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Engineering and Technology Dept.
Grossmont College
El Cajon CA 92020

Computers in Classrooms: Teaching the Teachers

Three big markets for personal computers will exist in years to come: small businesses, homes, schools. Educating the educators is something we can all get involved in.

Photo 1. A large computer installation. *(Courtesy of IBM)*

Today there is no reason why every elementary and secondary school should not have computers. Their potential uses are obvious and their cost is remarkably low. But widespread use of computers in classrooms will come only when teachers realize their value. This article discusses the possible uses of computers in classrooms, and describes workshops my associates and I have held for local teachers. My aims, here, are to present the criteria for these workshops, discuss the problems that we faced in organizing them, describe what we learned from our experiences and encourage others to help in this task of "educating the educators."

Facing the Problem

Any reader of this magazine is certainly aware that computers will soon be as much a part of daily life as typewriters, refrigerators, automobiles and television sets. Such everyday items surely must be part of classroom education at all levels. Students must grow up with the computer much as they grow up with the other products of our culture.

But the computer is not only a new household item, it is also a versatile tool that can aid in education. Computers can handle routine tasks such as grading and record keeping; help in generating class materials and providing self-paced review; and even supply simulated experiences ranging from simple games to complex system tasks. The possible uses of computers in education are unlimited. Now the sharp reduction in the cost of computers has made many of these uses economically feasible.

One obvious problem is that few teachers have the background required to take advantage of computers. Even science and mathematics teachers have seldom had more than a cursory (and often outdated) introduction to computers. These introductions typically treat the computer as a high-powered calculator, capable only of solving mathematical problems. Most teachers share such common public myths as:

1. Computers are intelligent and answer all questions posed

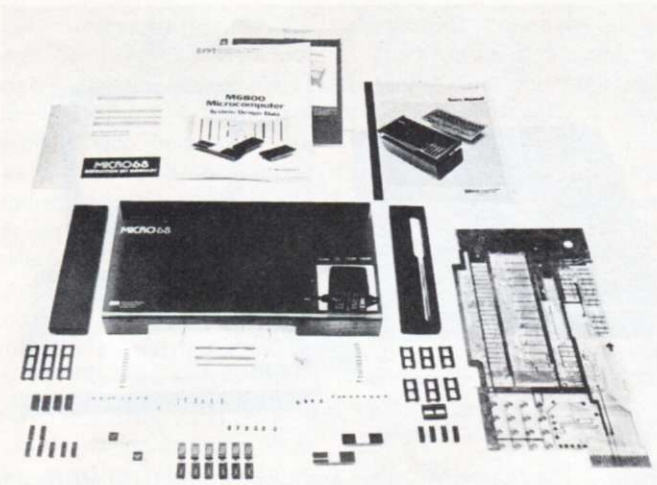

Photo 2. The Electronic Product Associates Micro-68 (exploded view shows components). (Courtesy of Electronic Product Associates)

to them (presumably in an eerie metallic voice).

2. People who work with computers must be wizards or mathematical geniuses. Computers remain remote and mysterious to the "man on the street."

3. Computers are depersonalizing, unimaginative and insensitive. Furthermore, they will eventually take over everything.

4. Computers are always right, or at least think they are. Somehow, though, they can always be outsmarted by a few extraordinary (or even ordinary) people.

5. Computers are large, very expensive and very complex. Average people can only look at an installation like that shown in Photo 1 from behind closed doors.

Even teachers who have some computer background are often unfamiliar with the new, low-cost microcomputers. Since teachers are already expected to be expert in sociology, anthropology, psychology, ecology, health and other subjects, this lack of familiarity can hardly be surprising.

On the other hand, most computer specialists (like myself) are unfamiliar with the problems of elementary and secondary teachers. Their needs and requirements are different from those of teachers at the college level. Elementary and secondary teachers need solutions to their problems, not just new tools that are difficult to use or understand and will simply clutter the classroom.

The Role of Computer Clubs

The personal-computer movement has some unique characteristics that can be used to solve this educational problem.

- Many personal-computer enthusiasts are newcomers to computing. They can therefore help alleviate fears that only experts can understand computers. Many computer-club members are themselves teachers.
- Personal-computing stores, magazines, conferences and clubs cater to the novice. They provide information at a variety of levels. Furthermore, other hobbyists are often willing to help novices.
- Personal computers are not financially out of reach for most schools. Complete units can be priced as low as $600, a cost comparable to that of a typewriter or television set.
- Personal computers are designed to be used by non-experts. Their size, appearance and operating methods make them far less forbidding than larger computers and far easier to explain.

Planning a Workshop

The potential for personal computers in the classroom is there but how do you translate it into reality? The rest of this article will deal with our experiences in offering personal-computer workshops to teachers. I hope you'll get some idea of approaches to take and pitfalls to avoid.

The original idea grew out of a microprocessor course I offer at Grossmont College. Although the course is primarily intended for engineers and technicians, many hobbyists also take it. Among my students was Dr. Russ Cassel, a well-known specialist in computer-aided instruction who is presently retired from the U.S. Air Force and from a professorship at the University of Wisconsin, Milwaukee. It was Russ who suggested we hold a workshop for teachers.

Since I am interested in continuing education and have given some workshops for engineers, I decided that the idea was worth pursuing. Our group finally decided on the following guidelines:

1. We would not assume that attendees had any previous background in computers.

2. We would emphasize the current state of the art in low-cost computers.

3. We would try to emphasize that you didn't have to be either an expert or a mathematical genius to use a computer. One approach would be to have local teachers and other non-experts explain how they were using computers.

4. We would try to give all participants some hands-on microcomputer experience.

5. We would hold all-day Saturday workshops at no charge.

Our net assets when we started were:

1. Cooperation from Grossmont College, which provided a room, reproduction of materials and some secretarial help. This was largely arranged by Dr. David Lien.

2. Cooperation from a local microcomputer manufacturer, Electronic Product Associates. This manufacturer agreed to supply us with some Micro-68s for the hands-on experience. The EPA Micro-68 is a Motorola 6800-based microcomputer that has a hexadecimal keyboard and display (see Photo 2), and can therefore be used without a terminal. It is also available in more elaborate configurations (see Photo 3) with various peripherals.

3. Help from some local computer enthusiasts, including present and former teachers.

Finding Willing Victims

What we lacked (besides good sense) were teachers (i.e., guinea pigs for this experiment). The obvious place to start was at nearby high

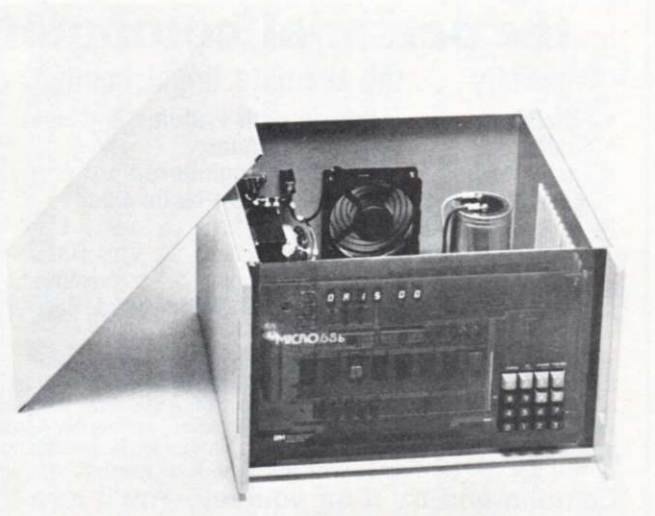

Photo 3. The Electronic Product Associates Micro-68b, a larger version of the original Micro-68. A printer, TV interface, cassette interface and floppy-disk system are available with this computer. (Courtesy of Electronic Product Associates)

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In response to pidgin English "Requests," **WHATSIT** can store, index, and retrieve information about one or several aspects of your business, hobby, or other application. You are free to intermix unrelated data on a single disc, or to "dedicate" an individual disc to each of a variety of applications.

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CONVERSATIONAL QUERY CAPABILITY

Data retrieval is equally easy. You can query the system directly about any data item on file, or you may inquire about any heading. All that's required is a pidgin English "Request," such as "WHEN'S DR. JEKYLL'S APPOINTMENT?" System response time is usually a matter of seconds.

Up to two headings may be specified in a single Request, a capability that makes possible versatile cross-indexing within the data base.

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For easy installation, the **WHATSIT** programs are supplied in the widely available North Star BASIC, and can be installed without modification on any S-100 bus (8080 or Z-80) computer equipped with a North Star disc system and at least 24K bytes of random access memory (RAM). For other disc systems or non-compatible computers, the programs would require modification.

SPECIFICATIONS
MODEL NS-3, Version 1

Hardware compatibility: Any S-100 Bus (8080 or Z-80) computer with one North Star disc system and 24K of RAM (random access memory).
Language: North Star BASIC, Version 6 Release 3.
Request types: Store, Scratch, Change, Add, Spill (6 types including Indexed, Selective, and Analog), plus special Requests.
Response time: Normally 3 to 10 seconds.
File capacity: 1500 to 3000 entries per disc, depending on average entry length.
Indexing: Every entry automatically indexed by Subject, Tag, Object.
Request length: Up to 100 characters.
Entry length: Up to 30 characters.

WHATSIT is available for $75.00 as a Ready-to-Run System, including three programs on Northstar disc and a 100-page user's manual written in non-technical language. The manual may be optionally ordered for $25.00. Besides detailed startup and operating instructions, the manual includes complete programs listings in BASIC.

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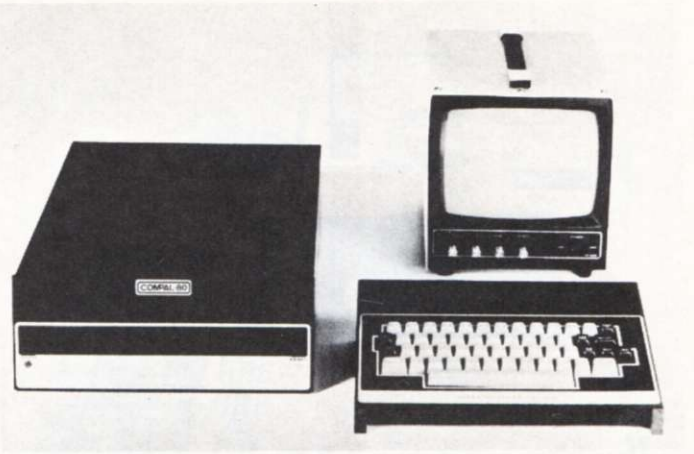


Photo 4. The Computer Power and Light COMPAL-80 Microcomputer. This system comes completely assembled, including the keyboard and TV monitor, for about $2300. Printers and floppy disks are available at extra cost. (Courtesy of Computer Power and Light)

schools; so we started to wade through the various bureaucratic levels. Surprise—the people at the first school we contacted were positive and enthusiastic. They had been using a time-sharing system and were anxious to learn about micros. This response was, of course, encouraging, and it turned out to be the only encouragement we would receive from any school.

The general response was: "What are you trying to sell?" "The person who handles computers is on vacation." "We're busy right now with exams, parent-teacher meetings, law enforcement, football, etc., but do call us back (preferably when we're out)." "I'll route the matter to our mathematics coordinator; he (or she, or it) will get back to you. But don't hold your breath."

The lesson here is that you'll need some patience (and some aspirin). Teachers are not lining up, waiting to find out about computers. You have to reach them and sell them on the idea; and that takes time and effort. A few notices or a few telephone calls will not do the job.

Fortunately, we wanted to start small and we had no illusions about a huge crowd. (Remember that we wanted to include hands-on experience.) In fact, our initial group was fifteen, padded by two deans from Grossmont College and a few ringers from the local computer club.

The Initial Program

The program consisted of two talks: one by me and another by Dr. Melvin Zeddies of United States International University. Mine, "An Introduction to Computers," described what a computer was, what made up a working system, what was presently available and how much it cost, what the future trends might be, where you could get more information, and how you might want to use a computer in the classroom. Copies of the slides are available from me for anyone who is interested.

Dr. Zeddies talked about his experiences in building several small computers for use in a high-school program for gifted students, covering such matters as how to obtain funding, build and maintain the computers, write programs, and provide some continuity in computer operations.

In addition, three local computer enthusiasts—Gary Mitchell, Laura Thomas and Carl Palechek—described their experiences with personal computers. The program was rounded out by a laboratory session which involved writing and executing several short machine-language programs.

In general, our participants found the workshop interesting

but had some reservations. Our real problem was that the EPA Micro-68 computers were not the type that would be useful at the elementary or secondary levels. These computers are really intended as digital trainers or prototyping systems for engineering applications. Several teachers suggested that they were interested in complete systems with adequate peripherals that could be programmed in a high-level language (preferably BASIC).

Furthermore, we had to show the teachers that personal computers could be a useful classroom tool. Several teachers said they needed to see things that they could use immediately, rather than just hear suggestions. We had to sit down and really think about how to sell teachers on utilizing computers.

The participants generally did not want to assemble kits, attach peripherals or maintain their own computers. They had neither the facilities nor the time for that approach. The only attraction of kits was that they could be purchased as instructional supplies rather than as capital equipment. Most school districts (like many companies and government agencies) have elaborate procedures for purchasing computers. Although these procedures make little sense now that computers are so inexpensive, they will remain an obstacle to computer purchases for many years.

Some Further Efforts

Since that first effort, we have held two more workshops. We now have cooperation from Computer Power and Light, a manufacturer of complete microcomputer systems that include a keyboard, monitor and audio cassettes (see Photo 4). These systems come assembled, and can be programmed in BASIC. The manufacturer provides local maintenance and some software. We are now trying to emphasize the use of computers to aid in remedial education (they have infinite patience), to provide simulated experience and to help teachers perform routine tasks.

The problem of reaching our potential audience remains a serious one. Clearly a small volunteer group cannot put a massive, continuous effort into publicity, personal contacts and telephone reminders. We are now trying to work through the San Diego County Department of Education and we're hoping the department can handle the difficult task of reaching that audience.

Overall, I think this experience has been useful, even though it is little more than a beginning. In fact, I may have learned more than the teachers since I have become acquainted with school administrations, financing methods, district policies and school problems. I have had an opportunity to see Bob Albrecht in action (he's fabulous), and to meet a large number of concerned educators.

Some Suggestions

Teacher education presents a real opportunity for local computer clubs and enthusiasts. I suggest the following guidelines.

1. Work through your local school district or county department of education. Otherwise the problem of publicity is enormous.

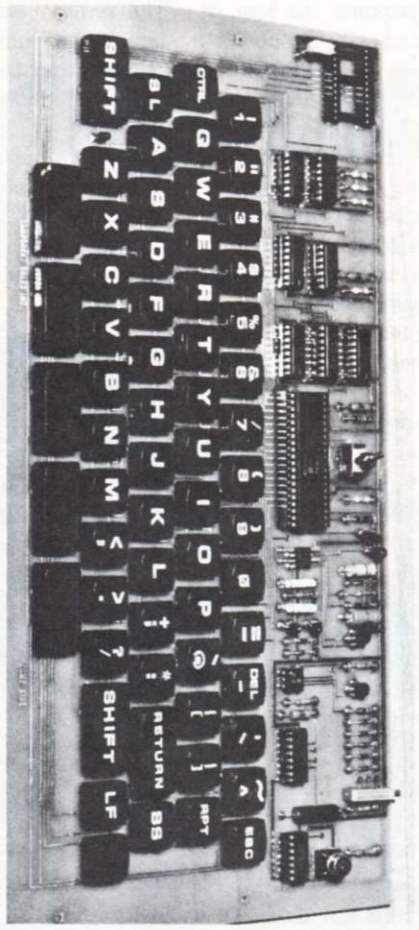
2. Explain computers from the beginning. Don't assume teachers have any background, particularly familiarity with the personal-computer movement. Remember that S-100 bus, Altair, Imsai, floppy disk, RAM, ROM and other such terms are not common knowledge.

3. Emphasize how teachers can use computers to help with everyday classroom tasks. Try to bring in local teachers who have actual experience with small computers.

4. Don't hesitate to include some games and other attention-grabbers—teachers are almost human, after all. Include some useful programs as well.

5. Include some organized hands-on experience, preferably involving programming low-cost computers in BASIC.

Stand Alone ASCII Keyboard Specification



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Actual experience is the only way to overcome the fear of computers so many people feel.

6. Discuss sources of additional information and equipment. These sources include computer clubs, stores and magazines. *Calculators/Computers* magazine is a new journal that deals specifically with educational applications. (I will gladly provide a list of selected books and magazines.)

7. Emphasize complete systems that do not require a high level of expertise to build, use or maintain. Explain some of the pitfalls, but don't make the road seem too hard to travel.

8. Be sure to note that we don't have all the answers yet. The entire personal-computer business is only a few years old, and most of the exciting developments are still ahead of us.

9. Try to get actual systems into schools, even if just for an afternoon. In-school demonstrations help create publicity and encourage students and teachers.

Acknowledgements

I am glad to be able to thank the following people for their invaluable assistance:

Dr. Russ Cassel, whose energy and enthusiasm should be a guide for all of us.

Dr. Melvin Zeddies, a first-class speaker and educator.

Dr. Jane Gawronski of the San Diego County Department of Education.

Dr. David Lien, Mr. Leslie Phillips and Ms. Margie McMurray of Grossmont College.

Mr. Victor Wintriss and Ms. Patti Neumann of Electronic Product Associates.

Mr. Michael Scholnick, Ms. Dianne Simpson and Mr. Ian Law of Computer Power and Light.

Mr. Wirt Atmar of Ai Cybernetic Systems, for providing a cassette describing Cybernetic's speech synthesizer.

Also—Carl Palechek, Ed Nagy, Gary Mitchell, Laura Thomas, Irv Stafford, Peter Young, Robert King, Lewis Freed, and many others. John Craig of *Kilobaud* has been a constant source of encouragement.■

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S. Clarke, "A PET for Every Home," *Kilobaud*, September 1977, pp. 40-42.

Calculators/Computers magazine, edited by Don Inman (assisted by Bob Albrecht). Available for $12 per year from DYMAX, PO Box 310, Menlo Park CA 94025.

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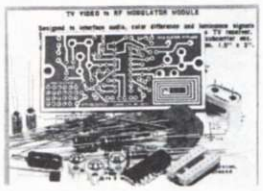

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Two Heathkit User Organizations??

You may have noticed that there are two entirely separate organizations for Heathkit computer users. HUG is the official Heath sponsored organization. The second organization publishes a periodic news letter called BUSS. This second organization is not affiliated with Heath Company in any way. Neither is it approved, sanctioned, or recommended. Heath Company bears no responsibility for the material it publishes or the advice it gives. The official, inside word will always come through HUG. If you want the latest word on new products, software updates, and other juicy news, keep reading REMark.

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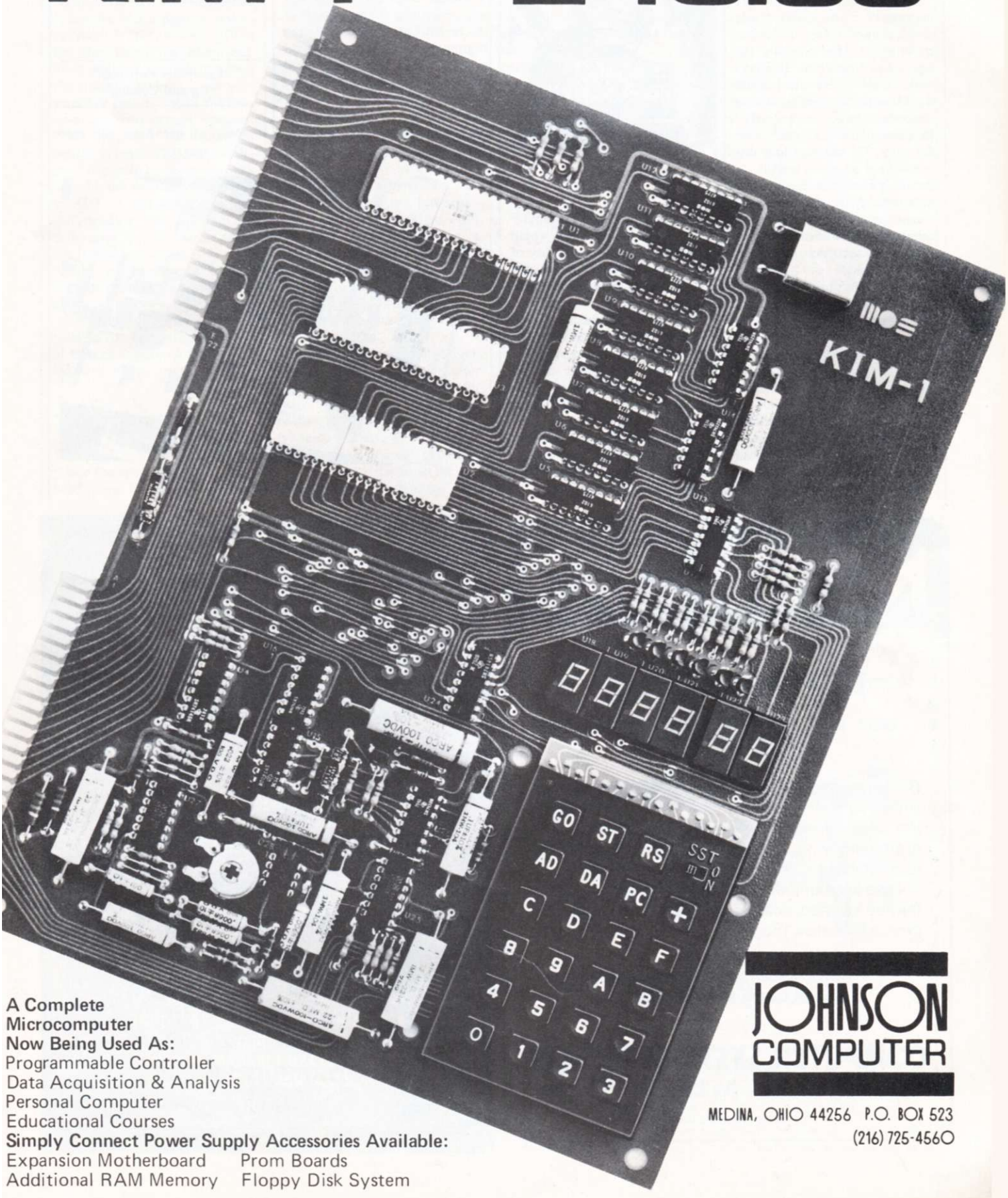

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PUBLISHER'S REMARKS

(from page 7)

the case: ". . . the plastic is not strong enough to keep the fasteners in place. After I opened the top a few times both fasteners broke loose." He also found trouble with the cover uprooting the keyboard when he removed it. He particularly had trouble with the color TV monitor and discussed that at great length . . . including a severe problem he had with radio frequency hash from the computer. He stressed this a couple of times and then went on to gripe that there were no peripherals available for the Apple bus.

He didn't like the game paddles supplied, so a great deal of the article was devoted to his making his own joystick, an engineering triumph of which he seemed extraordinarily proud. He left me with the strong impression that before I could do much with the Apple I would have to duplicate his chore of buying all the parts and building my own joystick. I would then have to dig into the Apple and wire my new control

Byte *editor Helmers.*

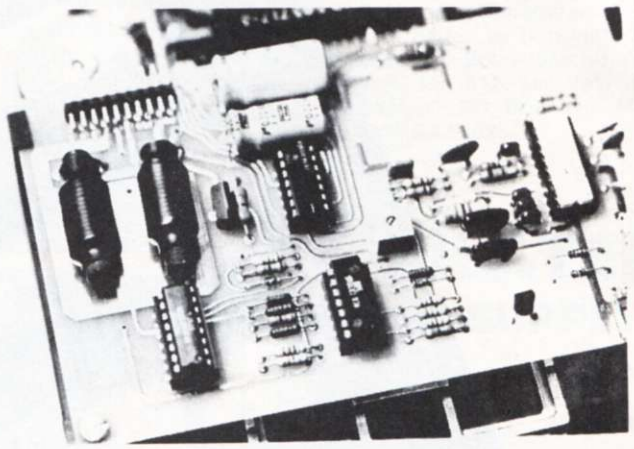
system directly into the computer before I could use it. This would obviously ruin the portability of the unit and I doubt if I could get the bottom cover back on. Phooey.

Helmers didn't like the BASIC supplied. "But the 5K BASIC, even given its string capabilities, is not what one would want to use. . . . The people at Apple have hacked the (BASIC) interpreter . . . had to sacrifice two statements: LET and REM." This in order to have graphics. He beefed about the lack of the high-resolution software package . . . called the applications software "a mixed bag" . . . didn't like the loose-leaf documentation and the lack of tutorial on how the computer works . . . and found the documentation "scanty" on the BASIC interpreter.

Absent from the review was any objectivity or discussion of the benefits of the system to the beginning computerist. He said nothing about where one could get applications software for the system . . . how easy it is to use and to learn . . . how many people are able to sit down and learn the fundamentals of microcomputing in a few hours with the Apple, etc. Obviously he had no interest in the tremendous enthusiasm of the Apple owners . . . any one of whom could have done a far superior job of reviewing the system.

Computer Portraits: Up and Coming

Most of use have run into



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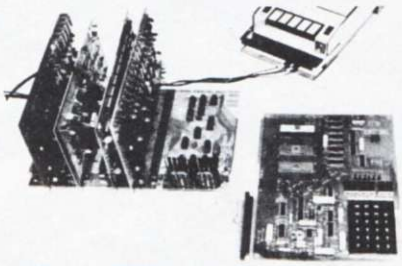

The KIM to S-100 bus Interface/Motherboard

- Combines the power of the 6502 with the flexibility of the S-100 bus
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◆ *Kit $125, Assembled $165*

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See us at the NCC Personal Computing Fair, June 5-8, 1978, in Anaheim, Calif.

FORETHOUGHT PRODUCTS

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computer-portrait outfits at shows, shopping centers, fairs, vacation spots, etc. It turns out, according to a release from Centronics (which we'll be publishing) that there are fortunes to be made with these systems.

One of the exhibits at the San Jose show was a portrait system by Micro Works, a new outfit in Del Mar (California, of course). Their price for a complete system was ridiculously low . . . around a quarter that of one of the lowest-priced commercial systems. While the cost of the equipment needed to make $100,000 in sales (mostly profits) over a six-week period is not relevant if it's under $50,000 . . . not many locations will produce that amount of dollars . . . so a few bucks saved is a few bucks earned.

Since many computer hobbyists are not totally opposed to making money with their systems, we'd like to have some articles on commercial applications of microcomputers . . . such as for computer portraits.

First European Microcomputer

The European agents for *Kilobaud* have forwarded information on NASCOM 1, a microcomputer kit selling for 980 DM (from an address in Trier, W. Germany). The system uses a Z-80 chip and has its own bus structure, which the literature doesn't divulge. They do have a NASCOM to S-100 bus interface board available, so any of the hundreds of S-100 boards can be used with the system. They also have a Kansas City cassette interface available.

The kit includes a full alphanumeric keyboard and character generator. It requires a TV set for video display and a separate power supply (another 130 DM). It appears to have 4K of memory and includes a small operating system (NASBUG) in ROM and its own cassette system, not compatible with any other known system (as usual).

My plans are to be in Europe in May, and I hope to have a fuller report on NASCOM after the May show in Paris. Trier is quite near the Luxembourg border, and is not that far from Paris. It is a beautiful old city, with many Roman ruins . . . such as the remains of extensive outdoor baths, and a coliseum for Roman games. I won't have a chance to get up there to see the NASCOM distributor; however, perhaps I will have a chance to visit the factory in the UK on the way to Paris.

Buying Mail Order

There are several firms that are not permitted to advertise in *Kilobaud* because we have had so many complaints about them. But, outside of checking the ads in *Kilobaud*, how can you protect yourself against rip-offs? Not that an ad in *Kilobaud* is positive proof of anything because we get taken in too . . . and of course there are still some credible advertisers who are not running ads in *Kilobaud* for reasons of their own . . . odd as this may seem.

To get your best shot at not getting a bad deal, I suggest the following procedure. This has to do with firms about which you may have a question . . . not steady advertisers in *Kilobaud* such as S.D. Sales, Godbout, etc. Before you plunk a big bunch of money in an envelope, take some precautions.

1. Write a letter to the firm asking for a confirmation of prices and a definite commitment on delivery within two weeks of your order. Keep a copy of this letter in your files.

2. If they do promise delivery within two weeks, it is time to place your order. If they say no, it is time to hold off until they get their act in shape. If you are going to order, send them a certified check or money order for the amount, or the order and a letter explaining exactly what you are ordering, giving every possible detail. State clearly that shipment is to be made within two weeks or else your check is to be returned. Send this letter by certified mail, with a return receipt. This costs a dollar and may be worth it. If you are not extremely clear in your order it could delay things while the firm writes to find out what baud rate you need, etc. Keep a

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*Offer Ends 7-1-78

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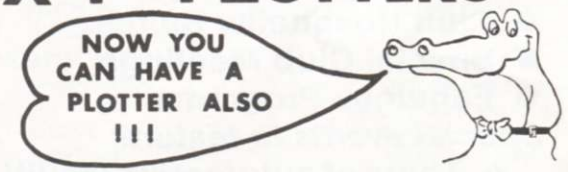

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Computerfest™ '78
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Detroit, Michigan 48202 U.S.A.
or call 24 hours (313)·775-5320

For convention *advertising* contact:
Mr. Ken Ascher – Advertising Director
c/o Communications Electronics™
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Ann Arbor, Michigan, 48106 U.S.A.
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ST. CLAIR SHORES
Computer Systems

MINNESOTA
SO. ST. PAUL
Rus-Con

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KANSAS CITY
Stone Balloon Hobby Ltd.
PARKVILLE
Computer Workshop of K.C.

NEBRASKA
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Omaha Computer Store

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PARLIN
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couple of copies of the order and check.

3. If you have heard nothing in a month it is time to get into action. Write a letter asking for the return of your money. Send a copy of your order to the firm and point out their promise of delivery within two weeks. Tell them that unless they respond immediately you will take the matter to the mail-order-fraud department of the post office, to your attorney general, and to the Better Business Bureau in his town. Keep a copy of this letter . . . and send me a copy.

4. If you hear nothing further within ten days, it is time to write to the post office, the attorney general, Better Business, and anyone else you can think of who might be interested. By all means, send a copy of the correspondence to me. I don't want to run ads from firms like this . . . and I just might be able to help you get your refund.

Book Manuscripts Wanted

The *Kilobaud* book department has been expanded recently and several books are in the works; more are needed . . . if you are looking for fame and fortune.

A publisher has two major functions, and *Kilobaud* is uniquely suited to both of these. First comes the printing of the book, which can be an expensive proposition. In our case, we edit the manuscript, do the drafting of any schematics, set the type, do needed photography, proofread the type, lay out the pages, put the type, photos and draftings together on the page, shoot the negatives, make the printing plates, buy the paper, print the book, bind it and ship it. Everything is done right at *Kilobaud*! Few publishers have such a complete setup . . . or one nearly as efficient.

The second function is advertising and distributing the book. Again we have everything, including a magazine to help with the advertising. Our marketing staff prepares promotions for computer stores, bookstores, radio stores, etc. Our sales staff is in touch with all possible book outlets. With over a dozen books now being distributed, we know the market well.

What kind of books are needed? Microcomputer-fundamental books are still selling well, despite the large number of them out there. Books of programs for microcomputer-users are exceedingly popular. Books on programming sell well. Heck, almost any book on computing sells. What are you waiting for? Wouldn't you like to see your name on a book cover?

If you have a book in the works you can do worse than get in touch with our book department and see if you have something viable. It sure is nice when those royalty checks come in.

Good News and Bad News

Perhaps you've noticed that prices on everything have been inching up. As long as we are all so enthusiastic about supporting an ever-growing government, one that has a strong vested interest in spending, not saving, inflation is going to be a fact of life. You've probably read about the recent postal hike and you may know about the next one that's coming. I sense that something has changed in postal rates for magazines when I have to pay 72¢ a copy to mail an issue of *Kilobaud* and remember when I paid 5¢ each to mail *73 Magazine*.

The excuses include more than postage. Paper has doubled in price in recent months, with the grades of paper we used to use being phased out and forcing us to use what the paper mills are making . . . paper so thin it is getting difficult to turn a page without skipping one or two and hardly noticing it. Printers, needing bigger Rolls Royces and yachts, have upped their take . . . and so it goes.

The bottom line is an increase in *Kilobaud*'s one-year subscription to $18. Since about half of our subscribers opt for a three-year subscription for $36, and we are not increasing this price, the net to us will be about 11 percent. This will put us back where we were when *Kilobaud* started.

With a very high percentage of the renewals coming through for three years, it will be the newcomers to the magazine who will foot the inflation on the one-year rate.

EDITOR'S REMARKS

(from page 7)

or give me a call for reservations and booth costs.

John Craig, RFD Box 100 D, Lompoc CA 93436, (805) 735-1023.

Article Submission

Hey, if you're going to write an article *don't* send it to more than one magazine at a time, OK? That isn't the way the game is played. I don't think any of us likes to be put in a position of "bidding" on a piece of material (and I won't), but even worse than that are the possible messes that can occur.

My most recent experience involving dual submissions resulted

LETTERS

(from page 20)

```
210 IFS(A)<>0THEN350\M2=0
215 Y1=Y1+1
220 FORZ9=0TO8STEPQ9
225 IFC9(A,Z9)=0THENEXIT320
230 A6=C9(A,Z9)\A6=V(A6)
240 IFA6<0THEN300\IFA6=11THENV(A9)=-1
260 IFA6=3THEN265\GOTO270
265 M4=A\GOTO390
270 IFA6=0THEN300
280 IF5>A6THEN285\GOTO290
285 M2=M2+A6^A6\GOTO300
290 A7=INT(A6/5)\IFA7=A6/5THENM2=M2+A7
300 NEXTZ9
320 IFM2>M3THEN325\GOTO350
325 M3=M2\M4=A
350 NEXTA\IFY1=1THEN355\GOTO390
355 PRINT"IT'S A DRAW"\END
365 FORA1=0TO3\A6=W(A1,M5)\IFS(A6)=0THEN366\GOTO367
366 M6=A6
367 NEXTA1
368 PRINT"THE OLD",M5
370 S$(M6,M6)="C"
375 A1=INT((M6-1)/16)+1\A2=M6-((A1-1)*16)
380 PRINT"I WON WITH BOARD",A1," POSITION",A2\GOSUB1000
382 END
390 S$(M4,M4)="C"\S(M4)=5
391 U2=M4\U4=5\GOSUB1400
392 A1=INT((M4-1)/16)+1\A2=M4-((A1-1)*16)
400 PRINT"I WENT BOARD ",A1," POSITION ",A2\GOTO90
410 PRINT" "\PRINT"YOU WON"\GOSUB1000\END
1000 PRINT"POSITIONS ARE",\FORA=0TO3\FORA1=1TO13STEP4\A2=20+(A1*4)
1100 PRINTTAB(A2-4),A+A1,\NEXTA1
1102 PRINT" "\NEXTA\PRINT" "\PRINT" "
1105 FORA=0TO3\PRINTTAB(A*15),"BOARD",A+1,\NEXT\PRINT" "
1107 PRINT" "\PRINT" "
1110 FORA=1TO4\FORA1=0TO48STEP16\A2=A+A1
1120 PRINTS$(A2,A2),S$(A2,A2),"/",
1121 PRINTS$(A2+4,A2+4),S$(A2+4,A2+4),"/",
1122 PRINTS$(A2+8,A2+8),S$(A2+8,A2+8),"/",
1123 PRINTS$(A2+12,A2+12),S$(A2+12,A2+12),"   ",
1124 NEXT
1125 IFA=4THEN1130
1127 PRINT\FORA2=1TO4\PRINT"///////////   ",\NEXTA2
1130 PRINT" "\NEXTA\PRINT" "\PRINT" "\RETURN
1400 FORU1=0TO8
1410 U3=C9(U2,U1)
1420 V(U3)=V(U3)+U4
1430 NEXT\V(0)=0\RETURN
```

from a record-keeping error on the author's part. It turned out he had submitted the article to another magazine, forgot about it and then sent it to *Kilobaud*. It initially blew my mind when I saw an article that I'd already bought in print . . . in another magazine.

We finally got things straightened out; but to paraphrase an oft-heard democratic dictum: "One article, one magazine."

NEW PRODUCTS

(from page 17)

age differential of bus signals that are asserted "high."

The Extensys device provides glitch-free signals (no spikes interference, crosstalk) by bringing some well-documented analog techniques from transmission-line analysis to the digital world of S-100 computers.

The "Glitch Grabber," which easily plugs into any open slot on the S-100 bus, features a proprietary self-regulating transistor network that controls voltages and modifies circuitry to handle less or more voltage; the circuitry is activated, however, only when the glitch is there, so it does not load the S-100 bus signals.

The "Glitch Grabber" is also very effective when used in business applications where reliable operations are of prime concern.

Extensys, 380 Bernardo Ave., Mountain View CA 94040.

PET-488 Cable Assembly

The Pickles and Trout PET-488 cable assembly makes your PET computer plug compatible with any IEEE-488 device. The PET computer can become the controller for a wide variety of electronic test equipment and computer peripherals. You can use your PET as the basis for an automated testing system or you can take advantage of the numerous peripheral devices (more appear every month) that can talk to the IEEE-488 bus.

The PET-488 cable assembly plugs directly into the edge connector on the back of the PET computer and has a completely 488 compatible connector on the other end. The cable itself meets all IEEE-488 specifications for shielding and crosstalk and is 18 inches (.45m) long. Price is $30 (California residents, please add 6 percent sales tax).

Pickles and Trout, PO Box 1206, Goleta CA 93017.

Professional Software

The Comprehensive Mailing List Program Package, #ML-1NS, is a modular program set which enables the user to start and effectively maintain one or more mailing lists. Operations include: Add, Delete, Search, Sort, Auto-Sort and Sequential Printout. Features include: user-selectable defaults for ease of entry, user-selectable number of labels across page for different printers and label sheets and user-selectable 3- or 4-line address for each independent entry. The program set is written for convenience and ease of use. Available with complete documentation and North Star diskette for only $25 ppd.

Delivery is from stock. Documentation package only is $4.50 ppd, fully refundable with order for diskette. Order from: Williams Radio and TV, Inc., Computer Division, 2062 Liberty St., PO Box 3314, Jacksonville FL 32206.

BOOKS

(from page 12)

impression of two guys talking to each other. The result is a very readable pair of books that are also extremely informative.

The books aren't flawless, of course. The most irritating things are the typographical errors. Fortunately, only a couple of them are likely to cause you any confusion while reading. An errata sheet will be available soon. Sorry, but even though I tried, I couldn't come up with anything else bad to say.

In short, these books are ideal for someone who is just getting into home computing. Even for the more experienced reader, they tie up a lot of the loose ends and show the relationships among things that may not have been clear before.

Tom Rugg
Los Angeles CA

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B14

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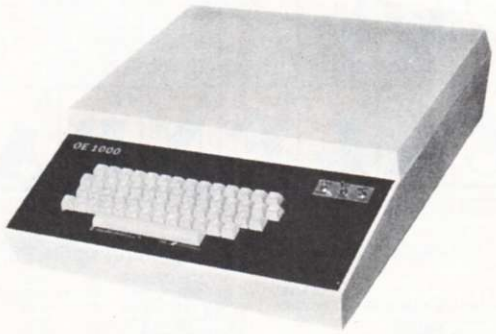

The OE 1000 Terminal is a low cost stand alone video terminal that operates quietly and maintenance free. It will allow you to display on a monitor or modified T.V. 16 lines of 64 characters. The characters can be any of the 96 ASCII alphanumerics, and any of the 32 special characters. In addition to upper-lower case capability it has a scroll up feature and full X-Y cursor control. All that is required from your microcomputer is 300 baud, RS 232 or 20 mA current loop, serial data. And if that is not enough the price is only $275.00 in kit or $350.00 assembled, plus $3.00 shipping and handling. To order phone or write:

OTTO ELECTRONICS
P.O. Box 3066
Princeton, N.J. 08540
609/448-9165

MC, BAC, COD accepted N.J. residents add 5% sales tax.
Dealer Inquiries invited.

09

Kilobaud Classified

Kilobaud classified advertisements are intended for use by those individuals desiring to buy, sell, or trade used computer equipment or software. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows five lines of about 22 characters each, including spaces and punctuation. The $10 box provides ten lines of type – again, each line is about 22 characters. Minimize capital letters, as they use twice the space of small characters. Payment is required in advance with ad copy. We cannot bill, or accept credit. Oversize ads are not accepted. Each subscriber is limited to two (2) identical ads in any given issue.

Advertising text and payment must reach us 60 days in advance of publication. For example, advertising copy for the March issue (mailed in February) must be in our hands on January 1. The publisher reserves the right to refuse a questionable or not applicable advertisement. Mail advertisements to: KILOBAUD CLASSIFIED, Kilobaud, Peterborough, NH 03458. Do not include any other material with your ad, as it may be delayed.

PET owners—train your new PET with this software: try Dictator at $10 or King at $7.50, or a tape of 10 games at $20. Send SASE for complete list. Guaranteed. Dr. Daley, 425 Grove Ave., Berrien Springs MI 49103.

TDL Xitan, 34K—250n SMB, video display brd ZPU, keyboard, 12" TV, $2095, Jon Batcheller. (904) 373-7004.

Sophisticated 2-player football simulation on cassette for Radio Shack TRS-80 Level 1 BASIC. Uses graphics to draw field, move ball, etc. $12. Dr. S. Harter, Box 17222, Tampa FL 33682.

PET users need info? Getting started with your PET workbook, $4. Workbook has helpful info, sample programs, exercises and fundamental features of PET BASIC. Send SASE for details. D. Smith, Box 921, Los Alamos NM 87544.

ADM-3A with upper/lowercase. Brand new. Guaranteed working perfectly. $600. Write: Terminal, PO Box 2467, N. Canton OH 44720.

For sale: Heath H8, H9, 12 K mem assembled. ecp-3801 recorder Ext-BASIC and all supporting prog & doc. $1400. T. Bratcher, 1926 Woodslea, Apt 5, Flint MI 48507. (313) 744-3098 after 6 PM.

TRS-80 Horoscopes. Level 1 BASIC. Tutorial on horoscope and zodiac. Locates houses and planets. Any date 1800-2000. Single pass for 16K and three pass prog. for 4K. Both for $7.50 (tape). D. L. Pitman, 3045 Tuna Canyon, Topanga CA 90290.

All prime, 100% guaranteed, in tubes. CD4030—25/$7.50, CA3079—25/$12, 74S112—25/$10. 74116—15/$15. A. Khan, 2355 Burch Cir. N.E., Atlanta GA 30319.

For Sale: GE capacitors 26,000 uF at 30 volts dc $2 each or three for $5. Postpaid U.S. only. L.F. Carbaugh, PO Box 398, New Cumberland PA 17070.

For Sale: Altair 8800B w/broken protect switch (bat handle was accidently snapped off). Worked fine before the mishap. $650. Jeff Smith, 5638 Whitsett #16, N. Hollywood CA 91607.

Sell: Heath H9 terminal, expertly assembled, $550. 10 new DPI 8-in. disks, $50. I ship. Andy Thornburg, 400 E. Jackson, DeSoto IL 62924.

Imsai with front panel, 22 motherboard, cabinet, 8080 CPU, 4K RAM, 8800 interface card, $200. Cromemco 8K Bytesaver with PROM burner and 2708s, $100. Cromemco 7+ I/O, $100. Tarbell cassette interface, $75. Processor Tech. 3 parallel, 1 serial I/O, $80. All of above $500 cash. Joe Petro, 3503 Berkeley Pl. N.E., Albuquerque NM 87103.

Apple II software—cassette: 16K blackjack—multicolor card display, 2-player paddle input, full Las Vegas rules, opt., autoplay by computer, sound effects, documentation incl., $10. George W. Lee 18803 S. Christina Ave., Cerritos, CA 90701.

For Sale: Mits 88-ACR, 88-2SIO TTY, 8800A, 88-4MCS, 88-16MCS. ASR-33 TTY. 2 IBM 5440 hard disks. Must sell. High bidder takes any item. Michael Clark, R.D. #3, Nazareth PA 18064 (215) 759-6873.

TRS-80 Sort: in BASIC I, 4K min. Sorts recs in memory on 1 or 2 numeric fields in asc. or desc. seq. Input from tape, k.b. or both. Output to tape or video. Can be subroutine. $10 on tape w/doc. To: Software, Box 6153, Syracuse NY 13217.

SWTP 6800/1 with 12K, serial control interface, parallel interface, documentation, in good condition, $620. J. Wendel, 2 2nd St. NE, East Grand Forks MN 56721.

Struggling Artist/Programmer needs hardcopy graphics, digital or analog X-Y plotter. Write: Mitch Wade, 20221 Birch St., Santa Ana Heights CA 92707.

For Sale: North Star Software Special. Personal finance and budgeting package, $15. Memory test, $10, Diskopy, $10. Both for $15. Stock market analysis package, $10. Correspondence editor, $5. Mail list, $5. Special assortment disk, $10. Plus much more. Send blank disk or $5.25 for disk. Write for complete list. Herb Schildt, 1007 N. Division, Urbana IL 61801.

GE opto-isolators H11A2, all prime. 100% guaranteed. With spec. 2/$1., 100/$40. A. Khan, 2355 Burch Cir. N.E., Atlanta GA 30319.

CIRCLE CHESS instruction book by Alphonso, used in Circle Chess software development. $5, Stanonis, Box 63, Des Plaines IL 60017.

Poly & TRS-80 Software—New, Original. Send for complete list. Ted Carter, 902 Pinecrest, Richardson TX 75080. (214) 235-0915.

KB CALENDAR

The following shows are coming up in '78:

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Paris	May 23-25
Atlanta	June 3-4
Anaheim	June 6-8
Dallas	June 17-18
Detroit	June 23-25
Wash DC	Jul 22-23
San Antonio	Aug 5-7
San Diego	Aug 22-24
Philadelphia	Aug 25-27
NYC	Sep 22-24
Houston	Sep 29-Oct 1
Dallas	Sep 29-Oct 1
Chicago (Benwill)	Oct 5-8
Chicago (Bunnell)	Oct 12-15
Seattle	Oct 21-22
Los Angeles	Nov 3-5

CORRECTIONS

Robert L. Smith of 2300 St. Francis Dr., Palo Alto CA 94303, writes:

"I have some information that may be of use to readers of the article, 'Super Terminal!' (March issue, p. 48), about the Burroughs/Friden 9350-2. There were some unidentified pins on Table 4 (and at least one pin in error). The identification should be as follows:

Pin No.	Function
24	SHIFT ENCODER #1
26	SHIFT ENCODER #2
27	BIT 6 OUT
28	PARITY BIT OUT
32	CONTROL BIT 6 OUT
33	CONTROL BIT 5 OUT
34	CONTROL PARITY BIT OUT
37	CONTROL BIT 7 OUT

Note that in Fig. 6, the missing pin is pin 27.

"It is not impossible to repair and modify the original boards, as I have done so, even before I obtained any original documentation. I did, however, have to generate a fair amount of documentation on my own.

"At least some of the ICs on the original circuit boards are apparently available from Raytheon. I have a limited supply of the various ICs (unused) if anyone is in need of them. I also have some used circuit boards and a fair amount of mechanical and electrical documentation for the 9350. However, I do not have any decent method for copying and distributing most of the documentation because of the large volume of the material."

Chris Kilgus of Phoenix AZ wrote to inform us that the ACIA in Fig. 1 of Don Gille's article "Tuned for Speed" (February issue, p. 59) is an MC 6850 rather than a 6820.

Our address was printed as Box 2485 in the "Mystery Program" in the April 1978 issue. It should be: Tom Rugg and Phil Feldman, PO Box 24815, Los Angeles CA 90024.

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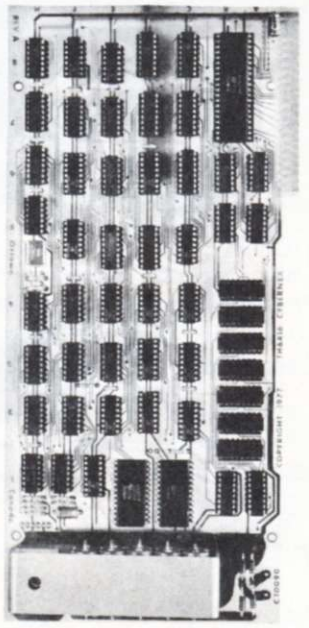

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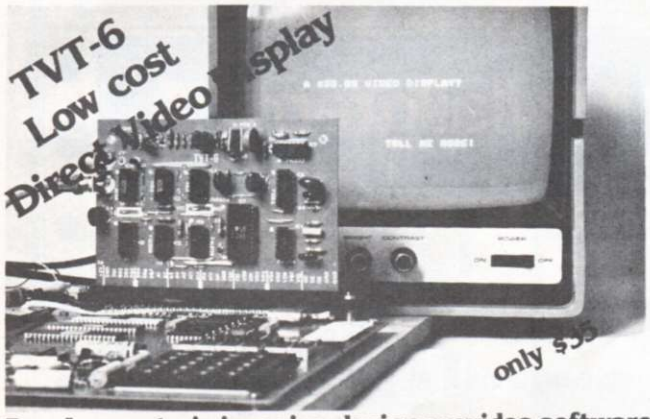

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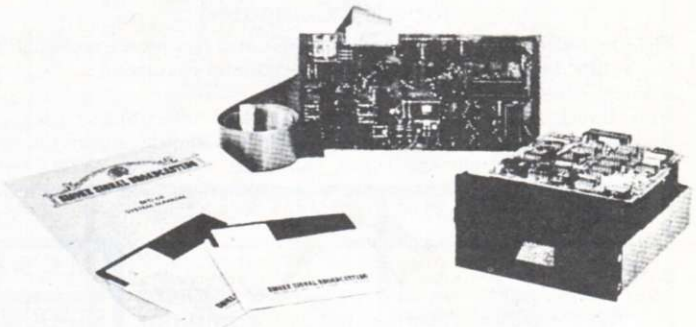

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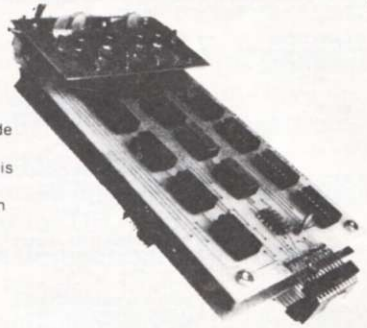

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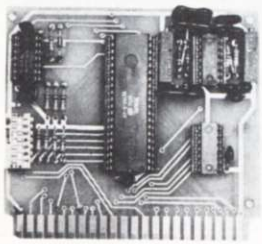

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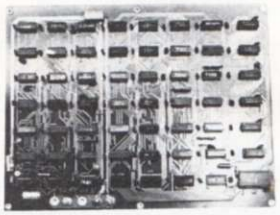

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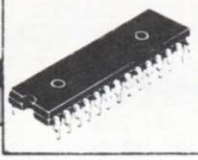

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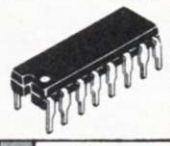

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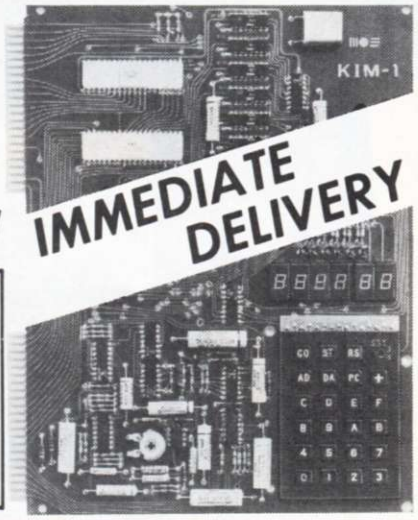

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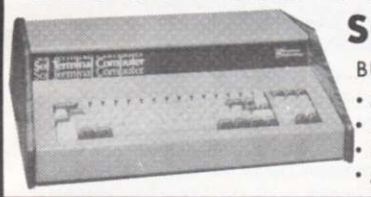

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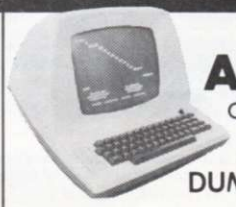

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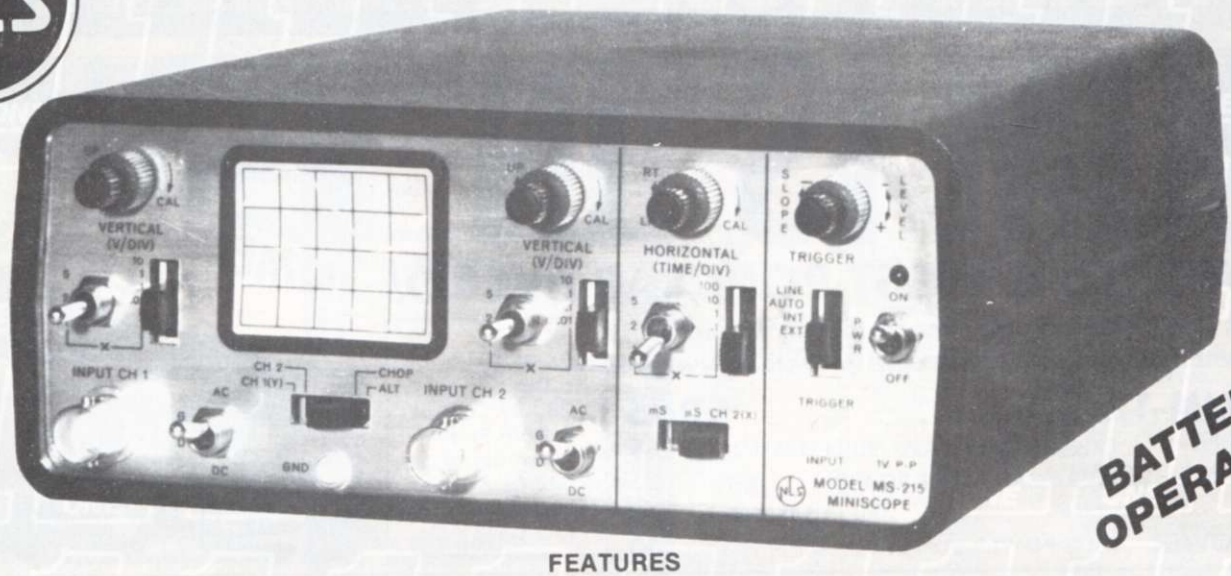

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From the originator of the Digital Voltmeter, Non-Linear Systems comes the MS-215 Miniscope. It is a fine electronic instrument with a great deal of measuring capability and excellent accuracy. Its design is modern, utilizing the latest in low-powered integrated circuits, and it is packaged into the smallest practical size. The instrument fits into many briefcases and tool boxes with room to spare.

Operating characteristics have been chosen so that the MS-215 will make all of the measurements needed in servicing most electronic equipment. It is field-portable so its use is not restricted to the bench.

SPECIFICATIONS:

Vertical
Mode: CH1, CH2, CH1 & CH2 (Chopped) & CH1 & CH2 (Alt.)
The Following Specifications apply to each channel

Y Axis
Verticle Input: 10mV/div to 50V in 12 Calibrated ranges, as follows:
x1-10mV/div to 10V/div in four ranges, each continuously variable.
x2-20mV/div to 20mV/div in four ranges, each continuously variable.
x5-50mV/div to 50mV/div in four ranges, each continuously vairiable.
Accuracy is 3%
Input Impedence: 1M ohm shunted by 50 pF.
Bandwidth: DC/DC to 15 Mhz ±6 db (DC to 8 Mhz ±3 db). AC, same as DC down to 3Hz.
Rise Time: Approximately 23 nS @ 1 division deflection.
Input Voltage: 250 maximum (DC and Peak AC).

Horizontal
Mode: Internal Time Base or External Horizontal, switch selectable. In the XY mode, vertical input is through CH1 and horizontal input is through CH2
Bandwidth: DC to 200 KHz (±3 db).
Coupling: AC, DC or ground, switch selectable. Low frequency point on AC is 3 Hz.
Input Impedence: 1Meg ohm shunted by 50 pF.
Deflection Factor: 10mV/div to 50V/div in 12 calibrated ranges. The ranges can be calibrated with the CH2 gain control
Input Voltage: 250V maximum (DC and Peak AC)
Time Base: **0.1uS/div to 0.5 Sec/div in 21' calibrated ranges, as follows:**
x1, uS-0.1uS/div to 100 uS/div. x2, uS-0.2uS/div to 200 uS/div.
x5, uS-0.5uS/div to 500 uS/div. x1, mS-0.1mS/div to 100 mS/div
x2, mS-0.2mS/div to 200 mS/div. x5, mS-0.5mS/div to 500 mS/div.
all in four ranges, each continuously variable. (Range increments ar .1, 1, 10, 100.) With vernier in full clockwise position, calibrated time measurements are possible. Accuracy is 3%.

Triggering
Internal: Sweep triggered from internal trigger source (In the dual trace modes, the internal trigger source is CH1).
Automatic: Trigger source is internal calibrater frequency. To be used if there is no other trigger source available to synchronize the sweep.
Line: Trigger is derived from line frequency when using the battery charger.
External: Controls function as for internal triggering (1 Megohm input impedence).
Slope: Selects sync to positive- or negative- going waveform.
Coupling: AC
Sensitivity: Less than 1 div for internal trigger and less than 1 volt for external trigger.
Level: Trigger Level control permits continuous adjustment of trigger point in all modes except Auto.
Internal Calibrater: A square-wave signal of 1 volt p-p ± 5% is provided. Frequency is approximately 1KHz.

Display
Graticule: 4x5 div, each division is 0.25 inch. Viewing area 1.1"Hx1.35"W
CRT: Bluish-white phospher, medium peristence. CRT uses low power filament for low battery drain. Instant onl

Power
On-Board Batteries: Three sealed, rechargeable lead acid "D" Cells
Operating Time: Typically 4 hours.
Charging Time Scope Operating: Will run indefinitely but not reach full charge.
Non-operating: Sixteen hours.
External Power: Battery charger 115 vac (220 vac on request). 50-400Hz, less than 15 watts.
Dimensions: 3.1"Hx6.4"Wx8.0"D.
Weight: Three pounds.

Environment
Operating Temperature: 0° to 40°C
Shock and Vibration: Designed to with stand normal shock and vibration encountered in commercial shipping and handling.

Accessories
Furnished: Tilt stand, battery charger, 2 input cables, and 3 miniature banana plugs.
Optional: Leather carrying case and probes
Warrranty: One year parts and labor. Made in the U.S.A.

MS-215 with Rechargeable Batteries and Charger $395.00

Leather Carrying Case

The leather case has 2 separate compartments. One to hold the scope, other to hold the charger, probe, shoulder strap, etc. The case can be w on the belt, or over the neck.

The snaps used on the case are "one way", thus accidental strikin the case against an object will not undo the snaps or let it be pulled off belt.

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Probes

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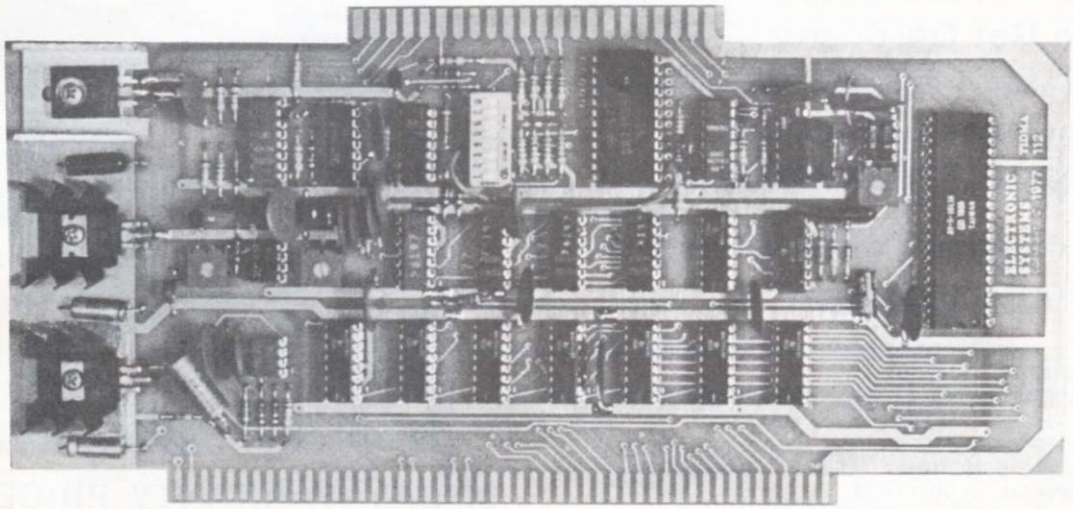
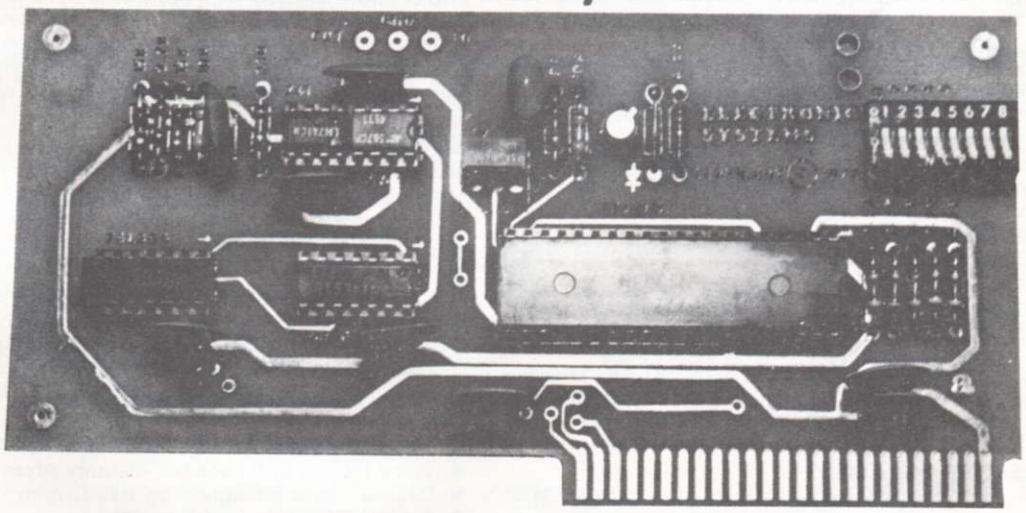


With this Tape Interface Direct Memory Access board you can record and play programs without a bootstrap loader (no prom). This can be up and running as fast as putting it in the socket. It takes complete control of the S-100 bus and reads or writes directly into the memory without the need for the microprocessor. It has an FSK encoder/decoder for direct connections to a low cost cassette recorder at 1200 baud, and inputs and outputs for direct connections to a digital recorder at any baud rate. This board is S-100 bus compatible.

Board only $35.00 Part No. 112; with parts $110.00 Part No. 112A

APPLE II SERIAL I/O INTERFACE



This serial I/O port works up to 30,000 baud. Software included are, an input and output routine from the Apple monitor or basic to a teletype or other serial printer. Also a program for using the Apple II for a video terminal or an intelligent terminal. It plugs into one of the Apple II peripheral connectors. It uses very low current. The input and output are RS-232.

Board only $15.00 Part No. 2; with parts $42.00 Part No. 2A. Assembled and tested $62.00 Part No. 2C.

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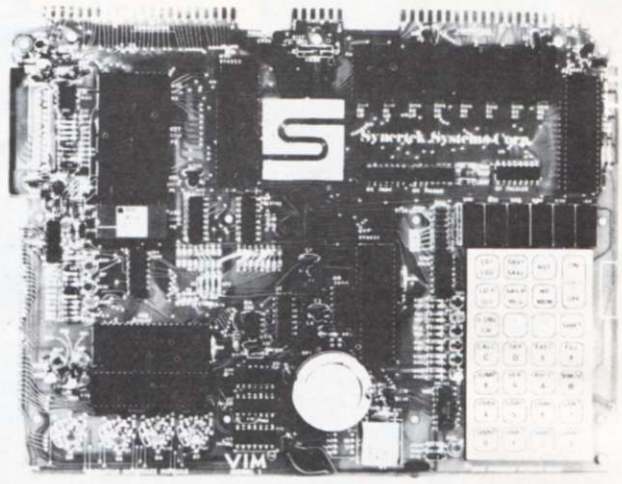

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- 4K BYTE ROM RESIDENT MONITOR and Operating Programs.
- Single 5 Volt power supply is all that is required.
- 1K BYTES OF 2114 STATIC RAM onboard with sockets provided for immediate expansion to 4K bytes onboard, with total memory expansion to 65, 536 bytes
- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
  - — Audio Cassette Recorder Interface with Remote Control (Two modes: 135 Baud KIM-1* compatible, Hi-Speed 2400 Baud)
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  - — System Expansion Bus Interface
  - — TV Controller Board Interface
  - — CRT Compatible Interface
- APPLICATION PORT: 15 Bi-directional TTL lines for user applications with expansion capability for added lines
- EXPANSION PORT FOR ADD-ON MODULES (51 I/O Lines included in the basic system)
- SEPARATE POWER SUPPLY connector for easy disconnect of the d-c power
- AUDIBLE RESPONSE KEYPAD

VIM-1 Manuals: The well organized documentation package is complete and easy-to-understand
VIM-1 CAN GROW AS YOU GROW. It's the system to BUILD-ON. Expansion features that are soon to be offered:

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VIM-1 PROVIDES YOU WITH ON-BOARD EXPANSION. The printed circuit board includes sockets to add additional ROM, PROM, RAM, or Peripheral Ports when you require them. VIM-1 doesn't require you to build up wire-wrap boards to use these options. VIM-1 option boards are merely plugged into the basic unit to give you the added capability you require. We have maintained KIM* hardware compatibility. Our boards will plug into any KIM* motherboard and card cage.

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Synertek has enhanced KIM-1* software as well as hardware. The software has simplified the user interface. The basic VIM-1 system is programmed in machine language. For those users who want to develop in assembly language directly on VIM-1 the optional RESIDENT ASSEMBLER/EDITOR can be purchased and plugged into the ROM/PROM expansion sockets ALREADY PROVIDED.

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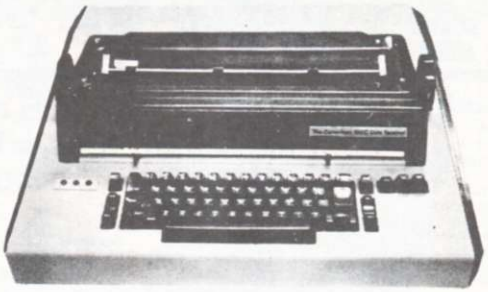

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WHAT YOU SHOULD KNOW BEFORE BUYING ANY STANDARD IBM SELECTRIC TERMINAL

- Carriage Return time is about 5 times longer than a standard terminal; therefore, you need to transmit up to 12 null or rubout characters after the standard CR/LF characters to allow enough time for the carriage return. This may require you to rewrite your computer's software. There are other characters which have similar problems such as Index, Tab, Backspace and Shift.
- The mechanics of the IBM Selectric limit the printing speed to a maximum of 14.9 characters per second, therefore it cannot run at 150 baud (15 characters/sec.)
- The standard baud rate for a Selectric is 134.5 and therefore cannot interface with a system having only the standard baud rates such as 110 or 150 without modifying or completely replacing the terminal's electronics.
- Some of the IBM Selectric terminals use a unique character ball and are *not* interchangeable with the standard typewriter ball. The balls for these are more expensive, harder to find, and do not have the font selection.
- The IBM Selectric's printer and keyboard are mechanically linked together and therefore, without sophisticated electronics, it cannot interface with a full-duplex system.
- The Selectric produces only 10 standard control codes versus 34 on a standard ASCII terminal.
- There are several IBM Selectric terminals around and *not all* have the heavy duty Selectric mechanism.

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- *TWO* operating systems (switch selectable)

A. As a standard IBM terminal using EBCDIC Code at 134.5 Baud. So that it can be used with IBM equipment.

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2. It generates all 34 of the standard ASCII control codes.
3. Full or Half-duplex operation.
4. Generation of parity.
5. Two modes of operation:
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   b. Typewriter Mode: Transmits both upper and lower-case codes, dependent upon the shift key being depressed or not.

- Has both RS-232 and 20 ma. Current Loop interfaces.
- Remote/Local switch, so it can be used as a typewriter or a terminal.
- Uses the standard IBM Selectric character ball.
- Has a 15" carriage for up to 132 characters per line.
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64K	995.00

THE 32K VERSION USES THE MOSTEK MK4115 RAM AND HAS 8K BOUNDARIES AND PROTECTION & UTILIZES DIP SWITCHES. P. C. BOARD COMES WITH SOCKETS FOR 32K OPERATION

BUY A S100 COMPATIBLE RAM BOARD AND UPGRADE THE SAME BOARD TO A MAXIMUM OF 65K MEMORY IN STEPS OF EITHER 8K OR 16K AT YOUR OPTION BY MERELY PURCHASING MORE RAM CHIPS FROM SD COMPUTER PRODUCTS.

THE 64K VERSION USES THE MOSTEK MK4116 RAM AND HAS 16K BOUNDARIES AND PROTECTION & UTILIZES DIP SWITCHES. P. C. BOARD COMES WITH SOCKETS FOR 64K OPERATION

LOOK AT THE FEATURES WE HAVE BUILT INTO THE EXPANDORAM!

- MEMORY ACCESS TIME IS 375 ns
- MEMORY CYCLE TIME IS 500 ns
- POWER REQUIREMENTS ARE:
  - 8 VDC 400 MA DC
  - 18 VDC 400 MA DC
  - —18 VDC 30 MA DC
- ON BOARD INVISIBLE REFRESH
- NO WAIT STATES REQUIRED
- NO CYCLE STEALING NEEDED
- ON BOARD REGULATION
- CONTROL, DATA & ADDRESS INPUTS UTILIZE LOW POWER SCHOTTKY DEVICES
- DESIGNED TO WORK WITH Z-80, 8080, 8085, CPU's

ADD $50.00 TO ABOVE PRICES FOR FULLY ASSEMBLED AND TESTED BOARDS

Low Cost Cassette Interface Kit

$19.95

Features: Play and record K.C. Standard 2400/1200 Hz tapes. 300 Baud, TTL I/O Compatible, Phase Lock Loop. Both 22 Pin Connector and 8 Pin Molex Connector. Comes partially assembled. Oscillator and phase lock loop pre tuned to K.C. Standard. Selector switch sends cassette data or auxiliary input data to microprocessor. LED indicates logic 1 level.

4K LOW POWER RAM KIT
The Whole Works - $79.95

Full Buffered - on board regulated - reduced power consumption utilizing low power 21L02-1 500ns RAMS - Sockets provided for all IC's. Quality plated through PC board.

*Add $10.00 for 250ns RAM operation.

8K LOW POWER RAM
$159.95

FULLY ASSEMBLED AND TESTED. NOT A KIT.

Imsai — Altair — S-100 Buss compatible, uses low power static 21L02-500ns fully buffered on board regulated, quality plated through PC board, including solder mask. 8 pos. dip switches for address select.

*Add $30.00 for 250ns RAM operation

Z-80 CPU BOARD KIT
Complete Kit $139.

CHECK THE ADVANCED FEATURES OF OUR Z-80 CPU BOARD: Expanded set of 158 instructions, 8080A software capability, operation from a single 5VDC power supply; always stops on an M1 state, true sync generated on card (a real plus feature!), dynamic refresh and NMI available, either 2MHZ or 4MHZ operation, quality double sided plated through PC board; parts plus sockets provided for all IC's. *Add $10. extra for Z-80A chip which allows 4MHZ operation.

NEW FROM S.D.

"VERSAFLOPPY"™ KIT

THE VERSATILE FLOPPY DISK CONTROLLER

ONLY $149.00

FEATURES: IBM 3740 Soft Sectored Compatible, S-100 BUS Compatible for Z-80 or 8080. Controls up to 4 Drives (single or double sided). Directly controls the following drives:

1. Shugart SA400/450 Mini Floppy
2. Shugart SA800/850 Standard Floppy.
3. PERSCI 70 and 277.
4. MFE 700/750.
5. CDC 9404/9406.

34 Pin Connector for Mini Floppy. 50 Pin Connector for Standard Floppy. Operates with modified CP/M operating system and C-Basic Compiler. The new "Versafloppy" from S.D. Computer Products provides complete control for many of the available Floppy Disk Drives, Both Mini and Full Size. FD1771B-1 Single Density Controller Chip. Listings for Control Software are included in price.

FD 1771B-1 CHIP ALONE $39.95

S. D. SALES NEW

EXPANDABLE EPROM BOARD

16K OR 32K EPROM $49.95 W/OUT EPROM

Allows You to Use Either 2708's For 16K of Eprom or 2716's For 32K of Eprom.

KIT FEATURES:

1. All Address Lines & Data Buffered
2. Quality Plated through P.C. Board Including Solder Mask and Silk Screen
3. Selectable Unit States
4. On Board Regulation Provided
5. All Sockets Provided W/Board

WE CAN SUPPLY 450As 2708's AT $11.95 WHEN PURCHASED WITH BOARD.

INTRODUCING THE SBC-100
(The Z-80 Based, S-100 Single Board Computer)

$349.00

FEATURES:

- No Front Panel Needed
- Z-80 CPU (2 or 4 MHZ)
- 1K RAM
- 4 ROM/PROM Sockets for 4K/8K of Memory
- SYNCHRONOUS/ASYNCHRONOUS Serial I/O with RS-232 and Current Loop Interface and Software
- Programmable Baud Rate
- Parallel Input Port
- Parallel Output Port
- 4 Channel Timer/Counter
- 4 Vectored Interrupts

O.E.M. SPECIAL

ASK ABOUT SPECIAL O.E.M. DISCOUNTS ON THE S.D. "COMPATIBLE SET"™

SBC-100 — SINGLE BOARD COMPUTER	$349.00
VERSAFLOPPY™ — FLOPPY DISK CONTROLLER	$149.00
EXPANDORAM — 32K RAM	$475.00
EACH KIT IF PURCHASED SEPARATELY TOTAL	$973.00

ORDER ALL 3 KITS TOGETHER FOR

$899.00

This Powerful Threesome Operates Together to Form A Comolete Computer for Your System.

Z-80 Programming Manual — IN DEPTH DETAIL OF THE Z-80 CPU MICRO-COMPUTER — **S. D. SALES SPECIAL $9.95**

RAMS

21L02 - 500NS	8/11.50
21L02 - 250NS	8/15.95
2114 — 4K	14.95
1101A — 256	8/$4.00
1103 — 1K	.35
MK 4115 - 8K	15.45
74S 200 - 256	3.95

CPU's

Z—80 includes manual	29.95
Z—80A includes manual	34.95
8080A CPU 8 BIT	11.95
8008 CPU 8 BIT	6.95

PROMS

1702A - 1K - 1.5us	3.95 or 10/35.
2708 - 8K - 450ns	14.95
5204 - 4K	7.95
82S129 — 1K	2.50
2708U 8K signetics 650ns	9.95

COUNTER CHIPS

MK50397 6 Digit elapsed timer	8.95
MK50250 Alarm clock	4.99
MK50380 Alarm chip	2.95
MK50395 6 digit up/dn. count.	12.95
MK5002 4 digit counter	8.95
MK5021-Cal. chip sq. root	2.50

S.D. NOW HAS SOFTWARE FOR IT'S CUSTOMERS

CP/M® DISK OPERATING SYSTEM . . . $99.95

CP/M is a powerful disk operating system which has become an industry standard. It is compatible with several disk based FORTRAN and BASICS. This package includes a CP/M diskette (mini or full size) adapted for S.D.'s SBC-100/VERSAFLOPPY. EXPANDORAM board set. Complete documentation is included. (® CP/M is a registered trademark of Digital Research Corp., Pacific Grove, CA.

Z-80® DISK BASED ASSEMBLER $69.95

Runs on ANY CP/M based disk system. Assembles the official Zilog-Mostek Mnemonics. Contains extensive set of pseudo-ops. Available on mini or full size diskette.

VERSAFLOPPY™ CONTROL FIRMWARE . . . $24.95

Provides control for VERSAFLOPPY and boots up CP/M. This runs on Z-80, 8080 or 8085 based computers. Available in 2708 or 2758 prom.

SD MONITOR $49.95

Powerful monitor for SBC-100 single board computers. Includes all VERSAFLOPPY control firmware. Comes in 2716 prom. Available in 4-6 weeks.

VERSAFLOPPY DIAGNOSTIC PROGRAM . . . $24.95

Provides routines which are helpful in checking out a disk based system. Available in 2708 or 2758 prom.

SUPER FLOPPY SPECIAL

S. D. SALES' VERSAFLOPPY S-100 CONTROLLER BOARD PLUS SHUGART SA 400 FLOPPY DISK DRIVE INCLUDING CABLE FOR ONLY

$449.00

MICROPROCESSOR CHIPS

8212 - 1/O port	3.50
8214 — P.I.C.	12.95
8216 — Non Invert Bus	4.95
8224 — Clock Gen.	4.95
8226 — Invert Bus	3.95
PIO for Z—80	14.95
CTC for Z—80	14.95
8228 Sys. Controller	8.20
8251 Prog. comm. interface	10.95
8255 prog. prep. interface	13.50
8820 Dual Line Recr	1.75
8830 Dual Line Dr.	1.75
2513 Char. Gen.	7.50
8838 Quad Bus. Recvr.	2.00
74LS138N — 1/8 decoder	.99
8T97-Hex Tri-State Buffer	1.25
1488/1489 RS232	1.50
TR 1602B Uart	3.95
TR 1863 Uart	8.50
FD 1771B-1	39.95

CMOS

4001	19	4029	99
4002	19	4042	69
4011	19	4047	1.50
4013	32	4049	35
4016	32	4069	23
4017	95	4071	19
4020	97	4076	97
4022	97	14518	1.10
4024	75	14528	85
4027	39	14529	85

CALL IN YOUR BANKAMERICARD (VISA) OR MASTER CHARGE ORDER IN ON OUR CONTINENTAL TOLL FREE WATTS LINE:

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Texas Residents Call Collect:

214/271—0022

DEALER INQUIRIES INVITED!

(All prices subject to change without prior notice.)

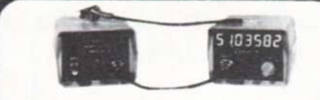
NO COD's. TEXAS RESIDENTS ADD 5% SALES TAX. ADD 5% OF ORDER FOR POSTAGE & HANDLING. ORDERS UNDER $10. ADD 75c HANDLING.FOREIGN ORDERS — U. S. FUNDS ONLY!

MS-15 MINISCOPE **$ 289.00** MS-15 MINISCOPE

NLS MS-15 MINISCOPE $ 289.00 NLS MS-15 MINISCOPE $ 289.00

NLS MS-15 MINISCOPE $ 289.00 NLS MS-15

NLS MS-15 MINISCOPE $ 289.00 NLS MS-15 MINISCOPE $ 289.00



SC-5 With Rechargeable Batteries & Charger Unit $89

FM-7 With Rechargeable Batteries & Charger Unit $195

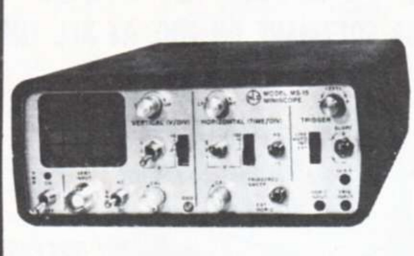
NLS

Features include: • By using the new NLS SC-5 Prescaler, the range of the FM-7 Frequency Meter, which is 10 Hz to 60 MHz, may be extended to 512 MHz (the upper VHF & UHF frequency bands). • The FM-7 utilizes an LED readout, providing 7-digit resolution. • The FM-7 can be calibrated to an accuracy of 0.00001%. • The SC-5 is accurate to one part per million. • Each unit has 30 millivolts sensitivity, is battery powered and has a charger unit included. • Dimensions of each are 1.9" H x 2.7" W x 3.9" D. • The units may be obtained separately or as a "Frequency Duo." • Parts & Labor guaranteed 1 year.

Tilt stand option .... $ 3.50
Leather case $16.00

MS-15 MINISCOPE $289

With Rechargeable Batteries & Charger Unit



- 15 megahertz bandwidth.
- External and internal trigger.
- Time base — .1 microsec. to 0.5 Sec/div - 21 settings. ± 3%.
- Battery or line operation.
- Automatic & line sync modes.
- Power consumption < 15 watts.
- Vertical Gain — .01 to 50 V/div - 12 settings ± 3%.
- Viewing area 1.1" x 1.35".
- Case size 2.7"H x 6.4"W x 7.5"D, 3 pounds.
- Parts & Labor guaranteed 1 year
- 10 to 1, 10 meg probe $24.50
- Leather carrying case $30.00

NLS

● MS-215 Dual Trace Version of MS-15 $395.00

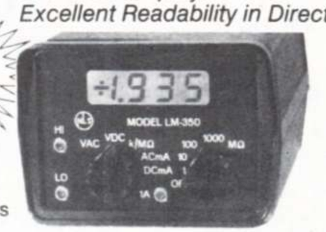
PROBE 1¢ with the purchase of SCOPE and the MENTION of this MAGAZINE

NEW VOLKSMETERS!

NLS

With LCD Display— Excellent Readability in Direct Sunlight!

NEW



1% LM-300 Full three digits $99.50*

0.5% LM-350 3½ digits $125.00*

FEATURES

- Measures DC volts, AC volts, ohms and current
- Automatic polarity, decimal and overload indication
- No zero adjustment and no full scale ohms adjust
- Large LCD display for easy reading without interpolation
- Size 1.9" H x 2.7" W x 4.0" D
- Parts and labor guaranteed for one year

SPECIAL!!

Batteries & Charger $1.00 with the purchase of Meter and the mention of this magazine

SPECIFICATIONS

MODE	RANGE	ACCURACY LM-300	ACCURACY LM-350	RESOLUTION	INPUT RESISTANCE	TEST CURRENT
VOLTS DC*	1 10 100 1000	±1% Reading†	±0.5% Reading†	1 mV 10 mV 100 mV 1 V	10 MΩ	
VOLTS AC*	1 10 100 1000	±1% Reading† 50-400 Hz	±0.75% Reading† 50-400 Hz	1 mV 10 mV 100 mV 1 V	10 MΩ, 30 pF	
KILOHMS**	1 10 100 1000 10000	±1% Reading†	±0.5% Reading†	1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ		1 mA 100 µA 10 µA 1 µA 100 nA
CURRENT	1 mA 10 mA 100 mA 1 A	±2% Reading†	±2% Reading†	1 µA 10 µA 100 µA 1 mA	1 kΩ 100 Ω 10 Ω 1 Ω	

* 1000 vdc or peak ac maximum any range. ... Digits
**Test Voltage (Ohms) ... Full Scale ... LM-300, ... Full Scale ... LM-350
† LM-350 has 100% over-range ... full scale readings are 1,999, 19.99, etc.

Tilt Stand Option, add $3.50
Leather Case $16.00
3AA NiCad-Batts. & Charger $12.00

Standard AA-size batteries provide up to 20 hours of operation.
Rechargeable NiCad batteries and charger unit available as optional equipment.
*Batteries not included.

LEDU

MG 10A List $72.00

Perfectly balanced, fluorescent lighting with precision magnifier lens. For prof'l, techn'l & hobbist. Has die cast protective shade, inst. start 3 diopter lens. 42" reach. $44.95

with T-9 fluorescent lamp (required) $48.95
colors: Gray or Black
Chocolate Brown
2 choices please

$44.95 SPECIAL

8803 MOTHER BOARD FOR S100 BUS MICRO-COMPUTERS

Vector

- Kit includes 12 tantalum capacitors for +5, +12, —12 buses and insulated mounting spacers.
- Wiring side shown. Component side bare epoxy glass with white markings for component locations.
- G10 epoxy glass board with 2 ounce copper, solder plated and .038 diameter holes for leads.
- Solder mask with solder windows on etched circuits to avoid accidental short circuits.
- Mounts 11 receptacles with 100 contacts (2 rows) on .125 centers with .250 row spacing, Vector part number R681-2, or mounts 10 receptacles plus interconnections to smaller mother board for expansion.
- Includes etched circuits and instructions for option of active, pull-up, or floating terminations.
- Large buses: +5V and GND (10 AMPS), ± 12V or 16V (7 AMPS). Current ratings are per MIL-STD-275 with 10°C rise.
- Fits in Vector-pak enclosures.
- Fits in IMSAI 8080 microcomputer as expander board.

Price: $29.50

Vector Plugboards

8800V

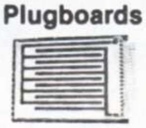
Universal Microcomputer/processor plugboard, use with S-100 bus. Complete with heat sink & hardware. 5.3" x 10" x 1/16".

1-4	5-9	10-24
$19.95	$17.95	$15.96

8801-1

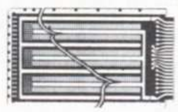
Same as 8800V except plain, less power buses & heat sink.

1-4	5-9	10-24
$14.95	$13.46	$11.96



3682 9.6" x 4.5" $10.97
3682-2 6.5" x 4.5" $9.81

Hi-Density Dual-In-Line Plugboard for Wire Wrap with Power & Grd. Bus Epoxy Glass 1/16" 44 pin con. spaced .156



3677 9.6" x 4.5" **$10.90**
3677-2 6.5" x 4.5" **$9.74**

Gen. Purpose D.I.P. Boards with Bus Pattern for Solder or Wire Wrap. Epoxy Glass 1/16" 44 pin con. spaced .156

3662 6.5" x 4.5" **$7.65**
3662-2 9.6" x 4.5" **$11.45**

P pattern plugboards for IC's Epoxy Glass 1/16" 44 pin con. spaced .156

R644 P.C. recepticle 22/44 cont. .156 ctrs. pierced solder eyelets tails gold $2.95
R644-3 P.C. recepticle 22/44 cont. .156 ctrs. Wire Wrap tails gold $4.49

S-100 Bus P.C. Edge Connectors

R681 DIP solder tails on .140 spaced rows for ALTAIR mother boards. Fits .042" dia. holes, gold $7.35
R681-1 .025" sq., 3 wrap lengths posts (.62 long) on .250 spaced rows, gold $5.00
R681-2 .025" sq., 1 wrap length posts (.22 long) on .250 spaced rows for wrapping or DIP solder for IMSAI mother boards, gold $5.85
R681-3 pierced solder eyelet tails, gold $7.35

1/16 Vector BOARD

.042 dia holes on 0.1 spacing for IC's

Phenolic

PART NO.	SIZE	PRICE
64P44-062XXP	4.5 x 6.5"	$ 1.49
169P44-062XXP	4.5 x 17"	$ 3.51

Epoxy Glass

PART NO.	SIZE	PRICE
64P44-062	4.5 x 6.5"	$ 1.70
84P44-062	4.5 x 8.5"	$ 2.10
169P44-062	4.5 x 17"	$ 4.30
169P84-062	8.5 x 17"	$ 6.39

SLIT-N-WRAP

Wraps insulated wire on .025" square posts
FOUR TIMES FASTER than regular manual wrap post tools

P180 with two 100' spools of 28 ga. wire **$24.50**

P160-4T includes charger, wire **$75.00**

Vector

NO PRE-STRIPPING*
NO PRE-CUTTING*
SPOOL-FED WIRE*

*The spooled wire passes through the tool past a slitting edge next to the wrap post. A narrow longitudinal cut is made in the insulation where it presses the square post corner; the bared copper is indented by the sharp edge (7 turns = 28 contacts). Insulation is not where wrapped but not between terminal posts when led straight out of the tool.

"Daisy-chain" runs. Reliable and easy to use. Manual or power operation.

SLIT-N-WRAP WIRE $2^{25} Package
NO. 28 GAGE INSULATED WIRE, 100' SPOOLS
W28-2-A Pkg. 3 Green W28-2-C Pkg. 3 Clear
W28-2-B Pkg. 3 Red W28-2-D Pkg. 3 Blue

2708

8K 450 ns

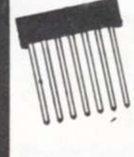
EPROM

FACTORY PRIME

$10.00 EA.

25 + *Call For Price*

14 & 16 PIN 3 LEVEL WIRE WRAP SOCKETS



14-T3 100 for **$30.00**
16-T3 100 for **$30.00**
50 of ea. for **$32.00**

ACE • All-Circuit Evaluator

for fast, solderless, plug-in circuit building and testing

10% OFF

Just plug in any components with leads to .032" dia. Interconnect with solid wire up to 20 ga. Assembled models too!

ACE Model No.	Tie Points	DIP Capacity	No. Buses	No. Posts	Board Size (inches)	Price Each
200-K (kit)	728	8 (16's)	2	2	4-9/16 x 5-9/16	$18.95
208 (assem.)	872	8 (16's)	8	2	4-9/16 x 5-9/16	29.95
201-K (kit)	1032	12 (14's)	2	2	16 x 7	24.95
212 (assem.)	1224	12 (14's)	8	2	4-9/16 x 7	34.95
218 (assem.)	1760	18 (14's)	10	2	6-1/2 x 7-1/8	46.95
227 (assem.)	2712	27 (14's)	28	4	8 x 9-1/4	59.95
236 (assem.)	3648	36 (14's)	36	4	10-1/4 x 9-1/4	79.95

Gold-anodized aluminum base/ground, non-corrosive nickel-silver terminals, 4 rubber feet.

Model 236

SALE

LIQUID CRYSTAL DIGITAL CLOCK-CALENDAR

- For Auto, Home, Office
- Small in size (2x2½x½)
- Push button for seconds release for date.
- Clocks mount anywhere with either 3M double-sided tape or VELCRO, included.
- 2 MODELS AVAILABLE: LCD-101, portable model runs on self-contained batteries for better than a year. LCD-102, runs on 12 Volt system and is back-lighted.
- LCD-101 or LCD-102 your choice .... **$34.95 ea.**
- Clear desk stand for **$2.00**

3 LEVEL GOLD WIRE WRAP SOCKETS

	1-24	25-49	50-99
8 pin	.47	.42	.37
10 pin	.45	.41	.37
14 pin	.39	.38	.37
16 pin	.43	.42	.40
18 pin	.75	.68	.62
20 pin	.84	.77	.71
22 pin	1.00	.97	.95
24 pin	1.00	.94	.75
28 pin	1.09	.98	.84
36 pin	1.59	1.45	1.30
40 pin	1.49	1.39	1.29

MICRO-KLIP
for .042 dia. holes
(all boards on this page)
T42-1 pkg. 100 ..... $ 1.50
T42-1 pkg. 1000 ..... $11.00
P-149 hand installing tool ..... $ 2.03

.8" LED ALARM CLOCK

12 hr. LED Alarm Clock uses 3½ digit .8" LED Display with AM/PM indicators and colons. Direct drive, PIN to PIN interface with 5199BA I.C. Just add switches, AC Supply, Alarm. Display and I.C. only

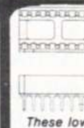
$7.95 or 2/$15.00

Price Breakthrough! $17^{95}

MA1003 CAR CLOCK

Bright Green Fluorescent Display Crystal Time Base Assembled, just add switches and 12 VDC.

SPECIAL

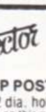


14CS2 100 for $14^{00}
16CS2 100 for $16^{00}
14 pin CS2 10 for $2^{00}
16 pin CS2 8 for $2^{00}

These low cost DIP sockets will accept both standard width plugs and chips.

For use with chips, the sockets offer a low profile height of only .125" above the board. These sockets are end stackable.

Vector



WRAP POST
for .042 dia. holes
(all boards on this page)
T-44 pkg. 100 ..... $ 2.28
T-44 pkg. 1000 ..... $14.00
A-13 hand installing tool ..... $ 2.80

PRIORITY ONE ELECTRONICS ©

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VISA — master charge

Terms: VISA, MC, BAC, check, Money Order, C.O.D., U.S. Funds Only. CA residents add 6% sales tax. Minimum order $10.00. Orders less than $75.00 include 10% shipping and handling, excess refunded. Just in case please include your phone no. **"Sorry, no over the counter sales"** Good thru July 15, 1978

P21

Send for our latest brochure.

phone orders welcome (213) 893-8202

OEM and Institutional inquiries invited.

24 PIN DIP PLUGS WITH COVERS

3 / $1.00
40 / $10.00

New! 16K E-PROM CARD

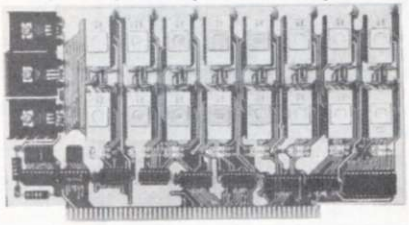
IMAGINE HAVING 16K OF SOFTWARE ON LINE AT ALL TIME!

S-100 (Imsai/Altair) Buss Compatible!

KIT FEATURES:

1. Double sided PC board with solder mask and silk screen and gold plated contact fingers.
2. Selectable wait states.
3. All address lines & data lines buffered!
4. All sockets included.
5. On card regulators.

KIT INCLUDES ALL PARTS AND SOCKETS (except 2708's). Add $25. for assembled and tested.



PRICE CUT!

$57.50 kit

WAS $69.95

SPECIAL OFFER:

Our 2708's (450NS) are $12.95 when purchased with above kit.

Fully Static!

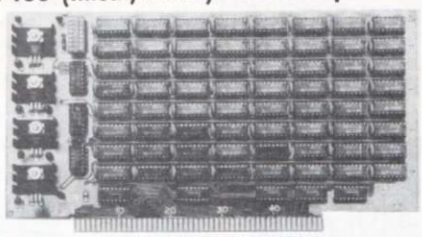
ADD $20 FOR 250NS

8K LOW POWER RAM KIT-$149.00

S-100 (Imsai/Altair) Buss Compatible!

KIT FEATURES:

1. Doubled sided PC Board with solder mask and silk screen layout. Gold plated contact fingers.
2. All sockets included.
3. Fully buffered on all address and data lines.
4. Phantom is jumper selectable to pin 67.
5. FOUR 7805 regulators are provided on card. (450NS)



USES 21L02 RAM'S!

2 KITS FOR $279

Fully Assembled & Burned In $179.00

Blank PC Board w/ Documentation $29.95

Low Profile Socket Set 13.50

Support IC's (TTL & Regulators) $9.75

Bypass CAP's (Disc & Tantalums) $4.50

MOTOROLA QUAD OP - AMP
MC 3401. PIN FOR PIN SUB. FOR POPULAR LM 3900.
3 FOR $1

ALARM CLOCK CHIP
N.S. MM5375AA. Six Digits. With full Data. **New!**
$1.95 each

FULL WAVE BRIDGE
4 AMP. 200 PIV.
69¢ 10 FOR $5.75

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MOTOROLA 7805R VOLTAGE REGULATOR
Same as standard 7805 except 750 MA output. TO–220. 5VDC output.
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450 NS! 2708 EPROMS
Now full speed! Prime new units from a major U.S. Mfg. 450 N.S. Access time. 1K x 8. Equiv. to 4-1702 A's in one package.
$15.75 ea. 4 FOR $50.00

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A major U.S. computer mfg. installed thousands of these 4K Motorola RAM's on the wrong boards and had to remove them. All parts were then tested, and met **FULL SPECS!** If you don't mind a little solder on the leads, then this is the best memory buy in the world. Arranged as 4096 x 1 Bits. 470 NS.
The Motorola 6605 is one of the easiest dynamic RAM's to use since it DOES NOT require multiplexed addresses as do most other 4K's such as the 4096 or 4027.
A complete memory board design using the 6605 is outlined in the Motorola M6800 Applications Manual starting on page 4-70.

99¢ EACH (WITH DATA SHEET) LOOK!

MCM6605 FOR $6.95 YOU GET AS MUCH STORAGE AS IN 32 - 2102's! **8 FOR $6.95** 4096 BYTES OF RAM!

FULLY GUARANTEED! **SURPLUS BUY OF THE DECADE!!!**

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Small Size: 1¼ x ⅝ Inches.

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7496 — 5 Bit Universal Shift Register **4 FOR $1**
74L93 — New By T.I. Low Power 4 Bit Counter **3 FOR $1**

Mylar Capacitor

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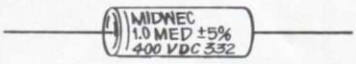
2 FOR $1



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#40536. Rated 3 AMP 400 PIV. TO-5 Case Mounted on Heatsink.

75¢ **3 FOR $2**

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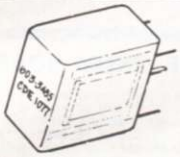
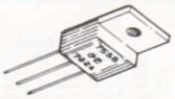
1 OHM 15W. 5%
3/$1.00

3.16 OHM 2W. 5%
5/$1.00

More Tantalum Caps
4.7 MFD 20V — 6/$1.00
22 MFD 20V — 4/$1.00



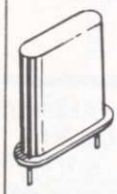
12VDC Relay by CDE.
SPDT. Coil is 280 ohm.
Small Size. **$1.29**

75¢  **GE TRIAC**

GE 10 AMP Triac

SC146D. House no. To-220 case. Rated 10 amps 400PIV.
75¢ ea. **3/$2.00**

EXPERIMENTER'S CRYSTAL



262. 144KHZ. This frequency is 2 to the 18th power. Easily divided down to any power of 2, and even to 1HZ. New by CTS-Knight. A $5 value!

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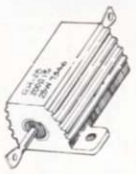
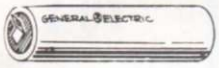
DALE POWER RESISTOR



200 OHM 25 WATTS
1%. #RH-25
2 FOR $1

GE NICAD!



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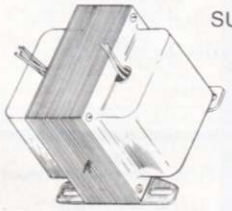

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F8	8 Bit CPU (3850)	16.95 +
Z80	8 Bit CPU (3880) (2MHz)	22.00 +
Z80A	8 Bit CPU (4MHz)	28.00 +
CDP1802CD	8 Bit CPU	19.95 +
2650	8 Bit CPU	24.95 NEW
AM2901	4 Bit CPU	22.95
6502	8 Bit CPU	12.25 +
6800	8 Bit CPU	18.95 +
6802	MPU	25.00 NEW
8008-1	8 Bit CPU	9.95 +
8035	8 Bit CPU w clock 64 byte ram	22.00 NEW
8080A	8 Bit CPU	11.95 +
8085	8 Bit CPU (1 2ns)	27.00 NEW
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8080A SUPPORT DEVICES

8212	8 Bit I O Port	3.50 +
8214	Priority Interrupt Control	9.00 +
8216	Bi-Directional Bus Driver	3.75 +
8224	Clock Generator & Driver (2MHz)	3.50 +
8224-4	Clock Generator & Driver (4MHz)	9.95 +
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8253	Programmable Interval Timer	21.95 +
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3341A	64 x 4 Bit 1.0 MHz	6.50
2812D	32 x 8 Bit 0.5 MHz	16.95 +

F-8 SUPPORT DEVICES

3851	Program Storage Unit	13.95 +
3853	Static Memory Interface	13.95 +

STATIC RAMS

		1-15	16-63	64 up	
21L02	1K x 1 (450ns)	1.50	1.24	1.18 +	
21L02	1K x 1 (350ns)	1.60	1.35	1.25 +	
21L02	1K x 1 (250ns)	1.75	1.60	1.50 +	
4100	4K x 1 (200ns)	10.75	10.00	9.25 +	
1101A	256 x 1 (1 usec)	1.00	.90	.80 +	
2101-1	256 x 4 (450ns)	2.95	2.75	2.60	
2102	1K x 1 (1 usec)	1.25	1.15	1.00	
2102-1	1K x 1 (450ns)	1.40	1.25	1.10 +	
2111-1	256 x 4 (450ns)	3.95	3.50	3.25 +	
2112-1	256 x 4 (450ns)	2.95	2.80	2.59	
2114-3	1024 x 4 (300ns)	11.00	10.00	9.25 +	
2125L	1024 bit (70ns)	11.10	9.00	8.30	NEW
2147	4096 x 1 (70ns)	37.50			NEW
31L01	16 x 4 (110ns)	2.50	2.35	2.00	
3106	256 x (Tri State)	3.95	3.70	3.25	
3107	256 x 1 (80ns)	3.95	3.70	3.25	
TMS 4044/45	4K x 1 (450ns)	9.95	9.00	8.95	NEW
4200A	4K x 1 (250ns)	12.95	11.95	11.00 +	
TMS 4045/45	1024 x 4 (450ns)	11.00	10.00	9.25	
5101	256 x 4 (650ns)	8.30	7.40	7.25 +	
74C89	16 x 4 (275ns)	3.25	3.05	2.85	
7489	16 x 4 (Bns)	2.25	2.10	1.90	
74S201	256 x 1 (50ns)	4.50	4.00	3.75	
P8101	256 x 4 (450ns)	4.25	3.40	2.80	NEW
P8155	256 x 8 22	17.00	14.00		NEW
P8156	256 x 8 22	21.00	18.00		NEW
8599	16 x 4 (50ns)	1.88	1.75	1.60	
91C28PC	1K x 1 (250ns)	1.65	1.45	1.30	

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2513	Upper (12 +5)	6.75
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MC4024	Dual VCO	2.25 +
566	VCO Function	1.50 +

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MM5311	24 Pin BCD Output 6 Digit	6.95
MM5313	28 Pin 6 Digit	6.95
MM5314	24 Pin 6 Digit	6.95
MM5316	40 Pin Alarm Leadout (F3817)	8.95
MM5375	Clock Chip	0.95
CT7001	Clock Chip Calendar	8.00

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1702A	256 x 8 Bit (1 us) TS Erasable	4.00 +
2704	512 x 8 Bit (450ns) TS Erasable	15.00 +
2708	1024 x 8 Bit (450ns) TS Erasable	12.00 +
2716 (5+12)T)	1024 x 16 Bit (450ns) Erasable	30.00 +
2716 (5v)INTL	1024 x 16 Bit (450ns) Erasable	38.00 NEW
2758 (5v)	1024 x 8 Bit (450ns) Erasable	26.80 NEW
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D3804	4K Bit 512 x 8 OC (90ns)	13.00 NEW
5203AQ	256 x 8 Bit (1 us) TS Erasable	5.00 +
5204AQ	512 x 8 Bit (1 us) TS Erasable	6.00
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82S129B	256 x 4 Bit (50ns) TS	4.25
8223B	32 x 8 Bit (50ns) OC	3.50 +

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6810P	128 x 8 Static Ram (450ns)	4.95
68B10P	128 x 8 Static Ram (250ns)	6.00 NEW
6820P	Peripheral Interface Adapter	7.50 +
6821P	Peripheral Interface Adapter	7.50 NEW
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6834P	512 x 8 Bit Erasable Prom 500	16.95
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6860P	0-600 RPS Modem	10.00 +
6862P	2400 RPS Modulator	14.50 +
6871P	Clock	28.00 NEW
6875P	Clock	8.75 NEW
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3881	Parallel I O Controller	12.95
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2518B	32 x 6 Bit 2.0 MHz	3.95
2533V1	1024 x 1 Bit 1.15 MHz	2.00
TMS3002	50 x 2 Bit 1.0 MHz	1.00
TMS3112	32 x 6 Bit 2.0 MHz	3.95
MM5058	1024 x 6 Bit 1.5 MHz	2.00

KIM

6102		8.00 NEW
6502	CPU	11.95 +
6520	Peripheral Interface Adapter	11.95 +
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6530	RAM/ROM I/O Interval Timer	15.95
6530-002	RAM/ROM I/O Interval Timer	15.95
6530-003	RAM/ROM I/O Interval Timer	15.95
6530-004	TIM RAM/ROM I/O Interval Tim	15.95
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4160/4116	16K x 1 Bit (200ns) (16 pin)	32.00 +
1103	1024 x 1 Bit (300ns)	1.00 +
2104	4096 x 1 Bit (300ns) (16 pin)	4.00 +
2107B	4096 x 1 Bit (300ns) (22 pin)	4.25 +
2107B-4	4096 x 1 Bit (270ns) (22 pin)	3.95 +
TMS4050	4096 x 1 Bit (300ns) (18 pin)	4.00 +
TMS4060	4096 x 1 Bit (300ns) (22 pin)	4.50
TMS4070-2	16K x 1 Bit (200ns) (16 pin)	32.00 NEW
4096	4096 x 1 Bit (300ns) (16 pin)	4.00 +
4116/4160	16K x 1 Bit (200ns) (16 pin)	32.00 +
MM5270	4096 x 1 Bit (200ns) 22 pin	4.50 +
MCM6605	4096 x 1 Bit (200ns) (22 pin)	5.00 +

USRT

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AY5-1013A	30K Baud (12 +5)	5.25 +
AY5-1014A	40K Baud (5 volt)	8.25 +
TR1602B	20K Baud (12 +5)	5.25 +
TMS6011	200K Baud (12 +5)	5.95 +
IM6402	200K Baud (5 volt)	10.80
IM6403	200K Baud (5 volt)	10.80

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N8T20	Bi-Directional One Shot	3.30 +
N8T26	MPV 31 Dir. Bds. Ext	2.10 +
N8T95	Hex Buffer Tri-State	1.35
N8T96	Hex Inverter Tri-State	1.35
N8T97	Hex Buffer Tri-State	1.35
N8T98	Hex Inverter Tri-State	1.35
81LS95	Lo Pwr TS Octal Buffer (True)	2.00
81LS97	Lo Pwr TS Octal Buffer (Inv)	2.00
1488	RS232 Quad Line Driver	1.75 +
1489	RS232 Quad Receiver	1.75 +
D3205	1 of 8 Binary Decoder	4.00 NEW
D3207A	Quad NAND to MOS Driver	4.55 +
D3208A	Hex Sense Amplifier	14.20 NEW
D3211		10.00 NEW
83222	Refresh Controller	9.70 NEW
83242	Address Multiplexer & Refrsh Cntr	10.15 NEW
D3245	Quad TTL MOS Driver	5.60 NEW
C3404	6 Bit Latch 12ns O/P Delay	6.75 +
F3408A	Hex MOS Sense Amp Tri-State	12.00 +
P4201A	Clock Generator	5.20 +
MM5320	TV Camera Sync Generator	7.50
MM5369	Oscillator Pre-Scaler	1.90
TMS5501	Multi-function I/O Controller	24.95
DM8130	10 Bit Comparator	2.90
DM8131	4 Input and NAND Tri-State	2.75 +
DM8833	Quad Tri State Transceiver (True)	2.50
DM8835	Quad Tri State Transceiver (Inv)	2.50
DM8837	Hex Unified Bus Receiver	2.50
MK50240	Organ Top Octave Generator	20.00 NEW
MK50250	Clock	15.00 NEW

STATIC RAM BOARDS

8K

250ns	ASSEMBLED & TESTED	$189.95
450ns	ASSEMBLED & TESTED	$149.75
250ns	KIT	$169.95
450ns	KIT	$125.00
	BARE BOARD	25.00

6800 ADAPTER to S-100 System KIT $12.95

16K

250ns	ASSEMBLED & TESTED	$435.00
450ns	ASSEMBLED & TESTED	$380.00
450ns	KIT	$335.00

32K

250ns	ASSEMBLED & TESTED	$850.00
450ns	ASSEMBLED & TESTED	$775.00
450ns	KIT	$675.00

DYNAMIC RAM BOARDS

On board Refresh power is provided with no wait states or cycle stealing required.
+8VDC 400MA DC, +18VDC 400MA DC and −18VDC 30MA DC.

EXPANDABLE 32K

8K (375ns)	KIT	$151.00
16K (375ns)	KIT	$259.00
24K (375ns)	KIT	$367.00
32K (375ns)	KIT	$425.00

EXPANDABLE 64K

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$124.95 KIT

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COMPU/TIME CT 100

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The CT200 is a number oriented microprocessor intended for use in those applications that require fast versatile mathematical solutions.
THIS IS NOT A CALCULATOR CHIP. THERE ARE NO KEY DELAYS.
The CT200 has a unique architecture that is designed to be a TASK processing system within a system. This unique architecture will allow the CT200 to work and run with ANY S100 BUS microprocessor system. It is completely compatible with Z80 4MHZ version, also 8080, 6800, 6502 microprocessor. A micro incoded instruction set allows programming in a calculator like language. The instruction set includes a full set of test and branch instructions. All decoding of S100 bus signals (for select or control functions) is performed with clocked latches to eliminate the possibility of glitches.

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1 MHZ Crystal Oscillator
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Both software programmable
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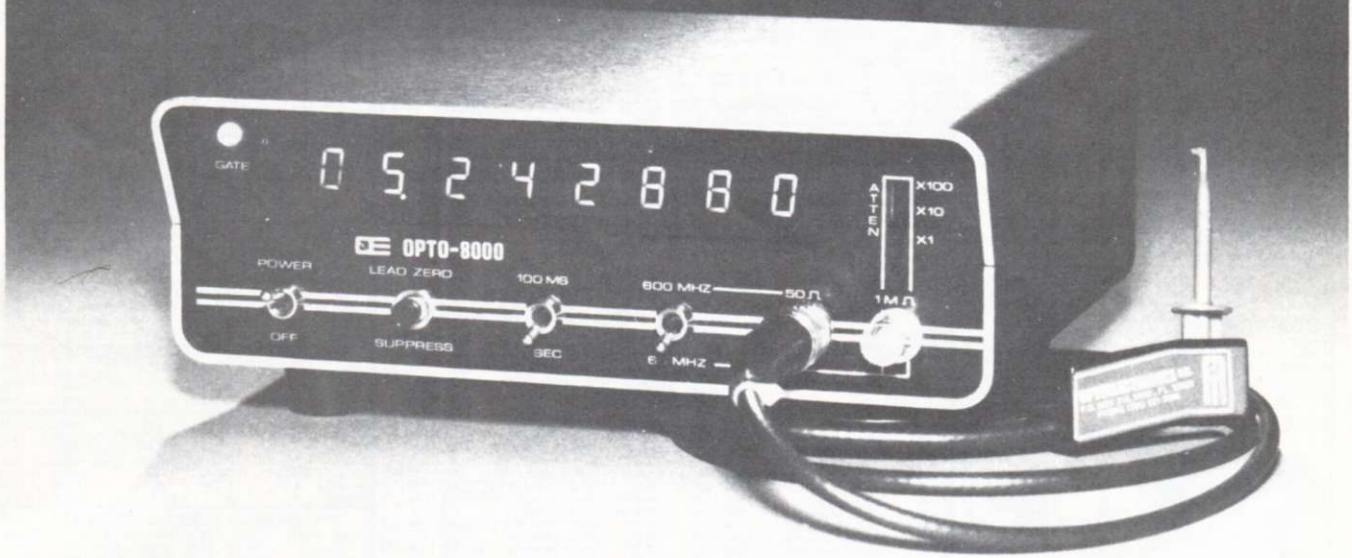

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Frequency Range—10 Hz to 600 MHz
Resolution—1 Hz to 60 MHz; 10 Hz to 600 MHz
Decimal Point—Automatic
All IC's socketed (kits and factory-wired)
Display—8 digit LED
Gate Times—1 second and 1/10 second
Selectable Input Attenuation—X1, X10, X100
Input Connectors Type —BNC
Approximate Size—3"h x 7½"w x 6½"d
Approximate Weight—2½ pounds
Cabinet—black anodized aluminum (.090" thickness)
Input Power—9-15 VDC, 115 VAC 50/60 Hz
or internal batteries

OPTO-8000.1 Factory Wired	**$299.95**
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SN7413N	.40	SN7491N	.59	SN74176N	.79
SN7414N	.70	SN7492N	.43	SN74177N	.79
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SN7432N	.25	SN74123N	.49	SN74193N	.79
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SN7438N	.25	SN74126N	.49	SN74195N	.69
SN7439N	.25	SN74132N	.75	SN74196N	.89
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XC526	Clear	4/$1
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XC556	Red	100/$8
XC556	Green	4/$1
XC556	Yellow	4/$1
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MAN 84	Common Cathode-yellow	.300	.99
MAN 3620	Common Anode-orange	.300	.99
MAN 3630	Common Anode-orange ±1	.300	.99
MAN 3640	Common Cathode-orange	.300	.99
MAN 4610	Common Anode-orange	.300	.99
MAN 4640	Common Cathode-orange	.400	.99
MAN 4710	Common Anode-red ±1	.400	.99
MAN 4730	Common Anode-red	.400	.99
MAN 4740	Common Cathode-red	.400	.99
MAN 4810	Common Anode-yellow	.400	.99
MAN 6610	Common Anode-orange-D.D.	.560	.99
MAN 6630	Common Anode-orange	.560	.99
MAN 6640	Common Cathode-orange-D.D.	.560	.99
MAN 6650	Common Cathode-orange ±1	.560	.99
MAN 6660	Common Anode-orange	.560	.99
MAN 6680	Common Cathode-orange	.560	.99
MAN 6710	Common Anode-red-D.D.	.560	.99
MAN 6730	Common Anode-red ±1	.560	.99
MAN 6740	Common Cathode-red-D.D.	.560	.99
MAN 6750	Common Cathode-red ±1	.560	.99
MAN 6760	Common Anode-red	.560	.99
MAN 6780	Common Cathode-red	.560	.99
DL701	Common Anode-red ±1	.300	.99
DL702	Common Cathode-red	.300	1.25
DL704	Common Cathode-red	.300	.99
DL707	Common Anode-red	.300	.99
DL741	Common Anode-red	.600	1.25
DL746	Common Anode-red ±1	.630	1.49
DL747	Common Anode-red	.600	1.49
DL749	Common Cathode-red ±1	.630	1.49
DL750	Common Cathode-red	.600	1.49
DL338	Common Cathode-red	.110	.35
FND70	Common Cathode	.250	.69
FND359	Common Anode	.350	.75
FND503	Common Cathode (FND500)	.500	.99
FND507	Common Anode (FND510)	.500	.99
5082-7300	4 x 7 Sgl. Digit-RHDP	.600	19.95
5082-7302	4 x 7 Sgl. Digit-LHDP	.600	19.95
5082-7304	Overrange character (±1)	.600	15.00
5082-7340	4 x 7 Sgl. Digit-Hexadecimal	.600	22.50

RCA LINEAR

CA3013	2.15	CA3082	2.00
CA2023	2.56	CA3083	1.60
CA3035	2.48	CA3086	.85
CA3039	1.35	CA3089	3.75
CA3046	1.30	CA3130	1.39
CA3059	3.25	CA3140	1.25
CA3060	3.25	CA3160	1.25
CA3080	.85	CA3401	.49
CA3081	2.00	CA3600	3.50

CALCULATOR CHIPS AND DRIVER

FCM3817	$ 5.00
MM5725	2.95
MM5736	1.95
MM5738	2.95
DM8864	2.00
DM8865	1.00
DM8887	.75
DM8889	.75
5030	7.95

CLOCK CHIPS

MM5309	$ 9.95
MM5311	4.95
MM5312	4.95
MM5314	4.95
MM5316	6.95
MM5318	9.95
MM5369	2.95
MM5841	9.95
7001	5.95

9374 - 7-segment LED driver common anode LEDs $ .99

IC SOLDERTAIL — LOW PROFILE (TIN) SOCKETS

	1-24	25-49	50-100
8 pin LP	$ .17	.16	.15
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	$ .37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL STANDARD (TIN)

	1-24	25-49	50-100
14 pin ST	$ .27	.25	.24
16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	$ .99	.90	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

SOLDERTAIL STANDARD (GOLD)

	1-24	25-49	50-100
8 pin SG	$ .30	.27	.24
14 pin SG	.35	.32	.29
16 pin SG	.38	.35	.32
18 pin SG	.52	.47	.43
24 pin SG	$ .70	.63	.57
28 pin SG	1.10	1.00	.90
36 pin SG	1.75	1.40	1.26
40 pin SG	1.75	1.59	1.45

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-24	25-49	50-100
8 pin WW	$ .40	.38	.35
10 pin WW	.45	.41	.37
14 pin WW	.39	.38	.37
16 pin WW	.43	.42	.41
18 pin WW	.75	.68	.62
22 pin WW	.95	.85	.75
24 pin WW	1.05	.95	.85
28 pin WW	1.40	1.25	1.10
36 pin WW	1.59	1.45	1.30
40 pin WW	1.75	1.55	1.40

50 PCS. RESISTOR ASSORTMENTS $1.75 PER ASST.

ASST. 1	5 ea.	10 OHM / 27 OHM	12 OHM / 33 OHM	15 OHM / 39 OHM	18 OHM / 47 OHM	22 OHM / 56 OHM	1/4 WATT 5% – 50 PCS.
ASST. 2	5 ea.	68 OHM / 180 OHM	82 OHM / 220 OHM	100 OHM / 270 OHM	120 OHM / 330 OHM	150 OHM / 390 OHM	1/4 WATT 5% – 50 PCS.
ASST. 3	5 ea.	470 OHM / 1.2K	560 OHM / 1.5K	680 OHM / 1.8K	820 OHM / 2.2K	1K / 2.7K	1/4 WATT 5% – 50 PCS.
ASST. 4	5 ea.	3.3K / 8.2K	3.9K / 10K	4.7K / 12K	5.6K / 15K	6.8K / 18K	1/4 WATT 5% – 50 PCS.
ASST. 5	5 ea.	22K / 56K	27K / 68K	33K / 82K	39K / 100K	47K / 120K	1/4 WATT 5% – 50 PCS.
ASST. 6	5 ea.	150K / 390K	180K / 470K	220K / 560K	270K / 680K	330K / 820K	1/4 WATT 5% – 50 PCS.
ASST. 7	5 ea.	1M / 2.7M	1.2M / 3.3M	1.5M / 3.9M	1.8M / 4.7M	2.2M / 5.6M	1/4 WATT 5% – 50 PCS.

ASST. 8R Includes Resistor Assortments 1-7 (350 PCS.) **$9.95 ea.**

$5.00 Minimum Order – U.S. Funds Only
California Residents – Add 6% Sales Tax

Spec Sheets – 25¢
1978A Catalog Available–Send 35¢ stamp

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WIRE-WRAP KIT — WK-2-W

WRAP • STRIP • UNWRAP

- Tool for 30 AWG Wire
- Roll of 50 Ft. White or Blue 30 AWG Wire
- 50 pcs. each 1", 2", 3" & 4" lengths — pre-stripped wire.

$12.95

WIRE WRAP TOOL WSU-30
WRAP • STRIP • UNWRAP -$6.95

WIRE WRAP WIRE — 30 AWG

25 ft. min. $1.25 50 ft. $1.95 100 ft. $2.95 1000 ft. $15.00
SPECIFY COLOR — White - Yellow - Red - Green - Blue - Black

WIRE DISPENSER — WD-30

- 50 ft. roll 30 AWG KYNAR wire wrap wire **$3.95 ea.**
- Cuts wire to desired length
- Strips 1" of insulation **Specify** — Blue-Yellow-White-Red

REPLACEMENT DISPENSER SPOOLS FOR WD 30
Specify blue, yellow, white or red **$1.98/spool**

EXAR

XR-L555 — $1.50
Micro-Power version of the popular 555 Timer and directly interchangeable. Dissipates 1/15th the power and operates down to 2.7 volts. Perfect for battery operation and CMOS circuits.

XR2242CP — $1.50
Precision timing circuit for generating timing pulses in **minutes, hours** and days or up to 1 year by using two. Reduces cost of time delay circuits. Basic 555 Timer with built-in 8-bit Counter.

XR2206KA-$14.95 XR2206KB-$19.95

XR205	$ 8.40	XR1489	1.39	XR2556	$ 3.20
XR210	4.40	XR1800	3.20	XR2567	2.99
XR215	4.40	XR2206	4.40	XR3403	1.25
XR320	1.55	XR2207	3.85	XR4136	1.25
XR555	.39	XR2208	5.20	XR4151	2.85
XR556	.99	XR2209	1.75	XR4194	1.45
XR567CP	.99	XR2211	5.25	XR4202	3.60
XR567CT	1.25	XR2212	4.35	XR4212	2.05
XR1310P	1.30	XR2240	3.45	XR4558	.75
XR1468CN	3.85	XR2264	4.25	XR4739	1.15
XR1488	1.39			XR4741	1.4"

ZENERS — DIODES — RECTIFIERS

TYPE	VOLTS	W	PRICE	TYPE	VOLTS	W	PRICE
1N746	3.3	400m	4/1.00	1N4005	600 PIV	1 AMP	10/1.00
1N751A	5.1	400m	4/1.00	1N4006	800 PIV	1 AMP	10/1.00
1N752	5.6	400m	4/1.00	1N4007	1000 PIV	1 AMP	10/1.00
1N753	6.2	400m	4/1.00	1N3600	50	200m	6/1.00
1N754	6.8	400m	4/1.00	1N4148	75	10m	15/1.00
1N959	8.2	400m	4/1.00	1N4154	35	10m	12/1.00
1N965B	15	400m	4/1.00	1N4305	75	25m	20/1.00
1N5232	5.6	500m	.28	1N4734	5.6	1w	.28
1N5234	6.2	500m	.28	1N4735	6.2	1w	.28
1N5235	6.8	500m	.28	1N4736	6.8	1w	.28
1N5236	7.5	500m	.28	1N4738	8.2	1w	.28
1N456	25	40m	6/1.00	1N4742	12	1w	.28
1N458	150	7m	6/1.00	1N4744	15	1w	.28
1N485A	180	10m	5/1.00	1N1183	50 PIV	35 AMP	1.60
1N4001	50 PIV	1 AMP	12/1.00	1N1184	100 PIV	35 AMP	1.70
1N4002	100 PIV	1 AMP	12/1.00	1N1185	150 PIV	35 AMP	1.70
1N4003	200 PIV	1 AMP	12/1.00	1N1186	200 PIV	35 AMP	1.80
1N4004	400 PIV	1 AMP	12/1.00	1N1188	400 PIV	35 AMP	3.00

SCR AND FW BRIDGE RECTIFIERS

C36D	15A @ 400V	SCR(2N1849)	$1.95
C38M	35A @ 600V	SCR	1.95
2N2328	1.6A @ 300V	SCR	.50
MDA 980-1	12A @ 50V	FW BRIDGE REC.	1.95
MDA 980-3	12A @ 200V	FW BRIDGE REC.	1.95

TRANSISTORS

C106B1	.50			2N3904	4/1.00
MPSA05	.30	2N3055	.89	2N3905	4/1.00
MPSA06	5/1.00	MJE3055	1.00	2N3906	4/1.00
TIS97	6/1.00	2N3392	5/1.00	2N4013	3/1.00
TIS98	6/1.00	2N3398	5/1.00	2N4123	6/1.00
TIS133	5/1.00	PN3567	3/1.00	PN4249	4/1.00
TIS135	5/1.00	PN3568	4/1.00	PN4250	4/1.00
40409	1.75	PN3569	4/1.00	2N4400	4/1.00
40410	1.75	MPS3638A	5/1.00	2N4401	4/1.00
40673	1.75	MPS3702	5/1.00	2N4402	4/1.00
2N918	4/1.00	2N3704	5/1.00	2N4403	4/1.00
2N2219A	3/1.00	MPS3704	5/1.00	2N4409	5/1.00
2N2221A	4/1.00	2N3705	5/1.00	2N5086	4/1.00
2N2222A	5/1.00	MPS3705	5/1.00	2N5087	4/1.00
2N2369	5/1.00	2N3706	5/1.00	2N5088	4/1.00
2N2369A	4/1.00	MPS3706	5/1.00	2N5089	4/1.00
MPS2369	5/1.00	2N3707	5/1.00	2N5129	5/1.00
2N2484	4/1.00	2N3711	5/1.00	PN5134	5/1.00
2N2906	4/1.00	2N3724A	.65	PN5138	5/1.00
2N2907	5/1.00	2N3725A	1.00	2N5139	5/1.00
2N2925	5/1.00	2N3772	2.25	2N5210	5/1.00
MJE2955	1.25	2N3823	1.00	2N5449	3/1.00
2N3053	2/1.00	2N3903	4/1.00	2N5951	3/1.00

CAPACITOR CORNER

50 VOLT CERAMIC DISC CAPACITORS

	1-9	10-49	50-100		1-9	10-49	50-100
10 pf	.05	.04	.03	.001μF	.05	.04	.035
22 pf	.05	.04	.03	.0047μF	.05	.04	.035
47 pf	.05	.04	.03	.01μF	.05	.04	.035
100 pf	.05	.04	.03	.022μF	.06	.05	.04
220 pf	.05	.04	.03	.047μF	.06	.05	.04
470 pf	.05	.04	.035	.1μF	.12	.09	.075
100 VOLT MYLAR FILM CAPACITORS							
.001mf	.12	.10	.07	.022mf	.13	.11	.08
.0022	.12	.10	.07	.047mf	.21	.17	.13
.0047mf	.12	.10	.07	.1mf	.27	.23	.17
.01mf	.12	.10	.07	.22mf	.33	.27	.22
+20% DIPPED TANTALUMS (SOLID) CAPACITORS							
.1/35V	.28	.23	.17	1.5/35V	.30	.26	.21
.15/35V	.28	.23	.17	2.2/25V	.31	.27	.22
.22/35V	.28	.23	.17	3.3/25V	.31	.27	.22
.33/35V	.28	.23	.17	4.7/25V	.32	.28	.23
.47/35V	.28	.23	.17	6.8/25V	.36	.31	.25
.68/35V	.28	.23	.17	10/25V	.40	.35	.29
1.0/35V	.28	.23	.17	15/25V	.63	.50	.40
MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS							
Axial Lead				**Radial Lead**			
.47/50V	.15	.13	.10	.47/25V	.15	.13	.10
1.0/50V	.16	.14	.11	.47/50V	.16	.14	.11
3.3/50V	.14	.12	.09	1.0/16V	.15	.13	.10
4.7/25V	.15	.13	.10	1.0/25V	.16	.14	.11
10/25V	.15	.13	.10	1.0/50V	.16	.14	.11
10/50V	.16	.14	.12	4.7/16V	.15	.13	.10
22/25V	.17	.15	.12	4.7/25V	.15	.13	.10
22/50V	.24	.20	.18	4.7/50V	.16	.14	.11
47/25V	.19	.17	.15	10/16V	.14	.12	.09
47/50V	.25	.21	.19	10/25V	.15	.13	.10
100/25V	.24	.20	.18	10/50V	.16	.14	.12
100/50V	.35	.30	.28	47/50V	.24	.21	.19
220/25V	.32	.28	.25	100/16V	.19	.15	.14
220/50V	.45	.41	.38	100/25V	.24	.20	.18
470/25V	.33	.29	.27	100/50V	.35	.30	.28
1000/16V	.55	.50	.45	220/16V	.23	.17	.16
2200/16V	.70	.62	.55	470/25V	.31	.28	.26

SOCKET JUMPERS

Mates with two rows of .025" sq. or dia. posts on patterns of .100" centers and shielded receptacles. Probe access holes in back. Choice of 6" or 18" length.

Part No.	No. of Contacts	Length	Price
924003-18R	26	18"	$ 5.38 ea.
924003-06R	26	6"	4.78 ea.
924005-18R	40	18"	8.27 ea.
924005-06R	40	6"	7.33 ea.
924006-18R	50	18"	10.31 ea.
924006-06R	50	6"	9.15 ea.

JUMPER HEADERS

Solder to PC boards for instant plug-in access via socket-connector jumpers. .025" sq. posts. Choice of straight or right angle.

Part No.	No. of Posts	Angle	Price
923863-R	26	straight	$1.28 ea.
923873-R	26	right angle	1.52 ea.
923865-R	40	straight	1.94 ea.
923875-R	40	right angle	2.30 ea.
923866-R	50	straight	2.36 ea.
923876-R	50	right angle	2.82 ea.

INTRA-CONNECTOR

Provides both straight and right angle functions. Mates with standard .10" x .10" dual row connectors (i.e. 3m, Ainsley, etc.) Permits quick testing of inaccessible lines.

Part No.: 922576-26 **No. of contacts:** 26 **Price** $6.90 ea.

INTRA-SWITCH

Permits instant line-by-line switching for diagnostic or QA testing. Switches actuated with pencil or probe tip. Mates with standard .10" x .10" dual-row connectors. Low profile design. Switch buttons recessed to eliminate accidental switching.

Part No.: IS-26 **No. of contacts:** 26 **Price** $13.80 ea.

CRYSTALS

THESE FREQUENCIES ONLY

PART NO.	FREQUENCY	CASE	PRICE
CY1A	1.000MHz	HC33	5.95
CY1.84	1.8432MHz	HC33	5.95
CY2A	2.000MHz	HC33	5.95
CY2.01	2.010MHz	HC33	1.95
CY2.50	2.500MHz	HC33	4.95
CY3.27	3.2768MHz	HC33	4.95
CY3.57	3.579545MHz	HC33	4.95
CY3A	4.000MHz	HC18	4.95
CY4.91	4.916MHz	HC18	4.95
CY7A	5.000MHz	HC18	4.95
CY5.18	5.185MHz	HC18	4.95
CY6.14	6.144MHz	HC18	4.95
CY6.40	6.400MHz	HC18	4.95
CY6.55	6.5536MHz	HC18	4.95
CY12A	10.000MHz	HC18	4.95
CY14A	14.31818MHz	HC18	4.95
CY19A	18.000MHz	HC18	4.95
CY18.43	18.432MHz	HC18	4.95
CY22A	20.000MHz	HC18	4.95
CY30A	32.000MHz	HC18	4.95

SWITCHES

¼" mounting holes

					1-9	10+
TOGGLE (sub-minature)	JMT121	SPDT	on-off-on		$1.95	$1.43
	JMT123	SPDT	on-none-on		1.65	1.21
	JMT221	DPDT	on-off-on		2.55	1.87
	JMT223	DPDT	on-none-on		2.15	1.58
TOGGLE (Printed Circuit)	MPC121	SPDT	on-off-on		$2.05	$1.53
	MPC123	SPDT	on-none-on		1.75	1.31
	MPC221	DPDT	on-off-on		2.65	1.97
	MPC223	DPDT	on-none-on		2.25	1.68
PUSH BUTTON	PB123	SPDT	maintained		1.95	1.47
	PB126	SPDT	momentary		1.95	1.47
PUSH BUTTON Minature	MS102	DPST	momentary open		.35	.30
	MS103	SPST	momentary closed		.35	.30
DIPSWITCH SPST	206-4	8 pin dip	4 switch		1.75	1.65
	206-7	14 pin dip	7 switch		1.95	1.85
	206-8	16 pin dip	8 switch		2.25	2.15

1/16 VECTOR BOARD

	0.1" Hole Spacing Part No.	P-Pattern L	W	Price 1-9	10 up
PHENOLIC	64P44 062XXXP	4.50	6.50	1.72	1.54
	169P44 062XXXP	4.50	17.00	3.69	3.32
EPOXY GLASS	64P44 062WE	4.50	6.50	2.07	1.86
	84P44 062WE	4.50	8.50	2.56	2.31
	169P44 062WE	4.50	17.00	5.04	4.53
	169P84 062WE	8.50	17.00	9.23	8.28
EPOXY GLASS COPPER CLAD	169P44 062WEC1	4.50	17.00	6.80	6.12

ELECTRO WRAP

Model P180 includes 2-100' spools #28 AWG wire wrap wire

Supplies insulated wire from spool to wrap-posts without prestripping and precutting using "daisy chain" method.

Model P180 **$24.50**

REPLACEMENT WRAP BIT for P180 Slit N Wrap
No. P180A $12.95 each

Replacement wire-wrap wire for P180 #28 AWG (pkg. of 3) $2.75 each
W28-2-A green W28-2-B red
W28-2-C clear W28-2-D blue

INSTRUMENT/ CLOCK CASE

Injection molded unit. Complete with red bezel. 4½" x 4" x 1-9/16".

$3.49

MICROPROCESSOR COMPONENTS

CDP 1802	CPU	$19.95	Z80	CPU	$24.95
P8085	CPU	29.95	2650	MPU	26.50
8080A	CPU	10.95	MC6800	MPU	19.95
8212	8-Bit Input/Output	4.95	MC6810API	128 X 8 Static Ram	5.95
8214	Priority Interrupt Control	7.95	MC6820	Periph. Interface Adapter	7.95
8216	Bi-Directional Bus Driver	4.95	MC6821	Periph. Interface Adapter	11.50
8224	Clock Generator/Driver	5.95	MC6830L8	1024 X 8 Bit ROM	14.95
8228	System Controller/Bus Driver	5.95	MC6850	Asychronous Comm. Adapter	14.95

USER MANUALS

1802M	CDP1802 Manual	$ 7.50
Z80M	Z80 Manual	7.50
2650M	2650 Manual	5.00

SHIFT REGISTERS

MM500H	Dual 25 Bit Dynamic	.50
MM503H	Dual 50 Bit Dynamic	.50
MM504H	Dual 16 Bit Static	.50
MM506H	Dual 100 Bit Static	.50
MM507H	Dual 100 Bit Static	.50
MM510H	Dual 64 Bit Accumulator	.50
MM5013N	1024 Bit Accumulator Dynamic	2.95
MM5016H	500/512 Bit Dynamic	.89
MM5017N	Dual 500/512 Bit Dynamic	2.95
2504T	1024 Dynamic	3.95
2518	Hex 32 Bit Static	4.95
2519	Hex 40 Bit Static	4.00
2522	Dual 132 Bit Static	2.95
2524	512 Dynamic	.99
2525	1024 Dynamic	2.95
2527	Dual 256 Bit Static	2.95
2528	Dual 250 Static	4.00
2529	Dual 240 Bit Static	4.00
2532	Quad 80 Bit Static	2.95
2533	1024 Static	2.95
3341	Fifo	6.95
74LS670	4 X 4 Register	1.95

ROM'S

2513(2140)	Character Generator (upper case)	$ 9.95
2513(3021)	Character Generator (lower case)	9.95
2516	Character Generator	10.95
MM5230N	2048 Bit Read Only Memory	1.95

UART'S

AY-5-1013	30K BAUD	$ 5.95

RAM'S

1101	256 X 1	Static	$ 1.49
1103	1024 X 1	Dynamic	99
2101	256 X 4	Static	5.95
2102	1024 X 1	Static	1.75
2107/5280	4096 X 1	Dynamic	4.95
2111	256 X 4	Static	6.95
2114	4K X 1	Static 450ns	9.95
2114L	4K X 1	Static 450ns Low Power	10.95
2114-3	4K X 1	Static 300ns	10.95
2114L-3	4K X 1	Static 300ns Low Power	11.95
7489	16 X 4	Static	5.95
8101	256 X 4	Static	5.95
8111	256 X 4	Static	6.95
8599	16 X 4	Static	3.49
21L02	1024 X 1	Static	1.95
74200	256 X 1	Static	6.95
93421	256 X 1	Static	2.95
MM5262	2K X 1	Dynamic	.49
MK4027 (UPD414)	4K	DYNAMIC 16 PIN	5.95
MK4116 (UPD416)	16K	DYNAMIC 16 PIN	29.95
TMS4044-45NL	4K	STATIC	14.95

PROMS

1702A	2048	Famous	$ 5.95
5203	2048	Famous	14.95
82S23	32 X 8	Open C	5.00
82S115	4096	Bipolar	19.95
82S123	32 X 8	Tristate	5.00
74S287	1024	Static	7.95
2708	8K	EPROM	10.95
2716 T.I.	16K	EPROM	29.95
2716 Intel	16K	EPROM	59.95
6301-1	1024	Tri-State Bipolar	3.49
6330-1	256	Open C Bipolar	2.95
74186	512	TTL Open Collector	9.95
74188	256	TTL Open Collector	3.95

SPECIAL REQUESTED ITEMS

TELEPHONE KEYBOARD CHIPS

AY-5-9100	$14.95
AY-5-9200	14.95
AY-5-9500	4.95
AY-5-2376	14.95
HD0165	7.95
74C922	9.95

ICM CHIPS

ICM7045	$24.95
ICM7205	19.95
ICM7207	7.50
ICM7208	19.95
ICM7209	6.95

NMOS READ ONLY MEMORIES

MCM6571	$13.50
MCM6574	13.50
MCM6575	13.50

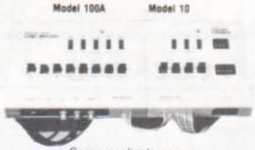
TV GAME CHIP SET
AY-3-8500-1 Chip and 2.010 MHz Crystal **$7.95**

MISCELLANEOUS

11C90	$19.95	MK40240	$17.50
MC3061P	11.95	DS0026CH	3.75
MC1408L7	4.95	TIL308	10.20
MC1408L8	5.75	95H90	11.95
LD110/111	$25.00/set		
MC4016(74416)	7.50		
4N33	3.95		

PARATRONICS Logic Analyzer Kit Model 100A

$229.00/kit



- Analyzes any type of digital system
- Checks data rates in excess of 8 million words per second
- Trouble shoot TTL, CMOS, DTL, RTL, Schottky and MOS families
- Displays 16 logic states up to 8 digits wide
- See ones and zeros displayed on your CRT, octal or hexadecimal format
- Tests circuits under actual operating conditions
- Easy to assemble — comes with step-by-step construction manual which includes 80 pages on logic analyzer operation.

(Model 100A Manual - $4.95)

- Some applications are:
  - — Troubleshooting microprocessor address, instruction, and data flow
  - — Examine contents of ROMS
  - — Tracing operation of control logic
  - — Checking counter and shift register operation
  - — Monitoring I/O sequences
  - — Verifying proper system operations during testing

PARATRONICS TRIGGER EXPANDER - Model 10 **Model 10 Kit - $229.00**

Adds 16 additional bits. Provides digital delay and qualification of input clock and 24-bit trigger word. — Connects direct to Model 100A for integrated unit).

Baseplate — $9.95
Model 10 Manual — $4.95

B&K PRECISION 3½-Digit Portable DMM

- Overload Protected
- .3" high LED Display
- Battery or AC operation
- Auto Zeroing
- 1mv, 1Va, 0.1 ohm resolution
- Overrange reading
- 10 meg input impendence
- DC Accuracy 1% typical

Ranges: DC Voltage - 0-1000V; AC Voltage: 0-1000V Freq. Response: 50-400 HZ DC/AC Current: 0-100mA Resistance: 0-10 meg ohm Size: 6.4" x 4.4" x 2"

Model 2800 $99.95

Comes with test leads, operating manual and spare fuse.

Accessories:
AC Adapter BC-28 $9.00
Rechargeable Batteries BP-26 20.00
Carrying Case LC-28 7.50

CSC 100 MHz 8-Digit Counter

- 20 Hz-100 MHz Range
- .6" LED Display
- Crystal-controlled timebase
- Fully Automatic
- Portable — completely self-contained
- Size — 1.75" x 7.38" x 5.63"
- Four power souces, i.e. batteries, 110 or 220V with charger 12V with auto lighter adapter and external 7.2-10V power supply

MAX-100 $134.95

ACCESSORIES FOR MAX 100:
Mobile Charger Eliminator use power from car battery — Model 100 — CLA $3.95
Charger/Eliminator use 110 V AC — Model 100 — CAI $9.95

63-Key Unencoded KEYBOARDS Hexadecimal Encoder

This is a 63-key, terminal keyboard newly manufactured by a large computer manufacturer. It is unencoded with SPST keys, unattached to any kind of PC board. A very solid molded plastic 13 x 4" base suits most application. IN STOCK **$29.95/each**

19-key pad includes 1-10 keys, ABCDEF and 2 optional keys and a shift key. **$10.95/each**

$5.00 Minimum Order — U.S. Funds Only
California Residents — Add 6% Sales Tax

Spec Sheets — 25¢
1978A Catalog Available—Send 35¢ stamp

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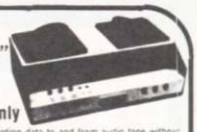
J1

The Incredible "Pennywhistle 103"



$129.95 Kit Only

The Pennywhistle 103 is capable of recording data to and from audio tape without critical speed requirements for the recorder and it is able to communicate directly with another modem and terminal for telephone "hamming" and communications for the deaf. In addition, it is free of critical adjustments and is built with non-precision, readily available parts.

Data Transmission Method	Frequency-Shift Keying, full-duplex (half-duplex selectable)
Maximum Data Rate	300 Baud.
Data Format	Asynchronous Serial (return to mark level required between each character).
Receive Channel Frequencies	2025 Hz for space; 2225 Hz for mark.
Transmit Channel Frequencies	Switch selectable: Low (normal) = 1070 space, 1270 mark; High = 025 space, 2225 mark.
Receive Sensitivity	-46 dbm accoustically coupled.
Transmit Level	-15 dbm nominal. Adjustable from -6 dbm to -20 dbm.
Receive Frequency Tolerance	Frequency reference automatically adjusts to allow for operation between 1800 Hz and 2400 Hz.
Digital Data Interface	EIA RS-232C or 20 mA current loop (receiver is optoisolated and non-polar).
Power Requirements	120 VAC, single phase, 10 Watts.
Physical	All components mount on a single 5" by 9" printed circuit board. All components included.

Requires a VOM, Audio Oscillator, Frequency Counter and/or Oscilloscope to align.

The Original the 3rd Hand

$9.95 each

- *Leaves two hands free for working
- * Clamps on edge of bench, table or work bench
- * Position board on angle or flat position for soldering or clipping
- * Sturdy, aluminum construction for hobbyist, manufacturer or school rooms

DIGITAL STOPWATCH

- Bright 6 Digit LED Display
- Times to 59 minutes 59.59 seconds
- Crystal Controlled Time Base
- Three Stopwatches in One: Times Single Event — Split & Taylor
- Size 4.5" x 2.15" x .90" (4½ ounces)
- Uses 3 Penlite Cells.

Kit — $39.95
Assembled — $49.95
Heavy Duty Carry Case $5.95

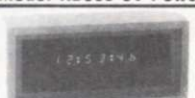
Stop Watch Chip Only (7205) $19.95

IMC 3½ DIGIT DPM KIT

- New Bipolar Unit
- Auto Zeroing
- .5" LED
- Auto Polarity
- Low Power
- Single IC Unit

Model KB500 DPM Kit $49.00
Model KB503 5V Power Kit $17.50

JE700 CLOCK



The JE700 is a low cost digital clock, but is a very high quality unit. The unit features a simulated walnut case with dimensions of 6" x 2½" x 1". It utilizes a MAN72 high brightness readout and the MM5314 clock chip.

12 or 24 Hour

115 VAC KIT ONLY **$16.95**

JE803 PROBE

The Logic Probe is a unit which is for the most part independable in trouble shooting logic families TTL, DTL, RTL, CMOS. It derives the power it needs to operate directly off of the circuit under test drawing a scant 10 mA max. It uses a MAN3 readout to indicate any of the following states by these symbols (H) - 1 (LOW) - 0 (PULSE) - P. The Probe can detect high frequency pulses to 45 MHz. It can't be used at MOS levels or circuit damage will result.

$9.95 Per Kit
printed circuit board

T²L 5V 1A Supply

This is a standard TTL power supply using the well known LM309K regulator IC to provide a solid 1 AMP of current at 5 volts. We try to make things easy for you by providing everything you need in one package, including the hardware for only

JE225 $9.95 Per Kit

CSC PROTO BOARDS

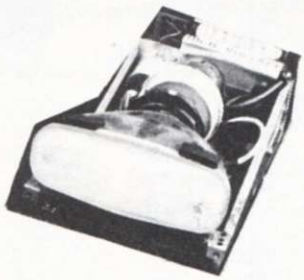
PROTO BOARD 6
$15.95
(6" long X 4" wide)

PB100 - 4.5" x 6"	$ 19.95
PB101 - 5.8" x 4.5"	29.95
PB102 - 7" x 4.5"	39.95
PB103 - 9" x 6"	59.95
PB104 - 9.5" x 8"	79.95
PB203 - 9.75 x 6½ x 2¾	80.00
PB203A - 9.75 x 6½ x 2¾ (includes power supply)	129.95

PROTO CLIPS

14 PIN	$4.50
16 PIN	4.75
24 PIN	8.50
40 PIN	13.75

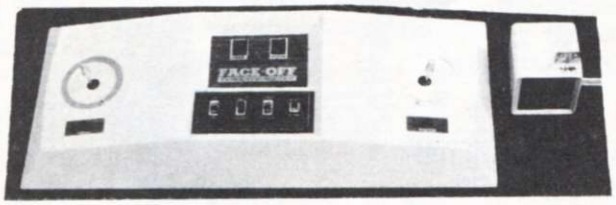
TYPESETTING MONITOR



We have acquired an unusual video monitor. It was originally designed for and used in the photo typesetting industry. As the typesetter composed his copy, the copy would appear on the screen. The tube is a flat type about 6½" x 2¼", since only one line of copy was scanned at a time. Most of the tubes have slight burn marks, but are still usable. We have all the circuitry, and will supply the circuitry with each order. We believe most of these units are in working order, since they were taken out of service when the equipment was upgraded. Looks like a good start to make into your own video monitor at giveaway prices. We have them with and without the CR tubes. Sold as is only.

STOCK No. 5603K Typesetter monitor with tube & circuit diagrams . . . . . $22.50 ea. 2/$40.00
STOCK No. 5604K Typesetter monitor without tube, with circuit diagrams . $15.00 ea. 2$25.00

TV HOCKEY and SOCCER GAME plus VIDEOCUBE

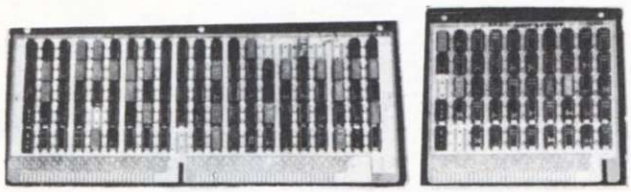


For some time we have been selling our VIDEOCUBE, the TV interface between computers, cameras, etc., and your TV set. We sold them in kit form, and to date we have sold over 3,000. We sold the complete VIDEOCUBE, when available, for $16.95.

We now have a limited number of Hockey-Soccer Video games, complete with VIDEOCUBE interface, at a new low price of $18.95; previously sold for $27.50 in kit form. This gives you two games, at two levels of skill, with LED readouts for scorekeeping. This game sold in Boston department stores for $79.50.

STOCK No. 5495K Complete VIDEO GAME & VIDEOCUBE $18.95 ea. 2/$35.00

WIRE WRAP BOARDS LOADED WITH 7400 SERIES ICs



Since last summer, we have been selling 2 wire wrap boards, Our Stock No. 6558K with approximately 100 sockets, and our Stock No. 6559K with approximately 45 sockets. These have been successful, based on your orders and reorders. We now have the same boards, but with the sockets still containing the original SN7400 series ICs that were used in the computer that these boards were designed for. We checked the value of these ICs, against the lowest price ICs in several Electronics magazine, and found that at the lowest possible surplus prices, the values of the ICs on the 100 socket board ran to over $40.00. A sample of some of the chips on the board we looked at are as f ollows: 74H87, 7486, 74107, 7451, 7400, 7404, 7495, 7493, 7492, 74193, 7489 and many others, to numerous to mention. Also on some boards, are a few linears, and phase locked loops. Not everyone needs every chip, but if you are working at all with TTL, this is a great opportunity to get an inventory of the most useful chips at a ridiculous price. We are selling the 100 socket board with about 100 chips, for $10.00 more than the board itself, and the 45 socket chip for $5.00 more than the board itself. We will also include with each board, 2 edge connectors with the 100 socket board, and 1 edge connector with the 45 socket board.

STOCK NO.6558K	75 to 100 socket board	$18.75 ea. 2/35.00
STOCK NO.6559K	45 to 50 socket board	$11.75 2/22.00
STOCK NO.6749K	75 to 100 socket wire wrap board with ICs and edge connectors	$28.75 ea. 2/55.00
STOCK NO.6750K	45 to 50 socket wire wrap board with ICs and edge connector	$16.75 ea. 2/32.00
STOCK NO.6603K	Edge connector for either board	$ 2.00 ea 3/5.00

MORE NEW TRANSFORMERS

TRANSFORMER 1. Primary 115 V, Secondary 1, 30V @ 2 A.Secondary 2, 16.5 V @ 1.2 A. Secondary 3, 16 V @ 3.5 A. Secondary 4, 9.5 V @ 3.5 A.

STOCK NO.6677R Wt. 10 lbs. $10.95 ea. 2/20.00

TRANSFORMER 2. Primary, 115 V. Secondary 1, 12 V. @ 5 A., Secondary 2, 24 V. @ 9 A., Seconday 3 14 V. @ 20 A. Secondary 4, 125 V. @ 1.5 A.

STOCK NO.6675K 16 lbs. 18.95 2/36.00

TRANSFORMER 3. Primary 115 V. Secondary 1, 12.6 V ct @ 1 A.Secondary 2, 33 V tapped at 13.1 V @ 1 Amp. Secondary 3, 140 V. @ 100 ma.

STOCK NO.6772K 2 lbs. 4 1/16"x 2 1/16"x 2 5/8". 2.95 ea. 2/5.00

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NYLON CONNECTORS

Complete Connectors Per Pkg.	Type No.	Class	Description	Mfg by Molex Price Ea. Pkg.
5	1625-1PRT	Min.(.062")	1 Circuit	$1.75
3	1625-2PRT	"	2 Circuit	1.90
3	1625-3PRT	"	3 Circuit	2.10
2	1625-4PRT	"	4 Circuit	2.10
2	1625-5PRT	"	5 Circuit	2.20
2	1625-6PRT	"	6 Circuit	2.35
1	1649-8PRT	"	8 Circuit	1.55
1	1625-9PRT	"	9 Circuit	1.75
1	1625-12PRT	"	12 Circuit	1.90
1	1625-15PRT	"	15 Circuit	2.30
1	1625-24PRT	"	24 Circuit	3.25
1	1772-36PRT	"	36 Circuit	4.55
5	1619PRT	Std.(.093")	1 Circuit	1.75
3	1545PRT	"	2 Circuit	1.90
3	1396PRT	"	3 Circuit	2.10
2	1490PRT	"	4 Circuit	2.10
2	1653PRT	"	5 Circuit	2.20
2	1261PRT	"	6 Circuit	2.35
1	1292PRT	"	9 Circuit	1.80
1	1360PRT	"	12 Circuit	1.90
1	1375PRT	"	15 Circuit	2.45

Prototype hand tools combine efficiency with economy. Ideal for prototype or limited production runs.
HT-1919 for .093" pin dia. terminals ..... $8.95 each
HT-1921 for .062" pin dia. terminals ..... $8.95 each

Econo-Extractor removes terminal from nylon connector housing with smoothness and ease.
HT-2054 for extracting .093" pin dia. terminals ..... $2.25 each
HT-2023 for extracting .062" pin dia. terminals ..... $2.25 each

Deluxe ejector tools. spring-loaded for simple, efficient removal of terminal from nylon connector housing-extracts either male or female terminals of same pin diameter.
HT-2038 for extracting .093" pin dia. terminals ..... $6.70 each
HT-1010-282 Replacement tip for HT-2038 ..... $2.50 each
HT-2285 for extracting .062" pin dia. terminals ..... $6.70 each
HT-1672-3 replacement tip for HT-2285 ..... $2.50 each

INTEGRATED CIRCUITS

555 Timer 8 pin mini-DIP	.49
741 Compensated OP-Amp 8 pin DIP	.37
LM 1889N RF Video Modulator	7.45
CA3130 Bipolar/Mos-FET Op Amp	1.19
CA3140 MOS-FET Op Amp, Bi-polar out	.99
LM3909 Lo Voltage Led Pulser	1.50
LM3911 Temp Control CHIP	1.50
Signetics 2504TA 1024 bit S.R. memory (1404A)	$1.75
MCM 6571P Character Generator	9.95
MCM6571AP Character Generator	9.95
MCM6575P Character generator	$9.95
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LM2907N Tachometer F/V Converter	2.65
LM1812N Ultra-sonic Transceiver	9.15
LM1815 Adaptive Sense Amp for Tachometer	5.73
S2518B Hex 32 bit Shift Register	$2.95
TL170 TO-92 Hall effect switch w/spec sheets	1.25
MC14409P Telephone Rotary Pulser	10.98
MC14419P Touch Pad Converter for 14409	4.25
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74C915 7 Segment to BCD Converter	2.99
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74C926 4 Decade Counter w/carry	12.00
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9601 Retriggerable One shot	.50
MC4015P Hi Speed quad "D" low power TTL	$1.00

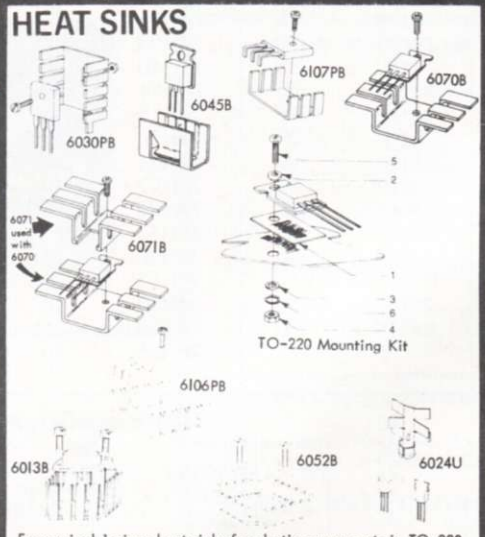
DATA AQUISITIONS SUBSYSTEM

ADC0817 is a 40 pin CMOS I.C. with an 8-bit analog-to-digital converter, a 16 channel multiplexer and micro processor compatible control logic. Converter features high impedance chopper stabilized comparator, voltage divider with analog switch tree and a sucessive approximation register. Latched Tri-State outputs for easy u-processon interface. Require only 15 mW of power from single 5V supply. Fast, 100uS conversion time.
ADC0817.....(40 pin DIP).....$29.88
Spec sheets.....$1.00

Annie Sez,

If you've been studying to find a better source for your electronic parts, enroll in TRI-TEK. We're a degree better!

HEAT SINKS



Economical 1 piece heat sinks for plastic power parts in TO-220 and Motorola cases 77, 90, 199, and TO-126. All are black anodized aluminum. "B" series is anodized after forming. "PB" series is anodized prior to forming.

THM	6030PB	Vertical	25¢, 5/$1.00, 10/$1.90
THM	6045B	Slip Over	30¢, 4/$1.00, 10/$2.00
THM	6070B	Extra Disipation Horiz.	35¢, 3/$1.00, 10/$3.00
THM	6071B	Top Hat for 6070	35¢, 3/$1.00, 10/$3.00
THM	6106PB	Flat With Fingers	30¢, 4/$1.00, 10/$2.00
THM	6107PB	Smaller Size Flat	25¢, 5/$1.00, 10/$1.90
THM	6013B	TO-3 Diamond	69¢, 4/$2.50, 10/$5.00
THM	6024-U	Unfinished TO-92	10/$1.00, 100/$5.00
THM-6052B		TO-3 Square	60¢, 5/$2.50, 10/$4.25

TO-220 6 Piece Mounting Kit - Handy Package...25¢

P. C. BOARD TERMINAL STRIP

Molded body encloses postive screw activated clamp which will accomodate wire sizes 14-30 AWG. Contacts and pins are solder plated copper. Pins are on .200 inch (5.08mM) for standard P. C. mounting. 10Amp rating. Compare our prices before you buy.

4 pole	TS-2504	.99	
8 pole	TS-2508	1.49	
12 pole	TS-2512	2.19	

S-100 BUS CONNECTORS (IMSAI TYPE)

Gold, Solder tail for Mother boards $4.50, 4/$17.00
Tin-Nickel, (NASGLO) Solder tail $3.75, 4/$14.00
Gold, wire-wrap..... $4.50, 4/$17.00
Tin-Nickel, (NASGLO) wire-wrap $3.75, 4/$14.00

HEX DARLINGTON ARRAY

MC1413P is a 16 pin DIP package with (6) 50V 500mA Darlington pairs.
MC1413P.....$1.59
Specs/Apps.....30¢

I.C. SOCKETS

Lo Profile Tin Solder Tail Dip Sockets

8 pin	10/$1.50	100/$14.00	1000/$120.00
14 pin	10/$1.70	100/$16.00	1000/$140.00
16 pin	10/$1.90	100/$18.00	1000/$160.00

VOLTAGE REGULATORS

7805-06-08-12-15-24 TO220	95¢ 5/$4.50
7905-06-08-12-15-24 TO 220	95¢ 5/$4.50
78L05A-12-15 4% 100 mA TO-92 Plastic	50¢
78H05KC 5V 5A TO-3	9.15
78H12KC 12V 5A TO-3	9.15
78H15KC 15V 5A TO-3	9.15
Lm317K 1.5A *Adjustable* TO-3	4.99
Lm317T 1.5A *Adjustable* TO-220	3.99
Lm317MP .5A *Adjustable* TO-202	13.95
TL430C Adjustable Zener-*Think About It*	1.50
TL497C Switching Reg. & Inductor	9.50
RCA CA 3085 100 mA *Adjustable*	.60

ADJUSTABLE NEGATIVE REGULATOR

LM337 is the compliment to the popular LM317 positive adjustable regulator. Capable of 1.5Amp from - 1.2V to - 37V.
LM337K.....(TO-3 Metal)..... $5.99
LM337T.....(TO-220 Plastic)..... $4.65
Specs and applications.....60¢

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IN4004 400 V 1 amp	10/$1.00
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D-600 115 V, 100 mA Hi Speed Signal	20/$1.00
D2131 200 V, 25A Stud	85¢
D2135 400 V, 25A Stud	1.00
D2138 600 V, 25A Stud	1.55
D3289R 200 V, 160A Stud Anode	5.85
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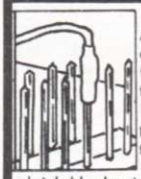
D1A-0030 30V DIAC	10/$1.00

100V 2.5 WATT ZENER
IN5051A Epoxy Zener with heavy silver leads.....25¢

MISCELLANEOUS

RG-174 Miniature 50Ω coax	50'/4.25
WSU-30 Wire Wrap/unwrap tool	5.95
WSU-30M Modified Wrap/unwrap tool	6.95
BW-630 Battery Operated Wrap Tool	34.95
—Free Wire with any Wrap Tool —	
Miniature Square .05/100V Monolithic Cap	10/2.00
FND5002 .125" C.C. 7 Seg. Read-out	.49¢, 10/$3.95
2N4036 90V, 1A PNP Silicon TO-5	.50
2N6101 80V, 10A NON HI GAIN TO-220	.50
6.3 VCT, 1.2A Transformer F41X	2.49
12V, 1A Transformer with 6' Power Cord	2.88



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1N914	100v	10mA	.05
1N4005	600v	1A	.08
1N4007	1000v	1A	.15
1N4148	75v	10mA	.05
1N753A	6.2v	z	.25
1N758A	10v	z	.25
1N759A	12v	z	.25
1N4733	5.1v	z	.25
1N5243	13v	z	.25
1N5244B	14v	z	.25
1N5245B	15v	z	.25

SOCKETS/BRIDGES

8-pin	pcb	.25	ww	.45
14-pin	pcb	.25	ww	.40
16-pin	pcb	.25	ww	.40
18-pin	pcb	.25	ww	.75
22-pin	pcb	.45	ww	1.25
24-pin	pcb	.35	ww	1.10
28-pin	pcb	.35	ww	1.45
40-pin	pcb	.50	ww	1.25
Molex pins .01		To-3 Sockets		.45
2 Amp Bridge		100-prv		1.20
25 Amp Bridge		200-prv		1.95

TRANSISTORS, LEDS, etc.

2N2222A	NPN (2N2222 Plastic .10)	.15
2N2907A	PNP	.15
2N3906	PNP (Plastic)	.10
2N3904	NPN (Plastic)	.10
2N3054	NPN	.35
2N3055	NPN 15A 60v	.50
T1P125	PNP Darlington	.35
LED Green, Red, Clear, Yellow		.15
D.L.747	7 seg 5/8" High com-anode	1.95
XAN72	7 seg com-anode (Red)	1.25
MAN71	7 seg com-anode (Red)	1.25
MAN3610	7 seg com-anode (Orange)	1.25
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MAN74A	7 seg com-cathode (Red)	1.50
FND359	7 seg com-cathode (Red)	1.25

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4012	.20
4013	.40
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4015	.90
4016	.35
4017	1.10
4018	1.10
4019	.50
4020	.85
4021	1.00
4022	.85
4023	.25
4024	.75
4025	.30
4026	1.95
4027	.50
4028	.95
4030	.35
4033	1.50
4034	2.45
4035	1.25
4040	1.35
4041	.69
4042	.95
4043	.95
4044	.95
4046	1.75
4049	.45
4050	.45
4066	.95
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4071	.35
4081	.70
4082	.45
MC14409	14.50
MC14419	4.85

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7400	.15	7473	.25	74176	1.25	74H72	.45
7401	.15	7474	.30	74180	.75	74H101	.75
7402	.20	7475	.35	74181	2.25	74H103	.75
7403	.20	7476	.40	74182	.95	74H106	.95
7404	.15	7480	.55	74190	1.75		
7405	.25	7481	.75	74191	1.05	74L00	.25
7406	.35	7483	.95	74192	.75	74L02	.25
7407	.55	7485	.75	74193	.85	74L03	.30
7408	.25	7486	.25	74194	1.25	74L04	.30
7409	.15	7489	1.35	74195	.95	74L10	.30
7410	.10	7490	.55	74196	1.25	74L20	.35
7411	.25	7491	.95	74197	1.25	74L30	.45
7412	.30	7492	.95	74198	2.35	74L47	1.95
7413	.35	7493	.35	74221	1.00	74L51	.45
7414	1.10	7494	.75	74367	.85	74L55	.65
7416	.25	7495	.60			74L72	.45
7417	.40	7496	.80	75108A	.35	74L73	.40
7420	.15	74100	1.15	75110	.35	74L74	.45
7426	.30	74107	.35	75491	.50	74L75	.55
7427	.45	74121	.35	75492	.50	74L93	.55
7430	.15	74122	.55			74L123	.85
7432	.30	74123	.55	74H00	.15		
7437	.30	74125	.45	74H01	.25	74S00	.35
7438	.35	74126	.35	74H04	.20	74S02	.35
7440	.25	74132	1.35	74H05	.20	74S03	.30
7441	1.15	74141	.90	74H08	.35	74S04	.30
7442	.45	74150	.85	74H10	.35	74S05	.35
7443	.65	74151	.65	74H11	.35	74S08	.35
7444	.45	74153	.75	74H15	.45	74S10	.35
7445	.65	74154	.95	74H20	.30	74S11	.35
7446	.95	74156	.95	74H21	.25	74S20	.35
7447	.95	74157	.65	74H22	.40	74S40	.20
7448	.65	74161	.85	74H30	.20	74S50	.20
7450	.25	74163	.85	74H40	.25	74S51	.25
7451	.25	74164	.60	74H50	.25	74S64	.20
7453	.20	74165	1.50	74H51	.25	74S74	.35
7454	.25	74166	1.35	74H52	.15	74S112	.60
7460	.40	74175	.80	74H53J	.25	74S114	.65
7470	.45			74H55	.20		
7472	.40						

74S133	.40
74S140	.55
74S151	.30
74S153	.35
74S157	.75
74S158	.30
74S194	1.05
74S257 (8123)	1.05
74LS00	.25
74LS01	.35
74LS02	.35
74LS04	.30
74LS05	.45
74LS08	.25
74LS09	.35
74LS10	.35
74LS11	.35
74LS20	.25
74LS21	.25
74LS22	.25
74LS32	.40
74LS37	.35
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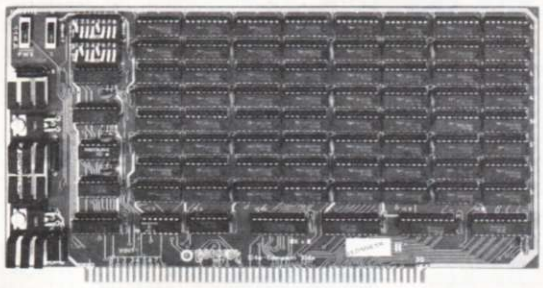

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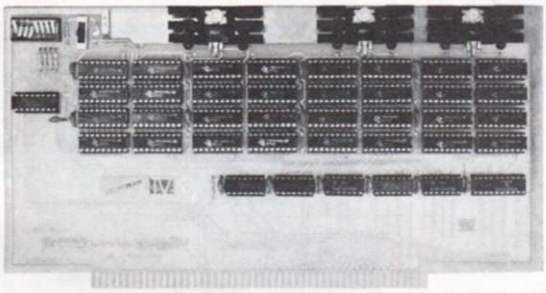

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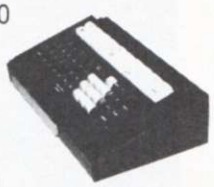

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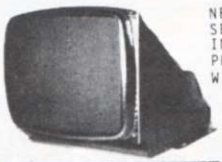

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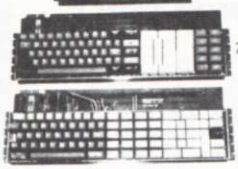

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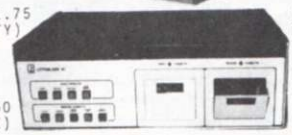

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+5	31.0	RTL	B317	$135
+5	24.0	RTL	B318	$98
+5	32.5	RTE	B319	$138
+5	74.0	RTP	B320	$198
+5	74.0	RTL	B321	$198
+12	2.5	RTL	B323	$21
+12	5.0	RN	B324	$38
+12	7.3	RTL	B325	$44
+12	10.0	RTL	B327	$75
+12	10.5	RTE	B328	$65
+12	16.0	RTL	B329	$90
+12	26.5	RTL	B330	$144
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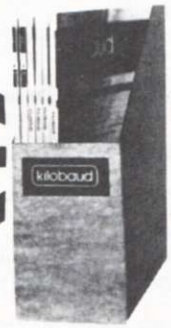

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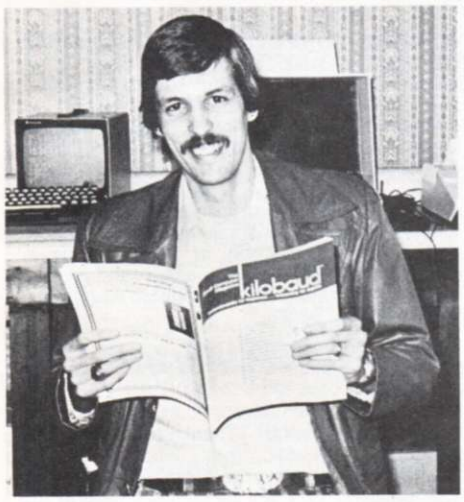
This chap behind the Kilobaud is the driving force behind a new microcomputer system . . . using the 6100. Does that give it away? Watch out for the dealer network he's getting together.

LAST MONTH'S MYSTERY READER



Last month's "Who's Behind the Kilobaud" was Steven Pereira, president of the Microcomputer Store in Nashua. Nashua now has three-going-on-four computer stores, which is remarkable considering its size. New Hampshire's freedom from a sales tax, which saves substantial dollars on a computer system, is drawing many companies to Nashua. Among the many new factories put in recently were a couple by DEC.

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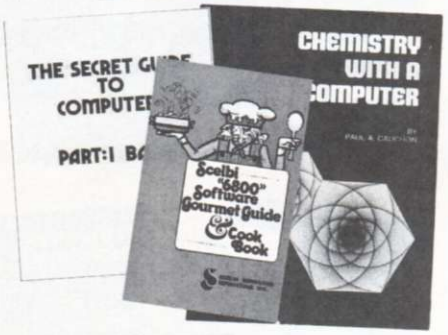

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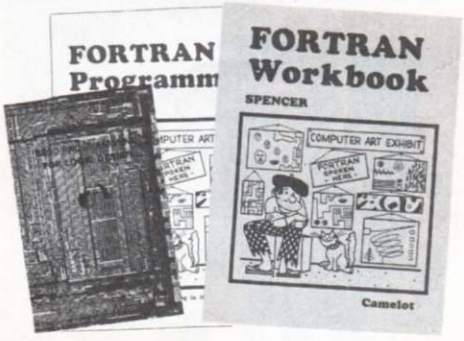

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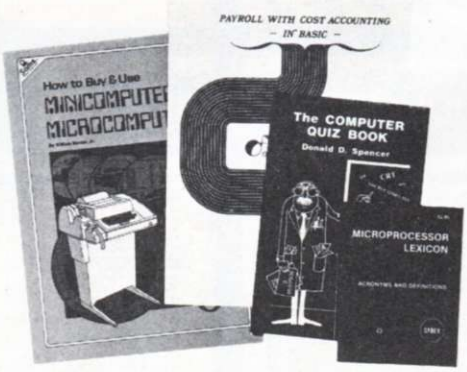

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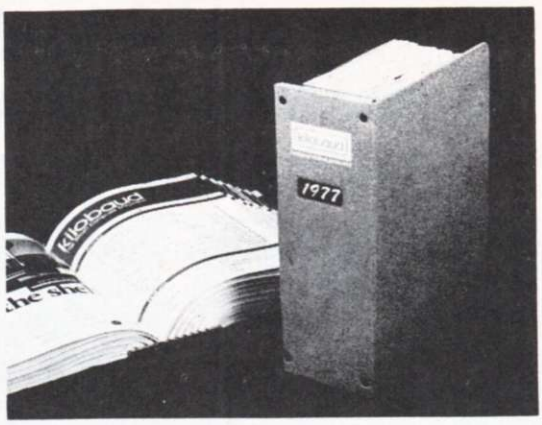

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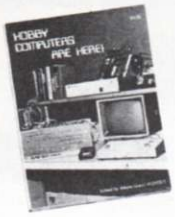

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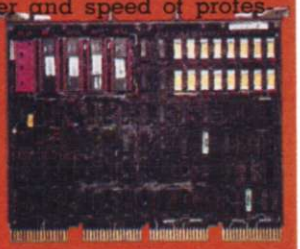

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