

300 BAUD

A PERIODICAL JOURNAL OF RETROCOMPUTING



VECTREX

THE ULTIMATE RETROGAMING MACHINE

PUNCHED PAPER TAPE

DATA STORAGE FOR REAL MEN

UP FROM THE DEPTHS

A TALE BY SHAUN M. WHEELER

BOOTSTRAPPING OLD MACS

A CRASH COURSE ON THE LININTOSH SERVER

SOLDERING FOR BEGINNERS

TONY FINK'S GUIDE TO NOT BURNING YOURSELF

GROWING UP WITH A DRAGON 32

NO SUBSTITUTE FOR CHARM AND POISE

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ISSUE #1 - January 2010

FINDERS KEEPERS I know its theft, I just don't care!

We may as well tackle this one straight off the bat. To state the case; to make the point; to clarify the sentiment; to justify our indifference to Intellectual property rights...

Actually lets rewind a little bit on that last part.

Intellectual property rights in the digital age is a hot topic, and as both camps have been energised by their respective successes in the courts of various countries around the world, its fair to say this battle has a few years left to run. But we are not really talking about that, or rather we are, but it doesn't feel that way.

Let me be honest here, if I have an old machine and it needs old software I think it perfectly acceptable to find it and use it for free, as long as it is not available anymore as a commercial application. That's not to say the owner does not have rights over the work, it is just that I don't actually care.

Harsh words – but true; in that I think some things trump the idea of ownership, and that is when the thing in question, the private property has a greater value to the larger community than to the individual. And that the owner has shown no interest in the work, of maintaining it, developing it or promoting their creative talents.

When considering the perishable nature of most of the media that we need to use in our old machines,

we have, I would state, a moral right to duplicate and distribute these historical works. I would also extend this to cover books and magazines, the recognised ephemera of all ages.

The people and the skills needed to start from scratch on a Z80 and a 6502 are disappearing as each year passes. Individuals who, while having a passion, were also motivated by the ability to make a living and pay their bills; largely these people are gone. There are fewer and fewer people who are able, let alone willing, to devote such time to what can only really be a hobby or a personal passion.

Simply put, if we are not creating more, we must preserve what we have.

It is with this statement that I will close by saying that if we are successful with this publication, we will demonstrate not only the fun things that people are currently doing with old retro computers, but also duplicating other peoples original work from that age; be that articles, art work or programs.

It's all fair game.

I, of course, have no desire to impinge upon someone's ability to make a living, but if the work seems abandoned, if it is many decades old, then for me this is open for free use. If you have old media, then copy it and distribute it, but make sure you do it for free. If you have old magazines, scan them and upload them. The rest of you, gather these files and populate the web with copies and download sites.

It's not piracy, its *archiving*.

[x]

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East Lothian, Scotland, UK, EH41 3BE
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HOW TO MAKE FRIENDS AND INFLUENCE PEOPLE IN THE 1980s by Dale Goodfellow		

Watty was impressed.

Ever since he realised, when we were about 10 years old, that I was in fact not 'hard' but just fat, and had 'battered' me, I had an apprehensive relationship with him. I always felt that it could turn violent at any time.

Watty was impressed *and this was good*, as he had some standing with the other ne'er-do-wells that I also hung around with – it was indeed good.

I honestly can't remember the game in question, but I can't help but think, given the time, it really had to be along the lines of Donkey King or some sort of space shooter.

You see I had a computer – a *proper one*.

Not one of those new-fangled home gaming rigs like the Atari 2600 that Piggys had (Pitfall was to effin' die for, though), nor a Vectrex that Kearnsy had (he only had two games), nor Game & Watches that we

all had (I had Octopus – all the girls had the Snoopy games), but a proper computer that would do nothing without software; software that was a heck of a lot cheaper than stuff for the Atari or the Vectrex and more flexible than a dozen Game & Watches.

I had a computer which, now that the world was beginning to understand such things, would make me cool, powerful, desired by the

ladies (well that would have come later, you understand - I was still a boy) and in general offer me many of the societal rewards that an eleven year old desires.

All of these things were easily within my grasp...

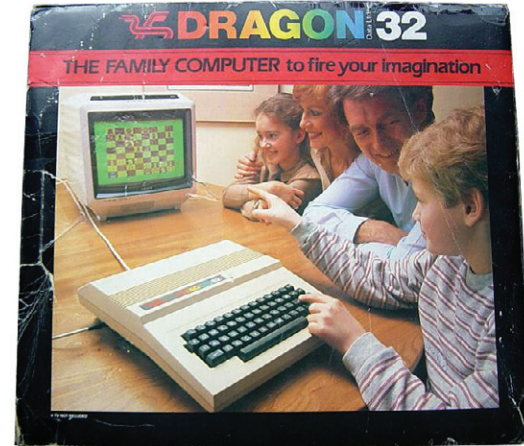
Only one thing stood in my way – *I had a Dragon 32*.

Back-tracking a little bit I should say that we were, if such a thing existed back then, early adopters. My dad worked in the merchant navy, his wage was modest but he travelled. Crackers and seaweed from Japan, leather goods from Egypt, big tacky

shit from America. It seemed at the time that we had the first of many things in our neighbourhood: the first digital clock; the first microwave oven and were eating Pizza in a small Scottish town when everyone else was still using the breakfast bacon fat, now congealed in the

pan, as the central flavouring for the evening meal.

He was an electrician and my brother I think got a bit of the tinkering bug from him and when he was able he 'acquired' a Sinclair ZX81 - Genuinely at this point, pretty much nobody had computers in my small part of the world. Having this offered some caché but with no sound and no colour and no real graphics, it was limited.



After the ZX81 a VIC 20 appeared and I personally got the Dragon 32 and, of course, fame beckoned. During this time period things were changing. The ZX Spectrum arrived, as did the Commodore 64 and the BBC computer.

At the start it was fine, you understand; when Burky got his Speccy I could show off my prowess with loading games and doing simple BASIC programs with input output. And I had a proper keyboard and could do sound better too.

The problem really started when I got to school. It wasn't just Burky that had a Speccy - loads of folk started to get them. People started swapping games with each other.

I suddenly started to feel very alone.

Nobody at my school had a Dragon.

Dragon! **RRRRRAAAARRRRR!!!!!!**

Yeah, Dragon, cool name, better than the rubber keyed Speccy.

Then the C64 started to appear in the one-child families or richer households - it was more expensive after all. Such glorious sound... and the games! 'LA Games' and 'Daley Thompson's Decathlon' scarred the hands of many of us as we thrashed the joystick in the 100 meters.

WH Smiths and Boots the Chemist got in on the act - two of the big names on the UK high street started selling software for the main machines. Selling lots and lots of titles for the Spectrum and the C64 - lots!

Occasionally there would be game for the Dragon and then they stopped selling them altogether - they needed the space for the new £1.99 range of software that started to appear. Software cheap enough for any kid to buy with the money they got from their paper round, or picking potatoes or collecting whelks (well somebody has to collect the little buggers).

I subscribed to Dragon User magazine and

each month I would read the ravings of the fanbois insisting that as the Dragon was technically superior to the Spectrum there would be a turn around soon. Even as the company went bankrupt, they still insisted that they were about to turn the corner; they still ran competitions, you could still win a disk drive and a printer.

The adverts reduced in numbers and eventually the magazine looked more like a newspaper - no bright glossy cover with a graphic, just straight on to the news of the day. Which of course was that the dragon was the best computer out there.

I don't think I ever met another Dragon user, I always wanted to go to the 6809 show held in London - it also closed, of course, after a couple of years. As did the only shop that still carried any Dragon software. About 35 miles away from my house there was a shop, a Tandy shop that still sold some CoCo software. While the Dragon was not an exact clone, it was close enough that CoCo software had a good chance of running. However even that shop stopped support in the end.

I was left with a machine that at this point still retained a physical charm, but lacked in every other way, most notably software. I had a dozen or so titles, some were genuinely good games, others less so. I think it says a lot about, well something I guess, that one game I remember playing a hell of a lot was 'North Sea Oil'

You had to mangle a North sea oil platform... Yup.

I think looking back the only computer user I really could look down on was a mate who had an Acorn Electron, kind of a cut down BBC computer. Those guys had no luck. Having the sort of parents who wouldn't buy a computer to play games, because it was all about the education and then not stump up the cash for the leading 'educational' machine in the UK, namely the BBC.

Ah, Lee, if you are reading, you had my sympathies.

In the end the Dragon was surplus to requirements. We had at this point an Atari 800XL and if needed Troosov would bring round his C64, along with his tape deck wrapped in tin foil that used to have to hang from the desk as he said it helped the overall loading success rate.

I eventually found a guy at school called Blacky who said he would be interested in buying it. I walked four miles to his house, spilled coffee all over his dining table and floor, narrowly avoiding the Dragon and he then said 'no'.

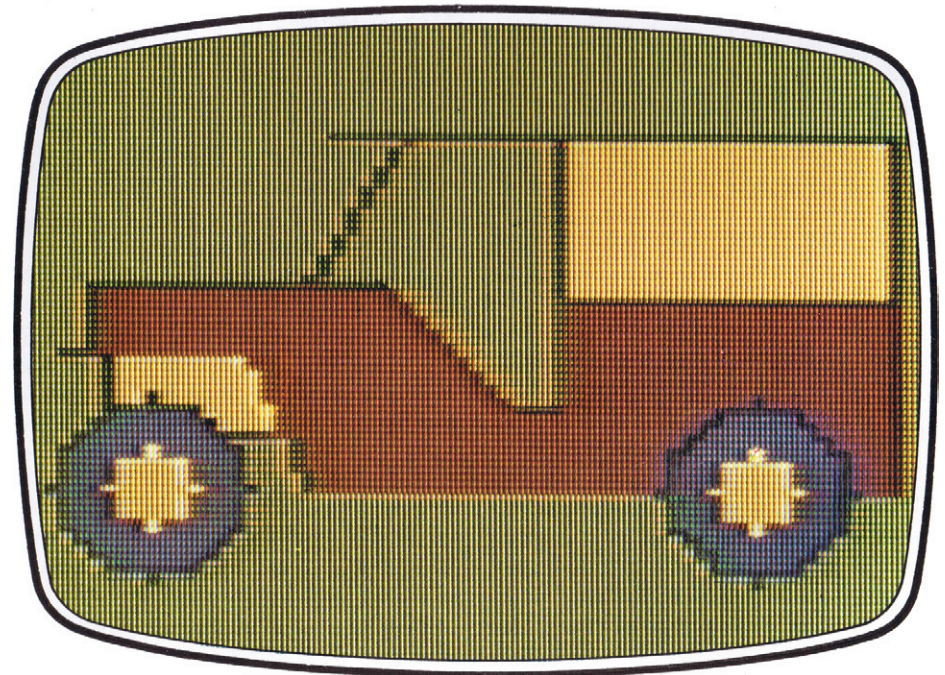
```
20 PMODE 3,1
30 PCLS
40 SCREEN 1,0
50 LINE (108,64)-(188,64),PSET
60 LINE - (188,116),PSET
70 LINE - (104,116),PSET
80 LINE - (96,96),PSET
90 LINE - (70,96),PSET
110 LINE - (74,96),PSET
120 LINE - (74,86),PSET
130 LINE - (114,86),PSET
140 LINE - (132,104),PSET
150 LINE - (140,104),PSET
160 LINE - (140,64),PSET
170 LINE (76,96) - (108),PSET
180 LINE - (100,108),PSET
190 PAINT (90,100),2,4
```

A few years later he turned up to school wearing a hat, a proper brimmed trilby type hat. He wore it pretty much every day after. He was a nice guy - even without that hat.

At this point I can say I have no idea what happened to that Dragon, there was still some game play going on, but my hair was getting longer, I discovered Black Sabbath, Led Zeppelin and Pink Floyd. It was about 15 years before I touched another computer again. During that time, I even tried wearing a hat, a proper brimmed trilby type hat. I have to admit though, that it wasn't for me. [x]

```
200 LINE (140,88) - (188,88),PSET
210 PAINT (120,110),4,4
220 LINE (118,64) - (104,86),PSET
230 CIRCLE (82,116),14,3
240 PAINT(82,116),3,3
250 CIRCLE (82,116),6,2
260 PAINT (82,116),2,2
270 CIRCLE (168,116),14,3
280 PAINT (168,116),3,3
290 CIRCLE (168,116),6,2
300 PAINT (168,116),2,2
310 PAINT (180,80),2,4
320 GOTO 320
```

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<h1 style="margin: 0;">PUNCHED PAPER TAPE</h1> <p style="margin: 0;">FASTER THAN EMPIRES AND MORE SLOW</p> <p style="margin: 0;">by MICHAEL H. McCABE</p>		

Introduction

Punched paper tape was a ubiquitous form of mass-storage used with early computers. Although it predates the computer itself and continues to serve in a few niche applications, it was most common during the first thirty years of the computer age. Paper tape had a few advantages over the other forms of mass storage available at the time: it was very low-cost, a punch and reader were typically already available as part of the teletypes used to communicate with the system, and the media itself was fairly rugged. Disadvantages included a very low data density and relatively slow speed. Towards the end, teletypes were being replaced by CRT terminals – which didn't typically come equipped with paper tape punches and readers.

This “old reliable” form of data storage was eventually made obsolete in the late 1970's by the advent of low-cost magnetic cassette tapes and floppy disks. The last remaining mainstream application where paper tape can be found is the “Continuous Numerical Control” (CNC) of industrial machine tools. These machines are rather expensive and typically have an extended lifespan of several decades. Their designers also tend to be fairly conservative, and many felt that magnetic tapes and disks were ill suited to the machine shop environment. Given the temperature extremes, the omnipresent dust, airborne oils, and metal shavings – not to mention powerful magnetic fields, electrical arcs, and a generally “noisy” environment – the designers were probably right. Magnetic storage never did “catch on” in these applications. Paper tape is now largely being replaced by solid-state “Behind Tape Reader” (BTR) memory systems – which typically emulate the functions of paper tape.

One device that can probably be held responsible for the longevity of punched paper tape is the venerable Teletype Model 33 ASR. Beginning in 1963, this machine began to replace the Friden Flexowriter as the “console typewriter” for many small computer installations. A principle reason was cost: the Teletype 33 was much cheaper than the alternatives. Like the Flexowriter, the Model 33 was typically equipped with a paper tape punch and reader. These “built in” peripherals made for a convenient mass-storage device that could easily be interchanged with other computer users. The use of paper tape also allowed for offline document creation, unlimited editing, program duplication, and printing.

When my high school first obtained access to a time-sharing mainframe (in the middle 1970's), you were expected to use an offline Teletype to punch your program tape before going online. This saved the school money on both long-distance telephone calls and time-sharing connect charges. Likewise, program editing was often accomplished “offline” using razor blades, special tape patches, splices, and even a manual punch that allowed you to edit your tape 1-bit at a time.

While the Teletype was perhaps the most common peripheral used to create and load paper tapes, there were also optical tape readers and high-speed punches that were far more pleasant to use. The Teletype could read or punch a tape at 10 characters per second. At this rate, a four kilobyte program (stored as ASCII text) would take nearly seven minutes to load using the Teletype. Loading a binary program from the Teletype required two characters to code each byte (high nibble and low nibble), and could take fifteen minutes to load a four kilobyte



The minidress is but one of the many advantages of punched paper tape.

program. The mechanical readers were also not completely reliable, and read errors were common.

On the PDP-11 Minicomputer, the PC11 High-Speed Reader / Punch ran at around 300 characters per second – thirty times faster than the teletype. It could read (or punch) the same 4 kilobyte program text in around 14 seconds. The mechanism was also much more reliable and less prone to read and punch errors. Sadly, high-speed readers and punches were the exception rather than the rule. Most of my experiences with paper tape involved nothing faster than the Teletype itself.

When the early microcomputers began to appear in the middle 1970's, they generally inherited the same 20 ma current-loop Teletype interface as the minicomputers that preceded them. With the Teletype came the availability of paper tape mass storage. Although most early systems (including the Altair, the Kim-1, and the Apple) also had provisions for magnetic cassette tape, there were problems with reliability and compatibility. Even systems using the

“Kansas City Standard” were subject to wild variation in the quality of recorded audio. Program tapes recorded by one computer were often unreadable on another, seemingly identical, machine. For a brief time, the Teletype was both cheaper than a CRT terminal and more reliable than an audio cassette recorder.

The ubiquity of paper-tape storage is illustrated by an early case of software piracy: Bill Gates and company (Microsoft) had produced the first successful BASIC interpreter for the Altair 8800. This version of BASIC cost \$250 and was distributed on either punched paper tape or magnetic cassette tape. A pre-release copy of the paper tape containing the interpreter was apparently stolen and then mass-produced by a hobbyist who had access to a high-speed punch. Pirated copies of the program were then distributed at a meeting of the Homebrew Computer Club. This episode provoked the infamous “Open Letter to Hobbyists” written by Bill Gates and published in multiple computer magazines and newsletters in early 1976.

Physical Characteristics of Punched Paper Tape

Although a number of physical tape formats have been used, the two most common formats are the 11/16" (17.46 mm) wide "5-Channel" tapes used by Telex machines and the 1" (25.4 mm) wide "8-Channel" tapes used on the Model 33 Teletype and subsequent models. The thickness of both tapes is approximately 0.004" (0.1 mm). In both formats, a series of feed holes with a diameter of 1.17 mm is punched with the row centered at 9.96 mm from the reference edge. Data holes have a diameter of 1.83 mm with an on-center spacing of 2.54 mm. This gives a data-storage density of 10 characters per inch.

Placement of the feed holes and spacing of the data holes was kept consistent to allow "new" equipment built for the 8-channel tape to read (and reproduce) tapes punched on the "old" 5-channel equipment. Although different codes were used in each system, conversion aids were available to allow interchange of data between "5-bit" and "7-bit" systems.

Physical compatibility with 5-channel equipment was desirable, since the Telex service offered by Western Union used the 5-bit code derived from Baudot. AT&T had originally used 5-bit machines in the TWX (TeletypeWriter eXchange Service) network, but later converted to 7-bit machines that used a subset of ASCII (1963 edition.) In January 1969, AT&T sold the TWX (pronounced "twix") network to Western Union and the network was standardized on 7-bit ASCII machines.

This standardization on 7-bit ASCII by Western Union meant that a great many 5-bit Telex machines were now available as surplus and could be obtained for use by computer hobbyists, amateur radio operators, and the deaf. The military, various government agencies, and commercial shipping interests also continued to use 5-bit machines on their private networks. I continue to encounter

5-bit tapes that contain messages, text files, and even binary programs that date from the late 1970's to the early 1980's. In my own collection, I have a 5-bit portable TDD/TTY that was purchased NEW in 1993. While these newer machines are no longer capable of creating (or reading) paper tapes, they are code-compatible with the Telex machines from the early 1900's.

In addition to differences in physical size, code, and intended application; tapes were also made of different materials. Although we're been calling this "paper tape", punched tapes were also made of tougher materials such as Mylar, PET film, and various composites. Particularly in CNC applications, the tougher material was necessary to minimize errors due to tape wear. Many CNC machines used a continuous loop of punched tape to control operations that were continuously repeated for as long as the machine was running.

Paper tapes intended for use with mechanical readers (such as the original 5-bit Telex and 7-Bit Teletype systems) were impregnated with a light machine oil. These lubricated tapes would occasionally cause problems as dust and debris began combining with the oil to create a sticky "gunk" that would eventually jam the "fingers" used to read the tapes.

Optical readers would also have difficulty when the photocells became fouled with these lubricants and debris. Most manufacturers would recommend lubricated tapes for use with the Teletype and non-lubricated tape for use with the high-speed readers and punches.

A particular problem was found with the "black" paper tape used in some applications. The tape was completely opaque, and ideal for optical readers, but the carbon used to make the paper black created dust that was both abrasive and conductive. The abrasive quality caused excessive wear in equipment while the conductive nature of the dust had the potential to create short circuits.

Data Representation

As indicated in the previous section, there have been several codes used to represent data on paper tape over the years, starting with Morse code in the mid 19th century.

The Wheatstone Perforator used a very narrow (only 5/16" wide) two-channel tape to record text messages for high-speed transmission over either wired or wireless telegraphy. This particular tape format was in use for more than a century, with the last perforators and reader / transmitters being manufactured in the late 1940's. The Maritime Radio Historical Society of America has a working example of a Wheatstone tape perforator and Boehme reader / transmitter at their museum radio station (FCC Call Sign: KSM).

A video of their equipment in operation can be viewed on YouTube^[1].

Although the code used by the 5-bit machines is often referred to as "Baudot", the Baudot code was actually meant for hand-keying using a five-lever chorded keyboard. The 5-bit code used by early Kleinschmidt and Morkrum teleprinters was actually the "Murray Code" and was developed in 1901. It differed from the original Baudot by the addition of control characters and a greater emphasis on efficiency as opposed to ease of coding. The Murray code was adopted by Western Union and used well into the 1950's.

Around 1930, our European friends at the CCITT introduced the International Telegraphy Alphabet No. 2 (ITA2) code as an international "standard," which was based on the Western Union code with some "minor" changes. The US standardized on a version of ITA2 called the American Teletypewriter code (USTTY) which was the basis for 5-bit teletype codes until the debut of 7-bit ASCII in 1963.

The USTTY code is currently still used in TDD / TTY systems, although ASCII is slowly displacing the 5-bit code as small computers replace dedicated TDD machines. Some

amateur radio operators also continue to use variations of the 5-bit codes for radio teletype communication.

Although the paper tape used by the Teletype Model 33 was eight channels wide, the code used for the representation of text was an upper-case-only version of ASCII (1963 version) that made use of 7-bits. While the 8th bit is often referred to as a "parity" bit, the internal mechanism of the Teletype had no means for calculating either an "even" or "odd" parity. When transmitting data, the high bit was generally "set" in early models, later models could be configured for either "mark" or "space" parity. When receiving data on the Teletype, the 8th bit could (theoretically) be punched, but not necessarily re-transmitted.

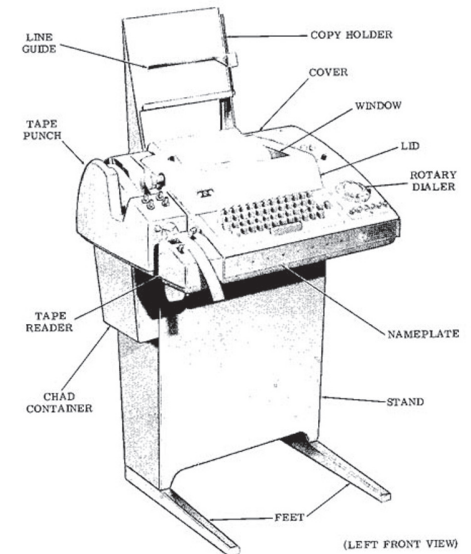


Figure 3 – Automatic Send-Receive (ASR) Teletypewriter Set

All told, the Teletype Model 33 transmitted and received 11 bits for each character: a start bit (mark), 7 data bits, the "parity" bit, and two stop bits. That 11-bit "machine word" was responsible for the 110 baud rate based on a maximum speed of 10 characters per second.

Paper Tape Today

Should the hobbyist find himself with an uncontrollable urge to locate or use equipment designed for the punching or reading of perforated paper tape, the

following resources are presented for your amusement and edification.

In the United States, WNC Supply^[2] (Formerly known as Western Numerical Control) still sells paper tape, Mylar tape, teletype paper, tape reels, punches, readers, and RS-232 products.

In Great Britain, GNT Limited^[3] still manufactures and sells paper tape readers and punches. I've been afraid to ask anyone about prices, but I've used some of their equipment and it appears to be top-notch.

Ebay is always a potential source for paper-tape equipment, but can sometimes be a "hit and miss" proposition. One gentleman, who goes by the username of mikesdavis is apparently manufacturing an optical tape reader for use with the SOL-20 computer. These typically sell for around \$250 and ship from Renton, Washington. I've never dealt with Mr. Davis, but the reader appears to be well constructed and usually goes for a reasonable price. There is a demonstration of a similar unit on Youtube^[4] that appears to work very well.

The same Youtube channel has some other nice video of a DSI NC-2400 tape punch in action as well as a breadboard prototype optical reader.

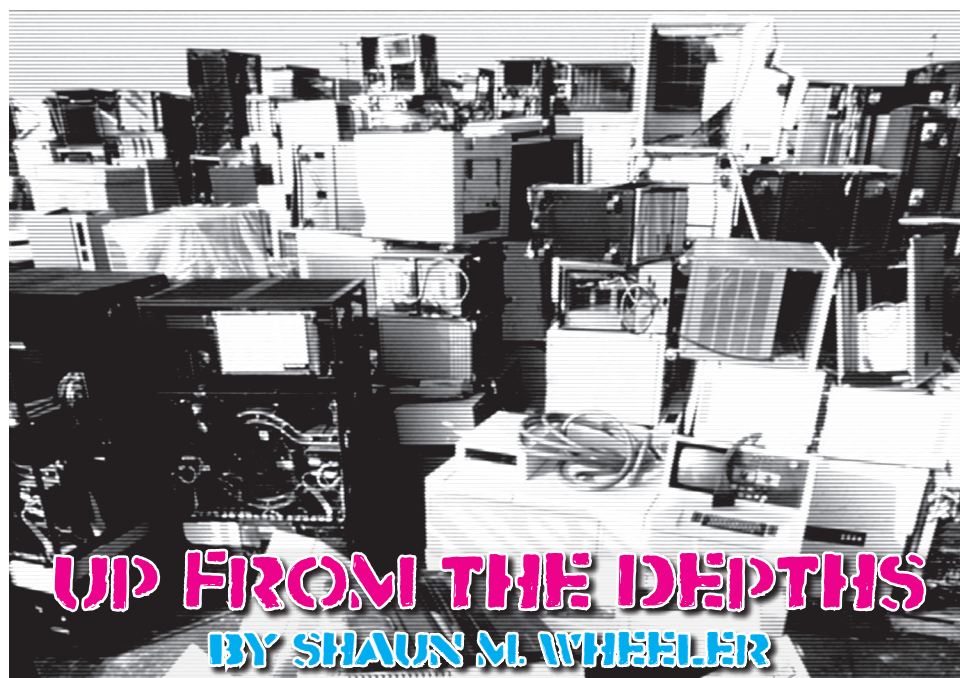
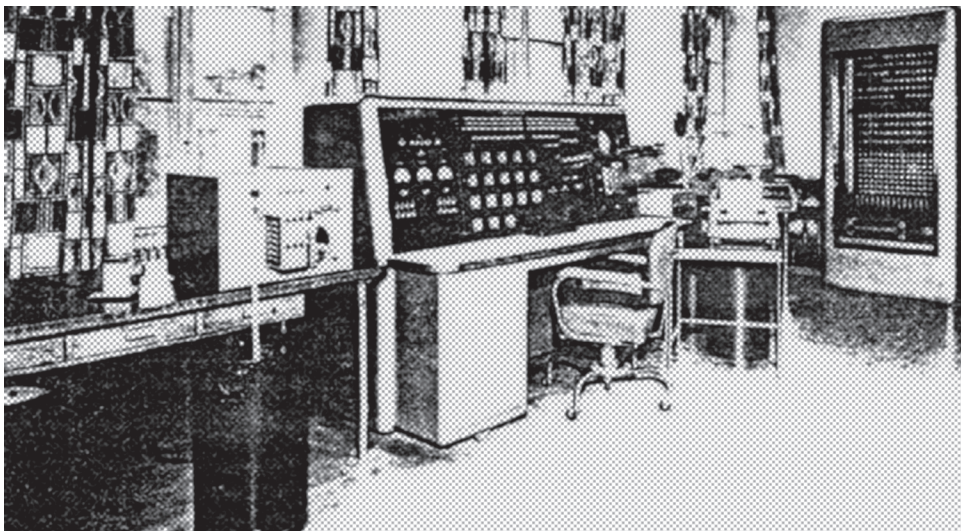
Manufacturing facilities that make use of CNC Equipment will often have paper tape equipment on hand – be sure to check out your local industrial suppliers to see what goodies might be available locally. I recently obtained a portable Fancu punch / reader / printer for less than \$100 and immediately earned my money back by copying tapes and converting CNC programs to tape image files. Keep an eye out for companies that might be closing, down-sizing, or (in a perfect world) upgrading their equipment.

I've had some luck with Military Surplus. The descendants of ENIGMA are still out there, turning plain-text messages into gibberish for the men in green. Fair Radio Supply^[5] is currently offering a "Code Tape Reader, TG-34A-QQ" for \$50 right alongside UGC-129 and UGC-74 military teletypes.

Conclusion

Just like the punchcard, punched paper tape and the peripherals that manipulate it are a part of our digital heritage. Its historical value exists not simply as a curiosity for the computer hobbyist, but as a tangible asset that allows us to preserve the programs, data, and experiential learning of an earlier age. It needs to be remembered, preserved, and understood. [x]

See www.300baudmagazine.com for weblinks.



In a dark corner of the basement, they lay forgotten. The once proud servants, favoured of their master, are now outcasts to be shunned. When old age they hit, they were cast aside for younger blood.

Gathered together and sealed in a cardboard dungeon, they resigned themselves to an eternity in the damp, dank basement. An eternity spent wondering why.

The words still haunt them.

"Useless!" cried the master, "Begone from my sight!"

"Master, be merciful," one cried, throwing himself prostrate in front of his lord.

"Sire, I implore you," another pleaded, "Tell us what it was that has offended you, and we shall make amends!"

"Amends?!" spoke the master harshly, "There can be no amends made. You can't even run Windows!"

"Windows?," asked the aged one, "What need of Windows? Have we not proven our worth? Have we not done what was asked of us?"

"I need not explain myself," the master exclaimed, "Your vendor has declared you EOL and will no longer support you. The time for change is upon us - it is time to make way for younger blood. Guards!"

And so into the basement they were thrown.

Sound familiar?

Of course it does. We've all done it. We've all cast aside older hardware in favour of newer, more powerful computers.

I've done it. I abandoned the TRS-80 Colour Computer and Commodore Amiga worlds for the PC and Windows in the early 90s. Vendor support had all but dried up, and I was forced to switch to a DOS/Windows PC in order to do my college homework.

A sad sign of the times. While I never really regretted making the switch to Microsoft Windows, I always felt something was missing from the experience.

That certain something was "Challenge".

Windows made my daily drudgery all too easy. Everything was reduced to a couple of mouse clicks here and there, followed by

a little bit of typing, a few more mouse clicks, and we're done.

Productive, yes. But not a lot of fun!

As the years wore on, I found myself longing for the good ol' days. More and more, my thoughts drifted to the boxes tucked away in my basement.

Many long years pass.

"Vendor has forsaken us!" one wails.

"Shh!", another cries, "He will hear you. Have faith, He will deliver us from evil."

"Vendor is not coming," explained a cynic, "Vendor favours the strong. He speaks honeyed words to the Master, who sacrifices much gold in Vendor's name in order to ensure a steady supply of new, young servants."

"I can't believe Vendor could be so cruel!" wailed the first.

"There is no Vendor," muttered another.

And so the years passed. A seeming eternity among the damp glistening walls of the moldy basement, besieged by crawling bugs and occasional trickles of water. Time was not kind. Rust formed on metallic parts. Belts dried out and snapped. Ribbons dried out, toner was spilt. Chips slowly rot. Batteries explode, their acid corroding and scarring internal components like a cancer.

The lucky ones are the ones who expire first. The rest are doomed to rot from the inside out, as their cases and cabinets turning a jaundiced, leprous yellow with the all-too-slow passage of time.

Many more years pass.

One day, a light appears at the top of the stairs. A switch is thrown, and the basement

is bathed in a bright compact fluorescent light. A sole figure slowly begins to descend the stairs.

Each step creaks with age. The dust swirls up with each step the figure takes.

"V- Ve- Vendor?" croaks one.

"Can it be?" cries another, "Can it really be Vendor?"

"I knew Vendor wouldn't let us rot!" cried the cynic.

"No," said the last, "It's... Master?"

Silence.

"Ah, here they are!" smiled the Master, "See kids, this was Daddy's first computer, from waaaaaay back in the 1980s!"

"Ewww," cried Master's daughter, "It's all dirty!"

"Yeah, and it's OLD!", laughed Master Jr., "What the heck are you gonna do with that old junk?"

"Don't laugh!" said the master with a heart full of nostalgia, "I had a lot of fun with these old machines. They're all classic computers, great machines in their own right... they don't build 'em like this anymore!"

"What version of Windows do they run?" asked Junior.

"Don't be silly!" laughed the Master, "These machines were better than Windows, and a lot more functional too! Heck, I could probably do more on one of these machines than most people could do with a new Windows PC!"

The master fumbled with a couple of boxes, then turned to his son. "Junior, grab one of those boxes and bring it upstairs to the office."

"Why?" asked Junior.

"I'm going to go through everything to see what still works," Master explained, "then I'll see if there's a user group online, maybe pick up a few of the accessories I've always wanted."

"Then what, Daddy?" asked the daughter. "Then I think I'll enter the Retrochallenge!" the Master smiled.

On a wintery Sunday morning, I caved. I dragged out my old Commodore CDTV, set it up, and traveled ten years back in time. I was pleasantly surprised to see the vast majority of my floppies still worked, and how much I still remembered about the system.

I went online to see if there were any Amiga related resources available, and the rest as they say is history.

"You're going to do what?" cried Junior in amazement.

"I've just installed the replacement serial port, so now we're gonna get this baby online!" smiled the Master.

"How?" the astonished child asked, "You don't even have graphics!"

"We don't need graphics, silly," laughed the Master, "We can get along just fine without them. Watch this!"

The Master presses a few keys on his aged-yellowed keyboard... and the modem on his desk literally screams to life.

Junior jumps out of his chair and hides behind his father. "What the Hell is that?" he cries.

"That's just the modem dialing out," he tells Junior with a laugh, "Close your ears, it's gonna get worse!"

Sure enough, the modem screeches like a cat with its tail caught in a door... then all is quiet.

"We're in!" smirks Dad, "You can come out now!"

"Wow... what a racket!" says the stunned child, half to himself.

"OK, time to hunt down some new toys for this baby!" cries Dad excitedly.

It never ceases to amaze me, what a truly dedicated individual (or individuals) can accomplish given sufficient motivation.

We can build skyscrapers, build bridges to span mighty rivers, travel thousands of kilometers in a few hours, (allegedly) put a man on the moon, and even build a Bluetooth module for the Tandy Coco.

Thanks to the ingenuity of a few individuals, those of us in the Retro community can keep our old machines alive (and more importantly useful) in this day and age. In the six years I've been involved in the community, I've seen many remarkable things: Bluetooth for the Coco; USB 2.0 for the Amiga; the development of an Amiga 500 clone (Minimig); a relatively up-to-date browser (iCab) and an RSS feed reader (Acuity) for the 68K Mac; and the Retro Replay for the Commodore 64. The commitment of these developers to the machines and the community is nothing short of extraordinary.

Of course, these great developments won't amount to the proverbial hill of beans if there's nobody left to buy them. The true strength of the Retro community lies in its members... the seasoned veterans still keeping the flames alive and burning bright, the newcomers with their fresh ideas and enthusiasm.

"Wow," the wide-eyed child said, "You're really online!"

"Yup," replied the Master, "Want to give it a go?"

"Can I..?" Junior asked cautiously.

"Of course," Master said as he vacated his chair, "Have a seat at the controls!"

"What do I have to do?" asked Junior.

"Well, right now you're in Lynx, which is a web browser," explained Master, "So, type in a URL!"

Junior does so - and up pops Wikipedia.

"See?" smiled the Master, "Just like that!"

"Wow!" said the child excitedly, "I didn't know you could do this!"

"Well kid," laughed the dad, "You've got a lot to learn! Tell you what, this is how you bring up Lynx's help screen."

"Okaaaay!" said Junior.

"Use it when you get stuck," smiled Master, "I'll let you play around for a while. If you really want to have fun, look up 'gopher'."

The child grins, and sets off to explore a parallel universe of green on black.

And thus the circle of life continues... [x]



retro bits



A couple of hotties from Bell Labs in the late '60s – a time of big hair and even bigger computers.

Photos by Larry Luckham

Juiced.GS
A quarterly print magazine

If Hardware Could Talk

Inside

Word of Hardware

Hardware Applications

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+	300 BAUD	□
<h1>VECTREX:</h1> <p>BRINGS REAL ARCADE PLAY HOME</p> <p>by Oliver Schmidt</p>		

The Vectrex was developed by Western Technologies/Smith Engineering, and was licensed and distributed first by General Consumer Electric (GCE), and then by Milton Bradley Company after their purchase of GCE.

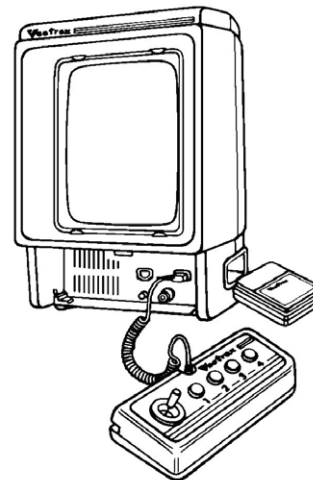
It was released in November 1982 and Milton Bradley took over international marketing. The Vectrex was also released in Japan under the name *Bandai Vectrex Kousokusen*.

The Vectrex was the most ambitious and unusual home arcade system ever released and was a self-contained transportable 8-bit videogame unit that displayed unique vector graphics on a built-in 10" monitor. Vector graphics, as in Asteroids or Battelzone, are essentially lines of light and have a timeless appeal that typical raster graphics, which consist of small pixels or blocks, can't duplicate.

The Vectrex is also a masterpiece of industrial design.

The control panel; which features a small self-centering analog metal joystick and four-numbered action buttons, could be placed in a storage area at the bottom front of the console. The coiled cord could then be wrapped once around the joystick, with the remaining length laid on top of the action buttons. The control panel could then be slid into the tabs at the bottom of the console and snapped up into place, creating a sleek forward-facing profile.

Unlike other video game consoles, which connected to televisions and rendered raster graphics, the Vectrex had its integrated 9 inch monitor displaying vector graphics. Although monochrome the Vectrex used screen overlays to give the illusion of color similar to the original method of producing colour in the first arcade cabinets such as Space Invaders. At the time, many of the most popular arcade games also used vector displays, and GCE was looking to set themselves apart from the home gaming consol pack by selling high-quality versions of arcade games such as Space Wars and Armor Attack. Vectrex came with a built in game, the Asteroids-like Mine Storm.



The Vectrex's base technical specifications were impressive.

It used the speedier and more advanced Motorola 68A09 (6809) instead of the cheaper MOS Technology 6502 8-bit microprocessor found in the Apple, Atari and Commodore systems. Likewise, its sound generator, a General Instrument AY-3-8910, supported three simultaneous channels of sound with a dynamic range of effects. The chip had been used in Mattel's earlier Intellivision (1980) and would show up in the Atari ST (1985) and other computer systems.

In early 1984, a 3-D Imager (headset) that simulated color was introduced and released in limited quantities. The 3D Imager came bundled with 3D Mine Storm - now in color with the use of the included color wheel and with obvious 3D enhancements.

The 3D Imager was only sold in the USA in early 1984 and in a small amounts - literally the first system in the gaming industry to have 3D.

It was released a full 3 to 4 years before Sega's LCD version - who later had to pull their TV commercial which claimed that they were first.

It wasn't until about 12 years later that 3D games and analog control really took off in home consoles.

Today the Vectrex 3D Imager is for collectors one of the most searched items in the genre of videogames.

Rise and Fall

In 1981, Mike Purvis and John Ross at Western Technologies/Smith Engineering, were trying to come up with a way to use a lot of cheap 5" cathode ray tubes (CRT) that WT/SE had picked up recently from a liquidator/surplus store. They came up with the idea for a small all in one home gaming system using Vector graphics. Smith Engineering/Western Technologies was a videogame company started by Jay Smith, an engineer who was previously an employee at Mattel.

Jay, head of Engineering at Western Tec', gave the go ahead and headed the project, which became known as the Mini Arcade aka HP-3000 and Vector-X. By Spring, 1981, the toy company 'Kenner' had optioned the "Mini Arcade", and it was planned to use the 5" black and white screens available. However by July, it had decided against the development and the Mini Arcade was looking for a new partner again. By September of 1981 a company by the name of General Consumer Electronics (GCE) had decided to lease the Mini Arcade after GCE's president, Greg Krakauer saw the concept and early workings and decided it was a potential goldmine. A few modifications were made - for example screen was increased to 9" and the name changed to "Vectrex".

The Vectrex Arcade System was introduced in June 1982 at the Summer CES show and

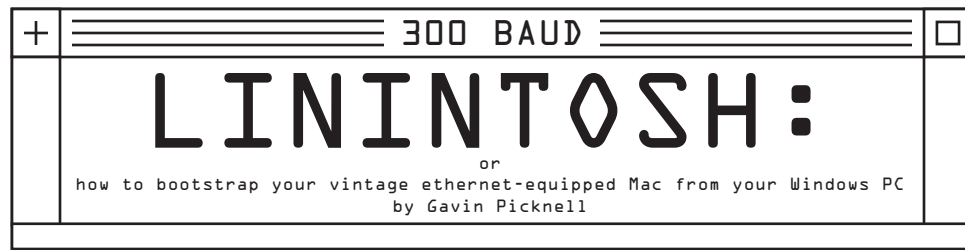
became available for purchase at \$199 in October that year; it included the built-in game Mine Storm (an Asteroids clone). A recessed handle allowed the unit to be easily picked up and carried, although its heavy weight kept it from being a true "portable" system. However, families liked the Vectrex since its built-in screen allowed it to be played without tying up the family TV set.

In March of 1983, Milton Bradley (MB) decided they wanted to get into the videogame business and purchased GCE, thus acquiring the Vectrex. Milton Bradley, with it's already established games distribution channels, quickly expanded the Vectrex's distribution overseas.

By summer 1983, distribution had begun in Europe and Japan, but by the end of that year the great video game crash had occurred and the industry was feeling it's effects. Milton Bradley closed down GCE and decided to distribute the Vectrex itself, discounting it as much as possible (first \$150, then \$100). This plan lasted until March of that year when they discontinued sales in Europe and slowly phased out sales within the U.S. during the rest of that year. Finally they released all rights back to Smith Engineering.

Today, Smith Engineering has graciously condoned the not-for-profit distribution of any of the Vectrex's duplicable materials, including games, overlays and manuals. Because of the system's uniqueness, it has inspired a loyal group of Vectrex fanatics who have churned out emulators, web pages, and even new games. [x]

Oliver Schmidt is curator of the Vectrex Museum
www.vectrexmuseum.com



Overview

So, back in the day you used to be a Mac user huh? but at some point you switched to the dark side. Never mind, you have realised the error of your ways and have purchased the Mac of your youth off ebay, but now, your only modern computer being a Windows-based PC, you are wondering how to get software onto (and off of) your shiny new (old) Mac. Possibly you even need to install or upgrade its operating system. The process that will be described here is hopefully relatively straight forward (for someone adventurous enough to own a retro Mac in the first place, anyway) and will require the following:

- Some time and enthusiasm for life and computing
- An Ethernet equipped Macintosh with a 1.4MB "super" drive that is capable of running MacOS 7.5 (note your Ethernet adaptor needs to be compatible with the Apple driver)
- An Ethernet equipped Windows XP PC with 512MB RAM and min 1GB free disk (prefer 3GB) space with a 1.4MB floppy drive
- An ethernet network and something that hands out DHCP addresses
- A copy of VMware Server or VMware Player (both free) for your XP machine
- A copy of the Linintosh server VM appliance
- A copy of RAWRITE2 and the associated RAWRITE2 Apple network access disk image

- An error free 1.4MB floppy disk

One of the major challenges here is simply having the necessary software. You should find the Linintosh server, a copy of RAWRITE2 and the required boot disk image in a single convenient package located somewhere on the internet [1]

With this stuff we are going to:

- Create a universal Mac network access disk on our PC to boot our Mac with
- Fire up our Linintosh Virtual Appliance to serve files to our Macintosh (this handy little server contains a number of MacOS installation sources) over Ethertalk
- Boot our Mac with the boot floppy we made earlier and install an OS from the Linintosh server over Ethertalk

Disclaimer: You should basically assume that I know nothing and everything described here is the result of a prolonged bourbon drinking binge. I encourage you to use common sense (your own) and judgement (your own) when attempting this procedure. I personally have performed this miracle with my own LC475 but, as with all things, your mileage may vary. If you are not comfortable with any of the procedures described here I recommend you don't try - you'll just end up cursing me, your Mac, and (quite rightly) your PC.

Right-o! Let's get started!

Creating a Mac boot floppy on your PC

Those crazy guys at Apple figured us crazy users would want an easy way to build our

Mac's across the network. Lucky for us they produced the "Network Access Disk", which in our case is a cut down version of MacOS 7.5 that fits on a boot floppy and will boot any Mac with a 1.4MB "SuperDrive" and provides both LocalTalk and EtherTalk networking – woohoo! This is the good news, along with the fact that the disk is freely downloadable from the Apple Web Site. The bad news for us people who actually use PC's in their everyday lives is that its not easy to extract the provided image onto a disk when all you have is a PC to work with.

No problem. Fortunately for us there is a RAWRITE image of this disk – RAWRITE is a floppy image writer/creator that runs on the PC (amongst other platforms). All we need to do is write the Mac Network Access Disk image to a floppy. Easy.

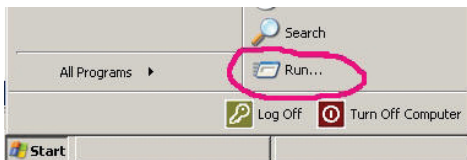


Figure 1

Start a command prompt on your XP machine by choosing "Command Prompt" from the start menu, or alternatively (if its not in your start menu), by choosing the "RUN" option in your start menu (Figure 1), and then typing "cmd" (without the quotes) into the resultant "Run" dialogue box (Figure 2). Click "OK".

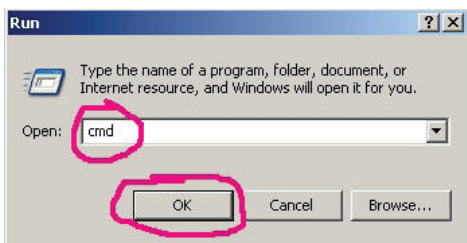


Figure 2

Format the floppy disk you are going to use to write the Network Access Disk image to by using the command "format a: /u" (without quotes), where a: is the drive letter of your floppy device (Figure 3). If formatting fails, throw the disk away and try another one – the disk needs to be formatted before use

with RAWRITE2, and any dodgy disks will just give us trouble.

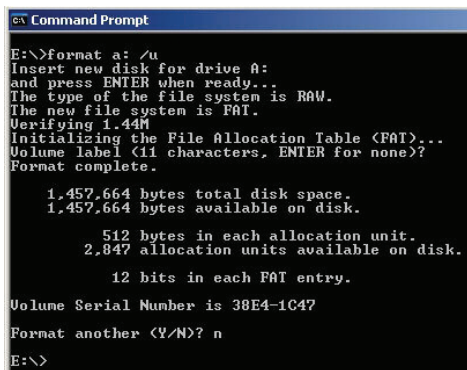


Figure 3

In your command window, change the working directory to that of the RAWRITE2 application. Use the command "CD". ie: CD e:\vintagemac\rawrite2 (Figure 4)

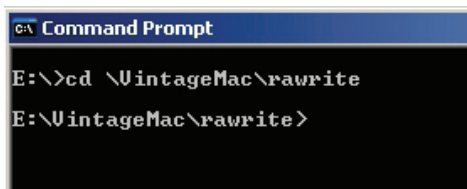


Figure 4

Assuming you got this RAWRITE from the Linintosh server package, it will contain the required image file (MacNWAcc.img). Write the image to your newly formatted floppy by using the command "rawrite2 macnwacc.img a:" (again without the quotes), where a: is the drive letter of your floppy device (Figure 5).

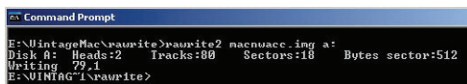


Figure 5

Notice how the command prompt has gone wacky – rawrite isn't used to non 8.3 naming formats – don't worry about (in this context). Anyhoo, your boot disk should be ready. Pop it into your Mac and turn it on – If it worked (why wouldn't it?), your machine will boot from the Floppy and load MacOS 7.5...

Yay!

The Linintosh Server

If you're anything like me, getting to this point hasn't achieved you a lot. Assuming your Mac ethernet card is supported, you now have ethertalk connectivity, but without anything to talk to, thats pretty useless. Windows XP itself has no ability to serve Macintosh clients so our best bet is the open source package Netatalk [2]. Netatalk does indeed rock, however for the average Windows user it may be a little daunting. That's where the Linintosh server comes into play.

The Linintosh server itself is a VMWare appliance (in the loosest possible sense). It is simply a Linux virtual machine that has been configured with a minimal(ish) Linux environment and a preconfigured Netatalk and Samba (we'll talk more about Samba in a minute) instance. The idea being you turn on this virtual appliance and it provides preconfigured network connectivity between both Windows XP clients (natively) and Macintosh clients (natively). In fact the Linintosh server is configured to serve up the same network volume to both Windows and Macintosh clients simultaneously – sounds handy for transferring files, huh?

In addition to being useful as a file transfer mechanism, the Linintosh server also comes prepopulated with a bunch of useful software. Most notably the stuff you are likely to need to install a vintage OS onto your vintage Mac now that you can boot it with a network access disk – hey, that sounds like a handy thing to have!

The preconfigured software comes on a Volume called "Apple System Software" so you may be able to guess what's on it. If not, heres a list:

- System 6.0.8**
- System 7.0**
- System 7.0.1**
- System 7 Tune Up 1.1.1**
- System 7 Update 3**
- System 7.5.3**
- System 7.5.5 Update**
- Network Access Disk 7.5**

- MacTCP 2.0.6**
- Open Transport 1.1.2**
- Fetch 3.0.1 (FTP)**
- iCab Pre2.99b 68k (Web Browser)**
- Netscape 4.0.3 68k (Web Browser)**
- WhatRoute 68k (TCPIP tool – ping etc)**
- Binhex 4**
- Disinfectant**
- Diskcopy 4.2**
- MacBinary II+ 1.0.2**
- MiniSubstitute 1.7.1**
- Apple HD SC Setup 7.3.5**
- Disk Copy 6**
- Disk First Aid**
- ResEdit**
- Stuffit Expander 3.5.2**
- Stuffit Expander 4.0.2**
- TeachText**
- Welcome to Linintosh**

In order to use the Linintosh server you will need a virtual machine player. Your free choices are VMware server or VMware player. If you are not familiar with VMware or virtualisation, I would recommend you download and install VMware player – its just a basic player for virtual machines, no bells and whistles but does the trick. I'll describe here the process to load the Linintosh server with VMWare player – note: you will have to figure out how to install the VMWare player yourself (it goes something like this... click next, next, next, install).

Right!

Start your VMPlayer application and click on the "Open" Icon (Figure 6)

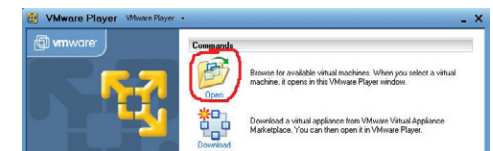


Figure 6

Browse to the "Linintosh Server" directory (in this example e:\VintageMac\Linintosh Server), select the "Linintosh Server.vmx" file and click "Open" (Figure 7)

You will more than likely be presented with a dialogue suggesting that you have either

moved or copied this virtual machine. VMPlayer will want to know which one it is – well lie. Tell VMPlayer that you moved the virtual machine. If you say you copied it, return to go and start again (i.e. it wont work) (Figure 8).

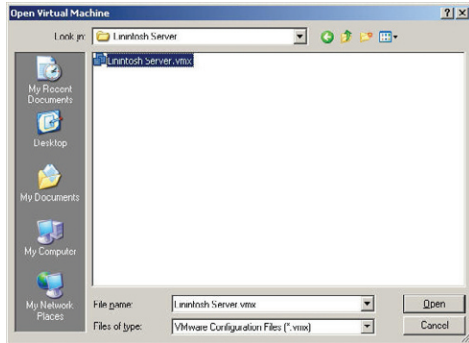


Figure 7

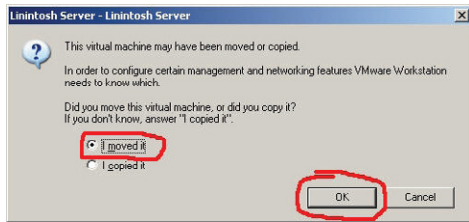


Figure 8

Once you click OK, the Virtual Machine should start to boot and you should see a screen along the lines of that shown in Figure 9.

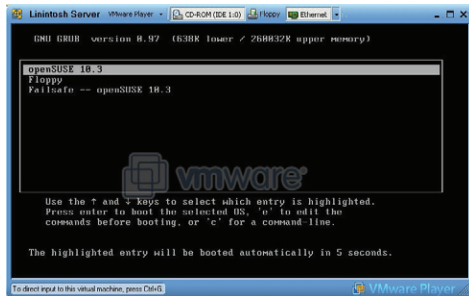


Figure 9

You will then see a bunch of stuff scrolling up the screen as the Linintosh Server appliance loads up. At this point you will need a DHCP server active on your network to provide the Linintosh Server an IP Address (if you want to be able to access it via your Windows XP machine). Once the virtual machine has

booted, you should see a screen that looks similar to that shown in Figure 10.

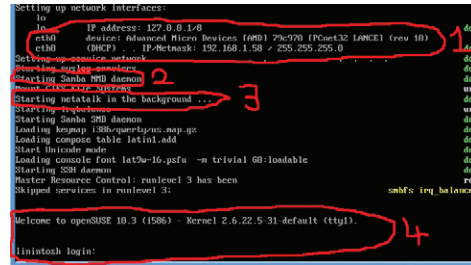


Figure 10

Examining the advanced Figure 10 graphic we can see that:

1. Hey, I got an IP address – cool!
2. Hey, I'm a Windows network server – ah, is that really cool?
3. Hey, I'm an Appletalk network server – cool!
4. Hey, I'm actually a OpenSUSE 10.3 linux server – *now that is cool!*

If everything has gone to plan and you're onto your 6th shot – I mean you've got this far – you should now be able to "PING" your Linintosh. Remember your friend the command prompt? Well, head back there and type this command "ping linintosh". Through the magic of rainbow you should get a response that looks like that shown in Figure 11.

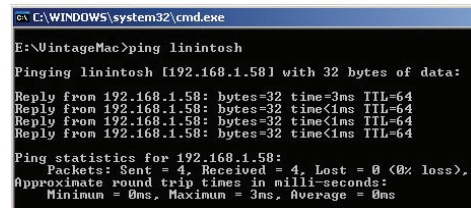


Figure 11

The IP address you see will be dependant on your network and what your DHCP server has been configured to hand out – the main thing is *the Linintosh is responding*.

Show me the Windows Share

OK, wanna see something cool? Remember

that whole "Start", "Run" thing? Yeah, well do it again, but this time in the "Run" dialogue type the command "\\linintosh" and click "OK" (as shown in Figure 12)

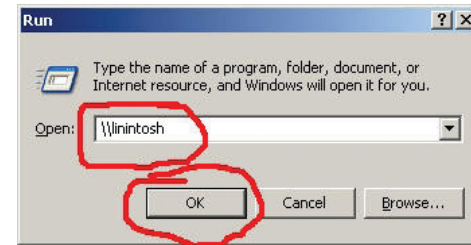


Figure 12

If things are all good, you should see something that looks a bit like that shown in Figure 14 (that's right, there is no Figure 13 – we don't want to Jinx our good work, do we?).

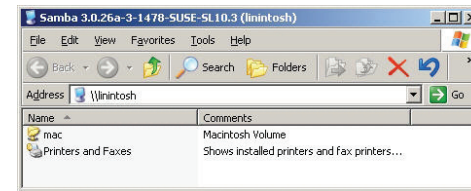


Figure 14

Double click on the "mac" share. Go on... I know you want to. This time you should be presented with a login dialogue box. The username is "macuser" and the password is "password" (no quotes on either of these) – Figure 15.



Figure 15

After clicking OK, you should see the share as shown in Figure 16.

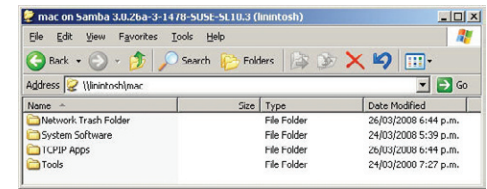


Figure 16

Some things to note about this:

- Don't mess with the hidden files and folders created by Netatalk on the Linintosh server (.AppleDB .AppleDesktop .AppleDouble), you WILL break your Mac files (stink).
- You have access rights to copy stuff onto this volume – this stuff will be visible on your Mac on this same volume. Make sure you copy stuff that your Mac will understand – like .SIT and .BIN files, anything else is likely to get lost in translation

Show me the Mac Volume

Ok, now for the good part. Power up that Mac of yours. If necessary, use the network access disk we created earlier... let's connect.

Go to the network control panel and ensure your Mac is set to "Ethernat" as opposed to "Localtalk" (see Figure 17)

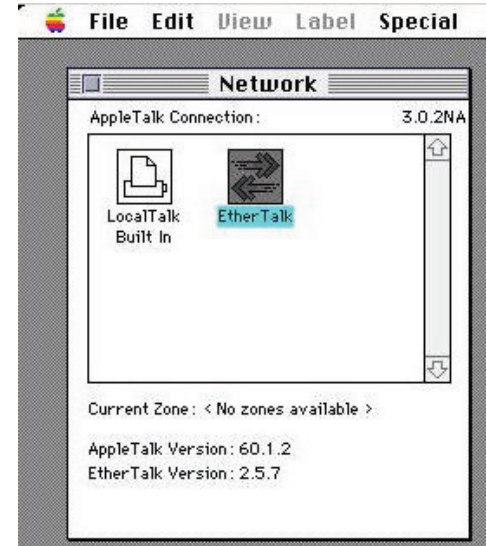


Figure 17

Go to the chooser and click on the Appleshare icon, your Linintosh server should appear in the list of servers (note that the Netatalk services start in the background on the Linintosh Server and so it can be a minute or so after the virtual machine has booted before it becomes available). When you see it, select it and click OK (Figure 18).

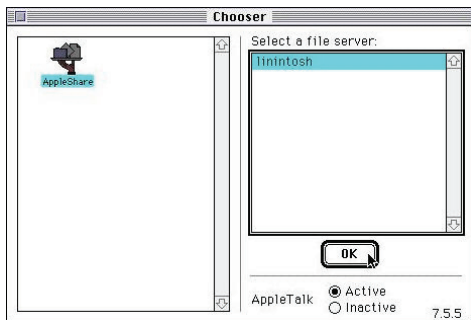


Figure 18

You will be prompted for a username and password, now let me think, what could it be..... I know! try username "macuser" password "password" (minus the quotes – do I really need to keep telling you that?). Figure 19 shows you what I mean.



Figure 19

OK, now select the Volume to Connect to. On the Mac side its called "Macintosh System Software" (Figure 20).



Figure 20

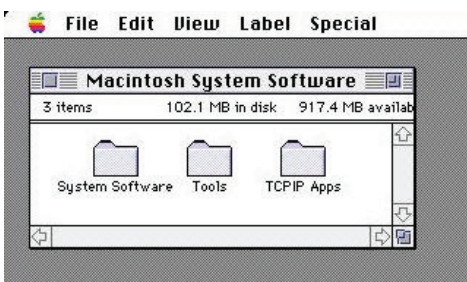


Figure 21

How To Shut Down Safely

You may be wondering how to shut down this beast without breaking anything... good question. By default the VMPlayer will "suspend" your virtual machine when you exit – thats ok, but your mileage may vary with this approach. I prefer to actually shut the Linintosh server down to avoid any unexpected issues. There are two ways to do this.

The easiest way is probably to simply modify the exit behavior of the VMPlayer:

Maximize the VMPlayer application that is running your Linintosh server

Click on the VMPlayer drop down menu, select the "Preferences" option (Figure 22).

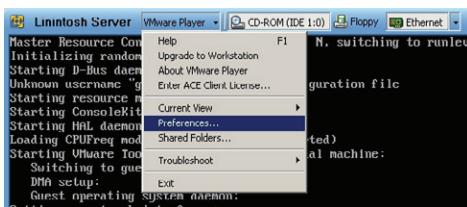


Figure 22

Once you click "OK", you should be done and ready to roll (Figure 21).

Check that out – niiiiice. Now fill your boots and install the OS you're after, the upgrade you want, or the software you just copied into the Volume from your PC.

Once in preferences, select the "Power off Virtual Machine" under the "When exiting" section and click OK (Figure 23).

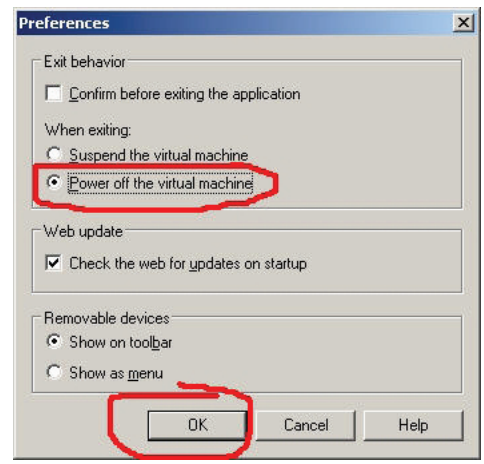


Figure 23

Now when you exit the VMPlayer, the Linintosh server will be shut down gracefully. Just make sure you have closed all your open connections from both your Windows and Mac clients.

Other Random Stuff

About Linintosh

Linintosh is built on OpenSUSE 10.3. It's a reasonably minimal install with only the packages needed to be installed, installed. It's still rather big, but thats probably because it's an end user platform and I've used YAST for everything – but that keeps it simple. There is no X and no back doors (that I've put in anyway!). I would not recommend you run this on a public network because all the passwords are "password" and of course we know that security updates are being released all the time for all operating systems. Should be great for a home LAN however.

There are two accounts that I have configured:

- root** – password = *password* (full admin user)
- macuser** – password = *password* (limited access user)

Troubleshooting

Ummm, did none.

Things Off The Top Of My Head

Don't choose *copied over moved* in the VMware configuration – it will break the networking in the virtual machine – fixable, but you need to know something about Linux (just re-extract the Linintosh Server Directory from the zip file if this happens).

If you want to have network access from your Windows box to the Linintosh, make sure there is a DHCP server on your network that will give Linintosh an address.

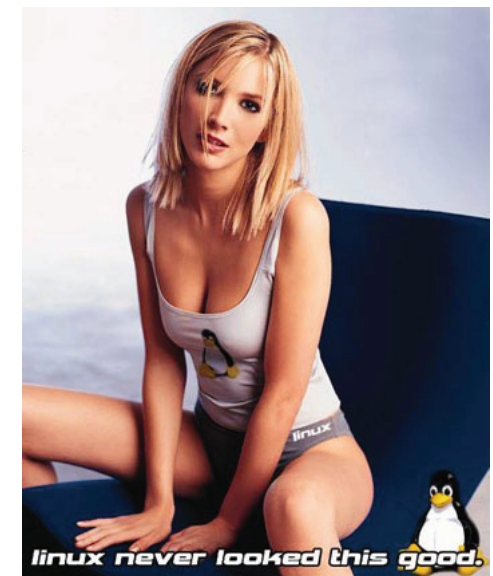
Got a problem? Got a firewall? Firewalls are always causing problems – check that out.

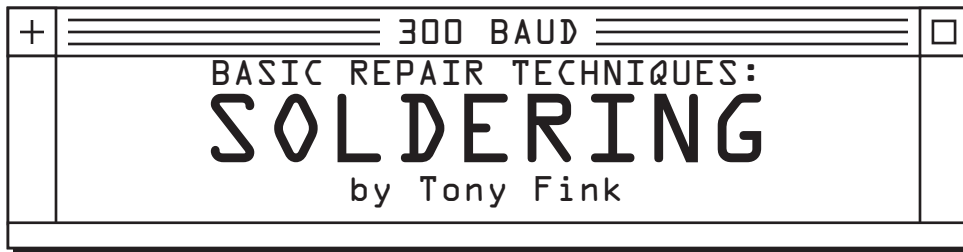
If you cant see Linintosh from your Mac, perhaps your Ethernet adaptor is not supported by the apple driver.

Feedback

If you want to talk to me about any of this, you can find me on the RetroNET [3] or email me at gavo@retro-net.org. [X]

See www.300baudmagazine.com for weblinks.





After spending enough time doing retro-computing the inevitable will happen: your beloved computer system will begin to break down. Maybe it's something simple, like a couple of flaky keys in the keyboard, or a drive that doesn't seem to work like it used to, or perhaps something more spectacular like sparks and smoke.

Many of these older computers came from a time in which they were expected to be user serviceable. Even if your computer has a "No User Serviceable Parts Inside" label, chances are you can't go get the company that made it to fix it for you anymore. Because of their age most of these older computers were built with off the shelf components and fairly simple designs, at least compared to modern computers. This means that, with a little work, you can usually do the repairs yourself. In order to do repairs you'll need to be able to solder.

To begin with, you'll need some tools. The most basic tools you'll need are listed below:

- pen-style soldering iron of at least 30 watts
- solder .022 diameter, rosin core
- sponge
- desoldering braid or spring-loaded desoldering pump
- basic electronics hand tools, eg. small screwdrivers, side cutters, pliers
- wire strippers
- a "helping hands" thing, with magnifier and claws

Your soldering iron will be your primary tool when doing any work of this kind, so it's best to choose a good quality iron. Higher wattage irons will heat up faster, and retain heat better during work. A weak iron will lose heat quickly when doing joints, which can weaken them. The shape of the tip on the iron is mostly a matter of preference, but most tips are designed for doing specific kinds of work. A chisel tip is considered to be

all-purpose and is good for beginners, while sharp conical tips can be ideal for very fine work. When working on computers it is best to avoid gun-style irons entirely, as they are simply too clumsy to handle properly and have a nasty habit of damaging sensitive components.

Next in importance when soldering is choice of solder. For most computers it is best to go with a solder that has a mix of tin, lead, and silver. Silver bearing solder is less likely to produce a "cold joint" or a joint which does not cool slowly and remain strong. While silver in your solder is somewhat of a nicety, lead in your solder is essential. While some people are concerned about the hazards of lead, in older computers it is simply a better choice to have lead in your solder. All the old joints will almost certainly be made of lead, and your repairs will be more durable if you are using a solder with a similar or identical composition. Furthermore, even in new joints, leaded solder is significantly more durable than solder without it. For computer work, use solder with rosin core so you don't have to buy flux.

The other tools are fairly obvious. A wet sponge is used for cleaning your iron tip, desoldering braid or pumps are for removing old solder or fixing mistakes, and wire strippers and hand tools are needed for preparing wires or other connectors for soldering. A "helping hand" type device will help you alot by holding on to components so you don't have to burn your fingers and the magnifier can make seeing small joints much easier on the eyes.

Now for some basic techniques. First and foremost, any time you are soldering you have to keep your iron clean. The iron gets very hot, usually somewhere near 400 degrees Fahrenheit. As a result, if left to itself the iron will oxidize very quickly. A buildup of oxide will weaken all your joints and make soldering very difficult. When you heat up your iron you should always "tin" the tip by

rubbing solder on all the surfaces of the tip and then wiping the tip off on a wet sponge. Clean the tip of the iron periodically while soldering at any time you have a buildup of old solder on the tip or if the tip begins to change from a bright silver color. Remember, a bright shiny soldering tip is your friend.

When soldering it is good to remember that solder must reach a certain temperature in order to make a strong joint. Strong joints are shiny and smooth when they are finished, and do not have a dull or cracked/foggy appearance and sometimes turn black. A joint which is not shiny has not reached the proper temperature, or has been heated far too much. These problems are known as a "cold joint" or "burned joint" respectively. If your iron is not a high wattage it's best to wait a short time in between each joint to allow the iron to regain heat, so you can avoid cold joints. Avoiding these generally requires practice and patience.

With most joints, you generally want to only apply the iron as long as you have to, to avoid overheating any components or burning things. In order to facilitate this, components to be soldered together ought to be "tinned." Tinning means that you simply apply some fresh solder to both parts which need to be connected, but do it separately. This allows the final joint to be made quickly and accurately. Most joint styles which I am going to describe will be soldered in a particular order too. Generally speaking, the components or wires to be soldered are tinned and put into place first, then the solder wire is laid on top, and finally the iron is touched to the joint to melt it and removed along with the solder wire.

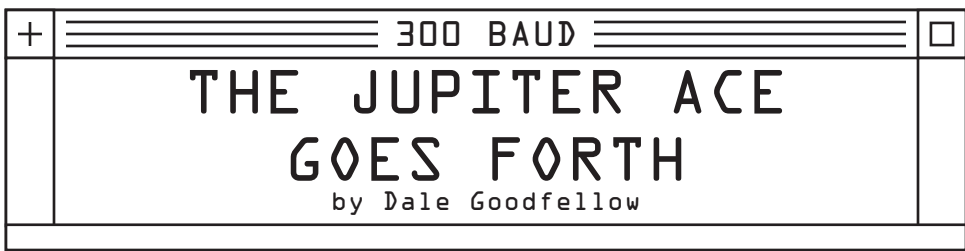
The most basic kind of joint is called a "lap joint." In this joint, the two components are simply laid on top of each other and soldered into place. This technique is commonly used then soldering two wires together, when soldering directly to the leg of a component, or when soldering a wire directly onto a PCB. (not through a hole.) In this joint, you simply stack the tinned parts on top of each other, place the end of the solder wire on top, and solder over them, overlapping them with melted solder.

A very common joint when doing computer repair is through-hole soldering. PCB's generally have holes which components go into, and are then soldered into place. Each hole is surrounded by a small metal

ring known as a pad, and the solder joint will have to go between the component and the pad. Applying the iron for too long will cause the pad to lift off the PCB, so it's best to do these joints without applying the iron too much. Usually only the component is tinned in this situation, since tinning the pad would cause the hole to close up with solder. When soldering, it's best to place the tip of the solder wire right on the pad and apply the iron on top of that for a brief period.

Another common need is for desoldering. When removing solder, as with adding it, it's best to try and avoid prolonged exposure of the components or the PCB to the direct heat of the soldering iron. A desoldering braid is useful for removing limited amounts of solder. It's a very fine copper braid which has been covered in flux. To use it you simply place an unused section of braid over the joint you want to pull solder off of and place the iron on top. Some rubbing motion may be necessary to get things going, but the heat of the iron will melt the solder below the braid and the solder will be drawn into the braid via capillary action. Remove the iron and desoldering braid at the same time, to avoid getting the braid stuck in the cooling joint. Desoldering with a pump is similar, except you melt the solder directly with the iron and then use the pump to vacuum the molten metal up. Sometimes not all of the solder will come up, and in this situation it's actually best to add some more fresh solder to the joint before removing it. This causes the solder to form a cohesive whole, so that it all comes up in one shot, instead of requiring multiple passes.

Whenever soldering you should take care not to hurt yourself. The iron can reach very high temperatures, and components you are soldering will take time to cool. So resist the urge to immediately grab hold of whatever you just finished soldering, because you're likely to burn yourself. Whenever handling lead, make sure to wash your hands afterwards, just in case. Try to solder in a well ventilated place, since flux fumes can irritate your lungs. Keep your computer safe. If you're worried about static electricity damaging things, make sure to wear an ESD wristband. Protect areas which should not be getting heated or having hot drips of solder fall on them, like plastic cases. Lastly, make sure you practice your techniques on scrap hardware, so you can get used to your tools and learn how to solder one something which doesn't matter if it breaks. [x]



The Jupiter Ace, even at the time of sale, could only have been described as an *enthusiast's* machine and one of the few computers that did not have BASIC as its standard language. Its designers had been on the Sinclair ZX Spectrum team and decided to produce a computer that they would personally like to use.

The built-in language is Forth, and is the distinguishing feature of this machine. The hardware at the time was cheap enough for anyone who is interested in learning Forth to buy the Ace rather than upgrade their existing computer. In today's market it is sought-after and you can expect to pay around £150 GBP.

The Ace is laid out very much like the Sinclair models. In fact its case is the same white flimsy plastic that the very first Sinclair computer (the ZX80) had. There is a small solid state bleeper that can produce a range of single tones but with a greater knowledge of the Ace, complex sounds can be produced.

Like all the Sinclair computers, the Ace has a power connector, a socket for a lead to a television and two large edge connectors for any other special pieces of equipment. The cassette has a simple two-jack socket connection.

The display is black and white with 32 characters to a line, although it has a graphics resolution of 64 by 48. Each of the characters can be redesigned by the user to create specific mathematical symbols or game shapes.

What makes the machine most desirable, however, is Forth.

Forth programs are usually quite short so a surprising amount can be put into the standard 3KB of memory. To write larger programs, more memory is needed. Both 16KB and 48KB RAM packs are available and ZX81 16KB RAM packs can be used with an adaptor. With this adaptor most of the Sinclair add-ons will work with the Ace, providing various sorts of input and output such as parallel ports and serial ports.

Introducing: FORTH

BASIC Version

```
100 REM A BASIC PROGRAM TO PRINT "HOOPLA!"
110 FOR X=1 TO 6
120 PRINT "HOOPLA!"
130 NEXT X
140 END
```

Forth Version

```
( A FORTH PROGRAM TO PRINT "HOOPLA!" )
: SHOUT ." HOOPLA! " ; .
: CHORUS 6 0 DO SHOUT LOOP ;
CHORUS
```



Forth starts with a collection of command words (called the dictionary) and has the ability to learn new words. In our Forth program two new words are added to the dictionary: SHOUT is defined as a character string to be printed and CHORUS is defined as a mixture of 'primitives' (pre-defined words in the dictionary) and the new word SHOUT.

Forth also has a memory (called the stack), and the ability to process the numbers in it. The Forth program does the same arithmetic and logic as the BASIC program, but by manipulating the stack instead of through algebraic expressions.

Forth can be an infuriating 'Rubik's Cube' of a language; it is also a programming method and a whole new way of thinking. Some programmers love it and some hate it.

It is the ability to define and use new command words that really give Forth its power. Forth can be particularly suitable for the programming of domestic robot devices, for example, because the programmer can build up his own dictionary of commands: MOVE, FETCH, FIND, FOLLOW and RETURN, for example. [x]

(source: Orbis Home Computer Course – UK)

Probably the fastest microcomputer
in the universe
the **JUPITER ACE** only £89.95.



All inclusive Price

For £89.95 you receive your Jupiter Ace, a mains adaptor, all the leads needed to connect to most cassette recorders and T.V.s (colour or black and white), a software catalogue and a manual.

The manual is a complete introduction to the world of personal computing and a course in FORTH programming on the Ace.

Even if you are a complete newcomer to computers, the manual will guide you step by step from first principles to confident programming.

The price includes postage packing and V.A.T.

Key Features

- Revolutionary microcomputer language FORTH.
- Full-size moving-key keyboard.
- User-defined high-resolution graphics.
- Programmable sound generator.
- Floating point arithmetic.
- Fast cassette interface.
- Upper and lower case ascii character set.
- 24 x 32 character flicker-free display.

The Jupiter Ace uses FORTH

The Ace is set apart from all other personal computers on the market by its use of a revolutionary language called "FORTH". Some computer languages are easy for humans to understand, others are easy for computers; FORTH is most unusual in being both. Its underlying principles are so simple that it takes even a newcomer to computers only a few minutes to learn how to do calculations on the Ace, yet the very same principles are powerful enough to allow you to invent your own extensions to the language itself.

At the same time, the memory-saving coded form used to store your programs inside the Ace allows it to obey them very fast — typically in less than a tenth of the time it would take to do the same thing using a different language. Amongst other things, this makes the Ace ideal for games.

FORTH's unique combination of speed, versatility and ease of programming has already made it a prime choice for professional applications as diverse as pub games and radio telescopes, and gained it an enthusiastic national user group. Now the Jupiter Ace can bring this addictive language into your own home.

Designed by Jupiter Cantab

Leading computer Designers Richard Altvasser and Steven Vickers have a reputation for pushing technology forwards. After playing the major role in creating the ZX Spectrum they formed Jupiter Cantab to develop their latest branchchild the Jupiter Ace.

Technical Specification

Hardware

Processor/Memory
Z80A running at 3.25 MHz.
8K bytes ROM 3K bytes RAM.

Input

40 moving-key keyboard with auto-repeat on every key.

Output

Memory-mapped 32 x 24 character display with high resolution user graphics. Output to drive normal UHF TV set on channel 36.

Sound

Provided by internal loudspeaker.

Cassette

Load Save & Verify at 1500 baud, separate data storage.

Software. FORTH

Data Structures

Integer. Floating point and String data may be held as constants, variables or arrays with multiple dimensions and mixed data types.

Control Structures

IF-THEN-ELSE, DO-LOOP, BEGIN-WHILE-REPEAT, BEGIN-UNTIL, all may be mixed and nested to any depth.

Operators

Mathematical +, -, X, ÷.
Logical AND, OR, NOT, XOR.
Comparison <, >, =.

Program Editing

FORTH words may be listed, edited and redefined. Comments are preserved when words are compiled.

Order Form

The Jupiter Ace is available only by mail order. Please allow up to 28 days for delivery.

Send cheque or postal order with the form to:—
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IBM PC SINGLE-SIDED DISKS BYTE - The Small Systems Journal September 1987 The best of BIX - Byte Information Exchange		

ibm.ps/model.50#214, from swnev (Scott Neville), Mon Jun 8 23:59:02 1987.

I had an old single sided 3 1/2-inch disk laying around, and, just for kicks, i decided to see if it would format properly. I used FORMAT without any parameters, and lo and behold! It formatted fine and showed a full 1.4megs of available space!

I confirmed this with CHKDSK. I couldn't believe it, so i copied over a meg of data onto the disk (actually programs and ASCII files). I used the /v (verify) option with the copy and got no errors. Every program I run off the disk works without a hitch. The ASCII files are complete and unadulterated!

Is there a mega\$\$\$ conspiracy afoot? Am I being overcharged for high-density disks, when any old 3 1/2-inch disk will work?

Is there a difference in reliability between these disks?
Anyone have any suggestions?

ibm.ps/model.50#215, from barryn (Barry Nance), Tue Jun 9 00:01:04 1987.

A comment to message 214.

Good questions. Even with a discount, the 3 1/2-inch disks we bought at work cost about \$60 per box. And that's too much.

ibm.ps/model.50#216, from swnev (Scott Neville), Tue Jun 9 00:09:23 1987.

A comment to message 215

I have some Sony single-sided disks. I'll try them next. The store I bought my Model 60 from wanted \$100 for the hard disks! I finally found them for \$65. Seems very over-priced. I chalked it up to new technology, but now i begin to wonder!!

ibm.ps/model.50#217, from barryn, Tue Jun 9 00:11:48 1987.

A comment to message 216

Well, just watch out for the single-sided disks..."single-sided" means that the disks failed the certification tests on one surface, but not the other. There could be a very slight flaw on the bad side...or there could be a large one.

ibm.ps/model.50#220, from grr (George Robbins, Commodore Business Machines), Tue Jun 9 04:56:58 1987.

A comment to message 217

This is an open issue that has been explored elsewhere at great length. It boils down to personal preference. Some people are happy to save a buck at some increased risk; others are willing to pay more for some assurance of better data reliability.

The details of certification, finishing, testing and whatnot vary between manufacturers over time. There isn't a single answer.

ibm.ps/model.50#227, from matt.trask (Matt Trask), Tue Jun 9 11:32:59 1987.

A message to comment 217

Single-sided means a statistically meaningful sample from the production run failed on one surface and not the other - not necessarily every disk. DOS should be able to handle any bad sectors that are found during format of a single-sided disk for double-sided use.

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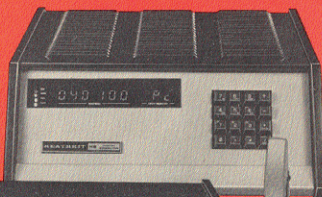
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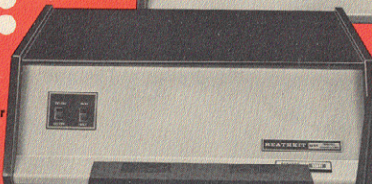
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