PROCESSOR TECHNOLOGY
ACCESS.
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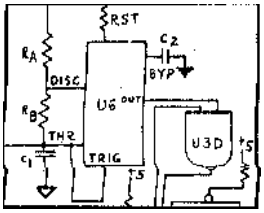

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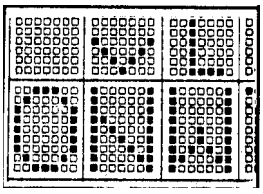

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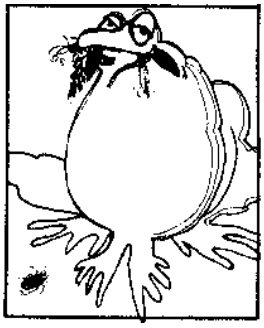

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Bug Squad..... page 9.

Here we are, now in the third issue of ACCESS, and as Aram and I have told you in the past, we openly solicit your thoughts, opinions, input and output on many fronts. Critiques are always welcome - some good ideas have been coming in the mail, and we'll be happy to see others on how we can improve our service.

Notes on availability and delivery. Since the last ACCESS, we've pretty well completed deliveries on BASIC/5 and CUTER software packages. GAMEPAC 1, MATHPACK, and TREK 80 on cassette are next in line; deliveries on them will begin in July, and much of our other software will be forthcoming later this summer.

Deliveries of Helios II, our dual-drive floppy disc system, are targeted to begin in mid-to-late July. We'll ship the earliest orders first, but due to the large number of back orders on file, it will be some time before we're totally caught up on deliveries.

We've already begun deliveries of our 16KRA dynamic memory board although slowly. If you have one on order, you can be assured of receiving it soon.

Specifications sheets for the new GPM (General Purpose Memory) Module will be available in July. You can get them from our Customer Service Department or your local PTC dealer.

Sol Users' Group. If you currently own a Sol computer, you may be interested in the Sol Users' Group. The Group was created to provide a dialogue among Sol owners, by sharing applications, software, and other information for mutual member benefit. The Sol Users' Group (not affiliated officially with Processor Technology) can be contacted through Bill Buras, 4190 Maybell Way, Palo Alto, CA 94306. (No phone calls, please!)

We need you! In the interest of providing continued informational support, especially in connection with interfacing Processor Technology hardware with other manufacturers' software, we'd like to hear your ideas, see your programs, whatever you've got. We will be happy to publish useful information that you might contribute. Mom will finally see your name in print!

PTC dealers. New ones are continually added to our ever-growing list. They're all authorized to both sell and service Processor Technology products, and to act as distributors for Processor/ Software Technology software. To keep you up to date, the current dealer roster is listed in this issue of ACCESS. Of course, your dealer's always interested in hearing from PTC customers, so why not pay him a visit?

ACCESS subscriptions. Let us know if you've subscribed and are having trouble receiving your copy regularly. Is your mailing address correct as printed on the label? Have any suggestions for improvement?

ACCESS Issue No. 1 is now out of print; no back copies are available.

Finally, we do appreciate all the support and feedback many ACCESS readers have provided. The comments, positive, negative or otherwise, indicate your interest in PTC and help us to give you what you want. I think those of you who have contacted us on the one-to-one communication basis (by phone or letter) have found responsive follow-through on our end. Further improvement can come from your suggestions, so let us know what you're thinking. Again, the number is (415) 652-8080 for teletroubleshooting (between 9:30 am and noon or 1:30 to 4 pm Pacific Time); for technically oriented software questions, call (415) 349-8080.

See you next issue.

Ralph I. Palsson

Subscription Information

ACCESS is published every six weeks. If you like what you see, we hope you'll send us $4.00 for a year's subscription so we can keep the info coming. Write to us at Processor Technology, 6200 Hollis Street, Emeryville, CA 94608.

50 Hz Operation of the Sol-PC

The demand for Sols is international, and a great many countries have power systems which operate at 50 Hz (cycles per second). Sol transformers are designed to operate at this frequency without derating, and a 220, 235 or 250 volt power supply is available from the factory.

In most countries where the line frequency is 50 Hz, the television display standards have been adapted so that the vertical sweep frequency is also 50 Hz (this reduces flicker). The resulting display contains 625 scan lines per frame, or 312 ½ lines per frame.

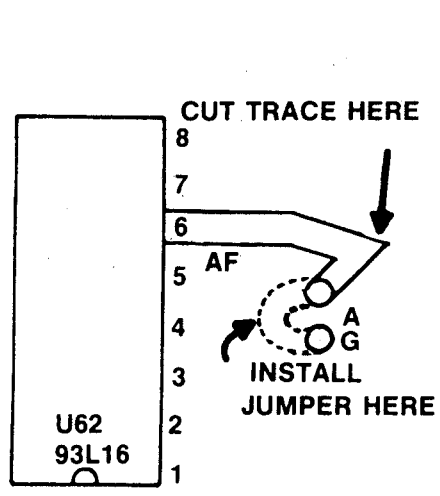
The frequency of the synchronization pulses produced by the Sol can be changed to this new standard quite easily on the E revision boards, and with a little more difficulty on the D revision boards. In both cases, the change involves disconnecting pin 5 of the U62 from pin 6 and reconnecting it to pin 4 of U62. Jumper pads have been provided for this purpose on the E revision, so that the change is a simple, one-cut, one-jumper modification performed on the top side of the boards. The angled trace leading from pad AF is cut and a jumper is installed between pad AF and AG.

The D revision boards requires two trace cuts. One is made on the top side of the board between U 62 and U 61 (the trace leading from pin 5 of U 61 is cut). The remaining trace cut is made on the bottom (solder) side of the board. One is between pins 4 and 5 of U 62. Two jumpers must now be installed, both on the solder side of the board. One is between pins 4 and 5 of U 62. The other connects pin 6 of U 62 with pin 5 of U 61.

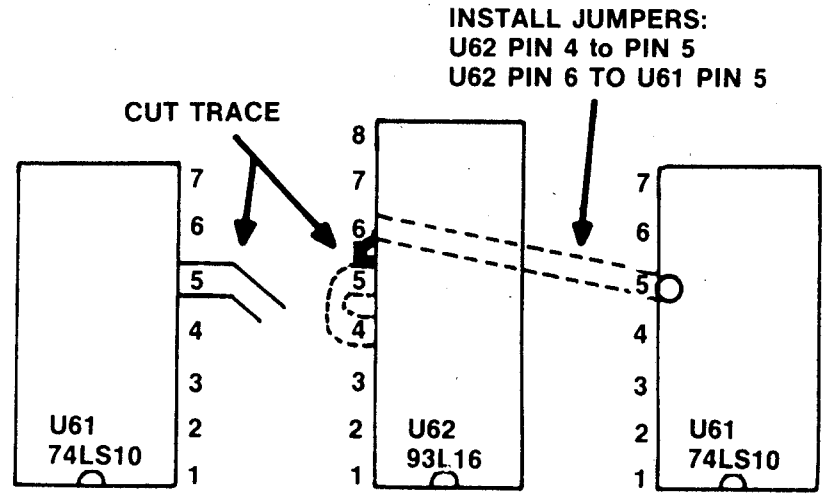
The VDM-1 may also be modified to allow 625-line operation. On all revisions of the board, cut the trace connecting pins 5 and 6 of IC8. Using a wire jumper, connect pin 5 of IC 8 to pin 4 of IC 8. This is all that is required to modify the VDM-1.

These modifications will present a display of 16 visible text lines which appear somewhat more compact vertically than the 60 Hz display. This is because the time from the bottom of the display to the top has been doubled from the equivalent of four text lines to eight text lines.

Lee Felsenstein



REVISION E PC BOARDS
FIG. 1



REVISION D PC BOARDS
FIG. 2

Your ALS-8 Applications Notes are on the Way!

After a seemingly interminable delay, the first batch of Application notes are really and truly in the mail to all you ALS-8 Users' Group members. Once the material is in your hot little hands (in a very fancy binder, no less), you'll be better able to appreciate the power and versatility of your ALS-8, and you should have some very happy hours of computing.

If you haven't received your notes by the time you read this, please drop us a note right now, so we can track down whatever clerical or shipping errors crossed you up.

Our sincerest apologies for the delay.

Will Vern even finish telling us the "real story" behind the VDM-1? Yes, indeed! The continuing saga of the Flickerless VDM-1 has been temporarily interrupted. It'll be back with the next issue. Stay tuned.

Basic Theorem of Programming: The program is absolutely right, therefore the computer must be wrong.

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PROCESSOR TECHNOLOGY

ACCESS

Editor: Aram Attarian II

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A Letter From the Editor

"Give me a cigarette, because I'm so hungry that I got nobody to sleep with tonight."

Old Russian Proverb

Well, who would have thought it. There I was at 8 o'clock Saturday morning, slightly hungover, arriving at the Civic Center for the First West Coast Computer Faire - and there were already people lined up clear around the corner. (Unless I was still seeing double from the Processor Technology Dealer Banquet, which featured Peking Duck, a few Tsingtsao beers, Sweet and Sour Chicken, a few more Tsingtsao's, Manchurian Beef, a few etc.)

By the time the last plug was pulled Sunday night, more than 12,000 people had paid $6 to $9 a head to get a look at the latest marvels from Processor, IMSAI, Polymorphic, Apple, Byte Shops, and well over 100 other exhibitors. There were lots of neat things: programs for kids, color graphics, music (including the premiere of the Software Technology Music System – but you can read about that in our literature. No advertising here). And seminars on everything from tutorials for the complete novice to bus and interface standards. The building was basically hot, and it was crowded, and everybody was pretty high.

All in all, the impression was that it was a very good event. The people who planned the Faire did a good job, and we'll probably draw even bigger crowds next year, what with people like Radio Shack and Heathkit getting into the act. The price probably put it out of range for a lot of people who might have come this time, but given the rate of growth in the home computer field …

Aram Attarian II

P.S. Now that we've got ACCESS going, and we're starting to get some feedback, we're re-evaluating our procedures. Issue No. 4 will be a little late, because we're going to make some changes to make it a better quality production, in line with some of the suggestions you've made. So long 'til then.

Attention, CONSOL Users

All Processor Technology software has recently been modified in a very important way that encourages standardization. If you've been looking forward to having some Sol software for your CONSOL Proms, you'll have to let us re-program for you. There's no charge. Just mail your CONSOL Proms, suitably packaged, to Processor Technology; we'll take care of the rest. Turn-around time is about 2 weeks, dependent on the vagaries of the U.S. Postal Service, natch.

If you're planning to upgrade to SOLOS anyway, don't worry about it.

Newett Awl's Screen Sort

This little program does what's called a bubble sort: each byte in the sorted area is compared to the next higher byte. If the first byte has a higher value, the two are swapped in the memory. Then the same thing is done for the next two, and so on through the entire sort area. After the first pass, the last byte in the sort area will be the highest value, so when you set up to pass over the sort area again, you can shorten it by one byte at the high end. And if you keep track of what swaps take place during the sort, you can quit as soon as no swapping occurs.

I have located this routine in low memory, so you don't need much to play with it. I used the VDM screen for the sort area, so you can see exactly what's going on – if your eyes can be synched to the screen! Try putting a whole mess of garbage on the screen, then executing the program at location 0000. Your screen may never be the same!

Those of you who are adventuresome and mischievious might try modifying line 0047 to read 0047 SIZE DW, 2047 ARBITRARY LENGTH and line 0048 to read 0048 TOP EQU, 0200H USE TV DAZZLER AREA. Then if you have Lichen Wang's Kaleidoscope, assemble this program so that it is above 0900 (HEX), get Kaleidoscope running, then stop and run the sort program.

I've purposely coded the program so that it will sort any length field by manipulating the SIZE and TOP. A little practice and imagination should do the rest. I sorted the train program (naturally), but it broke my heart to see the little engine torn apart so badly and so quickly.

A couple of program notes: at line 40, the zero flag is being set or reset by the ADD B in line 37. As we all know but often forget, the DCX H at line 39 has no effect on the accumulator flags. At line 25, I just arbitrarily stuff register B with the last byte looked at.

This is an interesting use for the flag. At line 37, all I need to know is whether or not swapping occured. If the test at line 20 tells me that a byte in register A has a higher value than the byte in memory, I know for sure that it isn't zero and can safely use it for a simple flag.

Reprint Permission of Newett Awl

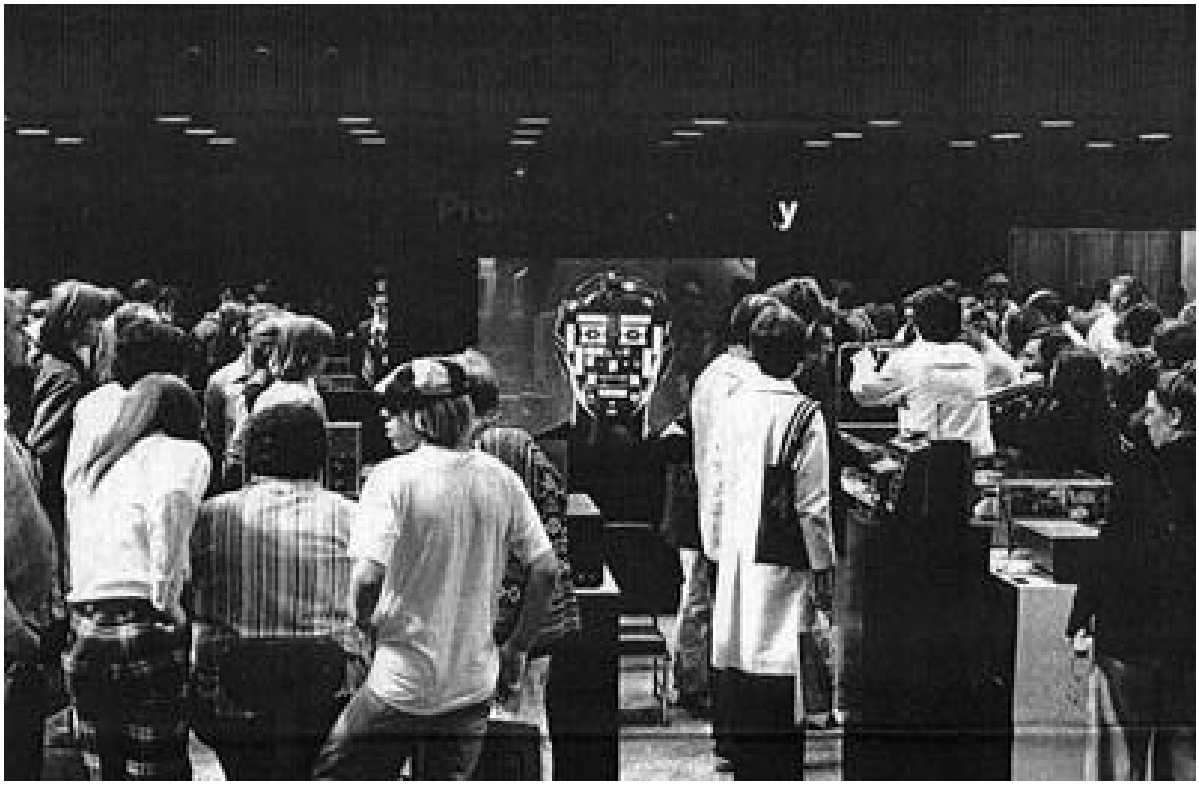
```
                    0001 ********************************************
                    0002 *                                          *
                    0003 *  NEWETT AWL'S SCREEN SORT FOR THE SIGHT  *
                    0004 *  OF YOUR LIFE!                           *
                    0005 *                                          *
                    0006 *                                          *
                    0007 ********************************************
                    0008
0000 2A 3F 00       0009 SORT   LHLD   SIZE    GET SIZE OF SORT AREA
0003 7D             0010        MOV    A,L     SEE IF SIZE IS
0004 B4             0011        ORA    H       ..ZERO
0005 CA 3A 00       0012        JZ     DONE    IF YES, LEAVE
0008 22 3D 00       0013 CON1   SHLD   COMPCT  SET UP COMPARISON POINT
000B 22 3B 00       0014        SHLD   ITMCNT  RESER ITEM COUNT
000E 01 00 00       0015        LXI    B,0     CLEAR B/C
0011 21 00 CC       0016        LXI    H,TOP   POINT TO TOP OF AREA
0014 11 01 CC       0017        LXI    D,TOP+1  POINT TO TOP+1 OF AREA
0017 1A             0018 CON2   LDAX   D       GET ITEM B FROM AREA
0018 BE             0019        CMP    M       COMPARE TO ITEM A
0019 D2 21 00       0020        JNC    CON3    GO CON3 IF A<B
001C 4E             0021        MOV    C,M     GET A TO REG. C
001D 77             0022        MOV    M,A     PUT B WHERE A WAS
001E 79             0023        MOV    A,C     PUT A WHERE B WAS
001F 12             0024        STAX   D       PUT A WHERE B WAS
0020 47             0025        MOV    B,A     USE BYTE FOR SWAP FLAG
0021 23             0026 CON3   INX    H       INCREMENT A POINTER
0022 13             0027        INX    D       INCREMENT B POINTER
0023 E5             0028        PUSH   H       KEEP MEMORY REFERENCE
0024 2A 3B 00       0029        LHLD   ITMCNT  RESTORE ITEM COUNT
0027 2B             0030        DCX    H       DECREMENT IT
0028 22 3B 00       0031        SHLD   ITMCNT  RESTORE ITEM COUNT
002B 7D             0032        MOV    A,L     TEST IF
002C B4             0033        ORA    H       ..ITEM COUNT IS ZERO
```

```
002D El          0034         POP    H       GET MEMORY REF. BACK
002E C2 17 00    0035         JNZ    CON2    N0, GO DO MORE
0031 AF          0036         XRA    A       CLEAR FLAGS
0032 80          0037         ADD    B       PCT SWAP FLAG
0033 2A 3D 00    0038         LHLD   COMPCT  GET NEW ITEM COUNT
0036 2B          0039         DCX    H       REDUCE COMPARE COUNT BY 1
0037 C2 08 00    0040         JNZ    CON1    GO CON I IF IT DID SWAP
003A C9          0041 DONE    RET
                 0042 *
                 0043 * WORKING STORAGE AREA
                 0044 *
003B 00 00       0045 ITMCNT DW     0      INNERITEM COUNT
003D 00 00       0046 COMPCT DW     0      NO. OF ITEMS IN THE LIST
003F FF 03       0047 SIZE   DW     1023   ARBITRARY LENGTH
CC00             0048 TOP    EQU    0CC00H  USE SCREEN FOR AREA OF 1
                 0049 *


                 0004 * END OF PROGRAM

COMPC   003D     0013 0038
CON1    0008     0040
CON2    0017     0035
CON3    0021     0020
DONE    003A     0012
ITMCN   003B     0014 0029 0031
SIZE    003E     0009
SORT    0000
TOP     CC00     0016 0017
```

Eggleston's Extension Principle: Programming errors which would normally require one day to find will tape five days when the programmer is in a hurry.



Top Photo, Processor Technology's booth at the First West Coast Computer Faire, with some spacy stuff up on the big display. Yep, it really was that crowded all weekend.

Left, Kids engrossed in a game of Target. Maybe you're right about CHOO-CHOO, Joe - still, I know some big kids that got off on it. (See Reader Feedback).

Bottom left, Kids of all ages got turned on by Sol.

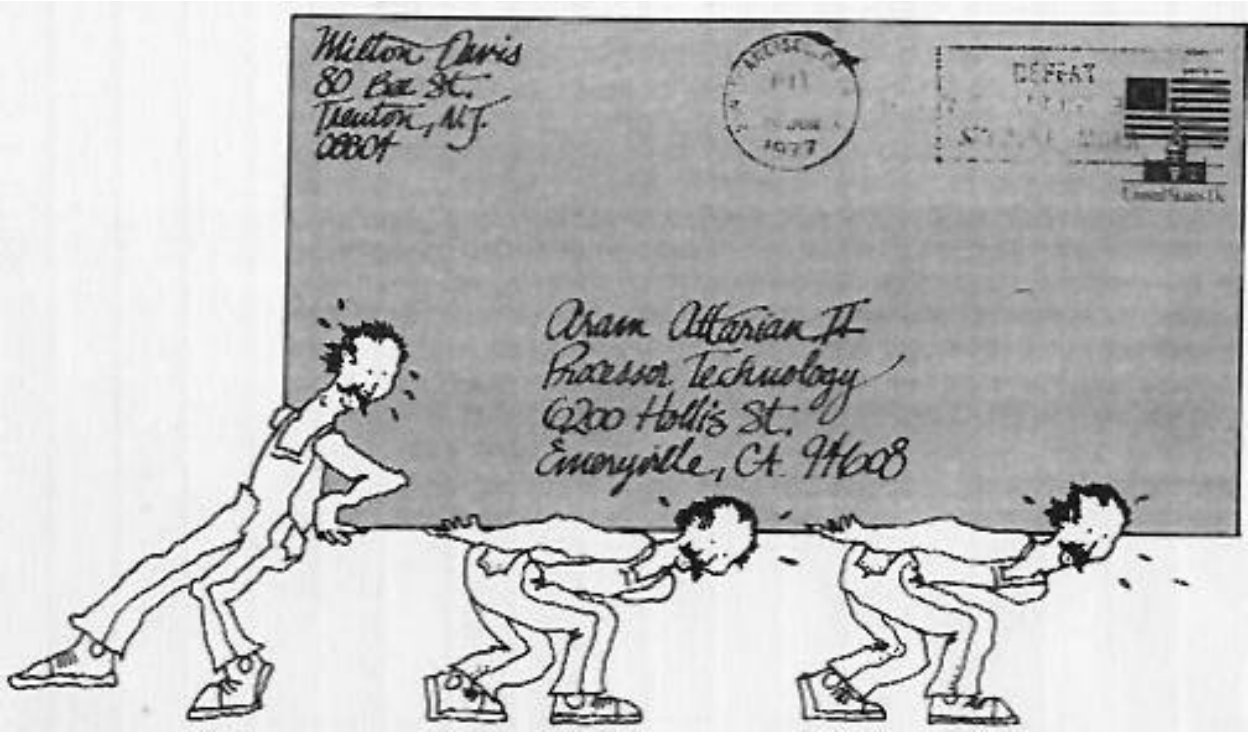
Bottom right, The Processor booth. No, that's not me in the background. Bet he plays a mean game of Target, though.

Left, Bob Marsh of Processor Technology demonstrates Sol. "You mean you can do that with a computer?"

Below left, We make the big time -- Glenn Tenney of Software Technology details the STC music system in an interview by NBC at the Faire.

Bottom right, And here I am in my red suspenders, as promised.

All photos by Rick Meyer



Reader Feedback

We don't have space to print all the letters we're receiving, but we'll try to get as many in as we can. We reserve the right to edit for space and content so we can include as wide a cross-section of opinion as possible. We'll reply to all of you personally if you include a self-addressed stamped envelope.

Aram Attarian II

Sir:

As evidenced by the many excerpts in ACCESS, you obviously enjoy Conrad Schneiker's Abridged Collection of Interdisciplinary Laws. Although the Laws are not copyrighted, don't you think it would only be fair to credit the source?

Gregg Townsend Sunnyvale, CA

Dear Gregg:

My source was Logical Laws, Accurate Axioms, Profound Principles, Trusty Truisms, Homey Homilies, Colorful Corollaries, Quotable Quotes, and Rambunctious Ruminations. This mouthful is the title of a pamphlet "compiled by the computer company that's out to make life a little simpler." Happy to credit both sources.

AA II

Dear Aram:

Enclosed check for $4 for a year of ACCESS. Now my observations.

1. You are doing it wrong. Should be notebook-size sheets - how does one file for reference?

2. Last year I filled out a card for which I was supposed to receive something over the year, supposedly edited by Gordon French. What happened?

3. In order for ACCESS to be meaningful, it should be understandable. The biggest fault I find with all publications is that someone just plunks down a program, period. There is a crying need to explain, in detail, at least a few times, the meaning of all the listings as they relate to hardware. Nobody to date has done this. Why do editors assume that we hobbyists know all this?

Joseph P. Chalala

Willow Street, PA

Dear Joe:

Thanks for the sub. In answer to your points:

1. Our format will be changing in the near future, and we'll take your suggestion into consideration. Good point.

2. See the reference to the ALS-8 User's Group in this issue (also in last issue).

3. Most listings include comments that are supposed to explain the software, but you're right, more text is needed for a really good understanding.

AA II

Dear Gentlepersons:

As you hopefully know by now, Newett Awl's choo choo train has at least one error in it. (Vol 1, No. 1 of Access). At address 00D0 the listing (page 11) shows a "A8", while the dump format on page 12 shows a "AB". Now, please, I beg of you, tell me what kind of an assembler you have that generates incorrect code… (by the way, an "AB" wipes out most of memory, I trust the "A8" to be correct). But even so, we have entered and checked the code three times, and it certainly does't seem to work on my Sol… the front part of a steam engine does appear, and it vibrates back and forth for about 5 seconds, and then as it apparently attempts to do something else, it crashes, writing "E9" 8S at 25, 26, A5, A6, 125, 126. Perhaps it could be a hardware problem, you will have a better idea about that than I.

2) Would it be possible to provide me with a copy of SOLOS and SOLED (a listing would suffice), as I would like to find out the correct way to function the tape drives among other things. I do appreciate your relative thoroughness in design and implementation of the Sol, you did a rather professional job.

I am managing the West Lafayette Data Domain Store and I put together a Sol-PC. In the mean time, we have lost the envelope and registration etc. Would you please either send another set of reg. cards & whatever or simply send what I was supposed to ask you to send (other chapters of the manual, personality module exchange, whatever, I've forgotten even what it was…)

J. Gregory Madden
Mgr. Data Domain of W. Lafayette
Pres. JGM Development Labs

Dear Greg:

1. Choo choo was written for VDM-1, and we'll be publishing Sol patches and updates in the next ACCESS.

2. See this issue for SOLOS.

3. Customer Service has taken care of your problem by now.

AA II

Dear Aram:

In the "Bug Squad," ACCESS 2, Fix No. 5, you show a cut on trace to pin 26 of J11. The descriptive matter says pin 73. Which is correct and are the other fixes as accurate?

Dr. George L. Haller
Naples, Florida

Dear George:

See "Bug Squad" in this issue. The other fixes are OK.

AA II

Mr. Editor:

As of this date your world renowned (sic) service mgr. is still promising heaven on earth to us (I will admit) suckers! I suggest you change "protecth" to "mana-na." That's Spain for tomorrow, capito. (sic, sic, and sic).

Anyway, in my opinion you guys are full of crabs, who in his right mind would establish a computer company in a "rundown, skid row, full of yech! God forsaken place like Emeryville." Obviously, this company did, even the newspaper it publishes and personnel are affected by the locale – it's full of bugs. Care to publish this letter go ahead.

Your ads are pretty and very convincing, look who it caught with $1000 plus to buy your A # $!!?? Sol-20 board that won't work ME. (and a few more sics) "Whoever heard of a Sol not working." Look for mine stupid!

If I had to do it all over again will buy a Heathkit color TV set kit not a "goddam" Protech Sol-20. Count me out as your ardent supporter of Sol – it's for the birds.

Hal Martino II

Dear Hal:

Have you hugged your kids today? Love,

AA II

Dear Ralph and Aram:

Here are some general and specific comments on ACCESS.

1. The software listings are good and useful, but they take a lot of room. Might it not be better to bind up the long ones separately and sell like No. 1 and No. 2? Actually, I do hope you will provide listings of SOLED, 8K BASIC & FOCAL, ALS-8, TREK 80, etc. I am somewhat of a software listing junky -that's why I'm a PTC customer (i.e., free software).

1A. Choo Choo Train is a bit immature, games like Life and Target are more suitable even for kids. I have a 9-year-old playing Trek.

2. I am a little concerned that you are using ACCESS to distribute errata for Sol. I think you should also compile and send out loose-leaf sheets for the instruction book – or even charge for an updated instruction set. Sol systems are likely to be around for a long time and the book is likely to remain with the system, but a stack of old ACCESS's is likely to be lost and with them the errata.

2a. Should not Errata No. 3 (Ground Noise Fix) concern itself with IC #107 and not IC #33?

2b. Any reason for not revising the 8 leads to J2 on the card (cut and jump) if I want? (i.e., is it more involved?)

3. "Waiting for BASIC-5." I do see both sides of the issue. I do expect a properly designed and debugged product, with good documentation, for my money and I will wait a reasonable time for it. And I have seen how several publications have been very critical of certain minor problems – which can really hurt a manufacturer.

But then again, it's a new product and it is intended for the sophisticated hobbyist who is capable of understanding and making fixes to PC cards and software. Sol and SW #2 are good examples. Still I cannot believe that things take as long as they do, or have in the past. Perhaps the answer is a system where you have two levels of customers – those who want preliminary releases and are willing to pay for fixes or updates, and those who want a final, warranted product.

Joseph Gaffney Lyndhurst, NJ

Dear Joe:

1. See the letter from Joe Chalala.

2. This will be the case in the future, but you have to consider the amount of bookkeeping necessary for that type of project. We'll be using Helios II to handle it, but they're hard to get right now.

2a. No.

2b. No.

Thanks for a very thoughtful letter. Readers like you will help us make ACCESS a lot more responsive.

AA II

A Run/ Stop Circuit for User Control of Sol's X-Ready Line

The ability to stop and examine the various state of a system as the program is executing allows the user to detect errors embedded within the system. To this end, I have written a series of articles dealing with the implementation of "Front Panel" features on an S-100 system. These should assist both hobbyist and professional with standard system maintenance.

This first installment deals with stopping or slowing the instruction execution time from tens of microsecond to a user defined time. As most S-100 bus processors follow a set of protocol, the heart of any front panel is the run/stop circuit. By holding down the ready line, the user can cause the processor to idle as long as that line is down. Thus, the toggling of the ready line will allow the slowing or stopping of the processor from machine cycle to machine cycle.

With the R/S switch, you can control the X-READY line by setting and resetting the R/S (Run/Stop) flipflop U1A. With the R/S switch in the run position, the R/S flipflop is reset on $\phi 2$, forcing X-READY high. In the stop position, the switch NAND's together the stop value ($\phi 2$, PSYNC) and the MI/FETCH cycle (D05). A new fetch will then set one input high to the X-READY NAND gate.

When the R/S flipflop is set in the stop position, the state of the X-READY line is determined by the state of the single step S/S (single step) flipflop. If it's set, the !Q output applied to the other input of the X-READY NAND gate U3C will be low. And the X-READY line will be high, thus allowing the processor to run. The S/S flipflop will be reset at the next PSYNC pulse, stopping the processor.

The inverters U2D and U2E are wired as a R/S flipflop to debounce the single step switch. SSS U6 is a multi-vibrator used to set the S/S flipflop at a variable rate. The vibrator will be inhibited by U2C until the multiple step switch is depressed; its rate is determined by the values of RA, RB, and C1:

Charge time — .685 (RA + RB) C1

Discharge time — .685 (RB) C1

Period — .685 (RA + 2R2) C1

Frequency — 1.46 (RA + 2RB) C1

Parts list:

U1 74109 For approximately 10 steps per second

U2 7406 RA = 3.3 meg

U3 7400 RB = 3.3 meg

U4 7420 C1 = .01

U5 555 C2 = .001 uf (C2 is a bypass capacitor of approximately .001 uf)

U6 8T97 The pull-up resistor values are 2.2K

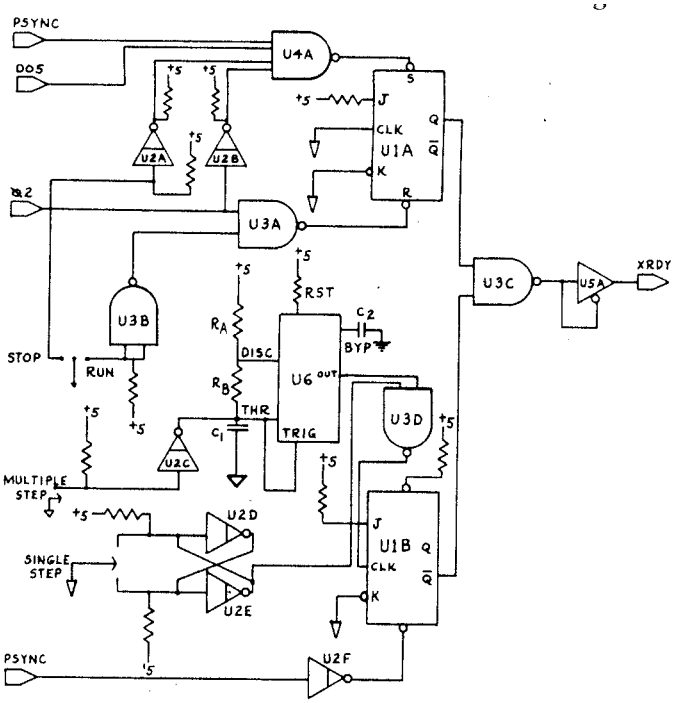
Stop/Run switch SPDT

Single Step switch SPPT

Multiple Step switch SPST Normal Open

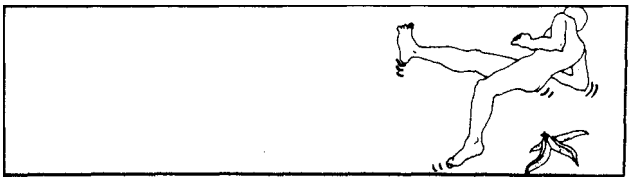
In the next of the series, I will diagram the proper connection of indicator lights to the S-100 bus, showing use of the first two installments.

Steve Wong



OOPS!

Our kit packers made a mistake! A few Sol kits shipped in April or May '77 contain form 74LS153 integrated circuits. Do not use these chips. We will gladly replace them with the proper part, i.e., 74LS253's. Let us know, and we'll take care of it immediately.



Audio Cassette Test Routine

This is a machine language routine written to run on a Sol PC, Sol 10 or Sol 20 as a functional test of the audio cassette hardware. It uses only the `ENTER`, `DUMP`, and `EXECUTE` commands, and requires no additional memory.

Enter the routine through the command mode as shown in the first section of the program. At the end of this section, your Sol will return to the command mode. Then use the second section to dump memory C900 through C94F. Check that the data has been entered correctly; ignore bytes `C946` through `C94F`.

Put good quality blank tape in your recorder and connect its aux input to the Sol Audio Out J6, using audio cable. Set the recorder's volume and tone controls per Sol Manual Section 8. Push Record and Play simultaneously to move past the leader. Pure clocks will be recorded until you give the command `EXEC C900`.

This command will cause a 256-bit incrementing data pattern to be recorded continuously until you stop it. When you've recorded as much tape as you want, you'll have to do a restart and return to the command mode. Rewind the tape to the beginning, then attach an audio cable from Sol Audio IN J7 to the recorder's Monitor or Earphone output. With some recorders, you'll have to disconnect the Aux/Audio Out cable before you can play back. Then put the recorder in the Play mode and execute either `C90E` (Normal Read Entry Point) or `C91C` (Alternate Read Entry Point).

The Normal Read Entry causes data to be read from the tape and displayed on the screen. The display will begin when the beginning of the data is recognized, and it will occupy 6 lines of the screen. The sequence will correspond to one of the data patterns shown in Figure E, depending on the character generator used. Visually inspect the display for correctness: the pattern should begin at the left margin of the screen and continue for two full lines, then repeat with reversed screen polarity for another two lines. The last two lines will repeat the original

pattern to fill out the display. Now, data will continue to be read from the tape and written over the previous display: only the character polarity should change, causing the display to alternate from white-on-black to black-on-white. Neither the horizontal nor vertical position should change; a shift in position indicates either the loss or addition of random characters.

To discover where read errors might be expected to occur, experiment with the volume and tone controls, audio cables, or phase-locked loop adjustments.

You can realign the received data display at any time by doing a restart to command mode and then executing `C90E` again. Careful examination of the display will reveal any out-of-sequence characters, which indicate read errors.

If the beginning of the pattern can't be found, use the Alternate Read Entry Point to display whatever is being read.

Pat Tuell

```
C900                0001 START  EQU    0C900H
C900                0002 RD1    EQU    0C90EH
C900                0003 RD2    EQU    0C91CH
C900                0004 RD3    EQU    0C91FH
C900                0005 RD4    EQU    0C932H
C900                0006 RDA    EQU    40H
C900                0007 TBE    EQU    80H
C900                0008 STS    EQU    0FAH
C900                0009 DAT    EQU    0FBH
C900 DB FA          0011 START  IN     STS    GET TAPE STATUS
C902 E6 80          0012        ANI    TBE    AND WAIT FOR TBE
C904 CA 00 C9       0013        JZ     START
C907 0C             0014        INR    C      COMPUTE PATTERN
C908 79             0015        MOV    A,C
C909 D3 FB          0016        OUT    DAT    WRITE TAPE
C90B C3 00 C9       0017        JMP    START  FOREVER
C90E DB FA          0018 RD1    IN     STS    GET TAPE STATUS
C910 E6 40          0019        ANI    RDA    AND WAIT FOR RDA
C912 CA 0E C9       0020        JZ     RD1
C915 DB FB          0021        IN     DAT    GET TAPE DATA
C917 DE FF          0022        SBI    0FFH   WAIT FOR START
C919 C2 0E C9       0023        JNZ    RD1
C91C 21 00 CE       0024 RD2    LXI    H,0CE00H  POINT TO SCREEN
C91F DB FA          0025 RD3    IN     STS    GET TAPE STATUS
C921 E6 40          0026        ANI    RDA    AND WAIT FOR RDA
C923 CA 1F C9       0027        JZ     RD3
C926 DB FB          0028        IN     DAT    GET TAPE DATA
C928 77             0029        MOV    M,A    PUT IT ON THE SCREEN
C929 2C             0030        INR    L      COMPUTE SCREEN POSITION
C92A 7D             0031        MOV    A,L
C92B DE 00          0032        SBI    00H
C92D C2 1F C9       0033        JNZ    RD3    GO GET MORE DATA
C930 26 CF          0034        MVI    H,0CFH  SET SCREEN OVERFLOW
C932 DB FA          0035 RD4    IN     STS    GET TAPE STATUS
C934 E6 40          0036        ANI    40H    AND WAIT FOR RDA
C936 CA 32 C9       0037        JZ     RD4
C939 DB FB          0030        IN     DAT    GET TAPE DATA
C93B 77             0039        MOV    M,A    PUT IT ON THE S
C93C 2C             0040        INR    L      COMPUTE POSITION
C93D 7D             0041        MOV    A,L
C93E DE 80          0042        SBI    80H
C940 C2 32 C9       0043        JNZ    RD4    GET MORE DATA
C943 C3 1C C9       0044        JMP    RD2    REPEAT READ , F

DAT     00FB    RD1     C90E    RD2     C91C    RD3     C91F
RD4     C932    RDA     0040    START   C900    STS     00FA
TBE     0080
```

```
>EXEC C900     *** CAUSES DATA PATTERN TO BE WRITTEN
                   TO AUDIO CASSETTE INTERFACE

>EXEC C90E     *** NORMAL READ ENTRY POINT.  READS FROM TAPE.
                   WAITS FOR BEGINNING OF PATTERN, AND DISPLAY
                   DATA READ FROM CASSETTE ON THE SCREEN

>EXEC C91C     *** ALTERNATE READ ENTRY POINT.  READS FROM TAPE
                   AND DISPLAYS DATA ON THE SCREEN

    *** VISUALLY INSPECT DATA ON SCREEN.  YOU SHOULD SEE AN
    INCREMENTING PATTERN FOR SIX LINES.  THE HORIZONTAL POSTITION
    OF EACH CHARACTER MUST NOT CHANGE.  YOU WILL SEE EACH
    CHARACTER ALTERNATE FROM WHITE-ON-BLACK TO BLACK-ON-WHITE
    AT A XXX XX 1200 BAUD RATE.  CHECK FOR CHARACTERS OUT OF
    SEQUENCE.
```

Bug Squad

Error in the Sol Input/Output Schematic

The bug: Two pin numbers are transposed on the schematic.

The squasher: The pin for J1 (Carrier Detect-EIA) SCD should be labeled "8"; the pin for J1 (Data Set Ready-EIA) SDSR should be labeled "6". (See figure B)

Error in the Sol Manual

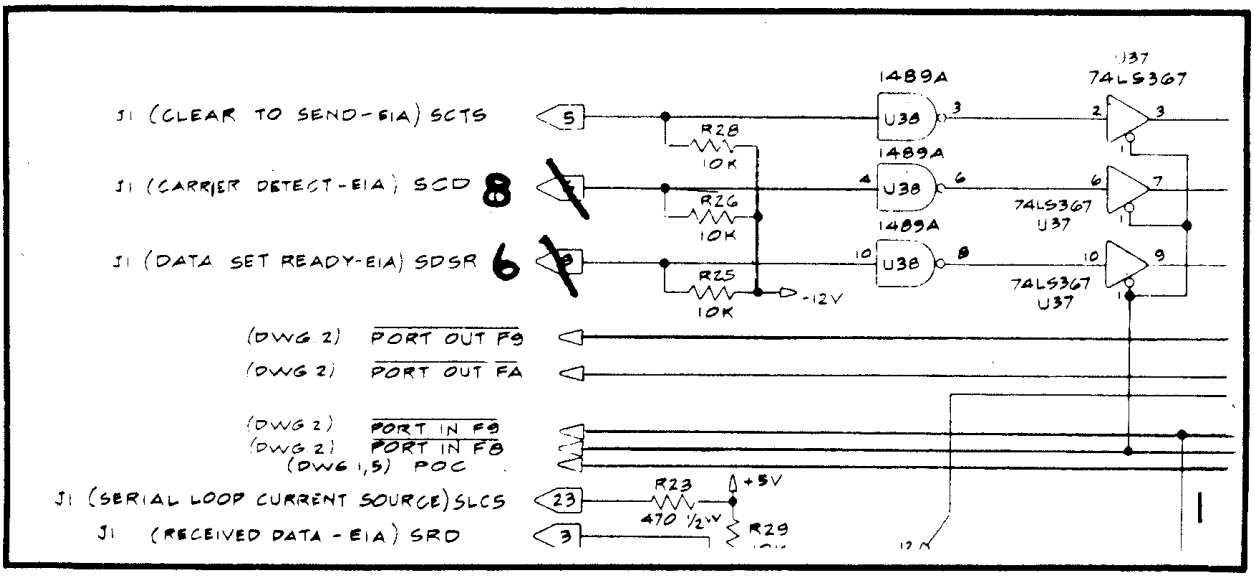
The bug: There are two mistakes on page AVII-7 pertaining to the Serial I/O Control.

The squasher: On S4-1, reverse the "odd" and "even." On S4-2 and S4-3, all "ON's" should be "OFF's" and all "OFF's" should be "ON's.

Error in the DMA/Interrupt Unscramble Fix

The bug: We gave you this fix in the last issue of ACCESS; the wording was correct, but the drawing that accompanied it wasn't.

The squasher: Figure C shows the correct change.



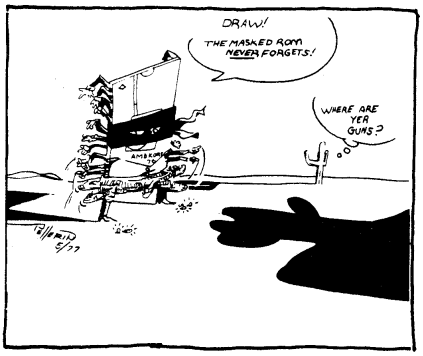
How to Jumper the 3P+S for Use with CUTER

Figure A shows the 3P + S jumpered for use with the CUTER™ operating system with a parallel keyboard and ASR-33 teletype.

The teletype is accessed as the serial pseudoport, PORT #1.

The keyboard is the normal pseudoport #0 input device. Note that the keyboard strobe signal is high until a key is pressed, then goes low for approximately 1 microsecond. If the pulse width of the strobe is greater than the time it takes to process the keyboard information (about 20 microseconds), the system will not work reliably.

Vern Muhr



Software Techniques: The Care and Feeding of Cassette Tape Systems

Dropped bits! Yes, the symptoms of a malnourished cassettte system can be pretty ugly, but they can be avoided by paying proper attention to all three basic elements of your setup - the cassette, the tape machine, and the most important of all, the human element. Follow these tips, and you'll find that the handling and maintenance routine for a cassette system is fairly simple but watch out if it isn't observed!

The cassette. Blank cassettes range in price from under 500 to well over $2. The more expensive ones have better audio fidelity, but that may or may not be relevant to your needs for recording digital data. Only trial and error will give you the experience for selecting the most suitable tape, so run some tests using inexpensive cassettes; if cost is no object, you may want to try some of the more expensive ones as well. Record a few long files (program or data) and then check for read errors. (Pat Tuell's program is designed for just this.) If you have friends with experience in recording programs, by all means ask them for brand recommendations.

Length is something to consider too. A C40 cassette provides about 20 minutes of recording time per side, and at 1200 baud (120 characters per second), each minute is about 7K bytes. Think about it. Are you likely to record 140K bytes of data? If not, a C30 cassette (15 minutes a side) is quite adequate and less expensive.

Finally, a word about care. A cassette appears to be durable and impervious to the elements - quite the contrary. They can be crushed or broken, and they seem to act like a magnet for ashes, dirt and liquids. Always keep them in their protective plastic covers when they're not in use, and never leave them lying around loose.

The tape machine. Again, you may not need the high audio fidelity standards of the most expensive decks, in fact hi fi cassette units may not work as well as ordinary portable machines. You should choose a reliable, well-made machine that will keep the tape moving smoothly at a constant speed. We highly recommend the Panasonic RQ-413AS, retail list $89.95. Some features that are especially helpful (though not absolutely necessary) for digital data recording:

An AUX recording input to facilitate hookups

A tone control

A digital counter to help you locate files on the tape

A review feature for fast forward or rewind while you're listening to the tape (again, to facilitate finding files).

You. It's not just the equipment and the tape that make a good cassette memory system, but what you do and how you do it. Here are some ideas to help you get the most from your system.

After you've recorded a tape, set the digital counter to zero and issue a CAT command (tape catalog SOLOS/CUTER command). As each file header is displayed, make a note of the reading on the digital counter, the exact file name, load address and file length. Label the cassette with this information. Then later you won't have to wonder where each file begins, where it will normally be loaded, or how much memory is required.

If you're putting more than one file on a tape side, use the name END for it) at the end of the last one. It will let you know when you've gone past the recorded portion in reading back.

When you're recording data, make sure that the volume control is set at the proper level – about 2/3 of full volume on many portable machines, but you should experiment to find the best setting for yours. If the volume is too high, the signal may be distorted; but believe it or not, one of the most common causes of playback problems is simply not having the volume control turned up. If you have a tone control, it should be adjusted for maximum frequency response.

Take good care of your machine. Clean the tape heads every so often, because dirty heads are a good way to introduce random read errors. Make sure all cables are properly connected – a common source of problems.

And finally, make sure that the machine is set to "Record" when you're saving programs or data onto tape. Sounds elementary, but everybody has had the experience of forgetting and kicking himself for it at least once!

SOLOS Unveiled

Printed below is the entire 2048 byte SOLOS program which is the standard operating system for a Sol computer and its peripherals.

In this listing you will find a useful library of pre-written routines for developing your own programs. Included are input/output routines for all the ports, load and save routines for cassette tape, and string processing routines.

Furthermore, this listing is the best way we know to demystify SOLOS and give you the inside scoop on how it really works. The program is well written (if we don't say so ourselves), highly compact, and provides a standardized software and hardware interface between all of the Sol's internal circuitry and many external peripheral devices. We hope you will find the programming techniques it incorporates valuable.

[… actual SOLOS listing removed as it is available elsewhere …]

Processor Technology Corp.
6200 Hollis Street
Emeryville, CA 94608