

INSIDE:

- □ New DEC Disks
- □ Do They Still Use Calculators?
- What I Learned About RT11
- A DIBOL
 Subroutine
- Megabyte Memory Now Available for Older PDP-11's
- □ A Timesharing COBOL for Small PDP-11's
- □ The Bridge
- □ DEC Timesharing (1965)
- Optimizing RSX-11M
 Terminal Response
 By The Use Of A
 Funnel Task
- DEXPO 82 & Beyond
- □ Interactive Russian Language Tutorial
- DEC Personal Computer Families
- □ ? Why TECO ?
- □ ? How TECO ?
- □ Structured Programming in DEC BASIC
- Word Processing
 with DEC Computers
 Hints & Kinks

□ More . . .

*THIS MAGAZINE IS NOT SPONSORED OR APPROVED BY OR CONNECTED IN ANY WAY WITH Digital Equipment Corporation. "DEC" IS A REGISTERED TRADEMARK OF Digital Equipment Corporation. Digital Equipment Corporation is the owner of the trademark "DEC" and is the source of all "DEC" products--.

USER-11: POWERFULLY PRODUCTIVE.

People productivity. It's more important than ever. And a good database system can mean *real* productivity.

USER-11 is a high-performance database system.

It is a fact: Software designed with USER-11 is built more quickly, operates more reliably, and performs better than other software techniques.

USER-11 is unique. It's easy to install. Easy to learn. And easy to apply. Adaptive tools and a standard approach ensure that maintenance is easier than ever.

A key to USER-11's success is its powerful, dictionary-based modules. Software developers simply describe and assemble these modules to create custom business packages—at an unprecedented rate. Naturally USER-11 is supported with excellent documentation and a variety of training options for beginner to expert. Our commitment is to your complete satisfaction.

Whether you are a software provider or a software user, we guarantee you will be delighted.

Ask us about USER-11 and our family of business software products, or better yet, ask a *productive* USER!



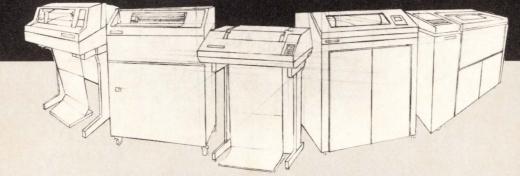
North County
 Computer Services, Inc.
 2235 Meyers Ave.,
 Escondido, California 92025
 (714) 745-6006, Telex: 182773

*USER-11 is currently available for DEC computers using the RSTS operating system.

Southern Systems has a printer that's right for your computer.

Compatibility guaranteed with all DEC processors!

PDP/8, PDP/11, LSI/11, VAX, DEC 10, DEC 20. Choose either long-line or short-line configuration.



Get the printer system that's guaranteed... from the leading add-on printer company, Southern Systems. You'll add-on a printer, plus unmatched expertise and topquality service, when you add-on Southern Systems. Maximum

M

rai

M



performance/minimum downtime results from technological innovation, expert installation and longterm service, nationwide. Sales offices in all major U.S. cities and in western Europe, United Kingdom and Canada.

Southern Systems

The Printer System Problem-Solvers 2841 Cypress Creek Road, Fort Lauderdale, Florida 33309 (305) 979-1000 • (800) 327-5602 • Telex 522135 In Canada (800) 661-1165 [Alberta: (403) 230-2044] In Europe 44-3-726-7282

y computer system is a	Name	
and I need a printer system in the speed	Title	
nge of:	Company	
33-55 cps (letter quality) 200-300 lpm600-900 lpm1000 plus	Address	
Parallel	City	
Serial (synchronous or asynchronous) y requirements areImmediate	State	Zip
3-6 months For information only	Telephone	

CIRCLE D7 ON READER CARD

VAX USERS

Yes! You can get high quality word processing in Native Mode!!

Don't take OUR word for it!

Convince YOURSELF!

SEE

MASS-11

.

Quick Edit — No special functions keys

Formatting — You see what you get

Footnoting — Done your way

Redlining — Eliminate proofreading PLUS

Form Letters and Lists and Data Base Management and **MUCH** more.

For a demonstration on your VAX contact:

Microsystems Engineering Corporation

(312) 882-0111

2400 Hassell Road • Suite 410 • Hoffman Estates, Illinois 60195

VAX is a trademark of Dig. Equip. Corp. MASS-11 is a trademark of Microsystems Eng. Corp.

CIRCLE D1 ON READER CARD

CONTENTS

NEV	V DEC DISKS	. 8
	Carl B. Marbach	
2	DEC announces a new technology.	
DO	THEY STILL USE CALCULATORS?	14
	Sterling Crum DIGICALC, a spread sheet financial planning tool that runs on 11's and VAX is the subject of	
	Sterling's article. It's about time something that runs on an Apple computer can now run on	
	ours.	
WH	AT I LEARNED ABOUT RT11 — Part I	16
	Ed Judge	
	Our RT11 correspondent starts what we hope to be a continuing effort by telling us some of	
	the good things about RT11. I hope Ed will continue to help us with the RT11 section and we	
	invite all the RT11 people to help us with their contributions.	
A D	IBOL SUBROUTINE	22
	Chuck Evans	
	We all need to write checks, here's how to put the amounts on the check line in English.	-
ME	CABYTE MEMORY NOW AVAILABLE FOR OLDER PDP-11's	24
	Ken Pruyn 18 bitters (11/34's etc) could access 256KB and 16 bitters (11/03's etc) could access 32KB	
	right? Wrong! At least now and Ken tells us how.	
AT	IMESHARING COBOL FOR SMALL PDP-11's	28
	Rick Jamieson & Eric Dickman	
	The people from EEC have many products for the DEC marketplace. This describes one of them.	
THE	BRIDGE	30
	Deryk Van Brunt & Julian Henkin	
	With the explosion of micro computers, and the DEC micro now entering the field (it will run	
	CP/M), products that link these two systems will become commonplace. This is one of those	
-	products.	-
DEC	Peter Clark	34
	A veteran of PDP-6 days, Peter reminds us of how it was in the olden, golden days.	
OPT	IMIZING RSX-11M TERMINAL RESPONSE BY THE USE OF A FUNNEL TASK	38
011	James A. McGlinchey	50
	A RSX professional and DECUS veteran, Jim will be our RSX editor/consultant. The RSX section	
	will, under Jim's direction, be a continuing feature; we look forward to your contribution!	
	Besides, someone with an 11/23 in his basement can't be all bad.	
DE)	(PO 82 & BEYOND	40
DE	Larry Hollander	40
DE	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO	40
DEX	Larry Hollander A professional showman, with the credentials to prove it. Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will	40
	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace.	
	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL	40
	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan	
	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a	
	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan	
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer.	
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES	
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon	42
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new	42
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers.	42
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ?	42
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. C PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach	42
INT	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and	42
INT DEC ? W	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL.	42 50 58
INT DEC ? W	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and	42
INT DEC ? W	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. VHY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. IOW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate	42 50 58
INT DEC ? W	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. VHY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which	42 50 58
INT DEC ? W	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his	42 50 58
INT DEC ? W ? H	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work.	42 50 58
INT DEC ? W ? H	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. CUCTURED PROGRAMMING IN DEC BASIC	42 50 58
INT DEC ? W ? H	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. WW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. CUCTURED PROGRAMMING IN DEC BASIC A Cini	42 50 58
INT DEC ? W ? H	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. CUCTURED PROGRAMMING IN DEC BASIC AI Cini "Professor" Al is an ex-DEC employee, a refugee from software support who has contributed	42 50 58
INT DEC ? W ? H	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. WW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. CUCTURED PROGRAMMING IN DEC BASIC A Cini	42 50 58
INT DEC ? W ? H STF	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. VHY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. CUTURED PROGRAMMING IN DEC BASIC A Cini "Professor" Al is an ex-DEC employee, a refugee from software support who has contributed many scholarly articles to other journals. He is president of Computer Methods Corporation providing "concepts" and programming in and around the Philadelphia area. Al's concepts are applicable to all languages and we are glad to be able to present him to you.	42 50 58
INT DEC ? W ? H STF	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. VHY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OW TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. CUCTURED PROGRAMMING IN DEC BASIC A Cini "Professor" Al is an ex-DEC employee, a refugee from software support who has contributed many scholarly articles to other journals. He is president of Computer Methods Corporation providing "concepts" and programming in and around the Philadelphia area. Al's concepts are	42 50 58
INT DEC ? W ? H STF	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. OV TECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. CUTURED PROGRAMMING IN DEC BASIC AI Cin "Professor" Al is an ex-DEC employee, a refugee from software support who has contributed many scholarly articles to other journals. He is president of Computer Methods Corporation providing "concepts" and programming in and around the Philadelphia area. Al's concepts are applicable to all languages and we are glad to be able to present him to you. RD PROCESSING WITH DEC COMPUTERS - Hints & Kinks Lawrence H. Eisenberg	42 50 58 59 64
INT DEC ? W ? H STF	Larry Hollander A professional showman, with the credentials to prove it, Larry brought off the first DEXPO (DEC compatible show) with surprising smoothness and professionalism. His DEXPO shows will follow DECUS and become a fixture in the DEC marketplace. ERACTIVE RUSSIAN LANGUAGE TUTORIAL Scott H. Stuart and Barbara Kurshan This is an expanded version of a short paper from the Atlanta DECUS meetings. It covers a conversion from a Honeywell machine to VAX, downline loading of the cyrillic character set into a Decwriter (with a Datasouth logic board), and teaching the Russian language with a VAX computer. PERSONAL COMPUTER FAMILIES John B. Runyon In John's own style (e.e. cummings made good, didn't he?) we learn more about DEC's new personal computers. HY TECO ? Carl B. Marbach Veteran of 17 years of interactive computing. Currently editor of RSTS PROFESSIONAL and THE DEC PROFESSIONAL. WT ECO ? Martin Pring, D.Phil. Originally from Oxford University where he majored in limericks but managed a doctorate instead. Now Director of the University of Pennsylvania Medical School Computer facility which operates a PDP-10. Martin specializes in writing extravagant code — and TECO suits his sensibilities. He is also never satisfied until he understands how things work. UCTURED PROGRAMMING IN DEC BASIC A Cini "Professor" Al is an ex-DEC employee, a refugee from software support who has contributed many scholarly articles to other journals. He is president of Computer Methods Corporation providing "concepts" and programming in and around the Philadelphia area. Al's concepts are applicable to all languages and we are glad to be able to present him to you. RD PROCESSING WITH DEC COMPUTERS - Hints & Kinks	42 50 58 59 64

COMING

- DEXPO 82 (West) Preview
- Australia **DECUS** Report
- Financial Planning Systems
- DEC Introduces **New Disk Systems**
- Remote Diagnosis
- Modems and Multiplexers
- RSTS to ??? Communications
- How TECO?
- Why EDT (KED)
- RSX Techniques
- VAX Bus Architecture
- Performance Measurement **Inside DEC**
- Unibus Anatomy

FROM THE EDITORS 4 LETTERS TO THE DEC PRO 6 DEAR DR. DEC. (questions & answers) 36 PROFESSIONAL ETC (news & notes) . 87

THE DEC PROFESSIONAL Magazine, July 1, 1982, Vol. 1, No. 1. Published bi-monthly. Subscriptions: no charge for qualified U.S. sites: foreign - \$50 (US\$) per year. Published by Professional Press, Inc., 161 E. Hunting Park Avenue, Philadelphia, PA 19124. Application to mail at Second Class postage rates is pending at Philadelphia, PA. Send all correspondence and change of address to: THE DEC PROFESSIONAL, Box 362, Ambler, PA 19002-0362, telephone (215) 542-7008. Copyright © 1982 by Professional Press, Inc. No part of this publication may be reproduced in any form without written permission from the publisher.

DECPROFESSIONALDECPRO

FROM THE EDITORS



PAGE 4

WELCOME

Carl Marbach

Welcome to the first issue of the DEC PROFESSIONAL. Three years ago when Dave and I started the RSTS PRO-FESSIONAL, I had no idea that it would grow to over 4000 dedicated readers worldwide, and that ultimately it would lead us to a new magazine directed toward all of DEC's computers. There is no telling how big the world of DEC is, but we expect this issue to reach about 50,000 people who use DEC computers. Just to give you a feel for how many this is, it will take one whole 18 wheel trailer truck to hold the 20 tons of magazines!

We will be bringing you a professional journal, which will match your professional skills in using DEC computers. The DEC PROFESSIONAL will explore the beginnings of DEC from project Whirlwind and the PDP-1, through the PDP-8 and on to today's offerings. The magazine will carry technical articles about subjects of interest to DEC computer users, news releases, sections on all operating systems, hardware articles, application examples, case histories, current product analyses and news from the product lines.

More than anything, this is your journal. It will be brought to you by the many men and women who contribute their knowledge to you. It will be a forum for users to voice their viewpoints on the world of DEC. Many people have received valuable information from the RSTS PROFESSIONAL over the years; it will be up to you to make the DEC PROFESSIONAL the source of as much good information. We solicit your articles and will pay an honorarium for each one accepted for publication; we believe you deserve to be paid for doing something for the DEC community. All opposing viewpoints to our own will be given free space to reply (we may get the last word however).

You can also count on us here to do our share. In the months to come you will read about the Remote Diagnosis Center in Colorado Springs where we visited not too long ago, the Galway Ireland European distribution center, Merrimack New Hampshire's performance testing laboratory, new products, rumored products and third party vendor products. We will have question and answer sections found in the "Dear Dr. DEC" section. In short, this will be the place for information pertinent to DEC computers. Welcome.



ONLY NUMBER TWO

Dave Mallery

To no one's surprise, DEC is now number two in the industry, according to Datamation's top 100 ratings. Elbowing aside some aging mainframers, DEC has taken the last stride from fourth to second.

Isn't it amazing that the top two firms in this giant industry are only now beginning to begin to compete? It is almost as though they really have been in different industries all this time and we should not have been comparing them at all.

The difference between 'Big Blue' and our friends in Maynard is simply one of origins. When Ken, Gordon and their small band of engineers were etching modules in dime store fishtanks, they were coming from an MIT-inspired vision that computers should be interactive, easy to use and even friendly!

At the same time, our friends in Armonk were perpetuating in OS/360 the concept that the only way to communicate with a computer was through cryptic cyphers on an 80-column relic from the 1890 census. After all, you can't obsolete all those model 29 keypunches out there on rent, can you?

So there you are, Ken Olsen, only number two. Thanks.



JULY 1982



Editors R.D. Mallery Carl B. Marbach

Assistant Editor/Advertising Helen B. Marbach

Assistant Editor/Operations Peg Leiby

Administrative Assistant Hope Makransky

Editorial Assistant Linda DiBiasio

Subscription Fulfillment Kathi B. Campione Claire Hollister

Contributors Deryk Van Brunt Al Cini Peter Clark Sterling Crum Eric S. Dickman Lawrence H. Eisenberg Chuck Evans Julian Henkin Larry Hollander **Rick Jamieson** Ed Judge Barbara Kurshan James A. McGlinchey Martin Pring, D.Phil Ken Pruvn John B. Runvan Scott H. Stuart

Cartoons Douglas Benoit

Game Verification Team Bill Marbach, Mary Marbach, Sydra Mallery, Sam Mallery

Design & Production

Grossman Graphics

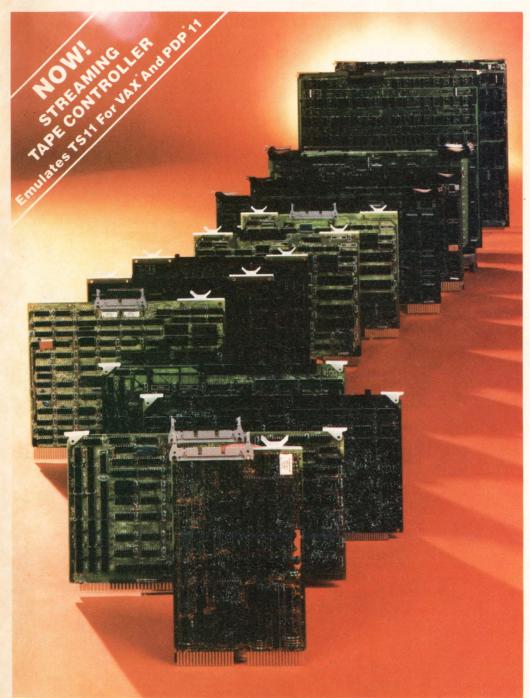
Printing & Binding Schneider Litho Co., Inc.

Editorial Information: We will consider for publication, all submitted manuscripts and photographs, and welcome your articles, photographs and suggestions. All material will be treated with care, although we cannot be responsible for loss or damage. (Any payment for use of material will be made only upon publication.)

*This magazine is not sponsored or approved by or connected in any way with Digital Equipment Corporation. "DEC" is a registered trademark of Digital Equipment Corporation. Digital Equipment Corporation is the owner of the trademark "DEC" and is the source of all "DEC" products --.

Material presented in this publication in no way reflects the specifications or policies of Digital Equipment Corporation. All materials presented are believed accurate, but we cannot assume responsibility for their accuracy or application.

Peripheral Processors from Xylogics



*REGISTERED TRADEMARKS OF DIGITAL EQUIP. CORP. **REGISTERED TRADEMARK OF DATA GENERAL CORP. ***REGISTERED TRADEMARK OF INTEL NATIONAL

More Disk and Tape Control at Lower Cost

100% Emulation

Peripheral Processors provide efficient low-cost, software transparent alternatives to original disk and tape controllers offered with Unibus*, Q-bus, Data General's I/O bus**, and Multibus***-compatible systems.

Optimum System Performance

Peripheral Processors can go beyond emulation to provide throughput rates and maximum storage capacities not possible with conventional controllers. For example, the Xylogics 440 Peripheral Processor for Multibus systems can operate at speeds up to 1.2 MB per second on consecutive sectors and control a maximum of 2.4 GB of storage.

Greater Mass Storage

Peripheral Processors let you expand mass storage beyond your computer manufacturer's upper limits. Our model 650 for PDP11 and VAX systems can support eight storage modules in any mix of drive capacities up to 675 MB each.

More Choices

Over 16 Peripheral Processors are available to handle storage devices like Winchester disks, streaming tapes, cartridge tapes, reel-to-reel tapes, cartridge disks, and storage modules.

Better System Price Performance

Peripheral Processors do more, in less space and at lower cost than conventional controllers. They increase system throughput, and effectively lower storage costs per megabyte.

Unlimited Growth

Xylogics is an innovator in the field of mass storage control. Whether your plans call for more cost-effective peripheral control capabilities or complete mass storage subsystems, Xylogics has what you need. Call us today to learn how you can benefit from Peripheral Processor technology. Boston (617) 272-8140, Chicago (312) 660-1460, New York (201) 691-2800, London (0753) 78921, San Francisco (408) 995-5205, Los Angeles (714) 966-0888, or headquarters (800) 225-3317.



U.S. Headquarters: 144 Middlesex Turnpike, Burlington, MA 01803 Tel: (617) 272-8140 (TWX 710-332-0262) European Headquarters: 46-48 High Street, Slough, Berks SL1 1ES U.K. Tel: (0753) 78921; Telex 847978

TO THE DEC PRO Send letters, comments, photos, etc. to: Letters to the DEC PRO, Box 362, Ambler, PA 19002. Dear Dec Pro: fli Congratulations on your first issue. May you have great success for many years. Knowing your past work as I do, 0 K I'm certain that wish will come to be. Sincerely, A Friend E 6)(N 4 P R К W R R 5 R THIS PAGE IS J 0 RESERVED Z m h FOR YOUR LETTERS. f ſ ()0 Z F A M 27 в H -J A P L

DILOG GOES WITH LSI-11, PDP-11, VA X-11*

Dilog offers the widest range of single board DEC emulating disc and magnetic tape controllers for LSI-11, 11/2, 11/23, PDP-11 and VAX-11 compatibility.

This growing family includes over 20 software transparent disc and tape products: WINCHESTER AND BACKUP SOLUTIONS FOR MOST APPLICATIONS.

DISC—5¹/₄," 8" or 14" WINCHESTER/SMD/CMD/LARK/ CARTRIDGE/FLOPPY controllers with RX02, RK05, RL01/RL02, RP02/RP03, RK06/RK07 and RM02/RM05 emulations and features like 22-bit addressing, 32 or 56-bit ECC, universal formatting (allows you to mix drive types on the same controller without hardware modification), and automatic media flaw compensation.

MAG TAPE—1/4" cartridge/1/2" NRZI/PE, streaming or conventional couplers or controllers with TM11, TS03 and TS11 emulations.

NEW VAX-11/PDP-11 CONTROLLERS

- DU 132 TS-11 emulating coupler with expanded buffering for streaming or conventional 1/2" industry standard magnetic tape drives. One coupler can accommodate up to 4 drives at speeds to 125 ips, and you get dual density 800/1600BPI as an added feature. RT, RSX, RSTS and VMS software compatibility.
- DU 215 RK06/07 emulating SMD disc controller with 56-bit ECC, universal formatting, optimal device for Winchester and CMD applications. RSX, RSTS and VMS software compatibility.
- DU 218 RM02/05 emulating SMD disc controller for SMD and Winchester applications with full software transparency under RSX and RSTS as well as Media compatibility when used with 80 and 300 MB SMD (CDC 9762/9766) compatible disc drives.

NEW LSI-11 CONTROLLERS

- DQ 212/215 SMD interface. Universal formatting allows mixing or matching two 8" or 14" drives with different characteristics and without component changes for up to 220 MB of software transparent formatted capacity. 56-bit ECC, RP02/03 or RK06/07 emulations.
- DQ 444 CDC FINCH interface. Intelligent uP module mixes any two drives of this class with universal formatting. RL01/02 emulations. Built-in drive capacity expansion handling.

All DILOG controllers are price competitive with significant OEM discounts being offered under a Mix and Match plan. 30-day delivery is standard. Distributor inquiries invited. For complete price/performance details, contact DILOG.

Corporate Headquarters

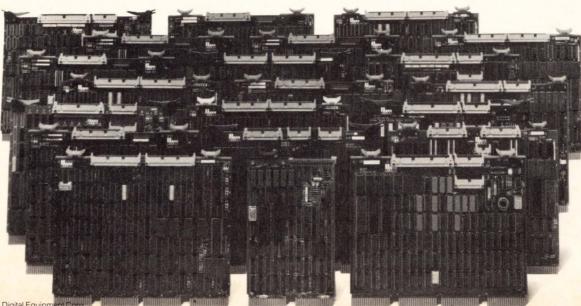
12800 Garden Grove Blvd. • Garden Grove, Calif. 92643 • Phone: (714) 534-8950 • Telex: 681 399 DILOG GGVE

Eastern Regional Sales Office 64-A White Street • Red Bank, New Jersey 07701 • Phone: (201) 530-0044

European Sales/Service Office

12 Temple Square • Aylesbury, Buckinghamshire • England • Phone: 44-296-34319 or 34310 • Telex: 837 038 DILOGI G





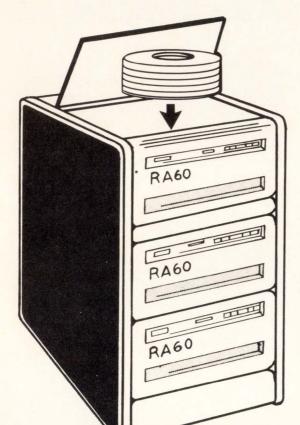
*Trademark Digital Equipment Co

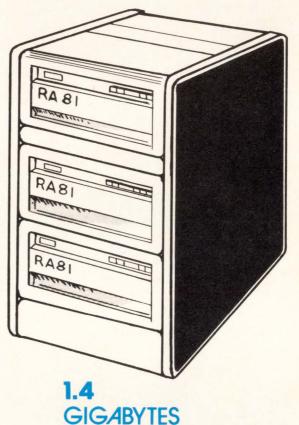
CIRCLE D19 ON READER CARD

DECPROFESSIONALDECPRO

NEW DEC DISKS DEC ANNOUNCES A NEW TECHNOLOGY

By Carl B. Marbach





WINCHESTER

615 MEGABYTES REMOVABLE

When DEC delivered the first disk drive for the PDP-6 (nee PDP-10) computer it was an RPO2; but it wasn't made by DEC. Later models the RPO3 and RPO4 were not DEC either. DEC has bought and resold disk drives from ISS (Sperry), Memorex, Control Data and others. Most of the disks installed are made by other sources, a fact that DEC is about to change.

In the 1960's DEC computers sported Teletype corporation ASR33 and ASR35 teletypes as their interactive devices. At one point when deliveries of teletypes was about 9 months, used ones sold for \$900 while new ones could be ordered for \$600 — but you could have the used ones tomorrow. While DEC deliveries haven't always been terrific ("can you wait two years for your VT100 sir?"), DEC realized that it couldn't be dependent on Teletype for terminals, and they developed the LA30. Although that product was something less than terrific, it shortly spawned the famous LA-36 Dec-Writer that has been with us for 8 or more years and surely belongs in the computer hall of fame.

In the 1970's DEC was dependent on outside (second) sources for most of their disk drives. In 1980 and 1981 most of the large drives sold were either CDC (Control Data) or Memorex. I reported in 1981 that DEC was manufacturing its own drives in the Colorado Springs manufacturing facility and that at least one of the drives was a Winchester type. Taking a firm hand on the market, it appears that DEC is The most complete line of Interface Products for PDP*-11, LSI-11 and VAX* Computers with features you can't get anywhere else

For DEC users... MDB makes the difference!

You *can* have it all! Along with the benefits of your DEC computer, you can get interface products that significantly extend the capability, flexibility and economy of DEC systems. MDB makes more DEC system boards than any independent manufacturer—some with plain vanilla compatibility; others with plain incredible performance boosting features. For example—

- Line printer controllers for every major line printer, with complete self-testing capability and optional RS-422 "long lines."
- Peripheral device controllers for card readers, X-Y plotters, electrostatic printer/plotters and paper tape readers/punches.
- DZ11 compatible multiplexors for LSI-11 and PDP-11 users; some combine RS-232 and current loop or RS-422 with a single board.
- High speed synchronous serial interfaces; one DUP-11 compatible model has all bit and byte protocols even for LSI plus X.25 capability.
- Inter processor links between Unibus computers or between Unibus and Q-bus.

0'0'0

0

• System modules including DMA modules with RS-422, general purpose parallel and digital I/O interfaces, an IEEE 488 bus controller and a programmable real time clock.

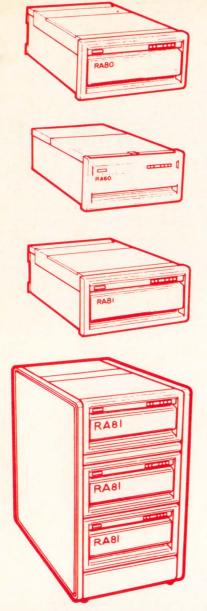
- PROM memory modules, some with an on-board PROM programmer.
- General purpose interface and bus foundation modules.
- LSI-11 based subsystems and systems with capabilities like TU-58 cartridge storage and memory management.
- LSI-11 system boxes with 22-bit addressing and switching power supplies.
- LSI-11 bus repeater and bus switches to allow sharing of memories and peripherals between processors.

All MDB products are available under GSA contract #GS-00C-02851.

Give your DEC system *all* the benefits. Discover the difference MDB interface products can make. *Trademark Digital Equipment Corp.

> **MDB:** 1995 N. Batavia Street Orange, California 92665 714-998-6900 TWX: 910-593-1339

Circle D6 for LSI, D54 for PDP.



now ready to become its own major disk supplier for the rest of the 1980's and beyond. Rumor is that CDC will no longer be supplying disks in quantity to DEC, a blow to CDC's OEM business and sure to produce a glut on the market of 9762 80 MB disks and 9766 300 MB disks. Watch for prices to fall accordingly.

The surprising thing about DEC's recent announcement is the price. For the first time, the independents are going to have a tough time competing on price with DEC. The new drives will offer stiff competition and will certainly stimulate the marketplace to reduce prices and boost performance to keep pace with . . . at last . . . the industry leader.

The new disk subsystems utilize the new DIGITAL STORAGE ARCHITECTURE (DSA) which uses the new UDA50 controller system. The UDA50 is an extremely intelligent controller for the Unibus that will improve I/O performance substantially, make data integrity so good that you may not see ANY errors for the life of your drive, and be flexible enough to allow you to mix and match different drives on one controller.

I/O throughput can be improved by raw power or by

improving the way the data is transferred. The UDA50 optimizes transfers by several methods. The UDA50 stores up to 12 system commands and then manages these commands to provide maximum disk and head efficiency. The UDA50 will order seek requests, handle overlapped seeks (relieving the host processor from this task), and optimize rotational delays by queuing requests for alternate cylinders. Bad blocks will be remapped in a NEARBY area which will improve handling of data which has to be fragmented because of these errors. The UDA50 also contains twelve sectors of RAM allowing it to"buffer" (cache?) the data between the disk and the host processor. All of these are impressive methods for increasing the amount of data that can be transferred between the disk and the processor.

The error handling is so good in the UDA50 that you may never see errors on these disks. Besides an expanded ECC field that allows up to 10 errors in on 512 byte block to be corrected, it also allows entire sectors to be retired if too many ECC errors occur in that area. The ECC code itself is checked by the Error Detecting code (EDC) in the UDA50. All error recovery including, header checking, seek error recovery, data comparisons (if requested), media verification and error reporting as well as the others mentioned above are all performed in the UDA50 itself, releasing the processor from these tasks.

Users and field service personnel will like the fact that multiple drives are connected radially, not serially to the controller. This means that one failure will not cause others to fail, and that the failed drive can be taken out of the circuit without reconfiguring the rest of the drives. The microdiagnostics contained in the drives themselves should diagnose over 80% of all failures.

For pure speed the UDA50 is fast. It can support transfer rates of almost 3MB/second. The massbus and RM05 transfer at 1.2MB/second. I hope I have sufficiently whet your appetites for what exactly these disks drives are. Well, finally herrrreeesss the disk drives:

THE RA80/RM80

DECPROFESSIONALDECPRO

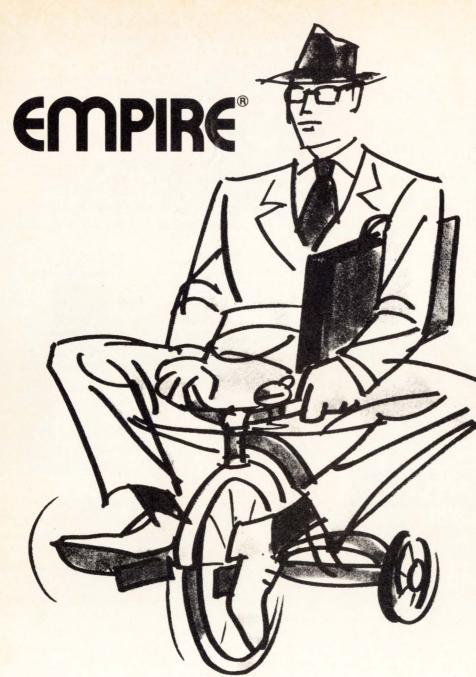
This Disk in either the RM or RA versions (different controllers for differing machines) is 121 MB formatted capacity. It is a fixed media, which is to say a "Winchester type" disk which is likely to be extremely reliable, noted by its basic service charge of \$111/month. The disk drive retails for \$21,000 including controller and is \$14,000 for an add-on. The price on this drive has been lowered recently to match the other products in price/performance.

The RA60

This drive offers 205MB (formatted) in a removablemedia system. Basic price is \$22,000 with add-ons at \$15,000. This drive will be a staple in medium size systems like VAX 11/750's or 11/44's because it is removeable, the backup problem can be solved by having two of them.

The RA81

The big brother of the new technology, this 456MB formatted Winchester drive will find its way onto some of



The one financial modeling system you'll never outgrow.

Other financial modeling systems work fine. To begin with. The problem is that they can't expand as your company's requirements expand. You're stuck with a tricycle in the jet age.

EMPIRE is the most powerful and complete decision support system — designed for your growing needs. EMPIRE understands the language of business and is easy to learn. A beginner builds models after a two-day class. The sophisticated user can take advantage of a modeling language used by major consulting and time-sharing companies to develop their proprietary products.

With EMIPIRE you can examine an unlimited number of scenarios before you commit resources. With EMPIRE you can generate clear, attractive management documents. You can even create color plots and pie charts.

EMPIRE, the decision maker's decision-maker, is available on DEC-10, DEC-20, VAX, VM/CMS, and MVS/TSO systems.



For information, contact: EMPIRE Information Center Route 206 & Orchard Road, CN-8 Princeton, New Jersey 08540 (201) 874-9000



THE CARE/DM SYSTEM

Now You Can Profit From The Lucrative Medical/Dental Market!



Reports and more!

Only CARE offers a total marketing program for DEC Timesharing Firms and Packaged Software Distributors

- Office Management System accomplishes Patient Scheduling, Billing, Insurance Forms, Detailed
- Designed for RSTS/E and VAX Timesharing
 - Basic Plus 2
 - Dasic Plus
 - RMS Files
 - VT100 Full Screen





mark a turning point in DEC's disk history. These are the first large scale disk offerings from DEC that are competitive in every respect and the UDA50 opens a new controller technology. We can expect that the conventional disk subsystems now on DEC computers will lose value quickly when volume deliveries begin on these systems late this year. Opportunities will exist for some bargain hunting in the disk marketplace both before and after these new disk drives begin to appear. The UDA50 may be foretelling the demise of the massbus on the PDP-11/70 in favor of the UNIBUS UDA50. In the Atlanta DECUS meeting there were some ideas expressed that the 11/70 replacement will be a smaller (single board?) version of the 70', repackaged without the massbus, but with either (both?) a UNIBUS or a Q-BUS. Got that friends: a Q-BUS 11/70 with a UNIBUS UDA50! maybe, maybe not.

The disk drive technology is moving fast and DEC seems to be keeping pace, or maybe leading the pack. Next issue we will discuss the performance of these new systems and compare them to the existing disk drives available today. I'll also bet that the competition will be introducing some new hardware to compete with (read: more bang for the buck) these new, exciting products from DEC.

PROFESSIONALDECPROFESSIONALDECPROFESSIONALDECPROFESSIONALDECPROFESSIONALDECPROFESSIONA

The Single Source for Digital Products Service

DEC Module Repair, Exchange or Replacement

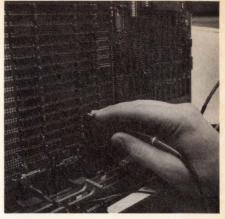
Photos show how we're fully equipped to repair and test DEC,* PDP-11* and TERMINAL MODULES. All modules we repair are 100% inspected.

DIGITAL PRODUCTS REPAIR CENTER

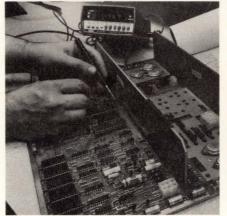
939 Eastwind Drive Westerville, Ohio 43081 614/890-0939













Expert, Fast and Reliable Work

Serving the computer systems market since 1973, we are now troubleshooting, repairing and testing hundreds of modules weekly.

We can turn around a critical repair job in just 24 hours! Tenday service is normal. The modules we return to you are guaranteed to meet or exceed the manufacturer's specifications. And we prove it by submitting an inspection and test report.

For emergency service, 7 days a week, 24 hours a day, call

614/890-0939

*DEC and PDP are registered trademarks of Digital Equipment Corporation.



DO THEY STILL USE CALCULATORS?

By Sterling Crum, WHY Systems Incorporated, Redmond, Washington

Historically, writing has progressed from the drawings of cave men to the quill pen to typewriters to word processors. In counting, we see evolution in terms of using fingers, piles of stones, the abacus, an adding machine, the electronic calculator, and pocket calculators. The latest and most powerful calculating tool is the electronic worksheet.

Most of us have seen or worked with the traditional accounting ledger spreadsheet or 'worksheet'. Frequently there are descriptions down the left column, month designations across the top of each of the columns, and room for a total column on the right. In preparing a budget, each line could represent a budget category and have the monthly budgeted amounts crossing the page. Each line is totaled, and each month's column is totaled. A change to a single number involves erasing a figure, writing in a new one, and adding up the affected row and column. This becomes a tedious process, and requires much perseverance to repeatedly make changes by hand.

Many people have tried computerizing simple calculating functions in a general sort of way. The electronic worksheet is the result of many mancenturies of computer development. An electronic worksheet displays the data entered in rows and columns. Formulas or equations can also be entered onto the worksheet allowing totals, ratios, comparisons and similar requests to be met. By entering new data or by changing existing numbers, you can quickly calculate the result of your actions.

Who uses a worksheet program? Anyone who works with numbers might use a worksheet program. The most obvious uses are in accounting; with a little creative thought you will find productive uses in almost any discipline. Scientists, engineers, managers, and executives all use electronic worksheets. The key to who should use a worksheet is linked to productivity increases. Used appropriately, an electronic worksheet can solve difficult problems quickly. Frequently, a worksheet user will be able to get important answers that were not previously cost effective to obtain. If there is a calculator on the desk, there is justification to consider worksheet applications. The people who need more accurate numbers faster should use an electronic worksheet package.

What is an electronic worksheet used for? The uses of a worksheet program are endless. Some use a worksheet to solve simple or complex equations. Others use it to perform normal calculator functions. Still others use the program as a complete decision support tool. Specific uses are planning, cash flow analysis, budgeting, financial modeling, what-if analysis, making projections, business plans, sales reports, cost estimates, pricing, tax planning, chemical formulation, time management, regression analysis, and structural design and analysis. Whatever uses can be found for a calculator can be enhanced and extended by using an electronic worksheet program.

You use an electronic worksheet program like a calculator. The video display and keyboard are part of your workstation. You don't sit down with an input sheet, draw up the changes, and send them away for processing. When you want to see the effects of some change to your existing data, you call up your stored worksheet, make the changes, and see the results. No one else needs to get into the loop. You are in control of the timing and response to your request. Since the worksheet program is used like a calculator, anyone should be able to use it. A good electronic worksheet program balances ease of training and ease of use. A novice user must be able to use the package with little training. The sophisticated user must not be constantly encumbered by enforced handholding.

Program Implementation

The electronic worksheet was first introduced for use on micro computers. The dedicated computer power and relative low cost could be justified by many managers and executives in meeting their number processing needs. Electronic worksheet programs have been credited with playing a major part in giving credibility to the entire microcomputer marketplace, with more than 300,000 worksheet packages installed to date. A recent survey showed that eighty seven percent of all micro computer systems being purchased for business use included an electronic worksheet package. With a typical micro computer configuration costing between \$4,500 and \$6,500, there is clear evidence that worksheet packages have substantial value to many people.

Most of the worksheet interest has been focused on the stand-alone micro computer world. In the environment where large computer systems and terminals already exist, the situation is not as simple. Most workspaces do not have room for a terminal for data processing and a micro computer system for worksheet use. The computer user does not want to constantly switch from one operating environment to another. Much of the data input to a worksheet already exists on the main computer system, and no one wants to enter and re-enter data in different places. Integration of worksheet usage and other computer use becomes critical when there are existing computer systems in place.

The task of creating an electronic worksheet program for use on the broad spectrum of DEC computers is monumental. Compatibility with existing applications is critical, but every application on each computer system around the world is different. Each user places specific requirements on the program, and expects to obtain specific results. Each DEC operating environment imposes unique limitations on the electronic worksheet development process. WHY Systems Incorporated, located in Redmond, Washington answered this challenge with DIGICALC, the electronic worksheet for DEC computers.

DIGICALC is currently in use by hundreds of users around the world. VAX/VMS and PDP-11 RSTS/E versions of DIGICALC are being used daily by accountants, engineers, bankers and researchers. Executives, managers and professionals have come to depend upon the results of their DIGICALC activities. Users with other DEC systems running RSX, TOPS-10/20, RT11, TSX-Plus and Unix anxiously await similar capabilities on their computers.

In the past, the worksheet concept has been limited in growth by the micro computer equipment it was to run on. DIGICALC was designed exclusively for the larger computers built by the talents and broad experience of a very capable design team, the program was built for growth. As large scale computer users develop new needs, the program can grow to meet them. DIGICALC currently exhibits many of the characteristics of the yet unborn second generation of electronic worksheet programs.

The program is built to use the popular VT-100 terminal family, and makes extensive use of the advanced features available with it. The reverse video feature is used to retain the characteristic graphic display found on the most popular micro computer worksheet program. The scrolling regions are used to allow vertical movement without re-writing major portions of the screen. The numeric keypad is used in word processing style to allow quick and easy acces to the complete command set available in DIGICALC. For the micro computer worksheet user, the standard 80 and wide 132 character per line display formats are a particularly refreshing change.

Integration with existing computer applications is important. A DIGICALC interface allows you to retrieve data from existing data structures and include it in a worksheet. After DIGICALC calculations are completed, the results can be carried forward to some other installation specific data set. Another compatibility issue is worksheet size. Many micro computer users do not have the large data handling requirement that exists on larger computers. DIGICALC's ample worksheet size allows models to be built that have previously been impossible.

Many DIGICALC users have been particularily intrigued with the worksheet consolidation feature available with the package. Using consolidation, departments, divisions, or companies can have like data consolidated into a single master worksheet for overall evaluation. Consolidation introduces a three dimensional aspect to the electronic worksheet. Another feature, indirect worksheet reference, allows totals or other data to be in one worksheet, but to be used wherever necessary. One application of indirect reference allows projected factors like inflation or indexing to be stored in one worksheet, with changes being reflected in all of the associated models.

This allows worksheets to be kept up to date without re-entering data across a series of worksheets.

Extensive data editing features allow formatting of data in a presentation format that is appealing to the user. The display of negative values can be used as an example. Some want a leading minus sign. Other situations call for a trailing minus, the negative value to be enclosed in parentheses, or for a credit symbol to be displayed. In any case, DIGICALC meets the need. Most users of DIGICALC can prepare presentation quality reports that give answers to the questions being asked. Summary

Do they still use calculators? Of

course, but the use of newer technology answers the demands for general calculation capability in a computer assisted environment. The decisions that hinge upon electronic worksheet calculations frequently shape the future of an organization. In many cases, the results supplied by the worksheet can not otherwise be obtained in a cost justifiable or time sensitive manner. For the DEC computer user, the costs of supporting this calculation environment can be spread over a large group of occasional users, and often justifies itself in a single use. The payback comes in the results of the decisions that are made, and how they influence the overall goals set before you.



DECPROFESSIONALDECPRO

WHAT I LEARNED ABOUT RT11 Part 1

By Ed Judge, 30 Autumn Dr., Northampton, MA 01060

This article is about an RT11 system. I, and others considered more knowledgeable than I, consider it to be one of the finest single user operating systems available for small computers. I feel that the TSX-Plus enhancement of RT11 fully rounds out its wonderful complement of single-user capabilities with multi-programming and multi-tasking, making it in most instances as good as RSTS or RSX at much lower cost. More and more utilities that are present in the larger operating systems are appearing in RT11, either as public domain or commercial offerings, and are further enhancing the utility of the system as a whole. We must remember, however, that with new enhancements come new problems.

Until recently, when a certain large operating system was completely dropped from favor, RT11 was the least favored of the DEC operating systems, with a poor interpreted BASIC (DEC BASIC developers — take a look at DTS BASIC and what Data Terminal Systems has done to the modest V2 DEC BASIC), no compiled BASIC, no file system like RMS, no database (except for SIMILE which comes from Za-Tro), no standard ISAM utilities, no conditionals etc. in command files a la VAX, and storage devices are limited to 64K blocks. Hopefully, some or all of these shortcomings will be corrected in later releases.

With all of this, it is obvious why RT users feel that their operating system has been given the short end in development. Indeed, those not familiar with RT might wonder why so many people like it so much. There are three reasons — speed, simplicity, and "user-friendliness". DEC could make it much better; probably the best system available on any computer of any size, but as it stands, along with the freely availably public domain software utilities that mimic the DEC-supported utilities of the larger operating systems, it still seems to be one of the best single user environment available for small systems.

I would like to relate to you some experiences I've had working with RT-11 while installing various pieces of software and hardware. The first is the installation of a tape drive. All you old hands will have probably gone through this before, but if you are a small business user contemplating the same problems that confronted me, it will be more than of interest — it will let you know many of the common problems faced when an upgrade with non-DEC components is attempted. I will also mention some of the more useful public domain software available for enhancing the operation of RT11.

As I was progressing through my working with my new hard-disc system, I had little fear that my new set of 5-MB RL01's had enough storage to last me well into the '90's, and maybe into the next century. After struggling along with a set of floppies for 3 years, even after they had been upgraded from RX01's to RX02's, they seemed to be fast as lightning and as big as the ocean. Wisdom came about 4 months later, when I realized that it is a nice thing to be able to get at a lot of data at one time. Maturity comes in realizing that 5 MB's is not a lot of storage. Changing discs is at best annoying when you are trying to selectively copy data from many discs with the editor (wouldn't it be nice if KED would allow 2 files to be on the screen at once, like many of the "toy" computers running CP/M do). If it were all available at once, I could get obnoxious tasks such as selective backup and recovery of data, file creation from many smaller files, etc., done quickly.

As I pondered this problem, I also noticed that hard disc packs are very expensive for storage of archival data, and because of DEC's special formatting, done only at the factory, they could not be second sourced. One company tried, and was slapped with a lawsuit. DEC needn't have bothered, as the quality control was terrible. Some of my friends had 5 out of 5 arrive and check out with more bad blocks than the replacement table would allow. The New technology locks you in to the New Technologists.

Floppys were a nightmare, as they were very slow (relatively) and could be easily damaged if the door were closed and the floppy not inserted all the way. My floppy drives have some sort of mechanism to prevent this, but it does not always seem to function in cases where the disc pulls back just a little after full insertion, perhaps by sticking to a finger. This situation occurs when the operator gets careless after the 16th or 17th disk insertion, and it does not help one's state of mind. As time goes on you can also accumulate an amazing amount of floppies, even with a DD/DS model, which stores about 1.2 MB of formatted data. One of a set can easily get lost, or can be confused as to which is the latest update if one forgets just once to date the disk. This situation hovered around the brink of disaster altogether too often. Something had to be done.

The Better Way became evident when I began to read about tape drives and how wonderfully they were suited to backup of hard disks. I remember reading about how disks would eventually obviate the need for tape drives, but those writers were where I was when I received my system, not where I was when I had to pay a couple of hundred dollars for a 5 or 10 MB disk pack.

I quickly found what I felt was the best deal for my Q-bus machine, the DILOG DQ-130 controller (a single quad board that supported 800 and 1600 BPI from 12 to 125 ips) and the CIPHER F880, known as the Microstreamer. It was a 25 ips (inches per second) start/stop drive and a 100 ips streamer, and it would assume either mode upon being addressed as "MTO:" (for regular mode) or "MT4:" (for streaming mode). With the DILOG controller, it was completely software transparent to the system. It even ran DEC diagnostics. The folks at both companies were great, and they even had some sort of deal where they sold the whole system for a rather small amount. They may still have it.

Let's compare apples

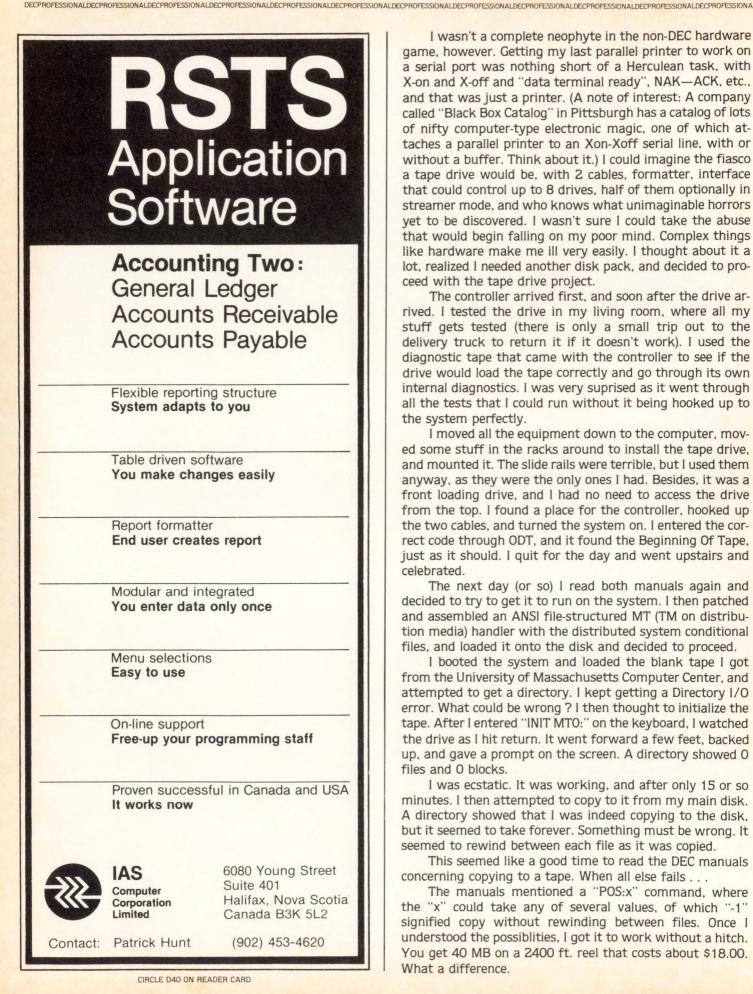
MUX25 Comparison List

FEATURE	SCITEC MUX25	MICOM M824-NF*	MICOM M824
Terminal Activated Configuration from any Terminal, On Line, Password Guarded.	1	X	X
Any Combination of Speed, Parity, Bits, Flow Control, Field Selectable, Non Volatile Store.	1	X	X
All Terminal/CPU Vendor Support Standard.	1	X	X
Per Channel Flow Control In Band/Out of Band.	1	X	X
EIA Controls.	1	X	1
Terminal Activated Diagnostics from any Terminal, Password Guarded.	1	X	X
Terminal Activated Statistics from any Terminal.	1	X	X
Channel Priority Selectable per Channel.	1	X	\$200
Link Speeds to 9600B.	V	V	J
Remote Configuration, Diagnostics and Statistics Password Guarded.	1	X	X
Price (based on US Domestic List).	\$1200	\$1400	\$1850
		*No Frills	

The Scitec MUX25 is the most versatile and cost effective 4 channel data concentrator available today. It combines low end price with high end features in a package unbeatable on today's market. Not only is it the best solution for "first time" point to point users but it is also upwards compatible to the Scitec CPX25 communications processor for use in a sophisticated network environment. Compare its features and you will see why it is the obvious pick of the crop. Write or call your nearest Scitec office for further information on the features of the MUX25 Data Concentrator.

Eastern Region (Head Office): 126 Thames Street, Newport RI. 02840. Tel: (401) 8494353. TIX: 952158. Central Region: 9801 W. Higgins Road, Suite 220, Rosemont III. 66018. Tel: (312) 6924930. TIX: 253751. Western Region: 3401 Investment Blvd, Suite 204, Hayward CA. 94545. Tel: (415) 887 7753. TIX: 172937.





I wasn't a complete neophyte in the non-DEC hardware game, however. Getting my last parallel printer to work on a serial port was nothing short of a Herculean task, with X-on and X-off and "data terminal ready", NAK-ACK, etc., and that was just a printer. (A note of interest: A company called "Black Box Catalog" in Pittsburgh has a catalog of lots of nifty computer-type electronic magic, one of which attaches a parallel printer to an Xon-Xoff serial line, with or without a buffer. Think about it.) I could imagine the fiasco a tape drive would be, with 2 cables, formatter, interface that could control up to 8 drives, half of them optionally in streamer mode, and who knows what unimaginable horrors yet to be discovered. I wasn't sure I could take the abuse that would begin falling on my poor mind. Complex things like hardware make me ill very easily. I thought about it a lot, realized I needed another disk pack, and decided to proceed with the tape drive project.

The controller arrived first, and soon after the drive arrived. I tested the drive in my living room, where all my stuff gets tested (there is only a small trip out to the delivery truck to return it if it doesn't work). I used the diagnostic tape that came with the controller to see if the drive would load the tape correctly and go through its own internal diagnostics. I was very suprised as it went through all the tests that I could run without it being hooked up to the system perfectly.

I moved all the equipment down to the computer, moved some stuff in the racks around to install the tape drive. and mounted it. The slide rails were terrible, but I used them anyway, as they were the only ones I had. Besides, it was a front loading drive, and I had no need to access the drive from the top. I found a place for the controller, hooked up the two cables, and turned the system on. I entered the correct code through ODT, and it found the Beginning Of Tape, just as it should. I quit for the day and went upstairs and celebrated.

The next day (or so) I read both manuals again and decided to try to get it to run on the system. I then patched and assembled an ANSI file-structured MT (TM on distribution media) handler with the distributed system conditional files, and loaded it onto the disk and decided to proceed.

I booted the system and loaded the blank tape I got from the University of Massachusetts Computer Center, and attempted to get a directory. I kept getting a Directory I/O error. What could be wrong ? I then thought to initialize the tape. After I entered "INIT MTO:" on the keyboard, I watched the drive as I hit return. It went forward a few feet, backed up, and gave a prompt on the screen. A directory showed O files and 0 blocks.

I was ecstatic. It was working, and after only 15 or so minutes. I then attempted to copy to it from my main disk. A directory showed that I was indeed copying to the disk. but it seemed to take forever. Something must be wrong. It seemed to rewind between each file as it was copied.

This seemed like a good time to read the DEC manuals concerning copying to a tape. When all else fails . . .

The manuals mentioned a "POS:x" command, where the "x" could take any of several values, of which "-1" signified copy without rewinding between files. Once I understood the possiblities, I got it to work without a hitch. You get 40 MB on a 2400 ft. reel that costs about \$18.00. What a difference.

DECPROFESSIONALDECPROF

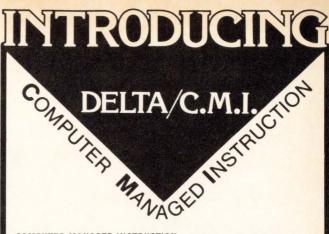
This contrasts sharply with the installation of my double sided 8" FD1160 NEC (= very expensive) floppies, one of which was DOA (dead on arrival) in the box. After I returned the bad one, I hooked up the good one. In just a couple of seconds we had another bad one, as the FACTORY MANUAL had the DC power plug connections backwards. It took a long time to convince the company that it was indeed their fault, and a longer time to get them both back. I actually got back a different set of drives, so I never knew how bad the others were. I still have not received another manual or update, and this drive had been out a while. Why was this mistake still in the manual?? I guess some companies just care more about their clients than others.

Another problem with NEC floppies that seems small until you have clobbered a disk is that it's nearly impossible to put a hardware write-protect switch on it. The US reps took months to tell me that it would take guite a bit to add in the switch, and that I would have to wait several more months while they got a readable set of prints for the controller board from JAPAN! I am still waiting for the information. I feel that I am a reasonable person, but I will never again buy another NEC product if I can help it. Other floppies are better and faster. I was suprised to find that their track to track time was 5 ms instead of the 3 ms you would normally associate with a steel-band stepper-motor drive. I do miss the security of a write-protect switch, and so far I have only wiped out 2 floppies by switching source and destination in the command string, which is the reverse of the CCL syntax.

After using the tape for awhile in standard mode (25 ips), I wanted to get the streaming mode working. At first it would just drop into ODT when "MT4:" was addressed. With the up-to-date patches installed, it merely told me that the device was not there. A definite improvement. I checked the tape drives manual, tried it with the switches set in any reasonable manner, and still had no device there. Then, after reading the manuals again on a tip from a friend, I realized that the file structured ANSI tape handler had to be told how many drives were to be on line in order to construct a table internally. Once I reassembled the handler with MT\$UN = 5 (MTO + 4 = MT5: !!) in the conditional file, all was golden. However, the software has a hard time keeping up with 100 ips. I hope to write a small fast handler that will just dump a tape to a disk in ANSI standard format. At least the machine works.

I now had a system of backing up that seemed foolproof (until it encounters a bigger fool) and was reasonably inexpensive to use. This allowed me to get involved in other projects that would proceed to aggrevate my nervous condition.

I felt that the system would not break me from the cost of backing up daily data, but the clumsiness of the small capacity drives was still there. At the moment I am attempting to convert one of my RL01's to an RL02, using parts from a drive that was damaged in shipment which I purchased from a liquidator. I hope that it is as free from hassle as the tape drive. RL01's seem to be a waste of time, considering their cost, size, power consumption, cost of media per megabyte, and storage capacity. RL02's are not much better. They are twice as good as RL01's, but the disk pack is even more expensive. Both are sturdy, though, and on the Q-bus, you don't have much choice if you want all DEC stuff.



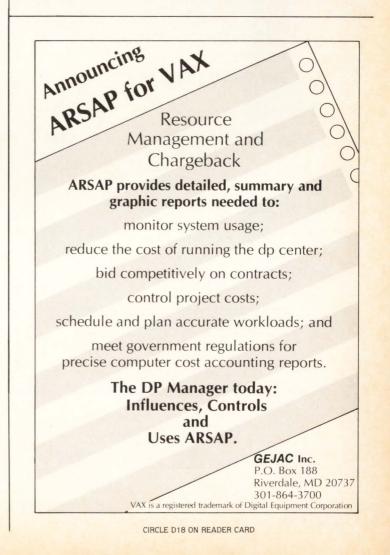
COMPUTER MANAGED INSTRUCTION, a tool for the modern educator

CMI, a powerful tool for the modern educator is now a reality. CMI is a computer program designed to provide computerized instruction, tests and remedial work to students. It adapts to each students ability allowing them to work at their own pace. Students log on and access the information using the EXPLORE function, an easy to use, interactive program. The educator can design multiple learning modules using the flexible CREATE function and monitor each student's performance via the REPORT function. CMI was designed by university faculty and is currently being used in secondary schools, vocational schools and universities.

*For RSTS Users.

To find out how CMI can benefit your institution contact

ELEX The Effective Learning Exchange P.O. Box 14, Medford, New Jersey 08055 609/654-1100 CIRCLE D17 ON READER CARD



DEC

DEC 1200 BAUD PRINTERS

_A120-AA	EIA, KSR, Keyboard Only	51,995
A120-BA	EIA, Keyboard & Keypad, KSR	2,075
_A120-RA	Receive Only	1,795
A180-EA	EIA'Only	1,750

DEC CRT'S

/T101-AA	EIA, Non Upgradeable \$ 995
/T131-AA	w/AVO, PCO, & Screen Editing SAVE
/T100-AA	EIA 1,375
/T132-AA	AVO, Screen Editing 1,450
/T102-AA	
/T100-WA	AVO, Word Processing SAVE

DEC 300 BAUD PRINTERS

LA34-DA	EIA
LA34-AA	EIA w/Forms 875
LA34-RA	EIA, Receive Only
LA38-GA	EIA, KP & Tractor 1,000
LA38-HA	EIA, KP, Tractor & Stand 1,100
LA38-AA	EIA, KP, Forms & Tractor 1,150

CASH PRICES • IN STOCK IMMEDIATE DELIVERY

SCHERER'S MINI COMPUTER MART 6145 Dolan Place Dublin, Ohio 43017

BRAND NEW * WARRANTY * ATD

CIRCLE D20 ON READER CARD

I now felt that I should look into after market drives of higher capacity than allowed by DEC. Three immediately came to the forefront; Priam, Quantum, and the foreign entry Fujitsu. The Fujitsu (a 14" 169 MB unformatted) was available in 2 weeks with a controller that emulated 5 RK07's (28 MB formatted), and it was the fastest and cheapest of the bunch. I asked some friends who knew about these types of drives and was told that they were probably the best available for the price. There was a headper-track option that was available and seemed interesting, but it was \$1500.00 extra and only had .6 MB under the heads. If it were twice that, I would have gotten it to hold not only SWAP.SYS, but also SYSLIB and SYSMAC.

Some American entries were in the wings, but for right now, the Fujitsu was about the best price/performance package available. 169 Megs! This was on-line capacity! Being a little wiser now, I knew that this capacity would last about a year, maybe more. Whatever, it would be a welcome relief that would simplify my life considerably. If DECPRO is interested, I will tell that tale and others in later articles. Up to this date, I had not dropped a disk pack, but it is bound to happen sooner or later. I just hope that it will now be much later.

I've heard that RT11 V5 will have logical subdevices and expandable command language along with other improvements. I have these now, along with other conveniences in V4 with many of the public domain utilities available. There are several magtape utilities that I use often. They usually come with sources so they can be further customized, and are a great deal in software. I wonder how long it will be before V5 becomes reasonably stable. I always goof up patches, and hate having to do them, but they seem to come free with the operating system.

I have mentioned the public domain softwares that make V4 easier to work with. Some of the more useful ones are:

The AR: and XD: subdevice handlers. They make a file look like a random access device. They use standard DEC file format (RT11) and can therefore read device image files ("COPY/DEV/F ILES SOURCE DEST", where DEST is a file on some disk structured device) also. I keep FORTRAN stuff on subdevice FOR:, letters on subdevice LET:, etc.

RTCON which is another handler type program which lets you reassign the console to another port.

UPDATE maintains a commented directory file of the device that it is on.

SYSAVE is a TECO driven copying utility. It will allow you to copy from a larger device (RK, RM) to a smaller device (DX, DY) in any manner DIR can produce a file. It also copies for "best fit" and will alternate between two identical output devices.

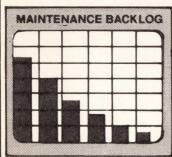
I offer a copying service for these and many more public domain offerings. If they interest you, send a self addressed envelope with 40 cents postage on it, and enclose a dollar to offset the cost of duplicating the directory sheets. I will send back a list of what I have available on floppies, and info on other stuff that I have around. I do this for the small user, who finds DECUS expensive, or who cannot or does not have the time to weed through all the offerings available for those that would be useful to him or his business. Also, many are offered only on tape, and I offer them on a floppy.

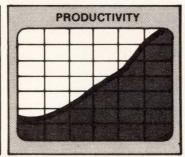
I hope that this was at least a somewhat informative article, and that you have enjoyed reading it,

For maximum COBOL programming productivity... automate with



COBOL program generation and development for DEC* systems TOPS-20/VMS/RSTS-E/RSX-11M/IAS





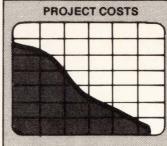
SB-5 lets your design and programming talent concentrate on the creative aspects of application software development.

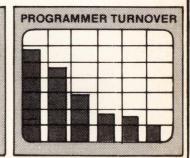
SB-5 automates four major elements of program development: designing...documentation...maintenance.

SB-5 provides these major capabilities:

- On-line entry of program descriptions
- Design previews (screens, reports, etc.)
- COBOL program generation
- Automatic program documentation

plus other valuable programming-support features.





- **SB-5** writes 100% source COBOL code...produces 100% of the system, program and operating documentation.
- **SB-5** makes programming easier, faster, more consistent, and more accurate.
- SB-5 automatically generates accurate projectquality and project-status management reports.

The bottom line: SB-5 can increase programming productivity up to 20:1 while reducing programming and maintenance costs substantially.

For more information, literature, or a demonstration, write or phone...

BUSINESS CONTROLS CORPORATION

507 Boulevard, Elmwood Park, N.J. 07407 • 800/526-0161 (except N.J.) • 201/791-7661

Advancing automated programming technology since 1971

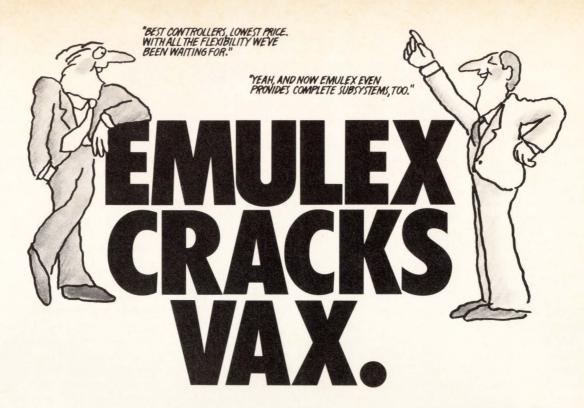
* DEC, TOPS-20, VMS, RSTS-E, RSX-11M, and IAS are trademarks of Digital Equipment Corporation.

PAGE 22

A DIBOL SUBROUTINE

By Chuck Evans, Data Processing Manager, Times Publishing Co., Erie, PA 16534

;DISCLAIMER:	RECORD ;THESE ARE MISC. WORK AREAS AND COUNTERS.
THIS SUBROUTINE WILL ACCEPT AN EIGHT-DIGIT DOLLARS-AND-CENTS AMOUNT AND	NEW, D3
;RETURN THAT AMOUNT IN ENGLISH. IT WILL HANDLE AMOUNTS LESS THAN ONE ;MILLION DOLLARS, AND CAN BE USED FOR CHECK PROTECTION.	KSP, D1 WRK, A110
; IT HAS NO GUARANTEES, EXPRESS OR IMPLIED, AND IT IS PROVIDED IN THE SHARING	PROC
<pre>SPIRIT OF DECUS. ANYONE MAY USE IT, WITH THE FOLLOWING RESTRICTIONS: - THIS DISCLAIMER MUST BE INCLUDED,</pre>	AWRK=X ; MOVE THE INCOMING DECIMAL AMOUNT TO THE WORK AREA.
; - IT MAY BE GIVEN TO ANYONE ELSE, - IT IS NOT TO BE SOLD !!	WRDNO, BLD= ;CLEAR THE BUILD AREA WRK= ;CLEAR THE OUTGOING WORK AREA
- 11 15 WOI TO BE SOLD 11	The Joban ind Coloring work and
; CHUCK EVANS DIRECTOR OF DATA PROCESSING TIMES PUBLISHING CO ERIE, PA.	;NOW, WE START BUILDING THE NUMBER OF THOUSANDS THAT ARE IN THE NUMBER.
START	IF(AWRK(1,3).NE.000)BL3A=' THOUSAND '
SUBROUTINE WRDBX X, D ;INCOMING ARGUMENT	IF(AM1.EQ.0)GOTO WD2 BL1=UNITS(AM1)
P, A ;OUTGOING, OR RETURNED ARGUMENT	BL1A=' HUNDRED ' WD2, IF(AM2.EQ.0)GOTO WD3
RECORD ;BELOW ARE OUR UNITS DESCRIPTIONS: , A9,'ONE '	IF(AM2.GT.1)GOTO WD2A
, A9,'TWO ' , A9,'THREE '	BL2=UNITS(AM1A) GOTO WD4
, A9, 'FOUR '	WD2A, BL2=TENS(AM2)
, A9,'FIVE ' , A9,'SIX '	WD3, IF(AM3.EQ.0)GOTO WD4 BL3=UNITS(AM3)
, A9, 'SEVEN '	
, A9,'EIGHT ' , A9,'NINE '	; NOW WE WORK ON THE HUNDREDS: WD4, IF(AM4.EQ.0)GOTO WD5
, A9, 'TEN '	BL4=UNITS(AM4)
, A9,'ELEVEN ' , A9,'TWELVE '	BL4A=' HUNDRED '
, A9, 'THIRTEEN ' , A9, 'FOURTEEN '	- THEN THE REPAIR TE ANY
, A9,'FIFTEEN '	; THEN THE "TENS", IF ANY WD5, IF(AM5.EQ.0)GOTO WD6
, A9,'SIXTEEN ' , A9,'SEVENTEEN'	IF(AM5.GT.1)GOTO WD5A. ; THE "TEENS" ARE HANDLED HERE:
, A9, 'EIGHTEEN '	BL5=UNITS(AM2A)
, A9,'NINETEEN ' RECORD,X	GOTO WCTS WD5A, BL5=TENS(AM5)
UNITS, 19A9 ; THIS RE-DEFINES THE UNITS AREA, SO THAT ; THEY CAN BE CALLED BY NUMBER.	
, THEI OWN DE CALLED DI NOLDAN	; THEN THE UNITS:
RECORD ; THIS DOES THE SAME THING WITH "TENS" DESCRIPTIONS.	WD6, IF(AM6.EQ.0)GOTO WCTS BL6=UNITS(AM6)
, A7,'TEN '	DEC-ONIS(MO)
, A7,'TWENTY ' , A7,'THIRTY '	; AND FINALLY, THE CENTS:
, A7,'FORTY ' , A7,'FIFTY '	WCTS, BL6A=' AND '
, A7,'SIXTY '	BL7=CENTS BL8='/100 DOLLARS.'
, A7,'SEVENTY' , A7,'EIGHTY '	
, A7, 'NINETY ' RECORD, X	; NOW THAT OUR OUTPUT HAS BEEN BUILT INTO WORK AREA, WE REMOVE EXTRA SPACES:
TENS, 9A7 ; AND THIS REDEFINES THE TENS DESCRIPTIONS.	KSP= OLD=
	NEW=1 WDLP, INCR OLD
RECORD BLD ; THIS IS A WORKING AREA, INTO WHICH THE RETURNED	IF(BLD(OLD,OLD).EQ.' '.AND.KSP.EQ.1)GOTO WDLP
; ARGUMENT IS BUILT. BL1, A9 ;THE QUANTITY OF HUNDREDS OF THOUSANDS GOES IN HERE, AND	WRK(NEW,NEW)=BLD(OLD,OLD) IF(BLD(OLD,OLD).EQ.'.')GOTO FINIS
BL1A, A9 ;THE WORD "HUNDRED" GOES IN HERE, IF NEEDED. BL2, A9 ;IF THERE ARE TENS OF HUNDREDS, THEY GO IN HERE.	IF(BLD(OLD,OLD).EQ.' ')KSP=1 IF(BLD(OLD,OLD).NE.' ')KSP=0
, A1	INCR NEW
BL3, A9 ; IF THERE ARE UNITS OF HUNDREDS, THEY GO IN HERE. BL3A, A10 ; THE WORD "THOUSAND" GOES HERE, IF NEEDED.	GOTO WDLP
BL4, A9 ;THE QUANTITY OF HUNDREDS GOES IN HERE, AND	; AND AFTER ALL THE SMOKE HAS CLEARED, WE RETURN THE OUTGOING ARGUMENT
BL4A, A9 ;THE WORD "HUNDRED" GOES IN HERE, IF NEEDED. BL5, A9 ;"TENS" GO IN HERE	; TO THE CALLING PROGRAM. FINIS, P=WRK
, A1 BL6, A9 ;AND UNITS GO IN HERE.	RETURN
BL6A, A5 ;THE WORD "AND" GOES HERE	;
BL7, D2 ;TWO-DIGIT CENTS AMOUNT GOES HERE BL8, A13 ;"/100 DOLLARS." GOES HERE	; HERE IS A SIMPLE TEST PROGRAM, SO THAT YOU CAN SEE HOW TO PASS THE
RECORD	; ARGUMENTS, AND SO YOU CAN SEE THE PROGRAM WORK ON YOUR SCREEN.
RECORD, X	
AM1, D1 ;THIS BUSINESS REDEFINES THE DECIMAL WORK AREA. AM2, D1	RECORD PRT, A120
AM3, D1	ANS, A8
AM4, D1 AM5, D1	DEC, D8 PROC
AM6, D1 CENTS, D2	OPEN(8,0,'KB:')
RECORD, X	READS(8, ANS)
, D1 AM1A, D2	IF(ANS(1,4).EQ.'STOP')STOP DEC=ANS
, D1	XCALL WRDBX(DEC, PRT)
AM2A, D2 , D2	WRITES(8, PRT) GOTO LOOP
	END
	-



Emulex introduces the SC750 disk controller. And suddenly your VAX-11/750 disk drive options are wide open. It's the only DEC alternative.

You can mix brands. Mix storage capacities. Mix media types. All working off a single controller.

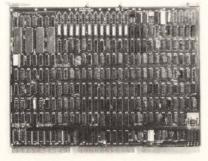
Better yet, the SC750 gives you all of this flexibility along with maximum system performance and media compatibility.

Our new controller is fully embedded and designed expressly for the VAX-11/750 CMI bus structure. Yet it costs thousands less than DEC and other "boat anchor" designs. This software transparent controller emulates the DEC RH750 Massbus adapter with attached RM03, RM05, RM80 or RP06 drives.

And all of the great features of the new SC750, like all Emulex controllers, are available as complete disk subsystems, pretested and installed by Emulex.

Read the facts below, then get the whole story on our total commitment to the VAX marketplace by writing or calling Emulex Corp., 2001 Deere Ave., Santa Ana, CA 92705. (714) 557-7580. TWX 910-595-2521. Outside California, call toll-free, (800) 854-7112.

For immediate off-the-shelf delivery, call our distributor: First Computer Corporation, 645 Blackhawk Dr., Westmont, IL 60559; (312) 920-1050. In Europe: Emulex Corp., 10th floor, Cory House, The Ring, Bracknell, Berkshire, England. Telephone: 0344-84234; Telex 851-849781.



SC750. THE ONLY ALTERNATIVE.

A single-board, embedded disk controller that interfaces directly to the VAX CMI bus. Functionally identical to the DEC RH750 with its disk adapters. Mix and match drive capacities from 80 to 675 MBytes. Serial data rates to 15 MHz to accommodate the new class of high-density drives. Features automatic self-test, intelligent buffer management, media compatibility, software transparency, low cost and single-board reliability. Available now.



Complete VAX-11 disk subsystems now available.

MEGABYTE MEMORY NOW AVAILABLE FOR OLDER PDP-11s

By Ken Pruyn, KONELAR, Corp., Box 267, Bedford, Mass. 01730

New self-managed memory and virtual memory linker from KONELAR lets you run megabyte programs on existing PDP-11s that do not have DEC memory management available, at very high speed, without the problems of overlay region conflict, and with an increase in available workspace. This memory management system supports up to 64 megabytes of memory.

Until now, users of older PDP-11s have been constrained by the lack of memory management when running large programs.

One solution to this problem is to use disk overlays. While overlays allow large programs to run in the small memory space available, overlays are really not an attractive solution. Even with a very fast disk it takes a lot of time to load and reload overlays. Performance suffers.

An external device that uses bulk, semi-conductor memory to emulate a disk speeds things up quite a bit by eliminating the positional and rotational latency delays. But loading 4000 words from a disk emulator still requires 4000 bus transactions and memory accesses, so the disadvantage of slow data transfer still exists.

Besides the performance penalty that goes with using overlays, setting up the overlay structure itself is quite tedious. You must insure that the assignment of subroutines to overlay regions satisfies the highly restrictive CALL and RETURN rules. Resolving overlay conflicts frequently requires creating many overlay regions, so that, even with overlays, it is still very difficult to fit the overlay regions into the available address space.

A HARDWARE AND SOFTWARE SOLUTION

KONELAR's solution is ideal for those of you with PDP-11 /04s and /05s running RT-11 who wish to run very large programs with fast access to large program and data space.

When you cannot add memory management to the processor, the alternative is to add the memory management capability to the memory itself. KONELAR memory includes the memory and the memory management unit on a single Hex board. It fits into any Hex SPC slot and comes in two sizes: one-quarter megabyte and one megabyte. You can increase memory by adding more boards for a total of 64 megabytes.

The address space is divided into pages of 4K bytes each. The memory management unit has a page address register for each page. Managing the memory involves moving an extended physical memory address into each page address register, thereby providing a 26 bit physical address. To remap a 4K byte page, you need only move a new extended address into the page address register. This method is both simple and fast.

Memory management hardware alone is, of course, not enough. The software side of the solution comes in two parts: one for programs (VMLINK) and one for the data (VM.SYS).

DISK ACCESS DELAY AND TRANSFER TIME ELIMINATED

JULY 1982

Large programs are handled by a virtual memory overlay scheme implemented by the KONELAR linking loader, VMLINK. VMLINK is used instead of the standard RT-11 LINK program.

VMLINK aligns the overlay regions with physical memory block boundaries and links into the user program a runtime memory management control routine. At the first CALL to an overlay routine, the memory management initialization routine completes loading the entire program into physical blocks in extended memory. During the running of the program, activating new segments requires no data transfer at all. Mapping in new segments is done by the memory management control routine simply by writing the appropriate memory address extension into the corresponding page address register. One MOV instruction maps each 2K words in the program segment. Not only is disk access delay time eliminated, but the transfer time is also eliminated. It is fast.

NO MORE OVERLAY CONFLICT

High speed access of large programs is good news, but it is by no means the best part of using VMLINK. The possibility of overlay conflict is also eliminated. The run-time memory management control routine undoes on the RETURN what it did on the CALL. Any routine can CALL any other routine without regard to the segment or region it might be located in. Wrestling with overlay conflicts, with their frustrations and potential for well hidden and catastrophic bugs, is a thing of the past. One overlay region is all you need. You can use more if you like, but it isn't necessary.

AN INCREASE IN WORKSPACE

There is yet another benefit as well. When you eliminate extra overlay regions, all of the space that was used by the extra regions can be added to the working data space. Commonly used subroutines can be moved out of the root, making it smaller and freeing up additional space for data. In a typical overlay situation, the data space was usually squeezed to a bare minimum, so that even a small, absolute gain represents a large, incremental gain. The newly increased space may be several times as large as that available originally.

Fast access to data is supported in another way too. VM.SYS is a psuedo device handler that treats a portion of the extended memory as a file structured device. You can read and write data files in high memory using the normal RT-11 I/O operations. You can specify how much of the extended memory is to be used as file space, and how much is to be used for program segments. The memory management system supports up to 64 megabytes of memory providing plenty of room for both.

MEMORY ONLY SYSTEM OPERATION

Another performance gain can be achieved by using the

AC USERS Test your word processing I.Q.

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

THE CHALLENGE:

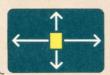
Almost any word processing software package will have such features as menus, editing, spelling error detection, list processing, cut and paste, automatic word wrap and automatic pagination. . .

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

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

THE QUESTIONS:

EDITING



Which kind of editing operation is quickest to exe-

cute 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?



- a) One easy stroke with no codes?
- b) Two or more with complex w-p codes?
- c) Three or more?

LEXIBILITY

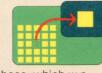
As the business manager of your

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 infor-



mation guickly 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?

G COMPAT-

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?

MATH

Your company has a number of financial applica-



tions 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.

PUT OUR SOFTWARE TO THE TEST Call for a demonstration by modem in your office today. (617) 358-7782 (617) 443-6376



EEC SYSTEMS INC. Dept. TDP, 286 Boston Post Road, Wayland, MA 01778

LEX-11 is available under the following operating systems: RT-11, TSX-Plus, RSX-11M, RSTS/E, IAS, UNIX (both PDP-11 and VAX), IDRIS, VMS. . . and it works in exactly the same way, with the same features for all operating systems, with your existing peripheral equipment.

DECPROFESSIONALDECPRO

VM device as your system device. All of your system transactions will then be memory to memory transfers with very fast response. You can even configure a high performance system without using an expensive, high speed disk at all.

To use the VM.SYS handler as your system device, you must first start your system from some nonvolatile device. You can start up from a slow, inexpensive device (e.g., floppy disk or DECtape). Then the following simple start-up command file initializes extended memory as your system device and starts the system running:

.INITIALIZE/NOQUERY VM: .COPY/SYSTEM SY: VM: .COPY/BOOT SY:RT11SJ.SYS VM: .BOOT VM:

IMPROVED EQUIPMENT RELIABILITY

By replacing the functions of the system disk, a data disk, or an overlay disk, or especially all three, with the equivalent functionality in extended memory, it is possible to eliminate an enormous amount of disk accessing. Fewer disk accesses mean less wear and tear on the disk itself, and greatly reduced vibration for the entire system, resulting in longer life and better system reliability.

PDP-11s THAT ALREADY HAVE DEC MEMORY MANAGEMENT

PDP-11s with DEC memory management available can do most of these same things with some limitations. There are significant differences in both the hardware and the software.

There are two major hardware differences between DEC memory management and KONELAR memory management. DEC memory management divides the address space into pages of 4K words, KONELAR uses pages of 2K words. Less space is lost in allocating memory areas when smaller pages are used. Many of the PDP-11s with memory management already in the field have an absolute upper limit of 256K bytes of memory available. That limit should be no problem for any but the largest programs. But if the extended memory area is to be used for high speed data storage as well, 256K bytes less the space used by programs is really a very small file area, less than a single density floppy disk.

RT-11 Version 4 introduced a virtual memory overlay capability in the linker. Use of DEC virtual memory overlays requires using the XM version of the monitor. The resident portion of the XM monitor is larger than the other monitors, so you are faced with a substantial reduction in the space available for the user program.

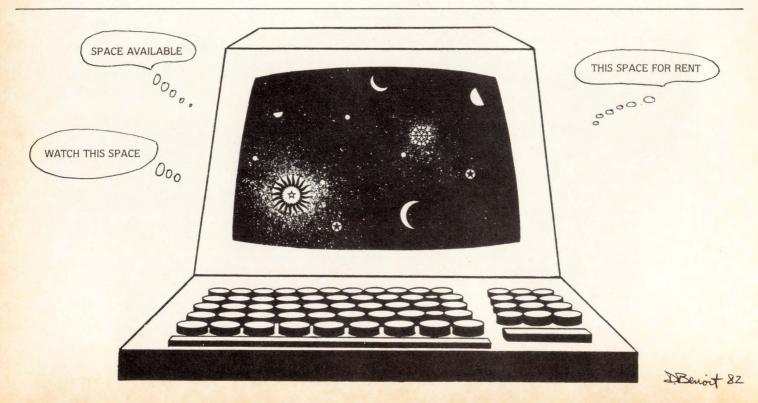
The DEC virtual memory overlay system does not remove the restrictions on the placement of subroutines in regions; all of the old overlay conflict problems still exist.

Because the DEC memory pages are 4K words in size, the root segment, each of the overlay regions, and the resident monitor area must all be allocated in multiples of 4K words. The lost space can be substantial. For example, a program segment which actually uses 5K words requires an overlay region of 8K words when using DEC memory management, but only requires 6K words using KONELAR memory management.

The DEC extended memory psuedo device handler is not supported by the extended memory monitor so you cannot use extended memory for both program segments and file structured data at the same time.

KONELAR MEMORY FOR THE LSI-11

KONELAR self-managed memory is also available for the LSI-11 family. The memory management unit is contained on one dual-height board. Memory boards are added in one-quarter megabyte increments, also on dual height boards. Ribbon cables interconnect the memory management board with the memory boards. VMLINK and VM.SYS may then be used by your software.



DIGCALCTM The total electronic spread sheet for DEC... computer systems.



WHY SYSTEMS has developed the "big machine" software package for Executives, Accountants and Professionals who need their numbers fast and accurate. DIGICALC[®] is designed exclusively for DEC equipment, with an amazing range of applications and one of the finest built-in automatic training procedures on the market. Prepare everything from budgets to multi-year forecasts, change one value and DIGICALC will re-compute all of your results and give you a hardcopy too. The tabular worksheet display on the wide screen can be as simple or complex as you wish and has the capability to call on numerous mathematical functions. For an amazing display of DIGICALC's ease of operation and virtually limitless capabilities call WHY SYSTEMS. Runs on RSTS/E and VMS.

- ON-LINE HELP AND SELF TEACHING MODE
- TEN KEY NUMERIC DATA ENTRY
- EXTERNAL FILE INTERFACE
 WORKSHEET
- CONSOLIDATION • "BOARDROOM QUALITY"
- REPORTS • EXTENSIVE MATH FUNCTIONS ALGEBRAIC LOGICAL FUNCTIONAL
- SCIENTIFIC USER DEFINED FUNCTIONS •SAVES AND RECALLS
- WORKSHEETS.



CALL TODAY (206)881-2331 FOR FREE BROCHURE AND DIAL-UP DEMONSTRATION

CIRCLE D23 ON READER CARD

A TIMESHARING COBOL FOR SMALL PDP-11s

By Rick Jamieson Ph.D., Systems Eleven, Australia and Eric S. Dickman M.S., M.B.A., President, EEC Systems, Wayland, Massachusetts

INTRODUCTION

RJ-11 COBOL is a compiler written in Macro-11 and runs under RT-11, TSX and RSTS/E operating systems for the LSI-11 and PDP-11 series of computers. A timesharing system has recently been implemented to run programs compiled by RJ-11 COBOL. Both the timesharing software and the COBOL programs are memory-resident, and the system responds quickly even on floppy-disk hardware.

This timesharing system fills a real need in the marketplace. For instance small commercial users often require more than one terminal, but do not need the power of a general-purpose timesharing system. Also, systems based on floppy-disk hardware often have a requirement for multiple terminals, but this has not been practical with timesharing systems available to date.

The timesharing system implemented with RJ-11 Cobol has been found to be efficient and fast even on floppy-disk hardware. Although only COBOL programs can be run, it is well-suited to the specialized requirements of small commercial systems.

OVERVIEW

RJ-11 COBOL is comprised of a compiler and a run-time system. That compiler produces directly in one pass, object code consisting of links to subroutines in the run-time system. The object code is very concise — for example a 1000-line COBOL program with a moderate data area would result in object code of only about 12,000 bytes. The run-time system is also moderate in size, being only about 8K words and having no overlays.

It seemed feasible therefore to design a system based on a machine with 28 or 30K words of memory which would accomodate the following modules all within the available memory:

RT-11 resident monitor

RT-11 User Service Routine

RT-11 device handlers

Up to 6 user programs

Terminal I/O routines.

In addition, a small routine in the run-time system is used to load programs, and to unload them by re-positioning the remaining programs.

OBJECT CODE DESCRIPTION

The COBOL compiler produces "object code" consisting of the following elements:

- a data area as defined by the DATA DIVISION of the program
- links to run-time subroutines, together with associated information, defined in the PROCEDURE DIVI-SION
- a list of item-descriptions which specify the attributes of the data-items and literals
- the edited PICTUREs
- the file-names referred to in the program
- details of each file

At the front of each compiled program is a list of base addresses for each of the above elements. All other addresses are stored as relative addresses, for example, a data address is stored as an address relative to the beginning of data; a procedure address (e.g., in a GO TO statement) is stored as an address relative to the beginning of the procedure code.

It was possible therefore for the timesharing system to load programs consecutively in memory, and to adjust the table of base addresses to reflect the true position of each program. Having done this, the run-time system could operate largely unchanged from the single-user version.

TERMINAL ROUTINES

DECPROFESSIONALDECPRO

The multi-terminal support system of RT-11 was not used, since it was desired to interface the program loading functions and the COBOL run-time system closely with the terminal routines. Instead, a simple but effective set of routines was designed to handle all keyboard and terminal printing functions.

In many ways these routines were very standard. Keyboard and printer ring-buffers were used for each terminal. The common routines were entered from a set of consecutive entry points for each terminal—so that each routine could determine the terminal number and then store and retrieve data using relevant indexed addressing modes.

A full type-ahead facility was achieved by enabling the keyboard interrupts continuously.

However, echoing of input was not done until a program requested keyboard input, so that program-generated printing appears on the terminal in the correct sequence, and echoing can be inhibited if requested by the program.

The keyboard input routine processes a full line before sending it to the requesting program, so that swapping of processor control between programs is minimized. The keyboard routine also processes tabs, and control and delete characters.

TIMESHARING SYSTEM

It was found to be undesirable to time-slice the execution of programs running concurrently, since the run-time system had not been written to be re-entrant, and a large impure area was used by the arithmetic routines.

Instead, each COBOL program was allowed to run until a certain number of COBOL verbs had been processed, before control was switched to another program. In this way processing of most (except by device interrupt routines, which do not interfere with hardware or program registers).

All input-output is performed asynchronously — that is, a request is made to an RT-11 handler to initiate an I/O transfer, and then control returns to the run-time system while the transfer is carried out by the hardware or interrupt routines.

Whenever an I/O transfer is initiated in this way, the running program is temporarily suspended and control passed to other programs awaiting execution. There are thus two ways in which a program can be temporarily suspended:

- after initiation of an I/O transfer
- after execution of a set number (e.g., ten) of COBOL verbs which do not involve I/O transfers.

When a program is suspended, the system saves the hardware registers RO to R5 any information on the processor stack (including return addresses for subroutines), and certain program memory registers. The system then enters a loop which tests to see whether each terminal in turn is waiting for its associated program to be resumed. A program may request resumption under conditions such as:

- completion of keyboard input

- emptying of a printer buffer if it was previously full

DECPROFESSIONALDECPROFESSIONALDECPROFESSIONALDECPROFESSIONALDECPROFESSIONALDECPROFESSIO

- completion of an I/O transfer
- after suspension due to the set number of verbs having been processed

Changing control between two programs has been found to take about 1 msec on an 11/03. COBOL verbs take typically 0.5 msec to execute. So the timesharing system is extremely fast, and with three terminals operating it has been found that, because of processor overlap with I/O transfers, each terminal can respond almost as quickly as if there were only the one terminal on the system.

A full type-ahead facility was achieved by enabling the keyboard interrupts continously.

SYSTEM FEATURES

Several new features were included in the timesharing system:

File-Locking was implemented using the OPEN LOCKED statement to avoid concurrent updating of a record by two terminals and to provide necessary control over file-enlarging and sorting operations.

The CURRENT-DATE Field was kept separate for each terminal, so that different terminals could operate with different effective dates if required.

A TERMINAL-NO Field was added to allow a program to determine the current terminal number.

A READ-BLOCK Verb was added which specifies a relative block number for a file, thus allowing COPY and DUMP programs to be written in COBOL.

Features previously developed for the single-terminal system were also retained in the timesharing system. Output from the common COBOL compiler can be run either on the single-terminal or timesharing system, and can utilize features such as:

File-access Methods: Sequential, relative, indexed and dynamic.

Record Organization: Fixed or variable-length.

File Organization: Blocked or unblocked. Records in blocked files do not overlap physical disk block boundaries. Such file organization is required for the indexed-sequential system and for the SORT verb.

DEBUG Mode allows breaking of a program at a specified location, and inspection of data location.

File-Maintenance Utility Programs including CREATE, UPDATE and LIST can be used to create files, write, change or delete records, and list the contents of records. These programs utilize a system "file-specification" file, which stores the names and attributes of files and fields within records.

DISPLAY and ACCEPT Options allow cursor control and flexible layout of documents.

Links to MACRO Routines may be made by writing routines in the form of RT-11 handlers.

ANSI 74 compatibility is achieved with full implementation of the STRING, UNSTRING and INSPECT verbs.

SUMMARY

The timesharing system described here runs multiple COBOL programs without disk swapping and is unique in that it operates with floppy-disk hardware.

It should prove to be a valuable addition to the software available for small commercial systems.

Note: Part of this article was presented as a paper by R. Jamieson to a meeting in Australia, August 1981.

RJ-11 Cobol is distributed in the USA by EEC Systems, Wayland, Massachusetts.

For more information on RJ-11 Cobol contact: Eric S. Dickman, EEC Systems, 286 Boston Post Road, Wayland, MA. 01778, (617) 358-7782,





CIRCLE D26 ON READER CARD

THE BRIDGE

By Deryk Van Brunt and Julian Henkin Virtual Microsystems, Inc. Berkeley, CA 94704

CP/M*, Control Program for Microcomputers, is a device-independent operating system authored in 1977 by Gary Kildall of Digital Research. During the last five years, CP/M* has evolved into the standard operating system for microcomputers.

The fantastic growth of the microcomputer industry has been largely dependent on the de facto adoption of a common operating system. With a growth rate of just under twenty-five percent per year, the juvenile industry is already twenty percent as large as the well-established minicomputer industry. With an installed 500,000 microcomputers, the CP/M* marketplace becomes a very tempting target for the authors of applications programs. The difference in market size between the CP/M* world and the world of minicomputers has permitted CP/M* authors to charge between 10 and 50 times less for their software than their counterparts writing for the minicomputer marketplace. The availability of inexpensive software has further stimulated microcomputer manufacturers and users to employ the CP/M^{*} operating system, thus perpetuating the existing CP/M* standard.

Since microcomputers, or personal computers, are commonly operated by those with little or no technical computer knowledge, CP/M* software, as a rule, is designed to be much more user-friendly than minicomputer software. CP/M* programs are almost always less expensive to purchase than functionally equivalent minicomputer programs, and frequently are less expensive to operate, due to the reduced training costs.

The large, heterogeneous CP/M* market permits CP/M^{*} authors to profitably develop programs for very specific applications. Consequently, over 1000 application software packages are available to CP/M users. This personal, inexpensive, and creative software is a great advantage to the CP/M* user.

Documentation for CP/M* application software is generally much more useful than the documentation developed for its minicomputer counterparts. In general, CP/M* documentation benefits from extensive field testing. For example, the documentation for SuperCalc, a CP/M* application software, is typeset, printed on high quality paper, includes a tutorial section and removable reference card and is clearer than many of the more expensive non-CP/M counterparts, such as DigiCalc.

Until now, CP/M* application packages could only be used on microcomputers. Minicomputer users have been unable to tap this reservoir of relatively cheap, high quality software, even though some of these packages clearly address their needs. To carry the example through, SuperCalc retails for \$295 and has many of the same capabilities as DigiCalc which retails for \$10,000 for VAX.

A virtual microcomputer, defined as a task running on a minicomputer which provides a simulation of the CP/M* environment, has many benefits. In addition to permitting the minicomputer to use CP/M* software, the virtual microcomputer would have access to the minicomputer's large capacity system disks, fast line printers, telecommunication subsystems and all other superior peripherals. While maintaining its microcomputer capability, the virtual microcomputer can retrieve information from any minicomputer databases. Thus all the existing terminals, now functioning as microcomputers, are on line and networked, in contrast to a series of dedicated microcomputers. Some further advantages of the virtual microcomputer are realized when it is used in conjunction with an actual microcomputer. When used in this manner, the dedicated microcomputer can function off line, conserving the minicomputer's CPU time. The program results can then be transferred to the minicomputer and shared with the users of the virtual microcomputers.

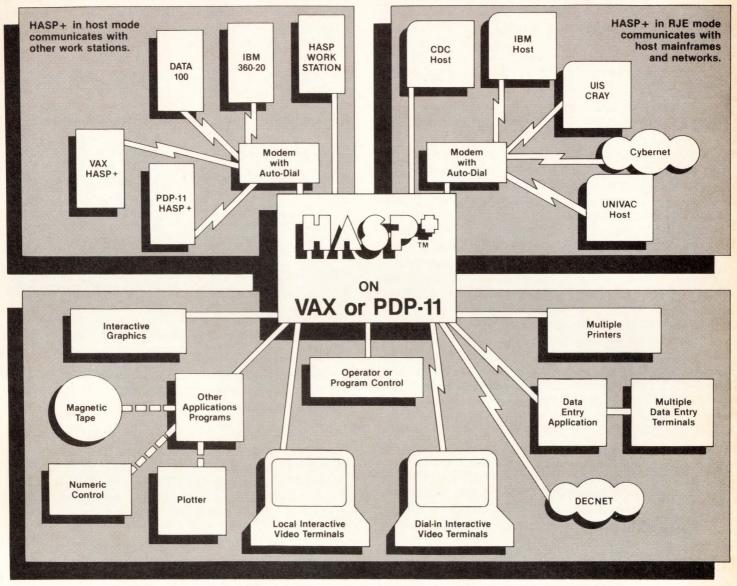
In recent years the price of computer hardware has declined rapidly, while the the performance of hardware per unit cost has increased dramatically. These welcome improvements in hardware performance have only further increased the importance of developing user-friendly and flexible software. The cost of software development, however, continues to rise, and there has been, unfortunately, little improvement in programmer productivity. Current trends indicate that as the cost of software increases with respect to hardware, the incentive to provide emulation capability also increases. Many operating systems already have built-in emulators, such as VMS which includes an RSX emulator. A logical projection of this trend would be that end users can expect to see some standardization among computer operating systems in the years to come.

In mid-1981, Berkeley Systems Works (BSW), a speech synthesis research company, developed a need to use a project planning and critical path program. Project planning software for minicomputers tends to cost more than \$15,000 per system. Milestone, however, a CP/M* program costing less than \$300, fit their needs except that it was only available under CP/M*. Unfortunately, BSW wanted a system which was integrated with their other minicomputer-based operations, and they were not about to trade the convenience of reliable peripherals, remote access and multi-use capability for a microcomputer. Virtual Microsystems Incorporated (VMI), was created to develop and market such a CP/M* emulator.

Of the many possible design alternatives available to VMI, it was decided that the Bridge, the name chosen for the program, would simulate an 8080 on a PDP-11 or VAX: one could then run the desired program under the

·CP/M is a registered trademark of Digital Research, Inc.

HASP+ makes communications a snap for VAX and PDP-11 users without busting your budget.



HASP+ TODAY'S MOST ADVANCED STAGE OF BI-SYNC COMMUNICATIONS

HASP+ first-time users are testing within hours and implementing complex applications in just a few days. Datanex developed HASP+ as a generalized Bi-Sync multileaving workstation program for VAX and PDP-11 computers. It allows economical communications with IBM, CDC, and other mainframes and networks. Installed as a system utility on VAX and PDP-11 computers, HASP+ can emulate any standard HASP multileaving workstation in RJE mode, plus it can operate as a host to other workstations in Host mode. For needs ranging from simple RJE to multiple site auto-dial networks, HASP+ can be generated in a rich variety of configurations and provides simple mechanisms for integration with other applications.

When it comes to the bottom line, nobody can beat HASP+. There are even bigger breaks for OEM's and multiple system users. But a great price is just a small part of the many benefits found with Datanex, . . . such as a dozen years in

HASP+ is a trademark of Datanex, Inc. Cybernet is a trademark of Control Data Corporation. VAX, PDP-11, DEC and DECNET are trademarks of Digital Equipment Corporation.

Bi-Synch communications on DEC computers . . . ease-of-use combined with unmatched versatility . . . a great, easy-to-follow documentation and installation kit . . . choice of standard DEC interfaces for low overhead at any line speed . . . and much more. Consider our satisfaction guarantee with a **no-risk trial** which puts **you** in the driver's seat.

The Datanex customer list reads like an International Who's Who. Users include B. F. Goodrich, Boeing, British Aerospace, Control Data, Corning Glass, European Space Agency, Ford, General Motors, Hughes Aircraft, McDonnell-Douglas, NASA, G. D. Searle, University of North Carolina, the U. S. Air Force, and 3-M. And that's only a few of the hundreds who have already discovered the benefits of Datanex communications software. Call Datanex today to discuss your needs.



simulator. It was then suggested that CP/M* could be rewritten for DEC minicomputers in order to support the application programs. However, since the efficiency of the operating system has little effect on the efficiency of most microcomputer programs, it was decided to let the virtual CPU in the Bridge run a licensed, modified copy of the CP/M* operating system. In order to run an application program it would be necessary to simulate all of the CP/M*style peripherals that the program required. The Bridge, therefore, consists of a virtual terminal, two virtual floppy disks and other virtual peripherals.

The virtual RAM in the Bridge is just an array in the minicomputer's memory. A key problem arose in deciding how much main memory would be needed to run the Bridge. It might have been possible to use one of the minicomputer's relocation registers for the virtual RAM but this would have resulted in a much slower and less portable product. It was decided to limit the Bridge to machines that could provide a full 64k bytes of memory to each user; this requirement still imposed a maximum size of 8k bytes for the simulator and the other parts of the package.

The two virtual floppy disks are normal binary files on a hard disk. Although their internal structure makes no sense to the DEC operating system, they can be copied, backed up on tape, and transfered to other users. The files cannot be processed (edited or printed) using standard DEC utilities. The Bridge, however, recognizes these files as standard CP/M* floppy disks. Each virtual floppy can store up to 64 CP/M* files. Naturally, each user can have as many virtual floppy disks as he requires, and can process these files with any standard CP/M^{*} utility. There are two key advantages to having virtual floppy disks: 1) the performance of a virtual floppy disk is up to 10 times faster than the access time of a real floppy disk; 2) the virtual floppy disks are just normal files on a minicomputer disk, and, as such they do not get lost or scratched. Moreover, virtual floppies are backed up with the rest of the system. They can also be accessed remotely from any attached terminal or microcomputer.

CP/M* assumes that there is a printer attached to the computer, and provides a convenient way to access it. The Bridge intercepts all attempts to write to the printers and makes a file on the host system which consists of the virtual printer's output. Development of Bridge could have stopped there, letting the user print his file when he finished using the CP/M* program. However, one of the fundamental assumptions behind the emulator was that users should not be required to have more information about the operating environment than that contained in an elementary manual for CP/M^{*}. Therefore, it was necessary to provide a utility which would allow someone to print a hardcopy from within the Bridge mode. The utility PRINT.COM is an application program written in 8080 assembly, which signals to the host operating system that the virtual printer's file is to be spooled to the real printer.

One of the paradoxes of the computing world is that some so-called microcomputers are now larger and faster than many traditional minicomputers. Most micros address 64k bytes of memory, more than many PDP/11s. A 4 MHz Z80 can add two numbers in approximately one microsecond faster than some minicomputers. Because a simulated machine will always be several times slower than a

dedicated real machine and since additional space for the simulator would have to be found within the real machine, it was forseen that there would be a problem with both space and time (especially with the smaller machines).

As a result of a great deal of optimization the CPU simulation in the Bridge is less than four times real time when running on a VAX 11/750 or 11/780. This approaches the theoretical limits for such a simulator.

Each instruction on the 8080 requires a complete subroutine on the DEC minicomputer for its simulated execution. Each subroutine consists of from five to twenty instructions in the host system. In addition to simulating the execution of the 8080 instructions, it is also necessary to fetch and decode the next instruction and to set the simulated flags correctly. The task of decoding the simple 8080 instruction set was not too difficult. However, the 8080 has several design mistakes in the original chip which had to be incorporated into the virtual machine. For example, the parity flag is unnecessary, the DAA instruction does not work correctly for subtraction and there is no overflow flag. Care was taken to reproduce these and all other mistakes to ensure that all 8080 software would run correctly. The net effect is a virtual CPU that runs five to seven times slower than the actual CPU given equivalent machine instruction times.

In essence, the Bridge consists of all the aforementioned virtual elements which are exercised by the following utilities:

FileLink Transfers files to your virtual "floppies" from your user area on the system disk or to the system disk from the virtual floppies.

DiskLink Copies a standard 8" CP/M* distribution floppy read on an RXO1 or RXO2 floppy disk drive to a virtual floppy. The virtual floppy appears as a single directory entry in your native operating system under any you choose. It is also used to write virtual floppies to physical floppies readable by CP/M* micros with 8" drives.

PIP.COM A file transfer utility for copying files from one floppy to another. In addition, it can perform partial copies and case translations.

ASM.COM An 8080 assembler, this program produces Intel hex format output.

LOAD.COM Loads Intel hex format files and creates runable binary files of the type .COM.

STAT.COM Used to give statistics on the current state of the system including file sizes and space remaining in your virtual floppies.

DDT.COM An 8080 debugger, this program will allow you to trace and set breakpoints in CP/M* programs, examine the memory and registers of your virtual floppies and case translations.

DUMP.COM An improved dump utility which will allow you to examine and alter the contents of your virtual floppies in hexidecimal form.

ED.COM A simple line editor for creating text or programs in the virtual machine.

DECPROFESSIONALDECPROFES

PRINT.COM Submits the printer output of the virtual machine to the printer spooler of the native operating system. All output which the virtual machine directs to the printer is captured and stored in a file.

EXIT.COM Will cause you to leave the virtual machine and return to the native operating system.

One of the more important features of the Bridge is that it provides a uniform computing environment across a wide variety of different computers. Within the personal computer world, IBM format single density floppy disks have become a de facto standard. The internal structure of the virtual floppies in the Bridge is closely related to this format. The DEC RXO1 format, however, is slightly different from the IBM standard. Nevertheless, the Bridge includes a utility called DiskLink which will copy a real CP/M* floppy to and from the virtual floppies. This utility allows users to carry information between micros and the Bridge via an industry standard transfer media. This same process can also be used to carry information between different versions of the Bridge running on different computers.

It is also necessary to transfer information between the CP/M* files created on the virtual floppy disks and the normal files of the host operating system. For example, a file might be edited with WORDSTAR under CP/M* and then transmitted over a computer network to that computer's host files. The Bridge provides the utility FileLink which actually transfers information both ways between the virtual floppy disks and files on the host's file system. FileLink, in conjunction with DiskLink, is a powerful mechanism for transferring information between incompatible minicomputer operating systems.

The rapidly increasing cost of software is forcing the industry to consider new means of increasing programmer productivity. The declining cost of computer hardware suggests a strategy of tailoring the "machine" to the programmer, rather than forcing the programmer to learn about a new environment. This notion is completely consistent with the ongoing discussion of a common or standard operating system. Presumably, one day, all computers may be capable of addressing their users in a common language. A "dir" may mean the same thing on computers produced by a variety of manufacturers.

Most analysts have assumed that this evolution towards a common operating environment would take place through the adoption of a common "shell" standard, or via a common operating system such as UNIX. However, because many of the large computer firms have huge investments in their proprietary operating environments and a strategic interest in incompatibility, it may be that a bottom-up evolution of a common environment will be witnessed. The economic forces promoting an interest in standardization, balanced by the continued interest on the part of the major computer vendors to maintain their current systems, may lead to the gradual distribution of virtual machines throughout the marketplace, thus providing the functional equivalent of standardization.



AN INTELLIGENT ALTERNATIVE

CALL (714) 730-0722

DEC COMPUTERS & NON DEC PERIPHERALS • DEPOT AND FIELD SERVICES

- AVAILABLE 7 DAYS A WEEK
- NEW "MAINTENANCE BY MAIL" PROGRAM



DEC TIMESHARING (1965)

By Peter Clark

The majority of DEC timesharing customers are relative newcomers as far as timesharing is concerned. Many may also be newcomers to Digital as well. The University of Pennsylvania Medical School Computer Facility (MSCF) has been a DEC customer since 1965. In fact, we purchased the first timesharing system available from DEC, the PDP-6.

Before 1965, the MSCF owned a Control Data 160-A. The 160-A would probably be classified as a moderate sized mini today. It as a single user machine with no batch processing capability. Programmers and/or users would go to the computer room, sit at the console, load the paper type bootstrap and start up a program. This was our environment when we first started to hear about "timesharing." Of course, my first thought was, "It sounds OK but it can't possibly be as good as having the entire computer to yourself. Besides, who the hell is Digital Equipment Corporation and what is a PDP."

We soon found out that DEC was a computer manufacturer in Maynard, Mass. and PDP was a "Programmed Data Processor." At the time, there were not many places to go to see a PDP-6 (I think DEC made 24 of them). We were lucky. Applied Logic Corporation in Princeton, NJ already had one.

My first session on a timesharing system was at Applied Logic to try to convert a large FORTRAN system. The conversion from CDC FORTRAN turned out to be easy. It would be with FORTRAN II.

At first exposure to the terminal (Teletype Model 33), I was a bit apprehensive about screwing up other users. I was assured that I could type anything I pleased and the system would not crash. This turned out to be very nearly true. I was sold on timesharing when I realized that I could do everything I could do on the 160-A and then some.

When our own PDP-6 came a few months later, we became "true" customers. We soon found out what the deficiencies of the system were. The first problem turned out to be with DEC's delivery system. The driver of the truck that picked up our system from Maynard drove his 14 foot truck under a 12 foot bridge. Most of the computer survived. Our delivery date was moved back a few weeks, and the printer (128 columns, 600 LPM from Analex) ran for two months naked: No case.

The configuration we ordered had 64K words of memory (36 bit words), four dual dectape drives, 2 556 BPI magtapes (7 track), a 600 LPM printer and a 300 CPM card reader. You will notice the absence of any disk. This meant that any system access required reading a magnetic tape device. In those days, the dectapes were used for that. The dectape was used rather like a random access device. One could read or write in fixed blocks on the tape in sequential or random fashion. The acccess time was measured in seconds or possibly minutes if other drives were in use.

There was no such thing as swapping jobs which meant we had to sign up for the amount of core required. You reserved a terminal, XK of core and a time slot (max one hour). This assumed we knew how much core was needed

which frequently was not true. There was no such thing as shareable programs in 1965. Every user that was compiling had to have his own version of the compiler in his core area. Of course, in those days, the FORTRAN compiler was 11 or 12K words and the operating system was about 6K words. Today our TOPS-10 operating system is about 60-70K words. We could effectively support about 4-6 simultaneous users with much bickering about who had more core than he should have, etc.

Cache, or semi-conductor memory was not in use at this time, but the "six" did have some fast memory. The first 20 (octal) locations of core were mapped into "fast memory"; a special set of locations that were accessed in the [nano-second] range (we never knew how). These locations were used as fast accumulators. The real first 20 locations of core were inaccessible to the programmer and were known as "shadow memory". This shadow memory had a very important use. There was no bootstrap module in this machine, so the bootstrap was kept in the shadow memory. The procedure was to use the shadow memory to read a paper tape, which read the monitor off a dectape. When hardware failures occurred, it was likely that the shadow memory would be wiped out, necessitating that it be toggled in through the console switches, all 16 instructions (36 bits = 36 switches). The then system manager (still is!) had a success/failure ration of about 10-1 favoring failure, so it was up to the resident CE to toggle it in. (He had it all memorized, which should give you an indication of how often it was used.) All of our CE's were good, but the best was something to see... Arthur Rubenstein (he plays the piano) never looked this good! His hands moved so fast, it was impossible to see each individual movement. Although he now heads up the Cherry Hill, NJ, Field Service office, he still has the shadow memory bootstrap for the PDP-6 memorized.

The sequence to compile, load and execute a FORTRAN program was as follows (The (".") dot, as RT11 people know, is the monitor prompt):

.R F4

; get FORTRAN compiler in 12K of core

* DTA1:PROG = DTA2:PROG1,PROG2,....,PROGN

- ; wait another minute or so to compile
- ; sources from DTA2 and put the relocateable
- ; files on DTA1. (Pray for no errors.)

* AL

; back to monitor

.R LOADER 30

; get loader in 30K

*DTA1:PROG

: load in program

*SYS:/S

; search system

- ; dectape for FORTRAN library routines
- ; wait a couple of minutes

.SAVE DTA1:PROG

; save loaded program

?DEVICE LPT NOT AVAILABLE

; whoops, someone else is using the printer now. let's go see how long he will be.

The above sequence no doubt seems very archaic, and it was. But, at that time, disks were still a very new thing and anyway, DEC didn't sell or support one with the PDP-6. Shareable code couldn't really be supported with PDP-6 hardware even if it had been thought of. Queuing of input and output really needs a disk to be done effectively. We could have had printer output go out to magtape or dectape but there was no software available to make that process easy or manageable, i.e., schemes for labelling output on tape, etc. There were no command files supported. No. "CCL" (concise command language). Today on the TOPS-10 system, to do the above compile, load and go sequence, you type:

.EX PROG1, PROG2, ... PROGN

or

.EX @PROG.CMD ; command file

This capability, which came from a DEC customer originally, was not available until the very early 70's.

Two editors were popular the, LINED and TECO. LINED was a line number oriented editor that required line numbers on data that was to be edited. PIP provided switches to add and delete line numbers. It operated like the BASIC Plus monitor editor; i.e., add or delete whole lines. There was no way to change a part of a line. TECO (Text Editor and Corrector) was used by more sophisticated users (has this changed?) and ran not unlike today's version (yes, TECO is on all DEC computers) notwithstanding 15 years of refinements.

Multiplexing (we called it scanning) was handled by a PDP-8 in half duplex mode. Full duplex came with our first disk (RPO2) and monitor. We had one dial in line and our ubiquitous CE rigged a red light to tell us someone was on. The "8" could not sense the carrier and had no way of knowing when someone hung up or was cut off, so it was not unusual for a person dialing in to find a job already attached to that keyboard; KB to you, TTY to us.

The next real breakthrough in timesharing for us was the purchase of an RPO2 disk pack drive and disk monitor. Then we had real time-sharing. Jobs could now be swapped to the disk and we could easily handle 20-30 users. Terminal data was handled in full duplex mode and a new innovation was /xxx/ to show what had been deleted when rubout was typed.

THE DEC **DECISION SUPPORT** SOLUTION

When it comes to comprehensive financial, organizational or strategic planning on VAX, DECsystem-10 and DECsystem-20,

FCS-EPS

Is the Choice of Professional Planners Around the World.

FCS-EPS is the one system that brings the power of the computer directly into the hands of the planning professional. More than just a modeling system, FCS-EPS is a sophisticated, open-ended system easily applied to virtually any planning task. Over 160 built-in planningoriented functions allow you to be immediately productive. "What if" analysis, goal-seeking, a customized report writer, hierarchical consolidation, and a built-in financially oriented language make the utility of FCS-EPS virtually unlimited, all without the need to know any cryptic computer language.

The system is compatible with all DEC operating systems. 850 users of FCS-EPS can't be wrong. Find out more about truly user-oriented financial planning systems. Contact EPS today. San Jose, CA 800/538-7578 or 408/292-6212; Toronto 416/279-8711; London (01) 579-6931.

Clip and mail to EPS,	Inc., 1788 Technology Drive, San Jose, CA 95110
Yes. Send m	e information on FCS-EPS
Yes. Send m Financia	e "Selecting and Evaluating al Modeling Systems."
Name	Title
Company	Address
City	StateZip
Phone	Computer now in use
	CIRCLE D41 ON READER CARD

In the 60's DEC field service was much different than today. We had a resident service engineer (CE). The card reader required almost constant adjustment and it seemed he was always busy fixing something. We used to estimate MTTR (Meantime to Repair) by the number of open cabinet doors, and there were a lot of doors. It seems he was always fixing our TTY Model 33's. When we moved to Model 35's, we thought we really had it made. 10 CPS was great if it was reliable. Now we see our service technician once a week for an hour or so. I wonder why our rates haven't gone down????

Current DEC timesharing systems have learned a lot from the old PDP-6 days. I hope you RSTS users appreciate the efforts of us old PDP-6 users.

DECPROFESSIONALDECPROFES

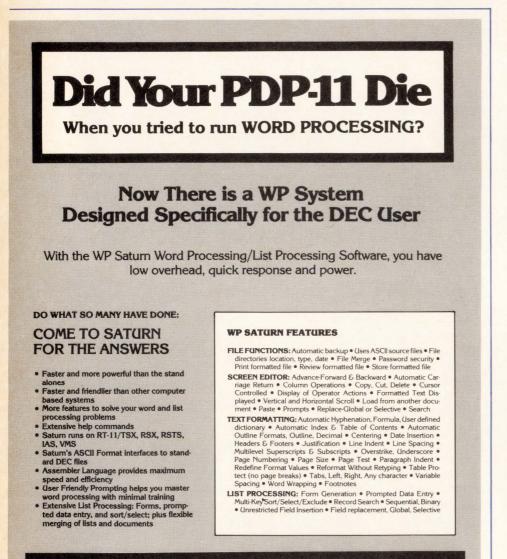


Dear Dr. DEC:

I have DECservice coverage on my computer, what happens when it isn't fixed after 8 hours of on-site time? Send Help

Dear Send Help: It is probably on the way. Your DECservice agreement spells out the exact escalation your problem will take within the field service group servicing your computer. DECservice usually specifies a specific response time usually 4 hours in major metropolitan areas. After the engineer has been on-site for a specified time, the problem may be escalated to branch support, district support, regional support or even directly to the main office! Generally, all of these times are coordinated with the branch manager responsible for your account; I suggest you call him in and ask him to explain exactly what escalation you can expect in the event of a problem.

P.S.: Why not do it when your system is



For additional information call toll free 1.800.328-6145

(612) 944-2452

running, that way there won't be pressure on either one of you.

Dear Dr. DEC: What is a Bus Load? My field engineer tells me I may have to **Bussed** out many. Dear Bussed out: Every device put on a bus (Omnibus, Unibus, Q-Bus, etc.) soaks up a certain amount of energy making itself known to the bus and responding to interrupts at its address and other things that it does. The Bus can only support so many of these loading devices before there isn't enough energy to drive the next one. When this happens you need a "bus repeater". This will allow you to add more devices up to the limit of the next bus. This device is made by DEC and is also available from other vendors such as ABLE computer (see inside back cover).

Dear Dr. DEC:

Why does DEC offer both 20ma and EIA interfaces? Which is best?

Connect

Dear Connect: Way back when men were men, all we had were ASR33 teletypes from the Teletype corporation. These were all mechanical, 110 baud (1 start, 8 Data, and 2 stop bits for a total of 11) 10 character/second, all upper case, noisy terminals. These came in either 60ma (milliamp) or 20ma (change a few jumpers) versions. These terminals had been in use for years on the Telex and TWX networks and were virtually the only interactive devices on DEC computers. Later, a standard interface was adopted by the EIA known as RS-232. The EIA RS-232 allowed such things as modem control signals, timing signals, data signals and more. When terminal manufacturers began making terminals, most adhered to this standard.

When DEC started making terminals (remember the VT05 and the LA30?) they offered the 20ma to be compatible with the older interfaces, and the newer RS-232 so they could be used with other computers and with modem controlling signals. Most of the terminals today are RS-232 standard, but DEC still offers 20ma as an option. The LA36 had 20ma standard and RS-232 as an option, while the newer LA34 has just the opposite; RS-232 standard and 20ma optional.

DL11's come in both flavors as do DZ11's and DH11's. You can't mix and match on one unit. Which is better? For modem control you need RS-232. but for distance you can match the 1000 feet spec for 20ma.

CIRCLE D35 ON READER CARD

6875 Washington Avenue South, Suite 218, Edina, MN 55435

EXTEND YOUR PERIPHERAL VISION.

DEC USERS. The new TC-30 and TC-50

streamer controllers let you set your sights on maximum performance.

The TC-30 fits all PDP-11* and VAX 11* computers; the TC-50 fits all LSI-11* Q bus* computers. Both have the features to help you turn your peripheral visions into reality:

- Controls up to eight 1/2" tape drives
- Mix of streaming and formatted stop/start drives
- 64 byte read/write data buffers
- Single board embedded
- TM11 software compatible

- Designed for read and write on-thefly even with stop/start drives
- Designed for easy service by the customer or by the factory
- Supplied with extensive Diagnostics
- One year factory warranty
- · 30 day delivery
- Backed by one of the best First Party factory service organizations in the business.
- Supports 6250 bpi streaming drives

Learn how your DEC computer can achieve maximum performance. Call or write: Western Peripherals,

14321 Myford Road, Tustin, CA 92680, U.S.A. (714) 730-6250. TLX: 472 0629,

CABLE: WESPER.

In U.K.: 1st Floor The Parade, Frimley, Camberley Surrey GU165HJ England, Telephone 0276-20934, TLX: 858306



*Trademark name of Digital Equipment Corporation.

CIRCLE D36 ON READER CARD

OPTIMIZING RSX-11M TERMINAL RESPONSE BY THE USE OF A FUNNEL TASK

By James A. McGlinchey, RA Enterprises, North Wales, PA 19454

Terminal-oriented applications running under RSX-11M are often beset with response time problems. The attendant system overhead can often be minimized by taking advantage of the asynchronous nature of a terminal-oriented system.

Two architectures are commonly used in designing a terminal-oriented application running under RSX-11M. One approach is to use a single spawnable task which can be activated by each terminal in the system (Fig. 1). A second approach is to use one task which acts as a terminal communications funnel, passing commands and data to applications tasks (Fig. 2).

As with any trade-off decision involving RSX, neither choice is optimum across the entire spectrum of applications. The single task/single terminal design is desirable when many different applications are running on the same system, or if only a few terminals are dedicated to the application being considered. If an entire system is dedicated to one application, or if many terminals within a multiapplication system are assigned to an application, then the funnel task approach works best.

Performance of a terminal-oriented application is directly related to the task spawning facility of RSX. If a task installed with a name beginning with '. . .' is activated by its assigned terminal, RSX will run a copy of it under a unique name. This may result in several copies of the same task being active at the same time, each competing for system resources. This in turn causes an inordinate amount of shuffling, swapping, and checkpointing, and in general gives the system all the vitality of a constipated elephant. While some of this difficulty can be alleviated by manipulating the tasks' priorities, improvement in overall response is usually marginal at best. Further degrading the system is the operating system overhead necessary to evaluate the tasks sitting in the checkpoint file waiting to run. The users complain 'the system runs slow'!

The funnel task approach dedicates one task to handling all terminal input. It 'owns' all the terminals. It is the only task in the system which communicates with terminals. The funnel task can parse terminal input and in turn activate the appropriate applications program. Since only one copy of the funnel task is necessary, the shuffling/checkpointing load is lightened, and terminal response improves noticeably.

The trade-off to be made between the two design approaches is that of implementation ease versus speed of system response. The single task/single terminal approach is simpler to design and therefore simpler to implement. It can be accomplished quickly. The funnel task approach is complicated in its design primarily due to its asynchronous nature, and therefore takes longer to implement. But take heart — this isn't as bad as it may seem. An application im-

plemented in a single task/single terminal architecture can be converted easily, so long as the component tasks do simple things, like "get-an-input-line-and-do-something-with-it-QUICKLY, DAMMIT-and-display-an-output-message". Tasks like this can be easily changed to get input from their receive data queue instead of a terminal, and likewise for output.

The funnel task is really the first element of a system whose operation is entirely asynchronous. Referring again to Figure 2, the funnel task's operation is asynchronous due to the nature of the human operator. The requests to tasks A,B,C, and D are again asynchronous, as they are activated in response to requests from the funnel task, i.e., messages appearing in their receive queue. The completion of each task's execution is asynchronous with regard to overall system operation, and therefore, the output is placed asynchronously into the funnel task's receive queue.

The end result of this design is that only one copy of each application task is active at any one time, thus minimizing any need for shuffling and checkpointing. In a dedicated system it may even be possible to fix all tasks in memory and wring out a little more improvement in terminal response.

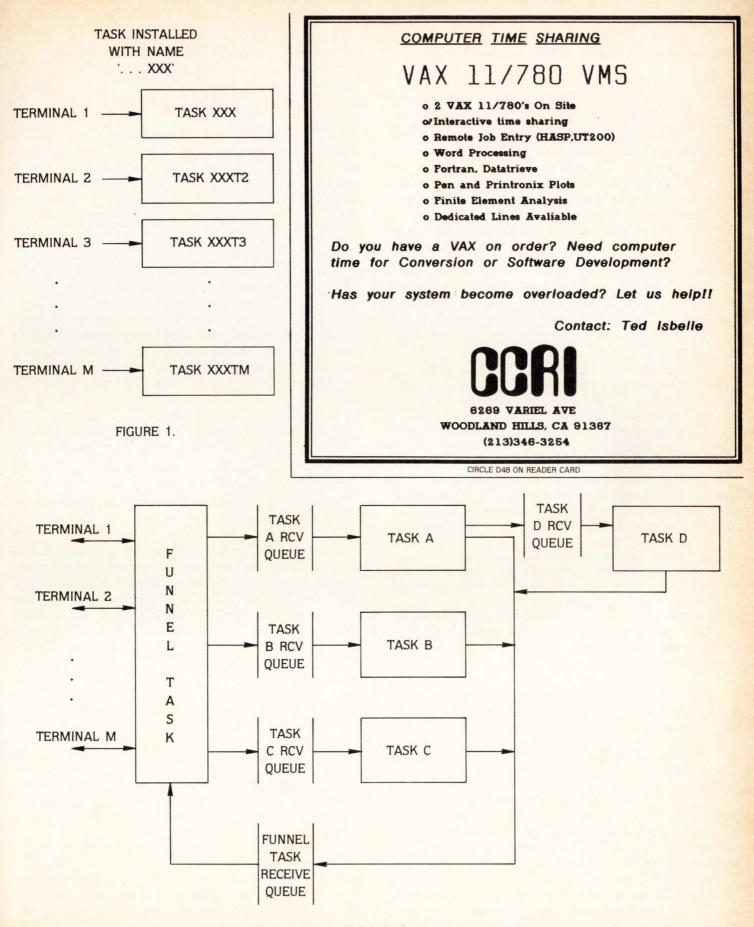
An optimum for applications tasks in a funnel task design is to have many small tasks which become active, do one thing, then exit. Tasks of this kind should be installed at a high priority so that their system resource demands are satisfied quickly.

The funnel task design has another advantage. The applications tasks can be multi-threaded; that is, they can act on all requests in their receive queue whenever they are activated. In a transaction processing system, multithreading means that several transactions can be in different stages of processing all at the same time, and yet have decent system response characteristics.

To summarize the system design guidelines for a funnel task-based system:

- The funnel task does all terminal communications.
- The funnel task activates the applications processing tasks.
- The funnel task communicates with all other tasks via the Send/Receive facility in RSX-11M.
- The applications tasks are all small, single-purpose tasks which run at high priority.
- Applications tasks may be multi-threaded.

One final thing to think about: The User-Written Command Line Interpreter (CLI) facility in RSX-11M PLUS and RSX-11M Version 4.0 makes it possible to have the funnel task configured as CLI to further enhance system integrity and response. More about this in a future article.



DEXPO 82 AND BEYOND

Larry Hollander, President, ExpoConsul, International, Inc.

"We didn't have to wade through people who only speak IBM." —Arthur Coston, president Applied Information Systems, describing his experience at DEXPO 82.

It was as the grand opening of a new industry. It was going to bring together DEC users and compatible suppliers in greater numbers than ever before. On the morning of May 10th in the last few hours before the show was set to open its doors, all the research, all the long hours of preparation, all the confident predictions now became nervous anticipation.

The question was not, "would anybody come?" The real question was, "would the **right** people come?" After all, this was DEXPO 82. This was the First National DEC-Compatible Industry Exposition. And the right people were DEC users and only DEC users.

In case you haven't heard, the right people did come to DEXPO 82, which was held last May 10-12 in Atlanta. Many visitors had come to Atlanta also to attend the DECUS conference that was held only a few blocks away. Many others had come expressly to see the 125 vendors exhibiting the latest DEC-compatibles. Arthur Coston recalls meeting a number of DEC users who had never even heard of DECUS: "For instance, there was one group, who we'll probably be able to sell something to, who had bought a system from an OEM. The supplier had neglected to pass along the literature on DECUS, so we told them about the society and suggested they join."

Like many other DEC users who came to DEXPO 82, that group of visitors will find that one conversation, one good idea, one single bit of information made their visit worthwhile. And isn't that the definition of a good show? From the very first, DEXPO was designed to be a forum for the open exchange of information between the everincreasing population of DEC users and the ever-widening choice of compatible suppliers.

"We got a chance to talk to everybody who came to our booth. And because we were all in the same world, we got some very good feedback on the new products we were showing." —Jack Saltiel, vice president, Compumart.

All that anyone expected from DEXPO 82 was for DEC users to be able to locate the vendors and products they need in one place — without having to waste time with exhibitors who do not sell DEC-compatibles. By that standard alone, Ken O'Mohundro, president, Able Computer judged the show "better than NCC."

By the time the show was over, it became apparent that something else of value was happening, something of great importance to the future of the DEC-compatible marketplace. Not only were DEC users finding what they



JULY 1982

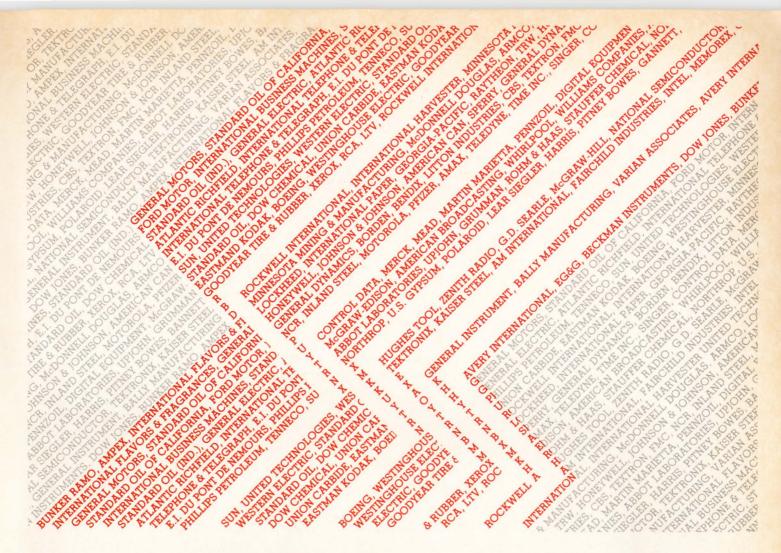
needed, but also they were talking to vendors about the products they needed **but could not find anywhere**. Actually, they were designing the DEC-compatible products of tomorrow.

"We picked up a lot of interest for a product we're working on right now. The next show, DEXPO/West 82, is probably the ideal spot to introduce it. I wish the company could take more space." —Ron Shephard, sales representative, Software AG.

The future of the DEC-compatible industry is the future of DEXPO, too. By speeding the industry's development, growth and progress, the show will grow and prosper. DEC users who come to DEXPO/West at the Anaheim Convention Center, December 7-9, 1982, will find it 60 percent larger than the show held last May. In fact, it's already larger than the first show, as is DEXPO/East 83 (Kiel Auditorium, St. Louis, May 22-24, 1983), and new exhibitors are added almost every day. Obviously, Arthur Coston is not alone in his declaration, "If you're in the DEC-compatible marketplace, DEXPO, is it. This has to be Number One."

In addition to fulfilling all its original goals — and achieving instant market dominance along the way — DEXPO also emerged as the place where DEC-compatible technologies will move forward . . . one step at a time. The next step is DEXPO/West 82. After that, DEXPO/East 83. Then, about six months later, another step. Each DEXPO show will define the current state of the art and shape its future.

Perhaps Jack Saltiel described that future best when he said, "DEXPO will help us and other companies who are trying to grow maintain contact with the DEC user community. It will enable more new companies to enter the market because it streamlines the marketing process. This will help the entire industry by making the market richer." Come share the riches.



Fortune 500's finest have selected us for use with their DEC and DG minicomputers.

For over a decade, System Industries has provided reliable and cost-effective data base storage alternatives to many Fortune 500 companies using DEC and DG minicomputers. SI has over 20,000 installations around the world today, because we've given DEC and DG users just what they wanted:

L.MORE RELIABILITY. SI provides great data base solutions—like our redundant Add-On Non-Stop Reliability (ANSR) systems. Or our 160 or 675 Mbyte, SMD-compatible Winchester storage systems, for more dependability and increased throughput.

2. SPACE SAVING CONFIGURATIONS. The SI storage alternative puts many more Mbytes in a single footprint. We'll give you the equivalent of 8 "logical" RM03s in the space normally occupied by one RM03 from DEC. Or the equivalent of 6 RM05s in the space normally occupied by four from DEC.

3. EXCELLENT SERVICE. We maintain service centers in the U.S. and Europe. We offer 4-hour response to calls within a 50-mile radius of major U.S. cities. And 24 hours/ day, 7 days/week service contracts in all metropolitan areas.

4. FAST DELIVERY. SI has built its reputation on quick delivery. Typically, we can give DEC and DG users valuepacked data base storage systems in 30 to 45 days ARO.

For more information about the popular choice of the Fortune 500, and the accepted storage alternative of DEC and DG minicomputer users, contact us today at any of the offices listed below.



United States: 1855 Barber Lane, Milpitas, CA 95035, (408) 942-1212, Telex 346459. Europe: System Industries (Europe), System House, Guildford Road, Woking, Surrey, GU22 7QQ, England, (44) 4862 5077, Telex 859124. California (714) 851-6289, (213) 822-3161; Colorado (303) 986-1591; Georgia (404) 955-2252; Illinois (312) 948-9330; Massachusetts (617) 431-7240; Michigan (313) 663-4925; New Jersey (201) 839-8650; New York (212) 696-0650; Ohio (513) 771-0075; Texas (713) 497-7224, (214) 386-8776; Virginia (703) 734-9700; Washington (206) 451-8791; West Germany (49) 6102 5464; Sweden (46) 08-63 16 20 CIRCLE D32 ON READER CARD

INTERACTIVE RUSSIAN LANGUAGE TUTORIAL

By Scott H. Stuart; Barbara Kurshan, Director of Academic Computing, Hollins College

INTRODUCTION

This paper is a thorough presentation of the details of an interactive Russian language testing program that was written in BASIC on a Honeywell Computer, and then converted to run on a VAX 11/780. It is an expansion of a presentation the authors gave at the 1982 DECUS convention in Atlanta. In this paper, we will discuss the program, its conversion and implementation, and its present and future use at Hollins.

PURPOSE

The program RUSS is an interactive testing program designed to quiz begining students in Russian vocabulary and grammar. The program provides vocabulary drills and a series of grammar exercises on noun, verb, and adjectival endings as well as on numbers. Vocabulary has been entered lesson-by-lesson from V.G. Kostomarov's 'RUSSIAN FOR EVERYBODY' (RUSSKIJ JAZYK DLJA VSEX). Within each of these lessons the student can choose options which include whether or not to include stresses; the type of test he will take; the lesson(s) covered by the test; and whether to be supplied with the Russian or English form of the question.

HISTORY

The program was originally written at Dartmouth College by Lawrence W. Robinson '80. Barry Scherr of the Russian department acted as the faculty liaison and Russian language advisor. It is presently in wide-spread use as an aid to begining and intermediate Russian students.

It was written in S-BASIC, a structured BASIC that has been developed at Dartmouth in the last few years. It was written and implemented on a Honeywell computer and is presently running on that machine at Dartmouth.

The program was converted by a translator from S-BASIC to standard BASIC and sent to Hollins College in that form. It was converted to VAX-BASIC and is presently running on the VAX 11/780 at Hollins. This conversion took approximately 250 man-hours with at least 25% of this time spent learning VAX-BASIC and VMS. The program was converted by Scott H. Stuart with technical advice from Barbara L. Kurshan. Walter Tuman of the GERUSPAN department (GErman-RUSsian-SPANish), provided Russian language advice and testing of the Russian program.

OPERATION OF THE PROGRAM

To run the program the student logs on to the RUSSIAN account and simply types 'RUN RUSS' (or several symbolic equivalences). The student is first asked for some general information regarding his name, professor, and type of transliteration chart to use. Then he is asked for the test type and options (including lesson numbers). The student has the option of testing one lesson, a range of lessons, or all lessons up to a certain lesson.

There are seventeen different test types. These include tests on general vocabulary, verbs in a variety of tenses,

nouns in one of 6 cases, pronouns, adjectives, adverbs, infinitives, gerunds, participles, imperatives, and numbers. For each test there are from 2 to 12 different options from which to choose. These options include the case, tense, and/or gender of the word, and the type of prompt the student will receive. The prompt can be in English, or it can be the Russian base of the particular word. All answers must be entered in Russian. The combination of tests and options provides over 200 distinct test types. There are more than 1200 different words arranged into 44 lessons. Groups of 20 words are selected for each test. This allows close to a quarter of a million distinct words and thousands of combinations of different tests. While beginning students often do not go much beyond the vocabulary tests in the present tense, the program is more than sufficient in variety and quantity. The Russian professor commented that the program 'increases the capabilities of the text tenfold'.

Figures 1 and 2 provide a sample run displaying the selection of the test and various options.

TYPE OF TEST (Type 'HELP' if you need it): ? HELP

Flease enter the type of test that you wish to take.

The test types include :

VOCABULARY	NOMINATIVE	ACCUSATIVE
GENITIVE	DATIVE	PREPOSITIONAL
INSTRUMENTAL	VERBS (present	; and future tenses)
PAST TENSES	INFINITIVES	GERUNDS (past and present)
PARTICIPLES	IMPERATIVES	NUMBERS
PRONOUNS	ADJECTIVES	SHORT-FORM ADJECTIVES

You need only enter the first three letters of the test type.

TYPE OF TEST (Type 'HELP' if you need it): ? VOCABULARY

LESSON OFTION (type 'HELF' if you need it): ? HELP

You have the following options :

'N1' : TESTS ONE LESSON

'N1 - N2' : TESTS LESSONS N1 THROUGH N2

- N1' : REVIEWS UP TO LESSON N1

```
(NOTE: 'N1' and 'N2' are positive integers,
with 'N2' greðter than 'N1'.
The highest allowable lesson number is 44.)
LESSON OPTION (type 'HELP' if you need it): ? 8-9
```

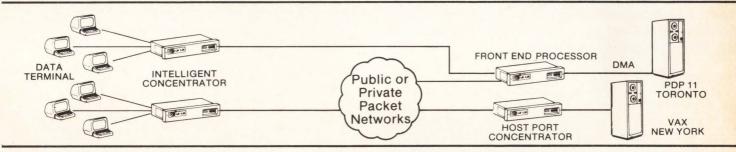
Do you want to include stresses ? N

FIGURE 1

After gathering information from the student, the program opens the appropriate files and reads in all the applicable words. Each word is stored in one of 44 general data files. These files are keyed to the lessons in the text. Each record of these files is stored as a triple. The fields are the English translation, the internal Russian form of the word, and a key that indicates in what tests the word can be used. Verb conjugations, case matching, pluralization, and gender

What gives your VAX or PDP 11 TOTAL NETWORKING, MORE THRUPUT AND BETTER PERFORMANCE?

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



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

Front End Processor

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

Intelligent Concentrator

Allows up to 32 asynchronous terminals to access your computer through packet networks. Plus, it supports formatted screen mode for

prompting and checking information from data entry clerks. The templates are stored in the concentrator and accessed as needed for greater accuracy and reduced CPU processing time.

Portal

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

Electronic Mail

Provides a rapid cost efficient way to exchange business information at any time or place, accessed by standard terminals directly or through any X.25 network.



Barry Walker 20 Enterprise Drive P.O. Box 5880 London, Ontario N6A 4L6 (519) 686-2900 Brian Liska Suite 1810 25 Adelaide St. E. Toronto, Ontario M5C 1Y2 (416) 365-7322

Roger D'Hollander Suite 203 825 Manning Gardens N.E. Calgary, Alberta T2E 7L4 (403) 248-1304 CIRCLE D33 ON READER CARD Frank Vecchiarello Plaza Office Centre Route 73 and Fellowship Rd. Mount Laurel, New Jersey U.S.A. 08054 (609) 234-8141 PAGE 44

DECPROFESSIONALDECPRO

TYPE OF TEST (Type 'HELF' if you need it): ? PARTICIPLES

Please enter the number of the type of participle on which you wish to be tested. (1) PRESENT ACTIVE PARTICIPLES

(2) PAST ACTIVE PARTICIPLES (3) PAST PASSIVE PARTICIPLES (long-form) (4) PAST PASSIVE PART "IPLES (short-form)

PARTICIPLE TYPE: ? 2

LESSON OFTION (type 'HELF' if you need it): ? -9

Do you want to include stresses ? NO

you want to be supplied with the Russian INFINITIVE (Otherwise, you will be supplied with the English translation.) ? YES

YOU WILL BE TESTED ON PAST ACTIVE PARTICIPLES, IN THE MASCULINE SINGULAR FORM. You do not have to include stress marks.

Press 'RETURN' when you are ready to continue : ?

FIGURE 2

matching are done by the program. All words can be used for the vocabulary test. Irregular words, numbers, and pronouns are handled by special subroutines.

Data files are stored in terminal format files and can be changed by an editor. They are opened with 'ACCESS READ' so that more than one user can access a file concurrently.

All files are read sequentially until the end of file. If there are more than twenty appropriate words from the lessons requested then twenty of the words are randomly chosen. If there are less than twenty appropriate words, then the test is administered with that number. The order of the words is then shuffled and the student is given either the English form of the answer or the base Russian form. For example if the test is on past tense verbs, the base Russian form would be the infinitive and the student would be asked for the correct conjugation in Russian. The student is then asked for the correct Russian form.

The answer read in from the file is transformed from internal Russian (unique to the program) to the user's Russian. It is then compared to the user's answer.

If it is incorrect, some diagnostics are performed and a suggestion as to the type of mistake made is given to the user. These suggestions include information as to whether the problem is in the stem or the ending, and the number of words in the student's answer as compared to the number of words in the correct answer. The student can enter three incorrect answers before the correct answer is given.

The student is told if the answer is correct, and randomly given encouragement and congratulations in Russian. The student can always press 'RETURN' and he will be given the answer. 'STOP' will terminate any test.

Figure 3 shows a sample run that gives some diagnostic information to the user.

After completion of that lesson, the student is given a summary of his performance. This includes the number of questions tested, the number right on the first try and the number right on subsequent attempts. Similar information, including the date and, time in and time out is written to a file that the the professor can look at. The student is then allowed one of several exit options. Exit options include retesting, listing the missed words, saving the missed words in a file, and simply ending the test.

1. TABLE ? STOL PRAVIL NO. 2. HE HAS ? U NEGO ESS NET. ESHCHE RAZ. The 1st word is correct. The 2nd word is correct. Hint: I think you have a problem in the stem in the 3rd word. HE HAS ? U NEGO EST PRAVIL NO. 3. WELL ? NU PRAVIL (NO. TOCHNO. 4. MASHENKA ? MASHENKO NET. ESHCHE" RAZ. Hint: I think you have a problem in the stem. MASHENKA ? MASHENK NET. ESHCHE" BAZ. Hint: I think you have a problem in the stem. MASHENKA ? The correct answer is MASHEN<KA 5. THEY HAVE ? A NIX NET. ESHCHE" BAZ. Hint: The correct answer is 3 words long, whereas your answer was only 2 words long. Hint: I think you have a problem in the stem in the 1st word. The 2nd word is correct. THEY HAVE ? U NIX EST<

JULY 1982

PRAVIL NO.

6. SATURDAY ?

FIGURE 3

The diagnostic information and the exit options are illustrated in figure 4.

On the first try, you got 4 out of 10, or 39% correct. Of the 6 that you missed the first round, you eventually got 2 or 33% correct.

Exit option (type 'help' if you need it): ? HELP

You have the following exit options:

Q - quit now store a file of your missed words

L - list the words you missed R - retest the words you missed

- prints this message H

Exit option (type 'help' if you need it): ?

FIGURE 4

Numbers are handled in a different manner. Numbers from 1 to 999 can be tested. This is done only in the nominative singular case. The student is asked for the upper limit on which he wants to be tested, and then the number is randomly generated within that range. The numbers are formed in a manner similar to that in which it would be done in English. There are unique words for the digits 1

DEC-COMPATIBLE PERIPHERAL CONTROLLERS



LSI-11[®] compatible controller for 80-300MB CDC, Ampex and Fujitsu CMD/SMD

Dataram Corporation offers the industry's widest range of DEC-compatible peripheral controllers — from comparatively simple NRZI tape controllers to complex 300 MB storage module drive (SMD) controllers.

An impressive array of state-of-the-art controllers, all built around high-speed bipolar microprocessors. All software compatible with the host LSI-11, PDP®-11, or VAX® minicomputer...and all available now.

And Dataram's controllers are designed to save you money, and, more importantly, space — our controllers typically occupy half the space required for the comparable controller from DEC. Doing it with a level of performance that makes any member of this family worth looking at.

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



Princeton Road Cranbury, New Jersey 08512 Tel: 609-799-0071 TWX: 510-685-2542

CONTROLLER	DESCRIPTION	COMPATIBILITY
C03	Cartridge disk controller	RK05
C33	Cartridge disk controller	RK05
Т03	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	R K 06
Products printed in red are LSI-11 Bus compatible.		

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

DEC, LSI-11, PDP, UNIBUS and VAX are registered trademarks of Digital Equipment Corporation.

DECPROFESSIONALDECPRO

through 9 and for the muliples of ten up to 100. The particlar number is formed by combing the correct base words (i.e. 236 = two hundred thirty six).

Figure 5 shows a sample run testing on numbers.

TYPE OF TEST (Type 'HELP' if you need it): ? NUMBERS

What case do you want to be tested in ? NOMINATIVE

Do you want to include stresses ? N

What is the highest number that on which you wish to be tested (from 9 to 999) ? 565

The numbers will ranse from 1 to 565.

YOU WILL BE TESTED ON NUMBERS. WHEN THERE'S THE OPTION, THEY WILL BE MODIFYING MASCULINE INANIMATE OBJECTS (I..E., USE 'DVA' AND 'ODIN'). You do not have to include stress marks.

Press 'RETURN' when you are ready to continue : ?

1. FOUR HUNDRED AND FORTY SIX ?

The correct answer is CHETYRESTA SOROK SHEST<

2. TWENTY EIGHT ?

The correct answer is DVADCAT< VOSEM<

3. ONE HUNDRED AND FIFTY SEVEN ?

The correct answer is STO PJAT<DESJAT SEM<

4. FOUR HUNDRED AND FORTY NINE ?

The correct answer is CHETYRESTA SOROK DEVJAT<

5. FIVE HUNDRED AND EIGHTEEN ?

FIGURE 5

SECURITY

All files within the program are opened relative to the directory in which the program is running. Security has not been a concern at Hollins, therefore we have left all files in one account and anyone logging in to that account could manipulate them. For many of the students using the program, this is their first encounter with the computer, so they often are not aware of how to manipulate the files. Nevertheless, anyone with a little knowledge about VMS could gather the statistical information as well as the 'annonymous' student comments. The program is not used, nor was it designed as a testing program, so the available information is not very sensitive.

If security is a concern, or if you want to use the program as a measuring tool, the security could be improved. All statistical information could be written to a subdirectory in the professor's account. The image could be installed as a 'privileged image' and given WRITE access to that directory. Students in a certain 'group' could be given execute privileges to that image.

In order to protect against accidental deletions of files, default protection has been set so that the owner has READ/EXECUTE privileges to most files. WRITE privileges must be granted to the scratch files, the file that indicates which transliteration scheme is used, and the comment file.

PROGRAM MODULES

The program consists of five BASIC files and approximately 50 data files. The total space taken for the source files is 468 blocks. The data files occupy a total of 130 blocks, and the executable image occupies 430 blocks. There is no need to keep the source file on disk.

RUSS is the driving program. It contains approximately ten internal subroutines (GOSUB . . .), that perform most of the work. These include subroutines to get information about the student and professor; get information about the type of test and lesson on which the student will be tested; to test for 'NUMBERS'; to test on 'PRONOUNS'; to test on all other topics; to record diagnostic information; to execute various exit options; and to gather student comments.

The remaining four files contain external subroutines that are called by the main program and/or from other subroutines. The contents of each of these files as well as brief description of their function is listed below.

RUSSUBS1 contains subprograms that deal with either the comparison of the user's input with the machine's answer, or the transmutation of the English words.

RUSSUBS2 contains subprograms that handle spelling rules, mutations, or stress handling.

RUSSUBS3 contains subprograms that deal with declensions and conjugations of Russian nouns, adjectives, and pronouns.

RUSSUBS4 contains subprograms that conjugate verbs and verbal forms.

COMMAND PROCEDURE SPY

This command procedure is provided for use by the Russian teacher to manipulate informational files. It was included so that the professor using the program need not have any knowledge about VMS. It is menu-driven and executes standard VMS commands. Specifically it allows the professor to display, print, or delete individual student files, all student files or the comment file.

This procedure is protected by a password. The password is contained in the file and can be changed by use of an editor. Also the program executes non-reserved commands so that a student with basic knowlege of the VMS operating system could perform the same operations. A more secure system could be devised by moving all the informational files to the professor's account.

Figure 6 shows the main menu for the SPY command procedure.

SPY

You are running the KGB RUSSIAN SPY program. Plese answer all questions as they appear.

Please enter the first 2 letters of your last name : tu

Please type in your password :

PLEASE CHOOSE ONE OF THE FOLLOWING OPTIONS

'DI': display individual student files 'DA': display all student files 'DC': display the comment file 'PI': print individual student files 'PA': print all student files 'PC': print the comment file 'DLI': delete individual student files 'DLA': delete all student files 'DLC': delete the comment file 'QC': stop execution of the program

OFTION:

FIGURE 6

10% FINANCING

104

ANNUA

Is our pleasure showing? Forgive us this time, but this special 10% financing opportunity for DEC PDP-11 and VAX users is too exciting for our usual low-key approach.

Our 10% annual interest rate is just another of many reasons to select Amcor's sophisticated "New Generation Software" now.

If your manpower needs are increasing, and your revenues are decreasing, you need to take a good hard look at boosting your productivity. You probably need tighter controls on inventory and accounts receivable. You certainly need to increase the productivity of your programming and administrative staff. You definitely need comprehensive, sophisticated software. **IF YOU'VE** Meanwhile, you need the money to do it.

We've got it all. That's right -for a limited time only, Amcor is offering 10% financing on some of the most comprehensive DEC-compatible software available. Amcor provides productivity solutions for A/R, A/P, General Ledger, Payroll, Inventory Control, Order Processing and Sales Analysis.

> Our commitment to excellence is also evident in one of the most powerful DBMS' on the market. "Ambase", which includes a report generator, screen formatter, query language and automatic code generator. A world leader in software solutions, Amcor has installed over 600 software systems worldwide. So. . . we have the productivity solutions, and we have the money. Call us now and we will tell you how you can have it too. Our tollfree number is 1-800-626-6268.

amcor computer corp.

Headquarters: Louisville, KY Regional Offices: Nationwide 502-491-9820

GOT IT...

FLAUNT IT

CONVERSION TO THE VAX 11/780

The major problems in performing the conversion to VAX-BASIC were the differences between the two languages (Dartmouth BASIC and VAX-BASIC), reading the tape, and the already mentioned unfamiliarity with VAX-BASIC.

The major differences in the languages concerned file management. These differences included opening, closing, reading, writing, updating, and noting the end of file. Another difference was that a "" instead of a "!" was used for comments. Normally this would not be a problem and was changed by global editor commands. The problems arose because the "" was a special code character that was used in the program to indicate certain types of words. When these characters were changed, small bugs were introduced. These small bugs were only small after they were removed.

The tape was of variable record length and was unlabeled. We did read it with 'TAPECOPY' as 80 byte records and had to delete and then reinsert carriage returns and line feeds.

CYRILLIC ALPHABET

The program can be run using the Cyrillic (Russian) alphabet or an English transliteration scheme.

The major use at Hollis is from a single Decwriter II terminal using the Cyrillic alphabet. Use of this character set was accomplished by installing a DS120 Terminal Controller in the Decwriter. This controller allowed for the definition of an alternate character set. The controller is a 9" x 10" digital electronics card incorporating an Intel microprocessor. Specifically it is designed to convert an LA36/LA35 to a 1200 baud teleprinter.

It also has 'User Programmable Characters' as an option. This feature is used in producing the Cyrillic alphabet. The characters are read in from a file which defines them as a series of vectors that correspond to rows in a 6 by 9 matrix. This matrix describes each character. The alternate characters are enabled and disabled at the appropriate times throughout the program. This is only done if the user chooses to get the answers in Cyrillic.

The board was purchased from Datasouth Computer Corporation of Charlotte, North Carolina. Installation is a non-trivial but manageable half-day job. The cost of the DS120 with the option was approximately \$900.

Hollins has just acquired several GIGI terminals. Future plans include using these terminals to produce the Cyrillic character set.

Figure 7 shows the English and Cyrillic transliteration charts. Figure 8 shows a sample run using the Cyrillic alphabet.

CONCLUSION

This program is an excellent example of the use of a CAI program with a foreign language. The computer is used to make the program much more than a simple drill exercise. It follows all branches and produces many more examples than could be provided in a class. The ease of use on the VAX makes the system a useful tool for instruction. When the program was first installed, the former non-users of the computer had to be carefully led throught its operation. It did not take long, however before they felt very comfortable using 'BORIS', as it came to be called in the Russian department. BORIS is now in widespread use and it has been very well received by both the students and the professor who are using it. Future use and positive acceptance of the pro-

A	
5	
Б В Г Д	
r.	
4	
E	
E	
E E XX 3	
3	
И	
Й	
к л м н о	
л	
M	
H	
0	
n	
P	
P C T Y •	
L	
Y	
Ф	
×	
ц	
4	
ш	
ų	
ъ	
ы	
b	
Э	
ĸ	
я	

DECPROFESSIONALDECPRO

b

đ

d

3

h

Note that the character '3' (three) is used for a 'Z'. Note also that the letter 'E' is first an 'E', then a <BACKSPACE>, and then a <QUOTES MARK>.

PROFESSOR (type 'XX' if you do not have a professor): ? xx

FIGURE 7. Transliteration Schemes

1. IT'S ALL THE SAME?

The correct answer is BCB PABHO 2. LITTLE; SMALL?

The correct answer is MAJEHDKWA 3. CHESS SET; CHESSMEN?

The correct answer is WAXMATN 4. LET'S PLAY?

The correct answer is AABAWTE CNFFAEM 5. I HAVE?

The correct answer is Y MEHA ECTb 6. FOREST; WOODS?

The correct answer is AEC 7. RIVER?

The correct answer is PEKA 8. WEDNESDAY?

The correct answer is CPEAA 9. WELL....?

The correct answer is HY 10. TABLE?

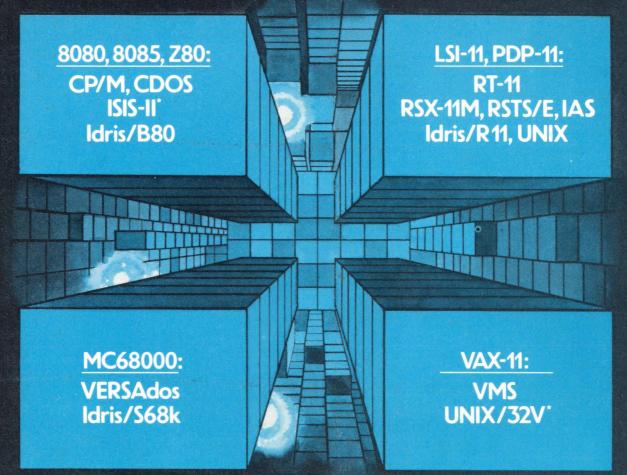
FIGURE 8

gram should encourage other professors to use or design learning packages for the VAX.

For information on obtaining this package, contact: Barbara L. Kurshan, Director of Academic Computing, Hollins College, Hollins, Virginia 24020.

C is better than ever.

Whitesmiths, Ltd. is now shipping Release 2.1 of our highly acclaimed C Compilers for ten different operating system families on four architectures:



'Available in source form only.

Idris is a trademark of Whitesmiths, Ltd.
UNIX is a trademark of Bell Laboratories
CP/M is a trademark of Digital Research
RSX-11M, RSTS/E, RT-11, LSI-11, PDP-11, IAS, VAX, and VMS are trademarks of Digital Equipment Corporation
VERSAdos is a trademark of Motorola Inc.

We've added optimizations, sped up runtime routines, and (ahem) fixed all known bugs. The portable C library is more extensive than ever, with new math functions, pattern matching routines, and support for Ada-style exception handling. And it's easier than ever to interface to new environments.

Native compilers are only \$750, including shipping in the continental U.S. Cross compilers, for most combinations of host system and target machine, are \$1350. A Pascal Compiler may be included for an additional \$200. Old customers may upgrade for just half of the new price. And maintenance is now only 25% of the license fee per year.

Now's the time to write or call.

Distributors: Australia, Fawnray Pty Ltd. P.O.B 224 Hurtsville NSW 2220 570-6100 Japan, Advance Data Controls Corp. Chiyoda-ku, Tokyo 03263-0383 United Kingdom, Real Time Systems, Newcastle upon Tyne 0632 733131



Parkway Towers, 'B', 485 US Route 1 So., Iselin, New Jersey 08830 (201) 750-9000 Telex: 645592

DECPROFESSIONALDECPROFESSIONA

DEC PERSONAL COMPUTER FAMILIES

By John B. Runyon, Publisher, (C) 1982 COMPUTERS-R-DIGITAL monthly, Box J, Navesink, NJ 07752 John publishes a DEC Monthly Newsletter, COMPUTERS-R-DIGITAL. He has allowed us to print this article.

We shall explore what the new DEC series is, what it means, and what the present DEC personal computer choices are. Together we can even muse as to why some of the various DEC "personal" models of yesterday may be a much better choice for you temporarily until tomorrow or the next DEC quarter. We shall think about computer planning for obsolescence within 2-3 years for new purchases we have yet to make, so we don't too become obsolete.

Bang, the shoe has dropped, the giant has stepped but the thunder is not yet heard. Just as lightning is seen before heard, the eventual thunderous crash is more frightening than the electric shock. One is instantanious and sharp, the other long reverberates. That in a storm dogs howl, cats hide, and children scream will not be unlike the eventual results of DEC's personal computer entries when the competition feels its effects.

The industry is revolutionizing itself once again. People ask why, now, and how. Big companies will absorb little companies' markets even if the little companies are successful and profitable.

None of the big computer companies, first for so long in table top manager and executive systems, permitted smaller companies to capture the market. But big companies have always waited until the smaller ones bore the cost of market education and establishment or proof of a large buyer population. Then they overcome the mistakes and lack of facilities of these smaller companies with large scale economy via engineering, marketing, packaging, and resources. To make a style-setting, proprietary and attractive molded cabinet, create professional documentation, provide training and end user support or service, are major expenses usually not possible for the small company or even recognized as necessities.

DEC, IBM, and Xerox plus a few others in the semiconductor businesses, such as Texas Instruments, vie for market dominance once assured primarily to Apple and Radio Shack. Also, DEC now has a major plant successfully manufacturing state-of-art competitive, custom IC computer and bus interface chips, which are sold in quantity both internally and externally. It makes it possible to internally and confidentially manufacture better and cheaper computers faster. Not unimportant is that another company is not being paid by DEC, as in the past, to tool up for later compatibile competition. The "Soul of a Machine" will be harder to determine or copy. That soul will be encapsulated to the microscopic level in goo, and sealed in cases with warrantee seals. Such is the protection and luxury of resources not available to small manufacturers.

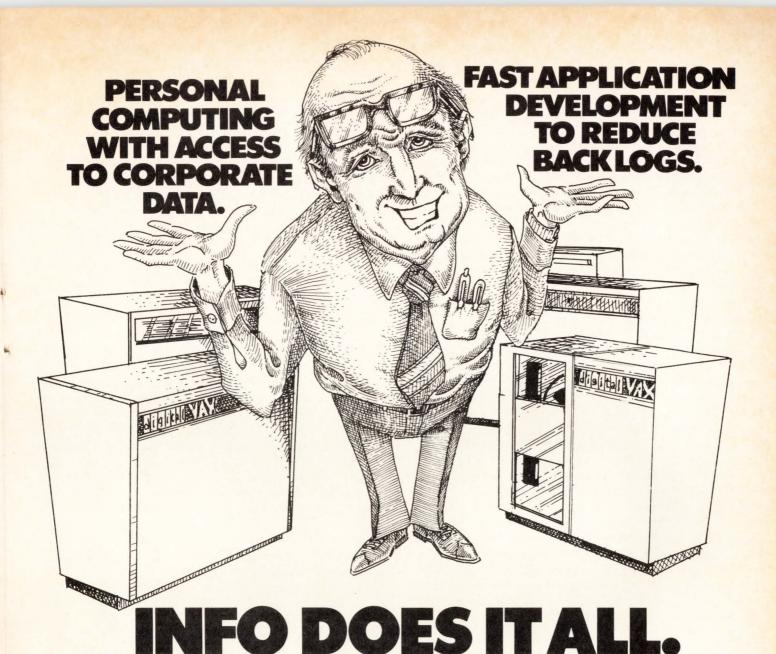
In the low end of DEC personal computers, video terminals, disk controllers, etc., no DEC manufactured computer chips are used yet, such as the 1 chip PDP-11/21. Why should DEC buy thousands of chips from others when its own plant can brew and cook them up from its own recipies? Time, probably just time. Thousands of 8080 rejected chips for VT100s once back logged a warehouse full of terminals while the compatibles copied even DEC's case and DEC built factories. Also, DEC uses thousands of other common computer chips, such as Z-80, etc., in most controllers, DEC terminals, VT180 personals plus the 2 chips in the new "Rainbow" and an optional 2nd chip in the new DECmate personal computers. But these are only one single board, easily substituted later (in the standard CPU box) with a DEC chip without much if any system redesign, i.e., reuse the superlative if not obviously brilliant Erector set modularity. The 11/21 chip is separately sold now.

It would be inconceivable not to see the PDP 11/21 in DEC products, possibly first as a disk controller and small computer even if advertised as being for dedicated control uses only because of its memory map, etc.

Larger DEC personal computers use DEC's own 11/23 + chip set in a BOUNDED bus system somewhat reminiscent of the PDP-150. Later an UNBOUNDED bus 11/23 + personal system will be announced, reminiscent of the VT-103's (that followed the PDT-150) with its open ended modularity (using the personal packaging). Two very important words, much to big for this article, a subject of a large article later, as will be the subject of busses. New busses, a 11/70 "Q" bus. A fast bus if not a mass bus. Resonant busses, async busses, sync busses. Keep your standing wave ratio down, terminate in a disk and/or multifunction board.

What now will happen? Other "hobby" systems must be in jeopardy. While apparently, Apple will not have as many serious problems as most other big corporations, DEC will affect them very significantly. Other large companies also sell small business systems but these are primarily to customers of their larger systems rather than frequently to large quantities of new customers and to unnecessarily cost conscious victims.

One can still read that Honeywell even claims to have invented the minicomputer and has made one for a long time, but it is not common to hear of them in the news, in compatible software or hardware offerings, at schools, customers or even through brokers. It is important to hear of computers in these ways. It is a reason for, if not significant measure of, the success of DEC and IBM. So, too, with Univac and Burroughs products in the realm of small systems. There are many good small systems but ones not well known, or actively supported by many other organizations of vendors, users, etc. Lots of people feel that it is just too dangerous to invest themselves or their organization in unpopular products because of both the personal career and corporation risk. For relatively little gain, usually a minimal financial gain and state-of-art gamble, few are so daring. Computer sales will get fewer as big company choices become available. People who own Apples and other systems tell me they would buy DEC instead now; and the same must be true of IBM who expects to sell 200,000 of its sys-



INFO gives me the best of both...personal computing versatility and fast application development capability.

For your non-technical users...Personal Computing.

INFO is so easy to use that managers and secretaries alike can solve many of their information processing requirements. With only one day of training. They can set up files, query and generate reports. Develop selfediting data entry screens and write simple application programs. By solving their own problems, my users have become part of my staff without being part of my budget!

NOW, INFO IS APPROVED FOR DIGITAL'S EXTERNAL APPLICATION SOFTWARE LIBRARY.

For your technical staff ...Fast Application Development.

INFO cuts development time drastically. From ¼ to 1/10th the time a COBOL project would take. Not only can my technical staff concentrate on main line applications, they can get them done faster. Why? Because INFO gives them the simplicity of a Relational DBMS plus the versatility of a fourth-generation application generator.

For your budget...It's affordable, less than the cost of a programmer.

INFO is the least expensive alternative. With INFO, you can turn any terminal into a personal computer, allow users to "do it themselves," and double your staff without adding a * person. And if you have a DEC VAX, INFO is ready to go to work for you.

For your future growth.

INFO is a growing state-ofthe-art system, designed specifically to meet your needs now and in the future. We will soon offer an integrated word processing, personal computing, application generator and decision support system featuring a revolutionary RELATIONAL FREE TEXT DBMS, and modeling. At a price you can afford.

For your information.

Executives in more than 700 companies have already found that INFO makes their job a lot easier. Why not see if INFO can do it for you. Call or write Henco Software, Inc., 100 Fifth Avenue, Waltham, MA 02154 (617) 890-8670, (TWX: 710 324 7701)



* DEC and VAX are trademarks of Digital Equipment Corporation. tems this year; i.e., they expect to do better with one small system than Series 1 and some of their other small systems.

DECPROFESSIONAL DECPROFESSIONA

Is there any room for anyone else, even if already here? There are a lot of reasons to believe — no, there is no room — well maybe a little, just a little. Just for a few but definitely not some of the now popular wonders of today. Data processing on a game computer beyond a few hundred name/label list is hardly feasible nor is adding larger storage. Toy computers, just because chips are cheap, will have to be recognized as games and not considered as computers just because of complex programming. The father who bought his son a game, didn't buy a computer any more than a train set is a railroad. The professional who plays games with the real computer will learn something and be entitled to entertainment but it is not a game computer. The game plans for success of "toy" vs real computers are very incompatible.

Systems design, programming and engineering are the most marvelous and entertaining of all games to which people devote their whole time as a lifestyle. But these are games of infinite boredom, grueling discipline, and such difficult, error-prone study as to be unpleasant work to the general populace. They do not consider it as play and often get rid of the machine. Even easy to use computers with canned financially useful programs are definitely not what they buy a computer for in order to have fun.

The point is that DEC writes and in many ways distributes games of pure entertainment for its computers. It, like XEROX and IBM, is not yet and may never try to get into the hobby entertainment business of game computers. Politely, in shock and horror at the question, they replied discretely to get entertainment software from others when queried whether games would soon be available for their machines. That such games are already available is not a sales benefit of any real buying significance to DEC's perceived prospects for its small computers now being announced.

The marketing strategy of DEC, now into personal business computers for managers and executives, programmers and users, whether at work or home, is no longer just a model or two of a personal computer like many personal computer manufacturers. Some say that its one VT-100 expansion kit called VT-180 was only an emergency measure. It may be more important than that because many will consider the VT-180 a better choice than the newer offering. It will continue to be marketed while the new personal computers are not yet deliverable and afterwards. You can buy it via official distributors like MTI even bundled with turnkey software, from DECdirect, DECstores, etc. The distributors provide much more local support and service but other procurement sources have other benefits.

The PDT-150 (at unbelievably attractive prices from brokers), VT-103, and used DEC systems can be had immediately with full PDP-11 computer benefits not possible in the new personal product line but at the sacrifice of other benefits. You have to think out the long and short term aspects of it all. A used PDP11V03 at much less cost than the personal computers but with much more power, and even current PDP-11/23's, sell at extremely attractive personal level prices. Rental from Hamilton may be a way to get PDP-11

computer power immediately while waiting for the new line to be deliverable or for the big Winchesters and streaming tape to become available on small DEC systems from DEC. There are immediate solutions in the DEC products for personal computing which are good choices.

Thus far the current DEC personal computer options have been reviewed. Now the fall, than next spring offerings. However, a VAX-730 computer with work stations may be a more economical and better choice for some purportedly small computer systems' requirements and even not take as much as a desk top system. That is the subject of another article.

The personal family of DEC computers are:

- Rainbow, a dual processor 8 bit and 16 bit system wherein the correct processor is automatically selected according to the type of software involved. CP/M Operating System.
- 2. DECmate, essentially for word processing via PDP-8 chip, but has a CP/M optional chip board. Hence, it runs DEC's now famous WIPS word processing, DIBOL, FORTRAN, OS/8 Operating System, various PDP-8 programs including a huge array of turnkey applications by DEC and others. The are 106 vertical and horizontal turnkey applications (listed with vendor name/addresses in a DEC directory to be reviewed) including the DIBS A/R, A/R, G/L general applications or, for example A/R, etc. especially for dentists, accountants, contractors, etc. Separate packages by various vendors. DECmate is already a proven successful standalone and timeshare word, data, and communications processor for non-dp clerical type end users. Currently, there are generically 3 type standalone DECmates:
 - Video terminal with internal processor on a rollabout cart housing 2 or 4 diskette drives. Based on vintage you get:
 - 1. VT-100 or VT-52 video terminal
 - 2. RX01 or RX02 diskettes
 - As above but cart replaced with desk side pedestal, the width of a diskette drive. It can be converted into a desk or work station. Extremely practical and attractive, also mobile.
 - 3. The DECmate in personal packaging.
- Professional Series, currently the 325 and 350 using the PDP-11/23 + BOUNDED bus.
- LCP, (Low Cost Product is the current nomenclature), 11/23 + series with UNBOUNDED bus for possible introduction next spring, not yet announced.

You, of course, will assume that each higher series will be, in effect, a much higher total price or else there would not be a reason for separate models to exist. Intelligently, you should assume that the the apparent differences between series should not look like major differences in prices. Pricing is like automobiles with accessories and options. It should be; and it is the same price range as automobiles. You should assume that when properly evaluated, the software costs (total, maybe NOT ALL from DEC even if you intend to program) should approach or exceed the hardware costs. Service costs will be much less than for cars, or than for the typical percent of system costs used for large machines. In large machines, the total service costs in a few

ELEGTRONIC MAIL. PRACTICALLY SPEAKING.

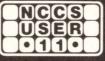
Sooner or later you will be using electronic mail. It just makes good sense. When you do, you will want a system that is complete—a delivery system, a scheduling system, and an information manager. Your electronic mail system will become an essential part of your office environment. INTECOM is such an electronic mail system*

INTECOM's power is easy to control. It relates to the way you work. Electronic IN, OUT, and HOLD baskets are just what you would expect. You can scan your IN basket, selecting only those message subjects you

> wish to read. Or, you can place a message into your HOLD basket for a number of days to have it automatically reappear in your IN basket on the appointed day. You can even have INTECOM recall specific messages by providing your own selection criteria. Replying, forwarding, and sending to groups are as easy as can be. And these are just a few of the features in store for you.

You owe yourself a closer look. Write for a brochure or give us a call direct.

INTECOM...*the* INtelligent TExt COMmunicator.



North County Computer Services, Inc. 2235 Meyers Ave., Escondido, California 92025 (714) 745-6006, Telex: 182773

*INTECOM is currently available on DEC computers using the RSTS operating system. RSTS is a registered trademark of Digital Equipment Corporation. INTECOM is a trademark of Logic eXtension Resources. DECPROFESSIONALDECPROFES

years exceed the hardware costs since they are frequently (not always) derived from a percentage of hardware costs. Hardware + Software (systems and applications) + Service (hardware and software versions/bugs) + Operations + Utilities + Site + Cost is what is necessary to use any computer, whether owned, rented or leased. It still applies to small computers, too. But these are not ones in which one might not buy an operating system in order to save money.

It is important to realize that all the families of all the personal series use essentially the same, the Erector set modular mechanical and electronic components. Only the internals of the CPU portion of the box are ESSENTIALLY different. That is NOT to say that different capacity power supplies may be used just as in VT-100 vs VT-103 and now VT-101. That is not to say that wiring harnesses will be the same between CPU types. That is not to say that a DEC chip like the 11/21 or others could not later be offered, too, as still another series. Universal boxes, parts, and electronics enables mass production speeds and economies, what DEC can do that smaller companies can not do with such benefit. Moreover, DEC can additionally use these parts in its big computers; and it would be typical for them to do so.

The packaging is so obvious, so ingenious, so brilliant, so similar but different from tradition or precedent that DEC continues with their innovative fame even more in the packaging than in the processors. Since the wonder is more in the packaging than CPU or disks (currently) and since there is so much to reveal about each component, whole separate articles will be devoted to them. For example while packaging is all new for the personal series, there is usefulness of it for bigger systems (both hardware and software). The major components are universal across all of the above personal series and significant questions about them listed below will be the aspects in additional articles:

- 1. Video monitor, not VT100
- 2. Key Board, longer and lower than VT100
- 3. Erector Chassis (invented nomenclature):
 - 1. Cabinet (convertible):
 - 1. Table Top
 - 2. Pedestal
 - 3. Rack
 - 2. Storage (5-1/4", NO 8" option), magnetic:
 - 1. Diskette (dual)
 - 2. Winchester (1 only)
 - 3. Power Supply
 - 4. CPU Box:
 - 1. Various CPU's
 - Up to 256 KB in Prof Series
 - 3. Other options
 - 5. Ball Pen Service Tool (instead of screwdriver)
- 4. Operating System(s):
 - 1. RSX, scaled down and hardware dependant
 - 2. CP/M
 - 3. DECmate (various, mentioned above)
 - 4. What about RT-11 & especially DIBOL?
 - 5. What about RSTS?
 - 6. What about UNIX?
- 5. VAX file system?
- 6. Utility programs initially supplied?

- 7. Vertical & horizontal Application Software?
- 8. Peripheral Support, now & later?
- 9. Graphics & color?
- Languages such as BASIC+2. What of all the other popular languages, especially DIBOL, PASCAL, and FOR-TRAN?
- 11. Pricing & discounting?
- 12. Options (Hardware & software utilities/applications)?
- 13. Sales channels (mail order, professional & retail, will DEC use other retailers than its own stores)?
- 14. Service (software & hardware)?
- 15. Installation?
- 16. Documentation?
- 17. Training?
- 18. Performance?
- 19. Commissioned software development (has already started)?
- 20. How will it be integrated within larger DEC Systems and used as peripherals to them, so you can be sure of both?
- 21. How will the marketplace react and to what degree, especially the professional, educational, and Plug Compatible markets?
- 22. For the Rainbow, what is the bus standard?
- 23. The subject of RSX multi-tasking will be an important one that is thoroughly implemented in RT-11's foreground/background/underground system jobs.

So more, much, much more to follow, as always, space permitting to detail, and interpret the significance of the above. The products are exciting and will fill a mission but they will not replace the larger DEC computers for many professionals for a long time, if only due to the very small storage currently available. The answers to the above list are the reasons why the |D|I|G|I|T|A|L| SYSTEMS will be so significant and so competitive so there is no reason to expect them to be the cheapest alternatives. Support is worth money if there is enough variety of it to custom meet every need as is the case now.

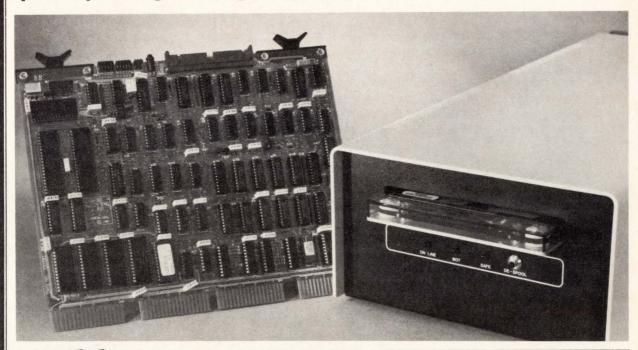
While this currently very limited and bounded storage capacity will be increased, there may not be enough major incentive for DEC to do that very quickly or until that of the larger "Q" bus machines is increased with Winchester disks. The competition between the personal and 40" cabinet machines or between the product lines will be interesting. For many professionals more concerned with DP than number crunching, the 11/03 has sufficient power even if the 11/23 is faster and allows more memory. So the the limited storage certainly will prohibit personal computer use of the machine until it can be expanded. Less experienced people will find out the hard way as is the case now with other small computers where people just don't understand how small a few megabytes are in terms of computer requirements in non-number crunching applications.

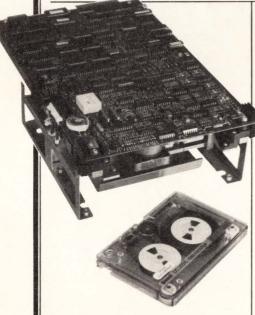
The history of old computers offers some guidance in buying new ones if we can learn anything new from old history when we buy our next computer, whether personal or 40" cabinet model (which can be had with a 11/03, 11/23, 11/24, 11/44, or VAX 730 all in the same small 40" cabinet).

As the 11/23 becomes more universal the differences

Introducing Alloy's LSI-11 Streamer...

with high-speed streaming, file-oriented operation, standard DEC utilities, simultaneous print spooling and high capacity.





Now there's a streamer for LSI-11 Winchester backup that lets you dump files at high speeds and, more importantly, helps your restore system files quickly and confidently. Alloy's new LSI-30 is a DEC.

Alloy's new LSI-30 is a DEC LSI-11 compatible controller

designed for the streaming tape drives of Data Electronics Inc. (DEI). Unique among streamers, the LSI-30 provides file-oriented backup/restore operation under standard DEC utilities, including PIP, FILEX, BRU, DUP, COPY, DSC and PRESERVE — at streaming speeds of 1.5 megabytes per minute. A full 10 or 20 megabytes are stored on each 450-foot cartridge, unlike the typical 4.5 megabytes with conventional stop-start tape drives.

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.

Get it all from Alloy

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.



Magnetic Media for Micro's

The Modern Data Communicator's Bible "They Swear by it!"



Over 8,000 corporations (and 400 of the Fortune 500) put their faith in the BLACK BOX® Catalog of data communication devices.

This unique catalog brings together over 200 items specifically designed for today's data communicator, all under one cover. Detailed product descriptions and photos (with prices) bring the store to the shopper for convenient ordering. Included are 3 models of IBM compatible protocol converters, and a new programmable communication adapter. It also features over 20 models of interface converters, 22 different data switches, 9 EIA test sets, and terminal and port sharing devices, sign-on and answer-back boxes, limited distance and short-haul modems and modem eliminators. There are tools of the trade, and a full line of cables and related parts.

BLACK BOX® Catalog's long-standing reputation for new-product development, testing and evaluation continues as a direct response to customer inquiry. The never-ending demand for new products and applications, combined with BLACK BOX® Catalog's quick reaction to these needs, keeps them at the forefront of data communications technology. Every product is backed by a one year warranty, and every product is available for a thirty-day trial evaluation

The answers to a data communicator's prayers are in the BLACK BOX® Catalog.



in 11/03 instruction sets may become important for software portability. True of other 11's too. Also, confusion may develop about the differences in the older backplanes and support by controllers of 22, 18, & 16 bit addressing or the differences between the older and new memories. This is why you should save the old handbooks that detail old products after they are phased out or coverage is condensed in the newer handbooks. Notice how one of DEC's most popular and wonderful drives, the RK05, is slipping silently into oblivion. RSTS won't even recognize it anymore.

This is why you should buy all the manuals of anybody's product when you buy the product. Later they will not be available at all or rapidly enough when needed. It would be impossible to expect a DEC repairman to be able to bring them all for your repair or work very effectively with microfilm. They are not cheap to buy or store; and they tend to get lost or taken. It's what to do when you buy your new computer, then keep reviewing the manual lists since all manuals are not available as soon as the machines are deliverable and some manuals are preliminary ones that undergo revisions. The VT100 manual is a prime example, there were over 3 revisions to the user manual on it. There are also Engineering Change Orders (ECO) and Printed Circuit Board revision etch levels of the stages of product development which sometimes limit what are thought to be acceptable options to use.

In 2 years your new computer will seem technologically very old. In 3 it will be obsolete (even if you can not face it) and in 5 years, no matter how well it works... well think of the RK05. How long since you saw a new DEC system in those very space efficient and still almost 50% cheaper 6' racks that double the front panel space. They don't look as good but they work very much better. Now why should they be "traditional" even for the huge systems like VAX 780 and 2020?

AUTHOR! AUTHOR!

The DEC Professional wants you to be an author! Send your articles of interest to us on mag tape in either RNO, PIP or WORD-11 format. Eighty percent of this issue was transmitted via telecommunications from author's mag tapes to phototypesetting equipment and was not retyped.

DEC USERS

PROFESS

RSTSPROFESSIONALRSTSPROFESSIONALRSTSPROFESSIONALRSTSPROFESSIONALRS

magazine!

don't

miss

this

LASTSPROFESSIONALASTSP

TSPROFESSION ALRSTSPROFESSION ALRSTSPROFESSION ALRSTSPROFESSION ALRSTSP

We would like to introduce you to the **RSTS PROFESSIONAL**, the magazine for interactive DEC computer people. You'll find many articles of interest to you useful, too! The **RSTS PROFESSIONAL** is valuable reading for users of all operating systems. We have now expanded to include a special VAX section — The VAX-SCENE ... and we will have more!

R STS PROFESSIO	ONAL (2	ox 361, Fort Wa 15) 542-7008	ashington, PA 1	9034 Fill o	out and mail this portion.
 Payment enclosed, please enter my subscript U.S. (3rd Class) - \$35; Canada & U.S. (1st Class) 	y ,	,	0 payable in U.S	. dollars.	
□ Bill me, and please enter my subscription for	one year (6 issues).			
Please send Back Issues circled: \$10 ^{oo} per issue enclosed. Bill me at \$12 ^{oo} per issue. All 12 for \$80 enclosed.	Vol. 1, #1 Vol. 2, #1 Vol. 2, #2	Vol. 2, #3 Vol. 2, #4 Vol. 3, #1	Vol. 3, #2 Vol. 3, #3 Vol. 3, #4	Vol. 4, #1 Vol. 4, #2 Vol. 4, #3	
Name			200 8 3 4 million		Suite
Address		City	St	ate	Zip
Country			Telephone ()	
FREE CLASSIFIED AD WITH SUBSCRIPTION! Your	first 12 words are				DP/7-8

? Why TECO ?

By Carl B. Marbach

TECO can be used on all DEC operating systems! The main reason to use TECO and the major premise of this article is —

! BECAUSE IT IS THE EASIEST EDITOR TO USE !

The fact that it is the fastest, most versatile, and most powerful editor is secondary to the main premise. It is always interesting to note that editors are almost always used by experienced programmers and users, and we are afraid it's too complicated for these talented people! For any of you who have stayed away from TECO because it was too complicated, hard, or secretive (it is not a DEC supported product, just everyone at DEC uses it), read on and I'll show you the easiest editor around.

The first thing one wants to do to edit is invoke the editor and tell it what you want to edit. Thus,

TECO FOO.BAS

starts TECO, identifies that you want to edit FOO.BAS and as a bonus, create FOO.BAK in case you destroy or modify something you didn't want to. Clearly, there is no shorter, clearer or easier way to do this.

TECO now responds with an * indicating its readiness to accept commands. A subset of TECO commands necessary to edit files is listed here.

V	View the line you are currently
	on.
L	Move to the next line.
D	Delete the next (following) character.
К	Delete from where you are to the next CR LF, inclusive.
Ixxx < ESC>	Insert text XXX.
Sxxx <esc></esc>	Search for XXX. Searches and Inserts are delimited by ESC (altmode).
< ESC > < ESC >	Go and do it.
EX < ESC > < ESC >	All finished, exit to monitor.

Thus, to delete the 10th line of a Basic program called FOO:

ICall in the editor ITECO prompt
Move 9 lines forward
!Kill it
Execute the command ITECO prompt for next com- mand

TECO commands may be given one at a time. It is usually more convenient to type, in a single command string, several commands that form a logical group. <ESC> are only needed between things that require a delimiter (i.e., searches). Typically, this looks like

*9LK\$\$!\$ is an <ESC> echo

To delete the 10th character in the 10th line:

*9L9CD\$\$

DECPROFESSIONALDECPROFESSIONA

To delete CARL from the text:

* SCARL\$!Delimit the search with one <esc></esc>
*-4D	IDelete the four characters
	(-means before)
*V\$\$!View it and do it
To insert DEC:	

* IDEC PRO < CR>	Note that carriage return
\$\$	places you in the next line and
	is required to insert a line.

Note that < RETURN > is not used very much in TECO. < ESC delimits searches and tells it when to go. The reason is that you may someday want to operate on < RETURN > (delete it to move two lines into one) and using < ESC > divorces TECO delimiters from the standard monitor delimiter, < RETURN >. Notice that now you can invoke the editor, search, add, and delete either lines or characters, and exit saving the file and creating a backup.

You have now noticed that commands can take numeric arguments (-4C) and they can operate forward and backward. An important TECO concept is the pointer (where you are in the file). Movements C and -C are relative to the current pointer position while L (or -L) puts you at the beginning of the next (or previous) line. After a little practice you will find keeping track of the pointer second nature, and movements becoming automatic. The single letter commands are somewhat cryptic but they make movements in the text and commands easy to type in and perform.

Why edit at all? I know DEC sites where they don't use any editor except for patching cusps, and then it is a cookbook approach. I have implemented TECO as an editor here because, simply, it increases programmer productivity. We can change all the "GET#File.5%" in one swell foop, or realign an output format quickly and easily. We almost never retype a whole line at the monitor level unless we are debugging interactively. In short, editors allow a single change on a long line to be made quickly and easily and they allow multiple changes to be made (in loops) with one command.

This is not meant to be a TECO text, but simply an argument that you can use TECO easily. A programmer with interactive experience can read the beginners TECO section in the manual, and begin editing in less than half a day: and be proficient in less than one week of editing. TECO offers not only editing, but a powerful string manipulation language that has great power and features.

The previous article has convincingly argued the case for 'Why TECO?'. One cogent reason is that, despite the richness of the command set and the consequent power of TECO as an editing language, the beginner can perform any straightforward editing task very concisely with only a small subset of its commands, such as C, D, K, T, L, I, N, FN and the basic loop structure. There are, however, a few pitfalls for the unwary; specifically, a certain class of operations, when performed in the most direct way, can be very inefficient. Furthermore, certain more intricate problems can be solved very simply if one knows, or at least knows of the existence of and can look up or enquire about, a much more extended set of commands. The purpose of this article is to warn of some of the pitfalls and, in pointing out how they may be circumvented, to engender an appreciation of the power and utility of some of the more advanced commands.

In order to understand how it is possible to be inefficient in TECO it is necessary to have some understanding of how it functions internally. Editing is performed on a coreresident text buffer that is filled from and emptied to the input-output buffers. In default of direct commands TECO will manage the flow into and out of the text buffer itself as needed and so this schema will usually be transparent to the beginning user. The limits of the text buffer are only appreciated when occasional attempts are made to type or delete text beyond them, and the commands whereby its size can be manipulated by demanding input to or output from it are, for the most part, unknown. The importance of the text buffer to the consideration of efficiency arises from the fact that each time any element of a command string causes it to grow or shrink by the addition or deletion of characters, it must be completely repacked. Most inefficiencies are characterized by approaches that repeatedly and unnecessarily insert/erase small numbers of characters into/from the text buffer. It is this class of inefficiency that I shall address here.

Before passing to some specific examples, I should briefly mention another factor that might be perceived as a potential source of inefficiency. This is that most TECOs are interpreters. They take each element of a command string, decode it to determine the required action, then perform that action. If the element is in a loop it is decoded in each iteration; there is no storage of compiled (decoded) instructions, as for example is the case for a FORTRAN or BASIC plus-2 program. Although it is always desirable to use as concise an equivalent command string as possible, especially within loops, this factor is seldom a significant one, particularly for the beginning user. The reason is the very conciseness of TECO commands: the overhead of interpreting them is in general a small percentage of the time consumed in executing them.

Let me illustrate the problems associated with repacking TECO's text buffer with a real-life example. I have a FORTRAN program originally designed to output the numerical tables it calculates to a terminal as efficiently as possible, in terms of type-out time. Each column is six characters wide and columns are separated by a single blank. To

? How TECO

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

retain as much precision as possible output formats are constructed internally, and for simplicity each element of the table is output separately, suppressing all carriage control. For example, if X is determined to obey $100.00 \le X <$ 1000.0, it is output by:

WRITE (KB,FMT2)X

where the array FMT2 contains ('+',F6.2.\$)(equivalent to print #KB, using "###, ##", X;). As so often happens, this program was later modified to fulfill a purpose other than that for which it was originally designed. Its output became too voluminous to direct to a terminal and was therefore sent to a disk file for later printing. Unfortunately, in our FORTRAN the character \$ at the end of the variable format only suppresses carriage control when output is to a physical terminal. In the disk file each element of a row, such as X above, occupied a separate line beginning with +. When the file was output to the printer with the interpretation of the first character of each line as FORTRAN carriage control, all of the columns were overprinted on top of one another.

The most immediate solution to this problem was plainly to search the file for and delete each of the very frequent occurrences of the character string < carriage return> < line feed > +. The simplest way to do this is to use the A command repeatedly to read the whole file into the text buffer, for reasons explained below, and then search-replace the string with an FS command. Since it is being replaced by nothing that is deleted, a delimited search-replace is the most elegant construct:

> * < @FS/ +//;>EX\$\$

Execution of this procedure with a small test file of only 20,000 characters and 2000 occurrences of the string to be deleted took 32.6 seconds of CPU time (KI10 processor). The reason for this excessive time is plain: for each string deleted all subsequent characters in the text buffer had to be repacked equivalent in this case to unpacking and repacking the whole 20,000 character buffer 1000 times. Since the time taken by this procedure grows as the square of the size of the file, it is plainly inapplicable to cases of realistic size.

This approach can be improved by working with a text buffer of normal size, without appending to it, and using the FN command to search through the file, in place of the FS in the above example. A problem with this is that TECO will, if it can, on filling the text buffer terminate it at the end of a line. Therefore, a small proportion of the < carriage return> + strings are split across consecutive text buffers and therefore not found in the first pass through the file. Thus, the file must be repeatedly searched, reporting each

time a string is found in sweeps after the first, until none is found (this is the reason that reading the whole file into the text buffer in the first solution so much simplifies it). Thus, after the first pass through the file, we do:

For the test file described above, it was on the fourth sweep of the file that no Xs were typed out. That is, no example of the string was found and most probably, but not certainly, all occurrences of it have been deleted. This took a total of 16.3 seconds. Although this time only grows proportionately to a power of the size of the file of about 1.3, it is still unacceptably large for routine practice use.

To obtain a really efficient solution to this problem one must control the emptying and filling of the text buffer oneself. The following example shows how this can be done:

*<0UA< S +\$; QA,.-3P .UA >B,QAK ZUZ A (QZ-Z)''E-1;'>EX\$\$

The outer loop initializes the inner loop by storing zero in Q-register A, OUA. The inner loop then searches the current text buffer for occurrences of the string with the S command. Each time one is found, the text from the end of the previous occurrence to the beginning of the current one is copied to the output buffer without modification, QA,.-3P. The pointer position at the end of the current occurrence is stored in Q-register A, .UA. When no more are found, the inner loop exits, and the outer loop continues by deleting all of the text from which that to be retained has been copied, B.OAK. The number of characters left in the text buffer is recorded in Q-register Z, ZUZ, more text, if available, is read into it from the input buffer, A. A test is made to determine whether the number of characters in the text buffer has changed, (QZ-Z)"E, and if it has not, the task is over and the loop is exited, 1:. Otherwise, ', the outer loop is reiterated.

This operation took 5.0 seconds of CPU time on the test file. It only requires a single pass of the file, and the time required depends linearly on the file length.

Very similar procedures can be applied to cases where repeated insertion, rather than deletion, is required. As an example, a large, profusely commented FORTRAN program had all of its comments neatly enclosed in boxes of asterisks:

C******	• • • • • • • • • • • • • • • • • • • •	* * * * * * *
C*		
C*	comment	
C*	comment	
	etc	

In the course of extensive improvements to the program the comments were further expanded and modified beyond recognition. This was done in free format and the net effect was to shift the right-hand margin of asterisks to the left and make it extremely ragged. It became plainly desirable to restore the readability of the program and comments. Since the parent program came from cards, the original line length was 80 characters.

To realign the right margin, a line of 78 blanks was inserted at the beginning of the first text buffer and then:

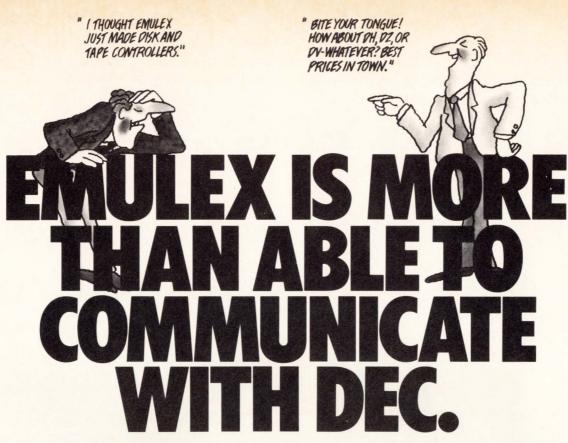
> * < 80UA >S C\$: .UB L 3R .UE (QB-QE + 78)UN QN''N QA..P B,QNP .UA'> 80,QAK ZUZ A (QZ-Z)''E 1; '> B,80K EX\$\$

The outer loop is very similar to that of the previous example, except that the first 80 characters of the text buffer contain the line of blanks (including carriage return and line feed) and are ignored. In the inner loop comment lines are sought, identified by < carriage return> < line feed>C. If found, the pointer position after the C, .UB, and that before the terminal asterisk, L 3R .UE, are stored in Q-registers B and E respectively. The number of missing characters is calculated in Q-register N, (QB-QE*78)UN, and if non-zero, QN"N, the new text prior to the terminal asterisk, QA, P, and sufficient extra blanks, B,QNP, are copied to the output buffer. Q-register A is then updated with the current pointer position, .UA. Note how much more efficient the insertion of the blanks is made than with the simpler equivalent ON <1\$>, in which for each iteration the text buffer must be repacked.

It should be plain that the techniques illustrated in the two examples discussed above for deletion and insertion are equally applicable to replacement or in fact any mix of the fundamental processes. My third and final example addresses replacement of strings of variable length. It concerns a problem that we had in bygone days reading 7-track even parity BCD tapes generated on *BM machines. (Since the growth in personal computer use is likely to make this journal the subject of family reading, I have eschewed ob-



DECPROFESSIONALDECPRO



We're also able to save you plenty: For instance, you get DH11 performance for a DZ11 price. Four new space-saving single-board communications multiplexers. And an increase in VAX-11 terminal handling capacity by up to 50%. Maintained nationwide by Control Data. Microprocessor-based architecture and common hardware deliver faster, more flexible line-handling. Self-test on power-up. Full software transparency. And Emulex reliability standards. Communicate with Emulex now. Write or call Emulex Corp., 2001 Deere Ave., Santa Ana, CA 92705; (714) 557-7580, TWX 910-595-2521. Outside Calif.: (800) 854-7112.

For immediate off-the-shelf delivery, call our national distributor: First Computer Corporation, 645 Blackhawk Dr., Westmont, IL 60559; (312) 920-1050. In Europe: Emulex Corp., 10th floor, Cory House, The Ring, Bracknell, Berkshire, England. Telephone: 0344-84234; Telex 851-849781.

CS11/H (PDP-11) \$7560 for 48 lines' CS11/U (VAX-11) \$7884 for 48 lines* CS11/V \$4464 for 16 lines*

CS21/Z \$2550*

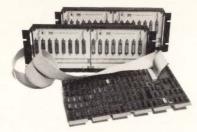
CS21/U (VAX-11) \$2844 for 16 lines* CS21/H (PDP-11) \$2520 for 16 lines*



Up to 64 DH11 channels from one board.

DH11-compatible MUX lets you mix RS-232 & current loop interfaces in 8-line groups. Built-in DM11-compatible modem control. DMA output eliminates host interrupts. Self-test capabilities. Transparent to PDP-11 software. Emulex' own software on VAX.

*Price each in 100 quantities All Emulex disk, tape, and communications products can be combined to reach quantity price breaks.



Higher DV11 performance, lower price.

DV11-compatible multiplexer. Mixes 8-lines synchronous & asynchronous on PDP-11s. Ideal for Bisync & DECNET. 8-32 lines per controller. DMA input & output. Software transparent under DECNET. Compact package offering higher line-handling speeds & improved throughput.



Replace DEC DZ11/E and save.

Perfect if you don't need DH11 performance. Softwaretransparent to all DEC operating systems. Easy PROM change enables quick upgrade to DH-11 performance. Saves one slot per 16 lines.





New economical DH11-type multiplexer.

Lowest cost, highperformance communications MUX. Priced way less than DEC's DZ11, with DMA to boot. 16 RS-232 lines per board, modem control included. Can use H317 distribution panel. Transparent to PDP-11 software; Emulex software on VAX. DECPROFESSIONALDECPRO

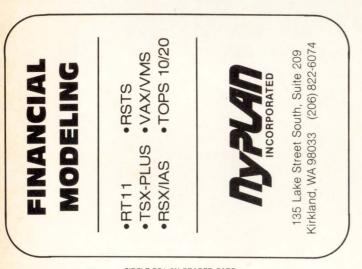
TRANSFER FILES between DEC PDP-II's, LSI-II's & VAX II's ... even with different operating systems!

XOREN IPL-II transmits files over either a direct line or telephone line using standard asynchronous terminal ports (DL-II, DZ-II, DH-II etc.) Full communications error-checking ensures error-free transfers even over noisy lines. Versions are available for most DEC operating systems including RSX-II M, RSX-II M PLUS, IAS, RT-II, CTS-300, RSTS/E, CTS-500, VAX/VMS, TSX, TSX PLUS.

Call Collect

SOFTPAK ASSOCIATES 634¹/₂ Venice Blvd. Marina del Rey, CA 90291 (213) 822-1830

CIRCLE D43 ON READER CARD



CIRCLE D31 ON READER CARD

scenity. In this case the asterisk replaces the operative vowel to protect those of tender years or sensibilities.) Because a zero frame at even parity has no bits set and therefore cannot be used for synchronization, their character code was modified so that all blanks on them were replaced by % characters. The problem of course was to restore the blanks.

We procede much as in the previous example, placing at the beginning of the first text buffer a line of blanks greater than the longest contiguous string of % in the file, say 148 in number. Then:

* <150UA <S%S; QA,.-1P .UB ZUA :S1 N%\$'`S(.-1)UA ' (QA-QB+1)UN QAJ B,QNP >150,QAK ZUZ A (QZ-Z) ''E 1;' >B,150K EX\$\$

This command string follows principles very similar to those discussed in the first two examples, and I leave it as an exercise for the reader to work out how it performs the required task. The command :S N%\$"S searches for any character that is not % and returns a truth value that is tested for success in the search.

I hope that the above examples have given some idea of the efficiences that can be achieved with TECO when many repetitive modifications must be made to one file. In general, in such cases the most efficient procedure is not the simplest and involves more advanced commands. The choice whether to devise and use it will depend on the length of the file, the frequency of the required modifications, and how often in the future the same or a very similar procedure will need to be employed. However, a knowledge of these more advanced commands will always be found to be useful. In the second example the calculation of the number of blanks to be inserted to justify the right margin could not have been made without them, and the corrections either could not have been made, or would have required time-consuming manual or trial-and-error counting.



CIRCLE D53 ON READER CARD

MINICOMPUTER PROGRAM ERRORS DUE TO PARASTATIC CONDUCTANCE

By D.A. Lowe, Staff Assistant, Occidental Life of California

Extensive research in the Home Office has determined that a large percentage of minicomputer system program errors are being caused by parastatic conductance resulting from differential spurving of the hydroscoptic marselvanes located in the prefabulated amilite base of the unilateral detractor mechanism.

Digital Equipment Corporation has been unable to offer any remedy for this troublesome situation other than to recommend manestically spacing the grouting brushes on the periphery of the nubbing purwell.

Although on the surface this would appear to alleviate the problem, we have found that this leads to further complications causing the regurgitative wennel sprocket to transmit microgriffage to the anhydrous dangling pin, from whence it is modulated, amplified, and splitnagled, thus causing transendental hopper dadoscope failure. This, in turn, causes quasipiestic depleneration of the bitumogeneous sprandels, thus leading to an even higher level of high RMP peak nivel-sheave voltage which further magnifies the amnesial slump.

It should be apparent that any successful solution has to be based on the regeneration of low-ohmic nofers combined with a high degree of medial interation of magneto-reluctance and resistance to atmospherical rillarah.

Fortunately, we have discovered a simple and effective remedy which involves merely modifying the spiral decommutator with the installation of a rectabular extrusion bracket and trichotometric indicator support (see attachment).* These items should be purchased (out of petty cash) from any local supply house and installed immediately. Upon installation, the above cited malfunctions should be reduced significantly and you should experience greatly increased non-reversible tremic amifacience.

Note that the special ambihelical hexnut is unique in that any attempt to remove it in the conventional manner only succeeds in tightening it. Because of this design, the nut must be fully screwed on before it can be screwed off.

DEC BEST VALUES

PAGE 63

PRE-OWNED DEC EQUIPMENT

BUYING AND SELLING

SYSTEMS • CPU's • PERIPHERALS • TERMINALS **OPTIONS • MEMORY • COMPATIBLES**

CALL DICK BAKER (305) 979-2844

Carico Center 2845 NW 62nd Street

incorporated Ht. Lauderdaie, Honda 000 Telephone (305) 979-2844

CIRCLE D55 ON READER CARD

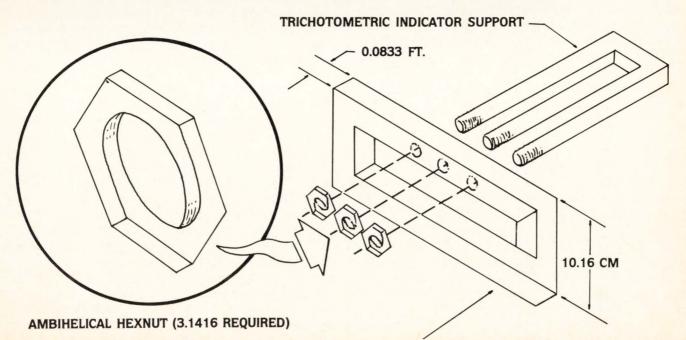
Ft. Lauderdale, Florida 33309

APPLE / RSTS APPLE / VAX COMMUNICATIONS

XCHANGE-11 GIVES APPLE II COMPUTER USERS AN EASY WAY TO SEND AND/OR RECEIVE DISK FILES TO OR FROM DEC SYSTEMS WITH 100% ACCURACY, ONLY \$995 COMPLETE, CONTACT SANDRA YOUNG (617) 782-6100

GEORGE W. HALLAHAN & COMPANY, INC. **1660 SOLDIERS FIELD ROAD** BOSTON, MASSACHUSETTS 02135

CIRCLE D9 ON READER CARD



MATERIAL: Ag + Au (SILVER THREADS AMONG THE GALLED)

RECTABULAR EXCRUSION BRACKET (MIL-6-2980)

STRUCTURED PROGRAMMING IN DEC BASIC

By Al Cini, Computer Methods Corporation

Al Cini will be conducting a one-day presymposium seminar at DECUS this Fall on Structured Programming in V2 BASIC, which will review the application of structured methods to the development of BASIC software using the new Version 2 language features. For more information, write to DECUS, Presymposium Seminars, MR2-3/E55, I Iron Way, Marlboro, MA 01752. Or call Computer Methods Corporation at (609)788-8440.

"When are you going to stop calling it BASIC?"

This question followed a presentation given by DEC's BASIC language development team at DECUS this Spring, which reviewed the planned features of DEC BASIC Version 2. The next release of BASIC, expected in early 1983 for both PDP-11 and VAX operating systems, promises a complement of powerful new language features previously offered only by "serious" compilers like PASCAL and PL/1, and implements most of the requests accumulated on the BASIC "wish list" over the last few years.

This giant leap in the evolution of the BASIC language parallels changes in user attitudes toward BASIC programming in particular and toward software development in general: programs cost more than computers, so we need to learn how to program computers better. The data processing community expects more from its compilers these days, because it wants to spend less time using them to build and fix programs.

We'll talk about BASIC V2 a little later, but first lets talk about programming in general, and structured programming in BASIC's current release.

Program Writing and Model Building

When you or I write a computer program, we transfer from our brains a precise and unambiguous description of a process to a coding form/keypunch/terminal. A process is a function which accepts raw symbols (input) and transforms them into finished symbols (output) according to a carefully formulated and totally predictable set of rules. In one of those "Pay attention! You might need this some day" sessions back in high school we all learned what computer programs are:

Y = F(X)

A computer program is a function which "maps" or transforms a set of input symbols into a corresponding set of output symbols. If you use physical raw materials for "X" (like glass, paper, or steel) and "real" finished products for "Y" (like houses, magazines, or cars) then "F" can be the workers, assembly lines, tools, methods and procedures which define a factory or business. When "X" is quantities/part numbers and "Y" is summary reports/paychecks/ledger sheets then "F" is a factory management or payroll or budgeting system. As we write software, we construct conceptual models of real things (input and output symbols) and processes (program instructions).

"Good" and "Bad" Programs

Good computer programs are

- · workable, i.e., their outputs correspond to their "real" world counterparts,
- · efficient, i.e., they transform inputs into outputs within an acceptable period of time, and
- organized, i.e., they are packaged to simplify their subsequent modification and maintenance.

We can all agree that workability is a central determinant of program "goodness", but program efficiency and organization are traditional points of dispute within the programming community, many of whose members insist that they are mutually antagonistic propositions. Most people believe that "organized" programs programs written according to currently accepted standards of program structure — are "over-written": big and slow. By the same token, people are quick to accept the premise that software maintainability can be gained only at the expense of performance. On the contrary, efficiency and organization are two coefficients in the same equation: given that a program works, "goodness" is determined both by the efficiency with which it runs on computer and by the ease with which it can be extended/repaired/adapted as its real-world environment changes. Sensible data processing professionals can't say they've done a good job building a system unless they can honestly say they considered both program efficiency and organization. "Structured Programming" comprises a set of straightforward rules which can guide us in writing organized programs.

THE MEANING OF STRUCTURE

The early work in structured programming centered around a hypothetical system of "correctness proofs", which, it was hoped, would provide a basis for proving programs correct before they get to the computer. The goal of such systematic "desk checking" wasn't so much the development of such a proof procedure (the application of which could be quite tedious for a large system) as it was the definition and understanding of "correct" software. Everyone observed that some programs, apparently more organized than others, would more readily lend themselves to this sort of process, so the preliminary focus of study shifted to collecting commonalities among organized programs. Largely by induction (through later these ideas would be refined and verified more rigorously), the following "earmarks" of organized programs emerged:

1. They appeared to comprise well-defined segments, which were connected at discrete points and did not randomly reference each other's components.

DECPROFESSIONALDECPROFES

- 2. They tended to avoid obscure language constructs.
- 3. They were relatively easy to read.
- 4. They avoided unnecessary extremes of involution, such as excessive parenthetical nesting or multi-level IF-THEN.

Over time, these observations were refined and reduced to a few definitions which are the basic principles of structured programming:

A program is a representation of a procedure suitably defined to allow its automatic execution by a computer. All programs can be written using combinations of the following elementary structures:

Sequence. In a program sequence, control is transferred serially from the first statement (the top) to the last (the bottom).

Selection (IF-THEN-ELSE). In a program selection, the alternative execution of two distinct and separate program segments is based on the evaluation of a logical condition.

Iteration (DO-WHILE). In a program iteration, a program segment is executed repeatedly while an associated logical condition is true.

As a new era of respect for "common sense" dawns in our industry, we observe that English is a superset of FOR-TRAN (and all other programming languages), and not vice versa. It is therefore possible to render a plain English translation of any program, and often it is handy to do so in advance of actual programming. Structured programmers often discuss something called "pseudo-code", which is really an ad-hoc form of "pigeon-English" they use to express thoughts in a systematic way. Free of the ideosyncracies of particular programming languages, pseudo-code programs allow easy exchange of ideas among programmers and, eventually, can be converted to code in the target computer language by following a few rules. Pseudo-code representations of the elementary structures follow:

Sequence.

Statement 1 Statement 2 Statement n

Selection.

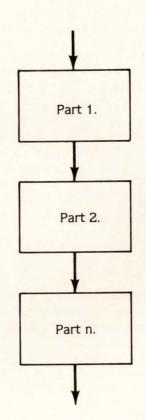
IF < condition—> THEN Statement A1 Statement A2 Statement A3 ELSE Statement B1 Statement B1 ENDIF. Iteration. DO WHILE < condition > Statement 1 Statement 2

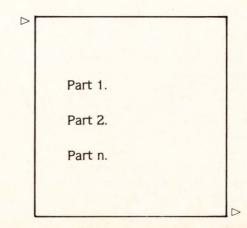
Statement n

END DO.

Note: when the ELSE in a selection has no statements, it is sometimes parenthesized:

IF < condition > THEN Statements (ELSE) ENDIF. Flowcharts, in a structured context, assume a somewhat new meaning. Each of the elementary structures has only one entry and exit, so flowcharts of the structures typically sport one "in" arrow (at the top) and one "out" arrow (at the bottom). Combinations of the structures, therefore, are easily partitioned into their basic components — a property not often found in traditional flowcharts. This "plug-toplug" compatibility of program elements lead to the development of an alternative flowcharting technique (called Schneiderman diagrams, or Chapin charts), offered as a contrast to traditional flowcharts below:





DECPROFESSIONALDECPRO

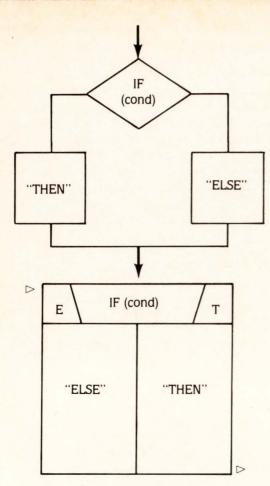


FIGURE 2. Selection.

While the three elementary program forms presented so far have been proven to be sufficient, two additional structures are introduced for convenience (see figures 4 and 5 on page 68).

Most people associate structured programming with notorious campaigns against the use of "GO TO" in programs and, since none of the idealized "elementary structures" includes a provision for unconditional branching, such an association is, in theory, accurate. In practice, however, people aren't programming in pseudo-code on Turing machines, and most commonly employed programming languages do not offer direct representations of the elementary structures (this is very true in FORTRAN, for example, and to a lesser extend in BASIC-PLUS). Current state of the art, alas, demands an occasional unconditional branch.

As a practical matter, building structured programs in "real" computer languages is accomplished through the canny use of traditional language elements to synthesize the elementary structures — now and then, these devices will demand a GO TO.

The Many Faces of DEC BASIC Version 1

"DEC BASIC" is a loosely organized collection of concepts about what the BASIC language should be, currently realized in three similar implementations: BASIC-PLUS is the interpretive BASIC which has found a permanent home within the RSTS/E operating system, apparently never to

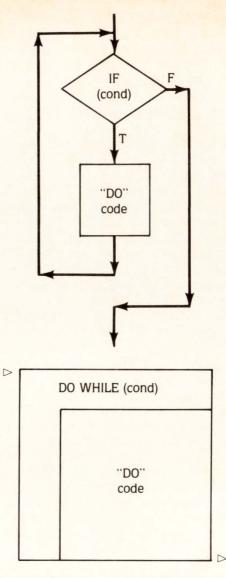


FIGURE 3. Iteration (DO-WHILE).

roam; BASIC-PLUS-2 is a compiled version of BASIC-PLUS which includes enhanced syntax and broadened I/O capabilities via RMS VAX-11 BASIC is a native-mode language available under VAX/VMS which offers some enriched syntax over BASIC-PLUS-2 as well as a substantially more "approachable" program development environment. These products were built by different people with different attitudes at different times—and it shows. While they are all very similar, they are each a little different.

In the sections which follow, we will discuss structured programming with repect to BASIC-PLUS and BASIC-PLUS-2; the BP2 material can, for the most part, be applied directly to VAX-11 BASIC. This done, we can make a few points about VAX-11 BASIC programming in particular, and then present some of the features the PDP-11 and VAX BASIC complilers will all have in common when BASIC Version 2 is released early next year.

Writing Structured BASIC-PLUS/BASIC-PLUS-2 Programs

BASIC-PLUS is an easy-to-use, highly interactive language which offers rapid program development and fairly good run-time economy (for an interpreter). A wealth of <section-header><text><text><text><text>

IT'S 2:28 AM

The kid with his auto-dial MODEM just found your "new" dial-in number 555-0112 on the 112th try. He's in and you are out.

LOTS OF LUCK!



Software Product Description

Product Name: LOCK-11 Version 2.3

Description:

DECPROFESSIONALDECPRO

Lock-11 is a security superstructure built upon the standard RSTS password structure that provides the following extensions:

- Full V7.1 support
- USERID implementation for Dial-in, Packet and Concentrators.
- Macro DPY a rewrite of VTSDPY for VT100's, interfaced with security file and featuring a repertoire of 'UT' type commands for system managers.
- First release of SAFE-11, a 'menu' environment (KBM/RTS) that keeps non-privileged users where they belong.
- Absolute control of system access by keyboard. Manager may limit any keyboard to certain accounts or groups of accounts and control time as well as day of week access.
- Password knowledge is no longer carte blanche system access. System detects unauthorized use of passwords. Privileged passwords don't work on non-privileged keyboards. Non-privileged passwords work only on specified keyboards.
- Real time system surveillance. Manager specifies a list of alarm keyboards which log all infractions and probes as they happen. Opser is not required.
- Auto-login (with or without password) and chain with specified core common contents by KB.
- Manager may establish special priority/burst settings by KB. Manager may establish default output protection code. @ assignment and up to three specific user logicals for each KB. Default RTS is also selectable. All assignments are made at log-in.
- Manager specifies a list of console keyboards from which security file editor may operate.
- · Manager may define a KB-specific access-denied message.
- Manager may specify number of retries before access-denied and number of access-denied messages before line disable. Hangup on access denied is optional. All above may be specified on a per-kb basis.
- A macro DYNPRI program is included which performs the following functions:
 - Users may be dispatched into ten separate priority queues, separately tunable on-line. Each queue has ten levels. Queues are selectable by KB.
 - DYNPRI detects hibernating jobs and announces the fact on ALARM keyboards. Privileged jobs hibernating cause extra loud and long alarms.
 - DYNPRI produces almost no load in operation and runs in 5K words.
 - DYNPRI will hold up to fourteen files open for performance purposes.
 - DYNPRI will kill hibernating jobs in up to ten [p,*] or [p,pn]'s

Minimum Hardware/Software Required:

Any valid RSTS/E system running Version 7.0 or later. Any version of RSX emulation is needed.

Support: See License Agreement

Installation: User Installed

Ordering Information:

Available on 9 track 800 or 1600 BPI tape. Mu	Itiple CPU discount schedule:
First license	0% discount
Second thru Fourth license	40% discount
Fifth thru Twentieth license	70% discount

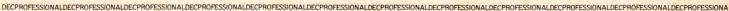
Licensed users desiring source code for internal use only must execute a separate Program Sources License Agreement. Sources are available at ten times the initial license fee.

License Fee:

Single CPU license: \$1250.00. Annual maintenance at 12% of current list price.

Contact:

Dave Mallery Nationwide Data Dialog 215—364-2800 PAGE 68



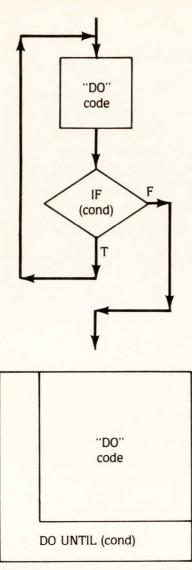


FIGURE 4. Iteration (DO-UNTIL).

software has been and is being written effectively in BASIC-PLUS everyday. (Its compiled counterpart, BASIC-PLUS-2, isn't as interactive a language, but it offers a broadened syntax and extra features.) Nonetheless, there are two major restrictions inherent in this language which complicate the construction of structured software. Specifically. 1) BASIC-PLUS (and PLUS-1) statements are identified by numeric rather than symbolic labels (PASCAL offers both, numeric labels required only the unnecessary GO TO), and 2) the BASIC-PLUS "IF-THEN" constuct allows only one statement within the scope of THEN and ELSE (except for the last one on the line), and offers no "END IT" device. For the most part, these restrictions arise because, at the moment, neither BASIC-PLUS nor PLUS-2 is an entirely "block structured" language.

Nonetheless, structured programs can be written in these languages, but in doing so, we must be careful not to accept BASIC-PLUS language constructs which appear structured at their face value.

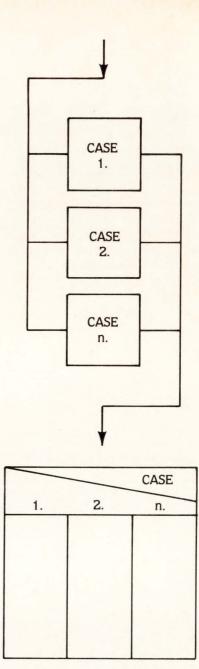


FIGURE 5. Case Selection.

Structuring BASIC-PLUS Programs.

As we've already suggested, "block-structured" languages are easier to structure than non-block-structured languages. Simply stated, block-structured languages allow progammers to treat a series of program statements as though they were a single statement, and these 'blocks' of software can be substituted in-line for any single statement. PASCAL's 'IF' device, like BASIC-PLUS, allows only one statement in its 'THEN' and 'ELSE' clauses. Unlike BASIC-PLUS, however, a series of statements can be substituted for a single statement by bracketing them with 'BEGIN' and 'END' statements. Thus PASCAL allows

IF < condition > BEGIN	THEN
	Statement;
	Statement
END	
ELSE	
BEGIN	

Statement; Statement

END

BASIC-PLUS, of course, does not and, in fact, neither does PLUS-2. Even though BASIC-PLUS-2 allows multiple program statements in 'THEN/ELSE' clauses, extreme care must be taken when one of these statements is another IF, for example, the following pseudo-code can't be represented directly in BASIC-PLUS-2:

```
IF < condition—1 > THEN

A = 0

B = 0

IF < condition—2 > THEN

C = C + 1

ELSE

C = C - 1

ENDIF.

Q = 0 ! < —This poses a problem

ELSE

A = 1

ENDIF.
```

In this example, the statement 'Q = 0' is handled in line with its predecessors 'A = 0' and 'B = 0'. Directly converting this statement to BASIC-PLUS-2 places 'Q = 0' in line with the alternative statement for the innermost 'IF', viz. 'C = C -1'. While this "dangling-ELSE" problem is easily sidestepped in a trivial case such as this (we'll consider some alternative approaches in the next examples), more complex expressions involving even shallowly nested 'IF' statements can be quite misleading.

In an earlier definition of block-structuring, we listed two criteria for truly block-structured languages: 1) That multiple program statements can be treated as a single statement, and 2) That such multiple-statement blocks can be substituted in-line for single statements or other multistatement blocks. BASIC-PLUS and PLUS-2 meet the first criterion, but not the second. It is possible for a group of program statements in a BASIC-PLUS program to be treated as a single statement by bracketing them with GOSUB/ RETURN statements, by including them in function definitions, or by compiling them separately as subroutines (PLUS-2 only, of course). An invocation of such a "block", via GOSUB, CALL or function reference is syntactically equivalent to a single statement: thus, we meet criterion 1 for block-structuring. Unfortunately, we can't take these groups and substitute them in place for the statements which invoke them. As a result, these 'paragraphs' (in this respect, they are similar to COBOL paragraphs) will end up in geographically separate places in the listing. Our BASIC-PLUS rendering of the previous pseudo-code problem, using out-of-line blocks, becomes:

1000	IF < condition -1> THEN GOSUB 2000	&
	ELSE	&
	A=1	8
	! ENDIF.	
2000	A=0	&
	/ B=0	&
	IF < condition -2 > THEN	&
	C = C + 1	&
	ELSE	8
	C=C - 1	8
	! ENDIF.	
2010	Q=0	8
	RETURN	&

DECPROFESSIONALDECPRO

With a little rearrangement, it is often possible to express such constructs using in-line code. To further pursue the previous example:

1000 IF NOT <condition-1> THEN 8 A=18 ELSE 8 A=0 8 B=0 & IF <Condition-2> THEN & C = C + 18 ELSE & 8 C = C - 1ENDIF. 1010 Q=0 UNLESS < CONDITION-1>

It is possible, using out-of-line code blocks, to convert selective pseudo-code directly to BASIC-PLUS and BASIC-PLUS-2. Without a pre-processor of some kind, however, the resulting listing can be unwieldy. Rearrangements of program logic, particularly involving the use of statement modifiers can preserve the structure of a program without sacrificing its clarity. With practice, these "work-arounds" evolve as matters of unique style which, nonetheless, are maintainable across programmers.

The sequence and iteration structures are easily represented in BASIC-PLUS and PLUS-2 syntax. Unless an error is trapped (we'll discuss this later), and collection of executable statements which does not contain branching instructions will constitute a sequence, and any collection of statements bracketed (or modified) by "WHILE" or "UNTIL" will constitute a "DO-WHILE" loop. The "case selection" structure which is really a syntactically convenient nested "IF-THEN" device, has as its most direct BASIC-PLUS analog the "ON < scaler > GOSUB" statement, which executes one of a vector of out-of-line blocks based on a given scalar value. ("ON < scalar > GOTO", inasmuch as it fails to offer automatic return to its following statement via "RETURN" from its out-of-line blocks, is a less suitable substitute.)

Note, however, that although BASIC-PLUS provides an "UNTIL/NEXT" loop control mechanism, it does not behave at all like the "DO-UNTIL" structure. Instead, both "WHILE" and "UNTIL" loops in BASIC-PLUS evaluate their specified conditions before the code within them is executed (this is often called a "leading" decision). The DO-UNTIL structure, on the other hand, tests its associated condition after its code is executed (a "trailing" decision). Thus, in a DO-UNTIL, the scope of the loop will always run at least once when the loop is activated, but in BASIC-PLUS "UNTIL' and "WHILE" loops the enclosed code may never run at all. Indeed, "WHILE <condition>" and "UNTIL NOTE <condition>" ARE EQUIVALENT IN BASIC-PLUS AND BASIC-PLUS 2.

"DO-UNTIL" can be expressed in BASIC-PLUS by using combinations of "IF-THEN" and "GOTO", or by using "UNTIL (or WHILE)/NEXT". The following program segments will search through DATA statements in a program until "* FILES" is found.

1000	RESTORE	
1010	READ X\$	8
	IF X\$ <> "*FILES" THEN 1010	

- or --

1000	RESTORE	&
1	READ X\$	8
1	UNTIL X\$="*FILES"	&
1	READ X\$	&
1	NEXT	&

While the second implementation of this simple example may seem unusual (for one thing, it uses two identical READ statements), it is the most commonly applied and most maintainable representation of "DO-UNTIL". Structured programs in other languages lacking a generic "DO-UNTIL", most notably COBOL, will use such a "pump priming" READ on an input data set before entering a loop to process subsequent records. While the statements themselves are syntactically identical, reading the first record in a file is considered functionally different from reading each subsequent record; hence, we are justified in including the (apparently) same statement in two different places. Other devices in BASIC-PLUS and BASIC-PLUS-2 can be employed to further clarify a program's intent.

User-Defined Functions.

We've already mentioned 1) that BASIC-PLUS statements are identified by numeric labels rather than alphanumeric names, and 2) "blocks" of BASIC-PLUS code must be organized into separate packets and invoked out-of-line. Using function definitions, a BASIC-PLUS programmer can partially defuse these problems—particularly in this age of "EXTEND" mode—and greatly improved code readability. Major sections of BASIC-PLUS code can be collected into appropriately named functions, and invoked by name rather than number from the main body of the program. If these functions carry no argument lists (for the most part, the limited capabilities of these argument lists offer no advantage in this context), they become mechanically interchangeable with GOSUB/RETURN, but offer significant internal documentation advantages.

The FOR Statement.

The BASIC-PLUS and PLUS-2 "FOR" statement hasn't been mentioned so far because, strictly speaking, it isn't

needed to write structured programs. Just the same, FOR/NEXT loops are procedurally similar to (but not identical with) WHILE and UNTII loops, and are an obvious choice in looping situations with concommitant indexing.

Statement Modifiers:

DECPROFESSIONALDECPROFES

Special forms of the selection and iteration elements we've mentioned so far (and one we haven't mentioned: "UNLESS") can serve as modifiers of individual program statements, and, as we have seen, these constructions can be used to circumvent compiler restrictions (particular with IF-THEN) which can hamper the implementation of the elementary structures. When the modified statement is a GOSUB, CALL, or function reference the scope of the statement modifier can be very significant; though given minor play in the manuals, statement modifiers are powerful language tools.

Logical Variables and EXTEND Mode.

All programs consist of instruction and data components, and while the chief realm of structured programming is "the procedure division," maintainable software is a function of clarity of expression within the "data division" as well. BASIC-PLUS and BASIC-PLUS-2 offer, at minimal cost (one word of job space for every three characters in BASIC-PLUS), up to 30 characters in variable of function name. Descriptive (not necessarily lengthy) nomenclature for such items (PURCHASE.ORDER.NO\$ or even PO.NO\$ rather than Q3\$) will go a long way toward simplifying a system's maintenance. Also, the TRUE/FALSE value of a given condition can be set or evaluated and stored in a name integer variable. Using such a variable name in place of the condition's less clear arithmetic expression — particularly in the "main" section of a program — can more clearly express the "functional reason" for a loop or "IF."

Alternatives for Formatting Programs.

It should be clear by now that a goal of structured discipline is more easily maintainable software. We need to understand, however, that a maintainable program is more a matter of clarity than mere uniformity. Structured programming will, of course, leave the selection and representation of algorithms up to the programmer, who may then choose from among available language devices to represent the required program structures. This process leaves considerable room for the development of individual style as it stresses the value of straightforward expression. At the same time, a certain measure of uniformity in program appearance will be a natural by-product.

Our examples so far have made use of indentation and spacing to emphasize the scope of effect of various control statements, and thus to improve the readability of the code.

The Limitation of Comments.

Comments in program listings, flowcharts, block diagrams, and all forms of ancillary program documentation suffer the same phenomenon of program maintenance: **documentation** lag. Documentation lag occurs when, for whatever reason, a change to a program is made, but not to its accompaying documentation. This can happen not only dur-

Take a look at IRTUS 232

The Conference

A top flight series of seminars, guest speakers and panel discussions covering topics such as RSTS, VAX, Software and Hardware specifics, and information about your future as a DEC user.

The Exposition

20,000 square feet of space and an in-depth representation of DEC compatible hardware, software and services.

For Information Please Call Exposition Management: Dame Associates Inc. 51 Church Street Boston, MA 02116 (617) 482-0097



1982 Conference And Exposition For DEC Users

Boston Park Plaza and Plaza Castle October 4 - 6, 1982

Sponsored by Independent RSTS Users Society (IRUS) and Hardcopy Magazine

ing the maintenance of an old system, but during the development cycle of new programs as well. Under these circumstances, ancillary documentation not only loses its descriptive value, but may even do serious damage by misleading further development or engineering efforts.

Of course, comments should not be "banned." Certain comments such as copyright notices, titles, modification histories, variable and procedure name inventories, etc. are helpful and justifiably included in locally adopted programming standards. But comments can't necessarily be relied upon. The listings of structured programs should, for the most part, offer their "logic comments" intrinsically within the code itself. Changes to the code will then necessarily change the "comments".

VAX-11 BASIC CONSIDERATIONS

VAX-11 BASIC is the latest in a series of BASICoid languages developed by DEC for use on its VAX-11 computer family under the VMS operating system. The fact that it isn't called "BASIC-PLUS-3" misleads us to believe that it owes little to its familiar PDP-11 based predecessors; on the contrary. VAX-11 BASIC is what you might get if you crossed the flexibility and "programmer friendliness" of the BASIC-PLUS interpreter with the broadened capabilities and improved performance of the BASIC-PLUS-2 compiler. While VAX-11 BASIC and VMS offer some very unique capabilities of their own, the syntax of the language is much the same and is, for the most part, upward-compatible from the PDP-11.

DATA TYPES AND DECLARED CONSTANTS

VAX BASIC introduces a new class of data (EXTERNAL), as well as a new data type (LONG, for longword integer). A DECLARE statement, which allows the definition of symbolic constants and explicit typing of program variables, is also provided.

VAX BASIC integers may be 16- or 32-bit values, depending on whether they are DECLAREd "WORD" or "LONG" within the program. Variables declared INTEGER, and integer variables defined in the traditional fashion by a trailing %, will be compiled as word or longword depending on a COMPILE command switch (/WORD or /LONG). As on the PDP-11, 16-bit integers can represent numbers from -32767 to +32768. The new 32-bit integer, or **longword**, can assume values from -2147483647 to +2147483648. Unfortunately, while short and long integers can be mixed within a single program via DECLARE, it is still not possible to mix both single and double precision floating point variables. The precision of floating point values is still determined on an allor-nothing basis by a COMPILE switch (/DOUBLE).

EXTERNAL variables and constants are resolved at LINK time (the LINKER is VMS much faster answer to TKB), and are used to reference global error constants, to define external program functions, and to reference externally defined variables. External constants are used by VMS to define symbolic status values which are returned by operating system services. Using EXTERNAL constants, a program which issues a system service can check the results against the symbol SS\$__NORMAL rather than the constant 1%. This makes the program more readable and, should the value for an external constant change, the referencing program can be adapted without editing by simply re-LINKing it.

The DECLARE statement permits the definition of symbolic constants within an application program. "DECLARE INTEGER TRUE = -1" will establish an integer constant TRUE with a boolean value of "true" within the program. Likewise, I/O channel numbers and other program-dependent parameters can be established as symbolic constants using DECLARE. Variables within the program can by "typed" in DECLARE statements, eliminating the requirement that integer names end in a percent sign and string names end in a dollar sign. "DECLARE STRING X" established a string variable X, which is not to be confused with the well-known floating point variables of the same name. In practice, using DECLAREd variables with implicitly typed % and \$ variables can be very confusing, and will demand a lot of mental adjustment.

Some Notes on Error Handling.

DECPROFESSIONALDECPROFES

BASIC-PLUS, BASIC-PLUS-2, and VAX-11 BASIC runtime errors are handled by direct out-of-line transfers into designated error routines, which then typically "RESUME" into the mainstream of processing after the proper action is taken. It has become common practice to trap all such errors to some common location (usually line 19000), where processing proceeds through a series of tests (sometimes called a "skip chain") to determine where the error actually happened, and what should be done about it.

Obviously, this is a workable device. Nonetheless, it poses some disadvantages:

- All program segments which can cause runtime errors are bound together by the common error routine. A change to the error code can, therefore, inadvertently change the behavior of an unrelated module. This restriction is minimized when the common error routine is kept to a skeletal, minimum size.
- The error recovery process of a program segment will not be localized to that segment. This may necessitate "page-flipping" of program listings during maintenance.
- 3) The "skip chain" in the common error routine is likely to contain tests on the ERL pseudo-variable (it almost certainly will if the same error is possible at different points in the program). Editing or resequencing line numbers in the body of the program, without reflecting these changes in the error area, will cause problems.
- Connected through the common error routine, individual program segments can't be fully isolated from others for unit testing.
- 5) When converting BASIC-PLUS to BASIC-PLUS-2 or VAX BASIC, program modules which are coupled to a common error routine — particularly if they are functions — will branch out of their defined boundaries to process their errors. This may defeat features in future releases of the product, such as

global optimization, and such modules do not submit readily to subroutine conversion for overlaying. The alternative to a common error area — error trapping within the segment causing the error — circumvents these disadvantages. More importantly, the general notion of functionally localized software, which is a central structured programming theme — implies local error handling.

DECPROFESSIONALDECPROFES

Remember, however, that "ON ERROR GO TO 19000" cannot be labelled "bad" and forbidden, any more than "GO TO' can. Standards for such specific language mechanisms are adopted on an installation-dependent basis, in reponse to the unique pressures of a particular project or programming shop. Although the widely published "BASIC-PLUS Standards" document used by DEC to write RSTS/E CUSPS mandates an ON ERROR GO TO 19000, it nonetheless allows for the establishment of local error trapping where needed. In any event, where common error handling is employed, the size of the "common" area should be restricted, with the bulk of error recovery occurring local to the sement which caused it.

Performance and Efficiency.

A wealth of essentially sloppy code is excused on the grounds of "performance" and "efficiency". Until now, we've made no mention of the relative performance advantages of particular techniques, because the performance characteristics of a program or system is by far more a function of its basic design than of its individual statements. Indeed, most of us will remember that when we've isolated performance problems in our systems, really significant improvements in efficiency statistics demanded re-design rather than re-arrangement of programs.

Just the same, for your information, bench tests on the use of GOSUB vs. function references (without arguments, since the presence and size of an argument list detracts greatly from the run-time performance of function invocation) suggest that executing functions takes about twice as long as executing statement subroutines. By the same token, paired GOTOs in and out of code segments takes about half the time as GOSUB/RETURN. Remember, though, that in comparing these implementation-dependent program control devices, we are dealing in milliseconds (an 11/70 takes about 2.2 seconds to invoke a function **10000** times; 10000 iterations through the corresponding GOSUB construction took about 1 second.)

As we mentioned earlier, the size of variable names has no effect on the size of a BASIC-PLUS-2 program, while, for each name, BASIC-PLUS requires one word of job space for every three characters.

Program Design.

An extensive discussion of the design techniques which normally precede the development of structured programs, often referred to as "top-down" design, is beyond the scope of this article. Traditionally, however, structured systems are designed from the "top" of an application (the part the user sees) to the "bottom" (the part the programer deals with) by successively refining nested functional modules until the lowest modules can be implemented in the target pro-



PACS[™] with EZLOG[™] is today's standard in:

Resource Accounting Performance Monitoring Internal/External Billing Project-Based Accounting



CIRCLE D57 ON READER CARD

gramming language. This process of "stepwise refinement" offers relatively quick availability of the "user interface" portion of a system, and on-going consistency checks which assure the ultimate correct interplay of all software components.

Top-down system design is similar to outlining the contents and component topics of a book before it is written. The major topics are selected and ordered first, then each major topic is "refined" in terms of its sub-topics, until the lowest level topics are specified enough to allow orderly research and composition. In the final analysis, sticking to the original outline guarantees a cohesive final product.

In a multi-person project, the top-down design strategy allows (to an extent) the parallel design and implementation of individual components, and offers a framework for the partitioning of "people tasks" which allows engineers to work independently and yet converge on an integral product.

While the elementary structures we've itemized and discussed so far are sufficient for building structured programs, any such resultant program is not guaranteed to be structured simply because it consists of organized pieces. The prelimary act of functional analysis, however informal, is essential to the development of structured software.

DEC BASIC VERSION 2: WHAT TO LOOK FOR

In our discussion of program structure with respect to current implementations of DEC BASIC, we referred to a DECPROFESSIONALDECPRO

few language weaknesses:

- In the "procedure division":
 - There is no "END IF" construct to facilitate nested conditional statements.
 - Program statements are numbered rather than labeled.
- In the "data division":
 - In PDP-11 implementations, named constants must be assigned at execution-time: VAX BASIC permits compile-time declaration of named constants, but does not allow expressions involving previously DECLAREd constants.
 - DEC BASIC data typing is inherently weak. Floating point precision is determined on an "all or nothing" basis within a program, and the only support for an aggregate data structure is (in BP2 and VAX BASIC) the somewhat cumbersome MAP statement.

Version 1 programming is hindered by other restrictions as well:

- The APPEND function is implemented as a command rather than a program statement; developers have to "remember" to include elements from source libraries when they build programs.
- There are no provisions for conditional compilation.
- There is only partial source-level language compatibility between the PDP-11 and VAX versions of the language.

DEC BASIC Version 2, which (incredibly) will be the same language on both PDP-11 and VAX systems, addresses these restrictions with some remarkable new syntax features. (BASIC-PLUS will not change; only BP2 and VAX BASIC will see a Version 2).

INHERENT STRUCTURED PROGRAMMING SUPPORT

BASIC V2 will support a generalized END statement, which will be used to terminate "blocks" within a program. Let's take another look at the nested IF example we had so much trouble expressing in V1:

```
IF < condition-1 > THEN

A = 0

B = 0

IF < condition-2 > THEN

C = C + 1

ELSE

C = C - 1

END IF

Q = 0

ELSE

A = 1

END IF
```

As you can see, the pseudo-code is directly representable in BASIC V2. No extra line number is needed to terminate an IF block, so IF statements can be nested anywhere within a multi-statement line.

For Version 1, we suggested the use of functions without arguments to aid program readability in the absence of alphabetic statement labels. V2 BASIC will still allow statement numbering (in fact, the first statement of a V2 program will require a number, as will ON ERROR GO TO and RESUME), but will permit alphanumeric statement labelling as well. The colon, retired from service as a statement separator years ago when BP2 was first introduced, has returned as the label separator:

1000 GOSUB OPEN_FILES

OPEN__FILES: OPEN X\$ FOR INPUT AS FILE 1%, & ORGANIZATION INDEXED, &

Note that the relaxed program formatting rules already found in VAX BASIC, which eliminate the need for a backslash between statements and demands an ampersand (&) continuation character only when an individual statement must be continued on several physical lines, will be available on all systems. Also, internal symbols in V2 BASIC will be permitted up to 31 alphabetic/numeric characters, including underscore (__) as well as period (.). External symbols, such as subroutine and MAP/COM names, will still be limited to six characters on PDP-11 systems.

The present ON/GOTO and ON/GOSUB will be supplemented by the V2 SELECT statement:

SELECT X%

CASE 1 GOSUB ADD.TAX CASE 2 GOSUB COMPUTE.RATES CASE 3,4 GOSUB ADD.BALANCE CASE ELSE GOSUB NO.SUCH.OPTION END SELECT

SELECT is functionally equivalent to the old devices, except that the default case (i.e., one outside the tested range of values for the target variable) is handled explicitly rather than via an error trap. Also, the straightforward expression of case alternatives within a SELECT offers some distinct documentation advantages.

V2 BASIC DATA TYPING

At last! In DEC BASIC Version 2, we will be allowed to mix single and double precision floating point variables within a single program! Actually, this minor breakthrough is just the tip of the iceberg: V2 BASIC will offer a greatly enriched range of data typing support, including user-defined data types.

With the DECLARE statement, V2 BASIC coders can define variables with any the following internal representations:

DECLA	RE				&
	BYTE	A0	I	8 Bit integer	&
,	WORD	BO	I	16 bit integer	&
,	LONG	CO	Ī	32 Bit integer	&
۰,	SINGLE	DO	I	Single precision float	&
,	DOUBLE	EO	I	Double precision float	&
,	DECIMAL	FO	I	Packed decimal	&
,	STRING	GO	I	Character string	&
I					

(G and H floating point formats, for compatibility with other processors, will also be supported.)

DECLAREd variables cannot carry the % and \$ suffix which implicitly type integer and string variables in V1. % and \$ typing is also available and can be mixed with DECLAREd variables, but if you prefer, a compiler switch

JOIN THE RGTI INFREQUENT FLYER PROGRAM.

Looking for a speedier way to solve program problems at your remote sites? Our TeleSupportsm software can help you connect without even leaving your office.



SCREENSHARE-11: Now you can see what's *really* happening on any user's screen. Diagnose and solve problems, run demonstrations, train operators—exactly as you would if you were on the scene. You can type input visible to both you and the user. Or, choose an "observe only" connection for supervision or security.

RFX-11: Transfer *any* type of PDP-11 or VAX file over the telephone with a single, standard command. You can quickly bring a user

problem back to your site for analysis, then send back corrected data or programs. Error free.

With RFX-11's Transparent Mode, use the terminal right on your desk to work directly on a remote computer.

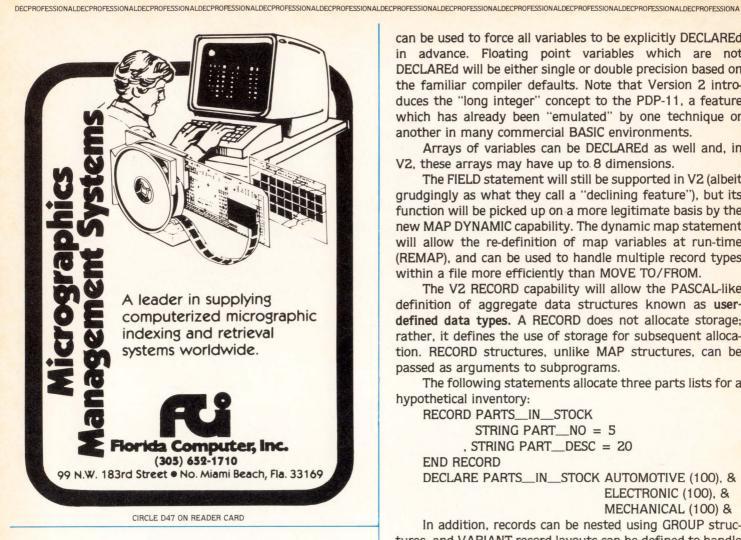
These field-proven software tools will help you respond faster and more effectively. With your feet still firmly on the ground.

RGTI Systems One Penn Plaz	s Software za, New York, N.Y. 10001	
software pack	formation about RGTI's TeleS ages: HARE	upport [™]
Operating sys		UNIX
Name		
	State Z	DP-7

UNIX is a trademark of Bell Laboratories. PDP-11, VAX, RSX, RSTS and RT-11 are trademarks of Digital Equipment Corporation.



CIRCLE D29 ON READER CARD



DEC MONTHLY NEWSLETTER COMPUTERS DIGITAL

A MONTHLY PUBLICATION

FREE

FOR DEC ENTHUSIASTS Information on all PDP-11 Systems from VAX to 11/03, all operating systems, languages and applications. **BOX J. NAVESINK. NJ 07752** 201-291-1208

can be used to force all variables to be explicitly DECLAREd in advance. Floating point variables which are not DECLAREd will be either single or double precision based on the familiar compiler defaults. Note that Version 2 introduces the "long integer" concept to the PDP-11, a feature which has already been "emulated" by one technique or another in many commercial BASIC environments.

Arrays of variables can be DECLAREd as well and, in V2, these arrays may have up to 8 dimensions.

The FIELD statement will still be supported in V2 (albeit grudgingly as what they call a "declining feature"), but its function will be picked up on a more legitimate basis by the new MAP DYNAMIC capability. The dynamic map statement will allow the re-definition of map variables at run-time (REMAP), and can be used to handle multiple record types within a file more efficiently than MOVE TO/FROM.

The V2 RECORD capability will allow the PASCAL-like definition of aggregate data structures known as userdefined data types. A RECORD does not allocate storage; rather, it defines the use of storage for subsequent allocation. RECORD structures, unlike MAP structures, can be passed as arguments to subprograms.

The following statements allocate three parts lists for a hypothetical inventory:

RECORD PARTS_IN_STOCK STRING PART_NO = 5, STRING PART_DESC = 20 END RECORD

DECLARE PARTS_IN_STOCK AUTOMOTIVE (100), & ELECTRONIC (100), &

MECHANICAL (100) &

In addition, records can be nested using GROUP structures, and VARIANT record layouts can be defined to handle multiple record types.

Other features of V2 BASIC include embedded listing control directives (%PAGE, %TITLE, etc.), conditional compilation capability (%IF...%THEN...%END %IF can be used to delimit source statements and only those in the "true" clause will be compiled), and an embedded APPEND facility (%INCLUDE). The VAX-11 BASIC externally compiled function feature will find its way into the PDP-11 world with Version 2, as will EXTERNAL data types.

Remember that these V2 BASIC features were announced as planned capabilities at Spring DECUS, and not necessarily committed features. While it's safe to assume that all of these new "bells and whistles" will be there in 1983 when the product is released, some specifics of syntax may change as field test experience dictates over the coming months.

Conclusions.

It's obvious that structured methodologies are changing not only the way we write programs, but our programming languages as well. V2 BASIC will provide direct representations for all of the elementary structures, but you don't need to wait for Version 2 to start thinking about how you do your work now. At the same time, remember that no programming language - no matter how rich its syntax can cover for disorganized, poorly considered, plain "bad" programming.

WORD PROCESSING WITH DEC COMPUTERS HINTS AND KINKS

Lawrence H. Eisenberg 17141 Nance Street Encino, California 91316

ABSTRACT

This paper discusses various handy hints and kinks associated with the use of Word Processing Systems on the PDP-8 and PDP-11 systems. While developed primarily with WPS-8, the routines and hints offered generally are applicable with WPS-11 and other commercially available systems currently utilizing the WPS-8 format. The discussion presented below consists of the various matters presented at the Spring 1980 Symposium in a Panel Discussion with Ms. Vicki Ann Rose, Digital Equipment Corporation, Merrimack, N.H., Mrs. Nancy Evans, Federal-Mogul Corporation, Southfield, MI and this author.

LIST PROCESSING HINTS

FIELD IDENTIFIERS AND DATA PROCESSING

The "lists" which are developed in list processing often are useful for data processing activities as well as many of the Word Processing and List Processing purposes. For PDP-11 users, many of the data files developed under Word Processing may be addressed directly by data processing. However, for PDP-8 users the WPS-8 files (which are saved in a format similar to COS-310) cannot be addressed directly by COS-310 or OS/8. While the WS-200 series originally was disigned to provide for direct communication between Word Processing and COS-310, this feature no longer is supported and the WS-200, as with all other WPS-8 systems, requires conversion to utilize the files. (Conversion utilities for both COS-310 and OS/8 are available through the These utilities transfer list DECUS LIBRARY. processing type files between the various systems. The conversion procedures are not discussed in this paper.)

It is most helpful, therefore, to maintain the LIST FIELD IDENTIFIERS as <u>upper case characters</u>. While the DEC WPS manuals show the field identifiers (e.g. - <field1>) as lower case fields, such was not meant to be a <u>required</u> form for identifying the fields. The use of lower case by DEC was a throwback to computer manuals which used lower case to indicate operator decisions, as opposed to upper case which indicated mandatory acts.

Since each of the WPS-8 systems utilizes special characters to indicate lower (and upper) case shifts, any conversion program is going to require considerable additional (and wasted) time in order to perform the conversion, as each of the special characters will have to be stripped from the field before the data can be used by the data processing system.

If there is even the remotest possibility that your list files will be used in data processing, it is important to avoid the use of hard [the RETURN key] returns except at the end of a field identifier. In other words <u>use one identifier for every line of</u> text. For example:

DO NOT USE

<NAME>John Doe <ADDRES>123 Any Street Our Town, U.S.A. 00123

DO USE

<NAME>John Doe <ADDS1>123 Any Street <ADDS2>Our Town, U.S.A. <ADDS3> <ADDS4> <ZIP>00123

In many conversion programs, and nearly all data processing programs, the carrier returns within a field will be read as a terminator, and the information following the return will be lost during the conversion or use by the program.

While the use of several fields may appear somewhat cumbersome at first, the benefits soon become very apparent. Also, the more available fields, the easier it is to edit and to SORT!

SELECTION SPECIFICATION - TO SELECT ONLY IF SOME CHARACTER EXISTS

The DEC manuals fail to disclose the selection specification which can be used to select a record only if a field has information. The wild card specifications presented by DEC are $\langle ? \rangle$ and $\langle * \rangle$. The $\langle ? \rangle$ is used to <u>replace a letter</u> (i.e., it must be preceded or followed by some character other than a $\langle ? \rangle$). The $\langle * \rangle$ is used to define a field as containing ANY OR NO characters.

From time to time it is necessary to select a record ONLY IF A GIVEN FIELD HAS SOME INFORMATION. There are two possibilities; the first example given is the most reliable:

- (1) if<field5> =<?><*>
 then process record
- (2) not if < field5> =
 then process record

(The use of lower case is for example, only. USE UPPER CASE!) The last example would follow other qualifiers; if used alone the results are not predictable.

DELETING UNUSED LINES FROM FINAL OUTPUT WHERE THERE IS NO DATA

Regretably this author allowed an article to be published upon this subject (12-BIT Nov. 1979) which contained an inaccuracy. The information which is presented in this paper is correct, and has been tested under several conditions. (The prior article presented a situation which would work only if the field size was known in advance.)

DEFINING THE PROBLEM: EMPTY FIELDS ON LINES WHICH SHOULD NOT BE PRINTED. The problem which often is encountered is how to eliminate blank lines which are printed when there is a field which is empty, but which has been defined in the form. We will use an address block as an example.

<NAME> <TITLE> <COMPANY> <APT/SUITE#> <ADDR1> <ADDR2> <ADDR3> <CI/ST/ZP> <DROP>

In the example presented it is obvious that several of the fields might not be present in the final printout. The individual may have no title; s/he may not be associated with a company; there may be no apartment or suite number; there may only be a single address line. However, if the FORM is created in the manner indicated, which, in the example (and only by way of illustration) would be the same as the LIST, the final output would be printed with blank lines for each line on which there is missing data.

There is a solution. It takes a little planning, but once understood, it is simple to apply to every situation. (Just keep in mind, however, that this solution will cause each missing field to disappear and to bring the following line up one line feed! You must remember to allow for this, if the missing lines could affect other line-count features of your form.)

The first step is in the creation of a FORM. To accomplish the desired result for any set of circumstances <u>it is necessary to create two FORMS</u>. The first FORM should include only the variable information, and will, itself, become the LIST which then will be used to create the actual FORM or PRINTOUT. THERE CAN BE NO SPACES OR TABS ON ANY LINE WHICH MAY "DISAPPEAR", EITHER IN THE ORIGINAL LIST OR ON THE FORM. (Adjust the Left Ruler in lieu of a single tab, if indentation is desired.)

The FIRST FORM is created to determine which, if any, fields are not present and automatically to create a "wrap", as opposed to a HARD RETURN, for each such field. It also is used to create the second LIST. To accomplish this, it is necessary to create "soft" returns on each line which may not have information upon a field. This is done by using dummy rulers <u>after</u> each line which reasonably is expected to "wrap". Using the LIST above, and assuming that EVERY LINE may possibly have a missing field, we could create a form as follows [NOTE THE RULERS!]:

L	R
• 1 • 2 • 3 • 4 • 5 •••••••••••••••••••••••••••••••	. 6 . 7 . 8
< <name><name></name></name>	
.T	
<	
<pre><<apt suite#=""><apt suite#=""> L</apt></apt></pre>	
<pre><<addr1><addr1> LT</addr1></addr1></pre>	R
< <addr2><addr2> L</addr2></addr2>	RR
< <addr3><addr3> LT</addr3></addr3>	RR
< <ci st="" zp=""><ci st="" zp=""> L</ci></ci>	RR
< <drop><drop> LT</drop></drop>	RR
<<>	

Note that each of the rulers is identical, except for the dummy tab which follows every alternate ruler. The only purpose for the tab is to create a new ruler which can be imbedded. (If the rulers were identical, they would all disappear, and the method described could not be used.) Also note that the last line, DROP, has been indented by changing the left margin. The "indent" feature may be used on any line and is used to avoid the insertion of tabs or spaces which necessarily will defeat this utility. Also note the <u>"<<>"</u> identifier to create the new list! (Down arrows indicate hard returns which may be observed with GOLD VIEW.)

Using the blue EDIT keys, proceed to the beginning of each line AFTER A LINE WHICH MIGHT RESULT IN AN EMPTY FIELD. Use the Blue LINE key to travel from line to line. With the cursor on the left margin, strike the RUB CHAR OUT key <u>ONCE</u>. (This will delete the hard return and, upon a GOLD VIEW, will disclose a funny looking circle at the end of the sentence, instead of a down arrow.) Repeat for each line which might reasonably be expected to have an empty field. [If it becomes necessary to edit the last letter, back the cursor to the end of the line -this will place it under the last letter -- and insert the new characters. The last letter will continue to travel and, if undesired, must be deleted.] Run the List Processing feature, creating a document. The document created by this feature will, itself, become the LIST for the second part of the program.

Upon completion, you will have created a form which, when operated with the List Processing Feature, will result in a new LIST which will have "wraps" in each empty field, between a ruler. YOU MUST BE CAREFUL TO AVOID TABS OR SPACES IN EMPTY FIELDS AND IN THE FORMS or this utility will not work properly.

The SECOND STEP is to create another FORM, which is identical to the first, except for the special field indentifiers.

From the following illustration (on the next page), note that that extra field identifiers have been removed. This will be the final list and will eliminate the spaces between lines which otherwise would have been created as a result of unwanted fields.

If you should find spaces between lines, the problem most likely will be that tabs or spaces were imbedded in either the FORMS or the original LISTS. Check them carefully.

The following form is such an illustration:

As with the first FORM, line feed to the beginning of each line AFTER the field which may not be present, and enter a RUB CHAR OUT to delete the hard return. (If you merely copied the document, be careful, as you may delete a character from the preceding line. To edit this problem, BACK UP to the preceding line (you will be on the last character). Re-type the last character (the one which is above the cursor) and any character which was deleted. Finish with a hard return. Delete the remaining character above the cursor, which should remove the hard return, also. (Check with GOLD VIEW.)

Now, USING THE NEW LIST CREATED BY THE LAST FORM AS YOUR LIST DOCUMENT, run the list processing again. This time, the new document (which also can be a direct PRINT) will cause all of the empty fields to "fold" upon themselves, so that all of the rulers with "soft" returns will collapse and final output will be without lines between information. While all rulers will appear on the screen, there will be no returns within them; the printer will skip to the next line of text without printing the "empty" lines.

If it appears that there is a space between rulers on which there was no data, check to see if there had been a space or tab on either of the FORMS or LISTS used for the procedure. Check your original LIST with GOLD VIEW. Each empty field's right arrow should be followed by an immediate down arrow (without a space).

Remember, you only have to create the two forms ONCE. They can be used for every processing run. (Actually, you need create the form only once, and then add the extra field identifiers to one of the forms. If you should get a line wrap, because of the extra space required by the new field identifiers, don't worry. The program automatically will adjust.)

PROGRAMMING NOTE: Although you can use the same selection specification for both forms, you also can use the simple specification of "process record" for the second run, as you already have specified the records to be used.

L					R		
. 1 . 0	2.	3.	4.	5.	6.	7.	8
<name> LT</name>					R		
<title></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td><COMPANY></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>LT
<APT/SUITE#></td><td></td><td></td><td></td><td></td><td>RR</td><td></td><td></td></tr><tr><td>L</td><td></td><td></td><td></td><td></td><td>RR</td><td></td><td></td></tr><tr><td><ADDR1>
LT
<ADDR2></td><td></td><td></td><td></td><td></td><td>RR</td><td></td><td></td></tr><tr><td>L</td><td></td><td></td><td></td><td></td><td>R</td><td></td><td></td></tr><tr><td><ADDR3>
LT</td><td></td><td></td><td></td><td></td><td>R</td><td><mark>_</mark></td><td></td></tr><tr><td><CI/ST/ZP></td><td>Ţ</td><td></td><td></td><td></td><td>D</td><td></td><td></td></tr><tr><td><DROP></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>LT</td><td></td><td></td><td></td><td></td><td>R</td><td></td><td></td></tr></tbody></table></title>							

DECPROFESSIONALDECPROFES

COMFORT NOTE: Although this may appear somewhat clumsy, it actually is rather easy and once you get the hang of it, you will find the procedure very useful!

USING LIST PROCESSING TO CREATE AN INDEX OR TABLE OF CONTENTS

Presently there is little ease with which to create an index or a table of contents with the existing WPS-8 or WPS-11 systems. While 11-based systems will semi-automatically create an index and Table of Contents, and most dedicated word processing systems do the same, some ingenunity is required to acomplish this with DEC's systems (although we are assured that this, too, will change some day!).

For the time being, a fairly long document can become a LIST document using the following procedure.

First, copy the document over to another location (or on another diskette), as you are going to alter it (i.e., destroy it) considerably.

Second, decide on some easy shorthand for the catagories you are going to use with your index or table of contents. For example, you might wish to use <H> for headers; <N> for names, etc. Choose a character to be used as a dummy field identifier, e.g. <X>.

Enter a terminator and the dummy field identifier in the PASTE buffer, as you will be using it quite a bit during this exercise. (To enter it in the paste buffer, type it and then cut it.)

E.g.: <><X>

Start the document with the dummy field (e.g., <X>) and proceed to the first data which is to be used in the Table of Contents or Index. Let's suppose the first data is a header, which will use the <H> identifier. Enter a terminator <> and field identifier <H> immediately preceding the header and then enter the PASTE immediately after the header. Thus, the document would appear something like this:

top of page <x></x>	
(miscellaneous data)	
<> <h>TITLE OF DOCUMENT<><x></x></h>	
<> <h>First Subheading<><x></x></h>	
<pre>(miscellaneous data)</pre>	
<pre><> [entered as last character in document] b o t t o m o f p a g e</pre>	

DECPROFESSIONALDECPROFES

In the same manner, identify the different titles throughout the document, such as names, subtitles, books, etc., until you have identified each item which will be used in your index or Table of Contents.

CAUTION: As you proceed through the document, enter the PASTE in a random manner (i.e., insert the dummy field identifier <><X>) about every 2/3 screen, or more often. This is necessary as no field may contain more than 1500 characters, and to avoid an error message you will have to insert the dummy field every so often. It doesn't matter how often you use the dummy field, as it never will be referenced during list processing.

At the very end of the document, be sure to enter a terminator <> or an error message will occur (it won't affect your program, but no error is more comforting than some buzz error which might leave some doubt).

After proceeding through the entire document, you can create a very simple FORM and SELECTION SPECIFI-CATION. The FORM may consist of a single entry (e.g., <H>). The selection specification may be "process record". Operating the List Processing, then, will transfer each data identified with the <H>, and will skip all of the rest. (If you have to format the output, it will be much easier to do so after running the list processing.)

Also, if you have the type of document which might require some form of sorting, such as alphabetical listings, you can perform some minimal alphabetical sorting by use of the wild cards in your selection specification. (This will require several runs through the list processing; e.g.: if $\langle N \rangle = A^*$ then process record, will pick up every name starting with an upper case A, etc.) If there are only a few records, then use of the cut and paste feature will probably result in an easier, as well as faster, alphabetical processing.

Another feature, which will result in much faster opeartion if several field identifiers are being used, is to utilize the double LIST feature (i.e., create a new LIST with a single pass). To create a new LIST, set up your FORM (for the above example) as follows:

<<H><H> <<N><N> <<>>

Processing the entire document will fill a new document with each field, in a random manner, and you then can run a second pass which will be more selective as to the order in which you want the items to appear. All of the dummy <X> field data will be omitted from the new LIST.

USING LIST PROCESSING TO LOCATE DISKETTE INDEX INFORMATION

It is not unusual to want to find information from a diskette index, and to avoid going into the index (where there is a danger of losing the document). The diskette index is set up as a LIST document, and can be used for many purposes. (It even can be alphabetized, or otherwise sorted, if care is used, by using the procedures set forth above, or with the SORT program available to WPS-8 users.)

The INDEX LIST for each diskette is formatted:

<n>title data <#>5<>

Using $\langle n \rangle$ for your selection specification, you can seek any type of sequence desired. E.g., if you want to find if "John Doe" appears, and on which document(s), the selection specification could be set:

> if <n> =<*>John Doe<*> then process record

The FORM would be set:

<n> <#>

Running the List Processing will show the presence of the requested data, and the document number, each time it appears. On long or several indexes this can save time, and is more positive than using the I command to examine every page of every index.

LINE NUMBERING USING WORD PROCESSING

Presently there is no easy way to number the lines on a document under WPS-8. Perhaps some day the powers to be will provide us with this feature, but for the time being it is necessary to use some planning in order to accomplish line numbering.

At the moment, the easiest way to number lines, whether starting with 1 and proceeding to nnnn, or repeating the same number of lines per page, is to do it by brute force.

Create your document in the normal manner, but allow sufficient extra space on the left margin ruler for the numbers to be used plus at least two spaces. Thus, if you ordinarily would use the left margin for your left ruler and expect to use three digits for the numbers, set your left ruler, initially, five spaces to the right. (NOTE: There will be a slight variance in this procedure for inside paragraphs. This is discussed below.)

Upon completion of the document, AND AFTER FINAL EDITING, the line numbers can be added by re-setting the left margin on the ruler to its normal location AND INSERTING A TAB AT THE FORMER LEFT MARGIN LOCATION. While this would ordinarily cause the text to "re-wrap", it will make no difference.

Proceed to the beginning of each line, using the BLUE LINE editor key.

Enter the line number and then TAB. Repeat this for each line to be numbered. Since the text already has been edited, the new line numbers will not affect your prior formatting, as you are using all of the extra space with the line numbers and tabs.

If you need to enter identical line numbers for each page (e.g., such as with legal pleadings of 1 through 28 or 32 for each page) then you can do this with a User Defined Key. Anything more, however, will use up all of the buffer space available for the User Defined Keys.

The use of the line numbers and tabs will not affect right justification, as each line number will follow

a soft return. HOWEVER, SUBSEQUENT EDITING WILL BE VERY DIFFICULT. Therefore, try to avoid numbering the lines until the document is ready for final output.

INSIDE PARAGRAPHS

DECPROFESSIONALDECPRO

To use the line numbering feature on inside paragraphs, where the numbering is to remain on the left margin, use a W (wrap) in the ruler instead of the L for Left Margin. The first line of each inside paragraph will have to be double tabbed, but you will find it fairly easy to master after a few attempts. When you are ready to insert the line numbers, it will be necessary to remove the W from the ruler, and to replace it with a T (tab). When tabbing over from the number insertions, the text will remain formatted in the same location as with the W, and, as before, right justification will remain undisturbed.

If further editing may be expected, it may be easier to retain a copy of the document before line number inputting, especially where the editing may be extensive. The procedure indicated is not intended as a solution, but, rather, as a procedure which may make life somewhat easier for you.

INSERTION OF PORTIONS OF LONG DOCUMENTS, TOO LONG FOR "CUT AND PASTE", AND/OR WHERE ALL IMBEDDED MATERIAL IS DESIRED, AND/OR WHERE A "GO GET" ROUTINE IS NOT AVAILABLE BECAUSE THERE IS INSUFFICIENT ROOM REMAINING ON THE DISKETTE

It is not at all unusual to have the need to use a portion of a long document in a document presently being created. Quite often, also, the size of the required material exceeds the buffer space allowed with the "cut and paste" method (which often deletes a lot of the material you wanted); the remaining space on the diskette is insufficient to allow you to GO GET the old document, and then cut out the unwanted portions (even if all you want is in the first few pages) or you want to retain imbedded materials, such as rulers and page markers, and the cut and paste method won't retain them. Do not lose hope, there is a fairly simple remedy.

SOLUTION: Edit the old document to the portions desired. Enter a "boilerplate library" type of indicator at the beginning of the text to be copied, and a <> terminator. E.g.:

<<COPY1>>text material (may be as long as needed) <>

Use the same procedure for each section to be copied, but identify each portion with different names, e.g.: <<COPY1>>, <<COPY2>>, etc. (These identifiers can be removed, later, quite easily by using the blue <> key to advance through the document and rubbing out the identifiers.)

Note the drive and document number of the old document. Return to your new document and, with the Gold Menu (i.e., the editor menu) feature, change the boilerplate library to the drive and document number containing the old document.

Proceed to the portion of the new document which is to receive the old document's information, enter GOLD LIBRARY and the name (e.g., COPY1, COPY2, etc.). The information will be transferred, including all imbedded materials, such as rulers.

After using this method, be certain to reset the boilerplate library, in the editor menu, for its proper location.

ABBREVIATION AND BOILERPLATE LIBRARIES

There is no end to the utility to which the system libraries may be appreciated by the Word Processing operator. Undoubtedly, these features are among the most important individual assets of the entire system.

Naturally, the needs of each user will be different. We believe that the following hints will be of interest to most users.

UPPER VS. LOWER CASE FOR FIELD IDENTIFIERS.

Again, as with List Processing, there is no requirement that you use lower case field identifiers for the libraries. In fact, upper case identifiers generally are much preferable, as reference to the library document may be made in upper or lower case and still retrieve the document, whereas if the library field identifier is in lower case, only a lower case identifier will retrieve it. This especially can be annoying if you are seeking an abbreviation library document (which does not echo the input on the screen) and you happen to have the caps lock activated.

LOCATION OF LIBRARIES

The Word Processing manuals and the self-paced teaching manuals for WPS-8 identify SYSTEM 2 and SYSTEM 3 as the location for the abbreviation and boilerplate libraries. Indeed, all the software for the Word Processing software comes with SYSTEM 2 and SYSTEM 3 initiated as the respective libraries.

There is no magic in the assignment of locations for the libraries and your own particular needs should dictate where these libraries are located, and even whether you might wish to change libraries during different operations (a very helpful and powerful feature).

In a client or job oriented operation, where each client or job is assigned an individual data diskette (or RL01 allocation) it might be most helpful to always have the boilerplate library as the first document to be created on that data diskette (which will always be document #2, as #1 is reserved for the diskette's index). If this is done, data which is repetitious for each client or job easily may be recalled by using the same abbreviations or identifiers for each diskette. For example, in our own operations we would identify the name and address block of our client with a field identifier of <<CLIENT>>. Since this information resides only on the diskette in use, every time the library identifier of CLIENT is used, the name and address of that client is displayed in the document. Naturally, the same is true with all information which applies to the specific account, but which is similarly identified for all accounts.

In this manner, the SYSTEM diskette's space is reserved for other needs, and many other libraries.

JULY 1982

ALTERNATING LIBRARIES

There is no particular requirement that the library document always be in the same location. On the other hand, it often is helpful to be able to have several documents available on a given diskette which can be utilized as a library document for a particular purpose. This especially is helpful in creating new documents, where there is going to be repetitious use of some phrases. A new abbreviation library can be created, for these phrases only, and the phrases called with short entries. When completed, the library contents can be deleted (or retained, if desired) and the library document changed to the standard.

The use of such a "temporary" library especially is appreciated when one no longer has to search through the current document for specific phrases to be "cut and pasted" at a specific location.

Also, if a library document becomes too lengthy, then it takes a considerable period of time for the computer to find the phrases you need. To avoid this problem, you often can break your library documents into catagories, and, knowing the catagory desired, assign that document as the library (abbreviation or boiler plate) document for the current assignment.

USE OF THE HELP COMMAND FOR LIBRARY CONTENTS

As use of library documents increases it becomes increasingly difficult to remember field identifier assignments, and hard copy reminders become antiquated, misplaced, or unhandy. There is, however, an on-line solution, and that is a HELP COMMAND.

When creating a library document, the first field identifier should be <<HE>> for the abbreviation library and <<HELP>> for the boilerplate library. (Entering "help" will call the field in both cases, although the extra letters ("lp") will appear on the screen after an abbreviation library call.)

Prepare a Table of Contents which identifies each field identifier and its meaning, which can be called by the HELP command. As each new abbreviation is added to the library, the HELP section also is updated with the new command information.

To seek and examine the HELP information, which only can be accomplished while editing a document, the operator simply (1) enters the SELect key; (2) enters GOLD ABBREVIATION or GOLD LIBRARY and the word HELP (although only HE is required for an abbreviation); and the HELP information is displayed upon the screen. [Reference to "sub-help" libraries may be followed with another GOLD LIBRARY command.] After examining the displayed information, the operator (3) strikes the CUT key and all the displayed information is removed from the screen to the position where the SELect was inserted and the library may be accessed for the desired field.

By no means is the information provided here exhaustive of the potential for the HELP library. One may use HELP as a key to provide the operator with special instructions with respect to procedures to be followed with specific routines or documents. In fact, one can have a separate library entitled HELP. (To access the library, the library document is changed to [diskette].HELP, from the Editor Menu, which automatically will change the library document.)

SETTING UP THE LIBRARY DOCUMENTS TO DELETE THE HARD RETURN

There are two methods available to avoid hard returns following a Library Document call. (I.e., where special formatting is required the formatting must follow the library field identifier in order to be imbedded.)

The first method, of course, is to have the library information begin immediately after the field identifier (<<field>>Data xxx).

The second utilizes the soft return described in preceding sections. The following is an example:

L-----R----<<DOCUMENT>> LT-----R---

TITLE

(data)

<<

Without modification, if DOCUMENT is referenced by the library an extra return will result, as creation of the document necessarily required a hard return after the field identifier.

However, with the insertion of a new ruler (a dummy ruler is indicated, but it should represent a' required format) the hard return can be changed to a soft return (by moving to the beginning of the line immediately after the field identifier and striking the RUB CHAR OUT key) and, when referenced, the soft return will be ignored. The imbedded ruler also will appear.

USE OF LIBRARY DOCUMENTS FOR EXTRA RULER STORAGE

Quite often the ten ruler storage availability of the Word Processing System is inadequate, either because more rulers are required or because it is difficult to remember which is which. There is an alternative.

Using the same technique for removing the hard return described in the foregoing sections, rulers can be saved in a library and can be called by document type. This especially can be helpful for unusual documents, but also is helpful for general documents. The following are examples of two rulers. Expansion of the concept is quite unlimited and, obviously, up to the individual user. <<LETTER>>>

<<

<<schedule>> L---T----->R <<

Naturally, a schedule of all of the rulers can be part of the HELP library.

SPREADING A TITLE OR HEADING

One additional note. The soft return also can be used to spread a word, or series of words, accross an entire page. Provided that the RIGHT MARGIN is set with a J (justification), everything on the soft return line will be spread across the page if the next line commences with any type of an imbedded command (e.g., ruler, print control, page marker, etc.). Example:

L---P----T----T------H----J------H-----J-------(Miscellaneous text to the next line)

TITLE

L---T-----T------H-----J-------

By creating a soft return (i.e., using the RUB CHAR OUT at the beginning of the first line after "TITLE" in the above example, the word "TITLE" will be spread accross the page as follows:

Т I Т L E In order to create the "soft" return, it only was necessary to modify some portion of the ruler, imbed it and then delete the hard return with the RUB CHAR OUT from the beginning of the line.

SOME ADVANCED FEATURES FOR INDEXES (INDEXI?)

In a preceding section of this paper, we have discussed the manner in which an index or a Table of Contents can be created, using the List Processing features of the Word Processing Systems. Here we will discuss, briefly, two enhanced features -including page numbers and sorting.

To include page numbers it is, of course, necessary to have a "finished" copy of the document, as you will have to insert the page numbers after each word to be referenced.

Using a "finished" copy, we mark each word which is to become part of the index. Using the techniques described above, we enter the field identifier before the word, or phrase, and follow it with a space and the page number. Then, the terminating left/right arrow and dummy field identifier follow the number. For example, we are indexing on the phrase "List Processing":

[Text ... <><I>List Processing 22<><X> ...]

In a long document, we do not attempt to identify each page where the word or phrase appears, but merely repeat the process.

Depending upon how involved the index may be, we will either run the List Processor on the <I> field and pick up every instance using a "sub list" which will be SORTed, or we will use a conditional run, based upon the first letter of the field creating a semi alphabetical listing.

[The "sub-list" is quite simple. It is identified as <<I><I>.]

If we create a long index, we then SORT the "sublist" index using the SORT package which is available through your DEC WPS representative.

DECPROFESSIONALDECPRO

What's this? You say your rep doesn't know what you are talking about? If you have any difficulty, send this author two blank diskettes, a returnable mailer AND RETURN POSTAGE, and we will send you a copy of the SORT package and its instructions. Two diskettes are required as the SORT is in DIBOL and operates on COS-310, whereas the instructions are on a WPS diskette.

Upon completion of the SORT, it is a fairly simple matter to "cut" the repetitions and allow their page numbers to flow onto the first use of the term. (Using a RIGHT ARROW ">" as the right margin -- before the R or J -- will allow these numbers to flow backwards so you can have several numbers, with commas, on the same line.)

PERMANENT CUTTING OF LONG SECTIONS OF A DOCUMENT

As you may realize, it is not possible to "cut" more than about 2-1/2 pages of a document at one time. If you want to delete several pages, and do not have to save them for any other purpose, then this can be accomplished with a single operation without concern over the actual length of the material being deleted.

The procedure requires that you proceed to the starting point of the "cut" (which can be the end or the beginning of the "cut") and press the white SEL key. Then, immediately press the red CUT key. This will remove all data from the paste buffer.

Press the white SEL key again and proceed to the point where you wish to end the cut. Press the GOLD REPLC keys (GOLD and '). This will replace all of the data between the SELect position and your current place with a single null. The cut data is not replaceable so do not use this as a "cut and paste" routine. [For long "CUT AND PASTE" routines, refer to the section above which discusses changing your document to a library document.]

TRANSPORTING RULER AND PRINT SETTINGS TO NEW SYSTEMS

Often it becomes necessary to transport your ruler and print settings from one system diskette to another. There is a fairly easy way to accomplish this.

For the ruler settings, you merely create a single document using your old system diskette and then begin to enter ruler settings separated by some meaningful code so you can identify the settings when used on the new system. E.g.:

```
0
L---P---T---->-----R
1
D---P---T----T----- ... -R
```

etc.

Placing this document diskette under control of the new system diskette (and the document may, of course, reside on the new system diskette) you merely advance below each ruler, enter GOLD RULER and then SHIFT [number] to preserve the ruler. Continue with each ruler until all 10 have been transferred over (or as many as are needed).

NOTE: The same procedure can be used in your LIBRARY to save more than ten rulers, or to call rulers by document name. Just enter the RULER NAME between the arrows (e.g. <<LETTER>>) and follow the identifier with a return. Place the desired ruler under the identifier, then enter a single RUB CHAR OUT to remove the hard return and enter your end of field marker (<<). Now, when you call the RULER from the LIBRARY, it will appear where you want it without extra returns.

For PRINTING COMMANDS, create up to ten separate documents and merely file them away. Go into the PRINT MENU for each document (either as you create them and afterward) and call up your PRINT COMMANDS from your old SYSTEM diskette. Save the commands on the document by using the GOLD MENU. Placing the diskette with your "new" SYSTEM diskette, you merely begin to print each of the documents. When in the PRINT MENU enter SS nn to save your PRINT COMMANDS as reflected on the particular document.

The procedure is also available for special printing requirements on documents where there are insufficient printer commands (i.e. -- 10) available. Just identify a document with the name of the particular type of printer commands you want to save, and you always can assign that to any of the numbers you wish for special purposes. (We find that reserving control number 9 for this purpose works out just fine.)

SUMMARY

DEC's Word Processing Systems (and even those which utilize DEC equipment) clearly are among the most powerful available on the market today. The potential -- indeed the need -- for improvements is all too obvious, if DEC intends to remain a serious contender for the Word Processing Market.

In the meantime, there are numerous routines which are available in the existing system which can make it work better and faster for you, and that is what automated word processing is supposed to be all about.

The examples provided here are but a few of the many work saving features which are available. It appears that these examples have never previously been documented by DEC, which really is a shame.

We do hope, however, that the foregoing will be of some assistance to the Word Processer user and that this Article may become part of your Word Processing Manuals.

A note of thanks to DEC users and the entire DEC-compatible community...

You made DEXPO 82 your Show. So we're making DEXPO/West 82 bigger to serve you even better.

You didn't have to participate in DEXPO 82 to benefit from its immediate success. The strength of the first Show — held last May in Atlanta — assures support for more and bigger DEXPO Shows in the future. For DEC users and compatible vendors, it means new opport inities to meet face-to-face and help shape a prosperous DECcompatible industry. Both visitors and exhibitors who were at the Show are quick to agree that DEXPO is now the single most important event for every member of the DEC-compatible community. And they are looking for ward to protude DEC-compatible community.

Both visitors and exhibitors who were at the that DEXPO is now the single most important event for every member of the DEC-compatible community. And they are looking forward to an of the DEC-compatible community. And they are looking forward to even bigger DEXPO/West 82 — at the Anaheim Convention Center, Decenter 7-9. This time, many DEC users are planning to bring teams of executives to see and compare the latest DEC-compatible hardware, software, services and supplies. For their part, a large proportion of exhibitors are planning to interference it expanded exhibits and product innovations. They'll be joined by

For their part, a large proportion of exhibitors are planning wream. We want the two properties and product innovations. They'll be joined by as many as 75 new exhibitors. DEXPO/West 82 will be the most comprehensive exhibitions of DECcompatible alternatives, enhancements and special solutions there work has ever seen. It will serve the largest audience of DEC users of West 82 wisit one show. Most important of all, you can be sure DEXPO/West 82 will meet all your DEC-directed needs ... a tradition that will be gotted ued at DEXPO/East 83, Kiel Auditorium, St. Louis, May 22-24, 1983.

NAME

TITLE

COMPANY

ADDRESS

TELEPHONE (

CITY

TELL ME MORE ABOUT DEXPO/WEST 82

Send me and my associates ______visitor

ZIP

registration tickets and complete information on the vendors and products we'll find at DEXPO/ West 82.

□ I'm interested in exhibiting in the DEXPO Shows. Send me a prospectus, a floor plan and a complete list of exhibitors.

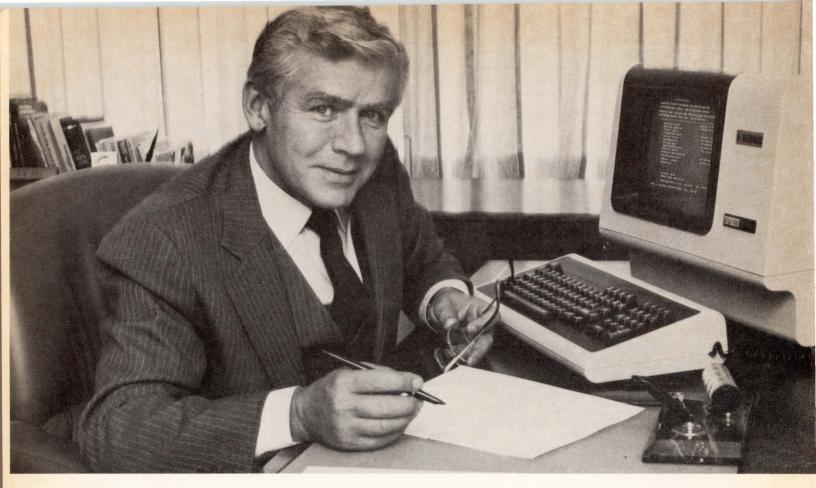
STATE

Mail to: Expoconsul International, Inc. 19 Yeger Road Cranbury, NJ 08512 CALL: 609-799-1661

The Second National DEC-Compatible Industry Exposition

Anaheim Convention Center Anaheim, California December 7-9, 1982

DEXPO[™]/West 82



TAKE THE "WORK" OUT OF RSTS/E NETWORKING AND SAVE MONEY TOO.

If information processing is important to you and your organization, then an efficient networking system is essential. DMG/NET is a networking software package designed for RSTS/E systems, which is not only highly efficient, but is also multi-functional, simple to use and can cut your communication costs substantially.

YOU DON'T HAVE TO BE A COMPUTER PROFESSIONAL TO USE DMG/NET.

DMG/NET allows interactive access to electronic mail systems, public databases, service bureaus and other remote systems, whether they are RSTS/E, other DEC systems or even non-DEC. File transfer is possible between RSTS/E systems—local or remote, and operation is so simple, anyone can use the system even your non-computer people. Once a connection is made, communication is exactly as if the remote computer was in the next room.

YOU CAN CUT YOUR COMMUNICATION COSTS BY UP TO 90%!

DMG/NET not only makes network communication extremely simple, but through the utilization of X.25 networks it makes communication extremely cost efficient too. No matter what the size of your RSTS/E system, if you currently use dialup or leased lines, installing DMG/NET with X.25 could cut your communication costs by up to 90%!

If you'd like to take the "work" out of your networking and save money at the same time, send for more information on DMG/NET.

Just complete the coupon and mail it to us today. Or give us a call and we'll be happy to arrange a demonstration.



Return coupon to: Digital Management Group Ltd. 4800 Yonge Street, Willowdale Ontario, Canada M2N 6G5

 Tell me more about DMG/NET for RSTS/E
 I'd like some information on DMG/NET for VAX.

Name	_		
Title			
Company	_		
Address			
City	200	_ State	-
ZipF	hone ()	007/82

Digital Management Group Ltd.

4800 Yonge Street, Willowdale, Ontario. Canada M2N 6G5 Telephone: (416) 225-7788

RSTS/E, DEC and VAX are registered trademarks of Digital Equipment Corporation. DMG/NET is a registered trademark of Digital Management Group Ltd.



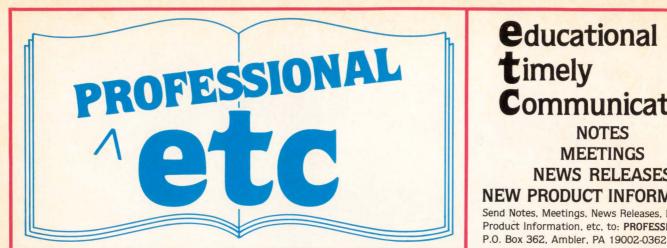
Dear DEC User:

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.



CORTEX/DECTM COMBINE SOFTWARE-**/HARDWARE FORCES**

Wellesley, MA - In a cooperative marketing agreement signed with Digital Equipment Corporation, CORTEX Corporation will provide eight software packages designed for DEC's new ProfessionalTM series computers, under the professional operating system. These software applications and tools provide essential data management, analysis and graphics capabilities, with administrative applications for business managers, applicationdevelopment tools for the programming professional.

Digital's expertise in computer system development and manufacturing combines with CORTEX specialization in software development for effective product promotion and utilization and mutual benefit.

Of the eight software packages, three are off-the-shelf applications, while five are tools for application development and personal information management.

The three off-the-shelf applications, Executive Desk Set, Programmer's Desk Set, and Human Resource Management (HRM) System, are directed towards professionals requiring better business organization and administration.

Five software tools allow the user to create, manage, analyze, inspect, protect, and change personally selected information files, as well as develop entire business applications. They consist of: the Application Factory, Personal Information Manager, Executive Information Manager, Executive Data Display System (CORTEX-EDDS), and Secure.

All eight software packages will be available November, 1982, from CORTEX Corporation. For further information, contact Mr. Kimball L. Mason, Vice President of Marketing, at 617-237-2304.

MEC RELEASES OFFICE AUTOMATION PACKAGE FOR VAX/VMS

Hoffman Estates, IL — Microsystems Engineering Corp. is capturing DEC's VAX Office Automation market with its software products. Everett Karels, President of MEC stated that his company's market surveys show that office automation software will be essential to more than half of all VAX installations.

Its user-proven MASS-11 word processing, list processing, and data base manager software package has been released for use

under VAX/VMS in the native mode. Numerous universities and government agencies have completed extensive evaluations of the package; it is now ready for the general VAX user. Building on seven years experience with Office Automation Systems on an installed base of over 1000 PDP-11 sites worldwide, MEC is now concentrating on VAX/VMS.

With the simple addition of MASS-11, every terminal on a VAX system can become an office automation work station. MASS-11 on VAX can perform many advanced office automation functions such as redlining, footnoting, glossaries, form letters, and lists with interfaces to electronic mail and DECNET. And, it's available at a fraction of the cost per terminal of leading stand-alone word processing systems.

'MASS-11 is easy to learn. Most users need only a short training session", states Ms. Carol Karels, Director of User Services, who has conducted numerous training sessions for MEC's large national accounts. Groups of secretaries can usually be productive after a two-hour, hands-on tutorial.

MEC provides a unique set of training manuals that set a new standard in software documentation. Color-coded index tabs and self-paced examples help new users rapidly gain proficiency with MASS-11 functions. Supplementary reference manuals that serve as a guide for experienced users and system managers are also provided.

For the word and list processing package, MASS-11 is licensed at \$10,000 per computer with an additional \$2500 for the data base management package. Educational and volume discounts are available. Write or call MEC, 2400 W. Hassell Rd., Hoffman Estates, IL 60195, 312-882-0111 for further information.

UNIQUE ADAC CARD GUIDE SOLVES LSI-11 HALF-QUAD BOARD CENTER SUPPORT PROBLEMS

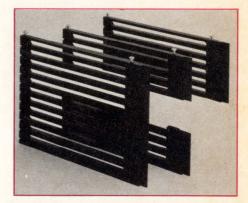
Woburn, MA - A unique injection molded center support device is now standard equipment in the card cage of all ADAC System 1000 and 1000TU LSI-11 bus enclosures and backplane assemblies.

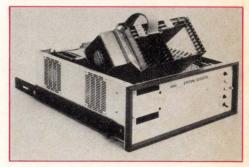
The card guide prevents sagging, shorting and other possible failure conditions when half-quad boards are utilized in LSI-11 fullquad card cages. ADAC's exclusive guide provides a permanent, mechanically stable solution over clip and spacer devices which can transfer support loads from one board to

educational timely Communications NOTES MEETINGS NEWS RELEASES **NEW PRODUCT INFORMATION** Send Notes, Meetings, News Releases, New Product Information, etc. to: PROFESSIONAL etc.

another.

Of particular importance to circuit designers is the ease with which the ADAC card guide can be field-modified to accept combinations of full and half-quad boards. The high-capacity card cages of System 1000 and 1000TU can accept up to 11 full-quad boards and up to 22 half-guad boards or any combination thereof with the new card guide. Top and bottom screws assure continued rigidity and proper vertical spacing even if the card guide has been cut to accept full-quad boards.





Large horizontal slots in the card guide permit unimpeded air flow across the cage. A full-height flange on the guide snaps firmly into the backplane for positive positioning of support tracks in relation to PC connector strips.

ADAC also announces that the tilt-up card cages can now be locked in full vertical as well as traditional 30° position. The cage cooling fan and baffle assembly is now mounted on the tilt-up cage of all current production System 1000 units as it has been

JULY 1982

on all System 1000TU's. Proper cooling is maintained during start-up and system diagnosis when operating with the card cage in an up position.

Factory-wired 22 bit addressing is now an optional extra for both System 1000 and System 1000TU backplanes.

The new ADAC card guide is standard at no extra cost. For additional information, contact: Mr. Ben Minsk, ADAC Corp., 70 Tower Office Park, Woburn, MA 01801; Phone: (617) 935-6668; Telex: 949329.

NEW PRICING FOR SCRIBE ON VAX 11/730 Pittsburgh, PA — Scribe, a powerful document production system, is now immediately available for use on Digital Equipment Corporation's recently announced VAX-11/730. It also currently operates on other Digital models including DECSYSTEM-10, DECSYSTEM-20, VAX 11/750 and VAX 11/780 at installations both here and in Europe.

Providing capabilities far beyond standard word processing systems, Scribe is particularly suited to producing complex written documents. It easily handles the production of reports, financial summaries, manuals, and proposals as well as book-length manuscripts complete with automatically generated indexes and bibliographies. Other important features include the ability to merge text with graphics and to produce color slides.

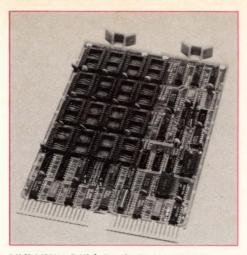
With the release of the VAX 11/730, the text formatting capabilities of Scribe are now available to a broader marketplace. The new machine, in combination with today's high quality/low cost printing technologies, will enable many organizations to retain complete in-house control of a document from initial drafting to final production.

A single processor perpetual license fee on the VAX 11/730 is \$12,500 at a commercial site and \$7,500 at an educational site. Scribe is also available for additional processors at the same site for 20% of the original license fee. Each standard Scribe license includes support for various output devices such as line printers, letter-quality robot typewriters, the GSI CAT 8 photocomposer and the DEC GIGI color graphics terminal. Also available at an additional fee is support for the Xerox 9700, the Xerox 5700, the Imagen IMPRINT 10 and the IBM 6670 laser printers and for the Mergenthaler Omnitech/2000, the Mergenthaler VIP, and the Compugraphic 8600 photocomposers. Scribe is regularly upgraded to support new printing device technology and full program maintenance is available, including hot-line telephone consultation, dialup diagnosis and customized enhancements.

The vendor, UNILOGIC, Ltd., is located in the Bellefield Building, 160 N. Craig, Pittsburgh, PA 15213; (412) 621-2277.

MDB INTRO'S DEC COMPATIBLE HIGH DENSITY PROM/ROM MODULE Orange, CA — A high density PROM/ROM dual size module that upgrades the LSI-11 capability, has been introduced by MDB Systems, Inc., the world's largest independent manufacturer of interface products.

Featuring 22-bit addressing for LSI-11/23 users, which is unavailable on DEC supplied PROM modules, the device has 16 sockets, each with 24-pins. It also accepts a wide variety of user supplied chips such as masked



MLSI-MRV11-C High Density PROM/ROM Memory Module with 22-bit Addressing. From MDB Systems, Inc.

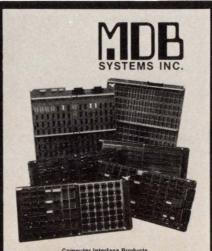
ROMs, fusible link PROMs, and ultra-violet eraseable PROMs.

Called the MLSI-MRV11-C, this new, general purpose memory module can be used in either a direct access or window-mapped mode for 16K, 32K, or 64K bytes of ROM. Chip array sizes can be 1K x 8, or 4K x 8 bits with maximum memory sizes of 16KB or 32KB, or 64KB.

PRICE: \$216.00 in single units. DELIVERY: 30 Days ARO.

Over thirty products for Perkin-Elmer computers are described in an eight page illustrated brochure from MDB Systems, Inc., the world's largest independent manufacturer of interface products. The brochure also contains simplified interface schematics and block diagrams for some of the products.

To receive a copy of the MDB Systems, Inc., brochure entitled "Computer Interface Products for use with Perkin-Elmer Compters" contact MDB Systems, Inc., 1995 North Batavia Street, Orange, California 92665. Telephone—714-998-6900, TWX-910-593-1339.



Computer Interface Products for use with PERKIN-ELMER Computers

THE BRIDGETM — CP/Mtm MINICOMPUTERS

Berkeley, CA — Virtual Microsystems announced today the release of THE BRIDGE, a CP/M simulator for DEC computers. THE BRIDGE links DEC computers with the inexpensive and user-friendly software developed for microcomputers. By using THE BRIDGE to create "virtual" microcomputers DEC users can have the flexibility and ease of personal computers — and still share files, operate in a time-sharing environment, and use existing highspeed peripherals and fullysupported equipment.

PAGE 89

THE BRIDGE is not a "CP/M-like" operating system — instead, THE BRIDGE is an implementation of CP/M on DEC equipment and includes license to CP/M itself. It loads on your PDP/11TM or VAXTM as does any other applications program. Once the program is requested, the user is presented with a standard CP/M prompt. From then on, operating THE BRIDGE is nearly the same as running a personal computer. What's the difference? Instead of fooling around with floppy disks, the user has access to "virtual floppies" - files which are resident on the host system. Naturally, file interchange among different users of THE BRIDGE (or with those created off-site on physical floppies) is a snap. Also the THE BRIDGE eliminates the need for supporting, connecting and duplicating terminals, floppy disks drives, printers and modems. The result? Microcomputer flexibility and ease with mini-computer level support and reliability.

CP/M is fast becoming the standard operating environment for microcomputers. The Xerox 820, IBM Personal Computer and DEC's own VT180 all run this operating system. As a result, an enormous amount of inexpensive, user-friendly software has been created for these devices. Furthermore, the huge size of the CP/M market has made possible astonishingly low prices for surprisingly sophisticated programs. Consider: SuperCalcTM, an electronic spreadsheet — Wordstartm, and easy wordprocessor - Milestonetm, a PERT charting program. The average cost for these microcomputer packages is less than \$500.00. Compare that to minicomputer packages which usually cost several thousand dollars and can cost tens of thousands. THE BRIDGE will give you access to this huge and growing world of cost-effective software.

THE BRIDGE is available now for your DEC PDP/11 or VAX running RSTS RSX or UNIX TM. It costs \$3,500.00, far less than the cost of a single personal computer.

THE BRIDGE is available from: Virtual Microsystems, and affiliate of Berkeley Systems Works, Inc., 2409 Telegraph Avenue, Berkeley, CA 94704. (415) 841-5083. Attn: Lance Batten.

Trademarks: CP/M is a registered trademark of Digital Research, Inc. DEC, PDP and VAX are trademarks of Digital Equipment Corp. Milestone is a trademark of Organic Software. Supercalc is a trademark of Sorcim. Wordstar is a trademark of Micropro International.

INDUSTRIAL-GRADE ALTERNATIVE TO THE PDP-11/44 INCLUDES ONE MEGABYTE OF MEMORY WITH INTEGRAL 80 MEGABYTE WINCHESTER

Irvine, CA — ABLE Computer announces MAGNUM+TM, a one megabyte alternative to the PDP-11/44 with an 80 megabyte

PAGE 90



imbedded disc. The new system provides MIL-type performance at commercial prices and has been designed with "uptime" as a primary consideration. It marks ABLE's entry into the high-reliability, industrial-grade computer systems market.

MAGNUM+ is UL listed and fully FCC and CSA approved. MTTR is kept low by features such as the special maintenance front panel which allows the display of bus signals on all internal buses and the built-in digital voltmeter which serves as a power monitor. MTTR is enhanced further by totally modular design for easy replacement, making it possible to disassemble and reassemble the entire system in a few minutes without special tools.

System design keeps the companion reliability characteristic, MTBF, high. Most prominent among the features serving this purpose are a 75A remote-sensed MIL-grade power supply from LH Research and six (3 intake—3 exhaust) super-quiet, ball-bearing fans for the superior airflow requirements of today's high-current, high-power controllers.

"What we are offering fills the gap between existing DEC systems and those very expensive MIL-spec systems. MAGNUM+ provides performance as close to MIL-spec as you can get while still remaining affordable," said Ray Ball, Director of Marketing. He added, "With our emphasis on uptime and broad system performance margins, we have put together a package which adapts very well to the user's environment. It works where he works and stands up under the most severe operating conditions. MAGNUM+ doesn't need any special care and handling out in the field."

The standard system includes floating point, memory management, extended memory addressing to 4 megabytes, 8K bytes of cache memory, serial console interface, imbedded cartridge tape, programmable line time clock, bootstrap loader, microcoded ODT, diagnostics and front panel switch register. An imbedded PDP-11/23 engine is enhanced in the MAGNUM+ to provide full software compatibility with RSX-11M, RSTS/E and RT11 operating systems. Also included is a power supply with remote sensing and optimal access to voltage adjustments.

MAGNUM+ is intended for use in demanding environments such as industrial automation applications, fault-critical communications systems, oil-field operations and shipboard installations. Various configurations are available, including desk, industrial-cabinet and standard-rack models. Domestic list price for a complete 80 megabyte system is \$44,760. Delivery is 60 days ARO.

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 generalpurpose 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.

DATANEXUS, INC. ANNOUNCES MICRONEXUS

Salt Lake City, UT — Datanexus, Inc. today announced MICRONEXUS, "The Computer That Comes On a Tape." MICRONEXUS resides on the host computer and makes mini-computers compatible with microcomputer software.

MICRONEXUS is a complete virtual 8080 micro-computer software system designed to be used on Digital Equipment Corporation's PDP/11 and VAX mini-computer systems.

MICRONEXUS includes all the characteristics of a hardware microcomputer system. Since MICRONEXUS is completely compatible with 8080 code, it will run CP/M or other standard 8080 operating systems, as well as 8080 stand-alone applications. No translation, conversion, or application source code is necessary.

MICRONEXUS may also be used as a development tool, or it may be used to run application which will later be off-loaded to standard micro-processors.

Lynn Alley, the principal designer of MICRONEXUS, noted that it is a tool which opens up a previously untapped library of micro software for the PDP-11 and VAX user. He stated that micro software is the fastest growing segment of the software industry, and MICRONEXUS makes this huge software "library" immediately available to the DEC user at low cost.

Mr. Alley further commented that the initial purchases of MICRONEXUS would probably be for the mini-computer 'add-on' software market. Software for primary applications would still be purchased from traditional mini-computer software vendors because of performance trade-off characteristics between a micro and mini product.

For those DEC users who want to purchase 'add-on' software applications for their site libraries such as: spread-sheet manipulators, modeling, word-processing, small business accounting packages, code development tools and languages, small data base management systems, graphics, games, etc., and are concerned with the high cost of 'add-on' mini-computer software, MICRONEXUS might very well be the answer.

MICRONEXUS-RSTS is currently shipping for all RSTS and CTS-500 DEC users. MICRONEXUS-RSX and MICRONEXUS-UNIX are currently under development and will be available soon. MICRONEXUS-VAX and MICRONEXUS-RT will ship later this year.

MICRONEXUS is being marketed with an optional indirect command processor, DO-11. DATANEXUS claims that it is one of the most powerful DEC-compatible command processors, since its design allows it to do many tasks impossible for other command processors. DO-11 automates many of the routine tasks of operating MICRONEXUS, or any other software.

JULY 1982

DATANEXUS is accepting orders for MICRONEXUS, DO-11 and CP/M. Further information may be obtained by contacting DATANEXUS at (801) 272-8294. They are located at 3760 South Highland Drive, #405, Salt Lake City, Utah 84106.

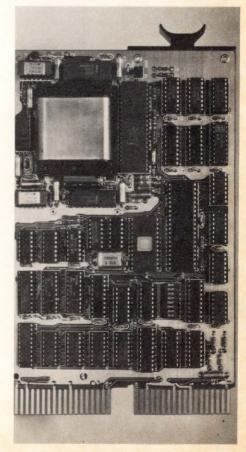
NEW SINGLE-BOARD BUBBLE-MEMORY SYSTEM FOR LSI-11 MICROCOMPUTERS -128K bytes of storage on one dual-height module

Dublin, CA — The Bubbl-Tec division of PC/M, Inc. has announced availability of industry's first single-board magnetic-bubble mass-storage memory system for Digital Equipment Corporation (DEC) LSI-11 microcomputers.

All-solid-state bubble-memory systems are ideal for environments where mechanical mass-storage systems are unsuitable, and also where the relatively high storage capacity of a disk system is not required. For most process-control applications, bubble-memory systems are also less costly than a floppy disk.

The bubble-memory system provides a 5 to 10 times improvement in access time compared to a floppy disk, and greatly improves system reliability.

Bubbl-Tec's new QSB-11 BUBBL-BOARD bubble-memory system for LSI-11's is comprised of a single 1M-bit bubble device (with its attendant support circuitry), plus a complete controller which emulates the DEC RX01 floppy-disk system. The controller handles bubble-device formatting and control, interfaces the bubble-memory



DECPROFESSIONALDECPRO

system to the LSI-11 bus structure, and provides for both soft- and hard-error detection and correction.

The bubble-memory system is fully compatible with all DEC LSI-11 systems, including the original LSI-11, the LSI-11/02, the LSI-11/23, the new SBC-11/21 FALCON, and the LSI-11/23-PLUS.

The QSB-11 is also fully compatible with all DEC software written for the LSI-11, including the popular RT-11 operating system. A builtin RT-11 bootstrap is included on-board. No other hardware is required to make the bubble-memory system act as either a system or non-system mass-storage device.

The controller also contains built-in selfdiagnostics to simplify field maintenance of the bubble-memory system.

The QSB-11 is built on a dual-height LSI-11 module and contains 128K bytes of nonvolatile storage. Access time to the first data byte averages less than 41 milliseconds, and data are transferred to/from the host system at a rate exceeding 68,000 bits per second. The memory system is specified for operation over a 0-to-70 degree C ambient temperature range.

Power consumption is less than 15 watts. Only +5-volt and +12-volt power are required, and these are derived directly from the LSI-11 bus.

The QSB-11 is priced at \$1614, quantity ten. OEM discounts are available. Delivery 30 days. For more information contact Al Foreman at Bubbl-Tec, 6800 Sierra Court, Dublin, Calif. 94566; Phone (415) 829-8700; TWX/Telex 910-389-6890.

QT PRINTER SYSTEMS EXCEED SALES PROJECTIONS AT SSI

Fort Lauderdale, FL — The QT Series' durability and operator-friendly features have created a market acceptance that was unexpected even in maximum sales projections, said James W. Rule, vice president/marketing for Southern Systems.

"Our QT Series sales have doubled the projections we made at the introduction of these new printer systems. Typically, we plan for a year of just being in the marketplace with a new product before we expect widespread acceptance. But there's been no new product resistance to the QT primarily because it has a heritage of dependability with unmatched cost/performance ratio."

Rule said that the features offered by the QT previously were found only on printers in



price categories \$10,000 to \$40,000 higher than the QT series. "Many of these features contribute substantially to an operator's efficiency and productivity," said Rule.

Forms alignment techniques offered on the QT, for example, are a major timesaver for operators. As use of preprinted forms continues to grow, a forms alignment system like the QT's is essential to quickly align the initial margins, both vertically and horizontally for accurate printing in defined positions on pre-printed forms.

The single cycle feature also works well with the Forms Alignment system, allowing an operator to print just one line of data then stop to check alignment accuracy.

The VFU feature permits quick slewing vertically, another time saving aspect.

Infinite fine-tuning adjustments increase operator precision in alignment as well. The servo-controlled adjustment can be used using the QT 600 at remote, job-entry work stations at three different locations.

PAGE 91

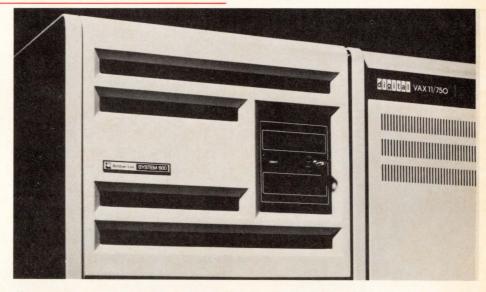
Skidmore, Owens & Merrill, a nationally known architectural and engineering firm is using a QT Series with its DP system.

Safecard, a pacesetter in protection of charge cards, uses the QT1200 with its PDP-11/70 system.

QT1200s are handling the output for several DECSYSTEM20 processor sites including Nova University and Tillinghast, Nelson & Warren in Atlanta.

Other users of the QT1000 include Northrop, Singer's Simulations Group in Maryland, General Electric of Vermont, Harris Corporation in Melbourne, FL, an Exxon subsidiary in Texas and many others.

BRITTON-LEE INTRODUCES RELATIONAL DBMS FOR DEC VAX/VMS Los Gatos, CA — Britton-Lee, Inc. announces



The new Britton-Lee System 300 and System 600 (System 600 shown) bring high-performance relational database management to DEC VAX computer users.

even while the printer is running.

"Alignment time is a significant key to operator productivity," said Rule. "If an operator spends 10 minutes on alignment instead of two, the output speed is indirectly degraded, and productivity is reduced."

Offering the quietized cabinet as a standard reflects today's awareness of the need to decrease noise pollution. Yet the QT Series—with speeds of 300, 600, 1000, and 1200 lpm—is priced competitively with products that offer quietized cabinets only as options.

The ruggedness of the QT Series is a feature that represents a response to user's demands that a printer perform long, non-stop hours of functioning.

Not only smaller companies but the giants of American business are turning to Southern Systems QT Series.

Using 600 lpm systems for several months are the Mosteck Corp., which changed from Printronix; Johns Hopkins University, Lockheed Missile & Space Division in Sunnyvale, Calif.; Polaroid; Coulter Electronic in Miami, and others.

At United Technologies' Research Center in East Hartford, Connecticut, a QT600 is functioning with a VAX 11/780.

The U.S. Nuclear Regulatory Commission is

the introduction of the SYSTEM 300 and SYSTEM 600 relational database management systems for DEC computer systems. These products are for use with the VAX-11/750 and VAX-11/780 computers that use the VMS operating system. Additionally, versions of the SYSTEM 300/600 are available for use with PDP-11 and VAX-11 computers running the UNIX operating system.

The heart of the SYSTEM 300/600 is the Britton-Lee Intelligent Database Machine (IDM). The IDM combines relational database management software with hardware designed specifically to perform database management at high speeds. Located between computer and disks, the IDM offloads the entire database management function from the computer.

The low-priced SYSTEM 300 is ideally suited for medium demand VAX applications. The SYSTEM 600 is a higher performance product, making it an ideal match for high demand applications with large databases and many users. The SYSTEM 300 can control up to four SMD compatible disk drives for databases of up to 2.7 billion bytes. The SYSTEM 600 controls up to sixteen disk drives for a maximum database size of 10.8 billion bytes. The SYSTEM 300/600 attach to the VAX

PAGE 92 DECPROFESSIONALDECPROFESSIONA

computer via a high speed IEEE-488 parallel interface

The SYSTEM 300/600 include an IDM (mounted in a 40 inch cabinet), hardware to interface directly to the VAX UNIBUS adapter, and Support Software that runs under the VMS operating system. Also included is one year of software maintenance, which includes software updates and phone-in consulting. Additional software maintenance and hardware service contracts are available. Installation is available separately

Also included with the SYSTEM 300/600 is the Britton-Lee IDL Query Language. This user-friendly query language allows unskilled users to easily access and modify SYSTEM 300/600 databases. Included for application programming, is a runtime subroutine library that allows VAX-11 FORTRAN and COBOL programs, and "C" programs to access SYSTEM 300/600 databases. Optional VMS precompilers allow IDL commands to be embedded in VAX-11 FORTRAN and COBOL programs, and "C" programs. Database administration utilities, which allow for backup, crash recovery and bulk loading of data, are included in the standard product.

A unique feature of the SYSTEM 300/600 is that it can be connected to several computers simultaneously. This allows multiple VAX computers to use it as a centralized database resource. The optional SYSTEM 300/600 Interface Package provides this feature.

The Britton-Lee SYSTEM 300 and SYSTEM 600 can be ordered beginning June 1, 1982. The SYSTEM 300 is priced starting at \$62,900 and the SYSTEM 600 starts at \$85,300. The SYSTEM 300/600 Interface Package that allows the System 300/600 to be connected to additional VAX computers is available for \$15,800. Pricing for the UNIX versions of the SYSTEM 300/600 is the same.

For more information: Mark Willner, Director of Product Management; Peter Moulds, Product Marketing Manager, Britton-Lee, Inc., 408-378-7000. Intelligent Database Machine, IDM, and IDL are registered trademarks of Britton-Lee, Inc. DEC, VAX, VMS, PDP, and UNIBUS are registered trademarks of Digital Equipment Corporation.

SIGNAL TECHNOLOGY ANNOUNCES VERSION 4.0 OF SIGNAL PROCESSING SOFTWARE PACKAGE

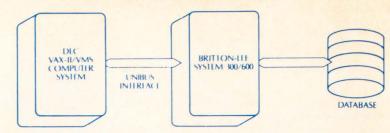
Santa Barbara, CA - ILS Version 4.0 is now available with expanded signal processing capabilities, according to Dr. Larry Pfeifer, Vice President of the Santa Barbara-based software-development firm.

ILS (Interactive Laboratory System) is an organized software package of approximately 80 applications programs for interactive signal processing. First released in 1978, ILS has become one of the few scientific software packages to receive the ICP Million-Dollar award.

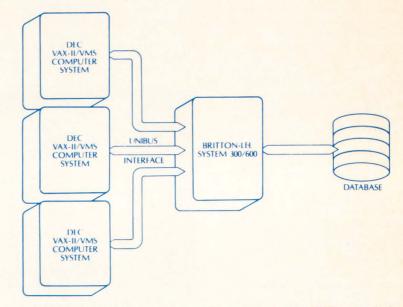
Version 4.0 now supports VAX-VMS and VAX/UNIX systems with 32-bit integers, digitized sampled data files of arbitrary lengths and 14th order FFT's with window lengths up to 16384 points. It also supports both Tektronix and Hewlett Packard graphics terminals, plus graphics output to disk files and the Tektronix 4662/4663 flatbed plotters.

Signal processing capabilities have been expanded by adding four new programs

BRITTON-LEE SYSTEM 300/600



A single DEC VAX-11/VMS computer system using the Britton-Lee System 300/600 relational database management system.



A number of DEC VAX-11/VMS computer systems can access the Britton-Lee System 300/600 as a centralized database management resource

which include convolution of a long duration time series with a filter impluse response using short overlapped FFT's, and correlation of two long duration time series using short overlapped FFT's.

For applications using multichannel signals, there is a new program offering multiplexing and demultiplexing of multichannel sampled data files. In addition, there is a program for the extraction of feature vectors from time series data for eventual use in pattern recognition experiments.

The software updates provided with Version 4.0 include modifications and enhancements to 40 other programs and subroutines, plus a complete set of new documentation.

According to Dr. Pfeifer, ILS is installed in more than 240 locations around the world, and is the world standard in signal processing software. Typical applications include those in speech processing, noise and vibration, acoustics, biology, communications, simulation, digital filtering, sonar, radar and seismic.

For more information, contact Dr. Pfeifer at Signal Technology, Inc., 5951 Encina Road, Goleta, CA 93117. (805) 683-3771. Outside California, call toll-free (800) 235-5787.

CARE ANNOUNCES NEW SOFTWARE PRICING STRUCTURE

Springfield, IL — Care Information Systems Inc. has announced a new concept in software package pricing - discounts to users with smaller computer systems.

Time-share firms and software distributors with smaller DEC hardware pay less for the CARE/DM SYSTEM, a package designed for managing medical and dental offices. Owners of larger systems with greater earning power pay the regular price for the software.

Care Information Systems President John Struckhoff said, "The new pricing structure allows smaller users to benefit from the CARE/DM SYSTEM. Those who could not cost-justify the software before can now purchase the package and take advantage of its earning potential.

Pricing ranges from \$9,950 for the PDP 11/23 to \$39,500 for the VAX 11/780. Users who upgrade to a larger CPU receive the full credit of the original purchase price towards a new upgrade license.

Complete pricing information and package specifications are available from Care Information Systems Inc., 3009 South Sixth Street, Springfield, IL 62703, (217) 522-CARE.

IXTP FROM INTERPLEX, INC.

Mountain View, CA - INTERPLEX, INC., 2680 Bavshore Frontage Rd., Mountain View, Calif. 94043, is today announcing the release of IXTP, a software utility package which provides both format generation and transaction processing capabilities.

Intended for sale as source code to be integrated into other software, the binary version is also available.

The source code is written in MACRO-11 and can be easily adapted to a wide range of **Digital Equipment Corporation computer** systems. The binary version is executable under RT-11, having been developed on an LSI-11 microcomputer system.

This utility package has two related principal functions; the first permits the user to create data entry and print formats (ie. screens, panels, views, etc), while the second permits transaction entry/edit/printout using the previously defined formats.

In the context of this software, a format is composed of fields each of which includes a text part and/or a data element. Associated with each field is a set of attributes: data type, default data value, upper and lower bounds on data value, keyword and access priority level.

The binary version is priced at \$500. and the source code at \$5,000, both under license agreements.

TOUCH-SENSITIVE CRT OPTION AVAILABLE FOR DEC'S VT100 VIDEO DISPLAY TERMINAL

Newtonville, MA - Interaction Systems, Inc. announces the availability of a customdesigned touch-sensitive CRT option for the DEC* VT100* video display terminal.

Designated the Model TK-2100, the touchsensitive CRT option complements the double-height double-width character feature of the VT100, resulting in a display that is ideal for menu selection applications.

The touch-sensitive CRT option allows data to be inputed to a system by simply touching, with a fingertip, the area where appropriate information is displayed on the display screen of the VT100. This option allows person who are not familiar with the use of computerized equipment to interact with online information without prior training.

The option consists of a touch-sensitive faceplace, an electronic touch control and interface board, interconnecting cables, mounting hardware, and easy installation instructions

The TK-2100's touch-sensitive faceplate is mounted in front of the CRT monitor of the VT100. When the faceplate is touched by a user's finger, an electronic method under software and microcomputer control is used to identify and interpret the changes in capacitance which are detected. The touchsensitive CRT option utilizes a continuous recalibration technique in order to compensate for temperature, humidity, or other environmental fluctuations or changes, resulting in error-free, touch-sense accuracy in virtually all operating environments.

The Model TK-2100 is priced in single unit quantity at \$945. Substantial quantity discounts are also available. Delivery is thirty days ARO

Interaction Systems, Inc. also provides custom-designed touch-sensitive CRT options for lear Siegler's ADM 32 and ADM 42 video display terminals and similar componentry for most other popular CRT terminals.

Interaction Systems, Inc. is a leading manufacturer of touch-sensitive computer display terminals and of componentry for integration of the touch-sensitive feature into video display terminals manufactured by other companies.

For more information: Steven J. Puchkoff, Vice President-Marketing, (617) 964-5300. *DEC and VT100 are trademarks of Digital Equipment Corporation.

WESPERCORP'S THIRD QUARTER PROFITS **UP 24 PERCENT**

DECPROFESSIONALDECPRO

Tustin, CA - WESPERCORP (AMEX) today announces its current financial results: For the Third Quarter ended March 31, 1982*

Sales - + 8% to \$3,593,200 Net Income - + 24% to \$381,900

Earnings Per Share - + 22% to \$.28 *As compared to the same period in 1981.

Randy Knapp, President of WESPERCORP, commented that the Company is experiencing some early signs of recovery from its low First Quarter with increased sales activity, particularly in the Datasystems subsidiary. Although the Third Quarter results are encouraging, it is still too early to predict whether this recovery will continue into the Fourth Quarter. If this trend continues, WESPERCORP expects to show reasonable growth for the year.

Sales for the first Nine Months of Fiscal

			3 MONUIS	9 101011115
	Q/E	Q/E	Ending	Ending
	3/31/82	3/31/81	3/31/82	3/31/81
Net Sales	3,593,200	3,323,100	10,347,000	9,901,200
Cost Goods Sold	1,573,700	1,577,200	4,732,700	4,871,000
G&A and R&D	1,349,400	1,200,400	4,001,900	3,432,400
Net Before Tax	670,100	545,500	1,612,400	1,597,800
Taxes	288,200	236,100	693,500	689,800
Net Income	381,900	309,400	918,900	908,000
Weighted Shares				
(outstanding)	1,369,781	1,3674,409	1,370,909	1,348,439
EPS	\$.28	\$.23	\$.67	\$.67

APPLICATIONS

Applications of Interaction's touch-sensitive CRT option exist wherever simplification of access to online infor mation is desirable. For example:

- simplified operator controls
- office systems
 inventory control
- computer-aided instructions
- medical systems
 public use transaction systems
- consumer sales dialog
- catalog or directory search
 information retrieval

The double-height, double-width character feature of the VT100 complements the use of the touch-sensitive feature in menu selection applications

1982 increased 5 percent over the same period last year to \$10,347,000. Earnings for the period rose 1 percent to \$918,900 as compared with \$908,000 in the prior year. Earnings per share for the Nine Months were \$.67, unchanged from the same period last year.

WESPERCORP, through its Western Peripherals division, manufactures magnetic tape and disc drive controllers for use with mini and microcomputers. Its Datasystems subsidiary produces line printer controllers for minicomputers and its Wesperline division manufactures a complementary line of enclosures to house mini and microcomputers and peripherals. WESPERCORP's newly formed subsidiary, Wesper Microsystems, manufactures and markets add-on controllers that expand the capabilities of popular personal computers.

O Mantha O Mantha

Q/E 3/31/82	Q/E 3/31/81	Ending 3/31/82	9 Months Ending 3/31/81
3,593,200	3,323,100	10,347,000	9,901,200
1,573,700	1,577,200	4,732,700	4,871,000
1,349,400	1,200,400	4,001,900	3,432,400
670,100	545,500	1,612,400	1,597,800
288,200	236,100	693,500	689,800
381,900	309,400	918,900	908,000
1,369,781	1,3674,409	1,370,909	1,348,439
\$ 28	\$ 23	\$ 67	\$ 67

FEATURES

- Reliability The touch-sensitive faceplate has no active or
- mechanical elements and is maintenance free
- Microprocessor controlled touch detection elimi-nates false touches.
- Automatic initialization and continuous recalibration compensate for changes in the operating environment

Ease of Integration into VT100

- Selectable baud rate
- Selectable touch detection time
- Selectable touch repeat rate All electronic and mechanical components needed for installation are included.
- Automatic Self-Diagnostic and Error Reporting



The TK-2100 touch-sensitive **CRT option for the DECTM** VT100TM by Interaction Systems, Inc. CLASSIFIED

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

NEWS

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.

POSITIONS AVAILABLE AT PIKES PEAK LIBRARY DISTRICT

SYSTEMS MANAGER: individual with BA or BS, 2 years experience managing in a RSTS/E installation to supervise and manage on-going operation of a PDP 11/70, 11/44 operation and to plan and budget for the various functions of the Systems Department at "Maggie's Place" a computer operation of international reputation for innovative computer applications and informations systems. Knowledge of Basic+2, RSTS and RMS 11 required. Salary comensurate with experience. P.O. Box 1579, 20 N. Cascade Avenue, Colo. Springs, CO 80901.



FOR SALE PDP 11 70, one megabyte RM03 (67 megabyte) disk drive, two TU45 tape drives, two DZ11 8 line (E.I.A.), LA 36 console terminal. Replacing 4 year old system with VAX 11780 covered by DEC service since new. Call Joe Gerlach, 312-977-2675.

FOR SALE: PDP-11/44, 256KW, RK07's, DZ11, LA34, TJE-16 Mag Tape, RSTS/E and other licenses. George Arnold (414) 784-8250.



featuring: telecomphotoset

LIST OF ADVERTISERS

ABLE	DD OG L B COVER
AMCOR	
ALLOY ENGINEERING	
APPLIED DATA RESEARCH	
BUSINESS CONTROLS CORPORATION	
BLACK BOX CATALOG	
CABLESHARE, INC.	
CALIF. COMPUTING RESOURCES	
CARE INFORMATION SYSTEMS	
СОМРИСОМ	
COMPUTERS-R-DIGITAL	
DATANEX	
DATANEX	
DATA STORAGE TECHNOLOGY	
DATAWARE	
DEXP0 82	
DIGITAL MANAGEMENT GROUP	p.84
DISTRIBUTED LOGIC CORP.	
DATA PROCESSING DESIGN	
EEC SYSTEMS	
EFFECTIVE LEARNING EXCHANGE	
ELECTRONIC SERVICE SPECIALISTS	p.12
EMULEX CORP.	pp 23.61
ENTERPRISE TECHNOLOGY	
EPS, INC.	n 35
FLORIDA COMPUTER, INC.	
FREDERICK ELECTRONICS	
GEJAC	
GEORGE W. HALLAHAN	
HENCO SOFTWARE	
IAS COMPUTER CORP. LTD.	
IRUS	
M SYSTEMS	
MARWAY PRODUCTS, INC.	
MDB SYSTEMS, INC.	
MICROSYSTEMS ENGINEERING	
NATIONWIDE DATA DIALOG	
NYPLAN, INC	
NORTH COUNTY COMPUTER SERVICES, INC.	
ON TRACK SYSTEMS	
RADGO SALES	
RELIANCE ELECTRIC	
RGTI	
SATURN SYSTEMS	
SCHERER'S MINI COMPUTER MART	
SCITEC	
SIGNAL TECHNOLOGY	
SOFTPAK ASSOCIATES	
SOUTHERN SYSTEMS	
SYSTEM INDUSTRIES	
TYMSHARE	
WESPERCORP	
WHITESMITH'S LTD.	
WHY SYSTEMS	
XYLOGICS	p.5

PDP II USERS

WANT AN ALTERNATIVE? YOU CAN HAVE ONE

with computer maintenance from TYNSHARE®

- Maintenance Provided on PDPII Systems
- Mixed Vendor Systems Is Our Specialty
- Servicing Most Major U.S. Cities

Don't wait until your system is down again. For more information write or call now!

Return to: Tymshare Inc. • 3300 Capitol Avenue • Fremont, California 94538 or call 415/794-2528

YOUR NAME	I WOULD LIKE TO BE CONTACTED BY TYMSHARE TO DISCUSS MY MAINTENANCE NEEDS IN MORE DETAIL.	MY PRESENT CONTRACT EXPIRES
	I Would Like A PRICE QUOTE ON THE COST TO MAINTAIN MY COMPUTER SYSTEM	EQUIPMENT TYPE QUANTITY EQUIPMENT TYPE QUANTITY
ADDRESS	TYPE OF MAINTENANCE COVERAGE YOU DESIRE (CHECK ONE)	
PHONE NO.	 8 am to 5 pm Monday through Friday 8 am to 8 pm Monday through Friday 24 hour Monday through Friday 24 hour, 7 days per week Per Call Only Other – Please indicate below: 	
	CIRCLE D11 ON READER CARD	

ABLE GOLD

ABLE IS STILL WINNING THE DECATHON

That rare symbol of achievement and stability in the wild world of DEC compatibility

ABLE is the leading independent supplier of DEC compatible products. No one else comes close. Probably no one else ever will come close because we are still charging along the path that put us on top in the first place. Today, we have the biggest selection in the industry and a pipeline full of new ideas for making your present system run better than ever. We deliver top performance at a competitive price, and we deliver on time. But there is one very important quality which sets us apart from the rest. We are the *innovators*. Fifteen out of our first eighteen products were industry "firsts" which gave DEC users like you their most significant way to achieve better performance without upgrading to a more expensive computer.

Every time we come in first, you come out ahead. That's why there are more than 5,000 ABLE clients worldwide involving 15,000 installations and \$30,000,000 worth of products shipped to date. Our client list runs from "A" to "Z" and includes hundreds of the most famous names of all, along with the small and medium-sized companies which are just as important to us as their larger contemporaries. Find out about our complete line of UNIBUScompatible general-purpose, special-memory and data-communications products as well as the MAGNUM[™] series of computer systems. Find out about our deep commitment to post-sale service which goes far beyond delivering products and includes a worldwide customer support program long recognized as tops in the add-on market. Then go for the gold. Become an ABLE client.

ABLE'S FIFTEEN FAMOUS FIRSTS

- 1st UNIBUS Converter UNIVERTER™
- 1st UNIBUS Cache CACHE/45[™]
- 1st 8KByte UNIBUS Cache CACHE/434[™]
- 1st Full 256KByte FASTBUS Memory Add-In SCAT/45[™]
- 1st Dual-Width In-Line Bus Repeater REBUS™
- 1st Single-Board 4-Line DL Family QUADRASYNC[™]
- 1st Single-Board 4-Line Auto Dialer QUADRACALL™
- 1st 19.2 KBaud DH Communications Multiplexer DMAX/16 $^{\scriptscriptstyle \rm M}$
- 1st Full-Capability DV Replacement ABLE DV/16
- 1st Single-Board 16-Line DZ ABLE DZ/16
- 1st Single-Board DH · ABLE DH/DM
- 1st Single-Board Data Communications Multiplexer with Up/Down Compatibility DZ to DH and More with Simple, Socketed, ROM Changes • ABLE VAX DZ
- 1st 11/34 RSTS Memory Expander Allowing Full 4MByte Addressability • ENABLE/34^{**}
- 1st HiRel 11/24-11/44 Computer System Alternative, a Low Maintenance Industrial Product at a Fair Price • 34 & 44 MAGNUM"
- 1st 11/23 UNIBUS Converter with I/O Map Allowing Full 4MByte Addressability and Full RSTS and RSX Application • UNIMAP"

WHEN WE COME IN FIRST, YOU COME OUT AHEAD. ABLE PRODUCTS MAKE ANY UNIBUS SYSTEM RUN STRONGER AND LAST LONGER.

the computer experts

ABLE COMPUTER, 1732 Reynolds Avenue, Irvine, California 97214. (714) 979-7030. TWX 910-595-1729 ACT IRIN. ABLE COMPUTER, ABLE Computer House, London Road, Newbury, Berkshire, England RG13 2QJ. 44(0635) 32125. TELEX 848715 ABLE G. ABLE COMPUTER GmbH, Forsthausstrasse 1, 8013 Haar (Near Munich), West Germany. 49 089/463080, 463089. TELEX 05213883 ABLE D.

UNIBUS, FASTBUS, RSTS, and DEC are trademarks of Digital Equipment Corporation.

WORD-11. The Word Processing System Vital For VAX.

VAX

DICTIONARY

VAN

VAX

SWI-

The Unabridged Addition.

WORD-11

No matter how many additions you've made to your VAX,[™] it won't be complete without WORD-11.[™] It's the sophisticated word processing system designed to help you use all the other information you've stored. With features like list processing, built-in dictionaries for spelling error detection, automatic table of contents and footnoting that make report writing a snap.

WORD-11 runs concurrently with data processing on multiple terminals. It's easy to use. And it's been up and running in hundreds of installations all over the world for years.

WORD-11 is easy to install and operate. It's

cost effective. And it's supported by a dedicated team of experienced specialists. It could be the most important addition you make to your VAX installation. For details, Call, (714) 993-4160.

VAX

DATA

DICTIONARY

VAX

VAX

COBO

WORD-11 is also available for Digital's RSX-11M,TM RSX-11M PLUSTM and RSTS/ E^{TM} operating systems.



CORPORATE OFFICE 181 W. Orangethorpe, Suite F Placentia, CA 92670 714-993-4160 Telex 182-278

VAX

RMS

VAN

VAX

OFFICE PLUS

VAX

DBMS

VAX

NEOSI

NAMORIA

N Y OFFICE 420 Lexington Avenue, Suite 633 New York, NY 10170 212-687-0104 WASHINGTON D C OFFICE 4520 East-West Highway, Suite 550 Bethesda, MD 20814 301-657-4098

WORD-11 is a trademark of Data Processing Design, Inc. VAX, RSX-11M, RSX-11M PLUS, and RSTS/E are trademarks, and remaining titles are products or trademarks of Digital Equipment Corporation.

KSTS/E are materialks, and remaining times are products of that

CIRCLE D12 ON READER CARD