ACS NEWSLETTER

a publication of the
AMATEUR COMPUTER SOCIETY

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MEMBERSHIP AND SUBSCRIPTION

Although I'd hoped to be able to send you the ACS Newsletter free, the costs of printing and postage are just too high, despite several contributions, unsolicited but highly welcome.

Therefore, a combined membership and subscription fee of $3.00 has been established. There will be no dues, at least not in the foreseeable future. The number of Newsletter issues you will receive will depend on how many join, and should be at least 8, probably more. The Newsletter will appear about every 6 or 8 weeks.

To become a member of the Amateur Computer Society and receive the ACS Newsletter issues that will follow this one, please send $3.00 to

Stephen B. Gray
Amateur Computer Society
219 West 81 St
New York, N.Y. 10024

Those who sent contributions are ACS members as of now, and will have their subscriptions extended to the full amount of their gifts.

The Beginning

The Amateur Computer Society was launched on the afternoon of May 5, 1966, when letters of announcement were sent to ten technical and hobby magazines. So far, five have printed the letter: Control Engineering (June, p 12); QST (July, p 78); EEE (June, p 142); EDN (July, p 7); and Computer Design (August, p 12).

The original letter of announcement ran this way:

"This is an invitation to your readers who are amateur builders of digital computers to join the new Amateur Computer Society, whose main purpose is to exchange information through a newsletter. To limit the membership to the really serious, the ACS is open only to those who are building or operating a homemade computer that can at least perform automatic multiplication and division.

"The newsletter will contain queries from members with problems, answers provided by myself or other readers, details of computers built by members and by manufacturers, and information on surplus computer hardware, cheap integrated circuits, and relevant publications.

"Will qualified readers please send me information about their computers, such as word length, memory size, clock speed, number of instructions, sources of hardware and schematics, present problems, and details of clever solutions to previous problems.

"If there is enough interest in a lower-level group, it may be possible to form an "Amateur Computer Logic Society," for those who want to construct logic circuits and simple computers."

The first four magazines printed various parts of the first three paragraphs. Only Computer Design printed the entire letter, so the great majority of responses were from a rather high caliber of amateur.

Response

As of today's mail, 54 letters and telephone calls have been received, from 19 states, including Hawaii, plus Canada and Switzerland, and continue to come in at the rate of one a day. A third came from IEEE members; two are Senior Members. Five gave their ham call letters.

Most of the prospective ACS members are in the New York area (19), the Los Angeles area (11), or the Chicago area (9). Many are engineers; several work for computer manufacturers (IBM, Univac, GE, Honeywell) in logic or memory design. Two are in highschool.

As expected, only a very few are past the half-way mark in the building of their computers. One man is about two-thirds of the way toward completion; the rest range from "I've been thinking about building a computer for some time" to "I have the shift registers completed."

The most common problems are with input/output, memory, and finding overall computer schematics. This issue of the Newsletter will deal mainly with the problem of the schematics, as this is the main deterrent to getting started for most of us.

First ACS Mailing

To all those who wrote to the ACS, a two-page resume of the plans and aims of the Society was sent. Because this first issue of the ACS Newsletter will be sent to all future enquirers, the ACS resume, which was dated July 1, 1966, is reprinted here, in part:

"The main reason for the existence of the ACS is to enable amateur computer builders to help each other, saving time and money by trading ideas. And there are many areas where an amateur needs help:

"A. Circuits

1. Surplus. Where can they be bought? Where do you get the schematics? How do you use circuit boards whose terminal contacts have been broken off (as all surplus IBM SMS boards, for example)?

2. Construction. Where can you find schematics, with parts values, for not-too-complicated circuits? What are the most practical and cheapest ways of mounting the components on a board? Are homemade printed-wiring boards cheap enough to use?

3. Integrated Circuits. Who makes the cheapest and most reliable IC's? What are the best and cheapest ways of mounting them?

"B. Mounting of Circuit Boards

1. Fixed. Is there a practical way to do this?

2. Plug-In. What female connectors are cheap enough to use in quantity?

3. Modular Front Panels. Are commercial panels (with jacks) available? What types of homemade modular (individual) panels are most practical and cheapest?

(Continued next page)

"C. Interconnections

1. Fixed. Is fixed wiring practical? What are the most practical ways to use fixed wiring?

2. Plugwires. Is it practical to use plugwires to interconnect circuits? What plugwires, commercial or homemade, are cheapest and best? What cheap plugboards are available?

"D. System Design

1. Overall. Where can computer schematics be obtained? Can an amateur design his own computer?

2. Memory. What type of memory is cheapest? What is the overall cost of a core memory, per bit?

3. Display. Which is cheapest, neon or incandescent lamps? What other displays are economical?

4. Output. What output is cheapest and most practical? Are there cheap tape punches? Is a printer too expensive?

"D. Help

1. What commercial companies are helpful in providing information or surplus parts, or both?

2. What companies refuse to give information, such as schematics for surplus components?

"The plan, at present, for the newsletter is to include the above listing of the basic problems in the first issue, and then go into each of the 14 categories in one of the following issues. Each issue will also contain problems outlined by members and solutions furnished by myself (if I have the answer) or by other members in later issues. There will also be information on commercially made computer trainers, which are usually simple enough to be built by a computer amateur, if he can get his hands on the schematics.

"P.S. As for my own background, I've been an editor and writer on computers for more than 10 years, including five years as the computer editor of "Electronics" magazine."

COMPUTER SCHEMATICS

1. Flodac. The simplest computer for which schematics are available is the Univac Flodac, which is actually a fluid-logic demonstrator. However, if you have a good knowledge of logic, you should be able to convert the fluidics to electronic logic. If any of you do, please let me know; perhaps we can make the electronic schematics available to others.

Flodac has a memory (4 words of four bits each), arithmetic register, function select, clock, four instructions, etc. It's a minimum computer, but contains all the essentials.

Although Univac would not provide the schematics, the patent gives all the details. Send 50¢ to the Commissioner of Patents, Washington, D.C., and ask for a copy of patent 3,190,554, "Pure Fluid Computer," by A.J. Gehring, Jr. et al.

By the way, Univac recently started to market fluidics elements, but the prices are rather steep for an amateur, something

over $10 for a flip-flop.

2. Pedagac. Although never built, this "pedagogic automatic computer" is thoroughly described in three chapters of "Digital Computer and Control Engineering" (R.S. Ledley, McGraw-Hill Book Co., 1960, 835 pages, $15.50).

Pedagac has 19-bit words, 17 instructions, a magnetic-drum memory, serial arithmetic and a single-address scheme. There are six types of circuit cards; the basic package is an AND-OR (three ANDs and one OR), the output of the OR available direct and inverted.

The basic Pedagac transistor is a 2N643, which may be obsolete, and may be equivalent to a 2N395 or 2N397. The basic diode is a DR435 ($80/100), which may be equivalent to a TI55, 1N4009, 1N698, 1N910, 1N911, 1N497 or 1N695. The 1N911 seems the closest match, but this needs checking out.

Pedagac requires about 5,000 wire connections. The book gives a rack layout and a partial wiring table.

An associate of Dr. Ledley has written me that Pedagac has never been constructed. It was not designed to be built; as its purpose was pedagogical, the plans were not checked out as thoroughly as if construction had been the goal. It was noted that Pedagac has no real provision for input or output.

3. Digiac 3050. A $2500 semi-automatic desk-top computer trainer without memory, this has 4-bit words, three registers, input pushbuttons and output lamps, and 7 instructions.

The parallel adder uses different logic in each of the four stages: NOR, NAND, DCTL and AND-OR-INV logic.

Digiac 3050 uses 382 1N60 diodes ($23/100) and 204 transistors, designated "DE01" on the schematics. These are made to order for the company, but are directly replacable by 2N404's ($31/100).

A schematic is included for the power supply, which furnishes the required ±10 volts, and the -17.5 volts.

The Digiac 3050 manuals are $10 for the set of two, one on computer description, the other on programming and applications. Digital Electronics Inc., Ames Court, Plainview, New York 11803.

(The Digiac 3080 manual, originally planned as a $50 set of two, has finally been published as a single programming manual for $8. Digiac 3080 is a $19,500 computer trainer, desk-size, with 25-bit words, over 100 instructions, 4096-word magnetic-drum memory and paper tape I/O, plus IBM Selectric I/O typewriter.)

4. Bi-Tran Six. This $5500 desk-top computer trainer weighs 98 pounds, has a single-address binary parallel scheme, and thirty instructions. The core memory contains 128 6-bit words. Indicator lamps show the operation of all registers.

Volume 1 of the two Technical Operations Manuals covers operation, theory and schematics of individual circuits. Complete parts descriptions are included, except for transformers and core memory. The transistors used are: 2N1304, 2N1305, 2N1309. Diodes: 1N270.

Volume 2 covers maintenance

programs, wiring diagrams and logic diagrams.

Price for both manuals, $29.95; Fabri-Tek Inc., 1019 East Excelsior Blvd., Hopkins, Minn. 55343.

5. Russian ENC. Vacuum-tube computer trainer, this "Educational Numerical Computer" uses 19-bit words, a single-address system, and has 11 instructions.

It also has a magnetic-drum memory of 1,024 words, using a "drum from a machine of the series Urals-1." Photoelectric tape-reader input, printer output.

Seventeen types of circuits are used in ENC, total of 387, including 163 flip-flops. Main tube types are 6N3P, 6P1P, 6Zh2P, for those of you with access to Soviet tubes.

The 168-page English translation of the original Russian (1963) book gives a complete discussion of ENC; very interesting to read how the "other side" computes. Send $3.00 for "Digital Computer for Training Purposes (ENC), by V.I. Matov, et al, JPRS: 24,498, OTS 64-31219," to Clearing House for Federal Scientific and Technical Information, Springfield, Virginia 22151.

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Negotiations are under way with 4 other manufacturers to see if they can sell us sets of overall schematics, but the outlook isn't good. If you know of other available computer schematics, let me know and I'll mention them in the next issue of the ACS Newsletter.

It was hoped that manuals would be obtainable for the Univac 422 computer trainer, with magnetic-core storage, 15-bit words, nine registers and 64 instructions. However, the 422 has been "destandardized," according to Univac, and the manuals are no longer available.

BOOKS AND BOOKLETS

We Built Our Own Computers, A.B. Bolt, editor. Cambridge University Press (New York office: 32 East 57 St.), 1966. 101 pages, $3.95 hardcover; $1.95 paperback.

This book, reviewed here only because several members had asked about it, describes very simple computers, analog and digital, made by 6th-form boys (12 years old) at a British school.

Of use only to beginners and those working with beginners. The digital "computers" all use relays and are quite small.

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Integrated Circuit Projects From Motorola, available from HEP, Dept. ACS, Box 955, Phoenix, Arizona 85001; $1.10 ($1 plus 10¢ for handling and postage). Has 96 pages, is the first IC project book for the hobbyist and experimenter. Among the contents: a square-wave generator with 10-nsec rise time, frequencies from 6 Hz to 60 kHz; binary computer; organ, etc. (Haven't seen it yet, but seems well worth the dollar.)

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Design of Transistor Switching Circuits for Data-Processing Equipment, 75 cents from RCA, Electronic Components and Devices, Harrison, N.J. Has 44 pages on design considerations, procedures and examples, plus typical switching circuits using RCA transistors. The 16 circuits use a variety of transistors and

voltages; there is not a unified set of circuits. The booklet ends with a computer transistor data chart: 6 memory-driver types, 44 logic types, maximum ratings and electrical characteristics limits for each.

PROBLEMS AND (SOME) ANSWERS

1-1. Where can I buy computer components?

These have been mentioned:

John Meshna, 19 Allerton St, Lynn, Mass. 25¢ for catalog.

ALCO, 3 Wolcott Ave, Lawrence, Mass.

C and H, Pasadena, Calif.

Salvage Depts of Autonetics and Hughes Aircraft, in California, Saturday mornings.

NOTE: Order by mail only as a last resort. Word on one store is that "much of the computer equipment is pretty junky ... the memory drums seemed beyond repair...." Caveat Emptor.

1-2. Does anyone have manuals or schematics for the magnetic-drum system built by LFE in 1955-6 for the RCA 501, with a 15-million-bit capacity, 120 heads, 100-plus mercury-wetted relays and what appears to be two separate amplifier chassis?

1-3. Where can I get "WY" IBM SMS circuit cards?

1-4. How can I solve the problem of high-speed, high-power drum head-switching at low cost?

1-5. What is a suitable connector for a 10" x 12" PC board? I'd like to use wire-wrap interconnections.

1-6. Where can I buy low-cost integrated circuits?

The cheapest IC's I've seen are the Fairchild RTL epoxy TO-5 devices, newly reduced to:

	1-99	100-999	1,000 up
Buffer	$.80	$ .54	$ .36
Dual 2-input gate	.80	.54	.36
JK FF	1.50	1.00	.67

Fairchild Semiconductor, 313 Fairchild Drive, Mountain View, Calif.

The Motorola MC700P series includes a dual JK flip-flop for $2, 1-999; the Philco E-line Series DTL has a JK FF for $2.80, 100-999.

1-7. How can I design a 10-μsec delay line using RC elements?

1-8. What are the pros and cons on serial versus parallel address and associated circuit requirements?

1-9. Where can I locate a cheap electroluminescent output display?

YOUR ANSWERS TO THESE PROBLEMS WILL BE PRINTED IN THE NEXT ISSUE.

THE LAST WORD

That's it for the first issue. As of today's mail, we have 60 potential members. And the latest word on the possibility of being able to buy overall schematics for a couple of standard computers is more encouraging now. See the next issue.

NEXT ISSUE will be about input-output equipment. If you have had any experience with this, or thoughts to share, send details. What is cheap and reliable? Can we make it? Where can we get it? How much of an interface does it require?