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THE SYM-1 USERS' GROUP NEWSLETTER

VOLUME III, NUMBER 1 (ISSUE NO. 11) - SPRING 1982 (JAN/FEB/MAR)

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BACK ISSUES ARE STILL AVAILABLE AS FOLLOWS:

Issue 0, the Introductory Issue (1979), and Issues 1 through 6 (Volume I, 1980), are available, as a package, for $12.00, US/Canada, and $16.00, First Class/Airmail, elsewhere.

Issues 7 through 10 (Volume II, 1981), are available for $10.50, US/Canada, and $14.00, First Class/Airmail, elsewhere.

ON LATE NEWSLETTERS

We received today, in mid-March 1982, our copy of "THE TARGET - an AIM65 newsletter" for July/December 1981. We get lots of SYM applicable ideas from Donald Clem's (R.R. #2, Conant Road, Spencerville, OH 45887) newsletter, just finishing its third year. It is a bi-monthly, so this was actually a triple issue, covering July/August, September/October, and November/December of 1981. So you see, SYM-PHYSIS is not really "later than you think". We are merely conforming with computer newsletter tradition! Speaking seriously, though, now that we have gotten "organized" to the point of using reviewers to help evaluate, debug, and polish submitted software, and volunteers to answer requests for help (see below), we should be able to meet the quarterly deadlines.

"HELP"

We apologize once again for not being able to answer all of your letters for help, and ask you to write again if your problems have not yet resolved themselves. We think that we will be able to provide faster response time in the future, even while we ourselves are traveling, or otherwise not available, through the following procedure:

If, and really only if, your requests for help are on separate sheets of paper from any other type of correspondence, clearly marked "HELP", and are accompanied by a self addressed, stamped (US only) return envelope, whoever opens the mail will be able to "batch" them and send the entire package to one of a number of SYMmers who have offered to provide such help. It would be unfair to ask these volunteers to also pay for your postage. Overseas reply postage costs can best be handled by enclosing low denomination local currency.

SYM DISK OPERATING SYSTEMS

The SYM-1, as it comes out of its box, is a 1K RAM, 4K ROM, single cassette based system, powering-up, and/or resetting, to SUPERMON. When fully loaded (no external expansion, but with the Blalock RAM Board or 2114 piggy-backing considered "internal"), it becomes an 8K RAM, 20K ROM, dual cassette based system, still resetting to SUPERMON, but with RAE and BASIC capabilities.

At this point all SYMs are essentially equal, and all software is fully transportable via physical cassette transfers. Most of the SYMmers with whom we have communicated have brought their cassette systems up to nearly 100% reliability (some at double and triple times the standard speed). We have managed to read every cassette we have received (even double speed ones) because good cassette practice includes making at least double dumps (we use triple dumps on distribution cassettes) to provide data redundancy in the event of any glitches caused by tape dropouts.

We are very much satisfied with the SYM cassette interface as the primary means for inter-SYM data and software interchange. With a 4K, or even an 8K system, the cassette interface provides an acceptable mass storage system. With expansion to 24K or 32K, and the concomitant longer files, cassettes become impractical, except for backup purposes (when we had only one SYM/FODS system we backed up our mailing lists on a second disk and triple cassette dumps!). Have you ever seen a 48K Apple II system without at least a single Disk II beside it?

Note that we said Disk II; we emphasize this, because all Apple IIs use the same (or wholly compatible) controllers, drives and DOSes, thus ensuring full software transportability between Apples. It is this "universality" of software exchange that provides a large market for software entrepreneurs, thereby encouraging the development of good (and bad!) software for the Apple. Furthermore this software is distributed mainly on diskettes.

We are now too far downstream with the SYM for a universal DOS (Disk Operating System) to evolve, and perhaps this is for the best, after all. We are free to chose any combination of hardware and software that matches our needs, subject, of course, to our financial abilities. In the following paragraphs, we will briefly describe some of the disk systems now available for SYM, but first presenting some preliminary background information on drives and disks in general.

GENERAL

For "personal" use, especially for the type of research and report preparation we do, we prefer the 5 1/4 inch drive systems because they are quieter, more compact, and cheaper than 8 inch drive systems. Where the noise, size, and cost are not important factors, the greater access speed and on-line storage capacity of the 8 inch drives are really nice to have, and in some applications, even these might be inadequate. That's why hard disks are becoming so popular!

The choice of drive size is yours alone to make, as is the choice of make and model. The major differences between the various brands appear to be in the speeds at which the heads are loaded against the disk and the rates at which the heads are stepped from track to track. The controller software has built-in delays to accomodate the slowest available drives. If you use one of the faster drives it is well worth your time to customize the software to it. Disk load times can be speeded up by as much as a factor of five times. While most suppliers of DOSes guard their source codes as if they were were divine mysteries, a disassembly and study of that part of the object code containing the

(continued to page 11-36)

A 40K SYM-1 MEMORY EXPANSION BY GEORGE WELLS

Here is a memory expansion scheme for the SYM-1 that has the following features:

1. 40K of RAM continuous from $0000 to $9FFF.
2. Top three 1K groups of RAM ($9400-$9FFF) are write protectable.
3. EPROM or ROM can overlay RAM from $1000 to $8FFF with automatic switching between them.

The components used in this arrangement would typically be:

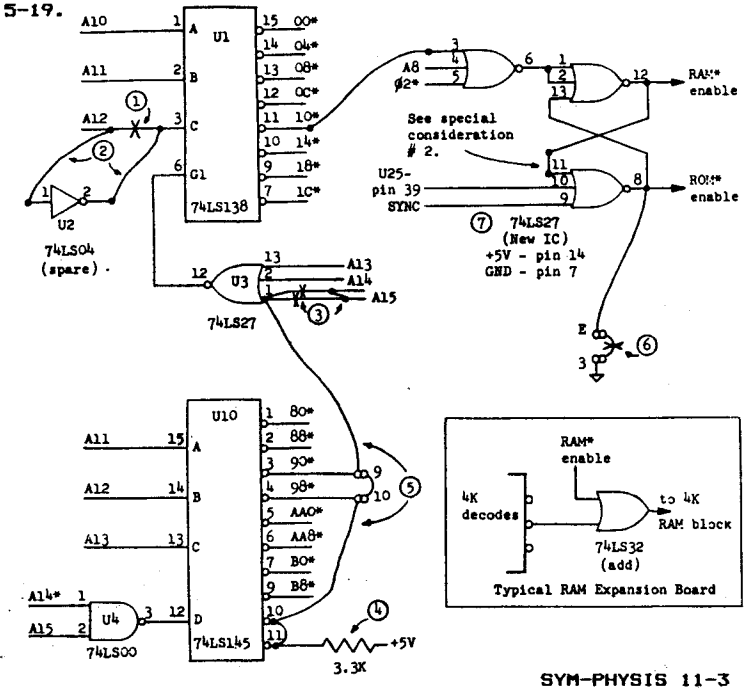
1. 4K on-board static RAM with modified decoding to appear at $9000-$9FFF.
2. Blalock's 4K static RAM expansion with modified decoding to appear at $0000-$0FFF.
3. 32K dynamic RAM at $1000 to $8FFF (available from several sources).
4. Monitor ROM at $8000 to $8FFF (normal).
5. Additional EPROMs, as desired, between $1000 and $7FFF.
6. One IC wired to automatically switch between the RAM and ROM banks.

Anyone attempting to implement this idea should thoroughly understand it before beginning. The procedure given assumes that you can find the various signals on your PC boards and that you have some knowledge of logic design.

Before starting, the address space between $0000 and $9FFF should be clear of all memory and I/O except for the original 4K RAM, the Blalock 4K RAM, and the System Monitor ROM. Also, verify correct operation of the Write Protect feature as described in the SYM-1 Reference Manual, pages 4-26 and 5-19.

For the following steps in modifying the SYM-1 board, refer to the schematic. The first two steps move the write protectable memory to the top of the 8K RAM space.

(If you have only 8K of RAM, you can perform just these first two steps now, and the remainder when you get 32K more.)



(1) Cut the A12 trace leading to pin 3 of U1 on the bottom side of the board.
(2) Insert the spare inverter by adding two wires to the bottom of the board as shown. Make sure U2-pin 2 goes to U1-pin 3.

At this point, you should again verify correct operation of the Write Protect function, but this time the three 1K groups are $1400-$17FF, $1800-$1BFF, and $1C00-$1FFF. To write protect the last 1K of RAM, it is only necessary to enter W 1 (instead of W 001).

The next three steps move the 4K block of RAM currently at $1000-$1FFF to $9000-$9FFF. This includes the write protectable RAM. The Blalock RAM stays at $0000-$0FFF.

(3) On the bottom of the board, cut the two traces leading to U3-pin 1 and join them with wire, leaving pin 1 out of the connection.
(4) On the top of the board, install a 3.3K pull-up resistor from pins 10 and 11 of U10 to any convenient +5V source.

At this point, the previously unused outputs of decoder U10 will go low any time an address block beginning with $0, $4, or $C is accessed.

(5) On the bottom of the board, continue wiring the pull-up to jumper pads 9 and 10 and then to U3-pin 1. Make sure all other jumpers to pads 9 and 10 are removed.

Now, pin 1 of U3 will go low for block $0, $4, $9, or $C; however, when block $4 or $C is accessed, pin 2 (A14) will be high. Therefore, pin 12 of U3 will go high (enabling the RAM decoder U1) only for blocks $0 and $9. Test to see that you do indeed have RAM at these two blocks and that you can write protect the three 1K groups at $9400-$97FF, $9800-$9BFF, and $9C00-$9FFF.

If everything works correctly, you are ready to add the RAM/ROM bank selector.

(6) Remove the ground jumper between pads E and 3 on the SYM-1.
(7) Wire up the IC as shown in the schematic. Don't forget the power and ground connections.

[Note - Asterisks, "*", indicate barred signals. For example, pin 5 of the new IC must go to the clock signal that is brought out on pin Y of the expansion connector--not pin U.]

One method of adding this IC to the SYM-1 is to cement it to the board with its pins facing up and solder wires directly to the pins. Depending on how you use the bank selection to switch between the 32K RAM expansion and EPROM, you will need to bring one or both of the RAM* and ROM* Enable signals off the SYM-1 board to the expansion board(s). Both of these are active low signals.

Some memory boards have bank switching capabilities built into them which makes the interface simple, but almost all boards provide jumper decoding in 4K blocks which allow the addition of an OR-gate to provide the required gating for each 4K block of RAM (see schematic). It is not necessary to switch the entire 32K of RAM--only those blocks which share the same address space with ROM or EPROM. Until you add bank switched EPROM, the only RAM block you will need to switch is block $8 ($8000 to $8FFF). Most EPROM expansion boards provide several jumpers to select the EPROM type and address decoding. For a 2716, pins 18 and 20 are usually tied together to the address decode. In such a case, bank selection is easily performed by disconnecting pin 20 from pin 18 and tying it instead to the ROM* Enable signal.

Theory of Operation

The key to understanding how the bank selector works is in realizing that the only way a 6502 instruction in ROM can have access to the entire address space is through one of the indirect addressing modes which reads page zero just before accessing the desired memory location. (BASIC also accesses memory through an absolute mode instruction which fortunately was copied to page zero RAM.) Remember that BASIC does not actually execute the "program" in RAM--that is really "data" for the interpreter program in ROM. The same is true for RAE and the Monitor: they all access the RAM indirectly, treating it as "data". The Monitor also needs to access itself, but it always does this through absolute mode instructions (again--fortunately!).

Thus, all that is needed to switch between the RAM and ROM banks is a flip-flop which is set one way (to enable ROM) whenever an op-code fetch occurs (SYNC goes high) and set the other way (to enable RAM) whenever any access to page zero is made. The circuit detects page zero whenever the pins 3, 4, and 5 of the new IC are all low. Pin 3 goes to U1-pin 11 which is labeled "10$" but is really "00$" because of the changes made in steps 1 and 2. Actually, to make the hardware a little simpler, the circuit also detects page two, which is of little consequence as long as page one is excluded. (This is important so that JSRs in the Monitor or EPROM will work.) There is one other way that the ROM bank can get enabled and that is with the software-controlled Power On Reset signal coming from the CA2 output on U25 (pin 39). Without this signal it would be possible for the RAM bank to be enabled while the 6502 RESET vector was being fetched causing the CPU to go to an unknown location and possibly modifying RAM.

Special Considerations

1. If you cold start to BASIC and let it figure out how much RAM you have, it will start writing $55 and then $AA to every memory address starting at $0200 and continuing until an address is reached which will not accept the $55 or $AA. If you have not write protected any RAM, then the memory test will continue up to address $A000 which is port B of VIA #1. If you have installed a second cassette control on bit 7 of this port (as per RAE requirements), then that cassette will become activated when you enter BASIC, just like it does when you enter RAE. If you have any other devices on this port, make sure they will not be damaged by BASIC's initialization.

2. Sometimes you may want to examine the contents of the Monitor ROM, but if you try you'll discover that what you are reading is the RAM--not the ROM. A simple way to disable the bank selector is to install a switch or jumper between pins 11 and 12 of the flip-flop. Opening this connection will force all indirect memory accesses to go to the ROM bank. If you need software control of this feature, you can instead tie pin 10 of the flip-flop to a different port bit output which your software can drive high to read the ROM. However, if you do this you will have to drive it low after every reset in order to enable the bank selector.

3. If you put any machine code on page zero or two of memory, remember that all fetches or stores to bank memory will access the RAM bank.

4. If you install EPROMs between addresses $1000 and $7FFF, they can only contain executable machine code and data that is accessed with absolute mode instructions. You cannot put the BASIC trig function expansion in this region since it contains data that is fetched indirectly by the BASIC interpreter. The best place to put an EPROM containing the BASIC trig functions is at $F000-$F7FF.

5. Do not try to bank switch the BASIC ROMs. They contain several data tables that are fetched indirectly.

6. You can bank select the two RAE ROMs, putting either RAM or EPROM in the "RAM" banks. However, as with all the other RAM banks, this memory can contain only data that is accessed indirectly. This would be an ideal place to put a disk buffer or video memory (for RAM), or character generator tables, or sound generation constants (for EPROM). You could also put some I/O in these regions as long as the programs that access them use indirect addressing. If you decide to implement any of these exotic expansions, you're on your own! Just make sure you know what you're doing.

Conclusion

Now you don't have to feel jealous of those other guys with their super bank switcher computers--you can have one too at a fraction of the cost. Furthermore, you can understand exactly how yours works. And it sure is nice to be able to sign on to BASIC and see it print, "40447 BYTES FREE"!

RECOMMENDED SYM-1 MODS

We "routinely" modify all of our personal SYMs, and those going into OEM systems, as follows (listed in priority order):

1. To improve READ performance - replace C16 with a 0.01 ufd disc cap.
2. To improve WRITE performance - replace R88 with a 1 K resistor.
3. To improve "From TTY Keyboard" performance (on 20 mA current loop) - install a 1 K resistor from the base of Q28 to ground.
4. To recover the use of PB6 of VIA No. 1 (for 8 bit D/A and A/D applications) - install a 1 Meg resistor from pin 3 of U26 to ground.

The word "improve" is used in the sense of increasing reliability when interfacing with external equipments, i. e., cassette recorders and current loop terminals.

TAPE TIP

There are often times when it is desirable to determine the ending address (EAD) of a file being read in with .L2. EAD is required when using the .L2 FF,SAD,EAD option; also, in cases where most, but not all of a file is readable, it may be helpful to know how much of the file has actually been read in up to the abort point. Find out this way:

After either a successful or an aborted .L2, enter the .M <cr> command and the address of the memory location whose contents are being displayed is EAD+1 or the address of the first non-read byte. Armed with this information, partial BAS-1 and RAE-1 files can be read in with .L2, "terminated" to match BAS-1 or RAE-1 protocol, and the proper pointers then set to permit at least partial recovery of otherwise "lost" material.

"DOUBLE-DECKING" THE SYM

The suggestions of "piggy-backing" 2114s to get 8K of on-board RAM, and the two RAE-1/2 chips (also the two BAS-1 chips, when BAS-1 came only in the two chip version) to get two ROMs into one socket, were reported on in early issues of SYM-PHYSIS. We also reported on the existence of three unused inverters, and gave their locations (in U2, U9, and U38).

We have added additional logic chips to several of our SYMs by glueing them, pins-up, to the board, and wiring them in as required. Joe Hobart's suggestion, in Issue No. 10, of piggy-backing a 74LS04 (hex inverter) over the 7408 (and gate) at U24, to pick up the +5 V and GND, started us to thinking about the following: What other double-decking possibilities might be useful?

Perhaps logic to provide full address decoding for the VIAs and the 6532

to allow more effective use of $A000-$AFFF and $F800-$FFF9? Actually, only the top 6 bytes of SYSRAM at $A67A-$A67F need be "echoed" at $FFFA-$FFFF. Full address decoding would permit installation of a 2716 EPROM (less six bytes) at $F800.

Your first impulse might be to suppress the SYSRAM echo altogether and put your choice of NMI and IRQ into a 2716 EPROM at $F800, or a 2732 at $F000. This is not too good an idea, however, since one rather "widely-used", "very well-known", (how's that for "one-upsmanship"!) programming technique for subroutine calling involves "calling" subroutines with BRK (not JSR!), and returning with RTI (not RTS!). Both FODS and CODOS use this technique very effectively, and SUPERMON returns from subroutine USRENT with an RTI, just as it would from a real BRK. Since this approach requires changing IRQVEC, IRQVEC should itself be in RAM or at least point to RAM, where changes can be made.

Other possibliities for chip piggy-backing include buffer/drivers, multiplexers, flipflops, or almost any TTL chip, for that matter. If any of your I/O subsystems require such chips, such as, for example, a 20 mA current loop to inverted TTL conversion, perhaps you could mount them directly on the SYM?????

NEW BOOK REVIEW

We have long recommended Lance A. Leventhal's "6502 Assembly Language Programming" as one of the two books which every serious SYMmer should have on hand (the other is Marvin De Jong's "Programming & Interfacing the 6502, With Experiments"). For 6809 SYMmers we have recommended Leventhal's "6809 Assembly Language Programming".

We now recommend a third book for the 6502ers: Lance A. Leventhal and Winthrop Saville's "6502 Assembly Language Subroutines", OSBORNE/McGraw-Hill, Berkeley, California, 1982. This nearly 550 page book is a veritable encyclopedia of both general programming concepts for the 6502 (with lots of carry-over to other systems) and specific subroutines, very thoroughly documented, for array manipulation, string processing, code conversion, bit manipulation, I/O, interrupt processing, etc.

The highest praise that I can give this book is to say that even after more than four years of using the 6502 on a nearly daily basis, I will now check with Leventhal and Saville first, before starting any major programming effort, to find the "right way" to do it. The information on common programming errors, and how to avoid them, will save enough in "wasted" development time to pay for the book many times over; the subroutines are given in a form that is immediately usable.

A BASIC VARIABLE CROSS REFERENCE LISTER

June 10, 1981

Dear Lux:

Enclosed is a copy of a program which searches a BASIC text file and picks out all the new variable names. It has three distinct parts; the text search, a sorter, and a printing segment.

The first part creates a file (starting at $3400) of 5-byte elements, one for each new variable it encounters in the text. The first byte is for the type of variable, the next two are the variable name, and the last two are the line number where the variable occurs in the text. I have chosen the type values so that the sorting routine will put simple real variables first, string variables second, and on through to subscripted integer variables last. All characters in a variable name after the first two are ignored; if it is a one-character variable a space is substituted for the second character. The line number bytes are copied directly from the text file.

New variable names can be introduced in BASIC only in certain ways; they may be the first word of a statement, or they can occur only after the reserved words DIM, FOR, INPUT, LET, READ, and DEF FN (and in some versions, after GET). Therefore, in this program all other occurrences of variable names are ignored.

The sorting segment is a (more or less) standard bubble sort which sorts the list in place.

The printing segment has two counters which I have set for my system, but they should probably be changed for others. These are: (1) the maximum numbers of line numbers for a given variable printed for each line of output, and (2) the number of lines of output per page on the terminal screen. I have set these numbers at 8 and 15 respectively. The latter feature was included to allow time to study the list of variables before it disappears off the screen. Hitting any key causes the printout to continue.

The program ends with a simple RTS which works fine if it is run with a .G 3000 out of SYM MON 1.1. Care must be taken if the program is called in a way such that the return address is not stacked.

The program could be modified for other 6502 systems by making the appropriate changes for the reserved-word tokens and adding steps to recognize other reserved words. Also the addresses of the BASIC routines and the MON 1.1 subroutines must be made correct for other systems.

Best Regards,

/s/ Jim Pengra

21 February 1982

Dear Jim:

Finally getting around to going through the backlog of tapes and cassettes, after all these months. Tried the program, found one bug, and have several suggstions.

The bug is that, while it works fine when called from MON, and does what it should when called from BASIC with X=USR(ORIGIN,0) it returns to BASIC with a ?TM ERROR message. Didn't have time to track down the source of the bug, which is most likely traceable to "playing" with the pointers during the program and not restoring them prior to return. The ?TM ERROR message can be suppressed, however, by the ad hoc trick of calling the program with a string variable name, e. g., X$=USR(ORIGIN, 0). While the return to BASIC with an RTS is okay, I have gotten used to returning from USR calls with JMP $D14C, so I made that change in the program.

The suggestions (some posed as questions) are as follows:

(1) Rather than use space above the machine language program for temporary storage, why not use the space between the end of program space and top of memory?

(2) Instead of the format you use, how about one where you do not use the headings to indicate and separate variable types, but instead indicate the variable types by following their names with %, $, (), %(), $()? (For arrays, the number of subscripts, and perhaps even the dimensions could be indicated?????)

(3) The printing of eight line numbers per line is too many if four decimal digit line numbers are used, so I cut the maximum down to six.

(4) Since one of the reasons for a program like this is to give the user information on possible variable name conflicts, thus permitting renaming if necessary, shouldn't the listing include ALL occurrences of the name?

Am now using the version of your program listed below where the output format comes closer to complying with suggestion (2) above. Studying how your program works will give readers a good insight into how BASIC itself works!

- - - - Lux

```
0010 ;                  VARIABLE NAME FINDER
0020
0030 ;                          by
0040
0050 ;                    JAMES G. PENGRA
0060
0070 ;                   Physics Department
0080 ;                    Whitman College
0090 ;                 Walla Walla, Washington
0100 ;                       99362
0110
0120
0130 ;THIS PROGRAM SEARCHES A BASIC TEXT FILE FOR
0140 ;VARIABLE NAMES, SORTS THE LIST BY TYPE (STRING,
0150 ;INTEGER, ETC.) AND ALPHABETICALLY, AND THEN PRINTS
0160 ;THE NAMES AND THEIR LINE NUMBERS. IT ALSO FINDS
0170 ;SOME ERRORS.
0180
0190
0200 ;  VARIOUS SYM MON 1.1 SUBROUTINES
0210
0220 CRLF       .DE $834D
0230 SPC2       .DE $833F
0240 OUTCHR     .DE $8A47
0250 INTCHR     .DE $8A58
0260 TECHO      .DE $A653
0270 ACCESS     .DE $8B86
0280
0290 ;  SYM BASIC ROUTINES AND ADDRESSES
0300
0310 FACTO      .DE $B2
0320 FLOATC     .DE $D9FF
0330 FOUT       .DE $DB9A
0340 CHRGET     .DE $CC
0350 CHRGOT     .DE $D2
0360 SEARCH     .DE $CC5D
0370 TEXT.PTR   .DE $C49F
0380 ALPHA      .DE $CEE9
0390 USRRET     .DE $D14C
0400 TXTPTR     .DE $D3
0410 DISSTK     .DE $66
0420 ADPTR1     .DE $72
0430
0440 ;  OTHER COUNTERS AND VECTOR LOCATIONS
0450
0460 COUNT      .DE $E8
0470 P0         .DE $EA
0480 P1         .DE $EE
0490 BASE       .DE $EC
0500 BUFF       .DE $61
0510
0520 ORIGIN     .DE $3000
0530 HOLD       .DE ORIGIN+$0400
0540
```



```
0550            .BA ORIGIN
0560            .MC $9000
0570            .OS
0580
3000- 20 9F C4  0590 START     JSR TEXT.PTR  ;SET POINTER FOR CHRGET/GOT
3003- 20 0A 31  0600           JSR SET.PTRS  ;SET OTHER PTRS
3006- A0 02     0610 LINLINK   LDY #02       ;CHECK LINE LINK HI,
3008- B1 D3     0620           LDA (TXTPTR),Y        ;IF ZERO, THEN
300A- D0 03     0630           BNE CONT
300C- 4C 24 31  0640           JMP DONE      ;END OF SEARCH
                0650 ;
300F- C8        0660 CONT      INY
3010- B1 D3     0670           LDA (TXTPTR),Y        ;STORE LINE NUMB
3012- 85 64     0680           STA $BUFF+3   ;IN BUFFER
3014- C8        0690           INY
3015- B1 D3     0700           LDA (TXTPTR),Y
3017- 85 65     0710           STA $BUFF+4
3019- E6 D3     0720 INCR      INC $TXTPTR   ;MOVE CHRGET/GOT
301B- D0 02     0730           BNE DINC      ;POINTER THRU
301D- E6 D4     0740           INC $TXTPTR+1         ;LINKAGE AND LINE
301F- 88        0750 DINC      DEY           ;NUMBER BYTES
3020- D0 F7     0760           BNE INCR
3022- 20 CC 00  0770 ONE       JSR CHRGET    ;GET NEXT CHAR
3025- C9 80     0780           CMP #$80      ;IF < $80 IT'S A NAME
3027- 90 7D     0790           BCC NAME      ;OTHERWISE, CHECK FOR TOKENS WHICH
3029- C9 81     0800           CMP #$81      ;'FOR'   PRECEDE NEW VARIABLES
302B- F0 F5     0810           BEQ ONE
302D- C9 84     0820           CMP #$84      ;'INPUT'
302F- F0 4D     0830           BEQ BEE
3031- C9 85     0840           CMP #$85      ;'DIM'
3033- F0 ED     0850           BEQ ONE
3035- C9 86     0860           CMP #$86      ;'READ'
3037- F0 E9     0870           BEQ ONE
3039- C9 A7     0880           CMP #$A7      ;'LET'
303B- F0 E5     0890           BEQ ONE
303D- C9 95     0900           CMP #$95      ;'DEF'
303F- D0 09     0910           BNE DEE
3041- 20 CC 00  0920           JSR CHRGET    ;CHECK FOR REST OF 'DEF FN'
3044- C9 9F     0930           CMP #$9F      ;'FN'
3046- F0 DA     0940           BEQ ONE
3048- D0 4B     0950           BNE ERR
                0960 ;
304A- 20 CC 00  0970 DEE       JSR CHRGET    ;CONTINUE UNTIL FIND
304D- C9 3A     0980 CMP3A     CMP #':       ;END OF STATEMENT
304F- F0 D1     0990           BEQ ONE
3051- C9 00     1000           CMP #00       ;OR END OF LINE
3053- F0 B1     1010           BEQ LINLINK
3055- C9 22     1020           CMP #'"       ;QUOTES MAY CONTAIN COLONS
3057- D0 F1     1030           BNE DEE
3059- 20 8A 30  1040           JSR QUOTES
305C- D0 EF     1050           BNE CMP3A     ;ALWAYS
                1060 ;
305E- 20 D2 00  1070 AAY       JSR CHRGOT    ;FIND OUT HOW VAR NAME ENDED
3061- F0 EA     1080 THREE     BEQ CMP3A     ;WAS IT END OF LINE OR STATEMENT?
3063- C9 AC     1090           CMP #$AC      ;WAS IT AN '='?
3065- F0 E3     1100           BEQ DEE
3067- C9 2C     1110           CMP #',       ;MORE VARS IN THIS STATEMENT?
3069- F0 B7     1120           BEQ ONE
306B- C9 28     1130           CMP #'(       ;IF SUBSCR'P'D THEN FIND END OF I
306D- F0 02     1140           BEQ FIN
306F- D0 24     1150           BNE ERR       ;IF NONE OF THESE, THEN ERROR
                1160 ;
3071- 20 CC 00  1170 FIN       JSR CHRGET    ;FIND END OF SUBSCR'P'D VAR
3074- C9 29     1180           CMP #')
3076- D0 F9     1190           BNE FIN
```

```
307B- 20 CC 00  1200          JSR CHRGET    ;AND SEE WHAT'S NEXT
307B- 4C 61 30  1210          JMP THREE
                1220 ;
307E- 20 CC 00  1230 BEE      JSR CHRGET    ;ANY MESSAGE IN 'INPUT' STATEMENT?
3081- C9 22     1240          CMP #'"
3083- D0 21     1250          BNE NAME      ;IF NOT, GET VAR NAME
3085- 20 8A 30  1260          JSR QUOTES    ;IF SO FIND END
3088- D0 F4     1270          BNE BEE       ;ALWAYS, TO SKIP ';' AFTER STRING
                1280 ;
308A- 20 5D CC  1290 QUOTES   JSR SEARCH    ;MOVE THRU STRING AND GET
308D- 20 D2 00  1300          JSR CHRGOT    ;CHAR AFTER CLOSING QUOTE
3090- A2 69     1310          LDX #$69      ;RESET DESCRIPTOR
3092- 86 66     1320          STX *DISSTK   ;STACK PTR
3094- 60        1330          RTS
                1340 ;
3095- A0 38     1350 ERR      LDY #M5-M0    ;SEND ERROR MESSAGE
3097- 20 7F 32  1360          JSR MESSAGE
309A- A9 63     1370          LDA #$63      ;SET BASE PTR TO LINE NUMB
309C- 85 EC     1380          STA *BASE     ;POSITION IN BUFFER - 1
309E- 84 ED     1390          STY *BASE+1   ;Y=0
30A0- 20 52 32  1400          JSR PR.LINUM
30A3- 4C 4C D1  1410          JMP USRRET    ;TERM PROGRAM
                1420 ;
30A6- A2 02     1430 NAME     LDX #02       ;ASSUME REAL, NONSUBSCRIPTED VAR
30A8- 86 61     1440          STX *BUFF     ;1ST POS IN BUFF IS FOR 'TYPE'
30AA- A2 00     1450          LDX #00
30AC- 86 63     1460          STX *BUFF+2   ;CLEAR  2ND CHAR IN NAME BUFF
30AE- 20 E9 CE  1470          JSR ALPHA     ;IS FIRST CHAR A LETTER?
30B1- 90 E2     1480          BCC ERR       ;ERROR IF NOT
30B3- 95 62     1490 STBUFF   STA *BUFF+1,X         ;IF SO STORE IT
30B5- E8        1500          INX
30B6- 20 CC 00  1510 GET      JSR CHRGET    ;GET NEXT CHAR
30B9- F0 34     1520          BEQ STORE     ;Z=1 IF CHAR IS 0 OR ':'
30BB- C9 AC     1530          CMP #$AC      ;'=' TOKEN MEANS END OF VAR
30BD- F0 30     1540          BEQ STORE
30BF- C9 30     1550          CMP #'0       ;IF CHAR >= '0' THEN
30C1- B0 06     1560          BCS CHKX      ;SEE IF NAME IS > 2 CHARS LONG
30C3- C9 2C     1570          CMP #',       ;A COMMA?
30C5- F0 28     1580          BEQ STORE     ;THEN STORE
30C7- D0 06     1590          BNE AG        ;IF ANYTHING ELSE, CHECK VAR TYPE
30C9- E0 02     1600 CHKX     CPX #02
30CB- 90 E6     1610          BCC STBUFF    ;IF X<2, STORE CHAR IN BUFF
30CD- B0 E7     1620          BCS GET       ;ELSE CONT
30CF- C9 24     1630 AG       CMP #'$       ;A STRING VAR?
30D1- F0 10     1640          BEQ STRING
30D3- C9 25     1650          CMP #'%       ;INTEGER VAR?
30D5- F0 14     1660          BEQ INTEGER
30D7- C9 28     1670          CMP #'(       ;SUBSCRIPTED?
30D9- D0 BA     1680          BNE ERR       ;IF NOT, THEN THERE'S AN ERROR
30DB- A9 01     1690          LDA #01       ;SET 0-BIT FOR
30DD- 05 61     1700          ORA *BUFF     ;SUBSCRIPTED VAR
30DF- 85 61     1710          STA *BUFF
30E1- D0 0C     1720          BNE STORE     ;ALWAYS
                1730 ;
30E3- A9 10     1740 STRING   LDA #$10      ;SET 4-BIT FOR
30E5- 05 61     1750 OR       ORA *BUFF     ;STRING VARS
30E7- 85 61     1760          STA *BUFF
30E9- D0 CB     1770          BNE GET       ;ALWAYS
                1780 ;
30EB- A9 80     1790 INTEGER  LDA #$80      ;SET 7-BIT FOR INTEGER VAR
30ED- D0 F6     1800          BNE OR        ;ALWAYS
                1810 ;
30EF- A0 04     1820 STORE    LDY #04       ;STORE 5 BYTES FROM BUFF
30F1- B1 EE     1830 LOADS    LDA (P1),Y
30F3- 91 EC     1840          STA (BASE),Y  ;IN VAR ARRAY
```



```
30F5- 88        1850          DEY
30F6- 10 F9     1860          BPL LOADS
30F8- 20 FE 30  1870          JSR INBAS5
30FB- 4C 5E 30  1880          JMP AAY
                1890 ;
30FE- 18        1900 INBAS5   CLC           ;INCR BASE PTR BY 5
30FF- A5 EC     1910          LDA *BASE
3101- 69 05     1920          ADC #05
3103- 85 EC     1930          STA *BASE
3105- 90 02     1940          BCC OUTS
3107- E6 ED     1950          INC *BASE+1
3109- 60        1960 OUTS     RTS
                1970 ;
310A- A9 34     1980 SET.PTRS LDA #H,HOLD   ;SET POINTERS - ALL NOT USED
310C- 85 EB     1990          STA *P0+1     ;IN EVERY SECTION OF PROGRAM
310E- 85 73     2000          STA *ADPTR1+1
3110- 85 ED     2010          STA *BASE+1
3112- A9 61     2020          LDA #L,BUFF   ;USE P1 TO
3114- 85 EE     2030          STA *P1       ;POINT TO SORT BUFFER
3116- A9 05     2040          LDA #05
3118- 85 72     2050          STA *ADPTR1
311A- A9 00     2060          LDA #00
311C- A8        2070          TAY
311D- 85 EA     2080          STA *P0
311F- 85 EF     2090          STA *P1+1
3121- 85 EC     2100          STA *BASE
3123- 60        2110          RTS
                2120 ;
                2130
                2140 ;      * * * BUBBLE SORT * * *
                2150
3124- A8        2160 DONE     TAY           ;ZERO Y
3125- 91 EC     2170          STA (BASE),Y  ;END LIST WITH 0 TO STOP SORT
3127- 20 0A 31  2180          JSR SET.PTRS  ;RESET POINTERS
312A- A9 0A     2190          LDA #10
312C- 85 EC     2200          STA *BASE     ;BASE NOW USED AS UPPER SORT PTR
312E- B1 EA     2210          LDA (P0),Y    ;CHECK 1ST BYTE OF VAR ARRAY
3130- D0 03     2220          BNE NEXT2
3132- 4C 4C D1  2230          JMP USRRET    ;NO VARS FOUND, END PROG
                2240 ;
3135- A0 00     2250 NEXT2    LDY #00
3137- B1 72     2260          LDA (ADPTR1),Y
3139- D0 03     2270          BNE SAVEBUF   ;IF NO MORE VARS THEN
313B- 4C A4 31  2280          JMP PRINT     ;GO TO PRINTOUT
                2290 ;
313E- A0 04     2300 SAVEBUF  LDY #04
3140- B1 72     2310 LOADB    LDA (ADPTR1),Y        ;PUT HIGHER VAR IN
3142- 91 EE     2320          STA (P1),Y    ;BUFFER
3144- 88        2330          DEY
3145- 10 F9     2340          BPL LOADB
3147- A0 00     2350 ZEROY    LDY #00
3149- B1 EE     2360 CPCHAR   LDA (P1),Y    ;THEN COMPARE IT TO LOWER ONE
314B- D1 EA     2370          CMP (P0),Y
314D- 90 25     2380          BCC EXCH      ;EXCHANGE IF (P0) > (ADPTR1)
314F- D0 05     2390          BNE STORBUFF  ;IF CHARS EQUAL,
3151- C8        2400          INY
3152- C0 03     2410          CPY #03
3154- 90 F3     2420          BCC CPCHAR    ;KEEP CHECKING, OTHERWISE
3156- A0 04     2430 STORBUFF LDY #04       ;PUT
3158- B1 EE     2440 LOADT    LDA (P1),Y    ;CONTENTS OF BUFFER
315A- 91 72     2450          STA (ADPTR1),Y        ;IN ADPTR1 SPACE
315C- 88        2460          DEY
315D- 10 F9     2470          BPL LOADT
315F- A5 ED     2480 PTRS     LDA *BASE+1   ;ADVANCE PTRS BY 5
3161- 85 EB     2490          STA *P0+1
```

```
3163- 85 73      2500            STA *ADPTR1+1
3165- A5 EC      2510            LDA *BASE
3167- 85 72      2520            STA *ADPTR1
3169- 85 EA      2530            STA *P0
316B- 20 8B 31   2540            JSR DEP05
316E- 20 FE 30   2550            JSR INBAS5
3171- 4C 35 31   2560            JMP NEXT2      ;AND SHUFFLE AGAIN
                 2570 ;
3174- A0 04      2580 EXCH       LDY #04        ;MOVE P0 VAR UP ONE SPACE
3176- B1 EA      2590 LOADE      LDA (P0),Y
3178- 91 72      2600            STA (ADPTR1),Y
317A- 88         2610            DEY
317B- 10 F9      2620            BPL LOADE
317D- A5 EA      2630 P0>ADPTR1  LDA *P0         ;AND THEN DECR PTRS
317F- 85 72      2640            STA *ADPTR1
3181- A5 EB      2650            LDA *P0+1
3183- 85 73      2660            STA *ADPTR1+1
3185- 20 8B 31   2670            JSR DEP05
3188- 4C 47 31   2680            JMP ZEROY
                 2690 ;
318B- 38         2700 DEP05      SEC            ;DECR P0 PTR BUT,
318C- A5 EA      2710            LDA *P0        ;NOT BELOW
318E- E9 05      2720            SBC #05        ;HOLD
3190- 85 EA      2730            STA *P0
3192- B0 0F      2740            BCS OUTD
3194- A5 EB      2750            LDA *P0+1
3196- E9 00      2760            SBC #00
3198- C9 34      2770            CMP #H,HOLD
319A- B0 05      2780            BCS STORIT
319C- 68         2790            PLA            ;PULL RETURN OFF STACK,
319D- 68         2800            PLA            ;THERE'S NO MORE,
319E- 4C 56 31   2810            JMP STORBUFF   ;SO STORE BUFFER
                 2820 ;
31A1- 85 EB      2830 STORIT     STA *P0+1
31A3- 60         2840 OUTD       RTS
                 2850 ;
                 2860
                 2870 ;     * * * PRINTOUT ROUTINE * * *
                 2880
31A4- 20 0A 31   2890 PRINT      JSR SET.PTRS   ;RESET POINTERS
31A7- A0 02      2900            LDY #02        ;CLEAR BUFFER, USED FOR COMPARISON
31A9- 91 EE      2910 ST         STA (P1),Y     ;OF VAR NAMES
31AB- 88         2920            DEY
31AC- 10 FB      2930            BPL ST
31AE- A9 0F      2940            LDA #15
31B0- 85 EA      2950            STA *P0        ;P0 NOW USED AS I/O LINE COUNTER
31B2- A2 0E      2960            LDX #14        ;SEND 28 SPACES
31B4- 20 75 32   2970            JSR CRLF.SPS
31B7- C8         2980            INY            ;WAS $FF, WANT 0
31B8- 20 7F 32   2990            JSR MESSAGE    ;PRINT HEADINGS
31BB- A0 00      3000 NEXTVAR    LDY #0
31BD- B1 EC      3010            LDA (BASE),Y   ;GET VAR TYPE
31BF- F0 E2      3020            BEQ OUTD       ;0 MEANS END OF LIST & PROGRAM
31C1- C5 61      3030            CMP *BUFF      ;SAME AS LAST TIME? - NO NEED
31C3- F0 30      3040            BEQ VAR        ;TO INDEX HERE
31C5- 85 61      3050            STA *BUFF      ;IF NOT, ESTABLISH NEW TYPE
31C7- 20 4D 83   3060            JSR CRLF
31CA- 20 4D 83   3070            JSR CRLF
31CD- A9 00      3080            LDA #00
31CF- 85 62      3090            STA *BUFF+1    ;A=0, IF NEW TYPE THEN NEW NAME
31D1- A5 61      3100            LDA *BUFF      ;GET TYPE AGAIN
31D3- 10 11      3110            BPL ANDIT      ;INTEGER TYPES HAVE NEG TYPE #
31D5- A0 30      3120            LDY #M3-M0     ;SEND '%'
31D7- 20 7F 32   3130 JMESS      JSR MESSAGE
31DA- A5 61      3140 SUBSC      LDA *BUFF      ;GET TYPE AGAIN
```



```
31DC- 4A         3150            LSR A          ;SUBSCRIPTED TYPES HAVE 0-BIT SET
31DD- 90 16      3160            BCC VAR
31DF- A0 34      3170            LDY #M4-M0     ;SEND '( )'
31E1- 20 7F 32   3180            JSR MESSAGE
31E4- F0 0F      3190            BEQ VAR        ;ALWAYS
                 3200 ;
31E6- 29 10      3210 ANDIT      AND #$10       ;CHECK FOR STRING TYPE
31E8- D0 04      3220            BNE STR
31EA- A0 29      3230            LDY #M1-M0     ;SEND ' '
31EC- D0 E9      3240            BNE JMESS      ;ALWAYS
                 3250 ;
31EE- A0 2C      3260 STR        LDY #M2-M0     ;SEND '$'
31F0- D0 E5      3270            BNE JMESS      ;ALWAYS
                 3280 ;
31F2- 20 4D 83   3290 TWO        JSR CRLF
31F5- C8         3300 VAR        INY
31F6- B1 EC      3310            LDA (BASE),Y   ;COMPARE VAR NAME TO LAST ONE
31F8- D1 EE      3320            CMP (P1),Y     ;IF IT'S NOT THE SAME
31FA- D0 0A      3330            BNE PUT        ;START NEW LINE
31FC- 48         3340            PHA   ;SAVE 1ST CHAR TEMP
31FD- C8         3350            INY
31FE- B1 EC      3360            LDA (BASE),Y   ;COMPARE 2ND CHAR
3200- D1 EE      3370            CMP (P1),Y
3202- F0 2E      3380            BEQ NUMB       ;IF EQUAL, JUST PRINT LINE NUMB
3204- 68         3390            PLA   ;GET 1ST CHAR BACK
3205- 88         3400            DEY
3206- 91 EE      3410 PUT        STA (P1),Y     ;UPDATE BUFF 1ST POS
3208- 20 4D 83   3420            JSR CRLF       ;NEW LINE
320B- C6 EA      3430            DEC *P0        ;P0 IS LINE COUNTER
320D- 10 12      3440            BPL JOCHR
320F- 48         3450            PHA            ;SAVE ACC TEMP
3210- A9 0F      3460            LDA #15        ;15 LINES/PAGE
3212- 85 EA      3470            STA *P0
3214- 20 86 8B   3480            JSR ACCESS
3217- CE 53 A6   3490            DEC TECHO      ;NO ECHO
321A- 20 58 8A   3500            JSR INTCHR     ;WAIT FOR KEY
321D- EE 53 A6   3510            INC TECHO      ;REENABLE ECHO
3220- 68         3520            PLA   ;GET 1ST CHAR BACK
3221- 20 47 8A   3530 JOCHR      JSR OUTCHR     ;PRINT 1ST CHAR
3224- C8         3540            INY
3225- B1 EC      3550            LDA (BASE),Y   ;GET 2ND CHAR AGAIN
3227- 91 EE      3560            STA (P1),Y     ;UPDATE BUFF 2ND POS
3229- D0 02      3570            BNE JOUT
322B- A9 20      3580            LDA #'         ;SUBST A SPACE IF NAME 1 CHAR LONG
322D- 20 47 8A   3590 JOUT       JSR OUTCHR
3230- D0 0A      3600            BNE RES.CNT    ;ALWAYS
                 3610 ;
3232- 68         3620 NUMB       PLA   ;1ST CHAR OFF STACK
3233- C6 E8      3630            DEC *COUNT
3235- 10 09      3640            BPL NORM
3237- A2 00      3650            LDX #00        ;NEW LINE - PUT IN SPACES
3239- 20 75 32   3660            JSR CRLF.SPS
323C- A2 05      3670 RES.CNT    LDX #05        ;MAX SIX LINE NUMS PER LINE
323E- 86 E8      3680            STX *COUNT     ;RESET COUNT OF LINE NUMB'S
3240- 20 3F 83   3690 NORM       JSR SPC2
3243- 20 3F 83   3700            JSR SPC2
3246- 20 3F 83   3710            JSR SPC2
3249- 20 52 32   3720            JSR PR.LINUM   ;PRINT LINE NUMB
324C- 20 FE 30   3730            JSR INBAS5     ;INCR PTR FOR NEXT VAR
324F- 4C BB 31   3740            JMP NEXTVAR
                 3750 ;
3252- C8         3760 PR.LINUM   INY   ;SUBR TO CALC & PRINT LINE NUMB
3253- B1 EC      3770            LDA (BASE),Y   ;PUT LINE NUM
3255- 85 B1      3780            STA *FACTO-1   ;IN FACTO REGISTER
3257- 85 B3      3790            STA *FACTO+1
```

```
3259- C8          3800            INY
325A- B1 EC       3810            LDA (BASE),Y
325C- 85 B2       3820            STA $FACTO
325E- A2 90       3830            LDX #$90
3260- 38          3840            SEC
3261- 20 FF D9    3850            JSR FLOATC      ;FLOAT IT
3264- 20 9A DB    3860            JSR FOUT        ;AND CONVERT TO ASCII IN $100
3267- A2 00       3870            LDX #00
3269- BD 01 01    3880 LOADC      LDA $101,X      ;GET LINE NUMB
326C- F0 06       3890            BEQ DPR         ;0 MEANS END OF LINE NUMB
326E- 20 47 8A    3900            JSR OUTCHR
3271- E8          3910            INX
3272- D0 F5       3920            BNE LOADC       ;ALWAYS
                  3930 ;
3274- 60          3940 DPR        RTS
                  3950 ;
3275- 20 4D 83    3960 CRLF.SPS   JSR CRLF        ;SEND CRLF & 2#X SPACES
3278- 20 3F 83    3970 SPACES     JSR SPC2
327B- CA          3980            DEX
327C- 10 FA       3990            BPL SPACES
327E- 60          4000            RTS
                  4010 ;
327F- B9 8C 32    4020 MESSAGE    LDA M0,Y        ;GET MESSAGE CHAR
3282- D0 02       4030            BNE JPRINT      ;MESSAGES END WITH 0
3284- A8          4040            TAY
3285- 60          4050            RTS             ;RETURNS WITH Z=1 & Y=0
                  4060 ;
3286- 20 47 8A    4070 JPRINT     JSR OUTCHR
3289- C8          4080            INY
328A- D0 F3       4090            BNE MESSAGE     ;ALWAYS
                  4100 ;
                  4110 ;
328C- 0A 0A 56    4120 M0         .BY 10 10 'VARIABLES USED' 13 10 10
328F- 41 52 49
3292- 41 42 4C
3295- 45 53 20
3298- 55 53 45
329B- 44 0D 0A
329E- 0A
329F- 4E 41 4D    4130            .BY 'NAME' '   LINE NUMBER(S)' 00
32A2- 45 20 20
32A5- 20 4C 49
32A8- 4E 45 20
32AB- 4E 55 4D
32AE- 42 45 52
32B1- 28 53 29
32B4- 00
32B5- 20 20 00    4140 M1         .BY $20 $20 $00
32B8- 20          4150 M2         .BY $20
32B9- 20 24 00    4160            .BY ' $' $00
32BC- 20          4170 M3         .BY $20
32BD- 20 25 00    4180            .BY ' %' $00
32C0- 28 20 29    4190 M4         .BY '( )' $00
32C3- 00
32C4- 0D 0A 45    4200 M5         .BY $0D $0A 'ERROR IN LINE ' $00
32C7- 52 52 4F
32CA- 52 20 49
32CD- 4E 20 4C
32D0- 49 4E 45
32D3- 20 00
                  4210 ;
                  4220            .EN
```


A CORRECTION ON BAS-1 AND INTEGER VARIABLES

In Issue No. 10 we stated that the BASIC (BAS-1) Reference Manual made no mention of integer variables. We stand corrected. The top paragraph on page 9 contains the sentence "If the (variable) name ends in "%", then the variable is an integer variable, and may contain only integer values."

Oh, well, our error is not quite as bad as that made by a writer in one of the popular 6502 journals who stated that SYM's BAS-1 did not support integer variables at all. Apparently he never tried to use the "%" to see what would happen.

RFI (TVI) FROM THE KTM?

One of our callers asked us what measures we had taken to reduce TV interference from our KTM-2. He stated that his KTM-2 created interference on every TV in his apartment building. We told him that we had no experience with TVI, and after he hung up, we realized we had forgotten to ask whether he was using an RF modulator on his KTM-2.

We are in an area served only by one off-the-air TV station, on Channel 12, whose antenna is within 10 miles. No UHF within 90 miles, and only marginal reception from two distant VHF stations on Channels 7 and 9. Our "entertainment" video comes in by 14 channel cable (two channeld are "scrambled"), and we have two VCRs (Beta and VHS) for taping computer system demonstrations and lectures, plus at least four TVs and monitors within 25 feet of three nearly-always working SYM/KTM systems, and have seen absolutely no signs of TVI.

Our understanding is that TVI may be most troublesome on Channel 2, which we receive via shielded cable, with no interference. Are there any SYMmers out there bothered with TVI, and if so, what can be done to minimize the problems?

COMPUTER VIDEO

We used to carry a compact SYM-1 system along with us for demonstration purposes, and often still do, not so much now to demonstrate it, but for working purposes. We decided to give up the idea of trying to demonstrate the tremendous versatility of the SYM-1 (nee the VIM - Versatile Interface Module) by actual "live" demonstrations. This is because we have a number of SYM-1 systems dedicated to special applications, including speech synthesis, music generation, high resolution black & white graphics, color graphics, semi-automated production of distribution cassettes and disks, word processing, program development, hardware development and checkout, 6809 experimentation, etc., and it is really not practical to transport all of these for show-and-tell sessions.

We now feel that it is far simpler to bring along videotaped demonstrations, instead. Most schools and governmental agencies, and many industrial facilities have, or have access to, 3/4 inch U-Matic Format VCRs. Our university video crew prepared a 28 minute tape on the SYM-1, and a Honeywell video crew videotaped a 28 minute lecture entitled "How to Select a Personal Computer" for us. These tapes are so helpful that we decided it would be nice to be able to do our own, but on the 1/2 inch Beta and VHS VCR formats (much less expensive!). We can then dub to a borrowed U-Matic (the computer science department has one) recorder for school use. Here are some thoughts on the subject:

The RCA VP3301 Video Terminal (which we reviewed several issues ago, and for which we are dealers) turns out to be just the item for the generation of both still and animated titles, and areas of uniform color for headers and trailers, and to separate segments. The VP3301 has both RS-232C (EIA) (with inverted TTL compatibility) and 20 mA current loop (CL) interfaces.

We use our VP on the 20 mA interface and call it with a version of our decwriter II printer patch, modified for two reasons: first the VP does not accept 600 baud (which was added to our decwriter), and second, the VP requires "handshaking" at its higher baud rates. On the CL interface the rates are 110, 300, and 1200 baud. On the EIA interface the rates are 110, 300, 1200, 4800, 9600, and 19,200 baud! Of course the SYM-1 software stops at 4800, but as we get going, and convert one SYM's CL interface into a second EIA interface, we'll also look into modifying the software to the 19,200 rate. What beautiful animation that could permit! As of now we're working at the 110 rate, so that the titles are generated character by character, as if being hand typed.

We lent Jack Gieryic, who has a VHS VCR system, a VP3301 to "play" with, in exchange for the use of any software he developed for it. The VP also has excellent music capabilities. The video output is available at an RCA phono jack, and the audio output at a built-in speaker. Two additional VP3XXX series terminals are available. The VP3303 provides both video and audio modulation on an RF carrier (channel 3 or 4 selectable), and the VP3501 also has a built-in direct-connect modem, so that any facility with a telephone and a "telly" can become a computer terminal location. Even if you are not into Video Recording, you might want to consider the VP3XXX series terminals purely as a color graphics output device for the SYM-1, or as a "spare" terminal.

We tried feeding the KTM-2/80 video directly into a VCR, rather than using a video camera to copy the screen, and ran into two problems:

(1) The same reason that makes the use of an RF converter impractical also operates here. The 80 column format requires around 7.2 MHz bandwidth. We will try again with a KTM-2 (the 40 column terminal), since this requires only around 3.6 MHz. Meanwhile, we'll zoom in with a camera to portions of the KTM-2/80 monitor screen to make the characters easily readable on a color TV.

(2) Monochromatic signals at frequencies near 3.59 MHz confuse color TV sets into thinking color signals are being received (this is how the Apple II generates its color graphics); spurious colors are then displayed (no problem on B/W sets!).

Jack Gieryic showed us some video recordings of his MTU Visible Memory graphics, with pretty, but difficult to predict, color fringing. The colors do enhance the graphics, but the fringes make text rather unreadable. The best solution here seems to be to avoid videotaping high resolution black and white graphics for later presentation on a color monitor (unless you have an Apple II!). Of course, if your computer outputs NTSC color signals there is no problem. When we reinstall our ColorMate Board we'll try videotaping its output. It has been temporarily removed from service because it and the FDC-1 Floppy Disk Controller cannot co-reside at the $9000 block. The ColorMate (and the FDC-1) will both be moved to an 8K system and the ColorMate will be restrapped to $7000 for testing.

ANOTHER APPLE READER/WRITER?

Dave Kemp sent us many months ago a very compact Apple II Cassette Read/Write program. We didn't publish it until now because we hadn't tested it as yet. This was because he sent us only a source code listing (not in RAE format, because he does all of his software development on a larger system, then downloads the object code to the SYM).

Our typing is slow, so we now type in only the object code, turn Dessaintes' Disassembler loose on that, and then replace the "meaningless" labels with mnemonics from the printed listing. This gives us time to study the code as we replace the labels, as well as saving us typing time. We then insert comments only for the really obscure points.

To save on space, the version printed here is uncommented, and the label size was reduced to five characters with FO S 5 (the default is 10) so that we could get two columns to the page. Incidentally, if you have only a 40 column terminal, you will get nicer screen listings if you do the same, and also put all comments on separate lines. For your information the more pertinent commented lines are given below in a separate listing.

We publish this now mainly in the hope that owners of PETs, OSIs, Ataris, etc., will be inspired to write equivalent programs for their own systems so that "pure" ASCII text files, such as, for example, those generated by TECO, can be freely transportable.

Some of you might also want to compare the relative merits and speeds of the two cassette subsystems, and might perhaps even prefer to use the Apple format!

Notice also Dave's use of a D/A converter on the A Port to display the measured times during readback (the lines involving D2A and D2AD may be omitted if you do not need them). Since we have D/A converters on both the A and B Ports (for our stereo music system), we enjoyed watching both the signal itself and the measured time display on a dual trace scope.

COMMENT LINES (EXTRACTED FROM A MORE DETAILED VERSION WITH THE USE OF RAE'S ">FI " COMMAND) FOLLOW. THE UNCOMMENTED SOURCE CODE LISTING (CUT AND PASTED TO FIT A SINGLE PAGE!) APPEARS ON PAGE 19.

```
0310  APPLE  CPX #$02 !TWO PARAMS      0890         EOR #$FF !COMPLEMENT
0340         CMP #$14 !L3 HASH CODE     0940         LDY #$FF !RESTART
0360         CMP #$1F !S3 HASH CODE     0960         CMP #$CE !???
0390         LDA #$07 !CONFIGURE        1010         AND #$40 !BIT SIX
0410         LDA #$20 !FIVE SEC HDR     1080  HEADR  LDY #$AF !650 USEC
0430  WR1    LDX #$00 !ZERO INDEX       1110         ADC #$FE !???
0510  WRBYT  LDX #$10 !WRITE BYTE       1130  WRBIT  LDY #$E1 !(F0) 250 USEC
0590  READ1  LDX #$FF !INITIALIZE       1150         LDY #$C2 !(E1) 500 USEC
0810  RBYT   LDX #$08 !READ BYTE        1180         LDA #$FF !---
0840         CMP #$A8 !(DC)             1230         EOR #$08 !---
```

SYM-PLE COPY

SYM-ple Copy is a very useful utility program for making duplicates of SYM Format tapes. It provides the user with multiple options for duplicating anything from single programs to entire cassettes, with minimal effort. SYM-ple Copy is completely relocatable, so that it can be entered far away from any programs read in.

It is necessary to have two cassette recorders, one for reading programs from the master tape, the other for recording to the copy tape. Each must have a remote jack, or the equivalent, so that both can be under computer control. In order to control them automatically, an inexpensive external circuit must be implemented, as shown in Figure 1. This circuit is essentially the same as the on-board cassette control circuitry, with the exception of resistors R1 and R2.

SYM-ple Copy is actually two programs in one. After the user starts the program a question mark appears on the display. This asks the user if he wishes to use Option A or Option B.

Option A allows the user to start the program and leave while all programs on the master tape are duplicated to the copy tape. In answer to the "?" the user enters "F" for the "fast and easy" way of copying tapes. Immediately the tape player begins reading the first program from the master tape; it then stops and the recorder writes that program to the copy tape. These steps are repeated until all programs have been copied.

(continued to page 11-20)

```
0010 ;     APPLE CASSETTE READ/WRITE
0020 ;     MONITOR EXTENSIONS FOR SYM
0030 ;   ADAPTED FROM APPLE MONITOR ROM
0040 ;         BY D. KEMP    SEPT 79
0050
0060 ;TO ENABLE:   .SD STRT,A66D
0070 ;TO WRITE :   .S3 STAD,ENAD
0080 ;TO READ  :   .L3 STAD,ENAD
0090
0100 OLD     .DE $F9
0110 CKSUM   .DE $FA
0120 BUFAD   .DE $FE
0130
0140 INCP3   .DE $B293
0150 INCMP   .DE $B2B2
0160 START   .DE $BDA9
0170
0180 TAPIN   .DE $A000
0190 D2A     .DE $A001
0200 D2AD    .DE $A003
0210
0220 TAPOU   .DE $A402
0230 TIMER   .DE $A406
0240 TIM8    .DE $A415
0250
0260 STRT    .DE $0200
0270
0280         .BA STRT
0290         .OS
0300

0200- E0 02      0310 APPLE   CPX #$02
0202- D0 61      0320         BNE ERR
0204- 20 93 B2   0330         JSR INCP3
0207- C9 14      0340         CMP #$14
0209- F0 2B      0350         BEQ READ
020B- C9 1F      0360         CMP #$1F
020D- D0 56      0370         BNE ERR
020F- 20 A9 BD   0380 WRITE   JSR START
0212- A9 07      0390         LDA #$07
0214- 8D 02 A4   0400         STA TAPOU
0217- A9 20      0410         LDA #$20
0219- 20 97 02   0420         JSR HEADR
021C- A2 00      0430 WR1     LDX #$00
021E- 41 FE      0440         EOR (BUFAD,X)
0220- 48         0450         PHA
0221- A1 FE      0460         LDA (BUFAD,X)
0223- 20 2C 02   0470         JSR WRBYT
0226- 20 B2 B2   0480         JSR INCMP
0229- 68         0490         PLA
022A- 90 F0      0500         BCC WR1
022C- A2 10      0510 WRBYT   LDX #$10
022E- 0A         0520 WRBY1   ASL A
022F- 20 A2 02   0530         JSR WRBIT
0232- D0 FA      0540         BNE WRBY1
0234- 18         0550 WRBY2   CLC
0235- 60         0560         RTS
                 0570
0236- 20 A9 BD   0580 READ    JSR START
0239- A2 FF      0590 READ1   LDX #$FF
023B- 86 FA      0600         STX $CKSUM
023D- BE 03 A0   0610         STX D2AD
0240- 20 7A 02   0620 READ2   JSR RBIT1
0243- B0 F4      0630         BCS READ1
0245- CA         0640         DEX
0246- D0 F8      0650         BNE READ2
0248- 20 7A 02   0660 READ3   JSR RBIT1
024B- 90 FB      0670         BCC READ3
024D- 20 7A 02   0680         JSR RBIT1
0250- 20 67 02   0690 READ4   JSR RBYT
0253- 81 FE      0700         STA (BUFAD,X)
0255- 45 FA      0710         EOR $CKSUM
0257- 85 FA      0720         STA $CKSUM
0259- 20 B2 B2   0730         JSR INCMP
025C- 90 F2      0740         BCC READ4
025E- 20 67 02   0750         JSR RBYT
0261- 45 FA      0760         EOR $CKSUM
0263- F0 CF      0770         BEQ WRBY2
0265- 38         0780 ERR     SEC
0266- 60         0790         RTS
                 0800
0267- A2 08      0810 RBYT    LDX #$08
0269- 48         0820 RBYT1   PHA
026A- 20 77 02   0830         JSR RBIT
026D- C9 A8      0840         CMP #$A8
026F- 68         0850         PLA
0270- 2A         0860         ROL A
0271- CA         0870         DEX
0272- D0 F5      0880         BNE RBYT1
0274- 49 FF      0890         EOR #$FF
0276- 60         0900         RTS
                 0910
0277- 20 88 02   0920 RBIT    JSR GETTR
027A- 20 88 02   0930 RBIT1   JSR GETTR
027D- A0 FF      0940         LDY #$FF
027F- 8C 15 A4   0950         STY TIM8
0282- C9 CE      0960         CMP #$CE
0284- 8D 01 A0   0970         STA D2A
0287- 60         0980         RTS
                 0990
0288- AD 00 A0   1000 GETTR   LDA TAPIN
028B- 29 40      1010         AND #$40
028D- C5 F9      1020         CMP $OLD
028F- F0 F7      1030         BEQ GETTR
0291- 85 F9      1040         STA $OLD
0293- AD 06 A4   1050         LDA TIMER
0296- 60         1060         RTS
                 1070
0297- A0 AF      1080 HEADR   LDY #$AF
0299- 20 AB 02   1090         JSR WRBI2
029C- D0 F9      1100         BNE HEADR
029E- 69 FE      1110         ADC #$FE
02A0- B0 F5      1120         BCS HEADR
02A2- A0 E1      1130 WRBIT   LDY #$E1
02A4- 90 02      1140         BCC WRBI1
02A6- A0 C2      1150         LDY #$C2
02A8- 20 AB 02   1160 WRBI1   JSR WRBI2
02AB- 48         1170 WRBI2   PHA
02AC- A9 FF      1180         LDA #$FF
02AE- CC 06 A4   1190 WRBI3   CPY TIMER
02B1- 90 FB      1200         BCC WRBI3
02B3- 8D 15 A4   1210         STA TIM8
02B6- AD 02 A4   1220         LDA TAPOU
02B9- 49 08      1230         EOR #$08
02BB- 8D 02 A4   1240         STA TAPOU
02BE- 68         1250         PLA
02BF- CA         1260         DEX
02C0- 60         1270         RTS
                 1280
                 1290         .EN
```

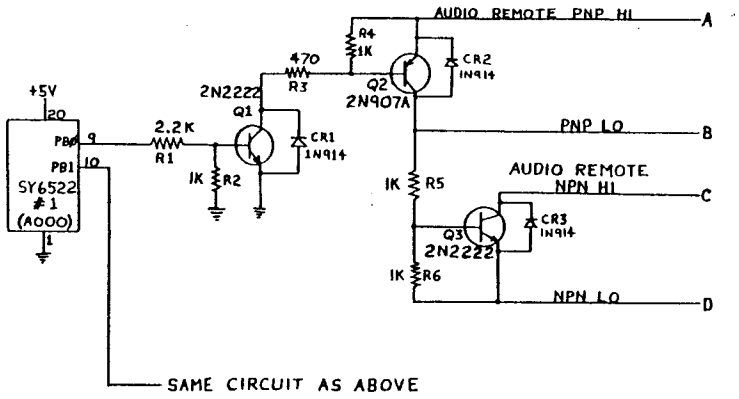

SYM-PLE COPY (continued from page 11-18)

Option B allows the user full control over which programs are to be copied. In answer to the initial "?" the user may hit any key except "F", for example, "D", for do-it-yourself! When the key is hit the player reads in the first program and stops, and the ID and the starting address of the program are displayed. The user may enter "0" to bypass copying, if he so desires. Otherwise, if he wishes a copy to be made, he may enter either a "1" followed by two hex digits which will become the new ID, or any other character, in which case the ID will remain the same as on the source cassette. The process is repeated for each file on the master tape.

Only the first six locations in page zero are used. These are for EAL, EAH, SAL, SAH, ID, and a scratch byte, respectively. A "safe" origin for SYM-ple Copy in smaller systems would be at $0006, since it is good programming practice for 6502 systems to origin most programs at $0200 and above, and for SYM programs to do their own initialization of page zero (and page one), if required. This is because SYM will "hang-up" when reading data from cassettes which cross the page zero/page one boundary, and reading cassette data across the page one/page two boundary will clobber the stack and any returns you may have saved there!

SYM-PLE COPY - BY: P. GLENN NORMAN, 806 WAVECREST, HOUSTON, TX 77062

[EDITOR'S NOTE: This program will work with BAS-1 files (which all start at $0201, incidentally) but Option B will not be usable with RAE-1 files. This is because RAE-1 files are dumped with an initial header in which the File Number is imbedded, and all headers and files are dumped to tape with ID = 00. RAE-1 is designed to work with a dual cassette system such as Mr. Norman suggests, and so is most of Jack Brown's software, but with the write casseette remote driven by CB2 and the read cassette remote driven by PB7 of VIA #1, rather than by PB1 and PB0 as Figure 1 shows.]



NOTE: PB0 controls the tape player
PB1 controls the tape recorder
Refer to the SYM-1 Reference Manual for a particular recorder's hookup.
If outputs C & D are used, A must be tied to +5V.

Figure 1

AUDIO CASSETTE REMOTE CONTROL

SYM-PLE COPY

```
0300  20 86 8B          JSR  ACCESS   Unwrite System RAM
0303  A9 09       HERE: LDA  #$09     Set up ability
0305  20 A5 89          JSR  CONFIG       to use display
0308  A9 53             LDA  #$53     Load "?" in accumulator
030A  8D 00 A4          STA  DIG      Put "?" on display
030D  20 23 89          JSR  KEYQ     Is key down on keypad?
0310  F0 F1             BEQ  HERE     If no, keep "?" displayed
0312  20 AF 88          JSR  GETKEY   If yes, get that key
0315  85 05             STA  $0005        and store it in $0005
0317  A9 03             LDA  #$03     Configure PB0 & PB1
0319  8D 02 A0          STA  $A002        as outputs
031C  A9 01       BEGIN: LDA  #$01     Tape player, on
031E  8D 00 A0          STA  $A000    Tape recorder, off
0321  A0 80             LDY  #$80     Set up mode for SYM format
0323  20 A9 8D          JSR  START    Initialize
0326  20 52 8D  SEARCH: JSR  SYNC     Get in sync
0329  20 E1 8D    DATA: JSR  RDCHTX   Read first character
032C  C9 2A             CMP  "*"      Start of data?
032E  F0 06             BEQ  LOAD     If so, get data
0330  C9 16             CMP  "sync"   If no, sync character?
0332  D0 F2             BNE  SEARCH   If not, start sync search
0334  F0 F3             BEQ  DATA     If yes, keep looking for "*"
0336  A9 80       LOAD: LDA  #$80     Reset to SYM mode
0338  85 FD             STA  MODE         for tape format
033A  20 E5 8D          JSR  RDBYTH   Read ID off tape
033D  8D 00 A4          STA  DIG      Display on LED (not decoded)
0340  85 04             STA  $04      Store ID in user buffer
0342  20 74 8E          JSR  RDCHK    Get SAL from tape
0345  85 FE             STA  BUFADL   Put in monitor buffer
0347  85 02             STA  $02      Also store in user buffer
0349  20 74 8E          JSR  RDCHK    Get SAH from tape
034C  85 FF             STA  BUFADH   Put in monitor buffer
034E  85 03             STA  $03      Also store in user buffer
0350  20 74 8E          JSR  RDCHK    Get EAL from tape
0353  8D 4A A6          STA  EAL      Save in monitor buffer
0356  85 00             STA  $00      Also store in user buffer
0358  20 74 8E          JSR  RDCHK    Get EAH from tape
035B  8D 4B A6          STA  EAH      Save in monitor buffer
035E  85 01             STA  $01      Also store in user buffer
0360  20 DE 8C          JSR  LT7H     Ok, read data off tape
0363  90 02             BCC  OK       Data read in ok?
0365  B0 BA       BACK: BCS  BEGIN    No - start over
0367  A5 03         OK: LDA  $03      Pick up SAH from buffer
0369  20 FA 82          JSR  OUTBYT   Display on LEDs
036C  A5 02             LDA  $02      Pick up SAL from buffer
036E  20 FA 82          JSR  OUTBYT   Display on LEDs
0371  A5 04             LDA  $04      Pick up ID from buffer
0373  20 FA 82          JSR  OUTBYT   Display on LEDs
0376  A5 05             LDA  $05      Pick up operation type
0378  C9 46             CMP  "F"      See if user had hit "F"
037B  F0 15             BEQ  KEEP     Yes - no need to wait
037D  A9 00             LDA  #$00     Tape recorder, off
037F  8D 00 A0          STA  $A000    Tape player, off
0381  20 AF 88          JSR  GETKEY   Wait for user to hit key
0384  C9 30             CMP  "0"      Is choice = "0"?
0386  F0 94             BEQ  BEGIN    Yes - then start all over
0388  C9 31             CMP  "1"      Is choice = "1"?
038A  D0 05             BNE  KEEP     No - keep record as is
038C  20 D9 81          JSR  INBYTE   If "1", get ID from user
038F  85 04             STA  $04          and store in buffer
0391  A2 FB       KEEP: LDX  #$FB     Load pointer with minus 5
0393  B5 05      TABLE: LDA  $05,x    Pick up all data from buffer
0395  9D 4F A6          STA  $A64F,x  Store data in monitor area
0398  E8               INX           Increment pointer
0399  D0 F8           BNE  TABLE     Keep loading if not finished
039B  A9 02           LDA  #$02      Tape player, off
039D  8D 00 A0        STA  $A000     Tape recorder, on
03A0  A0 80           LDY  #$80      Load Y with SYM format
03A2  20 87 8E        JSR  DUMPT     Save data on tape
03A5  38              SEC            Ok, start
03A6  B0 BD           BCS  BACK            all over again
```


"PRETTY-PRINTING" IN RAE

Here is a small section of a program sent to us by John Blalock. He has solved the problem of making the comments following one byte instructions line up with the comments following multi-byte instructions in a very "pretty" way.

```
                0001 PTR        .DE 0
                0002 COUNT      .DE 0
                0003
0200- 20 11 02  2540 GETCH      JSR SAVER     ;save all registers on stack
0203- 08        2550            PHP :         ;save flag register separately
0204- A0 00     2560            LDY #0        ;clear Y register
0206- A5 00     2570            LDA *COUNT    ;was COUNT = zero ?
0208- D0 07     2580            BNE ONE?      ;no, then branch
020A- C8        2590            INY :         ;it was zero, add 1 to Y
020B- B1 00     2600            LDA (PTR),Y   ;get MSD of line number
020D- E6 00     2650            INC *COUNT    ;now COUNT = one
020F- D0 00     2660            BNE NDONE     ;branch always
                9001 ONE?
                9002 SAVER
                9003 NDONE
```

A VERY USEFUL "SIGNAL GENERATOR"

Occasionally SYMmers may have troubles with their SYMs failing to operate when new RAM or ROM is added. This is often due to some added memory being "stuck" in the selected position so that its data is always dumping to the data lines, due to faulty decoders, or whatever. If you have a scope, or even just an inexpensive logic probe, all you need is a simple device to get your SYM to cycle through all 64K addresses, so that you can observe the responses throughout the system.

Volume 1, Issue 3, Page 1, of Commodore's TECHTOPICS describes just such a device, which they call a NO OP TESTER. In brief, just take a "spare" 6502, and bend up pins 26 through 33 so that they will not fit into the socket. These pins are data lines DA7-DA0, respectively. Next, wire pins 26, 27, 28, 30, and 32 to pin 8 (+5V), and pins 29, 31, and 33 to pin 21 (GND). Install this "doctored" 6502 into your system and then do your signal tracing.

What you have done is forced the 6502 data lines to "read" $EA, which is the NOP code. Since NOP is a two cycle operation, the 6502 will count through all 64K addresses in 128K useconds, or at a 7.63 Hz rate. You should then "probe" address lines, decoder outputs, chip selects, etc.

Just for the fun of it, we wired up a NOOP TESTER, and checked out the address decoding chips on a working SYM with both a scope and an under $20.00 logic probe from Radio Shack. We may make up a 6507 version for use in KTM-2 trouble-shooting. (Thanks to Chuck Harrison, of Groton, CT, for sending us the copy of TECHTOPICS and other valuable material.)

SEAT THOSE CHIPS

FORETHOUGHT PRODUCTS, 87070 Dukhobar Road, Eugene, OR 97402, makes a number of accessory products for the AIM 65 which will also work with the SYM-1. We quote from their newsletter, "The AIM-Mate Monitor", Vol. 1, No. 3, some advice which is also pertinent to the SYM:

"A number of AIM 65 system problems have been traced to faulty IC sockets on older AIM 65 boards. These sockets, which make contact with only the outside shoulder of the IC pin, can develop a high resistance between the socket and the IC pin over time. If trouble occurs with older AIM 65 boards, try re-seating all the ICs (pressing firmly on both ends will usually do the trick) before you ship it off for repair. Keeping the ICs firmly seated in their sockets (especially the 40-pin ICs) will often head off system trouble with these not-so-perfect sockets. Note: Newer AIM 65 boards use a socket type which is not subject to these problems."

We pointed out this problem as existing with some SYMs and KTMs in an earlier issue. The types of sockets used by Synertek Systems Corporation do vary from one production run to the next, and often differ from 18-pin to 24-pin to 40-pin types, so you'll just have to look at your own systems to see which you have. Meanwhile, "flexing your boards and wiggling your chips" often helps, at least temporarily, in "fixing" some of your intermittent problems. Our FODS system gives an error message when what has been down-loaded to RAM does not check when compared immediately to the contents of the disk (really a great feature). Whenever this happens, we wiggle the connectors on our external 16K RAM Board (one made by Synertek to fit the Motorola EXORCISOR bus) and the problem clears up.

MORE ON THE CASSETTE INTERFACE

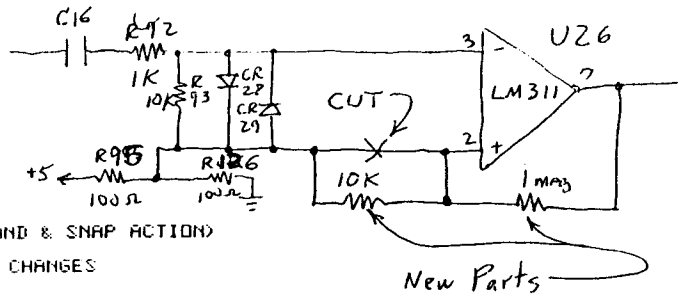
TRANSCONTINENTAL MEMO

FROM: JERRY AVINS
TO: LUX LUXENBERG
SUBJECT: SYM TAPE INTERFACE

139 KENDALL RD.
KENDALL PARK
N.J. 08824

DEAR LUX,

THE OTHER DAY, I HAD SOME TROUBLE WITH A TAPE THAT HAD WORKED OFTEN IN THE PAST, PROVIDED I USED A "GOOD" RECORDER AT THE "RIGHT" VOLUME. A QUICK LOOK WITH THE OSCILLOSCOPE RAISED MY EYEBROWS, TURNED MY STOMACH, AND CAUSED MY HEART TO SINK. THE RISETIME OF THE COMPARITOR OUTPUT WAS VERY LONG, AND THE TRANSITION VERY IRREGULAR. AFTER REFORMATTING MY ANATOMY, I TOOK A HARD LOOK AT THE SOFT ERRORS.



HYSTERESIS (DEAD BAND & SNAP ACTION)
CIRCUIT CHANGES

THE SCHEMATIC SHOWED THAT NO HYSTERESIS IS PROVIDED, AND BEFORE CHANGING THE DIODE CONNECTIONS AS J. SINNETT (SYM-PHYSIS 3-4) SUGGESTS - A GOOD IDEA THAT I HAVEN'T GOTTEN AROUND TO YET - I CHOSE TO INSTALL THE HYSTERESIS. IN THE DIAGRAM , THE 10K RESISTOR MAKES THE HYSTERESIS POSSIBLE AND INCIDENTALLY TEMPERATURE-COMPENSATES THE COMPARITOR. THE 1 MEG RESISTOR COULD BE VARIED TO CHANGE THE AMOUNT OF HYSTERESIS, BUT THE NEED SHOULD NOT ARISE. THIS MOD DOESN'T INTERFERE WITH BIASING THE COMPARATOR TO MAKE PB6 ON U25 AVAILABLE. THE NEW RISETIME IS BETTER THAN MY AUDIO SCOPE CAN FOLLOW, SO THERE IS NO LONGER ANY NEED TO TURN VOLUME UP TO WHERE RECTIFICATION BECOMES A PROBLEM.

NOW ALL OF MY CHEAP RECORDERS ARE "GOOD", AND MUCH LOWER VOLUMES ARE "RIGHT". I JUST TURN UP THE KNOB UNTIL THE 'AUDIO' LED GLOWS DIMLY AND THINGS WORK FINE. INCIDENTLY, C16 AT .22 OR .05 MICROFARADS WORKS ABOUT AS WELL: MAYBE THE BEST VALUE IS IN THE MIDDLE!

P.S. In a later telecon Jerry says that, in his opinion, after many experiments, a 0.22 ufd capacitor works best at C16. We feel that the choice may depend on the recorder being used. We like the smaller values since low frequency response is not required, and the smaller values reduce the effects of any 60 Hz hum present, and permit faster "settling" if there is a DC component at the input to C16. Slow settling could (and does) prevent RAE GEts from locking onto the short synch bursts if the read recorder is started under remote control.

Many recorders do not have a DC-blocking capacitor at the earphone jack. For example, our Radio Shack Realistic CTR 80(A) puts out -0.47 V at the earphone jack when in STOP; this jumps to over 5.2 V and settles down to 2.77 V when in PLAY. When we parallel the jack with an 8 ohm earphone and then remove the earphone the polarity reverses (this DC shift is one reason we recommend leaving an earphone in; the other is for proper loading).

MORE ON COPYRIGHTS

ITEM 1

We received, through Jack Gieryic, a copy of the Honeywell Computer Club Newsletter, dated February/March 1981 (sic, it should have said 1982!), with an article by Dan Buchler, entitled "Copyright Software Considerations for Microprocessor Users", from which we quote the following sentence:

". . . If you have two persons using a program on the same or different systems, you may not copy a copyright program simply for the convenience of the second person who wants to use the system. . . ."

We feel that the home environment is so distinctively different from the traditional academic and industrial environments in which computers once exclusively resided, that whatever family members do with their "family" computers in the privacy of their own homes must be treated differently under the law.

We treat purchased software much as we do a reference book (with the exception that we immediately make a backup copy). We buy only one copy, and each family member uses it as required. Since we have elected to satisfy our family requirements by providing individual systems for each user, rather than with a single time-shared multi-user system, each of the systems has a copy available on its own mass storage device. This is for convenience mainly, and it is very unlikely that two copies are being used simultaneously.

ITEM 2

We have just received a copy of Saturn Software's SK-FORTH 79 (Release 2.0), and a beautiful package it is, indeed. The two manuals which come with the package are extremely thorough, and, of course, are coprighted!

We worked with Jack Brown on the production of the manuals for Release 1.0, and we know how much time and effort went into those, and what the printing costs for a small production run can be, so we have a pretty good idea of how many copies of Release 2.0 must be sold in order for Jack Brown to break even on his production costs, let alone grow exorbitantly rich on the profits.

We certainly hope that Jack finds it worth his time and effort to continue publishing such quality software, with full source code available. He can only do this if enough copies are sold. This means that we, as users, should ask ourselves how we would feel if Jack were giving away, or swapping, copies of similiar quality software we ourselves were trying to market, whenever we are tempted to exchange a copy of FORTH for a copy of Pascal, or whatever!

ITEM 3

Source code is protected under the copyright law in much the same manner as any other "literary" work. But what about object code, in ROMs, for example?

Richard H. Stern, in the February 1982 issue of Computer Design, Vol. 21, No. 2 (pp. 131-144), in an article entitled "Copying ROMs: Right or Wrong" cites the two following court decisions, which should answer the question(?).

(1) 1979: Chicago Federal Trial Court, in Data Cash Systems, Inc v JS&AA Group, Inc - - ROMs ARE NOT protected under copyright law.

(2) 1981: San Francisco Federal Trial Court, in Tandy Corp v Personal Micro Computers, Inc - - ROMs ARE protected under copyright law.

Take your choice!

ON ROMS, SRAMS, AMD EPROMS

We will be rebuilding our EPROM burner(s) to handle 2532s and/or 2732s, and, while we are at it, we will add some "convenience" features to be able to download 2K ROMs as well, in particular those with chip-select polarities different from "standard", i.e., those which we can't just plug into a SYM for reading. Examples of such ROMs are those in the Apple II, and, closer to home, the "main" ROM in the KTM.

We have D(ynamic)RAM at $9000 ("surplus" from the 32K Beta Board) on our main development system in which we test and debug programs to be burned into 2716 EPROMs at the same address for OEM systems. A variety of 2K x 8 S(tatic)RAMs, (some CMOS) - Hitachi 6116, TMM 2016, NEC 446 and 447, Toshiba 5516, etc. - is now available which are pin compatible with the 2716s, and may be used for similiar program development. We prefer RAM to ROM, anyway, in disk systems (except for a BOOT ROM), and so will be putting a 6116 in at $F000 in our CODOS system.

If you plan to use only 2K EPROMs or SRAMs in the SYM sockets, you might wish to abandon the wiring convention suggested for 2716s used on the SYM, as described in Table 4-3a of the SYM-1 Reference Manual. This convention was adopted so that pin 20 could be used for chip selection for all ROMs and EPROMs used on the SYM. The standard convention for 2716s is to use pin 18 as the Chip Enable (low) and to tie pin 20 - Output Enable (low) to ground. This choice has the added advantage that the 2716s are placed in a low power "standby" mode when not selected. Pin 21 should remain connected to +5 V. The only change then needed when installing a 2K x 8 SRAM in place of a 2716 is to rewire pin 21 to RAM R/W (Read-High/Write-Low), which is available at pin Z of the Expansion Connector (E).

Mitchell G. VanOchten, of Livonia, MI, recommends the following method of installing SRAMs in U21, U22, and/or U23:

> Tie K, L, and/or M (pins 20) to ground at jumper position 2 - 3.
> Tie F, G, and/or H (pins 21) to RAM R/W at E - Z.
> Tie B, C, and/or D (pins 18) to the desired 2K address block at the appropriate jumper point, with external 2.2 K pull-up resistors to +5 V.

Mr. VanOchten reports that he had spurious addressing problems when using pins 20 for chip selection, and that the method presented above eliminated the troubles. We have not yet installed our "sample" SRAM, so we don't know if the "fix" he suggests is necessary. We would prefer to use the pull-up resistors already on board at K, L, and M. Our own suggestion would be to tie K, L, and M to the 2K address block jumpers, as recommended in the reference manual, but then tie B, C, and D to H, L, and M, respectively, so that CE (pins 18) and OE (pins 20) are tied together. The power-saving standby mode is thus still enabled.

SYNERTEK ROMS

Here is a list of the Synertek proprietary ROMs used in the SYM-1. We do not have any information on the ROMs used in the SYM-2, MDT-1000, KTM-3, etc.

02-0012A	2332 (4K)	MON 1	(SY 1.0)
02-0012B	2332 (4K)	*MON 2	(SY 1.1)
02-0053A	2364 (8K)	RAE-1	(Requires inversion of A12)
02-0053B	2364 (8K)	*RAE-1	(Current one chip version)
02-0023A,24A	2x2332 (4K,4K)	*RAE-1/2	(Two chip version)
02-0058A	2364 (8K)	*BAS-1	(One chip version)
02-0019A,20A	2x2332 (4K,4K)	BAS-1	(Two chip version)

NOTES: The suffixes "A" and "B" in some production runs are replaced by "-01" and "-02", respectively. "*" indicates current production.

KTM-2/80 CHIPS

The 2K ROM (2316E) currently being supplied with the KTM-2/80s bears the house number 02-0050-02 (the -02 indicates a "B" version). Our original "Old Faithful" KTM-2/80 has a ROM marked 02-0050-A. Since we have not disassembled either we do not know how the two ROMs differ. It is possible that the differences may be significant when when you replace the ROM with an EPROM of your own programming.

The KTM-2s use the 02-0016B as the main ROM. The very, very, old KTM-2s used the 02-0016-01 (we had one of these), and the display was much too wide for the typical overscanning type of monitor, or a TV set (with RF input) to handle. Switching from the -01 (or A) ROM to the -02 (or B) ROM required also a change of the crystal from 12.598 MHz to the current 14.31818 MHz value.

All KTMs use 02-0017B ROMs for character generation; unlike all other Synertek 2316Es these are directly replaceable by 2716 EPROMs, since the three CS lines have the same polarity specifications.

Bob Myers asked us to point out that some KTMs use 20-pin 8304s at U34 and U35, while others use 18-pin 8T245s. The board will accept either type, although all the manuals we have seen specify the 8304. The 8304 is described in the manual as a port, bi-directional. The 8T245 is similiar to the 74245, but has a different pinout.

MODIFYING KTM-2/80 ESCAPE SEQUENCES

The following extracts from a recent letter from Dr. Strube provide additional information on KTM-2/80 customization. Note that he, too, is an experimental psychologist. The FORMATTER he describes is even more versatile than SWP-1! We have not tried it ourselves, as yet, because we must first "recustomize" it for our own system configurations(s), which differ from his in memory mapping, etc. His instruction manual is superb. We'll be contacting him to see if he wishes to offer it for sale.

D r. G E R H A R D S T R U B E

Sckellstraße 5 D-8000 München 80 Tel. 089-4801417

Re: Customizing the KTM, and text FORMATTER

thank you for including my notes on the KTM in the latest issue of SYMPHYSIS. Since you now got an EPSON printer, with a real wealth of ESC codes (not all compatible with the KTM), I should like to point out how to 'customize' KTM escape sequences.

The 2k KTM program (let us assume addresses from $000 to $7FF) tests for ESC at locations $58C and $5DB by CPX §$D8 (backwards as usual, so $D8 actually means $1B). Ensuing CPX commands test for all the ESC sequences:

LOCATION	CPX §$	MEANING	
$5C9	BC	=	abs. cursor addr.
$5D7	D4	+	rel. cursor addr.
$5E3	A2	E	form feed
$5EA	12	H	home
$5F4	52	J	clear EOS
$5FB	D2	K	clear EOL
$602	E2	G	enter graphics mode
$60F	4A	R	enter reverse mode
$617	E6	g	leave graphics mode
$624	4E	r	leave reverse mode
$62C	36	1	aux. port off
$639	32	L	aux. port on

I am glad to credit my colleague, Dr. Werner Schubö, for the discovery of these addresses. On my system, I have changed the ESC 1 to an ESC CR in order to avoid having printed an '1' when I switch off my printer (which is connected to the KTM aux port).

My printer, by the way, is an Olivetti typewriter which uses daisy-wheels and prints up to 30 chars. per second. As you may have guessed, it is the most expensive part of my system (about $ 1600), but, since I use it for all my manuscripts, it is indispensable. The rest of the system consists of a SYM, together with a Computerist DRAM, a Philips Mini-DCR (digital cassette recorder, 6kBaud, ECMA norm), and an Anderson-Jacobson modem (connecting my SYM to a Cyber 175). Through the addition of two 6551 ACIAs, the modem and the KTM are both handled by interrupt. - I use a second, 'naked' SYM, with some analog and digital interfaces, for control of experiments, then read the data into my SYM at home, send them to the Cyber for statistical analysis, and get the results back to where I write the reports (I'm an experimental psychologist, by the way).

Since you took interest in the text formatting program I use, I have prepared some information which, along with the source included, should enable you to adapt FORMATTER to your system with little effort. I'm eager to get your remarks, since I do not know other formatters for RAE, e.g. the Moser TWP.

Sincerely yours,

Ihr

CONVERTING TTY OUT TO A SECOND CRT OUT

Here's a very simple way to convert SYM's 20 mA Current Loop (CL) output to Inverted TTL output. Remember that Inverted TTL is accepted by most modern modems (DCE - Data Communication Equipments) and/or terminals and printers (DTE - Data Terminal Equipments) which conform to RS-232C (EIA) specifications. All such equipments designed around the 1488/1489 transmitter/receiver chip pair will accept Inverted TTL. All Epson serial interface adapters accept Inverted TTL, so that if you want to free your parallel interface for more interesting uses, such as Voice I/O, EPROM burning, or whatever, here is how to do so.

Incidentally, the SYM-1 is configured as a DCE, the main port on the KTM as a DTE, and the aux port on the KTM as a DCE. When interconnecting DCEs to DTEs, wire 2 to 2 and 3 to 3. When interconnecting DCEs to DCEs or DTEs to DTEs, wire 2 to 3 and 3 to 2. In all cases 7 is the signal ground on both. Be careful in using pin 1 as a signal ground, as on some equipments it is connected to the third wire of the power cord, and accidents can happen in this area.

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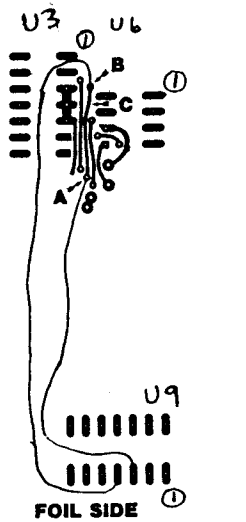
Dear Lux,

To modify the current loop output to the same configuration as the CRT output for inverted TTL output to a serial printer, an inverter and a resistor must be added. This was discussed in an earlier newsletter.



An easy way to do this is to cut the foil at point "C" located on the foil side of the board between U3 and U6. Solder a wire from point "A" to pin 3 of U9 (input to inverter), and solder a wire from point "B" to pin 4 of U9 (output of inverter). Push the wires right into the feedthrough holes at points "A" and"B". You have now connected the unused inverter in U9 between PB5, pin 18 of U27, and the base resistor of Q30. (See fig. 4.2 in the Sym Reference Manual.)

Next connect a 200 or 220 ohm resistor from the emmiter of Q30 to ground.

This is done by first locating resistor R110. On the newer SYM-1's R110 is located just to the right of pins 13 and 14 of the "K" connector. On the bottom of the board, solder the new resistor from the inside end (the end farthest from the "K" connector) of R110, to pin 12 of the "K" connector (ground).

However, on older boards, that have discrete resistors instead of RN1, R110 is located about ½ inch down from the "K" connector and your new resistor should be soldered to the outside end (nearest board edge) of R110 and Pin 12 of the "K" connector. This completes the modification.

I am using this port to drive an Epson MX-80 printer, which is equiped with the 2K buffered serial interface. I have connected the "Busy" signal, pin 20 of the printer, to pin "K" of the "A" connector as prescribed by Browns Extended-Sym Basic. This allows me to operate the KTM-2/80 at 4800 baud and the printer at 2400 baud. It works GREAT!

Before I connected the "Busy" signal I was operating the printed at 1200 baud. This worked OK for short listings but for longer ones, above 2.5K or so it was too fast and I had to reduce it to 600 baud.

I like the serial printer interface because it frees the ports for other purposes.

Harold Hansen

A BASIC DISASSEMBLER

Here's a handy little utility program for BASIC users who have a once-in-a-while need to use a disassembler to help them debug a USR function, or perhaps make a few minor changes. Dean Garth, its author, would like to organize a users' group in his area. His address is 28619 Golden Meadow Drive, Rancho Palos Verdes, CA 90274.

The workings of the disassembler are easy to figure out. It is a so-called "table-driven" disassembler, and by changing the table entries it can be made to work with any micro, such as, for example, the 8049 as used in the Epsons. Following the LISTing is a disassembly of a portion of SUPERMON, obtained by answering the START ADDRESS ? and END ADDRESS ? questions by &"8000", and &"80FF", respectively.

```
100 REM """""""""""""""""""""""""""
110 REM "  A BASIC DISASSEMBLER  "
120 REM "       DEAN GARTH       "
130 REM """""""""""""""""""""""""""
140 DIM H$(15),A(15),B(15)
150 FOR K=0 TO 15: READ H$(K),A(K),B(K):NEXT K
160 DIM C$(15,15)
170 FOR K=0 TO 14
180 FOR J=0 TO 15
190 READ C$(J,K)
200 NEXT J
210 NEXT K
220 INPUT "START ADDRESS ? ";X
230 INPUT "END ADDRESS ? ";Y
240 PRINT
250 PRINT
260 PRINT "ADRESS";TAB(9);"NMEMONIC";TAB(21);"OPCODE"
270 PRINT "---------------------------"
280 IF X>0 THEN 300
290 X=65536+X
300 IF Y>0 THEN 320
310 Y=65536+Y
320 C=PEEK(X)
330 A1=INT(X/4096): B1=X-A1*4096
340 C1=INT(B1/256): D1=B1-C1*256
350 E1=INT(D1/16): F1=D1-E1*16
360 PRINT H$(A1);H$(C1);H$(E1);H$(F1);TAB(9);
370 E2=INT(C/16): D2=C-E2*16
380 IF D2>0 THEN 400
390 F=A(E2)-1: GOTO 490
400 IF D2>6 THEN 420
410 F=1: GOTO 490
420 IF D2>8 THEN440
430 F=0:GOTO 490
440 IF D2>9 THEN 460
450 F=B(E2)-1: GOTO 490
460 IF D2>10 THEN 480
470 F=0: GOTO 490
480 F=2: GOTO 490
490 PRINT C$(E2,D2);TAB(21);H$(E2);H$(D2);: IF F=0 THEN 550
500 FOR K=1 TO F
510 C=PEEK(X+K)
520 D3=INT(C/16): E3=C-D3*16
530 PRINT SPC(1);H$(D3);H$(E3);
540 NEXT K
550 PRINT
560 X=X+F+1
570 IF X>Y THEN 950
580 GOTO 320
590 DATA 0,1,2,1,2,3,2,3,2,3,2,3
600 DATA 4,1,2,5,2,3,6,1,2,7,2,3
610 DATA 8,0,0,9,2,3,A,2,2,B,2,3
620 DATA C,2,2,D,2,3,E,2,2,F,2,3
630 DATA BRK,BPL,JSR,BMI,RTI,BVC,RTS,BVS, ,BCC,LDY IMM
640 DATA BCS,CPY IMM,BNE,CPX IMM,BEQ,ORA IND X,ORA IND Y
650 DATA AND IND X,AND IND Y,EOR IND X,EOR IND Y
660 DATA ADC IND X,ADC IND Y,STA IND X,STA IND Y
670 DATA LDA INDX,LDA IND Y,CMP IND X,CMP IND Y
680 DATA SBC IND X,SBC IND Y, , , , , , , , , , ," "
690 DATA LDX IMM, , , , , , , , , , , , , , , , ," "
700 DATA " ", , , , , ,BIT Z PAGE, , , , ," "
710 DATA STY Z PAGE, STY Z PAGE X,LDY Z PAGE,LDY Z PAGE X
720 DATA CPY Z PAGE, ,CPX Z PAGE, ,ORA Z PAGE
730 DATA ORA Z PAGE X,AND Z PAGE,AND Z PAGE X,EOR Z PAGE
740 DATA EOR Z PAGEX,ADC Z PAGE,ADC Z PAGE,STA Z PAGE
750 DATA STA Z PAGE X,LDA Z PAGE, LDA Z PAGE X
760 DATA CMP Z PAGE, CMP Z PAGE X,SBC Z PAGE,SBC Z PAGE X
770 DATA ASL Z PAGE,ASL Z PAGE X,ROL Z PAGE,ROL Z PAGE X
780 DATA LSR Z PAGE,LSR Z PAGE X,ROR Z PAGE,ROR Z PAGEX
790 DATA STX Z PAGE,STX Z PAGE Y,LDX Z PAGE,LDX Z PAGE Y
800 DATA DEC Z PAGE,DEC Z PAGE X,INC Z PAGE,INC Z PAGEX
810 DATA " ", , , , , , , , , , , , , , , ," "
820 DATA PHP,CLC,PLP,SEC,PHA,CLI,PLA,SEI,DEY,TYA,TAY,CLV
830 DATA INY,CLD,INX,SED,ORA IMM,ORA ABS Y,AND IMM,AND IMM Y
840 DATA EOR IMM,EOR ABS Y,ADC IMM,ADC ABS Y, ,STA ABS Y
850 DATA LDA IMM,LDA IMM Y,CMP IMM,CMP ABS Y,SBC IMM,SBC ABS Y
860 DATA ASL A, ,ROL A, ,LSR A, ,ROR A, ,TXA,TXS,TAX,TSX
870 DATA DEX, ,NOP, , , , , , , , , , , , , , ," "
880 DATA " ", , ,BIT ABS, ,JMP ABS, ,JMP IND, ,STY ABS, ,LDY ABS
890 DATA LDY ABS X,CPY ABS, ,CPX ABS, ,ORA ABS,ORA ABS X
900 DATA AND ABS,AND ABSX,EOR ABS,EOR ABS X,ADC ABS,ADC ABS X
910 DATA STA ABS,STA ABS X,LDA ABS,LDA ABS X,CMP ABS,CMP ABS X
920 DATA SBC ABS,SBC ABS X,ASL ABS,ASL ABS X,ROL ABS,ROL ABS X
930 DATA LSR ABS,LSR ABS X,ROR ABS,ROR ABS X,STX ABS, ,LDX ABS
940 DATA LDX ABS Y,DEC ABS,DEC ABS X,INC ABS,INC ABS X
950 END
```

```
ADRESS   NMEMONIC     OPCODE
---------------------------
8000     JMP ABS      4C 7C 8B
8003     JSR          20 FF 80
8006     JSR          20 4A 81
8009     JSR          20 71 81
800C     JMP ABS      4C 03 80
800F     PHP          08
8010     PHA          48
8011     TXA          8A
8012     PHA          48
8013     TSX          BA
8014     LDA ABS X    BD 04 01
8017     AND IMM      29 10
8019     BEQ          F0 07
801B     PLA          68
801C     TAX          AA
801D     PLA          68
801E     PLP          28
801F     JMP IND      6C F6 FF
8022     PLA          68
8023     TAX          AA
8024     PLA          68
8025     PLP          28
8026     JMP IND      6C F8 FF
8029     JSR          20 86 8B
802C     SEC          38
802D     JSR          20 64 80
8030     LDA IMM      A9 31
8032     JMP ABS      4C 53 80
8035     PHP          08
8036     JSR          20 86 8B
```

TOM GETTY'S "3-D TIC-TAC-TOE"

Tom Gettys is an extremely talented and versatile Computer Scientist. Without his very close collaboration SYM-PHYSIS would never have been born. To give you just one example of how prolific he is we reproduce below the directory of a disk (HDE/FODS) which he gave us more than a year ago. The "." which appears before each five character file name (and the starting addresses 0201) indicates that these files are written in BAS-1 (with disk interface added, of course). This disk is but one of many in his disk library.

To give you an idea of the quality of his programming we also are publishing his program ".3D", which is a three dimensional Tic-Tac-Toe written for the SYM with KTM-2/80. We wish we could reproduce the opening graphics on the Epson but the KTM's cursor control ESC sequences "don't compute" on the Epson (incidentally, Tom showed us recently some high resolution Epson graphics he had produced with his Graftrax 80 driver routine).

Following the opening graphics, four four-by-four grids are drawn on the screen and the computer asks: "Who gets to move first?" If your answer begins with "Y" (for "YOU", meaning, in this case, the computer), it plays first. The computer plays a strong game; you may have to study the implemented algorithm if you want to increase your chances of winning!

It's only a very minor point, of course, but notice the "pretty-printing" format Tom uses, especially the nested FOR . . . NEXT loops in lines 7080 through 7110. Tom has also provided us with a very useful utility, "PAC", which removes all "null" lines, "surplus" spaces, and REMs (make certain first that you never GOTO a line beginning with a REM!) from a BASIC program, to allow more "RUNning" room.

We have often asked Tom to compile his best SYM software into book form, but he replies that no one would really be interested. We'll keep working on him!

```
>DC DIR 2   Disk No. 50 - Miscellaneous Gettys' BASIC Programs
01 .MULT   0201 09D6 01 01    02 .BIO    0201 07F5 02 01
03 .EVEN   0201 04DB 02 13    04 .RESEQ  0201 0516 03 03
05 .FIND   0201 03D4 03 10    06 .FFT    0201 0B46 03 14
07 .HANOI  0201 0AA5 05 01    08 .WARI   0201 04FF 06 03
09 .PLOT   0201 076C 06 09    10 .PLOT1  0201 07E8 07 04
11 .PLOT2  0201 08AA 07 16    12 .PLOT3  0201 08A1 08 14
13 .DEPTH  0201 0CD4 09 12    14 .OTHEL  0201 0C76 11 02
15 .THINK  0201 0C52 12 07    16 .DEMOS  0201 0E8D 13 12
17 .PLOTS  0201 0A2B 15 06    18 .REVRS  0201 033F 16 07
19 .TREE   0201 0482 16 10    20 :AUX    0200 0C7D 16 16
21 .PRIM1  0201 029E 18 05    22 .PRIM'  0201 047A 18 07
23 .PRIM2  0201 03F3 18 12    24 .BINOM  0201 0657 18 16
25 .SAMPL  0201 0385 19 09    26 .QKSRT  0201 0863 19 13
27 .PRIME  0201 0560 20 10    28 .LIFE0  0201 06DF 21 01
29 .LIFE   0201 1192 21 11    30 .LIFER  0201 0908 23 11
31 .3D     0201 19D4 24 10    32 .PIMS   0201 179B 27 10
33 .STATS  0201 041C 30 06    34 :LIFE   0200 16D1 30 11

NEXT: T33 S05
```

NOTE: File 34 is RAE source code for a ML version of "The Game of Life", very much faster than the BASIC version.

```
1000 DIM PA%(63,6), VA%(75), SQ%(63), WN(3)
1010 :
1020 REM          Define the KTM 2 display control constants
1030 :
1040 ES$=CHR$(27)
1050 ER$=ES$+"R" : DR$=ES$+"r"
```



```
1060 EG$=ES$+"G" : DG$=ES$+"g"
1070 CR$=ES$+"+" : CA$=ES$+"="
1080 CS$=ES$+"E" : HM$=ES$+"H"
1090 EL$=ES$+"K" : ES$=ES$+"J"
1100 :
1110 :
1120 REM        MAIN CONTROL STRUCTURE
1130 :
1140 PRINT CS$
1150 GOSUB 9000      REM     display the game name
1160 GOSUB 7000      REM     generate the data base constants
1170 PRINT CS$
1180 GOSUB 6000      REM     display the playing board
1190 :
1200 PRINT
1210 INPUT "Who gets to move first? "; A$
1220 IF LEFT$(A$,1)="Y" THEN PA=-1 : GOTO 1460
1230 :
1240 REM          Get and check player's move for errors
1250 :
1260 PRINT
1270 INPUT "What is your move? "; BD, SQ
1280 MV=16*(BD-1)+SQ-1
1290 IF BD<1 OR BD>4 THEN PRINT "Illegal board number" : GOTO 1260
1310 IF SQ<1 OR SQ>16 THEN PRINT "Illegal square number" : GOTO 1260
1320 IF SQ%(MV)<>0 THEN PRINT "That's already occupied" : GOTO 1260
1330 :
1340 REM          Display move and update data base
1350 :
1360 MK$="X" : GOSUB 2260
1370 PRINT ES$
1380 SQ%(MV)=1 : PA=-1
1390 FOR I=0 TO 6
1400 :    SP=PA%(MV,I)
1410 :    IF SP=-1 THEN 1460
1420 :    VA%(SP)=VA%(SP)+1
1430 :    IF VA%(SP)=4 THEN 2040
1440 :    IF VA%(SP)=3 THEN PA=SP
1445 NEXT
1450 :
1460 REM          Check for a win by the computer
1470 :
1490 FOR I=0 TO 75
1520 :    IF VA%(I)=15 THEN WN=-1 : PA=I : GOTO 1550
1540 NEXT
1550 IF PA<>-1 THEN GOSUB 2100 : MV=EM : GOTO 1840
1560 :
1570 REM          Determine computer's move
1580 :
1590 MX=0 : MC=-1 : MV=-1
1600 FOR I=0 TO 63
1610 :    IF SQ%(I)<>0 THEN 1780
1620 :    SV=0
1630 :    FOR J=0 TO 6
1640 :        PA=PA%(I,J)
1650 :        IF PA=-1 THEN 1730
1660 :        VA=VA%(PA)
1670 :        IF VA=0 THEN 1710
1680 :        IF VA<5 THEN SV=SV+VA*VA : GOTO 1710
1690 :        QU=INT(VA/5)
1700 :        IF VA=5*QU THEN SV=SV+QU
1710 :    NEXT J
1720 :
1730 :    IF SV<MX THEN 1780
1740 :    PC=SGN(PA%(I,6))
1750 :    IF SV>MX OR PC>MC THEN 1770
```

```
1760 :   IF PC<MC OR RND(1)<0.5 THEN 1780
1770 :   MX=SV : MV=I : MC=PC
1780 NEXT I
1790 :
1800 IF MV=-1 THEN PRINT "It looks like a cat's game!" : END
1810 :
1820 REM            Update data base
1830 :
1840 SQ%(MV)=5
1850 FOR I=0 TO 6
1860 :   PA=PA%(MV,I)
1870 :   IF PA=-1 THEN 1910
1880 :   VA%(PA)=VA%(PA)+5
1890 NEXT
1900 :
1910 REM            Show player our move
1920 :
1930 MK$="O" : GOSUB 2260
1940 PRINT "I moved to board"; BD; " square"; SQ
1950 IF WN=0 THEN 1240
1955 PRINT : PRINT "...and winning!!!"
1960 MK$=EG$+CHR$(96)+DG$
1980 FOR I=0 TO 3
1990 :   MV=WN(I)
2000 :   GOSUB 2260
2010 NEXT
2020 PRINT : PRINT : END
2030 :
2040 PRINT : PRINT "You won!!!"
2045 PA=SP
2050 GOSUB 2100 : GOTO 1960
2100 :
2110 :
2120 REM            This subroutine returns the number of the remaining
2130 REM            empty square (I) in the path MV%.
2140 :
2150 K=0
2160 FOR I=0 TO 63
2170 :   FOR J=0 TO 6
2180 :       SP=PA%(I,J)
2190 :       IF SP=-1 THEN 2240
2200 :       IF SP<>PA THEN 2230
2210 :       IF SQ%(I)=0 THEN EM=I
2220 :       WN(K)=I : K=K+1 : IF K=4 THEN RETURN
2230 :   NEXT J
2240 NEXT I
2250 :
2260 :
2270 REM            This subroutine enters a mark (MK$) on the board
2280 REM            in square SQ%.
2290 :
2300 BD=INT(MV/16)+1
2310 SQ=MV-16*(BD-1)+1
2320 QU=INT((SQ-1)/4)
2330 MO=SQ-4*QU
2340 Y=2*QU+34
2350 X=18*BD+4*MO+12
2360 PRINT CA$+CHR$(Y)+CHR$(X)+MK$;
2370 PRINT CA$+CHR$(43)+CHR$(33)
2380 RETURN
6000 :
6010 :
6020 REM            Print a new board
6030 :
6040 FOR I=1 TO 4 : PRINT TAB(18*I-13); "Board"; I; : NEXT
6050 :
```



```
6060 PRINT ER$; EG$
6070 PRINT BD$(0)
6080 FOR I=0 TO 2 : PRINT BD$(1) : PRINT BD$(2) : NEXT
6090 PRINT BD$(1) : PRINT BD$(3)
6100 :
6110 PRINT DR$; DG$
6120 RETURN
7000 REM            For each square, compute or read in the
7010 REM            number of any path involving that square.
7020 :
7030 FOR I=0 TO 3
7040 :   READ BD$
7050 :   BD$(I)=BD$+" "+BD$+" "+BD$+" "+BD$
7060 NEXT
7070 :
7080 FOR I=4 TO 6
7090 :   FOR J=0 TO 63
7100 :       PA%(J,I)=-1
7110 :   NEXT
7120 NEXT
7130 :
7140 FOR I=0 TO 15
7150 :   QU=INT(I/4)
7160 :   PA%(I,0)=QU
7170 :   PA%(I,1)=I-4*QU+4
7180 :   PA%(I,2)=I+40
7190 :   READ PA%(I,3)
7200 NEXT
7210 :
7220 FOR I=16 TO 63
7230 :   QU=INT(I/16)
7240 :   MO=I-16*QU
7250 :   PA%(I,0)=PA%(MO,0)+10*QU
7260 :   PA%(I,1)=PA%(MO,1)+10*QU
7270 :   PA%(I,2)=PA%(MO,2)
7280 :   READ PA%(I,3)
7290 NEXT
7300 :
7310 FOR I=0 TO 15
7320 :   READ S
7330 :   FOR J=4 TO 6
7340 :       READ PA%(S,J)
7350 :   NEXT
7360 NEXT
7370 :
7380 RETURN
7390 :
8000 DATA "A000y000y000y000B", "V   V   V   V   V"
8010 DATA "h000p000p000p000i", "C000x000x000x000D"
8020 :
8030 DATA  8,60,62, 9,57, 8, 9,65,58, 9, 8,66, 9,61,63, 8
8040 DATA 18,69,70,19,68,18,19,71,72,19,18,75,19,73,74,18
8050 DATA 28,70,69,29,72,28,29,75,68,29,28,71,29,74,73,28
8060 DATA 38,61,63,39,65,38,39,57,66,39,38,58,39,60,62,38
8070 :
8080 DATA 0,56,68,69, 3,64,70,71, 12,59,72,73, 15,67,74,75
8090 DATA 21,56,57,60, 22,62,64,65, 25,58,59,61, 26,63,66,67
8100 DATA 37,61,65,67, 38,57,59,63, 41,60,64,66, 42,56,58,62
8110 DATA 48,67,70,72, 51,59,69,75, 60,64,68,74, 63,56,71,73
8120 :
9000 :
9010 :REM             Output the game banner
9020 :
9030 PRINT ER$; EG$
9040 T%=22
9050 PRINT TAB(T%);
```

```
 Y!!!!oZ            \''''Z
o      Zo           !     \
1Ywwwk  |           |  jwwwZ\
     Y! !    Y!!Z   ! a    !g
     1q |    1qqm   | a    |g
Yoqqqm  !           ! a  Y\g
ao''''  Y           | |||\Yo
\qqqqqo             Zqqqqqq

tttJIt tttJ    tttJIttt tttJ    tttJIttJIttt
Ld L d d  L rr Ld LdttL d  L rr Ld Ld   dds K
 d  IK Kttd     d  d  d Kttd     d  dttddttL
```

NOTE: On the KTM-2/80 the above gibberish reads, in large, shaded, three dimensional appearing, block characters, on two lines:

3 - D

TIC-TAC-TOE

```
9060 PRINT " Y!!!!"+DR$+"o"+ER$+"Z           "+DR$+"\''''"+ER$+"Z"
9070 PRINT TAB(T%);
9080 PRINT "o     "+DR$+"Zo"+ER$+"           !      \"
9090 PRINT TAB(T%);
9100 PRINT "l"+DR$+"Ywww"+ER$+"k !           ! j"+DR$+"www"+ER$+"Z\"
9110 PRINT TAB(T%);
9120 PRINT "    Y! !   Y!!Z    ! a   !"+DR$+"g"+ER$
9130 PRINT TAB(T%);
9140 PRINT "    lq !   lqqm    ! a   !"+DR$+"g"+ER$
9150 PRINT TAB(T%);
9160 PRINT "Y"+DR$+"o"+ER$+"qqqm !           ! a  Y"+DR$+"\g"+ER$
9170 PRINT TAB(T%);
9180 PRINT "a"+DR$+"o'''' Y"+ER$+"           ! !!!"+DR$+"\Y"+ER$+"o"
9190 PRINT TAB(T%);
9200 PRINT "\qqqqqo            "+DR$+"Z"+ER$+"qqqqqo"
9210 :
9220 T%=13
9230 PRINT : PRINT
9240 PRINT TAB(T%);
9250 PRINT "tttJIt tttJ    tttJIttt tttJ    tttJIttJIttt"
9260 PRINT TAB(T%);
9270 PRINT "L"+DR$+"d "+ER$+"L d d  L rr L"+DR$+"d "+ER$+"L";
9280 PRINT DR$+"d"+ER$+"tt"+DR$+"L "+ER$+"d  L rr L"+DR$+"d ";
9290 PRINT ER$+"L"+DR$+"d  "+ER$+"d"+DR$+"d"+ER$+"s K"
9300 PRINT TAB(T%);
9310 PRINT DR$+" d  "+ER$+"I"+DR$+"K K"+ER$+"ttd     "+DR$+"d  d  d K";
9320 PRINT ER$+"ttd     "+DR$+"d  d"+ER$+"ttd"+DR$+"d"+ER$+"tt"+DR$+"L"
9330 :
9340 PRINT DR$; DG$
9350 PRINT CA$+CHR$(32+23)+CHR$(32+0);
9360 T%=23
9370 PRINT TAB(T%); "Copyright 1980, thomas gettys";
9380 PRINT CA$+CHR$(32+1)+CHR$(32+24);
9390 RETURN
```

JACK BROWN'S VISIT

Jack Brown (Mr. Saturn Software) and family visited with us overnight on their way to the 7th West Coast Computer Faire (we first met Jack in person two years ago, when he visited with us overnight on his way to the 5th West Coast Computer Faire!). History was repeating itself, but on this visit he brought even more wonderful goodies than last time. We describe one of them below, in connection with Pascal.

X-RAY

Saturn Software's latest products, SYM-Pascal (Release 2.0), and X-RAY (Release 2.0) are by Ralph Dean, and by Ralph Dean & Jack Brown, respectively. Pascal needs no introduction, and we did mention earlier that SYM-Pascal is integer only.

We do not find this a real limitation, since most of our interests do not require floating point arithmetic. Hal Chamberlin's MTU Advanced Music Synthesis package (in machine language) and Jack Brown's "Turtle-Graphics" (in FORTH) both use simple algorithms and simple table lookups to do fairly sophisticated tasks such as Fourier Synthesis, and the like, with the 16-bit precision that is more than adequate for the jobs, and, much more important, fast enough for the jobs! The lack of floating point is a challenge, not a handicap, to a skilled programmer.

We also mentioned earlier that Pascal operates "under" RAE. This means, in effect, that Pascal source files are actually RAE files, and that all RAE commands, including disk linkages and other add-ons, are built-in to Pascal. Now comes the exciting part!

X-RAY does for RAE even more than Brown's Enhancements do for BASIC. Among other things, it adds the following commands to RAE (and hence also to Pascal):

ADdress line# (gives RAM location of start of line), APpend line# (see below), EXecute addrs (see below), FL(for FiLe) addrs (lets you keep several files going), REstore (recover after clear or cold start), SAve ID addrs1 addrs2 (for object code!), TApe 1, TApe 2 (to change tape speed to single or double!), and an improved EDit line#.

There is not enough space to describe all of these new commands in the detail they deserve, but here are very brief explanations of two of them:

EXecute is similiar in function to .E in SUPERMON, in that a sequence of RAE commands can be prestored in RAM, and then EXecuted by giving the address as a parameter. Since all DOS (Disk Operating System) commands are callable from RAE, any desired DOS sequence may also be EXecuted.

APpend lets you "scroll" through a text file by holding down the RETURN key. The vertical scrolling stops with the cursor at the end of a line when the RETURN key is released. The direction of "vertical" scrolling is reversed with CTRL U (up), and CTRL D (down). The cursor may be scrolled "horizontally" in wrap-around fashion through a line with CTRL H (BS or left), and CTRL I (TAB or right), and characters may be inserted, deleted, replaced, etc., exactly as if you were using a memory mapped display. Nearly any terminal which responds to CTRL H by backspacing can be used. The command is called APpend because its most "natural" function (since the cursor waits at the end of a line) is to append comments to source code.

X-RAY makes text editing and source code commenting almost a pleasure. We originally purchased our SYM mainly because RAE was "promised" as an accessory, and we knew that RAE would be great. We are continually being surprised by RAE becoming even greater and greater with such add-ons as X-RAY. We never dreamed it could become this good!

SYM DISK OPERATING SYSTEMS (continued from page 11-2)

disk "primitives" may let you speed up your system significantly. MTU's CODOS system comes with a built-in utility to customize your system, bless them! The program lists the default value of each built-in delay, and waits for either a <cr> or the entry of a better value, which you obtain from the spec sheet on your disk drive.

DRIVES

The 5 1/4 inch drives come in 35 track (Shugart SA-400) and 40 track versions (Shugart SA-400L). We mention the Shugart brand name here, not as a specific recommendation, but because their models are, in a way, de facto "standards". These are single-sided drives. The Shugart SA-450 types are 40 track double-sided drives. All of these drives may be operated either in single- or double-density mode; this choice depends primarily on the capability of the disk controller and which mode(s) the software supports. Some 5 1/4 inch drives reduce the intertrack spacing from the Shugart "standard" to provide twice as many tracks in the same space.

The Shugart SA-800/801 is the single-sided 8 inch "prototype", and the Shugart SA-850/851 is the double-sided version. The SA-800 may be used only with soft-sectored disks, the SA-801 with hard-sector as well. The SA-850 and SA-851 differ from each other in this same regard. The 801 (and 851) may be used with soft-sectored disks and a 34-wire cable instead of the standard 50-wire cable (e.g., FODS 8 inch systems).

All Shugart compatible disk drives accept the same types of power and controller cable connectors. All have an almost bewildering selection of "options", selectable by cutting traces and/or adding jumpers, and must be configured to meet any special requirements imposed by the controller and software. The factory installed jumpers are for single drive systems, and must be modified for multiple drive systens. All 5 1/4 drives require +12 V and +5 V regulated, and all 8 inch drives require 110 V AC (US), +24 V, and +5 V. Some 8 inch drives also require -5 V.

DISKS

The most "universal" type of disk is the soft-sectored disk, which has only a single hole to mark the "origin" for each revolution. Hard-sectored disks may have 10, 16, or 32 additional holes to mark sector boundaries. We will consider only soft-sectored disks here. The least expensive disks are the single-sided, single-density ones. This does not necessarily mean that they cannot be used at double density, or that the second side (which is the "top" side, by the way) is not usable. By cutting out a second "write-protect" notch (on 5 1/4 inch only), and punching a second "track-hole" in the protective case, most single-sided disks may be flipped over to use either side. It is claimed by some that this is not a good idea, but Apple II owners do this all the time, since the Drive II does not even require the punching of a second track-hole.

Double-sided disks have the track hole in a slightly different location and will not work in a single-sided drive. Double-sided drives will accept either type of disk and can be jumpered to work either as a double-sided drive when double-sided disks are used, or as, in effect, two distinct single-sided drives, callable separately if a single-sided disk is used.

HUDSON DIGITAL ELECTRONICS' - FILE ORIENTED DISK SYSTEM (FODS)

We now have two, and will soon have three, dual 5 1/4 inch SYM-FODS systems operational, and in almost constant use, with no preventive maintenance. One system is 35 track, the other two are 40 track. Disks with 35 or fewer tracks "in-use" are freely interchangeable. FODS was our very first DOS and we learned a lot from it. FODS is strictly a single-density, single-sided system, as it stands. We have also had on hand, for nearly a year, a FODS 8 inch controller, which operates at twice the clock rate (the only difference), and we think that the 5 1/4 software could be modified to support double-density operation with the 8 inch controller.

While we have 7 mini-floppy (5 1/4 inch) drives around, until last week we had only one 8 inch drive, and that was "permanently" on our CODOS system. We will soon be packaging a self-contained dual 8 inch drive unit on a wheeled table which can be rolled around to service three computer systems. Each will have an extension cable dangling from it so that we can plug the drive system into it. One computer system will have both 8 and 5 1/4 inch FODS controllers installed, one at $A888, the other at $A880. Both may be co-resident and either booted up separately. This will permit us to support both FODS formats.

The FODS controllers are about 4 x 6 inches in size, and, being built for the KIM-4 bus, require unregulated +8 V, -8 V, and +16 V. The on-board regulators may be shorted across, and regulated +5 V, -5 V, and +12 V supplied instead. Interface to the SYM is from the Expansion Connector to a VIA on the Controller Card, which shares space with the SYM's "extra" VIA at $A800. Since FODS needs nearly 4K of RAM at $7000 for its own use, and perhaps 2K of RAM in the $6000 block, external memory is required. FODS goes very well with the 32K Beta DRAM board, which needs only +5 V, but generates its own +12 V and -5 V on-board, enough to support the FODS controller, as well as itself.

FODS stores its files sequentially on the disk, never over-writing existing files, and thus must be periodically "packed" to compact the active files. This may not be the most "popular" technique, but it is good insurance. Even when you "clear" a disk by deleting the directory (DEL INDEX!), the data is still easily recoverable by indirect methods.

UK SYM-DOS

Even though FODS source code is not published, a group of SYMmers in the United Kingdom has disassembled and studied the inner workings of FODS. As a result they have generated a new DOS (called by them UK SYM-DOS), wholly compatible with the HDE Controller and existing FODS disks. In UK SYM-DOS, they have compacted the code, speeded up the PAK operation, and worked out a way to squeeze all of the utilities except $FM (ForMat) into the same 4K as the main portion of the DOS, thus speeding up all utilities by avoiding the access to the disk to download and overlay the utilities.

They have added a number of new instructions which permit accessing individual sectors, overwriting files if desired (avoiding the need to pack), creating EXECute files (all SYM-DOS command names are four characters long, instead of three, as in FODS), etc. Best of all, it is available in well commented source code form, and studying the source is a good way to learn how disk systems really work.

While UK SYM-DOS is descended from FODS it is a wholly new creation. The authors deserve commendation for making it 100% compatible with existing FODS files. We feel it is an enhancement to FODS, and cannot hurt FODS sales in any way. In fact, UK SYM-DOS is available only on a FODS compatible disk, which requires that the purchaser have a FODS system to begin with.

MTU'S CHANNEL ORIENTED DISK OPERATING SYSTEM (CODOS)

We have been using Micro Technology Unlimited's CODOS for over a year on our high resolution graphic system, and CODOS forms the basis for Jack Gieryic's graphics as well. Jack Brown also has both CODOS and FODS. Both systems are excellent; they represent two completely different programming philosophies and approaches to system design. The "channel orientated" concept (no time to define it here) is a very elegant technique for I/O management, which takes a while to get used to, but makes CODOS a really versatile instrument.

Having only a single-drive system available kept us from providing the SYM/CODOS community with full support. There was just no way to automate the copying of disks (for distribution) on a single-drive system. This situation will be resolved by this summer, and we will provide full SYM/CODOS support.

We should point out that CODOS supports only 8 inch drives, up to four of them, in ddouble-density mode. Double-sided drives are supported (if double-sided disks are used, but then not all users can read your disks), and, with four double-sided drives you will have over 4 Megabytes of on-line storage. MTU recommends the Qume DataTrak 8 to go with CODOS, and we have followed their recommendation.

Because we had only a single Qume, and were not yet certain what our second drive would be, we never bothered to optimize our CODOS system to the Qume. When Jack Brown heard our disk drives chugging along, he asked if he could optimize one of our CODOS disks for us; he did and we could not only see the speed improvement, the system now purred, rather than chugged. Things did not have to hurry-up and then stop to wait for the software delays to time out. Except for the CODOS.Z program itself, all disk programs are independent of the optimization parameters. All MTU boards use the KIM-1 pinout (same as the SYM E-connector) and use small amounts of unregulated +8 V and +16 V.

Who should consider CODOS? If you want high resolution B/W graphics you will need the 8K RAM Visible Memory. Both it and the SYM fit neatly into an MTU Card Rack. Then the CODOS controller is actually part of a 16K Dynamic RAM board that fits into the same card rack. You can buy it just for the 16K memory expansion, and add the disk drive(s) at a later date. You will then have one of the fastest, highest capacity, floppy disk systems available for any microcomputer system, bar none. Consider CODOS too, if your data base is likely to be on the largish side, or extremely rapid access is needed.

We will be supporting the SYM/Visible Memory software and the RAE/CODOS interface. We recommend that the BASIC/CODOS interface be handled through Jack Brown; that way all of his BASIC enhancements will be an integral part of the interface.

THE SYM USERS' GROUP FLOPPY DISK CONTROLLER (FDC-1)

When we accepted Synertek Systems Corporation's offer to be allowed to "adopt" the FDC-1 as "our baby" if we promised to support it properly, we did not fully realize what the "child-support" involved, or how much of an initial outlay of time and money would be required.

If we are to fully support FDC-1 with a strong software base, it would be stupid to distribute the software on cassette. This means that we will have to set up two 32K dual disk drive systems, one 8 inch, and one 5 1/4 inch, to do the job. That works out to lots of dollars. A dollar saving alternative is a single system on which we change controllers to switch from one size drive to the other. We'll start out this way.

So much for the hardware costs. Now for the software costs!

Only a preliminary partial manual in rough draft form now exists. This must be completed and edited, and we'll have to hire a typist and train him/her to "SWP" out the final version on one of our SYMs, and hire someone to do the drawings. Then there will be the printing costs, which are very high for small runs. Should we print 500, 1000, 2000, 5000 manuals? At perhaps $3.00 per copy a run of 2000 will mean a $6000 outlay immediately.

The EPROM source code was not available to us in RAE format so we had to disassemble the object code, and use RAE to replace the meaningless labels with meaningful mnemonics. Next we will append the comments. We are very thankful for Dessaintes' Disassembler and X-RAY; without them the job would be even more tedious than it has to be. Should we supply source code on disk, with the higher medium and copy-time costs, or should we go to a printed listing, with the higher initial costs?

We tell you our problems, not to elicit your SYMpathy, but to answer, in advance, those who are wondering why it takes so long, and especially those who want to know why we (SUG) won't "honor" the price for a fully assembled and tested FDC-1 at the price originally announced by SSC.

The Synertek logo will not appear on the FDC-1, so we'll design our own. Since the FDC-1 is primarily "for SYM-1", and since fruit names are state-of-the-art these days, should the logo read "perSYMone"?

And now, here's the bottom line:

We will be placing initial orders for circuit boards, components, and drive cables in early April, and FDC-1 kits, complete with double-drive cables will be ready for shipment by mid-June, 1982, on a first ordered, first shipped basis, at the following prices (enclose check with order):

US	$195 UPS, Street address only, not P.O. Box
Canada	$200 Airmail
Europe	$205 Airmail
Elsewhere	$209 Airmail

>>>>>Please state whether 8 inch or 5 1/4 inch cables are needed<<<<<

California residents please add 6% sales tax.
Foreign residents please advise classification for lowest duty rate.

MISCELLANIA

This is a "special" issue for those readers who do not like special issues devoted to single topics. For those who like games, there is a "3 - D TIC-TAC-TOE", and for those who feel we are biased against BASIC in favor of assembly language, there is a BASIC DISASSEMBLER, which might even arouse a latent interest in assembly language programming.

As usual, and with regret, we must apologize for not being able to answer all of the letters requesting help. Getting out two issues in the same quarter left little "free" time. We will apologize in advance for the next quarter as follows: While all letters arriving durng the period mid-April through mid-May (1982) will be opened and read by the office staff while we are visiting Australia and New Zealand, few technical questions will be answered, so we request you hold your questions till later in May.

When we return we'll start our policy of batching questions and sending them on to those who volunteer to help (see page 1). We would gladly like to hear from some of the more experienced SYMmers who would enjoy helping beginneers, and even non-beginners needing help.

For those readers who object to our use of the editorial "we" as sounding too pretentious, or pontifical, I can only reply that I was taught I should avoid the use of I as much as I could, and I don't know how I can, in all due modesty, use an "I" for an "I" when I was educated to use 'we' instead. I'm sorry about that.

JEFF LAVIN was working very hard on preparing a questionnaire to be mailed with this issue. The answers would have gone into a computerized data base which would be useful in forming "Special Interest Groups". He sent us a preliminary draft which looked great, but we were too overloaded to get it back to him in time for this issue. It will have highest priority for Issue No. 12.

There were a number of notes to go in the space below about books written by SYMmers, and products available from SYMmers. Since there is not enough space to include them all, and we don't want to upset those whose notes were not selected, we'll just leave the space blank, and get all of the notes into Issue No. 12

We will be teaching a SYM based Microprocessor Course at the University of California at Davis, Davis, CA 95616. If you are interested in more information, contact Garrett Jones, c/o University Extension, phone (916) 752-2177.

This issue should reach Australia and New Zealand about the same time we do. We are both looking forward to an Easter in autumn, and to meeting many of our readers down-under. Look for Issue No. 12 around mid- July.