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FROM THE EDITORS

What language is best? Carl Marbach

Many people are asking this question and since I have some definite ideas on this subject, I will answer in print. Is PASCAL what we should be teaching our students, is ADA the "next" language, isn't COBOL the best language to know when finding a job, all DEC systems seem to use BASIC. How do we sort out all this information?

Like the child who has to decide between Howard Johnson's 21 flavors, or Baskin and Robbins 34 flavors (special for the month is . . .) the computer community is deluged with languages, and faced with a difficult choice. When I was a graduate student studying computer science I was forced (it was part of the curriculum) to take a course titled "programming languages." What we did for one semester was write programs in a different language every two weeks. I discovered shortly that they were pretty much all the same; of course the syntax was different, but there wasn't much basic difference between the covers. Then I ran into SNOBOL, that was different. Someday I'll write an article on how it was different, but give me that exception and let's talk about how the others were alike.

One of my favorite recollections is of an air traffic problem in Canada some years ago. It seems that some pilots were using the countries bi-lingual laws (everything must be in French AND English) to reply to air traffic instructions in French. Some pilots didn't understand (English is the international standard) and there were fears that an accident could be caused by the confusion. One bi-lingual pilot summed up his feelings by saying, "I would no sooner use French in my airplane than I would use English in bed!" You see, some languages fit certain situations better than others. Of course the English speaking countries continue to have children so English must work in bed, even if French is better.

We are reduced then, to choosing which language is better, marginally better, for THE JOB we have to do. Basic may be a "better choice" for a business application on a PDP-11 than COBOL, but not if the program is to migrate to an IBM system at some time. PASCAL embodies lots of structured programming constructs, but so did ALGOL and where is that language now? ADA is being "specified" by the government, an institution not known for its brilliance, and is COBOL which was specified by them so terrific? Why are they always telling US some time. Pascal embodies lots of structure.
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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.

Congratulations on a fine publication. I thoroughly enjoyed your first issue and wish you success in your endeavor to provide a much needed service to DEC users.

Perhaps some of your readers can help with a situation encountered attempting to use DECFORM with Digital Information Systems DBL compiler. I would like to compile it under DBL so that ISAM files and subroutines written for use with other DBL programs can be utilized.

I am running RT-11/TSX+ on an 11/23. The command file generated by FOCOMP has been modified to use the DBL compiler and the subroutine DECF1.DBL has been compiled with the DBL compiler. The compile and link runs without any error messages. However, when the form program is run, it goes through normal initialization dialogue then returns to the monitor immediately after the message "CREATING A NEW FILE" is displayed. The form is never displayed on the screen.

If anyone has used FOCOMP with DBL or can shed some light on the reasons for this situation I would appreciate hearing from them. I may be contacted at: Mount Dora Growers Cooperative, 680 S. Highland St., P.O. Box 36, Mount Dora, Florida 32757, (904) 383-4114. Paul H. Lorentz

Readers!??

I was able to review your new magazine, "The DEC Professional," from someone else's copy.

Our process control group supports twenty-one plants in the United States, each of which have 2 to 5 Digital RSX11M based systems. My area of responsibility is system software support for all of these systems. I know I will find "The DEC Professional" magazine interesting and useful.

Please send the July issue, if possible, and enter my name for regular distribution.

N.L. Pallett, Sr. Systems Analyst
GM Assembly Division, Warren, MI

Our entire supply of July's charter issue of the DEC* Professional was used up in the 1st week by our eager readers. We promise to print an additional 3,000 copies beginning with the September issue, and will immediately add your name to our subscription list.

Let me take this opportunity to congratulate you on your first issue of the DEC Professional.

As a major supplier of OEM products to the DEC marketplace, Xylogics is concerned about the amount and quality of exposure we get and I think that your new publication will serve these needs very well.

Your format provides a well-rounded mix of technical and informative material as well as a comprehensive list of advertisers whose purpose it is to address the needs of DEC users in the variety of applications they have.

I'm sure that all the careful thought and planning that went into this new publication will make it very successful and well received in the industry. On behalf of Xylogics, I trust that your success will be ours as well.

Louis J. Finnegan
Vice President, Sales, North America

Just finished reading your first issue and enjoyed it very much. I learned a few things also.

Keep up the good work.

Warren A. Blower, Jr., Service Manager
Warner & Swasey Co., Solon, OH

Congratulations on your first issue of the DEC Professional. I found the magazine extremely readable and informative.

I hope to see many good things in the coming issues of the DEC Professional.

Stephen Meadow, Systems Analyst
Hospital of the Univ. of PA, Phila., PA

I need information!!!!

Where can I obtain a course-by-mail-in Dibol programming.

Send information to: N.H. Nermyr, P.O. Box #802, Cut Bank, MT 59427

Thank You, N.H. Nermyr

Readers!??

I have a DEC PDP 11/03 with 2 RXV11 Disc drives. The terminal we are using is a VT-52.

What is the availability of software for this system, any sources you could refer would be greatly appreciated.

Thomas M. Williams
V.P. Permanent Placements
Staff Dynamics, Darien, Conn
Can any of your readers help this person?

First let us congratulate you on a fine job on your innaugural issue. DEC PRO promises to be a mainstay of the DEC user's reading diet.

We did find one thing to object to in this issue. Namely, Ed Judge's statement in "What I Learned about RT-11" that "no database (except for SIMILE . . . )" exists for RT-11 users.

RTFILE (R) is perhaps the oldest and most widely used database management system for users of RT-11 (as well as TSS-Plus, STAR-eleven, SHARE-eleven, and the UNIX, RSTS, and RX RT-11 emulators). Commercially available since 1980, RTFILE is now running at about 250 DEC sites. Recent additions to our user group include McDonnell-Douglas, Monsanto, and the Swiss Federal Institute of Technology (ETH).

ConTel has recently announced plans for the immediate development of a native RSX-11M version of RTFILE. This product will be available on 1/1/83, and will offer to the RXS user the same unbeatable price/performance ratio over all competitive DBMS (the entry level price for RTFILE is $1500) products that RTFILE now offers to the RT-11 user.

We hope that you will correct this error in Mr. Judge's otherwise informative article.

Robert C. Natale, Manager
Small Computer Systems Group
ConTel Info. Systems, Bethesda, MD

We would like to comment on the article titled The Bridge, by Msrs. Van Brunt and Henkin which appeared on page 30 of the July issue of DEC PRO. While we agree with much of the article, we believe there were some errors and exaggerations which would tend to mislead DEC PRO's readers.

It should be stated at the outset that New England Digital Systems, Inc. is a dealer for DIGICALC, MICRONEXUS (a CP/M emulator that currently runs under RSTS/E), and CP/M software including SuperCalc. Thus while we might have some self-interest in the matter, we are qualified to comment on the utility of the two "spread sheet" software packages and CP/M emulation.

SuperCalc offers excellent single user "electronic spread sheet" capabilities to the micro computer world. It does however have some definite limitations. Its spread sheet size, which in theory may reach 63 columns by 254 rows, is in fact limited by the availability of only 30k to 35k of remaining RAM, in a 64k version of CP/M. This presents no problem for simple budgets or financial models. However, we have found that the typical user bumps up against capacity limitations very quickly, when trying to design more complex...
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MODULAR PROGRAMMING —
TOP-DOWN DEVELOPMENT

By Michael H. Koplitz

The concepts of top-down development can be applied to the design of a system, the design of programs within the given system and to the design of the modules which make up the programs. A module is a collection of logically related code. Therefore an entire program could be thought of as a module. Since several programs (or modules) make up a system it is logical to think of the system in top-down form.

To understand the concepts of modular programming it is necessary to determine what a module is. The characteristics of a module are:

1. A module is a separate compilation (subprograms, programs).
2. A module has a name.
3. A module must return to its caller.
4. A module may invoke other modules.
5. A module must have a single entry and exit point.
6. A module is relatively small in size (less than 200 lines of code).
7. A module should not keep a history of what has occurred previously for the purpose of modifying its action or logic path.
8. A module has a single function.

There are several guidelines available to limit the complexity of modules. A maximum can be set for the number of source statements that a module can contain. Another way is to limit the maximum size of main storage allocated to each module. Also the maximum number of decision statements that a module may contain can be limited. A maximum number of possible paths through a module can also be set. The simplest guideline to use when creating a module is to allow the module to have only ONE function. The guidelines to be used for the development of a project or a program must be decided before the development of the system or of the program can commence.

There are several advantages to the concept of modularity. These are:

1. Modularity allows a large program to be written by several programmers thus providing the possibility of earlier completion.
2. It encourages the creation of commonly used routines to be placed in a library.
3. Modularity simplifies the overlay procedure of loading a large program into main storage.
4. Modularity provides more checkpoints on which to measure progress.
5. Modularity provides the framework that should allow for more complete testing.
6. Modularity simplifies the design of a program making it easier to modify.

The liabilities of modularity are:

1. The execution time for the program may be longer.
2. Storage size may be larger.
3. The compile time may be longer, and load time may be longer.

4. Intermodule communication problems may be increased.

The advantages of modular programming far outway the disadvantages. The amount of time saved when maintenance must be performed will far outway the potential extra time and storage space that a modular program needs.

Top-down program design is based on the idea of levels of abstraction becoming levels of modules in a program. In a system design, the levels of abstraction become the programs of the system. To picture these levels the hierarchy chart was developed. The hierarchy chart demonstrates the different levels of abstraction. The chart is functionally oriented and shows the control of flow within the system or within the program.

Vertical control of flow is most important in a hierarchy chart. The flow of control proceeds along the vertical lines that connect the modules in the hierarchy chart. This means that any module can invoke any other module at a lower level, and then the lower level module must pass control back when it has completed. To insure vertical control within the hierarchy chart the following guidelines should be observed:

1. A module must return to its caller, the only exception to this is error detecting.
2. A module can call a module below the level on which it appears, but it may NOT call another module on the same or higher level.
3. The major decisions should be placed at as high a level as possible.
4. A lower-level module should not make decisions that a higher-level module must follow.

AN EXAMPLE OF A HIERARCHY CHART

The advantages to vertical flow within the hierarchy chart are: the logic is easier to follow since only one path can be taken between the modules. The top modules will reveal the general logic of the entire program (or system). Maintenance is much easier since logic is grouped. The coding and testing of the higher level modules before the lower level modules will reveal any modular design problems and reveal logic flaws.

After the hierarchy chart is developed for the system/program, it is imperative that a method for the development of modules is decided on. There are two basic methods available. They are the hierarchical approach and the execution-order approach.
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The hierarchical approach consists of modules that are coded and tested based on their position in the hierarchy chart. All of the modules at a given level are coded and tested before modules at a lower level. The hierarchy approach does not specify the order in which the modules on a particular level are created.

This approach can create some problems with data dependency. Data dependency is when a module has a requirement that another module has to produce some data for the module to operate.

In this case module A is data dependent on module B.

There are two points to remember when the hierarchical approach is used. The first point is data dependency, flow of data between modules. This problem may make it difficult to code and test modules which are on the same level. The apparent solution is to code those modules, on the same level, which produce data for other modules on the same level, first. The second point to remember is that the hierarchical approach leaves the bulk of modules to be done at the end of the project. This could create some machinescheduling and manpower allocation problems.

The other approach that can be taken is the execution-order approach. In this method the modules are developed in the order in which they are to be executed when the system/program is fully developed and becomes operational. The advantage to this method is that data dependency is minimized. The disadvantage is that this method implies a sequence of coding and testing whereby programmers assigned to the project must wait their turn to develop their modules.

Another disadvantage is that large stubs (testing skeletons) are needed to check the output of each module, since later modules that would check data have not been developed yet. To avoid this problem the developer can:

1. Redraw the hierarchy chart.
2. Use special debug output routines which have been written previously.
3. Code easy to use output statements in the stub.
4. Depart from the strict execution-order approach.

The simplest solution to this question is to use a combination of both approaches. It must be remembered that the following conditions must be met to preserve top-down development.

1. The control path to the modules must have already been established.
2. All data values that a module must have are available.
3. Requirement of the earlier sequenced modules.
5. Handling data exceptions.

To develop the modules for a system, the developer must first write down the overall function of the system. For example, the function of a system could be: write a payroll system. After the function of the system has been determined, a list of the reports, maintenance, and utility functions are listed. For the payroll system the list could be:
I want to join INFO with VAX.

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Address __________________________
City ____________________ State ________ Zip __________

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1. Input of timecards.
2. Payroll register.
3. History register.
4. Check register.
5. General Ledger Posting.
6. Checks.
7. Utilities.
8. Maintenance.
These functions can be developed into the following hierarchy chart.

```
<table>
<thead>
<tr>
<th>Payroll</th>
<th>system</th>
</tr>
</thead>
<tbody>
<tr>
<td>ledger:</td>
<td>reports:</td>
</tr>
<tr>
<td>[General]</td>
<td>[Utility]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>Time cards</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Payroll</td>
<td>History</td>
</tr>
</tbody>
</table>
```

**PAYROLL HIERARCHY CHART**

The hierarchy chart will be used to determine the development approach of the system. Each program/module/function can then be taken one at a time and developed into a program hierarchy chart. This chart will be used for program development. The same idea for the system development is used to develop the program hierarchy chart. For example, take the payroll register module, and list the functions of the program:
1. Read a record from the payroll file.
2. Calculate taxes.
3. Calculate deductions.
4. Print data on the report.

Then draw the hierarchy chart from the list of functions.

```
<table>
<thead>
<tr>
<th>Payroll register</th>
</tr>
</thead>
<tbody>
<tr>
<td>read record</td>
</tr>
<tr>
<td>deductions</td>
</tr>
</tbody>
</table>
```

**PAYROLL REGISTER HIERARCHY CHART**

Each of these modules can be broken down further and further until a simple function is processed. There is a limit to the amount a module is broken down into sub-modules. This limit is determined by the programmer. Note that loops, decisions, etc., are not indicated in the hierarchy chart. The internal mechanisms of the loop can be written in a pseudo language or flowchart.

The major advantage of modular programming is that when a change, which is inevitable, is required any programmer can locate the code to change easily. It is easy because each module does ONE function. Modular programming also allows many programmers to develop different modules of a system, or of a program, allowing for faster system development.
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CIRCLE D69 ON READER CARD
If you are using RMS-11K indexed files you may be interested in a utility called RMSBLD that we have developed to 1) optimize these files at initial set-up and 2) provide standard documentation for later reference. This article describes the rationale behind RMS indexed file optimization and briefly reviews some of the aspects of the program. Additional background information may be found in Chapter 6 of the RMS-11K Users' Guide (pp.6-1 to 6-33).

1.0 INTRODUCTION:

In an RMS indexed file, definition of areas allows the user to gather logical elements of the file into groups of continuous ranges of virtual block numbers (VBN’s). These VBN’s can, with the use of RMSBLD, be mapped onto a contiguous set of logical blocks on the disk. This allows RMS to traverse an index with little or no head movement until the read for the actual data record. It should be noted that this sequence of associations of logical file elements is lost when RMS extends an area that has been filled. For this reason, RMSBLD creates the file based on an “expected” number of records. The area scheme used by RMSBLD is as follows:

1. Area 0: Data records Only.
2. Area 1: Lowest Level Index Records
3. Areas 2-N: Secondary Index Data Records (SIDR’s) for Alternate Keys 1-N

The following diagram illustrates how the use of areas groups logical file elements.

RMS will create Area 0 contiguously, if you request it, but because of an unfixed bug in RMS on RSTS, areas 1 - N are not created contiguously. A workaround for this is to use RMSDEF via RMSBLD to create the file and use PIP to recreate the file contiguously. We recommend this strategy for moving EMPTY RMS indexed files only. For moving populated files we recommend using RMSIFL rather than PIP.

2.0 PROGRAM DESCRIPTION:

Optimization of indexed files can save significantly on I/O time and reduce the impact on RSTS but performing the calculations necessary to select optimum bucket and area sizes for indexed files is a complicated and time-consuming task. RMSBLD interactively performs these calculations in response to user supplied information on expected number of records, record size, key position, etc. Program suggested bucket sizes can be overridden.

Four documents are automatically created by RMSBLD:

1) * .RMS — a document showing RMSBLD’s questions and user provided answers.
2) * .CMD — an ATPK indirect command file to create the indexed file.
3) * .DEF — an RMSDEF command file created by RMSDEF when the *.CMD file is used.
4) * .DSP — Output from RMSDSP of the newly created file.

These documents are useful for maintaining documentation standards, while reviewing the performance of the program as well as of the file. We have found, at our site, for very large files (greater than 65535 blocks) that the primary data area (area 0) is sometimes too small. In this case, we hand edit the *.CMD file to enlarge this area. In the initial setup mode of the program, RMSBLD allows you to select the protection code and file cluster size. Defaults are 48 and
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RMSBLD uses default file extensions which conform to our facility standards. A ".WRK" file denotes a transient (work) indexed file and a ".IDX" denotes a permanent indexed file.

RMSBLD is a user friendly tool for accomplishing the calculation and creation of fully optimized indexed files.

<table>
<thead>
<tr>
<th>Previous work file</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous file or new name</td>
<td>EXAMPL</td>
</tr>
<tr>
<td>Number of records in file</td>
<td>30000</td>
</tr>
<tr>
<td>Duration of File</td>
<td>PER</td>
</tr>
<tr>
<td>Record Format</td>
<td>FIX</td>
</tr>
<tr>
<td>Record Format Overhead( Bytes)</td>
<td>7</td>
</tr>
<tr>
<td>Recordsize</td>
<td>400</td>
</tr>
<tr>
<td>Data type of Primary key</td>
<td>STR</td>
</tr>
<tr>
<td>Last byte of Primary Key</td>
<td>84</td>
</tr>
<tr>
<td>Placement of key</td>
<td>(16, 55, 70, 82)</td>
</tr>
<tr>
<td>Lengths of segments</td>
<td>(1, 4, 7, 1)</td>
</tr>
<tr>
<td>Name of key</td>
<td>PATIENT.ID</td>
</tr>
<tr>
<td>Duplicates allowed</td>
<td>NO</td>
</tr>
</tbody>
</table>

### Activity Overhead Table

<table>
<thead>
<tr>
<th>For a bucket size of 1</th>
<th>The activity overhead (bytes)</th>
<th>102</th>
</tr>
</thead>
<tbody>
<tr>
<td>For a bucket size of 2</td>
<td>The activity overhead (bytes)</td>
<td>204</td>
</tr>
<tr>
<td>For a bucket size of 3</td>
<td>The activity overhead (bytes)</td>
<td>307</td>
</tr>
<tr>
<td>For a bucket size of 4</td>
<td>The activity overhead (bytes)</td>
<td>409</td>
</tr>
<tr>
<td>For a bucket size of 5</td>
<td>The activity overhead (bytes)</td>
<td>512</td>
</tr>
<tr>
<td>For a bucket size of 6</td>
<td>The activity overhead (bytes)</td>
<td>614</td>
</tr>
</tbody>
</table>

### Table of Calculations

<table>
<thead>
<tr>
<th>BSIZE</th>
<th>NIRBK</th>
<th>NDBRK</th>
<th>mrf/NIRBK</th>
<th>NIRBK**2</th>
<th>NIRBK**3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>31</td>
<td>1</td>
<td>30000</td>
<td>961</td>
<td>29791</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
<td>2</td>
<td>10000</td>
<td>9005</td>
<td>250047</td>
</tr>
<tr>
<td>3</td>
<td>95</td>
<td>3</td>
<td>409</td>
<td>95</td>
<td>857375</td>
</tr>
<tr>
<td>4</td>
<td>127</td>
<td>4</td>
<td>7500</td>
<td>16129</td>
<td>2048380</td>
</tr>
<tr>
<td>5</td>
<td>159</td>
<td>5</td>
<td>6000</td>
<td>25281</td>
<td>4019680</td>
</tr>
<tr>
<td>6</td>
<td>191</td>
<td>6</td>
<td>5000</td>
<td>36481</td>
<td>6967870</td>
</tr>
</tbody>
</table>

### Calculations for alternate index # 1

| Number of index Records per bucket | 100 |
| Number of Data Records per bucket | 252 |
| Deletion overhead | 4 |
| Duplicates factor | 600 |
| Adjusted Buckets at level 0 | 142 |
| Number of buckets at level # 1 | 1 |
| Allocation for Area 2 | 286 |

Development of this software was supported by the Comprehensive Cancer Center for the State of Florida, Miami, Florida. For more information regarding this software or copies write to: RMSBLD, Division of Biostatistics, Comprehensive Cancer Center for the State of Florida, P.O. Box 016960 (D8-4), Miami, Florida 331101.
How to get from here to there for $200 a channel.

Teltone is driving down the cost of data links in local area network applications.

For an effective end-to-end price of only $200 per channel, our new M-825 Asynchronous Data Multiplexer is fully compatible with T1 digital carrier transmission systems as well as private networks using microwave T1 connections or four-wire (two twisted pair) circuits.

The M-825 is designed to accommodate 32 full-duplex data sources through conventional RS-232C cable interfaces. It's totally transparent to all data formats and protocols at rates of up to 19.2 Kbps, so there are no speed switches or adjustments to be made.

Single bit error detection and correction logic is included to minimize transmission faults. And because the composite speed of the M-825 is 1.544 Mbps, all 32 ports can be used simultaneously at up to 19.2 Kbps without data blocking.

For private four-wire installations up to 6,400 feet apart, the M-825 will perform reliably without any external equipment. If needed, the distance between multiplexers can be extended by means of inexpensive, readily available repeaters.

Here at last is a simple, cost-effective alternative to point-to-point wiring, leased lines, coaxial cable and limited distance modems — an alternative that makes good sense today.

For more information about the M-825, call our toll-free hotline at 1-800-227-3800 Ext. 1123 (in Calif. 1-800-792-0990 Ext. 1123) or write Teltone Corporation, PO Box 657, Kirkland, WA 98033. In Canada call (416) 475-0837 or write 91 Telson Road, Markham, Ontario L3R 1E4.
Primary Key Data Area is 0

; Fill Factor Optimization For Data Buckets 819
; Primary key index Area is 1
; Fill Factor Optimization For index Buckets 819
; Low Index area is 1
; Here is the cluster size and protection code
-1
48
YES

C

DEASSIGN
ASSIGN DATA:O
ASSIGN SY:I
ASSIGN SY:S
SHOWL0

**DEPROFESSIONAL**

FLAG
S:EXAMPL.IDX/CACHE/SEQ

Z

PIP O:EXAMPL.IDX/MODE:1808 =S:EXAMPL.IDX

PIP S:EXAMPL.IDX/DE/ER/LO

$ENABLE LOG
! QUE:ing OUTPUT to printer !

$DISABLE LOG
DSP S:EXAMPL.DSP=0:EXAMPL.IDX/FU
QUE/GLP0:RMSBLD/JCOPIES:2=S:EXAMPL.DSP/,MORE
S:EXAMPL.RMS/,MORE
S:EXAMPL.CMD/,MORE
S:EXAMPL.DEF/,MORE

EXTEND
OR ERROR GOTO 13200
chain.entry% = 0$

***************

PROGRAM TITLE BLOCK
***************

PROGRAM : RMSBLD.R2S
VERSION : V7.0-2
EDIT LEVEL : B
EDIT DATE : 05-MAY-82

AUTHOR : Kevin Mallory
          Systems Programmer
          with
          Mark Brumlett
          Systems Manager
          at
          University of Miami
          School of Medicine
          Comprehensive Cancer Center
          for the State of Florida
          at
          PO Box 016960 (D8-4)
          University of Miami
          Miami, Florida 33101

ADDRESS : RMSBLD.ODL
          RMSBLD.CMD
          RMSBLD.OFL
          RMSBLD.CMD
          RMSBLD.OFL
          RMSDEF
          RMSIFL
          RMSDEF
          RMSIFL

I/O CHANNELS USED

CHANEL# VARIOUS USE
00 --------- console
01 temps temp channel
02 bytes KB:
11 log$ log file

***************

VARIABLE DEFINITIONS

NAME USE
--------- -----
acq$ accuracy of string function
alt$ loop index...
skey$ String constant ALTERNATE
ash$ Flag if null key value wanted
ans$ Holder for responses
aovh Calculated Activity overhead
area,extension.size Holds sizes of the areas.
area( 10 )
ask$ Flag to ask question...
bucketsize$ Bucket size...
buck$ Loop index Bucketsize
buck$ Bucket pointer length
buck$ User input bucket...
loop...
calcpent Calculation variable.
chain,entry Chain entry flag..
check$ Loop index
check$ Flag of changes allowed
chgd$ Changes allowed in key NO
check$ Channel for command flag
command$ String constant CMD
ct = LF
data$ "DATA:"
datafill$ Fill data buckets ( Bytes )
data$ to fill data buckets
data$ Allocation for data ( or sidr's)
sp$ alternate key pointer length
sp$ String constant DEF
sdef$ Debugging flag..
Test your word processing I.Q.

And discover how the advanced features of LEX-11 can increase your w-p capabilities.

THE CHALLENGE:
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.

...But can you tell the difference between run-of-the-mill software and a system that is really special?

EEC SYSTEMS offers you this challenge! Test your word processing I.Q.

THE QUESTIONS:

1 EDITING
Which kind of editing operation is quickest to execute and easiest on the eyes of the word processing user?
- a) Full screen editing allowing for easy cursor movement around the screen?
- b) Moving the cursor around by doing a line count?
- c) 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...
- a) View it on the screen as it would come out of the printer?
- b) 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?

a) One easy stroke with no codes?
b) Two or more with complex w-p codes?
c) 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...
- a) Look for w-p software that allows you to change and add menus, and change function keys?
- b) 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?
- a) One that can access a particular record by going to it directly?
- b) 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...
- a) ASCII formatted files?
- b) Software which requires non-printing characters in it's 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...
- a) On-screen calculating allowing for editing, storing and recall of equations, calculations integrated with your word processing applications?
- b) Software where the math capabilities are tied to the list processing module?
- c) A separate math package?

THE ANSWERS:
If you answered "a" to all of the questions above, go to the top of the class. Chances are that you already use LEX-11 or are about to buy it. You know that LEX-11 is the ONLY word processing software that combines these advanced features... and more... in one software package.

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LEX-11 is available under the following operating systems: RT-11, TSX-Plus, RSX-11M, RSTS/E, IAS, UNIX (both PDP-11 and VAX), IDRIS, VMS... and it works in exactly the same way, with the same features for all operating systems, with your existing peripheral equipment.
(code snippet from a programming document)
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In business, dreams become goals to be attained. The very real goal of increased productivity is common to us all. Amcor can help you effectively reach this goal by using modern tools of the highest technology.

AMBASE, our Data Base Management/Application Development System, is just such a tool. In addition to the sophisticated data management capabilities of AMBASE, it consists of flexible report and screen generators, as well as an automatic code generator and a very friendly query capability.

AMBASE customers are writing a wide variety of application packages from student registration, voter information, to payroll, and a comprehensive criminal investigation system. AMBASE was designed to handle diverse industry application requirements such as those of government, education, finance, distribution, manufacturing, professional organizations, and more.

Our customers are not only writing a variety of applications systems, they are doing so in record time. Systems that used to take weeks to write are being completed in days, resulting in dramatic increases in programmer productivity.

AMBASE is the DBMS around which our other application software has been designed. Amcor's A/R, A/P, General Ledger, Inventory Control, Order Processing and Sales Analysis systems are fully integrated and are being continually enhanced to make even more flexible in meeting customer requirements.

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CIRCLE D46 ON READER CARD
1900 IF name$ = RAD$( m$( 123 ) + SWAPS( m$( 123 ) ) )

2000 IF wrkfil$

2300 IF PRINT #05, "Please answer the following questions about the file"

2400 IF name$ = newnam$

2500 PRINT #05, "How many logical data records are expected"

2600 IF "Is this a permanent file or a work file (PER)"

2700 IF "open dev$

2900 filler$ = syosdk$ + nam$ + dot$ + filtyp$

3000 PRINT #05, "The records of an indexed file may have a fixed format"

3100 PRINT #05, "What format will the records be (FIXED)"

3200 | ****************************************************** |
Emulex takes the inside track on VAX-11/780* mass storage.

Announcing V-Master/780. A whole new packaging concept in software transparent mass storage adapters for VAX-11/780.

**Simpler, less expensive, more reliable.**

Just what OEMs and system integrators need. Two V-Masters can fit right into the internal RH780 spaces for control of up to 16 drives. And a third will replace the SBI terminator. The result: Add more peripherals without adding an expansion cabinet.

Each V-Master chassis has four slots. Two boards interface with SBI; the other two can contain fully-overlapped SC780 disk and/or TC780 tape controllers. Reliability improves because of fewer components, boards and interconnects.

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**Increase performance, improve flexibility.**

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And you get all the other Emulex benefits, too. Like the ability to mix drive types and capacities. Unlimited selection of peripheral make and model. SMD media compatibility.

**Now available as complete subsystems.**

Choose from a wide selection of peripherals up to 675MB. We test each system nearly 100 hours and do our own installation. Nationwide and regional service organizations provide timely maintenance.

Look into our unique rental/purchase plans. You can even trade in your old non-DEC controller.


---

*VAX and VMS are trademarks of Digital Equipment Corporation. The VAX 11/780 shown is manufactured and marketed exclusively by DEC.*
IF format$ = fixed$ THEN format$ = true$

FOR i$ = 1 TO 3
    IF format$ = fixed$ THEN
        fWrite.out$( format$, "Record Format" )
        fWrite.out$( NUM$( rfo% ) , "Record Format Overhead( Bytes ) " )
        PRINT #kb%, "What will be the maximum recordsize?";
        INPUT #kb%, maxrec$
        IF maxrec$ < 05 OR maxrec$ > 9999 THEN PRINT #kb%, "Try again.
        GOTO 3400
    IF i$ = FN write.out$( NUM$( maxrec$ ) , "Recordsize ") THEN
        GOSUB 10000
    END IF
    IF i$ = FN write.out$( NUM$( maxrec$ ) , "Recordsize ") THEN
        GOSUB 10000
    END IF
    PRINT #kb%, i$ = FN write.out$( NUM$( maxrec$ ) , "Recordsize ")
    GOTO 3400

PRINT #kb%,
    "What will be the maximum recordsize?";
PRINT #kb%,
    "Input the place and the length of the dups allowed, name etc..."
PRINT #kb%,
    "Up to 10 Alternate keys are currently allowed"
PRINT #kb%,
    "should you need more please see the system manager";
INPUT #kb%,
    "How many alternate keys will be defined <0> ";
numb.$ of.keys$
PRINT #kb%,
    "Keys may have the following data types:";
PRINT #kb%,
    "String, INTEGER, Packed decimal, or Binary."
PRINT #kb%,
    "The following questions deal with the keys for ";
    "the file."
PRINT #kb%,
    "Keys may have the following data types:";
PRINT #kb%,
    "String, INTEGER, Packed decimal, or Binary."
PRINT #kb%,
    "Input the place and the length of the dups allowed, name etc..."
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    "String, INTEGER, Packed decimal, or Binary."
PRINT #kb%,
    "Input the place and the length of the dups allowed, name etc..."
The speed, efficiency, flexibility and user control of the top statistical multiplexer in its class is now available for DEC operating systems.

BABYMUX™

The speed, efficiency, flexibility and user control of the top statistical multiplexer in its class is now available for DEC operating systems.

8 LANES IN 1
BABYMUX allows data traffic for up to 8 remote terminals to merge onto a single phone line inter­connecting a VAX or PDP-11 host computer. You need only connect the channels of your existing asynchronous communications controller—such as a DZ11 or DH11—to the local BABYMUX, and your terminals to the remote BABYMUX. BABYMUX trans­ports data for any combination of remote standard RS232 asynchronous devices, including VDTs, serial printers or bar-code readers. And BABYMUX works with RSTS, VMS and UNIX operating systems.

FASTER THRUWAYS
With terminal and composite line speeds of up to 19.2K, BABYMUX’s thruways will handle any data that comes along — including a variety of speeds at the same time. BABYMUX clears passing lanes for the most important data convoys with user-programmed priority port selection, and uses sophisticated data compression to shorten every convoy for increased throughput. Even with all this sophisticated data compression, and error detection and correction, BABYMUX’s operations are still invisible to both the host computer and all the terminals.

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Everything needed to program and control BABYMUX’s data transit system is right on the face of the device, so you don’t need to hunt for DIP switches or to hook up an auxiliary terminal. And BABYMUX’s unique status indicator lights reveal a variety of traffic conditions, including percentages of line use, error rates and problem alert. You can even program the remote BABYMUX from the local BABYMUX.

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Research Triangle Park
North Carolina 27709
(919)549-8210

CIRCLE D77 ON READER CARD
The document appears to be a programming or system management manual. It includes several sections that discuss setting up constant definitions, subroutine sections, and the structure of main program logic. The text is technical and detailed, likely explaining how to configure or troubleshoot certain system utilities. It seems to be part of a larger manual, possibly for a computer system or data management system, given the technical nature of the content.
What gives your VAX or PDP 11 TOTAL NETWORKING, MORE THRUPUT AND BETTER PERFORMANCE?

Cablesshare's full line of Dec maintained X.25 computer communication products.

Our family of LSI-X.25 products are designed to give you everything needed to join the Networking revolution. You will increase the efficiency of your operation while improving your speed, accuracy, flexibility and control.

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Connects your PDP-11 or VAX to packet switched networks without any application software changes while it increases CPU processing capacity and eliminates expensive communications port hardware.

**Intelligent Concentrator**
Allows up to 32 asynchronous terminals to access your computer through packet networks. Plus, it supports formatted screen mode for prompting and checking information from data entry clerks. The templates are stored in the concentrator and accessed as needed for greater accuracy and reduced CPU processing time.

**Portal**
File transfer between VMS, RSTS/E and RSX-11M systems eliminating magnetic tape or costly hardware solutions. Portal can be used with Cablesshare's full X.25 networking products to provide file transfer over both public and private packet switched networks.

**Electronic Mail**
Provides a rapid cost efficient way to exchange business information at any time or place, accessed by standard terminals directly or through any X.25 network.
7000 IF ASK% THEN PRINT #kb$, "How many segments for ", typ$1 = typ$", key ";
PRINT #kb$, NUM( alikes$ ) = SPACE( 15 );
ELSE/value$ = 15;
7100 FOR i$ = 15 TO value$;
7200 PRINT #kb$, "Enter the position of segment ";i$;
PRINT #kb$, "of the key ";
INPUT #kb$, inp$;
PRINT #kb$,;
7225 IF inp$ = r$ THEN PRINT #kb$, "No default";
GOTO 7230;
7230 start% ( i8%) = VAL( inp$ );
7250 IF start% ( i8%) > maxseg$ THEN PRINT #kb$, "Value greater than ( or equal to ) ", 
"record size of "; maxseg$;
ELSE/value$ = 15;
7300 FOR i$ = 15 TO value$;
7350 FOR i$ = 15 TO value$;
7400 PRINT #kb$, "Enter the length of segment ";i$; of the key ";
INPUT #kb$, inp$;
PRINT #kb$,;
7420 IF inp$ = r$ THEN PRINT #kb$, "no default";
GOTO 7430;
7430 long$( i4%) = VAL( inp$ );
7450 IF keylen$ = keylen$ + long$( i4%) OR
keylen$ = keylen$ OR
long$( i4%) > maxlen$ THEN PRINT #kb$, BEL = "Key too long ", 
" trap = 1 / zero ";
ELSE/value$ = 15;
7500 ON INSTR( 15, ",SHORT", LEFT$( keytyp$, 15 ) )
GOTO 7600, 7600, 7600;
7600 IF long$( i4%) < 15 OR
long$( i4%) > maxlen$ THEN PRINT #kb$, BEL = "Key too long ", 
" trap = 1 / zero ";
ELSE/value$ = 15;
7700 IF long$( i4%) < 25 AND
long$( i4%) < 45 THEN PRINT #kb$, "Key size must be 2 or 4 for integer ";
ELSE/value$ = 15;
Your time is money

Every second you spend programming costs you money. Our **DEC-compatible software** gets you faster answers and more productivity with lower programming costs.

Take EasyEntry, our forms management and data entry system for the PDP-11 and VAX. You design and implement forms on-screen — in hours instead of days.

But you don't sacrifice versatility for speed. EasyEntry is powerful enough to handle complex tasks like transaction processing and data retrieval.

It can be used as your complete data processing system.

And we have three more software solutions to save you time and money: AIS-PL/I, a multi-purpose language for the PDP-11 and VAX; BURCOM-11, our exclusive Burroughs-DEC communications link and WP Saturn, a powerful word and list processor for the PDP-11 and VAX.

Applied Information Systems — we get you the information you need. When you need it.
Do The Figuring Of The optimum Bucketsize For The Primary index...

Calculation of statistics:

do$ = \Rightarrow Deletion Overhead
Calculation on the basis of:

I If No Duplicates For Primary

\( \text{dof} = \text{Record Size} \)

**SUBROUTINE**

Calculates Optimum Bucket size For Primary index:

Formulas used:

- \( N \text{IRBK} = (512 \times \text{BUCKETSIZE}) - 15/\text{PKL} + \text{EPL} \)
- \( N \text{IRBK} = (512 \times \text{BUCKETSIZE}) - 15 \) - 100 - \( \text{RFO} + \) \( \text{RFO} \)
- \( \text{LINE3} = \text{NF} / \text{ndrbk} \)

**SUBROUTINE**

Calculate Squares And Cubes Of \( N \text{IRBK} \)

For Calculating The Optimum Bucket size For the file.

**SUBROUTINE**

Write To Command File after defining each key

Answers written to command file:

- Yes... Another Key.
- No... Key type:
  - Position
  - Name Of Key (NONE)
  - Duplicates Allowed (YN)
- Changes allowed...

PRINT #cmds$ ( IF not first$ )

PRINT #cmds$, "$ALLOW FATAL ERRORS"

PRINT #cmds$, "$DISABLE log" IF not debug$

PRINT #cmds$, "The activity overhead (bytes): $aovh"

PRINT #cmds$, "For a bucket size of $buckettesiz"; 

RETURN

10300 IF ( question% = 'N' AND ans% = 'N' )

10350 IF log% < 10$

10400 NEXT buckettesiz$
Computer ills ???
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When your computer system is down, you feel it. Tymshare’s prompt emergency response will have your computer installation healthy in short order. To keep your system operating efficiently we will prescribe a custom preventive maintenance program which will insure maximum availability at the lowest possible cost.

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CENTRAL: 11999 Katy Freeway / Houston, Tx 77079 / (713) 870-0923
WEST: 3300 Capital Avenue / Fremont, Ca 94538 / (415) 794-2538
"BSIZE" ; "TAB(6$); "NIRBK", "NDRBK", "nr/NIRBK", "NIRBK**", "NIRBK**", "NIRBK**".

NEXT index$

SUBROUTINE

PRINT #kb$, " Please answer < Y >es or < N>o 

IF ASCII (yn$) <> 78% 

RETURN 

RETURN

FOR each level of index $

SUBROUTINE

PRINT #kb$, "Determine The Allocation For The Prologue 

automatic 3 Blocks... For Each 5 Keys Over 
The First Five Alternate Keys One Block Is 
Added. After Eight Keys (Eight additional Areas) 
Two Blocks are Added For Each Key 

RETURN

NEW POINTER LENGTH FOR ALTERNATE KEYS... 

SUBROUTINE

if duplicates are allowed, must change some 
of the numbers around to make things 
a little more difficult... 

SUBROUTINE... NUMBER OF ALTERNATE KEYS 
WITH THE SAME KEY VALUE...

SUBROUTINE... Deletion overhead Change( do$ ); do$
Run CP/M On Your DEC With The Bridge. Run inexpensive CP/M® programs on your DEC® minicomputer with The Bridge® virtual microcomputer system. Now, every terminal attached to your minicomputer can run CP/M programs directly, as if they were dedicated microcomputers. Finally — the gap between the worlds of mini and micro disappears.

The Virtual Microcomputer System. The Bridge is a system of hardware and software for your DEC LSI-II®, PDP-11®, or VAX® minicomputer. The hardware, called the z-Board,® executes the program at speeds greater than those of dedicated micros. Together they constitute a breakthrough — unlocking a vast library of cost-efficient software for your minicomputer.

The z-Board. The z-Board is a hardware accelerator for The Bridge featuring four z-80's®, 256K bytes of memory, and a bit slice state machine. A key component of the system, the z-Board provides four users (per board) with an enhanced microcomputer environment. The z-Board is available for the Q-bus® and UNIBUS®.

System Integration. One of the key benefits of The Bridge is that all microcomputer operations are centralized in your mini. It's no longer necessary to maintain various micros at different work stations — all with different disk formats. The Bridge gives you one format, available to each operator, at every terminal. Every virtual micro can share files with every other virtual micro in your system.

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CIRCLE 063 ON READER CARD
Now PDP-11/23 users can expand memory beyond 256KB, maintain software compatibility and use existing peripherals and controllers!

Another Technically Advanced Solution From Monolithic Systems.

Our engineers have developed a practical, cost-effective way to increase PDP-11/23 memory beyond 256KB. Our new Buccaneer™ MSC 8702 extends the addressability of the LSI-11/23 microcomputer from 18 to 22 bits, transparently, while maintaining compatibility with RSX-11M version 3.2, RSTS/E version 7.0 and the large array of existing LSI-11/23 peripheral controllers. No software drivers or patches have to be written.

In addition to allowing the user many peripheral options now available, the MSC 8702 provides additional slots to accommodate new 22-bit DMA controllers, giving the MSC 8702 a long, useful life.

Consider Your Options

Of course you can increase your system performance by other means. You could move to a PDP-11/24, but that would require new peripherals. Or you could purchase a PDP-11/23 PLUS, but that would require new peripheral controllers. Currently, only one 22-bit device is available from DEC for that system.

After you consider your...
MSC 8702 Description and Capacity

MSC 8702 FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>8702-01</th>
<th>8702-03</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSI-11/23 CPU with memory management</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>512 KB parity memory</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Peripheral bus map</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3 bus grant cards</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6 x 9 back plane</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>300 watt power supply</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dual cooling fans</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Power sequence module/line time clock</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Multifunction module with 2 serial ports</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CAPACITIES

- Expansion to 4 megabytes of parity memory
- 5-quad and 1 dual high 18-bit peripheral slots
- 3-dual high 22-bit OMA slots

options, you will agree that there is really only one practical and economical way to increase your PDP-11/23 performance: the MSC 8702.

The Bottom Line The MSC 8702's ability to expand your system capabilities while maintaining complete software compatibility is impressive by itself. The clincher is the fact that the MSC 8702 is much less expensive than moving to PDP-11/24 or PDP-11/23 PLUS systems.

Questions? Contact us at

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Englewood, Colorado 80112
Phone: 1-800-525-7661
In Europe,
Justinian Str 22, AM
Holzhausen Park
Frankfurt, West Germany 6000
Phone: 49611590061

We'll give you complete details.

Monolithic Systems corp.

...means technically advanced solutions.
Define The Areas For The Keys Of The File

Define the fill factors for the file to optimize it fully:

Only Fill Data Buckets To 60% Then Split
Fill index Buckets To 90% And Then Split

NOTE:
These are only Honored on Rebuild such as IPL
RMS does not honor these factors on random inserts.

Written to Command File:

no more areas
file default extension quantity...
area number for data buckets (primary)
fill number for data buckets
area number for index buckets...
area number for lowest index level of cur. key.

print cmdfil$, NUL$( area.extension.size$)
print cmdfil$, "Here is where we assign the keys to the areas."
print cmdfil$, "Primary Key Data Area is "
print cmdfil$, "Area Fill Factor Optimization For Data Buckets"
print cmdfil$, "Fill Factor Optimization For index Buckets"
print cmdfil$, "Fill Factor Optimization For index Buckets"
print cmdfil$, "Lowest Level Index Records Area"
print cmdfil$, "1"
print cmdfil$, "Area assignments for Alternate Key "; doit2% ;
doit2% = (indatap$% / 100% ) * (bks$ % 510$)
print cmdfil$, "Area assignments for Alternate Key "; doit2%
print cmdfil$, "Primary Key Data Area is "
print cmdfil$, "Fill Factor Optimization For Data Buckets"
print cmdfil$, "Fill Factor Optimization For index Buckets"
print cmdfil$, "Fill Factor Optimization For index Buckets"
print cmdfil$, "Lowest Level Index Records Area"
print cmdfil$, "1"

Close the Command File.......

Finish Out the Define Utility...
Cluster Size Of File...
Protection Code...
(48 FOR WITHIN PROJECT)
Close The Command File.......
"C" To Exit Define...

print cmdfil$, "Here is the cluster size and protection code"
print cmdfil$, "Area assignments for Alternate Key "; doit2%
print cmdfil$, "Primary Key Data Area is "
print cmdfil$, "Fill Factor Optimization For Data Buckets"
print cmdfil$, "Fill Factor Optimization For index Buckets"
print cmdfil$, "Fill Factor Optimization For index Buckets"
print cmdfil$, "Lowest Level Index records in area "
print cmdfil$, "1"

Change program defaults.....

print #k$, HT: "Changing program defaults "
print #k$, HT: "Changing program defaults "
print #k$, HT: "Changing program defaults "
print #k$, HT: "Changing program defaults "
print #k$, "Default OUTPUT disk for file "
print #k$, HT: "After it is created contiguously by FIP * "
print #k$, HT: "ACCESS READ, OUTPUT.dev$ = "
dum$ = 11
input linE #k$, dum$
print #k$, GOT0 12752
if ASCII( dum$ ) = 115
dum$ = CVT$( dum$, 15% + 85% + 85 + 165 + 32% +128 )
return
dum$ = "END"
goto 12751
if instr$( 15, dum$, " ") = 0%
output.dev$ = dum$
if lEm( output.dev$ )
print #k$, HT: "Cluster size for file is "
print #k$, "NUM$( file.box.size$ ) = SPACE$( 15% )
if file.box.size$ < -15
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---

### DEC COMPATIBLE SYSTEMS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSI 11/23</td>
<td>$9,995</td>
</tr>
<tr>
<td>PDP 11/34</td>
<td>$29,995</td>
</tr>
<tr>
<td>PDP 11/44</td>
<td>$49,950</td>
</tr>
<tr>
<td>PDP 11/70</td>
<td>$108,950</td>
</tr>
<tr>
<td>VAX 750</td>
<td>$39,995</td>
</tr>
</tbody>
</table>

### DISK SUBSYSTEMS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAX 780 300MB R</td>
<td>$27,885</td>
</tr>
<tr>
<td>VAX 780 474MB W</td>
<td>$26,500</td>
</tr>
<tr>
<td>VAX 750 160MB W</td>
<td>$15,000</td>
</tr>
<tr>
<td>VAX 750 80MB R</td>
<td>$14,250</td>
</tr>
<tr>
<td>VAX 730 80MB W</td>
<td>$9,295</td>
</tr>
<tr>
<td>PDP 11/70 300MB R</td>
<td>$20,500</td>
</tr>
<tr>
<td>PDP 11 80MB W</td>
<td>$8,500</td>
</tr>
<tr>
<td>LSI 11 80MB W</td>
<td>$6,500</td>
</tr>
</tbody>
</table>

### MAG TAPE SUBSYSTEMS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSI-11 45 IPS 1600/800 BPI</td>
<td>$7,000</td>
</tr>
<tr>
<td>LSI-11 75 IPS 1600/800 BPI</td>
<td>$7,950</td>
</tr>
<tr>
<td>LSI-11 125 IPS 1600/800 BPI</td>
<td>$8,785</td>
</tr>
</tbody>
</table>

### DG COMPATABLES

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>80 MB Disk Sys</td>
<td>$8,400</td>
</tr>
<tr>
<td>70 MB Disk Sys</td>
<td>$7,400</td>
</tr>
<tr>
<td>256 KG Memory</td>
<td>$3,750</td>
</tr>
<tr>
<td>8 Line Mux</td>
<td>$2,250</td>
</tr>
<tr>
<td>75 IPS Magtape Subsystem</td>
<td>$8,750</td>
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</tbody>
</table>

### MUX’S & INTERFACES

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>C-DL11-E &amp; W</td>
<td>$650</td>
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<tr>
<td>C-D21-1-A</td>
<td>$1,550</td>
</tr>
<tr>
<td>C-D21-1-E</td>
<td>$2,550</td>
</tr>
<tr>
<td>C-DH11-AD</td>
<td>$3,500</td>
</tr>
<tr>
<td>DH11-AA (DEC)</td>
<td>$2,200*</td>
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</tbody>
</table>

### TERMINALS & PRINTERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-VT100</td>
<td>$895</td>
</tr>
<tr>
<td>C-LP11-AA</td>
<td>$5,200</td>
</tr>
<tr>
<td>C-LP11-YA</td>
<td>$6,875</td>
</tr>
<tr>
<td>C-LP11-CA</td>
<td>$10,940</td>
</tr>
<tr>
<td>D.P. 300 LPM Printer</td>
<td>$4,500</td>
</tr>
</tbody>
</table>

### MAGTAPE DRIVES

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>45 IPS</td>
<td>$4,900</td>
</tr>
<tr>
<td>75 IPS</td>
<td>$5,850</td>
</tr>
<tr>
<td>125 IPS</td>
<td>$6,800</td>
</tr>
<tr>
<td>37.5 IPS</td>
<td>$2,500*</td>
</tr>
</tbody>
</table>

### DISK DRIVES

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 MB Kennedy Winch</td>
<td>$3,995</td>
</tr>
<tr>
<td>80 MB CDC 9762 (Refurb.)</td>
<td>$4,500*</td>
</tr>
<tr>
<td>80 MB Kennedy</td>
<td>$4,475</td>
</tr>
<tr>
<td>160 MB Fujitsu</td>
<td>$7,000</td>
</tr>
<tr>
<td>474 MB Fujitsu</td>
<td>$13,995</td>
</tr>
</tbody>
</table>

### DEC TERMINALS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT100</td>
<td>$1,395</td>
</tr>
<tr>
<td>VT101</td>
<td>$995</td>
</tr>
<tr>
<td>VT125</td>
<td>$2,930</td>
</tr>
<tr>
<td>LA120-AA</td>
<td>$1,995</td>
</tr>
<tr>
<td>VT18X-AC</td>
<td>$1,947</td>
</tr>
</tbody>
</table>

---

SPECIAL DEC or DG 80 MB CDC 9762 Disk, Controller, Cables & Terminator ................................................. $8,950

All prices are subject to availability and may change without notice.

---

SPECIAL DEC or DG 80 MB CDC 9762 Disk, Controller, Cables & Terminator ................................................. $8,950

---

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*DEC is a registered trademark of Digital Equipment Corporation.

*DG is a registered trademark of Data General Corporation.
FUNCTIONS

12753 PRINT #kb$, HT + "Fill factor for data buckets " +
  NUM$( dataprcntli ) + SPACE$( 15 );
  dum$ = nli$
  INPUT #kb$, dum$
  dum$ = CVT$( dum$, 15 + 45 + 85 + 165 + 325 + 1255 )
  RETURN
GOTO 12753

12754 PRINT #kb$, HT + "Fill factor for index buckets " +
  NUM$( indaprcntli ) + SPACE$( 15 );
  dum$ = nli$
  INPUT #kb$, dum$
  dum$ = CVT$( dum$, 15 + 45 + 85 + 165 + 325 + 1255 )
  RETURN
GOTO 12754

12755 PRINT #kb$, HT + "Percentage of deletions expected " +
  NUM$( delaprcntli ) + SPACE$( 15 );
  dum$ = nli$
  INPUT #kb$, dum$
  dum$ = CVT$( dum$, 15 + 45 + 85 + 165 + 325 + 1255 )
  RETURN
GOTO 12755

12799 RETURN

12800 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

12850 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

EXPONENTIATION FUNCTION

STRING ARITHMETIC

DEF FNSTEPF( expo$, stuff$, acc$ )
  dum$ = "$1"
  FOR delindx$ = 1 TO expo$
    dum$ = PROD( stuff$, dum$, acc$ )
    NEXT delindx$
  FNSTEPF = dum$
  FNEND

12950 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

ROUNDING FUNCTION...

DEF FNround( ir )
  round$ = ( ir*10+.5)/10
  round$ = NUM$( round$ )
  decimal$ = INSTR( 15, round$, ".")
  round$ = LEFT( round$, round$ + decimal$ )
  UNLESS INSTP( 15, round$, "E" )
  FNround = VAL( round$ )

13000 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

FUNCTION TO WRITE TO LOG FILE DO WE

FIND WHAT WE DID.

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

13100 FNEND

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

ERROR TRAPPING SECTION

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

13200 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

TRAP ILLEGAL FILE OPERATIONS

ERR:

24 > It was an illegal file tell the name of it...

56 > Can't find that file try again.

148$> Recordsize mismatch on file open.

149$> I can't do the IFL into new file if requested!

IF ( ERR = 56 AND ERL = 2000 )
  THEN PRINT #kb$, "File name":
  PRINT #kb$, "wrlf$":
  RESUME 1300

13400 IF ( ERR = 56 AND ERL = 2000 )
  THEN PRINT #kb$, "ERR$( ERR )
  CLOSE #25
  PRINT #kb$, "Try again "
  RESUME 1300

13500 IF ( ERR = 56 AND ERL = 2100 )
  THEN RESUME 2200

13600 IF ( ERR = 148$ AND ERL = 12000$ )
  THEN rec.size.size.matched = true$
  PRINT #kb$, HT + "The recordsize of the file ":wrlf$;
  PRINT #kb$, HT + "Does not match the size you requested ":
  PRINT #kb$, "For the new file ":
  PRINT #kb$, HT +
"Can not perform an IFL to the new file"

PRINT #kb, "\nm Analysis of the file\n  Please check your key and try again later."
RESUME 32760

13800 IF ( ERR = 61$ AND ERL = 7700 )
  THEN PRINT #kb, "Do you wish to continue <YES> ?"
  yns = "Y" If yns = "N" &
  yns = CVT$(LEFT$( yns, $5 ), -5 ) &
  IF INSTR 1, yns, "YES") = 0 &
  THEN PRINT #kb, "Please answer Yes or No."
  GOTO 13800 &
  ELSE IF ASCII( yns ) = 89 &
  THEN RESUME 7400 &
  ELSE RESUME 32760 &
  END IF

14000 IF ( ERR = 61$ AND ERL = 7800 )
  THEN PRINT #kb, "Please check your key and try again later."
  GOTO 13900 &
  ELSE IF ASCII( yns ) = 89 &
  THEN RESUME 7400 &
  ELSE RESUME 32760 &
  END IF

14100 IF ( ERR = 61$ AND ERL = 8100 )
  THEN PRINT #kb, "Please check your key and try again later."
  GOTO 13900 &
  ELSE IF ASCII( yns ) = 89 &
  THEN RESUME 7400 &
  ELSE RESUME 32760 &
  END IF

32760 END

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INTRODUCTION AND FLOATING-POINT NUMBERS

IN BASIC PLUS

By W. Franklin Mitchell, Jr., Computer Operations Supervisor, Erskine College, Due West, SC 29639

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1.0 Purpose

The purpose of this paper is to study the internal structure of integer and floating-point numbers of RSTS/E \* BASIC PLUS and to manipulate these structures in usable ways.

2.0 Binary encoding schemes

Here is a table showing four ways the eight different codes available in a three-bit binary number can be used to represent integers. Three of these encoding schemes allow for negative as well as positive values.

<table>
<thead>
<tr>
<th>Unsigned Integers</th>
<th>2's-complement</th>
<th>Sign-magnitude</th>
<th>Excess-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 111</td>
<td>3 011</td>
<td>3 011</td>
<td>3 111</td>
</tr>
<tr>
<td>6 110</td>
<td>2 010</td>
<td>2 010</td>
<td>2 110</td>
</tr>
<tr>
<td>5 101</td>
<td>1 001</td>
<td>1 001</td>
<td>1 101</td>
</tr>
<tr>
<td>4 100</td>
<td>0 000</td>
<td>0 000</td>
<td>0 100</td>
</tr>
<tr>
<td>3 011</td>
<td>-1 111</td>
<td>-0 100</td>
<td>-1 111</td>
</tr>
<tr>
<td>2 010</td>
<td>-2 110</td>
<td>-1 101</td>
<td>-2 110</td>
</tr>
<tr>
<td>1 001</td>
<td>-3 101</td>
<td>-2 110</td>
<td>-3 001</td>
</tr>
<tr>
<td>0 000</td>
<td>-4 100</td>
<td>-3 111</td>
<td>-4 000</td>
</tr>
</tbody>
</table>

The 2's-complement method has the advantage that addition and subtraction are simple to do. The excess-4 method has the advantage because the bit patterns fall into their correct order when viewed as unsigned numbers, making comparison easy.

3.0 Integers

Integers in BASIC PLUS occupy one word of memory each. Integer variables end with a percent sign (%) like 1%, X%, INDEX%, etc. They are stored in a 2's-complement representation. Integer values have a range of from -32768 to +32767. (The statement X% = -32768% is illegal in BASIC PLUS under V7.0-07 of RSTS/E. One must use X% = -32767% - 1% or X% = 32767% + 1% or X% = 32768% or X% = 2% \* 15%). The 2's-complement representation causes the sixteenth bit (bit 15 counting from 0) to act as a sign bit. If this bit is 0, the integer is positive. If this bit has a value of 1, the integer is negative.

\[
\begin{array}{lllllllllllllllll}
| \text{word:} | \text{sign} | \text{byte 1} | \text{byte 0} |
|--------------|------------|--------------|
| 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 |
\end{array}
\]

Examples showing the bit patterns of some integers:

<table>
<thead>
<tr>
<th>Integer</th>
<th>2's-complement</th>
<th>Excess-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000000000000000 0</td>
<td>3 011</td>
<td>3 XOR -4 111</td>
</tr>
<tr>
<td>0000000000000001 1</td>
<td>2 010</td>
<td>2 XOR -4 110</td>
</tr>
<tr>
<td>0000000000000000 0</td>
<td>1 001</td>
<td>1 XOR -4 101</td>
</tr>
<tr>
<td>0000000000000000 0</td>
<td>0 000</td>
<td>0 XOR -4 100</td>
</tr>
<tr>
<td>0000000000000000 0</td>
<td>-1 111</td>
<td>-1 XOR -4 011</td>
</tr>
<tr>
<td>0000000000000000 0</td>
<td>-2 110</td>
<td>-2 XOR -4 010</td>
</tr>
<tr>
<td>0000000000000000 0</td>
<td>-3 101</td>
<td>-3 XOR -4 001</td>
</tr>
<tr>
<td>0000000000000000 0</td>
<td>-4 100</td>
<td>-4 XOR -4 000</td>
</tr>
</tbody>
</table>

Notice that when the exclusive or function (XOR) is applied to the three-bit integers and -4, only the sign bit is changed. Note also that the integers in the excess-4 column are in unsigned descending order. This same process will work for 16-bit integers if the XOR function is applied to each 16-bit integer and -32768%.

3.1 CVT%$() function

The CVT%$() function is used to convert an integer to a two-byte character string so that it can be stored in a Record I/O or Block I/O file. The ordering of the integer's bytes and the two-byte character string is reversed. This reversal places the two bytes in the character string so that LEFT (CVT%$(X%), 1%) contains the sign bit plus the high-order bits of the integer and RIGHT (CVT%$(X%), 2%) contains the low-order bits of the integer. The CVT%$() function is the inverse function for CVT%$().

```javascript
Integer Format after CVT%$( )

<table>
<thead>
<tr>
<th>word:</th>
<th>byte 0</th>
<th>byte 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CVT%$() examples (*->* = "yields"):

\[
\begin{align*}
\text{CVT%$}(0) & \rightarrow \text{CHR}\%(0) + \text{CHR}\%(0) \\
\text{CVT%$}(1) & \rightarrow \text{CHR}\%(0) + \text{CHR}\%(1) \\
\text{CVT%$}(2) & \rightarrow \text{CHR}\%(0) + \text{CHR}\%(2) \\
\text{CVT%$}(3) & \rightarrow \text{CHR}\%(1) + \text{CHR}\%(3) \\
\text{CVT%$}(4) & \rightarrow \text{CHR}\%(2) + \text{CHR}\%(4) \\
\end{align*}
\]

3.2 Sort keys

The need to build a sort key that contained a mixture of characters, integers, and floating-point numbers occurred at Erskine a short time ago. It was desired to convert all these data types to strings and concatenate them into one sort key. This has the effect of causing integers to sort as if they were unsigned, i.e., negative values first and positive values last. For example, the numbers 1, -1, 2, -2, 3 would sort to -1, -2, 3, 2, 1. While this method does order the values, it does not sort them correctly. If the integers are changed by reversing the sign bit, thereby converting them to excess-32768 form, the integers sort exactly as desired. For example, the numbers 1, -1, 2, -2, 3 would then sort to 3, 2, 1, -1, -2. The sort key is easily built using CVT%$ (X% XOR BIT.15%), where BIT.15% is -32768%. (See appendix B)

Consider the following 3-bit 2's-complement integers:

<table>
<thead>
<tr>
<th>2's-complement</th>
<th>Excess-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 011</td>
<td>3 XOR -4 111</td>
</tr>
<tr>
<td>2 010</td>
<td>2 XOR -4 110</td>
</tr>
<tr>
<td>1 001</td>
<td>1 XOR -4 101</td>
</tr>
<tr>
<td>0 000</td>
<td>0 XOR -4 100</td>
</tr>
<tr>
<td>-1 111</td>
<td>-1 XOR -4 011</td>
</tr>
<tr>
<td>-2 110</td>
<td>-2 XOR -4 010</td>
</tr>
<tr>
<td>-3 101</td>
<td>-3 XOR -4 001</td>
</tr>
<tr>
<td>-4 100</td>
<td>-4 XOR -4 000</td>
</tr>
</tbody>
</table>

Notice that when the exclusive or function (XOR) is applied to the three-bit integers and -4, only the sign bit is changed. Note also that the integers in the excess-4 column are in unsigned descending order. This same process will work for 16-bit integers if the XOR function is applied to each 16-bit integer and -32768%.
4.0 Floating-Point Numbers

BASIC PLUS on a RSTS system can be created with either a single-precision two-word floating-point package or with a double-precision four-word floating-point package. The single-precision values provide approximately seven decimal digits of accuracy.

The double-precision values have approximately 16 decimal digits of accuracy.

Magnitude ranges for floating-point numbers will be discussed later.

4.1 Structure of Floating-Point Numbers

The floating-point number's exponent is stored using eight bits in excess -128 notation. That is, exponents from -128 to +127 are stored by an eight-bit unsigned integer whose value is from 0 to 255. (-128 + 128 = 0, 127 + 128 = 255)

Floating-point numbers are represented in sign magnitude notation with the binary radix point to the left. Floating-point values undergo hidden-bit normalization. That is, they are stored without their most significant bit, since the most significant bit is always a 1. Zero is an exception, the hidden bit as well as word(s) two, [three, and four] are assumed to be zero if all bits in word one are zero.

Consider the following numbers ("B xxx" means "2 to the xxx"):
4.2 CVTFS( ) function

The CVTFS( ) function is used to convert a floating-point number to either a four or eight byte character string so that it can be stored in a Record I/O or Block I/O file. The CVTFS( ) function reverses the ordering of the floating-point number's bytes and words. The CVTFS( ) function is the inverse function for CVTFS( ).

Two-Word Floating-Point Format after CVTFS( )

```
<table>
<thead>
<tr>
<th>word</th>
<th>bit</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>byte 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>byte 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

Four-Word Floating-Point Format after CVTFS( )

```
<table>
<thead>
<tr>
<th>word</th>
<th>bit</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>byte 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>byte 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>byte 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>byte 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

4.3 Crossing math packages

It is possible to use two-word values that have been stored in a Record I/O or Block I/O file from a program that is running in the four-word math package.

FIELD #1%: 4% AS TWO.WORDS, ...
PADS = STRING$ (4%, 0%) | 14 null characters
FOUR.WORD = CVTFS (PADS + TWO.WORDS ) | make 8 bytes out of 4

It is also possible to use four-word values that have been stored in a Record I/O or Block I/O file from a program that is running in the two-word math package.

FIELD #1%: 8% AS FOUR.WORDS, ...
TWO.WORD = CVTFS ( RIGHT (FOUR.WORDS, 5%)) | make 4 bytes out of 8

In either case, precision is limited to approximately seven decimal digits of accuracy.

4.4 Some examples

Consider the following program:

OLD FPN
Ready
LIST
<table>
<thead>
<tr>
<th>FPN</th>
<th>09:00 AM</th>
<th>20-May-82</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20-May-82</td>
</tr>
</tbody>
</table>

Construct some two-word floating-point numbers
<table>
<thead>
<tr>
<th>15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>word</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>byte 0</td>
</tr>
<tr>
<td>byte 1</td>
</tr>
</tbody>
</table>

Finally, precision is limited to approximately seven decimal digits of accuracy.
DEC USERS . . .
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We would like to introduce you to the RSTS PROFESSIONAL, the magazine for interactive DEC computer people. You’ll find many articles of interest to you — useful, too! The RSTS PROFESSIONAL is valuable reading for users of all operating systems. We have now expanded to include a special VAX section — The VAX-SCENE ... and we will have more!
4.5 Single-Word Floating-Point Numbers

Floating-point numbers in virtually the same range as two-word floating-point numbers can be stored on disk in just two bytes. The following program demonstrates some “single-word” floating-point numbers:

OLD 1WFPN

Ready

LIST

1WFPN 09:15 AM 20-May-82
1 1000 EXTEND
1 | Single-word floating-point numbers
1 | 20-May-82 F. Mitchell Erskine College
1010 PAD$ = STRING$(2%,0%)
1011 PRINT "Two-word FPN", "One-word FPN"
1020 PRINT "PRINT "20-0PP" , "20-0PN""
1500 DATA 123, 1234, 12345, 123456, 0.1
1501 DATA 1023, 1024, 1025, 0.17014E39
1502 GOTO 15020
1503 END

Ready

RUNNH

Two-word FPN One-word FPN

123 123
1234 1232
12345 12288
123456 123392 --Note the loss of precision!
0.999994E-1
1023 1020
1024 1024
1025 .170141E39 .169477E39

Ready

4.6 Negative Zero in BASIC PLUS

Does negative zero exist in BASIC PLUS? The following program shows some of the characteristics of “negative zero”:

OLD ZERO

Ready

LIST

ZERO 09:13 AM 20-May-82
1 1000 EXTEND
1 | Negative Zero?
1 | 20-May-82 F. Mitchell Erskine College
1610 ZERO = 0.
1611 NEGATIVE.ZERO = CVTFS( STRING$(2%,0%) + CHR$(128%)+CHR$(128%))
1612 PRINT "The sign bit is 1 and it is not a valid negative zero.
1620 PRINT "PRINT "Zero is equal to negative zero."
1630 IF ZERO = NEGATIVE.ZERO
1631 THEN PRINT "the same."
1632 ELSE PRINT "different."
1640 IF ZERO > NEGATIVE.ZERO
1641 THEN PRINT "Zero is greater than negative zero."
1642 ELSE PRINT "Zero is less than or equal to negative zero."
32767 END

Ready

RUNNH

zero : 0 negative zero: 0 negative zero * (2^128) = -5

Zero and negative zero are different. Zero is greater than negative zero.

Is NEGATIVE.ZERO really "-0" or is it "+-1/2 * (2^128)"? Under the two-word math package it is "+-1/2 * (2^128)." Under the four-word math package it is a value that is greater than zero! (Try the above program under both math packages.)

4.7 Sort keys

As stated earlier, the need to build a sort key that contained a mixture of characters, integers, and floating-point numbers occurred at Erskine a short time ago. It was desired to convert all these data types to strings and concatenate them into one sort key. The following function was designed to produce a string from a floating-point number that would sort correctly:

1000 BIT.15% = 32767% + 1%
15000 DEF$ FNSORT.KEY$(FNP)
15010 X$ = CVTFS(FNP)
15020 GOTO 15010 IF FNP < 0,
15030 X$ = CVTFS(RIGHT(X$,3%)) XOR -1%
15040 PRINT "Record is negative.
15050 PRINT "X$ = CVTFS(LEFT(X$,3%)) + XOR -1%
15060 PRINT "Record is positive.
15070 IF X$ = CVTFS(LEFT(X$,3%)) XOR -1%
15080 THEN PRINT "Record is negative.
15090 ELSE PRINT "Record is positive.
15100 FNSOR.T$.KEY$(X$) = CVTFS(LEFT(X$,3%)) + CVTFS(X$)
15110 FNEND
15120 DATA -1

Build sort key string for two-word math package

The floating-point number’s ordering of sign bit first, exponent next, and high-order bits to low-order bits last is the correct ordering for making sort comparisons. It’s necessary to alter some bits so that the CVTFS($) strings sort correctly.

All that is needed to convert zero or positive floating-point numbers to a sort key string is to switch the sign bit and to reverse the ordering of the words that the CVTFS($) function applied. Switching the sign bit is accomplished by using XOR BIT.15%.

Negative floating-point numbers are a BIT more complicated (pun intended). All the bits of a negative floating-point number (such as -2) are the same as its opposite positive floating-point number (2) with just the sign bit reversed. Negative floating-point numbers would sort backwards if only the sign bit were reversed. That is 0, 1, -1, 2, -2, 3, -3 would sort to 3, 2, 1, 0, -3, -2, -1. The solution to this problem is not only to change the sign bit of negative floating-point numbers, but also to switch all 1’s to 0’s and switch all 0’s to 1’s. This makes “large” negative floating-point numbers “small” and vice versa. To switch all the bits, each word of the floating-point number is XORed with -1% (all 1’s). Lastly, the ordering of the words is reversed. When all this is done, 0, 1, -1, 2, -2, 3, -3 will sort to 3, 2, 1, 0, -1, -2, -3.

Consider the following example 3-bit floating-point numbers (1st bit = sign bit, no exponent, no hidden bit, and 2 bits of mantissa):
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Original 3-bit FPN  FNSORT.KEYS(FPN)

3 011  3 111
2 010  2 110
1 001  1 101
0 000  0 100
-1 101 -0 011
-2 110 -0 010
-3 111 -3 000

Note that the bit patterns in the FNSORT.KEYS(FPN) column are in unsigned descending order.

5.0 Conclusion
An understanding of integer and floating-point numbers in BASIC PLUS allows one to build sort keys, to cross math packages via a disk file, to "play" with single-
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CIRCLE 039 ON READER CARD

PROGRAMMING CARDS

By Joe Doyle

Did you ever wonder why you keep things? I cleaned out my desk drawer the other day and found nine programming/reference cards, two pocket guides, and four keypad diagrams. For the life of me, I can't figure out why I have them all. I guess it's the sense of security. They are convenient, concise, accurate, but generally virgin. I have a PDP11 programming card that I've never used. I won't throw it out. Some day I might need to know the address of the Stack Limit Register.

Some cards give me a sense of nostalgia. I still have my first card. A Quick Reference to HP 2000 B/C Time Shared Basic. The copyright date is July, 1971. I haven't used an HP since 1974, but it is fun to look at the old commands.

The only green card I have is an IBM System 360. It cost me fifteen cents in 1972. I still use it in translating from ASCII to EBCDIC. Cards are getting expensive. I don't have a TECO card. Five dollars for a new version, let alone version 29, is outrageous. But I'm not cheap. The VT101 card cost $975. The PDP11 card cost $60,000.

All cards come in different sizes. The Timeplex and PDP11 programming cards are almost the same size. The VT101 and VT131 cards are the same width but different lengths. The VT131 is the same length as the IBM, but the VT131 is a quarter inch wider. The LA120 card is the skinniest. All the cards fit in my shirt pocket but not at the same time. The HP card is so long I can use it as a chin rest. The RSTS/E Pocket Guide, which according to its name was made to fit in a pocket, doesn't fit in my pocket. (There must be something significant in this.) The VT100 card gets my vote for the best sized card. The Wafe Pocket Guide is the correct pocket guide size.

Some cards fold like a book, some fold like a letter, and some fold like an accordion. The VT131 card is six pages. The VT100 card is only three pages with more information than the other two. The trend is clearly toward more pages and more white space.

The VAX11 programming card isn't a card at all. It's a book. If you fold it in half, it is the same size as the LA120 card. It is eight pages unfolded and sixteen pages folded. The information is the same as the IBM 360 card.

I have put my cards back in the desk drawer. That's where they should be. I think I'll get a duplicate set for my briefcase.
REAL RSTS SECURITY

- **LOCK-11**
  - Access control with 'hardened' security file and editor.
  - Unlock specific \([p, pn]\) or \([p, *]\) for specific user or keyboard.
  - Unlocks can cover specific day & time ranges.
  - Comprehensive alarms from independent sources.
  - Auto log in available, with or without password.
  - Auto keyboard disable on probe.
  - All user-assignable logicals, default KBM, etc, automatic.
  - Person-oriented user-id or (mix/match) KB: based security specifications.

- **SAFE-11**
  - A MENU run-time environment \([KBM]\)
  - Total containment of non-privileged users.
  - Multi-level MENU access control; entire applications, selected menus or parts of menus can be locked by: a) system manager b) supervisor.

REAL RSTS CONTROL

- **LCKDPY TSK (VT5DPY in MACRO) The ultimate MACRO SYSTAT.**
  - The system manager's observation platform
  - Issue 'UTILITY' commands without exiting display.
  - Hi-light activity of selected keyboards.
  - Alarms certain critical conditions.
  - Negligible load.

- **DYNPRI TSK (Macro-of course)**
  - LOCK-11's observation platform.
  - Online-tunable dynamic priority changer.
  - Biases response in favor of KB-state users.
  - Auto hibernate detect and alarm.
  - Can kill HB-s in selected \([p, pn]\) or \([p, *]\)
  - Can print audit trail of arrivals and departures.
  - Negligible system load.
THE FEATURES OF DBL
By Adrienne H. Webb, DISC, Sacramento, CA

DBL is a business-oriented programming language which provides users of PDP-11 and VAX computers with portability, increased programmer productivity, and efficiency of operation. DBL currently runs under RT-11, TSX/TSX-Plus, RSTS, RSX-11M and VAX/VMS operating system environments. DBL is a much extended superset of DEC’s DIBOL-11 but can accept virtually all existing DIBOL-11 sources unmodified. The extensions in DBL include structured programming facilities, source library “include” capabilities, self-contained ISAM file structures, autoload/shared runtime support, and intermodule “global” data storage features.

The DBL Symbolic Debugger permits immediate debugging of DBL programs without special advance preparations. This is important in quickly and accurately diagnosing program malfunctions particularly in “production” software where time is of the essence. The Debugger’s most important features include multiple breakpoints in any module, access to data in any module in the calling chain, “full” traceback of internal and external calls, “goto” specification to alter program flow, automatic debug reentry on CNTRL/C, and post mortem debug entry on fatal errors.

The DBL ISAM facility is tree-structured and self-reorganizing. Reorganizing includes reclamation of unused index and data entries thus greatly minimizing the need for frequent file reorganizations. Each ISAM file consists of one index partition and up to seven disjoint data partitions. DBL includes utilities to define ISAM files and report on their current status.

Also included is a high-speed load/unload utility. All utilities can be chained to from DBL programs and can be instructed to chain back to DBL programs. This allows fully automated access to ISAM facilities.

Attached is a small program intended to show the power available to DBL programmers through the use of these structured programming extensions. The “cleanliness” of the code also gives great benefit when support is required for that code. The easier to read and follow, the more efficient will be the support process for that code.

The use of “nested” case statements, plus DBL’s “BEGIN-END”, “BEGINCASE-ENDCASE”, “IF-THEN-ELSE”, “FOR-DO” extensions are used in this program, designed to check out fixed length I/O by: creating a test file of 512 character records using PUTS, performing GETS, GET, PUTS and PUT checks on these records, then continuing this operation for records of 256, 128, 64 and 32 characters long. Also shown in this example is DBL’s comprehensive use of error reporting.

```
INPUT Data Division

SUBROUTINE INPUT
   
   ROW,D  ;Row at which the input field begins
   COL,D  ;Column at which the field begins
   INPB,D ;The field to input to.

   ** Arguments **

   ;Do VT100/VT52 terminal type input, allowing escape sequences, "w", and (backspc) as terminators.

   ;** Arguments **

   2 ROW,D  ;Row at which the input field begins
   3 COL,D  ;Column at which the field begins
   4 INPB,D ;The field to input to.

   ;The maximum size is implied
   ;by the size of the passed field.
```

IT’S TIME FOR A STRUCTURED SUPERSET OF DEC’S DIBOL.
5 TYPE _A_ \*The type of input that is to occur:
| \*A\* - Alphanumeric, case sensitive
| \*AL\* - Alphanumeric, case insensitive
| \*A\*T\* - Alphanumeric, case sensitive and trailing space allowed
| \*A\*T\*L\* - Alphanumeric, case insensitive and trailing space allowed
| \*N\* - Numeric, positive only
| \*N\*S\* - Numeric, signed allowed
| \*N\*S\*E\* - Numeric, signed or escape

6 INF10D
7 INF11D
8 INF12D
9 INF13D
10 INF14D

** Local Storage **

11 COMMON

** Global Storage **

12 RECORD
13
14 RECTYPE A
15 RTYPE A
16 TFYPE A
17 TFYPE A
18 POST100 A
19 DROW A
20 DCOL A
21 ROW2 A
22 COLS2 A
23 FLOGS A
24 I A

INPUT Procedure Division

25 1 PROC
26 2 IF **TFYPE** THEN
27 3 XCALL **FLAGS**
28 4 IF **TFYPE** THEN
29 5 BEGIN
30 6 DROW = ROW
31 7 DCOL = COL
32 8 END ELSE
33 9 BEGIN
34 10 ROW2 = ROW+31
35 11 COLS2 = COL+31
36 12 END
37 13 XCALL **PAINT**
38 14 BEGIN
39 15 XCALL ** ACCES**
40 16 IF ( **TFYPE** EQ 'A' ) THEN
41 17 ELSE
42 18 BEGIN
43 19 XCALL **CFLG**
20 21 IF ( ITYPE2 EQ ' ' ) THEN
22 22 BEGIN
23 23 XCALL **FC**
24 24 IF ( ITYPE2 EQ 'L' ) THEN
25 25 BEGIN
26 26 XCALL **FC**
27 27 ELSE
28 28 BEGIN
29 29 XCALL **FC**
30 30 BEGIN
31 31 XCALL **FC**
32 32 ELSE
33 33 ELSE
34 34 BEGIN
35 35 XCALL **FC**
36 36 BEGIN
37 37 XCALL **FC**
38 38 ELSE
39 39 ELSE
40 40 BEGIN
41 41 XCALL **FC**
42 42 BEGIN
43 43 XCALL **FC**
44 44 ELSE
45 45 ELSE
46 46 BEGIN
47 47 XCALL **FC**
48 48 BEGIN
49 49 XCALL **FC**
50 50 BEGIN
51 51 XCALL **FC**
52 52 BEGIN
53 53 XCALL **FC**
54 54 BEGIN
55 55 BEGIN
56 56 BEGIN
57 57 BEGIN
58 58 BEGIN
59 59 BEGIN
60 60 BEGIN
61 61 BEGIN
62 62 BEGIN
63 63 BEGIN
64 64 BEGIN
65 65 BEGIN
66 66 BEGIN
67 67 BEGIN
68 68 BEGIN
69 69 BEGIN
70 70 BEGIN

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MODEMS & MULTIPLEXERS
REMOTE ACCESS TO A DEC SYSTEM

By Carl B. Marbach, Editor, DEC Professional

After a DEC system is installed and local terminals are connected, a need often arises to have terminals located at remote locations to access the system. The knowledge and understanding of how to accomplish this task is usually painfully acquired while implementing some type of communications system. As "communications" applies to DEC systems, I will try to explain how this task can be accomplished.

SINGLE TERMINAL DIAL-UP CAPABILITIES FOR DEC

One of the first types of communications that most DEC systems is likely to have is a dial-up capability. See Figure A. This is usually considered to be the simplest type of communications available. It is also a very useful thing to have as it allows systems programmers, managers, users, etc., to access the computer from wherever they happen to be. It is not unusual to be able to recognize a computer user travelling to a DECUS meeting by looking for the people who are carrying portable communication terminals. I have learned that it is not necessary for me to take a portable terminal to these meetings because I know I can borrow one easily.

In order to understand how a communications system works, let's divide it up into its component parts.

THE RS232 INTERFACE.

The RS232 interface, sometimes designated EIA, is a common interface found on DEC systems. This interface is available on the PDP-11 either in a single line DL11 or the family of multiplexers, DH, DZ, DJ, etc. Although a complete understanding of this interface is beyond the scope of this article, we will describe enough of the interface and how the operating system uses it to allow the user to connect terminals or modems successfully.

The RS232 interface terminates in a 25 pin connector, DB-25P (plug) male connector or a DB-25S (socket) female connector. The designation of male or female is not important for the discussion, however, the designation of the specific pins is. Each of the 25 pins has a particular function as described in Figure B. Most of these functions are not used by DEC systems, and in fact, only three functions are necessary to transmit data between the interface and the local terminal. These are Pins 1 and 7, which represent ground and Pins 2 and 3, which represent the data leads. These two pins are often confused because they are labeled transmitted and received data. N.B.: data transmitted on Pin 2 by the terminal must be received on Pin 3 of the computer and vice versa. This switching of Pins 2 and 3 is normally accomplished by a null modem.

Typically, these leads are all that you can control with a non-modem controlling RS232 EIA interface.

In order to properly control dial-in facilities, your EIA interface must be able to control more than just these leads. In fact, "modem control" means that the interface has the ability to control additional leads. When using modem control, DEC systems use the following five leads or pins on the RS232 interface.

1. Ring indicator on Pin 22. When the phone rings, this lead from the modem is on. When the computer sees this lead come on, it knows that the phone is ringing.

2. Carrier Detect, Pin 8. When the modem connected to your interface is receiving a carrier from the other modem, this pin is on. When this pin is off, the system knows that the modem at the other end is no longer connected to our modem. The modems talk to each other over this carrier; that is, there is a tone constantly generated over the line and the data is modulated over this tone. This is the tone you hear when you dial a data set and it beeps at you.

3. Clear To Send, Pin 5. When this signal is on it is all right for the computer to send data to the other modem. In the normal DEC system, this lead would be on all the time. Flow control, or stall, is normally controlled by the use of XON and XOFF. Other systems may control flow by raising and lowering this signal.

4. Data Terminal Ready, Pin 20. This lead is the one that the computer uses to answer the phone. When the computer sees the phone ringing, this lead is raised to indicate to the modem that it should answer the phone. It is also the lead DEC systems use to hang-up the telephone. When you use the RSTS utility command, HANGUP KBn, it lowers this pin, thus hanging up the telephone line.

5. Request To Send, Pin 4. This lead indicates that the computer is ready to receive data; it is the opposite of Clear To Send, where the modem is telling the computer that it is all right to send data. Again, as in signal number 3, this is not normally used for flow control in DEC systems and, therefore, it is not used.

THE MODEM.

Now that we have the RS232 leads coming out of the computer, if they don't go directly to a terminal they must go...
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THE "PHONE LINE."

If we were to operate on a pair of telephone wires that we owned; that is, we leased two wires from the telephone company and they go from our computer to a terminal site somewhere else, we would hook up the two wires between the modems, the RS232 interface from the computer to one modem, the terminal to the other, and we could communicate. Modem control would not be required.

More usually, however, is a situation where we don't actually lease the telephone line for a single terminal but, rather, we associate a telephone number with the computer and we expect to be able to dial in and talk to a RSTS system. This requires additional considerations. The computer must now recognize that a call is coming in and answer this call thus establishing the communications. From the computer's point of view it looks like this:

1. On the ring indicator lead coming from the modem, the signal that there is a ring; i.e., someone is calling, appears. The ring indicator lead is asserted when the "telephone" rings.

2. When RSTS sees the ring indicator, it then asserts the data terminal ready indicator indicating that the modem is now to answer the phone.

<table>
<thead>
<tr>
<th>Line Number</th>
<th>RS-232-C Designation</th>
<th>Standard Circuit Designations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protective Gnd</td>
<td>AA</td>
</tr>
<tr>
<td>2</td>
<td>Transmitted Data</td>
<td>BA</td>
</tr>
<tr>
<td>3</td>
<td>Received Data</td>
<td>BB</td>
</tr>
<tr>
<td>4</td>
<td>Request to Send</td>
<td>CA</td>
</tr>
<tr>
<td>5</td>
<td>Clear to Send</td>
<td>CB</td>
</tr>
<tr>
<td>6</td>
<td>Data Set Ready</td>
<td>CC</td>
</tr>
<tr>
<td>7</td>
<td>Signal Ground</td>
<td>AB</td>
</tr>
<tr>
<td>8</td>
<td>Received Line Signal Detect</td>
<td>CF</td>
</tr>
<tr>
<td>9</td>
<td>Reserved for Testing</td>
<td>—</td>
</tr>
<tr>
<td>10</td>
<td>Reserved for Testing</td>
<td>—</td>
</tr>
<tr>
<td>11</td>
<td>Unassigned</td>
<td>—</td>
</tr>
<tr>
<td>12</td>
<td>Secondary Received Line Signal Detect</td>
<td>SCF</td>
</tr>
<tr>
<td>13</td>
<td>Secondary Clear to Send</td>
<td>SCB</td>
</tr>
<tr>
<td>14</td>
<td>Secondary Transmitted Data</td>
<td>SCA</td>
</tr>
<tr>
<td>15</td>
<td>Transmitter Signal Element Timing</td>
<td>DB</td>
</tr>
<tr>
<td>16</td>
<td>Secondary Received Data</td>
<td>SBB</td>
</tr>
<tr>
<td>17</td>
<td>Receiver Signal Element Timing</td>
<td>DD</td>
</tr>
<tr>
<td>18</td>
<td>Unassigned</td>
<td>—</td>
</tr>
<tr>
<td>19</td>
<td>Secondary Request to Send</td>
<td>SCA</td>
</tr>
<tr>
<td>20</td>
<td>Data Terminal Ready</td>
<td>CD</td>
</tr>
<tr>
<td>21</td>
<td>Signal Quality Detector</td>
<td>CG</td>
</tr>
<tr>
<td>22</td>
<td>Ring Indicator</td>
<td>CE</td>
</tr>
<tr>
<td>23</td>
<td>Data Signal Rate Selector</td>
<td>CH/CI</td>
</tr>
<tr>
<td>24</td>
<td>Transmit Signal Element Timing</td>
<td>DA</td>
</tr>
<tr>
<td>25</td>
<td>Unassigned</td>
<td>—</td>
</tr>
</tbody>
</table>

Notes: SA = Secondary Transmit Data
SB = Secondary Received Data

FIGURE B.

to something else which is going to allow us to communicate over a (telephone) line. Essentially what we have to do is take the digital data coming from the interface and change it into something that can be carried over telephone lines. Telephone lines carry sound. Sound is not digital but analog. Therefore, we need a device which will take digital data from the interface and transform it into an analog signal which can be transmitted over the voice (i.e., sound) system of the telephone line. This device is called a modem. This acronym stands for MODulator, the part of the instrument which takes the digital data and modulates it into an analog signal, and a DEModulator, which takes the analog signal and changes it back into a digital one. So, all a modem actually does is change digital data into sound, transmit it over the telephone line, and turn it back into digital data at the other end.

So far, then, we have the following configuration for single terminals communicating with the DEC system; that is, RS232 interface, modem, telephone line, modem, terminal. See Figure C.
3. At this point, the phone is answered and RSTS asserts the data carrier lead and communications are established between the two modems.

4. Should there be an interruption in carrier, RSTS can recognize the fact that the carrier is now gone, hangs up the telephone and detaches the job. Thus, if we are cut off, our job becomes detached and the telephone is hung up ready for us to re-dial or have someone else dial in.

All of this assumes that your interface supports, and that you have sysgened in, modem control. Modem control allows RSTS to recognize and control the leads necessary to establish and to break the communications link. It is possible to have a dial-up facility at your RSTS system if you have not either gened modem control or if your multiplexer does not support modem control. This can be done by having the modem itself handle all of the controlling functions of answering the telephone, establishing the data carrier, and monitoring the data carrier to make certain that communications are continually established. To the RSTS system, then, the output from such a modem looks like a regular RS232 terminal which is ALWAYS connected.

As a consequence of a system like this, should you become disconnected, RSTS has no way of knowing when the job has disconnected, and leaves the job hanging or running at that mode. The next person who dials in will be connected to your job. This may be a security problem which you do not want to happen at your site. I might point out that some of the early communications interfaces on the PDP/10-PDP/6 computer (DEC's first large scale timesharing computer) did not control modem leads and operated in this fashion (some still do).

THE MODEM AND "PHONE LINE."

Local

By now it may have occurred to some of you that we have not described how the modem is hooked up to the telephone line. True, we know that the modem is hooked directly to the RS232 port on the computer and to the terminal on the other end. But how does it hook up to the telephone line both at the computer end and at the remote terminal end? In practice, this depends upon what type of modem you have. At the computer end, one will have asked the telephone company for a telephone number which will be our dial-in number for our computer. We have three choices to make at this time. They are:

1. Is the telephone company to provide the modem (they call it a data set)? If the answer to this question is in the affirmative, all that is necessary is to ask the phone company to install the data set and specify the options. With the data set will be an RS232 connector which can be connected directly to the computer. See Figure D.

2. If you wish to supply your own modem, it may be of two types. The older type is simply a modem and needs to have a protective device installed between it and the telephone network. This device, called a data access arrangement (DAA), serves to protect the integrity of the switched network and also to allow your modem to control such things as answering the phone, hanging it up, busyting it out, etc. See Figure E.

3. Your modem may be one of the newer type, which has been registered by the FCC and, therefore, can be attached directly to the switched network via the proper data jack. See Figure F. Here, modems will have a Universal Service Operating Code (USOC) number and Ringer Equivalent. They will also specify the type of data jack. Three of these standard jacks are:

   - Permissive Data Jack
   - USOC RJ11C

![Permissive Data Jack USOC RJ11C](image-url)
Remote

The remote modem and terminal of this system is, by necessity, somewhat different than the computer end. How much different it is depends upon whether you wish the remote to be portable or fixed. If it is to be at a fixed location, almost the same situation applies as previously described for the computer end; i.e., the telephone company can supply the data set, you can supply an approved modem which then requires a DAA; or you may have one of the newer modems which does not require a DAA. See Figure G.

If you do not get a telephone company supplied data set which comes with a telephone dialing instrument, you will need some type of dialing instrument so that you can originate the call to the computer.
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with high-speed streaming, file-oriented operation, standard DEC utilities, simultaneous print spooling and high capacity.

Now there’s a streamer for LSI-11 Winchester backup that lets you dump files at high speeds and, more importantly, helps your restore system files quickly and confidently.

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A 15K-byte data relaxation buffer on the controller allows overlapped I/O with disk activity with no specialized programming. Emulating the DEC TM-11 tape system, the LSI-30 not only provides backup, but also serves as spooling storage or program load. An LS-30/P version is available which includes a serial RS-232 interface to connect the system printer through the DLV-11J to provide off-line tape-to-printer operations, leaving the LSI-11 free for other tasks.

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Direct CP/M access to data files allows LSI-11 users to work freely with either CP/M or DEC file formats. Specifically, CPM-11 is a task designed to operate concurrently with other DEC processes in a multi-user environment.

Alloy has also provided for future LSI-11 hardware and software revisions by providing for 22-bit extended addressing. The complete CPM-11 product includes a CP/M license and all standard utilities in addition to the processor board.

For more information, write or call Information Services, Alloy Computer Products, 12 Mercer Rd., Natick, MA 01760. (617) 655-3900. TWX: (710) 346-0394.

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If you wish your installation to be portable, this can be accomplished by an acoustic coupler or modem. The acoustically coupled modem allows you to take the handset of a normal telephone and place it in the coupler (modem) which then transmits the sound audibly between the transmitter and receiver of a telephone handset. This hookup offers the most flexible solution to the portability problem as your modem can be used at almost any telephone in the world: Princess and Mickey Mouse phones excluded.

How fast are you going to be able to communicate over this dial-up arrangement we have just configured? Because of the way the data is handled on this circuit, most acoustically coupled modems are limited to 30 characters a second. However, there are several which are capable of 120 characters per second when direct connected via a data jack or DAA and at least one that can be used on an acoustically coupled basis.

You may have heard the term "baud" before. Baud stands for bits per second. Since each character normally takes ten data bits (one stop, one start and eight data bits), 30 cps requires 300 bits per second or 300 baud while 120 cps requires 1200 baud. Thus, your single dial-up computer circuit is usually configured for 300 or 1200 baud (speed 300 or speed 1200). The two are usually not interchangeable and modems for one cannot be used for modems from another. Also, modems of different manufacturer may not be compatible with each other.

It is not unusual for DEC systems to have many dial-in ports. People may be dialing in from all over simultaneously. With such a configuration, it is possible to have modems at the computer end rack mounted, sharing a common power supply, with only the wires for the RS232 interfaces and the data jacks or DAA wires coming from the rack. In a DEC system that has 16 such modems, the space and convenience savings can be considerable.

These modems are available from the phone company (called the "113 modem") or from several private vendors in both 300 and 1200 baud varieties. A view of such an arrangement is shown in Figure H.
Dataram Corporation offers the industry's widest range of DEC-compatible peripheral controllers — from comparatively simple NRZI tape controllers to complex 300 MB storage module drive (SMD) controllers.

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The chart shows our current family of peripheral controllers, growing every day. If you don’t see the controller you need, we’re probably working on it right now. Call us and discuss your requirements.

---

<table>
<thead>
<tr>
<th>CONTROLLER</th>
<th>DESCRIPTION</th>
<th>COMPATIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>C03</td>
<td>Cartridge disk controller</td>
<td>RK05</td>
</tr>
<tr>
<td>C33</td>
<td>Cartridge disk controller</td>
<td>RK05</td>
</tr>
<tr>
<td>T03</td>
<td>NRZI mag tape controller</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T04/C</td>
<td>Mag tape streamer coupler</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T04/N</td>
<td>NRZI mag-tape controller</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T04/D</td>
<td>Dual density mag tape controller</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T34/C</td>
<td>Mag tape streamer coupler</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T34/N</td>
<td>NRZI mag tape controller</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T34/D</td>
<td>Dual density mag tape controller</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T36</td>
<td>Dual density mag tape controller</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>T34/T</td>
<td>GCR mag tape controller</td>
<td>TM11/TU10</td>
</tr>
<tr>
<td>S03/A, S04/A</td>
<td>80 MB/300 MB SMD controller</td>
<td>RM02/RM05</td>
</tr>
<tr>
<td>S03/A1, S04/A1</td>
<td>80 MB/160 MB SMD controller</td>
<td>RM02</td>
</tr>
<tr>
<td>S03/B</td>
<td>80 MB/300 MB SMD controller</td>
<td>RK07</td>
</tr>
<tr>
<td>S03/C</td>
<td>200 MB/300 MB SMD controller</td>
<td>RM06</td>
</tr>
<tr>
<td>S03/D, S04/D</td>
<td>96 MB CMD controller</td>
<td>RK06</td>
</tr>
<tr>
<td>S33/A</td>
<td>80 MB/300 MB SMD controller</td>
<td>RM02/RM05</td>
</tr>
<tr>
<td>S33/A1</td>
<td>80 MB/160 MB SMD controller</td>
<td>RM02</td>
</tr>
<tr>
<td>S33/B</td>
<td>80 MB/300 MB SMD controller</td>
<td>RK07</td>
</tr>
<tr>
<td>S33/C</td>
<td>200 MB/300 MB SMD controller</td>
<td>RM06</td>
</tr>
<tr>
<td>S33/D</td>
<td>96 MB CMD controller</td>
<td>RK06</td>
</tr>
</tbody>
</table>

Products printed in red are LSI-11 Bus compatible. Products printed in black are UNIBUS® compatible for PDP-11 and/or VAX minicomputers.

---

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A user faced with a requirement to drive a non-DEC peripheral from RSX-11M can choose from several options. Some are simple, some difficult, and the DEC manuals lend no help in assessing the potential costs and benefits of each approach.

The word 'device' here means something that whizzes, whirs, spins, blinks, pops, clomps, or nods and is connected to the UNIBUS, Q-BUS, or MASSBUS of a PDP-11. Terminals and things which behave like terminals are driven through the RSX terminal driver, and constitute a separate family of devices subject to entirely different considerations.

Devices are typically interfaced to RSX-11M via a software entity known as a 'device driver'. A device driver is a collection of subroutines and an interrupt service routine which constitute an extension of the RSX executive.

"Write a device driver" is the standard DEC reply to the question of adding non-DEC device support to RSX, yet writing a device driver is only one of a number of possible approaches. The choice of the appropriate technique depends on the type of device, requirements for shared access, the experience of the programmer, and the time available for implementation. Each approach is described below, along with its attendant benefits and costs.

**Use an existing DEC-supplied device driver**

This is the best of all possibilities, and also the least likely. In order to use an existing DEC device driver, the foreign device must behave EXACTLY like its DEC-supplied counterpart; differences may not be obvious. Unless a vendor explicitly claims direct replacement compatibility, don't expect it. A disk having the same capacity and data transfer rate as an RL02 will not necessarily mimic an RL02 where RSX is concerned.

**Write a device driver**

DEC uses device drivers in RSX to realize a number of design goals. A device driver serializes access to devices via the QIO facility, fields device interrupts in a timely and controlled fashion, provides a standard interface to all devices at both task and executive levels, and gives access to such I/O facilities as Asynchronous System Traps and Event Flags.

A device which transfers data, generates interrupts, and is to be accessed from more than one task is best interfaced with a device driver. If any of these conditions is missing, simpler approaches exist which might well be considered.

Device drivers aren't particularly difficult to write if you've written one before. An experienced RSX-11M System Programmer should be able to do even a complicated driver in less than two weeks. There's a Catch-22 here, in the word 'experienced'. If you're thinking about writing a device driver as your first venture into RSX systems programming and expect to get it done by next Friday, think again. Granted, DEC has provided an excellent manual on the subject and plenty of models exist, but the amount of detail encountered in writing a device driver for RSX-11M is enough to put a programmer into the Massachusetts State Home for the Bewildered. Allow at least a month to write your first driver, two to be safe, and take the DEC training course on writing drivers before you start.

Ancillary Control Processors (ACPs) are often mentioned in the same breath as I/O drivers. An ACP is a special type of RSX task which works in conjunction with a driver to implement a protocol. For instance, F11ACP in RSX imposes the Files-11 protocol on all mounted disks. An ACP is usually overkill. Be wary, particularly if the programmer is inexperienced and overly enthusiastic about the prospect of writing an ACP. Having written an ACP gives great face to an RSX Systems Programmer, but it is a task only for an experienced person who has written a few drivers and who understands the RSX executive's internals.

**Use a privileged task which maps to the I/O page**

A privileged RSX task which has switched stacks is mapped to the I/O page and has exclusive access to it. Once mapped to the I/O page the task can manipulate device registers, thus effecting a data transfer. A privileged task can, in addition, connect to an interrupt and thus field interrupts from a device. A task has more code space than does a driver, so more intelligence can be built in.

Consider this approach if you have only one task which has access to the device and does only polled I/O to it. A good example is sampling an analog-to-digital converter.

This approach is tempting at first glance, since a task is a more easily understood entity than a device driver. Don't yield too quickly to that temptation. All too often these tasks become functional equivalents of device drivers, implemented as kludged-up code which mimics functions already provided in the RSX executive. Another drawback: since any RSX task must compete with all other tasks for access to the CPU, scheduling timely task execution may become an unforeseen problem.

This approach should not be used if the task has to ac-
cess another task's data buffer. An RSX task does not have access to data in another task's address space. Only by resorting to extreme measures can this be done, measures often tantamount to one task reaching into another task's underdrawers!

The Connect-to-Interrupt facility is so complicated and fraught with potential difficulty that it is treated separately.

Use a non-privileged task linked to an I/O device common

The rationale for using this approach is the same as for the privileged task, although this approach is somewhat more limited. It should be used for those devices such as DR11's where a single value is deposited or retrieved from a device register. Since the task is not privileged, it does not get serialized access to the I/O page, nor does it have access to any executive routines.

This technique can be used to give FORTRAN tasks direct access to the I/O page. The procedure for creating an I/O device common is described in the RSX Task Builder Manual.

Now about Connect-to-Interrupt . . .

The only appropriate use of Connect-to-Interrupt is for pure interrupting devices, those which transfer no data whatsoever. A device driver is preferable for all other types of interrupting devices.

At first glance, Connect-to-Interrupt seems like a way to avoid writing a device driver, in that it gives a privileged task the ability to respond to an interrupt from a device. Yet this facility is so difficult to use and places such severe restrictions on a task invoking it that most knowledgeable RSX users refuse to SYSGEN it into their systems.

Conclusions

When all cases are considered, the device driver still seems to be the most preferable, given the technical ability to implement one. We have seen some cases where another approach might work just as well and, perhaps more important, we have seen seemingly simple approaches which have the potential to be surprisingly difficult.

RSTS/E SOFTWARE PACKAGES

- **KDSS**, a multi-terminal key-to-disk data entry system. (Also available for RSX-11M.)
- **TAM**, a multi-terminal screen-handling facility for transaction-processing applications. (Also available for RSX-11M.)
- **FSORT3**, a very fast sort. Directly sorts RSTS/E files containing up to 16 million keys or records. Up to 70 times as fast as the RSTS-11 Sort package in CPU time.
- **SELECT**, a convenient, very quick package for extracting records that meet user-specified selection criteria.
- **BSC/DV**, a device driver for the DEC DV11 synchronous multiplexer that handles most asynchronous protocols.
- **COLINK**, a package that links two RSTS/E systems together using DMC11s. Supports file transfers, virtual terminals, and across-the-link task communication.
- **DIALUP**, a package that uses an asynchronous terminal line to link a local RSTS/E system to a remote computer system. Supports file transfers, virtual terminals, and dial-out through a DN11.

(The performance-critical portions of the first five packages are implemented in assembly language for efficiency.)

Evans Griffiths & Hart, Inc.
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CIRCLE D65 ON READER CARD
The concept of a data base is not new. For years every office operated and controlled its own data stored in filing cabinets. All that computers did was to mechanise the process; the justification of a computer system was “speed, at less cost”.

Early computer programs only dealt with their own immediate application requirements; the next stage wasn’t considered. Applications tended to be developed in isolation, having their own data and programs; hardly surprising when they were only mechanising one department’s filing cabinet at a time. Inevitably new applications tended to overlap previous work which often necessitated changes to earlier programs and data; e.g., sales invoicing, followed by sales analysis. It was not unknown to find there was insufficient information to produce effective analysis the first application had to be amended. The result—application development took longer and went over budgeted costs.

A second major problem area arose. As more departments’ filing cabinets were mechanised it became evident that the same data was being input and stored for different applications from different sources at different times of the week or month. Which data was correct and which files were up-to-date at any one time? The classic problem of duplicated data; on which data should management base its decisions? DATA is a major resource in any company; incorrect or out-of-date information is a liability.

As additional systems were introduced management became concerned with the inability of the computer department to produce accurate and specific information quickly. So management began to demand that applications be integrated. The result, after several years, horrified top management—late projects, considerable overspend, systems not meeting specifications and a large increase in hardware costs. Many Chairmen called a halt to the spiralling costs; there had to be a better way.

In the late 60’s Dr. Orlickey wrote, in a book that included the then well known failures of Management Information Systems in some large U.S. companies—“there was an inevitable rise in cost for each further step taken towards integration”. This he attributed to:

- an increase in commonality or overlapping of existing systems.
- an increase in complexity with each new development.
- an increase in hardware cost to accommodate the growing software requirements.

Dr. Orlickey claimed the underlying problem was caused by piece-meal development. He stated four major problem areas:

1) Users no longer had control over their files; their data was passed to the computer department. Any data errors
were passed back to the user for checking and resubmission. The updating and processing cycle became longer.

2) Computer people had disregarded the natural and inevitable duplication of data obtained from different sources. There were multiple versions of the truth, each of which may have been critical to decision making.

3) Users were unable to get information when they wanted it. The reports they received were voluminous and often out-of-date.

4) Each application had its own data files. It was difficult to obtain related information quickly and concisely.

Dr. Orlickey summarised the four basic requirements for a Data Base Management System, as:

- Common, non-redundant data. DATA is a major resource. A common pool of accurate, up-to-date data is needed, with no duplication.
- Optimal access. Data must be available when the user requires it, with due regard to security and integrity. Data must be on-line.
- Application independence. Data should be kept independent from applications. As applications grow, and as data fields are added, we should not have to change existing programs.
- Data relatability. All applications should be able to access the same data from differing viewpoints, subject to security provisions.

These points are still valid today. However, we would add one further point to meet today’s requirements:

- User Control. The need for users to regain the operation and control of their own data. To be able to make ad-hoc enquiries and reports, without involving a computer department.

3. Conventional Programming

Conventional programming departments, those using high-level languages; e.g., COBOL, are faced with well-known problems. Applications development is time-consuming. A detailed study, analysing user requirements, tends to be far more thorough than may be necessary; this is primarily due to the difficulty in handling changes and amendments at a later date. The result is often a more thorough, more complex system which will take even longer to develop; a syndrome generally known as ‘paralysis by analysis’.

System design is then ‘frozen’ at an early stage. However, in real life changes to business and system requirements occur; the longer the system development gap—from design to implementation — the more changes there will be. Changes are resisted as long as possible, but inevitably they have to be continuing the development to the original specification while another group is redesigning the system. This inevitably causes problems for the user.

As the number of implemented applications grows the problem of maintaining the systems increases rapidly. Eventually a group of programmers spends most of its time maintaining and amending systems. This is expensive and unproductive.
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CIRCLE 166 ON READER CARD

4. CUPID Applications

What the user needs is a system that can be developed and implemented quickly, perhaps with only some of the requirements available initially. Once implemented the user will always find changes or improvements he would like which he could not previously appreciate. His understanding of what a computer system can do for him grows rapidly and so his expectations increase. He wants a system that is flexible enough to respond to his needs; he needs CUPID.

CUPID takes away the repetitive and highly technical skills required to produce effective systems. All of the clever programming is looked after by CUPID in a standard manner. Applications are developed more quickly and consistently, and the amount of system testing is reduced. The resulting systems can accommodate growth without unduly affecting existing programs, and can respond to changes quickly. CUPID-based systems meet the criteria of flexibility.

CUPID satisfied the user criteria of:
- putting the operating and control of an application back with the user.
- providing security and data integrity to enable users to operate the system effectively.
- giving the user facilities to make ad-hoc enquiries and reports when he needs them.
- allowing the user to develop his systems further, without having to call in a computer expert or department.

For each job CUPID guides a user at a VDU terminal in a simple and friendly way through a series of selections from the general to the particular. At the particular he may be asked questions that require simple answers to define the parameters of his job.

Standardised procedures make training and VDU terminal operation easy to understand. Implementation is quick; additional applications pose no training problems.

CUPID is self documenting. There is always up-to-date documentation of a user’s system. This saves considerable time and cost in maintaining well documented systems, and reduces on-going maintenance to a minimum.

CUPID satisfied the major DBMS criteria:
- there is a common, non-duplicated pool of data.
- data is available to the user when he needs it.
- data is independent from the application. Additional system development causes no disruption to existing systems.
- data can be assessed from many viewpoints by the use of multi-keys in a record.
- users have control over their own systems.

Summary: A CUPID-based system is flexible, user-friendly and easy to use. It may be easily developed, often by users themselves. It encourages users to fully use the system. Such systems can be designed and implemented quickly; quick implementation reduces the system development gap, gives users early experience and benefits from improved productivity, and system design can more easily take into account user changes based on implementation experience.

Growth, flexibility, security of data and low maintenance costs are ensured.
Today computer-based Decision Support Systems (DSS) are found in medium-to-large organizations. These systems differ from financial or manufacturing transaction systems in that the design emphasis is on flexibility and responsiveness to individual executive problem-solving. In order to be successful in this environment, DSS combine interactive computing, easy-to-use languages oriented to the non-programmer, flexible reporting and graphics output, internal and external data bases and telecommunications.

Corporations generally have available two basic approaches to satisfying DSS computing needs for their managers and analysts. The first involves all users sharing a central, interactive computing resource (outside timesharing, inside timesharing, or in-house mainframe computers running an interactive partition alongside other jobs). The second approach is towards using desktop computers.

Ross Systems participates in this shared computing approach by providing commercial timesharing on multiple VAX 11/780s and PDP 11/70s, and by helping our clients establish their own internal timesharing systems.

Until now the benefits of using large-scale computers for decision support by financial managers has been limited. As a result, some non-programming managers are now using small, inexpensive personal computers at their desks for simple, individual computing needs. Generally these machines have been purchased by individual executives and managers outside the MIS department under office supply budgets, in order to overcome some of the barriers between the manager and available computing resources.

Again, there are negative aspects to this approach of using desktop machines just as with the shared computing approach (complex languages, ongoing costs, and overloaded internal timesharing systems). Desktop computers offer very limited computing power, with usually no support to the user, yet with a bewildering array of languages of widely varying quality. In particular, for the corporate user today, it is very difficult to access corporate data, leaving the manager or analyst no option but to re-type data onto local storage. Nor can one local user usually solve mutual problems networked to another local user.

True financial Decision Support Systems (DSS) require sophisticated and powerful hardware and software tools. However, these two approaches — DSS using only large host computers, and individuals using micros — neither by itself — are the answer.

Ross also participates in a new emerging trend — Distributed Financial Planning (DFP) — thanks to new...
developments in hardware and software. Powerful desktop computers (inexpensive relative to large computers) are being combined with large host computers in fully distributed environments, using full capability software. The synergy of desktop and host computers with enabling software offers enormous potential for individual financial managers in modeling and planning.

DFP augments the strengths of the shared computing approach with the strengths of the desktop with few of the drawbacks. This approach makes a very powerful decision support environment. That combination of the benefits of both approaches will be available shortly through the third generation of desktop computers and software being developed specifically for them. DEC's new Professional series of business-oriented personal computers, particularly the Model 350, is a leading example of the hardware for DFP support environment.

The DEC Professional 350™, with its POS file structures upwardly-compatible with VMS and RSX-11M, is a solution to the problems of host and personal computer incompatibility. Ross Systems is playing a key role in integrating these units into the decision support environments already developed for clients.

MAPS/Pro™, Ross System's new software product for the DEC Professional 350 will be the first of this new generation of financial modeling languages common across the breadth of DEC's line of micro- and minicomputers. MAPS/Pro, available concurrently with the delivery of the Model 350, takes advantage of the bit-mapped CRTs, large core and local memory, and integral help facilities of the 350, while offering much of the power and flexibility of MAPS/Host, its compatible version for PDP-11s and VAXes.

In order for a Distributed Financial Planning environment to be successful, it must offer 1) Desktop computers (with disk file storage systems) that run with operating systems compatible with host computers; 2) An easy to use comprehensive financial modeling language common for desktop micros up to superminis and larger; 3) Telecommunications to transfer data from the desktop computer to the shared host computer; 4) Libraries of financial models within the company for distributed access by various users; and 5) Financial data base management capability to allow sharing through various desktop or host computers, with appropriate security controls.

The whole benefit of distributing computing power to the end user is simplicity of operation. For the long run integration of all computing resources within a company, desktop computers must have operating systems compatible with host computers. Too much time is spent today translating data between basic operating and file systems. Often it is physically impossible to move data electronically between hardware from different manufacturers.

For financial planning and modelling, the user will be able to solve larger problems or maintain larger data bases on the host computer. For this, a user should need to learn only one language instead of two or three. The chosen language must be as simple as a spreadsheet, yet with forecasting, reporting and statistical techniques.

Telecommunications binds together the distributed network of computing power. With this next generation of DEC business computers using the Telephone Management System option for the 350, it is possible for a non-technical user to access data residing on another Professional 350 or the host by giving the “name” of the machine, a machine password, the “name” of the data file and its password and letting the 350 take care of all necessary handshaking.

The ability to build libraries of models is important to an organization. This enables the organization to use standardized models, and to be able to distribute them electronically in pre-tested form to the desktop network to ensure up-to-date decision support tools.

Finally, the successful Distributed Financial Planning system includes a financial data base management sub-system to simplify the storage and transfer of data between desktop and host computers. The user will be able to use individual data in numerous specialized models, as well as accessing corporate data bases.

Distributed Financial Planning will bring the benefits of a powerful and standard usage to all levels — hardware, modeling software, telecommunications, libraries and data bases. The ideal DFP decision support environment is then in the realm of actuality, available in presently available DEC hardware and ROSS software.

BIOGRAFICAL NOTE
Bruce Powell is the Director of Corporate Marketing for Ross Systems, Inc. of Palo Alto, California. He is thus responsible for identification and development of new markets and products for Ross Systems, as well as directing corporate advertising and sales support. Prior to joining Ross Systems, he was in sales management with Tymshare and Itel.

Powell is a 1968 graduate of the Graduate School of Business at Stanford University and received his engineering degree from MIT.
FROM THE EDITORS  
...continued from page 4

Dave Mallery

heads to manipulate. With the right smarts in its firmware, it will be able to keep all heads moving at once. When they are feeding enough buffer in the VSC, the actual transfer rate across the bus will approach the theoretical maximum, even in a disk-bound commercial environment.

I guess my message to my friends in the Gulch is: "It's time to start innovating, guys..." Start thinking with the controller, instead of the drive. If DEC wants to, it can undercut the slim profit margins from the Eagle at will. An innovative structuring of available new devices that addresses the commercial problem of disk/seek bound-edness while fooling the bus into believing it's one of the standards will truly put a tiger in your tank.

Carl Marbach

state that there is NO one language that will save us all. There is no one language that will be "best" under all circumstances.

What we need to do, as an industry, is improve what we have, continue searching for a better way (language) and make ourselves better at doing our job. With the proliferation of programs (something does run those home computers) the need to program well has never been greater. A move in the right direction will be DEC's BASIC Version 2 due out sometime this year. It employs many of the constructs BASIC needs to be a better language, that is, to do what it does better. According to Al Cini of Computer Methods Corporation, DEC's BASIC V2 is "terrific." He's seen the product early so he can teach a pre-symposium seminar in December. What that means to many of us is that we don't have to scrap all of our old BASIC programs and re-write them in the "new" language but we can maintain and improve them using the new constructs available in V2; Thank you DEC.

I protest being called the "old dog who can't learn new tricks" by people who say I'm sticking to BASIC (and TECO) when all these new languages are out there. I resisted PL-1 (whew) and maybe RPG is the IBM way of the future, but over the years I have developed some fine software using DEC machines and BASIC and I haven't been abandoned for a new language; I've been given new tools to make things better! Soon, with some luck, I'll be able to make my systems run on computers from micro size (Micro-11) to mainframe size (VAX-11/782 or DECSYSTEM 1099) without any migration problems.

New languages have a place, but I'd no sooner use BASIC on an IBM system than CP/M on my PDP-11. Meanwhile, hats off to the DEC BASIC people, and maybe the FORTRAN, COBOL, MACRO, C, BLISS, TECO, RPG, PASCAL, PL-1, SNOBOL, LISP, APL, ALGOL, MUMPS, CORAL 66, CPL, and any others I forgot, will take the hint and give us new tools to improve their languages and our use of them.
FITALL.RNO

DEC'S NEW "ERECTOR" SET COMPUTERS

By John B. Runyon, Publisher, Computers-R-Digital, Box J, Navesing, NJ 07752

(Knee Bone Song)

You have to feel it to understand, it's much too simple to explain simply. The obvious is too illusive. By looking at it you can't understand the meaning of what you clearly see.

Sure, it's the old wonderfully successful expander box modular computer only in concept. But the concept is again brand new, reborn, since it's not just a bunch of distinct modules that somehow, for all their diverse variety and electronic complexity (including cooling and RFI cable management) seem to all fit into a relay rack. Nor is it the whole blooming mess jammed into a small table top unit. It is also a floor mount pedestal—all at the same time. You just change the "skins" to make one into another mounting scheme. A DECism of universality.

A DEC Manager showed a picture of the expected DEC box appearing in a trade press publication. He showed it with chagrin and disappointment, almost disgust and fury. Same concept and "we got ya."

It was what he said, "You might have expected it if we were not DEC." A common floppy unit to fit under a video terminal the way a certain famous company did in stereotyping the obvious forerunners. Why didn't the VT180 do it? "But from DEC," he said, "wouldn't you have expected something more innovative, creature unique, challenging and exciting."

As his voice softened, became more compassionate, seemed more understanding—still disappointed. Then loudly, "It's an insult, from DEC it should be assumed there would be something better! They could have even assumed more..." Obviously, he was right; and that is why many in the trade press, market research, and systems development do not try to outguess DIGITAL. Without an innovation, DIGITAL rarely announces new products.

The crowd was electrically charged as he pulled boxes from the chassis, moved parts around. "What's so good about all of that," we wondered. Tight engineering, integration, perception about need and functionality he seemed to say—more felt than heard. He grew live, tall, showed pride. We waited, slowly absorbed. We started to realize—slowly then faster—like a crescendo in music—exponents in math.

Oh yea, simple obvious, my gosh marvelous. And then the crowd all started to realize the ramifications and design universality. You could feel it. There seemed to be a growing noise. So simple, so obvious, wonderful only because no one else had thought it all out. Wow, simplicity to the point of being trivial. Engineering excellence. DEC had done it again—confounded the obvious into metal and machines while once again holding back—not telling the whole story of what would obviously be enhancements. So once again they could repeat the same strategy in an evolution of designs.

The Power box fits into the chassis
The Computer " " " "
The Storage box " " " "
(Some types like diskette and Winchester)
All with the point of a pen (yes, a ball pen!)
The chassis fits into the table top
The chassis fits into the rack
The chassis fits into the side cabinet
Now hear the design of DEC

But for several different computers:
The CPU fits into the CPU box
The interfaces fit into the CPU box
The memory fits into the CPU box
All the way it's been done before

Not done yet, it's all engineering:
The computer fits into the packing box
Nothing weighs over 35 lbs.
The secretaries build their computers by special instructions.

And another song later:
The monitor...
The keyboard...
But that's another story, sufficient unto itself.

You've heard about Noah's Ark...previously in my DEC product family descriptions.

Oh that's a whole new story because they are for various computers and embody special studies to make them better than the best high seller, the most popular video terminal—the VT100. Will the VT100, too, still survive—what will the compatibles do, make another compatible?

Not done yet:
The RSX software is bundled...but it's a special subset RSX and the next family member, LCP, uses full RSX...

The chat goes on:
The dual processor CP/M is 8 and 16 bit processors
The DECmate is 12 bit but has an 8 bit CP/M option
The 11/23+ is...
The RSX is...
The VAX file system is...
The voice system Telephone Management is...
Sorry, I can see it all so clearly, but not interpret it in a few words cause it's all so simple. If it were more complex, it would be easier to explain.

That's the simple part. The boxes are different sizes so one system has a physical rather than electronic limitation on expansion. Otherwise a game or tradeoff has to be played with board sizes, Kilobytes/board and selective options. Some software has hardware requirements where space precludes other hardware options. You wouldn't put the leg bone from an elephant on a giraffe or the giraffe's neck on a zebra, now would you... well maybe someone would try.

DEC is in "hot pursuit" of and rapidly "commissioning" vendors to write or adapt their software for these families, especially the Professional Series. This is why some of the prospective vendors are advertising their products. Some who have, were surprised to receive calls from and sign contracts with the big "D". It has happened to advertisers in this publication. Nothing happens to those that are unknown or obscure in the marketplace except for vain prayers. Soon DEC will publish a directory of them; and a preliminary listing has already been issued of 20 of them. Already, there is one listing 106 software products for the DECmate (reviewed in C-R-D).

On the other hand, futility is telephoning for attention (have you ever tried it). Quite a cause in trying to scale the knee bone to the thigh bone and hear the word... It's faster and cheaper to advertise and to catch other customers as well for evaluation, feedback, who can also give reputation testimonials which mean a lot to DEC. DEC is obvious in seeking a huge inventory, even of similar (competitive) types for their computer families. Software-ONLY OEM's for DEC, a newly evolving market like for the big computers where DEC places or discounts the hardware instead of and in addition to selling it to turnkey organizations.

But it is not a matter of garage operations that has characterized the hobby marketplace. The documentation that takes as long or longer than the software to create or mature business plans count significantly more than the genius of concepts not tested by various real life circumstances. Many are to be disappointed by questions having nothing to do with software systems analysis, and programming that cause their flat out rejection. Get it all connected to the head bone.

NOW HEAR THIS, we heard of a very huge sale of these little boxes to one of the largest corporations, quantities in the 5 figures; and we heard of telephone sales in the 3 figures per day! You can not always detail all you hear when it sounds too extraordinary since some wouldn't believe it and others would demand proof. Still, as we always have believed, there will be a computer on every desk... sometimes in place of the telephone as a communicator, and every office will be wired more for data than sound. There is much more in that sentence than the obvious or prophecy... so until I can say more, there is joy in computing.

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CIRCLE 087 ON READER CARD

LETTERS TO THE DEC PRO...

...continued from page 6

models, for applications such as job costing, inventory or pricing.

DIGICALC, a multi user program, has a spread sheet size of 615 columns by 615 rows, all of which is useable. In addition, DIGICALC allows consolidation of up to 999 individual spread sheets at a time, and through indirect reference, facilitates retrieval of data from any individual cell on any work sheet stored on disk, without exiting the current worksheet.

SuperCalc does not support worksheet consolidation or indirect reference of this sort.

SuperCalc has an excellent user training manual, and makes available an on line "help" facility which serves to remind the user of the meaning of the command level symbolic abbreviations.

DIGICALC includes on line tutorials and a detailed topical "help" facility which (in our experience) enable first time users to become proficient without ever having to look at the reference manual. The commands in DIGICALC are accessed through clearly marked function keys. There is no need to learn a symbolic language of any sort. DIGICALC also supports the use of named variables as well as the use of cell coordinates in retrieving values and writing equations. This is a user-friendly enhancement of particular value.

Further comparisons are possible but the key point is that both Supercalc and DIGICALC provide superb price/performance values in their intended environments.

Emulators, such as the BRIDGE or MICRONEXUS will allow low cost CP/M software to run on "mini" equipment, albeit at a sacrifice in performance. There are many useful application programs available under CP/M which are unavailable under the "mini" operating systems. Others might be available, but at a cost (and with a corresponding power) that could seldom be justified. For such situations, we recommend running the CP/M software under emulation as the best possible solution.

In the case of "electronic spread sheet" software, however, the situation is very much different. Such programs quickly become indispensable tools in the hands of DP professionals as well as non-programmers. These programs are frequently and heavily used.

A company that requires the computing power of RSTS/E or VMS for its normal business, and attempts to run micro level spread sheet software under emulation, is likely to be very disappointed. The combination of large model size, multi user activity, extensive calculation loads, and the added burden of running under emulation, will degrade overall system performance, and still not provide an adequate solution to the company's modeling requirements. For such situations, we strongly recommend the use of DIGICALC, running in native mode, as opposed to SuperCalc run under CP/M emulation. The solution must be scaled to the size of the problem.

Oh yes, one more point. DIGICALC retails for $4,000 to $6,000 depending on the operating system, not $10,000 as stated in the article.

Boldface names are trademarks.

Arnold Cohen, President
New England Digital Systems, Inc.
Marblehead, MA
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 editors

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DEC USERS ATTENDING ANAHEIM DECUS MEETINGS TO GET FREE ADMISSION TO DEXPO/WEST 82, ANAHEIM CONVENTION CENTER, DEC.7-9

Anaheim. — Registrants for the DECUS (Digital Equipment Corp. Users Society) Conference to be held in Anaheim next December will be able to use their badges for free registration to the nearby DEXPO/WEST 82 exposition. DEXPO/WEST 82 — The Second National DEC-Compatible Industry Exposition — will be held at the Anaheim Convention Center, December 7-9, 1982. "This policy makes it even easier for DEC users to find the DEC-compatible products and services they need to improve their systems," said Larry Hollander, president of Expoconsul International, Inc., organizers of the DEXPO Shows. Nearly 5,000 DEC users are expected to attend the DECUS meetings. "We're making it possible for all of them to visit the Show while they're here," Hollander added. DEXPO/WEST is expected to attract 8,000 DEC users.

At the same time, Hollander announced that demand for exhibit space in the Show had forced the expansion of DEXPO/WEST. The new floor plan will make DEXPO/West twice the size of the first DEXPO Show held last May. "A good number of returning exhibitors are doubling and tripling the size of their exhibits," Hollander said. "And they are being joined by new exhibitors almost every day." Already the world's biggest exhibition of DEC-compatible hardware, software, services and supplies, DEXPO/WEST
can now accommodate up to 250 exhibitors. Hollander expressed confidence that all space will be taken well before the Show opens. DEC users and vendors of DEC-compatibles can get additional information on DEXPO/WEST 82 at the Kiel Auditorium, St. Louis, May 22-24 — by contacting Expoconsul International, Inc., 19 Yeger Road, Cranbury, NJ 08512; telephone (609) 799-1661.

"BRING YOUR BOSS FOR FREE" ADMISSIONS POLICY ANNOUNCED FOR DEXPO/WEST 82; MORE THAN 200 BOOTHS ALREADY TAKEN FOR 2ND DEC-COMPATIBLE EXPOSITION

Anaheim, — A new "Bring Your Boss for Free" admissions policy makes it possible for data processing managers, top corporate executives and senior technical staff members at companies using Digital Equipment Corp. computers to register for DEXPO/West 82 at reduced prices . . . when they come in pairs. DEXPO/West 82, the Second National DEC-Compatible Industry Exposition, will be held at the Anaheim Convention Center, Anaheim, CA, December 7-9, 1982.

The announcement was made today by Larry Hollander, president of Expoconsul International, Inc., organizer of the DEXPO Shows. "We hope to encourage greater communication among all levels of management at DEC-using companies," Hollander explained. "Because DEC features all the latest in DEC-compatibles, and only DEC-compatibles, the Show gives DEC-users an excellent opportunity to explore maximum potential of their computer systems — and then make fully informed decisions." Visitors from the same company will be required to register in pairs and present business cards as documentation in order to take advantage of the program. Both registrants will then pay only half the usual at-door registration fee — that is, two for the price of one.

DEXPO/West 82 will be the largest DEC-compatible show ever — twice the size of the first DEXPO held last May. The first Show featured 125 vendors occupying 150 booths. DEXPO/West will have 250 vendors in 300 booths. For additional information, contact Larry Hollander, president, Expoconsul International, Inc., Cranbury, NJ 08512; Call (609) 799-1661.

COMPATIBLE HARDWARE & SOFTWARE FOR DEC PERSONAL COMPUTERS AMONG NEW PRODUCTS TO BE FEATURED AT DEXPO WEST 82, ANAHEIM, DEC. 7-9

Anaheim, — Although dozens of vendors are planning major DEC-compatible product introductions as part of their exhibits in DEXPO WEST 82, it appears that the introductions that will generate the most excitement and industry-wide interest will be the products designed to be used with Digital Equipment Corporation's personal computers.

"Right now, the biggest customers for DEC's personal computers are the people already using larger DEC machines, and they're eager to discover the full range of hardware and software available for the personal computers," stated Larry Hollander, president of Expoconsul International, Inc.

"Since every single one of the 8,000 or so executives attending DEXPO West 82 will come from companies now using DEC systems, the Show will be the focal point of their personal computer buying decisions.

To accommodate this interest in the personal computer compatibles, exhibitors offering these products will be identified by a special sign. "We are taking every step to help the DEC-compatible industry communicate and prosper," Hollander added. DEXPO WEST 82 — The Second National DEC-Compatible Industry Exposition — will be held at the Anaheim Convention Center, Anaheim, CA, December 7-9, 1982.

The Show was recently expanded to make room for 250 exhibiting companies that will occupy 300 exhibit booths. Twice the size of DEXPO West 82 held last May, DEXPO WEST 82 will be the world's largest, most comprehensive exhibition of DEC-compatibles in history.

For additional information, contact Larry Hollander, president, Expoconsul International, Inc., 19 Yeger Road, Cranbury, NJ 08512; call (609) 799-1661.

SOFTWARE LINKS DEC COMPUTERS TO REMOTE TERMINALS THROUGH TELEPHONES

Virtual Terminal (VT), Back/REST and RIFLE will be exhibited at DEXPO/WEST in December. Zia Corporation announces the availability of a new software product, Virtual Terminal (VT), for RT-11 and TXS+ users. VT permits a virtual connection to be established between an interactive CRT / printer (data input port) and an input port of a second, remote computer, without disconnecting or otherwise altering the local terminal configuration. Once the connection is made, the user may interact with either computer system and transfer data files in either direction. VT requires no special software in the remote computer, permitting access to virtually any system which supports asynchronous ASCII terminals.

According to Zia President Glenn Burnett, VT provides the user with complete control of the communications link configuration without making hardware adjustments.

"Transmission rates, incoming and outgoing parity, selection of full- or half-duplex operation, and use of XON/XOFF protocols at both sites are controlled by the user with simple terminal commands," he said. "In essence, VT converts the local system into a super-smart terminal without interfering with other work running on the system."

With an autodialing modem, users may select modem speed and place calls to the remote site without physical access to the modem itself. Special support for the DEC DF03-AC modem is also provided to enable calls to be placed automatically from a command file or by terminal entry.

Burnett cited a number of applications already in use with the product. "For example, one of our customers uses a commercial time-sharing system to extract data from one of its large data bases. Formerly, he used a dedicated CRT/printer combination to make a hard copy of the retrieved data, which he then entered manually into his local system for final analysis. Using the same communications hardware, he now transfers the data directly to his computer system at high speed, saving considerable time and money while reducing errors. The CRT and printer that use to be dedicated to the time-sharing system are now available for full-time use on his local computer."

VT is priced at $650 and may be obtained from Zia at P.O. Box 351, Morris Plains, N.J., (201) 382-7177. OEM and dealer discounts are available.

NEWMAN EXHIBITS AT DEXPO WEST

Ann Arbor, Michigan — Newman Computer Exchange, the leading source of used DEC and DATA GENERAL equipment, will exhibit at Booth #406 at DEXPO WEST, December 7-9, 1982.

Newman's DEC and DATA GENERAL traders will be on hand to advise you on the availability and price of equipment you want and the marketability and value of equipment you no longer need.

Literature will be available along with the opportunity to get on the Newman list.

For more information call: Amanda Kreger, (313) 994-3200.

ROSS AT DEXPO

Palo Alto, CA — MAPS is Ross Systems' financial modeling package designed for an array of applications for the financial executives. Financial forecasting, budgeting, strategic business planning, personnel planning, tax analysis, and consolidations are just a few of the areas in which MAPS has been repeatedly successful. A full color graphics package is included with MAPS creating a perfect tool for faster, more accurate financial decision making. Used on Digital Equipments' PDP-11 and VAX-11 computers, MAPS is a language for decision support of non-programming executives.

Ross Systems will also supply a version of MAPS for the new DEC professional 350, called MAPS/Pro, which contains all of the commands and capabilities of MAPS. MAPS/Pro also shares features and benefits of its forerunner such as interactive "friendliness", flexible reporting, integrated graphics, prompts, HELP messages, and a library of financial functions.

INTAC is Ross Systems' database management system, and is a powerful tool for organizing and reporting strategic data. Data entry, data validation, updating, reporting and inquiry are all available in easy-to-use Business English. INTAC applications include financial information databases, headcount planning, accounting systems, asset/liability management, and much more.

VIKING FORMS MANAGER FOR PDP-11 NOW AVAILABLE

Tulsa, OK. — Viking Forms Manager, the online forms development and data entry utility created by Viking Software Services, Inc. for use with Digital Equipment VAX computers, is now available for the PDP-11 with RX-TIM operating system to provide maximum utilization of the data entry and computer operating efficiencies.

The Viking Forms Manager (VFM) is a software product used to create, operate and maintain end user and data entry application programs in an interactive environment.

"This version of RX-TIM operating system version improves the productivity of the programmer by giving the programmer new techniques to create a well structured modular program," explains Mr. John Haley, President of Viking Software Services, Inc.
“These structured programs greatly improve the productivity and accuracy of the data entry operators.”

Originally developed for the VAX environment in 1980, VFM’s wide user acceptance made the development of a PDP-11 version the next logical step. “We released the PDP-11 version in response to our users request for a programmer and operator productivity aid in the minicomputer environment,” states Mr. Haley.

RXS CROSS-COMPLIER RELEASED TO OEMs

Portland, OR — Oregon Software, formerly “OMSI” is now releasing a Pascal-2 system development package to major RSX users seeking a lead position in the Motorola MC68000 market. The heart of the package is an RSX-based optimizing cross-compiler virtually identical to the RSX native compiler that has been on the market for more than a year.

The package will not be available to end users until later this year. Oregon Software is making the preliminary version available for OEM customers because of the significant lead time required to bring out major products on the new processor.

The RSX-based Pascal-2 cross-compiler will run on standard RSX systems, including the VAX in compatibility mode. The cross-compiler generates object files that can be linked and run under the VERSAdos operating system on the MC68000. The package includes the support library and XFR, a utility that can transfer object files or text files between RSX and VERSAdos.

The cross-compiler includes, as an option, a concurrent programming package that allows user code to run without an operating system on the MC68000. The option allows concurrent programming in standard Pascal, using monitors and predefined “primitives” to synchronize concurrent processes. The package allows true priority scheduling and the ability to write device drivers in Pascal. Sources are included. A PDP-11 stand-alone system is scheduled for release later this year.

PRICE LIST FOR PASCAL-2 MC68000-RELATED PRODUCTS

(OEM discounts available according to volume)

The cross-compiler development system: a cross-compiler that resides on the RSX operating system and generates code executing under the VERSAdos operating system on the MC68000; MC68000 support library; a data transfer utility; and a native RSX compiler that includes an interactive source-level debugger, a profiler, and other utilities.

Price: $5950 for the cross-compiler package data transfer utility: $7950 including the RSX native compiler and RSX utilities.

The native development package: a native VERSAdos compiler, an interactive source-level debugger, a profiler, and other utilities running on VERSAdos.

Price: $5950

The stand-alone package: allows concurrent programming in standard Pascal, using monitors and predefined “primitives” to synchronize concurrent processes. Includes sources. Offered only as an option to one of the packages above.

Price: $2,000 (internal use only); $3,000 (includes right to distribute as part of user code).

NEW DEC-ALIKE MINI WHIZZES IN FOR DEXPO

(Booth 805)

An LSI-11 based minicomputer, which has a disk transfer rate three to five times faster than the industry standard, will make its debut performance at DEXPO WEST ‘82 in December.

Venue for this second National DEC-compatible exhibition is the Anaheim Convention Centre in California, December 7-9.

The super-fast mini is the competitively priced Spectrum-Eleven, designed and manufactured by Webster Electronics Inc., which has offices in New York and Sunnyvale, California.

In designing his Spectrum computer range, Webster Electronics’ President, Mr. David Webster, has spurned the familiar paths taken by the “Me Too!” DEC-compatible mini-makers, and undertaken a revolutionary re-vamp of classic LSI-11 architecture.

Mr. Webster uses the LSI-11 as the central processor in the unit, but in addition has added his own innovative I/O processor (referred to as the GPMI, or General Purpose Multiple Interface) which bypasses the central processor for simple housekeeping tasks and links directly via an independent memory bus to the interfacing hardware. This frees the CPU (Central Processor Unit) for its major function of fetching and executing useful instructions.

The Spectrum display at Booth 805 at DEXPO will feature two recently released major models from the range - one, a Spectrum-Eleven JM, a one Megabyte memory computer with 132 Megabyte Winchester storage and a removable 40 Megabyte streaming Magnetic tape, all in a waist high system cabinet. Disk access performance of this model is optimised by use of high-energy voice coil head positioners and 3100 rpm brushless direct drive spindle motors. Blazing disk transfer rates in excess of 1 Megabyte per second are preserved direct to memory by use of an independent memory bus and transparent I/O processor.

The second model to be demonstrated is the Spectrum-Eleven GC, a desk top mini, which has eight inch fixed Winchester disk storing 30 Megabytes with a floppy disk back-up of 1.26 Megabytes. As with the JM, transfer rate is one Megabyte per second.

Application software abounds for all manner of accounting, financial, manufacturing, scientific, engineering, graphic, word processing, database or educational use! While compilers or interpreters exist for nearly every computer language.

Programs written especially for demonstration at DEXPO WEST ‘82 will reveal the significant disk data transfer acceleration of the Spectrum through special comparative tests sampled on the terminals at the booth.

These will not only highlight the speed of the Spectrum, but will show how with the addition of more than four terminals (Spectrum GC will accommodate up to 14 and JM, up to 16 users), the system may be extended without a dramatic loss of individual user power.

Webster Electronics is a 12 year old company which started as an electronics consultancy, and began producing a DEC-based range of minis in 1977. The first
machines were floppy-disk computers, graduating to Winchester technology with the introduction of the 8" fixed disk at the end of last year.

The company has an international clientele among its installations which includes the United States, Australia, South East Asia and People's Republic of China. (There are four Spectrum boards based in Peking running educational software to train programmers and operators.)

What then is the key to Spectrum's success—or, if you like, the philosophy behind the GPMI?

David Webster's inspiration for this additional processor came from an idea used in DEC's PDP-11/05, the PDP-11 introduced in 1972, now superseded. In this model DEC had worked into the processor microcode the emulation of a switch panel, a console light display and a console terminal interface.

David perceived that the idea could be taken a lot further by using a separate microprogrammed slave I/O processor which could emulate the presence of a far wider range of peripherals and take over considerable control of input/output functions.

While DEC has withdrawn the 11/05, the concept of limited peripheral emulation has been retained in later PDP-11 models. The idea was not, however, developed into a separate slave processor running alongside the central processor.

This concept was the exclusive brain child of David Webster, and as he points out, because the slave processor does not have to fetch and execute instructions, it has ability to handle a wider range of peripherals and I/O functions.

The original Webster I/O processor consisted of two boards which were built in alongside the LSI-11 in the early floppy disk model Spectrums launched in 1977. This processor handled the memory, floppy disks, card reader, line printer, two serial lines and bootstrap.

When the first fixed 8" Winchester Disk Spectrums were launched last September, a second I/O processor board was added to the existing two, the latter of which had been specially designed to handle the fixed Winchester disk, and a yet to be-announced cartridge tape drive. In the latest J/M models 4 Webster GPMI boards run alongside the LSI-11 central processor.

The GPMI provides its own high speed direct memory access connection to the Winchester disk, allowing transfer rates many times greater than the limiting bandwidth of the Q-bus. DMA efficiency is enhanced by avoiding CPU and bus latencies.

The GPMI arbitrates all contentions for device and memory access, and handles dynamic memory refresh. It continuously polls all devices for interrupt requests, and arbitrates and manages the interrupt process.

Component count, interconnection count and power dissipation are all better than halved by generalising and combining the interface logic, so improving reliability over discrete interface designs.

The presence of the GPMI is transparent to programs running in the LSI-11, and imposes no significant overhead on normal program execution.

Operating systems supported by the configuration include RT11, TSX, TSX plus, RSX and UNIX. For further information: — Webster Electronics Inc., Suite 620, 1 North Broadway, White Plains, N.Y. 10801. Mr. Paul Karchawer.


NEW VERSION OF CARE/DM SYSTEM OFFERED AT DEXP0 WEST

Springfield, IL — A new version of the CARE/DM SYSTEM, a software package for medical and dental office management, will be exhibited at DEXP0 West, the Second National DEC-Compatible Exhibition, Anaheim Convention Center, December 7-9, 1982.

Formerly limited to operation only with the PDP/11 family, the CARE/DM SYSTEM has been modified for use with VAX processors. The new operating capability allows implementation by a broader range of DEC users, time-sharing firms and packaged software distributors. Designed to operate in both RSTS/E and VMS environments, the package is programmed in BASIC plus 2 and VAX BASIC languages.

The CARE/DM SYSTEM is a total administrative management system for physicians, dentists and group practices. It manages patient information registration, service recording, billing, insurance processing, scheduling/recall, collection management and patient history.

Package pricing is determined by hardware size. Owners of large systems with greater earning power pay the regular price for the software while discounts are offered to users with smaller systems. Pricing ranges from $9,950 for the PDP11/23 to $39,500 for the VAX 11/780. Care Information Systems, Inc. offers complete installation, training and service and also serves as a DEC OEM.

For further information, contact Ernest
PROSYS 1 MONITORING AND CONTROL SYSTEM
TO BE DEMO'D AT DEXPO/WEST
PROSYS 1, from ADAC, knows it's a data acquisition and control system, and a very good one at that! Visitors to Booth 427 in Anaheim can watch several versions of up-and-running PROSYS 1's demonstrate their dedicated, single-minded, easy to use data acquisition and control capabilities.

Combining a DEC LSI-11/2 or 11/23 microcomputer with cartridge tape or floppy disc storage and a choice of ADAC's microcomputer with cartridge tape or floppy disc storage and a choice of ADAC's high quality LSI-11 Bus enclosures, PROSYS 1 fills the gap between expensive mainframes and conventional programmable controllers. With its very simple language PRO software package, PROSYS 1 is already programmed as a multi-tasking system that needs minimal programming for most monitoring and control applications.

Even the PID algorithm is part of the intelligence built into the software, filling out simple specification blocks is all that is necessary to direct PROSYS in how to perform the majority of monitoring and control functions. Offering screw terminal access, PROSYS 1 handles high level and low level analog inputs and optically-isolated discrete I/O, including pulse counting, pulse train outputs, contact closure sensing, and switching of 24-28 volts DC, and of 120-240 volts AC.

PROSYS 1 approaches turnkey ease for the user and provides the most powerful performance in its price range. With more than 1000 variations of PROSYS 1 available, the optimum configuration for each application is assured.

FOR IMMEDIATE ACTION
DEXPO 82 in Atlanta secured more industry press for exhibitors than any other computer show short of the giant NCC and Comdex exhibitions. It came through hard work and pre-established channels set up by Expoconsul.

RSTS PROFESSIONAL . . .
... Will pick up DEXPO WEST exhibitor press releases as editorial policy dictates for its October issue. Press releases should be sent to arrive ASAP to: Ms. Helen Marbach, RSTS Professional, Box 361, Ft. Washington, PA 19034, (215) 542-7008.

WHY SYSTEMS RELEASES DECISION SUPPORT TOOL FOR DEC COMPUTERS
Redmond, Washington — A new decision support system has been released by WHY Systems Inc. The DIGICALCTM package was designed for Digital Equipment Corporation computers, and is currently available on VAX using the VAX/VMS operating system and on PDP-11 systems running under RSTS/E or CTS-500.

DIGICALC is an interactive, CRT-oriented planning and forecasting tool used by accountants, engineers, managers, executives, scientists and others who want to automate their number processing needs. Both simple and complex numeric calculations can be quickly and easily performed, giving the user more time to work on other matters.

"Increased productivity is the key," said Wayne Yarnall, President of WHY Systems. "DIGICALC is designed to give key personnel the answers to complex problems quickly, so that they can make important decisions with the best possible data at their fingertips." Yarnall added, "An investment in DIGICALC gives your top people additional leverage, and it has a payback period that can be measured in days or weeks, not months or years."

The most common uses of DIGICALC are for budgeting and financial modeling. An accounting worksheet is displayed on the video screen. A simple model might consist of budget descriptions down the left-hand column, headings for twelve months across the top, with totals for each month, and cross totals for each budget category. Data can be entered directly onto the screen by the user, or it can come from an external source such as an existing General Ledger system on the same computer.

In a modeling session, any of the factors that make up the model can be changed, and the entire model can be immediately viewed from the new prospective. This "What if" capability is especially helpful to the business manager. The manager can say "What if sales drop 3.8 percent, and inflation increases 1.2 percent per month for the next six months?"

The new scenario will be displayed, and the results are available to continue the modeling process. Worksheets can be prepared for individual departments, and can be consolidated into divisional and organization-wide models. After all the interactive modeling is complete, DIGICALC will print reports that can be used throughout the organization.

The development of the DIGICALC electronic spreadsheet system was heavily influenced by real-world users. More than 150 companies purchased the earlier version 1.0 prototype of DIGICALC and began using it to meet their planning needs. Computer based instruction modules allow a new DIGICALC user to learn modeling techniques in a single lesson. As many as 70 users on a single computer can be trained to use the modeling system, and their responses have shaped the released product. "Our users have made DIGICALC version 1.1 into the full modeling package that it is; without the enhancements they have requested, we'd just have an ordinary electronic spreadsheet program," said Yarnall.

DIGICALC is used by banks, accounting firms, engineering companies, schools, manufacturing plants and marketing organizations. The most common user of DIGICALC is manager or executive using a hands-on approach to computer assisted management. The most avid and effective users are those that have oversight responsibility for computerized applications, but haven't had any tools available to assist them in their budgeting and forecasting work.

The product can be used effectively in any environment with the proper operating system. DIGICALC is completely self-contained, and no extra-cost system hardware or software options are required in order to use it. Facilities for transferring data into and out of DIGICALC for use with other computer applications are provided.
WHY Systems, Inc. specializes in the development of software for DEC computer systems. Its offices are located at 16902 Redmond Way, Redmond, Washington 98052; telephone (206) 881-2331.

XYLOGICS TO DISPLAY COMPLETE PRODUCT LINE AT DEXPO WEST

Burlington, MA — XYLOGICS announced today that it will show-off its complete product line in Anaheim, CA, December 7-9, 1982, at the popular DEXPO West '82 Trade Show.

XYLOGICS manufactures Peripheral Processors interfacing to Digital Equipment Corp.'s Q-Bus/Unibus; Intel's National's Multibus; and Data General's I/O Bus computer systems. Generally, XYLOGICS intelligent controllers provide a wide range of drive interfaces, i.e., SMD, ANSI, Priam, Pertec (Tape); and include a variety of emulations which give users more flexibility in configuring systems.

For the convenience of its customers, XYLOGICS carries a multitude of drives specially integrated to its Peripheral Processors. The newest line of XYLOGICS STORAGE CELLS combines state-of-the-art disk and tape storage technology in space saving cabinets. The XSC100 Series provides up to 320 megabytes of on-line disk storage for PDP-11 and VAX-11 computer systems via one or two Windchdsk disk drives interfaced to the host computers through XYLOGICS Model 650 Emulating Peripheral Processor. The 672 Emulating Peripheral Processor controls a 1/2" streaming tape drive which also operates in a conventional start-stop mode. This compact design is packaged in one 40" high cabinet and is DEC software compatible.

The XSC200, XSC220, and XSC240 Series is a complete subsystem with several different combinations of Winchester disk capacities and cartridge tape if required, packaged in an attractive steel box measuring 24" deep x 16-3/4" wide x 5-1/4" high. The host computers are interfaced through appropriate XYLOGICS Emulating Peripheral Processors.

More than just a subsystem. . . The "XL" Series of SOFTWARE SAVER SYSTEMS is a complete functional package including a DEC LSI-11 microprocessor, memory up to 4 megabytes, Q-Bus backplane, Winchester disk and cartridge tape, with eight pre-wired RS232 ports. Software is provided for RSX-11M to support 22 bit addressing.

XYLOGICS will be located at Booth #212 — ready, willing, and able to give you in-depth details on its complete product line.

DISC AT DEXPO

Sacramento, CA — DBL is a business-oriented programming language which provides users of PDP-11 and VAX computers with portability, increased programmer productivity, and efficiency of operation. DBL is a much extended superset of DEC's DIBOL-11 but can accept virtually all existing DIBOL-11 sources unmodified. The extensions in DBL include structured programming facilities, source library "include" capabilities, self-contained ISAM file structures, auto-load shared runtime support, and intermodule "global" data storage features. The DBL Symbolic Debugger permits immediate debugging of DBL programs without special advance preparations. The DBL ISAM facility is tree-structured and self-reorganizing. Reorganizing includes declaration of unused index and data entries thus greatly minimizing the need for frequent file reorganizations. Portability of DBL programs is of paramount concern. Currently spanning all of DEC's major operating systems, DBL is now being developed for non-DEC environments so as to provide the widest possible choice of hardware and systems for the DBL users and distributors.

The product will be on exhibit for the first time by DISC at DEXPO WEST '82, the Second National Dec-compatible exhibition, Anaheim Convention Center, Anaheim, CA, December 7-9, 1982.

"TWICE-THE-LIFE", 8" DUAL-SIDES, DUAL-DENSITY FLOPPY DISKS FOR DEC'S Q-BUS*

The FD4 Two-Megabyte Floppy Disk System from Synemed, Inc., offers twice the MTBF, twice the media life of other systems and a happy solution to the threat of critical data losses!

Based on NEC's reliable Soft-Touch** drive, this competitively priced dual-sided, dual density disk system provides Q-Bus* users with a superlong MTBF of 15,000 hours (compared to an average of 8,000 for other drives) — and the FD4 is the only system with air-cushion protection to extend media life.

A unique air damper at the base of the head-loading mechanism eliminates the pinching, or biting of disk surfaces that leads to the excessive wear and information drop-out common to other double-sided floppy disk systems. Now, even in those applications where data loss is most critical, media wear and its associated costs can be cut dramatically without jeopardizing data integrity.

Pluggable in half-quad slot and completely transparent to DEC RX02 software, the FD4 runs DEC's ZRDBD diagnostic and looks like a double size RX02 with 1962 formatted blocks per disk.

Please direct inquiries to: (Dexpo/West 82 — Booth 606) SYNEMED, INC. 1215 Fourth Street, Berkeley, CA 94710, Attn: Kevin Miller.

*Trademark Digital Equipment Corp.
**Trademark NEC Information Systems, Inc.

SOFTWARE CORPORATION AT DEXPO/WEST

Current software development and maintenance practices are expensive, difficult to manage, and produce products of inconsistent quality. There is much room for improvement!

At Softool Corporation we have created SOFTOOL® which is an integrated environment for the cost-effective management, development and maintenance of quality software. Order of magnitude productivity improvements can be attained with SOFTOOL®. SOFTOOL® is available, off-the-shelf, for different computer systems and for different programming languages.

The software life-cycle process involves four main phases. They are:
Requirements
• Design
• Programming
• Change and Configuration Control.

SOFTOOL® is composed of four component environments which correspond to the four principal phases of the software life-cycle. Each environment represents an integrated methodology and supporting software tools, and each is part of an integrated whole. These environments are:
• Change and Configuration Control Environment
• Programming Environment
• Design Environment
• Requirements Environment

Please note that these environments are being made available in a sequence that allows a user to put in place, in a pragmatic manner, a comprehensive software support facility. The Change and Configuration Control and the Programming Environment are currently available, off-the-shelf, for a growing number of different computer systems. The Design and Requirements Environments are forthcoming products.

All programming language dependencies are confined to the Programming Environment. We currently support, off-the-shelf, two distinct versions of the Programming Environment: Fortran and Cobol. The other three component environments are independent of the programming language in which the user’s source code is written.

SOFTOOL® is currently available, off-the-shelf, for the Digital Equipment Corporation VAX computer.

SOFTOOL® can be procured directly from Softool Corporation or from Digital Equipment Corporation.

ZIA CORPORATION INTRODUCES BACK/REST VERSION 1.1

BACK/REST, the software package that utilizes diskettes to back up larger devices is now available for OEM and end user distribution from Zia Corporation.

Zia’s latest utility fills an industry need by providing a low-cost and effective means of utilizing small back up devices. This is accomplished by allowing files to cross volume boundaries, permitting backing files larger than the back up device. (For example, a 1500 block file on an RL01 could be backed to RX01 diskettes.)

Users are thus spared from abandoning scores of small disks they already possess, saving themselves money by not having to buy larger replacements.

While many users are targeted for the product, Glenn Burnett, president of Zia Corporation, expects initial response from owners of Winchester’s and other non-removable drives. Files can be moved between any two access devices which include such systems as RX01/02, RX01/02, RX05/06/07 and TUS8 among others. In addition to allowing full use of PIP style wildcards on either backup or restore, BACK/REST also permits INCLUDE, BEDORE, SINCE AND VERICY in the same operation.

Also, NOREPLACE is provided in the RESTORE function which gives the user tremendous flexibility in backing files.

“THE SINCE command is very useful in updating our end users because all files since the last update can be quickly copied for distribution,” Burnett explained.

BACK/REST incorporates both syntax checking and interactive prompts keeping the package efficient and easy to use.

Occupying only 2Kw allows use of available memory for I/O buffering, resulting in a fast operation, limited only by the transfer rates of the devices involved. Command file execution is also supported, and the DIRECTION function allows the user to output a single or partial directory of the backed volumes to any device.

BACK/REST also minimizes the time needed for back up: while files are being moved to DY1, diskettes can be changed in DYO. BACK/REST itself prompts the operator to make the volume change.

For more information on BACK/REST contact Glenn Burnett, P.O. Box 351, Morris Plains, N.J. 07950 or call (201) 328-7177.

RIFLE

RIFLE, an interactive file transfer system has been announced by Zia Corporation. RIFLE allows users to establish their own file transfer and communications network.

Glenn Burnett, president of Zia, said RIFLE is especially useful to OEM’s or anyone with multiple remote sites which require timely support from a central location. Also, users with more than one CPU on site can utilize the “peripheral sharing” feature of RIFLE which allows access to any peripheral on another system. RIFLE’s “permission” command allows access to either specified files or file types for write/read or replace operations.

RIFLE requires only a single DLV11 type serial line, and can operate at up to 9.6K baud, either locally or over remote communications lines. All error checking is handled internally by RIFLE.

Utilizing a queue technique developed by Zia, RIFLE is capable of executing up to six simultaneous operations between two systems. RIFLE can operate as a background, foreground, or as a system job. RIFLE may operate interactively or unattended through use of RIFLE command files. All RIFLE operations, as well as errors, are logged in an audit trail, which may be directed to any device.

One application of RIFLE is to permit an OEM to update all remote users via 300/1200 baud dial-up lines. Any type of file can be transferred to or from the remote computer through instructions issued at the OEM’s request.

Another use of RIFLE is to “share” peripherals between two CPU’s at the same site. The CPU’s can be connected directly to operate at 9.6K baud. Either CPU can transfer files to the other peripherals. Especially useful if one system has a letter quality printer and floppy disks, while the other has a high...
speed printer and 5/10 Mb disks.
RIFLE is available for multi or single sites. Multi-site licenses are $2,500 and include the right to produce remote-site copies as required. Single-site licenses at $600 are for a single CPU only (quantity discounts are available). For further information, contact Zia Corporation, P.O. Box 351, Morris Plains, New Jersey 07950 (201) 540-9341.

NIS Introduces Pascal-Plus and PRES

Accent R is a high productivity development tool allowing computerized information management applications to be developed in a fraction of the normal time. Accent R's combination of a relational DBMS with a non-procedural query language and a 4th generation high-level structured programming language makes immediate and direct access to information a reality for strategic planning, decision support, and information management on DECsystem-10 and -20 computers.

VUE is an interactive project management system that provides a convenient tool to plan and manage complex projects. VUE performs critical path analysis for projects with up to 3,000 activities. VUE performs very well in environments where multi-on- and/or off-site users need program access. The menu-driven user interface allows easy data entry, modification, and report selection. VUE runs on DECsystem-10/20, HP3000, VAX, PDP-11, and Perkin Elmer. Reporting is done on CRT's, printers, or optional graphics plotters.

Pascal-Plus is a production oriented compiler for DEC-10 and DEC-20 users, developed for the serious Pascal implementor. Pascal-Plus extends standard features, removes many of the arbitrary restrictions appearing in standard Pascal versions, and utilizes an advanced optimization design. New features normally occurring in languages such as ADA, FORTRAN, and ALGOL, have been added to increase programming power and flexibility. The Pascal-Plus compiler produces code that is 30-40 percent more compact than most standard compiler versions, with a corresponding increase in processing speed. Pascal-Plus is an interactive personnel resource management system. PRES provides record keeping and record tracking for all employees, including such features as job history, benefits administration, compensation, and salary history, special government requirements, such as affirmative action reports, are met, as are regular corporate needs. PRES offers a powerful reporting function. This menu-driven system allows easy data entry, modification, and report selection.

Dave Bray (PRES), Joe Rizzo (VUE), and John Enyedy (Accent R, Pascal-Plus) will be representing National Information Systems at booth #432, waiting to demonstrate the power of these products.

Dave Bray (PRES), Joe Rizzo (VUE), and John Enyedy (Accent R, Pascal-Plus) will be representing National Information Systems at booth #432, waiting to demonstrate the power of these products.
PRESS RELEASES

VERSATILE CUPID — A SOLUTION TO REDUCE APPLICATION DEVELOPMENT TIMES AND CUT COSTS

Leicester, England — Most managers of costly computer development projects know the problems of achieving development deadlines. Projects that report satisfactory progress for long periods suddenly start slipping a week before implementation and can continue to do so for a considerable period of time. There can be many factors that contribute to the escalation of cost and extension of deadlines.

One factor is the conventional approach to developing commercial applications in high and low level languages. Writing a lot of programs in languages is time consuming, hence software becomes expensive even if one can solve the problem of recruiting the ideal technical staff.

Then there is the problem of software maintenance which, to most managers’ dismay, consumes a significant proportion of their staff time.

As a result, a number of applications development aids were developed by various software vendors to reduce project costs and increase technical staff productivity.

One such product is CUPID, developed by TUBS and used in every application developed by TUBS and software vendors and end users who have access to CUPID.

CUPID is an application management system, software development aid and Data Base Management System which in its basic form contains sufficient artificial intelligence to enable users to develop interactive applications. Users are able to quickly and easily generate the format of interactive screens to accept and validate the data, define the processing of the information through the database and format complex reports. CUPID also generates its own technical documentation.

CUPID is user friendly and very English-like.

CUPID allows a developer of systems on DEC computers to maximise the effectiveness of designing, writing, debugging and monitoring application software. The use of CUPID yields significant savings in reduced development time (up to 75% in some applications) and reduced maintenance and enhanced activity. This development tool can be used on a broad spectrum of DEC based systems using any of the following operating systems: RT11, CTS 300, TSS plus, RTSTF, CTS 500, RSX11/M, VAXVMS with either DIBOL or DBL runtime system.

CUPID is aimed at all EDP organisations who are designing, writing, monitoring and enhancing application systems. CUPID leads you through a series of simple steps to define your data files, your screen formats for data entry and your report formats for management analysis. CUPID uses multi-indexed files, and all your housekeeping functions are in-built and automatic. There are basically three aspects to CUPID:

1. File Definition: in this phase one defines the file layout, totalling requirements, selection criteria and report sequences. Features for multi-file update provide necessary maintenance routines.

CUPID allows the user to design and structure multi-level user menus. All functions within the system are defined in simple, conversational mode. As your requirements grow you can amend all aspects of CUPID as easily as you defined them.

User comments to date are extremely favourable. A software consultant commented, “We built a specialised stock control system . . . in less than two hours we defined the files and data defined five data entry screens and wrote four batch reporting programs . . . this would have taken us at least a week using standard methods.”

Other users have commented that where up to four technical staff would be necessary to develop an application using conventional methods, only one was employed to develop an application using CUPID.

Listed below are some CUPID based applications developed by TUBS and other software vendors and end users:

- Fully Integrated Accounting Systems
- Payroll
- Stock Control
- Sales Order Processing
- Farm Management System
- Bill of materials and Production Control
- Asset Register
- Barley Purchase to Malt Production
- Time Recording/Project Control
- Estate Agents
- Mailing
- Student Records Administration
- Financial Ledger Development
- Investments Administration
- Live Stock Market Auctioneers
- Animal History
- Expense Analysis
- Dye Recipe System
- Plant Hire Systems
- Wines and Spirits Wholesale Distribution
- Accounting System

If you are having problems with development deadlines or planning new developments, CUPID could be your solution. For further information on CUPID application packages or an estimate for your applications to be developed by our own experienced staff, contact Avadear Sinappan or Jeremy Lowden at TUBS, 30 New Walk, Leicester. LE1 6TW. Telephone: Leicester (0533) 551410.

ADAC LSI-11 SOFTWARE ENHANCED TO SUPPORT UNIBUS

Woburn, MA — The highly-successful ADLIBRT data acquisition and control subroutine software library for use with ADAC’s extensive line of LSI-11 bus interfaces operating under DEC RT-11 has been upgraded to also support Basic and Fortran with ADAC’s analog I/O boards for the PDP-11 Unibus systems. The boards supported include three 12 bit, high level input, A/D converters and a 12 bit 4-channel D/A output converter.

The ADLIBRT flexible, real-time software package features 15 callable subroutines in easy-to-understand basic or for novice programmers while providing enough power for sophisticated users. Operating in single job or foreground/background environments, ADLIBRT is fully DEC RT-11 compatible and is an excellent tool for rapid program development for R&D, scientific, process control and similar applications.

The supported A/D converters are the 100 KHz Model 600/11AD and 35 KHz Model 635/11AD which are input protected to +15 volts, and the 20 KHz Model 635/11AL with protection to +40 volts and special filtering to minimize noise interference. Multiple, stoppable input ranges are standard.

All three A/D boards are equipped to facilitate DMA and can be populated with up to 32 differential inputs or 64 pseudo differential or single-ended inputs. Other options include up to 4 channels of digital to analog output, and programmable gain with automatic zeroing.

The Model 600/11DA board contains four high-speed, 12-bit digital-to-analog latched converters, has a programmed pulse circuit for scope control and offers optional third-wire sense detection.

All other ADAC LSI-11 Q bus interfaces can be cable connected to invisibly front end Unibus through the use of ADAC’s Model 1900 Translator board. In this mode, ADLIBRT customers can handle the complete range of LSI-11 analog-digital-analog functions including analog high level, low level and thermocouple inputs as well as all of ADAC’s discrete I/O boards for LSI-11.

ADLIBRT Software Library is available on floppy diskette, hard disk or tape cartridge media complete with user manual and both source and object codes at a low $395.00 one-time, no-license-restriction cost to ADAC customers.

ADAC also offers a library of subroutines fully compatible with DEC RSX-11M.

ADLIBRSX similarly supports all of ADAC’s LSI-11 and Unibus interfaces as callable subroutines in Basic and Fortran, plus supporting Pascal and providing I/O drivers for Macro 11 programmers.

ADAC ADLIBRT subroutine software has been heralded by users as the most successful, bug-free LSI-11 bus interface library on the market.

For more information, contact: Mr. Ben Minsk, ADAC Corporation, 70 Tower Office Park, Woburn, MA 01801, Phone: (617) 935-6668, Telex: 949329.

NEW ASYNCHRONOUS SERIAL INTERFACE FOR LSI-11 COMPUTERS, INCORPORATES THREE DIFFERENT INTERFACE CIRCUITS AND PRINTS THE BUSY DETECTION

Orange, CA — A new asynchronous serial interface for LSI-11 computers, from MD8
Systems, Inc., the world's largest independent manufacturer of interface products, offers complete DEC DLV11-F compatibility plus the advantages of a unique "buffer ready" signal capability and RS-422 interface circuitry. The buffer ready monitor increases computer throughput when used with printers that do not provide X-on/X-off protocols, or the software does not monitor these protocols.

Printer Busy monitor circuit in the EIA modes. This feature allows connection to a variety of economical serial interface printers such as the TI810, Centronics 704 or Teletype 40 — printers which present the transition of a buffer-full status line from a SPACE (+12VDC) to a MARK (-12VDC) when the printer buffer is full and no further data should be sent. The Buffer Ready circuit allows the printers to be run at maximum speeds with no danger of buffer overrun. The RS-422 capability allows placement of printers, Video Display Terminals or other devices with corresponding circuitry at distances up to 4000 feet from the host computer.

Also unique to the MKB interface is the availability of four levels of priority interrupts (as compared to one level for DEC DLV11-F) which allows the assignment of priority to high speed devices. The MSL-72V1-FX offers a serial EIA-RS-232C/CCITT V.24, 20 MA current loop, as well as an RS-422 interface. baud rates are programmable and switch selectable from 50 to 19,2K baud. Also switch selectable are the Word Character Format, the Address and Interrupt Vectors.

Price: $385.00 in single units; Delivery: 30 Days ARO. Domestic list price is $1850 for the basic eight-line multiplexer. At approximately $100 per line, this gives the user DH class DMA performance at DLV11-J prices.

ABLE is the world's largest independent supplier of enhancement interfaces for the VAX, PDP-11, System 20 and LSI-11 series of computers. Since 1976, the company has manufactured an extensive line of communications, general-purpose products, all of which are hardware compatible with and software transparent to the host machine. They are supported and serviced worldwide with offices and plants located throughout the United States and Canada, as well as in England, Germany and Puerto Rico. ABLE also manufactures the MAGNUM™ series of computer systems.

WORD PROCESSING SOFTWARE RUNS ON DEC SYSTEMS FROM LSI-11 TO VAX

Pricing for standalone systems (the standalone has its own operating system and runs on 311PDP-11 including the MINC, MINI-MINC, and PDT; $2200, with user written subroutine-like operations. A menu driven system, CT*OS has been shown to be easily learned by non-DP personnel, and provides a smooth transition from manual to DP operations. Functions include global search and replace, cut and paste files, list processing, ASCII file handling, 132 column document width, stored text libraries, right justified margins, sub and superscripts, centering, automatic pagination, and a powerful nesting arrangement of user defined keys to invoke user written subroutine-like operations. Scheduled for release next quarter, are onboard math operations, calendaring, electronic mail, communications and text versions. RT-10 provides a complete set of tools for handling your own applications, with an easy-to-use interface.

At present, CT*OS is available on DEC "300" and "500" series of computer systems.

According to STI Vice President Dr. Larry Pfeifer, "There is a very strong demand for ILS overseas, as indicated by the level of international sales that we've enjoyed without having physical representation in foreign countries. With the appointment of these overseas representatives, Pfeifer continued, "we will be able to more fully respond to the international interest that has been expressed for our ILS package."

Dr. Pfeifer also noted that the new representatives will be able to provide on-site demonstrations and video tape presentations of the software system.

Over 200 installations use ILS in a variety of technologies including: noise and vibration, biological, acoustics, speech, sonar, radar, seismic and simulation. Used with a variety of computers and graphics terminals, ILS features include pattern analysis, digital filtering, signal editing, 3-D displays, coherence, FFT/IFFT, modeling, correlation, convolution, signal displays and spectral analysis.

STI was founded in 1977 and is a leader in signal processing software development, VAX/VMS high performance database systems, VAX/VMS job accounting software, and nationwide computer timesharing services. STI is located at 5951 Encina Road, Goleta, California 93117, (805) 683-3771 or outside California call toll free (800) 235-5787.

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DH-CLASS PERFORMANCE NOW AVAILABLE ON -11/23 SYSTEMS

Irvin, CA — ABLE Computer announces ABLE Q/DHM, a microprogrammed asynchronous controller which makes DH-class performance possible on the PDP-11/23 and LSI-11/23 based systems. ABLE Q/DHm is the first DMA communications multiplexer ever made for -11/23 based systems. It connects any standard Q-Bus to as many as 16 asynchronous communications lines with DMA output capabilities.

The DMA controller provides significant system throughput improvements over interrupt-driven devices, according to Ray Ball, Director of Marketing. He said, "The DMA output means that the processor does not need to process an interrupt for each character, but for a whole block of characters at one time. By using word output transfers, our new multiplexer really does allow optimum Q-Bus utilization."

ABLE Q/DHM is fully software transparent to DEC established drivers for the DH11 and DM11, making modern control standard on all lines — available for use when needed. The new controller also provides interface and signals conforming to EIA RS-423 and is compatible with and software transparent to DEC LSI-11, PDP-11 and VAX systems.

Written entirely in MACRO-11 machine language for efficiency of memory usage and processing speed, CT*OS presents a minimal overhead load for simultaneous WP/DP operations, both in single and multiple station (up to 90) configurations. For example, a single station system requires 56Kb of memory.

Both DEC VT-52 and VT-100 intelligent terminals, as well as a wide range of letter and draft quality printers: Diablo, NEC, Qume, Sanders and DEC are supported. German, French and Dutch language versions are available.

The software runs on DEC systems from LSI-11 to VAX, the standalone is now available in Version 4, making it one of the more powerful WP packages on the market today. It is available to run under a variety of operating systems, including its own operating system for single terminal use, RSTS/E, RSY-11 and VAX/VMS; thus allowing it to operate in the full range of DEC LSI-11, PDP-11 and VAX systems.

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DISK PACK REPAIR SERVICE

Lorton, VA — Crashed or damaged disk packs can be returned to a condition equal to new at considerable savings over replacement costs.

Precision Methods, Inc. offers complete refurbishing service for most types of removable disk packs. This service includes disassembly, replacement of platters, balancing, burnishing, servo-writing and electronic analysis. Packs can be returned standard or flag-free and carry a new pack warranty.

DEC products repaired include: RM03, RM05, RP06, RP04, RP02, RK05, RL01 and RL02.

Precision Methods, Inc. is a nationwide organization. Corporate Headquarters is at 8825 Telegraph Rd., Lorton, VA 22079-0228, (703) 339-7050.

ADAM

Wrentham, MA — Adam, Advanced Data Accessing Method, is a substitute for Digital Equipment Corporations Record Management Services (RMS).

ADAM is based on the principle of data independence. It allows the same collection of records to be accessed in several different ways simultaneously (i.e. hashed, link, ISAM). Allowing for this, total freedom is afforded a programmer to choose the best access method for any given program rather than being restricted to a single method.

ADAM is a structured set of procedures and utilities which allows the full use of the concept of data independence. By including within a program only those procedures required for an application, ADAM will take less code than traditional methods.

ADAM utilities allow complete access and maintenance of files, records and data. Through its utilities, a programmer, operator, or privileged user can create files, create new accessing paths, maintain records, check on the status of files and their structure, or access a data base without creating special programs for each task.

A Data Dictionary, Sort and Report Writer are also included.

ADAM is aimed at the CTS-300, CTS-500, and VAX/DIBOL user community.

A distributor program is available to qualified firms.

For additional information on this and other products, contact Jon Springer at (617) 384-8681, or write World-Wide Computer Resources, Ltd., 15 Trafalgar Square, Wrentham, MA 02093.

NEWMAN HOTWIRE LISTS UNUSUAL VALUES

Ann Arbor, MI — The Hotwire is a monthly listing of top values in DEC and DATA GENERAL hardware from Newman Computer Exchange. Look to the bright yellow and red Hotwires for values unusual even for Newman Computer Exchange.

A/D CONVERTER FOR DEC PDP-11 UNIBUS

Woburn, MA — ADAC Model 635/11AL analog to digital converter system is designed to provide ± 40 volt common mode multiplexer protection plus optimized interference filtering for operation in noisy environments.

This 20 KHz standard size UNIBUS compatible board fits directly into a single slot of the mainframe of any DEC PDP-11 minicomputer. High speed sample and hold is also a standard feature.

The 12 bit Model 635/11AL can be populated with up to 32 fully differential inputs, or with up to 64 channels of single ended or pseudo-differential MUX input. Multiple stappable input ranges are standard. Programmable gain amplification, automatic zeroing, and provision for up to four channels of digital to analog conversion are optionally available.

Operating under program control, Model 635/11AL includes circuitry for program interrupt mode — DMA is optionally available and performs in conjunction with DEC DR11-B or DEC DR11-W. Flat shielded ribbon cable with connectors and clamps are furnished for analog I/O.

In addition to Model 635/11AL, ADAC offers the ± 15 volt protected 100 KHz Model 600/11AD and 35 KHz Model 635/11AD; and four channels of high speed 12-bit digital to analog latched conversion in Model 600/11DA.

This family of boards is supported via the ADAC subroutine libraries ADLIBRT and ADLIBRSX operating under DEC RT-11 and DEC RSX-11M.

For additional information contact: Mr. Ben Minsk, ADAC Corporation, 70 Tower Office Park, Woburn, MA 01801, Phone: (617) 935-6666, Telex: 494329.
load and full-load testing. Explained in the brochure, photos of troubleshooting and testing procedures, is that the Center’s capabilities include repair of PC Boards from Reliance® and Toledo® equipment plus AutoMate® Programmable Logic Controllers. Repair service is also furnished for computer and control equipment made by Digital Equipment Corp., Data General and GRI. Noted is that 10-day service is normal but emergency repairs can be made in 24 hours. Also described is the Reliance Electric parts exchange program for selected AutoMate CRT Programmable Controller components which gives users immediate repair service to minimize equipment downtime, and the AutoMate CRT Programmer Rental System for reducing programming costs.

To obtain a copy of the new Digital Products Repair Center Brochure — H-2661-2 — write to Reliance Electric Company, 24701 Euclid Avenue, Cleveland, Ohio 44117.

E.P.S., Inc. Announces the Availability of the “Decision Support Primer”


E.P.S. is the author of the powerful financial planning and modeling software system FCS-EPS which evaluates the comprehensive facilities in FCS-EPS, E.P.S. has created a manual which takes the user step by step through the modeling process and shows how to apply the facilities to real life situations. The manual is designed for use while at a computer terminal.

After using the Decision Support Primer, one should be able to understand the concept of a data matrix, and set columns or enter logic, data, and program specifications. The user will be able to calculate and list the matrix, create “boardroom quality” reports, and simple graphics, create and run command files and perform basic what-if analysis and file housekeeping. In addition, upon completion of the primer, the user will save and recall files, will be able to fully utilize various data modules and will understand the interaction between modules.

To order the Decision Support Primer, at $25.00 per copy, contact: E.P.S., Inc. One Industrial Drive, Windham, N.H. 03087. 603/898-1800. E.P.S., Inc. has offices in Atlanta, Boston, Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, Phoenix, San Diego, Seattle, and Tampa.

New Literature: Automatic Voltage Controls

Bristol, CT — New 32-page Stabiline® Automatic Voltage Control Bulletin SVC/1281 describes Superior Electric’s complete line plus a reference guide to voltage disturbances and solutions. There is also a handy glossary of electronic and voltage control terms.

Product ratings, specifications and descriptions include: AC Voltage Monitors having detachable detector modules that detect and record high or low voltage, sags, surges, impulses, common-mode noise and power interruptions; Line Conditioners that correct for high, low or fluctuating voltages, noise and transients, particularly for computers and other voltage-sensitive equipment; Transient Voltage Suppressors that isolate transverse-mode (line-to-line) noise on power lines; High Isolation Transformers that isolate equipment from common-mode noise generated by power consuming devices; and several types of Automatic Voltage Regulators that correct power line variations and maintain constant voltage to equipment.

For copy, call or write manufacturer The Superior Electric Company, 383 Middle Street, Bristol, Connecticut 06010. Telephone 203/582-9561.

Scientific Research Management Corporation Offers ‘Free’ Disk Pack Inspection, Cleaning Service

San Jose, CA — Scientific Research Management Corporation (SRMC), a third-party computer services maintenance organization, has announced a “no charge” disk pack inspection and cleaning service for all its contract customers.

Scientific Research’s new service covers ten disk packs per processor site with an annual charge of $25 for each additional disk pack above ten to be inspected and cleaned. All future new disk packs to be added to the service will also be subject to a $25 charge except those packs purchased through SRMC which are delivered pre-inspected.

“As far as we know,” explained John Poffenroth, SRMC’s Vice President of Software Services, “there is no other maintenance organization that offers such a free service to its customers.”

Poffenroth cited a widely circulated insurance industry report that “fewer than 7 percent of all companies that experience severe damage to their (computer) operations are in business five years after the loss.” He said the report indicated that while users know the value of their hardware, most have no idea of the total value of their storage media. Duplicating valuable company data on disks does little good, he added, if these disks are in any way faulty or degraded.

SRMC’s disk pack inspection service will help locate surface defects which could cause costly downtime due to head crashes, Poffenroth noted. After inspection, each side pack will be uniformly cleaned and identified for serviceability.

SRMC is qualified to service computer and peripheral equipment supplied by more than 15 different manufacturers, including Digital Equipment Corp. (DEC), Vax, Control Data Corporation (CDC), EMulex, Plessey, Printronix, Mostek and Motorola.

“Our service rates,” Poffenroth said, “are on the average fifteen percent lower than other comparable third-party maintenance organizations. One key reason we can charge these lower rates is complete computer automation throughout SRMC’s business organization, making us highly efficient and cost-effective.”

Besides providing third-party maintenance services for a highly diversified customer base of computer users throughout California, SRMC also buys and sells DEC minicomputer systems. The company was formed in February, 1980, and operates from a new leased facility in San Jose.

CP/M Capability for LSI-11’s

Natick, MA — Alloy Computer Products has announced a new CP/M-11 Processor that gives LSI-11 users the capacity to implement their choice of popular CP/M software at a fraction of the cost of a complete CP/M system by enabling the DEC LSI-11™ to run CP/M™ programs without modification.

Direct CP/M access to data files allows LSI-11 users to work freely with either CP/M or DEC file formats and performance equals or exceeds that of conventional CP/M systems.

With the Alloy CP/M-11 Processor, users simply insert single density CP/M diskettes directly into their DEC disk drives. The 5MHz Z-80 microprocessor executes programs independently of the LDI-11, which performs only the program directed I/O functions. Any required high speed data transfer is effected by a DMA interface through the LSI-11. To insure continued upward compatibility for future LSI-11 hardware/software revisions, the Alloy CP/M-11 Processor provides 22 bit extended addressing. For installation versatility, the CP/M-11 Processor permits a choice of multiplexed or dedicated operation through its auxiliary RS232C serial terminal port.

Packaged on a single dual size card with 64K of RAM, the Alloy CP/M-11 Processor is currently available from stock under RT™ and TSX-Plus™ operating systems, and will soon be offered for RXS™ and RSTS™ as well.

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**Alloy CP/M-11 Processor Features**

- CP/M Program Access to DEC Data Files
- CP/M Diskettes Can Be Run Directly On DEC Disk Drives
- 5 MHz Z-80 Based
- High Speed DMA Interface to LSI-11
- 22 Bit Extended Addressing
- Auxiliary RS232C Serial Terminal Port
- Currently Available Under RT and TSX-Plus
- Under Development For RXS and RSTS
CORTES ANNO UNCES COLOR BUSINESS GRAPHICS PACKAGE
Wellesley, MA — CORTEX Corporation is now marketing the new Executive Data Display System (CORTEX-EDDS™), a simple-to-use, device-independent, full-color business graphics software package to run on Digital Equipment Corporation’s VAX™ system. EDDS supports the DEC Professional computers and Hewlett Packard plotters as output devices.

The CORTEX-EDDS graphics option is an independent, interactive facility using English language commands to allow considerable power and flexibility in plot design and data manipulation. Existing data in standard file formats may be quickly transferred to CORTEX-EDDS, or data may be entered interactively. Data may also be transferred from other products.

Using a selection of fourteen different lettering fonts, CORTEX-EDDS transforms data into multi-colored line plots, high-low-close plots (up to ten variables per plot), scatter diagrams (supports several hundred observations per line or scatter plot), horizontal/vertical bar charts, and pie charts. Standard text may also be displayed in the variety of fonts that includes Roman, Greek, Italic, Gothic, and Script.

CORTEX-EDDS includes standard plot design templates which may be modified, yet enable quick production of presentation charts and graphs. In addition, custom-designed templates also may be created, saved, and restored for future use.

For all INFORM users who acquire CORTEX-EDDS, CORTEX also offers an invisible INFORM interface which passes information from existing INFORM databases for graphic representation. While both products complement each other, each may stand alone.

According to EDDS designer, Laurence Tympanick at Software Vision, “Our goal was to provide easy-to-use, powerful, flexible, high-quality graphics software at a reasonable cost. I think we succeeded.”

For additional information, please contact Mr. Kimball L. Mason at CORTEX Corp., 617-237-2304.

CONTEL TO MOVE RTFILE DBMS TO RSX OPERATING SYSTEM
Bethesda, MD — ConTel Information Systems, a subsidiary of Continental Telecom, Inc., has announced plans to release a version of RTFILE (R), ConTel’s proprietary relational data base management system, to run directly under DEC’s RSX-11M operating system.

RTFILE currently runs under DEC’s minimal real-time operating system, RT-11, and under RT-11 extensions, such as TSX-Plus, SHARE-eleven, and STAR-eleven, and the VAX, RSX, RSTS, and UNIX RT-11 emulators. ConTel has been evaluating new operating system environments for RTFILE, including UNIX, CP/M, and RSX-11M, for the past six months.

According to Robert C. Natale, Manager of ConTel’s Small Computer Systems Group, work has already begun on the project and the fully supported product will be available in January of 1983. Natale offered the following explanation for the decision to port RTFILE to RSX-11M:

“We made the decision to port RTFILE to RSX-11M, rather than UNIX or CP/M, primarily for three reasons: First, the path from RT-11 to RTFILE is a natural one and entails the least effort and risk on our part. We have an existing RTFILE user base of over 200 installations and this base provides an excellent pool of major reference accounts. The RSX-11M version of RTFILE will be an excellent product because the RT-11 version is a time-tested, field-proven product.

“Second, development of the RSX-11M version will lead directly to migration of RTFILE ‘downwards’ to DEC’s new personal computers the Professional 300 series, and ‘upwards’ to the VAX line. DEC is very well positioned for long-term dominance of the serious micro/min/midi market and it makes sense for us to capitalize on our software investments by working with the hardware leader.

“Third, DEC had recently announced new operating system pricing policies. The most visible aspect of these new policies is an across-the-board reduction in price; the most important aspect to us is that now RSX-11M is a much more attractive buy for the LD1-11/23 user than before. We expect to see a large market for the RSX-11M version of RTFILE among LSI-11/23 users next year.”

The RT-11 version of RTFILE costs from $1500 to $5000, depending on options selected; the RSX-11M version will probably range in price from $3000 to $10,000.

Additional information is available from ConTel Information Systems, Small Computer Systems Group, 4330 East-West Hwy #200, Bethesda MD 20814, 301-654-9120.

NEW PRODUCT ANNOUNCEMENT
Elm Grove, WI — McHugh, Freeman & Associates, Inc. announces the availability of their Address List Processing (ALP) package for DEC PDP 11 and VAX computers. ALP performs on-line screen entry list maintenance and envelope/label production.

ALP OFFERS THESE FEATURES:

List Creation
Each list is created with an identifier and twelve data fields. Additional data fields and their edit characteristics can be defined for each list. The ability to define additional data fields allows the flexibility of handling uniquely structured lists with one software package.

Address Entry
Address records can be entered via keyboard entry to a formatted screen or from lists supplied on magtape. Individual field editing is performed including state abbreviation and zip code validation checking. Canadian and foreign addresses are accepted with special postal code processing for Canadian addresses.

Duplicate Entry Detection
Duplicates are detected upon keyboard entry of the duplicate. The screen is formatted to show the current entry and sequentially any duplicates found in the system. The new entry may then be accepted or rejected.

List Maintenance
Lists may be removed to tape or separate files for backup. Complete lists can be purged through the use of one program. Using the backup and restore facilities additional data fields can be appended to an existing list. Address records may be individually updated, deleted or displayed.

List Extraction
A list or lists can be extracted and merged using the list extraction facility. Lists can be extracted against all or any combinations of list identifier code, last name, title, company, and zip code/country. Each field may be selected for range or list (list of inclusions or
list of exclusions) processing. Additionally if only one list is to be extracted further extraction can be performed against all or any of the fields uniquely defined for that list. List extraction can be performed in bath or on-line mode. A proofing program is supplied to allow the printing and inspection of an extracted list before envelope or label production begins.

Envelope/Label Production

Labels can be printed 1-up, 2-up, 3-up, or 4-up Cheshire or self-adhesive labels on any width larger than 3 inches. Envelopes can be printed with or without return addresses. Envelopes or labels can be printed in alphabetical or zip code order. Variable address line count envelopes or labels can be intermixed in the printing.

ALP will be available for RSTS/E in July, 1982, RSX-11M in August, 1982 and VAX/VMX under native mode Basic Plus in September, 1982. The package will sell for $1995.00. Demonstration packages will be available. For further information, contact Warren Lilly at McHugh, Freeman & Associates, Inc., 1135 Legion Drive, Elm Grove, Wisconsin 53122, U.S.A., Telephone: (414) 794-0250

THE DIRECT LINE OF ANSI TERMINALS:

VP800/A, VP800/B and VP800/C

Sunnyvale, CA — The DIRECT line of ASCII terminals offers the user three levels of support. The VP800/A is a high performance interactive terminal offering both ASCII compliance and DEC** VT100** and VT52** compatibility, 8K of display memory, a buffered printer port, and allowing user design of special character fonts, at an outstandingly low cost. The VP800/B adds local editing and block mode capabilities and provides 16K bytes of display memory. The top of the line is the VP800/C, which combines all these features with field definition, extensive data entry checking, and program downloading and debugging capability. DIRECT custom tailors these products to meet even the most demanding user requirements.

AMCOR ANNOUNCES SOPHISTICATED ALTERNATIVE TO "COMPUTER STORE" CONCEPT

Louisville, KY — Amcor Computer Corp. recently announced the release of their Business Automation Center Program.

This sophisticated alternative to the "Computer Store" concept provides a professional approach toward business automation.

An Amcor Business Automation Center is dedicated to computer solution for business applications. The program consists of two major elements; online remote computing service, and business Computer System Sales and Service. It is a proven turnkey entry into "the computer evolution", and the program is offered on a protected territory basis.

The BAC program provides computer service companies with Amcor software Products for their remote computing service, and substantial discounts on Digital Equipment Corp. based mini and micro computer hardware and terminals, as well as ARC Micro computer packages.

Amcor’s Business Automation Center concept is a proven program, with software installations in dozens of computer service organizations around the world.

The program is offered only to successfully established computer service organizations who have demonstrated their reputation in their community. The Business Automation Center Program offers proven products based on the latest available technology. Amcor offers a National Lead Generation Program, and a National Marketing Network to sell products developed by the BAC affiliates.

A BAC can achieve a 100% ROL with the initial sale of the Amcor software products provided with the program.

For information on becoming the Authorized Business Automation Center Affiliate for your area contact; Marketing Department-BAC Division, Amcor Computer Corp., 1900 Plantside Drive, Louisville, KY 40299; or call TOLL FREE 1-800-626-6268.

FEATURES

• Simple, easy-to-follow installation and operating instructions.
• Controllable (totally) from the Microcomputer terminal keyboard.
• Accurate reliable, error-free transmission of any file.
• Enables true Down-Line-Loading to a Micro (or another PDP-11).
• Makes Distributed-Data-Processing a reality.
• Unlimited Networking possibilities.

REQUIREMENTS

MINICOMPUTER

• Apple II or II+ with 48K Memory, Apple DOS or Apple CP/M, and, two (or more) disks.
• Software distribution is via 5 1/4 inch standard mini-floppy.

PDP-11 MINICOMPUTER

• RSTS/E (or CTS-500) Operating System (with BASIC-PLUS).
• Serial line interface
• Software distribution is via Standard 9 Track 1600 BPI Magnetic Tape.

DIRECT INCORPORATED: — 1279 Lawrence Station Road, Sunnyvale, California 94086 / (408) 734-5504 Telex 17227 / Outside California (800) 538-8404.

DIRECT (U.K.) Ltd.: 12 Rufford Court, Hardwick Grange, Woolfston, Warrington WA1 4RF Telex 66910 / Padgate (0925) 814072.
A SOFTWARE SYSTEM FOR DEC COMPUTERS, SO COMPLETE, SO EFFICIENT, DEVELOPMENT DEADLINES SOLVE THEMSELVES.

Cupid is easy to use. Complete application development can be done without programming. This reduces timescales for application development dramatically saving you time and money.

Cupid is cost efficient. Complete interactive applications can be quickly developed and efficiently run. No other software productivity aid offers more.

Cupid's powerful inbuilt features include:
- multiple indexing capability
- complete program and data base self-documentation
- portability between operating systems
- easy alteration of existing applications
- password protection and multi-user security
- structured reports from multiple related files
- data item and record redefinition
- easy interface with other systems including MCBA
- runs under RSTS/E, RT-11, RSX-11M, CTS 300, CTS 500, TSX Plus, VAX/VMS

Whether you are a PDP-11 or VAX-11 user, Cupid can put efficient application development in your operations. For more information write TUBS Software, 654 Bair Island Road, Redwood City, California 94063 or call (415) 369-2866.

TUBS SOFTWARE

Distributor Inquiries Welcome

MCBA is a registered trademark of Mini-Computer Business Applications Inc.
DEC is a registered trademark of Digital Equipment Corp.

SUMMARY

The following are available NOW!
Apple DOS and PDP-11 Version $995.00 Complete
Apple CP/M and PDP-11 Version $995.00 Complete
Any (Standard) CP/M and PDP-11 Version $995.00 Complete
PDP-11 Software Module (alone) $895.00 Complete
VAX based implementation $995.00 Complete

GEORGE W. HALLAHAN & COMPANY
(1660 Soldiers Field Road, Boston, Massachusetts 02135 (617) 782-6100) is a specialized firm that provides total data processing consulting and computer software services to companies with DEC (Digital Equipment Corporation) computer systems.

ACC TO SUPPLY ETHERNET EMULATOR TO ADVANCED MICRO DEVICES
Santa Barbara, CA — Associated Computer Consultants (ACC) has entered into an agreement with Advanced Micro Devices (AMD), Sunnyvale, CA for the development of a hardware emulator for the AMD Am7990 Family of Ethernet node integrated circuits.

ACC's emulator will allow customers to begin development of Ethernet hardware and software based on AMD functions prior to the availability of integrated circuits. Cables will be provided to allow the user to plug the emulator into sockets intended for the AMD integrated circuits on the board under development. The emulator, which will sell for under $3000, will be available from ACC in the fourth quarter of 1982.

AMD's family, to be introduced in 1983, is designed to provide the minimum package count for the logic, protocol and control functions required to interface all popular 16-bit microprocessors to an Ethernet bus. The Am7990 is a single-chip VLSI local area network controller for Ethernet (LANCE). The Am7991 is a serial interface adaptor (SIA) which performs Manchester coding/decoding and interface to the transceiver cable.

ACC is a diversified manufacturer of data communications equipment designed for networking applications. Ethernet-compatible products currently available include the IF-11/ETHERNET controller which supports all three levels of Xerox Network Standards and provides programmable data processing power in a modular architecture.

For more information contact: Brian McGann, Associated Computer Consultants, Local Area Network Center, 2901 Park Avenue, Soquel, CA 95703, 408-425-0937

DON'T MISS EVEN ONE!

BE SURE TO MAIL YOUR SUBSCRIPTION CARD IN TIME FOR THE NEXT DEC PRO ...
TYMSHARE SIGNS CONTRACT WITH CITIZENS FIDELITY BANK TO PROVIDE POS SERVICES

Cupertino, CA — Tymshare, Inc., has signed a contract with Citizens Fidelity Bank to provide comprehensive point-of-sale services, which Citizens Fidelity will in turn provide to its merchant customers nationwide.

This is Tymshare's second contract announcement for this enhanced POS service. The first was with Barnett Banks of Florida, Inc. The service enables merchants to obtain both credit card authorization and check guarantee verification within seconds, through easy-to-use terminal devices located at the point of purchase.

Citizens Fidelity, the second largest bank in Kentucky, will sell the POS services to its merchant base of some 14,000 organizations, including many national accounts, representing about 32,000 outlets and more than one billion dollars in sales. The bank's client base includes oil companies (such as Exxon and Shell), restaurant chains (such as Benihana of Tokyo and the Chart House), and retail outlets (such as W.R. Grace subsidiaries and Radio Shack). Citizens Fidelity also provides processing services for 180 banks in Kentucky, Indiana, Ohio, Illinois, Tennessee, West Virginia, and New Jersey.

Through Tymshare, the bank will be able to offer its merchant customers authorization and verification services for the major bankcards and travel and entertainment cards through terminal devices or audio-response units. Although the Tymshare system is compatible with a wide variety of terminal devices, the most popular offering is the GTE MICRO-FONE(TM).

Using the GTE MICRO-FONE, merchants can access the Tymshare Authorization Center through the TymNet® data communications network by a local phone call in most cities. To receive an authorization, the merchant keys in the required code on the terminal. The code is transmitted to the center via TymNet and a response is given to the merchant within seconds.

Tymshare provides authorization services through dial-up or polled terminals, voice or audio response units, or computer-to-computer links, and can provide local maintenance and support for these services in most cities.

Tymshare is a major international computer information management and telecommunications services firm, offering a broad range of services through offices located across the United States and by affiliated operations in Canada, Western Europe, and Japan. Tymnet, Inc., a subsidiary of Tymshare, operates TymNet, the world's largest public packet data communications network.

MARC ANNOUNCES GREEK/MATH CHARACTER SET FOR VT-100

Palo Alto, CA — MARC Software International, Inc. has just announced a new GREEK/MATH Character Set option for the DEC VT-100 CRT terminal (Advanced Video Option required). MARC's option on a VT-100, coupled with MARC'S MUSE Word Processing software package, offers a very powerful scientific typing capability.

MUSE and the VT-100 can display the standard characters and the alternate GREEK / MATH character set at the same time. This allows the user to view the Greek or math characters as they are entered and significantly reduces technical document preparation time. The following example is a complex scientific formula which can easily be generated with MUSE on the VT-100 screen and then printed on a letter-quality printer.

Using MUSE and MARC'S Greek/Math Option, 13-level formulas may be created as one base line with as many as 6 superscript and 6 subscript levels. After creation, each formula may be centered, tabbed, moved, or copied just like any other section of text.

The GREEK/MATH Character Set Option is contained in an EPROM which is delivered with detailed installation instructions. The VT-100 has an empty socket for the MARC EPROM and installation requires absolutely no modification.

The GREEK/MATH Character Set is available for immediate delivery at a price of $100 in single quantity. For further information on the GREEK/MATH Character Set and MUSE Word Processing Software, call (415) 326-1971 or write to MARC Software International, Inc., 525 University Avenue, Suite 810, Palo Alto, CA 94301.

DATA ACE

Anaheim, CA

A powerful and inexpensive RDBMS for DEC 11/23

- Relational Database Management and Operating System
- Conversational Data Definition Language (DDL)
- Interactive Query Language to navigate your Database (DIL)
- Block structured programming language for easy development (DBL)
- Full Screen TEXT EDITOR to easily create and maintain programs and procedures.

Summary

The potential and actual computer user has two seemingly incompatible requirements. First, he wants his system to suit his needs exactly and immediately; secondly he does not want to invest heavily in hardware, software packages, database managers or operating systems, programmers, analysts or operators.

DATA ACE is announced today by Aregon Systems Inc. as one of a new breed of systems which offer the computer user the exciting opportunity to get the best of both worlds. Competing in features with IBM's SQL or Tymshare's MAGNUM-large mainframe offerings - DATA ACE can cost as little as $100 a use (at maximum volume discount) and runs on a TRS/80 Model II. DATA ACE includes a unique combination of operating system, relational database manager, compiler, interpreter, full screen editor, interactive command languages and other utilities.

In short, the end user with the help of DATA ACE can now automate his business rapidly and UNIQUELY to his exact requirements.

Global Data Corporation is also looking for distributors with strong positions in vertical markets who could exploit the potential of DATA ACE.

Technical System Features

DATA ACE today is a fully conversational and interactive RELATIONAL DATA BASE MANAGER and operating system. The DATA INTERROGATION LANGUAGE (DIL), what is in reality a transaction processor and the
DATA DEFINITION LANGUAGE (DDL) both operate in an interactive and conversational mode. Using these two languages, complete systems can be created in a matter of hours. System maintenance becomes then a trivial task. There is also a powerful programming language called DATA MANIPULATION LANGUAGE (DML). DML is an interactive structured programming language with the ease of use of BASIC, the logical power of PASCAL and the efficiency of "C". However DML may be executed interactively while programs are being prepared. Once fully tested, these same programs may later be compiled for fast execution. Volume 2 of the User Guide covers DML in detail and includes a grammar and three worked examples with "D" charts and programs listings. A comprehensive DATA DICTIONARY, present in memory drives the system permitting complete separation of data from program logic. The database may be changed without affecting the application programs or procedures. An extensive EDITOR simplifies maintenance of CATALOGed PROGRAMS or PROCEDURES for immediate or later use. A HELP facility operates at two levels - the first explains the meaning of each FIELD, the second explains the command syntax in its own context so that the new user learns the system extremely rapidly. In this way system and application documentation is built in to the system appropriately to the needs of the context and the user.

Systems Available

DATA ACE runs on a TRS-80 Model II with 64KB of memory, an Expansion Box with at least one drive and a printer either Centronic compatible or Daisy Wheel (model #26-1158). DEC 11/23 (or plug compatible); users should describe their configuration to us since we can handle most of them.

Background to Global Data Corporation and Aregon Systems Inc.

Global Data Corporation is part of the Aregon Systems Group of companies which are financed by the British Technology Group, a British government owned investment corporation. Global Data is an international software and systems group of companies. It develops and supplies "programmerless" and easy to use systems. These systems, available today, are designed to meet the requirements of the office of the future. In addition, Global has required and will continue to acquire computer service bureaus through which to support the software resulting from this investment. Global employs about 180 people in the US and has offices in Anaheim, New York, Chicago and San Jose.

For further information on any aspects of Global's products and services, please contact:

Aregon Systems Inc., Anaheim, California 92806, (714) 634-9012, Michael C. Strong
Global Data Corporation - Southern Cal. / Anaheim, Calif. 92806, (714) 634-9012
IBM Services: Robert W. Carlle, Time-Sharing and Microcomputers; J. Chris Horrocks
Global Data Corporation - Northern Cal. / San Jose, Calif. 95131, (408) 263-4033, Jim Lahodny
Global Data Corporation - Midwest / Harvey, Illinois 60426, (312) 596-6800, John Lestina

NEW MULTIPLEXER INTERFACES TO DEC SYSTEMS

Research Triangle Park, NC — Network Products, Inc. is pleased to announce BABYMUX — the user-upgradable statistical multiplexer — for use with DEC systems.

• BABYMUX allows great flexibility on configuration. The common communications line can be asynchronous up to 9,600 baud or synchronous up to 19,200 baud. Terminals can be run up to 19,200 bps. BABYMUX supports a wide variety of options in baud rate, parity, flow control, stop bits, and character length. Each terminal can be configured at a different baud rate and with different characteristics; a terminal and its corresponding channel on the computer side can also be set to different baud rates or types of flow control.

- BABYMUX flow control is ideal for DEC systems. On input, it gives you a wide margin to stop sending data; on output, data transmission can stop quickly — a useful feature for terminals such as the VT100 that require fast response.

The database may be changed without affecting the application programs or procedures.

- BABYMUX gives you local copy capability. You can copy one or all local ports to groups of remote ports.

- BABYMUX performs error detection and correction, and increases the apparent bandwidth of the communications line. All data transmitted over the composite line is checked for accuracy, and automatically retransmitted when an error is detected.

- BABYMUX operation is transparent to the computer, the terminal, and to you — so it can work with any DEC or DEC-compatible operating system, asynchronous communications channel, or terminal. No systems or applications programming is necessary, nor is any change in terminal operation.

- BABYMUX is field-upgradeable. You can start out with a two-channel base unit and later expand it in the field to five or eight channels, in a matter of a few minutes.

- BABYMUX's front panel shows you status information on line usage, terminal activity, error rate, and data transmitted. The front panel is also used to program channel and terminal configurations.

- BABYMUX allows great flexibility on configuration. The common communications line can be asynchronous up to 9,600 baud or synchronous up to 19,200 baud. Terminals can be run up to 19,200 bps. BABYMUX supports a wide variety of options in baud rate, parity, flow control, stop bits, and character length. Each terminal can be configured at a different baud rate and with different characteristics; a terminal and its corresponding channel on the computer side can also be set to different baud rates or types of flow control.
AVIV TFC-922 Dual Density, Single Quad Board Tape Controller for DEC LSI-11.

INDUSTRY'S FIRST, DUAL DENSITY, SINGLE QUAD BOARD TAPE CONTROLLER FOR DEC LSI-11 ANNOUNCED BY AVIV CORP. Woburn, MA — Aviv Corporation has introduced the industry's first dual density (800/1600 bpi - NRZI/PE) single quad board tape controller for all DEC's LSI-11 computers. Called the TFC-922, the new imbedded controller features 2901 microprocessor design and requires only a single slot in the host computer.

Now, system builders and users can eliminate expansion chassis used with the currently available controllers which occupy two or four slots. According to Aviv's National Sales Manager Victor B. Vogel, the new unit is priced at $3300 in single quantities and is offered with the following features: Large FIFO data buffer, BURST mode transfer operation, compatibility with all industry standard 1/2" tape drives up to 125 ips, and improved data reliability and throughput due to automatic threshold control during read retry.

The TFC-922 will support up to 8 transports and allows mixing of two tape speeds as well as mixing of both NRZI and dual density drives. The unit is software compatible with previous Aviv tape controllers and with DEC's TM-11 handler. Other features include internal diagnostics on power up, on-the-fly read/write, software controlled byte swapping for IBM and DEC packing and optional read/write of gapless tape. Delivery for the TFC-922 is 30 days A.R.O.

Aviv Corporation has manufactured a complete line of tape controllers for DEC and DG minicomputers since 1976 and is the industry's leading supplier for 6520 GCR systems. Detailed specification data on both the new GCR system and the single board TFC-922 is available from Aviv Corporation, 6 Cummings Park, Woburn, Mass. 01801. Telephone (617) 933-1165. Contact Victor B. Vogel or Edmond W. Arsenault.

SOFTWARE TRACKS MORTGAGES AT BOSTON'S MUTUAL BANK FOR SAVINGS Wellesley, MA — A mortgage tracking system built for Mutual Bank for Savings in Boston using INFORM software and Digital Equipment Corporation's hardware, and PDP 11/70TM, enables on-line interviews, fast determination of appraisal and credit status, and rapid log and report generation. "What used to take weeks to determine, now takes minutes to locate and then to generate," according to Loan Officer, Anne F. Craigs. INFORM from other fourth-generation products distinguishes itself by the combination of fast software development and fast machine execution distinguishes INFORM from other fourth-generation products. Craigs continued. "Besides getting all of the management and processing work done in an efficient manner, the system has allowed us to be more competitive with other financial institutions in our quality of service." Craigs continued.

The INFORM Mortgage Tracking System decreases the amount of time the bank needs to qualify applications and make loan commitments and lowers the cost of processing mortgage applications through automated procedures. For example, more than twenty-five automatically prepared forms on a daily, monthly, or ad hoc basis help complete transactions and ease compliance with government requirements.

Two interfacing departments previously arranged mortgage loans at Mutual Bank: Appraisal-Underwriter and Secretarial. Of a total of 13-18 employees, three to six appraisers saw properties and made recommendations for loans, while five to nine secretaries completed the required typing and paperwork. Delays and losses frequently occurred in this backlog of paperwork. Going to an on-line system consolidated the two departments, reduced the number of appraisers, and upgraded the secretarial position. Mortgage loans are now handled in a single department consisting of nine employees: two appraisers, fee appraisers, and three interviewers — mortgage representatives — who input application information directly into the system via DEC VT-100TM terminals.

Craigs added, "Going to the INFORM system allowed us to reorganize with fewer positions, upgrade some positions, and lower the high labor cost of the Origination Department. Mutual Bank selected INFORM software to build their customized system because of its flexibility and ease-of-use. "Besides getting all of the management and processing work done in an efficient manner, the system has allowed us to be more competitive with other financial institutions in our quality of service," Craigs continued.

The INFORM Application Development System not only accelerates application development time by a factor of 6 to 10 but then can tune application run-time performance with efficiency increases of 60% to 90%. This combination of fast software development and fast machine execution distinguishes INFORM from other fourth-generation productivity languages. INFORM is built especially for Digital Equipment Corporation's mini-computers from the PDP-11/23TM up to the VAX 11/782TM and runs under VMSTM, RSX-11M+TM, and IASrM operating systems.

For additional information, call Mr. Kimball L. Mason, Marketing Vice President, at CORTEX Corporation in Wellesley, Mass., at 617-237-2304.
ADD-IN INTELLIGENT CONTROLLER PROVIDES BOTH GRAPHICS AND SYSTEM CONSOLE FUNCTIONS FOR Q-BUS SYSTEMS.

Canoga Park, CA — Graphics processing applications are proliferating as users discover the power of low cost computers to communicate complex concepts with multidimensional plots of variables and by animation.

DEC's LSI-11 is one of the most widely installed small computers. Graphics compatibility for LSI-11 based systems has been made easier with a new add-in intelligent graphics controller, the VDC11-C, from Q-bus systems house Andromeda Systems Inc., Canoga Park, California. Designed to be transparent to existing LSI-11 software, the VDC11-C emulates industry standard Tektronix 4010 in the graphics mode and DEC's VT52 in the alphanumeric mode. The VDC11-C is also offered as part of a complete graphic terminal, the VDT11-C.

Conventional graphics often uses the storage intensive direct-memory map technique. With memory mapping, each pixel is represented by one host system memory bit. This involves significant CPU overhead to generate a point by point display and results in a slow image write rate, inability to use standard terminal handling software, and often the inability to do much else with the system when a graphic update is in progress. The distributed processing approach chosen by Andromeda, uses a microprocessor within the VDC11-C controller to execute successive high-level commands that are generated by the host CPU. These are input through a DLV11 type serial port emulator in the controller. A typical "Draw Line" command requires only specifications of the end-points by the host LSI-11. The display processor in the VDC11-C then, independently, calculates which pixels in the display memory are to be set to display a straight line between the specified end-points. A 64Kb display memory provides adequate space in the controller for two pages of display memory and a processor scratch pad.

The VDC11-C operation may be seen from the block diagram of Fig. 1. The Q-bus interface sees two "DLV11" serial interfaces. One drives an RS232 serial port, and is useful for connecting to external RS232 devices such as printers and modems. The second "DLV11" interface appears to the LSI-11 host processor and its operating systems as a true serial port, but is really a special parallel interface driving a 6502-based display processor within the controller, the 6502 was selected for its ease in implementing bit manipulation operations and for its interrupt handling ability. The control program is contained in 6Kb of PROM, and includes the 6502 control program, alphanumeric character generation and keyboard encoder. Eight Motorola 6665 type 64K dynamic RAMs form the two port display memory. This is partitioned as two 16Kb display pages, 16Kb of scratchpad memory containing the stack and working storage area, and an additional 16Kb available for future enhancements. Note that one port of the RAM connects to the display processor bus, while a second port drives video generator logic.

The video generator creates horizontal and vertical sync, plus video output for a standard "direct drive" B/W video monitor in a 512 H by 256V raster scan. To get the desired 256 line vertical scan, the horizontal frequency is increased from a standard 15750Hz rate to 16250Hz. This is well within the tolerance of a well designed monitor. Completing the system is an input port to receive data from either a serial or a parallel keyboard.

The performance features of the VDC11-C display controller include the ability to emulate the Tektronix 4010 with a 512H by 256V physical resolution. The 1024H by 768V logical display of the 4010 is automatically remapped to that of the VDC11-C. Experience has shown that this is quite adequate for a large variety of graphic operations.

Several additional features beyond those of the 4010 are provided: selective erase; two pages of display memory useful for alternating between an alphanumeric menu and a graphic image; and for animation, the entire display may be read back to the host system, allowing storage and host CPU processing of images. A "strip chart" mode is available where the graphics may be vertically scrolled. Graphic data developed by the host as vectors can be converted to raster format by the VDC11-C, and output via an RS232 port for printing on a dot matrix printer/plotter. Full emulation of virtually any alphanumeric terminal is possible with the VDC11-C by alternating the control ROM contents. The DEC VT52, plus some enhancements, is presently supported. The enhancements include smooth scrolling for easier reading during scrolling, and support of the VT52 special graphics set as standard. A VIEW mode is provided where the control characters are displayed rather than executed—particularly useful for analysis of serial line operations.

The equivalent speed of operation for alphanumericics is about 15Kbaud, and in the graphics mode, about 1200 x-y points per second and 100 average length vectors per second.

The entire VDC11-C is packaged on a standard dual height Q-bus compatible card and draws all power from the Q-bus backplane. The controller is a member of Andromeda's growing graphics product line that includes the VDT11 video terminal family and supporting software packages. The VDC11-C controller is available at $1700 (qty 1) and as part of a complete turnkey graphic display terminal, the VDC11-C, including a 12" video monitor, serial keyboard and all cabling at $2200 (qty 1). DFM pricing is available. Delivery in small quantities is stock to 30 days.

For additional information contact: Mr. Les LaZar, Andromeda systems inc., 9000 Eton Avenue, Canoga Park, California 91304, (213) 709-7600.

FIGURE 1. Block diagram of the VDC11-C display controller.

VDC11-C intelligent display controller provides add-in graphics capability for Q-bus systems.
SOPHISTICATED VAX ORDER ENTRY AND INVENTORY SYSTEMS INTRODUCE NEW SOFTWARE TECHNOLOGY

Lubbock, TX - Compu-Share, Inc. has announced two new packages to supplement the VAX accounting software introduced last Spring. The packages are developed for an interactive environment and are fully integrated with the accounting systems. The obvious functions available with other systems are also offered with OE-11 and IC-11. These include on-line calculation of pricing, inventory query and status reports, sales analyses (both from OE-11 and IC-11), invoice generation, multiple units-of-measure, pricing levels, discounts, contract pricing, capability of manufacturer's numbering, etc. However, the new packages introduce new technology in software to solve many inherent problems previously declared "unsolvable".

The OE-11 entry screen incorporates a scrolling region to enter the line items of an invoice to alert shipping to the order status, sales analyses (both from OE-11 and IC-11), invoice generation, multiple units-of-measure, pricing levels, discounts, contract pricing, capability of manufacturer's numbering, etc. However, the new packages introduce new technology in software to solve many inherent problems previously declared "unsolvable".

Another new development allows a company to select only the desired fields to appear on the entry screen. Each user may assign default answers to selected fields. In this manner, a company has its own order entry screen - accommodating the particular type of orders it receives. With OE-11, the user is offered complete control over the design of his forms. Acknowledgements, picking lists, and invoices are all produced with a user-defined parameter file controlling the output of the information.

Each location is assigned a default paper flow for its orders. This way, one department may write invoices directly from order entry (point of sale invoicing) while others on the same system may generate picking lists (warehouse shipping) and others may initiate drop-shipment processing (agency representation).

Each assignment of a new unit of measure incorporates a new pricing assignment for the product. This way, items sold in multiple units of measure can vary in pricing according to the measure. The scrolling region capabilities have opened a unique enhancement that allows software to "run" on more than one system - just like a CP/M style program. The 3000 series may be used as a "virtual" CP/M floppy disk, providing all the benefits of a floppy disk without the hardware. The CP/M operating system may be run on any minicomputer from the IBM-PC to the Data General VMS, depending on the requirements of the user.

Pricing can be completely on-line with OE-11, or can be run as a batch process to speed ordering. Available pricing considerations include 4 levels (in addition to cost), unlimited number of discount codes (that can be applied to any or all levels or contracts), contract pricing, and quotation pricing. The order status can be flagged as a quote, credit-hold, pricing-hold, or released to the flow. Individual items are accumulated when back-ordered, special-ordered, or "lost orders" (a sale lost because not in stock).

The price of the two systems is $3500 each, which includes massive documentation of some 2000 pages. More information can be obtained from Compu-Share, Inc., 3824 50th Street, Lubbock, Texas. Phone 806-792-3785 for Larry Landusky, Director of Marketing.

IDBS ANNOUNCES SEED CONSULTING SERVICES

Philadelphia, PA — The consulting department at International Data Base Systems, Inc. in Philadelphia announces the availability of its services to users of the SEED Data Base Management System. The Consulting group is ready to assist SEED users in all areas of data base activity data base concepts to specific SEED techniques. For SEED users, Consulting will assess data needs and data organization, as well as provide data base design, tuning, and administration. Consulting also offers its services for benchmark design, implementation, and support, and system analysis and design. The IDBS consultants maintain expertise in numerous skills, including applications and systems development; development of enhanced and customized DBMS features; and structured development techniques.

Long- and short-term Consulting support are available both in Philadelphia and on-site. Short-term (one day to two weeks) fees are calculated hourly ($80) and weekly ($3000). Long-term (three weeks to one year) rates range from $2000 to $2750 per week, based on the length of the engagement.

SEED, a comprehensive directory-driven Data Base Management System, supports a variety of data structures and is accessible from both COBOL and FORTRAN. The SEED system includes the KERNEL Data Description and Data Manipulation Languages, HARVEST Query Language, RAINBOW Color Graphics Facility, BLOOM Report Writer, VISTA Screen-formatting and Editing Tool, GARDEN Interactive Data Manipulation Language, and SPROUT Intelligent File Processor. SEED runs on hardware from a wide variety of vendors, including PRIME, CDC, DEC, IBM, PERKIN-Elmer, MODCOMP, IBM, SEL, and Hewlett-Packard. International Data Base Systems, Inc. is located at 2300 Walnut Street, Philadelphia, PA 19103. Contact Jim Huddleston, Manager of Consulting, at (215) 568-2424.

INTERACTIVE ACCOUNTING SOLUTION AVAILABLE FOR VAX-11'S

Nashua, NH — The FASBE Group is pleased to announce its product, IBMS, a totally integrated online financial information system designed for use on all Digital Equipment Corporation's VAX series.

IBMS is designed to effectively and efficiently control financial information through seven integrated subsystems: 1) Directory Control 2) General Ledger 3) Accounts Payable 4) Purchase Order Entry 5) Inventory Control 6) Accounts Receivable 7) Budget

All subsystems are developed in COBOL and are designed primarily for the educational marketplace. Features of IBMS include: online access to committed, expenditure and uncommitted account balances; full support of encumbrance accounting; user definable account number structure up to 35 characters; flexible report writers for the creation of reports instantaneously; online inquiry by account, vendor, P.O., or product number; flexible journal entry process; sophisticated error detection; online edit and validation of all transactions; total security to limit access to financial data, definable by the user; menu-driven approach for easy access to all IBMS functions.

The IBMS package ranges in cost from $10,000 - $50,000 depending upon the number of modules purchased. Prices include installation, maintenance and training.

IBMS is available from The FASBE Group, 92 Main Street, Suite 108, Nashua, New Hampshire 03060. (Telephone: 1-603-883-3212)

CP/M* MICRO CO-PROCESSORS FOR THE DEC* UNIBUS AND Q-BUS

Philadelphia, PA — Virtual Microsystems Inc. of Berkeley, California announced today the release of the z-Board micro co-processor for the UNIBUS and Q-Bus. The z-Board works with VMI's product THE BRIDGE Virtual Microcomputer System, to provide a complete virtual CP/M environment on a VAX, PSP-11, or LSI-11 minicomputer.

The UNIBUS version of the z-Board features 4 z-80 microprocessors and a full 256 kbytes of memory, along with a bit slice state machine which handles the bus interface. The Q-Bus version is similar, but may be populated with 1 to 4 z-80's. Each of the z-80's operates independently, providing each BRIDGE user with full microcomputer functionality at any of the attached terminals.

A BRIDGE user begins a session by running THE BRIDGE as a task under VMS, RXS, RSTS, RT-11, or UNIX. THE BRIDGE first tests to see if a z-80 is available on the z-Board. If one is available, the user is "attached" to it. From that point on, the user feels as though his terminal is a fast CP/M microcomputer using hard disk. He can then run any of the programs in the vast CP/M software library. If a slot on the z-Board is available (any number of z-Boards can be added to a system), the user is "attached" to THE BRIDGE simulator, which performs all calculations in software. THE BRIDGE handles all I/O, disk storage, printing, and communications. The system also makes use of "virtual floppy disks", files on the hard disk which are like a CP/M floppy disk.

THE BRIDGE Virtual Microcomputer system, complete with z-Board, helps the information manager to manage the proliferation of microcomputers. A virtual microcomputer is available to any person on the system at anytime, yet the files are not distributed among various incompatible devices. A virtual microcomputer system can help reduce the costs of hardware significantly, and
provide a much more integrated data processing environment. THE BRIDGE and z-Board combination are extraordinarily cost-effective; each slot on the z-Board costs around $1000 — far less than a "low-end" personal computer; yet THE BRIDGE provides hard disk, access to the fast system printers, and is integrated into an already existing, professionally managed system. THE BRIDGE and z-Board are available now for the full range of DEC computers under all the major DEC operating systems. THE BRIDGE costs between $1000-$3500 depending on the size of the minicomputer; each UNIBUS z-Board costs $4000 - Q-Bus versions vary between $1250 and $3500 depending on the number of installed microcomputers. THE BRIDGE and z-Board are trademarks of Virtual Microsystems Inc.

CP/M is a trademark of Digital Research. DEC, RSC, VM, RT-11, RS15, and VAX are trademarks of Digital Equipment Corporation.

MINI-FILE NEWS RELEASE
Kirkland, WA — The unique Teletone Data Carrier System is now available in an economical two to eight channel package that can grow into a large scale low cost local data communications network.

The DCS-2 adds a data channel to virtually every PABX telephone system for simultaneous voice and data communications on local telephone pairs. Terminals can be placed wherever a telephone is located, without tying up the telephone. Plug-in components install quickly, and a terminal can be relocated in minutes.

The dedicated full duplex, asynchronous data links run at any speed to 9600 bps. The range of the system is limited to about 5,000 cable feet between the telephone site and PABX interface point. If the distance between PABX wire center and computer room exceeds several hundred feet, a DSC-2A system with integral multiplexers may be used which concentrates 32 channels over a telephone wire. The complete eight channel system costs approximately $474 per channel. The RJ1C jack that provides the interface to the PABX system can be ordered from the organization (Telephone Company or Interconnect) that provides the PABX services.

UCSD PASCAL USERS TO MEET IN DALLAS
Dallas, TX — The UCSD Pascal System Users' Society (USUS) will hold its semi-annual national meeting here October 29-31, according to Robert Peterson, USUS president.

The meeting, which follows ACM '82, will be held at the Harvey House Hotel in Dallas. Key-note speaker for the meeting will be John D. Page, vice president of engineering for Software Publishing Corp. (Mountain View, CA).

Page will give those attending a forecast of what's ahead for the '80's in data management on micros. He is the sole author of PFS, the single best selling Apple Pascal program.

The meeting will feature technical presentations, an expert user panel, software exchange, hardware and software demonstrations, and special interest group meetings. At a major vendor panel, those attending will be able to interrogate hardware and software suppliers.

Also on the program will be two tutorials that will be free to the public. One is an introduction to the p-System, and the other deals with advanced topics.

Start-up meetings will be held for two new special interest groups — one for users of the IBM Personal Computer and one for users of Texas Instruments computers, Peterson said.

Existing special interest groups for Apple users, DEC users and those concerned with compatibility, communication and the software library will also meet. The software library is available to members at the meeting at substantially reduced rates.

Advance registration will be $25, payable to USUS Meeting Committee, P.O. Box 1148, La Jolla, CA 92038. Registration at the door will be $35 and will begin at 10 a.m., Friday, October 29.

Hotel reservations may be made directly with the Harvey House Hotel, 7815 LBJ Freeway, Dallas, TX 75240. (214) 931-3131. Cut-off date for confirmed reservations is October 15.

USUS (pronounced use-us) is a vendor-independent, non-profit users' group for the most widely used, machine-independent software system — the UCSD Pascal System, also known as the p-System.

UCSD Pascal has more than 100,000 users and is capable of running on nearly any computer. It was developed to facilitate software portability.

USUS was created in 1980 to promote and influence the development of the UCSD Pascal System and to provide a forum for education and information exchange about it. USUS has individual as well as institutional members in more than 20 countries. Annual membership in the society is $20 for individuals and $500 for institutions.

VZPLAN
Vancouver, BC — Canadian European Systems Ltd. (CES) of Vancouver, Canada is pleased to announce the release of VZPLAN, the visual planning and reporting system.

VZPLAN is an electronic spread sheet for HP 3000, DEC PDP-11 (RSTS-E) and DEC VAX environments. VZPLAN can be used as a stand alone package or in conjunction with CES' DAINEV, the fully integrated planning and reporting system.

VZPLAN offers dynamic visual planning for spread sheets of 100 rows by 60 columns. Rows can be expanded to 1000 if required. VZPLAN combines the ease of use of a menu driven system with a simplified command structure for visual planning and modelling.

VZPLAN uses terminal technology, row expansion, and has function key options for fast model development. Commands include: DEFINE; ALTER; INSERT; DISPLAY; RECALL; CLEAR; SAVE; DELETE; CONSOLIDATE. Functions include: ALL STANDARD OPERANDS; INFLATE; DEFLATE; STEP; EXTRAPOLATE; INTERPOLATE; CONSTANT; REPEAT; CYCLE; ACCUMULATE; IRR; NPV. In addition, functions are available to ADD, SUBTRACT, MULTIPLY, and DIVIDE entire spread sheets or portions of spread sheets.

VZPLAN incorporates the reporting power and flexibility of the DAINEV System.

VZPLAN is available for a license fee of $1,250 US. The system is fully documented and trial periods are available.

For more information contact: Canadian European Systems Ltd., P.O. Box 2884, Vancouver, BC, V6B 3X4; 604/732-9141.

HUMAN DESIGNED SYSTEMS ESTABLISHES SALES/SERVICE REGIONAL OFFICE IN CHICAGO
Philadelphia, PA — Human Designed Systems, Inc. has established a Midwest Region for sales and service of its display terminals. Headquarters of the region will be in the Chicago area at 2 Talcott Road, Park Ridge, Illinois 60068. Telephone 312/825-2960.

Dan Lesser, who has served as the New England Regional sales representative in Human Designed Systems' Northeast Regional office, will head the new Midwest Regional operation.

Human Designed Systems, Inc. sells its display terminals through a series of direct sales offices (in Boston, Philadelphia, Chicago, Los Angeles and San Francisco) and sales representatives throughout North America, Australia, and Europe.

Human Designed Systems, Inc. is located at 3440 Market Street, Philadelphia, PA 19104. Telephone 215/382-5000.
MACHINE VISION DEVELOPMENT TOOL NOW AVAILABLE FROM OCTEK INC.

Burlington, MA — Octek advances the development of computer-based vision systems with the announcement of its new Machine Vision Module (MVM). The MVM software package runs under Octek's image processing equipment to give developers an integrated set of tools for building flexible vision systems. MVM provides a watershed of timesaving productivity benefits for work in robotics, automation, and numerical control tools. The package promotes applications dependent on positioning and device control, noncontact monitoring and measurement, and inspection.

A complete set of high-level program modules can be used to setup regions of interest for object analysis including grey-scale thresholding, binary conversion, and connectivity. MVM is an agile programming environment designed to help identify features based on area, perimeter, centroid, compactness, major/minor axes, elongation, orientation.

Versatile multilevel object/feature addressing — specific location, sequential, or hierarchical — improves speed and functionality. Computed area, geometric pattern type or grey scale are some of the filters the Machine Vision Module can use when searching for objects. MVM also takes advantage of dedicated firmware for high-speed run-length encoding.

MVM is Fortran based, fully warranted, and includes installation and programming manuals. Combined development package of software license and required hardware starts at $9900 for DEC Q-bus- and Unibus-based systems. Delivery is in 60 days ARO. Single quantity software license is $2400; delivery 30 days ARO. Contact Octek Inc., 7 Corporate Place, Burlington MA 01803, (617) 273-0851.

Sequence Showing Machine Vision Module Interfaced to a Robotic Arm Performing Pick and Place Using OCR

1. Typical set up for a robot vision application. Scene shows robotic arm with stand (Model RM-101, manufactured by Mitsubishi Electric Company), vidicon camera on tripod with lighting, display monitor and Octek function control keyboard.

2. Robotic arm picks up a random keyboard cap and places it under camera's view. Scene is digitized using an Octek Image Analysis Processor (IAP) that determines position and character on key top using OCR.

3. Monitor displays what the computer sees (right). Identifies key as a "1" (recognition is performed regardless of orientation). Instructs robot where key is located, then tells it to pick up key (left).

4. Key is placed successfully in sequential order with other keys. Robot then waits for further instructions from the Octek IAP.
SUBJECT: CONVERSION UTILITY PERMITS
DEC RT-11 USERS TO ACCESS CP/M
Palo Alto, CA — MicroTech Exports, Inc. announced the release of a DEC to CP/M version of its REFORMATTER™ conversion software. The company, a leading producer of file conversion software, states that this version reads and writes CP/M single density diskettes under RT-11, giving DEC users the ability to transfer files quickly between DEC RT-11 and CP/M formats.

MicroTech Exports spokesman Oscar Rosenbloom reports, “Now DEC RT-11 users have an inexpensive way to access the tremendous base of CP/M source files.” At $350 per licensed copy, the utility is priced well under other conversion programs available to DEC users. He added that users can also exchange files between PDP/11 and CP/M-based word processors. Mr. Rosenbloom emphasized that this version operates under the DEC RT-11 operating system and does not require the CP/M operating system.

You may choose to incorporate in-house repair — this leads to considerable expense because of parts inventory and the time involved and may not be the most cost effective for your needs.

A second source for repair is to return the defective board to the O.E.M. Because the O.E.M. is basically a manufacturer, repair is not his main concern and sometimes turnaround and quality suffer.

The third, and probably the most effective, is an independent third-party repair center. In choosing an independent, you must select a company that incorporates your criteria for repair — whether your concern is fast turnaround, quality assurance, complete line capabilities, price, or a combination.

One company with 12 years experience in the service repair business has recently entered the computer repair field. The Division, PSI Computer Services, is located in Woburn, Massachusetts and has dedicated itself to fast turnaround with quality backed with a 6 month warranty at competitive prices. With over a million dollars invested in computers for system testing and parts inventory, they have expanded rapidly in the computer repair field.

Depot repair is a viable alternative for computer system maintenance. Having met the 3 criteria necessary, a company is in a position to save considerable dollars over the maintenance contract approach.

For further information, contact PSI Computer Services (617) 933-6905 or (313) 261-4654.

PLANNING FOR A DISASTER
The Commercial Services Division of Arbat Systems Limited discusses its backup service for Digital Equipment Corporation PDP-11 and VAX computers in the booklet “In case of fire, break seal and read instructions at least 30 days before you smell smoke.” The publication answers, in brief, users’ major concerns about disaster recovery, including the cost of the loss of information processing functions, insurance considerations, and back-up alternatives.

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American Management and Information Systems, Serban D. Constantin, (713) 496-7584.

Wanted DEC RK05, disks, controller, etc. or equivalent by hobbyist for Q-BUS. H. Kolesnik, 5277 S. Kenton Way, Englewood, Colo. 80111, (303) 779-5256.

DEC Board Repair — PDP8, LSI11, PDP11, Terminals, Tape and Disk drives. Contact Electronic Service Specialists (414) 255-4634. 5 day turnaround, 120 day warranty.
You're stuck on the Expressway traffic again and it's a toss up — Who will boil over first, you or your car? Your mind drifts for a moment.

**RUN BOMBER**

YOU ARE NOW A PILOT IN A WORLD WAR II BOMBER

WHICH SIDE — ITALY (1), ALLIES (2), JAPANESE (3), GERMANY (4)? 2

AIRCRAFT — LIBERATOR (1), B-29 (2), B-17 (3), LANCASTER (4)?

YOU'RE BUSTING A GERMAN HEAVY WATER PLANT IN THE ROHR.

HOW MANY MISSIONS HAVE YOU FLOWN?

15, I'm a real ace.

You're back. The traffic seems to be easing. You turn on the radio to get some news. “The market was down 15 points in reaction to the raising of the prime rate to 12.75%. The biggest losers were IBM, RCA ...” You can't bear to hear any more so you switch to music.

**RUN STOCK**

THIS PROGRAM PLAYS THE STOCK MARKET. YOU WILL BE GIVEN $10,000 AND MAY BUY OR SELL STOCKS. THE STOCK PRICES WILL BE GENERATED RANDOMLY AND THEREFORE THIS MODEL DOES NOT REPRESENT EXACTLY WHAT HAPPENS ON THE EXCHANGE.

(I'm not so sure it doesn't happen that way! ...)

<table>
<thead>
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<th>STOCK</th>
<th>INITIALS</th>
<th>PRICE/SHARE</th>
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<tbody>
<tr>
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<td>IBM</td>
<td>109.25</td>
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<tr>
<td>RED CROSS OF AMERICA</td>
<td>RCA</td>
<td>79.5</td>
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<tr>
<td>LICHTENSTEIN, BUMRAP &amp; JOKE</td>
<td>LBJ</td>
<td>170.00</td>
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<tr>
<td>AMERICAN BANKRUPT CO.</td>
<td>ABC</td>
<td>151.25</td>
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<tr>
<td>CENSURED BOOKS STORE</td>
<td>CBS</td>
<td>115.25</td>
</tr>
</tbody>
</table>

NEW YORK STOCK EXCHANGE AVERAGE: 125.05

WHAT IS YOUR TRANSACTION IN IBM? +85

***** END OF DAY 1'S TRADING *****

<table>
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<tr>
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<th>VALUE</th>
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***** END OF DAY 2'S TRADING *****

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<td>85</td>
<td>11262.5</td>
<td>18.5</td>
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</tbody>
</table>

Terrific! I'm rich!

You're almost home. You could kill your boss for giving you that extra work. That S.O.B.!! But you dare not say anything.

**RUN BOXING**

OLYMPIC BOXING — 3 ROUNDS

INPUT YOUR OPPONENTS NAME

? THE BOSS

INPUT YOUR MAN'S NAME

? JOEL

DIFFERENT PUNCHES ARE, 1 FULL SWING, 2 HOOK, 3 UPPERCUT, 4 JAB

WHAT IS YOUR MAN'S BEST? 3

AND WHAT IS HIS VULNERABILITY? 4

THE BOSS' ADVANTAGE IS 4 AND VULNERABILITY IS SECRET.

ROUND 1 BEGINS ...

JOEL'S PUNCH? 1

JOEL SWINGS AND HE MISSES

JOEL IS ATTACKED BY AN UPPERCUT (OH, OH) ... AND THE BOSS CONNECTS ...

JOEL IS ATTACKED BY AN UPPERCUT (OH, OH) ... AND THE BOSS CONNECTS ...

JOEL'S PUNCH? 2

JOEL GIVES THE HOOK ... CONNECTS ...

JOEL'S PUNCH? 2

JOEL GIVES THE HOOK ... CONNECTS ...

THE BOSS GETS JOEL IN THE JAW (OUCH!) ..... AND AGAIN!

JOEL IS ATTACKED BY AN UPPERCUT (OH, OH) ... BLOCKS AND HITS THE BOSS WITH A HOOK.

THE BOSS GETS JOEL IN THE JAW (OUCH!) ..... AND AGAIN!

JOEL IS KNOCKED COLD AND THE BOSS IS THE WINNER AND CHAMP.

AND NOW GOODBYE FROM OLYMPIC ARENA.

Just like at work. The boss wins!

You pull into the driveway and get out of the car. A frisby comes sailing toward you and smacks you in the temple. You look up but no one is in sight. You open the door and yell “Hi dear, I'm home,” only to be told that because you were 30 minutes late, no one could wait, dinner is on the table and she'll be down to sit with you after she gets off the phone. You eat alone, in silence. After dinner you go to your study where you hang out a "Do Not Disturb" sign and lock the door. You dial 789-0000 and put the phone down on the coupler. You log in and type

**RUN ADVENTURE**

YESTERDAY YOU WERE AT A COMPLEX JUNCTION ...

GO WEST

A LITTLE DWARF JUST WALKED AROUND A CORNER, SAW YOU, THREW A LITTLE AXE AT YOU WHICH MISSED, CURSED, AND RAN AWAY.
YOU ARE IN BEDQUILT. A LONG EAST/WEST PASSAGE WITH HOLES EVERYWHERE. TO EXPLORE AT RANDOM SELECT NORTH, SOUTH, UP, OR DOWN.

THERE IS A LITTLE AXE HERE.

TAKE AXE.

OK.

There is a knock at your door. "Dear, how was your day?"
"Fine," you say to your wife. "Listen, I'm on an important call. I'll be with you in about half an hour." She leaves.

WEST

YOU ARE IN SWISS CHEESE ROOM.

WEST

YOU ARE AT THE EAST END OF THE TWO PIT ROOM.

WEST

YOU ARE AT THE WEST END OF THE TWO PIT ROOM.

WEST

YOU ARE IN THE SLAB ROOM. THERE IS A THREATENING LITTLE DWARF IN THE ROOM WITH YOU. ONE SHARP, NASTY KNIFE IS THROWN AT YOU. MISSES.

Another knock. "Daddy, can you help me with my math?"
"I'll be with you in half an hour. I'm involved in something impor-
tant," you say and you hear the footsteps going away from the door.

THROW AXE.

YOU KILLED A LITTLE DWARF. THE BODY VANISHES IN A CLOUD OF GREASY BLACK SMOKE. THERE IS A LITTLE AXE HERE.

TAKE AXE.

OK

UP

YOU ARE IN A SECRET NORTH/SOUTH CANYON.

SOUTH.

YOU ARE IN A SECRET CANYON WHICH EXITS TO THE NORTH AND EAST.

A HUGE GREEN FIERCE DRAGON BARS THE WAY!

THE DRAGON IS SPRAWLED OUT ON A PERSIAN RUG!!

Somehow the hustle of the traffic, the news of the stock market, your boss and your family don't seem as important as they did a little while ago. You look over the keyboard and a gleam comes to your eye. You raise your hand and slowly, but with some authority, type in

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CIRCLE D84 ON READER CARD
Why TECO?

By Carl B. Marbach

Gone are the days when RUN $TECO was the only TECO monitor command and the only way TECO could be used. With the introduction of CCL's we can TECO FOO, BAR, or MUNG FOO. The latest versions of TECO now support DECSCOPES (VT05, VTS2, and VT100) via code in the editor itself (such commands accessible by the user are called primitives; i.e., V is a primitive to type the current line, while OLT uses several primitives to do the same thing). What we mean is that within the TECO language there are commands to control the screen of the Scope Terminals. V35 of TECO documents (via the MACRO code) how these primitives are built in the source code, and invites (?) support of foreign scopes.

It was of course inevitable that once these primitives were in place, a really good use of them would surface. An example of this is Version 02.00 of VTEDIT. VTEDIT is a TECO MACRO that controls the screen of a scope terminal and allows files to be edited as if TECO were a "KEYPAD" editor. A "KEYPAD" editor is one that allows the special keys (→ , ↑ , ↓ , ← ) to be used, and also implements the "Alternate keypad" mode on the terminal to allow single strokes to do special functions.

When we: TECO/VTEDIT FOO.BAR the monitor loads the VTEDIT MACRO into Q register I and executes it (MI). The MACRO then begins editing FOO.BAR by displaying 24 lines of it on the screen with a blinking cursor showing the "pointer" position. Although this is TECO running, the commands and structure are definitely NOT TECO. To insert text, for instance, position the blinking cursor via the arrows on the keypad, and type in what you want. The scope "window" is continuously updated and what you type in goes directly to the screen.

Each key on the keypad has a special function which will help you edit programs or data. It even has a key that lets you enter a real TECO command (beware). Although the overhead of VTEDIT can be considerable it has some useful features that should not be overlooked. One is its formidable formatting capabilities re: BASIC-PLUS. If you invoke the editor by: TECO/VTEDIT FOO.BAS/79, VTEDIT will handle the & <cr> continuation lines for you, placing the & in column 79 if the next line does not contain a line number. This means that you can enter a BASIC program without worrying about continuation, as VS EDITION takes care of it for you! Of course, TECO/VTEDIT FOO.BAR/131 will reformat the program so that all & will be in column 131.

V7.0 comes complete with TECO V35, VTEDIT V02.00, TECO.DOC. Release Notes for TECO and several neat TECO MACROS — all fun.

You don't want the overhead of this MACRO, or all the pseudo functions, but you do want to see what is happening to your text window? Do you have a VT100 (or foreign VT100)? If you do, you can build SCROLLING TECO. This requires rebuilding the TECO.RTS after modifying on the MACRO programs that make up TECO itself (all is described in the release notes). Although the resulting RTS is bigger the results are interesting. It uses the split screen scrolling of the VT100 to produce two windows: one of the text the other of the TECO commands. At once a 'window' of the text buffer is shown at the top 24-n lines, while the TECO commands are displayed in the lower n lines of the screen. As new TECO commands are entered they scroll within that region, and the text 'window' is modified, reflecting the current state of the text buffer.

SCROLLing TECO can be used as a teaching aid because you see the changes to the text buffer as they happen. Those of you who have not seen the split/scroll of the VT100 are in for a treat. Also, since SCROLLing TECO uses real TECO commands, those of us used to the short but sweet instruction set feel right at home. You won't find yourself short if you can't find a VT100, because you will be using real TECO all along.

TECO... A keypad editor, a window editor, an editor and maybe most important, a language. Don't miss it.

"The" History of TECO. We hope to publish the entire story in a future issue. Each box represents an implementation or a release.
In last issue's article, "How TECO?", while pointing out how certain potential inefficiencies in the use of TECO can be circumvented by the use of moderately advanced techniques, I made extensive use of Q-registers in my examples. In this article, also intended mainly for the interested TECO user who is ready to progress from the novice stage, I shall examine the uses of Q-registers somewhat more systematically. There are thirty-six Q-registers, designated by the twenty-six letters of the alphabet and the ten decimal digits, that may be used to store and retrieve either text or integers. Although many applications will require the storage of both data types, I will describe them separately for the sake of clarity.

The simplest example of text storage and retrieval arises when a section of a program is to be duplicated at or transferred to another location in the same file. To pick up, say, three lines of text, we position the pointer at the beginning of the first line and storing them in register T without changing the source or pointer position. We can then delete them from the source, if necessary, position the pointer at the location where they are to be inserted, and completing the task. The text remains unchanged in register T, and so can be used for multiple insertions or replacements. For example, suppose we have a FORTRAN COMMON block

```plaintext
COMMON /DATA/ TIME(100), CONCA(100)
```

to which another array, CONCB, is to be added in all routines in a file. We could locate the first appearance of the COMMON and make the required change

```
*L 2R I.CONCB(100)$ OTT$$
```

and hammering the <alt mode> key twice in relief, they find that they neglected the all-important i at the beginning. They then usually receive some error message as their text is interpreted as a command string, and, if their profanity is loud enough and an expert is in earshot, they will be told to do

```
**I
```

This transfers all of the previous command string, including one of the two terminating <alt modes> 's, to register I. It then only remains to reposition the pointer, if necessary, and

```
*GI-D$$
```

inserting the required text and deleting the trailing <alt mode>. Note that the * command must be typed immediately after TECO's prompting *, and requires no terminating <alt mode> 's.

Not only may one store commands in Q-registers, one may also execute them there. Consider the following case, in which a program is to be searched for all occurrences of the SIN function, each of which is to be inspected and in appropriate instances changed to COS:

```
*NSIN($0TT$$
PHASE = SIN(OMEGA*TIME)
**S
*R-3DICOS$0TT$$
PHASE = COS(OMEGA*TIME)
**C
*MSS$$
```

The first command string finds and displays an occurrence of SIN, and is then stored in register S for reuse. *S. SIN is then changed to COS, the result displayed, and the command string used stored in register C. *C. Then we use the stored search command string, MS, to find and display the next SIN function. This could be changed, MC, and/or MS used to find the next occurrence.

You may by now be realizing that, with the data storage capabilities that Q-registers provide, and with the subroutine structure that the ability to execute commands in them confers, TECO can be used as a programming language. Indeed it can. One of the older PDP-10 manuals contains the intriguing statement that TECO "...can...operate upon arbitrary length character strings under control of commands which are themselves character strings (and contains the mechanisms neces-
sary to exploit this recursiveness)." That may have been what first stirred my interest in its more powerful capabilities.

An integer expression, n, can be evaluated and its result stored in register N by

\[ n \text{UNS}\]

This result is then available for use in expressions or commands that take a numeric argument or arguments by referencing it as QN. Among the numeric data most frequently used during editing are pointer positions and character counts. For example, to transfer a string of text within parentheses to register P:

\[ * S( -1 ) U B S I S Q B \text{, } X P \text{S}\]

The pointer position before the opening parenthesis is stored in register B, S( -1 )UB, the pointer is positioned after the closing parenthesis, SIS, and then the text is transferred. QB..XP. In several of the examples in the previous article we wished to attempt to append to the current buffer from a file, exiting from a loop if no more text was available. We achieved this by

\[ * < \ldots \ldots \text{ ZUZ } A \text{ (QZ-Z)}' \text{E } 1: > \text{ EXSS}\]

ZUZ stores the count of characters in the buffer in register Z, and A appends to it. If the stored and new values of Z are equal, (QZ-Z)'E, we exit from the loop, 1:, otherwise reiterate, ">. Much of the utility of numeric calculations in TECO derives from the richness and diversity of the numeric quantities available to it. We have already met uses of the current pointer position, ... and the number of characters in the buffer, Z. Other examples range from the number of characters in register T, QT, and the ASCII value of the next character typed on the keyboard, T T (very useful for introducing an element of interactive choice into an otherwise automated editing process), to the time of day, T H, and the value of the console switch register, T F ! The next example of number storage in Q-registers introduces three more useful ways of generating numeric values, /, nA and T T. A new entry has been inserted into a table of binary switches. All subsequent switch values in the table, uniquely identified as strings of digits preceded and followed by <tab>, must therefore, be multiplied by two. This is accomplished by:

\[ * S< \text{tab} > \text{E} D S: R \text{,UB /US } (O A- \text{E} S< \text{tab} > )'E Q B \text{.K } (2*Q S/)' > \text{ E X S}\]

We iteratively search for <tab> followed by any digit, exiting the loop if no more such strings are found, <S<tab> \& E DS, reverse over the digit, R, store the current pointer position in register B, UB, and then read the value of the whole digit string into register S, /US. This positions the pointer after the last digit, so we test whether the ASCII value of the next character in the buffer, OA, is equal to that of <tab>. T T <tab>, by (OA- \text{T T } <\text{tab}>)'E If it is, we delete the digit string, QB.K, and insert the string of twice its value into the buffer, (2*Q S/), and in either case continue the loop, ">.

As a final example of what may be done with Q-registers, let us consider the Q-register pushdown list. Do any examples of its utility immediately spring to your mind? No? Suppose we wanted to insert the number stored in register N into the buffer in hexadecimal. To represent a number in arithmetic of some base, the general procedure is to repeatedly divide it by the base, storing the remainders. These, in reverse order, represent the digits of the number in that base. The last-in-first-out structure of a pushdown list performs this elegantly:

\[ * Q N U 1 \text{ OC} \]

First, we put the number into register 1, QNU1, and initialize the count of hexadecimal digits to zero, OUC. Then, in the first loop we store a copy of register 1 in register 2, Q1U2, divide register 1 by sixteen, the number base, (Q1/16)U1, and calculate the remainder of this division into register 2, using the copy of the dividend already there, (Q2-(16*Q1))U2. We push this result onto the stack, \[2\text{, increment the count by one, } \%\text{CS, and exit the loop if all information has been divided out of register } 1, Q1' \text{E } 1, \text{ else reiterate, } >. \text{ The count of characters specifies how many times the second loop is to be executed, } QC<. \text{ In it we pop each digit off the stack into register 1, } J 1, \text{ and store the ASCII value of the digit } 0 \text{ in register } 2, \text{ } \%\text{CS. However, if the hexadecimal digit is greater than nine, (Q1-9)'G, we must represent it as a letter, so we store ten less than the ASCII value of the letter } A \text{ in register } 2, \text{ ( } \%\text{CS. In any case, we insert the character whose ASCII value is the number in register 1 plus the appropriate addendum in register 2 into the buffer, } (Q1+Q2)\text{S, and repeat the loop, } >. \text{ You may have noticed that I have been attempting to use registers whose letters are mnemonic for the data stored whenever possible, reserving the registers identified by digits for short-term scratch use. It is difficult to imagine structured TECO: concise commands of a few characters perform functions that would take whole programs in other languages, but the adoption and observation of such conventions should assist in error avoidance and detection. More extensive documentation can be provided in program labels, but they will have to be the subject of a future article.} \text{ The uses (and probably the abuses, too!) of Q-registers are very diverse and extensive, and I hope that this brief and rather selective review of some of them has given you a feel for their power. They range from deciding whether the current year, } \uparrow \text{B, is leap, to providing an efficient vehicle for the frequent insertion of the text:} \]

\[ \text{There was an old man from...} \]

which I keep in Q-register L.
A BASIC-PLUS-2 PROGRAMMER'S GUIDE TO RESIDENT LIBRARIES
By Al Cini, Computer Methods Corporation

While they evolve along distinctly different paths, RSTS/E and RSX occasionally intersect in some commonly implemented function or feature designed to promote compatibility between them. The RSTS/E V7.0 flavor of "Program Logical Address Space" monitor directives parallels its RSX-11 counterparts, offering the BASIC-PLUS-2 programmer expanded control of the physical relocation of portions of his or her application programs within computer memory. Provided monitor support for resident libraries was selected at system generation*, you can take advantage of this new feature in two ways:

1. You can use Taskbuilder commands to build and "link" to resident libraries. Only a very little bit of non-threatening assembly language coding is required — the Taskbuilder does most of the work.

2. You can execute .PLAS monitor calls to attach and map resident libraries. This approach requires some moderately demanding MACRO, but offers great flexibility of control over user memory.

This article will treat the Taskbuilder procedures required to create and use resident libraries, including all the assembly language needed to create "resident common" memory areas. While some discussion of their possible uses will be offered, a detailed discussion of .PLAS directives is deferred to your copy of the "RSTS/E System Directives Manual." Material presented in this article is intended as a supplement to standard RSTS/E documentation. Some previous familiarity with Taskbuilder procedures is assumed, and the reader is referred to the "RSTS/E Taskbuilder Reference Manual" for in-depth treatment of specific commands.

What is a resident library?

Shared memory segments — regions of physical computer memory which appear to be a part of one or more active user jobs — are not new to RSTS/E. RSTS has made good use of such structures for years; they're called run-time systems. A really lucid description of how RSTS/E relocates, or "maps," user programs, run-time systems, and resident libraries within physical computer memory (including a truly inspired drawing worth many thousands of words on the topic) can be found in Chapter 2 of the System Directives Manual. Briefly, a RSTS/E job's "logical" memory consists of its (optional, if disappearing RSX) run-time system (HISEG), its task image, and up to 5 optional resident libraries (even more, provided they're not all "attached" by a job at the same time).

In the BP2 environment, the run-time system may be RSX, BP2COM, BASIC2, or RMS11. Compiled code and data will comprise the task image, which can access either or both of the "standard" resident libraries (RMSRES/RMSSEQ and BASICS), as well as other user-built libraries.

In the BASIC-PLUS environment, a user job will consist of a flavor of BASIC-PLUS run-time system (determined when it is initially built) and a "work area" containing semi-compiled instructions and data. The total memory taken by all simultaneously mapped software components cannot exceed 32KW (this is the infamous "32K limit"). BASIC-PLUS-2 programmers are well aware that, within this limitation (it may be even more strict, depending on the local SWAP MAX), BP2 program size can be traded off against execution-time performance by selecting from among a somewhat confusing assortment of HIESEGs, ODL files, and RESLIBs in taskbuilding their jobs.

It's important to note that, when assembling memory segments into jobs, RSTS/E considers user memory in 4KW "pages." A user job can control up to eight of these pages at a time, and the Taskbuilder deals in pages when connecting separate memory components to your task (see figure 1). The system "maps" these pages into physical memory by loading address relocation information into the job's 8 Active Page Registers (APRs) using mechanics which are totally transparent to the user. An important practical ramification of this "page" architecture is that any resident library or run-time

*The "disappearing RSX" option, while not a strict necessity, is a practical requirement for BASIC-PLUS-2 resident libraries.
system will occupy multiples of 4KW user memory chunks. Thus, a stripped-down 14KW BASIC-PLUS run-time system will not allow a program size of 18KW; 16KW is still the maximum. Likewise, a shared common area containing a one word status flag will gobble up another 4095 words of user memory when it's attached to a job. Note that physical memory is allocated by RSTS/E in smaller 1KW chunks, so small memory segments (such as the 3KW RSX run-time system) occupy memory regions rounded up to the next 1KW in size.

Like a run-time system, a resident library exists within a distinct, named region of physical computer memory defined when it is ADDed to the system (normally via the UT ADD LIBRARY command). Like a run-time system, a resident library may be mapped into more than one user job at a time (i.e., may be "shared"), and may contain subroutines, program sections, or other "global" symbols which may be referenced transparently by an associated task. Unlike a run-time system, a shared library contains no job control structures (such as a pseudo-vector or keyboard monitor), must be loaded at a specific physical memory address, and may be "attached" or "detached" dynamically by a user program. The RSTS/E implementation of resident libraries indeed closely parallels its run-time system mechanism. If you re-name BP2COM.RTS, as PB2COM.LIB, it can then be ADDed and "linked" to your BASIC-PLUS-2 program (your HISEG must be disappearing RSX to manage this) just as though it were a resident library.

**Things that go into resident libraries.**

A resident library may contain only code (such as RMSRES and BASICS), only data (this is a "shared common" area, and can be used for high-speed inter-job communication), or some specially tailored combination of code and data.

A shared library containing code is considered to be re-entrant if the software within it can be executed simultaneously by more than one task (e.g., RMSRES, BASICS). BASIC-PLUS-2, like most high-level language processors, does not generate re-entrant code: resident libraries containing BP2 subroutines thus can't be shared by multiple jobs.

Whether it contains code and/or data, a resident library may either be position-dependent or position-independent. A library is position-independent if it can be accessed successfully regardless of its placement in a user's logical memory; any of user APRs 1-7 may be used to map a position-independent library. A position-dependent library, on the other hand, must always be loaded at a certain user memory address, which corresponds to a "base" address specified to the Taskbuilder when the library is constructed (position-independent libraries are taskbuilt with a base address of 0). RMSRES, for example, is a position-independent library. All run-time systems, because they are explicitly built to occupy the highest user-memory addresses, are position dependent.

In practical BP2 terms, a user program accesses a position-dependent library via global symbol (i.e., subroutine entry point) names, while a position-independent library may be entered by subroutine reference and/or referred to by COMMON or MAP name. Since BP2 compiled code is position dependent, BP2 resident subroutine libraries will be position dependent as well. A main program can communicate with such subroutines via argument lists, but not through MAP or COMMON areas. Two or more BP2 jobs can communicate with each other at super-fast core speeds through an easy-to-build "shared common" resident library, which must be position independent and, hence, can't contain any user-written BP2 subroutines (as we'll see later, elements from BP2COM.OLB can be incorporated into a shared common area to "flesh it out" to a 4KW boundary and conserve user address space).

![Figure 1. "Page" organization of a RSTS/E job.](image-url)
Building a resident library of BP2 subroutines.

Consider the following simple BP2 program modules:

OLD MAIN

BASIC2

LISTNH

100 ! THIS SIMPLE ROUTINE CALLS TWO SUBROUTINES: &
! &
! STRING RETURNS A RANDOM STRING OF 10 &
! &
! STRREV TAKES A CHARACTER STRING ARGUMENT &
! &
! CHARACTERS. &

1 110 CALL STRING (X$)
1 120 PRINT X$
1 130 CALL STRREV (X$)
1 140 PRINT X$
1 150 GO TO 110
32767 END

BASIC2

OLD STRING

BASIC2

LISTNH

1 1 SUB STRING (X$)
1 100 X$=’’
1 110 X$=X$+CHR$(RND*26+65) &
  FOR I%=1% TO 10%
32767 SUBEND

BASIC2

OLD STRREV

BASIC2

LISTNH

1 1 SUB STRREV (X$)
1 100 Y$=’’
1 110 Y$=Y$+MID(X$,I%,1%) &
  FOR I%=LEN(X$) TO 1% STEP -1%
1 120 X$=Y$
32767 SUBEND

BASIC2

A resident library (MEMRES) containing the STRING and STRREV subroutines can be built with the following TKB command files:

(MEMRES.CMD:)
SY:MEMRES/-HD, MEMRES, MEMRES=MEMRES/MP
PAR=MEMRES:120000/60000
STACK=0
//
Once constructed, the main BP2 program can link to the subroutines in MEMRES as follows:

```plaintext
RUN $TKB
TKB>MAIN=MAIN,LIB:BP2COM/LB
TKB>/
ENTER OPTIONS:
TKB>RESLIB=MEMRES/RW
TKB>UNITS=12
TKB>ASG=SY:6:7:8:9:10:11:12
TKB>EXTTSK=512
TKB>///
Ready
```

Note that a user program can be taskbuilt to a resident library which is not ADDed. If you refer to MEMRES.CMD, you will note that we have requested a task image, a load map, and a symbol table via our "MEMRES/-HD, MEMRES, MEMRES" command line. The symbol table file (MEMRES.STB) contains address information for STRING and STRREV needed to resolve the CALLs to these subroutines from the main program. The RESLIB option in the above TKB sequence directs the Taskbuilder to MEMRES.STB for this linkage data, and the Taskbuilder generates the required .PLAS directives to map our MEMRES library. RESLIB will accept a [p,pn] designation within the library name field, thus allowing users to link to resident libraries under other system accounts.

If we were to run MAIN at this point, we would get a confusing "? Can't find file or account" error message. This is caused by our Taskbuilder-generated .PLAS directives failing to attach to MEMRES, which we have yet to load into memory. Since only specially SIL-formatted files can be ADDed, we need to use the MAKSIL program to build MEMRES.LIB (MAKSIL is not built automatically during SYSLIB BUILDing — you may need to copy MAKSIL from your distribution kit):

```plaintext
MEMRES can now be ADDed:

RUN $UTILITY
UTILITY V7.0-07
$ADD LIBRARY [1,201]MEMRES<0>/ADDR:100/RW/1USER
$EXIT

Ready

(Refer to your "RSTS/E Programmer's Utilities Manual" for an in-depth description of MAKSIL.)

This command ADDs MEMRES from the specified account (the default is [0,1]; if the .LIB file is under any other account — even your own — a [p,pn] must be specified) into main memory, beginning at physical address 100KW. Since BP2 subroutines "write" on themselves, the /RW switch is needed. Our specified protection code is 0, which allows all users read/write access to the MEMRES memory area. This code can be tailored to protect a shared library in much the same way as a disk file (see the "System Manager's Guide"). The /USER switch will deny all access to MEMRES for any more than one user at a time. Since BP2 subroutines are not re-entrant, this avoids the probable bizarre and random consequences of simultaneous multiple-user execution. (Should this occur inadvertently, MEMRES — which may be corrupted in the process — should be REMOVED and freshly ADDed. The /REMOVE switch will cause a fresh MEMRES copy to be loaded each time a new job attaches to it: in this BP2 context, /REMOVE is a good idea.)

Refer to the previously presented MEMRES.ODL file, and notice that subroutines from BP2COM are linked into MEMRES. Memory resident libraries must be "self-contained" — they cannot call subroutines in their referencing tasks. If you were to
specify map file output for MAIN.TSK, however, you would note that BP2COM routines used by MAIN that are already linked into MEMRES are not copied from BP2COM into MAIN.TSK. Instead, the Taskbuilder resolves references to these library routines into MEMRES, making it a "mini-BASICS" as well as a user subroutine area.

Note the "PAR=MEMRES:120000:60000" option within MEMRES.CMD. This option "names" the shared region, and specifies that it should be built beginning at user address 120000 (20KW) for a length of 60000 octal bytes (12KW). This particular specification precludes the use of any HISEG (other than disappearing RSX), but can be modified to make room for one. Note that the TKB "% Task exceeds memory limits" warning message accompanies any attempt at building 10 pound programs in 5 pound bags. You can refer to the map file to determine the necessary base address/length adjustments, then re-TKB the library.

Memory-resident overlays.

Single-user-only subroutine libraries offer few advantages to the BP2 programmer; if not for memory-resident overlays, there would be little point in discussing resident libraries of BP2 subroutines. Consider the following revision to MEMRES.ODL:

```
 NAME X
 USER: FCTR *! (STRING-LIB, STRREV-LIB)
 LIBR: FCTR LB:BP2COM/LB
 END
```

As with disk overlays, the STRING and STRREV subroutines are assigned to the same user logical address. Unlike disk overlays, global address reference to these overlaid program segments is accomplished via memory mapping directives rather than disk READs from a task image file. This overlay approach requires the following modified MEMRES.CMD:

```
 SY:MEMRES/-HD,MEMRES,MEMRES=MEMRES/MP
 PAR=MEMRES:120000:60000
 STACK=0
 GBLREF=STRING
 GBLREF=STRREV
```

Note that less user space is required (in this simple example, the saving is negligible), and that our subroutine names must be explicitly declared as global references. This is required because, by "overlaying" STRING and STRREV on top of an empty "dummy" root segment (X), we eliminate the automatic placement of global references to STRING and STRREV into MEMRES.STB by the taskbuilder. Note also that BP2COM.OLB modules, since they are not in the root of our overlay structures, can't be shared by the main program. While we've saved some space by overlaying, we've forced an extra 3KW of BP2COM routines into MAIN.TSK. Referring to our load map, we can include these BP2COM OTS routines into the root of our MEMRES overlay library by brute force:
This maneuver at once reduces the physical size of MEMRES by 3KW (BP2COM appears only once within the root segment of MEMRES, rather than once in each overlay segment), and the logical size of MAIN.TSK by 3KW (because MAIN.TSK can now use BP2COM routines contained in MEMRES). As the number of overlay segments increases, this device can become very important indeed.

Of course, these "memory-resident overlay" libraries cannot be shared, and depending on program size can demand large regions of precious physical memory. Certain "number crunching" applications involving the invocation of very large subroutines within program loops can be constructed using memory resident overlays, and will run faster than a corresponding disk-overlay implementation. (Read the resident library chapter of the Taskbuilder manual before striking off to convert your number-crunchers; there are annoying restrictions to using AUTOLOAD with memory resident overlays in a resident library which make direct translation of disk overlay specifications somewhat risky.)

Shared common.

Probably the most useful application of resident libraries in a BP2 environment is the "shared common" area. Using shared common, a MAP or COM in one program can be overlaid onto MAP or COM regions of the same name in one or more other programs — thus, separate RSTS/E jobs can exchange large volumes of data at memory cycle speeds.

The following trivial assembly language program defines a four-byte program segment named LINK:

```
.TITLE TEST
.PSEC LINK.D,RW,GBL,REL,OVR
.BLKB 4.
.END
```

The .PSEC MACRO directive is analogous to the BP2 MAP statement. The .BLKB directive allocates a "block" 4 bytes long (the '.' after the 4 specifies a decimal rather than octal byte count).

Assuming that PIP or an editor were used to build TEST.MAC containing the preceding MACRO program, a shared common area by the name TEST.LIB can be built as follows:

```
RUN $MAC
MAC > TEST = TEST
MAC > Z

RUN $TKB
TKB > TEST/-HD/PI,TEST,TEST = TEST
TKB > /
ENTER OPTIONS:
TKB > PAR = TEST:0:0
TKB > STACK = 0
TKB > //
Ready
```

The following assembly program defines a four-byte program segment named LINK:

```
.TITLE TEST
.PSEC LINK,D,RW,GBL,REL,OVR
.BLKB 4.
.END
```

```
.END
```

RUN (1,8)MAKSIL
MAKSIL V7.0-07
Resident Library name? TEST
Task-built Resident Library input file <TEST.TSK>?
Include symbol table (Yes/No) <Yes>?
Symbol table input file <TEST.STB>?
Resident Library output file <TEST.LIB>?
TEST built in 1 K-words, 0 symbols in the directory
TEST.TSK renamed to TEST.TSK<40>

Ready
Two sample BP2 routines which can communicate via TEST:

**OLD WRITER**

**BASIC2**

**LISTNH**

```plaintext
10 ! WRITER ... THIS ROUTINE WRITES RANDOM NUMBERS &
   ! INTO THE "LINK" SHARED COMMON AREA. &
   !
100 COM (LINK) X
105 X=RND
110 X=RND &
   UNTIL X=0
32767 END
```

**BASIC2**

**OLD READER**

**BASIC2**

**LISTNH**

```plaintext
10 ! READER ... THIS ROUTINE DISPLAYS THE CONTENTS OF THE NUMBER &
   ! STORED IN "LINK" WHENEVER IT CHANGES. &
   !
100 COM (LINK) Y
110 Z=Y
120 IF Z<>Y THEN &
   PRINT Y &
   Z=Y
130 GO TO 120
32767 END
```

(Note: these routines must be compiled with the /NODOUBLE switch, if double precision floating point format is the compiler default.)

These programs can be linked to TEST.lib with the following taskbuilder commands.

```
RUN $TKB
TKB>WRITER=WRITER,LIB:BP2COM/LB
TKB>/
ENTER OPTIONS:
TKB>RESLIB=TEST/RW
TKB>UNITS=12
TKB>/
TKB>READER=READER,LIB:BP2COM/LB
TKB>/
ENTER OPTIONS:
TKB>RESLIB=TEST/RO
TKB>UNITS=12
TKB>/
```

After TEST.lib is added to the system, run READER and WRITER simultaneously using two terminals (you can "DETACH" WRITER, if you like). Notice that adjusting the run-burst of these jobs significantly affects the READER display rate (you may need a high-speed CRT to see a difference). This is because both jobs are compute-bound at the same priority, and will be scheduled on a "round robin" basis as their run bursts expire.

Transfers between jobs — particularly involving large data volumes — are substantially faster via shared common than by way of message send/receive. Also since transfers are direct from task image to task image, monitor overhead is completely by-passed and system loads are correspondingly lightened. In such "transaction processing" applications, however, the programmer assumes responsibility for coding the "handshaking" necessary to synchronize jobs communicating through a resident common. In our simple example, a change in the state of the contents of a shared MAP is used to "signal" printing within the READER job. In general, however, two or
more compute-bound jobs "looking" for changes in state indicator variables will impose quite a system burden. Alternatively, the availability of data for processing in a shared MAP can be signalled by sending a small interjob message, and completion of processing can be acknowledged in the same manner.

The Taskbuilder commands we used to link WRITER and READER to the shared common area TEST include provisions for specifying the type of access required (/RW in the RESLIB command requests read-write access: /RO specifies read-only access). This specification is made independently of the protection code and /RW switch specified when the common area is ADDED, and consequently access violations are handled differently by the system depending on whether the error is detected when the accessing program is initially loaded ("?Protection violation" immediately after RUN), or while it is running ("?Memory management violation" during program execution).

As an added suggestion, a shared MAP area, associated with an RMS file opened in one job, can be interchanged with another job which doesn't use RMS. Certain RMS-intensive applications which could benefit from non-overlaid RMS (or another job which doesn't use RMS. Certain RMS-intensive tasks for your planned resident common is a good bet) . Also, remember that whenever you make a change to the size of one or more .PSECTs within a resident common, it and all of its referencing tasks must be re-built.

Incorporating OTS routines within a resident common area.

Consider our TEST.LIB shared common area. Note that, because we want to reference it by COM or MAP area equivalence, we need to Taskbuild it with the /PI (position-independent) switch. Remember that, since our MEMRES BP2 resident subroutine library was position-dependent, we could pass arguments to STRING and STRREV but could not pass information to them via MAP or COMMON. Also note that, because resident libraries occupy 4KW multiples of user address space our TEST shared common area occupies 4096 words of user space, while actually making use of only 2 of them. In practice, few MAP areas will align perfectly to 4KW boundaries, and the resulting wasted space may often prove prohibitive.

By playing a few Taskbuilder games (borrowing from the re-build procedures for the BASICS shared library-check your BP2 Installation Guide and BP2 distribution kit), we can incorporate commonly used BP2COM/LB routines into our shared common area to "flesh it out" and make better use of the space within it.

The procedure is simple:
1. Compile a sample BP2 program (one of the referencing tasks for your planned resident common is a good bet).
2. Taskbuild it and obtain a .MAP file. For example:
   RUN $TKB
   TKB > WRITER.WRITER=WRITER.LB:BP2COM/LB
   TKB > //
3. Get a listing of the .MAP file, and look for the heading SECTION on the left near the top of the first page. Note the heading TITLE on the right side of the same line.
4. Under the heading SECTION, look for BP20TS:(RW,1.LCL,REL,CON). Entries in this column are in alphabetical order, so BP20TS should be close to the top.
5. BP20TS is the name of the .PSECT into which all required BP2 system subroutines are collected. In the TITLE column under this BP20TS entry is a list of modules which were required by your sample routine.
6. Use Taskbuilder "BP2COM/LB:" to include these Modules from BP2COM into your shared common area. Using WRITER and TEST, here is an example command file:

   TEST/-HD/PI,TEST,TEST=TEST
   LB:BP2COM/LB:$CNTRL
   LB:BP2COM/LB:$ICEND
   LB:BP2COM/LB:$ERROR
   LB:BP2COM/LB:$FMOD
   LB:BP2COM/LB:$FRAND
   LB:BP2COM/LB:$TESTS
   LB:BP2COM/LB:$IEULT
   LB:BP2COM/LB:$IVOPN
   LB:BP2COM/LB:$BINIT
   LB:BP2COM/LB:$STMSC
   LB:BP2COM/LB:$ICRCL
   LB:BP2COM/LB:$JCONV
   LB:BP2COM/LB:$ICEOL
   LB:BP2COM/LB:$BFPER
   LB:BP2COM/LB:$BBTKS
   LB:BP2COM/LB:$BXTSA
   LB:BP2COM/LB:$ICKOP
   LB:BP2COM/LB:$ICFSS
   LB:BP2COM/LB:$STGA
   LB:BP2COM/LB:$ICULT
   LB:BP2COM/LB:$RGLCB
   LB:BP2COM/LB:$SAVRG
   / PAR=TEST:160000:20000
   STACK=0
   //
7. Obtain a program called RESSTB from your BP2 VI.6 distribution kit, and run it as follows:

```
RUN (1,8)RESSTB
ENTER FILE SPECIFICATION FOR RESIDENT LIBRARY ? TEST
ENTER 3 CHARACTER CCL/MCR NAME ? BP2
THE PSECT FOR YOUR LIBRARY IS BASOTS.
```

(Always answer "BP2" to the "ENTER 3 CHARACTER CCL/MCR" prompt, whether or not the CCL name you specified when you built BP2 VI.6 was "BP2").

While our TEST.MAC program is position-independent, BP2COM OTS routines are not. We therefore, use both the /PI switch and non-zero base and length values in the PAR command to, in effect, build a curious hybrid resident library which has a position-independent symbol table (including PSECT addresses), but which is linked to a specific user memory address. Since .PSECT names within shared libraries (with position-independent .STBs) must not be the same as any in a referencing task (except, of course, for the shared COM/MAP), RESSTB is used to "tweak" the symbol table file entry for BP2OTS, changing it to BASOTS. **Note that the alphabetical order of PSECT names within the symbol table must be preserved** — your shared library must not use any MAP/COM names between BASOTS and BP2OTS. Also, modules included from BP2COM must be listed in the same order as they were found in the .MAP file.

8. The TEST shared library may now be ADDed and linked in the manner outlined earlier.

**Remember: these procedures are release-dependent. They work with BP2 VI.6, but may not with previous or later releases.**

Omission of the RESSTB step will result in "LOAD ADDRESS OUT OF RANGE" errors when Taskbuilding tasks against shared common area containing OTS routines. Also, any "undefined global reference" errors accompanying the TKB for a shared common are probably the result of omitting or misspelling a required OTS module name.

**.PLAS directives.**

So far, we've confined our discussion of resident libraries to the Taskbuilder commands and options required to build and link to them. While a programmer in this environment is totally unaware of the dynamics involved, the Taskbuilder, in fact, uses .PLAS directives to accomplish this linkage. Armed with some knowledge of MACRO and the .PLAS monitor call formats, a systems programmer can dynamically map a resident library up to 32KW in size, mapping it 4KW at a time (use smaller segments, if you like — the mapping can take place beginning at any 32 word boundary for a minimum length of 32 words). Such a program can, in effect, directly address 60KW or more of user space to implement some exotic "virtual array" scheme for use in some scheduling or array processing application (remember, a job can "map" as many as five resident library areas at once: that's access to more than a quarter megabyte of space). All the information needed can be found in your "MACRO Programmer" and "Monitor Directives" manuals (refer to your "BP2 User's Guide" for information on calling user-written MACRO subroutines).

**CONCLUSION**

The Taskbuilder is slow. It takes forever to assemble a runnable core image. Now, at last, with RSTS/E V7.0, the Taskbuilder offers you something to read and think about ... while it's Taskbuilding. Have fun.
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