ACS NEWSLETTER

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THE ACS STORY

An article about the Amateur Computer Society has been accepted by Computers & Automation magazine, and should appear shortly.

RECOMP II AND III FOR SALE

Autonetics is offering a very limited number of Recomp II and III general-purpose computers for 3% of the original cost: $3.000; used but guaranteed to operate. Joe Tolbert says the II is more desirable, even though it's older, because it has, for one thing, more hardware instructions (71 to the III's 48). It has more available programs (50 subroutines, 80 programs and 185 users' programs) than the III (56 subroutines, but only 63 programs and 16 users' programs).

Both the II and III are fully transistorized and include: computer, control console, photoelectric tape reader, tape punch, typewriter and desk. Both operate from standard 115-volt lines. Also available is a limited number of peripherals such as high-speed tape punch/reader, and Versa tape and keyboard.

For further information, and/or a system description and index of programs, contact H.O. Elkins, (714) 632-3031. Address: Autonetics, North American Rockwell, P.O. Box 4192, 3370 Miraloma Ave., Anaheim, Calif. 92803. There may still be a couple left.

$750 EDUCATIONAL COMPUTER

Information about a new educational computer, the Kenbak-1, was sent by John Ranelletti, a new member in California. Further info was obtained by a call to Kenbak Corp., 8714 Darby Ave., Northridge, Calif. 91324, phone (213) 349-3861.

This $750 machine weighs 12 pounds, measures 19 by 4½ by 12 inches, consumes 40 watts. To keep costs down, it is a minimal computer: I/O is by console switches and lamps; memory consists of 1024-bit Intel MOS shift registers; the Motorola, TI and Fairchild TTL ICs are soldered in.

There are no peripherals just now; a punched-card input device, manual type, will be available this winter for about $100, with factory retrofitting. A more flexible model may be available in a year or two, but no work has been done on it yet, says president John Blankenbaker.

A 24-page programming reference manual costs $2.00, and a manual of 30 laboratory exercises is $6.00. A maintenance and theory-of-operation manual, containing complete schematics, will be published soon, at $10.00.

The 8-bit Kenbak-1 has three programming registers, five addressing modes (constant, memory, indexed, indir indirect-indexed), two's complement arithmetic, serial operation. The memory consists of 256 eight-bit bytes. There are 21 basic instructions: Add, Sub, Load, Store, And, Or, Load Complement, 4 Jumps, Skip on 0, Skip on 1, Set 0, Set 1, Shift Left & Right, Rotate Left & Right, No Op, and Halt.

There are 34 register-to-register operations (transfers, additions, subtractions, etc.) produced by a single instruction using the memory-

addressing mode.

There are no plans to offer a kit. "Our answer has always been that we might consider it, but only at a higher price. What we would potentiallly save on labor is lost in headaches and troubles (for us)!" However, it might be possible for some people to come in on several Saturdays and each build one under supervision, but no price has been established for this, says John Blankenbaker, who also says that Kenbak would be happy to receive members of the ACS for a visit to the plant.

MINUTEMAN COMPUTER INFO

Autonetics has prepared a Technical Data Package for the D-17B computer for $100. The publication contains sections on logic fundamentals, a D-17B description, word formats and programming, circuits, functional logic description, and maintenance data. The 15 guidance electronics modules can be removed to reduce power consumption and heat generation. The cutoff date for ordering this package was 9-15-71, although it may still be available.

Autonetics has also developed an Input/Output Interface for the Minuteman I D-17B computer. It comes with or without an ASR-33 Teletype. With, $5200 (all electronics are in the TTY console); without, $3500. Interface schematics are not available separately.

CODE IN, PRINTED TAPE OUT

"Automatic radiotelegraph translator and transcriber, by Gonzales and Vogler (Ham Radio, Nov. 1971, pp 8-23), uses several dozen TTL ICs in digital circuits to decode Morse (at up to 120 wpm) and feed it to a strip printer. The printer described is the Model 4 by Computer Terminal Systems in Plainview, N. Y., and costs $129.99 for an "evaluation sample." On page 99 of the same issue is an ad by the authors, offering detailed construction plans for $14.95.

SIGNS OF THE TIMES

Several ambitious construction projects have been mentioned in these pages as forthcoming in one of the electronics hobby magazines. Well, the magazine has decided to cut out the big build-it-yourself articles and go to the smaller stuff. So don't look for an IC clock run by TV digital code (Aug. 1970 Newsletter, p 6) or the inexpensive time-sharing terminal (May 1970, p 2). (The magazine is Popular Electronics, which, starting next January, will be merged with Electronics World, and will be known as Popular Electronics including Electronics World. After all the converted EW subscriptions run out, the EW name will be dropped.)

DESK CALCULATOR KIT

The last big construction article Popular Electronics will run is "An Electronic Desk Calculator You Can Build," (Nov. 1971, p 27-32). The calculator adds, subtracts, divides and multiplies up to 16 digits, and has an electro-luminescent segmented display of eight digits. A shift key causes the first or last 8 digits of the 16-digit results to be displayed. The six LSI ICs can be bought separately for $75 (this is called item EA-80, which sounds like an Electronic Arrays item), as well as a keyboard for $21, etc.; the complete calculator kit, with case, is $179 plus $5 for postage from MITS, 2016 San Mateo N.E., Albuquerque, New Mexico 87110. The article hasn't enough details to permit building the calculator; you'd have to buy the kit. MITS

has another calculator, with square-root capability, but none of the electronics hobby magazines are running big construction articles any more. The emphasis is now on the easier-to-build items.

NIXIE TUBES AND MOLEX IC TERMINALS

Joe Tolbert mentioned a company with low prices on several items: Black Mountain Engineers, P.O. Box One, Corinth, Vermont 05039.

They have type AZK Nixies, manufacturer's rejects, at $2.90 each, for 1 to 19; socket for 55¢. Molex IC-mounting terminals (see Newsletter for Aug. 1970, p 5) are 67¢ per strip of 56 (for four 14-pin or 3½ 16-pin DIPs); over 500 (9 or more strips), 56¢ a strip; over 5000 terminals, 0.9¢ each.

Black Mountain sends several application notes on numerical indicators. They also sell first-quality 7400-series ICs; a 7400 gate is 35¢ each; the 7483 4-bit full adder is $2.25 each.

XDS MEMORY STACKS

Valley Computer Corp., 17027 Roscoe Blvd., Northridge, Calif. 91324, sells used computers such as the RPC-4000 ($14-21K), LGP-21 ($12-14K), LGP-30 ($5-7K) and XDS 930 and 940 ($50K up). They have ten XDS memory stacks, 16K words of 24 bits, 1.75-µsec cycle time, for $300 each; "some of them have minor problems, but all are generally operational."

WORD FROM WIEBKING

Steve Wiebking writes from Ohio:

"I've located a dealer who will be of interest to many members. He has a 4K x 40-bit, 1-µsec memory unit with drive electronics, for $80. He can't guarantee it, but he expects that more such units will be available from time to time. They are failures from G.E. computers; one or two of the inhibit lines have burned out, leaving 38 or 39 usable bits. Otherwise, they are supposedly OK. Present units are of Ampex manufacture. Future units may be Fabri-Tek or Lockheed. The complete unit is 4 x 10 x 12 in., and weighs 12 pounds.

"The dealer is Mr. Gary Forbes, 3641 E. Van Buren, Phoenix, Ariz. 85008. He mentioned that he gets other "interesting" Honeywell items from time to time: IC boards, Teletype and other interface circuitry, CPU's (GE 200 and 400 series), and miscellaneous peripheral equipment."

Steve's letter of July 8:

"I have finally regained my sanity long enough to settle firmly on building a PDP-8. I am nearing the end of about 4 weeks of leave of which I spent a large part giving closer consideration to the various machines I have collected information on. While I still feel that there are many machines I would prefer to a PDP-8, I am forced to the conclusion that any machine I can build in a reasonable length of time is better than any machine I can't. I can use DEC's plans right down to the last logic board except around the memory controls, and this will save me a lot of work over trying to design my own from scratch.

"So, I won't be giving away that manual as in the previous letter, but I can still supply Xeroxes at the following postpaid prices:

PDP-8/I	Vol. 1	$7
	Vol. 2	$12
PDP-8/L	Vol. 2	$4.50

Volume 2 in either case contains all the logic diagrams. Volume 1 is probably not necessary.

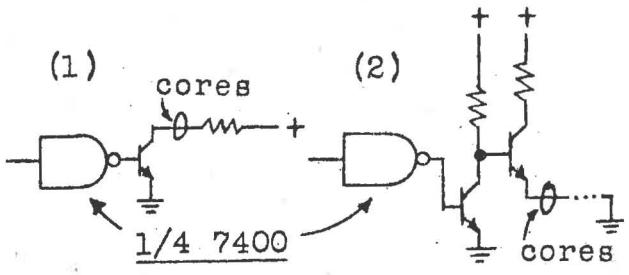
"On memories: I haven't gotten around to testing the rectifiers yet, but it has occured to me that part of the advantage of 3-to-1 selection ratio in a core stack can be had without the need for separate drivers for the X direction on each plane. (Three-to-one selection ratios are usually achieved by using the inhibit line to bias all cores in the plane with $-\frac{1}{2}$ units of current and driving the X and Y lines with +1 full units of current each. This results in +3/2 units of current at the selected core and $+\frac{1}{2}$ or $-\frac{1}{2}$ at all other cores in the plane. Unfortunately, inhibiting will not work with this arrangement even if you had a fifth wire to do it with. Consequently, separate driving of the X lines is required for each plane; this much of the system is similar to a $2\frac{1}{2}$D conventional system.)

"Note that the only problem arises in the write cycle. There is no real difficulty connected with using 3:1 selection in the read cycle when the inhibit wire is not used anyway, and using the 2:1 selection system in the write cycle. There may be a problem if your drivers are transformer-coupled to the drive line, but I will be coupling my drivers direct to the selection lines, and the only change required in the design to have different read and write currents will be to have different load resistors in the drivers at opposite ends of the lines. It would also be necessary to change the inhibit drivers to bi-directional operation.

"Members may be wondering "why bother" if they have not read the two articles I referenced in the Nov. 1970 Newsletter (p 1). The 3:1 selection allows a higher current at the selected core; this results in faster switching, which means a faster read cycle in the case I've described. Because the core switches about twice as fast, the output is higher for a stored "1" (about 250-300 mV in the case of my 80-mil cores). Alternately, the value of the $\frac{1}{2}$-select current can be reduced so that the memory will operate over a wider temperature range without a temperature-compensated power supply. Since you are still using 2:1 selection in the write cycle, you can't reduce it too much, but increased speed in the read cycle over a 2:1 system should more than make up for what you lose by lowering the drive currents."

Steve's postcard of Sept. 11:

"At the rate things are going, I may not get any more work done on my computer until I graduate from AFIT next March. 2N5451's work OK as high-current switches. The switching speed looks like it is OK for memories as fast as 1-2 μsec if used in circuit 1. Note



that there is no base resistor. Use of a base resistor in this circuit with 2N5451's or other cheap transistors causes the turn-off time to become longer than the memory cycle. Circuit 1 has been built and will definitely work. Circuit 2 has not yet been tried, but should be OK as the positive-end-of-the-drive-line switch. (No. 1 is for ground end.) While testing testing #1, I found that a little bypass capacitance on the power supply is worse than none. I originally put .01 μF across the supply, but this converted the .2v spikes into a 3 or 4v sinewave on the 5v supply. A large (~10 μF) electrolytic finally smoothed them out."

Steve's letter of October 19:

"I never have quite given up on the IBM 360/50, although I have off and on considered a number of smaller, more sensible machines. Lately, though, a number of things have happened to make this a much more reasonable project.

"About a year ago I bought a copy of 'Microprogramming: Principles and Practices' by Samir S. Husson (Prentice-Hall, $16.95). Mr. Husson was one of the leading designers of the 360 series, and the book concentrates on the "how it was done" approach to the subject. There are long chapters on the 360/40 and 360/50 as well as two other machines. Reading the chapter is sufficient to put you in a position to write your own microprograms, but the chapters cover a lot of ground; it took me about 10 days to get through the one on the 360/50.

"A very helpful feature of the book is the many references to IBM engineering manuals. I ordered the model 50 manuals referred to by Mr. Husson a few months ago, and I have just ordered the ones referred to in the first set of manuals. The logic diagrams in these manuals are much easier to follow than the DEC PDP-8 manuals, mostly because they are broken up into small functional units and all signals flow from left to right. The manuals generally seem to be directed to field engineers learning how to service the machines, and are loaded with explanations and charts.

"I bought one manual on the 360/25 last year, and it is not nearly as clear as the ones on the 50. Different models of the 360 were developed by independent teams.

"From what I have read in the Newsletter, most members seem to be interested in a machine that will cost only a couple hundred dollars. I can't see any of the 360 models falling into this category. I would guess that a model 40 with a 4K x 18 memory could be put together using surplus core and cheap ICs for a little over $1000 (would you believe $1500, maybe?). The 50 with minimum memory (4K x 36) should cost me about twice as much.

"If there are any members interested in spending this amount on their machine, I would be more than happy to write them a letter on the sorts of problems likely to be encountered in building such a machine. I don't have any information on the 30. I don't recommend the 25. It is interesting from the point of view of havings its microprogram in main core, but unless you think the ability to change your instruction set at will is an advantage, the only thing it has to offer is upward compability. Even though it uses 900-nsec core, a PDP-8 could easily beat it in terms of 'numbers crunched per second.'

"The thing that has kept me from taking the 360 seriously before now was the need to build a large, fast ROM without going broke; in the case of the 50, a 1408-word by 176-bit ROM with about 100-nsec access and 500-nsec cycle is required. Assuming half the bits are 1's, over 100,000 diodes would be needed for a diode ROM, so that approach is out...."

Steve's letter of Oct. 28:

"American Micro-Systems offers a dual 480-bit shift register for $3.50 in quantities over 25. Depending on which part of the country you live in, the distributor is Cramer, Industrial Electronics, Bodelle, or Century Electronics. I didn't have any luck the last time I tried to coordinate an order for registers, but the price is lower and the quantity is smaller this time, so I'm willing to try it again. The registers are guaranteed to 1

The Amateur Computer Society is open to all who are interested in building and operating a digital computer that can at least perform automatic multiplication and division, or is of a comparable complexity.

For membership in the ACS, and a subscription of at least eight issues of the Newsletter, please send $3 (or a check) to:

Stephen B. Gray
Amateur Computer Society
260 Norotон Ave.
Darien, Conn. 06820

The Newsletter will appear about every two months or so.

MHz with a "typical" 2½-MHz rate. [Steve's address is Apt. 119, 251 W. Dayton-Yellow Springs Rd., Fairborn, Ohio 45324.]

"Incidentally, members who are willing to put up with a serial memory no longer have any excuse for putting off construction; 1024 words of 15 bits will cost only $56 plus drive circuits.

"The rest of the IBM manuals I ordered arrived. They did not contain all I had expected, but the combined set contains diagrams of all the logic "whose function is not immediately apparent" and has flowcharts of all instructions that will convert to microinstructions rather easily. Actual logic and microinstruction diagrams are apparently buried in manuals referred to as the ALD's and CLD's. These are frequently referred to, but no form number is ever given, so it is probably not possible to order them. From a sour-grapes point of view, what I have might be optimum, since it will require me to get a fairly good understanding of the machine before I start filling in the missing parts.

"Direct substitution of TTL is feasible for all 360 models from 50 on down. The logic used is similar to series 930 DTL. The easiest way to collect a set of hardware manuals for a model is to order a few known ones, then order the ones referred to in these, etc. Starter sets for several of the models are:

360/20 Y26-5909, Y25-3027
360/25 Y24-3527, A24-3510, R25-5402
360/30 A24-3231, 225-3360, 225-3362
360/40 223-2840 thru 223-2844
360/50 Y22-2821, Y22-2822

"Particularly with the newer models 20 and 25, you may occasionally find that some of the manuals are "restricted distribution" and cannot be bought. On the other hand, depending mostly on the time of day, you may be able to buy them after all. In the case of hardware manuals, they apparently all start out with Z prefixes, which means they can't be sold to anybody, including the fellow who wrote them. Only one of the 360/50 manuals I ordered was restricted (the time of day was wrong that particular time) and this was volume one of a pair for which the second one is not restricted."

WANTED: HELP WITH 8/L

Al Kilburn writes that he has a PDP 8/L. He's interested in information on interfacing an audio tape recorder with it, and in cheap peripherals such as printer, card reader; and also used boards compatible with DEC sockets; 6844 S. Oglesby, Chicago, Illinois 60649.

CONNECTORS FOR SALE

I have 62 used Amphenol connectors, female, type 26-190-32, 3 3/4 in. long. These have 32 contacts; two opposed sets of 16, the sets ½ in. apart. Originally held ¼-inch-thick analog boards. Catalog price (for 50-99), $2.60 each. Sale price for all 62: $30 or best offer.