western engineer

MICRO/DESKTOP COMPUTERS AND APPLICATIONS
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FEATURE ARTICLE

Micro/Desktop Computers and Applications

By Kenton Johnson, P.E.

There is a "small" revolution happening in engineering offices around the world. "Small" computers — specifically micro and desktop computers — are revolutionizing the way in which engineers are viewing computers.

Computers fall into the following general categories:

- Multi-user computers:
  Large computers (e.g., IBM 370)
  Minicomputers (e.g., Digital Equipment PDP 11/70)
- General purpose, single-user computers:
  Microcomputers (e.g., Radio Shack TRS-80)
  Desktop computers (e.g., HP 9835)
- Limited, single-user computers:
  Intelligent terminals (e.g., Tektronix 4025)
  Programmable calculators (e.g., HP 65)

The computers in the **second category, micro/desktop computers,** are more affordable and less complex than the mini/large computers. Yet, they are powerful enough to perform many of the useful functions performed in an engineering firm or department.

The **third category** (limited, single-user computers) contains powerful tools, but not powerful enough to perform several general purpose functions. Some intelligent terminals perform many of the same functions as micro/desktop computers, but on a limited basis.

There are some gray areas between and within these categories, so there is often disagreement on exact definitions.

MICRO/DESKTOP COMPUTERS

Micro/desktop computers generally include: a processor, keyboard, CRT display, magnetic tape or disk, and some kind of printer. Desktop computers have much of this built into the main chassis. Microcomputers usually come as components.

Micro/desktop computers take up no more than one desk: desktop computers on top of the desk; micros on top or built into the desk.

Micro/desktop systems start below $5,000 and include such computers as:

- Radio Shack TRS-80
- Apple II

Micro/desktop systems can also start between $5,000 and $15,000. These systems include computers such as:

- Vector Graphic MZ
- Chromatics desktop graphics system
- Digital Equipment PDP-11V23
- Hewlett Packard 9845
- Tektronix 4051 desktop graphics system
- Many others

However, it must be noted that you must add application programs, a maintenance contract, and other necessities. In general, you can expect **monthly costs for these items to be 3-7% of the total hardware system costs.** The range is due to differing financial arrangements, and costs for application programs.

APPLICATIONS

Until recently, **computer use by many engineering firms** has been restricted to a timesharing service or to sharing an in-house minicomputer with the accounting department. This was either expensive, frustrating, or both.

Micro/desktop computers can perform most of the functions historically performed by larger, expensive computers. Yet, they require neither air conditioning nor a staff of "computer scientists." The concept of using only large, central computers for engineering work is obsolete.

Some of the functions that these small but powerful computers perform are:

- Design calculations (structural, hydraulic, mechanical)
- Accounting (job costs, ledgers, payroll)
- Estimating (job costs, future trends)
- Word processing (reports, specifications)
- Computer graphics (charts, graphs)
- Computer-aided drawing
- Computer-aided instruction
- Data reduction (survey calculations, experiment statistics)
- Management information storage and retrieval

Micro/desktop features and applications are very attractive. **Graphics displays** are simple and cost-effective. Desktop models are **compact and portable.** A micro/desktop computer can **easily be tailored** to your specific needs. **Word processing, accounting,** and **management programs** are available to aid the engineer. In addition, **micro/desktop computers can be connected to larger computers** via telephone lines for very cost-effective computer timesharing.

The 1980s have been proclaimed by many sources as "the decade of the computer." Your ability to function effectively will greatly depend on your ability to harness computer technology. **Energy consciousness, lack of trained technicians and professionals, and a crying need to increase productivity** dictate a great increase in computer use. Micro/desktop computers offer tremendous potential for very cost-effective computer processing.

HISTORICAL PERSPECTIVE

Over the last five years, **micro/desktop computers have matured.** They now have the power and memory of earlier, larger computers. Development of computer languages, processors, and programs for business and engineering have elevated micro/desktop computers from toys to useful and affordable tools for the engineer.

The **1980s will bring more power and programs** for engineering uses. Unit costs will continue to go down and standard capabilities will continue to expand. Program packages developed by engineers as part of their work will continue to be for sale or sharing.

Micro/desktop manufacturers have realized that good program packages, maintenance, and manuals are essential to their survival. Those manufacturers who give good support, sell more computers. This in turn brings their prices down and

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Micro/Desktop Computers

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gives them price advantages over those who do not provide good support.

FUTURE PERSPECTIVE

What new developments can you expect in the 1980s? From conversations with several marketing departments, plus what is possible, **quantum jumps in the power and user orientation can be expected.**

Most micro/desktop computers use cassette tape or flexible disks for **secondary memory.** However, 8-inch hard disks are now available with 5-30 times more storage at costs similar to flexible disks. Magnetic bubble memory will soon be available as built-in or plug-in modules at less cost, with more capacity, and much faster access than present secondary memories.

In addition, **primary memory capacity will grow** so that only historical information need be stored in secondary memory.

These advances will all fit as well, if not better, into existing micro/desktop computer chassis. By building as much into the chassis as possible and eliminating mechanical devices, reliability will greatly increase.

The speed of the processor will also increase. Most micro/desktop computers internally operate with one character (8 bits) at a time. Newer processors operate with two characters (16 bits) and future processors will operate with three or four characters (24 or 32 bits). This greatly reduces the number of memory cycles needed to execute one instruction. It also increases the amount of data that will be handled at one time. **These processors will be available as field upgrades.**

By essentially eliminating constraints in primary and secondary memory and greatly increasing the speed of processing, **more user-oriented features will be added.**

For instance, **functions to prompt and guide the user** will become standard. Better input translation and error correction will be developed.

Programming languages (e.g., BASIC) will be greatly enhanced and reside in a primary memory at all times. (Now, they are typically loaded from tape or disk.) Other programming languages (FORTRAN, APL, PASCAL) are now readily available.

Enhancements, such as voice or hand written data input, are now possible and will be implemented. Color graphics displays and plotters will be more affordable and widely used.

Micro/desktop computers, when properly applied, are useful and powerful engineering tools. Look for very exciting advances in technology and support. This means that you can expect them to grow as your needs grow.

Kenton Johnson is a graduate of California State University at San Jose with an M.S. in Cybernetic Systems Engineering. He is a member of CSE, IEEE, ACM, and a Director of Metro Chapter PEC.

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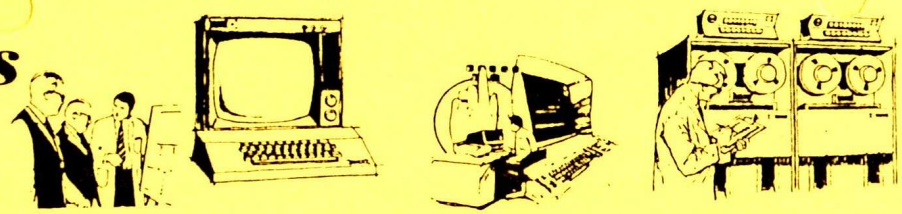
Computer Trends in Construction



By Kenton H. Johnson, P.E.
Editor,
Engineers Computer Applications Newsletter (ECAN)

EDITOR'S NOTE: *This is the first column on computers to regularly appear in the* **PEC Reporter**. *Its purpose is to inform, analyze and provide advice on computer applications specifically for engineering in the construction industry. Your feedback and contributions will be very much appreciated.*

Since 1979, the author has been a foremost authority on computers and for engineering construction design and management. An engineer and computer professional, formerly with several engineering organizations, he is a highly-respected writer, computer consultant and speaker. Contact Kent Johnson at 1100 W. Littleton Blvd., P.O. Box 112-PEC, Littleton, Colorado 80160-0112; telephone (303) 797-3603.

Examining computer trends in construction reminds me of the old analogy about the blind men and the elephant—your perception of the trends depends upon the part(s) which you hold. The following supports this theory.

Paul Levin is the publisher of the newsletter, *Computers, Productivity & Management in Construction*, as well as the *Construction Computer Applications (software) Directory*. His publications and research are directed to the contractor.

Paul sees an abundance of software available, providing both confusion and opportunity. Competition is keen, so prices are low. But, contractors quickly find that it takes time and money to learn and convert to new software and computer systems.

However, the payback is directly proportional to your willingness to take the time to overcome "computer fear" and "bang on the keyboard" yourself.

Larry True is both a construction claims and computer consultant. He is the author of *Contractor's Computer System Specifier* and *Contractor's Computer System Evaluator* published by Paul Levin.

Larry has seen a maturing of software on microcomputers, so that a contractor can realistically do project scheduling, job costing, and accounting, without serious constraints. Many minicomputer software vendors now offer microcomputer packages. However, only a few are the same as their minicomputer counterparts.

You can now network micros together without technical or software problems, and more software vendors are working with networks. This makes mini-like systems available at micro prices.

Chris Olson, of *Building Design and Construction* magazine, takes a readership survey each year. Trends are towards micros, scheduling software, and more communicating between architects, engineers, and contractors. The survey results will be out in his October issue.

Carl Meglan, chairman of PEC, is an avid user of micros himself. He has five micros in his office now, four of which are portables. He has been very successful linking his computers over phone lines between himself, other construction engineers, and to information databases.

He believes very strongly in sharing information, building databases, and manipulating the information with general-purpose software. However, learning time is still too long.

Since good training organizations are hard to find locally, he'd like to see PEC take on some of this task. This can be accomplished through seminars, good examples, trading your general-purpose software templates and ideas, and communicating computer-to-computer.

Susanne Leckband, the PEC Construction Computer Applications Project manager, wholeheartedly supports these concepts. She and Carl have described the "Bulletin Board" idea, which sounds like an excellent means of raising our awareness as well as sharing ready-to-go information and templates. She's working on the other training alternatives and would appreciate your help.

I'll address these topics, and those you suggest, in more depth in upcoming columns.

Contacts for people mentioned above:

- Paul Levin owns Construction Industry Press, 1105-F Spring St., Silver Spring, Maryland 20910; 301-589-4884.
- Larry True owns Demand Construction Services, 7430 E. Caley Ave., Bldg. 1, Ste. 350, Englewood, Colorado 80111; 303-740-8647.
- Chris Olson, Cahners Publishing, P.O. Box 5080, Des Plaines, Illinois 60018; 312-635-8800.
- Carl Meglan, P.O. Box 29190, Columbus, Ohio 43229; 614-891-9259.
- Suzanne Leckband, 8751 E. Mulberry, Scottsdale, Arizona 85251; 602-947-1640.

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Computer Definitions . . .

A *minicomputer* is a scaled-down version of the original class of computers, now known as *large* or *mainframe* computers. Minicomputers, like larger computers, are designed and priced to be used by several people at a time. Good examples are: Prime computers, Digital Equipment VAX, Data General Eclipse, and Hewlett-Packard 3000.

A *personal computer* is a computer designed for use by one person at a time. The IBM Personal Computer (PC), its predecessors, successors, and compatibles are good examples for construction applications.

The term *microcomputer* covers a wide range of computers, generally derived from the now *personal computer* (single-user) class of computers. High-end or *super-micros* can support more than one user at a time on two to twenty terminals (displays), depending on the type and mix of applications.

Thus, *micros* overlap *minis* in capabilities, performance, and price. The terms best refer to the origin computers or software, rather than the raw technological capabilities.

Software is simply a general term for the programs that tell a computer what to do, such as output a line on a printer or display, or assist you in part of your business. That assistance is generally called an *application*, and includes: accounting, estimating, report writing, or information management.

General-purpose software means a program or programs that allow you to construct your own applications, and include:

- Electronic worksheets (spreadsheets).
- Word processing (entering and editing pages of text).
- Database management (filing, selecting, sorting, and printing).
- Graphics (simple lines and text for presentations and reports).
- Telecommunications (talking to another computer generally over phone lines).

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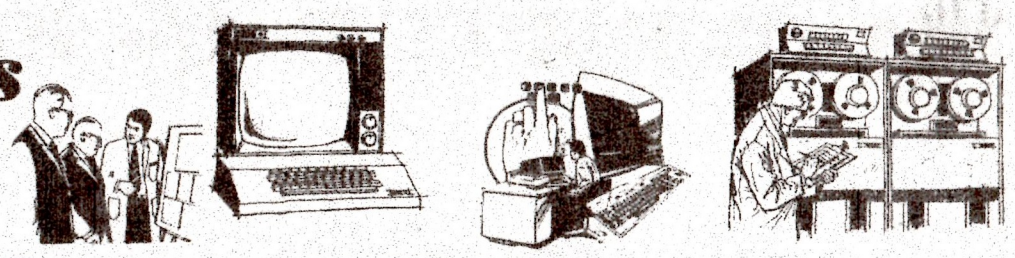

Inexpensive Subsequent Computer Systems

By Kenton H. Johnson, P.E.
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Happy with your IBM-PCs/compatibles and not feeling an urgent need to upgrade, but you want more systems? Want everyone to have a diskette-based word processor/data manager/worksheet generator to feed hard disk systems? Trying to establish a PC lab or training center? Need a system at home? Another office? As a backup system?

You may be a good candidate for *used IBM PCs or compatibles.* Many companies are upgrading to IBM-PC-ATs/compatibles and want to sell their PCs or XTs. Prices vary from one-third on up, depending on their need, your horse-trading ability, and any middle-man markups.

To be on the safe side, take prospective equipment to, or bring in a certified service man for a thorough inspection. Sorbus, TRW, and other third-party service people would be better than the service man from a retail store. If you can not get at the equipment, buy it contingent on your acceptance, pay very little to get it sent, and have it immediately inspected by your service man.

Ask the service man to tell you about:

- Third-party disk drives, tape drives, memory boards, monitors, and other accessories that may not be serviceable.
- Poorly maintained equipment.
- Other potential service problems.
- Other sources for inexpensive, but good quality used equipment.
- Good third-party accessories to upgrade your equipment and the used equipment, and where to buy them.
- Incompatibilities — run your software on the used equipment, as well as test with Lotus 1-2-3 and "Flight Simulator", a couple of good incompatibility detectors.

Sources for used equipment include: PC clubs, local newspapers, computer magazines and newspapers, associates, large companies, tech schools and colleges.

Another option for a *personal* purchase of a second system is a PC compatible from Asia (where many of our American brands are assembled), that is sold well in your area. Prices are very low. I've always been a believer that you get what you pay for, so don't count on it to be as reliable as a more expensive American or Japanese PC. Watch out for incompatibilities, and back up your work often.

Used CADD Equipment — Sell Or Buy

Posthaur—Pinkert buys and sells used mini-based CADD systems. One of the few who have survived, I've had good dealings with them. Relicensing CADD software is tricky, and they'll be happy to tell you what policies are for various vendors.

Though you can buy training, installation, and support from the used equipment's vendor, it's probably best to buy a used CADD system after buying your first system.

Contact Wayne Gunter, Posthaur-Pinkert, 12138 Piping Rock, Houston, Texas 77077; telephone (713) 589-2291.

Inexpensive Intergraph Workstations

Need additional Intergraph workstations on your in-house system for engineers, checkers, and supervisors to look at data or to do mostly editing? Would you prefer $5,000-$20,000 to $20,000-$45,000 per workstation?

Bentley Systems has over 100 Intergraph installations using their $8,500 software (on the VAX) to drive graphics terminals to act as Intergraph terminals. Called PseudoStation, the software drives Tektronix 4100 and compatible terminals.

The normally-used Tek terminals range from $7,000 to $13,000. Terminals that emulate Tektronix 4100s start lower and finish much lower than Tek's top end.

Bentley also offers software for your IBM-PC, XT, AT, or compatible, running PC/MS-DOS 2.0 or greater, to emulate the Tektronix 4100s. The software, PseudoTerm, is $595, and requires:

- A serial port.
- An IBM, Tecmar, or Hercules graphics card.
- Matching graphics monitor.

This may add about $1,700 to your PC.

It also supports Diablo and Tektronix color ink-jet printers, and Epson printers. With a second serial port, you can use a Sumagraphics tablet or Mouse Systems mouse. PseudoTerm also emulates a DEC VT52 or VT100 terminal.

For more information, contact Scott Bentley, Bentley Systems, 3700 Market Street, Philadelphia, Pennsylvania 19104; telephone (3215) 386-6800.

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