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THE SYM-1 USERS' GROUP NEWSLETTER

ISSUES NUMBERS 5 & 6 - SEPTEMBER/OCTOBER/NOVEMBER/DECEMBER 1980

SYM-PHYSIS is a bimonthly publication of the SYM Users' Group, P. O. Box 315, Chico, CA, 95927. SYM-PHYSIS and the SYM Users' Group (SUG) are in no way associated with Synertek Systems Corporation (SSC), and SSC has no responsibility for the contents of SYM-PHYSIS. SYM is a registered trademark of SSC. SYM-PHYSIS, from the Greek, means the state of growing together, to make grow, to bring forth.

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COMMENTS AND REMARKS

This double issue marks the end of our first year of publication as a bimonthly. Many of our readers requested that we do monthly....No way!!!! Our own inclination was to drop the newsletter entirely, and to retire to a subtropical paradise somewhere, far from a source of the necessary power to operate a SYM.

Computer newsletters seem to have short (but merry?) lives. Eric Rehnke's KIM-1/6502 USER NOTES did not quite make it through its third year. Eric is now with Rockwell International, editing their in-house newsletter, INTERACT, for the AIM-65. We read it regularly, for any ideas which we can possibly assimilate into our own systems. VIPER, the newsletter for the RCA COSMAC VIP (Versatile Interface Processor, an excellent 1802-based single board computer) lasted only two years. The Pet Gazette also had a short life span. Fortunately, COMPUTE, is carrying on with the mission of these newsletters.

Well, we're not yet ready to quit, though we do feel mighty tired at times, so we'll try for another year. To ease the frequency of the pain

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somewhat, while possibly increasing its intensity accordingly, we will go quarterly. Instead of 24 pages six times a year, SYM-PHYSIS will be 36 pages, four times a year. Any advertising materials will be on extra pages, and no editorial material will be sacrificed.

We appreciate the many letters and telephone calls which we have received, thanking us for the services provided by the Users' Group. These kind words do make our efforts seem worthwhile, and provide the incentive to continue. We are now only about a month behind in our correspondence, however, for which we offer our apologies, and two or three months late on RAE NOTES No. 3. At least, we are able to keep up with your telephoned questions!

Incidentally, if anyone is preparing an index (for personal use) in RAE format, on cassette, of the material in Issues 0 through 6, we would be pleased to publish it in Issue 7; we're sure other readers would also appreciate it.

SYM AS A PERSONAL COMPUTER & THE EDUCATIONAL/ACADEMIC MARKET

SYM-1, like many other single board computers, was intended to serve primarily as a simple, versatile, relatively inexpensive, system test and evaluation vehicle, and as a "learning system" for the particular family of chips sourced by its manufacturer.

As was the case with several other single board computers, users quickly realized that SYM could form the basis for a powerful "personal" computer; personal, not only in the sense that it is personally affordable, but because it can be "personalized" to match the user's needs, and personality. As of this writing, there are about 20,000 SYMs out there, and we have about 1000 subscribers. Many of our subscribers have more than one SYM, and many non-subscribers read borrowed copies. SYM-PHYSIS thus reaches at least 5% of the SYM owners, and perhaps as many as 10%. Many owners are using their SYMs in far more sophisticated ways than could ever have been foreseen. Their SYMs are being expanded into full-blown systems (no two alike) for unique applications, and with, of course, mostly non-Synertek add-ons.

The only major accessories or expansion products marketed by Synertek Systems Corporation which are priced at the personal computerists' price level are BAS-1, RAE-1, and the KTM-2s (now, also the -3s). As is the case with Apple, Pet, TRS-80, etc., numerous entrepreneurs are providing SYM compatible accessories and expansions at prices far lower than the "original source" can profitably meet at low volume. Synertek Systems sees its major market as the large volume, OEM/Industrial user, not the educational/academic or personal system user, and has oriented its marketing and customer support services accordingly, as many SYM owners are discovering. Where then, are the non-OEM/Industrial users to find the technical (both software and hardware) support for their systems?

The optimum support that a computer manufacturer can provide for its educational/academic and personal system customers is to support a users' group, which can then provide a vehicle for "self-support." We feel that Synertek Systems is providing us (as the Users' Group) all of the support (moral, and technical) we need, and that this support will continue to increase as we continue to prove that we, in turn, are passing this support on to SYM users. In short, we believe that SSC is providing excellent, and an increasing amount, of user support, through their support of the SYM Users' Group.

We feel that the educational/academic market for systems built around the SYM-1 : BAS-1 : RAE-1 : KTM-2/80 nucleus is far greater than (continued on page 5/6-24)

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VERY CHEAP EPROM ERASER

In BYTE, Vol.2, No. 1, January 1977, many years ago, Lawrence Burbey described how to 'Build the "Coffee Can Special" EPROM Eraser.' We finally were able to check out Mr Burbey's suggestions last week, and can suggest an even cheaper approach; skip the coffee can!

Nearly four weeks after we asked our local appliance dealer to order some for us, we received three of the Sylvania 4 W Germicidal Lamps, Type B. These lamps are less than 1 1/2 inches in diameter, and require an adaptor (their base is like that of an outdoor Christmas tree lamp, known as "Intermediate") to fit into a standard lamp socket. We obtained two wall mounting lamp sockets and wired them in series, put the Type B in one, and a 25 W lamp in the other. The 25 W lamp glowed brightly, but the Type B did not. When we switched to a 40 W lamp the Type B lamp began to glow after a few seconds of warm-up time. The series lamp is required for current limiting, otherwise the Type B will go "poof" and probably spread mercury vapor all around. The 40 W seems right, so I didn't move up to a 60. The Type B ran very cool, so I placed a "loaded" (incorrectly) 2716 EPROM directly on top of the lamp. After 10 minutes the EPROM read all FF's when checked out in the SYM.

No, I didn't use the coffee can recommended by Burbey, nor did I use the pair of bread-baking tins recommended (for eye-safety) by L. B. Golter in 'Build a Low-Cost EPROM Eraser,' BYTE, April, 1980. The corrugated paper in which the Type B lamp was wrapped had the following warnings:

The eyes and skin should be protected from the direct rays of this germicidal lamp. Ordinary window glass, opaque materials, or clothing are adequate protection.

I used a piece of cardboard for protection. A second warning appears on the wrapper:

This lamp emits some ultraviolet wavelengths which produce ozone in the air. Where the sharp odor of ozone is detected, personal exposure should be avoided as inhalation for repeated periods or over a half hour at a time may cause respiratory irritation.

Yes, there was a minor ozone odor within an inch or two of the lamp, but none at a distance of one foot, so I see no problem here. I have no data on lamp life, but I have written Sylvania for a spec sheet on the Type B. They are supposed to last years in clothes driers (as "germicidal" lamps), however. And one more "fact": U. S. postage stamps fluoresce beautifully in the "short-wave" ultraviolet radiation emitted by this type of lamp, but not under longer wave, so-called "black light" radiation.

MORE ON THE TYPE 'B' LAMP

We now have more information on the Type 'B' Lamp recommended above as a "cheap" EPROM Eraser. Type B refers to the type of glass used; this type of glass transmits ozone generating radiation at 185 nm (1 mw for the 4 W lamp), as well as "erasing" radiation at 254 nm (100 mw for the 4 W lamp). The ozone itself has no odor; the odor commonly attributed to ozone is actually that of the nitrous oxide it forms in combination with atmospheric nitrogen. The Type B lamp will neutralize objectionable odors, such as stale tobacco smoke, or mildew, etc., and, from what I can gather, if you cannot smell the nitrous oxide, the ozone has reverted to oxygen, and presents no hazard.

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The specification sheet for the lamp states that the glass used in ordinary eyeglasses provides adequate eye protection, and that the skin can stand continuous radiation at an irradiance of 0.1 uW/sq.cm. Since the 4 W lamp produces an irradiance of 1.2 uW/sq.cm. at one meter, it would be "skin-safe" at 3 meters.

Anyway, I am now convinced that suitable eye/skin protection is provided by the cardboard tube from a toilet tissue roll, which fits nicely over the lamp. The tube can be cut to be slightly longer than the lamp, and a piece of conductive foam in which the EPROM to be erased is inserted can serve as the "lid." What could be cheaper? And deodorize the room at the same time, if the air is circulating?

The lamp is rated at 0.35 A at 10.5 V (I measured 10.5 VAC when in series with the 40 W incandescent lamp), and has a rated life of 4000 hours.

CASSETTE INTERFACE COMMENTS

Only two of our purchasers of cassette software have not been able to read our cassettes. We sent these two subscribers new cassettes, plus a cassette with a 6 minute sync signal on one side, and a repeated sequence of one page blocks on the other side, to give them plenty of time to adjust volume controls. This must have done the job, since we have not heard further from them.

We received a review copy of 6502 FORTH from Eric Rehnke, and could not read it. He replaced it with a KIM format tape, which we did read. Also, we have had problems reading Jack Brown's tapes. We tried six recorders and three SYMs with no luck. One of our subscribers in Wales will be visiting us this month, and he asked us to purchase a number of items for him including two Sanyo 1530A recorders. We purchased for him instead two Model 1540A recorders. These are a better buy, since they have EJECT, and include the AC Adaptors.

While checking these out I tried Jack Brown's tapes on these machines. Through serendipity (the oscilloscope was connected to the right point and the read plus didn't fit right in the earphone Jack), I discovered that the input wave shape was much more nearly symmetrical, when the plus was in only part way, leaving the internal speaker connected. I was able to read Jack's tapes then, but the noise was deafening. I will look into this matter further, and report next issue. In the meantime I am sending Jack one of my recorders to ensure getting a readable copy of the source code for SYM-FORTH. (Since my writing the above, Jack has switched from his "high-quality" recorder to one of Radio Shack's cheapest models, and I now read him just fine. Seems that price correlates inversely with reliability!)

On the other hand, I received a cassette today from Stephen Cole of Hants, England at 2800 Baud, twice normal SYM speed, which I read easily. We have always thought of the KIM format as a fallback if the SYM format doesn't work, but the KIM speed takes 21 times as long. Cole's tape made me realize that we could also send the SYM format at half or quarter speed, if necessary. In computing SYM vs KIM format speeds note that each SYM byte requires 9 bits SYM and 18 bits KIM.

RECOMMENDED READING

The two bimonthlies, COMPUTE., which deals with 6502-based System Computers, and compute II., which covered the 6502- and 1802-based Single Board Computers, are merging into a single monthly, COMPUTE. This is welcome news, indeed, since, as you will see elsewhere in this issue, SYM owners can benefit from programs for, and information about Apple (and Pet and Atari, and OSI, and the others). Address, page 1-8.

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ENHANCING THE SYM-1 I/O CAPABILITIES AT (ALMOST) NO COST

Perhaps you, too, may have wondered why Synertek "spoiled" one of the two 8-bit parallel ports in VIA #1, at \$A000, by assigning PB 6 to ON BOARD CASSETTE IN. The reason was to provide "compatibility" with KIM-1, which lacked PB 6 for a very good reason.

KIM used a pair of 6530's to provide its I/O-TIMER capabilities, and to hold the 2 K KIM (Keyboard Interface Monitor) firmware. The 6530, which Rockwell calls the RRIOT (for ROM-RAM-I/O-TIMER), is very much like the 6532, which Rockwell calls the RIOT (for obvious reasons), except for also including a 1 K ROM. In the 6530, PB6 was sacrificed to free its pin to be used as one of the ROM addressing lines. Synertek "replaced" the pair of 6530s on the KIM with one 6522 (VIA) and one 6532 (RIOT), and put the 4 K VIM (Versatile Interface Monitor, now called SUPERMON) into a single 4 K ROM. Since KIM lacked PB 6, the SYM designers felt free to dedicate PB 6 to one of the system functions.

With my KIM I used an 8-bit digital to analog converter (DAC) on the A Port for music generation, and then added a 6-bit DAC on the B Port. I was then able to generate 64 by 64 vector graphics on an oscilloscope. I didn't even use the full 8-bit port because of memory poverty (only 5 K RAM!).

With one of my SYMs, there is 32 K of memory for handling vector graphics. While detailed vector graphics on an oscilloscope would present flicker problems, my intention is to deflect a large screen laser display, where the flicker would be part of the ambience. Furthermore, for direct film recordings with the laser beam, flicker is again not a problem.

Thus, I want 256 by 256 laser graphics (4 K of memory and pixels) and the two 8-bit DACs. Also, see elsewhere in this issue, I want two 8 bit DACs for my new Stereo Music Synthesizer software package from Micro Technology, Unlimited (MTU). For these, and many other reasons, I have long been looking for, and and finally found, a simple way to recover the use of PB 6.

I recently received, almost as a gift, a used dual trace oscilloscope, which I have been using to "study" the performance of the cassette interface (some SYMs still have problems in this area). Meanwhile the scope helped me to find a very simple way to restore the full use of PB 6 without interference with the cassette function.

PB 6 is available on the Expansion Connector as pin E-X (AUD TEST). You can bring a wire from there (or from any of a number of places on SYM) to near the Application Connector. Since you are unlikely to need all of the signals on the A connector you can replace any one of them with PB 6. Now for the simple "fix". By biasing the inverting input (pin 3) of the LM 311 comparator (U26) very slightly negative with respect to the non-inverting input, the output of the comparator (which connects directly to PB 6) will "float" high when there is no cassette input; otherwise it will "read" the cassette input values properly. This biasing is easily, and very cheaply, done by connecting a one megohm resistor from pin 3 of U 26 to ground. This may not be the optimum value of resistance but it does work well. And, now, PB 6 is free for use as an output when not inputting tape. Have not tried using it as a direct input, because I don't need it, but I see no reason why active low signals (inactive during cassette input) could not be wire-ored to PB 6 as inputs. I do plan to use Port B indirectly as an input though, and either the unused CA 1 or CB 2, in analog to digital conversions, as soon as I work out the details.

ENHANCING THE SYM-1 TIMER CAPABILITIES AT NO COST

And now, let's examine the timer situation. KIM used two timers, one in each 6530. These timers are of the 6532 (not 6522) type. One was dedicated for system use, the other totally free. Many KIM programs were written using the interrupt capabilities of the 6530/6532 timer. These may be adapted directly to SYM. Contrary to the misinformation on the top of page 4-20 of the SYM-1 Reference Manual, all 32 of the 6532 addresses are available (although many of these are redundant). In fact, one address listed as being 'N/A' is actually used by MON 1.1! See lines 0256 and 0257 of the cassette interface portion of MON 1.1.

The four Write Timer addresses at \$A41C-\$A41F Enable Interrupt. The four Write Timer addresses at \$A414-\$A417 Disable Interrupt. Read Timer at \$A404 Disables Interrupt. Read Timer at \$A40C Enables Interrupt. So so ahead and wire up the IRQ output of the 6532, and take advantage of the timer interrupt and the PA 7 edge detect interrupt capabilities, if you need them.

Incidentally, while MON 1.0 used the 6522 timer in its cassette software, MON 1.1 uses the Divide by 8 feature of the 6532. Since the count of this clock is compared with HSBDRY for the 0/1 decision, it is apparent that HSBDRY is the number of 8 (not 5 !) microsecond intervals. And, now, the default value for HSBDRY (\$46 = 70 DEC) is actually 560 (not 350) microseconds. To set an actual value of 350 usec, HSBDRY would have to be 44 DEC = \$2C. This is far too low. Even to read the worst tapes I receive, I need never go below \$39.

It was Gene Zumchak, of Niagara Micro Design, Inc., 1700 Niagara St., Buffalo, NY 14207, who pointed out to me the 8 vs 5 usec error in the description of the new (MON 1.1) SYM High Speed Tape Format. Gene writes an excellent column for COMPUTE., and has developed some excellent KIM/SYM products, including an S-100 expansion bus.

TODAY SYM-FORTH, TOMORROW SYM-PASCAL!

I am not given to being overly enthusiastic about computer languages. I have not yet jumped on the Pascal bandwagon, although my academic colleagues wish to banish BASIC totally from the curriculum, and replace it with Pascal. Right now, however, my enthusiasm for FORTH is growing more rapidly with each use. I am willing to predict that the special issue on FORTH of BYTE Magazine, Vol. 5, No. 8, August 1980, will do more to spread the popularity of FORTH than all that has been written on it up to that issue, and that FORTH may even overtake PASCAL in "popularity."

My first impression of FORTH was similar to my first impression of the H-P calculators, both based on an aversion to having to store in my own head-memory a knowledge of what both I and the calculator had put on the stack. The Reverse Polish Notation (RPN) didn't bother me, however, and I soon realized that never did I have to keep track of more than a few items at once.

Why all the enthusiasm? While preparing for this issue, we had the opportunity to learn and use nearly all of the "higher level" languages available for SYM. These and their origins and sources will be reviewed elsewhere in this issue. FORTH has been placed in the public domain and numerous versions are available, as can be realized at once by scanning the ads in the referenced issue of BYTE. Eric Rehnke kindly lent me a review copy of 6502 FORTH, together with a source listing and extensive documentation, and examples of its use. I would, and do recommend his version highly, because of the updating service and extensive documentation he is providing, for any 6502 system other than the SYM.

Fortunately, for SYM owners, Jack Brown (of Brown's Basic Enhancements) has just finalized a version of FORTH, especially tailored to fit the SYM. It is called, naturally, SYM-FORTH! It is tailored to fully utilize all of the features present in the SYM monitor. Jack has provided additional FORTH "Screens", for those SYMmers with KTM-2s, to enhance the editing capability within the basic FORTH package. He has also sent us FORTH Screens to provide interesting graphics on the MTU Visible Memory. His SYM-FORTH manual and the sample Screens provide a self-contained instruction package, bringing you up to a reasonable proficiency level within a few hours.

Incidentally, the 6502 Assembler built into SYM-FORTH occupies less than 1 K of RAM. Up to now, Bob Denison's 2 K Symbolic Assembler, was the most compact Symbolic Assembler available (it is still the only "free-standing" assembler which can be useful on a 4 K SYM).

While I am in love with RAE, and feel very friendly toward BASIC (it being so widely spoken, though despised by the programming elite), if I could have only one higher level language on my SYM, I think I would choose FORTH. Why? Because my main applications are word processing (I bet that I could write a great word processor in FORTH), graphics, and audio (voice and music). FORTH seems, to me, to be a "natural" for these latter two applications. Jack is now working on a SYM-Pascal! Having observed both the quality of Jack's work, and the speed at which he works, we should be able to have a good Pascal on our SYMs very soon.

MODIFIED EPROM BURNER

Below is the Wiring List for Gieryic's Modification of Hobart's EPROM Programmer. See page 5/6 - 27 for more information.

EPROM PIN	AA CONNECTOR	SIGNAL	6522 NAME
1	6	ADDR 7	2PB7
2	H	ADDR 6	2PB6
3	7	ADDR 5	2PB5
4	J	ADDR 4	2PB4
5	8	ADDR 3	2PB3
6	K	ADDR 2	2PB2
7	9	ADDR 1	2PB1
8	L	ADDR 0	2PB0
9	D	DATA 0	2PA0
10	3	DATA 1	2PA1
11	C	DATA 2	2PA2
12	1	GROUND (ALSO FOR 25VOLT SUPPLY)	
13	12	DATA 3	2PA3
14	N	DATA 4	2PA4
15	11	DATA 5	2PA5
16	M	DATA 6	2PA6
17	10	DATA 7	2PA7
18	4	(NOT)	2CA2
		CE/PGM	
19	15	ADDR 10	3PB2
20	5	(NOT) OE	2CB2
21	--	+25 VOLTS	(.1 CAP TO GROUND)
22	T	ADDR 9	3PB1
23	16	ADDR 8	3PB0
24	A	+5 VOLTS	(.47 CAP TO GROUND)

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ON POWER SUPPLIES, EXPANSION BUFFERING, AND SYSTEM RELIABILITY

Our working habits are such that we jump from one task to another, wake up in the middle of the night with a great idea, or break for a nap or a thought session in the hot tub. Thus, there is always something "important" in both of our office SYMs that we would hate to lose (we do have backup at all times, however, but it's nicer never to need it, like insurance). Thus our systems are left on (except for the video monitors) at all times, except when we leave town for one reason or another, and we want our SYMs ready at all times, and to have a much better memory than our own.

There was a period when our systems behaved rather flaky at times. (Note to our overseas subscribers, and American, as well: "Flaky" is American slang, but very appropriate here. It means "consisting of flakes," but one of the dictionary definitions of flake is "a small loose mass or bit (sic)"; also, flake is a synonym for chip. Flake derives from the Norwegian word flak, which means disk. Thus flaky is legitimate computerese Jargon.) At any rate, loose bits, or "flakes" were giving us problems. We suspected bad chips, poor system design, whatever; anything but the real causes.

The real problems turned out to be not with the digital design, but in the power supply area. We found that, when we were using power supplies at over 75% of their specified current capacity, we began to have loose bit problems, that disappeared when we cooled the power supplies with a fan. Apparently, a power supply operated near its specified limits should not be installed in a confined space without either forced air cooling, or being mounted on a heat conducting surface. Our solution was to split the loads between several power supplies, operating each one at well below rated capacity.

Next, we had long leads from the power supplies to the various subsystems. Because the wire sizes (chosen randomly) and the current drains differed, we measured differences in both ground and +5 levels between, for example, the SYM and the disk controller (mounted with the disks) as high as 0.5 V. When we installed a pair of 12-gauge leads from the power supply to the system, and shorter leads to the subsystems, all of our problems vanished. Our SYMs are now far more reliable than even I am.

And now for possible buffer problems: On our two main systems we do NOT buffer the expansion "bus", and we fill the 4 K "gap" at \$1000-\$1FFF with the (unbuffered) 4 K Blalock expansion board. On another system at school we are using a buffered motherboard which has sockets to hold 4 K of RAM to fill this gap. This board has two sets of three-state, two-way buffers in series on the data bus to the 4 K of RAM. We noticed peculiarities in accessing data from this RAM block which we could only attribute to problems with the buffers. Rather than replacing these buffer chips, which, incidentally, are quite expensive, and hard to locate, we removed them from their sockets and replaced them with wire jumpers. This cured the problem.

The problem was not in reading data from this block, but whenever a STA instruction to this block was performed elsewhere, the instruction forced a break instruction to follow. While I don't fully understand the problem, it is possible for the sudden current surges caused by a number of fast acting three-state buffers changing state simultaneously to interfere with the control bus signals.

While this problem was local to us, several readers have reported having similar problems with other buffered expansion devices for the SYM. These apparently work well with KIM and AIM, but give problems with some, not all SYMs. One of our readers still has not solved his problems; we have asked him to keep us posted on his progress.

SYM-PHYSIS 5/6-8

VIDEO MONITORS AND POWER SUPPLIES

We hadn't intended to market SYM hardware; we started to do so mainly as a courtesy to our overseas subscribers, who find it very expensive to purchase multiple money orders in small amounts each. On some items we buy for resale, we are given a reasonable discount for purchases in modest quantities. On others the discount is trivial, or even zero, for small quantities. One example of the latter is a line of power supplies, advertised in the popular computer magazines at \$24.95 for the 3 A model. The price to us as an OEM is also \$24.95 in lots of up to 24.

We are beginning an OEM activity, assembling systems which include a SYM-1 with 4 K RAM, BAS-1, and RAE-1/2 installed, a KTM-2/80, a Leedex Video Monitor, a Power-One 5 V, 6 A power supply, a Sanyo 1540A cassette recorder, all interconnecting cables, and the SWP-1 and Brown Basic Enhancement Package. The future addition of a Blalock 4 K Memory Expansion Board and a printer will provide at least one class of users (some of my non-technical college professor colleagues) with reasonable word processing and Computer Assisted Instruction capabilities at a far lower cost than available in any other system. They will have to provide their own enclosure.

As a result of this we will have in stock the Leedex Video Monitors, and the Power-One 3 A and 6 A (both with OVP) power supplies. An OEM presumably makes his profit on the "system integration" part of his job, and on the software sales, rather than on the hardware markup. The hardware components are not really purchased for individual resale.

If you wish, however, you may purchase Leedex Monitors and Power-One power supplies from us, for MORE than you would have to pay elsewhere. These items are too heavy to justify overseas airmail costs, so we do not recommend them to overseas subscribers. With the Power One you will be getting parts list and instructions for adding unregulated +11 and +22 and regulated +12 V if you wish. With the Leedex Monitor, you will be getting the assurance that the Leedex has been personally checked out by us for at least an hour in one of our working systems, prior to our reshipment. Incidentally the Leedex and Power-One items have been selected by Syntek Systems Corporation as components of their own Micro Development Tool (MDT) Systems, and have excellent reliability records.

HUGH CAMPBELL'S APPLE TAPE LOADER

The program on page 5/6-22 is printed as a disassembly of the object code cassette dump sent us by Mr. Campbell. It is easily relocatable any whole number of pages by changing the 13 values of \$3E. It adds the following command to MON 1.1, if its starting address is patched to the Unrecognized Command Vector (URCVEC), with .SD 3E00,A66D(cr):
.A xxxx,yyyy(cr)

This command loads a (machine language) Apple tape from xxxx to yyyy. The user is reminded to observe all copyright restrictions concerning making backup, duplicate, or modified, copies of purchased software.

A PROGRAM JUST LOADED WITH GOODIES

The following program is one that probably none of you will want in its entirety, yet we publish it completely because it shows explicitly how to do what so many of you have asked: "How can I write my own power-on routine?"

In addition, the program is loaded with many nice features, literally too numerous to mention, although we'll cover as many as possible.

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First, read Mr. Cole's letter, which he sent in the form of initial comments in the source code; this will describe the hardware complement he is using. We are not familiar with the Ithaca Audio V.D.U., although it is a very popular "rider" on the S-100 bus. We will say more elsewhere on the Beta Computer 32 K Dynamic RAM Card.

Since the source code was so lightly commented (we're glad because it does save printing space!), we felt obliged to add a few, near the end.

The program occupies 2 K, from \$F000 to \$F7FF. There is still unused EPROM from \$F5D9 to \$F7FB for additions. \$F800 to \$FFFF is still available for echoing system RAM. It is left as "an exercise for the student" to argue the merits of this approach. Mr. Cole has given up VIA #3 and its associated functions, to be able to assign its 1 K address space to the V.D.U. The VIA chip could be given another address, of course, and its functions preserved, if desired, by adding the calls in this EPROM. But when was the last time you called on VIA #3, except through ACCESS? Note that JSR ACCESS will write over several bytes in the V.D.U. Notice the elegantly human-factored approach in the load-on message and in the clock setting routine.

In summary, whether you are a beginner or a pro, whether you skim through this program or study it in great detail, you have got to learn something new and useful from it.

PRINT 0000 0370

```
0010 ;STEPHEN E. COLE M.I.P.R.E. T(ens). C.E.I.
0020 ; 70,SYDNEY ROAD
0030 ; GOSPORT,
0040 ; HANTS,
0050 ; PO12 1PL
0060 ;21st AUGUST 1980
0070 ;Dear Lux:
0080 ;This program sits at F000 and resets on power up.
0090 ;The V.D.U is the ITHACA AUDIO S-100 card Type IA-1100 and is
0100 ;at location $AC00 to $AFF.
0110 ;The ram is the beta computers 32k dynamic ram card.
0120 ;The ram is allocated from $1000 to $7FFF and $9000 to $9FFF;
0130 ;the latter for patches both rae and basic
0140 ;I'm very pleased with progress of SYM-PHYSIS.
0150 ;and feel the articles cover a wide range. Author Richards
0160 ;has been thinking about AA-Connector Bus but thinks as I do
0170 ;that it would take up one of the ports to control the tri-state
0180 ;buffers, which would probably be the best way to control it.
0190 ;At the moment I am working on a auto trace for BASIC to
0200 ;be patched like Jack Brown's editor. Have you any advice
0210 ;on how to do this?
0220 ;Disks at this moment are not possible due to cash flow.
0230 ;I would like to get in contact with any other sym-physis
0240 ;members in the British Isles to organise a get together.
0250 ;I work for the British Broadcasting Corporation
0260 ;as an engineer on operations and maintenance at B.B.C. T.V. (SOUTH)
0270 ;in Southampton.
0280 ;Also the program below reads the keyboard port to provide a slow
0290 ;down routine, and the CR on the hex key pad acts as the break key
0300 ;which is extended outside the box on to the ascii keyboard;
0310 ;which is a full ascii type with numeric pad and cursor control keys.
0320 ;My printer is a tractor feed 132 col variable paper 8" to 15" wide.
0330 ;It is made by a firm in Germany, RENA; have you ever heard of them?
0340 ;It is a 5 by 7 dot printer and prints all 35 dots at once
0350 ;at 132 characters a second.
0360 ;That's all for now; hope to hear from you soon.
0370 ;
```

SYM-PHYSIS 5/6-10

STEPHEN COLE'S POWER-ON
UTILITY PROGRAM

```

0380      .OS
0390      .LS
0400      .BA $F000
0410      ; VDU CONTROL PATCH
0415      ; AND CURSOR ADDRESSING
0420      ;
0430 IER      .DE $A00E
0440 IFR      .DE $A00D
0450 PCR      .DE $A00C
0460 ACR      .DE $A00B
0470 TILL      .DE $A006
0480 T1HC      .DE $A005
0490 COUNTCLOCK .DE $A612
0500 SECS      .DE $A613
0510 MIN      .DE $A614
0520 HOUR      .DE $A615
0530 DDRA      .DE $A003
0540 ORA      .DE $A00F
0550 CURID      .DE $A600
0560 CHAR1      .DE $A601
0570 LINENO      .DE $A602
0580 KBCHAR      .DE $A603
0590 PRFLAG      .DE $A604
0600 COUNT      .DE $A605
0610 LINBUF      .DE $9F70
0620 TECHD      .DE $A653
0630 INVEC      .DE $A660
0640 OUTVEC      .DE $A663
0650 BEEP      .DE $B972
0660 IER1      .DE $A80E
0670 IFR1      .DE $A80D
0680 PCR1      .DE $A80C
0690 ACR1      .DE $A80B
0700 DDRA1      .DE $A803
0710 DDRB1      .DE $A802
0720 ORA1      .DE $A801
0730 ORB1      .DE $A800
0740 RAM      .DE $A600
0750 MAP      .DE $A606
0760 LA      .DE $A60A
0770 SA      .DE $A60E
0780 BASIC      .DE $C000
0790 BASICWARM .DE $9000
0800 RAE      .DE $B000
0810 RAEWARM      .DE $B003
0820 STATUSVEC .DE $B96A
0830 UNRECVEC .DE $B1D1
0840 DISSCANVEC .DE $B906
0850 EXEVEC      .DE $B87E
0860 TRACEVEC .DE $B0C0
0870 USERBR      .DE $B04A
0880 IRQVEC      .DE $B00F
0890 NMI      .DE $B09B
0900 OUTBYT      .DE $B2FA
0910 INBYTE      .DE $B1D9
0920 OUTCHR      .DE $B8A7
0930      ; MEMORY MAP VDU
0940      ; 1 K BLOCK
0950      ; START ADDRESS $AC00

```

```

F000- A2 FF 0960 ;
F002- 9A 0970 RESET
F003- A9 CC 0980
F005- 8D 0C A0 0990
F00B- A9 04 1000
F00A- 48 1010
F00B- 28 1020
F00C- A2 7F 1030
F00E- BD CB F4 1040
F011- 9D 00 A6 1050
F014- CA 1060
F015- 10 F7 1070
F017- A9 FF 1080
F019- 8D 02 A8 1090
F01C- 8D 03 A0 1100
F01F- 20 72 B9 1110
F022- A9 00 1120
F024- 8D 05 A6 1130
F027- 20 3D F0 1140
F02A- 20 3D F0 1150
F02D- A2 00 1160
F02F- BD 4B F5 1170
F032- 20 47 BA 1180
F035- E8 1190
F036- E0 8E 1200
F038- D0 F5 1210
F03A- 4C 00 80 1220
F03D- 8D 01 A6 1230
F040- A9 80 1240
F042- CD 01 A8 1250
F045- F0 0E 1260
F047- A2 20 1270
F049- A0 FF 1280
F04B- B8 1290
F04C- C0 00 1300
F04E- D0 FB 1310
F050- CA 1320
F051- E0 00 1330
F053- D0 F4 1340
F055- A9 00 1350
F057- CD 04 A6 1360
F05A- F0 03 1370
F05C- 20 11 F3 1380
F05F- AD 01 A6 1390
F062- AE 00 A6 1400
F065- 38 1410
F066- C9 20 1420
F068- B0 03 1430
F06A- 4C 9A F1 1440
F06D- C9 7F 1450
F06F- D0 05 1460
F071- A9 20 1470
F073- 4C F8 F2 1480
F076- 20 06 A6 1490
F079- E8 1500
F07A- E0 40 1510
F07C- B0 13 1520
F07E- 8E 00 A6 1530
F081- 20 0A A6 1540
F084- 20 0E A6 1550
F087- 18 1560

```

```

F088- 69 80 1580
F08A- 20 06 A6 1590
F08D- AD 01 A6 1600
F090- 60 1610
F091- AC 02 A6 1620
F094- C0 0F 1630
F096- F0 0C 1640
F098- C8 1650
F099- 8C 02 A6 1660
F09C- A2 00 1670
F09E- 20 17 F1 1680
FOA1- 4C 7E F0 1690
FOA4- A9 40 1700
FOA6- 8D 0B A6 1710
FOA9- A9 AC 1720
FOAB- 8D 0C A6 1730
FOAE- 8D 10 A6 1740
FOB1- A9 00 1750
FOB3- 8D 0F A6 1760
FOB6- A9 C0 1770
FOB8- CD 0F A6 1780
FOBB- D0 22 1790
FOBD- A9 AF 1800
FOBF- CD 10 A6 1810
FOC2- D0 1B 1820
FOC4- A9 C0 1830
FOC6- 20 8A F2 1840
FOC9- A9 AF 1850
FOCB- 20 94 F2 1860
FOCE- A2 00 1870
FOD0- A9 20 1880
FOD2- 20 0E A6 1890
FOD5- E8 1900
FOD6- E0 40 1910
FOD8- D0 F8 1920
FODA- A2 00 1930
FODC- 4C 7E F0 1940
FODF- A2 00 1950
FOE1- 20 0A A6 1960
FOE4- 20 0E A6 1970
FOE7- E8 1980
FOEB- E0 40 1990
FOEA- D0 F5 2000
FOEC- 18 2010
FOED- A9 40 2020
FOEF- 6D 0B A6 2030
FOF2- 8D 0B A6 2040
FOF5- 90 09 2050
FOF7- 18 2060
FOF8- A9 01 2070
FOFA- 6D 0C A6 2080
FOFD- 8D 0C A6 2090
F100- 18 2100
F101- A9 40 2110
F103- 6D 0F A6 2120
F106- 8D 0F A6 2130
F109- 90 AB 2140
F10B- 18 2150
F10C- A9 01 2160
F10E- 6D 10 A6 2170
F111- 8D 10 A6 2180
F114- 4C B6 F0 2190
F117- 18 2200

```

```

ADC ##80
JSR MAP
LDA CHAR1
RTS
LDY LINENO
CPY ##0F
BEQ SCROLL
INY
STY LINENO
LDX ##00
JSR LINE
JMP CUR
LDA ##40
STA LA+1
LDA ##AC
STA LA+2
STA SA+2
LDA ##00
STA SA+1
LDA ##C0
CMP SA+1
BNE NOT
LDA ##AF
CMP SA+2
BNE NOT
LDA ##C0
JSR SUB1
LDA ##AF
JSR SUB2
LDX ##00
LDA ##20
JSR SA
INX
CPX ##40
BNE YES
LDX ##00
JMP CUR
LDX ##00
JSR LA
JSR SA
INX
CPX ##40
BNE MOREVDU
CLC
LDA ##40
ADC LA+1
STA LA+1
BCC AGAIN1
CLC
LDA ##40
ADC SA+1
STA SA+1
BCC AGAIN
CLC
LDA ##01
ADC LA+2
STA LA+2
CLC
LDA ##40
ADC SA+1
STA SA+1
BCC AGAIN
CLC
LDA ##01
ADC SA+2
STA SA+2
JMP AGAIN
CLC

```

F118- A9 40	2210	LDA **40	F1A8- F0 C4	2840	BEQ CLINE	F225- 18	3470	CLC
F11A- 6D 07 A6	2220	ADC MAP+1	F1AA- C9 10	2850	CMP **10	F226- 69 80	3480	ADC **80
F11D- 20 8A F2	2230	JSR SUB1	F1AC- F0 D8	2860	BEQ FR1	F228- 20 06 A6	3490	JSR MAP
F120- 90 09	2240	BCC NO	F1AE- C9 0B	2870	CMP **0B	F22B- 4C 8D F0	3500	JMP FINISH
F122- 18	2250	CLC	F1B0- D0 03	2880	BNE CARRYON		3510 ;	
F123- A9 01	2260	LDA **01	F1B2- 4C 42 F1	2890	JMP LU		3520 ;	
F125- 6D 08 A6	2270	ADC MAP+2	F1B5- C9 00	2900 CARRYON	CMP **00	F22E- 20 F7 F1	3530 TAB	JSR CLCUR
F128- 20 94 F2	2280	JSR SUB2	F1B7- F0 26	2910	BEQ CLEAR	F231- 4C 76 F0	3540	JMP TA
F12B- 18	2290 NO	CLC	F1B9- C9 09	2920	CMP **09		3550 ;	
F12C- 60	2300	RTS	F1BB- F0 71	2930	BEQ TAB		3560 ;	
F12D- 38	2310 LU1	SEC	F1BD- C9 08	2940	CMP **08	F234- 20 72 89	3570 BELL	JSR BEEP
F12E- AD 07 A6	2320	LDA MAP+1	F1BF- F0 79	2950	BEQ BS	F237- 4C 8D F0	3580	JMP FINISH
F131- E9 40	2330	SBC **40	F1C1- C9 1D	2960	CMP **1D		3590 ;	
F133- 20 8A F2	2340	JSR SUB1	F1C3- F0 45	2970	BEQ HOME		3600 ;	
F136- B0 09	2350	BCS LU2	F1C5- C9 07	2980	CMP **07	F23A- 20 F7 F1	3610 BS	JSR CLCUR
F138- 38	2360	SEC	F1C7- F0 6B	2990	BEQ BELL	F23D- 20 0E A6	3620	JSR SA
F139- AD 08 A6	2370	LDA MAP+2	F1C9- C9 03	3000 CTRLC	CMP **03	F240- CA	3630	DEX
F13C- E9 01	2380	SBC **01	F1CB- D0 0A	3010	BNE RET	F241- E0 FF	3640	CPX **FF
F13E- 20 94 F2	2390	JSR SUB2	F1CD- A9 CC	3020	LDA **CC	F243- F0 03	3650	BEQ UL
F141- 60	2400 LU2	RTS	F1CF- CD 0C A0	3030	CMP **A00C	F245- 4C 7E F0	3660	JMP CUR
F142- 20 F7 F1	2410 LU	JSR CLCUR	F1D2- F0 06	3040	BEQ ON	F248- A2 3F	3670 UL	LDX **3F
F145- 20 0E A6	2420	JSR SA	F1D4- 8D 0C A0	3050	STA **A00C	F24A- AC 02 A6	3680	LDY LINENO
F148- 20 2D F1	2430	JSR LU1	F1D7- 4C 8D F0	3060 RET	JMP FINISH	F24D- C0 00	3690	CPY **00
F14B- AC 02 A6	2440	LDY LINENO	F1DA- A9 EC	3070 ON	LDA **EC	F24F- F0 22	3700	BEQ BOTTOM
F14E- 88	2450	DEY	F1DC- 8D 0C A0	3080	STA **A00C	F251- 88	3710	DEY
F14F- C0 FF	2460	CPY **FF		3090 ;		F252- 8E 00 A6	3720	STX CURID
F151- D0 0C	2470	BNE LU3		3100 ;	LDA **20	F255- BC 02 A6	3730	STY LINENO
F153- A0 0F	2480	LDY **0F	F1DF- A9 20	3110 CLEAR	LDX **00	F258- AD 07 A6	3740 TOP	LDA MAP+1
F155- A9 AF	2490	LDA **AF	F1E1- A2 00	3120	STA **00	F25B- 38	3750	SEC
F157- 20 94 F2	2500	JSR SUB2	F1E3- 9D 00 AC	3130 CL	STA **AC00,X	F25C- E9 40	3760	SBC **40
F15A- A9 C0	2510	LDA **C0	F1E6- 9D 00 AD	3140	STA **AD00,X	F25E- 20 8A F2	3770	JSR SUB1
F15C- 20 8A F2	2520	JSR SUB1	F1E9- 9D 00 AE	3150	STA **AE00,X	F261- 90 03	3780	BCC TOP1
F15F- 8C 02 A6	2530 LU3	STY LINENO	F1EC- 9D 00 AF	3160	STA **AF00,X	F263- 4C 7E F0	3790	JMP CUR
F162- 4C 7E F0	2540	JMP CUR	F1EF- E8	3170	INX	F266- CE 08 A6	3800 TOP1	DEC MAP+2
F165- 20 F7 F1	2550 OPEN	JSR CLCUR	F1F0- E0 00	3180	CPX **00	F269- CE 10 A6	3810	DEC SA+2
F168- 20 0E A6	2560	JSR SA	F1F2- D0 EF	3190	BNE CL	F26C- CE 0C A6	3820	DEC LA+2
F16B- 4C E4 F2	2570	JMP OPENSUB	F1F4- 4C 0A F2	3200	JMP HOME	F26F- 18	3830	CLC
F16E- A2 3F	2580 CLINE	LDX **3F		3210 ;		F270- 4C 7E F0	3840	JMP CUR
F170- A9 20	2590	LDA **20		3220 ;	LDX CURID	F273- A2 3F	3850 BOTTOM	LDX **3F
F172- CA	2600 CLINE1	DEX	F1F7- AE 00 A6	3230 CLCUR	JSR LA	F275- A0 0F	3860	LDY **0F
F173- 20 0E A6	2610	JSR SA	F1FA- 20 0A A6	3240	CLC	F277- 8C 02 A6	3870	STY LINENO
F176- D0 FA	2620	BNE CLINE1	F1FD- 18	3250	ADC **80	F27A- 9E 00 A6	3880	STX CURID
F178- 4C 7E F0	2630	JMP CUR	F1FE- 69 80	3260	RTS	F27D- A9 00	3890	LDA **00
F17B- 20 F7 F1	2640 START	JSR CLCUR	F200- 60	3270		F27F- 20 8A F2	3900	JSR SUB1
F17E- 20 0E A6	2650	JSR SA		3280 ;		F282- A9 AF	3910	LDA **AF
F181- A2 00	2660	LDX **00		3290 ;	JSR CLCUR	F284- 20 94 F2	3920	JSR SUB2
F183- 4C 7E F0	2670	JMP CUR		3300 ;	JSR SA	F287- 4C 7E F0	3930	JMP CUR
F186- A9 C3	2680 PR1	LDA **X11000011	F201- 20 F7 F1	3310 CR	JMP NEWLINE	F28A- 8D 07 A6	3940 SUB1	STA MAP+1
F188- 8D 0C A8	2690	STA PCR1	F204- 20 0E A6	3320		F28D- 8D 0F A6	3950	STA SA+1
F18B- A0 FF	2700	LDY **FF	F207- 4C 91 F0	3330		F290- 8D 0B A6	3960	STA LA+1
F18D- 88	2710 Y7	DEY		3340 ;		F293- 60	3970	RTS
F18E- C0 00	2720	CPY **00		3350 ;	JSR CLCUR	F294- 8D 08 A6	3980 SUB2	STA MAP+2
F190- D0 FB	2730	BNE Y7	F20A- 20 F7 F1	3360 HOME	JSR MAP	F297- 8D 10 A6	3990	STA SA+2
F192- A9 E3	2740	LDA **X11100011	F20D- 20 06 A6	3370	LDA **00	F29A- 8D 0C A6	4000	STA LA+2
F194- 8D 0C A8	2750	STA PCR1	F210- A9 00	3380	TAX	F29D- 60	4010 ;	RTS
F197- 4C CD F2	2760	JMP PR2	F212- AA	3390	TAY		4020 ;	
F19A- C9 0D	2770 CTRL	CMP **0D	F213- AB	3400	STA CURID		4030 ;	
F19C- F0 63	2780	BEQ CR	F214- 8D 00 A6	3410	STA LINENO	F29E- A9 01	4050 KBSCAN	LDA **X00000001
F19E- C9 01	2790	CMP **01	F217- 8D 02 A6	3420	JSR SUB1	F2A0- 8D 0B A8	4060	STA ACR1
F1A0- F0 D9	2800	BEQ START	F21A- 20 8A F2	3430	LDA **AC	F2A3- 8D 0C A8	4070	STA PCR1
F1A2- C9 11	2810	CMP **11	F21D- A9 AC	3440	JSR SUB2	F2A6- A9 02	4080	LDA **X00000010
F1A4- F0 BF	2820	BEQ OPEN	F21F- 20 94 F2	3450	JSR LA	F2AB- 2C 0D A8	4090 KBWAIT	BIT IFR1
F1A6- C9 0E	2830	CMP **0E	F222- 20 0A A6	3460				

F2AB- F0 FB 4100	BEQ KBWAIT	F336- C8 4730 Y2	INY	F3C0- 60 5360	RTS
F2AD- AD 01 A8 4110	LDA ORA1	F337- C0 80 4740	CPY ##80	F3C1- 08 5370	PHP
F2B0- 18 4120	CLC	F339- D0 FB 4750	BNE Y2	F3C2- 48 5380	PHA
F2B1- 69 80 4130	ADC ##80	F33B- A9 00 4760	LDA ##00	F3C3- F8 5390	SED
F2B3- 8D 03 A6 4140	STA KBCHAR	F33D- 8D 0F A0 4770	STA ORA	F3C4- A9 F0 5400	LDA ##F0
F2B6- AD 0D A8 4150	LDA IFR1	F340- 8D 05 A6 4780	STA COUNT	F3C6- 8D 06 A0 5410	STA TILL
F2B9- 8D 0D A8 4160	STA IFR1	F343- 60 4790	RTS	F3C9- A9 C2 5420	LDA ##C2
F2BC- A9 80 4170	LDA #X100000000	F344- A9 08 4800 FFP	LDA #X00001000	F3CB- 8D 05 A0 5430	STA T1HC
F2BE- 2C 53 A6 4180	BIT TECHO	F346- 8D 0F A0 4810	STA ORA	F3CE- CE 12 A6 5440	DEC COUNTCLOCK
F2C1- F0 06 4190	BEQ NOECHO	F349- A0 00 4820	LDY ##00	F3D1- D0 38 5450	BNE EXIT
F2C3- AD 03 A6 4200	LDA KBCHAR	F34B- C8 4830 Y3	INY	F3D3- A9 14 5460	LDA ##14
F2C6- 20 3D F0 4210	JSR VDU	F34C- C0 80 4840	CPY ##80	F3D5- 8D 12 A6 5470	STA COUNTCLOCK
F2C9- AD 03 A6 4220 NOECHO	LDA KBCHAR	F34E- D0 FB 4850	BNE Y3	F3D8- A9 01 5480	LDA ##01
F2CC- 60 4230	RTS	F350- A9 00 4860	LDA ##00	F3DA- 18 5490	CLC
F2CD- A9 00 4240 PR2	LDA ##00	F352- 8D 0F A0 4870	STA ORA	F3DB- 6D 13 A6 5500	ADC SECS
F2CF- CD 04 A6 4250	CHP PRFLAG	F355- 60 4880	RTS	F3DE- 8D 13 A6 5510	STA SECS
F2D2- F0 07 4260	BEQ PR3	F356- A9 10 4890 VTP	LDA #X00010000	F3E1- C9 60 5520	CHP ##60
F2D4- 8D 04 A6 4270	STA PRFLAG	F358- 8D 0F A0 4900	STA ORA	F3E3- D0 29 5530	BNE EXIT
F2D7- AD 01 A6 4280	LDA CHAR1	F35B- A0 00 4910	LDY ##00	F3E5- A9 00 5540	LDA ##00
F2DA- 60 4290	RTS	F35D- C8 4920 Y1	INY	F3E7- 8D 13 A6 5550	STA SECS
F2DB- A9 01 4300 PR3	LDA ##01	F35E- C0 80 4930	CPY ##80	F3EA- A9 01 5560	LDA ##01
F2DD- 8D 04 A6 4310	STA PRFLAG	F360- D0 FB 4940	BNE Y1	F3EC- 18 5570	CLC
F2E0- AD 01 A6 4320	LDA CHAR1	F362- A9 00 4950	LDA ##00	F3ED- 6D 14 A6 5580	ADC MIN
F2E3- 60 4330	RTS	F364- 8D 0F A0 4960	STA ORA	F3F0- 8D 14 A6 5590	STA MIN
F2E4- A8 4340 OPENSUB	TAY	F367- 60 4970	RTS	F3F3- C9 60 5600	CHP ##60
F2E5- E8 4350	INX	F368- A2 00 4980 PRINTOUT	LDX ##00	F3F5- D0 17 5610	BNE EXIT
F2E6- 20 0A A6 4360	JSR LA	F36A- AD 0D A8 4990 STROBE	LDA IFR1	F3F7- A9 00 5620	LDA ##00
F2E9- 8D 01 A6 4370	STA CHAR1	F36D- 8D 0D A8 5000	STA IFR1	F3F9- 8D 14 A6 5630	STA MIN
F2EC- 98 4380	TYA	F370- A9 C7 5010	LDA #X11000111	F3FC- A9 01 5640	LDA ##01
F2ED- 20 0E A6 4390	JSR SA	F372- 8D 0C A8 5020	STA PCR1	F3FE- 18 5650	CLC
F2F0- AD 01 A6 4400	LDA CHAR1	F375- A0 FF 5030	LDY ##FF	F3FF- 6D 15 A6 5660	ADC HOUR
F2F3- E0 40 4410	CPX ##40	F377- 88 5040 Y6	DEY	F402- 8D 15 A6 5670	STA HOUR
F2F5- D0 ED 4420	BNE OPENSUB	F378- C0 00 5050	CPY ##00	F405- C9 24 5680	CHP ##24
F2F7- 60 4430	RTS	F37A- D0 FB 5060	BNE Y6	F407- D0 05 5690	BNE EXIT
F2F8- A2 3F 4440 CLOSE	LDX ##3F	F37C- A9 E7 5070	LDA #X11100111	F409- A9 00 5700	LDA ##00
F2FA- A8 4450 CLOSESUB	TAY	F37E- 8D 0C A8 5080	STA PCR1	F40B- 8D 15 A6 5710	STA HOUR
F2FB- CA 4460	DEX	F381- 18 5090	CLC	F40E- 68 5720 EXIT	PLA
F2FC- 20 0A A6 4470	JSR LA	F382- AD 0D A8 5100 TEST	LDA IFR1	F40F- 28 5730	PLP
F2FF- 8D 01 A6 4480	STA CHAR1	F385- 6A 5110	ROR A	F410- 40 5740	RTI
F302- 98 4490	TYA	F386- 90 E2 5120	BCC STROBE	F411- A2 00 5750 CLOCKSET	LDX ##00
F303- 20 0E A6 4500	JSR SA	F388- 8D 70 9F 5130	LDA LINBUF,X	F413- 8D 82 F4 5760 HR	LDA HRMESS,X
F306- AD 01 A6 4510	LDA CHAR1	F38B- 8D 00 A8 5140	STA ORB1	F416- 20 47 8A 5770	JSR OUTCHR
F309- EC 00 A6 4520	CPX CURID	F38E- EC 05 A6 5150 C01	CPX COUNT	F419- E8 5780	INX
F30C- D0 EC 4530	BNE CLOSESUB	F391- F0 04 5160	BEQ CRP1	F41A- E0 0D 5790	CPX #13
F30E- 4C 81 F0 4540	JMP PA	F393- E8 5170	INX	F41C- D0 F5 5800	BNE HR
4550 ;		F394- 4C 6A F3 5180	JMP STROBE	F41E- 20 D9 81 5810	JSR INBYTE
F311- AD 01 A6 4560 PRINT	LDA CHAR1	F397- A9 02 5190 CRP1	LDA #X00000010	F421- 8D 15 A6 5820	STA HOUR
F314- C9 0A 4570	CHP ##0A	F399- 8D 0F A0 5200	STA ORA	F424- A2 00 5830	LDX ##00
F316- F0 17 4580	BEQ LFP	F39C- C8 5210 Y	INY	F426- 8D 8F F4 5840 HI	LDA MINMESS,X
F318- C9 0D 4590	CHP ##0D	F39D- C0 80 5220	CPY ##80	F429- 20 47 8A 5850	JSR OUTCHR
F31A- F0 4C 4600	BEQ PRINTOUT	F39F- D0 FB 5230	BNE Y	F42C- E8 5860	INX
F31C- C9 0C 4610	CHP ##0C	F3A1- A9 20 5240	LDA ##20	F42D- E0 0F 5870	CPX #15
F31E- F0 24 4620	BEQ FFP	F3A3- 8D 00 A8 5250	STA ORB1	F42F- D0 F5 5880	BNE HI
F320- C9 0B 4630	CHP ##0B	F3A6- 4C 2F F3 5260	JMP LFP	F431- 20 D9 81 5890	JSR INBYTE
F322- F0 32 4640	BEQ VTP	F3A9- A9 14 5270	LDA ##14	F434- 8D 14 A6 5900	STA MIN
F324- AE 05 A6 4650	LDX COUNT	F3AB- 8D 12 A6 5280	STA COUNTCLOCK	F437- A2 00 5910	LDX ##00
F327- 9D 70 9F 4660	STA LINBUF,X	F3AE- 8D 0B A0 5290	STA ACR	F439- 8D 9E F4 5920 SE	LDA SECSMESS,X
F32A- E8 4670	INX	F3B1- A9 C0 5300	LDA ##C0	F43C- 20 47 8A 5930	JSR OUTCHR
F32B- 8E 05 A6 4680	STX COUNT	F3B3- 8D 0E A0 5310	STA IER	F43F- E8 5940	INX
F32E- 60 4690	RTS	F3B6- A9 F0 5320	LDA ##F0	F440- E0 0F 5950	CPX #15
F32F- A9 04 4700 LFP	LDA #X00000100	F3B8- 8D 06 A0 5330	STA TILL	F442- D0 F5 5960	BNE SE
F331- 8D 0F A0 4710	STA ORA	F3BB- A9 C2 5340	LDA ##C2	F444- 20 D9 81 5970	JSR INBYTE
F334- A0 00 4720	LDY ##00	F3BD- 8D 05 A0 5350	STA T1HC	F447- 8D 13 A6 5980	STA SECS

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F44A- A9 00      5990      LDA ##00
F44C- 8D 12 A6   6000      STA COUNTCLOCK
F44F- AA         6010      TAX
F450- BD AD F4   6020      LDA GOMESS,X
F453- 20 47 8A   6030      JSR OUTCHR
F456- E8         6040      INX
F457- E0 1E      6050      CPX #30
F459- D0 F5      6060      BNE GOCLOCK
F45B- 20 D9 81   6070      JSR INBYTE
F45E- C9 0D      6080      CMP ##0D
F460- D0 F9      6090      BNE BACK1
F462- 4C A9 F3   6100      JMP CLOCKSTART
F465- AD 15 A6   6110      LDA HOUR
F468- 20 FA 82   6120      JSR OUTBYT
F46B- A9 2E      6130      LDA #'
F46D- 20 47 8A   6140      JSR OUTCHR
F470- AD 14 A6   6150      LDA MIN
F473- 20 FA 82   6160      JSR OUTBYT
F476- A9 20      6170      LDA ##20
F478- 20 47 8A   6180      JSR OUTCHR
F47B- AD 13 A6   6190      LDA SECS
F47E- 20 FA 82   6200      JSR OUTBYT
F481- 60         6210      RTS
F482- 0D 45 4E   6220      HRMESS      .BY $0D 'ENTER HOURS '
F485- 54 45 52
F488- 20 48 4F
F48B- 55 52 53
F48E- 20
F48F- 0D 45 4E   6230      MINMESS      .BY $0D 'ENTER MINUTES '
F492- 54 45 52
F495- 20 4D 49
F498- 4E 55 54
F49B- 45 53 20
F49E- 0D 45 4E   6240      SECSMESS      .BY $0D 'ENTER SECONDS '
F4A1- 54 45 52
F4A4- 20 53 45
F4A7- 43 4F 4E
F4AA- 44 53 20
F4AD- 0D 54 4F   6250      GOMESS      .BY $0D 'TO START TYPE CR AT TIME SET '
F4B0- 20 53 54
F4B3- 41 52 54
F4B6- 20 54 59
F4B9- 50 45 20
F4BC- 43 52 20
F4BF- 41 54 20
F4C2- 54 49 4D
F4C5- 45 20 53
F4C8- 45 54 20
F4CB- 00 00 00   6260      DEFAULBK      .BY 00 00 00 00 00 00 $9D $00 $AC
F4CE- 00 00 00
F4D1- 9D 00 AC
F4D4- 60 BD 00   6270      .BY $60 $BD $00 $AC $60
F4D7- AC 60
F4D9- 9D 00 AC   6280      .BY $9D $00 $AC $60 00 00 00 00 00
F4DC- 60 00 00
F4DF- 00 00 00
F4E2- 00 00 00   6290      .BY 00 00 00 00 00 00 00 00 00
F4E5- 00 00 00
F4E8- 00 00 00

6300 ;COMMENTS ADDED BY LUX FROM THIS POINT ON:
6310 ;COMPARE THE ENTRIES FROM THIS POINT ON WITH THE
6320 ;MON 1.1 DEFAULT TABLE ON PAGES 4-21 AND 4-22 OF
6330 ;THE SYM-1 REFERENCE MANUAL, BEGINNING AT $A620.
6340 ;THESE ARE HIS 'J' COMMANDS FROM MON (SEE BELOW FOR DEFS):

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F4EB- 00 C0      6350      .SE BASIC
F4ED- 00 90      6360      .SE BASICWARM
F4EF- 00 80      6370      .SE RAE
F4F1- 03 80      6380      .SE RAEWARM
F4F3- 11 F4      6390      .SI CLOCKSET
F4F5- 65 F4      6400      .SI CLOCKCHECK
6410 ;HE CAN RESET WITH .J6 AT THE KEYBOARD
6420 ;IF IN MON, BUT NOT AFTER A SYSTEM CRASH.
6430      .SI RESET
6440 ;HE SETS HIS CASSETTE DEFAULTS TO 2800 BAUD!!!!
6450      .BY $00 $02 $04 $2C $23 $00
F4F7- 00 F0      6460      .BY $00 $1A $00 $00 $00 $00
F4F9- 00 02 04   6470      .BY $00 $00 $2D $00 $00 $00 $00
F4FC- 2C 23 00
F4FF- 00 1A 00
F502- 00 00 00
F505- 00 00 2D
F508- 00 00 00
F50B- 00
F50C- 00 6D 6E   6480      .BY $00 $6D $6E $86 $06 $00
F50F- 86 06 00
F512- 00 00 00   6490      .BY $00 $00 $00 $00 $00 $00 $00
F515- 00 00 00
F518- 00
F519- 00 00 01   6500      .BY $00 $00 $01 $4C $00 $80
F51C- 4C 00 80
F51F- B0 00 00   6510      .BY $B0 $00 $00 $00 $10 $00 $F0
F522- 00 10 00
F525- F0
F526- FF 00 00   6520      .BY $FF $00 $00 $00 $00 $4C
F529- 00 00 4C
6530 ;NOTICE THE USE OF THE .SI AND .SE PSEUDO OPCODES HERE:
F52C- 9E F2      6540      .SI KBSCAN
F52E- 4C         6550      .BY $4C
F52F- 3D F0      6560      .SI VDU
F531- 4C         6570      .BY $4C
F532- 6A 89      6580      .SE STATUSVEC
F534- 4C         6590      .BY $4C
F535- D1 81      6600      .SE UNRECVEC
F537- 4C         6610      .BY $4C
F538- D1 81      6620      .SE UNRECVEC
F53A- 4C         6630      .BY $4C
F53B- 06 89      6640      .SE DISSCANVEC
F53D- 7E 88      6650      .SE EXEVEC
F53F- C0 80      6660      .SE TRACEVEC
F541- 4A 80      6670      .SE USERBR
F543- C1 F3      6680      .SI CLOCKIRQ
6690 ;HE USES MON 1.1 IRQVEC AND NMI(VEC), BUT HIS OWN RESET.
F545- 9B 80      6700      .SE NMI
F547- 00 F0      6710      .SI RESET
F549- 0F 80      6720      .SE IRQVEC
6730 ;THERE IS HIS AUTO LOG-ON MESSAGE WHICH PRESENTS A
6740 ;"MENU" OF THE JUMP TABLE:
6750 MESSAGE      .BY $0D 'S.E.COLE SYS-1 AUG 1980' $0D
F54B- 0D 53 2E
F54E- 45 2E 43
F551- 4F 4C 45
F554- 20 53 59
F557- 53 2D 31
F55A- 20 20 41
F55D- 55 47 20
F560- 31 39 38
F563- 30 0D
F565- 20 4A 55   6760      .BY ' JUMP TABLE' $0D
F568- 4D 50 20
F56B- 54 41 42
F56E- 4C 45 0D

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F571- 30 20 42 6770      .BY '0 BASIC' $0D '1 WARM START BASIC' $0D
F574- 41 53 49
F577- 43 0D 31
F57A- 20 57 41
F57D- 52 4D 20
F580- 53 54 41
F583- 52 54 20
F586- 42 41 53
F589- 49 43 0D
F58C- 32 20 52 6780      .BY '2 RAE' $0D '3 WARM START RAE' $0D
F58F- 41 45 0D
F592- 33 20 57
F595- 41 52 4D
F598- 20 53 54
F59B- 41 52 54
F59E- 20 52 41
F5A1- 45 0D
F5A3- 34 20 53 6790      .BY '4 SET CLOCK' $0D '5 PRINT CLOCK' $0D
F5A6- 45 54 20
F5A9- 43 4C 4F
F5AC- 43 4B 0D
F5AF- 35 20 50
F5B2- 52 49 4E
F5B5- 54 20 43
F5B8- 4C 4F 43
F5BB- 4B 0D
F5BD- 36 20 52 6800      .BY '6 RESET SYS' $0D
F5C0- 45 53 45
F5C3- 54 20 53
F5C6- 59 53 0D
F5C9- 37 20 47 6810      .BY '7 GOTO HEX 0200' $0D
F5CC- 4F 54 4F
F5CF- 20 48 45
F5D2- 58 20 30
F5D5- 32 30 30
F5D8- 0D
        6820 THERE'S WHERE THE ACTUAL RESET VECTOR COMES FROM:
        6830      .BA $F7FC
        6840      .SI RESET
        6850      .EN
F7FC- 00 F0

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READING APPLE TAPES

Published below are portions of two letters from Hush Campbell, one of our many Australian subscribers.

We concur with Mr. Campbell's remark about Microchess at the current state-of-the-art. But, for its time, Peter Jennings's 1.1 K Microchess for the unaugmented KIM was a real tour de force. It seemed a near miracle to be able to have that neat little assembly of electronic parts tell us, on its little display, where it wished us to move its pieces. We converted our Microchess from KIM to SYM many months back, and it was just as much fun as on the KIM, in spite of our increased sophistication (both SYM and us!).

For awhile, we considered making arrangements to market our SYM version, until we found that one was already available from the 6502 Program Exchange. Very resretably, this version makes use of a terminal, so that, even though it will actually draw the board for you, on request, the old charm is gone. We decided against recommending that version when we found that, if we were in check, and made no attempt to protect our king, Microchess also ignored the check, and turned its attention elsewhere!

SYM-PHYSIS 5/6-19

Sargon is well known to us by reputation, and one of our colleagues reports that Fastsammon provides a worthy opponent. So that you can replay and 'post-mortem' a game, Fastsammon gives you the option to repeat the previous sequence of dice-throws with each restart. We publish below a copy of Mr. Campbell's Apple Loader Program, so that you can purchase some of the Apple (machine language only) programs on cassette for your use on SYM.

We have not been able to try the Apple Loader Program, ourselves, as we are still waiting for delivery of the Apple Tape 'Slide Show', which we ordered. We ordered this tape because of Dave P. Kemp's (developer of the SP-1 'Speak & Spell' interface for the SYM) article 'Slide Show for the SYM', in MICRO, Issue Number 25, June 1980. In this article Mr. Kemp shows how to, not only read machine language dumps of the Apple graphic displays into the SYM, but how to convert them from Apple display format into MTU's Visible Memory format in the process.

We will be sending copies of this issue to Hayden Books and to Quality Software, suggesting that they consider marketing SYM cassette versions of their programs. Quality Software, according to Mr. Campbell, does not attempt to 'protect' their software. Hayden does 'protect' their Apple software, but as you can see from Mr. Campbell's letter, such protection can be 'broken'.

17 August 1980

Dear Lux

19 Brushy Creek Road
Lenah Valley
Tasmania 7008
Australia

Thank you for your note about my SYM-1 modifications to Apple II games.

Yes - you can load Apple machine code cassettes into a SYM by using a modification of the Apple cassette load from their monitor. By a stroke of luck or something, the speed of the tapes is almost right. I have to slow down my Superscore recorder by about a quarter of a turn of the speed control. It was one of those 'I wonder if's...' that worked. It even worked with the MON - 1.0 that I was using when I found how to read Apple tapes.

Loading into SYM-1 helps to break security codes. When Mon 1.0 or 1.1 meets an Apple monitor address it returns to monitor without destroying the code, as the Apple does on RESET.

I have the code for loading Apple tapes, together with working modifications of:

Hayden's Sargon and Sargon II
Personal's Microchess and Checker King
Quality's Fastsammon

All are modified to run on a SYM-1 and a 40 character KIM-2, with primitive graphics. You really need a separate board for chess; the other two are OK on the VDU.

I have not relocated any of the programs, since I have only the code that I disassembled myself to work from, and plenty of RAM besides. The programs use the following RAM.

SARGON :- 800-2CFF
SARGON II :- E00-2FFF
FASTSAMMON :- 800-20D0
CHECKER KING :- 3D0-1FFF

I have not listed Microchess. It is not worth trying when the Sargons are available.

SYM-PHYSIS 5/6-20

