Texas Instruments Brisbane User Group (TIBUG)

BUG BYTES

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Editor's Note

Dennis Remmer
dennis@dstc.edu.au

The next meeting will be held at my workplace, the Distributed Systems Technology Centre (DSTC), Level 7 Gehrmann Labs, Research Road (off Upland Road), University of Qld, St. Lucia, on Wednesday night 1st October, starting at 8:00p.m.

There's a map of the University campus on Page 10, with the best route to get to the DSTC coming from the city.

I'll set up some Web browsers, so bring along a list of information/sites you'd like to visit.

Little on the TI front this month to report other than some information on the unreleased TI-99/2 computer, so I thought I'd regale you with tales from the edge of the computer industry.

Best Regards...

The TI-99/2

Alexios Chouchoulas,
machroom@vennea.demon.co.uk

(Editor: Continuing the series of overviews of obscure TI gear, here is some stuff I tracked down from the "Machine Room" website `http://www.tardis.ed.ac.uk/~alexios/MACHINE-ROOM/` *on the mysterious TI-99/2 computer which never saw the light of day.)*

Released (?): 1983

CPU: TMS-9995 (compatible with TMS-9900, but faster), 10.7 MHz

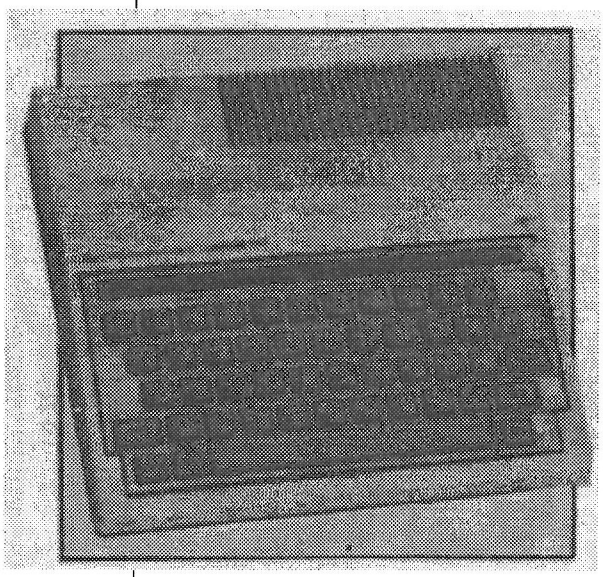
ROM: 32 kbytes

RAM: 4 kbytes

Case: Small, grey, with darker calculator-style keys. The keyboard resembles that of the Texas Instruments TI-99/4A only in lay-out. The quality of the case is made to resemble smaller machines like the Sinclair ZX-Spectrum.

Keyboard: Non-standard ASCII, normal style keys. There are almost no special keys, apart from the FUNC key, which accesses 10 function keys (the numerical keys), cursor movement keys (the E-S-D-X diamond), and less common ASCII characters (tilde, etc).

Display: Strangely enough, not driven by TI's Video Display Processor, TMS9918A. The TI-99/2 uses a cut-down version of the chip which only supports monochrome output and doesn't need its own memory (it shares memory with the CPU instead). I don't know if sprites are available. Possibly not. Only the TI-99/4A's text mode is supported: 32 x 24 (columns x rows). 256-character ASCII set. Characters are formed in an 8 by 8 pixel matrix. Characters reside in ROM and cannot be redefined, though TI has included some common game graphics in the character



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set. There were 2 colours (black and white) in total.

Audio: Specifications unknown. A good guess is that it has a sound chip compatible with that of the TI-99/4A. So, we can assume the TI-99/2 had three channels of sound and one channel of white noise. Mono sound. Full range of audible frequencies. Sound subsystem does not need CPU time in order to produce sound.

Input/Output: Bus connector. Serial printer port. TV connector (RF modulator). A weird power switch: it is very difficult to reach and also controls the broadcasting channel of the RF modulator. So, the switch has three positions: Channel 3, Off and Channel 4. Tape player/recorder connector, 450 baud(?) interface. Cartridge ('module') connector. Joystick port (up to two joysticks/paddles can be connected)

Trivia: I don't even know if this one was ever produced by Texas Instruments. All I remember is that I'd seen it in a Greek computer mag back in 1983 and thought it would be a stupid choice. I found the magazine again, and copied the specs from it. I have never ever seen a TI-99/2 in the flesh. Apparently, this is no surprise -- the machine was never released. I suspect it wouldn't sell very well, though. Interesting news: the machine's BASIC is a whooping 10 times faster than TI BASIC running on the TI-99/4A. This is because, on the TI-99/2, TI BASIC is written in TMS9995 assembly and not as programs for the VDP (no, don't ask).

Thanks To: Charles Good (cgood@bright.net), for providing the missing info on the TI-99/2 (among other things).

Cyberlore!

compiled by Alan Silverstein
ajs@hpfcdc.hp.com

(Editor: Maybe you've heard about the guy who complained to the PC manufacturer helpline that the cup holder in his new PC was too flimsy, or the woman who rushed out and bought Windows'95 when it was released because the TV ads said it could do anything, and then returned it to Microsoft crying 'fraud' **, well here is a long but fascinating set of postings to the internet on all manner of computer folklore. Enjoy!. P.S:*
** he was referring of course to his CDROM caddy*
*** she didn't actually have a PC!)*

COMPUTER-RELATED HORROR STORIES, FOLKLORE, AND ANECDOTES

Excerpts (edited) from net.rumor, March, 1986, with later additions, including a huge number from a rec.humor posting. I did some reformatting and a spelling check. Have at...

Musical Tektronix

The Tektronix 4051 (one of the first desk-top computers) had a microprocessor (6800 I think) deep inside it. Although the machine's native language was Basic, there were (undocumented) hooks to download and run machine code. The machine also had a synthesized bell. The result, of course, was that 4051 was one of the favorite musical instruments in some parts of Tek.

Poke Fun at your Pet

Apparently, you could make the monitor of a PET computer catch fire with a POKE. The poke controlled the size of the screen for the electron beam (which was under computer control). The idea was that you could change the screen size if you wanted to get around variations on the screen. Anyway, setting to zero meant the computer would try to paint the entire screen in the center of the screen, thus burning out the phosphor on the monitor!

Marching IBM

Anybody remember how to walk an IBM 1130's disk drives? I recall stories that the right program would start them marching across the room.

A friend of mine once told me how he used to do just that at U of Delaware. He used to do it from a terminal room where you couldn't see the machine itself, but you'd know when it happened -- the disk would pull either its power plug or its connection to the mainframe off, and the machine would crash.

The TRS-80 Model 1 used to put out so much RF interference, that one way of adding sound to ANY program was to put a small AM radio right by the machine, and listening to the electronic "music". Some programs even used this trait of the trash-80, instead of connecting up the external speaker.

TRS-80

In 1978, a company in my area which specialized in fruit orchard temperature alarm systems (it being necessary to awaken the farmers to start the smudge pots and ventilators (giant fans) in order to prevent damage to the fruit) decided they wanted to go into the TRS-80 I peripherals business. They hired me as an engineering technician and programmer.

There I was, working on programs to drive the peripherals, and having even the simplest programs crashing and going haywire for no apparent reason. Being brought up to never assume it's the machine's fault, I spent several weeks trying to figure out what I was doing wrong.

The one day my boss asked me to go to the company next door and assist them with a problem (they built hydraulic lift units, like the ones you see being used in construction...turned out we built the electronic control boxes for their lifts). I walk into the shop, and am confronted by 12 extra heavy duty arcwelding machines (these guys were welding steel up to 2" thick!). After solving their problem, I traced the power mains. Sure enough, we were drawing our AC feed from the same source they were, no transformers between us.

A few hours, a couple of isolation transformers and caps later, and all of a sudden my code runs perfectly.

The boss still didn't believe it, when I showed him the finally working code... he had pretty much decided I was a flop as a programmer. They decided two weeks later not to go into computers... too volatile, they said.

Personalities

I was once told that the operating system for the Burroughs B1700, another computer well-supplied with lights, displayed a smile in its idle loop.

Some Honeywell computers make "bird calls" over a built-in speaker when idle. If the computer room sounds like a jungle, then you're certain to get lots of CPU for your jobs.

Back when I was an undergrad at Oberlin College, I had the pleasure of working as an operator on their Xerox Sigma 9. The best part of the job was bringing down the machine. The console displayed "Thhhhhhats all Folks!!!", while the processor treated you to a rendition of the Star Spangled Banner on the CPU alarm.

Shaved Disks

Speaking of doing things to power lines...I remember a story I heard from my circuits professor in Colorado. It seems that they received a computer from the government (I can't remember the make, but it wasn't anything I had heard of before). This computer was a bit of a beast. It ran off of 3-phase power, and had a disk that was between 3 and 4 feet in diameter. Well, several students were involved in setting up the disk drive one night, and when the professor left he told them that they could connect everything, but not to power it up until he checked it over.

Well, you know students...they wired it up and turned it on. For those of you who are not to familiar with 3-phase power, if you reverse any 2 out of the 3 wires, the polarity changes. Well, they managed to reverse 2 of the wires, causing the disk to spin backwards. Now, since the heads are designed to float on a cushion of air above the disk, they went down instead of up, and the disk ended up with a nice groove right down the middle. Needless to say, the prof wasn't pleased when he came in the next morning and found his nice new disk turned into so many magnetic shavings....

Fan the Flames

In 1970 ('71?) Fresno State's computer room was the target of a firebomb thrown by some protesting students. The fire department arrived and hosed everything down. The fire damage was negligible. But then the FD decided that since it was electrical equipment, they should be using CO2 extinguishers instead.

Either water or CO2 would have been okay alone; but when the CO2 was sprayed on top of the water, it formed carbolic acid [or is it carbonic, I don't remember]. Destroyed all of the equipment, the disks, and the tapes. Took about a year and a half to recreate their records from hardcopy.

Free Paper

When MCIMail first went on the air, they charged for hardcopy mail delivery by the character (actually, 5000-character unit). You could mail yourself or a friend a few reams of paper for $1 by sending a file of formfeeds. They fixed their charging when we pointed this out.

Skim the Cream

*Is it really true that someone working for a bank or a large company diverted megabucks into his or her personal account by adjusting a program that figured out people's paychecks or interest payments so that it always rounded *down* to the nearest penny, never up, and then deposited the extra parts of pennies (mills) into his or her own account? I heard this story several years ago, but now I need to know if it's really true. So if you know the name of the bank or the company and the approximate year this person was caught...*

Not only is it true, it has also happened a lot more than just once. In fact, this is one of the simplest computer scams going. One of the cleverest ones I ever heard about involved someone working for a company (a fruit company, I believe) who had the computer change (just slightly) the recorded times (and prices) of the company's transactions on the commodities exchanges. His profits came from the slight changes (say,1/16 of a point) in the contract prices that occur all the time during a normal trading day.

I have seen several books which talk about these and other schemes in detail. Unfortunately, the names and dates are often not revealed as most companies are loath to have the general public find out the ease with which these types of crimes can be carried out, as well as the difficulty of discovering them once they have occurred. One of the most revealing items is the fact that computer criminals are almost always caught only because discrepancies in their lifestyles are noted (e.g. buying a 40-foot yacht on a $20k salary). In fact, the longest running crime I heard about, which involved a programmer (I believe) in a prominent New York bank, went on for close to 10 years. The culprit escaped detection so long because he had a $30,000-a- month gambling habit and was losing his illegal income as fast as he got it. He was finally caught when his bookie was arrested as part of a police 'sting' operation, and his name was found on the books as one of the largest customers.

Arms-Length

A fellow I worked with once told me a horror story that happened when he was working as an operator at MIT.

The system they were using had recently been converted to using a new type of coated fiberglass disk, to replace the old, heavy metal-platter kind. No problem there. Well, the system they had this "Emergency Stop" plug on it that you would pull when an emergency occurred (they assumed it was for, say, a flood in the machine room). One late evening, a couple of the operators were sitting around being bored, and decided to see what would happen when they pulled "Emergency Stop". Immediately after pulling it, they heard a strange sound in the disk cabinet. Looking over, they saw an arm emerge from the side of the cabinet, on either side of a platter, and CLAMP down on the platter. Apparently, this wasn't made for use with fiberglass platters.

They were picking splinters out of the walls for days.

Bathroom Humor

This story did not happen to me, and I disremember where I heard it, so it may

not be true, but it's interesting nonetheless, so...

There was a computer system that was experiencing intermittent power failures that were proving impossible to track down. Every means of recording device and electrical filter was used, but to no avail. The power failures always seemed to happen soon after lunch time, but for no apparent reason. After months of agonizing work, the technician finally figured it out:

The room on the other side of the wall from the computer room was the men's bathroom. The grounding for the computer room circuits went to the water pipes that serviced one of the toilets. The building was rather old, and the toilets were in some need of repair. It seems that when one sat on the toilet seat, the weight of the sittee would cause the whole construction to lean forward a bit - not much, but enough to cause the marginally attached grounding wires to separate from the water pipes as the pipes bent along with the toilet - voila - the computer re-boots.

Living On the Edge

Pat Hume, one of the very senior profs in CS at U of T, once told the story of how he broke the FERUT. FERUT was FERranti U of T, one of the first computers in Canada -- a great vacuum-tube monster. It had something like a ten-step procedure for powerdown. From time to time this machine got modified. One day Hume was the last user of the day, and the time came to shut it down. Somebody had added an extra step to the shutdown procedure, presumably as the result of some modification, but either the writing was illegible or the instructions weren't clear. He did the best he could, and smoke started coming out. He hastily finished the powerdown procedure, and called Ferranti. They naturally said "your service contract is nine to five, we'll be there tomorrow morning".

Next morning, the Ferranti technical crew showed up and spent all morning in the machine room. From Hume's description, one got the impression of technicians half-inside the computer briskly hurling parts out. Hume, a rather junior professor at the time, sat in his office all morning waiting for the word on the multi-million-dollar computer he'd broken. People walking past in the hall would look in with pitying expressions.

Towards noon, the Ferranti senior man walked into Hume's office with a box of parts, dumped them on his desk, and said "that's it". Machine restored to operation, junior professor not having to contemplate spending the next fifty years paying back its price... But the really cute part was that the machine's reliability was markedly better after this episode. He'd managed to apply just enough stress to blow out all the marginal parts.

Shoot to Kill

This was told to me by a fellow co-worker who worked for another large main frame manufacture previously.

It seems they delivered a new machine to an overseas site and during installation every time they applied power to one of the memory bays they blew every circuit breaker in the computer room. After resetting the circuits they again applied power to the memory bay with the same results. Since this was a new machine they crated it up and shipped it back and got a replacement.

When they got the damaged memory bay back the started to tear it down to find the cause of the short. Well what they found was a small hole about 3/8 in. in diameter going from top to bottom through some of the memory arrays, which cause a very effective short. After a lot of research they found the cause.

It seems that after the memory had passed test and evaluation and quality assurance the bay was crated and put in the warehouse to await delivery. At some time during its storage an electrician was hired to do some work and since it was a secure building the security guard had do go with him. The electrician at one point said that he had to go back down to his truck to get a drill and the guard asked why and the electrician said he needed to drill a hole right here (pointing to a spot on the floor). The guard then responded by pulling out his sidearm and proceeded to blow a hole at the appropriate spot which happened to be right above where the memory bay was being stored.

The last he knew the guard had been reprimanded and re-assigned to another of the security agency's customers.

Don't Forget

It seems a customer was having trouble with the floppy drive on his 9836 computer. He would write his files to disk every night before he went home to find the next morning the disks were unreadable. This went on for a few weeks so he decided to call HP. After the usual telephone interrogation the CE decided he would have to go on-site.

The CE tried to read the customer's floppy to no avail. Assuming a damaged disk, they tried a new one. To test the drive the CE initialized a new floppy, installed it into the drive, wrote a file only to read it back perfectly. Being a good CE he cleaned the heads on the disk drive, ran the diagnostics and sure enough, everything looked fine. Since both he and the customer were satisfied no problem existed, they decided the disk PM was worth the trip.

The next day the customer called the CE back because his disks were unreadable. The CE went back to the customer site and again, the disks were unreadable. He reviewed the command sequence used to create the files and all was correct. They cleaned the heads again, ran the diagnostics only to discover no problems. A new, initialized floppy worked fine. Just in case the diagnostics had gone awry, the CE, over the next couple of weeks, began to replace parts of the two drives. (Intermittent problems are always the most difficult to expose.) Finally the customer had two brand new drives only to find he could not read his disks.

The CE, becoming very frustrated, asked himself,"If I were a floppy disk why would I become unreadable?" EUREKA!!

It seems that every night, so that he would not forget to bring his files to work the next day, the customer would put them in a convenient place-right next to the door. HE HAD THEM STUCK TO THE FRIDGE WITH A MAGNET!

Of course the CE checked the immediate area of the computer for anything magnetic, but who would have thought...

Hip Pocket

Back when TRS-80s had just come out, my friend bought one. One day we were in a Radio Shack, and one of the guys working there gave a diskette to my friend. My friend folded it up and put it in his pocket....

Forgot to Rinse...

This is a true story (honest!):

A friend was having a problem with a sticky keyboard for his Mac. He was talking to another friend who off-handedly suggested putting into the dishwasher to clean it up. So, my friend did just that! Needless to say, the keyboard didn't function any too well after that.

Greek Tragedy

My dad was an electronics engineer in Greece, for a company that imported various high-tech lab equipment. One of them (A HP spectrophotometer, I think) was controlled by a special built-in computer, running optional proprietary software. Each optional package was copy protected. To enforce that, installing the package could only be done by a tech-rep; after the installation, the disks were automatically erased, and the program was kept in battery-backed RAM.

Anyway, at some point the computer lost all its programs. A call had to be made to Germany, for new disks to be sent as a replacement. My dad could not find the reason for this, and he was really surprised when the client called again, with the same problem next week. Call Germany again, install the disks again, then next week guess what happened: The lab calls again. But there was a definite pattern: The lab always found the system down on a Wednesday morning. Obviously, whatever went wrong happened on Tuesday nights only....

After more than a month of downtime, someone realized that the cleaning lady came to the room every Tuesday night. Someone went to check her and found out that she carried a nine-year old kid with her. The kid had discovered the machine's on-off switch, with a few buttons next to it. When the machine was on, pressing those buttons made cute sounds (audible warnings!) which are supposed to alert you to the fact that holding the button down for a few seconds would completely reset the machine. I guess the kid thought of it as an oversized musical instrument. The mom turned the machine off before she left, erasing error codes etc. No-one knows how much this story cost the lab in downtime.....

Tools of the Trade

When I was an undergrad at UNC, I spent a little time in the graduate department's graphics lab. When one of the grads was showing us the hardware, he pointed out a large rubber mallet sitting beside one of the cabinets. He said that the connection between the chips' prongs and their sockets sometimes became poor, and often when the system acted up the cure was to bang on the cabinet with the mallet to reseat the chips. He also said anytime they had a photo of the lab taken, they made sure the mallet was visible in the picture, and sent a copy to DEC, who apparently knew exactly what the mallet was for.

Backup your Disks

An office secretary was presented with her first PC and given large amounts of instruction on how to operate it. Just before he left, the C.E. asked the secretary, "What must you do every Friday?" to which the secretary replied "Copy my data disks so I don't lose any information." Satisfied, the C.E. departed. One week later there was a phone call; "I can't read my disks!" so the C.E. went back to the secretary. Sure enough the data disks were corrupt and unreadable. "Have you got copies of these disks?" -- "Yes" -- "Can I see them please?"

The secretary opened her desk drawer and removed several sheets of paper. Curiously the C.E. examined them to see each was a perfect photocopy of the data disks....

How does a computer work?

Some computer-illiterate visitors were shown the CDC6400 at the Hebrew University of Jerusalem. One of them asked, how does the machine do all these wonderful things? Their guide joked that it has a small man inside.

While he was speaking, a CDC technician (the late Rachmim Moreno, a small man indeed) had just finished some routine maintenance and stepped out of the machine.

Case-sensitive

Several years back I was working at a HMO and we had a lot of 8080 micros using ADM3A dumb terminals. These terminals were so dumb that all they had were upper case character sets. Eventually, upper management was talked into upgrading them to the ROM's with upper and lower case characters.

Well, one day we received this big three foot square box from the terminal manufacturer. Everyone was puzzled as to what they could be sending us. The person with the order said he had asked for 30 lower case options. The ADM3A terminal has an upper and lower clamshell like case. When the box was opened we found they had sent us 30 lower halves to the terminal case.

Foiling benchmarks

(This is just a rumor, but it's a *neat* rumor....)

It seems (allegedly) that certain Microsoft compilers are smart enough to figure out when they are being benchmarked. Any time the parser sees the "standard" 10,000-prime-numbers algorithm, it dumps that section of code and substitutes a set of hand-tuned, gut-level machine code designed to do that one thing as fast as possible! I don't think it actually just printed them out from a table, but you get the idea....

Also: (this is true)

One has to be careful when trying to benchmark optimizing compilers. These things *are* smart enough to notice that while you're doing all those expensive floating point calculations, you're never actually doing anything with the

answer... so the compiler just figures it all out once, and replaces all the calculations with a simple assignment.

Prime Computer once had a compiler optimize their competitor's benchmark down to a single NOP -- and for several years they gleefully used this "performance" figure in their ads.

Commentary

Another subclass of computer folklore is the occasional barbed comment that one can find when reading through source code. Operating-system programmers seem particularly prone to witty, shamefaced, or other slightly-off-center comments in their code.

Some examples come to mind (some of the details may be incorrect; it's been a long time since I read any of this code):

1) DEC RSX-11M (???) operating system. System fault handler module. If a bus-check fault occurs (indicating possible hardware problems with some device on the bus), the O/S traps to a fault-handler routine that tries to identify the offending hardware and reset it. If, while attempting to recover from a bus-check fault, a second such fault occurs, the system traps again... this time to a routine which simply masks off all processor interrupts and hangs in a tight loop. It's necessary to manually reset the machine to unhang it.

The comment on the loop reads, "The death of God left the angels in a strange position."

2) There are a couple of comments in the output-symbiont (print spooler) code in the old Xerox CP-V operating system. At the top of a long block of convoluted and otherwise undocumented code, there appears a taunting:

"See if you can figure out what I'm doing here."

Somewhat further on, there's a really dubious code-construct (I don't recall just what was being done), adorned with the comment:

"I'm ashamed of this"

3) In the synchronous-terminal (BISYNC) module in the CP-6 operating system's communications software, there's a routine that constructs synchronous data blocks (the ones that start out with the characters "syn, syn, dle", and so forth). The code comment reads

"With a SYNC SYNC here... and a SYNC SYNC there..."

The module is labeled "EIE_IO".

4) A related module, which was responsible for driving the Unit Record Peripheral printer, was labeled "Y@URP".

Time Gentlemen!

Rumor has it that when they closed down the 7094 at MIT in 1973, they found a low-priority job that had been submitted in 1967 and had not yet been run.

Insert next Floppy

I once worked at a company that released a version of UNIX on a series of seven floppies for installation on micros. These micros tended to be sold into doctor's and lawyer's offices where there were never any computer literate folk (and the vendors were always scarce when the end users needed them). Hence we had many amusing phone calls on our 800 line placed by secretaries trying to load UNIX.

One afternoon the following awaited us on our return to lunch:

"I'm following your instructions exactly, and I am still having a problem. I have placed floppies 1 through 6 into the floppy drive, but I can't stuff floppy 7 in no matter how hard I try!"

Our directions said "Insert next floppy". We forgot to say "Remove floppy and insert the next".

We spent the rest of the afternoon seeing how many floppies we could stuff into a floppy drive.

Boys will be boys...

A computer repairman was one day called to a grade school to repair their no longer working computer. When he opened up the processor, he found a thick coating of white dust covering every component within, i.e. backplane, mother board and all other PC boards, housing walls, etc. He had never seen any coating like this in any other computer. The repair of the processor involved simply blowing out the dust.

A few days later he was on another service call within the school for another computer. Walking by the room that contained the unit he had previously fixed, he decided to peek into the room to see how it was doing. What he saw explained the white dust. He saw several boys beating the chalk board erasers next to the fan in the unit, and watching the unit suck the dust inside.

Money Back Guarantee

Then there was the customer who complained because the new software release wouldn't print. This customer just *knew* he'd caught the software company in a bug and he was demanding his money back. My wife stepped through the whole process, set up a duplicate system on her end of the phone, and spent a fair amount of time duplicating his situation. At last she determined that the only possible failure was that his printer wasn't on line.

"I've managed to duplicate your error message," she finally told him after about three days of this.

"Aha! It *is* a bug, and you'll finally admit it! Are you going to refund my money?"

"Well, we'll see," she said. "First, look on your printer and see if the little green light marked 'on line' is lit."

"No, it isn't. What does it mean if it's not on line?"

"Well, it's like the lights are on but nobody's home..."

He never asked for his money back again.

Computer Welding

A first-hand story: this one actually happened to me. When I was a student at

the University of Texas, I was employed at a computer lab programming one of the early generation desktop computers. The machine was an 8080 (later Z80) CP/M machine with an S-100 bus in an IMSIA (sp?) cabinet. The IMSIA cabinet was about the size of a modern IBM-PC but about twice as high. The chassis was aluminum with a steel cover. The power cord for the system entered the cabinet through the rear and was connected directly to a terminal strip (two parallel rows of screws in a heavy piece of bakelite). The terminal strip was mounted on the backplane of the cabinet which was a sheet of aluminum about 1/8" thick.

Well one day I was merrily typing away on a terminal when an hair-raising event occurred. A jet of fire and sparks spewed out of the rear of the computer cabinet accompanied by brilliant ultraviolet light. It was as though someone had started up an arc welder inside the computer. The lab filled with ozone and smoke. The welding continued for about a two full seconds before it ceased of its own accord. It took a couple of minutes to get my heart out of my throat and get up the nerve to unplug the machine. When I examined the computer I found a 3/8" hole in the aluminum backplane of the computer which had obviously been torched out. The desk was covered with molten globules of aluminum which hardened into little pills.

The computer lab was in a building filled with engineering labs which contained all kinds of heavy equipment. Apparently one or more large machines had been switched on or off and a hell of a big power spike had come down the line. Evidently one of the screws in the computer's terminal strip was just a little bit too long and the tip of the screw was just a little bit too close to the aluminum backplane of the cabinet which was grounded of course. This closeness allowed the power spike to arc between the tip of the screw and the backplane. The arc continued until the hole it was melting in the backplane grew too large to sustain the arc.

The amazing part of this story was that the computer was completely unharmed save some cosmetic damage. Even the fuses were intact (they were "downstream" from the terminal strip). Furthermore, the building fuse hadn't blown. Basically, after about ten minutes to get my nerve back, I plugged the computer back in, cleaned the aluminum pills off my desk, and went back to work like nothing had happened. Try that with your Taiwan clone! (Later on I trimmed down all the screws in the power strip.)

Famous Bugs!

Famous Bugs courtesy of Dave Curry (ecn.davy@purdue), originally From John Shore (shore@nrl-css).

Some time ago, I sent out a request for documented reports on "famous bugs", promising to summarize the results for all who contributed. This is the promised summary.

I judge the effort as a failure. People encounter bugs and fix bugs and talk about bugs, but they rarely document bugs. Those responding to my request were well meaning and helpful, but I was left feeling a little like my hair was being done by a gossip-laden ex-hacker.

I am, of course, no different. I didn't have documentation for most of the famous bugs I knew about, and I don't have sufficient time, energy, and interest to follow all the leads. I should have known better.

One strong conclusion that I've reached is that many computer system horror stories become known as bugs when in fact they are not -- they're system problems that result from hardware failures, operator mistakes, and the like. Let me mention a few examples. In his book Software Reliability, Glenford Myers mentioned a number of classical software errors. For example, he mentioned that a software error in the onboard computer of the Apollo 8 spacecraft erased part of the computer's memory. I happen to have a copy of a memo by Margaret Hamilton that summarized the conclusions of a detailed study of every Apollo bug (see below), so I looked under Apollo 8. The best I could find was this: "16. Illegal P01. P01 was selected during midcourse, illegally by the astronaut. This action destroyed W-matrix (several erasables in AGC)." The software did erase the memory, but it did so because the astronaut did something illegal, and not because the programmer goofed. This example is characteristic of the Apollo errors (see below), most of which show the need for better exception handling as part of the software specification. But weak specifications are not the same thing as bugs.

Here's another example, also from Apollo. It starts with a note to me from Kaeler.pa at Xerox (via Butler Lampson):

I heard about the MIT summer student at NASA whose Apollo program filled up memory (with logging information) and flashed the red abort light a few seconds before the first moon landing. The student was in the control room, and after a little thought, said, "Go ahead, I know what it is, I will take responsibility". Luckily, he was right. He was awarded all sorts of medals for being willing to take the responsibility.

You should get this story from the horse's mouth before distributing it. I heard it from Neil Jacobstein (212-454-0212, in new york). He heard it from his advisor at the Johnson Space Center in Houston a few years ago. It might be interesting to trace this back to someone who really knows about it.

I called Jacobstein, and after some discussion he decided that the "bug" was probably the famous "1201 descent alarm" that I mention below. Again, this was caused by an astronaut error (a radar was turned on when it should have been off).

Lot's of people mentioned to me various NORAD "bugs" that caused alerts. I got a copy of a Senate Armed Services Committee Report of 9 October, 1980, "Recent False Alerts From the Nation's Missile Attack Warning System." It deals primarily with the June 1980 alerts, but it contains the following summary:

Oct. 3, 1979 -- An SLBM radar (Mt. Hebro) picked up a low orbit rocket body that was close to decay and generated a false launch and impact report.

November 9, 1979 -- False indications of a mass raid caused by inadvertent

introduction of simulated data into the NORAD Computer System.

March 15, 1980 -- Four SS-N-6 SLBMs were launched from the Kuril Islands as part of Soviet troop training. One of the lauches generated an unusual threat fan.

June 3, 1980 -- False indications caused by a bad chip in a communications processor computer

According to Borning@Washington (who by the way is studying computer problems in missile warning systems), the cause of the Nov. 1979 problem was as follows:

To test the warning system, false attack data was intermixed with data from actual satellite observations, put on tape, and run through the system. On November 9, the test tape of this sort was accidentally left mounted on a secondary backup computer. This machine was left connected to the system in use. When the primary computer failed, a backup computer was activated, which also failed. Then the secondary computer came into play, causing the alert.

All of these missile alerts were caused by real flying objects, hardware failures, or human error. I'm not saying that bugs didn't cause any missile alerts, just that the ones that are reputed to have been caused by bugs in fact were not.

Perhaps computer software -- as opposed to the combination of hardware, software, and people -- is more reliable than folklore has it. I would be interested in hearing your comments on this proposition.

Despite the foregoing problems, the assembly of responses makes interesting reading. In the following, I'll mention a few well-documented bugs and then append various extracts from what I received. Thanks to all who responded. In most cases, I eliminated duplicates. Special thanks to Peter Neumann (SRI), who seems to be keeping better track of these problems than anyone else. Many of these don't qualify as bugs by anyone's definition, but they're interesting stories so I've included some of them anyway.

Space-Shuttle Bug

This may be the most famous of all -- the one that delayed at the last minute the launch of the first space shuttle. The cause was a bug that interfered with the communication between concurrent processes -- an area of programming that is among the least well in hand. John R. Garman wrote about the problem in detail in ACM SIGSOFT Software Engineering News (SEN), vol. 6, No. 5, pp 3-10.

The First Bug

Worth mentioning for the trivia folks, it was a moth that was beaten to death by a relay in the Mark II. It was discovered by the Mark II staff, which included Grace Hopper. (Reports on this are a bit confusing. Many attribute the bug to her; in her own published account she refers to "we". I called and asked her. She said the machine operator actually pulled the moth out, and that it was found by the combined efforts of the staff.) Lots of people mentioned this bug to me; my favorite report attributed the bug to

"some little old lady who works for the Navy. She's the one who came up with Cobol, I think."

In fact, this is one of the better-documented bugs. You can even see its picture in the Annals of the History of Computing (vol. 3, July 1981, page 285). It's ironic that "modern" bugs have practically nothing in common with the first one (an exception being Dijkstra's well known remark about testing).

ARPANET Gridlock

In October 1980 the net was unusable for a period of several hours. It turned out that the routing processes in all the IMPs were consuming practically all resources as the result of processing three inconsistent routing updates. It turned out that the inconsistency arose from dropped bits in a single IMP. Whether you choose to call this a bug or not, clearly it demonstrated a design failure. The details are reported well by Eric Rosen in SEN, January 1981.

APOLLO flight experiences

When Margaret Hamilton was working at the Charles Stark Draper Laboratory in the early 1970s, she documented and analyzed in some detail the various "software anomalies" that occurred during several APOLLO flights. Apparently she did this at the request of Marty Shooman. I don't think that she ever published the results, but some years back she gave us a copy of "Shuttle Management Note #14" (23 October 1972), which summarized her analysis. It makes interesting reading.

One of her strongest conclusions was that 73% of the problems were caused by "real-time human error". Translated roughly into 1983 computer-speak, this means that the APOLLO software wasn't user friendly. (I guess they didn't have icons or something.) Apparently, there was much debate about this during the design, but the software types were told that astronauts have the right stuff or something so there was no need to make the software robust.

One example is quite widely known, as it occurred during the APOLLO 11 landing on the moon. In what was referred to as "1201-1202 Descent Alarms", the software kept restarting as the result of overloading. Turned out the radar switch was in the wrong position and used up 13% more computer time than had been anticipated.

Hamilton states that "pure software errors" were not a problem on APOLLO flights. I guess she means that the software met its specifications, which is quite an accomplishment. But the specifications apparently did not say much about error detection and recovery. Hamilton states that "all potentially catastrophic problems would have been prevented by a better and/or known philosophy of providing error detection and recovery via some mechanism."

Muni Metro Ghosts

The San Francisco Muni Metro under Market Street has been plagued with problems since its inauguration. From a software engineering point of view, the most interesting is the Ghost Train problem, in which the signalling system

insisted that there was a train outside the Embarcadero Station that was blocking a switch. Although in reality there was obviously no such train, operations had to be carried on manually, resulting in increasing delays and finally passengers were advised to stay above ground. This situation lasted for almost two hours during morning rush hour on 23 May 1983, at which point the nonexistent train vanished as mysteriously as it had appeared in the first place. (The usual collection of mechanical problems also has arisen, including brakes locking, sundry coupling problems, and sticky switches. There is also one particular switch that chronically causes troubles, and it unfortunately is a weakest-link single point of failure that prevents crossover at the end of the line.)

Jet Engine Failure Tied to Computer: It's Too Efficient

The efficiency of a computer aboard a United Airlines 767 jet may have led to the failure of both of the plane's engines, forcing the aircraft into a four-minute powerless glide on its approach to Denver, federal officials said Tuesday.... [The National Transportation Safety Board's] investigation has disclosed that the overheating problem stemmed from the accumulation of ice on the engines.... [I]t is believed that the ice built up because the onboard computer had the aircraft operating so efficiently during the gradual descent that the engines were not running fast enough to keep the ice from forming.... The incident raised questions among aviation safety experts about the operation of the highly computerized new generation of jetliners that are extremely fuel-efficient because of their design and computerized systems. "The question is at what point should you override the computer," one source close to the inquiry said.... [T]he engines normally would have been running fast enough to keep the ice from forming. In the case of Flight 310, investigators believe, the computer slowed the engine to a rate that conserved the maximum amount of fuel but was too slow to prevent icing. A key question, one source said, is whether the computer-controlled descent might have kept the flight crew from recognizing the potential icing problem. Airline pilots for some time have complained that the highly computerized cockpits on the new jets -- such as the 767, Boeing's 757 and the Airbus 310 -- may make pilots less attentive....

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Submissions should be about the TI Community in particular, computers in general, or of sufficient general interest. The preferred media is computer file, preferably in ASCII (Text) or Microsoft-Word compatible format, submitted on MacIntosh or IBM-compatible floppy disk or via Electronic Mail to the Editor. Handwritten submissions are acceptable but please remember that they have to be retyped. Other submissions, such as typed, printed or photocopied are welcome but must of reproducible quality.

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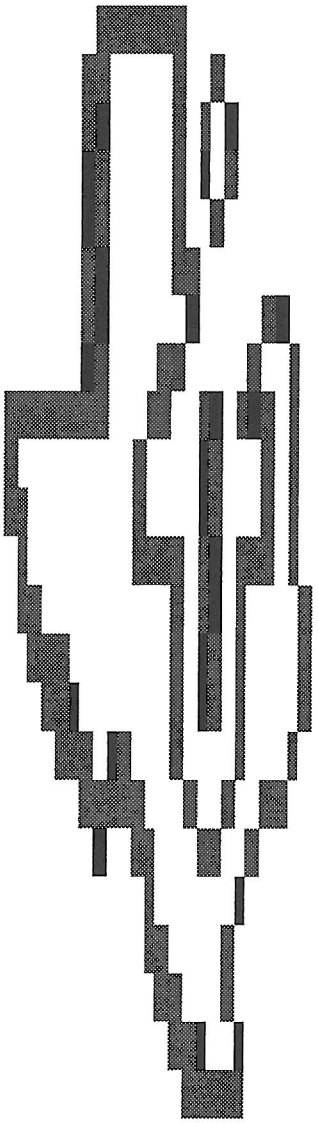
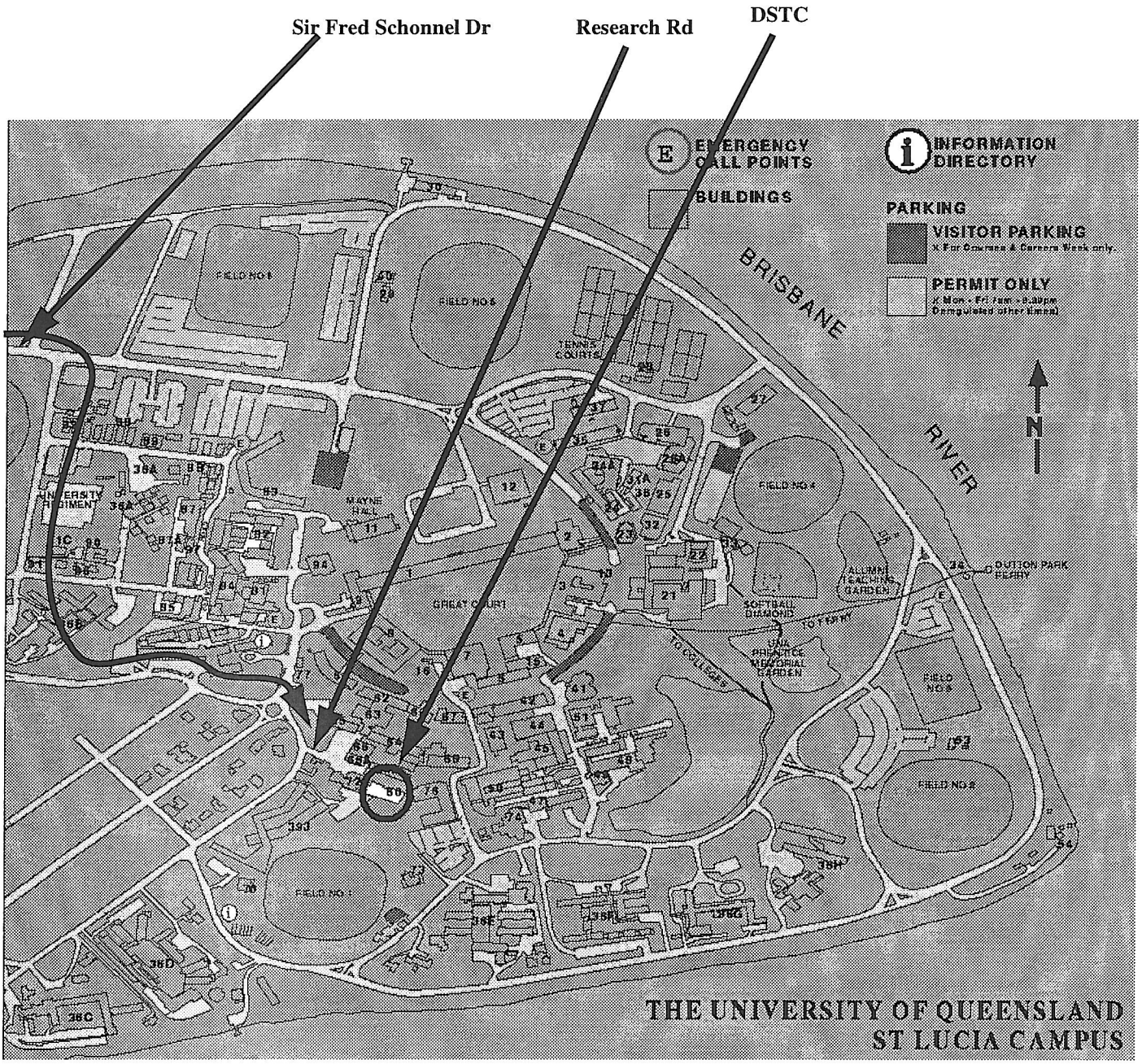
Dennis Remmer - TIBUG Editor
PO Box 30, Toowong QLD 4066
(Email: dennis@dstc.edu.au)





TI Brisbane User Group
18 Zammit St,
Deception Bay QLD 4508
Australia