Southwest Ninety-Niners Newsletter

contributed by
- Tom Wills -

SW99ers User Group President of Record

compliments of

TI99ers On-Line User Group

GENEVE 9640

www.ti99ers.org

SOUTHWEST NINETY-NINERS
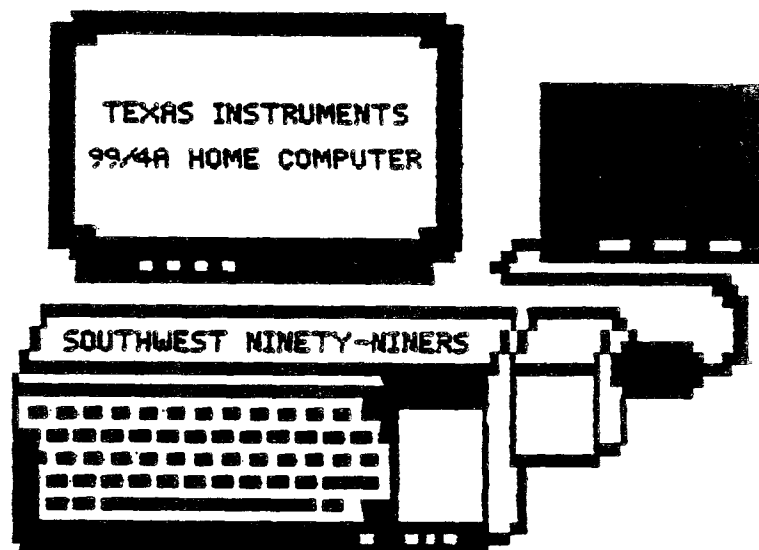
APRIL 1988

P.O. Box 17831 Tucson, AZ 85730

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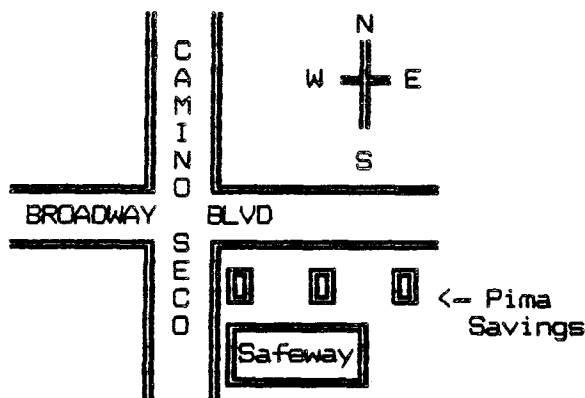
Newsletter
BJ & Jack Mathis - Editors

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BJ & Jack Mathis - Co-Chairmen
Joe Lenox - Fairware Librarian
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ATTENTION MEMBERS!!

Saturday, April 9th we will meet at Pima Savings on Broadway Blvd. east of Camino Seco at 1pm. We will continue to meet there until we find a better location. PLEASE CALL AN OFFICER, IF YOU HAVE ANY SUGGESTIONS.

Geneve Users Workshop: Second Tuesday of each month at 7:00pm (April 12th). Ed Hallett's home 5600 S Country Club #64 - 889-5525.

TI Users Workshop: Third Tuesday of each month at 7:30pm (April 19th). Bring all your TI-99/4A questions and problems to the Mathis Home - 5941 E 26th - 747-5046

Advanced Languages Workshop: Fourth Tuesday of each month at 7:30pm (April 26th). Includes: FORTH, A/L, etc. Rod Stallard's Home - 7575 E Logan - 745-6071

UPCOMING EVENTS

The demonstrations for the April meeting include an overview of Basic and Extended Basic by Leonard Taffs, more Assembly Language by Dave Wolfson and Al Armstrong will present information on disk drives and how they work.

Jack and I plan to arrive at Pima Savings around noon to set up for the meeting. We will be available for questions, disk sales, etc., until 1pm. when the regular meeting will start.

Programs bought by Southwest Ninety-Niner members at the TI-EXPO include IBasher, PC-Transfer, CSGD III, CSGD Cataloger, Remind Me!, Graphics Expander, Picture-It, and Print It. Let us know what you would like to have demos on at future meetings.

The Advanced Languages attendees have begun a study on Assembly Language. If the information presented by Dave Wolfson has peaked your interest, please consider joining the other enthusiasts at Rod Stallard's house.

PRESIDENT'S CORNER

Geoff Shipton of Australia was here on March 28th thru March 30th. We enjoyed his company, and he brought us updates for some programs. However, we were at the beginning of his United States tour this time, so he hadn't accumulated as much, yet this time.

I want to encourage all of you who are using Fairware you haven't paid for, to make your contributions. If you wish, the group can handle your contribution for you. I want to collect contributions for DM1000, BA-Writer, PRBASE, Archiver, and anything else you are using. The group is not licensed at this time to collect for TELCO, so please send the payment for it directly to the author.

The disk drives we ordered last month arrived and have been installed in the various systems. These TEACs are quieter than my TEACs. They also use less power than mine and mine are low-power drives!!

Our new printer has arrived! We got a Star Micronics NX-1000. It is a wonderful printer, maybe I'll get a chance to figure out all the new possibilitites with it soon!!

I now have a "Turbo TI", that is a TI with 32K on the 16 bit bus. It copies disks, loads programs, etc. up to 50% faster than the 32K in the Expansion box. Disks still take the same amount of time to initialize. The modification is in the difficult range, Jack says he won't do it for anyone else, but Ed Hallett is considering doing it for a fee. If you are interested talk directly to him.

RUMORS!! The newsletters I have been reading lately contain several old and some new rumors. I thought you should know they were around, but validity can not yet be confirmed. Rumor #1: TI is getting back into the computer world with a new TI-99/4A compatible computer!! Rumor #2: CorComp will soon be releasing a new TI-99/4A compatible computer!! Rumor #3: A print spooler will soon be available for the Horizon RAM Disks!! Rumor #4: MYARC's new dual/hard disk controller was released March 18th, retailing for $325!! Any truth in these rumors? Your guess is as good as mine on the first two rumors!! However, the second two rumors seem to have a better chance of being true!! Only the future will tell for sure!!!

BJ Mathis - 747-5046

February's Minutes

1. Question & Answer period:

Q. How does XMODEM differ from TE-II MODEM?
A. XMODEM is a standard that breaks things up into 128 character hunks. It is the standard used by nearly all computers. TE-II is used only by TI. It is limited to 300 BAUD.

Q. Will PRBASE run on Geneve?
A. There is a version designed for Geneve.

Q. Is the MYARC Disk Controller compatible with other than MYARC Drives?
A. It is compatible with all disk drives that can be used on the TI-99/4A, and will read and/or write more different formats than other controllers.

Q. Are all monochrome montiors compatible with Geneve?
A. Digital RGBs are not, but Analogs are.

Q. February MICROpendium announced a new PASCAL Interpreter? How is it different from what we already have?
A. The old PASCAL is in P-Code (Interpreted). They are developing a new PASCAL which will be compiled.

Q. J. Peter Hoddie says that RAMDISK can assigned as Drive #1?
A. It is true, but it is not especially advantageous.

Q. What is a Geneve?
A. It is a card contained computer that fits into a slot in the PE Box and has its own keyboard, is TI-99/4A compatible, and is made by a company called MYARC.

2. BJ briefly discussed some of the new ideas and programs that were presented at the Fest-West.

3. David Ormand presented an interesting overview of "C" language, relating it to the "small c" available for the TI-99/4A. He answered such questions as:
   a. What is "C"?

   b. What does "C" look like?

   c. What are the important features of "C"?

   d. How do you use "C"?

4. David Wolfson continued the presentation on Assembly Language. He emphasized the need to become very profficient in using Hexadecimal numbers.

5. The next meeting of the SouthWest Ninety-Niners will be held at Pima Savings on Broadway east of Camino Seco at 1:00pm on Saturday, April 9th, 1988.

Ed McCullough, Secretary

by BJ Mathis

Members of the SouthWest Ninety-Niners who attended the TI-XPO '88 were Ida McCargar, Ed Hallett, Wesley Eng, John & Maxine Hale, Les Neff, Ed McCullough, and Jack & BJ (me) Mathis. Members of the SouthWest Ninety-Niners handled various parts of the registration, entering information into the computer and assembling the nametags. Whenever we got a bit behind we put Wes on the computer (have you ever seen fingers fly?).

We spent several hours on Friday setting up and meeting other vendors. One of the first people to come by our booth during the set up was Bob Boone, President of the Ottawa Users Group. He noticed we had TELCO, a NEW terminal emulator written by Charles Earl also of the Ottawa Users Group. Bob asked when we had gotten it. My reply, "night before last", met with "here's an update" as he handed us an updated disk along with updates for a couple other programs. As we started updating our copies, Jack talked to him about the changes he has made to DM1000 V.3.5 as not all of them were incorporated into V.4.0. Jack printed the letter he had sent to Ottawa Users Group. Bob assured us he would get the information to Charles Earl (yes the same person who wrote TELCO will now be handling updates for DM1000).

Wes and Ed M. were already getting the vendors registered and name tags made for the next day, when John Hale and his wife, Maxine, showed up with the things they had brought from Tucson, along with another they hadn't brought along. Maxine had a bandage around her forefinger that made it look bigger than two or three fingers. Seems she shut and locked the car door on her finger as they arrived at the hotel. They spent several hours at the local hospital emergency room. The X-Rays showed it wasn't broken but she had to have stitches.

Les Neff showed up a little later with the stuff he brought in his car, and at that point everything was in place for the next day. Around midnight we managed to pry Ed H. away from the XPO area, he was afraid he "might miss something", but finally admitted he needed some food and sleep. Saturday morning we arrived at the XPO around 8:30am.

Presentations were made throughout both days by many of the vendors, Ed M. made sure someone from our group made it to each of them, tape recorder in hand. The presentations on Saturday included:

Horizon RAM Disks - Bud Mills, the new owner of Horizon. Bud Mills Services, 166 Dartmouth Dr., Toledo, OH 43614, (419)385-5946. He had the new line of Horizon RAMdisks, the HRD+ built with 32k chips instead of 8k, and plenty of parts kits too. Bud's booth was right next to ours and Ed H. could not resist "jumping the fence from time to time to play with the new toys". Ed M. spent some money at that booth!

TELCO - Bob Boone, Ottawa TI 99/4A User's Group, PO Box 2144 Station D, Ottawa, Ontario, Canada K1P 5W3. TELCO is a new Terminal Emulator written by Charles Earl also of the Ottawa User's Group.

MYARC products - Jack Riley representing MYARC, PO Box 140, Basking Ridge, NJ, 07920-1014, showed the 9640 and the new hard disk controller card shown during one of the presentations.

DataBiotics Grand RAM - Ken Hamai, member of BUG, the Brea User's Group, CA, and Aloha User's Group, HA, represented DataBioTics, PO Box 1194, Palos Verdes Estates, CA 90274. Disk software didn't seem to be available, but their latest modules were there for sale. Ken made a presentation on the Grand RAM, DataBioTics entry into the RAMdisk market.

MYARC Products - Les Merryman representing L & M Systems, the West Coast Distributor of MYARC products, 2330 E. Ave. J-8 #173, Lancaster, Ca. 93535, (805)946-1587. Marie Merryman helped in the booth, and they had some 9640's to sell. Price sheets were available for their product line.

Software - Ray Kazmer, 13225 Azores Ave, Sylmar, CA 91342, presented us with his new Infor com Rapid Loader V2.0. This new version will load Infocom Adventures in approximately 28 seconds. Ray, also presented two animation demonstrations for the TI-99/4A. They were written by two different programmers in Europe. Several programs were shown, all showed perfectly smooth animation, it was as good as any cartoon animation. Ray said both types were formed by loading several different pictures one over the other. These were just demos, but it boggles the mind to think of the possibilities!!

PC Transfer, Remind Me! and Graphics Expander - J. Peter Hoddie demonstrated PC Transfer that will allow the transfer of ASCII files between TI and PC compatibles via disk. Remind Me! by John A. Johnson is an excellent calendar planner with many features. Graphics Expander will allow changing of the size of fonts for Character Sets and Graphics Designs (CSGD) or TI-Artist, these fonts can then be saved back in either type of file, thereby allowing you to transfer them between the two programs as well as changing their size. Jim Lohmeyer helped out by manning the Genial Computerware booth with J. Peter Hoddie. The complete Genial Computerware software line was available. The Boston Computer Society software library catalogs were available and programs could be ordered. Genial is at PO Box 183, Grafton, MA 01519.

Video Flex Card for the PEB - Barb Wiederhold of Queen Anne Computer Shoppe, 6102 Roosevelt Way N. E., Seattle, Wa. 98115, (206)622-9400 or (206)522-6558. PEB card and software package offers a new graphic environment including many previously unavailable features for the 9640. They had their new PEB alternative called the VFIS Expansion System up and running. Both projects are produced by Miller Communications, 8815 18th Ave. S.W., Seattle, WA 98106, (206)762-7610. Tom Wynne helped out at the booth.

On Sunday the presentations covered:

Education Aids - Regena, Cheryl Whitelaw, P.O. Box 1502, Cedar City, Utah, 84720, (801)586-0157. Regena was selling her BASIC software collections.

Software - Ray Kazner showed the animation programs again and ran a program called Woodstock which was a 1987 Christmas present to the TI community (Available from the SW 99er library.)

Utility Programs - Tom Freeman presented information on the use of a group of utility programs he wrote and is selling as a fund raiser for the L.A. 99ers. Terrie Masters, Tom Freeman, Gail Fair and Fred Moore were found at the L.A. 99er Computer Group booth. P.O. Box 67179, L.A., CA 90067-1079. The entire L.A. library was there along with software they support from Ryte Data, Genial Computerware, Bytemaster, WG, Inscebot, etc. Handouts were available introducing McCann Software's newest project the Avanti-99 Forth Card! For info, McCann Software, P.O. Box 34160, Omaha, NE 68134.

Hardware modifications - Ken Hamaii demonstrated his many faceted portable TI-99/4A Home Modified Computer.

The Phoenix RAM Disk - Bud Mills explained the differences in building and using a Horizon RAM disk with the Geneve. And introduced the Phoenix RAM disk for the Geneve.

First Base, Encode It, and the RAVE RAM Disk - J. Peter Hoddie introduced FirstBase, a new era in database programs. Written in c99 by Warren Agee, this will surely be a winner. What Peter showed looked quite impressive. FirstBase includes batch processing, multiple keyword searches, macros, etc., and the largest data capacity available for the 4/A or 9640.

Peter also demonstrated Encode-It. Jim Lohmeyer and Peter Hodie went to work around 11pm Saturday writing a program to be released on Sunday. It was completed sometime in the we hours of the morning with neither participant getting any sleep. The program was called EnCode-It. It is designed to allow encryption of a file or an entire disk, it will work on any file type and any disk format, including RAMdisk. The main purpose of encrypting is to limit access to a file or disk. Once encrypted the file or disk must be unencrypted with this same program before it can be accessed or ran. Peter's comment was "Jim wanted me to teach him more about assembly language and he wanted to write a usable program not just some dumb little thing everyone learns to do." They are asking only $4.00 for Encode-It. J. Peter Hoddie, 12 Paul Revere Rd., Lexington, MA 02173 or Jim Lohmeyer, PO Box 122, Leroy, IL 61752.

Peter showed the new Rave memory enhancement card. It uses an operating system similar to John Johnson's for the Horizon RAM Disk, but modified for RAVE by Peter Hoddie. Peter said for those in the market for a RAMdisk, RAVE's product appears to have the best features of them all. It includes some of the features of the Super Cart, as well as some of the features of the Horizon RAMdisk.

MYARC products - Les Merryman conducted a Question and Answer brainstorming period. He was looking for ideas to help MYARC figure out what the TI community wants next.

MYARC products - Jack Riley

Picture It and Print It - Rodger Merritt 1949 Evergreen Ave.,

Fullerton, CA 92635, (714)990-4577, presented his software packages Print It and Picture It. Peter Hoddie once described Print It as the Fairware alternative to Font Writer! I understand that both packages were very popular at the TI-XPO judging by activity at the Tri-Valley and TICO booth.

The tapes are available to any SouthWest Ninety-Niners interested in listening to them.

Other vendors present at the two day TI-XPO were:

L.L. Conner Enterprise, 1521 Ferry St., Lafayette, IN 47904, (317)742-8146, had software packages available from Texaments, Asgard, Great Lakes, and others. Many assembled cables were also available.

John McDevitt of Rave 99, 112 Rambling Rd., Vernon, CT 06066, (203)871-7824, had keyboard enhancements and speech cards in plentiful supply. Their new memory enhancement PEB card was also available.

Digit Systems, 4345 Hortensia St., San Diego, CA 92103, (619)295-3301. Tom Spillane showed their Dijit Systems RGB Conversion Kit, RGB monitor 80 and their new AVPC (Advanced Video Processor Card). It is a PEB card which gives the 4/A user many features never before available for video enhancement.

Franz Wagenbach of T.A.P.E. Ltd., 1439 Solano Pl., Ontario, CA 91764, (714)989-9906, had plenty of Mechatronics nice, Mechatronics Extended Basic modules, Intern books, and showed graphics with Mechatronics 80 column card.

Espanore Ltd., 7270 Bellaire Ave., N. Hollywood, CA 91605, (818)765-0526, (800)247-6783 (USA), (800)225-8230 (CA). Bill Poland had computer paper, labels, tractor feed envelopes, ribbons, disks, disk storage boxes, etc.

Rocky Mountain User's Group in Denver CO had a booth also. They were selling just about everything, hardware and software. They were busy all weekend.

Great Lakes Software, 804 E. Howell, Mi. 48843, Gene Chandler and Richard Paquette. They had all their software represented including Joy Paint '99, Joy Paint Pal, and Certificate '99 Companion, including the latest release of Certificate '99, V2.0.

Ken Gilliland, 543 Riverdale Dr., #15, Glendale, CA 91204. manned the Fairware booth hosted by SNUG. There was absolutely NO support for Fairware this year, partly due to the lack of any signs indicating the booth's purpose. Ken completly reworked Dick Altman's Fairware list and was selling copies there. A few of those did sell and were well worth the $3.00.

Southern Nevada User's Group, the host group, had a booth with a Triton Turbo IT that didn't seem to draw much interest, except that it was continually chiming out with something that made me wish someone would answer the phone to shut it up!! They also, had a software library although it wasn't very visible, and applications

for anyone interested in joining SNUG. The members of SNUG were helpful in every way. Tony Lucio was enthusiastic and ready with a helping hand for anything. Steve Buchanan, Vice President, was ready to run across the room to help anyone in need. John Martin, President, was as busy as he could be and everyone at the XPO seemed intent on keeping him that way. Their Treasurer, Bob Beiber, was on top of the organization and helpful with information on the state and city taxes we had to collect and pay. I know there were many more of the SNUG members running about helping vendors and attendees, unfortunately I did not get to meet them all. One of their members also acted as the night watchman both Friday and Saturday night. SNUG P.O. Box 26301, Las Vegas, NV 89126-0301. BBS (702)648-1247.

The SouthWest Ninety-Niners booth sales included overlays, blank disks, software, hardware, books, and the SouthWest Ninety-Niners Fairware and Public Domain library. Members of the SW 99ers made themselves available to cover the booth at all times and answer questions for many of the attendees. Maxine Hale spent most of both days working even with her bandaged finger. I wish to thank all the members of the SW 99ers, PO Box 17831, Tucson, AZ 85730, for the support they showed for this endeavor on the part of the group.

All TI-XPO attendees who stayed at the hotel were treated to the Sunday buffet brunch in a room adjacent to the XPO. I have never seen so much food in one place before and the variety was overwhelming. Terrie Masters asked me to join her, Gail Fair (LA 99ers), Woodrow Wilson (San Diego 99ers), Tom Freeman (LA 99ers), Peter Hoddie, Jim Lohmeyer, Bob Boone, Cheryl Whitelaw (Regena), and Cheryl's husband, and son for the buffet. (No Terrie I did not blow my diet, actually lost five pounds over that weekend!) Terrie talked to several of us about the schedule of fairs around the country. A desire not to conflict with one another was expressed and a tentative schedule for next spring was agreed on. After suggesting the SouthWest 99ers host the Fest next year (declined due to geographic location), Terrie suggested the San Diego area. This possibility is being looked into. We had a wonderful, although brief, meal, everyone had to get back to their various booths.

The TI-XPO in Las Vegas was a very enjoyable weekend. I think all the SW 99ers who went learned something and the sense of family with all TIers was reinforced over and over again throughout the weekend. Thanks SNUG members for a memorable weekend!

TELCO REVIEW

by Todd Clifton

TELCO is a terminal emulator that does more to integrate the TI-99/4A (and Geneve) with other computers than any other package available. As a matter of fact you would expect to find a program like TELCO on the IBM or Mac, which becomes apparent as you boot TELCO, by the Menu System. TELCO is completly menu driven by sets of professional looking "overlays" that remind one of Sidekick on the IBM. The Menu System makes set up and use of TELCO so easy it is possible to set up and get on line without even looking at the documentation!! However, I do not recommend it, lest you miss some of the wonderful features.

As most of us are aware by now, a new version (1.3) of TELCO is now available. This version corrects several defects in the initial release that caused TELCO to fall short of its great potential. Now that the new update is available I feel it is fair to review this telecommunications package for the TI-99/4A.

TELCO is a difficult package to review because it offers the user so many options and capabilities that it's important to touch on many of them so the reader gets a good overview of the program. To do less would under-rate this great program.

TERMINAL MODE

This version of TELCO supports four different terminal protocals. These are ANSI, D410, ADM3A, and VT100. To explain each of these protocals is best left to another article. However, Teclo does emulate them and their particular key functions well. When in any

terminal mode, there is a menu "overlay" that shows, not only all TELCO function keys, but any keystrokes particular to your selected emulation. At the bottom of the screen is a status line that tells you your current baud rate, elapsed time, and current operation, unless you toggle the status line off.. In addition there are flags for spooler, log, parity setting, and window lock. Also keep in mind, the menu system may be bypassed by "hot keys" when in terminal mode and ANY TELCO option or function may be called up even while on line! As we go through TELCO's list of operations I think you will find this as impressive as I do.

REVIEW BUFFER

From within the terminal mode TELCO has an 8K buffer to review data. In this mode the Fctn 7 (Menu) key produces a menu describing keystrokes that guide you through the buffer much like a word processor. In addition, there is a screen dump of the current screen available.

CONFERENCE MODE

Also in terminal mode a conference mode is available. On larger services which support real time conferencing between several parties it becomes difficult to type a message while your screen is constantly scrolling with incoming messages! When in conference mode, TELCO creates a "window" at the bottom of the screen that allows you to type messages unaffected by screen movement.

EDITOR

From the Main Menu TELCO has available a D/V 80 editor. It supports 80 columns by 50 lines and is intended for input of short messages for later upload.

AUTO-DIALER

The Auto-Dialer that comes with TELCO is by far the best I've seen for the TI! The dialer maintains a file of up to 99 names and numbers to dial. In addition, when entering a new number TELCO prompts you for parity, terminal info, and baud rate. When a number is dialed and a connection is made TELCO configures itself to communicate with that system! This eliminates the need for multiple "default" files. To dial a number you just enter the number that appears next to the BBS name (1,2,3...) and presto, it's done! You also have the option of entering up to 15 numbers. TELCO will dial the first number and if there is no answer it will hang up and dial the next number you selected! This dialer is an integrated part of the program and can be called up at anytime while online to dial new numbers. Some other dialers only allow access to themselves when the program is first booted.

CATALOG

The Catalog function of TELCO is more like a mini disk manager! It catalogs disks similar to DM 1000 and allows you to delete, protect, and un-protect multiple files. In addition it allows you to "view" on screen any D/V 80 files on the disk.

FILE TRANSFERS

TELCO supports ASCII and X-MODEM (with and without CRC) transfers. TELCO's X-MODEM protocal is like Fast-Term in that if a TI file header is not the first record transmitted it will continue the download and save it in D/F 128 format. Some other programs will not support a download if it doesn't have the TI header. This allows you to download a BASIC program from another computer. By using a file coverter, you can edit the program and get it running on the TI! Don't laugh...I've done it and it works!!

SET UP OPTIONS

TELCO (using its Menu-System) allows you to set up a default file that will configure just about every option the program allows. One of the nicest things this does is let you set up the program to support nearly any modem. You can set hang-up strings, dial commands, etc. Most programs have these options hard coded into the program and require the user to obtain or use a Hayes "compatible" modem!

DOCUMENTATION

TELCO comes with a well written 20 page documentation file. It clearly explains TELCO's features and takes you step by step through the programs many options. If the programs menus aren't easy enough, the doc file makes it so anyone can use and understand TELCO.

CONCLUSION

TELCO runs on both the 99/4A and the Geneve. Make sure you obtain TELCO Version 1.3 (or above?). Earlier versions had quite a few bugs in them that 1.3 seems to have addressed.

Is there anything about TELCO I don't like? Well, yes there is. In the first version the print spooler and log are set up in such a way as to be confusing. Once the log or spooler is opened the data doesn't get put into them until it scrolls off the screen. Now while odd, it's not that bad. What gets confusing is the log/spooler indicator shows it is waiting, not active, which in fact it is. On version 1.3 you are given the choice of retaining this or changing to the more familiar "immediate" mode. The bad news is that it's just for the print spooler and not the log. The log still retains this odd "feature". Another minor improvement could be made by putting in a routine to sound the "chimes" when a down/upload is complete. At 300 baud a file transfer can take some time and it's nice to leave the room and do something else (like eat dinner!) until the transfer is complete.

TELCO was written by Charles Earl from the Ottawa Users Group of DM-1000 fame. This program is not a freebie and is worth FAR more than the $20 Mr. Earl expects from each program. After using TELCO a couple of times you'll feel pretty bad about not compensating him for his monumental contribution to the TI community. So get off the stick and make it worth this man's time!!

So, let me give it to you straight! TELCO, in my opinion, is the finest Terminal Emulator package available for the TI-99/4A. If you are playing around with Fast-Term and its bolt on auto-dialers or Mass-Transfer and its Y-Modem that no one supports or (God forbid!!) Texas Instruments TE II, get on the TELCO bandwagon...you'll never look back!!

ASSEMBLY LANGUAGE UNMASKED, REVEALED, DECODED, AND EXPLAINED
==

by Dave Wolfson

Languages, in General

BJ asked me to write this, so that you slugs and laggards who don't come to the meetings would know what happens there. Shame on you! These are only notes; you must come to the meetings to get the truth, the whole truth, on assembly language.

Languages construct meaning from combinations of LIMITED sets of symbols. So- called "machine language" uses two symbols: on-off, '1' and '0', yes-no, true-false, etc. Machine languages are simple for electrical devices, but almost impossible for human beings to understand or write.

Most languages familiar to humans use an alphabet of modest size, composed of letters, numbers, and punctuation symbols. Examples of such languages are English, Greek, Russian. Oh, yes, most computer languages use the same alphabet. In this respect, assembly language is like TI-Basic, GPL, Forth, C, and Fortran.

A distinction is often drawn between "high level" languages, where a few symbols supposedly do a lot of work, and "low level, primitive" languages in which one must say a lot to do a little. Assembly language is then relegated to the latter category. Anyone who has tried to do 'bit twiddling' in Basic knows that this distinction is meaningless. Languages all have their strong points and their weak points.

One of the first things designers of a new computer do is write an ASSEMBLER for it (in machine language). Thereafter no one ever wants to think of programming in machine language.

Von Neumann's Brain

Most computers do not know the difference between instructions and numbers. If allowed to do so they will try to execute numbers and use instructions as data. The instruction (never mind for now what it means) "JMP $+2" is translated by the TI Assembler into the binary string "0001000000000001"; it is also the number, decimal "4097".

All computers have a "program counter". The program counter is to digital computers what steering is to automobiles, and 'tells' the machine where to go next (e.g. get the next instruction). If you want/need to directly control the program counter you must use assembly language.

All familiar computers do the same five things over and over again, VERY FAST:
1) instruction fetch: get bits at the memory location identified in a special register (the "program counter")
2) decode: establish what operation is required and the location of the operands (the "data")
3) operand fetch: get the operands, and increment the program counter past operands which immediately follow the instruction
4) do instruction: "execute"
5) increment: increment the program counter, and loop to 1)

An assembly language statement corresponds to this structure. Characteristics of assembly language statements are: 1) one machine instruction = one assembly language instruction
2) ADDRESS-FIELD INSTRUCTION-FIELD OPERAND-FIELD
3) Address (or "label") field — memory location of the instruction
4) Instruction (or "operator") field — what to do
5) Operand field — do it to or with what?

The TI computers use two operands. More complicated computers use more than two operands, and thus are able to do more things in a single instruction.

Some Essential Background

What are BITS, NYBBLES, BYTES, WORDS, and LONGWORDS?

bit — single '1' or '0', 'on' or 'off', etc.
nybble — string of four bits, able to represent decimal numbers 0 to 15
byte — string of eight bits, representing one character or numbers from decimal 0 to 255
word — a sequence of bytes (two bytes, in the case of the TI-99 computer)
longword — a sequence of words (the TI-99 computer does not use these)

It is very convenient to represent nybbles as single symbols. That way a TI-99 word may be represented by a string of four symbols. Number base 16, otherwise called "hexadecimal", is widely used for this purpose. Get very comfortable with hexadecimal notation. Learn it, love it, live it!

```
0000 = '0'   0001 = '1'   0010 = '2'   0011 = '3'   0100 = '4'
0101 = '5'   0110 = '6'   0111 = '7'   1000 = '8'   1001 = '9'
1010 = 'A'   1011 = 'B'   1100 = 'C'   1101 = 'D'   1110 = 'E'
1111 = 'F'
```

For example, the binary word "1000011010110101" is hexadecimal "86B5".

Addressing

The TI-99 computer can address 32768 words (2 to the 15th power), however once a word is loaded (i.e., "fetched"), there are many instructions which permit bytes and even individual bits to be manipulated. NOT ALL machine instructions allow this — some do, and some don't.

The TI-99 recognizes the two bytes of a word as being stored in memory the same way you read them, with the highest, most significant byte first. Most computers do it the opposite way, which is more logical, but much harder to read and work with. Who said TI wasn't looking out for us!

To speed things up and save memory storage space, computer designers devise special memory locations where instructions and data (the same, remember) can be "pre-fetched". Some pre-fetching, you, the programmer, can control; some, the computer does on its own, whether you like it or not. Each computer has its own ways and means of pre-fetch. These special pre-fetch locations are variously called: registers, workspace, cache, high-speed memory, look-ahead, or pipeline.

The TI-99 uses an unusual pre-fetch scheme. There is a special internal register of fifteen bits, called the "workspace pointer" (WP). The workspace pointer functions like a ZIP code, addressing the sixteen consecutive memory words immediately at and following the held address. These sixteen memory words are referred to as workspace registers 0 to 15, often notated as 'R0' to 'R15'. The

machine can address the contents of the workspace registers by referring to "0" to "15", rather than having to give the full address. Why bother? A two-operand instruction uses three words of memory without pre-fetch. Each word must be fetched before the instruction can be executed. The same two-operand instruction uses only one word of memory when both operands are pre-fetched into workspace registers. The machine executes the instruction more quickly.

There is one more special register in the TI-99 besides the program counter and the workspace pointer, called the "status register." Machine instructions cause bits in this register to be set to '1' or reset to '0', depending on their results. Later machine instructions can then 'test' and act upon these "status bits". Other bits in the status register preserve information on the machine's current state, but are not generally subject to change. The TI-99 programmer doesn't often deal with this register directly.

Computer designers allow for various "addressing modes", e.g. ways of referring to instruction operands. While some addressing modes are common and obvious, there are no hard-and-fast rules. The programmer must learn what instructions allow which addressing modes, and how those modes work.

Put the Cart Before the Horse

Most of the TI-99 addressing modes are fairly easy to understand. The best way to become familiar with them, and which instructions allow which modes, is simply to study or write actual assembly language code. There is one exception, called "indexed addressing". Understand this mode, and the rest is duck soup.

With indexed addressing, you specify: 1) an ADDRESS word, and, 2) a WORKSPACE REGISTER number (1-15). The TI-99 gets the operand from the memory location addressed by the sum of the ADDRESS word and the contents of the REGISTER.

For example, you specify, using indexed addressing: 1) a "base address" word, '0008', and 2) a register number, '0002', which contains the number '0004'. The instruction operand is the number found in the memory location word '0008' + '0004', which is '000C'. You quickly learn that assembly language syntax requires that you put an '@' sign before the address, and that you put the register number in parentheses.

Consider the assembly language instruction "INC @0008(2)". This instruction means, simply, "add one to the operand". If workspace register 2 contains the number '0004' and memory location '000C' contains the number '9999', then after the instruction is executed, memory location '000C' contains the number '999A'. Remember, I warned you! Get familiar with hexadecimal notation. Just imagine you have sixteen fingers or toes. . . .

The main use of indexed addressing is in 'table look-up', a powerful technique which can make your little TI-99 work fast when it needs to. We'll be seeing much more of indexed addressing later.

By the way, it is difficult to comprehend the speed of a computer. The TI-99 can fetch the contents of a long novel from its memory, character-by-character, in about one second. See you at the meeting April 9.

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