ACS NEWSLETTER

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AMATEUR COMPUTER SOCIETY

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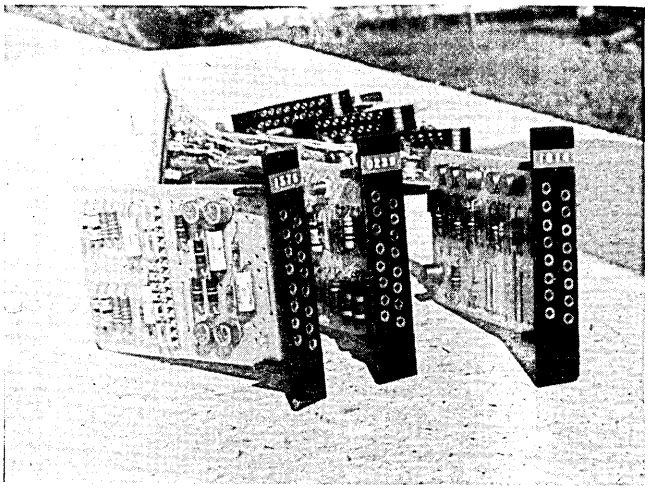
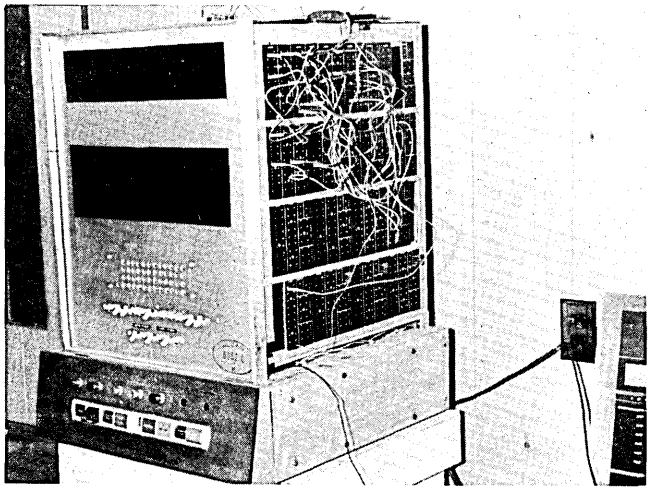
MOUNTING AND INTERCONNECTIONS ISSUE



These IBM cards are part of ...



... Allan Sinclair's computer.

CHANGE OF ADDRESS

The new address of the ACS is

Amateur Computer Society
260 Noroton Avenue
Darien, Conn. 06820

Because of this move, and because of a new job (and a new computer to learn), there has been no Newsletter since Number 6 in June.

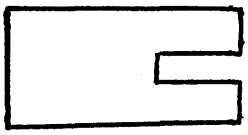
MOUNTING CIRCUIT BOARDS

Because it's seldom possible to buy used circuit cards with matching card cages, mounting such cards is usually a problem. Especially if they are IBM SMS cards, with the contacts broken off.

Card cages are usually expensive, as are printed-circuit connectors. So, unless you've got a lot of money to spend, you'll probably have to invent a mounting system of your own.

The photo at left above shows how Allan Sinclair mounted a number of SMS cards. The front panel is Bakelite, with 16 long brass eyelets pressed into undersize holes, and with wire soldered to the rear of the eyelets. These eyelets will take an AMP terminal (the eyelets I use will also take IBM patch cords).

The SMS card is held to the panel with 2 pieces of Bakelite, as shown at right.



Allan uses General Radio service cement. He says epoxy would no doubt be better, but the cement seems to work, as no strain is involved.

For larger (Univac) cards, Allan bought similar panels, 4" by 5", with 54 jacks already installed, and cut them down. These larger cards are epoxied into either blocks or cylinders of Bakelite, which are then screwed to the front panel. Some of the large

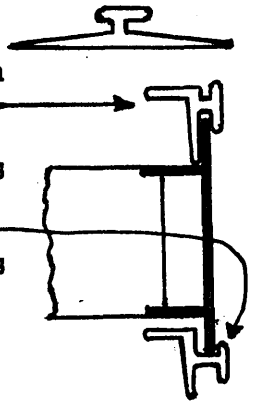
panels hold three cards, giving 12 flip-flops for a register.

Another mount for the SMS cards is a 15-contact Amphenol plug (which Allan bought for 5¢ each!), which is glued to the card.

Allan uses Dymo tape to put the last four digits of the 37---- IBM number on each panel, for identification.

The photo at right on the first page shows Allan's computer. The permanent stainless-steel front panel is off at the right. The computer operates on 12-bit words, with a 100-word 2½D core memory.

The mounting racks are made from heavy-duty aluminum shaped like this → One side is bent down to look like this → The aluminum is then turned and mounted as shown at right. By grinding this part nearly off, the cards can be inserted and dropped into the groove to keep them in place. By not using screws, the cards can be slid along to obtain different arrangements.



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Using screws, a cheaper (but less flexible) mounting system can be set up, with similar Bakelite panels that have holes drilled at top and bottom. The panels are screwed to a simple horizontal bar that is drilled and threaded to receive the screws. The bar has two lines of holes: one for the bottom holes of one row of panels; the other for the top holes of the other row. For rack mounting, the two horizontal bars at top and bottom need have only one row of holes. With this system, the full height of the rack is made use of.

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Jim Haynes uses Amphenol 15-pin connectors obtained from junk. When he runs out of junk ones, the new ones are only about 65¢ each, in lots of 100. Jim says there's a very inexpensive edge connector that is not very well known, made by Cinch, and called (as he remembers) the 257 series.

Bill Pfeiffer has found that the most usable female connectors are the bifurcated-edge-type PC variety, made by Cinch-Jones, Amphenol (series 143 and 133 for single and double), and USC type UPCR. Bill has been using the 22- and 44-contact types, mostly. Cost at surplus ranges from 25¢ on down.

MOUNTING INTEGRATED CIRCUITS

Mounting ICs is an even bigger problem than mounting circuit boards. There are several IC mounting boards available commercially, but they cost several times the price of the ICs they mount: $140 for a Motorola 16-IC breadboard; $21 for a Campion PC board that mounts 8 flat packs permanently.

Individual dual in-line sockets are expensive, too. Augat's #314 costs from 40¢ to 90¢, depending on quantity. Texas Instruments has an MPC18A socket in 14- and 16-pin DIL styles, solder-tail and wire-wrap types, for about $1.10 each, or 52¢ in quantities of 100-999.

Fred Strother has come up with a clever and very cheap method of mounting flat-pack ICs. He uses a perforated board with 0.05" hole spacing, and threads thin wires through the holes, in the desired circuit arrangements. The flat packs are then soldered to the wire "pads." The in-line packs have 0.1"

pin spacing, so they fit the same perforated board, which is available from Allied Radio (47R509 Micro-Vectorbord, 6½" x 4", $2.92, made by Vector), 100 N. Western Ave., Chicago, Illinois 60680. The wire can be single strands from regular stranded wire. Of course, this system requires that the inter-circuit wiring be laid out completely beforehand, and later changes are difficult. Also, a steady hand is needed for soldering, as the contacts are only 0.05 inch apart. This method could be used for breadboarding, by connecting the wire "pads" of a single IC (or group of ICs) to eyelet panel jacks.

The largest size of Micro-Vectorbord is 17" x 6", smallest is 4" x 2". An 0.1" hole-spacing is also available. Vector also makes a "D.I.P. Plugboard," with pads for mounting 12 dual in-line types, with or without sockets. The plugboards are pre-punched, pre-etched and pre-tinned, in an x-y matrix, with parallel copper lines running horizontally on one side and vertically on the other. Pins are inserted where an x-to-y connection is desired. The copper lines can be broken with a pad-cutter, to make a variety of interconnections. Connections to the pin contacts at the end of the board are made as desired. Several types are available, and cost about $10 each. A similar x-y matrix board for DIL circuits, without pads, is made by Vero, and sells for $8 for a 5" x 8" board; a single-sided 5" x 8" board is $5.31.

Vector Electronics Co., Inc.
1100 Flower St.
Glendale, Calif. 91201

Vero Electronics Inc.
176 Central Avenue, Box 26
Farmingdale, N.Y. 11736

Vero has an IC breadboarding kit for $40, consisting of a single-sided 18" board, a plug-in single-sided board, a double-sided plug-in board, an epoxy glass plain board, 500 terminal pins, a pin insertion tool, a spot face cutter, design sheet, and an edge connector. The holes in these Vero boards are on 0.1" centers, whereas the holes in the similar Micro-Circuit Veroboard kit, for $23, are punched with holes on 0.05" centers, for IC mounting.

INTERCONNECTIONS

There are, as most of you have found out, problems with either fixed wiring or with plugwires. Fixed wiring, of course, is cheapest. But, as Don Fronek pointed out in ACS Newsletter 5 (page 2), when you have close pin spacing, a soldered connection gets very messy when you're trying to keep things neat. The wires get burned, the solder slops over onto the adjacent pin, etc. Because Don finds himself changing circuits all the time, he prefers solderless connectors.

On the other hand, plugwires are expensive. Sometimes they can be bought surplus, such as the Hubbell plugs and plugwires I have. I bought some card cages that had a number of these miniature, automatic-locking, quick-disconnect plugs and jacks attached. The plugs cost $11.60 for 500 if you buy them from Hubbell; the eyelet panel jacks are $2 for 500. Jacks are also available in terminal-post adapter and screw binding-post types, as are crimp-terminal connectors and plug splices. The eyelet setting punch is $1.25, from Harvey Hubbell, Inc., Bridgeport, Conn. 06602. Crimping pliers are $2.40; minimum charge is $5.00.

Eyelets, by the way, are about the cheapest way of mounting anything. Drill holes in a plastic board,

press in eyelets and set them with a punch, and solder the item to the eyelets.

IBM plugwires (or patch cords, if you prefer) are plentiful, and are sometimes available cheaply when a punched-card installation is being changed over to a computer and is getting rid of all plugboards and wires. The plugboards can be used for mounting circuits; the only drawback is that it's often hard to solder to the large plugboard contacts, and the contacts are so close to each other that some can't be used and are therefore wasted. Be sure to get the type of plugboard that has contacts on it; the self-contacting type of plugboard has no contacts on the board itself, and is of little or no use to the experimenter. Plugboards are sometimes sold by surplus houses such as Olden and Meshna.

Jim Haynes uses fixed wiring, says plug wiring in a project the size of his would be impractical. However, he notes, one type of Cinch connector has taper-tab terminals, so that one could make up a sort of semi-fixed wiring, using plugwires with the taper tab clips.

Bill Pfeiffer's plugwires cost about 5¢ for each good double-plug type. His plugboard is an IBM 22 x 34-hole type, to the rear of which he solders his fixed wiring. Several rows are used for bunching purposes.

COMPUTER PC SALVAGE

A one-page item on salvaging computer PCs appeared in Popular Electronics (page 66, June 1966). The main item discussed is the type of desoldering iron with a rubber suction bulb attached. Also, five companies are listed as sources of PC boards: Arrow Sales, in Chicago, Radio Shack, Meshna, Poly Paks, and Transistors Unlimited.

BREADBOARDING ICS

An item in Electronics (page 103, July 25, 1966) shows how to breadboard ICs by plugging dual in-line packages directly into the type of connector used as edge connectors for PC boards. The specified connector is the Hughes EMS048DJ000, which has contact rows the right distance apart, and the 0.1" spacing that matches the DIP lead spacing. Pins inserted in the wiring side of the connectors permit connecting the ICs to each other and to external circuits. The cost of the Hughes connector and pins for 54 ICs is about $120, which gets more expensive than the ICs, so perhaps other, cheaper connectors can be found.

TAPEHEAD AND TRANSPORT

A tapehead and transport assembly is offered by Denson Electronics Corp., P.O. Box 85, Rockville, Conn. 06066. Made by ITT, the assembly is 6¼" wide (five assemblies were mounted side by side on a rack, on slides), 45" high, 26" deep. Looks like a tape-loop arrangement. The head has 22 tracks, used with one-inch computer tape. Cost: $245.

The Denson 1967 catalog is 90% closed-circuit and amateur tv used gear, some RTTY stuff. Also a page on instrumentation tape and a 20-track recording head.

IBM TO SELL SLT MODULES

IBM has announced that it will market SLT modules, which are the hybrid ICs used in the 360 computers.

Fifty diode-transistor types are available, at $1 to $1.50 each; minimum order $25. The DTL

modules include a NAND, NAND/NOR, flip-flop, exclusive OR, transmission-line receivers, line amplifiers and indicator drivers. Switching speeds are from 700 to 5 nanoseconds.

These modules are fallouts from the computer-grade types, and are called "industrial grade." Tolerances are about 3% wider than for computer-grade modules.

Information is available from IBM Corp., Industrial Products Marketing Dept., 1000 Westchester Avenue, White Plains, N.Y. 10604.

SHIFT REGISTERS

National Semiconductor Corp., 2975 San Ysidro Way, Santa Clara, Calif. 95051, is selling a 50-bit shift register for $9.85 in lots of 100, and a 100-bit shift register for $14.80 in 100 lots. Supply voltage is -10 volts, clock amplitudes are 16 volts. Model numbers are MM500 and MM502, respectively.

PORTABLE ELECTRONIC KEYBOARD FOR COMPUTER INPUT BY TELEPHONE

An interesting article by the above name appeared in the June 1967 IEEE Transactions on Electronic Computers (pp 332-334), by Lewin of RCA. Although few if any of us are anywhere near being able to use this type of input, the article makes interesting reading.

The device, which is acoustically coupled to an ordinary telephone handset, generates coded tone sequences representing the full ASCII character set. The characters are input, one at a time, by a stylus, touching the symbols on an electronic keyboard. The tone sequences correspond to those in most Teletype-Dataphone terminals in typical time-sharing systems. The device is intended for communication with a machine that has voice answer-back.

Production cost is estimated "in the $50 range." The device contains a decade counter, pulser, two-bit analog-to-digital converter, decoder, two-frequency voltage-controlled oscillator, a few logic gates, and a resistor encoder. The transistor types are 2N1307 (2N404) and 2N1306 (2N585); diodes are 1N34.

FAR-OUT MEMORY

The same issue of IEEE Transactions contains a short note (pp 370-371) on an optical-fiber memory, by Filippazzi of Olivetti-GE. The optical fiber is used as a delay line, which is much faster than most of us will ever need, as a light pulse travels through it at over 11 inches per nanosecond. But it is simple.

WIRELESS WORLD DIGITAL COMPUTER

The British magazine, Wireless World, has had a four-part article on building a small computer, in its 1967 issues for August (366-372), Sept. (416-423), Oct. (488-494) and Nov. (543-548).

The WW computer will add, subtract, multiply and divide. There are 28 instructions: 7 for arithmetic, 9 for transfer to store, 6 for transfer from store, and 6 various resets. Multiplication is by repeated addition, without shifting. Two 8-bit numbers can be added at slow speed (4 seconds), high speed (3.2 msec), or bit-by-bit.

Input of instructions is by toggle switches; input of data is by push-buttons; output is by neon lamps.

The prototype was built for about $160, without cabinet. The transistors were reject germanium types that cost less than 14¢ each (2G371/

The Amateur Computer Society is open to all who are interested in building and operating a digital computer that can at least performaautomatic 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, send $3 (or a check) to:

Stephen B. Gray
Amateur Computer Society
260 Noroton Avenue
Darien, Conn. 06820

The Newsletter will appear about every eight weeks.

D1476, Texas Instruments). Diodes are 18130 types. The front panel contains 53 neon lamps, with 6 groups of 8 lamps each, for three arithmetic registers and three storage registers.

Basic circuits are NOT, NOR, AND (diode-transistor), OR (diode), comparator and flip-flop.

A subroutine store is described briefly for those those who wish to add it to the computer. It provides 64 words of data or instructions, using wired-in diodes or diode "pegs" in a matrix programming board, or in a stepping switch or a stepping drum. With this store, series of instructions could be carried out.

UNIVAC MEMORY UNIT

Gadgeteers Surplus Electronics, 5300 Vine St., Cincinnati, Ohio 45217, has one Univac memory unit for $75. No information is available other than that the unit weighs 40 pounds, is "high density stacked," has muffin fans, and cost $40,000 when new. A photo from Ken Hanson shows two stacks mounted one above the other, like a figure 8, attabhed to a panel 2 feet high. Money back if not satisfied.

BUFFER MEMORIES FOR SALE

Sal Zuccaro has some buffer memories for sale. They are from Collins Radio gear, and were made by General Ceramics (now Indiana General) and by Telemeter Magnetics (now Ampex). Sal has three sizes, from 144 words of 4 bits each to 2048 words of 8 bits each. The memories are complete with core stacks, drive electronics, power supplies, logic, etc., and with Amphenol Blue Ribbon connectors for input/output. The smallest models take up about 10" of rack space, the largest take about 21".

Sal will provide copies of the instruction manuals, which contain specs, schematics, operating procedures, and timing diagrams.

The price per memory is $200 to $300, depending on size, plus the shipping charges. Sal's address is 14442 Elmhurst Circle, Huntington Beach, Calif. 92647.

Sal may also know where to get 75-ips Potter mag tape handlers for $50-60, if there are any left by the time you read this.

ACS COMPUTER SURVEY

The next page is a questionnaire for the ACS survey. Please fill it out (skip the personal data if you'd rather) and mail it in. Results of the survey will be in the next Newsletter if enough are received soon.

NEXT ISSUE will contain, among other things, comments by you on mounting circuits and interconnecting them; that is, if you send them to me as soon as you finish reading this issue. And send along any other information, comments and photographs that other ACS members might like to read or look at.

ACS COMPUTER SURVEY

Serial ___ Parallel ___ Number of registers _____

Transistor types _____

Integrated-circuit types _____

Card types: IBM ___ Univac ___ Other _____

Memory type _____ Number of words in memory _____

Input _____ Output _____

Number of instructions _____ Word length _____ Clock speed _____

Add speed _____ Instruction length _____

Special features: _____

_____

_____

_____

Estimated cost when complete _____ Cost so far _____

Estimated size when complete _____ Present size _____

How long working on it? _____ Fixed __ or non-fixed __ wiring?

In planning __, begun __ or completed _____?

Source of circuit schematics: Self-designed __ Other _____

Source of system schematics: Self-designed __ Other _____

Any other information?

Name _____

Position _____

Company _____

Education _____

Interested in computers since age _____