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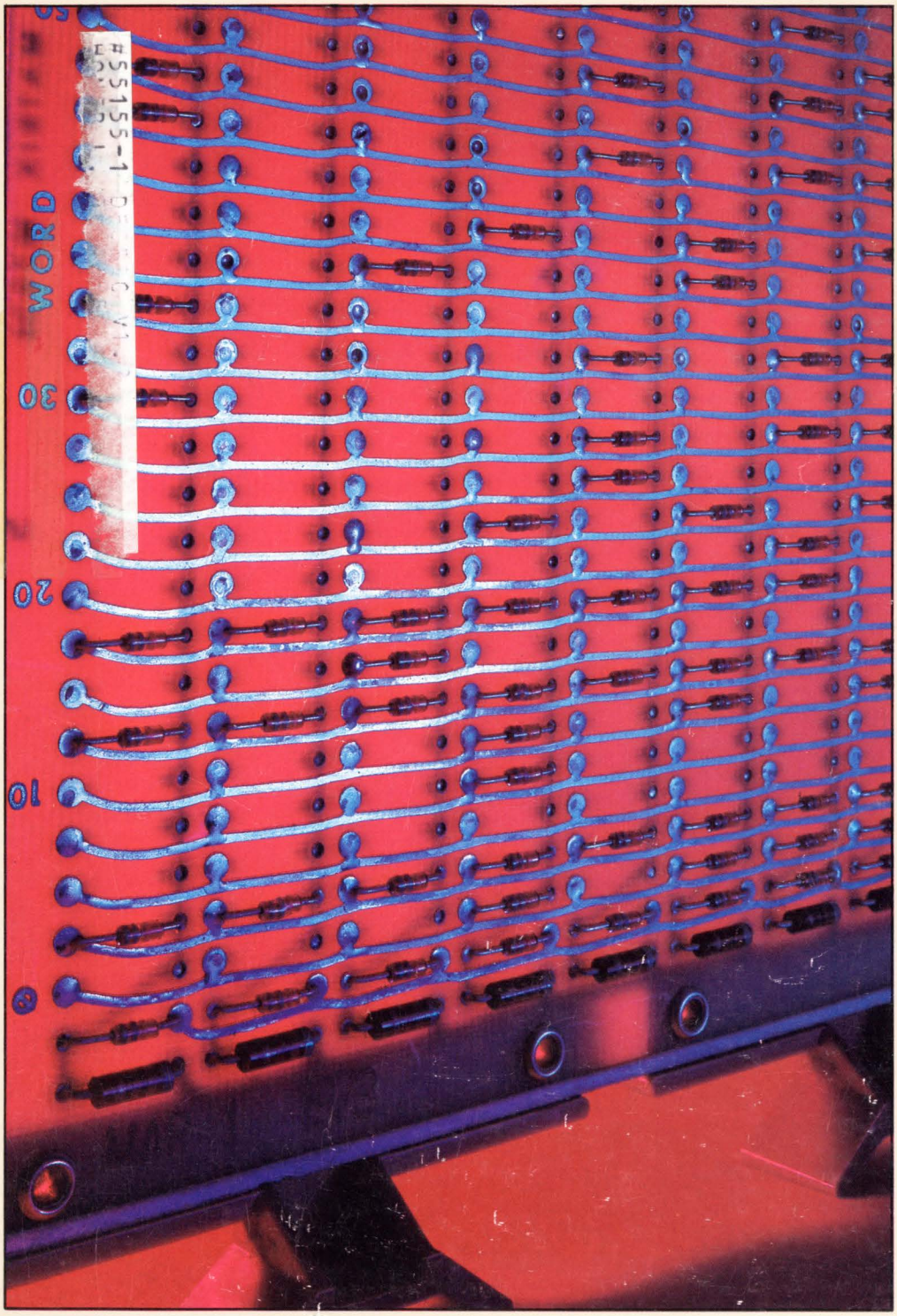
SEPTEMBER • 1982

THE DEC* PROFESSIONAL

• VOLUME 1, NUMBER 2 •

THE MAGAZINE FOR DEC USERS



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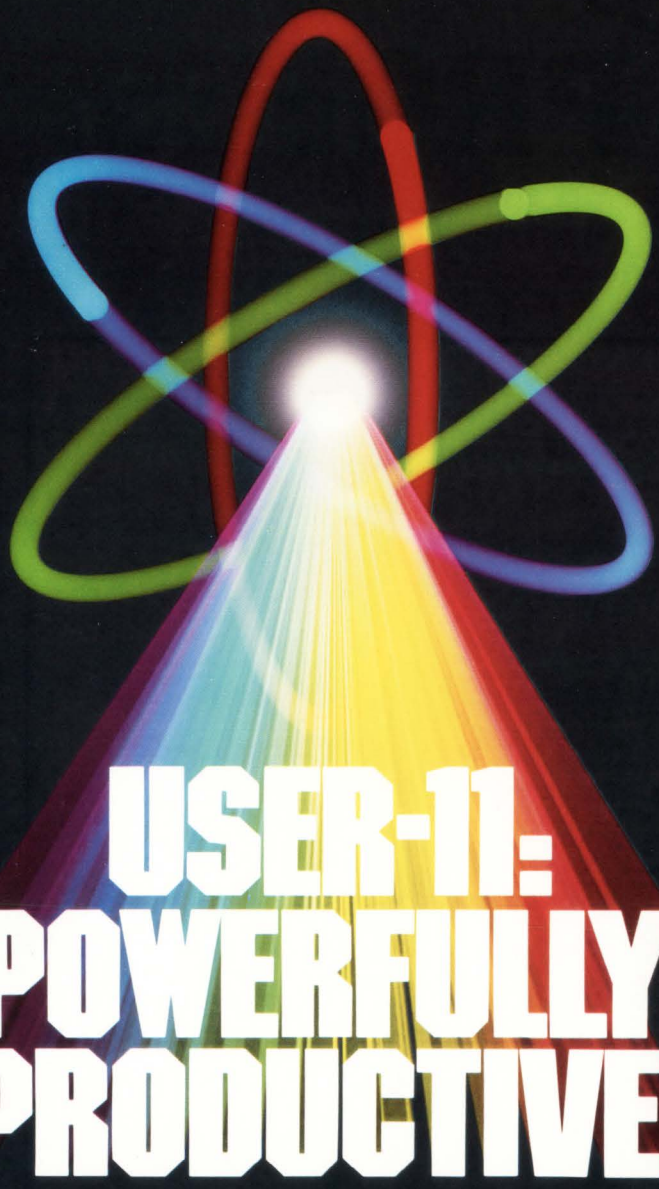

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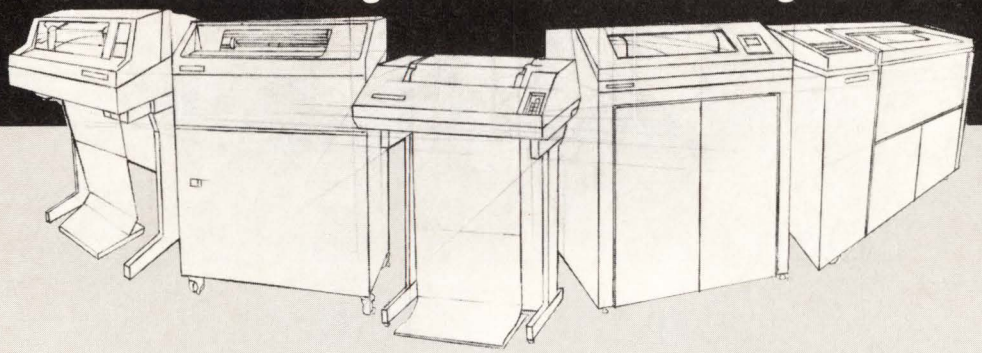

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- A Hospital Radiology System for VAX
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FROM THE EDITORS

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 how to do it anyhow? I would like to simply

. . . continued on page 67

Is There Life After DSA?

Dave Mallery

At first glance, it looks like DEC's new storage offerings have doomed the add-on disc vendors to oblivion. After all, how can they build a suitable answer to the RA81? It is certainly true that my five 9766's will go the way of the RP02 in short order, simply because of the large reductions in maintenance and the ever present electric bill (mine just went from 850 to 1300 dollars in one month . . .). It is also interesting to note that DEC has 'scooped' the other vendors. (I had 9766's from SI two years before you could buy RM05's from DEC).

You can now buy Fujitsu Eagles (470MB Winchesters) and even get delivery. This drive (a masterpiece of Japanese craftmanship), is the same size and shape as the RA81 and is probably equivalent in power and field service. The big plus for the short term is that it can be configured with your choice of massbus controllers. We have accumulated about four device years on a group of the Eagle's little brothers (160MB Fuji) without a single drive-related service call. Indeed, the drives are more reliable than the controllers!

Well and good; the gang at SI, Emulex, Braegen and all the others can spend the next three years selling Eagles, and of course, they will. The sales calls, however, will become very boring. The whole deal will hinge on whose controller is better (more reliable, faster, etc). It will be like the good old days in the auto industry.. should I put Firestones or Michelins on my Seville?? . . . shall I put a tiger in my tank??

Abusing my editorial privilege to the hilt, allow me to propose 'Dave's Storage Architecture'.

At COMDEX, I saw some really nifty 80MB Winchesters with a 20ms seek time. Starting with the presumption that these prototypes can actually be built in volume, how about an arrangement that looks like the figure at the end of this column (p. 67).

At the MASS/UNI bus end, the VSC looks for all the world like the registers of a UDA50 or its successor connected to a single 470MB RA81. The VSC is actually operating each PAIR of 80MB's in parallel, creating 100% redundancy. Any failing drive module can be user-replaced and its contents restored from its twin. As an option, (with the flick of a dip), the unit emulates a pair of RA81's: sacrificing redundancy but retaining the 80MB granularity of the data modules.

Rather than one, the VSC has six sets of

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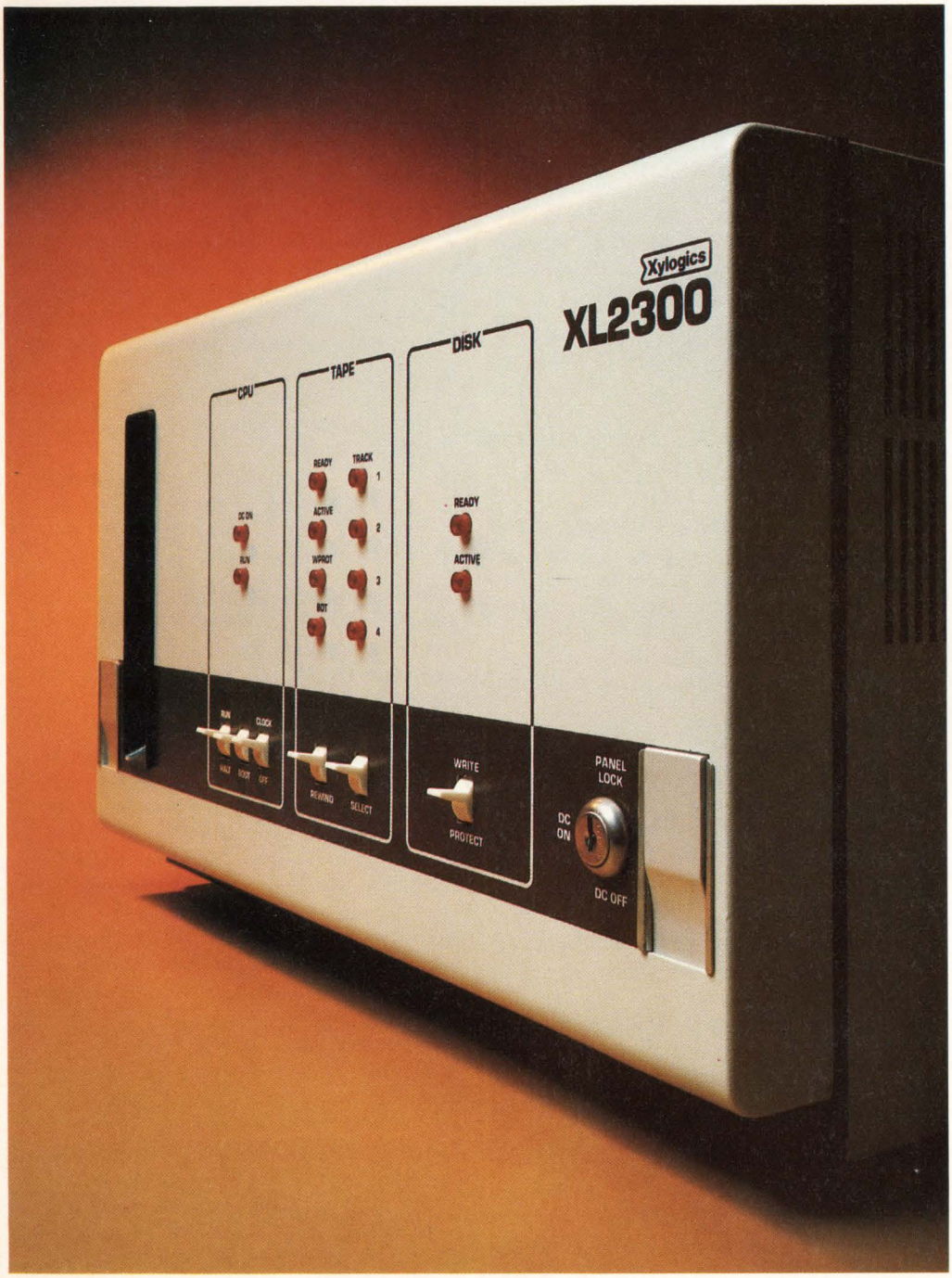

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CIRCLE D27 ON READER CARD

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 responsibilty 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 advertisters 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 Profesional.

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 our 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 TSX-Plus, STAR-eleven, SHARE-eleven, and the UNIX, RSTS, and RSX 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 RSX 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 Mssrs. 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

. . . continued on page 70

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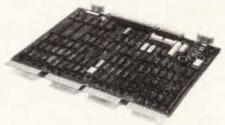
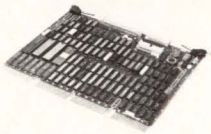


SMD INTERFACE COMPATIBLE—Model DQ202A—Exclusive universal formatting—switch selectable RP02/RP03—two drives—capacities to 300 MB—no drive parameters in on-board PROMS.



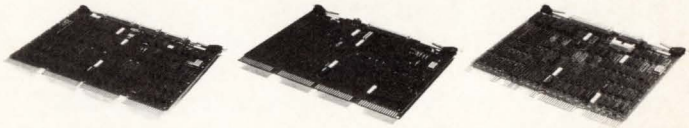
NEW—SMD INTERFACE COMPATIBLE—Model DQ215—Exclusive universal formatting—switch selectable RK06/RK07—56-bit ECC—22-bit memory addressing—two drives—capacities to 300 MB each—no drive parameters in on-board PROMS.

ST506 INTERFACE COMPATIBLE—Model 60X

PRIAM INTERFACE COMPATIBLE—Model 41X

CDC FINCH INTERFACE COMPATIBLE—Model DQ444

RL01/RL02 or RP02/RP03 emulations—each controller will handle two disc drives.



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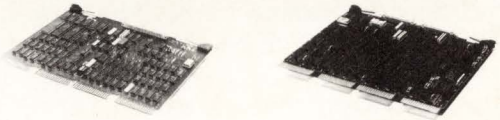

Contact your local DILOG sales office for complete details on specific models offering Greatest Data Storage for LSI-11.

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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 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:

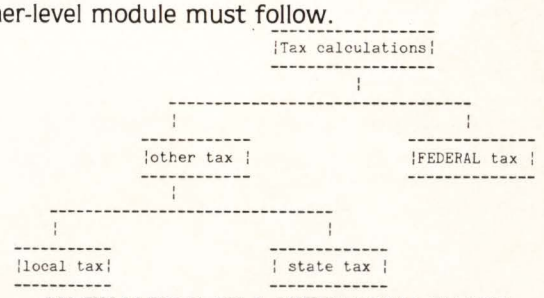
1. The execution time for the program may be longer.
2. Storage size may be larger.
3. The compile time may be longer, and load time may be longer.
4. Intermodule communication problems may be increased.

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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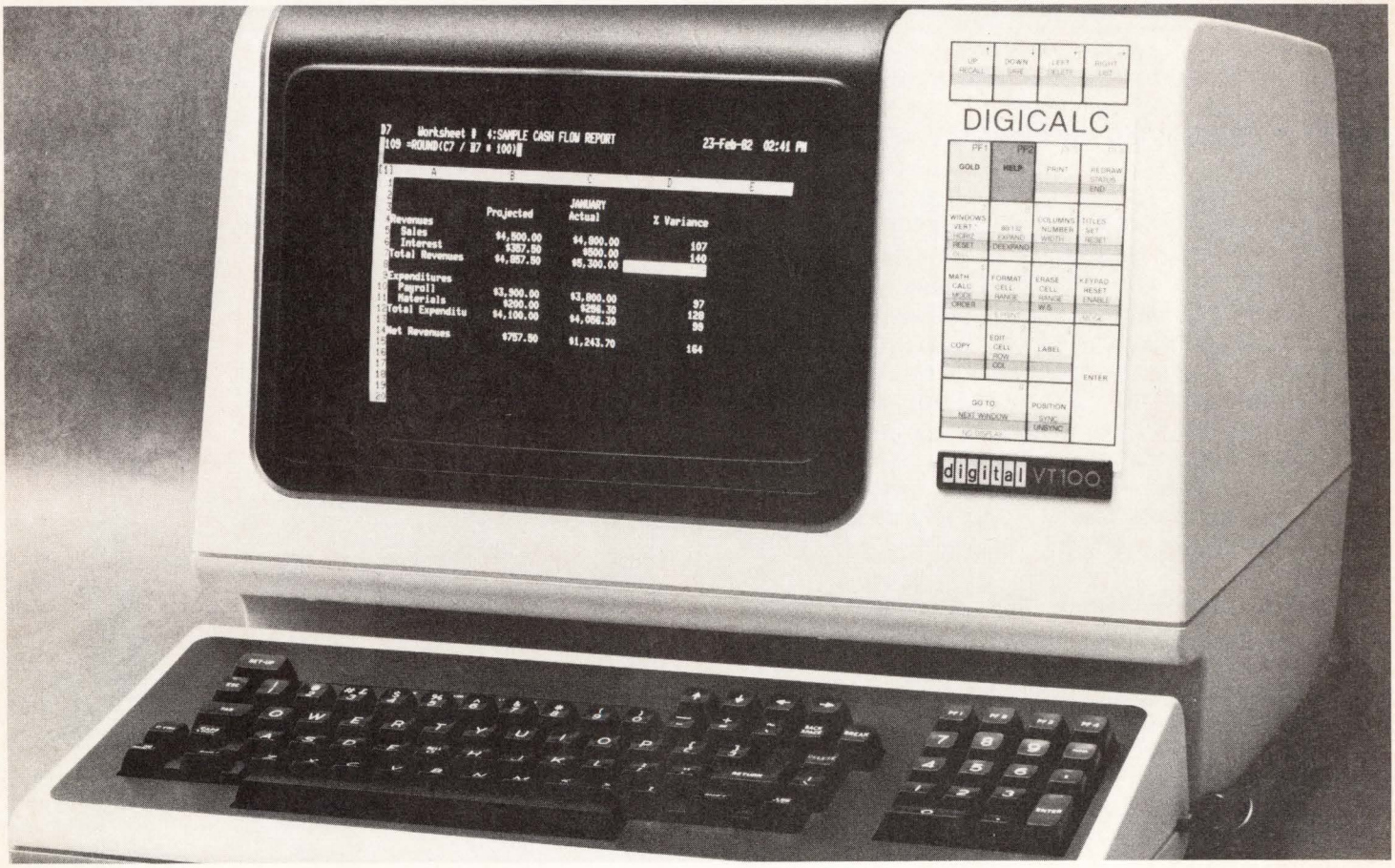

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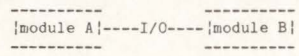
The hierarchical approach consists of modules that are coded and tested based on their postion in the hierarchy chart. All of the modules at a given level are coded and tested before modules at a lower level. The hierarchy approach does not specify the order in which the modules on a particular level 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 machine-scheduling 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.

When determining module development order in the combination approach four considerations should be examined.

1. Data dependency
2. Availability of resources.
3. Requirement of the earlier sequenced modules.
4. Complexity of the 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:

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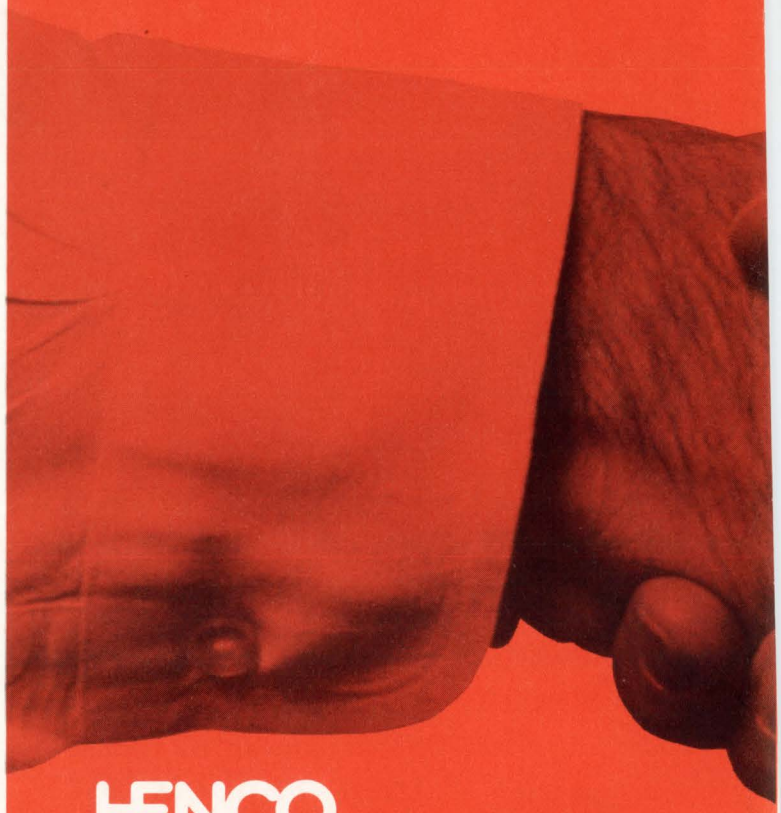

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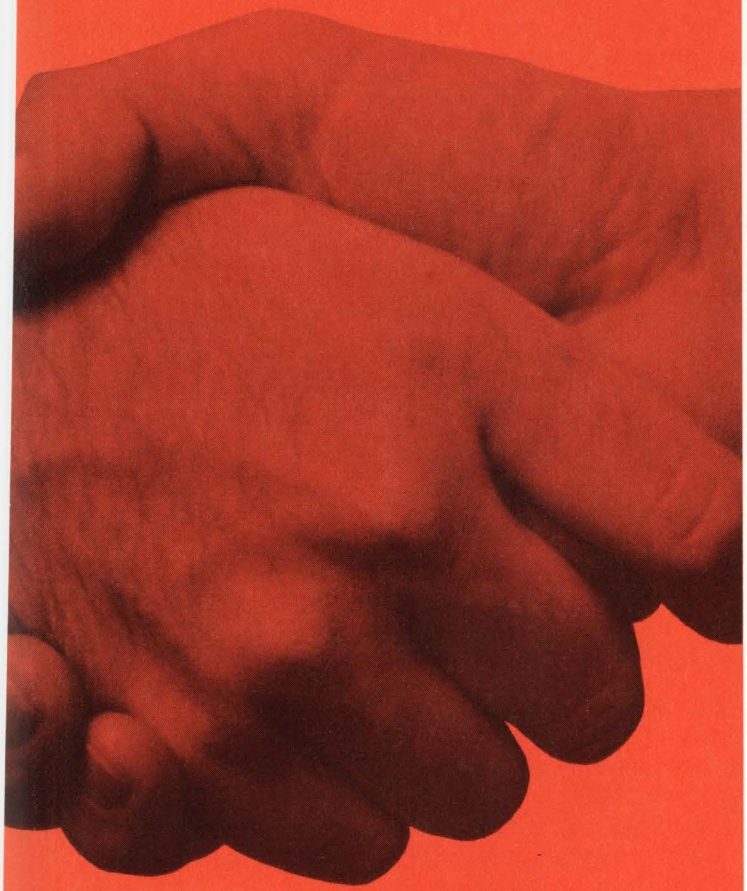

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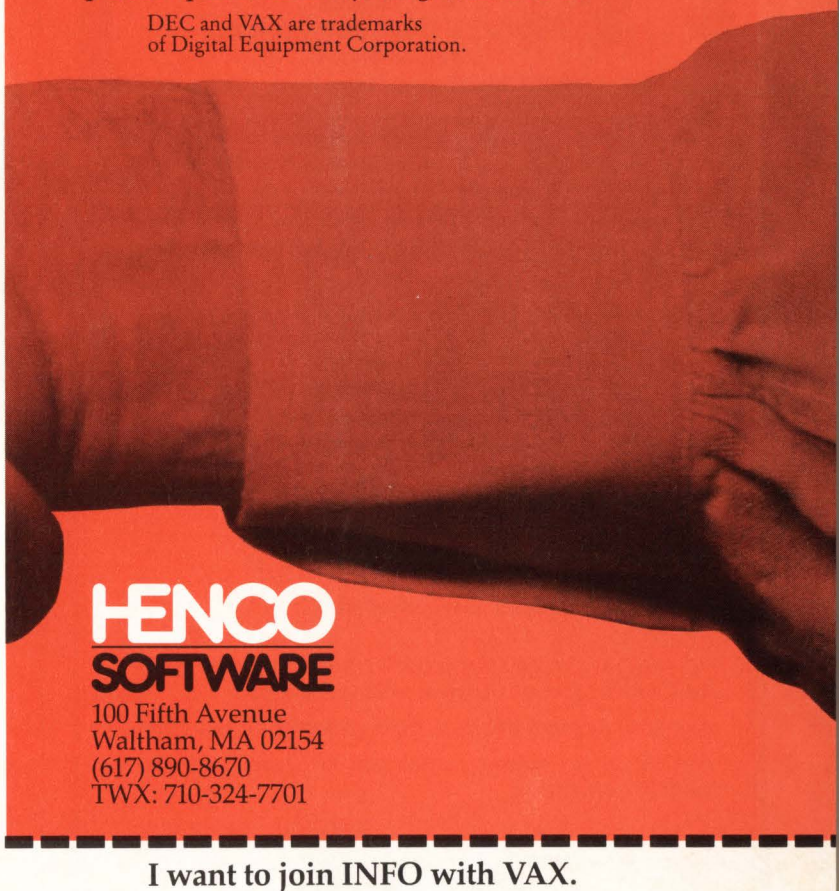

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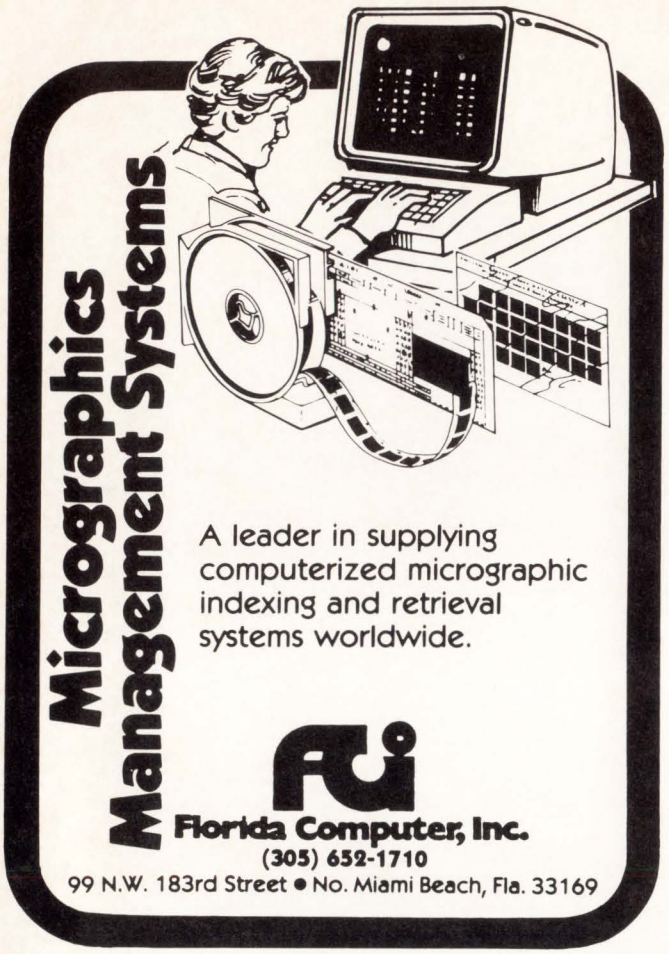

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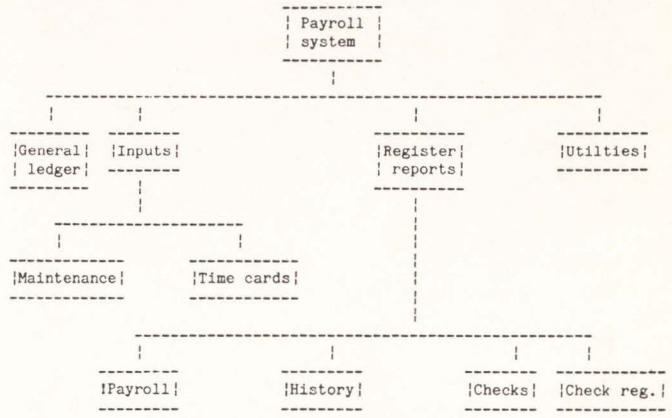
4. Check register.
5. General Ledger Posting.
6. Checks.
7. Utilities.
8. Maintenance.

These functions can be developed into the following hierarchy chart.



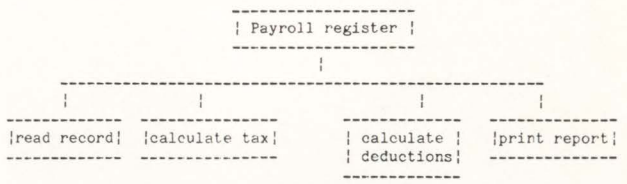
PAYROLL HIERARCHY CHART

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.



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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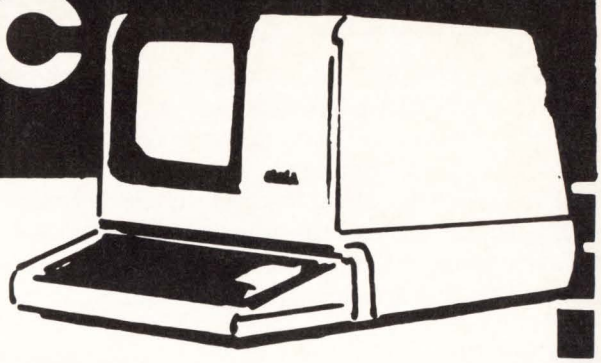

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RMSBLD
Interactive RMS-11K File Optimization Utility

By Kevin Mallory and Mark Bramblett, Comprehensive Cancer Center for the State of Florida, Miami, FL 33101

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:

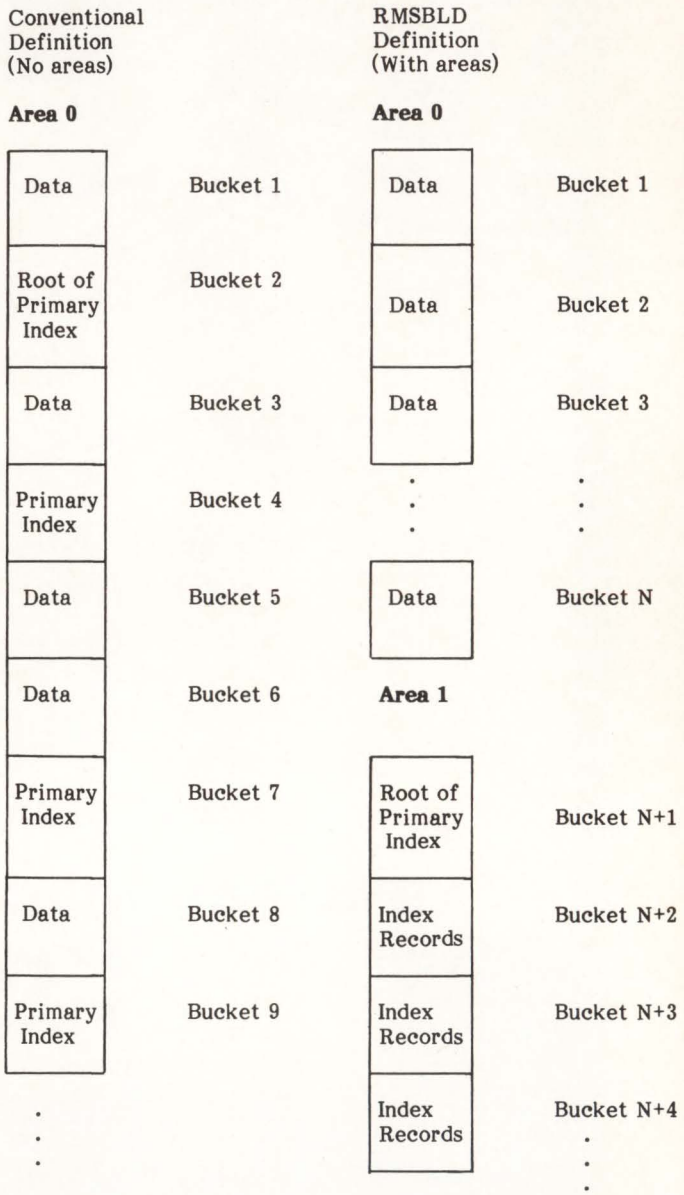
Optimization of indexed files can save significantly on I/O time and reduce the impact on RSTS but performing the calculations necessary to select optimum bucket and area sizes for indexed files is a complicated and time-consuming task. RMSBLD interactively performs these calculations in response to 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.

Diagram 1: Usage of Areas in RMS11-K Indexed files



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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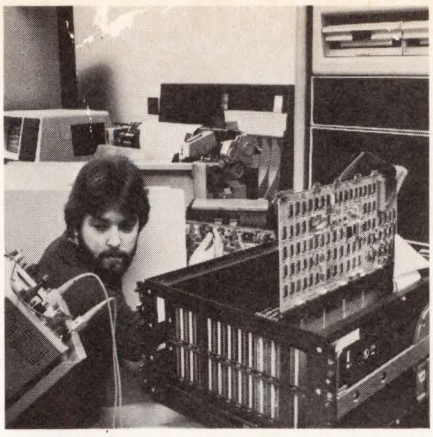

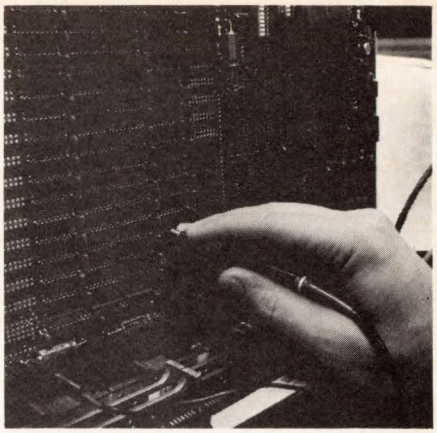

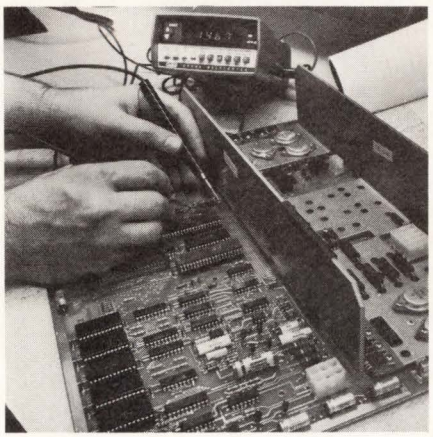

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256, respectively. RMSBLD uses default file extensions which conform to our facility standards. A *.WRK file denotes a transient (work) indexed file and a *.IDX denotes a permanent indexed file.

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```
                RMSBLD - Version 7.0-B

Previous work file                  N
Previous file or new name           EXAMPL
Number of records in file            30000
Duration of File                    PER
Record Format                       FIX
Record Format Overhead( Bytes )      7
Recordsize                           400


Data type of Primary key            STR
Last byte of Primary Key             84
Placement of key                    ( 16 , 56 , 70 , 82 )
Lengths of segments                 ( 1 , 4 , 7 , 1 )
Name of key                         PATIENT.ID
Duplicates allowed                  NO


Activity Overhead Table
-----------------------

For a bucket size of  1  The activity overhead (bytes)  102


For a bucket size of  2  The activity overhead (bytes)  204


For a bucket size of  3  The activity overhead (bytes)  307


For a bucket size of  4  The activity overhead (bytes)  409


For a bucket size of  5  The activity overhead (bytes)  512


For a bucket size of  6  The activity overhead (bytes)  614


                    Table of Calculations
                   ----------------------

BSIZE NIRBK    NDRBK          nrf/NDRBK      NIRBK**2        NIRBK**3
 1     31       1               30000          961            29791
 2     63       2               15000         3969           250047
 3     95       3               10000         9025           857375
 4     127      4               7500          16129         2048380
 5     159      5               6000          25281         4019680
 6     191      6               5000          36481         6967870

Bucketsize of the file               2
Adjusted Buckets at level 0          18000
Number of buckets at level # 1       342
Number of buckets at level # 2       6
Number of buckets at level # 3       1
Number of blocks for Data            36000
Allocation for Area  1               698

Data type of Alternate key          STR
Placement of key                     3
Lengths of segments                  7
Name of key                         DATE.ENTERED
Duplicates allowed                  YES
Changes Allowed                     YES
Define Null value for key           NO


Calculations for alternate index # 1


Number of index Records per bucket  100
Number of Data Records per bucket   252
Deletion overhead                   4
Duplicates factor                   6000
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 33101.

```
$ALLOW FATAL ERRORS
! Beginning definition of file  !
DEF
YES
EXAMPL.DEF
YES
SY:EXAMPL.IDX
NO
IDX
FIX
400
YES
;These questions are for the keys...
STR
( 16 , 56 , 70 , 82 )
( 1 , 4 , 7 , 1 )
PATIENT.ID
NO
;These questions are for the keys...
YES
STR
 3
 7
DATE.ENTERED
YES
YES
NO
NO
;These questions deal with areas of the file
YES
NO
;####Area Number#### 0
;Initial allocation
36003
;Here is the bucket size for the area
2
;Default ext quantity for area(blocks)
0
NO
YES
;####Area Number#### 1
;Initial allocation
698
;Here is the bucket size for the area
2
;Default ext quantity for area(blocks)
0
YES
;####Area Number#### 2
;Initial allocation
286
;Here is the bucket size for the area
2
;Default ext quantity for area(blocks)
0
NO
256
;Here is where we assign the keys to the areas.
```

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```
;Primary Key Data Area is 0
0
; Fill Factor Optimization For Data Buckets
819
; Primary Key index Area is 1
1
; Fill Factor Optimization For index Buckets
819
;Lowest Level index Records Area
1
;Here is the cluster size and protection code
-1
48
YES
^C
DEASSIGN
ASSIGN DATA:0
ASSIGN SY:I
ASSIGN SY:S
SHOWLO
FLAG
S:EXAMPL.IDX/CACHE/SEQ
^Z
PIP 0:EXAMPL.IDX/MODE:1808 =S:EXAMPL.IDX
PIP S:EXAMPL.IDX/DE/ER/LO
$ENABLE LOG
! QUEing OUTPUT to printer     !
$DISABLE LOG
DSP S:EXAMPL.DSP=0:EXAMPL.IDX/FU
QUE/QLP0:RMSBLD/JCOPIES:2=S:EXAMPL.DSP,/MORE
S:EXAMPL.RMS,/MORE
S:EXAMPL.CMD,/MORE
S:EXAMPL.DEF,/MORE
```

```
1       EXTEND                                                  &
\        ON ERROR GOTO 13200                                    &
\        chain.entry%    =       0%                             &

2        ! ################################################## !  &
         ! ================================================== !  &
         !       P R O G R A M   T I T L E   B L O C K      !  &
         ! ================================================== !  &
         !                                                    !  &
         !       PROGRAM         : RMSBLD.B2S                 !  &
         !       VERSION         : V7.0-2                     !  &
         !       EDIT LEVEL      : B                          !  &
         !       EDIT DATE       : 08-MAY-82                  !  &
         !                                                    !  &
         !       AUTHOR          : Kevin Mallory              !  &
         !                         Systems Programmer         !  &
         !                                                    !  &
         !                              with                  !  &
         !                                                    !  &
         !                         Mark Bramblett             !  &
         !                         Systems Manager            !  &
         !                                                    !  &
         !                         University of Miami        !  &
         !                         School of Medicine         !  &
         !                         Comprehensive Cancer Center!  &
         !                         for the State of Florida   !  &
         !                                                    !  &
         !                                                    !  &
         !       ADDRESS:        : PO Box 016960  (D8-4)      !  &
         !                         University Of Miami        !  &
         !                         Miami, Florida 33101       !  &
         !                                                    !  &
         ! ================================================== !  &
         ! ################################################## !  &
         !                                                    !  &
         !        N       O       T       I       C       E   !  &
         !       ---------------------------------------      !  &
         !                                                    !  &
         !       Neither the Authors nor the Authors'         !  &
         !       employers intend to support this software    !  &
         !       in commercial use.                           !  &
         !                                                    !  &
         !       It is guaranteed to be full of bugs and      !  &
         !       glitches. This software is not copyrighted   !  &
         !       and probably will not be.                    !  &
         !                                                    !  &
         !       It is presented as a solution to the         !  &
         !       RMS11-K indexed file optimization problem    !  &
         !       that we encountered at our site.             !  &
         !                                                    !  &
         !       ( If you wait till the next release of       !  &
         !         RMS11-K  DEC will be distributing          !  &
         !         A file design Utilty, or so I was told     !  &
         !         in Atlanta.   )                            !  &
         !                                                    !  &
         ! ================================================== !  &
         ! ################################################## !  &

3        ! ================================================== !  &
         !          ** D E S C R I P T I O N **               !  &
         ! ================================================== !  &
         !                                                    !  &
         !                                                    !  &
         !  Program to fully optimize RMS11-K indexed files.  !  &
         !  generates a command file for submission to        !  &
         !  ATPK which uses RMSDEF and RMSIFL to define and   !  &
         !  load ( if requested ) any previous records into   !  &
         !  the new file from a previous and compatible       !  &
         !  format file.                                      !  &
         !                                                    !  &
         ! ================================================== !  &
         !                                                    !  &
         !       RMSBLD.ODL & RMSBLD.CMD                      !  &
         !                                                    !  &
         !       RMSBLD.ODL...                                !  &
         !                                                    !  &
         !               .ROOT USER                           !  &
         !       USER:   .FCTR SY:RMSBLD-LIBR                 !  &
         !       LIBR:   .FCTR LB:BP2COM/LB                   !  &
         !       @LB:BP2IC4                                   !  &
         !       @LB:RMS11X                                   !  &
         !               .END                                 !  &
         !                                                    !  &
         !       RMSBLD.CMD...                                !  &
         !                                                    !  &
         !       SY:RMSBLD/FP,SY:RMSBLD=SY:RMSBLD/MP          !  &
         !       UNITS = 12                                   !  &
         !       ASG = SY:5:6:7:8:9:10:11:12                  !  &
         !       ;RESLIB=LB:BASICS/RO                         !  &
         !       TASK=...BLD                                  !  &
         !       EXTTSK= 1232                                 !  &
         !       //                                           !  &
         !                                                    !  &
         !       Use BASICS if you have it available....      !  &
         !                                                    !  &
         ! ################################################## !  &
         ! ================================================== !  &

5        ! ================================================== !  &
         !                                                    !  &
         !           I / O   C H A N E L S   U S E D          !  &
         !           -------------------------------          !  &
         !                                                    !  &
         !         CHANEL#   VAR.NAME    USE                  !  &
         !         ------    --------    ---                  !  &
         !           0                   Console Terminal     !  &
         !           2         temp%     temp Channel         !  &
         !           7         kb%       KB:                  !  &
         !           11        log%      log File             !  &
         !                                                    !  &
         ! ================================================== !  &

6        ! ================================================== !  &
         ! ################################################## !  &
         !                                                    !  &
         !     V A R I A B L E   D E F I N I T I O N S        !  &
         !                                                    !  &
         !                                                    !  &
         !                                                    !  &
         ! NAME                  USE                          !  &
         ! ----                  ---                          !  &
         !                                                    !  &
         ! acc%                  accuracy of string function  !  &
         ! allkeys%              loop index...                !  &
         ! alt$                  String constant ALTERNATE    !  &
         ! ans%                  Flag if null key value wanted!  &
         ! answer$               Holder for responses         !  &
         ! aovh                  Calculated Activity overhead !  &
         ! aovh%                 Internal value of aovh       !  &
         ! area.extension.size   Just that                    !  &
         ! areas( 10 )           Holds sizes of the areas.    !  &
         ! ask%                  Flag to ask question..       !  &
         ! b.ucketsize%          Bucket sizes...              !  &
         ! bks%                  Loop index Bucketsize        !  &
         ! bpl%                  Bucket pointer length        !  &
         ! bsize%                User input bucketsize.       !  &
         ! bucks%                loop index...                !  &
         ! calcprcnt             Calculation variable.        !  &
         ! chain.entry           Chain entry flag..           !  &
         ! check%                Loop index                   !  &
         ! chgs%                 Flag of changes allowed      !  &
         ! chgs$                 Changes allowed in key NO    !  &
         ! cmdfil%               Channel for command file.    !  &
         ! commander$            String constant CMD          !  &
         ! cr1.lf$               CR + LF                      !  &
         ! datadev$              "DATA:"                      !  &
         ! datafill%             Fill data buckets ( Bytes )  !  &
         ! dataprcnt%            % to fill data buckets       !  &
         ! datarea               Allocation for data ( or sidr's)!  &
         ! dbpl%                 alternate key pointer length !  &
         ! deaf$                 String constant DEF          !  &
         ! debug%                Debugging flag..             !  &
```

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

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

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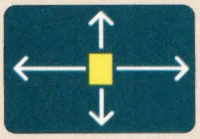
THE QUESTIONS:

1 EDITING



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

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

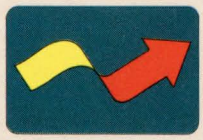
Using a well designed w-p system, how many keystrokes should it take to execute the most often used w-p functions?

a) One easy stroke with no codes?

b) Two or more with complex w-p codes?

c) Three or more?

4 FLEXIBILITY

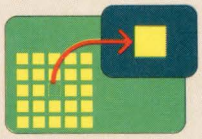


As the business manager of your company, you would like to find w-p software that you can tailor to your company's specific needs. Should you. . .

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

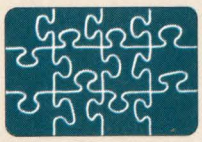


If you want to retrieve information quickly from a large database, which w-p software should you choose?

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 COMPATABILITY



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

a) ASCII formated 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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CIRCLE D22 ON READER CARD

```
! decimal%              Looking for "." in a string     !       &
! deindx%               Loop index                      !       &
! deleprcnt%            % deletions expected            !       &
! deltit$               A pip delete string.            !       &
! df                    duplicates factor               !       &
! do%                   Deletion overhead               !       &
! doit%                 LOOP index...                   !       &
! doit2%                LOOP index...                   !       &
! dot$                  Constant string of single dot   !       &
! dspit$                RMSDSP command string           !       &
! dum$                  Dumy string Variable.           !       &
! dumy$                 Used for string arith function. !       &
! dup$                  Duplicates allowed in key       !       &
! dupsprcnt%            % duplicate keys expected       !       &
! duration$             File duration PER               !       &
! exp%                  Loop index..                    !       &
! expo%                 Loop index.. in function.       !       &
! ext$                  Filename extension..            !       &
! false%                Flag = 0%                       !       &
! file.cluster.size%    Just that                       !       &
! fileo$                holder string file name         !       &
! filer$                Name of the file being built    !       &
! files$                Holder string file name         !       &
! filtyp$               File type string (IDX)          !       &
! first%                Flag number of times..          !       &
! fixer$                String constant FIX             !       &
! format%               Record type format flag         !       &
! formt$                Record format name string       !       &
! header$               Program Title header string     !       &
! i%                    Loop index..                    !       &
! i$                    SYS Call Variable.              !       &
! i1%                   Loop index..                    !       &
! i2%                   Loop index..                    !       &
! i3%                   Loop index..                    !       &
! i4%                   Loop index..                    !       &
! i8%                   Loop index..                    !       &
! id$                   SYSTEM IDENTFIER...             !       &
! ifl$                  RMSIFL command string           !       &
! in                    For rounding function           !       &
! in$                   Old file device.                !       &
! indall                ALLOCATION FOR index...         !       &
! index%                Loop index..                    !       &
! index6%               LOOP index...                   !       &
! index9%               LOOP index...                   !       &
! indfill%              Fill factor index buckets(bytes)!       &
! indxprcnt%            % To fill index buckets         !       &
! inp$                  temp variable to store input.   !       &
! kb%                   Channel for terminal I/O        !       &
! keydups%( 10% )       Key information                 !       &
! keylen%               Length of key..                 !       &
! keys%                 NUMBER OF KEYS....              !       &
! keytyp$               Key data type..                 !       &
! kyname$               Name of key                     !       &
! l%                    LOOP index....                  !       &
! l.astend%             Location last byte prim key.    !       &
! levelsp%              LEVELS in THE index...          !       &
! line3$( 6 )           Table for selection of b.size   !       &
! line3.dum$            temp holder for line3$( )       !       &
! log%                  Channel for log file            !       &
! long%( 8 )            Length of segments in keys      !       &
! looper%               Loop index                      !       &
! m%( 30 )              For sys calls..                 !       &
! maxlen%               Maximum possible length (recs ) !       &
! maxrec%               Record size..                   !       &
! more$                 "/MORE" + cr1.lf$               !       &
! myname$               Program ident..                 !       &
! nam$                  Name of project or file.        !       &
! nbk( 6 )              Number of buckets               !       &
! ndrbk$( 6 )           Table for selection of b.size   !       &
! ndrbk.dum             Dumy for ndrbk$                 !       &
! newind%               loop.                           !       &
! newnam$               Name for new file               !       &
! nirbk$( 6 )           Table for selection of b.size   !       &
! nirbk.dum             Dumy for nirbk$                 !       &
! nl$                   Null string..                   !       &
! nope$                 String constant NO              !       &
! nrf                   Number of records expected..    !       &
! nu.mber.of.keys%      Number of Alternate keys.       !       &
! nulit$                Null key value   NO             !       &
! nulval$               Saved input of null character   !       &
! nun$                  String constant NONE            !       &
! olddevice$            From whence the old file came   !       &
! oldext$               It's old extension              !       &
! oldnam$               and it's name                   !       &
! other.stuff$          Header information              !       &
! out$                  temp string var..length         !       &
! out1$                 temp string var..start byte     !       &
! outliner$             temp string OUTPUT var.         !       &
! OUTPUT.dev$           Device name string..            !       &
! pipit$                STRING TO PASS TO PIP...        !       &
! ppn$                  PPN                             !       &
! prog%                 Default is alwasys 0%           !       &
! proj%                 Current project number          !       &
! prologue%             NUMBER OF BLOCKS in PROLOGUE.   !       &
! queit1$               String for Queue                !       &
! queit2$               String for Queue                !       &
! question$             For logging function            !       &
! rec.size.mis.match%   file attributes not matched     !       &
! rfo%                  Record format overhead.         !       &
! s%                    File status word                !       &
! savnul$               ASCII null key fill string.     !       &
! segs%                 Number of segments for key.     !       &
```

```
! start%( 8 )           Start Byte for segements.       !       &
! stringer$             String constant STR             !       &
! stuff$                Dummy var. for function.        !       &
! sysdsk$               SYSTEM DISK STRING...           !       &
! sysser$               SYS Call                        !       &
! tabl$( 3, 6 )         Table for selection of b.size   !       &
! table%                Loop index                      !       &
! trap                  Used for zero division trap     !       &
! true%                 Constant.. = -1%                !       &
! typit$                Primary or Alternate string     !       &
! ver$                  Current Program version         !       &
! wrkdisk$              Constant string DR1:            !       &
! wrkfil%               Flag if a prev. file exists.    !       &
! wrkfil$               Name of prev. file.             !       &
! wrkit$                Constant  WRK                   !       &
! yn$                   Dumy for input                  !       &
! yup$                  Constant YES                    !       &
! zero                  Constant 0                      !       &
!                                                       !       &
! ##################################################### !       &
! ===================================================== !       &

7       ! ===================================================== !       &
        ! ##################################################### !       &
        !                                                       !       &
        !           F U N C T I O N S   U S E D                 !       &
        !           ---------------------------                 !       &
        !                                                       !       &
        !     FNSTEXP$( expo%, stuff$, acc% )                   !       &
        !                                                       !       &
        !                       String arithmetic function      !       &
        !                       Raises stuff$ to the expo%      !       &
        !                       With an accuracy acc%           !       &
        !     FNround( in )                                     !       &
        !                                                       !       &
        !                       rounding Function Floating      !       &
        !                       To Integer.                     !       &
        !                                                       !       &
        !     FNwrite.out$( answer$, question$ )                !       &
        !                                                       !       &
        !                       To Write To log File            !       &
        !                       What We Did.                    !       &
        !                                                       !       &
        ! ===================================================== !       &

8       ! ===================================================== !       &
        !                                                       !       &
        !      *** A r r a y   D i m e n s i o n i n g ***      !       &
        !                                                       !       &
        ! ===================================================== !       &

9       DIM     nirbk$( 6% ),   ndrbk$( 6% ),   m%( 30% ),              &
                long%( 8% ),    start%( 8% ),   line3$( 6% ),           &
                tabl$( 3%, 6% ),nbk( 6% ),      keydups%( 10% ),        &
                areas( 10% )                                            &

90      ! ===================================================== !       &
        ! ##################################################### !       &
        !                                                       !       &
        !                                                       !       &
        !                                                       !       &
        !             M A I N   P R O G R A M                   !       &
        !                                                       !       &
        !                                                       !       &
        !                                                       !       &
        ! ##################################################### !       &
        ! ===================================================== !       &

100     GOSUB 5700                              ! Constant init !       &

200     OPEN "_KB:" AS FILE #kb%                                        &
\       myname$         = "RMSBLD - "                                   &
\       ver$            = "Version 7.0-B" + SPACE$( 10% )               &
\       id$             =  RIGHT( SYS( CHR$(6%) + CHR$(9%)      +       &
                                       CHR$(0%) )   ,3%  )              &
\       other.stuff$    = TIME$( 0% ) + SPACE$( 5% ) + DATE$( 0% )      &
\       header$         = myname$ + ver$ + id$                          &
\       PRINT #kb%                                                      &
\       PRINT #kb%, header$     IF      NOT chain.entry%                &
\       PRINT #kb%,             FOR i% = 1% TO 3%                       &

300     PRINT #kb%,"Output documentation to <NONAME.RMS> ";             &
\       INPUT LINE #kb%, outliner$                                      &
\       outliner$       = CVT$$( outliner$,-1% )                        &
\       IF      POS( outliner$, ".", 1% ) <> 0%                         &
        THEN    PRINT #kb%,                                             &
\               PRINT #kb%,"No extension Please"                        &
\               PRINT #kb%                                              &
\               goto 300                                                &

310     IF      outliner$ = nl$                                         &
        THEN    outliner$ = "NONAME"                                    &

400     IF      outliner$ <> "KB:"                                      &
        THEN    outliner$ = outliner$ + ".RMS"                          &
\               OPEN    outliner$       FOR OUTPUT AS FILE #log%        &
        ELSE    log% = kb%                                              &

500     IF      log% <> kb%                                             &
        THEN    PRINT #log%, myname$ + ver$ + "Run at " + other.stuff$  &
\               PRINT #log%                                             &
```

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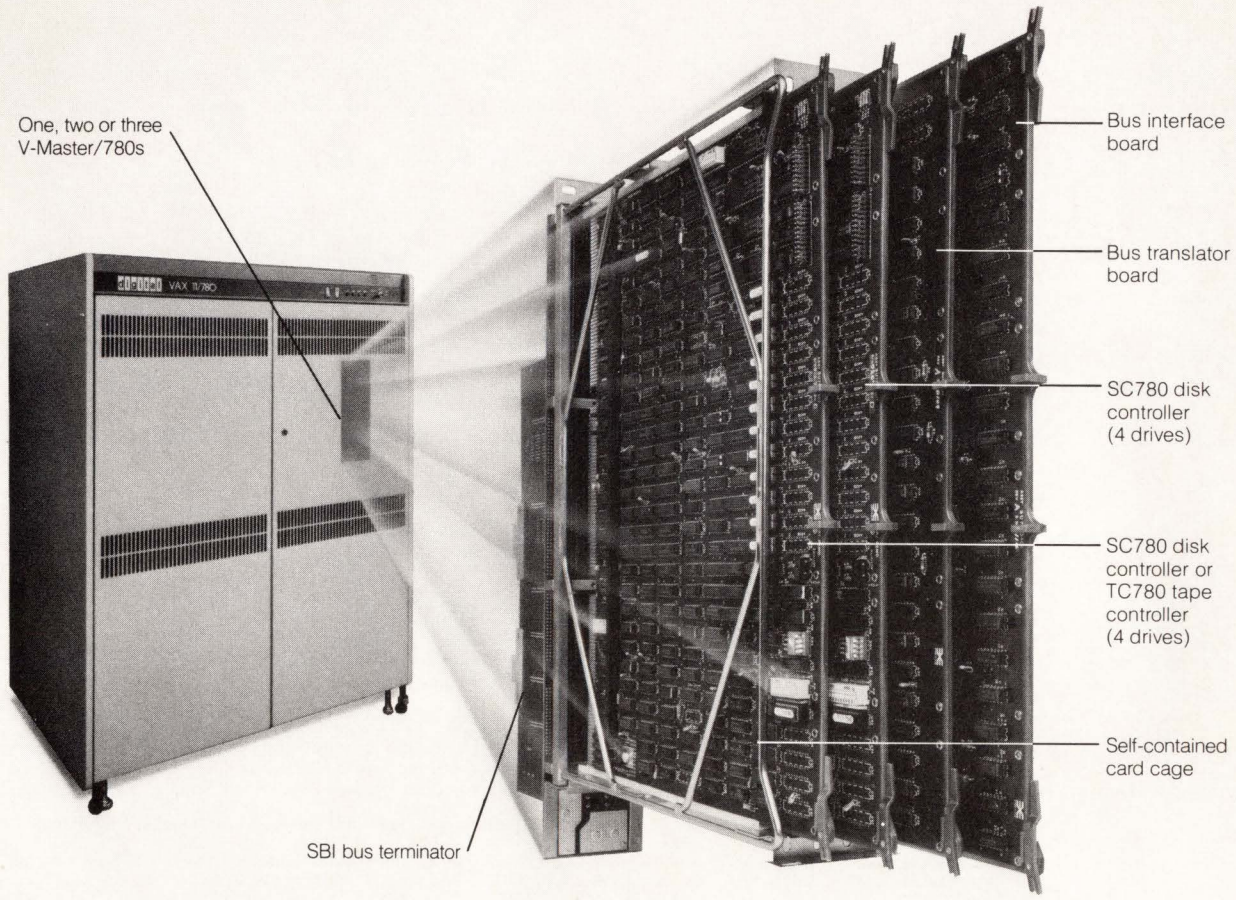
CIRCLE D46 ON READER CARD

```
700     ! ================================================== !       &
        !                                                    !       &
        !            OUTPUT a short program description      !       &
        !                                                    !       &
        ! ================================================== !       &

800     PRINT #kb%,                                                  &
          cr1.lf$ + HT + "     This utility calculates optimization " &
        + cr1.lf$ + HT +"statistics for RMS-11K indexed files."      &
        + cr1.lf$ + HT +"It will generate a command file which will " &
        + cr1.lf$ + HT +"define the file using RMSDEF will load any old"&
        + cr1.lf$ + HT +"records into the new file. "                &
        + cr1.lf$ + HT +"It will chain automatically to ATPK to create" &
        + cr1.lf$ + HT +"your file and will QUE certain vital documents"&
        + cr1.lf$ + HT +"concerning your file to the line printer in " &
        + cr1.lf$ + HT +"the machine room. You will be instructed later"&
        + cr1.lf$ + HT +"What you should do with these documents."   &
        + cr1.lf$ + HT                                               &
        + cr1.lf$ + HT                                               &
        + cr1.lf$ +     "Please Note... "                            &
        + cr1.lf$ +     "ALL Default Answers Are Shown in < Brackets >" &

900     PRINT  #kb%,                                                 &
        "Press  <CR> to continue <ESC> to change program defaults ";  &
                                                                     &
\       i$ = SYS( CHR$( 3% ) )                                       &
\       INPUT LINE #kb%, dumy$                                       &
\       i$ = SYS( CHR$( 2% ) )                                       &
                                                                     &
\       PRINT #kb%,                                                  &
\       GOSUB 12750             IF      ASCII( dumy$ ) = 27%         &

1000    ! ================================================== !       &
        !                                                    !       &
        !    Is there a file to bring in old records from ?  !       &
        !                                                    !       &
        ! ================================================== !       &
        PRINT #kb%,                                                  &
                                                FOR i% = 1% TO 2%    &
\       PRINT  #kb%,                                                 &
          "Is there a previous file to load records from <YES> "; &
\       INPUT #kb%, inp$                                             &
                                                                     &
\       inp$    =       yup$            IF inp$ = nl$                &
\       inp$    =       CVT$$( LEFT$( inp$, 1% ),  -1% )             &
\       IF      INSTR( 1%,"Y*N",inp$ ) = 0%                          &
        THEN            GOTO 1000                                    &

1100    IF      ASCII( inp$ )   =       78%                          &
        THEN    wrkfil%         =       false%                       &

1200    i$ = FNwrite.out$( inp$, "Previous work file" )               &

1300    ! ================================================== !       &
        !                                                    !       &
        !    Get A Project Name if there wasn't a work file  !       &
        !                                                    !       &
        ! ================================================== !       &

1400    PRINT #kb%,                                                  &
                "Previous workfile name " ;     IF wrkfil%           &
\       PRINT #kb%,                                                  &
        HT +    "File identification for new file ";                 &
                                                IF NOT wrkfil%       &
\       INPUT LINE #kb%, wrkfil$                                     &
\       wrkfil$ = CVT$$( wrkfil$, -1% )                              &
\       PRINT #kb%                                                   &
\       GOTO 1300                               IF wrkfil$ = nl$     &

1450    IF      POS( wrkfil$, ".", 1% ) <> 0% AND NOT wrkfil%        &
        THEN    PRINT #kb%, "No extension please"                    &
\               goto 1400                                            &

1500    i$ = FNwrite.out$( wrkfil$, "Previous file or new name" )     &

1600    ! ================================================== !       &
        !                                                    !       &
        !          Is The File Name Legal ?                  !       &
        !       Check where they claim the old file to be.   !       &
        !    olddevice$ = Where The Old File Resides( If Any ) !      &
        !       if a device was not found, assume SY:        !       &
        !                                                    !       &
        ! ================================================== !       &

1700    i$      =       SYS( CHR$(6%) + CHR$(-10%) + wrkfil$ )       &
\       CHANGE          i$ TO  m%                                    &
\       S%      =       m%( 29% ) + SWAP%( m%( 30% ) )               &
\       IF      S% AND 8192%                                         &
        THEN    olddevice$ = CHR$( m%( 23% ) ) + CHR$( m%( 24% )  ) + &
                             NUM$( m%( 25% ) ) + ":"                 &
        ELSE    olddevice$      =       sysdsk$                      &
                                                                     &

1705    in$     =       olddevice$                                   &

1800    PROGR%  =       m%(5%)                                       &
\       PROJ%   =       m%(6%)                                       &
\       IF      ( PROGR% = 0% AND PROJ%  = 0% )                      &
        THEN    PPN$ = ""                                            &
        ELSE    PPN$ =  "(" + NUM$(PROJ%)  + "," +                   &
                        NUM$(PROGR%) + ")"                           &

1900    nam$    =               RAD$( m%(7%) + SWAP%( m%(8% ) ) ) +  &
                                RAD$( m%(9%) + SWAP%( m%(10%) ) )    &
\       OLDnam$ =               PPN$ + nam$                          &
\       nam$    =               OLDnam$                              &
\       ext$    =               RAD$( m%(11%)+ SWAP%( m%(12%) ) )    &
\       OLDext$ =               ext$                                 &

2000    IF      wrkfil%                                              &
        THEN    OPEN    olddevice$ + OLDnam$ + dot$ + OLDext$        &
                        FOR INPUT AS FILE #temp%                     &
\               CLOSE #temp%                                         &

2100    OPEN    olddevice$ + oldnam$ + dot$ + deaf$                  &
                FOR INPUT AS FILE #temp%                             &
\       PRINT  #kb%,                                                 &
             "The file " + olddevice$ + oldnam$ + dot$ + deaf$ +     &
               " all ready EXISTS."                                  &
\       PRINT  #kb%,                                                 &
               "Please delete it or use a different project code name."&
\       GOTO 32760                                                   &

2200    PRINT  #kb%,                                                 &
               "Please answer the following questions about the file" &
\       PRINT  #kb%,                                                 &
               "that you will be configuring."                       &
 \      PRINT #kb%,                                                  &
                                                FOR i% = 1% TO 5%    &

2300    IF      wrkfil%                                              &
        THEN    PRINT  #kb%,                                         &
                "Please input the name for the new file ";           &
\               PRINT  #kb%,                                         &
                       " ( no extension ) ";                         &
\               INPUT LINE #kb%,  newnam$                            &
\               PRINT #kb%                                           &
\               newnam$ = CVT$$( newnam$ , -1% )                     &
\               GOTO 2300                       IF newnam$ = nl$     &
\               IF      INSTR( 1%,newnam$, "." ) <> 0%               &
                THEN    PRINT  #kb%, " No extension Please "         &
\               goto 2300                                            &

2400    IF      wrkfil%                                              &
        THEN    nam$ = newnam$                                       &
\               i$ = FNwrite.out$( newnam$, "New file Name")         &

2500    PRINT  #kb%,                                                 &
               "How many logical data records are expected "         &
                       + "in the life of the file ";                 &
\       INPUT #kb%, nrf                                              &
\       PRINT  #kb%,                                                 &
                                                FOR i% = 1% TO 2%    &
\       GOTO    2500                            IF nrf =< 0%         &
\       i$ = FNwrite.out$( NUM$( nrf ), "Number of records in file" ) &

2600    PRINT #kb%,                                                  &
               "Is this a PERmanent file or a WORk file <PER> ";     &
\       INPUT #kb%, inp$                                             &
\       PRINT #kb%                                                   &
\       inp$    =       duration$               IF inp$ = nl$        &
\       inp$    =       LEFT$( CVT$$( inp$, -1% ), 1% )              &
\       IF      INSTR( 1%, "P*W",inp$ ) = 0%                         &
        THEN    PRINT #kb%, BEL + " Try again"                       &
\               GOTO    2600                                         &

2700    IF      ASCII( inp$ ) = 87%                                  &
        THEN    output.dev$     =       wrkdisk$                     &
\               filtyp$         =       wrkit$                       &

2750    IF      ASCII( inp$ ) = 80%                                  &
        THEN    inp$            =       duration$                    &
        ELSE    inp$            =       wrkit$                       &

2800    i$ = FNwrite.out$( inp$, "Duration of File" )                &

2900    filer$  = sysdsk$ + nam$ + dot$ + filtyp$                    &

3000    PRINT #kb%,                                FOR i% = 1 TO 3%  &
\       PRINT  #kb%,                                                 &
               "The records of an indexed file may have a FIXed format"&
\       PRINT  #kb%,                                                 &
               "( all records are of exactly the same length )"      &
\       PRINT  #kb%,                                                 &
               "or a VARiable format (only a maximum length is known)."&
\       PRINT #kb%,                                                  &
                                                FOR i% = 1% TO 3%    &

3100    PRINT  #kb%,                                                 &
               "What format will the records be <FIXed> ";           &
\       INPUT #kb%, formt$                                           &
\       PRINT #kb%                                                   &
\       formt$  = fixer$                        IF formt$ = nl$      &
\       formt$  = CVT$$( formt$, -1% )                               &
\       inp$    = LEFT$( formt$, 1% )                                &
\       IF      INSTR( 1%, "*F*V*",LEFT$( inp$, 1% ) ) = 0%          &
        THEN    PRINT  #kb%, BEL + "Illegal record format"           &
\               GOTO 3100                                            &

3200    ! ================================================== !       &
        !                                                    !       &
        !       rfo% => Record Format Overhead               !       &
        !               7% For Fixed Size Records            !       &
        !               9% For Variable Length Records       !       &
        !                                                    !       &
        ! ================================================== !       &
```

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



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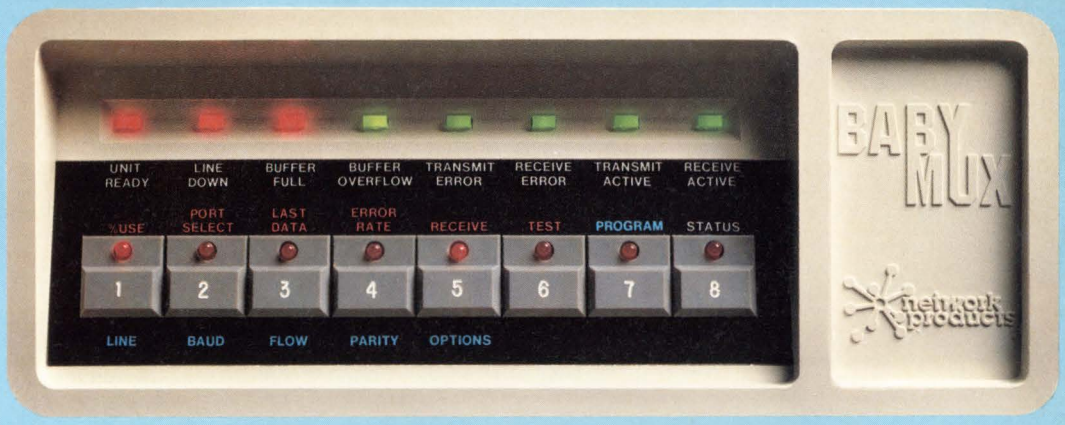
CIRCLE D15 ON READER CARD

```
        IF      formt$  = fixer$                                        &
        THEN    format% = true%                                         &

3250    rfo%    =       9%                      IF NOT format%          &

3300    i$ = FNwrite.out$( formt$, "Record Format" )                    &
\       i$ = FNwrite.out$( NUM$( rfo% ),                                &
                           "Record Format Overhead( Bytes ) " )         &

3400    PRINT #kb%,                                                     &
                                            FOR i% = 1% TO 2%           &
\       PRINT #kb%,                                                     &
              "What will be the maximum recordsize ";                   &
\       INPUT #kb%, maxrec%                                             &
\       PRINT #kb%                                                      &
\       IF      maxrec% =< 0%                   OR                      &
                maxrec% > 7665%                                         &
        THEN    PRINT  #kb%, BEL + "Try again."                         &
\               GOTO 3400                                               &

3500     i$ = FNwrite.out$( NUM$( maxrec% ), "Recordsize" )             &

3600    ! ===================================================== !       &
        !                                                       !       &
        !       With the recordsize and format information,     !       &
        !       we can attempt an open on the old file          !       &
        !       via RMS-11K to determine if the formats are     !       &
        !       compatible so that we don't get a mismatch      !       &
        !       on an attempted IFL                             !       &
        !                                                       !       &
        ! ===================================================== !       &
        GOSUB 12200             IF wrkfil%                              &

3700    ! ===================================================== !       &
        !                                                       !       &
        !   Open The Command File And Write Preliminary Items   !       &
        !                                                       !       &
        ! ===================================================== !       &
        GOSUB 10000                                                     &

3800    PRINT #kb%,                                                     &
                                FOR i% = 1% TO 3%                       &
\       PRINT  #kb%,                                                    &
               "The following questions deal with the keys for "        &
                                                  +"the file."          &
\       PRINT  #kb%,                                                    &
                                FOR i% = 1% TO 2%                       &
\       PRINT   #kb%,                                                   &
               "Keys may have the following data types:"                &
\       PRINT   #kb%,                                                   &
               "STRing, INTeger, PACked decimal, or BINary."            &

3900    PRINT #kb%,                                                     &
                                FOR i% = 1% TO 2%                       &
\       PRINT #kb%, "Up to 10 Alternate keys are currently allowed"     &
\       PRINT #kb%, "should you need more please see the system manager"&
\       PRINT #kb%                                                      &
\       INPUT #kb%, "How many alternate keys will be defined <0> ";     &
                                nu.mber.of.keys%                        &
\       PRINT #kb%                                                      &
\       keys% = nu.mber.of.keys%                                        &
\       GOTO 3900       IF              nu.mber.of.keys%   < 0%   OR    &
                                        nu.mber.of.keys%   > 10%        &

4000    PRINT  #kb%,                                                    &
                                FOR i% = 1% TO 3%                       &
\       PRINT  #kb%,                                                    &
               "It is time to define the primary key for the file."     &
\       PRINT #kb%                                                      &

4100    ! ===================================================== !       &
        ! ##################################################### !       &
        !                                                       !       &
        !     K E Y   D E F I N I T I O N   S E Q U E N C E     !       &
        !     -----------------------------------------         !       &
        !                                                       !       &
        ! 1.    3500  Input the place and the length )          !       &
        !             dups allowed, name etc...                 !       &
        !                                                       !       &
        ! 2.    7300    Write The Stuff We Found out To The     !       &
        !               Command File                            !       &
        !                                                       !       &
        ! 3.     7400 OR 8600...                                !       &
        !                                                       !       &
        !        7400 Will Choose The                           !       &
        !                                                       !       &
        !             Optimum Bucketsize Of The File            !       &
        !                                                       !       &
        !        8600 For Alternate Keys Only...                !       &
        !                                                       !       &
        ! 4.     8100                                           !       &
        !                                                       !       &
        !         Calculate The Areas Required For The          !       &
        !         index( s )....                                !       &
        !                                                       !       &
        !         Area Assignments for the file are as follows: !       &
        !         ------------------------------------------    !       &
        !                                                       !       &
        !         AREA 0 =>     Real Data Records..             !       &
        !         AREA 1 =>     Primary index Records..         !       &
        !         AREA 2 =      Alternate Key #1 Sidr's And     !       &
        !                       index Records ( Both )          !       &
        !         AREA N        Alternate Key #N                !       &
        !                                                       !       &
        !                                                       !       &
        ! ##################################################### !       &
        ! ===================================================== !       &
        FOR     allkeys% = 0% TO nu.mber.of.keys%                       &
\               GOSUB 6300                                              &
\               GOSUB 10100                                             &

4200            IF      first% = true%                                  &
                THEN    GOSUB 10200                                     &
                ELSE    GOSUB 12000                                     &

4300    ! ===================================================== !       &
        !                                                       !       &
        !       Define the keys for the file                    !       &
        !       at end of alternate keys write to command file  !       &
        !       to signal end of the keys...                    !       &
        !                                                       !       &
        ! ===================================================== !       &
                GOSUB 11400                                             &
\               first%          =       false%                          &
\               typit$          =       alt$                            &
\       NEXT    allkeys%                                                &
\       PRINT  #cmdfil%, nope$                                          &

4400    ! ===================================================== !       &
        !                                                       !       &
        !             Finish Up The Command File                !       &
        !             And Prepare To Exit.                      !       &
        !                                                       !       &
        ! ===================================================== !       &
        GOSUB 12400                                                     &

4500    ! ===================================================== !       &
        !                                                       !       &
        !       Fake out RMS-11 into making all the areas       !       &
        !       areas contiguious                               !       &
        !                                                       !       &
        ! ===================================================== !       &
        ext$    =       filtyp$                                         &
\       IF      wrkfil%                                                 &
        THEN    ext$ = wrkit$                                           &

4600    PRINT #cmdfil%, "DEASSIGN"                                      &
\       PRINT #cmdfil%, "ASSIGN " + OUTPUT.dev$  + "O"                  &
\       PRINT #cmdfil%, "ASSIGN " + in$      + "I"                      &
\       PRINT #cmdfil%, "ASSIGN " + sysdsk$ + "S"                       &
\       PRINT #cmdfil%, "SHOWLO"                                        &

4700    PRINT #cmdfil%, "FLAG"                                          &
\       PRINT #cmdfil%, "S:" + nam$ + dot$ + filtyp$ + "/CACHE/SEQ"     &
\       PRINT #cmdfil%, "^Z"                                            &

4800    pipit$ =    "PIP " + "O:" + nam$ + dot$ + filtyp$ +             &
        "/MODE:1808 ="    + "S:" + nam$ + dot$ + filtyp$                &
\       deltit$ = "PIP "  + "S:" + nam$ + dot$ + filtyp$ + "/DE/ER/LO"  &
\       PRINT #cmdfil%, pipit$                                          &
\       PRINT #cmdfil%, deltit$                                         &

4900    ! ===================================================  !       &
        !                                                       !       &
        !       Write The Command Line For The Ifl If There     !       &
        !       was A Previous Workfile With Records in It..    !       &
        !                                                       !       &
        !       Make sure that the file is flagged to be        !       &
        !       cached to speed up the operation                !       &
        !                                                       !       &
        !       And DSP the file to complete the set of         !       &
        !       documentation for the file.                     !       &
        !                                                       !       &
        ! ===================================================== !       &
        IF      wrkfil%                                                 &
        THEN    PRINT #cmdfil%, "FLAG"                                  &
\               PRINT #cmdfil%, "I:" + nam$ + dot$ + filtyp$ +          &
                                "/CACHE/RAN"                            &
\               PRINT #cmdfil%, "^Z"                                    &
\               ifl$  =     "IFL " + "O:" + nam$ + dot$ + filtyp$     + &
                        "/ER:" + "O:" + nam$ + dot$ + "ERR/LO="       + &
                        "I:"   + OLDnam$     + dot$                   + &
                        OLDext$+ "/CL:128/KR:0"                         &
                                                                        &
\               dspit$=     "DSP "`+ "S:" + nam$ + dot$ + "DSP" + "=" + &
                             "O:" + nam$ + dot$ + filtyp$     + "/FU"   &

5000    IF      NOT wrkfil%                                             &
        THEN    dspit$=     "DSP " + "S:" + nam$ + dot$ + "DSP" + "=" + &
                             "O:" + nam$ + dot$ + filtyp$     + "/FU"   &

5100    files$=   "S:" + nam$ + dot$                                    &
\       fileo$=   "O:" + nam$ + dot$                                    &
\       queit1$=    "QUE/QLP0:RMSBLD/JCOPIES:2=" +                      &
                        files$ + "DSP" + more$  +                       &
                        files$ + "RMS" + more$  +                       &
                        files$ + "CMD" + more$  +                       &
                        files$ + "DEF" + more$                          &
\       queit2$=    "QUE/QLP0:RMSERR/JCOPIES:2=" +                      &
                     fileo$ + "ERR"                                     &

5200    PRINT #cmdfil%, "$ENABLE LOG"                                   &
\       PRINT #cmdfil%, "! QUEing OUTPUT to printer    !"               &
\       PRINT #cmdfil%, "$DISABLE LOG"                                  &
\       PRINT #cmdfil%, ifl$    IF (NOT rec.size.mis.match%) AND wrkfil%&
\       PRINT #cmdfil%, "^Z"    IF (NOT rec.size.mis.match%) AND wrkfil%&
```

INFORMATION TRANSPORTATION



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CIRCLE D77 ON READER CARD

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```
\       PRINT #cmdfil%, dspit$                                          &
\       PRINT #cmdfil%, queit1$                                         &
\       PRINT #cmdfil%, queit2$ IF (NOT rec.size.mis.match%) AND wrkfil%&
\       CLOSE #cmdfil%                                                  &

5300    PRINT  #kb%                     FOR i% = 1% TO 3%               &
\       PRINT  #kb%,                                                    &
        cr1.lf$ + HT + "Your file will now be created by ATPK..."       &
              + cr1.lf$ + cr1.lf$                                       &
\       INPUT  #kb%, " Press <CR> to continue. ";dumy$                  &
\       PRINT  #kb%,"Please wait waking up ATPK ...."                   &
\       PRINT  #kb%,            FOR i% = 1% TO 10%                      &
\       i$ = SYS( CHR$( 8% ) + "ATPK " + nam$ + dot$ +          &
                  commander$ + "/CHAIN:RMSBLD.TSK;5400" )               &
\       CHAIN "$ATPK.TSK"                                               &

5400    cr1.lf$ = CHR$(13%) + CHR$(10%)                                 &
\       PRINT #kb%,                                                     &
  cr1.lf$ + "Please go to the machine room lineprinter and retrieve"    &
+ cr1.lf$ + "your file setup documentation....keep one copy for"        &
+ cr1.lf$ + "yourself and provide the system manager with the other."   &
+ cr1.lf$ + "If Gentry will not run with the bucket size calculated"    &
+ cr1.lf$ + "by this program... Then you must re-run this utility"      &
+ cr1.lf$ + "and choose the next smallest bucketsize rather than"       &
+ cr1.lf$ + "allowing the utility to do it for you.     "               &
+ cr1.lf$                                                               &
\       PRINT  #kb%                             FOR i% = 1% TO 5%       &
\       PRINT  #kb%, HT + "If you have any problems with this utililty" &
         + cr1.lf$ + HT + "Please inform the system mangaer. "          &
\       goto 32760                                                      &

5500    ! ################################################### !        &
        !                                                     !        &
        !                                                     !        &
        !  E N D   O F   M A I N   P R O G R A M   L O G I C  !        &
        !                                                     !        &
        !                                                     !        &
        ! ################################################### !        &

5600    ! =================================================== !        &
        ! ################################################### !        &
        !                                                     !        &
        !          S U B R O U T I N E   S E C T I O N        !        &
        !          ----------------------------------         !        &
        !                                                     !        &
        !  ;;;
```

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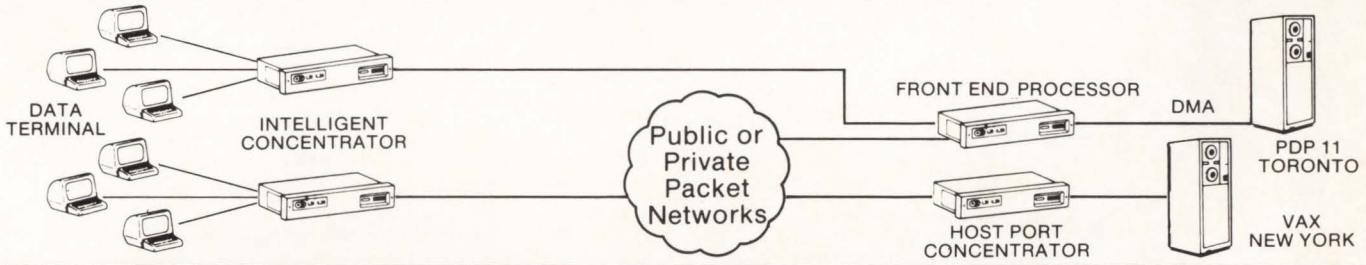

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CIRCLE D33 ON READER CARD

```
\               PRINT  #kb%,                                                &
                " and not in one block as in the RMSDEF utilty...     " &
\               PRINT  #kb%,                                                &
                "=====================================================" &
\               PRINT  #kb%,                                                &
                "Up to 8 segements are allowed for each key."               &
                                                                            &
\               PRINT  #kb%,                                                &
                                        FOR i% = 1% TO 3%                   &

6800    IF      NOT ASK%                                                    &
        THEN    PRINT    #kb%,                                              &
                "Since your key type is not string the key may"            &
                        + " not be segmented"                               &

6900    IF      NOT ASK%                                                    &
        THEN    INPUT #kb%, "Is this acceptable  <YES> "; yn$               &
\                       yn$ = CVT$$( yn$, -1% )                             &
\                       yn$ = yup$              IF yn$  = nl$               &
\                       PRINT  #kb%                                         &
\       IF      INSTR( 1%, "*Y*N*", yn$ ) = 0%                              &
        THEN    PRINT  #kb%, "Please answer <Y>es or <N>o "                 &
\               GOTO 6900                                                   &

7000    ! ================================================== !             &
        !                                                    !             &
        !       if the key type is string, then they can have  !            &
        !       segments                        ELSE           !            &
        !       they have only one segment...                  !            &
        !                                                      !            &
        ! ================================================== !             &
        IF      ASK%                                                        &
        THEN    PRINT  #kb%,                                                &
                "How many segments for " + typit$ + " key " ;               &
\               PRINT #kb%, NUM$( allkeys% ) + SPACE$( 1% );                &
                                IF ASCII( typit$ ) <> 80%                   &
\               INPUT #kb%, segs%;                                          &
\               GOTO    7000    IF      segs% > 8% OR segs% <= 0%           &
\               PRINT #kb%                                                  &
                                                                            &
        ELSE    segs% = 1%                                                  &

7100    FOR i3% = 1% TO segs%                                               &

7200            PRINT  #kb%,                                                &
                       "Enter the position of segment ";i3%;                &
\               PRINT  #kb%,                                                &
                       " of the key ";                                      &
\               INPUT  #kb%, inp$                                           &
\               PRINT  #kb%,                                                &

7225            IF      inp$ = nl$                                          &
                THEN    PRINT  #kb%, "No default"                           &
\                       GOTO 7200                                           &

7230            start%( i3% )   =       VAL( inp$ )                         &

7250            IF      start%( i3% ) >= maxrec%                            &
                THEN    PRINT  #kb%,                                        &
                        "Value greater than ( or equal to )"    +          &
                                " record size of "; maxrec%                 &
\                       GOTO 7200                                           &

7280    NEXT i3%                                                            &

7300    PRINT  #kb%,                                                        &
                                FOR i1% = 1% TO 3%                          &
\       keylen%         =       0%                                          &

7350    FOR     i4% = 1% TO segs%                                           &

7400            PRINT  #kb%,                                                &
                "Enter the length of segment "; i4%;" of the key ";         &
\               INPUT  #kb%, inp$                                           &
\               PRINT  #kb%,                                                &

7420            IF      inp$ = nl$                                          &
                THEN    PRINT  #kb%, "no default"                           &
\                       GOTO 7400                                           &

7450            long%( i4% ) = VAL( inp$ )                                  &
\               keylen% = keylen% + long%( i4% )                            &
\               IF      keylen%       > maxlen%  OR                         &
                        long%( i4% ) > maxlen%                              &
                THEN    PRINT  #kb%, BEL + "Key too long "                  &
\                       trap = 1 / zero                                     &

7500            ON      INSTR( 1%, "SIPB", LEFT$( keytyp$, 1% ) )           &
                        GOTO 7600, 7700, 7800, 7700                         &

7600            IF      long%( i4% )    <       1%              OR          &
                        long%( i4% )    >       maxlen%                     &
                THEN    PRINT  #kb%, BEL + "Key too long "                  &
\                       trap = 1 / zero                                     &
                ELSE    GOTO 7900                                           &

7700            IF      long%( i4% ) <> 2%                      AND         &
                        long%( i4% ) <> 4%                                  &
                THEN    PRINT #kb%,                                         &
                        BEL +"Incorrect length for key data type"           &
\                       PRINT  #kb%,                                        &
                               "Key size must be 2 or 4 for integer"        &
\                       trap = 1 / zero                                     &
                ELSE    GOTO 7900                                           &

7800            IF      long%( i4% ) < 1%                       OR          &
                        long%( i4% ) > 16%                                  &
                THEN    PRINT  #kb%,                                        &
                        BEL + "Incorrect length for key data type"          &
\                       trap = 1 / zero                                     &
                ELSE    GOTO 7900                                           &

7900    NEXT i4%                                                            &

8000    FOR i8% = 1% TO segs%                                               &
\               l.astend%       =                                           &
                        start%( i8% ) + long%( i8% ) + 1%                   &
                        IF start%( i8% - 1% ) < start%( i8% )               &
\       NEXT i8%                                                            &

8050    IF      first%                                                      &
        THEN    PRINT  #kb%,    "Last byte of primary key "; l.astend%      &
\               i$ =    FNwrite.out$( NUM$( l.astend% ),                    &
                                "Last byte of Primary Key "  )              &

8100    FOR check% = 1% TO segs%                                            &
\               IF     start%( check% ) + long%( check% ) > maxlen% OR      &
                       start%( check% ) + long%( check% ) > maxrec%         &
                THEN   PRINT  #kb%, "Error in key segmentation"             &
\                      PRINT  #kb%,                                         &
                       "Your key is greater than the absolute maximum ";&
\                      PRINT  #kb%, maxrec%                                 &
\                      PRINT  #kb%,                                         &
                       "or longer than your recordsize of ";maxlen%         &
\                      trap = 1 / zero                                      &

8200    NEXT check%                                                         &

8300    IF      segs% = 1%                                                  &
        THEN    out1$ = NUM$( start%( 1% ) )                                &
\               out$  = NUM$( long%( 1%  ) )                                &
        ELSE    out1$ = "("                                                 &
\               out1$ = out1$ + NUM$(start%(i2%)) + ","                     &
                              FOR i2% = 1% TO segs%                         &
\               out1$ = LEFT$( out1$, LEN( out1$ ) - 1%)                    &
\               out1$ = out1$ + ")"                                         &
\               out$ = "("                                                  &
\               out$ = out$ + NUM$( long%( i1% ) ) + ","                    &
                              FOR i1% = 1% TO segs%                         &
\               out$ = LEFT$( out$, LEN( out$ ) - 1% )                      &
\               out$ = out$ + ")"                                           &

8400    PRINT  #kb%,                                                        &
                              FOR i1% = 1% TO 3%                            &
\       INPUT #kb%, "Enter the name of this key < NONE > ";kyname$          &
\       kyname$ = nun$          IF kyname$ = nl$                            &
\       PRINT  #kb%,                                                        &

8450    IF      LEN( kyname$ ) > 32%                                        &
        THEN    PRINT #kb%, "Key Name too long must be less than 32 "       &
\               PRINT #kb%                                                  &
\               GOTO 8400                                                   &
        ELSE    kyname$ = CVT$$( kyname$, -1% )                             &

8500    PRINT  #kb%,                                                        &
                              FOR i1% = 1% TO 3%                            &
\       INPUT #kb%,                                                         &
            "Are you going to allow duplicates for this key <NO> ";dup$ &
\       PRINT  #kb%,                                                        &
\       dup$ = nope$            IF dup$ = nl$                               &
\       dup$ = CVT$$( dup$, -1% )                                           &
\       IF      INSTR( 1%, "YN",LEFT$( dup$, 1% ) ) = 0%                    &
        THEN    PRINT  #kb%, BEL + "Please answer Yes or No"                &
\               GOTO 8500                                                   &

8600    IF      ASCII( dup$ ) = 89%                                         &
        THEN    keydups%( allkeys% ) =  true%                               &

8700    PRINT #kb%                      FOR i1% = 1% TO 3%                  &
\       IF      NOT first%                                                  &
        THEN    INPUT #kb%,"Will you allow this key to change <NO> ";       &
                        chgs$                                               &
\               chgs$ = nope$                   IF chgs$ = nl$              &
\               chgs$ = CVT$$( chgs$, -1% )                                 &
\               chgs% = false%          IF ASCII( chgs$ ) = 78%             &

8800    IF      INSTR( 1%, "YN", LEFT$( chgs$, 1% ) ) = 0%                  &
        THEN    PRINT  #kb%, BEL + "Please answer Yes or No"                &
\               GOTO 8700                                                   &

8900    IF      first%                                                      &
        THEN    GOTO    9900                                                &

9000    INPUT #kb%,"Do you wish to define a null key value <NO> ";nulit$&
\       nulit$ = nope$          IF nulit$ = nl$                             &
\       nulit$ = CVT$$( nulit$, -1% )                                       &
\       IF      INSTR( 1%, "YN", LEFT$( nulit$, 1% ) ) = 0%                 &
        THEN    PRINT  #kb%, BEL + "Please answer Yes or No"                &
\               GOTO 8900                                                   &

9100    IF      ASCII( nulit$ ) = 89%                                       &
        THEN    ans% = true%                                                &
\               nulit$ = yup$                                               &
        ELSE    ans% = false%                                               &
```

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CIRCLE D78 ON READER CARD

```
9200    IF      ans%                                                    &
        THEN    PRINT  #kb%,                                            &
                "Enter the character with which to replace a null key ";&
\               INPUT LINE #kb%, nulval$                                &
\               PRINT  #kb%,                                            &
\               IF      LEN( nulval$ ) = 0%                             &
                THEN    PRINT #kb%, BEL + "Try again"                   &
\                       GOTO 9200                                       &

9300    SAVNUL$ = nulval$                                               &
\       ON      INSTR( 1%, " #?@", LEFT$( nulval$, 1% ) ) + 1%          &
                GOTO  9900,9500,9600,9700,9800                          &

9400    IF      NOT ans%        GOTO 9900                               &

9500    nulval$         =       "#40"                                   &
\       GOTO 9900                                                       &

9600    nulval$         =       "#43"                                   &
\       GOTO 9900                                                       &

9700    nulval$         =       "#77"                                   &
\       GOTO 9900                                                       &

9800    nulval$         =       "#100"                                  &

9900    RETURN                                                          &

10000   ! ================================================== !          &
        !                                                    !          &
        !               S U B R O U T I N E                  !          &
        !               -------------------                  !          &
        !                                                    !          &
        !       Command File Opener And Writer:              !          &
        !                                                    !          &
        !       Questions Answered:                          !          &
        !       ------------------                           !          &
        !       Hail Rmsdef     "DEF"                        !          &
        !       Yes Create A Command File...                 !          &
        !       Filespec...                                  !          &
        !       Yes Create The File We're Describing         !          &
        !       Name Of The File To Create...                !          &
        !       No Don't Superscede It If It Exists Already. !          &
        !       File Organization (idx)                      !          &
        !       Record Format ( Fix Or Var )                 !          &
        !       Maximum Record Size...                       !          &
        !       Yes Carriage Return Control.                 !          &
        !                                                    !          &
        ! ************************************************** !          &
\       OPEN    nam$ + dot$ + commander$ FOR OUTPUT AS FILE #cmdfil%    &
\       PRINT #cmdfil%, "$ALLOW FATAL ERRORS"                           &
\       PRINT #cmdfil%, "! Beginning definition of file !"              &
\       PRINT #cmdfil%, "$DISABLE log"          IF NOT debug%           &
\       PRINT #cmdfil%, deaf$                                           &
\       PRINT #cmdfil%, yup$                                            &
\       PRINT #cmdfil%, nam$ + dot$ + deaf$                             &
\       PRINT #cmdfil%, yup$                                            &
\       PRINT #cmdfil%, filer$                                          &
\       PRINT #cmdfil%, nope$                                           &
\       PRINT #cmdfil%, "IDX"                                           &
\       PRINT #cmdfil%, formt$                                          &
\       PRINT #cmdfil%, NUM1$( maxrec% )                                &
\       PRINT #cmdfil%, yup$                                            &
\       RETURN                                                          &

10100   ! ================================================== !          &
        !                                                    !          &
        !                                                    !          &
        !               S U B R O U T I N E                  !          &
        !               -------------------                  !          &
        !                                                    !          &
        !       Write To Command File after defining each key!          &
        !                                                    !          &
        !       Answers written to command file:             !          &
        !                                                    !          &
        !       Yes... Another Key.                          !          &
        !       Key Type...                                  !          &
        !       Positon                                      !          &
        !       Length                                       !          &
        !       Name Of Key (NONE)                           !          &
        !       Duplicates Allowed ( YN )                    !          &
        !       Changes Allowed....                          !          &
        !                                                    !          &
        ! ================================================== !          &
\       PRINT #cmdfil%,yup$             IF NOT first%                   &
\       PRINT #cmdfil%,keytyp$                                          &
\       PRINT #cmdfil%,out1$                                            &
\       PRINT #cmdfil%,out$                                             &
\       PRINT #cmdfil%,kyname$                                          &
\       PRINT #cmdfil%,dup$                                             &
\       PRINT #cmdfil%,chgs$            IF NOT first%                   &
\       PRINT #cmdfil%,nulit$           IF NOT first%                   &
\       PRINT #cmdfil%,nulval$          IF ans% AND NOT first%          &
                                                                        &
\       i$ = FNwrite.out$( out1$, "Placement of key"    )               &
\       i$ = FNwrite.out$( out$,  "Lengths of segments" )               &
\       i$ = FNwrite.out$( kyname$, "Name of key"       )               &
\       i$ = FNwrite.out$( dup$,   "Duplicates allowed" )               &

10110   IF      NOT first%                                              &
        THEN    i$ = FNwrite.out$( chgs$,  "Changes Allowed"    )       &
\               i$ = FNwrite.out$( nulit$, "Define Null value for key") &
\               i$ = FNwrite.out$( SAVNUL$, "Null key value  "  )       &
                                                        IF ans%         &

10120   RETURN                                                          &

10200   ! ================================================== !          &
        !                                                    !          &
        !                                                    !          &
        !               S U B R O U T I N E                  !          &
        !               -------------------                  !          &
        !                                                    !          &
        !                                                    !          &
        !       Do The Figuring Of The Optimum Bucketsize    !          &
        !       For The Primary index...                     !          &
        !                                                    !          &
        !       Calculation of statistics:                   !          &
        !                                                    !          &
        !       do%         =>  Deletion Overhead            !          &
        !                       Calculation on the basis of: !          &
        !                                                    !          &
        !               2%      If No Duplicates For Primary!          &
        !                       Key                          !          &
        !                                                    !          &
        !               2% +                                 !          &
        !               Position Of Last Byte in Key +  1%   !          &
        !                                                    !          &
        !                    ***If Duplicates Are Allowed    !          &
        !                       And Variable Length Records  !          &
        !               Else                                 !          &
        !                       do% = Record Size            !          &
        ! ================================================== !          &
        IF      keydups%( 0% )                                          &
        THEN    IF      format%                                         &
                THEN    do%     =       maxrec%                         &
                ELSE    do%     =       2% + l.astend% + 1%             &

10300   ! ================================================== !          &
        !                                                    !          &
        !          Calculate Optimum Bucket Size For         !          &
        !               Primary index:                       !          &
        !                                                    !          &
        ! Formulas used:                                     !          &
        !                                                    !          &
        ! NIRBK = (512*BUCKETSIZE ) - 15/ PKL + EPL          !          &
        ! NDRBK = ((512*BUCKETSIZE) - 15) - AOVH / RSZ + RFO  !          &
        ! LINE3$ = nrf/ndrbk$                                !          &
        !                                                    !          &
        ! ================================================== !          &
        GOSUB   5800                                                    &
\       i$ =    FNwrite.out$( cr1.lf$, cr1.lf$              )           &
\       i$ =    FNwrite.out$( nl$, "Activity Overhead Table" )          &
\       i$ =    FNwrite.out$( CHR$(13%), CHR$(10%)          )           &
\       i$ =    FNwrite.out$( nl$, "----------------------" )           &
\       FOR b.ucketsize% = 1% TO 6%                                     &
\               NIRBK.DUM = FNround( ((512% * b.ucketsize%)-15%) /      &
                                     (keylen% + bpl%) )                 &
\               nirbk$( b.ucketsize% )  = NUM$( NIRBK.DUM )             &
\               aovh      = FNround( (aovh%/100)*(512*b.ucketsize%) )   &
                                                                        &
\       PRINT  #kb%,    "For a bucket size of "; b.ucketsize%   ;       &
\       PRINT  #kb%,    " The activity overhead (bytes) "; aovh         &

10310   IF      ( question$ = nl$ AND answer$   = nl$ )                 &
        THEN    PRINT #log%,    FOR looper% = 1% TO 2%                  &

10350   IF      log% <> kb%                                             &
        THEN    PRINT  #log%, "For a bucket size of "; b.ucketsize%;    &
\               PRINT  #log%," The activity overhead (bytes) "; aovh    &

10355           ndrbk.dum = ( ((512% * b.ucketsize%)-15%)               &
                            - aovh ) / (maxrec%+rfo%)                   &
\               ndrbk.dum = FNround( ndrbk.dum )                        &
\               ndrbk.dum = 1%                  IF ndrbk.dum < 1%       &
\               ndrbk$( b.ucketsize% )  = NUM$( ndrbk.dum )             &
\               line3.dum = FNround( nrf /val( ndrbk$( b.ucketsize%)) ) &
\               line3$( b.ucketsize% )  = NUM$( LINE3.DUM )             &

10400   NEXT b.ucketsize%                                               &

10500   ! ================================================== !          &
        !                                                    !          &
        !                                                    !          &
        !       Calculate Squares And Cubes Of NIRBK%        !          &
        !       For Calculating The Optimum Bucket Size      !          &
        !       For the file.                                !          &
        !                                                    !          &
        !                                                    !          &
        ! ================================================== !          &
        FOR exp% = 2% TO 3%                                             &
\               FOR index% = 1% TO 6%                                   &
\                       tabl$( exp%, index% )   =                       &
                                NUM1$( FNround( VAL(                    &
                        FNSTEXP$( exp%, nirbk$( index% ), 1% ) ) ) )    &
\               NEXT index%                                             &
\       NEXT exp%                                                       &

10600   ! ================================================== !          &
        !                                                    !          &
        !       Print a table of the calculated values for   !          &
        !               future reference                     !          &
        !       Print a copy to the command file as well..   !          &
        !                                                    !          &
        ! ================================================== !          &
```

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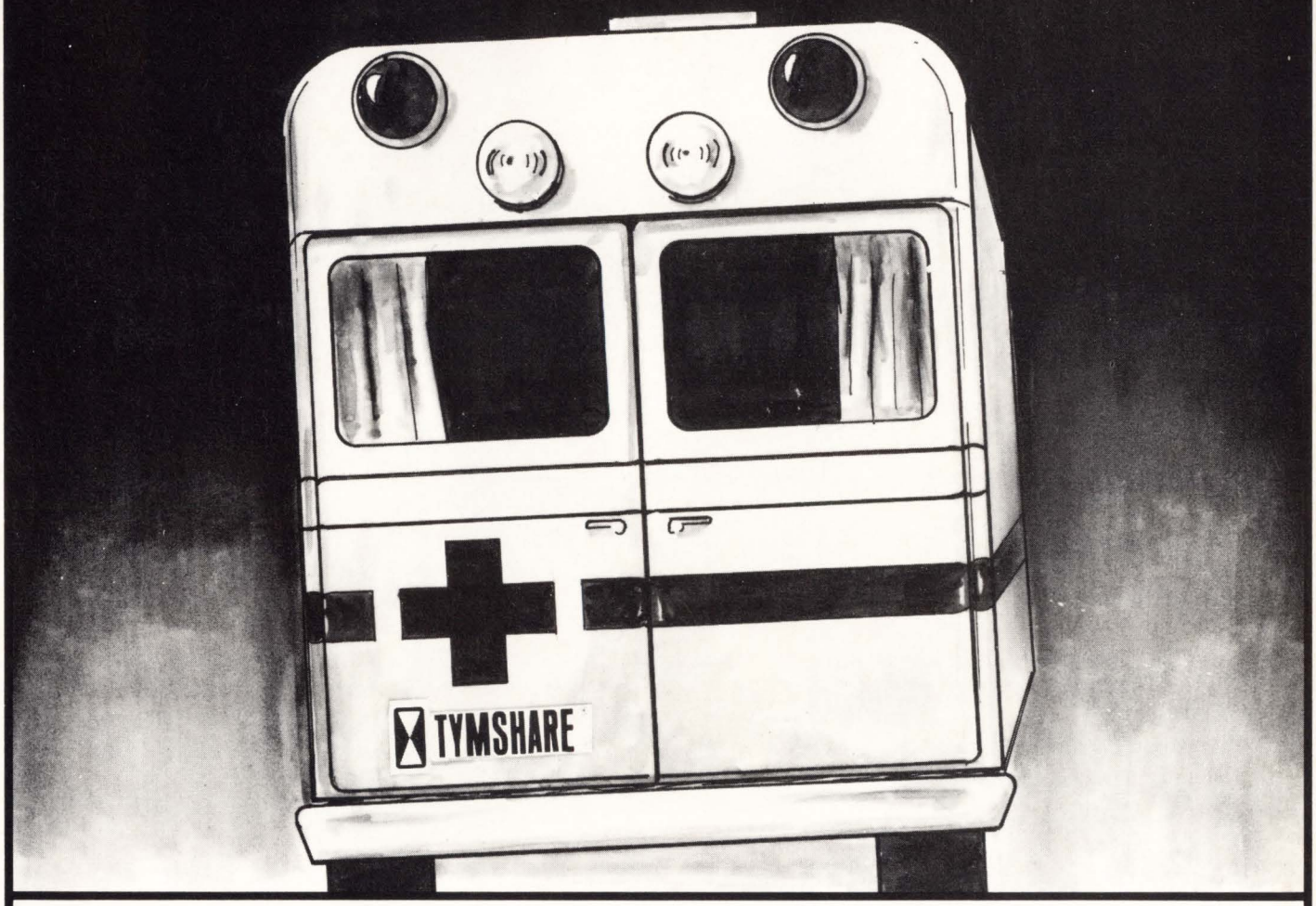

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CIRCLE D11 ON READER CARD

```
        PRINT #kb%,                     FOR i% = 1% TO 5%               &
\       HEADER$ = SPACE$( 6% ) + "Table of Calculations"                &
\       PRINT #kb%, HT + HT + header$                                   &
\       PRINT #kb%, HT + HT + SPACE$(6%) +                              &
                STRING$( LEN( header$ ), 45% )                          &
\       PRINT #kb%                      FOR 1% = 1% TO 2%               &
\       PRINT #kb%,                                                     &
      "BSIZE";TAB(6%);"NIRBK","NDRBK","nrf/NDRBK","NIRBK**2","NIRBK**3"&

10610   IF      log% <> kb%                                             &
        THEN    PRINT #log%, FF                                         &
\               PRINT #log%, HT + HT + header$                          &
\               PRINT #log%, HT + HT + STRING$( LEN( header$ ), 45% )   &
\               PRINT #log%                     FOR 1% = 1% TO 2%       &
\               PRINT #log%,                                            &
      "BSIZE";TAB(6%);"NIRBK","NDRBK","nrf/NDRBK","NIRBK**2","NIRBK**3"&

10620   FOR table% = 1% TO 6%                                           &
\               PRINT #kb%,                                             &
                        table%;TAB(5%);                                 &
                        nirbk$( table% ), ndrbk$( table% ),             &
                        line3$( table% ), tabl$( 2%, table% ),          &
                        tabl$( 3%, table% )                             &
\               PRINT #log%,                                            &
                        table%;TAB(5%);                                 &
                        nirbk$( table% ), ndrbk$( table% ),             &
                        line3$( table% ), tabl$( 2%, table% ),          &
                        tabl$( 3%, table% )                             &
                                                IF      log% <> kb%     &
\       NEXT table%                                                     &

10630   i$ = FNwrite.out$( cr1.1f$, cr1.1f$ )                           &

10700   ! ================================================== !          &
        !                                                    !          &
        !                Choose A Bucket Size...             !          &
        !   Use Only The Data Bucketsize Since It Is Usually !          &
        !       The Smaller Of The Two and RSTS/E will only  !          &
        !       let us have one size for both index and data !          &
        !                                                    !          &
        ! ================================================== !          &
        FOR newind% = 1% TO 6%                                          &
\               FOR exp% = 3% TO 2% STEP -1%                            &
\                       IF      newind% + 1% > 6%                       &
                        THEN    GOTO 11000                              &

10750   num.1   =       val( tabl$( exp%, newind% ) )                   &
\       num.2   =       val( line3$( newind%      ) )                   &

10800                   IF      num.1 >= num.2                          &
                        THEN    bks% = newind%                          &
\                               GOTO 11100                              &

10900           NEXT exp%                                               &
\       NEXT newind%                                                    &

11000   PRINT  #kb%,                                                    &
                "Appropriate Bucket size not found.." + BEL             &
\       PRINT #kb%, "Please inform the system manager that you are" +   &
                " having difficulties defining your file. "             &
\       GOTO 32760                                                      &

11100   ! ================================================== !          &
        !                                                    !          &
        !       assure the proper pointer lengts @5800       !          &
        !                                                    !          &
        ! ================================================== !          &
        GOSUB   5800                                                    &
\       PRINT #kb%                                                      &
\       PRINT #kb%,                                                     &
                "The optimum bucketsize for your file is "; bks%        &
\       INPUT #kb%," Is this calculation acceptable <Yes> "; yn$        &
\       PRINT #kb%                                                      &
\       yn$     =       yup$    if yn$ = nl$                            &
\       yn$     =       cvt$$( yn$, -1% )                               &
                                                                        &
\       IF      INSTR( 1%, "*Y*N*", yn$  ) = 0%                         &
        THEN    PRINT  #kb%,    "Please answer <Y>es or <N>o "          &
\               GOTO 11100                                              &

11200   IF      ASCII( yn$ ) <> 78%                                     &
        THEN    i$ = FNwrite.out$( NUM$( bks% ) ,                       &
                                "Bucketsize of the file" )              &
\               RETURN                                                  &

11300   INPUT #kb%, "Choose the proper bucketsize "; bsize%             &
\               goto    11300   if bsize% < 1% OR bsize% > 6%           &
\       bks%    =       BSIZE%                                          &
\       GOSUB   5800                                                    &
\       i$ = FNwrite.out$( NUM$( bks% ), "Bucketsize of the file" )     &
\       RETURN                                                          &

11400   ! ================================================== !          &
        !                                                    !          &
        !         Find Number Of Buckets At Each Level...    !          &
        !                                                    !          &
        ! ================================================== !          &
        indall      = zero                                              &
\       nbk( 0% )   = FNround( nrf / VAL( ndrbk$( bks% ) ) )            &
\       PRINT  #kb%,                                                    &
                "Number of buckets at level 0 ", nbk( 0% )              &
\       calcprcnt  = ( 1-( dataprcnt% / 100 ) )                         &
\       nbk( 0% )  = FNround( nbk( 0% ) + ( calcprcnt * nbk( 0% ) ) )   &
\       nbk( 0% )  = 1%         IF nbk( 0% ) = 0%                       &
\       PRINT  #kb%,                                                    &
                "Adjusted Number of buckets at level 0 ",               &
                                                nbk( 0% )               &
\       i$ =    FNwrite.out$( NUM$( nbk( 0% )),                         &
                                "Adjusted Buckets at level 0 " )        &
\       PRINT #kb%                                                      &
\       FOR index6% = 1% TO 6%                                          &
\               temp =  nbk( index6% - 1% ) / VAL( nirbk$( bks% ) )     &
\               calcprcnt       = ( 1-( indxprcnt% / 100 ) )            &
\               nbk( index6% )  = FNround( temp + ( CALCPRCNT*temp ) )  &
\               levelsp%        = index6%                               &
\               nbk( index6% )  = 1%    if nbk( index6% ) < 1%          &
\       PRINT  #kb%,                                                    &
                "Number of buckets at level ";  index6%,                &
                                                nbk( index6% )          &
\       i$ = FNwrite.out$( NUM$( nbk( index6% ) ),                      &
                                "Number of buckets at level #" +        &
                                NUM$( index6% )                 )       &
\               GOTO 11600              IF nbk( index6% )  = 1%         &

11500   NEXT index6%
11600   ! ================================================== !          &
        !                                                    !          &
        !          Determine The Initial Allocation          !          &
        !                                                    !          &
        ! ================================================== !          &
        datarea       = ( nbk( 0% ) * bks% )                            &
\       GOSUB   11800                           IF first%               &
\       areas( 0% )  = datarea   + prologue%    IF first%               &
\       PRINT #kb%,                                                     &
                "Number of Blocks for data "; datarea   IF first%       &
\       PRINT #kb%,"      ( Area # 0 ) "                IF first%       &
\       i$ = FNwrite.out$( NUM1$( datarea ),"Number of blocks for Data")&
                                                        IF first%       &
\       FOR index9% = 1% TO levelsp%    ! For each level of index !     &
\               nbk( index9% ) = ( nbk( index9% ) * bks% )              &
\               PRINT  #kb%,                                            &
                        "Number of Blocks at level "; index9% ;         &
\               PRINT  #kb%," of "; typit$; " index "; nbk( index9% )   &
\               indall = indall + nbk( index9% )                        &

11700   NEXT index9%                                                    &
\               areas( allkeys% + 1% ) = indall                         &
\               areas( allkeys% + 1% ) =                                &
                areas( allkeys% + 1% ) + datarea        IF NOT first%   &
\       PRINT  #kb%,                                                    &
\       PRINT  #kb%,    "Total Allocation for Area "; allkeys% + 1%;    &
\       PRINT  #kb%,    " for "; typit$ ;" index. ";                    &
\       PRINT  #kb%,    areas( allkeys% + 1% )                          &
                                                                        &
\       i$ = FNwrite.out$( NUM$( areas( allkeys% + 1% ) ),              &
                        "Allocation for Area "                          &
                      + NUM$( allkeys% +1% ) )                          &
\       RETURN                                                          &

11800   ! ================================================== !          &
        !                                                    !          &
        !       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            !          &
        !                                                    !          &
        ! ================================================== !          &
        WHILE  keys% > 8%                                               &
\                       prologue% = prologue% + 2%                      &
\                       keys% = keys% - 8%                              &
\               NEXT                                                    &
\               WHILE   keys% > 5%                                      &
\                       prologue% = prologue% + 1%                      &
\                       keys% = keys% - 5%                              &
\               NEXT                                                    &

11900   RETURN                                                          &

12000   ! ================================================== !          &
        !                                                    !          &
        !                  S U B R O U T I N E               !          &
        !                  -------------------               !          &
        !                                                    !          &
        !       Find the number of index records per bucket  !          &
        !       for alternate index                          !          &
        !                                                    !          &
        !       NEW POINTER LENGTH FOR ALTERNATE KEYS...     !          &
        !       ========================================     !          &
        !                                                    !          &
        !       FORMULAS FOR THE ALLOCATION FOR THE ALTERNATE !          &
        !       KEYS...                                      !          &
        !                                                    !          &
        !       if duplicates are allowed, must change some  !          &
        !       of the numbers around to make things         !          &
        !       a little more difficult...                   !          &
        !                                                    !          &
        !       DUPLICATES FACTOR... NUMBER OF ALTERNATE KEYS !          &
        !       WITH THE SAME KEY VALUE...                   !          &
        !                                                    !          &
        ! ================================================== !          &
\       IF      keydups%( allkeys% )                                    &
        THEN    do%     =       4%                                      &
\               PRINT  #kb%,                                            &
                        "Deletion overhead Change( do% )"; do%          &
```

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CIRCLE D63 ON READER CARD

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Our engineers have developed a practical, cost-effective way to increase PDP-11/23 memory beyond 256KB. Our new Buccaneers™ MSC 8702 extends the addressability of the LSI-11/23 microcomputer from 18 to 22 bits, transparently, while maintaining compatability 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

18 & 22 ADDRES

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MSC 8702 Description and Capacity

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

CAPACITIES

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

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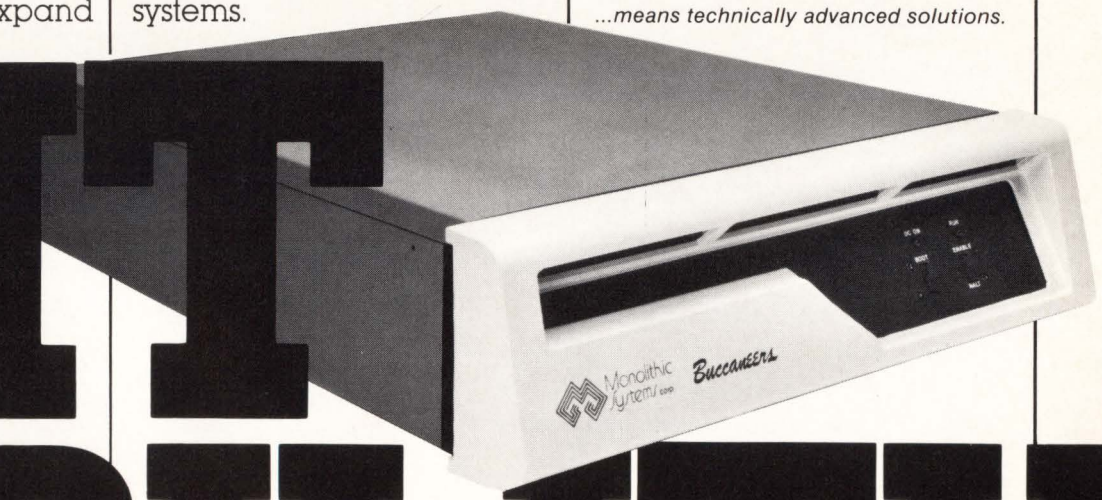

BIT SABILITY

CIRCLE D64 ON READER CARD

```
\               df      =       (dupsprcnt%/100) * nrf                  &
\               PRINT  #kb%,                                            &
                "Duplicates Factor Change"; df                          &

12100   NIRBK.DUM        = FNround( ((512%*bks%)-15%)                   &
                                    (keylen% + bpl%) )                  &
\       nirbk$( bks% )   = NUM$( NIRBK.DUM )                            &
\       ndrbk.dum        = FNround( ( ((512%*bks%)-15%)*df)/            &
                                    (keylen% + (dbpl%*df) + 4% + do%) ) &
\       ndrbk$( bks% )   =  NUM$( ndrbk.dum )                           &
\       PRINT #kb%, "Calculations for alternate index "; allkeys%       &
\       PRINT #kb%,                                                     &
\       PRINT #kb%,                                                     &
        "Number of index records per bucket for a bucketsize "          &
              + NUM$( bks% )  + SPACE$( 1% )+ nirbk$( bks% )            &
\       PRINT #kb%,                                                     &
\       PRINT #kb%,"Number of data records per bucket for a bucketsize" &
              + NUM$( bks% )  + SPACE$( 1% ) +  ndrbk$(bks%)            &
\       i$ = FNwrite.out$( cr1.lf$, cr1.lf$ )                           &
\       i$ = FNwrite.out$( nl$, "Calculations for alternate "           &
                         + "index #" + NUM$( allkeys% ) )               &
\       i$ = FNwrite.out$( cr1.lf$, cr1.lf$ )                           &
\       i$ = FNwrite.out$( cr1.lf$, cr1.lf$ )                           &
\       i$ = FNwrite.out$(  nirbk$( bks% ) ,                            &
                           "Number of index Records per bucket " )      &
\       i$ = FNwrite.out$(  ndrbk$( bks% ) ,                            &
                           "Number of Data Records per bucket " )       &
\       i$ = FNwrite.out$( NUM$( do% ), "Deletion overhead")            &
\       i$ = FNwrite.out$( NUM$( df  ), "Duplicates factor")            &
\       RETURN                                                          &

12200   ! ================================================== !          &
        !                                                    !          &
        !                   S U B R O U T I N E              !          &
        !                   -------------------              !          &
        !                                                    !          &
        !       Attempt an RMS11-K open on the file to assure !          &
        !       compatibility if a record transfer from      !          &
        !       a previous file is chosen                    !          &
        !       record format is fixed or variable.          !          &
        !                                                    !          &
        ! ================================================== !          &
        IF      wrkfil%                                                 &
        THEN    OPEN    wrkfil$ AS FILE #temp%,                         &
                ORGANIZATION indexED FIXED,                             &
                ACCESS READ,                                            &
                ALLOW NONE,                                             &
                RECORDSIZE maxrec%              IF format%              &
                                                                        &
                                                                        &
                OPEN    wrkfil$ AS FILE #temp%,                         &
                ORGANIZATION indexED VARIABLE,                          &
                ACCESS READ,                                            &
                ALLOW NONE,                                             &
                RECORDSIZE maxrec%              IF NOT format%          &
                                                                        &
12300           CLOSE #temp%                                            &
\               RETURN                                                  &

12400   ! ================================================== !          &
        ! ################################################## !          &
        !                                                    !          &
        !          D E F I N E   T H E   A R E A S           !          &
        !          -------------------------------           !          &
        !                                                    !          &
        !       This is the most important area of the program !         &
        !       this is where the file size is calculated and  !         &
        !       optimized.                                   !          &
        !                                                    !          &
        !       Notes:                                       !          &
        !                                                    !          &
        !       Default extension quantity of the areas is   !          &
        !       zero since RSTS/E will actually extend the   !          &
        !       file to the next cluster regardless of the   !          &
        !       size requested by RMS-11, so a request of    !          &
        !       0 will give you 1 full cluster of blocks     !          &
        !       which will be the pack cluster size.         !          &
        !                                                    !          &
        ! ################################################## !          &
        ! ================================================== !          &
        first%  =       true%                                           &
\       PRINT #cmdfil%,";These questions deal with areas of the file"  &
\       FOR     doit%   =       0%      TO      nu.mber.of.keys% + 1%   &
                                                                        &
\               PRINT #cmdfil%, yup$                                    &
\               PRINT #cmdfil%, nope$           IF first%               &
\               PRINT #cmdfil%, ";####Area Number####"; doit%           &
\               PRINT #cmdfil%, ";Initial allocation"                   &
\               PRINT #cmdfil%, NUM1$( areas( doit% ) )                 &
\               PRINT #cmdfil%, ";Here is the bucket size for the area" &
\               PRINT #cmdfil%, NUM1$( bks% )                           &
\               PRINT #cmdfil%, ";Default ext quantity for area(blocks)"&
\               PRINT #cmdfil%, NUM1$( 0% )                             &
\               PRINT #cmdfil%, nope$           IF first%               &
\               first%  =  false%                                       &
\       NEXT    doit%                                                   &

12500   ! ================================================== !          &
        !                                                    !          &
        !      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 A Rebuild such as IFL !       &
        !       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...             !          &
        !       fill number for index buckets...             !          &
        !       area number for lowest index level of cur. key !        &
        !                                                    !          &
        ! ================================================== !          &
        datafill%       = (dataprcnt%/100) * (bks% * 512%)              &
\       indfill%        = (indxprcnt%/100) * (bks% * 512%)              &
\       PRINT #cmdfil%, nope$                                           &
\       PRINT #cmdfil%, NUM1$( area.extension.size% )                  &
\       PRINT #cmdfil%, ";Here is where we assign the keys to the areas."&
\       PRINT #cmdfil%, ";Primary Key Data Area is 0"                   &
\       PRINT #cmdfil%, "0"                                             &
\       PRINT #cmdfil%, "; Fill Factor Optimization For Data Buckets"   &
\       PRINT #cmdfil%, NUM1$( datafill% )                              &
\       PRINT #cmdfil%, "; Primary Key index Area is 1"                 &
\       PRINT #cmdfil%, "1"                                             &
\       PRINT #cmdfil%, "; Fill Factor Optimization For index Buckets"  &
\       PRINT #cmdfil%, NUM1$( indfill% )                               &
\       PRINT #cmdfil%, ";Lowest Level index Records Area"              &
\       PRINT #cmdfil%, "1"                                             &

12600   FOR     doit2% = 1%     TO      nu.mber.of.keys% - 1%           &
                                                                        &
\       PRINT #cmdfil%, ";Area assignments for Alternate Key #";doit2%  &
\       PRINT #cmdfil%, ";Data Area"                                    &
\       PRINT #cmdfil%, NUM1$( doit2% + 1% )                            &
\       PRINT #cmdfil%, ";Fill factor for data buckets"                 &
\       PRINT #cmdfil%, NUM1$( DATAFILL% )                              &
\       PRINT #cmdfil%, ";index Area "                                  &
\       PRINT #cmdfil%, NUM1$( doit2% + 1% )                            &
\       PRINT #cmdfil%, ";Fill Factor for index buckets"                &
\       PRINT #cmdfil%, NUM1$( INdfILL% )                               &
\       PRINT #cmdfil%, ";Lowest level index records in area "          &
\       PRINT #cmdfil%, NUM1$( doit2% + 1% )                            &
                                                                        &
\       NEXT    doit2%                                                  &

12700   ! ================================================== !          &
        !                                                    !          &
        !       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%, NUM1$( file.cluster.size% )                     &
\       PRINT #cmdfil%, NUM1$( p.rotection.code%  )                     &
\       PRINT #cmdfil%, yup$                                            &
\       PRINT #cmdfil%, "^C"                                            &
\       RETURN                                                          &

12750   ! ================================================== !          &
        !                                                    !          &
        !                   S U B R O U T I N E              !          &
        !                   -------------------              !          &
        !                                                    !          &
        !       Change program defaults....                  !          &
        !                                                    !          &
        ! ================================================== !          &
        PRINT #kb%, HT + "Changing program defaults "                   &
\       PRINT #kb%,                                                     &
\       PRINT #kb%, HT + " <CR> skips current item "                    &
\       PRINT #kb%, cr1.lf$             FOR i% = 1% TO 2%               &
\       PRINT #kb%, HT + "Type  'END' to exit "                         &

12751   PRINT #kb%, HT + "Default OUTPUT disk for file "                 &
\       PRINT #kb%, HT + "after it is created contiguious by PIP <" +   &
                                OUTPUT.dev$ + ">";                      &
\       dum$    =       nl$                                             &
\       INPUT LINE #kb%, dum$                                           &
\       PRINT #kb%,                                                     &
\       GOTO 12752      IF ASCII( dum$ ) = 13%                          &
\       dum$    =       CVT$$( dum$, 1% + 4% + 8% + 16% + 32% +128%  )  &
\       RETURN          IF dum$ = "END"                                 &
\       GOTO 12751      IF INSTR( 1%, dum$, ":" ) = 0%                  &
\       OUTPUT.dev$ = dum$      IF LEN( OUTPUT.dev$ )                   &

12752   PRINT #kb%, HT + "Cluster size for file " ;                      &

\       PRINT #kb%, NUM$(  file.cluster.size% ) + SPACE$( 1% );         &
                                IF file.cluster.size% <> -1%            &
```

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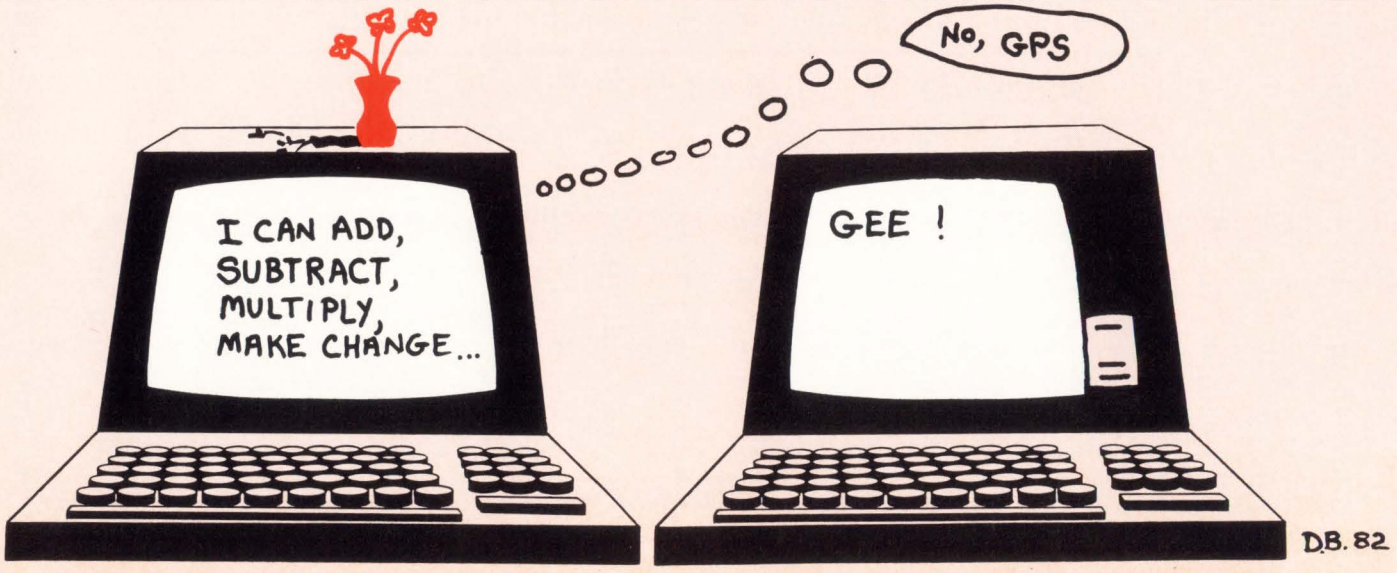
CIRCLE D71 ON READER CARD

```
\       PRINT #kb%, "256"       IF file.cluster.size% = -1%                 &
\       dum$    =       nl$                                                 &
\       INPUT #kb%, dum$                                                    &
\       PRINT #kb%,                                                         &
\       dum$    =       CVT$$( dum$, 1% + 4% + 8% + 16% + 32% +128%  )      &
\       RETURN          IF dum$ = "END"                                     &
\       GOTO 12753      IF ASCII( dum$ ) = 13%                              &
\       file.cluster.size% = VAL( dum$ )        IF LEN( dum$ )              &
\       temp    =       file.cluster.size% / 2%                             &
\       GOTO 12752      IF  INT( temp ) <> temp                             &

12753   PRINT #kb%, HT + "Fill factor for data buckets "        +           &
                NUM$(  datapront% ) + SPACE$( 1% );                         &
\       dum$    =       nl$                                                 &
\       INPUT #kb%, dum$                                                    &
\       PRINT #kb%,                                                         &
\       dum$    =       CVT$$( dum$, 1% + 4% + 8% + 16% + 32% + 128%  )     &
\       RETURN          IF dum$ = "END"                                     &
\       GOTO 12754      IF ASCII( dum$ ) = 13%                              &
\       datapront%      = VAL( dum$ )   IF LEN( dum$ )                      &

12754   PRINT #kb%, HT + "Fill factor for index buckets "       +           &
                NUM$( indxpront% ) + SPACE$( 1% );                          &
\       dum$    =       nl$                                                 &
\       INPUT #kb%, dum$                                                    &
\       PRINT #kb%,                                                         &
\       dum$    =       CVT$$( dum$, 1% + 4% + 8% + 16% + 32% +128%  )      &
\       RETURN          IF dum$ = "END"                                     &
\       GOTO 12755      IF ASCII( dum$ ) = 13%                              &
\       indxpront%      = VAL( dum$ )   IF LEN( dum$ )                      &
\       aovh%           = 100% - indxpront%                                 &

12755   PRINT #kb%, HT + "Percentege of deletions expected"     +           &
                NUM$( delepront% ) + SPACE$( 1% );                          &
\       dum$    =       nl$                                                 &
\       INPUT #kb%, dum$                                                    &
\       PRINT #kb%,                                                         &
\       dum$    =       CVT$$( dum$, 1% + 4% + 8% + 16% + 32% +128%  )      &
\       RETURN          IF dum$ = "END"                                     &
\       GOTO 12799      IF ASCII( dum$ ) = 13%                              &
\       delepront%      = VAL( dum$ )   IF LEN( dum$ )                      &

12799   RETURN                                                              &

12800   ! ================================================== !               &
        !                                                    !               &
        !                                                    !               &
        !       F   U   N   C   T   I   O   N   S            !               &
        !                                                    !               &
        !                                                    !               &
        ! ================================================== !               &

12850   ! ================================================== !               &
        !                                                    !               &
        !               EXPONENTIATION FUNCTION              !               &
        !               ( STRING ARITHMETIC    )             !               &
        !                                                    !               &
        ! ================================================== !               &
        DEF FNSTEXP$( expo%, stuff$, acc% )                                 &
\                       dumy$ = "1"                                         &
\                       FOR deindx% = 1% TO expo%                           &
\                               dumy$ =                                     &
                                        PROD$( stuff$,                      &
                                               dumy$,                       &
                                               acc%     )                   &
\                       NEXT deindx%                                        &
\       FNSTEXP$ = dumy$                                                    &
\       FNEND                                                               &

12900   ! ================================================== !               &
        !                                                    !               &
        !       ROUNDING FUNCTION...                         !               &
        !                                                    !               &
        ! ================================================== !               &
        DEF     FNround( in )                                               &
\               round   =       ( (IN*10+.5)/10  )                          &
\               round$  = NUM$( round          )                            &
\               decimal%= INSTR( 1%,round$,"." )                            &
\               round$  = LEFT ( round$,DECIMAL%)       IF decimal%         &
                                UNLESS  INSTR( 1%, round$, "E" )            &
\               FNround = VAL  ( round$         )                           &
\       FNEND                                                               &

13000   ! ================================================== !               &
        !                                                    !               &
        !       FUNCTION TO WRITE TO LOG FILE SO WE          !               &
        !       SEE WHAT WE DID..                            !               &
        !                                                    !               &
        ! ================================================== !               &
        DEF FNwrite.out$( answer$, question$ )                              &
\       IF              log% <> kb%                                         &
        THEN    PRINT #log%, question$;         UNLESS question$ = nl$&     &
\               PRINT #log%, TAB(35%) ;answer$  UNLESS answer$   = nl$&     &

13100   FNEND                                                               &

13200   ! ================================================== !               &
        ! ################################################## !               &
        ! ================================================== !               &
        !                                                    !               &
        !       E R R O R   T R A P P I N G   S E C T I O N  !               &
        !                                                    !               &
        !                                                    !               &
        ! ################################################## !               &
        ! ================================================== !               &

13300   ! ================================================== !               &
        !                                                    !               &
        !         T R A P   I L L E G A L   F I L E          !               &
        !               O P E R A T I O N S                  !               &
        ! ERR=                                              !               &
        !                                                    !               &
        ! 2% => It was an illegal file tell the name of it... !             &
        ! 5% => Can't find that file try again.              !               &
        ! 148%=> Recordsize mismatch on file open.           !               &
        !        cannot do the IFL into new file (if requested) !           &
        !                                                    !               &
        ! ================================================== !               &
        IF      ( ERR = 2% AND ERL = 1700% )                                &
        THEN    PRINT  #kb%,    "?Illegal file name";                       &
\               PRINT  #kb%,    wrkfil$                                     &
\                                       RESUME 1300                         &

13400   IF      ( ERR = 5% AND ERL = 2000 )                                 &
        THEN    PRINT  #kb%,    ERT$( ERR )                                 &
\               CLOSE #2%                                                   &
\               PRINT  #kb%,    "Try again "                                &
\               RESUME 1300                                                 &

13500   IF      ( ERR = 5% AND ERL = 2100 )                                 &
        THEN    RESUME 2200                                                 &

13600   IF      ( ERR = 148% AND ERL = 12200% )                             &
        THEN    rec.size.mis.match% = true%                                 &
\               PRINT #kb%, HT + "The recordsize of the file ";wrkfil$;     &
\               PRINT #kb%, HT +                                            &
                        "Does not match the size you requested (";          &
\               PRINT #kb%, maxrec%;                                        &
\               PRINT #kb%, " for the new file "                            &
\               PRINT #kb%, HT +                                            &
```



```
                    " Can not perform an IFL to the new file "      &
\               PRINT #kb%, cr1.lf$ + HT + "Continuing to define file" &
\               RESUME 12300                                        &

13700   ! ================================================== !      &
        ! ################################################## !      &
        !                                                    !      &
        !           M I S T A K E S   I N   T H E            !      &
        !             K E Y S   T R A P P I N G              !      &
        !                                                    !      &
        !          Division by zero used to get here         !      &
        !                                                    !      &
        ! ################################################## !      &
        ! ================================================== !      &
        IF      ( ERR = 61% AND ( ERL = 7400 or ERL = 7600) )       &
        THEN    PRINT  #kb%," Please Check the length of your" +    &
                       " primary key and try again later"           &
\                      RESUME 32760                                 &
                                                                    &

13800   IF      ( ERR = 61% AND ERL = 7700 )                        &
        then    INPUT  #kb%, "Do you wish to continue <YES> "; yn$  &
\                      yn$ = "Y"              IF yn$ = nl$         &
\                      yn$ = CVT$$( LEFT$( yn$, 1% ), -1% )        &
                                                                    &
\               IF      INSTR( 1, yn$ ,"YN" ) = 0%                  &
                THEN    PRINT  #kb%,"Please answer Yes or No "      &
\                              GOTO 13800                           &
                ELSE                                                &
                        IF      ASCII( yn$ ) = 89%                  &
                        THEN    RESUME  7400                        &
                        ELSE    RESUME 32760                        &

13900   IF      ( ERR = 61% AND  ERL = 7800 )                       &
        THEN    INPUT  #kb%, "Do you wish to continue <YES> "; yn$  &
\                      yn$ = "YES"            IF yn$ = nl$         &
\                      yn$ = CVT$$( yn$, -1% )                     &
                                                                    &
\               IF      INSTR( 1, yn$ ,"YN" ) = 0%                  &
                THEN    PRINT  #kb%,    "Please answer Yes or No "  &
\                       GOTO 13900                                  &

14000   IF      ( ERR = 61% AND  ERL = 7800 )                       &
        THEN            IF      ASCII( yn$ ) = 89%                  &
                        THEN    RESUME 7400                         &
                        ELSE    RESUME 32760                        &

14100   IF      ( ERR = 61% AND ERL = 8100 )                        &
        THEN    PRINT  #kb%, "Please check your key and try again later"&
\               RESUME 32760                                        &

14200   IF      (ERR)                                               &
        THEN    PRINT                                               &
                RIGHT ( SYS(CHR$(6%)+CHR$(9%)+CHR$(ERR)),3%);       &
                " At Line ";ERL; "in "; ERN$                        &
\               RESUME  32760                                       &

32760   ! ################################################## !      &
        ! ================================================== !      &
        !                                                    !      &
        ! c l o s e   u p   s h o p   a n d   w e r e   d o n e !   &
        !           ( t h e   f a s t   w a y )              !      &
        !                                                    !      &
        ! ################################################## !      &
        ! ================================================== !      &
        CLOSE 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, 11%, 12%     &
\       PRINT                                                       &
\       PRINT "RMSBLD - " + SPACE$(5%) + TIME$(0%)                  &

32767   END                                                         &
```

```
RMSBLD - Version 7.0-B          Run at 15:35        06-Jul-82

Previous work file                N
Previous file or new name         EXAMPL
Number of records in file          30000
Duration of File                  PER
Record Format                     FIX
Record Format Overhead( Bytes )    7
Recordsize                         400



Data type of Primary key          STR
Last byte of Primary Key           84
Placement of key                  ( 16 , 56 , 70 , 82 )
Lengths of segments               ( 1 , 4 , 7 , 1 )
Name of key                       PATIENT.ID
Duplicates allowed                NO

Activity Overhead Table
-----------------------

For a bucket size of  1  The activity overhead (bytes)  102

For a bucket size of  2  The activity overhead (bytes)  204

For a bucket size of  3  The activity overhead (bytes)  307

For a bucket size of  4  The activity overhead (bytes)  409

For a bucket size of  5  The activity overhead (bytes)  512

For a bucket size of  6  The activity overhead (bytes)  614
```

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CIRCLE D20 ON READER CARD

INTEGER AND FLOATING-POINT NUMBERS IN BASIC PLUS

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

Presented to the Carolinas' Local Users Group, 18 June 1982. Copyright © 1982 by Erskine College, Due West, SC

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

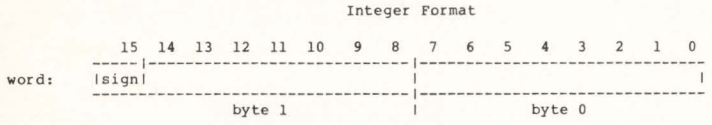
Here is a table showing four ways the eight different codes available in a three-bit binary number can be used to represent integers. Three of these encoding schemes allow for negative as well as positive values.

Unsigned		2's-complement		Sign-magnitude		Excess-4	
7	111	3	011	3	011	3	111
6	110	2	010	2	010	2	110
5	101	1	001	1	001	1	101
4	100	0	000	0	000	0	100
3	011	-1	111	-0	100	-1	011
2	010	-2	110	-1	101	-2	010
1	001	-3	101	-2	110	-3	001
0	000	-4	100	-3	111	-4	000

The 2's-complement method has the advantage in 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 I%, 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.

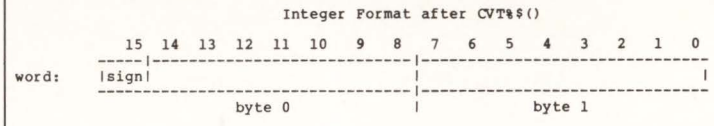


Examples showing the bit patterns of some integers:

0000000000000000	0	0111111111111111	32767
0000000000000001	1	1000000000000000	-32768
1111111111111111	-1	1000000000000001	-32767

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%$( ).




```
CVT%$() examples ("=>" = "yields"):
CVT%$(0%) => CHR$(0%) + CHR$(0%)      CVT%$(+32767%) => CHR$(127%) + CHR$(255%)
CVT%$(1%) => CHR$(0%) + CHR$(1%)      CVT%$(-32768%) => CHR$(128%) + CHR$(0%)
CVT%$(2%) => CHR$(0%) + CHR$(2%)      CVT%$(-1%)     => CHR$(255%) + CHR$(255%)
```

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, 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:

2's-complement		Excess-4	
3	011	3 XOR -4	111
2	010	2 XOR -4	110
1	001	1 XOR -4	101
0	000	0 XOR -4	100
-1	111	-1 XOR -4	011
-2	110	-2 XOR -4	010
-3	101	-3 XOR -4	001
-4	100	-4 XOR -4	000

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%.

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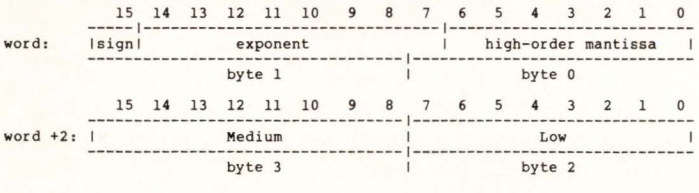
CIRCLE D66 ON READER CARD

4.0 Floating-Point Numbers

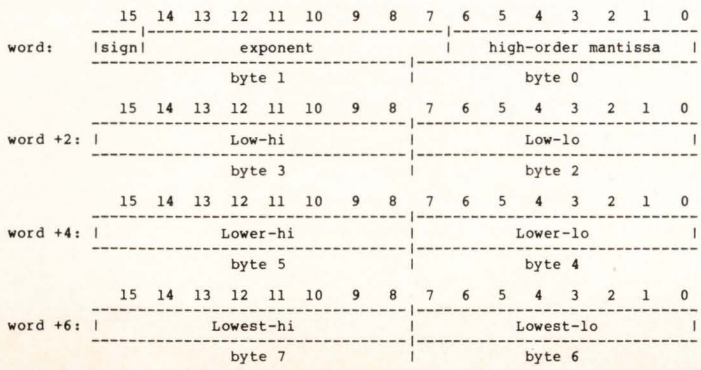
BASIC PLUS on a RSTS system can be created with either a single-precision two-word floating-point package or with a double-precision four-word floating-point package. The single-precision values provide approximately seven decimal digits of accuracy.

Two-Word Floating-Point Format



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

Four-Word Floating-Point Format



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.

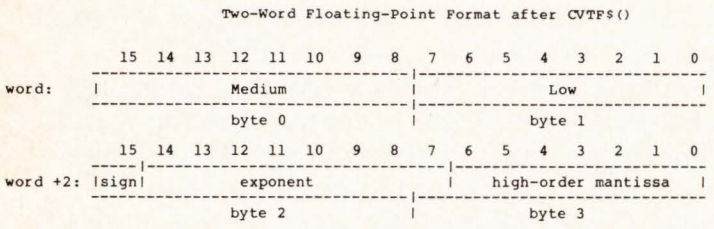
Consider the following numbers ("B xxx" means "2 to the xxx"):

Value	After normalization	With hidden bit
0.000101 B 000	0.101000 B -011	0.01000 B -011
0.010011 B 000	0.100110 B -001	0.00110 B -001
0.000011 B 000	0.110000 B -100	0.10000 B -100
1.010000 B 000	0.101000 B +001	0.01000 B +001
11.000000 B 000	0.110000 B +010	0.10000 B +010
64 (decimal)	0.100000 B +111	0.00000 B +111
	|↑	
	bit that can be hidden	

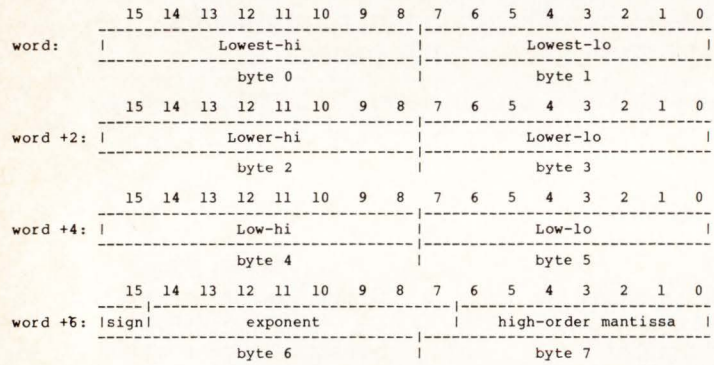
4.2 CVTF$() function

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

Two-Word Floating-Point Format after CVTF$()



Four-Word Floating-Point Format after CVTF$()



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.WORD$, . . .
PAD$ = STRING$(4%, 0%)                      ! 4 null characters
FOUR.WORD = CVT$F( PAD$ + TWO.WORD$ )       ! 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.WORD$, . . .
TWO.WORD = CVT$F( RIGHT(FOUR.WORD$, 5%) ) ! make 4 bytes out of 8
```

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

4.4 Some examples

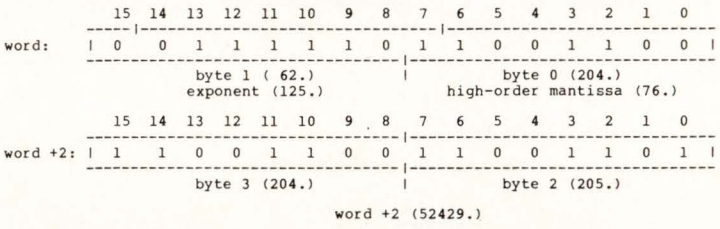
Consider the following program:

```
OLD FPN

Ready

LIST
FPN     09:00 AM        20-May-82
1000    EXTEND
!
!       Construct some two-word floating-point numbers
!
!       20-May-82       F. Mitchell     Erskine College

1010    BIT.15% = 2% ^ 15%
\       BIT.7%  = 2% ^  7%

1020    PRINT
\       PRINT "Sign", "Exponent", "High-order", "Low-order", "Resulting FPN"

1030    READ SIGN%, EXPONENT%, HIGH.ORDER%, LOW.ORDER
\       GOTO 32767 IF SIGN% < 0%

1040    WORD1% = (SIGN% * BIT.15%) + (EXPONENT% * BIT.7%) + HIGH.ORDER%
\       IF LOW.ORDER > 32767.
           THEN
                WORD2% = LOW.ORDER - 65536.
           ELSE
                WORD2% = LOW.ORDER

1050    FPN = CVT$F( CVT%$(WORD2%) + CVT%$(WORD1%) )

1060    PRINT
\       PRINT SIGN%, EXPONENT%, HIGH.ORDER%, LOW.ORDER, FPN
\       GOTO 1030

2000    DATA 0, 255, 127, 65535,        1, 255, 127, 65535
2010    DATA 0,   0, 127, 65535,        0,   0,   1,     0
2020    DATA 0,   0,   0,     0,        0, 128,   0,     0
2030    DATA 0, 129,   0,     0,        0, 129,  64,     0
2040    DATA 0, 130,   0,     0,        0, 130,  32,     0
2050    DATA 0, 130,  64,     0,        0, 130,  96,     0
2060    DATA 0, 125,  76, 52429

2999    DATA -1, -1,  -1,    -1

32767   END

Ready

RUNNH

     Sign          Exponent        High-order      Low-order       Resulting FPN

      0             255             127             65535           .170141E 39
      1             255             127             65535           -.170141E 39
      0             0               127             65535           .293874E-38
      0             0               1               0               .148085E-38
      0             0               0               0               0
      0             128             0               0               .5
      0             129             0               0               1
      0             129             64              0               1.5
      0             130             0               0               2
      0             130             32              0               2.5
      0             130             64              0               3
      0             130             96              0               3.5
      0             125             76              52429           .1

Ready
```

The above program run shows that floating-point numbers have values from -.170141E 39 to -.148085E-38, 0, and +.148085E-38 to +.170141E 39. Four-word floating-point values have virtually the same ranges as two-word floating-point numbers.

Take a closer look at one-tenth:

One-tenth



Floating-point values are stored in a rounded off form. The last bit of one-tenth is a 1 because of this rounding.

The following program shows how the repeating binary fraction one-tenth is formed:

```
OLD 1TENTH

Ready

LIST
1TENTH  09:05 AM        20-May-82
1000    EXTEND
!
!       Sum up binary fractions for 1/10
!
!       20-May-82       F. Mitchell     Erskine College

1010    TOTAL = 0.
\       PRINT

1020    READ POWER
\       GOTO 32767 IF POWER < 0.
\       PRINT USING "#.####### + 1/( 2 ^ ##) = ", TOTAL, POWER;
\       TOTAL = TOTAL + 1./(2. ^ POWER)
\       PRINT USING "#.#######", TOTAL
\       GOTO 1020

2000    DATA 4,5, 8,9, 12,13, 16,17, 20,21, 24,25, 27, -1

32767   END
```

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```
Ready

RUNNH

0.0000000 + 1/( 2 ^  4) = 0.0625000
0.0625000 + 1/( 2 ^  5) = 0.0937500
0.0937500 + 1/( 2 ^  8) = 0.0976563
0.0976563 + 1/( 2 ^  9) = 0.0996094
0.0996094 + 1/( 2 ^ 12) = 0.0998535
0.0998535 + 1/( 2 ^ 13) = 0.0999756
0.0999756 + 1/( 2 ^ 16) = 0.0999908
0.0999908 + 1/( 2 ^ 17) = 0.0999985
0.0999985 + 1/( 2 ^ 20) = 0.0999994
0.0999994 + 1/( 2 ^ 21) = 0.0999999
0.0999999 + 1/( 2 ^ 24) = 0.1000000
0.1000000 + 1/( 2 ^ 25) = 0.1000000
0.1000000 + 1/( 2 ^ 27) = 0.1000000

Ready
```

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
1000    EXTEND
!
!       Single-word floating-point numbers
!
!       20-May-82       F. Mitchell     Erskine College

1010    PAD$ = STRING$(2%,0%)
\       PRINT
\       PRINT "Two-word FPN", "One-word FPN"
\       PRINT

2000    READ X
\       GOTO 32767 IF X < 0.
\       X$ = CVTF$(X)
\       PRINT X, CVT$F( PAD$ + RIGHT(X$,3%) )
\       GOTO 2000

4000    DATA 123,  1234, 12345, 123456, 0.1
4010    DATA 1023, 1024, 1025,  0.170141e39

4999    DATA -1

32767   END

Ready

RUNNH

Two-word FPN  One-word FPN

 123           123
 1234          1232
 12345         12288
 123456        123392            -Note the loss of precision!
 .1            .996094E-1
 1023          1020
 1024          1024
 1025          1024
 .170141E 39   .169477E 39

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 NZERO

Ready

LIST
NZERO   09:32 AM        20-May-82
1000    EXTEND
!
!       Negative Zero?
!
!       20-May-82       F. Mitchell     Erskine College

1010    ZERO = 0.
\       NEGATIVE.ZERO = CVT$F( STRING$(2%,0%) + CHR$(128%) + CHR$(0%) )
!       Set only the sign bit

1020    PRINT
\       PRINT "zero:"; ZERO, "negative zero:"; NEGATIVE.ZERO,
\       PRINT "negative zero * (2^128): "; NEGATIVE.ZERO * (2.^64.) * (2.^64.)
\       PRINT
\       PRINT "Zero and negative zero are ";
1030    IF ZERO = NEGATIVE.ZERO
           THEN
                PRINT "the same.  ";
           ELSE
                PRINT "different.  ";

1040    IF ZERO > NEGATIVE.ZERO
           THEN
                PRINT "Zero is greater than negative zero."
           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.

Ready
```

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$(FPN)
\       X$  = CVTF$(FPN)
\       GOTO 15010 IF FPN < 0.
\       X2% = CVT$%(RIGHT(X$,3%)) XOR BIT.15%
\       FNSORT.KEY$ = CVT%$(X2%) + LEFT(X$,2%)
\       GOTO 15020
15010   X1% = CVT$%( LEFT(X$,2%)) XOR -1%
\       X2% = CVT$%(RIGHT(X$,3%)) XOR -1%
\       FNSORT.KEY$ = CVT%$(X2%) + CVT%$(X1%)
15020 FNEND
!
!       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 CVTF$() 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 CVTF$( ) 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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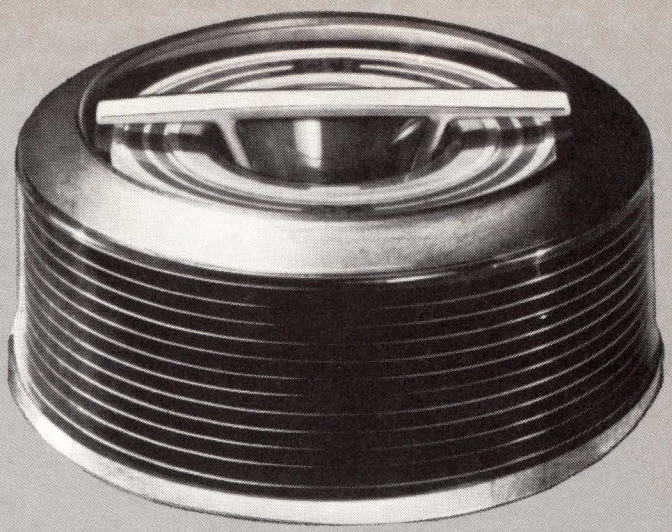

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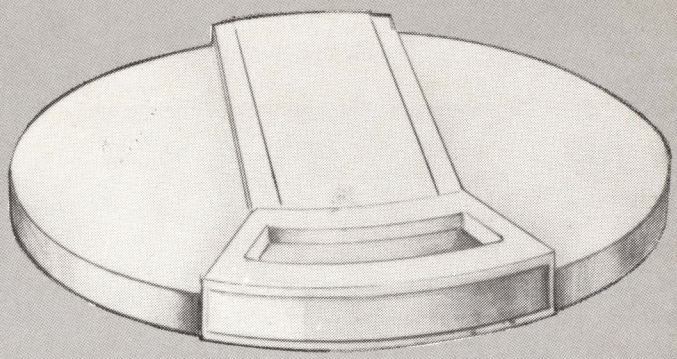
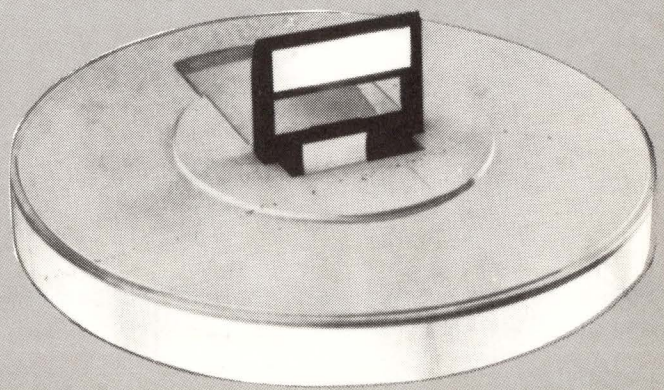
RM04, 5 Nashua 4473

RM02, 3 Nashua 4464-2



RK05 Nashua 4416-12, 4416-16



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Original 3-bit FPN	FNSORT.KEY$(FPN)
3 011	3 111
2 010	2 110
1 001	1 101
0 000	0 100
-0 100	-0 011
-1 101	-1 010
-2 110	-2 001
-3 111	-3 000

Note that the bit patterns in the FNSORT.KEY$(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-word floating-point numbers, to use "negative zero", and to have some understanding of the data produced by the following:

```
X$ = CVTF$(123.)

CHANGE X$ TO X%

PRINT X%(I%); FOR I% = 1% TO 4%

 0  0  67  246

Ready
```

APPENDIX A

Selected numbers in decimal, binary, octal, and hexadecimal.

Decimal	-----Binary-----	Octal	Hex
0	0000000000000000	000000	0000
1	0000000000000001	000001	0001
2	0000000000000010	000002	0002
3	0000000000000011	000003	0003
4	0000000000000100	000004	0004
5	0000000000000101	000005	0005
6	0000000000000110	000006	0006
7	0000000000000111	000007	0007
8	0000000000001000	000010	0008
9	0000000000001001	000011	0009
10	0000000000001010	000012	000A
16	0000000000010000	000020	0010
32	0000000000100000	000040	0020
62	0000000000111110	000076	003E
63	0000000000111111	000077	003F
64	0000000001000000	000100	0040
67	0000000001000011	000103	0043
76	0000000001001100	000114	004C
96	0000000001100000	000140	0060
125	0000000001111101	000175	007D
127	0000000001111111	000177	007F
128	0000000010000000	000200	0080
129	0000000010000001	000201	0081
130	0000000010000010	000202	0082
204	0000000011001100	000314	00CC
246	0000000011110110	000366	00F6
255	0000000011111111	000377	00FF
256	0000000100000000	000400	0100
52,429	1100110011001101	146315	CCCD
65,535	1111111111111111	177777	FFFF

APPENDIX B

Exclusive OR Truth Table

a	b	a XOR b
0	0	0
0	1	1
1	0	1
1	1	0

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CIRCLE D72 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 accordian. 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.

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    - Can print audit trail of arrivals and departures.
    - Negligible system load.

CIRCLE D49 ON READER CARD

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 preparatons. 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 facilites.

Attached is a small program intended to show the power available to DBL programmers through the use of these structured programming extensions. The "cleanness" 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.

```
                                                    DBL Compiler V2.2
INPUT  Data Division
1       SUBROUTINE INPUT
        ;
        ; Do VT100/VT52 terminal type input, allowing escape sequences, ^W,
        ; and <bckspc> as terminators.
        ;
        ; ** Arguments **
2               ROW     ,D      ;Row at which the input field begins
                                ; on the screen
3               COL     ,D      ;Column at which the field begins
4               INPBUF  ,A      ;The field to input to.
                                ; The maximum size is implied
                                ;  by the size of the passed field.
```


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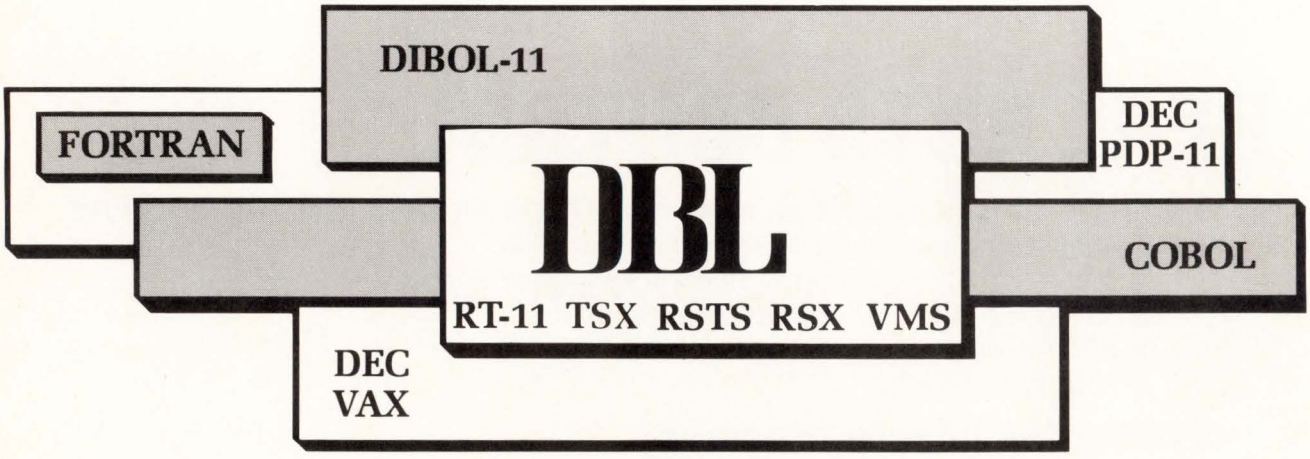

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```
 5              TYPE    ,A      ;The type of input that is to occur:
                                ;  "A" - Alphanumeric, upper case only
                                ; "AU" - Same as "A"
                                ; "AL" - Alphanumeric, lower case allowed
                                ;  "#" - Numeric, positive only
                                ; "#+" - Same as "#"
                                ; "#-" - Numeric, negative allowed
 6              INPSIZ  ,D      ;Returned with the number of characters
                                ; that were entered
 7              INPCTL  ,D      ;Returned status of the input:
                                ;  0 => Normal input
                                ;  1 => ^W typed
                                ;  2 => <bckspc> typed
                                ;  3 => ESC sequence typed

       ; ** Global Storage **

 8      COMMON
 9              TCHNL   ,D2     ;The input terminal's channel number
10              TTYPE   ,D1     ;Input terminal's type:
                                ;  0 => VT52 (or VT100 in VT52 mode)
                                ;  1 => VT100 in ANSI mode
11              INPVL   ,D18    ;If a numeric type input, the value of the
                                ;  input string entered
12              ESCNM   ,D1     ;If an escape sequence typed, the number of
                                ;  characters in the escape sequence
13              ESCSQ   ,A2     ;The escape sequence proper

       ; ** Local Storage **

14      RECORD
15              ITYPE   ,A2
16               ITYPE1  ,A1 @ITYPE
17               ITYPE2  ,A1 @ITYPE+1
18              POS100  ,A*  ,'[xx;yyyH'
19               DROW    ,D2 @POS100+1
20               DCOL    ,D3 @DROW+3
21              ROW52   ,D2
22              COL52   ,D3
23              FLGS    ,D8
24              I       ,D3

INPUT   Procedure Division

25  1   PROC
26               ITYPE = TYPE                   ;Save off the request type
27               XCALL FLAGS(FLGS,2)            ;And current flag settings
28               IF (TTYPE) THEN                ;Set appr position values
    2             BEGIN
29                DROW = ROW
30                DCOL = COL
    2             END
                 ELSE
    2             BEGIN
31                ROW52 = ROW+31
32                COL52 = COL+31
    2             END
33               XCALL PAINT('.')               ;Set the paint character
34               XCALL ACESC(8,13,23,27)        ;Define <bckspc>, <cr>,
                                                ; ^W, and <esc>
                                                ;  as activations characters
35               IF ITYPE1.EQ.'A' THEN          ;Set appr UC/LC state
                   IF ITYPE2.EQ.'L'
                     THEN XCALL FLAGS(10,1)
                     ELSE XCALL FLAGS(10,0)
                                                ;"dots" over i/p field
36      DOINP,   CALL POSTN
37               FOR I=1 STEP 1 UNTIL $LEN(INPBUF) DO INPBUF(I:1)='.'
38               DISPLAY (TCHNL,INPBUF)
                                                ;Do the actual input
39               CALL POSTN
40               IF $TRUE THEN READS(TCHNL,INPBUF) [EOF=INPEOF]
                 ELSE
    2             BEGIN
41      INPEOF,    XCALL MESAG(2,'Invalid input')
42                 GOTO DOINP
    2             END
43               INPSIZ = $RDLEN                ;Return size of the input

44               CASE $RDTRM OF                 ; type of terminator
    2             BEGINCASE
45                23:     INPCTL = 1            ; => ^W
46                 8:     INPCTL = 2            ; => backspace
    3           27:      BEGIN                 ; => escape
47                         INPCTL = 3
48                         XCALL FLAGS(10000,1)  ;Turn off echo,get rest of
49                         ESCNM = 1             ;  the escape sequence
50                         ACCEPT(TCHNL,ESCSQ)
51                         IF (ESCSQ.EQ.'?'.OR.ESCSQ.EQ.'O'.OR.ESCSQ.EQ.'[') THEN
    4                      BEGIN
52                           INCR ESCNM
53                           ACCEPT(TCHNL,ESCSQ(2:1))
    4                      END
54                         XCALL FLAGS(10000,0)  ;Restore echo
    3                    END
    2             ENDCASE
55                 ELSE INPCTL =                ; not ^W, <bkcspc> or <esc>

56               IF (ITYPE.EQ.'#') THEN         ;If numeric needed, vldate
    2             BEGIN
57                 ONERROR BADVAL
58                 IF $TRUE THEN
                    INPVL = INPBUF
                   ELSE
    3               BEGIN
59      BADVAL,      OFFERROR
60                   XCALL MESAG(2,'Invalid numeric value')
61                   GOTO DOINP
    3               END
62                 OFFERROR
63                 IF (ITYPE2.NE.'-') THEN
                    IF (INPVL.LT.0) THEN
    3                BEGIN
64                    XCALL MESAG(2,'Negative value not allowed')
65                    GOTO DOINP
    3                END
    2             END

66               XCALL DAESC(8,13,23,27)        ;Release activ characters
67               XCALL FLAGS(FLGS)              ;Restore the flags
68               RETURN                         ;Return to caller

69      POSTN,   IF (TTYPE) DISPLAY(TCHNL,27,POS100)
                   ELSE DISPLAY(TCHNL,27,89,ROW52,COL52)
70  1            RETURN

Errors:     0
Symbols:    21,  Literals:    24,  Labels:      5

,INPUT=INPUT
```


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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 conneced. 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 communcations 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 vise 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

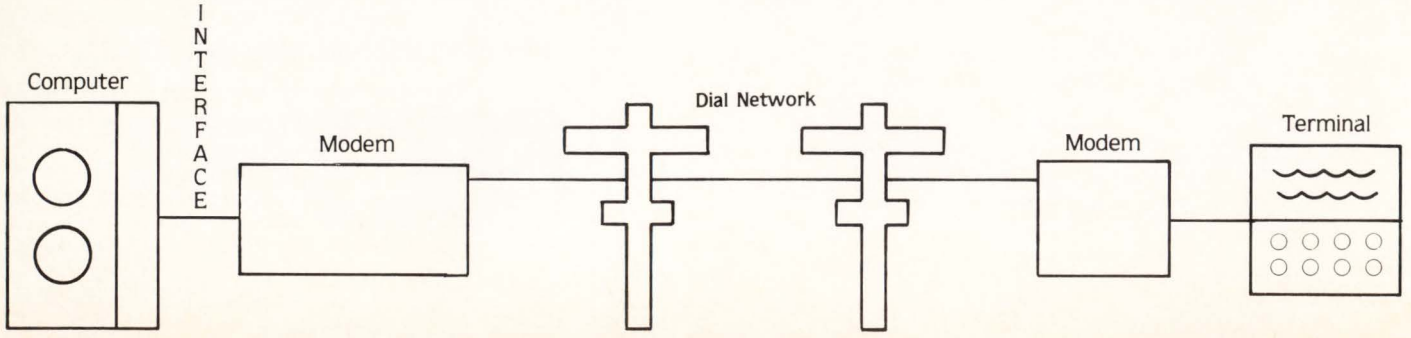

FIGURE A.

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

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.

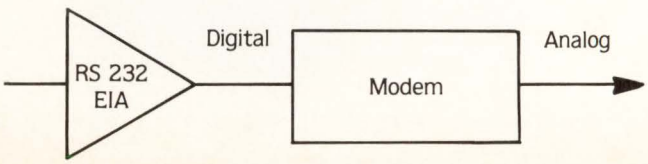

FIGURE C.

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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.

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).

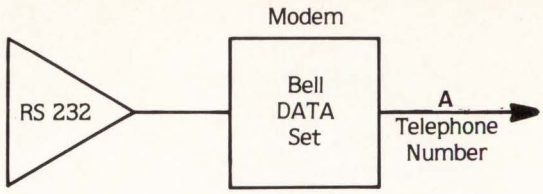


FIGURE D.

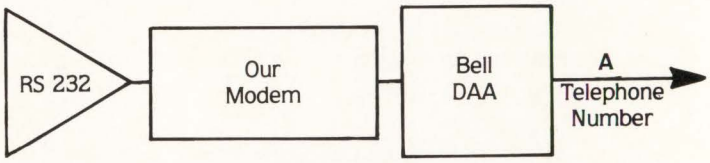


FIGURE E.

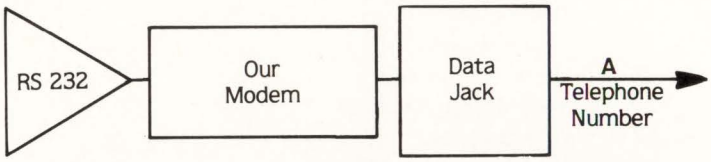


FIGURE F.

THE MODEM AND "PHONE LINE."

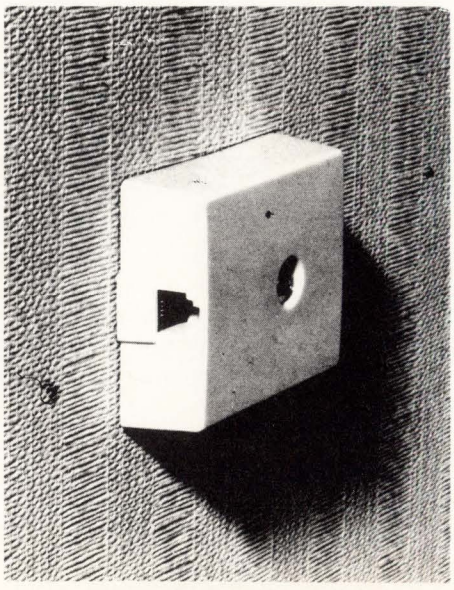
Local

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:

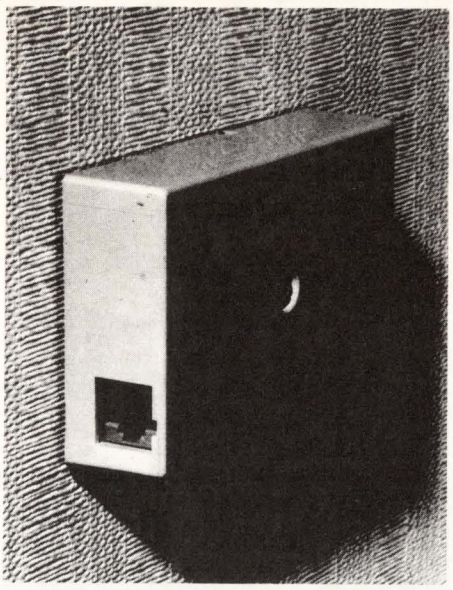
1. Is the telephone company to provide the modem (they call it a data set)? If the answer to this question is in the affirmative, all that is necessary is to ask the phone company to install the data set and specify the options. With the data set will be an RS232 connector which can be connected directly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

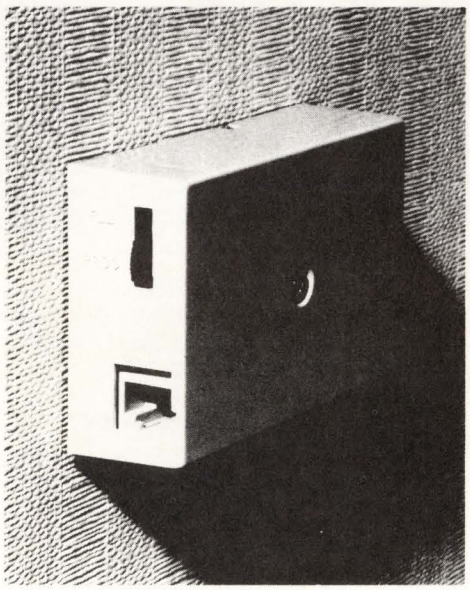
3. Your modem may be one of the newer type, which has been registered by the FCC and, therefore, can be attached directly to the switched network via the proper data jack. See Figure F. Here, modems will have a Universal Service Operating Code (USOC) number and Ringer Equivalent. They will also specify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



Permissive Data Jack
USOC RJ11C



Programmed Data Jack
USOC RJ45S (single line) and
USOC RJ45M (groups of eight lines)



Universal Data Jack
USOC RJ41S

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 compter 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 requre 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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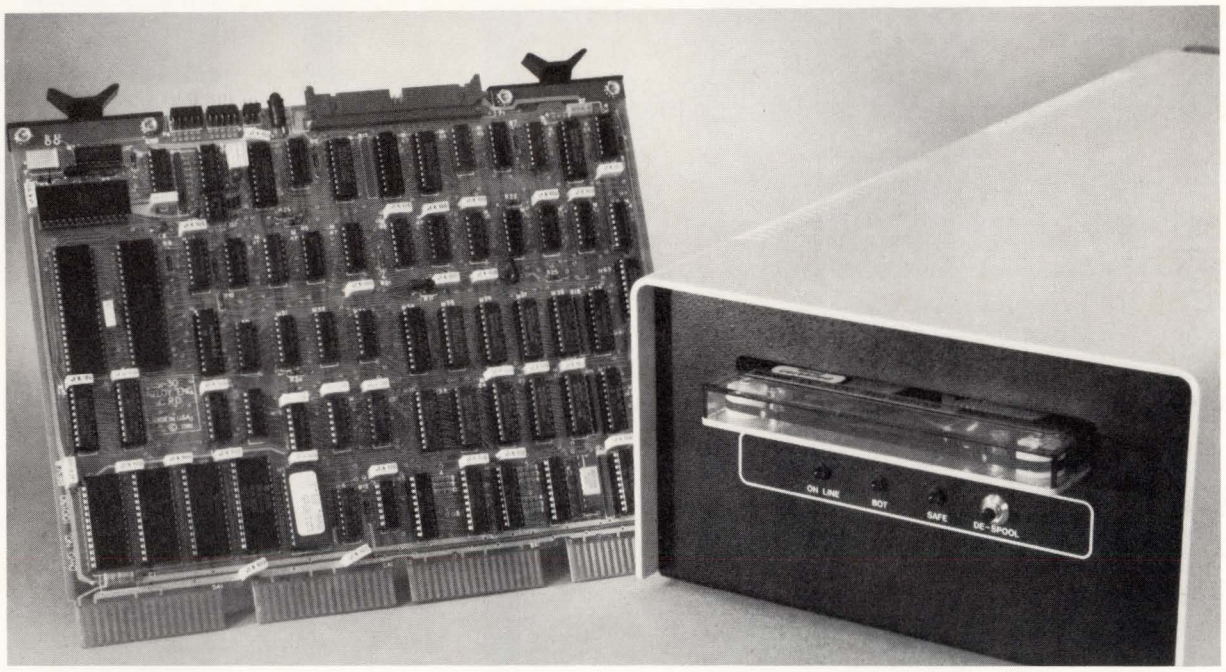

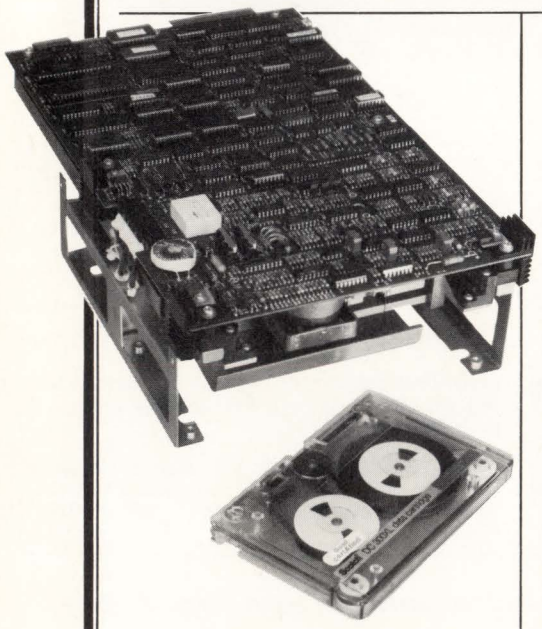

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Off-line de-spooling, too

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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The complete integrated subsystem, with controller, power supply, cabinet and tape drive is available from Alloy. For more information, write or call Nigel Spicer, Alloy Engineering Co., Inc., 12 Mercer Rd., Natick, MA 01760. (617) 655-3900. TWX: 710-346-0394.

For information on OEM volume quantities of the DEI streaming drive alone, contact Data Electronics Inc., 10150 Sorrento Valley Rd., San Diego, CA 92121. (714) 452-7840. Telex 69-7118.

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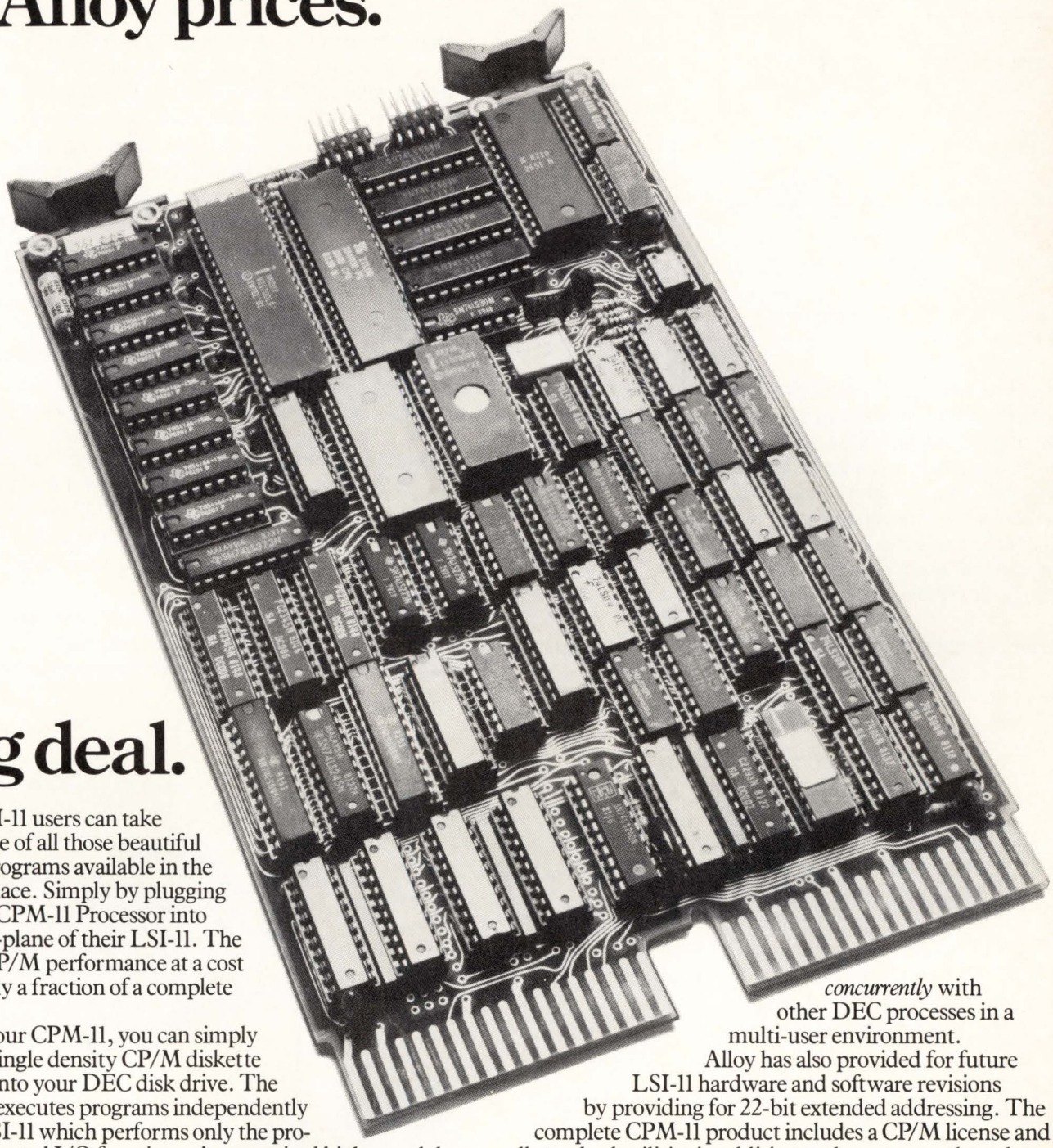

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With our CPM-11, you can simply insert a single density CP/M diskette directly into your DEC disk drive. The CPM-11 executes programs independently of the LSI-11 which performs only the program-directed I/O functions. Any required high-speed data transfer is effected by a DMA interface through the LSI-11. And you have a choice of multiplexed or dedicated operation through the CPM-11 Processor's auxiliary RS232C serial terminal port.

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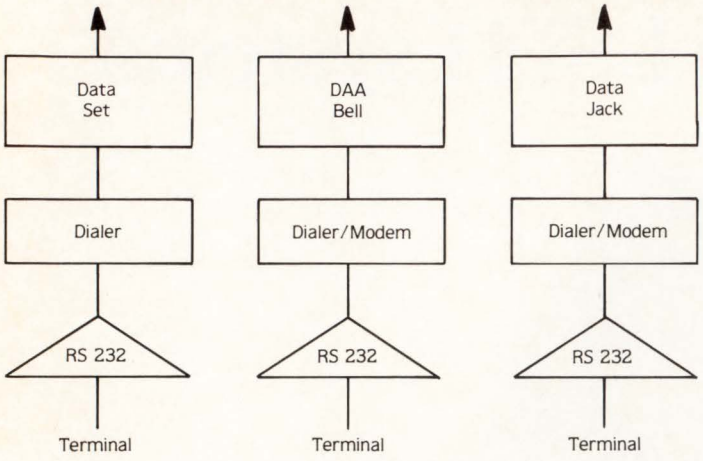
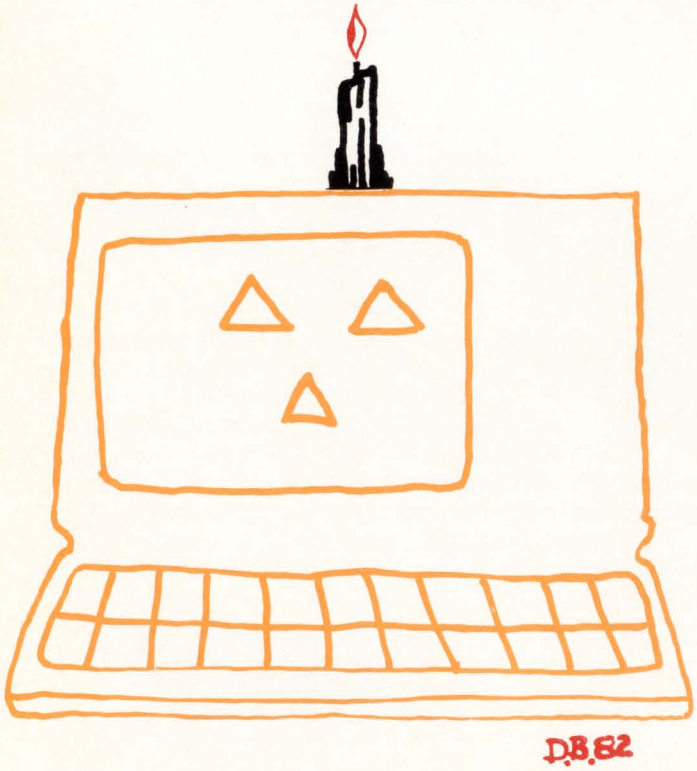


FIGURE G.

If you wish your installation to be portable, this can be accomplished by an accoustic coupler or modem. The accoustically coupled modem allows you to take the hand set 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 hand set. This hook-up 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.



DATA TRANSMISSION.

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 accoustically 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 accoustically 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 datajacks 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.

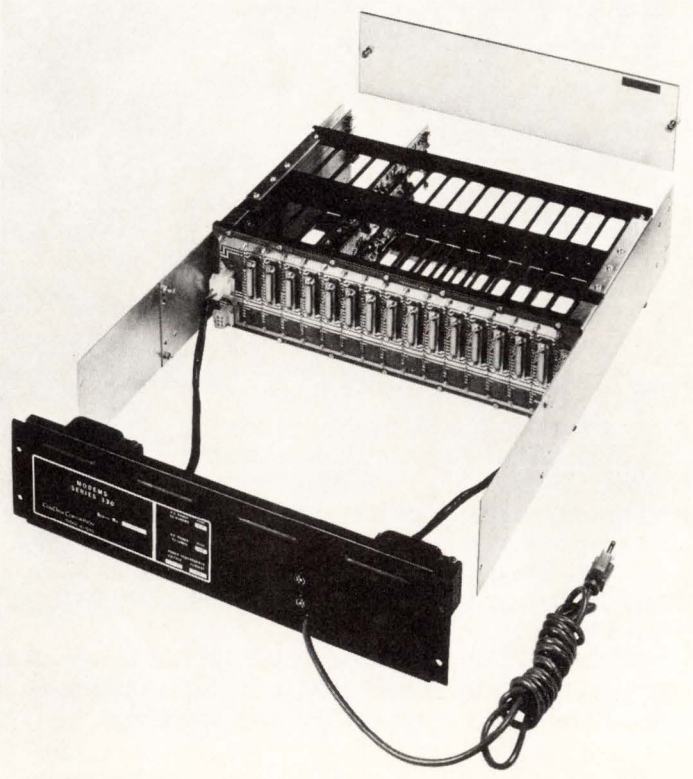
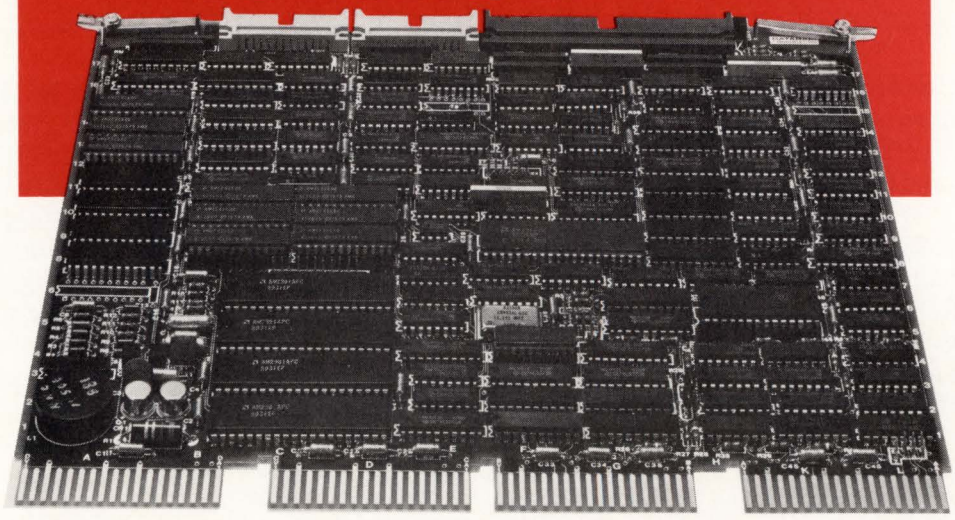


FIGURE H.

DEC®-COMPATIBLE PERIPHERAL CONTROLLERS



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CONTROLLER	DESCRIPTION	COMPATIBILITY
C03	Cartridge disk controller	RK05
C33	Cartridge disk controller	RK05
T03	NRZI mag tape controller	TM11/TU10
T04/C	Mag tape streamer coupler	TM11/TU10
T04/N	NRZI mag tape controller	TM11/TU10
T04/D	Dual density mag tape controller	TM11/TU10
T34/C	Mag tape streamer coupler	TM11/TU10
T34/N	NRZI mag tape controller	TM11/TU10
T34/D	Dual density mag tape controller	TM11/TU10
T36	Dual density mag tape controller	TM11/TU10
T34/T	GCR mag tape controller	TM11/TU10
S03/A, S04/A	80 MB/300 MB SMD controller	RM02/RM05
S03/A1, S04/A1	80 MB/160 MB SMD controller	RM02
S03/B	80 MB/300 MB SMD controller	RK07
S03/C	200 MB/300 MB SMD controller	RP06
S03/D, S04/D	96 MB CMD controller	RK06
S33/A	80 MB/300 MB SMD controller	RM02/RM05
S33/A1	80 MB/160 MB SMD controller	RM02
S33/B	80 MB/300 MB SMD controller	RK07
S33/C	200 MB/300 MB SMD controller	RP06
S33/D	96 MB CMD controller	RK06

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CIRCLE D45 ON READER CARD

INTERFACING NON-DEC PERIPHERALS TO RSX-11M SYSTEMS: TRADE-OFF DECISIONS

By James A. McGlinchey, RA Enterprises, Post Office Box 1595, North Wales, PA 19454

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, whirrs, 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 is 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 tsk, 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.

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

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ONE DATA BASE MANAGEMENT SYSTEM FROM ENGLAND

By Jeremy Lowden, TUBS LTD.

1. Why Data Base Management System (DBMS)

The need for Data Base Management Systems is widely accepted by the computer fraternity as the way all application software must go. It has been available on the larger mainframe computers for some years, but has not been readily available at the lower end of the mini computer range. One such system is about to be introduced for the larger micros. The older Data Base Management Systems tended to be cumbersome, with a Data Analysis design requirement of having to look at the whole of the company's data processing needs before being able to start on the first application. Even now Data Analysis tends to be a major exercise.

Only one or two of the more recent systems, CUPID (TUBS Data Base Management System) included, are available on mini computers. Because CUPID is a 'relational' database a lengthy Data Analysis is unnecessary.

An Application Management System, application software built around a data base management system, has inbuilt flexibility; it offers the user application systems that will meet his needs, will cater to user changes and be able to grow as the company grows without incurring the problems associated with traditionally developed software and software packages. The need to rewrite conventional application software often becomes apparent soon after it is implemented, and is put off as long as possible because it is time consuming, expensive and un-productive; there are other more pressing needs. Inevitably users suffer inadequate systems, poor performance and long delays, until eventually they look for alternative solutions.

Application Management Systems can be developed and installed very quickly, if only in part, enabling a user to gain early experience and early benefits. Additional applications, or developments to the existing application, can be implemented without changing the current system. Application rewrites are rarely neccessary; software lasts much longer. Therefore money spent on application software is a much better investment. Add the fact that with CUPID a user can easily produce his own ad-hoc enquiries and reports as well as develop his own system, and the money spent on Application Management Systems becomes an even better investment.

The better Application Management Systems allow for hardware upgrades to bigger computer systems, without changes to the application software. The user is not affected. Growth is assured.

These are some of the reasons why flexibility in software is so important.

2. DBMS Considerations

To appreciate Data Base Management we first need to look at the development of computer applications.

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 futher 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 duplicaton 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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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 implemetation 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.

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Brings Together DEC's New Professional 350 with Powerful Financial Planning Tool

By Bruce T. Powell, Director of Marketing,
Ross Systems, Palo Alto, CA

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

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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 subsystem 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, modelling 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.

BIOGRAPHICAL 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.

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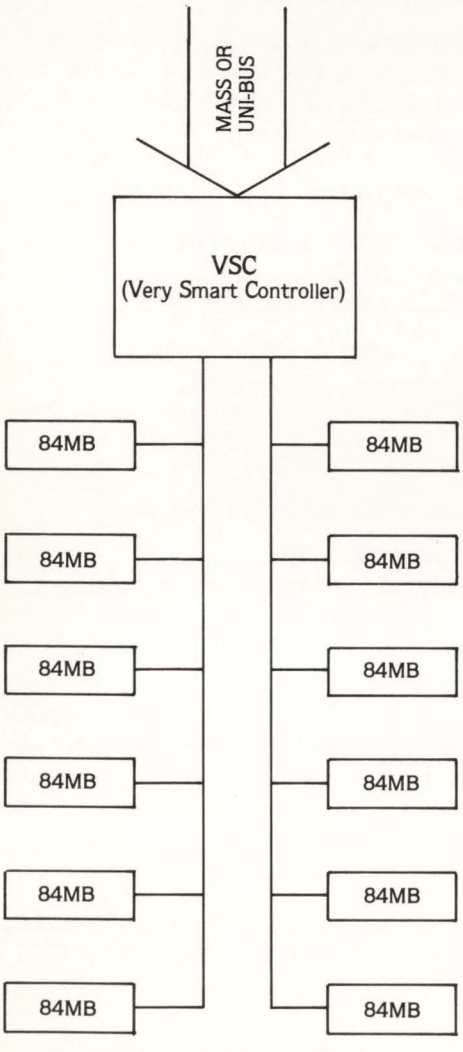
FROM THE EDITORS

. . . 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 boundedness 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.

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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 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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1123-AA	(new)	MK11-BE	(used)	RK07-PA	(new)	RM03-AA	(used)	DD11-CK	(used & new)
1134A-XE	(used)	MK11-CE	(new)	RK711-PA	(new)	RM03-BA	(used)	DD11-DK	(used)
1145	(used)	MS11-LB	(used & new)	RL01-AK	(used)	RP05-AA	(used)	DR11-B	(new)
1170	(used)	MS11-MB	(new)	RL11-AK	(used)	RX211-BA	(used)	DV11	(new)
								DZ11-A	(used)
								H960	(used)
								KE44-A	(new)
								KY11-LB	(new)
								M9301-YB	(new)

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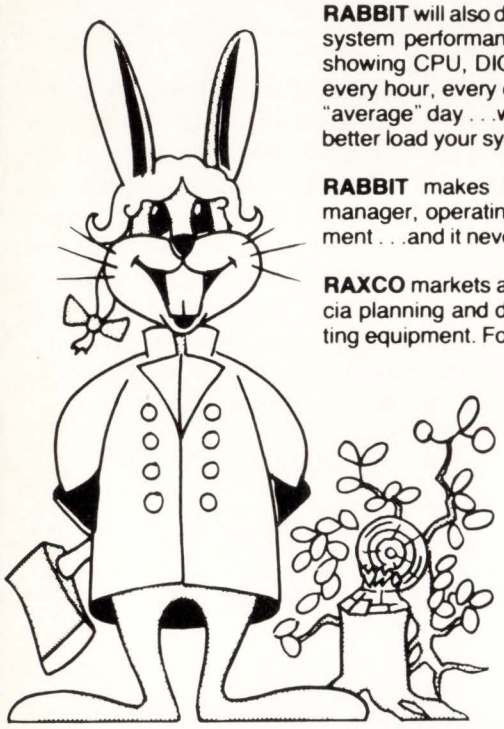

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LETTERS TO THE DEC PRO . . .

. . . 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 indispensible 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

PROFESSIONAL etc

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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educational timely Communications

NOTES
MEETINGS
NEWS RELEASES
NEW PRODUCT INFORMATION

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

DEXPO WEST 82 — SPACE ALLOTMENTS

BOOTH NO.	COMPANY
622	ACC
427	ADAC
302	ABLE COMPUTER
119	ADVANCED COMPUTER SYSTEMS
205	ADVANCED DATA MANAGEMENT
706	ADVANCED ELECTRONICS DESIGN
605	AMCOR
202	AMERICAN COMPUTER GROUP
428	AMPEX CORPORATION
418	ANADEX
103	ANDROMEDA SYSTEMS
601	APPLIED INFORMATION SYSTEMS
229-231	AVIV
625	BATTELLE
712	BRAEGEN MPD
405	BRITTON-LEE
632	BUSOLOGY
232	CAMBEX CORPORATION
425	CARE INFORMATION SYSTEMS
126	CHARLES RIVER DATA
517	CLYDE DIGITAL
422	COMDESIGN
312	COMPUMART
306	COMPUSHARE
327	COMPU-TOME, INC.
620	COMPUTER & TERMINAL EXCHANGE
111	COMPUTER HOTLINE
228	COMPUTER INTELLIGENCE CORP.
2007	COMPUTER MARKETING ASSOCIATES
412	COMPUTER PARTS EXCHANGE
431	COMPUTER SYSTEMS CORP.
726-728	COMPUTERWORLD
426	COMPUTERS-R-DIGITAL
430	CORTEX
512	DEC PROFESSIONAL
402	DATA PROCESSING DESIGN
226	DATA SOURCES
806	DATA SYSTEMS DESIGN
905	DATAMATION
528	DATANEX, INC.
106	DATARAM CORPORATION
906	DIGITAL COMMUNICATIONS ASSOC. INC.
705	DIGITAL INFORMATION SYSTEMS CORP.
121	DIGITAL MANAGEMENT CORP.
117	DIGITAL TECHNOLOGY INC.
525-527	DISTRIBUTED LOGIC CORP.
305	EEC SYSTEMS
717	EMULEX CORPORATION
505	EVANS GRIFFITHS & HART, INC.
318	EVEREST ELECTRONIC EQUIPMENT
107	FASBE GROUP, THE
831	FINAR
221	GEJAC
731	GENERAL DIGITAL INDUSTRIES
421	GENERAL ROBOTICS
821	GLENN A. BARBER & ASSOC., INC.
612	GROUP III ELECTRONICS
802	HARDCOPY
518	HENCO, INC.
225	HINDITRON OFFSHORE SOFTWARE SVCES.
831	J.B. HOTZE & COMPANY
113	INFO GRAPHICS
526	INFORMATION PRODUCTS SYSTEMS
701	INFORMATION & SYSTEMS RESEARCH
330	INFOSPHERE, INC.
332	INTEL CORPORATION
529	INTERACTIVE INFORMATION SYSTEMS, INC.
618	INTERACTIVE MANAGEMENT SYSTEMS
602	INTERACTIVE SYSTEMS, INC.
325	INTERACTIVE TECHNOLOGY
125	INTERNATIONAL SYSTEMS, INC.
707	INTL. MATH & STAT. LIBRARIES
702	C. ITOH ELECTRONICS
227	KINETIC SYSTEMS CORPORATION
617	LINKABIT CORPORATION
326-328	MDB SYSTEMS, INC.
721	MCCORMACK & DODGE CORP.
817	MIS WEEK
130-132	MANAGEMENT INFORMATION SYS. PTY. LTD.
321	MARC SOFTWARE
725	MARWAY PRODUCTS, INC.
112	MICOM SYSTEMS, INC.
331	MIDCOM CORPORATION
101	MINITAB PROJECT
2015	MONOLITHIC SYSTEMS CORP.
109	NASHUA
432	NATIONAL INFORMATION SYSTEMS
406	NEWMAN COMPUTER EXCHANGE
123	NORTH COUNTY COMPUTER SERVICE
105	NYPLAN, INC.
902	OASYS, INC.
732	ORGANIZATIONAL & SYSTEMS SPEC.
222	OREGON SOFTWARE
218	PSI COMPUTER SERVICES
2006	P-STAT
722	PENNINGTON SYSTEMS, INC.
729	PERITEK CORP.
912	PLESSEY PERIPHERAL SYSTEMS
825	PROTEON ASSOC., INC.
217	RGTI SYSTEMS SOFTWARE
532	ROM SYSTEMS, INC.
417	RELATIONAL SOFTWARE
317	RELATIONAL TECHNOLOGY
630	RELIANCE ELECTRONIC COMPANY
631	ROSS SYSTEMS
201	S & H COMPUTER SYSTEMS
115	SPSS
502	SATURN
118	SIGNAL TECHNOLOGY, INC.
329	C.D. SMITH & ASSOC., INC.
230	SOFTOOL CORPORATION
322	SOFTWARE AG
206	SOFTWARE HOUSE
604	SOFTWARE INTERNATIONAL
626-628	SOFTWARE RESULTS
606	SYNEMATION DIVISION OF SYNEMED
522	TEKRONIX, INC.
2012	TELTONE
102	U.S. DESIGN
531	VIKING SOFTWARE SERVICES
718	VIRTUAL MICROSYSTEMS, INC.
805	WEBSTER ELECTRONICS, INC.
122	WESTERN PERIPHERALS
521	WHY SYSTEMS, INC.
506	XEROX COMPUTER SERVICES
212	XYLOGICS
621	ZATRO
608	ZIA

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 and DEXPO/EAST 83 — 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 DEXPO 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 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 08512l call (609) 799-1661.

SOFTWARE LINKS DEC COMPUTERS TO REMOTE TIME-SHARING SYSTEMS

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 TSX+ users. VT permits a virtual connection to be established between any host system terminal (including dial-in ports) 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 sytem 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 analysis and report generation. 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, NJ, (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 forebear 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-11M operating system to provide maximum programming, 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.

"The PDP-11 with RX-11M 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.

RSX CROSS-COMPILER 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 MC6800 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 MC6800. 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 minimakers, and undertaken a revolutionary revamp 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 of Winchester storage and a removeable 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 electonics consultancy. and began producing a DEC-based range of minis in 1977. The first

Webster Electronics Inc. President, Mr. David Webster (right) with his Sales and Marketing Manager, Mr. Greg Macdonald (left) showing one of the DEC-compatible Spectrum-Eleven minicomputers that they will demonstrate at DEXPO WEST 82 (Booth 805).

This is a Spectrum Model JM with a storage of 132 Megabytes, featuring 40 Megabyte streaming magnetic tape for data back-up and software interchange.

The machine has a memory of 1 Megabyte.

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, Soust East Asia and People's Republic of China. (There are four Spectrums 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, an early 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 JM 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 contentins for device and memory access, and handles dynamic memory refresh. It continuously polls all deveces for interrupt requests, and arbitrates and manages the interrupt process.

Component count, interconnection count and power dissipation are all better than halved by generalisting 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 futher information: — Webster Electornics Inc., Suite 620, 1 North Broadway, White Plains, N.Y. 10801. Mr. Paul Karchawer. Webster Electronics Inc., 333 Cobalt Way, Suite 106, Sunnyvale, CA 94086. Ms. Anna Liddell.

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CIRCLE D35 ON READER CARD

NEW VERSION OF CARE/DM SYSTEM OFFERED AT DEXPO WEST

Springfield, IL — A new version of the CARE/DM SYSTEM, a software package for medical and dental office management, will be exhibited at DEXPO 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

Lang at DEXPO West booth Number 425 or contact CARE INFORMATION SYSTEMS, 3009 South Sixth Street, Springfield, IL 62703, (217) 522-CARE.

PROSYS I MONITORING AND CONTROL SYSTEM TO BE DEMO'D AT DEXPO/WEST

PROSYS I, from ADAC, knows it's a data acquisition and control system, and a very good one at that! Visitors to **Booth 427** in Annaheim can watch several versions of up-and-running PROSYS I's demonstrate their dedicated, single-minded, easy to use data acquisition and control capabilitiers.

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 I fills the gap between expensive mainframes and conventional programmable controllers. With its very simple language PRO software package, PROSYS I 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, 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.

See PROSYS 1 at DESPO/WEST **Booth 427**, or contact: Mr. Ben Minsk, ADAC Corporation, 70 Tower Office Park, Woburn, MA 01801, Phone: (617) 935-6668, Telex: 949329.

BATTELLE — BOOTH 625

Battelle's BASIS will be on exhibit at DEXPO WEST 82 at the Anaheim Convention Center in Anaheim, California, December 7-9, 1982. Visit the BASIS Staff in **Booth 625** to discuss the use of BASIS for your applications.

The BASIS software is an on-line interactive user-oriented Data Management System with comprehensive information retrieval, manipulation, and storage capabilities.

N programming is necessary in order to construct a BASIS database. this software is a fully self-contained modular system which allows applications to be implemented quickly and easily through the use of a Data Definition Language. The flexibility of BASIS permits database design changes without the disruption or reorganization of data.

Efficient methods for the retrieval and storage of data are part of the design of the BASIS system. Fast, consistent response times for very large textual databases are accomplished through the use of inverted indexes. Support of variable length records and data elements as well as record compression for optimum storage on direct access devices are also provided.

Multiple application types involving bibliograhic, full text and numeric databases for library, litigation, scientific, manufacturing, engineering, marketing, and publishing as well as many other applications are supported by BASIS.

The BASIS features include keyword, phrase and stem searching; word proximity searching; index browsing; full thesaurus capabilities which provides term switching as well as giving both broader and narrower terms; multilingual dialog files; on-line report definition and execution; on-line creation and editing of records; the ability to save a series of commands for use in later sessions; Data Definition Prompter; computational functions; system and user monitoring; batch loading of data in three formats; field level security, and full formatted screen capabilities, to name a few.

FOR IMMEDIATE ACTION

DEXPO 82 in Atlanta secured more industry press for exhibitors than any 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 DIGICALC™ 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 than 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 were 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 transfering 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/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 Windhcester 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 reclamation 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 enviroments 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.

XYLOGICS STORAGE CELLS (BOOTH 212)

"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 dampener 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 it's 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 ZRXDBO 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 NED Information Systems, Inc.

SOFTOOL 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:

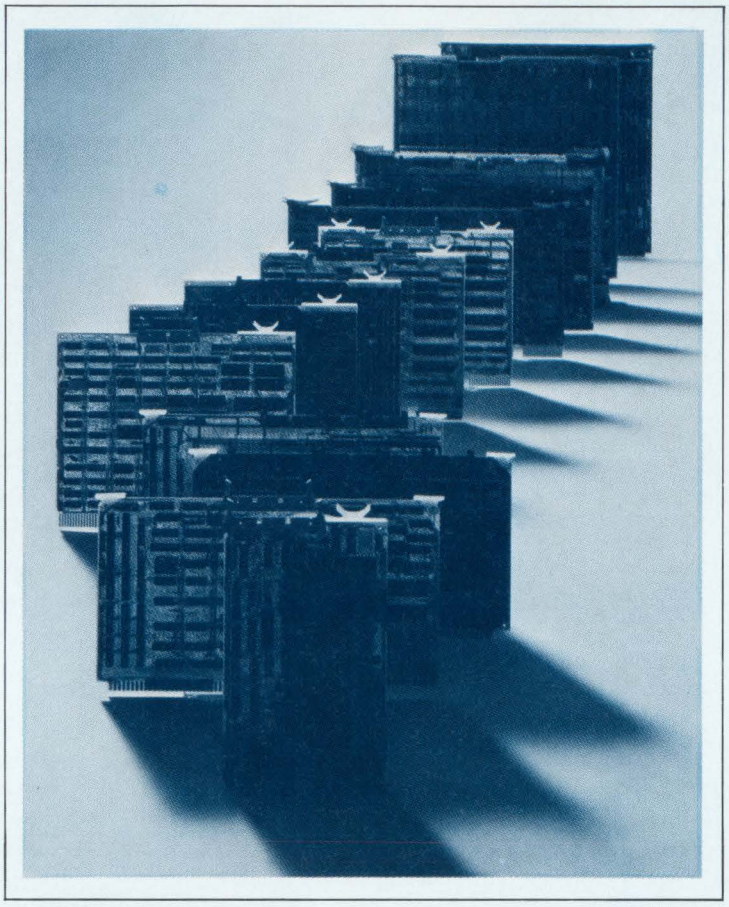
- Change and Configuration Control Environment
- Programming Environment
- Design Environment
- Requirements Environment

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.



XYLOGICS FAMILY OF PERIPHERAL PROCESSORS (BOOTH 212 at DEXPO WEST 82)

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 Winchesters and other non-removable drives. Files can be moved between any two random access devices which include such systems as R.01/02, RX01/02, RK05/06/07 and TU58 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 VERIGY in the same operation.

Also, NOREPLACE is provided in the RESTORE function which gives the user tremendous flexibility in baking 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 syntex 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 DIRECTORY function allows the user to output a full 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 toeither 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 product 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

Cupertino, CA — National Information Systems, Inc., will be showing ACCENT R and VUE and introducing PASCAL-PLUS and PRES at the Second National DEC-Compatible Exhibition, Anaheim Convention Center, Anaheim, CA, December 7-9, 1982.

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 complier 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 occuring 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.

PRES 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.

National Information Systems, Inc., is headquartered at 20370 Town Center Lane, Cupertino, California 95014.

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THE DEC PROFESSIONAL is your magazine. You can make it better by contributing articles, programs or comments directly to us. Our authors are paid honoraria for published works, which, because of their hard work, they deserve. We ask you to contribute; send us your manuscripts for possible publication (we prefer machine readable tapes or floppies in PIP, RNO, WORD-11, pr ?? format). THE DEC PROFESSIONAL, Box 362, Ambler, PA 19002, Attn: Editors. Thank you.

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PRESS RELEASES

VERSATILE CUPID—A SOLUTION TO REDUCE APPLICATION DEVELOPMENT TIMESCALES AND 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 few weeks 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 staffs' 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 data base 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 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, TSX PLUS, RSTS/E, CTS 500, RSX11/M, VAX/VMS 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 files, the record layouts and the required keys for individual and sequence reporting. Comprehensive validation checks are included.

2. Data Entry Definition: in this phase one designs the data entry screen formats, operator dialogue and data processing requirements between files.

3. Report and Maintenance Definition: in this phase one defines the report 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 applicatons 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 Load Administration
- Investments Administration
- Live Stock Market Auctioneers
- Animal History
- Expense Analysis
- Dye Recipe System
- Plant Hire System
- Wines and Spirits Wholesale Distribution and 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 applicatons to be developed by our own experienced staff, contact Avadiar Sinnappan 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 aquisition 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 calls 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, stappable 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.

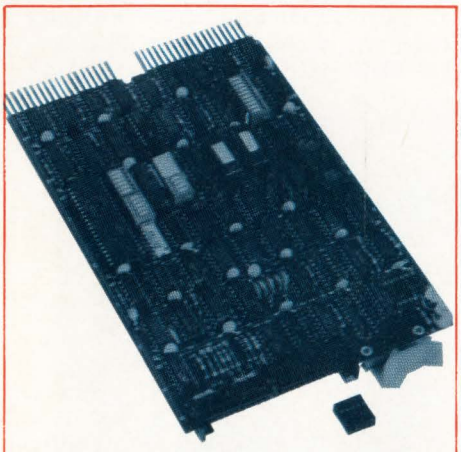
For more information, contact: Mr. Ben Minsk, ADAC Corporation, 70 Tower Office Park, Woburn, MA 01801, Phone: (617) 935-6668, Telex: 949329.

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

Orange, CA — A new asynchronous serial interface for LSI-11 computers, from MDB

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 thruput 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



MLSI-DLV11-FX, Asynchronous Serial Interface with EIA RS-232-C, 20 MA Current Loop and RS-422 Interface from MDB Systems, Inc.

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 MDB 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 MLSI-DLV11-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.

INTERNATIONAL REPS APPOINTED FOR SIGNAL PROCESSING SOFTWARE

Santa Barbara, CA — Signal Technology, Inc. (STI) has announced the appointment of marketing representatives in Japan, Sweden, Switzerland, and West Germany. The firms are: Rikei Corp. and Hakuto Corp., both of Japan; Computer Graphics AG, Switzerland; 3K Consultants, Sweden; and Team Computer Aided Engineering, West Germany. The marketing firms will represent STI's ILS (Interactive Laboratory System) software package. ILS is recognized as the world standard in interactive signal processing software.

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.

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

Irvine, CA — ABLE Computer announces ABLE Q/DH$_{tm}$, a microprogrammed asyncronous controller which makes DH-class performance possible on the PDP-11/23 and LSI-11/23 Q-Bus systems. ABLE Q/DH$_{tm}$ 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 capability 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/DH$_{tm}$ is fully software transparent to DEC established drivers for the DH11 and DM11, making modem 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 available with an EIA panel or with a line adapter/panel offering both EIA and 20ma current loop channels.

A large input silo improves the input handling capacity, thereby reducing the probability of data overrun for block mode terminals and computer-to-computer interconnects. Other features include on-board pencil switches for address and vector selection and comprehensive self-test diagnostics with LED display. Diagnostic loopback connectors are built into optional distribution panels.

Physically, ABLE Q/DH$_{tm}$ consists of a quad-width board for the first eight-line group, an optional expander board for the second eight-line group, and an optional distribution panel and cables. With the Q/DH, ABLE lets the user put sixteen lines in two quad-width slots compared to the conventional installation of four dual-width cards plus four sets of cables. Hardware is provided for future applications using 22-bit DMA addressing.

Delivery begins in October and will then be 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, memory and 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$_{tm}$ series of computer systems.

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

Pasadena, CA — CT*OS, a powerful word processing software package developed and marketed by Compu-Tome, Inc., Pasadena, California, 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, RSX-11M and VAX/VMS; thus allowing it to operate in the full range of 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.

A menu driven system, CT*0S 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 on-screen math operations, calendaring, electronic mail, communications. RT versions and TSX plus versions are currently available as well as one for the DEC "300" personal computer.

Pricing for standalone systems (the standalone has its own operating system and runs on all PDP-11 including the MINC, MINI-MINC, and PDT) is $2200, with RSX11M and 11M plus versions available at

$4200, RSTS/E available at $4200, RT-11 at $2200, and VAX/VMS available at $4900. CT*OS may be ordered on a variety of media and full user documentation, installation guides, keycap labels and telephone support are available.

Compu-Tome, Inc., 234 E. Colorado Boulevard, Pasadena, CA 91101, (213) 796-9371.

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.

Created for those end users and OEMs who are regularly in the market for DEC or DATA GENERAL equipment, the Hotwire can help you save on a wide variety of hardware.

To get a regular copy of this FREE special value listing, write to: Newman Computer Exchange, Inc. Dept P82RP, P.O. Box 8610, Ann Arbor, Michigan 48107. For more information about this offer, call: Amanda Kreger, (313) 994-3200.

GRC INTRODUCES MEMORY/SERIAL PORT KIT FOR LSI-11

Hartford, WI — General Robotics Corporation is now offering its popular MLV11 in kit form. The MLV11 provides 128KB of RAM and 2 serial asynchronous RS232 ports on a dual height module for the DEC LSI-11 UBUS. In kit form, the module is provided without memory chips, but is otherwise fully assembled and tested at the factory. OEM's may provide additional integration value by purchasing the sixteen 64K bit RAM chips and inserting them in the sockets provided. The 64K RAM chips are readily available from numerous manufacturers and distributors. The MLV11 is available in kit form off-the-shelf and is priced at $600 with OEM discounts available (F.O.B. factory). Two MLV11's are a direct replacement for a DEC MSV11-K 256KB RAM and a DEC DLV11-J 4 port serial I/O module. For more information write General Robotics Corporation, 57 North Main Street, Hartford, WI 53027, phone 414-673-6800, or call toll free 800-558-7832.

DIGITAL PRODUCTS REPAIR CENTER BROCHURE FROM RELIANCE ELECTRIC

Cleveland OH — A new four-page illustrated brochure describing how the Reliance Electric Digital Products Repair Center provides fast, reliable repair, exchange or replacement of PC Boards and related equipment is now available.

The file-size brochure points out that the Digital Products Repair Center is equipped to solve every possible kind of PC Board problem through the use of advanced, state-of-the-art equipment and instrument calibration procedures. PC Boards can be diagnosed and tested under simulated operating conditions, including heat and humidity environmental simulations, plus no-

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A/D CONVERTER FOR DEC PDP-11 UNIBUS FEATURES ±40 VOLT COMMON MODE MUX PROTECTION

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.

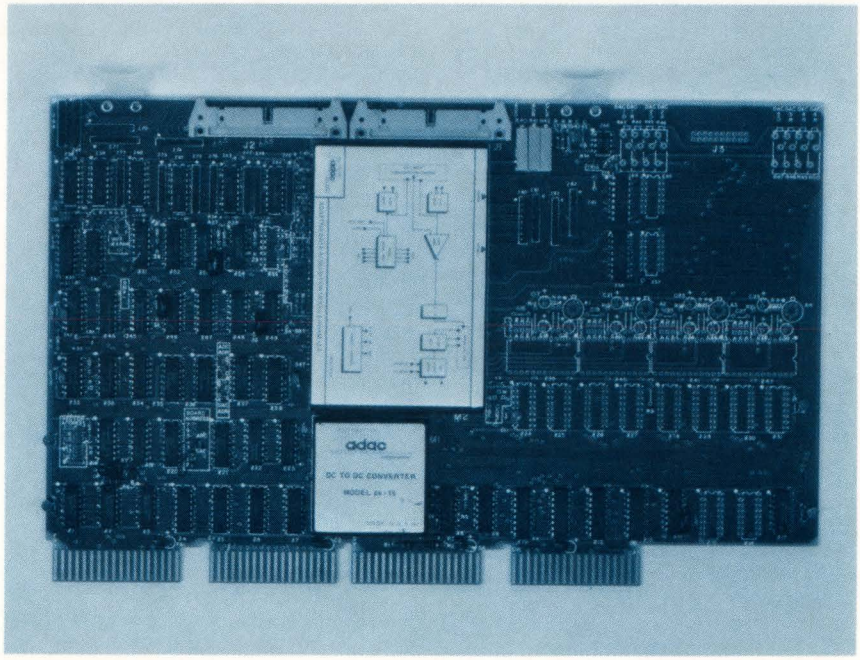
The 12 bit Model 635/11AL can be populated with up to 32 fully differential inputs, or with up to 64 channels of single ended or pseudo-differential MUX input. Multiple stappable input ranges are standard. Programmable gain amplification, automatic zeroing, and provision for up to four channels of digital 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) 935-6668, Telex: 949329.



load and full-load testing.

Explained in the brochure, containing 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 Process 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.

EPS, INC. ANNOUNCES THE AVAILABILITY OF THE "DECISION SUPPORT PRIMER"

Windham, NH — Harold L. Seils, Director of Marketing for EPS, Inc. announced here today that a new publication, "The Decision Support Primer", is available from EPS, Inc.

"The primer is our way of taking a seemingly complex subject and making it absolutely understandable ... usuable by any businessman," Seils said.

EPS are the authors of the powerful financial planning and modeling software system FCS-EPS which works on most brands of minicomputers and mainframes. In an effort to teach business planners how to use the comprehensive facilities in FCS-EPS, EPS 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 report 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: EPS, Inc. One Industrial Drive, Windham, NH 03087, 603/898-1800. EPS, 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 SVC1281 describes Superior Electric's complete line plus a reference of power line 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 attenuate 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 servicability.

SRMC is qualified to service computer and peripheral equipment supplied by more than 15 different manufacturers, including Digital Equipment Corp. (DEC), Pertec, 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 Northern 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

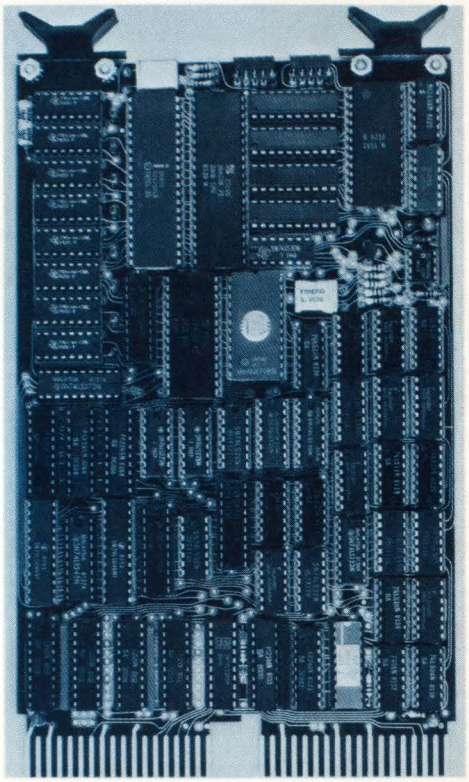
Natick, MA — Alloy Computer Products has announced a new CPM-11 Processor that gives LSI-11 users the capacity to implement their choice of popular CP/M software at a fraction of the cost of a complete CP/M system by enabling the DEC LSI-11™ to run CP/M™ programs without modification.

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 CPM-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 CPM-11 Processor provides 22 bit extended addressing. For installation versatility, the CPM-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 CPM-11 Processor is currently available from stock under RT™ and TSX-Plus™ operating systems, and will soon be offered for RSX™ and RSTS™ as well.



Alloy CPM-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**

CORTEX ANNOUNCES COLOR BUSINESS GRAPHICS PACKAGE

Wellesley, MA — CORTEX Corporation is now marketing the new Executive Data Display System (CORTEX-EDDS)tm, a simple-to-use, device-independent, full-color business graphics software package to run on Digital Equipment Corporation's VAXtm system. EDDS supports the DEC Professional computers and Hewlitt Packard plotters as output devices.

Line plots, scatter plots, bar charts, histograms, pie charts, and alpha signs are produced in full color using the Professional as an intelligent graphics terminal and then can be transferred to a choice of hardcopy graphic devices producing overhead transparencies, graphs, charts, or 35 mm slides.

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 lot), 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.

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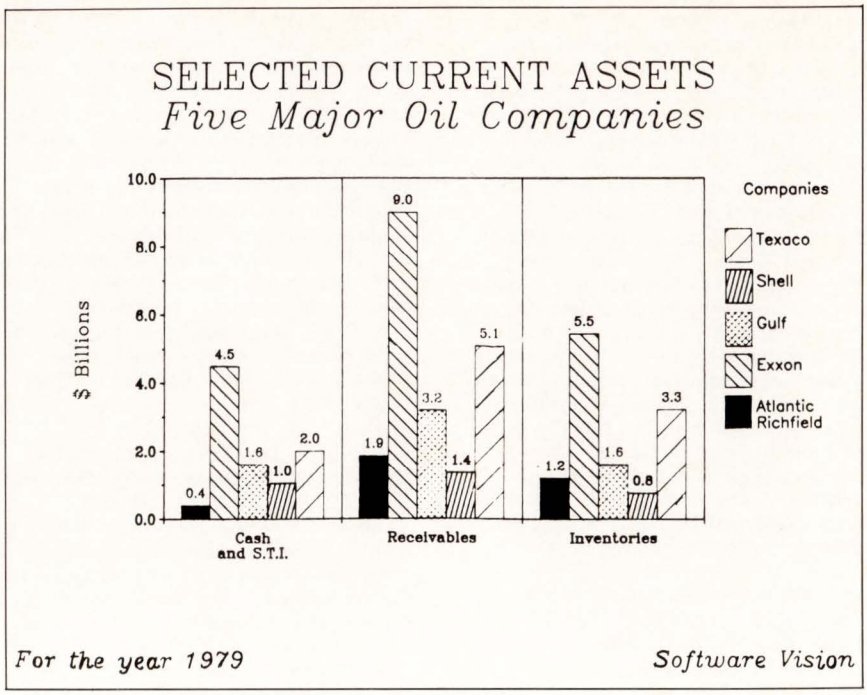
CONTEL TO MOVE RTFILE DBMS TO RSX OPERATING SYSTEM

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 o 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 RSX-11M 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/mini/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 LDI-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.

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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 identified 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) 784-8250

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 ANSI 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 reputability 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.

XCHANGE-11-From George W. Hallahan and Company, Inc.

Boston, MA — XCHANGE-11 is a Distributed Data Processing Communications Software Utility Package that performs an exact file-to-file transfer between an APPLE 11 or 11+ (DOS or CP/M) Microcomputer System and a Digital Equipment Corporation PDP-11 Mini-Computer System. Utilizing the CP/M standard Christensen Protocol, the utility enables data to be reliably transferred locally (between computers that are physically cable-connected), or remotely (via modems over dial-up phone lines).

The package consists of a set of programs, one which operates on the PDP-11 and one which operates on the Apple. Data file transmission in either direction is initiated and controlled by the Apple user and operates at up to either 4800 Baud (locally) or 1200 Baud (remotely). The size of the data file to be transferred is limited only by the size of the Apple's disk.

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.
- Micro-to-Micro, Micro-to-Mini, Mini-to-Micro, Mini-to-Micro-to-Mini.

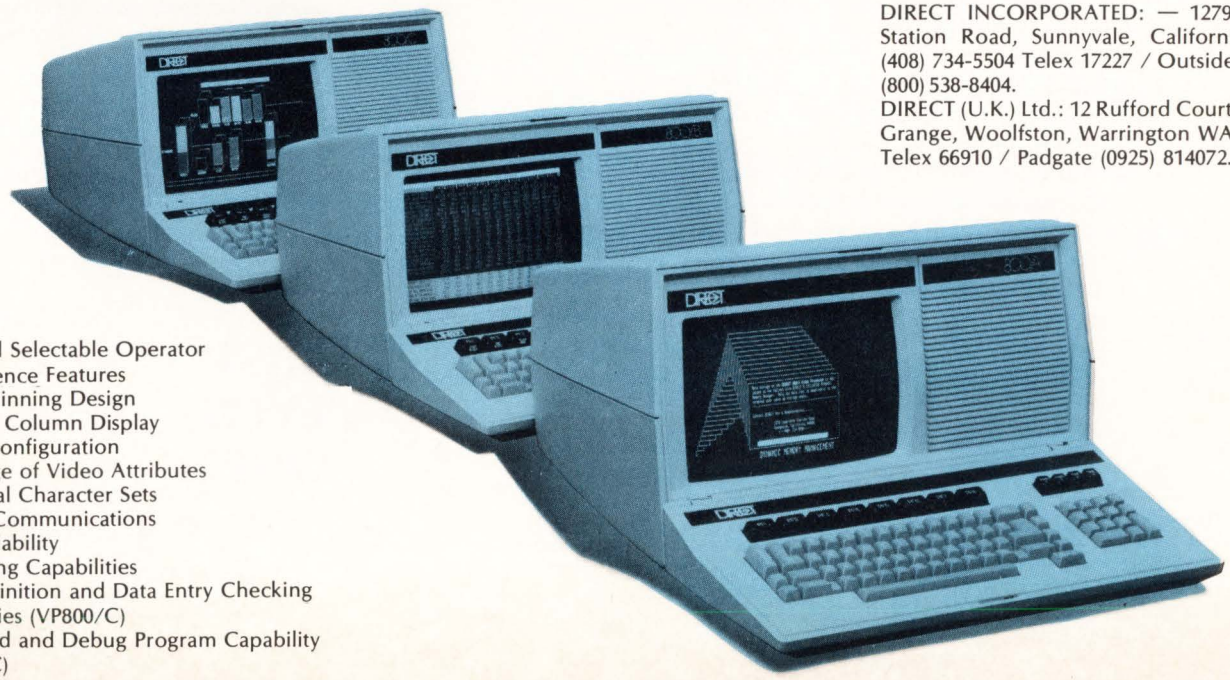
REQUIREMENTS

MICROCOMPUTER

- Apple 11 or 11+ 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-11MINICOMPUTER

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

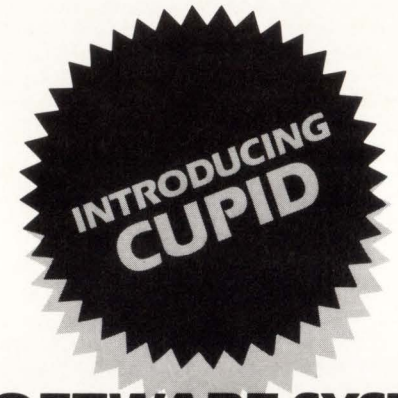


DIRECT INCORPORATED: — 1279 Lawrence Station Road, Sunnyvale, California 94086 / (408) 734-5504 Telex 17227 / Outside California (800) 538-8404.

DIRECT (U.K.) Ltd.: 12 Rufford Court, Hardwick Grange, Woolfston, Warrington WA1 4RF Telex 66910 / Padgate (0925) 814072.

Features

- Keyboard Selectable Operator Convenience Features
- Award Winning Design
- 80 or 132 Column Display
- Ease of Configuration
- Full Range of Video Attributes
- Additional Character Sets
- Flexible Communications
- High Reliability
- Full Editing Capabilities
- Field Definition and Data Entry Checking Capabilities (VP800/C)
- Download and Debug Program Capability (VP800/C)



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.

CIRCLE D89 ON READER CARD

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 integraged 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™.

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.

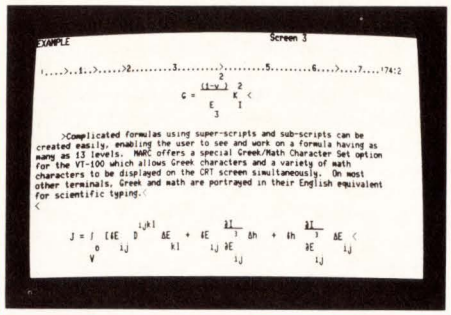
Tymshare is a major international computer information management and telecommunications services firm, providing a broad range of services through offices located across the United States and by affiliated operations in Canada, Western Europe, and Japan. Tymnet, Inc., a subsidiary of Tymshare, operates 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

MUSE
Technical Specifications
GREEK/MATH Character Set Option



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.

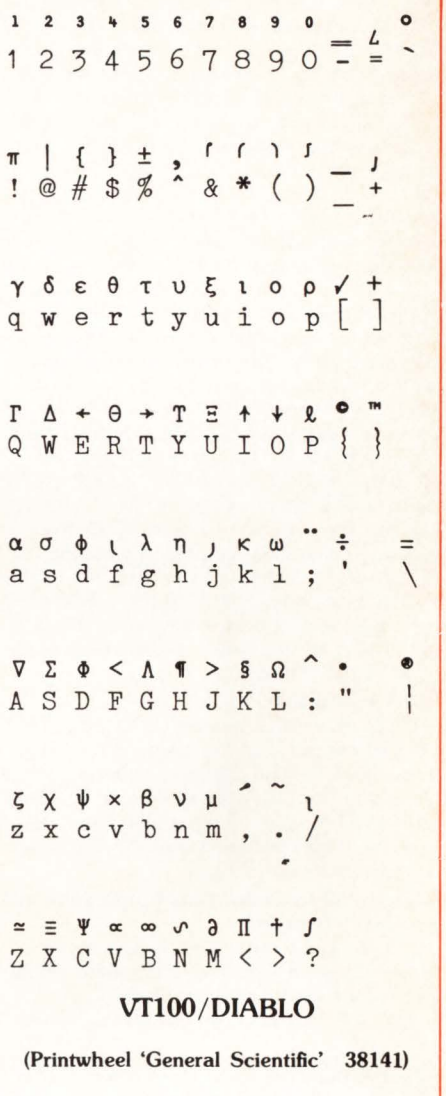
$$J = \int_{V^\circ} [\delta E_{ij} D^{ijkl} \Delta E_{kl} + \delta E_{ij} \frac{\partial I_3}{\partial E_{ij}} \Delta h + \delta h \frac{\partial I_3}{\partial E_{ij}} \Delta E_{ij} + S^{ij} \Delta\delta E_{ij}] \, dV^\circ$$

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 of the terminal.

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.

GREEK/MATH SYMBOLS



VT100/DIABLO

(Printwheel 'General Scientific' 38141)

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 (DML)
- 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 Tymshares'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 and structure 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 PRODEDURES 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. Carlile, 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

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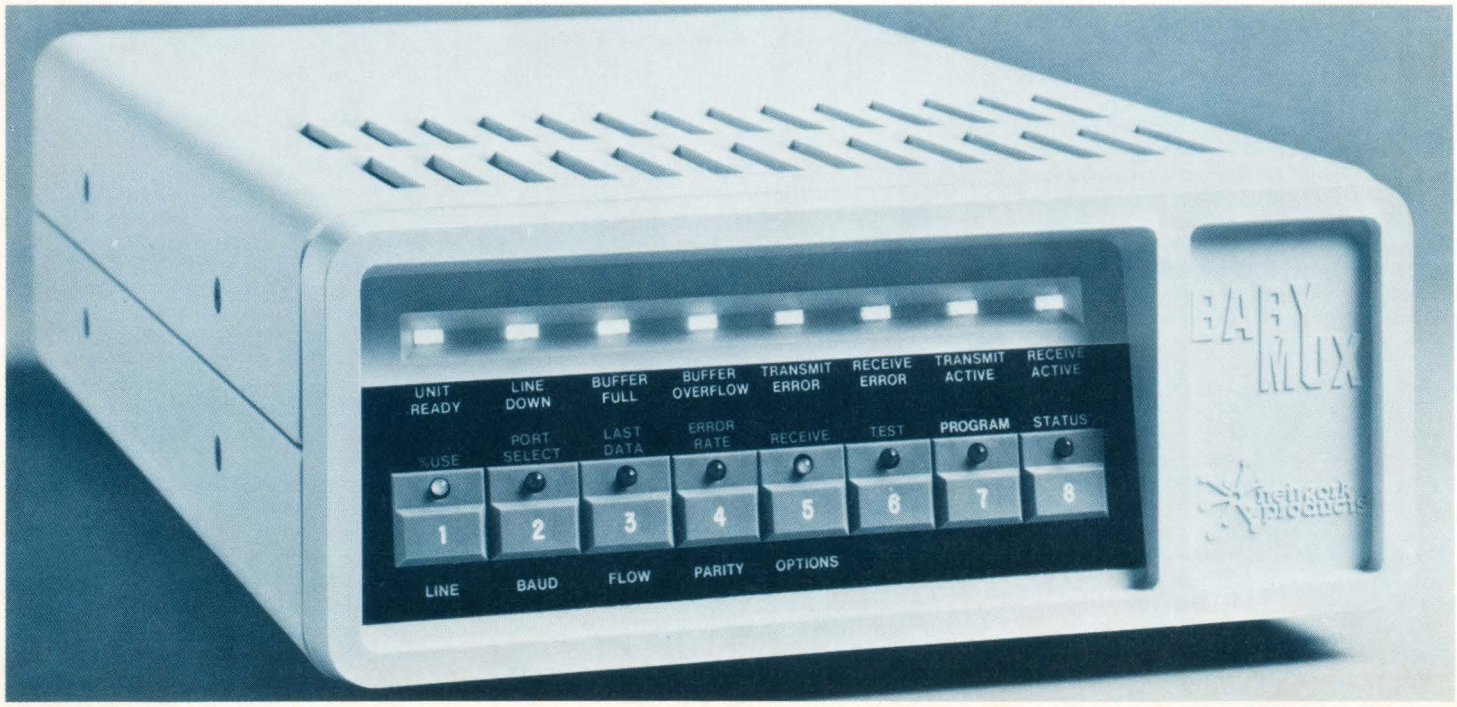
NEW MULTIPLEXER INTERFACES TO DEC SYSTEMS

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

- BABYMUX cuts your phone line and modem costs. It connects to an existing asynchronous communications controller, such as a DZ11 or DH11, to allow remote access of up to eight channels over one phone line, using one pair of modems. It supports serial printers, bar-code readers, or any other standard RS-232 asynchronous device, as well as remote CRT's.
- BABYMUX lets you perform remote programming. You can load the remote multiplexer's configuration from the local multiplexer, and inspect or update it without having to travel to the remote site.
- 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.
- 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-upgradable. 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.



• BABYMUX is designed for unattended operation. Start up is automatic. Preprogrammed configurations are retained even when power is off.

• Price: $1350 for base two-channel unit, all options included as standard. Three-channel expander kit: $475. Delivery: Stock to 30 days A.R.O.

• For technical information or the distributor nearest you contact: Network Products, Inc., Progress Center, Research Triangle Park, NC, 27709, (919) 549-8210.

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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 mag 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 ½" 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 6250 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.

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SOFTOOL® CHANGE AND CONFIGURATION CONTROL (CCC™)

Goleta, CA — Softool Corporation is pleased to announce the release of its Change and Configuration Control (CCC™) Environment.

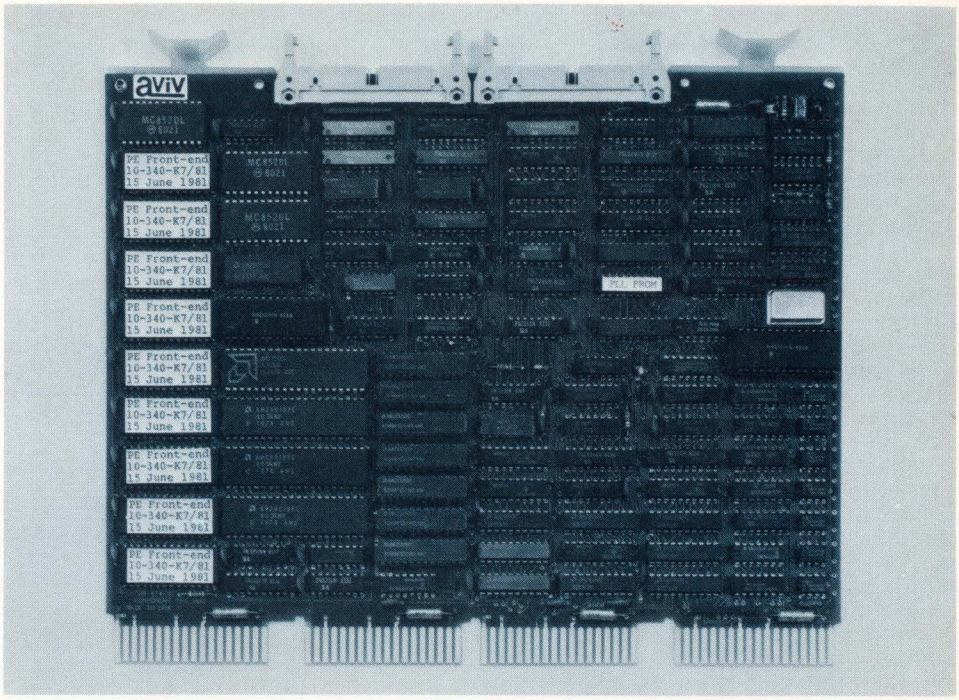
For a long time, software managers and programmers alike have been waiting for a software tool that would allow them to automatically keep track of all software and documentation changes and versions. CCC™ can reconstruct software and documents upon demand!

CCC™ is a comprehensive system for the management of software changes and configuration control. It is an interactive tool with an easy-to-use interface. It supports, in addition to automatic program reconstruction, impact of change reports, access control, archiving, compression, encryption, automatic backup and recovery, as well as other powerful features. It includes an editor, and provides interactive tutorials that facilitate training. CCC™ can handle programs written in any programming language.

CCC™ is part of SOFTOOL®, which is an integrated set of tools for software management, development and maintenance.

CCC™ is available, off-the-shelf, for DEC, DG Gould S.E.L., and IBM computers.

A permanent license for CCC™, including one year maintenance, costs $30,000. Various lease plans are also available.



AVIV TFC-922 Dual Density, Single Quad Board Tape Controller for DEC LSI-11.

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INFORM 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 11/70™M, 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.

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-100™ 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 reporting data we want and need by pushing a few buttons, the system has allowed us to project a much more professional image to the customer. To say it simply, the tracking 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-11/23™ up to the VAX 11/782™ and runs under VMS™, RSX-11M+™, and IAS™ 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 multi-dimensional 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 coupling 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

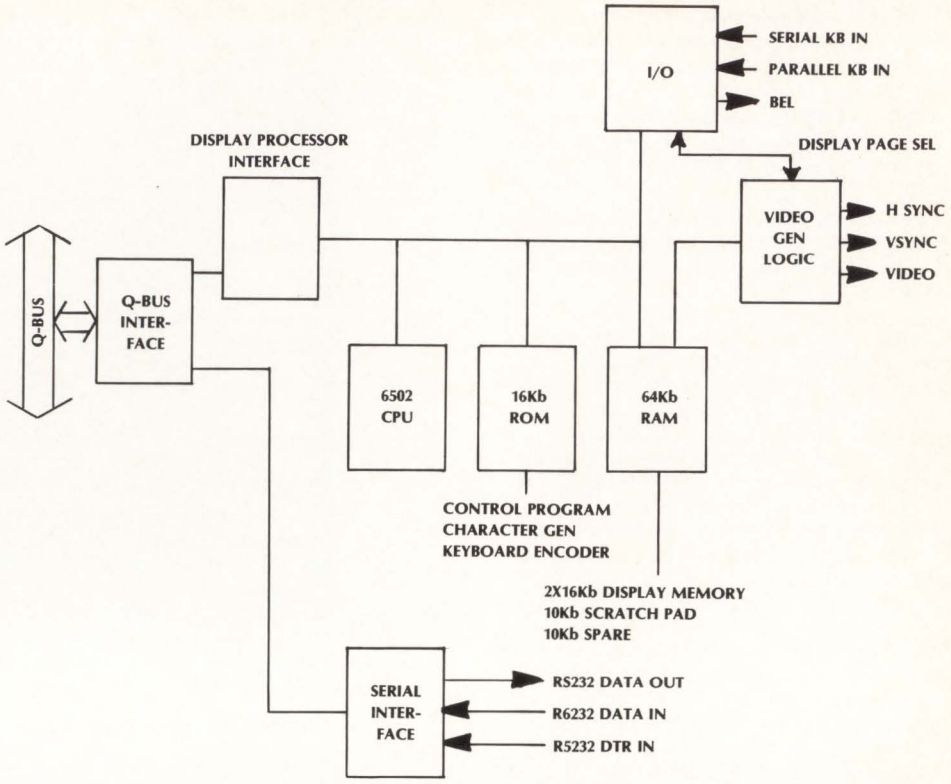


FIGURE 1. Block diagram of the VDC11-C display controller.

VDC11-C intelligent display controller provides add-in graphics capability for Q-bus systems.

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 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 alphanumerics 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). DEM 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.

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 invoices. This region appears as a window to partially view a rotating "drum". The size of the drum is dependent only on the number of lines entered on the order. You may rotate the drum forwards, backwards, and even "search" for a special line on the drum. This breakthrough in software technology offers unlimited lines for any order/invoice.

Another new development allows a company to select only the desired fields to appear on the entry screen. Each user may even assign default answers to selected fields. In this manner, a company has its own order entry screen - accomodating 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 sales 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 not only equal the best manual systems - but even exceed them," said a Compu-Share representative.

"For instance, a user can now insert any number of descriptive lines in the middle of an invoice to alert shipping to the location of an item, to inform the customer of some special problem, etc. During the odering process, changes can be made quickly and easily to units of measure, pricing, discounts, etc."

Everything is on-line with OE-11 and IC-11. Once an item is entered, its available quantity from inventory is shown in the quantity column. Available units of measure are shown as a message for alteration.

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 orders), 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 2,000 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, from general 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 dictionary-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-formating 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, DEC, DCD, 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 models.

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

Berkeley, CA — 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, RSX, 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 not 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 extradordinarily 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, VMS, RT-11, RSTS, 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 PBX Interface point. If the distance between PABX wire center and computer room exceeds several hundred feet, a DSC-2A system with integral muliplexers may be used which concentrates 32 channels over a telephone company T1 digital carrier or private four wire circuit.

A complete two channel "Mini-File" starter system is priced at less than $1500. It includes: the card file, a dual channel termination card and two station units. A complete eight channel system costs approximately $474 per channel. The RJ71C 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. Keynote 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 explosion, 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 Raod, 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

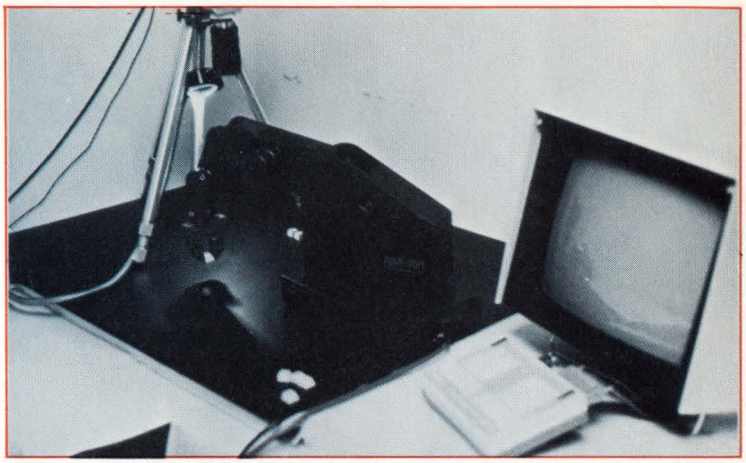
1. Typical set up for a robot vision application. Scene shows robotic arm with stand (Model RM-101, manufactured by Mitsubishi Electric Company), vidicon camera on tripod with lighting, display monitor and Octek function control keyboard.

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.

1.



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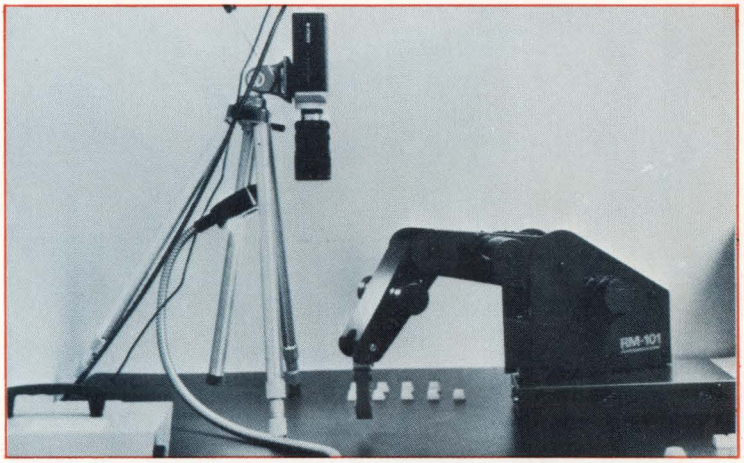

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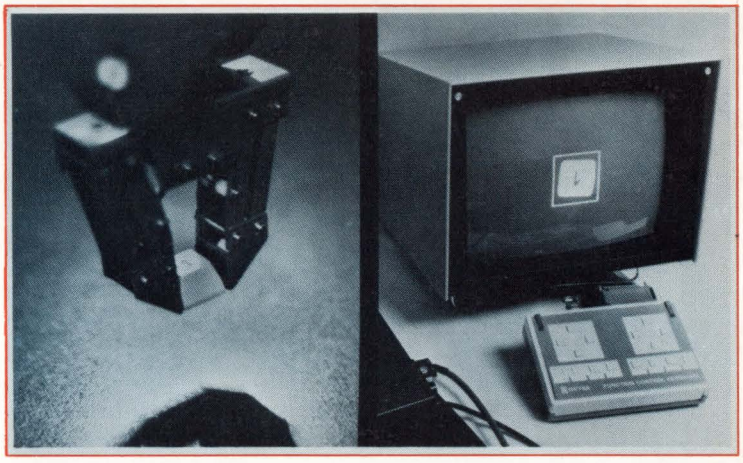

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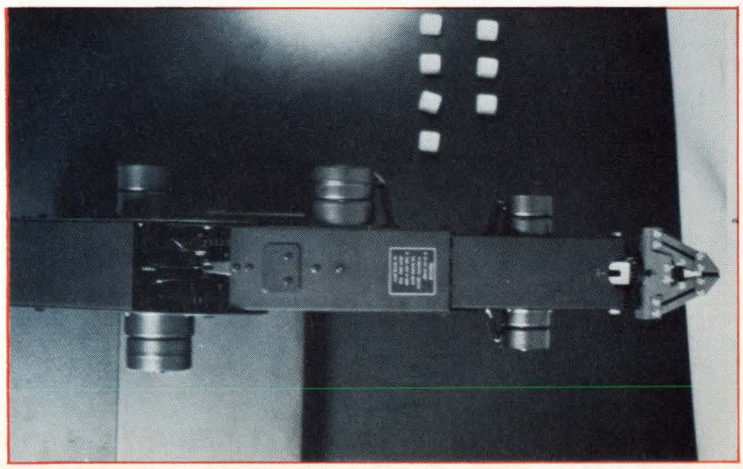
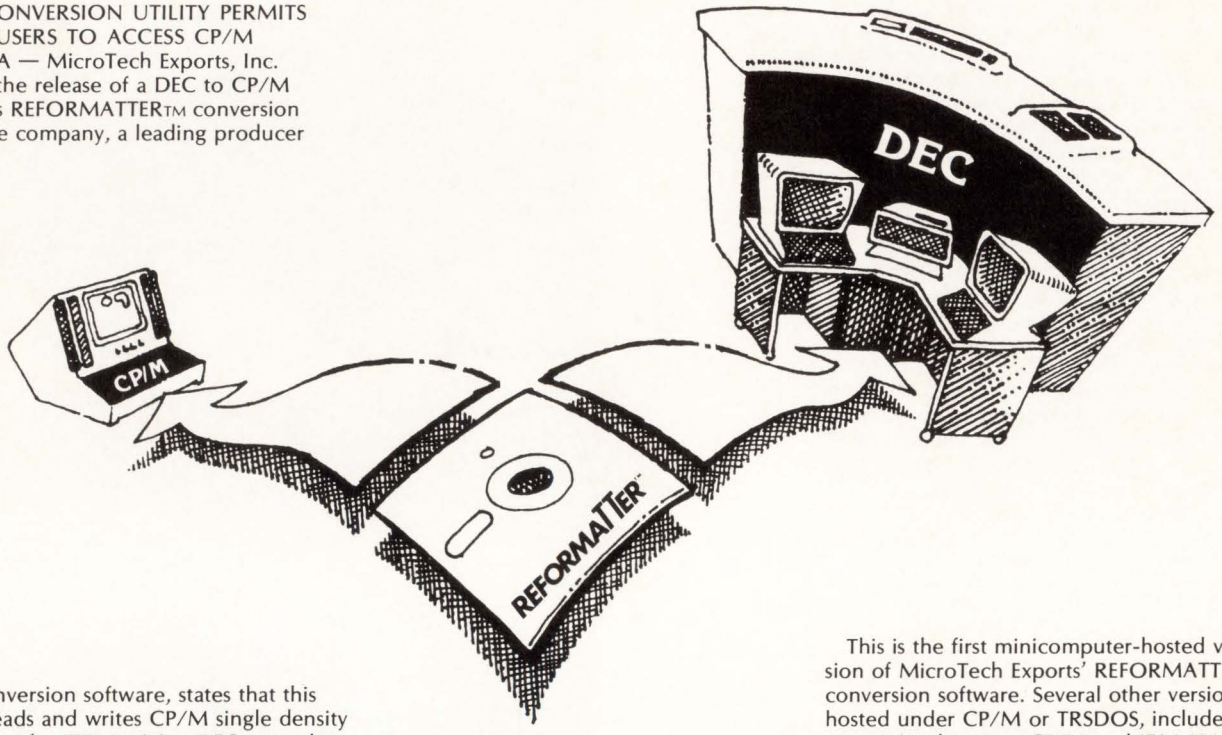


SUBJECT: CONVERSION UTILITY PERMITS DEC RT-11 USERS TO ACCESS CP/M

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.

This is the first minicomputer-hosted version of MicroTech Exports' REFORMATTER conversion software. Several other versions, hosted under CP/M or TRSDOS, include conversion between CP/M and IBM 3740 or DEC RT-11, and between TRSDOS and IBM 3740, DEC RT-11, or CP/M.

REFORMATTER conversion software is available directly from MicroTech Exports, and selected distributors such as Lifeboard Associates, Radio Shack, Software Distributors and Westico.

For more information, contact Oscar Rosenbloom, MicroTech Exports, Inc., 467 Hamilton Avenue, Palo Alto, Ca. 94301. Telephone (415) 324-9114.

NOTES NOTES NOTES

IS DEPOT REPAIR FOR YOUR COMPANY?

The high cost of maintenance contracts is forcing many companies with multiple computer systems to consider alternative avenues for maintaining their systems. Several qualifications must be met before a company can use a self-maintenance program.

Initially an inventory of spare boards should be on hand for the purpose of board swapping. Board swapping involves removing the defective board and replacing it with a "good" board to keep your system up and running. There are certain boards in a system that have a higher failure rate and your inventory should be based on those particular boards.

After you have your technician and your basic inventory, the third consideration is where or how to repair the defective board. There are several options open to you at this point.

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.

5 Hanover Square, New York, NY 10004.

Send Classified Ads to: Classified News, c/o THE DEC PROFESSIONAL, P.O. Box 362, Ambler, PA 19002-0362.

Classified ads are priced at $1.00 per word. Display ads are $35.00 per column inch, plus $1.00 per word. If we set, this includes border and 2 lines in bolder and/or larger type size, if desired, — please specify.

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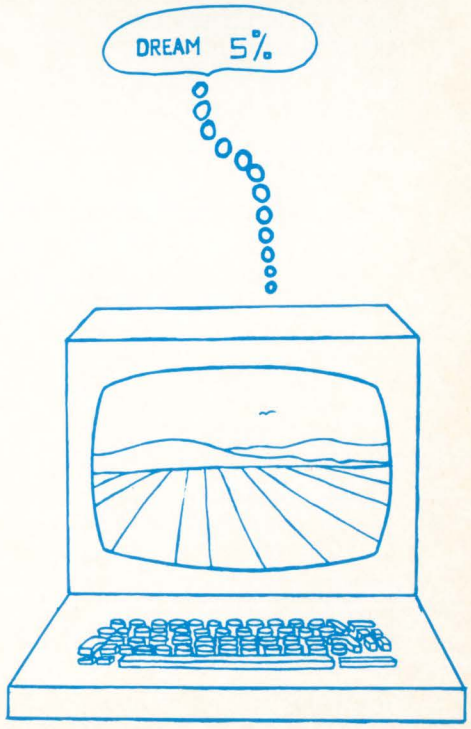

D. Borof

GAMES

By Joel Schwartz, M.D.

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! . . .

STOCK	INITIALS	PRICE/ SHARE
INT. BALLISTIC MISSILES	IBM	109.25
RED CROSS OF AMERICA	RCA	79.5
LICHTENSTEIN, BUMRAP & JOKE	LBJ	170.
AMERICAN BANKRUPT CO.	ABC	151.25
CENSURED BOOKS STORE	CBS	115.25

```
NEW YORK STOCK EXCHANGE AVERAGE: 125.05

WHAT IS YOUR TRANSACTION IN
IBM? +85
```

★★★★★ END OF DAY 1'S TRADING ★★★★★

STOCK	PRICE/ SHARE	HOLDINGS	VALUE	NET PRICE CHANGE
IBM	114.	85	9690	4.75

★★★★★ END OF DAY 2'S TRADING ★★★★★

STOCK	PRICE/ SHARE	HOLDINGS	VALUE	NET PRICE CHANGE
IBM	132.5	85	11262.5	18.5

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 frizby 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 TWOPIT ROOM.

WEST

YOU ARE AT THE WEST END OF THE TWOPIT 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 important," 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 hastle 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 gleem comes to your eye. You raise your hand and slowly, but with some authority, type in

KILL.

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? 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.TEC. The latest versions of TECO now support DECSCOPES (VT05, VT52, 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.

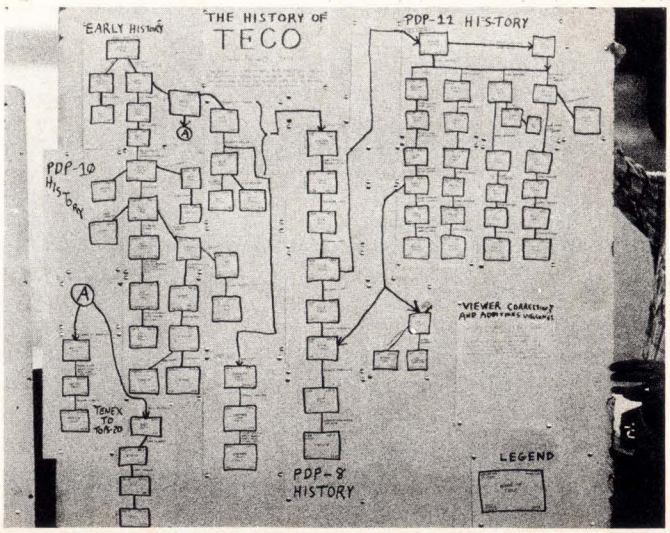
Each key on the keypad has a special function which will help you edit programs or data. It even has a key that lets you enter a real TECO command (beware). Although the overhead of VTEDIT can be considerable it has some useful features that should not be overlooked. One is its formidable formatting 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 VTEDIT 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.

? How TECO ?

The Uses and Abuses of Q-Registers

By Martin Pring, D.Phil.
Director Medical School Computer Facility
University of Pennsylvania
37th and Hamilton Walk, Philadelphia, PA 19104

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

```
*3XT$$
```

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

```
*GT$$
```

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

```
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)$ 0TT$$
```

and then

```
*0L 1XC L <NCOMMON /DATA/$: 0L K GC>$$
```

These command strings should be self-explanatory, except perhaps for the first two commands: in order to insert at the end of a line we advance the pointer to the next line, L, and reverse over the <carriage return> <line feed>, 2R.

Perhaps the first circumstance that introduces many TECO users to Q-registers is when, after typing a long insertion 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
*MS$$
        etc.
```

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

```
*nUN$$
```

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)UB S)$ QB,.XP$$
```

The pointer position before the opening parenthesis is stored in register B, S($ (.-1)UB, the pointer is positioned after the closing parenthesis, S)$, 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

```
*<... ... ZUZ A (QZ-Z)"E 1; '> EX$$
```

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 (very useful for introducing an element of interactive choice into an otherwise automated editing process), to the time of day, ↑H, and the value of the console switch register, ↑F ! The next example of number storage in Q-registers introduces three more useful ways of generating numeric values, /, nA and ↑↑ . 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<tab> ↑ED$;R.UB/US(0A- ↑↑ <tab>)"E QB,.K(2*QS/'>$$
```

We iteratively search for <tab> followed by any digit, exiting the loop if no more such strings are found, <S<tab> ^ED$;, 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, 0A, is equal to that of <tab>, ↑↑ <tab>, by (0A- ↑↑ <tab>) "E. If it is, we delete the digit string, QB,.K, and insert the string of twice its value into the buffer, (2*QS)/, 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 into 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:

```
*QNU1 0UC
<Q1U2 (Q1/16)U1 (Q2-(16*Q1))U2 [2 %C$ Q1"E 1; '>
QC< ]1 ↑↑ 0U2 (Q1-9)"G ( ↑↑ A-10)U2 ' (Q1+Q2)I$ >$$
```

First, we put the number into register 1, QNU1, and initialize the count of hexadecimal digits to zero, 0UC. 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, increment the count by one, %C$, and exit the loop if all information has been divided out of register 1, Q1"E 1;, else reiterate, '>.The count of characters specifies how many times the second loop is to be executed, QC<. In it we pop each digit off the stack into register 1,]1, and store the ASCII value of the digit 0 in register 2, ↑↑ 0U2. However, if the hexadecimal digit is greater than nine, (Q1-9)"G, we must represent it as a letter, so we store ten less than the ASCII value of the letter A in register 2, (↑↑ A-10)U2. In any case, we insert the character whose ASCII value is the number in register 1 plus the appropriate addendum in register 2 into the buffer, ' (Q1+Q2)I$, and repeat the loop, > .

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.

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, ↑B, is leap, to providing an efficient vehicle for the frequent insertion of the 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).

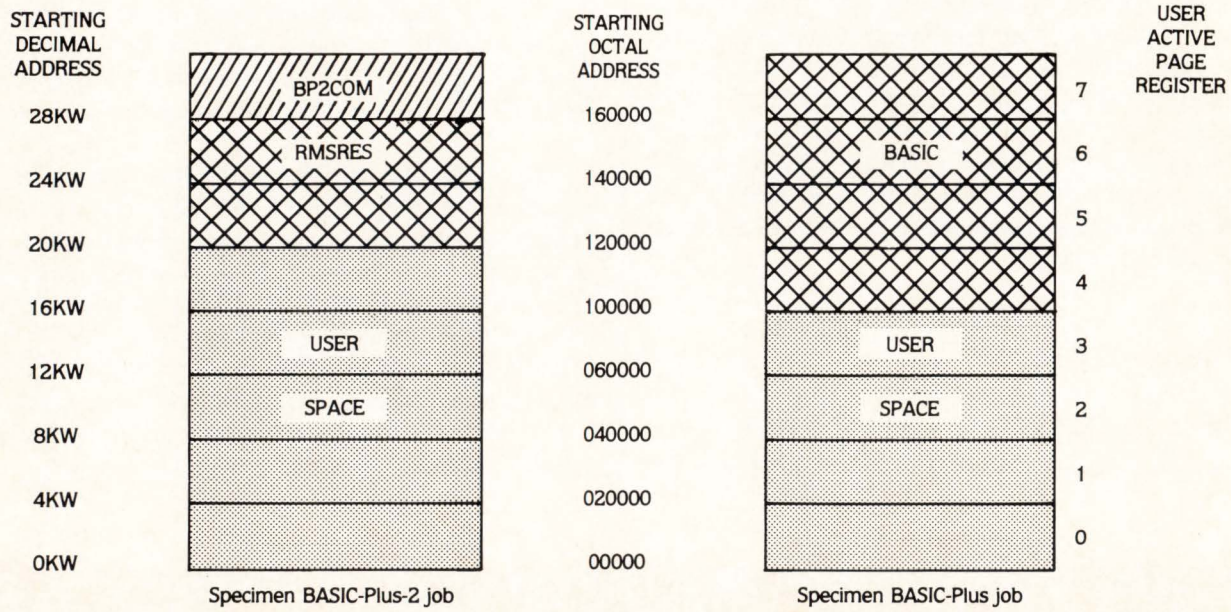


Figure 1. "Page" organization of a RSTS/E job.

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 &
          !                 ALPHABETIC CHARACTERS.          &
          ! &
          ! STRREV          TAKES A CHARACTER STRING ARGUMENT &
          !                 AN REVERSES IT CHARACTER BY &
          !                 CHARACTER. &
          ! &
!
110       CALL STRING (X$)
120       PRINT X$
130       CALL STRREV (X$)
140       PRINT X$
150       GO TO 110
32767     END

BASIC2

OLD STRING

BASIC2

LISTNH
1         SUB STRING (X$)
100       X$=''
110       X$=X$+CHR$(RND*26+65) &
                  FOR I%=1% TO 10%
32767     SUBEND

BASIC2

OLD STRREV

BASIC2

LISTNH
1         SUB STRREV (X$)
100       Y$=''
110       Y$=Y$+MID(X$,I%,1%) &
                  FOR I%=LEN(X$) TO 1% STEP -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
//
```

(MEMRES.ODL:)

```
        .ROOT USER
USER:   .FCTR STRING-STRREV-LIBR
LIBR:   .FCTR LB:BP2COM/LB
        .END
```

Once constructed, the main BP2 program can link to the subroutines in MEMRES as follows:

```
RUN $TKB
TKB>MAIN=MAIN,LB: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):

```
Ready

RUN (1,8)MAKSIL
MAKSIL  V7.0-07
Resident Library name? MEMRES
Task-built Resident Library input file <MEMRES.TSK>?
Include symbol table (Yes/No) <Yes>?
Symbol table input file <MEMRES.STB>?
Resident Library output file <MEMRES.LIB>?
MEMRES built in 5 K-words, 247 symbols in the directory
MEMRES.TSK renamed to MEMRES.TSK<40>

Ready
```

(Refer to your "RSTS/E Programmer's Utilities Manual" for an in-depth description of MAKSIL.)

MEMRES can now be ADDed:

```
RUN $UTILTY
UTILTY  V7.0-07
#ADD LIBRARY [1,201]MEMRES<0>/ADDR:100/RW/1USER
#EXIT

Ready
```

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 /1USER 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
        .ROOT X-USER
USER:   .FCTR *!(STRING-LIBR,STRREV-LIBR)
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:

```
        .NAME NLROOT
        .ROOT NLROOT-LIBR-USER
USER:   .FCTR *!(STRING,STRREV)
STRING: .FCTR SY:STRING-LB:BP2COM/LB
STRREV: .FCTR SY:STRREV-LB:BP2COM/LB
LIBR:   .FCTR A-B-C-D-E-F-G-H-I-J-K-L-M-N-O-P-Q-R-S-T-U-V-W-X-Y-Z-LIB1
LIB1:   .FCTR A1-A2-A3-A4-A5
A:      .FCTR LB:BP2COM/LB:$FADD
B:      .FCTR LB:BP2COM/LB:$STFN1
C:      .FCTR LB:BP2COM/LB:$FCON1
D:      .FCTR LB:BP2COM/LB:$STCOS
E:      .FCTR LB:BP2COM/LB:$JNCR
F:      .FCTR LB:BP2COM/LB:$ERROR
G:      .FCTR LB:BP2COM/LB:$JMOVS
H:      .FCTR LB:BP2COM/LB:$STMOS
I:      .FCTR LB:BP2COM/LB:$FMUL
J:      .FCTR LB:BP2COM/LB:$JNEXT
K:      .FCTR LB:BP2COM/LB:$FRAN0
L:      .FCTR LB:BP2COM/LB:$CALLS
M:      .FCTR LB:BP2COM/LB:$STGTA
N:      .FCTR LB:BP2COM/LB:$STMSC
O:      .FCTR LB:BP2COM/LB:$IEULT
```

```
P:      .FCTR LB:BP2COM/LB:$JCONV
Q:      .FCTR LB:BP2COM/LB:$ICEOL
R:      .FCTR LB:BP2COM/LB:$BFPER
S:      .FCTR LB:BP2COM/LB:$BBTKS
T:      .FCTR LB:BP2COM/LB:$BXTRA
U:      .FCTR LB:BP2COM/LB:$STLSS
V:      .FCTR LB:BP2COM/LB:$CNTRL
W:      .FCTR LB:BP2COM/LB:$CALLR
X:      .FCTR LB:BP2COM/LB:$BINIT
Y:      .FCTR LB:BP2COM/LB:$IVOFN
Z:      .FCTR LB:BP2COM/LB:$ICULT
A1:     .FCTR LB:BP2COM/LB:$ICROP
A2:     .FCTR LB:BP2COM/LB:$ICRCL
A3:     .FCTR LB:BP2COM/LB:$ICFSS
A4:     .FCTR LB:BP2COM/LB:RQLCB
A5:     .FCTR LB:BP2COM/LB:SAVRG
        .END
```

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
.PSECT LINK,D,RW,GBL,REL,OVR
.BLKB 4.
.END
```

The .PSECT MACRO directive is analagous 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

Ready

RUN $TKB
TKB  > TEST/-HD/PI,TEST,TEST = TEST
TKB  > /
ENTER OPTIONS:
TKB  > PAR = TEST:0:0
TKB  > STACK = 0
TKB  > //

Ready
```

```
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
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
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

BASIC2
```

(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,LB:BP2COM/LB
TKB>/
ENTER OPTIONS:
TKB>RESLIB=TEST/RW
TKB>UNITS=12
TKB>/
TKB>READER=READER,LB:BP2COM/LB
TKB>/
ENTER OPTIONS:
TKB>RESLIB=TEST/RO
TKB>UNITS=12
TKB>//

Ready
```

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 RMSRES), but can't afford the user space, might consider an "outboard RMS" processor routine which, upon request, READS/WRITES/UPDATES RMS files using record information contained in shared MAPs.

When building a shared common area, remember that the .PSECTs you define in the shared library must be at least as large as the MAP or COMMON areas they re-define within a referencing task (TKB will warn you with an "%Incompatible reference" message if they aren't). 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.OLB 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
   BP2OTS:(RW,I,LCL,REL,CON).
   Entries in this column are in alphabetical order, so BP2OTS should be close to the top.

5. BP2OTS is the name of the .PSECT into which all required BP2 system subroutines are collected. In the **TITLE** column under this BP2OTS 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:$ERROR
LB:BP2COM/LB:$FMOV
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:$BBTKS
LB:BP2COM/LB:$BXTRA
LB:BP2COM/LB:$ICROP
LB:BP2COM/LB:$ICFSS
LB:BP2COM/LB:$STGTA
LB:BP2COM/LB:$ICULT
LB:BP2COM/LB:RQLCB
LB:BP2COM/LB:SAVRG
/
PAR=TEST:160000:20000
STACK=0
//
```

7. Obtain a program called RESSTB from your BP2 V1.6 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.

Ready
```

(Always answer "BP2" to the "ENTER 3 CHARACTER CCL/MCR" prompt, whether or not the CCL name you specified when you built BP2 V1.6 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 V1.6, but may not with previous or later releases.****

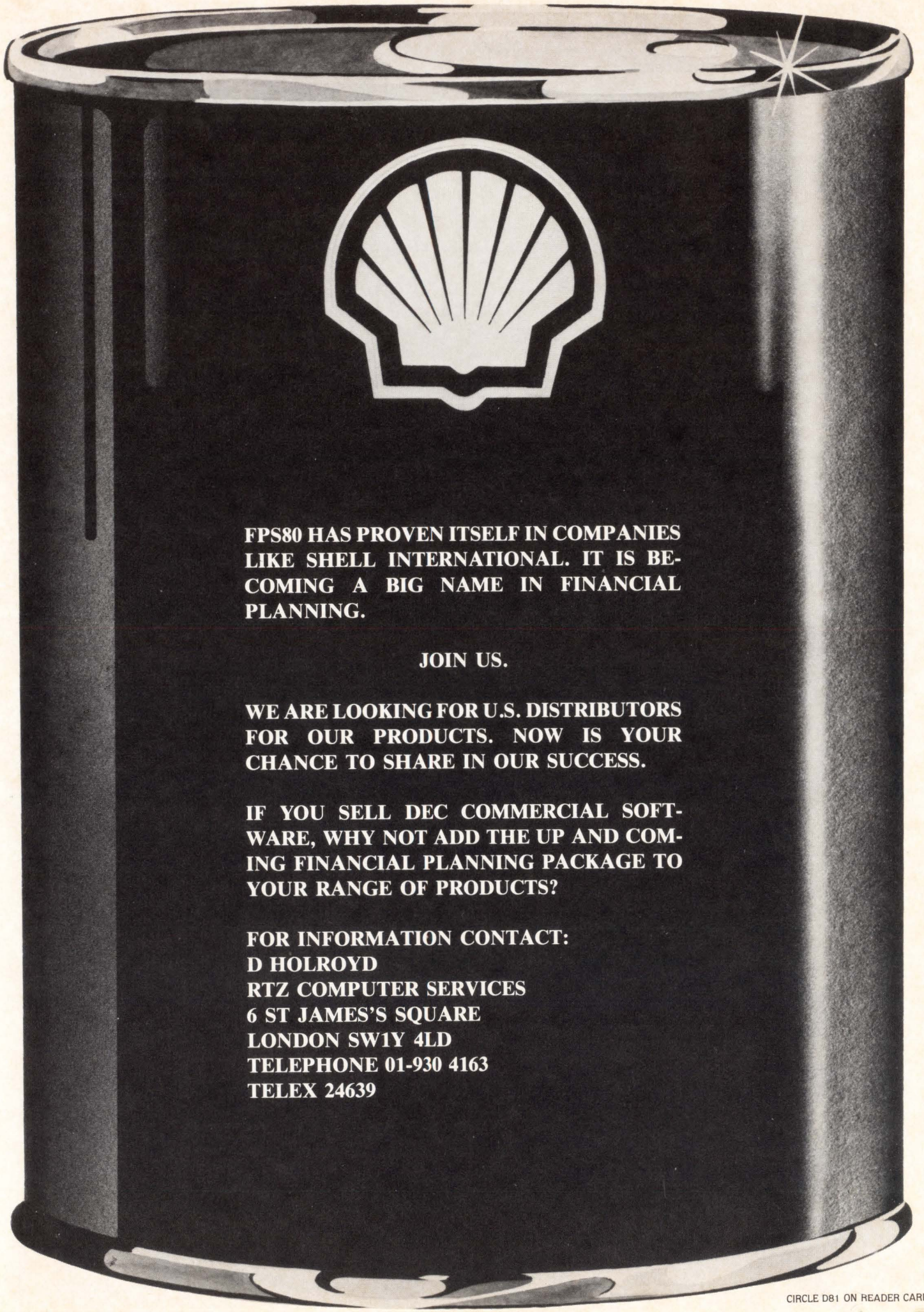
Omission of the RESSTB step will result in "LOAD ADDRESS OUT OF RANGE" errors when Taskbuilding tasks against shared common area containing OTS routines. Also, any "undefined global reference" errors accompanying the TKB for a shared common are probably the result of omitting or misspelling a required 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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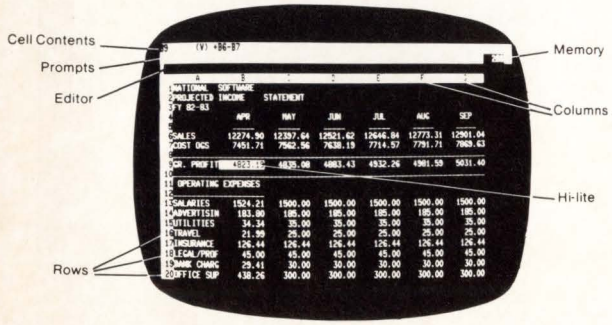

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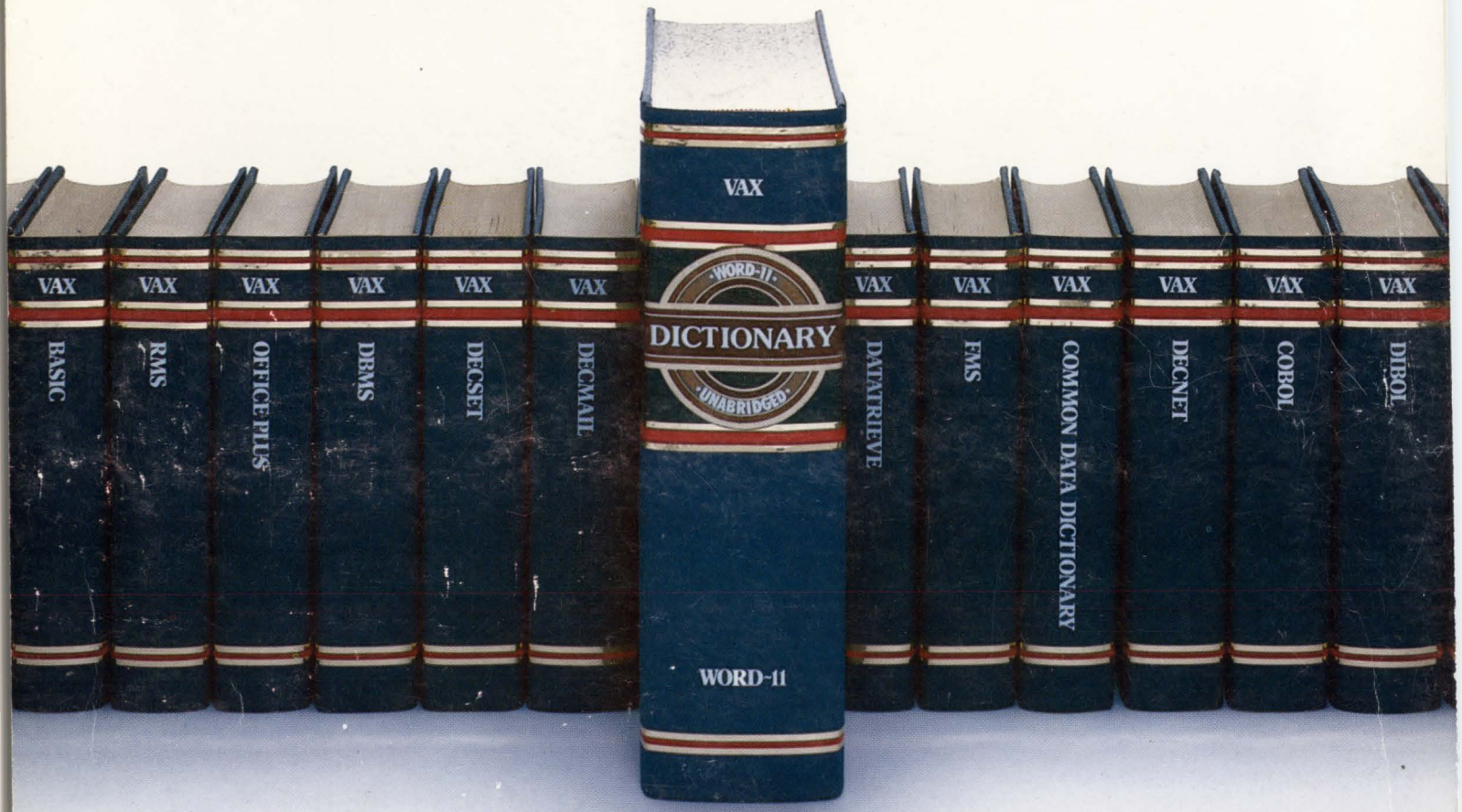

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