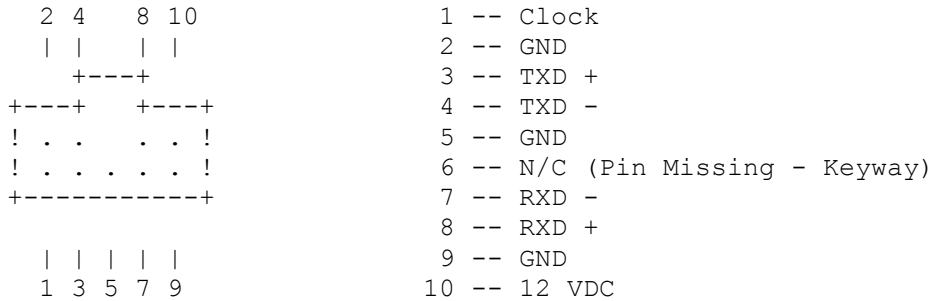
Macintosh (DTE) DIN-8			PDP-11 (DTE) IDC-10	
Pin	Signal		Signal	Pin
3	TxD-	-----	RXD-	7
4	GND	----+-----	GND	5
8	RxD+	----'		
5	RxD-	-----	TXD-	4
6	TxD+	(nc)		

Macintosh Serial Port Pinout:





DLV11-J Serial Port Pinout (PDP-11):



Now, to work out the details for the TU58 Simulator...

Finally, documentation on the backplane that resolves a few of my issues:

<http://hampage.hu/dr/qbus.html>

## July 14, 2009 16:00 HRS EDST

### The Macintosh Speaks to the PDP-11

The serial connection is working. The Mac is able to communicate with the PDP-11 at 9600 baud. With the processor halted, ODT is working -- I can deposit values in memory, recall those values, and even enter machine-language programs in Octal.

```

28
Start?

```

The next hurdle is to automate the loading and execution of software; initially from the Macintosh SE and eventually from a second machine that will serve-up TU58 or similar disk/tape images (just like a REAL mass-storage device!)

There's a simple sequence for loading a paper-tape image from ODT (the L command), but there's something wrong with my tapes (they're supposed to be in the absolute loader format.) Why does it always come back to software?

**July 15, 2009 19:06 HRS EDST**

**Harry Potter and the Half Blood Prince**

Didn't get much done last night or today -- had to take the kids and the ex-spouse to see the latest "must see" installment of the Harry Potter franchise. I must say that Hermione is looking better and better, if Ron and Harry continue to treat her as "one of the guys," I'll have to buy some hair dye, lose a hundred pounds, and move to England. Jennifer decided that we had to see the very first showing, so at 12:01 AM we were seated in a crowded auditorium. The movie didn't end until nearly 0300 local time, so I've been dragging all day. Also took my oldest son to the DMV to get his "learner's permit." If I don't post again, you can assume that I suffered some horrible fate while teaching a 16 y.o. how to operate an automobile.

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**July 16, 2009 12:30 HRS EDST**

**Pictures of Macintosh SE and PDP-11/03 Configuration**

Hello again! I haven't posted many photos of the pdp-11 / Macintosh SE configuration as yet, so here's a small gallery to document my progress thus far. The pdp-11 is currently configured as a "minimal" working system, given the spare cards I have on hand. It's mounted in a conventional 19" rackmount box, but I'm simply setting it on the desk for now.



*This is a photo of the Macintosh SE hooked up to the pdp-11*



*The business end of the minimal 11/03 system*



*A Front view of the pdp-11*



*DC Power is OK. System is ready to go!*



*CPU is running and actually executing a program!*

**July 16, 2009 15:46 HRS EDST**

### **Macro-11 Source Code for Lunar Lander**

It's not compiled or running on my system (yet), but I've located the source code for the original Lunar Lander game. It was hiding at Eric Smith's VT11 / GT40 website. This version requires a GT40 display device -- something that the Macintosh SE will be hard-pressed to emulate given the problems I've already experienced with video conversion on the compact Macs.

Still, it's a start. I've got the LSI-11 CPU to play with, the Mac SE works OK as a system console, and I can load and store programs.

[Eric Smith's GT40 Page](#)

While I'm at it, there are plenty of other pdp-11 resources out on the web that I'd like to point out.

First of all, SIMH is a well-known cross-platform emulator for a number of vintage computers. The PDP-11 emulator is exceptionally well done and well supported with a number of classic software packages available.

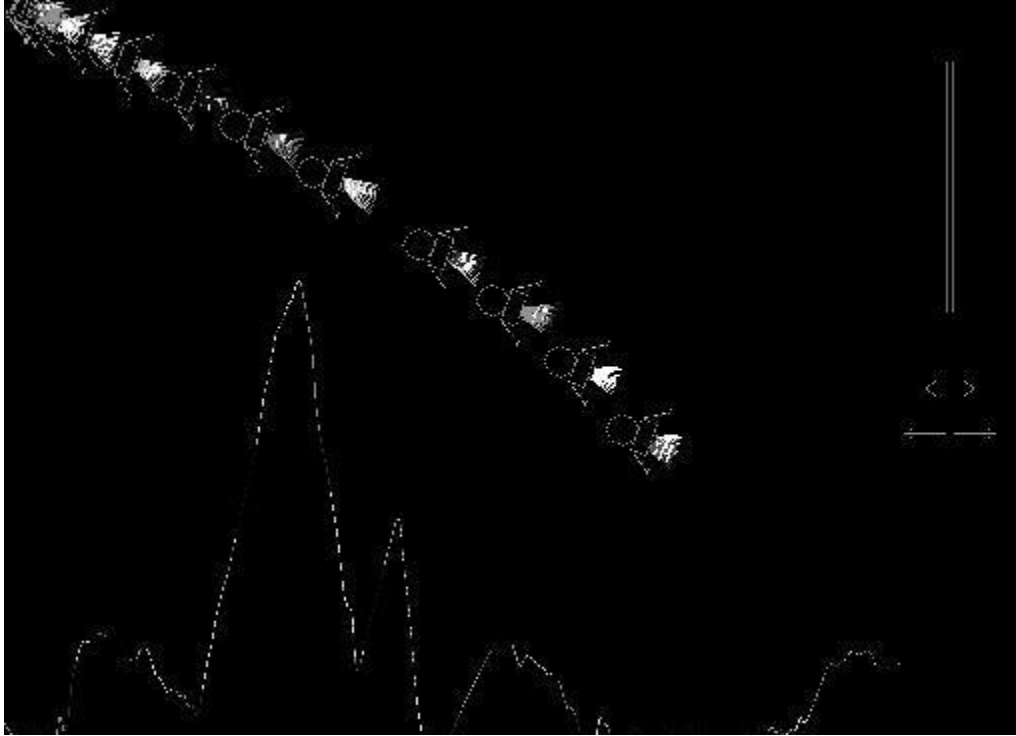
[The Computer History Simulation Project](#)

Secondly, John Wilson has created and distributes a very fast pdp-11 emulator known as ersatz-11. It runs on commodity PC's under DOS, Windows, and Linux. There's a free version for computer enthusiasts and a commercial version for folks who are still using a pdp-11 in a production environment.

<http://www.dbit.com/>

Finally, since I have yet to get any mass-storage or operating system running on this particular bare-bones PDP-11, a cross-assembler comes in pretty handy, even if it DOES run on a PC. Strobe Data systems created this particular cross-asmblr and it too is available on John Wilson's FTP server.

[Link to John Wilson's FTP server](#)



*This is a screenshot from Ersatz-11 running Lunar Lander on a PC.*

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## **July 16, 2009 20:42 HRS EDST**

### **Forty Years Ago Today -- The Launch of Apollo 11**

Sorry if your retro-browser doesn't handle Youtube very well; mine doesn't either.

It was forty years ago today, July 16, 1969 when Apollo 11 lifted off the pad at 13:32 HRS EDST. Four days later, Armstrong and Aldrin landed Eagle on the surface of the moon while Michael Collins orbited above. Presented here is a Youtube video of the launch -- no, I didn't make it; I was almost three years old at the time and wouldn't get my first movie camera for a few more years.

**July 17, 2009 10:23 HRS EDST**

**Playing Lunar Lander on the PDP-11**

Well, I messed around with the original lunar lander game on the Ersatz-11 emulator last night. Playing it on a raster-scan CRT instead of a vector scope creates a few issues, the VT11 display didn't have particularly persistent phosphors, so you didn't have to worry much about image ghosting or leaving a trail. The emulated VT11 doesn't clean up after itself, so every plot leaves a longer lasting trail to distract you.

Another issue is the user interface: the original hardware was equipped with a light-pen that was pretty forgiving of exact placement on the screen by the user. The mouse-pointer adaptation is less forgiving and harder to trigger an action. The vertical bars on the right side of the screen are used to control the engines thrust while the small and large arrows below are used to control the spacecraft attitude (primarily pitch, since this is a two-dimensional representation.) I have a great deal of trouble using these controls and haven't been able to successfully land the LEM yet on the emulator.

Running a similar (text only) game on the actual hardware, (pdp-11/03 w/ Macintosh SE console terminal) is a bit easier, despite a few glitches with VT-100 emulation on the Macintosh. I'm able to land safely about 25% of the time. The remainder of the time, I either have too much lateral velocity or collide with one of the vertical obstructions. So much for my qualifications as an astronaut.

As an aside, I plan on setting up some paper-tape I/O on the pdp-11 today. With any luck, I'll get some video of that and put it up on Youtube. There are already some brief demonstrations of the hardware in operation, you can check out those movies (and other boring films at <http://www.youtube.com/Paleoferrosaurus>)

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**July 18, 2009 09:05 HRS EDST**

**More Fun with Newtonian Physics on the Macintosh SE!**

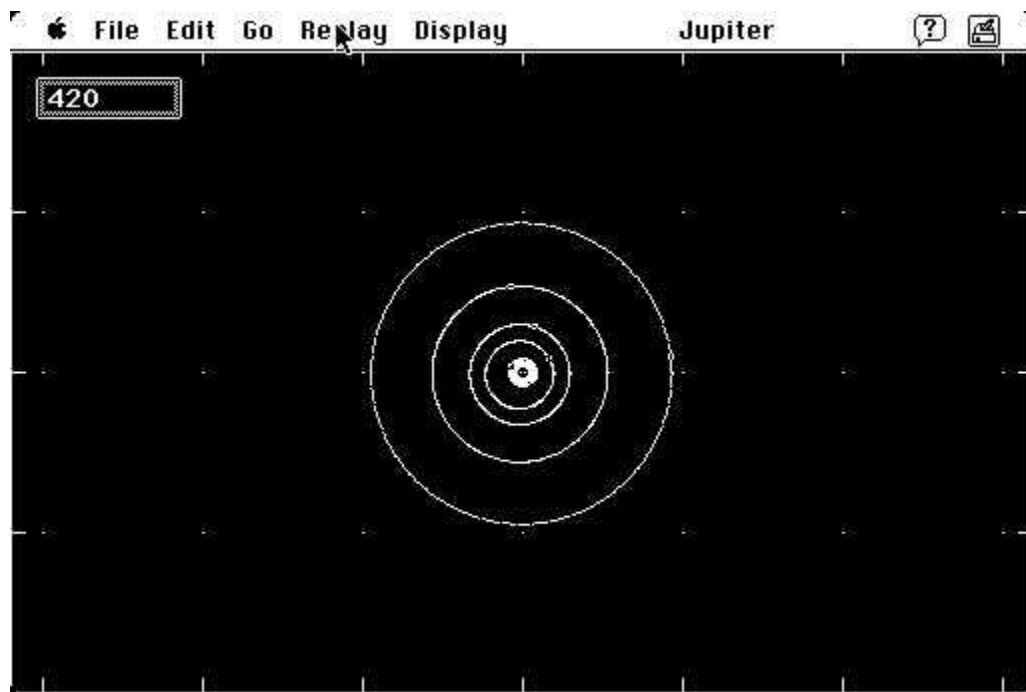
I've gotta admit, I enjoy trying to fly the lunar lander. In fact though, I crash it more than I land it. While browsing through the source code to find an easy "cheat" that would enable me to create a nice movie of my 'superb' piloting skills, I was disappointed to find just how arbitrary the internal workings of the game actually were (I'm talking about the text version here, not the rather high-end version for the GT40 / VT11.) Aside from the fact that it's a simple two-dimensional representation of a spacecraft's trajectory, the program lacks sufficient attention to the dynamics of spacecraft motion to be called a simulation.

Thus motivated, I decided to look for something better. My first thought was to write a simple BASIC application that would allow me to simulate an entire Apollo space mission -- from

liftoff to Earth orbit, the Earth-Moon transit, Lunar Orbit, Powered Descent, EVA, Ascent from the lunar surface, Lunar Orbit Rendezvous, Moon-Earth transit, re-entry, and landing. After taking a quick look at the actual Apollo flight plan and the mathematics involved, I came to the realization that it wasn't simple at all. It's been a while since I took Calculus (not that I did all that well to begin with!), and we never even touched on orbital mechanics. Likewise, the Physics were equally complicated and well over my head!

Time to scale it back a little bit... Maybe I could do something fairly simple to teach myself a little of the math and physics before I made more of an ass out of myself with (yet another) Lunar Lander program.

After doing a little bit of research and searching the web for classic Macintosh software, I found a cute little program called Gravitation Ltd. 5.0 with the subtitle of "The Solar System Construction Set for Macintosh." This program (which is also limited to a 2D representation) simulates the gravitational interaction between a number of bodies and presents an easily understood plot of their movements over time. It comes with a number of pre-defined systems, including our own solar system (out to Neptune), the Earth-Moon-Sun system, and the Jovian system with its many satellites.



*A screenshot of Gravitation Ltd. 5.0 showing the Jovian System.*

You can download Gravitation at the Macintosh Garden <http://www.macintoshgarden.org/games/gravitation-ltd-50>. Download it quick before bit-rot eliminates it forever!

After playing with Planetary systems for a while, I decided that I really needed some kind of a real-world application for orbital mechanics that would allow me to push the capabilities of the

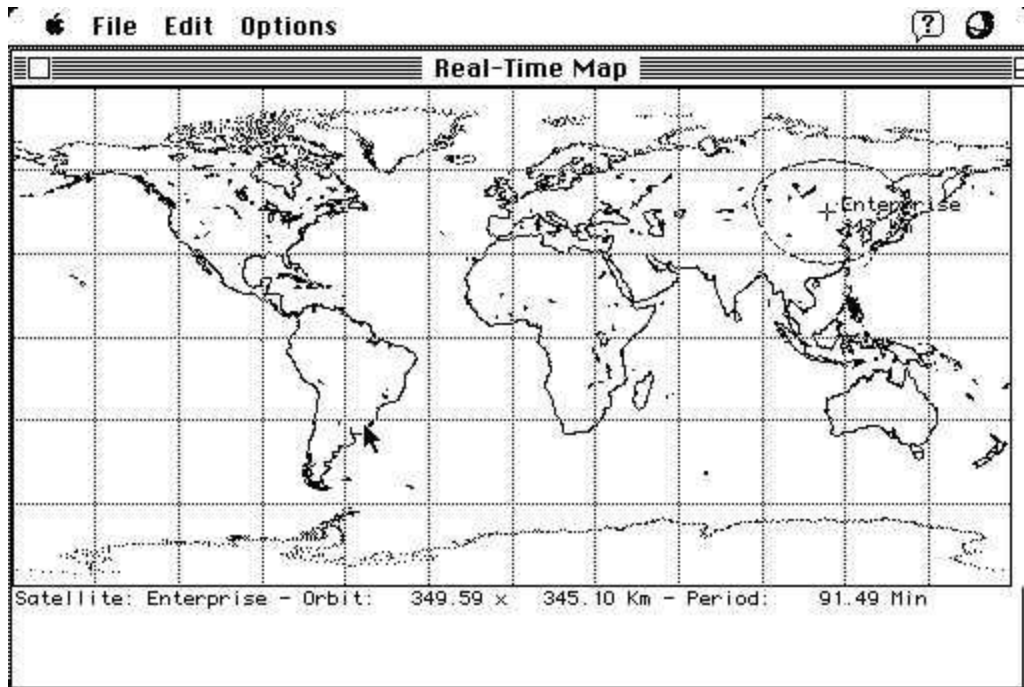
classic Macintosh. How about tracking REAL satellites in REAL time? Hey, I've got the hardware!



*An old C-Band Satellite Dish that I keep in the yard to annoy the neighbors (the Christmas lights really piss them off!)*

It turns out that the Amateur Radio community has a regular need to track a number of satellites, including the various AMSATS that have been launched over the years. Hams have been tracking and communicating with spacecraft ever since Sputnik was launched in 1957. Most (if not all) of the Astronauts and Cosmonauts currently orbiting the Earth in the International Space Station and Space Shuttle are amateur radio operators and make fairly regular contacts with Earth-bound Hams through the ARISS (Amateur Radio - International Space Station) program. Most contacts are made using common-variety 2-meter and 70 cm handheld FM radios. They make a special effort to set-up contacts with school children, using local amateur radio clubs to establish ground stations at the schools and allowing the kids to speak directly to the astronauts and cosmonauts.

Anyway, both commercial software and shareware for tracking satellites and spacecraft has been around since the first days of the Macintosh. The program I found is called MacSat and was written by Bill Bard, WD4IXI. Newer versions can be downloaded from the AMSAT Website at <http://www.amsat.org/amsat/ftpsoft.html#mac>. Some earlier versions have a Y2K problem and certain sets of orbital elements can be hard to find (due to our friends at Homeland Security), but the programs work pretty well.



*The Macintosh SE tracking a fictional satellite to demonstrate the real-time map feature.*



Using MacSat to aim the dish, I was able to receive a number of television signals on the old C-Band dish. Most have gone digital (my receiver is a 1st generation analog set), but there were a number of feeds that the dish could still receive.

Using MacSat to predict AMSAT passes and look angles, I was also able to receive a number of QSO's on both 2m and 70cm amateur radio frequencies. So far, I haven't heard the ISS or Space Shuttle, though (no passes yet today.)



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**July 18, 2009 13:54 HRS EDST**

**Spacecraft Tracking for the Hardware Impaired**

<http://spaceflight.nasa.gov/realdata/tracking/>

It's pretty close to what the Macintosh SE predicts (within a few seconds of time and a few hundred meters of position.) Not bad for Javascript!

Raw tracking data from NASA for the current space shuttle mission:

<http://spaceflight.nasa.gov/realdata/sightings/SSapplications/Post/JavaSSOP/orbit/SHUTTLE/SVPOST.html>

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**July 18, 2009 16:00 HRS EDST**

**Listening to the Shuttle / ISS**

Here's a list of frequencies you might be able to use to listen to the Space Shuttle / ISS with an ordinary HAM radio, Scanner, Aviation Radio, or General Coverage Receiver given an overhead or close-aboard pass. Most traffic is digital these days and uplinked to one of the TDRS satellites using a Ku-Band microwave set, but analog radio is still sometimes used.

- 296.800 MHZ AM -- Primary Air-to-Ground UHF Frequency
- 259.700 MHZ AM -- Secondary Air-to-Ground UHF Frequency
- 279.000 MHZ AM -- Spacesuit Communications
- 243.000 MHZ AM -- Military UHF "Guard Channel" Used with USAF
- 121.750 MHZ FM -- Old Shuttle / Mir VHF Frequency
- 139.300 MHZ FM -- Old Shuttle / Mir VHF Frequency
- 145.800 MHZ FM -- ARISS Voice & Packet Downlink
- 144.490 MHZ FM -- Region 2&3 (Americas and Pacific) Voice Uplink
- 145.200 MHZ FM -- Region 1 (Europe & Asia) Voice Uplink
- 145.990 MHZ FM -- Packet Radio Uplink
- 145.825 MHZ FM -- Simplex Packet Frequency
- 145.800 MHZ FM -- Crossband Repeater Downlink
- 437.800 MHZ FM -- Crossband Repeater Uplink

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## **July 19, 2009 10:40 HRS EDST**

### **Trying to Code a Reasonable Orbit Simulation**

Despite working the midnight shift, I decided to try my hand at writing an orbital simulation this morning. C++ is starting to make sense, so I'm pretty sure its a good time to take a nap. Program is based on some of the public-domain code at AMSAT.ORG. I'm trying to read their code and interpret how it works. Maybe if I understand the code, I can understand the math.

I checked into the HUNT game briefly last night -- didn't understand the display and got shot before I had a chance to make a move. Tried a few more times and died just as quickly. Rough crowd.

Also applied for a shell account on retro.net. The Mac 68K NetBSD looks very familiar. I've got a DEC 3000 that runs NetBSD, so it's pretty similar.

G'Night for now!

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## **July 19, 2009 14:15 HRS EDST**

### **Children Take Over Main Retrocomputer**

Well, the kids didn't let me sleep much -- "Dad, it's after noon!" -- and to add insult to injury, the youngest (Matthew) decided it was a good time to play ADVENTURE, using the Mac SE. At

least they have some taste when it comes to wasting time. Maybe this proves that there will be a next generation when it comes to computer geeks, and they ain't all script kiddies



I also alluded to the DEC 3000 in my last post -- no fair to claim it as a system if I don't show it (along with my much-adored "Spirit of '76" wallpaper.)



If you'd like to play with the DEC 3000, you can telnet to imac.paleoferrosaurus.com Port 23. Username: guest. Password: password. Play adventure! Edit text with vi! Write programs! Get bored!

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## **July 19, 2009 15:48 HRS EDST**

**Gee, I wonder why Guest isn't part of the WHEEL group?**

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## **July 20, 2009 20:38 HRS EDST**

### **Forty Years Ago Today -- Apollo 11 Lands on the Moon**

The videos above speak for themselves. The personal meaning is equally profound -- it was during my lifetime that humankind left the planet of origin and walked on another celestial body. It was a short stroll on the lunar surface that cost somewhere in the neighborhood of \$23 billion dollars. Depending on how you reckon the cost in human terms, the Apollo Program directly claimed the lives of at least seven astronauts (three in the Apollo 1 fire, four others in NASA aircraft accidents.) Still, to quote Neil Armstrong, "It's a view worth the price of the trip."

America has long neglected its space program; robbing my generation and my children's generation of their manifest destiny to become a spacefaring people. I hope that the memory of Apollo 11 will inspire our government and our people to once again "slip the surly bonds of Earth."

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## **July 21, 2009 23:00 HRS EDST**

### **Another Day, Wasted at Work**

Didn't get anything accomplished today -- had to work for money. Yesterday was also no-go for the most part, working in the morning and watching TV coverage of the Apollo anniversary. Just wish I had something truly retro like an IBM 7090 or and Apollo Guidance Computer to play with in honor of the occasion. Ah, well.

**July 22, 2009 21:15 HRS EDST**

### **Retro-Technology at Work**

Well, I've been bitching and moaning about how work is keeping me from my hobbies lately. I guess that's the wrong attitude -- especially since much of my work revolves around some technology that's pretty old in itself.



*A four-channel Motorola "Super Console" Base Station used for Fire Department and Emergency Medical Service Communications. These base stations date to the mid-1970's.*

My job title is officially "Supervisor" for a local emergency medical service, but for the most part the duties are no different from those of any other paramedic. The additional responsibilities are mostly centered around dealing with the various computers and communication devices that our service uses. We've got pretty recent computers (Winows XP and Vista machines) for our desktops, a stray laptop or two, and a communication system that comes to us directly from the late bronze age. That's much of what I've been dealing with lately.



*An "antique" Motorola Tone Encoder used to activate tone-alert monitors, pagers, and fire sirens. It produces a unique sequence of dual tones that are similar to DTMF.*

Around here (rural northwestern Pennsylvania), the EMS services are mostly operated by the fire departments. The organization I work for (the Central Erie County Paramedic Association) is owned by three volunteer fire departments. Those fire departments try to operate and staff basic-life-support (BLS) ambulances with volunteers, while the joint organization (CECPA) staffs a single ALS (advanced life support) unit (Medic2) with a paid paramedic. It's not much of a profession, but I've been doing it (EMS and communications) since the mid 1980's.



*A Gamewell Fire Box Alarm. These use a telegraphic method of signaling that dates back to the 1850's. Obsolete? Perhaps, but you can still buy brand new equipment that works exactly the way it did in the late 19th Century!*

While we acquired an enhanced 911 system in 1992 with fancy little desktop workstations (running DOS 5.0!), the communications infrastructure is much older, with first and second generation electronic switching systems handling the public-switched telephone network. Rollout of enhanced 911 was actually delayed (from 1988 - 1992) by the necessity of replacing electromechanical telephone switches with electronic ones. Even today, 17 years after rollout of the enhanced 911 system, we have difficulties with cellular telephones, PCS systems, and VOIP. Complicating matters is the fact that we need to support even older technologies like Baudot teletypes (used by the deaf), current-loop and carrier-current alarm signalling systems (like Gamewell boxes, bank alarms, and the like). Not to mention several generations of facsimile and data-communication technologies...

On the dispatch side, our radio system dates from the late 1940's and is primarily a half-duplex analog FM radio system on VHF Lowband. Dispatches are transmitted on 33.980 MHZ and consist of two parts -- a baroque and archaic tone signalling system that triggers personal pagers, fire-sirens, and similar alerting systems; and a voice message that transmits the actual location and nature of the emergency. Stations are still identified using morse code at 25 wpm.



*Clunky, but still useful -- this second-generation tone-and-voice pagers are used to alert firefighters and EMS workers of emergency calls. This example dates from 1985.*

A few years ago, I built a "new" alerting system for the Edinboro Fire Department that consisted of an old Motorola pager (dating from the mid-1980's), a few transistors, and a big honkin' relay to trigger some station gongs that are loud enough to wake the dead (or at least get the attention of a volunteer firefighter who happens to be listening to his iPod.) The system was a hit, and I've now built several more of these units that do simple tasks like sound alarms, open doors, and turn on station lighting. Now, I've been asked to build several more units for another fire department - this one a paid "city" fire service with multiple stations. I like the work, but I'm worried about finding enough vintage hardware that's in good enough condition to build a reliable system. We'll see how this goes.

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## **July 23, 2009 21:34 HRS EDST**

### **Getting Back to BASICS with Retrocomputing**

While playing around with the Macintosh SE today, I wrote a few short BASIC programs to simulate both ballistic trajectories and some simple orbital mechanics. I gave up on using C++ on the classic Mac for now, since the MPW package requires a whole lot of overhead just to open a window and operate in a "terminal" type environment. Simple programs that take fewer than 100 lines in BASIC take several times that amount in C or C++.

The original BASIC for the Macintosh (Microsoft) doesn't run very well under System 7 and isn't 32-bit "clean", so while its a very nice programming environment, it doesn't cut it for me today. My favorite thus far is Chipmunk BASIC for the Macintosh: it works, it's 32-bit clean, and it runs on everything from the Macintosh Plus to the G3 iMac. The programming paradigm is familiar to anybody who wrote BASIC programs on a classic 8-bit machine and it supports some very nice graphics.

You can download Chipmunk BASIC at <http://www.nicholson.com/rhn/basic/>

If I manage to write any code that doesn't embarrass me, I'll post it here.

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## **July 24, 2009 20:28 HRS EDST**

### **More on Satellite Tracking**

Wow! I had no idea that so many folks were interested in tracking satellites and spacecraft... I've gotten a few emails asking for more information on software that can automate pass predictions and get you the information in real time. Here's what I came up with on short notice. These websites are both for specific programs and collections of such software:

- <http://www.nlsa.com/>

- [http://www.dxzone.com/catalog/Software/Satellite\\_tracking/](http://www.dxzone.com/catalog/Software/Satellite_tracking/)
- <http://www.satscape.co.uk/main/satscape.php>
- <http://science.nasa.gov/realtime/>
- <http://science.nasa.gov/RealTime/jtrack/>

Now, keep the following caveats in mind: First, with the exception of the NASA sites that incorporate actual first-hand telemetry and radar data, these are *mathematical models* of spacecraft trajectories -- it's not like having primary radar that can give you a skin paint. (No, I wasn't emitting anything from the satellite dish shown on this page -- I was only using it to receive commercial television and radio broadcasts from satellites!) Second, the accuracy of these mathematical models is dependent upon the accuracy of the orbital elements you have for a given object -- if the elements are wrong, the tracking model is wrong. Third, the orbital elements have to be regularly updated -- even if the satellite or spacecraft isn't actively maneuvering, the orbital parameters will change over time. Orbits DO decay. Fourth, the availability of orbital elements on some spacecraft are problematic -- you're not going to be getting (accurate) information on the various spy satellites and military "assets" of the superpowers. They classify this stuff for a reason!

Finally, you don't really need a gigantic C-Band dish to receive signals from space! It certainly helps to have a high-gain antenna of some sort, but I've been able to pick up AMSAT traffic on a common police scanner with a whip antenna. If you plan on "working" an amateur radio satellite, you need something with enough gain to get your signal "up" and an antenna with enough signal to receive the downlink. Cross-Polarization helps, because the spacecraft may be tumbling or rotating as it approaches you. A "turnstile" dipole or "satellite" Yagi with elements offset 90 degrees is probably ideal, assuming you can keep the antenna pointed in the general direction of the spacecraft as it passes over head.

The receiver has to have a wide enough front end to account for the doppler shift (an increase in frequency as the satellite approaches your position and a corresponding decrease in frequency as the satellite passes your position.) A typical narrow-band amateur radio transceiver or scanner only allows you to "step" the frequency in 5 kHz increments -- either find a receiver that allows for continuous analog tuning or program a series of receiver memories with "steps" for use during the pass. I generally start at least 20 kHz above the downlink frequency and decrement in 5 kHz steps until the satellite is directly overhead. After the satellite is directly overhead, continue decrementing in 5 kHz as the satellite moves away from you. Please note, this requires a total of nine (9) memories for a single pass.

In order to receive images from weather satellites, you need an appropriate receiver, "turnstile" antenna, a radio-to-computer interface, and software to decode and display the image. I've never actually done this with my own gear, but I'm told it's not overly complicated. There are several guides on the web and a host of commercial interests that would be happy to set you up to receive weather information via satellite.

Finally, please understand that I'm not really an expert in these matters. If you really want the scoop, check out some of these "primary" sources for information:

- [The American Radio Relay League \(www.arrl.org\)](http://www.arrl.org)
- [The Radio Amateur Satellite Corporation](#)
- [Hobby Space - A Webguide to Space Hobbies and Activities](#)
- [Radio Sky -- Resources for Amateur Radio Astronomy](#)
- [Sky Vision -- A commercial enterprise selling "big dish" TV systems](#)

Well, that's all for now. I hope this post has answered some of the inquiries regarding spacecraft tracking and amateur satellite communications.

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## **July 25, 2009 22:00 HRS EDST**

Didn't get much accomplished today -- had to drive a couple hours in each direction for my daughter's first parade as a member of the marching band. Then, it turned out she didn't get to march because the local police blocked off the parade staging area and wouldn't let her in to join the band! The Oil City Police Department is now officially on my "shit list." The band director is also in trouble -- since he didn't make arrangements to get his people in (and out) as a group!

Aside from not letting Aurora march, the day involved a whole lot of walking up and down some pretty impressive hills. Admittedly, I need the exercise, but the loss of time was far more costly than any cardiovascular benefit thus derived!

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## **July 26, 2009 08:05 HRS EDST**

### **A Tempest in a Teapot**

[MacTV](#) put a real find on his blog yesterday(July 25.) The TPI 863-T wasn't a Macintosh Clone; it was a REAL Apple Macintosh Plus that was gutted and put into a shielded enclosure to meet U.S. Government specifications for minimal "spurious emissions" - e.g. the TEMPEST Standards. The concern was that spies, hackers, and other boogiemen might be able to use RF emissions from the computer to reconstruct whatever data was displayed on the screen. This sort of spying has a long history, dating to at least the first World War, when it was discovered that the magneto ignition of early aircraft engines produced radio-frequency noise that could be used to track the airplanes.

Later on, during the second World War, some rather smart fellows in Britain discovered that the local oscillator of a radio *receiver* (particularly a superheterodyne receiver) produced enough radio frequency noise to use radio direction finding (DF) techniques to locate the radio (and the lousy spy that happened to own it.) The techniques are rather straightforward, the only mystery here is as to *why* our cousins across the pond are so good at this Spy-Vs-Spy bullshit?

Anyway, by 1985 a Dutch gentleman by the name of Wim van Eck published a paper (available [here](#)) that scared the shit out of the American "intelligence community." Working with the BBC, Van Eck was able to demonstrate the ability to "read" a video-display remotely using nothing more than a high-gain antenna, a television set, and a few dollars worth of common electronic components. The emissions in question were primarily radiated by the display electronics themselves, and came to be known informally as van Eck Radiation. While the "real spies" had known about such things for quite a while, the publication of van Eck's paper put the information (and a fairly workable technique) into the public domain. Van Eck "phreaking" was now a real threat -- not just from high-end spies but from the casual hacker.

In truth, the government standards for both RF emissions (FCC Part 15 rules) and information security had existed for years, but van Eck's paper came to the attention of various bureaucrats who demanded that something be done. The answer, as far as van Eck radiation was concerned, was to replace the typical plastic enclosure of the video-display unit with a metallic Faraday cage and ground the heck out of everything. In the case of the TPI 863, they repackaged the computer into a metal box, put some copper foil screening over the analog board, eliminated the "modem" serial port, terminating the SCSI port with a bank of resistors, and charged the American Public about \$10,000 for an essentially obsolete, crippled computer that no longer had even the modest expansion potential of the Macintosh Plus. It was a scam -- and not even a very good one. As I recall, one of the few government agencies to actually purchase these systems was the U.S. Forest Service. I'm certainly glad that those darned Russian Spies never got a hold of Smokey the Bear's Document Folder.

The punch line to the whole sick joke (in this instance) was the stock Macintosh keyboard and unshielded keyboard cable. Tune any AM radio between stations, put it next to the cable and listen merrily to your keystrokes being broadcast out into the aether!

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**July 27, 2009 12:27 HRS EDST**

### **Macintosh SE Rescues Data from Windows NT Server!**

I've described the collection of "vintage" hardware that I get to maintain at work, but this probably takes the cake...

This morning, just before leaving work for the day (around 7:00 AM), I get a call from one of the folks in the business office that takes care of our bookkeeping. It seems that the server containing all our accounts has died and the "Geek Squad" dude that was sent out to fix the problem has never seen a SCSI RAID... They asked if I could get the data off the machine so it could be migrated to a new machine. Sure, what the heck...

My first thought was to use the LC-475 to drive the disk system and dump the data over ethernet to my laptop where a CD could be easily burned. That would have worked just fine, except that

the LC-475 is misbehaving today. Thus, the only working machine I have with a SCSI port is the Macintosh SE.

I wasn't sure that the SE had a recent enough version of PC exchange to read the PC-Formatted disk, but once I connected the drives (mounted in an external enclosure) and booted the SE, it mounted immediately and built a nice desktop file. Actually, the RAID is much faster than the native (built-in) disk on the SE, so I may do something interesting with the corpse when it's all said and done.

So, as we speak, the SE is reading the disk and pushing the data out over a serial link (at 56k) using Kermit. Only 40 gig or so remaining.... We'll see how this worked in a day or two.

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## **July 28, 2009 07:10 HRS EDST**

### **Data Rescue Complete Despite Slow & Buggy Serial Ports**

Well, I managed to get all the data transferred, but I really had to dial back the speed of the connection. I'm not sure which machine was at fault, but there were consistent errors with an overall loss of data at 56k. Ultimately, I found that 9600 baud was as fast as I could go without losing important bits here and there. At least the total quantity of data ended up being much less than I anticipated; although the RAID had a total capacity of 40 gb, most of that was Windows itself and didn't involve either the application programs or the all-important data. Total space on disk was around 420 mb when I was done; small enough to fit on a single CD-R.

The RAID is kind of interesting itself, it consists of five 8gb drives wired into a controller that makes it appear to be a single large disk -- so much for the "redundant" part of the name. The way this thing was configured, I honestly wonder if anybody really expected it to keep anything safe. None of the usual data-integrity measures were used -- no striping, disk shadowing, or error correction was enabled. It's just set up as a five-volume disk, 40 gb disk. Hmmmm.

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## **July 29, 2009 17:23 HRS EDST**

### **Still Slogging Away on the Macintosh SE**

Twenty-nine days into the retrochallenge and I'm starting to think about how exactly to wrap this up.

First off, the Macintosh SE has been a solid piece of equipment; giving me very few problems over the last month. The initial difficulties with the SCSI port have gone away without any direct intervention. Despite the problems I had with using the CD-ROM in the beginning, there were no

problems at all when I hooked up the RAID a few days ago. I'm tempted to think that the FDHD ROM upgrade may have had some beneficial effect, but I have no way to prove that one way or another. It might have been something as simple as a termination problem with the CD.

Despite what the college transcripts say, I'm not much of a programmer. Partly, I think its mostly for lack of necessity -- I can generally find off-the-shelf software that I can live with for any particular task. What software I did develop over the last month was both trivial and downright embarrassing. The only real high-level work I did was with the video conversion stuff, and in that case it all came to naught when the hardware didn't work as expected.

The final task that I'd like to complete before Friday is to locate a (working) high-density floppy drive and install that so I can rightly say that I finished the hardware upgrade.

The pdp-11 worked pretty well, and I was able to make image files of a few paper tapes. I still need to post that video on Youtube and "publish" those tape images so that I have some documentation.

Another task that I'd like to complete is to make some disk-images of both the Macintosh and the (other) PDP-11, so that I've got a complete software backup -- preferably somewhere out in the "cloud" so I can recover from any disasters here at the Dinosaur Ranch.

I'm sorry to see that wgoodf is throwing in the towel. I really enjoyed reading his posts -- both those on Twitter and in **his** personal blog. I suppose the wood-lice inside the keyboard enclosure were a sign that his computer suffered some "environmental issues" during it's life. I do hope that everything goes back together and works well.

I also enjoyed the "Hot Chicks and Old Computers" versus "Old Chicks and Hot Computers" series of posts. MacTV and MacFlyer both brought back a lot of memories.

I hope everybody had as much fun as I did; it was great to see all these old systems out and about!

More updates to follow -- I'm in this to the bitter end. Goodnight for now.

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**July 29, 2009 19:31 HRS EDST**

**Just for WGOODF: The love that dares not speak its name...**



*Nope, it's not me. I wish I was that thin. Heck, I wish I had that computer. The picture is from some computer site over in .DE land. I stole it fair and square. Photographer unknown. (I don't read German that well!)*

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**July 30, 2009 10:18 HRS EDST**

**The Shape of Things to Come**

Way back in 1964, the Radio Corporation of America (RCA) started an important trend in the computer industry by marketing the first "IBM Compatible" computer systems. The RCA computer was called the Spectra 70 and it copied the architecture and instruction set of the

landmark IBM 360. These weren't true "clones" since the I/O was handled differently, but the CPU followed the IBM 360 Principles of Operation pretty much to the letter.

Like the IBM offering, the RCA Spectra 70 was available in a number of models ranging from the Spectra 70/15 (a small system used primarily for unit-record operations or as a spooling device for a larger system) to the much larger Spectra 70/45 (a truly big-ass honkin' mainframe.) A few years later, RCA produced a time-sharing system built around an even larger model known as the 70/46. This time-sharing system featured a new operating system (TSOS) and virtual memory system (VMOS)-- something that IBM couldn't really duplicate until the IBM 370 came out in 1970. IBM's own time-sharing mainframes were pretty dismal; TSS/360 never really worked and folks who had been suckered into buying an IBM 360/67 for time-sharing usually ended up using another operating system like the Michigan Terminal System or its derivative, CP-67.

Despite the success of the time-sharing system and reasonable sales in the mainframe computer market, RCA chose to exit the computer business and in 1972, sold off the Spectra 70 line (as well as the associated customer base) to a number of different companies. In the USA, the purchaser was Sperry-Univac and the systems were rebadged as the UNIVAC 90 series. In Great Britain, the purchaser was English Electric and they became the System 4 range of computers. In Germany, Siemens got a piece of the pie. In Japan, it was Fujitsu. As an aside, Fujitsu and Siemens have since teamed up and still offer a descendant of this computer line; the Fujitsu-Siemens BS2000. The current offerings emulate the old RCA Spectra 70 architecture using SPARC microprocessors, but still run the VS/9 mainframe operating system. After 45 years, I'd say that VS/9 is just as venerable as Unix.

Anyway, even though I had used quite a few minicomputers and early microcomputers back in the 1970's, my first "love" was a Univac 90/60 that was owned and operated by Edinboro State College. My first encounters were with it as a hacker, then as a legitimate "tourist", and finally as a student. This was a "real" computer -- a third-generation behemoth that filled a rather large room itself. Terminals and I/O devices filled a wing of the building it was installed in. It snacked on punch cards, spun its magnetic tapes, spat out greenbar paper, and digested its programs on washing-machine-sized disk drives. I really loved that damned thing. The system was announced (by Univac) in 1973, purchased by Edinboro in 1974, installed in 1975, and actually running by 1976. The system was replaced in 1984 by a VAX 11/780 and sold to the U.S. Navy. That's where I lost track of it.

Now, I'm still looking for the "real thing", but after a decade of watching eBay and browsing the U.S. Federal Surplus lists, I tend to despair of finding a complete system in working order. Like its legitimate cousin, the IBM 360, most of these machines had enough gold-plating in their circuit boards to warrant a posthumous trip to the scrapper. Even finding photographs of the 90/60 is difficult. I've found a few grainy snapshots in college yearbooks and course catalogs, but nothing that really shows off the system in its full glory.

Nostalgia is what drew me to the Retrochallenge this year. Playing with a Macintosh SE and a pdp-11 was fun, but like unrequited love it is ultimately unsatisfying. The computer that I'm really fixated on is the Univac 90/60, and I suppose that I'm not really going to be happy until I

can do something about that fixation. My long-term goal then, is to somehow recreate that experience from three decades ago and resurrect the Univac 90/60.



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**July 31, 2009 11:31 HRS EDST**

**No Progress on UNIVAC 90/60 -- More Graphics for WGOODF**

I guess that maybe I feel guilty for searing everyone's eyeballs with that last picture. To make up for it, I dummed up the requested Twitter Monkey Logo. Thanks for letting me participate in the Retrochallenge 2009. Best of luck to everyone.

# Retrocomputing Challenge 2009 Official Twitter-Monkey



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*This document was originally created using SimpleText on a Macintosh SE. Original weblog uploaded to Yahoo Webhosting using Fetch. Recent edits using BBEdit Lite on the original Apple iMac. Final PDF created using CutePDF on a generic Wintel PC. Document last modified July 31, 2009.*