

DEC*

MARCH • 1983

THE ^ PROFESSIONAL

• VOLUME 2, NUMBER 2 • THE MAGAZINE FOR DEC USERS



President Ronald Reagan, Ken Olsen (r), DEC president, and Ralph Gillespie (l), Boston plant manager, greet employees at DEC's facility that manufactures the new LK-201 keyboard for the company's personal computer line.

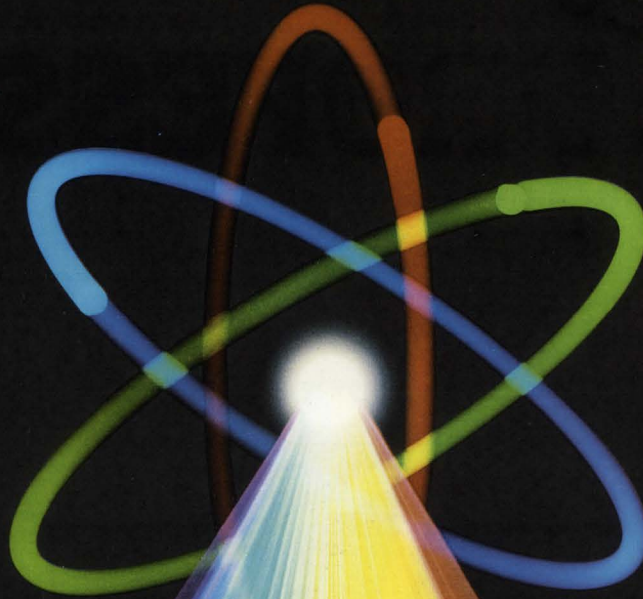
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FROM THE PUBLISHERS

Carl Marbach & Dave Mallery

Personal Computers! Judging from the cover, everyone is getting into the act!

All kidding aside, so are we. It is clear to us that in about a year, the majority of DEC users will be DEC Personal computer users. We are announcing a major new publication:

PERSONAL AND PROFESSIONAL: The Independent Magazine for Digital Personal Computer Users. We feel that we are qualified to bring our best efforts to you as we all become Personal Computer users together. We are calling this magazine **PERSONAL AND PROFESSIONAL** because it covers the new line of DEC microcomputers from the personal (Rainbow 100) to the professional (Professional 300 series).

There is going to be a big difference with the DEC Personal Computers. A very large number of DEC Personal Computer users will also be established DEC users. Remember that DEC does 80 percent of its business with about 400 firms. They plan to pump that existing market full of Personal Computers.

PERSONAL AND PROFESSIONAL will be a different kind of magazine in many ways. The lines of distribution are different. It is on a subscription basis. See our introductory subscription offer and postcard on page 19. You should be able to find **PERSONAL AND PROFESSIONAL** in your local computer store. Since the magazine is a late arrival in a field already jammed with magazines, we are relying on our position as users ourselves to give the publication uniqueness. We will have to serve both the traditional DEC user who is becoming a Personal Computer user (someone like ourselves) as well as the novice computerist who just brought one home from the retail store because he learned about DEC from his broker.

We will try to introduce the veteran DEC user to the maze of CP/M software that is already in place. When seasoned DEC Users run head-on into some of this software, sparks are bound to fly! The entrance of large numbers of experienced professional programmers into a field dominated by newcomers should produce some great copy. (Maybe even an implementation of TECO on the Rainbow!! Just think of all those thousands of people who think TECO is a power company or a lift truck manufacturer!)

When novice computerists run head-long into DEC, the same should be true! Someone will have to explain the wonders of DEC's management to them. We will also be able to tell them about what DEC made before Personal Computers!

PERSONAL AND PROFESSIONAL will bring you intelligent, concise and current topics from hardware insights to software reviews. And superior technical explanations are written in lay terms as they tackle topics that entice even the professional computer user.

Learn how today's personal computers

are answering the demand for increased capabilities with this list of regular **PERSONAL AND PROFESSIONAL** departments:

Characters — Hear what industry leaders, the men and women setting the fast pace of today's computer age, have to say in well-written and insightful interviews . . .

How To — Personal and Professional computer users tell how to do it, when to do it and why you do it . . .

Bits & Bytes — Easy to understand expert explanations of the computer's internal workings provide a better understanding of how it all works . . .

Input/Output — Digital personal computer users ask the questions and leading computer authorities give the answers that open new doors . . .

Digital Watch — With a finger on the pulse of the many computer developments and innovations, the staff of **PERSONAL AND PROFESSIONAL** report on how Digital is posturing itself and competing in the personal computer market . . .

Columns & Editorials — Expert opinion on anything and everything that affects the personal computer market or user . . .

Book Bag — What computer-related books are "musts" and which ones are "busts" . . .

Supplier Notes — Be kept totally up-to-date with the latest information on new hardware and software . . .

On The Exchange — a well-known analyst tells how personal computer companies are performing in the stock market . . .

Observations — Gain valuable insight from the experiences good and not so good of other personal computer users.

Features, Features & More Features — Each issue contains objective and well researched feature articles on the legal, educational, financial and management aspects of the world of personal computers. And much, much more . . .

In short, **PERSONAL AND PROFESSIONAL** will help you get the maximum benefits from your Digital personal computer.

Each issue of **PERSONAL AND PROFESSIONAL** is packed with the latest information on the world of personal computers in a high-quality, modern, attractive and easy-to-read format. The finest editors, writers, art directors, illustrators, cartoonists and photographers have been assembled to establish a new level of excellence and objectivity in personal computer magazines.

So, come along our yellow brick road and join us in the charter issue of **PERSONAL AND PROFESSIONAL**. We need your support on this one. While you're at it, you ought to run down to the local computer store and see what a real computer company builds when they set out to make a Personal. When you get there, ask them if they carry the new magazine for the DEC personals; if they don't, please tell them about **PERSONAL AND PROFESSIONAL** magazine.

THE DEC[®] PROFESSIONAL THE MAGAZINE FOR DEC USERS

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STAFF

Publishers: R.D. Mallery, Carl B. Marbach

Managing Editor: James L. Trichon

Director of Advertising: Helen B. Marbach

Business Manager: Peg Leiby

Assistant to the Editor: Hope Makransky

Editorial Assistant: Linda DiBiasio

Subscription Fulfillment:

Kathi B. Campione, Claire Hollister,
Steven Barsh, Margie F. Pitrone,
Connie Mahon

Mid-Atlantic Representative:

Ed Shaud
P.O. Box 187, Radnor, Pa. 19087
215/688-7233

N.Y. & New England Representative:

Jack Garland
P.O. Box 314 S.H.S., Duxbury, MA 02332
617/934-6464

United Kingdom Representative:

Pauline Noakes
RTZ Computer Services, Ltd.
P.O. Box 19, 1 Redcliff Street
Bristol, BS99-7JS
Phone: Bristol 24181

Contributors:

Jon H. Blasdel, Jr., N.A. Bourgeois, Jr.,
Howie Brown, Rick Cadruvi,
Jerry Cashin, Al Cini,
Dan Esbensen, John Gram,
Arthur Edward Groulx, Greg Justice,
James A. McGlinchey, Michael Mueller, S.J.
Gary Paine, Mark Paulk, Joel Schacht,
Judy Susia, Gerald M. Weinberg

Cartoons:

Douglas Benoit, Frank Baginski,
Emily T. Dahlstrom

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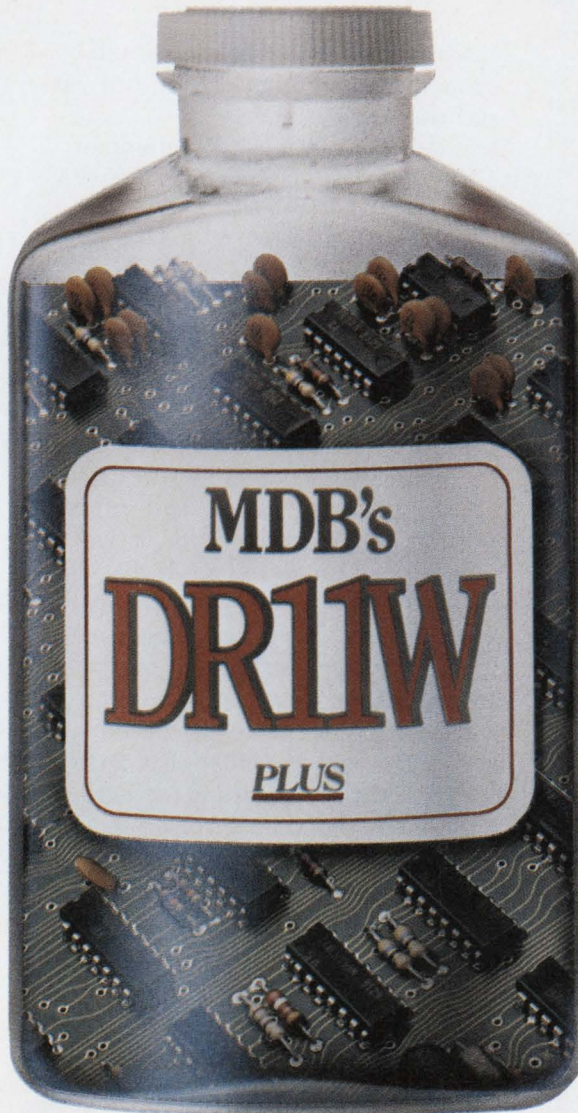
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LETTERS TO THE DEC PRO . . .

Send letters, comments, photos, etc. to: Letters to the DEC PRO, Box 362, Ambler, PA 19002.



I happened to read the article in your January [1983] issue entitled "I DON'T GET NO SUPPORT, Part Two" by Joel Schwartz, M.D. [Part One appeared in our November, 1982 issue.], and I believe there needs to be some comments made on the support issues in that article.

It sounded to me like a typical first time computer buyer who shops all over town trying to get the best price or free education from the computer stores and then expects super support or interest from the sales people (who hope that their support or knowledge will be rewarded by a sale). We in the industry have been burned by too many buyers who get a free education and then buy from the lowest priced vendor.

I think it is time for the computer sellers and the computer buyers to wake up! Personal computers are far less expensive than even the smallest of compact cars! When you buy a car today does the salesman know how to repair it? Does he include driving lessons in the purchase price? Of course not. There isn't enough profit margin, after expenses, for that kind of service. Well guess what? It's the same with computers only worse. There are only about 15-20 automobile manufacturers selling in the United States. There are over 350 computer manufacturers (with who knows how many resellers) offering computers in the United States today. Given the price and the competitive pressures, there simply isn't enough profit margin to support highly trained technical sales people on a quantity one purchase.

Today's low priced micro-computers and the corresponding software product must be sold on a retail basis. Additional support and/or training required, should be viewed as consulting services (similar to the fees paid Attorneys, CPA's and Doctors). If a retail store is a "nice guy" who takes the time to educate the buyer without charging, it will be out-of-business and

incapable of supporting the buyer on any basis in the long run.

Michael L. Holt
Commercial Computers, CA

Many of your fine articles would be even better if they were not so verbose.

Michael A. Branch, Sr. Programmer
The ENI Companies, Bellevue, WA

I came across your magazine in a friend's office, and it looks to me like a good way for some of us smaller system users to communicate. I am looking forward to an upgrade to an 11/23plus based system in the near future for engineering and report writing. I am looking for a word processor to run under RT-11 that can handle engineering/scientific/math type reports. That is, I want math symbols, large and small brackets, integral signs, Greek letters, superscripts, subscripts, etc. displayed on the screen as they will appear on the printer. Proper formatting for various printers for attendance free printing is also desired. I have heard a rumor from a former DEC employee that such a program has been developed

```

;
; Reverse a byte string.
; On entry (R5)+2 is the address of a two-word string descriptor.
; as follows:
;           address of first byte of string
;           byte length of string
;
; The order of the bytes in the string is reversed.
; R0, R1, and R2 are destroyed. R5 is preserved.
;
REVSTR: MOV     2(R5),R1      ;R1 points to string descriptor
        MOV     (R1)+,R0    ;R0 points to start of string
        MOV     (R1),R1     ;R1 = string length
        ADD     R0,R1       ;R1 points just beyond string
        BR     20$         ;into loop
;
10$:    MOVB    -(R1),R2     ;pick up byte from 2nd half
        MOVB    (R0),(R1)   ;replace it with byte from 1st half
        MOVB    R2,(R0)+    ;byte from 2nd half into 1st half
20$:    CMP     R0,R1       ;if we haven't reached midpoint yet...
        BLO    10$         ;..loop back
        RETURN
    
```

Steve Brecher, Software Supply, Long Beach, CA

. . . continued on page 103

$$\lim_{T \rightarrow \epsilon} \dot{x} \leq \int_1^2 \int_0^{\infty} \sqrt{\gamma + \ddot{\omega}} \left\{ \frac{\phi}{\epsilon} \right\} \Delta\{n\} \frac{\partial \kappa}{\partial \alpha} \nabla z \, d\rho$$

David E. Limbert, P.E., Director
Del Engineering, Durham, NH

Although I am not a Basic-Plus user, a compulsive disorder would not allow me to ignore STRREV.MAC (a string reversing routine) on p. 60 of your Jan. '83 issue [by Craig Goodrich]. To a degenerate hacker like me, any code segment of more than one instruction cries out for optimization. That years of therapy have not palliated this obsession is proved by the accompanying routine, REVSTR. It's one word shorter in the setup; faster in the loop; and works correctly in the case in which the string straddles virtual address 100000. Three principles have been applied to the original: use autoincrement addressing in place of indexing; move unconditional branches outside of loops; and always use unsigned comparisons on addresses.

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NEW—SMD INTERFACE COMPATIBLE—Model DU218—Full

RM02/RM05/RP06 media compatibility—interfaces PDP-11/04 through 11/60 computers with up to four Winchester, or CDC9762/9766 equivalent disc drives employing industry standard SMD interface, as well as Memorex 677/RP06 type drives—includes three sector buffering, 32-bit ECC and dual port capability.

MAGNETIC TAPE CONTROLLERS

These 1/2" mag tape controllers/couplers handle standard start-stop and streaming drives with TM-11 or TS-11 emulations.

1/2" STREAMING/START-STOP COMPATIBLE—Model DU130—

Handles up to eight 9-track, 800/1600 BPI industry standard drives at 12.5 ips to 125 ips—interfaces dual density (NRZI/PE) drives from all manufacturers. TM-11 emulation.

NEW—1/2" MAGNETIC TAPE COMPATIBLE—Model DU132—

Emulates TS-11—interfaces up to four start-stop or streamer drives, including "Cache Streamer"—** 12.5 ips to 125 ips speeds—exclusive 800/1600 BPI dual density—also interfaces GCR transports.

Contact your local DILOG sales office for complete details and O.E.M. quantity discount pricing/delivery of specific models providing Winchester/Backup for PDP-11.

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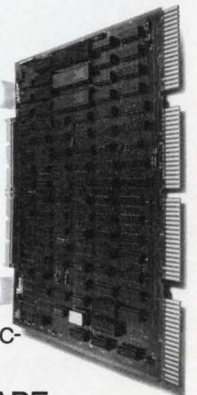
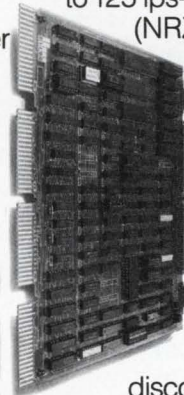
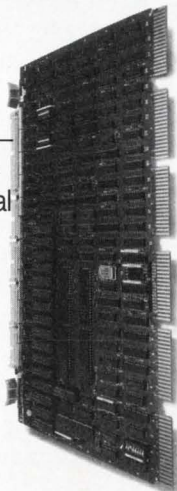
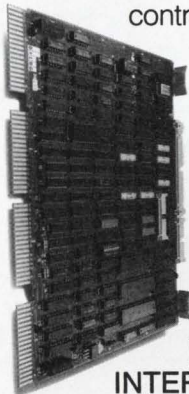
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THE POLLING SYSTEM, A Networking Tool For Asynchronous Communications

By Jon H. Blasdel, Jr., Austin Systems, Inc., Austin, TX

The Art of Time Division Multiplexing has advanced to the point that it is sometimes difficult to choose the proper product for a given application. Multiplexing as a sub-market in the overall Data Communications Industry has developed because it provides an economic tool to the user. The unique aspect of multiplexing is that each type of multiplexer was originally designed to fit a specific need and as long as that need exists, the device still has a market. In some cases, newer designs with additional features have replaced older equipment, however, we still have Frequency Division Multiplexers (FDM), Bit Interleave (Fixed Format) Time Division Multiplexers (BTDM), Character Interleave (Fixed Format) Time Division Multiplexers (CTDM), and today's most prolific seller, the Statistical Time Division Multiplexer (STDM).

We also find hybrid TDMs which combine bit and character techniques as well as STDM which also handle either bit or character interleave in a fixed format arrangement, concurrent with statistical techniques.

The latest advancement in TDMs is commonly referred to as the Polling Multiplexer. Several manufacturers have modified their standard STDMs to allow a multichannel unit

at the central site which communicates with remote units with only a portion of the total channel capacity in each of the remotes. When these are connected in a multidrop arrangement, the user can derive the benefits of fewer modems and lower overall telephone line cost.

To illustrate this last statement, refer to Figure (1) compared to Figure (2). Figure (1) shows a point-to-point or star configuration with a thirty-two (32) channel master station multiplexer interconnected to eight (8) separate four (4) channel remote multiplexers. In this illustration there are sixteen (16) modems and eight (8) separate leased data circuits. Figure (2) shows a total of nine (9) modems and one leased multidrop circuit.

It should be noted that there are differences in the devices designated as Polling Multiplexers by various vendors. For example:

1. There are multiplexers that allow a computer that does the polling to utilize one or more channels of a fixed format TDM to feed a remote multidrop line. Refer to Figure (3).

2. There are devices which are installed in a remote location and provide polling for either multidrop or point-to-point lines connected at the lower speed side. The high speed or aggregate side is connected to a CPU or its front end as a serial synchronous stream and is software demultiplexed at that point. Refer to Figure (4).

3. There are STDMs that poll as shown in Figure (2).

Now a new generation of equipment has been introduced. While generally referred to as a polling statistical multiplexer, it is actually a superset of that product type. This new device as supplied by TeleProcessing Products Inc., 4565 E. Industrial St., Bldg. 7K, Simi Valley, CA 93063, is named the Polling System. While some of the features of the Polling System are duplicated in one or more polling statistical multiplexers, no other unit offers all of the features in one coherent system.

All Statistical Multiplexers utilize some form of link protocol based on the CCITT X.25 protocol. The Polling System is no exception. The link protocol is the arrangement of serial bits transmitted from one station or device to another. Included are the delimiting characters or "Flags" which open and close a frame of information. Contained within the frame are address, controls, data and a very powerful error detection algorithm which provides for a request for retransmission if an error is detected.

Some of the features that distinguish the Polling System from other products in the marketplace are:

1. Remote units can be equipped with one, two or four individually addressable I/Os. In all configurations, only one modem is required at any physical location.

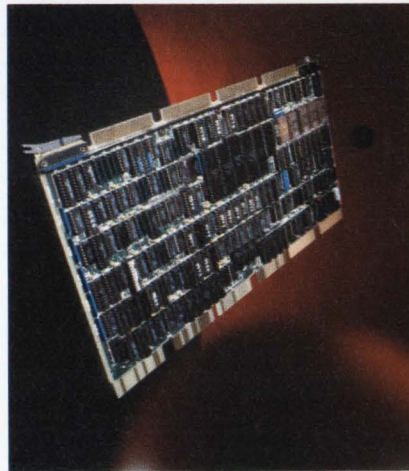
2. Link modem can be either synchronous or asynchronous, so it is applicable to in-house as well as long distance networks.

3. The system incorporates speed matching. A terminal can operate at a different bit rate than does the computer port to which it is assigned.

4. The system provides selectable logical port mapping

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at the central site. Any physical I/O can be logically connected to any computer I/O without changing cables.

5. Each central I/O can be configured as a dual purpose port. The port can be assigned to a remote port supporting a CRT part of the time and alternately can be assigned to a different port supporting a printer. Additionally a software program is contained in the central unit which allows host computer selection of up to six (6) priority levels of data being sent to remote device.

6. Each Polling System central unit has a control port that can be equipped with a control console, either a CRT or a hard copy KSR. This port can also be connected to a host port so the host control console can be used to control and monitor the Polling System. One further capability is that the control port can be remoted to allow the control console to be at a different physical location from the Polling System central unit.

7. The control port provides for manual selection of control commands to accomplish various maintenance and trouble shooting procedures. Included are:

Controls:

- Loop back of central site ports.
- Loop back of remote ports.
- Enable/disable remote ports.
- Initialize remote ports.

Status:

- Map display (report of physical configuration of system).
- Poll list display.
- Display central site I/O configuration.
- Display remote site(s) I/O(s) configuration.
- Display any channel that is in a test condition.

8. Many polled networks, today, use some form of network control systems. When purchased from a modem manufacturer or rented from the telephone company, the technique used for sending and receiving control information is a Frequency Division multiplexed side channel which operates at a much slower speed than the main data channel. The Polling System provides network control imbedded in the protocol. This benefits the user in several ways. No special modems are required. All control commands and status reports are at network speed, and no special additional control unit is required at the central site.

9. In addition to the controls and status information available via the control port, an optional capability provides for a Network Performance Analyzer. TeleProcessing Products has for some time, been providing devices to monitor the performance of IBM 3270 multidrop networks, both Bisync and SDLC. The features of these devices have been integrated into the Polling System. Among these are:

1. Poll to Poll Times
2. Channel Delay Times
3. Port Utilization (char/sec)
4. Line Performance
5. Average Host Response Times
6. Maximum Host Response Times
7. Selected Priority Outbound
8. Port Configuration
9. System Physical Definitions

The nice thing about the Polling System is that all stan-

dard capability is available in manual controls from the front panel so no control console is required if not desired. All controls and status information are in easy to understand English language whether manual or control console initiated.

One further enhancement recently announced, is the capability of interconnecting up to sixteen (16) Polling System master stations so all can be managed and controlled from a single control console. Each system can handle up to thirty-two (32) remote I/Os and an aggregate of 38.4 Kbps over 9600 Bps link modems. This concept of one control console provides a network manager with a single point control of 512 remote I/Os (1024 dual mode).

The Polling System is a networking tool that provides the user with decreased line cost and total transparency when used with asynchronous host computer I/Os and terminal devices. It is ideal for the small to medium user who wishes to acquire network management and performance analysis previously found only with large mainframes and more sophisticated terminal equipment that communicate using a higher level link protocol.

Many types of businesses could benefit from the use of the Polling System. Generally speaking, any business with a computer in a central location and multiple offices with one or only a few terminals should consider this product type. It is also an ideal tail circuit networking tool for the various private and public data networks.

As a Consultant in the Data Communications Industry, it is particularly satisfying to see manufacturers such as TeleProcessing Products provide user friendly systems. It makes recommendations a lot easier.

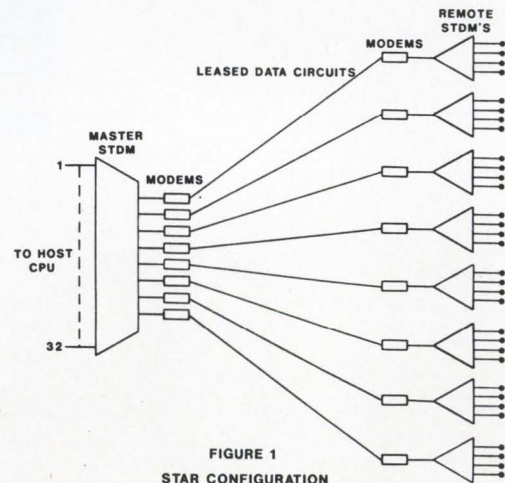


FIGURE 1
STAR CONFIGURATION

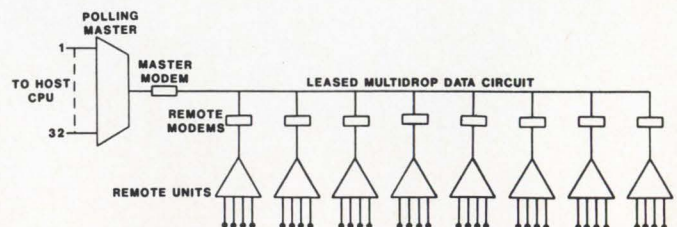


FIGURE 2
MULTIDROP CONFIGURATION



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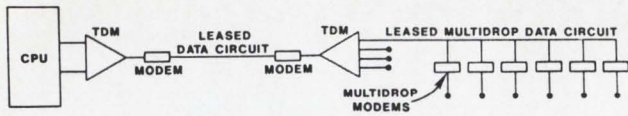


FIGURE 3
TAIL CIRCUIT MULTIDROP THROUGH TDM

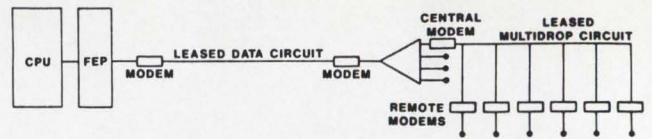


FIGURE 4
REMOTE POLLING MULTIPLEXER CONFIGURATION

Mr. Blasdell is one of the founders of Austin Systems Inc. He acts as a consultant in the area of management, marketing and product planning for vendors of Data Communications Equipment, as well as assisting users in network design.

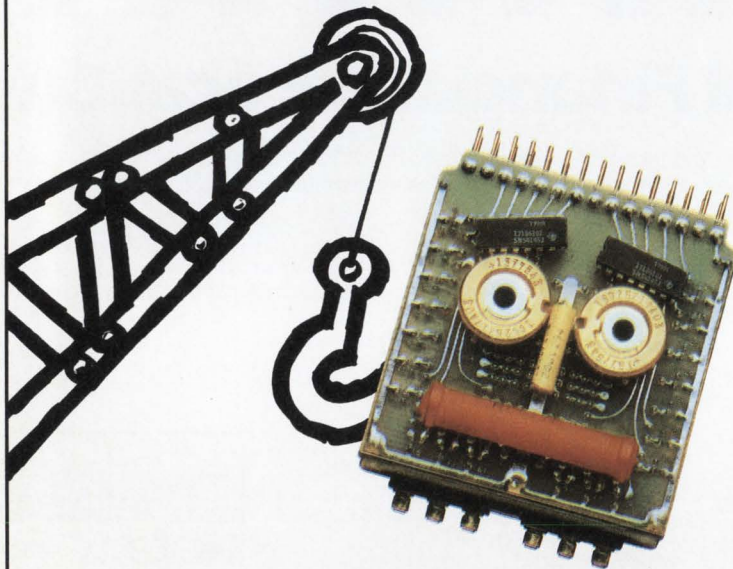
Mr. Blasdell is also the author and principle speaker in two seminar programs entitled "Basic Data Communications" and "Word Processing Communications" which are directed to both user and vendor personnel.

He has been active in the Communications industry since 1950 and has held various technical, marketing and management positions with

such companies as Tran/Amdahl, Racal-Milgo, Communications Logic Inc., TRW Controls, Texas Instruments and Shell Oil Co. He also operated his own manufacturing representative company for more than three years.

Mr. Blasdell has participated in several trade show sponsored work shops and presentations. Several of his articles have appeared in data communications trade journals. He was on the original Board of Directors for the Computer Peripheral Manufacturing Association and assisted in the formation of the Independent Data Communication Manufacturers Association.

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By Greg Justice

V.N.P.

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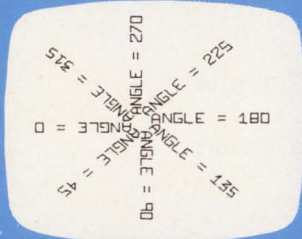
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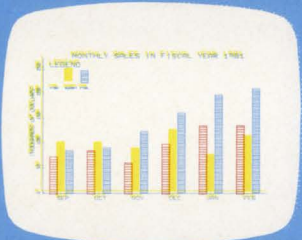
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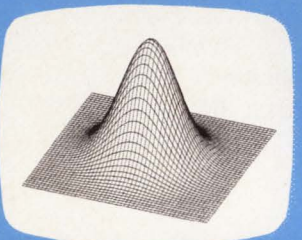
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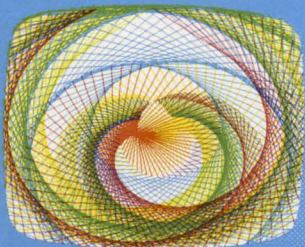
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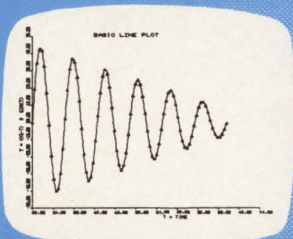
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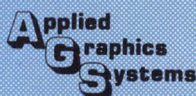
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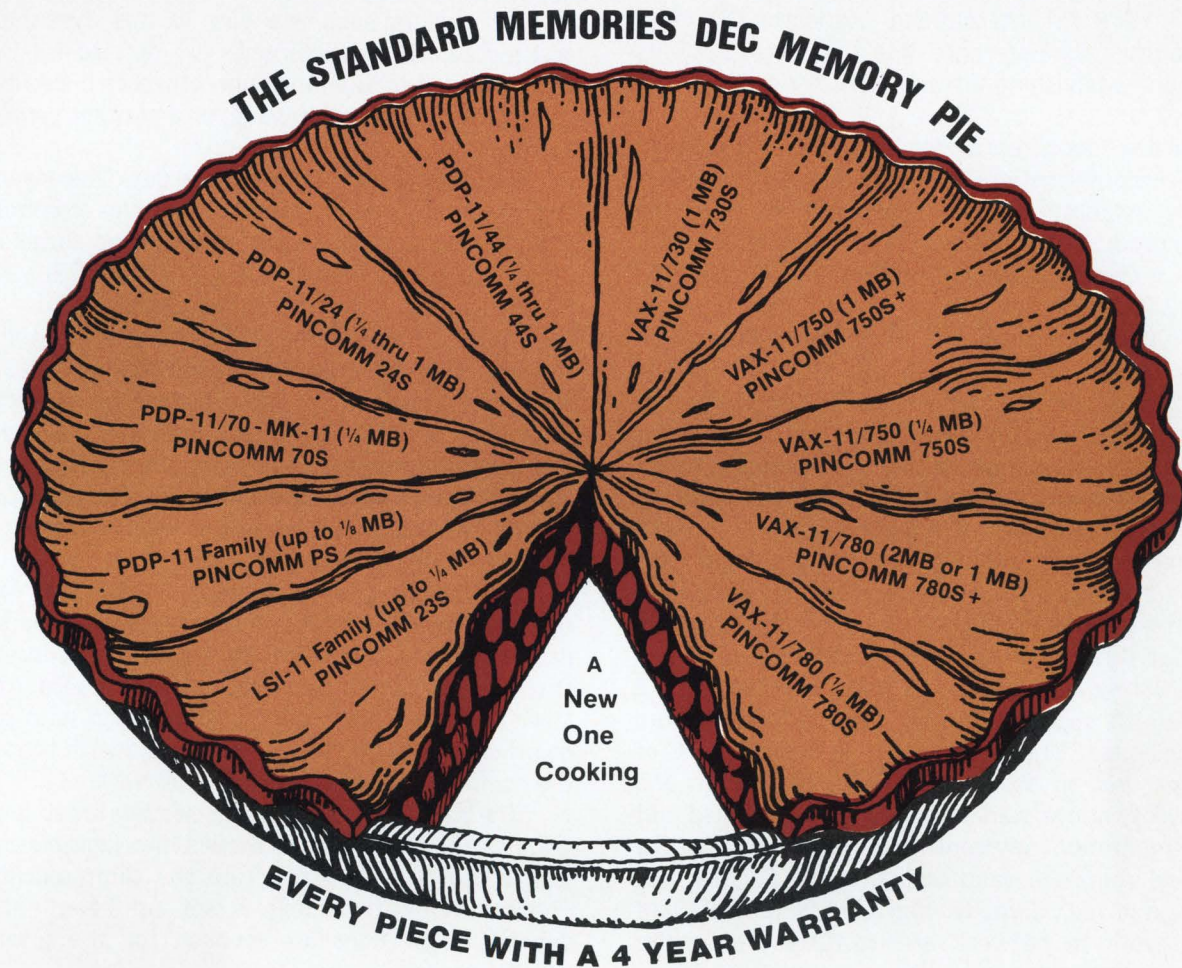
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DECNET AND THE OSI MODEL

By Mark Paulk, System Development Corporation, 4810 Bradford Blvd. NW, Huntsville, AL 35805

About 1974 Digital Equipment Corporation (DEC) announced a network, DECnet, to connect the various DEC computers. In 1979 the International Standards Organization (ISO) published the Reference Model for Open Systems Interconnection, establishing a framework for network implementation.

Any time a vendor offers a product in a rapidly evolving area such as computer networks, it runs the risk that standards will be established which invalidate much of the design of the product. The dilemma posed is a chicken-and-egg question. If there is heavy demand for a technology the vendor must satisfy its customers. If there is industry-wide use of a technology, standards will be established to govern compatibility of the devices which use that technology. Witness RS-232C as a methodology for connecting terminals and computers. DEC satisfied their customers' demands for computer interconnection, but the demand for computer interconnection, especially between heterogeneous systems, forced the later development of the OSI model.

The usual procedure followed by vendors caught between these horns appears to be to try to influence the standards committees to establish their product as the standard which all other vendors must then follow to remain competitive. The OSI model, however, is not a standard. It is a framework which suggests how a network architecture should be designed. This framework provides a set of "layers" to be used in designing a network. Within and across the layers various standards may be established, but a given implementation may implement only a subset of the OSI model and remain a valid OSI network. Further, the modular design of the OSI model was a logical derivation of the existing work in network architectures. The major vendor-supplied networks; e.g., DECnet and SNA, follow similar architectures in their design. Much of the Digital Network Architecture (DNA) maps directly onto the OSI model.

THE OSI MODEL

The OSI model describes the architecture of networks in terms of seven layers. This layered architecture is a logical approach to specifying communications between functions and their opposite numbers on another node. Except for the first, each of the seven layers is built on top of the preceding layer.

When an entity within a given layer communicates with an entity in the next higher or the next lower layer, we refer to the interface between layers. The term 'interface' has largely replaced the OSI terminology of Service Access Point in common usage. Entities in a layer only interface with entities in adjacent layers. They can also communicate with entities at the same layer level in the hierarchy. The rules governing such communication are called a protocol.

The first layer is called the physical layer. The physical layer is concerned with the transmission of bits over some physical medium such as a wire. At this layer the electrical and mechanical characteristics are defined for interfacing with the transmission medium, whether it be fiber optics, coax, twisted pair, microwave, or any other conceivable interconnector.

The second layer is called the data link layer. It turns the physical medium into an error-free communications channel. The data link layer provides the data-link control procedures which frame messages, check their validity, and manage access to and use of the channel.

The third layer is called the network layer. It provides the connection between the communicating nodes. If a node receives a message from one node directed to another node with which the originating node does not have a direct link, this layer is responsible for routing the message through the intermediate node on toward its destination. Congestion control is also performed at this level to prevent bursts of traffic from choking the network.

The fourth layer is called the transport layer. It is responsible for communications between the source and the destination nodes. The first three layers are concerned with the individual links between adjacent nodes; the fourth layer and those built on it are concerned with end-to-end communications and are not concerned with the location of the communicating nodes in the network.

The fifth layer is called the session layer. It binds and unbinds the distributed activities into logical relationships that synchronize and structure the communications link. The communications link is set up here, and system-dependent functions are invoked for the given pair of specific nodes.

The sixth layer is called the presentation layer and contains those functions which are frequently done for the user, especially those which involve the representation and manipulation of data. One example might be the conversion of EBCDIC codes to ASCII.

The seventh and final layer is called the application layer. It contains the program or utility which uses the network.

THE EVOLUTION OF DNA

Like any viable entity DECnet has evolved over the last decade. DECnet Phase I was a fairly restricted network implementation. The initial architecture of DECnet contained only four layers: physical, data link, network services and user application. Communication was strictly between adjacent nodes. The basic functionality offered was task-to-task communication via point-to-point line.

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(DDCMP) was designed at this time. No international standard was accepted at the time DDCMP was designed, although SDLC had been proposed to the ANSI protocol committee. DDCMP, unlike most other data link protocols, is a byte-count protocol. A field in the data contains a byte count, which is used to determine when a given message ends. The weakness of this protocol lies in the possible corruption of the byte count. Alternative techniques such as bit-stuffing are used by most modern protocols; e.g., HDLC. In bit-stuffing a special sequence of bits is used to frame the beginning and ending of messages. If that sequence of bits occurs naturally in the message string, then null bits are stuffed into the string and stripped by the receiver.

The Network Services Protocol (NSP) created and managed the communications mechanism between the communicating nodes. The Data Access Protocol (DAP) was developed at the user layer to obtain device and file services within the network.

DECnet Phase II added file transfer and remote-resource access to the DECnet capabilities, but the network still permitted only point-to-point communications. A Phase II DECnet network could contain up to 10 nodes.

DECnet Phase III extended the network size to a maximum of 255 nodes. More importantly, however, the architecture grew to five layers, the new one being the transport layer which added an adaptive routing capability to connect nonadjacent nodes in the network. This meant a new protocol—the transport protocol TP.

Unfortunately the terminology of network and transport layer names between DECnet and the OSI model is reversed. Layer 3 for OSI is called the network layer and for DECnet is called the transport layer. Similarly layer 4 for OSI is termed the transport layer and for DECnet the network services layer. This can be somewhat confusing.

Some recent writers have described DNA in terms of eight layers: the physical link, data link, transport, end-to-end control, session-control, network-management, network-application, and user. The top three layers are user oriented, the bottom four are system oriented, and the session control layer contains the software necessary to handle network input/output, control access, and initiate network tasks in response to application requests. Thus we see the evolution of DECnet from four to five to eight layers of hierarchy.

Phase III also introduced support for multipoint links. An X.25 interface was added to DECnet to maintain compatibility with the rest of the world, and an SNA protocol emulator was announced.

DECnet Phase IV will add an Ethernet interface capability and extend the network's maximum size to 1000 nodes.

COMPARING DNA AND THE OSI MODEL

Although somewhat surprising at the onset, the Digital Network Architecture is very similar to the OSI Open Systems Interconnection Architecture. The bottom four layers are essentially identical. The most jarring note is the annoying transposition of network and transport. The functionality of these layers is not disturbed by their nomenclature. DECnet has added the standards which have been established at this level—X.25 and Ethernet (although

Ethernet's future as a standard has not been assured at this writing, it seems likely that IEEE 802 will adopt as part of its Local Area Network standards the basic Ethernet scheme) to their existing DDCMP.

The presentation layer does not properly exist in DNA, but the Data Access Protocol does provide a remote file access service which performs some format conversion between the various internal file formats (sequential, relative, indexed, byte count, streamed, etc.) found on heterogeneous systems in the network.

As the standards have formed, DECnet has added them to its existing methods. At this writing an effort is being made to establish an approved standard for the transport layer protocol. There is discussion of further standards at the higher levels of the OSI model, but there are such wide disparities between the vendors (file system formats for example) that it seems unlikely that they will be a serious consideration for the network designer within the foreseeable future.

SUGGESTED READING

For the reader interested in reading further in the area of computer networks and protocols, Andrew Tanenbaum's *Computer Networks* is highly recommended. Tanenbaum's article on "Network Protocols" in the December, 1981 issue of *ACM Computer Surveys* is an excellent overview. Hubert Zimmerman's paper "OSI Reference Model — The ISO Model of Architecture for Open Systems Interconnection" in *IEEE Transactions on Communications* (April, 1980) is the primary reference for information in this area on the OSI model.

Digital Network Architecture is described by Stuart Wecker in "DNA: The Digital Network Architecture" (April, 1980) *IEEE Transactions on Communications* and in "DNA: An Architecture for Heterogeneous Computer Networks" by George Conant and Wecker, *Proceedings of the Third International Conference on Computer Communications*. Another good article is "Architectural Evolution: Digital unveils its DECnet Phase III" in the March, 1980, issue of *Data Communications*.

Layer	ISO Model	DECnet
7	Application	Application
6	Presentation	
5	Session	NONE
4	Transport	Network Services
3	Network	Transport
2	Data Link	Data Link
1	Physical	Physical

The approximate correspondence between the Digital Network Architecture and the ISO Open Systems Interconnection Architecture.

. . . continued on page 49

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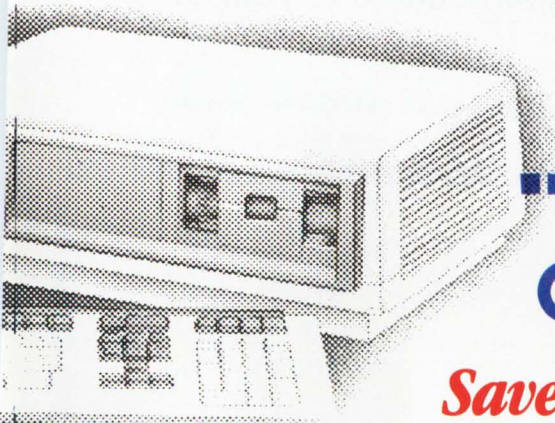
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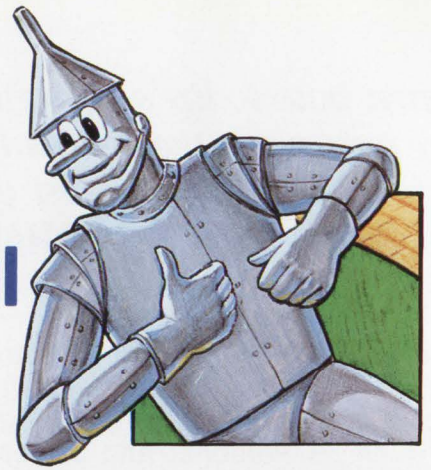
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"FRIENDLY" IS IN THE EYE OF THE USER

By Judy Susia, UINICOMP Corporation, Seattle, WA

Six months ago, I thought that software was a Women's Wear Daily term, and was not certain whether firmwear was discussed in mixed company. Had someone asked me what kind of data processing equipment I was familiar with, I'd have answered unhesitatingly, "BIC Banana." Now, however, I'm a User. And what's more, I've come to the conclusion that I've been a User for almost 20 years: I've used the Royal Manual typewriter, the IBM Selectric typewriter, the IBM Correcting Selectric, and now—CT*OS Word Processing, installed in a VAX 11/780. Anyone who does anything for 20 years is bound to develop some strong opinions about it. My most recent strong opinion relates to the term, "User Friendly."

For example, when I visited the Anaheim DEXPO, I compared some other word processing softwares with the one we use. Here may well have been the greatest number of "User-Friendly" references ever assembled under one roof in the history of mankind. Some of the systems to which they referred, however, were perfectly dreadful: complex maneuvers on unlabeled keys gave access to Ruler Mode, and once there, you had to draw your own base line for margins, tabs, line spacing. Then you had to re-manuever back into insertion mode to continue. There were systems that made you switch back and forth between correction and insertion modes for every typo. There were other horrors, yet these demonstrations were larded with vendor assertions that these were "User-Friendly" systems. When I presumed to point out that a tabulator is not a multi-column capability, one vendor suggested that a woman was hardly likely to understand these complex technical matters. Maybe so. Still, I am a production-level user of a sophisticated word processing system. I've trained other users in its use, and I've written a word processing manual for secretaries. This, plus my 20 years background with earlier word processing technologies, makes me pretty confident that I know a tabulator when I

see one. I also know friendly when I see it, and these were not friendly systems: they weren't even polite.

The problem here could be that "User-Friendliness" has become a cliché through overuse. Or maybe "friendly" is relative: I know one DP old-timer who thinks any system you can operate without a wrench is "User-Friendly." Then, too, the problem may be our vague definition of "User."

Consider that the typical user of most OA products is the secretary, typist, clerk, bookkeeper—usually women. If we take the "usually" rule a couple of steps further, we might be able to draw a general outline of what a new user might be like:

If she's under 30, the chances are excellent that she is responsible for children. Sitters' operating hours being what they are, and childrearing being what it is, this user may have little or no "extra" time, money, energy or attention. If she's over 30, she may well resent having hard-won and well-honed skills made obsolete by new technologies. Speed and accuracy requirements are becoming just as obsolete as those for strong, even keystrokes for uniformly dark characters and a readable tenth carbon copy. OA, like the six-gun of the Wild West, is the great equalizer. Status and security are in jeopardy.

Whatever the age, technophobia is not at all uncommon.

Then let us consider the field itself. It is not particularly well paid, nor are advancement opportunities numerous. The work can be brain-numbingly dull, and the stress level, according to a recent study, is second only to that experienced by Air Traffic Controllers. Also, many secretaries and typists are aware that they may be regarded as unbright because they remain in this traditionally female field; hence, a common objective is to find work with more status. Add to this a normal suspicion of change (to which no group is immune), and we have a rough sketch of the typical new user.

If the usual definition of "User-Friendly" is inadequate for this group,

then what may be required is a system that is not merely friendly, but seductive.

THE USER-SEDUCTIVE SYSTEM

1. It should be well-researched by the organization's systems people to be sure that it works the way it's supposed to, especially in combination with DP operations. Nothing could be less seductive than to kick WP users off the system because the WP software slows or halts data processing.

2. It should be in English, not code, and include a minimum of DP jargon.

3. There must be some provision for labeling the keys.

4. It should be menu-driven.

5. The basics should be designed so that the new user can produce simple documents after brief introduction to access, entry, correction, editing, and printing.

6. It should be sophisticated enough to reward the user's assimilation of each new capability with a more manageable workload. These capabilities will certainly include list processing, transferral of documents between users and in the same account, pot-boilers, cut & paste and user keys.

7. Secretarial work has certain standards, including appropriate division of paragraphs in pagination, avoidance of separating certain word groupings between lines (such as month and day, or proper names, etc.). The user must have discretion and flexibility in these areas.

8. Corrections should be as easy as mistakes. The PAC-MAN method is infinitely preferable to correction/insertion modes.

9. Routine adjustments should be routinely made—no fancy maneuvers should be required for margin, tab, or line spacing adjustments. Printing should require no more than one menu.

10. Continuing support should be available, preferably from a human being. This goes double for training: technophobiacs receive little comfort at the prospect of on-line training.

11. The documentation should be readable; if it isn't look around for a set of instructions. NOTE: Instructions and documentation are different. Imagine trying to assemble a tricycle late Christmas Eve with tricycle documentation. Then compare that image with

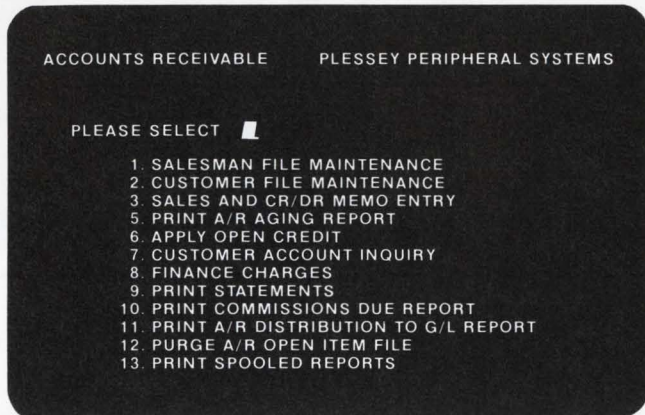
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4:	Foreign Sales	300,000	309,000	318,270	927,270	
5:						
6:	Total Sales	1,200,000	1,236,000	1,273,080	3,709,080	
7:	Cost of Goods Sold	624,000	635,030	646,267	1,905,297	
8:						
9:	Gross Margin \$	576,000	600,970	626,813	1,803,783	
10:						
11:	Operating Expenses					
12:	Sales Expense	149,000	150,490	151,995	451,485	25.0
13:	Marketing Expense	142,000	143,420	144,854	430,274	23.9
14:	Admin Expense	99,000	99,990	100,990	299,980	16.6
15:						
16:	Total Operating Exp	390,000	393,900	397,839	1,181,739	65.5
17:	Interest Expense	21,000	21,000	21,000	63,000	3.5
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the straightforwardness of a recipe for duck a l'orange or crochet instructions. Neither is simple, but both are stripped of unnecessary verbiage and presented with the meat close to the top. We users aren't stupid, you know: just inexperienced about computers.

12. A tabulator is not a multi-columnar capability.

THE POLITE INTRODUCTION TO THE SEDUCTIVE SYSTEM

Even a Robert Redford system requires a polite introduction. Take, for example, this company's transition to memory typewriters: the machines were bought second-hand, and although a short initial warranty period was provided, training was not. Neither were manuals, which the manufacturer refused to sell to owners of second-hand machines. The training cost per user was \$300, and could be acquired only at personal expense.

Secretaries were not warned of the coming transition, but returned one Monday to find their old Selectrics gone, and memory typewriters in their places. Management, assuming a typewriter is a typewriter, had no inkling that users couldn't reach a typo to erase it, and that the backspacing corrector would lift only half the error. It was also unfortunate that no plans were made for a reduced workload. Tempers were short, and trauma the order of the day. Several years later, this same management wondered why

the help seemed so reluctant to embrace word processing.

In comparison, my own firm's transition was downright sexy:

Reassurance—and—Familiarization. Users were assured that the typewriters would stay as long as they were wanted. At the same time, however, management cleverly provided a terminal beside each typewriter, with an account established for each user in her own name.

Training. Training was provided, and in the following way: One user was selected to receive in-depth training at the developer's site. This resulted in her being an in-house trainer, permitting gradual training, as opposed to a blitz (which certainly would have overwhelmed the more timid users). One-to-one training was scheduled, in increments of 30-minute sessions, first three and then two times/week. This did not interfere substantively with production, and further reassured the users.

Training was given high priority by management, discouraging interruption, postponement or cancellation of training sessions by executives with last-minute crises.

Transition. The users managed the transition. Each chose whether to word-process a task, or to revert to traditional methods. Within a couple of weeks after training began, users were word-processing about 90% of their workloads. (The remaining 10%

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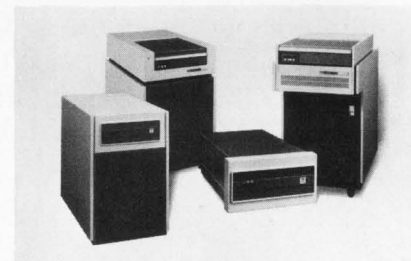
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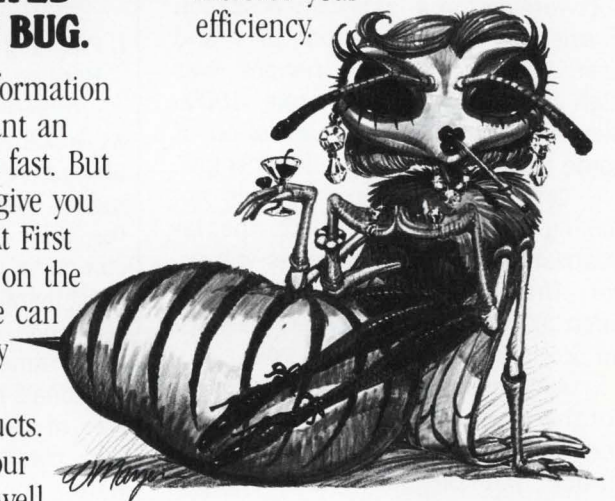
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depended upon acquiring another printer.)

The users met weekly to share problems, applications, and/or any mistakes, and developed supportive procedures and formats. In addition, they designed a central printing facility that automated most of the printing. (These weekly meetings, incidentally, resulted in the formation of the first CT*OS Users Group, and now includes users from other Seattle area organizations.)

Results: Production was virtually unaffected. Management was happy; the users were happy; DP was happy; and the conversion accounted a success by all involved. This was a User-Seductive conversion.

THE KEY

Hindsight, as they say, is 20-20, so now it's easy to see why this transition worked. The key, I believe, was respect for the user and the demands of the user's work. This was apparent in the software design, the care my boss took in selecting it, the transition plan, and user involvement. The reward was high production, good morale, 100% user success and the preservation of some very fine working relationships.

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A case in point is that the design for this plan came from our DP department. This does seem to negate a nasty rumor that DP people are long on technology and short on humanity. My own experience is that DP people, besides being very smart, are also tolerant, painstaking, witty, caring, and highly principled.

These qualities shine in genuinely friendly work—from design and documentation to system selection and humane transitions. This is what is broadening and strengthening the bridge to the 21st Century, over which so many of us must cross during the coming decade.

For myself, then, who have just set out on the journey, on behalf of my fellow travellers, and also for those who are yet to begin, I thank you. Thank you very much.

HANDLING PROBLEMS IN THE DEC ENVIRONMENT

By Howie Brown, Jamestown, RI

Introduction.

As DEC professionals, we have in common with all data processing professionals the problematic nature of our work. On the other hand, we face a unique set of circumstances stemming from the characteristics of the DEC world. That is to say, the problems we confront each day are shaped by such special factors as DEC's own structure, the nature of DEC-compatible hardware and software markets, the roles DEC systems are expected to fill at their sites, the architecture of the machines themselves, the availability of reliable support resources . . . the list is long.

I. Planning in the DEC Environment, or How to Avoid Surprises

Planning, which can be thought of as a blueprint for action, is often underdeveloped in the DEC environment. There are at least two reasons for this. First, the interactive mini-computer offers DEC programmers in most installations on-line access and interactive de-bugging. Unlike their mainframe-based colleagues, DEC professionals have developed their talents free of the turnaround limitations of the traditional batch environment. Batch mainframe systems typically have need to get the most bang possible out of a given test run. DEC professionals, on the other hand, have been more able to do "seat of the pants" work without sacrificing productivity.

The second reason why planning is often weak in DEC installations is the relatively small capital investment required to acquire a DEC system. As opposed to the costly mainframe and its considerable population of manager/systems analyst/system programmer/applications programmer/production manager/DP manager. One or two junior programmers/operators might round out this installation. The exceptions to this rule seem to be those

organizations where the DEC system is part of a larger DP network requiring a sizeable support staff.

On the other hand, the large mainframe support staff has historically included systems analysts or others whose primary function has been planning. For the traditional mainframe site, planning is an integrated discipline; for the DEC site, it is often an afterthought.

Planning requires an investment of staff time, therefore a cost. When is it cost-effective? To answer this question, we should first consider the point made at IRUS '82 by Rick Scherle of Software Techniques, namely, that planning is not unproductive time. Programmers who breathe a sigh of relief on walking out of planning meetings so they can "go back and get some work done" are off the mark. Planning typically makes time instead of consuming time. To the objection "we can't afford to do the kind of planning you recommend," the question should be, "Can we afford not to?"

Here is a profile of a classic unplanned project. Remembering that what applies to a complex project can also apply to a simple task, let's look at the risks the professional exposes himself to by underplanning:

BUDGET.

Based on ambiguous statement of user needs.

Unrealistic, usually overly optimistic.

TIMETABLE.

A guesstimate; typically reflects overall manpower planning based on a number of unrealistic budgets.

SPECIFICATION.

May consist of no more than some sketchy report layouts.

May be based on a series of verbal understandings between two individuals.

Many "hidden requirements" don't get specified.

. . . continued on page 30

TAMING THE EAGLE...

High-speed disk drives, like the Fujitsu Eagle, on your Q-bus? You bet, with Emulex's new SC03. This single-board controller supports full 22-bit addressing, boasts 14-sector buffering, and can handle 32 different combinations of drive configurations and much more—all for \$2800 list.

Current emulations: single or multiple RM02, RM05, RM80 or RP06's in either standard or expanded versions. You can look for the models that support the Eagle in April.

THROUGHPUT, THROUGHPUT, AND MORE THROUGHPUT...

Why should you VAX-750 and 780 users wait in a data traffic jam on the Unibus? An Emulex-controlled subsystem incorporating a CDC, Fujitsu, or other SMD disk drive can hook you right into the high-speed CMI or SBI bus.

Q-bus and Unibus environmentalists, take heart: You can plug an Emulex-packaged subsystem into Q-bus and Unibus models and gain efficiency—like no more infuriating, software-crunching "data lates."

BUSY SIGNALS...

All you DMF-32 dependent VAXers can expand communications with the DMF-32 emulating F models of Emulex's CS11 and CS21 communications MUXes. The F's offer 16 to 48 remote modem-controlled lines, compared to two remote modem-controlled lines per DMF-32. Present CS11-21ers can upgrade to the F models via a \$350 PROM change.

What's more, Emulex hears that DMF-32's are available from DEC only on certain VAX-11 models, and then only after a wait. The F's are available now for all VAX-11s.

RECIPE FOR VAX STORAGE...

Take one Fujitsu Eagle, add one CDC Keystone streamer for backup, mix well with an Emulex disk controller and an Emulex tape coupler, and pour into a 42-inch DEC-compatible cabinet. The result: The PXD51 Series, a complete line of high-speed, high-reliability mass-storage subsystems that provide combined disk and tape capability.

Storage capacities: 349 to 414 MBytes. Prices from \$26,150. Compare that to the competition, byte for byte.

FROM THE EMULEX FILE...

Emulex's figures for the first half of FY '83 are in: Revenues up 98 percent; earnings up 120 percent; earnings per share up 93 percent (that reflects our second public offering, completed in October). Emulex has reduced prices on selected Q-bus and Unibus products—SC02, SC04, TC01, SC21/V, and TC11. Special invitation: Next time you're in Southern California, give us a call to schedule a visit to our new 70,000 square-foot home in Costa Mesa, and we'll talk DEC there.



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COST.

Budgeted costs for planning and project support are relatively low.

Non-budget costs for items such as rewrites, fire-fighting, user dissatisfaction, and ongoing support are high.

PERFORMANCE.

Unwelcome surprises.

Inflexibility and difficulty in meeting changing user needs.

Interface problems.

Actual completion date may bear little relation to original target date, with no clear explanations.

Departure of key staff may spell disaster.

DOCUMENTATION.

Mostly done after the fact.

Superficial, incomplete.

STAFF DEVELOPMENT.

Assignments tend to be piecemeal tasks, therefore systems understanding among junior staff is not enhanced.

ONGOING SUPPORT.

Production mode requires ongoing senior staff intervention.

Now let's look at a well planned project or task:

BUDGET.

Based on a requirements analysis produced jointly by senior systems staff and user.

Within 15% of actual cost, based on original requirements.

Budget revisions due to change requirements are manageable tasks.

TIMETABLE.

Based on a fairly accurate prediction of resource availability.

SPECIFICATIONS.

Thoroughly documented, including report layouts, data flow, processing logic.

Draft specifications are widely distributed for critique.

Specs form the basis for eventual system documentation.

User-submitted change request can be incorporated into existing documentation in an orderly manner.

COST.

Relatively high budgeted planning and project support cost.

Non-budgeted costs (rewrites, fire-

fighting, user dissatisfaction, ongoing support) are low.

PERFORMANCE.

Generally meets user expectations.

Flexible in meeting changing user needs.

Completion data reasonably on target; deviations can be justified.

Loss of key staff may cause delay but not disaster.

No disruptive impact on the organization; the project fits into a smooth overall work flow.

DOCUMENTATION.

Mostly produced during development stage.

Generally thorough and accurate.

STAFF DEVELOPMENT.

Due to their involvement in planning, systems understanding among junior staff is enhanced.

ONGOING SUPPORT.

Few fires to fight.

System operates smoothly in production mode.

Need for programming support is limited and can mostly be handled by juniors.

Given this comparison, it's reasonable to expect competent management will perform a cost-benefit justification of the size of the planning budget for any non-trivial systems task.

Once they are down on paper, the risks associated with "seat of the pants" systems work usually look bigger than they're assumed to be. Since it makes time, rather than consuming time, planning can be expected to pay for itself several times over.

Good plans make sense in a number of specific situations. Here's a partial list of time savers:

Task sequences

Operations checklists

Timetables

Requirements analysis

Coding specs, especially using pseudo-code

Design decisions

Procedures

In future articles these items will be looked at in some detail.

UNDERSTANDING THE ELEMENTS OF SOFTWARE SUPPORT

AN INTRODUCTORY WORD

By John M. Gram

Support of software products is often loosely defined. Service departments, complaint departments, and marketing support personnel are not new; but the advent of software products that provides "easily, and cheaply updated" versions throw new light on this age old profession. This characteristic of our unique type of product has both advantages and disadvantages. Some vendors perhaps abuse the benefit by releasing software "just slightly ahead of our time." But properly managed, vendors may use the unique qualities of software products to provide timely, supported products. This series of articles addresses support of a software product from two perspectives; if you are either a vendor or a customer the articles should stimulate your thinking. While many of the issues are intuitive, as in any field, familiarity

"...Support is the phone ringing, the emergency, and that three-o'clock-in-the-morning interruption of sleep."

"...This new picture might provide some hope. We will never do away with that 3 A.M. call — however, with some planning, we can better anticipate our support of software products."

often takes us captive and prevents us from viewing our situations from more than a single perspective.

This series deals very little with hardware; its primary emphasis is the support of software products. Unfortunately, the word support means different things to different people. Some people don't like to think about support because they are field service representatives; customer support means that their beeper has gone off and they must leave the warm sheets for a cold car. Support is the phone ringing, the emergency, and that three o'clock in the morning interruption of sleep.

In contrast, I'd like to present a different picture of support. This new picture might provide some hope. We will never do away with that 3 A.M. call! However, with some planning we can better anticipate our support of software products. Without planning, product support is impossible. Careful planning eliminates irrational and illogical compromises made in response to a crisis. Instead, careful planning provides for reasonable, predictable, and acceptable response prior to the crisis event.

I remember years ago from my childhood the carefully lettered sign that spelled out the slogan, "Plan Ahead." All had gone well in lettering the sign except that the last two letters were squeezed in and curved around so that you had to turn your head to read them. Do you remember seeing that placard? Plan ahead. And really, unless we plan—software support will never be more than wrestling with one crisis after another. So I will present some ideas for your consideration; these ideas will equip you to better support your software product.

Some manufacturers defer thinking about support until after they have thoroughly saturated the market with their product. It's like the radio that the salesman wants to install into the new car that you're buying. Since he ordered the car from the factory without a radio, an "after market" radio must be put in. It looks quite similar to the factory model. But, somehow it just doesn't quite match up to the radio you could have had. Similarly,

unless product support is considered during the design of the product the battle is lost before it has ever begun. The best support plan must begin during product planning.

The future belongs to software vendors who offer the best product and the best support of that product. As users of computers become more familiar with computing systems and software products, they also become very discriminating consumers. Features will not be the singular characteristic of the product that sells. Software consumers (at least in the business realm) will also look for solidly performing products with accompanying documentation, training tools, and support services. As salaries continue to rise, the need for simple and yet powerful computing tools will continue. Powerful tools that are too complex for use and tools that break frequently will soon be cast aside for tools that are functional, dependable and enduring. In the near future, purchasers of software packages will not ignore

the worthwhile investment in a solid product in exchange for a cheap substitute. Software will be held up to the standards that other products have had to meet.

A Definition of Terms. Let's begin by defining the term: support. Product planning, faithful implementation, thorough testing, ample documentation, adequate training, and a program of problem correction all entwine to form product support. In the next several issues we will look at each of these elements of support. Some will be more pertinent for the vendor of software products; others will be directed more to the software product consumer. While I don't believe that there exist final answers to all of the issues, this series will provide a forum for discussion. Please feel free to write to me with your comments and ideas: John M. Gram, Software Support Manager, Data Processing Design, Inc., 181 W. Orangethorpe, Suite F, Placentia, CA 92670

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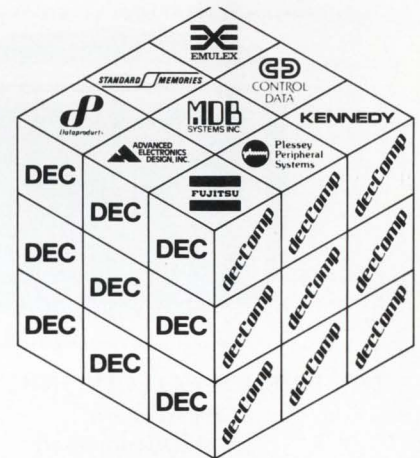
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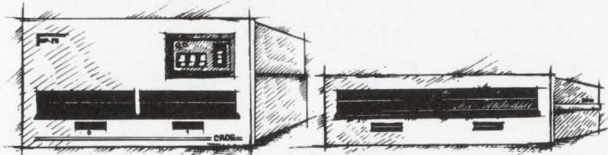
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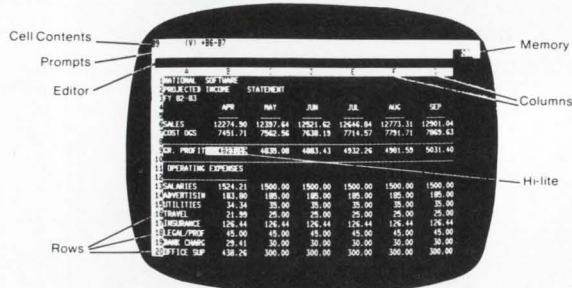
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CIRCLE D149 ON READER CARD

A VIEW FROM THE INSIDE

By Jerry Cashin

Perhaps it is their inherent New England conservatism; or perhaps they were a little tardy in recognizing the dimensions of an emerging market. It may even be the result of a perception that product longevity in the personal computer arena will hinge ultimately on system quality. But whatever the reason, Digital Equipment Corporation is a relatively late entrant to the personal computer sweepstakes.

At this point in time, there are over 160 offerings that fit into the small computer niche. Even a firm with the resources of DEC could find it difficult to penetrate this market in volume—unless they present something beyond the realm of the mundane, conventional systems served up by many of their competitors.

I tend to believe that corporate management did, in fact, recognize the business opportunities available in the end user micro marketplace, but like their Colonial forebears of yore—held their fire until ready. Ready in this case with a superb product line of personal computers. Not perfect, mind you, but an impressive array of customer-targeted units that will find almost universal acceptance.

The end micro market is, and probably will remain for several years to come, a volatile, almost seething, miasma of competing claims, niche-seeking product announcements, and harried product designers frantically lurching to stay one step ahead of gaining competition. It is an arena where one "hears footsteps." that is, today's sensation is tomorrow's wilted rose. A portable computer in a suitcase is faddishly intriguing one month, only to be eclipsed by a "better mousetrap" introduced the following month.

How does a responsible, almost paternalistic, business entity deal with this chaos? DEC has chosen to confront the situation in a manner that finds its parallels in human, as well as capitalistic terms. They have brought forth a fraternity of systems.

From the smallish Rainbow 100, through the functionally specific DECmate II, to the Professional Models 325 and 350, they have created a harmonious, if not always software compatible, fraternity of beautifully contoured processing systems. Rather than presenting a one-dimensional product that appeals to a limited segment of the buying public (as is often the case with a majority of the competition), DEC has "shotgunned" the potential customer base by generating a series of offerings that will be viable across multiple user populations. They waited to do it right—and they've done it, although, as stated, they are not fully compatible among all systems.

There are problems, however. Some of them have to do with the line itself, and others emanate from the realities of the current marketplace. Let's look at some of the known, and some not so well known, combatants that the DEC offerings will encounter in the immediate years ahead. Then

we shall look "over the shoulder" of company management in the person of Vice President of that firm's Small System Group — Andy Knowles, to record an executive view of, what is to DEC a whole new adversarial arena. First, the competition.

IBM — They will probably be number 1! There is an incredible momentum building behind this product, some of which is not all that obvious to the casual observer. First and foremost—they have a superior system, the first of the 16-bit generation within their price range to appear in mass quantities. The legendary "comfort factor" index associated with IBM has been invoked to the fullest. Their component packaging has become a model for the opposition including DEC. Their marketing is demonstrating the usual full-bore, smoothly tuned efficiency to which we have all become accustomed. IBM has produced a genuine market force.

Far more important than the preceding factors, however, is the avalanche of third party software about to become available for the PC. If synergistic, interrelated functional software represents the next generation of end user service, and I think it does, then IBM's Personal Computer will be at the forefront of its proponents. Evidence of this can be seen in two of the earliest examples of functionally integrated application software: Context Management Systems' "MBA" package and Lotus Development Corporation's "1-2-3" offering. They are both initially targeted for IBM's little dynamo.

Apple — The trailblazer and spiritual father of the personal computer industry as it has currently evolved, they perhaps offer the greatest challenge to IBM's seeming ascent to number 1. It all depends on the promise and performance of Apple IV. Touted to be an M68000 creation, it must break the mold of its technological counterparts (Radio Shack Model 16, Fortune 32:16, Corvus Concept, etc.) and forge new pathways in an industry accustomed to dramatic innovation.

This is not to say Apple will disappear if their new entry turns out to be less than a blockbuster. Assuming it is an otherwise quality product, Apple will remain a vital factor in the overall marketplace. But we are discussing Number 1, and to attain those lofty heights they will need a superb new computer system, especially in the areas of end user software and design flexibility.

Tandy — To paraphrase an old chestnut—The sun will never set on the Radio Shack empire! Not as long as they have over 6000 retail stores to market the package. The Model 16, which is their contemporary weapon against the products already described, is a fine system, but operates with the customarily unique Radio Shack operating system (TRSDOS-16). No company-generated attempt at compatibility here. If you join the Tandy team, you more than likely remain within their software orbit.

This is not necessarily a bad situation, since the company itself, along with an important array of third party software vendors, will undoubtedly provide completely acceptable user support in the years ahead. Small computer aficionados too often underestimate what Radio Shack has and can accomplish. They will be very strong for the indefinite future.

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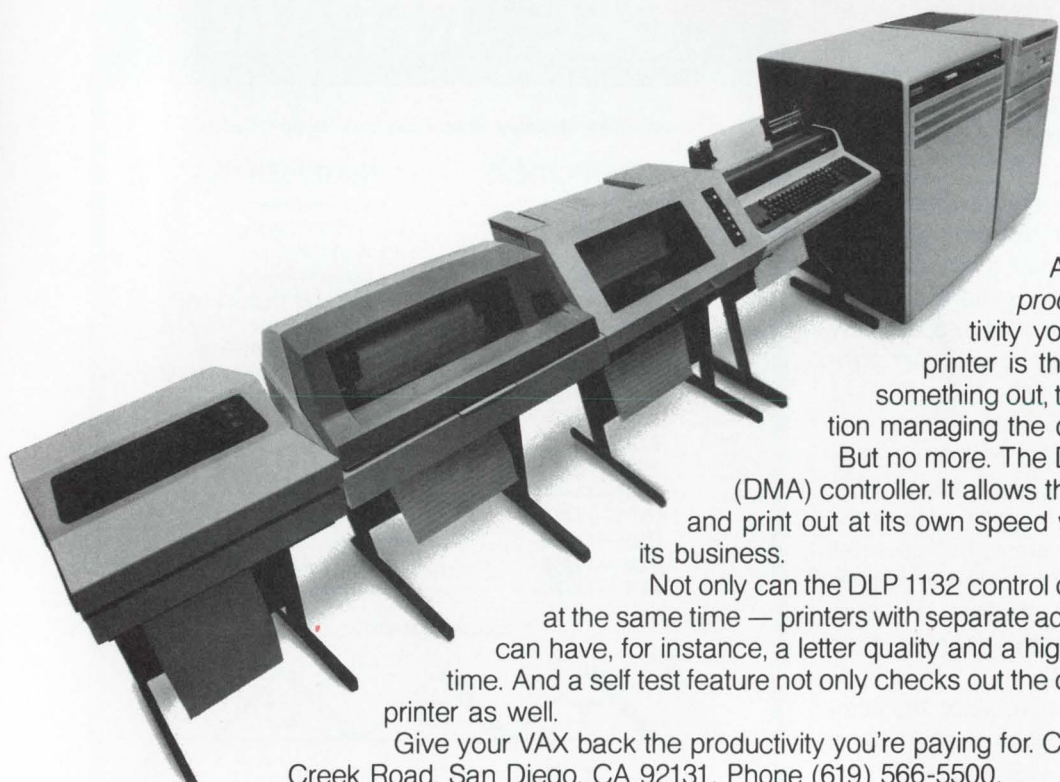


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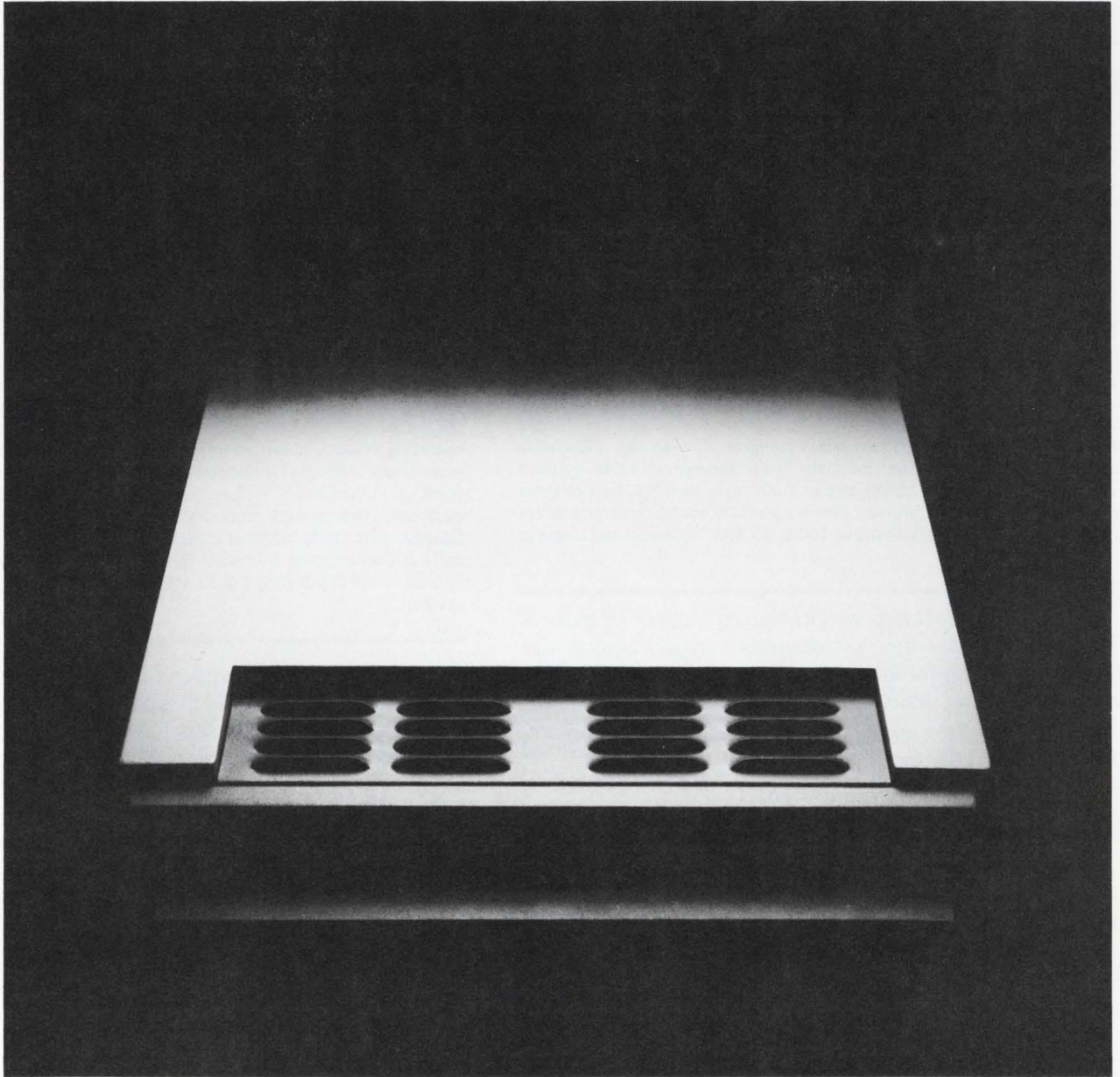
But no more. The DLP 1132 is a direct memory access (DMA) controller. It allows the printer to access memory directly and print out at its own speed while the computer goes on about its business.

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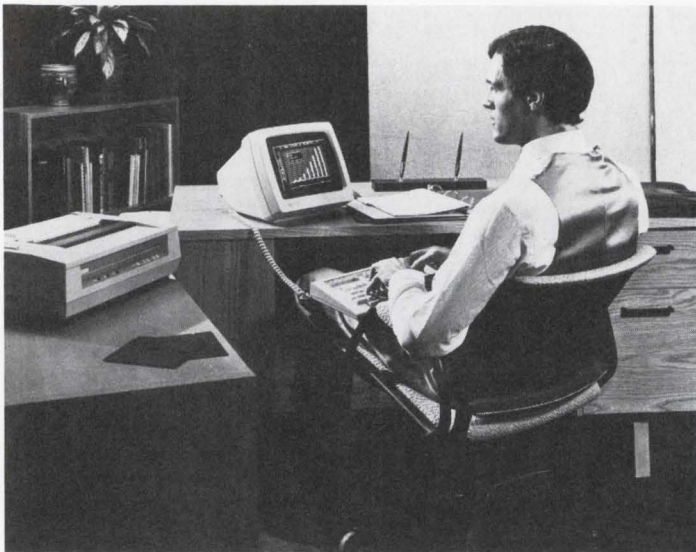
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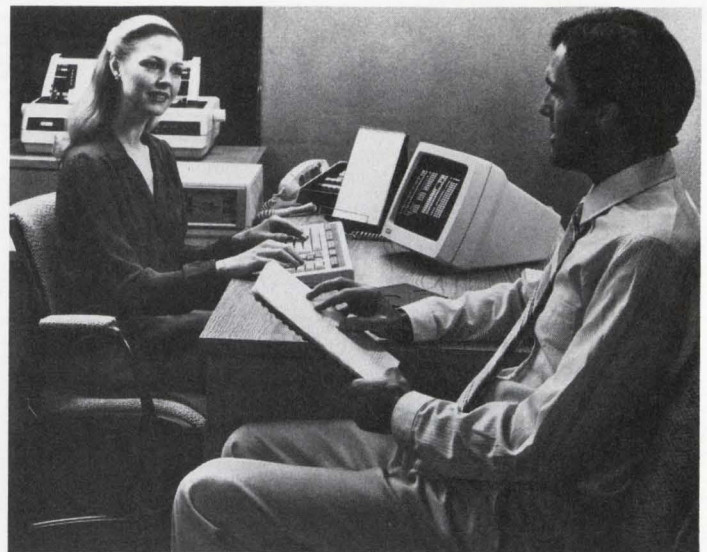
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Digital Equipment Corporation's new RAINBOW™ 100 personal computer is a compact, modular system that uses a two-processor, parallel-bus architecture to run either 8-bit or 16-bit application programs under the CP/M 86/80 operating system. System components include the 12-inch (diagonal measure) monochrome video monitor, low-profile, detachable keyboard, and a system box containing the processors with 64K bytes of memory (expandable to 256K) and an 800K-byte dual 5¼-inch diskette drive. The LASO matrix printer, shown at left, is one of three printer options. Basic price of the RAINBOW 100 is \$3,495. Deliveries will begin in the fall.



NEW DECmate II PERSONAL COMPUTER from Digital Equipment Corporation features one of the most advanced word-processing software packages in the industry. Primarily targeted for office management applications, DECmate II runs business application programs running under the COS 310 operating system. It can be linked to other computer systems via communications software for electronic mail or document transfer. Prospective users of DECmate II include secretaries, administrative aids, small businesses, independent professionals such as dentists and lawyers, and financial personnel, and other professionals in large corporations. The DECmate II uses compact 5.25-inch floppy disks and can be optionally configured to use 8-inch floppy disks used with other Digital word processing systems.

Cromemco — Not as well known as some of its more illustrious brethren, this microcomputer manufacturer has built a reputation for innovational product reliability. Along with its existing M68000/Z80—based system offerings, Cromemco has now leaped into the lower-end personal computer ferment with the Model C-10, a CP/M compatible unit with impressive credentials. Due to its precedent-breaking price structure, I venture that Cromemco will vault closer to industry leaders in the next few years in terms of unit sales.

There are other contenders, many of whom are capable of tilting the perceived balance of power. Commodore, for example, is in the fray with the BX256 model which will sustain their position among the small computer power elite. The Corvus Concept, with its inbred link to the company's Local Area Network product entitled Omninet, should enjoy a significant success in certain segments of the small computer arena. There are several additional firms who may yet surpass some of the aforementioned companies in terms of enduring market success.

This is the battleground into which DEC is entering, not without its own considerable resources, but facing the challenge of a tenacious, experience-tempered lineup of competitors. The market is fortunately expanding at the rate of approximately 50 percent annually, so there is "room at the top" if the product merits such devotion. The Rainbow/DECmate/Professional Series triad does meet the test.

Their primary strengths are in the following areas: management, user friendly software, multiple product choices, and packaging.

Ken Olsen, company president, remarked during last Spring's press conference accompanying the introduction of the personal computer line that DEC sought perhaps 25 percent of the market once production hit its stride. My interac-

tion with his chief deputy for that task, VP Andy Knowles, makes it evident that Olsen has chosen the right man to lead the charge. Knowles appears keenly aware of the forces in the market place, and where DEC must focus its interests for the long term. We met recently at the firm's Marlboro, MA administrative facility.

At the time of our conversation, there were less than 2000 models in the hands of targeted users. Most were applied in-house, the remainder "shipped to software development houses to encourage systems application generation," declared Knowles. "We will have real volume production in December and January, with Computerland shipments beginning in late November," he said. "Hamilton is also working on distribution options, and we are looking at other markets," stated Knowles.

The marketing goals for these systems are multiple. The two units in the Professional series, the top-of-the-line Model 350 and its technological twin — the Model 325 are "aimed at Fortune 1000 companies," according to VP Knowles. "We look for a capability to interface with an IBM host," he declared. Other interface possibilities will also be pursued for these two powerful systems, which can function either independently or as workstations within a larger processing configuration.

By targeting Fortune 1000 enterprises, DEC is literally seeking, as the name of the Models 325 and 350 implies, professional users; people who can employ the full resources of the product, perhaps even adding mini and supermini systems as the maturation process unfolds. In any event, the \$4000-\$5000 starting price locks DEC into a definable market segment.

Dataram goes to extremes to satisfy LSI-11 users.

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BACKPLANE	8 x 4	9 x 4	9 x 6	9 x 6	9 x 6
I/O MAPPING	None	None	Q-MAP	KT24	Q-MAP
BUS	22-bit Q-BUS	22-bit Q-BUS	22-bit Q-BUS and 18-bit Q-BUS	22-bit extended UNIBUS (EUB) & 18-bit UNIBUS	22-bit Q-BUS and 18-bit Q-BUS
MEMORY & PERIPHERAL SUPPORT	Up to 4.0MB, but limited to 256KB when using peripherals other than RL01/RL02 or RX01		Up to 4.0MB. No basic limitation on peripherals.		
PRICING	B23, M23, and W23 are approximately 35% less than comparable DEC systems in 1.0MB configurations. Additional 1.0MB memory modules from Dataram are about 40% less than DEC's equivalent 1.0MB memory. Contact us for actual price comparisons.				

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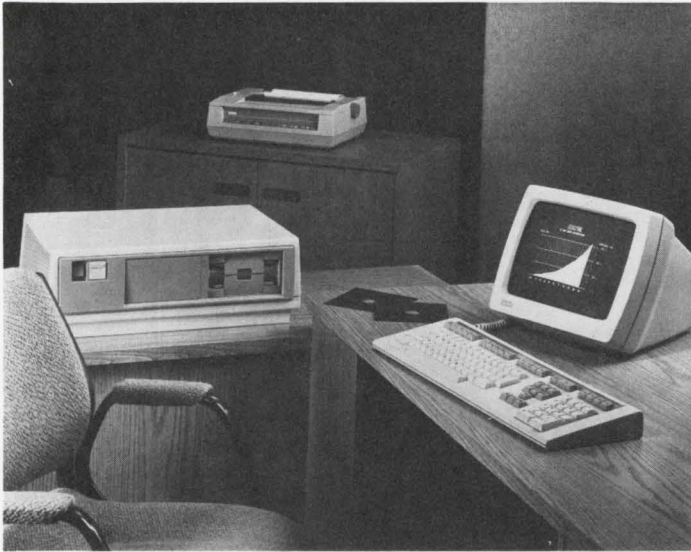
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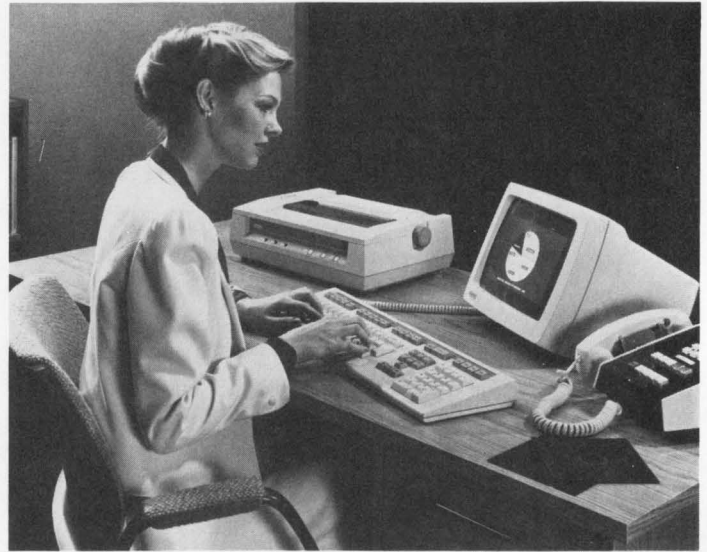
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The Professional™ 350, top of Digital Equipment Corporation's personal computer offerings, includes bit-map graphics as a standard feature along with a 16-bit PDP-11 CPU chip, 256K bytes of memory, 800-K byte dual mini-diskette drive, 12-inch monochrome video monitor and keyboard in a three-module configuration. The Professional 350 system box, which can be placed on a shelf, work surface, or in a floor enclosure, contains provisions for adding a five-megabyte Winchester-type disk unit and several option cards. The LASO dot matrix printer, shown here, is one of three printers available with Professional 300 series systems. The Professional 350 is priced at \$4,995; deliveries are scheduled for the fall.



Professional™ 325, one of Digital Equipment Corporation's new line of personal computers, features PDP-11 instruction set, dual 5.25-inch (2 x 400 Kbytes) floppy disks, 12-inch-diagonal bit map graphics display, low-cost dot-matrix printer. The new professional-grade personal computer employs an integrated, menu-driven operating system derived from the RSX-11M-PLUS minicomputer operating system with records management features added. Digital's Professional 300 series employs the same processor chip set as in the PDP-11/23 and PDP-11/24 computers, and has a memory capacity of 256 Kbytes, utilizing 64 K memory chips. The new Digital personal computers employ a human-engineered low-profile keyboard and CRT unit. The Professional 325 provides options that include a 13-inch-diagonal color CRT, an extended bit-map controller, and a floating-point unit. It is designed for use as a stand-alone system or for use as an element in a computer network. The Professional 300 series of personal computers has automatic diagnostic features to assure users of proper performance and to indicate any malfunctions for rapid repair.

Contrastingly, the Rainbow 100 is the entry level system, although with two CPU's and a large range of desirable features, it is not for the untrained neophyte. The Z80 and 8088 processors permit both 8-bit operation, not simultaneously, mind you, but alternately to allow older software to remain viable. New applications can subsequently be implemented in 16-bit mode. "It is for the individual user, the person who might use a spreadsheet," said Knowles. With up to 256K bytes of main memory, your prototypical independent operative has an impressive arsenal of computer resources with which to work, and at a base cost of about \$3500.

The DECmate II seems, to this observer, to be an adopted component of the product "family." Although sired by DEC, it does not present the software and hardware relationships evidenced in the Professional and Rainbow models. Built on the foundation of a modified PDP-8 processor, its operating system modules are unique to this unit.

That is somewhat understandable since, as Knowles states: "The DECmate II is for word processing, electronic mail, office management, and secretarial support". While this is certainly true, it does not alter the belief that DECmate II does not represent a symmetrical addition to the personal computer line. It resembles more an outgrowth of the earlier DECmate system, and functions as an upgrade to that predecessor. You are able to add a CP/M option, however, so that a certain degree of compatibility with the other offerings does exist. A DECmate II offering will cost approximately \$3700 at its lowest level.

Mr. Knowles cited five major characteristics emanating from the design phase that are key elements in their product fraternity. They are:

- Multi-tasking software (implemented in the Professional models).
- User friendly, menu-driven displays as opposed to conventional command-driven systems.
- More storage, such as permitted by the 800K byte total floppy disks and optional 5 million byte Winchester unit.
- Superior engineering and packaging, the latter having since been praised heavily by industry observers.
- Exceptional service, with several options by which a customer can request support.

Regarding interface to the DEC/Xerox/Intel Local Area Network entitled Ethernet, Knowles responds that "there already is a plug on the back of the machine." He estimates that the required "LSI technology should be ready by the middle of 1983." The connection cost per unit is the current stumbling block, so that Ethernet interface becomes more feasible. This is especially important to office automation configurations.

For long-range small system planning, the DEC Vice President foresees, in its barest form, more of everything. "More languages, particularly higher level, more speed and performance, more storage, more interfaces, more product expansion," he declared. Also envisioned is a larger degree of interconnect services to AT&T and IBM facilities. "The third generation now features multitasking. Multi-user software

“More languages, particularly higher level, more speed and performance, more storage, more interfaces, more product expansion.”



Andy Knowles, V.P. for Small System Development

will prevail in the future,” he predicts.

Knowles feels that DEC has pioneered the family alliance products concept at this level, as well as leading the way in people friendly software interaction. He anticipates many more functions being applied to the personal computer arena, and a strong increase in the use of very high level languages. This will make it easier for non-programmers to routinely utilize the systems. “PASCAL and C will predominate as application development languages,” he said.

Mr. Knowles expressed the view that the mini market will be undaunted by the spread of personal computers, particularly in the upper ranges of that activity. “It is more cost effective where significant storage requirements are needed,” he stated. An example of the latter would be found in large office automation environments. He did acknowledge that there might be a nibbling effect at the very lowest ends of the mini spectrum caused by microcomputers.

Thus, DEC is now launched into the personal system marketplace. They have the product mix needed to successfully confront the competition. Perhaps they are destined to be the top volume producer themselves, although this appears unlikely at this stage. Their market concept of a fraternity of offerings certainly presents great promise for customer acceptance and industry penetration. If DEC can sell up to 100,000 units in the first 12 months of full nationwide distribution, they will be well on their way to enduring achievements in the field of personal computers. . . . continued on page 42

Jerry Cashin is a civilian software specialist at Hanscom AFB, MA who specializes in personal computers. He has authored numerous articles for various publications.

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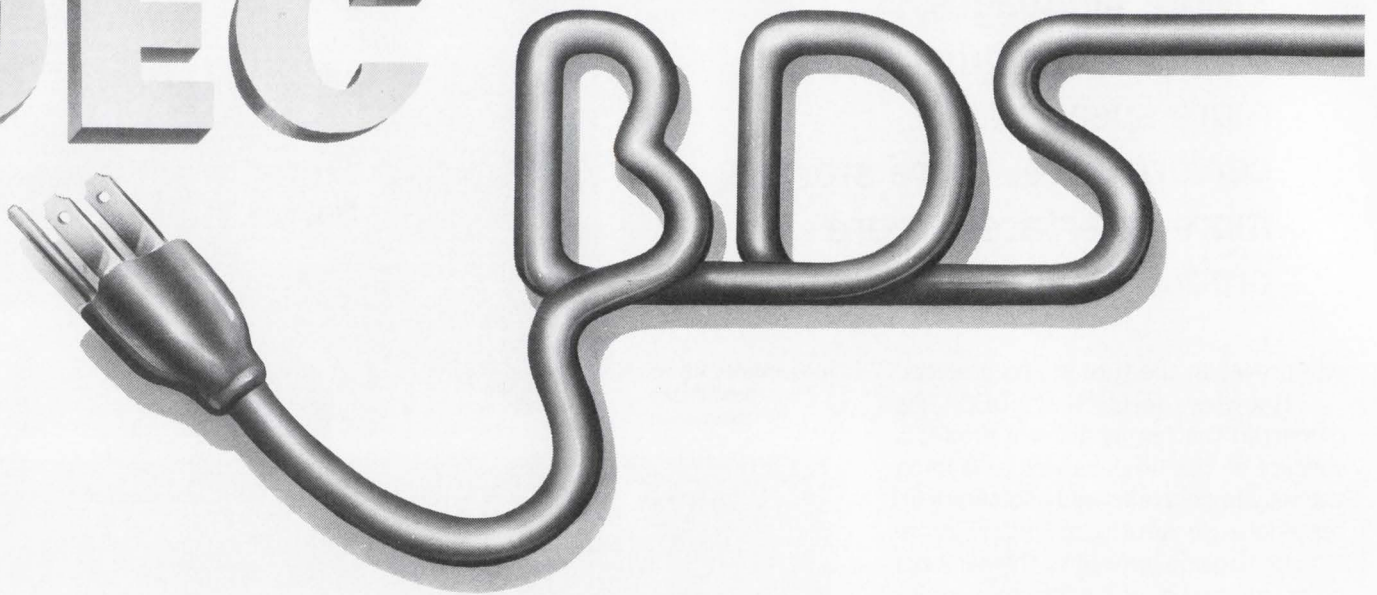
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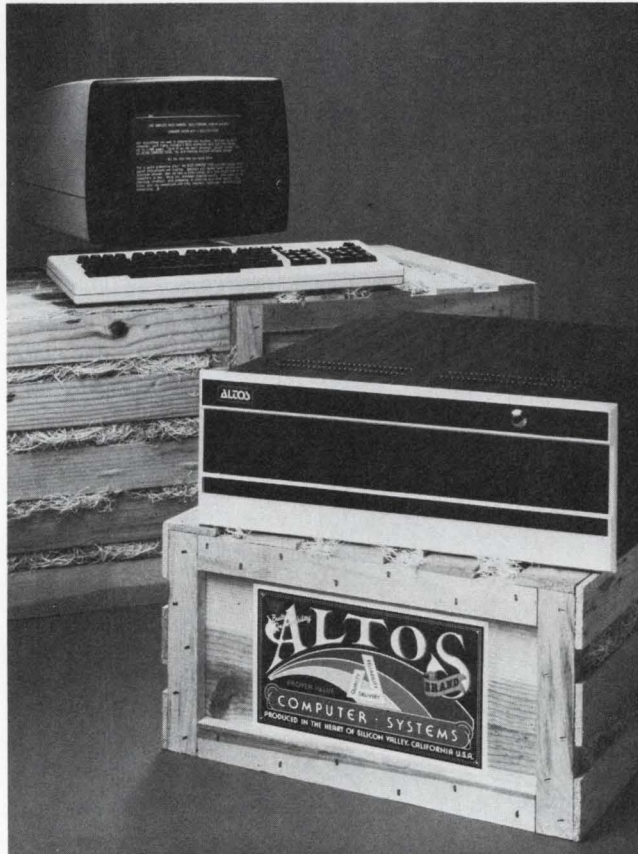
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DEC PERSONAL COMPUTER OVERVIEW

System	RAINBOW 100	DECmate II	Professional 325	Professional 350
Processor(s)	Z80 and 8088	6120 (PDP-8+)	F-11 (PDP-11/23)	F-11 (PDP-11/23)
Maximum Memory	256K bytes	64K words (96K bytes)	256K bytes	256K bytes
Operating Sys.	CP/M 86/80	COS 310 & WPS-8 (word processing)	P/OS	P/OS
CP/M Capability	Standard (86/80)	Optional (80)	To Be Announced?	To Be Announced?
Video Monitor	12-in monochrome	12-in monochrome	12-in monochrome	12-in monochrome
Video Control	Character Cell Graphics Option	Character Cell	Bit Map; integral graphics — color control optional	Bit Map; integral graphics — color control optional
Display	24 lines x 80/132 columns	24 lines x 80/132 columns	24 lines x 80/132 columns	24 lines x 80/132 columns
Color Video Monitor	Optional	None	Optional	Optional
Floppy Storage	5.25-in 800K bytes double density dual drive	5.25-in 800K bytes double density dual drive	5.25-in 800K bytes double density dual drive	5.25-in 800K bytes double density dual drive
Winchester Storage	5.25-in 5M byte optional (external)	5.25-in 5K byte optional (external)	None	5.25-in 5M byte internal option
Printers Supported	LA50, LQP02, LETTERPRINTER 100	LA50, LQP02, LETTERPRINTER 100	LA50, LQP02, LETTERPRINTER 100	LA50, LQP02, LETTERPRINTER 100
Printer Port	RS232	RS232	RS232	RS232
Telephone Management Sys.	No	No	To Be Announced	Yes
VT102 Emulation	Yes	Yes	Yes	Yes
VT125 Emulation	Optional	No	Optional	Optional
Memory Option	Yes	No	No	No
Misc. Options	Extended Capabilities Graphics	None	Floating Point Extended Bit Map Color Control	Floating Point Extended Bit Map Color Control
Third-Party System Software	MS-DOS "C" Compiler Compiler	CP/M 80	UCSD-P PASCAL Compiler	UCSD-P PASCAL Compiler

MODEMS & MULTIPLEXERS PART 4

By Carl B. Marbach, Publisher, DEC Professional

STATISTICAL MULTIPLEXERS

It is a buyer's market for statistical multiplexers. Many companies are producing a wide range of products that will multiplex data over a single phone line, providing us with multi-terminal capability at a remote location. There are simple products, complex products, expandable products; a diverse product line means tough decisions and confusing issues when trying to buy a statistical multiplexer. This article will try to help you sort out the important features to help you understand what and how much to buy.

HOW FAST DO THE MODEMS HAVE TO BE?

With the old time division muxes this decision was easy: Add up all the terminal's baud rates and that had to be the aggregate (speed of the telephone line and modems) rate. The aggregate rate could be higher if you didn't mind wasting bandwidth. If you had three 2400 baud terminals and two 1200 baud terminals the aggregate line would have to run at 9600 baud. Statistical muxes allocated the resources according to which terminal needed them, buffered other requests and X-OFF'd those it couldn't handle until it could when it would send an X-ON. The stat muxes are smart enough to do all this and the question is how smart are they; how much can we exceed the aggregate line speed and still be all right. Conventional wisdom said that up to two times the aggregate speed was fine, that is, four 2400 baud terminals could run on a 4800 baud phone line. In our office we have been running eight 2400 baud terminals on a 4800 baud link without any degradation in terminal response. In interactive use, up to four times the aggregate baud rate is not unusual. We also find that 2400 baud for terminals is a nice speed, fast enough to be look good and slow enough to fit four terminals on a 2400 baud link, eight terminals on a 4800 baud link and 16 terminals on a 9600 baud link. These are not hard written rules, in fact we have 16 terminals playing all day at 2400 baud on a 4800 baud link, a factor of 8 to 1!

HOW MANY CHANNELS DO I WANT?

That depends on how many terminals you want to run at the remote site. If you are clever, you can piggy-back terminals and a printer using the printer port of an advanced-video VT100 (or equivalent) and some software to activate or deactivate the printer. Once you have invested in the modems and the multiplexers you should be able to have each terminal on its own port, making them much simpler to use.

Multiplexers (by definition) start at two ports, both MICOM and BABYMUX have two port versions while most others offer a standard four or eight channel unit. TIMEPLEX makes eight channel through 24 channel ver-

sions and MICOM offers four through 16 channel units. The BABYMUX is unusual because it begins at two channels and expands with two groups of three making it possible to have two, five or eight channel configurations. COMDESIGN offers both a four and eight channel unit. GANDALF has several versions from four to 32 channels, some of which use a 16 bit microprocessor. RACAL-MILGO has four, eight, 16 and 32 channel versions and M/A-COM offers four to 32 channel models. DIGITAL COMMUNICATIONS ASSOCIATES (DCA) has multiplexers for four to 32 channel networks. INFOTRON offers models up to 32 ports in many different packages. To sum up: you can have from two to 32 channels and there are lots of companies to buy them from. If you are confused, slow down and keep reading; it may help.

WHAT KIND OF MODEMS DO I USE?

Modems, like multiplexers, come in many different sizes and shapes. Depending on the number of remote terminals you first have to decide how fast you want the modem to run the aggregate link. Remember the rule-of-thumb that four terminals should have about 2400 baud, eight to 16 terminals need 4800 and 16 to 32 should use 9600 baud links. Some of these manufacturers can supply modems built into the multiplexer box (integral modems). The advantage to building the modem into the multiplexer is that it is one less thing to worry about; there is no cable between the modem and multiplexer, no timing or interface considerations, and the diagnostics of the multiplexer will often help diagnose modem problems. The modem and multiplexer will also share a common power supply and enclosure thus saving some money over having two boxes. Integral modems make connections easy: just four wires from the modem/multiplexer to the junction box of the leased line.

If your network is less than ten miles from the computer you could consider limited distance modems which are less expensive than regular long haul ones. If you are between ten and 60 miles, consider a medium distance model (AVANTI makes one, GANDALF is another possibility). External modems offer the advantage of flexibility and expandability, you can start with 2400 baud modems on one system and easily upgrade it to 4800 baud by changing modems. If a modem should fail, it is easier to replace an external one than an integral one although modem failures are rare (integral modem failures are almost unheard of).

WHAT FEATURES SHOULD I LOOK FOR?

What kind of ice cream do you get at Howard Johnson's? The multiplexer market today offers more features than flavors of ice cream. Here are some of the important ones.

Flow Control: Most DEC systems require X-ON and X-OFF protocols for controlling data transmission. Some other manufacturers do this by raising or lowering some of the RS-232 leads, mostly RTS or CTS. Flow control is important because it is how the statistical multiplexer keeps house when it tries to handle eight 2400 baud terminals over a 4800 baud data link. If all eight of these terminals are

receiving data from the computer the following sequence occurs: The computer (local) multiplexer buffers the data coming from the computer while it tries to send it down the link. Since there is more data than available transmission capability, the buffer fills up. When the buffer gets nearly full the mux sends X-OFF to the computer via one or all of the eight terminal lines. When the buffer empties (which it will since it is no longer receiving data from the computer) the mux sends X-ON to the computer and the computer resumes sending data. In a second case, suppose all eight terminals at the remote location type an X-OFF, stopping the data from the mux so they can read their CRTs. The remote mux must interpret this X-OFF and stop sending data, it must also pass this X-OFF to the computer so that the computer will stop giving data to the local (computer end) mux. There is some delay from when the user types the X-OFF until the computer gets it. During this delay the multiplexers (usually the remote one) will buffer the data so the effect is one of an IMMEDIATE X-OFF. The passing of these X-ON's and X-OFF's is very complicated and early TIMEPLEX models had a bug which under certain circumstances prevented the X-OFF from working properly resulting in lost data; it has been fixed in all but their earliest multiplexers, but the lesson is to make sure that the mux you are choosing has and will work in a DEC environment.

Programming: All of these multiplexers will handle many different mix and match terminal speeds. Some will allow the baud rate at one end to be different from the baud rate at the other; that would be useful if all the computer ports were 2400 baud and you could use the multiplexer's autobaud (yes some have this feature even if the DEC computer doesn't) to automatically determine what the remote terminal's speed was. On a dial-up line, this could be very useful allowing both 300 baud and 1200 baud dial-up service with one number. Other programmable features might include seven or eight bit characters, one or two stop bits, parity selection, or different type of flow control.

Some of these multiplexers are programmed with dip switches (inside the multiplexers). The MICOM, Early TIMEPLEX, and latest TIMEPLEX are examples of this technique. There are switches for setting terminal speeds, terminal parameters, flow control and others. Others are programmed by some front panel buttons that run a software program that enables you to (in software) set all the parameters, such as terminal speeds, by pushing the correct sequence of buttons. There are variations on this theme with some units using a combination of thumbwheel switches and buttons, others using "magic" switches, and they are all different. The last (and best) way to program these is with a terminal connected to a "supervisory/command/monitor/executive" port. This terminal can display and/or change any of the programming characteristics. It can also usually display all kinds of good information on things like link errors, terminal status and multiplexer condition.

There has been a long standing argument around here whether the best programming method was via dip switches (which don't move by themselves) or via software (which mysteriously changes sometimes for no reason). Our first experience was with MICOMs, and although the switches don't ever move, each unit we have seems to have

a different location for the switches and they mean different things. Knowing how to set the switches for one MICOM is no guarantee that you will know what to do with the next one; but, once set they never seem to fail. We recently installed a pair of BABYMUXes and had to learn a new programming language. It was actually fun, but it did take two experienced programmers (!) about one hour to figure out how to make them work. Once we did however, it was great; we could configure either end, change parameters, and see what was what with either end. The language even included a "password" that required you to push certain buttons in a certain order before you could program the unit. It took a while to understand what to do, but once we did it went without problems. The last configuration we did was with a front panel that was a cross between buttons and software programming. The COMDESIGN has its front panel "buttons" labeled in English and a small alpha display that tells you (cryptically) what you are doing. It took a little less time to figure out than the BABYMUX but it was some time before we understood it. Then we hooked a terminal to the executive port of the COMDESIGN. It took about five minutes to understand what to do and then was it easy! This is the way to go! Without hesitation, the best feature you can get on a multiplexer is a command port. You can get away without one (we did for many years and still do) but it is a lot easier with one. The TIMEPLEX people told us this almost one year ago, but we didn't listen because it was an extra cost option and we didn't want to spend the money on frills. We still don't like frills, but I'll rethink my position; I like this kind of programming. MICOM has recently introduced this capability and some of the others have had it all along. COMDESIGN has planned to add this programming and monitoring capability to each port of the multiplexer. There will be levels of security that will allow ports to change their own parameters, other ports' parameters or the link characteristics. The ultimate in command ports is to use the regular terminal ports as command ports.

CAN I USE DIAL-IN MODEMS AT THE REMOTE END?

Most of the multiplexers today will pass not only data, but also the necessary EIA signals to allow you to control data-sets at the remote end. Some of the "economy" units don't, so know what you need.

HOW MUCH MEMORY SHOULD THE MULTIPLEXERS HAVE?

That's like asking how much memory a computer should have. Each one is different because it handles the memory in its own way. I tend to treat this subject as a "black box"; each mux should have enough memory to efficiently buffer the data for the number of terminals you will have attached to it. Some of these units can allocate the buffers on a selectable basis with some terminals having either more of the buffer available or having a higher priority in using the available buffer space. A high speed printer at the remote location might benefit from having more buffer available while an interactive terminal wouldn't need much of a buffer.

WHAT ABOUT THE "ERROR FREE TRANSMISSION"?

All of these units are capable of providing error free

. . . continued on page 46



Dear Dr. DEC:

1. After reading the recent letter concerning LA100 programming [THE DEC PROFESSIONAL, Vol. 2, #1, January, 1983] I thought that I would send in my solution to the magazine. There are two different applications.

2. The first application is (my own configuration) where the LA100 is running serially off a VT102 (or any VT100 with serial port). To set the printer to its various configurations you can use this technique. Start by:

- a. Make a list of all the escape sequences for the LA100 from the manual.
- b. Copy the printer controller escape sequences from the VT02 manual.
- c. Make a copy of the ASCII table (page 86 of VT102 is ok).
- d. Encode the necessary sequences into base 10 equivalents.

I wanted to be able to set the printer to any of its font configurations, form lengths, margins, vertical/horizontal spacings. So:

a. Using the KED I created a number of text files and indirect command files with all the appropriate setups. This involves using the SPECINS function and the ASCII table to convert something like ESC [m to the appropriate base 10 values of 27,91,109. You must encode the printer controller on and off in this manner (the VT100 displays the ESC as a pi character).

b. Now to set the printer from the VT102; send (use the TYPE command) the PC on sequence. No further characters will appear on the screen. Now send (TYPE) the appropriate printer setup sequences. Test the printer by running self test stuff. Then stop by using the PC off sequence.

It took about an hour to do this.
 3. The second application is when the printer is driven by a LP type driver. The technique I use here was shown to me by a friend. We use FORTRAN to do this. Code up the escape sequences in FORTRAN. A typical program to do the ESC [m would be:

```
PROGRAM X
WRITE (6,10) 27,91,109 !Lun 6 Being The Printer
10 FORMAT (A1,A1,A1) !Something Like This
STOP
END
```

Then just code up the various printer setups and compile/link and produce the various tasks you need (ie. RUN X). You can also make the VT100 go wild

with blinking, flashing, reverse video type messages. You can basically set up the VT100 from the host by encoding the various stuff in the manual on terminal set up. If you have the advanced video option you can use the limited line drawing set to do "limited" boxes, charts, and graphics on the VT100 on your own (see page 111 of 102 manual). You have to use the SCS sequence on the VT100 (pg 54) and the enter/exit graphics mode on the VT102 (pg 110). I don't know if one is "newer" than the other.

4. Hope this helps. J. Skardon

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data between the two multiplexers. There can be errors between the computer and the mux or between the remote mux and the terminal, but all the statistical multiplexers will handle the retransmission on error. One of the problems with statistical multiplexing is that when your line starts to degrade, it is often difficult to tell. Sometimes, when terminals began acting and echoing slowly it is the only indication that the telephone line has gone bad. Because of this, a useful feature is some kind of link statistic telling you how many errors the link is getting.

HOW DO I TELL THE MULTIPLEXER WHAT THE LINK SPEED IS?

Sometimes it is a settable parameter. Others are smarter and use the fact that the modem is generating a clock signal to tell. MICOM always uses the modem to tell what speed it is, COMDESIGN allows you to either set it yourself or have the modem tell the mux and BABYMUX needs to know what's going on. There is a method to all this madness and that is if the data link is asynchronous, the mux needs to know since it can't tell from the modem. Only some of these units can be configured with an asynchronous aggregate link. All can handle asynchronous terminals; isn't that what we all use?

WHEN IT DOESN'T WORK HOW DO I TELL WHAT'S WRONG?

Unfortunately this happens with all of the units I have been talking about. Most are so reliable that I can't tell you much about service. We have had the TIMEPLEX and MICOMs the longest and I think we have had one MICOM break but it was so long ago I can't be sure, and our TIMEPLEXers seem to go through spurts of problems, mostly with their power supplies. The BABYMUX and COMDESIGN we have been using for a few months have worked perfectly. Most of the problems you are going to experience are modem problems and phone line problems. Integral modems don't solve all of the problems because you still have to set some magic parameters like transmit level to 0 DBM and RTS delay to 9msec and others that I don't understand. Mostly you will use the factory defaults for these. A high percentage of the time, the phone line will be at fault. If the units have been in and working for some time, the most likely cause for failure (>90%) is the phone line. Don't expect Ma Bell to admit it! Just report the problem and wait for them to call and say they could find nothing wrong; chances are it's fixed! In initial installations more phone lines are bad, but more parameters are incorrectly set also. Read the manual very well, call the vendor to ask questions and ask the phone company to check the line.

We will cover troubleshooting communications links in the next in this series.

ARE THERE SOME SPECIAL TYPES OF MULTIPLEXERS?

For very short hauls on your own property you may be able to use multiplexers that don't need modems. TELTONE and SOLANA make some of this type. In areas of high electrical noise there are fiber-optic multiplexers that use light instead of electrical signals. There will be an article on this type of multiplexer set in a hospital radiology department in a near future issue.

HOW DO I MAKE UP MY MIND WHAT TO BUY?

Tough question. This is a competitive business and all the people mentioned here (and there are more) will be glad to send you literature, talk to you and in some cases send a salesman to visit. They can help you decide whether features, size, shape or money is most important to you. Just like people come in all shapes and sizes, so do statistical multiplexers; all in all, the multiplexers are more reliable and understandable than people.

PLEASE NOTE:

I have tried to tell you something about some of the multiplexers I know. I did not tell you about the ones I don't know. There are surely many more manufacturers of multiplexers and I am sorry I didn't tell your story. To the products I did talk about, I hope I have told mostly the right things. I am certain to have made mistakes and I apologize for them. I recently visited a computer installation that had four phone lines going to two remote locations. They could be saving a lot of money with multiplexers like the ones I have talked about and in addition they could be enjoying error free transmission and the capability of adding more terminals for a very small incremental cost. Knowing about modems and multiplexers is an important part of a professional's knowledge, why should DEC professionals be any different.

WANT MORE INFORMATION?

Here is a partial list of multiplexer companies that have products compatible with DEC computers. Contact them directly for more information and be sure to tell them you read about it in the DEC PROFESSIONAL!

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20151 Nordhoff Street
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805-964-9852

Network Products, Inc.
Box 13239
Research Park, NC 27709
919-549-8210

Digital Comm, Assoc.
135 Technology Park
Norcross, GA 30092
404-448-1400

Gandalf Data, Inc.
1019 S. Noel Avenue
Wheeling, IL 60090
312-541-6060

Infotron Systems Corporation
Cherry Hill Ind. Center
Cherry Hill, NJ 08003
609-424-9400

Halcyon Communications, Inc.
2121 Zanker Road
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408-293-9970

Solana Electronics
249 South Highway 101
Solana Beach, CA 92075
714-481-6384

Teltone Corporation
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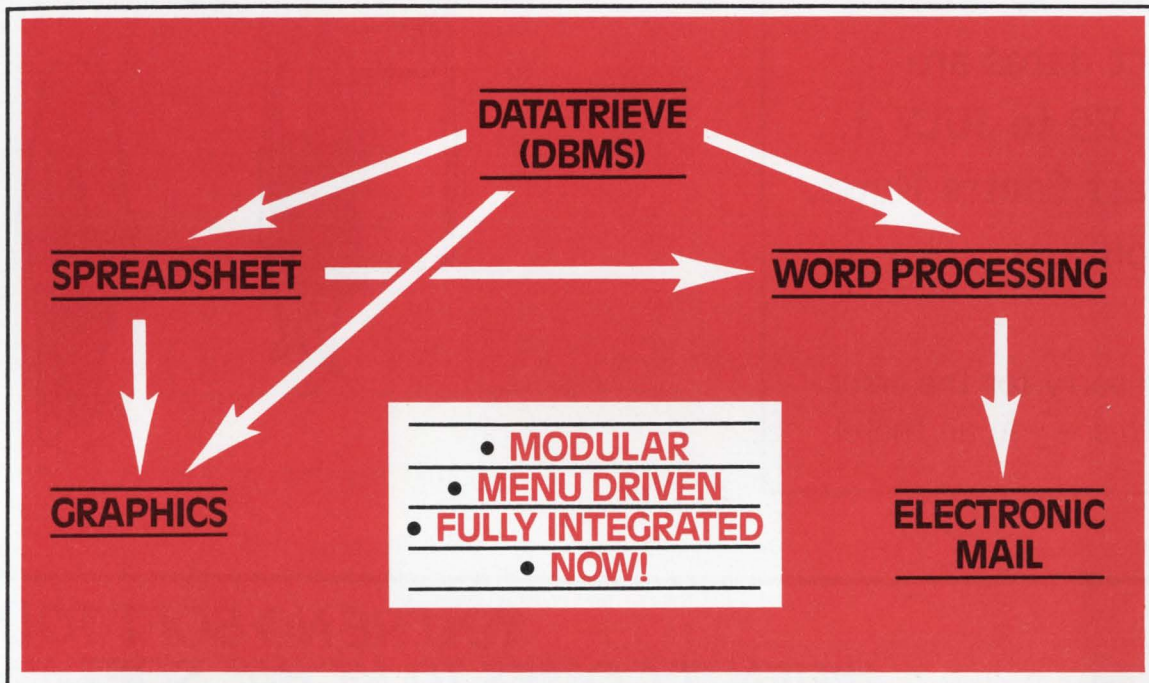
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In the last issue of **THE DEC PROFESSIONAL** we incorrectly stated the dates for DEXPO EUROPE 83. The correct dates are **JUNE 29 to JULY 1**, at West Centre Hotel, London.

We're sorry for the error. Hope to see you all there!



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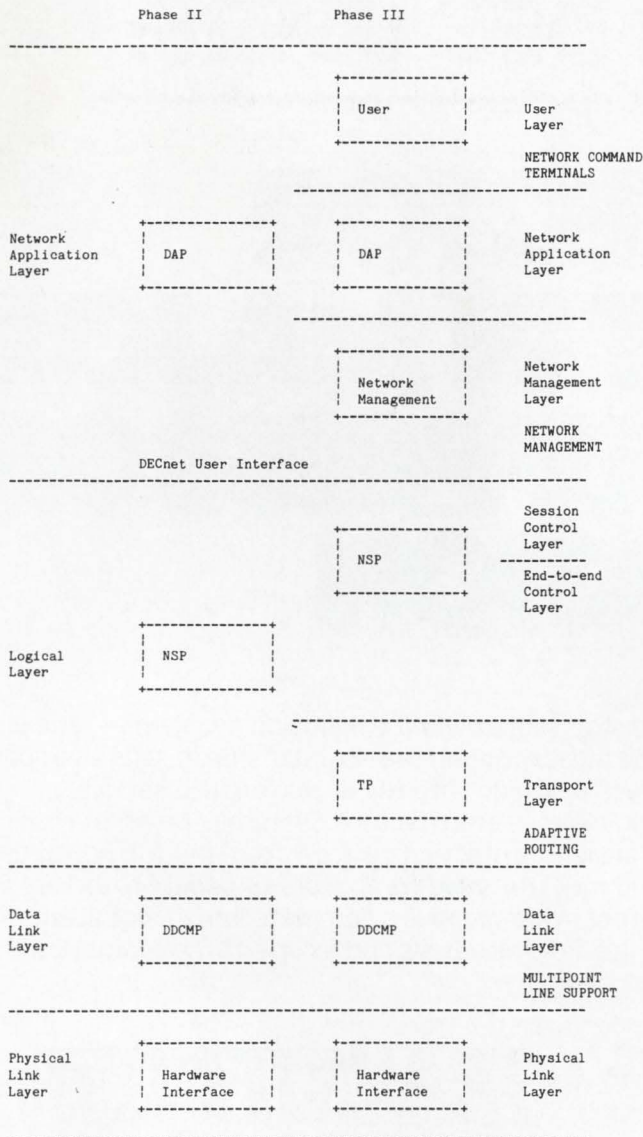
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DECNET AND THE OSI MODEL . . .

. . . continued from page 18



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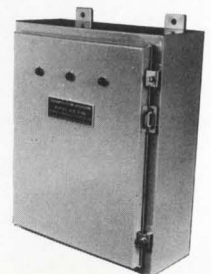
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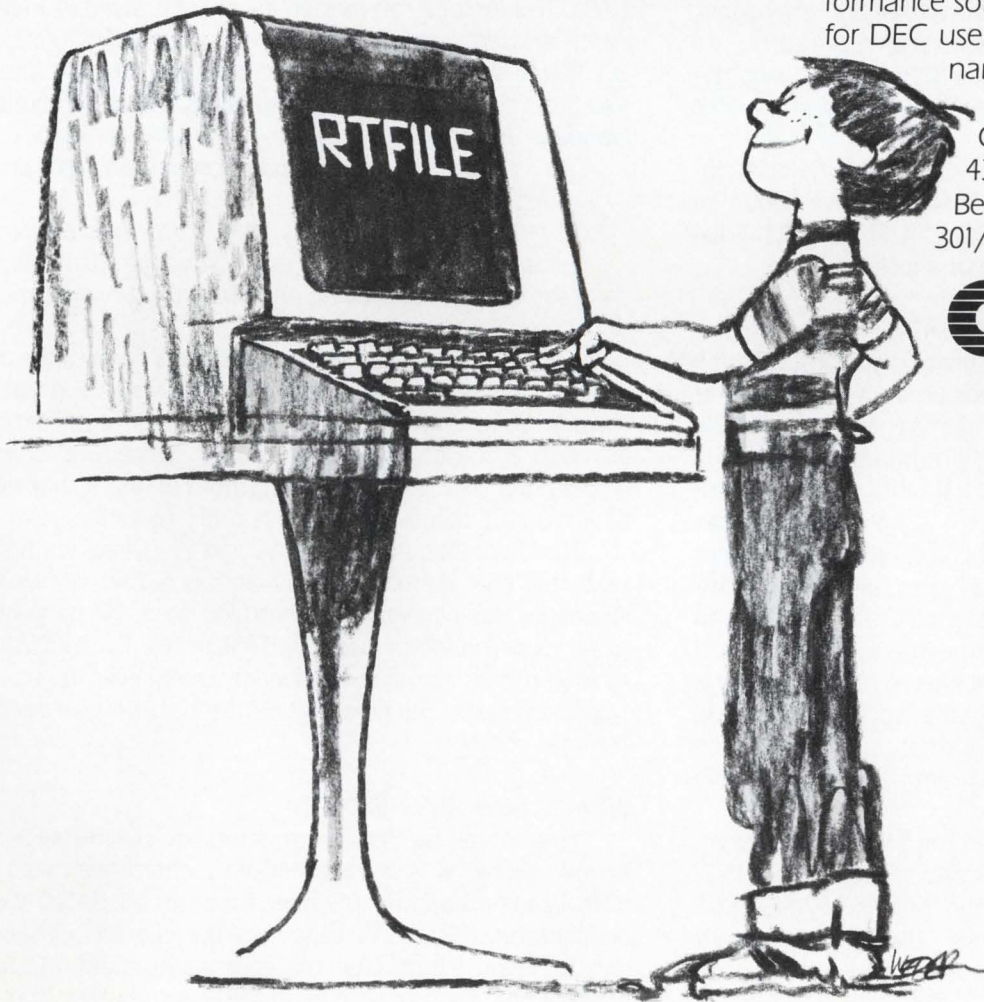
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BASIC VERSION 2

It Isn't Just for Breakfast Anymore!

By Al Cini, Computer Methods Corporation, Moorestown, NJ

Al Cini will be teaching Digital's BASIC Version 2 Update Seminar, scheduled in several cities through early summer. For more information, write to Digital Equipment Corporation, Seminar Programs, 12 Crosby Drive, Bedford, MA 01730. Or call (617) 276-4949.

Digital is now shipping the most significant advance in their realization of the BASIC programming language since the introduction of BASIC-PLUS-2 in 1975: BASIC Version 2. If you're currently a BASIC V1 programmer (PDP-11 BASIC-PLUS-2 or VAX-11 BASIC), BASIC V2 offers you a range of new syntax features which will change your BASIC coding habits forever. If your system lacks a BASIC compiler and you've always believed that "BASIC" is too simple and limiting for "real" production work, BASIC V2 will have you thinking again. It is every bit as rigorously defined and complete a third-generation programming language as COBOL, PL/I, or PASCAL. You should seriously consider buying and using it.

Of course, BASIC V2 provides upward compatibility from Version 1. If you like, you can continue to crank out BASIC code in the familiar V1 black, white, and gray tones as you always have—or you can start painting beautiful (i.e., more readable and maintainable) BASIC Programs using the spectrum of new language elements you'll find on the V2 palette.

After we've taken some time to review the major V2 innovations, you BASIC programmers should have begun to re-think your approach to the medium. And you BASIC disbelievers should be in a mild state of shock.

HOW DID WE GET THERE FROM THERE?

As the RSTS operating system gradually evolved from a largely education-oriented small-scale product into a popular large commercial system development vehicle, its intrinsic BASIC-PLUS — at one time its sole programming language — became its greatest limitation. As an interpreter, it combined a richly extended version of the simple BASIC syntax with a uniquely interactive "immediate mode" programmer environment to attract a devoted core of die-hard aficionados, many of whom steadfastly refuse even today to program in anything else. By the same token (that's a lexical joke, son), however, its interpretive nature resisted integration with other DEC "layered" software (such as RMS), and offered only crude program segmentation capabilities (given the 16KW limit on BASIC-PLUS program size, this was a big problem indeed).

These limitations, and the need for a solid BASIC product under RSX-11 were DEC'S inspiration for BASIC-PLUS-2: a true compiler which accepted the familiar BASIC-PLUS syntax (with some enhancements, mostly to support RMS-11) and generated relocatable (read that overlay-able) object code.

Those of us on hand at the time will perhaps recall the small riots at DECUS when RSTS product manager Simon Szeto announced that the "BASIC-PRUS" interpreter had been functionally "frozen" (sorry, Simon). Also, around this time, the phrase, "WAITING for a TASKBUILD" became a popular adornment on dead programmers' headstones.

Since then, BASIC-PLUS-2 has survived several attempts on its life (DEC calls them "maintenance releases") to become a respected product on the PDP-11 and, as VAX-11 BASIC, its syntax now thrives in native mode on the VAX as well (where, incidentally, nobody cares how big its OTS is). One may wonder, then, with this sterling record of success behind them, why Digital would go ahead and build a completely new BASIC V2, practically from scratch?

WHY BASIC V2? (Sorry, Carl)

DEC'S BASIC development efforts have been "reactions" for the most part — reactions to RMS, to PDP-11 size restrictions, to BASIC-PLUS performance complaints, to the need for a "good" BASIC on the VAX . . . As a result, DEC BASIC has lurched forward to its present state in independent, isolated phases. The current releases of Version 1 BASIC are annoyingly different between the 11 and the VAX, and they still suffer most of BASIC-PLUS' fundamental language deficiencies:

Only a very limited collection of data types is supported.

Its instruction set (i.e., its executable statements) lack a "block" structure (this is sometimes referred to as "structured programming" support).

The BASIC wish-list included requests for a range of additional bells and whistles as well, and Version 2 grants far more of them than it ignores, but the weak organization of elements in the language's "data" and "procedure" divisions represented that last dollop of primordial muck that had to be kicked off before the product could be taken seriously.

Now, proudly, even PASCAL and PL/I hackers have to take this new BASIC seriously. It has a few things their languages don't have, and when you turn the new syntax loose, it doesn't look much like BASIC at all. Even so, it's still as friendly as (or even friendlier than) ever in its new "glorified" state, and now a near-ideal commercial/scientific "bridge" compiler.

WHAT'S NEW IN VERSION 2?

First of all, an ampersand-and-backslash-free source format piloted in VAX-11 BASIC V1 (sometimes called "implicit line continuation") is now found in all BASIC V2 implementations. BASIC V2 requires a backslash (\) character **only** to separate more than one source statement on a single physical line, and the ampersand (&) continuation character

is now needed **only** to continue a single source statement across more than one physical line.

Also, BASIC V2 program statements may now be **labelled** as well as numbered, and all BASIC V2 branching statements (except RESUME, which still accepts only line numbers) can refer to either labels or numbers as their targets.

Statement labels conform to the same rules which govern other internal names (variable and function names), which for Version 2 have been expanded somewhat to allow the underscore (_) and dollar-sign (\$) as well as the period (.).

The following sample illustrates the new source format and statement labels:

```

10 OPEN "PEOPLE.FIL" FOR OUTPUT AS FILE 1$ &
    , ORGANIZATION INDEXED FIXED &
    , MAP PEOPLE

MAP (PEOPLE) &
    PE.F.NAME$ = 15 &
    PE.M.INIT$ = 1 &
    PE.L.NAME$ = 15

ON ERROR GO TO READ_ERROR

READ_LOOP:
  LINPUT "FIRST NAME :"; PE.F.NAME$
  LINPUT "LAST NAME :"; PE.L.NAME$
  LINPUT "INITIAL :"; PE.M.INIT$
  PUT #1$
  GO TO READ_LOOP

READ_ERROR:
  IF ERR = 11 THEN
    RESUME 100

  ELSE
    ON ERROR GO TO 0
  END IF

100 PRINT "All finished"
    CLOSE 1$
    END

```

Notice in this example that only the OPEN and MAP statements require explicit continuation (&), and that the first statement in a BASIC V2 program must have a line number (if you like, the line number can be immediately followed by a statement label). Also, since each program statement started on its own physical text line, we needed no backslash (\) statement separators.

If you were paying attention, you also spotted a new statement (END IF) just before line 100. This leads us to a review of the new BASIC V2 executable instructions.

THE "PROCEDURE DIVISION."

(Don't panic: There is no PROCEDURE DIVISION statement.) The executable code in a BASIC V2 program may be organized into "blocks" (i.e., groups of statements which behave as if they were a single statement) which eliminate a lot of the ambiguities of Version 1. First of all, an END IF statement may now be used to terminate an "IF" block without having to use a new line number. Particularly when IF's are nested, this clarifies the scope of an "IF" condition. There is no direct BASIC V1 equivalent representation of the following BASIC V2 example.

```

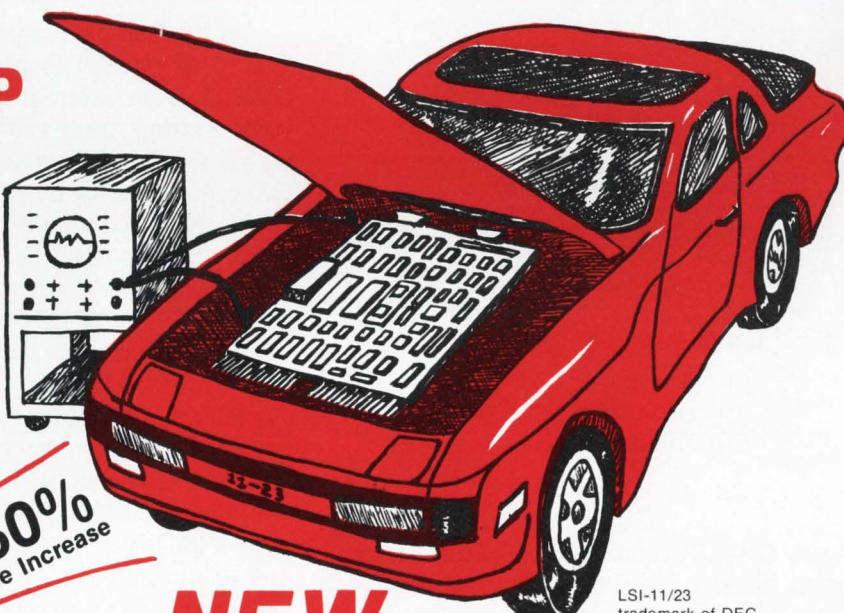
.
.
.
IF X = LOWLIM THEN
  Y = MAXLIM
  IF Z = 10 THEN
    Y = Y/2
  END IF
  IF Z = 20 THEN
    Y = 0
  END IF
ELSE
  X = X + INCREMENT_VALUE
END IF
.
.
.

```

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Expressing this example in BASIC V1 would require a rearrangement of the statements and perhaps an out-of-line branch or GOSUB. In BASIC V2, you can "say what you mean directly," without confusion.

If you've programmed in C, you'll find its SELECT construct in BASIC V2. SELECT can be used as an alternative to nested IF blocks when you need to perform some action based on the evaluation of several mutually exclusive conditions:

```

.
.
INPUT X
SELECT X
  CASE 1,3,5,7,9
    PRINT "ODD"
  CASE 2,4,6,8
    PRINT "EVEN"
  CASE 0
    PRINT "ZERO"
  CASE ELSE
    PRINT "UNKNOWN"
END SELECT
.
.

```

This example will report whether a single-digit integer entered into the variable X is odd, even, or zero. The CASE blocks can contain any number of statements, and if you like an entire program can be organized across a fifty page SELECT block as a series of fifty different CASEs, each one one page long.

SELECT/CASE is somewhat like ON-GOSUB or ON-GOTO, except the SELECT condition may be a string as well as a number:

```

.
.
INPUT X$
SELECT X$
  CASE "A" TO "Z"
    PRINT "UPPER-CASE ALPHA"
  CASE "a" TO "z"
    PRINT "LOWER-CASE ALPHA"
  CASE "0" TO "9"
    PRINT "NUMERIC"
  CASE ELSE
    PRINT "UNKNOWN"
END SELECT
.
.

```

It may even be an expression:

```

.
.
INPUT X$
SELECT LEN(X$)
  CASE 0
    PRINT "NULL STRING"
  CASE 1 TO 10
    PRINT "VALID LENGTH"
  CASE ELSE
    PRINT "STRING TOO LONG"
END SELECT
.
.

```

You can still use ON-GOTO and ON-GOSUB to branch within your program based on the traditional "one-to-n" scalar numeric value, with a handy new optional feature: OTHERWISE.

```

.
.
X=INSTR(1,"ABCDE",Y$)
ON X GOSUB &
  A_ROUTINE &
  B_ROUTINE &
  C_ROUTINE &
  D_ROUTINE &
  E_ROUTINE &
  OTHERWISE ERROR_ROUTINE
.
.

```

NEW BASIC V2 PROGRAM SEGMENTATION FEATURES.

Separately compiled functions, found previously only in VAX-11 BASIC V1, are now supported in both the PDP-11 and VAX implementations of BASIC. A separately compiled function subprogram, like its FORTRAN counterpart, accepts arguments from its caller through a formal parameter list and returns a single value as its "result" upon return. Unlike multi-line DEF functions, separately compiled FUNCTION subprograms can modify the actual parameters in their argument lists as can SUB subprograms, and variables defined within them are not globally known to the calling program. They can also be overlaid with other separately compiled modules on the PDP-11.

In addition, an EXTERNAL statement within the calling program can specify not only the names of its FUNCTION or SUB subprograms, but the number and type of its arguments as well. BASIC can then check the calling sequences for these subprograms at compile time to verify that they are correct (and even to take corrective action where possible), thus avoiding cryptic MEMORY MANAGEMENT VIOLATIONS at run-time.

Consider this example:

```

MAIN.B2S:
10 EXTERNAL STRING FUNCTION CONCAT (STRING,STRING)

  INPUT X$
  INPUT Y$
  PRINT CONCAT (X$,Y$)

  END

CONCAT.B2S:
10 FUNCTION STRING CONCAT (A$, B$)
  CONCAT=A$+B$
  END FUNCTION

```

In this sample program, the EXTERNAL statement at line 10 of the calling program (MAIN.B2S) specifies that CONCAT is an external FUNCTION subprogram which returns a string result and expects two string arguments. If we were to try to invoke CONCAT with more or less than two arguments, or by passing it a number rather than a string, the BASIC compiler would issue a diagnostic and save us considerable run-time embarrassment.

We could even specify argument passing mechanisms in the EXTERNAL definition of a FUNCTION, and BASIC would automatically adapt the calling sequence to conform to it. VAX-11 BASIC programmers who are tired of sorting out the required argument passing mechanism for various system services can recognize an immediate value for this feature. Imagine an "APPEND" (or better yet an %INCLUDE — more on %INCLUDE later) source file with a complete set of definitions for all the system services and RTL routines! Any volunteers?

Please don't everybody jump up at once . . .

THE "DATA DIVISION."

Wouldn't it be nice if we could mix single and double floating point variables in the same program? How about support for 8-, 16-, and 32-bit integers built right into the language?

Wouldn't you like to be able to explicitly identify and type your program variables, without having to rely on that tired old % and \$ convention?

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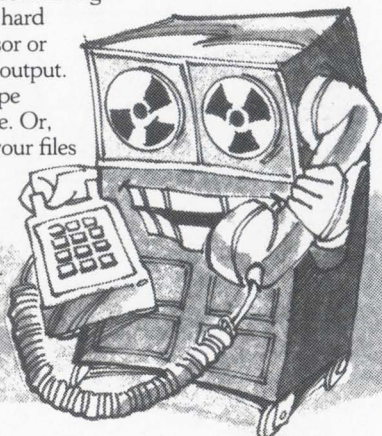
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If you answered "YES" to any of these, BASIC V2 is for you! It supports BYTE (8-bit), WORD (16-bit), and LONG (32-bit) integers, and SINGLE and DOUBLE floating point numbers on both the PDP-11 and the VAX. VAX-11 BASIC users will find support for DECIMAL, G_FLOAT, and H_FLOAT numbers as well (its rumored that "G" is for "Gigantic" and "H" is for "Humongous"). The following table lists and describes these data types, as well as another new one: RFA.

TABLE 1. BASIC Version 2 Data Types

Type Keyword	Size Range	Max Precision (DEC digits)	Internal Size (bytes)
Integers			
Byte	-128 to 127	2	1
Word	-32768 to 32767	4	2
Long	-2147483648 to 2147483647	9	4
Reals			
Single	.29*10 ⁻³⁸ to 1.7*10 ³⁸	6	4
Double	.29*10 ⁻³⁸ to 1.7*10 ³⁸	16	8
G_FLOAT*	.56*1 ⁻³⁰⁸ to .9*10 ³⁰⁸	15	8
H_FLOAT*	.84*10 ⁻⁴⁹³² to .59*10 ⁴⁹³²	33	16
Decimal	10 ⁻³¹ to 10 ³¹	31	0-16
String	0 — 65536 chars**	—	0-65536 (plus descriptor)
RFA	—	—	6

VAX-11 BASIC only
**Space permitting

The RFA (for Record's File Address) data type is a data structure maintained by RMS which uniquely identifies a record in an RMS file. The BASIC V2 GETRFA () function can be invoked after an RMS operation to return the current record's RFA for future use. A subsequent GET BY RFA statement can retrieve that record directly from the file with one or two accesses; in a large indexed file, this can avoid a costly trip through index buckets.

The DECLARE statement can be used to name and type variables and DEF functions in your programs:

```
10 DECLARE WORD X,Y,Z
   DECLARE LONG A,B
   DECLARE DOUBLE G,H,I
   DECLARE LONG FUNCTION ADD_THEM(WORD,WORD)
   DEF LONG ADD_THEM(WORD A, WORD B)=A+B
   INPUT X
   INPUT Y
   A=ADD_THEM(X,Y)
   .
   .
   .
```

You can also use DECLARE to name and type constants within your program:

```
10 DECLARE STRING CONSTANT VOWELS="AEIOU"
   DECLARE STRING CONSTANT CONSONANTS &
      ="BCDFGHJKLMNPQRSTVWXYZ"
   DECLARE STRING ALPHABET=VOWELS+CONSONANTS
   .
   .
   .
```

Note that DECLARE can contain expressions involving previously DECLARED constants; this can make your program a lot more readable:

```
10 DECLARE WORD CONSTANT TRUE = (1=1)
   DECLARE WORD CONSTANT FALSE = NOT TRUE
   DECLARE BYTE CONSTANT END_OF_FILE = 11
```



```

IF ERR=END_OF_FILE THEN
  NO_MORE_RECORDS = TRUE
RESUME ...

```

VAX-11 BASIC V2 programmers can even define their own data types. The VAX-11 BASIC RECORD statement — almost identical in form and function to its PASCAL counterpart — defines a “template” which can later be used anywhere a data type keyword is accepted to set up special data structures.

A VAX-11 BASIC “RECORD” immediately resembles a “MAP” when you first look at it, but the more you insist on comparing RECORDS and MAPs, the harder it is to understand what a record is. Consider this example:

```

10 RECORD PARTS
  STRING PART_NUM = 5
  STRING PART_NAME = 20
END RECORD PARTS

```

This RECORD definition very straightforwardly defines a “parts” data structure consisting of a 5-character part number and a 20-character part name. However, the structure doesn’t exist until you create an instance of it. For example:

```

20 MAP (PRT) PARTS PART_RECORD

```

This statement 20 “creates” a MAP of data type PARTS (defined in the RECORD at line 10), and gives it the name PART_RECORD.

```

20 DIM PARTS_RECORD(100)

```

Alternatively, this statement 20 “creates” a table of 101 items of type PARTS.

The data items defined within a record can only be identified by “qualifying” their names with the record instance in which they actually reside. Thus

```

PART_RECORD::PART_NUM

```

refers to the part number within our MAP record instance

```

PART_RECORD(50)::PART_NUM

```

refers to the 51st part number in our array (DIM) record instance

If this brief description of RECORD leaves you a little confused, consult the description of RECORDs in your User’s Guide. If you think you understand them, or if you don’t but are a punishment freak, consider the following example:

```

OPTION TYPE=EXPLICIT
RECORD COMPLEX
  SINGLE REAL_PART
  SINGLE IMAG_PART
END RECORD COMPLEX
DECLARE LONG I
DECLARE SINGLE N
DECLARE COMPLEX IROOT
DECLARE COMPLEX FUNCTION CSQRT(SINGLE)
DEF COMPLEX CSQRT(SINGLE NUMERIC_ARG)
IF NUMERIC_ARG < 0 THEN
  CSQRT::REAL_PART=0
  CSQRT::IMAG_PART=SQR(ABS(NUMERIC_ARG))
ELSE
  CSQRT::REAL_PART=SQR(NUMERIC_ARG)
  CSQRT::IMAG_PART=0
END IF
END DEF
INPUT "Please enter a number";N
UNTIL N=0
IROOT=CSQRT(N)
PRINT "The square root of";N;"is"; &
  IROOT::REAL_PART;"+";IROOT::IMAG_PART;"i";

```



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```

IF IROOT::IMAG_PART <> 0 THEN
  PRINT " (imaginary)"
ELSE
  PRINT
END IF

INPUT "Please enter another number";N
NEXT
END

```

Ready

RUNNH

```

Please enter a number? 4
The square root of 4 is 2 + 0 i
Please enter another number? -4
The square root of -4 is 0 + 2 i (imaginary)
Please enter another number? 3
The square root of 3 is 1.73205 + 0 i
Please enter another number? -10
The square root of -10 is 0 + 3.16228 i (imaginary)
Please enter another number? 0
Ready

```

In this example, RECORD is used to create an "imaginary number" data type for BASIC. A function to extract imaginary square roots is written to return the new "complex number" data type as its result.

Under VAX/VMS, RECORD data structures serve as the interface between BASIC V2 programs and the common Data Dictionary (CDD), so its a very handy feature to get to know.

OTHER ENHANCEMENTS.

We've eaten up a lot of magazine so far, and have covered less than half of BASIC V2's "breakthrough" features. Very quickly:

- BASIC Version 2 offers a range of compiler directives which can be used to "conditionally compile" parts of your source program based on the evaluation of a condition, or to %INCLUDE source code from a text file, or to enable/disable the inclusion of parts of your program in the program listing and cross reference.
- BASIC Version 2 permits you to specify within your program certain compiler parameters (e.g., scale factor) via the OPTION statement. Specifying OPTION TYPE=EXPLICIT in the beginning of your program "forces" you to DECLARE all your variables and can help you spot variable-name typographical errors.
- BASIC Version 2 allows you to specify variables as subscripts in DIM statements, and thereby dynamically allocate array space at run-time. BASIC V2 arrays, by the way, can have more than two dimensions (up to 8 on the PDP-11; up to 32 on the VAX).
- A new facility—MAP DYNAMIC—combines the performance of FIELD with the flexibility of MOVE TO/FROM.
- The VAX and PDP-11 implementations of BASIC V2, are believe it or not, largely source-compatible! Compiler switches will tell the compiler to warn you when you're using a feature that is not supported on "the other" machine.

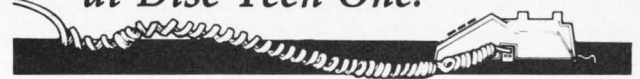
Still, more could be told! Read your documentation or, better yet, register for the BASIC Version 2 Update Seminar!

So stand proud, BASIC coder! The BASIC you have always loved despite its shortcomings no longer has them! And next DECUS, there'll be enough of us tuned in to the new BASIC to swell the ranks of the Structured Languages SIG beyond their wildest imaginings!

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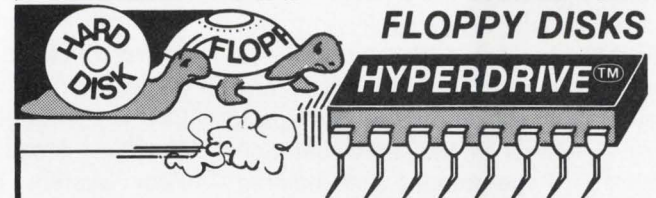


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do immediately when you think you have a disk corruption problem (I hope to do an entire article soon on disk corruption recovery):

1. Write-protect the disk — NOW!!!

2. Tell everyone to get off the system—they'll only do more harm.

3. Tell everyone to go home for the day. You'll need some time to think this one through. Disk corruptions can't be fixed in a hurry.

4. Look for a backup. Even if it's three weeks old, at least it's a starting point.

5. Remember the worst that can happen — you've lost the entire disk. Any recovery you can do at this point is gravy.

If you've lost just the home block, it's not too difficult to create a new one. If it's more than just the home block, you might want to get a copy of the RSX handout from the Fall 81 DECUS meetings, in which Mike Higgins published an excellent article on disk corruption recovery.

The Problem

You find F11ACP marked for abort.

The Cure

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The Problem

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The Cure

This is a case of pay-me-now-or-pay-me-later. You'll have to reconfigure your task to run as a suite of cooperating tasks, using some inter-task communication mechanism. If you like agonizing over ODL files, keep on keepin' on. Otherwise, take a good look at what you're doing, and break that task up now, before you waste half your life coding the same ODL file.

My list of "You know you've got trouble when . . ." items is much longer, and I hope to do more of this type of article as time goes on. Meanwhile, if our readers have any items to add to our collection, we'd appreciate your contribution.

4

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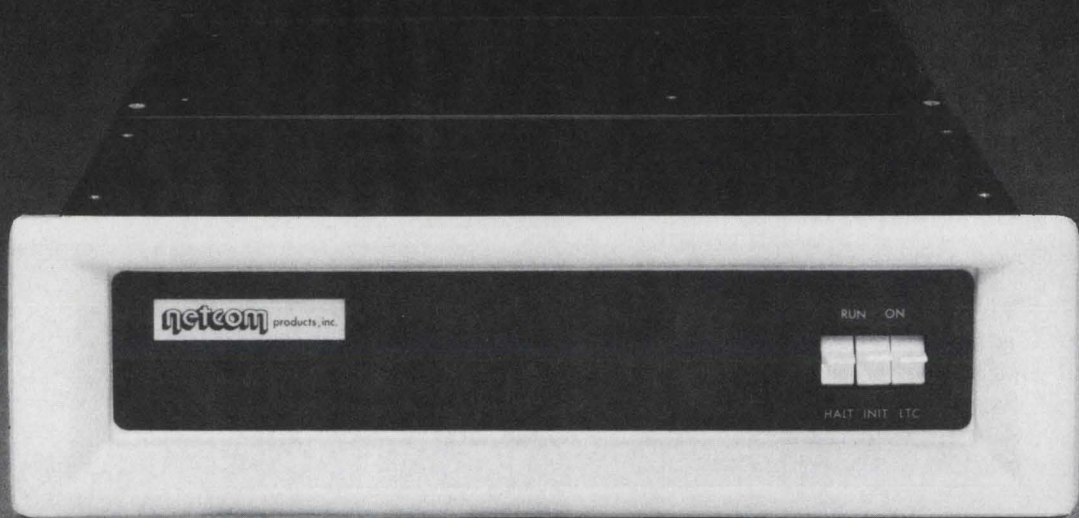
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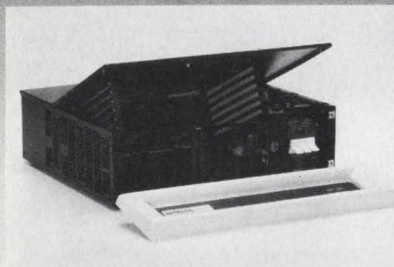
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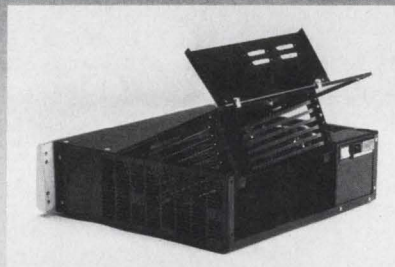
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TSXLIB

A FORTRAN Callable Implementation of the TSX-Plus EMTs

By N.A. (Nick) Bourgeois, Jr., Sandia National Laboratories, Albuquerque, NM 87185

Like RT-11, TSX-Plus offers the MACRO programmer a number of system services via programmed requests or EMTs. RT-11 makes its system services available to the FORTRAN programmer through the system subroutine library, SYSLIB. TSX-Plus also honors most RT-11 programmed requests. TSXLIB [1] makes the TSX-Plus EMTs available to the FORTRAN programmer as a library of callable routines. The code in TSXLIB is all reentrant.

NOTE: RT-11 is a trademark of Digital Equipment Corporation.

TSX-Plus is a trademark of S & H Computer Systems, Inc.

The TSX-Plus library routines provide facilities to support detached jobs, file structured device mounting and dismounting, communication between running programs, program performance analysis, real time program execution, shared run time system, shared files, system status information, communication between running programs and a terminal, program control of the terminal, ODT activation mode, and several miscellaneous EMTs. The system status information routines require the use of TSX-Plus version 2.2 [3]. Several of the real time support routines require TSX-Plus version 3.0 [5]. All other routines require TSX-Plus version 2.0 or later.

TSXLIB is available from the DECUS/US Chapter Program Library. The kit includes the MACRO source modules for all groups of routines, a complete user's manual, a cross reference chart, an indirect command file to build the library, and the implemented library. The cross reference chart lists for each routine the page number in the user's manual and the page number in the "TSX-Plus Reference Manual" [2].

The standard FORTRAN subroutine calling sequence shown below may be used to access all of the routines in TSXLIB.

```
CALL SUBRTN ( ARG1, . . . ,ARGn )
```

Those routines that return only one value are also callable as FORTRAN functions. This is as follows:

```
IRET = RTNAME ( ARG1, . . . ,ARGn )
```

The "TSX-Plus Reference Manual" describes how the EMTs implemented in TSXLIB are accessed from a MACRO program. However, the FORTRAN/MACRO interface described in the "RT-11 Programmer's Reference Manual" [4] may also be used to access the routines in the library. The TSXLIB (as well as SYSLIB) routines are also available to the "C" programmer via the DECUS "C" [6] library function, "call(. . .)".

Detached Job Support:

Table 1 lists the routines that provide detached job support from within an executing program.

TABLE 1. DETACHED JOB SUPPORT

ISTDJ	Get the status of a detached job.
KLDTJB	Kill a detached job.
STDTJB	Start a detached job.

Device Mounting and Dismounting:

It is possible to mount and dismount a file structured device for directory caching from within a running program. The routines listed in Table 2 provide these capabilities.

TABLE 2. DEVICE MOUNTING AND DISMOUNTING

DISMNT	Dismount a file structured device.
MOUNT	Mount a file structured device.

Interprogram Message Communication:

TSX-Plus provides an optional facility that allows running programs to communicate with each other. Table 3 lists the routines that support this interprogram message communication.

TABLE 3. INTERPROGRAM MESSAGE COMMUNICATION

MSGSDN	Send a message to another job.
RCVMSG	Try to receive a message from another job.
RCVMSW	Wait for a message from another job.

Messages are transferred between programs by using named message channels. A message channel accepts a message from a sending program, stores the message in a queue associated with the channel, and delivers the message to a receiving program on its request for a message on the channel. Message channels are separate from I/O channels.

Each active message channel has associated with it an ASCII character name that is used by both the sending and receiving programs to identify the channel. The names associated with the channels are defined dynamically by the running programs. A message channel is active when messages are being held in the queue associated with the channel or if a program is waiting for a message from the channel. When message channels become inactive they are returned to a free pool and may then be reused.

Once a message is queued on a channel, that message will remain in the queue until some program receives it. A program's exiting to the keyboard monitor does not remove any pending messages. This allows one program to leave a message for another program that will be run at a later time.



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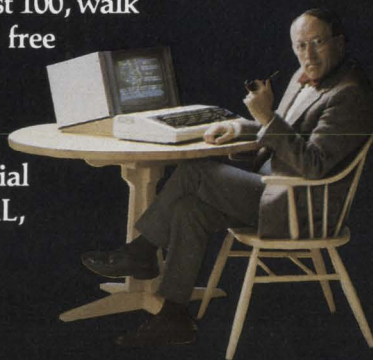
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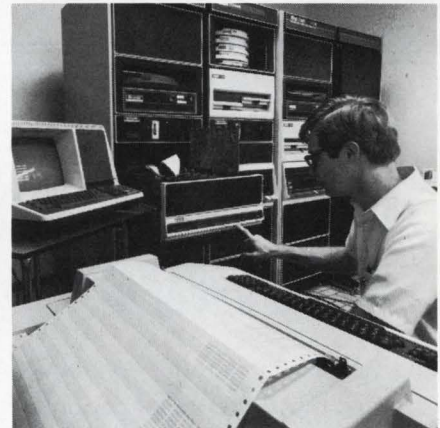
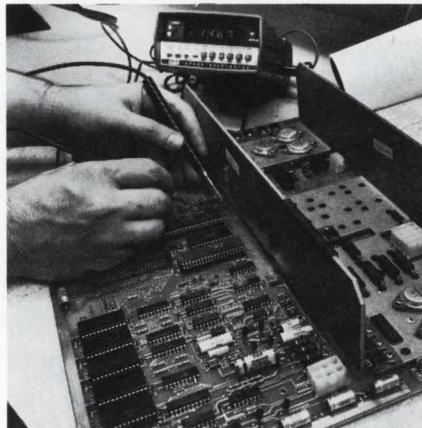
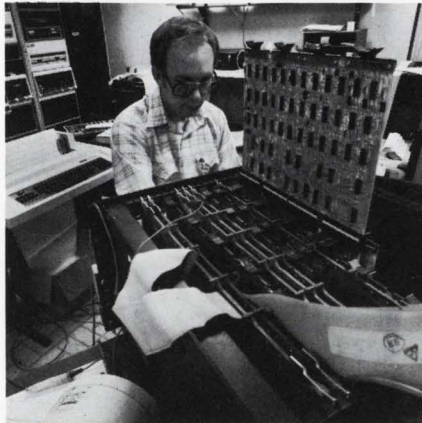
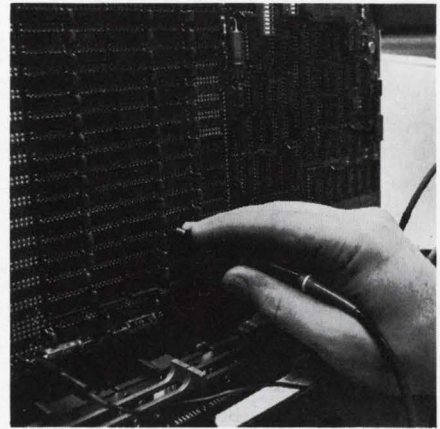
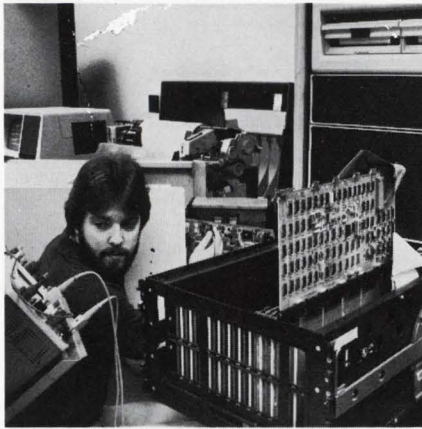
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Performance Analysis Support:

For many applications the keyboard monitor level performance analysis control provided by TSX-Plus is adequate. However, in cases such as analyzing the performance of an overlaid program it is necessary to have control over the performance analysis feature from the running program. The routines listed in Table 4 provide just this capability.

TABLE 4. PERFORMANCE ANALYSIS SUPPORT

INITPA	Initialize for a performance analysis.
ISPPA	Stop a performance analysis.
ISTPA	Start a performance analysis.
TERMPA	Terminate from a performance analysis.

Real Time Program Support:

The real time program support provided by TSX-Plus allows multiple real time programs to be run concurrently with normal time sharing operations. The basic functions provided by this facility are listed in Table 5.

A program must have operator privilege to use any of the real time routines. The real time facilities are available to both normal jobs controlled by time sharing lines and to detached jobs. Detached jobs started by time sharing users have operator privilege only if the user starting them does.

A basic facility required by many real time programs is the ability to access the I/O page which contains the peripheral device registers. A normal time sharing job does not have this access. It is instead mapped to a simulated

RMON. This allows programs that directly access offsets into RMON to run correctly.

TABLE 5. REAL TIME PROGRAM SUPPORT

CNVAPA	Convert a virtual address to a physical address.
IBICIO	Bit clear a value into the I/O page.
IBISIO	Bit set a value into the I/O page.
ICNINT	Connect an interrupt vector to a completion routine.
IPEKIO	Peek at a value in the I/O page.
IPOKIO	Poke a value into the I/O page.
IRLINT	Release an interrupt vector connection.
IUNLKM	Unlock a job from memory.
LKANMY	Lock a job into any memory.
LKLOMY	Lock a job into low memory.
MPIOPS	Map the I/O page into the program space.
MPRMPS	Map the simulated RMON into the program space.
TKCTL	Take exclusive control of the system.
RLCTL	Relinquish exclusive control of the system.
STPRLV	Set the user mode processor priority level.

A real time program can access the I/O page in one of two ways: it can map the I/O page into the program's space; or it can leave the simulated RMON mapped into the pro-

IT'S 5:30 PM, FRIDAY

Your FORMER programmer just went home.

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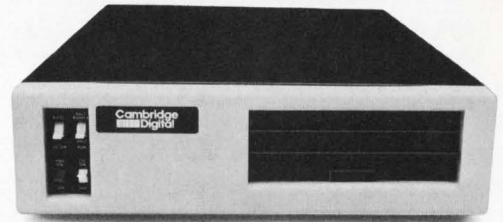
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gram's space and perform peek, poke, bit set, and bit clear operations into the I/O page. It is much more efficient to directly access the device registers by mapping the I/O page into the program's space than to use the routines to perform each individual access. However, this technique will not work if the program must also directly access offsets into RMON. The correct way to access offsets into RMON is with the SYSLIB routine, ISPY, which will work even if the I/O page is mapped into the program's space.

The TSX-Plus real time support facility allows a program to connect a real time interrupt to a completion routine. If this is done, the completion routine is executed each time the specified interrupt occurs. It is possible for several interrupt vectors to be connected to the same completion routine in a job but it is illegal for more than one job to connect to the same interrupt vector.

An execution priority may be specified for each completion routine. This is not the same as the hardware selected priority of the interrupt. All completion routines are synchronized with the job and run at hardware priority level zero. The completion routine priority is used to schedule the completion routines for execution. The available priority levels are zero through seven. The execution of a real time completion routine for one job will be interrupted and suspended if an interrupt occurs that causes a higher priority completion routine for another job to be queued for execution. However, a completion routine for a given job will never be interrupted to run another completion routine for the same job even if a higher priority completion routine is pending.

Completion routine priorities one through seven are real time priorities. They are higher than the priorities given to time sharing jobs and will always preempt the time sharing jobs. Completion routine priority zero is not a real time priority but rather a very high normal priority. Such zero priority completion routines are time sliced in the normal fashion. If a completion routine enters a wait state it relinquishes its real time priority. Jobs that have real time, interrupt driven completion routines need not be locked in memory.

In time critical, real time applications where a program must respond to an interrupt with minimum delay, it may be necessary for the job to lock itself in memory to avoid the time consumed in program swapping. This facility should be used with caution since if a number of large programs are locked in memory there may not be enough space left to run other programs.

A running program may gain exclusive access to the system to perform some time-critical task. The program may then relinquish this exclusive access when it is not needed.

Shared Run Time System Support:

TSX-Plus provides a facility that allows shared run time systems or data areas to be mapped into the address spaces of multiple time sharing jobs. Table 6 lists the routines that support this feature.

TABLE 6. SHARED RUN TIME SYSTEM SUPPORT

IASRNT	Associate/disassociate a shared run time system with a job.
MAPRNT	Map a shared run time system into a job's region.

Memory space can be conserved by having several jobs access a common copy of a run time system rather than having to allocate space within each job. Shared run time systems are never swapped out of memory. When a job is associated with a run time system, a portion of the job's virtual memory is mapped so as to allow access to the run time system.

Shared File Support:

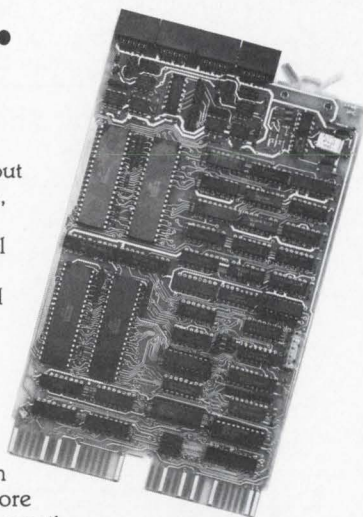
Table 7 lists the routines that offer access to the shared file record locking facility provided by TSX-Plus. This is useful in situations where programs being run from several terminals wish to update a common file. Through the record locking facility a program may gain exclusive access to one or more blocks in a shared file by locking those blocks. Other users attempting to lock the same blocks will be denied access until the first user releases the locked blocks.

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TABLE 7. SHARED FILE SUPPORT

ICKWTS	Check for writes to a shared file.
IDCLSF	Declare a file to be shared.
ISVST	Save the status of a shared file.
IUALBK	Unlock all locked blocks.
IUSPBK	Unlock a specific block.
LKBLK	Try to lock a block.
LKBLKW	Wait for a block to lock.

The recommended procedure for updating a shared file being accessed by several users is as follows:

1. Open the file.
2. Declare the file to be shared.
3. Lock all blocks which contain the desired record.
4. Read the locked blocks into memory.
5. Update the record.
6. Write the updated blocks to the file.
7. Unlock the blocks.
8. Repeat steps three through seven as required.
9. Close the file.

System Status Information:

Information typical of that returned by the SYSTAT keyboard command is made available to a running program by the routines listed in Table 8.

TABLE 8. SYSTEM STATUS INFORMATION

ICONTM	Determine the connect time for a job.
ICPUTM	Get the CPU time used by a job.
IEXSTS	Get a job's execution status.
ILNSTS	Check the status of a line.
IPGNAM	Get the name of the program being run by a job.
IPPNUM	Get the project-programmer number for a job.
MEMPOS	Determine the position of a job in memory.
MEMUSE	Determine the amount of memory used by a job.

Terminal Communications Support:

The routines that allow a running program to communicate with a terminal are listed in Table 9.

TABLE 9. TERMINAL COMMUNICATIONS SUPPORT

TRMIN	Accept a string of characters from the terminal.
TRMMSG	Send a message to another terminal.
TRMOUT	Send a string of characters to the terminal.

Terminal Control Support:

The several terminal control support routines are listed in Table 10.

TABLE 10. TERMINAL CONTROL SUPPORT

BRKCTL	Establish break sentinel control.
HIEFOF	Turn off the high efficiency terminal mode.
HIEFON	Turn on the high efficiency terminal mode.
IACTCH	Check for pending activation characters.
ITRERR	Check for terminal input errors.
ITRTYP	Determine the terminal type.
TIMOUT	Set the terminal read time out value.

Miscellaneous EMT Support:

Table 11 lists the routines that support the several miscellaneous EMTs provided by TSX-Plus.

TABLE 11. MISCELLANEOUS EMT SUPPORT

ISPBLK	Determine the number of free blocks in the spool file.
ISPY	Return values from within the simulated RMON (SYSLIB routine).
ITSLIC	Determine the TSX-Plus license number.
ITSLIN	Determine the TSX-Plus line number.
MEMSET	Set the memory allocation.

ODT Activation Mode Support:

ODT activation mode may be turned on and off from within a running program. Table 12 lists the routines that support this feature. In this mode TSX-Plus considers all characters to be activation characters except the digits, the comma, the dollar sign and the semicolon.

TABLE 12. ODT ACTIVATION MODE SUPPORT

RSRODT	Reset normal activation mode.
SETODT	Set ODT activation mode.

References:

1. N. A. Bourgeois, Jr., "TSXLIB — A library Implementation of the TSX-Plus Programmed Requests", 11-490, DECUS/US Chapter Program Library, Marlboro, MA, October 1982.
2. S & H Computer Systems, Inc., "TSX-Plus Reference Manual," Nashville, TN, December 1980.
3. S & H Computer Systems, Inc., "TSX-Plus version 2.2 System Release Notes," Nashville, TN.
4. Digital Equipment Corporation, "RT-11 Programmer's Reference Manual," AA-H378A-TC, Maynard, MA, March 1980.
5. S & H Computer Systems, Inc., "TSX-Plus version 3.0 System Release Notes," Nashville, TN.
6. Robert B. Denny, et al, "C Language System for RT-11," 11-513, DECUS/US Chapter Program Library, Marlboro, MA, January 1982.

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SEE PAGE 19

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DMP —

A DIBOL FILE DUMP UTILITY

By Gary Paine, Cybernetics Resources Corporation, Port Washington, NY

CMP has proven to be an extremely useful tool in all areas of system design, implementation and maintenance. It allows a programmer/user to dump records from an input file (which may be ISAM) to an output file or printer or terminal. It allows the output record to be any length, so that pieces of records or expanded records may be created. And it allows selection of the records to dump based on a field comparison with not equal, greater than, greater than or equal, less than, less than or equal, between, sequential, and all.

DMP queries a user for the following information:

INPUT FILE:
ISAM (Y,N):
OUTPUT FILE:
OUTPUT RECORD BEGINNING:
OUTPUT RECORD LENGTH:
OPERATION (EQ,NE,GT,GE,LT,LE,BE,SE,AL):
FIELD BEGINNING:
FIELD LENGTH:
FIELD VALUE:

If the operaton is all (AL), the above 3 field questions are not asked. If the operation is sequential (SE), the above 3 field questions are replaced by "NUMBER OF RECORDS TO DUMP." If the operaton is between (BE), a second field value is asked for.

DMP allows the user to examine data files and recreate pieces of them at 2 levels:

1) At the record level, CMP can create shorter or longer records:

Example 1: To dump the first 80 bytes of a 250 byte record to the terminal:
OUTPUT RECORD BEGINNING = 1, OUTPUT RECORD LENGTH = 80

Example 2: To create a file of 25 byte employee name records from a file of 250 byte employee master records where the employee name begins at location 10 for a length of 25:
OUTPUT RECORD BEGINNING = 10, OUTPUT RECORD LENGTH = 25.

Example 3: To lengthen the records in a file from 200 bytes to 250 bytes:
OUTPUT RECORD BEGINNING = 1, OUTPUT RECORD LENGTH = 250
(This will take 200 byte input records, pad them with 50 spaces, and write out 250 byte output records.)

2) At the file level, DMP can select records to write to the output file by comparing a value in a specified field in each input record against a user specified value. Note that "sequential" and "all" do not field comparisons. "All" simply dumps all records in the input file to the output file. "Sequential" dumps the first X records in the input file to the output file.

Example 1: To create a test file of the first 50 records in a large data file:
OUTPUT FILE = TEST FILE NAME, OUTPUT RECORD BEGINNING = 1,
OUTPUT RECORD LENGTH = INPUT FILE RECORD LENGTH, OPERATION = SE, NUMBER OF RECORDS TO DUMP = 50.

Example 2: An end user thinks there is a problem with all records in an ISAM file with an entry date of 10-21-82. To examine these records:
SPECIFY THE INPUT FILE, THE OUTPUT FILE (THIS CAN BE TT: OR LP: OR A TEMPORARY DATA FILE), OPERATION = EQ, FIELD LOCATION = DATE FIELD'S POSITION IN THE RECORD, FIELD LENGTH = 6, FIELD VALUE = 821021. ALL RECORDS WITH A DATE FIELD = 821021 WILL BE WRITTEN TO THE OUTPUT FILE (OR DEVICE).

Example 3: The user examines the records he selected in Example 2 and wants to purge all those with an entry date of 821021 from the file:
SPECIFY THE INPUT FILE, A TEMPORARY OUTPUT FILE, RECORD BEGIN = 1, RECORD LENGTH = INPUT FILE'S RECORD LENGTH, OPERATION = NE, FIELD LOCATION = THE DATE'S POSITION IN THE FILE, FIELD LENGTH = 6, FIELD VALUE = 821021. THIS WILL WRITE ALL INPUT RECORDS TO THE OUTPUT FILE. (NOTE THAT IF THE INPUT FILE WAS AN ISAM FILE, IT MUST NOW BE RECREATED FROM THE TEMPORARY FILE.)

Example 4: A user bombs out of a program with some file I/O oriented error message:
INPUT FILE = PROBLEM FILE; OUTPUT FILE = N (NONE), DMP WILL READ SEQUENTIALLY ALL RECORDS IN THE INPUT FILE AND DISPLAY A RECORD COUNT WHEN FINISHED. THE KNOWLEDGE THAT A FILE CAN OR CANNOT BE SEQUENTIALLY READ SUCCESSFULLY OFTEN SAVES TIME IN DETERMINING WHETHER THE PROBLEM IS IN THE DATA FILE OR THE APPLICATION PROGRAM.

Example 5: A payroll initialization batch stream selects all employee records from an employee file with an ative code of 'A' and writes them to a temporary file which it then sorts. DMP may be used in this batch stream in place of this simple selection program. (Or any simple program whose function is to select records based on one field being equal to, not equal to, greater than,etc. a given field).

Example 6: DMP is an excellent tool to back up an ISAM file to a DDF file or to the terminal printer.

As a consultant, I consider DMP to be an essential tool in my "tool kit." It allows me to examine and work with a client's data files without constantly writing file manipulation programs.

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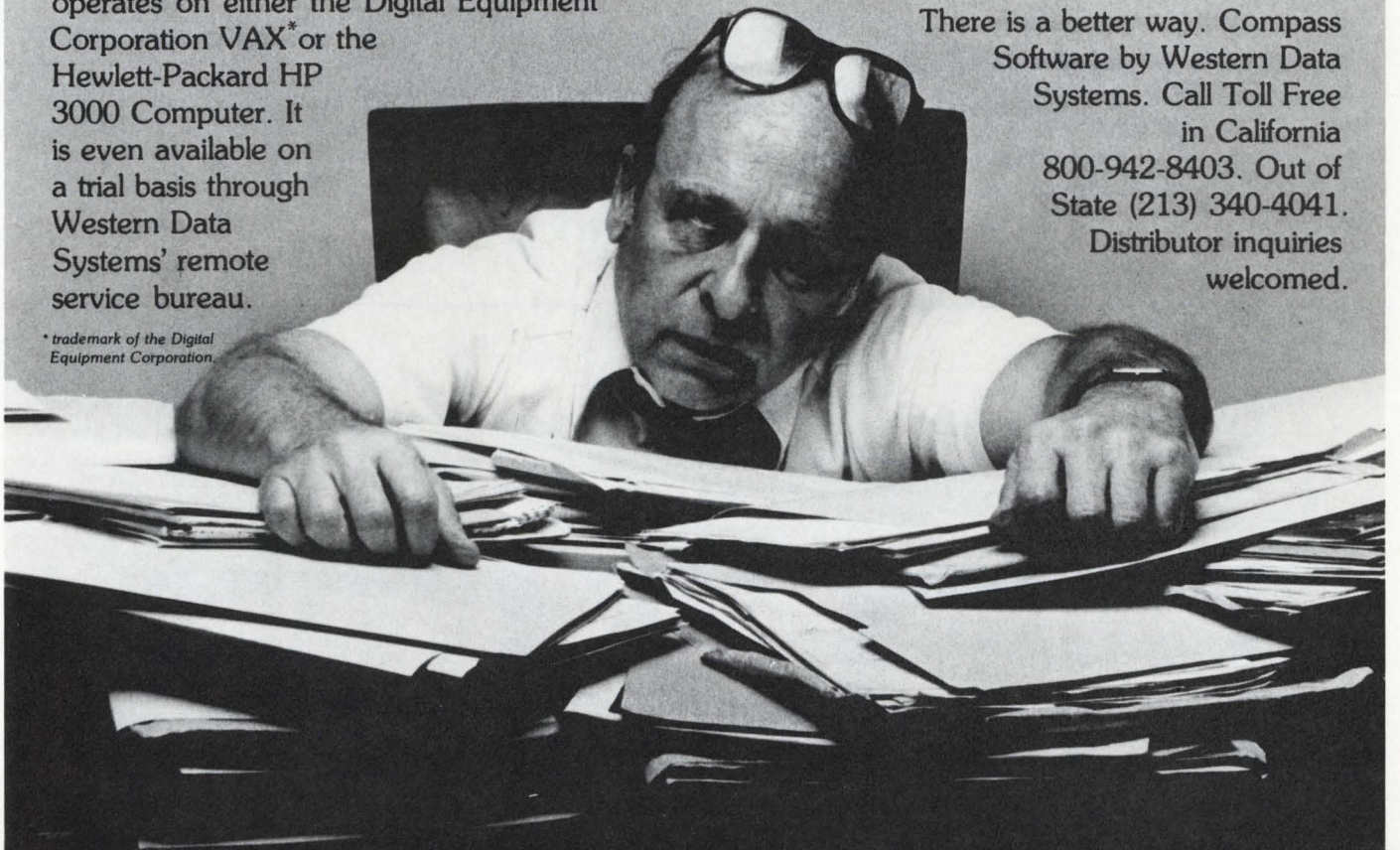
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Notes: There are no display escape sequences, so DMP works equally well on a hard copy console, VT-52, VT-100, or in a batch stream.

The current maximums are: record length—1200, field length—40, but these may be easily increased.

There is no edit checking of operator responses, so weirdness will generally cause DMP to bomb. Simply rerun DMP. Note: Nothing is updated by DMP except the output file it creates.

There is no "RECORD LOCKING" or "SLEEP AND RETRY" LOGIC, so in general a user should use DMP on an input file when no one else is accessing it.

A user needs no great technical knowledge, but should have current file layouts to use DMP.

All the DMP operations read the entire input file, except sequential (SE) which dumps the first X records and stops.

This version of DMP reads and writes RT-11 and RSTS DMS files.

```
START  DMP.DBL - DIBOL FILE DUMP UTILITY
       BY GARY PAINE, CONSULTANT
       CYBERNETICS RESOURCES CORPORATION, PORT WASHINGTON, N.Y.
       WRITTEN AT UNICOMP CORPORATION, SEATTLE, WA.
       EXTERNAL SUBROUTINES - FLAGS, TIME
       FUNCTION - QUERY OPERATOR FOR:
       ; INPUT FILE (AND WHETHER ISAM)
       ; OUTPUT FILE (DATA FILE NAME, 'TT', 'LP', ETC. OR 'N' (NONE))
       ; OUTPUT RECORD BEGINNING (LOCATION IN INPUT RECORD WHERE OUTPUT
       ; RECORD BEGINS)
       ; OUTPUT RECORD LENGTH (NEED NOT MATCH INPUT RECORD LENGTH)
       ; OPERATION (EQUAL, NOT EQUAL, GREATER THAN, GREATER THAN OR
       ; EQUAL, LESS THAN, LESS THAN OR EQUAL, BETWEEN,
       ; 1ST X SEQUENTIAL RECORDS, OR ALL RECORDS)
       ; (EQ, NE, GT, GE, LT, LE, BE, SE, AL)
       ; FOR OPERATIONS: EQ=NE,GT,GE,LT,LE - QUERY OPERATOR FOR:
       ; FIELD LOCATION (OF COMPARE FIELD)
       ; FIELD LENGTH (OF COMPARE FIELD)
       ; FIELD VALUE (OF COMPARE FIELD)
       ; FOR OPERATION: BE - QUERY OPERATOR FOR:
       ; FIELD LOCATION, FIELD LENGTH, FIELD VALUE, AND
       ; SECOND FIELD VALUE (UPPER BOUND OF COMPARE FIELD)
       ; FOR OPERATION: AL - NO FURTHER QUESTIONS ARE ASKED
       ; FOR OPERATION: SE - QUERY OPERATOR FOR:
       ; NUMBER OF RECORDS TO DUMP
       ; READ THE INPUT FILE SEQUENTIALLY AND WRITE ALL RECORDS
       ; TO THE OUTPUT FILE WHICH SATISFY THE DESIRED OPERATION.
       ; COUNT INPUT AND OUTPUT RECORDS. DISPLAY COUNTS AND ELAPSED
       ; TIME AT END.
       ;I/O
       ; 1 TT: OPERATOR INPUTS DESIRED PARAMETERS; I
       ; 2 INPUT FILE: SPECIFIED BY OPERATOR; I OR SI
       ; 3 OUTPUT FILE: SPECIFIED BY OPERATOR; O
```

```
DATA DIVISION
RECORD REC  INPUT RECORD
           +A1200
```

```
RECORD WORK
INFIL +A24      INPUT FILE
OUTFIL +A24     OUTPUT FILE
ISFLAG +A1     ISAM FLAG (Y,N)
ORB +D4        OUTPUT RECORD BEGINNING
ORL +D4        OUTPUT RECORD LENGTH
ORE +D4        OUTPUT RECORD END: (ORB + ORL - 1)
INCNT +D6      INPUT RECORD COUNT
OUTCNT +D6     OUTPUT RECORD COUNT
FB +D4        FIELD BEGINNING
FL +D4        FIELD LENGTH
FE +D4        FIELD END: (FB + FL - 1)
FV +A40       FIELD VALUE
SFV +A40      SECOND FIELD VALUE (FOR BE OPERATION)
OP +A2        OP CODE (EQ,NE,LT,GT,LE,GE,BE,SE,AL)
SEQ +D6       SEQUENTIAL MAXIMUM (FOR SE OPERATION)
ENDSW +D1,0   END OF FILE SWITCH (END = 1)
TT +D1,1     TERMINAL CHANNEL
IN +D1,2     INPUT CHANNEL
OUT +D1,3    OUTPUT CHANNEL
A4 +A4       ALPHA DISPLAY BUFFERS
A6 +A6
A8 +A8

RECORD INTIM   TIME IN
IHR +D2
IMIN +D2
ISEC +D2

RECORD OUTTIM  TIME OUT
OMR +D2
OMIN +D2
OSEC +D2

RECORD ETIM    ELAPSED TIME
EHR +D2
EMIN +D2
ESEC +D2

PROC (4)
CALL INIT      GET FILE INFO, RECORD INFO, FIELD INFO, OPEN FILES

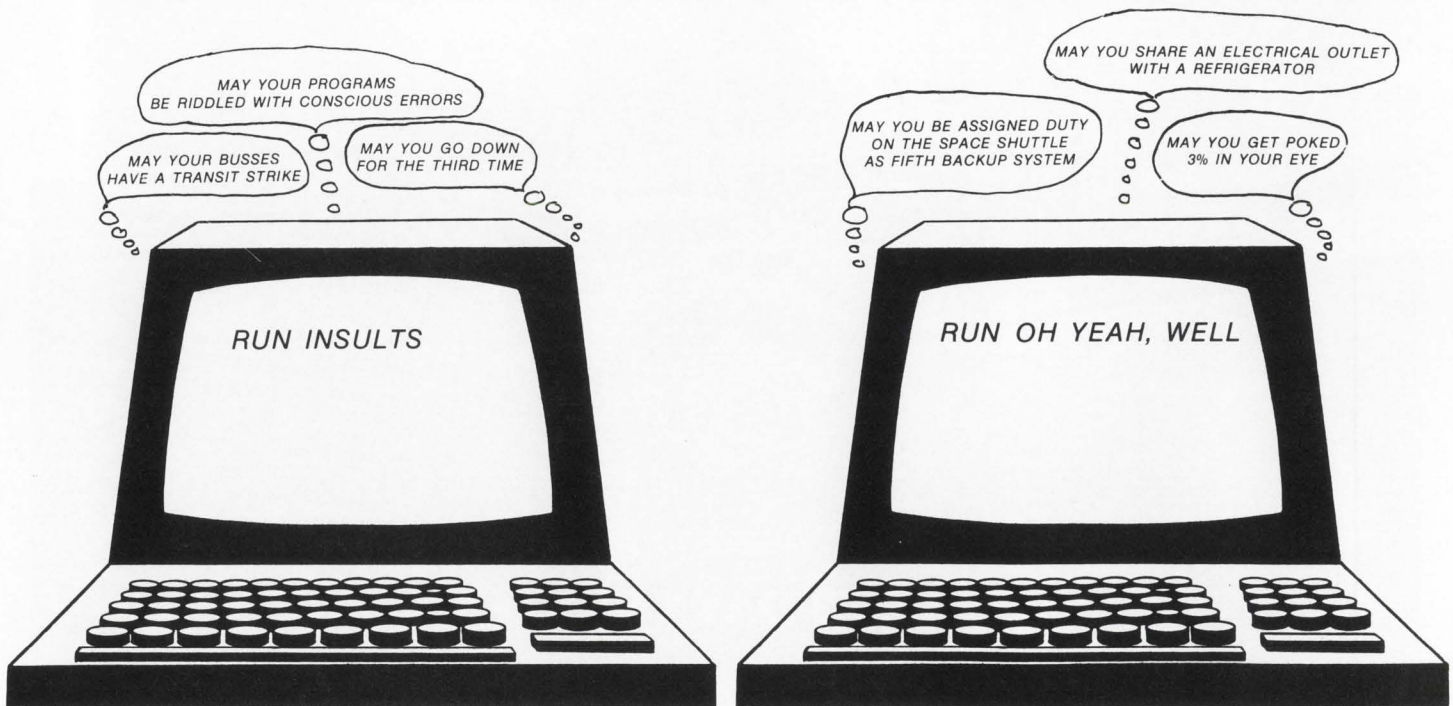
BRANCH,
IF (OP.EQ.'EQ') GO TO EQ
IF (OP.EQ.'NE') GO TO NE
IF (OP.EQ.'GT') GO TO GT
IF (OP.EQ.'GE') GO TO GE
IF (OP.EQ.'LT') GO TO LT
IF (OP.EQ.'LE') GO TO LE
IF (OP.EQ.'BE') GO TO BE
IF (OP.EQ.'SE') GO TO SE
IF (OP.EQ.'AL') GO TO AL
DISPLAY (TT, 'INVALID OF CODE')
GO TO EOF

EQ,
CALL READN    EQUAL
IF (ENDSW.EQ.1) GO TO EOF
IF (REC(FB,FE).EQ.FV) CALL WRITEN
GO TO EOF

NE,
CALL READN    NOT EQUAL
IF (ENDSW.EQ.1) GO TO EOF
IF (REC(FB,FE).NE.FV) CALL WRITEN
GO TO NE

GT,
CALL READN    GREATER THAN
IF (ENDSW.EQ.1) GO TO EOF
IF (REC(FB,FE).GT.FV) CALL WRITEN
GO TO GT

GE,
CALL READN    GREATER THAN OR EQUAL
IF (ENDSW.EQ.1) GO TO EOF
IF (REC(FB,FE).GE.FV) CALL WRITEN
GO TO GE
```



DB. 82

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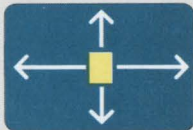
Almost any word processing software package will have such features as menus, editing, spelling error detection, list processing, cut and paste, automatic word wrap and automatic pagination. . .

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THE QUESTIONS:

1 EDITING



Which kind of editing operation is quickest to execute and easiest on the eyes of the word processing user?

- Full screen editing allowing for easy cursor movement around the screen?
- Moving the cursor around by doing a line count?
- Editing on the bottom line of text only?

2 DOCUMENT LAYOUT



Whatever document format you choose. . . you want to see what the finished article will look like. Should you. . .

- View it on the screen as it would come out of the printer?
- Run it through a pre-processor to see what it looks like and then if you like it, print it?

3 KEYSTROKES



Using a well designed w-p system, how many keystrokes should it take to execute the most often used w-p functions?

- One easy stroke with no codes?
- Two or more with complex w-p codes?
- Three or more?

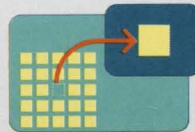
4 FLEXIBILITY



As the business manager of your company, you would like to find w-p software that you can tailor to your company's specific needs. Should you. . .

- Look for w-p software that allows you to change and add menus, and change function keys?
- Write your own custom software?

5 RETRIEVAL



If you want to retrieve information quickly from a large database, which w-p software should you choose?

- One that can access a particular record by going to it directly?
- One that searches through all the records on the database sequentially until it finds the right one?

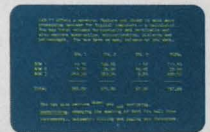
6 COMPATIBILITY



As a manager of MIS, you want a w-p system that can be integrated with any other DEC compatible application software. Should you choose w-p software with. . .

- ASCII formatted files?
- Software which requires non-printing characters in its file system?

7 MATH



Your company has a number of financial applications and is looking for a w-p package with math capabilities. Should you choose. . .

- On screen calculating allowing for editing, storing and recall of equations, calculations integrated with your word processing applications?
- Software where the math capabilities are tied to the list processing module?
- A separate math package?

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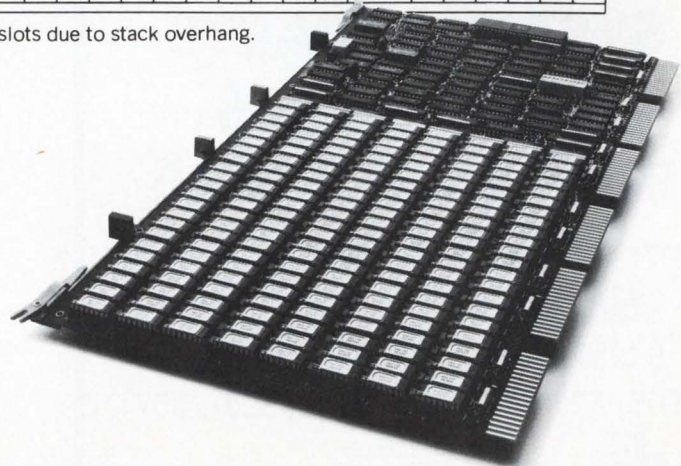
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MODEL	TYPE	CPU								BUS		CAPACITY				PARITY		ECC	ADDRESSING		BOARD SIZE																
		LSI-11/2	LSI-11/23	LSI-11/23+	PDP-11/24	PDP-11/34	PDP-11/44	VAX-11/70	VAX-11/730	VAX-11/750	Q-BUS	UNIBUS	EXT. UNIBUS	MEM. BUS	32KB	64KB	128KB	256KB	512KB	768KB	1.0MB	On-Board Parity	Bits Only	Non-Parity	16-bit	18-bit	22-bit	Dual	Quad	Hex							
SV32AP	MOS	•	•										•	•								•	•														
SV128A	MOS	•	•										•	•	•	•						•	•														
SV512	MOS	•	•										•	•	•	•						•	•														
S11L/F	MOS				•	•	•						•	•	•	•						•	•														
S11E/4	MOS				•	•	•						•	•	•	•						•	•														
S750	MOS						•	•	•				•	•	•	•						•	•														
✓ S780	MOS								•				•	•	•	•						•	•														
1132	CORE					•							•	•								•	•														
1132A	CORE					•							•	•								•	•														

*Memory is contained on a single board but requires space of two slots due to stack overhang.

✓ Check this one: about 1/3 the price of the DEC equivalent!

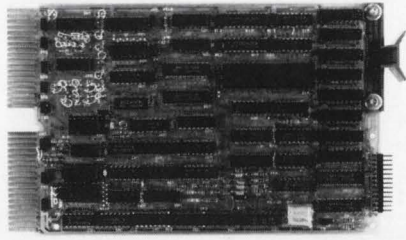


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```

LT,          ;LESS THAN
CALL READN
IF (ENDSW.EQ.1) GO TO EOF
IF (REC(FB,FE).LT.FV) CALL WRITEN
GO TO LT

LE,          ;LESS THAN OR EQUAL
CALL READN
IF (ENDSW.EQ.1) GO TO EOF
IF (REC(FB,FE).LE.FV) CALL WRITEN
GO TO LE

BE,          ;BETWEEN
CALL READN
IF (ENDSW.EQ.1) GO TO EOF
IF (REC(FB,FE).GE.FV.AND.REC(FB,FE).LE.SFV) CALL WRITEN
GO TO BE

SE,          ;SEQUENTIAL
CALL READN
IF (ENDSW.EQ.1) GO TO EOF
CALL WRITEN
IF (INCNT.EQ.SEQ) GO TO EOF
GO TO SE

AL,          ;ALL
CALL READN
IF (ENDSW.EQ.1) GO TO EOF
CALL WRITEN
GO TO AL

EOF,        ;AT END OF FILE DISPLAY COUNTS
CALL DSPCNT

EOJ,        ;CLOSE FILES AND STOP
CLOSE 1
CLOSE 2
IF (OUTFIL.NE.'N'.AND.OUTFIL.NE.'TT') CLOSE 3
STOP

;*****
;          CALLED SUBROUTINES
;*****

INIT,       ;INITIALIZE AND GET FILE INFO
XCALL FLAGS (01001000) ;ENABLE RUBOUT, DISABLE STOP
OPEN (TT,TT)
DISPLAY (TT,'INPUT FILE: ')
READS (TT,INFIL,EOJ)
DISPLAY (TT,'ISAM? (Y/N): ')
READS (TT,ISFLAG,EOJ)
IF (ISFLAG.EQ.'Y') OPEN (IN,SI,INFIL)
IF (ISFLAG.EQ.'N') OPEN (IN,I,INFIL)
DISPLAY (TT,'OUTPUT FILE? (N=NONE): ')
READS (TT,OUTFIL,EOJ)
IF (OUTFIL.EQ.'N') GO TO GETOP
IF (OUTFIL.NE.'TT') OPEN (OUT,O,OUTFIL)
DISPLAY (TT,'OUTPUT RECORD BEGINNING: ')
READS (TT,A4,EOJ)
ORB = A4
DISPLAY (TT,'OUTPUT RECORD LENGTH: ')
READS (TT,A4,EOJ)
ORL = A4
ORE = ORB + ORL - 1 ;CALCULATE OUTPUT RECORD END

GETOP,     ;GET DESIRED OPERATION AND FIELD VALUES
DISPLAY (TT,'OPERATION? (EQ,NE,GT,GE,LT,LE,BE,SE,AL): ')
READS (TT,OP,EOJ)
IF (OP.EQ.'SE') DISPLAY (TT,'NUMBER OF RECORDS TO DUMP: ')
IF (OP.EQ.'SE') READS (TT,A6,EOJ)
IF (OP.EQ.'SE') SEQ = A6
IF (OP.EQ.'AL'.OP.OP.EQ.'SE') GO TO INITX
DISPLAY (TT,'FIELD LOCATION: ')
READS (TT,A4,EOJ)
FB = A4
DISPLAY (TT,'FIELD LENGTH: ')
READS (TT,A4,EOJ)
FL = A4
FE = FB + FL - 1 ;CALCULATE FIELD END
DISPLAY (TT,'FIELD VALUE: ')
READS (TT,FV,EOJ)
IF (OP.NE.'BE') GO TO INITX
DISPLAY (TT,'SECOND FIELD VALUE: ')
READS (TT,SPV,EOJ)

INITX,    ;GET STARTING TIME
XCALL TIME (A6)
INTIM = A6
RETURN

;*****

READN,    ;READ A RECORD AND INCREMENT IN COUNTER
READS (IN,REC,EOIN)
INCR INCNT
READNX,  RETURN

EOIN,    ;SET END SWITCH AT END OF FILE
ENDSW = 1
GO TO READNX

;*****

WRITEN,  ;WRITE SELECTED RECORDS TO OUTPUT FILE AND INCR COUNTER
INCR OUTCNT
IF (OUTFIL.EQ.'N') RETURN
IF (OUTFIL.EQ.'TT') WRITES (TT,REC(ORB,ORE))
IF (OUTFIL.NE.'TT') WRITES (OUT,REC(ORB,ORE))
RETURN

;*****

DSPCNT,  ;DISPLAY COUNTS
XCALL TIME (A6)
;GET ENDING TIME
OUTTIM = A6
A6 = INCNT,'ZZZZX'
DISPLAY (TT,'13:10,RECORDS IN: ',A6,13,10)
A6 = OUTCNT,'ZZZZX'
DISPLAY (TT,'RECORDS OUT: ',A6,13,10)
;CALCULATE AND DISPLAY ELAPSED TIME
IF (ISEC.GT.OSEC) OMIN = OMIN - 1
IF (ISEC.GT.OSEC) OSEC = OSEC + 60
ESEC = OSEC - ISEC
IF (IMIN.GT.OMIN) OHR = OHR - 1
IF (IMIN.GT.OMIN) OMIN = OMIN + 60
EMIN = OMIN - IMIN
IF (IHR.GT.OHR) OHR = OHR + 24
EHR = OHR - IHR
A6 = ETIM,'XX-XX-XX'
DISPLAY (TT,'ELAPSED TIME (HH-MM-SS): ',A6,13,10)
RETURN

;*****

END
    
```


ROUTINE DEBUGGING

or Getting the Buggers Off Your Back

By Gerald M. Weinberg

Nothing is certain but death, taxes, and bugs! Like the poor, bugs will always be with us, Edsger Dijkstra notwithstanding. Anyone in a large programming shop who shows a modest talent for finding bugs is sure to attract hordes of other people's insoluble problems, much as flypaper attracts flies.

For a short time, such attention must be flattering to the flypaper, as it is to the "master debugger." In a few weeks or months, though, one begins to weary of finding the same old missing periods, misplaced semicolons, uninitialized variables, one-too-many loops, and off-by-one subscripts. We usually think that it's the flypaper that traps the flies, but think of it from the flypaper's point of view.

Some years ago, Tom Plum and I were teaching at the State University of New York and somehow got the reputation as the people to see when one had an insoluble bug. Before long, however, the hordes of miserable programmers (there were over 7,000 of them using the computing centre) began to use us as a first resort, rather than a last resort. As one of them put it, "I didn't know whether it would be a hard bug or an easy bug, so I thought it would save time to see you first."

That remark got us thinking. Besides, we were beginning to get complaints about the queues forming outside our office. We brainstormed the problem and came up with the following "Style Sheet for PL/I Programming—Routine Debugging." We hung it on our door, and provided a stack of free copies to all who sought our free services.

The rules for the use of the sheet were simple. Before we would look at a problem, the bearer had to swear that s/he had followed all the steps of Routine Debugging. If we later discovered that some step had not been followed, that person was put on the Buggers' Blacklist and was denied the use of our services for one year.

Read the checklist, keeping in mind that some of the items are specific to PL/I and some to the particular installation, and then I'll tell you what happened.

STYLE SHEETS FOR PL/I PROGRAMMING — ROUTINE DEBUGGING

C T.W.-S Plum and G.M. Weinberg, 1974

Routine debugging is the habit which, once established, helps you find 90% of the stupid little errors (and the not-so-stupid big errors) that infest a program. You should perform routine debugging on every listing you create.

Routine debugging means using all the information that the system gives you. As you check your listing, mark each item on it that has been fully used.

. . . continued on page 84

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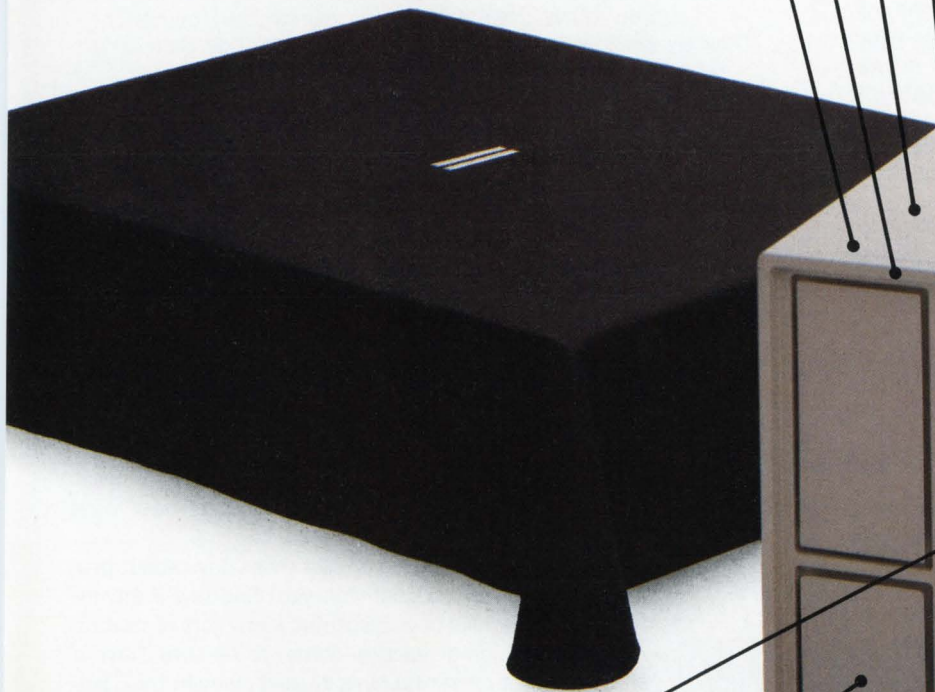
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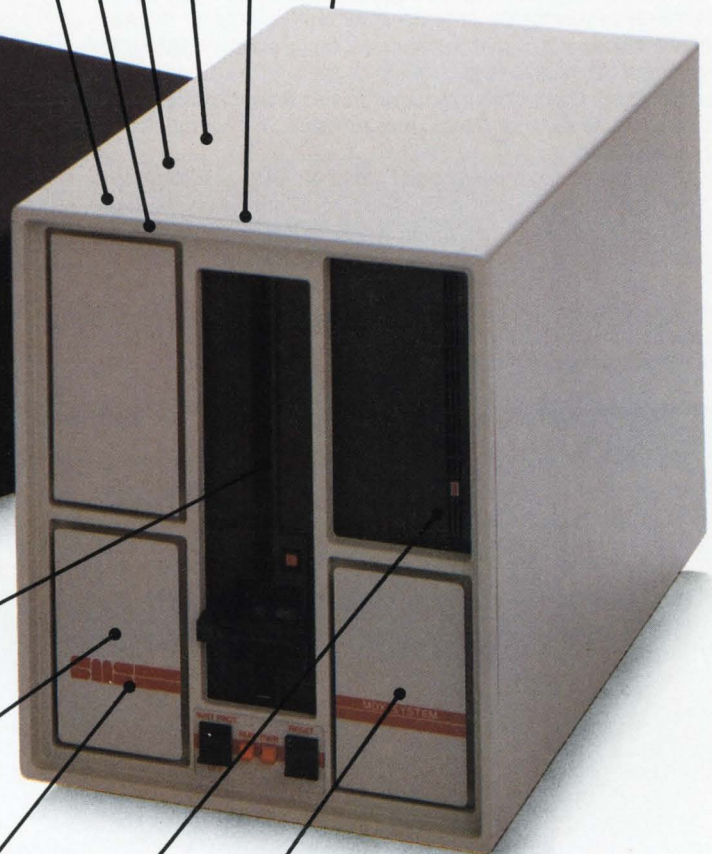
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1. Use the entire output, not just your program. So start at the top. HASP, JCL, . . . Anything look unusual? Any error messages? Are execution and CPU times and core reasonable?

2. Next review the compile output. Each independently compiled PROC Has the same format: OPTIONS (WAS *PROCESS punched correctly?); MACRO processor (no errors, please); source listing (STMT and LEVEL numbers look right? NEST numbers correct for DOs, ON-units? Nothing obviously strange about the listing?) 10/20 seconds per page should suffice.

3. The all-important ATR and XREF listing. Is everything declared, with DCL NO at the left? No? Stop and think about each and every name that isn't—is it OK? Look down the IDENTIFIER column: Anything unusual, like duplicate names, similar names (might be misspelled), PL/L keywords taken for variables, expected names missing, or . . .? Then check the ATTRIBUTES: are defaults what you want, are similar items given comparable attributes, are EXTERNAL names given same attributes in all modules, or . . .? REFERENCES: are some names never referred to, or only once? Why? Is the pattern of references unusual? If so, glance again at the listing.

4. Then review other compiler output. LENGTH AND STORAGE: Is everything reasonable at a glance? Are your record lengths right? COMPILER DIAGNOSTICS: ERRORS of all types should be checked out and checked off, even if 'corrected' by compiler. WARNINGS, even the most familiar ones, should be OK'd for each statement number given. Check especially on parameter passing, conversions, and the like, to see that things fit as expected. And that ends the compiler output.

5. Finally, the output from your program. Be sure it began execution by checking for 'hello' message. If not, check linkage editing, or if no MAIN was given. If you followed scrutable programming (and if you didn't, why not?) every input read was printed out. Check them off to be sure they are correct. Look at every line of output. Is it OK? Don't skip over the "insignificant little errors"—make a list of them as you go along, such as getting your formats right. Did the program stop normally? If not, the pro-

gram could have written one or two more lines than you see on the listing—lines which are lost in the buffer.

6. DIAGNOS output contains much useful information on abnormal terminations: Check the ONCODE, and the special built-in function values such as ONCHAR, ONSOURCE, and ONKEY. Check the status of all files—are their attributes correct? What is in the buffers? Especially check SYSIN or other STREAM input files that have not reached ENDFIELD, to see where the stream pointer is halted. Most troubles with STREAM input can be solved right here.

7. If there are SYSTEM ERROR MESSAGES, be sure you understand them. Look them up in MESSAGES AND CODES, even though the last three times you looked there it gave no useful information. This may be the one time it solves your problem.

8. Do all of these things, and do not stop the first time you find something wrong. Most runs have enough information to solve several problems at once—if you use it. You can debug twice as fast if you get out two bugs for each run! You can debug infinitely faster if you get out one bug by using the information that is staring you in the face, rather than slouching back to the machine with lots of "debug cards"—some of which will surely be misspelled.

AFTER YOU'VE DONE ALL THIS, if you still have trouble or simply don't understand something you found, find some experienced person to discuss your output with. All of us are eager to help those who know how to help themselves, but nobody is eager to waste time with someone who won't take the time to do his own ROUTINE DEBUGGING!

The first reaction, of course, was disbelief, but when the first few habitual offenders went on the Blacklist and were denied further services, the reaction was sharp. The queues quickly disappeared. The average number of bugs I looked at per day dropped from about 35 to one or two, and Tom's experience was similar.

Even nicer, the bugs we did see were ten times more interesting than the old ones. That was nicer for us, and nicer for our clients, whose turnaround time waiting for debugging help was vastly diminished. Most of them learned to help themselves without even walking over to our office from the computing centre—a great benefit in itself during the upstate New York winter.

There's a lot of talk these days about programmer productivity, yet I find few if any installations have instituted some sort of routine debugging practice. Some, to be sure, have a sheet of helpful hints tucked away in the Standards Manual, but there it does little good. Besides, if it's not backed up by some system of penalties, it's unlikely to be used.

Why not get your "master debuggers" to sit down and draw up a routine debugging checklist for their clients? An hour or so of effort now should save them and their clients hundreds of hours in the future. Use our sheet as a guide, if you like, but be sure to adapt it to your own language, operating system, and working environment.

Don't try to get the checklist to be perfect the first time. We didn't. Our first few rules sifted out some of the more blatant repetitive errors, leaving a residue in which the remaining repeaters were more conspicuous. We then added these to the list, one by one, and eventually evolved the list you see here. So you needn't be an expert to make such a list. All you need is a flock of habitual buggers standing outside your door. They'll teach you what you need to put on your checklist. Do it today! And good luck!

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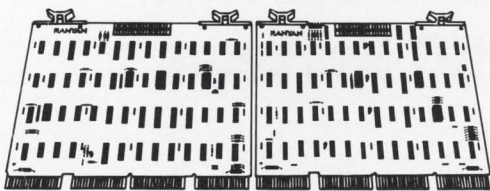
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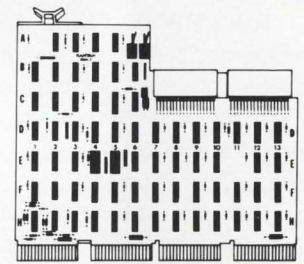
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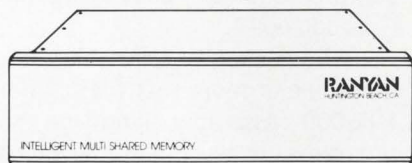


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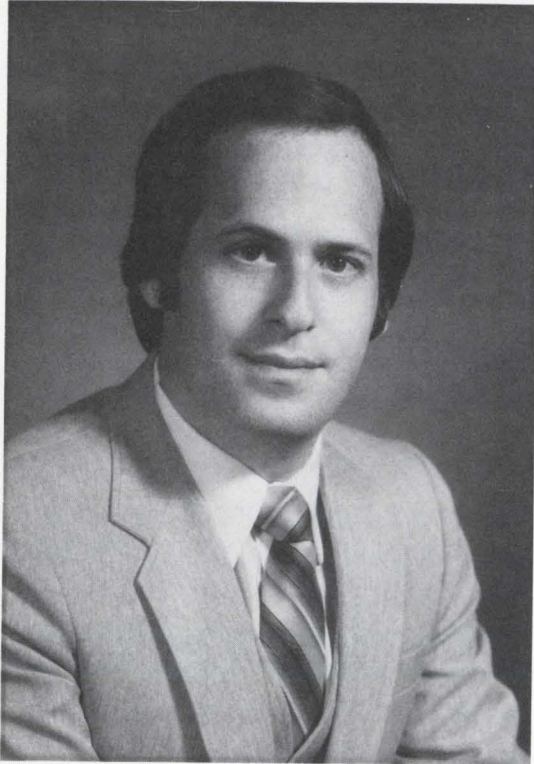
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M68000 CROSS ASSEMBLER

The Bridge Between Motorola and DEC Systems

By Joel Schacht, Vice President,
Oasys, Inc., Cambridge, Mass.

The M68000 CROSS ASSEMBLER development system allows users to develop assembly language source code for Motorola 68000-based microcomputer systems on a host Digital Equipment Corporation PDP/11 or VAX/11.

The cross assembler is designed for OEMs, system houses and end users who wish to "cross-develop" executable program images on a time-shared DEC machine and ultimately down-line load the resulting program on an M68000-based micro.

The cross assembler runs on VAX-UNIX (Berkeley 4.1), VAX VMS (V2.5 and 3.0), PDP-11 UNIX (V7), and PDP-11 RSX-11M. The assembler system is also capable of replacing the assembler that normally comes with Whitesmith "C" and PASCAL compilers.

The M68000 assembler system assembles approximately 4,000 statements per minute on the VAX, and is written in both Whitesmith "C" and standard UNIX C. Because it is C-based, the assembler is presently being migrated to a number of mainframe and microprocessor systems, both as a "cross" and "native" 68000 development system.

The cross assembler was developed originally in 1980 for internal use by Ruben Corporation of Cambridge, Mass. Ruben, the third 68000 user in

the United States, was faced with a scarcity of adequate cross development tools at that time. Having developed the assembly system for its own PDP-11 and VAX systems, Ruben successfully developed a comprehensive 100,000-byte multi-tasking operating system and an advanced, C-based natural language compiler/interpreter system. From 1980 until today, the M68000 assembler system has accumulated more than 50 man-years of inhouse production usage.

Subsequently, OASYS, Inc. of Cambridge, acquired the rights to the cross assembler system from Ruben, and has used it inhouse to develop all the software associated with its major software product, AIDE (Application Development Environment), a computer-aided application development system that is approximately 1 Mbyte in size.

FEATURES

The Motorola 68000 Assembler Development system is a complete package comprised of a relocatable macro assembler, linker, object module librarian and cross-reference utility.

Also available is a conversion utility that allows users to convert Whitesmith object modules to 68000

assembler format.

The cross assembler is fully compatible with Motorola's 68000 resident assembler. It offers conditional assembly, macro processing, an "INCLUDE" facility that maintains source program modularity, command files to handle multiple input files, and a full complement of pseudo-operations ("pseudo-ops").

The package's assembler takes as input one or more text files containing M68000 assembly language source programs. It assembles the programs and outputs a single object file that is suitable for input to the M68000 linker. The assembler also generates a listing file of the input programs, which features separate line numbering of "included" files to facilitate editing.

An important feature of the assembler is that its machine language instructions and assembler directives are accepted in the same format as is described in Motorola's EXORMACS (TM) M68000 RESIDENT STRUCTURED ASSEMBLER REFERENCE MANUAL and MC68000 16-bit MICROPROCESSOR MANUAL. The IF-THEN-ELSE structural control instructions have not, as yet, been implemented; however, all pseudo-operations instructions, including the INCLUDE facility

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and equated for register names, have been implemented as specified in the same manual.

Symbols may also be made "local" to the routines in which they appear. The system allows for symbols to be up to 30 characters in length, thereby permitting better internal documentation (the symbol names can be chosen to really mean something). Long names also provide the capability of interfacing with compilers that generate long symbol names.

The cross assembler features a unique, built-in Paged Memory Management capability (the PMM), that lets the user create a symbol table of unlimited size. It automatically

moves data to the system disk when main memory becomes full. Thus, depending upon the amount of disk space available, the user could conceivably define as many as 100,000 symbols. This makes the assembler system particularly useful in assembling very large programs on machines without virtual memory, such as the PDP-11, which are typically space bound. (Symbol table overflow is not a problem with the VAX because of its virtual memory management capability.)

The assembler allows full expressions with (), +, -, *, /, &, !, and shift operators. Constants may be decimal, hex, octal, binary, and character. Address mode selection is automatic; the as-

sembler chooses the most space efficient addressing modes on such generic instructions as ADD, SUB, and MOVE. Relocatable, absolute, and position independent code may be generated.

As many as 16 separate relocatable sections may appear in one program. At link time, the same relocatable sections of different programs are combined and placed in sequential memory locations.

External symbols may be defined using the XDEF directive in one program and referenced in another program using the same directive. Values of external symbols are resolved at link time. Conditional assembly is allowed both inside and outside macro definitions. Rather than specifically enumerating the names of source files to be assembled, a list of the names of the source files may be stored in a separate command file, which is then referred to when the assembler is invoked.

The assembler's macro facility is compatible with Motorola standard. There is no limit to the number of macro definitions allowed; a maximum of 36 arguments may be defined for any given macro, and macros may be nested up to 10 levels deep. Within macro definitions, conditional assembly directives are permitted, and unique symbols may be generated automatically for labels that appear within macro definitions.

THE ASSEMBLER

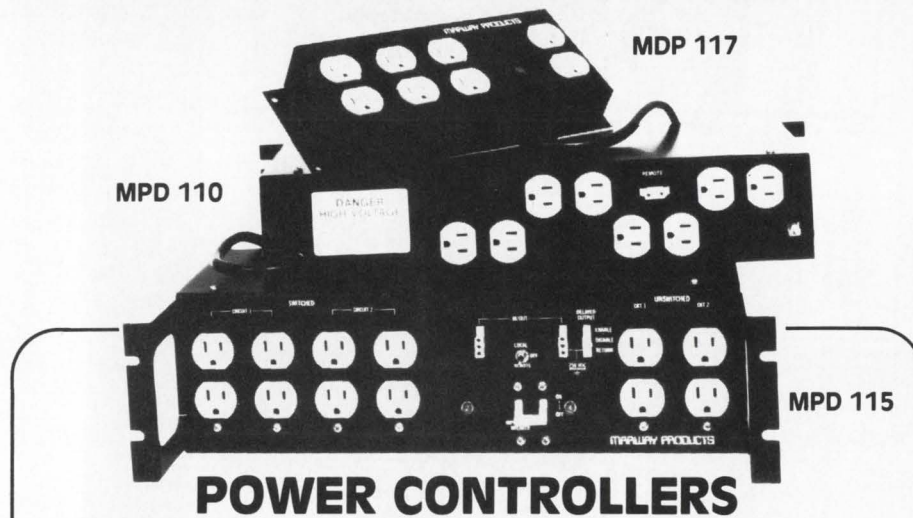
A command string to run the assembler looks like:

```
A68 objfile,listfile,creffile = srcfile2,....,srcfilen.
```

The command string consists of a list of file names. Files on the left side of the equal sign are output files; files on the right are source input files that are to be assembled.

The assembler produces three separate output files. The first contains the object output code translated from one or more source input files. The second, called the list file, contains the source listing of all the input files. The third file is a special one, since it is temporary. When this file is present, the cross reference utility program will produce a listing of all the source program's symbols.

If a file name is missing, the assembler will not produce a corresponding output file; it will simply



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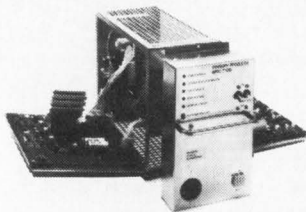
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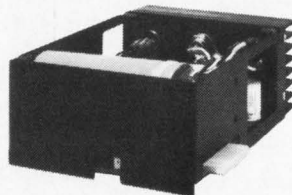
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discard output for which no name is specified.

The program to be assembled, given on the right side of the equal sign, may be broken up into more than one file. File names are written one after another and are separated by commas, as shown in the example above. The number of files that may be given is not limited by the length of the command line; file names may be continued on the next command line. Each file is assembled in the order in which it is listed in the command. (The last statement of the last file should be an END statement, or an error message will be generated.)

A typical assembly requires that several files are input to the assembler, where all but the last file consist of equates and storage allocations. The equates define data used by a program and/or routines residing in other files, while the last file usually contains the actual program to be assembled. Multiple input files may also be used to assemble large programs, and a large program may, in turn, be subdivided into several source files to make source code management and editing easier. The large file will still be assembled as a composite program.

ASSEMBLER WORK FILE

The 68000 assembler needs a temporary work file to hold the symbol table and any macro definitions, if present. The file is named ATMPL.TMP. It is automatically created on the system disk at the beginning of the assembly process and deleted at the end.

The size of the work file is dependent

upon the number of symbols and macros defined in a program. Every character which appears in a macro definition requires one byte of storage in the work file. For the symbol table, work file storage requirements are more difficult to calculate, but after the first 500 symbols have been defined in each program, about 20 bytes of storage area are needed for each symbol in the work file.

Most of the time, the programmer need not be concerned with the work file, but there must be enough space on

the system disk to hold it. Storage for the file is added incrementally, rather than all at once. If an assembly is aborted for any reason, the work file must be deleted manually.

THE LINKER

The linker is an important tool in medium and large scale software development projects. It allows large programs to be subdivided into smaller, more manageable pieces called "modules," which in turn contain one or more subroutines.

Modules are assembled separately and then combined with the linker. The linker provides a means by which one module can reference symbols defined in other modules.

A few advantages of using a linker with an assembler are that editing modules is faster and easier than editing programs; more than one programmer can work on a program at a time; and subroutines that are used in different programs may be assembled once, stored, and linked with other programs at a later time. In general, commonly used subroutines are stored in libraries, and the linker includes them in a program only if they are referenced in the program.

The M68000 linker combines any number of relocatable binary object programs previously produced by the assembler. It resolves references to external symbols, assigns absolute memory locations to relocatable sections, and outputs a single absolute object file.

The system has adopted its own format for OBJECT modules; however, the bound program

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that is output by the linker is fully compatible with Motorola's format.

For those using Whitesmith's "C", who wish to link Whitesmith object modules with the system object modules, an object file conversion utility may be used. The converter is particularly useful in converting Whitesmith's CLIB to the system.

Linker commands may be stored in a command file, thereby facilitating automatic program linking. The origin of any 16 relocatable sections may be specified explicitly. The linker produces a map file showing the load address of each module as well as the value of all external symbols.

The object output of the linker is in Motorola S format, which may be down-line loaded to a M68000 development system.

OBJECT LIBRARIAN

The librarian program is a utility that supports the M68000 linker. It functions as a repository for object modules (e.g., subroutines) to be used with the linker. The linker includes modules resident in the library into a program only if a reference is made to a member (object file) presently in the library.

An object module library comprises one or more separately assembled programs. The object codes for such programs are concatenated to form the object library. An object library is input to the linker like any other object input file, except that an asterisk (*) is placed in front of its file name. The asterisk indicates that the object code of a program in the library is to be included in the object output file only if one of its symbols is referenced by another such program.

Multiple object modules may be grouped into object libraries, and individual object modules in a library are included in the object output file only if referenced. The librarian is designed to maintain object libraries.

The present version of the librarian program operates rather simplistically. Each time it is run, it creates a new library file and places one or more programs in that file. If any object module in a library is changed, the entire library must be reconstructed. In the near future, the librarian capabilities will be expanded significantly to allow object module updates to occur without rebuilding the entire library, provide a means of specifying how and

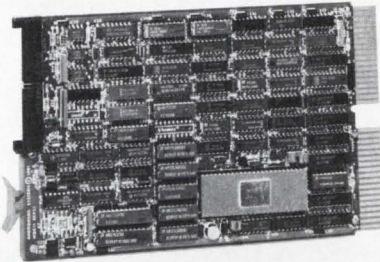
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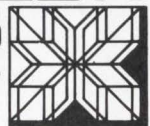
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in what order to resolve reference from various libraries, and an "exclusion" option (include all of the object modules from a particular library except those listed).

The linker may also be used to list the contents of a library file by specifying the U/option upon invocation. A map file will list each of the modules, its size, and the external symbols defined in it. The U/option is also used to suppress error messages for symbols not defined in the library.

CROSS REFERENCE FACILITY

The fourth utility of the M68000 cross assembler is used in conjunction with the assembler and the linker.

A cross reference listing for the assembler shows all symbols used in a program, the value of each symbol, the source file in which each symbol was defined, the line number in which it was defined, and the source file and line number in which each symbol was used.

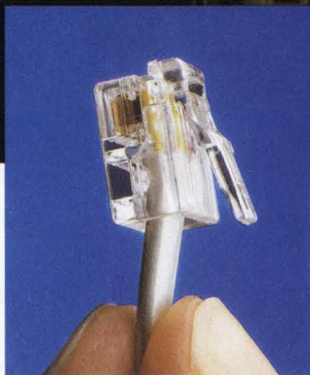
A cross reference listing from the linker will show all external symbols used in a program, the value of each symbol, the object module in which each symbol was defined, and the object and location in which each symbol was referenced.

To obtain a cross reference listing of a program, the programmer must first use the assembler or linker to generate a symbol table file. Such a file is created by specifying a third output file in the assembler or linker command. The output file must then be sorted, using a system sort utility. Next, the output of the sort utility is given to the CREF68 program, which formats the sorted symbol table file into a cross reference listing. That listing, in turn, may be printed out or appended to the end of a listing or map file.

The CREF program requires that the host computer have a SORT utility program capable of sorting fixed-length records with multiple keys. Both the RSX-11M and VAX/VMS sort programs are well suited for use with the CREF program.

AUTHOR JOEL SCHACHT has his BS in systems engineering from the Polytechnic Institute of Brooklyn and his MS in computer science from the University of Pennsylvania's Moore School of Electrical Engineering, where he was a Ford Fellow.

4



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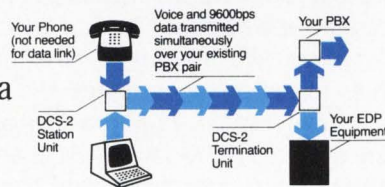
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TELTONETM

A REVIEW OF DATABASE MANAGEMENT SYSTEMS FOR RT-11

By Arthur Edward Groulx, Logicaid Limited, Nepean, Ontario, Canada

RT-11 users are fortunate because there are many excellent commercially available software products to support RT-11 applications. The purpose of this article is to review the family of products known as "database management systems" currently available to run under the RT-11 operating system.

Most readers are familiar with the concept of a database management system (DBMS). A DBMS manages data in a manner which is efficient in terms of computing efficiency, disk storage utilization, and programming time. The DBMS should be thought of as a tool used in building a final application. All known DBMS for RT-11 are powerful tools. They do not only manage data they provide application building tools which really simplify the traditional programming job.

In order to make the most of the current DBMS for RT-11, it's obviously necessary to have some knowledge of what is available. This article is not intended to decide what is the "best" DBMS. It is a review of DBMS which hopefully will demonstrate to the reader the value of any DBMS.

For this article, I decided to use the technique called "the vendor survey." In order to fairly survey the DBMS available for the RT-11 system, I created a thirteen part questionnaire and mailed it, via registered mail, to many organizations who had previously advertised the availability of such a product. Only three organizations had replied at time of writing. Consequently, I will review the three DBMS, in alphabetical order of product name, as follows:

Product name: D
Logicaid Limited
97 Craig Henry Drive
Nepean, Ontario
Canada K2G 3S8
Contact: Peter McWha at
613-820-1517

Product name: RDM —
Responsive Data Manager
Interactive Technology Incorporated
1225 N.W. Murray Road, Suite 108
Portland, Oregon 97229
Contact: Roger Brown at
503-644-0111

Product name: RTFILE (R)
ConTel Information Systems
Small Computer Systems Group
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Suite 200
Bethesda, Maryland 20814
Contact: Robert C. Natale at 301-654-9120

I should reiterate that this article is not a comprehensive review of every single RT-11 DBMS. There are other DBMS manufacturers. However, they were previously unknown (did not advertise in trade journals or appear at the shows I've been to), or, they didn't respond to my questionnaire by what I considered to be a fair deadline.

The tabulated results of the questionnaires appear shortly. The questionnaire format was chosen in order to attempt to objectify the differences or similarities in the various products. Since the questionnaire may have contained some bias, each respondent was permitted to explain in a limited space why his/her product would be the best to purchase. The results appear below. Remember: these are the verbatim statements made by the product vendors.

The owners of D wrote:

"D is a high performance relational database management system providing a powerful tool for development of data-driven sophisticated and integrated data processing applications. D is a complete system. D includes all necessary multitasking software, system maintenance tools, database development programs, and database maintenance functions required to develop transaction-oriented systems whose performance rival that of conventional systems running on superminis.

From the user's point of view, the D system is attractive because all interaction with D is performed using elegantly structured menus or meaningful conversations using grammatically correct English language. Absolutely no understanding of the RT-11 operating system is required by the D user.

D is up-to-date and undergoing constant development. For example, D already incorporates interfaces to RT-11 features available only in RT-11 version 5, which will not be released until mid-1983. The development of an SNA/SDLC feature is also under investigation."

The vendors of RDM state:

"RDM provides a complete application development package that eliminates the need for programming in code for many data processing applications. The RDM package provides for creating files, forms, processes, reports as well as the utilities for file maintenance in a simple, straightforward manner without writing program code. RDM is supplied with complete help files to assist the user. And the user may define help files for his or her own applications.

For the RT-11 environment, RDM provides application development capabilities that are fully transportable to other PDP-11 operating systems (RSX and RSTS/E) and the new DEC Professional 350 personal computer.

For the programming organization that has highly complex data acquisition or processing, RDM provides extension capabilities at the PASCAL programming level. For this environment, the RDM library of over 150 pre-programmed, tested and documented PASCAL procedures, is available to dramatically cut traditional programming time."

RTFILE's producers said:

"RTFILE is an interactive relational DBMS; it is a menu-driven, forms-oriented set of utilities which enable minimally trained end-users to perform a wide range of commonly needed data processing tasks without programming. Instead of having to learn a language's vocabulary, syntax, and grammar—as users must with all command-oriented products—RTFILE users perform the majority of their data processing tasks by selecting menu options and by completing CRT display forms when additional specifications (e.g., how to sort a listing, what calculations to perform, which records to include, etc.) are required.

New users can get acquainted with full RTFILE functionality for just \$1,500. When they want to move up to multiuser and/or multiprocessor support or want to link the RTFILE object modules into their own applications, they simply pay the upgrade differential. Annual support, after the free warranty period, includes telephone and mail assistance and semi-annual updates."

Before getting into the tabulated questionnaire results, I should point out that vendors were asked to respond describing "a complete, all-option, bundled system with all features included." Consequently, some features may be available only as options. On the other hand, some prices may be lower when unnecessary features are not purchased. Again, the reader should contact each vendor for details. All systems are restricted to single processor applications. Both the bundling and single processor restrictions were required to make a fair comparison without a lot of footnoting.

OPERATING ENVIRONMENT

The operating environment describes the prerequisite hardware and software necessary to support each DBMS. I know some of the answers don't make sense—for example, I don't think it's possible to run a TSX-Plus based system in less than 64Kb of memory and without any extra serial line interfacing or multiplexer hardware, but two vendors claimed it could be done.

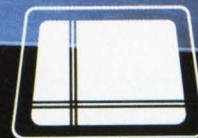
The EIS question relates to whether the PDP-11 or LSI-11 computer must have the necessary hardware or emulating software to support the multiply and divide processor instructions (and a few others). These instructions are not normally available on PDP-11/03s or PDP-11/05s, for example. There are software packages which permit emulation of those instructions on systems which do not have the necessary hardware.

The question concerning "disk blocks required" indicates how successfully a complete system runs on a floppy diskette or smaller hard disk. It is also an indication of how much software is in the DBMS. The number of modules indicates the amount of RT-11 directory space used by DBMS software. In this and all tables that follow, the questionnaire responses are displayed in alphabetical order of product name, starting from the left.

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CIRCLE D70 ON READER CARD

	D	RDM	RTFILE
Operating Systems RT-11 TSX TSX-PLUS	Yes Most Yes	Yes No Yes	Yes No Yes
Can more than one user be safely supported?	Yes	Yes	Yes
Is multiuser support via TSX or a vendor-supplied multiuser system?	Either	TSX	Either
Maximum number of users	16	Operating system dependent	Operating system dependent
Minimum memory for single user system	64Kb	50Kb	48Kb
Minimum memory for the multiuser system under TSX or TSX-PLUS	64Kb	50Kb	48Kb
Minimum memory for the multiuser system under vendor-supplied multiuser software	128Kb	Not applicable	48Kb
Does the system require EIS or an EIS emulator?	Yes	No	Yes
What extra hardware is required for multiuser use?	An appropriate serial line interface or multiplexer	None	None
Will it run on a floppy based system?	Yes, but not recommended	Yes, but not recommended	Yes
In which language is the product written?	MACRO	PASCAL	MACRO/FORTRAN
What type of line interfaces are supported? DLVIIJ DZII/DZVII DHII Other	Y e s Yes Yes MBVII etc.	Whatever TSX supports	Yes Yes Yes MBVII etc.
Are dial-up lines supported?	Yes	Yes	Yes
What is the maximum number of disk blocks required, exclusive of data files?	3500	2022	700
How many .SAV modules are there?	93	8	14
How many other modules are there?	6	54	5
Time in minutes for installation	40	15	15

ACCESS AND SECURITY

Most users are concerned about security of information managed at the computer center. As can be seen below, all reviewed DBMS products address this problem. Another concern is how functions are accessed. Some users prefer menus because all of the choices are presented, and use up more of the CRT screen, giving the impression that greater utilization of the CRT is happening. Other users don't like menus because they present too much information, reveal too much of what is going on in the computer system, require a higher level of literacy than might otherwise be necessary, and take too long to read anyhow.

Protection against piracy is a concern to the software manufacturer who is at least trying to recoup his investment. On the other hand, some piracy protection features display so much data when the protected product is started that they really do insult the end user. There are also times when two independent products' piracy-protection mechanisms actually conflict with each other. (It can get pretty bizarre—all because DEC did not see fit to include software legible serial numbers in the PDP-11 architecture.) This section also shows how the various DBMS deal with these concerns.

	D	RDM	RTFILE
How is secured access to the system achieved?	Correct userid, account and password	Correct userid/password or programmer/project number	UserId and access level
Is there function restriction?	Yes	Yes	Yes
Is there file (table) restriction?	Yes	Yes	Yes
How many access levels to files or tables are there?	5	255	More than ten thousand
Are passwords encrypted on disk?	Yes	No	Yes
Command Mode Is there a command mode? If so, how many standard commands are there? If so, may users easily add their own commands?	Yes 26 Yes	No	No
Menu Mode Is there a menu-mode? How many menus are there? What is the total number of menu items? May users easily add their own menus/items?	Yes 5 72 yes	Yes Unlimited 65,000 Yes	Yes 8 55 Yes
Are signons logged?	Yes	No	Yes
How is the system protected from piracy?	The purchaser's "company name" must be specified when D is ordered. This name appears at the system console during system booting and on all banner and standard report pages. Any attempt to change the name causes the system to self-destruct.	An encrypted userid and license number is compared against an encoded seed. Any user-inflicted changes cause the product to turn into a demonstration system.	Licensing messages are displayed. Function lock messages are displayed in the demonstration version. The SALCRIS hardware lock is optionally supported.

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CIRCLE D53 ON READER CARD

DBMS AND FILE STRUCTURE

The word "relational" is as overused as "user-friendly." Besides, the end user often doesn't care if his DBMS is truly, bona fide, absolutely "object-table-join-and-view," no-bullfeathers relational. He simply wants to know if it does the job. How each DBMS relates to "relational" is described in this section.

Are there really "user-unfriendly" software packages? I'm going to coin a new buzzword. "Energetic" computer systems are those that were formerly "user-friendly," and "lazy" computer systems were "unfriendly." These adjectives describe the work ethic of the programmers who wrote the systems. This section also deals then, with concerns of energy and laziness.

And does the DBMS have enough power to support the application the reader has in mind? By looking at limits imposed on various functions, glimpses of each DBMS's power are revealed. The DBMS user is also interested in whether the DBMS can manage the data types used in his application. For example, a FORTRAN-based installation may be interested in floating point number data, while a DIBOL or CTS-300 installation would not.

	D	RDM	RTFILE
How is the concept of the relational database supported?	Data items (objects) in otherwise unrelated files (tables) are related by Distributed Data Values (DDVs) occurring in all related files (tables). Any joins are created during runtime via the DDVs.	The data files must contain common fields to be related. The user can then declare the relation for specific processes or reports. The relationships are not bound to the data files. If any data files contain common field names, the user can specify an instance of the relation by specifying the common fields with a VIA clause.	Each database may contain a maximum of 5 indices. Indices may be unique and/or shared. Records within databases may be accessed via indices, sequentially, or by record number. Databases are joined via indices; up to 5 databases may be joined. All joins, projects, and views require no additional physical structures. Relations are dynamic and definitions are decomposed at join time to provide complete data independence.
File Types			
Indexed	Yes	No	Yes
Sequential	Yes	No	Yes
Direct Access	Yes	Yes	Yes
Other			"Text" in mid-1983
Maximum records			
Indexed	No limit		4 Billion
Sequential	32,768		4 Billion
Direct Access	65,535	65,534	4 Billion
How is file size increased?	With a utility	With a utility	With a utility
May files span physical volumes?	No	No	No
What is the maximum number of user files?	127	Limited by the RT-11 directory size	Limited by the RT-11 directory size
Multiple Databases Are they supported? How?	Yes Specific accounts may be authorized to access totally unrelated files. Such files are "visible" only to the authorized accounts. The files visible to the account form the mutually exclusive database.	Yes If there are multiple occurrences of the same type of data base, the user logon number can be affixed to the file automatically. Otherwise, they can just be specified.	Yes Logical links ("relationships") can be built via a menu option.
Maximum file name size, in characters	32	6	6

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- B Vice President
- C Controller/Treas./CFO
- D Financial/Acct. Mgmt.
- E Marketing Mgmt.
- F Administrative Mgmt.
- G MIS Director/DP Mgr./WP Mgr.
- H DP Mgmt. (Supervisory)
- I DP Staff
- J Engineering/Mfg. Mgmt.
- K Consultant
- L Other _____ (specify)

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Check One:

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- C Retailing/Distribution
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- E Government
- F OEM/Computer Consultant
- G Education
- H Health Care Institutions
- I Other _____ (specify)

3. **Computer Applications**

Check All That Apply:

- A Accounting/Office
- B Banking/Financial
- C Research/Scientific
- D Industrial/Engineering
- E Resale
- F Other _____ (specify)

4. **Type of Computer Used**

Check All That Apply:

- A *PDP 8 Family
- B *Q Bus (11/03, 11/23, 11/33)
- C *Unibus (11/24, 11/44, 11/70, 11/34, 11/40)
- D *Vax
- E *10 or 20
- F Non-DEC* _____ (specify)

I am a DECUS conference attendee.

5. **Operating System**

Check All That Apply:

- A *OS/8
- B *RT 11
- C *RSX, *IAS
- D *RSTS
- E *VMS
- F *Tops 10, 20
- G ** Unix
- H Other _____ (specify)

6. **Language Used**

Check All That Apply:

- A Fortran(s)
- B Basic(s)
- C PL/1
- D Cobol
- E Pascal
- F DIBOL/DBL
- G Other _____ (specify)

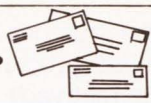
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Are upper/lower case file names supported?	Yes	Yes	Yes
Maximum number of data items per second	Unlimited	255	512
Maximum size of data item names, in characters	32	26	6
Are upper/lower case data items names supported?	Yes	Yes	Yes
What is the maximum number of names by which a single data item may be referred?	2	1	Unlimited
How many different data types are supported?	22	14	12
Data Types Supported			
System Date	Yes	No	Yes
System Time	Yes	No	Yes
User Identification	Yes	No	Yes
Dates	Yes	Yes	Yes
Upper case character strings (size)	Yes (80)	No	Yes (255)
Both case character strings (size)	Yes (80)	Yes (256)	Yes (255)
DIBOL numbers	Yes	No	No
Floating point	Yes	Yes	Yes
Double precision floating point	No	Yes	Yes
Single word integer	Yes	Yes	Yes
Fixed point	Yes	Yes	Yes
Octal	Yes	Yes	Yes
Radix-50	Yes	No	Yes
Boolean	No	Yes	Yes
Bit String	No	Yes	Yes
Others	Yes	Yes	Yes
Constraints on data items			
Characters in a specific position	Yes	No	No
Maximum/minimum values	Yes	Yes	Yes
Specific values	Yes	No	Yes
Maximum length	Yes	No	Yes
Default values	Yes	No	Yes
Others	Yes	No	Yes
Calculated Data Items			
Can a data item's value be calculated from other data item values? If so, how?	No	Yes	Yes
		A PASCAL-like formula is entered to define the calculated value	Create a calculation via a menu option, fill out displayed form. RTFILE generates formula internally and transparently from form entries.
Can a data item's value be supplied by a program during data entry?	Yes	Yes	Yes

. . . continued on page 104

LETTERS TO THE DEC PRO . . .

Send letters, comments, photos, etc. to: Letters to the DEC PRO, Box 362, Ambler, PA 19002.



. . . continued from page 6

First, let me say that there are thousands of us that feel J-11 news eclipses VAX news. That list must also include Intel, Motorola and Zilog.

How many Editors have your knowledge of the Unibus? I think it's wonderful to find a hardware expert as an editor and please keep it up.

I bought a PDP-11/04 in 1976 from an OEM that's gone now. It has the CPU board, a 65k memory board, a DL11-W, a DL11-E and 4 RK-05 controller boards for a total of 8. Wishing to upgrade to an 11/34, I examined the backplane and found that I had two 4 slot backplanes and the book says that a DD11-PK is the 9 slot backplane for 11-04s and 11-34s. Given the problem that PKs are hard to get and probably don't have 22 bit addressing I have a long unresolved question and high hopes that you can answer it.

Can I use a more modern bus like the DD11-DK? The lack of one slot halts any new drive, new software, new CPU and just about any upgrading plans. Perhaps you can appreciate how I felt when I saw the same author for the J-11 article and the Unibus article.

I enclose a stamped envelope for your answer. I don't need detail but I do need direction. Does my future include a PDP-J11/04 or PDP-J11/74? I eagerly await your eclipsing reply. Thank you.

James D. Andrews
Realtor, Barre, VT

Dear Jim, thanks for your kind words. We were both long-time DEC users before we started the "RSTS Pro" back in '79. You can't plug a CPU into the DK backplane. You can simply add on a DK or CK to your current backplane with a jumper if you have room in the box.

* * *

We are a Process Control Systems Engineering firm. Further, we use DEC's PDP11 for systems design. We saw your first issue of *THE DEC PROFESSIONAL*. We were impressed.

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Thank you for your concern.

Roger G. Blocks, P.E., President
Chem-Al, Inc., Racine, WI

* * *

I am looking forward to your articles on Winchester/cartridge tape

backup systems. A comparison chart showing vender & address, Q-bus or Unibus, Winchester capacity, tape capacity, DEC disk emulated, list price, serviced by, and backup software supplied or required would be most helpful to myself and, I'm sure, many readers. A neat feature would allow local backup without connection to the DEC.

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CIRCLE D71 ON READER CARD

If so, how?	When the file structure is defined, the user programmer indicates that each affected data item value is to be supplied by a program during data entry. The user program is responsible for supplying the data item value.	An external validate function can be added to the forms package that allows any user-defined program functions to extend the capability of the existing package.	Program calls in subroutine to execute a calculation "form" created per previous answer.
When a constrained data item is entered incorrectly, what does the user see? What is a typical error message displayed during data entry?	A user-specified error message The customer code is a three-character mnemonic containing letters only.	INVALID DATA	Error message "Exceeds Minimum/maximum value"

SCREEN AND MENU SUPPORT

How data is displayed or entered on the screen of a CRT is technically not a DBMS function. It is of interest, however, to those users who are enamored of the menu mode of operation, and need a high level tool for creating screen structures. In general, using such tools involves stating where on the CRT screen particular data item values are entered, and in what sequence various menus are displayed at the user's CRT. Only two of the respondents provide screen support in their systems. As this feature may be optional, the reader is again advised to consult the vendor.

	D	RDM	RTFILE
Is a forms entry/menuing facility provided?	No	Yes	Yes
What terminals are supported?		All	All

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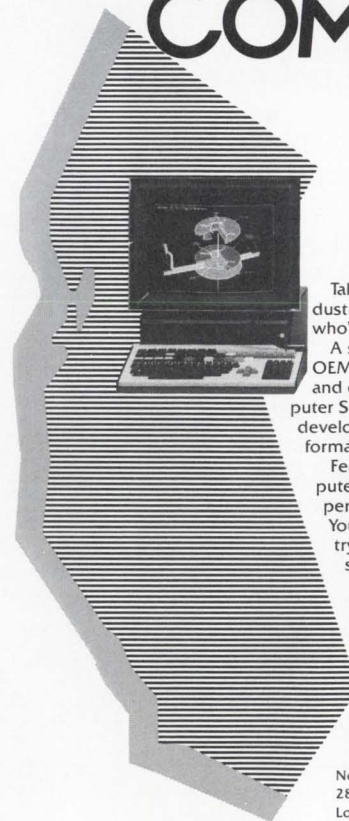
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Can support of a previously unknown terminal type be user-installed?	Yes	Yes
How many record types may be entered on one screen simultaneously?	1	1
Are VT100/VT52 graphics supported?	Yes	Yes (subset)
How and where are error messages displayed?	On line 24 with audio bell warning	Bottom two lines

REPORT GENERATION

Report generation is the ability of a DBMS to extract data satisfying logical criteria and display it in a meaningful form. The terms "retrievals" and "queries" are often used when discussing this function. A typical query would be something like "tell me the names of all potential customers in the state of Utah who have purchased products from us in the past but have not contacted us in the last 6 months." All reviewed DBMS have the capability of answering such questions.

DBMS users are also concerned with speed of retrieval. One of the more time-consuming functions during retrieval is the sorting of the extracted data. Benchmark data for this function was requested from each respondent.

The facility to produce a permanent data file gives the DBMS user the option of processing the extracted data later with statistical analysis or graphical output programs. Permanent listing files permit the DBMS user to reprint a report as necessary.

	D	RDM	RTFILE
Is it possible to retrieve/select multiple records satisfying logical criteria from a data base file?	Yes	Yes	Yes

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CIRCLE D164 ON READER CARD

How is such a selection stated?	With a simple query language	With a simple query language or by ranges	The user fills in a screen, stating logical modes, data item names, and comparison operations.
Is a permanent data file created during data selection?	Yes	No	No
May a permanent listing file be created during report generation?	Yes	Yes	Yes
Can the user specify the printer on which a report is printed?	Yes	Yes	Yes
Is there a forms mounting/alignment facility?	Yes	Yes	Yes
Is there a default report format requiring no extra structuring by the user?	Yes	Yes	Yes
Can a complex form structure (like payroll checks) be defined?	Not in current version	Yes	Yes
Is sorting available during report generation?	Yes	Yes	Yes
Minimum sort time to sort 1000 eighty-character records	4 seconds on PDP-11/34 with RLO1s	16 seconds on LIS-11/23 with RLO2s	22 seconds on LSI-11/23 with RPO2s
Maximum number of sort keys	Unlimited	10	10
Are all data items sortable?	Yes	Yes	Yes
Are subtotals provided on reports?	Yes	Yes	Yes
Other more complex totals provided		Item counts, line counts, page counts	Count, subtotal, page total, running subtotal, average

DBMS INTEGRITY

Every user values the data in the database. Consequently, the DBMS user is interested in protecting himself against a catastrophe like a head crash or unintentional or intentional destruction of the data by operations personnel. This section briefly shows how each vendor deals with this problem.

There are two ways to make backup copies of a database. The first is to periodically copy the database files to some other storage media and put that media in a safe place. The second way is to make some sort of backup "on-the-fly" as data is being entered. The second method is necessary when losing even a few minutes of data entry is expensive.

There are two common methods of making backups "on-the-fly." The first method is to make an exact copy of the database files on another disk volume of the same type simultaneously during actual data entry. Then, in the event of the loss of one disk, the user continues to run his application without the loss of any data, from the good, up-to-date copy. This method is expensive in terms of hardware, but the payoff is that valuable commodity known as "peace of mind."

The second method of making backups "on-the-fly" is to "log" each database transaction which changed the data in the database. One way of doing this is to print each new transaction on a printer. In the event of a catastrophe, data entry personnel re-enter all data entered since the last disk backup. Another way is to log each transaction in machine-readable form on another storage medium, often magnetic tape. In the event of a failure, data is read from the medium and the database is updated from the point of previous disk backup.

Records in a DBMS are usually interrelated by the use of transparent "pointer" information written as part of each database record, but invisible (hopefully) to the database user. Sometimes, a pointer can become corrupted, that is, the value of the pointer doesn't make sense. This can happen when the power fails just as a pointer value is being written on the disk.

In the better DBMS, this will result in the loss of at most one record. The ability to unload/reload the database means that the database can be examined and all pointer data can be restored, recovering any previously lost data.

In most RT-11 DBMS, database structuring occurs using conversational programs which ask the DBMS user questions about the structure (not the value) of the data to be kept in the database. The answers to the questions are stored in database "dictionary" files. The dictionaries are frequently accessed by the DBMS programs during data entry and retrieval. Building the dictionary requires that the database structure answer hundreds, sometimes thousands, of questions. It is therefore essential that the DBMS have some simple method for regeneration of an identical database structure.

	D	RDM	RTFILE
Are utilities provided to backup the database?	Yes	No, just copy	Yes
Are utilities provided to restore the database?	Yes	Yes	Optional
Is simultaneous (shadow) backup supported?	Yes	No	Yes
Is record logging on a printer or magnetic tape supported?	No	No	Optional
Is database unloading/reloading supported?	Yes	No	Yes
How is the current database structure determined?	The user runs a utility to display the entire database structure or displays selected substructures at his terminal.	Data Dictionary	Menu options to list data directory and data dictionary.
How can identical database structure without data be created on another system?	The user runs a utility which creates RT-11 indirect command files. When these indirect command files are run, an empty database structure is created.	Copy dictionaries to new system and run create menu commands.	Menu option

PROGRAMMER ACCESS

Because of the high level of the reviewed products, it is actually possible for an end user to build a complete database application with minimal prior data processing experience. On the other hand, some very sophisticated applications may require extra programming to be done. It is essential that the DBMS user have access to all information and subroutines necessary to permit a local programmer to create that extra programming. This includes detailed documentation at the bit level of the database structure, and a library of subroutines which perform all database access to speed development and prevent accidental damage to the database.

The language interface refers to the internal, machine-level structure of subroutine calls. The RT-11 FORTRAN style is widespread and flexible. The DIBOL style has never been documented. Fortunately, the DBL style is documented and is one of the many attractive features of that product.

One more word of caution. Use of software which is written in a higher level language may require the purchasing of a license to use that higher level language. The reader is advised to check with the vendor before ordering.

	D	RDM	RTFILE
Is there a library of subroutines to access the database?	Yes	Yes	Yes
Is the library in source or object form?	Object	Object	Object
What standard language interfaces are supported?	MACRO, FORTRAN, PASCAL	PASCAL	MACRO, FORTRAN, PASCAL
Is there a programmer's manual?	Yes	Yes	Yes
Is the database structure explained in detail?	Yes	Yes	To extent necessary

A USER APPLICATION

By now, the reader may be rather enthusiastic about the reviewed products, but undoubtedly is nagged by the question: "Is it really powerful enough to handle my application (or do I need to buy a VAX)?" In order to dispel this natural anxiety, the vendors were asked to describe the largest application they knew of.

The responses are encouraging and quite interesting. These products are used in applications that even five years ago were being handled by the expensive mainframes.

	D	RDM	RTFILE
What is a large application using this system?	A completely automated Public Refrigerated Warehouse with AS/RS equipment and office and operation personnel accessing the database simultaneously.	Process control for an 800 employee food processing plant including online data entry and retrieval for product quality.	Radio Common Carrier — inventory control, billing, telephone traffic logging in real time.
What is the processor and disk type used in this application?	PDP-11/34A with dual RK07s	PDP-11/44 with RM02	PDP-11/34A with RL01, RM02
How many users are supported in this application?	13	15	9
How many database accesses occur each day?	Over 20,000	Don't know	17,000

DEMONSTRATIONS AND MANUALS

After reading the previous section, the reader is probably about ready to buy. This section deals with the possibility of obtaining a demonstration system or viewing the manuals in advance of purchasing the software.

	D	RDM	RTFILE
Is it possible to receive a demonstration?	Yes	Yes	Yes
How is the product demonstrated?	Call 613-820-2641 to connect to the demonstration computer via a 300 baud modem.	Order demo system on RX01 or mag tape with documentation.	Request that a demo be sent or connect via 1200 baud dial-up line.
What is the cost of the demonstration?	Cost of a long distance telephone call	\$35	\$50
Are all features demonstrated?	No	No	Yes
Which features are not demonstrated?	Maintenance and structuring menus are displayed but may not be used.	Report writer II and process generator and library of object modules are not included.	
Are manuals available separately?	Yes	Yes	Yes
What is the cost of the manual package?	\$200	\$25	\$50
Is the cost of manuals credited toward system purchase?	Yes	No	Yes
How many manuals are there?	6	3	2

PRICING AND CONCLUSION

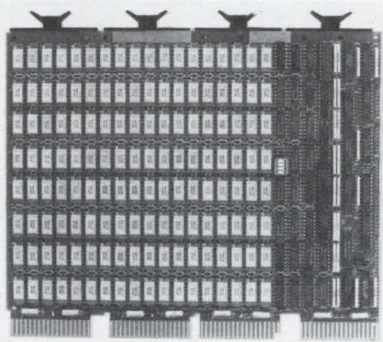
The reader has been convinced that the database management systems available for use with the RT-11 operating system are all powerful tools supporting sophisticated applications. The best part is that all the systems are attractively priced. These systems represent probably the best dollar value in software for ANY computer system and any operating system available. Take the time to obtain a demo — then consider the cost of developing that software in-house. The savings will be obvious.

And one final cautionary note. The prices stated are for a complete "bundled" system. It may be possible to "unbundle" the system to purchase only the options you really need. Contact the vendors to find out. You can bet they'll be more than happy to supply the information you need.

	D	RDM	RTFILE
What is the price of a single user system?	\$999 CDN	\$5000	\$3500
What is the price of a multi-user system?	\$999 CDN	PRICE NOT STATED	\$4500
Is single user access included in the multiuser system?	Yes	Yes	Yes
When was the last price increase?	September, 1982	Never had an increase	July, 1982
When is the next expected price increase?	April, 1983		
How long is the initial warranty?	180 days	120 days	90 days
Are updates included in the warranty period?	Yes	Yes	Yes
May software support be purchased when the warranty expires?	Yes	Yes	Yes
What is the cost of software support outside warranty?	\$500 CDN	\$1000	\$750
What is the time period of software support purchase?	180 days	1 year	1 year
Are updates included in software support?	Yes	Yes	Yes

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CIRCLE D180 ON READER CARD

EMULATING CHAIN TO LINE NUMBER IN VAX-11 BASIC

By Rick Cadruvi and Dan Esbensen, Digital Data Dialog, Inc., 609 South Escondido Blvd., Suite 101, Escondido, CA

The purpose of this article is to describe a mechanism for emulating the BASIC CHAIN LINE# command in VAX-11 BASIC. There are three major areas of this emulation approach that will be discussed. The first deals with being able to tell whether a program was RUN or CHAINED into. The second deals with getting a parameter, if CHAINED into, and branching to a specific line in the program. The third section discusses problems and advantages in using the mechanism described as opposed to using another mechanism (such as storing the necessary information in core common).

I. Determining if program RUN, or CHAINED into.

By now, you may be asking yourself the following question. WHY do we care if a program is RUN or CHAINED to? There may be several reasons why, but we can quickly point out two very important ones. The first reason is that you may not want someone to be able to list a directory and RUN a program to see what it does. The program may be part of a whole series of programs that must be executed in a specific order. The second reason is that you may want the program to take a different course of action depending on how the program was activated.

To determine if we have been RUN or CHAINED into, we need a routine to ask DCL which of these methods was used. The following VAX-11 BASIC external function will determine how the program was activated, and will also return the parameter given to the main program when activated. This parameter can be used to pass a line number to branch to.

NOTE: The mechanism used for executing a CHAIN causes DCL to execute a Foreign Command. It is all but impossible to tell whether a Foreign Command or a CHAIN was executed.

```

1      FUNCTION LONG RUN_CHAIN(PARAMETER$)
      !
      !> RUN_CHAIN() = Function to determine if RUN or CHAINED to.
      !
      ! Inputs :      None.
      !
      ! Outputs:      RUN_CHAIN = 0 if program RUN.
      !                RUN_CHAIN = 1 if program CHAINED to.
      !
      !                PARAMETER$ = Receives activation parameter
      !
      !> PARAMETER$ = String to receive activation parameter
      !
500   !
      !      E X T E R N A L   S T A T E M E N T S
      !
510   ! Define CLI (Command Language Interpreter) call back symbols
520   EXTERNAL LONG CONSTANT  CLI$B_RQTYPE,  &
      CLI$B_RQSTAT,  &
      CLI$Q_RQDESC,  &
      CLI$C_RQDESC,  &
      CLI$K_GETCMD,  &
      CLI$K_VERB_RUN, &
      CLI$K_VERB_FORE
      !> CLI$B_RQTYPE = Call back request type offset
      !> CLI$B_RQSTAT = Call back status byte offset
      !> CLI$Q_RQDESC = Return string descriptor offset
      !> CLI$C_RQDESC = Length of request buffer
      !> CLI$K_GETCMD = Call back GET COMMAND request type
      !> CLI$K_VERB_RUN = Program RUN status byte value
      !> CLI$K_VERB_FORE = Program CHAINED status byte value
1000  !
      !      E S T A B L I S H   E R R O R   H A N D L E R
  
```

```

1010  ON ERROR GO BACK
      ! Go back to calling program if errors encountered
1049  !
      !      I N I T I A L I Z E   U S E R   V A R I A B L E S
1050  ! Setup CLI call back Request Buffer
1060  CLIREQ$ =
      STRING$(CLI$B_RQTYPE,0$) + &
      CHR$(CLI$K_GETCMD) + &
      STRING$(CLI$C_RQDESC-CLI$B_RQTYPE-1$,0$)
      ! Initialize beginning of Request buffer to NULLs &
      ! and Setup Request type as GET COMMAND &
      ! and Initialize end of buffer to NULLs
      !> CLIREQ$ = CLI call back request buffer
1999  !
      !      M A J O R   L O G I C   O F   P R O G R A M
2000  ! Do CLI call back
2020  CALL SYS$CLI(CLIREQ$ BY REF)
      ! Call CLI (command line interpreter) to GET COMMAND &
      ! &
      ! NOTE: SYS$CLI expects the address of the buffer (call BY REF).
2100  ! Return command string to caller
2120  CALL LIB$SCOPY_DXDX(MID(CLIREQ$,CLI$Q_RQDESC+1$,8$) BY REF,PARAMETER$)
      ! Copy command string to callers string (PARAMETER$)
      !&
      ! NOTE: We use a VMSRTL routine because we only get back &
      ! a string descriptor from SYS$CLI. LIB$SCOPY_DXDX &
      ! expects address of descriptor (call BY REF).
2200  ! Get program activation method and return it to the caller
2220  RUN_CHAIN = 0$
      IF ASCII(MID(CLIREQ$,CLI$B_RQSTAT+1$,1$)) = CLI$K_VERB_FORE
      THEN
      RUN_CHAIN = 1$
      ! Initialize function return value to say program RUN
      ! IF Program CHAINED into (or foreign command)
      ! THEN Set function return value to reflect that
9000  !
      !      E N D   O F   P R O G R A M
9010  GOTO 32767
      ! Exit external function
32767  FUNCTIONEND
  
```

The following program calls RUN_CHAIN to find out how the program was activated. It tells the user whether the program was RUN or CHAINED into. It also displays the activation method. If the program was run, the activation command is the name of the program as typed by user (i.e., RUN SYS\$LOGIN:TEST.EXE yields SYS\$LOGIN:TEST.EXE). If the program is CHAINED into, then the activation command is any parameters passed. (i.e., CALL LIB\$RUN_PROGRAM("SYS\$LOGIN:TEST.EXE 31000") yields 31000).

```

1      ! Program to test RUN_CHAIN external function.
500   !
      !      E X T E R N A L   S T A T E M E N T S
510   EXTERNAL LONG FUNCTION RUN_CHAIN
      !> RUN_CHAIN = External function to see if RUN or CHAINED into.
1000  !
      !      E S T A B L I S H   E R R O R   H A N D L E R
1010  ON ERROR GOTO 19000
      ! Establish error handler
1999  !
      !      M A I N   L O G I C   O F   P R O G R A M
2000  ! Determine if RUN or CHAINED
2020  ACTIVATE$ = RUN_CHAIN(PARAMETER$)
      IF ACTIVATE$ &
      THEN PRINT "Program CHAINED into - Parameter = "; PARAMETER$
      PRINT "Program RUN - Parameter = "; PARAMETER$
      ! Call function to determine activation method
      !> ACTIVATE$ = Program activation method flag
      !> PARAMETER$ = String to receive activation parameter
      ! IF CHAINED into
      ! THEN Tell user program CHAINED into and display parameter
      ! ELSE Tell user program RUN and display parameter
  
```


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```

9000  !
      !   END OF PROGRAM
9010  GOTO 32767
      ! Exit program
19000 !
      !   ERROR HANDLER
19100 PRINT "Error"; ERR; "at line"; ERL; "- "; ERT$(ERR)
      RESUME 9000
      ! Display error information
      ! Exit program

32767  END
  
```

II. Getting CHAIN parameter and branching to the appropriate line number.

The following program executes the CHAIN and passes a parameter to the program.

NOTE: To pass a parameter, you must use the same NOTE:

```

1      CALL LIB$RUN_PROGRAM("SYS$LOGIN:TEST.EXE 31000")
      ! Chain to the test program
      !
      !-----
      ! NOTE: This is the way to CHAIN and pass a parameter.
      ! If you say CHAIN "SYS$LOGIN:TEST.EXE" in VAX-11
      ! BASIC, you cannot pass a parameter.
      !-----
32767  END
  
```

The following program calls RUN_CHAIN to determine if the program was RUN or CHAINED into. If it was CHAINED into, it then validates the parameter passed, and branches to the appropriate line number. If the name of the program happens to be SYS\$LOGIN:TEST.EXE, and was called by the previous program, it would yield the proper results, and thus execute line 31000.

```

1      ! Program to Branch to a specified line number if CHAINED into.
500   !
      !   EXTERNAL STATEMENTS
510   EXTERNAL LONG FUNCTION RUN_CHAIN
      !> RUN_CHAIN = External function to see if RUN or CHAINED into.
1000  !
      !   ESTABLISH ERROR HANDLER
1010  ON ERROR GOTO 19000
      ! Establish error handler
1999  !
      !   MAIN LOGIC OF PROGRAM
2000  ! Determine if RUN or CHAINED into
2020  ACTIVATE% = RUN_CHAIN(PARAMETER%)
      IF ACTIVATE% = 0% &
      THEN PRINT CHR$(7%); "Program is not to be RUN"
      GOTO 9000
      ! Call function to determine activation method
      !> ACTIVATE% = Program activation method flag
      !> PARAMETER% = String to receive activation parameter
      ! IF RUN
      ! THEN Tell user that they can't do that
      ! and Exit program
2100  ! Do branching based on parameter
2120  LINE.NUMBER% = VAL(PARAMETER%)
      !> LINE.NUMBER% = Integer value of CHAIN parameter
2140  GOTO 31000 IF LINE.NUMBER% = 31000%
      PRINT CHR$(7%); "CHAIN line number invalid - "; LINE.NUMBER%
      GOTO 9000
      ! Goto chain in line number if correct &
      ! Otherwise print an error to caller &
      ! and Exit program
9000  !
      !   END OF PROGRAM
9010  GOTO 32767
      ! Exit program
19000 !
      !   ERROR HANDLER
19100 IF ERL = 2120
      THEN PRINT CHR$(7%); "Invalid CHAIN parameter - "; PARAMETER%
      RESUME 9000
      ! IF CHAIN parameter is not a valid integer number
      ! THEN Print error message to user telling them that
      ! and Exit program
19200 PRINT "Error"; ERR; "at line"; ERL; "- "; ERT$(ERR)
      RESUME 9000
      ! Display error information
      ! Exit program
  
```



```

31000 |
|     CHAIN IN ENTRY CODE
31010 PRINT "Program CHAINed to line 31000 Properly"
GOTO 9000
| Tell user they got to this line correctly
| and Exit program
32767 END

```

III. Problems and Advantages in this method.

There are two potential problems in using this approach. The two problems have to do with distinguishing between CHAINs and Foreign Commands, and using undocumented (and thus unsupported) features.

The first problem is that you cannot tell the difference between a CHAIN and a Foreign Command line for program activation. This does allow a user to possibly execute the program from DCL without your knowing it. This is probably not a major drawback, since a user has to go to a little effort to setup a Foreign Command. If a user is listing directories and trying to execute programs to see what they do, he will more than likely be using the RUN command. This does not present much of a problem, since you can require a specific parameter string to be passed to the program. This can make it virtually impossible for the user to correctly guess the right parameter string to use with his Foreign Command. The following call to LIB\$RUN__PROGRAM (illustrating this kind of a solution), would yield the string "CHAIN TO LINE 31000." This could then be parsed to extract the line number 31000.

```
CALL LIB$RUN__PROGRAM(("SYS$LOGIN:TEST.EXE CHAIN TO LINE 31000"))
```

The second, and potentially major, problem with this approach for emulation of CHAIN to a line number, is that we are using an undocumented (and therefore unsupported) feature. It must be noted that DEC is free to change the SYS\$CLI call back mechanism, as well as the way that DCL executes a CHAIN any time they should feel it is necessary. This is probably not going to change very dramatically, since it has not changed significantly since the time that CHAIN was implemented. LIB\$GET_FOREIGN and LIB\$RUN__PROGRAM, also use the call back facility in a manner that expects it to work like we do. Since we have used symbolic offsets defined by the system, we should be safe unless DEC chooses to totally rewrite the mechanism for doing the CLI call back interfacing. It should also be noted that most of the DEC utilities run from DCL. The documented routines that allow CLI call back, also use SYS\$CLI in a similar fashion to the manner we have chosen.

The main advantage of using this approach, however, is that you can be guaranteed that the parameters received, as well as the activation method flags, will be cleared each time any program is executed. If you were to store the information needed for CHAIN to line number emulation in some process permanent common area (such as core common), you would have to setup the information each time you activated a program from either DCL or from a CHAIN. You would also have to clear the information as soon as you entered your program. This would allow a window (which could result in a failure to clear the information) between the time the user requested your program to be activated, and the time the routine in your program actually got around to clearing the information in the common area you have chosen.

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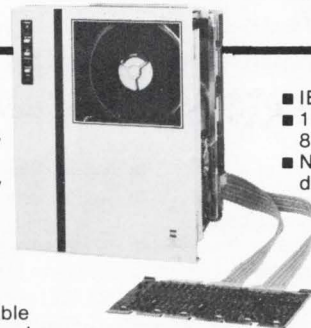
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Another advantage to this emulation approach is that you do not have to locate a common area that is process permanent and that also will not be destroyed by some other program the user may execute. Core common will probably be used by many programs, especially if you buy a large software package from a third party vendor.

Closing Comments:

The information described in this article is the result of a great deal of VAX/VMS experience and research on the part of the authors. Digital Data Dialog Inc., has tested and is using this approach (as well as the RUN_CHAIN external function) for in-house software. However, Digital Data Dialog Inc. can not guarantee that any of the code in this article is free from typing errors which may cause the programs to need minor modifications before the code will execute correctly.

This article uses the CLI call back interface, which is not currently documented. The authors plan to document the CLI call back facility in depth in a future article so the user community may make use of the information and features accessible only through the use of the CLI call back facilities.

NOTE: Digital Data Dialog Inc. will hold a "VAX-11 BASIC Professional Seminar" on April 7-8. Contact Digital Data Dialog Inc. for more information.

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AUTOMATIC SWITCHING BETWEEN TWO COMPUTERS

By Michael Mueller, S.J.
Rockhurst College
5225 Troost, Kansas City, MO 64110

ABSTRACT

In an installation with two computers, it is often desirable for the user to be able to switch a terminal to either of the machines. This article describes an inexpensive hardware device for performing this switching operation. Only one additional control wire is needed to the terminal in order to perform the switching operation.

With the coming of a VAX 11/750 as the second computer to Rockhurst College, it was necessary to have some of the terminals connect to both of the computers. Individual students and faculty members had to be able to switch between the two computers; and so this seemed to imply the need for some automatic switching apparatus. Figure 1 shows the configuration which we desired.

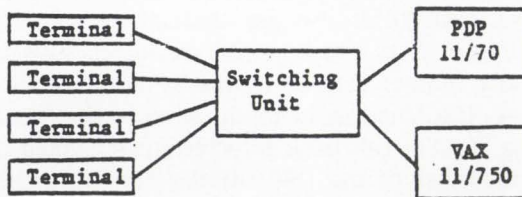
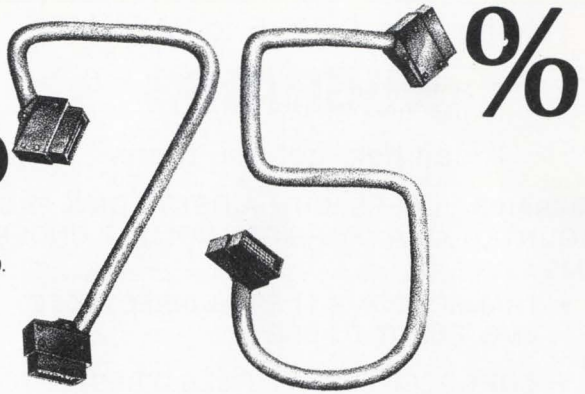


FIGURE 1. Configuration

Of course, it was possible to run two sets of connecting cables to each terminal and let the users switch between both at the terminal. This would mean that two sets of connecting cables would have to be run. After some initial investigation of switchers and port contention devices we realized that it would be expensive to have such a device performing the wizardly task of switching our terminals. Since it was too expensive to obtain the services of a full wizard, we had to settle for the "Sorcerer's Apprentice" instead. This switcher was designed to switch simple RS-232 signals between our PDP 11/70 and our VAX 11/750.

... continued on page 116

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BC02M-25/BG	WO21-WO22 Ribbon, 25FT	150	39	74	4A-LOTCB-AB/BG	Lot of 10, BC01V-25 (25' Cable)	899	695	22
BC025-05/BG	Cable, WO23-WO23 TU55 5FT	180	45	75	4A-LOTCB-AG/BG	Lot of 5, BC03M-A0 (100' Cable)	1,116	425	31
BC03L-05/BG	EIA Cable, H856 TO RS232C MAL	250	110	56	4A-LOTCB-AH/BG	Lot of 10, BC03M-A0 (100' Cable)	1,116	750	35
BC03N-A0/BG	100' Null Modem Ext Cable	140	95	32	4A-LOTCB-AI/BG	Lot of 25, BC03M-A0 (100' Cable)	2,748	1,895	38
BC03N-A0/BG	Coax Cable 100 Foot	140	80	42	4A-LOTCB-AJ/BG	Lot of 50, BC03M-A0 (100' Cable)	4,997	3,195	36
BC03N-A5/BG	Special Built Cable 150FT	200	100	50	4A-LOTCB-AK/BG	Lot of 5, BC05C-25 (25' Cable)	543	425	21
BC03P-A0/BG	Null Modem, 2 Fem Ends, 100FT	150	90	40	4A-LOTCB-AL/BG	Lot of 10, BC05C-25 (25' Cable)	1,015	795	21
BC04R-10/BG	Special Built Cable 10FT	32	22	31	4A-LOTCB-AM/BG	Lot of 25, BC05C-25 (25' Cable)	2,363	1,895	19
BC04R-12/BG	Mate-N-Lok to 4 Rings, 12FT	140	95	32	4A-LOTCB-AN/BG	Lot of 25, BC05C-25 (25' Cable)	4,375	3,595	32
BC04R-A0/BG	Special Cable 100FT	100	70	30	4A-LOTCB-AO/BG	Lot of 5, BC05D-25 (25' Cable)	648	475	26
BC04R-80/BG	Mate-N-Lok to 4 Rings, 200'	200	130	35	4A-LOTCB-AP/BG	Lot of 10, BC05D-25 (25' Cable)	1,197	895	25
BC04Z-01/BG	H856, 40 Conductor Flat (1')	48	26	45	4A-LOTCB-AQ/BG	Lot of 25, BC05D-25 (25' Cable)	2,742	2,175	20
BC04Z-06/BG	H856, 40 Conductor Flat (6')	50	30	40	4A-LOTCB-AR/BG	Lot of 50, BC05D-25 (25' Cable)	5,152	3,950	23
BC04Z-10/BG	H856, 40 Conductor Flat (10')	50	30	40	4A-LOTCB-AS/BG	Lot of 10, BC05D-50 (50' Cable)	695	525	24
BC04Z-15/BG	H856, 40 Conductor Flat (15')	80	40	50	4A-LOTCB-AT/BG	Lot of 25, BC05D-50 (50' Cable)	1,318	995	24
BC04Z-25/BG	H856, 40 Conductor Flat (25')	90	45	50	4A-LOTCB-AU/BG	Lot of 25, BC05D-50 (50' Cable)	3,115	2,375	23
BC05C-09/BG	Cable Modem 9FT	112	80	28	4A-LOTCB-AV/BG	Lot of 50, BC05D-50 (50' Cable)	5,750	4,495	21
BC05C-25/BG	BC05C-25 Cable Modem	120	90	25	4A-LOTCB-AW/BG	Lot of 5, BC11A-02 (2' Cable)	626	435	30
BC05D-15/BG	RS232 Male-Fem, 25 Cond, 15FT	125	95	28	4A-LOTCB-AX/BG	Lot of 25, BC11A-02 (2' Cable)	1,186	850	28
BC05D-20/BG	RS232 Male-Fem, 25 Cond, 20FT	130	95	26	4A-LOTCB-AY/BG	Lot of 25, BC11A-02 (2' Cable)	2,800	1,995	28
BC05D-25/BG	RS232 Male-Fem, RS232C Fem 25'	140	100	28	4A-LOTCB-AZ/BG	Lot of 50, BC11A-02 (2' Cable)	5,272	3,895	26
BC05D-50/BG	RS232 Male to Female, 50FT	150	110	26	4A-LOTCB-BA/BG	Lot of 5, BC11A-10 (10' Cable)	846	625	26
BC05E-75/BG	RS232 Male-Fem, 75 Cond, 75FT	225	160	28	4A-LOTCB-BA/BG	Lot of 10, BC11A-10 (10' Cable)	1,603	1,200	25
BC05F-A0/BG	Cable Interface LA30S	150	75	50	4A-LOTCB-BA/BG	Lot of 25, BC11A-10 (10' Cable)	3,785	2,925	22
BC05J-06/BG	Line Cord Set 240 V 6 FT	100	65	35	4A-LOTCB-BA/BG	Lot of 50, BC11A-10 (10' Cable)	7,125	5,595	21
BC05L-15/BG	H855 TO H855 Flat Reverse 15'	80	40	50	4A-LOTCB-BA/BG	Lot of 5, BC11A-15 (15' Cable)	996	775	22
BC05M-04/BG	Cable H856 to Mat-N-Lok 4'	42	20	52	4A-LOTCB-BA/BG	Lot of 10, BC11A-15 (15' Cable)	1,886	1,495	20
BC05M-20/BG	Special Cable 20FT	62	40	35	4A-LOTCB-BA/BG	Lot of 25, BC11A-15 (15' Cable)	4,454	3,650	18
BC05M-25/BG	Cable H856 to M-N-Lock 25'	65	45	30	4A-LOTCB-BA/BG	Lot of 50, BC11A-15 (15' Cable)	8,384	6,995	16
BC05M-50/BG	Cable H856 to M-N-Lock 50'	90	60	33	4A-LOTCB-BA/BG	Lot of 5, BC22A-10 (10' Cable)	228	140	38
BC05W-10/BG	50 Conductor Signal Cable 10'	85	45	47	4A-LOTCB-BA/BG	Lot of 10, BC22A-10 (10' Cable)	436	260	40
BC05W-25/BG	50 Conductor Signal Cable 25'	160	85	46	4A-LOTCB-BA/BG	Lot of 25, BC22A-10 (10' Cable)	1,038	600	42
BC06F-25/BG	M908 TO Compstar 181, 25 FT	425	225	47	4A-LOTCB-BA/BG	Lot of 50, BC22A-10 (10' Cable)	1,925	1,095	43
BC06K-10/BG	H885-H885, Mirror Conn, 10 FT	100	50	50	4A-LOTCB-BA/BG	Lot of 5, BC22A-25 (25' Cable)	262	190	27
BC06S-25/BG	Round Massbus Cable, 25 FT	1,040	425	59	4A-LOTCB-BA/BG	Lot of 10, BC22A-25 (25' Cable)	498	360	27
BC07A-10/BG	Cable H856 1-End 20 TW PR 10'	130	70	46	4A-LOTCB-BA/BG	Lot of 25, BC22A-25 (25' Cable)	1,181	850	28
BC07A-25/BG	Cable H856 1-End 20 TW PR 25'	154	120	22	4A-LOTCB-BA/BG	Lot of 50, BC22A-25 (25' Cable)	2,235	1,495	33
BC07B-25/BG	Cable H856 1-End 11 TW PR 25'	200	90	55	4A-LOTCB-BA/BG	Lot of 10, BC22B-10 (10' Cable)	257	145	43
BC07D-15/BG	H856 2-20 COND Ribbons 15'	140	85	39	4A-LOTCB-BA/BG	Lot of 25, BC22B-10 (10' Cable)	487	270	44
BC07D-25/BG	H856 2-20 COND Ribbons 25'	160	100	37	4A-LOTCB-BA/BG	Lot of 25, BC22B-10 (10' Cable)	1,151	650	43
BC08A-02/BG	M903 to M903 Dual Mylar 2'	150	40	73	4A-LOTCB-BA/BG	Lot of 50, BC22B-10 (10' Cable)	2,166	1,150	46
BC08A-05/BG	M903 to M903 Dual Mylar 5'	200	50	75	4A-LOTCB-BA/BG	Lot of 5, BC22B-25 (25' Cable)	307	195	36
BC08A-07/BG	M903 to M903 Dual Mylar 7'	200	50	75	4A-LOTCB-BA/BG	Lot of 10, BC22B-25 (25' Cable)	580	380	34
BC08A-09/BG	(M903-M903) 1.25' Mylar (9')	235	60	74	4A-LOTCB-BA/BG	Lot of 25, BC22B-25 (25' Cable)	1,367	900	34
BC08A-10/BG	M903 to M903 Dual Mylar 10'	250	65	74	4A-LOTCB-BA/BG	Lot of 50, BC22B-25 (25' Cable)	2,568	1,650	35
BC08A-15/BG	Cable, BC08A	300	75	75	4A-LOTCB-BA/BG	Lot of 5, BC04R-12 (12' Cable)	161	110	31
BC08A-25/BG	M903 to M903 Dual Mylar 25'	350	90	74	4A-LOTCB-BA/BG	Lot of 10, BC04R-12 (12' Cable)	307	199	35
BC08F-06/BG	Cable Module	300	100	66	4A-LOTCB-BA/BG	Lot of 5, BC04Z-10 (10' Cable)	243	165	32
BC08J-06/BG	H856 to M953 40 CND 3M 6'	125	80	36	4A-LOTCB-BA/BG	Lot of 10, BC04Z-10 (10' Cable)	452	299	33
BC08J-10/BG	H856 to M953 40 CND 3M 10'	180	90	50	4A-LOTCB-BA/BG	Lot of 5, BC04Z-25 (25' Cable)	419	215	48
BC08J-15/BG	H856 to M953 40 CND 3M 15'	215	100	53	4A-LOTCB-BA/BG	Lot of 10, BC04Z-25 (25' Cable)	777	410	47
BC08J-25/BG	H856 to M953 40 CND 3M 25'	250	110	56	4A-LOTCB-BA/BG	Lot of 5, BC05F-A0 (Cable In)	915	350	61
BC08J-50/BG	Cable 10' PDRB	325	200	39	4A-LOTCB-BA/BG	Lot of 5, BC05F-A0 (Cable In)	1,738	650	61
BC08K-06/BG	H856 to M955 40 CND 3M 6'	250	100	60	4A-LOTCB-BA/BG	Lot of 5, BC05M-04 (4' Cable)	200	95	52
BC08K-15/BG	H856 to M955 40 CND 3M 15'	300	125	58	4A-LOTCB-BA/BG	Lot of 10, BC05M-04 (4' Cable)	378	175	53
BC08M-0M/BG	H807 to H807 Mylar 11"	250	120	52	4A-LOTCB-BA/BG	Lot of 5, BC06S-25 (25' Cable)	4,875	1,995	59
BC08R-08/BG	H856-H856 3M REV 8'	68	35	48	4A-LOTCB-BA/BG	Lot of 10, BC06S-25 (25' Cable)	9,176	3,750	59
BC08R-20/BG	H856-H856 3M Cable (20')	90	55	38	4A-LOTCB-BA/BG	Lot of 5, BC07A-25 (25' Cable)	641	575	10
BC08S-05/BG	H856-H856 3M Strait, 5 FT	300	150	50	4A-LOTCB-BA/BG	Lot of 10, BC07A-25 (25' Cable)	1,128	1,095	2
BC08S-06/BG	H856-H856 40 Cond, Cable 6 FT	62	32	48	4A-LOTCB-BA/BG	Lot of 5, BC07D-15 (15' Cable)	649	395	39
BC09B-07/BG	Cable M912 12FT	1,936	800	58	4A-LOTCB-BA/BG	Lot of 10, BC07D-15 (15' Cable)	1,198	775	35
BC09B-10/BG	I/O Bus M912 Cable 10 FT	1,963	825	57	4A-LOTCB-BA/BG	Lot of 5, BC07D-25 (25' Cable)	758	495	34
BC09B-12/BG	I/O Bus 2 M912 to 1 M912, XXFT	2,300	875	61	4A-LOTCB-BA/BG	Lot of 10, BC07D-25 (25' Cable)	1,367	950	31
BC10K-05/BG	Cable 5 FT., Quick Latch	2,373	1,400	41	4A-LOTCB-BA/BG	Lot of 5, BC08S-06 (6' Cable)	298	140	53
BC10K-10/BG	10 MEM BUS Cable 10 FT.	2,551	1,500	41	4A-LOTCB-BA/BG	Lot of 10, BC08S-06 (6' Cable)	566	275	51
BC10K-15/BG	10 MEM BUS Cable, 15 FT	2,725	1,650	39	4A-LOTCB-BA/BG	Lot of 5, BC11S-25 (25' Cable)	647	425	34
BC10K-25/BG	POP 10 MEM BUS Cable	3,073	1,875	38	4A-LOTCB-BA/BG	Lot of 10, BC11S-25 (25' Cable)	1,204	795	33
BC10K-35/BG	AMP Quick Latch to (5) WO21 Cable	3,443	2,100	39	4A-LOTCB-BA/BG	Lot of 5, BC11S-50 (50' Cable)	811	595	26
BC10L-35/BG	AMP Quick Latch to (5) WO21 Cable	2,750	800	70	4A-LOTCB-BA/BG	Lot of 10, BC11S-50 (50' Cable)	1,510	1,095	27
BC11A-02/BG	External Unibus 2'	135	90	33	4A-LOTCB-BA/BG	Lot of 5, BC11S-A0 (100' Cable)	1,297	925	28
BC11A-05/BG	External Unibus 5'	155	110	29	4A-LOTCB-BA/BG	Lot of 10, BC11S-A0 (100' Cable)	2,415	1,795	25
BC11A-06/BG	External Unibus 6'	160	115	28	4A-LOTCB-BA/BG	Lot of 5, 70-11212-25 (Cable)	900	475	47
BC11A-08/BG	External Unibus 8'	170	125	26	4A-LOTCB-BA/BG	Lot of 10, 70-11212-25 (Cable)	1,626	895	44
BC11A-10/BG	External Unibus 10'	182	130	28	4A-LOTCB-BA/BG	Lot of 5, 70-11212-50 (Cable)	1,134	625	44
BC11A-15/BG	External Unibus 15'	210	160	23	4A-LOTCB-BA/BG	Lot of 10, 70-11212-50 (Cable)	2,130	1,195	43
BC11A-17/BG	Special Cable 17FT	215	170	20	4A-LOTCB-BA/BG	Lot of 5, BC10K-05 (5' Cable)	11,076	6,750	39
BC11A-20/BG	External Unibus 20'	220	175	20	4A-LOTCB-BA/BG	Lot of 10, BC10K-05 (5' Cable)	20,570	12,750	38
BC11A-25/BG	External Unibus 25'	230	180	21	4A-LOTCB-BA/BG	Lot of 25, BC10K-05 (5' Cable)	46,150	29,875	35
BC11A-35/BG	External Unibus 35'	400	300	25	4A-LOTCB-BA/BG	Lot of 5, BC10K-10 (10' Cable)	11,905	7,250	39
BC11A-50/BG	External Unibus 50'	450	350	22	4A-LOTCB-BA/BG	Lot of 10, BC10K-10 (10' Cable)	22,109	13,995	36
BC11K-25/BG	H856 1 End 20 Pair 25'	180	90	50	4A-LOTCB-BA/BG	Lot of 25, BC10K-10 (10' Cable)	49,604	33,125	33
BC11S-25/BG	H856 TO H856 18 TW PR 25'	138	90	34	4A-LOTCB-BA/BG	Lot of 5, BC10K-25 (25' Cable)	14,365	9,125	36
BC11S-50/BG	H856 TO H856 18 TW PR 50'	277	125	27	4A-LOTCB-BA/BG	Lot of 10, BC10K-25 (25' Cable)	26,679	17,900	32
BC11S-A0/BG	H856 TO H856 18 TW PR 100'	3,277	1,100	31	4A-LOTCB-BA/BG	Lot of 25, BC10K-25 (25' Cable)	59,856	39,750	33
BC20Y-25/BG	TU58 Cable, 25 FT.	120	45	62	4A-LOTCB-BA/BG	Lot of 5, BC10K-35 (35' Cable)	16,066	9,995	37
BC20Z-25/BG	TU58 Cable, 25 FT.	120	45	62	4A-LOTCB-BA/BG	Lot of 10, BC10K-35 (35' Cable)	29,837	18,950	36
BC21S-25/BG	VK170 10 Pin Comm Cable	120	40	66	70-06267-00/BG	Cable Module PC04	148	100	32
BC22A-10/BG	Null Modem RS 232 C 10'	55	30	45	70-09562-00/BG	Cable PWR Dist	39	29	25
BC22A-25/BG	Null Modem RS 232 C 25'	55	30	45	70-11212-00/BG	P11 Interface Cable	200	100	50

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CIRCLE D39 ON READER CARD

7) of the terminal. The switch connects the signal ground back to the switching unit. Thus it was only necessary to use a single extra wire for the switching operation. This was easy to implement since most of our cable contained four wires. The circuit at the terminal is shown in Figure 2.

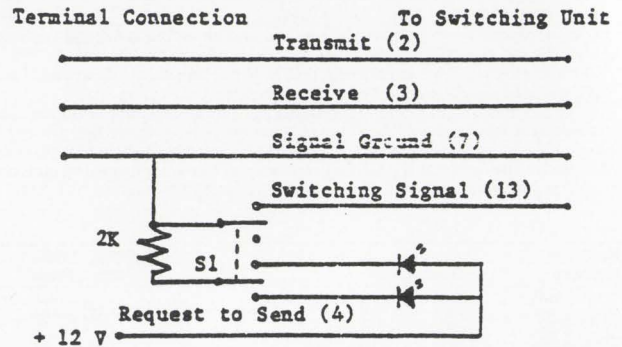


FIGURE 2. Terminal Switch

It is also possible to use the +12 volts of the other pinouts available at the terminal to drive LED indicators to show which computer is presently connected to the terminal. Lately with the mini system-status on RSTS/E and VMS, it is extremely easy to find out exactly the state of each of the machines the computers by typing <CTRL-T>. Faculty and computer center staff quickly discovered that they could be using their terminal on both machines and be running programs on both at the same time.

The Sorcerer's Apprentice Switcher is a simple device which allows the user to select on which machine to run. It is not very sophisticated since it uses electromechanical relays to perform the switching. Basically it consists of a power supply, a number of individual switching units (one for each of the lines to be switched), and switches at the terminals.

At each terminal to be switched, there is an inexpensive slide switch, S1, which is connected to the signal ground (Pin

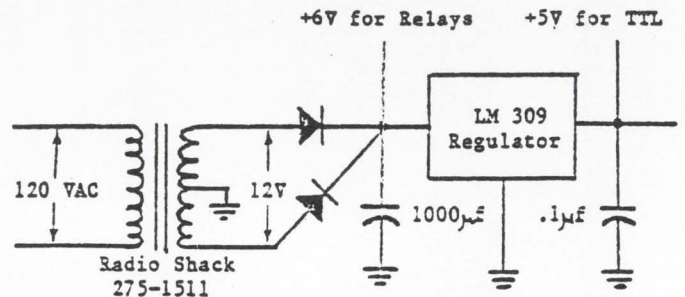


FIGURE 3. Power Supply

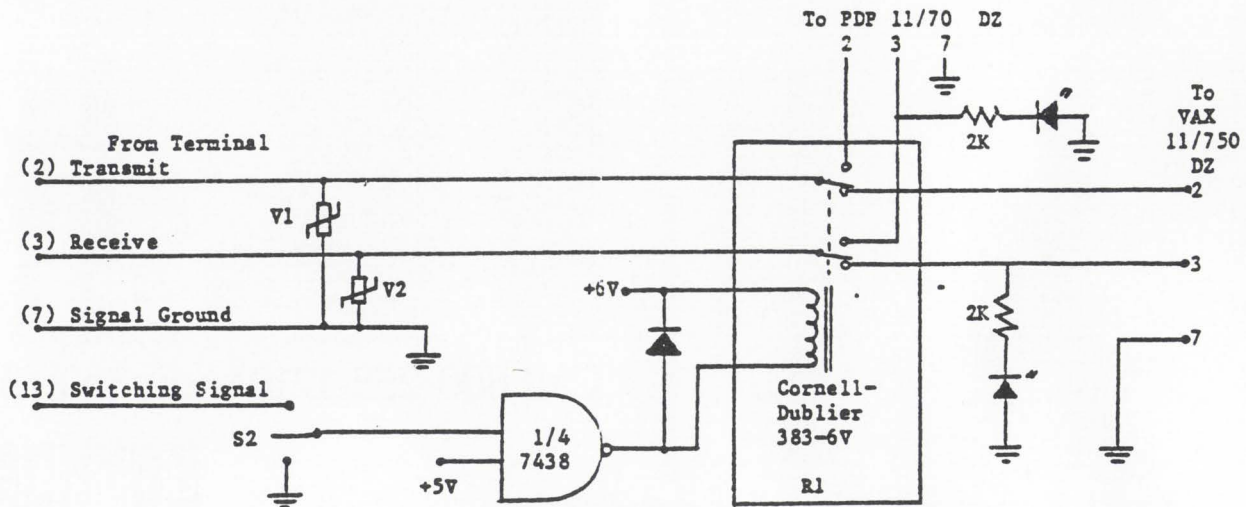


FIGURE 4. Individual Switching Unit

The main parts of the Sorcerer's Apprentice are the power supply and the individual switching units. The power supply consists of a transformer, rectifying diodes, capacitors, and a LM309 voltage regulator for the TTL integrated circuits. Figure 3 gives the schematic for the power supply.

In designing the switching unit, be sure to get a transformer which will supply enough power for all the switching units. Rockhurst's Sorcerer's Apprentice is capable of switching 32 different lines and uses a 3 amp transformer. You will have to determine the number of lines that you wish to switch and make that number of individual switching units. These usually come in multiples of four since there are four NAND gates on the 7438 integrated circuits. The schematic diagram for the individual switching unit is shown in Figure 4.

The lines carrying the RS-232 signal come from the individual terminal to the Sorcerer's Apprentice. The extra signal line, which is under the control of the remote user, enters the switcher along with the other RS-232 lines. This was fed through on Pin 13 of the connectors since this pin did not seem to be doing much on our terminals or computers. Because we have some long runs between buildings with our lines, we have metal oxide varistors and V1 and V2 on the transmit and receive lines to protect against over-voltage conditions. The computer center staff also thought that they would like control over the terminals. Thus switch S2 is an on-off-on double throw switch. In the upper position it connects the switcher to the terminal and allows the user to control which computer is con-

nected. The middle and lower positions force connection to one machine or the other.

The signal which comes from S2 then enters one quarter of a 7438 integrated circuit. This is an open collector NAND gate which is capable of driving the relay R1 which does the actual switching. The coil contacts of the relay have

a diode across them to prevent any coil discharge spikes from disturbing the other parts of the circuit as the relay switches. The inputs of the TTL integrated circuit are such that an unconnected input tends to "float" to the high state. This fact allows the single return line to force the state of the NAND gate. When there is a ground potential on the switching signal line the NAND gate will be in one state and when this potential is not present the input will be high and the gate will be in the other state. The relay coil is a low current 6 volt double pole double throw switch. If more lines needed to be switched, a second relay could be used.

With the demise of lights from the front panels of most machines, it is also possible to have indicator lights to show which machine a par-

ticular terminal is connected. Each indicator is a LED with a 2K resistor for proper current limitation across the receive and signal ground. The LED lights if a terminal is connected. It is also possible to use a two color LED and show when the line is busy or if it is idle.

In conclusion, the Sorcerer's Apprentice is an inexpensive, serviceable way of allowing the user at the terminal to choose which machine with just the flip of a switch.

The smoothest path between RSTS/E and VAX/VMS just got smoother: there's a major new release of

ROSS/V

ROSS/V has always provided:

- the fastest way to bring up RSTS/E applications on the VAX.
- the only way to do RSTS/E development on the VAX.
- an extensive subset of RSTS/E monitor calls and standard RSTS/E features, like CCLs, DOS-formatted magtape, and RSTS/E-style file update mode.

Now, in Version 3, ROSS/V supports:

- the "hidden" RSX run-time system (with 32 KW job size).
- resident libraries.
- job spawning and detached jobs.
- spooling to VMS print and batch queues.
- mailbox send/receive for communication with VAX-11 BASIC and other native mode applications.

How ROSS/V works:

ROSS/V is written in VAX-11 MACRO, and RSTS/E monitor calls are performed in VAX native mode. The rest of your PDP-11 code (in applications, run-time systems, TKB, etc.) is executed directly in the PDP-11 microcode that's present in every VAX. ROSS/V runs under VMS, not in place of it. Thus, some users may be working under the RSTS/E subsystem provided by ROSS/V while others are concurrently using any of the other VAX/VMS capabilities.

Call or write for the new ROSS/V technical summary, which describes all of ROSS/V's features.

Evans Griffiths & Hart, Inc.

55 Waltham Street
Lexington, MA 02173
(617) 861-0670

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Send Notes, Meetings, News Releases, New Product Information, etc. to: **PROFESSIONAL etc.**, P.O. Box 362, Ambler, PA 19002-0362.

Dear DEC User:

Professional et cetera is your section for educational, timely communications. It is a place for you to announce upcoming events or meetings and a place to comment on them.

It is a place for you to read about new products, and a place to comment on them.

It is a place for you to hear from companies whom you service or who service you — and a place to comment on them.

Please send all material to: Professional etc, The Dec Professional, P.O. Box 362, Ambler, PA 19002-0362. All announcements must be in our office one month prior to publication.

The Publishers

NEW PRODUCTS

DIGITAL RESPONDS TO HYPER-ETHERNET

Tewksbury, MA — Digital Equipment has announced new DECnet Phase XVIII Architecture. In response to recent Xerox and Wang improvements to Ethernet that provide people and facility transportation across inter-node links, DEC's latest DECnet provides these capabilities as well as providing for the creation of virtual facilities and even countries. These capabilities are provided by breakthroughs in communications technology that actually use the Ether as a communications media. Through the use of a new dedicated NANO-PDP-11/E99 gateway processor system, ETHERGATE, DECnet users can access anywhere in the Ethereal Plane.

This development obsoletes teleconferencing, since meeting groups can create their own common conference rooms and cafeterias, thus resolving space, travel and dining problems. There may be a few bugs left, as some of the dissenting DECnet Review Group members have not been seen since the last meeting held in such a virtual conference facility.

This breakthrough was brought about by a team effort of the Distributed Systems' Software and Hardware engineering teams in an effort to improve on their Tewksbury, Massachusetts facility. In a compromise decision, Distributed Systems will maintain an ETHERGATE in TWOOO, but it will connect directly to their new home somewhere in the Shire of their newly defined Middle Earth reality. Despite some difficulties, the scenery, windows, tax breaks, pool and racquetball courts made the relocation go quite smoothly. Engineering network topology will not change, as all forwarding will be done by the TWOOO Ethereal Plane Router residing in the crater

at the former building site.

Utility packages such as Ethereal Person Transfer (EPT) and Ethereal Facility Transfer (EFT) provide appropriate capabilities for casual users. Sophisticated users can create (\$CREATE), access (\$OPEN), and delete (\$NUKE) ethereal entities transparently from high level languages using the Ethereal Management System (EMS) package and the Ethereal Access Protocol (EAP). An ETHERTRIEVE utility for easy interactive use will be available shortly.

DECnet Phase XVIII follows on the success of the Phase XVI ability to access everyone's Digital Professional wrist watch computer system. This leads to the current Phase XVII architecture, which has routing capabilities that allow direct communications with the entire Earth population's Atari home video games.

Distributed Systems architects are hard at work on the next phase of DECnet that will include multi-plane existence network management (using the NIECE protocol) and galaxy level routing using 64K bit addresses.

Digital will continue to support its Gateway products into the Prime Material Plane. These products include an IBM ANA (Acronym-based Network Architecture) Gateway, the TOLKIEN product that allows control of all ring based networks, and our Mega-broad-jump-band hardware which leaps past Wang's products in the hype weary business marketplace.

ALU PIPE-LINE PROCESSOR ENHANCES IMAGE PROCESSING FOR Q & MULTI-BUS SYSTEMS

Woburn, MA — Real time image processing can now be done economically by DEC Q-BUS and Multi-Bus users, with the introduction of the ALU-512 Arithmetic Logic Unit pipe-line processor from Imaging Technology. The ALU-512 is the latest addition to Imaging's IP-512 family of image processing modules.

The IP-512 modules are plug

compatible with standard DEC Q-Bus and Multi-Bus host processors. The ALU-512 is a specialized pixel cruncher, capable of performing sequences of high speed multiplication and addition operations on 10 million image pixels per second, with results up to 16 bits of precision. At this processing rate, a standard 512x512, 30 frame/sec interlaced video signal can be operated on in real time. Compared with the conventional CPU bound approach, specific image processing algorithms such as image scaling, background subtraction, and 3x3 convolutions for filtering, can now be reduced from minutes down to a fraction of a second.

The ALU-512 is designed to be fully compatible with FB-512 Frame Buffers and the AP-512 Analog Processor module of the IP-512 family. Each FB-512 contains 262 Kbytes of on-board RAM for the storage of 512x512x8 pixel image. Up to four FB-512's can be configured as two 16 bit or four 8 bit deep images, for ALU processing. The ALU-512 treats the FB-512's as individual large arrays of high speed memory, and it performs pipe-line operations on multiple image memories. The ALU-512 also accepts digitized video data from the AP-512 Analog Processor, as an 8 bit operand. The AP-512 can accept input from standard video cameras for real time video digitizing in 1/30 second and can output to black and white or color monitors.

The IP-512 applications include Digital Radiography, Robotic Vision, Non-Contact Measurement, Thermal/Infrared Imaging, Teleconferencing, Image Analysis and Computer Graphics.

For more information write Robert Wang, Imaging Technology, Inc., 400 West Cummings Park, Suite 4350, Woburn, MA 01801 or call 617-938-8444.

IMSL ANNOUNCES SOFTWARE FOR DEC 10/20 & VAX-11

Houston, TX — IMSL, Inc. has

announced that MATH/PROTRAN and STAT/PROTRAN, two problem-solving software systems for mathematics and statistics, are now available for the VAX-11, DEC 10 and DEC 20 computers. Both PROTRAN products are designed to reduce programming effort at a substantial savings to the user.

A free 60-day trial for MATH/PROTRAN and STAT/PROTRAN is offered by IMSL to the first 500 users or until March 31, 1983, whichever occurs first. Those interested should contact IMSL to arrange for the free trial.

Both MATH/PROTRAN and STAT/PROTRAN, members of the IMSL PROTRAN family of products, are user-friendly packages designed to increase problem-solving productivity. Advantages to the PROTRAN user are that no formal programming knowledge is needed for its application; interface between PROTRAN products is compatible; error checking is provided; and Fortran can be easily intermixed with the more powerful PROTRAN statements.

MATH/PROTRAN solves problems in elementary operations and random number generations, interpolation and data smoothing, integration and differentiation, differential equations, linear and nonlinear algebraic equations, eigenvalues and eigenvectors, optimization, transforms and sorting.

STAT/PROTRAN assists in problem solving areas such as basic statistics, frequency tables and crosstabulations, correlation, regression analysis, analysis of variance, and random number generation.

Initial PROTRAN annual subscription rates for the DEC VAX-11 Series are MATH/PROTRAN - \$3,000; STAT/PROTRAN - \$2,500. The subscription rate for both MATH/PROTRAN and STAT/PROTRAN is \$4,500 the first year. IMSL is offering an introductory university price of \$500 for initial subscriptions for each product.

For additional information, including details on the free 60 day trial offer, contact IMSL, Inc., Sixth

Floor — NBC Building, 7500 Bellaire Blvd., Houston, Texas 77036-5085 USA, telephone 713-772-1927, outside Texas call toll free 800-231-9842, or telex 79-1923 IMSL INC HOU.

**DATARAM HAS INDUSTRY'S
FIRST 1.0MB ADD-IN FOR
USE ON THE VERSAbus**

Cranbury, NJ — Dataram Corporation announces its DR-680, the industry's first 1.0MB ADD-IN for use on the VERSAbus. The DR-680 marks Dataram's first entry into the VERSAbus-compatible marketplace. "VERSAbus" is the name given to the standard bus developed by Motorola to support their very successful 68000 microprocessor product line.

The 1.0MB DR-680 is internally configured as 256K x 39 and a depopulated 1/2MB (128Kx39) version is also available. Read access and cycle times are 425 and 535 nanoseconds, and Write access and cycle times are 190 and 800 nanoseconds.

The DR-680 conforms to the standard 14.5" x 9.25" VERSAboard. The DR-680 decodes 23 address bits, providing it is to be used in memory systems up to 16MB. DR-680 modules of equal capacity may be two-way interleaved for 16 or 32 bit transfers. The DR-680 starting address may be offset in increments equal to the capacity of the DR-680 being used.

The DR-680 may be configured to operate from either +5.0VDC only or +5.0VDC and +5.0VDC standby. Battery backup logic is provided in the DR-680 to allow data save capability when the +5.0VDC standby voltage is used.

An on-board control and status register (CSR) allows program control of ECC functions and contains the diagnostic information required for error analysis. The CSR may be read or written via I/O access on the VERSAbus. Soft error scrub is used to further increase memory reliability.

The DR-680 may be configured to perform match cycles. The match circuit compares the present and

previous long word bus addresses. When the two are equal, a match occurs and data can be immediately accessed from data registers without re-accessing the memory array. Match cycles provide greatly reduced access/cycle times when adjacent words/bytes are accessed. Operating temperature range is 0°C to 55°C.

Single quantity pricing for the 1.0MB and 512KB DR-680 is \$4200 and \$2900, respectively. Terms are net 30 days. Delivery is 45 days after receipt of an order. A full one year warranty is standard.

For further information call; John F. Gilligan, president, (609) 799-0071.

RT-NEWUSER COLLECTION

Altadena, CA — Computer Programming Services announced RT-NEWUSER, a collection of FORTRAN and MACRO subroutines, and assorted other items, to speed up programming and help overcome the problems a new user of digital's RT-11 operating system encounters.

RT-NEWUSER includes crash-proof FORTRAN data input subroutines, special FORTRAN string/data handling subroutines, MACRO VT-100 control subroutines, routines to transfer data to arbitrary serial I/O ports, various utility command files, FORTRAN program logic and control function subroutines and several subroutines that illustrate FORTRAN to MACRO and MACRO and FORTRAN data transfers.

RT-NEWUSER even includes a password system.

The various RT-NEWUSER programs will save users far more than the \$250 package price.

For more information contact Computer Programming Services, 2406 North Lake Avenue, Altadena, CA 91001. Telephone: 213-794-2857.

**STANDARD PRODUCT COSTING
RELEASED BY MCBA, INC.**

Montrose, CA — MCBA (Mini-Computer Business Applications, Inc.) has announced the availability of

More performance than you ever imagined — for \$1695. If you're considering a DEC® terminal, C. Itoh now has two reliable alternatives that could easily change your mind.

Take our 132-column CIT 101, for example. Unlike DEC's VT100®, it includes full AVO performance — as standard equipment. You also get a 96 ASCII character set, plus 128 special characters. Characters may appear single-width and double-width, double-height. Reverse video, blinking, half-intensity and underscore may be used in up to 16 combinations. The cursor may be underline or block, blinking or non-blinking, or invisible to the viewer — all under computer control. There's

raster graphics too. And 19.2K Baud asynchronous communications. Human engineered features include a non-glare screen and detached selectric-type keyboard. Of course, if all you need is 80-column capability, have we got a terminal for you.

The \$1195 80-column terminal that performs like a 132. It's C. Itoh's CIT 80, the DEC VT52® emulator that's packed with features many big-ticket terminals don't offer. Things like smooth scrolling, soft setup mode, line drawing graphics and unidirectional RS 232-C printer port. A 19.2K Baud main port features X/ON-X/OFF protocol as well as full and half-duplex in conversation mode. Video attributes include

blinking, underline, half intensity — even reverse video. You get CIT 101-type human engineered features too. Plus socketed firmware for maximum OEM flexibility.

Both terminals are backed by our 90-day warranty, fully field supported and ready for immediate shipment. So if you're thinking of getting a DEC terminal, consider the alternatives: CIT 80 and CIT 101.

For full details, contact our exclusive representative, ARCO Corporation, 2525 McCabe Way, Irvine, CA 92713, (714) 557-5118.

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ELECTRONICS, INC.**
One world of quality.

Before you order a VT100, think twice.



Standard Product Costing (SPC) written in Dibal® for DEC® PDP®-11s. SPC is the latest addition to the MCBA Manufacturing System.

MCBA's SPC is an interactive, comprehensive tool which accurately maintains standard (or estimated) costs for both manufacturing and accounting management. SPC maintains up-to-date costs for all products, parts, and services provided by a company. Deviations of current cost from planned objectives can be spotted immediately through the use of Standard Product Costing, MCBA claims, and problem areas can be identified for management attention. Since SPC is integrated with MCBA's Inventory Management and Standard Product Routing packages, labor and material figures are automatically kept consistent.

MCBA's SPC maintains both beginning-of-year (standard) and up-to-date (current) cost projections. Current purchase prices deviating from the standard material costs are highlighted on the *Purchase Price Variance Report*. "What-if?" cost analysis can be done. Critical ratios like gross margin percentages and cost variances are provided.

Any report generated by SPC may be displayed, printed immediately or spooled to a disk file at the user's option. Multiple companies and password security are supported.

SPC requires MCBA's Inventory Management (I/M) and Bill of Material Processor (BOMP) packages. If the user also has Accounts Payable and Standard Product Routing installed, SPC can automatically maintain information and provide more useful reports.

A source code license for MCBA's RT-11 Standard Product Costing is \$3,000 for one computer; \$4,000 for a 10-computer use license. MCBA's RT-11 I/M and BOMP are \$4,000 for one use; \$5250 for a 10-use license. All MCBA licenses include source code, *Software Reference Manual*, and *User's Manual*. MCBA is headquartered at 2441 Honolulu Avenue, Montrose, California; (213) 957-2900; telex 194188.

NASSAU HAS PROTECTION FOR DEC EQUIPMENT USERS

Cincinnati, OH — Standard Digital Equipment Corporation PDP11, VAX, DECSYSTEM-10 and DECSYSTEM-20 machines are not adequately protected from equipment damage due to operation at high machine room temperatures. The environmental specifications for DEC computer systems require operating temperatures below 80 to 85 degrees, F.

Under a field service hardware maintenance contract, the customer is responsible for maintaining an acceptable machine room operating environment, at the risk of expensive out-of contract service when machine damage is caused by overtemperature conditions. Occasional overtemperature incidents due to daily or seasonal variations coupled with inadequate air conditioning can go unnoticed by computer room personnel. The standard DEC hardware can neither detect these situations nor protect itself from damage. Overtemperature conditions contribute to intermittent equipment and component failures, resulting in machine downtime directly proportional to the number and degree of overtemperature incidents.

DEC Field Service has recognized these problems and has recommended the installation of additional protective equipment at many customer sites. The Nassau Systems C-01 is the most cost effective overtemperature protection system available and is designed specifically for all standard DEC minicomputer and mainframe systems. The unit provides a warning alarm and total system power shutdown at factory set temperature limits designed to meet the DEC environmental temperature specifications. The C-01 connects to the standard DEC AC power control system on the computer in order to provide the shutdown function.

For more information contact Bruce P. Almich, president, Nassau

Systems, P.O. Box 19329, Cincinnati, OH 45219, 513-231-1283.

ALTOS ADDS 8-BIT WITH DESKTOP DESIGN

San Jose, CA — Altos Computer Systems has announced the availability of an 8-bit microcomputer with increased hard disk storage and in a new streamlined desktop design.

The new Altos 580-10 is a 10 Mb, 3-user-port, 192K RAM, Z-80 system offered at \$6,490. It features 5¼-inch drive technology, utilizing double-sided, double density 1 megabyte floppy disks and a 10 Mb Winchester hard disk drive, and includes 4 serial and 1 parallel ports. Altos will continue to offer the Series 5-5D, a 5 Mb version at \$5,490, and the Series 5-15D with dual 5¼-inch disk drive selling for \$2,990. All the systems come standard with the MP/M II multi-user operating system.

Both the Series 5 and Altos 580 products can serve three users simultaneously, thus providing a low cost-per-station computer capability for small business. By sharing a data base, users benefit by not having to maintain the same data base separately as they would with single user systems.

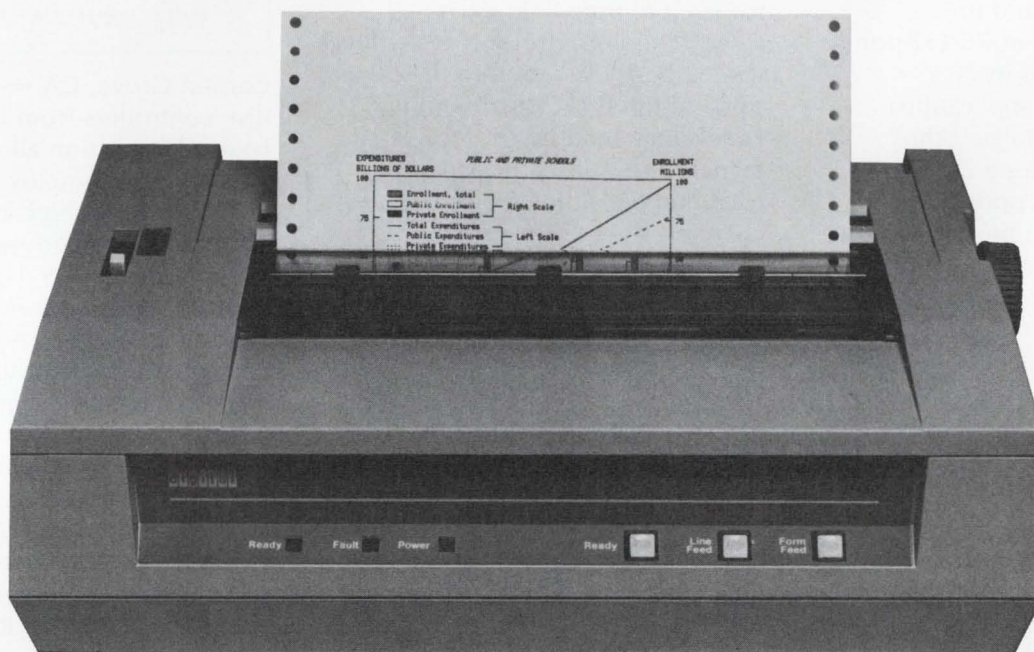
The Series 5 and Altos 580 products are compatible with CP/M®, MP/M™ and OASIS® operating systems as well as hundreds of application packages.

For more information, call Ron Conway, vice president/marketing, 408-946-6700.

EMULEX INTRODUCES STATCON SERIES 11

Costa Mesa, CA — Emulex Corporation has announced the availability of its new Statcon Series 11, a combined communications multiplexer and statistical concentrator. The product incorporates the technology introduced in Emulex's Statcon Series 21 to bring software transparent remote statistical concentration to users of Emulex's CS11 line of communications

HERE'S OUR PERSONAL ADVICE ON DEC'S NEW LA50 PERSONAL PRINTER.



We've got two pieces of advice on the LA50: First, buy one right now for every DEC video work station or personal computer system you have. The LA50 is that good, that versatile and that cost efficient.

Anyone who sits down in front of a DEC video screen will find an amazing variety of uses for the LA50: Its crisp, clear characters and Enhanced Single Pass Mode give letters, reports, memos and other documents a clean typewritten look. It prints full bit map dot addressable graphics—a capability usually found only on much more expensive printers. Simple or even complex graphics generated on your video display can be clearly and quickly printed. Variable pitches, friction and traction feed, snap-in print head and three print modes are just a few more of the LA50's remarkable features.

And this versatile printer will work beautifully at the end of DEC's new Rainbow Personal Computer.

Now for our second piece of advice on the LA50: Buy it from us. We're one of America's largest authorized DEC dealers. Our success is a result of our commitment to provide fast, friendly service combined with low, low pricing. Right now, the new LA50 starts as low as \$550 (additional discounts available with multiple orders, or cash purchases). And we're ready to ship any number of these personal printers to you within 24 hours.

So keep our personal advice in mind:

For the newest, most amazing personal printer on the market—buy the DEC LA50. And to get it fast at an amazingly low price—buy it from us. All you have to do is punch in America's best computer access code: 1-800-874-9748.

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& TERMINAL
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multiplexers.

"The Statcon Series 11," said William Dollar, product manager, communications, "utilizes the Company's CS11 series of host multiplexers and adds special micro-programming to provide the demultiplexing capabilities required to funnel remotely concentrated data into a single computer communications RS 232 port."

Up to 64 local and/or remote lines may be connected to any DEC PDP-11 or VAX-11 computer system using just a single backplane slot and without any modification of standard software by the user. Each remote link plugs into one of the local RS-232 ports and the remaining number of RS-232 ports may be allocated to local asynchronous line applications.

"Initially," said Dollar, "the product incorporates a DEC DH11 emulation and is supported in all PDP-11 and VAX-11 models; a DMF-32 emulation will be introduced soon. Existing CS11 configurations can be converted to include Statcon 11 capability by means of a simple PROM set change.

"The object in using any statistical data concentrator is to reduce telephone line costs by sharing one line among several remote terminals. In the past, this was accomplished by having a statistical concentrator at each end of the communications link. But this meant that, at the CPU end, there were as many local ports and cables between the CPU and the local concentrator as there were remote terminal interfaces.

"While the number of phone lines was reduced, the user paid for full local concentrator and host multiplexer capabilities.

"All users would obviously prefer to interface the composite communication line directly into the CPU through a single high speed data channel, thus using only one port," continued Dollar. "Previously, this presented a problem because a complex custom software package had to be developed to handle all aspects of multiplexing, demultiplexing, error handling, link initialization and synchronization,

and remote concentrator configuration.

"Very few users could justify this kind of effort, even in view of the hardware cost savings. Emulex has solved this problem completely: The user gets the best of both worlds — software transparency and minimum hardware cost."

A fully configured Statcon Series 11 consists of:

—CC11 communications controller.

—Up to four 16-line CP11 distribution panels.

—One or more CM22/EX local statistical concentrators.

An additional CM22/EX is added for each remote link; each CM22/EX plugs into one of the local RS-232 ports. The unused RS-232 ports of the CP11 Distribution Panels may be used for local asynchronous lines, provided the total number of local plus remote channels does not exceed 64.

In those cases where there are more lines for local than there are existing Distribution Panel ports, extra CP11 Distribution Panels may be added to accommodate the local user needs. Up to four CP11 Distribution Panels can be attached to a single CS11/MX Communications Controller.

The Statcon Series 11 will be offered in two DEC emulating models:

—CSM11/MH, emulating full DH11 performance on PDP-11 models. The CSM11/MH is fully software transparent to DEC operating systems and diagnostics. List price of the basic CSM11/MH is \$7300 for a 16-channel system with one CM22/EX.

—CSM11/MU, emulating full DH11 performance on VAX-11 models. The CSM11/MU uses an Emulex developed and supported VMS/UH software package. List price of the basic CSM11/MU is \$7600 for the same single-link, 16 channel configuration.

The Statcon Series 11 may be combined in Emulex's mix-and-match OEM and large end user volume purchase plan to qualify for price discounts. Emulex will support the Statcon Series 11 via its national

and international service network.

The CM22/EX Port Concentrator can be ordered with or without integral modems. Emulex supplies various models of remote data concentrators, but standard Micom Micro800/2 and/or 8000/2 statistical concentrators may be used at the remote end of each link.

For more information call or write Phillip Begich, director of national sales, Emulex Corporation, 3545 Harbor Boulevard, P.O. Box 6725, Costa Mesa, CA 92626. Telephones: (800) 854-7112; in California, (714) 662-5600.

NEW DISK CONTROLLERS WILL SAVE PANEL SPACE

Garden Grove, CA — Three new disk controllers from Distributed Logic Corporation allow system integrators to employ eight-inch Fujitsu or other high-capacity Winchester disk drives in their PDP-11/24 through PDP-11/70 minicomputer systems. The controllers and drives emulate RM02, RM03 and RM05 systems, but with significant savings in panel space.

For high-performance systems, the DU218-5 interfaces PDP-11s with up to four Fujitsu 2312 84M-byte Winchesters. The controller automatically maps each drive to emulate an RM02 or RM03, giving a total formatted storage capacity of 268M bytes. Each drive occupies only 0.37 cu. ft., compared with 15 cu. ft. required by the DEC drives. The Fujitsu drives have a 20msec average access time and 1.2M bytes per second data transfer rates.

The DU218-4 accommodates up to four 330M-byte Ampex Capricorn 330s which appear to the PDP-11s as RM05s. The Dilog DU218-3 mates PDP-11s with one or two 165M-byte Tecstor Sapphire 165 or 160M-byte CDC9730-160 disk drives. Each drive has data-storage capacity equivalent to two RM02 or RM03 drives and has a volume of about 3 cu. ft. These 14-inch drives have average access times of 30msec and data transfer rates of 1.2M bytes per second.

All Dialog DU218-series

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Now you can have electronic spreadsheet capabilities on your existing PDP-11 or VAX computers with CALC-11. CALC-11 is immediately available on the following operating systems:

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- * RSX-11
- * RSTS/E
- * VMS
- * UNIX

CALC-11 Special Features include:

- File Encryption
- Three Dimensional Spreadsheet
- Access to Non CALC-11 ASCII Files
- Command Access by Cell, Row, Column, Block of Cells or ALL
- Variable Individual Column Width
- Large Matrix Definition with Full Matrix Utilization
- High Quality Documentation with user Tutorials
- Technically Sound, Reasonably Priced and Easy to use

CALC-11 is ready, are you?

Designed & Developed by:
computer SYSTEMS corporation
 5540 Rock Hampton Court
 Indianapolis, Indiana 46268
 (317) 872-7200
 Telex 276243

*RT-11, RSX-11, RSTS/E and VMS are trademarks of Digital Equipment Corporation.
 TSX PLUS is a trademark of S&H Computer.
 UNIX is a trademark of Bell Laboratories.

controllers interface directly to the PDP-11 UNIBUS and are diagnostic and software transparent to RSTS-E or RSX-11M operating systems. A balanced transmission system, using differential transmitters and receivers, allows radial disk operation up to 50 feet and daisy chain operation up to 100 feet from the controller. The controllers require 5V@7.5A and -12V@0.6A from the system power supply.

Occupying a single "hex" slot in the computer or small peripheral

controller, the four-layer boards measure 15.75-inches by 8.78-inches (40.0cm by 22.17cm). Shipping weight, including operations manual and cable, is five lbs. (2.27kgm).

In single unit quantities, the DU218 series disk controllers are priced at \$2,990 each. Delivery is 30 to 60 days after receipt of order.

For more information, contact: Distributed Logic Corporation, 12800 Garden Grove Boulevard, Garden Grove, CA 92643, 714-534-8950; Telex: 681399.

CONTEL ANNOUNCES INTRODUCTORY OFFER

Bethesda, MD — Contel Information Systems has announced the availability of its interactive relational DBMS, RTFILE(R), for users of DEC's RSX-11M family of operating systems at special introductory prices.

RTFILE, an easy-to-use, menu-driven and forms-oriented database management system, is currently installed at some 280 DEC RT-11 sites, including TSX-Plus and SHARE-eleven timesharing sites and STAR-eleven distributed processing sites.

A spokesperson for Contel's Small Computer Systems Group — which oversees RTFILE development, support, and marketing — said that, "The RSX version of RTFILE looks and acts just like the RT-11 version — it's fast, easy-to-use, and highly productive." About 95% of the source code is shared verbatim between the versions, which virtually guarantees product reliability and smooth future development.

Contel has also announced plans to release versions of RTFILE for other DEC environments, including VAX/VMS and the Professional 300 series of personal computers.

Orders will be accepted through March 31 for RTFILE/RSX at the following special introductory prices: RTFILE/Single-User at \$1,500, RTFILE/Multi-User at \$2,500, RTUTIL Object Library at \$2,500. After March 31, the prices will be \$2,500, \$3,500, and \$3,500, respectively. The standard Contel discounts to qualified resellers will apply to the introductory offer prices.

Further information about RTFILE is available from Contel Information Systems, Small Computer Systems Group, 4330 East-West Highway, #200, Bethesda, MD 20814, (301) 654-9120.

LOW COST WINCHESTER UPGRADES FLOPPY BASED Q-BUS SYSTEMS

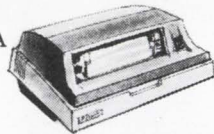
Canoga Park, CA — LSI-11 systems house Andromeda Systems, Inc. has introduced a new family of

Attention DEC users: Before you buy your next DEC line printer compare MTI's price on the identical printer.

DEC

DEC LP11-AA or LPV11-AA
300 lpm Band Printer

\$8,350



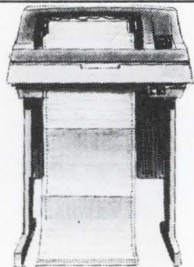
MTI

MTI Dataproducts B-300
(Includes DEC interface board,
cable & universal power supply.)

\$7,195

DEC LP11-EA or LPV11-EA
600 lpm Band Printer

\$13,600



MTI Dataproducts B-600
(Includes DEC interface board,
cable & universal power supply.)

\$8,895

Save thousands of dollars and needless waiting. MTI has the B-300 and B-600 in stock, ready for delivery. MTI is an authorized stocking distributor of Dataproducts line printers, the standard of the industry. So we get them first, and fast.

Our Dataproducts printers range from 200 to 1500 lines per minute, and are plug compatible with all popular minicomputers. We also specialize in setting up remote line printer stations.

Whether you buy, rent or lease our equipment, you'll find MTI is the one source for all the terminals, peripherals, systems, applications expertise and service you'll ever need for your communications network. At prices that are hard to beat. MTI. Call us today and save.

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Protocol Computers, MicroPro, Microsoft, Polygon and Select.

DEC is a registered trademark of Digital Equipment Corp.

CIRCLE D170 ON READER CARD

low cost Winchester mass storage subsystems that form a cost competitive upgrade path for Q-bus users who have been limited by cost constraints to floppy storage, and allows the user to upgrade storage by adding mass storage without the requirement for removable media.

The MDS (Mini Disk System) family offers storage capacities of 5, 10, 15 and 20 Mb, and emulation of standard DEC devices keeps existing application and system software usable. The MDS is fully compatible with LSF-11/2, 11/23/ and 11/23-Plus processors.

The complete MDS package consists of the Andromeda WDC11 dual-width controller card, a six foot cable and the MDS drive chassis. The chassis, a compact 15"Lx7"Wx4"H, may be placed on a desktop or mounted behind the host system. The WDC11 controller offers emulation of RK05, RL01/02 disks, plus an intelligent bootstrap for start-up.

Future system growth is supported by use of RLV12 compatible 22-bit DMA for all DEC device emulation and ability to service higher capacity drives, up to 160Mb, as they become available.

The MDS family is from stock to 30 days ARO and priced at \$3995, \$4700, \$5300, and \$5700 for the 5, 10, 15 and 20 Mb configurations, respectively. For further information contact: Andromeda Systems, Inc., 900 Eton Avenue, Canoga Park, CA 91304, (213) 709-7600.

PRODUCT UPDATES

DIGITAL & XOREN CO-OPERATE
IN FILE TRANSFER PACKAGE
FOR PROFESSIONAL SERIES

London, England — Digital Equipment and Xoren Computing are working co-operatively to adapt the XOREN IPL-11 file transfer software package to

Digital's new Professional 300 range of computers. Once it is adapted the package will be marketed by both Digital and Xoren.

During the development phase, Digital will be providing Xoren with technical expertise on the Professional series and will also be providing hardware facilities. The adaptation to the Professional range is expected to take about one month and once complete will enable files to be transferred between two Professional computers or between a Professional computer and a host PDP-11, LSI-11 or VAX-11 running under any of the major DEC

operating systems.

XOREN IPL-11 is already available for the RSX-11M, RSX-11M PLUS, RT-11, CTS-300, RSTS/E, CTS-500, TSX PLUS and VAX/VMS operating systems. All versions incorporate full communications error checking and enable files (including binary files) to be reliably transferred over a direct line or over a telephone line between any two computers in the LSI-11, PDP-11, VAX-11 ranges. The new version of the package will make full use of the menu driven features of the Professional 300. It will, however, use the same communications protocol as

Pascal POWER for your DEC Machine



PRICES Slashed

To keep pace with DEC's new micro line-up and reduced operating systems license fees, we are lowering the prices for the source code licenses of our

FIVE INTEGRATED FINANCIAL PACKAGES:

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~~\$ 995~~ ~~\$1,495~~ ~~\$1,995~~
NEW PRICES, per package: RT-11, ~~\$1,500~~; RSX-11M, ~~\$2,500~~; RSTS/E, ~~\$3,600~~

Since 1979, TBS has been providing the accounting needs for a diverse DEC customer base, from OEM's and accountants to scientific/engineering and industrial companies. In a recent independent survey, 90% of our users were very satisfied with performance and support.

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CIRCLE D192 ON READER CARD

the existing versions and will therefore be compatible with them.

For further information contact John Jarvis, Xoren Computing Limited, 28 Maddox Street, London W1R 9PF England.

**BRITTON-LEE ANNOUNCES
ACCELERATOR FOR DBMS**

Anaheim, CA — The IDM 500/2, a new accelerated relational DBMS

product introduced by Britton-Lee, more than doubles the performance of the existing product family. The latest in Britton-Lee's line of Intelligent Database Machine products, the IDM 500/2 is appropriate for DBMS applications with an average 900-1500 transactions per minute.

"The performance gains achieved with the IDM 500/2 are due to both hardware and software enhancements," said Phil Amend, vice president of marketing.

The IDM 500/2 includes a specialized high-speed data base processor designed and manufactured by Britton-Lee. The processor is capable of executing database instructions at a rate of ten million instructions per second.

Amend noted that "the 10 MIPS rate is more than five times faster than a VAX-11/780."

Britton-Lee is the first vendor to have offered a dedicated-function auxiliary processor which combines relational database software with specialized hardware specifically designed to perform the relational DBMS functions at very high speeds. Located between hosts and disks, the IDM products relieve the host computer of performing the tedious DBMS functions. The IDM product line covers a broad range of applications with the IDM 500/2 specifically targeted for high demand DBMS applications with from 400 to 4000 users and with databases as large as ten billion bytes.

Optionally available with the IDM 500/2 is an IDM facilities software package for DEC VAX and PDP-11 users running VMS or UNIX. This IDM facilities software package includes an on-line inquiry capability, a report writer, entry facility, programming language interfaces for COBOL, Fortran and "C", and database administration utilities.

Depending on its configuration, the price of an IDM 500/2 starts at \$85,000. For more information call Martin McKendrick: 408-378-7000.

NETCOM HAS NEW ENCLOSURES

Sunnyvale, CA — Netcom Products, Inc. has just released two new LSI-11* enclosure assemblies. The HL(X)-1123 enclosures are compatible with all LSI-11 microprocessor modules and are available with either front or rear module access. (*LSI-11 is a registered trademark of Digital Equipment Corporation.)

Standard features of the HL(X)-1123 include a 22-bit address, bus-structured 6-slot backplane, power supplies for the CPU, memory and peripherals and choice of switch/indicator modules for system control.

Software Tools for VAX/VMS

Make more of your VAX with packages from Evans Griffiths & Hart, Inc.

- **ROSS/V**, a RSTS/E subsystem for VAX/VMS written in VAX-11 MACRO. RSTS/E monitor calls are performed in VAX native mode; the rest of your PDP-11 code (run-time systems, TKB, applications, etc.) is performed directly in the PDP-11 microcode that's present in every VAX. ROSS/V provides the quickest way to migrate from RSTS/E to the VAX and a convenient way to do RSTS/E development on your VAX. While some VAX users are working in native mode, others are simultaneously working under ROSS/V's RSTS/E subsystem. Supports an extensive subset of RSTS/E monitor calls. Provides most of the standard RSTS/E features, like CCLs, send/receive, and RSTS/E-style file update mode. (ROSS/V is also distributed by Online Data Processing, Inc.)
- **KDSS**, a complete multi-terminal key-to-disk data entry subsystem. Eliminates the need for keypunching and stand-alone key-to-disk systems. (Also available for RSTS/E and RSX-11M.)
- **TAM**, an efficient multi-terminal screen-handling facility that provides complete support for the development of transaction-processing applications on a wide variety of terminals. (Also available for RSTS/E and RSX-11M.)
- **VSORT**, a powerful sort that is very much faster than SORT32. Sorts sequential and relative span and nospan files.
- **VSELECT**, an extremely fast package for scanning RMS files to extract and reformat records that meet user-specified selection criteria. Use VSELECT and VSORT to reduce the number of secondary keys you need in indexed files: you can select records from an indexed file and sort them in less time than it takes to run CONVERT on the file.
- **BSC/DV**, a VMS device driver for the DEC DV11 synchronous multiplexer. Suitable for handling a wide variety of bisynchronous protocols. (Also available for RSTS/E.)

Call or write for complete descriptions of features and benefits.

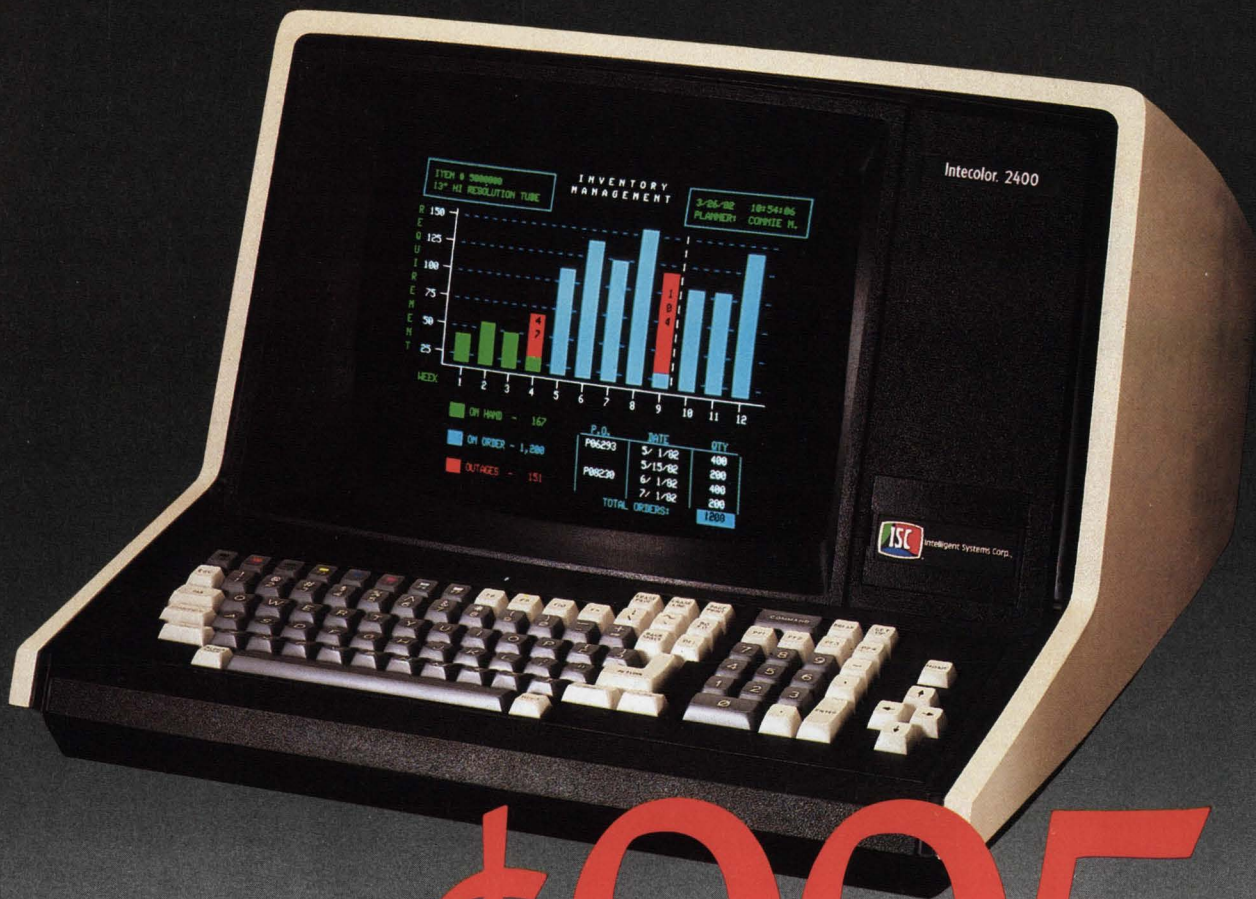
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CIRCLE D92

EGH



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The logical switch to color has never cost less. Now you can buy an Intecolor 2405 single evaluation unit at the 100-piece price of \$995 (U.S. domestic only).

You get the advantage of vector graphics on an 80 column by 24 line screen, without sacrificing the most important capabilities you want from a VT100 terminal. Plus, the 2405's vibrant color conveys more information, more quickly and with greater comprehension than monochrome.

ANSI X3.64 system compatibility. The 2405 is the ideal replacement or add-on terminal. Highly compatible with VT100 and numerous other ANSI X3.64 terminals, the 2405 is easily integrated into any ANSI X3.64 environment. It also includes ASCII codes and a VT52 mode.

With all the features you need. Eight foreground and eight background colors. Terminal based

Our ANSI X3.64 terminal has all the VT100 features you'll ever need in a conversational terminal. Plus color and vector graphics.

vector graphics. Data transmission baud rates from 50 to 19,200. English language menu set-up mode. Non-volatile set-up memory. Two full pages of screen RAM. In-line CRT. Auto degaussing. Powerful, 6 MHz 8085 microprocessor with four hardware interrupts. Plus, up to 72 function key definitions, optional.

Introductory price good through May 31, 1983. After that, our regular single-piece price of \$1195 goes into effect. So act now. Take full advantage of the color, vector graphics and flexibility of the Intecolor 2405—at the 100-piece price. Once you

do, we're confident that you'll enthusiastically agree with the growing number of OEMs and users who are making it dramatically clear that, "The future belongs to color!"

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Norcross, GA 30092, TWX 810-766-1581



Two new LSI-11 enclosure assemblies from Net-com Products, Inc.

Optional features consist of 19" rack mount capability, heavy-duty 12V power supply, key-lock switch, power down sequence, and mass storage add-on. Standard configurations of the HL(X)-1123 enclosures are \$1125; options extra.

For more information call Robert Hurley, president, 408-734-8732.

**EEC SYSTEMS ANNOUNCES
DEALER SUPPORT PACKAGE,
DISTRIBUTOR AGREEMENT**

Sudbury, MA — EEC Systems, Inc. announces a new dealer support package for OEMs interested in distributing their LEX-11 word and data processing software, available for DEC PDP-11 and VAX computers.

EEC Systems marketing director, Mercia Dickman, believes that the support package is comprehensive and gives dealers a good deal of incentive to sell LEX-11. EEC Systems are prepared to forward leads to well qualified OEMs in their geographical area as well as offering excellent dealer discounts on the product. However, other elements to the support program are more unusual. OEMs get marketing consultation as to fruitful avenues for sales in their area and assistance is given in the production of advertising materials, press releases, and application stories for local press. EEC Systems also will send their staff to regional trade shows initiated by one of their OEMs and will permit the use of their graphics and other trade show booth materials.

Mercia Dickman explained that EEC Systems found that this kind of support was necessary for smaller companies but with the support, smaller distributors have already shown that they are capable of securing large

numbers of sales of LEX-11.

She also pointed out that although EEC Systems was prepared to give a great deal of support for their OEMs, they did screen dealership requests very carefully. Dealer product training by EEC Systems is mandatory as is some commitment to use the product in the OEM's own business which EEC feels is the only way to get to really know the product and thus sell it effectively.

EEC Systems is currently looking to expand its OEM network for LEX-11 which at the moment is compatible with DEC PDP-11 and VAX computers. In 1983 the company plans to port LEX-11 onto other manufacturers' processors such as the Motorola 68000 and Intel 8086 and 88 processors. However, with the recent announcement of the availability of LEX-11 under P/OS for the new DEC Personal 300 series computer, EEC Systems predicts an ever greater demand for LEX-11.

Interested parties should call Mercia Dickman at 617-433-5106.

The company also announces that they have signed a distributor agreement with Clearpoint, Inc. to distribute Clearpoints' 22 bit memory modules for upgrading DEC PDP-11/23s to up to four megabytes of main memory. The 22 bit memory which has full parity and CSR is available in half and one megabyte modules on a single board making it the most densely packed memory in the industry. The new memory has been named QRAM-11 and EEC offers this memory for \$1,500 for the half megabyte and \$2,200 for the one megabyte board.

EEC President, Eric Dickman, said that this new move into the hardware business has occurred naturally as an outgrowth of the large growing EEC customer base who has purchased EEC's Catch-23 software which allows DEC users to upgrade their PDP-11/23's to 22 bit addressing while retaining 18 bit peripherals.

"The phenomenal success of Catch-23 has brought us into the upgrade market. So many of our customers asked us to recommend 22 bit memory that after a careful evaluation of all memory in the marketplace we came to the conclusion that the

Clearpoint designed QRAM-11 was superior both in design and reliability to anything else we saw available," said Dickman.

For more details about the QRAM-11 memory boards or Catch-23 software call or write Eric Dickman, president, EEC Systems, Inc., 327/E Boston Post Road, Sudbury, MA 01776. Telephone: 617-443-5106.

**EMULEX AUTHORIZES
10 DEALER-DISTRIBUTORS**

Costa Mesa, CA — Emulex Corporation has announced it has initiated a nation-wide network of authorized dealer-distributors for its comprehensive lines of DEC compatible disk and tape controllers, communications controllers and multiplexers, and mass storage peripheral subsystems.

"We've taken the important step of establishing a network of authorized dealer-distributors," said Fred B. Cox, Emulex's president, "to augment our rapidly developing direct sales force.

"The dealer-distributors we've selected have the technical and business expertise in the DEC marketplace that we feel is necessary to provide the service and support to which Emulex customers have become accustomed."

"Moreover," added Cox, "we expect that our dealer-distributor network and direct sales force will complement each other, resulting in still higher levels of service and support."

Emulex has initially designated 10 authorized dealer-distributors.

Western Scientific Marketing
5402 Ruffin Road #107
San Diego, California 92123

BFA Corporation
1704 Moon N.E. #7
Albuquerque, NM 87112

Datlease Systems
2770 East Regal Park Drive
Anaheim, CA 92806

Eakins Associates
999 Independence Avenue,
Building E
Mountain View, CA 94043

Digital Systems
9001 East Bloomington Freeway #114
Bloomington, MN 55420

Lowry & Associates
8163 West Grand River Avenue
P.O. Box 519
Brighton, MI 48116

Systems Technology Associates
15111 Mintz Lane
Houston, TX 77090

Dekalb Data Equipment
3169 Holcomb Bridge Road #125
Norcross, GA 30071

Total Tech
1925 Woodbridge Avenue
Edison, NJ 08817

Compumart
65 Bent Street
P.O. Box 568
Cambridge, MA 02141

**CONTROL DATA TO SERVICE
SPECTRA LOGIC CONTROLLERS**

Sunnyvale, CA — Spectra Logic Corporation and Control Data Corporation's Engineering Services Organization have signed an agreement under which Control Data will provide nationwide maintenance service for Spectra Logic's emulating single and multifunction disk and tape controllers used with Digital Equipment Corporation and Data General minicomputer systems. The SPECTRA 10, a DG disk controller; SPECTRA 12, a DEC PDP-11 disk controller; SPECTRA 20, a DG disk/tape controller; and SPECTRA 21, a DEC PDP-11 disk/tape controller are the Spectra Logic products to be serviced by CDC.

The maintenance service will be provided by Control Data's Engineering Services Organization both through on-site maintenance contracts and time and materials services. This service covers both disk and tape subsystems or the entire minicomputer system, excluding installation. CDC maintains service centers in 23 major cities in the U.S. Support for Spectra Logic products in DEC and Data General systems will be offered initially in those areas of greatest customer demand.

"This addition of third-party maintenance capability will greatly benefit prospective DEC and Data General customers by allowing them to use cost-effective independent disk and tape subsystems," said Allan

Abbott, president of Spectra Logic. "Our customers will now be able to use CDC maintenance to support attachment of a number of SMD disk drives and start/stop or streaming tape drives. Spectra Logic's responsiveness is well-known among our customers, and the CDC service capability will add to our reputation for fast, reliable service."

Service contracts will be handled directly between the user and Control Data's Engineering Services Organization. Spectra Logic will consign spare parts to CDC and also will provide technical data and support to CDC field service personnel.

Additional information about CDC service and maintenance is available from Terry H. Middlekauff, national sales manager, Control Data Corporation, Brenwood Office Park, 5720

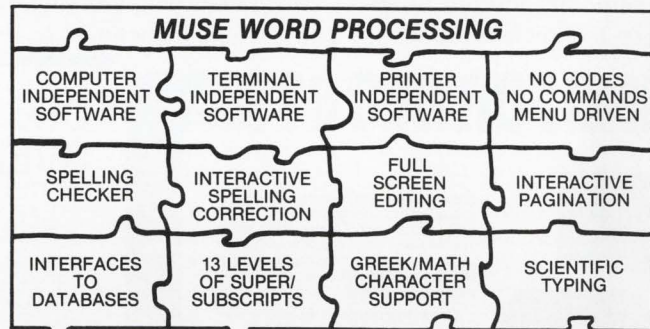
Smetana Drive, Minnetonka, MN 55343, phone: 612-931-3027.

**NEW SERVICE COMPANY
INSTALLS & MAINTAINS
DEC MULTI-VENDOR SYSTEMS**

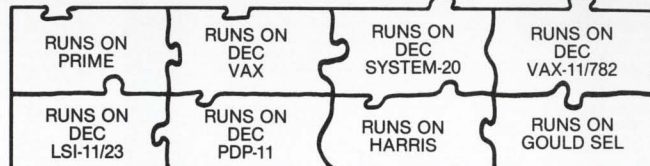
Costa Mesa, CA — Installation and maintenance for multi-vendor systems configured around Digital Equipment Corporation (DEC) CPUs is now available from CCG Computer Services Corporation, a newly-formed subsidiary of California Computer Group, Inc.

The new company services DEC-compatible peripherals and controllers manufactured by Control Data, Fujitsu, Cipher Data, Kennedy, Data Products, Emulex, Spectra Logic, Western Peripherals, MOSTEK, National

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Distributorship inquiries welcome. International offices are located in Tokyo, Japan; The Hague, Netherlands; and Genova, Italy.
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**Special Price Reduction for
Prime 2250 and VAX-11/730**

CIRCLE D183 ON READER CARD

Semiconductor, MDB and Plessey. A large inventory of spare modules and other replacement parts helps keep customer down time to a minimum.

CCG Computer Services Corp.'s president James Close has 22 years of experience in electronic systems test and field service. This has led to his heavy emphasis on responsiveness to local customer problems. A trained technician will arrive at the customer's site in four hours or less 80 percent of the time, coming from the company's home office in Orange County, California.

"We recognize that our success and reputation depend on providing fast action for all customers at all times," Close said; "future expansion will be controlled by this rule-of-thumb." Current operations focus exclusively on Orange County, Los Angeles and San Diego. Additional service offices will be opened where concentrations of DEC installations warrant employment of full-time technicians.

Close personally supervises day-to-day service operations and personnel training. Service technicians are first

sent to intensive seminars in the compatible device manufacturers' plants. Advanced training is led by Close himself, in CCG's in-house test and service laboratory. "We intend to create a level of confidence in the support of DEC-compatibles that equals — or exceeds — DEC's service of exclusively its own equipment," Close said.

DEC-compatible equipment traditionally has been serviced by third-party organizations, an arrangement which, many customers fear, means long response times and lack of overall system familiarity. This fear often discourages the purchase of any DEC-compatible equipment whatever.

"We are giving the data processing manager an alternative," said Close. California Computer Group, Inc., the parent company, is a large system integrator which markets DEC-, Data General- and Texas Instruments-compatible peripherals and controllers. Started two years ago, CCG has considerable experience installing equipment and working directly with device manufacturers to resolve any

performance difficulties. The new subsidiary company is seen as a means of putting this experience at users' disposal on a continuing basis.

"We know how to resolve problems quickly," said Close. "And we'll be there when we're needed, because of the company's policy of controlled growth."

CCG Computer Services Corp. is located at 3303 Harbor Boulevard, Suite G-10, Costa Mesa, California 92626. Telephone (800) 854-7488; in California (714) 966-1808; telex 183519 CCG CSMA.

SEMINARS & MEETINGS

VAX-11 BASIC
PROFESSIONAL SEMINAR

Escondido, CA — An intensive two-day "VAX/11 BASIC Professional Seminar" will be held in the San

LOOKING FOR DEC 8?



LOOK NO FURTHER! Newman Computer Exchange has a continuing commitment to the DEC8 market. Virtually the entire line, new and used, is available through us. And at great prices — an average of 60% below DEC list, even on new and unused equipment!

Check the good deals below. Then call us for our complete listings TODAY.

MODEL	DESCRIPTION	LIST PRICE	NCE PRICE	CASH PRICE
CPU's				
PDP8A205BP	32Kw MOS, KM8AA	5,825	1,050	995
PDP8A400BP	16Kw core, KM8AA, NEW	5,985	2,495	2,195
PDP8A620BP	16Kw core, KM8AA	9,030	2,825	2,625
MEMORY				
MM8AB	16Kw core for PDP8A	3,680	750	675
MM8EJ	8Kw core for PDP8E	1,365	525	450
MS8CB	32Kw MOS for PDP8A, NEW	3,850	395	350
OPTIONS AND INTERFACES				
DKC8AA	(M8316) I/O option, NEW	790	250	195
KC8AA	Programmer's console for PDP8A, NEW	885	450	395
KE8E	(M8340, M8341) extended arithmetic element, NEW	1,820	195	150
KL8JA	(M8655) serial line interface, NEW	645	350	300
DISKS				
RK8E/RK05JAA	2.5Mb disk & controller	9,227	2,990	2,890
RL8A-AK	5Mb disk & controller	6,400	2,550	2,450
RX28BA	Dual density, dual floppy & controller	4,150	2,650	2,450
RX8BA	Dual floppy and controller	4,600	1,895	1,795
PRINTERS				
LA8PA	LA180 printer, cable and interface	2,100	1,190	1,130
LQP8EA	LQP01 letter quality printer & interface	4,800	1,895	1,795
PC8E	High speed paper tape reader punch & controller	6,090	2,550	2,450

S231DF



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PDP 34 and other
systems not requiring a
dedicated branch panel.



Transtector® Systems has been building transient suppression equipment specifically for Digital Computers since 1970, providing cost effective protection to DEC users across the nation. Join the growing number of major corporations who are discovering Transtector — the choice of field service engineers. To learn more, call us toll free today at 1-800-635-2537 and end your powerline pollution problems.



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CIRCLE D62 ON READER CARD

CIRCLE D175 ON READER CARD

Diego area on Thursday, April 7, and Friday, April 8, 1983. Price for this two-day seminar is \$325. Workshop materials are included.

Seminar Topics Include: 1. Interfacing VMS; 2. Program Design; 3. Code Optimization; 4. Program Segmentation; 5. De-bugging; 6. Coding Standards and Techniques.

The majority of the seminar will be taught by Dan Esbensen, who is the current Chairman of the DECUS BASIC SIG. The DECUS organization has over 43,000 members and represents some 100,000 DEC computer sites. For the past two years, he has been one of 32 voting members on the ANSI X3J2 BASIC Standards Committee.

Interfacing VMS will be taught by Rick Cadruvi, whose experience includes four and one half years systems programming experience on the VAX. He has designed and implemented several AME's and has worked on ROSS/V; Rick is currently conducting a two-year research and development project for DIGITAL

DATA DIALOG on the VAX.

All travel arrangements and hotel accommodations may be made through DIGITAL DATA DIALOG.

To attend or for further information, call Will Mattisen or Debbi Robinson 619-743-0494 or write Digital Data Dialog, 609 S. Escondido Blvd., Suite 101, Escondido, CA 92025.

**PRACTICAL SAMPLING SYSTEMS
FOR
ON-LINE PROCESS MEASUREMENT**

Kent, England — This one-day seminar is a follow-up to those held in 1981 and 1978 in the same subject area. The objective is to provide an overall view of the use of sampling systems for on-line process measurement for liquids and gases, and also for slurries, pastes and solids, and to show by way of practical examples the methods which have been adopted in various industries.


The morning session will consist of

four keynote lectures covering respectively the use of sampling systems for liquids and gases, sampling of flue gases, sampling of slurries, pastes and solids, and sampling for environmental monitoring. The afternoon session will include presentations by speakers from a range of industries, plus a group discussion period in which speakers will lead groups in the discussion of a variety of topics of interest to delegates.

The seminar is primarily intended for instrument engineers, plant laboratory analysts and process control engineers in organizations making use of on-line process measurement. It will also be of interest to designers and engineers from plant contractors and to manufacturers of sensors, sampling systems and on-line instruments.

For further information about the seminar and literature display please contact the Conference Unit, Sira Institute Ltd, South Hill, Chislehurst, Kent BR7 5EH, England. Telephone 01-467 2636 Telex 896649.

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**ESSENTIAL RESOURCES OFFERS
CLIENT AWARENESS TRAINING**

Ansonia Station, NY — Essential Resources, Inc., a training company devoted to tailored on-site training in DEC software and the UNIX operating system, announces a new course offering: Client Awareness Training (CAT).

The two-day interactive seminar promotes and improves winning tactics for field support staff, when faced with difficult customers. Customer satisfaction has increased when companies have utilized CAT.

CAT is designed for field engineers and software specialists. Tailoring to the organization's particular requirements is accomplished by first consulting with management in order to determine their specific requirements. Difficult and sometimes critical situations which arise at the field support/customer interface are identified and analyzed. This process is then repeated with the field support personnel at the beginning of the seminar.

When repetitive patterns become evident, particularly with dissatisfied or technically unsophisticated customers, creative problem solving techniques are then utilized. Previous ways of handling these situations are replaced with more effective creative solutions. The interactive nature of the seminar provides the environment for this transition.

This approach has been developed by Martin Davis, president of Essential Resources, Inc., and consultants. His background includes extensive graduate work in the Physical Sciences, computer sales, technical software training and management training.

For more information call Martin Davis at 212-956-5988.

**SOFTWARE AG ANNOUNCES
OPENING FOR REGISTRATION
FOR 12TH USERS' CONFAB**

Reston, VA — Software AG of North America, Inc., has opened registration for its 12th Annual International Users' Conference to be held June

5-9, 1983, in New Orleans, Louisiana.

Under the theme "All That Jazz," the Conference will feature guest speakers, user presentations, workshops and tutorials designed for all levels of a company's product users.

Product change/enhancement sessions and presentations on product status and future goals will also be featured.

Keynote speaker, Charles P. Lecht, chairman of a "think tank" specializing in computer and communications systems technologies and author of *Waves of Change — A Techno-Economic Analysis of the Data Processing Industry*, will discuss future trends in hardware and software in "The Technology Vector" at the Conference.

Other scheduled speakers are: Ulric Weil, principal in electronic data processing at Morgan Stanley Inc., and author of *Information Systems in the 80s*; Ronald Ross, Data Base Newsletter editor; and William Perry, executive director of the Quality Assurance Institute.

The New Orleans Fairmont and Royal Sonesta Hotels will co-host the event, which will feature a Companion Program for spouses and an optional post-Conference trip to Cancun, Mexico.

Software AG of North America, Inc., develops and markets systems software products and specializes in data base management systems. For more information call Paula Brooks at 703-860-5050.

**UNI-OPS CONFERENCE
FOR NEWER UNIX & C
LANGUAGE USERS**

Walnut Creek, CA — The second annual Uni-Ops Conference for new Unix and C language users will be held the 28th and 29th of March, 1983, at the financial district Holiday Inn in San Francisco, CA.

The conference is organized into three major categories of activities for attendees:

1. General meeting sessions that will focus on the immense potential of this software system, and how to exploit it.
2. Birds-of-a-feather luncheons

where attendees can talk informally with other users who have similar applications or use similar Unix systems.

3. A vendor exhibition featuring Unix systems and software packages to run on them. Based on last year's showing, the majority of vendors are expected to have live computer systems available for hands-on demonstrations.

All three categories of activities are included with one registration fee: \$65 in advance or \$100 at the door. A detailed agenda and registration form are available directly from Uni-Ops.

Uni-Ops, a non-profit group interested in the advancement of Unix and C utilization, was founded in March, 1981, and has more than 500 members across the United States and in many foreign countries. Thirty-one Fortune-list companies and a similar number of prominent non-profit organizations have Uni-Ops members on their staffs. For further details call 415-945-0448.

**JOINT EVENT TO COVER
INFORMATION SYSTEMS,
ADVANCED MANUFACTURING**

New York, NY — Thousands of executives of manufacturing companies engaged in two separate critical areas—information management, on the one hand, and introducing advanced manufacturing technologies into their companies, on the other—will meet jointly for the first time to try to understand how best to coordinate their efforts and solve common problems.

The meeting will take place when the Information Management Exposition & Conference for Manufacturing — INFO/Manufacturing and HI-TECH 83 — the Exposition & Conference for Advanced Manufacturing Systems are held jointly at McCormick Place, Chicago, April 26 through 28, 1983.

Fifty-six conference sessions, jointly held for both groups, will try to bridge the gap in understanding. The thrust for INFO/Manufacturing is on helping manufacturing companies—many of which use computers and other information systems in their offices—to extend those systems and integrate them with information from the marketing,

accounting, financial, R&D, purchasing and shipping departments into a single system. Telecommunication and information problems involved in integrating information among home offices, plants and warehouses spread across state and national boundaries, also will be considered.

The concentration of HI-TECH will be on robotics, CAD/CAM/CAE, computer-controlled machine tools, flexible manufacturing systems, automatic assembly and equipment systems, automatic maintenance systems, automatic guided vehicles, automatic inspection systems, automatic storage and retrieval systems, programmable controllers, optical measuring systems, laser technology, and other automated production, design and support systems.

Still another feature for executives attending will be the opportunity to attend the National Material Handling Show & Forum, devoted to "The Automated Factory," which will be running at McCormick Place on the same dates. Special discounted registration fees will be available.

Full conference programs may be obtained from Clapp & Poliak (A Cahners Exposition Group Company) 708 Third Ave., New York, N.Y. 10017. (212) 370-1100. Advance Registration Cards, which admit to the show at reduced registration fees and speed the visitor through registration lines, may be obtained from the same source.

PEOPLE, PLACES & THINGS

**WHITESMITHS CONSOLIDATES
ALL OPERATIONS TO CONCORD**

Concord, MA — Whitesmiths, Ltd., has announced the consolidation of its two major offices into its Concord, MA location.

Funding for the consolidation was provided in part by the Massachusetts Capital Resource Company, an organization whose charter calls for

increasing employment opportunities in the state. The Venture Capital Fund of New England and FIN-TECH also secured a minority interest in the firm.

The Concord office will house all departments and operations, said Whitesmiths' president Dr. P.J. Plauger. Customer Service, formerly based in Iselin, NJ, will continue at the present Concord site, affording efficient interaction between all personnel and customers.


Whitesmiths, Ltd. is the developer of a wide range of computer systems software, including compilers, software tools and its own portable operating system. Founded in 1978 by Dr. Plauger, Whitesmiths has steadily increased the scope of its product line by adapting an original C compiler to work on several different classes of popular computers (manufactured by Digital Equipment Corporation, Intel, Motorola and Zilog), including the soon-to-be-released DEC Professional (CT325 and CT350) personal computer series, and the IBM Personal Computer.

In addition, Whitesmiths, Ltd. is the originator and developer of the Idris operating system. Described by Dr. Plauger as "a comprehensive, multi-user, multi-tasking operating system that provides a uniform operating environment across a broad spectrum of computers", Idris has won high acclaim for being small, portable and economical, making it a front-runner in the operating field.

All inquiries and correspondence should be directed to Whitesmiths, Ltd., 97 Lowell Road, Concord, MA 01742., Telephone: (617) 369-8499.

**SPSS PROMOTES RABJOHN
TO VP OF MARKETING**

Chicago, IL — SPSS Inc., developers of computer software for data analysis and information management, announced the promotion of James N. Rabjohn to the position of vice president of marketing. His new responsibilities will include the direction of general marketing strategy and con-



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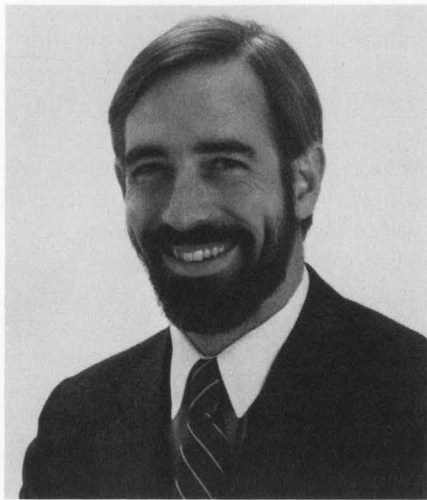
VAX single systems, \$5,500; 15 systems \$2,500 each. PDP-11 prices slightly lower.

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DP-383



James Rabjohn, vice president of marketing SPSS Inc.

continued supervision of the sales and marketing staff both here and abroad.

Rising steadily up the ranks at SPSS, Rabjohn began as a sales representative, was soon promoted to training coordinator, and in 1980 became director of marketing.

Rabjohn began his career as the associate research director at the National Opinion Research Center, an affiliate of the University of Chicago. He has served as a statistical consultant to many Fortune 500 corporations and is widely published in academic and corporate journals.

In making the announcement, President Norman H. Nie, said, "This promotion reflects recognition of the valuable contributions Jim has made to SPSS in the past, and our confidence in his aggressive pursuit of new horizons for success in the future."

A graduate of Williams College, Rabjohn received his Bachelor of Arts

Degree in Economics. He continued his masters and doctoral studies at the University of Chicago with a major academic focus in Political Science.

IMJ & ASSOCIATES CHANGES NAME; APPOINTS PRESIDENT AND DIRECTOR OF MARKETING

Newport Beach, CA — IMJ & Associates, Inc. has changed the corporation name to Fingraph Corporation. Fingraph Corporation is a privately-held business graphics firm with marketing and research development facilities located in Newport Beach, CA, Springfield, IL, and London, England.

Corporate headquarters will be at 4921 Birch Street, Suite 130, Newport Beach, CA, Telephone: 714-553-9134.

The new President and Chief Executive Officer is Frank Hahn. Prior to joining Fingraph, Hahn was corporate vice president of systems marketing for Pertec Computer Corporation, where he was responsible for worldwide development and distribution of all Pertec Systems Products.

The company has also appointed Dennis Farrell, director of marketing programs. He will be responsible for marketing plans, product marketing, internal and external education, sales support and advertising.

The initial product developed by the company is Fingraphtm, designed as a day-to-day management and decision support system for all levels of Executives and Management. The System allows management and finan-

cial support staff to use accurate, up to date business and financial data to best manage corporate activities and resources.

INTELLIGENT SYSTEMS NAMES KLEIN REGIONAL MANAGER

Norcross, GA — Intelligent Systems Corp., announces the appointment of Daniell C. Klein to the position of Northeastern Area Manager for The Executive Presentation Systemtm (EPS). Intelligent Systems' solution to the problem of creating high quality color graphics, EPS produces overhead projector transparencies and 35mm slides for business presentations at an affordable cost.

Prior to joining Intelligent Systems, Klein was with Lanier Business Products; his last position was national account manager for their Electronic Office Systems Division. His other responsibilities included sales and district management duties both internationally and domestic. He is a graduate of the University of Virginia.

Frank Marks, general manager of Executive Presentation Systems Corp., says that the addition of Klein will allow the company to better serve the expanding market for color graphics presentation systems. "Dan will concentrate his efforts on establishing and supporting a full-service dealer network. We are expanding our network with great care, because the key to customer satisfaction in the presentation graphics market is the complete package — system consultation, training, maintenance and update assist-

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ance. Dan's extensive background in the industry will be of direct benefit to our dealers and customers."

Intelligent Systems manufactures color graphics desktop computers, color graphics terminals and color presentation graphics systems. The company is headquartered in Technology Park/Atlanta, Norcross, Georgia. Intelligent Systems' stock is traded in the National Over The Counter market under the symbol INTS.

**INTECOLOR ANNOUNCES
TWO DISTRICT MANAGERS**

Norcross, GA — Intecolor Corp. announced the appointment of Mark Sayer to the position of Northern California district sales manager. His territory is comprised of the area of California north of San Luis Obispo.

President David M. Deans said, "Mark has good, solid experience in the color graphics field. His sales expertise will help us serve better the large and growing Northern California market. Many of the businesses in that area are seeking creative solutions to business problems — and color graphics generated by desktop computers are the answer in many situations."

Prior to joining Intecolor, Sayer was Sales Manager for International Applied Systems. He has a wide variety of experience in the microcomputer and graphics fields, including four years as an executive sales manager for Ramtek. Sayer has a bachelor's degree in Electronic Engineering from

the University of Santa Clara.

Also announced was the appointment of Bob Davenport to Western District sales manager. He will be responsible for the company's sales effort in the California counties of Orange, Imperial, San Diego and Riverside.

Said Deans of Davenport, Bob has been assigned to a strategic territory. Color and graphics are important problem-solving tools for virtually any business. With the density and diversity of industry in his area, Bob has an exciting challenge. He will concentrate on introducing customers to our new, low-cost Intecolor 2405 color terminal and developing our general business in Southern California."

Prior to joining the company, Davenport worked as an independent consultant in the computer industry. His experience also includes two years as a sales representative with the Thorson Company, and several years as a design engineer with a leading aerospace company. His undergraduate work was done in physics at Weber State College in Ogden, Utah. He holds an MSEE from California State University at Long Beach.

Intecolor Corp. is an operating division of Intelligent Systems Corp.

**SOUTHERN SYSTEMS OPENS
OFFICE IN UNITED KINGDOM**

Longdon, England — Southern Systems, Inc., printer system specialist, has opened a new subsidiary in the United Kingdom.

The new company, SSI Limited (UK), will handle all western European sales of Southern Systems' printer products ranging in speed from 56 to 5280 lines per minute. Miles W. Miller will be managing director, said J. Joseph Horn, Southern Systems president.

The new subsidiary's office is located in the Hounslow suburb of London, an area that has become a center for many leaders in the U.S., European and British electronics industry. Address is 248 Hanworth Road, Hounslow Middlesex TW3 3TY. Telephone is 01 572-5455.

In addition, Southern Systems representatives in Europe include Gallus-Plesner of Oslo, Norway; Garmann-Clausen of Stockholm, Sweden; and Findip of Helsinki, Finland.

Southern Systems, which recently introduced the first high-speed non-impact printer using ion deposition technology, is a seven-year-old firm specializing in printer systems compatible with most of the computer marketplace including IBM, Digital Equipment Corp., and many others.

The firm is headquartered at 2841 Cypress Creek Road, Fort Lauderdale, FL 33309.

**EVANS & SUTHERLAND
DONATES SIX COMPUTERS**

Salt Lake City, UT — Evans & Sutherland Computer Corporation recently announced the donations of PS 300 computer graphics systems to six universities involved in applying

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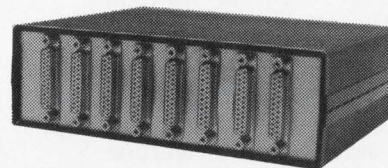
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high performance computer graphics in a variety of research and education disciplines. The donations were made to universities involved in the fields of mechanical engineering, chemistry, geophysics and computer sciences.

Recipients of the systems include:

- * University of North Carolina, Chapel Hill, NC
- * Lehigh University, Bethlehem, PA
- * University of Illinois, Urbana-Champaign, IL
- * University of California at Los Angeles
- * University of Wisconsin, Parkside, WI
- * Louisiana State University, Baton Rouge, LA

These universities join 31 other schools which have already received PS 300 systems. These donations will provide increased momentum for the advancement of high technology computer graphics in the academic environment. The PS 300 computer graphics system provides real-time, three-dimensional image interaction without significant host computer intervention.

Evans & Sutherland is a technology leader in the field of special purpose computers used to create graphic images. Products include sophisticated visual systems for pilot training simulators and high-performance interactive graphics terminals for engineering, design and research applications. Evans & Sutherland is a publicly held corporation with stock traded over the counter under the NASDAQ symbol ESCC.

HUMAN DESIGNED SYSTEMS
NAMES GELBERG VP/SALES

Philadelphia, PA — Human Designed Systems, Inc. has announced the promotion of Michael Gelberg to vice president for national sales, with responsibility for the firm's network of sales offices and distributors in the United States.

"The promotion of Mike Gelberg and the reduction in price of our AVT display terminal family," Executive Vice President Roger S. Pincus said, "is the first step in our program to

become a major supplier of display terminals for the 'technical professional' — the highly competent and highly trained computer user; the individual who is given a company's most difficult analysis, information processing or development assignments, and who is often paid a premium for these capabilities. He or she uses the computer or terminal extensively on a daily basis, to perform such tasks as engineering design, financial analysis, text editing, and software development. And because the 'technical professional' understands how to get his job done efficiently and productively, he can appreciate the benefits of the advanced features of the Concept terminal."

The Concept AVT terminal combines ANSI X3.64 functionality, DEC software compatibility, and switchable 80/132-column capability with the most extensive series of user-friendly, applications-oriented features available for smart terminal users. Included are four pages of memory standard (expandable to eight pages), 43 pro-

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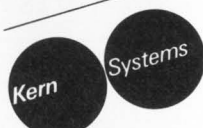


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grammable functions, windowing, and multiple computer capabilities. The Concept AVT-APL has the same capabilities and supports APL with full, true overstrike.

"Our goal for 1983 is to nearly triple the number of Human Designed Systems' sales offices in the United States," Pincus explained. "Mike Gelberg's job will be to create and manage that network of offices, staffing each with skilled professionals who can offer the sales know-how, technical and application competence, and service support that have become the hallmark of our company."

Human Designed Systems, Inc. is located at 3440 Market Street, Philadelphia, PA 19104. Telephone is 215-382-5000.

OIR OPENS EUROPEAN OFFICE

Waltham, MA — OIR, the Organization For Industrial Research Inc. — has opened an office in Amsterdam, The Netherlands. The office will serve OIR's growing customer base in Europe and the Middle East.

Peter Chevalier is the manager of the office. A native of the Netherlands, he spent the past two years as manager of technical services for OIR in the United States. Other members of the European staff are being drawn from the Netherlands and other countries.

Working closely with OIR headquarters in Waltham, MA, the office will provide a full range of technical and support services, focusing on new OIR systems such as Multiclass Classification and Coding, Multigroup Group Technology, and Multicapp Computer Assisted Process Planning, as well as the company's computer graphics software systems.

Implementation of these systems is currently underway in France, Germany, England and Northern Ireland.

PRECISION VISUALS MOVE TO NEW FACILITY, WILL EXPAND PAYROLL TO 100

Boulder, CO — To accommodate its rapid growth in just three years of existence, Precision Visuals, Inc., a computer graphics software firm, announced that it has acquired and moved into a new facility more than triple the size of the old one.

The new western-motif structure of glass, redwood and brick is located five miles from downtown Boulder and five miles above sea level, at the base of the Rocky Mountains. It features a "wired" office automation environment with a computer terminal at every desk connected to a new in-house minicomputer system. The new address and phone number is: 6260 Lookout Road, Boulder, CO 80301, 303/530-9000.

The 21,000 square foot building now houses 45 employees, but can comfortably accommodate more than double that amount. The company has plans to add 55 jobs, bringing the total to 100. They also have an option on nearby land should that become necessary as the firm expands.

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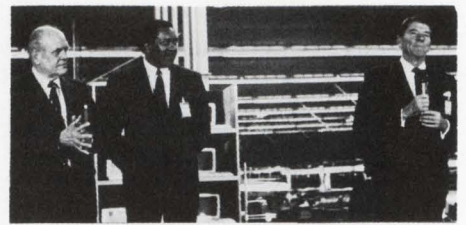
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"The new environment relieves some overcrowding we were experiencing, thus making our operation more productive. The natural beauty of this mountain area combined with the attractive new building itself gives the PVI employees—especially those engaged in product development—the first-class type of atmosphere they need to do their best creative work," said Bill Perry, director of finance.

Precision Visuals, Inc. is a leading supplier of graphics software offering device, machine, and even application independence. The company's DI-3000 graphics package has been installed at more than 300 sites worldwide. PVI recently introduced GRAFMAS-TERS, a panel-driven presentation graphics package that is designed for a broad range of users, including both DP and non-DP professionals.



PRESIDENT REAGAN VISITS DEC MANUFACTURING PLANT

On January 26th President Ronald Reagan visited DEC's Boston manufacturing plant in Roxbury, Massachusetts, a suburb of Boston. The President toured the facility which manufactures DEC's new LK-201 keyboard used on the Rainbow and Professional personal computers.

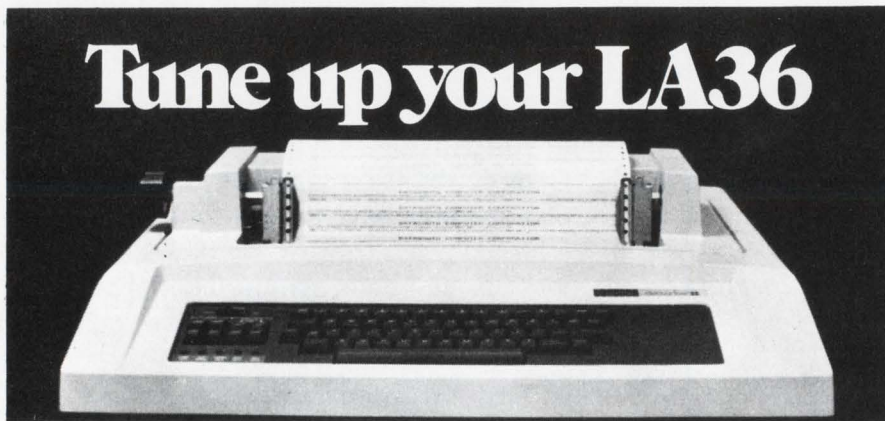
The President met with DEC President Ken Olsen and Plant Manager Ralph Gillespie and was shown around the 62,000 square foot building. The plant currently employs about 275 people most of whom are minorities. The plant was a cooperative project between DEC and the government to provide training and jobs in a technical manufacturing plant to minority urban workers.

The DEC PROFESSIONAL visited the manufacturing facility about one week after the President but we still got the VIP tour. Manufacturing Manager Jim Meyers escorted us around the plant explaining how the LK-201 keyboard is built. We met Robert Shagoury who explained in detail the steps component parts go through until the final stage when the LK-201s are actually attached to a Professional 350 for final testing. LK-201 keyboards are new to this plant which previously built keyboards and harnesses for the VT-100 series of terminals. The three-year-old plant is modern and clean with a new transporter system for moving materials automatically to the assembler when they need them.

Enthusiasm was high and we saw a videotape of the party held at the plant when it was announced that they were going to manufacture the LK-201. These workers really want to build this keyboard, and build it well. They are shooting for 99.8% quality out the door and are building up to that now. They hope to be able to build up to one million keyboards a year when they are able to run multiple shifts and all the production is in full swing.

DEC and the people in the plant are doing a great job. It is great seeing American workers enthused about their jobs and the company's product. There is a wealth of good, hard working people in our cities just waiting for the opportunity that DEC has made for the Boston people. While the LK-201 is being made here, the CRT display is still being made offshore in Taiwan. Maybe we could replace Taiwan with Philadelphia if we could get all the right people together. And then Baltimore, Chicago and . . .

By Carl B. Marbach, Publisher



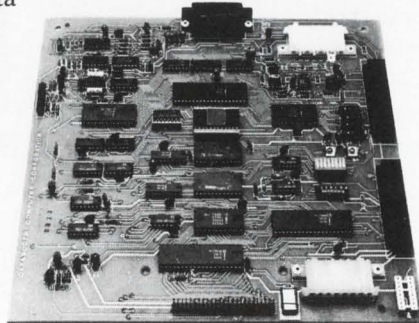
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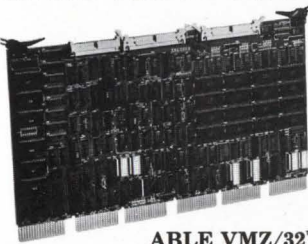
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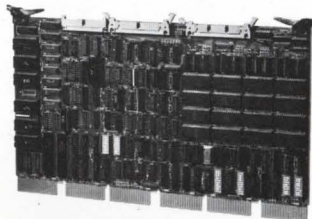
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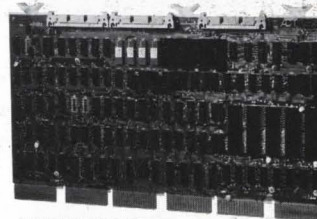
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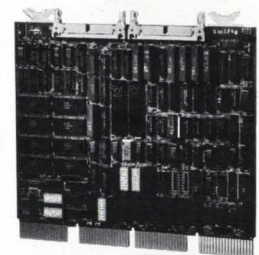
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